Cessna
A Textron Company

Maintenance Manual

MODEL 310R AND T310R

REVISION 15 TO THE BASIC MANUAL PROVIDES ADDITIONAL INFORMATION NECESSARY TO MAINTAIN THE AIRPLANE. REVISION 15 INCORPORATES TEMPORARY REVISION 3, DATED 15 JUNE 1999, TEMPORARY REVISION 4, DATED 16 JULY 1999, TEMPORARY REVISION 5, DATED 15 DECEMBER 1999, TEMPORARY REVISION 6, DATED 1 SEPTEMBER 2000, TEMPORARY REVISION 7, DATED 3 JUNE 2002, TEMPORARY REVISION 8, DATED 12 NOVEMBER 2002, AND TEMPORARY REVISION 9, DATED 2 AUGUST 2004.

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CESSNA AIRCRAFT COMPANY
WICHITA, KANSAS, USA

D2514-15-13

1 OCTOBER 1975

REVISION 15 17 JUNE 2005

REVISION

MODEL 310R SERIES
1975 THRU 1981
MAINTENANCE MANUAL

REVISION 15
17 JUNE 2005

D2514-15-13

The entire manual is provided with this revision. Please replace your current manual in its entirety.

LIST OF EFFECTIVE PAGES

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00-List of Effective Pages		
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RECORD OF TEMPORARY REVISIONS

Temporary Revision Number	Page Number	Issue Date	By	Date Removed	By
5-1	various pages	4/1/2009	ATP/MT		
5-2	various pages	AUG 15, 2019	ATP/RLL		
27-1	27-50-00; pages 501-507	AUG 1, 2021	ATP/RLL		

TEMPORARY REVISION NUMBER 5-1

DATED 1 APRIL 2009

MANUAL TITLE	Model 310R/T310R Series (1975 Thru 1981) Maintenance Manual
MANUAL NUMBER - PAPER COPY	D2514-15-13
MANUAL NUMBER - AEROFICHE	D2514-15-13AF
TEMPORARY REVISION NUMBER	D2514-15TR5-1

MANUAL DATE 1 October 1975 **REVISION NUMBER** 15 **DATE** 17 June 2005

This Temporary Revision consists of the following pages, which affect and replace existing pages in the paper copy manual and supersede aerofiche information.

CHAPTER/ SECTION/ SUBJECT	PAGE	AEROFICHE FICHE/FRAME	CHAPTER/ SECTION/ SUBJECT	PAGE	AEROFICHE FICHE/FRAME
S/B List	1 - 6	1/A09 thru 1/A14	5-12-47	1 - 5	Added
5-00-00	1 - 2	Added	5-12-48	1 - 2	Added
5-10-00	1 - 4	Added	5-12-49	1	Added
5-10-01	1 - 31	1/B21 thru 1/D03	5-12-50	1	Added
5-10-01	32 - 44	Added	5-13-00	1 - 9	1/F14 thru 1/F22
5-11-00	1 - 2	1/D04 thru 1/D05	5-13-00	10	Added
5-12-03	1 - 5	1/D14 thru 1/D19	5-14-00	1 - 6	1/G08 thru 1/G13
5-12-03	6	Deleted	5-14-05	1 - 3	1/G21 thru 1/G23
5-12-24	1	1/E17	5-14-06	1 - 3	1/H01 thru 1/H03
5-12-25	1	1/E18	5-14-36	1	1/I20
5-12-43	1	1/F13	5-14-38	1	1/I22
5-12-43	2	Added	5-14-44	1 - 2	Added
5-12-44	1 - 2	Added	5-14-45	1	Added
5-12-45	1 - 3	Added	5-30-00	1 - 18	Added
5-12-46	1 - 2	Added	6-20-01	1 - 4	2/D13 thru 2/D16

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CHAPTER/ SECTION/ SUBJECT	PAGE	AEROFICHE FICHE/FRAME	CHAPTER/ SECTION/ SUBJECT	PAGE	AEROFICHE FICHE/FRAME
27-00-00	601 - 604	5/A14 thru 5/A17	51-10-01	1 - 6	Added
27-00-00	605 - 606	Added	51-12-00	1 - 7	Added
27-10-00	401 - 420	5/A21 thru 5/B16			

REASON FOR TEMPORARY REVISION

1. To revise the Supplemental Inspection Document (SIDs) Information.
2. To add the Corrosion Prevention and Control Program (CPCP) Information.
3. To add Control Cable Inspection Information.
4. To revise Aileron Cable Removal and Installation Information.

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1. For Paper Publications, file this cover sheet behind the publication's title page to identify inclusion of the temporary revision in the manual. Insert the new pages in the publication at the appropriate locations and remove and discard the superseded pages.
2. For Aerofiche Publications, draw a line, with permanent red ink marker, through any aerofiche frame (page) affected by the temporary revision. This will be a visual identifier that the information on the frame (page) is no longer valid and the temporary revision should be referenced. For "added" pages in a temporary revision, draw a vertical line between the applicable frames. Line should be wide enough to show on the edges of the pages. Temporary revisions should be collected and maintained in a notebook or binder near the aerofiche library for quick reference.
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TEMPORARY REVISION NUMBER 5-2

DATED 15 AUGUST 2019

MANUAL TITLE	Model 310R Maintenance Manual
MANUAL NUMBER - PAPER COPY	D2514-15-13
TEMPORARY REVISION NUMBER	D2514-15TR5–2

MANUAL DATE 1 October 1975 **REVISION NUMBER** 15 **DATE** 17 June 2005

This Temporary Revision consists of the following pages, which affect and replace existing pages in the paper copy manual.

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5-10-00	1 thru 4	5-14-00	1 thru 6
5-10-01	1 thru 43	5-14-36	1 and 2
5-12-33	1 and 2	5-14-38	1 thru 3
5-12-51	1	5-14-46	1 thru 3
5-12-52	1	5-15-36	1 thru 3
5-13-01	1 thru 37	5-15-38	Deleted

REASON FOR TEMPORARY REVISION

1. To revise Inspection Time Intervals 5-10-00.
2. To revise Inspection Time Limits 5-10-01.
3. To revise Inspection Operation 33 document, 5-12-33.
4. To add Inspection Operation 51 document, 5-12-51.
5. To add Inspection Operation 52 document, 5-12-52.
6. To add Eddy Current Bolt Hole Techniques to Nondestructive Inspection Methods and Requirements, 5-13-01.
7. To revise List of Supplemental Inspections, 5-14-00.
8. To revise 5-14-36, Supplemental Inspection 57-10-06, Lower Main Wing Spar Cap Inspection and Modification.
9. To revise 5-14-38, Supplemental Inspection 57-10-08, Lower Carry-Thru Main Spar Cap (P/N 0811300-3).
10. To add 5-14-46, Supplemental Inspection 57-10-29, Lower Carry-Thru Main Spar Cap (P/N 0811300-78).
11. To add 5-15-36, Supplemental Inspection 57-10-06, Lower Main Wing Spar Cap Inspection and Modification.
12. To remove 5-15-38, Supplemental Inspection Number 57-10-08, Lower Carry-Thru Main Spar Cap Assembly at WS 18.13.

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TEMPORARY REVISION NUMBER 27-1

DATED 1 AUGUST 2021

MANUAL TITLE	Model 310R Maintenance Manual
MANUAL NUMBER - PAPER COPY	D2514-15-13
TEMPORARY REVISION NUMBER	D2514-15TR27-1

MANUAL DATE 1 October 1975 **REVISION NUMBER** 15 **DATE** 17 June 2005

This Temporary Revision consists of the following pages, which affect and replace existing pages in the paper copy manual.

SUBJECT	REMOVE PAGE(S)	INSERT PAGE(S)
27-50-00	**50**1 thru 507	**50**1 thru 507

REASON FOR TEMPORARY REVISION

1. Added a Caution stating "cable tensions on the forward cables are not the same from side to side".

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LIST OF MANUFACTURERS TECHNICAL PUBLICATIONS

1. List of Manufacturers Technical Publications

A. Outlined below is a list of manufacturers publications.

CHAPTER 34 - NAVIGATION

Item	Cessna Part Number	Manufacturers Part Number	Publication Part Number	Publication Title	Manufacturer
		R-546A&E	D4508-13	300 ADF Service Parts Manual	Cessna
		RT-385A	D4578-13	300 NAV/COM 720 Channel Service Parts Manual	Cessna
		R-446A	D4543-13	400 ADF Service Parts Manual	Cessna
		RT-485A	7010411	440NAV/COM 720 Channel Service Parts Manual.	Cessna
		RN-478A	D4564-13	400 R-Nav Service Parts Manual	Cessna
		RTA-476A	D4563-13	400 DME Service Parts Manual	Cessna
		R-402A	D4534-13	400 Marker Beacon Service Parts Manual	Cessna
		R-443B	D4535-13	400 Glideslope Service Parts Manual	Cessna
		AF-550A	D4565-1-13	400B Navomatic Service Parts Manual	Cessna
		IF-550	D4566-1-13	400B IFCS Service Parts Manual	Cessna
		IN-803A	D4561-13	400 Transponder	Cessna
		RT-859A	D4521-13	800 RMI Service Parts Manual	Cessna
		RN-878A	D4572-1-13	800 Transponder	Cessna
		R-1048A&B	D4571-13	800 R-Nav Service Parts Manual	Cessna
		R-1038A	D4570-13	1000 NAV System Service Parts Manual	Cessna
		R-1046A	D4345S1-13	1000 Communica-tions System Service Parts Manual	Cessna
		R-1043A	D4574-13	1000 ADF	Cessna
		IN-1004A	14583-13	1000 RMI Service Parts Manual	Cessna

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CHAPTER 34 - NAVIGATION

Item	Cessna Part Number	Manufacturers Part Number	Publication Part Number	Publication Title	Manufacturer
		PT-10-A	T-10R-13	HF Transceiver Service Parts Manual	Sunair
		RDR-150	ACS 806-13	Weather Radar Installation Manaul	Bendix
		RDR-150	EB22026A	Weather Radar - Color Installation Manual	Bendix
		RDR-160	ACD 813-13	Weather Radar Installation Manual	Bendix

CHAPTER 24 - ELECTRICAL POWER

Item	Cessna Part Number	Manufacturers Part Number	Publication Part Number	Publication Title	Manufacturer
		R2425	PRB8-13	Battery Service Manual	Prestolite
		G3600A	H5-50067	Landing Light Overhaul Parts	Grimes
		30-1172-1 & 30-1172-5	MD30-2-13	Strobe Light Maintenance	Grimes
		---	D5230-13	DC Generation	Cessna

CHAPTER 71 - POWER PLANT

Item	Cessna Part Number	Manufacturers Part Number	Publication Part Number	Publication Title	Manufacturer
		I0-520	X30039-13	Maintenance and Overhaul	Teledyne Continental
		TSI0-520	X30042-13	Maintenance and Overhaul	Teledyne Continental
		I0-520	X30040A-13	Parts Catalog	Teledyne Continental
		TSIO-520	X30043A-13	Parts Catalog	Teledyne Continental
		----	AV6-13	Spark Plug Services	Champion
		---	M73-19	Service Bulletin	Teledyne Continental

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CHAPTER 81 - TURBINES

Item	Cessna Part Number	Manufacturers Part Number	Publication Part Number	Publication Title	Manufacturer
		---	TP30-4001	Aircraft Turbochargers, Valves and Controllers Illustrated Parts Catalog	Kelley Aerospace
		---	TP20-0120	Aircraft Turbochargers, Valves and Controllers Overhaul Manual	Kelley Aerospace

CHAPTER 74 - IGNITION

Item	Cessna Part Number	Manufacturers Part Number	Publication Part Number	Publication Title	Manufacturer
Engine		---	S-200	Magneto Overhaul Instructions	Bendix

CHAPTER 21 - AIR CONDITIONING

Item	Cessna Part Number	Manufacturers Part Number	Publication Part Number	Publication Title	Manufacturer
		---	D5428-13	Heater and Components Service Parts Manual	Cessna
		---	D5213-13	Air Conditioning System Service Parts Manual	Cessna
		OM310-1	78D55-13	Air Conditioning System Overhaul Manaul	Janitrol

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CHAPTER 28 - FUEL

Item	Cessna Part Number	Manufacturers Part Number	Publication Part Number	Publication Title	Manufacturer
		9910202-1	M10030-13	Auxiliary Fuel Pump Overhaul Manual	Weldon
		9910202-2	M10032-13	Auxiliary Fuel Pump Overhaul Manual	Weldon
		4140-00-153	4140-00-13	Auxiliary Fuel Pump - Wing Locker Overhaul with Parts Breakdown Manual	Dukes, Inc.
		---	D5456-13	Capacitance Fuel System Test Box Operating Instructions	Cessna

CHAPTER 32 - LANDING GEAR

Item	Cessna Part Number	Manufacturers Part Number	Publication Part Number	Publication Title	Manufacturer
		---	D5266-13	Model 300 and 400 Series Component Maintenance Manual,	Cessna

CHAPTER 61 - PROPELLER

Item	Cessna Part Number	Manufacturers Part Number	Publication Part Number	Publication Title	Manufacturer
		3AF32C Series	710930-1-13	Propeller Parts Manual	McCauley
		---	780401-13	Governor and Accumulators Overhaul Parts Manual	McCauley

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CHAPTER 61 - PROPELLER

Item	Cessna Part Number	Manufacturers Part Number	Publication Part Number	Publication Title	Manufacturer
		0071-04160		Synchrophaser Services Parts Manual	Sigma-Tech1001 Industrial Rd. Augusta, KS 67010
		---	MPC4-13	Full Feathering, Constant Speed Propeller Governing System (Basic Principals)	McCauley
		---	810915	C500 Series Overhaul/Parts Manual	McCauley

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SERVICE BULLETIN LIST

Service Letter/Service Bulletin Number	Title	Service Bulletin Date	Manual Incorporation
SK310-32B	Oxygen Refill Kit - Less Bottle	26 Sep 1969	Jan 1978
SK310-100	Air Canister and Control Replacement Kit	2 Dec 1977	Nov 1978
SK310-101	Heated Windshield Panel Replacement	1 Mar 1978	Nov 1978
SK310-102	VHF Com Antenna	21 Jan 1980	Nov 1980
SK340-22	Alternator Fail Sensor Filter Installation	18 Jan 1980	Jan 1980
SK414-10	Synchrophaser System Modification Kit	1 Mar 1978	Nov 1978
SK414-16	Propeller Deice Cable Improvements	30 Jan 1981	May 1981
SK421-86	Emergency Locator Transmitter Battery Pack Replacement	13 Nov 1978	Jan 1979
SK421-89	Emergency Locator Transmitter Battery Pack Replacement	13 Nov 1978	Jan 1979
SK421-92A	Prestolite 100A Alternator Exchange	15 Jun 1981	Apr 1982
ME75-20 Revision 1	Front Wing Spar Inspection	12 Dec 1975	
ME75-25	Improved Voltage Regulator	26 Sep 1975	
ME75-26	Model 310 Emergency Exit Window	3 Oct 1975	
ME76-2	Wing Rib Improvement - Main Landing Gear Side Brace	5 Jan 1976	
ME76-4	Main Landing Gear Down Lock Pin and Set Screw Inspection	23 Jan 1976	
ME76-06	Aileron Pulley Installation	13 Feb 1976	
ME76-8	Induction Manifold Fuel Drain Hose Relocation (Right Hand Engine)	5 Apr 1976	
ME76-9	Improved Powerplant Control Cables	19 Apr 1976	
ME76-9 Supplement 1	Improved Powerplant Control Cables	28 Feb 1977	
ME76-15	Alternator Face Drive Gear Lockplate Inspection	26 Jul 1976	
ME76-17	Cowl Flap Handle Attachment Modification	16 Aug 1976	
ME76-23	Engine Airstarts At Altitude	20 Dec 1976	
ME76-24 Supplement 1	Aileron Trim Cable Interference Inspection	21 Feb 1977	
ME77-6	Lower Wing Skin/Front Spar Rivets	21 Mar 1977	
ME77-7	Airflow Micro Switch Replacements	21 Mar 1977	
ME77-9	Emergency Exit Modification	4 Apr 1977	

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Service Letter/Service Bulletin Number	Title	Service Bulletin Date	Manual Incorporation
ME77-10	Oil Filled Propeller Hubs	25 Apr 1977	
ME77-12	Nose Wheel Well Modification	2 May 1977	
ME77-22	Crankcase Identification, Inspection and Replacement	25 Jul 1977	
ME77-25	Encoding Altimeter Diode Replacement	6 Sep 1977	
ME77-34	Trim Control System Inspection	23 Dec 1977	
ME78-5	Hi-Lok Fasteners	20 Feb 1978	
ME78-7	Fuel Tank Inspection	20 Mar 1978	Nov 1978
ME78-8	HSI Electrical Connector Storage	20 Mar 1978	Nov 1978
ME78-9	Alternate Air Control Design Improvement	3 Apr 1978	Nov 1978
ME78-11	Scott "Sky Mask" Filter Retention	3 Apr 1978	
ME78-13	Improved Synchrophaser System	12 Apr 1978	
ME78-14	Heated Windshield Panel Replacement	10 Apr 1978	
ME78-23	Installation of Correct Spare Alternator Fuses	24 Jul 1978	
ME78-40	Instrument Panel Cooling Fan	23 Oct 1978	
ME79-2	Use of Fuel Additive for Cold Weather Operation	16 Feb 1979	
ME79-3 Revision 1	Oil Pressure Relief Valve Plunger and Screw Replacement	4 May 1979	
ME79-22	Taxi Lamp Improvement	6 Jun 1979	
ME79-25	Emergency Airworthiness Directive Dated June 7, 1979, On Airborne Vacuum Pump	9 Jul 1979	
ME79-26	Auxiliary Wing Locker Tank Filler Cap Rework	25 Jul 1979	
ME79-28	Trim Tab Actuator Inspection	1 Aug 1979	
ME79-32	Exhaust System Improvements	17 Aug 1979	
ME79-36	Fuel and Oil Line Restrictors	12 Oct 1979	
ME79-40	Troubleshooting for Vibrations	14 Dec 1979	
ME79-42	Oxygen Hose Assembly Inspection	14 Dec 1979	Nov 1980
ME80-1	Alternator Position	11 Jan 1980	Nov 1980
ME80-3	Alternator Out - Sensor Filter	1 Feb 80	
ME80-5	Improvements to Optional Fuel Flow Indicator	8 Feb 1980	
ME80-7	Improved Landing Gear Placards	22 Feb 1980	
ME80-10	Alternator Malfunction Inspection	24 Mar 1980	Nov 1980
ME80-11	Main Gear Aft Trunnion Support	18 Apr 1980	Nov 1980
ME80-12 Revision 1	100 Amp Teledyne Crittenden Alternator Improvements	6 May 1980	
ME80-13	Improved Powerplant Intake Manifold Drain System	7 Nov 1980	Feb 1981

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Service Letter/Service Bulletin Number	Title	Service Bulletin Date	Manual Incorporation
ME80-17	Exhaust System Flange Inspection	2 May 1980	
ME80-25 Revision 1	Fuel Flow Sensor Transducer Inspection/ Replacement	18 Jul 1980	
ME81-31	Pneumatic Extender Installation Nacelle, Nose Baggage and Avionics Doors	24 Nov 1981	Apr 1982
ME80-32	Turbocharger Induction System Troubleshooting	25 Jul 1980	
ME80-37	Repairable Fuel Drain Valves	8 Aug 1980	
ME80-48 Revision 1	Fuel Pump Thru Bolt Torque Inspection	5 Jun 1981	
ME81-3 Revision 1	Propeller Deice Cable Improvements	5 Mar 1982	
ME81-06	Oil Dipstick Corrosion	13 May 1982	
ME81-9	Cleveland Wheel Bearing Inspection and Wheel Spacer Replacement	10 Apr 1981	
ME81-13	Heater Hour Meter and Flight In Known Icing Accessory Kits	12 Jun 1981	
ME81-15	Instrument Clamp Inspection	26 Jun 81	
ME81-17 Revision 1	Improved Engine Compartment Hose Assemblies	5 Nov 1982	
ME81-20 Revision 1	Prestolite to Teledyne Crittenden 100 Amp Alternator Conversion	19 Aug 1983	
ME81-23	Flight In Known Icing Accessory Kit	21 Aug 1981	
ME81-31	Pneumatic Extender Installation for Nacelle and Nose Baggage and Avionics Bay Doors	24 Nov 1981	
ME82-4	100 Amp Prestolite Alternator Water Deflector Installation	15 Jan 1982	
ME82-55	Rudder Pedal Brake Return Spring Improvement	22 Oct 1982	
ME83-4 Revision 2	Pneumatic Door Extender Inspection/Repositioning	22 Apr 1983	
ME83-9	Propeller Counterweight Bolt Replacement	25 Mar 1983	
ME83-38	Repairable Fuel Drain Valve Improvement	2 Dec 1983	
ME84-30	Aircraft Windshield and Window Maintenance Procedure	27 Jul 1984	
ME84-31	Fuel Filter Diameter Modification and External Turbo Placard Removal	20 Jul 1984	
ME84-38	Main Gear Wheel Thru Bolt Improvement	16 Nov 1984	
MEB85-2	Fuel Filler Cap Inspection and Replacement	8 Feb 1985	
MEB85-9	Nav 2 Indicator Glideslope Placard Installation	10 May 1985	

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Service Letter/Service Bulletin Number	Title	Service Bulletin Date	Manual Incorporation
MEB85-10 Revision 1	Main Gear Wheel Thru Bolt Improvement	10 May 1985	
MEB85-20	Nose Gear Drag Brace Bearing Retention Improvement	18 Oct 1985	
MEB86-4	Altimeter Inspection and Modification	19 Mar 1984	
MEB86-5 Revision 2	Engine Cylinder Barrel Crack Inspection	16 Jan 1987	
MEB86-9	Heater Motor Clamp Modification	9 May 1986	
MEB86-15	Special "Seat Locked" and "Fuel Contamination" Warning Placards	11 Jul 1986	
MEB88-3 Revision 2	Auxiliary Fuel Pump Wiring Modification	19 Jan 1991	
MEB88-5 Revision 2	Nose Gear Trunnion Inspection and Replacement	31 Jan 1992	
MEB88-7	Main Landing Gear Inner Bearing Inspection/ Replacement	2 Dec 1988	
MEB89-3 Revision 2	Crew Seat Back Reinforcing Strap Installation	5 May 2003	
MEB91-9	Engine Cylinder Barrel Inspection	3 Dec 1991	
MEB92-6	Engine Rocker Shaft Retention Improvement For Inclined Valve Cylinders	24 Apr 1992	
MEB92-10	Engine Oil Cooler Inspection	9 Oct 1992	
MEB92-12 Revision 1	Replacement of Airmelt (Non-Var) Crankshafts Installed In Teledyne Continental Motors	17 Nov 1997	
MEB93-2	New and Rebuilt TCM Alternator Thru-Bolt Inspection	19 Mar 1993	
MEB93-3 Revision 1	Propeller Periodic Hub Inspection	18 Feb 1994	
MEB93-4 Revision 1	Engine Fuel Pump Drive Coupling Inspection/ Replacement	17 Nov 1997	
MEB93-5	Rocker Arm to Rotocoil Clearance Inspection	19 Mar 1993	
MEB93-8	Valve Retainer Key Installation Inspection	18 Jun 1993	
MEB93-11	Pitot Heater and Single Engine Operation Warning Placards	16 Dec 1994	
MEB93-12	Propeller Threaded Blade Inspection	17 Dec 1993	
MEB94-1	Emergency Exit Window Inspection	25 Feb 1994	
MEB94-2	Magneto Capacitor Inspection	18 Mar 1994	
MEB94-3 Revision 1	Dukes Auxiliary Fuel Boost Pump Overhaul Interval	23 Nov 1994	

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Service Letter/Service Bulletin Number	Title	Service Bulletin Date	Manual Incorporation
MEB94-4 Revision 1	Dukes Auxiliary Fuel Boost Pump Vane Replacement	23 Nov 1994	
MEB94-6	Replacement of Magneto Coils and Rotating Magnets	27 May 1994	
MEB95-2	Engine Oil Pump Gasket Inspection	24 Feb 1995	
MEB95-3	Engine Crankcase Stud Inspection	24 Mar 1994	
MEB95-9	Cabin Heater Fuel Line Inspection/Replacement	16 Jun 1995	
MEB96-3	Fuel Flow Transducer Replacement	1 Mar 1996	
MEB96-4	Seat Belt and Shoulder Harness Connection Inspection	29 Mar 1996	
MEB96-8	Airborne Fuel Pump Inspection/Replacement	21 Jun 1996	
MEB96-9	Engine Crankshaft Gear Bolt Inspection	16 Aug 1996	
MEB96-10	S51-10 Hose Inspection/Replacement	10 Oct 1996	
MEB96-11	Seat Belt and Shoulder Harness Installation	18 Oct 1996	
MEB97-3	AN3-5A Bolt Inspection/Replacement	24 Mar 1997	
MEB97-4	Flight In Known Icing Is Prohibited Placard Installation	24 Mar 1997	
MEB97-5	Engine Piston Pin Plug Wear Inspection	28 Jul 1997	
MEB97-9	Flap Actuator Limit Switch Inspection	6 Oct 1997	
MEB97-10	Engine Crankcase Overboard Breather Tube Inspection	6 Oct 1997	
MEB97-13	Teledyne Continental Motors (TCM) Crankshaft Ultrasonic Inspection	17 Nov 1997	
MEB98-6 Revision 1	Engine Intake and Exhaust Valve Inspection	26 Oct 1998	
MEB98-10	Airborne Vacuum Pump Inspection	2 Nov 1998	
MEB99-2	Teledyne Continental Engine Crankshaft Inspection	26 Apr 1999	
MEB99-4	Battery, Starter and External Power Relay Inspection	28 Jun 1999	
MEB99-5	Engine Baffle Modification	2 Aug 1999	
MEB99-6	Engine Exhaust Access Panels Installation	2 Aug 1999	
MEB99-7	Engine Beam Inspection and Modification	2 Aug 1999	
MEB99-8	Crossfeed Fuel Lines Replacement	2 Aug 1999	
MEB99-18	Exhaust Spring Inspection/Replacement	2 Aug 1999	
MEB99-19	Vacuum System Check - POH/Owner Manual/Flight Manual Supplement	4 Oct 1999	
MEB00-1 Revision 1	Teledyne Continental Engine Crankshaft Material Inspection	26 Dec 2000	

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Service Letter/Service Bulletin Number	Title	Service Bulletin Date	Manual Incorporation
MEB00-5	Vacuum System Manifold Check Valve Inspection/Replacement	2 Oct 2000	
MEB00-9 Revision 2	Engine Breather Line Modification/Breather Vent Tube Installation	4 Nov 2002	
MEB01-2	Universal Windshield Anti-Ice Panel Installation	29 Jan 2001	
MEB01-3	Alternator Drive Gear Hub Elastomer Inspection	26 Mar 2001	
MEB01-4	Teledyne Continental Engine Driven Fuel Pump Inspection and Seal Leak Test	2 Jul 2001	
MEB02-1	Engine Failure During Flight Emergency Procedures	28 Jan 2002	
MEB02-2	Dry Vacuum Pump and Coupling Replacement Requirements	25 Feb 2002	
MEB02-6	Engine Starter Adapter Shaft Seal Replacement	24 Jun 2002	
MEB02-8	Pointer 3000-11 ELT Installation	7 Oct 2002	
MEB02-12	Main Landing Gear Torque Link Inspection	4 Nov 2002	
MEB02-13	Magneto Capacitor Inspection	28 Dec 2002	
MEB04-2	Magneto Capacitor Inspection	20 Sep 2004	
MEB05-4	Lower Front Wing Spar Cap Inspection/Modification	30 May 2005	
MEB05-5 Revision 1	Lower Front Wing Spar Cap Inspection/Modification	22 Jan 2007	
MEB05-7	Engine Fuel Flow Transducer Replacement	3 Oct 2005	
MEB05-8	McCauley Propeller Hub Inspection	17 Oct 2005	
MEB05-9	Vacuum Pump Inspection/Replacement	7 Nov 2005	
MEB06-1	Electrical Ground Strap Inspection	16 Oct 2006	
MEB07-3	Access Panel Installation and Fuselage Wing Fitting Inspection	12 Nov 2007	
MEB07-4	Elevator Trim Tab Actuator Assembly Inspection	12 Nov 2007	
MEB08-2	Main Landing Gear Torque Tube and Support Bracket Inspection	14 Apr 2008	
MEB08-3	Upper Wing Skin Inspection	7 Jul 2008	
MEB08-5	Unision Industries Slick 4300/6300 Magnetos Inspection	4 Aug 2008	

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SERVICE BULLETIN LIST

Service Letter/Service Bulletin Number	Title	Service Bulletin Date	Manual Incorporation
SK310-32B	Oxygen Refill Kit - Less Bottle	26 Sep 1969	Jan 1978
SK310-100	Air Canister and Control Replacement Kit	2 Dec 1977	Nov 1978
SK310-101	Heated Windshield Panel Replacement	1 Mar 1978	Nov 1978
SK310-102	VHF Com Antenna	21 Jan 1980	Nov 1980
SK340-22	Alternator Fail Sensor Filter Installation	18 Jan 1980	Jan 1980
SK414-10	Synchrophaser System Modification Kit	1 Mar 1978	Nov 1978
SK414-16	Propeller Deice Cable Improvements	30 Jan 1981	May 1981
SK421-86	Emergency Locator Transmitter Battery Pack Replacement	13 Nov 1978	Jan 1979
SK421-89	Emergency Locator Transmitter Battery Pack Replacement	13 Nov 1978	Jan 1979
SK421-92A	Prestolite 100A Alternator Exchange	15 Jun 1981	Apr 1982
ME75-20 Revision 1	Front Wing Spar Inspection	12 Dec 1975	
ME75-25	Improved Voltage Regulator	26 Sep 1975	
ME75-26	Model 310 Emergency Exit Window	3 Oct 1975	
ME76-2	Wing Rib Improvement - Main Landing Gear Side Brace	5 Jan 1976	
ME76-4	Main Landing Gear Down Lock Pin and Set Screw Inspection	23 Jan 1976	
ME76-06	Aileron Pulley Installation	13 Feb 1976	
ME76-8	Induction Manifold Fuel Drain Hose Relocation (Right Hand Engine)	5 Apr 1976	
ME76-9	Improved Powerplant Control Cables	19 Apr 1976	
ME76-9 Supplement 1	Improved Powerplant Control Cables	28 Feb 1977	
ME76-15	Alternator Face Drive Gear Lockplate Inspection	26 Jul 1976	
ME76-17	Cowl Flap Handle Attachment Modification	16 Aug 1976	
ME76-23	Engine Airstarts At Altitude	20 Dec 1976	
ME76-24 Supplement 1	Aileron Trim Cable Interference Inspection	21 Feb 1977	
ME77-6	Lower Wing Skin/Front Spar Rivets	21 Mar 1977	
ME77-7	Airflow Micro Switch Replacements	21 Mar 1977	
ME77-9	Emergency Exit Modification	4 Apr 1977	

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Service Letter/Service Bulletin Number	Title	Service Bulletin Date	Manual Incorporation
ME77-10	Oil Filled Propeller Hubs	25 Apr 1977	
ME77-12	Nose Wheel Well Modification	2 May 1977	
ME77-22	Crankcase Identification, Inspection and Replacement	25 Jul 1977	
ME77-25	Encoding Altimeter Diode Replacement	6 Sep 1977	
ME77-34	Trim Control System Inspection	23 Dec 1977	
ME78-5	Hi-Lok Fasteners	20 Feb 1978	
ME78-7	Fuel Tank Inspection	20 Mar 1978	Nov 1978
ME78-8	HSI Electrical Connector Storage	20 Mar 1978	Nov 1978
ME78-9	Alternate Air Control Design Improvement	3 Apr 1978	Nov 1978
ME78-11	Scott "Sky Mask" Filter Retention	3 Apr 1978	
ME78-13	Improved Synchrophaser System	12 Apr 1978	
ME78-14	Heated Windshield Panel Replacement	10 Apr 1978	
ME78-23	Installation of Correct Spare Alternator Fuses	24 Jul 1978	
ME78-40	Instrument Panel Cooling Fan	23 Oct 1978	
ME79-2	Use of Fuel Additive for Cold Weather Operation	16 Feb 1979	
ME79-3 Revision 1	Oil Pressure Relief Valve Plunger and Screw Replacement	4 May 1979	
ME79-22	Taxi Lamp Improvement	6 Jun 1979	
ME79-25	Emergency Airworthiness Directive Dated June 7, 1979, On Airborne Vacuum Pump	9 Jul 1979	
ME79-26	Auxiliary Wing Locker Tank Filler Cap Rework	25 Jul 1979	
ME79-28	Trim Tab Actuator Inspection	1 Aug 1979	
ME79-32	Exhaust System Improvements	17 Aug 1979	
ME79-36	Fuel and Oil Line Restrictors	12 Oct 1979	
ME79-40	Troubleshooting for Vibrations	14 Dec 1979	
ME79-42	Oxygen Hose Assembly Inspection	14 Dec 1979	Nov 1980
ME80-1	Alternator Position	11 Jan 1980	Nov 1980
ME80-3	Alternator Out - Sensor Filter	1 Feb 80	
ME80-5	Improvements to Optional Fuel Flow Indicator	8 Feb 1980	
ME80-7	Improved Landing Gear Placards	22 Feb 1980	
ME80-10	Alternator Malfunction Inspection	24 Mar 1980	Nov 1980
ME80-11	Main Gear Aft Trunnion Support	18 Apr 1980	Nov 1980
ME80-12 Revision 1	100 Amp Teledyne Crittenden Alternator Improvements	6 May 1980	
ME80-13	Improved Powerplant Intake Manifold Drain System	7 Nov 1980	Feb 1981

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Service Letter/Service Bulletin Number	Title	Service Bulletin Date	Manual Incorporation
ME80-17	Exhaust System Flange Inspection	2 May 1980	
ME80-25 Revision 1	Fuel Flow Sensor Transducer Inspection/ Replacement	18 Jul 1980	
ME81-31	Pneumatic Extender Installation Nacelle, Nose Baggage and Avionics Doors	24 Nov 1981	Apr 1982
ME80-32	Turbocharger Induction System Troubleshooting	25 Jul 1980	
ME80-37	Repairable Fuel Drain Valves	8 Aug 1980	
ME80-48 Revision 1	Fuel Pump Thru Bolt torque Inspection	5 Jun 1981	
ME81-3 Revision 1	Propeller Deice Cable Improvements	5 Mar 1982	
ME81-06	Oil Dipstick Corrosion	13 May 1982	
ME81-9	Cleveland Wheel Bearing Inspection and Wheel Spacer Replacement	10 Apr 1981	
ME81-13	Heater Hour Meter and Flight In Known Icing Accessory Kits	12 Jun 1981	
ME81-15	Instrument Clamp Inspection	26 Jun 81	
ME81-17 Revision 1	Improved Engine Compartment Hose Assemblies	5 Nov 1982	
ME81-20 Revision 1	Prestolite to Teledyne Crittenden 100 Amp Alternator Conversion	19 Aug 1983	
ME81-23	Flight In Known Icing Accessory Kit	21 Aug 1981	
ME81-31	Pneumatic Extender Installation for Nacelle and Nose Baggage and Avionics Bay Doors	24 Nov 1981	
ME82-4	100 Amp Prestolite Alternator Water Deflector Installation	15 Jan 1982	
ME82-55	Rudder Pedal Brake Return Spring Improvement	22 Oct 1982	
ME83-4 Revision 2	Pneumatic Door Extender Inspection/Repositioning	22 Apr 1983	
ME83-9	Propeller Counterweight Bolt Replacement	25 Mar 1983	
ME83-38	Repairable Fuel Drain Valve Improvement	2 Dec 1983	
ME84-30	Aircraft Windshield and Window Maintenance Procedure	27 Jul 1984	
ME84-31	Fuel Filter Diameter Modification and External Turbo Placard Removal	20 Jul 1984	
ME84-38	Main Gear Wheel Thru Bolt Improvement	16 Nov 1984	
MEB85-2	Fuel Filler Cap Inspection and Replacement	8 Feb 1985	
MEB85-9	Nav 2 Indicator Glideslope Placard Installation	10 May 1985	

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Service Letter/Service Bulletin Number	Title	Service Bulletin Date	Manual Incorporation
MEB85-10 Revision 1	Main Gear Wheel Thru Bolt Improvement	10 May 1985	
MEB85-20	Nose Gear Drag Brace Bearing Retention Improvement	18 Oct 1985	
MEB86-4	Altimeter Inspection and Modification	19 Mar 1984	
MEB86-5 Revision 2	Engine Cylinder Barrel Crack Inspection	16 Jan 1987	
MEB86-9	Heater Motor Clamp Modification	9 May 1986	
MEB86-15	Special "Seat Locked" and "Fuel Contamination" Warning Placards	11 Jul 1986	
MEB88-3 Revision 2	Auxiliary Fuel Pump Wiring Modification	19 Jan 1991	
MEB88-5 Revision 2	Nose Gear Trunnion Inspection and Replacement	31 Jan 1992	
MEB88-7	Main Landing Gear Inner Bearing Inspection/ Replacement	2 Dec 1988	
MEB89-3 Revision 2	Crew Seat Back Reinforcing Strap Installation	5 May 2003	
MEB91-9	Engine Cylinder Barrel Inspection	3 Dec 1991	
MEB92-6	Engine Rocker Shaft Retention Improvement for Inclined Valve Cylinders	24 Apr 1992	
MEB92-10	Engine Oil Cooler Inspection	9 Oct 1992	
MEB92-12 Revision 1	Replacement of Airmelt (Non-Var) Crankshafts Installed In Teledyne Continental Motors	17 Nov 1997	
MEB93-2	New and Rebuilt TCM Alternator Thru-Bolt Inspection	19 Mar 1993	
MEB93-3 Revision 1	Propeller Periodic Hub Inspection	18 Feb 1994	
MEB93-4 Revision 1	Engine Fuel Pump Drive Coupling Inspection/ Replacement	17 Nov 1997	
MEB93-5	Rocker Arm to Rotocoil Clearance Inspection	19 Mar 1993	
MEB93-8	Valve Retainer Key Installation Inspection	18 Jun 1993	
MEB93-11	Pitot Heater and Single Engine Operation Warning Placards	16 Dec 1994	
MEB93-12	Propeller Threaded Blade Inspection	17 Dec 1993	
MEB94-1	Emergency Exit Window Inspection	25 Feb 1994	
MEB94-2	Magneto Capacitor Inspection	18 Mar 1994	
MEB94-3 Revision 1	Dukes Auxiliary Fuel Boost Pump Overhaul Interval	23 Nov 1994	

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Service Letter/Service Bulletin Number	Title	Service Bulletin Date	Manual Incorporation
MEB94-4 Revision 1	Dukes Auxiliary Fuel Boost Pump Vane Replacement	23 Nov 1994	
MEB94-6	Replacement of Magneto Coils and Rotating Magnets	27 May 1994	
MEB95-2	Engine Oil Pump Gasket Inspection	24 Feb 1995	
MEB95-3	Engine Crankcase Stud Inspection	24 Mar 1994	
MEB95-9	Cabin Heater Fuel Line Inspection/Replacement	16 Jun 1995	
MEB96-3	Fuel Flow Transducer Replacement	1 Mar 1996	
MEB96-4	Seat Belt and Shoulder Harness Connection Inspection	29 Mar 1996	
MEB96-8	Airborne Fuel Pump Inspection/Replacement	21 Jun 1996	
MEB96-9	Engine Crankshaft Gear Bolt Inspection	16 Aug 1996	
MEB96-10	S51-10 Hose Inspection/Replacement	10 Oct 1996	
MEB96-11	Seat Belt and Shoulder Harness Installation	18 Oct 1996	
MEB97-3	AN3-5A Bolt Inspection/Replacement	24 Mar 1997	
MEB97-4	Flight In Known Icing Is Prohibited Placard Installation	24 Mar 1997	
MEB97-5	Engine Piston Pin Plug Wear Inspection	28 Jul 1997	
MEB97-9	Flap Actuator Limit Switch Inspection	6 Oct 1997	
MEB97-10	Engine Crankcase Overboard Breather Tube Inspection	6 Oct 1997	
MEB97-13	Teledyne Continental Motors (TCM) Crankshaft Ultrasonic Inspection	17 Nov 1997	
MEB98-6 Revision 1	Engine Intake and Exhaust Valve Inspection	26 Oct 1998	
MEB98-10	Airborne Vacuum Pump Inspection	2 Nov 1998	
MEB99-2	Teledyne Continental Engine Crankshaft Inspection	26 Apr 1999	
MEB99-4	Battery, Starter and External Power Relay Inspection	28 Jun 1999	
MEB99-5	Engine Baffle Modification	2 Aug 1999	
MEB99-6	Engine Exhaust Access Panels Installation	2 Aug 1999	
MEB99-7	Engine Beam Inspection and Modification	2 Aug 1999	
MEB99-8	Crossfeed Fuel Lines Replacement	2 Aug 1999	
MEB99-18	Exhaust Spring Inspection/Replacement	2 Aug 1999	
MEB99-19	Vacuum System Check - POH/Owner Manual/Flight Manual Supplement	4 Oct 1999	
MEB00-1 Revision 1	Teledyne Continental Engine Crankshaft Material Inspection	26 Dec 2000	

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Service Letter/Service Bulletin Number	Title	Service Bulletin Date	Manual Incorporation
MEB00-5	Vacuum System Manifold Check Valve Inspection/Replacement	2 Oct 2000	
MEB00-9 Revision 2	Engine Breather Line Modification/Breather Vent Tube Installation	4 Nov 2002	
MEB01-2	Universal Windshield Anti-Ice Panel Installation	29 Jan 2001	
MEB01-3	Alternator Drive Gear Hub Elastomer Inspection	26 Mar 2001	
MEB01-4	Teledyne Continental Engine Driven Fuel Pump Inspection and Seal Leak Test	2 Jul 2001	
MEB02-1	Engine Failure During Flight Emergency Procedures	28 Jan 2002	
MEB02-2	Dry Vacuum Pump and Coupling Replacement Requirements	25 Feb 2002	
MEB02-6	Engine Starter Adapter Shaft Seal Replacement	24 Jun 2002	
MEB02-8	Pointer 3000-11 ELT Installation	7 Oct 2002	
MEB02-12	Main Landing Gear torque Link Inspection	4 Nov 2002	
MEB02-13	Magneto Capacitor Inspection	28 Dec 2002	
MEB04-2	Magneto Capacitor Inspection	20 Sep 2004	

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INTRODUCTION

1. General

WARNING: All the inspection intervals, replacement time limits, overhaul time limits, inspection methods, life limits, cycle limits, etc., recommended by Cessna are based on the use of new, repaired, or overhauled Cessna-approved parts. The data in Cessna's maintenance manuals and parts catalogs is not applicable if the parts are designed, built, repaired, overhauled, and/or approved by entities other than Cessna. The purchaser is warned not to rely on such data for non-Cessna parts. The purchaser must get from the manufacturer and/or seller of non-Cessna parts, the inspection intervals, replacement time limits, overhaul time limits, inspection methods, life limits, cycle limits, etc., for all non-Cessna parts.

A. The procedures in this manual are based on data that is available at the time of publication. This manual is updated, and supplemented, and will automatically change by all data that is issued in the Service Newsletters, Service Bulletins, Supplier Service Notices, Publication Changes, Revisions, Reissues and Temporary Revisions. The revisions become part of and are specifically incorporated in this publication. The user must know the latest changes to this publication through data available at the Cessna Authorized Service Stations or from the Cessna Product Support subscription services. Cessna Service Stations are supplied with a group of supplier publications. The supplier publications will give disassembly, overhaul, and parts breakdown data for some of the different supplier items. Supplier's publications are updated, supplemented, and specifically changed by the supplier-issued revisions and service data which may be issued by Cessna. This will automatically change this publication and is communicated to the field by the Cessna Authorized Service Stations and/or by Cessna's subscription services.

B. The inspection, maintenance and parts requirements for Supplemental Type Certification (STC) installations are not included in this manual. When an STC installation is included on the airplane, the parts of the airplane affected by the installation must be checked. Do an inspection in accordance with the inspection program published by the owner of the STC. The STC installations may change systems interface, operating characteristics and component loads or stresses on adjacent structures. The Cessna-provided inspection criteria may not be correct for airplanes with STC installations.

C. The revisions, temporary revisions,and reissues can be purchased from your Cessna Service Station or directly from Cessna Propeller Aircraft Product Support, Dept. 751, Cessna Aircraft Company, P.O. Box 7706, Wichita, Kansas 67277-7706, (316) 517-5800, Facsimile (316) 942-9006.

D. The data in this Maintenance Manual is applicable to all U.S.-and Foreign-Certified Model 310R and T310R model airplanes. Data that applies to a particular country is identified in the chapter(s) affected.

E. The Cessna Service Stations are supplied with all the supplemental maintenance data for this manual. They have the latest authoritative recommendations for servicing the Cessna airplanes.

2. Cross-Reference Listing of Popular Name Versus Model Numbers and Serials

A. The airplanes are certified by the model number. Names are often used for marketing purposes. To supply the same method of referring to the airplanes, the model number will be used in this manual. The airplane name may be used to distinguish the different types of the same model. The following table supplies a list of the names, model numbers and serial numbers.

NAME	MODEL	SERIAL NUMBERS
	310R	310R0001 thru 310R2140
	T310R	310R0001 thru 310R2140

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3. Coverage and Format

A. The Cessna Model 310R 1975 thru 1981 Maintenance Manual is prepared with information given by the Air Transport Association Specification Number 2200 for Manufacturer's Technical Data.

4. Temporary Revisions

A. Information that is available may be supplied by a temporary revision. This service is used to supply, without delay, new data that will assist in maintaining safe flight/ground operations. The temporary revisions are numbered consecutively with the ATA chapter assignment. Page numbering uses the three-element number which matches the Maintenance Manual. The temporary revisions are normally included in the Maintenance Manual at the next scheduled revision.

5. Aerofiche (Microfiche)

A. This maintenance manual is prepared for aerofiche presentation. A List of Chapters, which identifies the initial fiche/frame of each chapter section, has been assembled and included in the introduction. The List of Chapters is used to assist in the use of the aerofiche index. The List of Chapters is shown in the upper left frame of each aerofiche card.

6. Compact Disc (CD-ROM)

A. The following manuals and service publications are available on one CD-ROM (Compact Disc-Read Only Memory):

NOTE: The listed publications are kept up-to-date through routine revisions.

1. Cessna Model 310R 1975 thru 1981 Maintenance Manual
2. Cessna Model 310R Illustrated Parts Catalog
3. Cessna Model 310R Avionic Installation Service/Parts Manual

7. Using the Maintenance Manual

A. Division of Subject Matter.

(1) Cessna Model 310R 1975 thru 1981 Maintenance Manual is divided into four sections. The four sections are divided into chapters. Each chapter has its own effectivity page and table of contents. The following shows the manual divisions:

(a) Section 1 - Airplane General

Chapter	Title
5	Time Limits/Maintenance Checks
6	Dimensions and Areas
7	Lifting and Shoring
8	Leveling and Weighing
9	Towing and Taxiing
10	Parking, Mooring, Storage and Return to Service
11	Placards and Markings
12	Servicing

(b) Section 2 - Airframe Systems

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Chapter	Title
20	Standard Practices - Airframe
21	Environmental Systems
23	Communications
24	Electrical Power
25	Equipment/Furnishings
27	Flight Controls
28	Fuel
30	Ice and Rain Protection
31	Indicating/Recording Systems
32	Landing Gear
33	Lights
34	Navigation and Pitot/Static
35	Oxygen
37	Vacuum

(c) Section 3 - Structures

Chapter	Title
51	Standard Practices and Structures - General
52	Doors
53	Fuselage
55	Stabilizers
56	Windows
57	Wings

(d) Section 4 - Power Plant

Chapter	Title
61	Propeller
71	Power Plant
73	Engine Fuel and Control
74	Ignition
76	Engine Controls
77	Engine Indicating
78	Exhaust
79	Oil
80	Starting
81	Turbines

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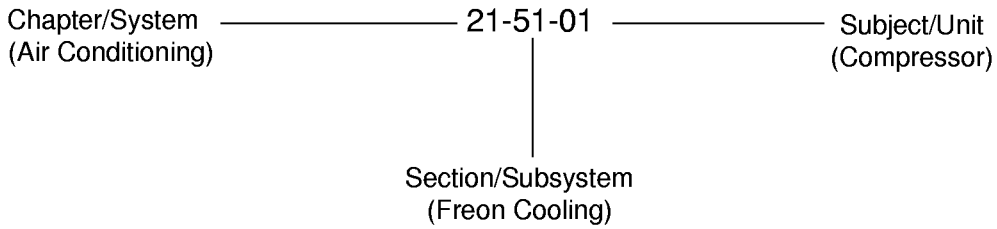
B. Page Numbering System.

(1) The page numbering system used in the Cessna Model 310R 1975 thru 1981 Maintenance Manual has three-element numbers separated by dashes. The page number and date are located to the right of the three-element number on each page.

A22923



(2) When the chapter/system element number is followed with zeros in the section/subsystem and subject/unit element number (21-00-00), the data is applicable to the entire system.

(3) When the section/subsystem element number is followed with zeros in the subject/unit element number (21-51-00), the data is applicable to the subsystem within the system.

(4) Subject/unit element number is used to identify data applicable to units in the subsystems. The subject/unit element number progresses in sequence from the number -01 in accordance with the number of subsystem units requiring maintenance information.

(5) All system/subsystem/unit (chapter/section/subject) maintenance instructions are separated into specific types of data:
   1. Description and Operation
   2. Troubleshooting
   3. Maintenance Practices

(6) Blocks of page numbers are used to identify the type of information:
   Page 1 through 99 - Description and Operation
   Page 101 through 199 - Troubleshooting
   Page 201 through 299 - Maintenance Practices

(7) The description and operation or troubleshooting information may not be necessary for simple units. For these units, the pages are omitted. When subtopics are small, they may be combined into a single topic titled Maintenance Practices. Maintenance Practices is a combination of subtopics. It may include Servicing, Removal/Installation, Adjustment/Test, Cleaning/Painting or Approved Repairs.

(8) Large subtopics may be treated as an individual topic. The list below shows the page numbering for individual topics:
   Page 301 through 399 - Servicing
   Page 401 through 499 - Removal/Installation
   Page 501 through 599 - Adjustment/Test
   Page 601 through 699 - Inspection/Check
   Page 701 through 799 - Cleaning/Painting
   Page 801 through 899 - Approved Repairs

(9) A typical page number:

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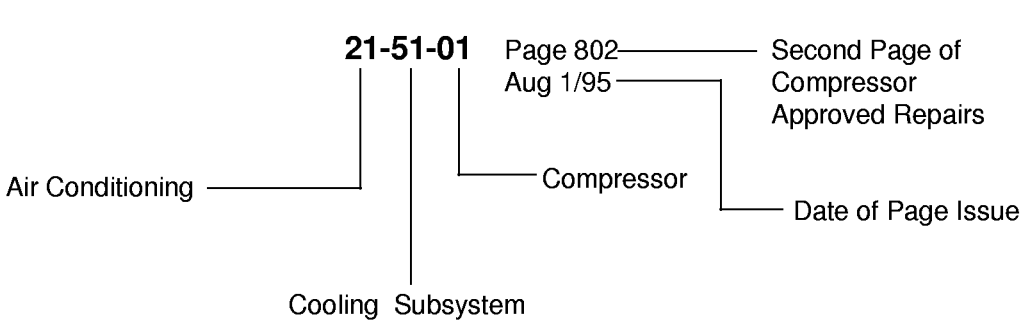

(10) The illustrations are also included in the page block numbering system. For example, all illustrations in a Maintenance Practice section will begin with the number 2 (i.e., Figure 201, Figure 202, etc.). All illustrations within an Approved Repair section will begin with the number 8 (Figure 801, Figure 802, etc.).

8. Effectivity Pages

A. A List of Effective Pages is supplied at the beginning of each maintenance manual chapter. All pages in the specific chapter are listed in numerical order on the effectivity page(s) with the date of issue for each page.

9. Revision Filing Instructions

A. Regular Revision.
(1) The pages that are removed or inserted in the maintenance manual are determined by the effectivity page. The pages are listed in sequence by the three-element number (chapter/section/subject) and then by page number. When two pages display the same three-element number and page number, the page with the most recent date must be put in the maintenance manual. The date column on the corresponding chapter effectivity page must verify the active page.

B. Temporary Revision.
(1) File the temporary revisions in the applicable chapter(s) in accordance with the filing instructions shown on the first page of the temporary revision.
(2) The rescission of a temporary revision is completed by including it in the maintenance manual or by a superseding temporary revision. A Record of Temporary Revisions is supplied in the Temporary Revision List. The temporary revision list is located before the Introduction-List of Effective Pages. A Manual Incorporation Date column on the Temporary Revision List page will indicate the date the Temporary Revision was incorporated, thus authorizing the rescission of the temporary revision.

10. Identifying Revised Material

A. Additions or revisions to the text in an existing section will be identified by a revision bar in the left margin of the page and adjacent to the change.

B. The minimum revisable unit in the Maintenance Manual is a subject (refer to Page Numbering System for definition of subject). All the pages in a subject will have the same date regardless if the data in that page has changed or not.

C. When large changes are made to the text in an existing section, revision bars will be shown for the full length of the text.

NOTE: Revision 15 to this maintenance manual changes the format from a GAMA specified format to an ATA specified format. No revision bars were used with this revision due to the complete reformatting of all pages contained within this manual.

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D. The illustrations shown in this manual may have hand indicators for revisions before March 1, 2000 or Revision 14, that direct attention to the change. Future revisions to the illustrations, beginning at Revision 14, will be shown by a revision bar along the entire vertical length of one side of illustration. No hand indicators will be shown.

11. Warnings, Cautions and Notes

A. Warnings, cautions and notes applicable to the instructions being completed are used. These adjuncts to the text are used to highlight or emphasize important data.
   (1) WARNING - This is applicable to the data that follows it. A warning puts attention to the use of the instructions, materials, methods, or limits that must be obeyed to prevent an injury or death.
   (2) CAUTION - This is applicable to the data that follows it. A caution puts attention to the use of the instructions, materials, methods, or limits which must be obeyed to prevent damage to the airplane or equipment.
   (3) NOTE - A NOTE follows the applicable instructions. It is for data only.

12. Cessna Propeller Aircraft Customer Care Supplies and Publications Catalog

A. A Cessna Propeller Aircraft Customer Care Supplies and Publications Catalog is available from a Cessna Service Station or directly from Cessna Propeller Aircraft Product Support, Dept. 751, Cessna Aircraft Company, P.O. Box 7706, Wichita, Kansas 67277-7706, (316) 517-5800, Facsimile (316) 942-9006. The catalog lists all publications and Customer Care Supplies available from Cessna for prior year models as well as new products. To maintain this catalog in a current status, it is revised yearly and issued in paper and aerofiche form.

13. Customer Comments on Manual

A. Cessna Aircraft Company has worked to furnish you with an accurate, useful, up-to-date manual. This manual can be improved with your help. Please use the return card, supplied with your manual, to report any errors, discrepancies, and omissions in this manual as well as any general comments you want to make.

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LIST OF REVISIONS

1. General

A. This Maintenance Manual includes the first issue and the revisions listed in Table 1. The revisions must be included in this manual as they are supplied. Make sure the information in this manual is current and that the latest maintenance and inspections procedures are available.

Table 1. Original Issue October 1975

Revision Number	Date	Writer	Revision Number	Date	Writer
1	January 1976		2	October 1976	
3	January 1977		4	November 1977	
5	March 1978		6	November 1978	
7	January 1979		8	November 1979	
9	January 1980		10	November 1980	
11	February 1982		12	May 1981	
13	April 1982		14	October 1996	
15	17 June 2005	las			

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LIST OF CHAPTERS

CHAPTER		EFFECTIVE DATE*	FICHE/FRAME	
5	Time Limits/Maintenance Checks	17 Jun 2005	1	B2
6	Dimensions and Areas	17 Jun 2005	2	D2
7	Lifting and Shoring	17 Jun 2005	2	E2
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9	Towing and Taxiing	17 Jun 2005	2	F2
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CHAPTER

5

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TIME LIMITS/MAINTENANCE CHECKS

1. Scope

A. This chapter provides the time limits and maintenance checks for the Model 310R and T310R airplanes. It is divided into several sections, each with a specific purpose toward providing information necessary to establish inspection criteria. Refer to the Description section for detailed information concerning each of these sections.

NOTE: The time limits and maintenance checks listed in this chapter are the minimum requirements for airplanes operated under normal conditions. For airplanes operated in areas where adverse operating conditions may be encountered, such as high salt coastal environments, areas of high heat and humidity, areas where industrial or other airborne pollutants are present, extreme cold, unimproved surfaces, etc., the time limits should be modified accordingly.

2. Inspection Requirements

A. Three basic types of inspections are available as defined below:
(1) As required by Federal Aviation Regulation 14 CFR 91.409 (a), all civil airplanes of U.S. registry must undergo a complete inspection (ANNUAL) each 12 calendar months. In addition to the required ANNUAL inspection, airplanes operated commercially (for hire) must also have an inspection each 100 hours of operation as required by Federal Aviation Regulation Part 91.409 (b).
(2) In lieu of the above requirements, an airplane may be inspected in accordance with a progressive inspection program in accordance with Federal Aviation Regulation Part 91.409 (d), which allows the workload to be divided into smaller operations that can be accomplished in a shorter time period.
(3) If an airplane is being operated under a CFR Part 135 Certificate, the operator may elect to use an Approved Aircraft Inspection Program.

3. Inspection Program Selection

A. As a guide for selecting the inspection program that best suits the operation of the airplane, the following is provided:
(1) If the airplane is flown less than 200 hours annually, the following conditions apply:
(a) If flown for hire:
1 An airplane operating in this category must have a COMPLETE AIRPLANE INSPECTION (ANNUAL) each 12 calendar months. In addition, an inspection is required each 100 hours of operation (100-HOUR). A COMPLETE AIRPLANE INSPECTION consists of all 25-hour, 100-Hour, and 200-Hour items plus those operations which are due at the specified time. Additionally, Component Time Limits shall be checked at each inspection interval to ensure proper overhaul and replacement requirements are accomplished at the specified times.
(b) If not flown for hire:
1 An airplane operating in this category must have a COMPLETE AIRPLANE INSPECTION each 12 calendar months of operation (ANNUAL). A COMPLETE AIRPLANE INSPECTION consists of all 25-hour, 100-Hour, and 200-Hour items plus those operations which are due at the specified time. It is also recommended that between annual inspections, all items be inspected at the intervals specified in the Inspection Time Limits. Additionally, Component Time Limits should be checked at each inspection interval to ensure proper overhaul and replacement requirements are accomplished at the specified times.
(2) If the airplane is flown more than 200 hours annually, the following condition applies:
(a) Whether flown for hire or not, it is recommended that airplanes operating in this category be placed on a progressive inspection program in accordance with Federal Aviation Regulation 14 CFR 91.409. However, if the airplane is not placed on a progressive inspection program, the inspection requirements for airplanes in this category are the same as those defined under Paragraph 3.A.(1)(a)1 or (b)1.

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(3) If the airplane is operated under 14 CFR 135, and flown an average of 400 hours annually, the following manufacturer's approved inspection program may be used. However, the program must be used as published and the latest revision must be incorporated.

4. Description

NOTE: Listed below is a detailed description and intended purpose of each section of this chapter.

A. Section 5-00-00, Time Limits/Maintenance Checks - General. This section provides a description and purpose of each section of this chapter.

B. Section 5-10-01, Inspection Time Limits.
(1) This section lists, in chart format, all inspection and servicing requirements which must be performed. Each page contains the following six columns:
(a) Revision Status provides the date that a given item was added, deleted or revised. A blank entry in this column indicates no change since the reissue of this manual.
(b) Inspection Item Code Number is a six-digit number permanently assigned to a scheduled maintenance item. A given inspection item code number will never change and will not be reused, in the event the scheduled maintenance item is deleted.
(c) Inspection Requirements provide a short description of the maintenance item and are listed in chapter order.
(d) Inspection Interval is a numeric code character indicating the frequency of the item. The frequencies corresponding to each code are listed at the beginning of Chapter 5-10-01.
(e) Applicable Operation(s) indicates the applicable inspection operation currently containing the inspection item.
(f) Applicable Zone refers to the physical location(s) in the airplane affected by the item.
(2) Primary purpose of the Inspection Time Limits section is to provide a complete listing of all inspection items in an order that allows easy access for the information listed previously. This section is not intended to be utilized as a guideline for inspection of the airplane.
(3) The Inspection Time Limits Chart shows the recommended intervals at which items are to be inspected, based on normal usage under average environmental conditions. Airplanes operated in extremely humid areas (tropics), or in exceptionally cold, damp climates, etc., may need more frequent inspections for wear, corrosion, and lubrication. Under these adverse conditions, perform periodic inspections in compliance with this chart at more frequent intervals until the operator can set his own inspection periods based on field experience. The operator's inspection intervals shall not deviate from the inspection time limits shown in this manual except as provided below:
(a) Each inspection interval can be exceeded by 10 hours (if time-controlled), or by 30 days (if date-controlled) or can be performed early at any time prior to the regular interval as provided below:
1 In the event of late compliance of any operation scheduled, the next operation in sequence retains a due point from the time the late operation was originally scheduled.
2 In the event of early compliance of any operation scheduled, that occurs 10 hours or less ahead of schedule, the next operation due point may remain where originally set.
3 In the event of early compliance of any operation scheduled, that occurs more than 10 hours ahead of schedule, the next operation due point must be rescheduled to establish a new due point from the time of early accomplishment.

C. Section 5-11-00, Component Time Limits. This section provides a list of overhaul or replacement intervals for components in chapter order. These requirements are not listed in the 5-10-01 Inspection Time Limits section. The component overhaul or replacement criteria must be utilized as a guideline for determining proper action regarding the components listed. These requirements must be worked into the continuous inspection program to provide a complete inspection program.

D. Section 5-30-00, Corrosion Prevention and Control Program (CPCP). This section gives the guidelines and applications of the CPCP. This is a program used to control the corrosion in the airplane's primary structure. The objective of the CPCP is to help to prevent or to control the corrosion so that it does not cause a risk to the continued airworthiness of the airplane.

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INSPECTION TIME INTERVALS

1. General

A. The primary purpose of this section is to provide inspection time intervals. The section 5-10-01 may be utilized in conjunction with 14 CFR Part 43 inspection scope and detail, but is not intended to be utilized as the primary checklist for inspection of the airplane.

NOTE: The inspection guidelines contained in this section are not intended to be all-inclusive, for no such charts can replace the good judgment of certified airframe and power plant mechanics in performance of their duties. As the one primarily responsible for the airworthiness of the airplane, the owner or operator should select only qualified personnel to maintain the airplane.

2. Procedure

A. A complete airplane inspection includes all inspection items as required by 14 CFR 43, Appendix D, Scope and Detail of annual/100-hour inspections. The chart provided in this section should be used to augment the inspection.

B. The Component Time Limits section (5-11-00) should be checked in conjunction with this inspection to ensure proper overhaul and replacement requirements are accomplished at the specified times.

C. The intervals shown are recommended intervals at which items are to be inspected based on normal usage under average environmental conditions. Airplanes operated in extremely humid areas (tropics), or in exceptionally cold, damp climates, etc., may need more frequent inspections for wear, corrosion, and lubrication. Under these adverse conditions, perform periodic inspections in compliance with this chart at more frequent intervals until the operator can set his own inspection periods based on field experience.

(1) The 14 CFR Part 91 operator's inspection intervals shall not deviate from the inspection time limits shown in this manual except as provided below: (Refer to 14 CFR 91.409)

(a) The airplane can only exceed its inspection point up to 10 hours, if the airplane is enroute to a facility to have the inspection completed.

(b) In the event of late compliance of any operation scheduled, the next operation in sequence retains a due point from the time the late operation was originally scheduled.

(c) In the event of early compliance of any operation scheduled, that occurs 10 hours or less ahead of schedule, the next phase due point may remain where originally set.

(d) In the event of early compliance of any operation scheduled, that occurs more than 10 hours ahead of schedule, the next phase due point must be rescheduled to establish a new due point from the time of early accomplishment.

3. Inspection Terms and Guidelines

A. For inspection terms and guidelines, refer to Chapter 5, Time Limits/Maintenance Checks - General.

4. Chart Legend

A. Each page of the inspection listed in Inspection Time Limits, section 5-10-01, contains the following five columns:

(1) REVISION STATUS - This column provides the date that a given item was added, deleted or revised. A blank entry in this column indicates no change since the original issue of this manual.

(2) INSPECTION ITEM CODE NUMBER - This column lists a six-digit number permanently assigned to a scheduled maintenance item. A given inspection item code number will never change and will not be reused in the event the scheduled maintenance item is deleted.

(3) TASK - This column provides a short description of the inspection and/or servicing procedures. Where a more detailed description of the procedure is required, a reference will be made to either another selection located within the maintenance manual or a specific reference to a supplier publication.

(4) INTERVAL - This column lists the frequency of inspection in alphabetic coded form. The legend for the alpha code is listed below.

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(5) OPERATION - The Progressive Care inspection program allows the work load to be divided into smaller operations that can be accomplished in a shorter time period. This program is detailed in section 5-12-00, which is the Progressive Care Program.
(6) ZONE - This column locates the components within a specific zone. For a breakdown of how the airplane is zoned, refer to Chapter 6, Airplane Zoning - Description and Operation.

5. Inspection Interval Requirements

Operation	Details
1 -	Every 50 hours of operation or 12 months, whichever occurs first.
2 -	Every 100 hours of operation or 12 months, whichever occurs first.
3 -	Every 200 hours of operation or 12 months, whichever occurs first.
4 -	Every 250 hours of heater operation.
5 -	Every 400 hours of operation.
6 -	Every 500 hours of operation.
7 -	Every 1500 hours of operation.
8 -	Every 12 months.
9 -	Every 2 years.
10 -	Every 3 years.
11 -	Every 5 Years.
12 -	Every 1000 hours of operation or 3 years, whichever occurs first.
13 -	Every 12 months, exhaust system removal or engine overhaul.
14 -	The first 100 hours of operation and every 200 hours of operation thereafter or 12 months, whichever occurs first.
15 -	Every 1400 hours of operation, 12 years, or engine overhaul, whichever occurs first.
16 -	The first 100 hours of operation on new, rebuilt, or overhauled engines and every 300 hours of operation after the initial inspection has been accomplished.
17 -	First inspection beginning 5 years from the date of manufacture, and inspect every 12 months thereafter you must make sure of the serviceability of the components. Refer to Airborne Air and Fuel Products Service Letter Number 39A or latest revision.
18 -	Every 500 hours of operation, 24 months, exhaust system removal or engine overhaul.
19 -	Inspect per MEB88-5 Revision 2, or latest revision. Refer to MEB88-5 Revision 2, or latest revision for the initial and repeat inspection intervals.
20 -	At the first 15,000 hours of operation and every 2000 hours of operation thereafter.
21 -	At the first 15,000 hours of operation or 20 years and every 2500 hours of operation or 5 years thereafter.
22 -	At the first 7,500 hours of operation or 15 years, inspection is to be repeated every 2,500 hours of operation or 5 years after the initial inspection has been accomplished.
23 -	At the first 5,000 hours of operation or 10 years, inspection is to be repeated every 1,000 hours of operation or 3 years after the initial inspection has been accomplished.

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Operation	Details
24 -	At the first 10,000 landings or 20 years, inspection is to be repeated every 2,000 landings or 4 years after the initial inspection has been accomplished.
25 -	At the first 4,000 landings or 8 years, inspection is to be repeated every 1,000 landings or 3 years after the initial inspection has been accomplished.
26 -	At the first 1,000 landings or 3 years, inspection is to be repeated every 500 landings or 3 years after the initial inspection has been accomplished.
27 -	At the first 5,000 landings or 10 years, inspection is to be repeated every 5,000 landings or 10 years after the initial inspection has been accomplished.
28 -	At the first 12,500 landings or 20 years, inspection is to be repeated every 2,500 landings or 5 years after the initial inspection has been accomplished.
29 -	At the first 15,000 landings or 20 years, inspection is to be repeated every 5,000 landings or 10 years after the initial inspection has been accomplished.
30 -	At the first 10,000 landings or 20 years, inspection is to be repeated every 5,000 landings or 10 years after the initial inspection has been accomplished.
31 -	At the first 10,000 hours of operation or 20 years, inspection is to be repeated every 5,000 hours of operation or 10 years after the initial inspection has been accomplished.
32 -	At the first 1,000 hours of operation or 3 years, inspection is to be repeated every 1,000 hours of operation or 3 years after the initial inspection has been accomplished.
33 -	At the first 15,000 hours of operation or 20 years, inspection is to be repeated every 5,000 hours of operation or 10 years after the initial inspection has been accomplished.
34 -	At the first 10,000 hours of operation or 20 years, inspection is to be repeated every 5,000 hours of operation or 10 years after the initial inspection has been accomplished.
35 -	Every 1,500 hours of operation or at engine overhaul.
36 -	Inspect per MEB99-7, or latest revision. Refer to MEB99-7, or latest revision for the initial and repeat inspection intervals.
37 -	At the first 11,000 hours of operation. Refer to 5-14-36, Supplemental Inspection Number 57-10-06, for repeat inspection information.
38 -	At the first 15,000 hours of operation or 20 years, inspection is to be repeated every 1,000 hours of operation or 3 years after the initial inspection has been accomplished.
39 -	At the first 6,500 hours of operation or 13 years, inspection is to be repeated every 2,500 hours of operation or 5 years after the initial inspection has been accomplished.
40 -	At the first 11,000 hours of operation or 20 years, inspection is to be repeated every 4,000 hours of operation or 8 years after the initial inspection has been accomplished.
41 -	At the first 11,000 hours of operation or 20 years, inspection is to be repeated every 2,000 hours of operation or 4 years after the initial inspection has been accomplished.
42 -	At the first 15,000 hours of operation or 20 years, inspection is to be repeated every 2,500 hours of operation or 10 years after the initial inspection has been accomplished.
43 -	Corrosion Prevention and Control Program Inspections (Baseline Program) items that are to be examined every 12 months. Refer to Section 5-30-00, Corrosion Prevention and Control Program, for additional information concerning repeat Corrosion Program Inspection intervals.

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Operation	Details
44 -	Corrosion Prevention and Control Program Inspections (Baseline Program) items that are to be examined every 24 months. Refer to Section 5-30-00, Corrosion Prevention and Control Program for additional information concerning repeat Corrosion Program Inspection intervals.
45 -	Corrosion Prevention and Control Program Inspections (Baseline Program) items that are to be examined every 36 months. Refer to Section 5-30-00, Corrosion Prevention and Control Program, for additional information concerning repeat Corrosion Program Inspection intervals.
46 -	Corrosion Prevention and Control Program Inspections (Baseline Program) items that are to be examined every 48 months. Refer to Section 5-30-00, Corrosion Prevention and Control Program, for additional information concerning repeat Corrosion Program Inspection intervals.
47 -	Corrosion Prevention and Control Program Inspections (Baseline Program) items that are to be examined every 60 months. Refer to Section 5-30-00, Corrosion Prevention and Control Program, for additional information concerning repeat Corrosion Program Inspection intervals.
48 -	Every 600 hours of operation.
49 -	At the first 2500 hours of operation or 10 years, inspection is to be repeated every 200 hours of operation or 2 years after the initial inspection has been accomplished.
50 -	Ever 4,000 hours of operation.
51 -	At the first 11,000 hours of operation, inspection is to be repeated every 400 hours of operation after the initial inspection has been accomplished.
52 -	At the first 15,000 hours of operation, inspection is to be repeated every 800 hours of operation after the initial inspection has been accomplished.

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INSPECTION TIME LIMITS

1. Inspection Items

REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	110001	Placards and Decals - Inspect for security, presence and legibility.	Every 200 hours or 12 months	3	223, 224, 225, 226, 227, 228
	214001	Heater (Stewart-Warner) - Check condition and operation.	Every 250 hours of operation	4	212
	214002	Cabin heater fuel lines. Check for condition, security and evidence of fuel leaks.	Every 200 hours or 12 months	3	212
	220001	Autopilot - Check Cables, Attachments, Pulleys and Turnbuckles for tension, condition and security.	Every 200 hours or 12 months	3	236, 311, 312
	220002	Autopilot - Inspect in accordance with applicable Autopilot or IFCS Service/ Parts Manual.	Every 100 hours or 12 months	2	228, 235, 236, 311, 312
	230001	Radio and Navigation System - Check for operation and condition.	Every 200 hours or 12 months	3	225, 228
Revised Apr 1/09	236001	Static Discharge - Check Static Bonding Strips and Static Discharge Wicks for security and general condition.	Every 200 hours or 12 months	3	340, 540, 640
	240001	Airplane Electrical System Wiring - Check for chafing, broken or loose terminals and general condition.	Every 100 hours or 12 months	2	110, 211, 212, 221, 222, 231, 232, 311, 312, 340, 430, 440, 510, 520, 530, 540, 610, 620, 630, 640
	240002	Junction Boxes - Check terminals for condition and security.	Every 100 hours or 12 months	2	211, 212, 221, 222,
	240003	Circuit Breaker Panel - Check terminals, wiring and mountings.	Every 100 hours or 12 months	2	221

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	240004	Voltage Regulators - Check wiring, mounting, condition and wire routing.	Every 200 hours or 12 months	3	222
	240005	Switches - Check operation, terminals, wiring and mounting.	Every 100 hours or 12 months	2	221, 223, 224, 225, 226, 227, 228
	240006	Landing Gear Relay and Limit Switch - Check mounting and terminals.	Every 200 hours or 12 months	3	231
	240007	Wing and Fuselage - Check wiring, routing, security and terminals.	Every 200 hours or 12 months	3	110, 211, 212, 221, 222, 231, 232, 311, 312, 340, 430, 440, 510, 520, 530, 540, 610, 620, 630, 640
	243001	Battery - check electrolyte specific gravity.	Every 50 hours or 12 months	1	530
	243002	Battery Box and Battery Cables - Inspect overboard drain tube. Check for corrosion, cable routing, support and security of connections.	Every 100 hours or 12 months	2	530
	243003	Alternators - Check brushes, leads, bearings and slip rings for condition and security.	Every 500 hours	6	430, 440
	243004	Alternators - Service (100-Amp Prestolite Only).	Every 100 hours or 12 months	2	430, 440
	246001	Starter Relay - Inspect contact area.	Every 400 hours	5	520
	250001	Upholstery, Headliner, Trim and Carpet - Check for condition and clean.	Every 200 hours or 12 months	3	221, 222, 231, 232
	250002	Seat Belts - Check for condition and security.	Every 50 hours or 12 months	1	221, 222, 231, 232

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	250003	Seat Bearings - Service.	Every 200 hours or 12 months	3	221, 222, 231, 232
	250004	Seat Adjusting Screw - Service.	Every 500 hours	6	221, 222
	250006	Pilot and Copilot Seats - Inspect seat tracks for wear and/or damage, controls for security of installation and operation, seat structure welds and mechanism for cracks, damage, and security.	Every 200 hours or 12 months	3	221, 222
	250007	Passenger Seats - Inspect seat backs for wear and/or damage; controls for security of installation and operation, seat structure and cushions for damage.	Every 200 hours or 12 months	3	231, 232
	250008	Replacement Fuses - Ensure that fuses are installed in glove box or under co-pilot's seat if glove box is not installed.	Every 200 hours or 12 months	3	222, 226
	256001	Emergency Locator Transmitter - Check operation, condition, security and battery pack for date check. Check in accordance with 14 CFR 91.207 and AC91-44. Check surrounding structure for corrosion.	Every 100 hours or 12 months	2	311, 312
	262001	Engine Compartment Fire Extinguisher - Check System, Pressure, Condition and Security.	Every 100 hours or 12 months	2	430, 440
	262002	Engine Fire Extinguisher - Check Hydrostatic Test Date.	Every 100 hours or 12 months	2	430, 440
	270001	Control Column - Check for security, looseness, wear and correct rigging.	Every 200 hours or 12 months	3	223, 224
	270002	Control Column Control Tube - Service.	Every 500 hours	6	223, 224
	270003	Control Column Bearings - Service.	Every 500 hours	6	223, 224
Revised Apr 1/09	271001	Aileron - Check hinges and hinge brackets for condition, cracks and security.	Every 200 hours or 12 months	3	530, 630

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	271002	Aileron - Check skins for cracks and loose rivets.	Every 200 hours or 12 months	3	530, 630
	271003	Aileron - Check bell crank, stop bolt, jam nut, linkage, pulleys and attach bolts for safety, security, condition, operation, and travel.	Every 200 hours or 12 months	3	530, 630
	271004	Aileron Trim Tab - Check hinges for condition, cracks and security.	Every 100 hours or 12 months	2	530
	271005	Aileron Trim Tab - Inspect skins for loose rivets and security.	Every 100 hours or 12 months	2	530
	271006	Aileron Trim Tab - Check bolts and linkage for condition, security, and cotter pin for safety.	Every 100 hours or 12 months	2	530
	271007	Aileron Trim Tab - Check free play and travel.	Every 100 hours or 12 months	2	530
	271008	Aileron Push-Pull Rod and Actuator Rod End Bearing - Inspect for evidence of binding and damage, tab attach fitting for condition, damage and security, and proper safetying of nut with cotter pin.	Every 100 hours or 12 months	2	530, 630
	271009	Aileron Trim Tab Actuator - Check for condition and security, snap rings for retention, snap ring seating in slot on bracket, clamp seating on actuator, and clamp bolts for broken torque putty. If cracks are found in putty, torque to 20-25 inch-pounds, check guard for condition and attachment and sprocket for condition, wear and attachment.	Every 100 hours or 12 months	2	530
	271010	Aileron Trim Tab Actuator - Service.	Every 200 hours or 12 months	3	530
	271011	Aileron and Aileron Trim Cables - Check for security, tension, and for fraying. Check turnbuckles for safety. Check pulleys for condition and security and mounting structure for cracks and condition.	Every 100 hours or 12 months	2	221, 222, 231, 232, 510, 520, 530, 610, 620, 630

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	271012	Aileron Hinges and Fittings - Check, refer to 5-14-01, Supplemental Inspection Number 27-10-04 for inspection procedures.	First 15,000 hours or 20 years, repeat every 2,500 hours or 5 years.	21	530, 630
Added Apr 1/09	271013	Aileron Attachments. Make sure you examine these areas: (1.) Trim tab actuating rod, (2.) Push-pull tube, (3.) Hinge brackets, (4.) Hinge bolts, (5.) Hinge bearings, (6.) Attach fittings. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor on bearings. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 24 months	44	530, 630
Added Apr 1/09	271014	Aileron Trim - Check the aileron trim control system, wing and fuselage control cables and pulleys in accordance with the Flight Control Cable Inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	Every 600 hours of operation	48	221, 222, 231, 232, 510, 520, 530
Added Apr 1/09	271015	Ailerons - Check the aileron control system, wing and fuselage control cables and pulleys in accordance with the Flight Control Cable Inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	Every 600 hours of operation	48	221, 222, 231, 232, 510, 520, 530, 610, 620, 630.
	272001	Rudder - Check hinges and balance weight for condition, cracks and security.	Every 200 hours or 12 months	3	340
	272002	Rudder - Check skins for cracks and loose rivets.	Every 200 hours or 12 months	3	340
	272003	Rudder - Check bell crank, stop bolt, jam nut, torque tube, linkage, pulleys and attach bolts for safety, security, condition, operation, and travel.	Every 200 hours or 12 months	3	321, 322, 340
	272004	Rudder Trim Tab - Check hinges for condition, cracks and security.	Every 100 hours or 12 months	2	340

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	272005	Rudder Trim Tab - Inspect skins for loose rivets and security.	Every 100 hours or 12 months	2	340
	272006	Rudder Trim Tab - Check bolts, linkage, and cotter pin for condition, security, and safety.	Every 100 hours or 12 months	2	340
	272007	Rudder Trim Tab - Check free play and travel.	Every 100 hours or 12 months	2	340
	272008	Rudder Trim Tab Actuator - Check for condition and security, snap rings for retention, snap ring seating in slot on bracket, clamp seating on actuator, and clamp bolts for broken torque putty. If cracks are found in putty, torque to 20-25 inch-pounds, and check guard for condition and attachment and sprocket for condition, wear and attachment.	Every 100 hours or 12 months	2	340
	272009	Rudder Trim Tab Actuator - Service.	Every 200 hours or 12 months	3	340
	272010	Rudder and Rudder Trim Cables - Check for security, tension, and for fraying and check turnbuckles for safety. Check pulleys for condition and security and mounting structure for cracks and condition.	Every 100 hours or 12 months	2	221, 222,233, 234, 235, 236, 311, 312, 321, 322, 340
	272011	Rudder Pedal Linkage and Bearings - Service.	Every 500 hours	6	221, 222
	272012	Rudder Pedal Bearing Halves and Rudder Gust Lock - Service.	Every 1500 hours	7	221, 222
	272013	Rudder Structure - Check, refer to 5-14-02, Supplemental Inspection Number 27-20-03, for inspection procedures.	First 7,500 hours of operation or 15 years, repeat every 2,500 hours of operation or 5 years.	22	340

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	272014	Rudder Torque Tube Assembly - Check, refer to 5-14-03, Supplemental Inspection Number 27-20-04 for inspection procedures.	First 7,500 hours of operation or 15 years, repeat every 2,500 hours of operation or 5 years.	22	340
	272015	Elevator Torque Tube Assembly - Check, refer to 5-14-04, Supplemental Inspection Number 27-30-00 for inspection procedures.	First 5,000 hours of operation or 10 years, repeat every 1,000 hours of operation or 3 years.	23	331, 332
Added Apr 1/09	272016	Rudder Attachment. Make sure you examine these areas: (1.) Trim tab actuating rod, (2.) Hinge brackets, (3.) Hinge bearings, (4.) Hinge bolts. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor on bearing. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 24 months	44	340
Added Apr 1/09	272017	Rudder Torque Tube Assembly. Make sure you examine these areas: (1.) Torque tube external and internal surfaces, (2.) Torque tube welds, (3.) Bell Crank attachment. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 24 months	44	340

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Apr 1/09	272018	Rudder structure. Make sure you examine these areas: (1.) Skin, (2.) Forward and aft spars at hinge locations. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	340
Added Apr 1/09	272019	Rudder Trim - Check the rudder trim control system, control cables, and pulleys in accordance with the Flight Control Cable Inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	Every 600 hours of operation	48	221, 222, 231, 232, 311, 312, 321, 322, 340
Added Apr 1/09	272020	Rudder - Check the rudder control system, control cables, and pulleys in accordance with the Flight Control Cable Inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	Every 600 hours of operation	48	221, 222, 231, 232, 311, 312, 321, 322, 340
	273001	Elevator - Check hinges for condition, cracks and security.	Every 200 hours or 12 months	3	331, 332
	273002	Elevator - Check skins for cracks and loose rivets.	Every 200 hours or 12 months	3	331, 332
	273003	Elevator - Check bell crank, stop bolt, jam nut, linkage, pulleys and attach bolts for safety, security, condition, operation, and travel.	Every 200 hours or 12 months	3	321, 322, 331, 332
	273004	Elevator - Check elevator balance weights for looseness and tip structure for cracks.	Every 200 hours or 12 months	3	331, 332
	273005	Elevator Trim Tab - Check hinges for condition, cracks and security.	Every 100 hours or 12 months	2	332
	273006	Elevator Trim Tab - Inspect skins for loose rivets and security.	Every 100 hours or 12 months	2	332
	273007	Elevator Trim Tab - Check bolts and linkage for condition, security, and cotter pin for safety.	Every 100 hours or 12 months	2	332

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	273008	Elevator Trim Tab - Check free play and travel.	Every 100 hours or 12 months	2	332
	273009	Elevator Push-Pull Tube and Actuator Rod End Bearing - Inspect for evidence of binding and damage; tab attach fitting for condition, damage and security, and proper safetying of nut with cotter pin.	Every 100 hours or 12 months	2	321, 322, 331, 332
	273010	Elevator Trim Tab Actuator - Check for condition and security, snap rings for retention, snap ring seating in slot on bracket, clamp seating on actuator and clamp bolts for broken torque putty. If cracks are found in putty, torque to 20-25 inch-pounds, and check guard for condition and attachment and sprocket for condition, wear and attachment.	Every 100 hours or 12 months	2	332
	273011	Elevator Trim Tab Actuator - Service.	Every 200 hours or 12 months	3	332
	273012	Elevator and Elevator Trim Cables - Check for security and tension, and for fraying and check turnbuckles for safety. Check pulleys for condition and security and mounting structure for cracks and condition.	Every 100 hours or 12 months	2	221, 222, 233, 235, 236, 311, 312, 321, 322, 332,
	273013	Electric Elevator Trim (Optional) - Check for security, condition and travel time.	Every 100 hours or 12 months	2	236
Added Apr 1/09	273014	Elevator Torque Tube Assembly. Make sure you examine these areas: (1.) Torque tube external and internal surfaces, (2.) Torque tube fitting attachment. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 24 months	44	331, 332

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Apr 1/09	273015	Elevator Attachments. Make sure you examine these areas: (1.) Hinge brackets, (2.) Hinge bolts, (3.) Hinge bearings, (4.) Trim tab actuating rod, (5.) Trim tab horn screws. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor on bearing. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 24 months	44	331, 332
Added Apr 1/09	273016	Elevator Trim - Check the elevator trim control system, trim control cables, and pulleys in accordance with the Flight Control Cable Inspection procedures in Chapter 27, Flight Controls, Inspection/ Check.	Every 600 hours of operation	48	221, 222, 231, 232, 311, 312, 321, 322, 332
Added Apr 1/09	273017	Elevator - Check the elevator control system, control cables, and pulleys in accordance with the Flight Control Cable Inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	Every 600 hours of operation	48	221, 222, 231, 232, 311, 312, 321, 322, 331, 332
	275001	Flaps - Check linkage, bell cranks, pulleys and cables for condition, tension and security.	Every 200 hours or 12 months	3	235, 510, 610
	275002	Flap Motor and Position Indicator - Check for travel, condition and security.	Every 200 hours or 12 months	3	228, 235
	275003	Flap Actuator Assembly - Check for condition, security and proper operating times.	Every 200 hours or 12 months	3	235
	275004	Flap Limit Switch and Motor - Check wiring and terminals for condition and security.	Every 200 hours or 12 months	3	235
Added Apr 1/09	275005	Flap Control System Installation. Make sure you examine these areas: (1) Control cables, (2) Associated hardware. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 48 months	46	512, 612

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Apr 1/09	275006	Flaps - Check flap travel, cable tension and travel time. Check the flap cable system, control cables, and pulleys, in accordance with the flight control inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	Every 600 hours of operation	48	231, 232, 510, 520, 530, 610, 620, 630.
	281001	Tip Tanks - Inspect mounting bolts for security, tip tank for leaks, cracks and dents.	Every 200 hours or 12 months	3	540, 640
	281002	Auxiliary Tanks - Inspect system for leaks and security.	Every 200 hours or 12 months	3	530, 630
	281003	Inspect BTC-39 Fuel Tanks for leaks. (Reference Service Letter ME78-7).	Every 12 months	8	530, 630
	282001	Fuel Selector Gear Box and Valve - Perform operational check (feel for detent through 270 degrees of travel). Check linkage, bearings, pins for condition and safety.	Every 100 hours or 12 months	2	233, 234, 510, 610
	282002	Fuel Selector Gear Box Gears - Clean and Service.	Every 200 hours or 12 months	3	233, 234
	282003	Fuel Selector Valve (Fuel Strainer) - Clean.	Every 100 hours or 12 months	2	530, 630
	282004	Fuel Selector Valve - Clean and Service Detent.	Every 100 hours or 12 months	2	233, 234
	282005	Fuel System Main - Inspect plumbing and component mounting for condition, security, system for leaks.	Every 100 hours or 12 months	2	233, 234, 510, 520, 530, 610, 620, 630
	282006	Boost Pumps (Auxiliary) - Inspect for leaks, operation, vent and overboard drain for obstruction.	Every 200 hours or 12 months	3	530, 630
	282007	Heater Fuel Filter - Remove, clean and inspect for deterioration.	Every 200 hours or 12 months	3	212

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	282008	Main Tank Fuel Transfer Pump - Check security and mounting.	Every 200 hours or 12 months	3	530, 630
Delete Apr 1/09	282009				
	282010	Main Tank and Wing Locker Fuel Transfer Pump Filter - Clean.	Every 200 hours or 12 months	3	530, 630
	282011	Wing Locker Transfer Pump - Check for leaks and security of mounting.	Every 200 hours or 12 months	3	520, 620
	301001	De-ice System - Check for leaks, condition and operation of controls, lines and clamps for security.	Every 200 hours or 12 months	3	235, 236, 311, 312, 430, 440, 510, 520, 530, 610, 620, 630
	301002	De-ice Boots - Check for Abrasions, Cuts, Nicks and Security of Mounting.	Every 200 hours or 12 months	3	331, 332, 340, 530, 630
	301003	De-ice Filter - Clean.	Every 100 hours or 12 months	2	430, 440
	301004	De-ice Vacuum Pressure Check Valves - Check for proper operation. Refer to Airborne Air and Fuel Products Service Letter Number 39A or latest revision.	Beginning first 5 years from date of manufacture, then every 12 months thereafter	17	430, 440
	301005	Electric Solenoid - Inspect electrical connection wiring for condition and security.	Every 100 hours or 12 months	2	430, 440
	304001	Check windshield anti-ice nozzles for security or obstruction.	Every 200 hours or 12 months	3	221

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	304002	Check Windshield Anti-Ice Alcohol Pump - Check for condition and security.	Every 200 hours or 12 months	3	211
	310001	Instruments - Check Markings and Condition.	Every 200 hours or 12 months	3	223, 224, 225, 226
	311001	Instrument Panel - Ground straps for security and condition.	Every 200 hours or 12 months	3	223, 224, 225
	311002	Instrument Panel and Control Pedestal - Check mountings and terminals for security. Check bonding between stationary panel and instrument panel for proper ground resistance, resistance must be 0.010 Ohms or less.	Every 200 hours or 12 months	3	223, 224, 225, 226, 227, 228
	321001	Main Gear Shock Struts - Check for evidence of leakage, proper extension. Check strut barrel for corrosion, pitting, and cleanliness.	Every 50 hours or 12 months	1	721, 722
	321002	Main Gear Shock Struts - Service.	Every 200 hours or 12 months	3	721, 722
	321003	Main Gear Torque Links - Inspect for wear and condition. Inspect connecting center bolt and washer for condition and security.	Every 200 hours or 12 months	3	721, 722
	321004	Main Gear Torque Links - Service.	Every 50 hours or 12 months	1	721, 722
	321005	Main Gear, all Spherical Rod Ends - Service.	Every 100 hours or 12 months	2	721, 722
	321006	Main Gear Side Brace - Service.	Every 100 hours or 12 months	2	721, 722
	321007	Main Landing Gear Support Bearing - Inspect retainer ring, bearing race and bearing for condition, wear, damage and security.	Every 100 hours or 12 months	2	721, 722

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Revised Apr 1/09	321008	Main Landing Gear Torque Tube Assembly Check, refer to 5-14-05, Supplemental Inspection Number 32-10-01 for inspection procedures.	First 3,000 landings or 20 years, repeat every 100 landings or 1 year.	25	721, 722
Revised Apr 1/09	321009	Main Landing Gear Torque Tube Assembly - Check, refer to 5-14-06, Supplemental Inspection Number 32-10-05 for inspection procedures.	First 10,000 landings or 20 years, repeat every 500 landings or 4 years.	24	721, 722
	321010	Main Landing Gear Pivot Bolt - Check, refer to 5-14-07, Supplemental Inspection Number 32-10-02 for inspection procedures.	First 1,000 landings or 3 years, repeat every 500 landings or 3 years.	26	721, 722
	321011	Main Landing Gear Fork Bolts (5/8 inch) - Check, refer to 5-14-08, Supplemental Inspection Number 32-10-03 for inspection procedures.	First 5,000 landings or 10 years, repeat every 5,000 landings or 10 years.	27	721, 722
	321012	Check Main Landing Gear, refer to 5-14-09, Supplemental Inspection Number 32-10-04 for inspection procedures.	First 12,500 landings or 20 years, repeat every 2,500 landings or 5 years.	28	721, 722

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Apr 1/09	321013	Main Gear Trunnion Assembly. Make sure you examine these areas: (1.) Main gear trunnion external surface, (2.) Main gear trunnion internal bore. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 36 months	45	721, 722
Added Apr 1/09	321014	Main Gear Outer Barrel Assembly. Make sure you examine these areas: (1.) Outer barrel surface, (2.) End upper strut and lower collar assembly, (3.) Link assembly. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the sliding surfaces of the oleo strut. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 36 months	45	721, 722
Added Apr 1/09	321015	Main Gear Axle Assembly. Make sure you examine these areas: (1.) Main gear axle and attach bolt, (2.) Wheel halves. NOTE: Disassemble the main wheel assemblies to get access. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the bearings. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	721, 722
Added Apr 1/09	321016	Main Landing Gear Torque Tube Life Limit, refer to 5-14-45, Supplemental Inspection Number 32-10-06 for inspection procedures.	Every 4,000 hours of operation	50	721, 722
	322001	Nose Gear Shock Strut - Check for evidence of leakage, proper extension and check strut barrel for corrosion, pitting, and cleanliness.	Every 50 hours or 12 months	1	720
	322002	Nose Gear Shock Strut - Service.	Every 200 hours or 12 months	3	720
	322003	Nose Gear Torque Link - Inspect for wear and condition. Inspect connecting center bolt and washer for condition and security.	Every 200 hours or 12 months	3	720

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	322004	Nose Gear Torque Link - Service.	Every 50 hours or 12 months	1	720
	322006	Nose Gear Trunnion Fitting - Service.	Every 100 hours or 12 months	2	720
	322007	For airplane serial numbers 310R0001 thru 310R1918: Service the Nose Gear Pivot Bushings.	Every 1000 hours or 3 years	12	720
	322008	For airplane serial numbers 310R1919 thru 310R2140 - Service the Nose Gear Pivot Bushings.	Every 100 hours or 12 months	2	720
	322009	Nose Gear, all Spherical Rod Ends - Service.	Every 100 hours or 12 months	2	720
	322010	Nose Gear Fork - Inspect for cracks, general condition and security of attachment.	Every 200 hours or 12 months	3	720
	322011	Nose Gear Fork - Check, refer to 5-14-10, Supplemental Inspection Number 32-20-00 for inspection procedures.	First 15,000 landings or 20 years, repeat every 5,000 landings or 10 years.	29	720
Added Apr 1/09	322012	Nose Wheel Well Structure. Make sure you examine these areas: (1.) Webs, (2.) Stiffeners, (3.) Brackets, (4.) Structural attachments. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 36 months	45	211, 212

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Apr 1/09	322013	Nose Gear Outer Barrel Assembly. Make sure you examine these areas: (1.) Outer barrel surface, (2.) End upper strut and lower collar assembly. NOTE: Disassemble the nose gear strut to get access. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor on the sliding surfaces of the oleo strut. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 36 months	45	720
Added Apr 1/09	322014	Nose Gear Inner Barrel Assembly. Make sure you examine these areas: (1.) Inner barrel surface, (2.) Strut tube assembly. NOTE: Disassemble the nose gear strut to get access. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the sliding surfaces of the oleo strut. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 36 months	45	720
Added Apr 1/09	322015	Nose Gear Trunnion Steering Assembly, Torque Link Assembly, and Nose Gear Fork. Make sure you examine these areas: (1.) Nose gear trunnion surface, (2.) Steering collar and steering collar attach bolt, (3.) Torque link, torque link attach pin, and attach bolt, (4.) Nose gear fork and shock strut bearing block. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 36 months	45	720

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Apr 1/09	322016	Nose Gear Trunnion Steering Assembly, Torque Link Assembly, and Nose Gear Fork. Make sure you examine these areas: (1.) Nose gear trunnion upper, lower inner bore surface and bearing, (2.) Torque link bolt and attach pin inner bore surface, (3.) Nose gear fork lug inner bore surface. NOTE: Disassemble the nose gear strut to get access. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the sliding surfaces of the oleo strut. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 36 months	45	720
Added Apr 1/09	322018	Nose Gear Axle Assembly. Make sure you examine these areas: (1.) Nose gear axle and attach bolt, (2.) Wheel halves. NOTE: Disassemble the nose wheel assembly to get access. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the bearing. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 36 months	45	720
	323001	Landing Gear System - Check actuating time and motor (Flight Check), Refer to 32-30-00, Extension and Retraction - Inspection/Check.	Every 50 hours or 12 months	1	720
	323002	Landing Gear Actuator - Inspect for condition, security, and wiring for condition, routing, and support.	Every 200 hours or 12 months	3	235
	323003	Landing Gear Actuator - Service.	Every 100 hours or 12 months	2	235
	323004	Manual Extension System - Inspect condition, operation and specification compliance. Refer to 32-30-00, Extension and Retraction - Inspection/ Check.	Every 200 hours or 12 months	3	235
	323005	Manual Extension System Support Bearings - Service.	Every 500 hours	6	235
	323006	Manual Extension System Spool and Bell Crank - Service.	Every 500 hours	6	235

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	323007	Manual Extension System Crank Handle Linkage - Service.	Every 500 hours	6	235
	323008	Manual Extension System Miter Gear - Service.	Every 1500 hours	7	235
	323009	Main and Nose Landing Gear Assemblies - Inspect for condition.	Every 50 hours or 12 months	1	720, 721, 722
	323010	Nose and Main Landing Gear Extension and Retraction System Check - Inspect condition, operation and specification compliance. Refer to 32-30-00, Extension and Retraction - Inspection/Check.	Every 200 hours or 12 months	3	720, 721, 722
	323011	Nose and Main Landing Gear Extension and Retraction Linkage - Check condition of linkage.	Every 200 hours or 12 months	3	720, 721, 722
	323012	Main Gear Uplock Bushings - Service.	Every 100 hours or 12 months	2	721, 722
	323013	Main Gear Thrust Washers - Service.	Every 100 hours or 12 months	2	721, 722
	323014	Main/Nose Gear Retraction System Teardown Check, refer to 5-14-11, Supplemental Inspection Number 32-30-00 for inspection procedures.	First 10,000 landings or 20 years, repeat every 5,000 landings or 10 years.	30	235, 510, 610, 720, 721, 722
	323015	Nose Gear Trunnion - Check (1.19 inch lugs), refer to 5-14-12, Supplemental Inspection Number 32-30-07 for inspection procedures.	Refer to MEB88-5 Revision 2, or latest revision for the initial and repeat inspection intervals.	19	720

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	323016	Nose Gear Trunnion - Check (1.31 inch lugs), refer to 5-14-13, Supplemental Inspection Number 32-30-08 for inspection procedures.	Refer to MEB88-5 Revision 2, or latest revision for the initial and repeat inspection intervals.	19	720
Added Apr 1/09	323017	Nose Gear Retraction Systems. Make sure you examine these areas: (1.) Mechanisms, (2.) Bushings, (3.) Bearings, (4.) Structural attachments. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information). NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the sliding surfaces of the oleo strut. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 36 months	45	720
Added Apr 1/09	323018	Main Gear Retraction Systems. Make sure you examine these areas: (1.) Mechanisms, (2.) Bushings, (3.) Bearings, (4.) Structural elements. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor on bearing. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 36 months	45	721, 722
Added Apr 1/09	323019	Main Landing Gear Torque Tube. Make sure you examine these areas: (1.) Torque tube internal and external surfaces, (2.) Torque tube welds. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 12 months	43	721, 722
	324001	Nose and Main Gear Wheel Bearings - Service.	First 100 hours and every 200 hours thereafter	14	720, 721, 722

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	324002	Nose and Main Wheel and Tires - Check wear, pressure and condition.	Every 50 hours or 12 months	1	720, 721, 722
	324003	Brakes - Perform operational check of main and parking brake system.	Every 100 hours or 12 months	2	721, 722
	324004	Brake System Plumbing - Inspect for leaks, condition and security. Check for proper routing and support.	Every 200 hours or 12 months	3	233, 234, 510, 610, 721, 722
	324005	Brake Assemblies - Check wear of lining and disc warpage.	Every 200 hours or 12 months	3	721, 722
	324006	Brake Master Cylinders - Service.	Every 200 hours or 12 months	3	233
	324007	Parking Brake Handle Shaft and Pivot Points - Service.	Every 500 hours	6	228
	325001	Nose Gear Shimmy Damper - Check for leakage and attach points for wear and condition.	Every 50 hours or 12 months	1	720
	325002	Nose Gear Shimmy Damper - Service.	First 100 hours and every 200 hours thereafter	14	720
	325003	Nose Wheel Steering System - Check cable tension, travel and gimbal bolts for condition and torque.	Every 100 hours or 12 months	2	211, 212, 720
	325004	Nose Gear Steering Stop Block - Check security.	Every 50 hours or 12 months	1	720
	331001	Instruments, Interior and Exterior Lights - Check for operation, condition of lens and security.	Every 50 hours or 12 months	1	221, 222, 223, 224, 225, 226, 227, 228, 231, 232, 340, 520, 540, 620, 640

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	331002	Warning Lamps - Check condition.	Every 100 hours or 12 months	2	223, 228
	334001	Landing Light Hinge Point - Service.	Every 500 hours	6	530, 630
	334002	Landing Light Internal Gears - Service.	Every 1500 hours	7	530, 630
	334003	Landing Light Exposed Gear Sector - Service.	Every 500 hours	6	530, 630
	340001	Antennas - Check Mounting and Security.	Every 200 hours or 12 months	3	221, 222, 231, 232, 311, 312, 340
	340002	Antennas and Cables - Inspect for Security of Attachment, Connections, and Conditions.	Every 200 hours or 12 months	3	221, 222, 231, 232, 311, 312, 340
	340003	Transponder - Inspect to comply with 14 CFR 91.413	Every 2 years	9	225
	341001	Pitot Static Sump(s) - Check for cracks, dents, leaks and presence of water, drain sumps.	Every 200 hours or 12 months	3	221, 222
	341002	Pitot Static System - Leak check.	Every 200 hours or 12 months	3	211, 212, 221, 222
	341003	Altimeter and Static System - Inspect as required by CFR Part 91, Paragraph 91.170 in accordance with CFR, Part 43, Appendix E, by Authorized Repair Station.	Every 2 years	9	211, 212, 221, 222, 223
	341004	Alternate Static Source - Check for obstructions and drain.	Every 200 hours or 12 months	3	211, 221
	350001	Oxygen System - Check installation, mountings, equipment and pressure.	Every 200 hours or 12 months	3	211, 221, 222, 231, 232
	350002	Oxygen Regulator - Check pressure and rate of flow.	Every 200 hours or 12 months	3	211

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	350003	Oxygen Masks and Hoses - Check condition and clean.	Every 200 hours or 12 months	3	221, 222, 231, 232
	350004	Oxygen Cylinder - ICC-3HT/DOT-3HT (Light Weight) - Inspect condition and hydrostatic test date.	Every 3 years	10	211
	350005	Oxygen Cylinder - ICC-3AA/DOT-3AA (Standard Weight) - Inspect condition and hydrostatic test date.	Every 5 years	11	211
	371001	Vacuum Pump - Wet - Inspect for leaks, condition and security.	Every 100 hours or 12 months	2	430, 440
	371002	Vacuum Dry Air Pump - Inspect for condition and security.	Every 100 hours or 12 months	2	430, 440
	371003	Vacuum Dry Air Pump Coupling - Inspect the drive coupling to make sure it is in satisfactory condition.	Every 100 hours or 12 months	2	430, 440
	371004	Vacuum Pump Pad Seal - Inspect for condition and replace seal if there is evidence of any oil leakage.	Every 100 hours or 12 months	2	430, 440
	371005	Vacuum Dry Air Pump - Inspect fittings for security.	Every 100 hours or 12 months	2	430, 440
	371006	Vacuum System Hoses - Inspect for hardness, deterioration, looseness and bulging.	Every 100 hours or 12 months	2	221, 222, 430, 440
	371007	Regulator and De-ice Control Valves - Inspect for general condition and security.	Every 100 hours or 12 months	2	510, 610
	371008	Vacuum Manifold Check Valve - Check for proper operation. Refer to Airborne Air and Fuel Products Service Letter Number 39A or latest revision.	Beginning first 5 years from date of manufacture, then every 12 months thereafter	17	430, 440

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	371009	Vacuum System Central Air Filter - Clean and inspect for deterioration and contamination.	Every 100 hours or 12 months	2	211, 212
	371010	Vacuum System Relief Valve - Check security and condition. Replace filter.	Every 100 hours or 12 months	2	510, 610
	521001	Cabin Door - Check for condition and operation.	Every 100 hours or 12 months	2	232
	521002	Cabin Door Latch Mechanism - Service.	Every 200 hours or 12 months	3	232
	521003	Cabin Door Hinge - Service.	Every 100 hours or 12 months	2	232
	521004	Cabin Door Retention - Check, refer to 5-14-14, Supplemental Inspection Number 52-10-00 for inspection procedures.	First 10,000 hours or 20 years, repeat every 5,000 hours or 10 years.	31	232
Added Apr 1/09	521005	Passenger/Crew Door Retention System (or cargo door, if installed). Make sure you examine these areas: (1.) Bell cranks, (2.) Pushrods, (3.) Handle, (4.) Pin retention linkages, (5.) Pins, (6.) Lockplates and guides, (7.) Hinges, (8.) Internal door framing. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 48 months	46	830
	522001	Emergency Exit Window Mechanism Inspection, refer to 5-14-15, Supplemental Inspection Number 52-20-00 for inspection procedures.	First 1,000 hours or 3 years, repeat every 1,000 hours or 3 years.	32	231

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	523001	Fuselage Baggage Door - Check for condition and operation.	Every 200 hours or 12 months	3	232
	523002	Fuselage Baggage Door Hinge and Door Stop - Service.	Every 500 hours	6	232
	523003	Fuselage Baggage Door Latch Mechanism - Service.	Every 500 hours	6	232
	523004	Wing Locker Door - Check condition, operation, and security of hinges, latches, and seals.	Every 200 hours or 12 months	3	520, 620
	523005	Wing Locker Door Stop - Service.	Every 500 hours	6	520, 620
	523006	Nose Baggage Door - Check for condition, operation, and security of hinges and latches.	Every 200 hours or 12 months	3	211
	523007	Nose Baggage Door Hinge and Door Stop - Service.	Every 500 hours	6	211
Added Apr 1/09	523008	Fuselage Nose Baggage. Make sure you examine these areas: (1.) Nose baggage shelves, (2.) Nose baggage lower internal structure. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	211, 212
	530001	Fuselage Exterior and Interior Surfaces - Check for damage, wrinkles, corrosion, etc.	Every 200 hours or 12 months	3	110, 211, 212, 221, 222, 231, 232, 311, 312
Added Apr 1/09	530002	Fuselage Skin. Make sure you examine this area: (1.) Skin in the area beneath the heater. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	211, 212
Added Apr 1/09	530003	Fuselage Lower Internal Structure Beneath the Floor Panels. Make sure you examine this area: (1.) Cabin structure under floorboards. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	233, 234

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Apr 1/09	530004	Fuselage Lower Internal Structure Beneath the Floor Panels. Make sure you examine these areas: (1.) Carry-thru front spar webs and spar caps, (2.) Carry-thru rear spar webs and spar caps, (3.) Front and rear spar attach fittings, (4.) Cabin frame lower corners, (5.) Fuselage skin. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	235, 236
Added Apr 1/09	530005	Areas of the Cabin Structure. Make sure you examine this area: (1.) Forward cabin bulkhead. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	211, 212
Added Apr 1/09	530006	Areas of the Cabin Structure. Make sure you examine these areas: (1.) Windshield frame, (2.) Window frames, (3.) Seat tracks, (4.) Seat attachment structure. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	221, 222
Added Apr 1/09	530007	Areas of the Cabin Structure. Make sure you examine these areas: (1.) Side and cabin door's forward frame, (2.) Window frames with emphasis at stringers and channel assemblies from frame aft of crew's window to aft bulkhead, (3.) Seat tracks, (4.) Seat attachment structure, (5.) Aft Cabin Bulkhead. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	231, 232
Added Apr 1/09	530008	Areas of the Cabin Structure for the Passenger/Crew Door (or cargo door, if installed). Make sure you examine these areas: (1.) Door frames. (2.) Door hinges. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 48 months	46	830

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Apr 1/09	530009	Fuselage External Skin. Make sure to examine these areas: (1.) Fuselage skin underneath antenna installation(s). NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	231, 232, 311, 312
Added Apr 1/09	530010	Fuselage External Skin. Make sure to examine these areas: (1.) Fuselage skin underneath antenna installation(s). NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	211, 212, 233, 234, 235, 236
	531001	Horizontal Stabilizer Rear Spar Angle Attachment, refer to 5-14-16, Supplemental Inspection Number 53-10-03 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	531002	Window Frame and Surrounding Structure, refer to 5-14-17, Supplemental Inspection Number 53-10-04 for inspection procedures.	First 10,000 hours or 20 years, repeat every 5,000 hours or 10 years.	34	221, 222, 231, 232
	541001	Engine Support Beams, refer to 5-14-18, Supplemental Inspection Number 54-10-00 for inspection procedures.	First 1,500 hours or at engine overhaul, repeat every 1,500 hours or engine overhaul.	35	430, 440

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	541002	Engine Beam Modification, refer to 5-14-19, Supplemental Inspection Number 54-10-01 for inspection procedures.	Refer to MEB99-7 or latest revision for the initial and repeat inspection intervals.	36	430, 440
	551001	Horizontal Stabilizer - Check bolts for security, attach bulkhead for cracks, failed fasteners and lower spar caps for cracks, hinge brackets for cracks and loose fasteners, and outboard hinge bearing for looseness.	Every 100 hours of operation or 12 months	2	321, 322, 331, 332
	551002	Horizontal Stabilizer Inspection, refer to 5-14-20, Supplemental Inspection Number 55-10-00 for inspection procedures.	First 10,000 hours or 20 years, repeat every 5,000 hours or 10 years.	31	321, 322, 331, 332
	551003	Horizontal Stabilizer Spars and Attachments, refer to 5-14-21, Supplemental Inspection Number 55-10-01 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	551004	Horizontal Stabilizer Forward Spar Upper Cap, refer to 5-14-22, Supplemental Inspection Number 55-10-02 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	551005	Horizontal Stabilizer Forward Spar Lower Cap, refer to 5-14-23, Supplemental Inspection Number 55-10-03 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	551006	Horizontal Stabilizer Forward Spar Attach, refer to 5-14-24, Supplemental Inspection Number 55-10-04 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	551007	Horizontal Stabilizer Rear Spar Lower Cap Attach, refer to 5-14-25, Supplemental Inspection Number 55-10-05 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	551008	Horizontal Stabilizer Rear Spar Upper Cap, BL 0.0, refer to 5-14-26, Supplemental Inspection Number 55-10-06 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	551009	Horizontal Stabilizer Rear Spar Lower Cap, BL 0.0, refer to 5-14-27, Supplemental Inspection Number 55-10-07 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
Added Apr 1/09	551010	Fuselage to Horizontal Stabilizer Attachment. Make sure you examine these areas: (1.) Tailcone bulkhead at forward spar assembly attachment, (2.) Tailcone bulkhead at aft spar attachment. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	321, 322

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Apr 1/09	551011	Horizontal Stabilizer Structure. Make sure you examine these areas: (1.) Forward spar upper and lower caps at access panels, (2.) Rear spar upper and lower caps, (3.) Auxiliary spars at access panels, (4.) Forward spar web and attachment to the tailcone bulkhead, (5.) Aft spar attachment to the tailcone bulkhead. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	331, 332
	552001	Outboard Elevator Hinge Bracket and Attachment- Check, refer to 5-14-28, Supplemental Inspection Number 55-20-00 for inspection procedures.	First 5,000 hours or 10 years, repeat every 1,000 hours or 3 years.	23	331, 332
	552002	Elevator Hinges and Fittings, refer to 5-14-29, Supplemental Inspection Number 55-20-01 for inspection procedures.	First 15,000 hours or 20 years, repeat every 2,500 hours or 5 years.	21	331, 332
	553001	Vertical Stabilizer - Check bolts for security, attach bulkhead for cracks, failed fasteners and, hinge brackets for cracks and loose fasteners.	Every 100 hours of operation or 12 months	2	321, 322, 340
	553003	Rudder Hinges and Fittings, refer to 5-14-31, Supplemental Inspection Number 55-30-01 for inspection procedures.	First 15,000 hours or 20 years, repeat every 2,500 hours or 5 years.	21	340

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	553004	Vertical Stabilizer Rear Spar Cap Attach, refer to 5-14-32, Supplemental Inspection Number 55-30-02 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	340
	553005	Vertical Stabilizer Spars and Attachments, refer to 5-14-30, Supplemental Inspection Number 55-30-00 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	340
Added Apr 1/09	553006	Fuselage to Vertical Stabilizer Attachment. Make sure to examine these areas: (1.) Tailcone bulkhead at vertical tail forward spar assembly attachment, (2.) Tailcone bulkhead at vertical tail rear spar assembly attachment. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	321, 322
Added Apr 1/09	553007	Vertical Stabilizer Structure. Make sure you examine these areas: (1.) Forward spar attachment to tailcone bulkhead, (2.) Aft spar attachment to tailcone bulkhead, (3.) Front and rear spar caps, (4.) Front spar web near tailcone attachment bolts, (5.) Stabilizer skin underneath antenna installation. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	340
	560001	Windshield and Windows - Inspect for condition. Check latches, hinges, and seals for condition, operation and security of attachment. Check window release handle for correct position.	Every 100 hours or 12 months	2	221, 222, 231, 232
	560002	Emergency Exit Window - Check window for security and proper installation. Check release mechanism for proper cable routing and release pin installation.	Every 100 hours or 12 months	2	231

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	560003	Emergency Exit Window - Remove and reinstall the window to assure proper operation of emergency exit.	Every 5 years	11	231
	570001	Wing - Check for loose rivets, cracks, loose mounting bolts and security.	Every 50 hours or 12 months	1	510, 520, 530, 610, 620, 630
	570002	Wing Wheel Well - Check root rib and wheel well for fume proofing.	Every 100 hours or 12 months	2	510, 610
	570003	Wing Spar Fittings - Check bolts for torque and security. First 100 hours of operation, check bolt torque. After first 100 hour inspection, check for security and working fasteners. Do not retorque fasteners after first 100 hour inspection.	Every 100 hours or 12 months	2	510, 610
	570004	Wing Lower Front Spar Fitting - Perform Type A Inspection. Refer to 57-00-00 Wings - Inspection/Check.	Every 1500 hours	7	510, 520, 530, 610, 620, 630
	570005	Wing Lower Front Spar Fitting, Flanges, and Lower Spar Cap - Perform Eddy Current inspection. Refer to 57-00-00 Wings - Inspection/ Check for inspection requirements.	First 15,000 hours, repeat every 2000 hours	20	510, 520, 530, 610, 620, 630
	570006	Wing Structure Exposed to Exhaust Gases - Inspect for any evidence of corrosion.	Every 100 hours or 12 months	2	520, 620
Added Apr 1/09	570007	Wing Structure External. Make sure you examine these areas: (1.) Skin with emphasis at skin overlaps and under access panels, (2.) Leading edge skin under de-ice boot. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	510, 610

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Apr 1/09	570008	Wing Structure Internal. Make sure you examine these areas: (1.) Wing front spar upper and lower spar caps, (2.) Upper and lower wing carry-thru main spar fittings, (3.) Upper and lower main spar wing root fittings. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	510, 610
Added Apr 1/09	570009	Wing Structure External. Make sure you examine this area: (1.) Skins with emphasis at skin overlaps under access panels. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	512, 612.
Added Apr 1/09	570010	Wing Structure Internal. Make sure you examine these areas: (1.) Rear spar upper and lower carry-thru fittings, (2.) Rear spar upper and lower caps, (3.) Rear spar cap. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 36 months	45	512, 612
Added Apr 1/09	570011	Wing Structure External. Make sure you examine these areas: (1.) Wing skin with emphasis at skin overlaps and under access panels, (2.) Main landing gear wheel well close-out rib, (3.) Rear spar upper cap near rear spar splice, (4.) Structure in the path of exhaust gases, (5.) Rear spar web. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	520, 620
Added Apr 1/09	570012	Wing Structure Internal. Make sure you examine these areas: (1.) Wing main spar lower and upper caps, (2.) Wing rear spar upper and lower caps, (3.) Wing lower auxiliary spar caps, (4.) Rear spar web. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 12 months	43	520, 620

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Apr 1/09	570013	Wing Structure External, between W.S. 90 and W.S. 133 forward of the main spar. Make sure you examine these areas: (1.) Skin under wing de-ice boot, (2.) Skin with emphasis at skin overlaps and under access panels. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	530, 630
Added Apr 1/09	570014	Wing Structure Internal, between W.S. 90 and W.S. 133 aft of the main spar. Make sure you examine these areas: (1.) Main upper and lower spar caps, (2.) Rear upper and lower spar caps with emphasis in exhaust path, (3.) Rear spar web. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	530, 630
Added Apr 1/09	570015	Wing Structure External, between W.S. 90 and W.S. 133 aft of the main spar. Make sure you examine these areas: (1.) Skin with emphasis at skin overlaps and under access panels, (2.) Rear spar upper and lower caps, (3.) Rear spar web with emphasis in exhaust path, (4.) Structure in the path of exhaust gases. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	530, 630
Added Apr 1/09	570016	Wing Structure External, between W.S. 133 and W.S. 200 forward of the main spar. Make sure you examine these areas: (1.) Skin under wing de-ice boot, (2.) Skin with emphasis at skin overlaps and under access panels. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	530, 630

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
Added Apr 1/09	570017	Wing Structure External, between W.S. 133 and W.S. 200 aft of the main spar. Make sure you examine these areas: (1.) Skin with emphasis at skin overlaps and under access panels, (2.) Rear spar upper and lower caps, (3.) Rear spar web. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	530, 630
Added Apr 1/09	570018	Wing Structure Internal, between W.S. 133 and W.S. 200. Make sure you examine these areas: (1.) Upper and lower main spar caps, (2.) Upper and lower rear spar caps. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	530, 630
Added Apr 1/09	570019	Wing Structural Attachments. Make sure you examine these areas: (1.) Tip tank fittings at forward and aft spars. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	540, 640
	571001	Wing Rib - Main Landing Gear Side Brace, refer to 5-14-33, Supplemental Inspection Number 57-10-03 for inspection procedures.	First 10,000 hours or 20 years, repeat every 5,000 hours or 10 years.	34	520, 620
	571002	Wing Lower Rear Spar Cap at Splice - Check, refer to 5-14-34, Supplemental Inspection Number 57-10-04 for inspection procedures.	First 5,000 hours or 10 years, repeat every 1,000 hours or 3 years.	23	530, 630

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	571003	Wing Lower Rear Carry-Thru Spar, refer to 5-14-35, Supplemental Inspection Number 57-10-05 for inspection procedures.	First 15,000 hours or 20 years, repeat every 1,000 hours or 3 years.	38	510, 610
	571004	Wing Main Spar Lower Cap, refer to 5-14-36, Supplemental Inspection Number 57-10-06 for inspection procedures.	First 11,000 hours of operation, refer to 5-14-36, Supplemental Inspection 57-10-06.	37	510, 520, 610, 620
	571005	Wing Aft Lower Auxiliary Spar Cap, refer to 5-14-37, Supplemental Inspection Number 57-10-07 for inspection procedures.	First 6500 hours or 13 years, repeat every 2,500 hours or 5 years.	39	510, 520, 610, 620
Revised Aug 15/19	571006	Wing Lower Carry-Thru Main Spar Cap (P/N 0811300-3), refer to 5-14-38, Supplemental Inspection Number 57-10-08 for inspection procedures.	First 11,000 hours, repeat every 400 hours.	51	510, 610
	571007	Wing Lower Front Spar Cap at Root Fitting Attach, WS 28.96, refer to 5-14-39, Supplemental Inspection Number 57-10-09 for inspection procedures.	First 11,000 hours or 20 years, repeat every 4,000 hours or 8 years.	40	510, 610
	571008	Wing Lower Front Spar Cap at Root Fitting Attach, WS 36.36, refer to 5-14-40, Supplemental Inspection Number 57-10-10 for inspection procedures.	First 11,000 hours or 20 years, repeat every 2,000 hours or 4 years.	41	510, 610

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	571009	Wing Lower Auxiliary Spar Cap, refer to 5-14-41, Supplemental Inspection Number 57-10-11 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	520, 620
	571010	Wing Front Spar Lug Inspection, refer to 5-14-42, Supplemental Inspection Number 57-10-12 for inspection procedures.	First 15,000 hours or 20 years, repeat every 2,500 hours or 10 years.	42	510, 610
	571011	Wing Tip Tank Attachment Inspection, refer to 5-14-43, Supplemental Inspection Number 57-10-13 for inspection procedures.	First 15,000 hours or 20 years, repeat every 2,500 hours or 10 years.	42	540, 640
Added Apr 1/09	571012	Wing Upper Center Skin Panel Inspection, refer to 5-14-44, Supplemental Inspection Number 57-10-28 for inspection procedures.	First 2,500 hours or 10 years, repeat every 200 hours or 2 years.	49	512, 612
Added Aug 15/19	571013	Wing Lower Carry-Thru Main Spar Cap (P/N 0811300-78), refer to 5-14-46, Supplemental Inspection Number 57-10-29 for inspection procedures.	First 15,000 hours, repeat every 800 hours.	52	510, 610
	610001	Propeller Spinner - Wash, check for cracks and fractures.	Every 50 hours or 12 months	1	410, 420
	610002	Propeller Blades - Check for nicks, cracks and scratches.	Every 100 hours or 12 months	2	410, 420

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	610003	Propeller Cylinder - Check allen screws for security.	Every 100 hours or 12 months	2	410, 420
	610004	Propeller Hub - Check general condition.	Every 200 hours or 12 months	3	410, 420
	610005	Propeller Governor - Check for operation, oil leaks, condition and security.	Every 200 hours or 12 months	3	430, 440
	610006	Spinner Bulkhead - Check for cracks and security on crankshaft.	Every 200 hours or 12 months	3	410, 420
	610007	Propeller - Check for oil leaks.	Every 200 hours or 12 months	3	410, 420
	610008	Propeller Mounting - Check nuts for security and blade track.	Every 100 hours or 12 months	2	410, 420
	610009	Propeller Deice Slip Rings, Brushes, and Boots - Check condition, operation and security of attachment.	Every 50 hours or 12 months	1	410, 420
	610011	Propeller Synchronizer - Check for condition and security.	Every 200 hours or 12 months	3	221, 222, 430, 440
Added Apr 1/09	610012	Propeller Assembly. Make sure you examine these areas: (1.) Propeller blade and attachment, (2.) Propeller hub, (3.) Propeller assembly bearings and pins. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 60 months	47	410, 420
	710001	Nacelle Firewall - Inspect for condition and security.	Every 200 hours or 12 months	3	430, 440
	710002	Engine - Wash, check for security of accessories.	Every 100 hours or 12 months	2	430, 440

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	710003	Engine Compartment - Visually check for condition, oil leaks, fuel leaks.	Every 100 hours or 12 months	2	430, 440
	710004	Engine Compartment Hoses - Fuel, (Check Fuel Lines Under Pressure), Oil, and Vacuum Hoses - Check for deterioration, leaks, discoloration bleaching and rubber hoses for stiffness.	Every 50 hours or 12 months	1	430, 440
	710005	Cylinder Compression - Refer to Manufacturer's Service Bulletin M84-15.	Every 100 hours or 12 months	2	430, 440
	710006	Engine Cylinders, Rocker Box Covers and Push-Rod Housing - Check for fin damage, cracks, oil leakage, security of attachment and general condition.	Every 100 hours or 12 months	2	430, 440
	710007	Crankcase - Oil Sump: Inspect for cracks and evidence of oil leakage, check bolts and nuts for looseness and retorque as necessary.	Every 100 hours or 12 months	2	430, 440
	710008	Engine Baffles And Seals - Check condition and security.	Every 50 hours or 12 months	1	430, 440
Added Apr 1/09	710009	Nacelle Internal Structure. Make sure you examine these areas: (1.) Firewall, (2.) Canted bulkhead, (3.) Stringers at engine mounts. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 12 months	43	430, 440
	711001	Cowling and Cowl Flaps - Wash and inspect for cracks, dents, condition of paint and other damage. Check fasteners and cowl flaps for condition, security, and operation.	Every 200 hours or 12 months	3	430, 440
	711002	Cowl Flap Control Cable and Housing - Service.	Every 200 hours or 12 months	3	430, 440
	711003	Cowl Flap Hinge - Service.	Every 100 hours or 12 months	2	430, 440

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	711004	Cowl Flap Linkage Pivot Points and All Spherical Rod Ends - Service.	Every 100 hours or 12 months	2	430, 440
Added Apr 1/09	711005	Nacelle External Structure. Make sure you examine these areas: (1.) Nacelle skin within path of exhaust, (2.) Exhaust stack. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 12 months	43	520, 620
Added Apr 1/09	711006	Nacelle Structure. Make sure you examine these areas: (1.) Nacelle lockers with emphasis at compartment's floor, (2.) Structure under nacelle lockers. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 12 months	43	520, 620
	712001	Engine Support Structure - Inspection. For Model T310R Airplanes only, having complied with and completed MEB99-7 and have been modified by the installation of SK310-112, or later revision. Visually check the engine support beams and canted bulkhead for corrosion. If corrosion is seen, recomply with MEB99-7, or latest revision. If any indication of exhaust gas leak or engine fire is seen, recomply with MEB99-7, or latest revision.	Every 12 months, exhaust system removal, or engine overhaul.	13	430, 440
	712002	Engine Support Structure - Inspection. For Model T310R Airplanes only, having complied with and completed MEB99-7 and have not been modified by the installation of SK310-112, or later revision. Recomply with MEB99-7, or latest revision.	Every 500 hours, 24 months, exhaust system removal or engine overhaul	18	430, 440
Added Apr 1/09	712003	Engine Support Structure. Make sure you examine these areas: (1.) Engine beams, (2.) Forward and aft engine mounts, (4.) Turbocharger support (if equipped with turbocharger). NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	Every 12 months	43	430, 440

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	715001	Engine Wire Bundles - Check for condition and security.	Every 100 hours or 12 months	2	430, 440
	716001	Induction Air Filter - Service. NOTE: Filter may need to be serviced more often if local dust conditions exist.	Every 50 hours or 12 months	1	430, 440
	716002	Induction System - Check condition and security of ducting and controls for operation and proper rigging.	Every 100 hours or 12 months	2	430, 440
	730001	Fuel/Air Metering Unit Fuel Screen - Clean.	Every 100 hours or 12 months	2	430, 440
	731001	Fuel Pump - Check for leaks, condition and security.	Every 100 hours or 12 months	2	430, 440
	731002	Fuel Injection System and Manifold - Check for leaking and manifold drain valves for proper operation.	Every 100 hours or 12 months	2	430, 440
	731003	Engine Fuel Injection Nozzles - At the first 100-hour inspection on new, rebuilt, or overhauled engines, remove and clean the fuel injection nozzles. Thereafter, the fuel injection nozzles must be cleaned at 300-hour intervals or more frequently if fuel stains are found.	First 100 hours and every 300 hours thereafter	16	430, 440
	741001	Magnetos - Clean and inspect per Teledyne Continental Ignition Systems Service Bulletin SB643 or latest revision. Refer to Cessna Supplier Service Notice SSN94-5.	Every 500 hours	6	430, 440
	742001	Spark Plugs - Clean and rotate (top right to bottom left, top left to bottom right).	Every 100 hours or 12 months	2	430, 440
	742002	Ignition Cables - Check condition and security.	Every 100 hours or 12 months	2	430, 440
	742003	Magneto - Check timing breaker gap and security.	Every 100 hours or 12 months	2	430, 440

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	760001	Control Pedestal - Inspect for condition and security.	Every 200 hours or 12 months	3	228
	760002	Control Pedestal Bearings - Service.	Every 500 hours	6	228
	760003	Engine Controls - Check travel and security. Inspect rubber seals on ends of control cables for deterioration.	Every 100 hours or 12 months	2	430, 440
	780001	Exhaust System (Stainless Steel or Partial Stainless Steel Systems Unknown or Repaired Only) Prior to complete 500-hour disassembly inspection - perform a visual inspection. Refer to detailed inspection procedures in 78-00-00, Exhaust - Inspection/Check.	Every 50 hours or 12 months	1	430, 440
	780002	Engine Exhaust System (Stainless Steel or Partial Stainless Steel Systems, Unknown or Repaired Only) After complete 500 hour disassembly inspection - Perform a visual inspection. Refer to detailed inspection procedures in 78-00-00, Exhaust - Inspection/Check.	Every 100 hours or 12 months	2	430, 440
	780003	Engine Exhaust System (Inconel Only) - Perform a visual inspection. Refer to detailed inspection procedures in 78-00-00, Exhaust - Inspection/Check.	Every 100 hours or 12 months	2	430, 440
	780004	Engine Exhaust System (Stainless Steel or Partial Stainless Steel Systems Unknown or Repaired) Perform a complete disassembly inspection. Refer To Detailed Inspection Procedures in 78-00-00, Exhaust - Inspection/Check.	Every 500 hours	6	430, 440
	780005	Engine Exhaust System (Inconel Only) - Perform a complete disassembly inspection. Refer to detailed inspection procedures in 78-00-00, Exhaust - Inspection/Check.	Every 1400 hours or 12 years	15	430, 440
	780006	Exhaust System (Inconel System Only) - Perform a disassembly inspection of the exhaust slip joints and turbocharger exhaust pipe. Refer to detailed inspection procedures in 78-00-00, Exhaust - Inspection/Check.	Every 500 hours	6	430, 440

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	790001	Engine Oil Pressure System - Check lines for leaks, bends, cracks and security.	Every 50 hours or 12 months	1	430, 440
	790002	Engine Oil Breather Separator (Turbo 310) - Clean.	Every 50 hours or 12 months	1	430, 440
	790003	Engine Oil - Change.	Every 50 hours or 12 months	1	430, 440
	790004	Engine Oil Filter - Replace filter and inspect adapters (Turbo 310).	Every 50 hours or 12 months	1	430, 440
	790005	Engine Oil Filter - Replace filter and inspect adapters (Standard 310).	Every 50 hours or 12 months	1	430, 440
	800001	Starter, Starter Solenoid and Electrical Connectors - Check condition and security of attachment.	Every 100 hours or 12 months	2	430, 440
	800002	Starter - Check brushes, commutator, and connectors.	Every 200 hours or 12 months	3	430, 440
	810001	Turbocharger - Check for condition, bulges, warps and security.	Every 100 hours or 12 months	2	430, 440
	810002	Waste Gate Valve and Controllers - Check condition and security of attachment.	Every 200 hours or 12 months	3	430, 440
	810003	Manifold Pressure Relief Valve - Visually check for obstructions, condition, security and operation.	Every 200 hours or 12 months	3	430, 440

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INSPECTION TIME LIMITS

1. Inspection Items

REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	110001	Placards and Decals - Inspect for security, presence and legibility.	Every 200 hours or 12 months	3	223, 224, 225, 226, 227, 228
	214001	Heater (Stewart-Warner) - Check condition and operation.	Every 250 hours of operation	4	212
	214002	Cabin heater fuel lines, check for condition, security and evidence of fuel leaks.	Every 200 hours or 12 months	3	212
	220001	Autopilot - Check Cables, Attachments, Pulleys and Turnbuckles for tension, condition and security.	Every 200 hours or 12 months	3	236, 311, 312
	220002	Autopilot - Inspect in accordance with applicable Autopilot or IFCS Service/ Parts Manual.	Every 100 hours or 12 months	2	228, 235, 236, 311, 312
	230001	Radio and Navigation System - Check for operation and condition.	Every 200 hours or 12 months	3	225, 228
	236001	Static Discharge - Check Static Bonding Strips for security.	Every 200 hours or 12 months	3	340, 540, 640
	240001	Airplane Electrical System Wiring - Check for chafing, broken or loose terminals and general condition.	Every 100 hours or 12 months	2	110, 211, 212, 221, 222, 231, 232, 311, 312, 340, 430, 440, 510, 520, 530, 540, 610, 620, 630, 640
	240002	Junction Boxes - Check terminals for condition and security.	Every 100 hours or 12 months	2	211, 212, 221, 222,

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	240003	Circuit Breaker Panel - Check terminals, wiring and mountings.	Every 100 hours or 12 months	2	221
	240004	Voltage Regulators - Check wiring, mounting, condition and wire routing.	Every 200 hours or 12 months	3	222
	240005	Switches - Check operation, terminals, wiring and mounting.	Every 100 hours or 12 months	2	221, 223, 224, 225, 226, 227, 228
	240006	Landing Gear Relay and Limit Switch - Check mounting and terminals.	Every 200 hours or 12 months	3	231
	240007	Wing and Fuselage - Check wiring, routing, security and terminals.	Every 200 hours or 12 months	3	110, 211, 212, 221, 222, 231, 232, 311, 312, 340, 430, 440, 510, 520, 530, 540, 610, 620, 630, 640
	243001	Battery, check electrolyte specific gravity.	Every 50 hours or 12 months	1	530
	243002	Battery Box and Battery Cables - Inspect overboard drain tube, check for corrosion cable routing, support and security of connections.	Every 100 hours or 12 months	2	530
	243003	Alternators - Check brushes, leads, bearings and slip rings for condition and security.	Every 500 hours	6	430, 440
	243004	Alternators - Service (100 Amp Prestolite Only).	Every 100 hours or 12 months	2	430, 440
	246001	Starter Relay - Inspect contact area.	Every 400 hours	5	520
	250001	Upholstery, Headliner, Trim and Carpet - Check for condition and clean.	Every 200 hours or 12 months	3	221, 222, 231, 232

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	250002	Seat Belts - Check for condition and security.	Every 50 hours or 12 months	1	221, 222, 231, 232
	250003	Seat Bearings - Service.	Every 200 hours or 12 months	3	221, 222, 231, 232
	250004	Seat Adjusting Screw - Service.	Every 500 hours	6	221, 222
	250006	Pilot and Copilot Seats - Inspect seat tracks for wear and/or damage, controls for security of installation and operation; seat structure welds and mechanism for cracks, damage and security.	Every 200 hours or 12 months	3	221, 222
	250007	Passenger Seats - Inspect seat backs for wear and/or damage; controls for security of installation and operation; seat structure and cushions for damage.	Every 200 hours or 12 months	3	231, 232
	250008	Replacement Fuses - Ensure that fuses are installed in glove box or under co-pilot's seat if glove box is not installed	Every 200 hours or 12 months	3	222, 226
	256001	Emergency Locator Transmitter - Check operation, condition, security and battery pack for date check. Check in accordance with 14 CFR 91.207 and AC91-44. Check surrounding structure for corrosion.	Every 100 hours or 12 months	2	311, 312
	262001	Engine Compartment Fire Extinguisher - Check System, Pressure, Condition And Security.	Every 100 hours or 12 months	2	430, 440
	262002	Engine Fire Extinguisher - Check Hydrostatic Test Date.	Every 100 hours or 12 months	2	430, 440
	270001	Control Column - Check for security, looseness, wear and correct rigging.	Every 200 hours or 12 months	3	223, 224
	270002	Control Column Control Tube - Service.	Every 500 hours	6	223, 224
	270003	Control Column Bearings - Service.	Every 500 hours	6	223, 224

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	271001	Aileron - Check hinges for condition, cracks and security.	Every 200 hours or 12 months	3	530, 630
	271002	Aileron - Check skins for cracks and loose rivets.	Every 200 hours or 12 months	3	530, 630
	271003	Aileron - Check bell crank, stop bolt, jamnut, linkage, pulleys and attach bolts for safety, security, condition, operation, and travel.	Every 200 hours or 12 months	3	530, 630
	271004	Aileron Trim Tab - Check hinges for condition, cracks and security.	Every 100 hours or 12 months	2	530
	271005	Aileron Trim Tab - Inspect skins for loose rivets and security.	Every 100 hours or 12 months	2	530
	271006	Aileron Trim Tab - Check bolts and linkage for condition, security, and cotter pin for safety.	Every 100 hours or 12 months	2	530
	271007	Aileron Trim Tab - Check free play and travel.	Every 100 hours or 12 months	2	530
	271008	Aileron Push Rod and Actuator Rod End Bearing - Inspect for evidence of binding and damage; tab attach fitting for condition, damage and security, and proper safetying of nut with cotter pin.	Every 100 hours or 12 months	2	530, 630
	271009	Aileron Trim Tab Actuator - Check for condition and security, snap rings for retention, snap ring seating in slot on bracket, clamp seating on actuator and clamp bolts for broken torque putty. If cracks are found in putty, torque to 20-25 inch-pounds, check guard for condition and attachment and sprocket for condition, wear and attachment.	Every 100 hours or 12 months	2	530
	271010	Aileron Trim Tab Actuator - Service.	Every 200 hours or 12 months	3	530

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	271011	Aileron and Aileron Trim Cables - Check for security and tension, for fraying and turnbuckles for safety. Check pulleys for condition and security and mounting structure for cracks and condition.	Every 100 hours or 12 months	2	221, 222, 231, 232, 510, 520, 530, 610, 620, 630
	271012	Aileron Hinges and Fittings - Check, refer to 5-14-01, Supplemental Inspection Number 27-10-04 for inspection procedures.	First 15,000 hours or 20 years, repeat every 2,500 hours or 5 years.	21	530, 630
	272001	Rudder - Check hinges and balance weight for condition, cracks and security.	Every 200 hours or 12 months	3	340
	272002	Rudder - Check skins for cracks and loose rivets.	Every 200 hours or 12 months	3	340
	272003	Rudder - Check bell crank, stop bolt, jamnut, torque tube, linkage, pulleys and attach bolts for safety, security, condition, operation, and travel.	Every 200 hours or 12 months	3	321, 322, 340
	272004	Rudder Trim Tab - Check hinges for condition, cracks and security.	Every 100 hours or 12 months	2	340
	272005	Rudder Trim Tab - Inspect skins for loose rivets and security.	Every 100 hours or 12 months	2	340
	272006	Rudder Trim Tab - Check bolts and linkage for condition, security, and cotter pin for safety.	Every 100 hours or 12 months	2	340
	272007	Rudder Trim Tab - Check free play and travel.	Every 100 hours or 12 months	2	340

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	272008	Rudder Trim Tab Actuator - Check for condition and security, snap rings for retention, snap ring seating in slot on bracket, clamp seating on actuator and clamp bolts for broken torque putty. If cracks are found in putty, torque to 20-25 inch-pounds, check guard for condition and attachment and sprocket for condition, wear and attachment.	Every 100 hours or 12 months	2	340
	272009	Rudder Trim Tab Actuator - Service.	Every 200 hours or 12 months	3	340
	272010	Ruddder and Rudder Trim Cables - Check for security and tension, for fraying and turnbuckles for safety. Check pulleys for condition and security and mounting structure for cracks and condition.	Every 100 hours or 12 months	2	221, 222,233, 234, 235, 236, 311, 312, 321, 322, 340
	272011	Rudder Pedal Linkage and Bearings - Service.	Every 500 hours	6	221, 222
	272012	Rudder Pedal Bearing Halves and Rudder Gust Lock - Service.	Every 1500 hours	7	221, 222
	272013	Rudder Structure - Check, refer to 5-14-02, Supplemental Inspection Number 27-20-03 for inspection procedures.	First 7,500 hours of operation or 15 years, repeat every 2,500 hours of operation or 5 years.	22	340
	272014	Rudder Torque Tube Assembly - Check, refer to 5-14-03, Supplemental Inspection Number 27-20-04 for inspection procedures.	First 7,500 hours of operation or 15 years, repeat every 2,500 hours of operation or 5 years.	22	340

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	272015	Elevator Torque Tube Assembly - Check, refer to 5-14-04, Supplemental Inspection Number 27-30-00 for inspection procedures.	First 5,000 hours of operation or 10 years, repeat every 1,000 hours of operation or 3 years.	23	331, 332
	273001	Elevator - Check hinges for condition, cracks and security.	Every 200 hours or 12 months	3	331, 332
	273002	Elevator - Check skins for cracks and loose rivets.	Every 200 hours or 12 months	3	331, 332
	273003	Elevator - Check bell crank, stop bolt, jamnut, linkage, pulleys and attach bolts for safety, security, condition, operation, and travel.	Every 200 hours or 12 months	3	321, 322, 331, 332
	273004	Elevator - Check elevator balance weights for looseness and tip structure for cracks.	Every 200 hours or 12 months	3	331, 332
	273005	Elevator Trim Tab - Check hinges for condition, cracks and security.	Every 100 hours or 12 months	2	332
	273006	Elevator Trim Tab - Inspect skins for loose rivets and security.	Every 100 hours or 12 months	2	332
	273007	Elevator Trim Tab - Check bolts and linkage for condition, security, and cotter pin for safety.	Every 100 hours or 12 months	2	332
	273008	Elevator Trim Tab - Check free play and travel.	Every 100 hours or 12 months	2	332

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	273009	Elevator Push Rod and Actuator Rod End Bearing - Inspect for evidence of binding and damage; tab attach fitting for condition, damage and security, and proper safetying of nut with cotter pin.	Every 100 hours or 12 months	2	321, 322, 331, 332
	273010	Elevator Trim Tab Actuator - Check for condition and security, snap rings for retention, snap ring seating in slot on bracket, clamp seating on actuator and clamp bolts for broken torque putty. If cracks are found in putty, torque to 20-25 inch-pounds, check guard for condition and attachment and sprocket for condition, wear and attachment.	Every 100 hours or 12 months	2	332
	273011	Elevator Trim Tab Actuator - Service.	Every 200 hours or 12 months	3	332
	273012	Elevator and Elevator Trim Cables - Check for security and tension, for fraying and turnbuckles for safety. Check pulleys for condition and security and mounting structure for cracks and condition.	Every 100 hours or 12 months	2	221, 222, 233, 235, 236, 311, 312, 321, 322, 332,
	273013	Electric Elevator Trim (Optional) - Check for security, condition and travel time.	Every 100 hours or 12 months	2	236
	275001	Flaps - Check linkage, bell cranks, pulleys and cables for condition, tension and security.	Every 200 hours or 12 months	3	235, 510, 610
	275002	Flap Motor and Position Indicator - Check for travel, condition and security.	Every 200 hours or 12 months	3	228, 235
	275003	Flap Actuator Assembly - Check for condition, security and proper operating times.	Every 200 hours or 12 months	3	235
	275004	Flap Limit Switch and Motor - Check wiring and terminals for condition and security.	Every 200 hours or 12 months	3	235
	281001	Tip Tanks - Inspect mounting bolts for security, tip tank for leaks, cracks and dents.	Every 200 hours or 12 months	3	540, 640

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	281002	Auxiliary Tanks - Inspect system for leaks and security.	Every 200 hours or 12 months	3	530, 630
	281003	Inspect BTC-39 Fuel Tanks for leaks. (Reference Service Letter ME78-7).	Every 12 months	8	530, 630
	282001	Fuel Selector Gear Box and Valve - Perform operational check (feel for detent through 270 degrees of travel) check linkage, bearings, pins for condition and safety.	Every 100 hours or 12 months	2	233, 234, 510, 610
	282002	Fuel Selector Gear Box Gears - Clean and Service.	Every 200 hours or 12 months	3	233, 234
	282003	Fuel Selector Valve (Fuel Strainer) - Clean	Every 100 hours or 12 months	2	530, 630
	282004	Fuel Selector Valve - Clean and Service Detent.	Every 100 hours or 12 months	2	233, 234
	282005	Fuel System Main - Inspect plumbing and component mounting for condition, security, system for leaks.	Every 100 hours or 12 months	2	233, 234, 510, 520, 530, 610, 620, 630
	282006	Boost Pumps (Auxiliary) - Inspect for leaks, operation, vent and overboard drain for obstruction.	Every 200 hours or 12 months	3	530, 630
	282007	Heater Fuel Filter - Remove, clean and inspect for deterioration.	Every 200 hours or 12 months	3	212
	282008	Main Tank Fuel Transfer Pump - Check security and mounting.	Every 200 hours or 12 months	3	530, 630
	282009	Main Tank and Wing Locker Fuel Transfer Pump Filter - Clean.	Every 200 hours or 12 months	3	530, 630
	282010	Main Tank and Wing Locker Fuel Transfer Pump Filter - Clean.	Every 200 hours or 12 months	3	530, 630

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	282011	Wing Locker Transfer Pump - Check for leaks and security of mounting.	Every 200 hours or 12 months	3	520, 620
	301001	De-ice System - Check for leaks, condition and operation of controls, lines and clamps for security.	Every 200 hours or 12 months	3	235, 236, 311, 312, 430, 440, 510, 520, 530, 610, 620, 630
	301002	De-ice Boots - Check for Abrasions, Cuts, Nicks and Security of Mounting	Every 200 hours or 12 months	3	331, 332, 340, 530, 630
	301003	De-ice Filter - Clean.	Every 100 hours or 12 months	2	430, 440
	301004	Deice Vacuum Pressure Check Valves - Check for proper operation. Refer to Airborne Air and Fuel Products Service Letter Number 39A or latest revision.	Beginning first 5 years from date of manufacture, then every 12 months thereafter	17	430, 440
	301005	Electric Solenoid - Inspect electrical connection wiring for condition and security.	Every 100 hours or 12 months	2	430, 440
	304001	Check windshield anti-Ice nozzles for security or obstruction.	Every 200 hours or 12 months	3	221
	304002	Check Windshield Anti-Ice Alcohol Pump - Check for condition and security.	Every 200 hours or 12 months	3	211
	310001	Instruments - Check Markings and Condition.	Every 200 hours or 12 months	3	223, 224, 225, 226
	311001	Instrument Panel - Ground straps for security and condition.	Every 200 hours or 12 months	3	223, 224, 225

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	311002	Instrument Panel and Control Pedestal - Check mountings and terminals for security, check bonding between stationary panel and instrument panel for proper ground resistance must be 0.010 Ohms or less.	Every 200 hours or 12 months	3	223, 224, 225, 226, 227, 228
	321001	Main Gear Shock Struts - Check for evidence of leakage, proper extension; check strut barrel for corrosion, pitting, and cleanliness.	Every 50 hours or 12 months	1	721, 722
	321002	Main Gear Shock Struts - Service.	Every 200 hours or 12 months	3	721, 722
	321003	Main Gear Torque Links - Inspect for wear and condition. Inspect connecting center bolt and washer for condition and security.	Every 200 hours or 12 months	3	721, 722
	321004	Main Gear Torque Links - Service.	Every 50 hours or 12 months	1	721, 722
	321005	Main Gear, all Spherical Rod Ends - Service.	Every 100 hours or 12 months	2	721, 722
	321006	Main Gear Side Brace - Service.	Every 100 hours or 12 months	2	721, 722
	321007	Main Landing Gear Support Bearing - Inspect retainer ring, bearing race and bearing for condition, wear, damage and security.	Every 100 hours or 12 months	2	721, 722
	321008	Main Landing Gear Torque Tube Assembly Check, refer to 5-14-05, Supplemental Inspection Number 32-10-01 for inspection procedures.	First 4,000 landings or 8 years, repeat every 1,000 landings or 3 years.	25	721, 722

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	321009	Main Landing Gear Torque Tube Assembly - Check, refer to 5-14-06, Supplemental Inspection Number 32-10-05 for inspection procedures.	First 10,000 landings or 20 years, repeat every 2,000 landings or 4 years.	24	721, 722
	321010	Main Landing Gear Pivot Bolt - Check, refer to 5-14-07, Supplemental Inspection Number 32-10-02 for inspection procedures.	First 1,000 landings or 3 years, repeat every 500 landings or 3 years.	26	721, 722
	321011	Main Landing Gear Fork Bolts (5/8 inch) - Check, refer to 5-14-08, Supplemental Inspection Number 32-10-03 for inspection procedures.	First 5,000 landings or 10 years, repeat every 5,000 landings or 10 years.	27	721, 722
	321012	Check Main Landing Gear, refer to 5-14-09, Supplemental Inspection Number 32-10-04 for inspection procedures.	First 12,500 landings or 20 years, repeat every 2,500 landings or 5 years.	28	721, 722
	322001	Nose Gear Shock Strut - Check for evidence of leakage, proper extension; check strut barrel for corrosion, pitting, and cleanliness.	Every 50 hours or 12 months	1	720
	322002	Nose Gear Shock Strut - Service.	Every 200 hours or 12 months	3	720

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	322003	Nose Gear Torque Link - Inspect for wear and condition. Inspect connecting center bolt and washer for condition and security.	Every 200 hours or 12 months	3	720
	322004	Nose Gear Torque Link - Service.	Every 50 hours or 12 months	1	720
	322006	Nose Gear Trunnion Fitting - Service	Every 100 hours or 12 months	2	720
	322007	For airplane serial numbers 310R0001 thru 310R1918: Service the Nose Gear Pivot Bushings.	Every 1000 hours or 3 years	12	720
	322008	For airplane serial numbers 310R1919 thru 310R2140 - Service the Nose Gear Pivot Bushings.	Every 100 hours or 12 months	2	720
	322009	Nose Gear, all Spherical Rod Ends - Service.	Every 100 hours or 12 months	2	720
	322010	Nose Gear Fork - Inspect for cracks, general condition and security of attachment.	Every 200 hours or 12 months	3	720
	322011	Nose Gear Fork - Check, refer to 5-14-10, Supplemental Inspection Number 32-20-00 for inspection procedures.	First 15,000 landings or 20 years, repeat every 5,000 landings or 10 years.	29	720
	323001	Landing Gear System - Check actuating time and motor (Flight Check), Refer to 32-30-00, Extension and Retraction - Inspection/Check.	Every 50 hours or 12 months	1	720
	323002	Landing Gear Actuator - Inspect for condition, security, and wiring for condition, routing, and support.	Every 200 hours or 12 months	3	235

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	323003	Landing Gear Actuator - Service.	Every 100 hours or 12 months	2	235
	323004	Manual Extension System - Inspect condition, operation and specification compliance. Refer to 32-30-00, Extension and Retraction - Inspection/ Check.	Every 200 hours or 12 months	3	235
	323005	Manual Extension System Support Bearings - Service.	Every 500 hours	6	235
	323006	Manual Extension System Spool and Bell Crank - Service.	Every 500 hours	6	235
	323007	Manual Extension System Crank Handle Linkage - Service.	Every 500 hours	6	235
	323008	Manual Extension System Miter Gear - Service.	Every 1500 hours	7	235
	323009	Main and Nose Landing Gear Assemblies - Inspect for condition.	Every 50 hours or 12 months	1	720, 721, 722
	323010	Nose and Main Landing Gear Extension and Retraction System Check - Inspect condition, operation and specification compliance. Refer to 32-30-00, Extension and Retraction - Inspection/Check.	Every 200 hours or 12 months	3	720, 721, 722
	323011	Nose and Main Landing Gear Extension and Retraction Linkage - Check condition of linkage.	Every 200 hours or 12 months	3	720, 721, 722
	323012	Main Gear Uplock Bushings - Service.	Every 100 hours or 12 months	2	721, 722
	323013	Main Gear Thrust Washers - Service.	Every 100 hours or 12 months	2	721, 722

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	323014	Main/Nose Gear Retraction System Teardown Check, refer to 5-14-11, Supplemental Inspection Number 32-30-00 for inspection procedures.	First 10,000 landings or 20 years, repeat every 5,000 landings or 10 years.	30	235, 510, 610, 720, 721, 722
	323015	Nose Gear Trunnion - Check (1.19 inch lugs), refer to 5-14-12, Supplemental Inspection Number 32-30-07 for inspection procedures.	Refer to MEB88-5 Revision 2, or latest revision for the initial and repeat inspection intervals.	19	720
	323016	Nose Gear Trunnion - Check (1.31 inch lugs), refer to 5-14-13, Supplemental Inspection Number 32-30-08 for inspection procedures.	Refer to MEB88-5 Revision 2, or latest revision for the initial and repeat inspection intervals.	19	720
	324001	Nose and Main Gear Wheel Bearings - Service.	First 100 hours and every 200 hours thereafter	14	720, 721, 722
	324002	Nose and Main Wheel and Tires - Check wear, pressure and condition.	Every 50 hours or 12 months	1	720, 721, 722
	324003	Brakes - Perform operational check of main and parking brake system.	Every 100 hours or 12 months	2	721, 722
	324004	Brake System Plumbing - Inspect for leaks, condition and security. Check for proper routing and support.	Every 200 hours or 12 months	3	233, 234, 510, 610, 721, 722

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	324005	Brake Assemblies - Check wear of lining and disc warpage.	Every 200 hours or 12 months	3	721, 722
	324006	Brake Master Cylinders - Service.	Every 200 hours or 12 months	3	233
	324007	Parking Brake Handle Shaft and Pivot Points - Service.	Every 500 hours	6	228
	325001	Nose Gear Shimmy Damper - Check for leakage and attach points for wear and condition.	Every 50 hours or 12 months	1	720
	325002	Nose Gear Shimmy Damper - Service.	First 100 hours and every 200 hours thereafter	14	720
	325003	Nose Wheel Steering System - Check cable tension, travel and gimbal bolts for condition and torque.	Every 100 hours or 12 months	2	211, 212, 720
	325004	Nose Gear Steering Stop Block - Check security.	Every 50 hours or 12 months	1	720
	331001	Instruments, Interior and Exterior Lights - Check for operation, condition of lens and security.	Every 50 hours or 12 months	1	221, 222, 223, 224, 225, 226, 227, 228, 231, 232, 340, 520, 540, 620, 640
	331002	Warning Lamps - Check condition.	Every 100 hours or 12 months	2	223, 228
	334001	Landing Light Hinge Point - Service.	Every 500 hours	6	530, 630
	334002	Landing Light Internal Gears - Service.	Every 1500 hours	7	530, 630
	334003	Landing Light Exposed Gear Sector - Service.	Every 500 hours	6	530, 630

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	340001	Antennas - Check Mounting and Security.	Every 200 hours or 12 months	3	221, 222, 231, 232, 311, 312, 340
	340002	Antennas and Cables - Inspect for Security of Attachment, Connections, and Conditions.	Every 200 hours or 12 months	3	221, 222, 231, 232, 311, 312, 340
	340003	Transponder - Inspect to comply with 14 CFR 91.413	Every 2 years	9	225
	341001	Pitot Static Sump(s) - Check for cracks, dents, leaks and presence of water, drain sumps.	Every 200 hours or 12 months	3	221, 222
	341002	Pitot Static System - Leak check.	Every 200 hours or 12 months	3	211, 212, 221, 222
	341003	Altimeter and Static System - Inspect as Required by CFR Part 91, Paragraph 91.170 in accordance with CFR, Part 43, Appendix E, by Authorized Repair Station	Every 2 years	9	211, 212, 221, 222, 223
	341004	Alternate Static Source - Check for obstructions and drain.	Every 200 hours or 12 months	3	211, 221
	350001	Oxygen System - Check installation, mountings, equipment and pressure.	Every 200 hours or 12 months	3	211, 221, 222, 231, 232
	350002	Oxygen Regulator - Check pressure and rate of flow.	Every 200 hours or 12 months	3	211
	350003	Oxygen Masks and Hoses - Check condition and clean.	Every 200 hours or 12 months	3	221, 222, 231, 232
	350004	Oxygen Cylinder - ICC-3HT/DOT-3HT (Light Weight) - Inspect condition and hydrostatic test date.	Every 3 years	10	211
	350005	Oxygen Cylinder - ICC-3AA/DOT-3AA (Standard Weight) - Inspect condition and hydrostatic test date.	Every 5 years	11	211

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	371001	Vacuum Pump - Wet - Inspect for leaks, condition and security.	Every 100 hours or 12 months	2	430, 440
	371002	Vacuum Dry Air Pump - Inspect for condition and security.	Every 100 hours or 12 months	2	430, 440
	371003	Vacuum Dry Air Pump Coupling - Inspect the drive coupling to make sure it is in satisfactory condition.	Every 100 hours or 12 months	2	430, 440
	371004	Vacuum Pump Pad Seal - Inspect for condition and replace seal if there is evidence of any oil leakage.	Every 100 hours or 12 months	2	430, 440
	371005	Vacuum Dry Air Pump - Inspect fittings for security.	Every 100 hours or 12 months	2	430, 440
	371006	Vacuum System Hoses - Inspect for hardness, deterioration, looseness and bulging.	Every 100 hours or 12 months	2	221, 222, 430, 440
	371007	Regulator and De-ice Control Valves - Inspect for general condition, and security.	Every 100 hours or 12 months	2	510, 610
	371008	Vacuum Manifold Check Valve - Check for proper operation. Refer to Airborne Air and Fuel Products Service Letter Number 39A or latest revision.	Beginning first 5 years from date of manufacture, then every 12 months thereafter	17	430, 440
	371009	Vacuum System Central Air Filter - Clean and inspect for deterioration and contamination	Every 100 hours or 12 months	2	211, 212
	371010	Vacuum System Relief Valve - Check security and condition. Replace filter.	Every 100 hours or 12 months	2	510, 610

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	521001	Cabin Door - Check for condition and operation.	Every 100 hours or 12 months	2	232
	521002	Cabin Door Latch Mechanism - Service.	Every 200 hours or 12 months	3	232
	521003	Cabin Door Hinge - Service.	Every 100 hours or 12 months	2	232
	521004	Cabin Door Retention - Check, refer to 5-14-14, Supplemental Inspection Number 52-10-00 for inspection procedures.	First 10,000 hours or 20 years, repeat every 5,000 hours or 10 years.	31	232
	522001	Emergency Exit Window Mechanism Inspection, refer to 5-14-15, Supplemental Inspection Number 52-20-00 for inspection procedures.	First 1,000 hours or 3 years, repeat every 1,000 hours or 3 years.	32	231
	523001	Fuselage Baggage Door - Check for condition and operation.	Every 200 hours or 12 months	3	232
	523002	Fuselage Baggage Door Hinge and Door Stop - Service.	Every 500 hours	6	232
	523003	Fuselage Baggage Door Latch Mechanism - Service.	Every 500 hours	6	232
	523004	Wing Locker Door - Check condition, operation, and security of hinges, latches, and seals.	Every 200 hours or 12 months	3	520, 620
	523005	Wing Locker Door Stop - Service.	Every 500 hours	6	520, 620
	523006	Nose Baggage Door - Check for condition, operation, and security of hinges and latches.	Every 200 hours or 12 months	3	211

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	523007	Nose Baggage Door Hinge and Door Stop - Service.	Every 500 hours	6	211
	530001	Fuselage Exterior and Interior Surfaces - Check for damage, wrinkles, corrosion, etc.	Every 200 hours or 12 months	3	110, 211, 212, 221, 222, 231, 232, 311, 312
	531001	Horizontal Stabilizer Rear Spar Angle Attachment, refer to 5-14-16, Supplemental Inspection Number 53-10-03 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	531002	Window Frame and Surrounding Structure, refer to 5-14-17, Supplemental Inspection Number 53-10-04 for inspection procedures.	First 10,000 hours or 20 years, repeat every 5,000 hours or 10 years.	34	221, 222, 231, 232
	541001	Engine Support Beams, refer to 5-14-18, Supplemental Inspection Number 54-10-00 for inspection procedures.	First 1,500 hours or at engine overhaul, repeat every 1,500 hours or engine overhaul.	35	430, 440
	541002	Engine Beam Modification, refer to 5-14-19, Supplemental Inspection Number 54-10-01 for inspection procedures.	Refer to MEB99-7, or latest revision for the initial and repeat inspection intervals.	36	430, 440

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	551001	Horizontal Stabilizer - Check bolts for security, attach bulkhead for cracks, failed fasteners and lower spar caps for cracks, hinge brackets for cracks and loose fasteners, and outboard hinge bearing for looseness.	Every 100 hours of operation or 12 months	2	321, 322, 331, 332
	551002	Horizontal Stabilizer Inspection, refer to 5-14-20, Supplemental Inspection Number 55-10-00 for inspection procedures.	First 10,000 hours or 20 years, repeat every 5,000 hours or 10 years.	31	321, 322, 331, 332
	551003	Horizontal Stabilizer Spars and Attachments, refer to 5-14-21, Supplemental Inspection Number 55-10-01 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	551004	Horizontal Stabilizer Forward Spar Upper Cap, refer to 5-14-22, Supplemental Inspection Number 55-10-02 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	551005	Horizontal Stabilizer Forward Spar Lower Cap, refer to 5-14-23, Supplemental Inspection Number 55-10-03 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	551006	Horizontal Stabilizer Forward Spar Attach, refer to 5-14-24, Supplemental Inspection Number 55-10-04 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	551007	Horizontal Stabilizer Rear Spar Lower Cap Attach, refer to 5-14-25, Supplemental Inspection Number 55-10-05 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	551008	Horizontal Stabilizer Rear Spar Upper Cap, BL 0.0, refer to 5-14-26, Supplemental Inspection Number 55-10-06 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	551009	Horizontal Stabilizer Rear Spar Lower Cap, BL 0.0, refer to 5-14-27, Supplemental Inspection Number 55-10-07 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	321, 322
	552001	Outboard Elevator Hinge Bracket and Attachment- Check, refer to 5-14-28, Supplemental Inspection Number 55-20-00 for inspection procedures.	First 5,000 hours or 10 years, repeat every 1,000 hours or 3 years.	23	331, 332
	552002	Elevator Hinges and Fittings, refer to 5-14-29, Supplemental Inspection Number 55-20-01 for inspection procedures.	First 15,000 hours or 20 years, repeat every 2,500 hours or 5 years.	21	331, 332
	553001	Vertical Stabilizer - Check bolts for security, attach bulkhead for cracks, failed fasteners and, hinge brackets for cracks and loose fasteners.	Every 100 hours of operation or 12 months	2	321, 322, 340

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	553003	Rudder Hinges and Fittings, refer to 5-14-31, Supplemental Inspection Number 55-30-01 for inspection procedures.	First 15,000 hours or 20 years, repeat every 2,500 hours or 5 years.	21	340
	553004	Vertical Stabilizer Rear Spar Cap Attach, refer to 5-14-32, Supplemental Inspection Number 55-30-02 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	340
	553005	Vertical Stabilizer Spars and Attachments, refer to 5-14-30, Supplemental Inspection Number 55-30-00 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years.	33	340
	560001	Windshield and Windows - Inspect for condition. Check latches, hinges, and seals for condition, operation and security of attachment. Window release handle for correct position.	Every 100 hours or 12 months	2	221, 222, 231, 232
	560002	Emergency Exit Window - Check window for security and proper installation. Check release mechanism for proper cable routing and release pin installation.	Every 100 hours or 12 months	2	231
	560003	Emergency Exit Window - Remove and reinstall the window to assure proper operation of emergency exit.	Every 5 years	11	231
	570001	Wing - Check for loose rivets, cracks, loose mounting bolts and security.	Every 50 hours or 12 months	1	510, 520, 530, 610, 620, 630
	570002	Wing Wheel Well - Check root rib and wheel well for fume proofing.	Every 100 hours or 12 months	2	510, 610

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	570003	Wing Spar Fittings - Check bolts for torque and security. First 100 hours of operation check bolt torque. After first 100 hour inspection check for security and working fasteners. Do not retorque fasteners after first 100 hour inspection.	Every 100 hours or 12 months	2	510, 610
	570004	Wing Lower Front Spar Fitting - Perform Type A Inspection. Refer to 57-00-00 Wings - Inspection/Check.	Every 1500 hours	7	510, 520, 530, 610, 620, 630
	570005	Wing Lower Front Spar Fitting, flanges, and Lower Spar Cap - Perform Eddy Current inspection. Refer to 57-00-00 Wings - Inspection/Check for inspection requirements.	First 15,000 hours, repeat every 2000 hours	20	510, 520, 530, 610, 620, 630
	570006	Wing Structure Exposed to Exhaust Gases - Inspect for any evidence of corrosion.	Every 100 hours or 12 months	2	520, 620
	571001	Wing Rib - Main Landing Gear Side Brace, refer to 5-14-33, Supplemental Inspection Number 57-10-03 for inspection procedures.	First 10,000 hours or 20 years, repeat every 5,000 hours or 10 years.	34	520, 620
	571002	Wing Lower Rear Spar Cap at Splice - Check, refer to 5-14-34, Supplemental Inspection Number 57-10-04 for inspection procedures.	First 5,000 hours or 10 years, repeat every 1,000 hours or 3 years.	23	530, 630
	571003	Wing Lower Rear Carry-Thru Spar, refer to 5-14-35, Supplemental Inspection Number 57-10-05 for inspection procedures.	First 15,000 hours or 20 years, repeat every 1,000 hours or 3 years.	38	510, 610

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	571004	Wing Main Spar Lower Cap, refer to 5-14-36, Supplemental Inspection Number 57-10-06 for inspection procedures.	First 11,000 hours of operation. Refer to 5-14-36, Supplemental Inspection 57-10-06	37	510, 520, 610, 620
	571005	Wing Aft Lower Auxiliary Spar Cap, refer to 5-14-37, Supplemental Inspection Number 57-10-07 for inspection procedures.	First 6500 hours or 13 years, repeat every 2,500 hours or 5 years	39	510, 520, 610, 620
	571006	Wing Lower Carry-Thru Main Spar Cap, refer to 5-14-38, Supplemental Inspection Number 57-10-08 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years	33	510, 610
	571007	Wing Lower Front Spar Cap at Root Fitting Attach, WS 28.96, refer to 5-14-39, Supplemental Inspection Number 57-10-09 for inspection procedures.	First 11,000 hours or 20 years, repeat every 4,000 hours or 8 years	40	510, 610
	571008	Wing Lower Front Spar Cap at Root Fitting Attach, WS 36.36, refer to 5-14-40, Supplemental Inspection Number 57-10-10 for inspection procedures.	First 11,000 hours or 20 years, repeat every 2,000 hours or 4 years	41	510, 610

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	571009	Wing Lower Auxiliary Spar Cap, refer to 5-14-41, Supplemental Inspection Number 57-10-11 for inspection procedures.	First 15,000 hours or 20 years, repeat every 5,000 hours or 10 years	33	520, 620
	571010	Wing Front Spar Lug Inspection, refer to 5-14-42, Supplemental Inspection Number 57-10-12 for inspection procedures.	First 15,000 hours or 20 years, repeat every 2,500 hours or 10 years	42	510, 610
	571011	Wing Tip Tank Attachment Inspection, refer to 5-14-43, Supplemental Inspection Number 57-10-13 for inspection procedures.	First 15,000 hours or 20 years, repeat every 2,500 hours or 10 years	42	540, 640
	610001	Propeller Spinner - Wash, check for cracks and fractures.	Every 50 hours or 12 months	1	410, 420
	610002	Propeller Blades - Check for nicks, cracks and scratches	Every 100 hours or 12 months	2	410, 420
	610003	Propeller Cylinder - Check allen screws for security.	Every 100 hours or 12 months	2	410, 420
	610004	Propeller Hub - Check general condition.	Every 200 hours or 12 months	3	410, 420
	610005	Propeller Governor - Check for operation, oil leaks, condition and security.	Every 200 hours or 12 months	3	430, 440

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	610006	Spinner Bulkhead - Check for cracks and security on crankshaft.	Every 200 hours or 12 months	3	410, 420
	610007	Propeller - Check for oil leaks.	Every 200 hours or 12 months	3	410, 420
	610008	Propeller Mounting - Check nuts for security, and blade track.	Every 100 hours or 12 months	2	410, 420
	610009	Propeller De-ice Slip Rings , Brushes, and Boots - Check condition, operation and security of attachment.	Every 50 hours or 12 months	1	410, 420
	610011	Propeller Synchronizer - Check for condition and security.	Every 200 hours or 12 months	3	221, 222, 430, 440
	710001	Nacelle Firewall - Inspect for condition and security.	Every 200 hours or 12 months	3	430, 440
	710002	Engine - Wash, check for security of accessories.	Every 100 hours or 12 months	2	430, 440
	710003	Engine Compartment - Visually check for condition, oil leaks, fuel leaks.	Every 100 hours or 12 months	2	430, 440
	710004	Engine Compartment Hoses - Fuel, (Check Fuel Lines Under Pressure), Oil, and Vacuum Hoses - Check for deterioration, leaks, discoloration bleaching and rubber hoses for stiffness.	Every 50 hours or 12 months	1	430, 440
	710005	Cylinder Compression - Refer To Manufacturer's Service Bulletin M84-15	Every 100 hours or 12 months	2	430, 440
	710006	Engine Cylinders, Rocker Box Covers And Push Rod Housing - Check for fin damage, cracks, oil leakage, security of attachment and general condition.	Every 100 hours or 12 months	2	430, 440

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	710007	Crankcase - Oil Sump: Inspect For Cracks And Evidence Of Oil Leakage, Check bolts and nuts for looseness and retorque as necessary.	Every 100 hours or 12 months	2	430, 440
	710008	Engine Baffles And Seals - Check condition and security.	Every 50 hours or 12 months	1	430, 440
	711001	Cowling and Cowl Flaps - Wash and inspect for cracks, dents, condition of paint and other damage. Check fasteners and cowl flaps for condition, security, and operation.	Every 200 hours or 12 months	3	430, 440
	711002	Cowl Flap Control Cable and Housing - Service.	Every 200 hours or 12 months	3	430, 440
	711003	Cowl Flap Hinge - Service.	Every 100 hours or 12 months	2	430, 440
	711004	Cowl Flap Linkage Pivot Points and all Spherical Rod Ends - Service.	Every 100 hours or 12 months	2	430, 440
	712001	Engine Support Structure - Inspection. For Model T310R Airplanes only, having complied with and completed MEB99-7 and have been modified by the installation of SK310-112, or later revision. Visually check the engine support beams and canted bulkhead for corrosion. If corrosion is seen, recomply with MEB99-7, or latest revision. If any indication of exhaust gas leak or engine fire is seen, recomply with MEB99-7, or latest revision.	Every 12 months, exhaust system removal, or engine overhaul.	13	430, 440
	712002	Engine Support Structure - Inspection. For Model T310R Airplanes only, having complied with and completed MEB99-7 and have not been modified by the installation of SK310-112, or later revision. Recomply with MEB99-7, or latest revision.	Every 500 hours, 24 months, exhaust system removal or engine overhaul	18	430, 440
	715001	Engine Wire Bundles - Check for condition and security.	Every 100 hours or 12 months	2	430, 440

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	716001	Induction Air Filter - Service. NOTE: Filter may need to be serviced more often if local dust conditions exist.	Every 50 hours or 12 months	1	430, 440
	716002	Induction System - Check condition and security of ducting and controls for operation and proper rigging.	Every 100 hours or 12 months	2	430, 440
	730001	Fuel/Air Metering Unit Fuel Screen - Clean.	Every 100 hours or 12 months	2	430, 440
	731001	Fuel Pump - Check for leaks, condition and security.	Every 100 hours or 12 months	2	430, 440
	731002	Fuel Injection System and Manifold - Check for leaking and manifold drain valves for proper operation.	Every 100 hours or 12 months	2	430, 440
	731003	Engine Fuel Injection Nozzles - At the first 100-hour inspection on new, rebuilt or overhauled engines, remove and clean the fuel injection nozzles. Thereafter, the fuel injection nozzles must be cleaned at 300-hour intervals or more frequently if fuel stains are found.	First 100 hours and every 300 hours thereafter	16	430, 440
	741001	Magnetos - Clean and Inspect per Teledyne Continental Ignition Systems Service Bulletin SB643, or latest revision. Refer to Cessna Supplier Service Notice SSN94-5.	Every 500 hours	6	430, 440
	742001	Spark Plugs - Clean and rotate (top right to bottom left, top left to bottom right).	Every 100 hours or 12 months	2	430, 440
	742002	Ignition Cables - Check condition and security.	Every 100 hours or 12 months	2	430, 440
	742003	Magneto - Check timing breaker gap and security.	Every 100 hours or 12 months	2	430, 440
	760001	Control Pedestal - Inspect for condition and security.	Every 200 hours or 12 months	3	228

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	760002	Control Pedestal Bearings - Service.	Every 500 hours	6	228
	760003	Engine Controls - Check Travel And Security. Inspect rubber seals on ends of control cables for deterioration.	Every 100 hours or 12 months	2	430, 440
	780001	Exhaust System (Stainless Steel Or Partial Stainless Steel Systems Unknown Or Repaired Only) Prior To Complete 500-Hour Disassembly Inspection. - Perform Visual Inspection. Refer To Detailed Inspection Procedures in 78-00-00, Exhaust - Inspection/Check.	Every 50 hours or 12 months	1	430, 440
	780002	Engine Exhaust System (Stainless Steel Or Partial Stainless Steel Systems, Unknown Or Repaired Only) After Complete 500 Hour Disassembly Inspection - Perform A Visual Inspection. Refer to detailed inspection procedures in 78-00-00, Exhaust - Inspection/Check.	Every 100 hours or 12 months	2	430, 440
	780003	Engine Exhaust System Engine Exhaust System (Inconel Only) - Perform A Visual Inspection. Refer to detailed inspection procedures in 78-00-00, Exhaust - Inspection/Check.	Every 100 hours or 12 months	2	430, 440
	780004	Engine Exhaust System (Stainless Steel Or Partial Stainless Steel Systems Unknown Or Repaired) Perform A Complete Disassembly Inspection. Refer To Detailed Inspection Procedures in 78-00-00, Exhaust - Inspection/Check.	Every 500 hours	6	430, 440
	780005	Engine Exhaust System (Inconel Only) - Perform A Complete Disassembly Inspection. Refer To Detailed Inspection Procedures in 78-00-00, Exhaust - Inspection/Check.	Every 1400 hours or 12 years	15	430, 440
	780006	Exhaust System (Inconel System Only) - Perform a disassembly inspection of the exhaust slip joints and turbocharger exhaust pipe. Refer to detailed inspection procedures in 78-00-00, Exhaust - Inspection/Check.	Every 500 hours	6	430, 440
	790001	Engine Oil Pressure System - Check lines for leaks, bends, cracks and security.	Every 50 hours or 12 months	1	430, 440

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REVISION STATUS	ITEM CODE NUMBER	TASK	INTERVAL	OPERATION	ZONE
	790002	Engine Oil Breather Separator (Turbo 310) - Clean.	Every 50 hours or 12 months	1	430, 440
	790003	Engine Oil - Change.	Every 50 hours or 12 months	1	430, 440
	790004	Engine Oil Filter - Replace filter and inspect adapters (Turbo 310).	Every 50 hours or 12 months	1	430, 440
	790005	Engine Oil Filter - Replace filter and inspect adapters (Standard 310).	Every 50 hours or 12 months	1	430, 440
	800001	Starter, Starter Solenoid And Electrical Connectors - Check condition and security of attachment.	Every 100 hours or 12 months	2	430, 440
	800002	Starter - Check brushes, commutator, and connectors.	Every 200 hours or 12 months	3	430, 440
	810001	Turbocharger - Check for condition, bulges, warps and security.	Every 100 hours or 12 months	2	430, 440
	810002	Waste Gate Valve And Controllers - Check condition and security of attachment.	Every 200 hours or 12 months	3	430, 440
	810003	Manifold Pressure Relief Valve - Visually check for obstructions, condition, security and operation.	Every 200 hours or 12 months	3	430, 440

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COMPONENT TIME LIMITS

1. Component Time Limit

A. All components not listed herein should be inspected as detailed elsewhere in this chapter and repaired, overhauled or replaced as required. Items shown here should be overhauled or replaced during regular maintenance periods falling due that are closest to the specified limit.

B. Replacement life of each component listed in this section applies to the part throughout its life on the original installation and on later installations. The life (number of hours or number of landings) must be recorded individually for these components and must remain with the component during removal. For example, if a component is removed for overhaul, it must be tagged with the life (number of hours or number of landings) at the date of removal and this tag must remain with the component throughout the overhaul process. (Overhaul of a component does not zero-time the life of the component.) When received from overhaul and installed on an airplane, the life of the component must be recorded to allow continued accumulation toward the life limit.

2. Schedule

A. Environmental Systems (Chapter 21)
   (1) Heater (See Cessna Heater and Components Overhaul/Parts Manual) -- Overhaul every 1000 hours.

B. Equipment and Furnishings (Chapter 25)
   (1) Restraint Assembly Pilot, Copilot and Passenger Seats -- Replace every 10 years.

C. Flight Controls (Chapter 27)
   (1) Flap Actuator Gearbox -- Overhaul every 2000 hours of operation or 4000 landings, whichever comes first.
   (2) Flap Actuator Motor -- Overhaul on condition.
   (3) Aileron Trim Tab Actuator -- Overhaul every 1000 hours or 3 years, whichever comes first.
   (4) Elevator Trim Tab Actuator -- Overhaul every 1000 hours or 3 years, whichever comes first.
   (5) Rudder Trim Actuator -- Overhaul every 1000 hours or 3 years, whichever comes first.

D. Ice and Rain (Chapter 30)
   (1) De-ice System (Airborne) Check Valve -- Replace every 10 years.

E. Landing Gear (Chapter 32)
   (1) Landing Gear Actuator -- Overhaul on condition.
   (2) Actuator Motor -- Overhaul on condition.
   (3) Shimmy Dampener -- Overhaul on condition.
   (4) Main Landing Gear Fork Bolts Part Number 5141052-1 -- Replace at the first 5000 hours of operation, and each 5000 hours thereafter.
   (5) Main Landing Gear Torque Tube Part Number 5045010-1, -2, -8, -13, -14, -19, -20, -24, or -25 -- Replace at the first 4000 hours of operation, and each 4000 hours thereafter.

F. Oxygen (Chapter 35)
   (1) Oxygen Bottle (ICC-3HT/DOT-3HT) -- Replace every 24 years or 4380 cycles, whichever occurs first.

G. Vacuum (Chapter 37)
   (1) Vacuum System (Airborne) Check Valves/Manifold Check Valves -- Replace every 10 years.
   (2) Vacuum System Filter - Replace every 500 hours of operation or 12 months, whichever occurs first.
   (3) Vacuum Pump (Dry) - Replace engine-driven dry vacuum pumps not equipped with a wear indicator, every 500 hours of operation, or replace according to the vacuum pump manufacturer's recommended inspection and replacement interval, whichever occurs first. For a vacuum pump equipped with a wear indicator, replace the pump according to the vacuum pump manufacturer's recommended inspection and replacement intervals.

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(4) Vacuum Pump (Dry) - Drive Coupling - Replace every 6 years. After 6 years, the urethane becomes hard and brittle and the coupling must be replaced. For airplanes equipped with Airborne vacuum pumps, refer to Airborne Service Letter Number 17 or latest revision for replacement vacuum pump drive coupling information.

H. Propeller (Chapter 61)
(1) Propeller -- Refer to the McCauley Service Bulletin 137W or the latest revision for the overhaul time limits.
(2) Governor -- Overhaul governor at engine overhaul, refer to governor manufacturer's overhaul manual.
(3) Accumulator, Unfeathering -- Overhaul at engine overhaul, refer to accumulator manufacturer's overhaul manual.

I. Power Plant (Chapter 71)
(1) Engine -- Overhaul (Model 310R and T310R airplanes). Refer to Teledyne Continental Service Information Letter SIL98-9A, or latest revision, for engine overhaul interval.
(2) Magneto -- Overhaul at engine overhaul, or every 4 years, refer to Teledyne Continental Ignition Systems Service Bulletin SB643A, or latest revision.
(3) Fuel Pump -- Refer to the manufacturer's Overhaul Manual for overhaul interval.
(4) Engine Compartment Flexible Fluid-Carrying Rubber Hoses (Cessna-installed), except Drain Hoses -- Replace engine compartment flexible fluid-carrying hoses (Cessna-installed only) manufactured of rubber material every 5 years, or at engine overhaul, whichever occurs first. This does not include drain hoses.

NOTE: Rubber hoses which are beyond these limits and are in a serviceable condition must be placed on order immediately and replaced within 120 days of receiving the new hose(s) from Cessna.

(5) Engine Compartment Drain Hoses -- Replace on condition.
(6) Engine Flexible Hoses (Continental Motors-installed) -- Refer to Continental Motors Engine Manual and Continental Motors service bulletins for replacement requirements.
(7) Engine Induction Air Filters -- Replace after six to eight cleanings, or sooner if holes are detected in the filter media.
(8) Engine Compartment Fire Extinguisher Cartridge - Replace every 4 years of service.

NOTE: Cartridge life is a combination of shelf life and service life. Cartridge life is six years (any combination of storage or installed service) and service life shall not exceed four years.

(9) Engine Mounts - Replace at engine overhaul.

J. Exhaust (Chapter 78)
(1) Engine Exhaust Multi-Segment V-Band Clamp(s) - Replace every 400 hours of operation.

NOTE: Multi-segmented V-band clamps shall be replaced every 400 hours total time in service (TTIS) until the initial 500 Hour Complete Disassembly Inspection or 500 Hour Partial Disassembly Inspection is accomplished. After completing the Disassembly Inspection and the installation of new clamps, the clamps shall be replaced every 500 hours of operation.

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COMPONENT TIME LIMITS

1. Component Time Limit

A. All components not listed herein should be inspected as detailed elsewhere in this chapter and repaired, overhauled or replaced as required. Items shown here should be overhauled or replaced during regular maintenance periods falling due that are closest to the specified limit.

B. Replacement life of each component listed in this section applies to the part throughout its life on the original installation and on later installations. The life (number of hours or number of landings) must be recorded individually for these components and must remain with the component during removal. For example, if a component is removed for overhaul, it must be tagged with the life (number of hours or number of landings) at the date of removal and this tag must remain with the component throughout the overhaul process. (Overhaul of a component does not zero time the life of the component.) When received from overhaul and installed on an airplane the life of the component must be recorded to allow continued accumulation toward the life limit.

2. Schedule

A. Environmental Systems (Chapter 21)
   (1) Heater (See Cessna Heater and Components Overhaul/Parts Manual) -- Overhaul every 1000 hours.

B. Equipment and Furnishings (Chapter 25)
   (1) Restraint Assembly Pilot, Copilot and Passenger Seats, -- Replace every 10 years.

C. Flight Controls (Chapter 27)
   (1) Flap Actuator Gearbox -- Overhaul every 2000 hours of operation or 4000 landings, whichever comes first.

   NOTE: For gearboxes on which the overhaul limits have been exceeded, accomplish the overhaul by no later than the next 300 hours, 400 landings, or May 30, 2006, whichever occurs first.

   (2) Flap Actuator Motor -- Overhaul on condition.
   (3) Aileron Trim Tab Actuator -- Overhaul every 1000 hours or 3 years, whichever comes first.
   (4) Elevator Trim Tab Actuator -- Overhaul every 1000 hours or 3 years, whichever comes first.
   (5) Rudder Trim Actuator -- Overhaul every 1000 hours or 3 years, whichever comes first.

D. Ice and Rain (Chapter 30)
   (1) De-ice System (Airborne) Check Valve -- Replace every 10 years.

E. Landing Gear (Chapter 32)
   (1) Landing Gear Actuator -- Overhaul on condition.
   (2) Actuator Motor -- Overhaul on condition.
   (3) Shimmy Dampener -- Overhaul on condition.
   (4) Main Landing Gear Fork Bolts Part Number 5141052-1 -- Replace at the first 5000 hours of operation, and each 5000 hours thereafter.

F. Oxygen (Chapter 35)
   (1) Oxygen Bottle (ICC-3HT/DOT-3HT) -- Replace every 24 years or 4380 cycles, whichever occurs first.

G. Vacuum (Chapter 37)
   (1) Vacuum System (Airborne) Check Valves/Manifold Check Valves -- Replace every 10 years.
   (2) Vacuum System Filter - Replace every 500 hours of operation or 12 months, whichever occurs first.
   (3) Vacuum Pump (Dry) - Replace engine driven dry vacuum pumps not equipped with a wear indicator every 500 hours of operation, or replace according to the vacuum pump manufacturer's recommended inspection and replacement interval, whichever occurs first. For a vacuum pump equipped with a wear indicator, replace the pump according to the vacuum pump manufacturer's recommended inspection and replacement intervals.

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(4) Vacuum Pump (Dry) - Drive Coupling - Replace every 6 years. After 6 years the urethane becomes hard and brittle and the coupling must be replaced. For airplanes equipped with Airborne vacuum pumps, refer to Airborne Service Letter Number 17, or latest revision for replacement vacuum pump drive coupling information.

H. Propeller (Chapter 61)
(1) Propeller -- Refer to the MaCauley Service Bulletin 137W or the latest revision for the overhaul time limits.
(2) Governor -- Overhaul governor at engine overhaul, refer to governor manufacturer's overhaul manual.
(3) Accumulator, Unfeathering -- Overhaul at engine overhaul, refer to accumulator manufacturer's overhaul manual.

I. Power Plant (Chapter 71)
(1) Engine -- Overhaul (Model 310R and T310R airplanes). Refer to Teledyne Continental Service Information Letter SIL98-9A, or latest revision, for engine overhaul interval.
(2) Magneto -- Overhaul at engine overhaul, or every 4 years, refer to Teledyne Continental Ignition systems Service Bulletin SB643A, or latest revision.
(3) Fuel Pump -- Refer to the manufacturers Overhaul Manual for overhaul interval.
(4) Engine Compartment Flexible Fluid-Carrying Rubber Hoses (Cessna-installed), except Drain Hoses -- Replace engine compartment flexible fluid-carrying hoses (Cessna-installed only) manufactured of rubber material every 5 years, or at engine overhaul, whichever occurs first. This does not include drain hoses.

NOTE: Rubber hoses which are beyond these limits and are in a serviceable condition must be placed on order immediately and replaced within 120 days of receiving the new hose(s) from Cessna.

(5) Engine Compartment Drain Hoses -- Replace on condition.
(6) Engine Flexible Hoses (Continental Motors-installed) -- Refer to Continental Motors Engine Manual and Continental Motors Service Bulletins for replacement requirements.
(7) Engine Induction Air Filters -- Replace after six to eight cleanings, or sooner if holes are detected in the filter media.
(8) Engine Compartment Fire Extinguisher Cartridge - Replace every 4 years of service.

NOTE: Cartridge life is a combination of shelf life and service life. Cartridge life is six years (any combination of storage or installed service) and service life shall not exceed four years.

(9) Engine Mounts - Replace at engine overhaul.

J. Exhaust (Chapter 78)
(1) Engine Exhaust Multi-Segment V-Band Clamp(s) - Replace every 400 hours of operation.

NOTE: Multi-segmented V-band clamps shall be replaced every 400 hours total time in service (TTIS) until the initial 500 Hour Complete Disassembly Inspection or 500 Hour Partial Disassembly Inspection is accomplished. After completing the Disassembly Inspection and the installation of new clamps, the clamps shall be replaced every 500 hours of operation.

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INSPECTION OPERATION 1

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 1 gives inspection items that are examined every 50 hours of operation or 12 months, whichever occurs first.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
331001	Instruments, Interior and Exterior Lights - Check for operation, condition of lens and security.	221, 222, 223, 224, 225, 226, 227, 228, 231, 232, 340, 520, 540, 620, 640		
250002	Seat Belts - Check for condition and security.	221, 222, 231, 232		
610001	Propeller Spinner - Wash, check for cracks and fractures.	410, 420		
610009	Propeller De-ice Slip Rings , Brushes, and Boots - Check condition, operation and security of attachment.	410, 420		
710004	Engine Compartment Hoses - Fuel, (Check Fuel Lines Under Pressure), Oil, and Vacuum Hoses - Check for deterioration, leaks, discoloration bleaching and rubber hoses for stiffness.	430, 440		

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
710008	Engine Baffles And Seals - Check condition and security.	430, 440			
716001	Induction Air Filter - Service. NOTE: Filter may need to be serviced more often if local dust conditions exist.	430, 440			
780001	Exhaust System (Stainless Steel Or Partial Stainless Steel Systems Unknown Or Repaired Only) Prior To Complete 500-Hour Disassembly Inspection. - Perform Visual Inspection. Refer To Detailed Inspection Procedures in 78-00-00, Exhaust - Inspection/Check.	430, 440			
790001	Engine Oil Pressure System - Check lines for leaks, bends, cracks and security.	430, 440			
790002	Engine Oil Breather Separator (Turbo 310) - Clean.	430, 440			
790003	Engine Oil - Change.	430, 440			
790004	Engine Oil Filter - Replace filter and inspect adapters (Turbo 310).	430, 440			
790005	Engine Oil Filter - Replace filter and inspect adapters (Standard 310).	430, 440			
570001	Wing - Check for loose rivets, cracks, loose mounting bolts and security.	510, 520, 530, 610, 620, 630			
243001	Battery, check electrolyte specific gravity.	530			
322001	Nose Gear Shock Strut - Check for evidence of leakage, proper extension; check strut barrel for corrosion, pitting, and cleanliness.	720			
322004	Nose Gear Torque Link - Service.	720			
323001	Landing Gear System - Check actuating time and motor (Flight Check), Refer to 32-30-00, Extension and Retraction - Inspection/Check.	720			
325001	Nose Gear Shimmy Damper - Check for leakage and attach points for wear and condition.	720			
325004	Nose Gear Steering Stop Block - Check security.	720			
323009	Main and Nose Landing Gear Assemblies - Inspect for condition.	720, 721, 722			
324002	Nose and Main Wheel and Tires - Check wear, pressure and condition.	720, 721, 722			
321001	Main Gear Shock Struts - Check for evidence of leakage, proper extension; check strut barrel for corrosion, pitting, and cleanliness.	721, 722			
321004	Main Gear Torque Links - Service.	721, 722			
	*** End of Operation 1 Inspection Items ***				

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INSPECTION OPERATION 2

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 2 gives inspection items that are examined every 100 hours of operation or 12 months, whichever occurs first.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
240001	Airplane Electrical System Wiring - Check for chafing, broken or loose terminals and general condition.	110, 211, 212, 221, 222, 231, 232, 311, 312, 340, 430, 440, 510, 520, 530, 540, 610, 620, 630, 640		
371009	Vacuum System Central Air Filter - Clean and inspect for deterioration and contamination	211, 212		
240002	Junction Boxes - Check terminals for condition and security.	211, 212, 221, 222,		
325003	Nose Wheel Steering System - Check cable tension, travel and gimbal bolts for condition and torque.	211, 212, 720		
240003	Circuit Breaker Panel - Check terminals, wiring and mountings.	221		

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
560001	Windshield and Windows - Inspect for condition. Check latches, hinges, and seals for condition, operation and security of attachment. Window release handle for correct position.	221, 222, 231, 232			
271011	Aileron and Aileron Trim Cables - Check for security and tension, for fraying and turnbuckles for safety. Check pulleys for condition and security and mounting structure for cracks and condition.	221, 222, 231, 232, 510, 520, 530, 610, 620, 630			
273012	Elevator and Elevator Trim Cables - Check for security and tension, for fraying and turnbuckles for safety. Check pulleys for condition and security and mounting structure for cracks and condition.	221, 222, 233, 235, 236, 311, 312, 321, 322, 332,			
371006	Vacuum System Hoses - Inspect for hardness, deterioration, looseness and bulging.	221, 222, 430, 440			
272010	Ruddder and Rudder Trim Cables - Check for security and tension, for fraying and turnbuckles for safety. Check pulleys for condition and security and mounting structure for cracks and condition.	221, 222,233, 234, 235, 236, 311, 312, 321, 322, 340			
240005	Switches - Check operation, terminals, wiring and mounting.	221, 223, 224, 225, 226, 227, 228			
331002	Warning Lamps - Check condition.	223, 228			
220002	Autopilot - Inspect in accordance with applicable Autopilot or IFCS Service/Parts Manual.	228, 235, 236, 311, 312			
560002	Emergency Exit Window - Check window for security and proper installation. Check release mechanism for proper cable routing and release pin installation.	231			
521001	Cabin Door - Check for condition and operation.	232			
521003	Cabin Door Hinge - Service.	232			
282004	Fuel Selector Valve - Clean and Service Detent.	233, 234			
282005	Fuel System Main - Inspect plumbing and component mounting for condition, security, system for leaks.	233, 234, 510, 520, 530, 610, 620, 630			
282001	Fuel Selector Gear Box and Valve - Perform operational check (feel for detent through 270 degrees of travel) check linkage, bearings, pins for condition and safety.	233, 234, 510, 610			
323003	Landing Gear Actuator - Service.	235			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
273013	Electric Elevator Trim (Optional) - Check for security, condition and travel time.	236			
256001	Emergency Locator Transmitter - Check operation, condition, security and battery pack for date check. Check in accordance with 14 CFR 91.207 and AC91-44. Check surrounding structure for corrosion.	311, 312			
273009	Elevator Push Rod and Actuator Rod End Bearing - Inspect for evidence of binding and damage; tab attach fitting for condition, damage and security, and proper safetying of nut with cotter pin.	321, 322, 331, 332			
551001	Horizontal Stabilizer - Check bolts for security, attach bulkhead for cracks, failed fasteners and lower spar caps for cracks, hinge brackets for cracks and loose fasteners, and outboard hinge bearing for looseness.	321, 322, 331, 332			
553001	Vertical Stabilizer - Check bolts for security, attach bulkhead for cracks, failed fasteners and, hinge brackets for cracks and loose fasteners.	321, 322, 340			
273005	Elevator Trim Tab - Check hinges for condition, cracks and security.	332			
273006	Elevator Trim Tab - Inspect skins for loose rivets and security.	332			
273007	Elevator Trim Tab - Check bolts and linkage for condition, security, and cotter pin for safety.	332			
273008	Elevator Trim Tab - Check free play and travel.	332			
273010	Elevator Trim Tab Actuator - Check for condition and security, snap rings for retention, snap ring seating in slot on bracket, clamp seating on actuator and clamp bolts for broken torque putty. If cracks are found in putty, torque to 20-25 inch-pounds, check guard for condition and attachment and sprocket for condition, wear and attachment.	332			
272004	Rudder Trim Tab - Check hinges for condition, cracks and security.	340			
272005	Rudder Trim Tab - Inspect skins for loose rivets and security.	340			
272006	Rudder Trim Tab - Check bolts and linkage for condition, security, and cotter pin for safety.	340			
272007	Rudder Trim Tab - Check free play and travel.	340			
272008	Rudder Trim Tab Actuator - Check for condition and security, snap rings for retention, snap ring seating in slot on bracket, clamp seating on actuator and clamp bolts for broken torque putty. If cracks are found in putty, torque to 20-25 inch-pounds, check guard for condition and attachment and sprocket for condition, wear and attachment.	340			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
610002	Propeller Blades - Check for nicks, cracks and scratches	410, 420			
610003	Propeller Cylinder - Check allen screws for security.	410, 420			
610008	Propeller Mounting - Check nuts for security, and blade track.	410, 420			
243004	Alternators - Service (100 Amp Prestolite Only).	430, 440			
262001	Engine Compartment Fire Extinguisher - Check System, Pressure, Condition And Security.	430, 440			
262002	Engine Fire Extinguisher - Check Hydrostatic Test Date.	430, 440			
301003	De-ice Filter - Clean.	430, 440			
301005	Electric Solenoid - Inspect electrical connection wiring for condition and security.	430, 440			
371001	Vacuum Pump - Wet - Inspect for leaks, condition and security.	430, 440			
371002	Vacuum Dry Air Pump - Inspect for condition and security.	430, 440			
371003	Vacuum Dry Air Pump Coupling - Inspect the drive coupling to make sure it is in satisfactory condition.	430, 440			
371004	Vacuum Pump Pad Seal - Inspect for condition and replace seal if there is evidence of any oil leakage.	430, 440			
371005	Vacuum Dry Air Pump - Inspect fittings for security.	430, 440			
710002	Engine - Wash, check for security of accessories.	430, 440			
710003	Engine Compartment - Visually check for condition, oil leaks, fuel leaks.	430, 440			
710005	Cylinder Compression - Refer To Manufacturer's Service Bulletin M84-15	430, 440			
710006	Engine Cylinders, Rocker Box Covers And Push Rod Housing - Check for fin damage, cracks, oil leakage, security of attachment and general condition.	430, 440			
710007	Crankcase - Oil Sump: Inspect For Cracks And Evidence Of Oil Leakage, Check bolts and nuts for looseness and retorque as necessary.	430, 440			
711003	Cowl Flap Hinge - Service.	430, 440			
711004	Cowl Flap Linkage Pivot Points and all Spherical Rod Ends - Service.	430, 440			
715001	Engine Wire Bundles - Check for condition and security.	430, 440			
716002	Induction System - Check condition and security of ducting and controls for operation and proper rigging.	430, 440			
730001	Fuel/Air Metering Unit Fuel Screen - Clean.	430, 440			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
731001	Fuel Pump - Check for leaks, condition and security.	430, 440			
731002	Fuel Injection System and Manifold - Check for leaking and manifold drain valves for proper operation.	430, 440			
742001	Spark Plugs - Clean and rotate (top right to bottom left, top left to bottom right).	430, 440			
742002	Ignition Cables - Check condition and security.	430, 440			
742003	Magneto - Check timing breaker gap and security.	430, 440			
760003	Engine Controls - Check Travel And Security. Inspect rubber seals on ends of control cables for deterioration.	430, 440			
780002	Engine Exhaust System (Stainless Steel Or Partial Stainless Steel Systems, Unknown Or Repaired Only) After Complete 500 Hour Disassembly Inspection - Perform A Visual Inspection. Refer to detailed inspection procedures in 78-00-00, Exhaust - Inspection/Check.	430, 440			
780003	Engine Exhaust System Engine Exhaust System (Inconel Only) - Perform A Visual Inspection. Refer to detailed inspection procedures in 78-00-00, Exhaust - Inspection/Check.	430, 440			
800001	Starter, Starter Solenoid And Electrical Connectors - Check condition and security of attachment.	430, 440			
810001	Turbocharger - Check for condition, bulges, warps and security.	430, 440			
371007	Regulator and De-ice Control Valves - Inspect for general condition, and security.	510, 610			
371010	Vacuum System Relief Valve - Check security and condition. Replace filter.	510, 610			
570002	Wing Wheel Well - Check root rib and wheel well for fume proofing.	510, 610			
570003	Wing Spar Fittings - Check bolts for torque and security. First 100 hours of operation check bolt torque. After first 100 hour inspection check for security and working fasteners. Do not retorque fasteners after first 100 hour inspection.	510, 610			
570006	Wing Structure Exposed to Exhaust Gases - Inspect for any evidence of corrosion.	520, 620			
243002	Battery Box and Battery Cables - Inspect overboard drain tube, check for corrosion cable routing, support and security of connections.	530			
271004	Aileron Trim Tab - Check hinges for condition, cracks and security.	530			
271005	Aileron Trim Tab - Inspect skins for loose rivets and security.	530			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
271006	Aileron Trim Tab - Check bolts and linkage for condition, security, and cotter pin for safety.	530			
271007	Aileron Trim Tab - Check free play and travel.	530			
271009	Aileron Trim Tab Actuator - Check for condition and security, snap rings for retention, snap ring seating in slot on bracket, clamp seating on actuator and clamp bolts for broken torque putty. If cracks are found in putty, torque to 20-25 inch-pounds, check guard for condition and attachment and sprocket for condition, wear and attachment.	530			
271008	Aileron Push Rod and Actuator Rod End Bearing - Inspect for evidence of binding and damage; tab attach fitting for condition, damage and security, and proper safetying of nut with cotter pin.	530, 630			
282003	Fuel Selector Valve (Fuel Strainer) - Clean	530, 630			
322006	Nose Gear Trunnion Fitting - Service	720			
322008	For airplane serial numbers 310R1919 thru 310R2140 - Service the Nose Gear Pivot Bushings.	720			
322009	Nose Gear, all Spherical Rod Ends - Service.	720			
321005	Main Gear, all Spherical Rod Ends - Service.	721, 722			
321006	Main Gear Side Brace - Service.	721, 722			
321007	Main Landing Gear Support Bearing - Inspect retainer ring, bearing race and bearing for condition, wear, damage and security.	721, 722			
323012	Main Gear Uplock Bushings - Service.	721, 722			
323013	Main Gear Thrust Washers - Service.	721, 722			
324003	Brakes - Perform operational check of main and parking brake system.	721, 722			
	*** End of Operation 2 Inspection Items ***				

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INSPECTION OPERATION 3

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 3 gives inspection items that are examined every 200 hours of operation or 12 months, whichever occurs first.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
530001	Fuselage Exterior and Interior Surfaces - Check for damage, wrinkles, corrosion, etc.	110, 211, 212, 221, 222, 231, 232, 311, 312		
240007	Wing and Fuselage - Check wiring, routing, security and terminals.	110, 211, 212, 221, 222, 231, 232, 311, 312, 340, 430, 440, 510, 520, 530, 540, 610, 620, 630, 640		
304002	Check Windshield Anti-Ice Alcohol Pump - Check for condition and security.	211		
350002	Oxygen Regulator - Check pressure and rate of flow.	211		
523006	Nose Baggage Door - Check for condition, operation, and security of hinges and latches.	211		

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
341002	Pitot Static System - Leak check.	211, 212, 221, 222			
341004	Alternate Static Source - Check for obstructions and drain.	211, 221			
350001	Oxygen System - Check installation, mountings, equipment and pressure.	211, 221, 222, 231, 232			
214002	Cabin heater fuel lines. Check for condition, security and evidence of fuel leaks.	212			
282007	Heater Fuel Filter - Remove, clean and inspect for deterioration.	212			
304001	Check windshield anti-ice nozzles for security or obstruction.	221			
250006	Pilot and Copilot Seats - Inspect seat tracks for wear and/or damage, controls for security of installation and operation, seat structure welds and mechanism for cracks, damage, and security	221, 222			
341001	Pitot Static Sump(s) - Check for cracks, dents, leaks and presence of water, drain sumps.	221, 222			
250001	Upholstery, Headliner, Trim and Carpet - Check for condition and clean.	221, 222, 231, 232			
250003	Seat Bearings - Service.	221, 222, 231, 232			
350003	Oxygen Masks and Hoses - Check condition and clean.	221, 222, 231, 232			
340001	Antennas - Check Mounting and Security.	221, 222, 231, 232, 311, 312, 340			
340002	Antennas and Cables - Inspect for Security of Attachment, Connections, and Conditions.	221, 222, 231, 232, 311, 312, 340			
610011	Propeller Synchronizer - Check for condition and security.	221, 222, 430, 440			
240004	Voltage Regulators - Check wiring, mounting, condition and wire routing.	222			
250008	Replacement Fuses - Ensure that fuses are installed in glove box or under co-pilot's seat if glove box is not installed.	222, 226			
270001	Control Column - Check for security, looseness, wear and correct rigging.	223, 224			
311001	Instrument Panel - Ground straps for security and condition.	223, 224, 225			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
310001	Instruments - Check Markings and Condition.	223, 224, 225, 226			
110001	Placards and Decals - Inspect for security, presence and legibility.	223, 224, 225, 226, 227, 228			
311002	Instrument Panel and Control Pedestal - Check mountings and terminals for security. Check bonding between stationary panel and instrument panel for proper ground resistance, resistance must be 0.010 Ohms or less.	223, 224, 225, 226, 227, 228			
230001	Radio and Navigation System - Check for operation and condition.	225, 228			
760001	Control Pedestal - Inspect for condition and security.	228			
275002	Flap Motor and Position Indicator - Check for travel, condition and security.	228, 235			
240006	Landing Gear Relay and Limit Switch - Check mounting and terminals.	231			
250007	Passenger Seats - Inspect seat backs for wear and/or damage; controls for security of installation and operation, seat structure and cushions for damage.	231, 232			
521002	Cabin Door Latch Mechanism - Service.	232			
523001	Fuselage Baggage Door - Check for condition and operation.	232			
324006	Brake Master Cylinders - Service.	233			
282002	Fuel Selector Gear Box Gears - Clean and Service.	233, 234			
324004	Brake System Plumbing - Inspect for leaks, condition and security. Check for proper routing and support.	233, 234, 510, 610, 721, 722			
275003	Flap Actuator Assembly - Check for condition, security and proper operating times.	235			
275004	Flap Limit Switch and Motor - Check wiring and terminals for condition and security.	235			
323002	Landing Gear Actuator - Inspect for condition, security, and wiring for condition, routing, and support.	235			
323004	Manual Extension System - Inspect condition, operation and specification compliance. Refer to 32-30-00, Extension and Retraction - Inspection/Check.	235			
301001	De-ice System - Check for leaks, condition and operation of controls, lines and clamps for security.	235, 236, 311, 312, 430, 440, 510, 520, 530, 610, 620, 630			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
275001	Flaps - Check linkage, bell cranks, pulleys and cables for condition, tension and security.	235, 510, 610			
220001	Autopilot - Check Cables, Attachments, Pulleys and Turnbuckles for tension, condition and security.	236, 311, 312			
273003	Elevator - Check bell crank, stop bolt, jam nut, linkage, pulleys and attach bolts for safety, security, condition, operation, and travel.	321, 322, 331, 332			
272003	Rudder - Check bell crank, stop bolt, jam nut, torque tube, linkage, pulleys and attach bolts for safety, security, condition, operation, and travel.	321, 322, 340			
273001	Elevator - Check hinges for condition, cracks and security.	331, 332			
273002	Elevator - Check skins for cracks and loose rivets.	331, 332			
273004	Elevator - Check elevator balance weights for looseness and tip structure for cracks.	331, 332			
301002	De-ice Boots - Check for Abrasions, Cuts, Nicks and Security of Mounting.	331, 332, 340, 530, 630			
273011	Elevator Trim Tab Actuator - Service.	332			
272001	Rudder - Check hinges and balance weight for condition, cracks and security.	340			
272002	Rudder - Check skins for cracks and loose rivets.	340			
272009	Rudder Trim Tab Actuator - Service.	340			
236001	Static Discharge - Check Static Bonding Strips and Static Discharge Wicks for security and general condition.	340, 540, 640			
610004	Propeller Hub - Check general condition.	410, 420			
610006	Spinner Bulkhead - Check for cracks and security on crankshaft.	410, 420			
610007	Propeller - Check for oil leaks.	410, 420			
610005	Propeller Governor - Check for operation, oil leaks, condition and security.	430, 440			
710001	Nacelle Firewall - Inspect for condition and security.	430, 440			
711001	Cowling and Cowl Flaps - Wash and inspect for cracks, dents, condition of paint and other damage. Check fasteners and cowl flaps for condition, security, and operation.	430, 440			
711002	Cowl Flap Control Cable and Housing - Service.	430, 440			
800002	Starter - Check brushes, commutator, and connectors.	430, 440			
810002	Waste Gate Valve and Controllers - Check condition and security of attachment.	430, 440			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
810003	Manifold Pressure Relief Valve - Visually check for obstructions, condition, security and operation.	430, 440			
282011	Wing Locker Transfer Pump - Check for leaks and security of mounting.	520, 620			
523004	Wing Locker Door - Check condition, operation, and security of hinges, latches, and seals.	520, 620			
271010	Aileron Trim Tab Actuator - Service.	530			
271001	Aileron - Check hinges and hinge brackets for condition, cracks and security.	530, 630			
271002	Aileron - Check skins for cracks and loose rivets.	530, 630			
271003	Aileron - Check bell crank, stop bolt, jam nut, linkage, pulleys and attach bolts for safety, security, condition, operation, and travel.	530, 630			
281002	Auxiliary Tanks - Inspect system for leaks and security.	530, 630			
282006	Boost Pumps (Auxiliary) - Inspect for leaks, operation, vent and overboard drain for obstruction.	530, 630			
282008	Main Tank Fuel Transfer Pump - Check security and mounting.	530, 630			
282010	Main Tank and Wing Locker Fuel Transfer Pump Filter - Clean.	530, 630			
281001	Tip Tanks - Inspect mounting bolts for security, tip tank for leaks, cracks and dents.	540, 640			
322002	Nose Gear Shock Strut - Service.	720			
322003	Nose Gear Torque Link - Inspect for wear and condition. Inspect connecting center bolt and washer for condition and security.	720			
322010	Nose Gear Fork - Inspect for cracks, general condition and security of attachment.	720			
323010	Nose and Main Landing Gear Extension and Retraction System Check - Inspect condition, operation and specification compliance. Refer to 32-30-00, Extension and Retraction - Inspection/ Check.	720, 721, 722			
323011	Nose and Main Landing Gear Extension and Retraction Linkage - Check condition of linkage.	720, 721, 722			
321002	Main Gear Shock Struts - Service.	721, 722			
321003	Main Gear Torque Links - Inspect for wear and condition. Inspect connecting center bolt and washer for condition and security.	721, 722			
324005	Brake Assemblies - Check wear of lining and disc warpage.	721, 722			

*** End of Operation 3 Inspection Items ***

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INSPECTION OPERATION 3

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 3 gives inspection items that are examined every 200 hours of operation or 12 months, whichever occurs first.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
530001	Fuselage Exterior and Interior Surfaces - Check for damage, wrinkles, corrosion, etc.	110, 211, 212, 221, 222, 231, 232, 311, 312		
240007	Wing and Fuselage - Check wiring, routing, security and terminals.	110, 211, 212, 221, 222, 231, 232, 311, 312, 340, 430, 440, 510, 520, 530, 540, 610, 620, 630, 640		
304002	Check Windshield Anti-Ice Alcohol Pump - Check for condition and security.	211		
350002	Oxygen Regulator - Check pressure and rate of flow.	211		
523006	Nose Baggage Door - Check for condition, operation, and security of hinges and latches.	211		

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
341002	Pitot Static System - Leak check.	211, 212, 221, 222			
341004	Alternate Static Source - Check for obstructions and drain.	211, 221			
350001	Oxygen System - Check installation, mountings, equipment and pressure.	211, 221, 222, 231, 232			
214002	Cabin heater fuel lines, check for condition, security and evidence of fuel leaks.	212			
282007	Heater Fuel Filter - Remove, clean and inspect for deterioration.	212			
304001	Check windshield anti-Ice nozzles for security or obstruction.	221			
250006	Pilot and Copilot Seats - Inspect seat tracks for wear and/or damage, controls for security of installation and operation; seat structure welds and mechanism for cracks, damage and security.	221, 222			
341001	Pitot Static Sump(s) - Check for cracks, dents, leaks and presence of water, drain sumps.	221, 222			
250001	Upholstery, Headliner, Trim and Carpet - Check for condition and clean.	221, 222, 231, 232			
250003	Seat Bearings - Service.	221, 222, 231, 232			
350003	Oxygen Masks and Hoses - Check condition and clean.	221, 222, 231, 232			
340001	Antennas - Check Mounting and Security.	221, 222, 231, 232, 311, 312, 340			
340002	Antennas and Cables - Inspect for Security of Attachment, Connections, and Conditions.	221, 222, 231, 232, 311, 312, 340			
610011	Propeller Synchronizer - Check for condition and security.	221, 222, 430, 440			
240004	Voltage Regulators - Check wiring, mounting, condition and wire routing.	222			
250008	Replacement Fuses - Ensure that fuses are installed in glove box or under co-pilot's seat if glove box is not installed	222, 226			
270001	Control Column - Check for security, looseness, wear and correct rigging.	223, 224			
311001	Instrument Panel - Ground straps for security and condition.	223, 224, 225			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
310001	Instruments - Check Markings and Condition.	223, 224, 225, 226			
110001	Placards and Decals - Inspect for security, presence and legibility.	223, 224, 225, 226, 227, 228			
311002	Instrument Panel and Control Pedestal - Check mountings and terminals for security, check bonding between stationary panel and instrument panel for proper ground resistance must be 0.010 Ohms or less.	223, 224, 225, 226, 227, 228			
230001	Radio and Navigation System - Check for operation and condition.	225, 228			
760001	Control Pedestal - Inspect for condition and security.	228			
275002	Flap Motor and Position Indicator - Check for travel, condition and security.	228, 235			
240006	Landing Gear Relay and Limit Switch - Check mounting and terminals.	231			
250007	Passenger Seats - Inspect seat backs for wear and/ or damage; controls for security of installation and operation; seat structure and cushions for damage.	231, 232			
521002	Cabin Door Latch Mechanism - Service.	232			
523001	Fuselage Baggage Door - Check for condition and operation.	232			
324006	Brake Master Cylinders - Service.	233			
282002	Fuel Selector Gear Box Gears - Clean and Service.	233, 234			
324004	Brake System Plumbing - Inspect for leaks, condition and security. Check for proper routing and support.	233, 234, 510, 610, 721, 722			
275003	Flap Actuator Assembly - Check for condition, security and proper operating times.	235			
275004	Flap Limit Switch and Motor - Check wiring and terminals for condition and security.	235			
323002	Landing Gear Actuator - Inspect for condition, security, and wiring for condition, routing, and support.	235			
323004	Manual Extension System - Inspect condition, operation and specification compliance. Refer to 32-30-00, Extension and Retraction - Inspection/ Check.	235			
301001	De-ice System - Check for leaks, condition and operation of controls, lines and clamps for security.	235, 236, 311, 312, 430, 440, 510, 520, 530, 610, 620, 630			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
275001	Flaps - Check linkage, bell cranks, pulleys and cables for condition, tension and security.	235, 510, 610			
220001	Autopilot - Check Cables, Attachments, Pulleys and Turnbuckles for tension, condition and security.	236, 311, 312			
273003	Elevator - Check bell crank, stop bolt, jamnut, linkage, pulleys and attach bolts for safety, security, condition, operation, and travel.	321, 322, 331, 332			
272003	Rudder - Check bell crank, stop bolt, jamnut, torque tube, linkage, pulleys and attach bolts for safety, security, condition, operation, and travel.	321, 322, 340			
273001	Elevator - Check hinges for condition, cracks and security.	331, 332			
273002	Elevator - Check skins for cracks and loose rivets.	331, 332			
273004	Elevator - Check elevator balance weights for looseness and tip structure for cracks.	331, 332			
301002	De-ice Boots - Check for Abrasions, Cuts, Nicks and Security of Mounting	331, 332, 340, 530, 630			
273011	Elevator Trim Tab Actuator - Service.	332			
272001	Rudder - Check hinges and balance weight for condition, cracks and security.	340			
272002	Rudder - Check skins for cracks and loose rivets.	340			
272009	Rudder Trim Tab Actuator - Service.	340			
236001	Static Discharge - Check Static Bonding Strips for security.	340, 540, 640			
610004	Propeller Hub - Check general condition.	410, 420			
610006	Spinner Bulkhead - Check for cracks and security on crankshaft.	410, 420			
610007	Propeller - Check for oil leaks.	410, 420			
610005	Propeller Governor - Check for operation, oil leaks, condition and security.	430, 440			
710001	Nacelle Firewall - Inspect for condition and security.	430, 440			
711001	Cowling and Cowl Flaps - Wash and inspect for cracks, dents, condition of paint and other damage. Check fasteners and cowl flaps for condition, security, and operation.	430, 440			
711002	Cowl Flap Control Cable and Housing - Service.	430, 440			
800002	Starter - Check brushes, commutator, and connectors.	430, 440			
810002	Waste Gate Valve And Controllers - Check condition and security of attachment.	430, 440			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
810003	Manifold Pressure Relief Valve - Visually check for obstructions, condition, security and operation.	430, 440			
282011	Wing Locker Transfer Pump - Check for leaks and security of mounting.	520, 620			
523004	Wing Locker Door - Check condition, operation, and security of hinges, latches, and seals.	520, 620			
271010	Aileron Trim Tab Actuator - Service.	530			
271001	Aileron - Check hinges for condition, cracks and security.	530, 630			
271002	Aileron - Check skins for cracks and loose rivets.	530, 630			
271003	Aileron - Check bell crank, stop bolt, jamnut, linkage, pulleys and attach bolts for safety, security, condition, operation, and travel.	530, 630			
281002	Auxiliary Tanks - Inspect system for leaks and security.	530, 630			
282006	Boost Pumps (Auxiliary) - Inspect for leaks, operation, vent and overboard drain for obstruction.	530, 630			
282008	Main Tank Fuel Transfer Pump - Check security and mounting.	530, 630			
282009	Main Tank and Wing Locker Fuel Transfer Pump Filter - Clean.	530, 630			
282010	Main Tank and Wing Locker Fuel Transfer Pump Filter - Clean.	530, 630			
281001	Tip Tanks - Inspect mounting bolts for security, tip tank for leaks, cracks and dents.	540, 640			
322002	Nose Gear Shock Strut - Service.	720			
322003	Nose Gear Torque Link - Inspect for wear and condition. Inspect connecting center bolt and washer for condition and security.	720			
322010	Nose Gear Fork - Inspect for cracks, general condition and security of attachment.	720			
323010	Nose and Main Landing Gear Extension and Retraction System Check - Inspect condition, operation and specification compliance. Refer to 32-30-00, Extension and Retraction - Inspection/ Check.	720, 721, 722			
323011	Nose and Main Landing Gear Extension and Retraction Linkage - Check condition of linkage.	720, 721, 722			
321002	Main Gear Shock Struts - Service.	721, 722			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
321003	Main Gear Torque Links - Inspect for wear and condition. Inspect connecting center bolt and washer for condition and security.	721, 722			
324005	Brake Assemblies - Check wear of lining and disc warpage.	721, 722			
	*** End of Operation 3 Inspection Items ***				

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INSPECTION OPERATION 4

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 4 gives inspection items that are examined every 250 hours of heater operation.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
214001	Heater (Stewart-Warner) - Check condition and operation.	212			

*** End of Operation 4 Inspection Items ***

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INSPECTION OPERATION 5

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 5 gives inspection items that are examined every 400 hours of operation.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
246001	Starter Relay - Inspect contact area.	520			
	*** End of Operation 5 Inspection Items ***				

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INSPECTION OPERATION 6

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 6 gives inspection items that are examined every 500 hours of operation.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
523007	Nose Baggage Door Hinge and Door Stop - Service.	211		
250004	Seat Adjusting Screw - Service.	221, 222		
272011	Rudder Pedal Linkage and Bearings - Service.	221, 222		
270002	Control Column Control Tube - Service.	223, 224		
270003	Control Column Bearings - Service.	223, 224		
324007	Parking Brake Handle Shaft and Pivot Points - Service.	228		
760002	Control Pedestal Bearings - Service.	228		
523002	Fuselage Baggage Door Hinge and Door Stop - Service.	232		
523003	Fuselage Baggage Door Latch Mechanism - Service.	232		
323005	Manual Extension System Support Bearings - Service.	235		
323006	Manual Extension System Spool and Bell Crank - Service.	235		

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
323007	Manual Extension System Crank Handle Linkage - Service.	235			
243003	Alternators - Check brushes, leads, bearings and slip rings for condition and security.	430, 440			
741001	Magnetos - Clean and Inspect per Teledyne Continental Ignition Systems Service Bulletin SB643, or latest revision. Refer to Cessna Supplier Service Notice SSN94-5.	430, 440			
780004	Engine Exhaust System (Stainless Steel Or Partial Stainless Steel Systems Unknown Or Repaired) Perform A Complete Disassembly Inspection. Refer To Detailed Inspection Procedures in 78-00-00, Exhaust - Inspection/Check.	430, 440			
780006	Exhaust System (Inconel System Only) - Perform a disassembly inspection of the exhaust slip joints and turbocharger exhaust pipe. Refer to detailed inspection procedures in 78-00-00, Exhaust - Inspection/Check.	430, 440			
523005	Wing Locker Door Stop - Service.	520, 620			
334001	Landing Light Hinge Point - Service.	530, 630			
334003	Landing Light Exposed Gear Sector - Service.	530, 630			
	*** End of Operation 6 Inspection Items ***				

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INSPECTION OPERATION 7

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 7 gives inspection items that are examined every 1500 hours of operation.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
272012	Rudder Pedal Bearing Halves and Rudder Gust Lock - Service.	221, 222		
323008	Manual Extension System Miter Gear - Service.	235		
570004	Wing Lower Front Spar Fitting - Perform Type A Inspection. Refer to 57-00-00 Wings - Inspection/ Check.	510, 520, 530, 610, 620, 630		
334002	Landing Light Internal Gears - Service.	530, 630		

*** End of Operation 7 Inspection Items ***

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INSPECTION OPERATION 8

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 8 gives inspection items that are examined every 12 months.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
281003	Inspect BTC-39 Fuel Tanks for leaks. (Reference Service Letter ME78-7).	530, 630			

*** End of Operation 8 Inspection Items ***

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INSPECTION OPERATION 9

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 9 gives inspection items that are examined every 2 years.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
341003	Altimeter and Static System - Inspect as Required by CFR Part 91, Paragraph 91.170 in accordance with CFR, Part 43, Appendix E, by Authorized Repair Station	211, 212, 221, 222, 223			
340003	Transponder - Inspect to comply with 14 CFR 91.413	225			
	*** End of Operation 9 Inspection Items ***				

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INSPECTION OPERATION 10

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 10 gives inspection items that are examined every 3 years.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
350004	Oxygen Cylinder - ICC-3HT/DOT-3HT (Light Weight) - Inspect condition and hydrostatic test date.	211			

*** End of Operation 10 Inspection Items ***

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INSPECTION OPERATION 11

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 11 gives inspection items that are examined every 5 years.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
350005	Oxygen Cylinder - ICC-3AA/DOT-3AA (Standard Weight) - Inspect condition and hydrostatic test date.	211			
560003	Emergency Exit Window - Remove and reinstall the window to assure proper operation of emergency exit.	231			

*** End of Operation 11 Inspection Items ***

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INSPECTION OPERATION 12

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 12 gives inspection items that are examined every 1000 hours of operation or 3 years, whichever occurs first.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
322007	For airplane serial numbers 310R0001 thru 310R1918: Service the Nose Gear Pivot Bushings.	720			

*** End of Operation 12 Inspection Items ***

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INSPECTION OPERATION 13

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 13 gives inspection items that are examined at every 12 months, exhaust system removal or engine overhaul.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
712001	Engine Support Structure - Inspection. For Model T310R Airplanes only, having complied with and completed MEB99-7 and have been modified by the installation of SK310-112, or later revision. Visually check the engine support beams and canted bulkhead for corrosion. If corrosion is seen, recomply with MEB99-7, or latest revision. If any indication of exhaust gas leak or engine fire is seen, recomply with MEB99-7, or latest revision.	430, 440			

*** End of Operation 13 Inspection Items ***

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INSPECTION OPERATION 14

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 14 gives inspection items that are examined the first 100 hours of operation and every 200 hours of operation thereafter or 12 months, whichever occurs first.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
325002	Nose Gear Shimmy Damper - Service.	720			
324001	Nose and Main Gear Wheel Bearings - Service.	720, 721, 722			

*** End of Operation 14 Inspection Items ***

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INSPECTION OPERATION 15

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 15 gives inspection items that are examined every 1400 hours of operation, 12 years or engine overhaul, whichever occurs first.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
780005	Engine Exhaust System (Inconel Only) - Perform A Complete Disassembly Inspection. Refer To Detailed Inspection Procedures in 78-00-00, Exhaust - Inspection/Check.	430, 440			

*** End of Operation 15 Inspection Items ***

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INSPECTION OPERATION 16

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 16 gives inspection items that are examined at the first 100 hours of operation on new, rebuilt or overhauled engines and every 300 hours of operation after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
731003	Engine Fuel Injection Nozzles - At the first 100-hour inspection on new, rebuilt or overhauled engines, remove and clean the fuel injection nozzles. Thereafter, the fuel injection nozzles must be cleaned at 300-hour intervals or more frequently if fuel stains are found.	430, 440			

*** End of Operation 16 Inspection Items ***

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INSPECTION OPERATION 17

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 17 gives inspection items that are examined beginning five years from the date of manufacture, and every twelve months thereafter you must make sure of the serviceability of the components. Refer to Airborne Air and Fuel Products Service Letter Number 39A or latest revision.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
301004	Deice Vacuum Pressure Check Valves - Check for proper operation. Refer to Airborne Air and Fuel Products Service Letter Number 39A or latest revision.	430, 440		
371008	Vacuum Manifold Check Valve - Check for proper operation. Refer to Airborne Air and Fuel Products Service Letter Number 39A or latest revision.	430, 440		

*** End of Operation 17 Inspection Items ***

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INSPECTION OPERATION 18

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 18 gives inspection items that are examined at every 500 hours of operation, 24 months, exhaust system removal or engine overhaul.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
712002	Engine Support Structure - Inspection. For Model T310R Airplanes only, having complied with and completed MEB99-7 and have not been modified by the installation of SK310-112, or later revision. Recomply with MEB99-7, or latest revision.	430, 440			

*** End of Operation 18 Inspection Items ***

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INSPECTION OPERATION 19

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 19 consists of items to be inspected per MEB88-5 Revision 2, or latest revision. Refer to MEB88-5 Revision 2, or latest revision for the initial and repeat inspection intervals.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
323015	Nose Gear Trunnion - Check (1.19 inch lugs), refer to 5-14-12, Supplemental Inspection Number 32-30-07 for inspection procedures.	720			
323016	Nose Gear Trunnion - Check (1.31 inch lugs), refer to 5-14-13, Supplemental Inspection Number 32-30-08 for inspection procedures.	720			
	*** End of Operation 19 Inspection Items ***				

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INSPECTION OPERATION 20

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 20 gives inspection items that are examined at the first 15,000 hours of operation and every 2000 hours of operation thereafter.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
570005	Wing Lower Front Spar Fitting, flanges, and Lower Spar Cap - Perform Eddy Current inspection. Refer to 57-00-00 Wings - Inspection/Check for inspection requirements.	510, 520, 530, 610, 620, 630			

*** End of Operation 20 Inspection Items ***

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INSPECTION OPERATION 21

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 21 gives inspection items that are examined at the first 15,000 hours of operation or 20 years, inspection is to be repeated every 2,500 hours of operation or 5 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
552002	Elevator Hinges and Fittings, refer to 5-14-29, Supplemental Inspection Number 55-20-01 for inspection procedures.	331, 332		
553003	Rudder Hinges and Fittings, refer to 5-14-31, Supplemental Inspection Number 55-30-01 for inspection procedures.	340		
271012	Aileron Hinges and Fittings - Check, refer to 5-14-01, Supplemental Inspection Number 27-10-04 for inspection procedures.	530, 630		
	*** End of Operation 21 Inspection Items ***			

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INSPECTION OPERATION 22

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 22 gives inspection items that are examined at the first 7,500 hours of operation or 15 years, inspection is to be repeated every 2,500 hours of operation or 5 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
272013	Rudder Structure - Check, refer to 5-14-02, Supplemental Inspection Number 27-20-03 for inspection procedures.	340		
272014	Rudder Torque Tube Assembly - Check, refer to 5-14-03, Supplemental Inspection Number 27-20-04 for inspection procedures.	340		

*** End of Operation 22 Inspection Items ***

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INSPECTION OPERATION 23

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 23 gives inspection items that are examined at the first 5,000 hours of operation or 10 years, inspection is to be repeated every 1,000 hours of operation or 3 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
272015	Elevator Torque Tube Assembly - Check, refer to 5-14-04, Supplemental Inspection Number 27-30-00 for inspection procedures.	331, 332		
552001	Outboard Elevator Hinge Bracket and Attachment-Check, refer to 5-14-28, Supplemental Inspection Number 55-20-00 for inspection procedures.	331, 332		
571002	Wing Lower Rear Spar Cap at Splice - Check, refer to 5-14-34, Supplemental Inspection Number 57-10-04 for inspection procedures.	530, 630		

*** End of Operation 23 Inspection Items ***

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INSPECTION OPERATION 24

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 24 gives inspection items that are examined at the first 10,000 landings or 20 years, inspection is to be repeated every 500 landings or 4 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
321009	Main Landing Gear Torque Tube Assembly - Check, refer to 5-14-06, Supplemental Inspection Number 32-10-05 for inspection procedures.	721, 722			

*** End of Operation 24 Inspection Items ***

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INSPECTION OPERATION 24

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 24 gives inspection items that are examined at the first 10,000 landings or 20 years, inspection is to be repeated every 2,000 landings or 4 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
321009	Main Landing Gear Torque Tube Assembly - Check, refer to 5-14-06, Supplemental Inspection Number 32-10-05 for inspection procedures.	721, 722			

*** End of Operation 24 Inspection Items ***

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INSPECTION OPERATION 25

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 25 gives inspection items that are examined at the first 3,000 landings or 20 years, inspection is to be repeated every 100 landings or 1 year after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
321008	Main Landing Gear Torque Tube Assembly Check, refer to 5-14-05, Supplemental Inspection Number 32-10-01 for inspection procedures.	721, 722			

*** End of Operation 25 Inspection Items ***

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INSPECTION OPERATION 25

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 25 gives inspection items that are examined at the first 4,000 landings or 8 years, inspection is to be repeated every 1,000 landings or 3 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
321008	Main Landing Gear Torque Tube Assembly Check, refer to 5-14-05, Supplemental Inspection Number 32-10-01 for inspection procedures.	721, 722			

*** End of Operation 25 Inspection Items ***

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INSPECTION OPERATION 26

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 26 gives inspection items that are examined at the first 1,000 landings or 3 years, inspection is to be repeated every 500 landings or 3 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
321010	Main Landing Gear Pivot Bolt - Check, refer to 5-14-07, Supplemental Inspection Number 32-10-02 for inspection procedures.	721, 722			

*** End of Operation 26 Inspection Items ***

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INSPECTION OPERATION 27

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 27 gives inspection items that are examined at the first 5,000 landings or 10 years, inspection is to be repeated every 5,000 landings or 10 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
321011	Main Landing Gear Fork Bolts (5/8 inch) - Check, refer to 5-14-08, Supplemental Inspection Number 32-10-03 for inspection procedures.	721, 722			

*** End of Operation 27 Inspection Items ***

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INSPECTION OPERATION 28

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 28 gives inspection items that are examined at the first 12,500 landings or 20 years, inspection is to be repeated every 2,500 landings or 5 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
321012	Check Main Landing Gear, refer to 5-14-09, Supplemental Inspection Number 32-10-04 for inspection procedures.	721, 722			

*** End of Operation 28 Inspection Items ***

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INSPECTION OPERATION 29

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 29 gives inspection items that are examined at the first 15,000 landings or 20 years, inspection is to be repeated every 5,000 landings or 10 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
322011	Nose Gear Fork - Check, refer to 5-14-10, Supplemental Inspection Number 32-20-00 for inspection procedures.	720			

*** End of Operation 29 Inspection Items ***

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INSPECTION OPERATION 30

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 30 gives inspection items that are examined at the first 10,000 landings or 20 years, inspection is to be repeated every 5,000 landings or 10 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
323014	Main/Nose Gear Retraction System Teardown Check, refer to 5-14-11, Supplemental Inspection Number 32-30-00 for inspection procedures.	235, 510, 610, 720, 721, 722			

*** End of Operation 30 Inspection Items ***

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INSPECTION OPERATION 31

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 31 gives inspection items that are examined at the first 10,000 hours of operation or 20 years, inspection is to be repeated every 5,000 hours of operation or 10 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
521004	Cabin Door Retention - Check, refer to 5-14-14, Supplemental Inspection Number 52-10-00 for inspection procedures.	232		
551002	Horizontal Stabilizer Inspection, refer to 5-14-20, Supplemental Inspection Number 55-10-00 for inspection procedures.	321, 322, 331, 332		

*** End of Operation 31 Inspection Items ***

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INSPECTION OPERATION 32

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 32 gives inspection items that are examined at the first 1,000 hours of operation or 3 years, inspection is to be repeated every 1,000 hours of operation or 3 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
522001	Emergency Exit Window Mechanism Inspection, refer to 5-14-15, Supplemental Inspection Number 52-20-00 for inspection procedures.	231			

*** End of Operation 32 Inspection Items ***

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INSPECTION OPERATION 33

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 33 gives inspection items that are examined at the first 15,000 hours of operation or 20 years, inspection is to be repeated every 5,000 hours of operation or 10 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

D. Item Code 571006 was removed from this Inspection Operation in Temporary Revision D2514-15TR5-2.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
531001	Horizontal Stabilizer Rear Spar Angle Attachment, refer to 5-14-16, Supplemental Inspection Number 53-10-03 for inspection procedures.	321, 322		
551003	Horizontal Stabilizer Spars and Attachments, refer to 5-14-21, Supplemental Inspection Number 55-10-01 for inspection procedures.	321, 322		
551004	Horizontal Stabilizer Forward Spar Upper Cap, refer to 5-14-22, Supplemental Inspection Number 55-10-02 for inspection procedures.	321, 322		
551005	Horizontal Stabilizer Forward Spar Lower Cap, refer to 5-14-23, Supplemental Inspection Number 55-10-03 for inspection procedures.	321, 322		
551006	Horizontal Stabilizer Forward Spar Attach, refer to 5-14-24, Supplemental Inspection Number 55-10-04 for inspection procedures.	321, 322		

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
551007	Horizontal Stabilizer Rear Spar Lower Cap Attach, refer to 5-14-25, Supplemental Inspection Number 55-10-05 for inspection procedures.	321, 322			
551008	Horizontal Stabilizer Rear Spar Upper Cap, BL 0.0, refer to 5-14-26, Supplemental Inspection Number 55-10-06 for inspection procedures.	321, 322			
551009	Horizontal Stabilizer Rear Spar Lower Cap, BL 0.0, refer to 5-14-27, Supplemental Inspection Number 55-10-07 for inspection procedures.	321, 322			
553004	Vertical Stabilizer Rear Spar Cap Attach, refer to 5-14-32, Supplemental Inspection Number 55-30-02 for inspection procedures.	340			
553005	Vertical Stabilizer Spars and Attachments, refer to 5-14-30, Supplemental Inspection Number 55-30-00 for inspection procedures.	340			
571009	Wing Lower Auxiliary Spar Cap, refer to 5-14-41, Supplemental Inspection Number 57-10-11 for inspection procedures.	520, 620			
	*** End of Operation 33 Inspection Items ***				

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INSPECTION OPERATION 34

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 34 gives inspection items that are examined at the first 10,000 hours of operation or 20 years, inspection is to be repeated every 5,000 hours of operation or 10 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
531002	Window Frame and Surrounding Structure, refer to 5-14-17, Supplemental Inspection Number 53-10-04 for inspection procedures.	221, 222, 231, 232		
571001	Wing Rib - Main Landing Gear Side Brace, refer to 5-14-33, Supplemental Inspection Number 57-10-03 for inspection procedures.	520, 620		
	*** End of Operation 34 Inspection Items ***			

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INSPECTION OPERATION 35

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 35 gives inspection items that are examined every 1,500 hours of operation or at engine overhaul.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
541001	Engine Support Beams, refer to 5-14-18, Supplemental Inspection Number 54-10-00 for inspection procedures.	430, 440			

*** End of Operation 35 Inspection Items ***

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INSPECTION OPERATION 36

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 36 consists of items to be inspected per MEB99-7, or latest revision. Refer to MEB99-7, or latest revision for the initial and repeat inspection intervals.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
541002	Engine Beam Modification, refer to 5-14-19, Supplemental Inspection Number 54-10-01 for inspection procedures.	430, 440			

*** End of Operation 36 Inspection Items ***

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INSPECTION OPERATION 37

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 37 gives inspection items that are examined at the first 11,000 hours of operation. Refer to 5-14-36, Supplemental Inspection Number 57-10-06, for repeat inspection information.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
571004	Wing Main Spar Lower Cap, refer to 5-14-36, Supplemental Inspection Number 57-10-06 for inspection procedures.	510, 520, 610, 620			

*** End of Operation 37 Inspection Items ***

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INSPECTION OPERATION 38

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 38 gives inspection items that are examined at the first 15,000 hours of operation or 20 years, inspection is to be repeated every 1,000 hours of operation or 3 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
571003	Wing Lower Rear Carry-Thru Spar, refer to 5-14-35, Supplemental Inspection Number 57-10-05 for inspection procedures.	510, 610			

*** End of Operation 38 Inspection Items ***

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INSPECTION OPERATION 39

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 39 gives inspection items that are examined at the first 6,500 hours of operation or 13 years, inspection is to be repeated every 2,500 hours of operation or 5 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
571005	Wing Aft Lower Auxiliary Spar Cap, refer to 5-14-37, Supplemental Inspection Number 57-10-07 for inspection procedures.	510, 520, 610, 620			

*** End of Operation 39 Inspection Items ***

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INSPECTION OPERATION 40

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 40 gives inspection items that are examined at the first 11,000 hours of operation or 20 years, inspection is to be repeated every 4,000 hours of operation or 8 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
571007	Wing Lower Front Spar Cap at Root Fitting Attach, WS 28.96, refer to 5-14-39, Supplemental Inspection Number 57-10-09 for inspection procedures.	510, 610			

*** End of Operation 40 Inspection Items ***

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INSPECTION OPERATION 41

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 41 gives inspection items that are examined at the first 11,000 hours of operation or 20 years, inspection is to be repeated every 2,000 hours of operation or 4 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
571008	Wing Lower Front Spar Cap at Root Fitting Attach, WS 36.36, refer to 5-14-40, Supplemental Inspection Number 57-10-10 for inspection procedures.	510, 610			

*** End of Operation 41 Inspection Items ***

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INSPECTION OPERATION 42

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 42 gives inspection items that are examined at the first 15,000 hours of operation or 20 years, inspection is to be repeated every 2,500 hours of operation or 10 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
571010	Wing Front Spar Lug Inspection, refer to 5-14-42, Supplemental Inspection Number 57-10-12 for inspection procedures.	510, 610		
571011	Wing Tip Tank Attachment Inspection, refer to 5-14-43, Supplemental Inspection Number 57-10-13 for inspection procedures.	540, 640		

*** End of Operation 42 Inspection Items ***

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INSPECTION OPERATION 43

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 43 gives the Corrosion Prevention and Control Program Inspections (Baseline Program) items that are to be examined every 12 months. Refer to Section 5-30-00, Corrosion Prevention and Control Program for additional information concerning repeat Corrosion Program Inspection intervals.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
710009	Nacelle Internal Structure. Make sure you examine these areas: (1.) Firewall, (2.) Canted bulkhead, (3.) Stringers at engine mounts. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	430, 440		
712003	Engine Support Structure. Make sure you examine these areas: (1.) Engine beams, (2.) Forward and aft engine mounts, (4.) Turbocharger support (if equipped with turbocharger). NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	430, 440		
570012	Wing Structure Internal. Make sure you examine these areas: (1.) Wing main spar lower and upper caps, (2.) Wing rear spar upper and lower caps, (3.) Wing lower auxiliary spar caps, (4.) Rear spar web. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	520, 620		

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
711005	Nacelle External Structure. Make sure you examine these areas: (1.) Nacelle skin within path of exhaust, (2.) Exhaust stack. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	520, 620			
711006	Nacelle Structure. Make sure you examine these areas: (1.) Nacelle lockers with emphasis at compartment's floor, (2.) Structure under nacelle lockers. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	520, 620			
323019	Main Landing Gear Torque Tube. Make sure you examine these areas: (1.) Torque tube internal and external surfaces, (2.) Torque tube welds. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	721, 722			
	*** End of Operation 43 Inspection Items ***				

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INSPECTION OPERATION 44

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 44 gives the Corrosion Prevention and Control Program Inspections (Baseline Program) items that are to be examined every 24 months. Refer to Section 5-30-00, Corrosion Prevention and Control Program for additional information concerning repeat Corrosion Program Inspection intervals.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
273014	Elevator Torque Tube Assembly. Make sure you examine these areas: (1.) Torque tube external and internal surfaces, (2.) Torque tube fitting attachment. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	331, 332		
273015	Elevator Attachments. Make sure you examine these areas: (1.) Hinge brackets, (2.) Hinge bolts, (3.) Hinge bearings, (4.) Trim tab actuating rod (inner surface), (5.) Trim tab horn screws. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor on bearing. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	331, 332		

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
272016	Rudder Attachment. Make sure you examine these areas: (1.) Trim tab actuating rod (inner surface), (2.) Hinge brackets, (3.) Hinge bearings, (4.) Hinge bolts. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor on bearing. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	340			
272017	Rudder Torque Tube Assembly. Make sure you examine these areas: (1.) Torque tube external and internal surfaces, (2.) Torque tube welds, (3.) Bell Crank attachment. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	340			
271013	Aileron Attachments. Make sure you examine these areas: (1.) Trim tab actuating rod (inner surface), (2.) Push-pull tube, (3.) Hinge brackets, (4.) Hinge bolts, (5.) Hinge bearings, (6.) Attach fittings. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor on bearings. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	530, 630			
	*** End of Operation 44 Inspection Items ***				

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INSPECTION OPERATION 45

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 45 gives the Corrosion Prevention and Control Program Inspections (Baseline Program) items that are to be examined every 36 months. Refer to Section 5-30-00, Corrosion Prevention and Control Program for additional information concerning repeat Corrosion Program Inspection intervals.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
322012	Nose Wheel Well Structure. Make sure you examine these areas: (1.) Webs, (2.) Stiffeners, (3.) Brackets, (4.) Structural attachments. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	211, 212		
570010	Wing Structure Internal. Make sure you examine these areas: (1.) Rear spar upper and lower carry-thru fittings, (2.) Rear spar upper and lower caps, (3.) Rear spar cap. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	512, 612		

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
322013	Nose Gear Outer Barrel Assembl. Make sure you examine these areas: (1.) Outer barrel surface, (2.) End upper strut and lower collar assembly. NOTE: Disassemble the nose gear strut to get access. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor on the sliding surfaces of the oleo strut. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	720			
322014	Nose Gear Inner Barrel Assembly. Make sure you examine these areas: (1.) Inner barrel surface, (2.) Strut tube assembly. NOTE: Disassemble the nose gear strut to get access. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the sliding surfaces of the oleo strut. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	720			
322015	Nose Gear Trunnion Steering Assembly, Torque Link Assembly, and Nose Gear Fork. Make sure you examine these areas: (1.) Nose gear trunnion surface, (2.) Steering collar and steering collar attach bolt, (3.) Torque link, torque link attach pin, and attach bolt, (4.) Nose gear fork and shock strut bearing block. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	720			
322016	Nose Gear Trunnion Steering Assembly, Torque Link Assembly, and Nose Gear Fork. Make sure you examine these areas: (1.) Nose gear trunnion upper, lower inner bore surface and bearing, (2.) Torque link bolt and attach pin inner bore surface, (3.) Nose gear fork lug inner bore surface. NOTE: Disassemble the nose gear strut to get access. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the sliding surfaces of the oleo strut. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	720			
322018	Nose Gear Axle Assembly. Make sure you examine these areas: (1.) Nose gear axle and attach bolt, (2.) Wheel halves. NOTE: Disassemble the nose wheel assembly to get access. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the bearing. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	720			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
323017	Nose Gear Retraction Systems. Make sure you examine these areas: (1.) Mechanisms, (2.) Bushings, (3.) Bearings, (4.) Structural attachments. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information). NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the sliding surfaces of the oleo strut. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	720			
321013	Main Gear Trunnion Assembly. Make sure you examine these areas: (1.) Main gear trunnion external surface, (2.) Main gear trunnion internal bore. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	721, 722			
321014	Main Gear Outer Barrel Assembly. Make sure you examine these areas: (1.) Outer barrel surface, (2.) End upper strut and lower collar assembly, (3.) Link assembly. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the sliding surfaces of the oleo strut. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	721, 722			
323018	Main Gear Retraction Systems. Make sure you examine these areas: (1.) Mechanisms, (2.) Bushings, (3.) Bearings, (4.) Structural elements. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor on bearing. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	721, 722			
	*** End of Operation 45 Inspection Items ***				

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INSPECTION OPERATION 46

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 46 gives the Corrosion Prevention and Control Program Inspections (Baseline Program) items that are to be examined every 48 months. Refer to Section 5-30-00, Corrosion Prevention and Control Program for additional information concerning repeat Corrosion Program Inspection intervals.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
275005	Flap Control System Installation. Make sure you examine these areas: (1) Control cables, (2) Associated hardware. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	512, 612			
521005	Passenger/Crew Door Retention System (or cargo door, if installed). Make sure you examine these areas: (1.) Bell cranks, (2.) Pushrods, (3.) Handle, (4.) Pin retention linkages, (5.) Pins, (6.) Lockplates and guides, (7.) Hinges, (8.) Internal door framing. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	830			
530008	Areas of the Cabin Structure for the Passenger/Crew Door (or cargo door, if installed). Make sure you examine these areas: (1.) Door frames. (2.) Door hinges. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	830			
	*** End of Operation 46 Inspection Items ***				

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INSPECTION OPERATION 47

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 47 gives the Corrosion Prevention and Control Program Inspections (Baseline Program) items that are to be examined every 60 months. Refer to Section 5-30-00, Corrosion Prevention and Control Program for additional information concerning repeat Corrosion Program Inspection intervals.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
523008	Fuselage Nose Baggage. Make sure you examine these areas: (1.) Nose baggage shelves, (2.) Nose baggage lower internal structure. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	211, 212		
530002	Fuselage Skin. Make sure you examine this area: (1.) Skin in the area beneath the heater. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	211, 212		
530005	Areas of the Cabin Structure. Make sure you examine this area: (1.) Forward cabin bulkhead. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	211, 212		

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
530010	Fuselage External Skin. Make sure to examine these areas: (1.) Fuselage skin underneath antenna installation(s). NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	211, 212, 233, 234, 235, 236			
530006	Areas of the Cabin Structure. Make sure you examine these areas: (1.) Windshield frame, (2.) Window frames, (3.) Seat tracks, (4.) Seat attachment structure. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	221, 222			
530007	Areas of the Cabin Structure. Make sure you examine these areas: (1.) Side and cabin door's forward frame, (2.) Window frames with emphasis at stringers and channel assemblies from frame aft of crew's window to aft bulkhead, (3.) Seat tracks, (4.) Seat attachment structure, (5.) Aft Cabin Bulkhead. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	231, 232			
530009	Fuselage External Skin. Make sure to examine these areas: (1.) Fuselage skin underneath antenna installation(s). NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	231, 232, 311, 312			
530003	Fuselage Lower Internal Structure Beneath the Floor Panels. Make sure you examine this area: (1.) Cabin structure under floorboards. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	233, 234			
530004	Fuselage Lower Internal Structure Beneath the Floor Panels. Make sure you examine these areas: (1.) Carry-thru front spar webs and spar caps, (2.) Carry-thru rear spar webs and spar caps, (3.) Front and rear spar attach fittings, (4.) Cabin frame lower corners, (5.) Fuselage skin. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	235, 236			
551010	Fuselage to Horizontal Stabilizer Attachment. Make sure you examine these areas: (1.) Tailcone bulkhead at forward spar assembly attachment, (2.) Tailcone bulkhead at aft spar attachment. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	321, 322			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
553006	Fuselage to Vertical Stabilizer Attachment. Make sure to examine these areas: (1.) Tailcone bulkhead at vertical tail forward spar assembly attachment, (2.) Tailcone bulkhead at vertical tail rear spar assembly attachment. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	321, 322			
551011	Horizontal Stabilizer Structure. Make sure you examine these areas: (1.) Forward spar upper and lower caps at access panels, (2.) Rear spar upper and lower caps, (3.) Auxiliary spars at access panels, (4.) Forward spar web and attachment to the tailcone bulkhead, (5.) Aft spar attachment to the tailcone bulkhead. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	331, 332			
272018	Rudder structure. Make sure you examine these areas: (1.) Skin, (2.) Forward and aft spars at hinge locations. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	340			
553007	Vertical Stabilizer Structure. Make sure you examine these areas: (1.) Forward spar attachment to tailcone bulkhead, (2.) Aft spar attachment to tailcone bulkhead, (3.) Front and rear spar caps, (4.) Front spar web near tailcone attachment bolts, (5.) Stabilizer skin underneath antenna installation. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	340			
610012	Propeller Assembly. Make sure you examine these areas: (1.) Propeller blade and attachment, (2.) Propeller hub, (3.) Propeller assembly bearings and pins. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	410, 420			
570007	Wing Structure External. Make sure you examine these areas: (1.) Skin with emphasis at skin overlaps and under access panels, (2.) Leading edge skin under de-ice boot. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	510, 610			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
570008	Wing Structure Internal. Make sure you examine these areas: (1.) Wing front spar upper and lower spar caps, (2.) Upper and lower wing carry-thru main spar fittings, (3.) Upper and lower main spar wing root fittings. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	510, 610			
570009	Wing Structure External. Make sure you examine this area: (1.) Skins with emphasis at skin overlaps under access panels. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	512, 612.			
570011	Wing Structure External. Make sure you examine these areas: (1.) Wing skin with emphasis at skin overlaps and under access panels, (2.) Main landing gear wheel well close-out rib, (3.) Rear spar upper cap near rear spar splice, (4.) Structure in the path of exhaust gases, (5.) Rear spar web. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	520, 620			
570013	Wing Structure External, between W.S. 90 and W.S. 133 forward of the main spar. Make sure you examine these areas: (1.) Skin under wing de-ice boot, (2.) Skin with emphasis at skin overlaps and under access panels. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	530, 630			
570014	Wing Structure Internal, between W.S. 90 and W.S. 133 aft of the main spar. Make sure you examine these areas: (1.) Main upper and lower spar caps, (2.) Rear upper and lower spar caps with emphasis in exhaust path, (3.) Rear spar web. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	530, 630			
570015	Wing Structure External, between W.S. 90 and W.S. 133 aft of the main spar. Make sure you examine these areas: (1.) Skin with emphasis at skin overlaps and under access panels, (2.) Rear spar upper and lower caps, (3.) Rear spar web with emphasis in exhaust path, (4.) Structure in the path of exhaust gases. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	530, 630			

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
570016	Wing Structure External, between W.S. 133 and W.S. 200 forward of the main spar. Make sure you examine these areas: (1.) Skin under wing de-ice boot, (2.) Skin with emphasis at skin overlaps and under access panels. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	530, 630			
570017	Wing Structure External, between W.S. 133 and W.S. 200 aft of the main spar. Make sure you examine these areas: (1.) Skin with emphasis at skin overlaps and under access panels, (2.) Rear spar upper and lower caps, (3.) Rear spar web. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	530, 630			
570018	Wing Structure Internal, between W.S. 133 and W.S. 200. Make sure you examine these areas: (1.) Upper and lower main spar caps, (2.) Upper and lower rear spar caps. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	530, 630			
570019	Wing Structural Attachments. Make sure you examine these areas: (1.) Tip tank fittings at forward and aft spars. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	540, 640			
321015	Main Gear Axle Assembly. Make sure you examine these areas: (1.) Main gear axle and attach bolt, (2.) Wheel halves. NOTE: Disassemble the main wheel assemblies to get access. NOTE: Do not apply LPS-3 Heavy-Duty Rust Inhibitor to the bearings. NOTE: Corrosion Prevention and Control Program Inspection item (baseline interval, refer to Section 5-30-00 for additional inspection information).	721, 722			
	*** End of Operation 47 Inspection Items ***				

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INSPECTION OPERATION 48

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 48 consists of items to be inspected every 600 hours of operation.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH INSP	REMARKS
273017	Elevator - Check the elevator control system, control cables, and pulleys in accordance with the Flight Control Cable Inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	221, 222, 231, 232, 311, 312, 321, 322, 331, 332		
273016	Elevator Trim - Check the elevator trim control system, trim control cables, and pulleys in accordance with the Flight Control Cable Inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	221, 222, 231, 232, 311, 312, 321, 322, 332		
272019	Rudder Trim - Check the rudder trim control system, control cables, and pulleys in accordance with the Flight Control Cable Inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	221, 222, 231, 232, 311, 312, 321, 322, 340		
272020	Rudder - Check the rudder control system, control cables, and pulleys in accordance with the Flight Control Cable Inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	221, 222, 231, 232, 311, 312, 321, 322, 340		

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ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
271014	Aileron Trim - Check the aileron trim control system, wing and fuselage control cables and pulleys in accordance with the Flight Control Cable Inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	221, 222, 231, 232, 510, 520, 530			
271015	Ailerons - Check the aileron control system, wing and fuselage control cables and pulleys in accordance with the Flight Control Cable Inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	221, 222, 231, 232, 510, 520, 530, 610, 620, 630.			
275006	Flaps - Check flap travel, cable tension and travel time. Check the flap cable system, control cables, and pulleys, in accordance with the flight control inspection procedures in Chapter 27, Flight Controls, Inspection/Check.	231, 232, 510, 520, 530, 610, 620, 630.			
	*** End of Operation 48 Inspection Items ***				

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INSPECTION OPERATION 49

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 49 gives inspection items that are examined at the first 2,500 hours of operation or 10 years, inspection is to be repeated every 200 hours of operation or 2 years after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
571012	Wing Upper Center Skin Panel Inspection, refer to 5-14-44, Supplemental Inspection Number 57-10-28 for inspection procedures.	512, 612			
	*** End of Operation 49 Inspection Items ***				

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INSPECTION OPERATION 50

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 50 gives inspection items that are examined every 4,000 hours of operation.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
321016	Main Landing Gear Torque Tube Life Limit, refer to 5-14-45, Supplemental Inspection Number 32-10-06 for inspection procedures.	721, 722			
	*** End of Operation 50 Inspection Items ***				

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INSPECTION OPERATION 51

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 51 gives inspection item(s) that are examined at the first 11,000 hours of operation, inspection is to be repeated every 400 hours of operation after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
571006	Wing Lower Carry-Thru Main Spar Cap (P/N 0811300-3), refer to 5-14-38, Supplemental Inspection Number 57-10-08 for inspection procedures.	510, 610			

*** End of Operation 51 Inspection Items ***

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INSPECTION OPERATION 52

Date: _____

Registration Number: _____

Serial Number: _____

Total Time: _____

1. Description

A. Operation 52 gives inspection item(s) that are examined at the first 15,000 hours of operation, inspection is to be repeated every 800 hours of operation after the initial inspection has been accomplished.

B. Inspection items are given in the order of the zone in which the inspection is to be completed. A general description of the inspection required and the Item Code Number for cross-reference to section 5-10-01 is shown. Frequently, tasks give more information about each required inspection. These tasks are printed in the individual chapters of this manual.

C. The right portion of each page gives space for the mechanic's and inspector's initials and remarks. A copy of these pages can be used as a checklist when these inspections are completed.

2. General Inspection Criteria

A. While each of the specified inspection tasks in this section are done, more general inspections of the adjacent areas must be done while access is available. These general inspections are used to find apparent conditions which can need more maintenance.

B. If a component or system is changed after a required task has been completed, then that specified task must be done again to make sure it is correct before the system or component is returned to service.

C. Do a preflight inspection after these inspections are completed to make sure all the required items are correctly serviced. Refer to the Approved Airplane Flight Manual.

ITEM CODE NUMBER	TASK	ZONE	MECH	INSP	REMARKS
571013	Wing Lower Carry-Thru Main Spar Cap (P/N 0811300-78), refer to 5-14-46, Supplemental Inspection Number 57-10-29 for inspection procedures.	510, 610			

*** End of Operation 52 Inspection Items ***

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SUPPLEMENTAL INSPECTION DOCUMENT

1. Supplemental Inspection Document

A. Introduction

(1) The Supplemental Structural Inspection Program for the Cessna Model 310 airplane is based on affected Model 300/400 airplane current usage and state-of-the-art analysis, testing, and inspection methods. Analysis methods include durability, fatigue, and damage tolerance assessments. A practical state-of-the-art inspection program is established for each Principle Structural Element (PSE), where:

A PSE is that structure whose failure, if it remained undetected, could lead to the loss of the airplane. Selection of a PSE is influenced by the susceptibility of a structural area, part, or element to fatigue, corrosion, stress corrosion, or accidental damage.

(2) The Supplemental Structural Inspection Program was developed through the combined efforts of Cessna Aircraft Company, operators of affected 300/400 model series airplanes, and the FAA. The inspection program consists of the current structural maintenance inspection, plus supplemental inspections, as required, for continued airworthiness of the airplane as years of service are accumulated. The current inspection program is considered to be adequate in detecting corrosion and accidental damage. The emphasis of the Supplemental Structural Inspection Program is to detect fatigue damage whose probability increases with time.

(3) **The Supplemental Structural Inspection Program is valid for Model 310 airplanes with less than 40,000 flight hours. Beyond this, continued airworthiness of the airplane can no longer be assured. Retirement of the airframe is recommended when 40,000 flight hours have been accumulated.**

B. History

(1) The first Cessna Model 310 was produced in 1955. The basic version of the Model 310 was produced through 1981 as the Model 310, 310B, 310C, 310D, 310F, 310G, 310H, 310I, 310J, 310K, 310L, 310N, 310P, 310Q, and 310R. Turbocharged versions of the airplanes (T310P, T310Q, and T310R) were built between 1969 and 1981.

C. Function

(1) The function of the Supplemental Structural Inspection Program is to find damage from fatigue, overload or corrosion through the use of the Nondestructive Inspections (NDI), and visual inspections. This Supplemental Inspection Document (SID) is only for primary and secondary airframe components. Engine, electrical items and primary and secondary systems are not included in this document.

(a) A list is included to show the requirements for the SID program for primary and secondary airframe components.

1 The airplane has been maintained in accordance with Cessna's recommendations or the equivalent.

2 If the SID is for a specific part or component, you must examine and evaluate the surrounding area of the parts and equipment. If problems are found outside these areas, report them to Cessna Aircraft Company on a reporting form. Changes can then be made to SID program, if necessary.

3 The inspections presented in the SID apply to all Model 310R airplanes. The inspection intervals presented are for unmodified airplanes, and represent the maximum allowable inspection times. Airplanes that have been modified to alter the airplane's design, gross weight or performance may need to be inspected more frequently. Examples of common STCs, which will require modified inspection intervals, include non-Cessna wing spar straps, vortex generators and non-standard engines. The owner and/or maintenance organization should contact the STC holder(s) or modification originator for obtaining new FAA-approved inspection criteria.

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2. Principal Structural Elements

A. Principal Structural Elements Description
(1) An airplane component is classified as a Principal Structural Element (PSE) if:
(a) The component contributes significantly to carrying flight and ground loads.
(b) If the component fails, it can result in a catastrophic failure of the airframe.
(2) The monitoring of these PSE's is the main focus of this Supplemental Structural Inspection Program.
(3) Typical examples of PSE's, taken from FAA Advisory Circular 25.571, are shown in Table 1.

Table 1. Typical Examples of Principal Structural Elements

Wing and Empennage:
Control surfaces, flaps, and their mechanical systems and attachments (hinges, tracks and fittings)
Primary fittings
Principal splices
Skin or reinforcement around cutouts or discontinuities
Skin-stringer combinations
Spar caps
Spar webs
Fuselage:
Circumferential frames and adjacent skin
Doorframes
Pilot window posts
Bulkheads
Skin and single frame or stiffener element around a cutout
Skin and/or skin splices under circumferential loads
Skin or skin splices under fore and aft loads
Skin around a cutout
Skin and stiffener combinations under fore-and-aft loads
Door skins, frames, and latches
Window frames
Landing Gear and Attachments
Engine Support Structure and Mounts

B. Selection Criteria
(1) The factors used to find the PSE's in this document include:
(a) Service Experience
1 Two sources of information were used to find the service discrepancies.
a Cessna Service Bulletins and Service Information Letters issued to repair common service discrepancies were examined.
b FAA Service Difficulty Records were examined.
2 The data collected was also used to find a component's susceptibility to corrosion or accidental damage as well as its inspectability.

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(b) Fatigue and Damage Tolerance Analysis
1 Fatigue and damage tolerance analysis were conducted for the critical areas of the PSE's. Details of these analysis are presented in Durability - Fatigue and Damage Tolerance.

(c) Stress Analysis
1 Stress analysis for the Model 310R used mathematical models developed for similar Model 300/400 series airframe components. Models were developed for the wing and carry-thru, flap, aileron, engine beam, fuselage, horizontal stabilizer, elevator, vertical stabilizer, rudder and nose and main landing gears. These models were reviewed to identify components that exhibit the potential for additional inspection requirements.

(d) Testing
1 New static tests for similar Model 300/400 series airframe components were conducted to verify the mathematical models which were developed. Test results from previously conducted static tests and fatigue cyclic tests were also reviewed to identify the critical areas of the PSE's. These test results were considered applicable to the Model 310R.

(e) Inspection of Airplane
1 A high-time Model 300/400 series airplane was purchased from a customer for disassembly and inspection in 1988. The airplane had over 20,000 flight hours and 60,000 landings. Locations where cracking was discovered during disassembly are included as inspection locations.

3. Durability - Fatigue and Damage Tolerance

A. Airplane Usage
(1) Airplane usage data for the SID program are based on the evaluation of the in-service utilization of the airplane and published data. This information was used to develop the representative fatigue loads spectra.
(2) Usage for spectra determination is defined in terms of a single flight representing typical average in-service utilization of the airplane. This usage reflects the typical in-service flight variation of flight length, takeoff gross weight, payload and fuel.
(3) The flight is defined in detail in terms of a flight profile. The profile identifies the gross weight, payload, fuel, altitude, speed, distance, etc., required to define the pertinent flight and ground parameters needed to develop the fatigue loads. The flight is then divided into operational segments, where each segment represents the average values of the parameters (speed, payload, fuel, etc.) that are used to calculate the loads spectrum.

B. Stress Spectrum
(1) A fatigue loads spectrum, in terms of gross area stress, was developed for each PSE to be analyzed based on the usage-flight profile. The spectrum represents the following loading environments: flight loads (gust and maneuver), landing impact, balancing tail loads, thrust loads, ground loads (taxi, turning, landing, braking, pivoting, etc.), and ground-air-ground cycles. The resulting spectrum is a representative flight-by-flight, cycle-by-cycle random loading sequence that reflects the appropriate and significant airplane response characteristics.

C. Description of the Flight Profiles
(1) A typical usage profile consisting of a single representative flight was created. An average flight length of 39 minutes was used, based on FAA recommendations in FAA publication AFS-120-73-2. A cruising altitude of 7000 feet was chosen based on interviews with Model 300/400 series operators. This single typical usage profile was used in the analysis for the Model 310R.

D. Damage Tolerance and Fatigue Assessments
(1) The damage tolerance and fatigue assessments provide the basis for establishing inspection frequency requirements for each PSE. The evaluation includes a determination of the probable location and modes of damage and is based on analytical results, available test data and service experience. The evaluation includes classical fatigue analyses, the determination of the crack growth time history and residual strength. Linear elastic fracture mechanics are used to perform the damage tolerance analysis, while fatigue analyses were based on the 'Palmgren-Miner' linear cumulative damage theory.

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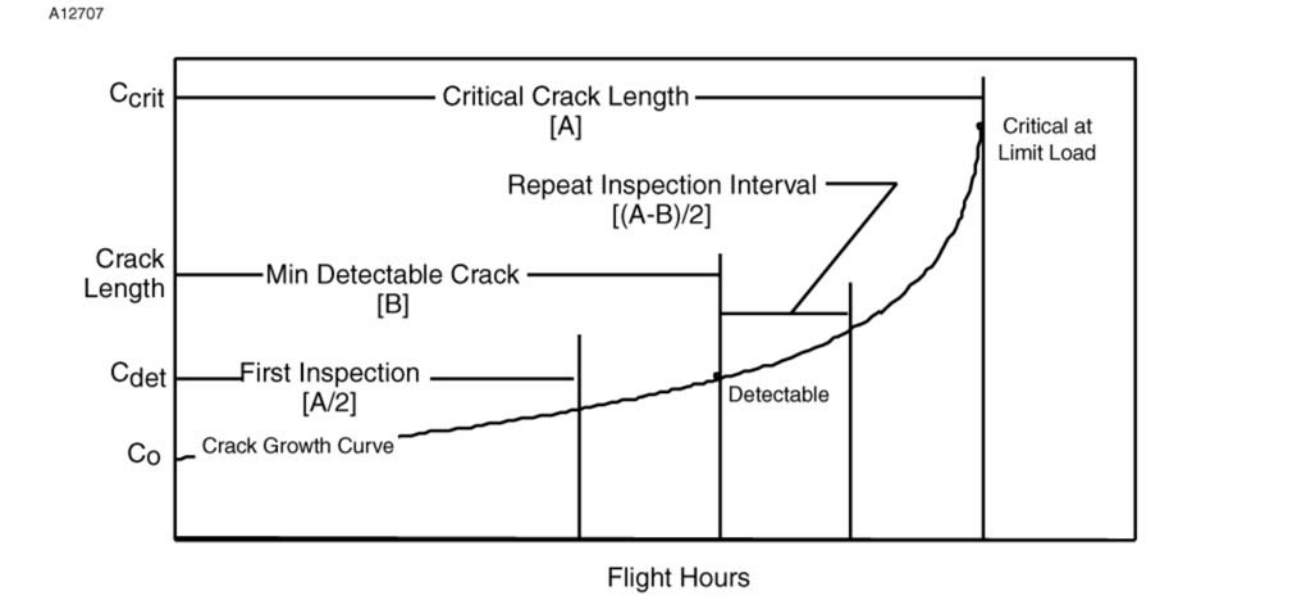
(2) In the analysis, particular attention is given to potential structural condition areas associated with aging airplanes. Examples include:
   (a) Large areas of structure working at the same stress level, which could develop widespread fatigue damage.
   (b) A number of small (less-than-detectable-sized) adjacent cracks suddenly joining into a long crack (for example, as in a line of rivet holes).
   (c) Redistribution of load from adjacent failing or failed parts causing accelerated damage of nearby parts (for example, the "domino" effect).
   (d) Concurrent failure of multiple load path structure (for example, crack arrest structure).

(3) Initial inspections of a particular area of structure are based on both crack growth and fatigue analytical results. For locations with long fatigue lives, the maximum initial inspection was limited to 15,000 flight hours. Structure with initial inspections based on fatigue life included the Model 310 wing and landing gear.

(4) Initial inspections for the Model 310R empennage and fuselage were based on crack growth. The crack growth for each PSE is calculated from the initial crack size c_o to crack length at instability/failure, c_{crit}, due to limit load. The crack growth history is represented in terms of crack length versus time in flight hours. Refer to Figure 1.



Typical Crack Growth Curve
Figure 1

4. Reporting - Communications

A. Discrepancies

(1) For the SID to continue to stay applicable, it is necessary to have a free flow of information between the operator, the FAA and Cessna Aircraft Company. The important information about the inspection results, repairs and modifications done must be supplied to Cessna Aircraft Company in order to assess the effectiveness of the recommended inspection procedures and inspection intervals to be calculated.

(2) Also, the operator's inspections and reports can find items not included in the SID before. These items will be examined by Cessna Aircraft Company and will be added to the SID for all of the operators, if applicable.

(3) Cessna Customer Service has a system to collect the reports. The applicable forms are included in this document. Copies of these forms are also available from a Cessna Service Station or Cessna Field Service Engineer.

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B. Discrepancy Reporting
(1) Discrepancy reporting is essential to provide for adjusting the inspection thresholds and the repeat times as well as adding or deleting PSE's. It may be possible to improve the inspection methods, repairs, and modifications involving the PSE's based on the data reported.
(2) All cracks, multiple cut off fasteners, and corrosion found during the inspection must be reported to Cessna Aircraft Company within ten days. The PSE inspection results are to be reported on a form as shown on the pages that follow.

C. Send the Discrepancy Form
(1) Send all available data, which includes forms, repairs, photographs, sketches, etc., to:

Cessna Aircraft Company
Attn: SID Program
Customer Service
Wichita, KS 67277
USA
Fax: 316-517-7271

NOTE: This system does not replace the normal channels to send information for items not included in the SID.

D. Cessna Aircraft Company Follow-Up Action
(1) All SID reports will be examined to find if any of the steps are necessary:
(a) Complete a check of the effect on the structural or operational condition.
(b) Complete a check of other high-time airplanes to find if a service bulletin shall be issued.
(c) Find if a reinforcement is required.
(d) Change the SID if required.

5. Inspection Methods

A very important part of the SID program is selecting and evaluating state-of-the-art nondestructive inspection (NDI) methods applicable to each PSE, and determining a minimum detectable crack length, c_{det}, for each NDI method. The minimum detectable crack length is used in conjunction with the critical crack length, c_{crit}, to define the life interval for the crack to grow from c_{det} to c_{crit} as: (Life @ c_{crit} - Life @ c_{det})/2. This interval is used to define the repeat inspection frequency for the SID program's required inspections. The initial inspection occurs at Life @ c_{crit}/2. For a given NDI method and PSE, c_{det} corresponds to a crack size with a 90% probability of detection. An example of initial and repeat inspection interval determination is shown in Figure 1. For fail-safe structure, the initial inspection requirements were based on fatigue analyses.
Potential NDI methods were selected and evaluated on the basis of crack orientation, location, c_{crit}, part thickness and accessibility. Inspection reliability depends on size of the inspection task, human factors (such as qualifications of the inspector), equipment reliability and physical access. Visual, radiographic, liquid penetrant, eddy current and magnetic particle methods are used.

6. Related Documents

A. Existing Inspections, Modifications, and Repair Documents
(1) Cessna has a number of documents that are useful to maintaining continued airworthiness of airplanes.
(a) Cessna 310R Series Maintenance Manual
(b) Cessna 310R Illustrated Parts Catalog
(c) Cessna Multi-Engine Service Information Letters and Service Bulletin Summaries
(d) Cessna Service Newsletter and Newsletter Summaries

B. Service Information Letters/Service Bulletins
(1) In addition to this maintenance manual, the following service information will be required to complete the SID inspections (5-14-XX and 5-15-XX document sections).

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Number	Title	Date	Reference SID Number
ME75-23S1	Main Landing Gear Fork Bolts (AD76-13-07)	08-02-76	32-10-03
ME76-2	Wing Rib Improvement - Main Landing Gear Side Brace	01-05-79	57-10-03
MEB88-5R2	Nose Gear Trunnion Inspection/ Replacement	10-02-00	32-30-07 & 32-30-08
MEB99-6	Engine Exhaust Access Panels Installation	08-02-99	54-10-01
MEB99-7	Engine Beam Inspection and Modification	08-02-99	54-10-01
MEB99-8	Crossfeed Fuel Lines Replacement	08-02-99	54-10-01

(2) The following Service Bulletins and Service Kits are assumed to have been accomplished, as applicable, prior to performing the SID inspections (5-14-XX and 5-15-XX document sections).

Number	Description
ME77-6	Lower Wing Skin/Front Spar Rivets (Effectivity: 310R0001 thru 310R0836)
ME77-12	Nose Wheel Well Modification (Effectivity: 310R0001 thru 310R0816)
ME80-11	Main Gear Aft Trunnion Support (Effectivity: 310R1614 thru 310R1690; 310R1801 Thru 310R1870)
ME84-38	Main Gear Thru Bolt Improvement (Effectivity: 310R0501 thru 310R2101)
MEB85-10	Main Gear Wheel Thru Bolt Improvement (Effectivity: 310R0501 thru 310R2101)
MEB88-7	Main Landing Gear Inner Bearing Inspection/Replacement (Effectivity: 310R0001 thru 310R1690)

C. For information regarding these documents, contact:

Cessna Aircraft Company
Customer Service
P.O. Box 7706
Wichita, KS 67277
USA
Fax: 316-517-7172

7. Applicability/Limitations

A. This SID is applicable to the Cessna Models 310R0001 thru 310R2140. This range of airplane includes both turbo T310R and non-turbo 310R airplanes.

B. STC Modifications
(1) The Cessna 310R airplanes can have modifications that were done by STCs by other organizations without Cessna Engineering approval. The inspection intervals given in this SID are for unchanged airplanes, and are the maximum approved inspection times.

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(2) Airplanes that have been modified to alter the airplane design, gross weight or airplane performance may need to be inspected more frequently. Examples of common STC's not covered by this SID document include non-Cessna wing spar straps, vortex generators and non-standard engines. The owner and/or maintenance organization should contact the STC holder(s) or modification originator for obtaining new FAA approved inspection criteria.

C. The SID inspection times are based on total airframe hours/landings or calendar time in service. If a specific airframe component has been replaced, the component is to be inspected, based on total component hours/landings or calendar time requirements. However, any attachment structure that was not replaced when the component was replaced must be inspected, based on the total airframe hours/landings or calendar time requirements.

8. PSE Details

A. Details

(1) This section contains the important instructions selected by the rationale process described in Section 2, Principal Structural Elements. These items are considered important for continued airworthiness of the Cessna 310R airplanes. Service Information Letters and Service Bulletins pertaining to the PSE's are listed in 5-14-00, Listing of Supplemental Inspections.

(2) A summary of the PSE's is presented in the 5-14-00, Listing of Supplemental Inspections. This can be used as a checklist by the operators. A summary of the inspections by flight hours is also given.

B. **PSE Data Sheets**

(1) A data sheet for each PSE is provided in each 5-14-XX Supplemental Inspection Document. Each data sheet contains the following:

(a) Supplemental Inspection Number
(b) Title
(c) Effectivity
(d) Inspection Compliance
(e) Initial Inspection Interval(s)
(f) Repeat Inspection Interval(s)
(g) Purpose
(h) Inspection Instructions
(i) Access/Location
(j) Detectable Crack Size
(k) Inspection Procedure
(l) Repair/Modification
(m) Comments

NOTE: The entry N/A under item (j) (Detectable Crack Size) means that no cracks are allowed in the PSE. Where both hour and calendar times are listed in items (e) and (f), inspection shall occur at whichever time comes first.

NOTE: Inspection intervals are given in both hour and calendar times. After the completion of each initial SID inspection, repeat inspections may be completed based on hour time if the Corrosion Prevention and Control Program (CPCP) in document 5-30-00, Corrosion Prevention and Control Program, is included in the airplane maintenance program.

NOTE: Accomplishment of SID inspections does not in any way replace preflight inspections, good maintenance practices, or maintenance and inspections specified in the appropriate Service/Maintenance Manual.

C. Repairs, Alterations and Modifications (RAM)

(1) Repairs, alterations and modifications (RAM) made to PSE's may affect the inspection times and methods presented in the SID. The flowchart in Figure 2. can be used to determine if a new damage tolerance assessment and FAA-approved supplemental inspection criteria are required.

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(2) Repairs not covered by the recommendations in this SID document may be coordinated with Cessna Customer Service at telephone 319-517-5800/FAX 316-517-7172. Since January 2003, repairs provided by Cessna Aircraft meet the damage tolerant assessment requirements.

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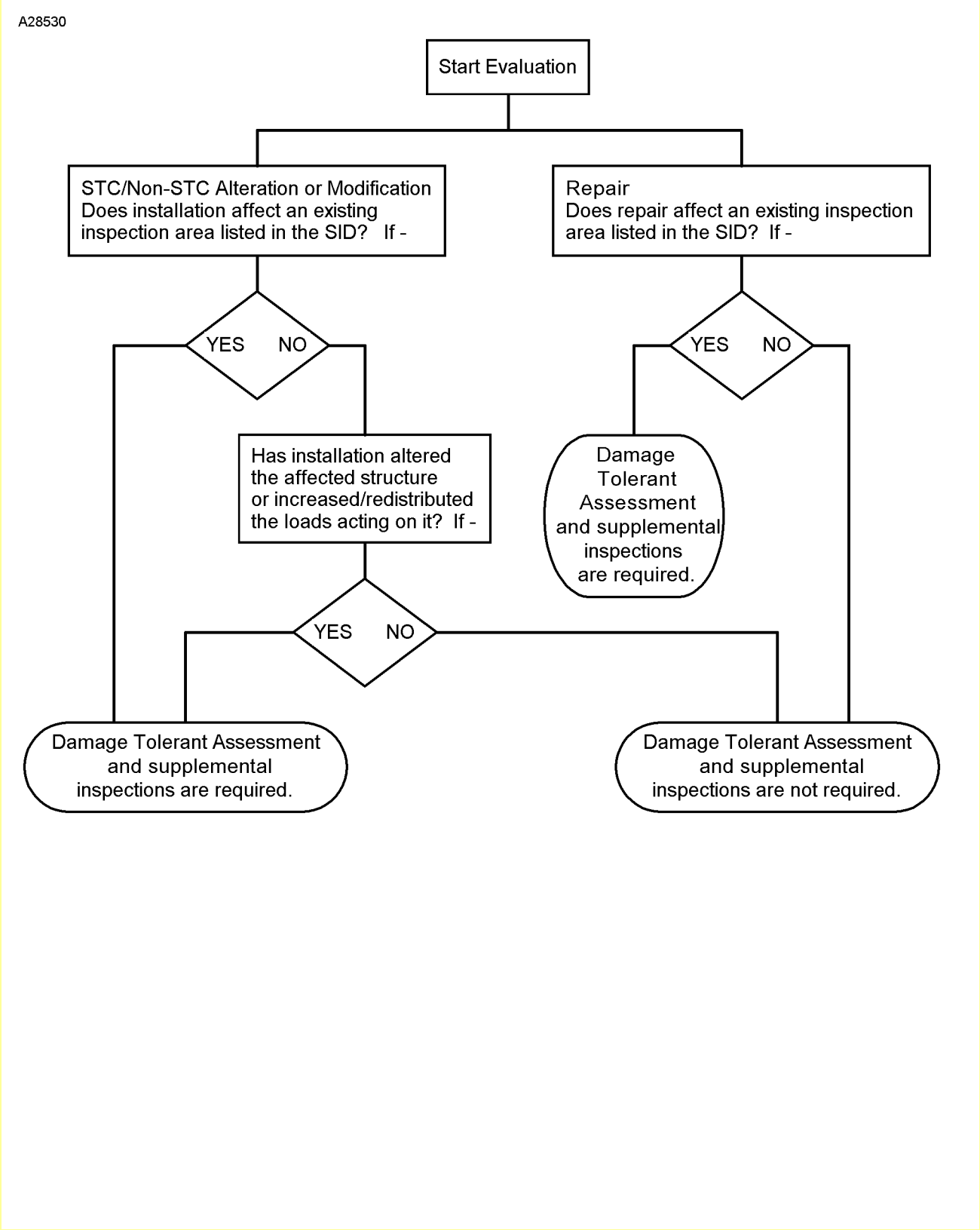

Damage Tolerance Assessment Flowchart
Figure 2 (Sheet 1)

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DISCREPANCY REPORT

SID NO: _____ AIRPLANE LOCATION: _____ S/N OF AIRPLANE: _____

INSPECTION CONDUCTED: Date _____ Airplane Total Hours _____ Cycles _____

Component Total Hours _____ Cycles _____

OWNER NAME _____ OWNER PHONE NUMBER _____

OWNER ADDRESS _____

SERVICE HISTORY:

_____

_____

_____

INSPECTION METHOD/LIMITS:

_____

_____

_____

ACCESS REQUIRED:

_____

_____

_____

REPAIR DESCRIPTION:

_____

_____

_____

COMMENTS:

_____

_____

_____

Enclose all available data including photos, sketches, etc., to:

Cessna Aircraft Company
Attn: SID Program
Customer Service
Dept. 751
P.O. Box 7706
Wichita, Kansas USA 67277
FAX 316-517-7271

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SUPPLEMENTAL INSPECTION DOCUMENT

1. Supplemental Inspection Document

A. Introduction

(1) The Supplemental Structural Inspection Program for the Cessna Model 310 airplane is based on Model 300/400 current airplane usage and state-of-the-art analysis, testing and inspection methods. Analysis methods include durability, fatigue and damage tolerance assessments. A practical state-of-the-art inspection program is established for each Principle Structural Element (PSE).

(a) A PSE is that structure whose failure, if it remained undetected, could lead to the loss of the aircraft. Selection of a PSE is influenced by the susceptibility of a structural area, part or element to fatigue, corrosion, stress corrosion, or accidental damage.

(2) The inspection program consists of the current structural maintenance inspection, plus supplemental inspections, as required, for continued airworthiness of the airplane as years of service are accumulated. The current inspection program is considered to be adequate in detecting corrosion and accidental damage. The emphasis of the Supplemental Structural Inspection Program is to detect fatigue damage whose probability increases with time.

(3) The Supplemental Structural Inspection Program was developed through the combined efforts of Cessna Aircraft Company, Model 300/400 series operators, and the FAA. This program is applicable for Model 310 airplanes with less than 40,000 flight hours. Contact Cessna Aircraft Company, Propeller Aircraft Product Support for additional inspection information regarding airplanes exceeding 40,000 flight hours.

B. History

(1) The first Cessna Model 310 was produced in 1955. The basic version of the Model 310 was produced through 1981 as the Model 310, 310B, 310C, 310D, 310F, 310G, 310H, 310I, 310J, 310K, 310L, 310N, 310P, 310Q, and 310R. Turbocharged versions of the airplanes (T310P, T310Q, and T310R) were built between 1969 and 1981.

C. Function

(1) The function of the Supplemental Structural Inspection Program is to find damage from fatigue, overload or corrosion through the use of the Nondestructive Inspections (NDI), and visual inspections. This Supplemental Inspection Document (SID) is only for primary and secondary airframe components. Engine, electrical items and primary and secondary systems are not included in this document.

(a) A list is included to show the requirements for the SID program for primary and secondary airframe components.

1 The airplane has been maintained in accordance with Cessna's recommendations or the equivalent.

2 If the SID is for a specific part or component, you must examine and evaluate the surrounding area of the parts and equipment. If problems are found outside these areas, report them to Cessna Aircraft Company on a reporting form. Changes can then be made to SID program, if necessary.

3 The inspections presented in the SID apply to all Model 310R airplanes. The inspection intervals presented are for unmodified airplanes, and represent the maximum allowable inspection times. Airplanes that have been modified to alter the airplane's design, gross weight or performance may need to be inspected more frequently. Examples of common STCs, which will require modified inspection intervals, include non-Cessna wing spar straps, vortex generators and non-standard engines. The owner and/or maintenance organization should contact the STC holder(s) or modification originator for obtaining new FAA-approved inspection criteria.

2. Principal Structural Elements

A. Principal Structural Elements Description

(1) An airplane component is classified as a Principal Structural Element (PSE) if:

(a) The component contributes significantly to carrying flight and ground loads.

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(b) If the component fails, it can result in a catastrophic failure of the airframe.

(2) The monitoring of these PSEs is the main focus of this Supplemental Structural Inspection Program.

(3) Typical examples of PSEs, taken from FAA Advisory Circular 25.571, are shown in Table 1.

Table 1. Typical Examples of Principal Structural Elements

Wing and Empennage:
Control surfaces, flaps, and their mechanical systems and attachments (hinges, tracks and fittings)
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Skin and single frame or stiffener element around a cutout
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Door skins, frames, and latches
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Landing Gear and Attachments
Engine Support Structure and Mounts

B. Selection Criteria

(1) The factors used to find the PSEs in this document include:

(a) Service Experience

1 Two sources of information were used to find the service discrepancies.

a Cessna Service Bulletins and Service Information Letters issued to repair common service discrepancies were examined.

b FAA Service Difficulty Records were examined.

2 The data collected was also used to find a component's susceptibility to corrosion or accidental damage as well as its inspectability.

(b) Fatigue and Damage Tolerance Analysis

1 Fatigue and damage tolerance analyses were conducted for the critical areas of the PSE's. Details of these analyses are presented in Durability - Fatigue And Damage Tolerance.

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(c) Stress Analysis
1 Stress analysis for the Model 310R used mathematical models developed for similar Model 300/400 series airframe components. Models were developed for the wing and carry-thru, flap, aileron, engine beam, fuselage, horizontal stabilizer, elevator, vertical stabilizer, rudder and nose and main landing gears. These models were reviewed to identify components that exhibit the potential for additional inspection requirements.

(d) Fatigue And Damage Tolerance Analysis.
1 Fatigue and damage tolerance analyses were conducted for the critical areas of the PSE's.

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1 New static tests for similar Model 300/400 series airframe components were conducted to verify the mathematical models which were developed. Test results from previously conducted static tests and fatigue cyclic tests were also reviewed to identify the critical areas of the PSE's. These test results were considered applicable to the Model 310R.

(f) Inspection of Airplane
1 A high-time Model 300/400 series airplane was purchased from a customer for disassembly and inspection in 1988. The airplane had over 20,000 flight hours and 60,000 landings. Locations where cracking was discovered during disassembly are included as inspection locations.

3. Durability - Fatigue and Damage Tolerance

A. Airplane Usage
(1) Airplane usage data for the SID program are based on the evaluation of the in-service utilization of the airplane and published data. This information was used to develop the representative fatigue loads spectra.
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(1) A typical usage profile consisting of a single representative flight was created. An average flight length of 39 minutes was used based on FAA recommendations in FAA publication AFS-120-73-2. A cruising altitude of 7000 feet was chosen based on interviews with Model 300/400 series operators. This single typical usage profile was used in the analysis for the Model 310R.

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(1) The damage tolerance and fatigue assessments provide the basis for establishing inspection frequency requirements for each PSE. The evaluation includes a determination of the probable location and modes of damage and is based on analytical results, available test data and service experience. The evaluation includes classical fatigue analyses, the determination of the crack growth time history and residual strength. Linear elastic fracture mechanics are used to perform the damage tolerance analysis, while fatigue analyses were based on the 'Palmgren-Miner' linear cumulative damage theory.

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(2) In the analysis, particular attention is given to potential structural condition areas associated with aging airplanes. Examples include:
   (a) Large areas of structure working at the same stress level, which could develop widespread fatigue damage.
   (b) A number of small (less-than-detectable sized) adjacent cracks suddenly joining into a long crack (for example, as in a line of rivet holes).
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(3) Initial inspections of a particular area of structure are based on both crack growth and fatigue analytical results. For locations with long fatigue lives, the maximum initial inspection was limited to 15,000 flight hours. Structure with initial inspections based on fatigue life included the Model 310 wing and landing gear.

(4) Initial inspections for the Model 310R empennage and fuselage were based on crack growth. The crack growth for each PSE is calculated from the initial crack size c_o to crack length at instability/failure, c_{crit}, due to limit load. The crack growth history is represented in terms of crack length versus time in flight hours. Refer to Figure 1.

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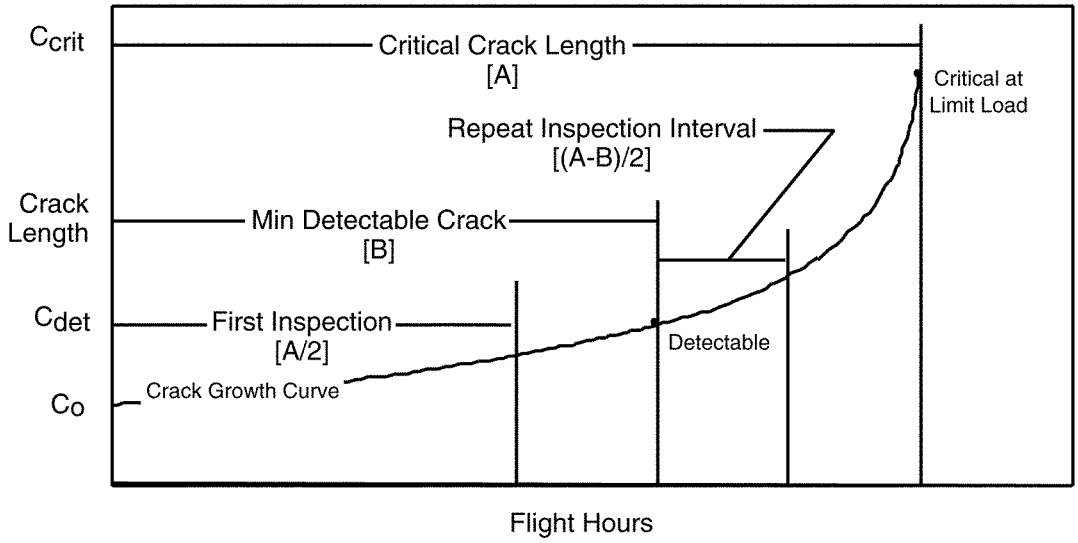

Typical Crack Growth Curve
Figure 1

4. Reporting - Communications

A. Discrepancies

(1) For the SID to continue to stay applicable, it is necessary to have a free flow of information between the operator, the FAA and Cessna Aircraft Company. The important information about the inspection results, repairs and modifications done must be supplied to Cessna Aircraft Company in order to assess the effectiveness of the recommended inspection procedures and inspection intervals to be calculated.

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(1) Discrepancy reporting is essential to provide for adjusting the inspection thresholds and the repeat times as well as adding or deleting PSE's. It may be possible to improve the inspection methods, repairs, and modifications involving the PSE's based on the data reported.
(2) All cracks, multiple cut off fasteners, and corrosion found during the inspection must be reported to Cessna Aircraft Company within ten days. The PSE inspection results are to be reported on a form as shown on the pages that follow.

C. Send the Discrepancy Form
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Cessna Aircraft Company
Attn: SID Program
Technical Support Services
Dept. 751
Wichita, KS 67277
USA
Fax: 316-942-9006

NOTE: This system does not replace the normal channels to send information for items not included in the SID.

D. Cessna Aircraft Company Follow-Up Action
(1) All SID reports will be examined to find if any of the steps are necessary:
(a) Complete a check of the effect on the structural or operational condition.
(b) Complete a check of other high-time airplanes to find if a service bulletin shall be issued.
(c) Find if a reinforcement is required.
(d) Change the SID if required.

5. Inspection Methods

A very important part of the SID program is selecting and evaluating state-of-the-art nondestructive inspection (NDI) methods applicable to each PSE, and determining a minimum detectable crack length, c_{det}, for each NDI method. The minimum detectable crack length is used in conjunction with the critical crack length, c_{crit}, to define the life interval for the crack to grow from c_{det} to c_{crit} as: (Life @ c_{crit} - Life @ c_{det})/2. This interval is used to define the repeat inspection frequency for the SID program's required inspections. The initial inspection occurs at Life @ $c_{crit}/2$. For a given NDI method and PSE, c_{det} corresponds to a crack size with a 90% probability of detection. An example of initial and repeat inspection interval determination is shown in Figure 1. For fail-safe structure, the initial inspection requirements were based on fatigue analyses.
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6. Related Documents

A. Existing Inspections, Modifications, and Repair Documents
(1) Cessna has a number of documents that are useful to maintaining continued airworthiness of airplanes.
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(b) Cessna 300 Series Parts Catalogs
(c) Cessna Multi-Engine Service Information Letters and Service Bulletin Summaries
(d) Cessna Service Newsletter and Newsletter Summaries

B. Service Information Letters/Service Bulletins
(1) In addition to this maintenance manual, the following service information will be required to complete the SID inspections (5-14-XX and 5-15-XX document sections).

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Number	Title	Date	Reference SID Number
ME75-23S1	Main Landing Gear Fork Bolts (AD76-13-07)	08-02-76	32-10-03
ME76-2	Wing Rib Improvement - Main Landing Gear Side Brace	01-05-79	57-10-03
MEB88-5R2	Nose Gear Trunnion Inspection/ Replacement	10-02-00	32-30-07 & 32-30-08
MEB99-6	Engine Exhaust Access Panels Installation	08-02-99	54-10-01
MEB99-7	Engine Beam Inspection and Modification	08-02-99	54-10-01
MEB99-8	Crossfeed Fuel Lines Replacement	08-02-99	54-10-01

(2) The following Service Bulletins and Service Kits are assumed to have been accomplished, as applicable, prior to performing the SID inspections (5-14-XX and 5-15-XX document sections).

Number	Description
ME77-6	Lower Wing Skin/Front Spar Rivets (Effectivity: 310R0001 Thru 310R0836)
ME77-12	Nose Wheel Well Modification (Effectivity: 310R0001 Thru 310R0816)
ME80-11	Main Gear Aft Trunnion Support (Effectivity: 310R1614 Thru 310R1690; 310R1801 Thru 310R1870)
ME84-38	Main Gear Thru Bolt Improvement (Effectivity: 310R0501 Thru 310R2101)
MEB85-10	Main Gear Wheel Thru Bolt Improvement (Effectivity: 310R0501 Thru 310R2101)
MEB88-7	Main Landing Gear Inner Bearing Inspection/Replacement (Effectivity: 310R0001 Thru 310R1690)

C. For information regarding these documents, contact:

Cessna Aircraft Company
Technical Support Services
Dept. 751
Wichita, KS 67277
USA
Fax: 316-942-9006

7. Applicability/Limitations

A. This SID is applicable to the Cessna Models 310R0001 through 310R2140. This range of airplane includes both turbo T310R and non-turbo 310R airplanes.

B. STC Modifications
(1) The Cessna 310R airplanes can have modifications that were done by STCs by other organizations without Cessna Engineering approval. The inspection intervals given in this SID are for unchanged airplanes, and are the maximum approved inspection times.

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(2) Airplanes that have been modified to alter the airplane design, gross weight or airplane performance may need to be inspected more frequently. Examples of common STC's not covered by this SID document include non-Cessna wing spar straps, vortex generators and non-standard engines. The owner and/or maintenance organization should contact the STC holder(s) or modification originator for obtaining new FAA approved inspection criteria.

C. The SID inspection times are based on total airframe hours/landings or calendar time in service. If a specific airframe component has been replaced, the component is to be inspected, based on total component hours/landings or calendar time requirements. However, any attachment structure that was not replaced when the component was replaced must be inspected, based on the total airframe hours/landings or calendar time requirements.

8. PSE Details

A. Details

(1) This section contains the important instructions selected by the rationale process described in Section 2, Principal Structural Elements. These items are considered important for continued airworthiness of the Cessna 310R airplanes. Service Information Letters and Service Bulletins about the PSEs are available from Cessna Aircraft Company.

(2) A summary of the PSEs is presented in the 5-14-00, Listing Of Supplemental Inspections. This can be used as a checklist by the operators. A summary of the inspections by flight hours is also given.

B. Repairs, Alterations and Modifications (RAM)

(1) Repairs, alterations and modifications (RAM) made to PSEs may affect the inspection times and methods presented in the SID. The flowchart in Figure 2 can be used to determine if a new damage tolerance assessment and FAA approved supplemental inspection criteria are required.

(2) Repairs not covered by the recommendations in this SID document may be coordinated with Cessna Propeller Aircraft Product Support at telephone 319-517-5800/FAX 316-942-9006. Since January 2003, repairs provided by Cessna Aircraft meet the damage tolerant assessment requirements.

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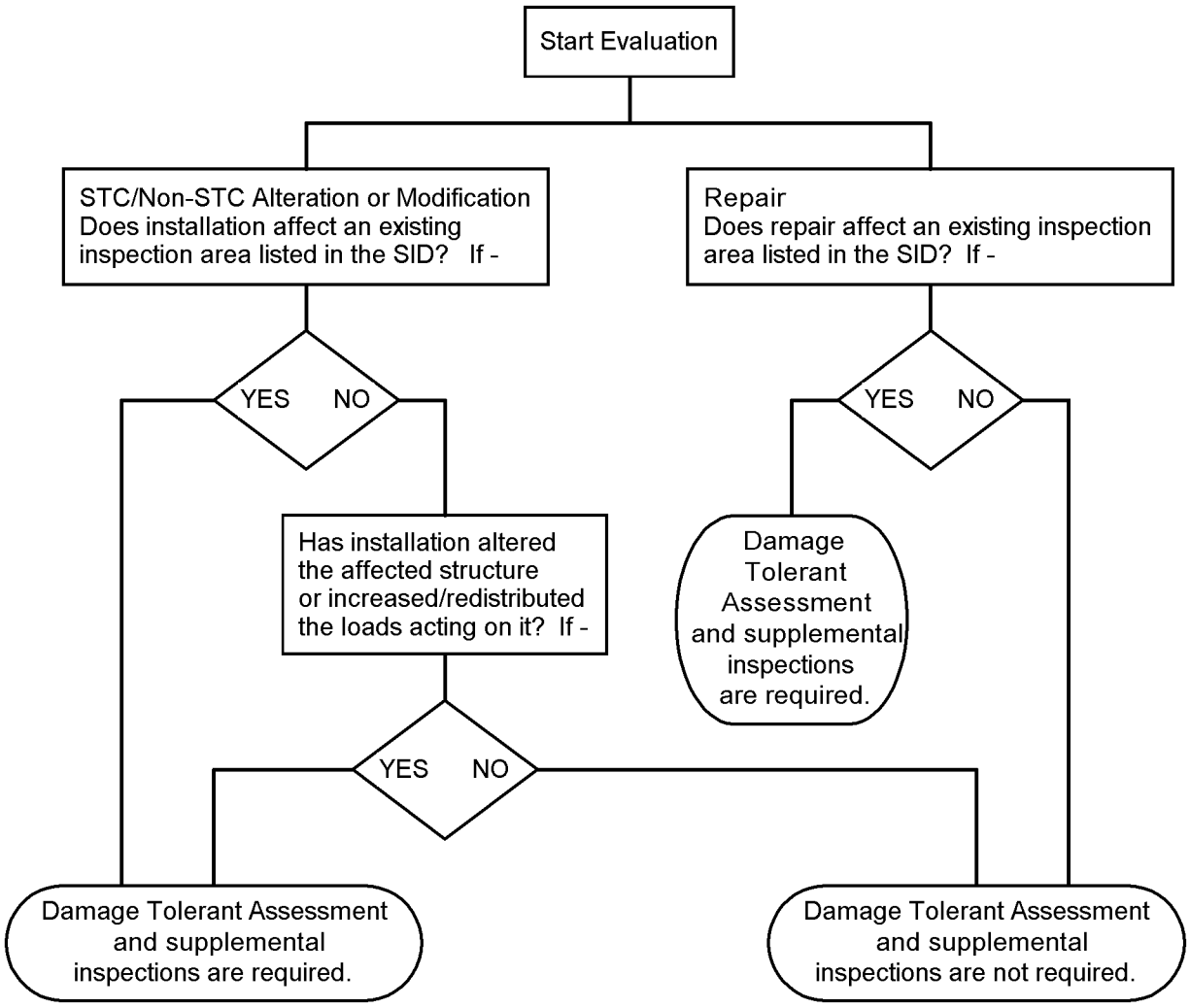

Damage Tolerance Assessment Flowchart
Figure 2 (Sheet 1)

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DISCREPANCY REPORT

SID NO: _____ AIRPLANE LOCATION: _____ S/N OF AIRPLANE: _____

INSPECTION CONDUCTED: Date _____ Airplane Total Hours _____ Cycles _____

Component Total Hours _____ Cycles _____

OWNER NAME _____ OWNER PHONE NUMBER _____

OWNER ADDRESS _____

SERVICE HISTORY:

_____

_____

_____

INSPECTION METHOD/LIMITS:

_____

_____

_____

ACCESS REQUIRED:

_____

_____

_____

REPAIR DESCRIPTION:

_____

_____

_____

COMMENTS:

_____

_____

_____

Enclose all available data including photos, sketches, etc., to:

Cessna Aircraft Company
Attn: SID Program
Technical Support Services
Dept. 751
P.O. Box 7706
Wichita, Kansas USA 67277
FAX 316-942-9006

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NONDESTRUCTIVE INSPECTION METHODS AND REQUIREMENTS

1. GENERAL REQUIREMENTS

A. General

(1) Facilities performing nondestructive inspections as defined in the 5-15-XX Inspection Documents should hold a valid FAA Repair Station Certificate with a Specialized Service Rating in the applicable method of nondestructive inspection.

(2) Personnel performing nondestructive inspections defined in the Supplemental Inspection Documents should be certified to a minimum of Level II in the appropriate inspection method as defined in a written practice that meets the minimum intent of The American Society for Nondestructive Testing Recommended Practice Number SNT-TC-1A or National Aerospace Standard NAS 410, NAS Certification and Qualification of Nondestructive Test Personnel.

(3) Organizations and personnel engaged in the application of nondestructive inspection and operating under the jurisdiction of a foreign government should use the appropriate documents issued by the applicable regulatory agency in complying with the above requirements.

(4) Facilities performing nondestructive inspection as defined in this Supplemental Inspection Document, should have access to the appropriate test equipment capable of performing the inspection and reporting the test results as defined in this manual.

2. GENERAL EDDY CURRENT INSPECTION

A. General

(1) Eddy current inspection is effective for the detection of surface and near surface cracks in nonferrous metals. The inspection is accomplished by inducing eddy currents into the material and observing electrical variations of the induced field. The character of the observed field change is displayed and interpreted to determine the nature of the indication. This method can be applied to airframe parts or assemblies where the inspection area is accessible to contact by the eddy current probe. An important use of eddy current inspection is for the detection of cracking caused by corrosion or stress in and around fastener holes. Bolt hole eddy current probes are effective in detecting fatigue cracks emanating from the wall of the fastener hole. Surface probes can detect cracks around fastener holes with the fastener installed.

B. Equipment

(1) The eddy current equipment listed in each procedure is what was used in the development of the inspection technique. Equivalent eddy current test equipment may be used, providing the equipment is capable of achieving the required frequency range and test sensitivity. When substitute equipment is used, it may be necessary to make appropriate adjustments to the established techniques.

(2) Instrument Requirements

(a) Certain inspection techniques require the use of instruments that provide both phase and amplitude information on a storage cathode ray tube for impedance plane analysis. Impedance plane instruments may be used as a substitute for metered instruments. Metered instruments shall not be substituted for impedance plane instruments where the ability to distinguish phase information is required.

(b) The instrument shall demonstrate a repeatable signal response that has a signal-to-noise ratio of greater than 3 to 1 for the test in which it is to be used. Impedance plane instruments shall be able to resolve the signal within the guidelines shown in Figure 1 and Figure 2.

(c) Functional performance of the eddy current instrumentation shall be verified at an interval of no more than one year.

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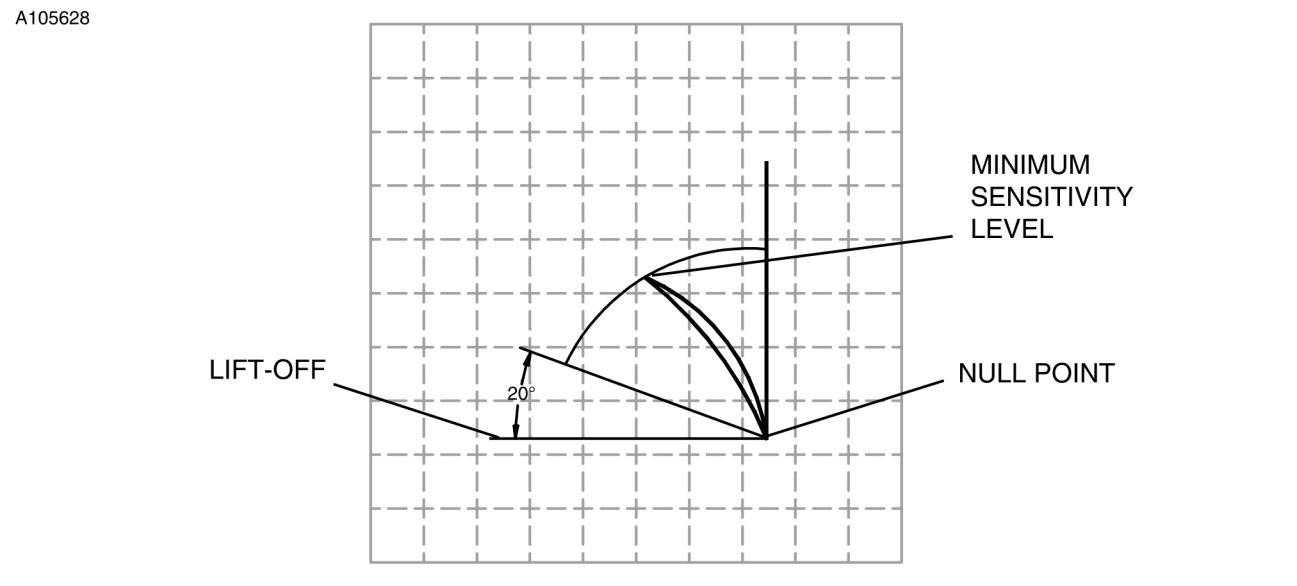
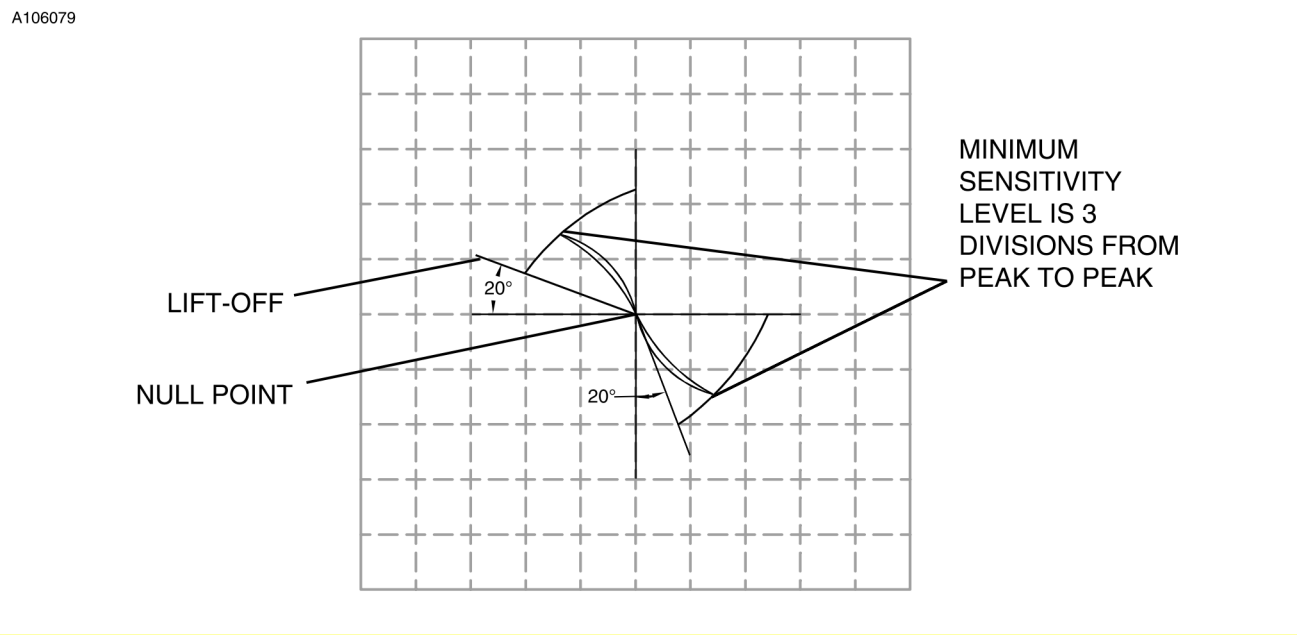


Absolute Probe Calibration Range
Figure 1



Differential Probe Calibration Range
Figure 2

(3) Probe Requirements
- (a) The probe may have an absolute or differential coil arrangement. The probe may be shielded or unshielded. A shielded probe is normally recommended.
- (b) The probe shall have an operating frequency that produces the required test sensitivity and depth of penetration as indicated in the technique.
- (c) Smaller coil diameters are more effective in detecting cracks. A coil diameter of 1/8 inch is normally used for surface crack detection. The coil will usually contain a ferrite core.
- (d) The probe shall not give interfering responses from handling pressures, scanning or normal operating pressure variations on the sensing coil that cause the signal-to-noise ratio to be less than 3 to 1.

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(e) Teflon tape may be used to decrease the wear on the eddy current probe coil. When Teflon tape is used, the instrument calibration must be verified.

(4) Calibration Standard Requirements

(a) In some cases, specially fabricated reference standards will be necessary to simulate a part's geometry, configuration, and/or a specific discontinuity location. If a technique specifies a reference standard manufactured by Cessna Aircraft Company, substitution of another standard is not permitted. If a general-purpose surface or bolt hole reference standard is indicated, substitution is permitted.

(b) Reference standards should be of an alloy having the same major base material, basic temper and the approximate electrical conductivity of the material to be inspected.

(c) Reference standards shall have a minimum surface finish of 150 RHR or RMS 165.

(d) An EDM (Electrical Discharge Machined) surface notch no deeper than 0.020 inch shall be used for surface eddy current inspection calibration. An EDM corner notch of no larger than 0.050 inch surface lengths shall be used for bolt hole eddy current inspection calibration. The dimensional accuracy of the notch shall be documented and traceable to the National Institute of Standards and Technology (NIST).

C. Inspection

(1) General Considerations

(a) Inspections shall not be performed until the temperature of the probe, the standard and the material have been allowed to equalize.

(b) Eddy current inspection requires that good contact be made between the probe and the part unless a specific procedure requires a certain amount of lift-off. The inspection area shall be free of dirt, grease, oil or other contaminants that may interfere with the inspection. Mildly corroded parts must be cleaned lightly with emery cloth. Heavily corroded parts must be lightly abraded and cleaned locally in the inspection area. If paint thickness is such that it will interfere with the inspection, the paint must be removed to maintain inspection sensitivity.

NOTE: All cleaning materials and methods shall be approved for use by the appropriate Cessna Aircraft Maintenance Manual, or Component Maintenance Manual.

(2) Instrument Calibration

(a) The instrument shall be calibrated and operated in accordance with the manufacturer's instructions. Calibration shall be done using the reference standard indicated in the inspection technique.

(b) Instrument calibration shall be performed prior to inspection. Calibration shall be checked at intervals necessary to maintain calibration during continuous use and at the end of the inspection. The instrument shall be recalibrated if any part of the system is replaced or if any calibrated control settings are changed.

(c) Normally, the instrument will be adjusted to achieve a minimum separation of three major screen divisions between the null/balance point and the appropriate reference notch. For a differential probe, the signal amplitude should be considered as peak to peak. Filters may be used to improve signal to noise ratio as necessary.

(3) Inspection Performance

(a) Whenever possible, the inspection area shall be scanned in two different directions which are at scan paths 90 degrees to each other.

(b) Scan the inspection area at index increments that do not exceed the width of the eddy current test coil. The part edge shall be scanned as long as the response from edge effect does not mask the calibration notch response. Areas where edge effect is greater than the calibration notch signal shall not be inspected using eddy current.

(c) Whenever possible, fillets and radii should be scanned both transverse and parallel to the axis of the radius. The edge of the fillet or radius shall be scanned transverse to the axis of the radius.

(d) If performing bolt hole eddy current inspection, the entire depth of a hole shall be inspected unless otherwise stated. Be aware that the hole may have more than a single layer of material.

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(4) Inspection Interpretation
   (a) If an indication is detected, carefully repeat the inspection in the opposite direction of probe movement to verify the indication. If the indication persists, carefully monitor the amount of probe movement or rotation required to cause the instrument to move off maximum indication response.
   (b) If performing bolt hole eddy current inspection with the probe centered on a crack, the signal will be at maximum and movement of the probe will cause the signal to begin returning to the original reading. Corrosion pits, foreign material, and out-of-round holes can cause an instrument response for 20 to 30 degrees of bolt hole probe rotation before the indication begins to return to the original reading.
   (c) Unless otherwise specified, cracks shall be considered unacceptable.
   (d) The end of a crack is determined using the 50 percent method. Scan the probe slowly across the end of the crack until a point is reached where the crack signal amplitude has been reduced by 50 percent. The center of the probe coil is considered the end of the crack.

3. GENERAL - EDDY CURRENT BOLT HOLE TECHNIQUES

A. Description
   (1) This procedure presents the general requirements for eddy current inspection of open fastener holes and may be used as a standalone procedure or in conjunction with other Nondestructive Testing (NDT) inspection procedures.
   (2) This procedure shall not supersede inspection requirements when defined by a specific NDT inspection procedure.
   (3) When a specific inspection procedure does not exist in this section and where no specific NDT inspection requirements are defined, this procedure may be used.
   (4) This procedure gives set up instructions for both manual bolt hole inspection and semiautomatic bolt hole inspections for impedance plane instruments.
   (5) This procedure gives general set up instructions which can be utilized by a variety of instruments. It does not give specific instructions regarding instrument specific settings. It is the responsibility of the inspecting organization to be familiar with the instruments being used.

B. Personal Requirements
   (1) For personnel certification requirements, refer to General Requirements in this chapter.

C. Eddy Current Test System
   (1) The eddy current test system shall consist, at a minimum of the following components.
      (a) Eddy current instrument
      (b) Probe
      (c) Reference standard
      (d) Cable
   (2) The test system shall demonstrate a repeatable signal response of a minimum of a 3:1 signal to noise ratio from the EDM notch in the reference standard when compared to a defect free area of the reference standard.
   (3) The functional performance of the eddy current instrument shall be verified on an annual basis.

D. Materials and Equipment
   (1) Tape
      (a) The tape used to help reduce noise and protect the coil on the probe should be Polytetrafluoroethylene (PTFE) or similar type adhesive backed tape commonly known as Teflon™ tape.
      (b) Other types of tape are allowed but it should be slick to allow the probe to rotate freely in the hole and have an adhesive backing to adhere to the probe.
      (c) Tape thickness for eddy current inspection will generally be in the range of 0.002 to 0.010 inches thick.
      (d) If used, tape shall be applied prior to calibration to verify that the proper sensitivity is achieved. Refer to Table 5 or Table 7.
      (e) Calibration will be verified if a different thickness of tape is applied then what was used for the original calibration.

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(2) Instrument.
  (a) The eddy current instrument will be an impedance plane type. Metered instruments are not allowed using this procedure.

(3) Probes
  (a) The probe may have an absolute, differential/reflection or differential/bridge coil arrangement. A differential/reflection or differential/bridge coil arrangement is necessary for semiautomatic rotary bolt hole inspection, and highly recommended for manual bolt hole inspections.
  (b) Probes may be shielded or unshielded but must be able to provide the sensitivity and signal to noise ratio described in this procedure.
  (c) Probes for manual inspection shall have an adjustable collar to control and maintain the depth that the probe is inserted into the hole.
  (d) The probe shall not give interfering responses from normal handling pressures, or normal operating pressure variations on the sensing coil.
  (e) An adjustable, self-expanding probe is recommended for semiautomatic inspection to ensure consistent coil contact with the side of the hole.
  (f) If a solid non-expanding probe is used it must fit the hole to allow for a minimum amount of lift-off. The difference between the diameter of the probe and the diameter of the hole shall not exceed 0.005 inches either without tape applied over the coil or after application of tape.
  (g) Choose a probe that fits the hole snugly while still allowing for free probe travel.
  (h) Teflon™ or similar tape may be used to help improve the signal to noise ratio and to decrease the wear on the eddy current probe coil.
  (i) The probe shall be capable of operating at the frequency required for the material being inspected. Refer to Table 1 for guidance on probe operating frequencies.

Table 1. Operating Frequencies

Condition	Material Type (Note: 1)	Frequency (Note: 2)
Nonmagnetic, High conductivity	Aluminum, Magnesium (15% or greater IACS)	200kHz-500kHz
Nonmagnetic, Low conductivity	Magnesium (< 15% IACS), Titanium, Inconel and Nickel alloys	1MHz-3MHz
High permeability	400 series Stainless, 17-7 TH1050, 4130 or 4300 series Steels, in any heat treat condition	00kHz-1MHz
Low permeability or Nonmagnetic	301 series, 304 series stainless, 17-7 PH annealed	1MHz-3MHz

NOTE: 1 - Material types listed are for information only, these are examples of common materials that would fall into the ranges listed under the heading, "Condition".

NOTE: 2 - The frequencies listed above are generally recognized to provide the optimum sensitivity in the materials listed. Use of frequencies outside of those listed are allowed providing that the sensitivity can be verified on the correct size EDM notch on a reference standard of similar material.

(4) Reference Standards
  (a) Reference standards should be constructed of an alloy similar to the base metal of the test object and conform to the requirements listed in Table 2.
  (b) Reference standards shall have a minimum surface finish of 150 RHR or RMS 165.
  (c) Reference standards used in accordance with this procedure shall at a minimum, have 1 corner EDM notch of 0.030 inch x 0.030 inch x 0.007 inch for the hole size being inspected.

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(d) A 0.030 inch x 0.030 inch corner notch or 0.050 inch x 0.050 inch corner notch shall be used for calibration unless otherwise specified. Refer to Table 3 and Table 4 in the calibration sections for sensitivity levels for the different sized notches.
(e) The dimensional accuracy of EDM notches shall be documented and traceable to the National Institute of Standards and Technology (NIST).
(f) A typical eddy current bolt hole reference standard is shown in Figure 3.

Table 2. Reference Standard Materials

Inspection Material Type	Material for Reference Standard (Note: 1)	
All conductive non-ferromagnetic alloys with conductivities of 15 percent IACS or greater.	Non-ferromagnetic alloy with a conductivity that is within ±15 percent IACS of the test material range, but not lower than 15 percent IACS.	2024-T3 27.5-32.5 % IACS 7075-T6 30.5-36 % IACS 7075-T76XX 38-42 % IACS 6013-T6X 40-43% IACS 6061-T6 40-50 % IACS
All conductive non-ferromagnetic alloys with a conductivity of 0.8 percent IACS to less than 15 percent IACS.	Non-ferromagnetic alloy with a conductivity that is not more than 1.0 percent IACS greater than the test material range or less than 0.8 percent IACS.	Titanium 6AL-4V ..1.01 % IACS Inconel ..1.7% IACS Magnesium AM100A-T4, AZ91C-T4, AZ91E-T4.. 9.9 % IACS
High permeability steel	400 series Stainless, 17-7 TH1050, 4130 or 4300 series steels in any heat treat condition.	
400 series stainless steel alloys.	Any 400 series stainless steel alloy.	
Low permeability alloys.	304 stainless or 17-7 PH annealed.	

NOTE: Materials listed are for information only. These are some common materials available and may be used. Reference standard material needs to conform to the requirements of Table 2.

(5) Inspection Preparation
(a) Hole bores shall be round and smooth enough to not cause eddy current signals that would exceed a 3:1 signal to noise ratio. Refer to Figure 12 and Figure 13.
(b) Visually inspect hole bores for nicks, burrs, scoring or other conditions that may cause an excessive noise signal.
(c) Any hole condition that would cause damage to the probe is not suitable for inspection. The condition must be corrected prior to inspection.
(d) If necessary, clean up the holes prior to the inspection utilizing one or more of the following methods.
1 Methods generally considered acceptable for cleaning are, (but are not limited to):
a Solvent moistened cotton swab.
b Scotch bright.
c Flex Hone.
(e) Do not oversize the hole during the cleaning process unless specifically allowed per the Maintenance Manual, the Structural Repair Manual, the Component Maintenance Manual, or on direction from Cessna Engineering.
(f) If allowed per the Maintenance Manual, Structural Repair Manual, Component Maintenance Manual, or other maintenance document or Engineering, a 1/64th inch, or the amount as directed, clean up ream may be performed if needed to achieve a satisfactory surface condition of the hole.
(g) If the hole cannot be satisfactorily cleaned up to allow for an inspection, contact Cessna Customer Service for instructions. Refer to the Introduction for contact information.
(h) Continue to the Manual Probe Calibration section or Calibration for Semiautomatic Hole Inspection section as needed.

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(6) Manual Probe Calibration

(a) The instrument shall be calibrated and operated in accordance with this procedure and the manufacturer's instructions.

(b) The minimum single layer material thickness that can be examined using a manual probe hole inspection is 0.063 inch.

(c) Instrument calibration shall be performed prior to inspection. Calibration shall be checked periodically during continuous use and at the conclusion of the inspection. If the calibration is below the levels originally established, all holes inspected since the last known good calibration check shall be reinspected. The instrument calibration shall be verified if any part of the system is replaced or if any calibrated control settings are changed.

(d) Teflon™ Tape is highly recommended to be placed over the probe coil. It will act as a wear surface and on high permeability steel will greatly improve signal to noise ratio.

(e) Positioning the thumb screw in line with the coil will help to define the position of the coil when the coil is in the hole. Refer to Figure 4.

(f) The use of a Low Pass Filter will help to improve the signal to noise ratio. Set it to the highest value that does not cause the signal to be unstable.

NOTE: Do not use the High Pass filter with the manual probe, regardless of the coil type.

(g) Setting Lift-Off for Absolute Probe

1 Select the probe for the best fit in the hole to be inspected and based on the requirements of Table 1.
2 Select the standard for the material being inspected based on the requirements of Table 2.
3 Turn on the instrument.
4 Connect the probe to the instrument using the proper cable and or balance coil.
5 Set the instrument frequency as appropriate per Table 1, for the material type being inspected.
6 Position the trace dot in the lower right quadrant of the screen, approximately 80% horizontal and 20% vertical for non-ferromagnetic materials and 50-60% horizontal and 20% vertical for ferromagnetic materials.
7 Place the probe on the surface of the standard with the collar hanging over the edge so the coil is in contact with the surface of the standard. Refer to Figure 5.
8 Ensure that there is no influence on the coil from any EDM notch, edge of the standard or hole edges.
9 Press the null/balance button.
10 Lift the probe off of the standard and adjust the phase or rotation so lift-off is traveling horizontal and to the left. Refer to Figure 5.
11 With the probe on the standard, rock the probe a little, if the dot moves to the right of null, re-null if necessary.

(h) Setting Lift-Off for Differential Probe

1 Select the probe for the best fit in the hole to be inspected and based on material type per Table 1.
2 Select the standard for the material being inspected based on the requirements of Table 2.
3 Turn on the instrument.
4 Connect the probe to the instrument using the proper cable and or balance coil.
5 Set the instrument frequency as appropriate per Table 1 for the material type being inspected.
6 Set the screen position of the dot to 50% horizontal and 50% vertical.
7 Place the probe on the surface of the standard with the collar hanging over the edge so the coils are in contact with the surface of the standard. Refer to Figure 6.
8 Ensure that there is no influence on the coil from any EDM notch, edge of the standard or hole edges.
9 Press the null/balance button.
10 Roll the probe from side to side while monitoring the display. Do not lift the probe from the standard.

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11 The dot should move back and forth from the center position as the probe is rolled back and forth. Reference Figure 6.
12 Adjust the phase/rotation to position the trace going horizontal. Refer to Figure 6.

NOTE: If the dot moves farther in one direction than the other, the coils were not perfectly centered on the surface of the standard when the null button was pressed. For setting the "Lift-Off" it is not that important that the signal is symmetrical.

(i) Adjusting Gain
1 Adjust lift-off for the probe being used. Refer to Setting Lift-Off for Absolute Probe or Setting Lift-Off for Differential Probe before continuing.
2 Apply Teflon™ tape to probe over coil if needed.
3 Position the probe collar so as to position the center of the coil approximately 0.030 inches below the edge of the collar and tighten the thumb screw. Use this dimension for either the 0.030 inch x 0.030 inch or the 0.050 inch x 0.050 inch notch. Refer to Figure 4.

NOTE: Typical shielded probe coils on most bolt hole probes are 0.060 inches in diameter, and unshielded probe coils are 0.090 inches in diameter. Use these diameters as a guide in positioning the edge of the collar.

4 Place the probe in the appropriate hole of the reference standard with the coil away from the EDM notch.
5 Press the null/balance button.
6 Rotate the probe in the hole so as to pass the coil over the corner EDM notch.
7 Adjust the gain to obtain a minimum signal response from the corner EDM Notch. Refer to Table 3.

Table 3. Calibration Levels.

EDM Notch Size (in inches)	Absolute Probe Minimum Peak Signal Response	Figure	Differential Probe Minimum Peak to Peak Signal Response	Figure
0.030 X 0.030	3 Divisions	Figure 7	30%	Figure 9
0.050 X 0.050	5 Divisions	Figure 8	70%	Figure 10

(j) Continue to the Determine Layer Thicknesses section and Manual Probe Inspection section.

(7) Calibration for Semiautomatic Hole Inspection
(a) The instrument shall be calibrated and operated in accordance with this technique and the manufacturer's instructions.
(b) The minimum material thickness that can be examined using semiautomatic hole inspection is 0.020 inch.
(c) Adjusting filter settings is very helpful in reducing noise and fine tuning the signal on the display and is necessary to achieve satisfactory results.

NOTE: Filter settings must be set correctly to achieve satisfactory results. To much input or not enough input from either, or both of the filter settings can be very detrimental to the inspection and may result in missed flaws. Consult the manufacturers instructions regarding your specific instrument for specifics about setting the filters.

(d) The High Pass Filter (HPF) should always be set to a value lower than the Low Pass Filter (LPF)

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(e) As a general rule, as hole sizes increase in diameter and or scanner rotation speed increases, the HPF and LPF setting will need to be increased.

(f) Most Nortec instruments default to filter settings of 500 for the LPF and 200 for the HPF. These are generally good numbers and may not need to be changed. Other manufactures may have different systems for setting the filters such as possibly a Band Pass filter option. Refer to the scope manufacturer's, owners manual for setting the filters if needed.

(g) The HPF should be set to optimize the response from the EDM notch. The HPF allows high frequencies to pass, (crack indications would be considered a high frequency response) or suppresses low frequencies produced by changes occurring over a longer period of time of coil contact such as, the hole being out of round, or minor surface blemishes.

(h) The LPF should be set to minimize the high frequency responses typically caused by noise generated by the probe and or the instrument while allowing lower relative frequency signals to pass such as from relevant crack indications. The LPF allows low frequencies to pass, or rejects high frequencies typically caused by noise generated by the probe or instrument.

(i) Instrument calibration shall be performed prior to inspection. Calibration shall be checked periodically during continuous use and at the conclusion of the inspection. If the calibration is below the levels originally established, all holes inspected since the last known good calibration check shall be reinspected. The instrument calibration shall be verified if any part of the system is replaced or if any calibrated control settings are changed.

1 Setting Lift-Off

a Select the probe for the best fit in the hole to be inspected and based on material type per Table 1.

b Select the standard for the material being inspected based on the requirements of Table 2.

c Apply Teflon™ tape to probe over coil if needed.

NOTE: Teflon™ tape is highly recommended and will greatly improve signal to noise ratio when inspecting high permeability steels.

d Insert probe into scanner.

e Connect scanner to the instrument using the appropriate cable.

f Turn instrument on.

g Set the frequency based on the material being inspected. Refer to Table 1.

h Turn the Sweep function off and adjust the instrument to have a flying dot or impedance plane display.

i If your instrument doesn't automatically position the dot at the center of the screen, adjust the X and Y position controls to position the dot at the horizontal and vertical center of the screen.

j Set the instrument initial gain setting to a 1:1 ratio.

k Refer to Table 4 and set initial filter settings based on probe diameter. Continue with Setting Filters, Calibration for Semiautomatic Hole Inspection Calibration after setting lift-off to ensure filter settings are optimized for the inspection.

l Turn on the scanner.

NOTE: If the scanner rotation speed is adjustable, set it for a minimum of 1,000 RPM's. For larger diameter holes scan speeds over 1500 to 2000 RPM may be necessary to ensure complete coverage unless scan index speeds are kept very slow.

1. Slower scanner rotation speeds will require slower scan indexing speed in the hole.
2. For steel or other high permeable materials, a slower scan rotation is often helpful in reducing interference from noise. If necessary, reduce scanner rotation speed until an acceptable signal to noise ratio is achieved.
3. Do the Determining Maximum Scan Index Speed steps after final adjustment in scanner rotation speed.

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m If the dot is not at the center of the screen, press the null button
n Hold the scanner so the probe is parallel to the surface of the standard. Refer to Figure 11.
o Place the probe in contact with the standard using light pressure, keeping the coil away from edges and EDM notches. This will generate a lift-off signal as the coil rotates. Refer to Figure 11.
p Adjust the phase or rotation to position the flat portion of the signal from lift-off horizontal, along the X axis. Refer to Figure 11.

NOTE: The signal from lift-off should be a flattened Figure 10 pattern. The less vertical spread there is in the signal from the lift-off, the less base line noise there will be on the sweep trace. If the signal from lift-off exceeds 2 major divisions in total vertical spread, reduce the gain until the signal from lift-off is less than 2 major divisions vertically and all or mostly on screen in the horizontal direction. Refer to Figure 11.

2 Setting Filters
a Use the values in Table 4 and or the following steps for initial filter settings.
1. With the scanner on and the probe in the appropriate hole in the reference standard.
2. Set the HPF to the lowest value.
3. Increase the HPF value until the signal sweep flattens out. Depending on where the LPF is set the signal may look a little noisy at this point.
4. Set the LPF to it's highest value.
5. Decrease the LPF value to get a stable dot or until the spikes from the noise signals decrease and the signal from the notch in the reference standard just starts to decrease.

Table 4. Filter Settings

Probe Diameter (in inches)	5/32 to 7/32	7/32 to 5/16	5/16 to 7/16	7/16 to 3/4
LPF	500	500	700	1500
HPF	150	200	300	500

NOTE: The values in Table 4 are meant as a guide. They will generally provide good results. Use them as a starting place and adjust them as needed to obtain the best signal to noise ratio and the most uniform response from the EDM notch.

3 Setting Inspection Gain
a Follow the steps for Setting Lift-Off and Setting Filters prior to setting the gain.
b Follow equipment manufacturer's directions on how to turn the Sweep on, and set the scope to display the sweep trace.

NOTE: Do not set the display to a Waterfall, Timed or Sync type display. Those displays are for use with an automatic scanner and specialized equipment.

c Turn on the scanner.
d Insert the probe into the appropriate sized hole in the reference standard.
e Maximize the signal from the corner EDM notch at the surface of the standard by moving the probe in and out of the hole until the best signal is achieved.

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f Adjust the gain and probe drive controls to achieve a minimum signal response from the reference notch as defined in Table 5.

NOTE: A probe drive of low or medium will usually provide better results than a probe drive of high. High probe drive can easily over drive the coils in the probe causing a saturated condition and loss of signal and sensitivity.

g Adjustments may need to be made in the Filter settings after setting the inspection gain as one does affect the other. After setting the gain, if the signal from the EDM notch is distorted or asymmetrical, or if the noise level is to high, make some adjustments to the HPF, or LPF as required. You may need to go back and forth between Filter and Gain settings a couple of times to achieve satisfactory results.

Table 5. Signal Response

EDM Notch Size (in inches)	Peak to Peak Signal Response	Figure
0.030 X 0.030	30%	Figure 12
0.050 X 0.050	50%	Figure 13

4 Determining Scanner Zero or 12 O'clock Position.

NOTE: When the scanner is on, the sweep trace from the left side to the right side of the screen represents one 360 degree revolution of the probe in the hole, regardless of the size of the hole or the speed of the scanner. So determining the circumferential position of an indication is a matter of determining where "zero" is on your scanner. Most manufacturers scanners will position the indication from the notch at the left (0) and right (100 percent) edge of the screen simultaneously when the top or front of the scanner is pointed at the indication. Refer to Figure 14. The steps below will set the zero position from the notch indication as stated above.

a Find a notch that you know the position of in the reference standard.
b With the scanner turned on, insert the probe into the appropriate size hole in the reference standard.
c Maximize the signal from the notch you are going to use to determine zero.
d Rotate the scanner while keeping the signal from the notch visible on the display. As the scanner is rotated, the notch signal will move to the left or right along the sweep line depending on which direction you move the scanner.
e Stop when the front or top of the scanner is pointing in the direction of the notch. Refer to Figure 14.
f The indication from the notch should be at the left and right side of the screen simultaneously, 0 and 100 percent. Reference this as the Zero or 12 O'clock position. Refer to Figure 14.
g With the scanner oriented in this position, an indication that was at the opposite side of the hole, towards the rear of the scanner or 6 O'clock, would be at the 50 percent screen width on the sweep trace. Refer to Figure 15.
h An indication at 9 O'clock would show on the sweep trace at approximately 25% and an indication at 3 O'clock would show at approximately 75%. Refer to Figure 15

NOTE: If the indication from the notch using your scanner is at a different screen position than stated above, that is okay. Make a note of the location on the screen of the indication when the top of the scanner is pointed towards the notch. Make adjustments to the other clock positions by the same amount as the zero position is off.

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5 Determining Maximum Scan Index Speed.
a Insert the probe into the appropriate hole in the reference standard and locate the corner notch at the interface of the first and second layers.
1. If using a single layer standard, insert the probe from the side opposite the notch and move towards the notch, stopping before the probe exits the hole and reversing direction of travel back towards the entry surface.
b Monitor the display while moving the probe in and out over the notch.
c Gradually increase the probe travel speed until the peak height of the notch response begins to decrease below 30% Peak to Peak.
d This is the maximum probe scan index speed.

(j) Continue to the Semiautomatic Inspection section.

(8) Determine Layer Thickness

(a) For manual probe inspection using an absolute probe the thickness of the layers to be inspected must be known for proper indexing. If the layer thicknesses are already known, continue to the Manual Probe Inspection section. If not, continue with the following steps to determine the thickness of the layers.

(b) If inspections will be performed with a differential probe, you do not have to measure the layer thicknesses. If you choose not to measure the layers continue to the Manual Probe Inspection section and index per step 9.A.(2).

(c) Inspection steps to determine layer thicknesses if they are not known.

NOTE: The following steps must be performed using an absolute coil hole probe.

1 Set the collar to a depth so the coil will not be influenced by any edge or interface.
2 Insert the probe into the hole.
3 Press the Null/Balance button.
4 Loosen the collar set screw and push the shaft of the probe into the hole toward the interface.
5 When you reach the interface, you will get a crack like indication from the interface.
6 Stop moving the probe when the indication is at maximum amplitude.
7 If the indication is off screen, record the current the gain setting and reduce the gain until you can pass the interface and keep the indication from the interface on screen.
8 When the indication from the interface is at the maximum amplitude, stop moving the probe and tighten the collar set screw.
9 Remove the probe and measure the thickness of the layer from the bottom of the collar to the center of the coil.

NOTE: If there are multiple layers that will need to be measured for thickness, do not move the position of the collar.

10 Inspect the layer per the indexing in Table 6.

(d) If there are multiple layers, make a note of this measurement and continue determining the remaining layer thicknesses as follows.

1 Without adjusting the depth of the probe collar, insert the probe into the hole until the collar is seated on the surface of the structure.
2 The dot position should return to where it was in step C.(8).
3 Loosen the set screw and push the probe slowly in to the hole. The dot should return to the null position.

NOTE: If the layers are not all the same materiel alloy and heat treat, the dot may not return to the exact null position as in step C.(3). As long as it's in the same general area that's fine. If it's of screen, press the null/balance button to bring it back on screen.

4 Continue pushing the probe into the hole until the next interface is reached. When you reach the interface, you will get a crack like indication from the interface.
5 Stop when the signal from the interface is at maximum amplitude.
6 Tighten the collar set screw and remove the probe from the hole.

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7 Measure from the bottom of the collar to the center of the coil.
8 Subtract the measurement of the previous layer/layers from this measurement.
9 Make a note of the layer thickness.
10 Repeat steps D.(1) thru .(9) as needed until all layers have been measured.

NOTE: After all of the layers have been measured, if the instruments gain setting was changed in step 8.C.(7), set it back to the value that you recorded.

(e) When all layers have been measured, continue to the Manual Probe Inspection section.

(9) Manual Probe Inspection

(a) The following instructions will provide inspection guidance for manual bolt hole probes using a differential or absolute coil arrangement.

1 To determine layer thicknesses if they are not known, do the steps in Determine Layer Thicknesses.
2 If using a differential probe. It is optional to set the collar for a depth of 0.030 inches and index every 0.060 inches to within 0.030 inches of the opposite surface.

NOTE: With a differential probe there will be very little or no impact from the interfaces of the different layers.

3 Calibrate manual probe, refer to Manual Probe Calibration.
4 Set the collar for a depth as directed per Table 6 or in the Manual Probe Calibration section for differential probe collar depth.
5 Insert the probe into the hole, hold the probe steady with the collar firmly seated on the surface of the structure.
6 Press the Null/Balance button on the instrument.
7 Rotate the probe through the entire diameter of the hole for each index depth required.
8 Monitor the display through each rotation for any crack like indications.

NOTE: If there is dot movement not consistent with that of a crack. You may have nulled on or very close to a crack. Position the probe in another spot in the hole at the same depth and re null, and re inspect the hole at the same depth.

NOTE: As in a surface inspection, dot travel will follow the same direction relative to lift-off for a crack. Dot movement in directions other than that which would be consistent for a crack in the material being inspected need to be investigated for relevance before being rejected as a crack.

9 If an indication is noted, refer to the Evaluation section, for characterization instructions.

Table 6. Scan Index For Layer Thickness

Layer Thickness (in inches)	Scan Index
0.063 to 0.090	Middle of the layer.
0.090 to 0.120	0.030 inch from each edge/interface.
Greater than 0.120 to 0.180	0.030 inch from each edge/interface plus the middle of the layer
Greater than 0.180	0.030 inch from each edge/interface plus 0.060 inch index

(10) Semiautomatic Inspection

(a) Inspection steps for semiautomatic hole inspection.

1 Calibrate per steps in the Calibration for Semiautomatic Hole Inspection section.
2 Set the instrument to Sweep display.

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3 Visually inspect holes per the Inspection Preparation section, and correct any conditions that would prevent an acceptable scan.
4 Check fit the probe to the hole/holes being inspected to ensure that the correct probe size is being used. Adjust fit if needed.
5 With the probe scanner turned on, slowly insert the probe into the hole while monitoring the display.
6 Make a complete scan of the entire length of the bore of the hole.

NOTE: A complete scan consists of monitoring the display as the probe is inserted all of the way into and through the hole and then back out of the hole.

NOTE: Do not exceed the index speed established in the calibration section.

(b) Any indication while in sweep mode that differentiates itself from baseline noise, needs to be investigated for the possibility of it being a crack.
1 With the probe in the hole and the scanner on, maximize the indication.
2 Turn the Sweep mode off so the flying dot or impedance plane mode is on.

NOTE: As in a surface inspection, dot travel will follow the same direction relative to lift-off for a crack. Dot movement in directions other than that which would be consistent for a crack in the material being inspected need to be investigated for relevance before being rejected as a crack. Refer to Figure 16, for examples of crack indications in different materials.

NOTE: If the indication in the display is traveling in a direction not consistent with a crack for the material being tested, it is probably not a crack. It still may be a rejectable condition though. Determine what the cause of the indication is to determine if it is rejectable.

(c) If an indication is noted, refer to the Evaluation section, for characterization instructions.

(11) Evaluation
(a) General
1 Any vertical deflection that is distinguishable from the null position and lift-off, and is not caused by noise, lift-off or part geometry is cause for further investigation regardless of signal amplitude. There are no acceptable cracks.
2 Unless otherwise specified, all cracks are rejectable regardless of length or signal amplitude.
3 Indications with a phase response different from the reference notch may indicate hole contamination or damage. If indications exceed a 3:1 signal to noise ratio, additional hole preparation, reaming and/or cleaning, may be required.
4 If horizontal lift-off is greater than 40% FSW on the impedance display check for out-of-round condition or interface noise. If allowed, have the hole reamed and then reinspect.

NOTE: Any damage to the bore of the hole that cannot be corrected through limits established in the Structural Repair Manual must be reported to Cessna Customer Service Engineering, refer to Introduction for contact information. Nicks and gouges are a rejectable condition as they could easily develop into a crack. These should be reported the same as reporting a crack indication.

5 Do not report the depth of the crack radially (distance into the material from the edge of the hole). Due to the nature of how a crack forms as compared to an EDM notch, depth measurements are very unreliable and should not be reported.
6 The use of a borescope, flashlight or other visual aids may be necessary to determine the cause of an indication.
a If a crack like indication is found:
1. Identify the circumferential position of the indication.

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2. Using an approved marker, mark the position around the hole to define the orientation of the crack.
3. If the indication is repeatable, verify that it is not due to foreign material stuck to the side of the hole or some other non relevant indication.
4. After the circumferential position has been established, inspect the hole again, if the circumferential position of the indication changes, it is not a crack.
5. Look into the hole using any means suitable to determine if any foreign material in the hole could be causing the indication.
6. If the fasteners were cadmium (cad) plated, pay particular attention to the possibility that some of the cad plating could be stuck to the side of the hole. Cad plating will give a very strong crack like indication on sweep mode but it will appear going near vertical when in the flying dot mode. Cad plating stuck to the side of the hole will usually be small, darker grey specs and would be located in line with the circumferential position of the crack indication.

NOTE: An X-ACTO™ blade or small dental pick can be useful to help remove a piece of cad plating stuck to the side of the hole. Use care to not gouge or damage the bore of the hole.

(b) Manual Probe.

1 For manual hole inspection, when the eddy current probe is centered over a crack, the signal will be at maximum and a small movement of the probe will cause the signal to diminish, returning to the null point. Corrosion pits, foreign material, gouges or other damage, will generally be apparent for a longer degree of probe rotation before the signal from the indication returns to the null point.

2 A crack indication will follow the same phase direction as a crack indication would in a surface inspection for the material being inspected.

3 If the indication in the display is traveling in a direction not consistent with a crack for the material being inspected, it is probably not a crack. It still may be a rejectable condition though. Determine what the cause of the indication is to determine if it is rejectable.

4 Nicks and gouges may have a signal similar in phase to a crack but the indication on the screen will usually be wide and more vertical and may apparent for a longer duration of probe rotation.

5 Determining the length of a crack.

a Insert the probe into the hole to approximately the depth of the crack.

b Locate the crack and peak the amplitude from the crack.

c If the peak amplitude from the indication is off screen, reduce the gain until the whole indication is visible in the display.

d Rotate the probe back and forth across the crack while moving the probe towards the end of the crack until a point is reached where the crack signal peak amplitude has been reduced by 50 percent.

e Tighten the set screw.

f If the crack is located common to the near surface, remove the probe and measure from the center of the coil to the edge of the collar. Report this dimension as the length of the crack.

g If the crack is common to an interface or the far edge, tighten the set screw on the collar and make a mark on the probe shaft with a sharp pencil at the end of the collar.

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h Loosen the set screw and move the probe towards the interface or far edge, once the interface or edge is determined, tighten the set screw and make another mark on the probe shaft.

NOTE: The interface or far edge can be determined by rotating the probe so the coil is not influenced by the crack and nulling the instrument. Slowly push the probe in towards the interface or edge. Both will give an indication very similar to a crack. Use the same method as finding the end of the crack to locate the edge of the interface or far edge of the part.

i Measure the distance between the center of the two marks. Report this dimension as the length of the crack.

(c) Semiautomatic Probe

1 Characterization to determine relevance of a crack indication should always be done with the display in the flying dot or phase analysis mode.

2 Maximize the signal from the indication.

3 With the display set to the flying dot mode, observe the signal characteristics of the indication.

a A crack will follow the same phase direction as a crack would in a surface inspection for the material being inspected, up and to the left for aluminum and vertical for steel. Semiautomatic inspection indications will have both a positive and negative component although they may not be equal.

b Corrosion will have a response that is very random and will have vertical and horizontal components to the indication. The signal will have the look of a birds nest on the display in the flying dot mode and on the sweep mode will most likely have multiple indications along the sweep base line similar to a noisy hole.

4 Determining the length of a crack.

a Set the display on the scope to Sweep mode.

b With scanner turned on, insert the probe into hole with crack indication.

c Peak the signal from the crack indication.

d If the peak amplitude from the indication is off screen, reduce the gain until the whole indication is visible in the display.

e Move the probe in the hole until the signal from the crack is reduced by 50%.

f Hold the scanner steady while maintaining the signal from the crack at 50%.

g Using a sharp pencil or other fine point marker, lay it on the surface of the part so that the point is at the same level as the surface of the part.

h Slowly move the pencil towards the shaft of the probe as it's rotating and make a mark on the probe shaft even with the surface of the part. Refer to Figure 17.

i If the crack is located common to the near surface, remove the probe and measure from the center of the coil to the center of the mark on the probe shaft. Report this dimension as the length of the crack.

j If the crack is common to an interface or the far edge, continue moving the probe in the hole until the interface or edge is defined or by a reduction in the signal amplitude of the crack indication of 50%.

k Hold the scanner and probe steady in the hole and make another mark on the probe shaft. Refer to Figure 17.

l Remove the probe from the hole and measure the distance from the center of the two marks. Report this dimension as the length of the crack.

(12) Reporting Results

(a) If part disposition has not been specified, contact Cessna Customer Service for disposition. Refer to Introduction for contact information. Make sure to provide the following information:

1 Location of the hole with observed discontinuity.

2 Length of crack in the bore of the hole.

3 If applicable, material layer or layers that are affected.

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4 Discontinuity orientation relative to hole. The 12 O'clock position is typically referred to as up in a hole that is oriented forward to aft or left to right and Forward in a hole that is oriented up and down.

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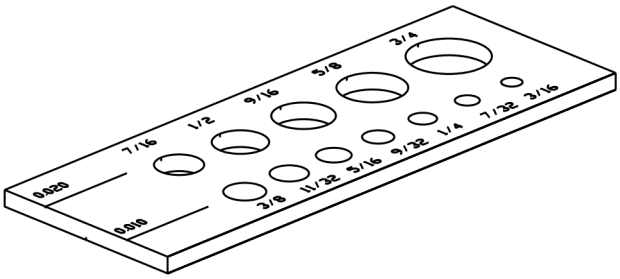

Typical Surface Reference Standard
Figure 3

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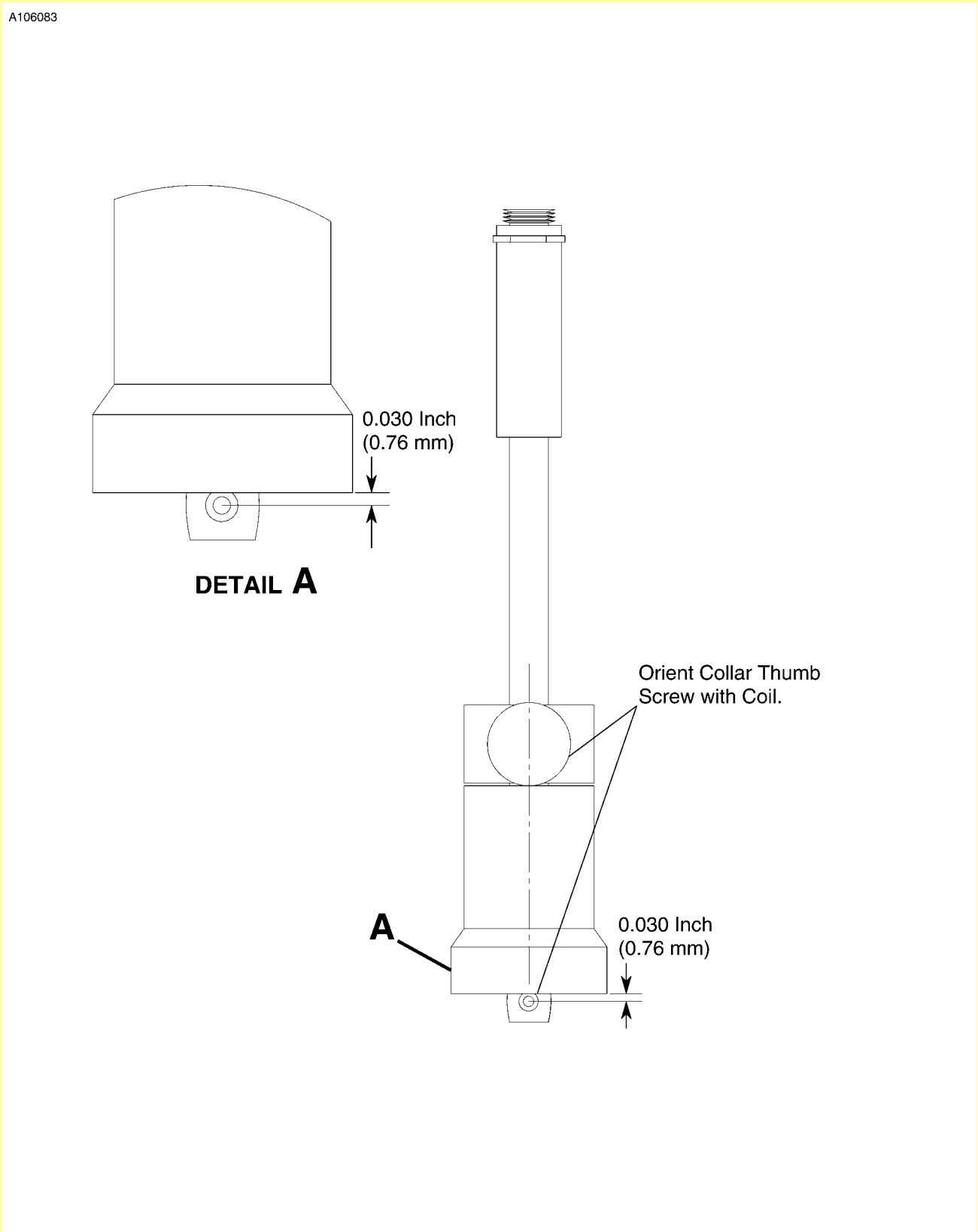

Probe Coil
Figure 4 (Sheet 1)

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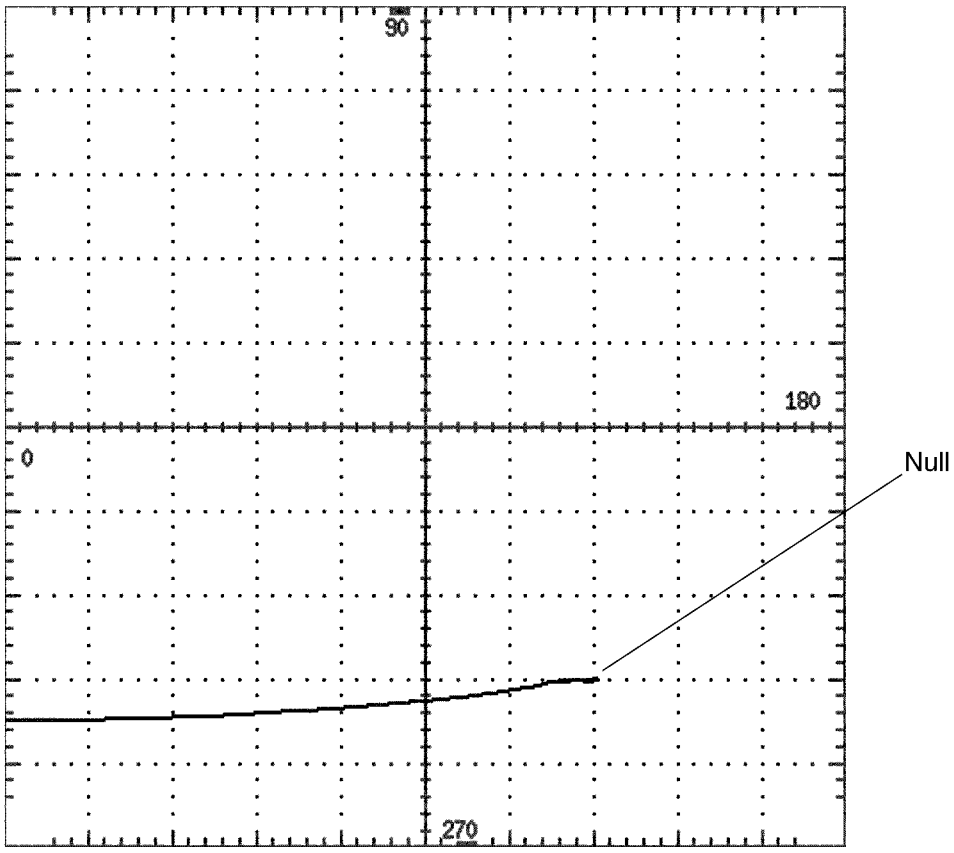
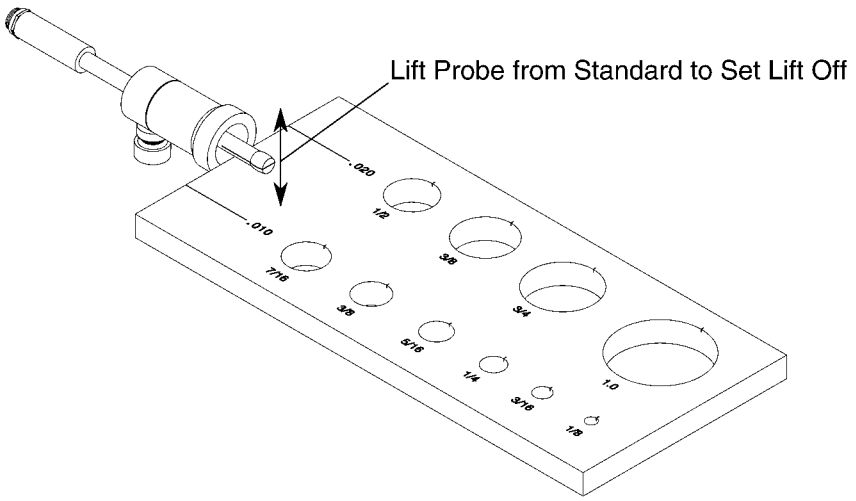
Lift Off display shown for Aluminum.
Display for other materials will be similar



Lift Off Display



List-Off Display
Figure 5 (Sheet 1)

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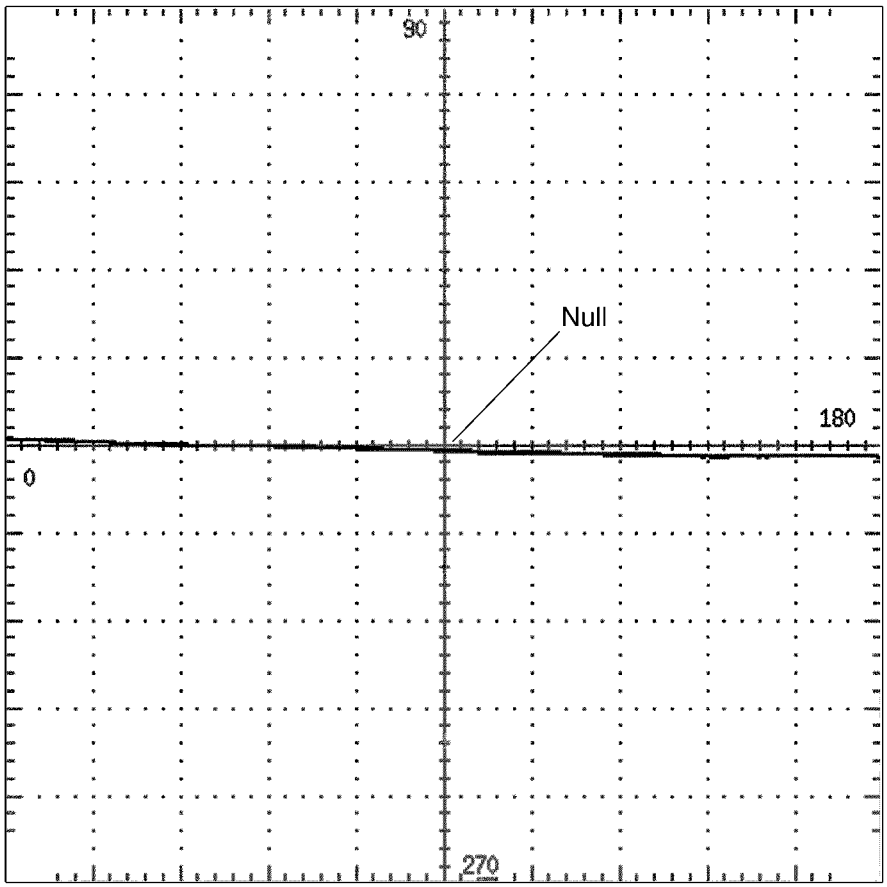
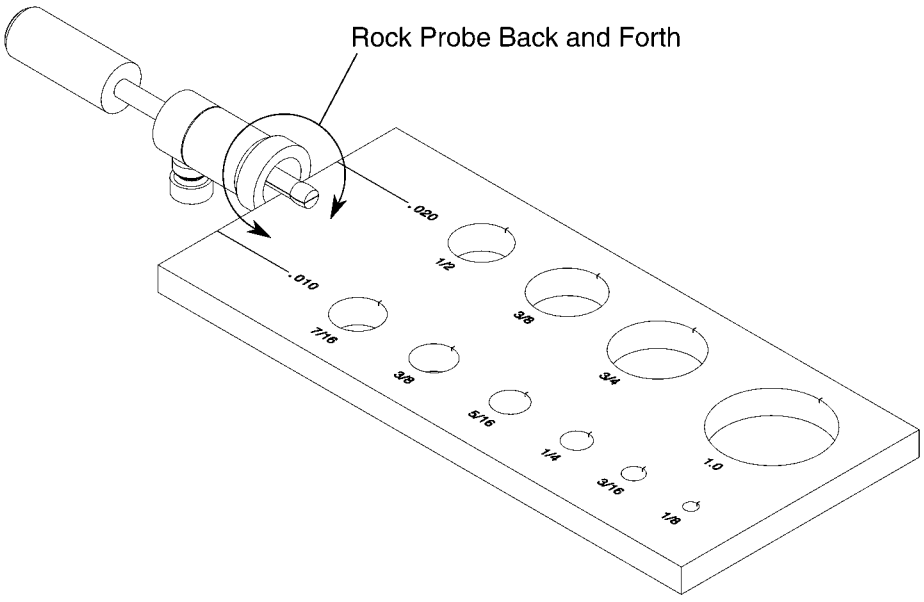


Lift Off Display



Lift-Off Display
Figure 6 (Sheet 1)

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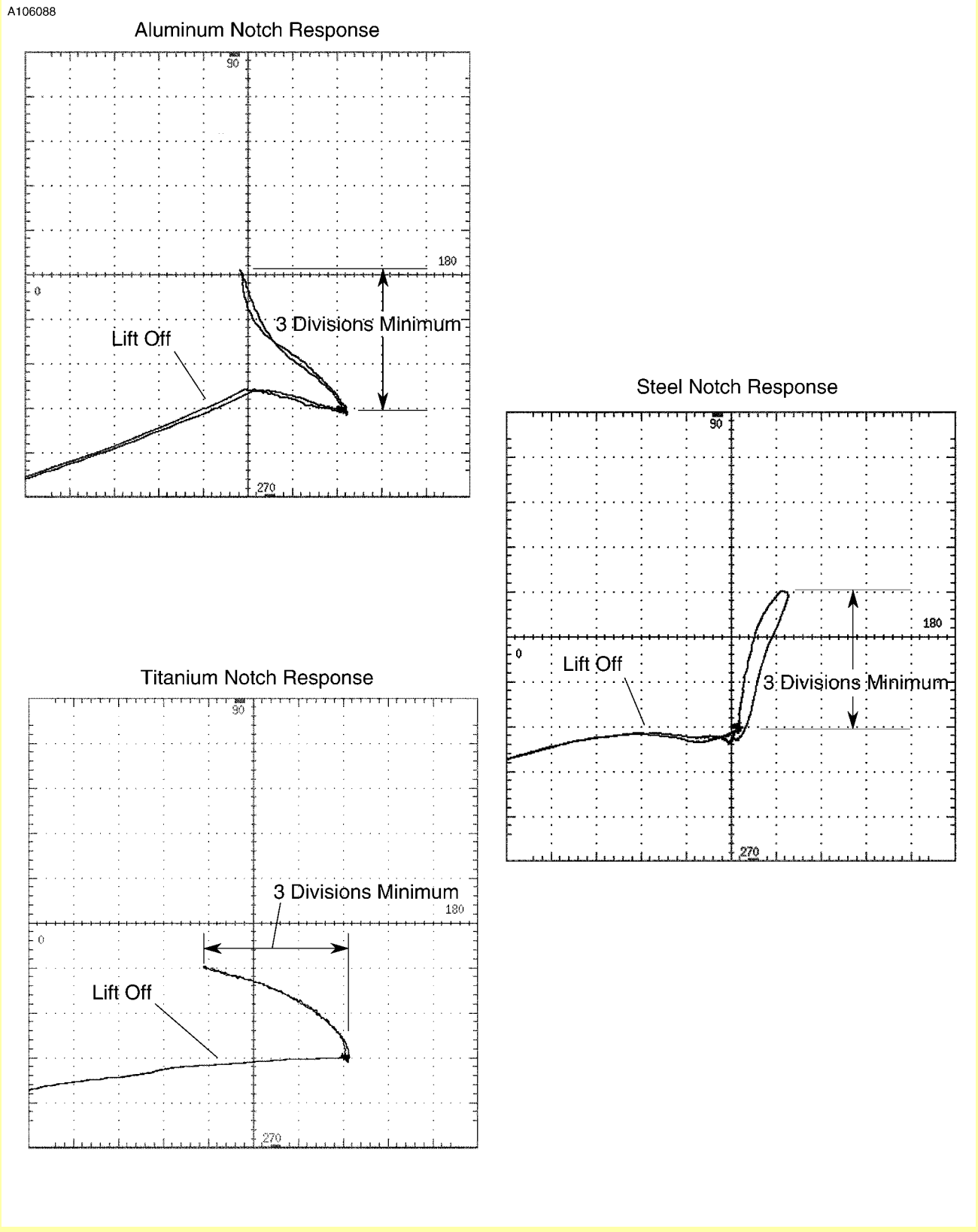

Notch Signal Response
Figure 7 (Sheet 1)

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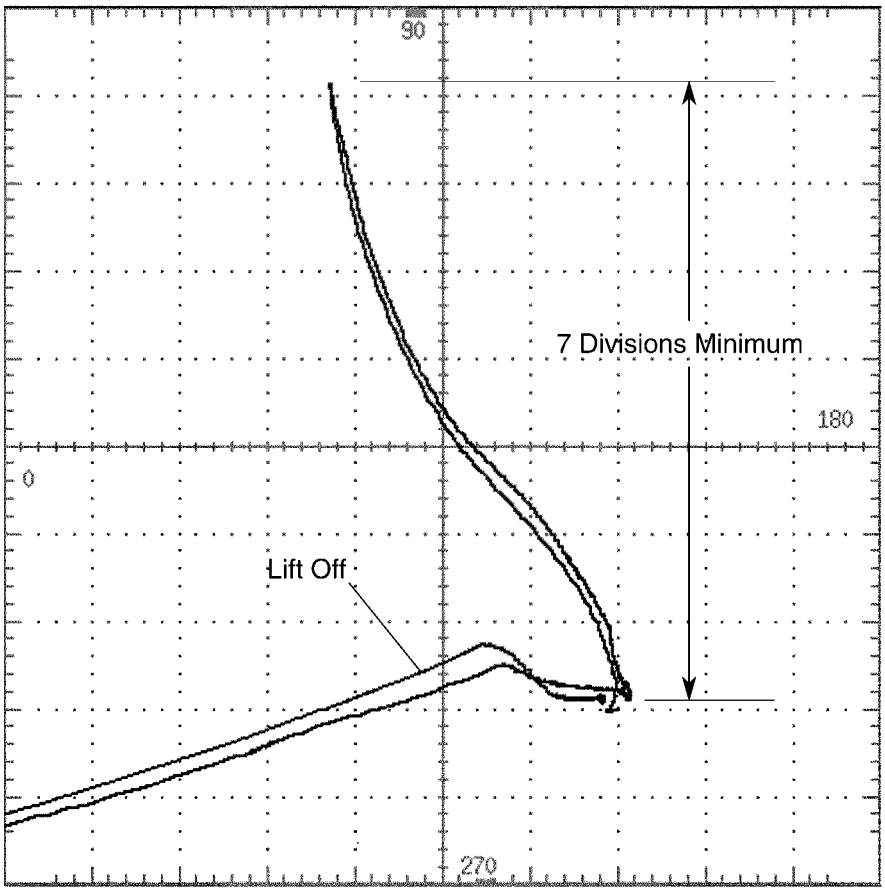
Indication from 0.050 Inch (1.27 mm)
EDM Notch in Aluminum



Notch Signal Response
Figure 8 (Sheet 1)

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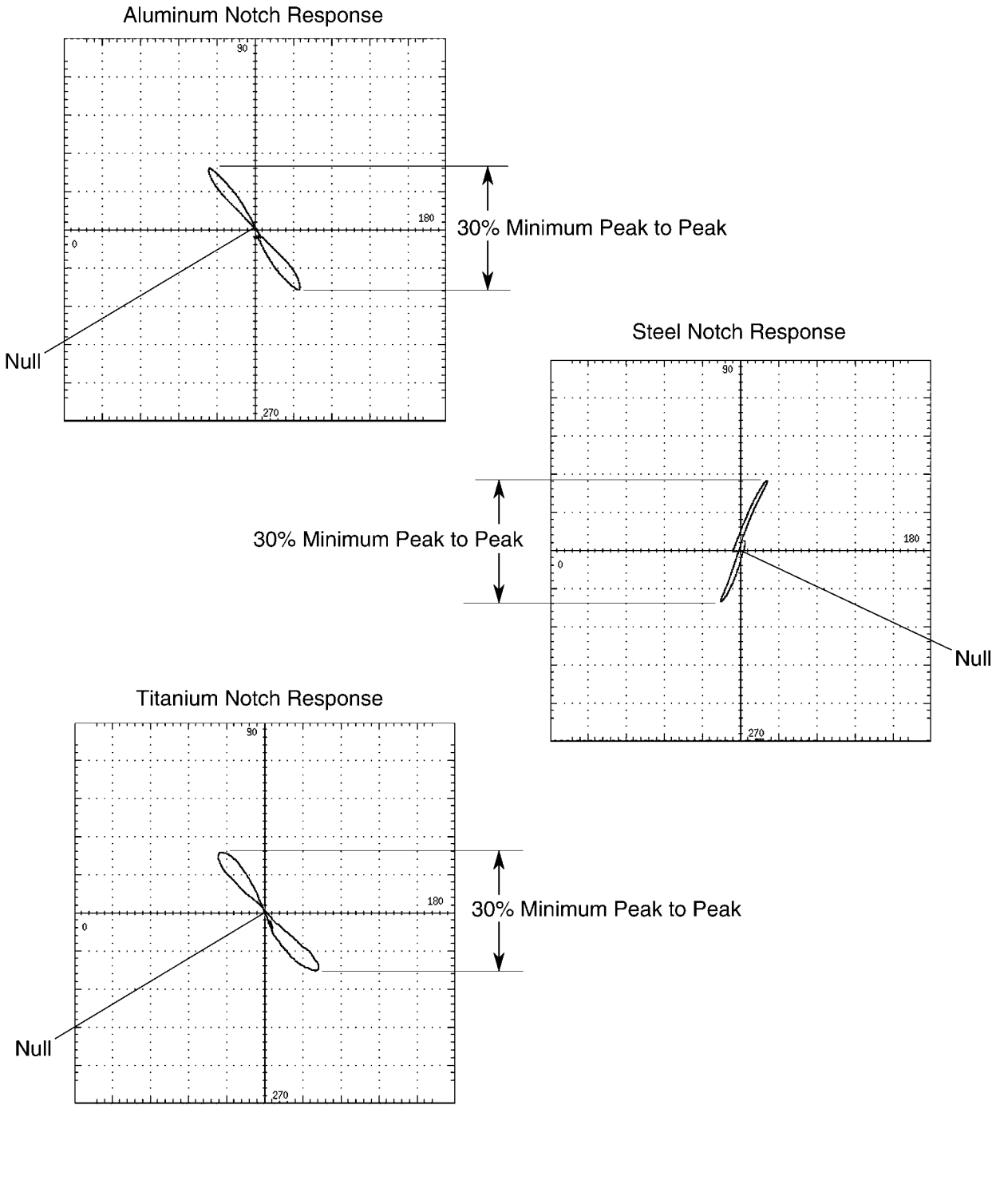

Notch Signal Response
Figure 9 (Sheet 1)

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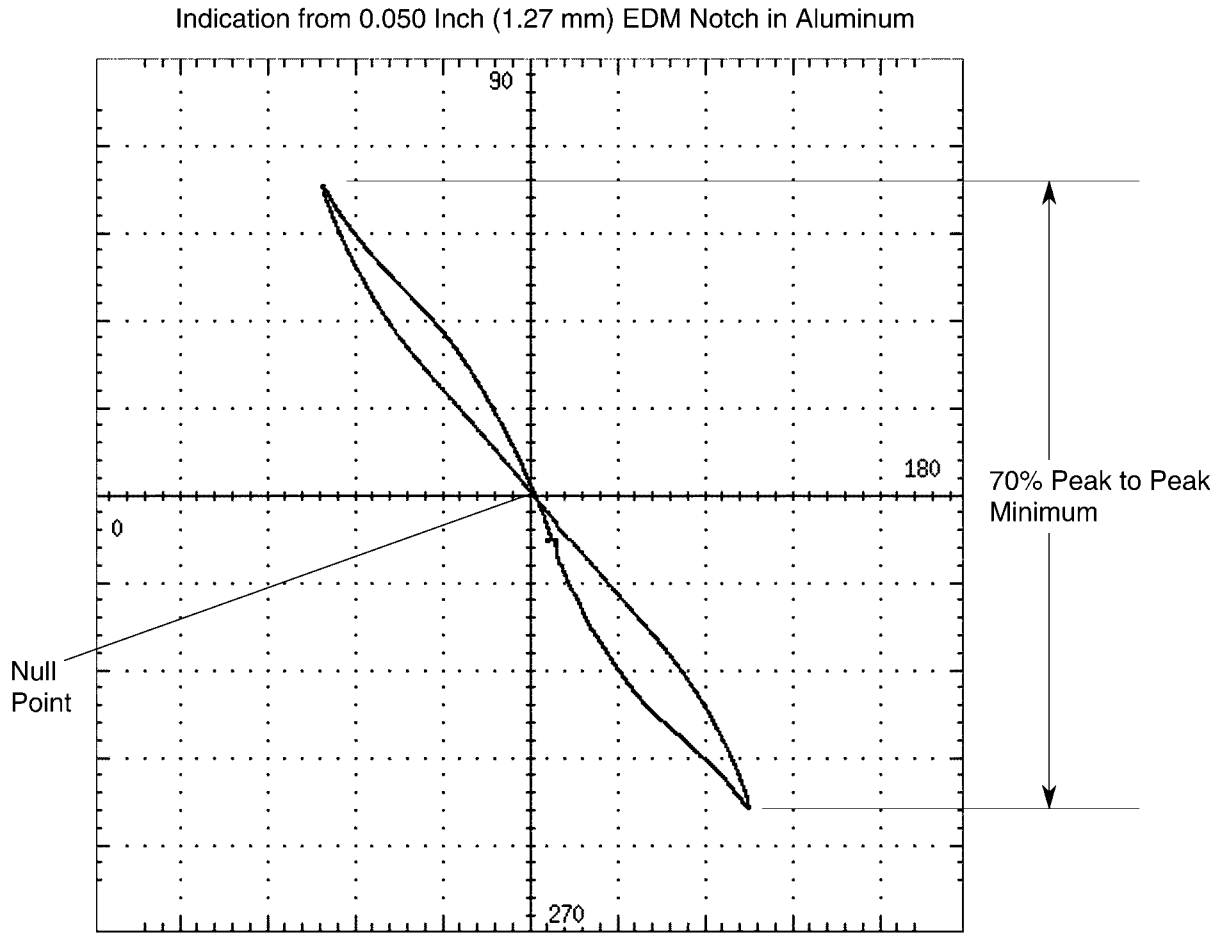

Notch Signal Response
Figure 10 (Sheet 1)

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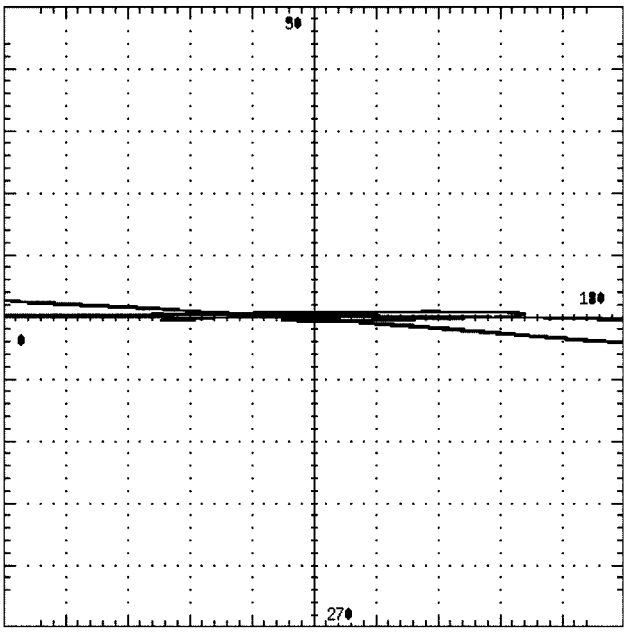
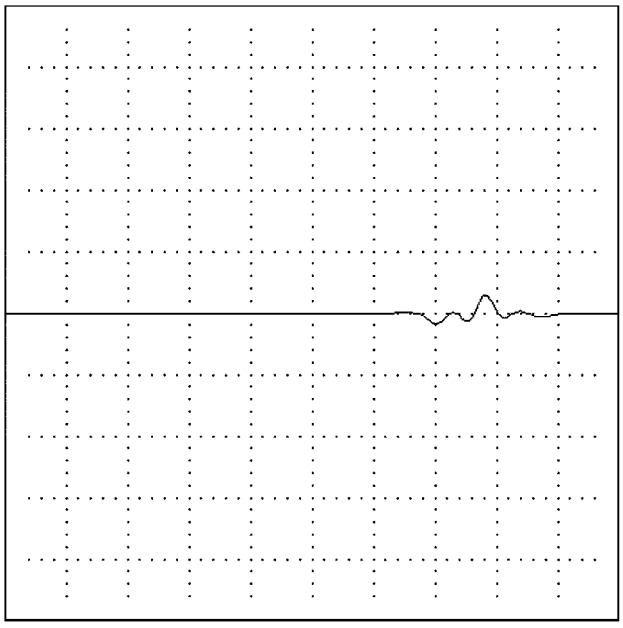
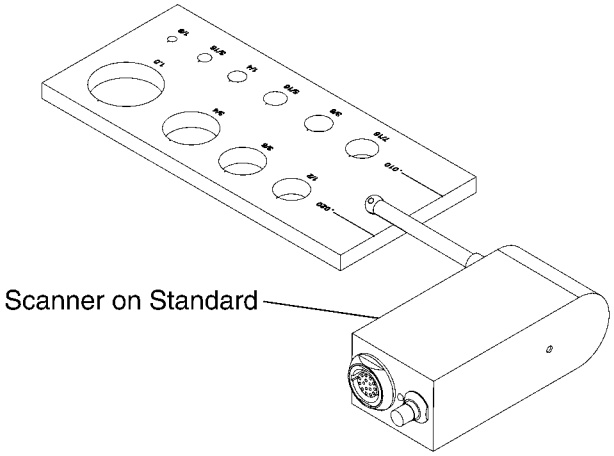
Impedance Plane Display of Lift Off



Sweep Display from Lift Off





Scanner On Reference Standard
Figure 11 (Sheet 1)

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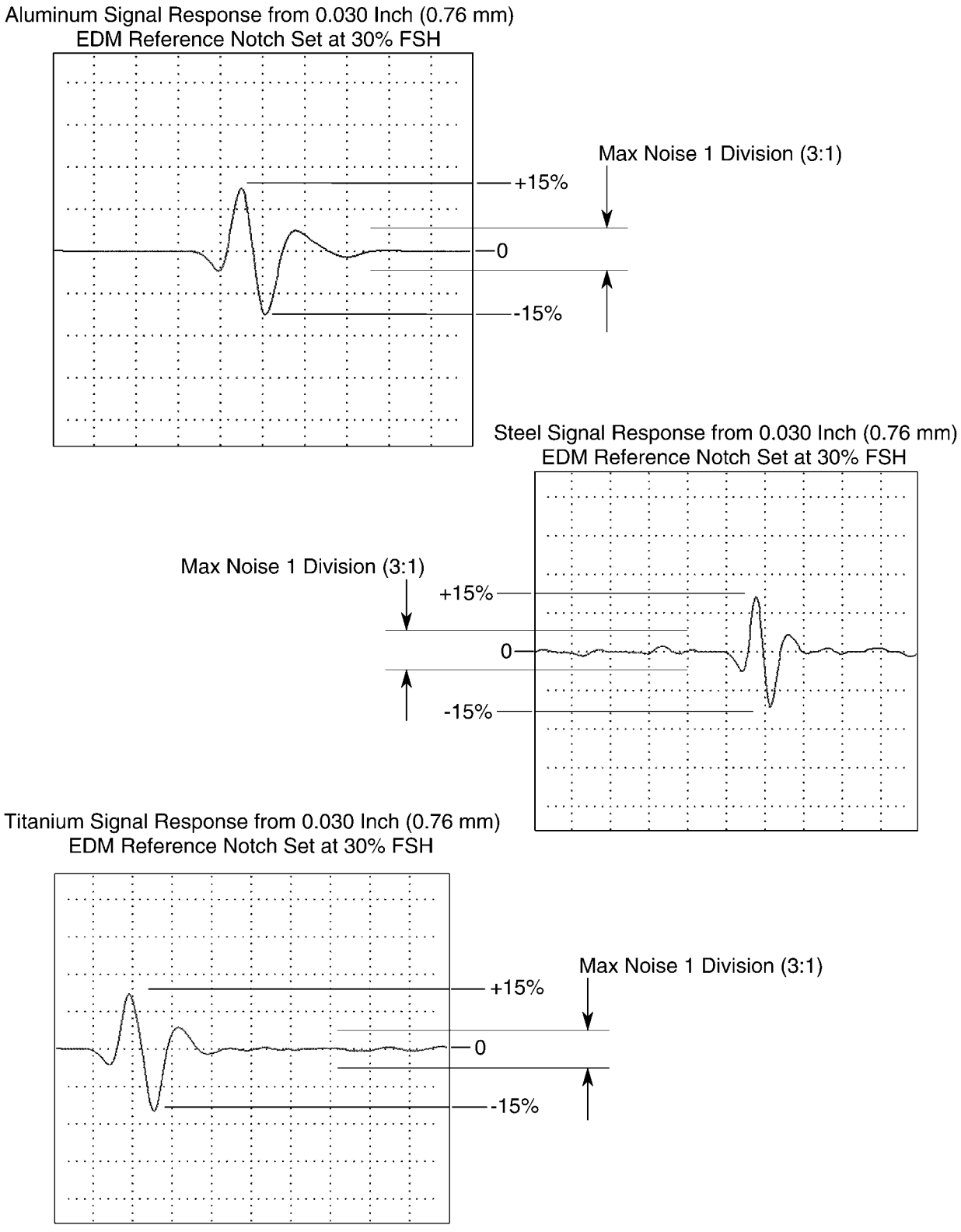

Notch Signal Response
Figure 12 (Sheet 1)

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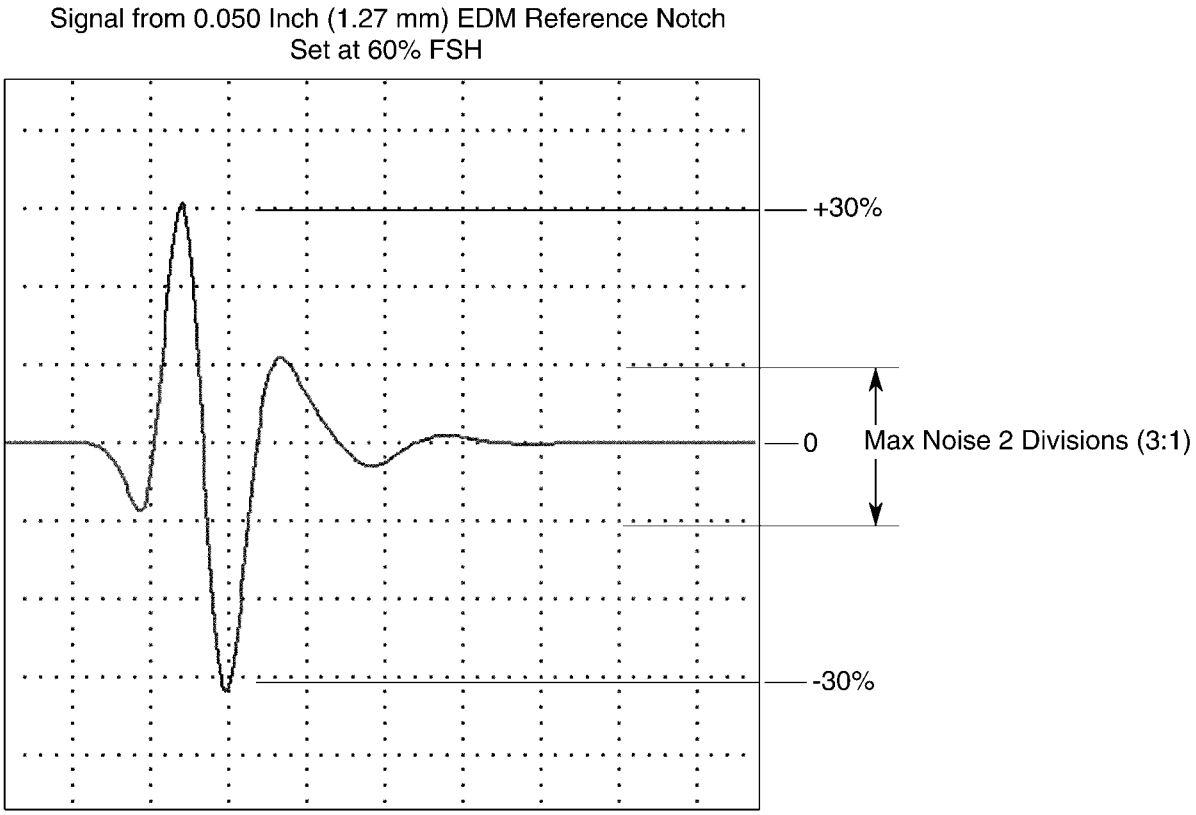

Notch Signal Response
Figure 13 (Sheet 1)

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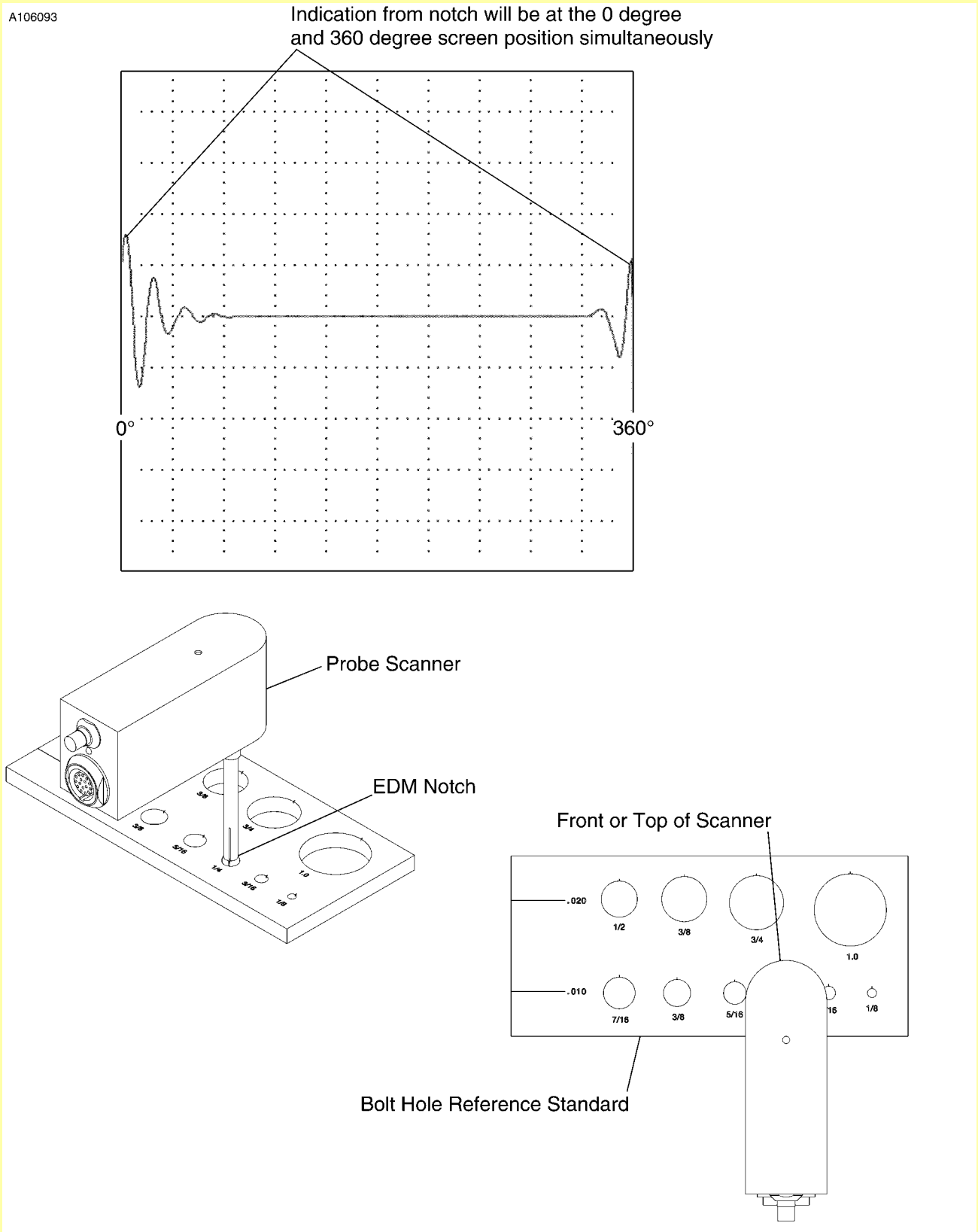

Determining Scanner Position
Figure 14 (Sheet 1)

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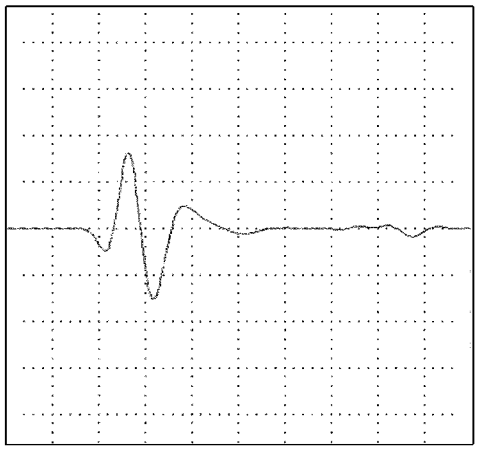
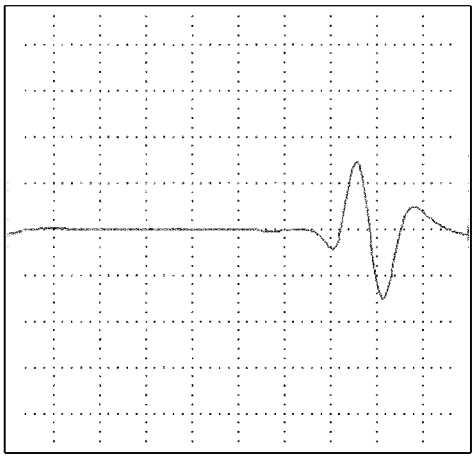
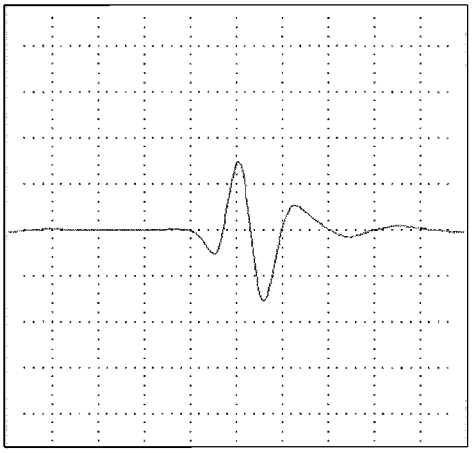


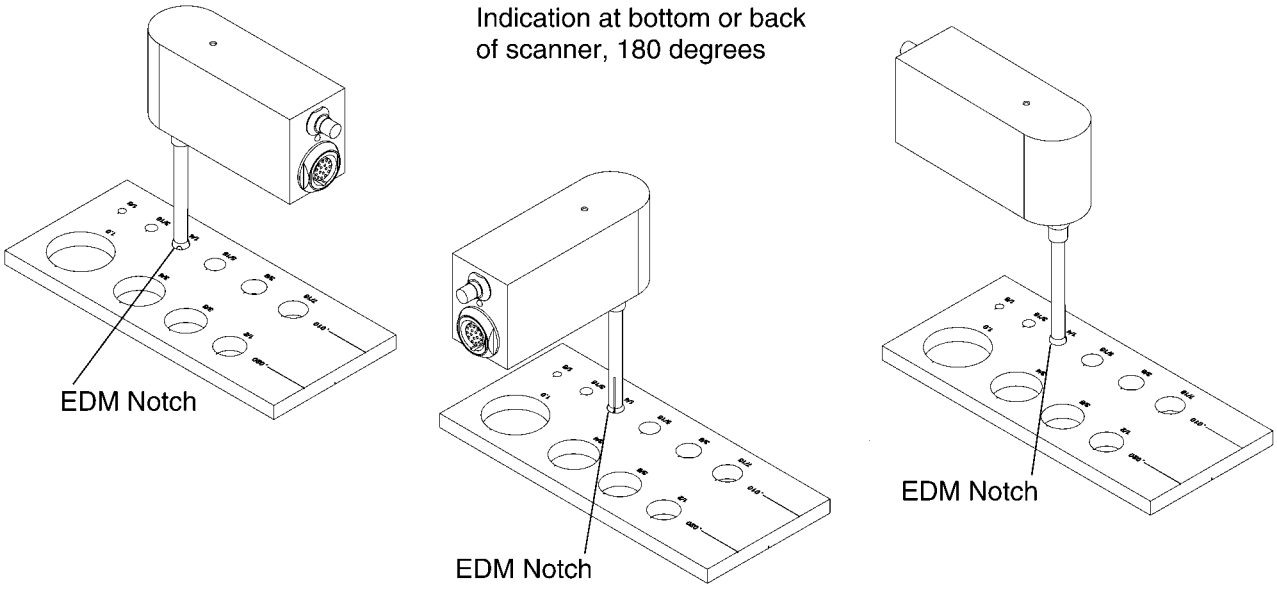
Indication at left side of scanner, 90 degrees



Indication at right side of scanner, 270 degrees



Indication at bottom or back of scanner, 180 degrees



Determining Scanner Position
Figure 15 (Sheet 1)

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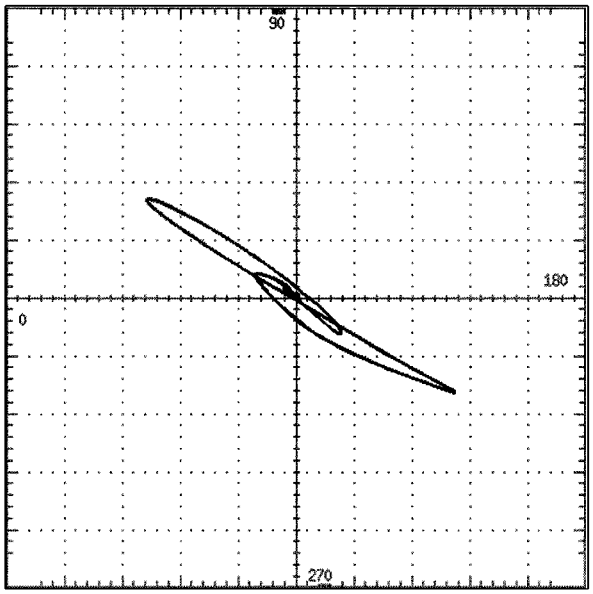
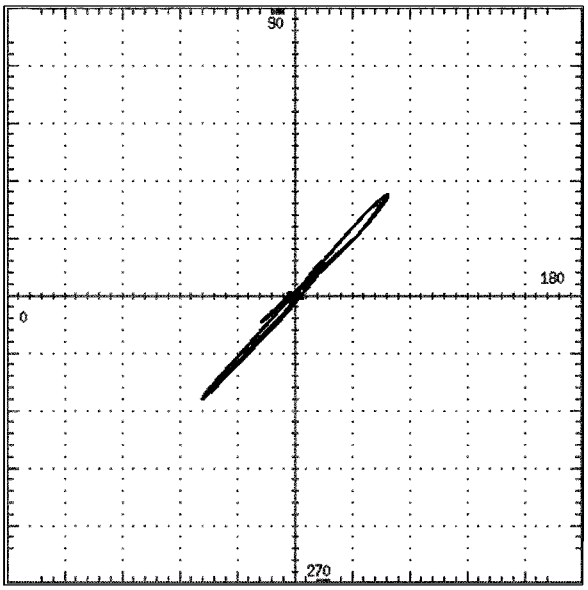
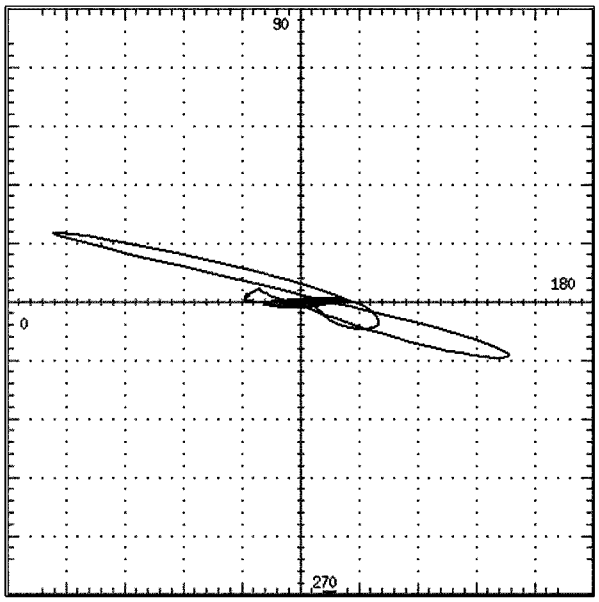
Aluminum at 500KHz



Steel at 500KHz



Titanium at 2MHz



Typical impedance plane responses in common materials from an EDM notch. Crack response would be very similar.

Crack Indications
Figure 16 (Sheet 1)

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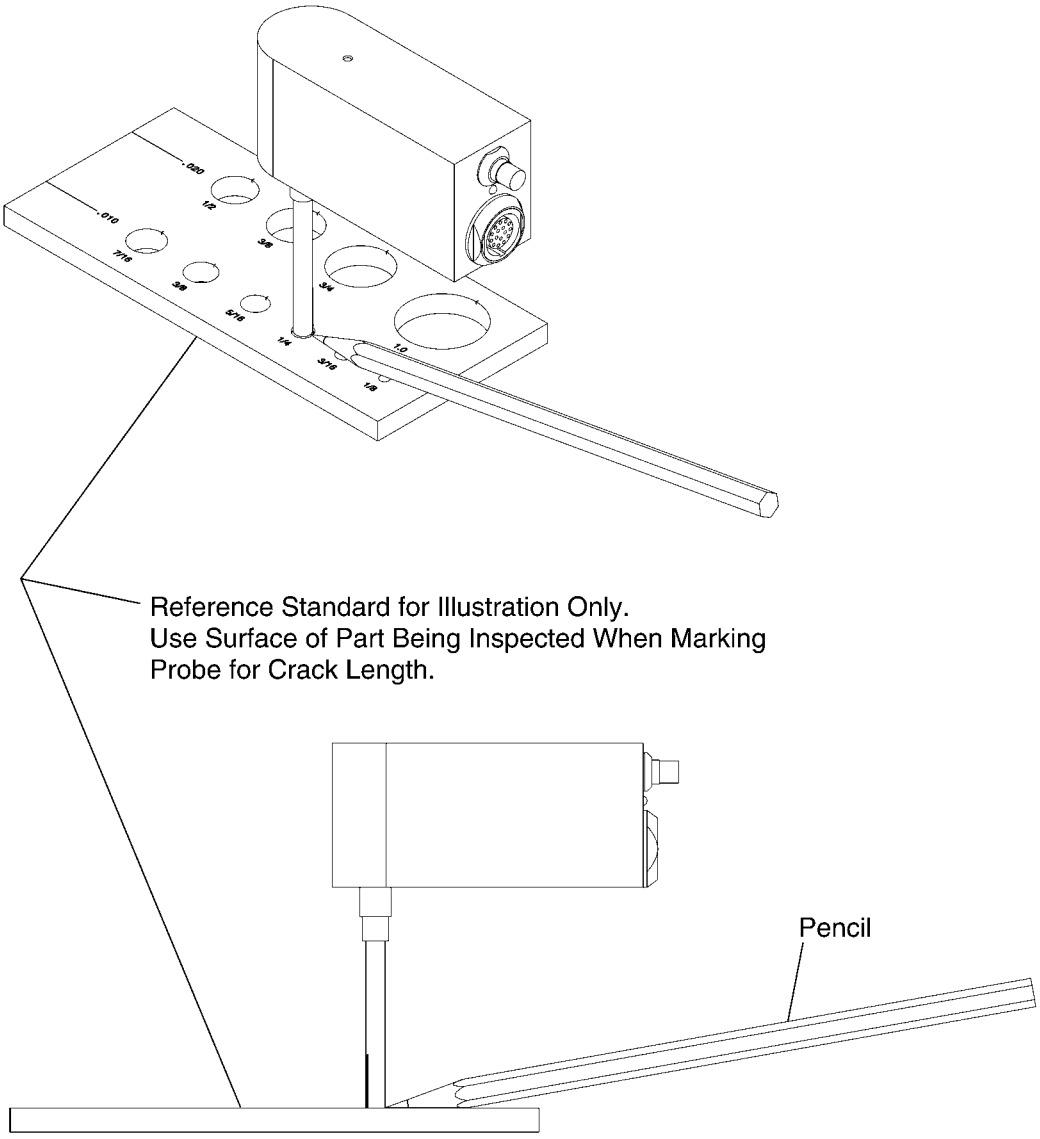

Determining Crack Length
Figure 17 (Sheet 1)

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4. GENERAL FLUORESCENT LIQUID PENETRANT INSPECTION

A. General

(1) Fluorescent penetrant inspection is effective in detecting small cracks or discontinuities open to the surface that may not be evident by normal visual inspection. Penetrant inspection can be used on most airframe parts and assemblies accessible for its application. The inspection is performed by applying a liquid that penetrates into surface discontinuities. The penetrant on the surface is removed and a suitable developer is applied to draw the remaining penetrant from the surface discontinuities. Visual indications are obtained by the fluorescence of the penetrant when exposed to ultraviolet light.

B. Materials and Equipment

(1) General

(a) Fluorescent penetrant is the required inspection method when penetrant inspection is specified in the Supplemental Inspection Document. Fluorescent penetrant inspection has a high sensitivity and the ability to detect small fatigue cracks open to the surface.

(b) The equipment and materials listed in each procedure were those utilized in the development of the inspection technique. Equivalent equipment and materials may be used if they provide equal or better sensitivity.

(2) Materials

(a) Only materials approved for listing on the latest revision to QPL-SAE-AMS-2644; Qualified Products List of Products Qualified Under SAE Aerospace Material Specification AMS 2644 Inspection Materials, Penetrant; or an equivalent shall be used for penetrant inspection. All materials shall be from the same family group. Interchanging or mixing penetrant cleaners, penetrant materials, or developers from different manufacturers is prohibited.

WARNING: Certain components intended for use in liquid oxygen systems must be tested with special penetrants designed as LOX usage penetrant, which is compatible with a liquid oxygen environment. Reaction between such environments and non-liquid oxygen usage penetrant can cause extremely violent explosion or fire.

(b) Penetrant materials are defined by specific classifications per SAE AMS 2644; Inspection Materials, Penetrant; or an equivalent and must meet or exceed the classifications listed below. This list assumes a portable inspection system for use at the airplane.

Type 1	(Fluorescent)
Level 3	(High Sensitivity)
Method C	(Solvent Removable)
Form d	(Nonaqueous Type 1 Fluorescent, Solvent Based)
Class 2	(Non-halogenated Solvent Removers)

(c) Visible dye penetrants (Type 2) shall not be used for inspections on this airplane or its components. This penetrant type has poor sensitivity compared to fluorescent type penetrant. It is extremely difficult to completely clean visible penetrant dyes from surface discontinuities under field conditions. Dye buildup can prevent subsequent penetrant inspections from entering or indicating surface discontintuities.

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CAUTION: Type 2 (visible) penetrants shall not be used for the inspection of aircraft or aircraft components.

NOTE: If Type 2 (visible) penetrant was used for an inspection, penetrant is no longer a valid inspection method for that inspection. Another inspection method must be used.

(3) Lighting Requirements
   (a) Penetrant inspection shall be performed in a darkened environment where the ambient white light intensity does not exceed two foot candles.
   (b) Ultraviolet lights used for penetrant inspection shall operate at a wavelength in the range of 320 – 380 nanometers. Light intensity shall be at least 1200 microwatts per square centimeter at the part surface or 1000 microwatts per square centimeter at a distance of 15 inches. Ultraviolet lights shall be energized for at least 10 minutes before use.
   (c) The ultraviolet light and the ambient light intensities shall be measured with a calibrated light meter prior to each inspection.

C. Inspection
(1) General
   (a) Fluorescent penetrant shall be accomplished in accordance with the procedures contained or referenced in the Supplemental Inspection Document. ASTM E1417, Standard Practice for Liquid Penetrant Examination, or an equivalent shall be consulted for the general requirements for penetrant inspection. In the event of a conflict between the text of the Supplemental Inspection Document and ASTM E1417, the text of the Supplemental Inspection Document shall take precedence.
   (b) Paint removal from the inspection area is required to allow penetration into surface discontinuities. In addition, the inspection area must be clean, dry, and free of dirt, grease, oil, paint or any contaminates which would interfere with the liquid penetrant inspection. Cleaning and paint removal methods selected for a particular component shall be consistent with the contaminants to be removed and shall not be detrimental to the component or its intended function.

NOTE: All cleaning materials must be approved for use by the appropriate Cessna Aircraft Maintenance Manual or Component Maintenance Manual.

NOTE: Mechanical methods of cleaning and paint removal should be avoided where practical. Take care when using mechanical methods of cleaning and paint removal to avoid filling in or sealing the entrance to a surface discontinuity. Penetrant inspection cannot show discontinuities that are not open at the surface.

CAUTION: Halogenated solvents shall not be used on titanium or high nickel alloy materials.

   (c) Throughout the penetrant inspection process, the materials, equipment, and area to be inspected shall maintain a temperature within the range of 40 – 120 degrees Fahrenheit.
(2) Penetrant Application
   (a) Completely cover the inspection area with the penetrant. Allow penetrant to remain on the area (dwell) for a minimum of 15 minutes for temperatures above 50 degrees Fahrenheit or 25 minutes for temperatures under 50 degrees Fahrenheit. Maximum dwell times should not exceed one hour except under special circumstances.

NOTE: If penetrant is allowed to dry on the inspection surface, it shall be completely removed and the cleaning and inspection reaccomplished.

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(3) Penetrant Removal
(a) Initially, remove the penetrant by wiping with a clean dry lint free cloth. Then remove the remaining penetrant using a clean lint free cloth dampened with the penetrant cleaner. Examine the inspection area with the ultraviolet light to ensure removal of the surface penetrant. This process is complete when all the excess surface penetrant has been removed from the area.

NOTE: Do not flush the surface or saturate the cloth with the penetrant cleaner. This may remove penetrant from smaller discontinuities, preventing their detection.

(4) Developer Application
(a) Inspection shall occur after a minimum dwell time of 10 minutes, but not after a maximum dwell time of four hours.
(b) The best result is obtained by applying the developer to achieve the minimum coating thickness possible. The coating should be slightly translucent with the color of the inspection area visible through the developer.
(5) Interpretation
(a) Personnel shall not wear light-sensitive (photochromatic) lenses during the evaluation process.
(b) Personnel shall allow a minimum of three minutes for dark adaptation of the eyes prior to evaluating inspections.

5. GENERAL MAGNETIC PARTICLE INSPECTION

A. General
(1) Magnetic particle inspection is a nondestructive inspection method for revealing surface and near surface discontinuities in parts made of magnetic materials. Alloys that contain a high percentage of iron and can be magnetized make up the ferromagnetic class of metals. The magnetic particle inspection method consists of three basic operations:
(a) Establishment of a suitable magnetic field.
(b) Application of magnetic particles.
(c) Examination and evaluation of the particle accumulations.
(2) Electrical current is used to create or induce magnetic fields into the material. The direction of the magnetic field can be altered and is controlled by the direction of the magnetizing current. When a magnetic field within a part is interrupted by a discontinuity, some of the field is forced out into the air above the discontinuity. The presence of a discontinuity is detected by the application of finely divided fluorescent ferromagnetic particles to the surface of the part. Some of the particles will be gathered and held by the leakage field. The magnetically held collection of particles forms an outline of the discontinuity and indicates its location, size and shape.

B. Materials and Equipment
(1) Fluorescent magnetic particle inspection has a high sensitivity and the ability to detect small fatigue cracks. Visible dry magnetic particles do not have the required sensitivity.

CAUTION: Visible dry magnetic particles shall not be used for inspection of aircraft or components.

(2) The equipment and materials listed in each procedure were those utilized in the development of the inspection technique. Equivalent equipment and materials may be used if they provide equal or better sensitivity.
(3) Magnetic particle inspection shall be accomplished in accordance with the procedures contained or referenced in the Supplemental Inspection Document. ASTM E1444, Standard Practice for Magnetic Particle Examination, and ASTM E709, Standard Guide for Magnetic Particle Examination, or equivalents shall be consulted for general requirements of magnetic particle inspection. In the event of a conflict between the text of the Supplemental Inspection Document and ASTM E1444 or ASTM E709, the text of the Supplemental Inspection Document shall take precedence.

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(4) Permanent magnets shall not be used, as the intensity of the magnetic field can not be altered to suit inspection conditions.

CAUTION: Permanent magnets shall not be used for inspection of aircraft or components.

(5) Contact prods shall not be used due to concerns with localized heating of the surface and arcing of the electrical current.

CAUTION: Contact prods shall not be used for inspection of aircraft or components.

C. Quality Control
(1) Quality control of magnetic particle materials and equipment shall be accomplished per ASTM E1444, ASTM E709, or equivalent document. This section assumes the use of a portable magnetic particle system for use on an aircraft (electromagnetic yoke, spray can type magnetic particles, and portable ultraviolet light).
(2) Dead Weight Check
(a) The electromagnetic yoke shall demonstrate the ability to lift 10 pounds with a leg spacing of two to four inches while operating on AC current. It shall demonstrate the ability to lift either 30 pounds with a leg spacing of two to four inches or 50 pounds with a leg spacing of four to six inches while operating on DC current.
(3) Lighting Requirements
(a) Magnetic particle inspection shall be performed in a darkened environment where the ambient white light intensity does not exceed two foot candles.
(b) Ultraviolet lights used for magnetic particle inspection shall operate at a wavelength in the range of 320 – 380 nanometers. Light intensity shall be at least 1000 microwatts per square centimeter. Ultraviolet lights shall be energized for at least 10 minutes before use.
(c) The ultraviolet light and ambient light intensities shall be measured with a calibrated light meter prior to each inspection.

D. Inspection
(1) Magnetic particle inspection shall be accomplished per ASTM E1444, ASTM E709, or equivalent document. This section assumes the use of a portable magnetic particle system for use on an airplane (electromagnetic yoke, spray can type magnetic particles, and portable ultraviolet light).
(2) Magnetic particle inspection can be accomplished through thin layers of paint. If the paint is thick enough that it will interfere with the inspection, it shall be removed. Cleaning and paint removal methods selected for a particular component shall be consistent with the contaminants to be removed and shall not be detrimental to the component or its intended function.

NOTE: All cleaning materials must be approved for use by the appropriate Cessna Aircraft Maintenance Manual, Component Maintenance Manual, or Nondestructive Testing Manual.

(3) An adequate magnetic field for inspection shall be tested using a Hall Effect meter, field indicator or equivalent detector. Quality indicators approved in ASTM E1444, ASTM E709 or equivalent documents may be used to determine the presence of an adequate magnetic field.
(4) When possible, the preferred method of particle application is the continuous method.
(5) A minimum three minute dark adaptation time is required before evaluating an inspection.
(6) Personnel shall not wear light-sensitive (photochromatic) lenses during the evaluation process.

6. GENERAL RADIOGRAPHY INSPECTION

A. General
(1) Radiographic inspection is a nondestructive inspection method used for the inspection of airframe structure inaccessible or unsatisfactory for the application of other nondestructive test methods. Radiographic inspection will show internal and external structural details of all types

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of parts and materials. The inspection is accomplished by passing radiation through the part or assembly to expose radiographic film. The processed film shows the structural details of the part or assembly by variations in film density.

B. Safety
(1) The use of radiation in nondestructive inspection presents a potential health hazard to operating and adjacent personnel, unless all safety precautions and protective requirements are observed. Information on radiation protection can be found in the Code of Federal Regulations Title 10 Parts 19, 20, and 34.6.1.2.

C. Requirements
(1) Radiographic inspection shall be accomplished in accordance with the procedures contained or referenced in the Supplemental Inspection Document. ASTM E1742, Standard Practice for Radiographic Examination, or equivalent shall be consulted for the general requirements for radiographic inspection. In the event of a conflict between the text of the Supplemental Inspection Document and ASTM E1742, the text of the Supplemental Inspection Document shall take precedence.
(2) The use of radioactive isotopes is not permitted due to the inability to alter the characteristics of the radiation produced.

CAUTION: The use of radioactive isotopes for radiographic inspection is prohibited.

(3) Abbreviations

KV = Kilovoltage

MAM = Milliampere minutes

SFD = Source to Film Distance

MAS = Milliampere seconds

(4) The film used for the radiographic inspection of this airplane shall be at least as sensitive to the discontinuity as the film listed in the Supplemental Inspection Document. Equivalence shall be established by either film manufacturer's documentation or a recognized industry standard.
(5) A densitometer shall be used to determine the density of the radiographic film. It shall be capable of reading film transmission density up to a maximum of 4.0 and have a density unit resolution of at least 0.02. The calibration shall be checked within the last 90 days per ASTM E1079, Standard Practice for Calibration of Transmission Densitometers, or equivalent.

D. Inspection Requirements
(1) Optimum densities are given for each inspection technique contained in this manual; however, densities in the area of interest below 1.5 and above 3.7 are unacceptable for the radiographic examination of this airplane.

NOTE: Settings specified in individual radiograph procedures in this manual were established to provide quality radiographs. It may be necessary to vary the MA, time and KV settings due to differences in equipment, film and method of processing in order to achieve the contrast, sensitivity, and density specified. X-ray equipment is considered acceptable, provided that it produces the quality radiographs specified for the procedures contained in this manual.

(2) When intensifying screens are used, front screens are not permitted. The back screen shall be at least 0.005 inch thick. The preferred screen material is lead. The back screen is not needed if backscatter radiation will not interfere with the inspection. All screens shall be free of cracks, creases, scratches, or foreign material that may interfere with the inspection.

NOTE: Fluorescent-type screens shall not be used unless specifically stated in the inspection technique.

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(3) When Image Quality Indicators (IQI) are specified, they shall be placed toward the edge of the film in a location where they do not interfere with the inspection.
(4) Each film shall be tagged using lead letters or an equivalent for identification. The tag shall be placed toward the edge of the film in a location that does not interfere with the inspection. At a minimum, the tag shall have the following information:
    (a) Inspection company identification
    (b) Aircraft type and serial number
    (c) The inspection being accomplished
    (d) Date inspected
    (e) Specific film location if inspection requires multiple radiographs
(5) After development, film shall be handled in such a way as to avoid damage to the image.

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LISTING OF SUPPLEMENTAL INSPECTIONS

1. Supplemental Inspection Procedures

A. Each of the supplemental inspections listed in this section has the instructions to do each Nondestructive Testing procedure needed.

B. Procedure
(1) Each supplemental inspection is assigned an independent item code in Chapter 5.
(2) The item codes are found in Chapter 5, Inspection Time Limits, section 5-10-01.
(3) The item code contains the subject and a reference to the actual supplemental inspection. These inspections are found in sections that begin with 5-14-XX.
(4) Each 5-14-XX section has the details of the inspection and, if needed, a reference to the nondestructive testing procedure for that inspection in section 5-15-XX.

C. If an airplane has exceeded the inspection limits given, the inspection must be done before September 17, 2006. Inspections in subsequent revisions to the SID shall be accomplished in accordance with the requirements of the revised inspection.

D. Service Information Letters/Service Bulletins
(1) In addition to this maintenance manual, the following service information will be required to complete the SID inspections (5-14-XX and 5-15-XX document sections).

Number	Title	Date	Reference SID Number
ME75-23S1	Main Landing Gear Fork Bolts (AD76-13-07)	08-02-76	32-10-03
ME76-2	Wing Rib Improvement - Main Landing Gear Side Brace	01-05-79	57-10-03
MEB88-5R2	Nose Gear Trunnion Inspection/ Replacement	10-02-00	32-30-07 & 32-30-08
MEB99-6	Engine Exhaust Access Panels Installation	08-02-99	54-10-01
MEB99-7	Engine Beam Inspection and Modification	08-02-99	54-10-01
MEB99-8	Crossfeed Fuel Lines Replacement	08-02-99	54-10-01

(2) The following Service Bulletins and Service Kits are assumed to have been accomplished, as applicable, prior to performing the SID inspections (5-14-XX and 5-15-XX document sections).

Number	Description
ME77-6	Lower Wing Skin/Front Spar Rivets (Effectivity: 310R0001 Thru 310R0836)
ME77-12	Nose Wheel Well Modification (Effectivity: 310R0001 Thru 310R0816)
ME80-11	Main Gear Aft Trunnion Support (Effectivity: 310R1614 Thru 310R1690; 310R1801 Thru 310R1870)
ME84-38	Main Gear Thru Bolt Improvement (Effectivity: 310R0501 Thru 310R2101)
MEB85-10	Main Gear Wheel Thru Bolt Improvement (Effectivity: 310R0501 Thru 310R2101)
MEB88-7	Main Landing Gear Inner Bearing Inspection/Replacement (Effectivity: 310R0001 Thru 310R1690)

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2. Supplemental Inspections

DETAILS FOUND IN SECTION 5-14-XX	SUPPLEMENTAL INSPECTION NUMBER	TITLE	INSPECTION COMPLIANCE (See Note 2 and Note 3) INITIAL	REPEAT	INSPECTION OPERATION	ITEM CODE
5-14-01	27-10-04	Aileron Hinges and Fittings	15,000 Hours or 20 Years	2,500 Hours or 5 Years	21	271012
5-14-02	27-20-03	Rudder Structure	7,500 Hours or 15 Years	2,500 Hours or 5 Years	22	272013
5-14-03	27-20-04	Rudder Torque Tube	7,500 Hours or 15 Years	2,500 Hours or 5 Years	22	272014
5-14-04	27-30-00	Elevator Torque Tube Assembly	5,000 Hours or 10 Years	1,000 Hours or 3 Years	23	272015
5-14-05	32-10-01	Main Landing Gear Torque Tube Assembly (For all main landing gear torque tubes except part numbers 5045010-32, -33)	3,000 Landings or 20 Years	100 Landings or 1 Year	25	321008
5-14-06	32-10-05	Main Landing Gear Torque Tube Assembly (For part numbers 5045010-32, -33 Main Landing Gear Torque Tubes)	10,000 Landings or 20 Years	500 Landings or 4 Years	24	321009
5-14-07	32-10-02	Main Landing Gear Bell Crank Pivot Bolt	1,000 Landings or 3 Years	500 Landings or 3 Years	26	321010
5-14-08	32-10-03	Main Landing Gear Fork Bolts (5/8 inch)	5,000 Landings or 10 Years	5,000 Landings or 10 Years	27	321011
5-14-09	32-10-04	Main Gear Actuator Attach Fitting	12,500 Landings or 20 Years	2,500 Landings or 5 Years	28	321012
5-14-45	32-10-06	Main Landing Gear Torque Tube Life Limit (For all main landing gear torque tubes except part numbers 5045010-32, -33)	4,000 Hours	N/A	50	321016
5-14-10	32-20-00	Nose Gear Fork	15,000 Landings or 20 Years	5,000 Landings or 10 Years	29	322011

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DETAILS FOUND IN SECTION 5-14-XX	SUPPLEMENTAL INSPECTION NUMBER	TITLE	INSPECTION COMPLIANCE (See Note 2 and Note 3) INITIAL	REPEAT	INSPECTION OPERATION	ITEM CODE
5-14-11	32-30-00	Main/Nose Gear Retraction Systems Teardown and Inspection	10,000 Landings or 20 Years	5,000 Landings or 10 Years	30	323014
5-14-12	32-30-07	Nose Gear Trunnion Inspection (1.19 inch lugs)	Per MEB 88-5R2	Per MEB 88-5R2	19	323015
5-14-13	32-30-08	Nose Gear Trunnion Inspection (1.31 inch lugs)	Per MEB 88-5R2	Per MEB 88-5R2	19	323016
5-14-14	52-10-00	Cabin Door Retention	10,000 Hours or 20 Years	5,000 Hours or 10 Years	31	521004
5-14-15	52-20-00	Emergency Exit Window Mechanism Inspection	1,000 Hours or 3 Years	1,000 Hours or 3 Years	32	522001
5-14-16	53-10-03	Horizontal Stabilizer Rear Spar Angle Attachment	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	531001
5-14-17	53-10-04	Window Frame and Surrounding Structure	10,000 Hours or 20 Years	5,000 Hours or 10 Years	34	531002
5-14-18	54-10-00	Engine Support Beams	1,500 Hours or at Engine Overhaul	1,500 Hours or at Engine Overhaul	35	541001
5-14-19	54-10-01	Engine Beam Modification	Per MEB99-7	Per MEB99-7	36	541002
5-14-20	55-10-00	Horizontal Stabilizer Inspection	10,000 Hours or 20 Years	5,000 Hours or 10 Years	31	551002
5-14-21	55-10-01	Horizontal Stabilizer Spars and Attachments	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	551003
5-14-22	55-10-02	Horizontal Stabilizer Forward Spar Upper Cap	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	551004
5-14-23	55-10-03	Horizontal Stabilizer Forward Spar Lower Cap	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	551005
5-14-24	55-10-04	Horizontal Stabilizer Forward Spar Attach	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	551006

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DETAILS FOUND IN SECTION 5-14-XX	SUPPLEMENTAL INSPECTION NUMBER	TITLE	INSPECTION COMPLIANCE (See Note 2 and Note 3) INITIAL	REPEAT	INSPECTION OPERATION	ITEM CODE
5-14-25	55-10-05	Horizontal Stabilizer Rear Spar Lower Cap Attach	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	551007
5-14-26	55-10-06	Horizontal Stabilizer Rear Spar Upper Cap, BL 0.0	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	551008
5-14-27	55-10-07	Horizontal Stabilizer Rear Spar Lower Cap, BL 0.0	15,000 Hours or 20 Years	5,000 Hours or 10 Years	36	551009
5-14-28	55-20-00	Outboard Elevator Hinge Bracket and Attachment	5,000 Hours or 10 Years	1,000 Hours or 3 Years	23	552001
5-14-29	55-20-01	Elevator Hinges and Fittings	15,000 Hours or 20 Years	2,500 Hours or 5 Years	21	552002
5-14-30	55-30-00	Vertical Stabilizer Spars and Attachments	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	553005
5-14-31	55-30-01	Rudder Hinges and Fittings	15,000 Hours or 20 Years	2,500 Hours or 5 Years	21	553003
5-14-32	55-30-02	Vertical Stabilizer Rear Spar Cap Attach	15,000 Hours or 20 Years	5,000 Hours or 10 Years	37	553004
5-14-33	57-10-03	Wing Rib - Main Landing Gear Side Brace	10,000 Hours or 20 Years	5,000 Hours or 10 Years	34	571001
5-14-34	57-10-04	Wing Lower Rear Spar Cap at Splice	5,000 Hours or 10 Years	1,000 Hours or 3 Years	23	571002
5-14-35	57-10-05	Wing Lower Rear Carry-Thru Spar	15,000 Hours or 20 Years	1,000 Hours or 3 Years	38	571003
5-14-36	57-10-06	Wing Main Spar Lower Cap Inspection and Modification	11,000 Hours	(See Note 1)	37	571004
5-14-37	57-10-07	Wing Aft Auxiliary Lower Spar Cap	6,500 Hours or 13 Years	2,500 Hours or 5 Years	39	571005
5-14-38	57-10-08	Lower Carry-Thru Main Spar Cap (P/N 0811300-3)	11,000 Hours	400 Hours	51	571006

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DETAILS FOUND IN SECTION 5-14-XX	SUPPLEMENTAL INSPECTION NUMBER	TITLE	INSPECTION COMPLIANCE (See Note 2 and Note 3) INITIAL	REPEAT	INSPECTION OPERATION	ITEM CODE
5-14-39	57-10-09	Wing Lower Front Spar Cap at Root Fitting Attach, WS 28.96	11,000 Hours or 20 Years	4,000 Hours or 8 Years	40	571007
5-14-40	57-10-10	Wing Lower Front Spar Cap at Root Fitting Attach, WS 36.36	11,000 Hours or 20 Years	2,000 Hours or 4 Years	41	571008
5-14-41	57-10-11	Lower Forward Auxiliary Spar Cap	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	571009
5-14-42	57-10-12	Wing Front Spar Lug Inspection	15,000 Hours or 20 Years	2,500 Hours or 10 Years	42	571010
5-14-43	57-10-13	Wing Tip Tank Attachment Inspection	15,000 Hours or 20 Years	2,500 Hours or 10 Years	42	571011
5-14-44	57-10-28	Wing Upper Center Skin Panel Inspection	2,500 Hours or 10 Years	200 Hours or 2 Years	49	571012
5-14-46	57-10-29	Lower Carry-Thru Main Spar Cap (P/N 0811300-78)	15,000 Hours	800 Hours	51	571013

NOTE 1: Refer to 5-14-33, Supplemental Inspection Number 57-10-06, for repeat inspection information.

NOTE 2: Except for Section 57-10-06, Supplemental Inspection 57-10-06, corresponding calendar inspection times are per Figure 1. Inspections should be accomplished at hours or calendar time specified, whichever occurs first. After the completion of each initial SID inspection, repeat inspections may be completed, based on hour time if the Corrosion Prevention and Control Program (CPCP) in Section 5-30-01 is included in the airplane maintenance program.

NOTE 3: If the number of landings is unknown, assume two landings are made for each flight hour.

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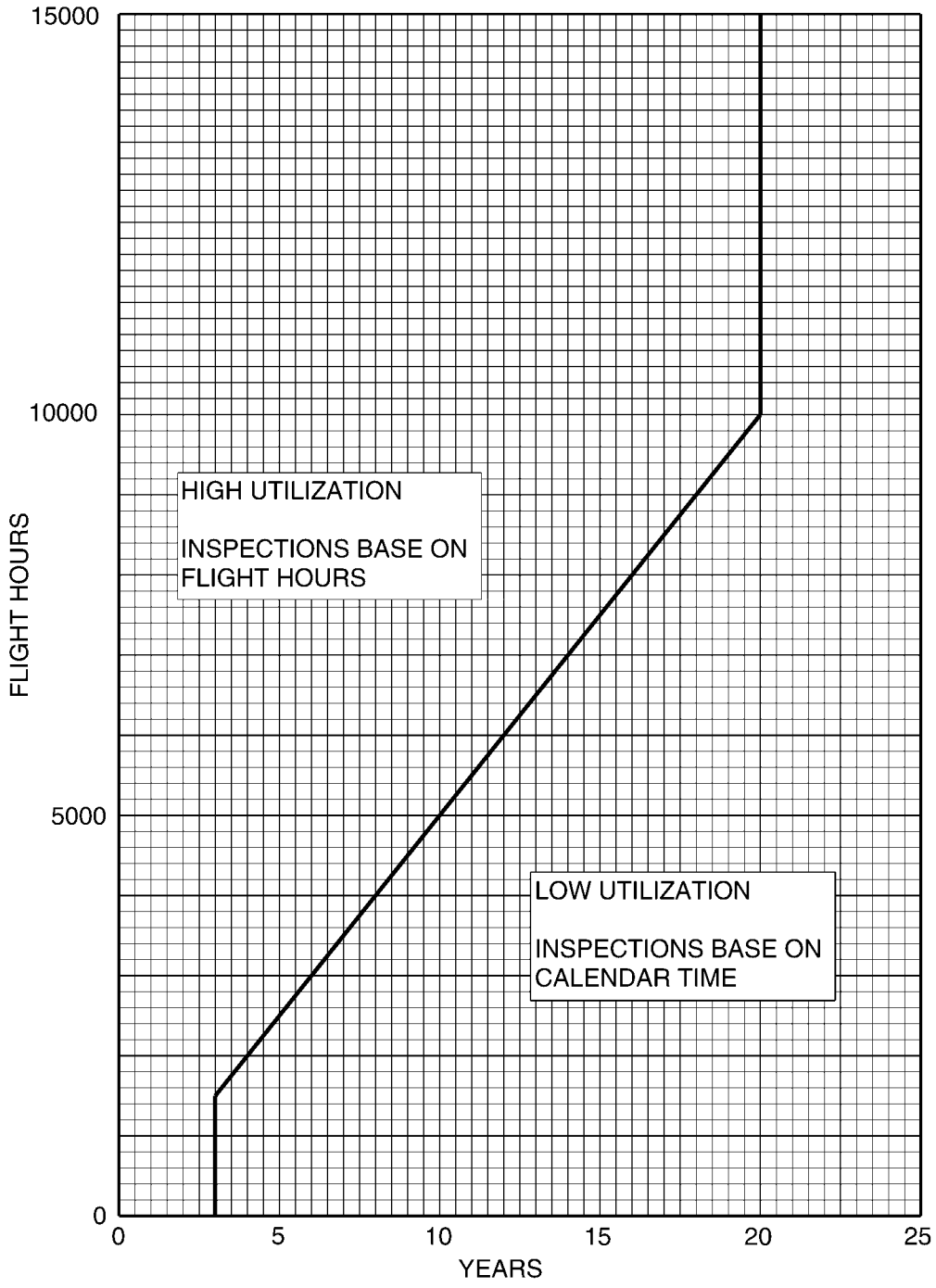

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Inspection Requirements - Hours to Years Equivalence
Figure 1

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LISTING OF SUPPLEMENTAL INSPECTIONS

1. Supplemental Inspection Procedures

A. Each of the supplemental inspections listed in this section has the instructions to do each Nondestructive Testing procedure needed.

B. Procedure
   (1) Each supplemental inspection is assigned an independent item code in Chapter 5.
   (2) The item codes are found in Chapter 5, Inspection Time Limits, section 5-10-01.
   (3) The item code contains the subject and a reference to the actual supplemental inspection. These inspections are found in sections that begin with 5-14-XX.
   (4) Each 5-14-XX section has the details of the inspection and, if needed, a reference to the nondestructive testing procedure for that inspection in section 5-15-XX.

C. If an airplane has exceeded the inspection limits given, the inspection must be done before September 17, 2006. Inspections in subsequent revisions to the SID shall be accomplished in accordance with the requirements of the revised inspection.

D. Service Information Letters/Service Bulletins
   (1) In addition to this maintenance manual, the following service information will be required to complete the SID inspections (5-14-XX and 5-15-XX document sections).

Number	Title	Date	Reference SID Number
ME75-23S1	Main Landing Gear Fork Bolts (AD76-13-07)	08-02-76	32-10-03
ME76-2	Wing Rib Improvement - Main Landing Gear Side Brace	01-05-79	57-10-03
MEB88-5R2	Nose Gear Trunnion Inspection/ Replacement	10-02-00	32-30-07 & 32-30-08
MEB99-6	Engine Exhaust Access Panels Installation	08-02-99	54-10-01
MEB99-7	Engine Beam Inspection and Modification	08-02-99	54-10-01
MEB99-8	Crossfeed Fuel Lines Replacement	08-02-99	54-10-01

   (2) The following Service Bulletins and Service Kits are assumed to have been accomplished, as applicable, prior to performing the SID inspections (5-14-XX and 5-15-XX document sections).

Number	Description
ME77-6	Lower Wing Skin/Front Spar Rivets (Effectivity: 310R0001 Thru 310R0836)
ME77-12	Nose Wheel Well Modification (Effectivity: 310R0001 Thru 310R0816)
ME80-11	Main Gear Aft Trunnion Support (Effectivity: 310R1614 Thru 310R1690; 310R1801 Thru 310R1870)
ME84-38	Main Gear Thru Bolt Improvement (Effectivity: 310R0501 Thru 310R2101)
MEB85-10	Main Gear Wheel Thru Bolt Improvement (Effectivity: 310R0501 Thru 310R2101)
MEB88-7	Main Landing Gear Inner Bearing Inspection/Replacement (Effectivity: 310R0001 Thru 310R1690)

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2. Supplemental Inspections

DETAILS FOUND IN SECTION 5-14-XX	SUPPLEMENTAL INSPECTION NUMBER	TITLE	INSPECTION COMPLIANCE (See Note 2 and Note 3) INITIAL	REPEAT	INSPECTION OPERATION	ITEM CODE
5-14-01	27-10-04	Aileron Hinges and Fittings	15,000 Hours or 20 Years	2,500 Hours or 5 Years	21	271012
5-14-02	27-20-03	Rudder Structure	7,500 Hours or 15 Years	2,500 Hours or 5 Years	22	272013
5-14-03	27-20-04	Rudder Torque Tube	7,500 Hours or 15 Years	2,500 Hours or 5 Years	22	272014
5-14-04	27-30-00	Elevator Torque Tube Assembly	5,000 Hours or 10 Years	1,000 Hours or 3 Years	23	272015
5-14-05	32-10-01	Main Landing Gear Torque Tube Assembly (For all main landing gear torque tubes except part numbers 5045010-32, -33)	4,000 Landings or 8 Years (See Note 4)	1,000 Landings or 3 Years (See Note 4)	25	321008
5-14-06	32-10-05	Main Landing Gear Torque Tube Assembly (For part number 5045010-32, -33 Main Landing Gear Torque Tubes)	10,000 Landings or 20 Years (See Note 4)	2,000 Landings or 4 Years (See Note 4)	24	321009
5-14-07	32-10-02	Main Landing Gear Bell Crank Pivot Bolt	1,000 Landings or 3 Years	500 Landings or 3 Years	26	321010
5-14-08	32-10-03	Main Landing Gear Fork Bolts (5/8 inch)	5,000 Landings or 10 Years	5,000 Landings or 10 Years	27	321011
5-14-09	32-10-04	Main Gear Actuator Attach Fitting	12,500 Landings or 20 Years	2,500 Landings or 5 Years	28	321012
5-14-10	32-20-00	Nose Gear Fork	15,000 Landings or 20 Years	5,000 Landings or 10 Years	29	322011
5-14-11	32-30-00	Main/Nose Gear Retraction Systems Teardown and Inspection	10,000 Landings or 20 Years	5,000 Landings or 10 Years	30	323014
5-14-12	32-30-07	Nose Gear Trunnion Inspection (1.19 inch lugs)	Per MEB 88-5R2	Per MEB 88-5R2	19	323015

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DETAILS FOUND IN SECTION 5-14-XX	SUPPLEMENTAL INSPECTION NUMBER	TITLE	INSPECTION COMPLIANCE (See Note 2 and Note 3)		INSPECTION OPERATION	ITEM CODE
			INITIAL	REPEAT		
5-14-13	32-30-08	Nose Gear Trunnion Inspection (1.31 inch lugs)	Per MEB 88-5R2	Per MEB 88-5R2	19	323016
5-14-14	52-10-00	Cabin Door Retention	10,000 Hours or 20 Years	5,000 Hours or 10 Years	31	521004
5-14-15	52-20-00	Emergency Exit Window Mechanism Inspection	1,000 Hours or 3 Years	1,000 Hours or 3 Years	32	522001
5-14-16	53-10-03	Horizontal Stabilizer Rear Spar Angle Attachment	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	531001
5-14-17	53-10-04	Window Frame and Surrounding Structure	10,000 Hours or 20 Years	5,000 Hours or 10 Years	34	531002
5-14-18	54-10-00	Engine Support Beams	1,500 Hours or at Engine Overhaul	1,500 Hours or at Engine Overhaul	35	541001
5-14-19	54-10-01	Engine Beam Modification	Per MEB99-7	Per MEB99-7	36	541002
5-14-20	55-10-00	Horizontal Stabilizer Inspection	10,000 Hours or 20 Years	5,000 Hours or 10 Years	31	551002
5-14-21	55-10-01	Horizontal Stabilizer Spars and Attachments	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	551003
5-14-22	55-10-02	Horizontal Stabilizer Forward Spar Upper Cap	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	551004
5-14-23	55-10-03	Horizontal Stabilizer Forward Spar Lower Cap	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	551005
5-14-24	55-10-04	Horizontal Stabilizer Forward Spar Attach	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	551006
5-14-25	55-10-05	Horizontal Stabilizer Rear Spar Lower Cap Attach	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	551007
5-14-26	55-10-06	Horizontal Stabilizer Rear Spar Upper Cap, BL 0.0	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	551008

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DETAILS FOUND IN SECTION 5-14-XX	SUPPLEMENTAL INSPECTION NUMBER	TITLE	INSPECTION COMPLIANCE (See Note 2 and Note 3)		INSPECTION OPERATION	ITEM CODE
			INITIAL	REPEAT		
5-14-27	55-10-07	Horizontal Stabilizer Rear Spar Lower Cap, BL 0.0	15,000 Hours or 20 Years	5,000 Hours or 10 Years	36	551009
5-14-28	55-20-00	Outboard Elevator Hinge Bracket and Attachment	5,000 Hours or 10 Years	1,000 Hours or 3 Years	23	552001
5-14-29	55-20-01	Elevator Hinges and Fittings	15,000 Hours or 20 Years	2,500 Hours or 5 Years	21	552002
5-14-30	55-30-00	Vertical Stabilizer Spars and Attachments	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	553005
5-14-31	55-30-01	Rudder Hinges and Fittings	15,000 Hours or 20 Years	2,500 Hours or 5 Years	21	553003
5-14-32	55-30-02	Vertical Stabilizer Rear Spar Cap Attach	15,000 Hours or 20 Years	5,000 Hours or 10 Years	37	553004
5-14-33	57-10-03	Wing Rib - Main Landing Gear Side Brace	10,000 Hours or 20 Years	5,000 Hours or 10 Years	34	571001
5-14-34	57-10-04	Wing Lower Rear Spar Cap at Splice	5,000 Hours or 10 Years	1,000 Hours or 3 Years	23	571002
5-14-35	57-10-05	Wing Lower Rear Carry-Thru Spar	15,000 Hours or 20 Years	1,000 Hours or 3 Years	38	571003
5-14-36	57-10-06	Wing Main Spar Lower Cap Inspection and Modification	11,000 Hours	(See Note 1)	37	571004
5-14-37	57-10-07	Wing Aft Auxiliary Lower Spar Cap	6,500 Hours or 13 Years	2,500 Hours or 5 Years	39	571005
5-14-38	57-10-08	Lower Carry-Thru Main Spar Cap	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	571006
5-14-39	57-10-09	Wing Lower Front Spar Cap at Root Fitting Attach, WS 28.96	11,000 Hours or 20 Years	4,000 Hours or 8 Years	40	571007
5-14-40	57-10-10	Wing Lower Front Spar Cap at Root Fitting Attach, WS 36.36	11,000 Hours or 20 Years	2,000 Hours or 4 Years	41	571008

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DETAILS FOUND IN SECTION 5-14-XX	SUPPLEMENTAL INSPECTION NUMBER	TITLE	INSPECTION COMPLIANCE (See Note 2 and Note 3)		INSPECTION OPERATION	ITEM CODE
			INITIAL	REPEAT		
5-14-41	57-10-11	Lower Forward Auxiliary Spar Cap	15,000 Hours or 20 Years	5,000 Hours or 10 Years	33	571009
5-14-42	57-10-12	Wing Front Spar Lug Inspection	15,000 Hours or 20 Years	2,500 Hours or 10 Years	42	571010
5-14-43	57-10-13	Wing Tip Tank Attachment Inspection	15,000 Hours or 20 Years	2,500 Hours or 10 Years	42	571011

NOTE 1: Refer to 5-14-33, Supplemental Inspection Number 57-10-06, for repeat inspection information.

NOTE 2: Except for 57-10-06, corresponding calendar inspection times are per Figure 1. Inspections should be accomplished at hours or calendar time specified, whichever occurs first.

NOTE 3: If the number of landings is unknown, assume two landings are made for each flight hour.

NOTE 4: For Torque tubes on which the initial inspection limit has been exceeded, accomplish the inspection no later than the next 400 landings or August 2, 2005, whichever occurs first.

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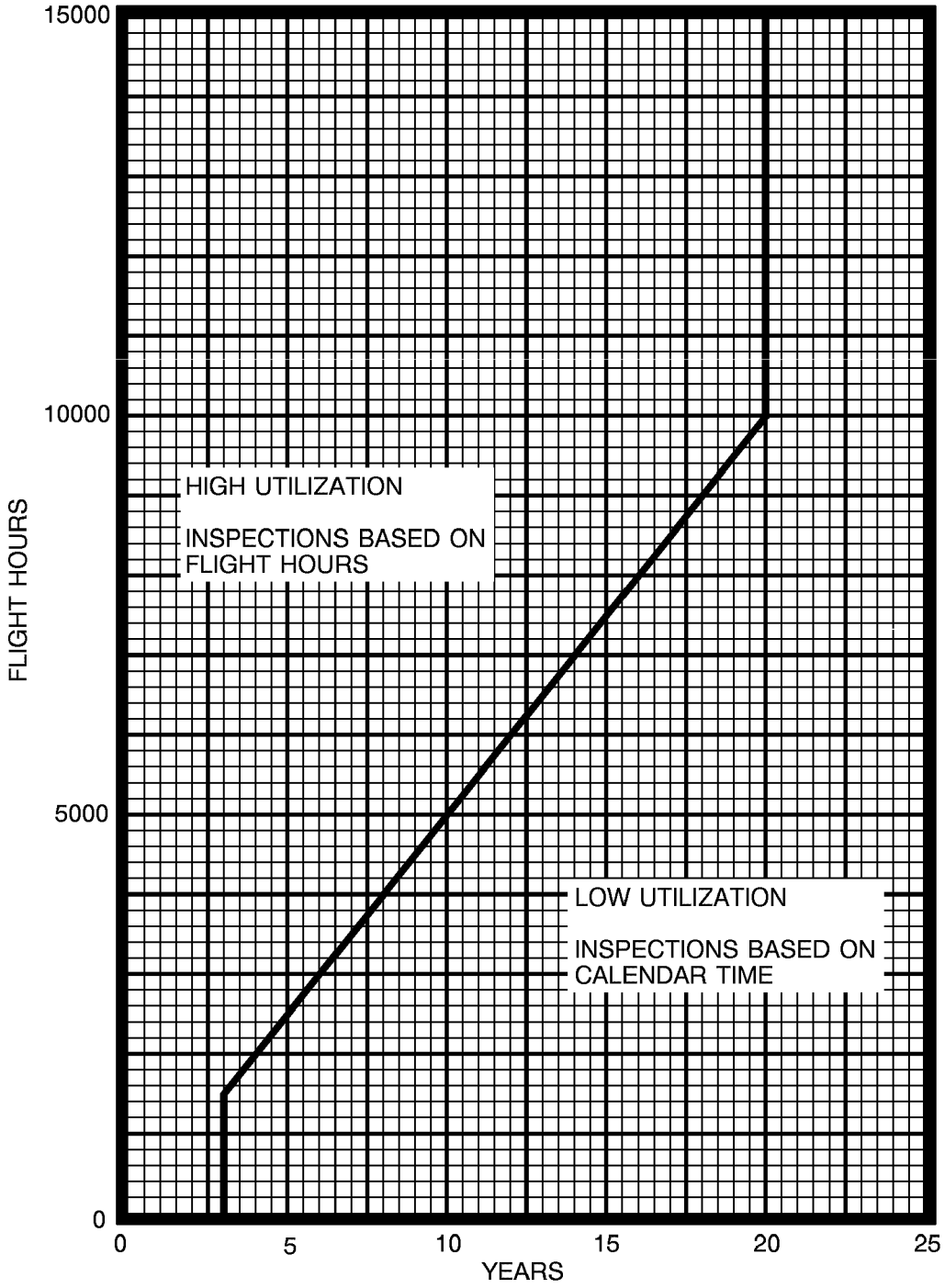

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Inspection Requirements - Hours to Years Equivalence
Figure 1

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SUPPLEMENTAL INSPECTION NUMBER: 27-10-04

1. TITLE

Aileron Hinges and Fittings

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	2,500 Hours	Or	5 Years

3. PURPOSE

To inspect aileron hinges, fittings and associated hardware and components for condition.

4. INSPECTION INSTRUCTIONS

A. Remove the ailerons in accordance with the Maintenance Manual.

B. Visually inspect aileron:
   (1) Hinges for condition, cracks, and security.
   (2) Hinge bolts and hinge bearings for condition and security.
   (3) Bearings for freedom of rotation.
   (4) Attach fittings for evidence of damage, wear, failed fasteners and security.

C. Eddy Current inspect aileron hinge attach fittings for cracks. Refer to 5-15-01, for specific instructions.

D. Reinstall aileron in accordance with the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	Visual: 0.25 Inch
	Eddy Current: 0.080 Inch (open hole)
	Eddy Current: 0.150 Inch (around fastener or bearing)

6. INSPECTION METHOD

Visual Inspection and Eddy Current.

7. REPAIR/MODIFICATION

Replace worn/damaged components with the latest superseding part numbers.

8. COMMENTS

Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 27-20-03

1. TITLE

Rudder Structure

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	7,500 Hours	Or	15 Years
	REPEAT	2,500 Hours	Or	5 Years

3. PURPOSE

To ensure structural integrity of the rudder assembly.

4. INSPECTION INSTRUCTIONS

A. Inspect rudder for deterioration resulting from fatigue, wear, overload, wind damage, and corrosion.

B. Inspect skins, spars, ribs and hinge brackets for cracks, corrosion, and working fasteners.

C. Remove bolts and inspect the hinge bolt holes for elongation and wear. Refer to the Maintenance Manual.

D. Install hinge bolts in accordance with the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Rudder	0.25 Inch

6. INSPECTION METHOD

Visual, refer to Figure 1.

7. REPAIR/MODIFICATION

Replace parts with elongated hole. Repairs may be made in accordance with the Maintenance Manual, which is considered to be acceptable repair data. Any repair not covered by recommendations in the above document should be coordinated with Cessna Propeller Aircraft Product Support prior to beginning the repair.

8. COMMENTS

None

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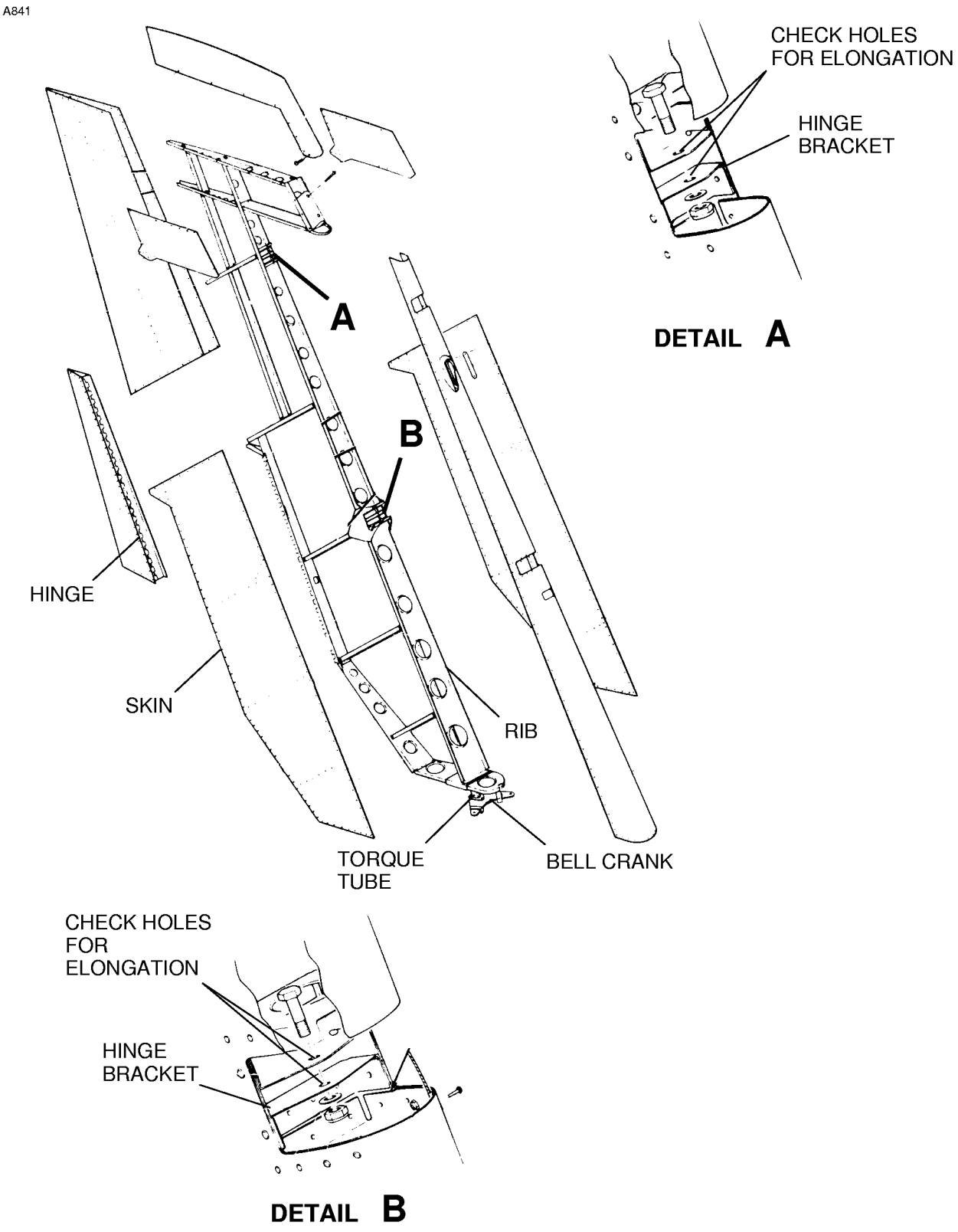

Rudder Structure
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 27-20-04

1. TITLE

Rudder Torque Tube

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	7,500 Hours	Or	15 Years
	REPEAT	2,500 Hours	Or	5 Years

3. PURPOSE

To ensure structural integrity of the rudder torque tube assembly.

4. INSPECTION INSTRUCTIONS

A. Remove rudder torque tube access plates in accordance with the Maintenance Manual.

B. Inspect weld on the torque tube, bell crank attachment, and bell crank hinge for cracks. (Reference Figure 1).

C. Inspect the torque tube for internal rusting.

D. Install rudder torque tube access plates in accordance with the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Rudder	0.25 Inch

6. INSPECTION METHOD

Visual

7. REPAIR/MODIFICATION

Repairs may be made in accordance with the Maintenance Manual, which is considered to be acceptable repair data. Any repair not covered by recommendations in the above document should be coordinated with Cessna Propeller Aircraft Product Support prior to beginning the repair.

8. COMMENTS

None

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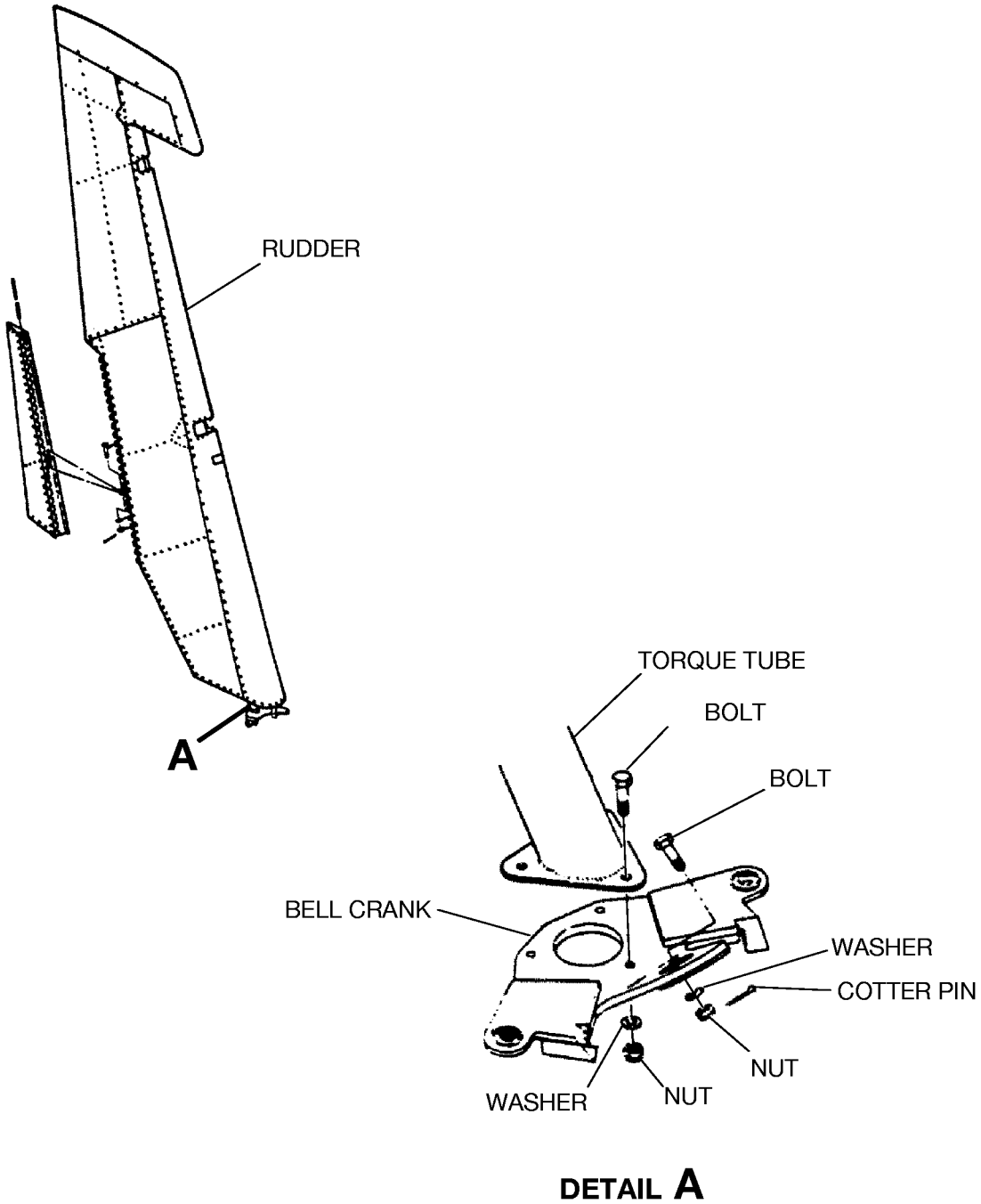

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Rudder Torque Tube
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 27-30-00

1. TITLE

Elevator Torque Tube Assembly

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	5,000 Hours	Or	10 Years
	REPEAT	1,000 Hours	Or	3 Years

3. PURPOSE

To verify the integrity of the elevator torque tube to elevator bell crank attachment.

4. INSPECTION INSTRUCTIONS

A. Inspect the torque tube and torque tube fitting for signs of corrosion, stress cracks, and lack of surface finish in the area of the torque tube fitting attachment. Refer to Figure 1.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Tailcone Stinger Area	0.25 Inch

6. INSPECTION METHOD

Visual, refer to Figure 1.

7. REPAIR/MODIFICATION

Replace torque tube in accordance with the Maintenance Manual.

8. COMMENTS

Loss or reduction in pitch control could result in the loss of the airplane.

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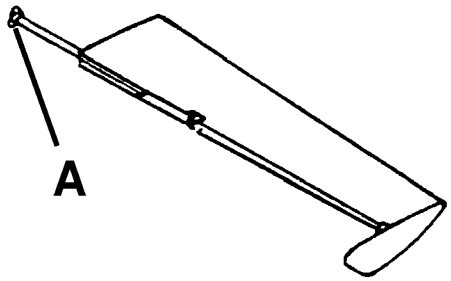

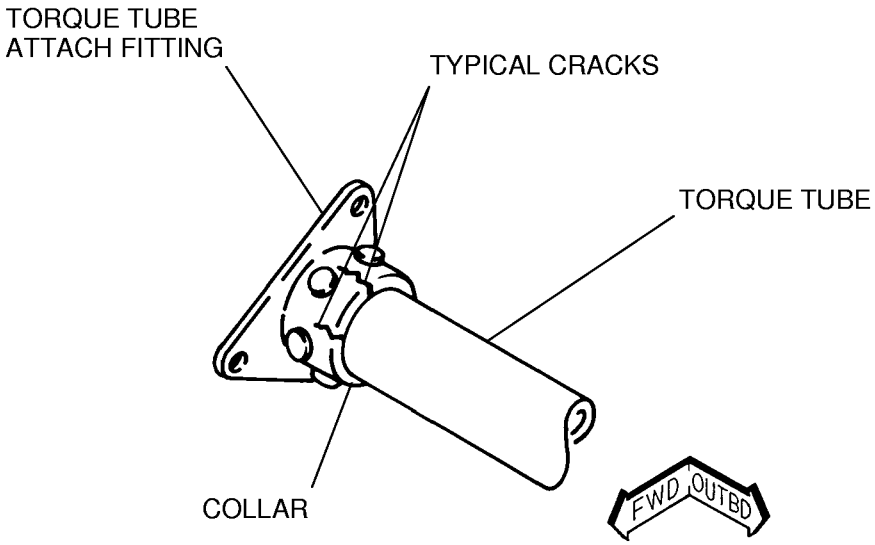

DETAIL A

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Elevator Torque Tube Assembly
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 32-10-01

1. TITLE

Main Landing Gear Torque Tube Assembly

2. EFFECTIVITY

The following airplanes except those that are equipped with part number 5045010-32, -33 Main Landing Gear Torque Tubes.

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	3,000 Landings	Or	20 Years
	REPEAT	100 Landings	Or	1 Year

3. PURPOSE

To verify the integrity of the main gear torque tube assembly.

4. INSPECTION INSTRUCTIONS

A. At 3,100 landings and every 100 landings or 1 year (whichever occurs first) thereafter:
   (1) Clean the main landing gear torque tube with solvent to remove dirt, grease, oil, loose paint and other substances that may interfere with the inspection. Refer to Figure 1.
   (2) Visually inspect the torque tube for corrosion.
   (3) Visually inspect the torque tube assembly for cracks in areas indicated.
      (a) If a crack is suspected, Magnetic Particle inspect the torque tube assembly for cracks. Refer to Figure 1. Refer to Supplemental Inspection Number 5-15-05, for specific instructions.

B. At 3,000 landings (or 20 years, whichever occurs first) and every 200 landings thereafter:
   (1) Remove the torque tube in accordance with the Maintenance Manual. Refer to Figure 1.
   (2) Clean the main landing gear torque tube with solvent to remove dirt, grease, oil, loose paint and other substances that may interfere with the inspection.
   (3) Use Magnetic Particle method to inspect the torque tube assembly for cracks in areas indicated. Refer to Figure 1. Refer to Supplemental Inspection Number 5-15-05, for specific instructions.
   (4) Install torque tube in accordance with the 310R Maintenance Manual.

NOTE: If the number of landings is unknown, assume two landings are made for each flight hour.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Main Landing Gear Wheel Well	0.10 Inch

6. INSPECTION METHOD

Visual and Magnetic Particle

7. REPAIR/MODIFICATION

Repair of cracks in the torque tube is not allowed. If corrosion deeper than 0.005 inch is found, replace the torque tube. Replace torque tube assembly in accordance with the 310R Maintenance Manual.

8. COMMENTS

Main gear collapse would cause damage to the airplane.

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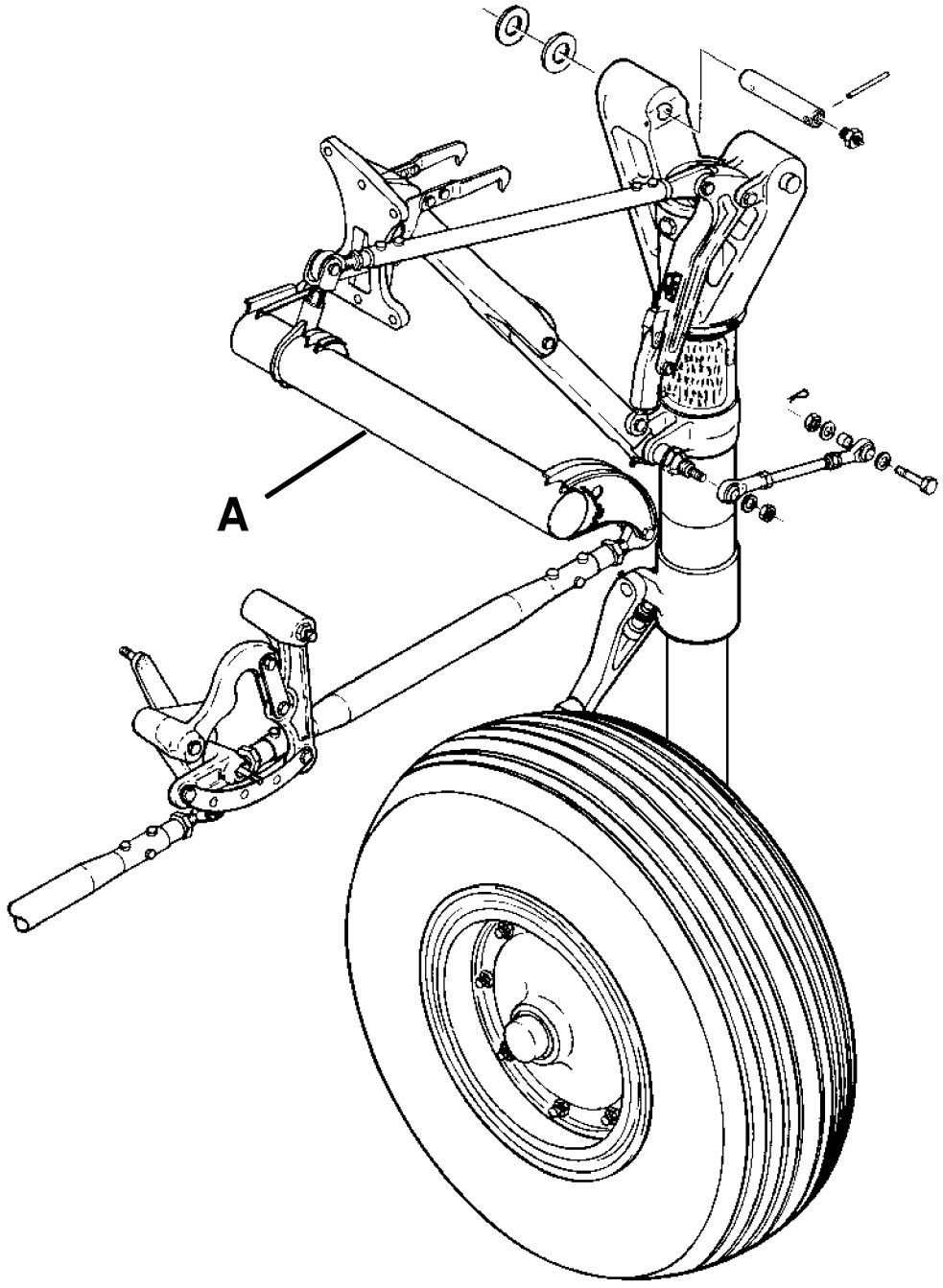

Main Landing Gear Torque Tube Assembly
Figure 1 (Sheet 1)

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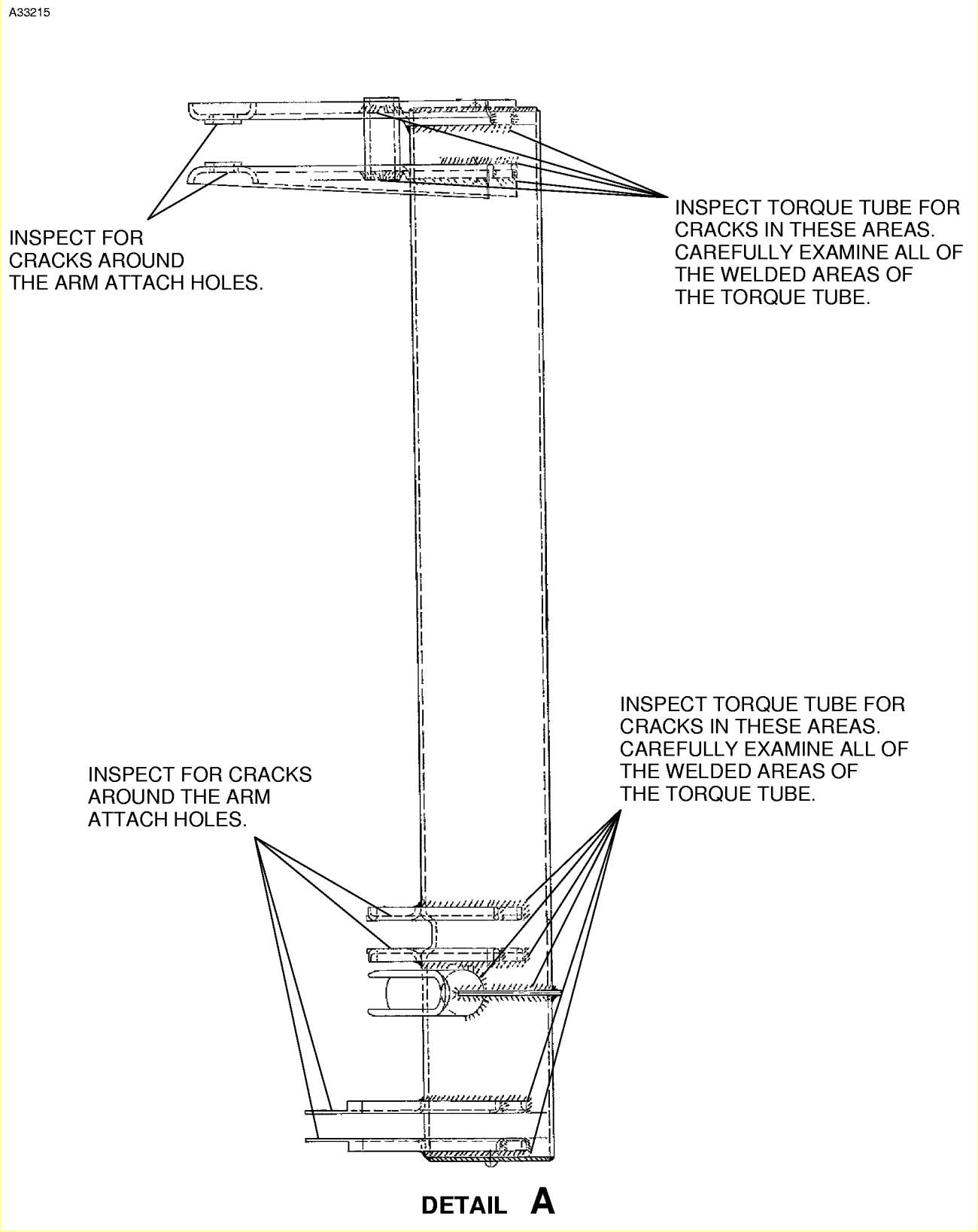

Main Landing Gear Torque Tube Assembly
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 32-10-01

1. TITLE

Main Landing Gear Torque Tube Assembly

2. EFFECTIVITY

The following airplanes except those that are equipped with part number 5045010-32, -33 Main Landing Gear Torque Tubes.
310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	4,000 Landings	Or	8 Years
	REPEAT	1,000 Landings	Or	3 Years

NOTE: For torque tubes on which the initial inspection limit has been exceeded, accomplish the inspection no later than the next 400 landings or August 2, 2005, whichever occurs first.

3. PURPOSE

To verify the integrity of the main gear torque tube assembly.

4. INSPECTION INSTRUCTIONS

A. Remove torque tube in accordance with the Maintenance Manual.

B. Use Magnetic Particle method to inspect the torque tube assembly for cracks in areas indicated. Refer to Figure 1. Refer to Supplemental Inspection Number 5-15-05, for specific instructions.

C. Install torque tube in accordance with the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Main Landing Gear Wheel Well	0.10 Inch

6. INSPECTION METHOD

Magnetic Particle

7. REPAIR/MODIFICATION

Replace torque tube assembly in accordance with the Maintenance Manual.

8. COMMENTS

Main gear collapse would cause damage to the airplane.

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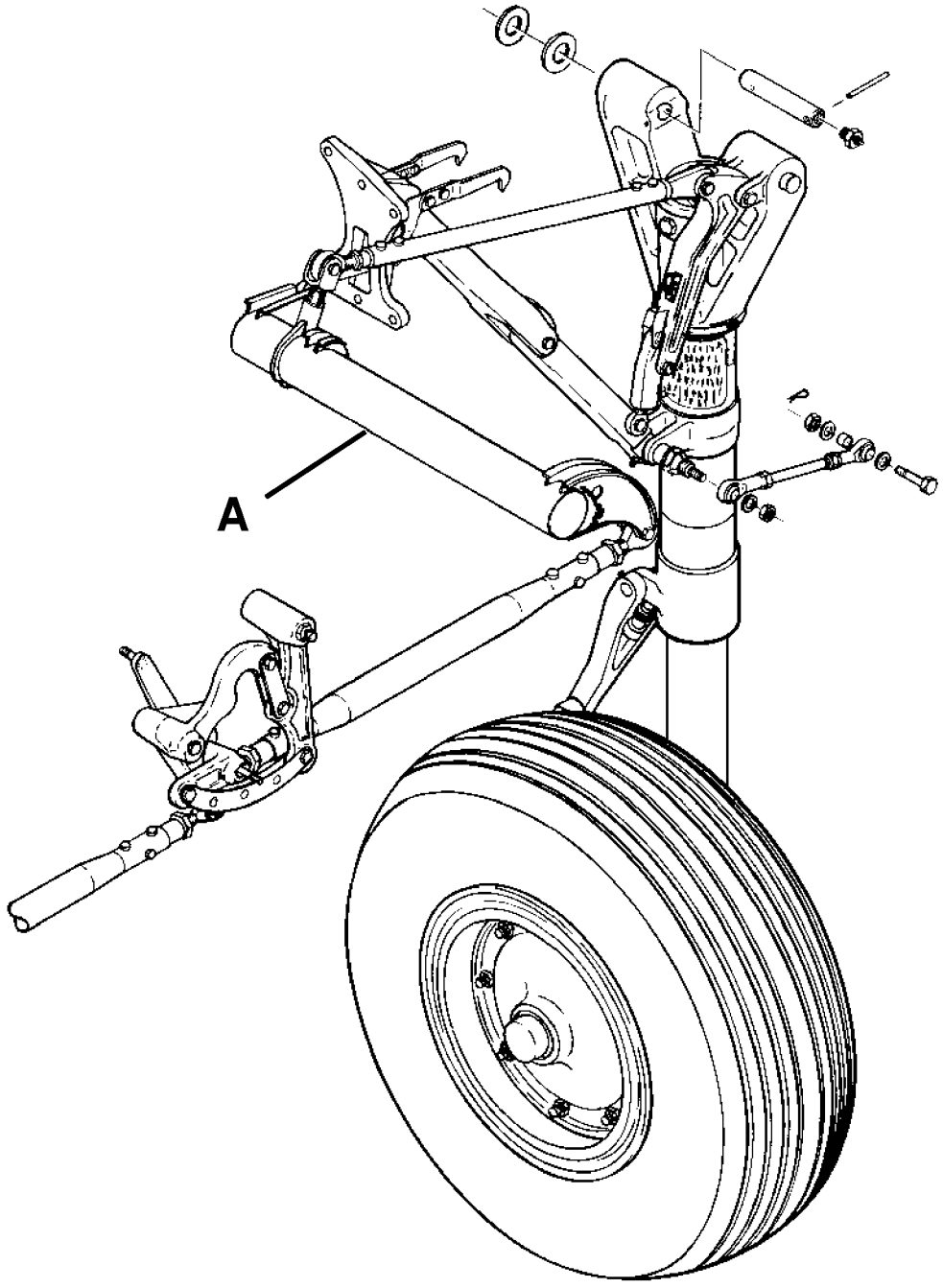

Main Landing Gear Torque Tube Assembly
Figure 1 (Sheet 1)

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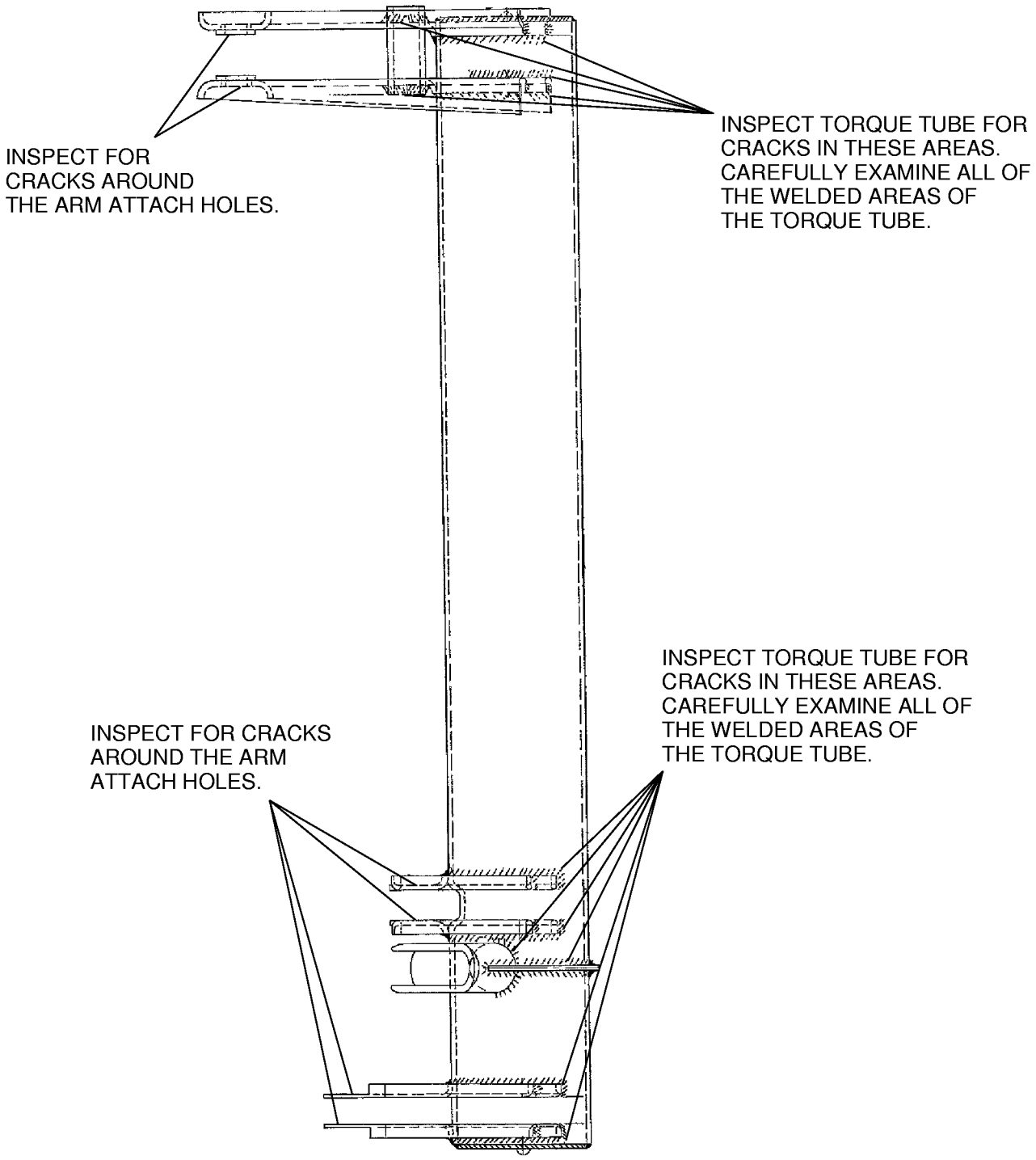

DETAIL A

Main Landing Gear Torque Tube Assembly
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 32-10-05

1. TITLE

Main Landing Gear Torque Tube Assembly

2. EFFECTIVITY

The following airplanes equipped with part number 5045010-32, -33 Main Landing Gear Torque Tubes.
310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	10,000 Landings	Or	20 Years
	REPEAT	500 Landings	Or	1 Year

3. PURPOSE

To verify the integrity of the main gear torque tube assembly.

4. INSPECTION INSTRUCTIONS

A. At 10,100 landings and every 100 landings or 1 year (whichever occurs first) thereafter:
   (1) Clean the main landing gear torque tube with solvent to remove dirt, grease, oil, loose paint and other substances that may interfere with the inspection. Refer to Figure 1.
   (2) Visually inspect the torque tube for corrosion.
   (3) Visually inspect the torque tube assembly for cracks in areas indicated.
      (a) If a crack is suspected, Magnetic Particle inspect the torque tube assembly for cracks. Refer to Figure 1. Refer to Supplemental Inspection Number 5-15-05, for specific instructions.

B. At 10,000 landings (or 20 years, whichever occurs first) and every 500 landings thereafter:
   (1) Remove the torque tube in accordance with the Maintenance Manual. Refer to Figure 1.
   (2) Clean the main landing gear torque tube with solvent to remove dirt, grease, oil, loose paint and other substances that may interfere with the inspection.
   (3) Use Magnetic Particle method to inspect the torque tube assembly for cracks in areas indicated. Refer to Supplemental Inspection Number 5-15-05, for specific instructions.
   (4) Install torque tube in accordance with the 310R Maintenance Manual.

NOTE: If the number of landings is unknown, assume two landings are made for each flight hour.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Main Landing Gear Wheel Well	0.10 Inch

6. INSPECTION METHOD

Visual and Magnetic Particle

7. REPAIR/MODIFICATION

Repair of cracks in the torque tube is not allowed. If corrosion deeper than 0.005 inch is found, replace the torque tube. Replace torque tube assembly in accordance with the 310R Maintenance Manual.

8. COMMENTS

Main gear collapse would cause damage to the airplane.

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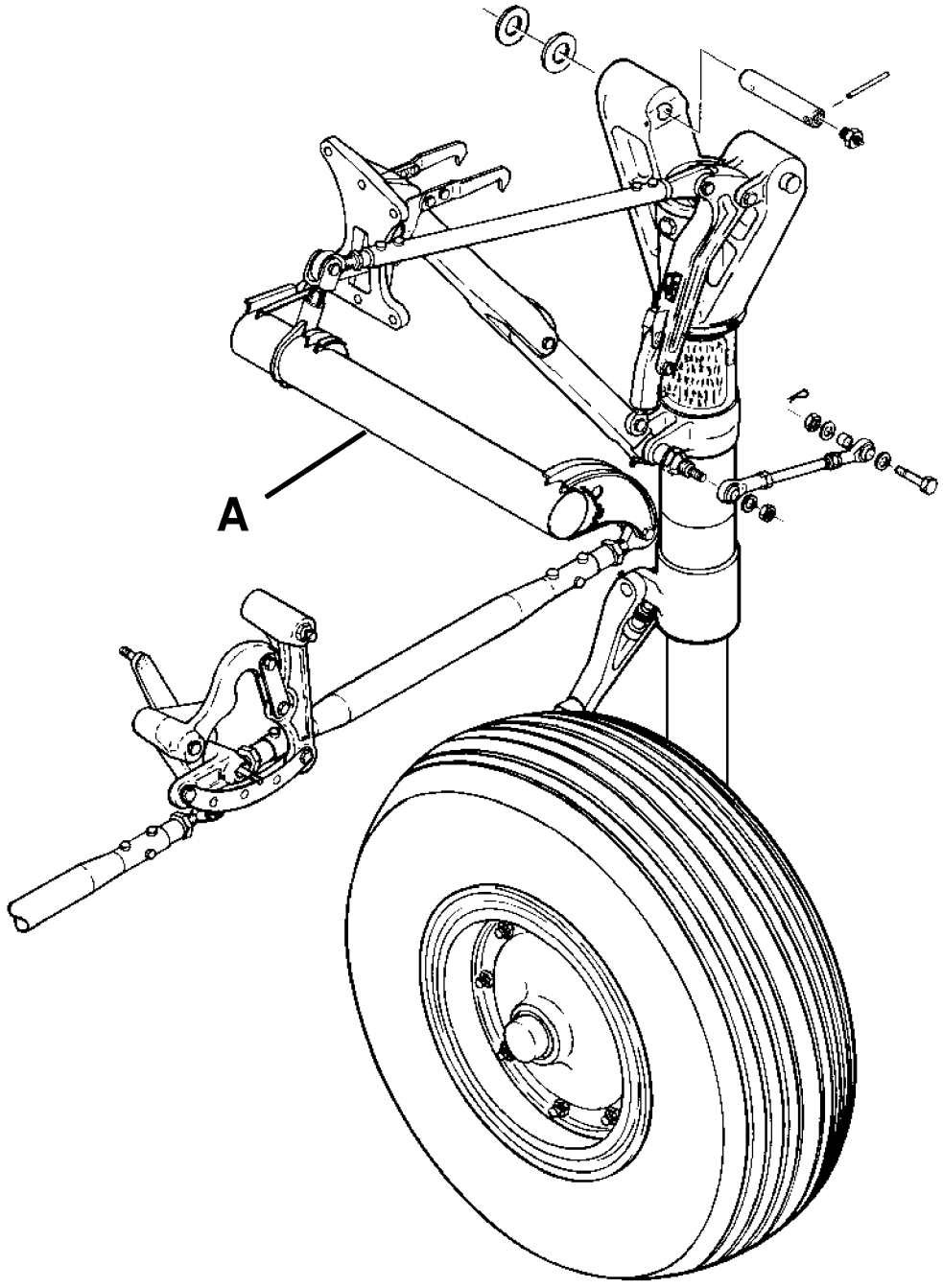

Main Landing Gear Torque Tube Assembly
Figure 1 (Sheet 1)

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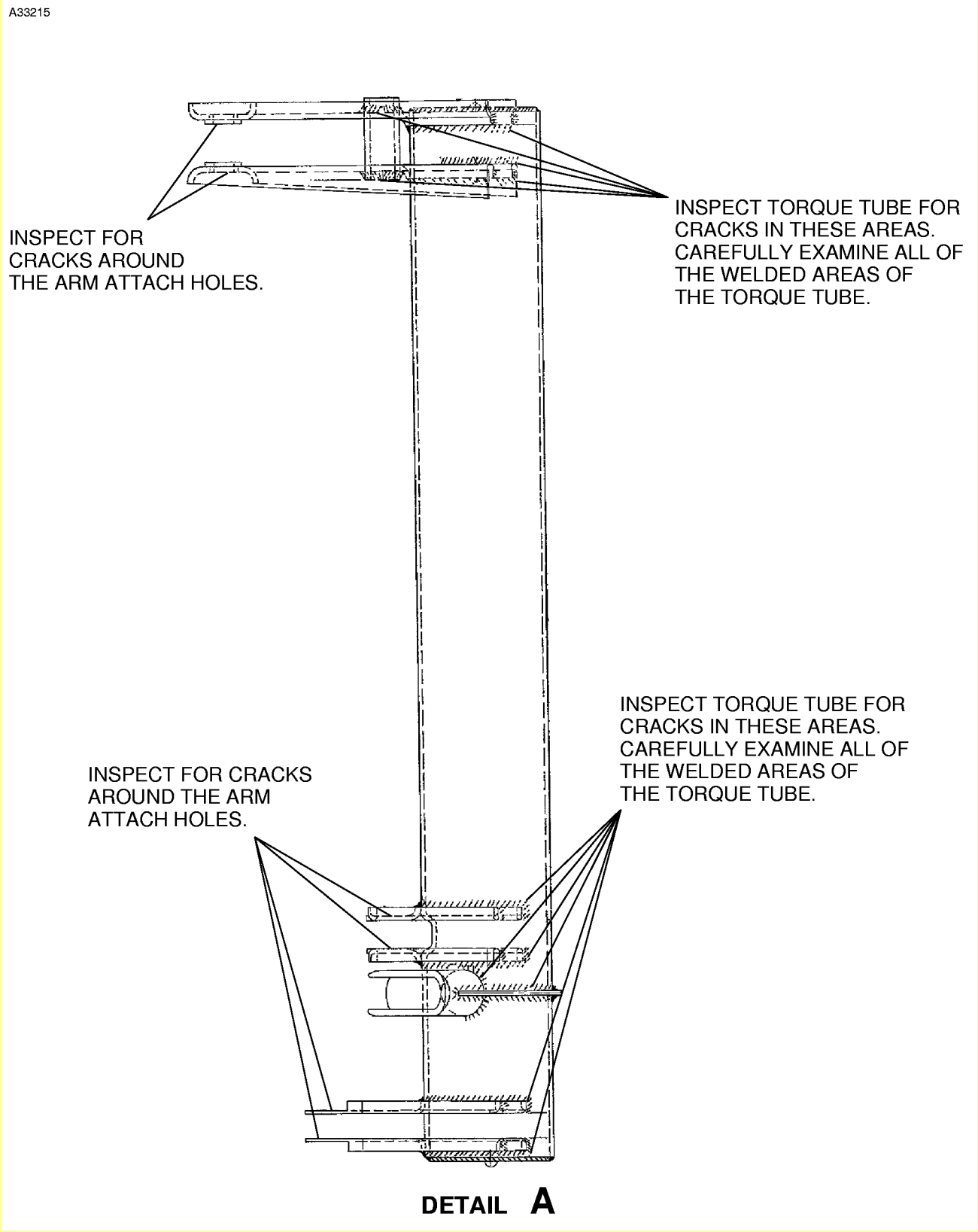

Main Landing Gear Torque Tube Assembly
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 32-10-05

1. TITLE

Main Landing Gear Torque Tube Assembly

2. EFFECTIVITY

The following airplanes equipped with part number 5045010-32, -33 Main Landing Gear Torque Tubes.
310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	10,000 Landings	Or	20 Years
	REPEAT	2,000 Landings	Or	4 Years

NOTE: For torque tubes on which the initial inspection limit has been exceeded, accomplish the inspection no later than the next 400 landings or August 2, 2005, whichever occurs first.

3. PURPOSE

To verify the integrity of the main gear torque tube assembly.

4. INSPECTION INSTRUCTIONS

A. Remove torque tube in accordance with the Maintenance Manual.

B. Use Magnetic Particle method to inspect the torque tube assembly for cracks in areas indicated. Refer to Figure 1. Refer to Supplemental Inspection Number 5-15-05, for specific instructions.

C. Install torque tube in accordance with the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Main Landing Gear Wheel Well	0.10 Inch

6. INSPECTION METHOD

Magnetic Particle

7. REPAIR/MODIFICATION

Replace torque tube assembly in accordance with the Maintenance Manual.

8. COMMENTS

Main gear collapse would cause damage to the airplane.

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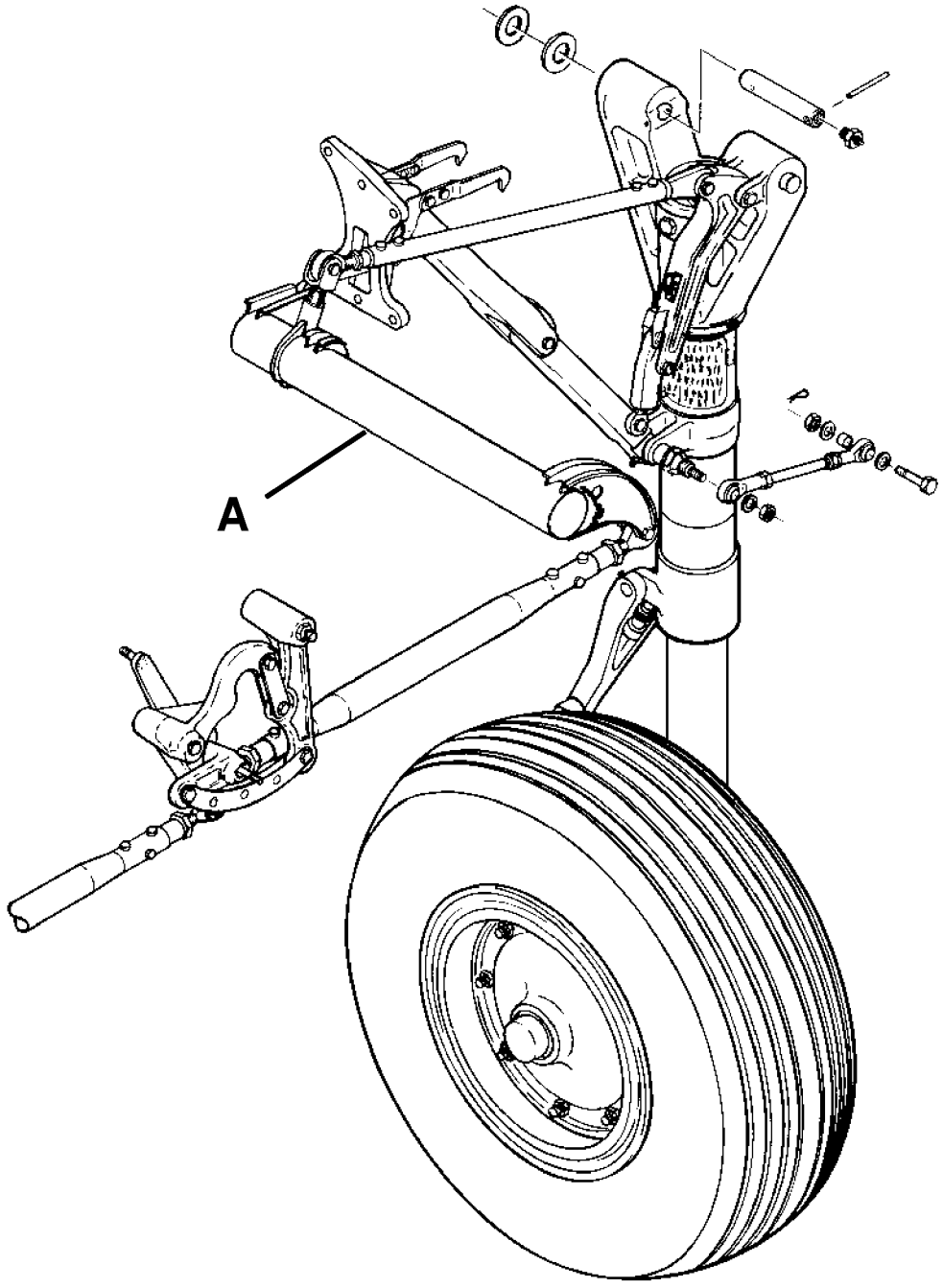
A33214



Main Landing Gear Torque Tube Assembly
Figure 1 (Sheet 1)

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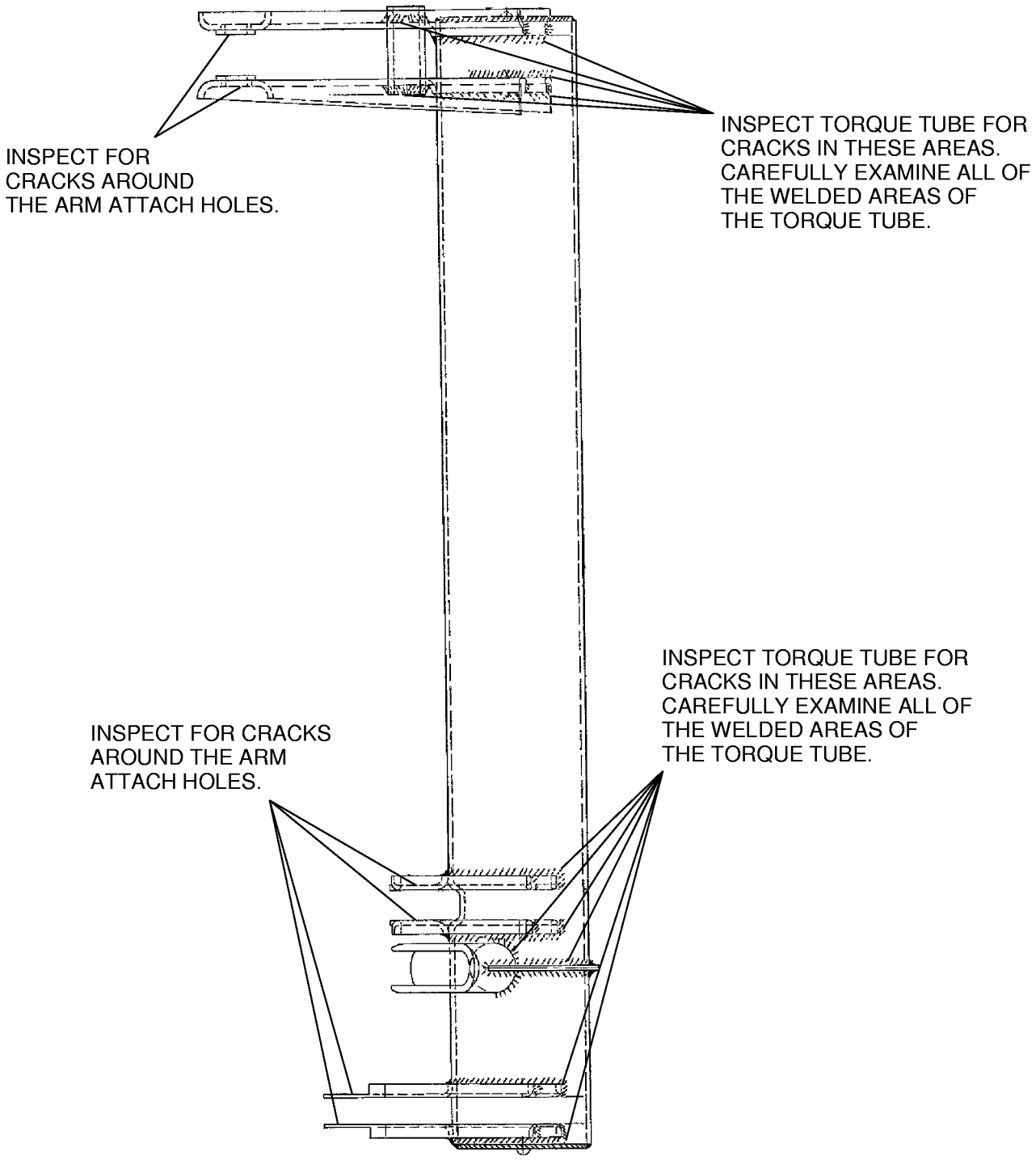
A33215



DETAIL A

Main Landing Gear Torque Tube Assembly
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 32-10-02

1. TITLE

Main Landing Gear Bell Crank Pivot Bolt

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	1,000 Landings	Or	3 Years
	REPEAT	500 Landings	Or	3 Years

3. PURPOSE

To verify the integrity of the bell crank pivot bolt.

4. INSPECTION INSTRUCTIONS

A. Remove the pivot bolt in accordance with the Maintenance Manual.

B. Inspect the bolt for evidence of shear failure.

C. Reinstall the bolt if no evidence of shear failure is present. Replace bolt if shear failure is present.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Main Landing Gear Wheel Well	N/A

6. INSPECTION METHOD

Visual

7. REPAIR/MODIFICATION

Replace bell crank pivot bolt in accordance with the Maintenance Manual. Refer to Figure 1.

8. COMMENTS

Bolt failure will cause the main gear to collapse.

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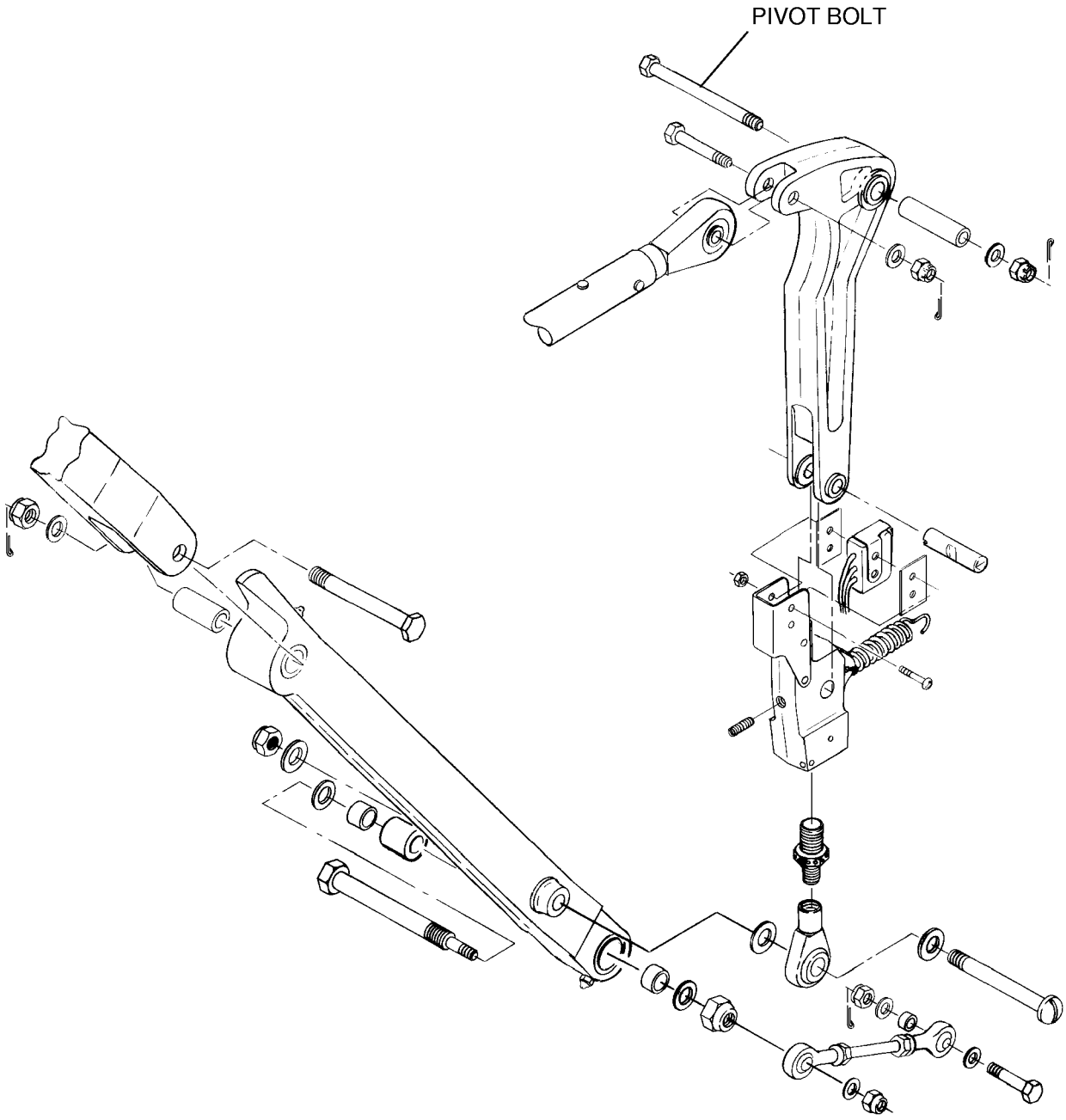
A31840



NOTE: LEFT SIDE SHOWN, RIGHT SIDE SIMILAR

14413003

Landing Gear Bell Crank Pivot Bolt
Figure 1 (Sheet 1)

© Cessna Aircraft Company

SUPPLEMENTAL INSPECTION NUMBER: 32-10-03

1. TITLE

Main Landing Gear Fork Bolts (5/8 inch)

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	5,000 Landings	Or	10 Years
	REPEAT	5,000 Landings	Or	10 Years

3. PURPOSE

To ensure that life-limited fork bolts are replaced per time schedule.

4. INSPECTION INSTRUCTIONS

A. Inspect fork bolts in accordance with Cessna Multi-engine Service Letter ME75-23, Supplement 1, or latest revision. Refer to Figure 1.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Main Landing Gear	N/A

6. INSPECTION METHOD

Visual

7. REPAIR/MODIFICATION

Refer to Cessna Multi-engine Service Letter ME75-23, Supplement 1, or latest revision.

8. COMMENTS

None.

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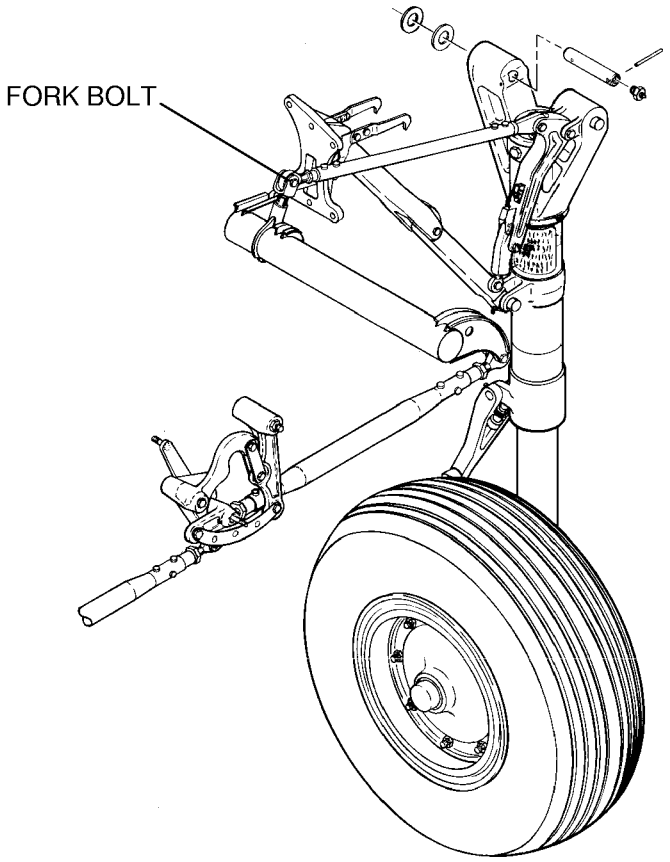
A31833



14413002

Main Gear Retraction Linkage
Figure 1 (Sheet 1)

© Cessna Aircraft Company

SUPPLEMENTAL INSPECTION NUMBER: 32-10-04

1. TITLE

Main Gear Actuator Attach Fitting

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	12,500 Landings	Or	20 Years
	REPEAT	2,500 Landings	Or	5 Years

3. PURPOSE

Detailed inspection of the main gear actuator attach fitting for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Jack the airplane off the ground surface. Refer to the Maintenance Manual.

B. Remove necessary assemblies to gain access to entire area of main gear actuator collar. Refer to the Maintenance Manual.

C. Refer to Section 5-15-09, Supplemental Inspection Number 32-10-04, for specific instructions.

D. Install any removed assemblies and return airplane to ground surface. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Main Gear Actuator Attach Fitting	0.10 Inch

6. INSPECTION METHOD

Eddy Current

7. REPAIR/MODIFICATION

Replace the main gear actuator collar if a crack is found. Refer to the Maintenance Manual.

8. COMMENTS

If a crack is detected, send findings to Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 32-20-00

1. TITLE

Nose Gear Fork

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Landings	Or	20 Years
	REPEAT	5,000 Landings	Or	10 Years

3. PURPOSE

Detailed inspection of the nose gear fork for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Jack the airplane off the ground surface. Refer to the Maintenance Manual.

B. Remove necessary assemblies to gain access to entire area of the nose gear fork. Refer to the Maintenance Manual.

C. Refer to Section 5-15-10, Supplemental Inspection Number 32-20-00, for specific instructions.

D. Install any removed assemblies and return airplane to ground surface. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Nose Gear	0.10 Inch

6. INSPECTION METHOD

Surface Eddy Current

7. REPAIR/MODIFICATION

Replace cracked parts.

8. COMMENTS

If a crack is detected, send findings to Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 32-30-00

1. TITLE

Main/Nose Gear Retraction Systems Teardown and Inspection

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	10,000 Landings	Or	20 Years
	REPEAT	5,000 Landings	Or	10 Years

3. PURPOSE

To inspect for fatigue cracks, excessive wear in mechanisms, bushings, bearings, attachment holes in structure and attaching hardware which could hinder proper rigging and cause gear-down position failures or structural failures.

4. INSPECTION INSTRUCTIONS

A. Remove all gear assemblies and retraction mechanism parts and hardware from the airplane. Refer to the Maintenance Manual.

B. Inspect the wing, nose wheel well and supporting structures for cracks, corrosion and elongated attachment holes. Repair or replace, as required.

C. Inspect all components of the gear and retraction mechanism for cracks, corrosion, and excess wear and replace with new parts/components where required. Refer to Figure 1, Figure 2, Figure 3, and Figure 4.

D. Reinstall all components and rig the system in accordance with the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Refer to the above inspection instructions.	0.25 Inch

6. INSPECTION METHOD

Visual.

7. REPAIR/MODIFICATION

Refer to the above inspection instructions.

8. COMMENTS

To assist in preventing gear and gear extension and retraction failures.

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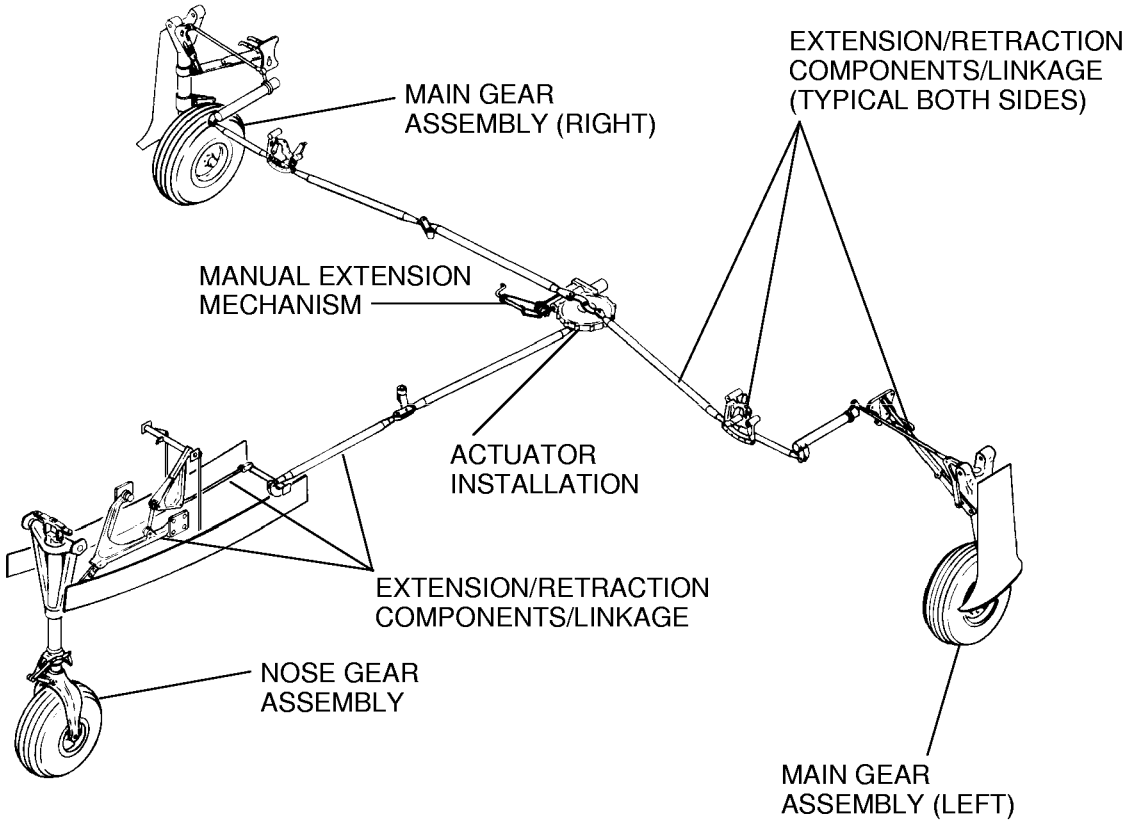
A31841



54403001

Electromechanical Landing Gear System (Typical)
Figure 1 (Sheet 1)

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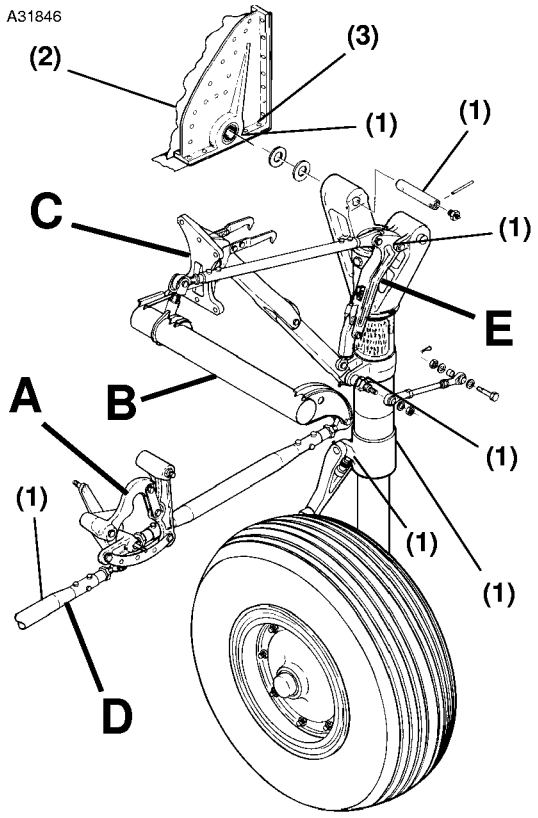
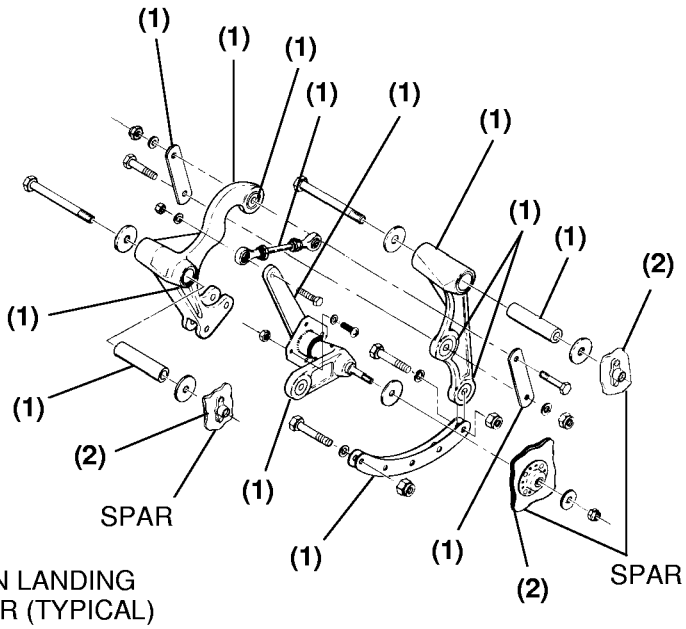




MAIN LANDING GEAR (TYPICAL)

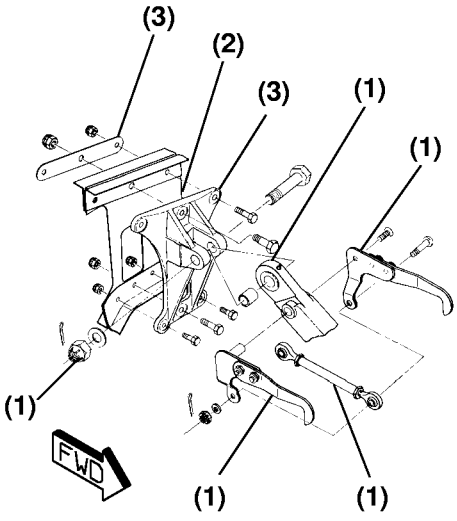
DETAIL A

(1) INSPECT FOR FATIGUE CRACKS, CORROSION AND REPLACE WITH NEW PARTS AS REQUIRED.

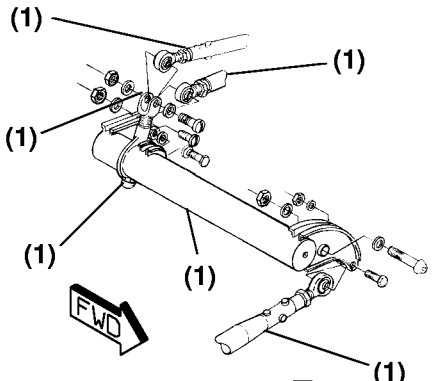
(2) INSPECT STRUCTURE FOR CRACKS, CORROSION AND ELONGATED ATTACHMENT HOLES. REPAIR OR REPLACE AS REQUIRED.

(3) INSPECT FOR CRACKS, CORROSION AND ELONGATED ATTACHMENT HOLES. REPLACE WITH PARTS/COMPONENTS AS REQUIRED.

NOTE: REPLACE ALL HARDWARE REMOVED DURING INSPECTION PROCEDURE WITH NEW ATTACHING HARDWARE AT REASSEMBLY/ REINSTALLATION.



DETAIL C



DETAIL B

1041R3001
1441R3002
A5241R1002
B5241R1003
C1441R1001

Main Landing Gear Retraction Linkage Installation
Figure 2 (Sheet 1)

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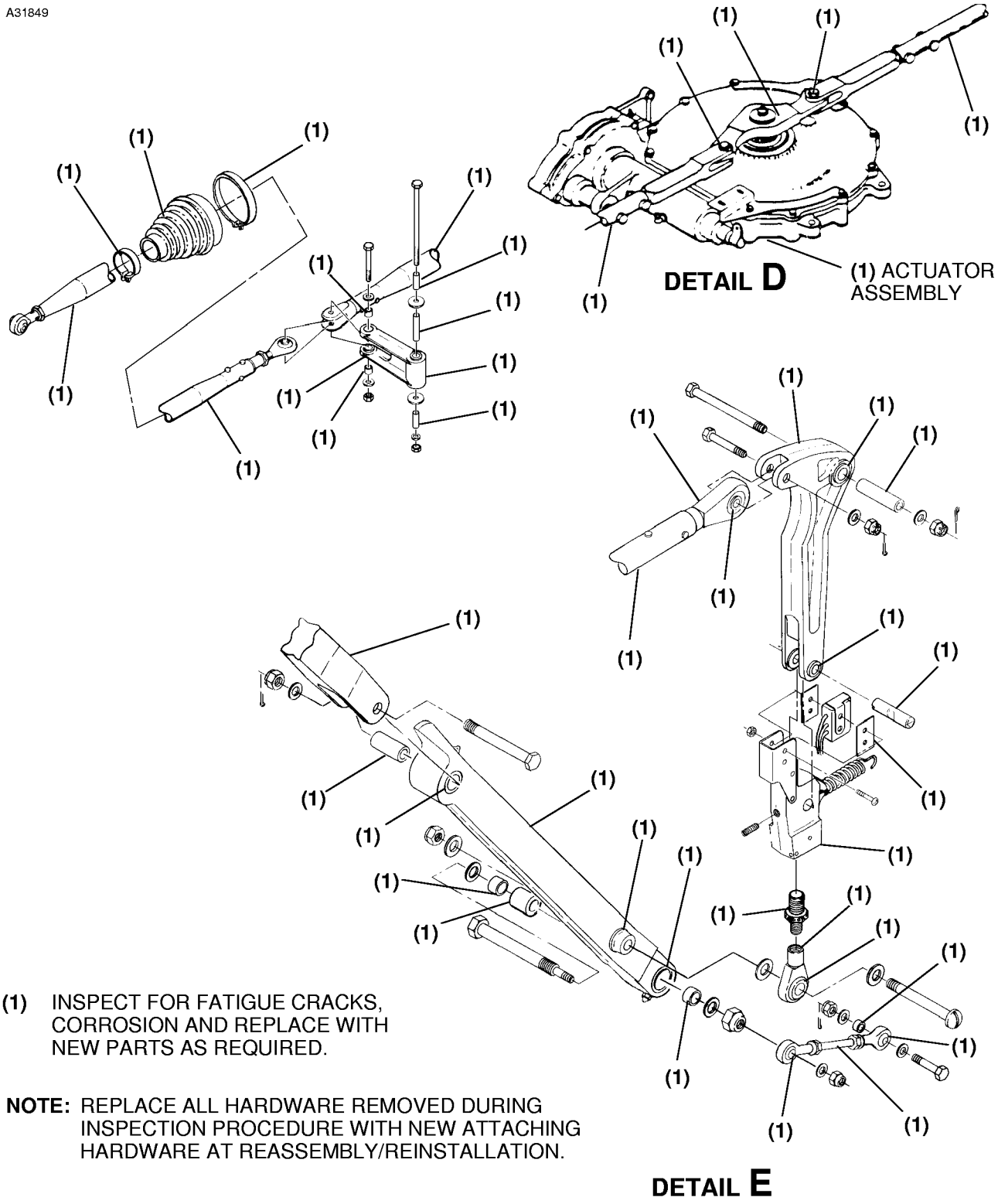

(1) INSPECT FOR FATIGUE CRACKS, CORROSION AND REPLACE WITH NEW PARTS AS REQUIRED.

NOTE: REPLACE ALL HARDWARE REMOVED DURING INSPECTION PROCEDURE WITH NEW ATTACHING HARDWARE AT REASSEMBLY/REINSTALLATION.

1441R2004
D5241R1013
E1441R3003

Main Landing Gear Retraction Linkage Installation
Figure 2 (Sheet 2)

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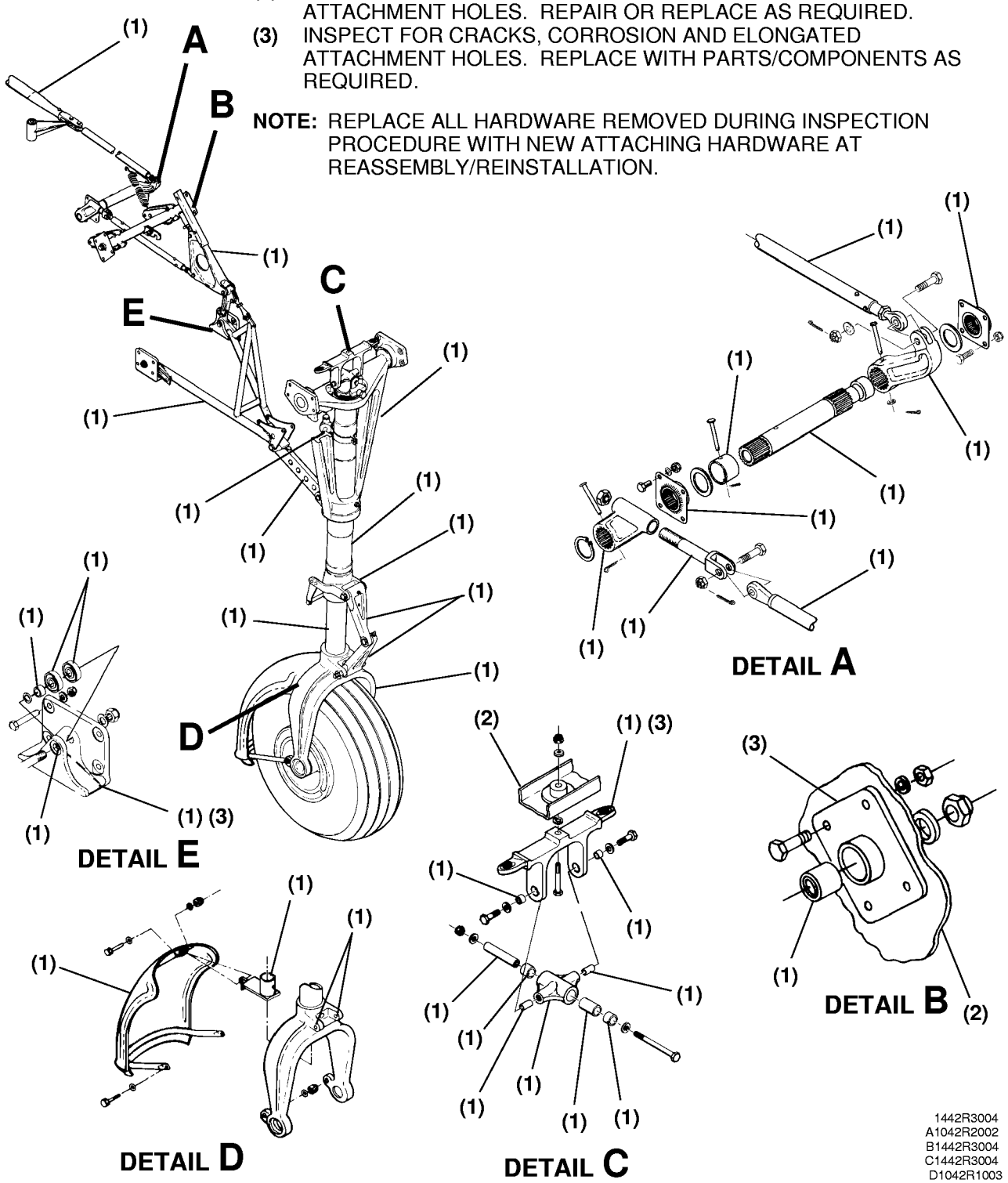
A31852

(1) INSPECT FOR FATIGUE CRACKS, CORROSION AND REPLACE WITH NEW PARTS AS REQUIRED.
(2) INSPECT STRUCTURE FOR CRACKS, CORROSION AND ELONGATED ATTACHMENT HOLES. REPAIR OR REPLACE AS REQUIRED.
(3) INSPECT FOR CRACKS, CORROSION AND ELONGATED ATTACHMENT HOLES. REPLACE WITH PARTS/COMPONENTS AS REQUIRED.

NOTE: REPLACE ALL HARDWARE REMOVED DURING INSPECTION PROCEDURE WITH NEW ATTACHING HARDWARE AT REASSEMBLY/REINSTALLATION.



1442R3004
A1042R2002
B1442R3004
C1442R3004
D1042R1003
E1442R3004

Nose Landing Gear Installation
Figure 3 (Sheet 1)

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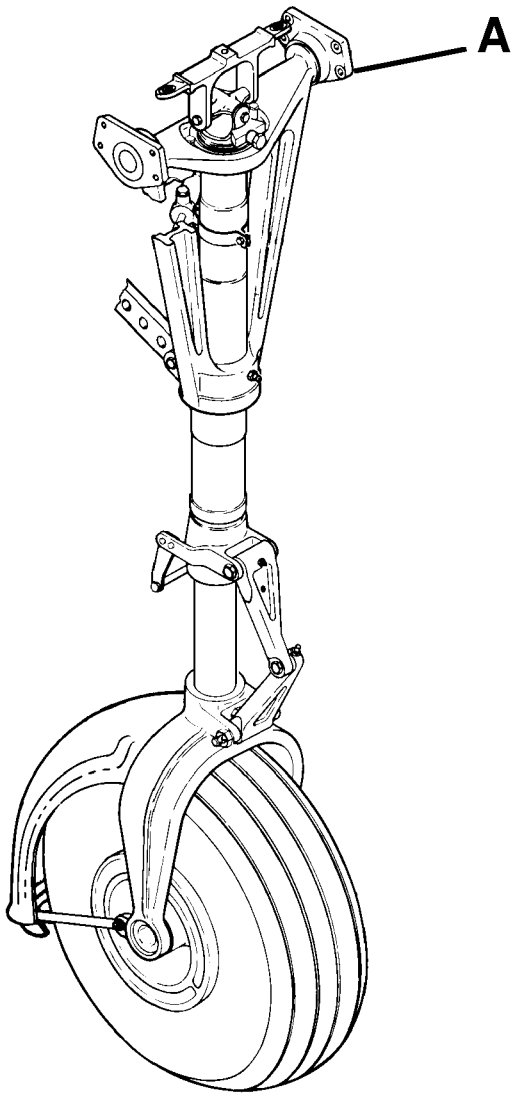
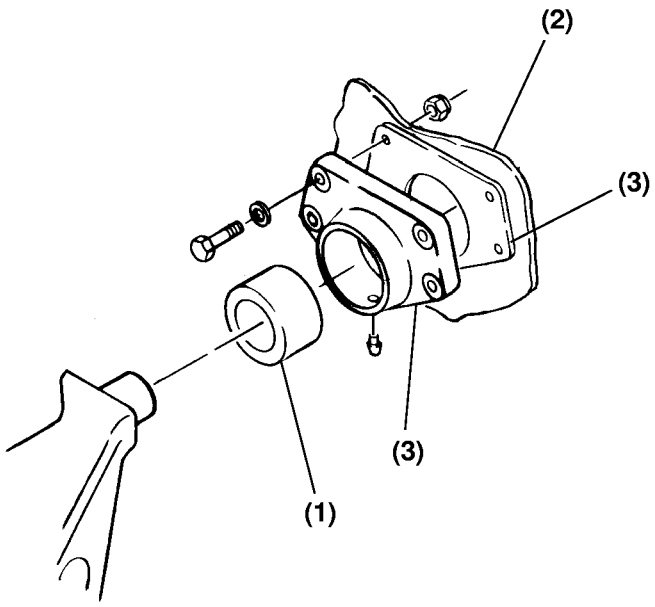
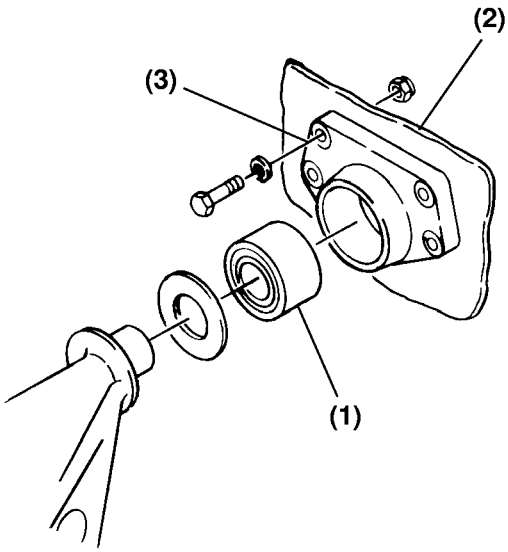
A31855





DETAIL A
LARGE LUG (1.31 INCH DIAMETER) TRUNNION



DETAIL A
SMALL LUG (1.19 INCH DIAMETER) TRUNNION

(1) INSPECT FOR FATIGUE CRACKS, CORROSION AND REPLACE WITH NEW PARTS AS REQUIRED.
(2) INSPECT STRUCTURE FOR CRACKS, CORROSION AND ELONGATED ATTACHMENT HOLES. REPAIR OR REPLACE AS REQUIRED.
(3) INSPECT FOR CRACKS, CORROSION AND ELONGATED ATTACHMENT HOLES. REPLACE WITH PARTS/COMPONENTS AS REQUIRED.

NOTE: REPLACE ALL HARDWARE REMOVED DURING INSPECTION PROCEDURE WITH NEW ATTACHING HARDWARE AT REASSEMBLY/REINSTALLATION.

1442R3004
A1042R1005
A1042R1005

Nose Wheel Well Structure
Figure 4 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 32-30-07

1. TITLE

Nose Gear Trunnion Inspection (1.19 inch lugs)

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL: Per MEB88-5R2

3. PURPOSE

Detailed inspection of the nose gear trunnion pivot lugs (1.19 inch only). If trunnion has been replaced with the 5942000-213 trunnion, inspect to Supplemental Inspection Number 32-30-08. Refer to 5-14-13.

4. INSPECTION INSTRUCTIONS

A. Refer to Cessna Multi-engine Service Bulletin MEB88-5R2, or latest revision, for accomplishment instructions.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Nose Section	N/A

6. INSPECTION METHOD

Fluorescent Penetrant

7. REPAIR/MODIFICATION

8. COMMENTS

If a crack is detected, replace the trunnion, refer to Cessna Multi-engine Service Bulletin MEB88-5R2 or latest revision for trunnion replacement instructions.

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SUPPLEMENTAL INSPECTION NUMBER: 32-30-08

1. TITLE

Nose Gear Trunnion Inspection (1.31 inch lugs)

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL: Per MEB88-5R2

3. PURPOSE

Detailed inspection of the nose gear trunnion pivot lugs (1.31 inch only).

4. INSPECTION INSTRUCTIONS

A. Refer to Cessna Multi-engine Service Bulletin MEB88-5R2, or latest revision, for accomplishment instructions.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Nose Section	N/A

6. INSPECTION METHOD

Fluorescent Penetrant

7. REPAIR/MODIFICATION

8. COMMENTS

If a crack is detected, replace the trunnion, refer to Cessna Multi-engine Service Bulletin MEB88-5R2, or latest revision, for trunnion replacement instructions.

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SUPPLEMENTAL INSPECTION NUMBER: 52-10-00

1. TITLE

Cabin Door Retention

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	10,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

To verify the integrity of the door retention system.

4. INSPECTION INSTRUCTIONS

A. Remove all the pin retention linkages from the upper and lower cabin door. Refer to the Maintenance Manual.

B. Inspect all the bell cranks, pushrods, handle, and pins for cracks, corrosion, worn holes and signs of fatigue. Refer to Figure 1.

C. Use magnetic particle method to inspect the latch pin receptacles for corner cracks. Refer to Section 5-15-14, Supplemental Inspection Number 52-10-00, for specific instructions.

D. Install all the pin retention linkages from the upper and lower cabin door. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Cabin Door	0.10 Inch

6. INSPECTION METHOD

Visual, Magnetic Particle, and Surface Eddy Current Inspection

7. REPAIR/MODIFICATION

Repairs may be made in accordance with the Maintenance Manual. Any repair not covered by recommendations in the above documents should be coordinated with Cessna Propeller Aircraft Product Support prior to beginning the repair.

8. COMMENTS

None

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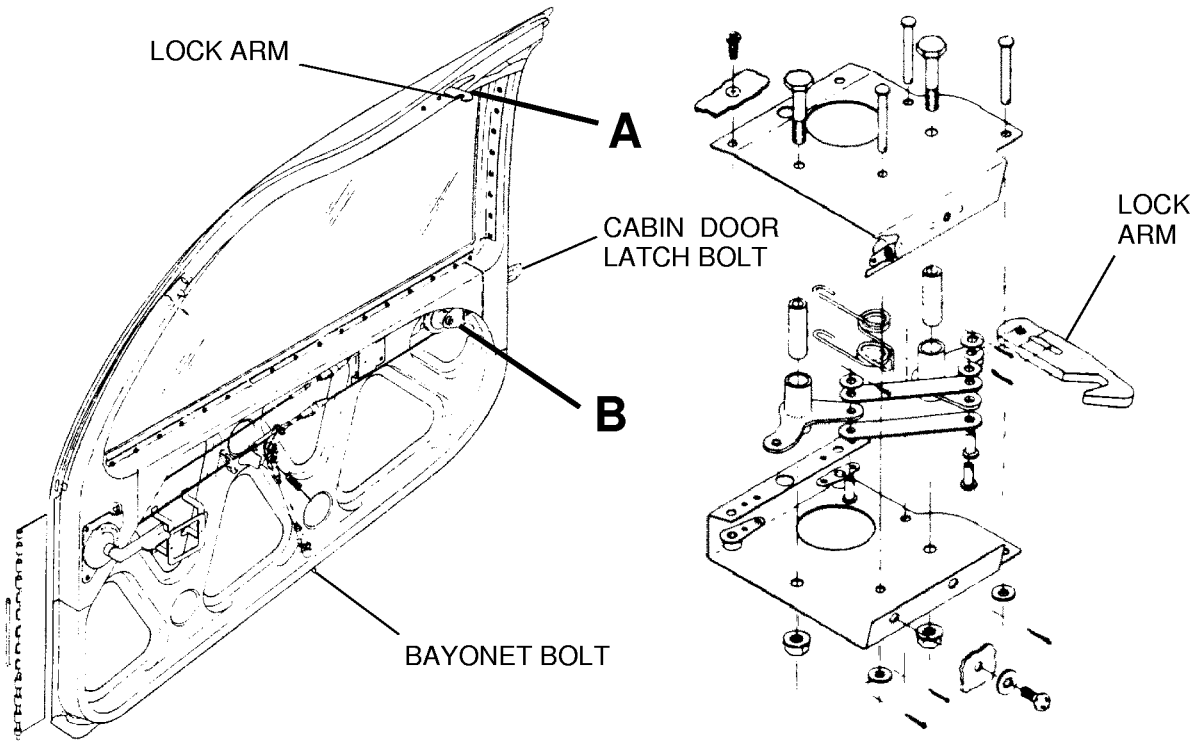
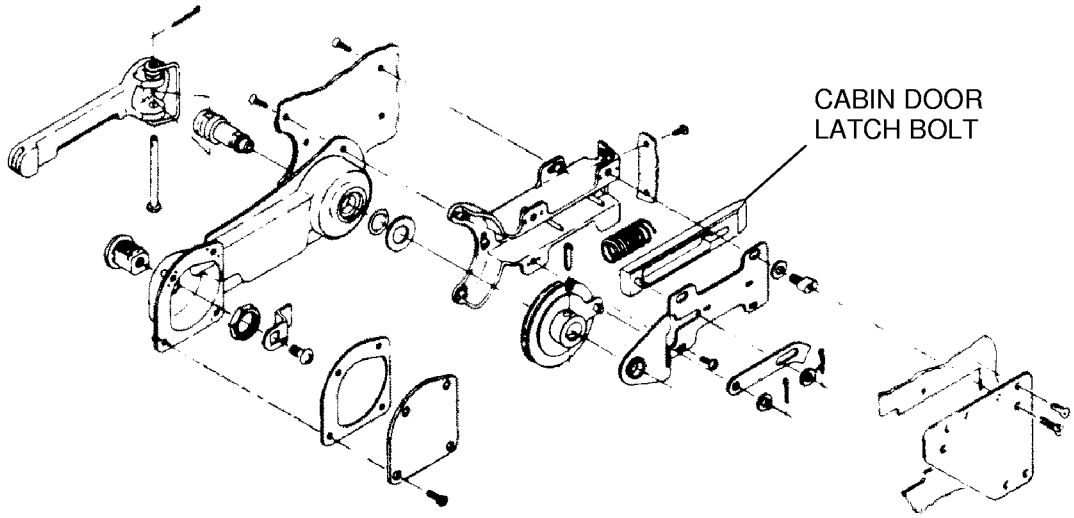
A1010



DETAIL A



DETAIL B

FWD

10114001
A10113002
B10112006

Cabin Door Linkage Installation
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 52-20-00

1. TITLE

Emergency Exit Window Mechanism Inspection

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	1,000 Hours	Or	3 Years
	REPEAT	1,000 Hours	Or	3 Years

3. PURPOSE

To ensure that the emergency exit window mechanism is in good condition and is functioning properly.

4. INSPECTION INSTRUCTIONS

A. Remove Royalite panels and visually inspect release ring/handle for cracks, wear and damage. Refer to Figure 1.

B. Visually inspect other release mechanism parts and components for cracks, wear, damage and deterioration.

C. Check operation of release mechanism.Refer to figure 1 sheet 2.

D. Refer to Section 5-15-15, Supplemental Inspection Number 52-20-00, for specific instructions.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Emergency Exit Window	0.10 Inch

6. INSPECTION METHOD

Visual, Fluorescent Liquid Penetrant, and Surface Eddy Current

7. REPAIR/MODIFICATION

Replace any worn, cracked, damaged or deteriorated parts with new parts as required. Refer to the Maintenance Manual and Illustrated Parts Catalog.

8. COMMENTS

None

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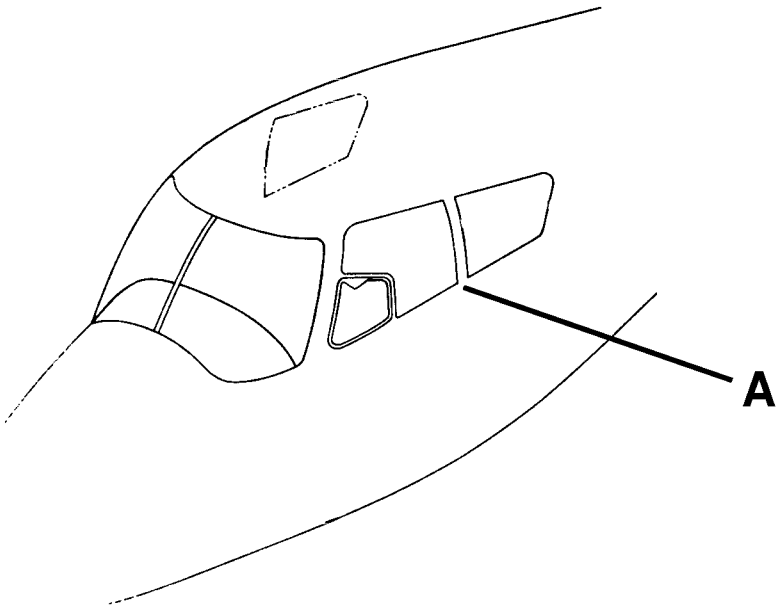
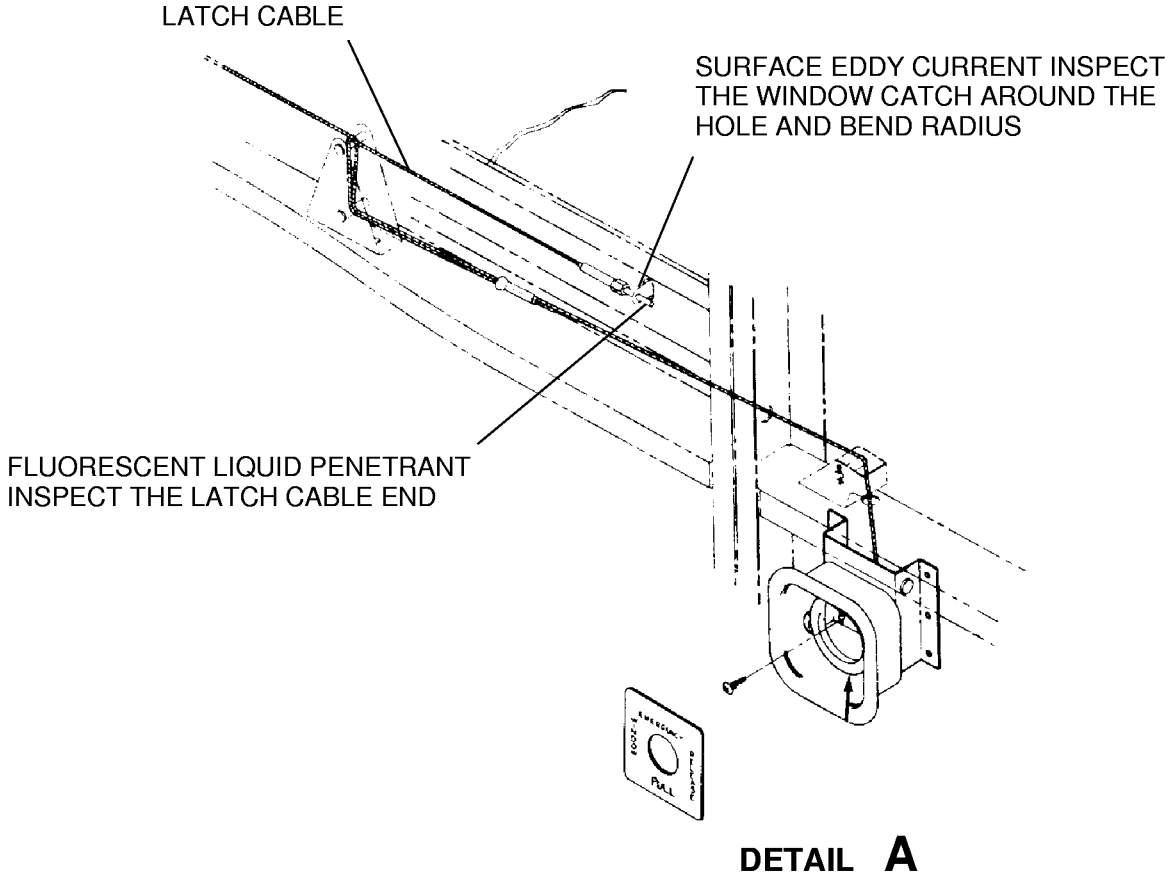
A1556





Emergency Exit Window Release Mechanism
Figure 1 (Sheet 1)

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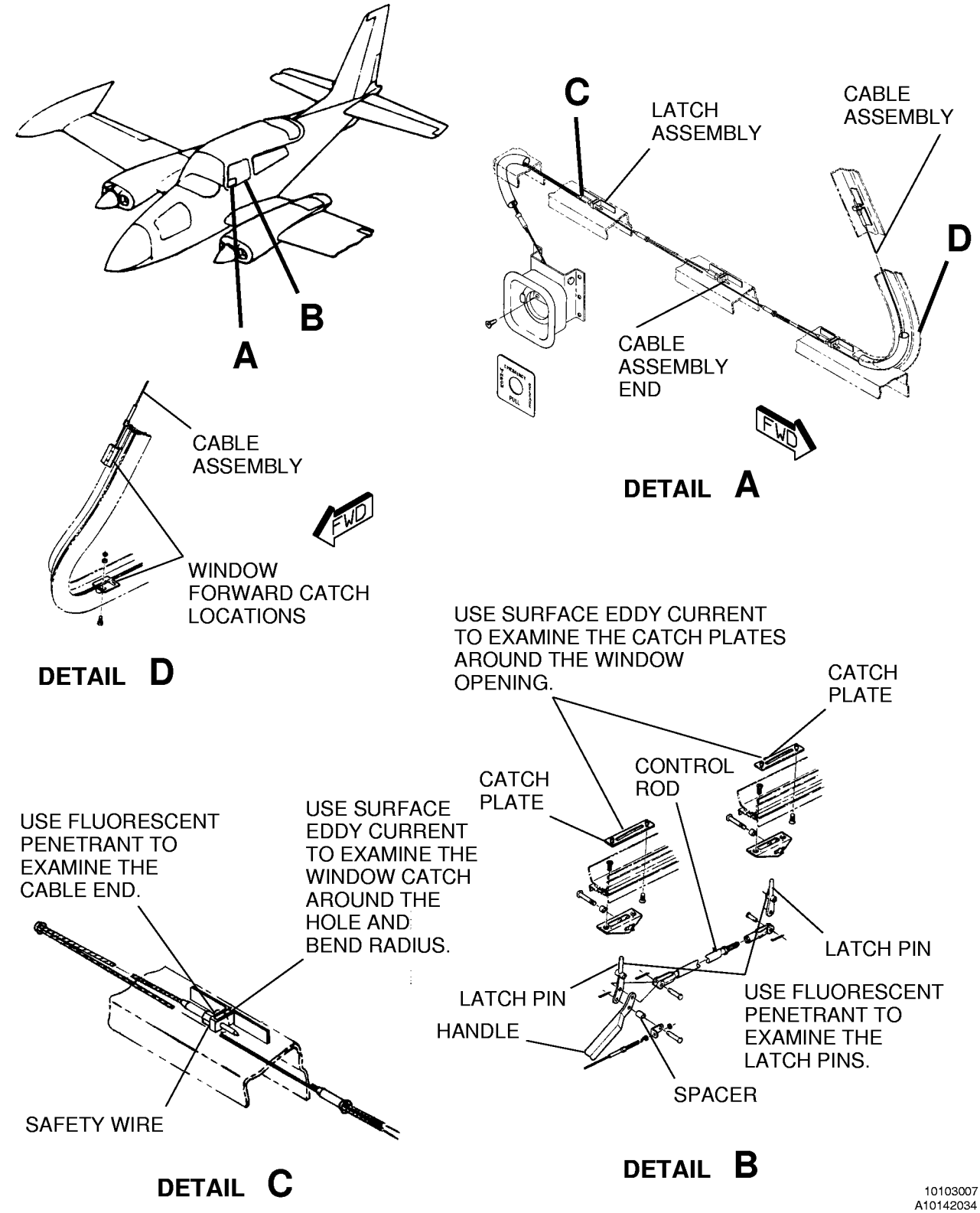
A36820



10103007
A10142034
C10142034

Emergency Exit Window Release Mechanism
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 53-10-03

1. TITLE

Horizontal Stabilizer Rear Spar Angle Attachment

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

A detailed inspection of the tailcone angle attachment to the horizontal stabilizer rear spar for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove the horizontal stabilizer. Refer to the Maintenance Manual.

B. Inspect the tailcone angle attachment and the horizontal stabilizer rear spar for corrosion.

C. Refer to Section 5-15-16, Supplemental Inspection Number 53-10-03, for specific instructions.

D. Reinstall the horizontal stabilizer. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Tailcone	0.080 Inch

6. INSPECTION METHOD

Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

It is permissible to repair by blending out up to ten percent of the spar cap thickness to remove corrosion. Refer to the Maintenance Manual for approved corrosion removal procedures. Repairs may be made in accordance with the Maintenance Manual, which is considered to be acceptable repair data. Repair of corrosion greater than ten percent of the spar cap thickness or any repair not covered by recommendations in the Maintenance Manual should be coordinated prior to beginning the repair with Cessna Propeller Aircraft Product Support.

8. COMMENTS

If a crack is detected, or corrosion requiring removal of more than ten percent of the spar cap or attachment angle thickness is discovered, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 53-10-04

1. TITLE

Window Frame and Surrounding Structure

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	10,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

An inspection of the window frames and surrounding structure for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove the upholstery panels to expose the window frames and cabin door frames. Refer to the Maintenance Manual.

B. Visually inspect structure for cracks, corrosion and signs of fatigue.

C. Reinstall the upholstery panels. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Fuselage Cabin	0.25 Inch

6. INSPECTION METHOD

Visual

7. REPAIR/MODIFICATION

8. COMMENTS

If a crack is detected, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 54-10-00

1. TITLE

Engine Support Beams

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	1,500 Hours	Or	At Engine Overhaul
	REPEAT	1,500 Hours	Or	At Engine Overhaul

3. PURPOSE

Detailed inspection of the engine beams for the Model 310 for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove engine from the airplane. Refer to the Maintenance Manual.
   (1) Remove four (4) bolts attaching unfeathering accumulator (if installed) and remove to allow access to the engine mount bolts. Do not disconnect hoses.
   (2) Mark all mount components for proper orientation, disconnect mounts from engine and engine beam and remove mounts. Retain bolts and washers.

B. Visually inspect engine support structure for cracks, overload deformations, corrosion, loose fasteners and exhaust leak heat damage.

C. Eddy current inspect the area around and between the fasteners common to the engine beams. Inspect the forward and aft engine mount areas including fastener holes in the unfeathering accumulator attach area. Refer to Section 5-15-18, Supplemental Inspection Number 54-10-00, for specific instructions.

D. Visually inspect engine support beam for loose or working fasteners. If no cracks or damage is found, restore airplane to appropriate configuration. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Left and right engine nacelles.	0.16 Inch

6. INSPECTION METHOD

Visual/Surface Eddy Current

7. REPAIR/MODIFICATION

Replace damaged parts or contact Cessna for possible repair definition.

8. COMMENTS

If a crack is detected, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 54-10-01

1. TITLE

Engine Beams Modification

2. EFFECTIVITY

310R0001 Thru 310R2140 (Airplanes equipped with turbochargers only)

INSPECTION COMPLIANCE

TYPICAL	**INITIAL**	Per MEB99-7
	REPEAT	Per MEB99-7

3. PURPOSE

Detailed inspection of the engine beams and canted bulkhead on the Model 310 for anomalies including cracks, corrosion and heat damage.

4. INSPECTION INSTRUCTIONS

A. Obtain Service Kits SK310-109 and SK310-112 and Service Bulletins MEB99-6, MEB99-7, and MEB99-8 from Cessna Aircraft Company.

B. Conduct inspections required by the Service Bulletins.

C. Correct anomalies as required by the Service Bulletins.

D. Install heat blanket as specified by the Service Bulletins.

E. Repeat inspections as addressed in the Service Bulletins.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Engine Beam	0.080 Inch

6. INSPECTION METHOD

Ultrasonic/Eddy Current

7. REPAIR/MODIFICATION

8. COMMENTS

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-00

1. TITLE

Horizontal Stabilizer Inspection

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	10,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

To inspect for skin and rib cracks on upper and lower surface of horizontal stabilizer.

4. INSPECTION INSTRUCTIONS

A. Inspect the upper and lower horizontal stabilizer skin area between front and rear spar at left/right horizontal stabilizer for cracks.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Tailcone	0.25 Inch

6. INSPECTION METHOD

Visual

7. REPAIR/MODIFICATION

Repairs may be made in accordance with the Maintenance Manual. Any repair not covered by recommendations in above document should be coordinated with Cessna Propeller Aircraft Product Support prior to beginning the repair.

8. COMMENTS

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-01

1. TITLE

Horizontal Stabilizer Spars and Attachments

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

To inspect the forward and aft horizontal stabilizer spars, auxiliary spars, and attachments for signs of damage, fatigue, corrosion and deterioration.

4. INSPECTION INSTRUCTIONS

A. Remove elevator from the airplane and open all horizontal stabilizer access panels. Refer to the Maintenance Manual.

B. Inspect the forward and aft spars, auxiliary spars, and attach fittings for cracks, corrosion, loose fasteners, elongated fastener attach holes and signs of fatigue and deterioration.

C. Close all horizontal stabilizer access panels and reinstall the elevator. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Tailcone	0.25 Inch

6. INSPECTION METHOD

Visual

7. REPAIR/MODIFICATION

It is permissible to repair by blending out up to ten percent of the spar cap thickness to remove corrosion. Refer to the Maintenance Manual for approved corrosion removal procedures. Repairs may be made in accordance with the Maintenance Manual, which is considered to be acceptable repair data. Repair of corrosion greater than ten percent of the spar cap thickness or any repair not covered by recommendations in the Maintenance Manual should be coordinated prior to beginning the repair with Cessna Propeller Aircraft Product Support.

8. COMMENTS

If a crack is detected, or corrosion greater than ten percent of the spar thickness is discovered, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-02

1. TITLE

Horizontal Stabilizer Forward Spar Upper Cap

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

Detailed inspection of the front spar upper cap horizontal flange fastener holes for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove the horizontal stabilizer. Refer to the Maintenance Manual.

B. Refer to Section 5-15-22, Supplemental Inspection Number 55-10-02, for specific instructions.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Tailcone	0.080 Inch

6. INSPECTION METHOD

Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

8. COMMENTS

If a crack is detected, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-03

1. TITLE

Horizontal Stabilizer Forward Spar Lower Cap

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

Detailed inspection of the front spar lower cap horizontal flange fastener holes for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove the horizontal stabilizer. Refer to the Maintenance Manual.

B. Refer to Section 5-15-23, Supplemental Inspection Number 55-10-03, for specific instructions.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Tailcone	0.080 Inch

6. INSPECTION METHOD

Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

8. COMMENTS

If a crack is detected, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-04

1. TITLE

Horizontal Stabilizer Forward Spar Attach

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

Detailed inspection of the front spar attachment for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove the horizontal stabilizer. Refer to the Maintenance Manual.

B. Refer to Section 5-15-24, Supplemental Inspection Number 55-10-04, for specific instructions.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Tailcone	0.080 Inch

6. INSPECTION METHOD

Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

8. COMMENTS

If a crack is detected, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-05

1. TITLE

Horizontal Stabilizer Rear Spar Lower Cap Attach

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

Detailed inspection of the rear spar lower cap horizontal flange attach points for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove the horizontal stabilizer. Refer to the Maintenance Manual.

B. Refer to Section 5-15-25, Supplemental Inspection Number 55-10-05, for specific instructions.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Tailcone	0.080 Inch

6. INSPECTION METHOD

Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

8. COMMENTS

If a crack is detected, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-06

1. TITLE

Horizontal Stabilizer Rear Spar Upper Cap, BL 0.00

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

Detailed inspection of the rear spar upper cap horizontal flange fastener holes around BL 0.00 for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove the horizontal stabilizer. Refer to the Maintenance Manual.

B. Refer to Section 5-15-26, Supplemental Inspection Number 55-10-06, for specific instructions.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Tailcone	0.080 Inch

6. INSPECTION METHOD

Surface and Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

8. COMMENTS

If a crack is detected, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-07

1. TITLE

Horizontal Stabilizer Rear Spar Lower Cap, BL 0.00

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

Detailed inspection of the rear spar lower cap horizontal flange fastener holes around BL 0.00 for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove the horizontal stabilizer. Refer to the Maintenance Manual.

B. Refer to Section 5-15-27, Supplemental Inspection Number 55-10-07, for specific instructions.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Tailcone	0.080 Inch

6. INSPECTION METHOD

Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

8. COMMENTS

If a crack is detected, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 55-20-00

1. TITLE

Outboard Elevator Hinge Bracket and Attachment

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	5,000 Hours	Or	10 Years
	REPEAT	1,000 Hours	Or	3 Years

3. PURPOSE

To inspect, repair, or replace the outboard elevator hinge bracket and stabilizer bracket.

4. INSPECTION INSTRUCTIONS

A. Remove the elevator from the airplane. Refer to the Maintenance Manual.

B. Inspect elevator and stabilizer hinge brackets for looseness, cracks and deterioration. Refer to Figure 1.

C. Reinstall elevator. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Horizontal Stabilizer	0.25 Inch

6. INSPECTION METHOD

Visual, refer to Figure 1.

7. REPAIR/MODIFICATION

Replace with the latest superseding bracket assemblies and attaching hardware.

8. COMMENTS

Failure can be critical to the airplane's pitch control.

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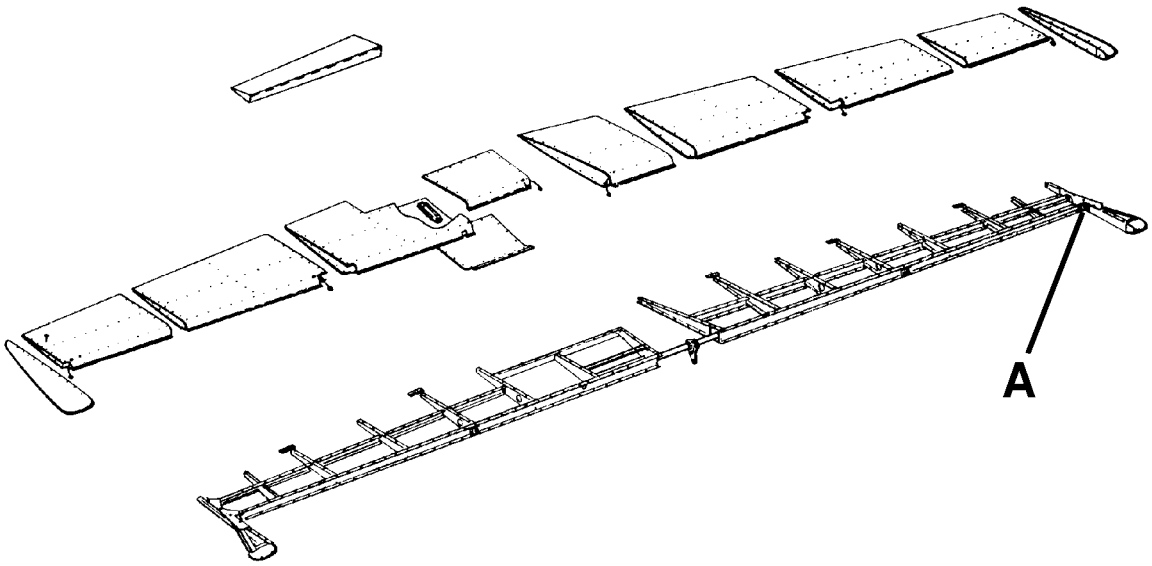
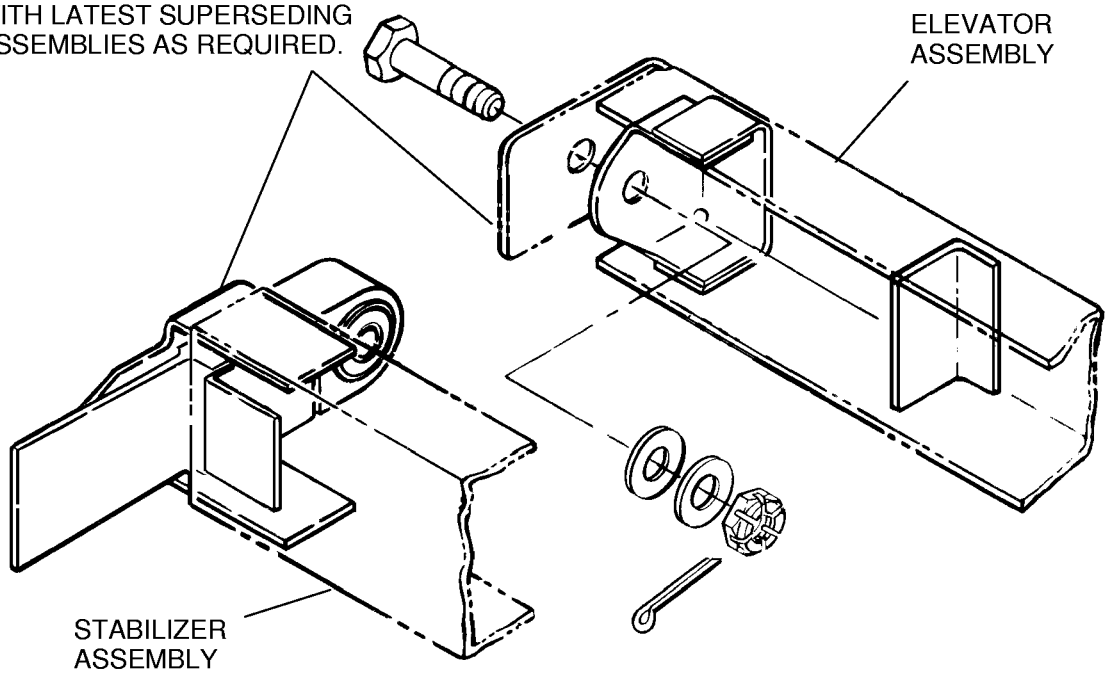


OUTBOARD ELEVATOR/STABILIZER HINGE BRACKETS - INSPECT FOR LOOSENESS, CRACKS AND DETERIORATION. REPLACE WITH LATEST SUPERSEDING BRACKET ASSEMBLIES AS REQUIRED.



DETAIL A

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Elevator and Trim Tab Assembly
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 55-20-01

1. TITLE

Elevator Hinges and Fittings

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	2,500 Hours	Or	5 Years

3. PURPOSE

To inspect the elevator hinges, fittings and associated hardware and components for condition.

4. INSPECTION INSTRUCTIONS

A. Remove the elevator from the airplane. Refer to the Maintenance Manual.

B. Perform a visual inspection.
(1) Inspect the elevator hinges for condition, cracks and security.
(2) Inspect the hinge bolts and hinge bearings for condition and security.
(3) Inspect the bearings for freedom of rotation.
(4) Inspect the attach fittings for evidence of damage, wear, failed fasteners, and security.

C. Refer to Section 5-15-29, Supplemental Inspection Number 55-20-01, for specific instructions.

D. Reinstall the elevator. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Horizontal Stabilizer	0.25 Inch Visual
	0.08 Inch Surface Eddy Current

6. INSPECTION METHOD

Visual and Surface Eddy Current

7. REPAIR/MODIFICATION

Replace unserviceable/damaged components with the latest superseding part numbers.

8. COMMENTS

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SUPPLEMENTAL INSPECTION NUMBER: 55-30-00

1. TITLE

Vertical Stabilizer Spars and Attachments

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

To inspect the vertical stabilizer spars and attachments for signs of damage, fatigue and deterioration.

4. INSPECTION INSTRUCTIONS

A. Remove rudder from the airplane and open all vertical stabilizer access panels. Refer to the Maintenance Manual.

B. Inspect the forward and aft spars and attach fittings for cracks, corrosion, loose fasteners, elongated fastener attach holes and signs of fatigue and deterioration. Special attention must be given to the aft spar structure for corrosion.

C. Close all vertical stabilizer access panels and reinstall the rudder. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Tailcone	0.25 Inch

6. INSPECTION METHOD

Visual

7. REPAIR/MODIFICATION

It is permissible to repair by blending out of up to ten percent of the spar cap thickness to remove corrosion. Refer to the Maintenance Manual for approved corrosion removal procedures.

Repairs may be made in accordance with the Maintenance Manual, which is considered to be acceptable repair data. Repair of corrosion greater than ten percent of the spar cap thickness or any repair not covered by recommendations in the Maintenance Manual should be coordinated prior to beginning the repair with Cessna Propeller Aircraft Product Support.

8. COMMENTS

If a crack is detected, or repair for corrosion is required beyond the defined limits, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 55-30-01

1. TITLE

Rudder Hinges and Fittings

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	2,500 Hours	Or	5 Years

3. PURPOSE

To inspect the rudder hinges, fittings and associated hardware and components for condition.

4. INSPECTION INSTRUCTIONS

A. Remove the rudder from the airplane. Refer to the Maintenance Manual.

B. Perform a visual inspection of the rudder:
(1) Inspect the hinges for condition, cracks and security.
(2) Inspect the hinge bolts and hinge bearings for condition and security.
(3) Inspect the bearings for freedom of rotation.
(4) Inspect the attach fittings for evidence of damage, wear, failed fasteners and security.

C. Eddy Current inspect the rudder hinge attach fittings for cracks. Refer to Section 5-15-31, Supplemental Inspection Number 55-30-01, for specific instructions.

D. Reinstall the rudder. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Vertical Stabilizer	0.25 Inch Visual
	0.080 Inch (open hole) Eddy Current
	0.150 Inch (around fastener or bearing) Eddy Currrent

6. INSPECTION METHOD

Visual and Surface Eddy Current

7. REPAIR/MODIFICATION

Replace failed/damaged components with the latest superseding part numbers.

8. COMMENTS

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SUPPLEMENTAL INSPECTION NUMBER: 55-30-02

1. TITLE

Vertical Stabilizer Rear Spar Cap Attach

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

Detailed inspection of the rear spar attachment for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Refer to Section 5-15-32, Supplemental Inspection Number 55-30-02, for specific instructions.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Tailcone	0.080 Inch

6. INSPECTION METHOD

Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

8. COMMENTS

If a crack is detected, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-03

1. TITLE

Wing Rib - Main Landing Gear Side Brace

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	10,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

Inspect the main landing gear upper side brace support for looseness, the support attachment bolts for proper torque, and wheel well ribs for cracks.

4. INSPECTION INSTRUCTIONS

A. Inspect the main landing gear upper side brace support for looseness, and support attach bolts for proper torque. Refer to the Maintenance Manual for torque values.

B. Inspect the wheel well ribs for cracks using surface eddy current.
(1) Refer to Section 5-15-33, Supplemental Inspection Number 57-10-03, for specific instructions.
(2) If cracks are found, wing rib(s) shall be repaired by installing Cessna Service Kit SK414-8E, or latest revision, which incorporates the latest structural changes.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	0.10 Inch

6. INSPECTION METHOD

Surface Eddy Current

7. REPAIR/MODIFICATION

Refer to Cessna multi-engine Service Letter ME76-2, or latest revision, and Service Kit SK414-8E, or latest revision.

8. COMMENTS

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-04

1. TITLE

Lower Wing Rear Spar Cap at Splice

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	5,000 Hours	Or	10 Years
	REPEAT	1,000 Hours	Or	3 Years

3. PURPOSE

Detailed inspection of the fastener holes common to the lower rear spar cap flanges and the lower rear spar cap splice angles for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove access panels in the aft auxiliary spar. Refer to the Maintenance Manual.

B. Remove wing access panels immediately outboard of the engine nacelle in the upper and lower skin. Refer to the Maintenance Manual.

C. Refer to Section 5-15-34, Supplemental Inspection Number 57-10-04, for specific instructions.

D. Inspect the rear spar for corrosion. Special attention should be given to the spar in the areas directly behind the exhaust ducts and near the flap attachments.

E. Reinstall wing access panels and auxiliary spar access panels in compliance with the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	0.080 Inch

6. INSPECTION METHOD

Bolt Hole and Surface Eddy Current

7. REPAIR/MODIFICATION

It is permissible to repair by blending out up to ten percent of the spar cap thickness to remove corrosion. Refer to the Maintenance Manual for approved corrosion removal procedures. If corrosion is caused by exhaust gases, contact Cessna Propeller Aircraft Product Support for additional instructions.

Repair of corrosion caused by exhaust gases, corrosion greater than ten percent of the spar cap thickness or any repair not covered by recommendations in the Maintenance Manual should be coordinated prior to beginning the repair with Cessna Propeller Aircraft Product Support.

8. COMMENTS

If a crack is detected, or repair for corrosion is required beyond the defined limits, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-05

1. TITLE

Lower Rear Carry-Thru Spar Cap

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	1,000 Hours	Or	3 Years

3. PURPOSE

Detailed inspection of the fastener holes through the lower rear carry-thru spars for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Obtain applicable Service Bulletins, Service Information Letters and/or Service Kits from Cessna Aircraft Company.

B. Install access panels as described in applicable Service Bulletin, Service Information Letter, and/or Service Kit.

C. Upon initial inspection and every fifth subsequent inspection, remove fitting from airplane. Refer to the Maintenance Manual.
   (1) Inspect spar and fitting for corrosion.
   (2) If corrosion is found on the fitting, replace with new fitting.

D. Refer to Section 5-15-35, Supplemental Inspection Number 57-10-05, for specific instructions.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	0.080 Inch

6. INSPECTION METHOD

Bolt Hole and Surface Eddy Current

7. REPAIR/MODIFICATION

Comply with applicable Service Bulletins, Service Letters and/or Service Kits from Cessna Aircraft Company.
Replace corroded or cracked fittings.
It is permissible to repair by blending out up to ten percent of the spar cap thickness to remove corrosion. Refer to the Maintenance Manual for approved corrosion removal procedures.
Repair of corrosion greater than ten percent of the spar cap thickness should be coordinated prior to beginning the repair with Cessna Propeller Aircraft Product Support.

8. COMMENTS

If a crack is detected, or corrosion greater than ten percent of the spar cap thickness is discovered, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-06

1. TITLE

Lower Main Wing Spar Cap Inspection and Modification

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	11,000 Hours
		After Modification
	INITIAL	20,000 Hours
	REPEAT	2,500 Hours

3. PURPOSE

To install spar cap reinforcing straps.

4. INSPECTION INSTRUCTIONS

A. Check aircraft log book to see if service kit SK320-57 for turbocharged airplanes or service kit SK310-115 for non-turbochagred airplanes has been installed.

B. If service kit SK320-57 or SK310-115 is not installed:
   (1) Obtain service kit SK320-57 or SK310-115 from Cessna Aircraft Company.
   (2) Install all fastener holes through the lower main wing spar cap and skin in accordance with the service kit instructions.
   (3) Inspect the spar for corrosion. Special attention to the spar structure in the nacelle area is recommended.
   (4) Install service kit SK320-57 or SK310-115.

C. If service kit SK320-57 or SK310-115 is installed:
   (1) Remove panels in the lower nacelle to allow access to the spar reinforcing straps. If the NDI inspector can not reach fasteners for inspection, it will be necessary to remove the lower nacelle skins.
   (2) Remove the heat shields to allow access to the surface of the spar reinforcing straps.
   (3) Refer to Supplemental Inspection Document 5-15-36, Supplemental Inspection Number 57-10-06 for specific instructions.

D. Install Service Kit.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing/Nacelle	0.080 Inch (SK320-57 or SK310-115 not installed)
	0.140 Inch (SK320-57 or SK310-115 installed)

6. INSPECTION METHOD

Bolt Hole Eddy Current and Surface Eddy Current

7. REPAIR/MODIFICATION

If necessary, install service kit SK320-57 or SK310-115 from Cessna Aircraft Company. Blend out of up to ten percent of the spar cap thickness is permissible to remove corrosion. Refer to the Model 310R Maintenance Manual, Chapter 51, for approved corrosion removal procedures. If corrosion is

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caused by exhaust gases, contact Cessna Customer Service for additional instructions. Repair of corrosion caused by exhaust gases, corrosion greater than ten percent of the spar cap thickness or any repair not covered by recommendations in the Maintenance Manual should be coordinated with Cessna Customer Service prior to service kit installation.

8. COMMENTS

Use the Discrepancy Report form in Supplemental Inspection Document 5-13-00, to report crack(s), corrosion, or damage that is found during this inspection. If crack(s), corrosion, or damage is found, replace the part or repair the part in accordance with the Model 310R Maintenance Manual. If a repair for crack(s), corrosion, or damage is required (for a repair that is not available in the Model 310R Maintenance Manual), contact Cessna Customer Service for possible repair instructions or replace the part.

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-07

1. TITLE

Lower Aft Auxiliary Spar Cap

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	6,500 Hours	Or	13 Years
	REPEAT	2,500 Hours	Or	5 Years

3. PURPOSE

Detailed inspection of the fastener holes through the lower aft auxiliary spar, for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove access panels in aft auxiliary spar. Refer to the Maintenance Manual.

B. Refer to Section 5-15-37, Supplemental Inspection Number 57-10-07, for specific instructions.

C. Inspect entire spar structure for corrosion. Special attention should be given to the area immediately behind the exhaust duct.

D. Install access panels to aft auxiliary spar. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	0.080 Inch

6. INSPECTION METHOD

Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

Refer to the Maintenance Manual for approved corrosion removal procedures. Repairs may be made in accordance with the Maintenance Manual, which is considered to be acceptable repair data. Any repair not covered by recommendations in the Maintenance Manual should be coordinated with Cessna Propeller Aircraft Product Support prior to beginning the repair.

8. COMMENTS

If a crack is detected, or repair of corrosion is required, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-08

1. TITLE

Lower Carry-Thru Main Spar Cap (P/N 0811300-3)

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	11,000 Hours
	REPEAT	400 Hours

3. PURPOSE

To inspect the lower carry-thru main spar cap for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Review the maintenance records to determine if the original spar cap has been replaced with a P/N 0811300-78 spar cap. If the spar cap has been replaced, complete SID 57-10-29 instead.

B. Determine if the carry-thru access panels defined in SK320-59 or MEB07-3 have been installed. If the access panels have not been installed. install them before completing this inspection.

C. Inspect the spar and fitting for corrosion. If corrosion is found on the fitting install a new fitting.

D. Conduct a surface eddy current inspection of the lower spar cap surface around the fasteners to look for cracks. Refer to 5-13-01, Nondestructive Inspection Methods and Requirements.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	0.230 Inch

6. INSPECTION METHOD

Surface Eddy Current

7. REPAIR/MODIFICATION

Install access panels defined in service kit SK320-59 or MEB07-3 from Cessna Aircraft Company. Replace corroded or cracked fittings. Blend out of up to five percent of the spar cap thickness is permissible to remove corrosion. Refer to the Model 310R Maintenance Manual for approved corrosion removal procedures. Repair of corrosion greater than five percent of the spar cap thickness should be coordinated with Cessna Customer Service prior to beginning the repair.

8. COMMENTS

Use the Discrepancy Report form in Supplemental Inspection Document Introduction to report crack(s), corrosion, or damage that is found during this inspection. If crack(s) are found replace the part. If corrosion is found replace the part or repair the part in accordance with the Model 310R Maintenance Manual. If a repair is required that is not available in the Maintenance Manual, contact Cessna Customer Service of possible repair instructions or replace the part.

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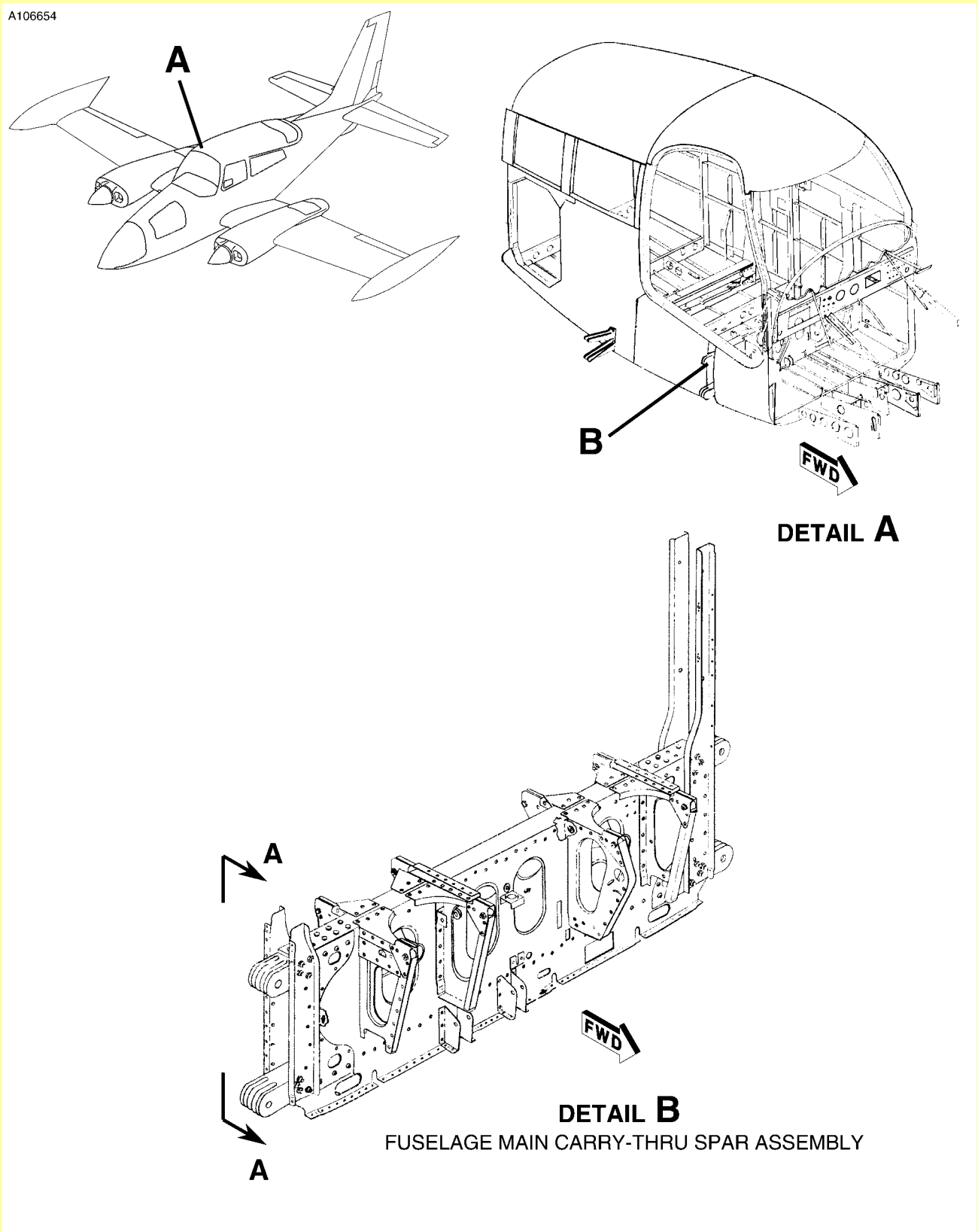

Lower Carry-Thru Main Spar Cap Inspection
Figure 1 (Sheet 1)

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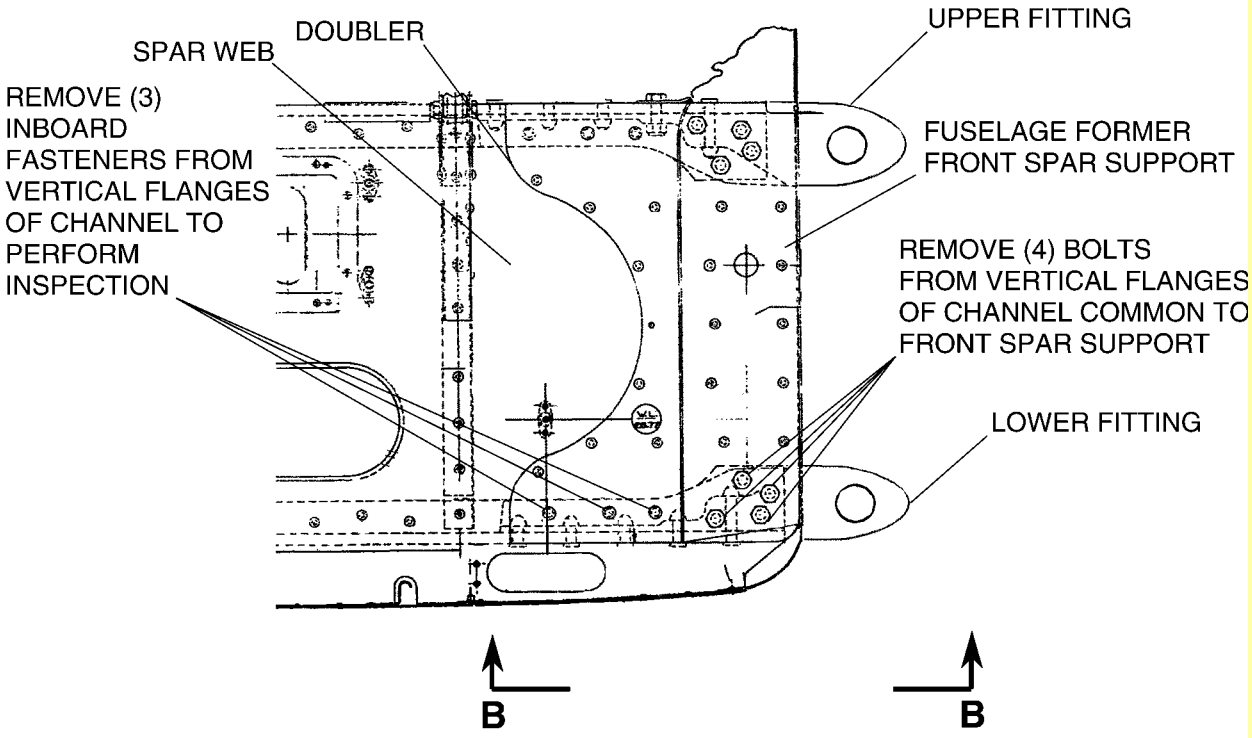
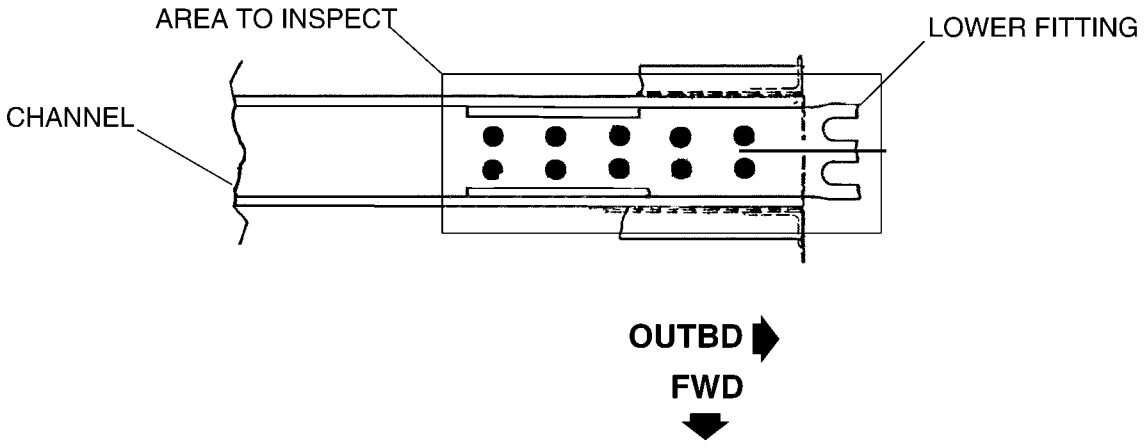


VIEW A-A
VIEW LOOKING FORWARD AT MAIN CARRY-THRU SPAR CAP ASSEMBLY.
(RIGHT SIDE SHOWN, LEFT SIDE OPPOSITE)



VIEW B-B
VIEW LOOKING UP AT MAIN CARRY-THRU SPAR CAP ASSEMBLY

D1042R2001

Lower Carry-Thru Main Spar Cap Inspection
Figure 2 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-09

1. TITLE

Wing Lower Front Spar Cap at Root Fitting Attach, WS 28.96

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	11,000 Hours	Or	20 Years
	REPEAT	4,000 Hours	Or	8 Years

3. PURPOSE

Detailed inspection of the fastener holes through the lower front wing spar fitting and lower front wing spar cap, for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove access panels forward of the main spar and inboard of the engine beam installation. Refer to the Maintenance Manual.

B. Inspect the fitting and spar for corrosion.
(1) If corrosion is found in the fitting, install a new fitting. Refer to the Maintenance Manual.

C. Refer to Section 5-15-39, Supplemental Inspection Number 57-10-09, for specific instructions.

D. Reinstall access panels forward of the main spar, and inboard of the engine beam installation. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	0.080 Inch

6. INSPECTION METHOD

Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

Replace corroded or cracked fittings.
It is permissible to repair by blending out up to ten percent of the spar cap thickness to remove corrosion. Refer to the Maintenance Manual for approved corrosion removal procedures.
Repair of corrosion greater than ten percent of the spar cap thickness should be coordinated prior to beginning the repair with Cessna Propeller Aircraft Product Support.

8. COMMENTS

If a crack is detected, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-10

1. TITLE

Wing Lower Front Spar Cap at Root Fitting Attach, WS 36.36

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	11,000 Hours	Or	20 Years
	REPEAT	2,000 Hours	Or	4 Years

3. PURPOSE

Detailed inspection of the fastener holes common to the wing lower front spar cap and the wing lower front spar root fitting for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove access panels forward of the main spar inboard of the engine beam installation. Refer to the Maintenance Manual.

B. Inspect the fitting and spar for corrosion.
(1) If corrosion is found in the fitting, install a new fitting. Refer to the Maintenance Manual.

C. Refer to Section 5-15-40, Supplemental Inspection Number 57-10-10, for specific instructions.

D. Reinstall access panels forward of the main spar inboard of the engine beam installation. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	0.080 Inch

6. INSPECTION METHOD

Surface and Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

Replace corroded or cracked fittings.
It is permissible to repair by blending out up to ten percent of the spar cap thickness to remove corrosion. Refer to the Maintenance Manual for approved corrosion removal procedures.
Repair of corrosion greater than ten percent of the spar cap thickness should be coordinated prior to beginning the repair with Cessna Propeller Aircraft Product Support.

8. COMMENTS

If a crack in the spar is detected, or corrosion greater than 10 percent of the spar cap thickness is found, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-11

1. TITLE

Lower Forward Auxiliary Spar Cap

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	5,000 Hours	Or	10 Years

3. PURPOSE

To provide a detailed inspection of the fastener holes through the lower forward auxiliary spar cap for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove access panels in the forward auxiliary spar. Refer to the Maintenance Manual.

B. Thoroughly inspect the forward auxiliary spar for corrosion. Special attention should be given to the areas near the exhaust duct.

C. Refer to Section 5-15-41, Supplemental Inspection Number 57-10-11, for specific instructions.

D. Reinstall access panels in the forward auxiliary spar. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	0.080 Inch

6. INSPECTION METHOD

Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

Refer to the Maintenance Manual for approved corrosion removal procedures. Repairs may be made in accordance with the Maintenance Manual, which is considered to be acceptable repair data. Any repair not covered by recommendations in the Maintenance Manual should be coordinated prior to beginning the repair with Cessna Propeller Aircraft Product Support.

8. COMMENTS

If a crack is detected, or repair for corrosion beyond the defined limits is required, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-12

1. TITLE

Wing Front Spar Lug Inspection

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	2,500 Hours	Or	10 Years

3. PURPOSE

To provide a detailed inspection of the wing front spar lugs for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Remove the wing gap cover to gain access to the front spar lower lugs. Refer to the Maintenance Manual.

B. Visually inspect the lugs for cracks, overload deformations, and corrosion.

C. Refer to Section 5-15-42, Supplemental Inspection Number 57-10-12, for specific instructions.

D. Reinstall the wing cap cover. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	0.080 Inch

6. INSPECTION METHOD

Bolt Hole Eddy Current

7. REPAIR/MODIFICATION

Comply with applicable Service Bulletins, Service Information Letters and/or Service Kits from Cessna Aircraft Company.

8. COMMENTS

If a crack is detected, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-13

1. TITLE

Wing Tip Tank Attachment Inspection

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours	Or	20 Years
	REPEAT	2,500 Hours	Or	10 Years

3. PURPOSE

Detailed inspection of the wing tip tank attachment structure.

4. INSPECTION INSTRUCTIONS

A. Remove the wing tip tank. Refer to the Maintenance Manual.

B. Visually inspect the lugs and wing spars for cracks, overload deformations, and corrosion.

C. Refer to Section 5-15-43, Supplemental Inspection Number 57-10-13, for specific instructions.

D. Reinstall the wing tip tank. Refer to the Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	0.080 Inch

6. INSPECTION METHOD

Bolt Hole and Surface Eddy Current

7. REPAIR/MODIFICATION

Replace cracked or corroded fittings. Repairs to the spars may be made in accordance with the Maintenance Manual, which is considered to be acceptable repair data.
Any repair not covered by recommendations in the Maintenance Manual should be coordinated prior to beginning the repair with Cessna Propeller Aircraft Product Support.

8. COMMENTS

If a crack is detected, contact Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-28

1. TITLE

Wing Upper Center Skin Panel Inspection

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	2,500 Hours	Or	10 Years
	REPEAT	200 Hours	Or	2 Years

3. PURPOSE

To require a visual inspection of the outboard edge of the upper center wing skin panel in the area of the main gear side brace support rib upper cap for cracks, corrosion, and damage.

4. INSPECTION INSTRUCTIONS

A. Make sure the airplane is secured.

B. Make sure area to be inspected is clean and free of loose paint.

NOTE: Access to the area to be inspected is through the main gear wheel well.

C. Refer To Figure 1. Do a visual inspection of the outboard edge of the center upper wing skin panel in the area of the main gear side brace support rib upper cap for:
(1) Cracks
(2) Corrosion
(3) Damage

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	0.25 Inch

6. INSPECTION METHOD

Visual

7. REPAIR/MODIFICATION

Repairs to the wing skins are to be made in accordance with the airplane Maintenance Manual, which is considered to be acceptable repair data. Any repair not covered by the recommendations in the Maintenance Manual should be coordinated with Cessna Customer Service prior to beginning the repair.

8. COMMENTS

Use the Discrepancy Report form in Supplemental Inspection Document 5-13-00, to report crack(s), corrosion, or damage that is found during this inspection. If crack(s), corrosion, or damage is found, replace the part or repair the part in accordance with the 310R Maintenance Manual or approved data. If a repair for crack(s), corrosion, or damage is required (for a repair that is not available in the Model 310R Maintenance Manual), contact Cessna Customer Service for possible repair instructions or replace the part.

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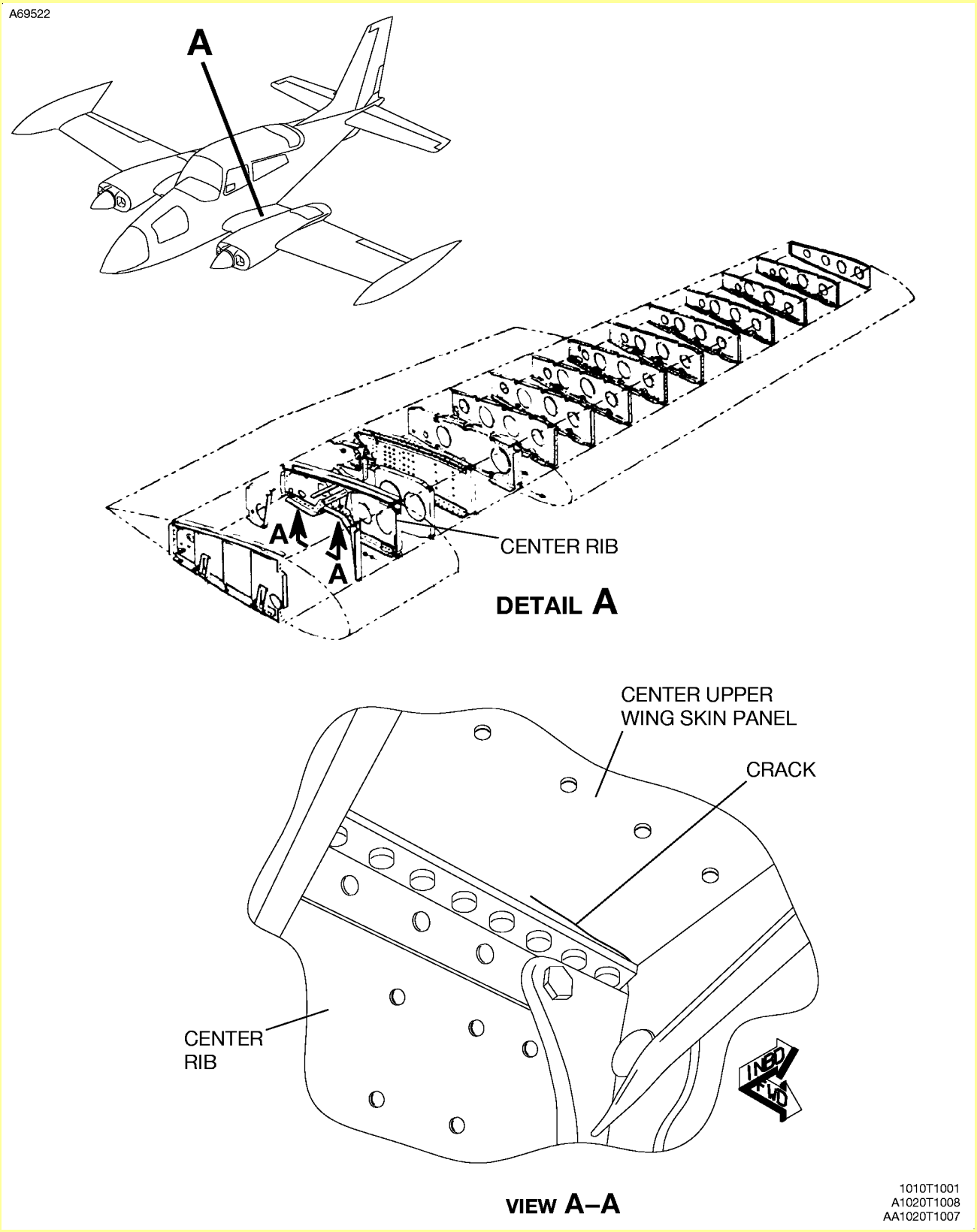

Center Wing Skin Panel Inspection
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 32-10-06

1. TITLE

Main Landing Gear Torque Tube Assembly

2. EFFECTIVITY

The following airplanes equipped with a part number 5045010-1, -2, -8, -13, -14, -19, -20, -24, and -25 Main Landing Gear Torque Tube.

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL: **INITIAL** 4,000 Hours

3. PURPOSE

To ensure that life limited main landing gear torque tubes are removed from service in accordance with the replacement time schedule.

4. INSPECTION INSTRUCTIONS

A. Replace the part number 5045010-1, -2, -8, -13, -14, -19, -20, -24, or -25 Main Landing Gear Torque Tube in accordance with the 310R Maintenance Manual.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Main Landing Gear Wheel Well	N/A

6. INSPECTION METHOD

N/A

7. REPAIR/MODIFICATION

N/A

8. COMMENTS

Main gear collapse would cause damage to the airplane.

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-29

1. TITLE

Lower Carry-Thru Main Spar Cap (P/N 0811300-78)

2. EFFECTIVITY

310R0001 Thru 310R2140

INSPECTION COMPLIANCE

TYPICAL:	**INITIAL**	15,000 Hours
	REPEAT	800 Hours

3. PURPOSE

To inspect the lower carry-thru main spar cap for cracks due to fatigue, overload, and corrosion.

4. INSPECTION INSTRUCTIONS

A. Review the maintenance records to determine if the original spar cap has been replaced with a P/N 0811300-78 spar cap. If the spar cap has not been replaced, complete SID 57-10-08 instead.

B. Determine if the carry-thru access panels defined in SK320-59 or MEB07-3 have been installed. If the access panels have not been installed. install them before completing this inspection.

C. Inspect the spar and fitting for corrosion. If corrosion is found on the fitting install a new fitting.

D. Conduct a surface eddy current inspection of the lower spar cap surface around the fasteners to look for cracks. Refer to 5-13-01, Nondestructive Inspection Methods and Requirements.

5. ACCESS AND DETECTABLE CRACK SIZE

ACCESS/LOCATION	DETECTABLE CRACK SIZE
Wing	0.230 Inch

6. INSPECTION METHOD

Surface Eddy Current

7. REPAIR/MODIFICATION

Install access panels defined in service kit SK320-59 or MEB07-3 from Cessna Aircraft Company. Replace corroded or cracked fittings. Blend out of up to five percent of the spar cap thickness is permissible to remove corrosion. Refer to the Model 310R Maintenance Manual for approved corrosion removal procedures. Repair of corrosion greater than five percent of the spar cap thickness should be coordinated with Cessna Customer Service prior to beginning the repair.

8. COMMENTS

Use the Discrepancy Report form in Supplemental Inspection Document Introduction to report crack(s), corrosion, or damage that is found during this inspection. If crack(s) are found replace the part. If corrosion is found replace the part or repair the part in accordance with the Model 310R Maintenance Manual. If a repair is required that is not available in the Maintenance Manual, contact Cessna Customer Service of possible repair instructions or replace the part.

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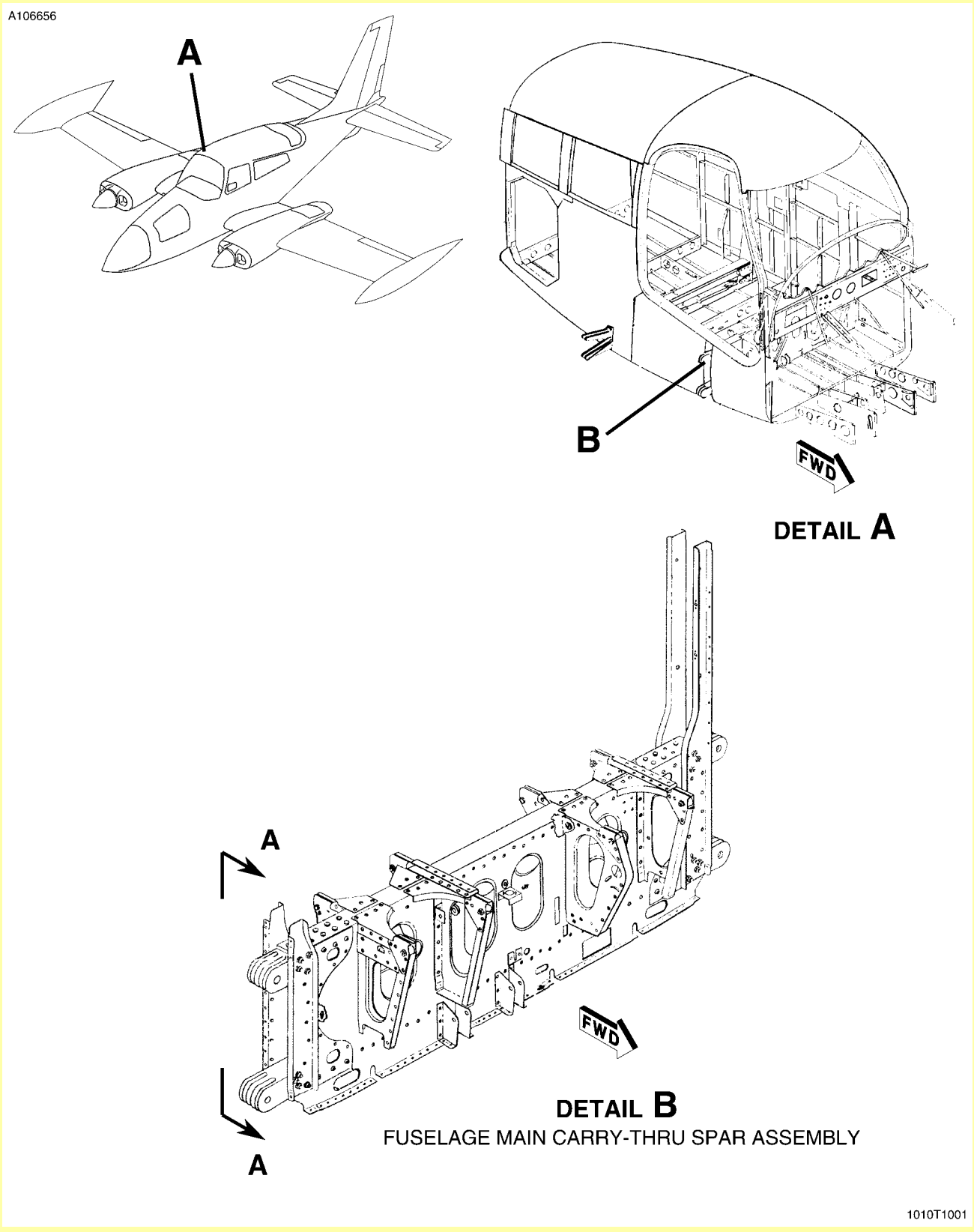

Lower Carry-Thru Main Spar Cap Inspection
Figure 1 (Sheet 1)

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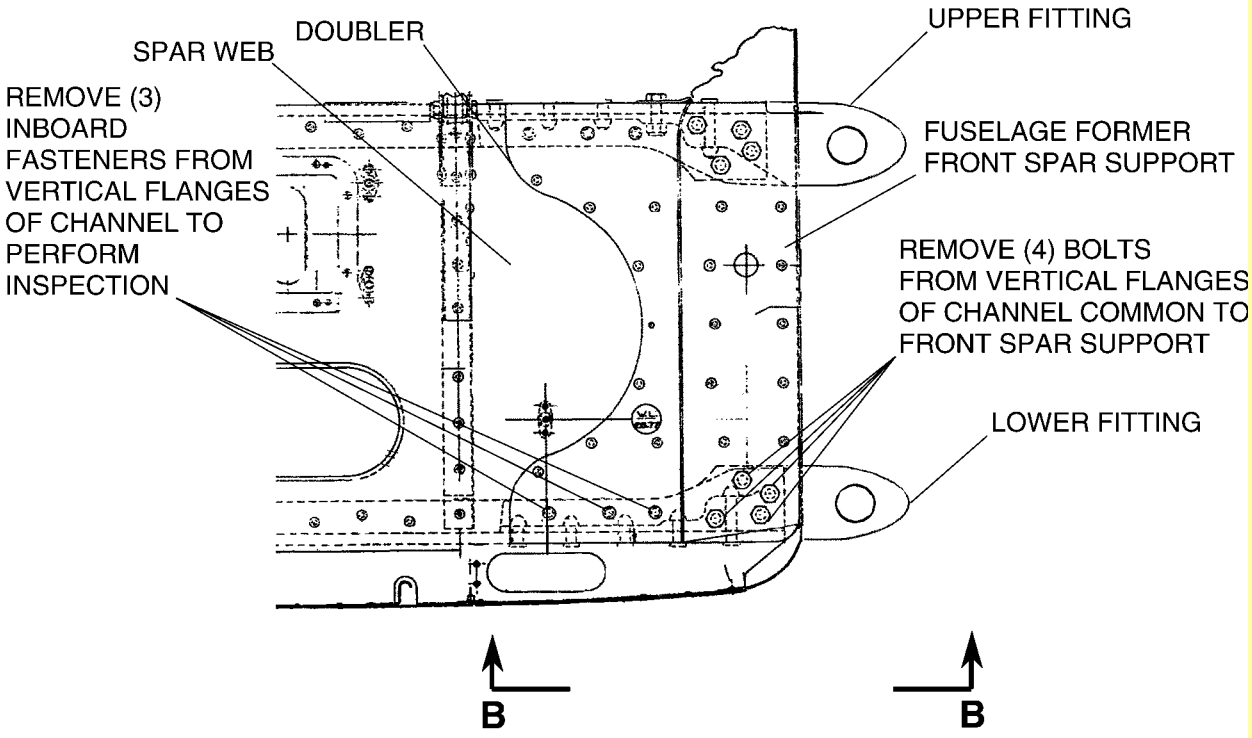
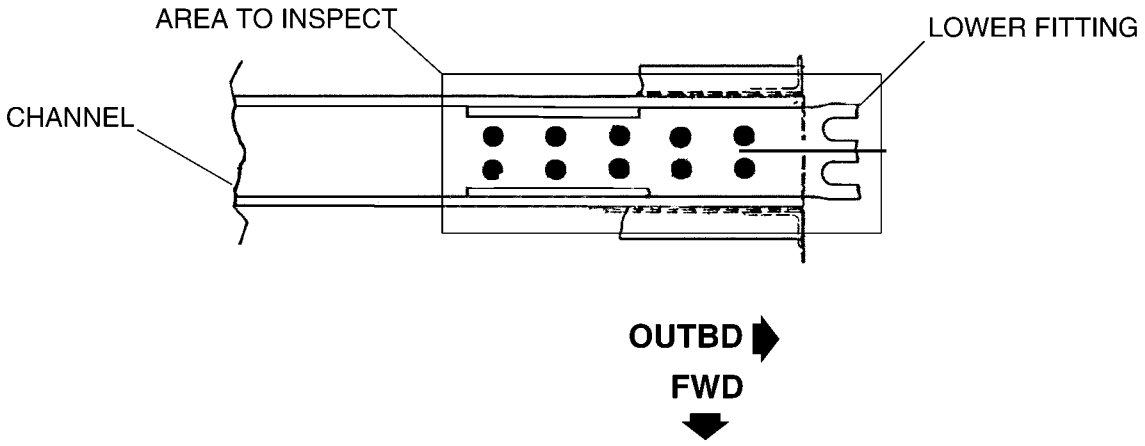


VIEW A-A
VIEW LOOKING FORWARD AT MAIN CARRY-THRU SPAR CAP ASSEMBLY.
(RIGHT SIDE SHOWN, LEFT SIDE OPPOSITE)



VIEW B-B
VIEW LOOKING UP AT MAIN CARRY-THRU SPAR CAP ASSEMBLY

D1042R2001

Lower Carry-Thru Main Spar Cap Inspection
Figure 2 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 27-10-04

1. TITLE

Aileron Hinges and Fittings

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Examine the aileron hinges and fittings for cracks..

4. PREPARATION

A. Clean the area with solvent to remove dirt, grease, oil, loose paint and other things that may have an effect on the inspection.

5. INSPECTION METHOD

Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 inch (open hole), 0.150 inch (around fastener or bearing)

7. EQUIPMENT

The following types of magnetic particle inspection yokes may be used to accomplish this inspection. Equivalent substitutes may be used for the listed equipment, refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19ell	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments 421 N. Quay Kennewick, WA 99336
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT-HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Connect the eddy current probe to the instrument.

B. Adjust the instrument frequency to 200 kHz.

C. Put the probe on the surface reference standard away from the calibration notches.

D. Set the null point.

E. Lift the probe from the standard and monitor the display for the lift-off response.

F. Adjust the display until the lift-off response goes horizontal and to the left.

G. Move the probe across the 0.020 inch deep reference notch and monitor the screen display.

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H. Adjust the display to get a minimum separation of 3 major screen divisions between the lift-off response and that from the notch. This sets the instrument sensitivity.

I. Do a surface eddy current inspection on the left and right aileron attach points at the aileron. Examine immediately adjacent to the holes and bearing edges. Examine around fasteners common to the attach brackets.

J. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support.

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SUPPLEMENTAL INSPECTION NUMBER: 32-10-01

1. TITLE

Main Landing Gear Torque Tube Assembly

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for cracks in the main landing gear torque tube assembly.

4. PREPARATION

A. Prepare the main landing gear torque tube assembly for inspection. Refer to Section 5-14-05, Supplemental Inspection Number 32-10-01, for specific instructions.

B. Clean the main landing gear torque tube with solvent to remove dirt, grease, oil, loose paint and other substances that may interfere with the inspection.

C. If paint thickness in the inspection area exceeds 0.003 inches thick, it shall be removed to perform the magnetic particle inspection.

5. INSPECTION METHOD

Magnetic Particle

6. CRACK SIZE

Minimum detectable crack size: 0.10 Inch

7. EQUIPMENT

The following types of magnetic particle inspection yokes may be used to accomplish this inspection. Equivalent substitutes may be used for the listed equipment.

CAUTION: Contact prods shall not be used on aircraft components or parts.

PART NUMBER	QUANTITY	DESCRIPTION
Magnaglo 14AM (Aerosol Can)	1	FLUORESCENT MAGNETIC PARTICLE BATH Magnaflux Corporation 7400 W. Lawrence Avenue Chicago, IL 50656
ZB-100F	1	PORTABLE ULTRAVIOLET LIGHT Magnaflux Corporation
505056	1	MAGNETIC FIELD STRENGTH INDICATOR Magnaflux Corporation
DA-200	1	ELECTROMAGNETIC YOKE Parker Research Corp. 2642 Enterprise Rd. Dunedin, FL 33528
Spectroline DSE-2000	1	LIGHT METER Spectronics Corp. 956 Brush Hollow Rd. Westbury, NY 11590

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8. QUALITY CONTROL

A. Electromagnetic Yoke Requirements
   (1) The electromagnetic yoke shall be capable of lifting a dead weight capacity of 10 pounds with a leg spacing of two to four inches, while using alternate current (AC).
   (2) The electromagnetic yoke shall be capable of lifting a dead weight capacity of either 30 pounds with a leg spacing of two to four inches, or 50 pounds with a leg spacing of four to six inches, while using direct current (DC).

B. Light Requirements
   (1) An inspection shall be performed in a darkened environment where the ambient white light intensity does not exceed two foot candles.
   (2) Ultraviolet light used for magnetic particle inspection shall operate at a wavelength in the range of 320 to 380 nanometers.
      (a) Light intensity shall be at least 1000 microwatts per square centimeter when measured at a distance of 15 inches from the filter.
   (3) Ultraviolet and ambient light intensities shall be measured with a calibrated light meter prior to performing the inspection.

9. INSPECTION INSTRUCTIONS

A. Remove all dirt, oil, grease and paint from the inspection area. Refer to Figure 1.

B. Inspect both the forward and the aft torque tube retraction arms.
   (1) Put the legs of the yoke in position to inspect for cracks parallel and perpendicular to the welds at the base of the arm.
   (2) Put the legs of the yoke in position to inspect for cracks initiating at all 360 degrees of the arm attach hole.
   (3) Each time the yoke is energized, apply steps C, D, and E.

C. Apply the fluorescent magnetic particle bath to the inspection area. Stop bath application and immediately energize the yoke for approximately one second.

D. Using the ultraviolet light in a darkened area, inspect the designated areas for cracks.

E. After completing the inspection, demagnetize the torque tube using the maximum alternating current. The residual magnetic field shall not exceed three Gauss.

F. Report any cracks detected during the inspection to Cessna Propeller Aircraft Product Support along with the approximate length and depth of the crack.

G. If paint was removed from the torque tube to achieve adequate magnetic field strength, repaint the torque tube.

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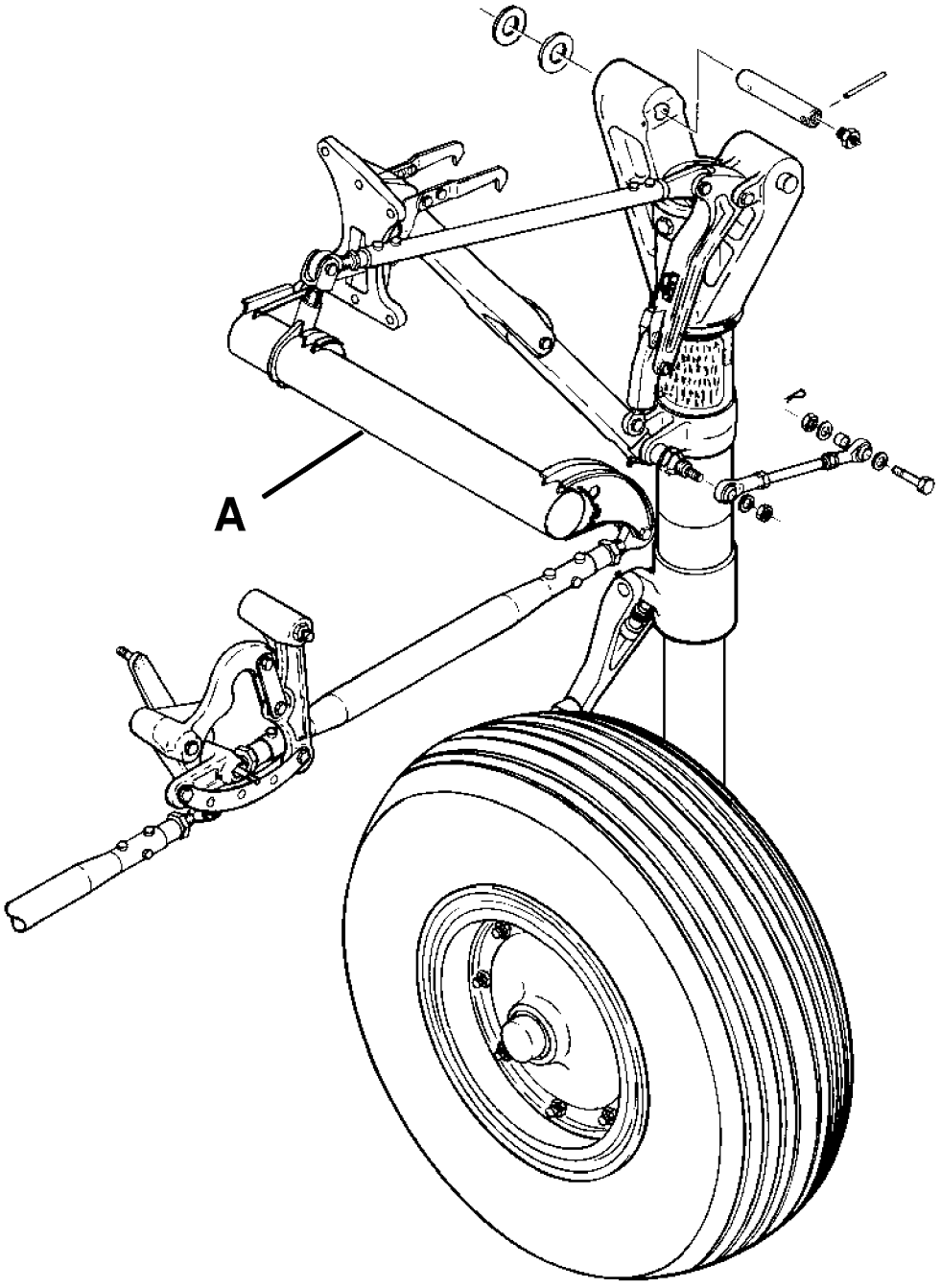

Main Landing Gear Torque Tube Assembly
Figure 1 (Sheet 1)

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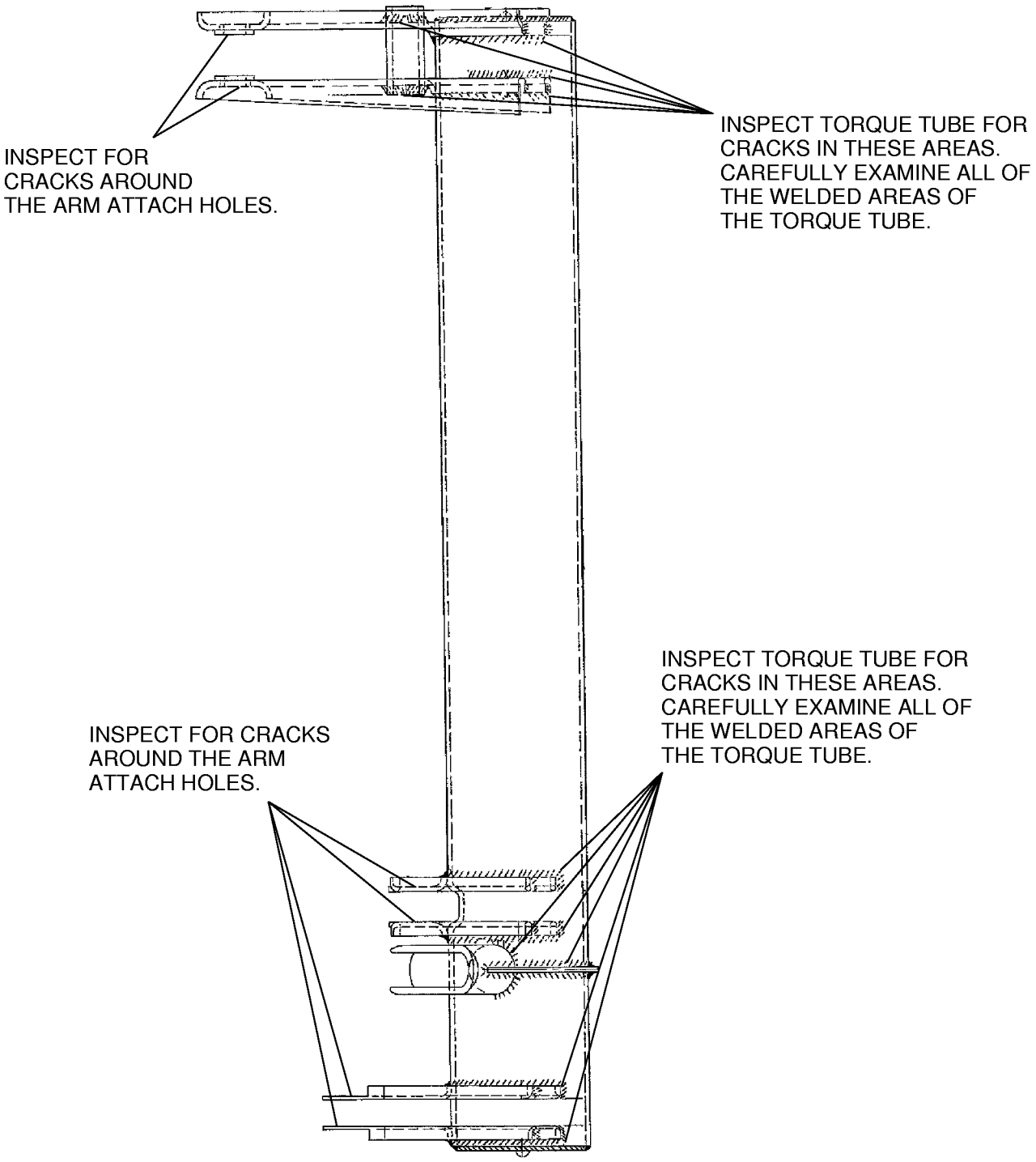

DETAIL A

Main Landing Gear Torque Tube Assembly
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 32-10-04

1. TITLE

Main Landing Gear Trunnion Collar

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for cracks in the main gear trunnion collar.

4. PREPARATION

A. Remove bushings (if applicable) from hole.

B. Clean the fork with solvent to remove dirt, grease, oil, loose paint and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Surface and Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.10 Inch

7. EQUIPMENT

The following equipment may be used to accomplish this inspection. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments 421 N. Quay Kennewick, WA 99336
MP905-60/2M 1-3 MHZ	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
BPM-20/1-3 MHZ	1	5/16 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp.
HRS-15S	1	COMBINED STEEL SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Calibration for surface eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 1.5 MHz.
   (2) Null the probe on the surface reference standard away from the calibration notches.
   (3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.
   (4) Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

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B. Calibration for bolt hole eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 1.5 MHz.
   (2) Null the probe in the bolt hole reference standard with the probe turned away from the calibration notch.
   (3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.
   (4) Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.050 inch corner notch in the reference standard.

C. Surface eddy current inspect around the edges and the base of the main landing gear actuator collar lug. Refer to Figure 1.

D. Bolt hole eddy current inspect the side brace attach hole. Hole size may vary from that listed. Refer to Figure 1.

E. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support along with the approximate length and depth of the crack.

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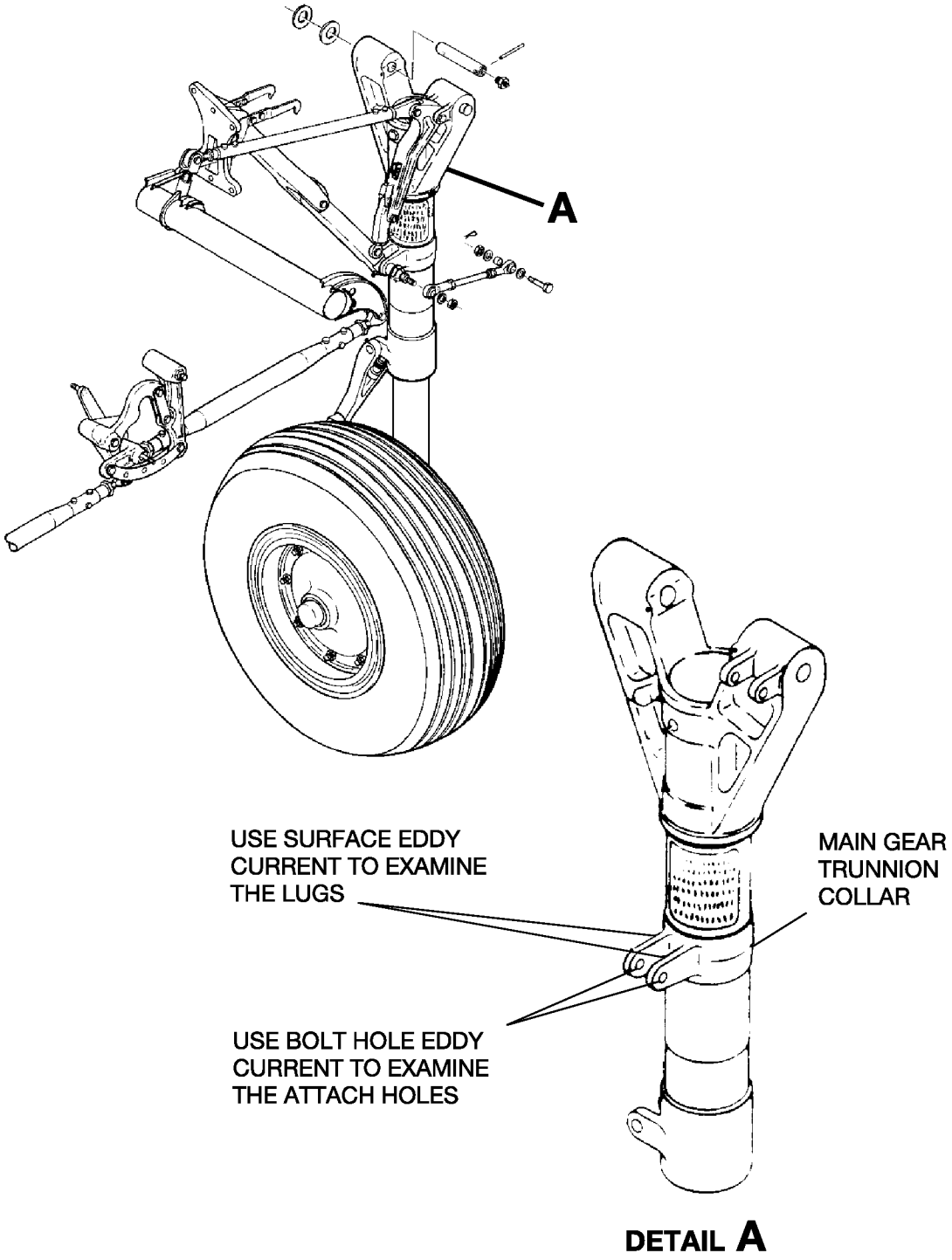

Main Landing Gear Trunnion Collar Inspection
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 32-20-00

1. TITLE

Nose Landing Gear Fork

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for cracks in the nose landing gear fork.

4. PREPARATION

A. Remove nose landing gear fork from the shock strut assembly. Refer to Section 5-14-10, Supplemental Inspection Number 32-20-00, for specific instructions.

B. Clean the fork with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.10 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE EDDY CURRENT INSTRUMENT Staveley Instruments Incorporated 421 North Quay Kennewick, WA 99336
MP905-60/100-500 kHz	1	1/8 INCH EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Calibration for surface eddy current probe.
   (1) Connect the surface probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe on the reference standard away from the calibration notches.
   (3) Adjust lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.
   (4) Set the sensitivity by adjusting the instrument controls to obtain a signal of at least three major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

B. Surface eddy current inspect the nose landing gear fork. Refer to Figure 1.
   (1) Surface eddy current inspect the upper radii of the nose landing gear fork.

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(2) Surface eddy current inspect the area around the axle attach holes to include the lower radii.
(3) Surface eddy current inspect the area around the center hole of the fork.
(4) Inspect both the inner and outer surface.

C. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the approximate length and depth of the crack.

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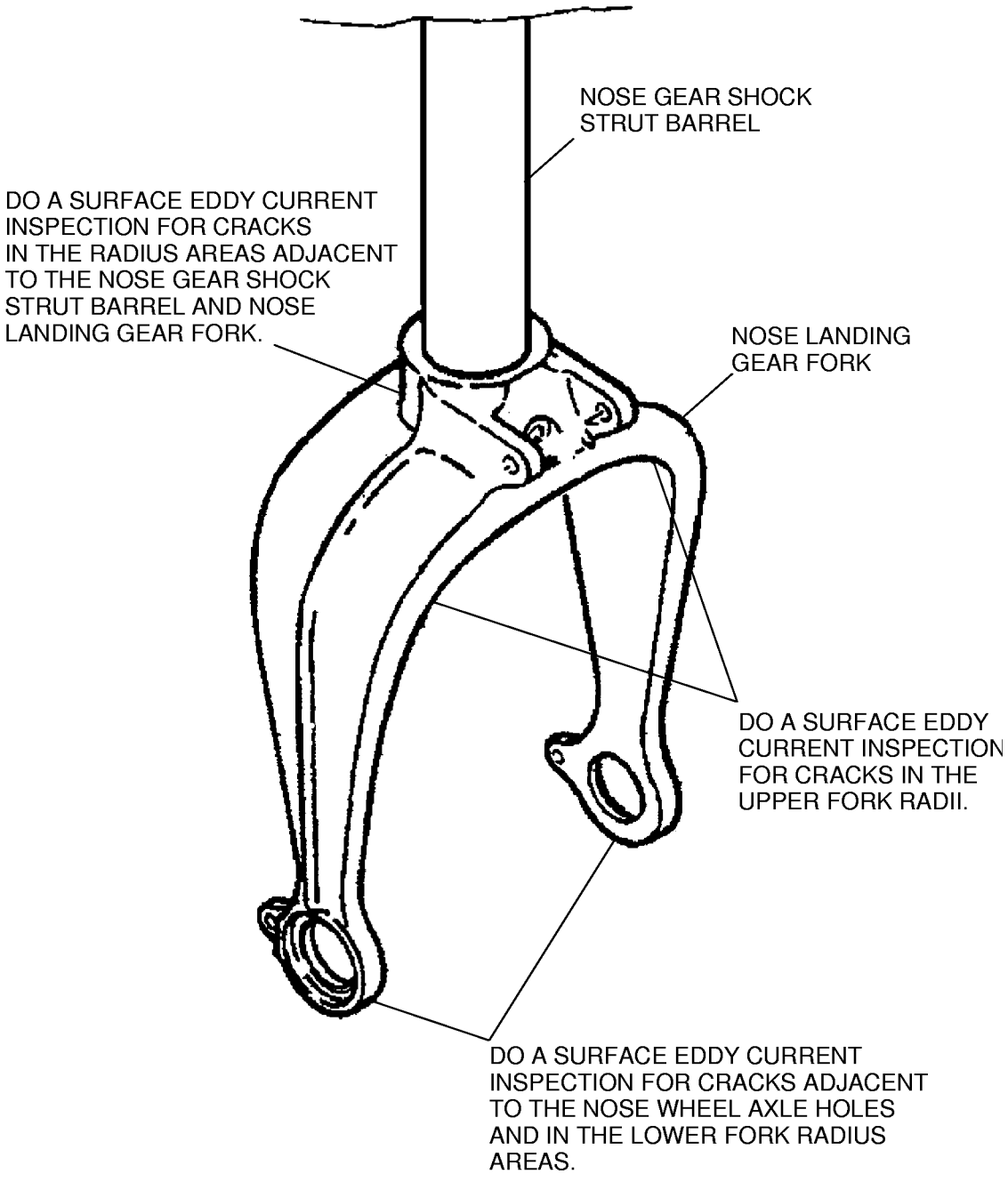

Nose Landing Gear Fork Inspection
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 52-10-00

1. TITLE

Cabin Door Retention

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for cracks in the door retention mechanism.

4. PREPARATION

A. Clean the parts prior to inspection with solvent to remove dirt, grease, oil, loose paint and other substances that may interfere with the inspection.

B. If paint thickness in the inspection area exceeds 0.003 inch thick, it shall be removed to perform the magnetic particle inspection.

5. INSPECTION METHOD

Magnetic Particle, Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.10 inch

7. EQUIPMENT

The following equipment was used to develop this inspection. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for magnetic particle and eddy current inspection requirements.

CAUTION: Contact prods shall not be used on aircraft components or parts.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Stavely Instruments 421 N. Quay Kennewick, WA 99336
505056	1	MAGNETIC FIELD STRENGTH INDICATOR Magnaflux Corp. 7400 W. Lawrence Avenue Chicago, IL 50656
ZB-100F	1	PORTABLE ULTRAVIOLET LIGHT Magnaflux Corp.
Spectroline DSE-2000A	1	LIGHT METER Spectronics Corp. Westbury, NY 11590
Magnaglo 14AM (Aerosol Can)	1	FLUORESCENT MAGNETIC PARTICLE BATH Magnaflux Corp.

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PART NUMBER	QUANTITY	DESCRIPTION
DA-200	1	ELECTROMAGNETIC YOKE Parker Research Corp. 2642 Enterprise Rd. Dunedin, FL 33528
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. QUALITY CONTROL

A. Electromagnetic Yoke Requirements
   (1) The electromagnetic yoke shall be capable of lifting a dead weight of 10 pounds with a leg spacing of two to four inches while using alternating current (AC).
   (2) The electromagnetic yoke shall be capable of lifting a dead weight of either 30 pounds with a leg spacing of two to four inches, or 50 pounds with a leg spacing of four to six inches, while using direct current (DC).

B. Light Requirements
   (1) Inspection shall be performed in a darkened environment where the ambient white light intensity does not exceed 2 foot candles.
   (2) Ultraviolet lights used for magnetic particle inspection shall operate at a wavelength in the range of 320 to 380 nanometers. Light intensity shall be at least 1000 microwatts per square centimeter.
   (3) Ultraviolet and ambient light intensities shall be measured with a calibrated light meter prior to performing the inspection.

9. INSPECTION INSTRUCTIONS

A. Remove all surface contaminates, such as oil and grease, prior to performing this inspection.

B. After disassembly, magnetic particle inspect the cabin door latch bolt, lock arm, and bayonet bolt (if applicable). Follow the instructions in steps C. through F. for each part. Refer to Figure 1

C. Apply the fluorescent magnetic particle bath to the part. Stop the bath application and immediately energize the yoke, using alternating current, for approximately one second.

D. Using an ultraviolet light in a darkened area, inspect for cracks in the area of interest.

E. After completing the inspection, demagnetize the part using maximum alternating current. The maximum residual magnetic field shall not exceed three Gauss.

F. Repeat this procedure for each part.

G. After disassembly, surface eddy current inspect the cabin door handles. Follow the instructions of steps H. through M. for each part.

H. Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.

I. Null the probe on the surface reference standard away from the calibration notches.

J. Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.

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K. Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

L. Inspect part.

M. Cracks detected during this inspection will be reported to Cessna Propeller Aircraft Product Support along with approximate length of and depth of crack.

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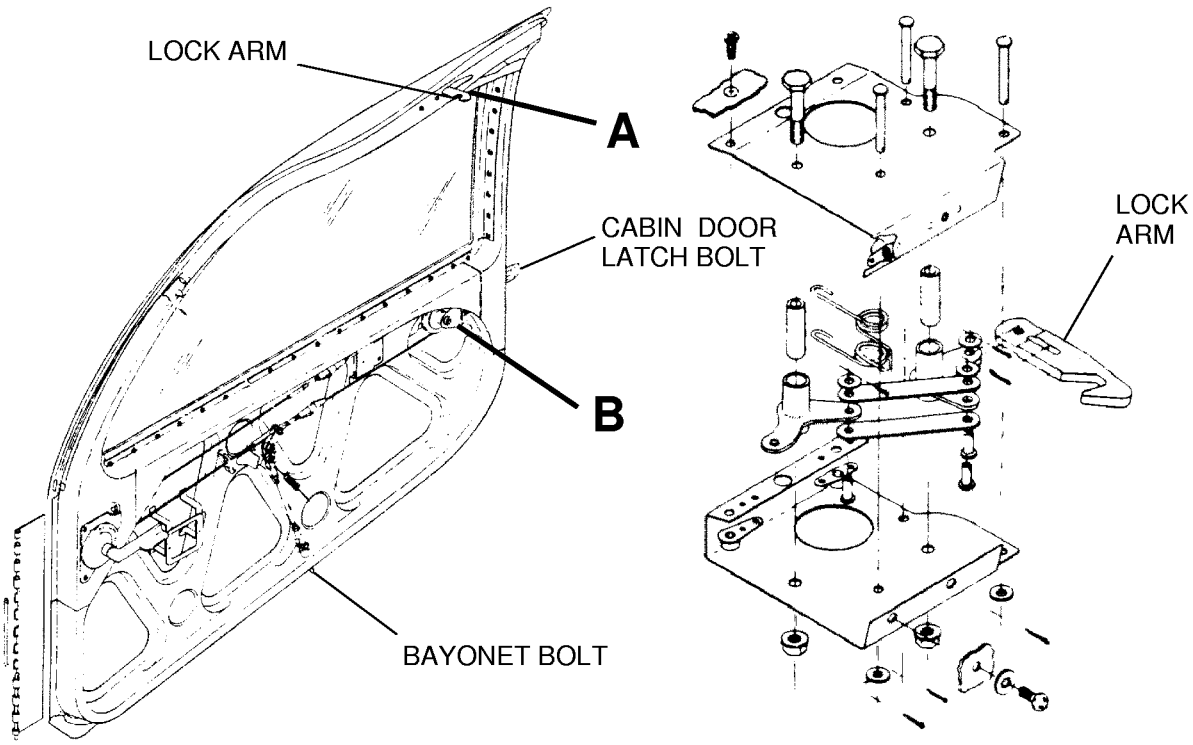
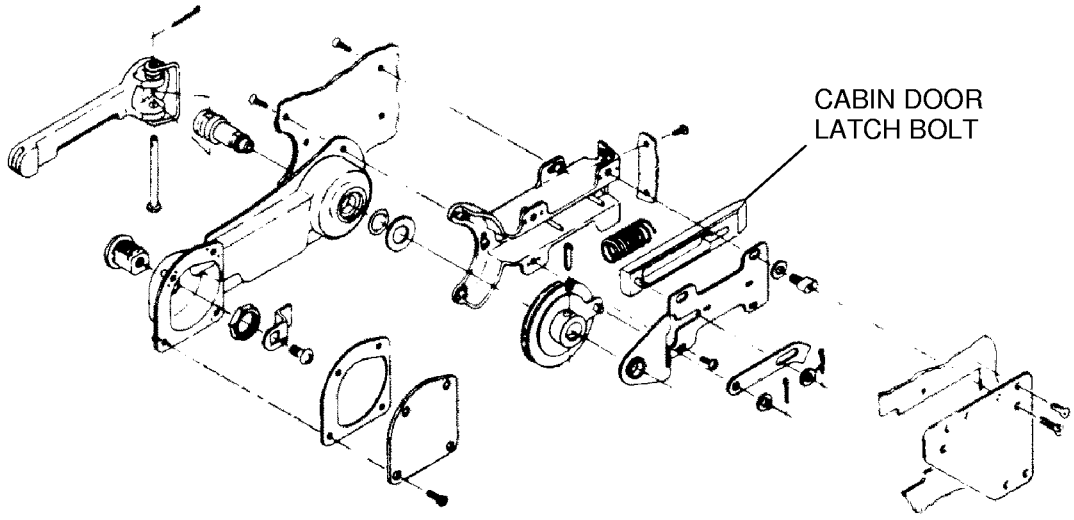


DETAIL A



DETAIL B

10114001
A10113002
B10112006

Cabin Door Linkage Installation
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 52-20-00

1. TITLE

Emergency Exit Window Mechanism Inspection

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for cracks in the emergency exit window mechanism.

4. PREPARATION

A. As necessary, remove paint from parts requiring penetrant inspection.

B. Clean the parts prior to inspection with solvent to remove dirt, grease, oil, loose paint and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Fluorescent Liquid Penetrant, Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.10 inch

7. EQUIPMENT

The following equipment was used to develop this inspection. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for fluorescent liquid penetrant and eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
SKC-HF	1	SOLVENT CLEANER Magnaflux 3624 West Lake Avenue Glenview, IL 60025
ZL-27A	1	FLUORESCENT PENETRANT Magnaflux Corporation
ZP-9F	1	DEVELOPER Magnaflux Corporation
ZB-23A	1	PORTABLE ULTRAVIOLET LIGHT Magnaflux Corporation
Spectroline DSE-2000A	1	LIGHT METER Spectronics Corp. Westbury, NY 11590
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032

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PART NUMBER	QUANTITY	DESCRIPTION
MP905-60/1-3 MHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp.
HRS-15S	1	COMBINED STEEL SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. QUALITY CONTROL

A. Refer to Section 5-13-01 for quality control requirements for penetrant materials and ultraviolet light.

9. INSPECTION INSTRUCTIONS - 310R0001 Thru 310R0800

A. Remove all surface contaminates, such as oil and grease, prior to performing this inspection.

B. After disassembly, fluorescent liquid penetrant inspect the shaft of each cable end. (Refer to Figure 1).

C. After disassembly, surface eddy current inspect each of the window catch locations. Depending on the window configuration, the catch may be made of aluminum or steel. For the steel catches, use the 1 - 3 MHz surface eddy current probe. For the aluminum catches, use the 100 - 500 kHz surface eddy current probe. Follow the instructions of steps D. thru H. for each part.

D. Connect the probe (be sure to use the probe appropriate to the material) to the eddy current instrument and adjust the instrument frequency to 200 kHz for an aluminum catch or 1.5 MHz for a steel catch.

E. Null the probe on the surface reference standard away from the calibration notches. Be sure to use the steel reference standard when inspecting a steel catch or the aluminum reference standard when inspecting an aluminum catch.

F. Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.

G. Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

H. Inspect part. Scan area around the hole and the area surrounding the bend radius. Cracks detected during this inspection shall be reported to Propeller Aircraft Product Support, along with the approximate length and depth of the crack.

10. INSPECTION INSTRUCTIONS - 310R0801 Thru 310R2140

A. Remove all surface contaminates, such as oil and grease, prior to performing this inspection.

B. After disassembly, fluorescent liquid penetrant inspect the shaft of each cable end and the latch pins. (Refer to Figure 2).

C. Any crack found is a reportable condition.

D. After disassembly, surface eddy current inspect each of the window catch locations and the catch plates. Depending on the window configuration, the catch may be made of aluminum or steel. For the steel catches, use the 1 - 3 MHz surface eddy current probe. For the aluminum catches, use the 100 - 500 kHz surface eddy current probe. Follow the instructions of steps D. thru H. for each part.

E. Connect the probe (be sure to use the probe appropriate to the material) to the eddy current instrument and adjust the instrument frequency to 200 kHz for an aluminum catch or 1.5 MHz for a steel catch.

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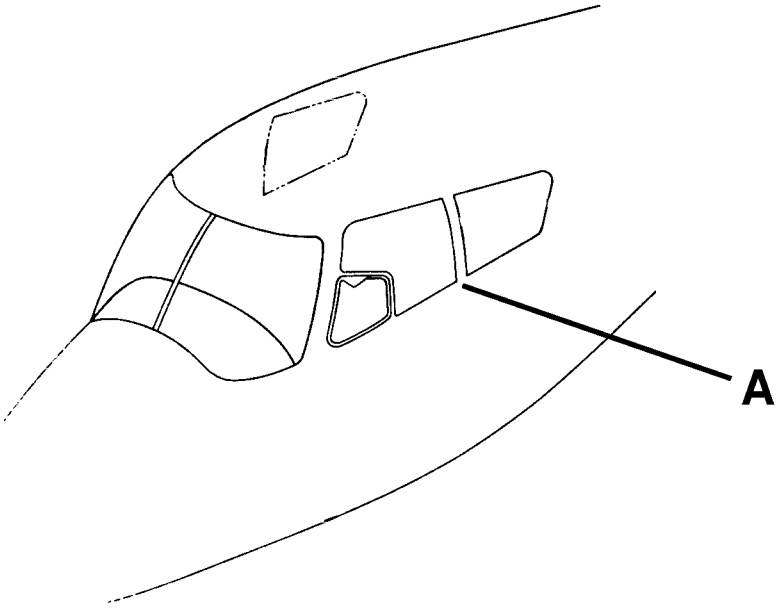

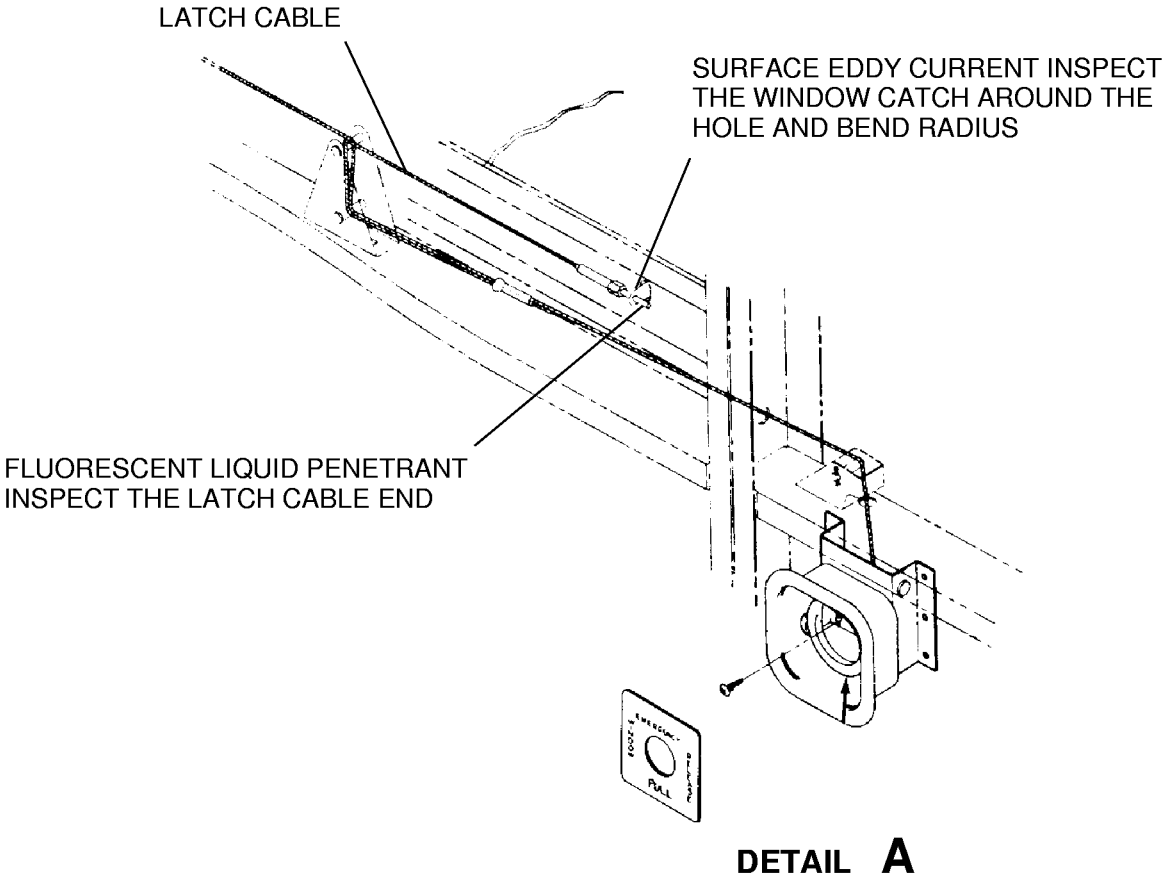

Emergency Exit Window Latch Location (Typical) - 310R0001 Thru 310R0800
Figure 1 (Sheet 1)

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F. Null the probe on the surface reference standard away from the calibration notches. Be sure to use the steel reference standard when inspecting a steel catch or the aluminum reference standard when inspecting an aluminum catch.

G. Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.

H. Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

I. Inspect part. There will be two catch plates per location. Scan area around the hole and the area surrounding the bend radius of each side. For the catch plates, scan around the opening. Any crack found is a reportable condition. Cracks detected during this inspection shall be reported to Propeller Aircraft Product Support, along with the approximate length and depth of the crack.

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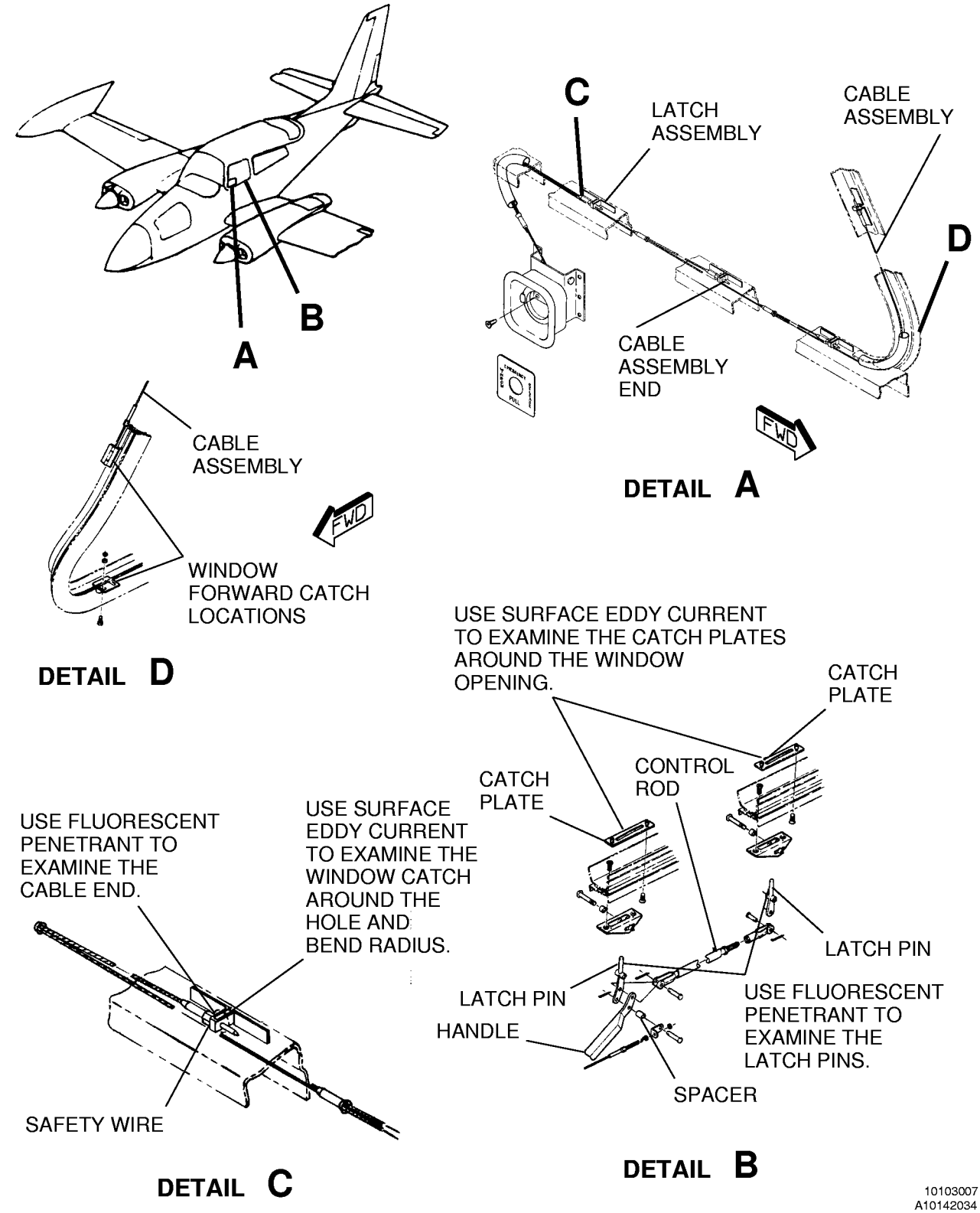

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C10142034

Emergency Exit Window Latch Location (Typical) - 310R0801 Thru 310R2140
Figure 2 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 53-10-03

1. TITLE

Horizontal Stabilizer Rear Spar Angle Attachment

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the tailcone angle attachment to the horizontal stabilizer rear spar.

4. PREPARATION

A. Refer to Figure 1.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this inspection. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
BPM-20/100-500 KHz	1	BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Remove all surface contaminates, such as oil and grease, prior to performing this inspection.

B. Connect the bolt hole probe (0.3125 inch diameter) to the eddy current instrument and adjust the instrument frequency to 200 kHz.

C. Null the probe in the appropriate reference standard hole with the probe turned away from the calibration notch.

D. Adjust the lift-off on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.

E. Adjust the instrument gain controls to obtain a signal amplitude response from the calibration notch that is a minimum of 3 major screen divisions.

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F. Inspect the inner circumference of the four attach holes common to the tailcone angle attachment to the horizontal stabilizer lower rear spar. Inspect the entire depth of each hole. Observe the phase and amplitude changes on the eddy current instrument. Refer to Figure 1, Sheet 2.

G. If an indication is noted, carefully repeat the inspection in the opposite direction to verify the indication.

H. If no cracks are detected during this inspection, reinstall the horizontal stabilizer. Refer to the Maintenance Manual.

I. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support. Include hole diameter, location of hole, hole edge distance, and length and direction of crack on the report.

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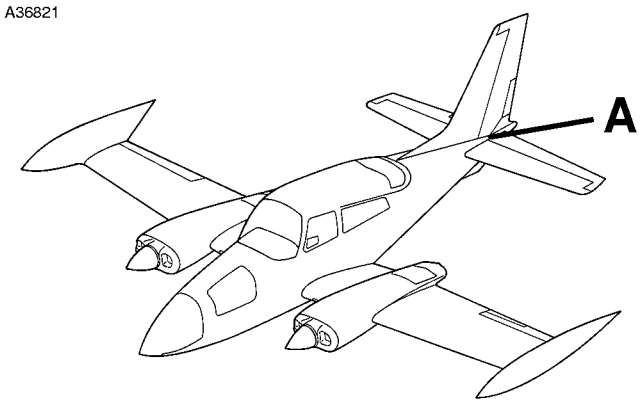

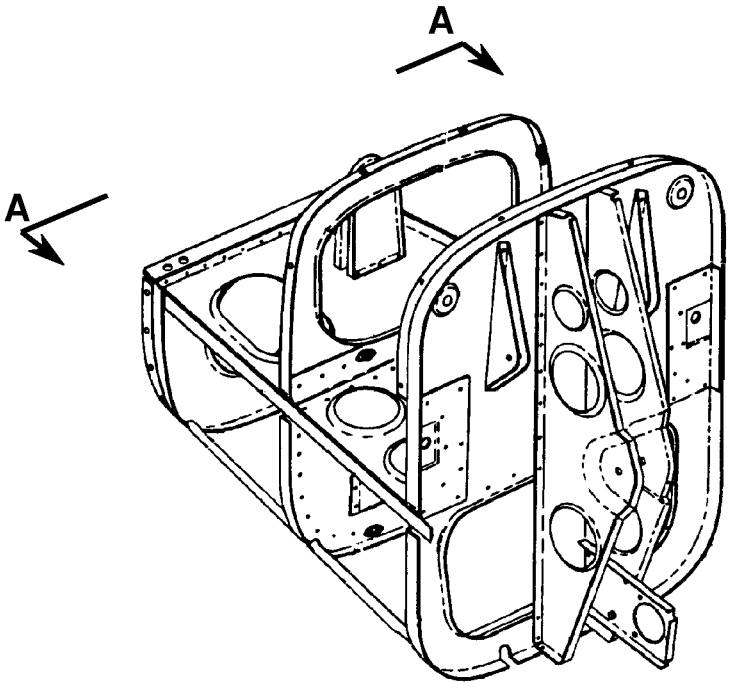

DETAIL A

Horizontal Stabilizer Assembly Rear Spar Angle Attachment
Figure 1 (Sheet 1)

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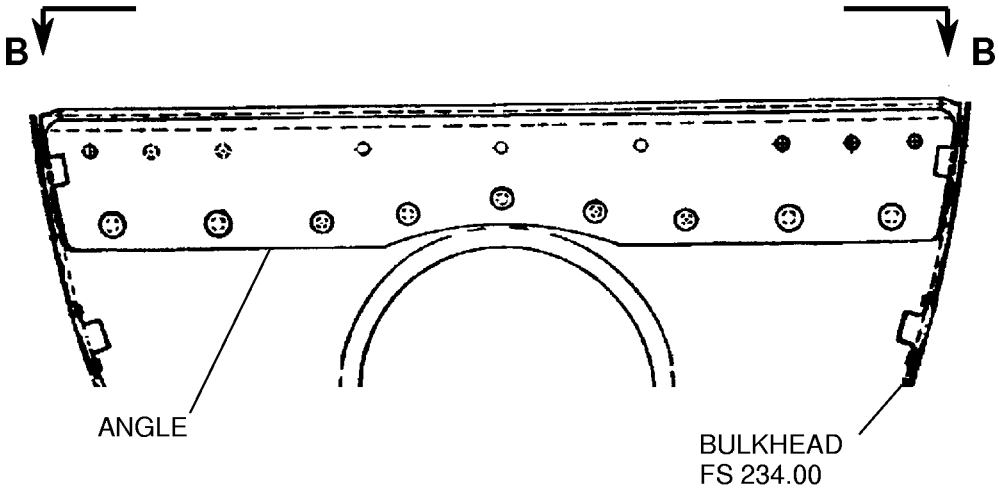
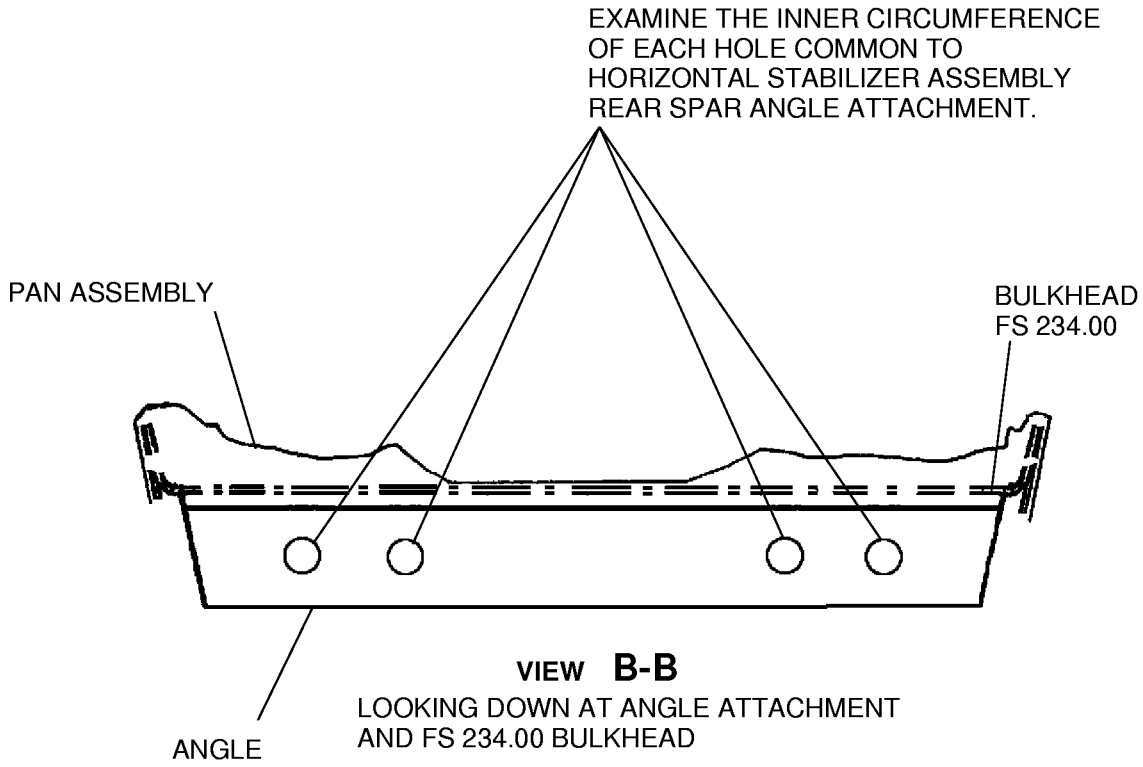
A36822



VIEW A-A
LOOKING FORWARD AT FS 234.00 BULKHEAD



VIEW B-B
LOOKING DOWN AT ANGLE ATTACHMENT
AND FS 234.00 BULKHEAD

Horizontal Stabilizer Assembly Rear Spar Angle Attachment
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 54-10-00

1. TITLE

Engine Support Beams

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for cracks in the engine beam support structure.

4. PREPARATION

A. Refer to Figure 1.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.160 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
MP905-60 100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Road Kent, WA 98032
MP905-60/1-3 MHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp.
HRS-15S	1	COMBINED STEEL SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. After disassembly, surface eddy current inspect the areas described in Figure 1.

(1) Depending on the configuration, some engine mount parts may be made of aluminum or steel. For the steel parts, use the 1 - 3 MHz surface eddy current probe. For the aluminum parts, use the 100 - 500 kHz surface eddy current probe.

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B. Connect the surface probe (be sure to use the probe appropriate to the material) to the eddy current instrument and adjust the instrument frequency to 200 kHz for an aluminum part or 1.5 MHz for a steel part.

C. Null the probe on the reference standard away from the calibration notches. Be sure to use the steel reference standard when inspecting a steel part or the aluminum reference standard when inspecting an aluminum part.

D. Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to left as the probe is lifted from the standard.

E. Set the sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch calibration notch in the reference standard.

F. Inspect around the circumference of each fastener common to the engine beams at the forward and aft engine mount attach area, and the fasteners indicated in Figure 1. Inspect around the open holes of the engine mounts. Observe the phase and amplitude changes on the eddy current instrument.

G. If an indication is noted, carefully repeat the inspection in the opposite direction to verify the indication.

H. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, length, and direction of crack.

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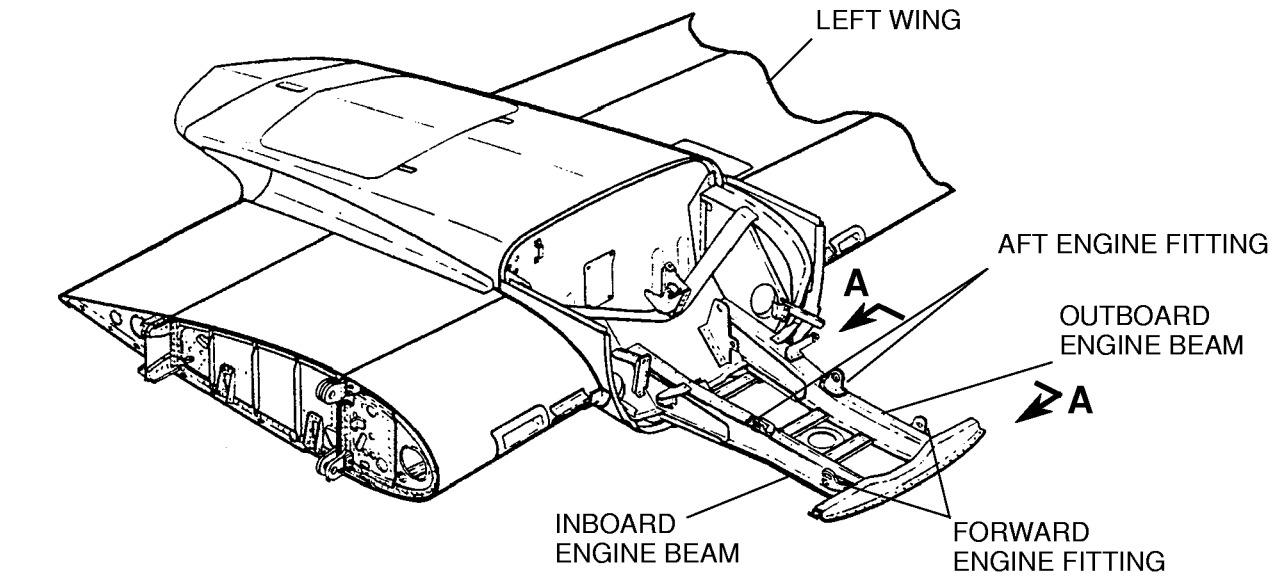

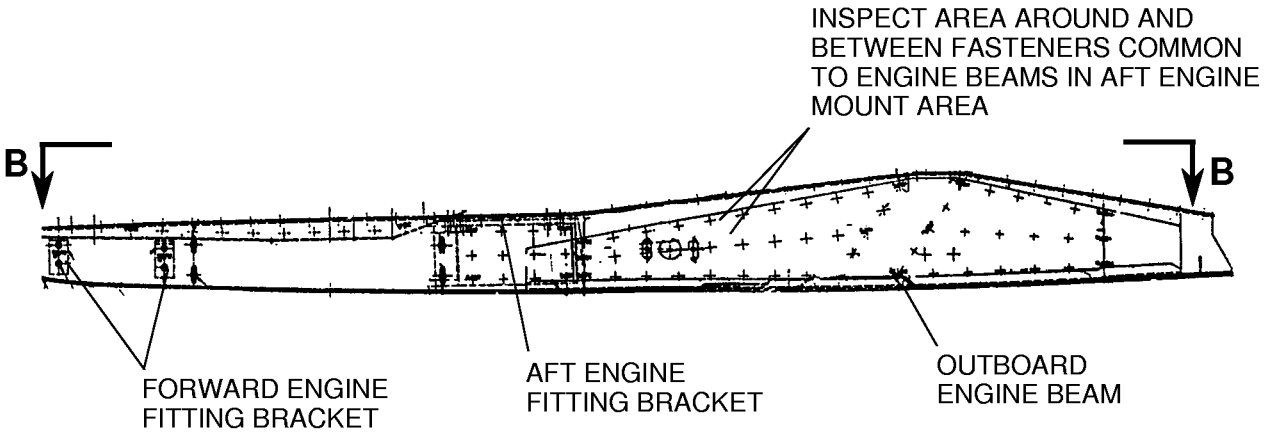

VIEW A-A

LOOKING INBOARD AT OUTBOARD ENGINE BEAM
(INBOARD ENGINE BEAM OPPOSITE)
(SHOWN WITHOUT ENGINE FITTINGS FOR CLARITY)

52203001
A-A52511002

Engine Beam Inspection
Figure 1 (Sheet 1)

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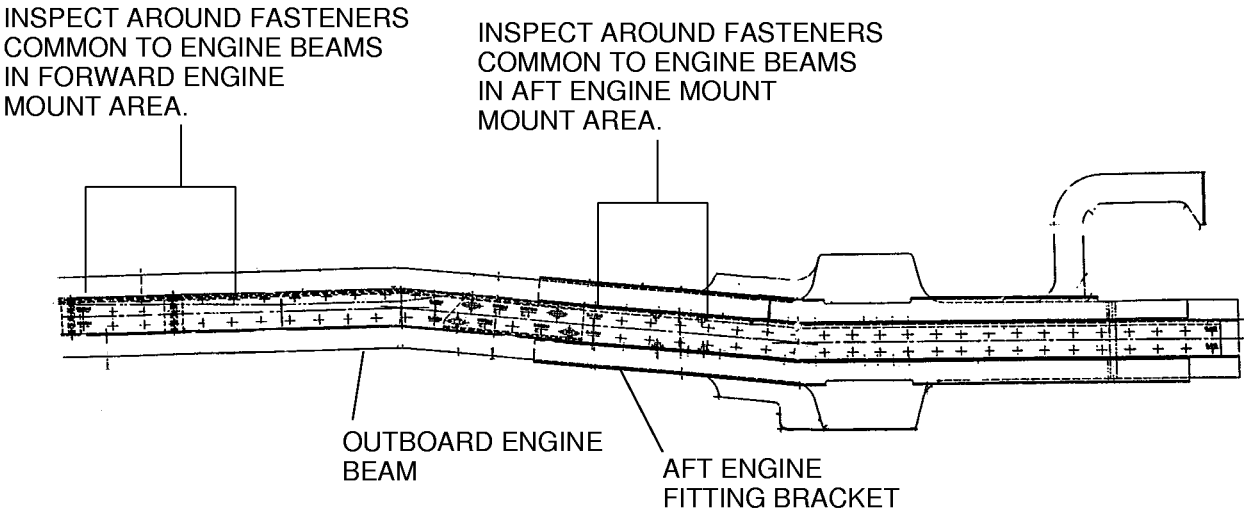

VIEW B-B

LOOKING DOWN AT OUTBOARD ENGINE BEAM
(INBOARD ENGINE BEAM OPPOSITE)

B-B5251R1003

Engine Beam Inspection
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-02

1. TITLE

Horizontal Stabilizer Forward Spar Upper Cap

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks originating in the fastener holes of the horizontal stabilizer forward spar upper cap.

4. PREPARATION

A. Remove 13 fasteners from the horizontal stabilizer assembly forward spar upper cap, one at BL 0.00, and six adjacent fasteners on each side of BL 0.00. Refer to Figure 1.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this inspection. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
BPM-10/100-500 kHz	1	5/32 INCH BOLT HOLE EDDY CURRENT PROBE BOLT HOLE Probe NDT Engineering Corp.
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Calibration for surface eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe on the surface reference standard hole away from the calibration notches.
   (3) Adjust lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.

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(4) Set the sensitivity by adjusting the instrument gain controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

B. Calibration for bolt hole eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe in the bolt hole reference standard with the probe turned away from the calibration notch.
   (3) Adjust lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.
   (4) Set the sensitivity by adjusting the instrument gain controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.050 inch corner notch in the reference standard.

C. Inspect the thirteen holes (one at BL 0.00 and six on each side) opened in the front of the horizontal stabilizer forward spar upper cap assembly. Inspect the entire depth of each hole using the bolt hole eddy current method. Refer to Figure 1, Sheet 2

   NOTE: Figure 1, View C-C depicts a typical hole cross section.

   (1) Include any brackets attached to the far side of the assembly as part of the hole.
   (2) Use the surface eddy current method to inspect the outer skin surface surrounding each hole.

D. If no cracks are detected during this inspection, reinstall the horizontal stabilizer. Refer to the Maintenance Manual.

E. Report any crack found to Cessna Propeller Aircraft Product Support, along with hole diameter, location of the hole, hole edge distance, and approximate length and depth of the crack.

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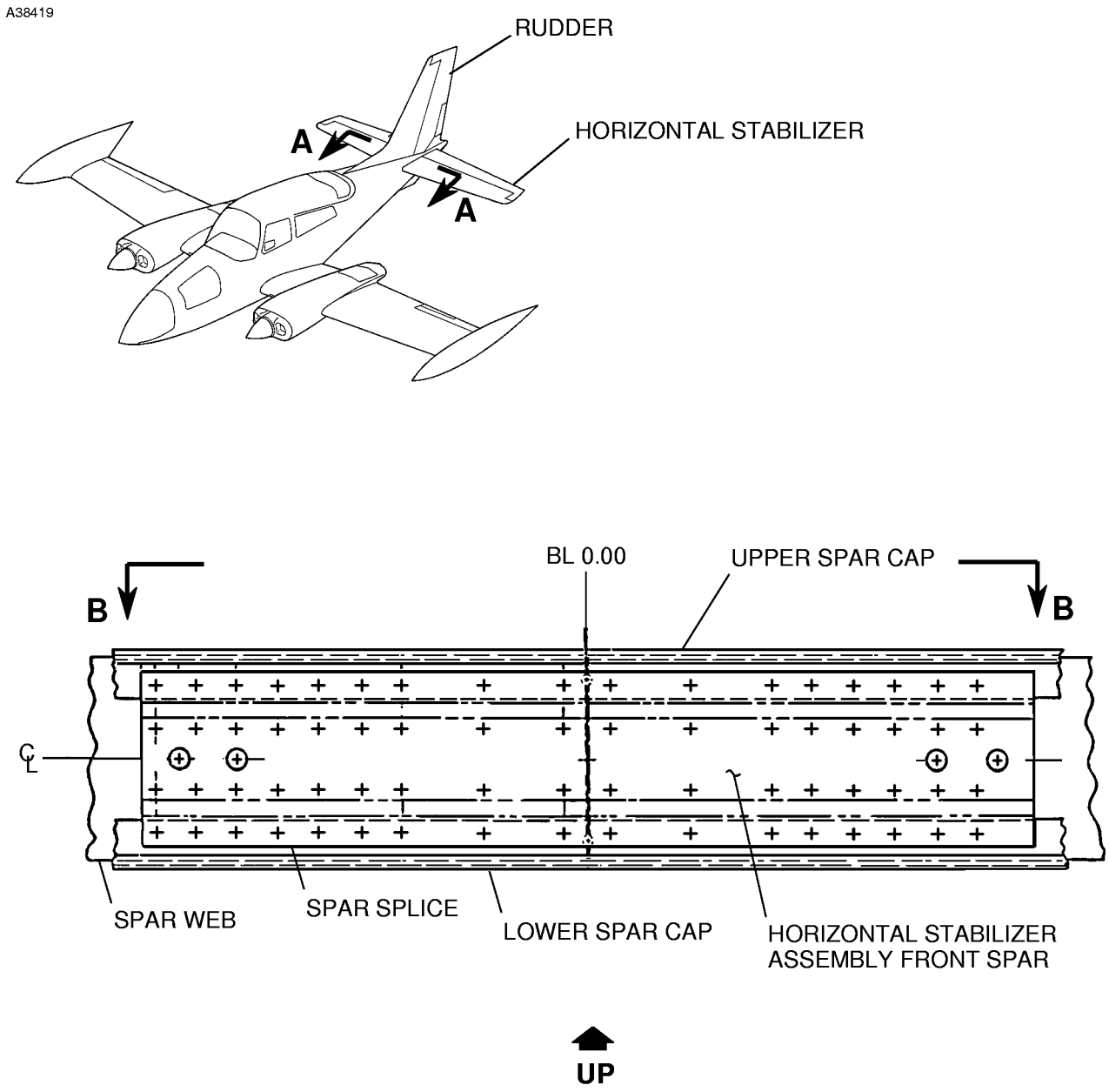

VIEW A-A
LOOKING FORWARD AT HORIZONTAL
STABILIZER FRONT SPAR

1010R1001
AA5232R1001

Horizontal Stabilizer Assembly Forward Spar Upper Cap Inspection
Figure 1 (Sheet 1)

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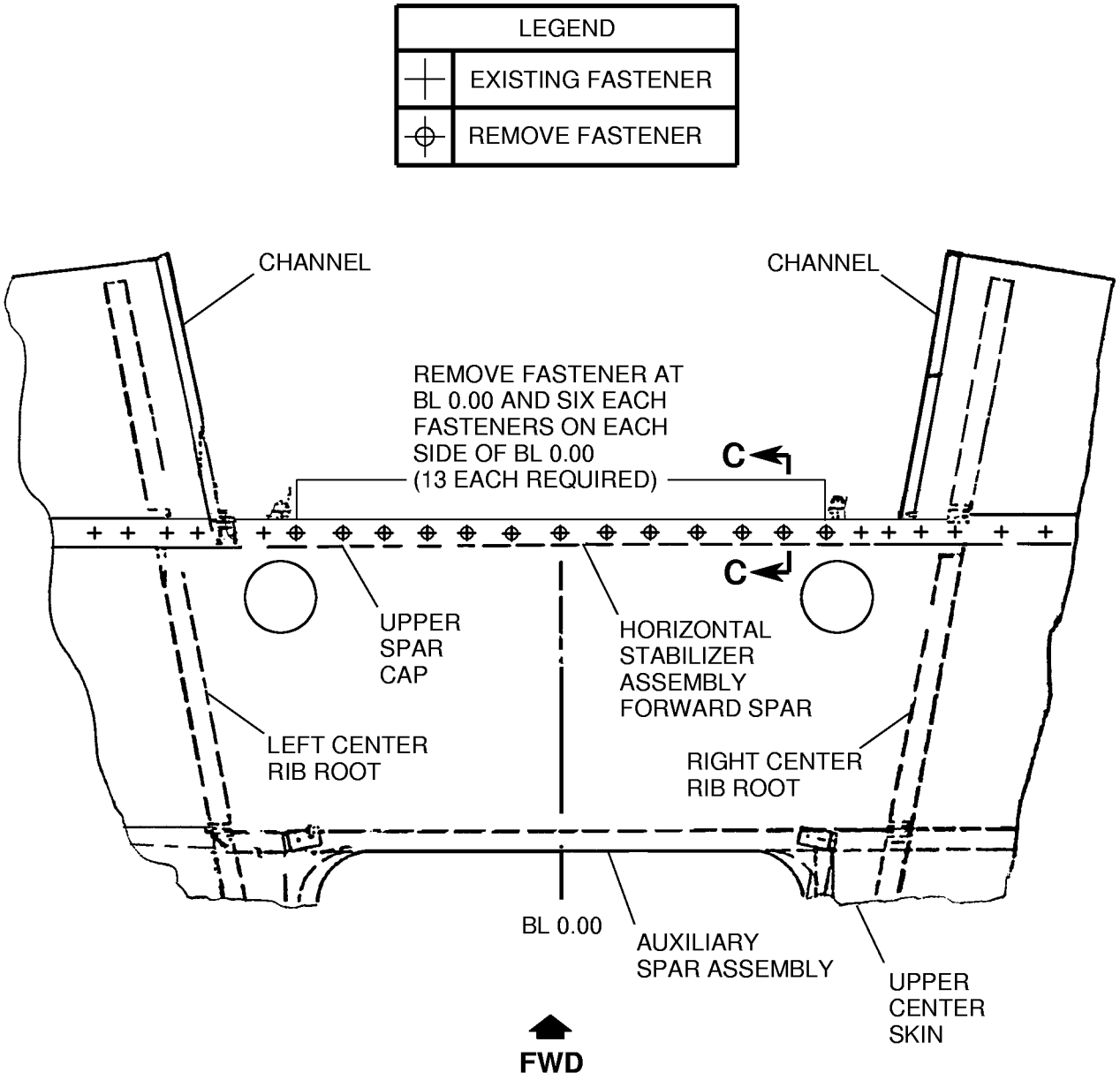

VIEW B-B
LOOKING DOWN AT HORIZONTAL
STABILIZER FORWARD SPAR

Horizontal Stabilizer Assembly Forward Spar Upper Cap Inspection
Figure 1 (Sheet 2)

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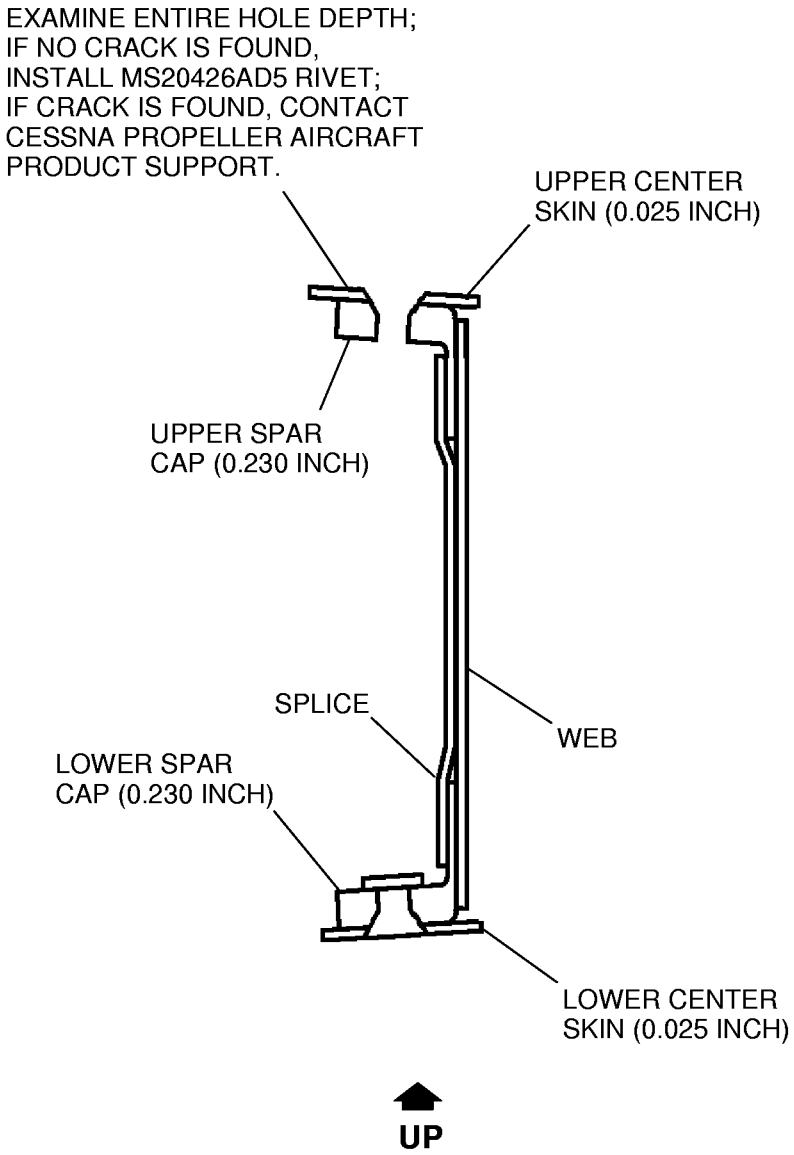

VIEW C-C
LOOKING INBOARD AT TYPICAL
UPPER SPAR CAP HOLE INSPECTION

Horizontal Stabilizer Assembly Forward Spar Upper Cap Inspection
Figure 1 (Sheet 3)

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-03

1. TITLE

Horizontal Stabilizer Forward Spar Lower Cap

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the horizontal stabilizer forward spar lower cap.

4. PREPARATION

A. Remove 13 fasteners from the horizontal stabilizer assembly forward spar lower cap; one at BL 0.00, and six adjacent fasteners on each side of BL 0.00. Refer to Figure 1.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Surface and Bolt hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering 19620 Russell Rd. Kent, WA 98032
BPM-10/100-500 kHz	1	5/32 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp.
HRS-15A		COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Calibration for surface eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe on the surface reference standard away from the calibration notches.
   (3) Adjust lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.

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(4) Set the sensitivity by adjusting the instrument gain controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

B. Calibration for bolt hole eddy current probe.
(1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
(2) Null the probe in the bolt hole reference standard with the probe turned away from the calibration notch.
(3) Adjust lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.
(4) Set the sensitivity by adjusting the instrument gain controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.050 inch corner notch in the reference standard.

C. Inspect the thirteen holes (one at BL 0.00 and six on each side) opened in the front of the horizontal stabilizer forward spar lower cap assembly. Inspect the entire depth of each hole using the bolt hole eddy current method. Refer to Figure 1 Sheet 2.

NOTE: Figure 1 View C-C shows a typical hole cross section.

(1) Include any brackets attached to the far side of the assembly as part of the hole.
(2) Use the surface eddy current method to inspect the outer skin surface surrounding each hole.

D. If no cracks are detected during this inspection, reinstall the horizontal stabilizer. Refer to the Maintenance Manual.

E. Report any crack found to Cessna Propeller Aircraft Product Support, along with hole diameter, location of the hole, hole edge distance, and approximate length and depth of the crack.

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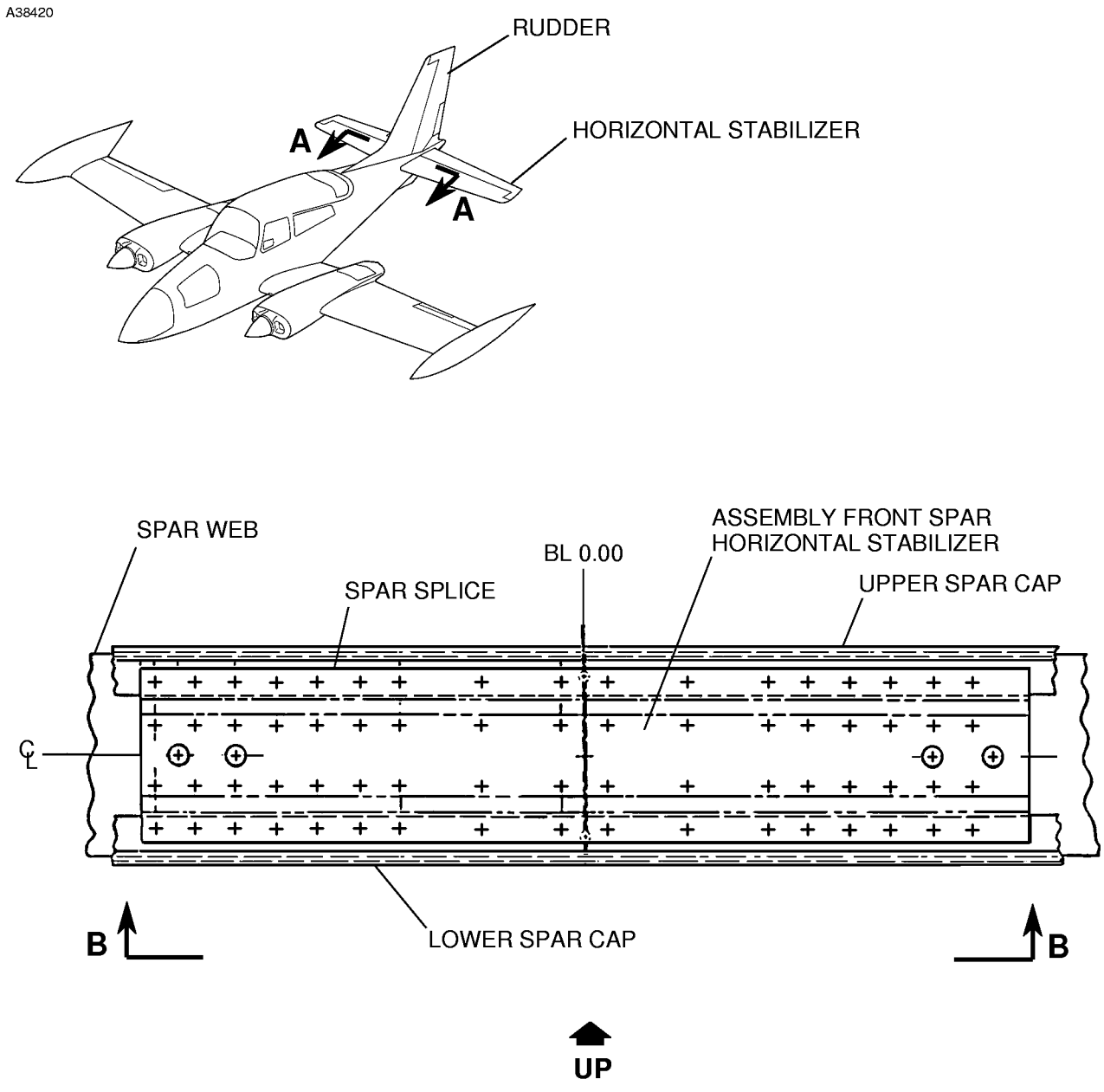

5232R1006
AA5232R1001

Horizontal Stabilizer Assembly Forward Spar Lower Cap Inspection
Figure 1 (Sheet 1)

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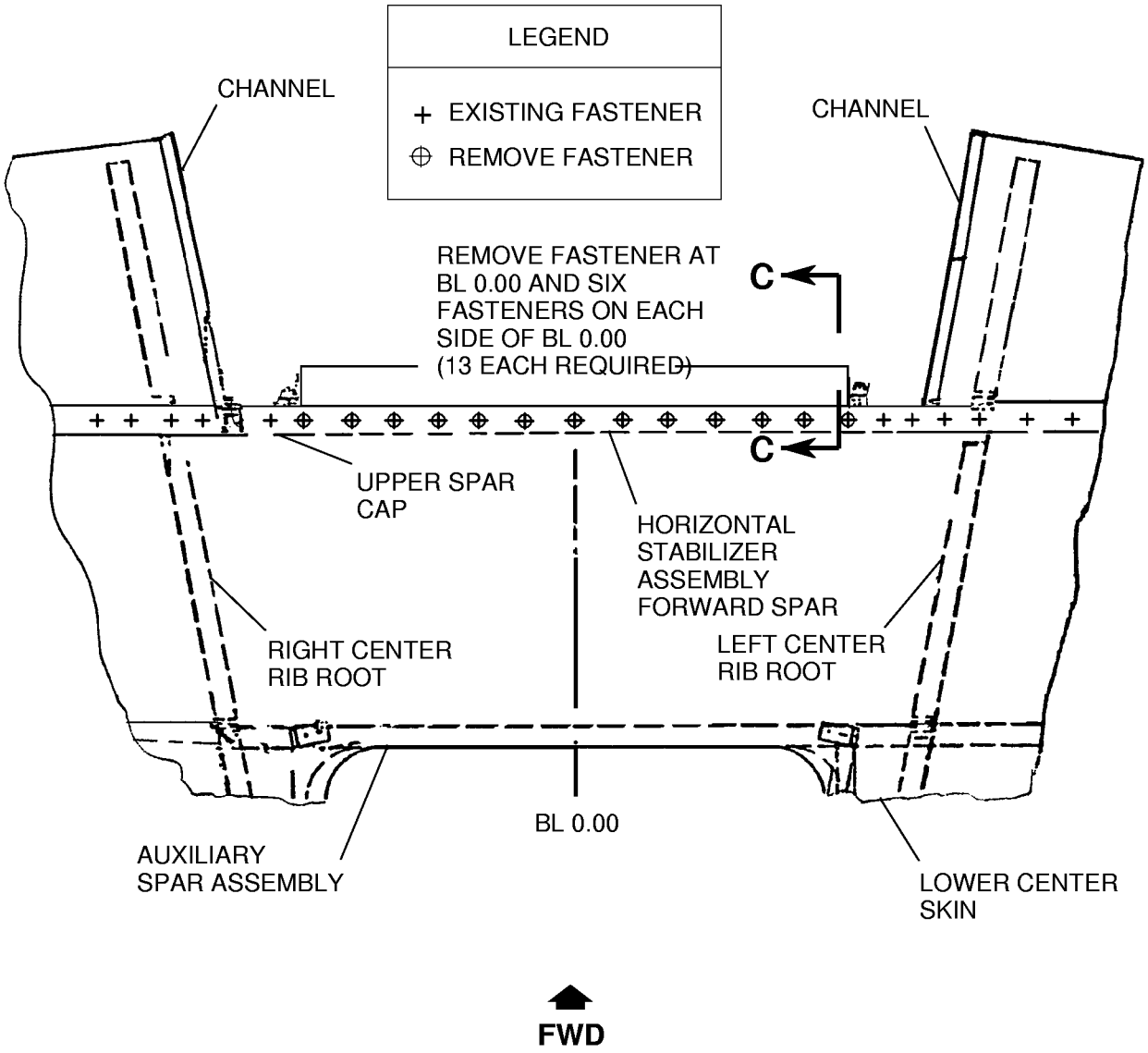

VIEW B-B
LOOKING UP AT HORIZONTAL STABILIZER FORWARD SPAR

Horizontal Stabilizer Assembly Forward Spar Lower Cap Inspection
Figure 1 (Sheet 2)

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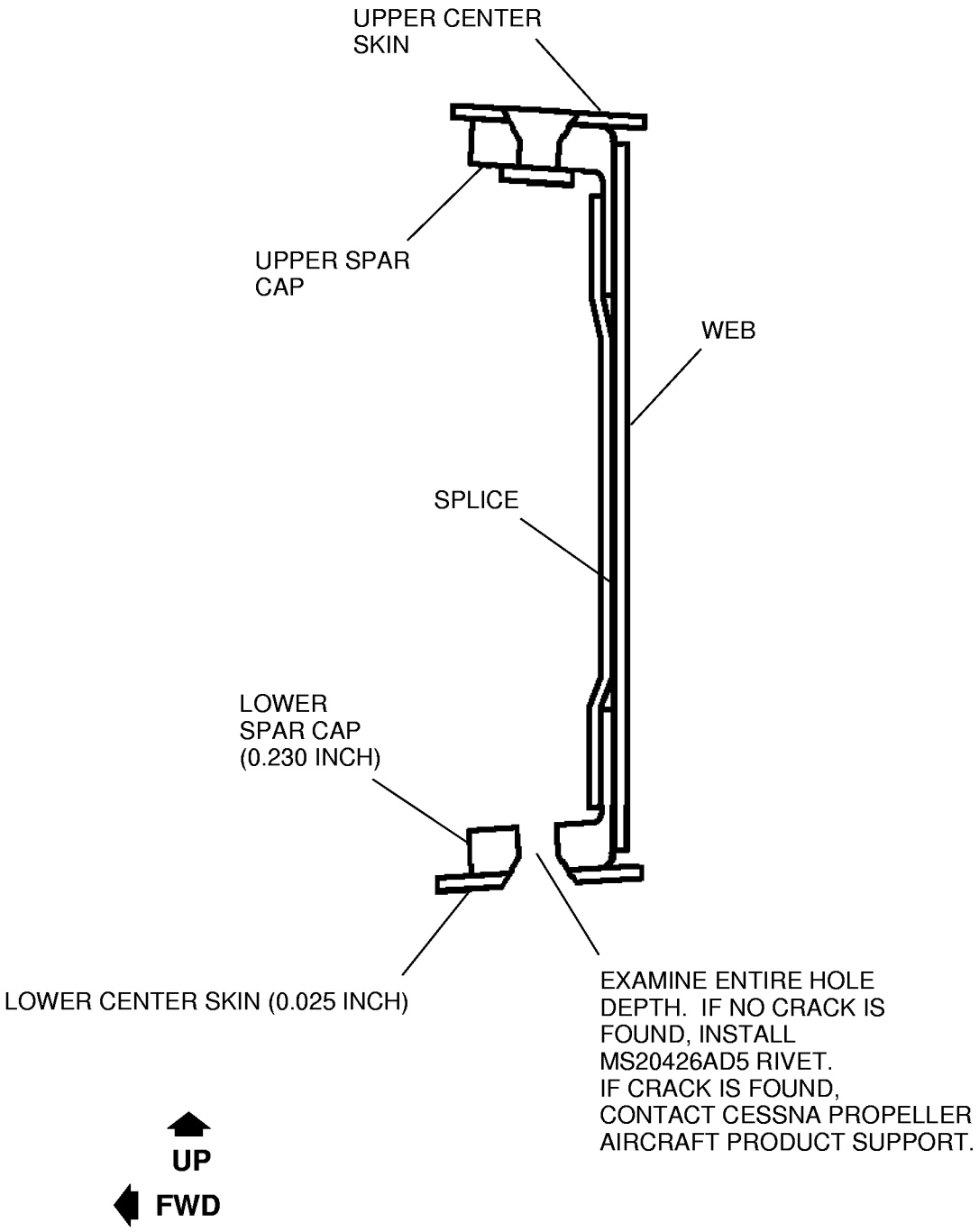

VIEW C-C
LOOKING OUTBOARD AT TYPICAL
UPPER SPAR CAP HOLE INSPECTION

C-C5232R1005

Horizontal Stabilizer Assembly Forward Spar Lower Cap Inspection
Figure 1 (Sheet 3)

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-04

1. TITLE

Horizontal Stabilizer Forward Spar Attach

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the horizontal stabilizer forward spar attach points.

4. PREPARATION

A. Remove the horizontal stabilizer forward spar attach bolts. Refer to Figure 1.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments Incorporated 421 North Quay Kennewick, WA 99336
BPM-24/100-500 kHz	1	3/8 INCH BOLT HOLE EDDY CURRENT PROBE, Bolt Hole Probe NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.

B. Null the probe in the bolt hole reference standard with the probe turned away from the calibration notch.

C. Adjust lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.

D. Set the sensitivity by adjusting the instrument controls to obtain a signal of at least 3 screen divisions of separation between the lift-off response and the original signal from the 0.050 inch corner notch in the reference standard.

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E. Bolt hole eddy current inspect the horizontal stabilizer forward spar attach bolt holes on both the fuselage and stabilizer. Inspect the entire depth and circumference of each hole.

NOTE: Figure 1 View B-B and Figure 2 View B-B shows a typical cross-section of the holes.

F. If no cracks are detected during this inspection, reinstall the horizontal stabilizer. Refer to the Maintenance Manual.

G. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and approximate length and depth of the crack.

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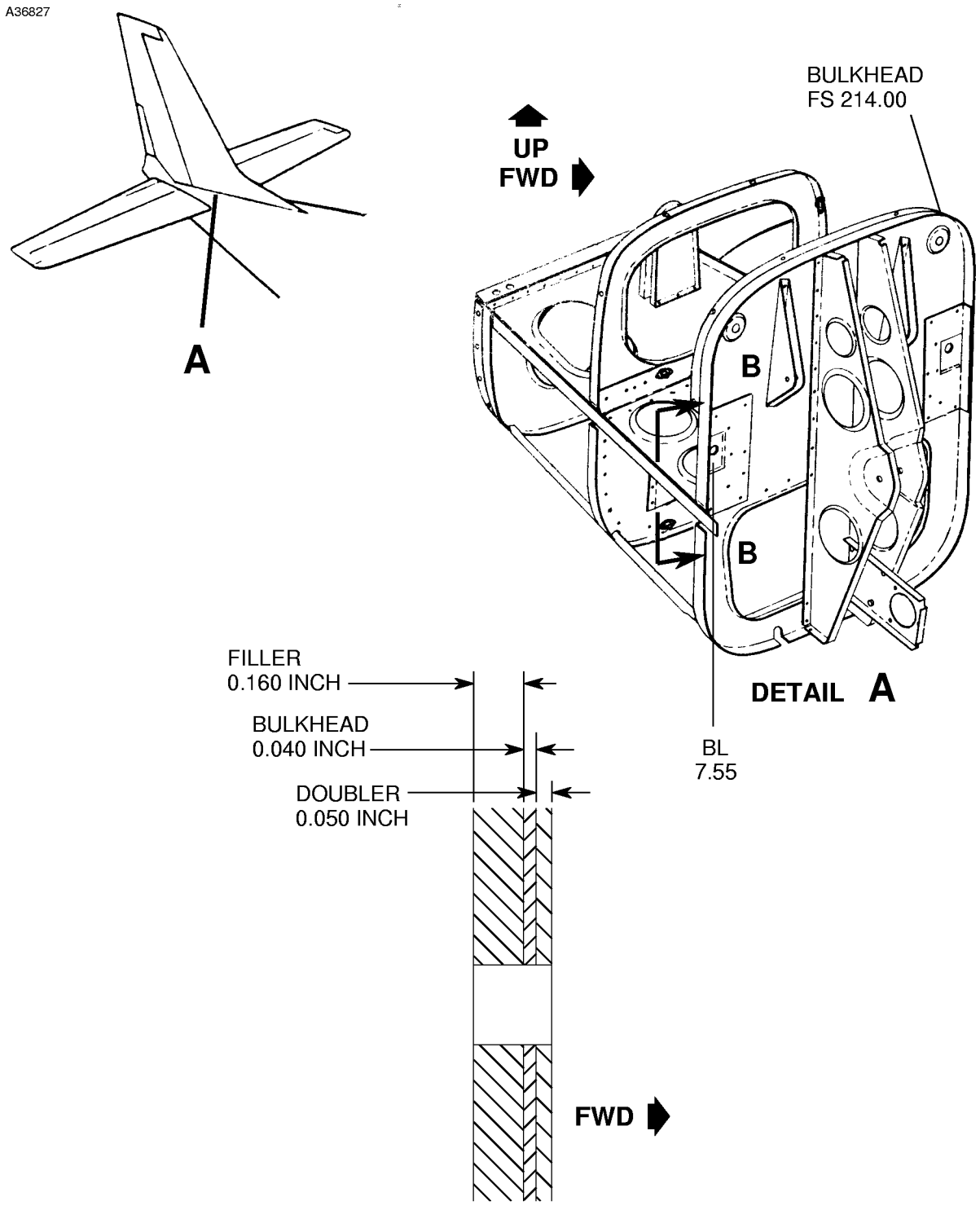

VIEW OF MATERIAL BUILDUP OF FUSELAGE BULKHEAD
HORIZONTAL STABILIZER FORWARD ATTACH HOLE

BB1032T1007

Horizontal Stabilizer Assembly Forward Spar Bulkhead Attach
Figure 1 (Sheet 1)

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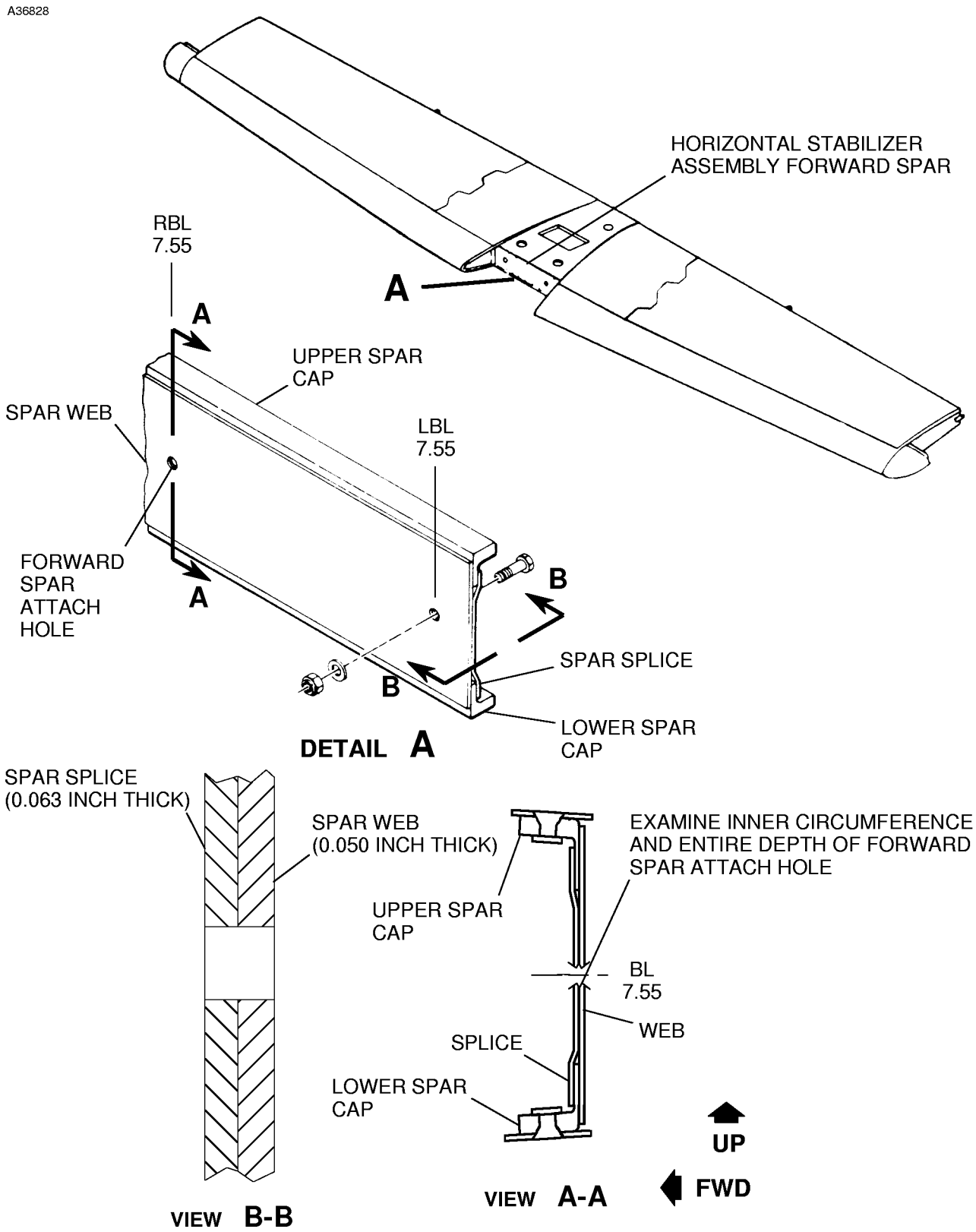

Horizontal Stabilizer Assembly Forward Spar Attach Hole Inspection
Figure 2 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-05

1. TITLE

Horizontal Stabilizer Rear Spar Lower Cap Attach

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the horizontal stabilizer rear spar lower cap attach points.

4. PREPARATION

A. Remove the attach bolts on the horizontal stabilizer rear spar lower cap. Refer to Figure 1.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
BPM-20/100-500 kHz	1	5/16 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp.
HRS-11A-0/050	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Calibration for surface eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe on the surface reference standard away from the calibration notches.
   (3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.
   (4) Set the sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from 0.020 inch deep notch in the reference standard.

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B. Calibration for bolt hole eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe in the bolt hole reference standard with the probe turned away from the calibration notches.
   (3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.
   (4) Set the sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from 0.050 inch corner notch in the reference standard.

C. Bolt hole eddy current inspect the horizontal stabilizer rear spar lower attach holes.

   NOTE: Figure 2 View C-C shows a typical cross-section of the holes.

   (1) Inspect the entire depth and circumference of each hole, except the skin.
   (2) Surface eddy current inspect the skin immediately adjacent to the attach holes.

D. If no cracks are detected during this inspection, reinstall the horizontal stabilizer. Refer to the Maintenance Manual.

E. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and approximate length and depth of crack.

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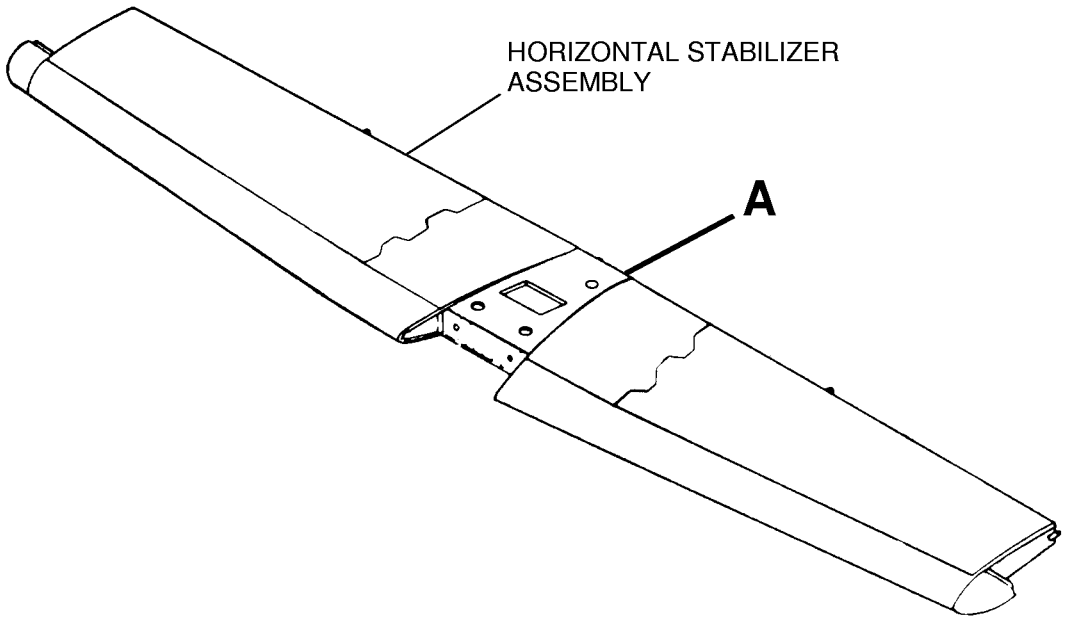

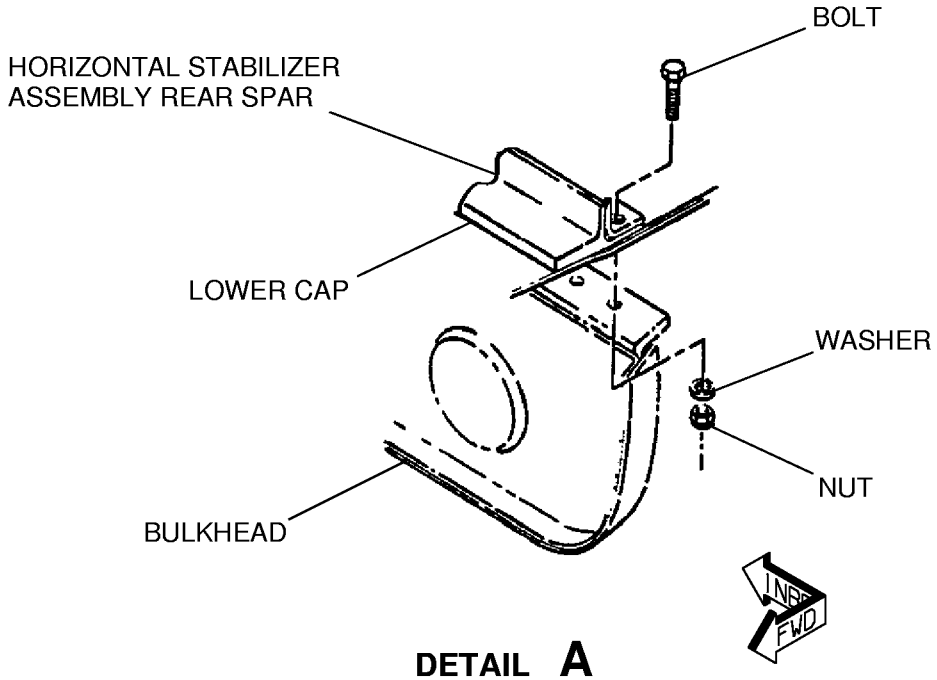

DETAIL A
LOOKING AFT AT HORIZONTAL
STABILIZER ASSEMBLY REAR
SPAR LOWER CAP ATTACH

Horizontal Stabilizer Assembly Rear Spar Lower Cap Attach
Figure 1 (Sheet 1)

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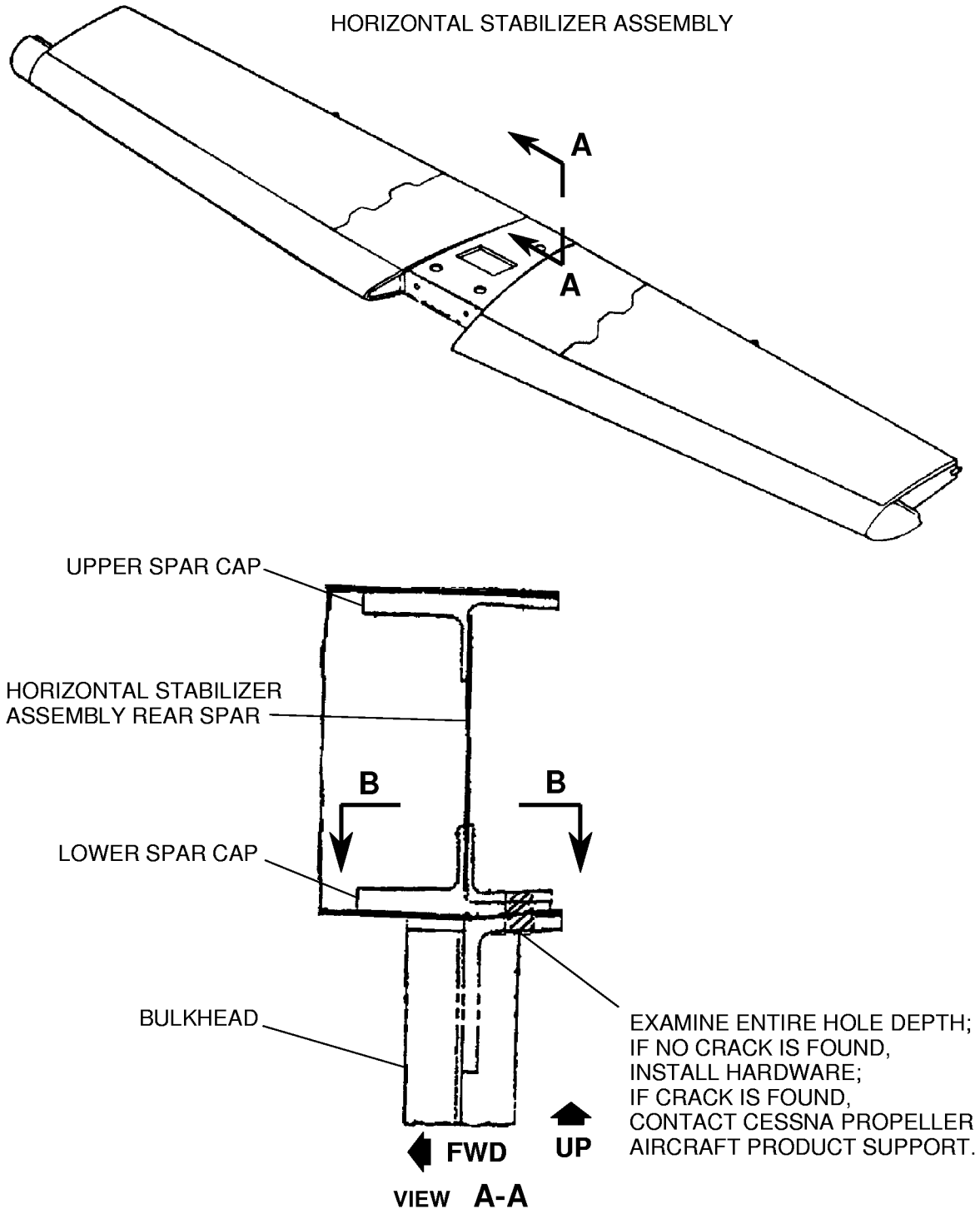

Horizontal Stabilizer Assembly Rear Spar Lower Cap Attach Inspection
Figure 2 (Sheet 1)

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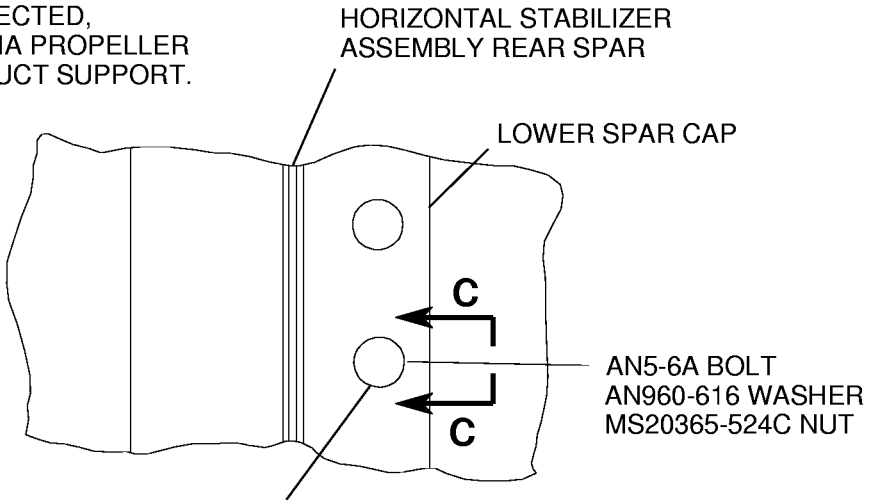
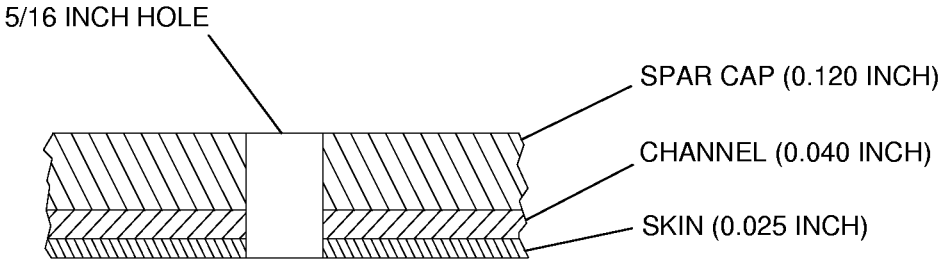
NOTE: IF NO CRACK IS DETECTED DURING INSPECTION, REINSTALL HARDWARE. IF CRACK IS DETECTED, CONTACT CESSNA PROPELLER AIRCRAFT PRODUCT SUPPORT.



VIEW B-B

LOOKING DOWN AT TYPICAL HORIZONTAL STABILIZER ASSEMBLY REAR SPAR LOWER CAP ATTACH



VIEW C-C

TYPICAL BOLT HOLE CROSS SECTION

BB1032T1008
A1032T1009

Horizontal Stabilizer Assembly Rear Spar Lower Cap Attach Inspection
Figure 2 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-06

1. TITLE

Horizontal Stabilizer Rear Spar Upper Cap, BL 0.00

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the horizontal stabilizer rear spar upper cap.

4. PREPARATION

A. Remove four fasteners, two fasteners outboard left and two fasteners outboard right of BL 0.00, on the horizontal stabilizer rear spar upper cap. Refer to Figure 1.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Surface and Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e[II]	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
BPM-8/100-500 kHz	1	1/8 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp.
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Calibration for the surface eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe on the surface eddy current reference standard away from the calibration notches.
   (3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.

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(4) Set the sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

B. Calibration for the bolt hole eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe in the bolt hole reference standard with the probe turned away from the calibration notch.
   (3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.
   (4) Set the sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.050 inch corner notch in the reference standard.

C. Bolt hole eddy current inspect the four fastener holes, two holes outboard left and two holes outboard right of BL 0.00, common to the horizontal stabilizer rear spar upper cap.

   NOTE: Figure 1 View C-C shows a typical cross-section of the holes.

   (1) Inspect the entire depth and circumference of each hole, except the skin.
   (2) Surface eddy current inspect the skin immediately adjacent to each hole.

D. If no cracks are detected during this inspection, install four each MS20470AD4 Rivets in the horizontal stabilizer rear spar upper cap.
   (1) Reinstall the horizontal stabilizer. Refer to the Maintenance Manual.

E. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and approximate length and depth of the crack.

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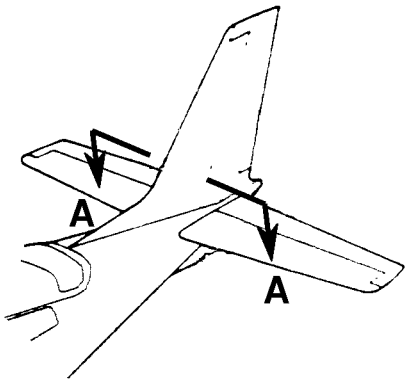

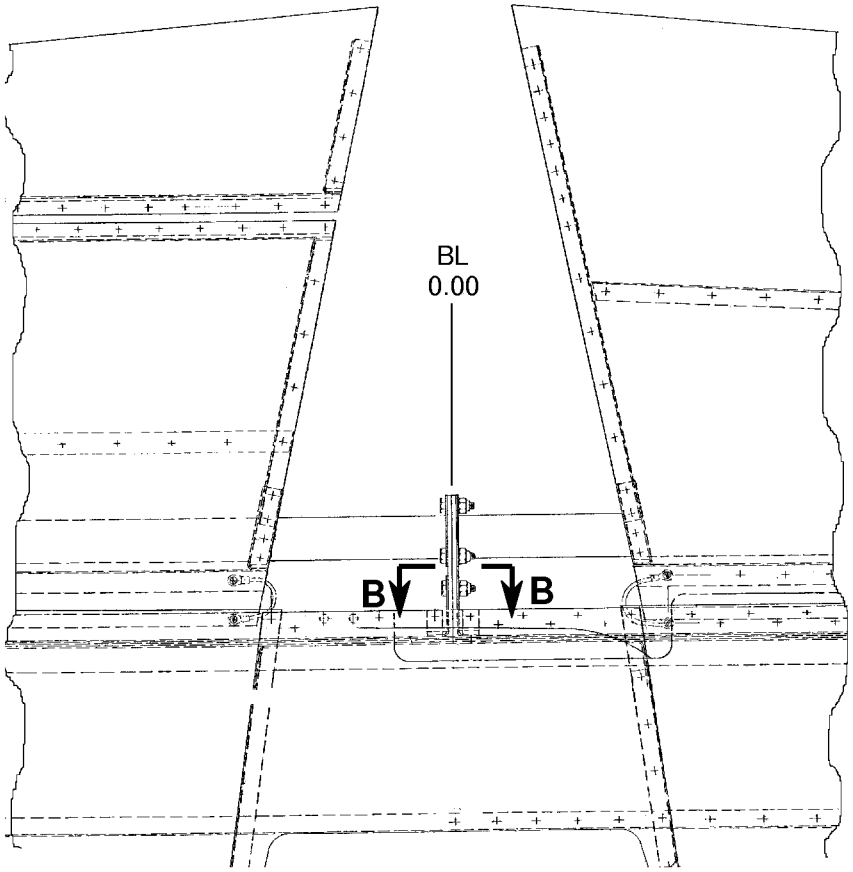

VIEW A-A
LOOKING DOWN AT HORIZONTAL
STABILIZER ASSEMBLY

Horizontal Stabilizer Assembly Rear Spar Upper Cap, BL 0.00
Figure 1 (Sheet 1)

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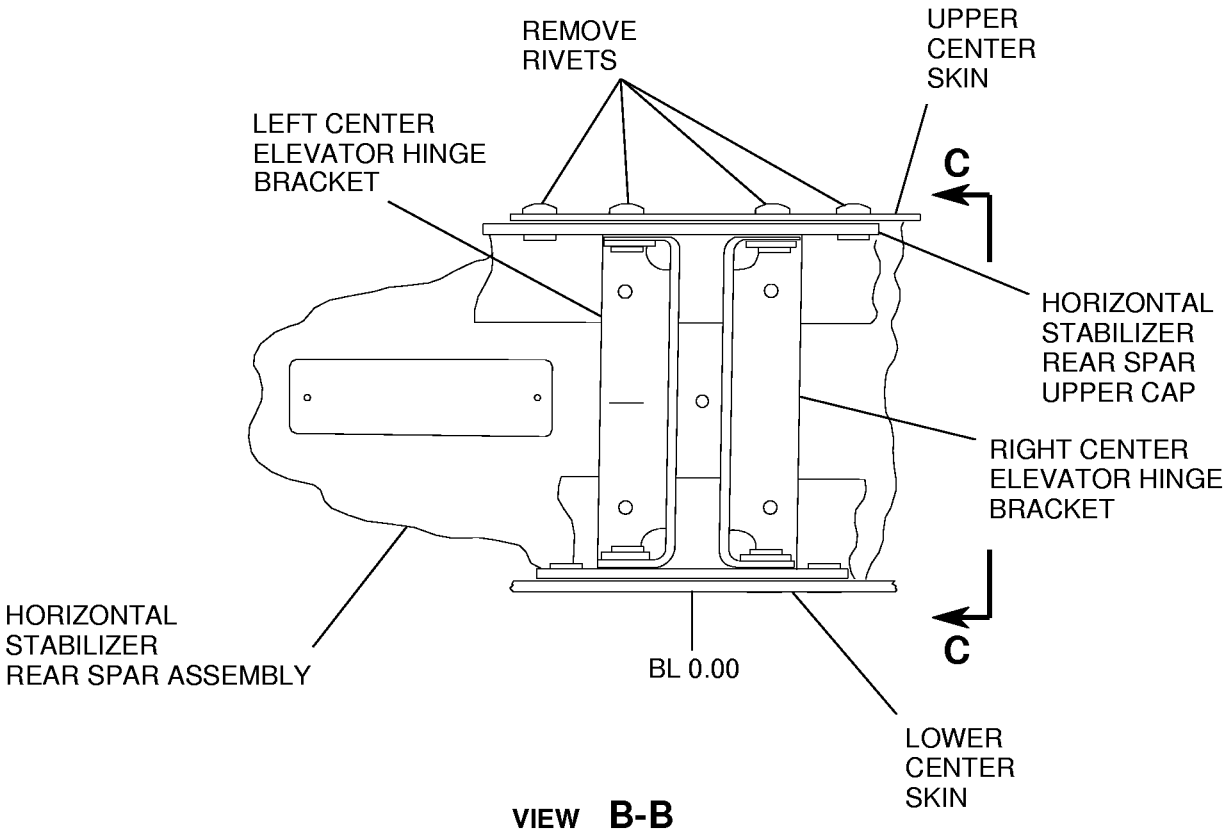
A1575

NOTE 1: INSPECT ENTIRE HOLE DEPTH

NOTE 2: IF NO CRACK IS DETECTED, INSTALL MS20470AD4 RIVETS.

NOTE 3: IF A CRACK IS DETECTED, CONTACT CESSNA PROPELLER AIRCRAFT PRODUCT SUPPORT.



VIEW B-B
LOOKING FORWARD AT REAR SPAR

1032T1010

Horizontal Stabilizer Assembly Rear Spar Upper Cap, BL 0.00
Figure 1 (Sheet 2)

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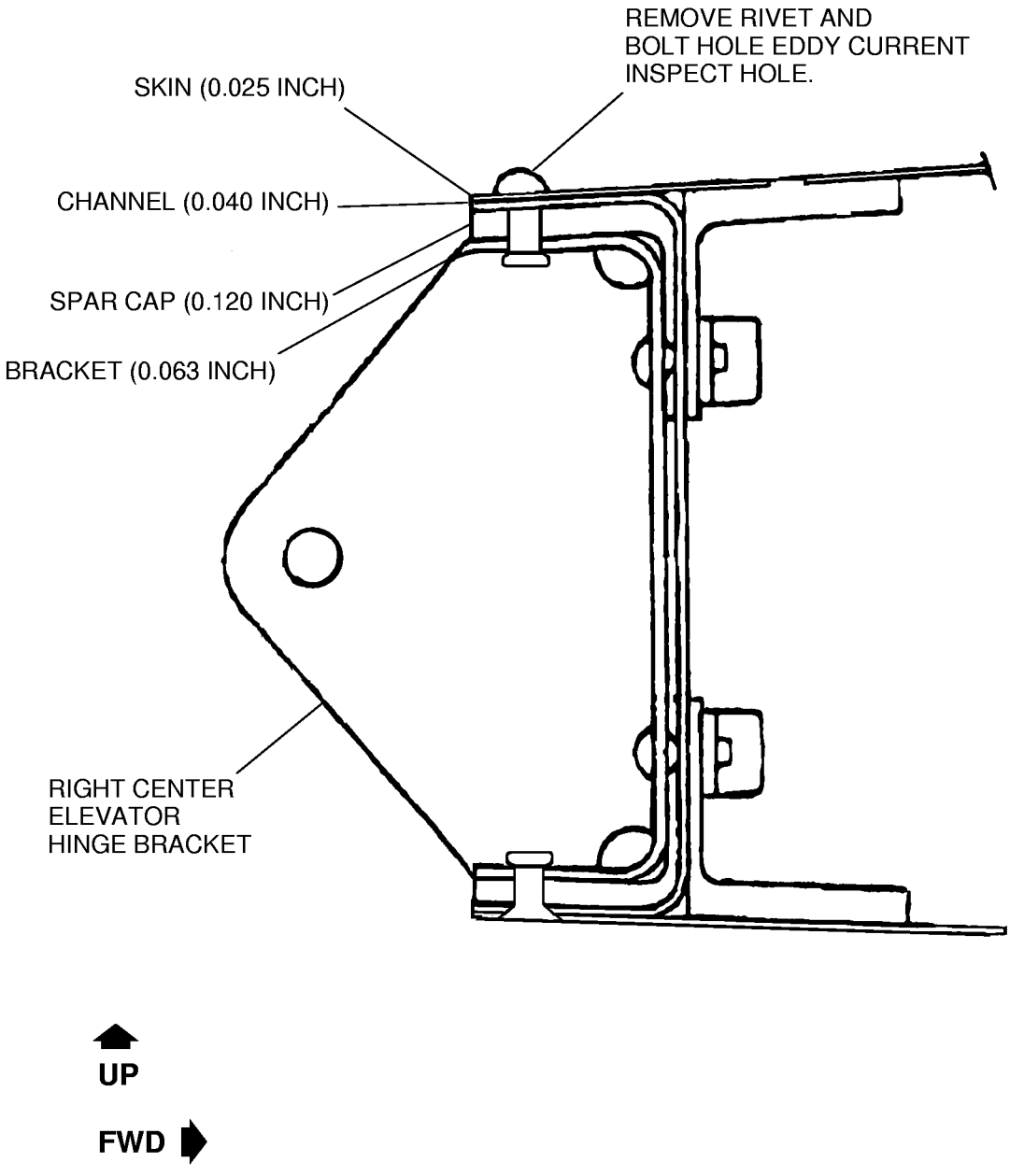

VIEW C-C
LOOKING INBOARD AT TYPICAL HOLE CROSS SECTION

Horizontal Stabilizer Assembly Rear Spar Upper Cap, BL 0.00
Figure 1 (Sheet 3)

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SUPPLEMENTAL INSPECTION NUMBER: 55-10-07

1. TITLE

Horizontal Stabilizer Rear Spar Lower Cap, BL 0.00

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the horizontal stabilizer rear spar lower cap.

4. PREPARATION

A. Remove two each fasteners, one outboard left and one outboard right of BL 0.00, from the horizontal stabilizer rear spar lower cap. Refer to Figure 1.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Surface and Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
VBPM-8/100-500 kHz	1	1/8 INCH BOLTHOLE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp.
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Calibration for surface eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe on the surface reference standard away from the calibration notches.
   (3) Adjust the lift-off deflection on impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.

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(4) Set the sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

B. Calibration for bolt hole eddy current probe.
(1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
(2) Null the probe in the bolt hole reference standard with the probe turned away from the calibration notches.
(3) Adjust the lift-off deflection on impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.
(4) Set the sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.050 inch corner notch in the reference standard.

C. Bolt hole eddy current inspect the horizontal stabilizer rear spar lower holes at BL 0.00.

NOTE: Figure 1, View C-C shows a typical cross-section of the holes.

(1) Inspect the entire depth and circumference of each hole, except the skin.
(2) Surface eddy current inspect the skin immediately adjacent to each hole.

D. If no cracks are detected during this inspection, install two MS20426AD4 Rivets in the horizontal stabilizer rear spar lower cap.

E. Reinstall the horizontal stabilizer. Refer to the Maintenance Manual.

F. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and approximate length and depth of the crack.

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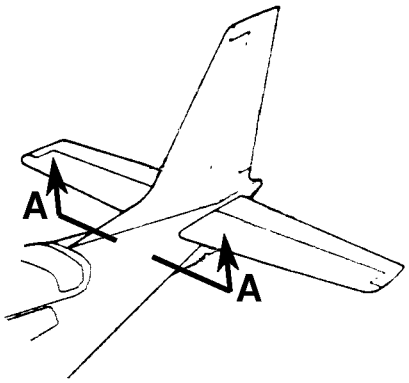

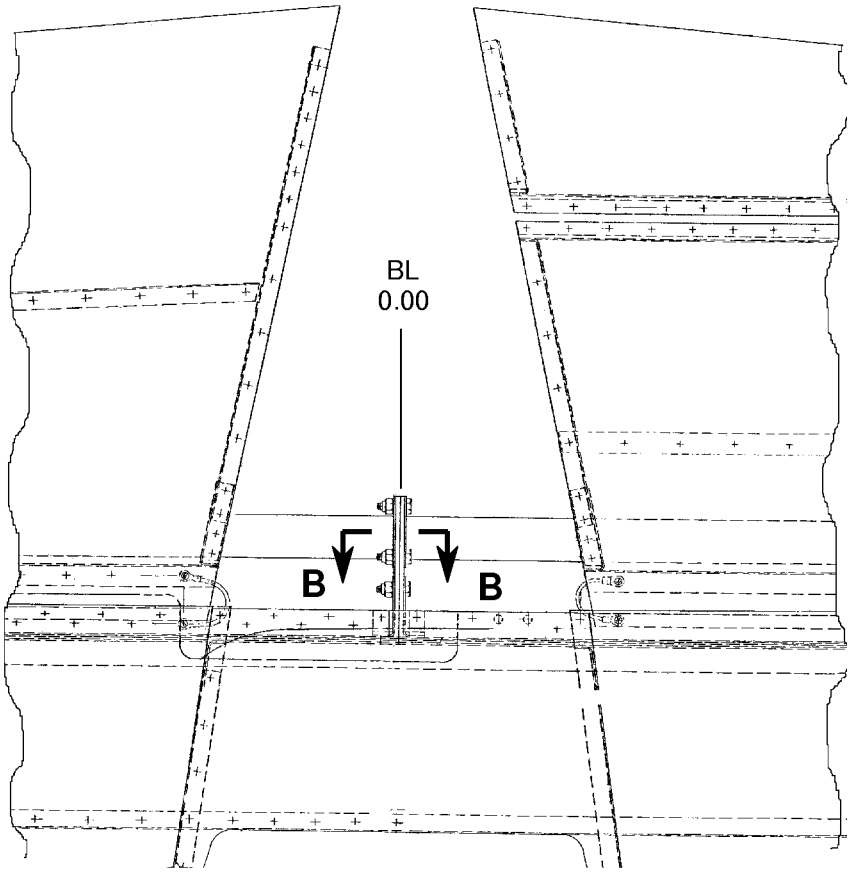

VIEW A-A
LOOKING UP AT HORIZONTAL
STABILIZER ASSEMBLY

Horizontal Stabilizer Assembly Rear Spar Lower Cap, BL 0.00
Figure 1 (Sheet 1)

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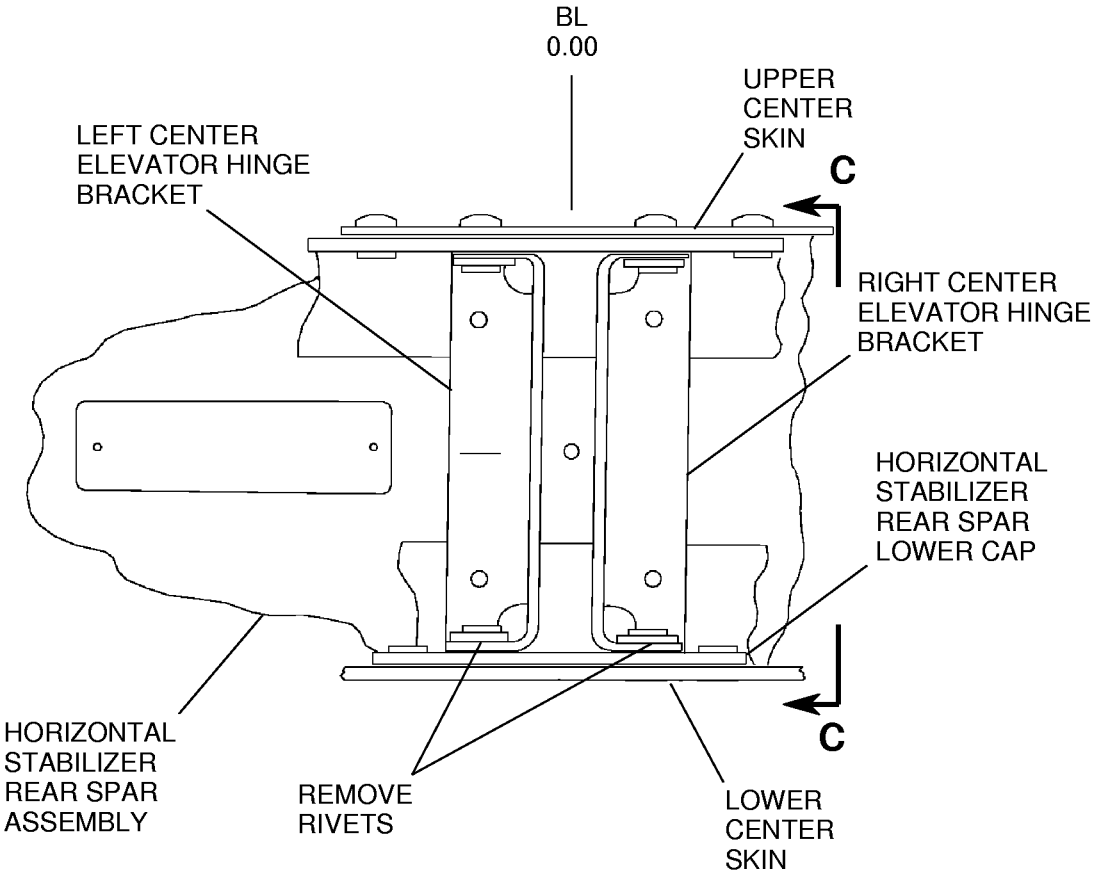

VIEW B-B
LOOKING FORWARD AT REAR SPAR

NOTE 1: EXAMINE ENTIRE HOLE DEPTH

NOTE 2: IF NO CRACK IS DETECTED, INSTALL MS20426AD4 RIVETS.

NOTE 3: IF A CRACK IS FOUND, CONTACT CESSNA PROPELLER AIRCRAFT PRODUCT SUPPORT

Horizontal Stabilizer Assembly Rear Spar Lower Cap, BL 0.00
Figure 1 (Sheet 2)

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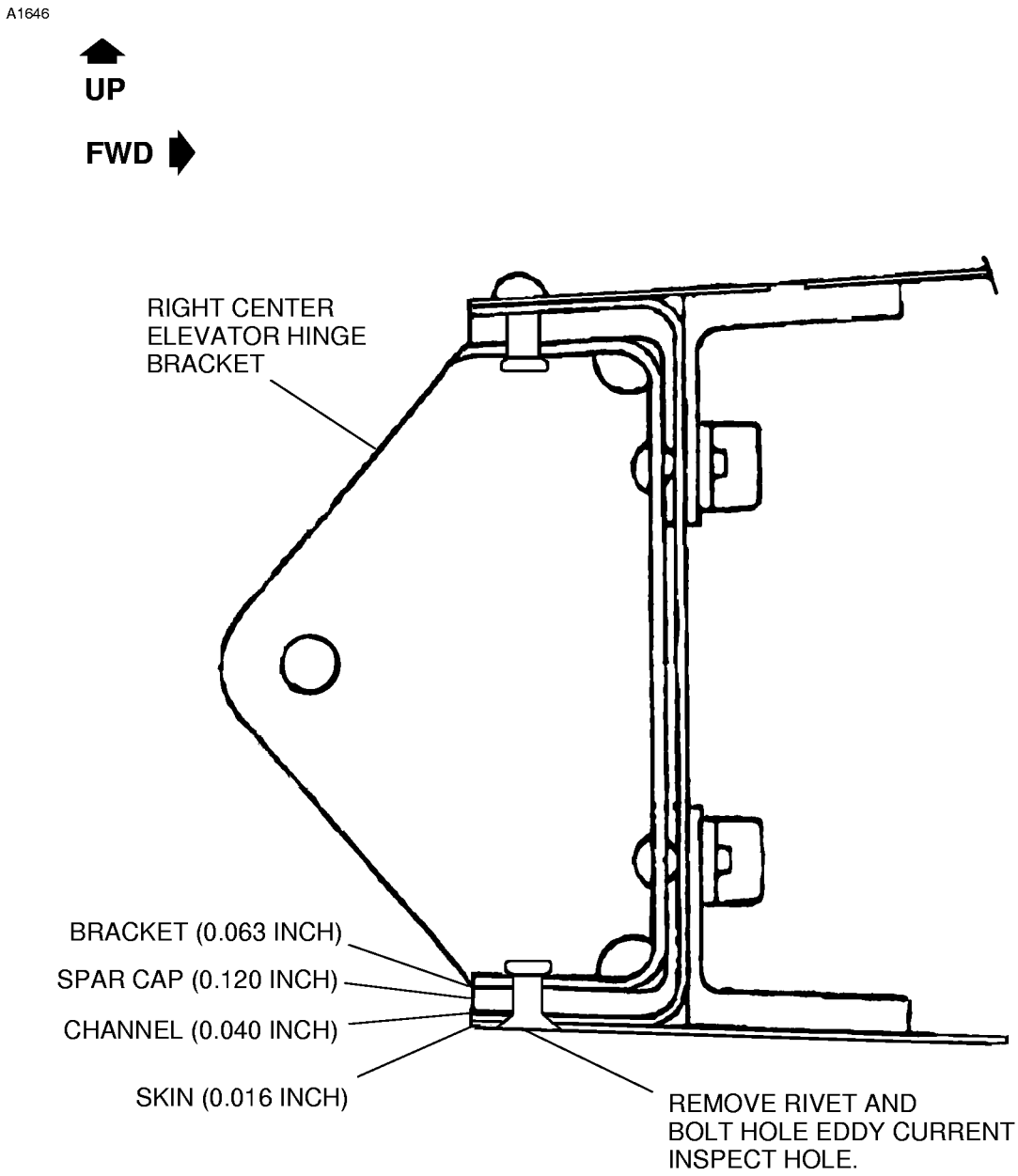

VIEW C-C
LOOKING INBOARD AT TYPICAL HOLE CROSS SECTION

Horizontal Stabilizer Assembly Rear Spar Lower Cap, BL 0.00
Figure 1 (Sheet 3)

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SUPPLEMENTAL INSPECTION NUMBER: 55-20-01

1. TITLE

Elevator Hinges and Fittings

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for cracks at the elevator hinges and fittings.

4. PREPARATION

A. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 inch (open hole), 0.150 inch (around fastener or bearing).

7. EQUIPMENT

The following equipment was used to develop this inspection. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.

B. Null the probe on the surface reference standard away from the calibration notches.

C. Adjust the lift-off deflection on impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.

D. Set the sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

E. Refer to Figure 1 and Figure 2. Surface eddy current inspect the left and right elevator attach points on the elevator and the horizontal stabilizer. Scan immediately adjacent to the holes and bearing edges. Scan around fasteners common to the attach brackets.

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F. If no cracks are detected during this inspection, reinstall the horizontal stabilizer. Refer to the Maintenance Manual.

G. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and approximate length and depth of the crack.

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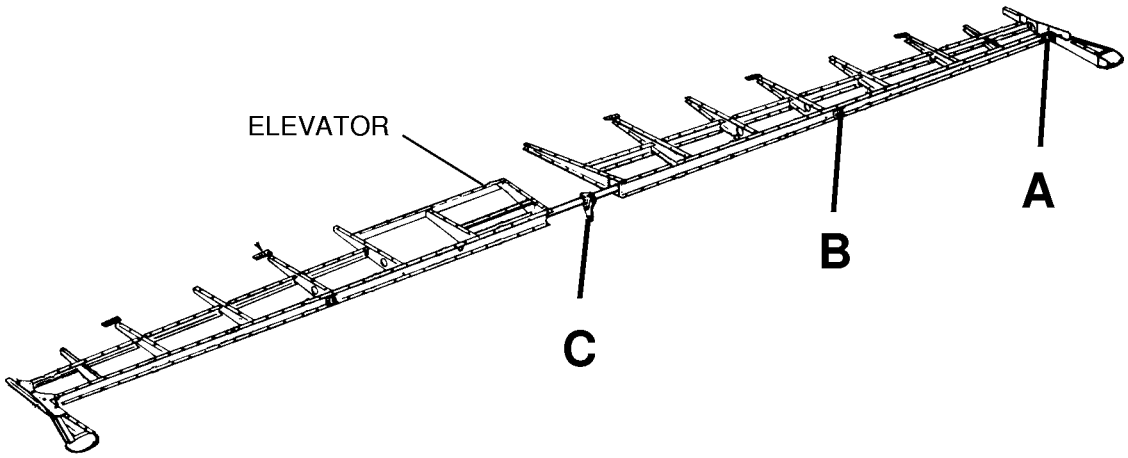
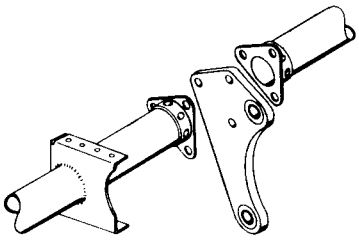
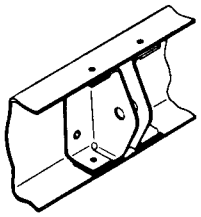
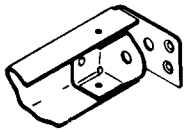




DETAIL C
CENTER HINGE HALF



DETAIL B
INBOARD HINGE HALF



DETAIL A
OUTBOARD HINGE HALF

NOTE 1: ELEVATOR SIDE OF ATTACH POINTS SHOWN. OPPOSING SIDES NOT SHOWN FOR CLARITY.

NOTE 2: SCAN ADJACENT TO THE HOLES AND BEARINGS. SCAN AROUND FASTENERS COMMON TO THE ATTACHED BRACKETS. SCAN LEFT AND RIGHT SIDE ATTACH POINTS.

Elevator Hinges and Fittings Inspection
Figure 1 (Sheet 1)

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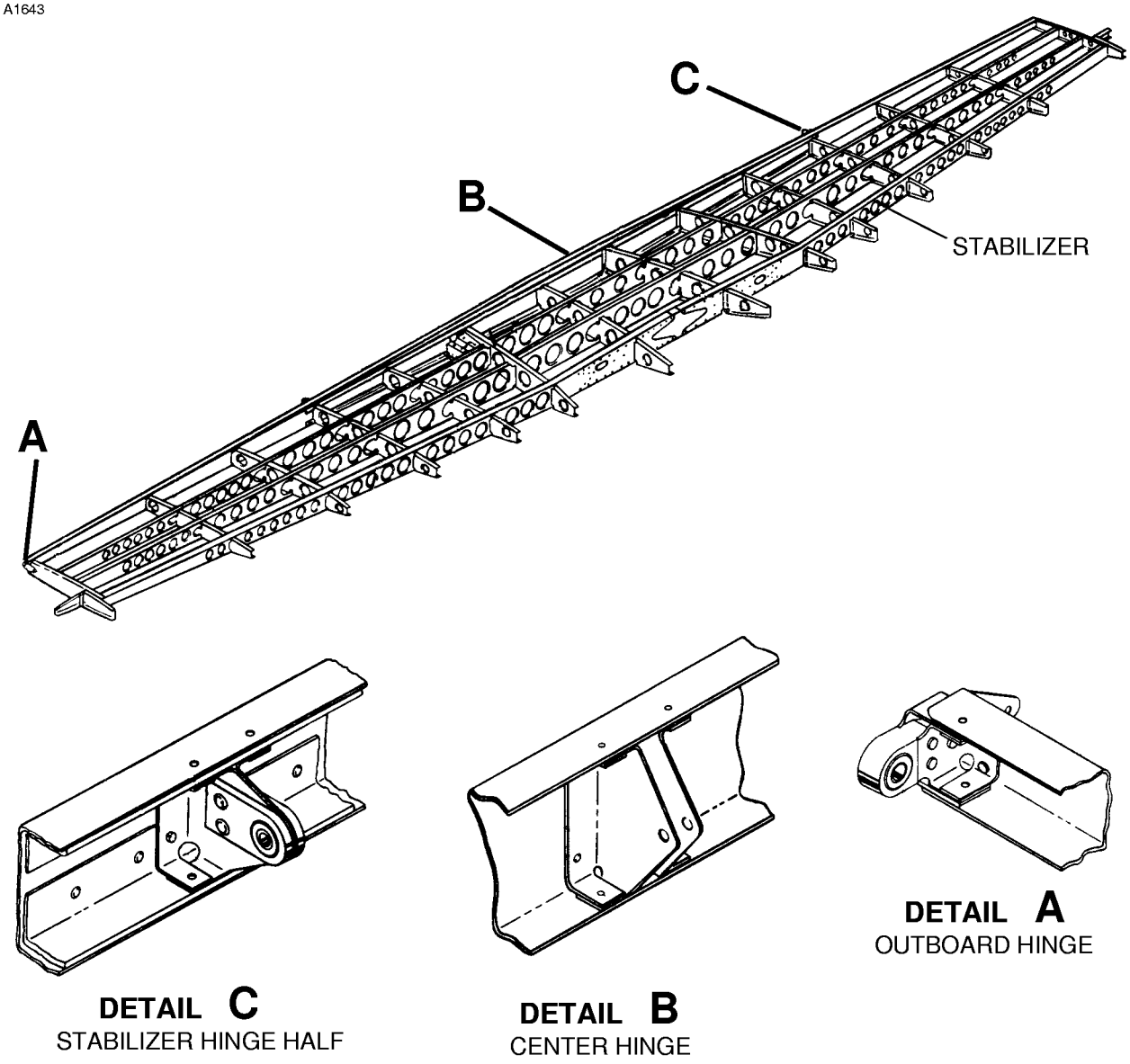

NOTE 1: STABILIZER SIDE OF ATTACH POINTS SHOWN. OPPOSING SIDES NOT SHOWN FOR CLARITY.

NOTE 2: SCAN ADJACENT TO THE HOLES AND BEARINGS. SCAN AROUND FASTENERS COMMON TO THE ATTACHED BRACKETS. SCAN LEFT AND RIGHT SIDE ATTACH POINTS.

Horizontal Stabilizer Hinges and Fittings Inspection
Figure 2 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 55-30-01

1. TITLE

Rudder Hinges and Fittings

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for cracks at the rudder hinges and fittings.

4. PREPARATION

A. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size:
0.080 Inch - Open Hole
0.150 inch - Around Fastener or Bearing

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032

8. INSPECTION INSTRUCTIONS

A. Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.

B. Null the probe on the surface reference standard away from the calibration notches.

C. Adjust the lift-off deflection on the impedance plane instrumentation so the deflection of the lift-off trace is horizontal and deflects from right to left as the probe is lifted from the part surface.

D. Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

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E. Refer to Figure 1 and Figure 2. Surface eddy current inspect the rudder attach points on the rudder and the vertical stabilizer.
   (1) Scan immediately adjacent to the holes and bearing edges.
   (2) Scan around fasteners common to the attach brackets.

F. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and approximate length and depth of crack on report.

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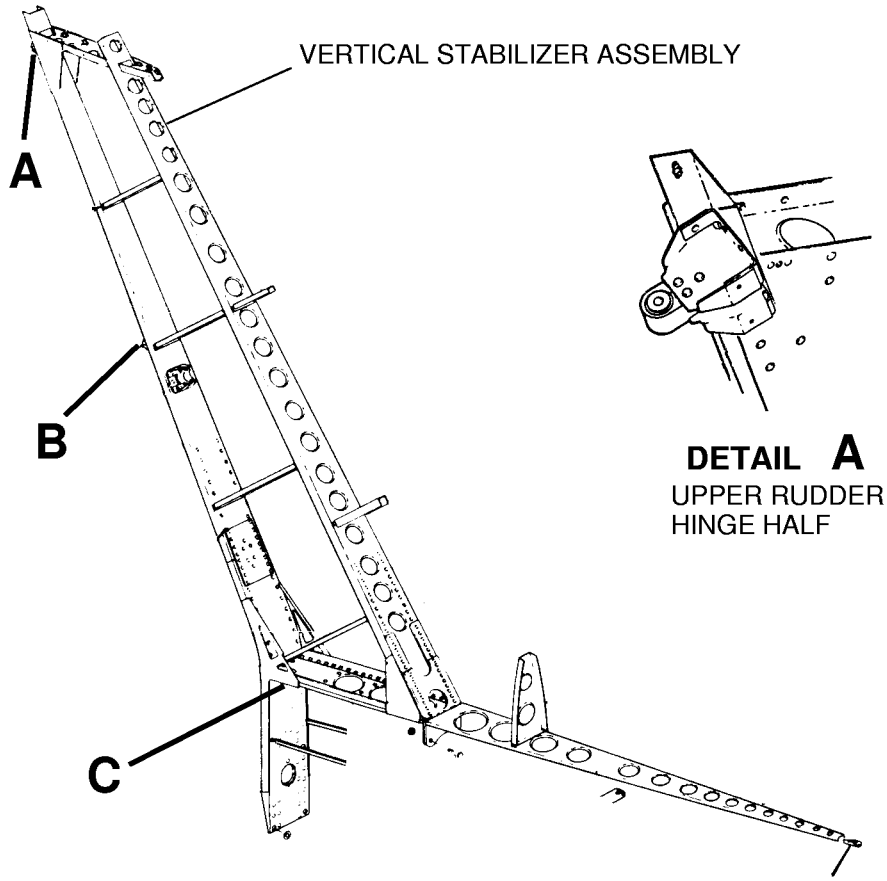
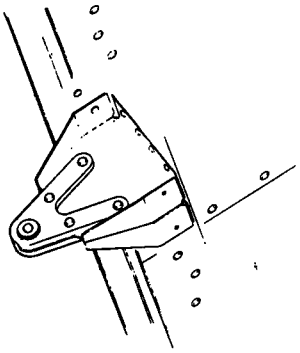
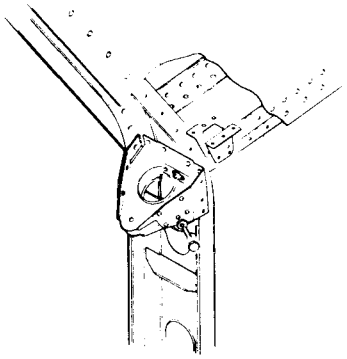


DETAIL A
UPPER RUDDER
HINGE HALF



DETAIL B
MIDDLE RUDDER
HINGE HALF



DETAIL C
LOWER RUDDER
HINGE HALF

NOTE 1: SCAN ADJACENT TO THE HOLES AND BEARINGS. SCAN AROUND FASTENERS COMMON TO THE ATTACH BRACKETS.

NOTE 2: SWEPT STABILIZER SIDE OF RUDDER HINGES AND FITTINGS AND ATTACH POINTS.

Vertical Stabilizer Rudder Hinges and Fittings Inspection
Figure 1 (Sheet 1)

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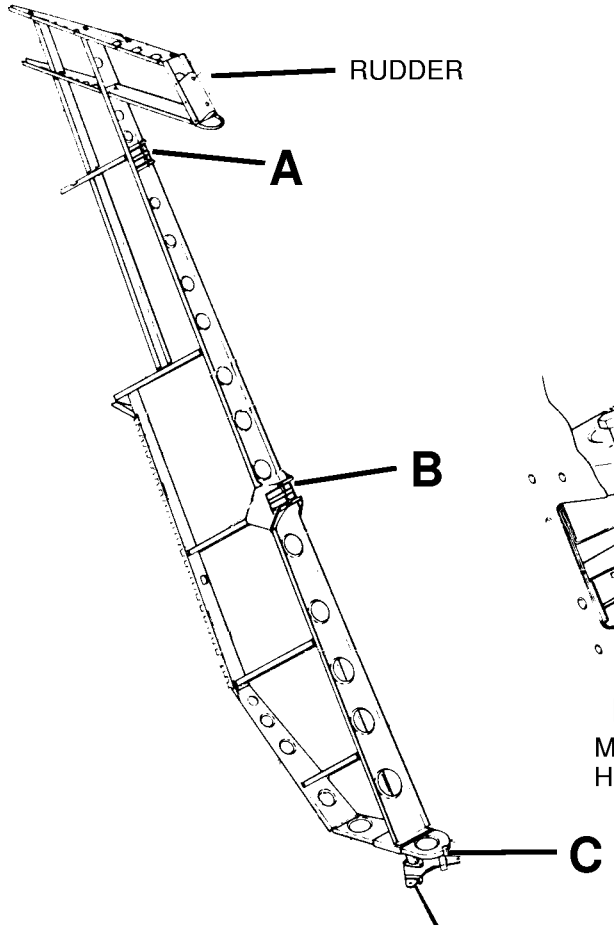
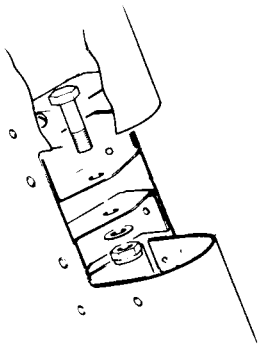
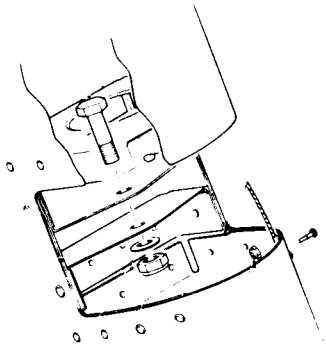




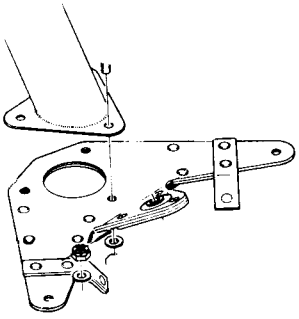
DETAIL A
UPPER RUDDER
HINGE HALF



DETAIL B
MIDDLE RUDDER
HINGE HALF

NOTE 1: SCAN ADJACENT TO THE HOLES AND BEARINGS. SCAN AROUND FASTENERS COMMON TO THE ATTACH BRACKETS.

NOTE 2: SWEPT RUDDER SIDE OF ATTACH POINTS SHOWN.



DETAIL C
RUDDER BELL CRANK
ASSEMBLY

Rudder Hinges and Fittings Inspection
Figure 2 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 55-30-02

1. TITLE

Vertical Stabilizer Rear Spar Cap Attach

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the vertical stabilizer rear spar cap attach points.

4. PREPARATION

A. Remove the vertical stabilizer rear spar cap attach bolts. Refer to Figure 1.

CAUTION: Do not remove more than one bolt at a time while performing this inspection.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the equipment listed. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
BPM-24/100-500 kHz	1	3/8 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd., Kent, WA 98032
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.

B. Null the probe in the appropriate bolt hole reference standard hole with the probe turned away from the calibration notch.

C. Adjust lift-off on impedance plane instrumentation so the deflection of the lift-off trace is horizontal and deflects from right to left as the probe is lifted from the part surface.

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D. Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.050 inch corner notch in the reference standard.

E. Bolt hole eddy current inspect the four attach point holes at both the vertical stabilizer and the fuselage bulkhead. Inspect the circumference of each layer in each hole. Refer to Figure 1 Detail A and Detail B.

NOTE: There is a nutplate installed on the forward side of the vertical stabilizer attach hole at the fuselage bulkhead. This may restrict the total depth of penetration into the hole.

F. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and approximate length and depth of the crack.

G. If no cracks are detected during this inspection, reinstall the vertical stabilizer rear spar cap attach bolts. Refer to the Maintenance Manual.

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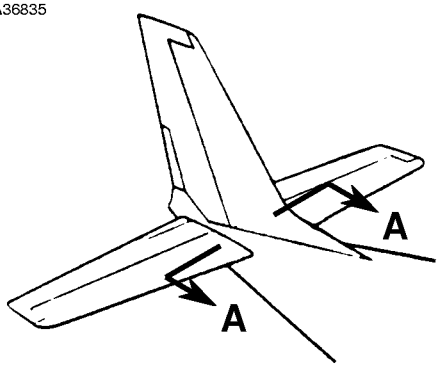
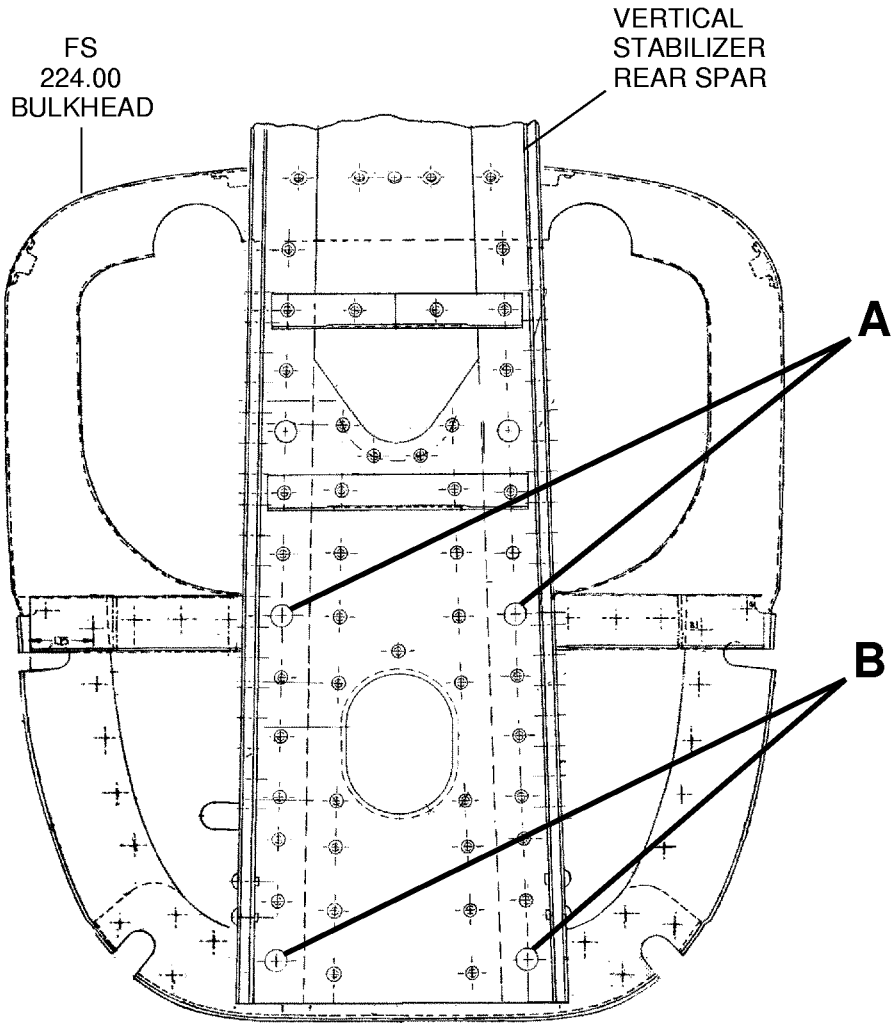


CAUTION: DO NOT REMOVE MORE THAN ONE BOLT AT A TIME WHILE PERFORMING INSPECTION



VIEW A-A
LOOKING FORWARD AT VERTICAL STABILIZER REAR SPAR AND FS 224.00 BULKHEAD

Vertical Stabilizer Assembly Rear Spar Cap Attach
Figure 1 (Sheet 1)

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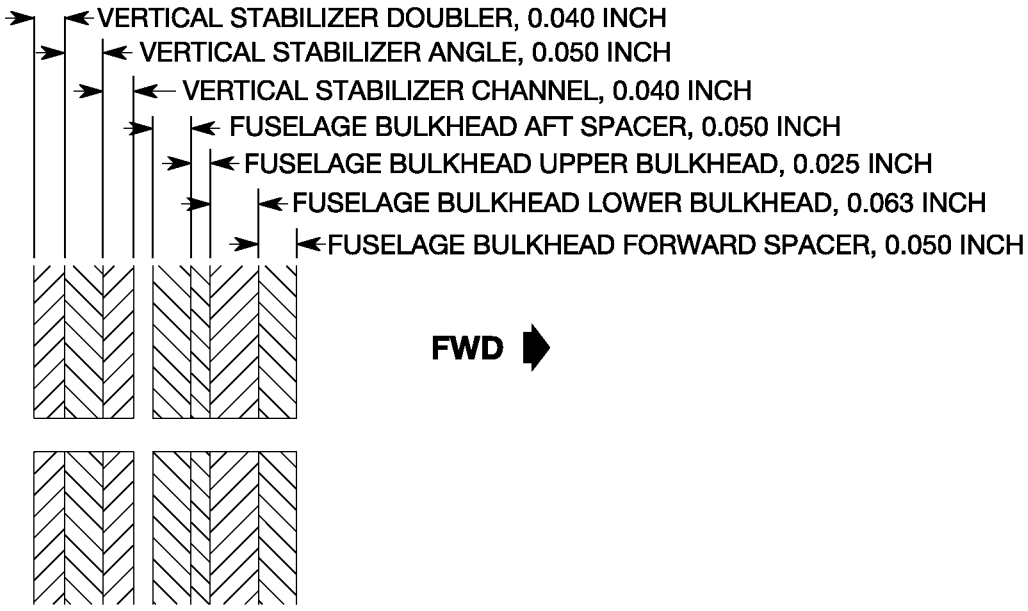
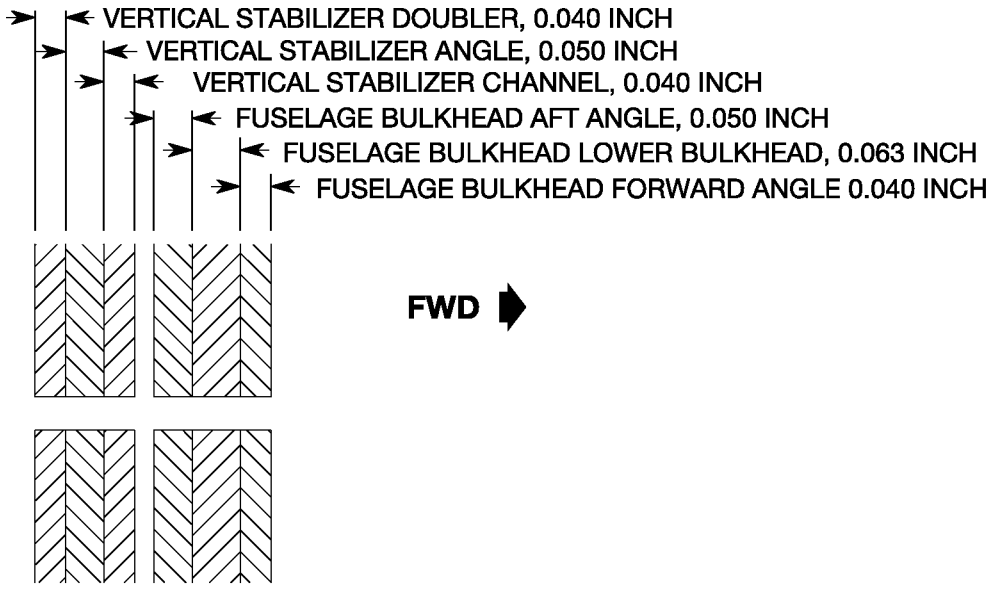


DETAIL A
TYPICAL VERTICAL STABILIZER AND FS 224.00
BULKHEAD UPPER BOLT HOLE CROSS SECTION



DETAIL B
TYPICAL VERTICAL STABILIZER AND FS 224.00
BULKHEAD LOWER BOLT HOLE CROSS SECTION

A1031T1010
B1031T1010

Vertical Stabilizer Assembly Rear Spar Cap Attach
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-03

1. TITLE

Wing Rib - Main Landing Gear Side Brace

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the main landing gear side brace support.

4. PREPARATION

A. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.10 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
MP905-60/100-500 kHz	1	EDDY CURRENT PROBE Surface Pencil Probe NDT Engineering Corp. 19620 Russell Rd., Kent, WA 98032
HRS-15A	1	REFERENCE STANDARD NDT Engineering Corp.

Reference Standard Notch Depths Surface Eddy Current: 0.008, 0.020, and 0.040 inch.

8. INSPECTION INSTRUCTIONS

A. Connect the surface probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.

B. Null the probe on the surface reference standard away from the calibration notch.

C. Adjust the lift-off on the impedance plane so the deflection of the lift-off trace is horizontal and deflects from right to left as the probe is lifted from the part surface.

D. Adjust the instrument gain controls to obtain a signal amplitude response from the 0.02" depth calibration notch that is a minimum of 3 major screen divisions.

E. Inspect for cracks on the forward and aft sides of the wheel well ribs. If the aircraft is modified by the addition of a doubler, the doubler is to be inspected. Observe the phase and amplitude changes on the eddy current instrument. Refer to Figure 1.

F. If an indication is noted, carefully repeat the inspection in the opposite direction of probe rotation to verify the indication.

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G. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of the hole, hole edge distance, and approximate length and depth of the crack.

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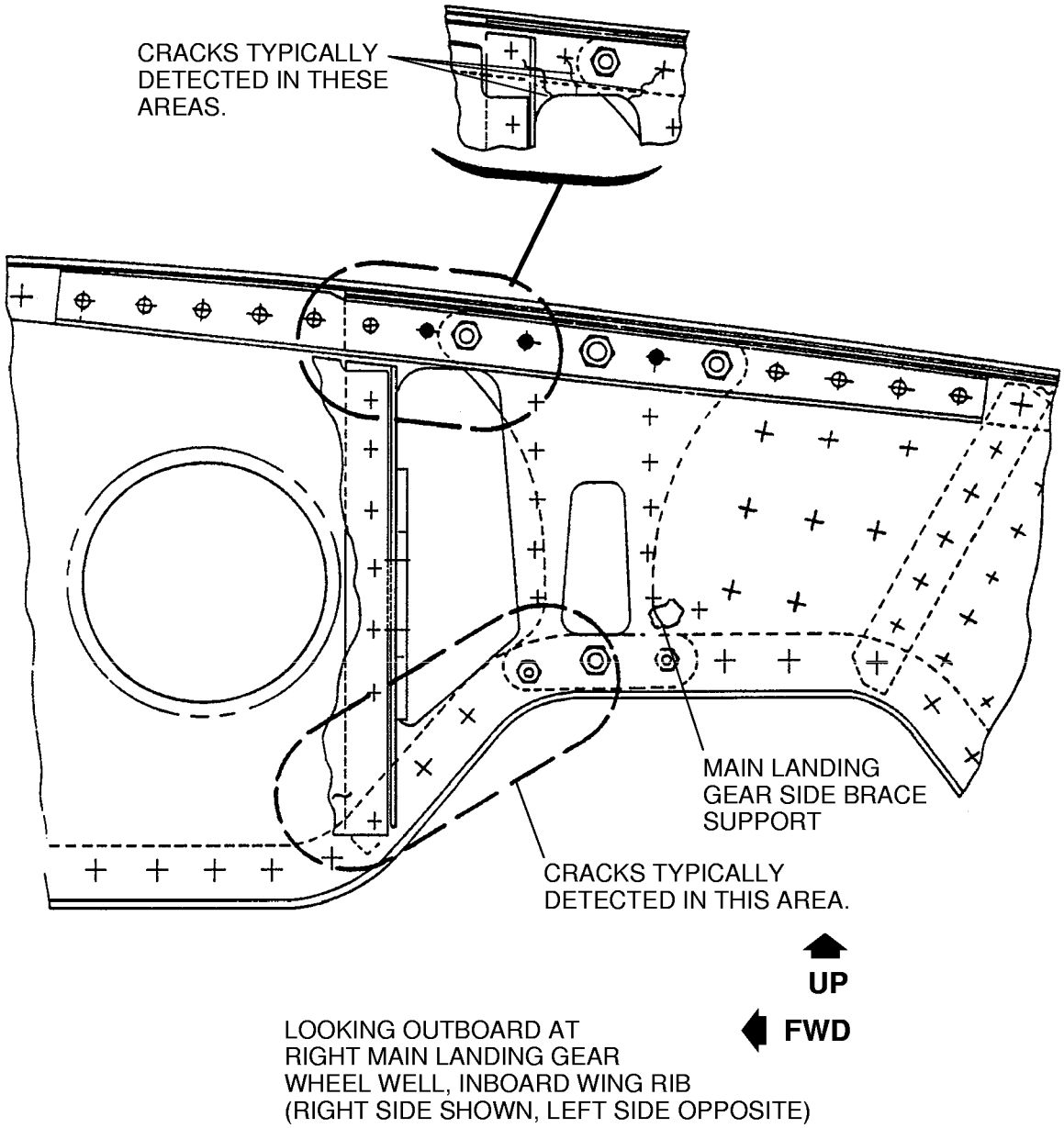

5222R1016

Wing Rib Improvement - Main Landing Gear Side Brace Inspection
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-04

1. TITLE

Lower Wing Rear Spar Cap Splice

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the wing lower rear spar cap flanges and the lower rear spar splice angles.

4. PREPARATION

A. Remove four fasteners (310R0001 - 310R0500) or two fasteners (310R0501 - 310R2140) common to the lower rear spar cap flanges and the lower rear spar cap splice angles at the outboard end of the splice. Refer to Figure 1.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole and Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent eddy current test equipment may be used providing the equipment is capable of achieving the required frequency range and test sensitivity. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
NDT 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
BPM-10/100-500 kHz	1	5/32 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp.
HRS-15A	1	REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Bolt Hole Inspection

(1) Connect the bolt hole probe (0.156 inch diameter) to the eddy current instrument and adjust the instrument frequency to 200 kHz.

(2) Null the probe in the appropriate reference standard hole away from the calibration notch.

(3) Adjust the lift-off on impedance plane instrumentation so the deflection of the lift-off trace is horizontal and deflects from right to left as the probe is lifted from the part surface.

(4) Adjust the instrument gain controls to obtain a signal amplitude response from the calibration notch that is a minimum of 3 major screen divisions.

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(5) Inspect the inner circumference of each hole common to the wing lower rear spar cap flanges and the lower rear spar cap splice angles at WS 80.13. Refer to Figure 1.
   (a) Inspect the entire depth of each hole.
   (b) Observe the phase and amplitude changes on the eddy current instrument.
   (c) If an indication is noted, carefully repeat the inspection in the opposite direction of probe rotation to verify the indication.
(6) If no crack is found, reinstall MS20426AD fasteners of appropriate size and grip length.
(7) Report cracks detected during this inspection to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and approximate length and depth of the crack.

B. Surface Inspection
(1) Standardize the eddy current instrument in accordance with the manufacturer's instructions using an operating frequency of 200 kHz.
(2) Adjust the instrument parameters such that the lift-off is placed horizontal and to the left of the null point on the impedance plane.
(3) Using the surface crack standard, adjust the instrument parameters to achieve a minimum vertical separation of 3 major divisions between the null point and the 0.020 inch depth surface notch indication.
(4) Perform a surface inspection immediately adjacent to the holes in the attach fitting.
   (a) Inspect both forward and aft side of each hole.
   (b) Perform a surface inspection in each radius and along the free edges of the attach fitting.
(5) Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and approximate length and depth of the crack.

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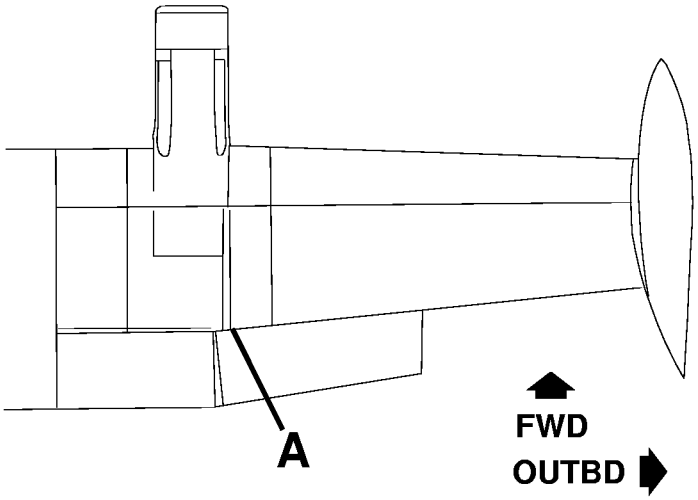
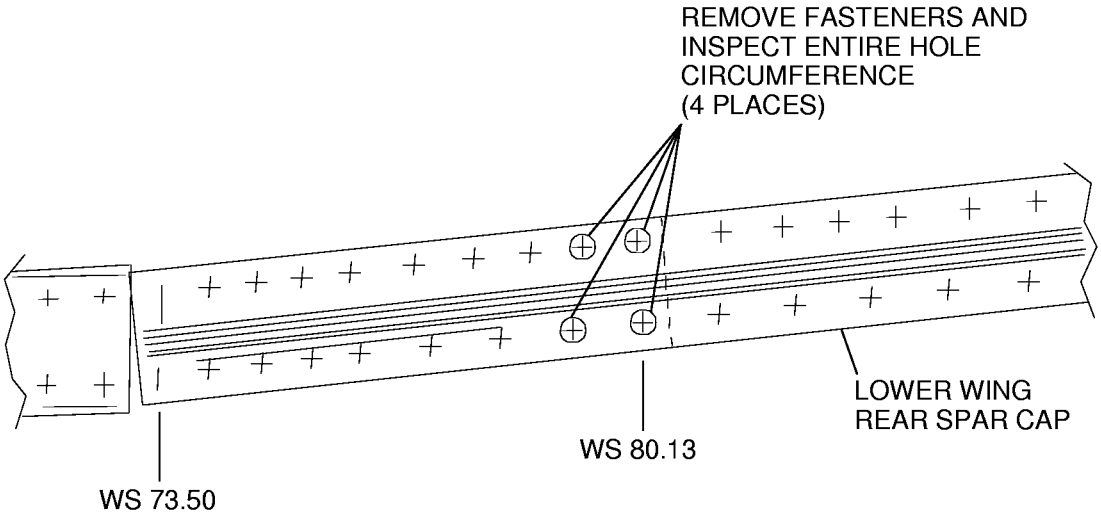


VIEW LOOKING UP AT LEFT WING



DETAIL A
AIRPLANES 310R0001 THRU 310R0500

5220T1009
A5220T1010

Lower Wing Rear Spar Cap at Splice, WS 80.13, Inspection
Figure 1 (Sheet 1)

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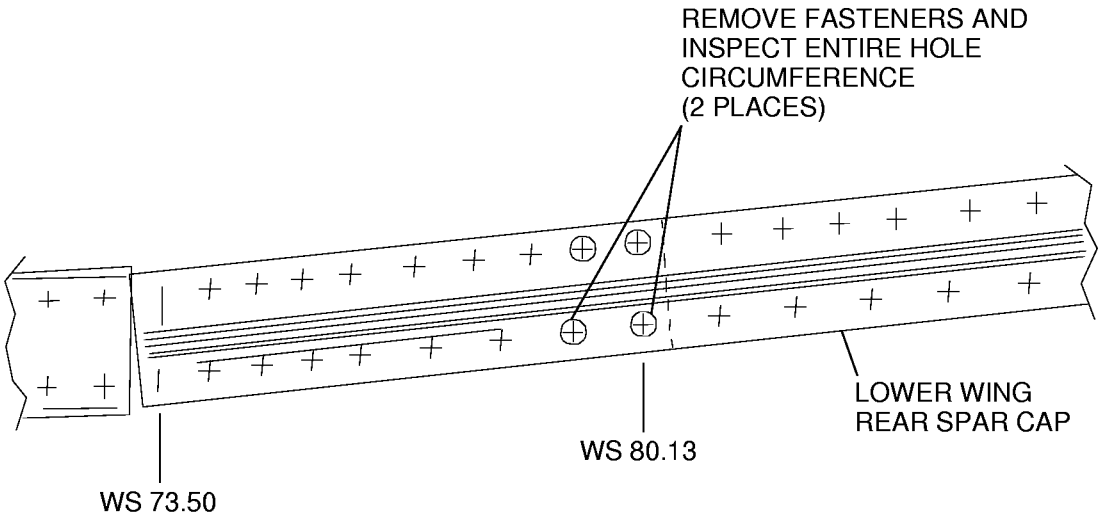

DETAIL A
AIRPLANES 310R0501 THRU 310R2140

A5220T1010

Lower Wing Rear Spar Cap at Splice, WS 80.13, Inspection
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-05

1. TITLE

Lower Rear Carry-Thru Spar Cap at BL 19.33

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the fastener holes at the lower rear carry-thru spar cap at BL 19.33.

4. PREPARATION

A. Remove attach fitting from airplane.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole and Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model-19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
BPM-24/100-500 kHz	1	3/8 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp.
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. Instructions for 1st Inspection and Every 5th Inspection Thereafter.

A. Calibrate Surface and Bolt Hole Eddy Current Probes.
   (1) Calibration for surface eddy current probe.
      (a) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
      (b) Null the probe on the surface reference standard away from the calibration notches.
      (c) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.

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(d) Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

(2) Calibration for bolt hole eddy current probe.

(a) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.

(b) Null the probe in the bolt hole reference standard with the probe turned away from the calibration notch.

(c) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.

(d) Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.050 inch corner notch in the reference standard.

B. Perform Inspection.

(1) Surface eddy current inspect around the fasteners. Inspect the forward spar cap radius, and aft spar cap radius for a distance of 7 inches inboard from the attach point. Surface eddy current inspect the free edges of the attach fitting. Refer to Figure 1.

(2) Bolt hole eddy current inspect all the holes common to the spar and fuselage frame, which were opened for the removal of the attach fitting. Bolt hole eddy current inspect the holes in the attach fitting. Inspect the entire depth and circumference of each hole. Refer to Figure 1.

(3) If no cracks are found, install new bolts in the spar caps and attach fittings.

(4) Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and the approximate length and depth of the crack.

9. Instructions for All Other Inspections (2nd thru 5th, 7th thru 10th, etc.).

A. Calibration for Bolt Hole Eddy Current Probe.

(1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.

(2) Null the probe in the bolt hole reference standard with the probe turned away from the calibration notch.

(3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.

(4) Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.050 inch corner notch in the reference standard.

B. Perform Inspection.

(1) Remove the two end bolts from the vertical flanges of the wing lower carry-thru rear spar cap, common to the attach fitting at the inboard end of the fitting.

(2) Clean the area with solvent to remove dirt, grease, oil, loose paint and other substances that might interfere with the inspection.

(3) Bolt hole eddy current inspect the most inboard two holes common to the spar and fuselage frame. Inspect the entire depth and circumference of each hole. Refer to Figure 1.

(4) If no cracks are found, install new bolts in the spar caps and attach fittings.

(5) Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and the approximate length and depth of the crack.

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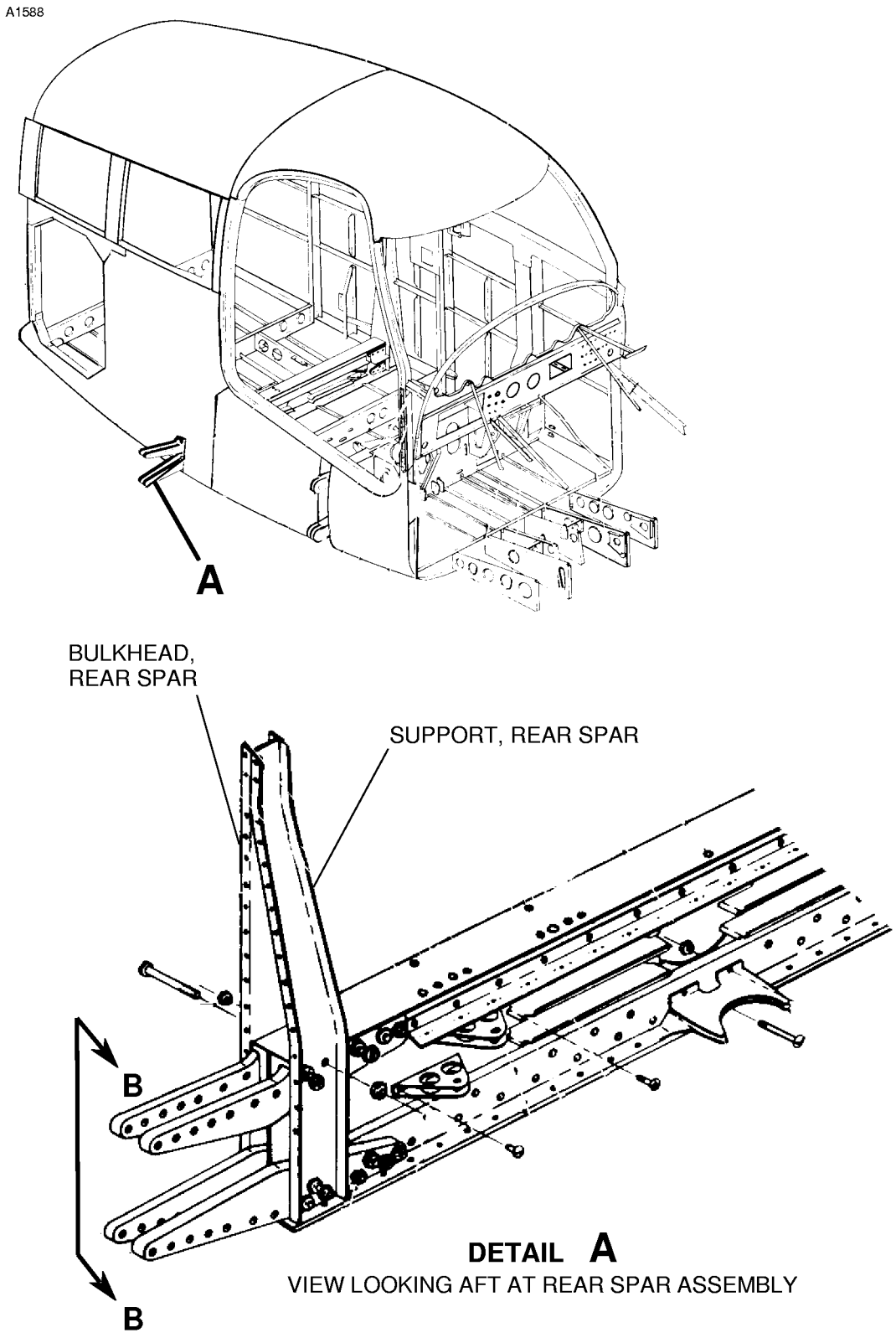

Lower Rear Carry-Thru Spar Cap at BL 19.33 Inspection
Figure 1 (Sheet 1)

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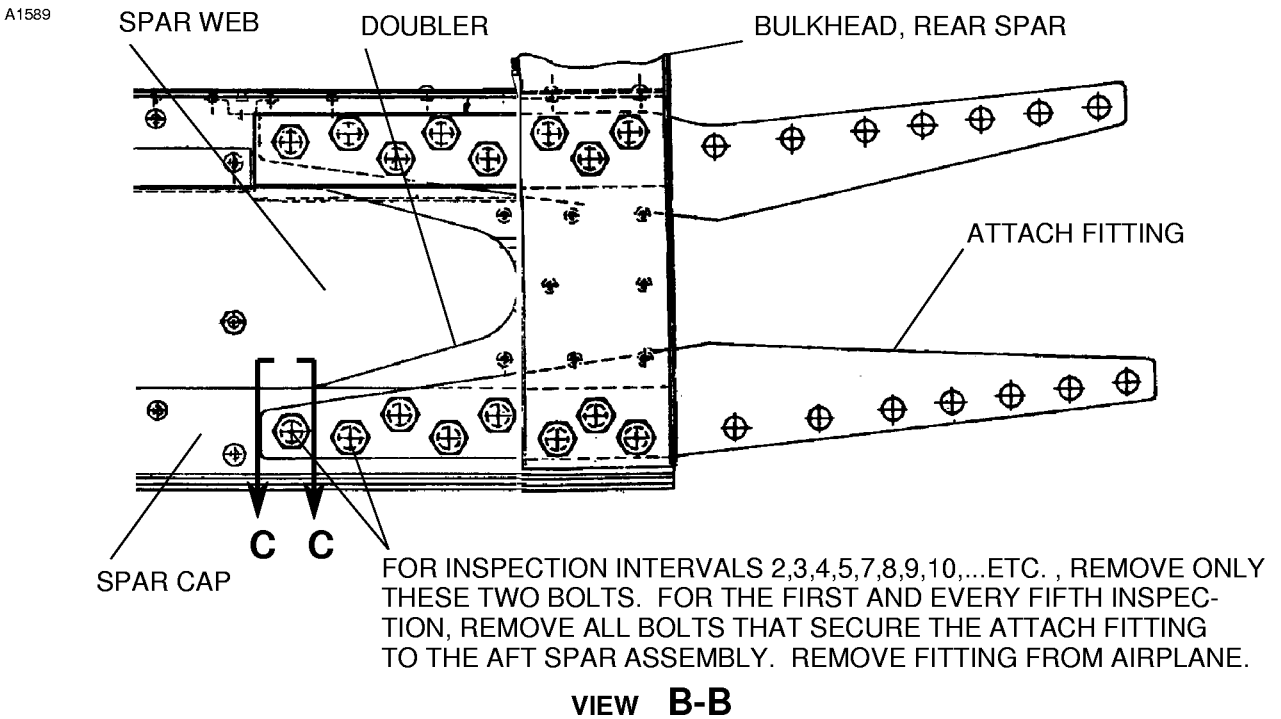

Lower Rear Carry-Thru Spar Cap at BL 19.33 Inspection
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-06

1. TITLE

Lower Main Wing Spar Cap Inspection and Modification

2. EFFECTIVITY

310R0001 thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the spar reinforcing straps.

4. PREPARATION

A. Remove panels in the lower nacelle to allow access to the spar reinforcing straps. If the NDI inspector can not reach fasteners for inspection, it will necessary to remove the lower nacelle skins.

B. Remove the heat shields to allow access to the surface of the spar reinforcing straps.

C. Clean the inspection area with solvent to remove dirt, grease, oil, loose paint, and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.140 Inch.

7. EQUIPMENT

The following equipment was used to develop this inspection. Equivalent substitutes may be used for the listed equipment. Refer to 5-13-01, Nondestructive Inspection Methods and Requirements, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19eII	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Olympus NDT (formerly Staveley Instruments, Inc) Phone: 781-419-3900 Fax: 781-419-3980 Email: info@olympusndt.com Web: http://www.olympusndt.com
MP905-60 100-500 kHz (NOTE 1)	1	1/8-INCH SURFACE EDDY CURRENT PROBE Olympus NDT (formerly NDT Engineering Corp.)
SRS-0824A (NOTE 2)	1	ALUMINUM SURFACE EDDY CURRENT REFERENCE STANDARD Olympus NDT (formerly NDT Engineering Corp.)
SRS-0824S (NOTE 2, NOTE 3)		STEEL SURFACE EDDY CURRENT REFERENCE STANDARD Olympus NDT (formerly NDT Engineering Corp.)

NOTE 1: Different drop lengths and shaft lengths may be needed to reach some areas.

NOTE 2: Reference standard needs a 0.020 Inch deep EDM notch for this inspection.

NOTE 3: Preferred material is 4130 steel.

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8. INSPECTION INSTRUCTIONS

A. Set up the eddy current instrument.

NOTE: Use the reference standard appropriate to the material for inspection.

(1) Connect the probe to the eddy current instrument and adjust the instrument frequency.
  (a) Use approximately 200 kHz for aluminum spar cap reinforcing strap.
  (b) Use approximately 500 kHz for steel nacelle fitting.

NOTE: Instrument frequency may vary depending on the instrument and surface probe used.

(2) Put the probe on the surface reference standard away from the calibration notches.
(3) Null or balance the instrument.
(4) Adjust lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.
(5) Set the sensitivity by adjusting the instrument gain controls to obtain a signal of at least three major screen divisions of separation between the lift-off response and the signal from the 0.020-inch-deep notch in the reference standard.

B. Examine the surface of the spar cap reinforcing strap around each fastener location. Refer to Figure 1.

C. Examine along the edges of the spar cap reinforcing straps where accessible. Refer to Figure 1.

D. Examine the surface of the nacelle fittings around each fastener location common to the nacelle fittings and the spar cap reinforcing straps. Refer to Figure 1.

E. Examine along the edges of the nacelle fitting aft of the engine beam where accessible. Refer to Figure 1 .

F. Use the Discrepancy Report form in Supplemental Inspection Document 5-13-00, to report crack(s), corrosion, or damage that is found during this inspection. If corrosion, or damage is found, replace the part or repair the part in accordance with the Model 310R Maintenance Manual. If a repair for corrosion, or damage is required (for a repair that is not available in the Model 310R Maintenance Manual), contact Cessna Propeller Aircraft Product Support for possible repair instructions or replace the part.

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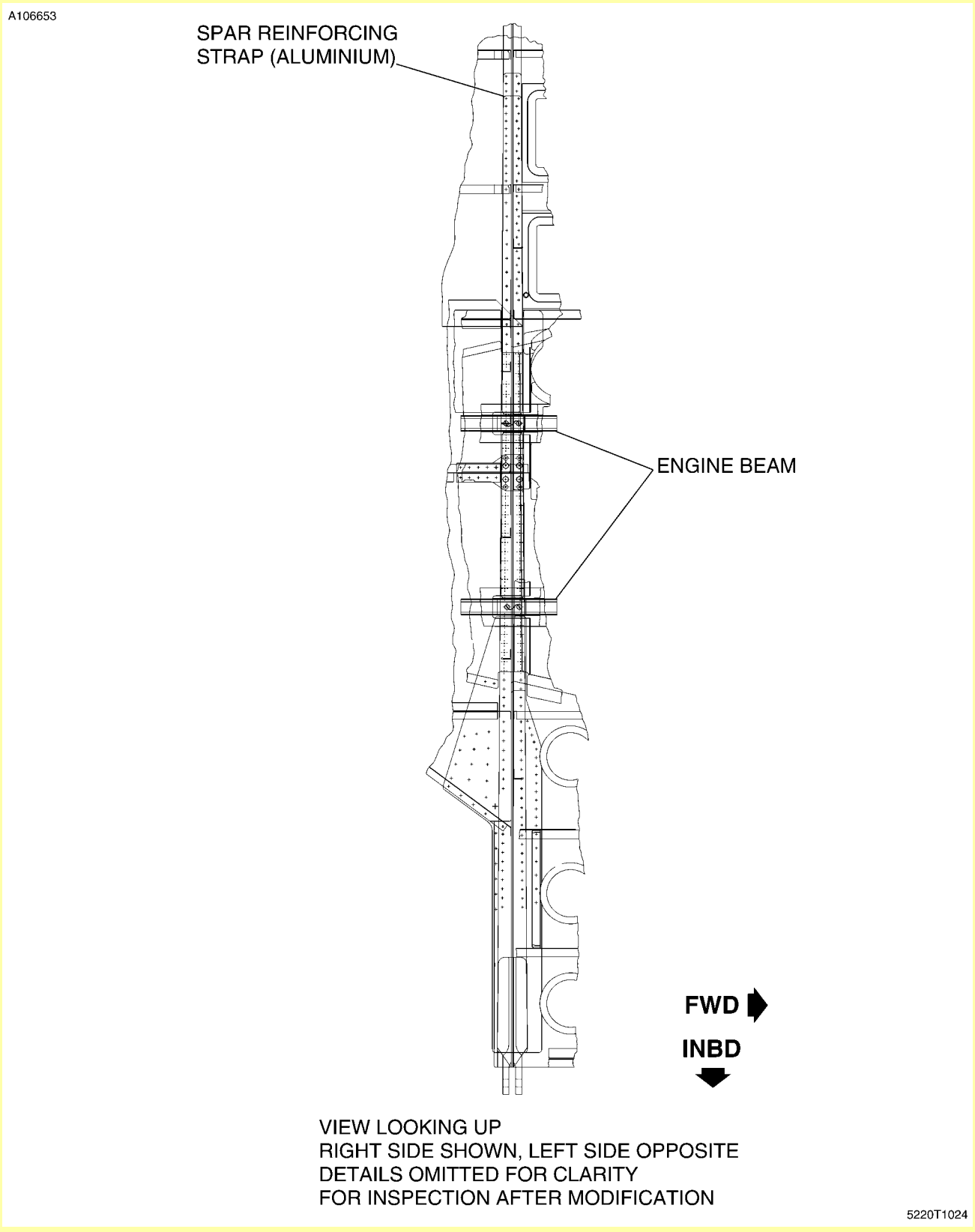

Lower Main Wing Spar Cap Inspection
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-07

1. TITLE

Lower Aft Auxiliary Spar Cap

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the lower aft auxiliary spar cap from 3.00 inches inboard of WS 71.91 to 3.00 inches outboard.

4. PREPARATION

A. Remove fasteners common to the skin and lower auxiliary spar cap from WS 68.91 to WS 74.91.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01 for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
BPM-10/100-500 kHz	1	5/32 INCH BOLT HOLE EDDY CURRENT PROBE . NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
HRS-15A	1	Reference Standard NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Calibration for bolt hole eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz
   (2) Null the probe in the bolt hole reference standard with the probe turned away from the calibration notch.
   (3) Adjust the lift-off deflection on the impedance plane instrumentation so the deflection of the lift-off trace is horizontal and deflects from right to left as the probe is lifted from the part surface.
   (4) Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions.

B. Bolt hole eddy current inspect the fastener holes common to the wing skin and lower aft auxiliary spar cap from WS 68.91 to WS 74.91. Inspect entire circumference and depth of each hole. Observe the phase and amplitude changes on the eddy current instrument. Refer to Figure 1.

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C. If an indication is noted, carefully repeat the inspection in the opposite direction of probe rotation to verify the indication.

D. If no cracks are found, install MS20470AD fasteners of appropriate size and grip length.

E. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and approximate length and depth of the crack.

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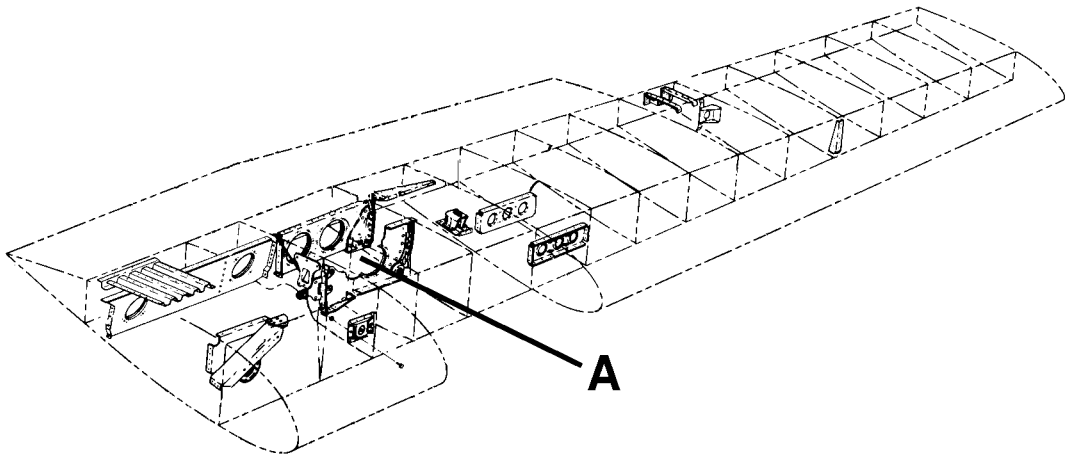

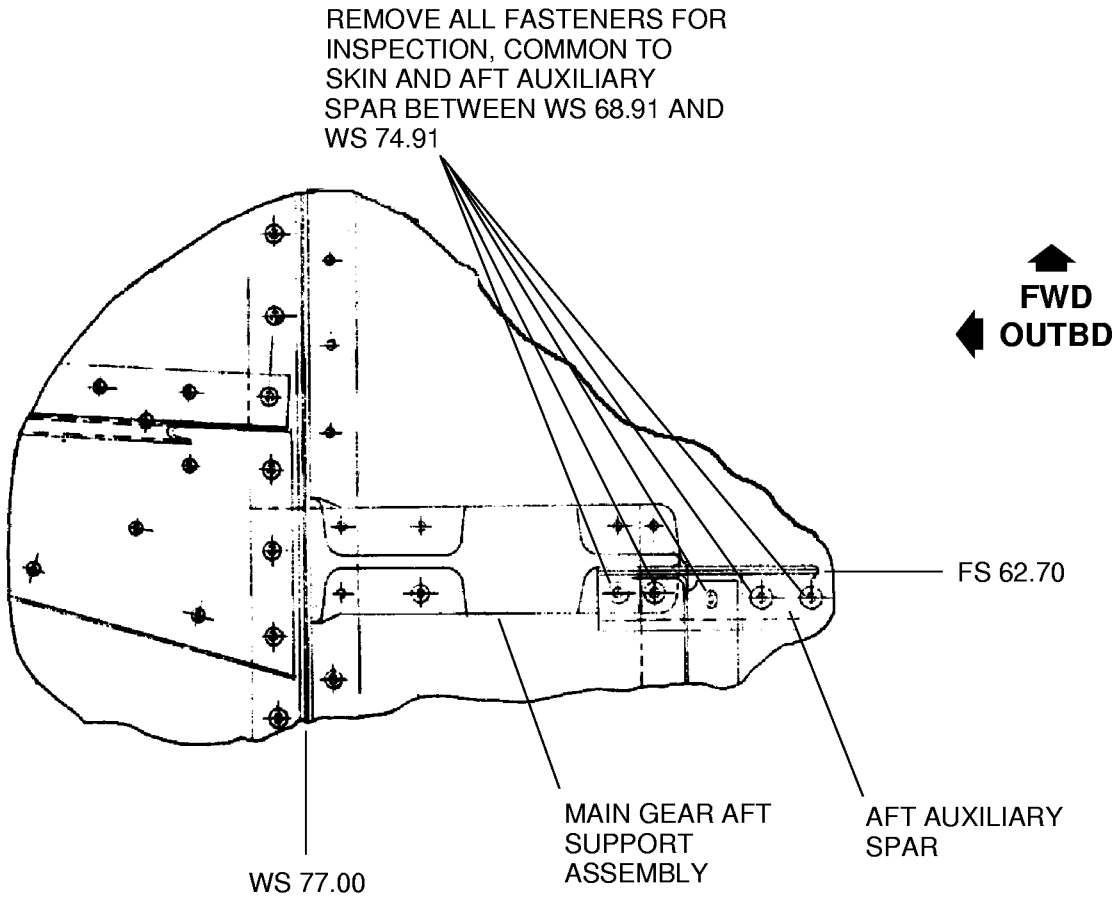

DETAIL A
VIEW LOOKING UP AT WING

Lower Aft Auxiliary Spar Cap Inspection at WS 71.91
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-08

1. TITLE

Lower Carry-Thru Main Spar Cap Assembly at WS 18.13

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the lower carry-thru main spar cap at the inboard side of the attach point, WS 18.13.

4. PREPARATION

A. Gain access to the area. See Figure 1.

B. Remove the left and right lower fittings from the airplane.

C. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole and Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model-19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
BPM-12/100-500 kHz	1	3/16 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
BPM-16/100-500 kHz	1	1/4 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp.
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp.
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Calibration for surface eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe on the surface reference standard away from the calibration notches.

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(3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.
(4) Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

B. Calibration for bolt hole eddy current probe.
(1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
(2) Null the probe in the bolt hole reference standard with the probe turned away from the calibration notch.
(3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.
(4) Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.050 inch corner notch in the reference standard.

C. Perform Inspection.
(1) Bolt hole eddy current inspect the holes common to the lower channel, which were opened by the removal of the fitting. Inspect the entire circumference and depth of each hole.

NOTE: Figure 1, Details B, C, and D depict typical hole cross-sections.

(2) Surface eddy current inspect the forward and aft radii of the lower channel form the outboard edge of the channel to 8.00 inches inboard.
(3) Bolt hole eddy current inspect the holes in the attach fitting that were common to the channel. Inspect the entire circumference and depth of each hole.
(4) Surface eddy current inspect each radii and free edge of the attach fitting.
(5) If no cracks or damage is found, reinstall the attach fittings with new bolts and rivets in the wing lower carry-thru front spar cap.
(6) Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and length and depth of the crack.

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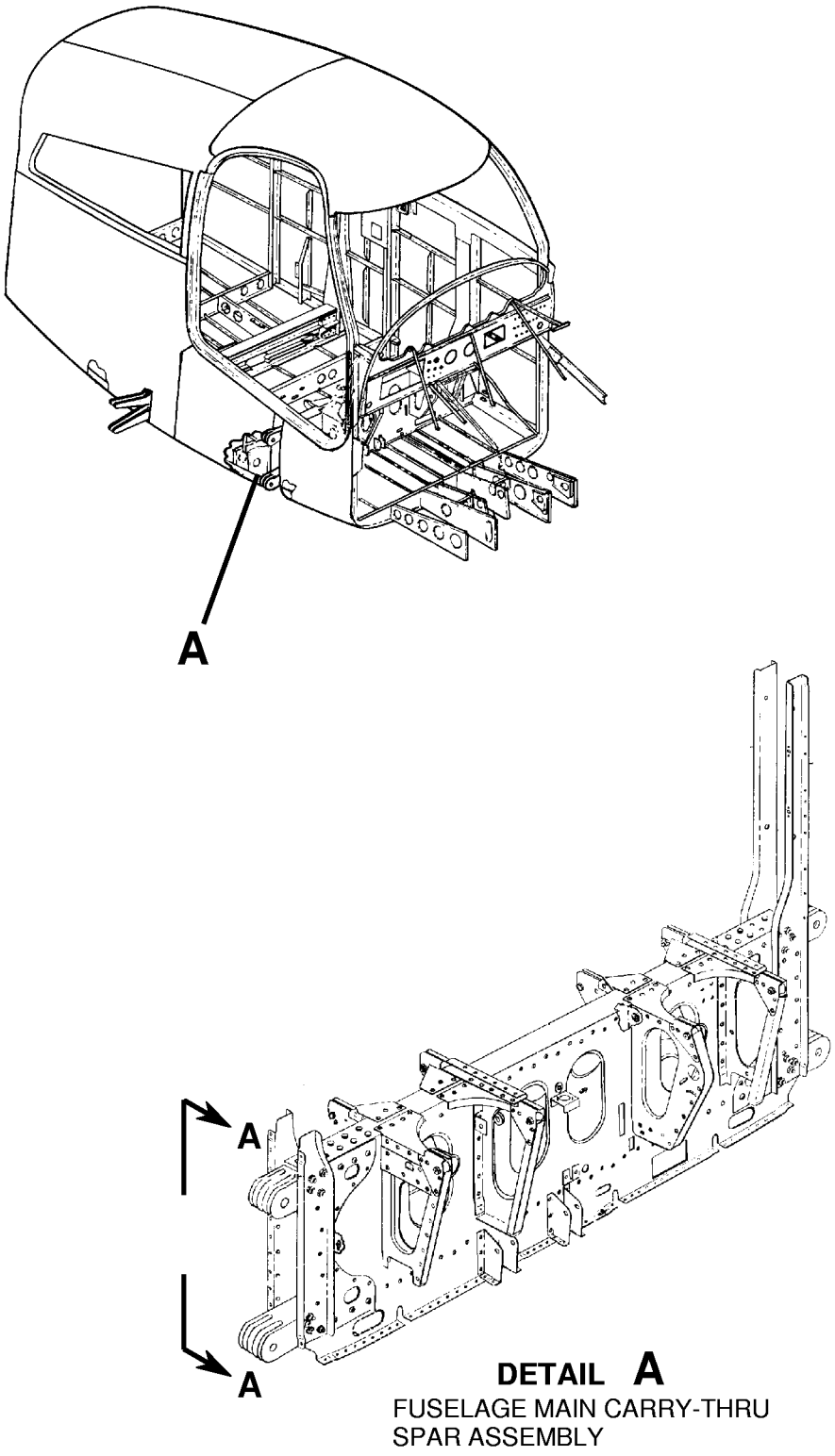

Lower Carry-Thru Main Spar Cap Assembly at WS 18.13
Figure 1 (Sheet 1)

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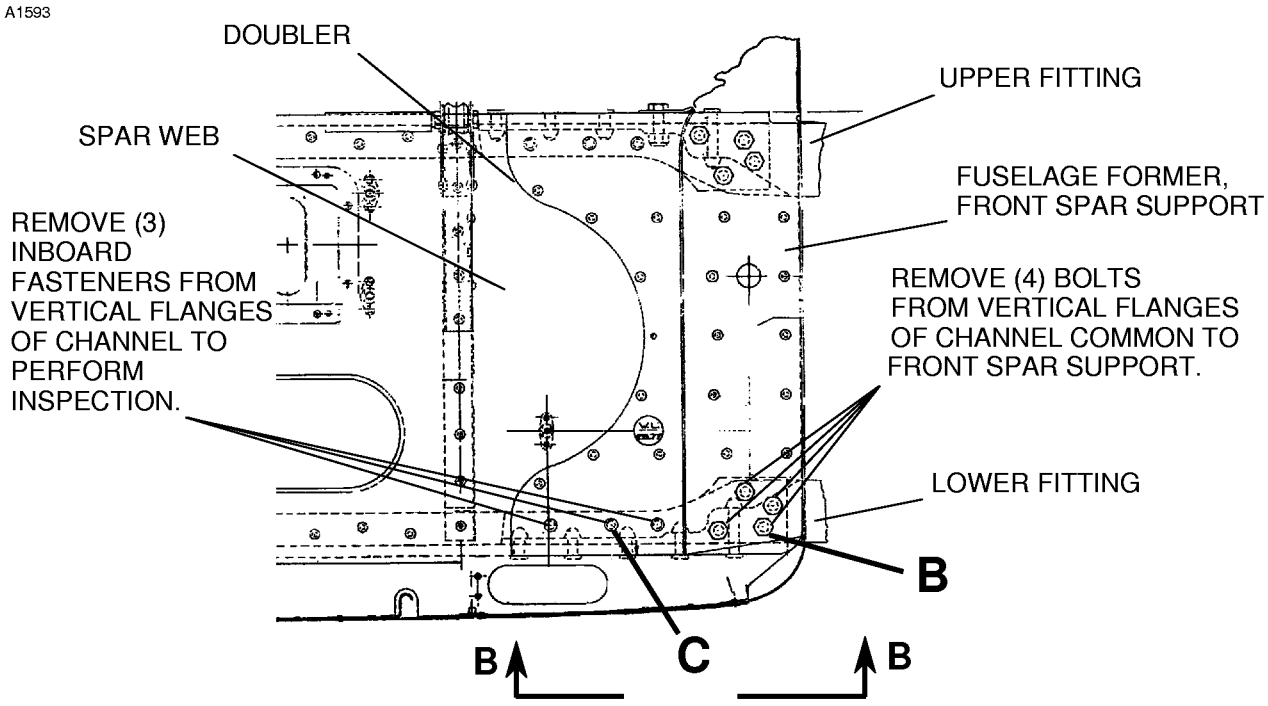
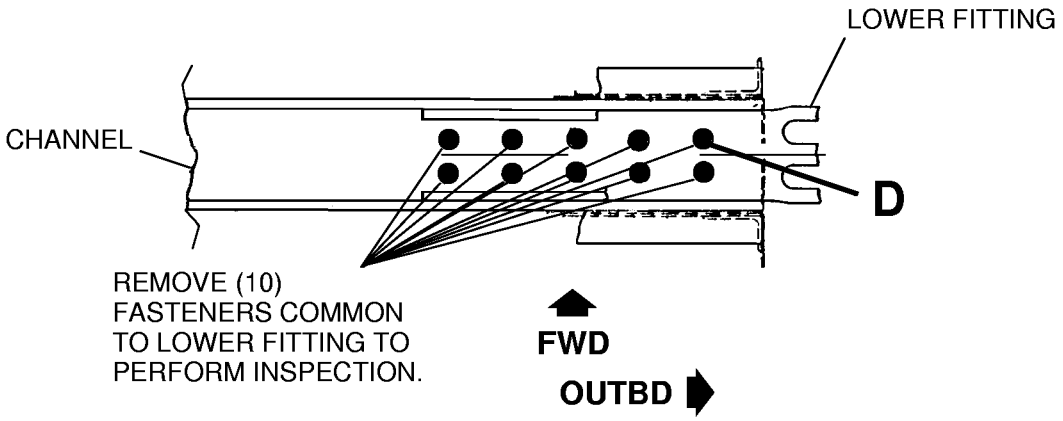


VIEW A-A

VIEW LOOKING FORWARD AT MAIN CARRY-THRU SPAR CAP ASSEMBLY.
(RIGHT SIDE SHOWN, LEFT SIDE OPPOSITE)



VIEW B-B

VIEW LOOKING UP AT MAIN CARRY-THRU SPAR ASSEMBLY.
(RIGHT SIDE SHOWN, LEFT SIDE OPPOSITE)

Lower Carry-Thru Main Spar Cap Assembly at WS 18.13
Figure 1 (Sheet 2)

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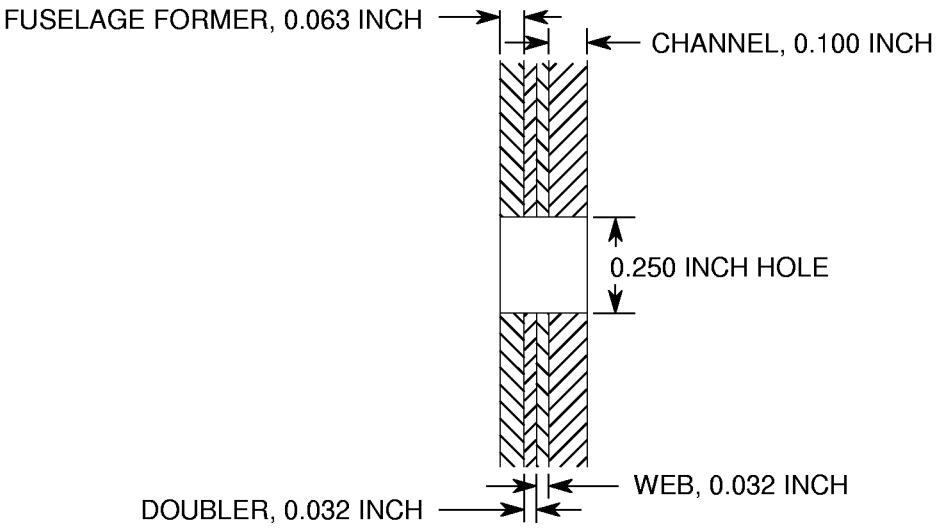
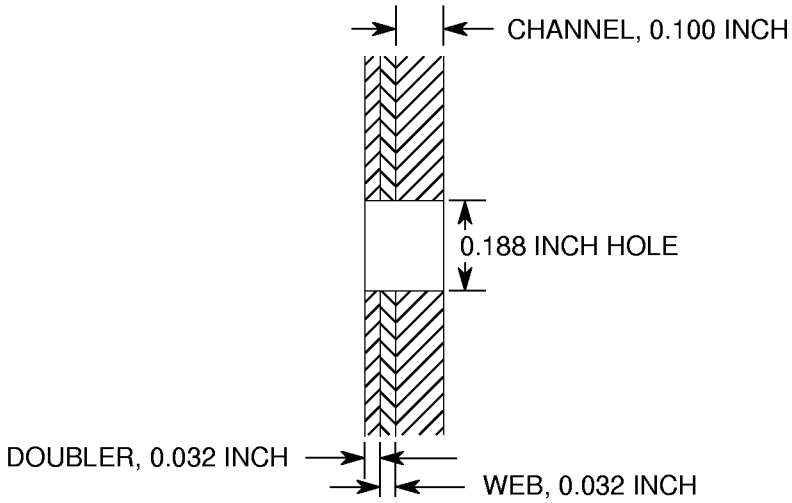


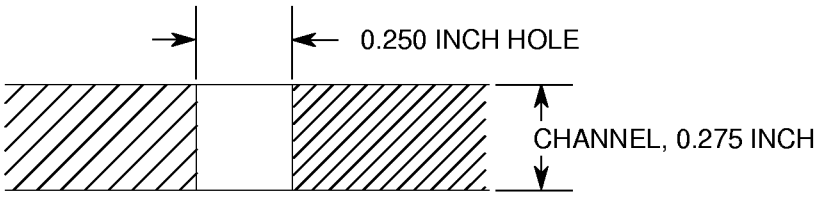
DETAIL B

0.250 INCH HORIZONTAL HOLES IN SPAR ASSEMBLY



DETAIL C

0.188 INCH HORIZONTAL HOLES IN SPAR ASSEMBLY



DETAIL D

0.250 INCH VERTICAL HOLES IN SPAR ASSEMBLY

B1010T1007
C1010T1008
D1010T1009

Lower Carry-Thru Main Spar Cap Assembly at WS 18.13
Figure 1 (Sheet 3)

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-09

1. TITLE

Wing Lower Front Spar Cap at Root Fitting Attach, WS 28.96

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the inboard vertical flange of the lower front spar root fitting at WS 28.96.

4. PREPARATION

A. Remove the two bolts through the vertical flange, at the inboard end of the lower front spar root attach fitting. Refer to Figure 1.

B. Remove the upper inboard rivet through the vertical flange, at the inboard end of the lower front spar root attach fitting. Refer to Figure 1.

C. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
BPM-12/100-500 kHz	1	3/16 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
BPM-16/100-500 kHz	1	1/4 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp.
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.

B. Null the probe in the bolt hole reference standard with the probe turned away from the calibration notch.

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C. Adjust the lift-off on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.

D. Set the sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.050 inch corner notch in the reference standard.

E. Bolt hole eddy current inspect the opened holes located at the inboard side of the lower front spar attach point. Inspect entire circumference and depth of each hole. Refer to Figure 1, View C-C and D-D.

F. If no cracks are found, reinstall bolts and install MS20470AD rivets of appropriate size and grip length.

G. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter; location of hole, hole edge distance, and length and depth of the crack.

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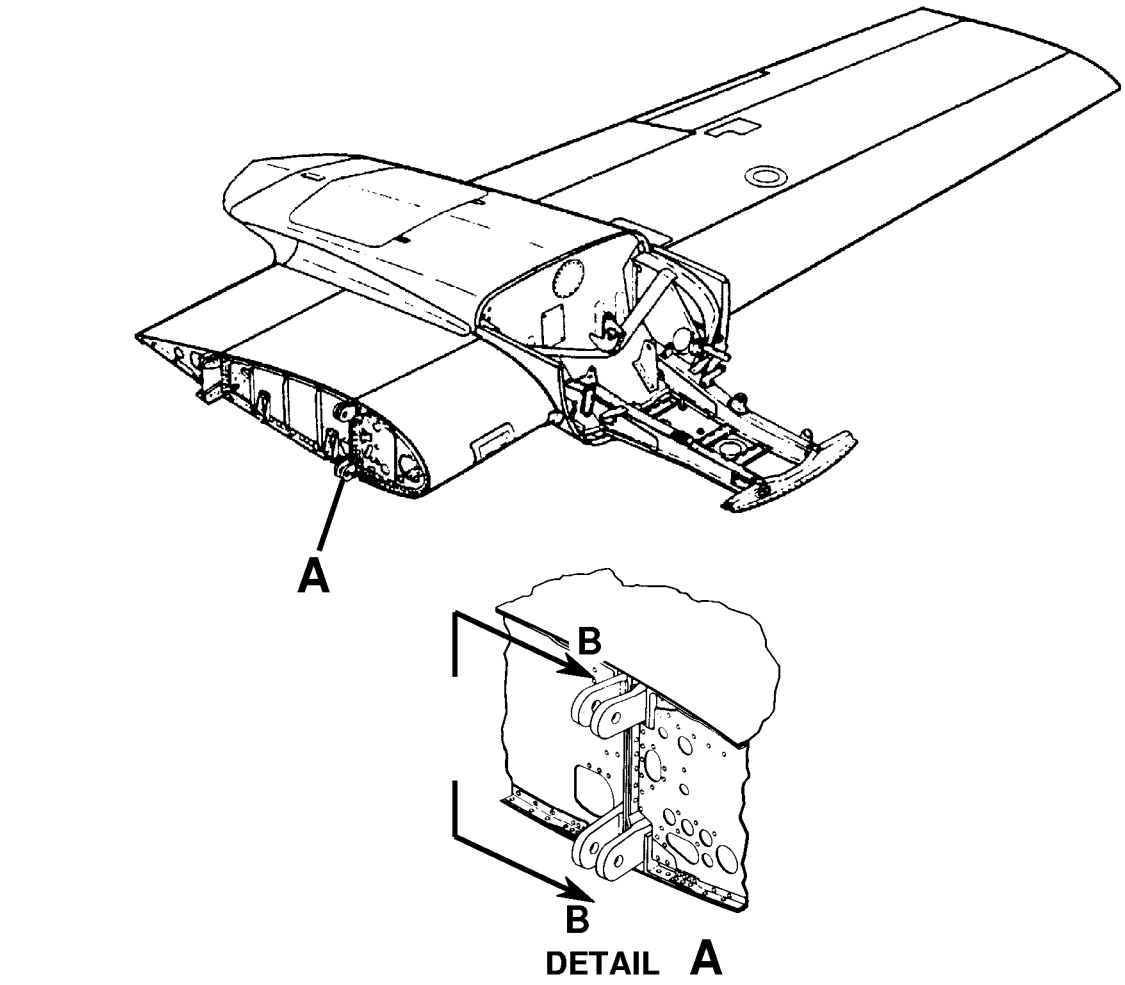

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Wing Lower Front Spar Cap at Root Fitting Attach, WS 28.96
Figure 1 (Sheet 1)

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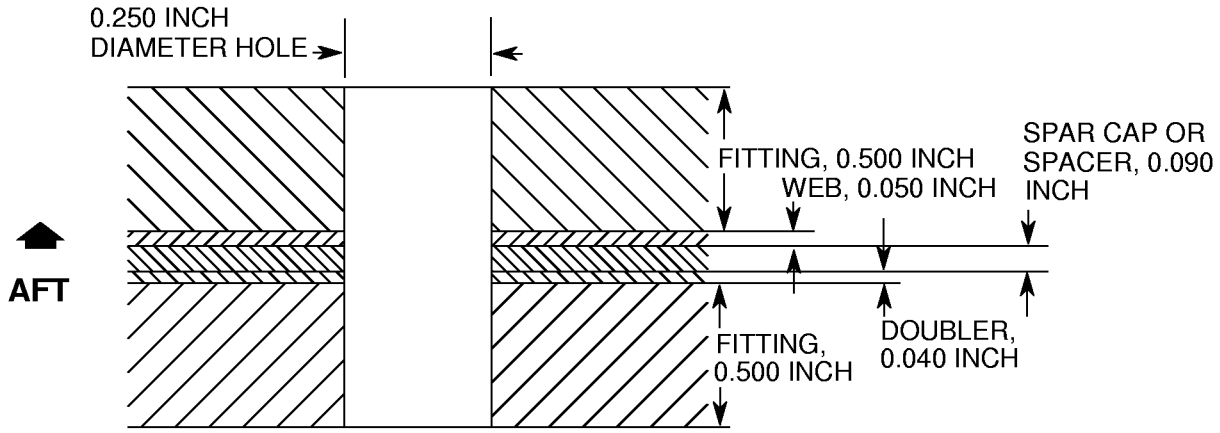
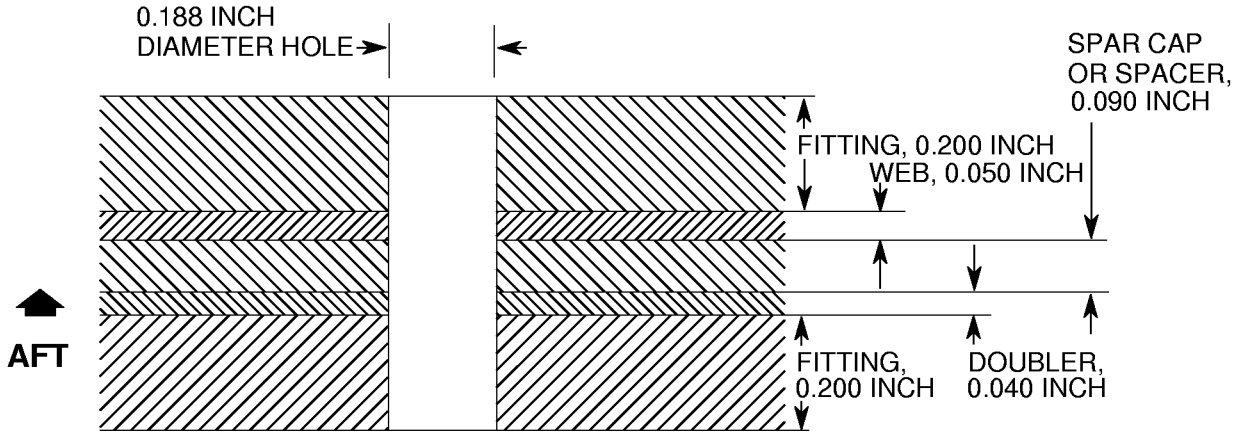


VIEW C-C
0.250 (1/4) INCH DIAMETER
HOLE CONFIGURATIUON



VIEW D-D
0.188 (3/16) INCH DIAMETER HOLE
CONFIGURATION

Wing Lower Front Spar Cap at Root Fitting Attach, WS 28.96
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-10

1. TITLE

Wing Lower Front Spar Cap at Root Fitting Attach, WS 36.36

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the vertical flange of the lower front spar root fitting at WS 36.36.

4. PREPARATION

A. Remove the two outboard rivets, through the vertical flange, at the lower front spar root attach fitting. Refer to Figure 1.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole and Surface Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
BPM-12/100-500 kHz	1	3/16 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Resell Rd. Kent, WA 98032
MP905-60/100-500 kHz	1	EDDY CURRENT SURFACE PROBE NDT Engineering Corp.
HRS-15A	1	REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Calibration for the bolt hole eddy current Inspection.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe on the surface reference standard away from the calibration notches.
   (3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the part surface.
   (4) Adjust the instrument to get at least 3 major screen divisions of separation between the null point and notch indication.

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B. Bolt hole eddy current inspection.
   (1) Perform bolt hole inspections on the two outboard holes common to the vertical flange of the wing front spar root fitting. Inspect the entire depth and circumference of each hole.
   (2) If an indication is noted, carefully repeat the inspection in the opposite direction of the probe rotation to verify the indication.
   (3) Cracks detected during this inspection shall be reported to Propeller Aircraft Product Support along with the following information: location of the hole, hole edge distance, and length and depth of crack.

C. Calibration for the surface eddy current Inspection.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Adjust the instrument parameters such that lift off is placed horizontal and to the left of the null point of the impedance plane.
   (3) Using the surface crack standard, adjust the instrument parameters to achieve a minimum vertical separation of at least 3 major screen divisions between the null point and the 0.020 inch deep surface notch indication.

D. Surface eddy current inspect the forward and aft radii of both the forward and aft attach fitting. Refer to Figure 1.

E. Surface eddy current inspect the radius and free edge of the attach fitting.

F. If no cracks are found, install MS20470AD rivets of appropriate size and grip length.

G. If an indication is noted, carefully repeat the inspection in the opposite direction of probe rotation to verify the indication.

H. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and length and depth of the crack.

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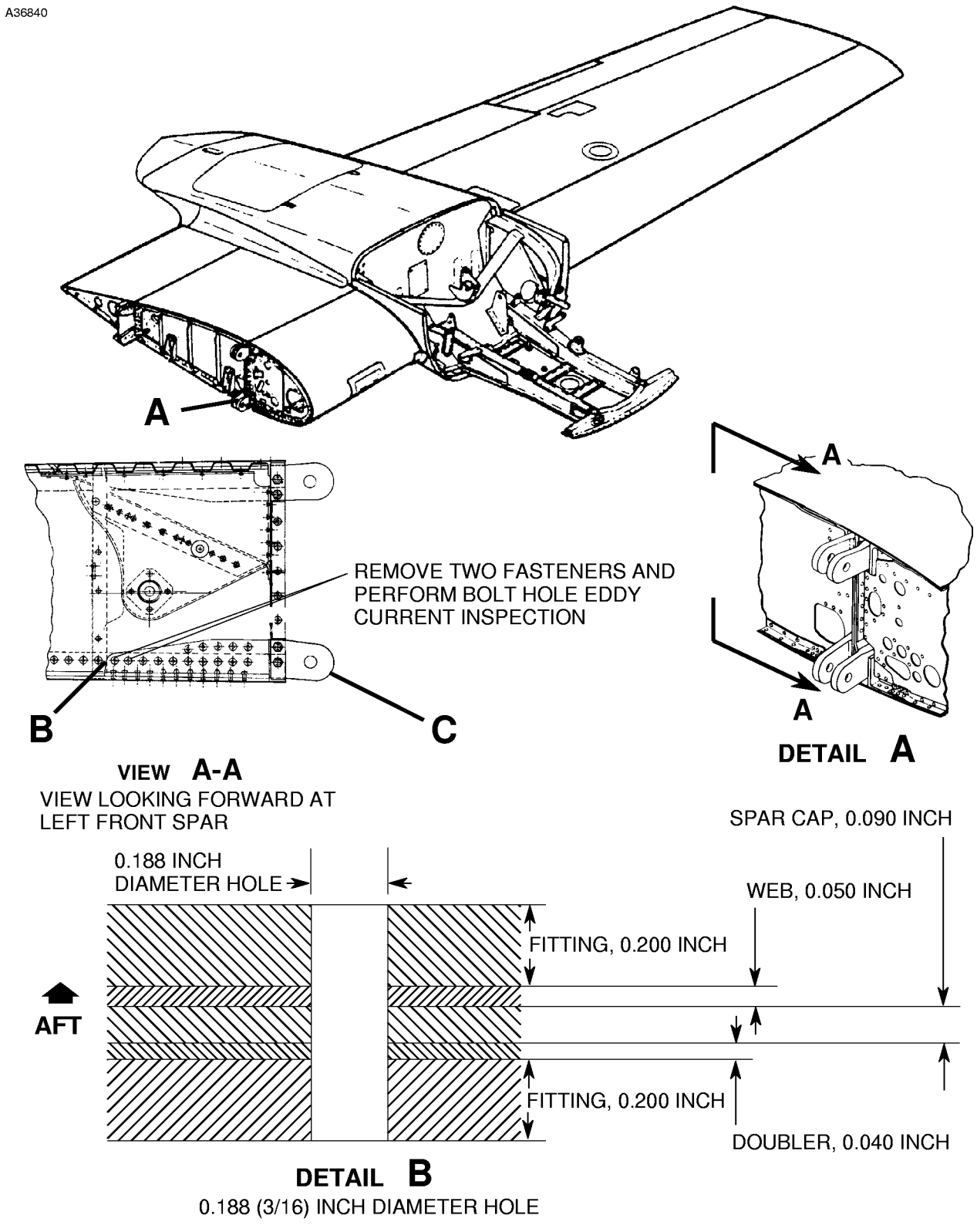

Wing Lower Front Spar Cap at Root Fitting Attach, WS 36.36
Figure 1 (Sheet 1)

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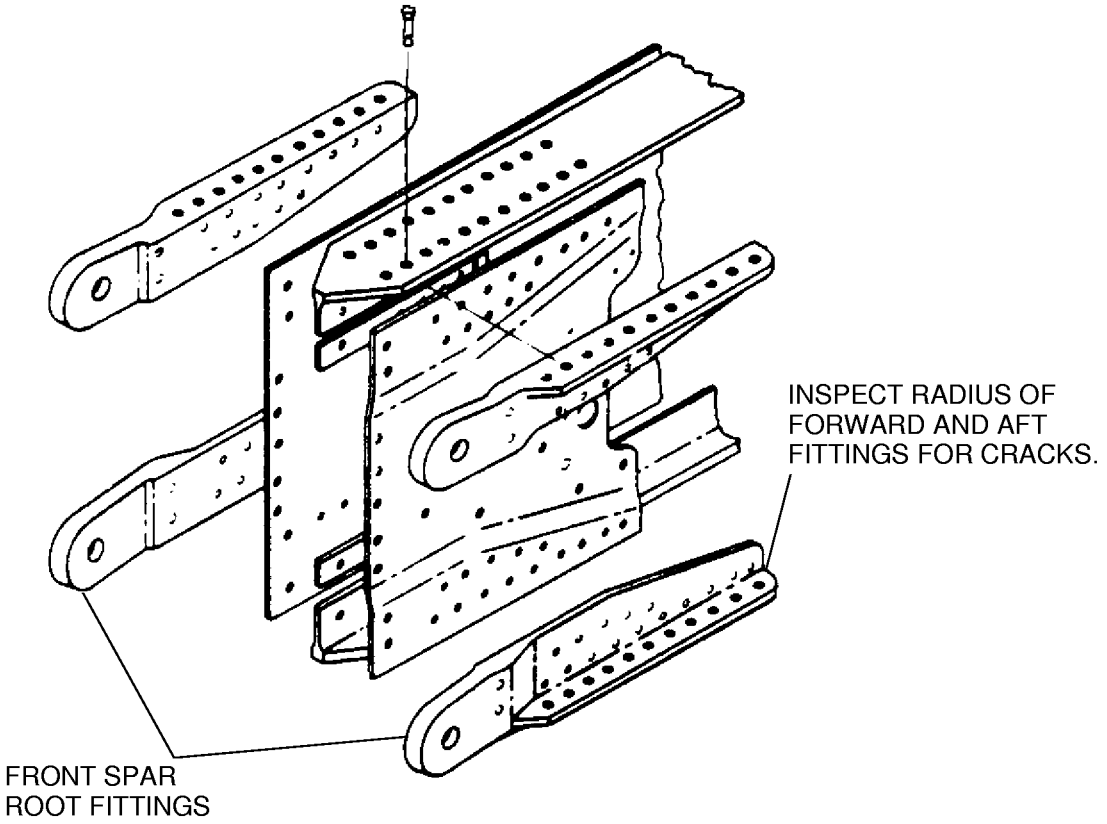

DETAIL C
VIEW LOOKING AFT

A1022R2002

Wing Lower Front Spar Cap at Root Fitting Attach, WS 36.36
Figure 1 (Sheet 2)

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-11

1. TITLE

Lower Forward Auxiliary Spar Cap at WS 68.88

2. EFFECTIVITY

310R00001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks in the lower forward auxiliary spar cap at WS 68.88.

4. PREPARATION

A. Remove fasteners common to the skin and the lower forward auxiliary spar cap from WS 65.88 to WS 71.88.

B. Clean the inspection area with solvent to remove dirt, grease, oil and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
BPM-10/100-500 kHz	1	5/32 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Resell Rd. Kent, WA 98032
HRS-15A	1	REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Calibration for bolt hole eddy current probe.
   (1) Connect the probe (0.156 inch) to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe in the bolt hole reference standard with the probe turned away from the calibration notch.
   (3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and deflects from right to left as the probe is lifted from the hole.
   (4) Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the reference standard.

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B. Perform Inspection.
   (1) Bolt hole eddy current inspect the holes opened by fastener removal. Inspect entire depth and circumference of each hole common to the skin and lower forward auxiliary spar cap from WS 65.88 to WS 71.88. Observe the phase and amplitude changes on the eddy current instrument. Refer to Figure 1.
   (2) If an indication is noted, carefully repeat the inspection in the opposite direction of probe rotation to verify the indication.
   (3) If no crack is found, install MS20470AD rivets of appropriate size and grip length.
   (4) Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and approximate length and depth of the crack.

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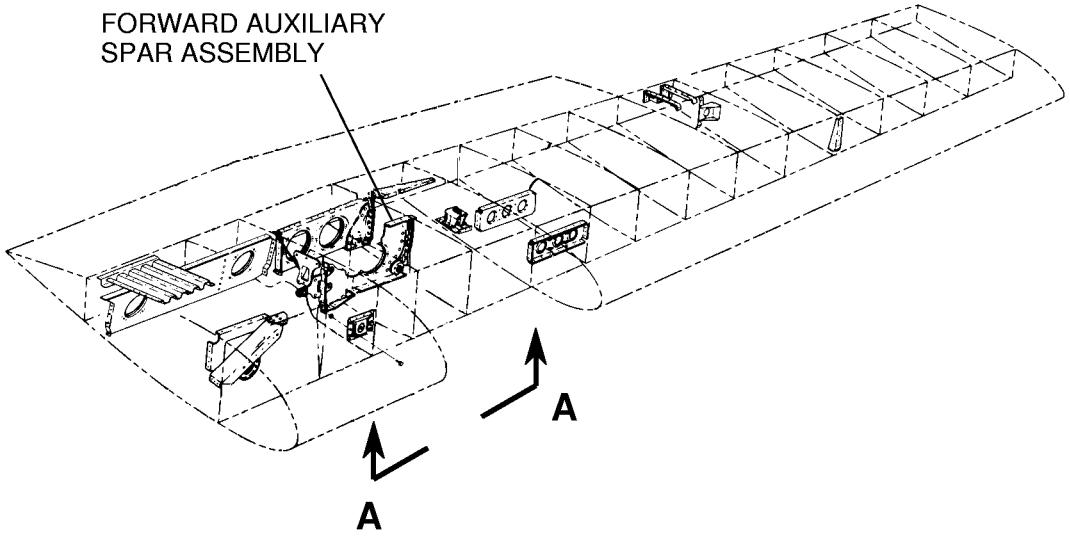

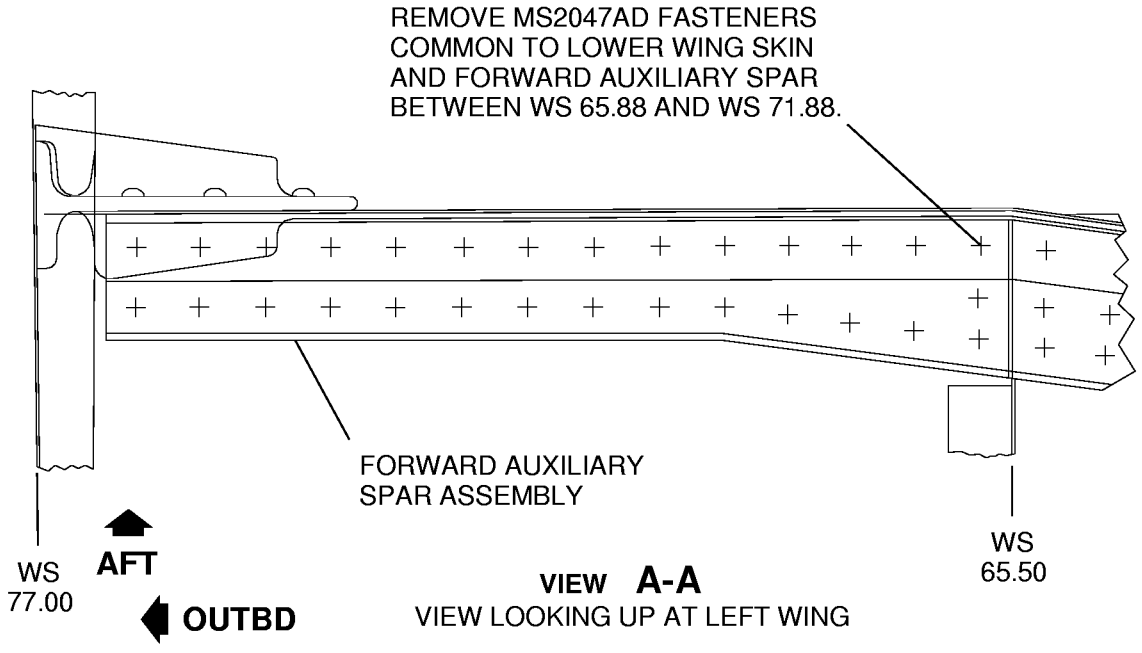

VIEW A-A
VIEW LOOKING UP AT LEFT WING

Lower Forward Auxiliary Spar Cap Inspection at WS 68.88
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-12

1. TITLE

Wing Front Spar Lug Inspection

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect for fatigue cracks at the bolt holes of the lower front spar attach point lug.

4. PREPARATION

A. Remove the wing attach bolt. Support the outboard wing as described in the wing removal section of the Maintenance Manual.

B. Clean the area with solvent to remove dirt, grease, oil, loose paint and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
BPM-40/10-500 kHz	1	5/8 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.

B. Null the probe in the bolt hole reference standard with the probe turned away from the calibration notch.

C. Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.

D. Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.050 inch corner notch in the reference standard.

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E. Bolt hole eddy current inspect the entire depth of the attach hole using the index steps shown. Inspect entire hole circumference at each index point. Refer to Table 1 and Figure 1.

NOTE: Index points are measured from center of the probe coil to the edge of the probe collar.

F. If no cracks are found, reinstall the wing attach bolt.

G. Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and length and depth of the crack.

Table 1. Index Depths

Index Point	Depth (inches)
1	0.080
2	0.195
3	0.355
4	0.430
5	0.625
6	0.705
7	0.865
8	0.945
9	1.075
10	1.150
11	1.315
12	1.395
13	1.585
14	1.665
15	1.825
16	1.935

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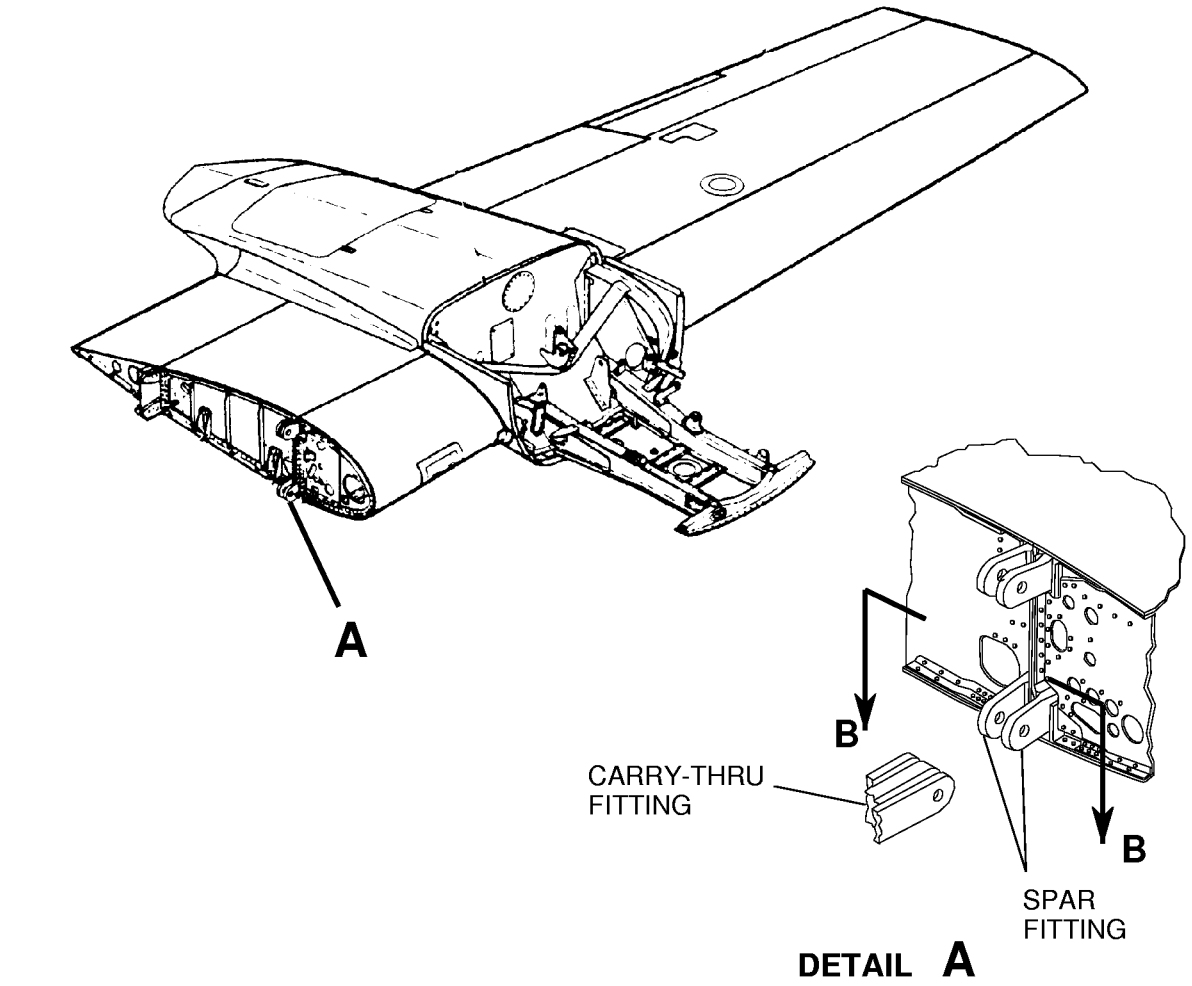

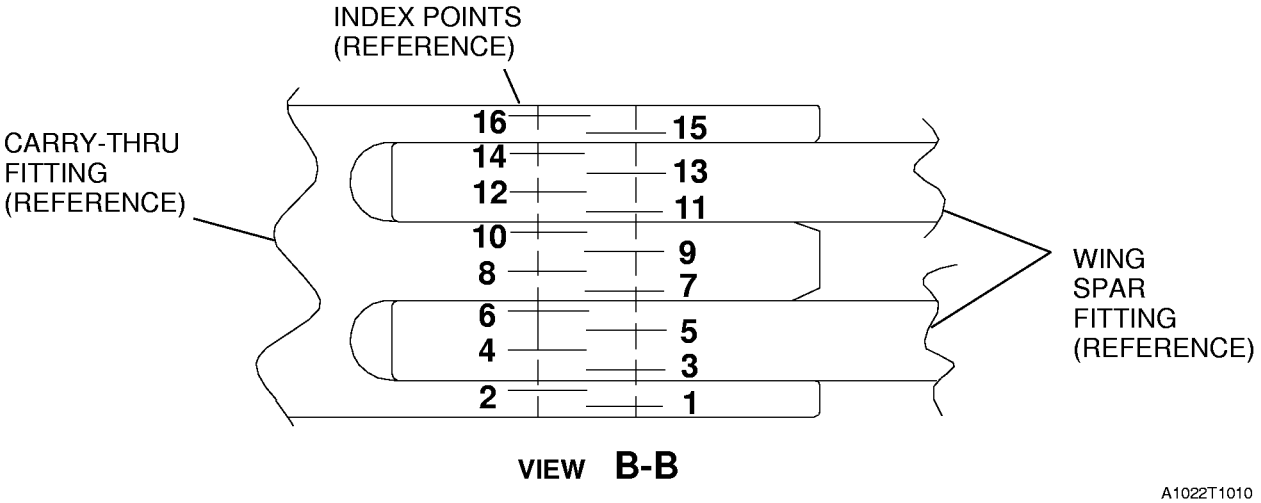

A1022T1010
BB1022T1011

Wing Front Spar Lug Inspection
Figure 1 (Sheet 1)

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SUPPLEMENTAL INSPECTION NUMBER: 57-10-13

1. TITLE

Wing Tip Tank Attachment Inspection

2. EFFECTIVITY

310R0001 Thru 310R2140

3. DESCRIPTION

Inspect the wing tip fuel tank attach points for fatigue cracks.

4. PREPARATION

A. Remove the wing tip tanks. Refer to the Maintenance Manual.

B. Clean the area with solvent to remove dirt, grease, oil, loose paint and other substances that may interfere with the inspection.

5. INSPECTION METHOD

Surface and Bolt Hole Eddy Current

6. CRACK SIZE

Minimum detectable crack size: 0.080 Inch

7. EQUIPMENT

The following equipment was used to develop this procedure. Equivalent substitutes may be used for the listed equipment. Refer to Section 5-13-01, for eddy current inspection requirements.

PART NUMBER	QUANTITY	DESCRIPTION
Model 19e^{II}	1	IMPEDANCE PLANE EDDY CURRENT INSTRUMENT Staveley Instruments, Inc. 421 North Quay Kennewick, WA 99336
BPM-20/100-500 kHz	1	5/16 INCH BOLT HOLE EDDY CURRENT PROBE NDT Engineering Corp. 19620 Russell Rd. Kent, WA 98032
MP905-60/100-500 kHz	1	1/8 INCH SURFACE EDDY CURRENT PROBE NDT Engineering Corp.
HRS-15A	1	COMBINED ALUMINUM SURFACE AND BOLT HOLE EDDY CURRENT REFERENCE STANDARD NDT Engineering Corp.

8. INSPECTION INSTRUCTIONS

A. Calibration for surface eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe on the surface reference standard away from the calibration notches.
   (3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the standard.
   (4) Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.020 inch deep notch in the reference standard.

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B. Calibration for bolt hole eddy current probe.
   (1) Connect the probe to the eddy current instrument and adjust the instrument frequency to 200 kHz.
   (2) Null the probe on the bolt hole reference standard with the probe turned away from the calibration notch.
   (3) Adjust the lift-off deflection on the impedance plane so that it runs horizontal and goes to the left as the probe is lifted from the hole.
   (4) Set sensitivity by adjusting the instrument controls to obtain a signal of at least 3 major screen divisions of separation between the lift-off response and the signal from the 0.050 inch corner notch in the reference standard.

C. Perform inspection.
   (1) Surface eddy current inspect immediately adjacent to the aft attach holes at both the wing spar (two holes) and the tip tank (one hole). Refer to Figure 1 and Figure 3.
      (a) Inspect both forward and aft side of each hole.
      (b) Inspect adjacent to the nut plate on the aft attach fitting.
   (2) Bolt hole eddy current inspect the forward attach point lugs at both the wing spar (four holes) and the tip tank (four holes). Inspect entire depth and circumference of each hole. Refer to Figure 1 and Figure 2.
   (3) Cracks detected during this inspection shall be reported to Cessna Propeller Aircraft Product Support, along with the hole diameter, location of hole, hole edge distance, and length and depth of the crack with report.

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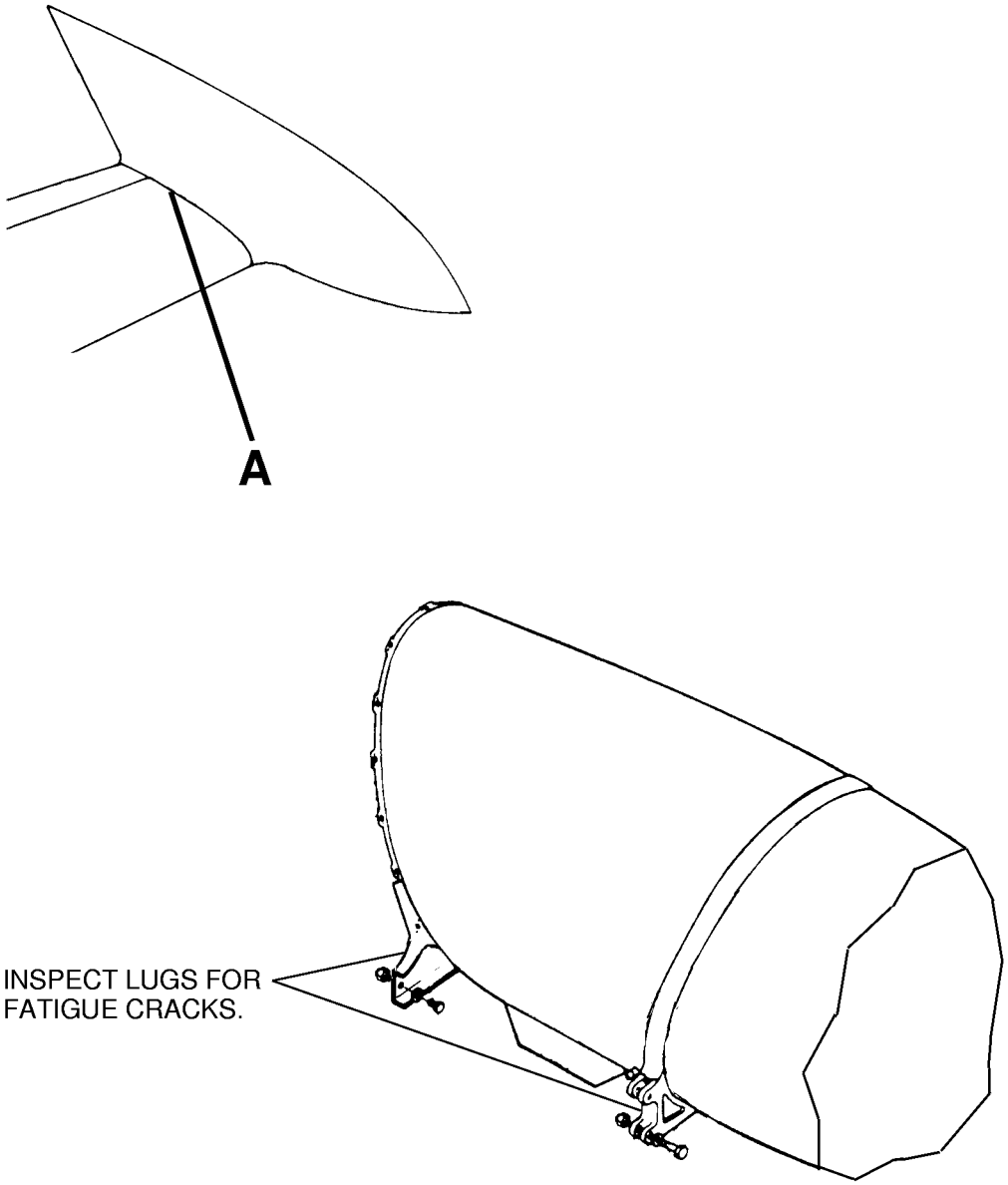

DETAIL A
WING TIP TANK (LEFT SIDE SHOWN
RIGHT SIDE OPPOSITE)

Wing Tip Fuel Tank Attachment Inspection
Figure 1 (Sheet 1)

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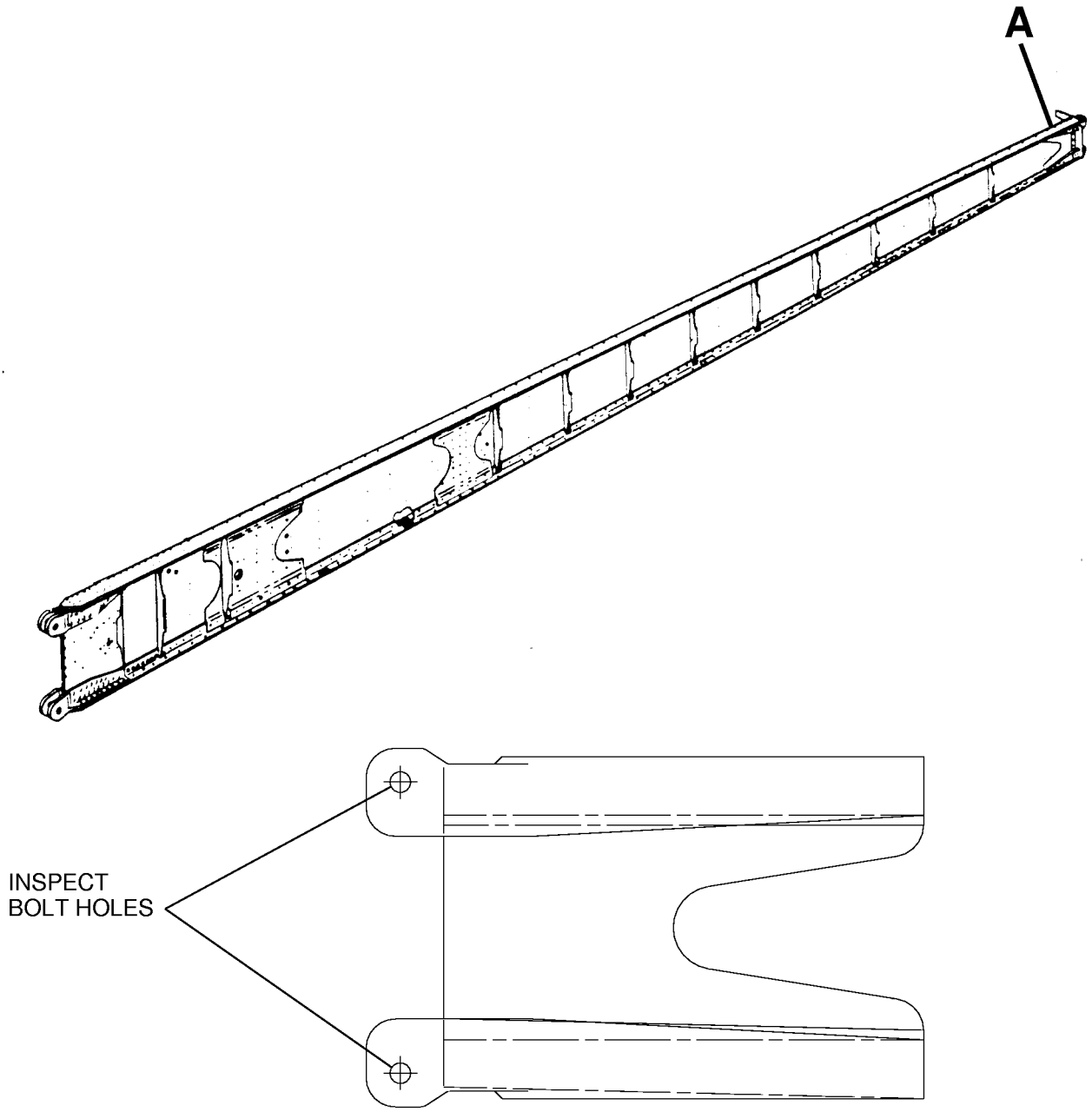

DETAIL A

A5022T1001

Wing Front Spar and Leading Edge Assembly
Figure 2 (Sheet 1)

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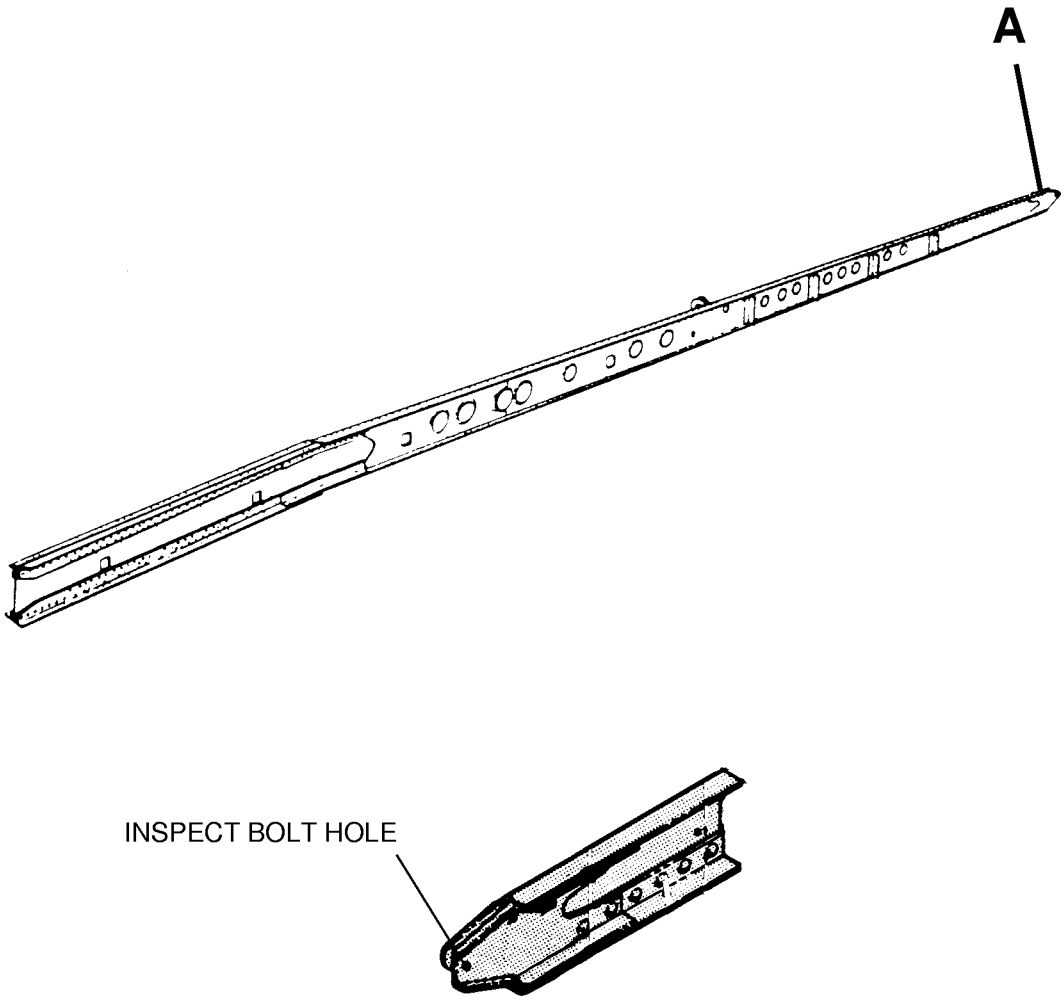

DETAIL A

Wing Rear Spar and Trailing Edge Assembly
Figure 3 (Sheet 1)

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CORROSION PREVENTION AND CONTROL PROGRAM

1. Introduction

A. As the airplane ages, corrosion occurs more often, while, at the same time, other types of damage, such as fatigue cracks occur. Corrosion can cause damage to the airplane's structural integrity, and if it is not controlled, the airframe will carry less load than what is necessary for continued airworthiness.

(1) To help prevent this, a Corrosion Prevention and Control Program (CPCP) was made. A CPCP is a system to control the corrosion in the airplane's primary structure. It is not the function of the CPCP to stop all of the corrosion conditions, but to control the corrosion to a level that the airplane's continued airworthiness is not put at risk.

B. Complete the initial CPCP inspection before August 1, 2010.

2. Corrosion Prevention and Control Program Objective

A. The objective of the CPCP is to help to prevent or to control the corrosion so that it does not cause a risk to the continued airworthiness of Model 310R airplanes.

3. Corrosion Prevention and Control Program Function

A. The function of this document is to give the minimum procedures necessary to control the corrosion so that the continued airworthiness is not put at risk. The CPCP consists of a Corrosion Program Inspection item, the area where the inspection will be done, specified corrosion levels and compliance times (Implementation Thresholds and Repeat Intervals). The CPCP also includes procedures to let Cessna Aircraft Company and the regulatory authorities know of the findings and the data associated with Level 2 and Level 3 corrosion damage. This includes the actions that were done to decrease possible corrosion in the future to Level 1 type corrosion damage.

B. Maintenance or inspection programs need to include a good quality CPCP. The level of corrosion identified on the Principal Structural Elements (PSE's) and other structure listed in the Baseline Program will help to make sure the CPCP provides good corrosion protection.

NOTE: A good quality program is one that will control the corrosion of all of the structure at Level 1 or better.

C. Corrosion Program Levels.

NOTE: In this manual, the corrosion inspection tasks are referred to as the Corrosion Program Inspection.

(1) Level 1 Corrosion.
- (a) Corrosion damage occurring between successive inspection tasks, that is local and can be reworked or blended out with the allowable limit.
- (b) Local corrosion damage that exceeds the allowable limit but can be attributed to an event that is not typical of the operator's usage or other airplanes in the same fleet (e.g., mercury spill).
- (c) Operator experience has demonstrated only light corrosion between each successive corrosion task inspection; the latest corrosion inspection task results in rework or blend out that exceeds the allowable limit.

(2) Level 2 Corrosion.
- (a) Level 2 corrosion occurs between two successive corrosion inspection tasks that requires a single rework or blend-out that exceeds the allowable limit. A finding of Level 2 corrosion requires repair, reinforcement or complete or partial replacement of the applicable structure.

(3) Level 3 Corrosion.
- (a) Level 3 corrosion occurs during the first or subsequent accomplishments of a corrosion inspection task that the operator determines to be an urgent airworthiness concern.

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4. References

A. This is a list of references for the Corrosion Prevention and Control Program:
(1) FAA Advisory Circular AC120-CPCP, Development and Implementation of Corrosion Prevention and Control Program
(2) FAA Advisory Circular AC43-4A, Corrosion Control for Aircraft
(3) Cessna Model 310R Illustrated Parts Catalog
(4) Cessna Model 310R Maintenance Manual

5. Control Prevention and Control Program Application

A. The Model 310R Corrosion Prevention and Control Program gives the information required for each corrosion inspection. Maintenance personnel must fully know about corrosion control. The regulatory agency will give approval and monitor the CPCP for each airplane.
(1) The CPCP procedures apply to all Model 310R airplanes that have exceeded the inspection interval for each location on the airplane. Refer to the Glossary and the Baseline Program.
(a) Cessna Aircraft Company recommends that the CPCP be done first on older airplanes and on airplane areas that need greater changes to the maintenance procedures to meet the necessary corrosion prevention and control requirements.
(2) Maintenance programs must include corrosion prevention and control procedures that limit corrosion to Level 1 or better on all Principal Structural Elements (PSE's) and other structure specified in the Baseline Program. If the current maintenance program includes corrosion control procedures in an inspection area and there is a report to show that corrosion is always controlled to Level 1 or better, the current inspection program can be used.
(a) The Baseline Program is not always sufficient if the airplane is operated in high humidity (severe) environments, has a corrosive cargo leakage, or has had an unsatisfactory maintenance or repair. When this occurs, make adjustments to the Baseline Program until the corrosion is controlled to a Level 1 or better. Refer to Chapter 51, Corrosion, and Chapter 51, Corrosion Severity Maps, to determine the severity of potential corrosion.
(3) The CPCP consists of the corrosion inspection applied at a specified interval, and, at times, a corrosion inspection interval can be listed in a service bulletin. For the CPCP to be applied, remove all systems, equipment, and interior furnishings that prevent sufficient inspection of the structure. A nondestructive test (NDI) or a visual inspection can be necessary after some items are removed if there is an indication of hidden corrosion, such as skin deformation, corrosion under splices, or corrosion under fittings. Refer to the Baseline Program.
(4) The corrosion rate can change between different airplanes. This can be a result of different environments the airplane operates in, flight missions, payloads, maintenance practices (for example, more than one owner), variation in rate of protective finish or coating wear.
(a) Some airplanes that operate under equivalent environments and maintenance practices can be able to extend the inspection interval Implementation Threshold (IT) or Repeat Interval (RI), if a sufficient number of inspections does not show indications of corrosion in that area. Refer to the Glossary.
(5) Later design and/or production changes done as a result of corrosion conditions can delay the start of corrosion. Operators that have done corrosion-related service bulletins or the improved maintenance manual procedures listed in the Corrosion Program Inspection can use that specified implementation threshold or repeat inspection interval. Unless the instructions tell you differently, the requirements given in this document apply to all airplanes.
(6) Another system has been added to report all Level 2 and Level 3 corrosion conditions identified during the second and each subsequent CPCP inspection. This information will be reviewed by Cessna Aircraft Company to make sure the Baseline Program is sufficient and to change it as necessary.

6. Baseline Program

A. The Baseline Program is part of the Corrosion Prevention and Control Program (CPCP). It is divided into individual inspection items. In this manual, the Baseline Program has been incorporated into the Inspection Time Limits and Inspection Operation 43, Inspection Operation 44, Inspection Operation

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45, Inspection Operation 46, and Inspection Operation 47. This program is to be used on all airplanes without an approved CPCP. Those who currently have a CPCP that does not control corrosion to Level 1 or better must make adjustments to the areas given in the Baseline Program.

B. Typical Airplane Zone Corrosion Program Inspection Procedures.
   (1) Remove all the equipment and airplane interior (for example, the insulation, upper upholstery panel, lower upholstery panel) as necessary to do the corrosion inspection.
   (2) Clean the areas given in the corrosion inspection before you inspect them.
   (3) Do a visual inspection of all of the Principal Structural Elements (PSE's) and other structure given in the corrosion inspection for corrosion, cracking, and deformation.
      (a) Carefully examine the areas that show that corrosion has occurred before.

         NOTE: Areas that need a careful inspection are given in the corrosion inspection.

      (b) Nondestructive testing inspections or visual inspections can be needed after some disassembly if the inspection shows a bulge in the skin, corrosion under the splices, or corrosion under fittings.
   (4) Remove all of the corrosion, examine the damage, and repair or replace the damaged structure.
      (a) Apply a protective finish where it is required. Refer to Chapter 20, Interior and Exterior Finish - Cleaning/Painting or Chapter 51, Corrosion - Description and Operation.
      (b) Clean or replace the ferrous metal fasteners with oxidation.
   (5) Remove blockages of foreign object debris so that the holes and clearances between parts can drain.
   (6) For bare metal on any surface of the airplane, apply fuel and corrosion resistant primer MIL-PRF-23377.
      (a) Apply a polyurethane topcoat paint to the exterior painted surface. Refer to the manufacturer's procedures.
   (7) Cessna Aircraft Company recommends that you apply a corrosion preventive compound once every two years to areas with a high possibility for severe corrosion identified in the corrosion inspection.
      (a) Apply one layer of LPS-3 Heavy-Duty Rust Inhibitor, or equivalent, that will soak into the fayed surfaces to replace water and prevent corrosion. Refer to Chapter 51, Corrosion - Description and Operation.
         1 Do Not Apply Compound to Displace Water and Prevent Corrosion to These Areas or Items:
            a Oxygen System Lines and Components
            b Cables, Pulleys, and Trim Tab Pushrod
            c Plastics, Elastomers
            d Lubricated and Teflon Surfaces (Greased Joints, Sealed Bearings, and Grommets)
            e Adjacent to Tears and Holes in Insulation (Not Waterproof)
            f Areas with Electrical Arc Potential, Wiring
            g Interior Upholstery Panels (Changes the Flammability Properties)
            h Pitot Tubes
            i Fuel Caps
            j Tie-Down Lugs
            k Chrome Items (handles, locks)
            l Standard Polished Spinner
            m Stall Warning Detector
   (8) Install the dry insulation blankets.
   (9) Install the equipment and airplane interior (for example, the upper upholstery panel and lower upholstery panel) that was removed to do the corrosion inspection.

7. Baseline Program Implementation

A. The Baseline Program is divided into specific inspection areas and zone locations. The inspection areas and zone locations apply to all airplanes. Refer to Chapter 6, Airplane Zoning - Description and Operation for an illustration of the airplane zone locations.

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8. Reporting System

A. Corrosion Prevention and Control Program Reporting System (Refer to Figure 1).
(1) The Corrosion Prevention and Control Program (CPCP) includes a system to report to Cessna Aircraft Company data that will show that the Baseline Program is sufficient and, if necessary, make changes.
(2) At the start of the second Corrosion Program Inspection of each area, report all Level 2 and Level 3 Corrosion results that are listed in the Baseline Program to Cessna Aircraft Company. Send the Control Prevention and Control Program Damage Reporting Form to:

Cessna Aircraft Company
Customer Service
P.O. Box 7706
Wichita, KS 67277
USA
Fax: 316-517-7271

9. Periodic Review

A. Use the Service Difficulty Reporting System to report all Level 2 and Level 3 Corrosion results to the FAA and to Cessna Aircraft Company. All corrosion reports received by Cessna Aircraft Company will be reviewed to determine if the Baseline Program is adequate.

10. Corrosion Related Airworthiness Directives

A. Safety-related corrosion conditions transmitted by a service bulletin can be mandated by an Airworthiness Directive (AD). Airworthiness Directives can be found on the FAA website: www.faa.gov.

11. Appendix A - Development Of The Baseline Program

A. The Corrosion Prevention and Control Program Baseline Program
(1) The function of the Corrosion Prevention and Control Program (CPCP) is to give the minimum procedures necessary to prevent and control corrosion so that continued airworthiness is not at risk. The Principal Structural Elements (PSE's) are areas where the CPCP applies.
(2) The CPCP Baseline Program consists of a Corrosion Program Inspection (CPI) and an inspection time. Each inspection is to be done in an airplane zone.
(3) The corrosion reports that are sent to Cessna Aircraft Company and data from the FAA Service Difficulty Records were used to identify the inspection areas of the Baseline Program. When more than one incident of corrosion was identified at a specified location, an inspection was included for that location in the Baseline Program.
(4) When corrosion was found once, the data was examined to find if the corrosion was caused by one specified occurrence or if other airplanes could have corrosion in the same location. If the corrosion is not linked to one specific occurrence, the inspection should be added to the Baseline Program.
(5) The inspection interval was specified by the duration and corrosion severity.

12. Appendix B - Procedures For Recording Inspection Results

A. Record the Inspection Results.
(1) It is not an FAA mandatory procedure to record the CPCP results, but Cessna Aircraft Company recommends that records be kept to assist in program adjustments when necessary. The inspection of records will make sure the identification, repeat inspections, and level of corrosion are monitored. The data can identify whether there is more or less corrosion at repeat intervals. The data can also be used to approve increased or decreased inspection intervals.

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CORROSION PREVENTION AND CONTROL PROGRAM DAMAGE REPORT FORM

To:
Cessna Aircraft Company
Customer Service
P.O. Box 7706
Wichita, Kansas 67277-7706
Phone Number: (316) 517-5800
Fax Number: (316) 517-7271

From:

Facility _____
Address _____
_____
_____
_____
Phone No. _____

Airplane Serial No._____
Utilization/Year (Hrs)_____
Total Time In Service (Hrs)_____
Registration No._____
Total Landings/Cycles_____
Fax No._____

Corrosion Inspection Number _____
Interval (Years) Since Last Inspection _____

Level Of Corrosion:
☐LEVEL 2 ☐LOCAL
☐LEVEL 3 ☐WIDESPREAD

DAMAGED PART NAME:
☐LONGERON/STRINGER ☐SKIN
☐FRAME ☐DOUBLER
☐BRACKET/SHEAR TIE ☐RIB
☐CHORD ☐BULKHEAD
☐WEB ☐FITTING
☐OTHER_____

LOCATION OF DAMAGE: ZONES _____
STA_____ TO STA_____
WL_____ TO WL_____
BL _____ TO BL_____

CAUSE OF DAMAGE:
☐ENVIRONMENT ☐INTERNAL LEAKAGE
☐CHEMICAL SPILL ☐LAVATORY SPILL
☐BLOCKED DRAIN ☐WET INSULATION BLANKET
☐UNKNOWN

ADDITIONAL DESCRIPTION OF DAMAGED AREA_____
_____
_____
_____
_____
_____

Corrosion Prevention and Control Program Damage Report Form
Figure 1 (Sheet 1)

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13. Appendix C - Guidelines

A. Glossary.
(1) The following additional information clarifies the previous sections of this document. Refer to Figure 2.

B. Glossary of General Descriptions.

WORD	GENERAL DESCRIPTION
Allowable Limit	The allowable limit is the maximum amount of material (usually expressed in material thickness) that may be removed or blended out without affecting the ultimate design strength capability of the structural member. Allowable limits may be established by the design approval holder. The FAA (or applicable regulatory authority) may also establish allowable limits. The design approval holder normally publishes allowable limits in the structural repair manual or in service bulletins.
Baseline Program	A Baseline Program is a CPCP developed for a specific model airplane. The design approval holder typically develops the Baseline Program. However, it may be developed by a group of operators who intend to use it in developing their individual CPCP. It contains the corrosion program inspection, an implementation threshold, and a repeat interval for the procedure accomplishment in each area or zone.
Basic Task	Refer to Corrosion Program Inspection.
Corrosion Program Inspection (CPI)	The Corrosion Program Inspection (CPI) is a specific and fundamental set of work elements that should be performed repetitively in all task areas or zones to successfully control corrosion. The contents of the CPI may vary depending upon the specific requirements in an airplane area or zone. The CPI is developed to protect the primary structure of the airplane.
Corrosion (Metal)	The physical deterioration of metals caused by a reaction to an adverse environment.
Corrosion Prevention and Control Program (CPCP)	A Corrosion Prevention and Control Program is a comprehensive and systematic approach to controlling corrosion such that the load carrying capability of an airplane structure is not degraded below a level necessary to maintain airworthiness. It contains the corrosion program inspections, a definition of corrosion levels, implementation thresholds, a repeat interval for task accomplishment in each area or zone, and specific procedures that apply if corrosion damage exceeds Level 1 in any area or zone.
Design Approval Holder	The design approval holder is either the type certificate holder for the aircraft or the supplemental type certificate holder.
Inspection Area	The inspection area is a region of airplane structure to which one or more CPIs are assigned. The inspection area may also be referred to as a Zone.
Inspection Interval	The inspection interval is the calendar time between the accomplishment of successive corrosion inspection tasks for a Task Area or Zone.

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WORD	GENERAL DESCRIPTION
Level 1 Corrosion	Level 1 Corrosion is one or more of the items that follow: 1. Corrosion damage occurring between successive inspections, that is local and can be reworked or blended out within the allowable limit. 2. Local corrosion damage that exceeds the allowable limit but can be attributed to an event not typical of the operator's usage or other airplanes in the same fleet (e.g., mercury spill). 3. Operator experience has demonstrated only light corrosion between each successive corrosion task inspection; the latest corrosion inspection task results in rework or blend out that exceeds the allowable limit.
Level 2 Corrosion	Level 2 corrosion occurs between two successive corrosion inspection tasks that requires a single rework or blend-out that exceeds the allowable limit. A finding of Level 2 corrosion requires repair, reinforcement or complete or partial replacement of the applicable structure.
Level 3 Corrosion	Level 3 corrosion occurs during the first or subsequent accomplishments of a corrosion inspection task that the operator determines to be an urgent airworthiness concern. **NOTE:** If Level 3 corrosion is determined at the implementation threshold or any repeat inspection, it should be reported. Any corrosion that is more than the maximum acceptable to the design approval holder or the FAA (or applicable regulatory authority) must be reported in accordance with current regulations. This determination should be conducted jointly with the design approval holder.
Light Corrosion	Light corrosion is corrosion damage so slight that removal and blendout over multiple repeat intervals (RI) may be accomplished before material loss exceeds the allowable limit.
Local Corrosion	Generally, local corrosion is corrosion of a skin or web (wing, fuselage, empennage, or strut) that does not exceed one frame, stringer, or stiffener bay. Local corrosion is typically limited to a single frame, chord, stringer, or stiffener, or the corrosion of more than one frame, chord, stringer, or stiffener where no corrosion exists on two adjacent members on each side of the corroded member.
Principal Structural Element (PSE)	A PSE is an element that contributes significantly to carrying flight, ground or pressurization loads, and whose integrity is essential in maintaining the overall structural integrity of the airplane.
Task Area	Refer to Inspection Area.
Urgent Airworthiness Concern	An urgent airworthiness concern is damage that could jeopardize continued safe operation of any airplane. An urgent airworthiness concern typically requires correction before the next flight and expeditious action to inspect the other airplanes in the operator's fleet.
Widespread Corrosion	Widespread corrosion is corrosion of two or more adjacent skin or web bays (a web bay is defined by frame, stringer, or stiffener spacing). Or, widespread corrosion is corrosion of two or more adjacent frames, chords, stringers, or stiffeners. Or, widespread corrosion is corrosion of a frame, chord, stringer, or stiffener and an adjacent skin or web bay.
Zone	Refer to Inspection Area.

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14. Application Of The Corrosion Program Inspection

A. Typical Airplane Zone Corrosion Program Inspection Procedures.

NOTE: For the Model 310R airplanes, the Basic Tasks are referred to as the Corrosion Program Inspection (CPI).

(1) Remove all of the equipment and airplane interior (for example, the insulation, upper upholstery panel, and lower upholstery panel) as necessary to do the corrosion inspection.
(2) Clean the areas given in the corrosion inspection before you inspect them.
(3) Do a visual inspection of all of the Principal Structural Elements (PSE's) and other structure given in the corrosion inspection for corrosion, cracking, and deformation.
  (a) Carefully examine the areas that show that corrosion has occurred before.

  NOTE: Areas that need a careful inspection are given in the corrosion inspection.

  (b) Nondestructive testing inspections or visual inspections can be needed after some disassembly if the inspection shows a bulge in the skin, corrosion under the splices, or corrosion under fittings.
(4) Remove all of the corrosion, examine the damage, and repair or replace the damaged structure.
  (a) Apply a protective finish where it is required. Refer to Chapter 11, Interior and Exterior Finish - Cleaning/Painting, or Chapter 51, Corrosion - Description and Operation.
  (b) Clean or replace ferrous metal fasteners that show signs of oxidation.
(5) Remove blockages of foreign object debris so that the holes and clearances between parts can drain.
(6) For bare metal on any surface of the airplane, apply fuel and corrosion resistant primer MIL-PRF-23377.
  (a) Apply a polyurethane topcoat paint to the exterior painted surface. Refer to the manufacturer's procedures.
(7) Apply compounds that will displace water and prevent corrosion. Refer to Chapter 51,Corrosion - Description and Operation.
  (a) Apply one layer of LPS-3 Heavy-Duty Rust Inhibitor, or equivalent, that will soak into the fayed surfaces to replace water and prevent corrosion.
    1 Do Not Apply Compound to Displace Water and Prevent Corrosion to These Areas or Items:
      a Oxygen System Lines and Components
      b Cables, Pulleys, and Trim Tab Pushrod
      c Plastics, Elastomers
      d Lubricated and Teflon Surfaces (Greased Joints, Sealed Bearings, and Grommets)
      e Adjacent to Tears and Holes in Insulation (Not Waterproof)
      f Areas with Electrical Arc Potential, Wiring
      g Interior Upholstery Panels (Changes the Flammability Properties)
      h Pitot Tubes
      i Fuel Caps
      j Tie-Down Lugs
      k Chrome Items (handles, locks)
      l Standard Polished Spinner
      m Stall Warning Detector
(8) Install the dry insulation blankets.
(9) Install the equipment and airplane interior (for example the upper upholstery panel and lower upholstery panel) that was removed to do the corrosion inspection.

15. Determination of the Corrosion Levels

A. Find the Corrosion Levels, refer to Figure 3.
  (1) Corrosion found on a structure when you use the Corrosion Program and Corrosion Prevention (CPCP) Baseline Program will help find the extent of the corrosion.

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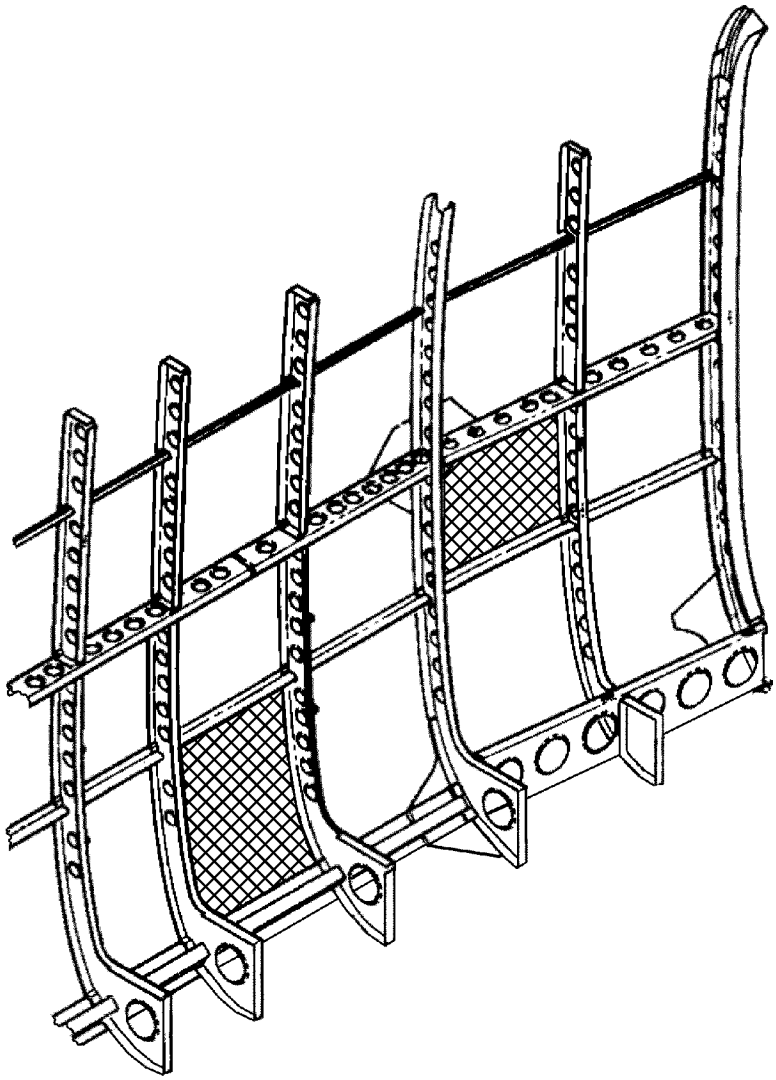

LOCAL CORROSION
(CORROSION FOUND IN NON–ADJACENT AREAS OF THE SKIN PANELS)

Corrosion Location
Figure 2 (Sheet 1)

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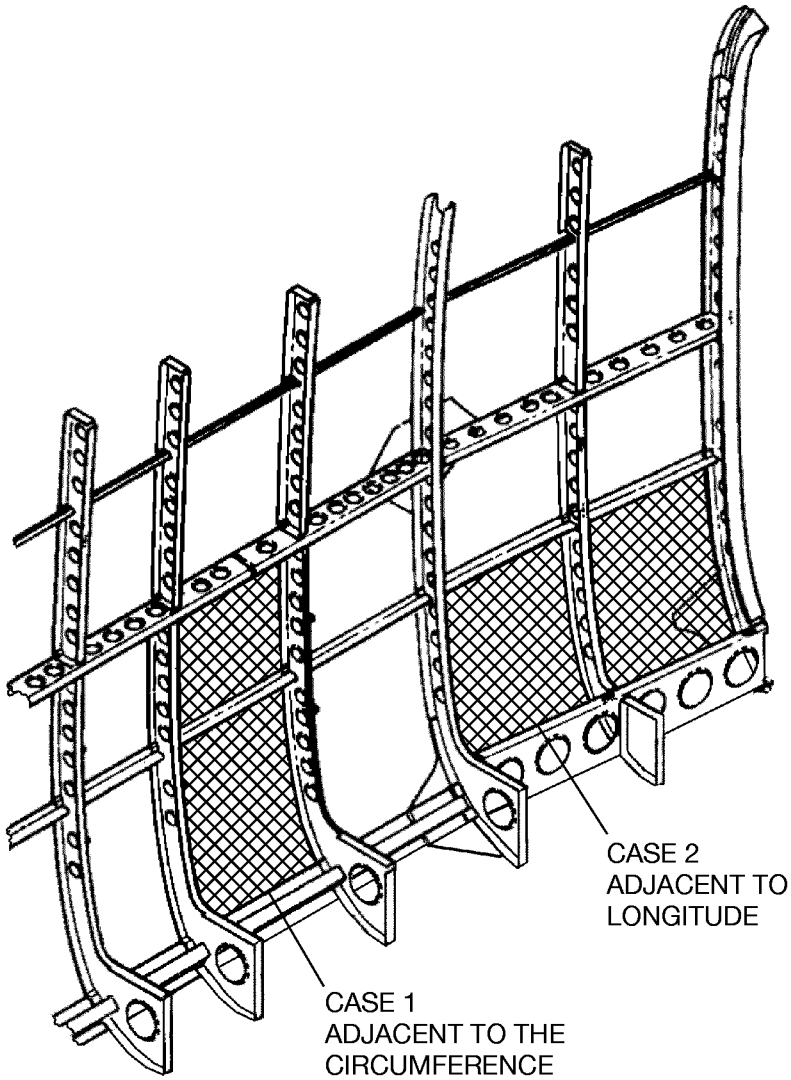

WIDESPREAD CORROSION
(CORROSION FOUND IN ADJACENT AREAS OF THE SKIN PANELS)

Corrosion Location
Figure 2 (Sheet 2)

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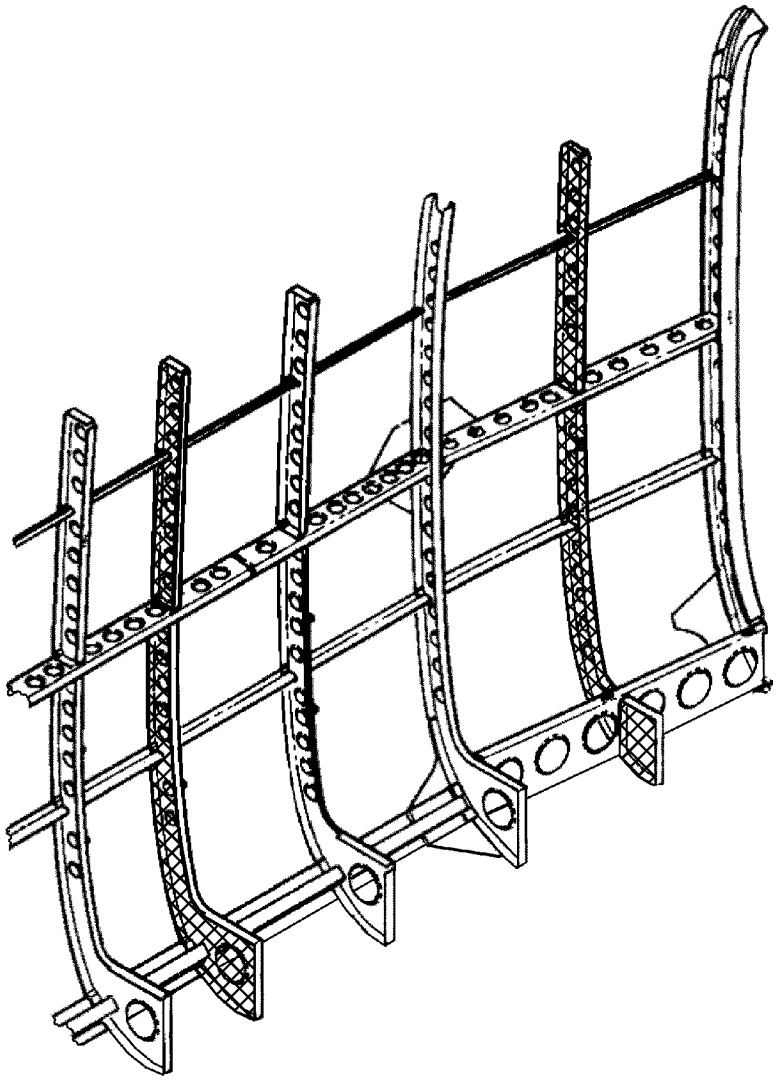

LOCAL CORROSION
(CORROSION FOUND IN NON–ADJACENT FRAMES)

Corrosion Location
Figure 2 (Sheet 3)

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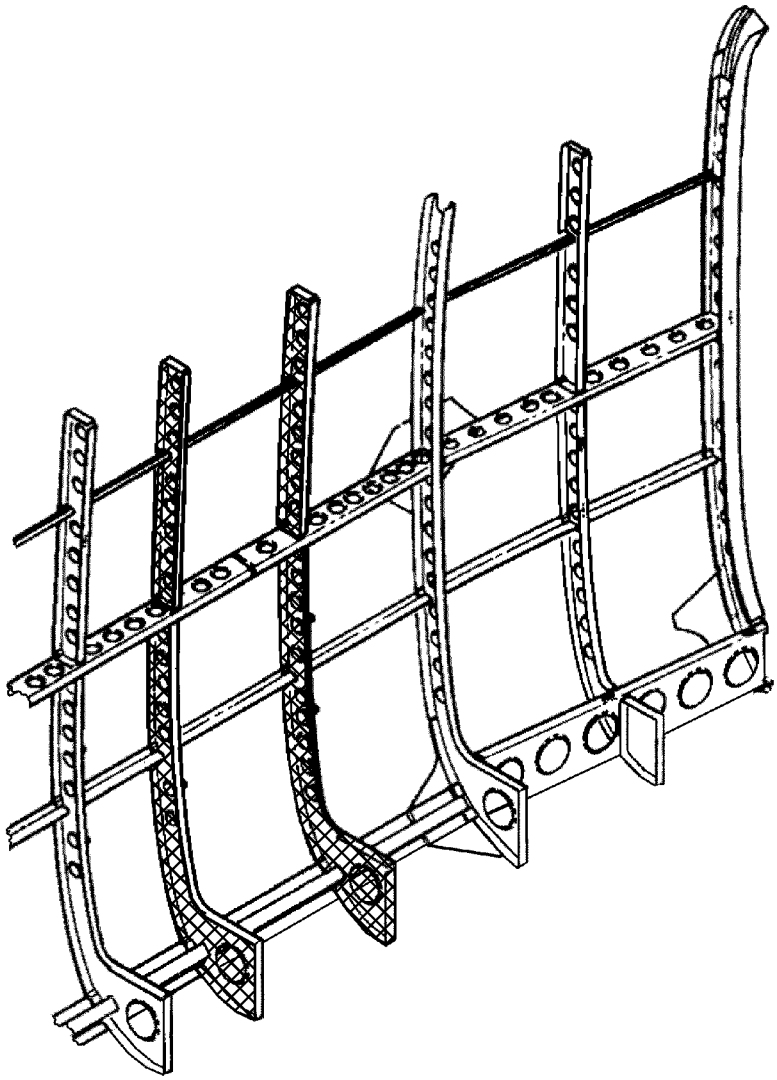

WIDESPREAD CORROSION
(CORROSION FOUND IN ADJACENT FRAMES)

Corrosion Location
Figure 2 (Sheet 4)

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(2) The second and subsequent inspections will find how well the CPCP program has been prepared, or if there is a need to make adjustments to the Baseline Program.
(3) A good quality CPCP is one that controls corrosion to Level 1 or better.
(4) If Level 2 corrosion is found during the second or subsequent inspection, you must do something to decrease the future corrosion to Level 1 or better.
(5) If Level 3 corrosion is found, you must also do something to decrease the future corrosion to Level 1. Also, a plan to find or prevent Level 3 corrosion in the same area on other airplanes must be added to the CPCP.
(6) All the corrosion that you can repair in the allowable damage limits, (less than 10 percent of the part thickness) is Level 1 corrosion.
(7) If all corrosion is Level 1, the CPCP is correctly prepared.
(8) If you must reinforce or replace the part because of corrosion, the corrosion is Level 2.
(9) If the part is not airworthy because of the corrosion, you must do an analysis to find out if the corrosion is Level 3.
(10) The chart found in this section will help find the level of the corrosion.
(11) The probability that the same problem will occur on another airplane is dependent on several factors such as: past maintenance history, operating environment, years in service, inspectability of the corroded area and the cause of the problem.

16. Level 2 Corrosion Findings

A. All Level 2 corrosion that is more than the rework limits of the approved repair procedures must be reported to Cessna Aircraft Company. Cessna Aircraft Company engineering will do an analysis to make sure the corrosion is not an urgent airworthiness concern.

B. When doing the analysis, Cessna Aircraft Company will consider:
(1) Can the cause of the corrosion be identified, such as a chemical spill or protective finish breakdown?
(2) Has the same level of corrosion been found on other airplanes?
(3) Are the corrosion protection procedures applied during manufacture the same for earlier and later models?
(4) Age of the corroded airplane compared to others checked.
(5) Is the maintenance history different from the other airplanes in the fleet?

17. Typical Actions That Follow the Determination of the Corrosion Level.

A. If corrosion is found, find the corrosion level, then do the necessary steps for a specific inspection.

B. If Level 1 corrosion is found during the first CPCP inspection.
(1) Repair the structure. Contact Cessna Customer Service for an approved repair procedure.
(2) Continue with the Baseline Program.
(a) Optional: Document the results of the inspection for use in validating program compliance.

C. If Level 2 corrosion is found during the first CPCP inspection.
(1) Repair the structure. Contact Cessna Customer Service for an approved repair procedure.
(2) Report the details of the corrosion you see to Cessna Customer Service and the FAA (or applicable regulatory authority).
(3) Continue to use the Baseline Program but check the corroded area carefully when you do a subsequent CPCP inspection.
(4) It is recommended that you record the results of the inspection to show compliance with the program.

D. If Level 3 corrosion is found during the first CPCP inspection.
(1) Immediately contact Cessna Customer Service and the FAA (or applicable regulatory authority) of the corrosion you found. Refer to Reporting System.
(2) Give sufficient information to make sure that the condition is a possible urgent airworthiness concern for your fleet. Get assistance from Cessna Customer Service to develop a plan of action.
(3) Apply the corrosion program inspection, which includes the repair of the structure. Contact Cessna Customer Service for an approved repair procedure.

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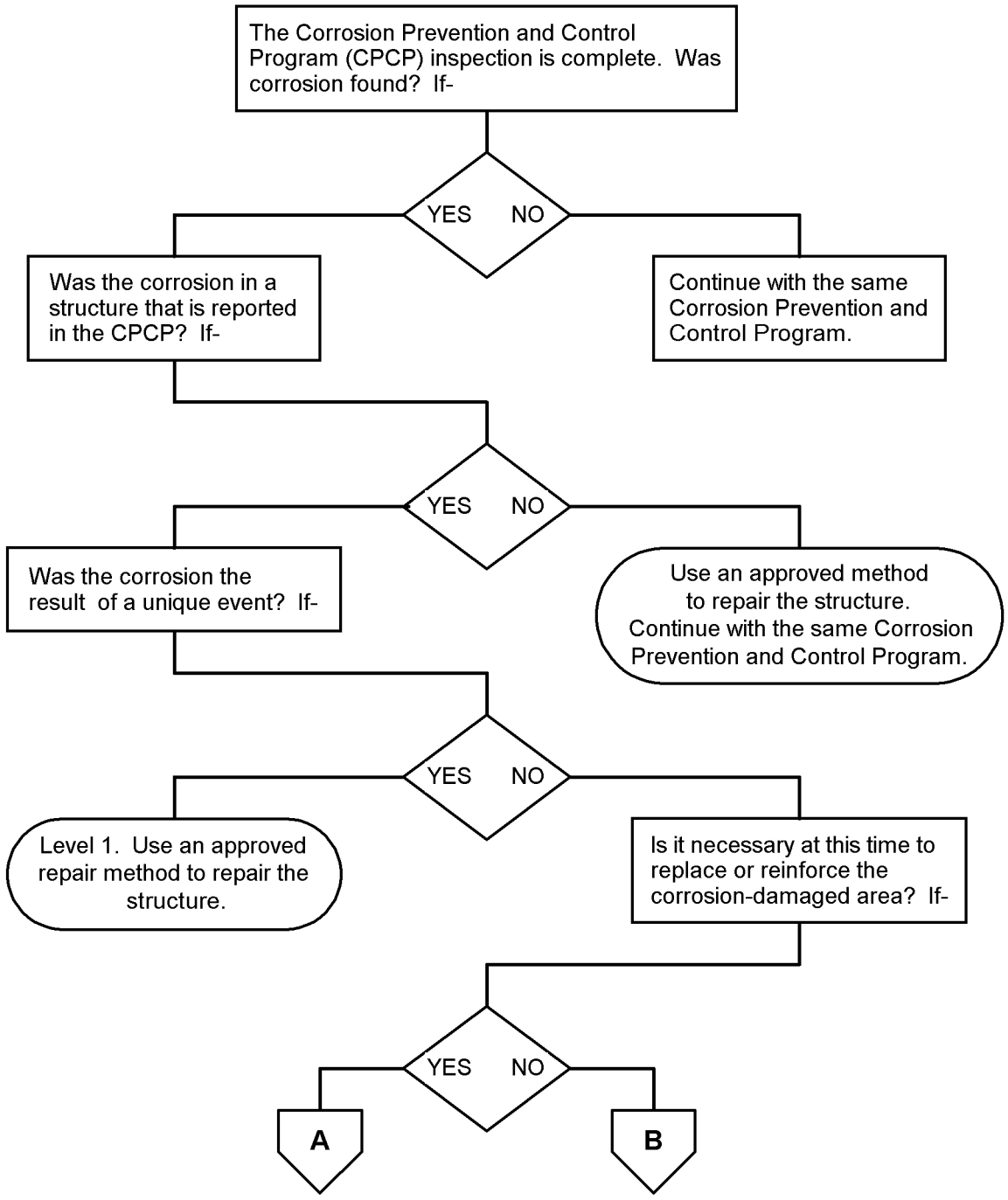

Corrosion Level Determination Chart
Figure 3 (Sheet 1)

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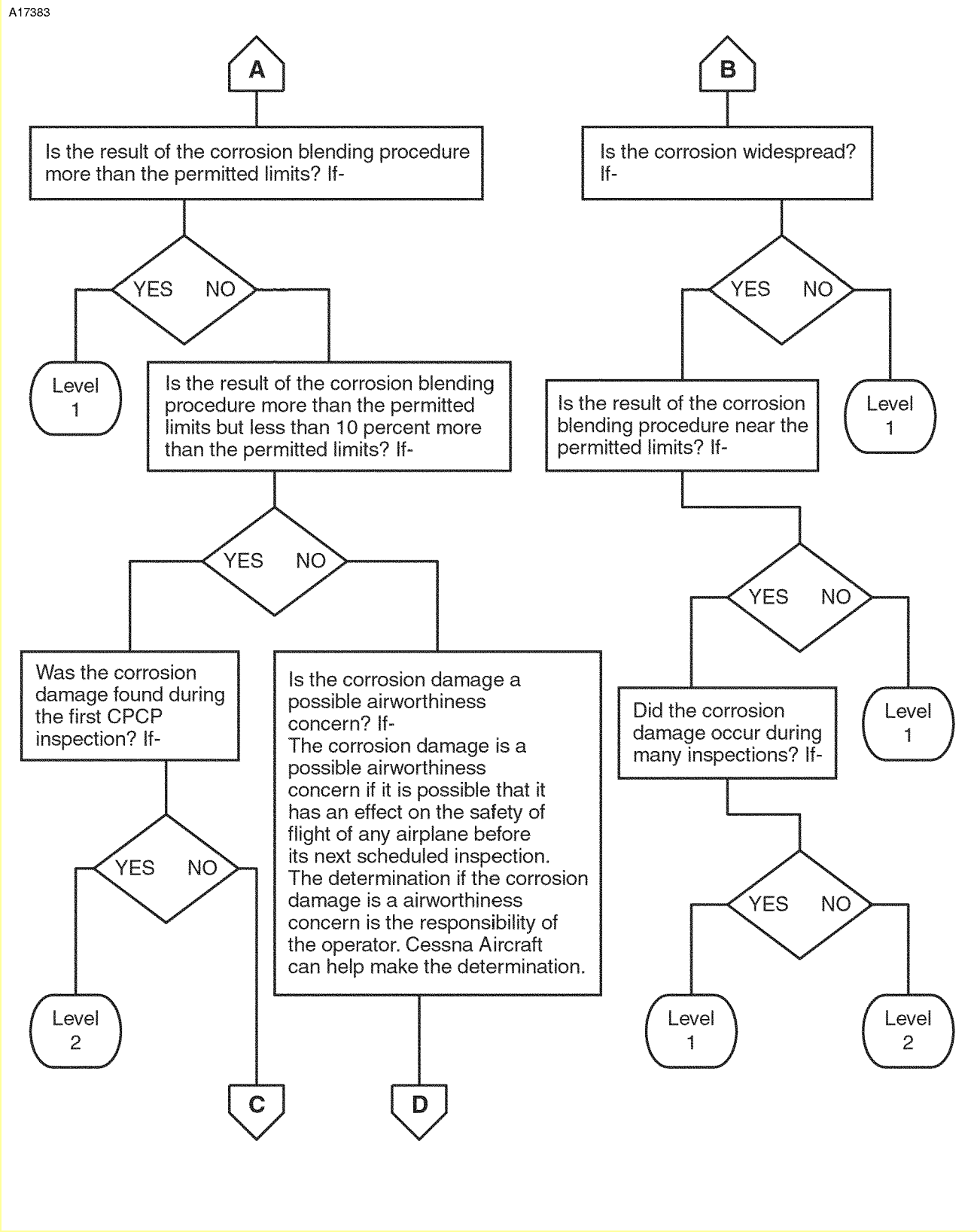

Corrosion Level Determination Chart
Figure 3 (Sheet 2)

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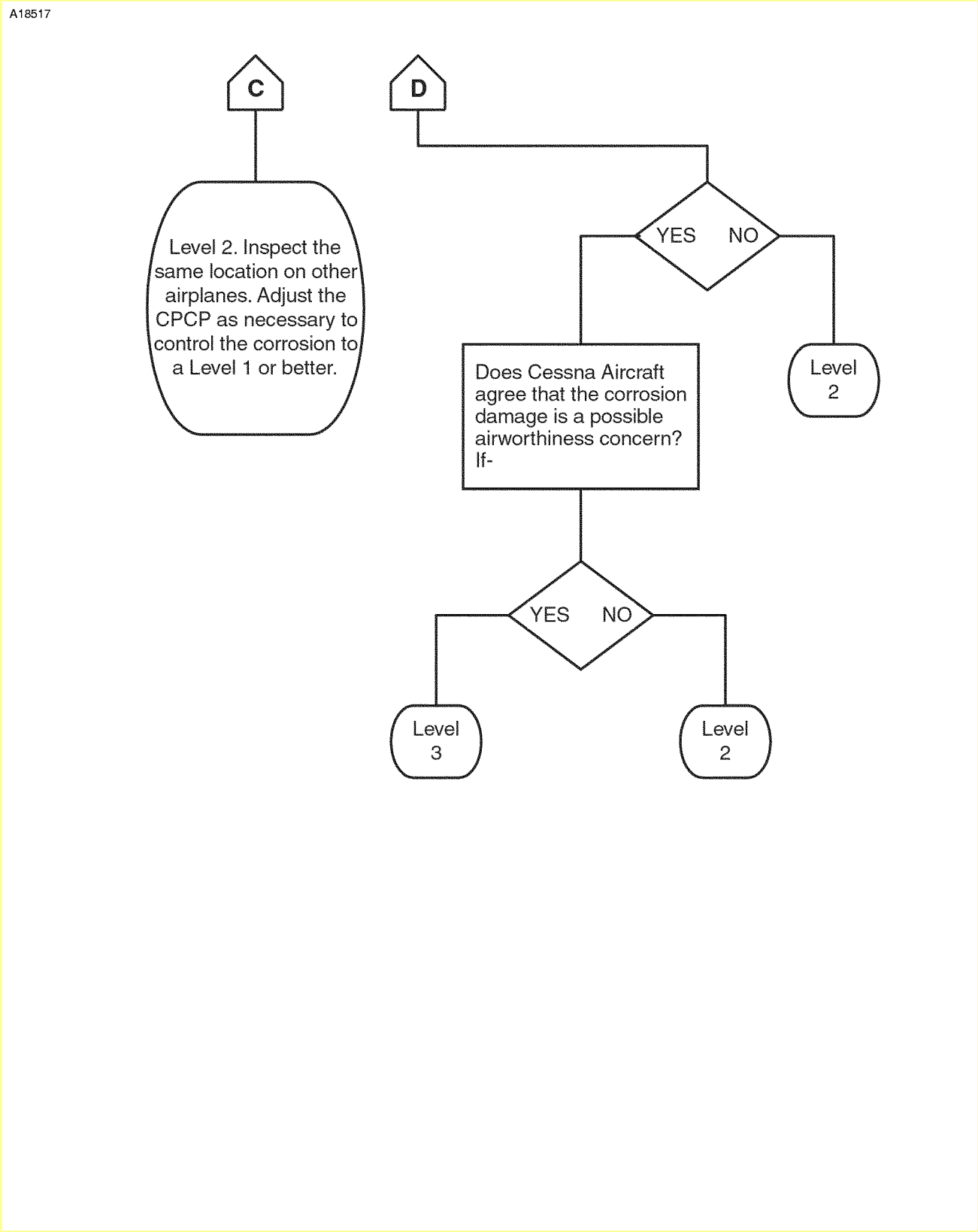

Corrosion Level Determination Chart
Figure 3 (Sheet 3)

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(4) Do a report that has the information of the findings. Refer to Corrosion Prevention And Control Program Reporting System - Description And Operation.
(5) Continue with the Baseline Program and other steps of procedure required by the FAA (or applicable regulatory authority). Examine this area carefully during future inspections.

E. If no corrosion is found during the second or subsequent CPCP inspection:
(1) Continue with the current Corrosion Prevention and Control Program. No adjustment of the current program is required.
(2) It is recommended that you record the results of the inspection for a possible increase of the corrosion inspection interval.

F. If Level 1 corrosion is found on the second or subsequent CPCP inspection:
(1) Do the corrosion program inspection, which includes the repair of the structure. Contact Cessna Customer Service for an approved repair procedure.
(2) Continue with the Baseline Program.
(3) No adjustment of the existing program is required.
(4) It is recommended that you record the corrosion inspection number and the results of the inspection to show that the program was obeyed.

G. If Level 2 corrosion is found on the second or subsequent CPCP inspection:
(1) Repair the structure. Contact Cessna Customer Service for an approved repair procedure.
(2) Do a report that shows the information about the corrosion and send it to Cessna Customer Service and the FAA (or applicable regulatory authority).
(3) If corrosion damage required the removal of material just beyond the allowable limits (within 10 percent), complete a check of the other airplanes in the fleet before you change your aircraft's maintenance program.
(a) If the corrosion is typical of Level 2, use the fleet data to find what changes are required to control corrosion to Level 1 or better.
(b) If fleet damage is typically Level 1, examine the corroded area during subsequent inspections on all affected airplanes.
(c) Make changes to your aircraft's maintenance program if the typical corrosion becomes Level 2.
(4) Further evaluation by Cessna Aircraft Company is recommended for Level 2 corrosion findings that are well beyond the allowable limits, and there is an airworthiness concern in which prompt action is required.

NOTE: The airworthiness concern is because of the possibility to have similar but more severe corrosion on any other airplanes in the operator's fleet prior to the next scheduled inspection of that area.

(5) Find the action required to control the corrosion to a Level 1 or better, between future successive inspections. These can include the items that follow:
(a) A structural modification, such as additional drainage.
(b) Improvements to the corrosion prevention and control inspections, such as more care and attention to corrosion removal, reapplication of protective finish, drainage path clearance.
(c) Decrease the inspection interval for additional airplanes that go into the program.
(6) Send a plan of corrective action to the FAA (or applicable regulatory authority) for approval and to Cessna Customer Service as needed.
(7) Use the approved plan of action.

H. If Level 3 corrosion is found on the second or subsequent CPCP inspection:
(1) Contact Cessna Customer Service and the FAA (or applicable regulatory authority) about the corrosion that was found.
(2) Send a plan to examine the same area on other affected airplanes in the operator's fleet.
(3) Apply the corrosion program inspection, which includes the repair of the structure. Contact Cessna Customer Service for an approved repair procedure.

I. Find the action needed to control the corrosion finding to Level 1 or better, between future successive inspections. These can include any or all of the following:
(1) A structural modification, such as additional drainage.

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(2) Improvements to the corrosion prevention and control inspections, such as more care and attention to corrosion removal, reapplication of protective finish, drainage path clearance.
(3) A decrease in the inspection interval for additional airplanes entering the program.

J. Send a plan of corrective action to the FAA (or applicable regulator authority) for approval and Cessna Customer Service as needed.

K. Use the approved plan of action.

L. It is recommended that you give the details of the findings to Cessna Aircraft Company.

18. Factors Influencing Corrosion Occurrences

A. If you find Level 2 or Level 3 corrosion, when you think about how to change your CPCP, think about the list that follows:
(1) Is there a presence of LPS-3 Heavy-Duty Rust Inhibitor?
(2) Is there a presence or condition of protective finish?
(3) What was the length of time since the last inspection and/or application of corrosion inhibiting compound?
(4) Was there inadequate clean-up/removal of corrosion prior to application of corrosion inhibiting compound, during previous maintenance of the area?
(5) Are the moisture drains blocked or is there inadequate drainage?
(6) What was the environment, the time of exposure to the environment and the use of the airplane?
(7) Was there a variation in past maintenance history and/or use of the airplanes in the operator's fleet?
(8) Were there variations in the production build standard in the operator's fleet?

19. Reporting

A. The minimum requirements to prevent or control the corrosion in the Corrosion Prevention and Control Program (CPCP) were made on the best information, knowledge and experience available at the time. As this experience and knowledge increases, the CPCP's intervals will be changed as necessary. A reporting system for this is in Section 8, Reporting System.
(1) You must contact the Cessna Aircraft Company about all Level 2 or 3 corrosion of the structure that is on the list in the Baseline Program that is found during the second and subsequent corrosion program inspections. Refer to Figure 1.

NOTE: You do not have to contact the Cessna Aircraft Company about corrosion that is found on structure that is not on the list in the Baseline Program, for example the secondary structure.

20. Program Implementation

A. When a CPCP is started, it is important to do the items that follow:
(1) Start inspections at the recommended interval following the completion of the first SID inspection.
(2) Once the Corrosion Program Inspection (CPI) is started, repeat the subsequent applications of the CPI at the recommended interval for each CPI.
(3) You can start a CPCP on the basis of individual CPI's or groups of CPI's.
(4) Cessna Aircraft Company highly recommends to start all of the CPI's as soon as possible. This is the most cost effective way to prevent or control corrosion.

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UNSCHEDULED MAINTENANCE CHECKS

1. General

A. During flight and ground operation, the airplane may be subjected to:
(1) Hard/overweight landings - detailed in paragraph 2. A.
(2) Overspeed - Exceeding placard speeds of flaps or landing gear exceeding airplane design speeds - detailed in paragraph 2. B.
(3) Severe air turbulence of severe maneuvers - detailed in paragraph 2. C.
(4) Lightning strike - detailed in paragraph 2. D.
(5) Foreign object damage - detailed in paragraph 2. E.
(6) High drag/side loads due to ground handling - detailed in paragraph 2. F.
(7) Engine/cabin vibration check - detailed in paragraph 2. G.
(8) Alternator Mechanical Failure. - detailed in paragraph 2. H.

B. These conditions are defined in paragraph 2. A through 2. H. When any of these conditions are reported by the flight crew, a visual inspection of the airframe and specific inspection of components and areas involved must be accomplished.

C. The inspections are performed to determine and evaluate the extent of damage in local areas of visible damage, and to the structure and components adjacent to the area of damage.

D. When a lightning strike is encountered, a comprehensive inspection of the airplane exterior is performed to locate possible damage.

E. If foreign object damage is encountered (suspected or actual), a visual inspection of the airplane must be accomplished before airplane is returned to service.

2. Unscheduled Maintenance Checks Defined

A. Hard/Overweight Landings.
(1) Any landing made by an airplane at what is believed to be an excessive sink rate. Closely related to hard landing, is overweight landing, which is defined as landing the airplane at any gross weight which exceeds placard landing weights.

NOTE: If the hard/overweight landing is combined with high drag/side loads, additional checks are required.

(2) Perform the following checks:
(a) Landing Gear.
1 Main Gear Shock Struts - Inspect for security of attachment and leakage.
2 Main Gear Actuator Attachments and Supporting Structure - Inspect for security, loose or failed fasteners and evidence of structural damage.
3 Nose Gear Trunnion at Crossarms, Supports and Attaching Structure - Inspect for security, loose or failed fasteners and any evidence of structural damage.
4 Nose Gear Actuator Attachments and Supporting Structure - Inspect for security, loose or failed fasteners and any evidence of structural damage.
(b) Wings.
1 Wing Surface in Landing Gear Area - Inspect for skin buckles, loose or failed fasteners, security of landing gear trunnion fittings and fuel leaks.
2 Trailing Edge - Inspect for any deformation affecting normal flap operation.

B. Overspeed Check.
(1) Any time an airplane has exceeded one or both of the following:
(a) Airplane overspeed exceeding placard speed limits of flaps and/or landing gear.
(b) Airplane overspeed exceeding design speeds.
(2) Perform the following checks:
(a) Landing Gear.
1 Trunnion and Supports - Inspect for cracks, security and evidence of structural damage.

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2 Doors and Attachments - Inspect for loose or failed fasteners, cracks, buckling and evidence of structural damage.
3 Check for freedom of movement and perform an operational check.

(b) Fuselage.
1 Radome - Inspect for buckling, dents, loose or failed fasteners and any evidence of structural damage.
2 All Hinged Access Doors - Inspect hinges, hinge attach points, latches and attachments, and skins for deformation and evidence of structural damage.

(c) Nacelles.
1 Skins - Inspect for buckling, cracks, loose or failed fasteners and indications of structural damage.
2 Fillets and Fairings - Inspect for buckling, dents, cracks and loose or failed fasteners.

(d) Stabilizers.
1 Inspect skins, hinges and attachments, movable surfaces, mass balance weights and attaching structure for cracks, dents, buckling, loose or failed fastener, and evidence of structural damage.

(e) Wing.
1 Check for skin buckling, cracks, loose or failed fasteners, attachments and structure for damage.
2 Check for freedom of movement and operation.

C. Severe Air Turbulence or Severe Maneuvers Check.

(1) May be defined as atmospheric conditions producing violent buffeting of airplane. Severe maneuvers can be defined as any maneuvers exceeding the Pilot's Operating Handbook limits.

(2) Perform the following checks:

(a) Stabilizers.
1 Horizontal Stabilizer Hinge Fittings, Actuator Fittings and Stabilizer Center Section - Inspect for security, loose or failed fasteners and any evidence of structural damage.
2 Vertical Stabilizer - Inspect for evidence of structural damage, skin buckles and security at primary attachments in tailcone. Loose or failed fasteners, damage to hinges and actuator fittings.
3 Elevator and Rudder Balance Weight Supporting Structure - Inspect for security, loose or failed fasteners and evidence of structural damage.

(b) Wing.
1 Wing to Body Fittings and Supporting Structure - Inspect for security, loose or failed fasteners and evidence of structural damage.
2 Trailing Edge - Inspect for any deformation affecting normal operation of flap and aileron.

D. Lightning Strike Check.

(1) If the airplane is flown through an electrically stressed region of the atmosphere, where electrical discharges are transferred from cloud to cloud and from cloud to earth, the airplane may become a part of this discharge path. During a lightning strike, the current enters the airplane at one point and exists at another, usually at opposite extremities. It is in these areas, wing tips, nose and tail sections, where damage is most likely to occur. Burning and/or eroding of small surface areas of the skin and structure may be detected during inspection. In most cases, the damage is obvious; in some cases, however, hidden damage may result. The purpose of the lightning strike inspection is to locate any damage that may have occurred to the airplane before returning it to service.

(2) Perform the following checks:

(a) Communications.
1 Antennas - Inspect all antennas for evidence of burning or eroding. If damage is noted, perform functional check of affected system.
2 Navigation.
a Radar Reflector, Feed Horn, Motor Box Assembly and Mounting Structure - Inspect for damage. If damage is noted, perform a bench check of system. If superficial pitting or burning of mount structure only is noted, perform a functional check of radar system.

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b Glideslope Antenna - Inspect for burning and pitting. If damage is noted, perform a functional check of glideslope system.
c Compass - Compass should be considered serviceable if the corrected heading is within +10 or -10 degrees of heading indicated by the remote compass system. If remote compass is not within tolerance, remove, repair or replace.

3 Fuselage.
a Radome - Inspect for evidence of burning or eroding.
b Skin - Inspect surface of fuselage skin for evidence of damage.
c Tailcone - Inspect tailcone and static dischargers for damage.

4 Stabilizers.
a Inspect surfaces of stabilizers for evidence of damage.

5 Wings
a Skins - Inspect for evidence of burning and eroding.
b Wing Tips - Inspect for evidence of burning and pitting.
c Flight Surfaces and Ringing Mechanisms - Inspect for burning and pitting.

6 Powerplant and Propeller.
a If lightning strike to the engine or propeller is suspected, notify Cessna field representative or airplane engine representative for disposition on engine status.
b If strike is confirmed, engine and propeller must be removed and returned to their manufacturer for inspection or overhaul, before being returned to service.

E. Foreign Object Damage Check.

(1) Damage to the airplane engine may be caused by the ingestion of slush, by a bird strike or by any other foreign object, while operating on the ground or in normal flight. Damage may also be caused by tools, loose hardware or pieces of safety wire left in the engine intake manifold during maintenance operations. The purpose of the foreign object damage inspection is to locate any damage prior to repairing or returning the airplane to service.

(2) Safety precautions should be taken to prevent foreign objects from coming in contact with the airplane during towing and at all times when airplane is not in service. To prevent dirt and foreign object damage, the engines should be provided with suitable covers. When there is wind and dust conditions, the covers should be installed as soon as practical following engine shutdown.

(3) The aerodynamic cleanliness level (degree of surface smoothness), contributes greatly to the performance capabilities of the airplane. It is important that the aerodynamic cleanliness level of the airplane be maintained.

(4) Contour and waviness distortion of the aerodynamic surface may be developed in the course of normal operation or by improper handling during maintenance operations. Doors and access panels are susceptible to waviness through rough handling. Care should be exercised in the handling of these items.

(5) Perform the following checks:

(a) Landing Gear.
1 Doors - Inspect for dents, cracks, misalignment and indication of structural damage.

(b) Fuselage.
1 Radome - Inspect for dents, cracks, punctures, scratches, etc.
2 Skin - Inspect forward and belly areas for dents, punctures, cracks and any evidence of damage.

(c) Nacelles.
1 Skins - Inspect for dents, punctures, loose or failed fasteners, cracks and indications of structural damage.

(d) Stabilizers.
1 Leading Edge Skins - Inspect for dents, cracks, scratches and any evidence of structural damage.
2 Surface Deice Boots - Inspect for cuts, punctures or tears.

(e) Windows.
1 Windshield - Inspect for chipping, scratches and cracks.

(f) Wings.
1 Leading Edge Skins - Inspect for dents, cracks, punctures and evidence of possible structural damage.

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2 Surface Deice Boots - Inspect for cuts, punctures or tears.

(g) Power Plant.

1 Cowling - Inspect for dents, cuts, tears, scratches, blood and feathers.

(h) Propeller.

1 Inspect for nicked, bent, broken, cracked or damaged blades. Check blade angle, and propeller track.

F. High Drag/Side Loads Due to Ground Handling Check.

(1) High drag/side load condition shall be defined to exist whenever the airplane skids or overruns from the prepared surface into an unprepared surface, or lands short of prepared surface, or makes a landing which involves the blowing of a tire or skids on a runway to the extent that the safety of the airplane is in question. This covers takeoffs and landings or unusual taxi conditions.

(2) Perform the following checks:

(a) Landing Gear.

1 Main gear and doors - Inspect for failed fasteners, buckling, security, cracks and evidence of structural damage.

2 Nose gear and doors - Inspect for failed fasteners, cracks, security, buckling and evidence of structural damage.

(b) Wings.

1 Wing to Fuselage Attach Fittings and Attaching Structure - Inspect for security, loose or failed fasteners and evidence of structural failure.

G. Engine/Cabin Vibration Check

(1) Vibration can be transmitted from the engine to the airplane structure from points of contact between engine components and the cowl, firewall, or engine mount. The following is a list of areas to be checked to ensure the engine is isolated from the airplane structure or to minimize the effect from components which must bridge between engine and structure.

(2) Perform the following checks:

(a) Baffle to Cowl Clearance.

1 Check inside of cowl for chafing; trim metal baffle as required. Repaint affected area and reinspect next flight.

(b) Exhaust to Cowl.

1 Check exhaust stack for clearance where it extends through cowl. Check stack and cowl for signs of interference. Enlarge cutout in cowl as required.

(c) Induction Hose Clamps.

1 Check induction hose clamp for clearance with the engine mount structure. Look for marks on engine mount. Rotate clamps as required.

(d) Exhaust Couplings.

1 Check exhaust couplings for clearance with the engine mount and/or nacelle structure and heat shields. Rotate couplings as required.

(e) Breather and Overboard Dump Lines.

1 Check all overboard dump lines from the engine for clearance with the firewall, cowl and/or cowl flap openings. Check cowl flap in both the open and closed positions. Reposition and reclamp to clear.

(f) Engine Isolators.

1 Check engine isolator bolt lengths. Bolts which are too long will shank out and will not apply the correct pressure to the isolator. Bolts must be removed to be properly checked. Replace with next size shorter bolt if barrel nut has shanked out.

2 Check isolators for aging and deterioration. Replace if rubber is separated from metal pad, there is cracking of the rubber, and/or pronounced set of the rubber pad.

3 Check that the large snubbing washers on the lower mounts (if installed) have proper clearance with the engine mount structure.

(g) Propeller.

1 Check propeller track, refer to detailed inspection procedures.

2 Check propeller for loose or binding blades, loose or missing attach bolts.

3 Check propeller spinner for loose, damaged, or deformed parts and visual wobble.

4 Check the propeller to ensure proper indexing with the engine crankshaft in compliance with Service Manuals (when applicable).

5 Balance suspected propeller if roughness continues.

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(h) Engine Controls.
1 Engine controls should be routed to provide a gentle curve between engine and firewall. They should not be stretched tight. Pull control through firewall, as required, and reclamp.
2 Check engine controls behind engine for contact with engine. Reroute and reclamp controls, as required, to clear.

(i) Starter Cable.
1 Check starter cable for clearance with cowl and that a loop is provided for flexing.

(j) Engine Condition.
1 Check spark plugs for proper type and for fouling or improper gap.
2 Check condition of ignition wiring.
3 Check condition of points.
4 Check magneto timing.
5 Check engine compression.
6 On fuel injection engines; check fuel injector nozzles for restriction and correct size. Check fuel pump settings and fuel distributor valve calibration and proper flow.
7 On turbo charged engines:
a Check nozzle shrouds for leakage; check air induction for leaks and/or rubber couplings for proper seal.
b Check turbocharger for foreign object damage, binding, or worn bearing.
c Check exhaust slip joints for proper axial loads. Axial loads must not exceed 200 lbs.
d Check security of exhaust ducting.

(k) Antenna Vibration.
1 Check antenna if vibration tends to be related to airspeed rather than power setting.

(l) Wheel Balance and Brake Disc Trueness.
1 Wheel balance and brake disc trueness can be sources of vibration during the ground run on some airplanes. These should be checked as a part of the vibration diagnostic process if conditions indicate that they may be a problem.

(m) Airframe Items.

NOTE: For low frequency vibration or "rumble" condition check the following:

1 Check proper rigging of wing flaps, gear doors, and landing lights.
2 Check external skins for excess oil canning.

(n) Interior Items.

NOTE: The following interior items can amplify normal vibration levels resulting in discomfort reports.

1 Check instrument panel for loose panels and interference among components attached to the instrument panel.
2 Check for excessive play on control mechanisms.
3 Check the cabin divider and attaching components for proper security.

H. Alternator Mechanical Failure.

NOTE: Inspect the alternator for indication of possible engine contamination. If any contamination is suspected, the propeller governor and propeller must be removed from the affected engine and inspected per the following procedures prior to further flight of the airplane.

(1) Inspect the governor gasket screen for signs of contamination. If no evidence of contamination is found, proceed to install components on engine.
(2) If evidence of contamination is found at the governor gasket screen, the governor must be disassembled and the pump gears and cavity inspected. If this inspection shows no indication of metal passing through the governor, reassemble the governor per the applicable McCauley Service Manual and install the governor and propeller on the engine.

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(3) If the governor inspection shows indications of metal passing through the governor, repair or replace the governor (as required) and clean and inspect the propeller per the following:
   (a) Remove cylinder from propeller and inspect piston "O" ring and cylinder walls.
   (b) Using a suitable solvent, flush cylinder piston rod and rear cavity (crankshaft pilot bore end) of propeller.
   (c) Assemble propeller per applicable McCauley Service Manual and install on engine.

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CHAPTER

6

DIMENSIONS AND AREAS

LIST OF EFFECTIVE PAGES

CHAPTER-SECTION-SUBJECT	PAGE	DATE
06-Title		
06-List of Effective Pages		
06-Record of Temporary Revisions		
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6-10-00	Pages 1-5	Jun 17/2005
6-20-00	Pages 1-3	Jun 17/2005
6-20-01	Pages 1-4	Jun 17/2005
6-20-02	Pages 1-8	Jun 17/2005

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RECORD OF TEMPORARY REVISIONS

Temporary Revision Number	Page Number	Issue Date	By	Date Removed	By
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DIMENSIONS AND AREAS - GENERAL

1. Scope

A. This chapter includes illustrations and statistical information concerning the Model 310R airplane. Provided are the overall airplane dimensions, surface areas, station locations, zones and access plate locations.

B. Dimensions and measurements are presented to aid the operator and/or maintenance personnel in ground handling the airplane and locating components.

2. Definition

A. Airplane Dimensions and Areas.
   (1) The section on airplane dimensions and areas provides airplane dimensions and identifies areas of the airplane.

B. Airplane Stations.
   (1) The section on stations provides illustrations to identify reference points on the airplane along a three axis division.

C. Airplane Zoning.
   (1) The section on zoning provides illustrations of all airplane zones.

D. Access Plates/Panels.
   (1) The section on access plates/panels provides numbering of all plates and panels based on specific airplane zones.

3. Description

A. The 310R is an all-metal, low-wing, twin-engine airplane built by the Cessna Aircraft Company of Wichita, Kansas. The airplane is powered by Continental six-cylinder horizontally-opposed engines, (IO-520M on the 310R and TSIO-520B on the Turbo 310R), driving constant-speed, all-metal, full-feathering propellers. A fully retractable, tricycle-type landing gear is provided on the airplane. Electrically operated, split-type wing flaps which can be extended to any angle between zero and 35 degrees are provided. Flight adjustable trim tabs are located on the right elevator, the rudder, and the left aileron.

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DIMENSIONS AND AREAS - DESCRIPTION AND OPERATION

1. Scope

A. This section identifies dimensions and areas of the airplane and airplane components in tabular form. Dimensions are selected for pertinent information of measurements that will aid the operator providing storage, passage through hangar doors, covering isolated areas of the airplane, and building or ordering maintenance stands. The dimensions are expressed in inches, angles are expressed in degrees and minutes, and weight is expressed in pounds. Refer to Figure 1.

2. Principal Dimensions and Specifications

A. Refer to Table 1and Figure 1 for principal dimensions.

Table 1. Specification and Adjustment

GENERAL	
A. Airplane Weight	
(1) Ramp Weight	
(a) 310R1201 Thru 310R2140	5535 Pounds
(2) Gross Weight - Takeoff	
(a) 310 and Turbo 310	5500 Pounds
(3) Landing Weight	
(a) 310 and Turbo 310	5400 Pounds
B. Airplane Dimensions	
(1) Fuselage Length	383.50 Inches
(2) Fuselage Height	125.74 Inches
(3) Wing Span	443.2 Inches
SERVICING	
A. Main Strut Pressure (Airplane On Jacks)	320 PSI
B. Main Strut Extension (On Ground)	3.00 Inches (Approx)
C. Nose Strut Pressure (Airplane On Jacks)	49 PSI
D. Nose Strut Extension (On Ground) (Empty Weight with Full Fuel and Oil)	1.60 Inches (Approx)
E. Main Gear Tire Pressure	60 PSI
F. Nose Gear Tire Pressure	40 PSI
G. Oil Sump Capacity (With Filter)	13 Quarts
H. Fuel	
(1) Approved Grades and Color	100 (formerly 100/130) Grade Aviation Fuel (Green) / Alternate 100LL Grade Aviation Fuel (Blue)
(2) Fuel Capacity (Each Tank)	
(a) Main (Tip) Tank	51 Gallons

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Table 1. Specification and Adjustment (continued)

(b) Auxiliary Tank	20.5 Gallons
(c) Auxiliary	32.0 Gallons
(d) Wing Locker Fuel Tank	20.3 Gallons
I. Windshield Anti-Ice System (Alcohol)	3.0 Gallons
J. Oxygen Cylinder (48.3 Cu. Ft.) (At 70°F)	1800 PSI
K. Oxygen Cylinder (76.6 Cu. Ft.) (At 70°F)	1800 PSI
FLIGHT CONTROLS	
A. Aileron	
(1) Aileron Up Travel	20, +1 or -0 Degrees
(2) Aileron Down Travel	20, +1 or -0 Degrees
(3) Aileron Cable Tension (At 65°F to 95°F)	25, +5 or -5 Pounds
B. Aileron Trim Tab	
(1) Aileron Trim Tab Up Travel	20, +1 or -0 Degrees
(2) Aileron Trim Tab Down Travel	20, +1 or -0 Degrees
(3) Aileron Trim Tab Cable Tension (At 65°F to 95°F)	10, +3 or -3 Pounds
C. Rudder (Measured Perpendicular to Hinge Line)	
(1) Rudder Travel Left	34 Degrees
(2) Rudder Travel Right	34 Degrees
(3) Rudder Cable Tension Forward of Centering Springs (At 65°F to 95°F)	25, +5 or -5 Pounds
(4) Rudder Cable Tension Aft of Centering Springs (At 65°F to 95°F)	45, +5 or -5 Pounds
(5) Nose Wheel Steering Cable Tension (At 65°F to 95°F)	20, +5 or -5 Pounds
D. Rudder Trim Tab (Measured Perpendicular to Hinge Line)	
(1) Rudder Trim Tab Travel Left	25, +1 or -0 Degrees
(2) Rudder Trim Tab Travel Right	20, +1 or -0 Degrees
(3) Rudder Trim Tab Cable Tension (At 65°F to 95°F)	10, +3 or -3 Pounds
E. Yaw Damper	
(1) Yaw Damper Cable Tension (At 65°F to 95°F)	16, +2 or -2 Pounds
F. Elevator	
(1) Elevator Up Travel	16, +1/2 or -0 Degrees
(2) Elevator Down Travel	15, +1 or -0 Degrees
(3) Elevator Cable Tension (At 65°F to 95°F) Aft of Station 132.00	32, +5 or -5 Pounds
G. Elevator Trim Tab	
(1) Elevator Trim Tab Up Travel	10, +1 or -0 Degrees
(2) Elevator Trim Tab Down Travel	26, +1 or -0 Degrees
(3) Elevator Trim Tab Cable Tension (At 65°F to 95°F)	10, +3 or -3 Pounds

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Table 1. Specification and Adjustment (continued)

H. Electric Elevator Trim Tab Control	
(1) Elevator Trim Tab Cable Tension (At 65°F to 95°F)	19, +3 or -3 Pounds
I. Flaps	
(1) Flaps Down Travel	35, +1 or -0 Degrees
(2) Flap Extend Cable Tension	85, +10 or -10 Pounds
(3) Flap Return Cable Tension	225, +25 or -25 Pounds

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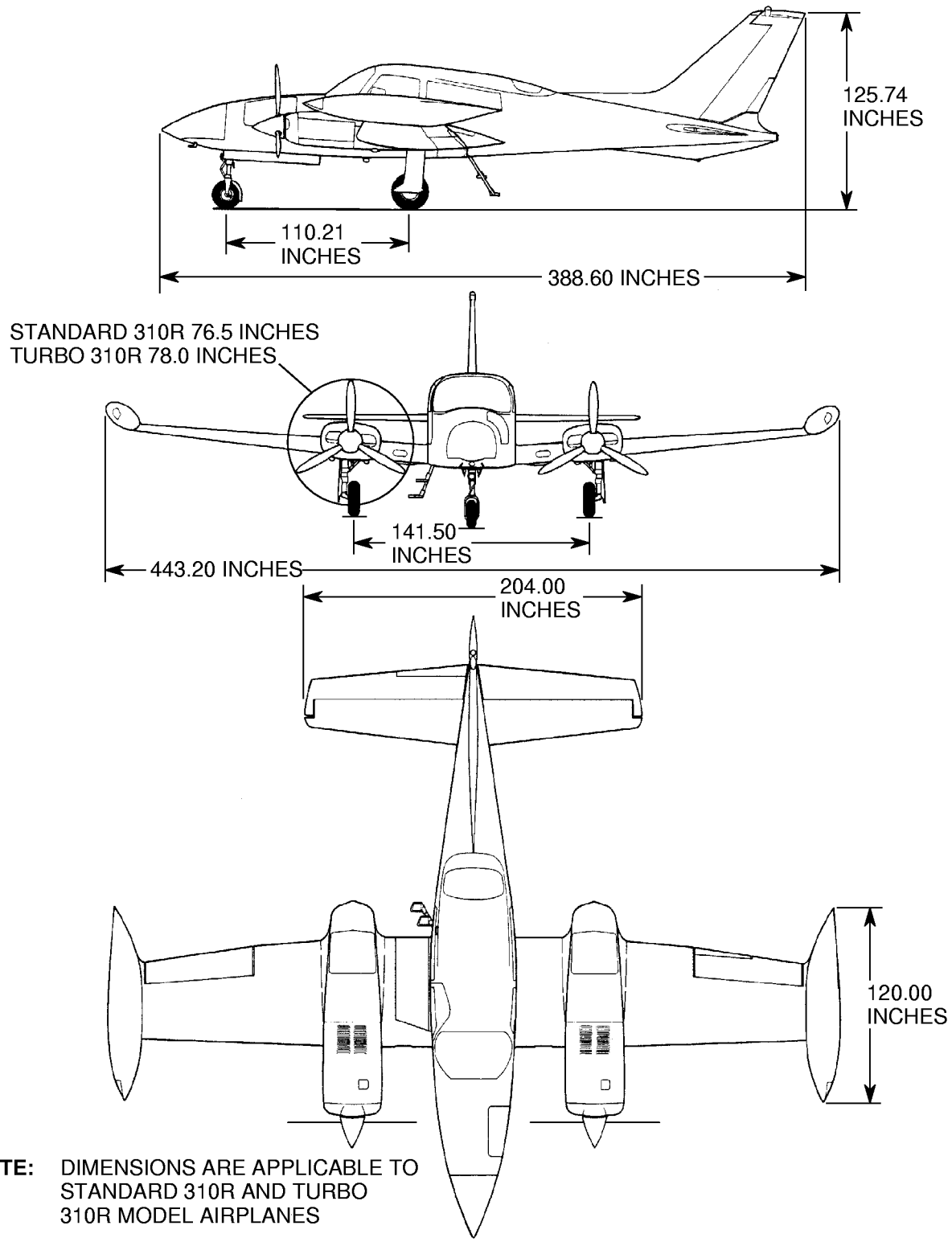

NOTE: DIMENSIONS ARE APPLICABLE TO STANDARD 310R AND TURBO 310R MODEL AIRPLANES

Airplane Dimensions
Figure 1 (Sheet 1)

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3. Access and Inspection Provisions

A. Access for periodic adjustment, lubrication, or inspection of certain parts of the airplane is gained by removing access hole covers or panels adjacent to the items affected. Access to the interior of aft fuselage is gained through the baggage compartment. To enter aft fuselage, remove the rear baggage compartment tailcone access cover.

CAUTION: Before entering aft fuselage, be sure rear section of the fuselage is supported. If you do not support the aft fuselage, the airplane can tip backward, causing damage to the airplane.

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AIRPLANE STATIONS - DESCRIPTION AND OPERATION

1. General

A. The airplane is laid out according to fuselage stations (FS) and wing stations (WS). These stations provide fixed reference points for all components located on or within the airplane. Fuselage Stations begin at the firewall (FS 0.00) and extend to the tailcone area (FS 234.00). Wing Stations begin at the root (WS 29.15) and extend to the tip (WS 199.92). Both Fuselage Stations and Wing Stations are measured in inches. For example, FS 189.10 is 189.10 inches aft of the firewall (FS 0.00).

B. For an illustration of Fuselage and Stations, refer to Figure 1.

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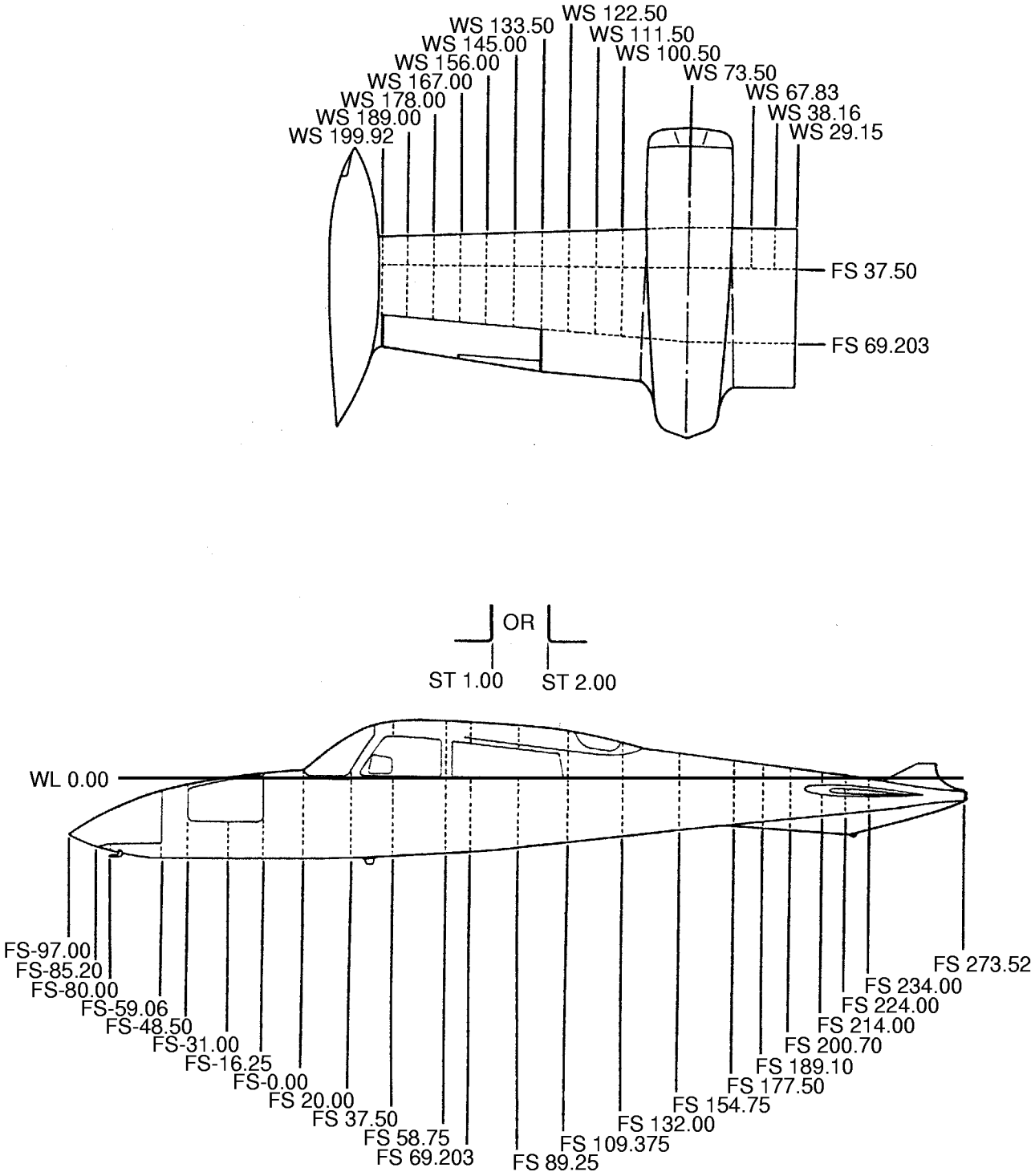

FUSELAGE STATIONS

NOTE: FUSELAGE STATIONS ARE MEASURED TO SURFACE OF BULKHEAD WEB UNLESS NOTED.

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Fuselage, Wing, and Empennage Stations
Figure 1 (Sheet 1)

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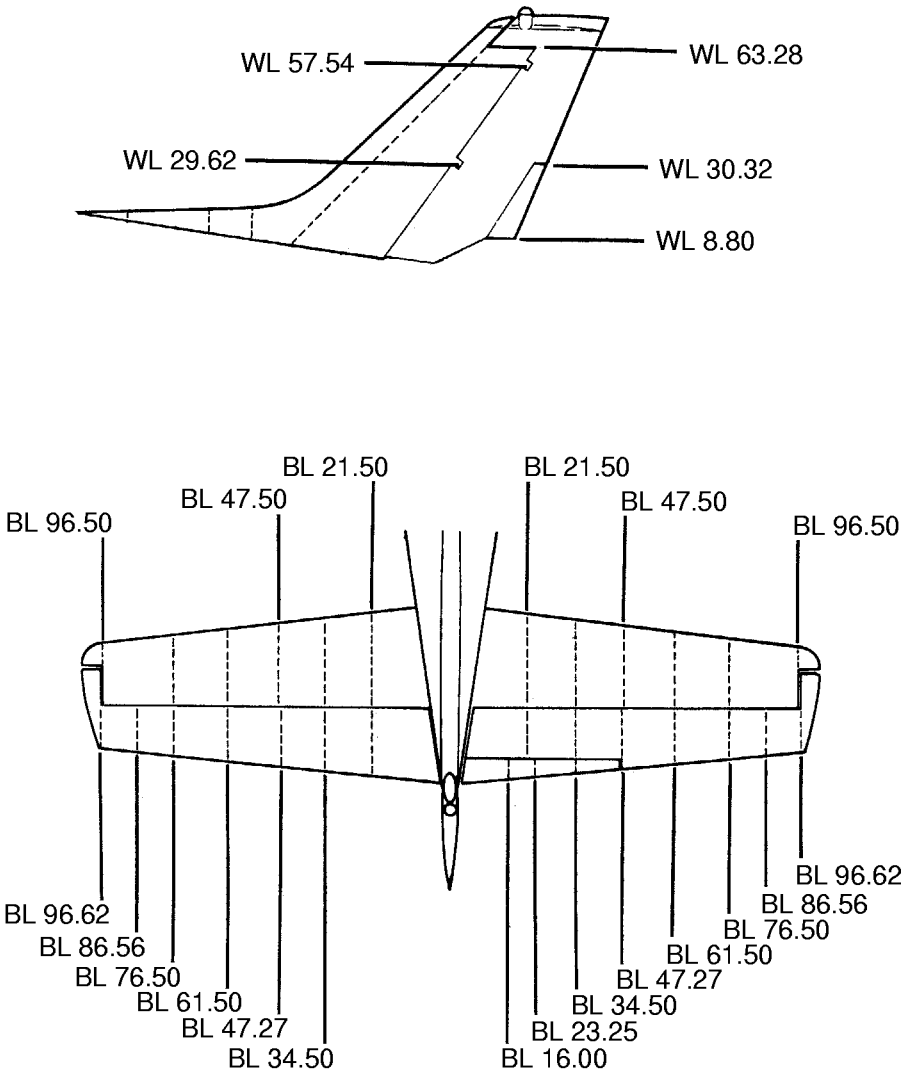

10103006

Fuselage, Wing, and Empennage Stations
Figure 1 (Sheet 2)

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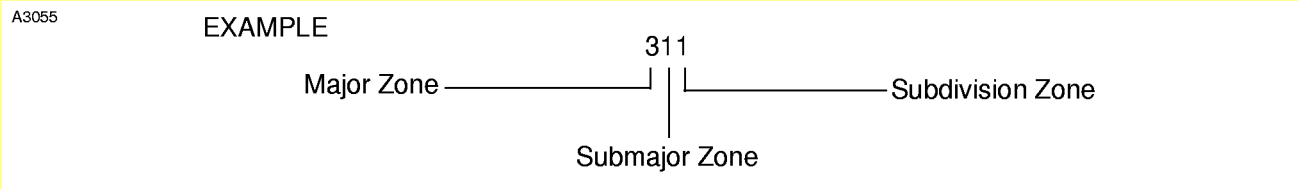
AIRPLANE ZONING - DESCRIPTION AND OPERATION

1. General

A. The Model 310R is divided into numbered zones to provide a method for locating components. The zones are identified by a three-digit number as shown in the example below. Each digit designates a zone category: major, submajor or subdivision.



B. Major Zones.
(1) 100 - Forward nose area.
(2) 200 - FS - to FS .
(3) 300 - FS to FS .
(4) 400 - Nacelle area forward of firewall.
(5) 500 - Left wing.
(6) 600 - Right wing.
(7) 700 - Landing gear and landing gear doors.

2. Description

A. Airplane zones may be utilized for location of work areas and components prior to beginning maintenance or service tasks on the airplane. Airplane zones are used in this manual to locate items such as placards and markings displayed on interior and exterior surfaces of the airplane. For a breakdown of the airplane zones, refer to Figure 1.

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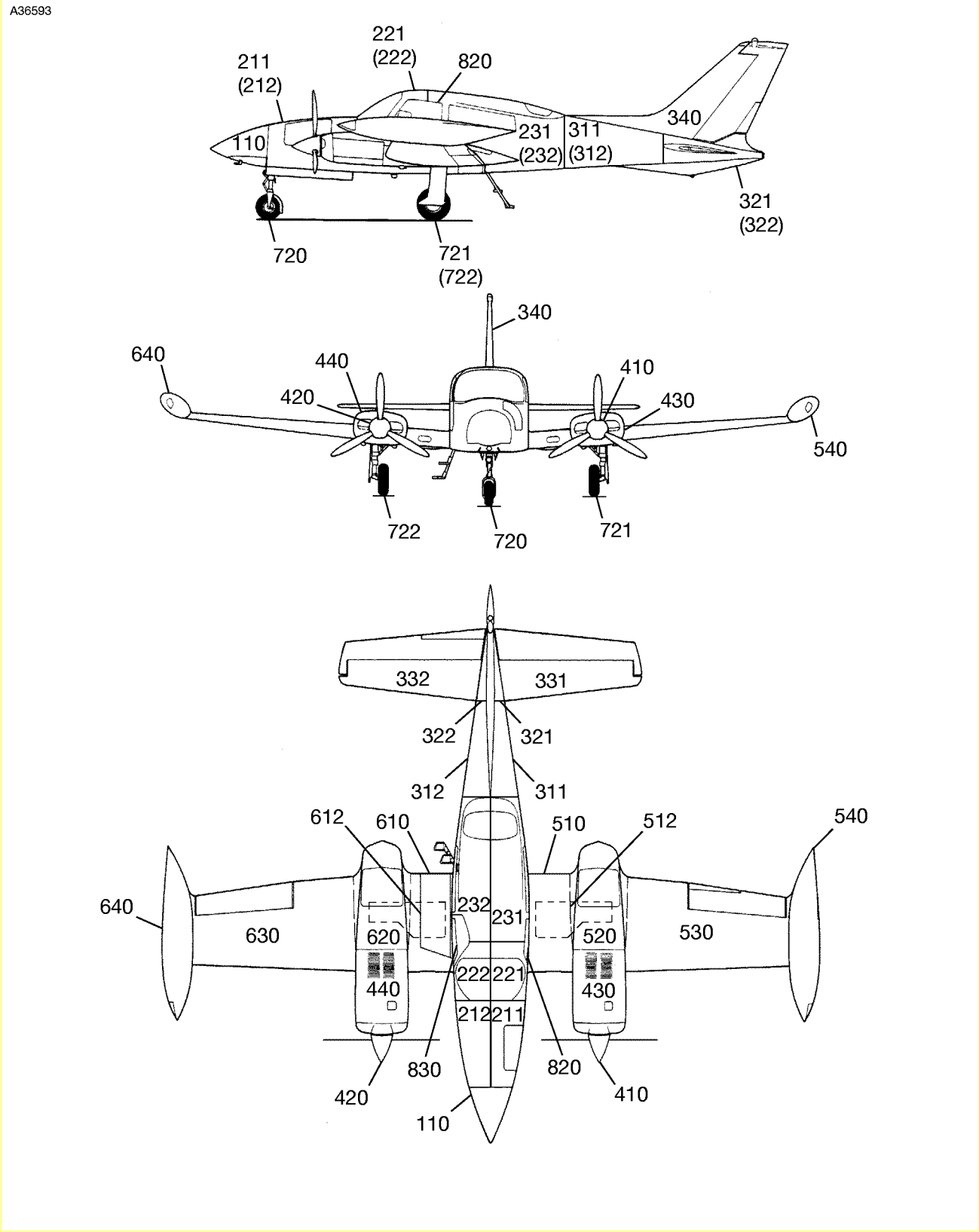

Airplane Zones
Figure 1 (Sheet 1)

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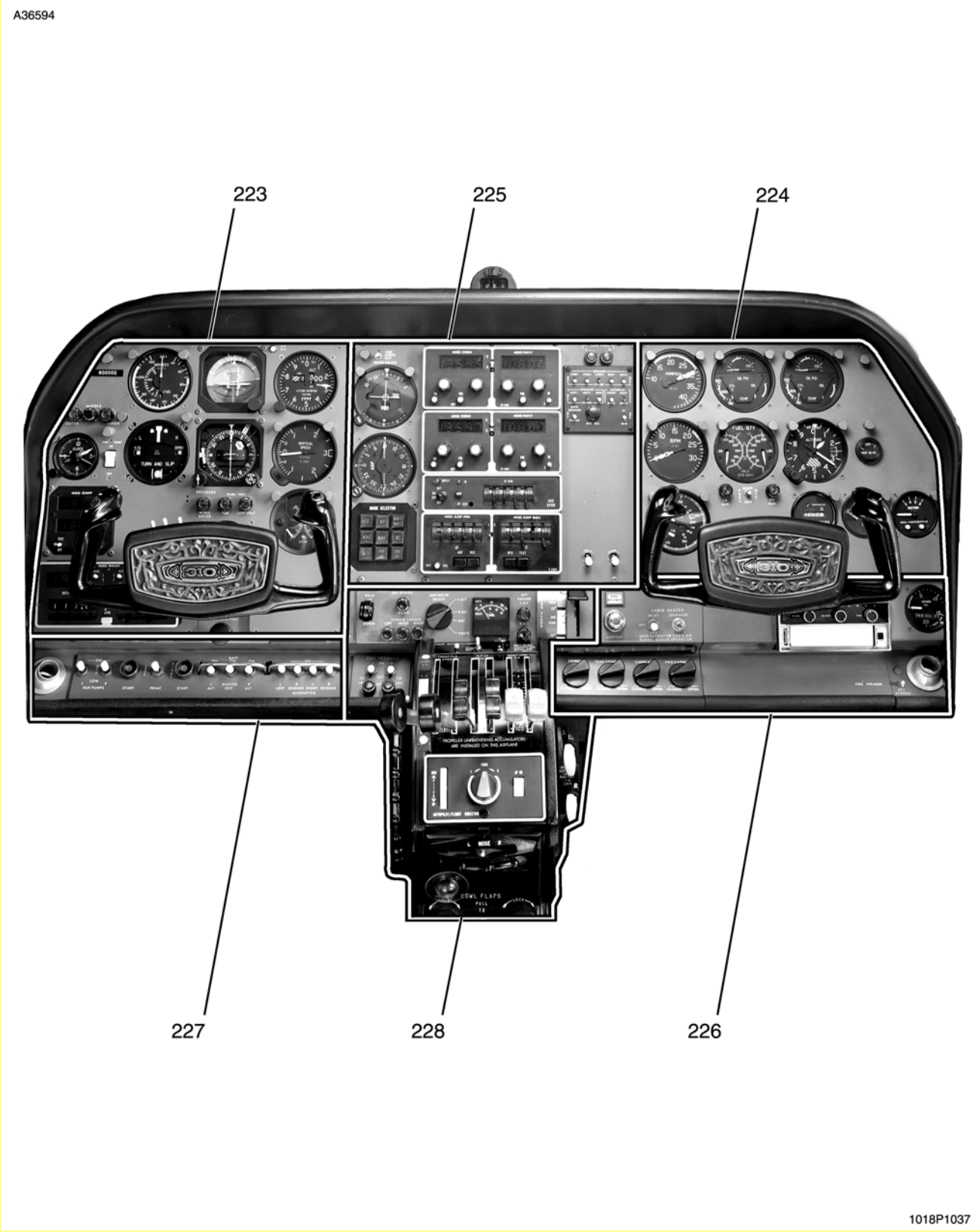

Airplane Zones
Figure 1 (Sheet 2)

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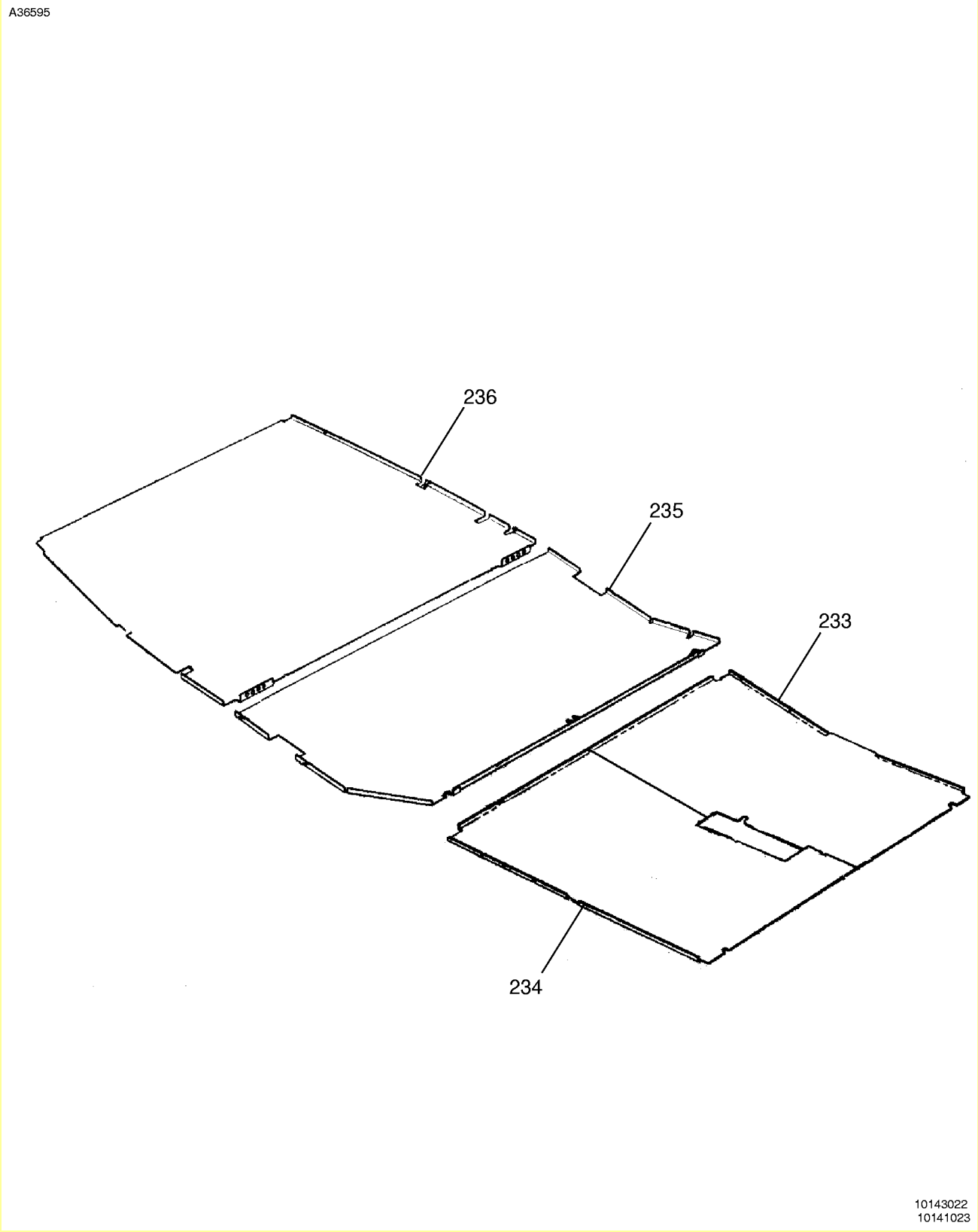

Airplane Zones
Figure 1 (Sheet 3)

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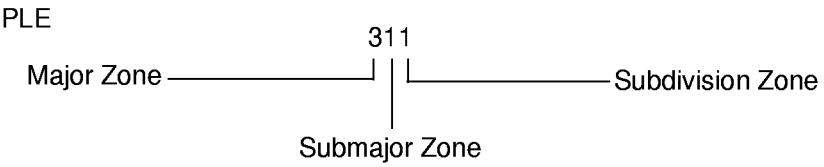
AIRPLANE ZONING - DESCRIPTION AND OPERATION

1. General

A. The Model 310R is divided into numbered zones to provide a method for locating components. The zones are identified by a three-digit number as shown in the example below. Each digit designates a zone category: major, submajor or subdivision.

A3055



B. Major Zones.
(1) 100 - Forward nose area.
(2) 200 - FS - to FS .
(3) 300 - FS to FS .
(4) 400 - Nacelle area forward of firewall.
(5) 500 - Left wing.
(6) 600 - Right wing.
(7) 700 - Landing gear and landing gear doors.

2. Description

A. Airplane zones may be utilized for location of work areas and components prior to beginning maintenance or service tasks on the airplane. Airplane zones are used in this manual to locate items such as placards and markings displayed on interior and exterior surfaces of the airplane. For a breakdown of the airplane zones, refer to Figure 1.

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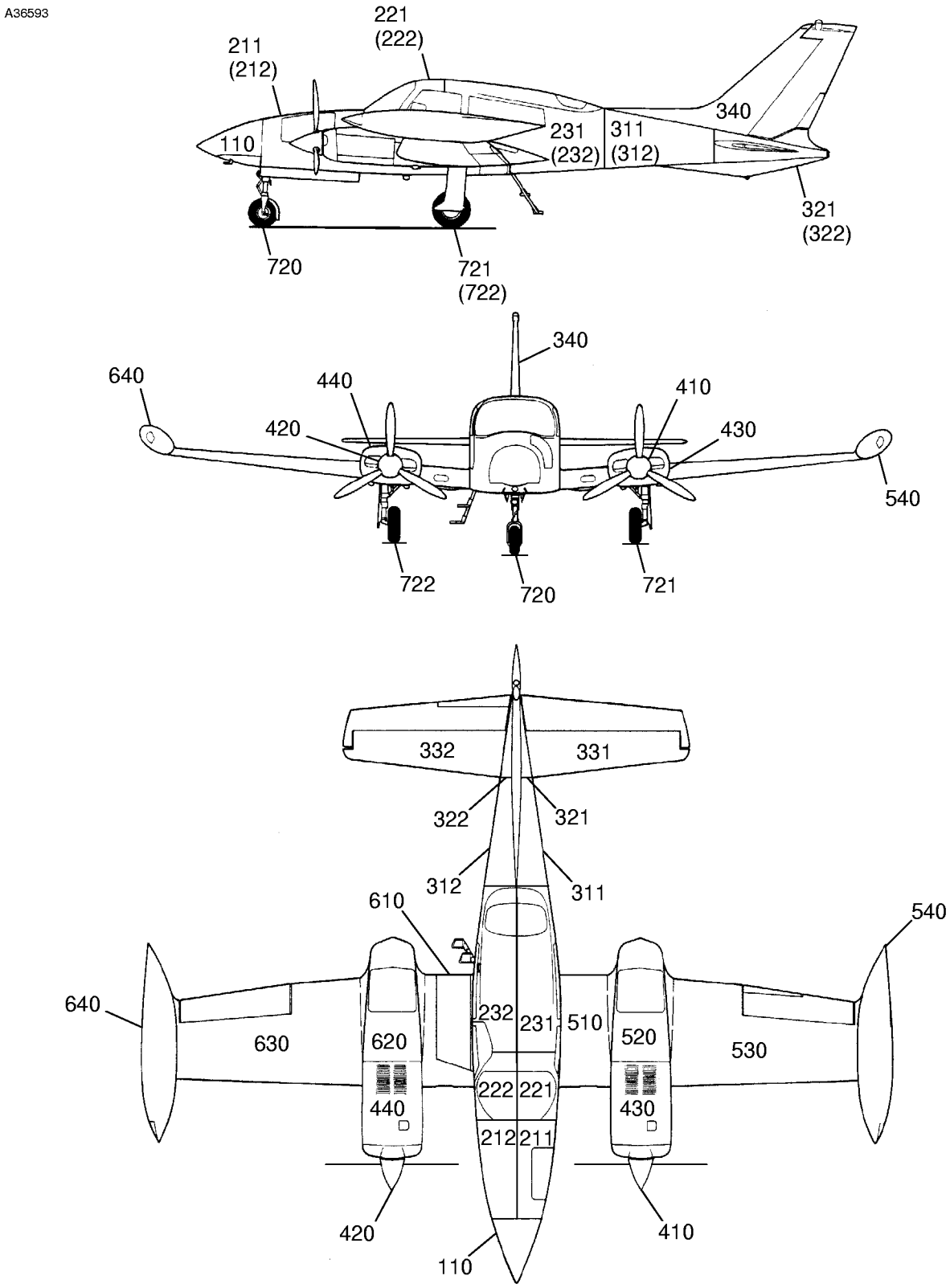

Airplane Zones
Figure 1 (Sheet 1)

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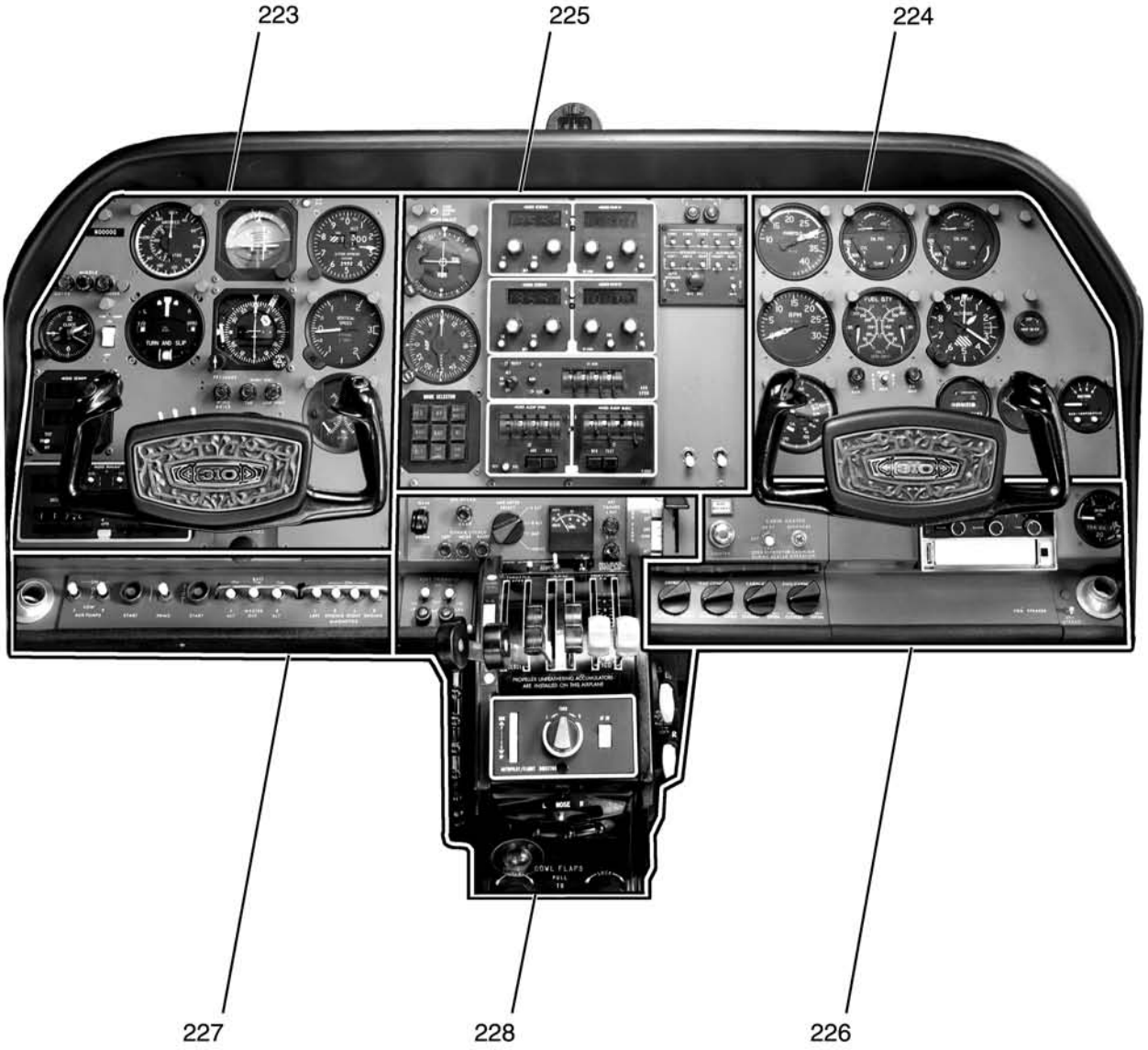

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Airplane Zones
Figure 1 (Sheet 2)

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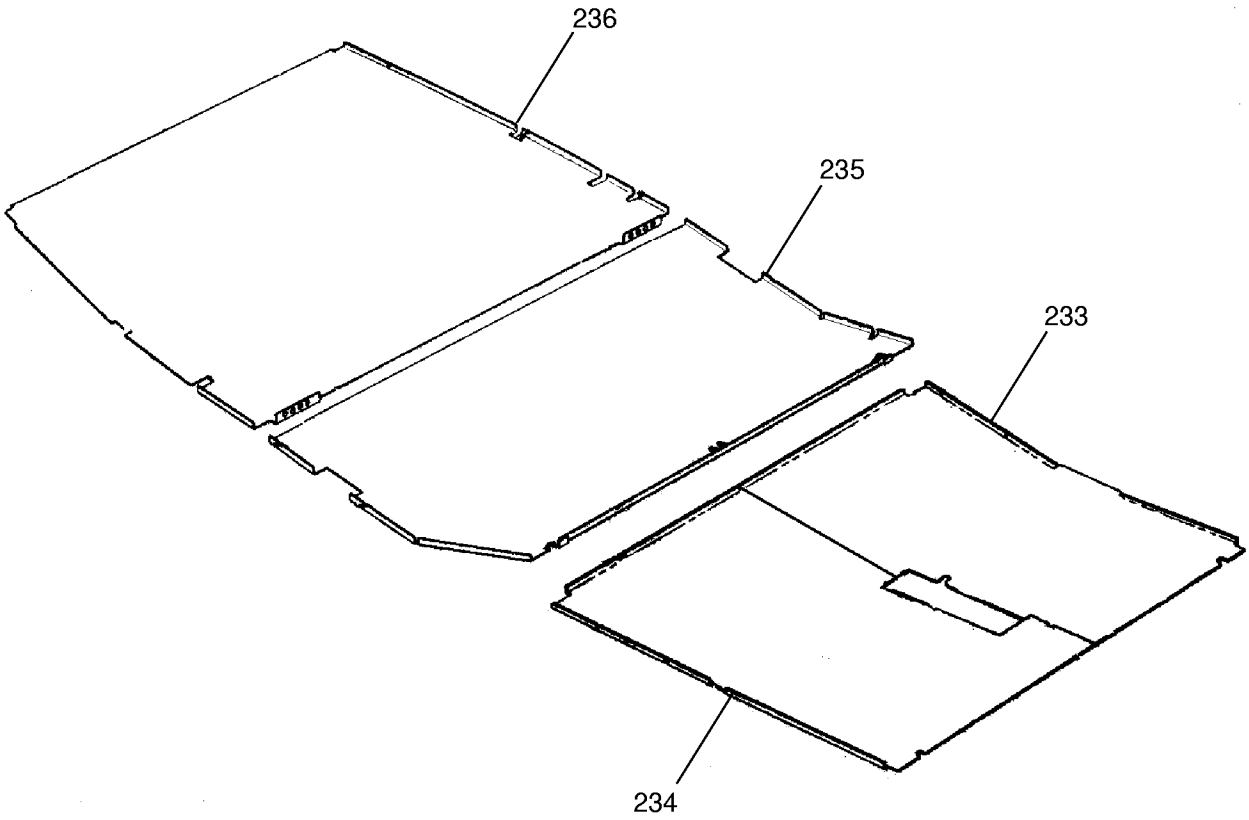

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Airplane Zones
Figure 1 (Sheet 3)

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ACCESS PLATES AND PANELS IDENTIFICATION - DESCRIPTION AND OPERATION

1. General

A. The airplane access plates are plates that cover holes that are small in size. Access panels are panels that cover access areas that are of larger size in comparison with access plates. Any access cover having a hinge is identified as a door regardless of the size.

2. Description

A. Access for periodic adjustment, lubrication, or inspection of certain parts of the airplane is gained by removing access hole covers adjacent to the items affected. Access to the interior of aft fuselage is gained through the baggage compartment door. To enter aft fuselage, remove the rear baggage compartment curtain assembly by releasing the attaching Dzus fasteners and screws.

NOTE: Access doors are provided for various purposes. Refer to Chapter 52, Doors - General for location of access doors.

CAUTION: Before entering aft fuselage, be sure rear section of the fuselage is supported. Failure to support aft fuselage may result in the aircraft tipping backward, causing damage to the aircraft.

B. Plates
(1) The location of the access plates on the surface of each wing (Refer to Table 1 and Figure 1). The location of the access plates on the surface of the fuselage and the empennage (Refer to Table 2 and Figure 2). The location of the access plates on the cockpit and cabin floorboard areas (Refer to Table 3 and Figure 3).

C. Panels
(1) The location of access panels on the surface of each wing (Refer to Table 1 and Figure 1). The location of access panels on the surface of the fuselage and empennage (Refer to Table 2 and Figure 2). The location of access panels on the cockpit and cabin floorboard areas (Refer to Table 3 and Figure 3).

3. Access Plates and Panel Identification

A. All access plates and panels are identified using a series of numbers and letters which identifies the zone, the exact panel identifier and location in the zone. (Refer to Example).
(1) Zones are identified by a three-number sequence. This three-number sequence is designated in Airplane Zoning - Description and Operation.
(2) Primary identifiers follow the three-number sequence, with the first plate/panel identified as “A,” the second plate/panel identified as “B” and so on.
(3) Locators follow the primary identifier and identify the top, bottom, left, right or internal orientation of the plate/panel. The second suffix letter identifies the plate, panel or door in its relation to the airplane such as top, bottom, left, right or internal.

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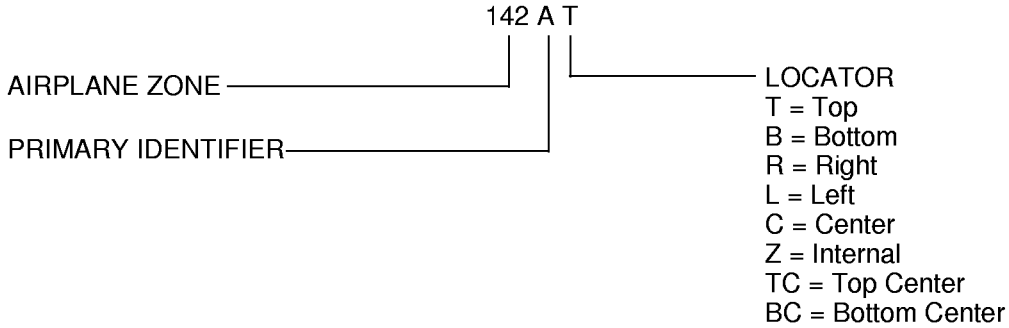

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B. In the following example, access plate 142AT supplies the following information:
(1) Zone Location (142).
(2) The first panel in the zone (panel A).
(3) Orientation of the panel (T for Top).

Table 1. Wing Access Plates/Panels Identification Callouts (Refer to Figure 1).

Identification	Description
Left Wing	
430AB	Oil Sump Drain Access
510AZ	Flap Cable Access
510BZ	Flap Cable Access
510AB	Engine Controls and Fuel Line Access
510BB	Heater Fuel Solenoid and Filter Access
510CB	Vacuum Access
510DB	Main Gear Door Access
520AB	Bottom Surface of Engine Nacelle Access
520BB	Fuel Signal Conditioner Access (310R0501 Thru 310R2140)
530AB	Fuel Line Access
530BB	Fuel Strainer and Selector Valve Access
530CB	Fuel Line Access
530DB	Fuel Line Clamp Access
530EB	Fuel Line Clamp Access
530FB	Tie Down Ring Access
530GB	Leading Edge Access
530HB	Fuel Line Access
530IB	Fuel Line Access
530JB	Aileron Trim Pulley Access
530KB	Outboard Flap Access
530LB	Aileron Cable Stops
530MB	Fuel Signal Conditioner Access (310R0001 Thru 310R0500)
530AT	Auxiliary Fuel Cell Access
530BT	Fuel Selector Valve Access
530CT	Battery Access
530DT	Aileron Bell Crank And Trim Actuator Access
Right Wing	
440AB	Oil Sump Drain Access
610AZ	Flap Cable Access

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Table 1. Wing Access Plates/Panels Identification Callouts (Refer to Figure 1). (continued)

Identification	Description
610BZ	Flap Cable Access
610AB	Engine Controls and Fuel Line Access
610BB	Heater Fuel Solenoid and Filter Access
610CB	Vacuum Access
610DB	Main Gear Door Access
620AB	Bottom Surface of Engine Nacelle Access
620BB	Fuel Signal Conditioner Access (310R0501 Thru 310R2140)
630AB	Fuel Line Access
630BB	Fuel Strainer and Selector Valve Access
630CB	Fuel Line Access
630DB	Fuel Line Clamp Access
630EB	Fuel Line Clamp Access
630FB	Tie Down Ring Access
630GB	Leading Edge Access
630HB	Fuel Line Access
630IB	Fuel Line Access
630JB	Aileron Bell Crank Access
630KB	Outboard Flap Access
630LB	Aileron Cable Stops
630MB	Fuel Signal Conditioner Access (310R0001 Thru 310R0500)
630AT	Auxiliary Fuel Cell Access
630BT	Fuel Selector Valve Access
630CT	Fuel Sensor Unit Access
630DT	Aileron Bell Crank Access

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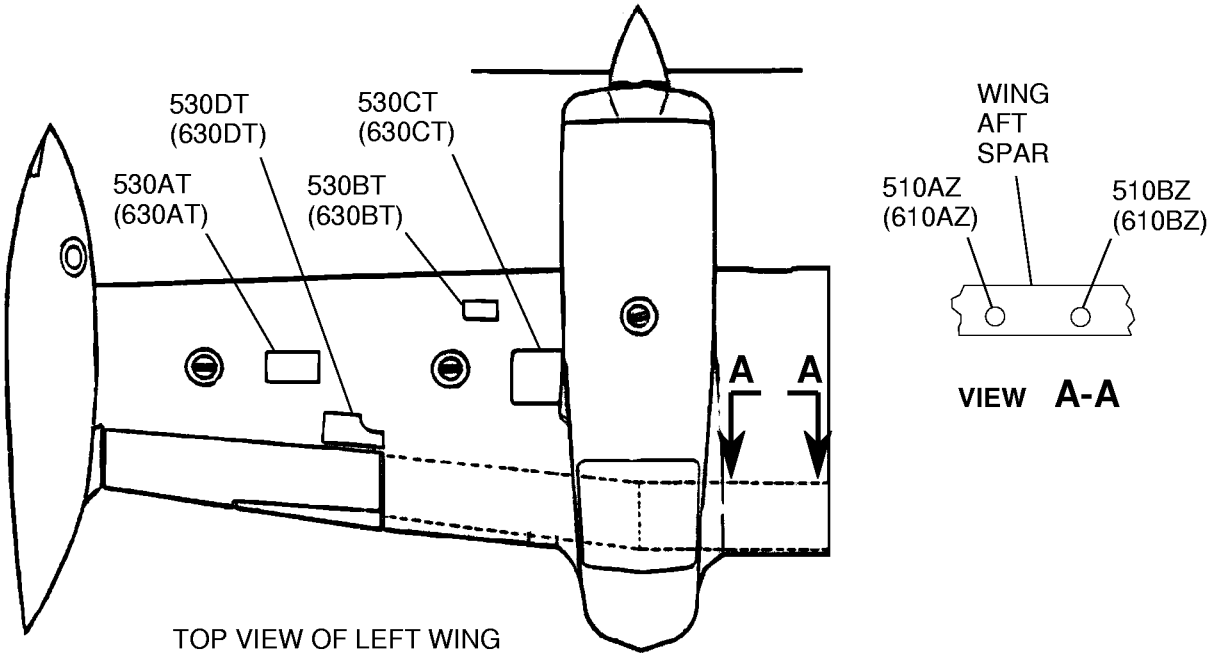

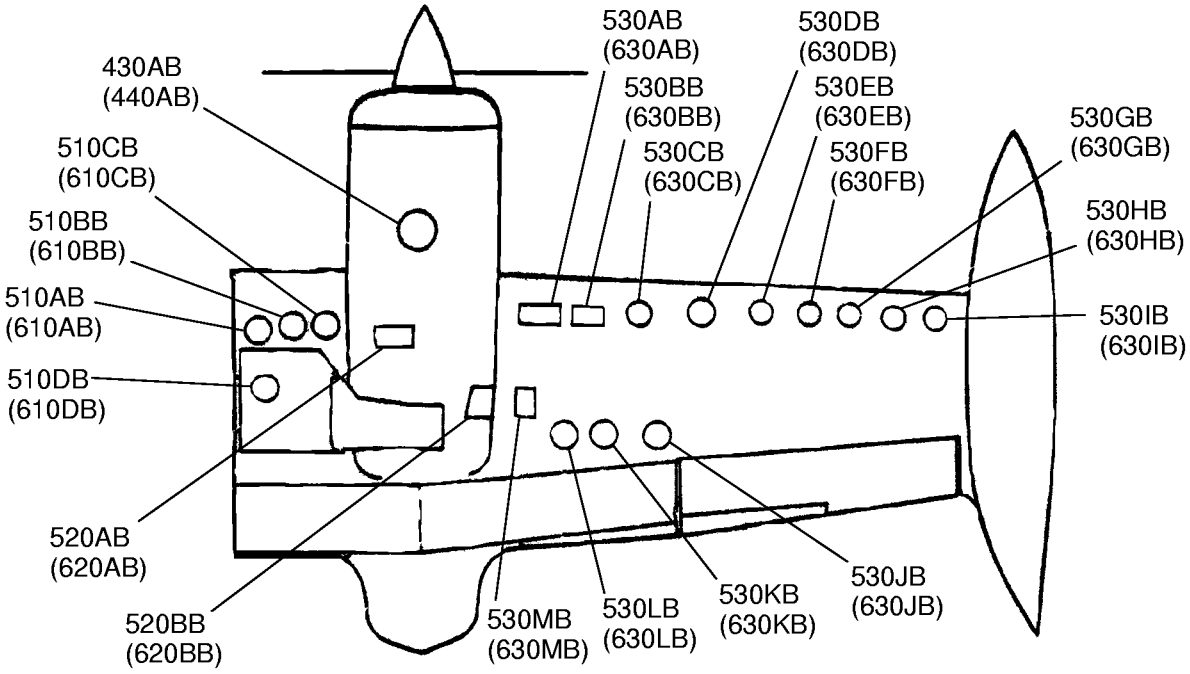

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Wing Access Plates/Panels Identification
Figure 1 (Sheet 1)

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Table 2. Fuselage and Empennage Access Plate/Panel Identification Callouts (Refer to Figure 2).

Identification	Description
221AB	Brake Master Cylinder Access
222AB	Control Cable Access
231AB	Lower Spar cap Access
231BB	Nose Gear Bell Crank Access
232AB	Lower Spar Cap Access
232BB	Flap Motor Access
321AB	Elevator Bell Crank Access
332AB	Elevator Trim Access
340AL	Rudder Trim Access

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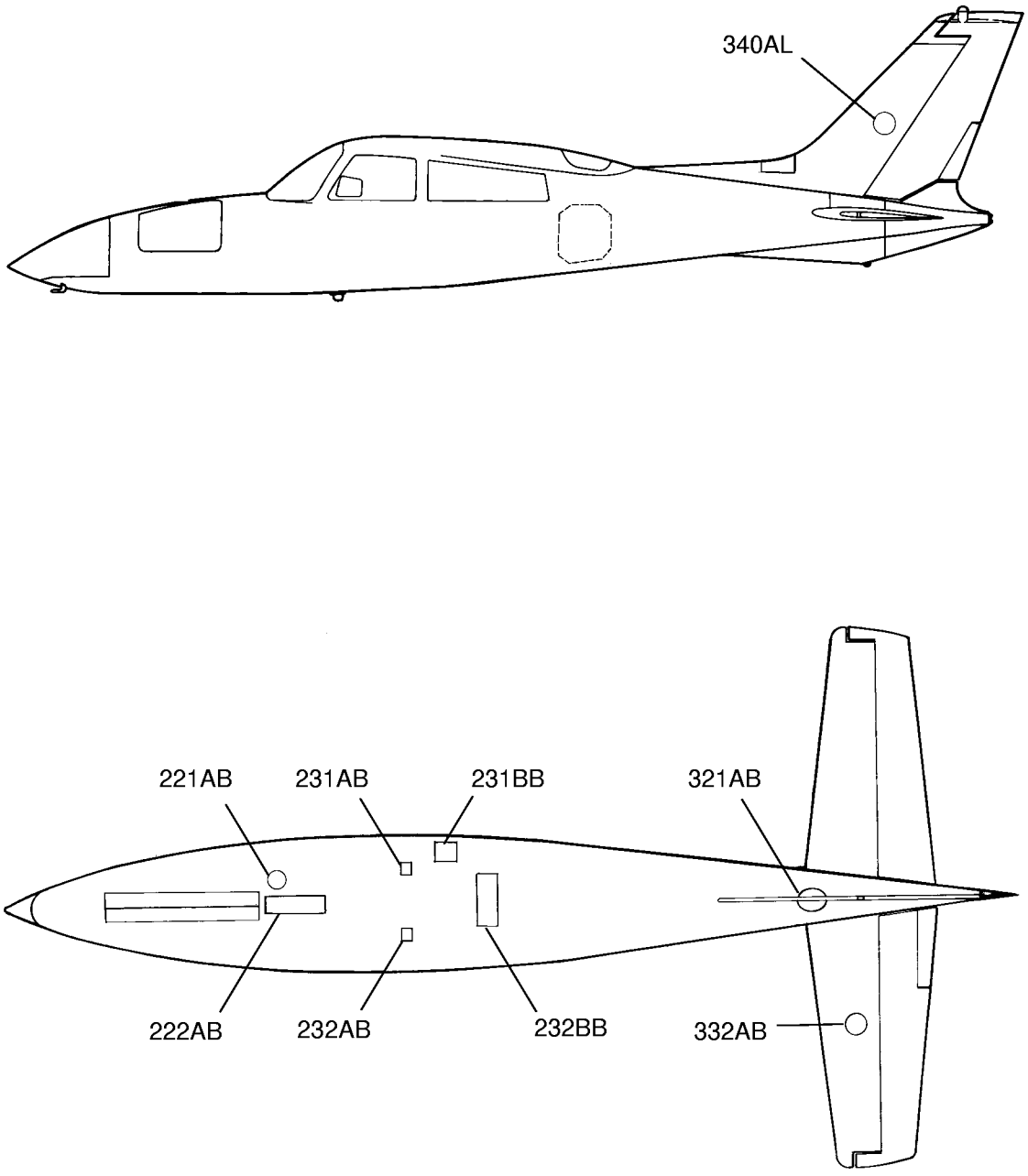

Empennage Access Plates/Panels Identification
Figure 2 (Sheet 1)

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Table 3. Cockpit and Cabin Floorboard Access Plates/Panels Callouts (Refer to Figure 3).

Identification	Description
233AT	De-Ice Line Access
233BT	De-Ice Line Access
233CT	Brake Line Access
233DT	Aileron Cable Access
234AT	Rudder Cable Access
234BT	Selector Valve Control Access
234CT	Selector Valve Control Access
234DT	Elevator Bell Crank Access
235AC	Flap Motor Access
235AT	Interspar Floorboard (Aft)
235BT	Langing Gear Motor Access
235CT	Interspar Floorboard (Forward)
235DT	Interspar Floorboard (Aft)
236AT	Center Floorboard (AFT) Control Cable Access
236BT	Center Floorboard (FWD) Control Cable Access
236CT	Retractable Step Access

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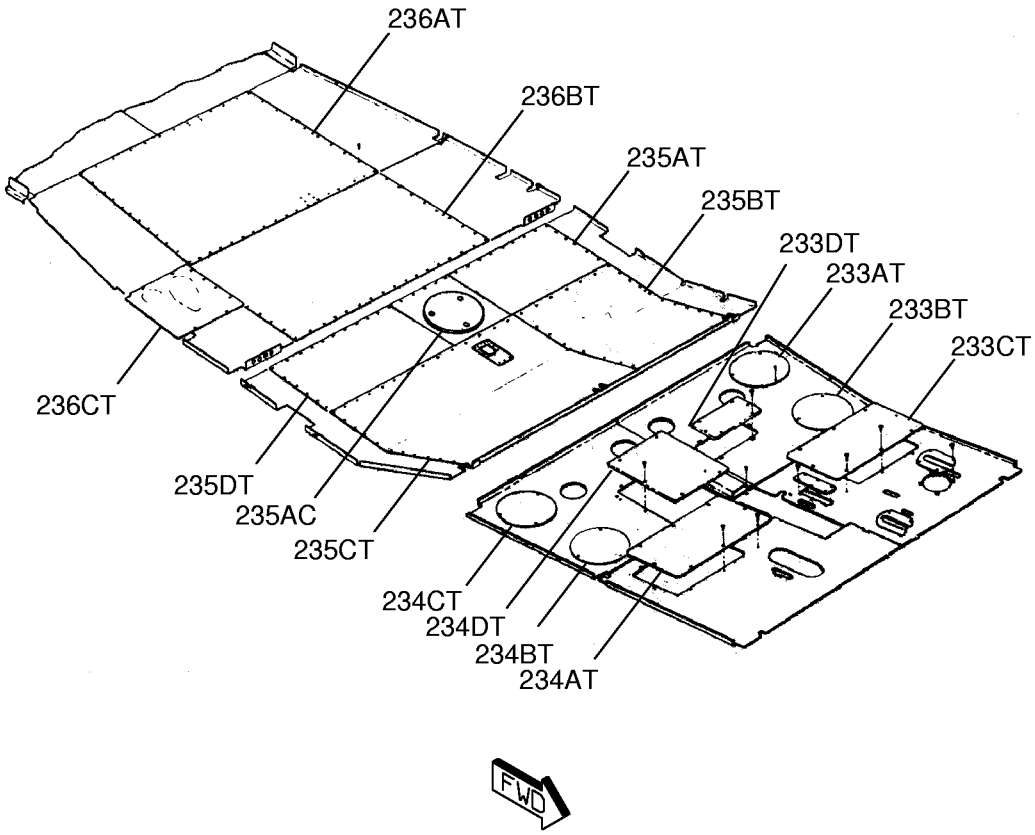

10143022
10141023

Fuselage Access Plates/Panels Identification
Figure 3 (Sheet 1)

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CHAPTER

7

LIFTING AND SHORING

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LIFTING AND SHORING - GENERAL

1. Scope

A. This chapter describes the necessary procedures to lift and shore the airplane in any of the conditions to which it may be subjected.

2. Definition

A. This chapter consists of one section to aid maintenance personnel in locating information. Following is a brief description of this section.
   (1) Jacking provides information about the jack points utilized during airplane maintenance and repair.
   (2) Shoring provides information necessary to support the airplane during maintenance and repair.

3. Description

A. The entire airplane may be lifted at wing and nose jack points to perform landing gear tests, removal and installation of main and nose gear, and major repairs. All three jacks must be used when jacking the airplane. The airplane may be lifted with full fuel tanks.

B. When possible, the airplane should be on a level surface when jacking. The jacking site should be protected from the wind preferably inside a hangar.

4. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Tripod Jack	2-170	Cessna Aircraft Co.	To jack airplane.
Hydraulic Jack	J930	Walker Mfg. Co. Racine, Wisc.	To jack airplane.

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LIFTING AND SHORING - MAINTENANCE PRACTICES

1. Hoisting

A. The 310 may be lifted by four hoisting lugs and a sling. These may be fabricated from any suitable material capable of sustaining a 5500 pound load. Each lug may be attached to the upper bolt which secures the front wing spar to the fuselage spar, and the upper bolt at the rear wing spar attaching point. Access to the wing spar bolts is gained by removing the wing fillet between the fuselage and each wing. Each lug may be temporarily attached to the upper bolt on each wing for hoisting purposes only. The forward spar bolts are located directly in line with the airplane center of gravity, so the sling should be positioned accordingly. Position a man at both the nose gear and the tail cone section of the airplane to assure that it stays level while hoisting.

NOTE: After removing lugs, torque front spar nuts to 60 foot-pounds, +5 or -5 foot-pounds, and rear spar nuts to 175 inch-pounds, +15 or -15 inch-pounds.

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JACKING - DESCRIPTION AND OPERATION

1. Jacking

A. Jacking Three Wheels (Refer to Figure 1).

NOTE: All jack points must be used whenever the airplane is to be raised from the ground.

(1) Ensure Static Ground wire is connected to airplane.

NOTE: Airplanes incorporating a flight hour recorder, remove the flight hour recorder fuse, located behind the circuit breaker panel to deactivate the flight hour recorder when maintenance requires the battery switch to be ON.

(2) Position jack beneath each jack pad.
(3) Ensure that jack cylinders are vertical at start of jacking operation to prevent side loads and possible gear strut binding.
(4) Simultaneously raise wing and fuselage jacks. Keep airplane level until tires are clear of ground. Maintain follower nut of each jack against jack shoulder.

CAUTION: Position padded stand under tailcone for added safety precaution.

NOTE: Raise tires no more than required for the maintenance being performed.

(5) Remove padded tail stand from under tailcone.
(6) Loosen jack follower nuts; lower fuselage and wing jacks simultaneously.
(7) Remove jacks.
(8) If flight hour recorder is incorporated; install fuse.

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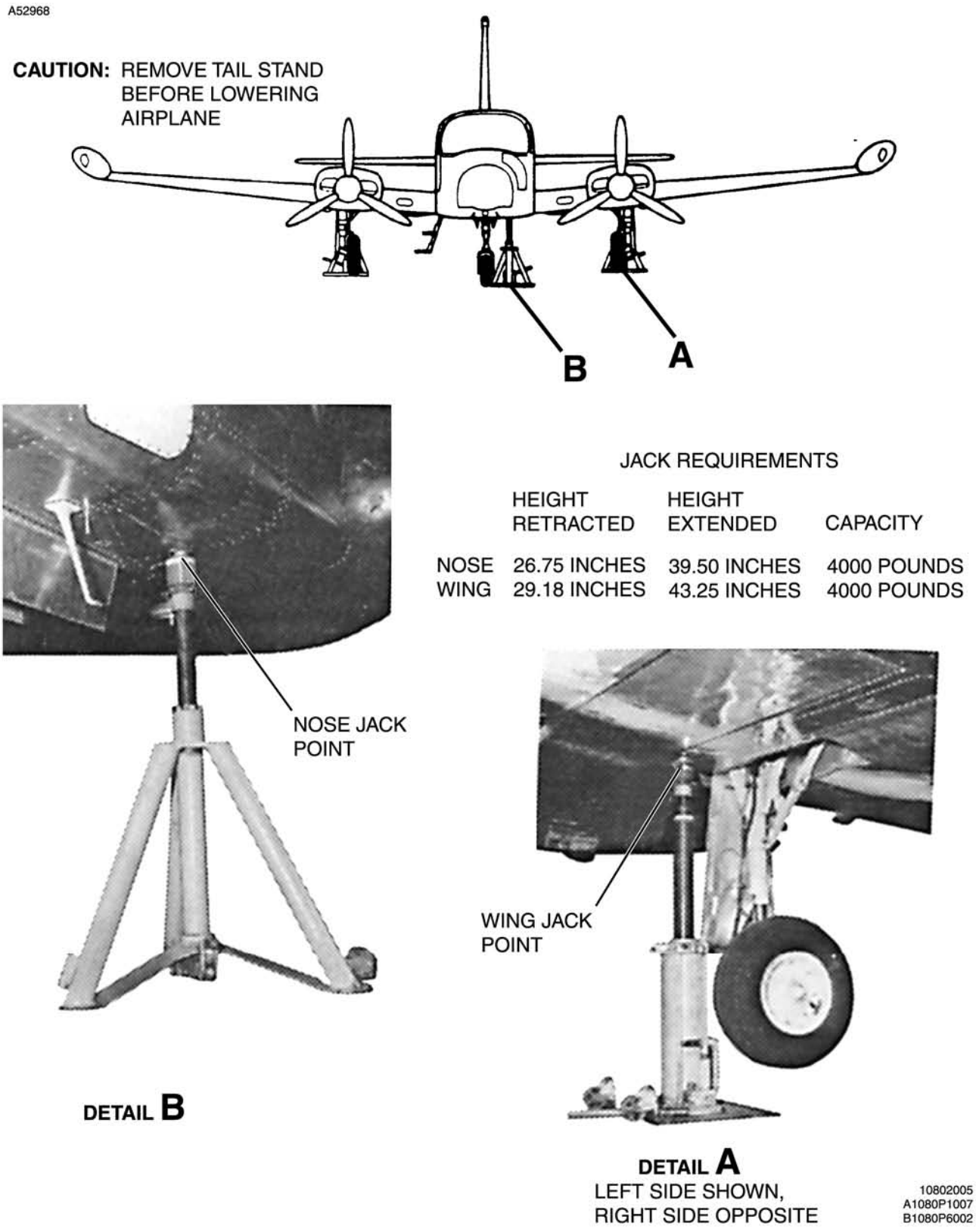

Jacking Points
Figure 1 (Sheet 1)

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JACKING - DESCRIPTION AND OPERATION

1. Shoring

A. Shoring the airplane is accomplished by using contour boards. The boards can be fabricated locally from 1" thick plywood by placing two pieces side by side and contouring to fit the lower surface of the wing and fuselage. The contour boards should be padded with 1/2 inch felt and covered with canvass duct tape.

B. Fuselage and wing jacks should be used in conjunction with wing and fuselage shoring.

C. Contour shoring may be used at the following locations.

Wing Stations	Fuselage Stations
Left and Right W.S. 29.15	F.S. 20.00
Left and Right W.S. 57.50	F.S. 37.50
Left and Right W.S. 89.50	F.S. 69.203
	F.S. 109.375
	F.S. 154.75

D. In some instances, it may be necessary to use a sling to raise the airplane. When using a sling, proceed as follows:
   (1) Fabricate sling from any suitable material capable of sustaining a 5500 pound load. Attach a hoisting lug to the sling. The lug attaches to the upper bolt which secures the front wing spar to the fuselage spar.
   (2) Access to the wing spar bolts is gained by removing the wing fillet between the fuselage and wing.
   (3) Each lug may be temporarily attached to the upper bolt on each wing for hoisting purposes only.
   (4) The forward spar bolts are located directly in line with the airplane center of gravity, so the sling should be positioned accordingly.
   (5) Position a man at both the nose and tail section of the airplane to assure it stays in a level position while hoisting.

NOTE: After removing lugs, torque front spar nuts to 60 foot-pounds, +5 or -5 foot-pounds, and rear spar nuts to 175 inch-pounds, +15 or -15 inch-pounds.

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CHAPTER 8

LEVELING AND WEIGHING

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LEVELING And WEIGHING - GENERAL

1. Scope

A. This chapter details the airplane leveling and weighing procedures.

2. Definition

A. This chapter consists of two sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Weighing and Balancing provides illustrations with instructions and formulas for weighing and balancing the airplane.
   (2) Leveling provides information relative to those units or components dedicated to the specific function of leveling the airplane.

3. Description

A. Weighing is accomplished by placing airplane on electronic type scales placed at each jacking point or using platform scales under each main and the nose wheel tires.

4. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Spirit Level	Commercially Available	Purchase Locally 18" length minimum	Level airplane.
Tripod Jack	2-170	Cessna Aircraft Co.	To jack airplane.
Hydraulic Jack	J930	Walker Mfg. Co. Racine, Wisc.	To jack airplane.
Scales	Commercially Available		Weigh airplane.
Chocks	Commercially Available		

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WEIGHING AND MEASURING - MAINTENANCE PRACTICES

1. Weighing

A. Airplane Weighing Procedures.
(1) Airplanes 310R0001 thru 310R0330, refer to the following weighing procedures.
(2) Airplanes 310R0501 thru 310R2140, refer to Section 6 of the Pilots Operating Handbook and FAA approved airplane flight manual for weighing procedures.

B. Preparation for Weighing.
(1) Wing flaps shall be fully retracted and all other control surfaces shall be in neutral.
(2) Service engine oil as required to obtain a normal full indication.
(3) Check landing gear down and parking brake released.
(4) Remove all equipment and items not to be included in basic empty weight.
(5) Adjust all seats to the normal operating position.
(6) Close all baggage doors, main cabin door, and emergency exit window.
(7) Clean the airplane inside and out.
(8) Remove all snow, ice, or water which may be on the airplane.
(9) Weigh the airplane in a closed hangar to avoid errors caused by air currents.
(10) Defuel the airplane in accordance with the following steps.

WARNING: Conduct all defueling operations at a safe distance from other airplanes and buildings. Fire fighting equipment must be readily available. Attach two ground wires from different points on the airplane to separate approved grounding stakes. The use of two ground wires will prevent ungrounding of the airplane due to accidental disconnecting of either wire.

(a) Turn off all electrical power.
(b) Turn fuel selectors OFF.
(c) Remove fuel filler caps and remove as much fuel as possible through the fuel filler by using a defueling pump.
(d) Drain the remaining fuel through the drain valves into an approved container.
1 The main tanks are drained by opening the drain valve on the bottom of each tank. The main tank fuel lines are drained by removing two fuel sump drain valves located on the left wing gap fairing. The right and left fuel selector valves are drained forward of the main spar on the outboard side of each nacelle.
2 Each auxiliary tank is drained through the drain valve located outboard of each nacelle and forward of the rear spar. The wing locker fuel tanks are drained by opening a drain valve located on the lower surface of the wing, inboard of the respective engine nacelle. Each wing locker fuel transfer line is drained by opening the drain valve located in the wing leading edge lower surface outboard of the respective nacelle.
3 Each drain should remain open until the defueling rate slows to approximately 1 drop per second.
(e) The fuel remaining on-board after defueling is residual fuel and is included in the basic empty weight.
(f) Drainable unusable fuel must be added after the weighing to obtain basic empty weight. Table 201 includes the weight and moment necessary to add the drainable unusable fuel.

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Table 201. Basic Empty Weight and Center of Gravity Table

		Weight - Pounds	CG Arm - Inches	Moment (Inch-Pounds/100)
Fuel Tank				
Drainable Unusuable Fuel At 6 Pounds Per Gallon	Left and right Main Tip	12.0	44.0	5.3
	Left and Right Wing Auxiliary	6.0	47.0	2.8
	Left Wing Locker	3.0	58.0	1.7
	Right Wing Locker	3.0	58.0	1.7
Airplane Weight (As Weighed)				
Basic Empty Weight				

C. Weighing.
(1) The airplane must be level when weighed.
(a) For longitudinal leveling, two bolts are located on the left aide of the fuselage at stations 88.9 and 59.1. Unscrew these two bolts approximately 1/4 inch so a spirit level can be placed on them.
(b) For lateral leveling, use a spirit level on the underside of the fuselage at station 37.5.
(2) When weighing on the wheels or jack points with mechanical scales, insure that the scales are in calibration and used per the applicable manufacturer's recommendations. When weighing on the wheels, deflate or inflate the gear struts and/or tires until the airplane is level.

CAUTION: Keep the airplane level while jacking to prevent the airplane from slipping off the jacks and damaging the airplane.

(3) When weighing on the jack points with electronic weighing scales, attach the electronic weighing cells to the proper mounting adapters to prevent slipping.
(a) Prepare the electronic weighing kit for use by following the manufacturer's instructions provided with the weighing kit. Adjust all jacks simultaneously until the cells are in contact with the jack points. Continue jacking, keeping the airplane level, until the airplane is supported at the jack points only.
(4) Determine scale reading, scale drift and tare from all three scales.
(5) Lower the airplane and clear the weighing cells as soon as the readings are obtained.

D. Computations (Refer to Figure 201).
(1) Enter the scale reading, subtract the scale drift, and tare from all three scale readings. Compute and retain the values for the airplane net weight of each weigh point and airplane total net weight.
(a) If the airplane jack points are used for weighing, use the following formula:
(69.2) - (69.2 X [Nose Jack Point Weight]) Divided By (Airplane Net Weight) = (Inches Aft Of Datum)
(b) If the airplane is weighed with scales under the wheels, use the following formula:
(55.63) - (110.21 X [Nose Wheel Scale Point Weight]) Divided By (Airplane Net Weight) = (Inches Aft Of Datum)
(2) Enter the total New Weight and CG Arm in the Basic Empty Weight and Center of Gravity Table columns in Table 201. Multiply the Weight (Lbs) entry times the CG Arm (In) entry to determine Moment (In-Lbs/100) entry. Delete printed weight, arm, and moments listed for fuel tank configurations not installed in the airplane. Total each of the three columns to determine basic empty weight, CG arm, and moment.

NOTE: An attempt should be made to verify the results of each weighing, when data for comparison is available.

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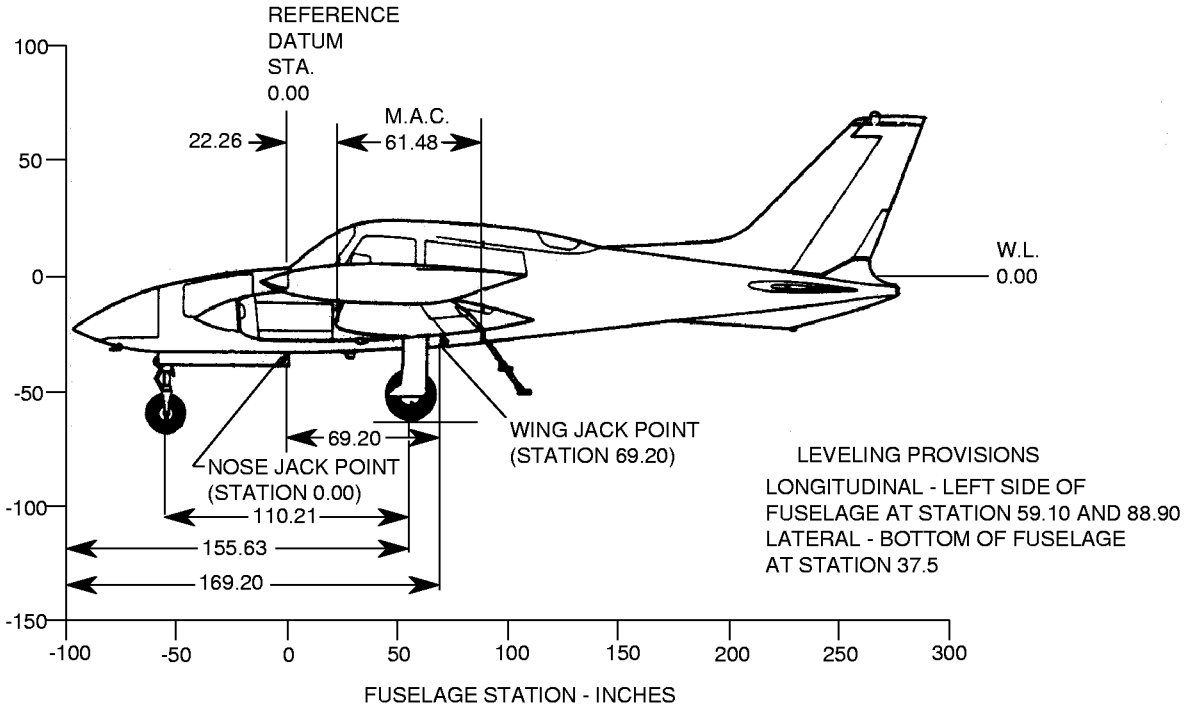

Weighing Airplane
Figure 201 (Sheet 1)

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(3) Enter Basic Empty Weight, CG arm, and moment in the airplane Weight and Balance Record.

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LEVELING - MAINTENANCE PRACTICES

1. Leveling

A. Leveling Longitudinally (Refer to Figure 201).
   (1) Back the leveling screws on the left side of the fuselage out a sufficient length to place spirit level on.
   (2) Adjust fuselage jacks as required to level airplane.

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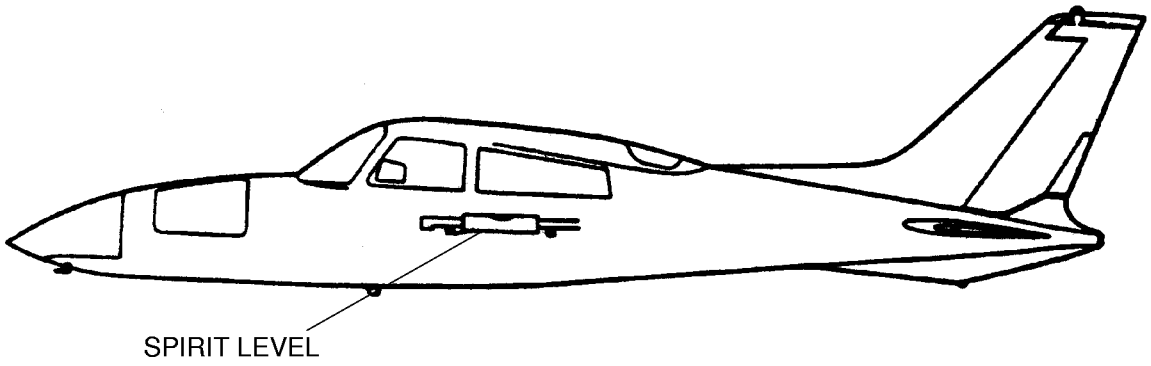
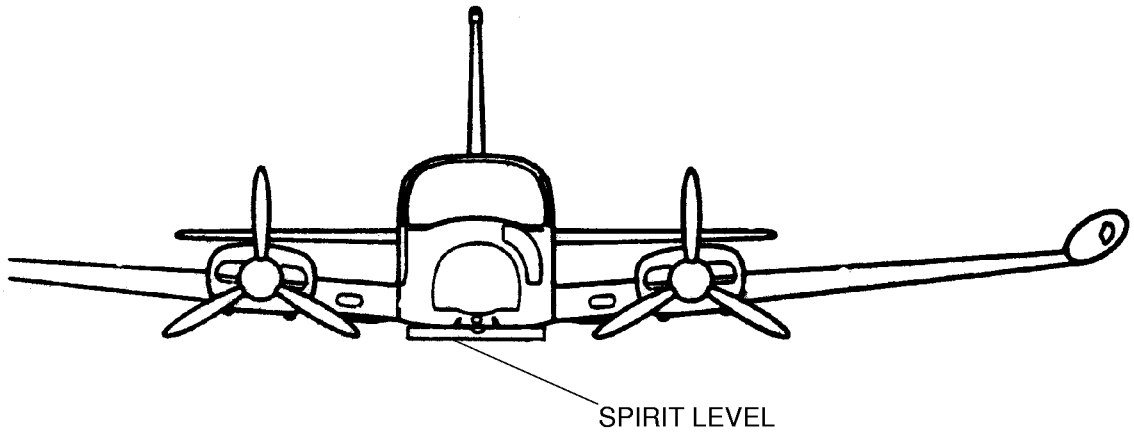


LONGITUDINAL LEVELING POINT



LATERAL LEVELING POINT

10103004

Leveling Airplane
Figure 201 (Sheet 1)

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CHAPTER

9

TOWING AND TAXIING

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TOWING AND TAXIING - GENERAL

1. Scope

A. This chapter contains those instructions necessary to tow and taxi the airplane.

2. Definition

A. This chapter consists of two sections to aid maintenance personnel in locating information. The following is a brief description of each section.
   (1) Towing provides the instructions necessary to safely tow the airplane. This section also includes a description of required equipment to tow the airplane.
   (2) Taxiing provides those instructions necessary to safely taxi the airplane.

3. Description

A. Towing and Taxiing Procedures are basically the same as those used on other airplanes equipped with tricycle gear.

B. The airplane can be towed forward or pushed aft, on hard surfaces, using a yoke-type tow bar attached to the nose wheel.

C. The airplane can be towed at the main gear when the airplane is in soft sand, earth, mud, or anytime damage could result to the nose gear.

4. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Tow Bar	SE411-1	Cessna Aircraft Co.	For nose gear towing.
Cable	Commercially Available		For main gear towing.

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TOWING - MAINTENANCE PRACTICES

1. Towing

A. Nose Gear Towing.

CAUTION: The parking brake must be released and external and internal rudder gust locks removed before towing. Failure to remove locks could result in structural damage to the airplane. Never push, pull, or lift airplane by the propeller, ailerons, elevators, flaps, nacelles, or unsupported skin between wing ribs.

(1) Place the tow bar at nose wheel. Insert tow bar into nose wheel axle and secure tow bar locking handle.
(2) Connect tow bar to towing vehicle.
(3) Station person in pilot's seat.
(4) Disengage parking brake.
(5) Remove internal and external rudder gust lock.
(6) Ensure that wheel chocks, static ground cables, external gust locks, and mooring cables are removed.
(7) If area is congested, station wing walkers to check clearance between airplane and adjacent equipment or structure.
(8) Tow airplane making smooth starts and stops with towing vehicle. Do not exceed turning limitations. Refer to placard on nose gear strut. 310R1881 thru 310R2140 are quipped with a stop block, which gives a positive indication that turn limits have been exceeded.

CAUTION: If turn limits are exceeded, structural damage may occur, and an inspection must be performed.

(9) When towing operation is complete, turn nose wheel to center, engage parking brake, chock wheels, connect static ground cable, install external and internal gust locks.

B. Main Gear Towing.
(1) Attach cable to each main gear and towing vehicle. Ensure cables are of sufficient length to clear airplane and the towing vehicle is on a firm surface.
(2) Remove wheel chocks, mooring cables, static ground cables, and external gust locks.
(3) Station person in pilot's seat.
(4) Release parking brake and remove internal and external gust locks.
(5) During towing steer the airplane by using the rudder pedals. Slow the airplane evenly and smoothly using airplane brakes.
(6) When towing is complete, center nose wheel, chock airplane wheels, connect static ground cable, install external and internal gust locks, and set parking brake if desired.
(7) Disconnect tow cables.

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TAXIING - MAINTENANCE PRACTICES

1. Taxiing

A. Preliminary Procedures.
(1) Clear the area around the airplane.
(2) Check main gear wheels and remove static ground cable, external and internal gust locks, and wheel chocks.
(3) Assure parking brake is engaged.

B. Taxiing Procedures.

WARNING: Ensure personnel and equipment are clear of propeller and airplane.

(1) Start engines, refer to Pilots Operating Handbook and FAA Approved Flight Manual.
(2) Release parking brake.
(3) Apply sufficient power to start taxi roll.

NOTE: It may become necessary to apply brakes to slow taxi speed. Intermittent braking provides a cooling period between brake applications.

(4) Steer the airplane using the rudder pedals. Nose gear steering is operated by the rudder pedals. While taxiing, make slight turns to determine effectiveness of nose gear steering.
(5) In congested areas, wing walkers should be used as an aid.
(6) Observe minimum turning radius during taxiing (Refer to Figure 1). Avoid high engine RPM while taxiing over ground containing loose stones or gravel to prevent damage to propeller blades.
(7) Taxi airplane to desired area.
(8) Apply parking brake, shut down engines, chock main gear wheels, connect static ground, and install internal gust locks. If the airplane is to be moored outside, install external gust locks and refer to Chapter 10 Mooring - Maintenance Practices.

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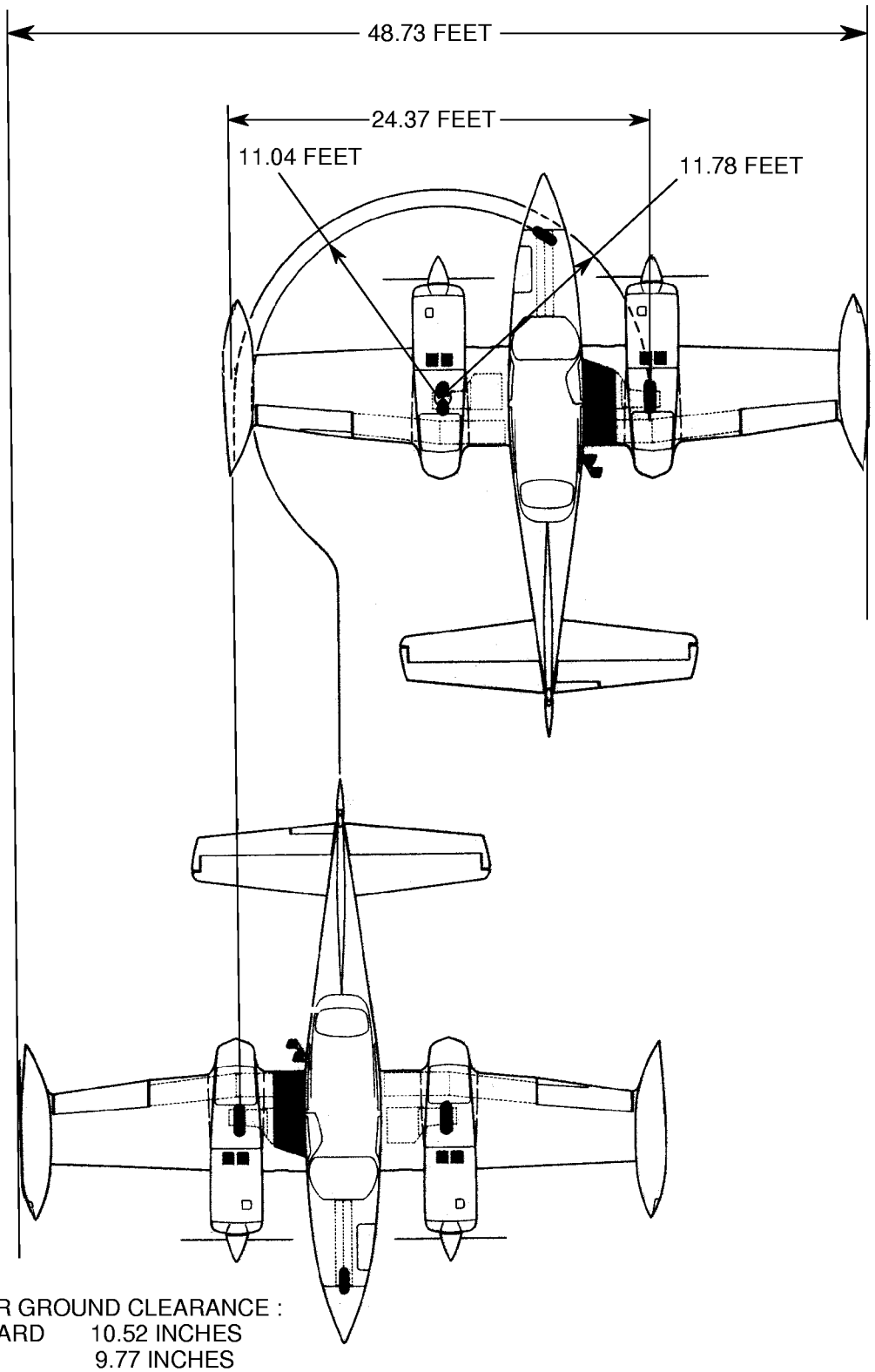

PROPELLER GROUND CLEARANCE :
310 STANDARD 10.52 INCHES
310 TURBO 9.77 INCHES

10803002

Minimum Turning Radius
Figure 201 (Sheet 1)

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CHAPTER 10

PARKING AND MOORING

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PARKING, MOORING, STORAGE, AND RETURN TO SERVICE - GENERAL

1. Scope

A. This chapter provides those instructions necessary to park and store the airplane for service in any of the conditions to which it may be subjected.

2. Definition

A. This chapter consists of two sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Parking and storage includes those instructions necessary to park or store the airplane in normal or abnormal conditions.
   (2) Mooring includes those instructions necessary to moor or park the airplane in normal or abnormal conditions or with the engine removed.
   (3) Return to service contains those instructions necessary to prepare the airplane for operation following mooring parking, or a period of storage.

3. Description

A. The airplane is normally parked or moored on a hard surface apron where necessary mooring accommodations are available.

B. The airplane may be parked during normal weather conditions by heading the airplane into the wind, installing wheel chocks, and engaging parking brake and control locks. Refer to mooring procedures if anticipation of high winds, or anytime the airplane is to remain outside for a length of time, such as overnight.

4. Grounding Electrodes

A. Grounding electrodes shall be provided on aprons and ramps where fuel servicing operations may be conducted. These electrodes are customarily pipes or rods 1/2 inch to 3/4 inch in diameter, of galvanized iron, steel, or copper weld steel, driven into the ground to reach below the permanent ground moisture level (6-8 feet). The top of the rod should be level with the surface of the apron or ramp, with a dished out area around the rod for attachment to the leads. Flush type terminal fittings which minimize tripping hazards are available. Since the conductivity of the soil varies in different locations, due principally to the moisture content of the soil, it may, in certain locations be necessary to employ ground rods longer than 8 feet in length.

B. Tie down bolts imbedded in concrete ramps have sometimes been found to be satisfactory as grounding electrodes, but when using this type of ground, the connection shall be made to the eye bolt, not the tie down ring. All such eye bolts shall be tested initially (and yearly thereafter, preferably during dry seasons) to assure that they actually do constitute a satisfactory ground medium. As low a resistance as possible should be secured and maintained with grounding electrodes. 10,000 Ohms is a practical recommended maximum.

5. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Wheel Chocks	Commercially Available		Chock landing gear wheels.
Pitot Tube Cover	Commercially Available		Prevent water entry.
Static Grounding Cables	Commercially Available		Static ground airplane.

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PARKING AND STORAGE - DESCRIPTION AND OPERATION

1. Rudder Pedals Gust Lock

A. The rudder pedals gust lock is installed on the left-hand floorboard with a clamp which permits the lock to pivot forward to engage the rudder pedals when in use, and back to the floorboard for stowage when not in use. The lock is adjustable fore and aft for rigging purposes (Refer to Figure 1).

NOTE: Rig gust control lock so that both rudder pedals must be pushed forward a minimum of 0.10 inch to engage lock.

2. Tie-Down

A. Refer to Mooring - Maintenance Practices for tie-down procedures.

3. Storage of Airplane

A. There are three recommended categories of storage of the airplane.
(1) Flyable Storage - Airplane which will not be flown for an indefinite period of time but which are to be kept ready to fly with the least possible preparation.
(2) Temporary Storage - Airplane which will be stored for a period of time up to 60 days.
(3) Indefinite Storage - Airplane which will be stored for an indefinite period of time.

CAUTION: Fuel and engine oil on the tires for an extended length of time will cause the rubber to deteriorate.

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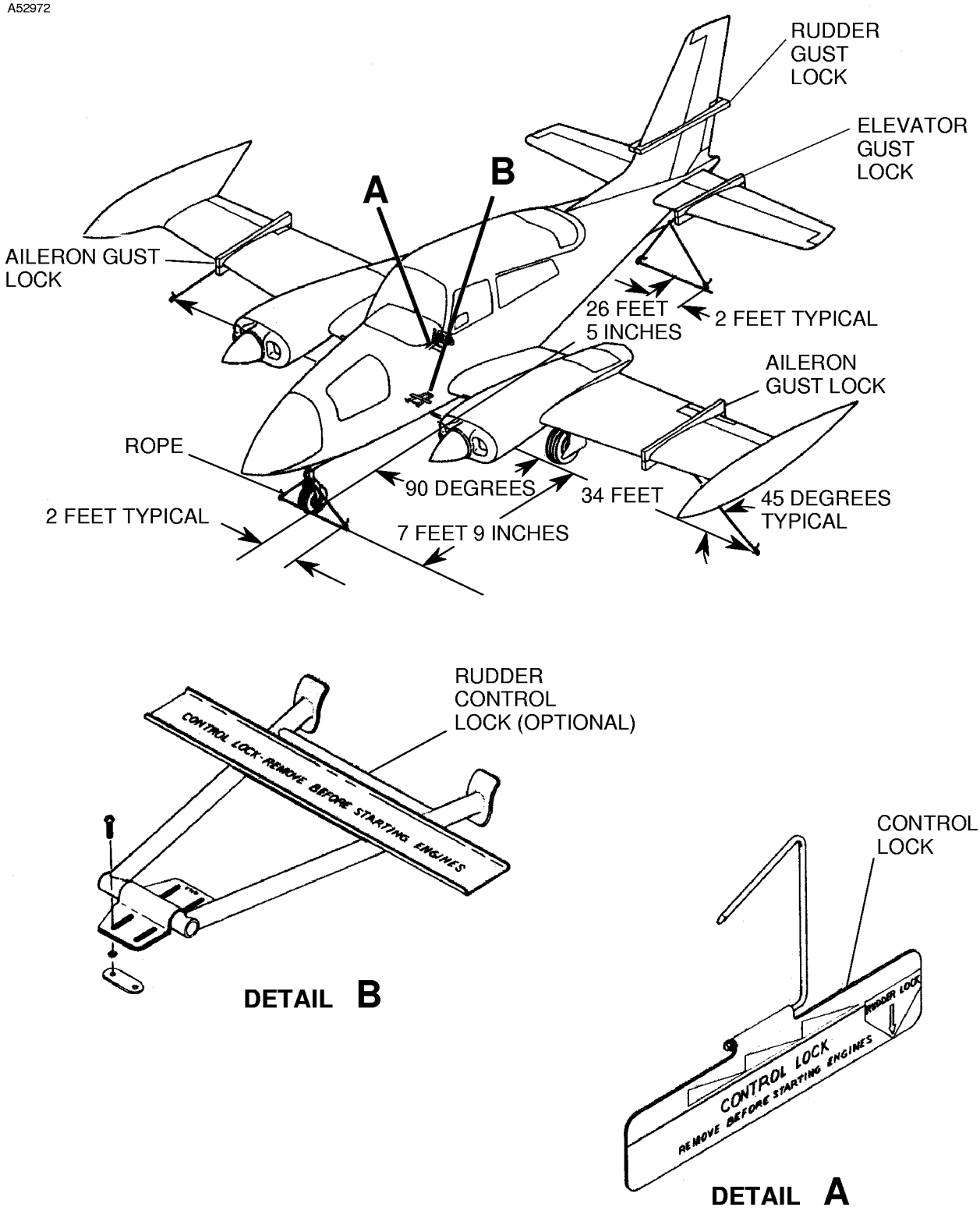

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Mooring Points
Figure 1 (Sheet 1)

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PARKING AND STORAGE - MAINTENANCE PRACTICES

1. Parking

A. Parking Instructions.
(1) Position airplane on level surface.
(2) Set parking brake and install internal control locks and external gust locks.

NOTE: If main gear wheels are chocked, the parking brake may remain released.

(3) Chock main gear wheels.
(4) Connect static ground cable to airplane.
(5) Install protective covers.
(6) Close windows and doors as necessary.

2. Flyable Storage

A. Flyable Storage Procedures (7 to 20 Days).
(1) Fill fuel tanks full to minimize condensation in the fuel tanks. Keep battery fully charged to prevent the electrolyte from freezing in cold weather. If the airplane is stored outside, tie-down should be accomplished in anticipation of high winds.
(2) Tie ropes or chains to the wing tie-down fittings located on the underside of each wing. Secure the opposite ends of the ropes or chains to ground anchors.
(3) Secure a rope (no chains or cables) to the upper trunnion of the nose gear and secure opposite end of rope to a ground anchor.
(4) Secure the middle of a rope to tail tie-down ring. Pull each end of rope away at 45 degree angle and secure to ground anchors at each side of tail.
(5) Install surface control locks on ailerons, rudder, and elevators if available.
(6) Install control lock on pilot control column if available; if control lock is not available, tie pilot control wheel back with front seat belt.
(7) For Engine Preservation, refer to the latest issue of Teledyne Continental Service Information Letter SIL99-1, or latest revision..

3. Temporary Storage

A. Temporary Storage Procedures (up to 90 Days).
(1) For Engine Preservation, refer to the latest issue of Teledyne Continental Service Information Letter SIL99-1, or latest revision.
(2) Install pitot tube cover, seal static source, install ground locks on retractable gear airplane and attach red streamers at each location. Close all vents and plug cowl openings to prevent bird nests in the engine compartment.
(3) Engines, with propellers installed, that are preserved for storage in accordance with this section should have a tag affixed to the propeller in a conspicuous place with the following notation on the tag: "DO NOT TURN PROPELLER - ENGINE PRESERVED."
(4) Disconnect or remove the battery from the airplane. If the battery is disconnected and left in the airplane, regular servicing will be required to prevent freezing or discharge. Batteries which are removed from the airplane and stored should be checked regularly for state of charge. To assure accurate warranty records, batteries should be reinstalled in the same airplane from which they were removed.
(5) If the airplane is stored outdoors, place control locks on all movable control surfaces and tie the airplane down snugly, not tightly, with enough clearance so wind gusts will not shift airplane into another. Leave no long chains dangling. Release the parking brake to prevent seizing and chock the wheels.

4. Indefinite Storage

A. Drain the engine oil and service with corrosive preventive mixture.
(1) For Engine Preservation, refer to the latest issue of Teledyne Continental Service Information Letter SIL99-1, or latest revision.

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(2) Seal the cold air inlet to the heater muff with moisture resistant tape to exclude moisture and foreign objects.
(3) Seal the engine breather by inserting a protex plug in the breather hose and clamping in place.
(4) Attach a red streamer to each place on the engine where bags of desiccant are placed. Either attach red streamers outside of the sealed area with tape or to the inside of the sealed area with safety wire to prevent wicking of moisture into the sealed area.
(5) Engines, with propellers installed, that are preserved for storage in accordance with this section should have each propeller tagged in a conspicuous place with the following notation on the tag: "DO NOT TURN PROPELLER - ENGINE PRESERVED."
(6) After the engine has been prepared for storage, remove the battery from the airplane, store in a cool dry place and check regularly for state of charge. Note serial number on battery and reinstall in the same airplane.
(7) If the airplane is stored outdoors, place control locks on all movable control surfaces and tie the airplane down snugly, not tightly, with enough clearance so wind gusts will not shift airplane into another. Leave no long chains dangling. Release the parking brake to prevent seizing and chock the wheels.
(8) Cover the airplane with moisture resistant paper and tape as necessary.

NOTE: The necessity of this requirement can be determined by the condition at the storage area.

(9) Install pitot tube cover and seal static source. Close all vents and plug cowl openings to prevent bird nests in the engine compartment.

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MOORING - MAINTENANCE PRACTICES

1. Mooring

A. Mooring Instructions.
(1) Park airplane on level surface.
(2) Set parking brake and install control lock.
(3) Chock main landing gear wheels.
(4) Connect static ground cable.
(5) Install external gust locks on rudder, elevator, and aileron (one lock on each control).

NOTE: If external rudder gust lock is not available, turn nose wheel to extreme right or left position.

(6) If airplane is to be moored on sod surface, proceed as follows:
(a) Drive the ground anchor stakes as shown in Figure 201, to provide a rope angle of 45 degrees to the ground. Secure chains or manila rope of 700 pounds or more tensile strength to the mooring fittings under the wings and secure opposite end to the ground stakes.
(7) Install protective covers.
(8) Close doors and windows as necessary.

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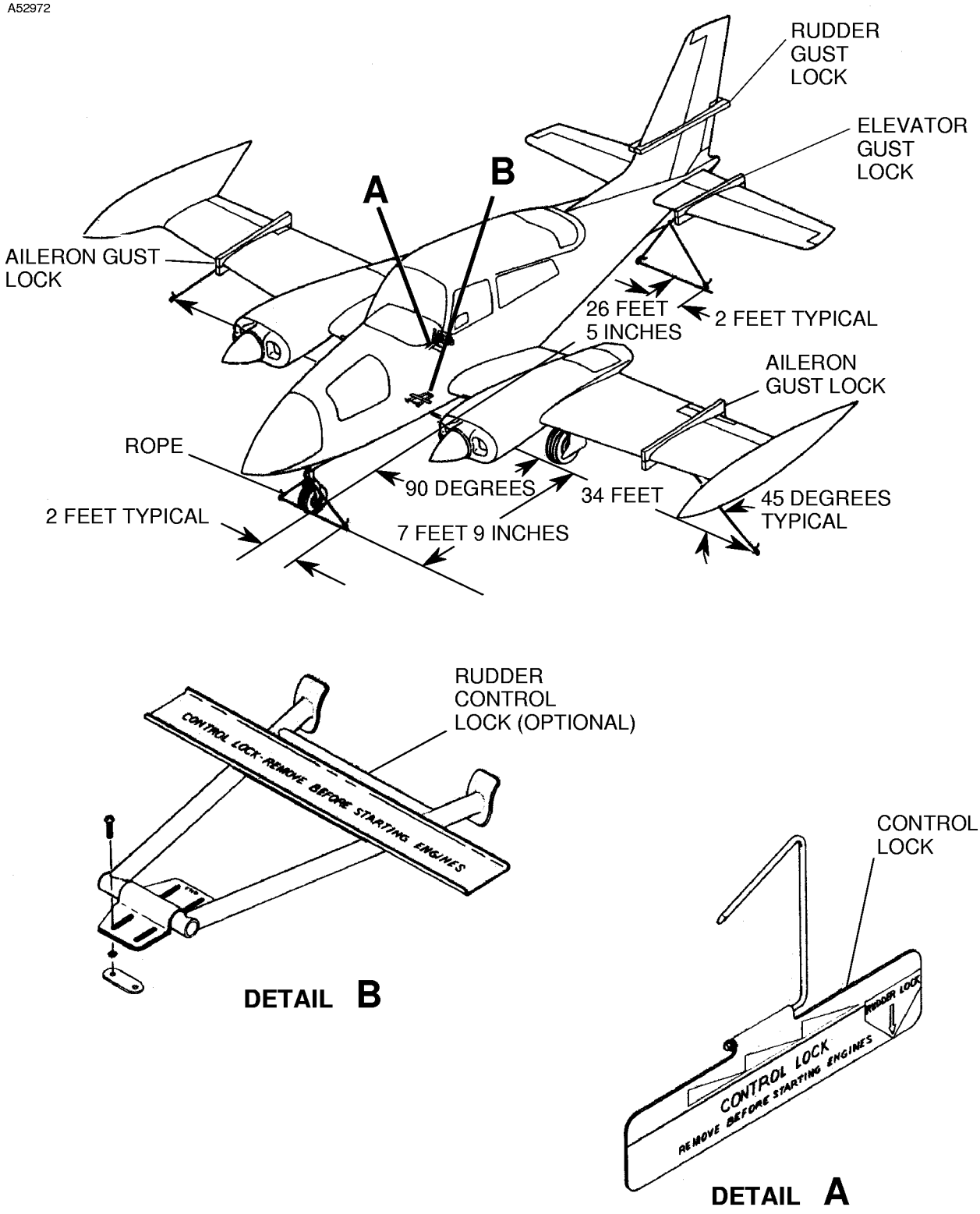

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Mooring Points
Figure 201 (Sheet 1)

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RETURN TO SERVICE - MAINTENANCE PRACTICES

1. Restoring Airplane to Service

NOTE: If the proper procedures were followed for indefinite storage, the airplane should require the following service.

A. Airframe:
   (1) Remove all covers from vents and air inlets.
   (2) Clean airplane if required.
   (3) Lubricate the airplane.
   (4) Check the brake cylinders, struts, and shimmy damper.
   (5) Drain a small amount of fuel from all fuel lines and check for water sediment.
   (6) Check fuel selector valve for evidence of leakage.

B. Battery:
   (1) Check battery, charge if necessary.
   (2) Install battery.

C. Engines:
   (1) For restoring engine to service, refer to the latest issue of Teledyne Continental Service Information Letter SIL99-1, or latest revision.
   (2) Perform complete ground runup check on engines.

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CHAPTER 11

PLACARDS AND MARKINGS

LIST OF EFFECTIVE PAGES

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11-Title		
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Scope . . . . . 11-00-00 Page 1
Definition . . . . . 11-00-00 Page 1

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PLACARDS AND MARKINGS - GENERAL

1. Scope

A. All procurable placards, labels, etc. shall be included in the Illustrated Parts Catalog. They shall be illustrated, showing the part number, legend, and location.

2. Definition

A. Exterior Placards and Markings.
   (1) Exterior placards and markings that are seen from the outside of the airplane are found in the Model 310R Illustrated Parts Catalog, Chapter 11, Placards and Marking.
   (2) Interior Placards and Markings.
      (a) Interior placards and markings that are installed in the flight and passenger compartment areas of the airplane are found in the Model 310R Illustrated Parts Catalog, Chapter 11, Placards and Markings.

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CHAPTER

12

SERVICING

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SERVICING - GENERAL

1. Scope

A. This chapter contains those instructions for the replenishment of fluids, scheduled and unscheduled servicing applicable to the whole airplane. (Refer to Figure 1).

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Replenishing contains those instructions necessary for the replenishment of fuel and other fluids, tire pressure, etc. Tank and reservoir capacities are included.
   (2) Scheduled servicing contains those instructions necessary to carry out servicing that may be scheduled. Includes instructions such as those for periodic lubrication of components, etc.
   (3) Unscheduled servicing contains those instructions necessary to carry out servicing that is normally unscheduled. Includes instructions such as those for ice and snow removal from parked airplanes.

3. Description

A. This text consists of descriptions, illustrations and servicing procedures necessary to locate system or component service points, and to replenish or service equipment as required.

B. Adherence to instructions, cautions, and warnings will avoid injury to personnel and damage to the airplane and associated equipment.

C. The operational integrity of the airplane systems can be seriously impaired if unapproved or contaminated fuels, oils, fluids, lubricants and materials are used. Mixture of various brands, kinds and qualities of material should be avoided.

D. The oil replenishment chart in Chapter 79 and the fuel system replenishment chart in Fuel - Servicing provide capacities and pressures. Additional information concerning servicing of the various airplane systems and components is provided in the applicable chapter.

E. Items to be serviced and/or lubricated are shown in the various procedures and illustrations. The illustration identifies the item, lubricant type and type of application. Refer to Chapter 5 for servicing frequencies.

F. Specified lubricants will meet requirements for extreme hot or extreme cold temperature operations. Use of substitutes or other lubricants may cause malfunction when operating in extreme temperature conditions, or may cause excessive wear due to improper lubrication.

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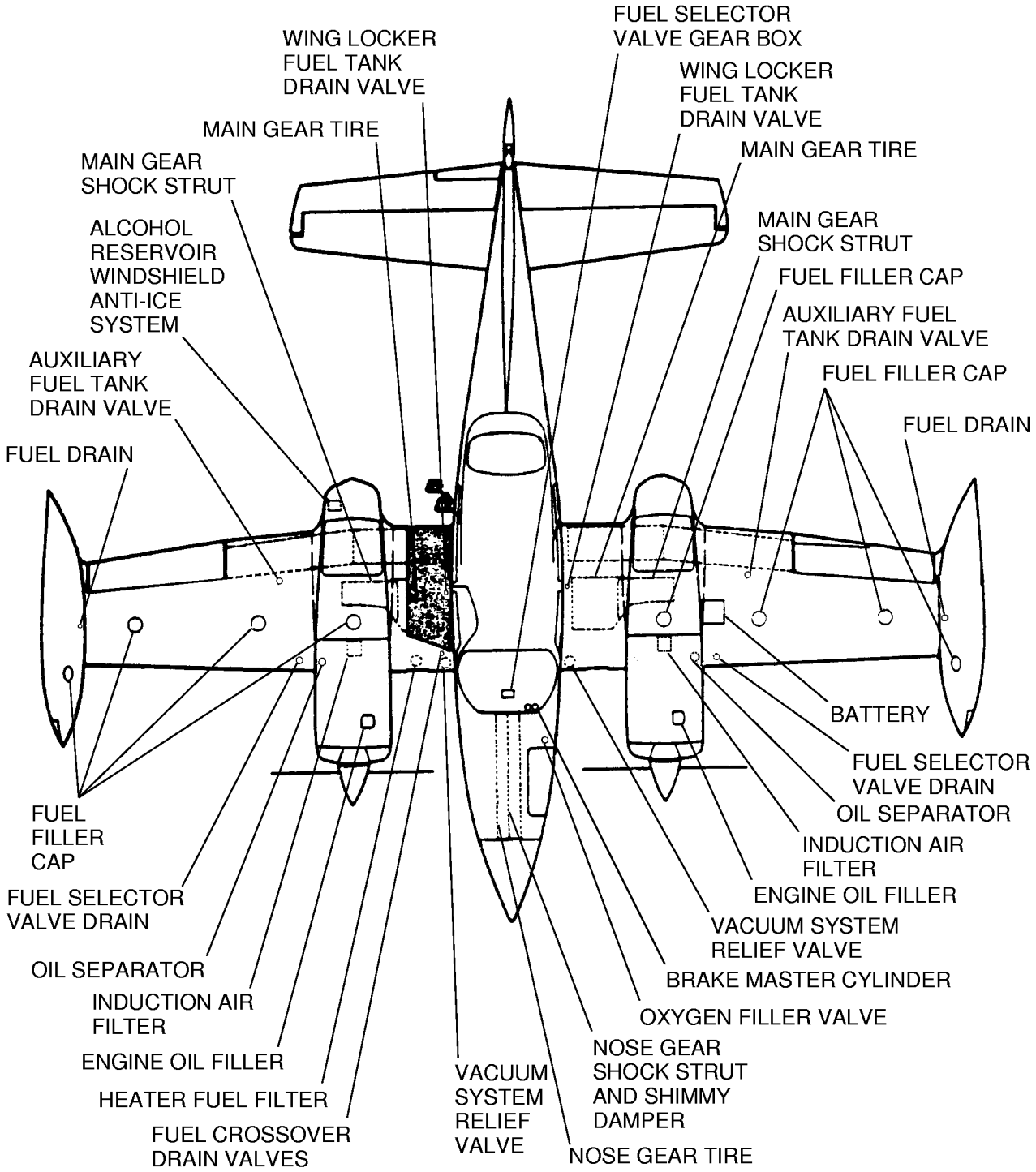

Figure 1 (Sheet 1)

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FUEL - DESCRIPTION AND OPERATION

1. Fuel Loading

A. Servicing.

(1) The main fuel tanks (tip tanks) are filled through a single filler valve located at the forward end of each tip tank. The left and right wing auxiliary and optional ranks are gravity filled through a single filler hole in each wing. Wing locker (optional) tanks are filled through the filler hole above the tank. The fuel tank capacities and acceptable fuel specifications are shown on the Fuel Replenishment Chart in Fuel - Servicing.

CAUTION: During fueling, ensure the nozzle is grounded to the airplane.

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FUEL - SERVICING

1. Fuel

A. Servicing.

WARNING: During all fueling procedures fire fighting equipment must be available. Two ground wires from different points on the airplane to separate approved grounding stakes shall be used to prevent accidental disconnecting of one ground wire.

(1) Fuel servicing rates on some ground servicing equipment may tend to exceed the airplane's fuel system intake rate, thus creating several false "FULL" indications. A slower fueling rate is recommended.

WARNING: Do not operate radio, radar, electrical or electronic equipment on the airplane during fueling.

(2) Connect ground wire from fueling nozzle to airplane grounding point.
(3) Remove filler cap, insert nozzle and fill tank.
(4) Remove fuel nozzle and nozzle ground wire.
(5) Install filler cap.

CAUTION: Ensure filler cap is locked down.

Table 301. Fuel System Replenishment Chart

QUANTITY EACH TANK				
TANK CAPACITY	**U.S. GALLONS**	**IMPERIAL GALLONS**	**METRIC LITERS**	**NAME, NUMBER, OR TYPE**
TIP TANK TOTAL CAPACITY	51.0	42.5	193.0	FUEL (APPROVED FUEL GRADES AND COLORS) 100LL GRADE AVIATION FUEL (BLUE) 100 (FORMERLY 100/130) GRADE AVIATION FUEL (GREEN)
OPTIONAL AUXILIARY TANK (40 GAL. OPTION)	20.5	17.1	77.5	
OPTIONAL AUXILIARY TANK (63 GAL. OPTION)	32.0	26.6	121.0	
OPTIONAL WING LOCKER TANK	20.3	16.8	76.8	

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2. Fuel Additive

A. Servicing.

(1) Strict adherence to recommended preflight draining instructions as called for in Pilot's Operating Handbook will eliminate any free water accumulations from the tank sumps. While small amounts of water may still remain in solution in the gasoline, it will normally be consumed and go unnoticed in the operation of the engine.

(2) One exception to this can be encountered when operating under the combined effect of: 1) use of certain fuels, with 2) high humidity conditions on the ground 3) followed by flight at high altitude and low temperature (flight levels of 20,000 feet or above and temperatures of -28.9°C (-20°F) or below). Under these unusual conditions small amounts of water in solution can precipitate from the fuel stream and freeze in sufficient quantities to induce partial icing of the engine fuel injection system.

(3) While these conditions are quite rare and will not normally pose a problem to owners and operators, they do exist in certain areas of the world and consequently must be dealt with, when encountered.

(4) Therefore, to alleviate the possibility of fuel icing occurring under these unusual conditions, it is permissible to add isopropyl alcohol or ethylene glycol monomethyl ether (EGME) compound to the fuel supply.

(5) The introduction of alcohol or EGME compound into the fuel provides two distinct effects: 1) it absorbs the dissolved water from the gasoline and 2) it has a freezing temperature depressant effect.

(6) Alcohol, if used, is to be blended with the fuel in a concentration of 1% by volume. Concentrations greater than 1% are not recommended since they can be detrimental to fuel tank materials.

(7) The manner in which the alcohol is added to the fuel is significant because alcohol is most effective when it is completely dissolved in the fuel. To insure proper mixing the following is recommended (Refer to Figure 301).

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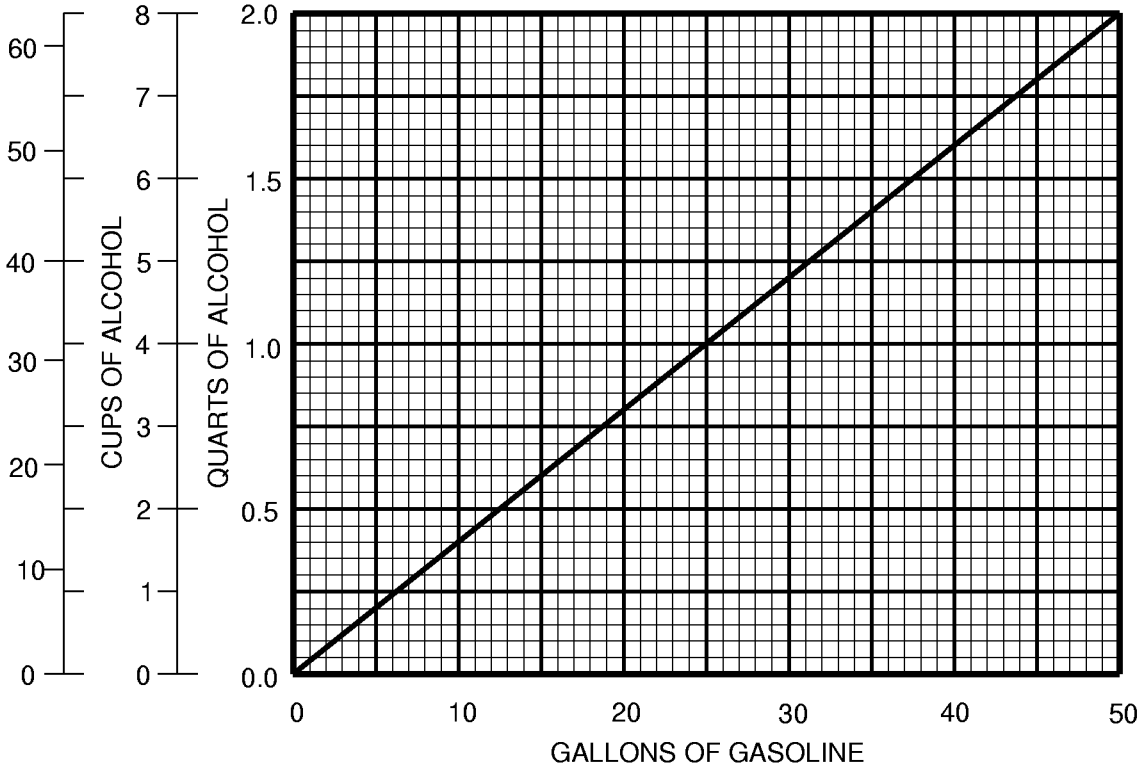

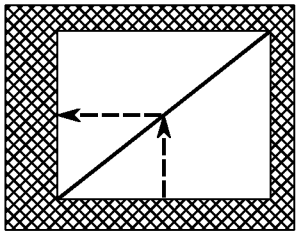

Alcohol - Fuel Mixing Ratio Chart
Figure 301

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(a) For best results the alcohol should be added during the fueling operation by pouring the alcohol directly on the fuel stream issuing from the fueling nozzle.
(b) An alternate method that may be used is to premix the complete alcohol dosage with some fuel in a separate clean container (approximately 2-3 gallon capacity) and then transferring this mixture to the tank prior to the fueling operation.

(8) Any high quality isopropyl alcohol may be used, such as: Anti-icing fluid (MIL-F-5566) or isopropyl alcohol (Federal Specification TT-I-735a).

(9) Ethylene glycol monomethyl ether (EGME) compound in compliance with MIL-I-27686E, if used, must be carefully mixed with the fuel in concentrations not to exceed 0.15% by volume.

CAUTION: Mixing of the EGME compound with the fuel is extremely important because concentration in excess of that recommended (0.15 percent by volume maximum) can have a deleterious effect on engine components. Use only blending equipment that is recommended by the manufacturer to obtain proper proportioning.

CAUTION: Do not allow the concentrated EGME compound to come in contact with the airplane finish or fuel cell as damage can result.

(10) Prolonged storage of the airplane will result in a water buildup in the fuel which "leeches out" the additive. An indication of this is when an excessive amount of water accumulates in the fuel tank sumps. The concentration can be checked using a differential refractometer, manufactured by the Seiscor Corporation, Tulsa, Oklahoma. It is imperative that the technical manual for the differential refractometer be followed explicitly when checking the additive concentration.

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BATTERY - SERVICING

1. General

A. The electrolyte level must be maintained such that the tops of the plates are covered with electrolyte.

2. Description

A. The battery is comprised of lead compound plates immersed in a diluted solution of sulfuric acid and water (electrolyte). Each cell has a nominal voltage of approximately 2.0 volts when fully charged. The cells are connected in series.

3. Servicing

A. The battery must be removed from the airplane for checking state of charge, charging the battery, and adding distilled water (electrolyte) to the battery.

B. Servicing of the lead-acid battery is limited to adding distilled water to the individual cells and cleaning the battery box. .

(1) Adding Electrolyte.

WARNING: Do not allow lead acid deposits to come in contact with skin or clothing. Serious burns may result unless the affected area is washed immediately with soap and water. Clothing will be ruined upon contact with battery acid.

CAUTION: Do not add any type of battery rejuvenator to the electrolyte. When electrolyte has been spilled from a battery, the electrolyte balance may be adjusted by following instructions in the battery manufacturer's maintenance manual.

(a) Remove lead-acid battery.
(b) Remove battery caps.
(c) Observe electrolyte level in cells. Electrolyte level should be even with the horizontal baffle plate or split ring at bottom of the filler neck.
(d) If fluid level is low, add distilled water to obtain proper level.
(e) Replace battery caps.
(f) Inspect and clean battery box as outlined in step (2).
(g) Reinstall battery to airplane.

(2) Cleaning The Battery Box.

(a) The battery box should be inspected and cleaned periodically. Use a strong solution of baking soda and water to clean the battery box. Remove hard deposits with a brush and flush thoroughly with clean water. The box should be thoroughly dried before installing battery.

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SCHEDULED SERVICING - DESCRIPTION AND OPERATION

1. General

A. This portion of scheduled servicing section assists the operator in recommended lubricants. For best results and continued trouble-free service, use clean and approved lubricants.

2. Lubrication Service Notes

A. Lubricant Application.
(1) Cleanliness is essential to good lubrication. Lubricants and dispensing equipment must be kept clean. Use only one lubricant in a grease gun or oil can.
(2) Store lubricants in a protected area. Containers should be closed at all times when not in use.
(3) Wipe grease fittings and areas to be lubricated with clean, dry cloths before lubricating.
(4) When lubricating bearings which are vented, force grease into fitting until old grease is extruded.
(5) When flush-type grease fittings (NAS516) are specified, use special grease gun adapter, Alemite Part No. 318049 or equivalent.
(6) After any lubrication, clean excess lubricant from all but actual working parts.
(7) All sealed or prepacked antifriction bearings are lubricated with MIL-G-23827A grease by the manufacturer unless otherwise specified.
(8) Do not oil antifriction bearings or expose them to spray from steam or chemical cleaning. When necessary to clean exterior bearing surfaces, wipe with a cloth dampened with Federal Specification P-D-680 solvent or equivalent.
(9) Friction bearings of the porous, sintered-type are prelubricated. An occasional squirt can oiling of such bearings with general purpose oil (MIL-L-7870) extends its service life.
(10) Lubricate unsealed pulley bearing, rod ends, pivot end hinge points and any other friction point obviously needing lubrication, with general purpose oil (MIL-L-7870).

3. Recommended Lubricants Table

A. The table that follows helps maintenance personnel in lubrication procedures.

NOTE: Equivalent substitutes can be used for the following items:

Table 1. Recommended Lubricants

Type of Lubricant	Principal Use	Recommended Product	Procurement Specification
Grease, Wide Temperature Range	Wheel Bearings	Mobil Grease 28; Mobil Oil Corp	MIL-G-81322
		Royco 22S; Royal Lubricants Co.	
		Aeroshell Grease 22 Shell Oil Co.	
		Aeroshell Grease 22c Shell International Petroleum Co, Ltd. London SE 17 NA UK	
Corrosion-Preventive Compound	Control Cables	Petrotect Amber; Pennsylvania	MIL-C-16173, Grade 4
		Royco 194R; Royal Lubricants Co.	

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Table 1. Recommended Lubricants (continued)

Type of Lubricant	Principal Use	Recommended Product	Procurement Specification
		Kendex 7004; Kendal Refinishing Co.	
Grease, high and low temperature	Torque links, electric elevator trim actuator	Mobil Grease 27; Mobil Oil Corp.	MIL-G-23827
		Aeroshell Grease 7; Shell Oil Corp.	
		Braycote 627S; Bray Oil Co., Los Angeles, Calif.	
		Low Temp Grease E.P.; Texaco Inc., White Plains, N.Y.	
		Royco 27A; Royal Lubricants Co.	
		Chevron Aviation Grease 55; Standard Oil Co. Bearing ChevronTexaco Corporation 6001 Bollinger Canyon Road San Ramon, CA 94583 (925) 842-1000 ChevronTexaco.com	
Grease, low and high temperature		Aeroshell Grease II; Shell Oil Co., New York 20, N.Y.	MIL-G-3278
		L324; Sinclair Refining Co., New York, N.Y.	
		Supermil Grease No. 8723; Standard Oil Co., Chicago, Ill.	
		Texaco UNI-Temp; The Texas Co., New York 17, N.Y.	
Grease, Lithium spray	Lubricate sliding surfaces, door latch pins	WG505; Unival Corp., Chemical Div.	
Grease, Silicone light consistency	Trim tab actuators; Throttle control cable, aft	Number 33; Dow Corning Co.	
Grease, Silicone with Teflon	Elevator Trim Actuator	Q5-0120; Dow Corning Co.	MIL-G-83261
		Tribolube-2; Aerospace Lubricants, Columbus, Ohio	

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Table 1. Recommended Lubricants (continued)

Type of Lubricant	Principal Use	Recommended Product	Procurement Specification
Grease, Molybdenum Disulfide - Low and high temperature	Caged bearings and high load surfaces	Castrolease MSA; Burmah-Castrol Inc., Hackensack, N.Y. 07601	MIL-G-21164
		Everlube 211-G Moly Grease; E/M Lubricants Inc., W. Lafayette, IN 47906	
		Royco 64 C; Royal Lubricants Co., East Hanover, N.J. 07939	
		Aeroshell Grease 17; Shell Oil Co., Houston, TX 77001	
Oil, general purpose	General	Royco 363; Royal Lubricants Co.	MIL-L-7870
		Gulflite Oil 6; Gulf Oil Corp.	
Petrolatum, Technical	General	Bray Coat -236; Bray Oil Co., 1925 N. Marina Ave. Los Angeles, Calif. 90032	VV-P-236
Solid film lubricant	Corrosion Inhibiting	3400A Bonded Lubricant; Dow Corning Corporation, Midland, Michigan	MIL-L-46010
		Lub-Lok 2109; Electrofilm Inc., North Hollywood, Calif.	
		Fel-Pro C-651-A; Fel-Pro Incorporated, Skokie, Illinois	
Penetrating/lubricant	Electrical connectors	LPS 1; LPS Research Laboratories, Inc., Los Angeles, Calif.	
Rust inhibitor lubricant, medium weight	General	LPS 2; LPS Research Laboratories, Inc., Los Angeles, Calif.	
Rust inhibitor lubricant, heavy-duty	Chain Lube	LPS 3; LPS Research Laboratories, Inc., Los Angeles, Calif.	
Varnish, moisture and fungus resistant, Type II	Treatment of printed circuit boards	96-005 Conformal Coating; Dow Corning Corporation	MIL-V-173

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Table 1. Recommended Lubricants (continued)

Type of Lubricant	Principal Use	Recommended Product	Procurement Specification
Hot application Petrolatum, Class 3	Press fits - to prevent corrosion	Code 312D; Southwest Grease and Oil Co., Wichita, Ka.	MIL-C-11796
		Gulf NO-RUST 7; Gulf Oil Corp., Houston, Tx.	
		Braycote 248; Bray Oil Co., Los Angeles, Ca.	
Cold application solvent cutback, Grade 1	Press fits to prevent corrosion	Vudol Anorustol 297; Getty Oil GmbH, Hamburg Germany	MIL-C-16173
		Braycote 103; Bray Oil Co., Los Angeles, Ca.	
		Nox-Rust 201B; Daubert Chemical Co., Chicago, Il.	
Hydraulic Fluid Petroleum Base	Brakes, Shock Struts Shimmy Damper	PQ2863, PQ2890; American Oil & Supply Co., Newark, N.J.	MIL-H-5606
		Braco 757B; Bray Oil Co., Los Angeles, Ca.	
		Mobil Aero HFB; Mobil Oil Corp., New York, N.Y. 10017	
		Aeroshell Fluid 41; Shell International Petroleum Co. Ltd., London SE 17 NA UK	
Lubricating Oil, General Purpose Low Temp	General Purpose Lubricant	PQ Rust Preventive #107; American Oil & Supply Co., Newark, N.J. 07105	MIL-L-7870

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Table 1. Recommended Lubricants (continued)

Type of Lubricant	Principal Use	Recommended Product	Procurement Specification
		Penreco 106 South Main Street Butler, PA 16001	
		Gulfite Oil Code No. 6; Gulf Oil Corp., Philadelphia, Penn.	
		1692 Low Temp Oil; The Texas Co., New York, N.Y. 10017	

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DOORS - SERVICING

1. General

A. If possible, do the airplane servicing in an area free of contamination from sand, dust or other environmental conditions that can contribute to incorrect lubrication procedures.

B. Refer to Table 301 and 302 to find the lubrication data.

Table 301. Lubrication Specifics

ITEM DESCRIPTION	LUBRICATION TYPE	APPLICATION	FIGURE NUMBER
Cabin Door Latch Mechanisms	GL	Hand	301 Sheet 1
Cabin Door Latch Cables	GL	Hand	301 Sheet 1
Cabin Door Bayonet Bolt	GL	Hand	301 Sheet 1
Cabin Door Bell Crank	GL	Hand	301 Sheet 1
Cabin Door Hinge	OG	Oil Can	301 Sheet 1
Cabin Door Push-Pull Rod Joints	OG	Oil Can	301 Sheet 1
Nose, Wing Locker, and Cabin Baggage Door Hinges and Door Stops	OG	Oil Can	302 Sheet 1
Cabin Baggage Door - Large, Latch Mechanism	GL	Hand	302 Sheet 1

Table 302. Recommended Lubricants

LUBRICATION TYPE	PROCUREMENT SPECIFICATION	LUBRICANT DESCRIPTION
GL	MIL-G-21164	Grease, molybdenum disulfide, for low and high temperatures.
OG	MIL-PRF-7870	Lubricating oil, general purpose, low temperature.

2. Cabin Door Lubrication

A. Lubricate the cabin door.

Refer to Figure 301

3. Nose, Wing Locker, and Cabin Baggage Door Lubrication

A. Lubricate the Nose, Wing Locker, and Cabin Baggage Doors.

Refer to Figure 302

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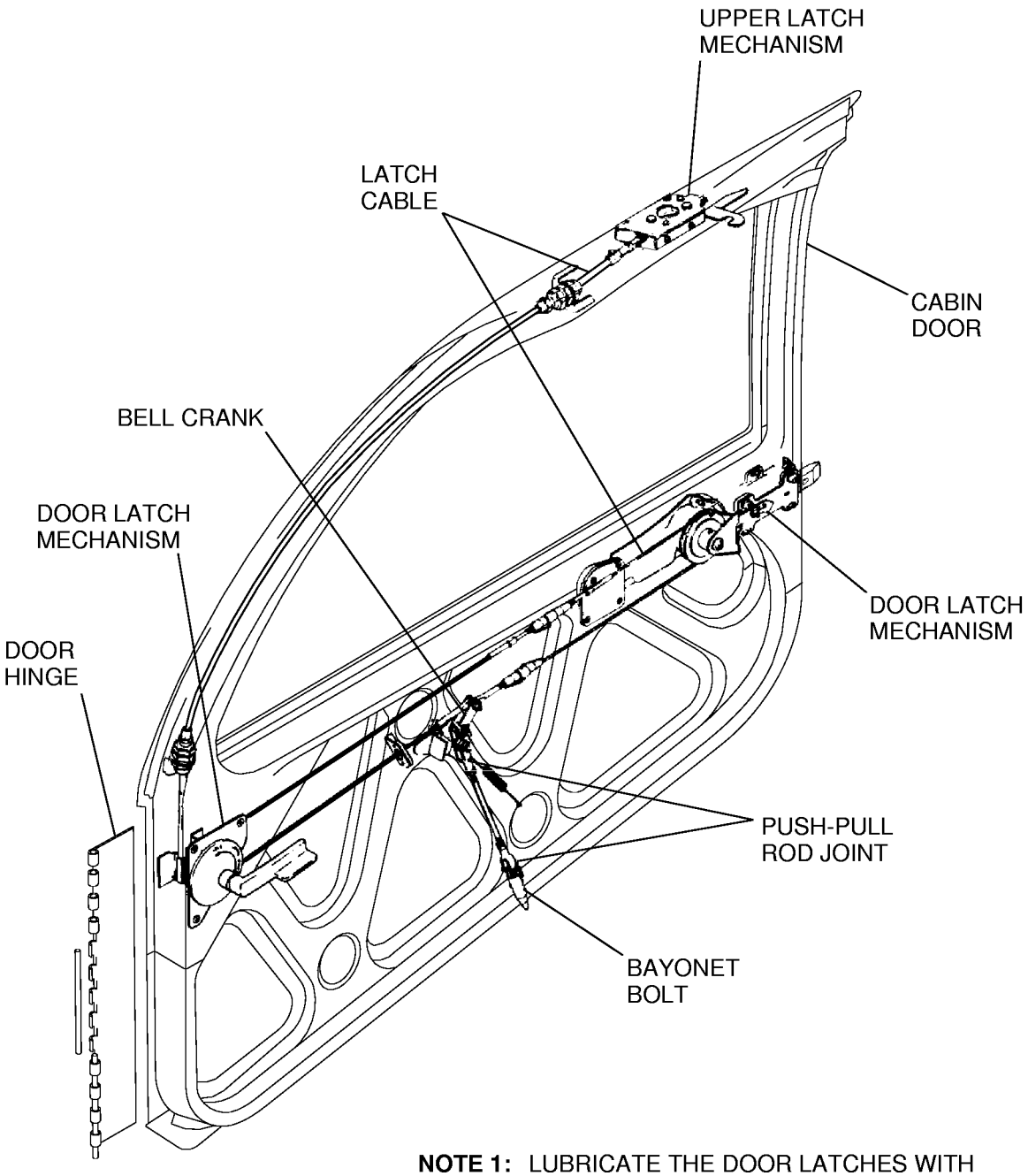
A54526



NOTE 1: LUBRICATE THE DOOR LATCHES WITH AUTOMOTIVE TYPE DOOR LATCH LUBRICANT.

NOTE 2: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

Cabin Door Lubrication
Figure 301 (Sheet 1)

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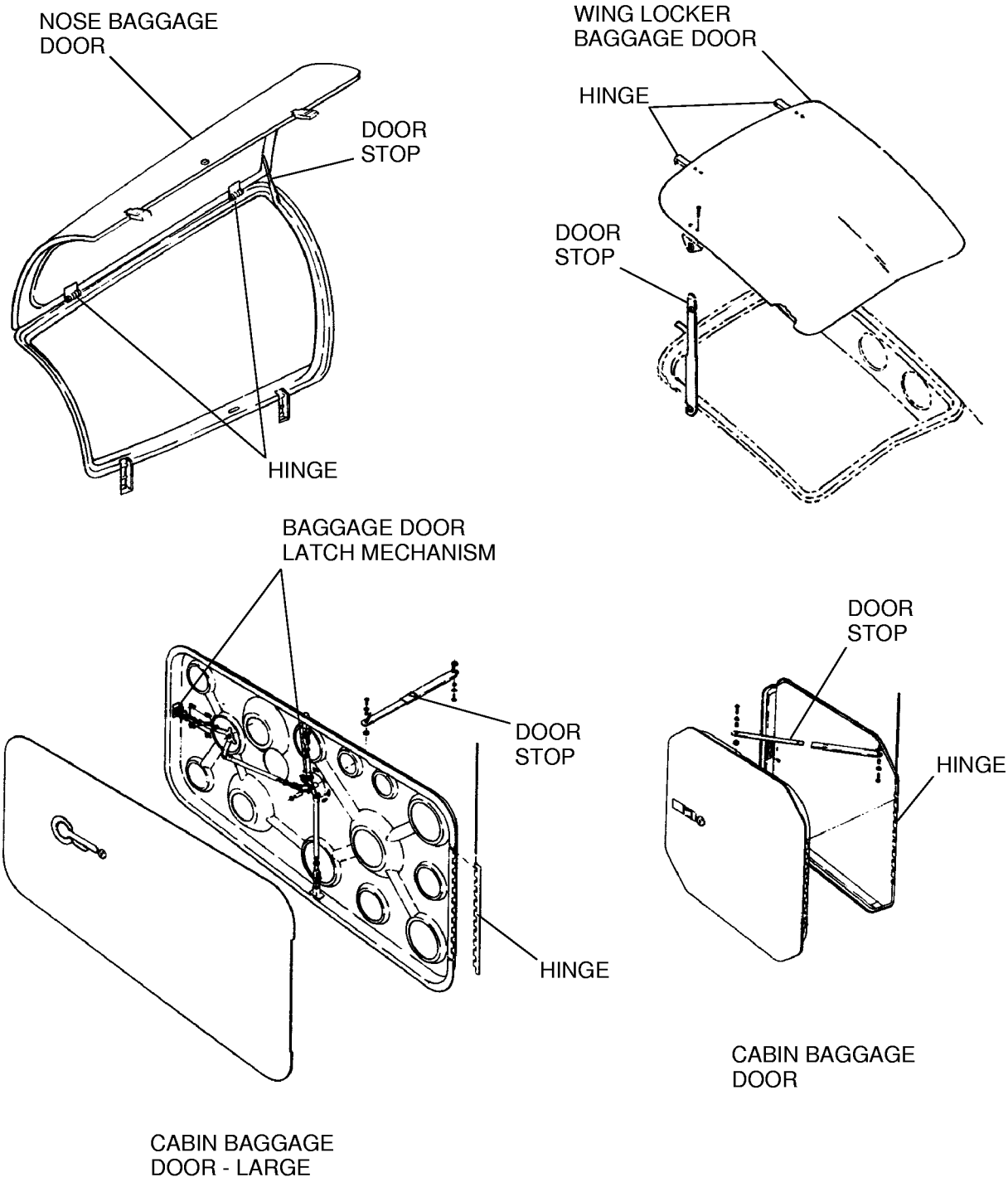

NOTE: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

Nose, Wing Locker, and Cabin Baggage Door Lubrication
Figure 302 (Sheet 1)

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LANDING GEAR ACTUATOR - SERVICING

1. General

A. If possible, do the airplane servicing in an area free of contamination from sand, dust or other environmental conditions that can contribute to incorrect lubrication procedures.

B. Refer to Table 301 and 302 to find the lubrication data.

Table 301. Lubrication Specifics

ITEM DESCRIPTION	LUBRICATION TYPE	APPLICATION	FIGURE NUMBER
Landing Gear Actuator Grease Fitting	GL	Gun	301 Sheet 1
Manual Extension Support Bearings	OG	Oil Can	301 Sheet 1
Manual Extension Spool and Bellcrank	GL	Hand	301 Sheet 1
Manual Extension Crank Handle Linkage	OG	Oil Can	301 Sheet 1
Manual Extension Miter Gears	GL	Hand	301 Sheet 1

Table 302. Recommended Lubricants

LUBRICATION TYPE	PROCUREMENT SPECIFICATION	LUBRICANT DESCRIPTION
GL	MIL-G-21164	Grease, molybdenum disulfide, for low and high temperatures.
OG	MIL-PRF-7870	Lubricating oil, general purpose, low temperature.

2. Landing Gear Actuator

A. Lubricate the landing gear actuator and manual extension system.

Refer to Figure 301

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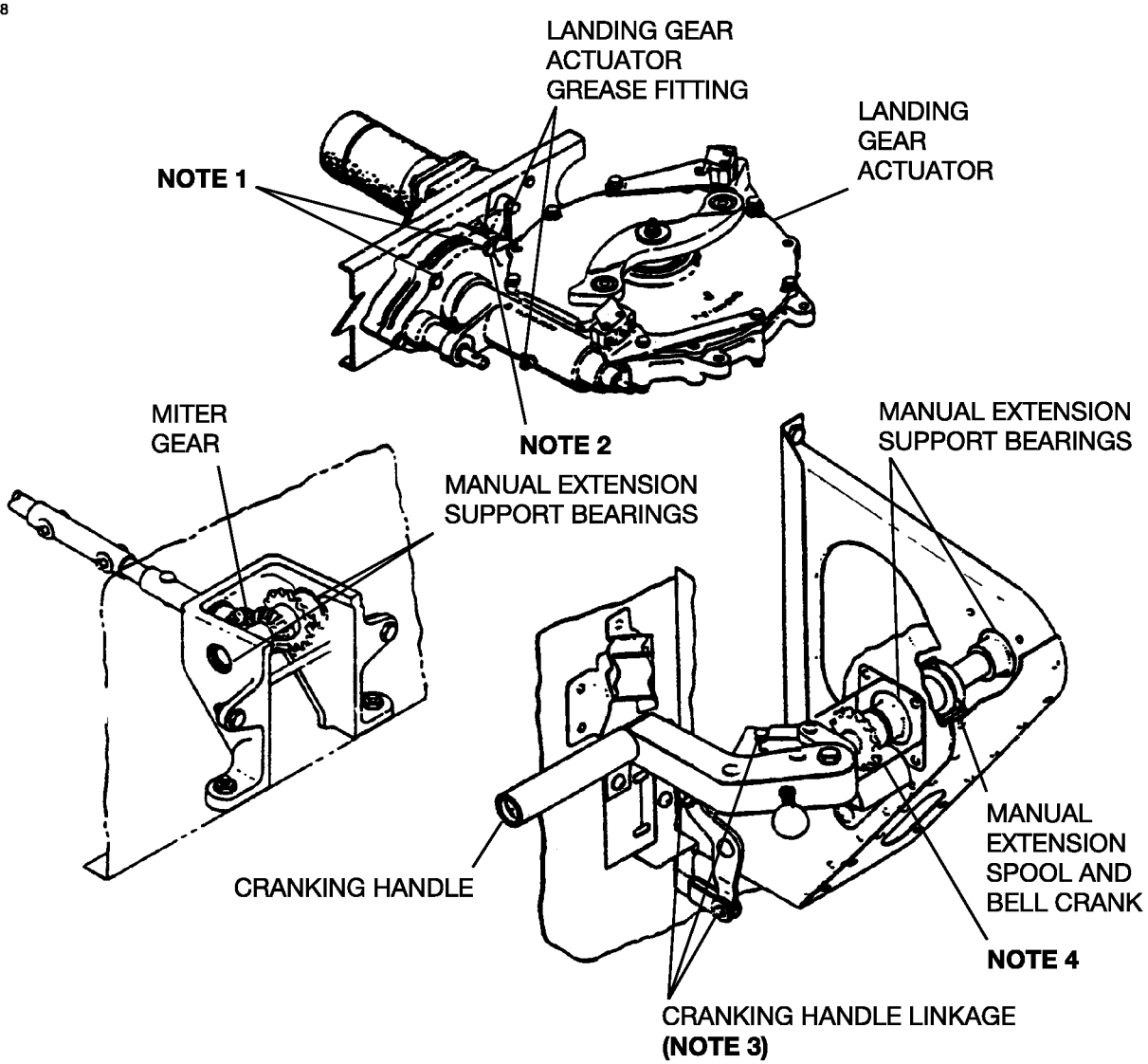
A54528



MANUAL EXTENSION (LANDING GEAR)

NOTE 1: WHEN YOU GREASE THIS FITTING, REMOVE THE BOLT TO PREVENT BREAKING THE SEAL. REINSTALL THE BOLT WHEN FINISHED GREASING. APPROXIMATELY 3 PUMPS ON A HAND GREASE GUN IS SUFFICIENT.

NOTE 2: IF UNABLE TO REACH GREASE FITTING FROM THE TOP, REMOVE THE PLATE ON THE BOTTOM SIDE OF THE AIRPLANE TO REACH THE FITTING.

NOTE 3: AFTER LUBRICATING, WIPE OFF EXCESS LUBRICANT ADJACENT TO THE CRANKING HANDLE.

NOTE 4: DO NOT OIL THE MANUAL EXTENSION CHAIN. AN OILED CHAIN WILL COLLECT DIRT AND GRIT. WIPE THE CHAIN WITH A CLEAN DRY CLOTH.

NOTE 5: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

10411005
10153005

Landing Gear Actuator and Manual Extension System
Figure 301 (Sheet 1)

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LANDING GEAR - SERVICING

1. General

A. If possible, do the airplane servicing in an area free of contamination from sand, dust or other environmental conditions that can contribute to incorrect lubrication procedures.

B. Refer to Table 301 and 302 to find the lubrication data.

Table 301. Lubrication Specifics

ITEM DESCRIPTION	LUBRICATION TYPE	APPLICATION	FIGURE NUMBER
Nose Gear Trunnion Fitting	GL	Gun	301 Sheet 1
Nose Gear Torque Link	GL	Gun	301 Sheet 1
Nose Gear Wheel Bearings	GW	Hand	301 Sheet 1
Nose Gear Bushings	OG	Oil Can	301 Sheet 1
Retraction Linkage Rod Ends	GL	Hand	301 Sheet 1
Pivot Bushings (Airplanes 310R0001 thru 310R1918)	GW	Hand	301 Sheet 1
Pivot Bushings (Airplanes 310R1919 thru 310R2140)	GW	Gun	301 Sheet 1
Main Gear Up Lock Bushings	GG	Oil Can	302 Sheet 1
Main Gear Wheel Bearings	GW	Hand	302 Sheet 1
Main Gear Torque Link Fittings	GL	Gun	302 Sheet 1
Main Gear Retraction Linkage Rod Ends	GL	Hand	302 Sheet 1
Thrust Washers	OG	Oil Can	302 Sheet 1
Side brace	GL	Gun	302 Sheet 1
Main Gear Trunnion Pivot Pin	GL	Gun	302 Sheet 1

Table 302. Recommended Lubricants

LUBRICATION TYPE	PROCUREMENT SPECIFICATION	LUBRICANT DESCRIPTION
GL	MIL-G-21164	Grease, molybdenum disulfide, for low and high temperatures.
OG	MIL-PRF-7870	Lubricating oil, general purpose, low temperature.
GW	MIL- PRF-81322	Grease, Aircraft, general purpose, wide temperature range.

2. Nose Gear

A. Lubricate the nose gear.

Refer to Figure 301

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3. Main Gear

A. Lubricate the main gear.

Refer to Figure 302

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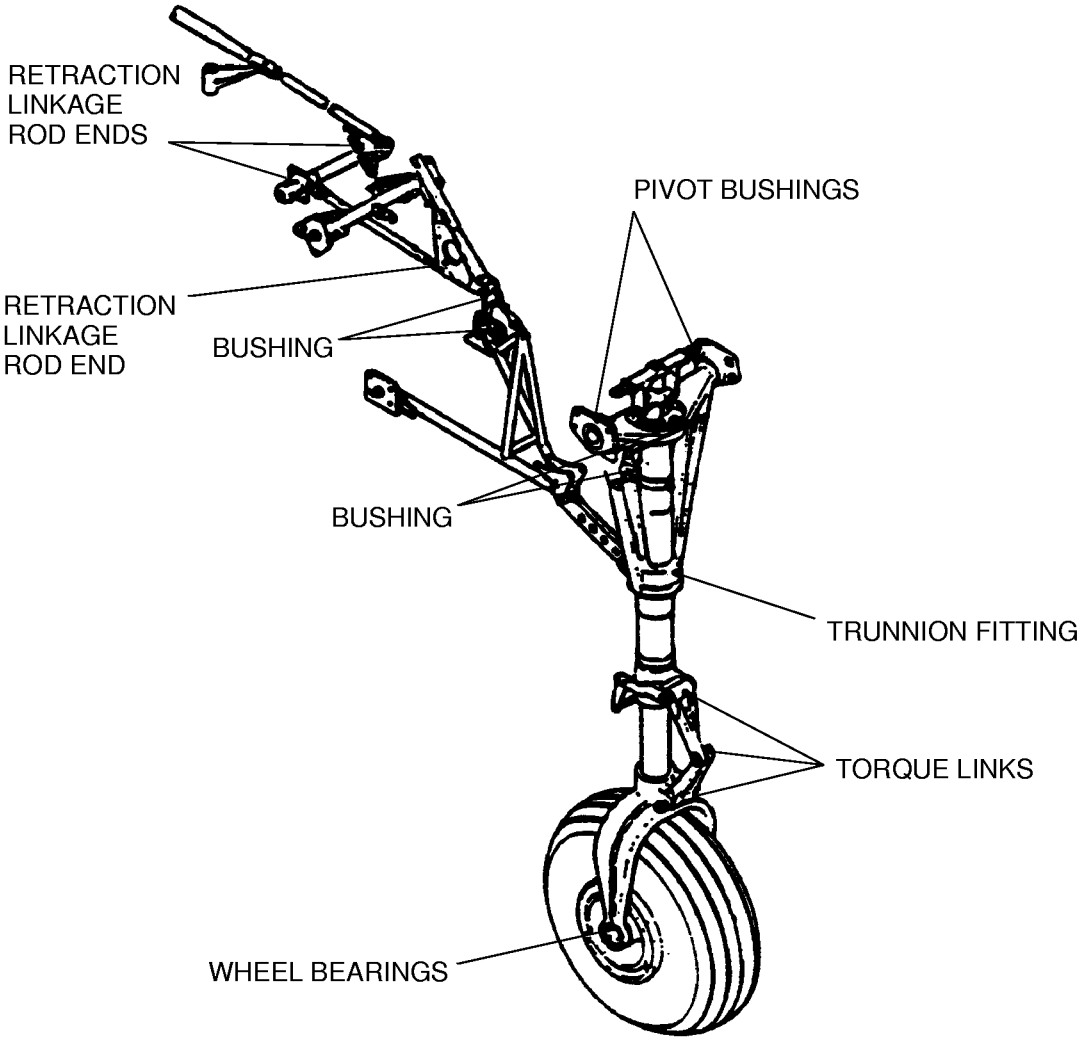
A54529



NOTE 1: WIPE POLISHED SURFACE OF LANDING GEAR SHOCK STRUT AND SHIMMY DAMPER PISTON ROD WITH A CLEAN DRY CLOTH AS NECESSARY.

NOTE 2: UNDER EXTREME CONDITIONS CLEAN AND LUBRICATE WHEEL BEARINGS EVERY 100 HOURS.

NOTE 3: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

14424001

Nose Gear Lubrication
Figure 301 (Sheet 1)

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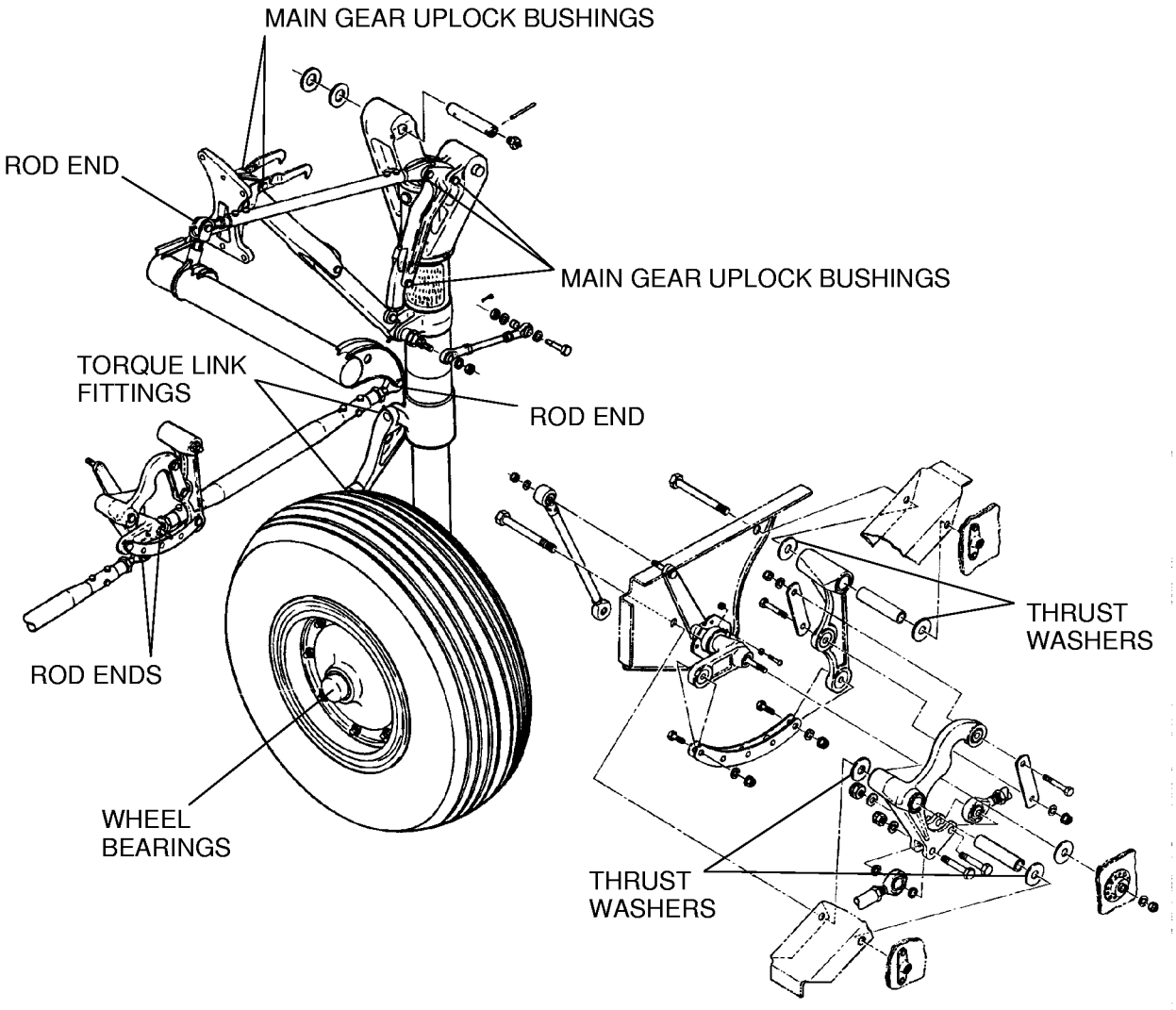
A54530



NOTE 1: WIPE POLISHED SURFACE OF LANDING GEAR SHOCK STRUT WITH A CLEAN DRY CLOTH AS REQUIRED.

NOTE 2: UNDER EXTREME CONDITIONS CLEAN AND LUBRICATE WHEEL BEARINGS EVERY 100 HOURS.

NOTE 3: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

14413002
10273001

Main Gear Lubrication
Figure 302 (Sheet 1)

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CONTROL COLUMN AND CONTROL PEDESTAL - SERVICING

1. General

A. If possible, do the airplane servicing in an area free of contamination from sand, dust or other environmental conditions that can contribute to incorrect lubrication procedures.

B. Refer to Table 301 and 302 to find the lubrication data.

Table 301. Lubrication Specifics

ITEM DESCRIPTION	LUBRICATION TYPE	APPLICATION	FIGURE NUMBER
Control Tube	FG	Hand	301 Sheet 1
Bearings	OG	Oil Can	301 Sheet 1

Table 302. Recommended Lubricants

LUBRICATION TYPE	PROCUREMENT SPECIFICATION	LUBRICANT DESCRIPTION
FG	SS-G-659	Powdered Graphite
OG	MIL-PRF-7870	Lubricating oil, general purpose, low temperature.

2. Control Column and Control Pedestal

A. Lubricate the control column and control pedestal.

Refer to Figure 301.

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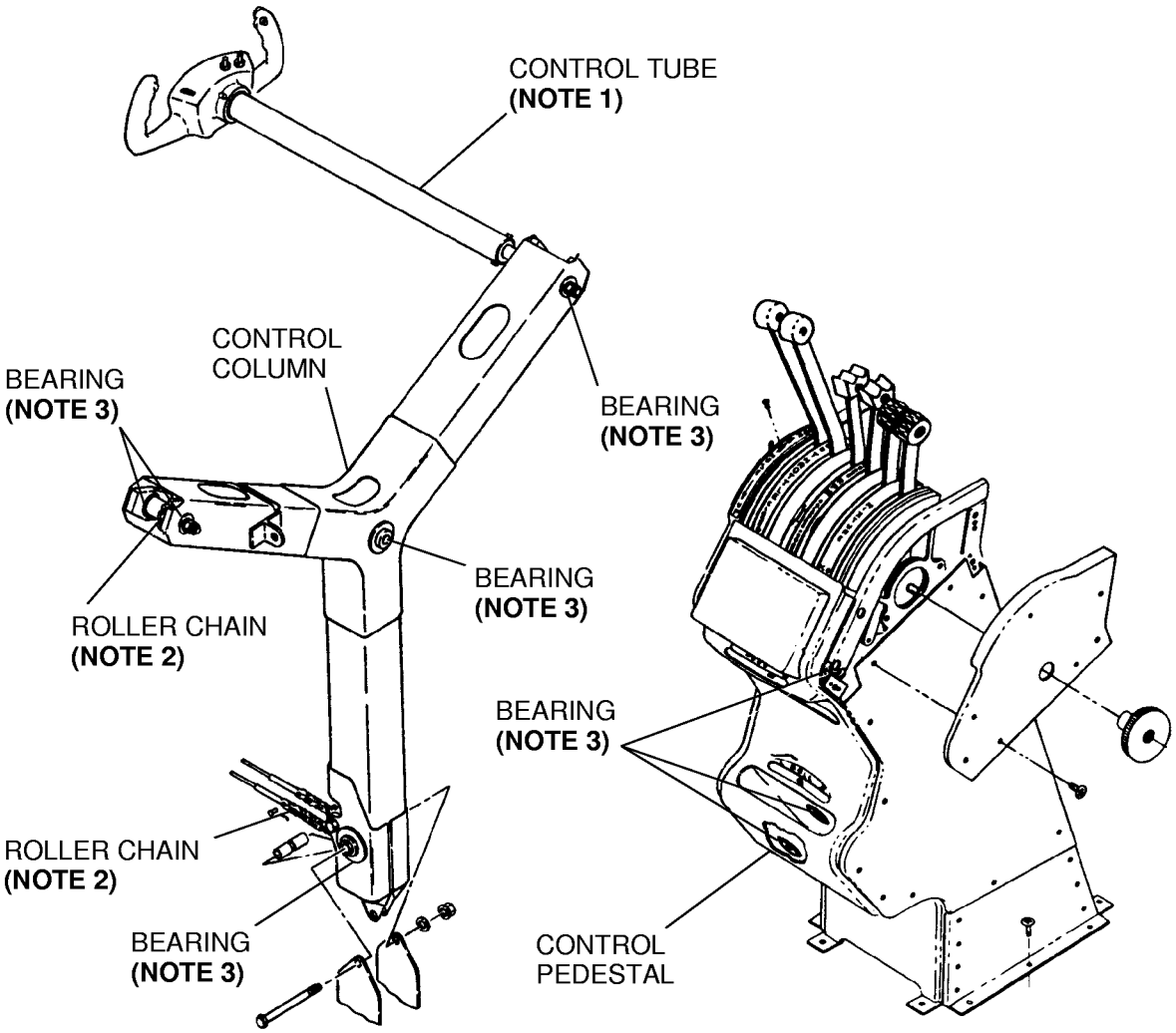
A54531



NOTE 1: APPLY A SMALL AMOUNT OF GENERAL PURPOSE POWDERED GRAPHITE, MIXED WITH LUBRICATING OIL, TO THE WHEEL CONTROL TUBE ADJACENT TO THE SOCKET ASSEMBLY ON THE INSTRUMENT PANEL. ACTUATE THE CONTROL TUBE FORWARD AND AFT TO MAKE SURE THE LUBRICANT PENETRATES INTO THE SOCKET ASSEMBLY. WIPE OFF CONTROL TUBE THOROUGHLY.

NOTE 2: DO NOT LUBRICATE ROLLER CHAINS ON ALL SYSTEMS EXCEPT AIRPLANES THAT OPERATE IN SEA COAST CONDITIONS. WIPE THE CHAINS WITH A CLEAN, DRY CLOTH.

NOTE 3: LUBRICATE UNSEALED PULLEY BEARINGS, ROD ENDS, OILITE BEARINGS, PIVOT END HINGE POINTS, AND ANY OTHER FRICTION POINT NEEDING LUBRICATION WITH GENERAL PURPOSE OIL AS REQUIRED.

NOTE 4: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

10151002
10612010

Control Column and Control Pedestal
Figure 301 (Sheet 1)

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RUDER PEDALS, GUST LOCK AND PARKING BRAKE - SERVICING

1. General

A. If possible, do the airplane servicing in an area free of contamination from sand, dust or other environmental conditions that can contribute to incorrect lubrication procedures.

B. Refer to Table 301 and 302 to find the lubrication data.

Table 301. Lubrication Specifics

ITEM DESCRIPTION	LUBRICATION TYPE	APPLICATION	FIGURE NUMBER
Rudder Pedal Linkage Bearings	OG	Oil Can	301 Sheet 1
Parking Brake Handle Shaft	OG	Oil Can	301 Sheet 1
Parking Brake Torque Tube Pivot Points	OG	Oil Can	301 Sheet 1
Rudder Pedal Torque Tube Bearings	GS	Hand	301 Sheet 1
Rudder Gust Lock	GS	Hand	301 Sheet 1

Table 302. Recommended Lubricants

LUBRICATION TYPE	PROCUREMENT SPECIFICATION	LUBRICANT DESCRIPTION
OG	MIL-PRF-7870	Lubricating oil, general purpose, low temperature.
GW	MIL- PRF-81322	Grease, Aircraft, general purpose, wide temperature range.

2. Rudder Pedals, Gust Lock, and Parking Brake

A. Lubricate the rudder pedals, gust lock, and parking brake.

Refer to Figure 301.

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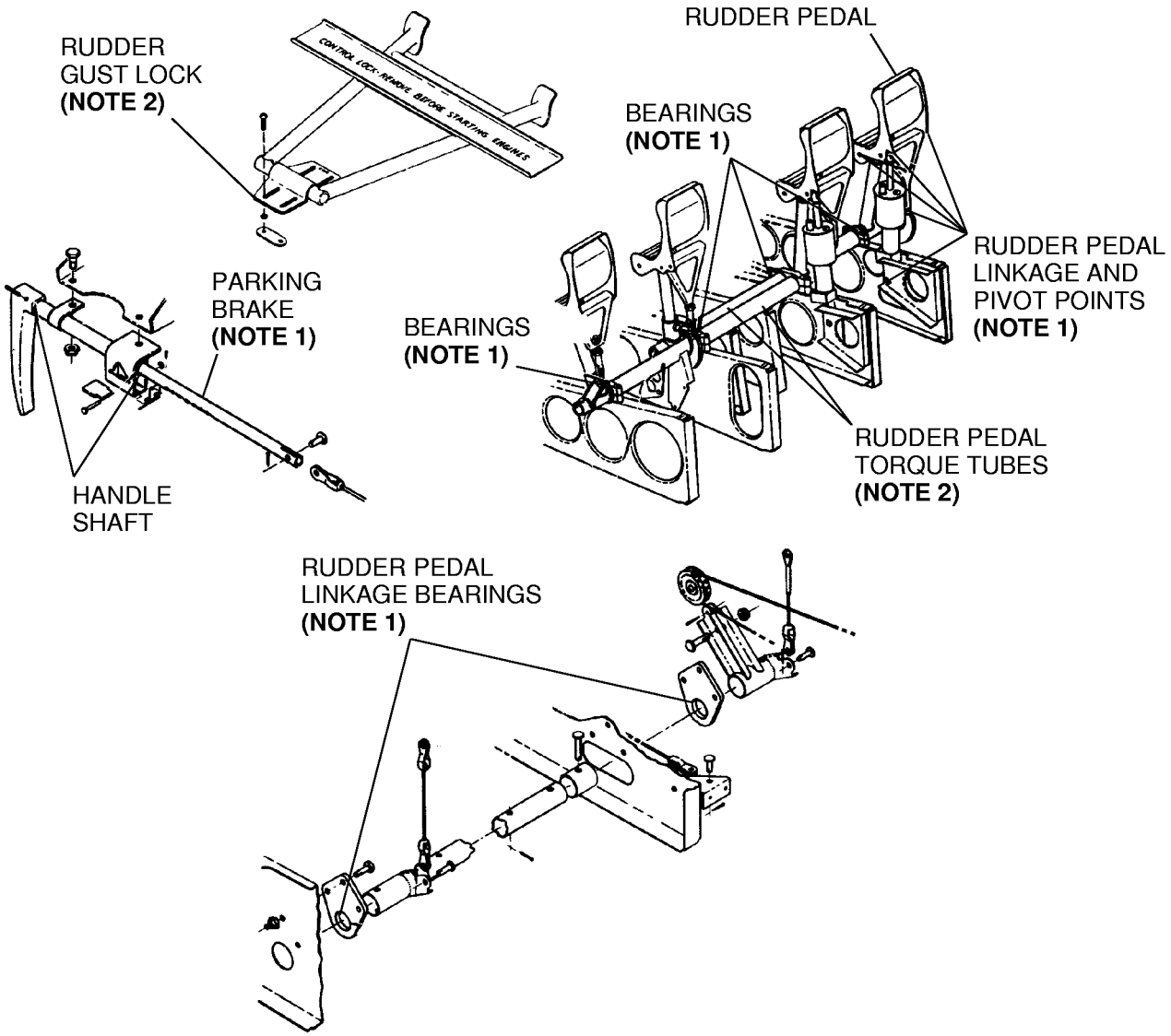
A54532



NOTE 1: AFTER LUBRICATING, ACTUATE THE RUDDER PEDALS AND PARKING BRAKE SEVERAL TIMES TO MAKE SURE SUFFICIENT PENETRATION OF THE LUBRICANT. WIPE OFF ANY OIL THAT REMAINS ON THE RUDDER PEDALS.

NOTE 2: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

14141032
10612028
10151001
10153006R

Rudder Pedals, Gust Lock, and Parking Brake
Figure 301 (Sheet 1)

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TRIM TAB ACTUATORS - SERVICING

1. General

A. If possible, do the airplane servicing in an area free of contamination from sand, dust or other environmental conditions that can contribute to incorrect lubrication procedures.

B. Refer to Table 301 and 302 to find the lubrication data.

Table 301. Lubrication Specifics

ITEM DESCRIPTION	LUBRICATION TYPE	APPLICATION	FIGURE NUMBER
Trim Actuator Internal Threads	GSL	Hand	301 Sheet 1
Clutch Assembly, Electric Trim	GSL	Hand	301 Sheet 1

Table 302. Recommended Lubricants

LUBRICATION TYPE	PROCUREMENT SPECIFICATION	LUBRICANT DESCRIPTION
GSL	565450-28	Grease, Light Cosistency, Low Temperature.

2. Trim Tab Actuators

A. Lubricate the trim tab actuator and electric trim clutch assembly.

Refer to Figure 301.

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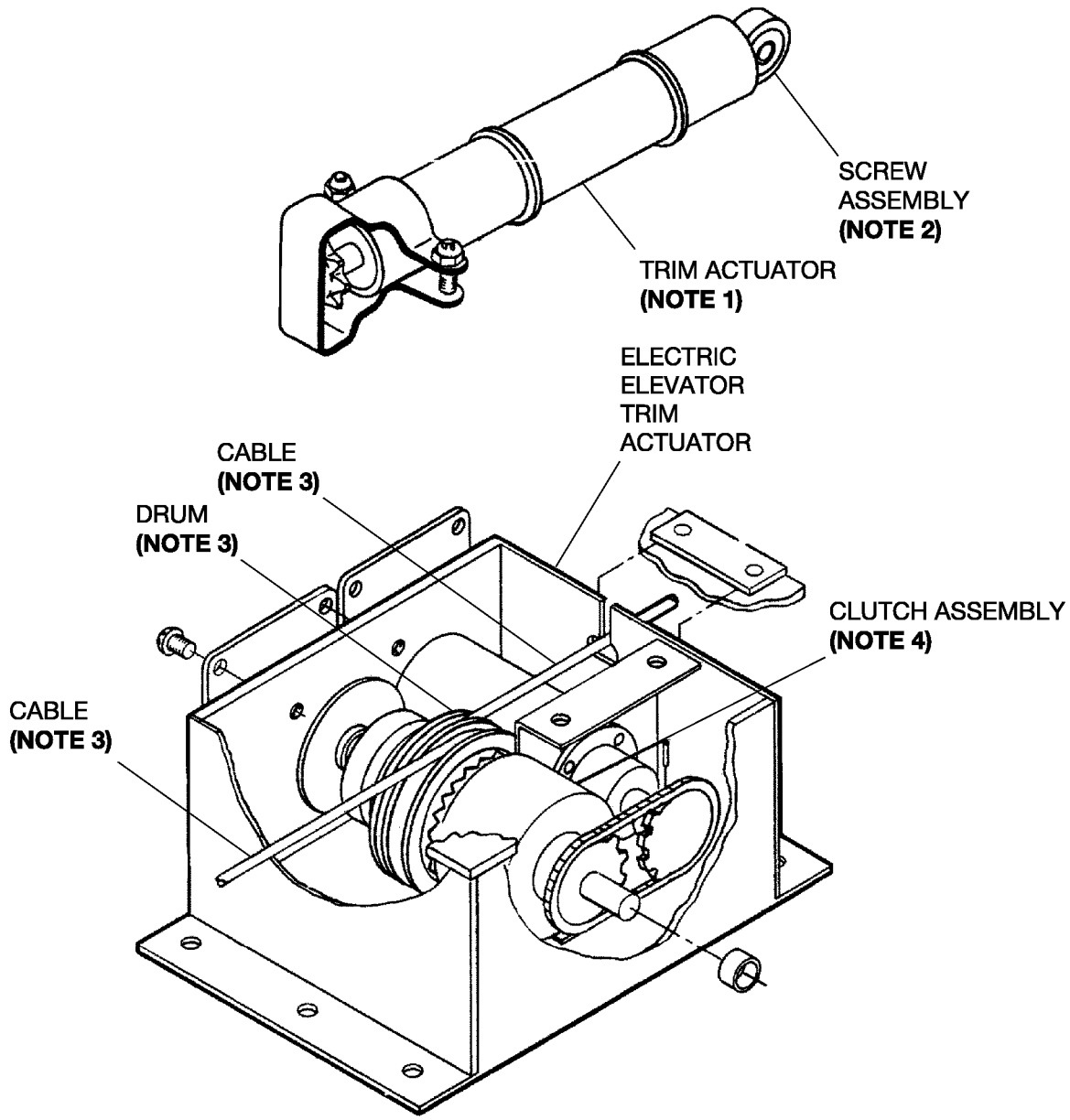
A54533



NOTE 1: DO NOT MIX SCREW ASSEMBLIES IN TRIM TAB ACTUATORS. ALWAYS CHECK RIGGING AFTER REMOVAL OF SCREW ASSEMBLY.

NOTE 2: REMOVE SCREW ASSEMBLY FROM TRIM TAB ACTUATOR (REFER TO REMOVAL AND INSTALLATIONS OF TRIM TAB ACTUATOR SCREW ASSEMBLY FOR SPECIAL INSTRUCTIONS). CLEAN SCREW ASSEMBLY. LUBRICATE THE INTERNAL AND EXTERNAL THREADS ON THE SCREW AND ACTUATORS.

NOTE 3: ELECTRIC TRIM TAB ACTUATOR DRUM AND CABLE MUST BE FREE OF GREASE AND OIL.

NOTE 4: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

10611013
10611014

Trim Tab Actuators
Figure 301 (Sheet 1)

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COWL FLAPS - SERVICING

1. General

A. If possible, do the airplane servicing in an area free of contamination from sand, dust or other environmental conditions that can contribute to incorrect lubrication procedures.

B. Refer to Table 301 and 302 to find the lubrication data.

Table 301. Lubrication Specifics

ITEM DESCRIPTION	LUBRICATION TYPE	APPLICATION	FIGURE NUMBER
Control Cable and Housing	FG	Hand	301 Sheet 1
Hinge	OG	Oil Can	301 Sheet 1
Pivot Points and Linkage	OG	Oil Can	301 Sheet 1
Spherical Rod Ends	OG	Oil Can	301 Sheet 1

Table 302. Recommended Lubricants

LUBRICATION TYPE	PROCUREMENT SPECIFICATION	LUBRICANT DESCRIPTION
OG	MIL-PRF-7870	Lubricating oil, general purpose, low temperature.
FG	SS-G-659	Powdered Graphite

2. Cowl Flaps

A. Lubricate the cowl flaps.

Refer to Figure 301.

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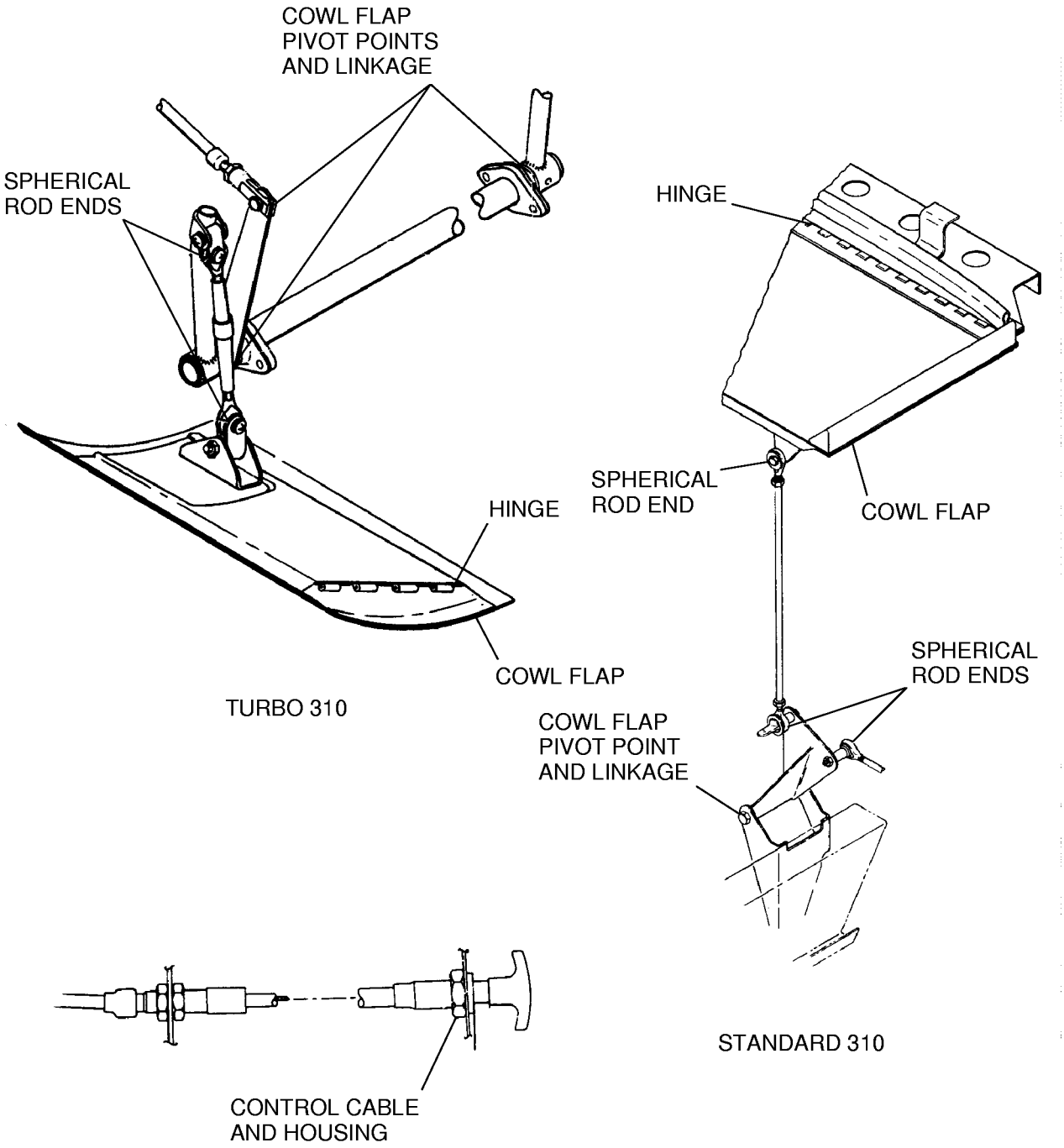
A54534



NOTE: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

10522002
10523004
10521001

Cowl Flap
Figure 301 (Sheet 1)

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FUEL SELECTOR - SERVICING

1. General

A. If possible, do the airplane servicing in an area free of contamination from sand, dust or other environmental conditions that can contribute to incorrect lubrication procedures.

B. Refer to Table 301 and 302 to find the lubrication data.

Table 301. Lubrication Specifics

ITEM DESCRIPTION	LUBRICATION TYPE	APPLICATION	FIGURE NUMBER
Fuel Selector Gear Box Gear	GL	Hand	301 Sheet 1
Fuel Selector Detents	FG	Hand	301 Sheet 1

Table 302. Recommended Lubricants

LUBRICATION TYPE	PROCUREMENT SPECIFICATION	LUBRICANT DESCRIPTION
GL	MIL-G-21164	Grease, molybdenum disulfide, for low and high temperatures.
FG	SS-G-659	Powdered Graphite

2. Fuel Selector

A. Lubricate the fuel selector.

Refer to Figure 301.

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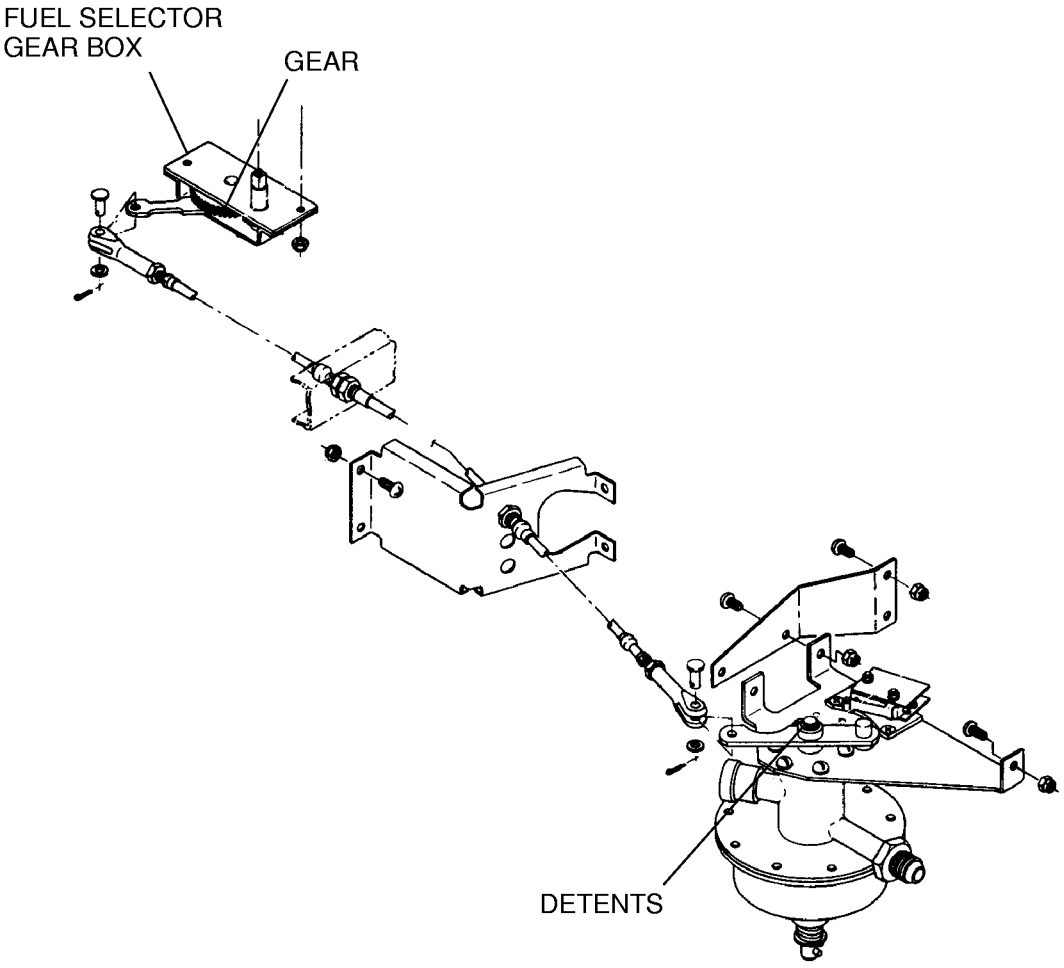
A54535



NOTE: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

10262009
10263012

Fuel Selector Gear Box
Figure 301 (Sheet 1)

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CREW SEAT - SERVICING

1. General

A. If possible, do the airplane servicing in an area free of contamination from sand, dust or other environmental conditions that can contribute to incorrect lubrication procedures.

B. Refer to Table 301 and 302 to find the lubrication data.

Table 301. Lubrication Specifics

ITEM DESCRIPTION	LUBRICATION TYPE	APPLICATION	FIGURE NUMBER
Bearings	OG	Oil Can	301 Sheet 1
Adjusting Screw	GL	Hand	301 Sheet 1

Table 302. Recommended Lubricants

LUBRICATION TYPE	PROCUREMENT SPECIFICATION	LUBRICANT DESCRIPTION
GL	MIL-G-21164	Grease, molybdenum disulfide, for low and high temperatures.
OG	MIL-PRF-7870	Lubricating oil, general purpose, low temperature.

2. Mechanical and Electrical Adjusting Seats

A. Lubricate the seat adjusting mechanism.

Refer to Figure 301.

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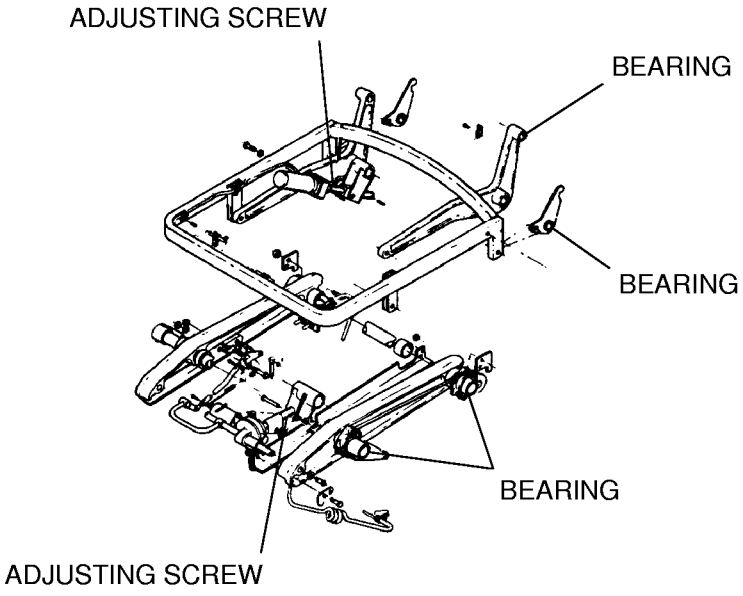
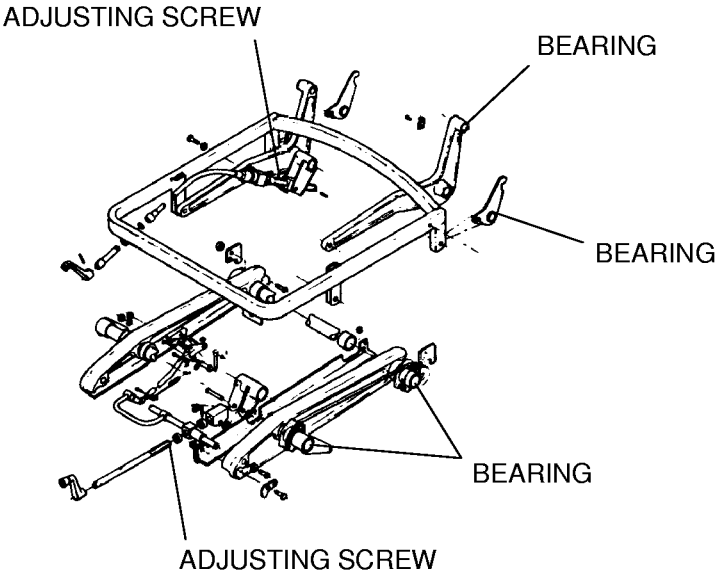
A54536



ELECTRICAL SEAT



MECHANICAL SEAT

14144006
14144007

Mechanical and Electrical Adjusting Seats
Figure 301 (Sheet 1)

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LANDING LIGHT - SERVICING

1. General

A. If possible, do the airplane servicing in an area free of contamination from sand, dust or other environmental conditions that can contribute to incorrect lubrication procedures.

B. Refer to Table 301 and 302 to find the lubrication data.

Table 301. Lubrication Specifics

ITEM DESCRIPTION	LUBRICATION TYPE	APPLICATION	FIGURE NUMBER
Hinge Point	OG	Oil Can	301 Sheet 1
Exposed Gear Sector	GL	Hand	301 Sheet 1

Table 302. Recommended Lubricants

LUBRICATION TYPE	PROCUREMENT SPECIFICATION	LUBRICANT DESCRIPTION
GL	MIL-G-21164	Grease, molybdenum disulfide, for low and high temperatures.
OG	MIL-PRF-7870	Lubricating oil, general purpose, low temperature.

2. Landing Light

A. Lubricate the landing light extend and retract mechanism.

Refer to Figure 301.

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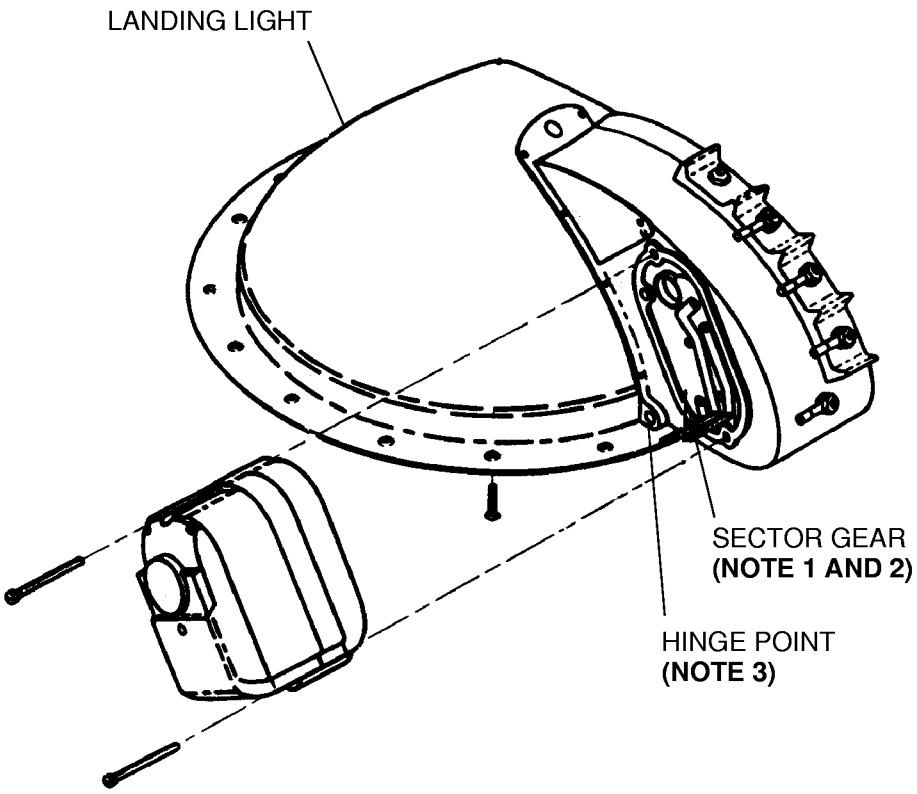
A54537



NOTE 1: EXTEND THE LIGHT TO LUBRICATE THE LARGE SECTOR GEAR. WIPE OFF EXCESS GREASE FROM GEAR BEFORE THE LIGHT IS RETRACTED.

NOTE 2: LUBRICATE THE OPTIONAL RIGHT WING LANDING LIGHT THE SAME WAY IF INSTALLED.

NOTE 3: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

51182010R

Landing Light
Figure 301 (Sheet 1)

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ALTERNATOR - SERVICING

1. General

A. If possible, do the airplane servicing in an area free of contamination from sand, dust or other environmental conditions that can contribute to incorrect lubrication procedures.

B. Refer to Table 301 and 302 to find the lubrication data.

Table 301. Lubrication Specifics

ITEM DESCRIPTION	LUBRICATION TYPE	APPLICATION	FIGURE NUMBER
Slip Ring End	SRI #2	Hand	301 Sheet 1

Table 302. Recommended Lubricants

LUBRICATION TYPE	PROCUREMENT SPECIFICATION	LUBRICANT DESCRIPTION
SRI	SRI #2	High speed bearing grease.

2. Alternator

A. Lubricate the alternator slip ring end bearing.

Refer to Figure 301.

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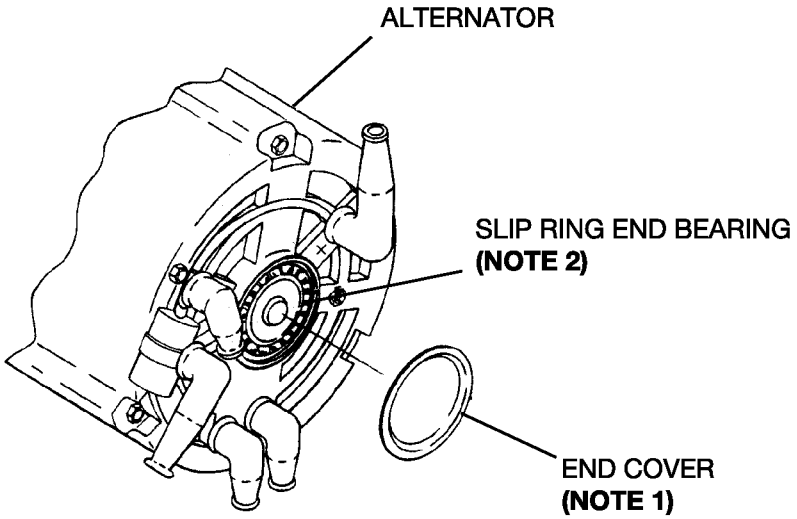
A54538



NOTE 1: REMOVE END COVER BY PRYING OUT WITH SMALL SCREWDRIVER. HAND LUBRICATE THE BEARING.

NOTE 2: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

58581001

Alternator Slip Ring End Bearing
Figure 301 (Sheet 1)

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UNSCHEDULED SERVICING - DESCRIPTION AND OPERATION

1. General

A. During operation, the airplane may be subjected to:

(1) Hard/overweight landings. Any landing made by an airplane at what is believed to be an excessive sink rate. Closely related to hard landings is the overweight landing. An overweight landing is defined as landing the airplane at any gross weight which exceeds maximum gross landing weight outlined in Pilot's Operating Handbook.

NOTE: If the hard/overweight landing is combined with high drag/side loads, additional checks are required.

(2) Overspeed - exceeding placard speeds of flaps, and exceeding airplane design speed. Any time an airplane has exceeded one or both of the following:
   (a) Airplane overspeed exceeding placard speed limits of flaps.
   (b) Airplane overspeed exceeding design speeds.

(3) Severe air turbulence or severe maneuvers. May be defined as atmospheric conditions producing violent buffeting of airplane. Severe maneuvers can be defined as any maneuvers exceeding Pilot's Operating Handbook limits.

(4) Lightning strike. If flown through an electrically stressed region of the atmosphere where electrical discharges are transferred from cloud to cloud and from cloud to earth, the airplane may become a part of this discharge path. During a lightning strike, the current enters the airplane at one point and exits at another, usually at opposite extremities. It is in these areas, wing tips, nose and tail sections where damage is most likely to occur. Burning and/or eroding of small surface areas of the skin and structure may be detected during inspection. In most cases, the damage is obvious. In some cases, however, hidden damage may result. The purpose of the lightning strike inspection is to locate any damage that may have occurred to the airplane before returning it to service.

(5) Foreign object damage.
   (a) Damage to the airplane engine may be caused by the ingestion of slush, by a bird strike, or by any other foreign object while operating the airplane on the ground or in normal flight. Damage may also be caused by tools, bolts, nuts, washers, rivets, rags or pieces of safety wire left in the engine nacelle inlet duct during maintenance operations. The purpose of the foreign object damage inspection is to locate any damage prior to repairing or returning the airplane to service.
   (b) Safety precautions should be taken to prevent foreign objects from coming in contact with the airplane during towing and at all times when airplane is not in service. To prevent dirt and foreign objects damage, the engines should be provided with suitable covers. When there is wind and dust conditions, the covers should be installed as soon as practicable following engine shut down.
   (c) The aerodynamic cleanliness level (degree of surface smoothness) contributes to performance capabilities of the airplane. It is important that the high cleanliness level be maintained.
   (d) Contour and waviness distortion of the aerodynamic surface may be developed in the course of normal operation or by improper handling during maintenance operations. Doors and access panels are susceptible to waviness through rough handling. Care should be exercised in the handling of these items.

(6) Towing with a large fuel unbalance or high drag/side loads due to ground handling.

(7) Severe cabin vibration or noise.

B. When any of these conditions are reported by the flight crew, a visual inspection of the airframe and specific inspections of components and areas involved must be accomplished.

C. The inspections are performed to determine and evaluate the extent of damage in local areas of visible damage, and to the structure and components adjacent to the area of damage.

D. When a lightning strike is encountered, a comprehensive inspection of the airplane exterior is performed to locate possible damage.

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E. If foreign object damage is encountered (suspected or actual), a visual inspection of the airplane must be accomplished before airplane is returned to service.

2. Cold Weather Servicing

A. If the airplane is to be used frequently in extremely cold weather, the oil shall be drained while the engine is hot and stored in a dry warm place until needed for next flight. If desired, the oil may be heated before it is poured into the engine for the next flight. Refer to Unscheduled Servicing - Maintenance Practices, for cold weather servicing of oil pressure lines.

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UNSCHEDULED SERVICING - MAINTENANCE PRACTICES

1. Extreme Weather Maintenance

A. Cold Weather.

(1) Starting in cold weather will be made easier by the installation of an optional oil dilution system and a ground power receptacle. If these aids are not installed, the following procedural steps may be accomplished.

(2) After the last flight of the day, drain engine oil into clean containers so it can be preheated. Cover the engines, including the rear air scoop opening, to prevent ice or snow from collecting inside the cowling. When preparing an engine for operation after using this procedure, preheat the oil. After preheating the oil, gasoline may be mixed with the oil in a ratio of one part gasoline to 12 parts oil before pouring the oil in the engines. If free air temperature is below -29°C (-20°F), the engine compartments shall also be preheated with a ground heater.

WARNING: To prevent serious injury or death, ensure the magneto switches are in the OFF position before pulling the propellers through by hand.

(3) Check all engine compartment drain and vent lines for presence of ice. Remove protective covers placed on engines and rear cowl opening. Pull propellers through several revolutions by hand before starting the engines.

WARNING: Preheat oil before diluting with gasoline and to prevent the possibility of a flash fire do not heat above 121°C (250°F).

CAUTION: Due to the desludging effect of the diluted oil, engine operation should be observed closely during the initial warm-up of the engines. Engines that have a considerable amount of operational hours accumulated since their last dilution period may be seriously affected by the dilution process. This will be caused by the diluted oil dislodging sludge and carbon deposits within the engines. This residue will collect in the oil sumps and possibly clog the screened inlet to the oil pumps. Small deposits may actually enter the oil pumps and be trapped by the main oil filter screens. Partial, or in some cases, complete loss of engine lubrication may result from either condition. If these conditions are anticipated after oil dilution, the engines should be ran for several minutes at normal operating temperatures and then stopped and inspected for evidence of sludge and carbon deposits in the oil sumps, oil coolers and oil filter screens. Future occurrence of this condition can be prevented by diluting the oil prior to each oil change. This will prevent accumulations of sludge and carbon deposits within the engines.

B. Winterization Kit.

(1) A winterization kit consisting of engine cooling air inlet restrictor baffles is available for use during continuous operation in very low temperature conditions. These baffles may be installed as an assist in maintaining engine cylinder head temperatures in the recommended temperature range. The winterization kit must be removed at temperatures of 20°F and above.

C. Hot Weather.

(1) In hot weather, with a hot engine, fuel may vaporize at certain points in the fuel system. Vaporized fuel may be purged by setting the mixture control in IDLE CUTOFF and operating the auxiliary fuel pump on "HI".

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(2) Engine mis-starts characterized by weak, intermittent explosions followed by puffs of black smoke from the exhausts are caused by over-priming or flooding. This situation is more apt to develop in hot weather or when the engine is hot. If it occurs, repeat the starting routine with the throttle approximately one-half OPEN, the mixture control in IDLE CUT-OFF and the auxiliary fuel pump switch OFF. As the engine fires, move the mixture control to full RICH and decrease the throttle to desired idling speed.

(3) Engine mis-starts characterized by sufficient power to disengage the starter but dying after 3 to 5 revolutions are the result of an excessively lean mixture after the start. This can occur in either warm or cold temperatures. Repeat the starting routine but allow additional priming time with the auxiliary fuel pump switch on "LO" before cranking is started or place the auxiliary fuel pump switch on "HI" immediately for a richer mixture while cranking.

(4) If prolonged cranking is necessary, allow the starter motor to cool at frequent intervals since excessive heat may damage the starter.

D. Dusty Conditions.

(1) Dust inducted into intake systems is probably the greatest single cause of early engine wear. Under high dust conditions, the induction air filters should be serviced daily.

E. Seacoast and Humid Areas.

(1) In salt water areas, special care should be taken to keep engines and engine accessories clean to prevent oxidation. Fuel and oil should be checked frequently and drained of condensed moisture in humid areas.

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FUSELAGE AND EMPENNAGE - SERVICING

1. Exterior Cleaning

A. Connect static ground cables to airplane.

B. Install protective covers on engine intake, and engine exhaust, pitot tubes, static ports and tailcone air inlets.

C. If there are leaks around cabin door, baggage door or foul weather window, seal with tape.

D. Brush or spray cleaner on surface as specified by the supplier. The strength of the chemical mixture will determine the cleaning power.

CAUTION: Do not brush windows. Windows are constructed of stretched acrylic and brushing may scratch the windows.

E. Rinse covers and tape.

F. Clean windows.

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CHAPTER

20

STANDARD PRACTICES - AIRFRAME

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STANDARD PRACTICES AIRFRAME - GENERAL

1. Scope

A. This Chapter describes the standard maintenance practices for maintaining and repairing items of the airframe, and systems that are typical to more than one area or system. Maintenance practices which are unique to a particular system, or subject are described in the appropriate chapter and section in the maintenance manual.

NOTE: Equivalent substitutes may be used for the following items:

NAME	NUMBER	MANUFACTURER	USE
Overall Base Paint	810 Series (Jet-Glo)	Sherwin-Williams 630 E. 13th St. Andover, KS 67002	Use as topcoat overall color.
Hisolids Corrosion Primer	483-928	Sherwin-Williams	Use as overall intermediate primer.
Hisolids Corrosion Primer	R4001-K14 MAX COR	U.S. Paint Corp. 831 S. 21st St. St. Louis, MO 63103	Epoxy Primer Base
Acid Resistant Enamel	Jet-Glo Urethane 571-567	Sherwin-Williams	Use as topcoat for battery box.
Polyester	PCA-1575-GP1	Polymer Corp. 2120 Fairmont Ave. Reading, PA 19612-4235.	Use as topcoat for landing gear.
Heat Resistant Enamel (Gray)	521-520	Sherwin-Williams	Use for engine mount and accompanying hardware in engine compartment.
Chromated Etch Primer	U2655 Wash Primer and 142265 Reducer	Sterling Lacquer Mfg. 3150 Brannon Ave. St. Louis, MO 63139	To prime bonded or spot welded assemblies.
Intermediate Epoxy Primer	825-8136 Base and VG8392 Activator T3871 Thinner	DuPont	To prime aluminum airplane exterior. To thin intermediate epoxy primer.
Polishing Compound	808 Polishing Compound	DuPont	To rub out overspray.
Cloth	Hex Wiping Cloth	Commercially Available	With solvent to clean airplane exterior.
Tape	Masking Tape, Y-231	3M Co. 3M Center Minneapolis, MN 55144	To hold masking paper in place.
Cleaning Solvent	Aliphatic Naptha	Commercially Available	To clean acrylic.
Paint Remover	Oakite EPA	Oakite Products Inc. 50 Valley Rd. Berkeley Heights, NJ 07922	To remove difficult epoxies and polyurethane.

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NAME	NUMBER	MANUFACTURER	USE
Paint Remover	1717 SC	B & B Chemical Co. Inc. 875 W 28th St Hialeah, FL 33010	To remove epoxies and urethane paint.
Paint Remover	5075 NP	B & B Chemical Co. Inc.	To remove epoxies and urethane paint.
Paint Remover	PR-4028	Eldorado Chemical Co. 14358 Lookout Road San Antonio, TX 78265-4837	To remove epoxies and urethane paint.
Paint Remover	Turco T-6776 LO	Henkel Surface Technologies	To remove lacquers, alkyds, epoxies and urethane paint.
Fireproof Coating (Intumescent Paint)	173	Flame Control Coatings P.O. Box 786 4120 Hyde Park Blvd. Niagra Falls, NY 14302	Fireproof coating of electrical power box.
Urethane-Acrylic Paint (Gray)	WP593	Sherwin-Williams	Top coat for electrical power box.
Modified Urethane Paint (Seal Gray)	WP46	Sherwin-Williams	Finish coat for electrical powerbox.
Cleaning Solvent	Methyl n-Propyl Ketone	Eastman Chem Products Wilcox Dr. & Lincoln St. Kingsport, TN	Hand wipe cleaning operations for all metals and painted surfaces.
Cleaning Solvent	Desoclean 110	PRC-DeSoto International Glendale, CA 91209	Hand wipe cleaning operations for all metals and painted surfaces.
Cleaning Solvent	DS108	Dynamold Solvents, Inc. 2905 Shamrock Ave. Ft. Worth, TX 76107	Hand wipe cleaning operations for all metals and painted surfaces.
Cleaning Solvent	Isopropyl Alcohol TT-I-735	Commercially Available	Hand wipe cleaning operations for all plastic surfaces.
Cleaning Solvent	Isopropyl Alcohol TT-I-735	Commercially Available	Hand wipe cleaning operations for all rubber, natural, or synthetic, and silicone surfaces.
Primer	MIL-P-23377F (or later revisions)	Use any corrosion primers that meet the requirements of this specification. Suggested primers are as follows:	Primer application operations - corrosion primers.
Primer	513 X 419/910 X 942	PRC-DeSoto International	Primer application operations - corrosion primers.
Primer	02-Y-40 or 02-4-40 CATA	Deft, Inc. 17451 Von Karman Ave. Irvine, CA 92714	Primer application operations - corrosion primers.

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NAME	NUMBER	MANUFACTURER	USE
Primer	U-1201F/U-1202F	Sterling Lacquer Mfg.	Primer application operations - corrosion primers.
Primer	R4001-K14 MAX COR	U.S. Paint Corp.	Primer application operations - corrosion primers.
Primer	DOD-P-15328	Use any pretreatment primers that meet the requirements of this specification. Suggested primers are as follows:	Primer application operations - pretreatment primers.
Base Coat	MIL-C-85285	Use any topcoats that meet the requirements of this specification. Suggested base coats are as follows:	Topcoat application operations - base coat.
Base Coat	Desothane 420HS, Hisolids	PRC-DeSoto International	Topcoat application operations - base coat.
Base Coat	Low VOC Enamel	Sterling Lacquer Mfg.	Topcoat application operations - base coat.
Base Coat	24F, 20 Series	Dexter Crown Metro Aerospace	Topcoat application operations - base coat.
Stripe Paint	MIL-C-85285	Use any topcoats that meet the requirements of this specification.	Topcoat application operations - stripe paint.
Sandpaper	180 grit or finer	Commercially Available	Paint removal operations - mechanical.
Paint Remover	TURCO T-6776 LO	Turco Products, Inc. Westminster, CA 92684	Paint removal operations - chemical.

2. Definition

A. This chapter is divided into subjects and sections to aid maintenance personnel in locating information. Consulting the Table of Contents will further assist in locating a particular subject. A brief definition of the subjects and sections incorporated in this chapter is as follows.

(1) The subject on Material and Tool Cautions describes general cautions and warnings applicable to maintenance on or around the airplane.

(2) The subject on Torque Data describes maintenance practices for torquing tools, torquing requirements, formulas and torque limits for various type fasteners.

(3) The subject on Safetying describes the proper methods and use of safety wire/lockwire, cotter pins and lock clip installations.

(4) The subject on Control Cables and Pulleys describes the construction, examination and storage of cable assemblies and pulleys.

(5) The section on Solvents, Sealants and Adhesives provides the description and uses for solvents and cleaners; fuel, weather, pressure and high-temperature sealing; and the application of adhesives and solvent bonding.

(6) The subject on Conversion Data contains information converting the more commonly used measuring units found in the Maintenance Manual.

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MATERIAL AND TOOL CAUTIONS - DESCRIPTION AND OPERATION

1. Titanium

CAUTION: Cadmium plated tools must not be used on titanium parts, particularly if parts are mounted where they may be subjected to temperatures above 250℉. Small cadmium deposits, which may be left on such parts, will react with titanium when heated, resulting in brittleness and possibly cracks.

CAUTION: Cadmium plated fasteners must not be used in contact with titanium parts.

2. Mercury

CAUTION: Mercury-containing thermometers and other test equipment must not be used on the airplane.

A. Mercury, by the amalgamation process, can penetrate any break in the finish, paint or sealing coating of a metal structural element. An oxide coating on a dry metallic surface will tend to inhibit an immediate action while a bright, polished, shining or scratched surface will hasten the process. Moisture will also promote the amalgamation process. Soils, greases or other inert contaminants, present on the metal surfaces, will prevent the start of the action. The corrosion and embrittlement which results from an initial penetration, can be extremely rapid in structural members under load. Once it has begun, there is no known method of stopping it. Complete destruction of the load carrying capacity of the metal will result.

3. Asbestos

WARNING: Asbestos fibers are harmful when ingested into the body. The following steps must be adhered to when working with parts containing asbestos.

A. Avoid inhalation of dust with either the following methods.
   (1) Use engineering controls, such as working with properly filtered exhaust chamber, or use wet methods to maintain exposure below OSHA personnel exposure limits.
   (2) If methods in step (1) above cannot be used, use respiratory protection, including high efficiency filters. Other protection must include coveralls, gloves and eye protection.

B. Dispose of all asbestos containing material in accordance with local, state and federal regulations.

4. Maintenance Precautions

WARNING: During maintenance, repair and servicing of the airplane, many substances and environments encountered may be injurious if proper precautions are not observed.

A. Carefully read and follow all instructions, and especially adhere to all cautions and warnings provided by the manufacturer of the product being used. Use appropriate safety equipment as required including goggles, face shields, breathing apparatus, respirators, protective clothing and gloves. Fuel, engine oil, solvents, volatile chemicals, adhesives, paints and strong cleaning agents may be injurious when contacting the skin or eyes, or when vapors are breathed. When sanding composites or metals or otherwise working in an area where dust particles may be produced, the area should be ventilated and the appropriate respirator must be used.

B. In case of a spill of hazardous material, consult the latest version of the Emergency Response Guidebook DOT P 5800.5 for guidance in dealing with the hazard. As soon as possible, notify CHEMTREC at 1-800-424-9300 (in the United States, including Alaska and Hawaii; and in Canada) for more detailed information in dealing with the hazard.

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5. General Usage Solvents

A. During the course of daily work routines, many will have the occasion to work with solvents. Webster's dictionary defines a solvent as, "a substance, usually liquid, that dissolves or can dissolve another substance." An example would be the reaction that is obtained when salt is added to water. The salt is dissolved by the water. General usage solvents include the following:

Methyl n-Propyl Ketone

Isopropyl Alcohol

Naptha

B. These chemicals/solvents are generally colorless, evaporate quicker than water, and tend to give off vapors in higher quantities as their temperature increases. The vapors are generally heavier than air, which causes them to collect in low lying areas or push normal oxygen and air out of a confined area. This situation can lead to oxygen deficient atmospheres. Many general usage solvents are also flammable.

C. Solvents are hazardous to work with because of their flammability, rate of evaporation and reaction to oxidizers. Solvents can also be an irritant to the skin and eyes.

D. Solvent flammability can be induced by a single spark, a smoldering cigarette, or even atmospheric conditions can ignite gasoline vapors. The vapors may also flash back to the original source which can explode. The same reaction can take place with Toluene or Isopropyl Alcohol. The lower the flash point of the chemical, the more likely it is to become flammable. Generally, flash points of less than 100°F (37.8°C) are considered flammables. Examples of solvent flash points are shown below:

SOLVENT	FLASH POINT
Methyl n-Propyl Ketone	45°F (7.2°C)
Isopropyl Alcohol	53.6°F (12°C)

E. The rate of evaporation is closely tied to flammability because normally the vapors must be present to ignite the liquid. Vaporization also allows the solvents, even those that are not flammable, to get into the air and into the body's blood stream through the lungs.

F. Solvents can also react explosively with oxidizers (chemicals which release oxygen). A very violent and uncontrollable reaction takes place which generates heat rapidly. For this reason, it is very important for each person to be aware of specific chemicals in use in the work area, and to comprehend the labeling of containers. Chemical manufacturers are required to label each container with a diamond shaped symbol: red for flammable and yellow for oxidizers.

G. Solvents can also damage the hands and skin. Solvents dry out skin and dissolve the natural oils. The condition can develop into an irritation or, if left untreated with continuous exposure it may progress to a dermatitis. Damaged skin allows other contaminants to worsen the condition, because the contaminants have easier access to the deeper levels of the skin. In serious cases, blood poisoning is also possible.

H. The best defense against skin irritation is not to be exposed, but many times exposure to solvents/ chemicals is unavoidable. Fortunately, the body is capable of filtering small amounts of solvents out of the body. This filtration function takes place in the liver. The liver receives blood which may be contaminated with solvents from both the lungs and the skin. If the quantities are low enough and infrequent enough, the liver can filter out the contaminants. This is one of the scientific facts on which OSHA based its Permissible Exposure Limits. However, when exposures are constantly above these levels over an extended period of many years, the filter (liver) becomes clogged and the solvents can then affect other parts/portions of the body.

6. National Emissions Standards for Hazardous Air Pollutants

A. National Emissions Standards for Hazardous Air Pollutants (NESHAP).
(1) The NESHAP standards have restricted the use of certain chemicals and solvents.

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(2) For complete details of the regulatory standards, see Federal Register, 40 CFR Part 63, [Ad-FRL-5636-1], RIN 2060-AG65.
(3) The currently acceptable replacements for chemicals that have been restricted or prohibited by the standards are listed in Exterior Finish - Cleaning/Painting, and these supersede materials which may be specified elsewhere in this manual.

B. NESHAP Requirements.
(1) Hand-Wipe Cleaning.
(a) All hazardous air pollutants or volatile organic compounds that are used as hand wipe cleaning solvents must meet a composition requirement and have a vapor pressure less than or equal to 1.75Hg inches @ 69°F (45 mm Hg @ 20°C.)
(b) The requirements specified may be met by an alternative compliance plan administered by the permitting authority and approved under Section 112(1) of the Clean Air Act.
(2) Primer Application.
(a) The organic hazardous air pollutant content is limited to 350 g/l (2.9 pounds per gallon), less water, as applied.
(b) The volatile organic compound limit is 350 g/l (2.9 pounds per gallon), less water, as applied.
(c) Achieve the content limits by using coatings below the content limit or use monthly volume-weighted averaging to meet content limits.
(3) Topcoat Application.
(a) The base coat organic hazardous air pollutant content must be less than 420 g/l (3.5 pounds per gallon), less water, as applied.
(b) The volatile organic compound limit is 420 g/l (3.5 pounds per gallon), less water, as applied.
(c) The topcoats must meet the requirements of MIL-C-85285.
(d) Stripe paint requirements are the same as the base coat requirements. If the recommended supplier cannot be used, then use base coat materials to paint stripes.

CAUTION: Operate all application equipment according to the manufacturer's specifications, company procedures or locally specified operating procedures.

NOTE: All paints and primers must have specific application techniques. If alternative is sought, use only the materials that are less than or equal in emissions, to less than HVLP or electrostatic spray application techniques.

(4) Depainting
(a) Depainting operations apply to the outer surface of the airplane and do not apply to parts or units normally removed. Fuselage, wings and stabilizers are covered. Radomes and parts normally removed are exempt from the following requirements:
1 No organic hazardous air pollutants are to be emitted from chemical strippers or softeners.
2 Inorganic hazardous air pollutant emissions must be kept to a minimum during periods of nonchemical based equipment malfunctions.
3 The use of organic hazardous air pollutant material for spot stripping and decal removal is limited to 190 pounds per airplane per year.
(b) Operating requirements for depainting operations generating airborne inorganic hazardous air pollutants include control with particulate filters or water wash systems.
(c) Mechanical and hand sanding are exempt from these requirements.

7. Facilities and Equipment

A. Facilities
(1) A system must be provided to collect processing waters to treat for chromium and pH or to be hauled away.
(2) Facilities must have proper safety equipment.

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B. Equipment
   (1) Spray application of cleaning solvents, paint removers or color chemical film treatment solutions is prohibited unless all requirements of NESHAP are met.
   (2) Spraying equipment to wash the airplane with alkaline cleaner may be used. This equipment should be adequate to spray deoxidizer, chemical film solutions and rinse water.
   (3) A high pressure washer is recommended, with or without hot water.
   (4) Respirators and/or dust masks should be used.

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TUBE BENDING AND FLARING - MAINTENANCE PRACTICES

1. General

A. Requirements are described in this section for bending and flaring of tubing to be used as conduit or airplane fluid systems.

2. Bending

A. Bending shall be accomplished by the use of suitable tube bending equipment. The following bending information conforms to standard MS33611.

B. Bending Criteria.
(1) Bends shall be uniform and without kinks.
(2) Embossed marks caused by pits and other minor imperfections in bend blocks are permissible in tubing used as a housing or conduit for electrical wires or air ducting, provided their height does not exceed 10 percent of the tube wall thickness.
(3) Mandrel bumps, flat spots and dents without abrupt change of section, shall not be cause for rejection, provided the tube diameter is not increased or decreased by more than 5 percent of the nominal tube diameter or 0.030 inch (0.762 mm), whichever is greater.
(4) Flatness in the area of a tube bend shall be defined by the formula:

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$$\frac{\text{MAXIMUM OUTSIDE DIAMETER - MINIMUM OUTSIDE DIAMETER X 100 PERCENT}}{\text{NOMINAL OUTSIDE DIAMETER}}$$

(5) Tube flatness for fluid systems with working pressures of 1000 PSI or greater shall not exceed 5 percent; for tubes with a nominal outside diameter of 0.500 inch (12.70 mm) or less, a maximum flatness of 0.020 inch (0.508 mm) will be allowed.
(6) Tube flatness for fluid systems with working pressures less than 1000 PSI shall not exceed 10 percent, or for tubes with a nominal outside diameter 0.500 inch (12.70 mm) or less, a maximum flatness of 0.020 inch (0.508 mm) will be allowed.
(7) For fluid systems with working pressures 500 PSI or greater, there shall be no wrinkles or kinks deeper than 1 percent of the tube outside diameter and no scratches deeper than 5 percent of the nominal wall thickness.
(8) For fluid systems with working pressures of less than 500 PSI, there shall be no wrinkles or kinks deeper than 2 percent of the tube outside diameter and no scratches deeper than 10 percent of the nominal wall thickness.
(9) Unless specified in the individual chapter for special application tubing (plumbing and conduit lines) shall have bend radius in accordance with the values described in Figure 202, Bend Radii.

3. Flaring

A. Flaring Criteria.
(1) Cut all tubing squarely and break all sharp edges to prevent cracking when flared. Remove burrs, but do not use metal wool when doing so.
(2) Flares in tubing shall be checked after forming for concentricity and alignment of flare with tube. Flares shall be free of cracks and the inside surface shall be smooth and free from grooves, tool marks, or other surface defects and must retain at least 82 percent of the original wall thickness. Superficial marks or "checks" on the external surface of the flare are not cause for rejection. Sleeves must contact the flared surface when pushed together by hand and be free to rotate when contacting the flare without interference of the bend radius. Refer to Figure 201.
(3) Form single flares in accordance with standard MS33584 and form double flares in accordance with standard MS33583, reference corresponding Figure 203 or Figure 204.

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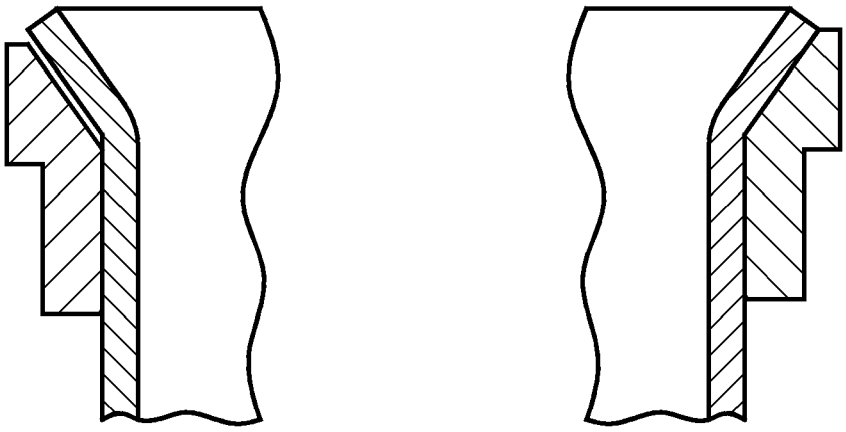

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Sleeve Installation
Figure 201 (Sheet 1)

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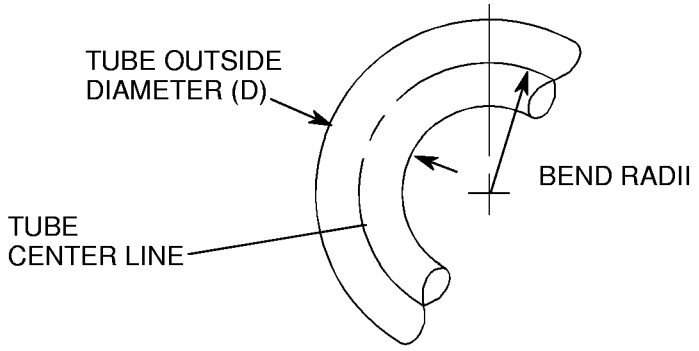

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TUBE OUTSIDE DIAMETER		RECOMMENDED BEND RADIUS 3D BEND RADIUS		4D BEND RADIUS		ADDITIONAL 6D BEND RADIUS	
INCH	mm	INCH	mm	INCH	mm	INCH	mm
1/8	3.175	0.375	9.525	0.500	12.700	0.750	19.050
3/16	4.762	0.563	14.286	0.750	19.048	1.125	28.572
1/4	6.350	0.750	19.050	1.000	25.400	1.500	38.100
5/16	7.937	0.938	23.811	1.250	31.748	1.875	47.622
3/8	9.525	1.125	28.575	1.500	38.100	2.250	57.150
7/16	11.112	1.312	33.336	1.750	44.448	2.625	66.672
1/2	12.700	1.500	38.100	2.000	50.800	3.000	76.200
5/8	15.875	1.875	47.625	2.500	63.500	3.750	95.250
3/4	19.050	2.250	57.150	3.000	76.200	4.500	114.300
7/8	22.225	2.625	66.675	3.500	88.900	5.250	133.350
1	25.400	3.000	76.200	4.000	101.600	6.000	152.400
1-1/8	28.575	3.375	85.725	4.500	114.300	6.750	171.450
1-1/4	31.750	3.750	95.250	5.000	127.000	7.500	190.500
1-3/8	34.925	4.125	104.775	5.500	139.700	8.250	209.550
1-1/2	38.100	4.500	114.300	6.000	152.400	9.000	228.600
1-5/8	41.275	4.875	123.825	6.500	165.100	9.750	147.650
1-3/4	44.450	5.250	133.350	7.000	177.800	10.500	266.700
1-7/8	47.625	5.625	142.875	7.500	189.500	11.250	285.750
2	50.800	6.000	152.400	8.000	203.200	12.000	304.800
2-1/4	57.150	6.750	171.450	9.000	228.600	13.500	342.900
2-1/2	63.500	7.500	190.500	10.000	254.000	15.000	381.000
3	76.200	9.000	228.600	12.000	304.800	18.000	457.200

For recommended bends (3D and 4D) and additional bends (6D) flatness, wrinkle and scratch criteria, refer to Bend Criteria.

Tube Bend Radii
Figure 202 (Sheet 1)

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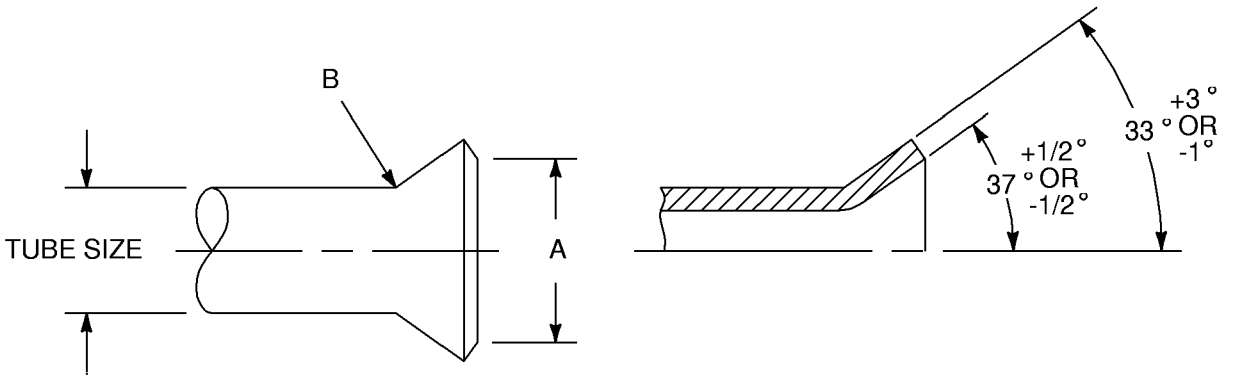

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TUBE SIZE (OUTSIDE DIAMETER) (INCHES)	**A DIAMETER (INCHES)** ALUMINUM ALLOY OR STEEL TUBING	**A DIAMETER (mm)** ALUMINUM ALLOY OR STEEL TUBING	B RADIUS +0.010, OR -0.010 INCHES (+0.25 OR -0.25 mm)
1/8	0.200 +0.000 or -0.010	5.08 +0.000 or -0.25	0.032 (0.81)
3/16	0.302 +0.000 or -0.010	7.67 +0.000 or -0.25	0.032 (0.81)
1/4	0.359 +0.000 or -0.010	9.12 +0.000 or -0.25	0.032 (0.81)
5/16	0.421 +0.000 or -0.010	10.69 +0.000 or -0.25	0.032 (0.81)
3/8	0.484 +0.000 or -0.010	12.29 +0.000 or -0.25	0.046 (1.17)
1/2	0.656 +0.000 or -0.010	16.66 +0.000 or -0.25	0.062 (1.57)
5/8	0.781 +0.000 or -0.010	19.84 +0.000 or -0.25	0.062 (1.57)
3/4	0.937 +0.000 or -0.010	23.80 +0.000 or -0.25	0.078 (1.98)
1	1.187 +0.000 or -0.015	30.15 +0.000 or -0.38	0.093 (2.36)
1-1/4	1.500 +0.000 or -0.015	38.10 +0.000 or -0.38	0.093 (2.36)
1-1/2	1.721 +0.000 or -0.015	43.48 +0.000 or -0.38	0.109 (2.77)

Flare shall be square with centerline of tube within +0.5, -0.5 degree.
Flare shall be concentric with outside diameter of tube within 0.005 inch (0.13 mm) TIR.
Flare shall be free of cracks or pit marks.

Single Flare
Figure 203 (Sheet 1)

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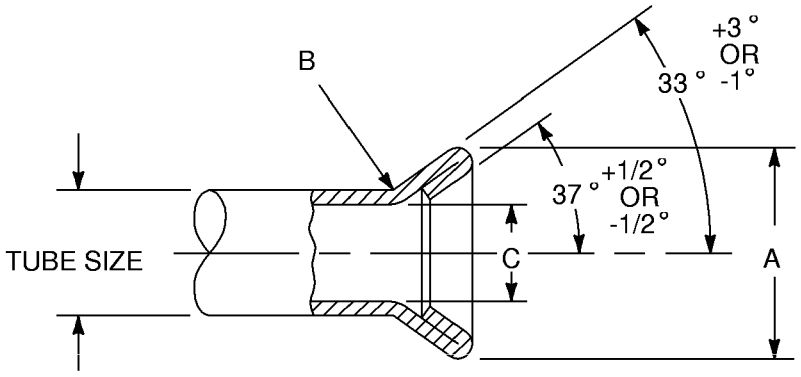

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TUBE SIZE OUTSIDE DIAMETER (INCHES)	A DIAMETER +0.000 OR -0.010 INCHES (+0.25 OR -0.25 mm)	B RADIUS +0.010 OR -0.010 INCHES (+0.25 OR -0.25 mm)	WALL THICKNESS INCHES (mm)	C MAXIMUM INCHES (mm)
1/8	0.200 (5.08)	0.032 (0.81)	--	--
3/18	0.302 (7.67)	0.032 (0.81)	0.028 (0.71) 0.035 (0.89)	0.178 (4.52) 0.164 (4.17)
1/4	0.359 (9.12)	0.032 (0.81)	0.028 (0.71) 0.035 (0.89)	0.241 (6.12) 0.227 (5.77)
5/16	0.421 (10.69)	0.032 (0.81)	0.035 (0.89) 0.049 (1.24)	0.289 (7.34) 0.263 (6.68)
3/8	0.484 (12.29)	0.046 (1.17)	0.028 (0.71) 0.035 (0.89) 0.049 (1.24)	0.366 (9.30) 0.352 (8.94) 0.326 (8.28)

Flare shall be concentric with outside diameter of tube within 0.005 inch (0.13mm) TIR.
Flare shall be free of cracks and pit marks.
Flare shall be square with tube centerline within 0.5 degree.

Double Flare
Figure 204 (Sheet 1)

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TUBING, HOSE AND FLUID FITTINGS - MAINTENANCE PRACTICES

1. General

A. This section on airplane hardware provides general maintenance information for tubing and hoses. All tubing and hoses used on the airplane may not be specifically identified in this section.

2. Description

A. The majority of tubing assemblies used in the airplane are machine formed aluminum or steel.

B. Hoses are utilized where a flexible line is more suitable for the installation. Therefore, hoses for fuel are used in the nacelle area, hoses for hydraulic fluid are used in the nacelle area, wheels and wheel well compartments and wings.

C. Fluid fittings used in the airplane can be grouped into the following categories: angle fittings with jam nuts, unions and pipe threads.

3. Precautions

A. When maintenance or repair is to be performed on lines, hoses or fittings on an active system in the airplane, observe the appropriate system precautions corresponding to maintenance required. Precautions are defined in system chapters.

4. Standard Maintenance Procedures

A. A list of maintenance hints is provided to aid maintenance personnel in handling, removal/installation and repairing tubing, hoses and fittings (Refer to Figure 201).
   (1) Cap or plug all tubing and hoses after disconnecting to prevent system contamination.
   (2) Visually check for cleanliness and evidence of contamination prior to connecting tubing or hoses. Replacement hoses and tubing that do not have protective covers shall be cleaned prior to installation.
   (3) When connecting rigid tubing, do not force assembly to installed position, normally, failure will result. If a mismatch between connections should result, refer to Figure 202 for allowable mismatch.

      NOTE: When attaching the identification tape to the lines to be identified, the tape shall be wrapped around the lines. The heat from a heat gun shall be applied to the tape to activate the adhesive on the tape at 275°F (135°C) for approximately 10 s econds.

   (4) Never stretch a hose to make a connection. A hose of insufficient length will result in a malfunction or a failure.
   (5) Ensure hose material composition is compatible with the applicable system fluids. Substituting a hose of incompatible material will contaminate the system.

5. Tubing and Hose Assemblies Removal/Installation

A. Removal of Tubing or Hose Assemblies.
   (1) Relieve all system pressure.
   (2) Loosen both ends of hose or tubing, cap or plug lines and fittings.
   (3) Remove all clamps securing the hose or tubing.
   (4) Remove and tag tubing or hose to aid in reinstallation.

B. Install Hose Assemblies.

   NOTE: If new hose is to be installed, ensure that hose is manufactured of the correct material and length.

   (1) Install hose assembly, observing standard procedures outlined in step 4.A.(1) thru 4.A.(5).
   (2) Torque B-nut. Refer to Table 201.

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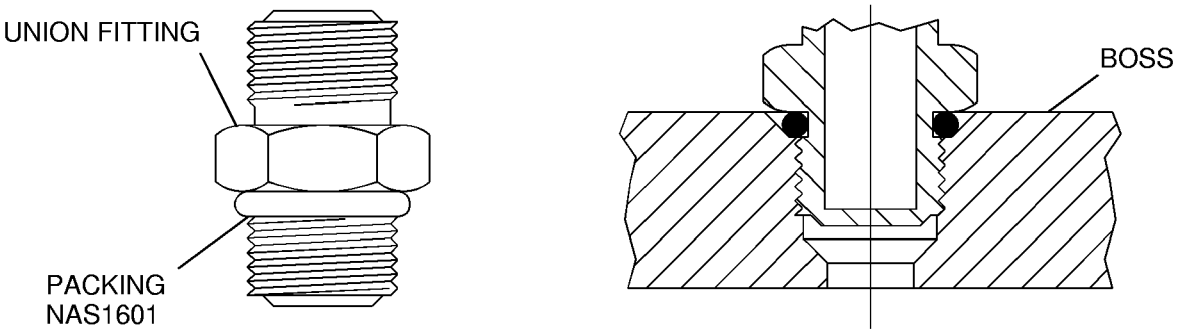
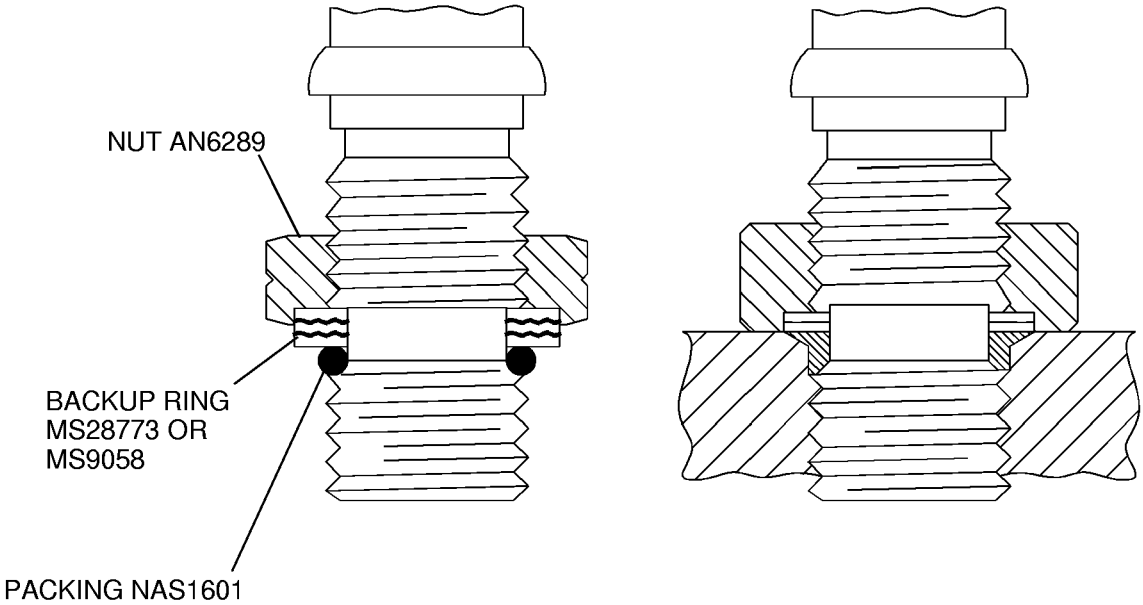


UNIVERSAL POSITIONING TYPE
FITTING INSTALLATION



UNIVERSAL POSITIONING TYPE FITTING
INSTALLATION USING AN6289 NUT

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6280T1002

Universal Fitting Installation
Figure 201 (Sheet 1)

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(3) After B-nut are torqued, inspect hose to ensure hose is not under tension; no indication of twisting is present.
(4) Verify hose is free to expand, contract and is clear of all structure. Where inadequate clearance exists between hose and structure, protection must be provided for hose to prevent damage from chafing.

C. Install Rigid Tubing.
(1) Observe standard maintenance procedures.
(2) Check tubing for damage, particularly at flared tubing ends, fittings and at bends. Tubing which is damaged shall be replaced.
(3) Verify fittings are properly aligned and secured before installation of tubing.
(4) Check alignment and fit of tube before installation as follows:
(a) Place tubing in proper installation position and tighten the coupling nut at one end of the tube assembly.
(b) The free tube end must be parallel with the fitting within 2 degrees. Refer to Figure 202.
(c) The free tube end must be in line with fitting, within 0.031 inch per 10 inches (0.793 mm per 0.254 m) of tube length. Refer to Figure 202.
(d) The free tube end must match the fitting cone lengthwise, within 0.031 inch per 10 inches (0.793 mm per 0.254 m) of tube length. Refer to Figure 202.
(5) Apply antiseize compound to fittings as specified.
(6) Install tubing on fittings; tighten B-nut to torque values specified in Table 201.

Table 201. Tubing/Hose Torque Limits

Hose Size	TUBING O.D.	FLARED OR FLARELESS FITTING WITH ALUMINUM OR ANNEALED STAINLESS STEEL TUBING, AND HOSE WITH ALUMINUM INSERT				FLARED OR FLARELESS FITTING WITH STEEL TUBING, AND HOSE WITH STEEL INSERT			
		INCH-POUNDS		NEWTON METERS		INCH-POUNDS		NEWTON METERS	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
-2	1/8	45	55	5.1	6.2	65	75	7.3	8.5
-3	3/16	75	85	8.5	9.6	95	105	10.7	11.9
-4	1/4	105	115	11.5	13.0	135	150	15.3	16.9
-5	5/16	135	145	15.3	16.4	180	200	20.3	22.6
-6	3/8	160	175	18.1	19.8	260	285	29.4	32.2
-8	1/2	265	290	29.9	32.8	475	525	53.7	59.3
-10	5/8	340	375	38.4	42.4	665	735	75.1	83.0
-12	3/4	425	470	48.0	53.1	855	945	96.6	106.8
-16	1	710	785	80.2	88.7	1140	1260	128.8	142.4
-20	1 1/4	855	945	96.6	106.8	1520	1680	171.7	189.8
-24	1 1/2	855	945	96.6	106.8	1900	2100	214.7	237.3

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Table 202. Fitting Torque Limits

FITTING SIZE	PIPE THREADED FITTING		ALUMINUM OXYGEN FITTING	
	INCH-POUNDS	NEWTON METERS	INCH-POUNDS	NEWTON METERS
1/8	175	19.8		
1/4	300	33.9		
5/16			100	11.3

Table 203. Jam Nuts and Fittings with Packings

TUBING O.D.	JAM NUT AND FITTING BOSS INSTALLATION				JAM NUT BULKHEAD INSTALLATION			
	INCH-POUNDS		NEWTON METERS		INCH-POUNDS		NEWTON METERS	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
3/16	28	32	3.2	3.6	28	32	3.2	3.6
1/4	38	42	4.3	4.7	38	42	4.3	4.7
5/16	58	63	6.6	7.1	58	63	6.6	7.1
3/8	70	80	7.9	9.0	70	80	7.9	9.0
1/2	145	155	16.4	17.5	145	155	16.4	17.5
5/8	190	210	21.5	23.7	190	210	21.5	23.7
3/4	285	315	32.2	35.6	190	210	21.5	23.7
1	475	525	53.7	59.3	190	210	21.5	23.7
1 1/4	570	630	64.4	71.2	190	210	21.5	23.7
1 1/2	570	630	64.4	71.2	190	210	21.5	23.7

6. Fluid Line Fitting Installation

A. Install Boss Connection Using Nut (AN924).
(1) Assemble nut (AN924) on fitting. Run nut onto fitting until nut is clear of thread relief.
(2) Lubricate packing with light coat of applicable system lubricant.
(3) Install packing on thread relief, against upper threaded section of fitting.

CAUTION: ENSURE PACKING IS COMPATIBLE WITH APPLICABLE SYSTEM FLUID.

(4) Screw fitting into boss until packing contacts boss chamber, indicated by resistance to turning. Refer to Figure 201.
(5) Position fitting to align with attaching tubing by unscrewing fitting not more than one full turn.
(6) Hold fitting with one wrench while tightening nut to torque value specified.

B. Install Boss Connection Using Nut (AN6289).
(1) Install nut (AN6289) on fitting. Run nut onto fitting until nut is clear of thread relief.
(2) Install applicable AN6246 leather, MS28773 or MS9058 teflon backup ring on thread relief fitting. Install leather type so that the smooth (hair) side will be next to the packing.
(3) Lubricate the backup ring and packing with a light coat of applicable system lubricant.

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(4) Install packing on thread relief.

CAUTION: ENSURE PACKING IS COMPATIBLE WITH APPLICABLE SYSTEM FLUID.

(5) Turn nut down until nut overlaps backup ring. If necessary, work backup ring into recess of nut. Continue turning nut down until packing is pushed firmly against lower threaded section of fitting. Refer to Figure 201.
(6) Screw fitting into boss until packing contacts boss as indicated by an increase in tightening force.
(7) Hold nut with one wrench while continuing to turn fitting in 1-1/2 additional turns. If necessary to position fitting, screw fitting up to one additional turn.
(8) Hold fitting in position with one wrench and tighten nut. Refer to Table 203.

NOTE: A slight extrusion of the backup ring is not considered detrimental.

C. Install An Fittings.
(1) Lubricate packing with light coat of applicable system lubricant.
(2) Install packing in fitting gasket groove.
(3) Install fitting in boss and tighten until fitting bottoms on boss.

D. Install Pipe Thread Fitting.

CAUTION: WHEN INSTALLING TEFLON TAPE, START WRAPPING TAPE AROUND FITTING TWO THREADS BACK FROM THE END. THIS WILL PREVENT ANY TAPE FROM ENTERING THE SYSTEM.

(1) Apply teflon tape specification S-1465-2 to the threads as follows:
(a) Start tape at or close to narrow end of threads. Wrap tape around fitting in the direction of the threads.
1 Clockwise for normal fitting.
2 Counterclockwise for left thread.
(b) Apply sufficient tension so that tape conforms to the shape of the threads.
(c) Overlap tape as it is applied up to 0.50 inch (12.7 mm). Doubled tape is sufficient to seal pipe thread fittings up to two inches (50.8 mm) in diameter.
(2) Thread fitting into boss until it becomes snug.
(3) Torque fitting to value indicated in Table 202.

7. Inspection/Check

A. Damage Limitations.

NOTE: Nicks and scratches not exceeding the following limitations may be repaired by polishing out the damaged area, using fine grade of emery cloth and oil. Finish polishing with crocus cloth and oil. Flush and clean all grit from line assembly.

(1) Replace steel tubing which has nicks or scratches deeper than 10 percent of tube wall thickness.
(2) Replace aluminum tubing which has nicks or scratches deeper than 20 percent of tube wall thickness.
(3) Replace pressure and return tubes which have dents deeper than 5 percent of tube outside diameter.

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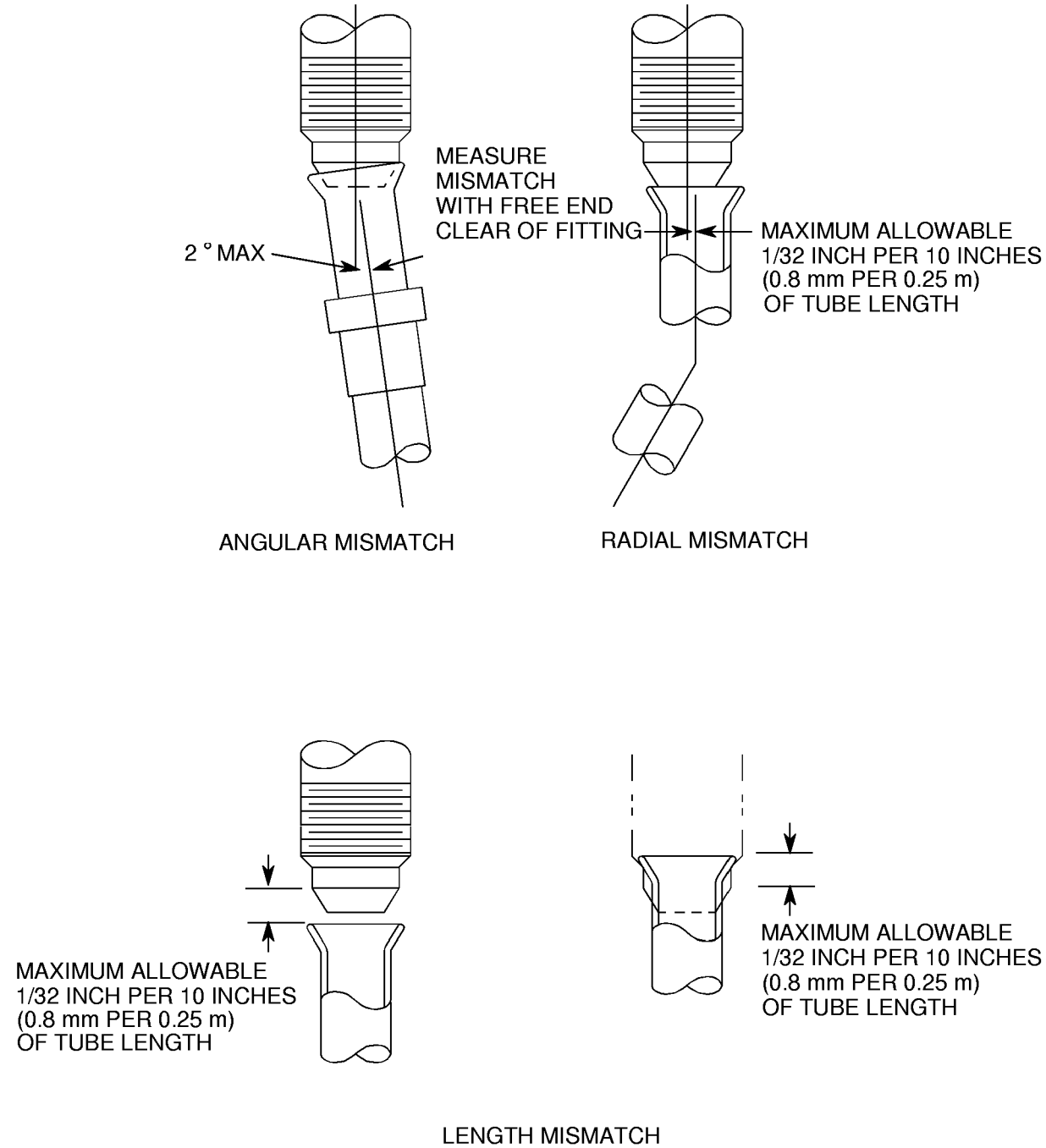

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Tube Installation Mismatch
Figure 202 (Sheet 1)

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8. Hydraulic, Pneumatic and Bleed Air Line, Fuel Line, Duct and Hose Inspection Criteria

WARNING: The entire oxygen system must be free of oil and grease to avoid the danger of spontaneous combustion and explosion when in contact with pressurized oxygen.

NOTE: Hydraulic, pneumatic and bleed air lines, fuel lines, ducts, hoses and associated fittings are to be checked when the individual component or system is checked. When working in a particular zone on the airplane and access panels or floorboards are removed, the hydraulic lines, ducts, hoses and associated fittings should be inspected.

A. Inspect Hydraulic, Pneumatic and Bleed Air Lines, Fuel Lines, Ducts, Hoses and Associated Fittings.
   (1) Inspect for proper routing and clamping. Lines and ducts must be adequately supported to prevent fatigue cracks at fittings.
   (2) Inspect for any evidence of chafing or other damage.
   (3) Chafing limits.
      (a) Aluminum: reject if nicks or scratches exceed 20 percent of wall thickness.
      (b) Stainless Steel: reject if nicks or scratches exceed 10 percent of wall thickness.
      (c) Replace pressure or return fuel tubing which has dents deeper than 5% of outside diameter.
   (4) Inspect hoses for twisting or weather checking or splitting.
      (a) Ensure hose assemblies have the proper freedom of movement necessary for their function and they do not chafe other items during their normal range of movement.
   (5) Inspect for evidence of fluid leakage.
      (a) Repair to a no-leak condition.
   (6) Verify wiring is not directly secured to lines or ducts. All wiring must be secured via D-rings to prevent chafing into and possible arcing to lines and ducts.
   (7) Oxygen lines are normally wrapped with heat shrink prior to installation. Pay particular attention to oxygen line routing and clamping to prevent possible line rupture or arcing to adjacent wiring.

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TORQUE DATA - MAINTENANCE PRACTICES

1. General

A. To ensure security of installation and prevent overstressing of components during installation, the torque values outlined in this section and other applicable chapters of this manual should be used during installation and repair of components.

B. The torque value tables, listed in this section, are standard torque values for the nut and bolt combinations shown. Components which require special torque values will have those values listed in the applicable maintenance practices section.

C. Torque is typically applied and measured using a torque wrench. Different adapters, used in conjunction with the torque wrench, may produce an actual torque to the nut or bolt which is different from the torque reading. Figure 201 is provided to help calculate actual torque in relation to specific adaptors used with the torque wrench.

D. Free Running Torque Value.

(1) Free running torque value is the torque value required to rotate a nut on a threaded shaft, without tightening. Free running torque value does not represent the torque values listed in the tables of this section. Torque values listed in the tables represent the torque values above free running torque.

EXAMPLE: If final torque required is to be 150 inch-pounds and the free running torque is 25 inch-pounds, then the free running torque must be added to the required torque to achieve final torque of 150 +25 = 175 inch-pounds.

(2) Breakaway torque value is the value of torque required to start a nut rotating on a thread shaft, and does not represent free running torque value. It should be noted that on some installations the breakaway torque value cannot be measured.

E. General Torquing Notes.

(1) These requirements do not apply to threaded parts used for adjustment, such as turnbuckles and rod ends.
(2) Torque values shown are for clean nonlubricated parts. Threads should be free of dust, metal filings, etc. Lubricants, other than that on the nut as purchased, should not be used on any bolt installation unless specified.
(3) Assembly of threaded fasteners, such as bolts, screws and nuts, should conform to torque values shown in Table 201.
(4) When necessary to tighten from the bolt head, increase maximum torque value by an amount equal to shank friction. Measure shank friction with a torque wrench.
(5) Sheet metal screws should be tightened firmly, but not to a specific torque value.
(6) Straight threaded connections using O-rings or gaskets for seal, such as AN924 or AN6298 nuts, and fittings conforming to MS33656, Style E, need not be tightened to a specific torque value, but shall be installed per AN10064.
(7) Countersunk washers used with close tolerance bolts must be installed correctly to ensure proper torquing (Refer to Figure 202).
(8) For Hi-Lok Fasteners used with MS21042 self-locking nuts. Fastener and nut should be lubricated prior to tightening.
(9) Tighten accessible nuts to torque values per Table 201. Screws attached to nutplates, or screws with threads not listed in Table 201 should be tightened firmly, but not to a specific torque value. Screws used with dimpled washers should not be drawn tight enough to eliminate the washer crown.
(10) Table 201 is not applicable to bolts, nuts and screws used in control systems or installations where the required torque would cause binding, or would interfere with proper operation of parts. On these installations, the assembly should be firm but not binding.

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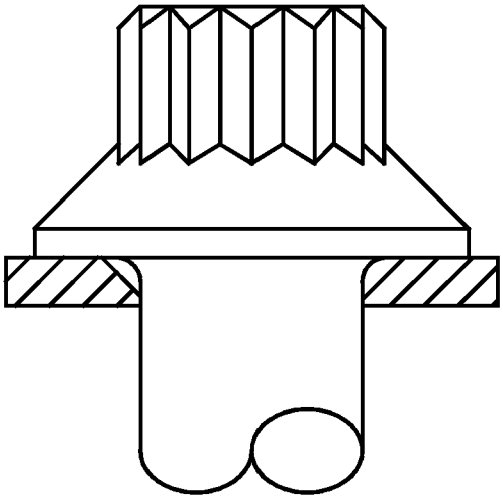
A2850

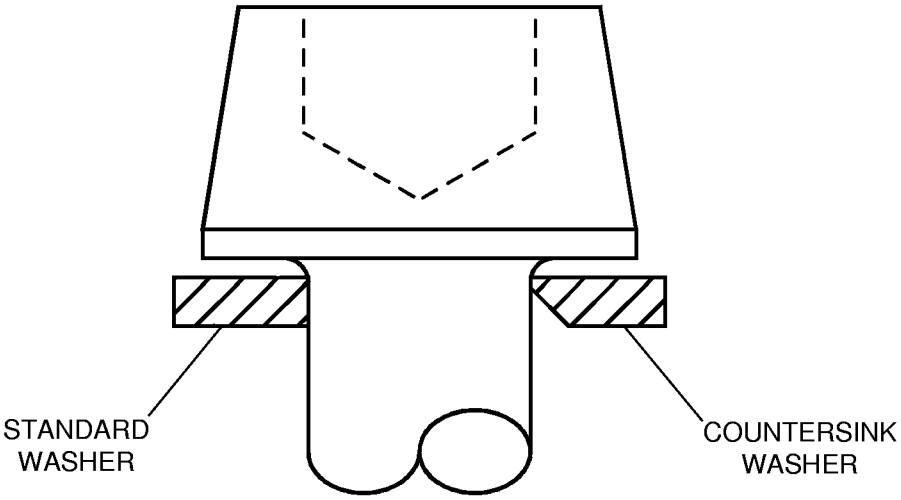
EXTERNAL WRENCHING HEAD



CORRECT INSTALLATION

INSTALL WASHER WITH COUNTERSUNK FACE NEXT TO BOLT HEAD RADIUS

INTERNAL WRENCHING HEAD



INCORRECT INSTALLATION

CAUTION: NEVER INSTALL STANDARD WASHER OR COUNTERSUNK WASHER IN REVERSE WHEN USING BOLTS WITH RADIUS UNDER THE HEAD.

5598T1004

Washer Installation Close Tolerance Bolts
Figure 201 (Sheet 1)

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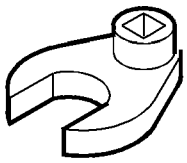
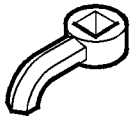
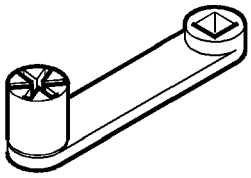
A2854



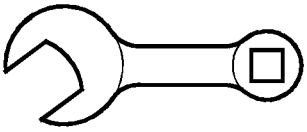
SHORT OPEN END ADAPTER



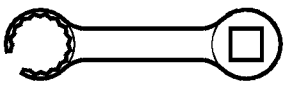
SETSCREW ADAPTER



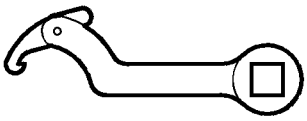
HOSE CLAMP ADAPTER



OPEN-END WRENCH ADAPTER

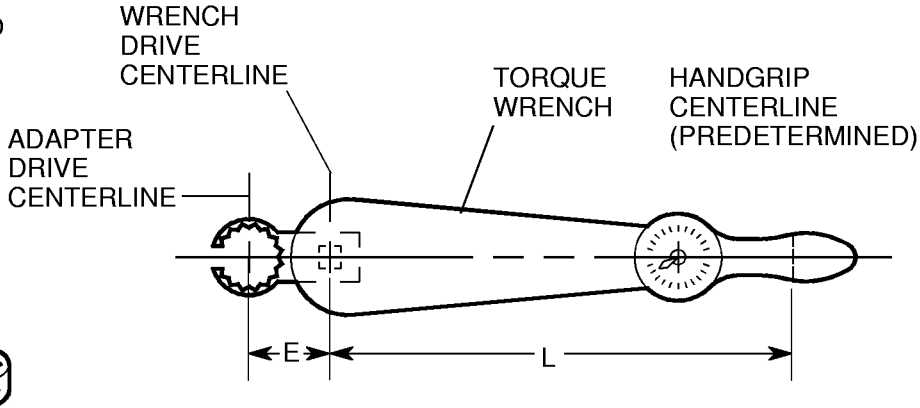


FLARE NUT WRENCH ADAPTER



SPANNER WRENCH ADAPTER

NOTE: WHEN USING A TORQUE WRENCH ADAPTER WHICH CHANGES THE DISTANCE FROM THE TORQUE WRENCH DRIVE TO THE ADAPTER DRIVE, APPLY THE FOLLOWING FORMULAS TO OBTAIN THE CORRECTED TORQUE USE EITHER ENGLISH OR METRIC VALUES AS REQUIRED.



FORMULA $\frac{T \times L}{L+E} = Y$

EXAMPLE (WITH "E" AS PLUS DIMENSION)

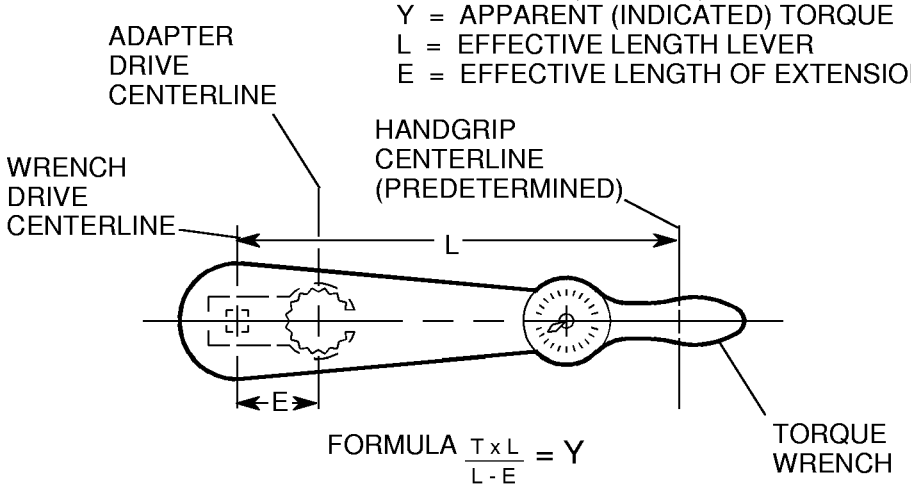
T = 135 IN-LB (15.3 Nm)
Y = UNKNOWN
L = 10.00 INCH
E = 1.5 INCH

$Y = \frac{135 \times 10}{10 + 1.5} = \frac{1350}{11.5} = 117.39$

Y = 117 INCH-POUNDS (13.2 Nm)

LEGEND

T = ACTUAL (DESIRED) TORQUE
Y = APPARENT (INDICATED) TORQUE
L = EFFECTIVE LENGTH LEVER
E = EFFECTIVE LENGTH OF EXTENSION



FORMULA $\frac{T \times L}{L - E} = Y$

EXAMPLE (WITH "E" AS MINUS DIMENSION)

T = 135 IN-LB (15.3 Nm)
Y = UNKNOWN
L = 10.0 INCH
E = 1.5 INCH

$Y = \frac{135 \times 10}{10 - 1.5} = \frac{1350}{8.5} = 158.82$

Y = 159 INCH-POUNDS (18.0Nm)

5598T2005

Torque Wrench and Adapter Formulas
Figure 202 (Sheet 1)

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(11) Castellated Nuts.
   (a) Self-locking and non self-locking castellated nuts, except MS17826, require cotter pins and should be tightened to the minimum torque value shown in Table 201. The torque may be increased to install the cotter pin, but this increase must not exceed the alternate torque values.
   (b) MS17826 self-locking, castellated nuts shall be torqued per Table 201.
   (c) The end of the bolt or screw should extend through the nut at least two full threads including the chamfer.

(12) Joints containing wood, plastics, rubber or rubberlike materials should be torqued to values approximately 80 percent of the torque at which crushing is observed, or to the requirements of Table 201, whichever is lower, or as specified.

2. Torque Requirements for Bolts, Screws and Nuts

A. Use Table 201 to determine torque requirements for bolts, screws and nuts.

Table 201. Torque Values Nuts, Bolts and Screws (Steel) (Inch-Pounds)

Size of Bolt, Nut or Screw	Fine Threaded Series (Tension Type Nuts)		Fine Threaded Series (Shear Type Nuts Except MS17826)		MS17826 Nuts	
	Standard	Alternate	Standard	Alternate	Standard	Alternate
8-32	12-15	- -	7-9	- -	- -	- -
10-32	20-25	20-28	12-15	12-19	12-15	12-20
1/4-28	50-70	50-75	30-40	30-48	30-40	30-45
5/16-24	100-140	100-150	60-85	60-100	60-80	60-90
3/8-24	160-190	160-260	95-110	95-170	95-110	95-125
7/16-20	450-500	450-560	270-300	270-390	180-210	180-225
1/2-20	480-690	480-730	290-410	290-500	240-280	240-300
9/16-18	800-1000	800-1070	480-600	480-750	320-370	320-400
5/8-18	1100-1300	1100-1600	660-780	660-1060	480-550	480-600
3/4-16	2300-2500	2300-3350	1300-1500	1300-2200	880-1010	880-1100
7/8- 14	2500-3000	2500-4650	1500-1800	1500-2900	1500-1750	1500-1900
1-14	3700-4500	3700-6650	2200-3300	2200-4400	2200-2700	2200-3000
1-1/8-12	5000-7000	5000-10000	3000-4200	3000-6300	3200-4200	3200-5000
1-1/4-12	9000-11000	9000-16700	5400-6600	5400-10000	5900-6400	5900-7000

- Fine Thread Tension application Nuts include: AN310, AN315, AN345, MS17825, MS20365, MS21044 through MS21048, MS21078, NAS679, NAS1291
- Fine Thread Shear application Nuts include: AN316, AN320, MS21025, MS21042, MS21043, MS21083, MS21245, NAS1022, S1117

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Table 202. Torque Values Nuts, Bolts and Screws (Steel) (Newton meters)

Size of Bolt, Nut or Screw	Fine Threaded Series (Tension Type Nuts)		Fine Threaded Series (Shear Type Nuts Except MS17826)		MS17826 Nuts	
	Standard	Alternate	Standard	Alternate	Standard	Alternate
8-32	1.4-1.7	- -	0.8-1.0	- -	- -	- -
10-32	2.3-2.8	2.3-3.2	1.4-1.7	1.4-2.2	1.4-1.7	1.4-2.3
1/4-28	5.6-7.9	5.6-8.5	3.4-4.5	3.4-5.4	3.4-4.5	3.4-5.0
5/16-24	11.3-15.8	11.3-17.0	6.8-9.6	6.8-11.3	6.8-9.0	6.8-10.1
3/8- 24	18.0-21.4	18.0-29.4	10.7-12.4	10.7-19.2	10.7-12.4	10.7-14.1
7/16-20	50.8-56.5	50.8-63.2	30.5-33.8	30.5-44.0	20.3-23.7	20.3-25.4
1/2-20	54.2-77.9	54.2-82.4	32.7-46.3	32.7-56.4	27.1-31.6	27.1-33.8
9/16-18	90.3-112.9	90.3-120.8	54.2-67.8	54.2-84.7	36.1-41.8	36.1-45.1
5/8-18	124.2-146.8	124.2-180.7	74.5-88.1	74.5-19.7	54.2-62.1	54.2-67.7
3/4-16	259.8-282.4	259.8-378.5	46.8-169.4	46.8-248.5	99.4-114.1	99.4-124.2
7/8-14	282.4-338.9	282.4-545.3	169.4-203.3	169.4-327.6	169.4-197.7	169.4-214.6
1-14	418.0-508.4	418.0-751.3	248.5-372.8	248.5-497.1	248.5-305.0	248.5-338.9
1-1/8-12	564.9-790.8	564.9-1129.8	338.9- 474.5	338.9-711.8	361.5-474.5	361.5-564.9
1-1/4-12	1016.8-1242.8	1016.8-1886.8	610.1-745.7	610.1-1129.8	666.6-723.1	666.6-790.8

- Fine Thread Tension application Nuts include: AN310, AN315, AN345, MS17825, MS20365, MS21044 through MS21048, MS21078, NAS679, NAS1291
- Fine Thread Shear application Nuts include: AN316, AN320, MS21025, MS21042, MS21043, MS21083, MS21245, NAS1022, S1117

3. Torque Requirements for Hi-Lok Fasteners

A. Use Table 203 to determine torque requirements for Hi-Lok fasteners.

NOTE: This table is used in conjunction with MS21042 Self-Locking nuts.

Table 203. Torque Values For Hi-Lok Fasteners (Alloy Steel, 180 to 200 KSI)

NOMINAL FASTENER DIAMETER	TORQUE VALUE (INCH-POUNDS)
6-32	8 to 10
8-32	12 to 15
10-32	20 to 25
1/4-28	50 to 70
5/16-24	100 to 140

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Table 203. Torque Values For Hi-Lok Fasteners (Alloy Steel, 180 to 200 KSI) (continued)

NOMINAL FASTENER DIAMETER	TORQUE VALUE (INCH-POUNDS)
3/8-24	160 to 190
7/16-20	450 to 500
1/2-20	480 to 690

4. Torque Requirements for Electrical Current Carrying And Airframe Ground Fasteners

A. Use Table 204 to determine torque requirements for threaded electrical current carrying fasteners.
(1) Torque values shown are clean nonlubricated parts. Threads shall be free of dust and metal filings. Lubricants, other than on the nut as purchased, shall not be used on any bolt installations unless specified in the applicable chapters of this manual.
(2) All threaded electrical current carrying fasteners for relay terminals, shunt terminals, fuse limiter mount block terminals and bus bar attaching hardware shall be torqued per Table 204.

NOTE: There is no satisfactory method of determining the torque previously applied to a threaded fastener. When retorquing, always back off approximately 1/4 turn or more before reapplying torque.

B. Use Table 205 to determine torque requirements for threaded fasteners used as airframe electrical ground terminals.

Table 204. Torque Values For Electrical Current Carrying Fasteners

FASTENER DIAMETER	TORQUE VALUE (INCH-POUNDS)
6-32	8 to 12
8-32	13 to 17
10-32	20 to 30
3/16	20 to 30
1/4	40 to 60
5/16	80 to 100
3/8	105 to 125
1/2	130 to 150

Table 205. Torque Values For Airframe Electrical Ground Terminals

FASTENER DIAMETER	TORQUE VALUE (INCH-POUNDS)
5/16	130 to 150
3/8	160 to 190

5. Torque Requirements for Straight Threaded Fittings

A. Use Table 206 to determine torque requirements for straight threaded fittings.

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Table 206. Torque Values For Straight Threaded Fittings (Inch-Pounds)

Tube Outside Diameter	Steel Tubing		6061-0 Aluminum 5052-0 Aluminum Tubing or Aluminum Hose Insert		6061-T Aluminum Tubing (Steel Sleeve)		
	Minimum Torque	Maximum Torque	Minimum Torque	Maximum Torque	Tube Wall **(Inches)	Minimum Torque	Maximum Torque
1/8	45	55	20	30	---	---	---
3/16	90	100	30	40	0.028	45	55
1/4	135	150	40	65	0.022 0.018 0.035 0.049	80 80 80 90	105 105 105 115
5/16	180	200	60	80	0.028 0.035 0.042	80 80 125	105 105 175
3/8	270	300	75	125	0.028 0.035 0.049	125 125 125	175 175 175
1/2	450	500	150	250	0.028 0.015 0.049 0.058 0.065	135 200 400 400 400	180 300 500 500 500
5/8	700	800	200	450	All	500	600
3/4	1100	1150	300	500	All	600	700
1	1200	1400	500	700	All	1000	1300
1 1/4	1300	1450	600	900	All	1300	1500
1 1/2	1350	1500	600	900	All	1400	1700
2	1500	1700	600	900	---	---	---

** Tube wall thickness is applicable to 6061-T aluminum tubing only.

6. Torque Requirements for Tubes and Hoses

A. Use Table 207 to determine torque requirements for tubes and hoses.

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Table 207. Torque Values for Tubing and Hoses (Inch-Pounds)

Hose Size	Tubing O.D	Aluminum Tubing (Flared)		Steel Tubing (Flared)		Aluminum Tubing (Flareless)		Steel Tubing (Flareless)	
		Min Torque	Max Torque	Min Torque	Max Torque	Min Torque	Max Torque	Min Torque	Max Torque
-3	3/16	- - -	- - -	90	100	75	90	90	100
-4	1/4	40	65	135	150	80	100	135	150
-5	5/16	60	80	180	200	100	130	180	200
-6	3/8	75	125	270	300	100	130	270	300
-8	1/2	150	250	450	500	200	240	450	500
-10	5/8	200	350	700	800	360	400	700	800
-12	3/4	300	500	1100	1150	390	430	1100	1150
-16	1	500	700	1200	1400	600	900	1200	1400
-20	1 1/4	600	900	1300	1450	600	900	1300	1450
-24	1 1/2	600	900	1350	1500	600	900	1350	1500

Hose Size	Tubing O.D.	Aluminum Fittings Oxygen Lines Only		Steel Hose End (Flared)		Steel Hose End (Flareless)	
		Min	Max	Min	Max	Min	Max
-3	3/16	- - -	- - -	70	100	95	105
-4	1/4	- - -	- - -	70	120	135	145
-5	5/16	100	125	85	180	175 dry	195 dry
-6	3/8	- - -	- - -	100	250	215	245
-8	1/2	- - -	- - -	210	420	470	510
-10	5/8	- - -	- - -	300	480	620	680
-12	3/4	- - -	- - -	500	850	855	945
-16	1	- - -	- - -	700	1150	1140	1260
-20	1 1/4	- - -	- - -	- - -	- - -	- - -	- - -
-24	1 1/2	- - -	- - -	- - -	- - -	- - -	- - -

7. Torque Requirements for V-Band Clamps

A. V-band clamps are used on engine bleed air lines and on the starter/generator. Clamp torque is dependent on V-band size and manufacturer. Clamps should be torqued according to torque value stamped on each individual clamp.

CAUTION: Do not exceed torque value stamped on clamp.

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SAFETYING - MAINTENANCE PRACTICES

1. General

A. Lockwire.
(1) Inconel (Uncoated), Monel (Uncoated).
(a) Used for general lock wiring purposes. Lock wiring is the application of wire to prevent relative movement of structural or other critical components subjected to vibration, tension, torque, etc. Monel to be used at temperatures up to 700°F and Inconel to be used at temperatures up to 1500°F. Identified by the color of the finish, Monel and Inconel color is natural wire color.
(2) Copper, Cadmium Plated and Dyed Yellow in Accordance with FED-STD 595.
(a) This will be used for shear and seal wiring applications. Shear applications are those where it is necessary to purposely break or shear the wire to permit operation or actuation of emergency devices. Seal applications are those where the wire is used with a lead seal to prevent tampering or use of a device without indication. Identified by the color of the finish, copper is dyed yellow.
(3) Aluminum Alloy (Alclad 5056), Anodized and Dyed Blue in Accordance with FED-STD 595.
(a) This wire will be used exclusively for safety wiring magnesium parts.

NOTE: Surface treatment which obscures visual identification of safety wire is prohibited.

B. Cotter Pin.
(1) The selection of material should be in accordance with temperature, atmosphere and service limitations.

C. Locking Clips.
(1) Used to safety turnbuckles.

2. Safety Wire

A. Wire Size.
(1) The size of the wire should be in accordance with the requirements of Table 201.

Table 201. Safety Wire Types and Corresponding MS Numbers

MATERIAL	NUMBER (MS20995-XXX)						
Ni-Cu Alloy (Monel)	NC20	NC32	NC40			NC51	NC91
Ni-Cr-Fe Alloy (Inconel)	N20	N32	N40			N51	N91
Carbon Steel	F20	F32		F41	F47		F91

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Table 201. Safety Wire Types and Corresponding MS Numbers (continued)

MATERIAL	NUMBER (MS20995-XXX)					
Corrosion Resistant Steel	C15	C20	C32	C41	C47	C91
Aluminum Alloy (Blue)		AB20	AB32	AB41	AB47	AB91
Copper (Yellow)	CY15	CY20				

Example of Part Numbers:
MS20995 CY20 = Copper, Shear or Seal Wire, 0.020 inch Diameter
MS20995 AB32 = Aluminum Alloy, Anodized, 0.032 inch Diameter

NOTE 1: The dash numbers indicate wire material and diameter in thousandths of an inch.

(a) 0.032 inch minimum diameter for general purpose lock wiring except that 0.020 inch diameter wire may be used on parts having a nominal hole diameter of less than 0.045 inch; on parts having a nominal hole diameter between 0.045 inch and 0.062 inch with spacing between parts of less than two inches; or on closely spaced screws and bolts of 0.25 inch diameter and smaller.
(b) 0.020 inch diameter copper wire should be used for shear and seal wire applications.
(c) When employing the single wire method of locking the largest nominal size wire for the applicable material or part which the hole will accommodate should be used.

3. Lockwire Installation

A. Method (Refer to Figure 201).
(1) The double-twist method of lock wiring should be used as the common method of lock wiring. The single wire method of lock wiring may be used in a closely spaced, closed geometrical pattern (triangle, square, circle, etc.), on parts in electrical systems, and in places that would make the single wire method more advisable. Closely spaced should be considered a maximum of two inches between centers.

CAUTION: Screws in closely spaced geometric patterns which secure hydraulic or air seals, hold hydraulic pressure, or used in critical areas, should use the double-twist method of lock wiring.

(2) Use single copper wire method for shear and seal wiring application. Make sure that the wire is so installed that it can easily be broken when required in an emergency situation. For securing emergency devices where it is necessary to break the wire quickly, use copper wire only.

B. Spacing.
(1) When lock wiring widely spaced multiple groups by the double-twist method, three units should be the maximum number in a series.
(2) When lock wiring closely spaced multiple groups, the number of units that can be lockwired by a twenty-four inch length of wire should be the maximum number in a series.
(3) Widely spaced multiple groups should mean those in which the fastenings are from four to six inches apart. Lockwiring should not be used to secure fasteners or fittings which are spaced more than six inches apart, unless tie points are provided on adjacent parts to shorten the span of the lockwire to less than six inches.

C. Tension.
(1) Parts should be lock wired to put tension on lock wires when the parts tend to loosen. The lockwire should always be installed and twisted so the loop around the head stays down and does not tend to come up over the bolt head and leave a slack loop.

NOTE: This does not necessarily apply to castellated nuts when the slot is close to the top of the nut; the wire will be more secure if it is made to pass along the side of the stud.

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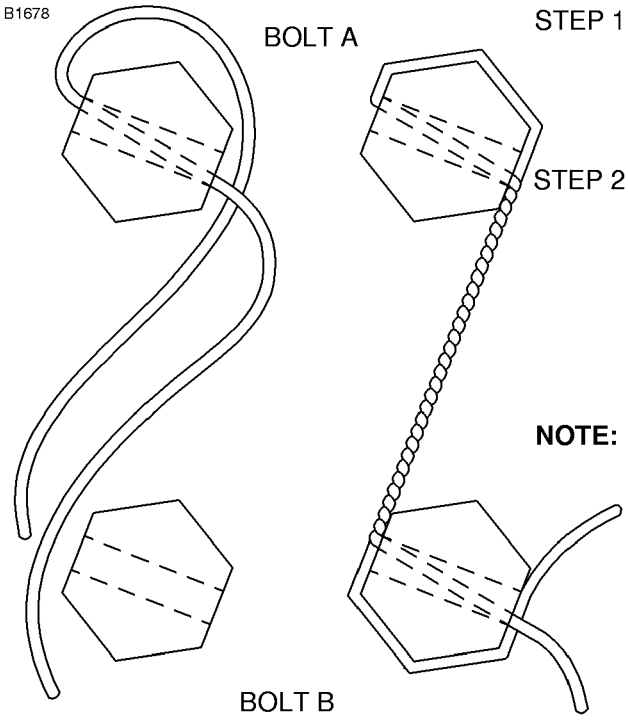
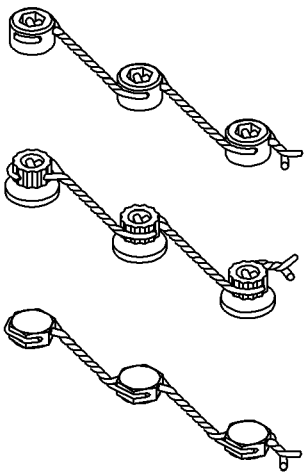


DOUBLE-WIRE SAFETYING

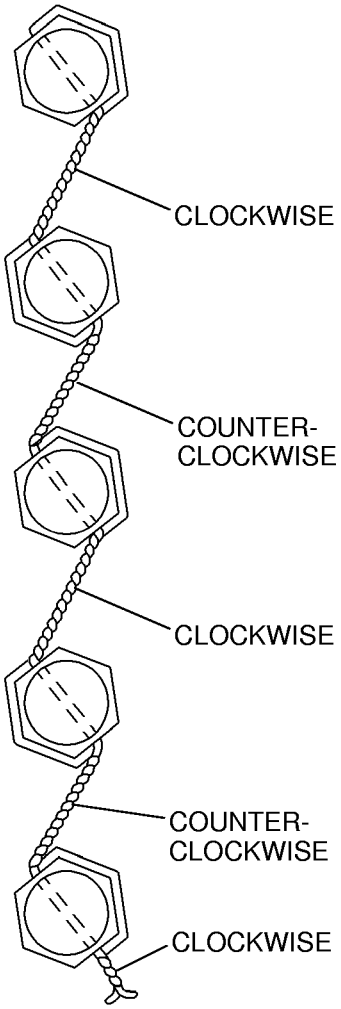
STEP 1. INSERT A WIRE THROUGH BOLT A AND BEND IT AROUND THE BOLT. IF NECESSARY, BEND THE WIRE ACROSS THE BOLT HEAD. TWIST THE WIRES CLOCKWISE UNTIL THEY REACH BOLT B.

STEP 2. INSERT ONE END OF THE WIRE THROUGH BOLT B. BEND THE OTHER END AROUND THE BOLT. IF NECESSARY, BEND THE WIRE ACROSS THE BOLT HEAD. TWIST THE WIRES COUNTERCLOCKWISE 0.50 INCH (12.70 mm) OR SIX TWISTS. CLIP THE ENDS OF THE WIRE AND BEND IT BACK AGAINST THE PART.

NOTE: RIGHT THREADED PARTS SHOWN. REVERSE DIRECTIONS FOR LEFT PARTS.



MULTIPLE FASTENER APPLICATION DOUBLE - TWIST



DOUBLE-TWIST SAFETYING

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Lockwire Safetying
Figure 201 (Sheet 1)

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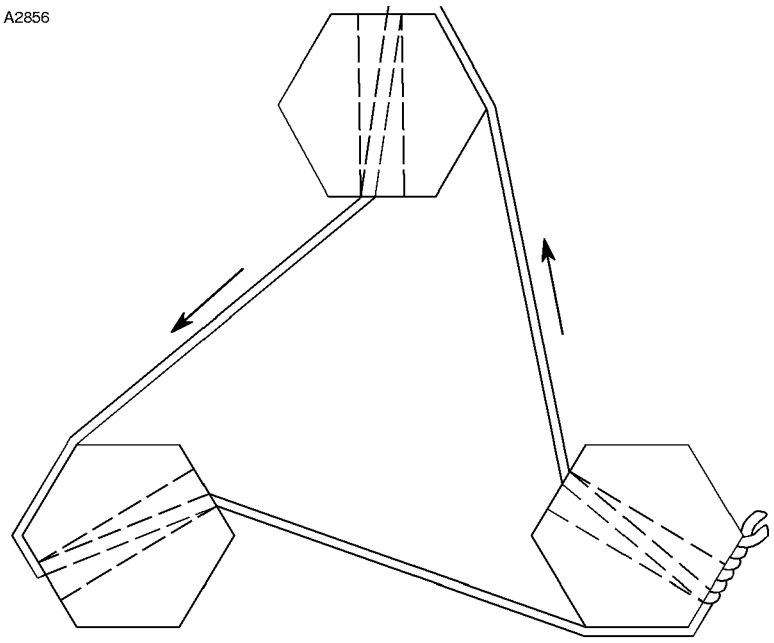
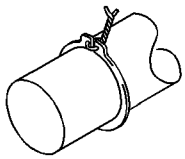
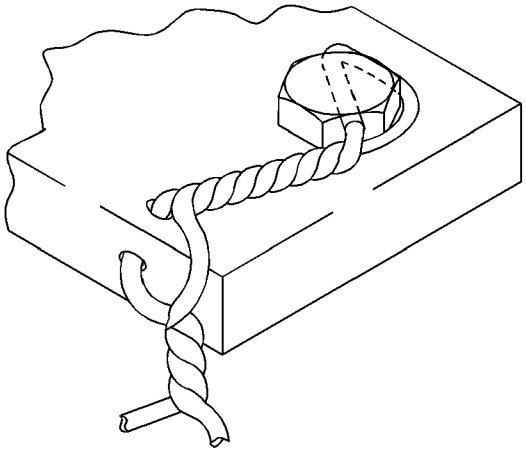


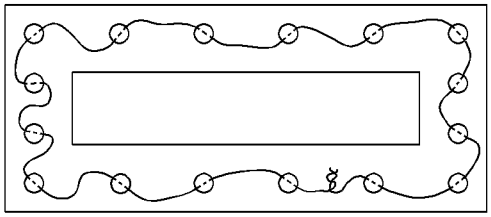
BOLTS IN CLOSELY SPACED, CLOSED GEOMETRICAL PATTERN. SINGLE WIRE METHOD.



EXTERNAL SNAP RING
SINGLE-WIRE METHOD



SINGLE FASTENER APPLICATION
DOUBLE-TWIST



SMALL SCREWS IN CLOSELY SPACED, CLOSED GEOMETRICAL PATTERN, SINGLE WIRE METHOD

NOTE: RIGHT THREADED PARTS SHOWN. REVERSE DIRECTION FOR LEFT THREADS

5598T1003
5598T1024

Lockwire Safetying
Figure 201 (Sheet 2)

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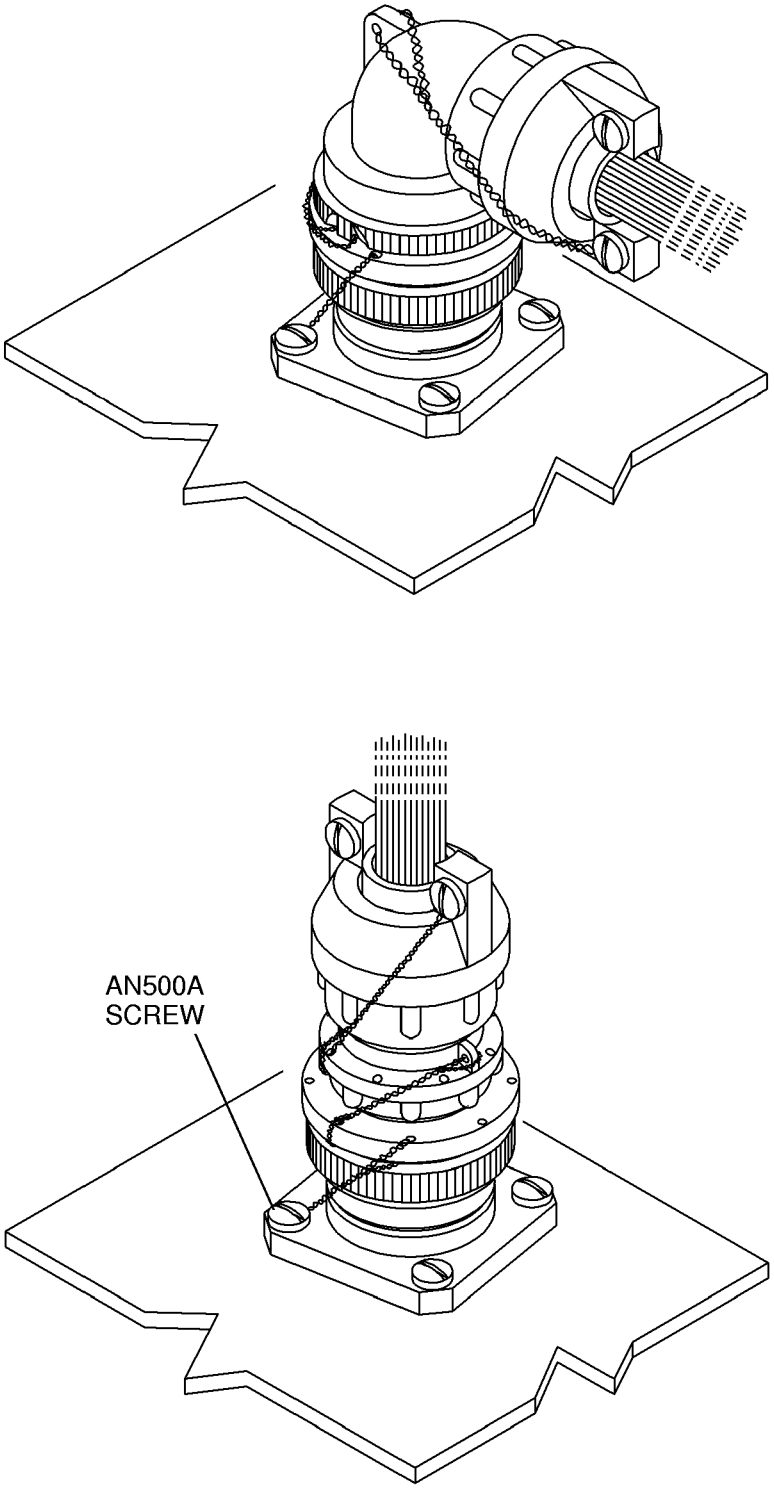

5598T1001

Lockwire Safetying
Figure 201 (Sheet 3)

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(2) Care should be exercised when installing lockwire, to ensure it is tight but not overstressed.

D. Usage.
(1) A pigtail of 0.25 to 0.50 inch (three to six twists) should be made at the end of the wiring. This pigtail should be bent back or under to prevent it from becoming a snag.
(2) Safety wire (lockwire) should be new upon each application.
(3) When castellated nuts are to be secured with lockwire, tighten the nut to the low side of the selected torque range unless otherwise specified, and, if necessary, continue tightening until a slot aligns with the hole.
(4) In blind tapped hole applications of bolts or castellated nuts on studs, lock wiring should be as described in these instructions.
(5) Hollow head bolts are safetied in the manner prescribed for regular bolts.
(6) Drain plugs and cocks may be safetied to a bolt, nut or other part having a free lock hole in accordance with the instructions described in this text.
(7) External snaprings may be locked if necessary in accordance with the general locking principles as described and illustrated. Internal snaprings should not be lock wired.
(8) When locking is required on electrical connectors which use threaded coupling rings, or on plugs which employ screws or rings to fasten the individual parts of the plug together, they should be lock wired with 0.020 inch diameter wire in accordance with the locking principles as described and illustrated. It is preferable to lock wire all electrical connectors individually. Do not lock wire one connector to another unless it is necessary to do so.
(9) Drilled head bolts and screws need not be lock wired if installed into self-locking nuts or installed with lockwashers. Castellated nuts with cotter pins or lockwire are preferred on bolts or studs with drilled shanks, but self-locking nuts are permissible within the limitations of MS33588.
(10) Lockwire shall not be used to secure or be dependent on fracture as the basis for operation of emergency devices such as handles, switches, guards covering handles, etc., that operate emergency mechanisms such as emergency exits, fire extinguishers, emergency cabin pressure release, emergency landing gear release and the like. However, where existing structural equipment or safety-of-flight emergency devices require shear wire to secure equipment while not in use, but which are dependent on shearing or breaking of the lockwire for successful emergency operation of equipment, particular care should be exercised to assure that lock wiring under these circumstances will not prevent emergency operations of these devices.

4. Cotter Pin Installation

A. General instruction for the selection and application of cotter pins (refer to Figure 202).
(1) Select cotter pin material in accordance with temperature, atmosphere and service limitations. Refer to Table 202.
(2) Cotter pins should be new upon each application.
(3) When nuts are to be secured to the fastener with cotter pins, tighten the nut to the low side (minimum) of the applicable specified or selected torque range, unless otherwise specified, and if necessary, continue tightening until the slot aligns with the hole. In no case should the high side (maximum) torque range be exceeded.
(4) Castellated nuts mounted on bolts may be safetied with cotter pins or lockwire. The preferred method is with the cotter pin bent parallel to the axis of the bolt. The alternate method, where the cotter pin is mounted normal to the axis of the bolt, may be used when the cotter pin in the preferred method is apt to become a snag.

Table 202. Cotter Pin Material

MATERIAL	TEMPERATURE	SERVICE
MS24665 Cotter Pins Carbon Steel	Ambient Temperature up to 460°F	Normal atmosphere cotter pins contacting cadmium plated bolts or nuts.
MS24665 Cotter Pins Corrosion Resistant Steel	Ambient Temperature up to 800°F	Non magnetic requirements cotter pins contacting corrosion resistant steel bolts or nuts in a corrosive atmosphere.

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(5) In the event when more than 50 percent of the cotter pin diameter is above the nut castellation, a washer should be used under the nut or a shorter fastener should be used. A maximum of two washers may be permitted under a nut.
(6) The largest nominal diameter cotter pin (listed in MS24665) which the hole and slots will accommodate should be used; but in no application to a nut, bolt or screw should the pin size be less than the sizes described in Figure 202.
(7) Install the cotter pin with the head firmly in the slot of the nut, with the axis of the eye at right angles to the bolt shank. Bend prongs so the head and upper prong are firmly seated against the bolt.
(8) In the pin applications, install the cotter pin with the axis of the eye parallel to the shank of the clevis pin or rod end. Bend the prongs around the shank of the pin or rod end.
(9) Cadmium plated cotter pins should not be used in applications bringing them in contact with hydraulic fluid or synthetic lubricants.

5. Locking Clip Installation

A. Safetying Turnbuckles (Refer to Figure 203).
(1) Prior to safetying, both threaded terminals should be screwed an equal distance into the turnbuckle barrel, and should be screwed in, at a minimum, so no more than three threads of any terminal are exposed outside the body.
(2) After the turnbuckle has been adjusted to its locking position, with the groove on terminals and slot indicator notch on barrel aligned, insert the end of the locking clip into the terminal and barrel until the "U" curved end of the locking clip is over the hole in the center of the barrel.
(a) Press the locking clip into the hole to its full extent.
(b) The curved end of the locking clip will latch in the hole in the barrel.
(c) To check proper seating of locking clip, attempt to remove pressed "U" end from barrel hole with fingers only. Do not use a tool as the locking clip could be distorted.
(3) Locking clips are for one time use only and should not be reused.
(4) Both locking clips may be inserted in the same hole of the turnbuckle barrel or in opposite holes of the turnbuckle barrel.

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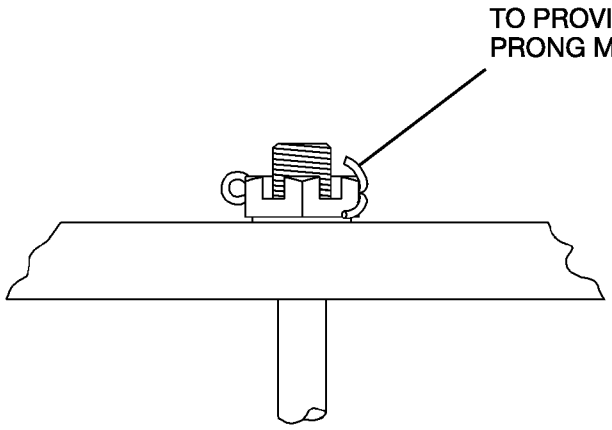
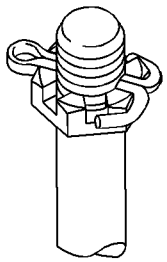
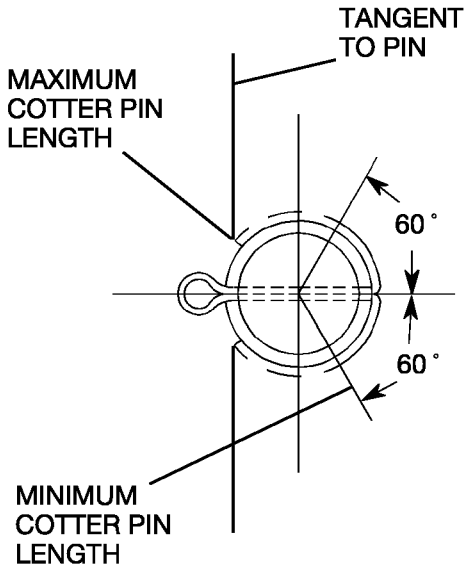
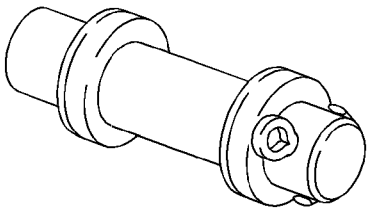


CASTELLATED NUT ON
PREFERRED METHOD



CASTELLATED NUT ON
ALTERNATE METHOD





PIN APPLICATION

THREAD SIZE	MINIMUM PIN SIZE	
	INCH	mm
6	0.028	0.71
8	0.044	1.11
10	0.044	1.11
1/4	0.044	1.11
5/16	0.044	1.11
3/8	0.072	1.83
7/16	0.072	1.83
1/2	0.072	1.83
9/16	0.086	2.18
5/8	0.086	2.18
3/4	0.086	2.18
7/8	0.086	2.18
1	0.086	2.18
1 1/8	0.116	2.95
1 1/4	0.116	2.95
1 3/8	0.116	2.95
1 1/2	0.116	2.95

5598T1025

Cotter Pin Safetying
Figure 202 (Sheet 1)

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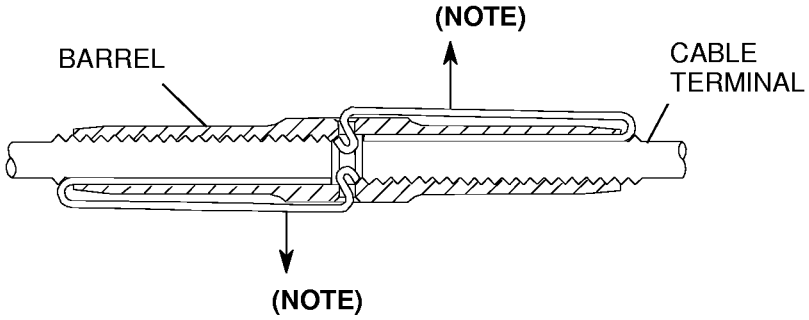
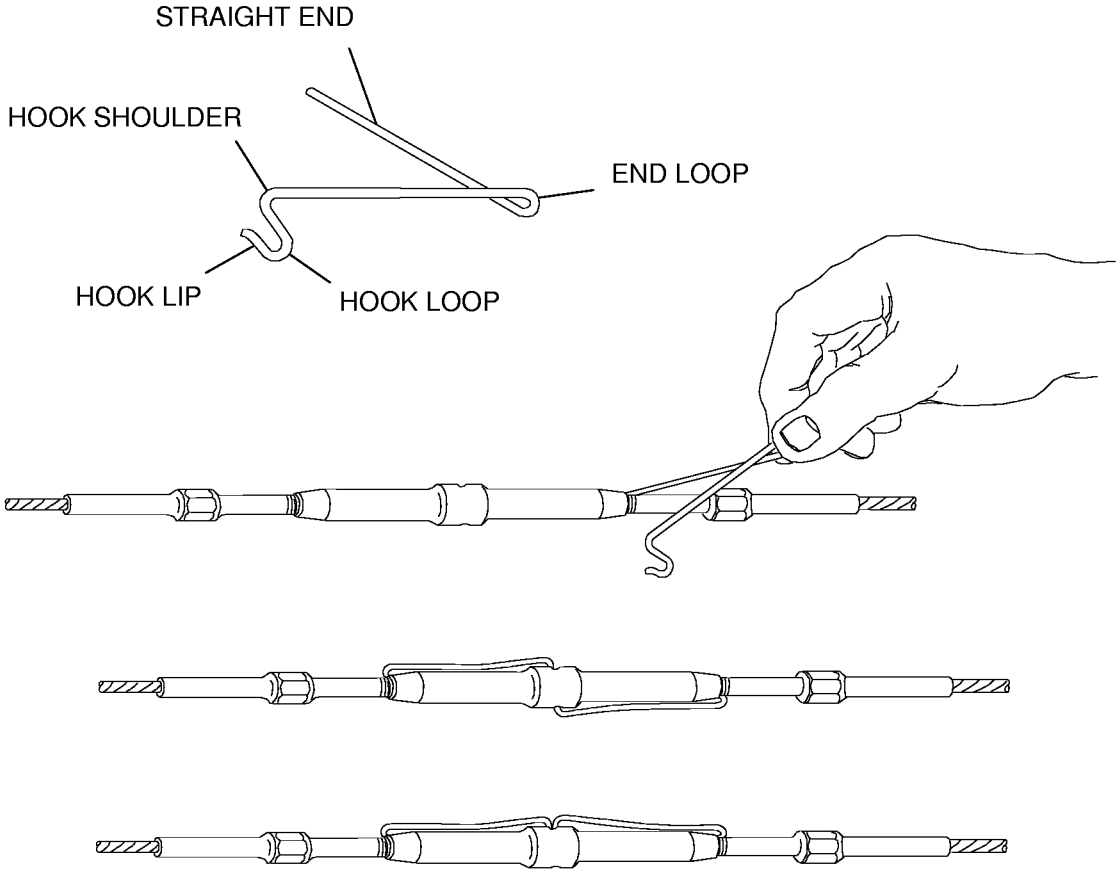


NOTE: PULL WITH YOUR FINGERS FOR AN INSPECTION TO MAKE SURE THE CLIP WILL NOT COME OUT.



SAFETY CLIP INSTALLATION

0798T1005
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0798T1004

Safetying Turnbuckle Assemblies
Figure 203 (Sheet 1)

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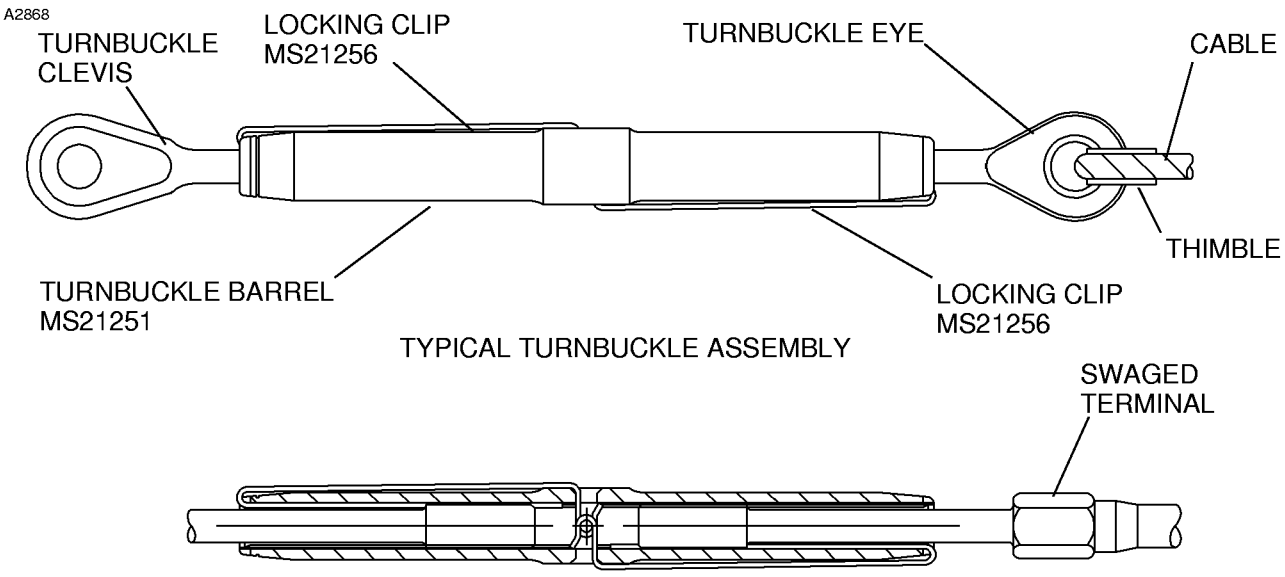

TYPICAL TURNBUCKLE ASSEMBLY

METHOD OF ASSEMBLING LOCKING CLIPS, TURNBUCKLE BARREL AND TERMINALS

5598T1023

NOMINAL CABLE DIAMETER	THREAD UNF-3	LOCKING CLIP MS21256 (NOTE 1)	TURNBUCKLE BODY MS21251
1/16	Number 6-40	-1 -2	-B2S -B2L
3/32	Number 10-32	-1 -2	-B3S -B3L
1/8	1/4-28	-1 -2	-B5S -B5L
5/32	1/4-28	-1 -2	-B5S -B5L
3/16	5/16-24	-1 -2	-B6S -B6L
7/32	3/8-24	-2	-B8L
1/4	3/8-24	-2	-B8L
9/32	7/16-20	-3	-B9L
5/16	1/2-20	-3	-B10L

NOTE 1: TWO LOCKING CLIPS REQUIRED FOR EACH TURNBUCKLE.

NOTE 2: "B" IN TURNBUCKLE BODY DASH NUMBER INDICATES BRASS. NO LETTER INDICATES STEEL.

Safetying Turnbuckle Assemblies
Figure 203 (Sheet 2)

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CONTROL CABLE WIRE BREAKAGE AND CORROSION LIMITATIONS - MAINTENANCE PRACTICES

1. Examination of Control Cables.

A. Control cable assemblies are subject to a variety of environmental conditions and forms of deterioration. Some deterioration, such as wire or strand breakage, is easy to recognize. Other deterioration, such as internal corrosion or cable distortion, is harder to identify. The following information will aid in detecting these cable conditions.

B. Broken Wire Examination (Refer to Figure 201).
   (1) Examine cables for broken wires by passing a cloth along length of cable. This will detect broken wires, if cloth snags on cable. Critical areas for wire breakage are those sections of cable which pass through fairleads, across rub blocks, and around pulleys. If no snags are found, then no further inspection is required. If snags are found or broken wires are suspected, then a more detailed inspection is necessary which requires that the cable be bent in a loop to confirm broken wires. Loosen or remove cable to allow it to be bent in a loop as shown. While rotating cable, inspect bent area for broken wires.
   (2) Wire breakage criteria for cables in flap, aileron, rudder, and elevator systems are as follows:
      (a) Individual broken wires at random locations are acceptable in primary and secondary control cables when there are no more than six broken wires in any given ten-inch cable length.

C. Corrosion.
   (1) Carefully examine any cable for corrosion that has a broken wire in a section not in contact with wear-producing airframe components, such as pulleys, fairleads, rub blocks, etc. It may be necessary to remove and bend cable to properly inspect it for internal strand corrosion, as this condition is usually not evident on outer surface of cable. Replace cable if internal corrosion is found. If a cable has been wiped clean of its corrosion-preventive lubricant and metal-brightened, the cable shall be examined closely for corrosion. For description of control cable corrosion, refer to Chapter 51, Corrosion and Corrosion Control - Maintenance Practices.

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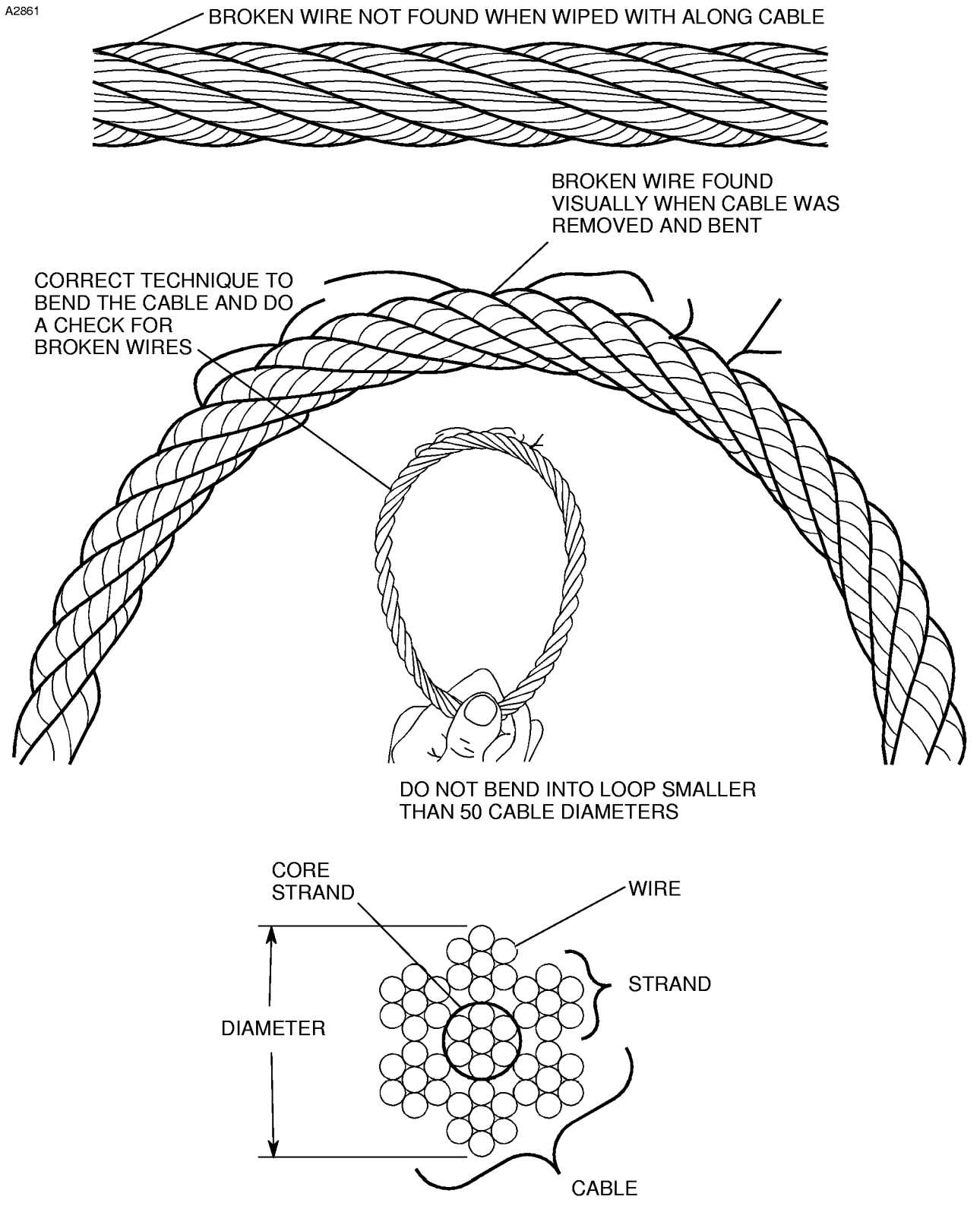

Cable Broken Wire Examination
Figure 201 (Sheet 1)

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BEARINGS - REMOVAL/INSTALLATION

1. Bearings Removal/Installation

A. Remove the Bearing (Refer to Figure 401).
   (1) Remove the bearing with its supporting bracket or component housing from the airplane, refer to the applicable chapter.
   (2) Push the worn bearing from its housing or supporting bracket.
   (3) After you remove the bearing, examine the component housing or bracket for structural damage (cracks, warpage or bends).
   (4) Examine the hole in the housing for damage, cracks or other abnormal conditions of the material and hole diameter.

NOTE: The gap between the bearing outside diameter and the hole inside diameter must be within 0.0010 to 0.0035 inch.

B. Install the Bearing (Refer to Figure 401, Figure 402, Figure 403 and Figure 404).

NOTE: The new bearings must stay in their packages until the time of the actual installation.

CAUTION: Do not let the cleaner penetrate into the bearing. This will remove the lubrication from the bearing.

(1) Clean the outer surfaces of the bearing and hole in the component housing with a clean cloth and remove all traces of oil or grease.

NOTE: The cloth must be moist with an approved cleaning solvent.

(2) Use a clean cloth to dry the bearing and hole.

CAUTION: Make sure that the retaining compound does not go into the bearing.

(3) Apply retaining compound to the outer surface of the bearing and the mating surface of the hole in the housing. Refer to the Application of Fastener Retaining Compounds and Table 401.
(4) Push the bearing into position.
(5) Use a staking tool to stake the bearing in place.
   (a) Stake between the current stake marks around the hole (refer to Figure 404).
   (b) If a new component housing or bracket is necessary, stake the bearing in the same pattern as the original installation.
   (c) If the bearing is not kept in position on the opposite side of the stake (Refer to Figure 402), use a support during the staking operation (Refer to Figure 403).
      1 Stake the bearing housing on both sides only if the bearing is not kept in position on the opposite side of the stake.
(6) Install the bearing component or bracket assembly on the airplane, refer to the applicable chapter.

C. Riveted-On Bearing Brackets or Housings:
   (1) The replacement bearing brackets, housings or bearing and bracket assemblies can be supplied without holes. The riveted installation must be put into position and drilled.

NOTE: If you replace a bearing that is attached with rivets, the alignment of the removed bracket must be marked. The new bracket must be installed in the original alignment.

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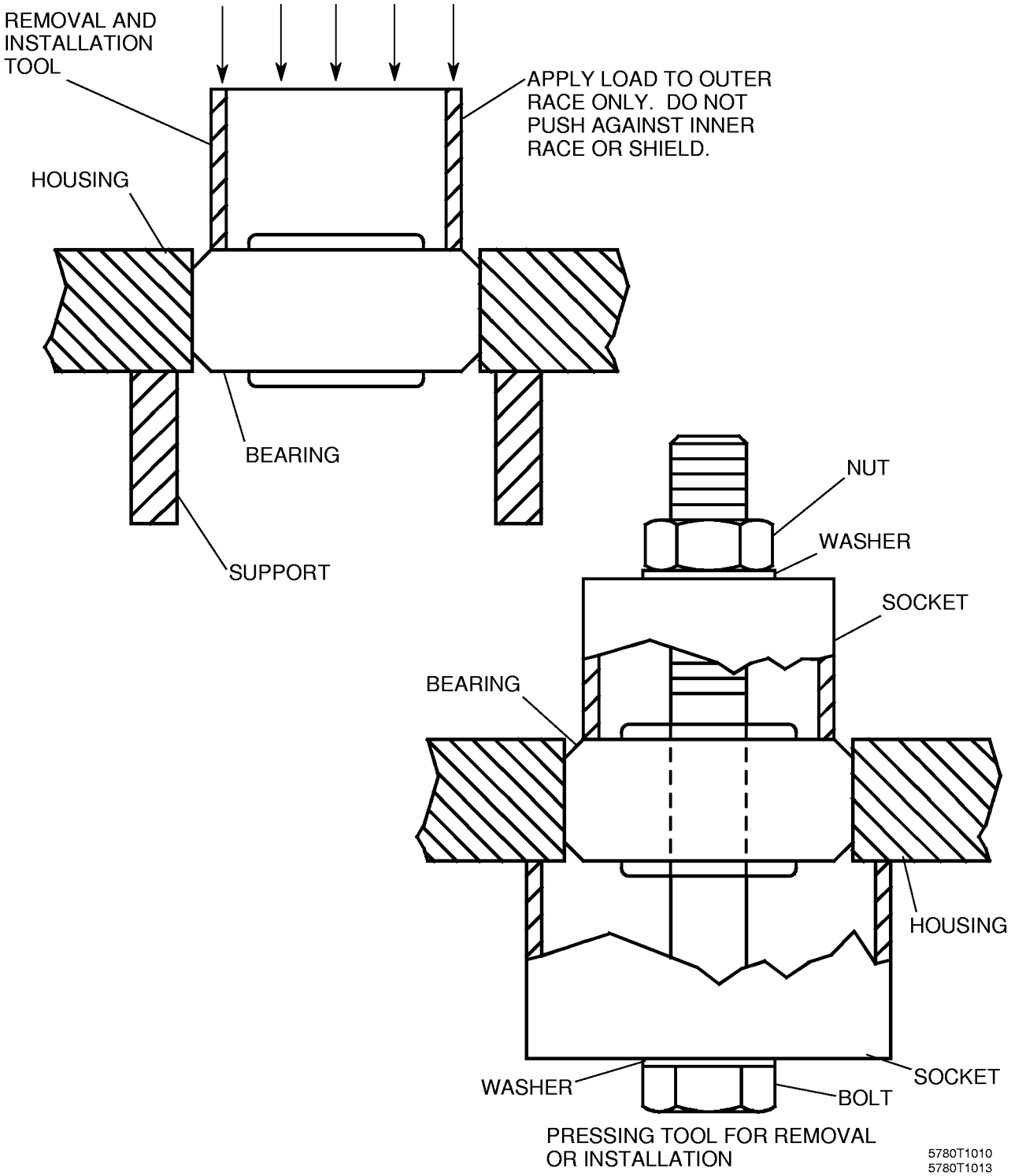
CENTER THE BEARING CAREFULLY IN THE HOUSING. THE BEARING SHALL NOT BE CANTED IN THE HOLE, AND IT SHALL NOT BE BOUND.

APPLY THE INSTALLING LOAD TO THE OUTER RACE OF THE BEARING.



Bearing Removal and Installation
Figure 401 (Sheet 1)

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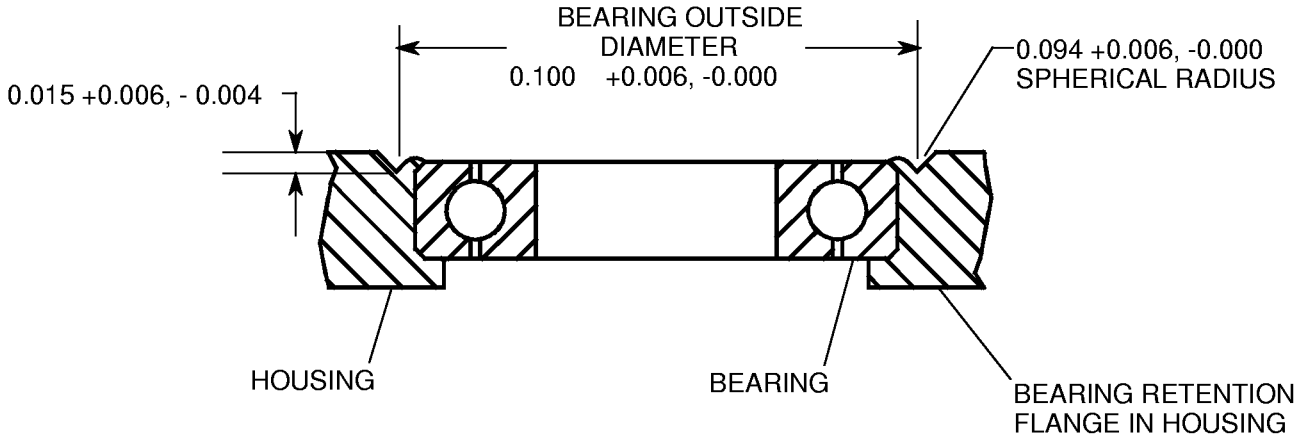
THE DEPRESSIONS SHALL BE CONCENTRIC WITH THE BORE OF THE BEARING, WITHIN 0.020 TOTAL INDICATOR READING.



5780T1010A

Staking Dimension
Figure 402 (Sheet 1)

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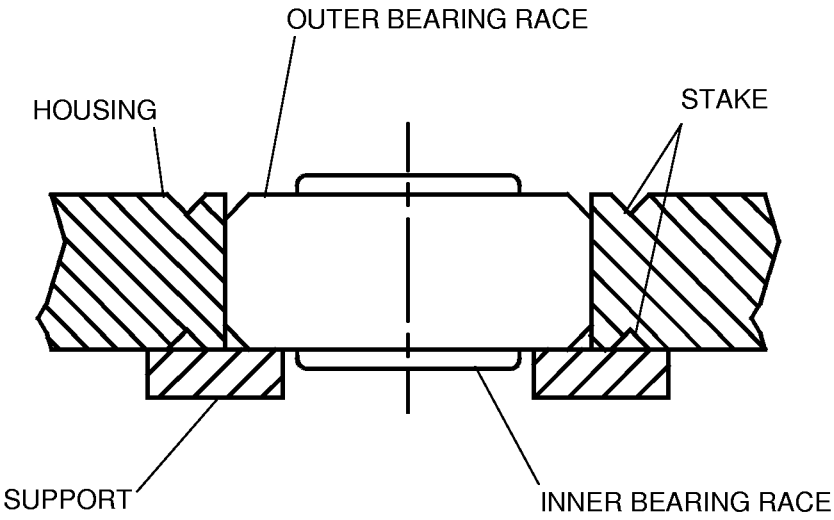
DO NOT SUPPORT AGAINST INNER BEARING RACE



5780T1009

Support During Staking
Figure 403 (Sheet 1)

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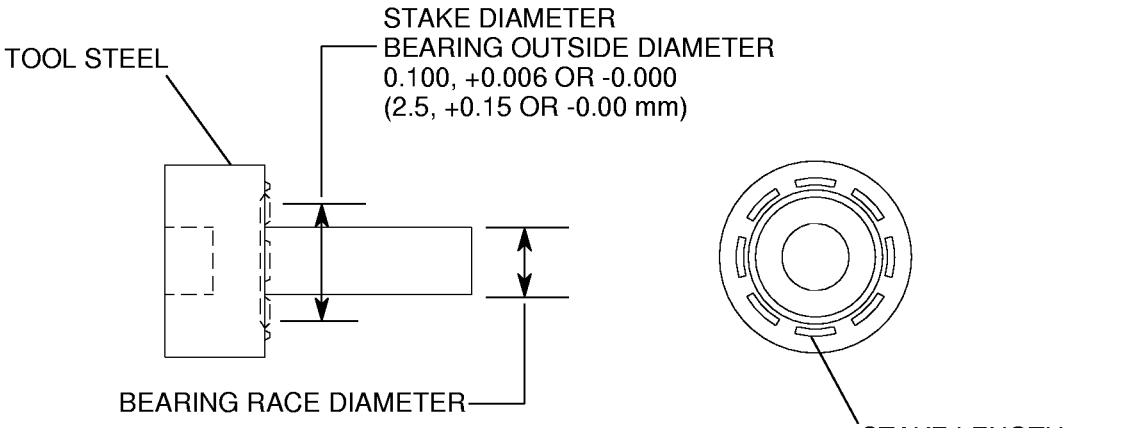
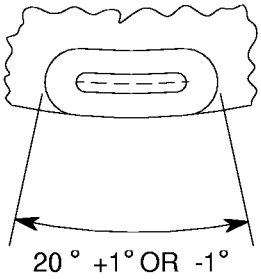
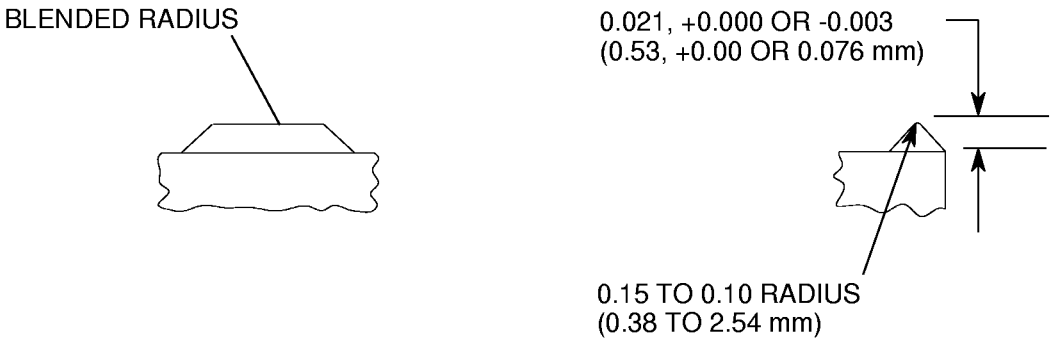


BEARING OUTSIDE DIAMETER	NUMBER OF STAKES
UP TO 0.734 (18.6 mm)	4
0.735 TO 0.984 (18.7 TO 25.0 mm)	6
0.985 TO 1.234 (25.1 TO 31.3 mm)	8
1.235 TO 1.690 (31.4 TO 42.9 mm)	10
1.691 TO 1.984 (43.0 TO 50.4 mm)	12





STAKE DETAIL

NOTE: ALL DIMENSIONS EXPRESSED IN INCHES

5780T1008
5780T1008A
5780T1008B

Staking Tool - Typical
Figure 404 (Sheet 1)

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2. Application of Fastener Retaining Compounds

A. General

(1) This procedure gives general methods to apply materials used to seal, lock and keep metal parts in position. The retaining compounds cure anaerobically, that is, they will become hard only when put between properly prepared mating surfaces where no air can touch the retaining compound. Refer to Table 201 for the retaining compounds and surface primers included in this procedure.

CAUTION: Make sure that the primer and retaining compounds do not touch the synthetic rubber.

CAUTION: Make sure that the primer and retaining compounds do not go into the bushings or bearings.

NOTE: It is not necessary to apply primer to surfaces other than cadmium, zinc, anodized or corrosion-resistant steel.

NOTE: For optimum strength properties, the gap between the bushing (bearing) outside diameter and the housing hole inside diameter must be within 0.0010 to 0.0035 inch.

NOTE: Primer and retaining compounds must be kept in an enclosed building that will give the containers protection from direct sunlight, wind and rain.

Table 401. Primer and Retaining Compounds

LOCQUIC SURFACE PRIMER - MIL-S-22473	GRADE	FORM	COLOR	APPLICATION
Primer (Catalog Number 747-56)	T	R	Yellow	(Ready to use) Can be used with Loctite 609 or 680 and Permabond HL038 or HH020.

RETAINING COMPOUND - MIL-R-46082	MANUFACTURER	APPLICATION
Loctite 609	Loctite Corp. Newington, CT 06111	Used as high strength retaining compound that cures quickly for studs, bearings and bushings.
Loctite 680	Loctite Corp.	Used as extra-high strength retaining compound that cures quickly for press fits on cylindrical parts.
Permabond HL038	Permabond International Corp. 480 S. Dean Street Englewood, NJ 07631	Used as high strength retaining compound that cures quickly for studs, bearings and bushings.
Permabond HH020	Permabond International Corp.	Used as extra-high strength retaining compound that cures quickly for press fits on cylindrical parts.

3. Bearing/Bushing Retention

A. Preparation

(1) Prepare the parts to be kept as follows:

(a) Before you apply retaining compound to a surface, clean it with an approved cleaning solvent. Use a clean cloth and remove all traces of grease or oil.

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(b) Keep contamination from the cleaned surfaces, especially if they are not assembled immediately after they are cleaned.
(c) Do not touch the clean parts with your bare hands. Use a clean cloth or clean white cotton gloves when you assemble the mating parts.

CAUTION: Primer has a chemical effect on materials such as thermoplastics or titanium.

NOTE: Some materials that are affected by softening or crazing include vinyl, cellulosic, styrene and methacrylate plastics. Thermosetting plastics are not affected.

B. Locquic Primer

NOTE: Cadmium, zinc, anodized, corrosion resistant steel and plastic surfaces must be primed with Locquic primer, Grade T, Form R (yellow).

(1) Apply MIL-S-22473 Locquic primer, Grade T, Form R (yellow), to all surfaces that touch. Do not apply the primer to the oil grooves or ports of the bearings.
(2) Let the surfaces air dry at room temperature for a minimum of 30 minutes.

C. Installation

NOTE: Bearings or bushings can be installed dry and the retaining compound applied as stated in the following step. A thin coat of retaining compound specified for repair can be applied to the primed surfaces that are to be joined and assembled wet.

(1) After the installation (wet or dry), apply MIL-R-46082 retaining compound.
(a) Touch the application nozzle of the retaining compound container to the mating joint between the bearing outside diameter and the housing.

NOTE: The compound will go into the joint by capillary action. When a ring of compound stays just outside the joint, the capillary penetration is complete.

4. Sealant and Retaining Compounds

A. Cure Methods
(1) Two methods to cure sealant and retaining compounds are:
(a) Method 1 - The parts must stay undisturbed for 24 hours at room temperature to get to full strength.

NOTE: If the bearing or bushing moves out of position before the full cure of the retaining compound is complete, the parts must be cleaned, primed and assembled again.

(b) Method 2 - The parts must cure at 275°F, +10° or -10°F for 15 minutes after the part gets to the necessary temperature.
(c) Examine the bearing for damage before it is put into position.

NOTE: Any damaged area of the bearing must be repaired before it is put into position.

(d) Lubricate the bearing or bushing after the retaining compound has cured.

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ELECTRICAL BONDING - MAINTENANCE PRACTICES

1. General

A. This section describes airplane electrical bonding requirements and procedures. Following procedures and specification, MIL-STD-464 Bonding, Electrical and Lightning Protection for Aerospace Systems, shall govern installation and testing of electrical bonds and ground returns.

NOTE: A variety of operational problems associated with electric, avionics and communications systems can be attributed to poor or inferior electrical bonding. These problems often include complete failure, reduced performance or, in the case of avionics and navigation systems, electromagnetic interference (EMI) or radio frequency interference (RFI).

B. Maintenance personnel must follow recommended practices for establishing, remaking, checking, and protecting electrical bonds, particularly during the following routine maintenance activities:
(1) Removal/installation of avionics and electrical equipment, and mounting trays.
(2) Assembly/reassembly of supporting structure for avionics or electrical equipment.
(3) Reinstallation of control surfaces and removable fairings (including radome and stinger).

2. Definitions

A. Within this section the following definitions are applicable.
(1) Bond (Electrical) - A fixed union existing between two objects providing good electrical conductivity, due to a low-resistance path between objects.
(2) Bonding (Electrical) - The process of making necessary connections to provide good electrical conductivity between units, or between unit and airplane ground.
(3) Ground - The common connection of the electrical circuits of a system or subsystem to a conductive medium, (airplane primary structure), that becomes a common reference plane for all voltage potentials in the airplane.
(4) Grounding - The process of making the necessary connection(s) to provide a ground for an electrical, electronic, or radio frequency circuit.
(5) Primary structure - Load carrying members of the airframe, such as bulkheads, ribs, webs, and stringers extending through two or more bulkheads or ribs. All primary structure is considered to be airplane ground.
(6) Secondary structure - Sheet metal or extruded metal parts attached to primary structure, (or to secondary structure that is ultimately attached to primary structure) in at least two places by structural fasteners.

3. Hardware and Material Usage

A. The following tables list recommended and prohibited hardware and materials for electrical bonding.

Table 201. Cleaning Material

Aluminum Wool
Sandpaper
Stainless Steel Wool
Aluminum Oxide Cloth, High Purity
Bonding Rotary Brush
MIL-PRF-680 Solvent

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Table 202. Bolts, Nuts And Screws

Cadmium Plated Steel	Recommended for all areas other than engine compartment and fuel system.
Corrosion Resistant Steel	Recommended for engine compartment and fuel system.
Aluminum	Recommended for all areas other than engine compartment.
Self-Tapping Screws	Prohibited for bonding application.
Zinc Plated Screws	Prohibited for bonding application.
Spring, Self-Locking, Clip in Instrument Mounting Nut	Prohibited for bonding application.
Wing Nuts	Prohibited for bonding application.

Table 203. Washers

Anodized	Prohibited for bonding application.
Zinc Plated	Prohibited for bonding application.
Unplated	Prohibited for bonding application.
NAS1149, MS35337, MS35339	Recommended for bonding in all areas.
Tooth Lockwasher	Prohibited for bonding application.

Table 204. Bonding Jumpers

MS25083	Recommended for bonding in all areas.
On Aluminum Alloys	Use aluminum or tinned copper jumpers.
On Steel Alloys	Use copper, brass or bronze tinned coated jumpers only.
In Fuel System	Use MS25083-7 only.

Table 205. Clamps

AN735	Recommended for bonding in all areas except fuel system.
AN735D	Recommended for bonding in fuel system.
Cushion Clamps	Prohibited for bonding applications.

Table 206. Nutplates

Cadmium	Recommended for direct bonding applications except in fuel system (prohibited for fuel system use).
Silver Plated or Corrosion Resistant Steel	Recommended for direct bonding applications in fuel system.
Non-Metallic Insert, Dry Film Lube Type	Prohibited for direct bonding applications.

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Table 207. Low- Resistance Test Set (Bonding Meter)

Keithley Model 580	Keithley Instruments, Inc Instrument Division 28775 Aurora Road Cleveland, OH 44139

4. Checking Electrical Bonding

A. Electrical bonding criteria.
(1) Bonding to primary structure (grounding) - This type of bonding shall only be considered satisfactory after resistance between bonded object and primary structure has been measured with a low-resistance test set (bonding meter), and found to be no more than the maximum allowable resistance for that application.

NOTE: In many cases the object to be grounded is mounted on or attached to secondary structure, or otherwise separated from direct contact with primary structure. Grounding depends on both satisfactory bonding of mounting tray to secondary structure, and of secondary structure to primary structure. Check resistance across each bond to identify the source(s) of poor grounding.

(2) Bonding one object to another - This type of bonding shall only be considered satisfactory after the resistance between the objects has been measured with a bonding meter and found to be no more than the maximum allowable resistance for that application.

B. Using a low-resistance test set (bonding meter).
(1) Follow manufacturers instructions included with test set for setup, operation, and reading of test set display.
(2) Place or connect probes on bare metal surfaces.
(3) The probes should be placed as close as possible to the bonding area, preferably within six inches along surface of the object or structural member.
(4) If it is necessary to remove paint or primer from a surface in order to provide good probe contact, apply the original (or equivalent) finish after checking bond.

5. Bonding Requirements

A. Current Path Return Bonds.
(1) Current return bonds are those required to complete the ground return path to the battery and/or the power generator source for all electrical and avionics equipment. This type of bond is accomplished with a standard hook up wire. Location of the ground bond connection should be to primary structure. In some cases where the equipment is internally case grounded, current return may be accomplished by direct bonding of mating surfaces and through the mounting hardware.
(2) If mating surface bonding resistance allowable in Table 208 cannot be met by direct surface bonding, then equipment or component in question must be bonded by a bolted bond jumper.

B. Radio Frequency and Static Bonds.
(1) All electrical and electronic equipment and/or components shall be installed in such a manner as to provide a continuous low-resistance path from the equipment enclosure to airplane primary structure.
(2) All metallic pipes, tubes and hoses carrying fluids in motion should be bonded to basic structure.
(3) Table 208 covers equipment and areas of radio frequency and static bonds.
(4) All control surfaces shall have a bonding jumper between airframe and control surface. Where necessary, additional jumpers shall be used between the control surface and structure to achieve the resistance level. A piano type hinge may be considered as self-bonded, provided the resistance across the hinge halves is satisfactory.

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(5) All conducting items, such as metal lines and/or tubing carrying fluids or air in motion having a linear dimension of 24 inches or more, installed within one foot of unshielded transmitting antenna lead-ins shall have a bond to structure. Refer to bonding of pipes and tubing.

Table 208. Typical Resistance Values

OBJECT TO BE BONDED	METHOD OF BONDING	MAXIMUM ALLOWABLE RESISTANCE VALUE (Ohms)	BOND TYPE (CLASS)
All electrical and electronic equipment ground return bonds to basic structure	Direct metal case to structure	0.0025	I
Antenna base	Metal base to metal fuselage through fasteners	0.0025	I
Battery box to basic structure	Direct metal case to structure	0.0025	I
Bulkhead feedthrough connectors	Metal to metal	0.0025	I
Cable bundle shields	Direct attachment to connector backshell	0.0025	I
Electric trim (actuator assembly)	Direct metal to metal	0.0025	I
Electrical devices to enclosure	Direct attachment through attachment hardware	0.0025	I
Electrical motors to adjacent structure	Direct metal to metal	0.0025	I
Engine to nacelle structure bond	Direct attachment by fasteners (metal nacelle)	0.0025	I
Instrument panels to stationary panel	Direct metal to metal attachment by fasteners	0.0025	I
Instruments	Direct metal to metal	0.0025	I
Radio racks, shelves and brackets to adjacent primary structure	Direct metal to metal	0.0025	I
Radome external diverter strips	Attachment to radome frame	0.0025	I
Rivet skin joints and breaks (across joint) or structural joints or breaks (across joint)	Direct metal to metal	0.0025	I
Servos amplifier, gaging equipment instruments, etc.	Direct metal to metal	0.0025	I
Side console and electrical equipment panels to basic structure	Direct metal to metal by fasteners	0.0025	I
Starters, generator and alternator grounds (case to engine frame)	Direct metal case to structure	0.0025	I
Static wicks (metal surface)	Direct metal to metal attachment by fasteners	0.0025	I
Stationary instrument panels to primary structure	Direct metal to metal by fasteners	0.0025	I

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Table 208. Typical Resistance Values (continued)

OBJECT TO BE BONDED	METHOD OF BONDING	MAXIMUM ALLOWABLE RESISTANCE VALUE (Ohms)	BOND TYPE (CLASS)
Structural joints or breaks (across joint)	Direct metal to metal	0.0025	I
Wing tie down and ground point	Attachment through fasteners	0.0025	I
Wing to fuselage	Direct metal to metal or attachment bolts	0.0025	I
Wire Bundle Shields	Direct attachment to backshell	0.0025	I
All electrical and electronic equipment ground return bonds to basic structure	Direct metal case to structure	0.005	II
Baggage/Avionics compartment door	Bonding jumper across hinge	0.005	II
Battery box cover	Fastener to battery box	0.005	II
Bearings (roller and ball) Piano hinged surfaces	Bonding jumper	0.005	II
Cable bundle shields	Bonding jumper	0.005	II
Doors and Inspection plates	Fastener to airplane structure	0.005	II
Electrical devices to enclosure	Bonding jumpers	0.005	II
Electrical motors to adjacent structure	Bonding jumper	0.005	II
Engine	Bonding jumper across mount	0.005	II
Instruments	Bonding jumper	0.005	II
Landing gear	Bonding jumper	0.005	II
Landing gear doors	Bonding jumper across hinge	0.005	II
Metal aileron	Bonding jumper across hinge	0.005	II
Metal cowls - removable	Fastener to engine frame	0.005	II
Metal elevator	Bonding jumper across hinge	0.005	II
Metal flap	Bonding jumper across actuator	0.005	II
Metal nacelle	Fastener to engine frame	0.005	II
Metal rudder	Bonding jumper across hinge	0.005	II
Nose wheel doors	Bonding jumper across hinge	0.005	II
Panel feed-thru plates	Bonding jumper	0.005	II

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Table 208. Typical Resistance Values (continued)

OBJECT TO BE BONDED	METHOD OF BONDING	MAXIMUM ALLOWABLE RESISTANCE VALUE (Ohms)	BOND TYPE (CLASS)
Servos amplifier, gaging equipment instruments, etc.	Bonding jumper	0.005	II
Trim tab	Bonding jumper across hinge	0.005	II
Wire Bundle Shields	Bond jumper to structure	0.005	II
Panel feed-thru plates	Direct metal to adhesively bonded honeycomb	0.03	III
Antenna base	Metal base to composite fairing through fasteners	0.05	V
Engine to nacelle structure bond	Direct attachment by fasteners (composite nacelle)	0.5	V
Static wicks (composite surface)	Direct metal to conductive adhesive to composite surface and attachment by fasteners	0.5	V
Control cables and rods to movable surfaces equipment	Bonding through or attachment hardware	0.01	IX
Metal ducts	Direct metal to metal and attachment anchors	0.005	IX
Metal ducts (nonelectrical: rigid and flexible)	Bonding through clamp and attachment hardware	1.0	IX
Metallic tubing	Feed-thru hardware and attachment anchors	1.0	IX
Oil and Anti-Ice tank	Attachment through fasteners	0.01	IX
Oxygen cylinders	Direct metal to metal or bonding jumper	0.01	IX
Radiators and heat exchangers	Bonding through or attachment hardware	0.01	IX
Seat frame	Attachment through fasteners	0.01	IX
Shock mounts	Direct metal to metal through attachment hardware	0.01	IX

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Table 208. Typical Resistance Values (continued)

OBJECT TO BE BONDED	METHOD OF BONDING	MAXIMUM ALLOWABLE RESISTANCE VALUE (Ohms)	BOND TYPE (CLASS)
Fuel filler nozzle	Attachment through fasteners	0.005	X
Bearings (roller and ball) Piano hinged surfaces	Metal to metal through bearing or hinge	0.01	XI
Metal flap	Rolller/track (loaded configuration)	0.5	XI

C. Shock Hazard and Lightning Protection Bonds.
   (1) If requirements of current path return bonds and radio frequency and static bonds have been successfully accomplished then shock hazard and lightning protection bonds have partially been fulfilled.
   (2) Shock hazard pertaining to exposed conducting frames or surfaces (such as elevators, flaps, trim tabs) or parts of electrical or electronic equipment shall have a low-resistance bond to primary structure.
   (3) Lightning protection bonding cover assemblies such as fuel fillers, fuel vents, pitot tubes, radome, plastic and fiberglass surfaces and control surfaces.
   (4) Typical resistance values are listed in Table 209.

Table 209. Shock Hazard and Lightning Protection Bonds.

OBJECT TO BE BONDED	MAXIMUM ALLOWABLE RESISTANCE VALUE (Ohms)
Instruments	0.01
Oxygen Cylinders	0.01
Metallic Tubing	1.00
Metal Ducts	0.005
Fuel Filler	0.005
Fuel Vents	0.005
Wing Tie Down and Ground Point	0.005
Electronic Equipment Below Radio Frequency	0.01
Control Cables and Rods to Movable Surface or Equipment	0.01

D. Bonding in Hazard Areas.
   (1) To eliminate any possible source of ignition in areas prone to explosion or fire hazards, do not add any new bonding installations in hazard areas.

WARNING: Current return grounds shall be avoided in fuel vapor areas.

E. Bonding Connection.
   (1) Bonding connections shall be so installed that vibration, expansion, contraction or relative movement, incidental to normal service use, will not break or loosen connection to such an extent that the resistance will vary during the movement.
      (a) Bonded connections shall be located in a protected area and whenever possible near an inspection door, or an accessible location to permit inspection or replacement.
      (b) Parts shall be bonded directly to primary structure rather than through other bonded parts such as plumbing, conduits, etc.

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(c) Bonding jumpers shall be installed so movable components are not impeded in their operation by jumper.
(d) Bonding connections shall not be made by compression fastened through nonmetallic materials.
(e) All bonding surfaces shall be cleaned prior to installation of bond joint.
(f) All nuts used in bonding shall be all metal self-locking type (no nonmetallic inserts).
(g) Radio frequency current returns shall not be made through magnesium alloys.
(h) Solder joints alone shall not be used for bonding parts subject to movement and/or vibration.
(i) All electrical bonding shall be accomplished without affecting the structural integrity of the airframe.
(j) Nonmetallic inserts or dry film lube nutplates should not be used for bonding application, such as antenna installation.
(k) All AC ground returns must be connected separate from DC ground returns.
(l) Shielded wire grounds shall be attached directly to the primary structure unless otherwise noted.
(m) Where possible, multiple bonding jumpers or dual system grounds (left system and right system) should not be connected to the same ground point on the primary structure.
(n) Electrical bonding procedure must not reduce corrosion protection of bonded objects.

NOTE: Apply sealant or epoxy primer to bare metal for corrosion protection.

6. Bonding Methods

A. The following bonding methods are provided to accomplish satisfactory bonds on the airplane. In most cases, a single method will satisfy requirements, while in others it may be necessary to use more than one method.
(1) Typical bolted bond jumper installation.
(a) All bolted type jumpers shall be per Figure 201 and Figure 202. All jumper connections shall be made with number eight screws. Number six screws may be used where edge distance will not permit use of number eight screws.
(2) Bonded by riveted and/or bolted skin construction.
(a) Close riveted and/or bolted skin construction is considered an adequate bond provided the resistance value between mating surfaces is 0.0025 ohms or less for current path return areas and 0.005 ohms for other areas.
(b) When bonding by riveted and/or bolted skin construction alone is not possible, bonding per Figure 203 and Figure 204 should be provided.
(3) Bonding by riveted and/or bolted bracket and angle construction.
(a) Close riveted and/or bolted bracket and angle construction is considered to be an adequate bond provided resistance value across mating surfaces is 0.005 ohms or less.
(b) If bracket and angle construction is used for current return path, then resistance value across mating surfaces and to primary structure must be 0.0025 ohms or less.
(c) Areas not meeting the requirements noted above shall be bonded in accordance with Figure 205, or by adding a bonding jumper across each joint to primary structure.
(4) Bonding of pipes and tubing.
(a) Metallic pipes and tubes supported with clean metal clamps to a metal structure member is considered to be an adequate bonds, provided the resistance value between line and primary structure is 1.00 ohms or less. Lines not meeting this requirement shall be bonded per Figure 206 and Figure 207.
(5) Typical access panel or door.
(a) Fastening hardware such as screws, latches, hinges, etc., is considered adequate bonding for access panels and doors provided the resistance value to structure is 0.005 ohms or less. Refer to Figure 208.
(6) Typical antenna bonding installation.
(a) Fastening hardware such as screws, nuts and nutplates is considered adequate bonding for radio antennas such as ADF loop, marker beacon, nav, com, etc., provided the resistance value from the antenna connector housing to adjacent basic structure is 0.010 ohms or less.

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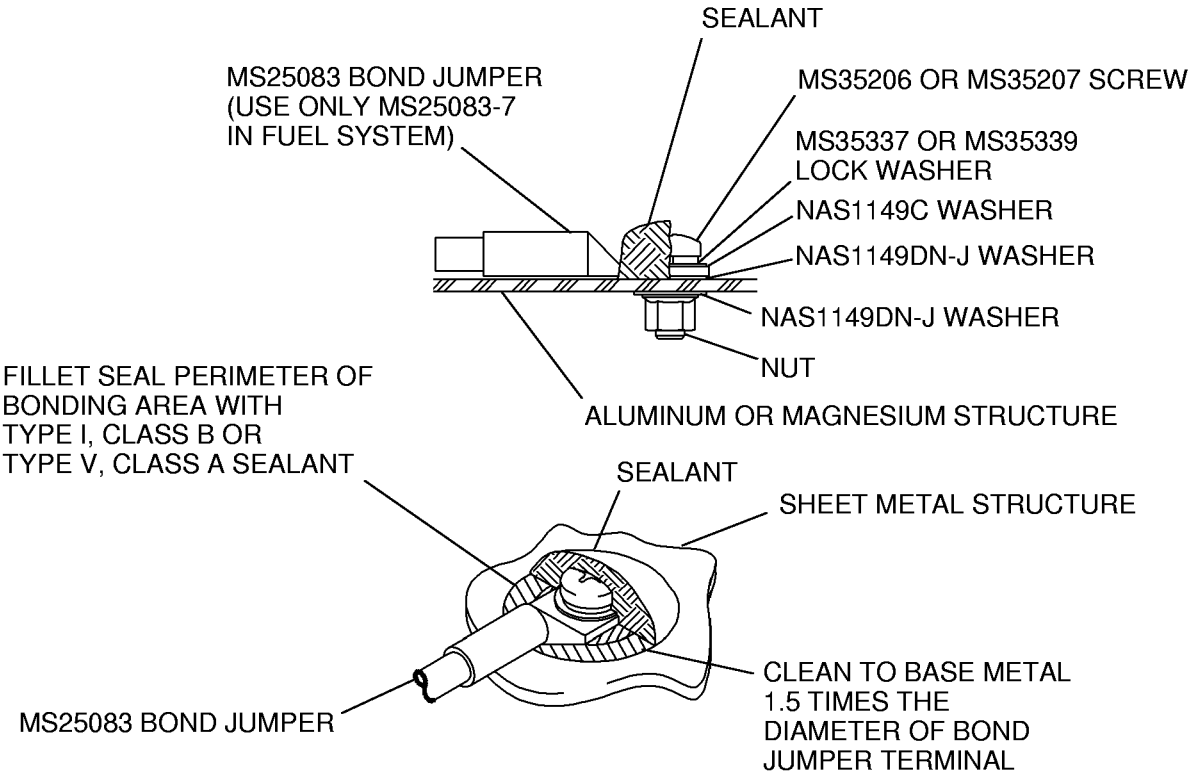

5580T2023(1)

Typical Bonding Jumper Installation for Aluminum and Magnesium Alloys
Figure 201 (Sheet 1)

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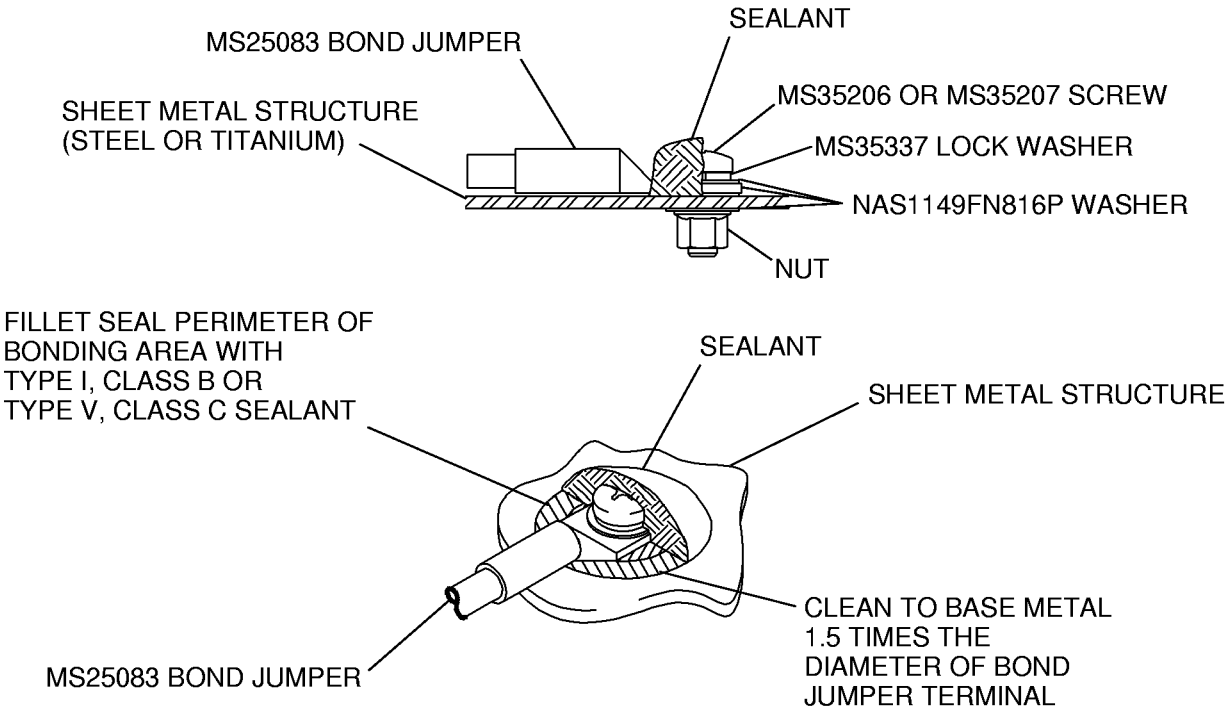

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Typical Bonding Jumper Installation for Steel and Titanium Alloys
Figure 202 (Sheet 1)

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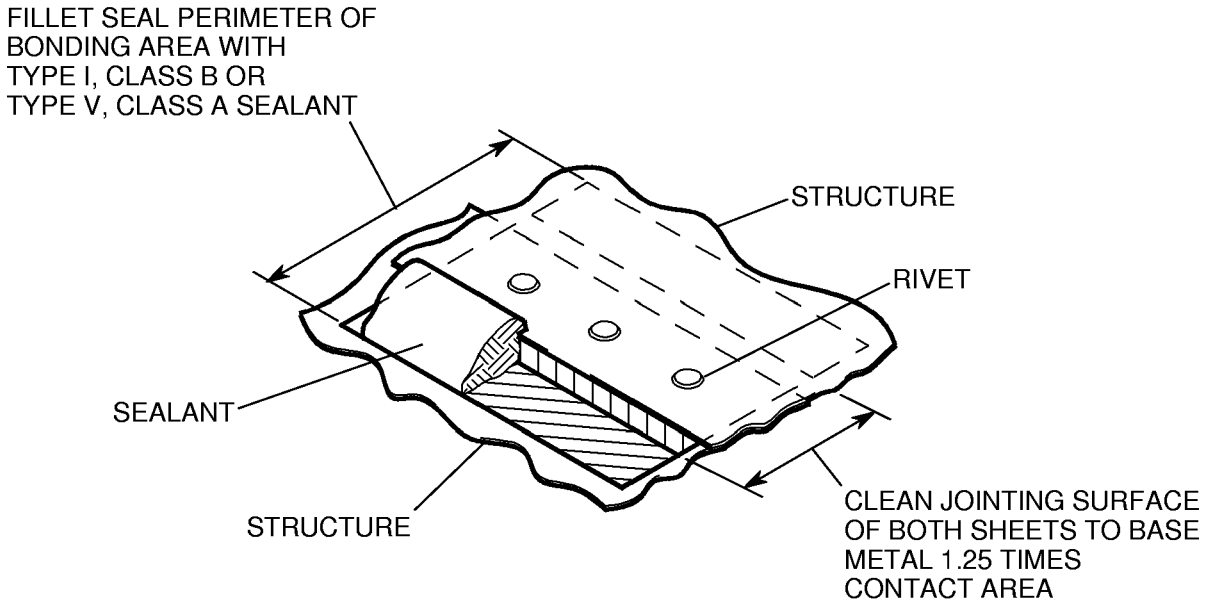

5580T2023(2)

Typical Bonding Joint Installation for Riveted Sheet Metal Construction
Figure 203 (Sheet 1)

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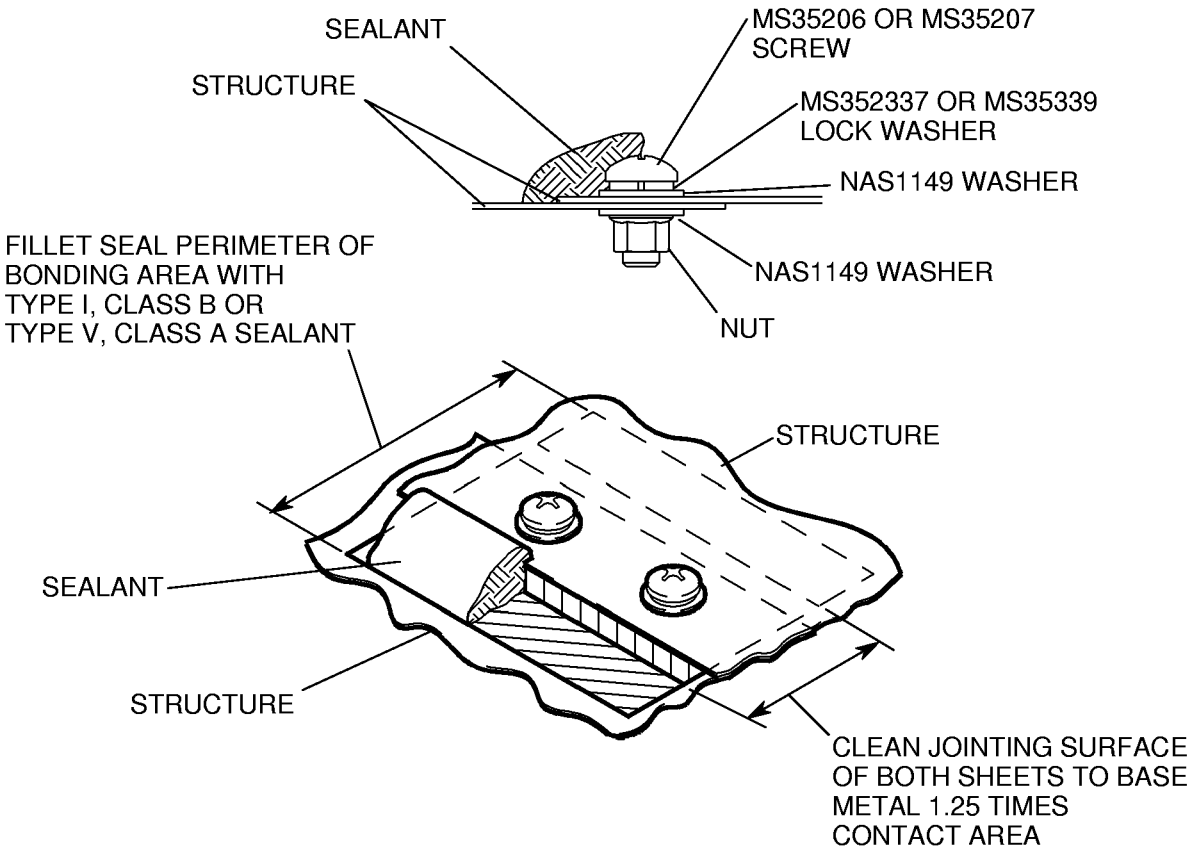

5580T2023(2)

Typical Bonding Joint Installation Using Sheet Metal and Screws
Figure 204 (Sheet 1)

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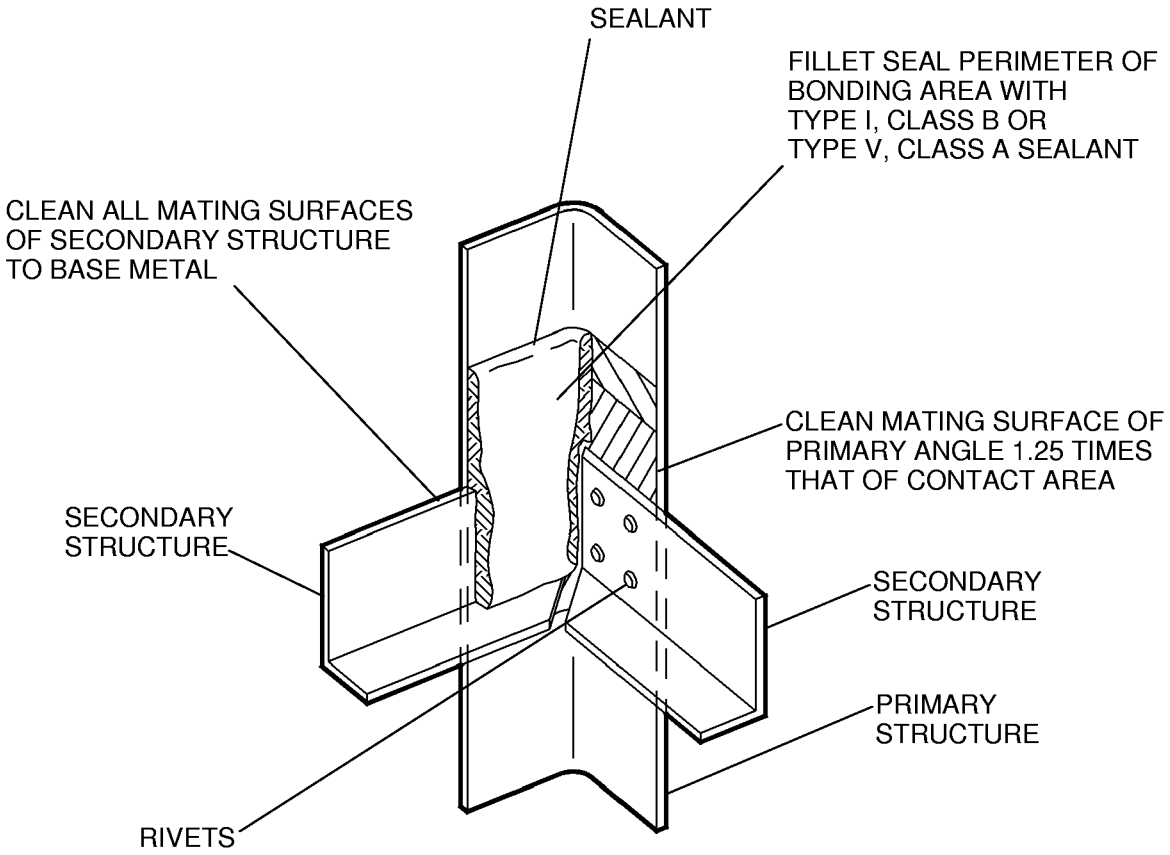

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Typical Bonding Installation on Bracket and/or Angle Construction
Figure 205 (Sheet 1)

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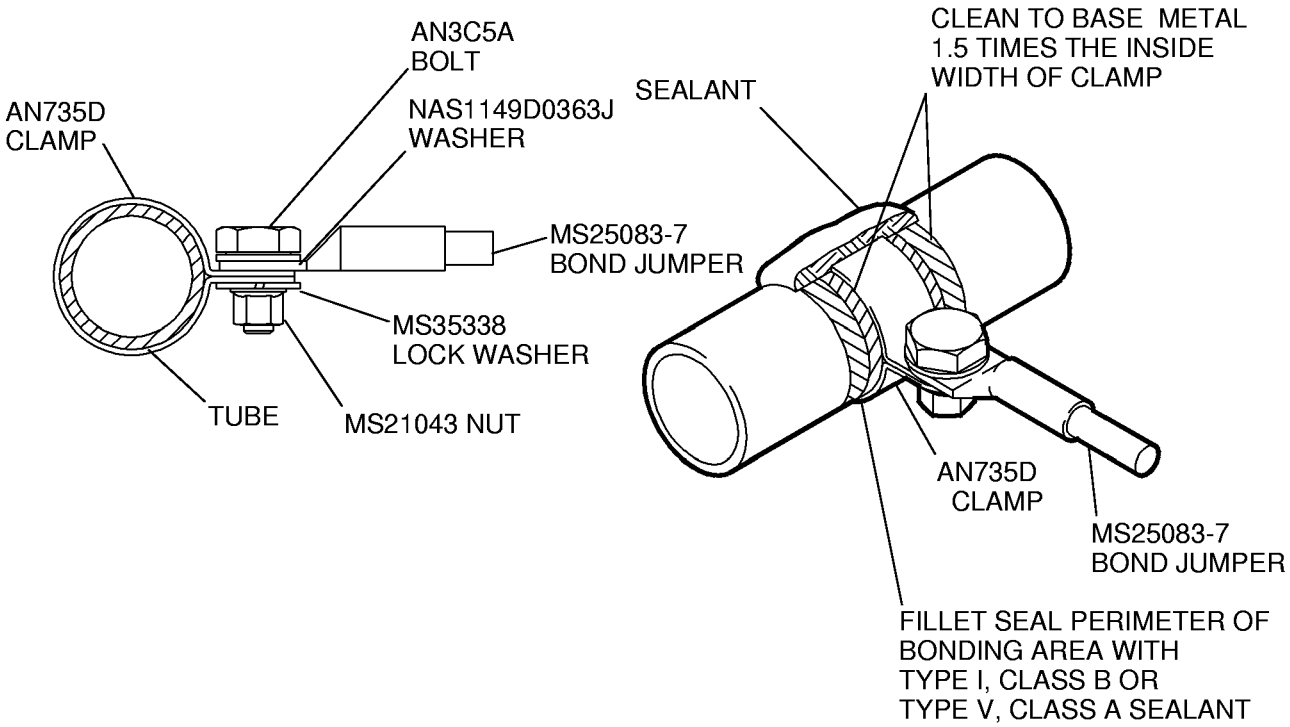

5580T2023(4)

Typical Bonding Jumper Installation of Plumbing to Structure
Figure 206 (Sheet 1)

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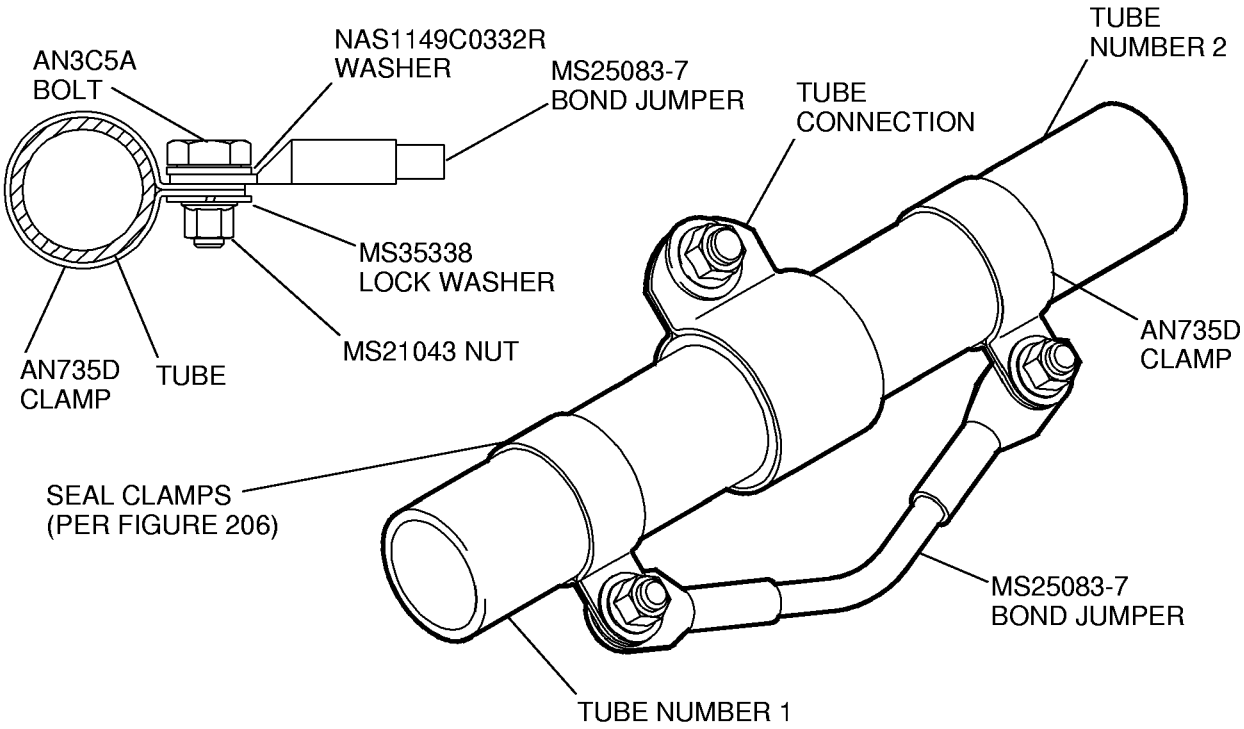

5580T2023(4)

Typical Bonding Jumper Installation for Continuity of Plumbing
Figure 207 (Sheet 1)

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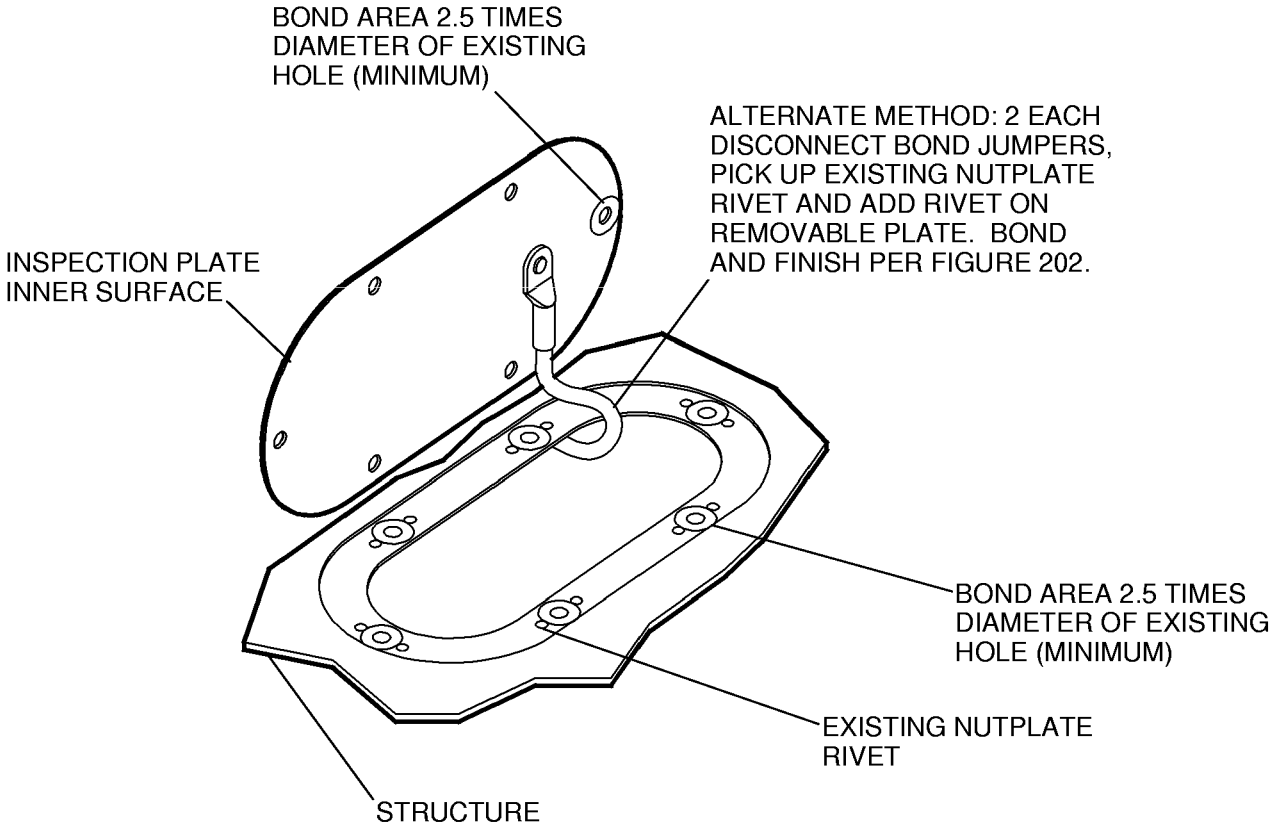

NOTE: THIS METHOD IS NOT APPLICABLE TO FUEL CELL ACCESS PANELS

5580T2023(5)

Typical Inspection Plate Bonding
Figure 208 (Sheet 1)

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(b) Bonding shall be improved on antennas not meeting the requirements noted above by performing one or all of following. Refer to Figure 209.
1 Bearing surface between mounting screw head and antenna metal insert shall be clean, free of paint and all insulating material. This should be done on at least 25 percent of the total mounting screws used for installation of the antenna.
2 Screw head, nut and/or nutplate structure bearing surface should be clean and bonded by riveted and/or bolted skin construction. Also, antenna mounting doubler should be bonded to basic structure by the same method.

(7) Ground studs.
(a) It is preferred to attach single ground wires to permanently installed ground studs rather than attach them to primary structure with removable screws. Stud can be properly bonded to primary structure and sealed for a permanent installation, and ground wires may then be attached to and removed from stud without affecting bond. Refer to Figure 210.

7. Bonding Surface Preparation

A. To ensure a firm bond by providing a clean area for resistance measurements, all bonds between two metal surfaces and bonding jumper attachment points must be free of all insulating material such as paint, primer, grease, oil, corrosion proofing, etc.
(1) Steel surface cleaning.
(a) Steel surface cleaning shall be performed by using 400 to 600 grit emery paper or cloth, or an equivalent fine sandpaper and/or aluminum oxide paper or cloth, stainless steel wool, or a stainless steel or monel bonding brush and wiped clean with MIL-PRF-680 solvent.
(2) Aluminum surface cleaning.

CAUTION: Do not use bonding brush on aluminum surface.

(a) Clean aluminum surfaces using aluminum oxide paper or aluminum wool. Wipe clean with MIL-PRF-680 solvent.

8. Bonding Protection

NOTE: Bonding protection preserves integrity of electrical bond by preventing entry of water, dirt, grease, oil, and corrosion between the bonded surfaces. It also prevents corrosion damage to structure.

A. Fillet seal perimeter of all electrical bonding areas with Type I, Class B Sealant or Class VC Adhesive. (Refer to Fuel, Weather, Pressure, and High Temperature Sealing - Maintenance Practices.)

B. Apply original or equivalent protective coating to bare areas remaining around bonding area.

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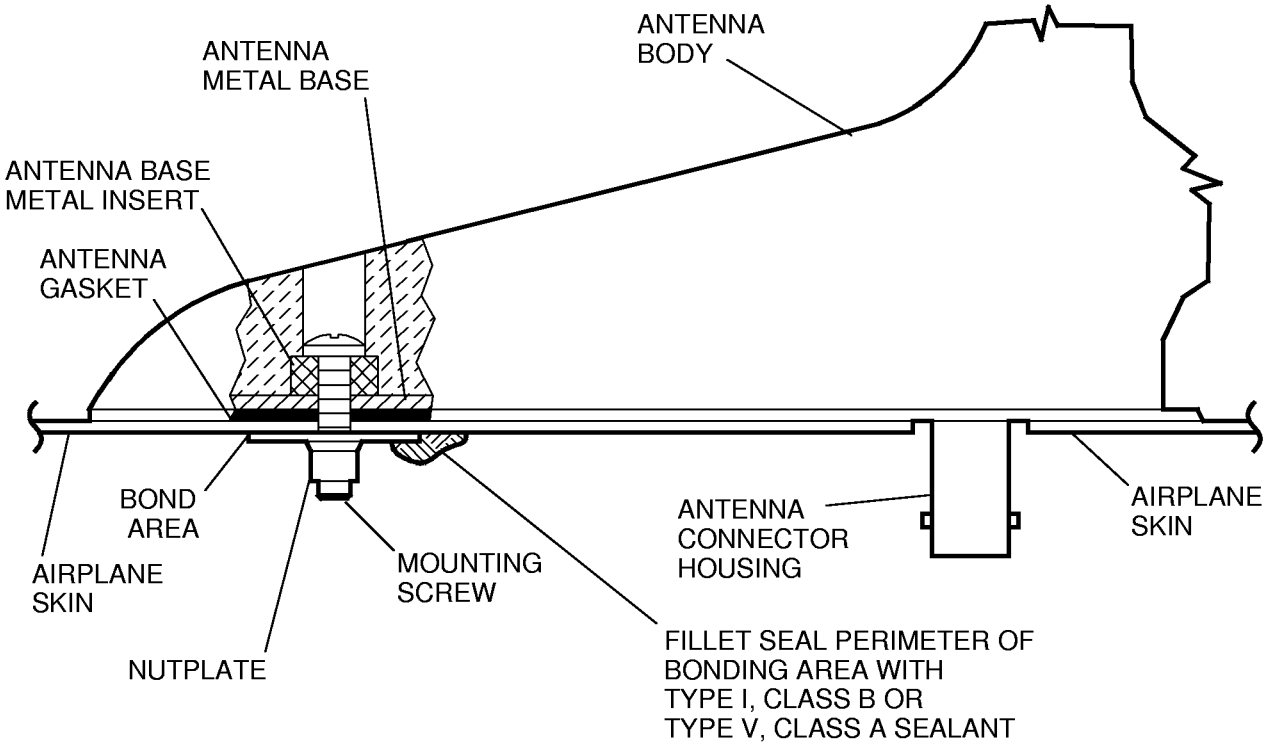

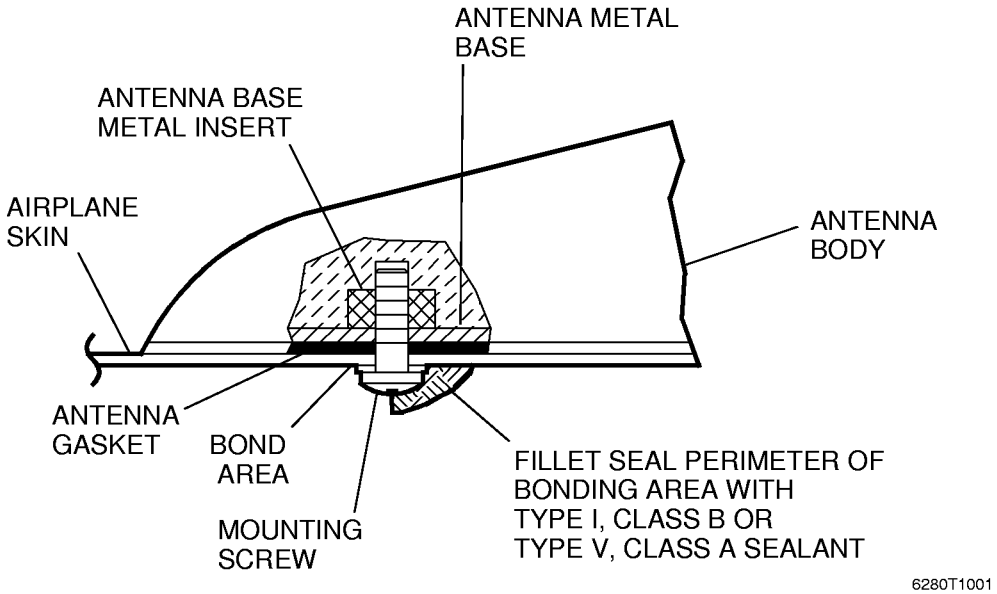

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Typical Antenna Bonding
Figure 209 (Sheet 1)

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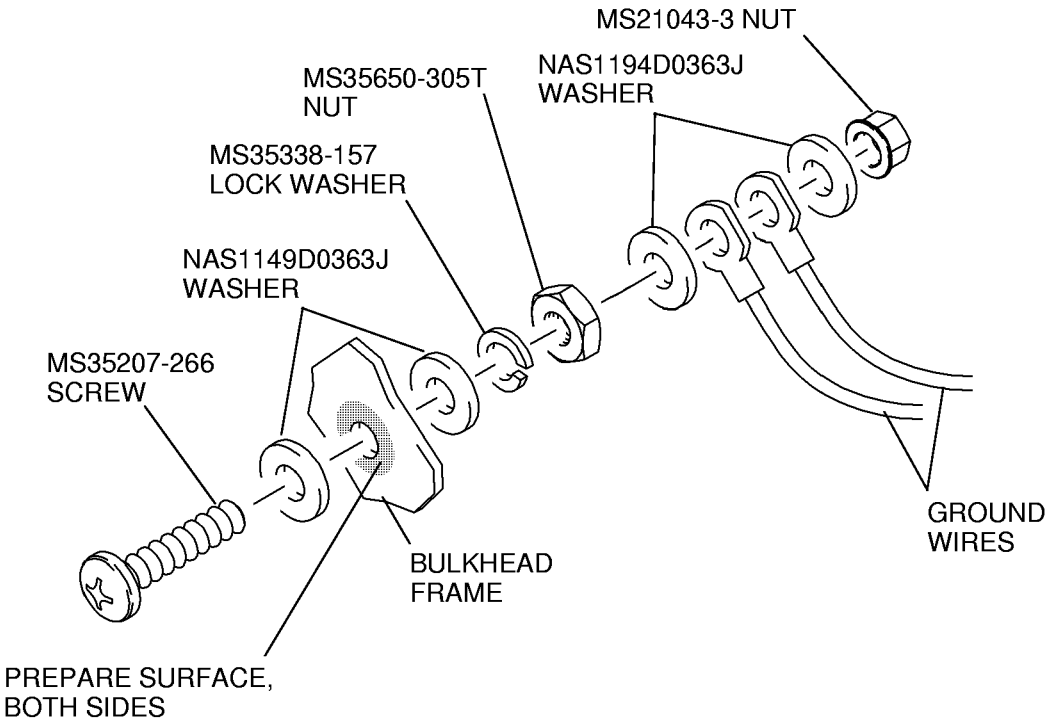

NOTE: SEAL PERIMETER OF BONDING AREA, BOTH SIDES TYPE I, CLASS B OR TYPE V, CLASS A SEALANT

Ground Stud Installation Bonding
Figure 210 (Sheet 1)

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SOLVENTS, SEALANTS AND ADHESIVES - DESCRIPTION AND OPERATION

1. General

A. Solvents, sealants and adhesives are composed of a group of chemicals that often prove toxic. Anyone engaged in maintenance, repair and operation of airplane and airplane accessories may be exposed to these chemicals.

B. To help avoid the effects of these toxic substances, work only in a clean, well-lit and well-ventilated area. Rubber gloves and protective clothing should be worn. Avoid breathing spray vapors as they are highly toxic.

C. When working with toxic substances, always be alert for symptoms of poisoning. If symptoms are observed, immediate removal of the victim from the contaminated area is most important.

2. Description

A. For clarification, the description of solvents, sealants and adhesives is presented in individual paragraphs.
   (1) Solvents.
      (a) Solvents are composed of chemicals which are capable of dissolving other materials and are primarily used as a cleaning agent. Solvent cleaning should be used when it is not practical to clean parts by vapor degreasing or immersion in chemical cleaners.
   (2) Sealants.
      (a) Sealants are composed of chemical compounds which are primarily used as a seal against the passage of air and liquids. Classification of sealants are categorized by type according to their application.
   (3) Adhesives.
      (a) Adhesives are composed of a mixture of chemicals which make an adherent that is primarily used for bonding like or unlike materials, and are classified according to their application.

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GENERAL SOLVENTS/CLEANERS - MAINTENANCE PRACTICES

1. General

A. Solvents are used in a wide range of cleaning activities and selected solvents can be used in the removal of oil, grease and dirt from objects without harm to metal, plastics or elastomeric parts. Refer to Tools, Equipment and Materials.

2. Tools, Equipment and Materials

NOTE: Equivalent substitutes may be used for the following items.

NAME	NUMBER	MANUFACTURER	USE
Detergent		Commercially available	General cleaning.
ScotchBrite Pads	Type A	3M Co. 3M Center St. Paul, MN 55101	Light abrasion of metal surfaces.
Sandpaper	320 Grit	Commercially available	Light abrasion of metal surfaces.
Rymple Cloth		Commercially available	Wiping and applying cleaning agents.
Wiping cloth white, oil free, absorbent		Commercially available	Wiping and applying cleaning agents.

3. Description

A. Solvents exhibit a selective solvent action which permits its use in the removal of oil, grease or dirt. For selection of proper solvent, refer to Table 201. For the cleaning of metal, plastics or rubber, proceed as follows:

(1) Metal.

NOTE: Prior to bonding or priming, lightly abrade surface with either a ScotchBrite pad or sandpaper prior to cleaning.

(a) Wipe off all excess oil, grease or dirt from surface.
(b) Apply solvent to a clean cloth by pouring solvent on the cloth from a safety can or other approved container. The cloth should be well saturated but not to the point of dripping.
(c) Wipe the surface with the moistened cloth as required to dissolve or loosen soil. Work on small enough area so the surface being cleaned remains wet.
(d) With a clean dry cloth, immediately wipe the surface while the solvent is still wet. Do not allow the surface to evaporate dry.
(e) Repeat steps (b) through (d) until there is no discoloration on the drying cloth.

(2) Plastic or Rubber.

NOTE: If cleaning a bonding surface, lightly abrade the bonding surface with sandpaper prior to cleaning.

(a) Remove heavy soil from surface by washing with a water detergent solution.
(b) Apply solvent to a clean cloth by pouring solvent onto cloth from a safety can or other approved container. The cloth should be well saturated but not to the point where dripping.
(c) Wipe the surface with the moistened cloth as required to dissolve or loosen soil. Work on a small enough area so that the surface being clean remains wet.
(d) Using a clean dry cloth, immediately wipe the surface while the surface is still wet. Do not allow the surface to evaporate dry.
(e) Repeat steps (b) through (d) until there is no discoloration on the drying cloth.

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Table 201. General Solvents

CLEANER/ SOLVENT	FEDERAL SPECIFICATION	TYPE CLASSIFICATION	USE/ DESCRIPTION FUNCTION	CAUTION/ WARNING
Dry	MIL-PRF-680	Type I - 100°F Type II - 140°F	General cleaning solvent. Dry cleaning of textile materials. Grease removal.	Flammable.
1-1-1 Inhibited Technical Trichloroethane	ASTM D4126	Type I - Regular Type II - with dauber Type III - Aerosol	Spot removing from fabrics. General cleaning solvent. Cleaning of assembled equipment.	Use with adequate ventilation. Avoid prolonged breathing of vapor. Avoid prolonged contact with skin.
Turco Seal Solvent Turco Products			Cleaning/Degreasing metal parts.	
Penwalt 2331			Preparing metal plate for painting.	Acid activated solvent, do not use on plastics.
Carbon Removing Compound	P-C-111A		Use in soak tank to facilitate removal of carbon, gum, oil and other surface contaminants except rust or corrosion from engine and other metal parts.	Removes paint. Avoid contact with skin.
Cleaning Compound	P-C-535		Heavy duty electro cleaner used for removal of soils from ferrous metal surfaces prior to electroplating or other treatments.	
Cleaning Compound, Unfinished Aluminum	MIL-C-5410	Type I - Viscous Emulsion Type II - Clear Liquid	Used full strength for overhaul of unfinished aluminum surfaces. Use full strength or diluted with mineral spirits and water for maintenance of airplane unfinished aluminum surfaces.	
Trichloroethylene	ASTM D4080	Type I - Regular Type II - Vapor Degreasing	Cleaning of metal parts. Degreasing of metal parts. Special purpose solvent.	Removes paint and damages plastics. Use only with adequate ventilation. High concentrations of vapor are anesthetic and dangerous to life. Very toxic.

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Table 201. General Solvents (continued)

CLEANER/ SOLVENT	FED-ERAL SPEC-IFICA-TION	TYPE CLAS-SIFICATION	USE/ DESCRIPTION FUNCTION	CAUTION/ WARNING
Polish, Metal Aluminum	MIL-P-6888C	Type I - Liquid Type II Paste	Metal polish for use on airplane aluminum surfaces.	Flammable.
Naphtha, Aliphatic	TT-N-958	Type I Type II	For use with organic coatings only. Cleaner for acrylic plastics and may be used in place of Type I General cleaning agent.	Do not use with acrylic plastics. Flammable. Vapor harmful. Avoid prolonged or repeated breathing or contact with skin.
Desoclean 110	020K019		Paint and adhesive thinner, cleaning agent.	Flammable.
Isopropyl Alcohol	TT-I-735		For use with organic coatings and as an anti-icing fluid. General Solvent for synthetic rubbers.	Use discriminately with acrylic plastics.
Wax, Airplane, Waterproof Solvent Type	MIL-W-18723C		A waterproof wax that can be dissolved or dispersed with an organic solvent.	Do not use solvents that may damage paint or finish for removal of wax.
Cleaning Compound, Aluminum	MIL-C-5410B	Type I - Viscous Emulsion Type II - Clear Liquid	Use full strength for maintenance of unfinished aluminum surfaces. Use full strength or diluted with mineral spirits and water for maintenance of unfinished aluminum surfaces.	Rubber or synthetic rubber gloves and eye protection should be used when handling the compound. Wash from skin immediately with water or a solution of sodium bicarbonate and apply glycerin or petroleum jelly. Wash from eyes as per manufacturer's instructions and report to nearest medical facility.
Methyl n-Propyl Ketone		Type II	Cleaner	Flammable. Eye protection should be used when handling. Use only with adequate ventilation. Vapor concentrations may cause drowsiness and irritation of eyes or respiratory tract.

4. Safety Precautions

A. Caution should be exercised during cleaning operations. Solvents should be considered flammable and should not be exposed to flame or spark under any circumstances. Fresh air masks and/or adequate ventilation are required for all closed areas.

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FUEL, WEATHER AND HIGH-TEMPERATURE SEALING - MAINTENANCE PRACTICES

1. General

A. This section provides instructions and details for various sealing applications. This section is generic to many Cessna products and can cover applications which are not used on the Model 310. Refer to specific maintenance practices to determine sealing applicability.

B. Sealing is intended to prevent the leakage of liquids, vapors or air pressure through airframe structure. Sealing is required for protection of personnel and equipment.

2. Tools and Equipment

NOTE: Specified sealants, cleaning solvents, parting agents, adhesion inhibitors and equipment are listed for use. Suitable substitutes can be used for sealing equipment only.

Table 201. Sealants Type I, Class A-1/2, or A-2 - AMS-S-8802

NAME	NUMBER	MANUFACTURER	USE
Sealants	P/S 890 Class A-2	PRC-DeSoto International 5426 San Fernando Rd. Glendale, CA 91209	Fuel, pressure and weather sealant brush application.
	PR-1440 Class A-1/2 Class A-2	PRC-DeSoto International	
	AC-236	Advanced Chemistry Technology Garden Grove, CA 92641	

Table 202. Sealants Type I, Quick Repair - MIL-S-83318

NAME	NUMBER	MANUFACTURER	USE
Sealants	PS 860 Class B-1/6	PRC-DeSoto International	Fuel, pressure and weather sealant. For limited repairs requiring rapid curing sealant.

Table 203. Sealants Type I, Class B-1/2, B-2 or B-4 - AMS-S-8802

NAME	NUMBER	MANUFACTURER	USE
Sealants	Pro-Seal 890 Class B-1/2 Class B-2 Class B-4	PRC-DeSoto International	Fuel, pressure and weather sealant spatula, faying seals application.
	PR-1440 Class B-2 Class B-4	PRC-DeSoto International	
	AC-236 Class B-2 Class B-4	Advanced Chemistry Technology	

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Table 204. Sealants Type I, Class C-20, C-48 or C-80

NAME	NUMBER	MANUFACTURER	USE
Sealant	Pro-Seal 890 Class C-20 Class C-48 Class C-80	PRC-DeSoto International	Fuel, pressure and weather sealant. Suitable for faying surface sealing.
	PR-1440 Class C-20	PRC-DeSoto International	

Table 205. Sealants Type II

NAME	NUMBER	MANUFACTURER	USE
Sealant	PR1448 Class B-2	PRC-DeSoto International	Void/hole filling compound.

Table 206. Sealant Type III

NAME	NUMBER	MANUFACTURER	USE
Sealant	PR-810	PRC-DeSoto International	High temperature sealing.

Table 207. Sealants Type IV

NAME	NUMBER	MANUFACTURER	USE
Sealants	Dapco 2100	D. Aircraft Inc. Anaheim, CA 92807	Firewall sealing.

Table 208. Sealants Type V

NAME	NUMBER	MANUFACTURER	USE
Sealant	RTV106	General Electric Co. Silicone Products Dept. Waterford, NY 12301	Extreme high temperature sealing.
Sealant	RTV162 Class E	General Electric Co. Silicone Products Business Dept.	High temperature and very strong bond and sealant.

Table 209. Sealants Type VI

NAME	NUMBER	MANUFACTURER	USE
Sealant (Acrylic Latex)	FA-0606 125	H. B. Fuller Company St. Paul, MN 55116	Water and weather-tight sealing.

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Table 210. Sealants Type VII

NAME	NUMBER	MANUFACTURER	USE
Sealant	Pro-Seal 895	PRC-DeSoto International	Aerodynamic smoothing compound.

Table 211. Sealant Type VIII

NAME	NUMBER	MANUFACTURER	USE
Sealant	PR-1428 Class B-1/2 Class B-2	PRC-DeSoto International	Used in areas for access.
	FR-1081 Class B-1/2 Class B-2	Fiber Resin Corporation Burbank, CA 91502	

Table 212. Sealants Type IX

NAME	NUMBER	MANUFACTURER	USE
Sealant	Fluorosilicone RTV 730	Dow Corning Corp. Midland, MI 48686	Used in areas exposed to fuel.

Table 213. Sealants Type X

NAME	NUMBER	MANUFACTURER	USE
Sealant	Pro-Seal 870 Class A Type I Class B Type II Class C Type IV	PRC-DeSoto International	Corrosion-inhibitive sealant.
	AC-635 Class B Type II Class C Type IV	Advanced Chemistry Technology	Corrosion-inhibitive sealant.

Table 214. Sealants Type XI

NAME	NUMBER	MANUFACTURER	USE
Sealant Tape	EP-7191 T-0877 (0.062 in. x 0.5 in).	Fiber Resin Corp.	Weather-tight window sealant tape.

Table 215. Sealants Type XII

NAME	NUMBER	MANUFACTURER	USE
Sealant	PR-1829	PRC-DeSoto International	Windshield and window sealant. Requires PR-142 adhesion promoter.
	PR-1425	PRC-DeSoto International	

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Table 216. Sealants Type XIII

NAME	NUMBER	MANUFACTURER	USE
Sealant	PR-1776 Class B-1/2 Class B-2	PRC-DeSoto International	Low density fuel tank sealant.

Table 217. Cleaning Solvents

NAME	NUMBER	MANUFACTURER	USE
Methyl n-Propyl Ketone		Commercially Available	Cleaning organic coating.
Naphtha Type III	MIL-PRF-680	Commercially Available	Presealing cleaning.
Desoclean 110		PRC-DeSoto International	Presealing cleaning.
Isopropyl alcohol	TT-I-735	Commercially Available	Cleaning plastic transparencies.

Table 218. Parting Agents

NAME	NUMBER	MANUFACTURER	USE
Silicone compound	AS 8660	Commercially available	Prevent sealant sticking.
Petrolatum technical	Federal Specification VV-P-236	Commercially available	Prevent sealant sticking.

Table 219. Equipment

NAME	NUMBER	MANUFACTURER	USE
Pneumatic sealing gun	Semco No. 250 with accessories (or equivalent)	PRC-DeSoto International	Injection sealing.
Hand-operated sealing gun	Semco No. 850	PRC-DeSoto International	Injection sealing.
Nozzles,		PRC-DeSoto International	Application of sealant.
Round 1/16 orifice	Semco No. 420		
Round 1/8 orifice	Semco No. 440		
Duckbill	Semco No. 8615		
Duckbill	Semco No. 8648		
Comb	Semco No. 8646		
Polyethylene cartridges with plungers and caps for sealant gun		Commercially available	Application of sealant.

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Table 219. Equipment (continued)

NAME	NUMBER	MANUFACTURER	USE
Metal spatulas with either stainless steel or glass plates		Commercially available	Mixing sealant.
Plastic lined cups, wax-free with caps		Commercially available	Mixing sealant.
Sealant fairing tools		Commercially available	To fair-in sealant.
Cheesecloth, lint-free		Commercially available	Cleaning.
Plastic scraper, 45-degree cutting edge		Commercially available	Removing old sealant.
Durometer	Rex Model 1500 (or equivalent)	Rex Gauge Company, Inc. 3230 West Lake Avenue P.O. Box 46 Glenview, IL 60025	Testing cure of sealant.
Gloves, lightweight lint-free white cotton		Commercially available	Removing old sealant.
Nylon bristle brushes		Commercially available	Removing old sealant.
Pipe cleaners		Commercially available	Cleaning.
Funnel brushes		Commercially available	Cleaning.

3. Definition of Sealing Terms

A. The following definitions are included to provide a basic concept of the special terms used in sealing. This list is not all inclusive but the more common terms are listed.

(1) Absolute Sealing - There can be no leakage allowed. All openings of any nature through the seal plane are positively sealed. This is the first level of sealing. (All holes, slots, joggles, fasteners and seams must be sealed.)

(2) Accelerator (Activator) - Curing agent for sealants.

(3) Application Time - The length of time sealant remains workable or suitable for application to structure by brush, extrusion gun, spatula or roller.

(4) Base Compound - The major component of a two-part sealing compound which is mixed with the accelerator prior to application to produce a fuel, temperature, pressure, weather and/or firewall sealing material.

(5) Brush Coat - Apply an over coating or continuous film of appropriate sealing compound by use of a brush.

(6) Electrical Seal Fitting - A device used for sealing electrical wires which pass through bulkheads, etc.

(7) Fay Seal or Faying Surface Seal - A seal barrier created by the sandwiching of sealant between mating surfaces of structure. Special attention must be taken to avoid metal chips or dirt at the faying surface.

(8) Fillet Seal - Applying a bead of sealant to a seam, joint or fastener after the assembly has all permanent fasteners installed.

(9) Hole - An opening that has no appreciable depth, such as a tool hole. Holes that penetrate the seal plane must be metal filled with a fastener, gusset or patch.

(10) Injection Seal - Filling of channels by forcing sealant into a void or cavity after assembly.

(11) Intermediate Seal - The second level of sealing. All holes, slots, joggles and seams in the seal plane must be sealed. A minor amount of leakage is tolerable and permanent fasteners are not required to be sealed.

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(12) Post-assembly Seal - A seal that is applied after the structure is assembled. (Fillet and injection seals.)
(13) Pre-assembly Seal - Sealant material that must be applied during or prior to the assembly of the structure. (Faying surface and prepack seals.)
(14) Prepack Seal - A pre-assembly seal used to fill voids and cavities; can be a primary seal used to provide seal continuity when used in conjunction with a fillet seal. It can be used as a backup seal to support a fillet across a void. Fill the entire cavity to be pre-packed. Usage as a primary seal should be kept to a minimum.
(15) Primary Seal - Sealant material that prevents leakage and forms a continuous seal plane. This seal is in direct contact with the fuel, vapor, air and acid. With few exceptions, it is in the form of a fillet seal.
(16) Sealant - A compound applied to form a seal barrier.
(17) Seal Plane - A surface composed of structure, sealant and fasteners on which the continuity of seal is established.
(18) Shank Sealing - Sealant compound shall be applied to the hole or to both the shank and the under head area of the fastener in sufficient quantity that the entire shank is coated and a small continuous bead of sealant is extruded out around the complete periphery of each end of the fastener when installed. The fastener shall be installed within the application time of the sealing compound used.
(19) Squeeze-Out Life - Length of time sealant remains suitable for structure assembly in faying surface seal application.
(20) Tack-Free Time - Tack-free time is a stage, during the cure of the sealant compound, after which the sealant compound is no longer tacky. When the sealant compound is pressed firmly with the knuckles, but no longer adheres to the knuckles, the sealant compound is tack-free.

4. Materials

A. Type of Sealants - Sealants are categorized by type of usage. Type I sealants are separated by class to differentiate the material to use by method of application. Dash numbers following the class designation indicate the minimum application time (in hours) for Class A sealant and Class B sealant and minimum work life (in hours) for Class C sealant. Reference Table 220 for application time and curing rate for Type I sealants.
(1) Type I - Fuel, pressure and weather sealant.
(a) Class A - Sealant which is suitable for brush application.
(b) Class B - Sealant which is suitable for application by extrusion gun, spatula, etc.
(c) Class C - Sealant which is suitable in faying surface applications.
(d) Quick Repair Sealant - This material is for use only in making repairs when an extremely rapid curing sealant is required. A possible application includes sealing a leaking fuel tank on an airplane which must be dispatched within a few hours.

Table 220. Curing Properties of Type I Sealant

CLASS	APPLICATION TIME (HOURS, MINIMUM)	WORK LIFE (HOURS, MINIMUM)	TACK-FREE TIME (HOURS, MAXIMUM)	CURING RATE (HOURS, MAXIMUM)
A-1/2	1/2		10	40
A-2	2		40	72
B-1/2	1/2		4	6
B-2	2		40	72
B-4	4		48	90

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Table 220. Curing Properties of Type I Sealant (continued)

CLASS	APPLICATION TIME (HOURS, MINIMUM)	WORK LIFE (HOURS, MINIMUM)	TACK-FREE TIME (HOURS, MAXIMUM)	CURING RATE (HOURS, MAXIMUM)
C-24	8	24	96	168 (7 days)
C-48	8	48	110	336 (14 days)
C-80	8	80	120	504 (21 days)

NOTE 1: Time periods are based on a temperature of 77°F and 50 percent relative humidity. Any increase in either temperature or relative humidity can shorten these time periods and accelerate the sealant cure.

(2) Type II - Hole filling compound . This material is for holes and slots that cannot be filled with one application of Type I; Class B sealant
(3) Type III - High-temperature sealant. This material is for use where exposure to fuel is moderate and for intermittent exposures up to 450°F, but is not suitab le for pressure sealing.
(4) Type IV - Firewall sealant. This material is for use when exposure to fuel is minimal and for intermittent temperature exposures up to 500°F, but is not s uitable for pressure sealing.
(5) Type V - Extreme high-temperature sealant. This material is for use where exposure to fuel is minimal and for intermittent exposures up to 600°F, and is also suitable for pressure sealing.
(6) Type VI - Watertight and weather tight sealant. This material is for use where there is no exposure to fuel, high temperature or pressure.
(7) Type VII - Aerodynamic smoothing compound. This material is used for filling skin gaps to obtain a smooth aerodynamic surface.
(8) Type VIII - Low Adhesion Access Sealant. This Class B material is designed for sealing faying surfaces where easy separation of the joined surfaces is required. The sealant has low adhesion and forms a gasket that molds itself to fill all irregularities between two surfaces. It is exceptionally resistant to fuels, greases, water, most solvents and oils, including red hydraulic oil.
(9) Type IX - Fluorosilicone RTV Sealant. This sealant is a room temperature vulcanizing sealant that will withstand fuel.
(10) Type X - Corrosion Inhibitive Sealant. These materials are 2-part, room temperature curing, synthetic rubber compounds used in the sealing and coating of metal components for protection against corrosion.

NOTE: Type X can be used in all applications where Type I is used except that it shall not be used for fuel tank sealing.

(11) Type XI - Sealant Tape. These materials are permanently pliable and can be used to set windshields before sealing or to seal covers.
(12) Type XII - Windshield and Window Sealant. These materials are 2-part, room temperature curing synthetic rubber compounds used to seal glass, polycarbonate, or acrylic transparencies.
(13) Type XIII - Low-Density (1.35 sp gr max) Fuel Tank Sealant. This material is manganese dioxide cured, for applications at service temperatures of -65° to 250°F (-54 t o 121°C).

CAUTION: Quick repair sealant must be applied within its working life of 15 minutes. Attempts to work quick repair sealant beyond working life will result in incomplete wetting of surface and will result in a failed seal.

5. General Requirements

A. When working with sealants, observe the following requirements.
(1) Unmixed sealants shall not be more than two months old when received. These sealants shall not be more than six months old when used.

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(2) Unmixed sealants stored at temperatures exceeding 80℉ shall be used within five weeks.
(3) Sealants which have been pre-mixed, degassed and flash frozen shall be maintained at -40℉ or lower and shall not be received more than two weeks beyond the date of mixing. These sealants shall not be used more than six weeks after the date of mixing.
(4) Frozen sealant shall be thawed before being used. If sealant were applied at a temperature below 60℉, it would not be sufficiently pliable for proper application and adhesion could be critically reduced by condensation of moisture. On the other hand, although sealant must extrude freely for proper application, it would be subject to excessive slumping if applied at a temperature above 80℉. Frozen sealant can be thawed by any suitable means which does not cause contamination or overheating of the sealant and does not shorten the application time of the sealant to an impractical period. Examples: Thawing by exposure to ambient air temperature, accelerated thawing by exposure in a constant temperature bath (using clean, hot water), accelerated thawing in a microwave oven. In any case, thawing temperature and time shall be adjusted to give a thawed sealant temperature between 60℉ and 80℉ at the time the sealant is applied.
(5) Mixed, frozen sealants which have thawed shall not be refrozen.
(6) Complete pre-assembly operations, such as fitting, filing, drilling, countersinking, dimpling and deburring, prior to cleaning and sealant application.
(7) Surfaces must be clean and dry, free from dust, lint, grease, chips, oil, condensation or other moisture, and all other contaminating substances prior to the application of sealant.
(8) Naphtha Type II or Isopropyl Alcohol (TT-I-735) are the only cleaners which can be used on plastic transparencies.
(9) Sealant materials can be applied to unprimed or primed surfaces. Nonchromated or epoxy primers shall have good adhesion to the substrate material and shall have aged at least 48 hours prior to sealant application.
(10) Sealants shall not be applied when the temperature of either the sealant or the structure is below 60℉.
(11) The sealants Pro-Seal 890 B-1/2, B-2 or B-4 are the only sealants which can be used on plastic transparencies.
(12) Sealant applied by the fillet or brush coat methods shall always be applied to the pressure side of a joint if possible.
(13) After application, sealants shall be free of entrapped air bubbles and shall not exhibit poor adhesion. All fillets shall be smoothed down and pressed into the seam or joint with a filleting tool before sealant application time has expired.
(14) Where fasteners have been sunk or under-head sealed, extruded sealant shall be evident around the complete periphery of the fastener to indicate adequate sealing. Sealant extruded through a hole by a rivet shall be wiped from the end of the rivet before bucking. Threaded fasteners which have been shank or under-head sealed shall not be retorqued after expiration of the application time of sealant. In torquing, turn the nut rather than the bolt if possible.
(15) Pressure testing shall not be accomplished until the sealant is cured.
(16) Sealant shall not be applied over ink, pencil or wax pencil marks. If these materials extend into the sealing area, they must be removed.
(17) If sealing is to be accomplished over primer and the primer is removed during the cleaning process, it is permissible to seal directly over the cleaned area and then touch up the exposed areas after the sealant has been applied and is tack free.
(18) Sealed structure shall not be handled or moved until sealant is tack free (sealant can be dislodged or have the adhesion damaged). Excessive vibration of structure, such as riveting and engine run up, is not permitted.
(19) Drilling holes and installing fasteners through a fay sealed area shall be performed during the working life of faying sealant, or the entire shank and area under fastener head shall be fay sealed.

6. Sealant Curing

A. Room Temperature.
(1) Room temperature curing properties are based on a temperature of 75℉, +5° or -5°F, and a relative humidity of 50 percent. Curing times of two-part sealants will shorten with increased temperature and/or relative humidities.

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(2) Room temperature curing properties of Type I sealants are given in Table 201.
(3) Room temperature curing properties of Type II sealant are: Application Time 2 Hours (Minimum); Tack- Free Time 20 Hours (Maximum); Curing Rate 40 Hours (Maximum).
(4) Room temperature curing properties of Type III sealant are dependent on solvent release. Type III sealant should cure for a minimum of 17 days at room temperature before being subjected to temperatures as high as 400°F.
(5) Room temperature curing properties of Type IV sealant are: Application Time 1-1/2 Hours (Minimum); Tack-Free Time 24 Hours (Maximum); Curing Rate 48 Hours (Maximum). Type IV sealant should cure for a minimum of 72 hours at room temperature before being subjected to temperatures as high as 400°F.
(6) Room temperature curing properties of Type V sealant are: Tack-Free Time 1/2 Hour (Maximum); Curing Rate 24 Hours (Maximum). Type V sealant should cure for a minimum of 48 hours at room temperature before being subjected to temperatures as high as 400°F.
(7) Room temperature curing properties of Type VI sealant are: Tack-Free Time 2 Hours (Maximum); Curing Rate 16 Hours (Maximum).
(8) Room temperature curing properties of Type VII sealant are: Class B-1/2 Application Time 1/2 Hour; Tack-Free Time 10 Hours; Cure Time 24/35R Hours/Hardness. Class B-2 Application Time 2 Hours; Tack-Free Time 24 Hours; Cure Time 48/35R Hours/Hardness.
(9) Curing properties of Type VIII , Class B sealants are the same as for Type I, Class B. Adhesion to aluminum should be (peel) less than 2 pounds/inch width.

B. Accelerated Curing.
(1) Accelerated curing of sealant can be accomplished in several ways. The procedure to be used is dependent on the type of sealant and other factors.
(2) The cure of Type I sealants and Type II sealants can be accelerated by an increase in temperature and/or relative humidity. Warm circulating air at a temperature not to exceed 120°F can be used to accelerate cure. Heat lamps can be used if the surface temperature of the sealant does not exceed 140°F. At temperatures above 120°F, the relat ive humidity will normally be so low (below 40 percent) that sealant curing will be retarded. If necessary, the relative humidity can be increased by the use of water containing less than 100 parts per million total solids and less than 10 parts per million chlorides.
(3) The cure of Type III sealants can be accelerated after first curing for a minimum of 72 hours at room temperature by heating for 8 hours with warm circulating air or heat lamps in such a manner that the surface temperature of the sealant does not exceed 120°F. (Lowered relative humidity is helpful.) Curing should be completed before the sealant is subjected to temperatures as high as 400°F.
(4) The cure of Type IV sealants can be accelerated by reducing the relative humidity. However, the sealants should be cured for a minimum of 72 hours at room temperature before being subjected to temperatures as high as 400°F.
(5) The cure of Type V sealants and Type VI sealants can be accelerated by the same procedures given for Type I sealants or Type II sealants .

7. Mixing of Sealants

A. Requirements.
(1) Sealants shall be mixed or thinned in accordance with the manufacturer's recommendations and thoroughly blended prior to application. All mixed sealant shall be as void free as possible.
(2) Prior to mixing, the sealing compound base and its curing agent, both in their respective original unopened containers, shall be brought to a temperature between 75°F and 90°F. All required mixing equipment should also be brought to a temperature between 75°F a nd 90°F.

B. Hand Mixing of Sealant.
(1) The correct amount of base and curing agent, per manufacturer’s instructions, shall be weighed in a clean, wax-free container immediately prior to mixing. An alternate method is to mix the sealant on a flat plate with a spatula. The scales and weighing process must be controlled within +2 or -2 percent to ensure good quality.
(2) Do not allow the accelerator to come in contact with the sides of the container.
(3) Materials shall be accurately weighed on scales that are calibrated and maintained for required accuracy.

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(4) Mix the components until the color is uniform taking care not to trap air in the sealant.
(5) Transfer the sealant to another clean container and complete the mix.

C. Mixing Two-Part Sealant Cartridges (Refer to Figure 201).

WARNING: The cartridge should be held firmly, but must not be squeezed, since the dasher blades can penetrate the cartridge and injure the hand.

(1) Pull dasher rod to the FULL OUT position, so the dasher is at the nozzle end of cartridge.
(2) Insert ramrod in the center of dasher rod against the piston and push the piston in approximately 1 inch.

NOTE: Extra force will be needed on the ramrod at the beginning of accelerator injection into the base material.

(3) Move the dasher rod in approximately 1 inch, then push piston in another inch. Repeat this action until accelerator is distributed along the entire length of the cartridge.

NOTE: The accelerator has been fully injected into the cartridge when the ramrod is fully inserted into the dasher rod.

(4) Remove and properly discard the ramrod.

NOTE: Mixing the accelerator and base material can be accomplished manually, or as an alternate method, with the use of a drill motor.

(5) Manual Mixing.
(a) Begin mixing operation by rotating the dasher rod in a clockwise direction while slowly moving it to the FULL OUT position.

NOTE: Do not rotate the dasher rod counterclockwise; the four-blade dasher inside the cartridge will unscrew and separate from the dasher rod.

(b) Continue clockwise rotation and slowly move the dasher rod to the FULL IN position.
1 A minimum of five full clockwise revolutions must be made for each full-out stroke and for each full-in stroke of the dasher rod. Approximately sixty strokes are necessary for a complete mix.

NOTE: If streaks are present in the sealant (viewing through the side of the cartridge), the sealant is not completely mixed.

(c) End mixing operation with the four-blade dasher at the bottom of the cartridge.
(d) Hold cartridge upright; unscrew dasher rod from the four-blade dasher by gripping the cartridge at the four-blade dasher and turn the dasher rod counterclockwise. Remove dasher rod.
(e) Screw appropriate nozzle into the cartridge. If sealant gun is to be used, install cartridge in gun.
(6) Drill Motor Mixing.

NOTE: A tapered rotary file or a 25/64 inch drill bit can be used with a drill motor to turn the dasher rod.

(a) Insert the rotary file/drill bit into dasher rod approximately 0.5 inch.

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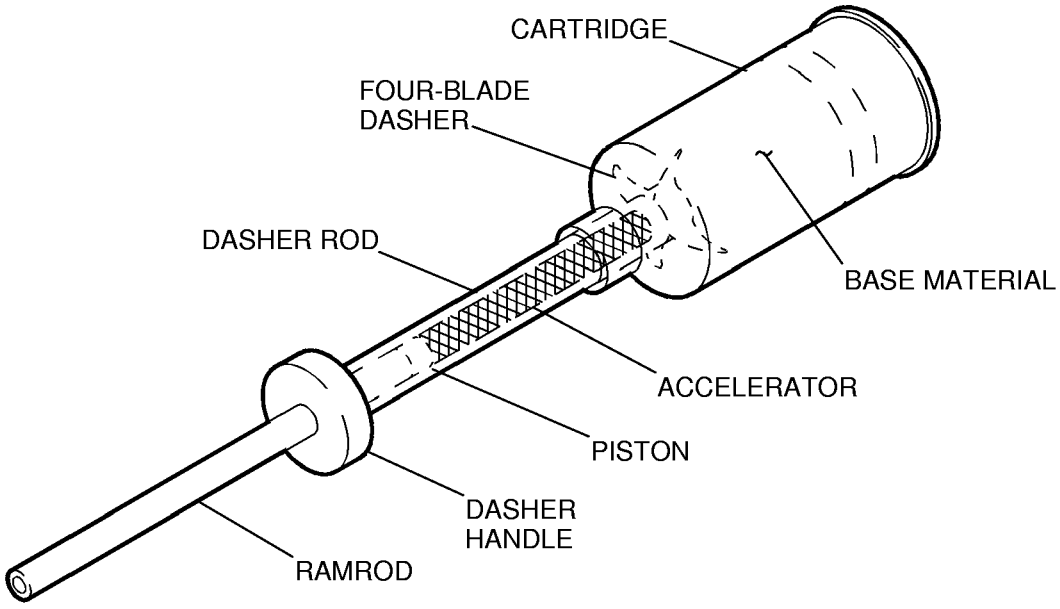

NOTE: CARTRIDGE IS DISPOSABLE AFTER USE.

5580T1044

Two-Part Sealant Cartridge
Figure 201 (Sheet 1)

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WARNING: The cartridge should be held firmly, but not squeezed, as the dasher blades can penetrate the cartridge and injure the hand.

(b) Verify the drill motor will rotate the dasher rod clockwise (looking toward the nozzle end of the cartridge).

(c) With the cartridge held firmly in one hand and the drill motor in the other, rotate the dasher rod at approximately 50 revolutions-per-minute while moving the dasher rod to FULL IN and FULL OUT positions.

1 Mix sealant for at least 50 strokes (a stroke is one complete full-in and full-out stroke of the dasher rod).

NOTE: If streaks are present in the sealant (viewing through the side of the cartridge), the sealant is not completely mixed.

(d) End mixing operation with the four-blade dasher at the bottom of the cartridge.

(e) Hold cartridge upright; remove drill motor and rotary file/drill bit from the dasher rod; unscrew dasher rod from the four-blade dasher by gripping the cartridge at the four-blade dasher and turn the dasher rod counterclockwise. Remove dasher rod.

(f) Screw appropriate nozzle into the cartridge. If sealant gun is to be used, install cartridge in gun.

8. Cleaning

A. All surfaces to which sealant is to be applied shall be clean and dry.

B. Remove all dust, lint, chips and shavings with a vacuum cleaner where necessary.

C. Cleaning shall be accomplished by scrubbing the surface with clean cheesecloth moistened with solvent. The cloth shall not be saturated to the point where dripping will occur. For channels and joggles, pipe cleaners and/or funnel brushes can be used instead of cheesecloth.

(1) Scotch Brite pads should be used to clean all nutplates (except domed nutplates) and all exposed bonding primer on all bonded assemblies.

(2) The solvents to be used on all surfaces to be sealed, except the fuel tank and on plastic transparencies, shall be A-A-59281, cleaning compound, ASTM D4126, 1, 1, 1 - Trichloroethane, Technical, Inhibited.

(3) The only solvent to be used on plastic transparencies shall be TT-I-735, isopropyl alcohol.

D. The cleaning solvent should never be poured or sprayed on the structure.

E. The cleaning solvent shall be wiped from the surfaces before evaporation using a piece of clean, dry cheesecloth so oils, grease, wax etc. will not be redeposited.

F. It is essential that only clean cheesecloth and clean solvent be used in the cleaning operations. Solvents shall be kept in safety containers and shall be poured on the cheesecloth. The cheesecloth shall not be dipped in the solvent containers and contaminated solvents shall not be returned to the clean solvent containers.

G. Final cleaning shall be accomplished immediately prior to sealant application by the person who is going to apply the sealant.

(1) The area which is to be sealed shall be thoroughly cleaned. A small clean paint brush can be needed to clean corners, gaps, etc. Always clean an area larger than the area where the sealant is to be applied. Never clean an area larger than 30 inches (0.76 meter) in length when practical. When the area is being scrubbed with a moistened cloth in one hand, another clean dry cloth shall be held in the other hand and shall be used to dry the structure. The solvent must be wiped from the surfaces before it evaporates.

(2) The above procedure shall be repeated until there is no discoloration on the clean drying cloth. Marks resulting from wax or grease pencils must be removed from parts prior to sealing.

H. Allow all cleaned surfaces to dry a minimum of 5 minutes before application of sealant materials.

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I. Sealant shall be applied as soon as possible after cleaning and drying the surfaces to be sealed. Do not handle the parts between the cleaning and sealing operations. Sealant application personnel handling cleaned surfaces shall wear clean white gloves to prevent surface contamination. In the event contamination does occur, the surfaces shall be recleaned.

J. Safety precautions should be observed during the cleaning and sealing operation. Cleaning solvents are toxic and flammable in most cases. Fresh air masks and/or adequate ventilation are required for all closed areas. The structure shall be electrically grounded before starting any cleaning or sealing operation.

9. Sealing Application

A. General.
(1) All new sealing shall be accomplished using the type of sealing material required for the area being sealed. All sealant repairs shall be accomplished using the same type of sealing material as that being repaired.
(2) Application time of the sealing compound shall be strictly observed. Material which becomes too stiff and difficult to work or which does not wet the surface properly shall be discarded even though the application time has not expired.
(3) Prior to sealant application, all surfaces to be sealed shall be cleaned per procedures outlined in Cleaning.

B. Faying Surface Sealing - The application of a faying surface seal shall be made only when new structure is being added to the airplane and requires a faying surface seal or when the structure and/or parts have been disassembled for reasons other than a faulty seal.
(1) Immediately prior to final closure of the joint, sealant shall be applied to one mating surface of the joint with a sealant gun, spatula, roller or other suitable tool. Sufficient sealant shall be applied so the space between the assembled faying surfaces is completely filled with sealant and a small excess is squeezed out in a continuous bead around the periphery of the joint when the joint is secured (Refer to Figure 202).
(2) Place parts in assembly position and install the fasteners within the application time of the faying surface sealant. When assembly with permanent type fasteners is not feasible, temporary fasteners (clecos or bolts) can be used, but when the temporary fasteners are used, they must be replaced by permanent type fasteners prior to the expiration of the work life of the faying surface sealant. Removal of each individual temporary fastener shall be followed immediately by the installation of the permanent fastener.
(3) When a fillet seal is required around the periphery of a fay sealed joint, it is not necessary to remove the sealant squeeze-out where the fillet is to be applied, provided the material which was squeezed out has been shaped into a small fillet configuration prior to expiration of the application time. When the squeeze-out has been shaped, a final or full bodied seal can be applied over the shaped squeeze-out without waiting for the squeeze-out to cure. If the squeezed out material was not shaped before expiration of its application time, it shall be cured to a tack-free condition and then removed, by use of a plastic tool, from locations where a fillet is to be applied.
(4) Immediately after assembly is completed and all permanent type fasteners have been installed, remove uncured sealant, which extrudes on the exterior of the airplane, using clean rags moistened with A-A-59107, Toluene.

C. Injection Sealing
(1) Sealant shall be injected in the channel, joggle, void or cavity from one point only, using a sealant gun. No air shall be entrapped, the channel, joggle, void or cavity shall be completely filled, and sealant shall emerge from the prescribed opening (Refer to Figure 203). If multiple exits or channels exist, block each channel exit after it is filled, without stopping the injection, so that sealant extrudes into all necessary channels.
(2) Remove excess sealant before expiration of its application time, and, using a suitable tool, smooth flush with the surface.

D. Fillet Sealing.
(1) Fastener considerations:
(a) Do not fillet seal any parts until they are held completely together by permanent fasteners.

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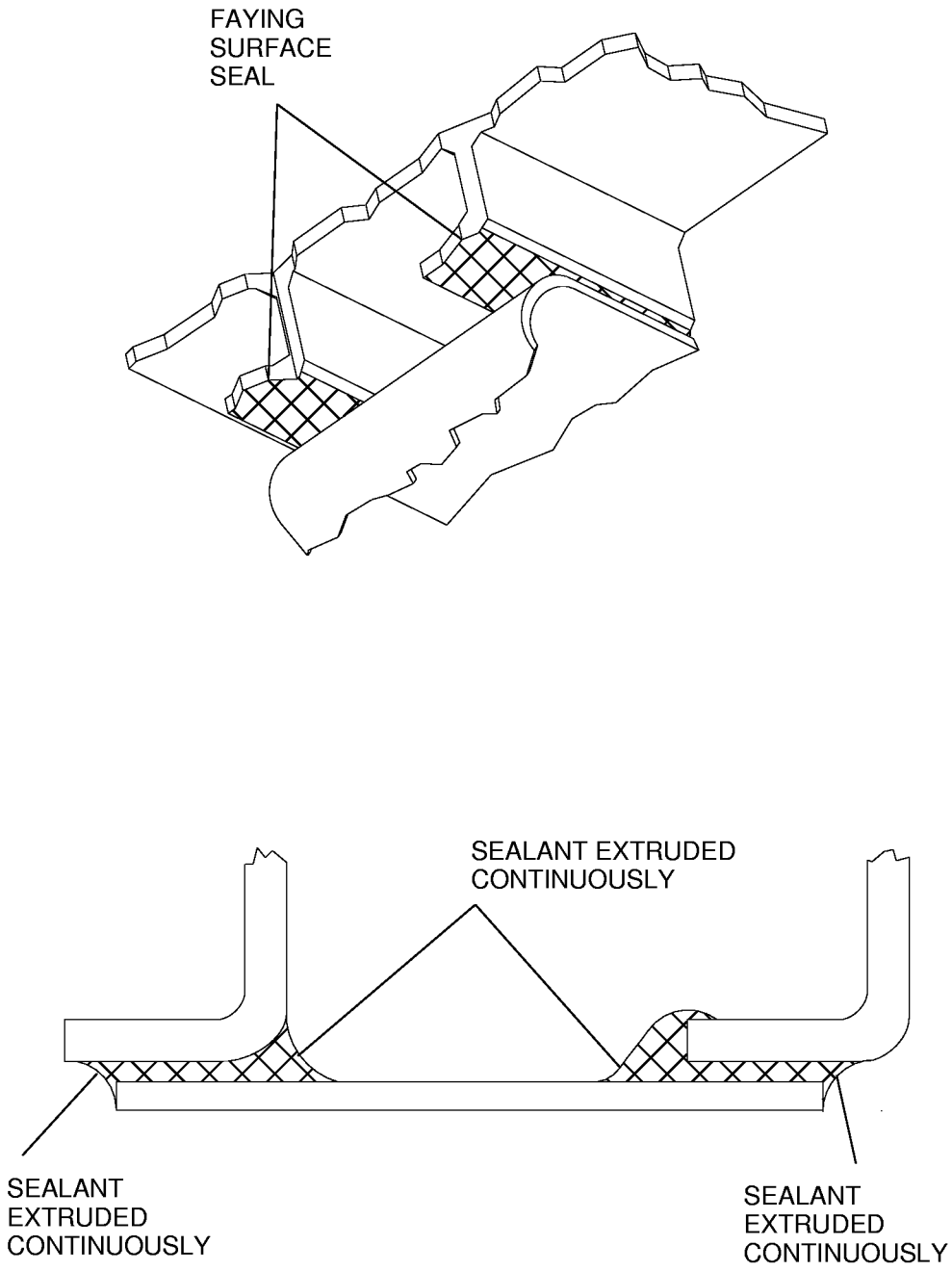

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Fay Sealing
Figure 202 (Sheet 1)

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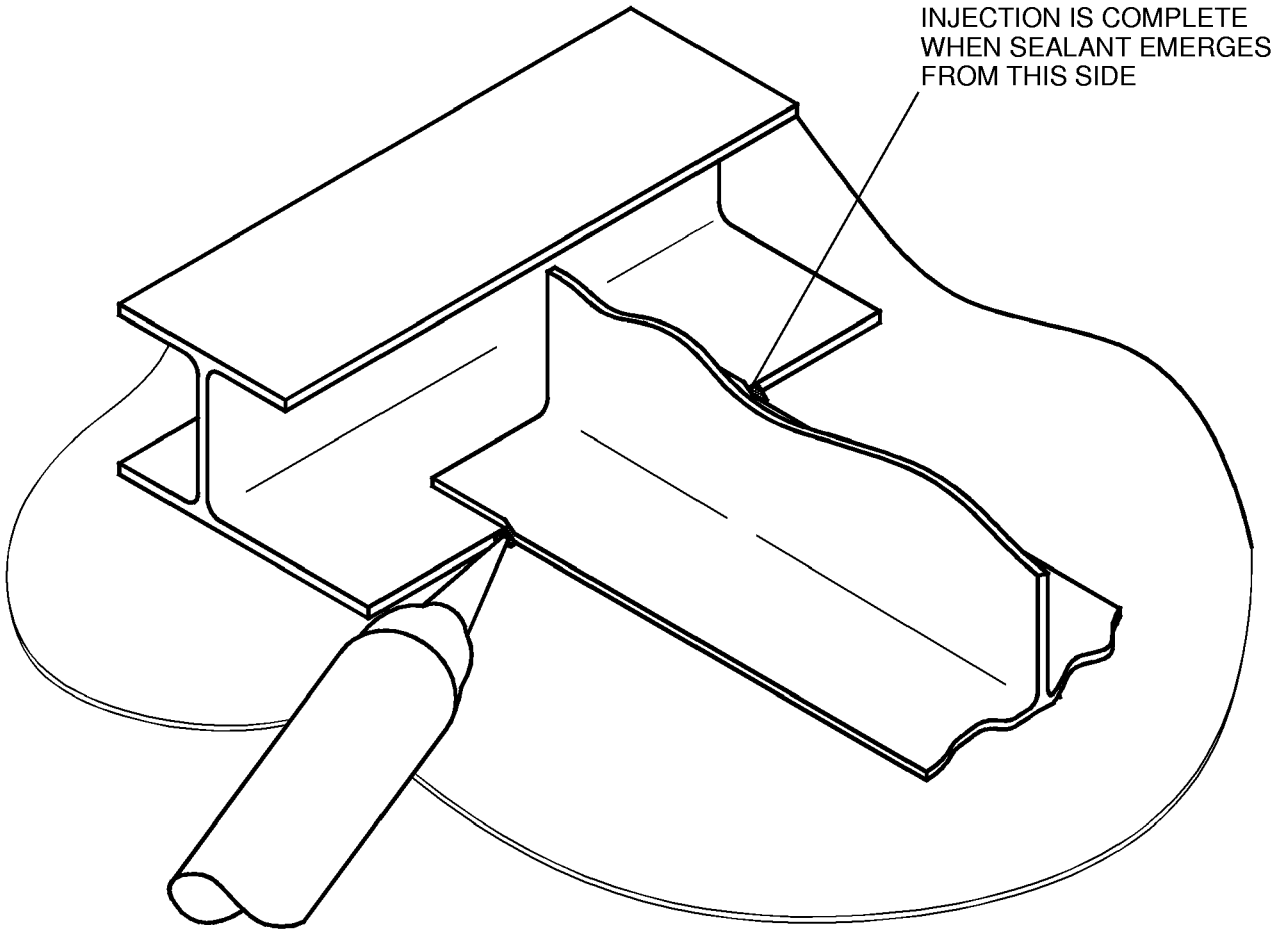

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Injection Sealing
Figure 203 (Sheet 1)

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(b) Prior to filleting the periphery of bolted structure and fittings, it is necessary that all bolts, accomplishing the attachment, be properly torqued.

(2) The sealant shall be applied using a sealant gun or spatula.

(3) When using a sealant gun for fillet sealing, the nozzle tip shall be pointed in the seam or joint and shall be maintained nearly perpendicular to the line of travel. A continuous bead of sealant shall precede the tip and the tip size, shape and rate of travel shall be such that sufficient sealant is applied to produce the required fillet.

(4) Fillets shall be shaped or formed to meet the size and shape requirements as shown in applicable figures using the nozzle tip and/or fairing tools to press against the sealant while moving parallel to the bead. Exercise caution to prevent folds and entrapment of air during application and shaping of the fillet and work out any visible air bubbles. The fillet shall be formed so the highest portion of the fillet is centered over the edge of the structure or fitting. Lubrication in any form shall not be used for smoothing purposes. In all cases, fillet size shall be kept as near minimum as practical.

(5) Where it is more convenient or fillet slumping is encountered, the fillet can be applied in two stages. A small first fillet shall be applied and allowed to cure to a tack-free state, and then followed by a second application of sealant sufficient to form the final fillet conforming to the specified dimensions for a fillet seal. If the first fillet has cured, it must be cleaned before the second application of sealant is made. If the fillet has only cured to a tack-free state, it shall be wiped lightly with a gauze pad or cheesecloth pad dampened with cleaning solvent.

(6) Allow the sealant to cure to a tack-free condition prior to the airplane being moved, handled and/or worked on.

(7) In cases where a fillet seal connects to an injection seal, the full bodied fillet shall extend past the end of the injection and then taper out.

(8) Lap joint and seam fillets shall be as shown in Figure 204.

(9) Butt joint fillets shall be as shown in Figure 205.

(10) Bolts shall be fillet sealed as shown in Figure 206. The area for sealing shall consist of the area of the structure surrounding the base of the fastener end, plus the entire exposed area of the fastener. An optional method of sealing threaded fasteners is to apply a brush coat of Type I, Class A sealant. Where brush coating is used as the method of sealing threaded fasteners, the sealant must be worked around each fastener with a stiff brush and considerable care to be effective. A simple pass of the brush with the sealant is not sufficient to produce an effective seal.

(11) Dome-type nutplates shall be fillet sealed as shown in Figure 207. The area for sealing shall consist of the area of the structure surrounding the base of the fastener and from there up over the rivets to the dome.

(12) Rivetless, self-sealing nutplates requiring sealing for lightning protection should be brush coated over the entire surface and mating structure.

(13) Hole filling and slot fillets shall be as shown in Figure 208.

(a) Holes and slots that are too large to be filled with one application of Type I, Class B sealant shall be filled with Type II sealant. Large holes or slots can be backed with masking tape to prevent excessive extrusion of sealant through the holes or slots, but the masking tape shall be removed after the sealant has cured to a tack-free condition.

(b) In all locations where Type II sealant has been applied, after the Type II sealant has cured to a tack-free condition it shall be brush coated with Type I, Class A sealant. The brush coat shall overlap the edge of the Type II sealant sufficiently to ensure complete coverage.

(c) Tooling holes shall be plugged with a shank sealed soft rivet and then brush coated with Type I, Class A sealant.

E. Firewall Sealing - The engine firewall shall be sealed to an intermediate level of sealing using Type IV sealant.

(1) Clean the areas to be sealed per procedures outlined in Cleaning.

(2) Mix, by weight, 1 part of curing agent with 100 parts of Type IV (Coast Pro-Seal #700) sealant.

NOTE: Sealant should be mixed by weight. It is important that accelerator be completely and uniformly dispersed throughout the base compound.

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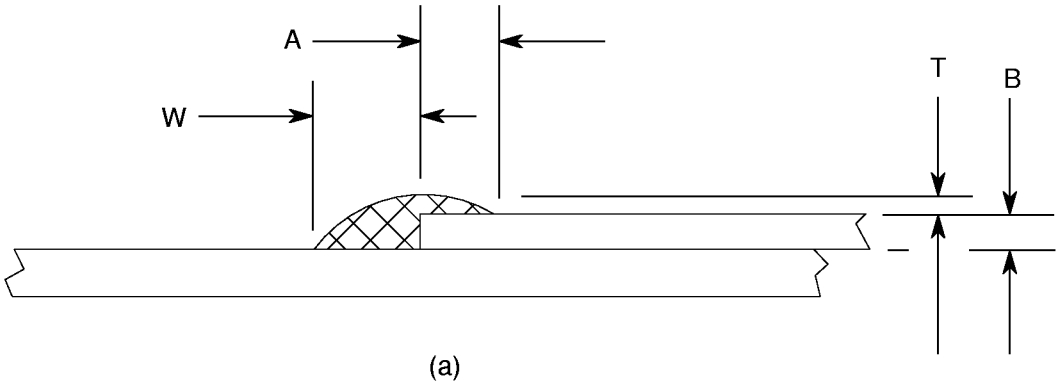
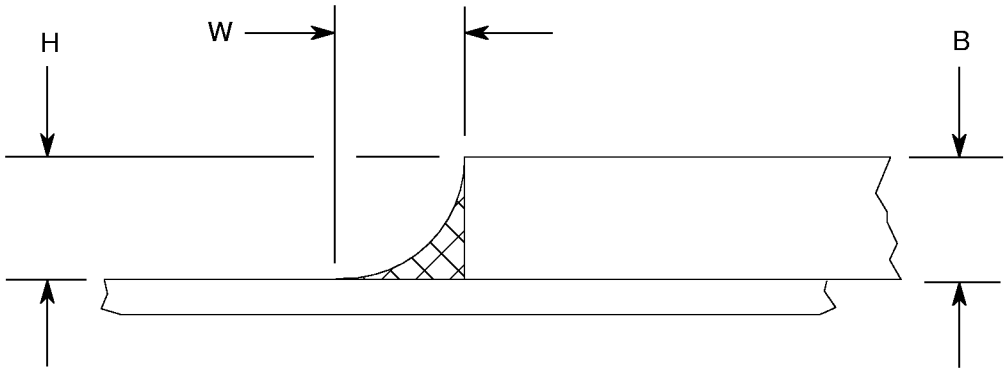


(a)



(b)

FIGURE	B	T	A	W	H
(a)	0.149 INCH (3.78 mm) MAX.	0.020-0.040 INCH (0.51-1.01mm)	0.125-0.25 INCH (3.2 - 6.4 mm)	0.250-0.375 INCH (6.4 - 9.5 mm)	-
(b)	0.150 INCH (3.81 mm) MIN.	-	-	0.250-3.25 INCH (6.4 - 9.5 mm)	APPROXIMATELY B .375 MAX (9.5 mm)

NOTE: ALL FILLETS MUST BE KEPT TO THE MINIMUM DIMENSIONS IF POSSIBLE.

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Lap Joint and Seam Fillets
Figure 204 (Sheet 1)

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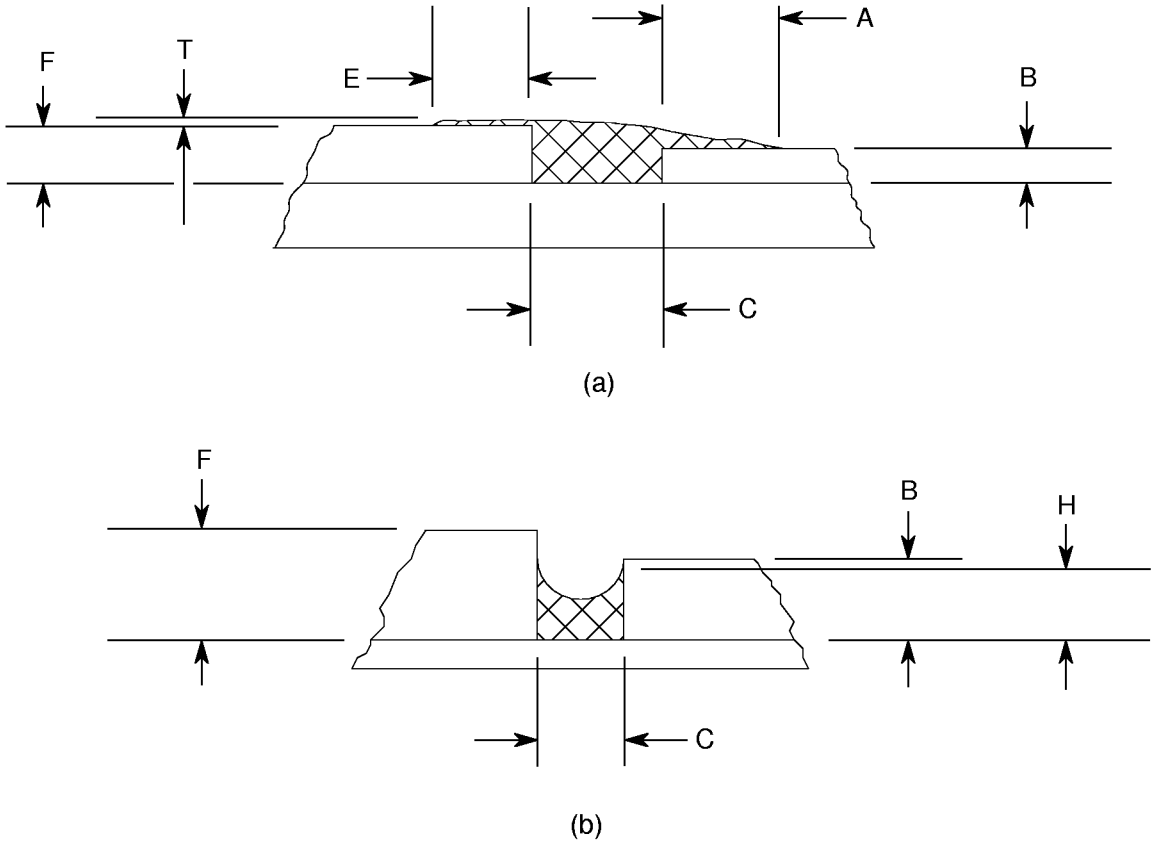

FIGURE	B	A	F	E
(a)	0.149 INCH MAX (3.78 mm)	0.125 - 0.25 INCH (3.2 - 6.4 mm)	0.149 INCH MAX (3.78 mm)	0.125 - 0.25 INCH (3.2 - 6.4 mm)
(b)	0.150 INCH MAX (3.81 mm)	-	0.150 INCH MIN (3.81 mm)	-

FIGURE	T	C	H
(a)	0.02 - 0.04 INCH (0.5 - 1.0 mm)	0.50 INCH MAX (12.7 mm)	-
(b)	-	0.50 INCH MAX (12.7 mm)	APPROXIMATELY B 0.25 INCH MAX (6.35 mm)

NOTE: IN ALL CASES, MINIMUM FILLET DIMENSIONS ARE SHOWN. FILLET SIZE MUST BE KEPT TO THE MINIMUM DIMENSIONS IF POSSIBLE.

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Butt Joint Fillets
Figure 205 (Sheet 1)

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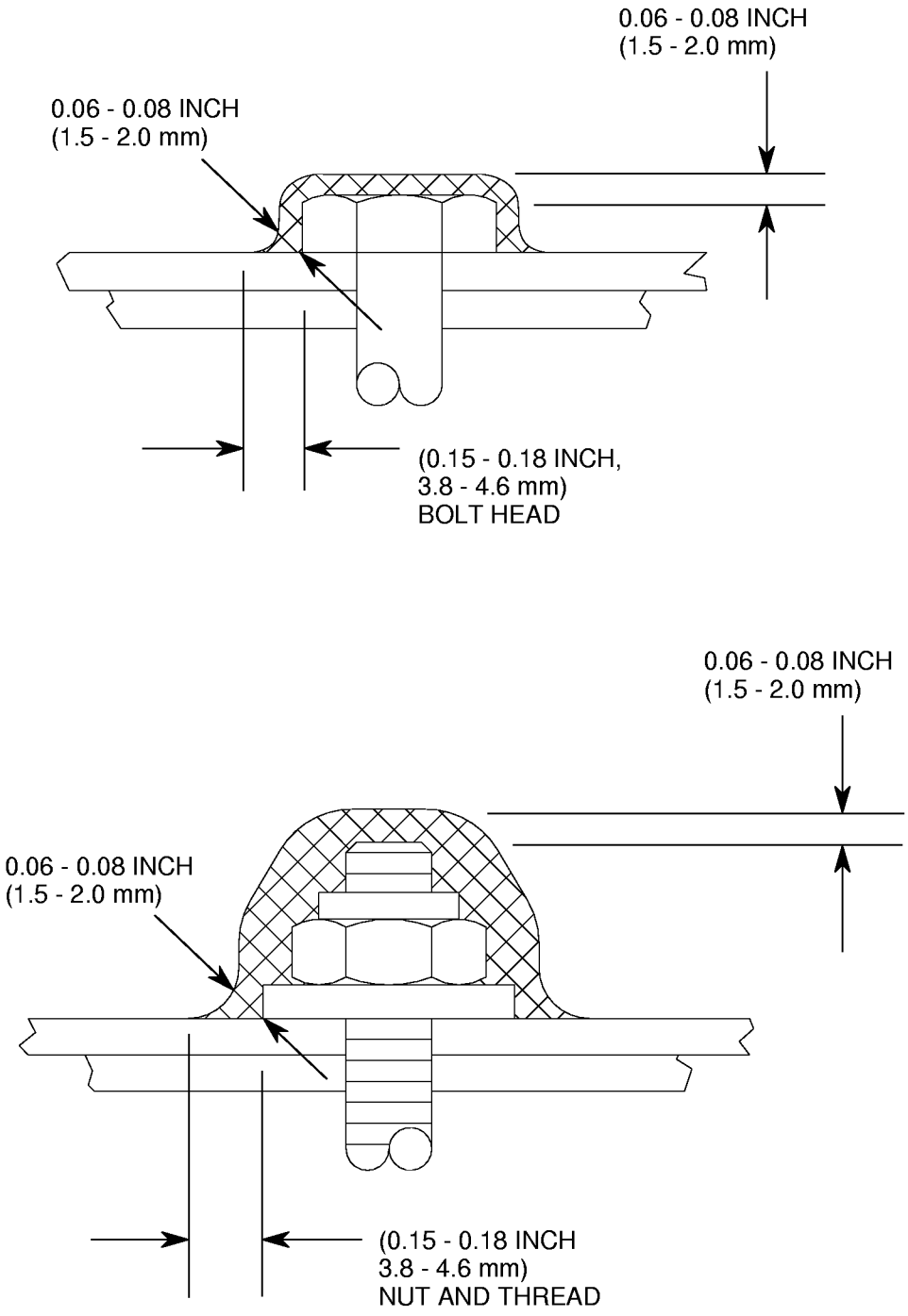

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Bolt Head, Nut and Thread Sealing
Figure 206 (Sheet 1)

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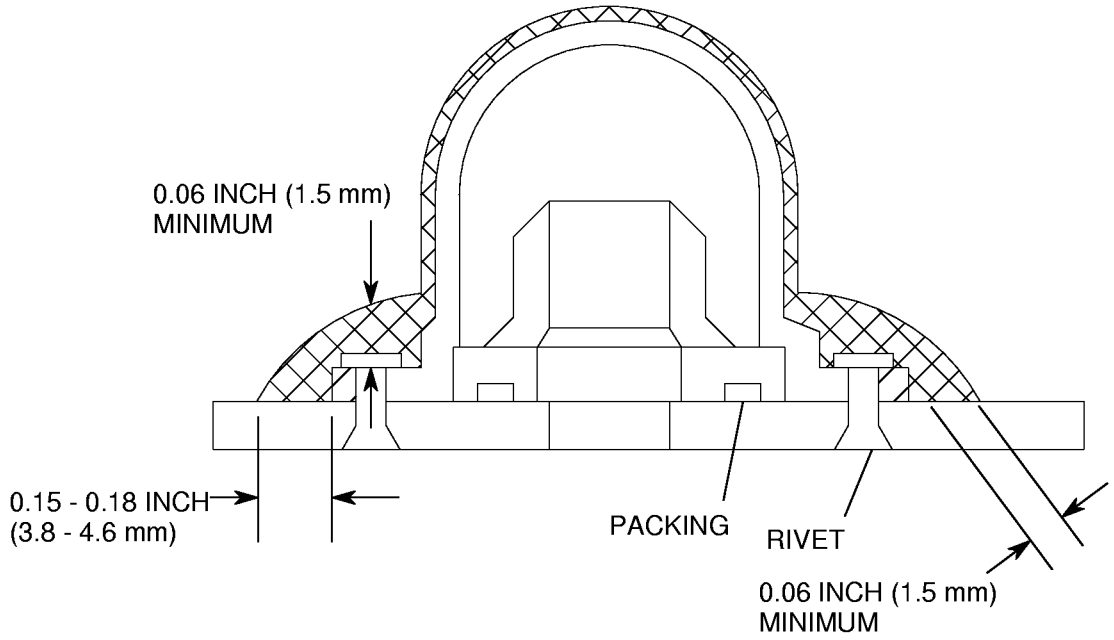

NOTE: IN ALL CASES, MINIMUM FILLET DIMENSIONS ARE SHOWN. FILLET SIZE MUST BE THE MINIMUM DIMENSIONS, IF POSSIBLE.

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Dome-Type Fillets
Figure 207 (Sheet 1)

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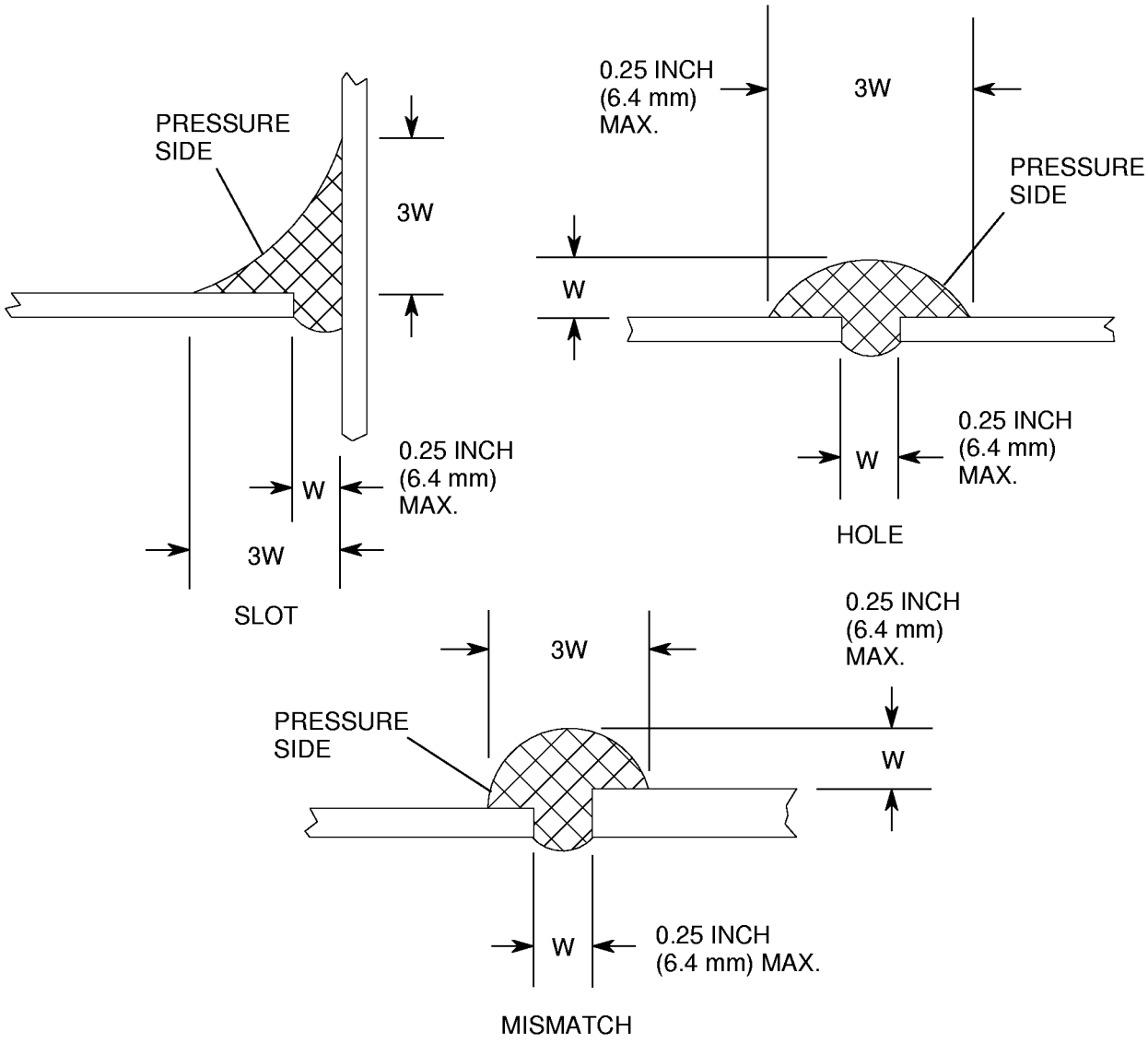

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Slot, Hole and Mismatch Sealing
Figure 208 (Sheet 1)

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(3) Using a spatula and fairing tool, apply a fillet of sealer along all cracks, seams, joints and also over all fasteners in the firewall.
(4) Type IV sealant shall be cured for a minimum of 72 hours at room temperature before being subjected to temperatures of 400°F.

10. Sealant Repair

A. Materials - Repairs, in general, shall be accomplished with the same type of material as that being repaired.

NOTE: Type I, Class B-1/2 sealant is recommended for use during cold weather to obtain an accelerated cure.

NOTE: Type I, Quick Repair sealant can be used as a repair for sealant in pressure vessels and fuel tanks if desired for fast cure and rapid dispatch.

B. Temperature Requirements.
(1) The structure shall be above 60°F before the sealant is applied and shall remain above 60°F until the sealant is tack-free.

NOTE: For outside operations only, the temperature of the structure can be allowed to drop below 60°F but not below 58°F after application and for a period of time not to exceed 48 hours; however, the structure must be subsequently heated to above 60°F and the sealant allowed to become tack-free before the tanks are refueled.

(2) The maximum air temperature allowed to come in contact with the curing sealant is 120°F.

C. Fillet and Fastener Sealing Repairs.
(1) Repair of damaged or faulty sealant applications shall be accomplished as follows:
(a) Remove all damaged or faulty sealant to ensure solid residual material.
(b) Sealant shall be cut so as to produce a smooth continuous scarfed face (Refer to Figure 209). The sealant shall be completely removed in the affected areas. The cutting tools should only be made from nonmetallic materials that are softer than aluminum.
(c) Inspect repair areas for clean and smooth cuts. Loose chunks or flaps of sealant on the cut areas shall be removed.
(d) Clean the area to be sealed, including the scarfed face of the old seal, per procedures outlined in Cleaning.
(e) Apply new fillet seals per Sealing Application, Fillet Sealing. Slight overlapping of the fresh material over the existing fillet is permissible. A large buildup of sealant shall not be allowed. Type VI sealant can be used over Type I sealant.Type VI sealant will cure more rapidly for weather and pressurization repairs.
(f) Rework of a fillet which has been over sprayed or brushed with primer shall be accomplished by a scarfed joint and removal of the fillet having primer on it, in the area of the repair. The primer shall not be sandwiched in between the old and new sealants.
(g) If the primer is removed during the cleaning operation, it is permissible to apply the new fillet seal directly over the clean bare metal and then touch up all exposed areas of bare metal with the proper primer after the sealant has been applied.

D. Faying Surface Sealing Repair - After determining the area which contains the faulty and/or leaking faying surface seal, the repair shall be accomplished by applying a fillet seal along the edge of the part adjacent to the faying surface seal long enough to fully cover the area of the faulty and/or leaking seal.

E. Brush Coat Sealing Repair - Repair of damaged or leaking brush coat seals shall be accomplished by removing the discrepant brush coat. Clean the area of sealant removal and the surrounding structure and sealant per procedures outlined in Cleaning. Apply a new brush coat of sealant.

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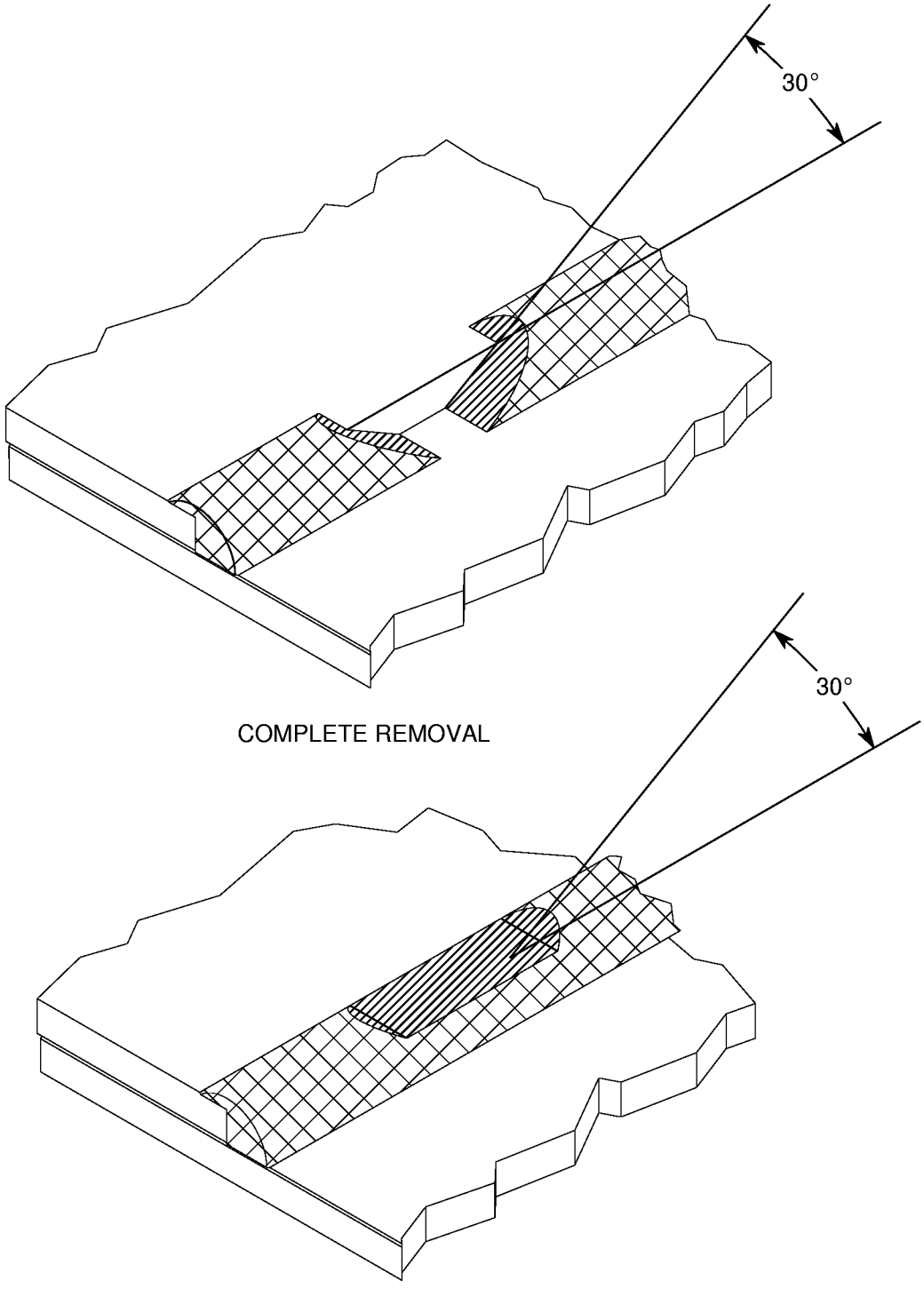

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Cutaway View of Sealing Bead
Figure 209 (Sheet 1)

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ADHESIVE AND SOLVENT BONDING - MAINTENANCE PRACTICES

1. General

A. This section describes the application of adhesives and solvent bonding.

B. A protective coating is applied to particular areas like exterior placards to protect the placard from hydraulic fluid and weather elements.

2. Safety

A. Cleaning and bonding operations should be performed in well ventilated areas away from sparks or flames.

B. Cleaning solvents should be dispensed from approved containers. Solvent wetted cheesecloth should be disposed of in special safety containers provided solely for this purpose.

C. Rubber gloves should be worn when practical, and hands should be washed prior to eating or smoking after handling solvents and adhesives.

3. Clear Polyurethane Topcoat

A. Mix the clear polyurethane C63C with the AA-92-C-39 catalyst according to manufacturer's directions. Apply the clear polyurethane coating in three uniform, 50 percent overlay spray coats to an approximate thickness of 2 1/2 to 3 mils dry film thickness. Air dry 4 to 6 hours or force dry at approximately 135℉ for 1 hour.

NOTE: All equipment should be cleaned immediately after use with T732A thinner.

4. Material Classification

A. Type I, Epoxy Base Adhesive.
(1) Used for bonding metal to metal, fiberglass, wood and thermoplastics.

B. Type II, Oil-Resistant, Synthetic Rubber Base Adhesive.
(1) Used for bonding fabric, leather, rubber, insulation batting, metals and ABS thermoplastics.

C. Type III, Fuel Resistant, Synthetic Rubber Base Adhesive.
(1) Used for bonding cork, leather and rubber gaskets to metals where there may be some exposure to fuel; also for rubber, wood, glass, vinyls and some plastics.

D. Type IV, Synthetic Resin Base Adhesives.
(1) Used for bonding vinyl materials to themselves or metals, glass, plastics and wood.

E. Type V, Silicone Rubber Base Adhesives.
(1) Used for bonding metals, plastics, glass, ceramic and rubber insulation.

F. Type VI, Solvent Cementing.
(1) Used for cementing thermoplastics to themselves. Solvents should be either C.P., U.S.P. or Reagent Grade. Heat and pressure may be used as an alternate method.

G. Type VII, Cyanoacrylate Base Adhesive.
(1) Quick setting adhesive used for plastics, metals and rubber (not waterproof).

H. Type VIII, Pressure Sensitive Adhesive.
(1) Used for quick mounting of small parts of metal, plastic, glass, wood or fabric.

I. Type IX, Polyurethane Base Adhesive.
(1) Used to bond plastics to themselves or other plastics.

J. Type X, Acrylic Plastic Base Adhesive.
(1) Used for bonding acrylic plastics to themselves, other plastics or metals.

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5. Material

Table 201. Adhesives

NAME	NUMBER	MANUFACTURER	USE
Type/Class IA	EA-9304.1 EA-9346.5	The Dexter Corporation Aerospace Material Division Ft. Lauderdale, FL	Adhesive
Type/Class IB	EA-9309.3NA EA-9314NA EA-9330.3 EA-9339	The Dexter Corporation Aerospace Material Division	Adhesive
	EPK-9340	The Dexter Corp. Engineering Adhesives Division Seabrook, NH	Adhesive
Type/Class IC	EA-9394 EA-9396	The Dexter Corporation Aerospace Material Division	Adhesive
Type/Class ID	A-1186-B	SIA Adhesives Inc. 123 West Bartges St. Akron, OH 44311	Adhesive
Type/Class IE	Fastweld 10	Ciba-Geigy Corp. Furane Aerospace Products Los Angeles, CA	Adhesive
	608 Epoxy-Patch	The Dexter Corp. Engineering Adhesives Division	Adhesive
	Polystrate 5-Minute Epoxy	ITW Devcon 30 Endicott St. Danvers, MA 01923	Adhesive
Type/Class IF	EA-960F	The Dexter Corporation Aerospace Material Division	Adhesive
	Aluminum Putty F	ITW Devcon	Adhesive
Type/Class IG	16307	Dayton-Granger Inc. 3299 SW 9th Ave. P.O. Box 350550 Ft. Lauderdale, FL 33335	Adhesive
	KE4238/HD3475	The Dexter Corp. Electronic Materials Divsion Olean, NY	Adhesive
Type/Class IH	15348	Dayton-Granger Inc.	Adhesive
Type/Class IIA	SC-1589	H. B. Fuller Company 1200 Willow Lake Blvd. P.O. Box 64683 St. Paul, MN 55164	Adhesive
	Vangrip 14-30	Mid-West Industrial Chemical Co. St. Louis, MO	Adhesive

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Table 201. Adhesives (continued)

NAME	NUMBER	MANUFACTURER	USE
	1300-L	3M Adhesives, Coatings & Sealers Division St. Paul, MN	Adhesive
Type/Class IIB	30-NF2000-NF/ Spray	3M Co.	Adhesive
Type/Class IIIA	Scotch-Grip 847	3M Co.	Adhesive
Type/Class IIIB	EC-776	3M Co.	Adhesive
	EC-776SR	3M Co.	Adhesive
	CS-3600	Flamemaster Corp. Chem Seal Division Sun Valley, CA	Adhesive
Type IV	EC2262	3M Co.	Adhesive
	4693	3M Co.	Adhesive
Type/Class VA	RTV102 RTV103 RTV108	General Electric Company Silicone Products Dept. Mechanicville Rd. Waterford, NY12188	Adhesive
	RTV732 RTV734	Dow Corning Corp.	Adhesive
Type/Class VB	RTV106	General Electric Company	Adhesive
Type/Class VC	RTV157 RTV159	General Electric Company	Adhesive
Type/Class VD	93-076 RTV	Dow Corning Corp.	Adhesive
	PSA529/ SRC18	General Electric Company	Adhesive
Type/Class VF	Silastic 730	Dow Corning Corp.	Adhesive
Type/Class VIIA	Loctite 49550	Loctite Corp. Newington, CT 06111	Adhesive
Type/Class VIIB	Blak Max 38050 38061	Loctite Corp.	Adhesive
Type VIII	950 Transfer Tape 4930 VHB Tape 4945 VHB Tape Scotch-Mount 4962	3M Co. Industrial Tape and Specialties Division St. Paul, MN	Adhesive
	FasTape 1191 UHA Transfer Tape FasTape 3099 UHA Transfer Tape	Avery Dennison Specialty Tape Division Painesville, OH	Adhesive

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Table 201. Adhesives (continued)

NAME	NUMBER	MANUFACTURER	USE
Type/Class IXA	Thixon 405	Morton Intl. Inc. Specialty Chemicals Group/ Adhesives West Alexandria, OH	Adhesive
Type/Class IXB	HE17017	Hartel Enterprises, Inc.	Adhesive
	Uralane 8089A/B Uralane 5774A/B	Ciba-Geigy Corp. Reliable Division Fountain Valley, CA 92708	Adhesive
Type X	32555 707	Loctite Corp.	Adhesive
	PS-18 PS-30	Caseway Industrial Products 6624 Prospect St. P.O. Box 249 Caseville, MI 48725	Adhesive
Type XI	Hot Melt Adhesive 6363	Bostik Inc. Middleton, MA	Adhesive
Type/Class XIIA	Duco Cement	ITW Devcon	Adhesive
Type/Class XIIB	Velcro #40	Velcro USA Inc. Manchester, NH	Adhesive

Table 202. Solvent Cements

NAME	NUMBER	MANUFACTURER	USE
Class VI Methyl n-Propyl Ketone MIBK Acetone Cyclohexanone Tetrahydrofuran Methylene Dichloride Ethylene Chloride		(All solvents should be either C.P., U.S.P. or Reagent Grade)	Cleaning
	EC4801	3M Co.	

6. Requirements for Bonding

A. Surfaces to be bonded must be clean and dry, free from dust, lint, grease, oil, condensation, other moisture and all other contaminating substances.

B. Jelled or over aged adhesives should not be used until they are tested.

C. Bonds should be free of wrinkles and entrapped air bubbles. They should not be loose at the edges or exhibit poor adhesion.

D. Containers for adhesives should be kept tightly closed when the adhesives are not being used, unless otherwise specified.

E. Adhesives should not be applied when the temperature of either the adhesive or the surfaces to be bonded is below 65°F.

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F. Two component adhesives require weighing and mixing unless pre-weighed kits are used. Weighing equipment should be kept clean and personnel doing the weighing should use good personal hygiene.

G. Metals should be chemically cleaned. In general, cleaning of metal surfaces for bonding consists of removing oils and greases by solvent or soap solutions. This is followed by mechanical abrading of the surface. Loose abraded particles should be removed before bonding.

H. In general, plastics, rubber, leather, cork, wood, etc., should be cleaned of oil and grease by use of solvent. Bonding of plastics and rubber will be improved by abrading the surface after degreasing. Loose abraded particles should be removed before bonding.

NOTE: All surfaces prepared for adhesive bonding should be free of grease, fingerprints, paint, heat scale, corrosion, smut, powder, etc.; slight water stains are permissible providing the surface passes the following:

(1) Examine metal surfaces while they are still wet from the rinsing operations for continuity of water film. Formation of water droplets or discontinuity of the water film (water break) indicates the presence of oily or greasy residues and parts should be reprocessed.
(2) If doubt exists to quality of rinse, the following test may be applied to parts while they are still wet from the rinsing operation. Select a representative area of the bonding surface and test this area with pH indicating paper. A pH of less than 5.0 or greater than 9.5 requires rerinsing and retesting of surface.

7. Manual Cleaning and Deoxidizing of Aluminum Alloys

A. Procedure.

NOTE: Exercise care to prevent trapping solutions at the edge of joints.

(1) Remove oil, grease, ink, etc. by solvent cleaning.
(2) Mask off dissimilar metals or surface not to be deoxidized.
(3) Spray, brush or swab alkaline cleaner (Turco 4215) on surface. Keep area to be cleaned wet for at least 5 minutes.
(4) Spray rinse thoroughly with room temperature water for a minimum of 3 minutes.
(5) With an acid brush, apply paste cleaner 0.06 inch to 0.12 inch thick on surface to be bonded. Allow the paste cleaner to remain on the surface for 45 to 60 minutes.
  (a) Paste cleaner (all measure by weight).
    1 Sulfuric Acid (Concentrated, Technical Grade): 38 percent, +2 or -2 percent; Sodium Dichromate Dihydrate: 7 percent, +1 or -1 percent; Cab-O-Sil: 7 percent, +1 or -2 percent.
    2 Balance: distilled water.
(6) Remove the paste with dry cheesecloth. Wash the area with a clean cheesecloth saturated with high purity water. Parts should be water-break free. If not, repeat procedure above beginning with Step 3. Dry the area for 15 minutes minimum with heat lamps before bonding.

NOTE: Parts processed should be handled so as to prevent recontamination by dirt, grease, fingerprints, etc. Personnel handling prepared surfaces for adhesive bonding should wear clean, white, low-lint gloves. Change gloves frequently to avoid contamination. Gloves may be contaminated easily by contact of working surface with body oils or hair. These soils must not be transferred to bonding surfaces. Prepared surfaces of items that will require transportation or short time storage should be wrapped with clean kraft paper.

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8. Liquid Solvent Cleaning

WARNING: Solvents should be considered flammable and should not be exposed to flames or sparks under any circumstances. Fresh air masks and/or adequate ventilation is required for all closed areas.

A. Requirements.
(1) Plastic or rubber materials should not be immersion cleaned or vapor degreased.
(2) Solvents should never be poured or sprayed on surface to be cleaned.
(3) It is essential that clean cloths and clean solvents are used during the final cleaning operation.
(4) Bonding or subsequent priming operations should be accomplished as soon as possible after cleaning and drying of surfaces.
(5) Solvent cleaned surfaces should be dry and free of all visible soils. Iridescent surfaces are evidence of improper cleaning.

B. Procedures.
(1) Liquid solvent cleaning should generally be used when it is not practical to clean parts of assemblies by vapor degreasing or immersion in chemical cleaners. However, some finishing codes require solvent cleaning. One or more steps may be eliminated if the surfaces to be cleaned are not soiled enough to warrant the inclusion of all steps.
(2) Wipe off excess oil, grease or dirt from surface.
(3) Apply solvent to a clean, oil-free cloth, preferably by pouring solvent on the cloth from a safety can or other approved container. The cloth should be well saturated but not to the point where it is dripping.
(4) Wipe the surface with the moistened cloth as required to dissolve or loosen soil. Work on a small enough area so that the surface being cleaned remains wet.
(5) With a clean dry cloth, immediately wipe the surface while the solvent is still wet. Do not allow the surface to evaporate dry.
(6) Repeat Steps (3) through (5) until there is no discoloration on the drying cloth.

C. Additions or Exceptions.
(1) Metals.
(a) Prior to bonding or priming, lightly abrade surface with ScotchBrite brand pads, Clean N' Finish material, Type A fine or aluminum oxide 320 grit sandpaper. Remove loose abraded particles and follow by solvent cleaning.

CAUTION: Abrasives containing silicone carbide are not suitable for this purpose and should not be used.

(b) Metal surfaces should be cleaned with a solvent chosen from reference Table 203.

Table 203. Solvent Metal Cleaners

METAL	SOLVENT
All	Methyl n-Propyl Ketone MIL-PRF-680 Solvent, Dry Cleaning, Type III TT-I-735 Isopropyl Alcohol

Table 204. Solvent Cleaners for Plastic Materials

PLASTIC TYPE	SOLVENT
ABS (Acrylonitrite-Butadiene-Styrene)	TT-I-735 Isopropyl Alcohol
Cellulose Acetate	MIL-PRF-680 Solvent, Dry Cleaning, Type III
CAB (Cellulose- Acetate-Butyrate)	

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Table 204. Solvent Cleaners for Plastic Materials (continued)

PLASTIC TYPE	SOLVENT
PPO (Polyphenylene Oxide)	
Polystyrenes	
Polyurethanes	
Silicones	
Vinyls	
Acrylics	TT-I-735 Isopropyl Alcohol
Polycarbonates	
Epoxies	
Melamines	
Nylons	
Phenolics	
Polyesters	Methyl-n-Propyl Ketone
Polyethylenes	Detergent, Liquid Dishwashing
Polypropylenes	
Polyimides	TT-I-735 Isopropyl Alcohol
Fluoroplastics (TFE, FEP, KEL-F)	MIL-PRF-680 Solvent, dry cleaning, Type III
	Methyl n-Propyl Ketone TT- I-735 Isopropyl Alcohol

(2) Plastic or rubber.
   (a) Removal of heavy soil from surfaces may be accomplished by washing the surface with a mild water and liquid dishwashing detergent solution prior to solvent cleaning.

CAUTION: Abrasives containing silicone carbide are not suitable for this purpose and should not be used.

   (b) Prior to bonding, lightly abrade surface with aluminum oxide 180 grit sandpaper. Remove loose abraded particles and follow by solvent cleaning.
   (c) Surfaces should be cleaned with a solvent chosen from Table 204 for plastic or Table 205 for rubber materials.

Table 205. Solvent Cleaners for Rubber Materials

RUBBER TYPE	SOLVENT
Buna S	TT-I-735 Isopropyl Alcohol
Buna N	
Neoprene	
Thiokol	
Butyl	

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Table 205. Solvent Cleaners for Rubber Materials (continued)

RUBBER TYPE	SOLVENT
Natural	
Silicones	TT-I-735 Isopropyl Alcohol
Ethylene Propylene	

NOTE 1: When cleaning rubber, use fluid sparingly and dry dampened area thoroughly.

9. Adhesive Mixing, Application and Curing

A. Type I Epoxy.

(1) These adhesives are two component materials and require weighing to obtain the proper amount of each component. Thorough mixing of the weighed components is required for the adhesive to perform properly. Do not mix large batches of the adhesives at one time as this reduces the pot life of the adhesive. Four hundred grams of the adhesive will generally give a pot life of 30 minutes. Small batches and shallow containers will lengthen pot life. Apply a coat of adhesive 0.020 to 0.030 inch (0.5 to 0.8 mm) thick to the surface to be bonded. Press bonded surfaces together to extrude excess adhesive and air so that the resultant bondline is 0.005 inch to 0.010 inch (0.13 mm to 0.25 mm) thick. Pressure may be applied by clamps or weights until cured. Cure for 24 hours at 77℉ (25℃) or 2 hours at 180℉ (82°C).

(a) Type IA (EA9309.3NA). Combine 100 parts by weight of component A with 23 parts by weight of component B. Mix thoroughly. Weight and mix per instructions on containers.

(b) Type IB (EA907). Combine 100 parts by weight of component A with 80 parts by weight of component B. Mix thoroughly and follow instructions on container. (Devcon F). Combine 1 part by weight Devcon F hardener with 9 parts by weight of Devcon F. Mix thoroughly to a lump free mixture. Devcon F will cure in 2 hours at 77°F (25℃). Both of these materials are primarily fillers for hole repair. Apply and shape to the desired thickness or contour, allow to cure, then sand to the desired shape or size.

(c) Type IC (EA9394NA and 380/6). These high temperature adhesives are mixed by combining 100 parts by weight of base material to 33 parts of hardener. Observe mixing instructions on containers.

(d) Type ID (A1186-B). Combine 1 part by weight of A1186-B catalyst A with 8 parts by weight of A1186-B, then mix thoroughly. The pot life of the mixed material is approximately 8 hours at 77℉ (25 ℃). Apply a coat of adhesive on the surfaces to be bonded and a llow them to air dry until the solvent odor is gone (approximately 3 to 4 minutes at 77℉ (25℃)). Press the faying surfaces firmly together, preferably using a hard rubber or plastic roller and allow them to remain together for 16 hours at 77°F (25℃) before handling. Cure for 24 hours at 77℉ (25℃) before applying stress to the bond. Maximum stre ngth develops in 5 days at 77°F (25°C). Pressure may be applied by clamps or weights dur ing part or all of the 5-day period as desired.

(e) Type IE (EC2216). Combine 100 parts by weight of component B with 140 parts by weight of component A. Mix until the components blend to a uniform medium gray color.

(f) Type IF (number 10). Combine equal weights or volume of both components. Mix together until material is one color. Apply to joint. Work life is only 5 minutes and material sets in 10 minutes. Apply pressure to the joint or component being bonded. Adhesive should carry a load within 1 hour.

B. Type II, III and IV Synthetic Rubber and Resin Adhesives.

NOTE: These adhesives are single component solvent blends of rubber or resin. They have high initial tack and will bond a wide variety of different materials.

(1) Apply a coat of adhesive on the surfaces to be bonded and allow them to air dry until most of the solvent has evaporated and the adhesive exhibits an aggressive tack. This condition can be determined by touching the adhesive lightly using the back of the knuckle instead of the fingertips in order to minimize contamination. When the adhesive is quite tacky but no longer

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transfers to the back of the knuckle, the surfaces are ready for bonding. This normally requires from 3 minutes to 30 minutes depending on film thickness, nature of the surfaces, temperature and humidity.

(a) Very porous surfaces may require two coats. If two coats are applied, let the first coat dry completely from 30 minutes to 60 minutes before applying the second coat and testing for tack as described above.

(b) When bonding two nonporous surfaces, the coat of adhesive to both surfaces may be allowed to dry completely and then one surface reactivated with a very light coat of adhesive and tested for tack as described above. This latter procedure will reduce the amount of solvent trapped in the bond and is especially useful in the case of bonding nonporous surfaces since trapped solvents can greatly prolong the time required for the bond to reach full strength.

(c) Press the faying surfaces firmly together, preferably using a hard rubber or plastic roller and apply any needed clamps or weight. Cure for at least 24 hours at 77°F (25°C) before applying any stress to the bond.

(2) Type II.
- (a) EC880. Bond according to procedures in step (1).
- (b) EC847. Bond according to procedures in step (1).
- (c) EC1300L. Bond according to procedures in step (1).
- (d) 5452 Contact Adhesive. Bond according to procedures in step (1).
- (e) 5431 Tuf-Grip Cement. Bond according to procedures in step (1).
- (f) 1636. Bond according to procedures in step (1).

(3) Type III.
- (a) EC847. Bond according to procedures in step (1).

(4) Type IV.
- (a) Type IV (EC2262). Bond according to procedures in step (1).

C. Type V Silicone Rubber Adhesives.

NOTE: These adhesives are one part silicone rubber material which will bond a wide variety of different materials. Cure of these adhesives is initiated by moisture in the air. Nonporous surfaces being bonded with these adhesives will cure very slowly or not at all on wide bond lines.

(1) Apply a coat of adhesive to the surfaces to be bonded and press them firmly together within 10 minutes. Apply pressure by clamps or weights for at least 24 hours at 77°F (25°C) before handling.

(2) Type VA (RTV157). Bond according to procedures in step (1).

(3) Type VB (RTV159). Bond according to procedures in step (1).

(4) Type VC.
- (a) RTV732. Bond according to procedures in step (1).
- (b) RTV734. Bond according to procedures in step (1).
- (c) RTV738. Bond according to procedures in step (1).
- (d) RTV102. Bond according to procedures in step (1).
- (e) RTV103. Bond according to procedures in step (1).
- (f) RTV108. Bond according to procedures in step (1).
- (g) RTV109. Bond according to procedures in step (1).
- (h) RTV162. Bond according to procedures in step (1).

(5) Type VD (RTV106). Bond according to procedures in step (1).

(6) Type VE (RTV94-034). Bond according to procedures in step (1).

D. Type VI Solvent Bonding.

(1) This type bonding depends on the solvent softening the plastic surfaces to be bonded. The softened surfaces are pressed together and held until the solvent evaporates and the plastic hardens. The appropriate solvent may be applied to plastic surfaces by brushing, spraying, dipping or by use of a felt pad.

(2) Allow the solvent to remain on the plastic until both surfaces soften then immediately join the surfaces while wet.

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(3) Apply clamps, weight or a holding fixture to keep the bonding surfaces in solid contact until the bond is firmly set. Allow the bond to set for 24 hours at 77°F (25°C) befo re applying any stress to the bond.

E. Type VII Cyanoacrylate.
(1) Apply adhesive to surface to be bonded. Do not apply excess adhesive. Mating parts should fit well so the bond line will be 0.005 inch (0.13 mm) or as specified on label. Apply clamping pressure.

F. Type VIII Pressure Sensitive.
(1) Clean surfaces to be bonded. Apply adhesive to bond surface and assemble with pressure. Adhesive gains strength with time under pressure although most parts may be handled within 5 to 10 minutes after application of pressure.

G. Type IX Polyurethane.
(1) This adhesive is a tough, flexible material which bonds a variety of plastic materials as well as aluminum. The adhesive offers excellent low temperature performance plus good peel. Weigh and mix adhesive in accordance with directions on label. Apply adhesive to area to be bonded. Clamp parts together so the resultant bond line will be within 0.005 inch to 0.020 inch (0.13 mm to 0.51 mm) and there is no entrapped air. Parts may be lightly handled after 6 hours but 24 hours of cure is preferred.

H. Type X Acrylic.
(1) PS-18.
(a) The mixing of PS-18 cement is based on 4 fluid ounces (118 ml) of cement. The 4 fluid ounces have a useful life of 30 minutes. Mix at a temperature of 65°F to 80°F (18°C to 27°C). Batches larger than 4 fluid ounces (118 ml) should not be mixed at one time. Do not mix more cement than can be used in 30 minutes. Unused cement should be discarded after 30 minutes.
(b) Add one capsule (2.4 g) of catalyst mixture (component B) to 4 fluid ounces (118 ml) of base cement (component A). Dissolve by stirring. The base cement with catalyst added may be stored in a refrigerator at 40°F (4°C) or below for 24 hours.

WARNING: Do not mix catalyst (component B) directly with promoter (component C). A violent reaction will take place when these two materials are directly mixed together. If promoter (component C) is accidentally spilled on skin, remove immediately by washing with soap and water.

(c) Just before using the catalyzed cement, add 5 ml of promoter (component C) to the mixture. Stir thoroughly. Do not add component C to more cement than can be used in 30 minutes.
(d) Surfaces of acrylic to be bonded should have these areas sanded and cleaned with aliphatic naphtha Type II (TT-N-95) before application of cement. Apply cement to bond area in sufficient quantity so the bond line, after pressure application, will be 0.005 inches to 0.015 inch (0.13 mm to 0.38 mm). Apply clamps or pressure by other means and hold for at least 3 hours at 75°F (24°C). After this time, parts may be lightly handled. Allow 24 hours at 75°F (24°C) for more complete cure.

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ANAEROBIC ADHESIVES - MAINTENANCE PRACTICES

1. General

A. This maintenance practice provides procedures for application of anaerobic adhesives. Anaerobic adhesives are retaining compounds which will harden between properly prepared mating surfaces where air is excluded.

WARNING: Some of these materials contain aromatic amines and/or cyano-acrylate fluids and are mildly poisonous. Avoid prolonged or repeated contact with the liquid or breathing of the vapors. Use with adequate ventilation. Cyano-acrylate adhesives will instantly bond skin and can cause severe eye injury. Apply only to surface to be bonded. In case of skin contact, flush with water. In case of eye or internal contact, get medical attention.

2. Materials

A. For anaerobic adhesive materials and application, refer to Table 201, Adhesives and Applications.

NOTE: Equivalent substitutes may be used for the following items.

NAME	NUMBER	MANUFACTURER	USE
Methyl n-Propyl Ketone		Commercially available	Cleaning solvent.
Desoclean 110	020K019	PRC-DeSoto International 5340 San Fernando Rd. Glendale, CA 94710	Cleaning solvent.
DS108		Dynamold, Inc. 2905 Shamrock Ave. Fort Worth, TX 76107	Cleaning solvent.
Locquic Primer N (Ready to use)	Catalog Number 764-56	Loctite Corp. 705 North Mountain Road Newington, CT 06111	May be used with Loctite products 515, 569 and 592.
Locquic Primer T	Catalog Number 747-56	Loctite Corp.	May be used with Loctite products 222, 242, 271, 277, 290, 416, 601, 620 and 680.
Wire Tacking Kit (Loctite)		Loctite Corp.	Tacking wires or wire bundles in place.

3. General Requirements for Bonding/Sealing

A. All surfaces to be bonded and/or sealed must be free of paints and corrosion preventive organic coatings.

B. Surfaces must be clean and dry prior to application of adhesive.
(1) Surface must be free from dust, lint, grease, chips, oil, condensation or other moisture and all other contaminating substances.

C. Primers and/or adhesives must not be applied when the temperature of the primer, adhesive or parts is below 60°F.

D. Excess adhesive must squeeze out of the joint when it is secured.

E. Correct primer and/or adhesive must be used.

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F. Correct cleaning solvent and procedure must be used.

Table 201. Adhesives and Applications

LOCTITE PRODUCT	COLOR	APPLICATION
222	Purple	Low strength locking and sealing or threaded fasteners (removable).
242	Blue	Medium strength locking and sealing of threaded fasteners and key assemblies (removable) (one-fourth inch diameter or larger).
271	Red	High strength locking and sealing of threaded fasteners (removable) (three-eighth inch diameter or larger).
277	Red	High strength locking and sealing welds and locking preassembled threaded fasteners.
290	Green	Penetrating action for sealing welds and locking preassembled threaded fasteners.
515	Purple	Form-in-place gaskets and dressing cut gaskets.
569	Brown	Seals hydraulic fluids, including fire resistant synthetics, to the working pressure of the hydraulic line.
592	White	Low strength sealing of pipe threads and threaded fittings.
601	Green	High strength retaining for studs, bearings, and bushings.
620	Green	High strength retaining at temperatures up to 450°F.
680	Red	Extra-high strength retaining for strengthening press fits and bonding cylindrical parts.
416	Clear	Wire tacking adhesive.

4. Cleaning

A. All surfaces to which adhesive is to be applied must be clean and dry.

WARNING: Caution must be observed during cleaning. Most cleaning solvents are toxic and/or flammable.

(1) Parts will be vapor degreased, cleaned with solvents, or, when a primer is to be used, the primer may also be used for cleaning.
(2) Allow all cleaned surfaces to dry a minimum of five minutes prior to application of primer and/or adhesive materials.
(3) In the event that contamination occurs, the surfaces must be recleaned.

5. Primer Application

A. When primer is used, it may be applied by dipping, brushing or spraying the surfaces to be bonded and/or sealed. The parts should be allowed to drain and air dry prior to application of the adhesive materials.
(1) Apply only a thin uniform coating, avoiding any excess.

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6. Adhesive Application

NOTE: All applications must be made using the proper adhesive material.

A. Application of Adhesive.
   (1) Apply the adhesive to both mating surfaces of the joint when possible.
   (2) Sufficient adhesive must be applied so the space between the assembled surfaces is completely filled with adhesive and a small excess is squeezed out around the periphery of the joint when the joint is secured.
   (3) After application of adhesive over primed surfaces, the joint should be secured immediately.
   (4) After the assembly is secured, remove uncured adhesive which extrudes onto the exterior of the joint. Use a wiper dampened with water or solvent as applicable.

7. Adhesive Cure

A. In most cases, adhesives applied to active surfaces will cure in 24 to 26 hours at 77°F.
   (1) Factors that influence cure are:
      (a) Activity of the surfaces.
      (b) Clearance in joint fit.
      (c) Specific adhesive material used.
      (d) Specific primer used, if any.
      (e) Temperature.

8. Wire Tacking

A. Wires and/or wire bundles may be tacked in place with adhesive Loctite 416 or using a Wire Tacking Kit.
   (1) When utilizing a Wire Tacking Kit, follow the instructions provided with the kit.
   (2) When utilizing adhesive Loctite 416 not in a kit, perform the following:
      (a) Hand solvent clean the surface. Refer to Cleaning.
      (b) Apply a thin stripe of "Speed" activator (primer) with the felt applicator in the bottle.
      (c) Position the wire and hold it against the surface.
      (d) Apply one or two drops of wire tacking adhesive over the wire.
      (e) Hold for 15 to 30 seconds.

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ADHESIVES, CEMENTS AND SEALANTS SHELF LIFE AND STORAGE - DESCRIPTION AND OPERATION

1. General

A. This section provides information which defines the proper storage and usable life (shelf life) of adhesives, cements and sealants which are used for maintenance and/or repair of the airplane. Also included in this section is the criteria used for testing these materials after the normal shelf life has expired, to determine if an extension to the shelf life is possible.

B. Shelf life refers to a specified period of time usually from the date of manufacture (normally stamped or printed on the product container) to the expiration date (which should be determined using limits specified in Table 1) or if applicable, the manufacturer's expiration date printed or stamped on the product container) The specified shelf life is dependent on proper storage in accordance with the limits specified in this section and/or the manufacturer's instructions.

2. Storage Criteria

A. Storage of Adhesives and Cements.
   (1) All adhesives and cements shall be stored under controlled temperature conditions. If open shop storage becomes necessary, these products shall in no case be stored in an area which will subject them to temperatures in excess of 95°F. Containers shall be tightly closed prior to placing them in the proper storage environment. For definition of the proper storage environment, refer to Table 1 and the following paragraphs. For identification of adhesive and cement classifications, refer to Adhesive and Solvent Bonding - Maintenance Practices.
      (a) Class I - These adhesives are epoxy base materials and have one-year storage at room temperature. 0°F storage will extend the storage life. Refer to the product container instructions for storage temperature and life.
      (b) Class II, III and IV - These adhesives are rubber and resin base and are good for six months at room temperature storage. 40°F storage will extend the storage life. Refer to the product container instructions for limits of each adhesive.
      (c) Class V - These are silicone rubber adhesives. If stored in their original containers at a temperature below 80°F, the shelf life is one year or as indicated on the storage container.
      (d) Class VI - These are solvent bonding solvents. They should be stored in tightly closed, original containers at 40°F.
      (e) Class VII - Cyanoacrylate base materials must be stored in the original containers at 40°F or as specified on the container instructions.
      (f) Class VIII - These are pressure sensitive materials. The shelf life is two years when stored at 75°F and 50 percent relative humidity.
      (g) Class IX - These are polyurethane products. Store in original container, between 70° and 100°F. Urethanes are moisture sensitive and precautions should be taken to ensure complete protection from moisture contamination. Container must be tightly closed at all times.
      (h) Class X - These are acrylic base materials. They require storage at 40°F or per instructions on product container.

B. Storage of Sealants.
   (1) All sealants shall be stored under controlled temperature conditions. If open shop storage becomes necessary, these products shall in no case be stored in an area which will subject them to temperatures in excess of 95°F or below 40°F. Containers shall be tightly closed prior to placing them in the proper storage environment. For proper storage environment, refer to Table 1 and the following paragraphs. For identification of sealant classification, refer to Fuel, Weather and High-Temperature Sealing - Maintenance Practices.
      (a) Premixed and frozen sealants shall be stored at -40°F or colder and shall not be used more than six weeks after the date of mixing, even if all storage is at -40°F or colder. If storage temperatures rise above -40°F, but are not warmer than -30°F, the material may be stored for a maximum of two weeks warmer than -40°F plus time at -40°F or colder for a combined total not to exceed five weeks beyond the date of mixing. If storage temperatures rise

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above -40°F but are not warmer than - 20°F, the materials may be stored for a maximum of one week above -30°F plus time at -40°F or colder for a combined total not to exceed four weeks beyond the date of mixing.

(b) Unmixed sealants shall be stored at a controlled temperature of between 40°F and 80°F and have a shelf life of approximately six months when stored within this temperature range. Unmixed sealants stored at temperatures exceeding 80°F shall be used within five weeks.

C. All materials should be used on a "first in, first out" basis. The adhesives, cements and sealants should be rotated so this requirement can be accomplished. All material containers should be clearly marked with a "use by" date, consisting of the year and month. All materials not used by this date must be tested prior to use. Refer to Testing Criteria and Table 1.

3. Testing Criteria

A. Any material (adhesive, cement or sealant) not used within its shelf life will be tested and the results reviewed to determine if the material is usable. If there is doubt about the material being usable, it must be properly disposed of. Material that has exceeded its original shelf life may be retested to determine if the material meets its requirements. Materials meeting their requirements will have their shelf life extended as specified in Table 1. Materials with shelf life extensions must be retested after a specified period of time. Refer to Table 1.

B. Testing of Overage Adhesives and Cements.

NOTE: Overage adhesives and cements are those that have exceeded their original shelf life and must be tested prior to use and/or given extended shelf life.

(1) For identification of adhesive and cement classification, refer to Adhesive and Solvent Bonding - Maintenance Practices.
   (a) Class I Epoxy Adhesive - Examine both components to ensure that they are still workable. Check for gelling and/or contamination. Stir components and mix a small amount of adhesive. Verify that adhesive sets up and hardens.
   (b) Class II, III and IV Rubber and Resin Base Adhesives - Open containers and check for gelling and/or contamination. Check for spreading and drying.
   (c) Class V Silicone Rubber Adhesives - Examine adhesive for hardness. If adhesive is still soft and can be spread, it is acceptable. Verify that adhesive will harden.
   (d) Class VI Solvent Bonding Solvents - Check for signs of apparent contamination. Solvents should be clean and clear with no signs of cloudiness.
   (e) Class VII Cyanoacrylic Base Adhesives - Verify that product is still liquid with no visible signs of contamination.
   (f) Class VIII Pressure Sensitive Materials - Open containers and inspect for hardening, gelling and contamination. Stir components and mix a small amount of adhesive. Verify that adhesive sets up properly.
   (g) Class X Acrylic Adhesives - Inspect base material to ensure that it is still liquid. Mix a small amount of the components and verify that it sets up properly.

(2) In general, if these materials exhibit normal physical properties, with no signs of hardening, gelling or contamination and set up and/or harden properly as applicable, the shelf life may be extended as specified in Table 1.

C. Testing of Overage Sealants.

NOTE: Overage sealants are those that have exceeded their original shelf life and must be tested prior to use and/or given extended shelf life.

(1) For identification of sealant classification, refer to Fuel, Weather and High-Temperature Sealing - Maintenance Practices.

(2) Overage sealants to be tested for possible shelf life extension shall be properly mixed using the correct materials, procedures and equipment.

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(3) Overage premixed frozen sealants, along with unmixed sealants should be visually inspected. Sealants which show conclusive evidence of separation, discoloration and/or gelling prior to the addition of a thinner or curing agent shall be discarded. When in doubt of the sealant quality, the overage sealant should be compared with the same type of sealant, under six months old, which is known to be satisfactory.

(4) The mixed sealants may be tested by placing a small amount of sealant (sample buttons) on a sheet of paper. After the sample buttons have cured, they should be cut in half and examined. The sealant should show no signs of spots or streaks of unmixed base compound or curing agent. However, sample buttons containing spots, streaks, discoloration and/or variations in uniformity of color are acceptable if these spots, streaks, etc., are tack free upon inspection. All mixed sealant should be as void free as possible.

(5) Contaminated sealant and premixed sealant that have been thawed and refrozen shall be discarded.

(6) Type I, Class A sealants should be checked for appearance, application time, tack-free time, cure time and adhesion.

(7) Type I, Class B sealants should be checked for appearance, application time, cure time, tack-free time and adhesion. In addition, Class B-2 and B-4 sealants should be checked for initial flow.

(8) Type I, Class C sealants should be checked for appearance, application time, cure time and adhesion. In addition, Class C sealants should be tested to determine that they are not at a tack-free condition at the end of their rated work life (squeeze out life).

(9) Type II sealants should be checked for appearance, application time, tack-free time and cure time.

(10) Type III sealants should be easily thinned with methyl n-propyl ketone. When difficulty is encountered in thinning this sealant, it should be discarded.

(11) Type IV sealants should be checked for appearance, application time, tack-free time and cure time.

(12) Type V and VI sealants should be checked for appearance, tack-free time and cure time.

(13) Type VII sealants should be checked for appearance, application time, tack-free time and cure time.

(14) Type VIII sealants should be checked for appearance, application time, tack-free time, cure time and adhesion. Adhesion to aluminum should be (peel) less than two pounds per inch of width.

NOTE: For application time, tack-free time and cure time for the above listed sealant types and classes, refer to Sealant Curing in Fuel, Weather and High- Temperature Sealing - Maintenance Practices. Also refer to Table 1,. Storage and Shelf Life of Adhesives, Cements and Sealants.

Table 1. Storage and Shelf Life of Adhesives, Cements and Sealants.

PRODUCT	STORAGE CONDITION (TEMPERATURE)	SHELF LIFE	EXTEND SHELF LIFE	RETEST IN
ADHESIVES AND CEMENTS				
EA9309.3NA	40 to 80°F	12 Months	6 Months	6 Months
EA9339	40 to 80°F	12 Months	6 Months	6 Months
EA9314	40 to 80°F	12 Months	6 Months	6 Months
EA9330	40 to 80°F	12 Months	6 Months	6 Months
EA907	40 to 80°F	12 Months	6 Months	6 Months
Devcon F	40 to 80°F	12 Months	6 Months	6 Months
EA934NA	40 to 80°F	12 Months	6 Months	6 Months
380/6	40 to 80°F	12 Months	6 Months	6 Months

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Table 1. Storage and Shelf Life of Adhesives, Cements and Sealants. (continued)

PRODUCT	STORAGE CONDITION (TEMPERATURE)	SHELF LIFE	EXTEND SHELF LIFE	RETEST IN
A1186-B	40 to 80°F	12 Months	6 Months	6 Months
EC2216	40 to 80°F	12 Months	6 Months	6 Months
#10 Fastset	40 to 80°F	12 Months	6 Months	6 Months
608 Quickset	40 to 80°F	12 Months	6 Months	6 Months
EC880	40 to 80°F	8 Months	3 Months	3 Months
EC847	40 to 80°F	8 Months	3 Months	3 Months
EC1300L	40 to 80°F	* 6 Months	* 3 Months	* 3 Months
5452	40 to 80°F	12 Months	6 Months	6 Months
5431	40 to 80°F	12 Months	6 Months	6 Months
1636	40 to 80°F	12 Months	6 Months	6 Months
EC2262	40 to 80°F	12 Months	6 Months	6 Months
RTV-157	40 to 80°F	12 Months	6 Months	6 Months
RTV-158	40 to 80°F	12 Months	6 Months	6 Months
RTV-159	40 to 80°F	12 Months	6 Months	6 Months
RTV-732	40 to 80°F	12 Months	6 Months	6 Months
RTV-102	40 to 80°F	12 Months	6 Months	6 Months
RTV-103	40 to 80°F	12 Months	6 Months	6 Months
RTV-106	40 to 80°F	12 Months	6 Months	6 Months
RTV-108	40 to 80°F	12 Months	6 Months	6 Months
RTV-109	40 to 80°F	12 Months	6 Months	6 Months
RTV-94-034	40 to 80°F	12 Months	6 Months	6 Months
Loctite 222	40 to 80°F	12 Months	6 Months	6 Months
Loctite 242	40 to 80°F	12 Months	6 Months	6 Months
Loctite 271	40 to 80°F	12 Months	6 Months	6 Months
Loctite 277	40 to 80°F	12 Months	6 Months	6 Months
Loctite 290	40 to 80°F	12 Months	6 Months	6 Months
Loctite 416	40 to 80°F	12 Months	6 Months	6 Months
Loctite 495	40 to 80°F	12 Months	6 Months	6 Months
Loctite 515	40 to 80°F	12 Months	6 Months	6 Months
Loctite 569	40 to 80°F	12 Months	6 Months	6 Months
Loctite 592	40 to 80°F	12 Months	6 Months	6 Months
Loctite 595	40 to 80°F	12 Months	6 Months	6 Months
Loctite 609	40 to 80°F	12 Months	6 Months	6 Months
Loctite 620	40 to 80°F	12 Months	6 Months	6 Months

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Table 1. Storage and Shelf Life of Adhesives, Cements and Sealants. (continued)

PRODUCT	STORAGE CONDITION (TEMPERATURE)	SHELF LIFE	EXTEND SHELF LIFE	RETEST IN
Loctite 680	40 to 80°F	12 Months	6 Months	6 Months
Loctite 12829	40 to 80°F	12 Months	6 Months	6 Months
Loctite 12839	40 to 80°F	12 Months	6 Months	6 Months
DA-552-1	40 to 80°F	12 Months	6 Months	6 Months
PS-18	40 to 80°F	12 Months	6 Months	6 Months
PS-30	40 to 80°F	12 Months	6 Months	6 Months
XA-3678	40 to 80°F	12 Months	6 Months	6 Months
XF-3585	40 to 80°F	12 Months	6 Months	6 Months
LR-100-226	40 to 80°F	12 Months	6 Months	6 Months
EC776	40 to 80°F	* 8 Months	* 3 Months	* 3 Months
SB and P-2	40 to 80°F	12 Months	6 Months	6 Months
SEALANTS				
Pro-Seal 890	40 to 80°F	6 Months	2 Months	2 Months
GC-408	40 to 80°F	6 Months	2 Months	2 Months
PR-1422	40 to 80°F	6 Months	2 Months	2 Months
PR-1440	40 to 80°F	6 Months	2 Months	2 Months
GC-435	40 to 80°F	6 Months	2 Months	2 Months
Pro-Seal 567	40 to 80°F	6 Months	2 Months	2 Months
PR-810	40 to 80°F	6 Months	2 Months	2 Months
Pro-Seal 700	40 to 80°F	6 Months	2 Months	2 Months
GC-1900	40 to 80°F	6 Months	2 Months	2 Months
PR-366	40 to 80°F	6 Months	2 Months	2 Months
Pro-Seal 735	40 to 80°F	6 Months	2 Months	2 Months
Pro-Seal 895	40 to 80°F	6 Months	2 Months	2 Months
Pro-Seal 706B	40 to 80°F	6 Months	2 Months	2 Months
PR-1321	40 to 80°F	6 Months	2 Months	2 Months
GC-200	40 to 80°F	6 Months	2 Months	2 Months
RTV-730	40 to 80°F	6 Months	2 Months	2 Months
Pro-Seal 815	40 to 80°F	6 Months	2 Months	2 Months
GC-402	40 to 80°F	6 Months	2 Months	2 Months

NOTE 1: * Do not use after three months of storage in the 81°F to 90°F range. Do not use after five days of storage above 90°F.

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INTERIOR AND EXTERIOR FINISH - CLEANING/PAINTING

1. General

A. Interior and exterior finish cleaning/painting consists of general information and instructions for applying chemical film treatments, primer and topcoats to the airplane.

2. Interior and Exterior Finishes

CAUTION: All plastic and fiberglass parts, except bushings, bearings, grommets and certain purchased antenna covers which are not colored or painted, shall be colored or painted to match adjacent surface. The head of the pitot tube must be open and free from paint and other foreign objects. The surface adjacent to static port must be smooth and free from all paint imperfection. Do not paint pitot tube, fuel caps, trim tab pushrods where they operate in an actuator, oleo strut sliding surfaces, standard polished spinners, exhausts stall warning vanes, chromed items (handles, locks, etc.) or light lens. Paint the landing gear barrels and torque links to match the overall color.

3. Paint Facility

A. Painting facilities must include the ability to maintain environmental control of temperature at a minimum of 65°F (18°C). All paint equipment must be clean. Accurate measuring containers should be available for mixing protective coatings. Use of approved respirators while painting is a must for personnel safety. All solvent containers should be grounded to prevent static buildup. Catalyst materials are toxic, therefore, breathing fumes or allowing contact with skin can cause serious irritation. Material stock should be rotated to allow use of older materials first, because its useful life is limited. All supplies should be stored in an area where temperature is higher than 50°F (10°C), but lower than 90°F (32°C). Storage at 90°F (32°C) is allowable for no more than sixty days, providing it is returned to room temperature for mixing and use.
   (1) Areas in which cleaning or painting are done shall have adequate ventilation and shall be protected from uncontrolled spray, dust, or fumes.
   (2) Areas for prolonged storage of cleaned parts and assemblies awaiting painting shall be free from uncontrolled spray, dust, or fumes, or else positive means of protecting part cleanliness such as enclosed bins or wrapping in kraft paper shall be provided.
   (3) Areas in which cleaning or painting are done shall be periodically cleaned and dusted.
   (4) Compressed air used for dusting and paint spraying shall be free from oil, water and particulate matter.

4. Sanding Surfacer

A. Purpose and Requirements.
   (1) Surfacer is applied over fiberglass and Kevlar assemblies to provide aerodynamic contour, smoothness and to seal porous surfaces. Application of surfacer also provides a good surface for a polyurethane finish.
   (2) The objective of a surfacer is to fill local depressions, pits, pin holes and other small surface defects so a smooth surface is obtained for paint. The total surfacer thickness shall not be greater than 15 mils (0.38 mm). Only enough surfacer shall be applied to obtain a smooth surface for paint. If less thickness will provide a smooth surface, this is better. A thick layer of surfacer is less flexible and may crack in service.
   (3) To complete the airplane's polyurethane finish over surfacer, begin by applying the intermediate coat. Apply topcoat (polyurethane enamel) using same procedure.
   (4) Should a repair be required (cracked or chipped paint) to areas where surfacer is applied, sanding surfacer should be removed to expose fiberglass or Kevlar. It may be necessary to remove all sanding surfacer on that individual assembly and/or component to obtain a satisfactory finish. For additional information, refer to Cleaning.

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(5) Sanding surfacer methods.
(a) Do not intermix vendor material or substitute material. Also, do not substitute instructions. Select and use one vendor's material and use the corresponding instructions.

B. Cleaning.

CAUTION: Do not use chemical strippers on fiberglass, Kevlar and graphite composite assemblies. Paint stripper solvent will damage these assemblies. Exterior composite assemblies include: inside of nose compartment doors, inside of nose landing gear doors, wing tips, aileron tips, inside tailcone access door, tailcone stinger cap, pylon ram air scoop and vertical stabilizer bullet

CAUTION: Carefully sand paint and/or sanding surfacer. Do not sand into the fabric layers of composite assemblies as this will result in loss of strength.

(1) Remove paint covering sanding surfacer by sanding. Paint should be removed well beyond damaged area. For best results, it is recommended to remove all paint covering sanding surfacer of that individual composite component.
(2) Remove sanding surfacer by sanding from individual component to expose fabric.
(3) Scuff sand area to be refinished with 320 grit paper. Do not over expose fabric.
(4) Clean surface with Methyl n-Propyl Ketone. Follow manufacturer's instructions for final cleaning prior to sanding surfacer application.

5. Paint Stripping

A. Mechanical Stripping
(1) Mechanical methods of stripping include power sanding with a disc or jitterbug type sander, grinder, hand sanding, and wire brushing.
(a) Ensure mechanical methods do not damage surfaces being stripped. Damage may include, but is not limited to, cutting fibers of composite structures or scratches in the surface of metallic surfaces.

CAUTION: Do not use low carbon steel brushes on aluminum, magnesium, copper, stainless steel or titanium surfaces. Steel particles may become embedded in the surfaces, and later rust or cause galvanic corrosion of the metal surfaces.

(2) Mechanical stripping must be used for stripping composite or plastic surfaces.
(3) Mechanical stripping is recommended for surfaces which might entrap chemical strippers and result in corrosion.
(4) Mechanical stripping is required for painted surfaces masked during chemical stripping.

B. Chemical Stripping.

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WARNING: Wear goggles, rubber gloves, aprons and boots. All paint strippers are harmful to eyes and skin. In case of paint stripper contact with skin, flush with water. In case of paint stripper contact with eyes, flush eyes thoroughly with water and consult physician immediately. Paint stripping should be done in a well ventilated area.

CAUTION: Do not use a heater with an open flame. Hydrochloric acid fumes are produced when paint stripping with a methylene chloride type stripper. If acid is deposited on airplane it will corrode all surfaces.

(1) Thoroughly clean airplane surfaces to remove all grease and other dirt which might keep stripping agent from attacking paint.
(2) All seams and joints must be protected by applying a tape, resistant to strippers, to every joint to prevent stripping chemicals from entering the skin joints. Chemicals used for stripping polyurethane paint are very difficult to remove from joints, and may promote corrosion or deteriorate bonding agents used in assembly of airplane.
(3) Mask following surfaces using plastic sheeting or waxed paper and plastic tape so as to make a safety margin of at least one-half inch (13 mm) between protected surface and surface to be stripped.

CAUTION: Do not use paper masking tape.

(a) Mask all windows and transparencies.

CAUTION: Use water and grease-proof barrier material and polyethylene coated tape to protect windows. Acrylic windows may be softened or otherwise damaged by paint stripper, solvent or paint.

1 Place barrier material over window and seal around periphery with polyethylene backed masking tape.
2 Cut second sheet of barrier material an inch (26 mm) or more larger than window.
3 Place second sheet of barrier material over window and seal with polyethylene tape.

(b) Mask all rubber and other nonmetals.
(c) Composites, if possible, shall be removed from airplane prior to stripping.
(d) Mask all pivots, bearings and landing gear.
(e) Mask all skin laps, inspection holes, drain holes, or any opening that would allow stripper to enter airplane structure.

CAUTION: Do not allow paint stripper to contact components made of titanium. Paint strippers may induce hydrogen embrittlement in titanium.

CAUTION: Do not allow paint stripper to contact high heat treated steel pins, such as pins attaching landing gear components. Paint strippers may induce hydrogen embrittlement in high heat treated steel.

(4) Apply approved stripper by spray or brush method.

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WARNING: Use normal safety precautions when using flammable materials during cleaning and painting procedures.

WARNING: Wear goggles, rubber gloves, apron and boots when working with paint stripper. Paint stripper solution is harmful to eyes and skin. Also wear appropriate respirator when applying "spray-on" strippers. The chemical supplier bulletins and instructions should be closely followed for proper mixing of solution, application methods and safety precautions.

(a) If using spray method, apply a mist coat to area to be stripped, then when paint begins to lift, apply a second heavy coat.
(b) If applying with brush, brush across the surface only once, in one direction.

(5) Allow stripper coating to lay on the surface until paint lifts.
(6) After paint begins to lift, use a propylene bristle brush to agitate stripper to allow deeper penetration of stripper.
(7) Remove lifted paint with a plastic squeegee. Dispose of residue in accordance with local regulations.
(8) Inspect all surfaces for incomplete paint removal.
(a) Repeat previous procedural steps as necessary until all paint is removed.
(9) After stripping airplane, thoroughly rinse to remove any stripping residue.
(10) Remove tape applied to protect joints and other masked areas.
(11) Carefully remove remaining paint at skin joints and masked areas by sanding with a hand or jitterbug type sander.
(12) If necessary to remove paint from inside skin joints, refer to Cleanout of Skin Joints.
(13) If corrosion is encountered, refer to Chapter 51, Corrosion/Repair for corrosion treatment.

C. Cleanout of Skin Joints.
(1) Install a surface conditioning disc on a pneumatic drill.
(2) Taper edge of disc to an edge which will allow edge to fit into skin joint seam.
(a) Run disc against a piece of coarse abrasive paper or a mill file until edge is tapered.

CAUTION: Ensure doubler at bottom of joint is not damaged or gouged in any way by this process Excessive pressure or dwell time will cause scratches or grooves in metal.

(3) Using tapered surface conditioning disc, remove paint and other material from joint seams.
(4) Carefully, and using as low speed as possible, remove paint and all other material from joint.

NOTE: Surface conditioning disc will wear rapidly. It will be necessary to resharpen (retaper) disc frequently.

6. Hand Solvent Cleaning

WARNING: Work in a well ventilated area free from sources of ignition. Use only approved solvents and materials.

CAUTION: Ensure airplane is grounded during solvent wipe.

A. Surface Cleaning.
(1) Apply solvent to a clean wiping cloth by pouring from a safety can or other approved container. The cloth should be well saturated with solvent. Avoid dipping wipers into open solvent containers as this contaminates the solvent.
(2) Wipe the surface with the wet cloth as required to dissolve or loosen soils. Work on a small enough area so that the area being cleaned remains wet with solvent.

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(3) With a clean dry cloth, immediately wipe dry the area being cleaned. Do not allow the surface to evaporate dry.
(4) Repeat steps (1) through (3) as required and change cloths often.

7. Maintenance of the Interior and Exterior Primary Coatings and Topcoat

A. Rework and repair primary coatings on airplane interior and exterior surfaces for protection and corrosion control.
(1) Minor scratches or blemishes on painted surfaces, which do not penetrate the epoxy primer or which penetrate the primer and expose bare metal, with the total area of exposed bare metal less than the size of a dime, touch up as follows:
(a) Hand solvent clean and sand with 320 grit or finer sandpaper.
(b) Clean with compressed air, hand solvent clean again, then wipe with a tack rag.
(c) Mix and reapply epoxy primer (MIL P-23377 or equivalent) as directed by the primer manufacturer or supplier.
(d) On a properly prepared surface, mix and apply polyurethane topcoat as directed by the paint manufacturer or supplier.
(2) Major abrasions or blemishes on painted surfaces which expose bare metal to an area larger than the size of a dime, touch up as follows:
(a) Hand solvent clean and sand with 320 grit or finer sandpaper.
(b) Clean with compressed air, hand solvent clean again, then wipe with a tack rag.
(c) Apply a spray wash primer or (preferred method) brush chem film primer. Mask the area to minimize the amount of primer from spreading over the existing epoxy primer. Let cure according to the product manufacturers recommendations.
(d) Mix and apply epoxy primer (MIL P-23377 or equivalent) to the affected area within four hours.
(e) If an exterior painted surface, mix and apply topcoat as directed by the paint manufacturer or supplier.

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CONVERSION DATA - DESCRIPTION AND OPERATION

1. General

A. This section contains information for converting the more commonly used measuring units found in this manual from the common United States system to the International System of Units (metric system).

B. Other conversion factors may be found in manuals such as *Standard for Use of the International System of Units (SI): The Modern Metric System*, prepared by ASTM, 100 Bar Harbor Drive, West Conshohocken, PA 19428-2959 USA.

2. Conversion Factors

A. Distance and Length
   (1) Multiply inches by 25.4 to obtain mm (millimeters).
   (2) Multiply feet by 0.3048 to obtain m (meters).

B. Mass
   (1) Multiply ounces by 28.35 to obtain g (grams).
   (2) Multiply pounds by 0.436 to obtain kg (kilograms).

C. Temperature
   (1) Subtract 32 from degrees Fahrenheit and multiply by 5/9 to obtain degrees Celsius.

D. Torque
   (1) Multiply inch-pounds by 0.11298 to obtain Newton-meters.
   (2) Multiply foot pounds by 1.3588 to obtain Newton-meters.

E. Force
   (1) Multiply pounds of force by 4.4482 to obtain N (Newtons).

F. Pressure
   (1) Multiply pressure (psi) by 6.8948 to obtain kPa (kiloPascals).

G. Mass flow
   (1) Multiply pounds-per-hour by 1.26 X 10^{-4} to obtain kg/sec.

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CHAPTER

21

AIR CONDITIONING

LIST OF EFFECTIVE PAGES

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21-00-00	Page 101	Jun 17/2005
21-20-00	Page 1	Jun 17/2005
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AIR CONDITIONING - GENERAL

1. Scope

A. This chapter describes those units and components which furnish a means of pressurizing, heating, cooling, moisture controlling, filtering, and treating the air used to ventilate the areas of the fuselage within the pressure seals.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Distribution describes that portion of the system used to induct and distribute air. Includes items such as ducting and vents.
   (2) Heating describes that portion of the system and its controls which supply heated air.
   (3) Cooling describes that portion of the system and its controls which supply cooled air.
   (4) Temperature control describes that portion of the system used to control the temperature of the air. Includes items such as thermal sensing devices and switches.

3. Environmental Systems

A. Description.
   (1) The environmental systems are defined as the airplane systems that are necessary for the comfort and safety of the flight crew and passengers.
   (2) In this manual, these systems consist of the heating, ventilating, and defrosting system.

4. Heating, Ventilating, and Defrosting System

A. Description.
   (1) The heating, ventilating, and defrosting system provides controlled air, either heated or cool, to all areas of the cabin. Air is supplied to the heater through a ram air opening in the nose of the airplane. From the heater, air is ducted to controllable heat outlets in the cabin. Two heat outlets are provided at the base of the windshield for defrosting purposes, two are located in the forward upholstery side panels, two are on the aft face of the main spar beneath the pilot and copilot's seat and a direct air outlet located on the forward cabin bulkhead (Refer to Figure 1).

5. Components Location Chart

A. Environmental Systems.

Component	Location
HEATER	
Filter and Solenoid	Right Wing
Ignition Plug	On Heater
Shut Off Valve (Manual)	Right Wing Gap Area
Thermostat	On Heat Control Assembly in Nose at FS 0.00 Bulkhead
Fuel Pump	On Heater

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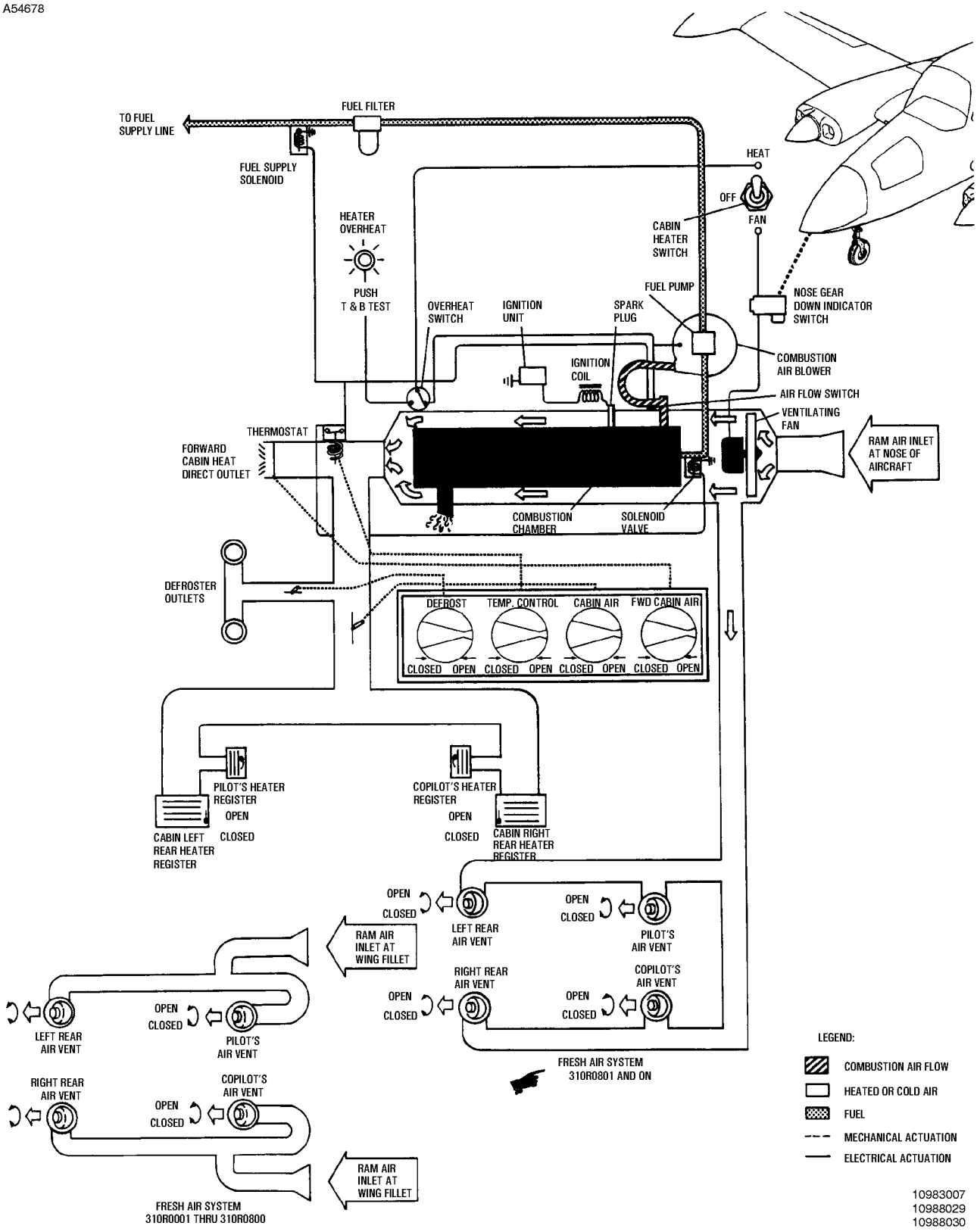

Heating, Ventilating, and Defrosting Schematic
Figure 1 (Sheet 1)

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6. Materials

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Methyl n - Propyl Ketone		Commercially Available	Cleaning.
Adhesive	EC2262	Minnesota Mining	Bonding duct to fittings.

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AIR CONDITIONING - TROUBLESHOOTING

1. Air Conditioning

A. Troubleshooting.
(1) For a guide to troubleshooting the heater system, refer to Table 101.

Table 101. Cabin Heater Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
HEATER FAILS TO LIGHT.	No power to heater.	Check electrical circuits.
	Faulty heater ignition system.	Replace spark plug or ignition unit.
	Faulty fuel solenoid shutoff valve.	Replace valve.
	Fuel filter dirty or clogged.	Replace filter.
	Heater spray nozzle clogged.	Clean if clogged or replace if damaged.
	Low output from combustion air blower.	Remove any obstructions or replace blower.
	Faulty air pressure switch.	Replace switch.
HEATER CYCLES OFF.	Obstruction in ventilating air duct.	Remove obstruction.
	Faulty or damaged vent air blower.	Repair or replace blower.
	Faulty cycling switch.	Replace switch.
HEATER BACKFIRES, BURNS WITH PULSATING COMBUSTION, OR SHOWS SMOKY EXHAUST.	Fouled spark plug.	Replace spark plug.
	Exhaust line restricted or insufficient combustion air.	Remove restrictions.
	Excessive fuel supply to heater.	Check fuel nozzle for looseness, proper part number, and damage. Replace if required.
	Faulty fuel pressure regulator or fuel pump.	Check for proper output pressure. Replace if faulty.
HEATER STARTS, THEN GOES OUT.	Improper fuel pressure at heater.	Check fuel pressure. Replace faulty components.
	Faulty overheat limit switch.	Replace limit switch.
HEATER FAILS TO SHUT OFF.	Fuel solenoid in heater stuck open or dirty.	Clean or replace valve.

(2) For troubleshooting the heater, refer to Heater and Components Overhaul/Parts Manual.

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DISTRIBUTION - DESCRIPTION AND OPERATION

1. Cabin Air Flow and Controls

A. Description.

(1) On Airplanes 310R0001 thru 310R0800, fresh air is routed through ducting from inlets located in the wing gap leading edge and expelled through individually controlled valves positioned by each seat. On Airplanes 310R0801 thru 310R2140, fresh air is routed from the heater blower fan through ducting and expelled through outlet valves. Heated or unheated fresh air is also routed through the heater chamber, through ducting and expelled through outlets located on the aft side of the front spar and outlets at side panel. Air is expelled from the cabin through an overboard vent located at the aft end of the cabin. A muffler is incorporated in the overboard vent on the 310 standard airplane.

(2) The cabin is heated by five warm air vents. Warm air is routed from the heater through air ducting and expelled into the cabin through four heat registers and a forward cabin outlet. Warm air is directed to the forward cabin, aft cabin, or defrost outlets by means of valves manually controlled by control knobs on the right instrument panel. Warm air outlets also have individual air control knobs which regulate the amount of warm air entering the cabin. A thermostat mounted on the heat control assembly controls the temperature of air entering the cabin.

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DISTRIBUTION - REMOVAL/INSTALLATION

1. Air Vents and Ducting

A. Removal (Refer to Figure 401).

NOTE: All fresh air inlet ducting is bonded to the adapters and fittings. Do not remove tubes except for replacement. A tube may be cut from a component and still have sufficient length for reinstallation when replacing a fitting or adapter.

(1) Remove seats, carpet, and upholstery panels as required to gain access to ducting; refer to Chapter 25.
(2) Remove access panels and wing gap fairings as required to gain access to ducting; refer to Chapter 6, Dimensions & Areas - General.
(3) Cut ducting off at the adapter or fitting and cut remainder from fitting with a knife. Clean bonding cement from fittings with Methyl n-Propyl Ketone.
(4) Remove air vent adapters by removing screws.

B. Installation (Refer to Figure 401).
(1) Install air vent adapters as shown in Detail A and Detail B of Figure 401.
(2) Route new ducting into position and bond to adapters or fittings with EC2262 adhesive. Prepare and apply adhesive in accordance with the manufacturer's instructions.
(3) Install access panels and wing gap fairing.
(4) Install upholstery panels, carpet, and seats.

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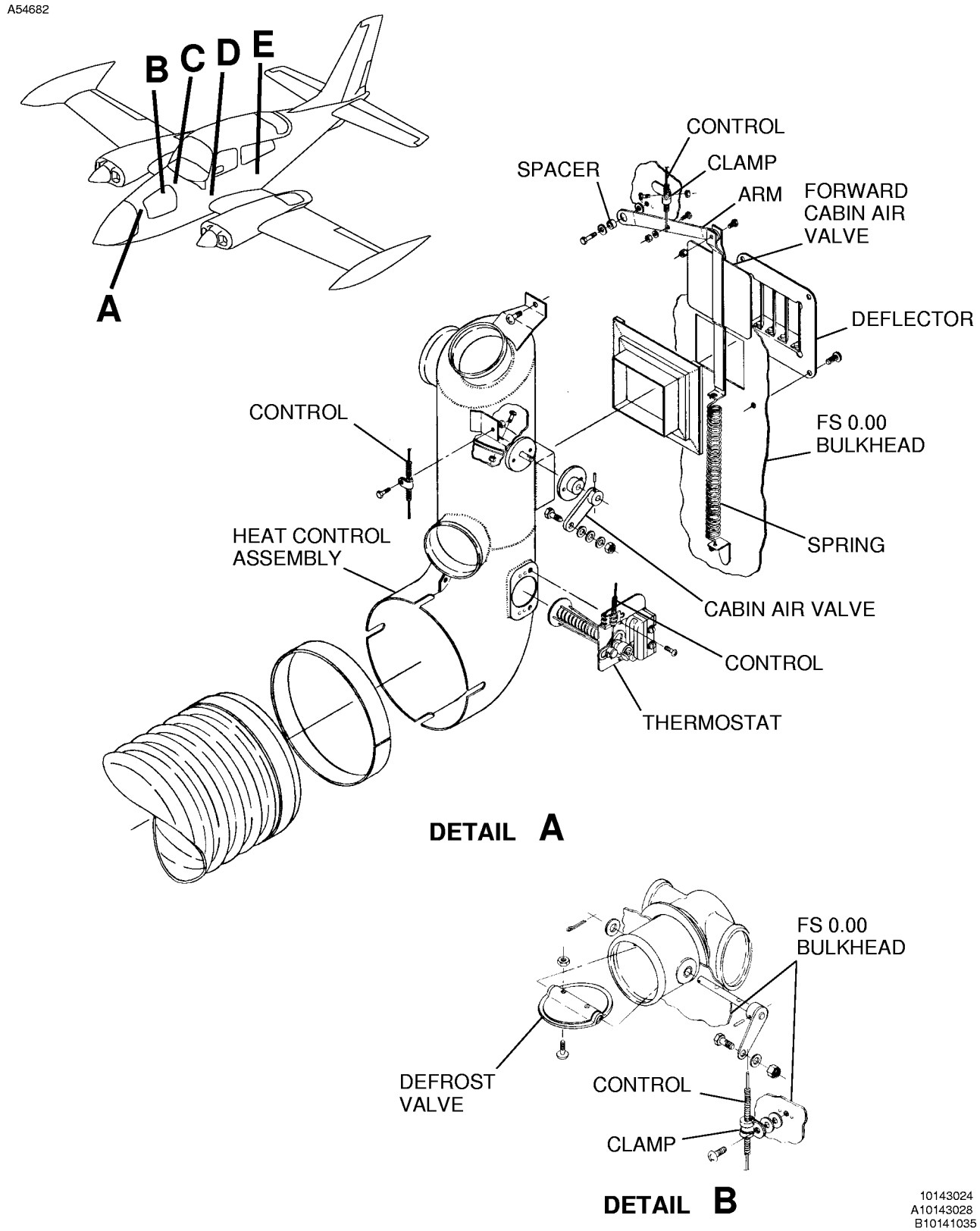

Heating, Ventilating, and Defrosting System Installation
Figure 401 (Sheet 1)

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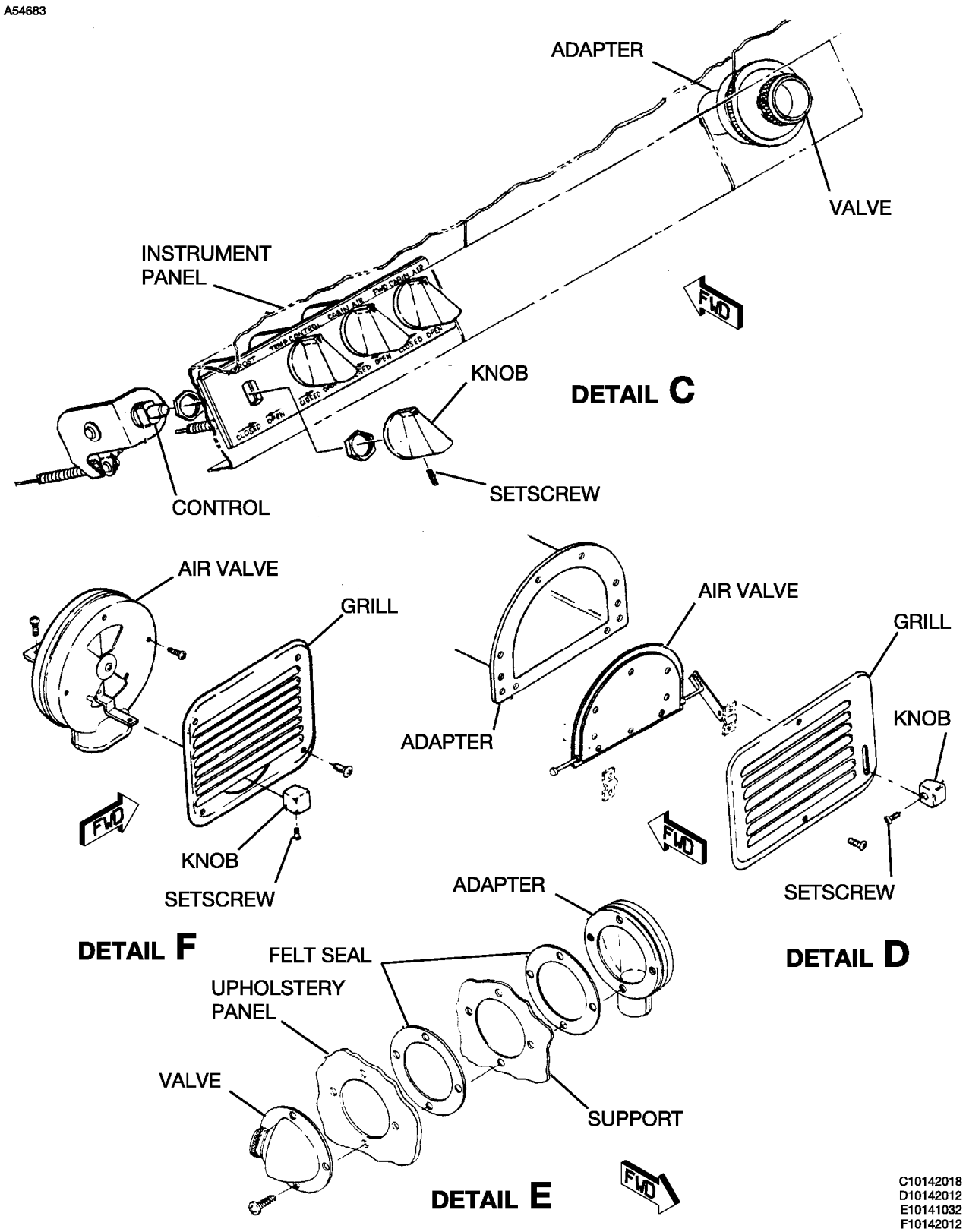

Heating, Ventilating, and Defrosting System Installation
Figure 401 (Sheet 2)

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HEATER - DESCRIPTION AND OPERATION

1. Heating System

A. Description.

(1) The heater is a gasoline combustion type mounted in the right side of the nose section. Fuel is routed from a tee in the fuel crossfeed line through a solenoid valve and a filter to a fuel pump mounted on the combustion blower motor. The heater fuel pump assembly is enclosed in a metal housing. The housing is vented and drained as a precaution against fire in the event of a fitting leakage. Fuel routed through the fuel line assembly enters the heater solenoid valve which allows fuel to pass through the combustion chamber spray nozzle. Electrical current is supplied to the combustion air blower, combustion air pressure switch, and ignition coil when the heater switch is placed in the HEAT position. When the nose gear is in the DOWN position, electrical current is also supplied to the ventilating fan. As the combustion air flow increases, the combustion air pressure switch closes and actuates the ignition coil and heater solenoid valve. Fuel then flows through the heater solenoid valve into the combustion chamber spray nozzle which injects a conical shaped spray cone of fuel into the combustion chamber where the spark plug is already sparking, thus combustion occurs. As the heated air flowing from the heater to the cabin exceeds the thermostat setting, the thermostat automatically closes the solenoid valve, stopping fuel flow into the heater. As the heater cools, the thermostat opens the solenoid valve, allowing fuel to flow and combustion takes place since the spark plug is continually sparking. By cycling on and off, the heater maintains an even air temperature in the cabin. The heater combustion chamber is completely separate from the ventilating system to prevent any exhaust gases from contaminating the cabin air. All exhaust gases are vented overboard through an exhaust tube directly beneath the heater.

2. Cabin Heater Fuel System

A. Description.

(1) The cabin heater fuel system consists of the solenoid valve, fuel filter assembly, and necessary plumbing for connection to the airplane's fuel system. The solenoid valve and filter assembly are mounted inside the right wing leading edge inboard of station 38.16. The solenoid valve is electrically operated and controls the fuel flow to the heater fuel pump. If an overheat condition exists in the heater, the solenoid will automatically be shut off.

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HEATER - TROUBLESHOOTING

1. Heater

A. Troubleshooting.
(1) For a troubleshooting table for the heater system, refer to Air Conditioning - Troubleshooting.

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HEATER - REMOVAL/INSTALLATION

1. Heater Assembly

A. Removal (Refer to Figure 401).
(1) Tag and disconnect electrical wires from the heater terminal strip.
(2) Loosen clamps securing blower outlet tube and remove tube from combustion air blower and heater.
(3) Loosen clamps securing blower inlet tube and remove tube from combustion air blower.
(4) Remove four screws and remove cover from fuel pump assembly (2).
(5) Remove fuel inlet shroud by removing two screws and clamp.
(6) Disconnect fuel supply line (3).
(7) Disconnect and remove fuel line.
(8) Disconnect and remove vent air inlet lines and vent air outlet lines.
(9) Remove four screws securing combustion air blower and fuel pump assembly to support brackets. Remove assemblies from airplane.
(10) Loosen clamp and slide ducts from heater.
(11) Remove clamp (9) and lift heater from airplane.
(12) Remove fuel drain line (8).

B. Installation (Refer to Figure 401).

NOTE: On installation ensure drain and vent lines are installed to provide a positive slope to drain.

NOTE: There are three types of heater blower motors. The original had the positive wire exiting from the end of the housing, while the two later configurations had the wire exiting from the side.

(1) If you are replacing a heater blower motor with a later configuration blower for the first time, modify the clamp as shown in Figure 402.

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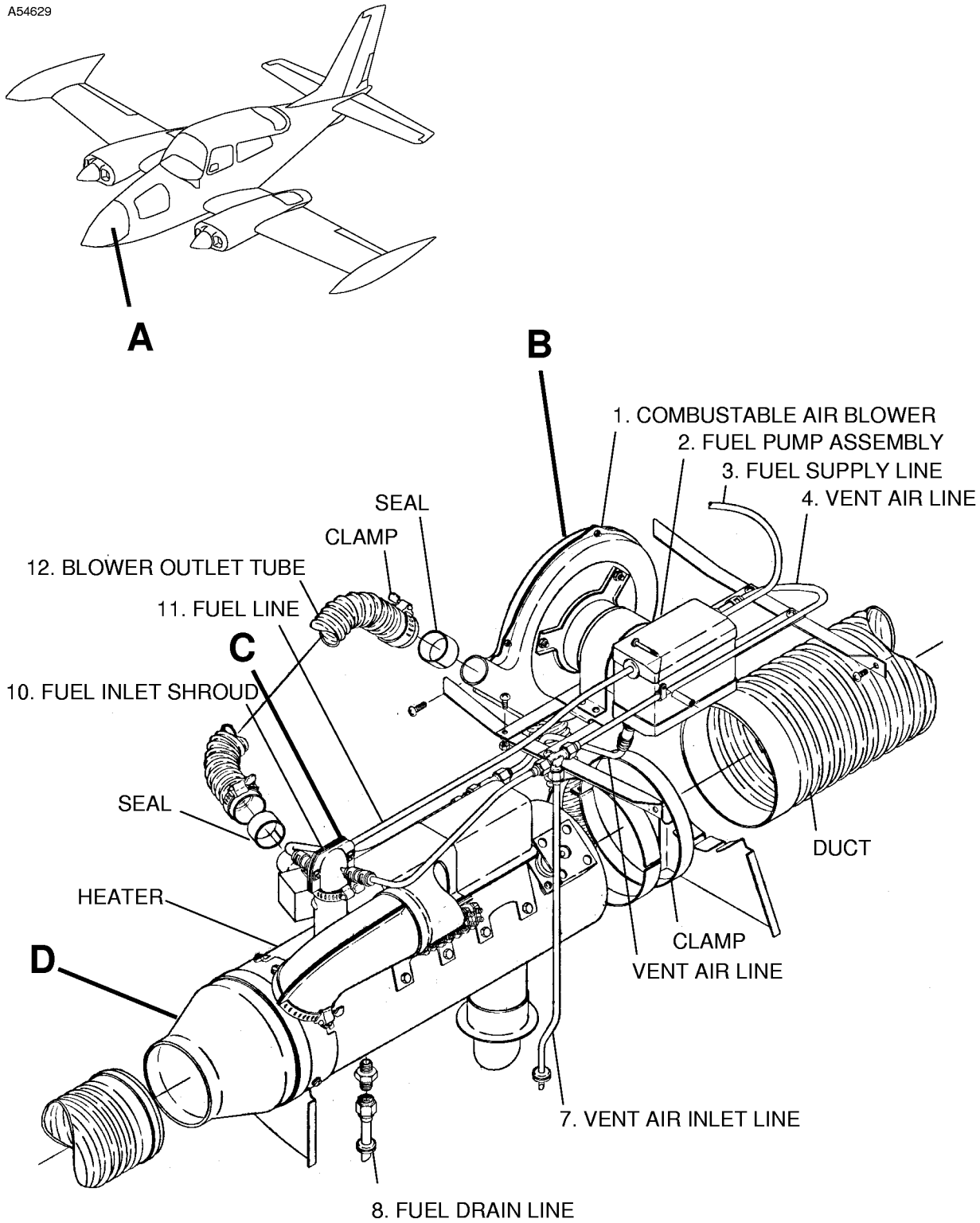

DETAIL A

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Heater Assembly Installation
Figure 401 (Sheet 1)

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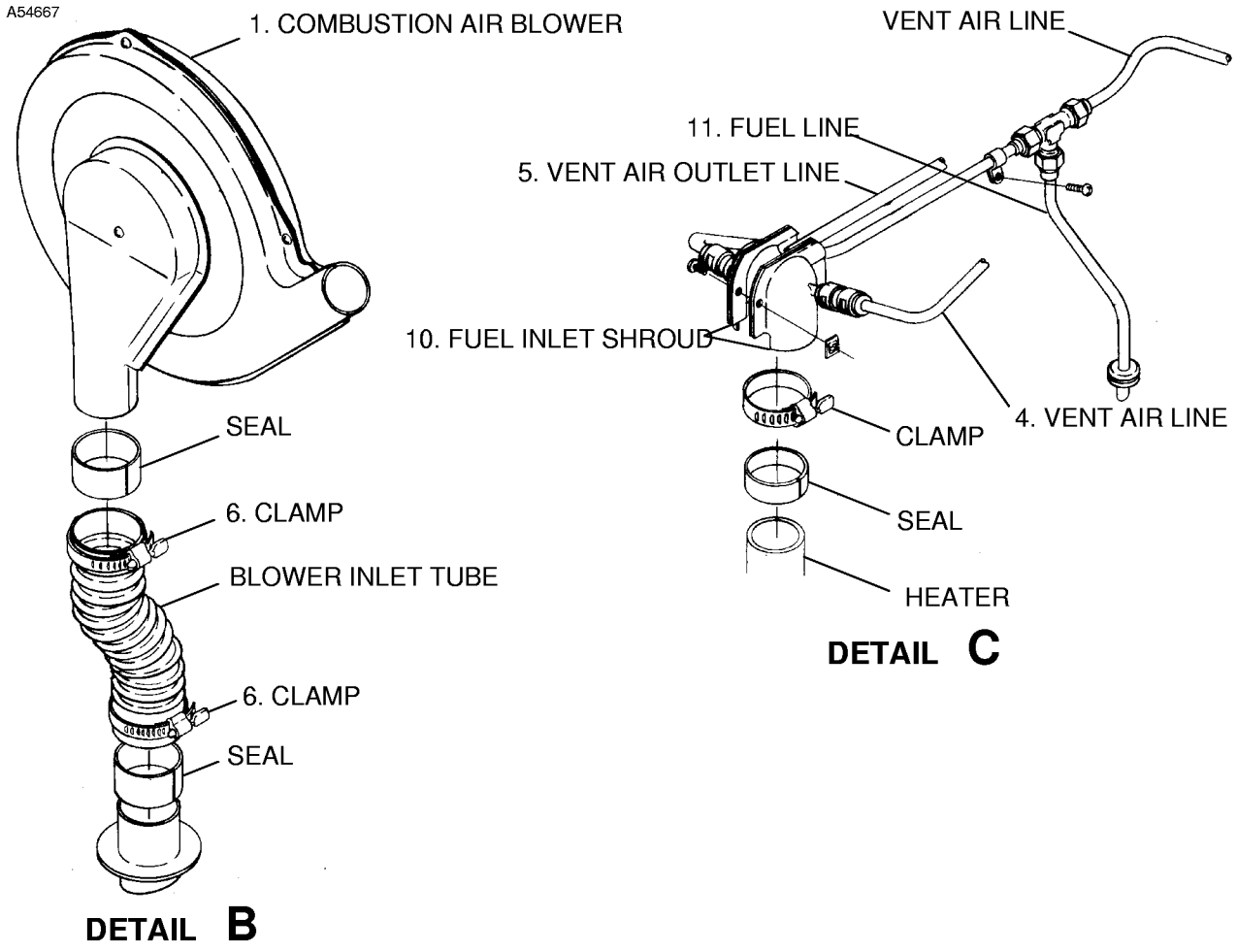

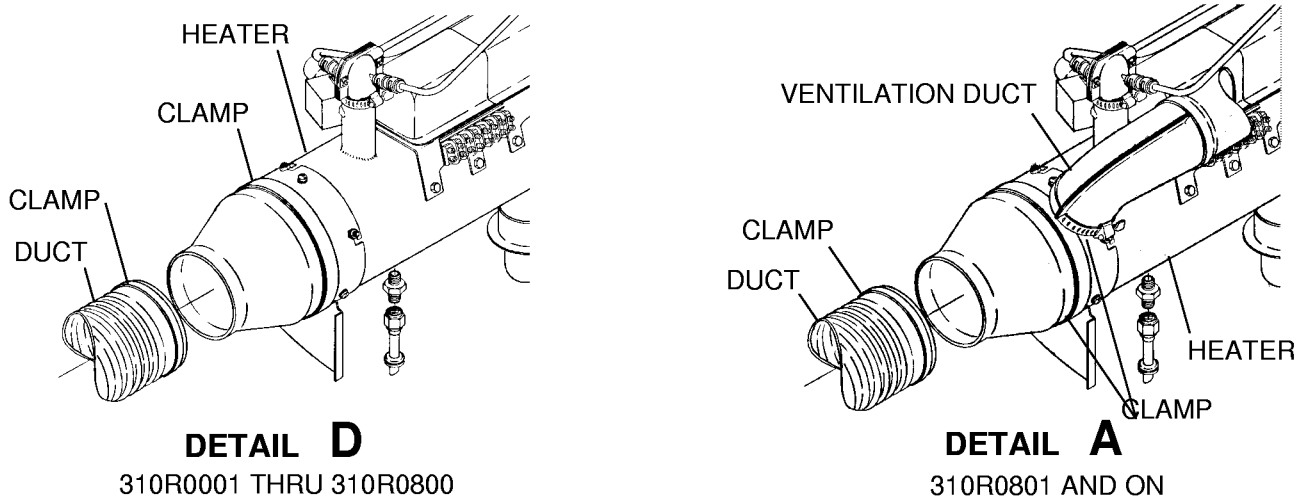

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Heater Assembly Installation
Figure 401 (Sheet 2)

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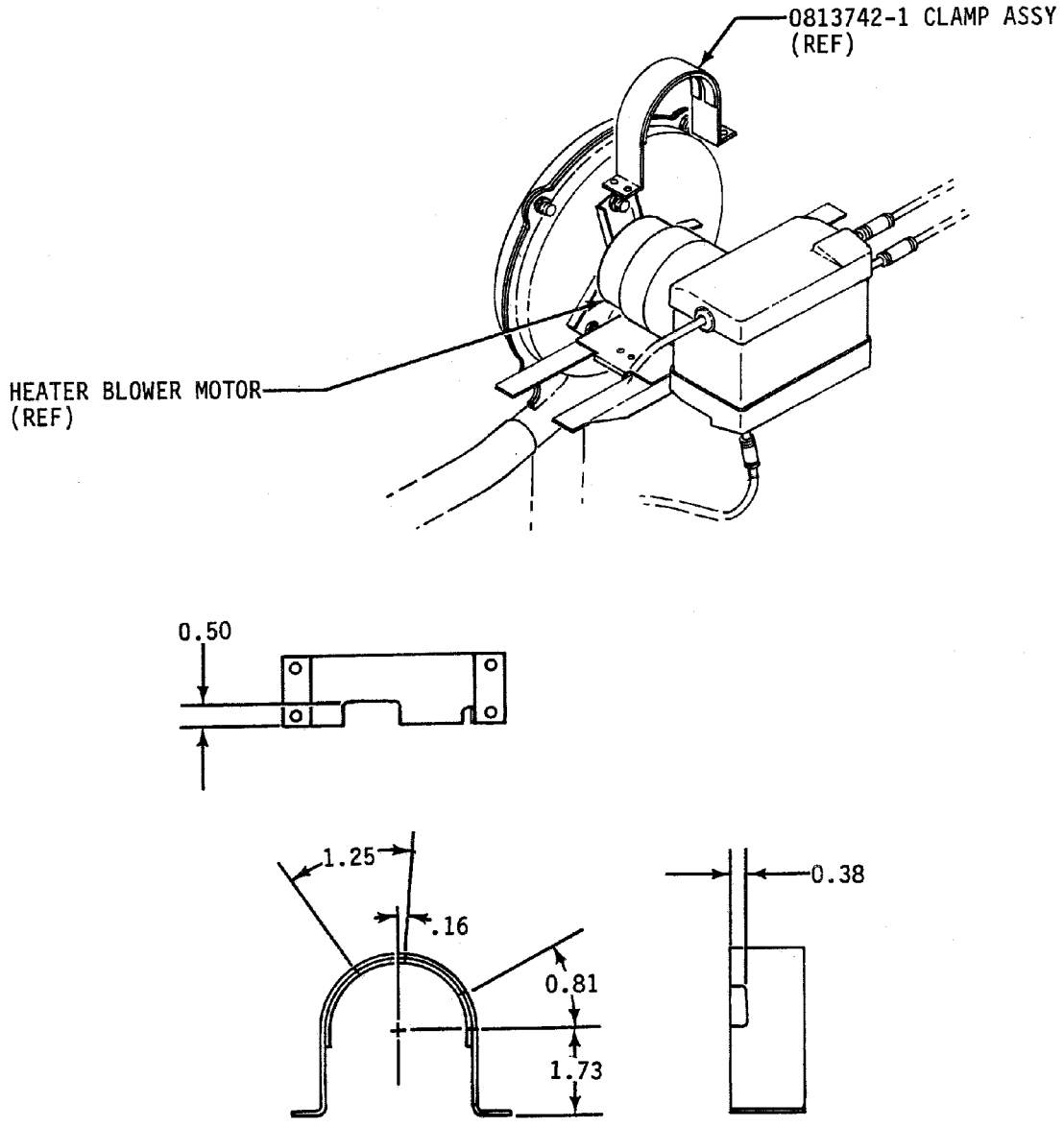

0813742-1 CLAMP ASSEMBLY

Heater Blower Motor Clamp Modification
Figure 402 (Sheet 1)

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(2) Install drain line (8) to heater assembly prior to installation of heater.
(3) Guiding fuel drain line (8) through the grommet in the lower skin, lower heater into place resting on the support brackets.
(4) Clamp forward end of heater to support with clamp (9).
(5) Slide forward and aft ducts onto heater and secure with clamps.
(6) Position combustion air blower and fuel pump assembly in place and secure bracket with four screws.
(7) Connect fuel line (11) to fuel pump (2) and at heater fuel inlet.
(8) Connect fuel supply line (3).
(9) Install blower inlet tube and secure with clamps (6).
(10) Install blower outlet tube (12) and secure with clamps.

NOTE: Operate heater and verify no leaks exist at fuel line connections before installing fuel pump cover and fuel inlet shroud.

(11) Install fuel pump cover with four screws.
(12) Install fuel inlet shroud (10) with two screws and clamp.
(13) Install vent air inlet line and vent air outlet lines as shown in Figure 401.

NOTE: Make sure vent air inlet line (7) is scarfed on the forward side and vent air outlet line (5) is scarfed on the aft side.

2. Solenoid Valve

A. Removal (Refer to Figure 403).
(1) Remove access covers from lower leading edge of right wing station 38.16.
(2) Position fuel selector control handles to OFF.
(3) Ensure electrical power is OFF.
(4) Identify and disconnect electrical wiring to solenoid valve.
(5) Disconnect fuel lines to the solenoid valve.
(6) Remove solenoid valve by removing screws and nuts.

B. Installation (Refer to Figure 402).
(1) Attach solenoid valve to rib, using screws and nuts.
(2) Connect fuel lines to solenoid valve.
(3) Identify and connect electrical wires to solenoid.
(4) Conduct an operational check and check for fuel leaks, refer to Heater - Inspection/Check.
(5) Install access covers.

3. Fuel Filter Assembly

A. Removal.
(1) Remove access covers from lower leading edge of right wing station 38.16.
(2) Ensure electrical power is OFF.
(3) Disconnect fuel lines from the filter assembly.
(4) Remove filter assembly by removing nut, spacers, and bolts.
(5) For disassembly of fuel filter, refer to Cessna Heater and Components Overhaul/Parts Manual.

B. Installation.
(1) Attach filter assembly to rib, using bolts, spacers, and nuts.
(2) Connect fuel lines to filter assembly.
(3) Conduct an operational check and check for fuel leaks, refer to Heater - Inspection/Check.
(4) Install access covers.

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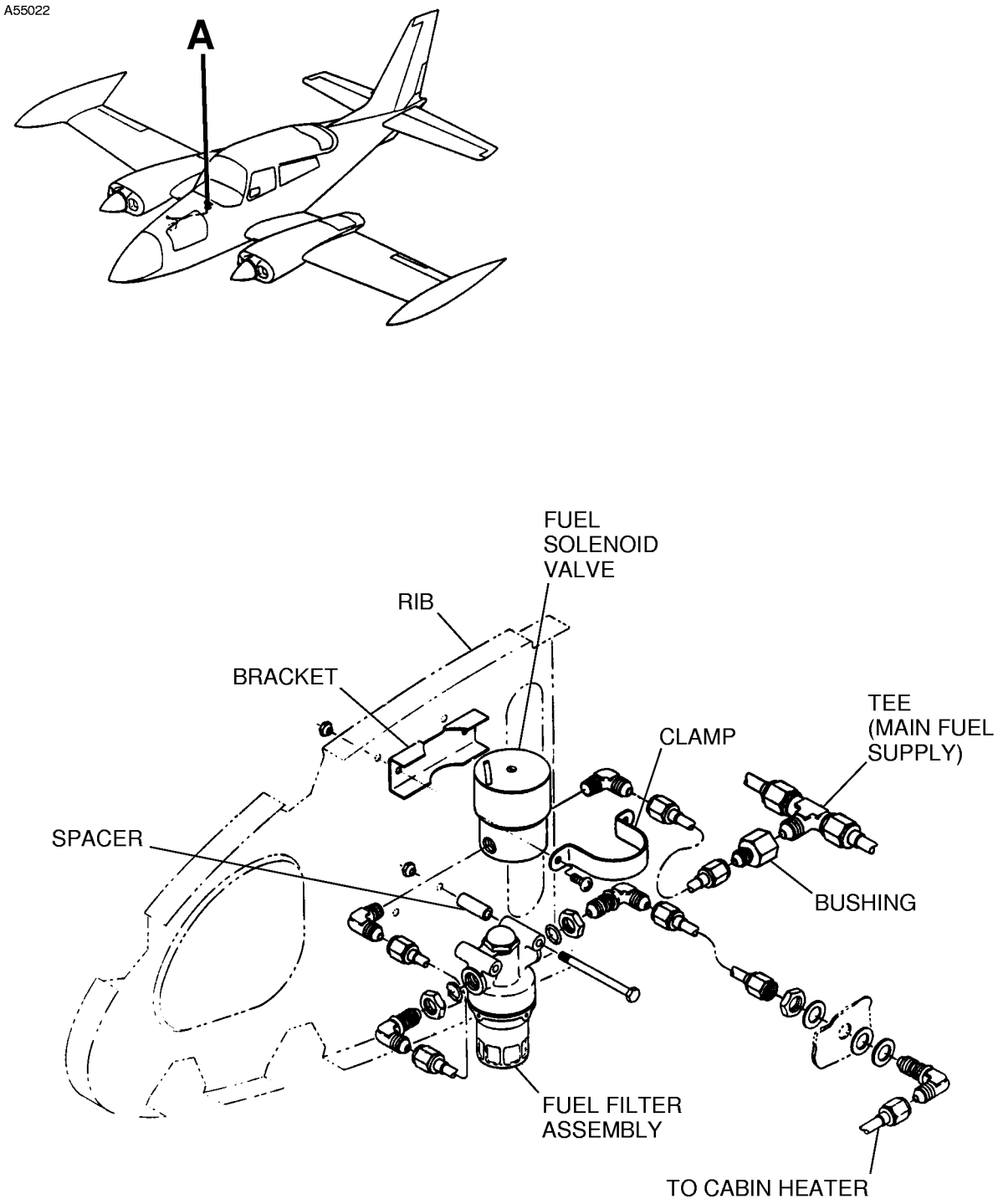

DETAIL A

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Cabin Heater Fuel System Installation
Figure 403 (Sheet 1)

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HEATER - INSPECTION/CHECK

1. Cabin Heater System

A. Cleaning and Inspection.
   (1) Clean any fuel line filter to prevent the buildup of ice, which will interfere with heater operation. Be sure to bleed the fuel line to the heater after cleaning the fuel filter.
   (2) Inspect the combustion air hose between the combustion air blower outlet and heater assembly air inlet. Small holes in the hose may not reduce airflow enough to prevent operation of the airflow switch, but they may bleed off enough air to cause premature fouling of the spark plug and the formation of excessive deposits in the burner assembly. Replace the hose if it is torn, pinched, restricted, or otherwise damaged.
   (3) Disconnect the thermostat leads and control cable and remove the thermostat from the ventilating air duct. Clean the helical element with a soft bristle brush to remove dust or dirt which may have accumulated in it. Replace the thermostat if the helical element is broken or distorted. Recalibrate the thermostat if heater output is low, or if the lockout overheat switch trips unnecessarily. Reinstall the thermostat into the ventilating air duct and connect the thermostat leads. Check pivot plate operation and adjust the control cable.
   (4) Inspect the heater fuel system for leaks. Check all lines, connections, seals, and gaskets for condition and security.

B. Operational Check.
   (1) Turn on heater with cabin thermostat set on lowest setting (preferable to run test in area with ambient temperature between 60°F - 80°F).
   (2) When heater starts cycling "OFF" and "ON" (both blowers will continue to run but fuel will automatically shut "OFF" and "ON"), turn cabin thermostat to maximum setting (the heater should burn longer and be "OFF" for shorter periods of time). Place a thermometer at the copilot air outlet. Outlet temperature should read 190°F, +10 or -10°F when the heater cycles "OFF" (do not allow temperature to exceed 220°F. At that point the duct limit switch will activate and shut off fuel flow until the thermostat is reset).
   (3) If thermostat (mounted on heater) adjustment is required, loosen set screw on thermostat cam and rotate counterclockwise to "increase" temperature setting. Tighten set screw (Refer to Figure 601).

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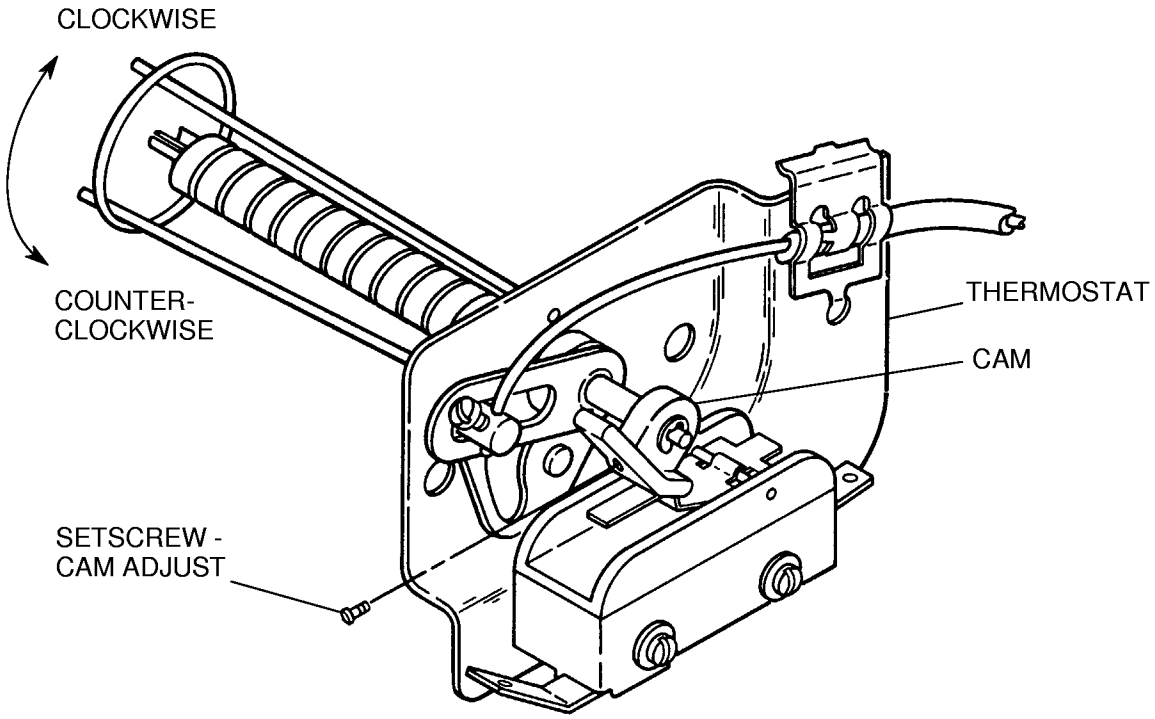

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Thermostat Adjustment
Figure 601

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(4) Turn heater "OFF" and turn ventilation fan blower "ON" to cool heater prior to complete shut down. At no time should there be any signs of fuel leakage.

C. 250 Hour Check

(1) After the first 250 hours of heater operation remove and inspect the spark plug.

(a) If the spark plug shows signs of fouling or erosion, return heater to a facility equipped to maintain combustion heaters for repair and testing.

NOTE: A fouled spark plug is an indicator of a fuel nozzle not operating correctly.

(b) If the spark plug is in good condition, clean and reinstall it.

(2) Check the ignition cable from the coil to the spark plug. Replace the cable if it is cracked or damaged or if the rubber boot is cracked or torn.

(3) Check the heater assembly, combustion air blower and fuel pump assembly, control box, remote solenoid valve, and thermostat for signs of damage, leakage, or overheating. Repair as necessary. Tighten loose hardware and make sure all wiring connections are tight.

(a) Check fuel lines and fittings for signs of leakage, tighten or replace parts as necessary.

(4) Remove the combustion air hose at the heater assembly air inlet. With the heater off, check the freedom of movement of the airflow switch vane inside the airflow switch. The vane should respond to light pressure. If resistance or binding sufficient to prevent normal operation of the switch is detected, remove the airflow switch and clean or repair the vane and shaft assembly as necessary.

CAUTION: Do not lubricate the vane or shaft with grease or oil. Lubricants attract and hold dust and dirt, and would cause the airflow shaft to bind.

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COOLING - DESCRIPTION AND OPERATION

1. Avionics Cooling System

A. Description.

(1) The avionics cooling system (instrument panel) is mounted in the control pedestal. The cooling system, which is optional, consists of a blower, filter, fuse holder, and electrical wiring. The blower is utilized to cool the avionics equipment mounted on the radio panel of the instrument panel.

(2) The supplemental avionics cooling system is mounted in the forward nose avionics bay. The cooling system consisting of two fans is installed when the 800 Avionics System, 800 Avionics System plus 400 DME, or when it is requested as an option. One fan is installed when only the 400 DME is installed. The fans are utilized to cool avionics located in the forward avionics bay.

2. Nav/Com Cooling System

A. Description.

(1) The cooling blower for the Nav/Com transmitter/receiver is mounted on the wheel well ahead of FS 0.0 bulkhead. Air ducts lead from the blower to the Nav/Com units.

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COOLING - REMOVAL/INSTALLATION

1. Avionics Cooling System

A. Removal (Refer to Figure 401).
(1) Ensure electrical power is OFF.
(2) Remove RH side panel from control pedestal as required to gain access to work area.
(3) Identify and disconnect blower ground wire (black) from structure; disconnect blower wire (blue) at splice.
(4) Remove blower and bracket from side panel of control pedestal by removing screws.
(5) Remove clamp from blower and bracket.

B. Installation (Refer to Figure 401).
(1) Position clamp on blower and secure clamp to bracket with bolt, washer, and nut.

NOTE: Clamp is to be positioned against stop block. Install blower with flow arrow pointing UP.

(2) Install blower and bracket to inside side panel of the control pedestal by screws.
(3) Identify and connect blower ground wire (black) to structure; connect blower wire (blue) at splice.

NOTE: Ensure ground wire is properly grounded.

(4) Replace RH side panel to control pedestal.

2. Supplemental Avionics Cooling System

A. Removal (Refer to Figure 402).
(1) Ensure electrical power is OFF.
(2) Remove forward nose bay access as required to gain access to work area.

NOTE: Note direction of airflow of fans and direction of deflectors on both fan installations.

(3) Identify and disconnect electrical wires from both nose cooling fans.
(4) Remove aft cooling fan and deflector from wheel well web by removing screws, washers, and spacers.
(5) Remove forward cooling fan and deflector from avionics shelf by removing screws, washers, spacers, and nuts.

B. Installation (Refer to Figure 402).
(1) Properly position forward cooling fan and deflector on avionics shelf and secure with screws, washers, spacers, and nuts.
(2) Properly position aft cooling fan and deflector to wheel well web and secure with screws, washers, and spacers.
(3) Identify and connect electrical wires to both nose cooling fans.
(4) Perform operational test.
(5) Install forward nose bay access.

3. Nav/Com Cooling System

A. Removal (Refer to Figure 403).
(1) Ensure electrical power is OFF.
(2) Remove aft panel in nose baggage compartment for access to blower.
(3) Tag and disconnect wiring lead.
(4) Remove tie strap (1) to remove ducts (2).

NOTE: If only one Nav/Com is installed, one of the outlets on the "T" adapter will be capped.

(5) Remove screws securing bracket (3) and remove blower and bracket assembly from the airplane.

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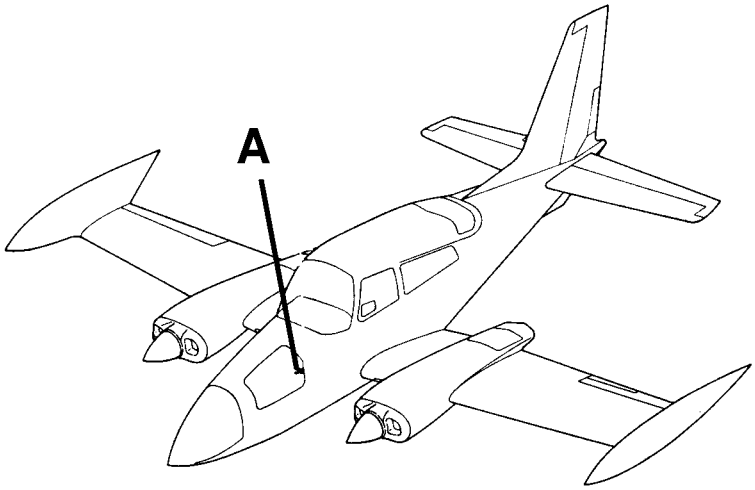

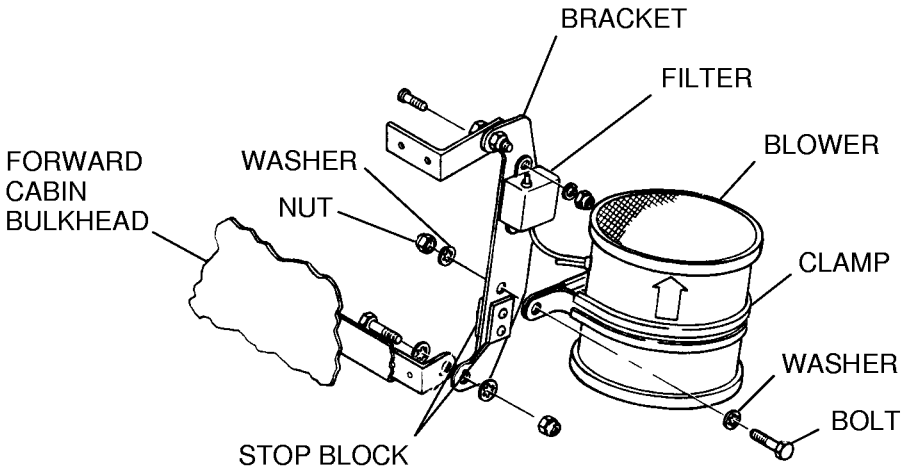

DETAIL A
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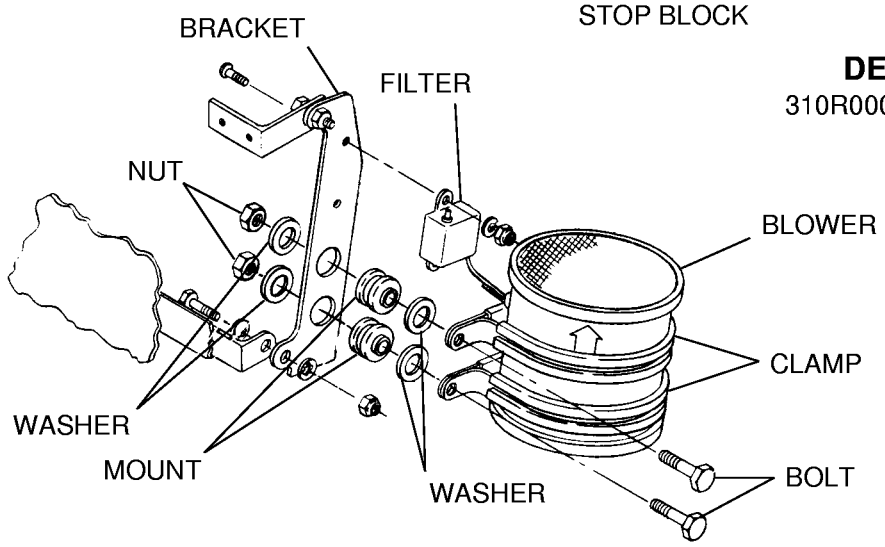

DETAIL A
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Avionics Cooling Blower Installation
Figure 401 (Sheet 1)

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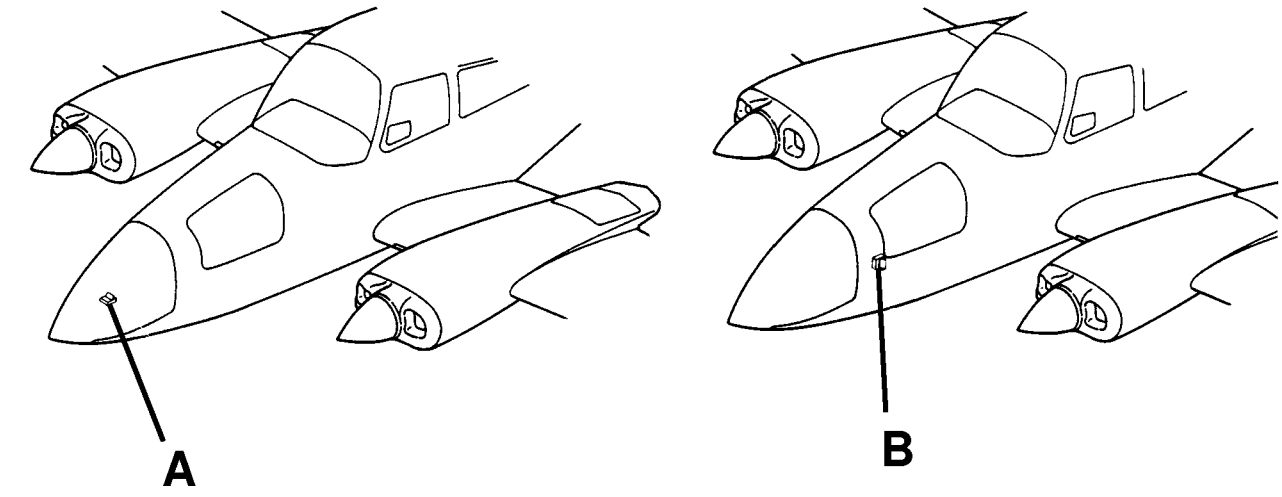

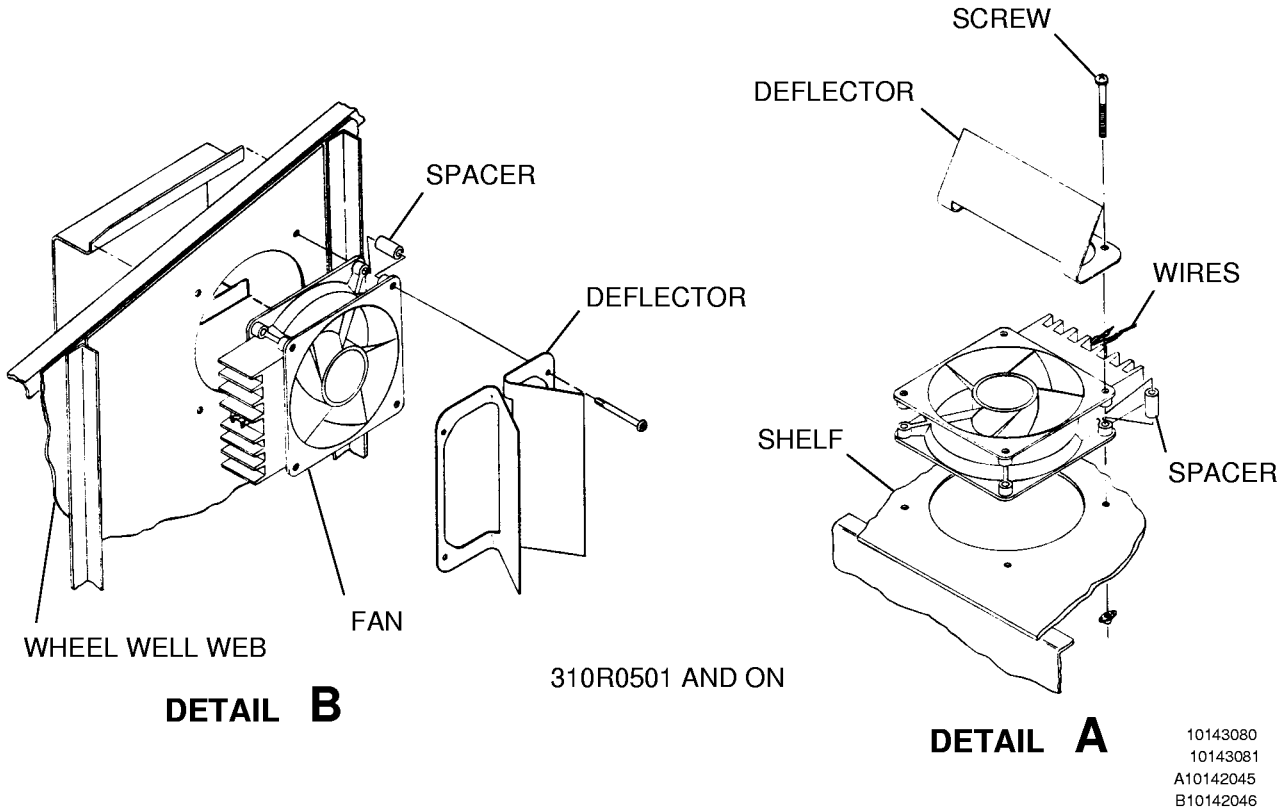

Avionics Cooling Fan Installation
Figure 402 (Sheet 1)

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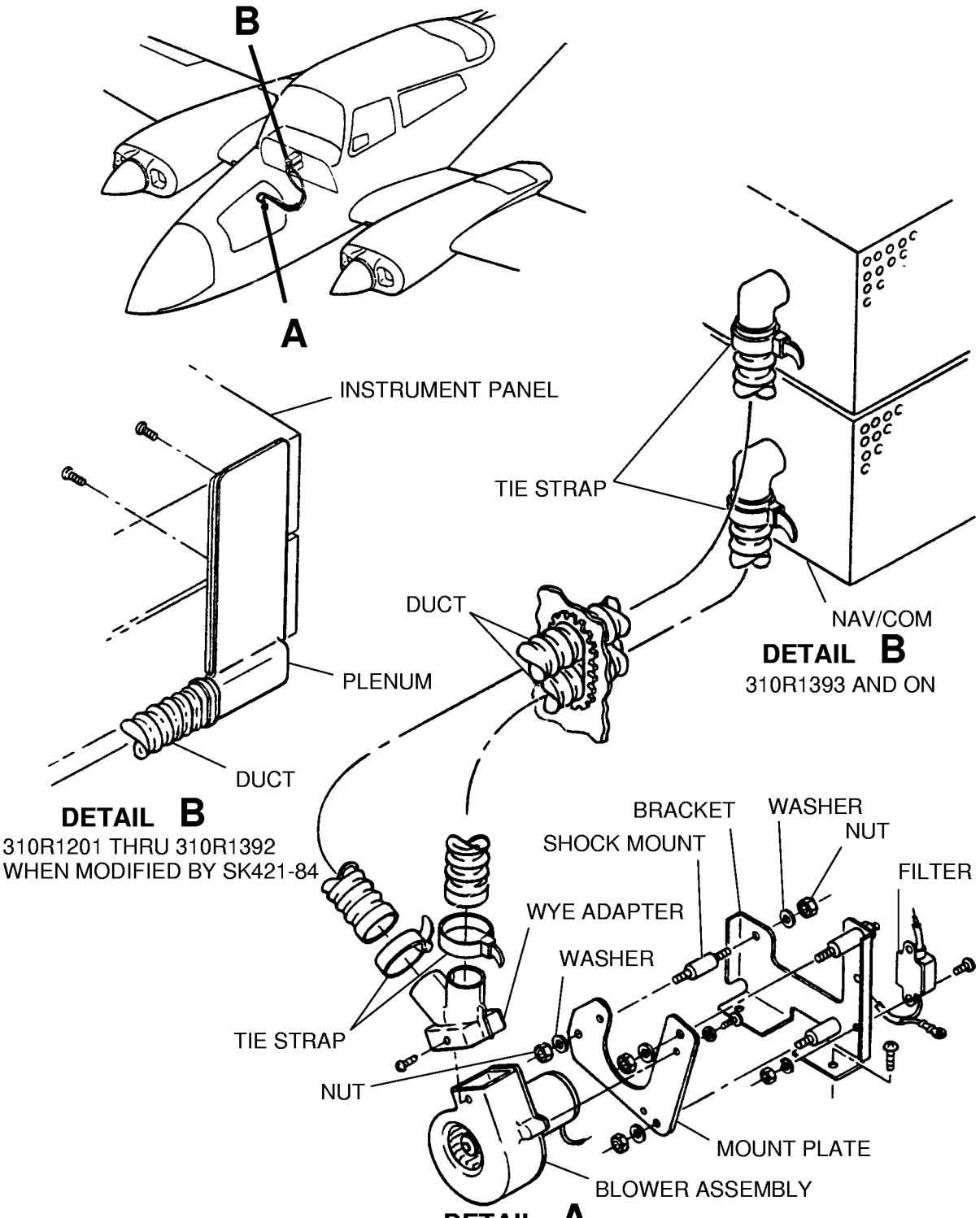

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Nav/Com Cooling System Installation
Figure 403 (Sheet 1)

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(6) The blower (4) and filter (5) can be disassembled from the bracket at bench.

B. Installation (Refer to Figure 403).
(1) If disassembled, assemble the blower (4) and filter (5) to the bracket at bench.
(2) Position blower and bracket assembly and secure bracket (3) with screws.
(3) Install ducts (2) and secure with tie strap (1).
(4) Remove tag and connect wiring lead.
(5) Perform operational test.
(6) Replace baggage compartment panel.

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TEMPERATURE CONTROL - DESCRIPTION AND OPERATION

1. Temperature Control

A. Description.

(1) The temperature of the cabin air is controllable by a control mounted on the instrument panel. The control knob mechanically controls the setting of a thermostat located on the heat control assembly. The thermostat cycles the heater to maintain the cabin temperature selected with the control knob.

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TEMPERATURE CONTROL - REMOVAL/INSTALLATION

1. Temperature Control

A. Removal.
(1) Loosen screw securing control wire to thermostat actuating arm.
(2) Remove clamp securing coil wire housing to the thermostat.
(3) Remove control knob by removing knob set screw.
(4) Remove nut securing temperature control assembly to the stationary instrument panel. Slide temperature control assembly forward until free of stationary instrument panel and then aft beneath stationary panel until coiled wire housing is removed from forward cabin bulkhead.

B. Installation.
(1) Route temperature control wire housing through forward cabin bulkhead and attach to thermostat with attaching clamp.
(2) Insert temperature control assembly through hole in stationary instrument panel and secure with nut.
(3) Place control knob on temperature control assembly and secure with set screw.
(4) With control knob turned to the LOW position and the thermostat arm forward, secure arm to the control wire by tightening clamp screw.

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CHAPTER 22

AUTO FLIGHT

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AUTO FLIGHT - GENERAL

1. Scope

A. This chapter describes those units and components which furnish a means of automatically controlling the flight of the airplane. (Refer to Figure 1).

2. Definition

A. This chapter consists of one section to aid maintenance personnel in locating information. Following is a brief description of this section.
   (1) Aerodynamic load alleviating describes that system or portion of the system that automatically corrects/provides for gust loading/upset, aerodynamic augmentation/alleviation/suppression, ride control, etc.

3. Description

A. 400A/B Nav-O-Matic Autopilot System (Optional).
   (1) The Cessna 400A/B Nav-O-Matic Autopilot (optional) is a two-axis automatic flight control system that governs the positions of the ailerons and elevators. About the roll axis, it provides lateral stability, heading hold, command turn, and automatic intercept and tracking of any VOR radial. In addition to holding the wings level and compensating for rotation about the pitch axis, the system provides an automatic intercept and track of any magnetic heading or VOR radial. About the pitch axis, it provides command pitch attitude hold, airplane altitude hold, automatic pitch trim, and an optional ILS coupler.
   (2) The 400A autopilot system consists of one each vacuum directional gyro and attitude gyro, controller, roll actuator, computer amplifier, pitch actuator, trim follow-up actuator, trim sensor, cable assemblies, autopilot disengage switch, and associated electrical wiring.
   (3) The 400B autopilot system consists of a directional gyro, attitude gyro, controller, aileron actuator, elevator actuator, elevator trim actuator, computer, altitude sensor, airspeed sensor switch, autopilot disengage switch, electric trim disengage switch, cable assemblies, and associated electrical wiring. The elevator trim actuator acts as autopilot pitch control as well as electric trim control.
   (4) The following offerings are options to the basic autopilot: ILS approach coupler and slaved directional gyro. The ILS approach coupler enables the pilot to fly inbound on ILS front course or back course, this option is installed in the computer and connects to the indicator at the nose junction box. The slaved directional gyro replaces the standard directional gyro and provides heading information for the 400A Nav-O-Matic.
   (5) Refer to Cessna 400A Nav-O-Matic Autopilot Service/Parts manual, for additional information of components, troubleshooting, and wiring diagrams.

CAUTION: Primary and secondary flight control cables, push-pull tubes, bellcranks and mountings on late model airplanes use dual locking fasteners. The lock nuts for these fasteners incorporate a fiber lock, and are castellated for safetying with a cotter pin. When any of these areas are disconnected on any airplane, new dual locking fasteners should be installed. See the Illustrated Parts Catalog for part numbers and location of these fasteners.

B. Integrated Flight Control System.
   (1) The Integrated Flight Control System (optional) is a two axis (aileron and elevator) automatic flight control system consisting of the autopilot and flight director. Either the flight director or the autopilot may be used separately or as a combination. As an autopilot, in addition to holding the wings level and compensating for rotation about the pitch axis, the autopilot provides an automatic intercept and track of any magnetic heading or VOR radial. Also included is an automatic pitch trim, turn command, pitch command, altitude hold, and an ILS approach feature. As a flight director, the integrated flight control system provides steering information,

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visually presented on the attitude director indicator (ADI), for climb, cruise, descent, and altitude hold. Heading, VOR navigation, glide slope, and ILS approaches are visually presented on the horizontal situation indicator (HSI).

(2) Three different series of the integrated flight control system are offered as options, these are: 300, 400, and 800 series integrated flight control systems.

(a) 300 and 400 Series Integrated Flight Control Systems.

1 The 300 and 400 Integrated Flight Control Systems consists of the 400A/B Nav-O-Matic autopilot and flight director, ILS coupler, slaved directional gyro, pitch synchronization, and associated avionics. Simultaneous or independent operation of the autopilot and flight director is provided and in addition to the autopilot features, the flight director includes pitch synchronization and go-around commands as selected by the pilot. The 300 and 400 Integrated Flight Control System includes a vacuum, slaved directional gyro with ADF presentation and the 400 IFCS includes a horizontal situation indicator (HSI). Nav 1 is connected to the HSI (400 IFCS), and Nav 2 is connected to an individual course indicator.

(b) 800 Series Integrated Flight Control System.

1 The 800 Integrated Flight Control System consists of 400A/B Nav-O-Matic autopilot and flight director, with yaw damper, altitude hold, automatic pitch trim, pitch synchronization, heading preselect, omni/ILS couplers, and turn and pitch command. Simultaneous or independent operation of the autopilot and flight director is provided and in addition to the autopilot features, the flight director includes pitch synchronization and go-around commands as selected by the pilot. The 800 Integrated Flight Control System includes a vacuum, slaved directional gyro with ADF presentation, and a horizontal situation indicator (HSI). Nav 1 is connected to the HSI and Nav 2 is connected to an individual course indicator. 400 or 800 avionics system may be used with the 800 Integrated Flight Control System.

(3) For additional description, installation adjustments, troubleshooting, schematic and parts listing, refer to Cessna Integrated Flight Control System Service/Parts Manual.

NOTE: Upon completion of installing the HSI, check to insure the pigtail cable with connector of HSI is secured forward and above the HSI indicator. Secure wiring using nylon tie straps, or with a clove hitch knot secured with a square knot using nylon cord. Move the control column to the far aft position (full nose up) and insure wiring clears all moving parts and structure.

CAUTION: Primary and secondary flight control cables, push-pull tubes, bellcranks, and mountings use dual locking fasteners. The lock nuts for these fasteners incorporate a fiber lock, and are castellated for safetying with a cotter pin. When any of these areas are disconnected new dual locking fasteners should be installed. See the Illustrated Parts Catalog for part numbers and location of these fasteners.

4. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Tensiometer	T5-2002-101	Pacific Scientific Co. Los Angeles, Calif.	To measure cable tension.

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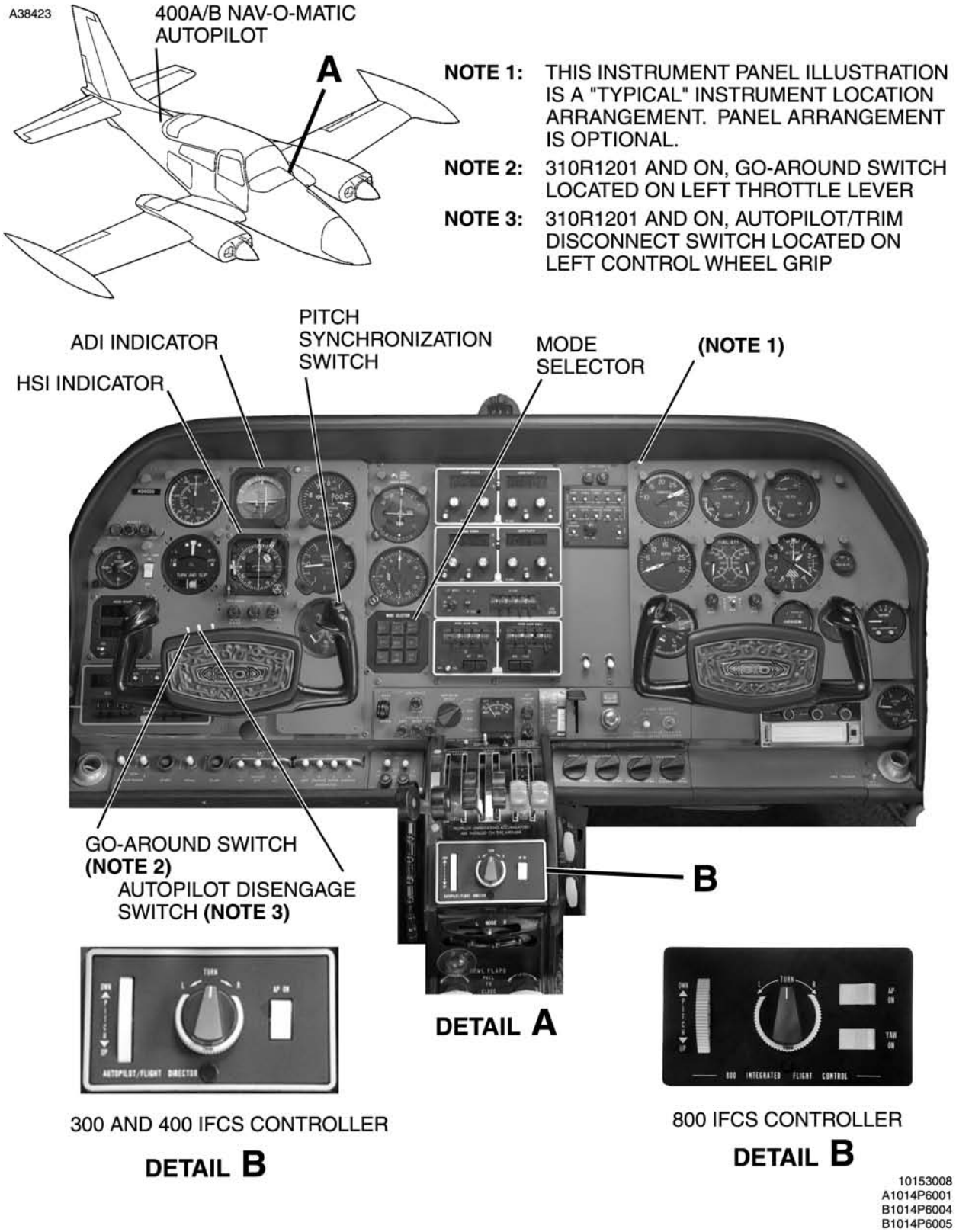

400A Nav-O-Matic Installation
Figure 1 (Sheet 1)

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AUTO FLIGHT - REMOVAL/INSTALLATION

1. Roll Actuator (400A Autopilot)

A. Removal (Refer to Figure 401).
(1) Remove rear upholstery panel and rear carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove rear seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(3) Remove floorboard above aileron bell crank, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) Relieve tension on cables to roll actuator by loosening turnbuckles near cable clamps.
(5) Disengage chain from sprocket on roll actuator.
(6) Disconnect electrical connector from roll actuator.
(7) Remove roll actuator from shelf by removing screws, lockwashers, and washers.

B. Installation (Refer to Figure 401).
(1) Secure roll actuator to shelf, using screws, lockwashers, and washers.
(2) Connect electrical connector to roll actuator.
(3) Position chain on sprocket of roll actuator. Chain must be distributed evenly around the sprocket.
(4) Rig autopilot aileron cables, refer to Auto Flight - Adjustment/Test.
(5) Install floorboards, rear carpet, rear upholstery panel, and seats.

2. Roll Actuator Cables (400A Autopilot)

A. Removal (Refer to Figure 401).
(1) Remove rear upholstery panel and rear carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove rear seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(3) Remove floorboard above aileron bell crank and autopilot pulley, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) At the aileron bell crank, loosen turnbuckles to roll actuator cables.
(5) Disconnect clevis from link at each end of roll actuator cables by removing bolts and nuts. Unscrew turnbuckle from cable terminals and connect guide wires to terminals.
(6) Remove cotter pins from pulley bracket aft of aileron bell crank.
(7) Remove three sets of pulleys aft of pulley bracket by removing nuts, bolts, and cotter pins.
(8) With guide wires attached; remove chain and cables at roll actuator. Leave guide wires in airplane.

B. Installation (Refer to Figure 401).
(1) Attach guide wires to cable terminals and pull cables forward into position at aileron bell crank area. Remove guide wires.
(2) Install chain on sprocket of roll actuator. Chain must be distributed evenly on sprocket.
(3) Install three sets of pulleys, using bolts, nuts, and cotter pins.

NOTE: Install pulleys at Fuselage Station 132.00 so upper cable is routed beneath the upper pulley and beneath left-hand pulley at Fuselage Stations 109.37 and 89.25. Likewise, bottom cable is routed beneath lower and right-hand pulleys.

(4) Install cotter pins at pulley bracket.
(5) Connect clevis and turnbuckle to each end of cable terminals.
(6) Connect cable clevises to links at cable clamps, using bolts and nuts.
(7) Rig roll actuator cables, refer to Auto Flight - Adjustment/Test.
(8) Install floorboards, carpet, seats, and rear upholstery panel.

3. Pitch Actuator (400A Autopilot)

A. Removal (Refer to Figure 401).
(1) Remove rear upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove stabilizer fairings, refer to Chapter 6, Dimensions and Areas - General.

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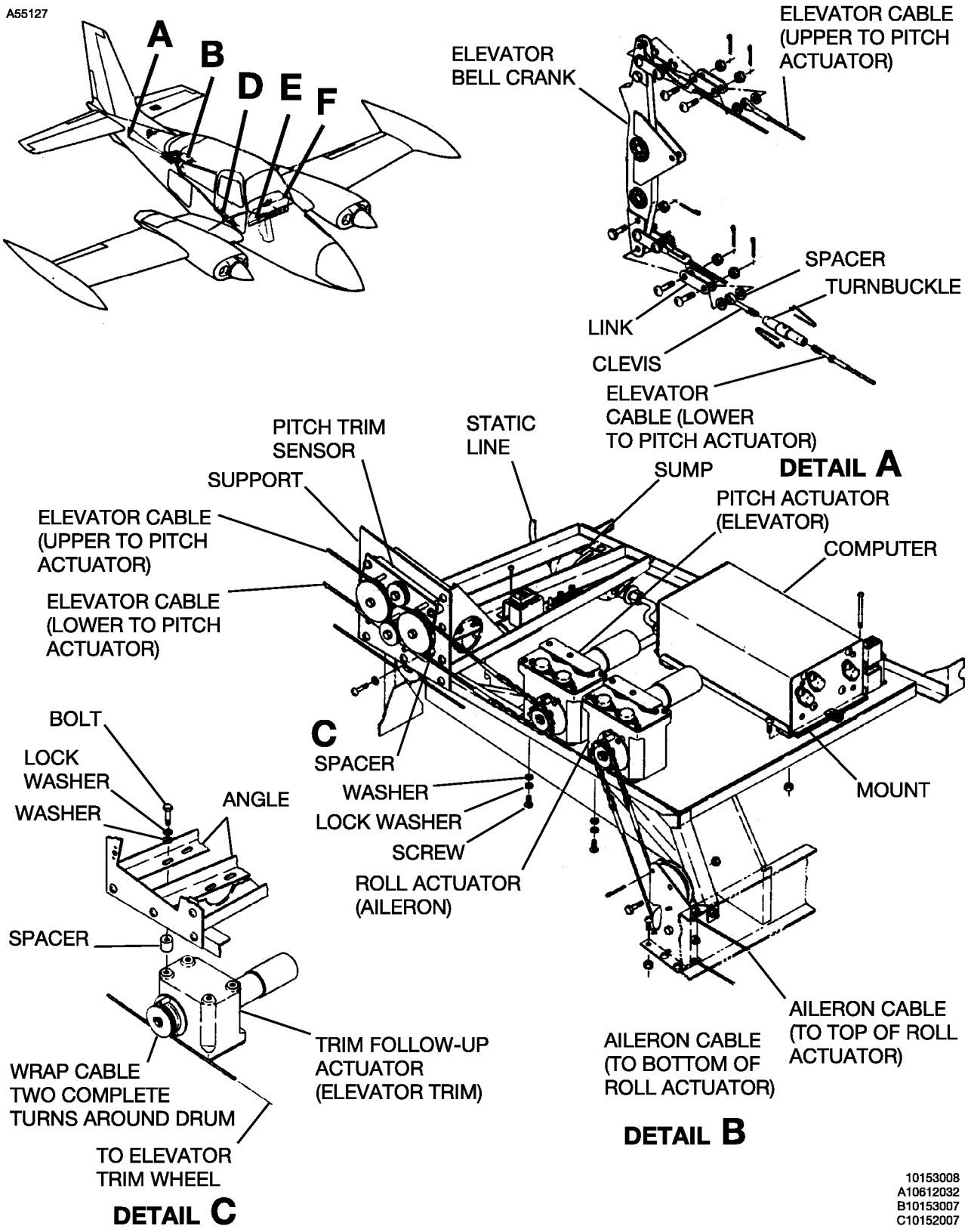

400A Nav-O-Matic Installation
Figure 401 (Sheet 1)

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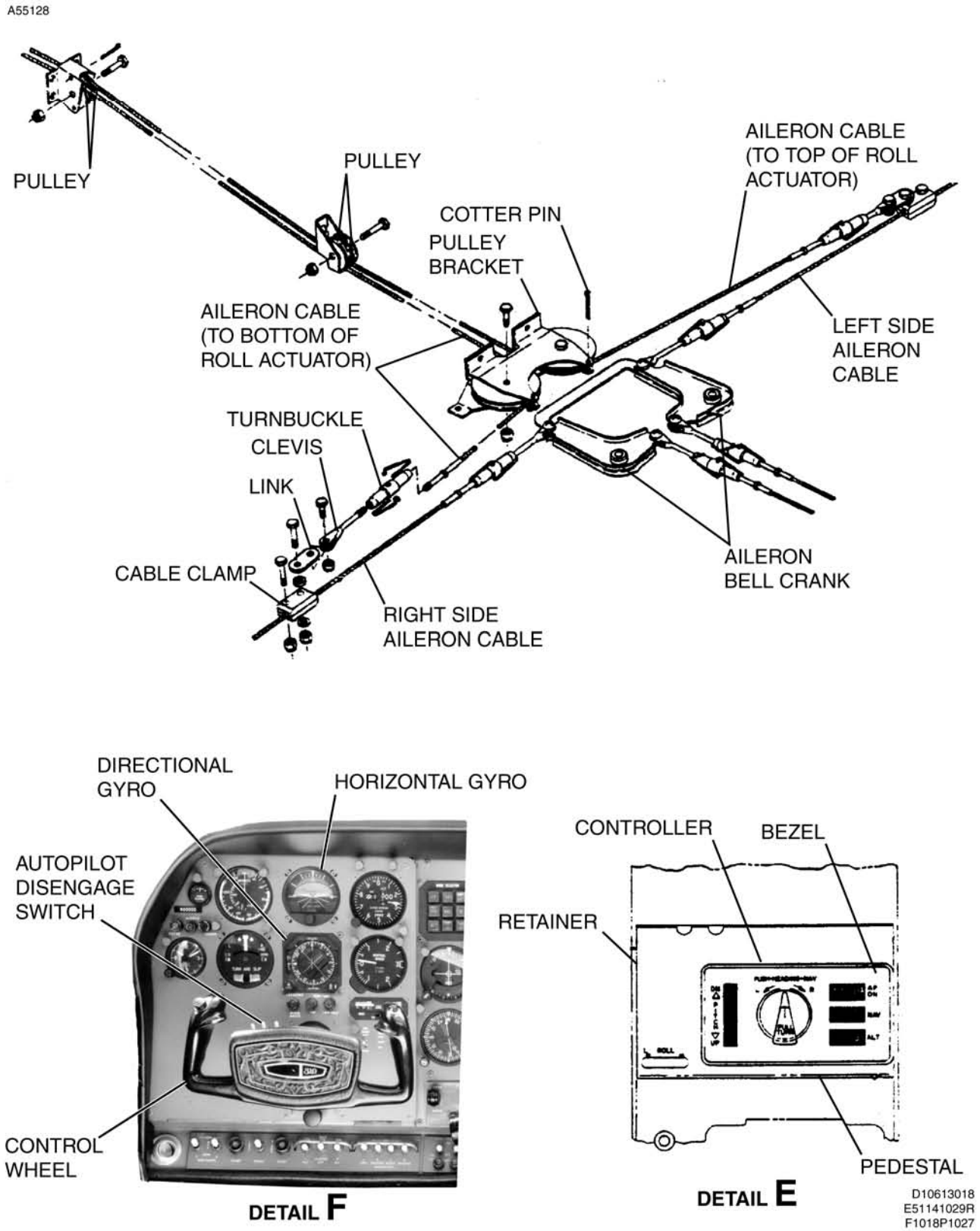

400A Nav-O-Matic Installation
Figure 401 (Sheet 2)

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(3) Relieve tension on pitch actuator cables by loosening turnbuckle.
(4) Disengage chain from sprocket on pitch actuator.
(5) Disconnect electrical connector from pitch actuator.
(6) Remove pitch actuator from shelf by removing screws, lockwashers, and washers.

B. Installation (Refer to Figure 401).
(1) Secure pitch actuator to shelf, using screws, lockwashers, and washers.
(2) Connect electrical connector to pitch actuator.
(3) Install chain on sprocket of pitch actuator. Chain must be distributed evenly on sprocket.
(4) Rig pitch actuator cables, refer to Auto Flight - Adjustment/Test.
(5) Install stabilizer fairings and rear upholstery panel.

4. Pitch Actuator Cables (400A Autopilot)

A. Removal (Refer to Figure 401).
(1) Remove rear upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/ Installation.
(2) Remove stabilizer fairings, refer to Chapter 6, Dimensions and Areas - General.
(3) Relieve pitch actuator cable tension by loosening turnbuckle at elevator bellcrank.
(4) Disconnect pitch actuator cables from elevator bellcrank links by removing bolts, spacers, nuts, and cotter pins.
(5) Remove turnbuckle with clevis attached from cable terminal.
(6) Remove pulleys at pitch trim sensor to allow cables to pass through.
(7) Attach guide wires to cable terminals and pull cables from airplane at pitch actuator.

B. Installation (Refer to Figure 401).
(1) Connect guide wires to cables and pull cables into position at elevator bellcrank. Disconnect guide wires.
(2) Install chain on sprocket of pitch actuator. Chain must be distributed evenly on sprocket.
(3) Install pulley at pitch trim actuator.
(4) Connect clevis and turnbuckle to cable terminal. Attach cables to links, using bolts, spacers, nuts, and cotter pins.
(5) Rig pitch actuator cables, refer to Auto Flight - Adjustment/Test.
(6) Install stabilizer fairings and rear upholstery panel.

5. Elevator Trim Follow-Up Actuator (400A Autopilot)

A. Removal (Refer to Figure 401).
(1) Remove rear upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/ Installation.
(2) Disconnect electrical connector from follow-up actuator.
(3) Remove follow-up actuator from angles by cutting safety wire and removing bolts, washers, spacers, and lockwashers.
(4) Slide follow-up actuator aft far enough to unwind cable from drum and remove follow-up actuator.

B. Installation (Refer to Figure 401).
(1) Wrap cable two complete turns around the drum of the follow-up actuator.
(2) Secure follow-up actuator to angles, using bolts, washers, spacers, and lockwashers. Safety wire bolts.
(3) Rig elevator trim follow-up cables, refer to Auto Flight - Adjustment/Test.
(4) Install rear upholstery panel.

6. Elevator Pitch Trim Sensor (400A Autopilot)

A. Removal (Refer to Figure 401).
(1) Remove rear upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/ Installation.
(2) Remove stabilizer fairings, refer to Chapter 6, Dimensions and Areas - General.
(3) Remove pulleys from pitch trim sensor as required to free cables.
(4) Disconnect electrical connector from pitch trim sensor.

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(5) Remove pitch trim sensor from support by removing screws, washers, and spacers.

B. Installation (Refer to Figure 401).
(1) Secure pitch trim sensor to support, using screws, washers, and spacers.

NOTE: Ensure pitch trim sensor is installed with overhanging pulley on sensor positioned forward.

(2) Position cables on pulleys and install removed pulleys.
(3) Connect electrical connector to pitch trim sensor.
(4) Check autopilot elevator cables for proper rigging, refer to Auto Flight - Adjustment/Test.
(5) Install stabilizer fairings and rear upholstery panel.

7. Computer (400A Autopilot)

A. Removal (Refer to Figure 401).
(1) Remove rear upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Disconnect static line and electrical connectors from computer.
(3) Remove computer from shelf by removing attaching screws, lockwashers, and washers.

B. Installation (Refer to Figure 401).
(1) Secure computer to shelf, using screws, lockwashers, and washers.
(2) Connect electrical connectors and static line to computer.
(3) Install rear upholstery panel.

8. Aileron (Roll) Actuator (400B Autopilot)

A. Removal (Refer to Figure 402).
(1) Remove right wing access plate as required to gain access to actuator.

NOTE: The actuator may be removed from the mount without disturbing the cable tension if only the actuator is being replaced.

(2) Disconnect electrical connector from actuator.
(3) Remove actuator from mount by removing four bolts.
(4) If actuator mount is to be removed, proceed as follows:
(a) Remove cable chain guard pins from actuator mount.
(b) Remove turnbuckle safeties, loosen turnbuckle and remove cable chain from actuator sprocket.
(c) Remove mount from supports by removing four screws.

B. Installation (Refer to Figure 402).
(1) If actuator mount was removed, install mount as follows:
(a) Position mount to supports and secure with four screws.
(b) Route cable chain over actuator sprocket making sure cables are not crossed.
(c) Install cable chain guard pins in actuator mount.
(d) Tighten turnbuckle to adjust cable tension to 12 pounds, +3 or -3 pounds. Safety turnbuckle with clips.
(2) Install actuator to mount with four bolts. Safety wire bolts.
(3) Connect electrical connector.
(4) Install access cover.

9. Aileron (Roll) Actuator Cables (400B Autopilot)

A. Removal (Refer to Figure 402).
(1) Remove right wing access covers as required to gain access to actuator, pulleys, and aileron bellcrank.
(2) Remove turnbuckle safeties and loosen turnbuckle.
(3) Remove cable chain guard pins from actuator and remove chain from actuator sprocket.

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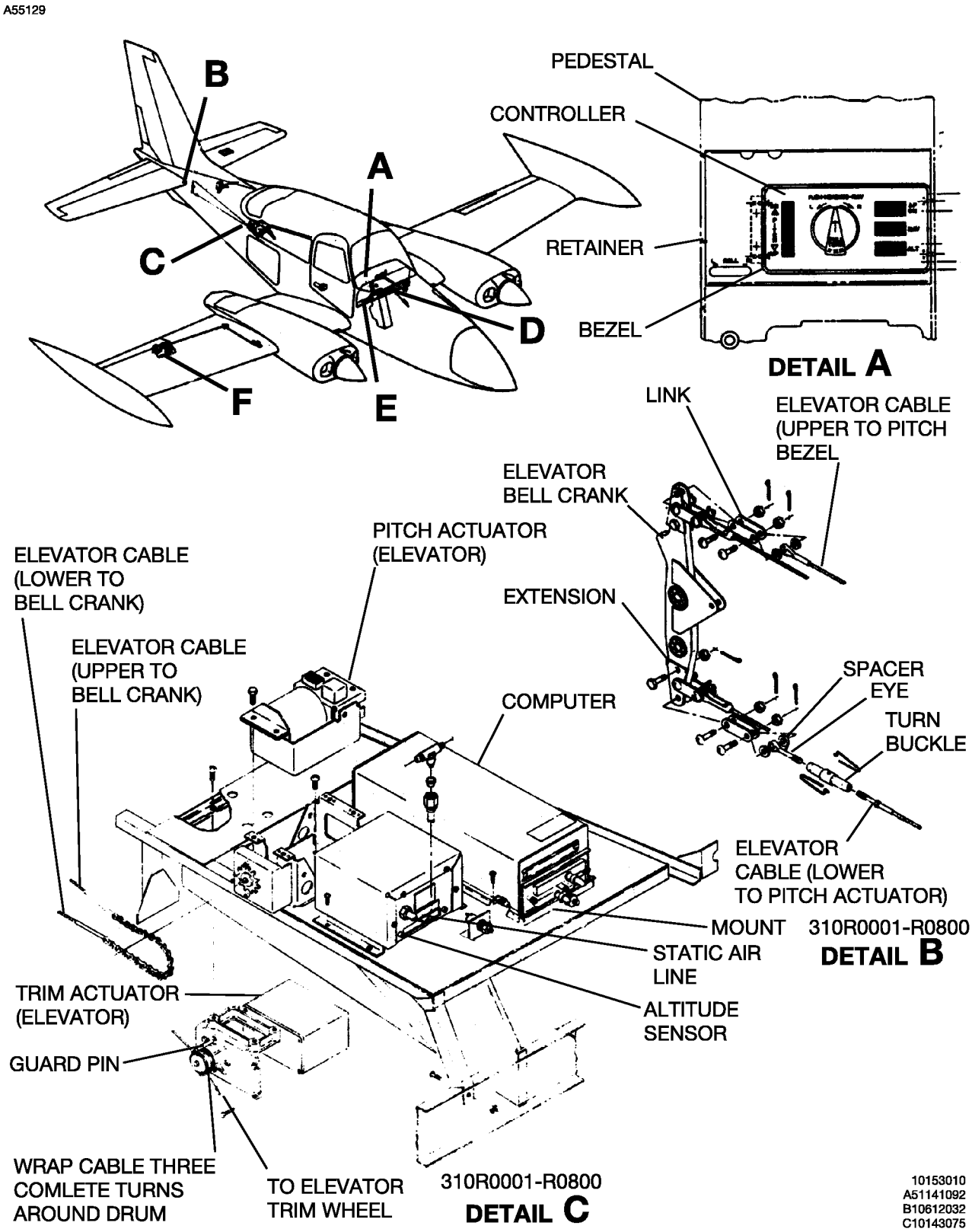

400B Nav-O-Matic
Figure 402 (Sheet 1)

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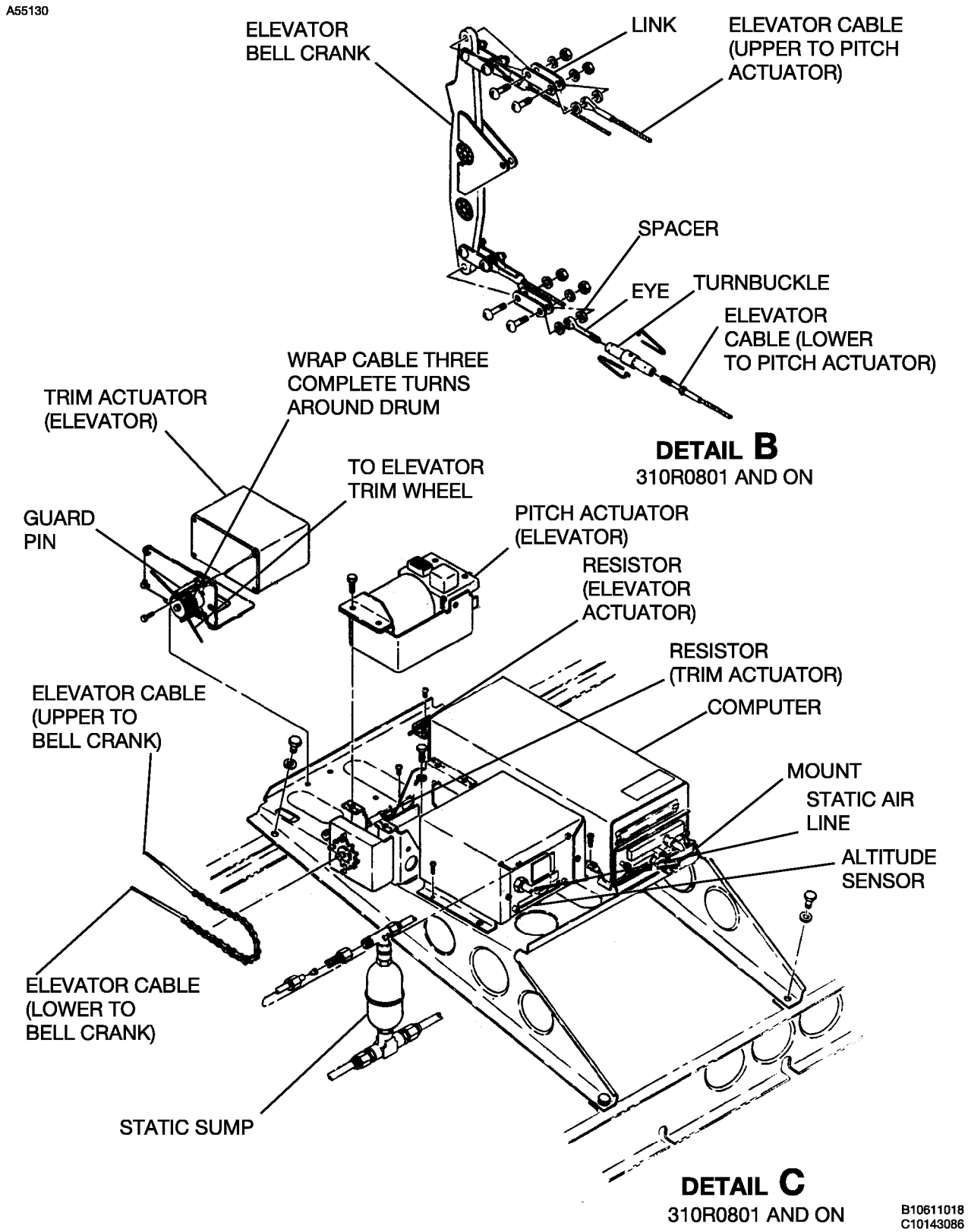

400B Nav-O-Matic
Figure 402 (Sheet 2)

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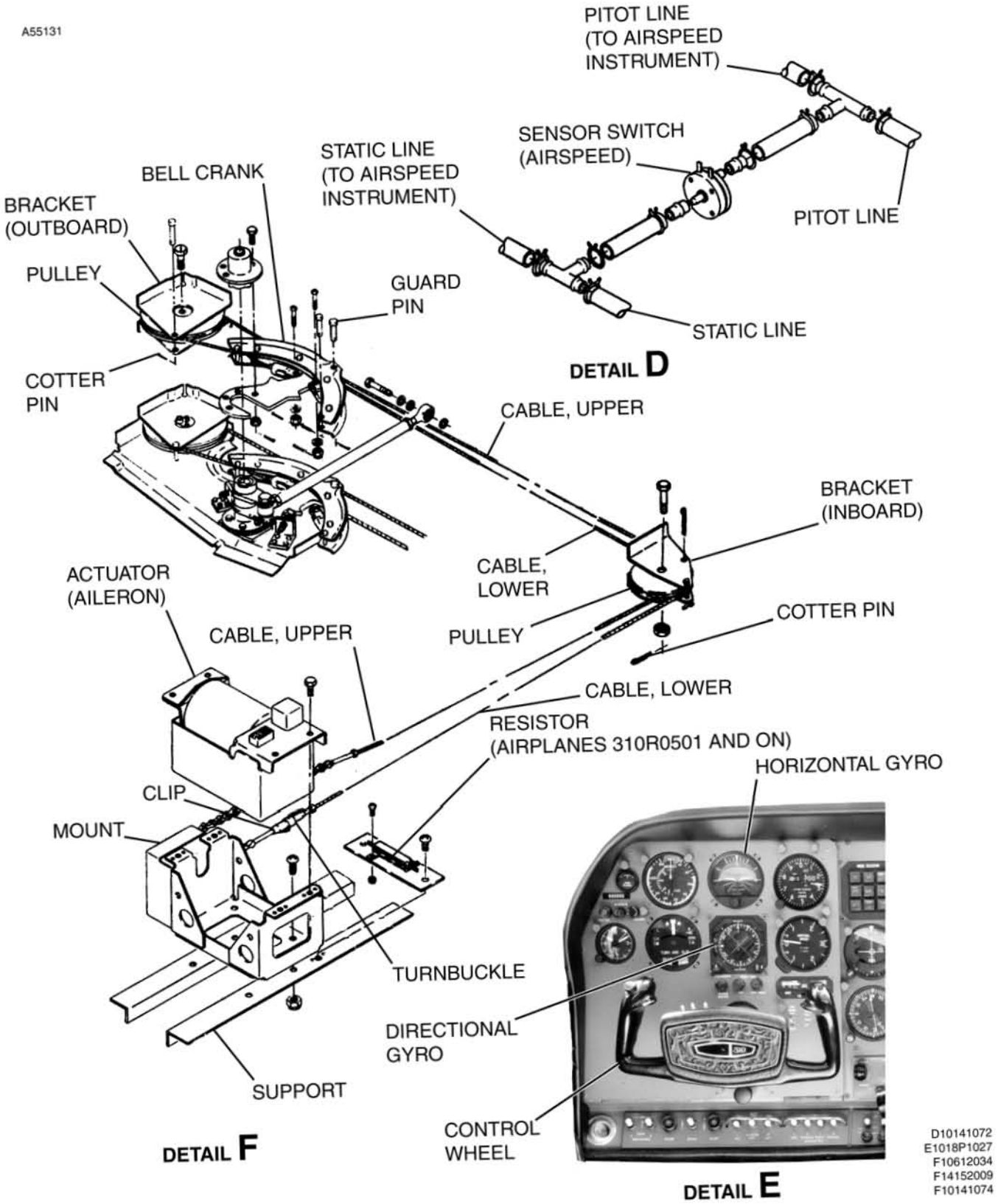

400B Nav-O-Matic
Figure 402 (Sheet 3)

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(4) Remove cable guard pins from bellcrank by removing cotter pins and pins (three places).
(5) Disconnect cables from aileron bellcrank by removing cotter pins, nuts, washers, and bolts.
(6) Remove pulley and cotter pin from outboard pulley bracket.
(7) Remove cotter pin cable guards from inboard bracket.
(8) Route cables and chain assembly from airplane.

B. Installation (Refer to Figure 402).
(1) Route cables into right wing so that the upper cable will go direct to the bellcrank, the lower cable will route around the outboard pulley, then back to the bellcrank.
(2) Install the outboard pulley and guard pin. Make sure cable is in the groove of the pulley.
(3) Attach cables to bellcrank with bolts, washers, nuts, and cotter pins.
(4) Install three guard pins in bellcrank and secure with cotter pins.
(5) Route upper cable and chain assembly over the actuator sprocket and install turnbuckle.
(6) Install guard pins in actuator and cotter pins in inboard bracket.
(7) Tighten turnbuckle to adjust cable tension to 12 pounds, +3 or -3 pounds. Safety turnbuckle with clips.
(8) Install access panels.

10. Elevator (Pitch) Actuator (400B Autopilot)

A. Removal (Refer to Figure 402).
(1) Remove rear upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/Installation, to gain access to actuator.

NOTE: The actuator may be removed from the mount without disturbing cable tension if only the actuator is being replaced.

(2) Disconnect electrical connector from actuator.
(3) Remove actuator from mount by removing four bolts.
(4) If actuator mount is to be removed, proceed as follows:
(a) Remove elevator bell crank access panel, refer to Chapter 6, Dimensions and Areas - General.
(b) Relieve tension on actuator cables by loosening turnbuckle.
(c) Remove guard pins from actuator mount and disengage chain from actuator.
(d) Remove actuator mount from shelf by removing four screws.

B. Installation (Refer to Figure 402).
(1) If actuator mount was removed, install mount as follows:
(a) Position mount to shelf and secure with four screws.
(b) Route cable chain over sprocket making sure cables are not crossed.
(c) Install cable chain guard pins in actuator mount.
(d) Tighten turnbuckle to adjust cable tension to 22 pounds, +2 or -2 pounds. Safety turnbuckle with clips.
(2) Install actuator to mount with four bolts. Safety wire bolts.
(3) Connect electrical connector.
(4) Install access cover and rear upholstery panel.

11. Elevator (Pitch) Actuator Cables (400B Autopilot)

A. Removal (Refer to Figure 402).
(1) Remove rear upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove elevator bell crank access panel, refer to Chapter 6, Dimensions and Areas - General.
(3) Disconnect lower cable from elevator bell crank by removing turnbuckle.
(4) Disconnect upper cable from elevator bell crank links by removing cotter pin, nut, spacers, and bolt.
(5) Remove cable chain guard pins from actuator and remove chain from sprocket.
(6) Remove cable assembly from airplane.

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B. Installation (Refer to Figure 402).
   (1) Install cable assembly on actuator with chain over actuator sprocket and cable with turnbuckle terminal to the lower side.
   (2) Install chain guard pins in actuator.
   (3) Connect upper cable to elevator bell crank with bolt, spacers, nut, and cotter pin.
   (4) Connect lower cable to turnbuckle eye with turnbuckle barrel.
   (5) Tighten turnbuckle to adjust cable tension to 22 pounds, +2 or -2 pounds. Safety turnbuckle with clip.
   (6) Install elevator bell crank access panel.
   (7) Install rear upholstery panel.

12. Elevator Trim Tab Actuator (400B Autopilot)

A. Removal/Installation.
   (1) For removal and installation of elevator trim tab actuator, refer to Chapter 27, Elevators - Removal/Installation.

13. Computer (400B Autopilot)

A. Removal (Refer to Figure 402).
   (1) Remove rear upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/ Installation.
   (2) Disconnect electrical connector from computer.
   (3) Remove computer from mount.
   (4) Remove mount from shelf by removing four screws.

B. Installation (Refer to Figure 402).
   (1) Position computer mount to shelf and secure with four screws.
   (2) Install computer to mount.
   (3) Connect electrical connector.
   (4) Install rear upholstery panel.

14. Altitude Sensor (400B Autopilot)

A. Removal (Refer to Figure 402).
   (1) Remove rear upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/ Installation.
   (2) Disconnect electrical connector.
   (3) Disconnect static air line.
   (4) Remove altitude sensor from shelf by removing four screws.

B. Installation (Refer to Figure 402).
   (1) Position altitude sensor on shelf and secure with four screws.
   (2) Connect static air line.
   (3) Connect electrical connector.
   (4) Install rear upholstery panel.

15. Airspeed Sensor Switch (400B Autopilot)

A. Removal (Refer to Figure 402).
   (1) Disconnect electrical connectors from sensor switch.
   (2) Disconnect pitot line and static air line from sensor switch.

B. Installation (Refer to Figure 402).
   (1) Connect pitot line to high pressure part of sensor switch.
   (2) Connect static air line to low pressure part of sensor switch.
   (3) Connect electrical connectors.

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16. Elevator Trim Follow-Up Cables

A. Removal/Installation.
(1) If elevator trim follow-up cables are to be removed, refer to Chapter 27, Elevators - Removal/Installation. Rig cables in accordance with Auto Flight - Adjustment/Test.

17. Gyros

A. Removal/Installation.
(1) For removal and installation of gyros, refer to Chapter 31, Instrument and Control Panels - Removal/Installation, removal/installation of typical instrument.

18. Switches

A. Removal/Installation.
(1) For removal and installation of switches, refer to Chapter 31, Instrument and Control Panels - Removal/Installation.

19. Controller

A. Removal (Refer to Figure 401).
(1) Remove controller from retainer by loosening screw in face of controller.

B. Installation (Refer to Figure 401).
(1) Install controller in retainer and tighten screw.

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AUTO FLIGHT - ADJUSTMENT/TEST

1. 400A Nav-O-Matic Autopilot Aileron Control Cables

NOTE: Cable tension should be adjusted when ambient temperature is 65°F to 95°F. Allow airplane temperature to stabilize for a period of four hours.

A. Rigging (Refer to Figure 501).
(1) Verify that aileron control system is properly rigged, refer to Chapter 27, Ailerons - Adjustment/Test.
(2) Using a clamp or other locking device, lock ailerons in the neutral position.
(3) Ensure chain is evenly distributed over aileron roll actuator sprocket.
(4) Slide cable clamp of aileron roll actuator cables outboard from pulley bracket until slack is removed from cables. Tighten cable clamps in place on RH and LH aileron cables.

NOTE: Cable clamps must be equal distance from pulley bracket to properly rig aileron cables.

(5) Place the tensiometer on cables to aileron roll actuator and rig cables to 12 pounds, +3 or -3 pounds tension by tightening turnbuckles.
(6) Remove locking device from aileron control surfaces and move aileron through entire travel. Observe chain over sprocket of aileron roll actuator for sufficient remaining links at the extreme travel limits.
(7) Safety turnbuckles.

2. 400A Nav-O-Matic Autopilot Elevator Control Cables

A. Rigging (Refer to Figure 501).
(1) Verify that elevator control system is properly rigged, refer to Chapter 27, Elevators - Adjustment/Test.
(2) Using a clamp or other locking device, lock elevator in the neutral position.
(3) With elevator control surface in the neutral position, ensure chain is distributed evenly over sprocket on elevator pitch actuator.
(4) Place tensiometer on cables to elevator pitch actuator and tighten cable turn-buckle to obtain 22 pounds, +2 or -2 pounds cable tension.
(5) Remove locking device from elevator control surfaces and move elevator through entire travel. Observe chain on sprocket of pitch actuator for sufficient remaining links at the extreme travel limits.
(6) Safety turnbuckle.

3. 400A Nav-O-Matic Autopilot Elevator Trim Control Cables

A. Rigging (Refer to Figure 501).

NOTE: Before rigging the trim follow-up cables, ensure cable makes two complete turns on the trim follow-up actuator drum.

(1) Rig elevator trim follow-up cables (without electric trim) as follows:
(a) Verify trim tab system is properly rigged, refer to Chapter 27, Elevators - Adjustment/Test. Cable tension shall be 19 pounds, +3 or -3 pounds.
(b) Adjust the trim tab stop blocks as follows:
1 Rotate elevator trim control wheel so that trim tab is 10 degrees up, +1 or -0 degrees, locate aft stop block adjacent to cable terminal, and tighten. Slide the center stop block against aft stop block and tighten.
2 Rotate elevator trim control wheel so that the elevator trim tab is 26 degrees down, +1 or -0 degrees. Slide forward stop block against the center stop block and tighten.
(2) Rig elevator trim follow-up cables (with electric trim) as follows:
(a) Verify electric trim tab system is properly rigged, refer to Chapter 27, Elevators - Adjustment/Test. Cable tension shall be 19 pounds, +3 or -3 pounds.

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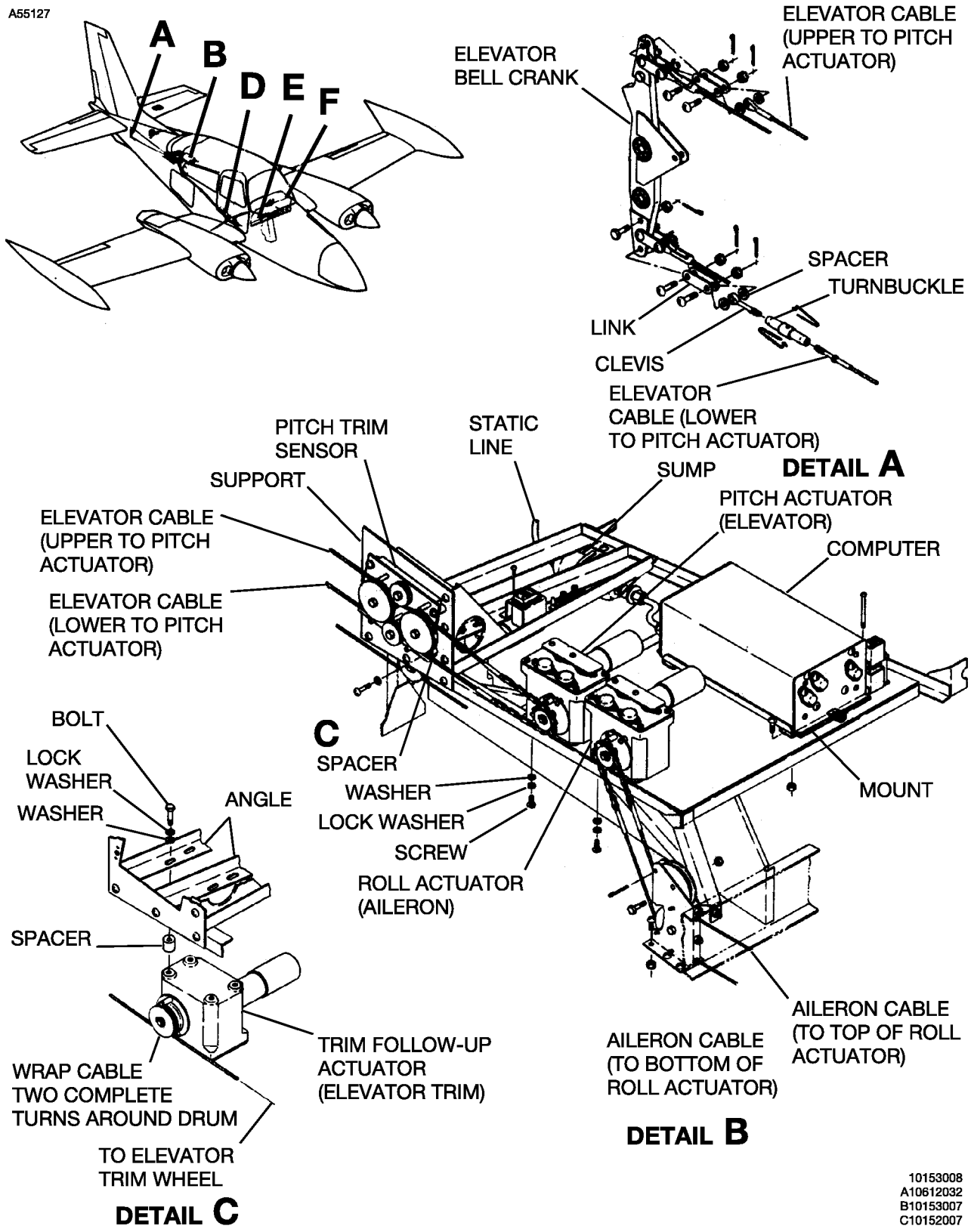

400A Nav-O-Matic Installation
Figure 501 (Sheet 1)

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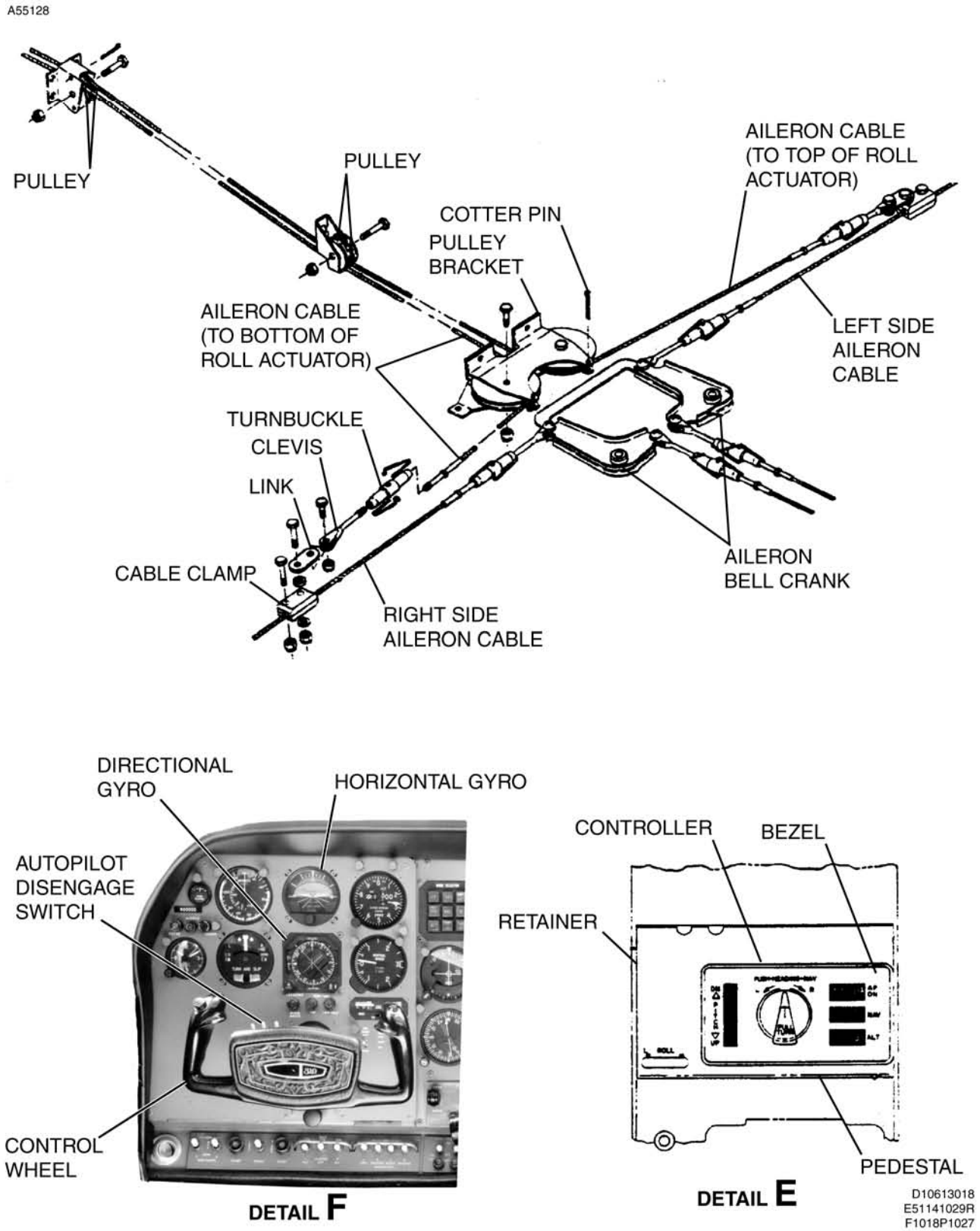

400A Nav-O-Matic Installation
Figure 501 (Sheet 2)

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(b) Refer to Chapter 27, Elevators - Adjustment/Test, rig electric trim stop blocks.

NOTE: After rigging of autopilot system is complete, turn on autopilot and verify that the control surfaces respond in the correct direction. Assist the movement of the elevator by pulling back on control wheel, this will aid in overcoming the counterbalance of the elevator bob-weight.

4. 400B Nav-O-Matic Autopilot Aileron Control Cables

NOTE: Cable tension should be adjusted when ambient temperature is 65°F to 95°F. Allow airplane temperature to stabilize for a period of four hours.

NOTE: The use of DC torque actuators used in the 400B Nav-O-Matic Autopilot System instead of "position" actuators eliminate the need to synchronize autopilot cables with aileron cables.

A. Rigging (Refer to Figure 502).
(1) Place tensiometer on cables to aileron (roll) actuator and rig cables to 12 pounds, +3 or -3 pounds tension by tightening turnbuckles.
(2) Safety turnbuckles.

5. 400B Nav-O-Matic Autopilot Elevator Control Cables

A. Rigging (Refer to Figure 502).
(1) Place tensiometer on cables to elevator (pitch) actuator and rig cables to 22 pounds, +2 or -2 pounds tension by tightening turnbuckles.
(2) Safety turnbuckles.

6. 400B Nav-O-Matic Autopilot Elevator Trim Control Cables

A. Rigging (Refer to Figure 502).
(1) Rig elevator trim control cables, refer to Chapter 27, Elevators - Adjustment/Test.

NOTE: After rigging of autopilot system is complete, turn on autopilot and verify that the control surfaces respond in the correct direction. Assist the movement of the elevator by pulling back on control wheel. This will aid in overcoming the counterbalance of the elevator bob-weight.

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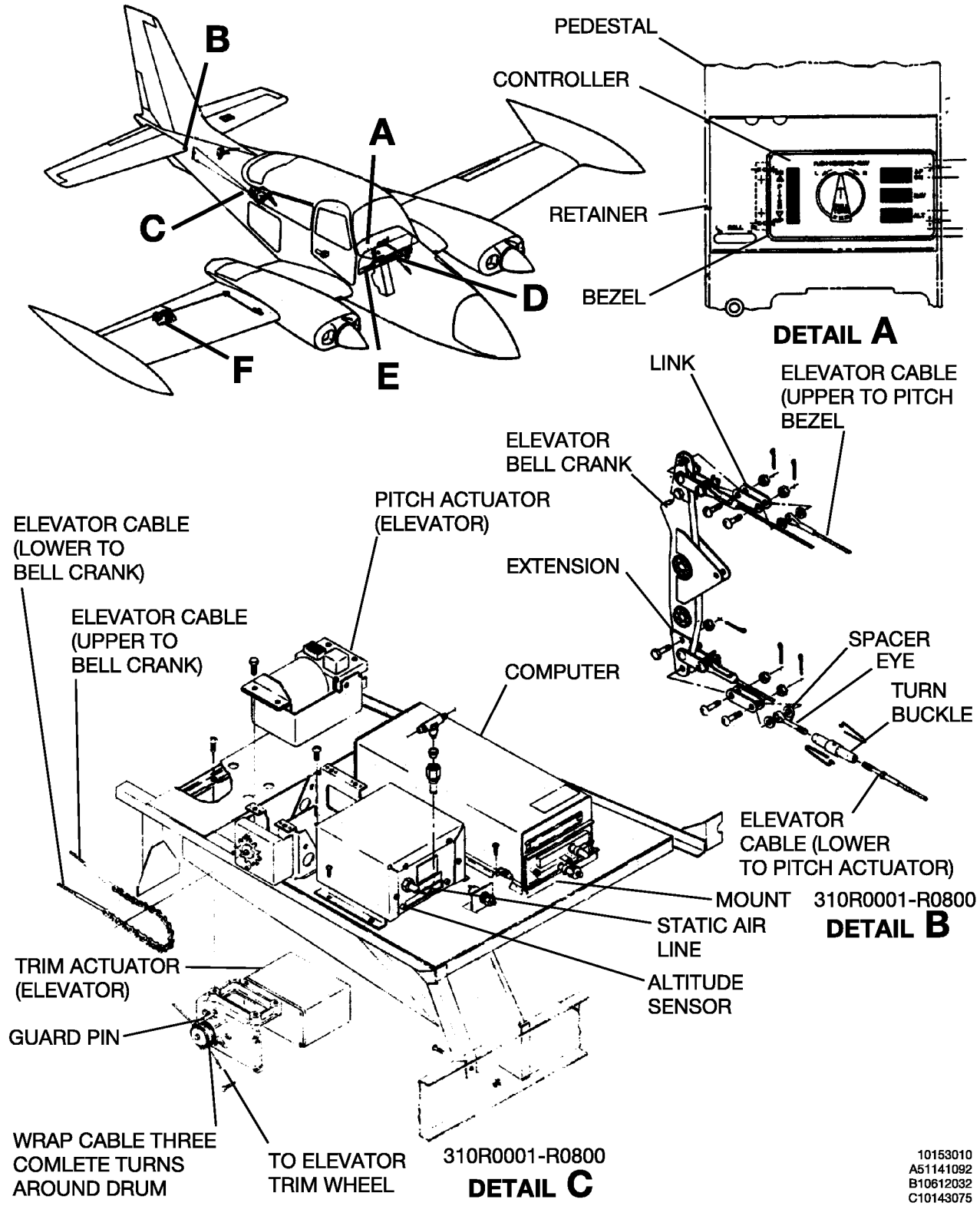

400B Nav-O-Matic
Figure 502 (Sheet 1)

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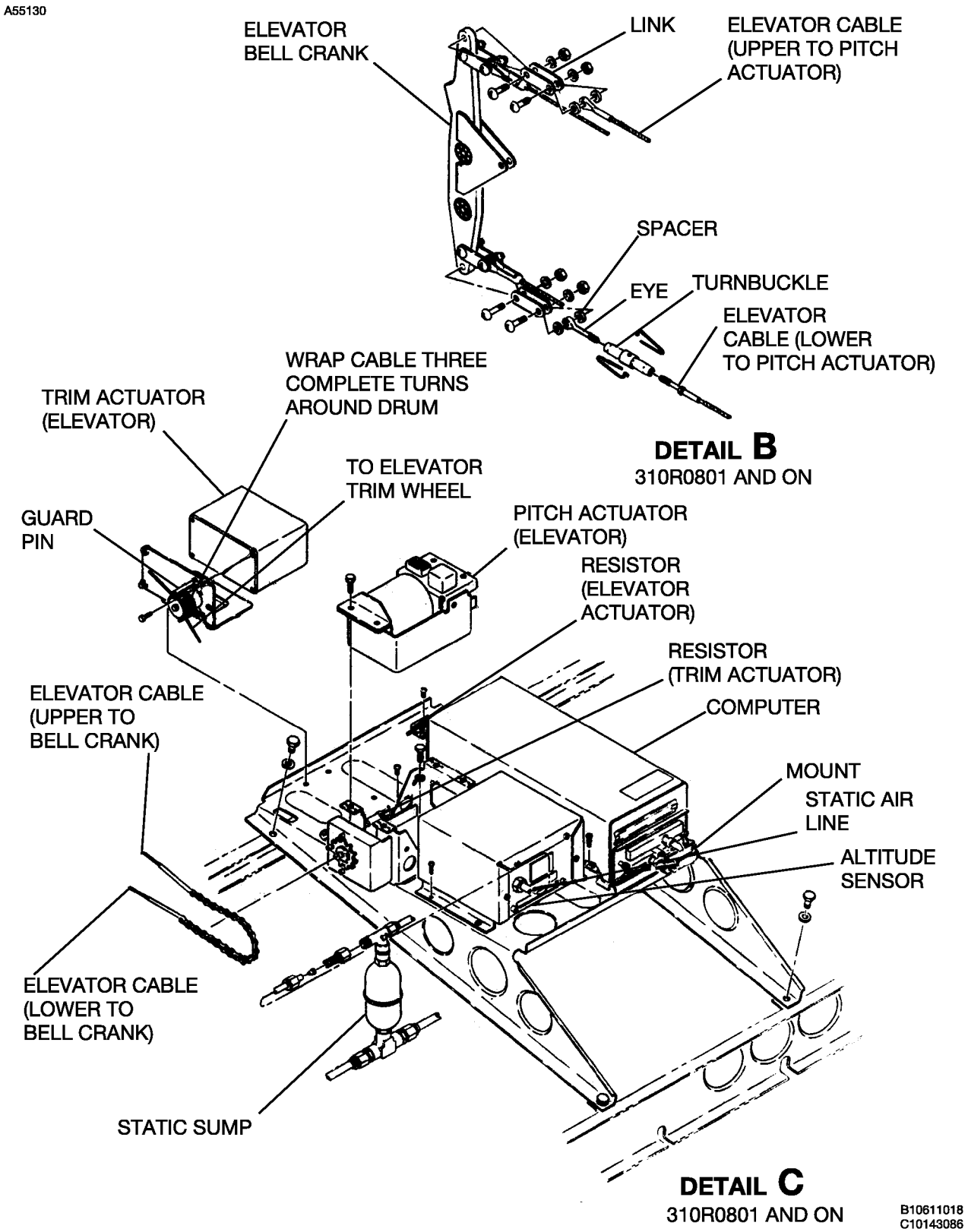

400B Nav-O-Matic
Figure 502 (Sheet 2)

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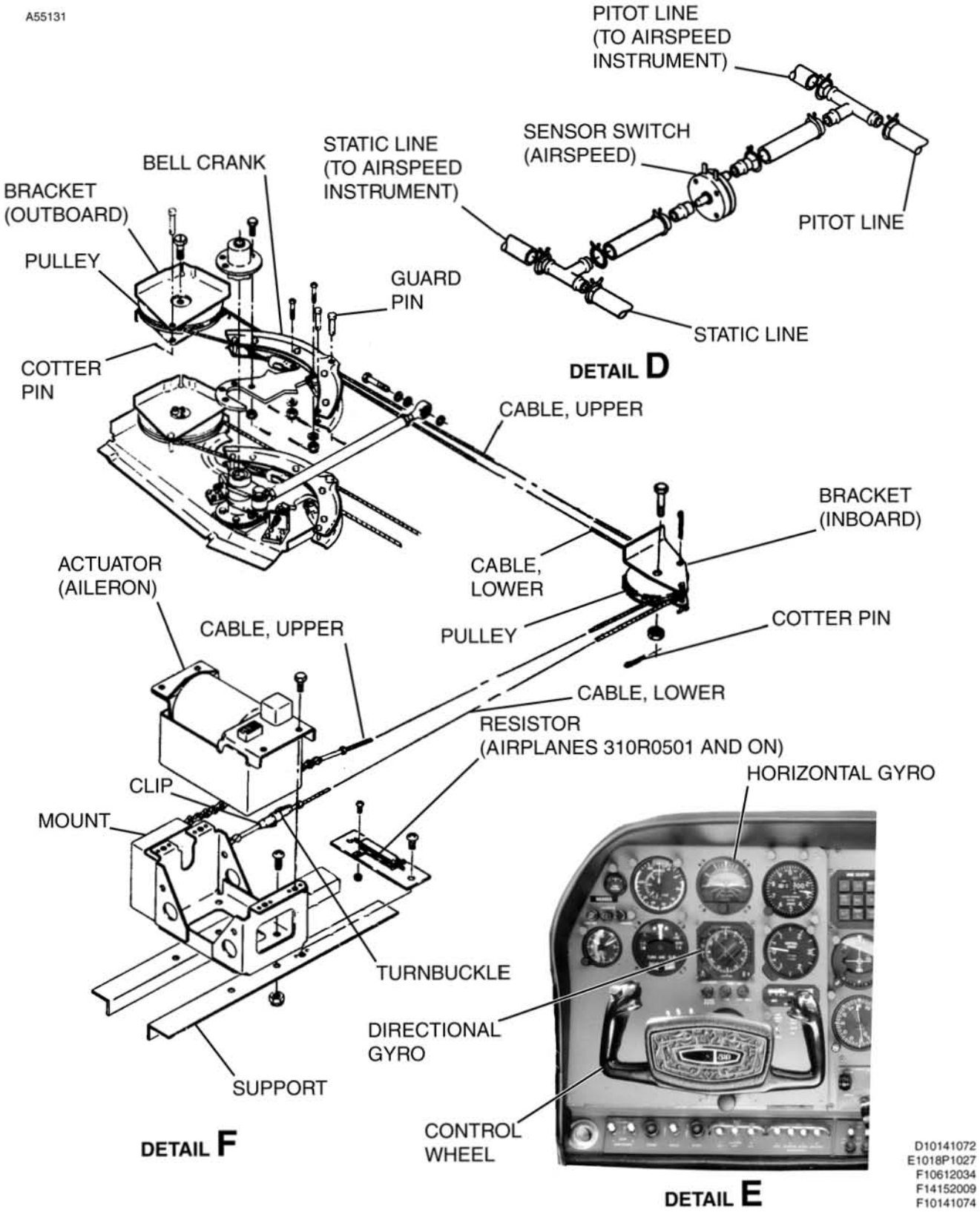

400B Nav-O-Matic
Figure 502 (Sheet 3)

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AERODYNAMIC LOAD ALLEVIATING - DESCRIPTION AND OPERATION

1. Yaw Damper System

A. Description.

(1) The yaw damper system is an independent system consisting of a gyro-computer (turn and slip indicator), control switch, yaw actuator and disengage switch, cables assemblies, and electrical wiring.

(2) The gyro picks up the signal, routes it through a built-in computer in the gyro, amplifies the signal and sends the amplified signal to the yaw actuator, located in the tailcone. The yaw damper control switch is mounted separately from the flight controller on all installations except the 800 integrated flight control system (IFCS). On airplanes incorporating the 800 IFCS the yaw damper control switch is part of the autopilot flight controller. The yaw damper disengage switch is located on the left control wheel.

(3) The yaw actuator, located in the tailcone is mounted to a bracket attached to a bulkhead and supported by support brackets. The yaw damper actuator drives a chain which is attached to cable assemblies, connected to the rudder bell crank.

CAUTION: Primary and secondary flight control cables, push-pull tubes, bell cranks, and mountings use dual locking fasteners. The lock nuts for these fasteners incorporate a fiber lock, and are castellated for safetying with a cotter pin. When any of these areas are disconnected, new dual locking fasteners should be installed. See the Illustrated Parts Catalog for part numbers and location of these fasteners.

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AERODYNAMIC LOAD ALLEVIATING - REMOVAL/INSTALLATION

1. Yaw Damper Actuator

A. Removal (Refer to Figure 401).

NOTE: The yaw damper motor can be removed from the actuator assembly mounting bracket without disturbing the yaw damper cable assemblies.

(1) Ensure airplane's electrical power is OFF.
(2) Place a suitable support under tailcone.
(3) Remove stabilizer fairings, refer to Chapter 6, Dimensions and Areas - General.
(4) Remove rear upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/ Installation.
(5) Loosen turnbuckle and remove chain.
(6) Disconnect electrical connector from yaw damper actuator.
(7) Remove screws securing motor assembly to mounting bracket assembly and remove motor assembly.
(8) Remove bolts and nuts securing mounting bracket assembly to bracket and remove mounting bracket assembly.

B. Installation (Refer to Figure 401).
(1) Align mounting bracket assembly to bracket and secure with bolts and nuts.
(2) Slide motor assembly into mounting bracket, engaging gears and secure with screws.
(3) Connect electrical connector to motor assembly.
(4) Engage chain on sprocket. Ensure chain ends are even after engaging sprocket.
(5) Rig yaw damper system, refer to Aerodynamic Load Alleviating - Adjustment/Test.
(6) Install rear upholstery panel.
(7) Install stabilizer fairings.
(8) Remove support from tailcone.

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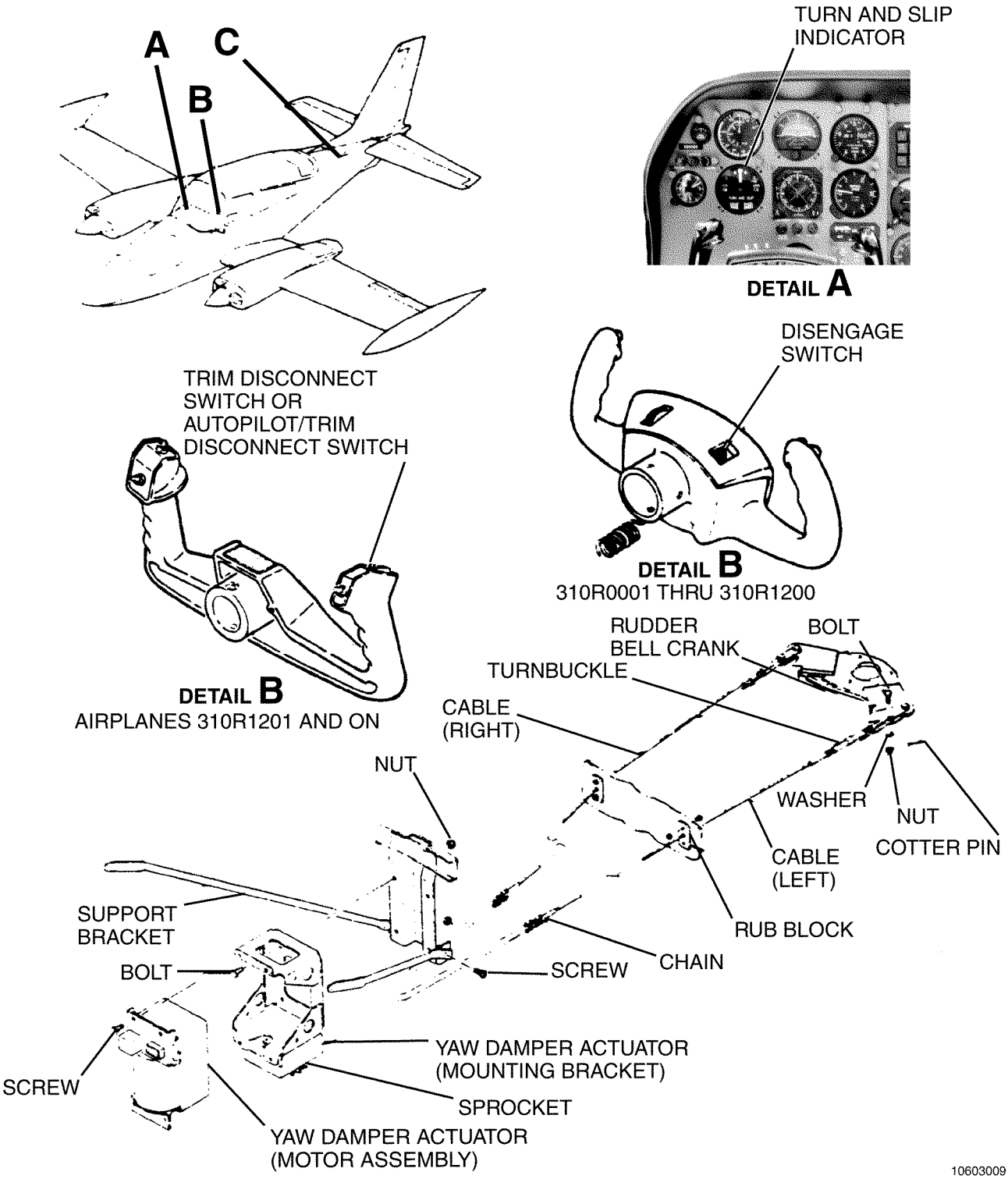

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Yaw Damper Installation
Figure 401 (Sheet 1)

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AERODYNAMIC LOAD ALLEVIATING - ADJUSTMENT/TEST

1. Yaw Damper System

A. Rigging (Refer to Figure 501).
   (1) Verify that the rudder control system is properly rigged, refer to Chapter 27, Rudder - Adjustment/Test.
   (2) For access to bellcrank, remove stabilizer fairings, refer to Chapter 6, Dimensions and Areas - General.
   (3) Unsafety turnbuckle and rig cables to 16 pounds, +2 or -2 pounds tension (rudder at neutral position). Safety turnbuckle.
   (4) Install stabilizer fairings.

B. Functional Test.
   (1) Release rudder gust lock if installed, before performing functional test.
   (2) With rudder in neutral position, push tailcone approximately 6 inches to the left while observing rudder. Rudder should pivot to the left to compensate for nose of airplane moving right.
   (3) With rudder in neutral position, push tailcone approximately 6 inches to the right while observing rudder. Rudder should pivot to the right to compensate for the nose moving left.
   (4) Check yaw damper disconnect switch for ON-OFF operation

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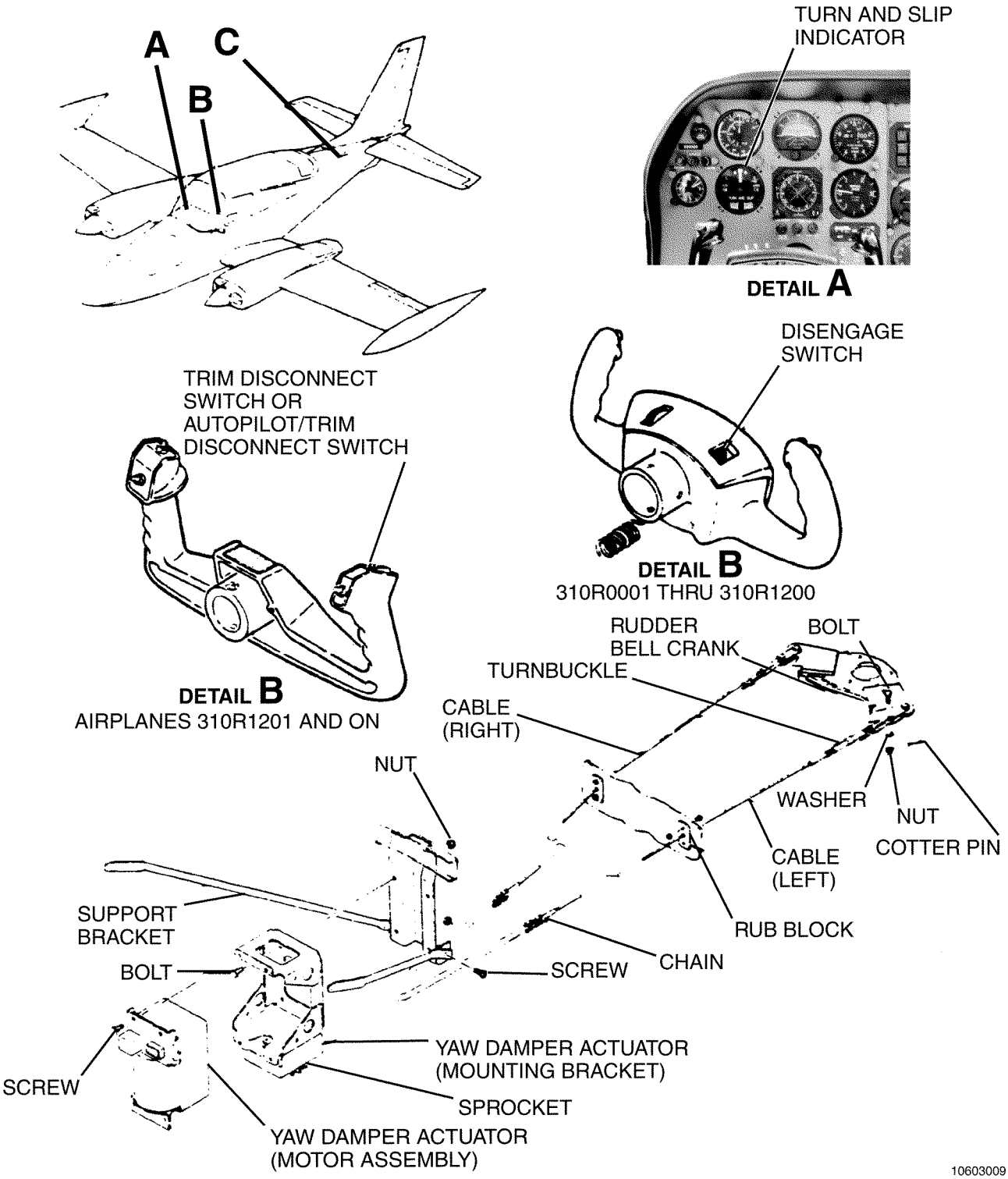

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Yaw Damper Installation
Figure 501 (Sheet 1)

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CHAPTER

23

COMMUNICATIONS

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COMMUNICATION - GENERAL

1. Scope

A. This chapter describes the communication systems available for installation in the 310R model airplane. For maintenance on specific components in each system, refer to the appropriate supplier's service manual.

B. For servicing information pertaining to the 300 and 400 Nav/Com Systems, refer to Chapter 34.

2. Definition

A. Audio signals from the communication and navigation receiver/transmitters are directed to the audio amplifier switching panel. The pilot may select any combination of signals to be directed to the headphones or cockpit speaker.

B. Intercom between the pilot and copilot is also provided through the audio amplifier switching panel. The intercom system also permits communication between the pilot and passengers through the cabin speakers.

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AVIONICS MASTER SWITCH BREAKERS - DESCRIPTION AND OPERATION

1. General

A. Electrical power to the (factory-installed) avionics bus is supplied by the avionics circuit breaker, located in the left wing outboard of the engine nacelle. Electrical power is routed from the wing circuit breaker to the AVIONICS Master switch/breaker, which controls the ON and OFF electrical power at the avionics bus. An ALTERNATE AVIONICS POWER switch/breaker is provided on the circuit breaker panel for backup, electrical power in the event the wing circuit breaker, master switch or their associated circuits become inoperative. Refer to the applicable avionics system wiring diagram furnished with the aircraft for the various (optional) factory-installed avionics. Optional avionics shelves are located in the nose section of the airplane. Access to the avionics shelves are gained by removing the nose cap. The avionic junction blocks are located below the left-hand nose baggage shelf.

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ELECTRONIC INTERFERENCE - DESCRIPTION AND OPERATION

1. Radio Noise.

A. Radio noise is a problem of great importance to the aircraft industry. A noisy radio system may actually imperil the safety of the aircraft occupants. The performance of radio navigation equipment can be completely erroneous if radio noise is excessive. For this reason, radio installations should be made only by persons who are qualified. Radio noise is not generated in a properly operating radio set, but is merely presented to the listener in an audible form exactly the same way that a radio station is received. Many forms of noise can exist in any particular aircraft and, ironically, sometimes certain aircraft can be amazingly quiet. This condition is unusual and even though the aircraft is quiet without noise suppression, it cannot be released without proper suppression. A quiet aircraft without suppression may degenerate into a noisy aircraft with changes in age, temperature, and humidity. Common radio noise is generated by ordinary electrical devices in the aircraft such as flap or gear motors, navigation light flashers and ignition or alternator systems. By properly installing capacitive and inductive devices in these circuits, the noise can usually be reduced to a tolerable level. A more difficult type of noise to suppress, is that generated by friction between two components or a rectification. Another difficult problem is noise that is carried to sensitive areas by grounding loops. The following paragraphs contain solutions that have been effective for the factory. It is important to remember that each aircraft may present a slightly different problem and, therefore, a "fix" on one aircraft will not necessarily be effective in all cases.

2. Alternator Noise.

A. While the alternators are relatively free from radio noise, there is the possibility the alternators will produce an audible noise in the radio and electronic systems. Inside the alternator a three phase AC voltage is applied to a full wave rectifier assembly, thus converting the AC voltage to DC. During the rectification, an AC ripple appears on top of the DC voltage, thus the bus voltage is actually fluctuating. While the battery acts as a capacitor, it is also necessary to have additional filtering. This is accomplished by the use of a capacitor from the output terminal to ground at the alternator. The use of solid state regulators reduces the possibility of regulator noise to a minimum and will not require filtering.

3. Ignition Noise.

A. The sound of ignition noise is easily identified because of its timing. The 310 aircraft has a shielded magneto ignition system. Each secondary lead from the magneto to the plug is a shielded wire. Double shielded wiring is used in the primary circuit with a special suppressor in series with the switch lead. The suppressor is constructed coaxially with a shielded lead coming out of the end which is connected to the magneto cigarette cartridge. The double shielded wire is connected to the terminal end of the filter (the shield is grounded). The double shielded wire enters the cabin area through connectors in the wing root rib to prevent noise transfer to the junction box wiring. The double shielding is continued to the inside of the cabin to the magneto switch. The magneto switches are enclosed in a shielded case to which the double shield of the wire is grounded. If ignition noise is prevalent in the radio system, the entire magneto system should be checked for tight connections, especially in the root rib connectors and at the switch and suppressor. All ground connections in the circuit are critical and any oil or dirt accumulation should be cleaned from the connection and the metal should be brightened to provide the best possible ground. Ignition harness should be replaced if the shielding becomes questionable.

4. Flap and Landing Gear Motor Noise.

A. During the landing approach, an unfiltered motor in the flap or gear circuits can produce a startling volume of noise which is very distracting. There is also the possibility of the noise blanketing a message from the tower during the approach. It is possible that sufficient noise could be created through these circuits to blanket an ILS signal, creating a hazardous situation. For these reasons, the circuits have a filter section built into the motor. The filter should be very effective if the unit is properly grounded. If noise becomes excessive with good grounding, a motor overhaul or replacement may be necessary.

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5. Auxiliary Fuel Pump Noise.

A. Coaxial type capacitors produce effective results when installed on the base of the fuel boost pumps. Because of the location of the fuel pump and capacitors, the connections must be kept tight to avoid any possible arcing. When proper filtering and grounding do not produce the desired filtering results, a new pump should be tried.

6. Lighting Circuit Noise.

A. All lighting components on the 310 aircraft have internal filters and usually do not require external capacity. The light wiring, however, because of this route to the extremities of the aircraft can, in unusual cases, conduct noise to vital areas. The light wires and electrical wiring bundles should be routed away from the antenna and loop antenna cables to prevent picking up noise in the radio systems. Shielding should be properly grounded.

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ELECTRONIC INTERFERENCE - TROUBLESHOOTING

1. General.

A. Troubleshooting Electronic Interference Guide

NOTE: The following general troubleshooting information is presented as a guide to determine the system or systems producing the interference.

(1) Pinpoint the particular system causing the noise by the process of elimination.
(2) Once the system causing a particular noise is isolated, investigate the particular system or systems to determine which component or components are causing the noise, by observing which components are actually operating when the noise occurs.
(3) Check the component for proper operation or damage.
(4) Check wiring connections and wiring coming in contact with moving parts.
(5) Check wire routing for proper separation.
(6) Check wire shielding where applicable.
(7) Check all system grounds.

2. Alternator Noise.

NOTE: If alternator noise is experienced and it is determined it is coming from the output of the alternator, the following troubleshooting should be accomplished before attempting additional filtering.

A. Check attenuator output bypass filter for broken leads or inadequate ground.

B. Check the lead attaching to alternator power (+) terminal is as short as possible or approximately 1 to 2 inches long.

C. Check alternator ground wire for any damage or improper contact or corrosion between terminal and grounding point.

D. Check alternator brushes for damage that could be arcing.

E. Check alternator brush tension for proper seating.

3. Regulator Noise.

NOTE: If regulator noise is present and traced to the regulator and its associated control leads the following checks should be made before attempting to add additional filtering.

A. Check regulator adjustment for proper setting (27.25 to 27.75 volts).

B. Check regulator noise filter for damage, loose wires, broken leads, or improper connections.

C. Check shield wire on regulator to alternator field wires for proper termination (single point ground), shield damage, check for adequate coverage at termination ends.

D. Check alternator for brush arcing.

4. Electric Trim Motor Noise

A. In the event of noise difficulties caused by the trim system motors, the following should be checked to insure standard noise suppression equipment is properly installed.

B. Check that motor frame and actuator assembly are properly grounded.

C. Check capacitors inside of motor for broken leads or damage.

D. Check to make sure shielded wires are properly grounded at the actuator assembly and that the shields are not shorted in other areas to structure which could create noise loops.

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E. If the filters are good and noise is not totally eliminated the following procedures should be attempted to eliminate the noise.
   (1) Change C_1 to .05 microfarad.
   (2) Add a 1.0 microfarad feed-thru capacitor with shielded lead to (+) lead of the side producing the noise. Attach the housing or capacitance ground to the actuator housing assembly.
   (3) Make sure shielding wire and motor frame are making good ground.
   (4) If the motor is noisy in both directions of rotation add a 1.0 microfarad feed thru capacitor to both leads and insure that shield and housing or capacitor ground are attached to the actuator housing assembly.
   (5) The addition of larger capacitors, inductors are RF chokes is not recommended; experience has proven no significant change in additional filtering.

5. Fuel boost and Auxiliary Transfer Pump Noise.

A. If boost pump noise is experienced in the audio system, check for the following:
   (1) Insure that wiring is properly shielded.
   (2) Insure shields are properly grounded.
   (3) Check loose wiring connections for looseness and breaks.

NOTE: If the cause of the noise cannot be eliminated, a .47 microfarad 50 WVDC feed-thru capacitor should be installed in the power (AX) lead as close to the pump as possible and insure the case of the capacitor is properly grounded to the airframe.

6. Anti-Collision Light Noise.

A. If the anti-collision lights are causing noise in the audio system, the following should be checked:
   (1) Filter for proper ground.
   (2) Lamp circuit for loose connections and wiring.
   (3) Bulb for loose socket.
   (4) Internal filter for damage.
   (5) External light for proper ground to frame or structure of aircraft.

7. Strobe Light Noise.

A. If the strobe lights are causing noise in the audio system from radiation or in-line interference, the following should be checked:
   (1) Make sure all power supply units are grounded properly to the airframe.
   (2) Insure the shielded wires and twisted pairs from the tail light are grounded.

NOTE: Grounds must be terminated at the power supply.

   (3) Insure tail Nav light is adequately grounded.

8. Intermittent Radio Operation

A. Intermittent radio failures have been attributed to connector contact surface contamination caused by flux and/or flux residue. This contamination can be removed by washing the contact surface with one of the following cleaners:

Name	Manufacturer
Rosin Residue Remover	Alfa Solder Co., Kester Solder Co., Ersin Solder Co
GC Relay Clean.	
LPS Instant Contact Cleaner	
Any Hydrocarbon or Fluorocarbon cleaner followed by second wash with alcohol.	

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HIGH FREQUENCY (HF) COLLINS HF-200 - DESCRIPTION AND OPERATION

1. General

A. The Collins HF-200 high frequency (HF) system provides long range communication between the airplane and ground station or another airplane. This system provides amplitude-modulated (AM) and upper side band (USB) communication on 20 channels with a frequency range from 20 to 22.9999 MHz.

B. The HF communication system consists of HF control located in the instrument panel, automatic antenna coupler located in the tailcone, transceiver and power amplifier located on the nose avionics shelf.

2. Description

A. Control Panel.
   (1) The control panel is used for remote control of transmitting and receiving functions.
      (a) ON/OFF Volume Control - This control controls the power to the system and varies the audio gain.
      (b) Mode Control - Selects system mode of operation.
      (c) Clarifier Control - Switch portion enables (out of detent) or disables (OFF position) clarifier function. Rotating the control permits tuning the received frequency ±100 Hz (USB mode only); the clarifier function is automatically disabled during transmit.
      (d) Squelch Control - Switch portion enables (out of detent) or disables (test position) squelch function. Rotating the control sets the squelch threshold.
      (e) Channel Selector - Selects desired channel; system automatically tunes to the selected channel.

B. Transceiver.
   (1) The transceiver is a solid-state, remote mounted, noncompatible amplitude-modulated (AM) and upper side band (USB) unit. The transceiver has an operating frequency range between 2.0 to 22.9999 MHz.

C. Power Amplifier.
   (1) The power amplifier contains a 2 stage rf driver to amplify the 250 MW peak envelope power (pep) rf input from the transceiver to a 100 w peak envelope power (pep) output automatic antenna coupler during transmit mode.

D. Automatic Antenna Coupler.
   (1) The automatic antenna coupler automatically matches the impedance of the airplane ground wire antenna to the 50 ohm resistive output of the power amplifier. The information generated within automatic antenna coupler is for the tuning cycle control of the power amplifier and transceiver.

E. Antenna.
   (1) The HF-200 antenna consists of an antenna wire which is anchored on top of the cabin just aft of the windshield, then routed back to the vertical stabilizer and from the vertical stabilizer to the antenna feed-thru on the fuselage.

3. Operation

A. The HF-200 operates in two modes: upper side band (USB) and amplitude-modulated (AM). This USB mode is used to communicate with other station operating in upper side band. AM, this mode is included to allow communication with AM stations. The AM mode is not compatible with stations operating on USB channels.

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HIGH FREQUENCY (HF) COLLINS HF-200 - MAINTENANCE PRACTICES

1. General

A. For shop maintenance of the Collins HF-200, refer to applicable Collins manual.

2. Removal/Installation of HF-200 Components

A. Remove HF Control.
   (1) Turn electrical power OFF.
   (2) Remove screws securing control to instrument panel.
   (3) Remove HF control from instrument panel and disconnect electrical connector.

B. Install HF Control.
   (1) Connect electrical connector to HF control.
   (2) Slide HF control in instrument panel and secure with screws.

C. Remove Automatic Antenna Coupler.
   (1) Turn electrical power OFF.
   (2) Open tailcone access door.
   (3) Disconnect electrical connectors.
   (4) Remove screws securing automatic antenna coupler mount.

D. Install Automatic Antenna Coupler.
   (1) Position automatic antenna coupler on mount and secure with screws.
   (2) Connect electrical connectors.
   (3) Close tailcone access doors.

E. Remove Power Amplifier and/or Transceiver (Typical).
   (1) Turn electrical power OFF.
   (2) Remove nose avionics access panel.
   (3) Disconnect coax and electrical connectors.
   (4) Loosen screws securing clamp until clamp is clear of power amplifier and/or transceiver; then remove.

F. Install Power Amplifier and/or Transceiver (Typical).
   (1) Position power amplifier and/or transceiver in mounting tray.
   (2) Tighten screw until clamp is firmly over lip on power amplifier and/or transceiver.
   (3) Connect coax and electrical connectors.
   (4) Install nose avionics access panel.

G. Remove Antenna.
   (1) Remove cotter pins, washers and pins securing insulators to brackets.
   (2) Open tailcone access door and disconnect coax connector at antenna feed-thru.
   (3) Remove screws securing antenna feed-thru to fuselage skin.
   (4) Unscrew sleeve from elbow and elbow from base. Using a suitable tool compress, compression click to release antenna wire.

H. Install Antenna
   (1) Slide sleeve and elbow on to antenna wire. Push antenna into base until antenna wire locks into compression clip.
   (2) Screw elbow into base and sleeve into elbow.
   (3) Install seal and antenna feed-thru on fuselage skin and secure with screws. Connect coax connector.
   (4) Install insulators on brackets and secure with pins, washers and cotter pins. Reseal with Dow Corning DC-4.

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3. Adjustment/Test High Frequency

A. Bonding Test.
(1) Measure the DC resistance between each shock mount of the receiver-exciter mount and the power amplifier/power supply mount and airplane structural ground.
(a) Connect the negative lead of the bonding meter to airplane structural ground and the positive lead to the equipment shock mount.
(b) The DC resistance must be less than 0.0025 ohms. If the resistance is greater than 0.0025 ohms, remove the equipment mount, shelf and bond straps. Abrasive clean all contacting surfaces and also clean the surfaces with MEK. Refer to Structural Repair Manual for abrasive cleaning material and procedure.
(c) Reassemble mounts and measure the DC resistance again. If the resistance is still greater than 0.0025 ohms, add bonding straps as required between the mount and airplane structure. The bond straps shall be as short as possible and the length to width ratio shall not exceed 10:1.

B. Operational Test.
(1) Apply external power to the airplane.
(2) Set Com 3 switch on the audio control panel to headphone or speaker position as desired.
(3) Turn the OFF-VOLUME control clockwise and allow five minutes warm up for side band and one minute for AM operation.
(4) Select the desired channel with the channel select control.
(5) Select the proper modulation with the mode switch.
(6) Turn the squelch counterclockwise and adjust the volume for normal noise output; then, slowly adjust the squelch clockwise until the receiver is silent.
(7) When an RF signal is received, adjust the CLARIFIER for maximum signal clarity.
(8) To transmit, select Com 3 position on the audio control panel and then depress the microphone.

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AUDIO CONTROL PANEL - ADJUSTMENT/TEST

1. Audio Control Panel

A. Adjustment/Test.

(1) Turn ON battery switch or connect external power unit. Turn all radios ON and tune to a transmitting frequency.

(2) Turn microphone select switch to COM 1 and then to COM 2 positions, communicate with another station on both radios.

(3) Move each receiver switch to SPEAKER and HEADPHONE positions. Each radio should be heard in the speaker and headphone as switches are moved.

(4) Turn OFF each receiver switch to radios.

(a) Turn microphone selector switch to COM 1, COM 2, or COM 3 (if installed) communicate with another station or radios.

(b) Move automatic receiver switch to SPEAKER and HEADPHONE positions. Each radio should be heard in the speaker and headphone as switch is moved.

NOTE: If radio receiver switch was left in SPEAKER position and automatic receiver switch is in HEADPHONE position, audio will be heard at speaker and headphone or vice versa.

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CABIN STEREO SYSTEM (MOTOROLA TM226S) - DESCRIPTION AND OPERATION

1. Description

A. The stereo system is an optional installation. The system consists of a stereo tape player located in the glove box, dual aft cabin speakers, headset and headset transducers. The eight-track tape player has an automatic program switching feature for continuous play and also a manual pushbutton control for immediate program switching.

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CABIN STEREO SYSTEM (MOTOROLA TM226S) - TROUBLESHOOTING

1. General

A. Troubleshooting the stereo system consists of isolating malfunctions by operating the system and utilizing the simplified electrical schematic, in Chapter 24, Communications And Interior Systems Diagrams.

2. Tools and Equipment

NOTE: Equivalent substitutes may be used for the following listed item.

Name	Number	Manufacturer	Use
Multimeter	Model 260	Simpson Electric Co.	Voltage and continuity checks.

3. Troubleshooting

A. In troubleshooting the stereo system, check for proper voltage to the stereo player (12 volts DC).
   (1) Isolating erratic operation to the tape player, the problem may be cleared by cleaning the tape head and capstan (refer to cleaning instructions in maintenance practices section).
   (2) Isolating a malfunction to the cabin audio circuit may require troubleshooting the audio control panel (refer to audio integrating system).

B. For more detailed troubleshooting of individual system components, refer to the appropriate Motorola maintenance manual.

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CABIN STEREO SYSTEM (MOTOROLA TM226S) - MAINTENANCE PRACTICES

1. General

A. Maintenance of the stereo system is primarily replacement, with the exception of cleaning the tape head and capstan of the tape player.

2. Removal/Installation of Stereo Equipment

A. Remove Stereo Tape Player.
   (1) Turn electrical power OFF.
   (2) Remove screws securing stereo to doubler and channel.
   (3) Disconnect electrical connector and stereo from glove box.

B. Install Stereo Tape Player.
   (1) Connect electrical connector and slide stereo in glove box.
   (2) Install screws securing stereo in glove box.
   (3) Check operation of stereo.

C. Remove Speaker.
   (1) Remove speaker cover.
   (2) Remove screws securing retainer and speaker.
   (3) Disconnect wiring and remove speaker.

D. Install Speaker.
   (1) Connect wiring to speaker; install speaker and retainer securing with screws.
   (2) Install speaker cover.

E. Remove Headset Transducer.
   (1) Remove control knobs.
   (2) Remove bezel by removing screws.
   (3) Remove screws securing headset transducer to upholstery panel.
   (4) Tag and disconnect electrical wires and remove headset transducer.

F. Install Headset Transducer.
   (1) Connect electrical wires to headset transducer and remove tags.
   (2) Position headset transducer on upholstery panel, securing with screws.
   (3) Position bezel on upholstery panel, securing with screws.
   (4) Install control knobs.

3. Cleaning

A. Cleaning Stereo Tape Player.
   (1) Over a period of operating time, oxide from the tape will accumulate on the tape head and capstan which may cause tape hiss and erratic operation.
      (a) Hold the player cartridge door open.
      (b) Clean tape head and capstan with a soft cloth or cotton swab moistened with isopropyl alcohol or approved head cleaner.

CAUTION: Do not use carbon tetrachloride, acetone or other solvents for cleaning. Permanent damage to the tape head may result.

4. Adjustment and Test

A. Preliminary Test Setup.
   (1) Apply 27.5 VDC power to the stereo and audio switching panel by engaging their respective circuit breakers.

NOTE: Power to audio switching panel is not required for systems with a ASP-310 panel for stereo operation.

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B. Stereo System Operation.
   (1) Place the tape cartridge in the tape player tape door.
   (2) Press the select button for "CHANNEL 1".
      (a) The "CHANNEL 1" indicator lamp shall light.
   (3) Repeat step 2 for channels 2, 3 and 4, respectively.
      (a) The "CHANNEL 2, "CHANNEL 3", and "CHANNEL 4" indicator lamps shall light.
   (4) Press the SELECT button for "CHANNEL 1", and the speaker ON-OFF switch to "ON".
   (5) Place the transducers volume controls in mid-range position.
   (6) Place the tape player "VOLUME", "BALANCE", and "TONE" control levers to the mid-range positions.
      (a) Audio shall be heard in both speakers and the four transducers with pneumatic headsets plugged in.
   (7) Place the tapeplayer "VOLUME" lever from full left to full right positions and then back to mid-range.
      (a) The volume in speakers and headsets shall increase then decrease.
   (8) Place the tape player "TONE" lever from full left to full right positions, and then back to mid-range.
      (a) The tone in the speakers and the headsets shall vary as marked on the tape player.
   (9) Place the tape player "BALANCE" lever from full left to full right positions and then back to mid-range.
      (a) The audio shall be heard in one speaker and headset in the full left and right positions of the lever control, and then in both speakers and headsets in the mid-range position, respectively.
   (10) Vary the volume controls on each of the four transducers from full CCW to CW.
      (a) The volume shall increase in the individual headsets, respectively.
   (11) Press the tape player SELECT to CHANNEL 2, CHANNEL 3, CHANNEL 4, respectively.
      (a) The tape player track playing shall change in accord.
   (12) Place the tape player REPEAT switch to the "ON" position.
      (a) The tape player track that is playing shall repeat.
   (13) Play the SPEAKER ON-OFF switch to the "OFF" then "ON" position, respectively.
      (a) The speakers shall turn off then on in accord.
   (14) Place the SPEAKER ON-OFF switch to the "ON" position.

C. Cabin Address Operation with the 800 and 1000 Audio Panels.
   (1) Adjust the tape player VOLUME, TONE and BALANCE controls to produce the desired audio response in both the speakers and headsets.
   (2) Place the 800 or 1000 audio switching panel function switch in the "CABIN" position.
      (a) The audio from the tape player in both speakers and headphones shall be muted.
   (3) Press the MIC KEY button and talk into microphone.
      (a) The MIC audio shall be heard in both cabin speakers and the headsets for each transducer, respectively.
   (4) Repeat step 2 thru step 3, but with the SPEAKER ON-OFF switch in the "OFF" position.
      (a) The MIC audio shall be heard in both cabin speakers, and the headsets for each transducer, respectively.

D. System Shutdown.
   (1) Remove the tape cartridge from the tape player "TAPE DOOR".
   (2) Place the stereo circuit breaker to "OFF" position.
   (3) Place the audio switching panel circuit breaker to "OFF" position if applicable.

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AUDIO CONTROL PANEL - DESCRIPTION AND OPERATION

1. Description

A. The audio control panel installed on the instrument panel, provides audio control; both transmission and reception for the communications and navigation equipment installed in the aircraft.
   (1) The microphone selector switch, selects transmitter 1, 2 or 3 for audio communications. The speaker/phone toggle switches permit the operator to monitor various received signals. The received signal (by the selection on speaker/phone switches) may be audible on the headphone or the speaker. To receive a signal the toggle shall be positioned to either the speaker or phone.
   (2) The audio control panel, incorporates an automatic speaker and phone toggle switch. This switch is used with the microphone select switch, to provide automatic audio through the speaker or headphone. When the Com 1, 2, or 3 toggle switches are OFF and transmit selections for Com 1, 2 or 3 are made at the microphone select switch.

B. To operate the audio system, apply power to the system.
   (1) Transmit --- The speaker/headphones toggle switches have three positions, SPEAKER-OFF-HEADPHONES. Position a switch to SPEAKER, the receiver audio in that system will be audible in the speaker. Position a switch to HEADPHONE, the received audio in that system will be audible in the headphone. The OFF position prevents received audio from entering the speaker or headphones. Also, audio may be received at the speaker or headphone automatically when the AUTO SPEAKER/PHONE switch is in the desired position (toggle switches OFF) and selection is made at the MIC SEL switch. Audio volume is controlled at the respective transmitter for both speaker and headphone.

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AUDIO CONTROL PANEL - TROUBLESHOOTING

1. Audio Control Panel

NOTE: Troubleshooting of the audio control panel includes checking of communications and navigation radios for a complete operational system.

CAUTION: Replacement of a 300 or 400 NAV/COM may result in a magnetic compass error. It will be necessary to assure correct compass calibration following radio replacement.

A. Troubleshooting.
(1) For troubleshooting the audio control panel, refer to Table 101.

NOTE: Perform audio control panel troubleshooting with normal voltage applied and radio systems operating.

Table 101. Audio Control Panel Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
NO AUDIO IS DETECTED AT THE HEADPHONES OR SPEAKER.	Lack of continuity in wiring.	Turn microphone selector switch to COMM 1; tune COMM radio to control tower frequency and ADF radio to local AM broadcasting signal. If no audio is detected, check continuity of wiring to headset or speaker. Repair or replace wiring as required.
	Low voltage, circuit breaker or wiring.	Remove audio control panel and check for 28 Volts at pins 43 and 49 of electrical connector. If low voltage, check circuit breaker and wiring. Repair or replace circuit breaker and/or wiring as required.
	Lack of continuity of pin 41 to airplane structure.	Check continuity of pin 41 to airplane structure. Repair as required.
	Unserviceable audio control panel.	Repair audio control panel.
ONE RADIO WILL NOT TRANSMIT.	Lack of continuity in wiring.	Check continuity of audio and transmit control wiring to radio. Repair as required.
	Unserviceable audio control panel.	Repair audio control panel.

(2) For wiring diagrams, refer to Chapter 24, Electrical Power.

NOTE: Audio control panel wiring diagrams should be used with optional communication and navigation wiring diagrams furnished with the airplane to aid in troubleshooting.

2. Wiring Diagrams

A. Troubleshooting of the audio control panel wiring includes the following:
(1) Tools and Equipment

NOTE: Equivalent substitutes may be used for the following listed item.

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Name	Number	Manufacturer	Use
Multimeter	Model 260	Simpson Electric Co.	General.

B. Troubleshooting Audio control Panel.
(1) For airplanes 310R0001 Thru 310R0500 refer to Figure 101.
(2) For airplanes 310R0501 Thru 310R2140 refer to Figure 102.

NOTE: Audio control panel wiring diagram should be used with optional communication and navigation wiring diagrams to aid in troubleshooting.

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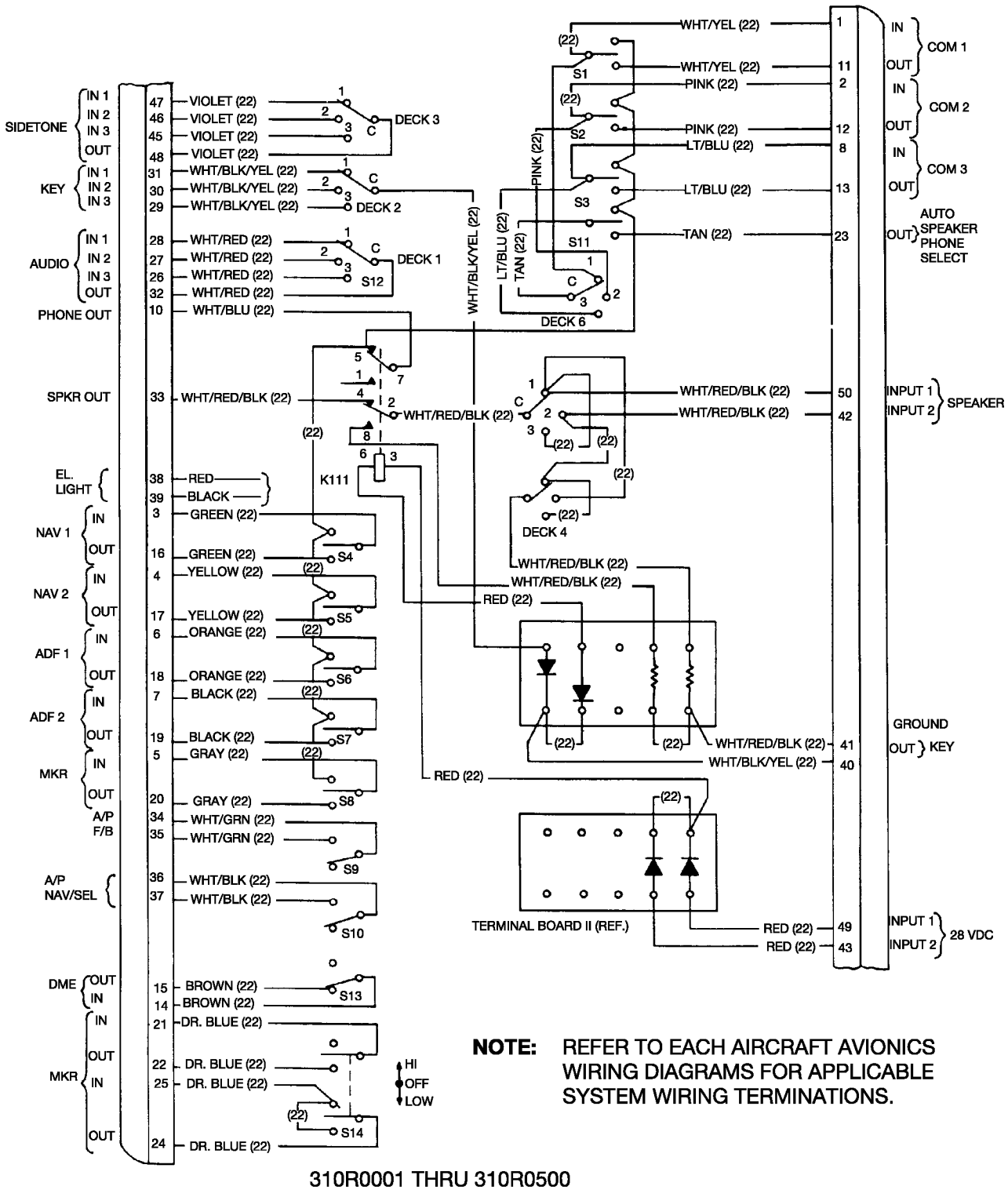

NOTE: REFER TO EACH AIRCRAFT AVIONICS WIRING DIAGRAMS FOR APPLICABLE SYSTEM WIRING TERMINATIONS.

310R0001 THRU 310R0500

1098R8014

Audio Control Panel Wiring Diagram (310R0001 Thru 310R0500)
Figure 101 (Sheet 1)

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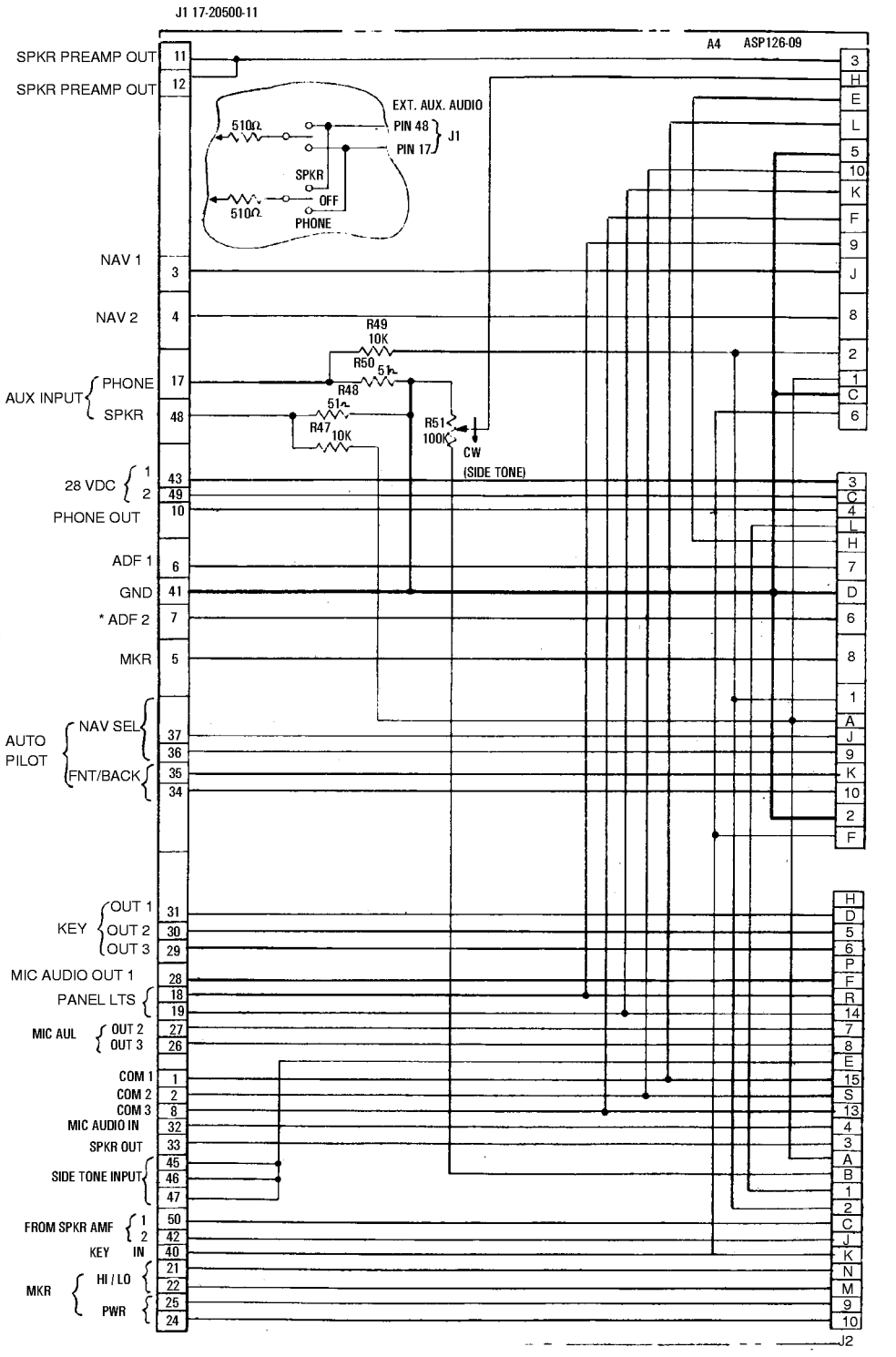

Audio Control Panel Wiring Diagram (310R0501 Thru 310R2140)
Figure 102 (Sheet 1)

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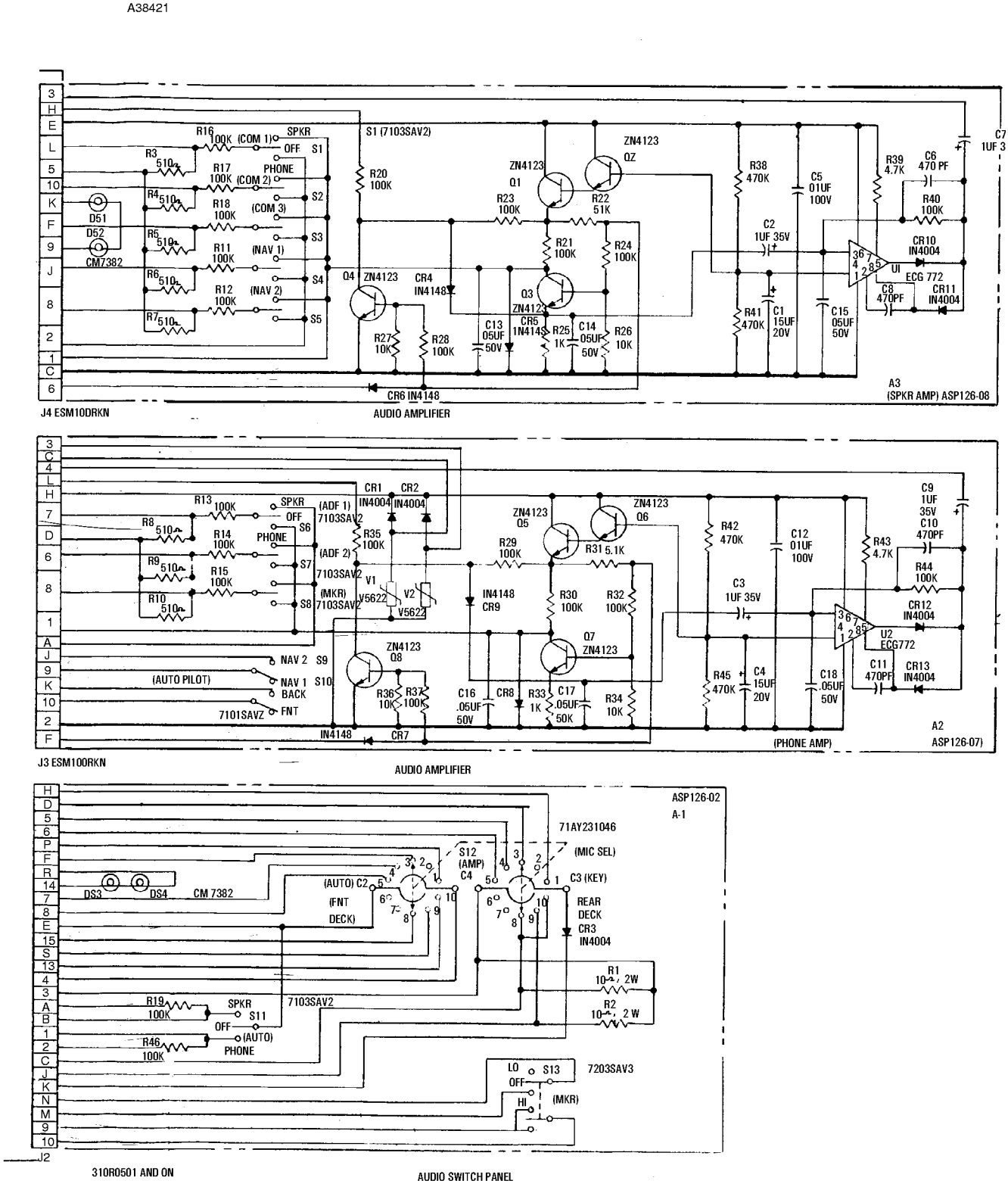

Audio Control Panel Wiring Diagram (310R0501 Thru 310R2140)
Figure 102 (Sheet 2)

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AUDIO CONTROL PANEL - MAINTENANCE PRACTICES

1. General

A. Maintenance practices for the audio control panel will consist of removal and installation.

2. Removal/Installation Audio Control Panel

A. Remove Audio Control Panel.
   (1) Turn electrical power off.
   (2) Remove screws, securing audio control panel to instrument panel.
   (3) Pull audio control panel aft and disconnect electrical plug.

B. Install Audio Control Panel.
   (1) Connect electrical plug to audio control panel.
   (2) Position audio control panel in instrument panel and secure with screws.
   (3) Perform operational check, refer to Adjustment/Test.

3. Adjustment/Test

A. Audio Control Panel Operational Check.
   (1) Turn on battery switch or connect external power unit. Turn all radios ON and tune to a transmitting frequency.

B. Turn microphone select switch to Com 1 and then to Com 2 positions, communicate with another station on both radios.

C. Move each receiver switch to speaker and headphone positions. Each radio should be heard in the speaker and headphone as switches are moved.

D. Turn off each receiver switch to radios.
   (1) Turn microphone selector switch to Com 1, Com 2 or Com 3 (if installed) communicate with another station or radios.
   (2) Move automatic receiver switch to speaker and headphone positions. Each radio should be heard in the speaker and headphone as switch is moved.

NOTE: If radio receiver switch was left in speaker position and automatic receiver switch is in headphone position, audio will be heard at speaker and headphone or vice versa.

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STATIC DISCHARGING - MAINTENANCE PRACTICES

1. General

A. Trailing edge dischargers (optional) may be installed at the airplane extremities to dissipate static electricity.

B. Static wick dischargers showing deterioration should be replaced.

2. Removal/Installation of Static Wick

A. Remove Static Wick.
   (1) Remove screws securing static wick to structure and remove static wick.
   (2) Clean and burnish the metal surface where the static wick contacts the airplane skin.

B. Install Static Wick.
   (1) Secure static wick to structure with screws.

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STATIC DISCHARGE - INSPECTION/CHECK

1. Static Discharging

A. Inspection/Check

(1) Visually inspect the static wicks. Check for loose screws and damage. Conduct a resistance check on each static wick. Resistance shall not be greater than .0005 Ohm. If the resistance is greater, remove the wick and clean attachment areas with bonding brush. Reinstall and recheck resistance.

NOTE: To check resistance use a "DIGITAL LOW RESISTANCE OHMMETER WITH CHARGER", part number 24700, of James C. Biddle Company, Plymouth Meeting, PA, 19462, per manufacturer's instructions or equivalent.

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CHAPTER 24

ELECTRICAL POWER

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ELECTRICAL POWER - GENERAL

1. Scope

A. This chapter describes those electrical units and components which generate, control, and supply electrical power for other systems, including generators, relays, inverters, batteries, etc., through the secondary buses, as well as common electrical items such as wiring, switches, connectors, etc.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) DC generation describes that portion of the system used to generate, regulate, control, and indicate DC electrical power, including such items as generators, batteries, and control and regulating components.
   (2) External power describes that portion of the system within the airplane that connects external electrical power to the airplane electrical system.
   (3) The wiring diagrams section contains wiring diagrams for all airplane electrical systems.

3. Description

A. Power Distribution.
   (1) DC electrical power is the airplane's main source of electrical power. The DC electrical power system is divided into two independent systems; the left-hand and right-hand. Each system has a power source. A cross-tie bus connects the systems together to supply power to the various load demands throughout the airplane. Normally both systems operate in parallel. In the event of a power loss of one alternator system, electrical power is supplied from the opposite system through the cross-tie bus. When the airplane is on the ground, a DC external power receptacle (optional) is utilized to supply DC power to the airplane's electrical system.
   (2) Two engine-driven alternators, one on each engine, are normally the source of power supplied to all DC load buses and to charge the storage battery. The standard alternator system includes two 50-ampere alternators, the optional system includes two 100-ampere alternators.
   (3) One 24-volt lead-acid battery, located in the left wing outboard of the engine nacelle; is the airplane's secondary DC power source. Battery power is utilized to start the engines. Also, if the alternator systems fail, the battery will supply power to the electrical systems.
   (4) External DC power can be connected to the airplane through the external power receptacle (optional), located on the aft lower surface of the left-hand nacelle baggage compartment. When external power is connected, the auxiliary power relay energizes, connecting the external power source to the hot battery bus, supplying DC power to the electrical systems. When external power provisions are available on the airplane, its use is recommended for engine starting and electrical ground maintenance operations.
   (5) Electrical load distribution, from the power sources to the various using systems throughout the airplane, is accomplished by wiring, buses, and circuit breakers. The circuit breaker panel is located on the left cabin wall forward of the pilot's seat.

B. Avionics.
   (1) Avionics systems pertain to the autopilot system, integrated flight control system, audio control panel, and emergency locator transmitter. Refer to the applicable avionics system wiring diagram furnished with the airplane for the various (optional) factory-installed avionics. Optional avionics shelves are located in the nose section of the airplane; refer to Chapter 53, Nose Cap - Removal/Installation. Access to the avionics shelves are gained by removing the nose cap. The avionic junction blocks are located below the left-hand nose baggage shelf.
   (2) Electrical power to the (factory-installed) avionics bus is supplied by the avionics circuit breaker, located in the left wing outboard of the engine nacelle. Electrical power is routed from the wing circuit breaker to the AVIONICS Master switch/breaker, which controls the ON and OFF electrical power at the avionics bus. An ALTERNATE AVIONICS POWER switch/breaker is provided on the circuit breaker panel for backup, electrical power in the event the wing circuit breaker, master switch, or their associated circuits become inoperative.

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4. Components Location Chart

A. Electrical System

Component	Location
Overvoltage Relay	On Front Spar Under Floorboard - Copilot's Seat
Voltage Regulators	Under Copilot's Seat
Ammeter Fuse	In Each Wing Root Junction Box
Battery Solenoid	LH Engine Nacelle Firewall
Starter Solenoid	LH Engine Nacelle
Starter Vibrator	LH Panel Brace Forward Of Instrument Panel
External Power Receptacle	Under Side of LH Wing Outboard of Nacelle
Terminal Blocks	
TB14	Forward of Instrument Panel at Center Line of Airplane
TB15	Forward of Instrument Panel on LH Side of Center Line
TB16	Forward of Instrument Panel at Center Line of Airplane

5. Tools and Equipment

A. Equivalent substitutes may be used instead of the following listed items.

Name	Number	Manufacturer	Use
Multimeter	Model 260	Simpson Electric Co.	Voltage and continuity checks.
Volt-Ohm-Milliammeter	Model 630	Triplett Corp.	Voltage and continuity checks.
Wrench	P/N 5090005-1	Cessna Aircraft Company	Removal and installation of alternator coupling.

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ELECTRICAL POWER - INSPECTION/CHECK

1. Electrical System

A. Inspection/Check.

NOTE: The left upholstery panel, pedestal covers, and all applicable access covers must be removed prior to inspecting wiring, circuit breakers, or other electrical components.

(1) Inspect wiring for chafing, terminals for security, and general condition; circuit breakers for mounting and condition; regulators for mounting, terminals for loose wires; switches for loose wiring proper mounting; relays for wiring and mounting; starter cable for clearance with cowl and proper flexing; motors for proper mounting and wires for clamp.
(2) Inspect instruments and interior lights for operation and broken glass; instrument panel and control pedestal for loose wiring, clamps, and terminals for security.
(3) Inspect wing and fuselage wiring for proper wire routing, clamped properly, and loose terminals.
(4) Inspect external power receptacle for proper door closing, terminals for corrosion and looseness.
(5) Inspect engine compartment wire bundles for proper clamping, evidence of burning, heat hardness, security, and chafing.
(6) Inspect stall warning vane and heater for proper operations and security.

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DC GENERATION - DESCRIPTION AND OPERATION

1. Alternators and Voltage Regulators

A. Two engine-driven alternators, one installed on each engine, supply the power source to all DC load buses and to charge the storage battery. Each alternator system consists of the alternator, volt age regulator, overvoltage relay alternator fail sensor, alternator out indicator light and alternator switch.

B. There are two solid state voltage regulators, located under the copilot's seat. Each voltage regulator incorporates an adjustment screw and terminal connections. The voltage regulator controls the voltage output of its respective alternator. The voltage regulators are electrically connected in parallel in the system. Once the voltage regulator is adjusted, the voltage remains almost constant, since the regulator is unaffected by either length of service, by change in temperature or by changes in the alternator output and speed. Should adjustment of a voltage regulator be required, turn adjustment screw clockwise to increase and counterclockwise to decrease voltage output.

C. There are two overvoltage relays, located under the copilot's seat on the front spar. Each overvoltage relay, provides overvoltage protection for its respective alternator system. Each overvoltage relay will trip, disabling its alternator system when an overvoltage of 32 volts, +3 or -3 volts is sensed at the relay. The overvoltage relay can be reset by switching the respective alternator switch OFF then back to ON position.

D. Two alternator fail sensor units are utilized in the alternator system, one sensor for each alternator. The alternator fail sensor is located adjacent to its respective alternator on the engine baffle. The sensor senses alternator low voltage and activates (illuminates) the respective alternator out indicator light on the instrument panel, when the alternator is off or out condition occurs, caused by a failure in the alternator or by other means.

E. Alternator Failure.

CAUTION: On airplanes 310R1801 thru 310R2140, in the event of an alternator failure indication, an inspection of the alternator and related systems is to be performed prior to the next flight per the Teledyne Continental Service Bulletin M80-8 or latest revision and Cessna Multi-engine Service Letter ME80-10, or latest revision.

2. Battery and Battery Box

A. One 24-volt, 25 ampere-hour, lead-acid type battery is located in a battery box in the left wing. The battery supplies power for the engine starter system and electrical system when the engines are not operating. Positive and negative terminals of the battery are clearly marked on the battery case adjacent to each battery post. An acid-resistant lift cord is permanently attached to the battery case to aid in removal and installation.

B. The battery box is located in the left-hand wing outboard of the engine nacelle. Access to the battery and box is gained by removing the wing access panel above the battery box. A drain and vent tube are incorporated on the battery box to provide drainage for fluid and vapors. The battery box is secured to the wing structure with screws. A tie-down strap is utilized and attaches to the top of the battery box to secure the battery in place.

3. Controls and Indicators

A. The electrical power source control switches and indicators are located on the various switch panels mounted on the instrument panel.

(1) The battery master switch is located between the left and right alternator switches on the left side of the instrument panel. A switch bar is installed across the top of the three switches to permit simultaneous shutoff. When the battery switch is placed in ON position, it actuates the battery relay which connects the battery to the battery shunt.

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(2) Two alternator switches marked L ALT and R ALT have two positions ON and OFF. With the alternator switch in the ON position, the alternator control for regulation, protection and load bus connection is automatic. Placing the switch to OFF will isolate the alternator from its load bus. Should an overvoltage in the system result, causing tripping of the overvoltage relay, repositioning the respective alternator switch from ON to OFF, back to ON will reset the overvoltage relay.

(3) A voltameter, located on the instrument panel, is provided to monitor alternator current output, battery charge or discharge rate and bus voltage. An AMP METER SELECT switch, labeled L ALT, R ALT, BAT and VOLTS is located to the left of the voltameter. Positioning the switch L ALT, R ALT, or BAT position, the respective alternator or battery amperage can be monitored. Positioning the switch to VOLTS position, the electrical system bus voltage can be monitored.

B. Indicator Lights.

(1) The alternator failure lights located on the instrument panel adjacent to the voltameter will illuminate when the respective alternator system has a failure.

(2) The battery voltage monitor light located on the instrument panel adjacent to the turn and bank light provides a warning when illuminated that the electrical system is operating on battery power. The battery voltage monitor system, consists of a low voltage monitor assembly, located on the forward bulkhead station 0.00; the warning light and electrical wiring. The monitor assembly will illuminate the warning light with decreasing voltage between 24.5 and 25.5 volts and remain ON with voltage lower than turn on voltage. The warning light will turn OFF with increasing voltage between 24.5 and 26.0 and remain off with voltage higher than turn off voltage.

(3) The airplane's major light circuits are interior lights and exterior lights.

(4) A stall warning system with a transmitter installed in the leading edge of the left wing provides audio warning from a warning horn when the airplane approaches a stall.

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DC GENERATION - TROUBLESHOOTING

1. Alternators and Voltage Regulators

A. Troubleshooting.
(1) Troubleshooting the alternator system is considerably simplified by the incorporation of the amp meter select switch which allows the left or right alternator and battery DC output power to be visually displayed on the voltameter. The left and right alternator failure lights illuminate when the respective alternator is removed from the load bus.
(2) Refer to Electrical Power - General for required tools and equipment.
(3) For troubleshooting the alternator system, refer to Table 101.

Table 101. Alternator System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
LIGHT INDICATES ALTERNATOR FAILURE.	Low voltage.	Adjust voltage regulator.
	No voltage.	Reset. If reset fails, replace overvoltage relay.
	Faulty wiring.	Check wiring and correct as required.
	Faulty alternator.	Replace alternator.

2. Battery

A. Troubleshooting.
(1) For troubleshooting the battery, refer to Table 102.

Table 102. Battery Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
LOSS OF BATTERY POWER.	Low battery charge.	Charge battery.
COMPLETE FAILURE TO OPERATE.	Loose battery connections.	Check connections.
FREQUENT ADDITION OF WATER.	Low electrolyte level.	Check and adjust electrolyte level.
	Improper operation of voltage regulator.	Check and adjust voltage regulator.
BATTERY DOES NOT HOLD CHARGE.	Faulty battery.	Replace battery.

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DC GENERATION - MAINTENANCE PRACTICES

1. Battery

A. Maintenance Practices.

CAUTION: Water consumption will increase during warmer temperatures, so electrolyte level should be checked regularly. Fifty-hour inspection intervals are recommended. This inspection interval may need to be reduced to maintain proper electrolyte level, depending on the operator's experience and condition.

(1) Each cell of the battery incorporates an electrolyte level indicator to prevent overfilling of the cell. Filling instructions are molded in the top of the battery case. Only distilled water shall be used when servicing the battery; tap water will shorten the life of the battery. Low electrolyte level, inadequate charging, and long idle periods in a discharged condition are main causes for a battery to become sulphated and unserviceable. A large number of the sulphated batteries can be restored to their normal working condition by long charging periods as outlined in the Manufacturers Service Manual. Operators need to check electrolyte level and to recharge batteries that have been sitting unused for long periods of time, especially if left in an uncharged condition. To determine a battery charge, take a specific gravity reading with a hydrometer. If airplane is to be parked more than two days, it is recommended the circuit breaker be pulled to the hot battery bus circuits which are consuming power. If airplane is to be parked more than two weeks, it is recommended the circuit breakers be pulled to radios (frequency memory), cabin lights and clock.

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DC GENERATION - REMOVAL/INSTALLATION

1. Battery

A. Removal (Refer to Figure 401).
(1) Refer to Chapter 6; remove left-hand wing access panel above the battery.
(2) Disconnect the ground cable from the negative terminal of the battery.

CAUTION: Always remove the ground cable first and install it last to prevent accidental short circuits.

(3) Disconnect the power cable from the positive terminal of the battery.
(4) Remove the tie-down strap by removing screw and washers.
(5) Remove the battery from battery box.

B. Installation (Refer to Figure 401).
(1) Position battery in battery box; battery terminals facing aft.

NOTE: Coat battery terminals and cable terminals with a light coating of grease.

(2) Secure the battery in position, using tie-down strap, washers and screws.
(3) Connect the power cable to positive terminal of battery, using wing nut, lockwasher and flat washer.

CAUTION: When connecting the battery cables to the battery, ensure cable grommets are properly installed over the edge of the battery box cable holes.

(4) Connect the ground cable to negative terminal of battery, using wing nut, lockwasher and flat washer.

CAUTION: Ensure battery cables are connected correctly. Reverse polarity will damage diodes in the alternators.

(5) Install wing access panel.

2. Battery Box

A. Removal (Refer to Figure 401).
(1) Remove the battery; refer to Removal/Installation of Battery.
(2) Remove the battery cables and grommets from battery box.
(3) Remove the screw attaching battery box to the structure.
(4) Lift the battery box from wing.

B. Installation (Refer to Figure 401).
(1) Align battery box drain and vent tubes with holes in the wing lower surface and insert tubes into fume seal and grommet.
(2) Secure battery box to structure using screws.
(3) Install battery cables and grommets in battery box.
(4) Install battery; refer to Removal/Installation of Battery.

3. Alternator

A. Removal (Refer to Figure 402)

NOTE: The alternator removal/installation procedure is the same for both alternators.

(1) Remove engine cowling; refer to Chapter 71, Engine Cowling - Removal/Installation.
(2) Disconnect and tag electrical leads and stow out of the area.

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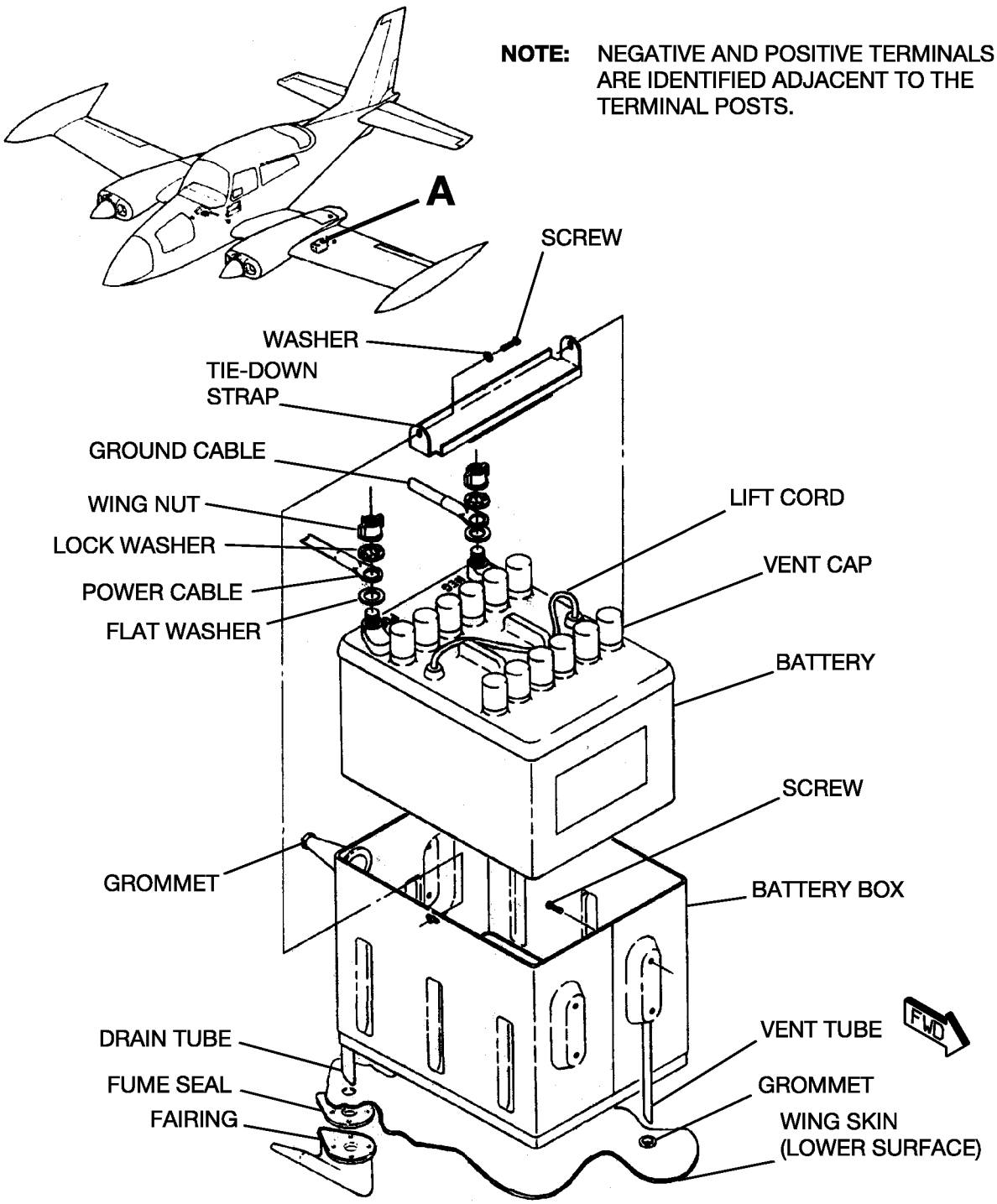

DETAIL A

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Battery and Battery Box Installation
Figure 401 (Sheet 1)

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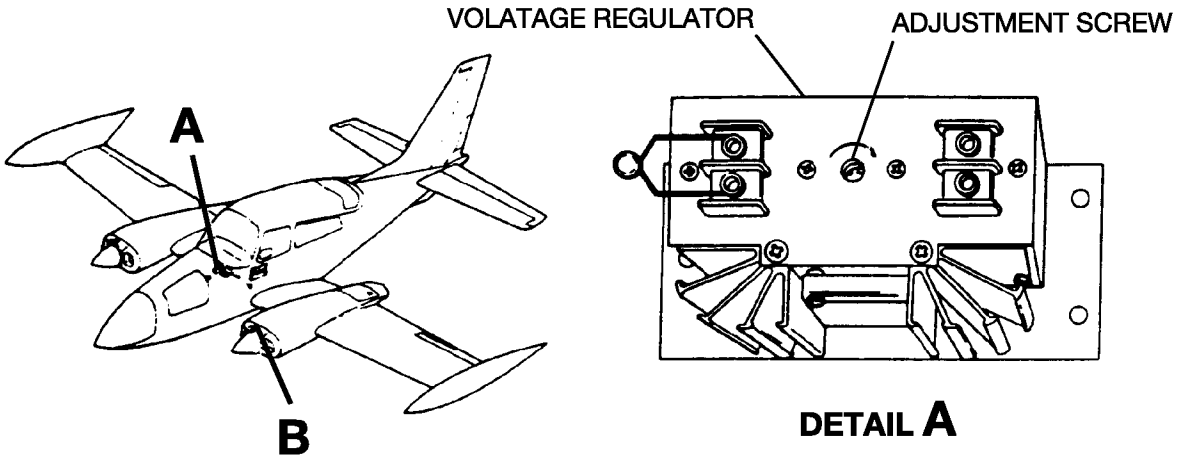

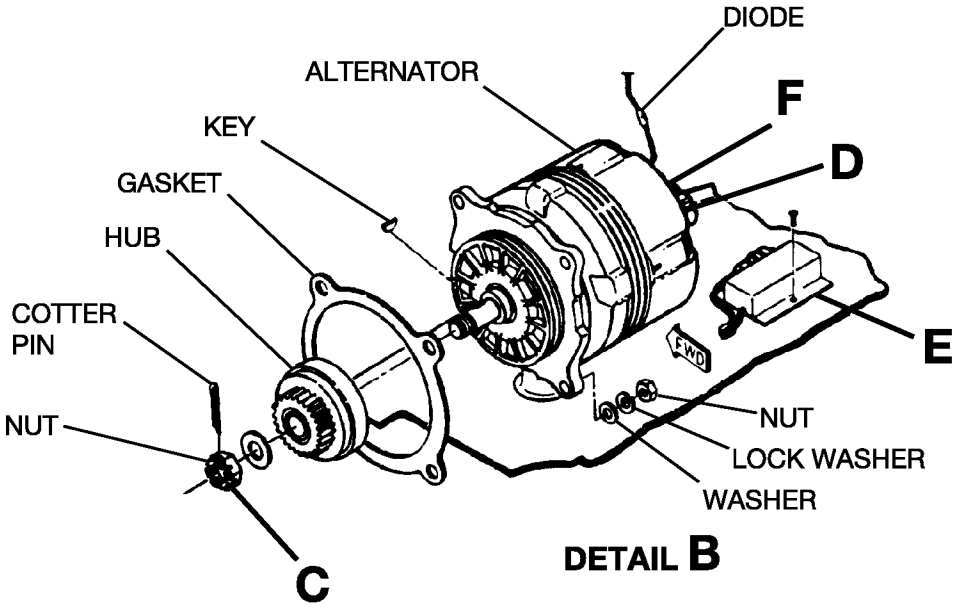

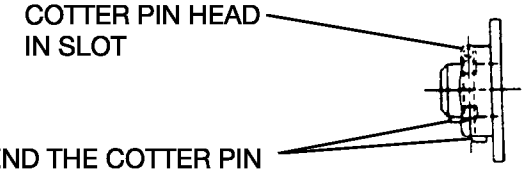

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Alternator and Voltage Regulator
Figure 402 (Sheet 1)

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(3) Remove nuts, lockwashers and washers securing alternator to engine.
(4) Carefully work alternator from the engine pad.

CAUTION: Use care when removing alternator to prevent damage to splines on the alternator.

(5) Install protective cover on engine pad to prevent entry of foreign material.

B. Installation (Refer to Figure 402).

NOTE: The alternator removal/installation procedure is the same for both alternators.

(1) Remove protective cover from engine pad.
(2) Make sure gasket has not been damaged or has been replaced.
(3) Position alternator on engine pad.

CAUTION: Before installing alternator, always make sure the nut on the drive shaft of the alternator is safetied with the cotter pin installed as shown in Figure 402. If the nut is not safetied properly, damage could result to the gears and alternator shaft.

(4) Work alternator in position and install washers, lockwashers, and ground lead terminal and install the nuts securing alternator.
(5) Torque nuts to 155 to 175 inch-pounds.
(6) Connect electrical wiring.

CAUTION: Ensure alternator wiring is connected properly. Reverse polarity will destroy diodes in the electrical system.

NOTE: Ensure ground wire (size 2 gage) is connected to negative terminal and structure ground 100 amp alternator only.

(7) Install engine cowling; refer to Chapter 71, Engine Cowling - Removal/Installation.

4. Alternator Hub

A. Removal (Refer to Figure 402).
(1) Remove alternator.
(2) Remove cotter pin; then using special wrench P/N 5090005-1, to hold shaft from turning, remove nut and thrust washer.
(3) Pull alternator drive gear hub from alternator shaft, using care not to damage hub assembly.

B. Installation (Refer to Figure 402).
(1) Apply clean engine oil to shaft of alternator and install key.
(2) Slide alternator drive gear hub onto shaft and onto key.
(3) Install thrust washer on alternator shaft with bearing material (copper color) side toward the hub.
(4) Install nut; then use special wrench P/N 5090005-1 to hold shaft from turning, torque nut to 450-500 inch-pounds.

NOTE: Ensure wrench 5090005-1 is aligned and seated in notch of alternator drive gear hub flange so that no damage will occur when torque is applied to nut.

(5) Install cotter pin as shown in Figure 402.
(6) Install alternator.

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5. Voltage Regulator

A. Removal (Refer to Figure 402).
(1) Remove copilot's seat; refer to Chapter 25, Flight Crew Seats - Removal/Installation.
(2) Remove electrical wires from voltage regulator.
(3) Remove the screws securing the regulator to the support bracket and remove voltage regulator.

B. Installation (Refer to Figure 402).
(1) Attach voltage regulator to support bracket, using screws.
(2) Connect electrical wires to voltage regulator.
(3) Adjust the alternator system; refer to DC Generation - Adjustment/Test.
(4) Install copilot's seat; refer to Chapter 25, Flight Crew Seats - Removal/Installation.

6. Battery, Alternator and Ignition Switches

WARNING: During removal of any switch except the battery switch, the battery switch must remain OFF. When removing the battery switch, disconnect the battery ground cable at the battery to prevent an accidental short circuit.

A. Removal (Refer to Figure 403).
(1) Master battery switch OFF.
(2) Remove cotter pin and pin securing switch bar to switch bar bracket.
(3) Remove nut securing switch to left control panel.
(4) Remove the wires from the switch.

B. Installation (Refer to Figure 403).
(1) Connect the wires to the proper switches.
(2) Insert switch in proper position in the switch panel and secure with nut. Ensure switch bar bracket is installed on applicable switch.
(3) Install switch bar using pin and cotter pin.

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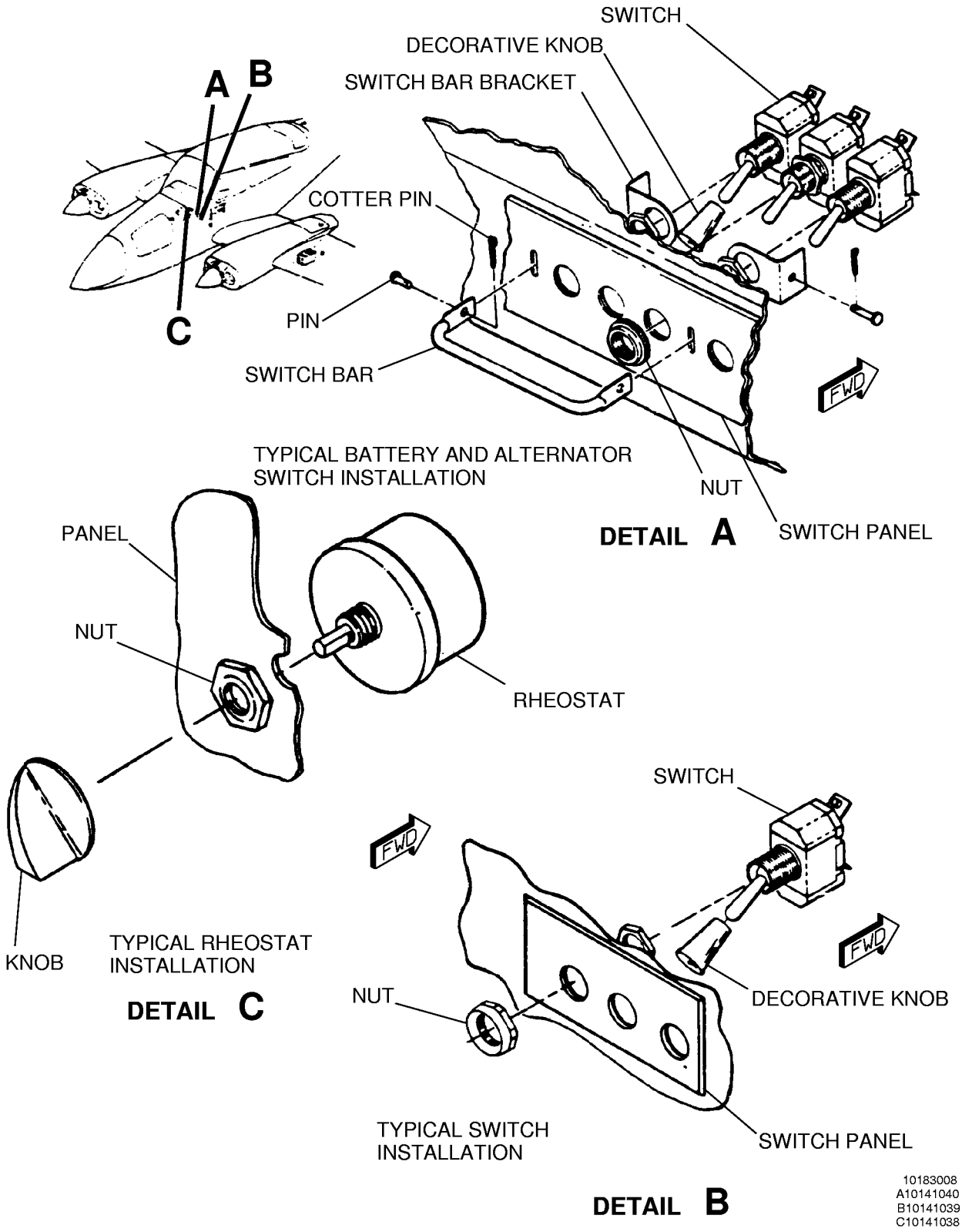

Typical Switch and Rheostat Installation
Figure 403 (Sheet 1)

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DC GENERATION - ADJUSTMENT/TEST

1. Voltage Regulator

A. Adjustment/Test (Refer to Figure 501).

(1) Install a 2 percent voltmeter connected to the airplane power bus. (The power bus is considered to be between the alternator power circuit breakers and the individual circuit breakers for each system and not at the cigar lighter.)

(2) Disconnect the paralleling wire (terminal marked "PAR") from either voltage regulator and leave it disconnected.

NOTE: All adjustments are performed while operating the LH engine. (RH engine shall not be running.)

(3) With LH engine running at 1200 prop RPM, position LH ALT switch ON. (RH ALT switch must be OFF.) Add 10 to 15 amp load to LH alternator system. Run this load for at least two minutes.

NOTE: To adjust voltage regulator, turn adjustment screw clockwise to increase and counterclockwise to decrease voltage.

(4) Adjust LH voltage regulator to read 27.5 volts on the voltmeter, connected to the airplane's power bus. Allow sufficient time for voltage to stabilize between adjustment.

NOTE: The airplane's voltameter shall not be used for voltage setting.

(5) While continuing to operate the LH engine and alternator with the same electrical load as before, turn the RH ALT switch ON. (RH engine is still not running.)

(6) The remaining adjustments should be made using either a Simpson 260 or a Triplett 630 VOM.

CAUTION: Observe with caution that the field circuits of either alternator system never touch ground or other electrical circuits, even for an instant, or the voltage regulators may be damaged.

(7) Select VOM to 0-50 V scale and connect VOM between the field terminals of the left and right voltage regulators (plus side meter to LH voltage regulator).

(8) Now very slowly rotate the RH voltage regulator adjustment screw while observing the VOM which has been connected to the two field terminals.

(a) If a reverse (down scale) reading is obtained, turn the RH voltage regulator adjustment counterclockwise, this should bring the meter scale up.

(b) Then very slowly turn RH voltage regulator adjustment clockwise to the point where the field VOM will read near zero.

NOTE: A stable reading should not be expected. Voltage will fluctuate.

(c) Then using the 0-10 volt and 0-2.5 volt scales on the VOM, continue adjustment of the RH voltage regulator to a lover voltage differential. (The 0-2.5 volt scale is recommended for making the final adjustment.) The correct adjustment has been achieved when the VOM will remain briefly in the vicinity of zero, swinging both up scale and down scale.

(9) Shutdown all power to the airplane and disconnect VOM from field terminals.

(10) Reconnect the paralleling wire to terminal marked "PAR" on the voltage regulator the wire was disconnected from.

(11) After airplane has been restored to original configuration, the RH engine should be started, both alternator switches turned ON and system should be operated at different loads to verify that paralleling is within 10 percent of load and bus voltage has remained within the 27.5 volts, +.25 or -.25 volt limit.

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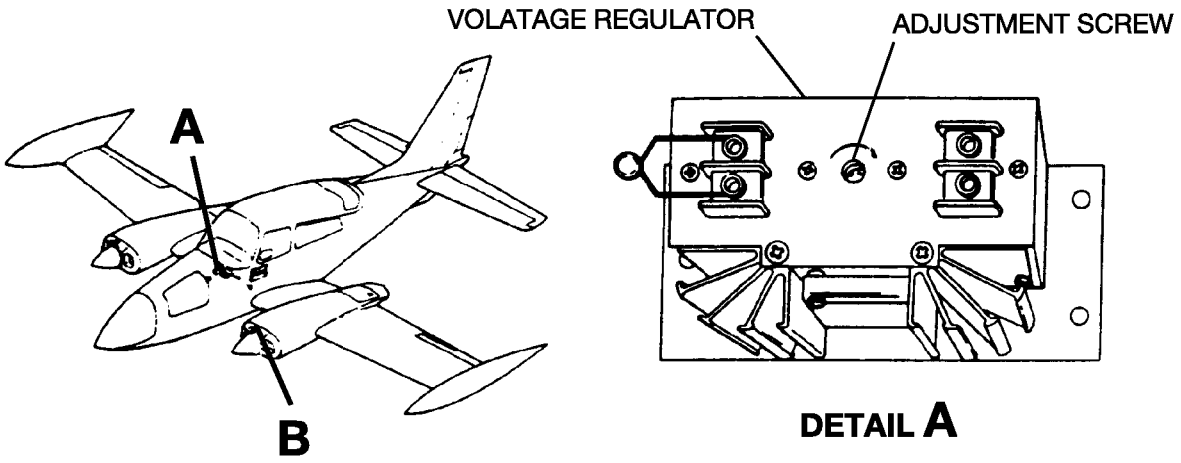

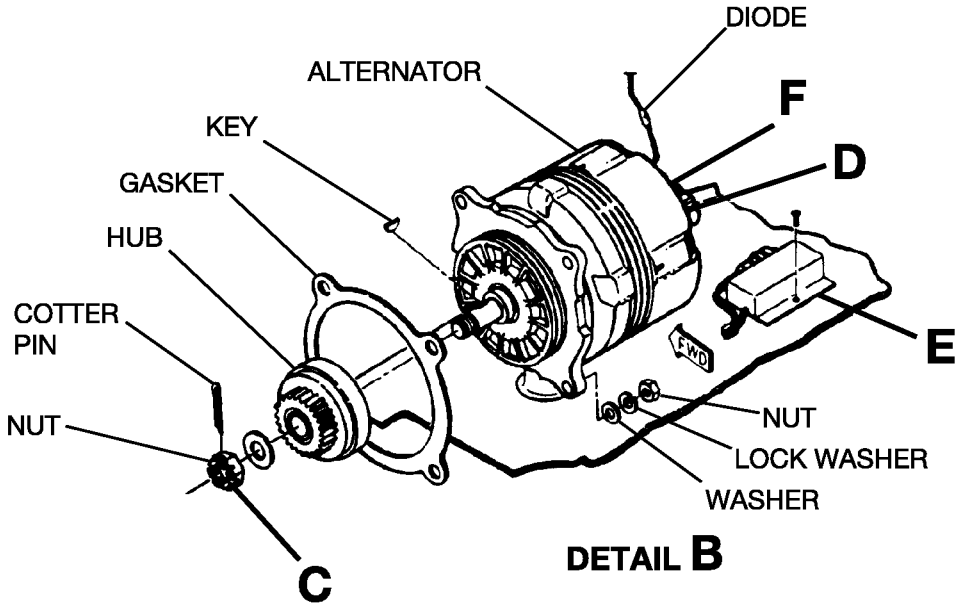

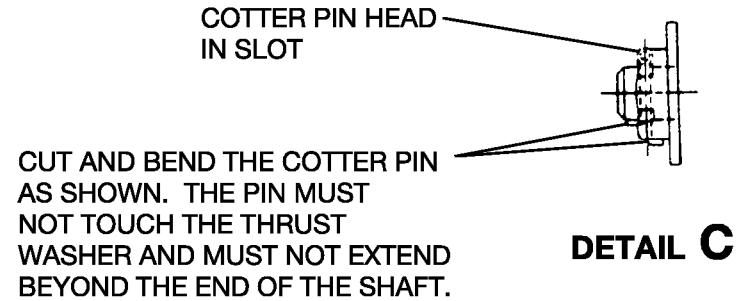

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Alternator and Voltage Regulator
Figure 501 (Sheet 1)

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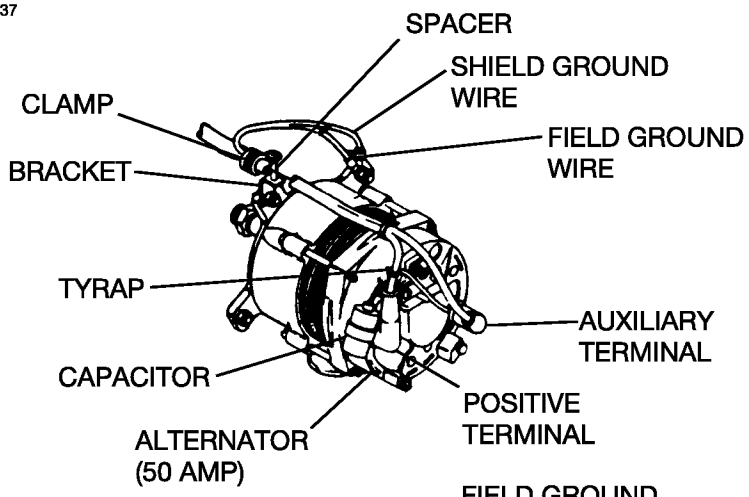
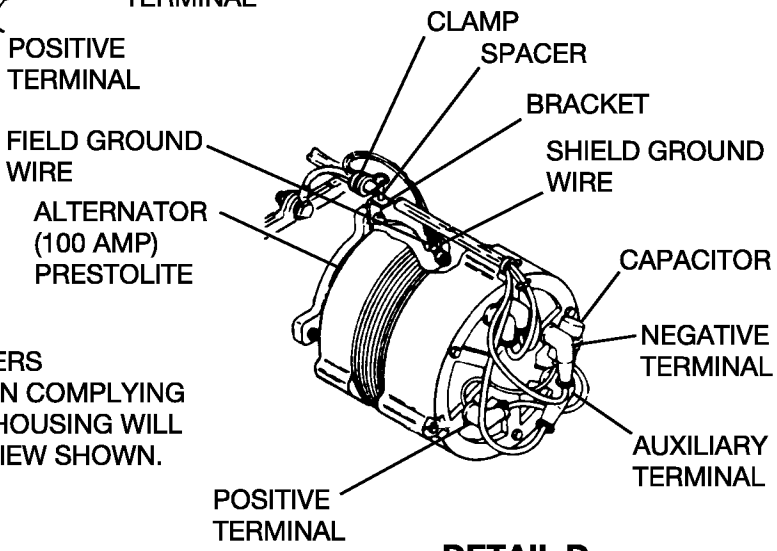


DETAIL D

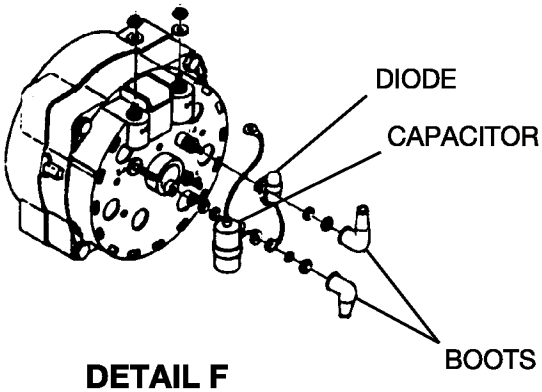
(TYPICAL WIRE ROUTING)



DETAIL D

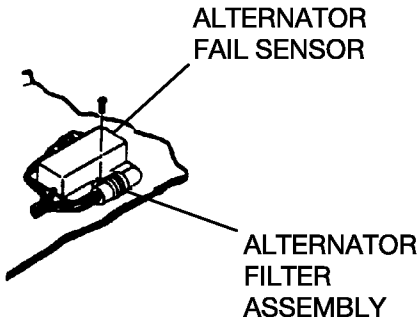
(TYPICAL WIRE ROUTING)

NOTE: ON AIRPLANES SERIAL NUMBERS 310Q459 THRU 310R1690 WHEN COMPLYING WITH ME80-1, THE SLIP RING HOUSING WILL BE ROTATED 180° FROM THE VIEW SHOWN.



DETAIL F

100 AMP ALTERNATOR
310R1801 AND ON
(TELEDYNE CRITTENDON)



DETAIL E

310R000R THRU 310R1423
WHEN MODIFIED BY SK340-22
FILTER USED WITH B1207-2 SENSOR ONLY

D10581010
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Alternator and Voltage Regulator
Figure 501 (Sheet 2)

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DC GENERATION - INSPECTION/CHECK

1. Battery

A. Inspection/Check.
   (1) Remove wing access panel above battery.
   (2) For cleaning, refer to DC Generation - Cleaning/Painting. Inspect battery case for possible cracks and deterioration. Check electrolyte for specific gravity using a hydrometer for a reading of 1.265 to 1.285, corrected to temperature. Check that specific gravity of the electrolyte does not vary more than 0.020 between cells. Should a greater variation exist, battery should be slow charged and retested. Remove battery from airplane when charging battery. DO NOT use external power generators for charging purposes.

2. Battery Box

A. Inspection/Check.
   (1) Remove wing access panel above battery.
   (2) For cleaning, refer to DC Generation - Cleaning/Painting. Inspect the cleaned battery box for physical damage and for areas lacking proper acid proofing. Badly damaged or corroded boxes shall be replaced. Inspect surrounding areas of wing adjacent to battery box for damage and corrosion. For acid proofing battery box, refer to DC Generation - Cleaning/Painting.

3. Alternator

A. Inspection/Check.
   (1) Clean the alternator by washing down at the time the engine is cleaned, using the same cleaning procedure.
   (2) Inspect alternator for condition and security. Inspect all electrical connections for cleanliness and security.
   (3) For electrical output and operational check, refer to Operational Checks in this section. Refer to Component Time Limits for overhaul and replacement time limits.
   (4) Inspect 100-amp alternator slip ring end bearing by removing bearing and cover. Inspect bearing for signs of overheating or indication that the rotor shaft has been turning in the inner race or the outer race has been turning in the end head. If any of these conditions exist, replace or repair alternator. Refer to Manufacturer's Overhaul/Parts Manual.
   (5) Check bearing grease for signs of overheating, discoloration or contamination. If any of these conditions exist, replace bearing; if not, lubricate bearings.

B. Operational Check of Alternator and Regulator.
   (1) With both engines operating at 1000 RPM and the Battery and Alternator Switches ON, check the following:
      (a) Select voltage position on voltmeter and assure bus voltage is 27.5 volts, +1.0 or -1.0 volts.
      (b) Select Battery position on voltmeter and note battery is charging; charging amperage indication will vary as the battery builds up to normal charge.
      (c) Load electrical system with all external lights, fuel pumps, pitot heat, etc., and check the alternator output; it should be positive and equal within 10 amps when loaded up to 100 amps total load.

      NOTE: If total load is below 15 amps, one alternator may show little or no output. If so, turn producing alternator OFF; the other alternator should pick up the load. Also, when one alternator is not carrying any load, the corresponding light may come on or flicker ON and OFF. This is acceptable.

C. Operational Check of Alternator Failure Circuit.
   (1) With both engines operating at idle RPM, place Battery switch and Alternator switches to OFF, and observe that failure lights are out.
   (2) Reduce electrical load to minimum to avoid discharging the battery.
   (3) Turn ON Battery switch and observe both Alternator Failure lights illuminate.

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(4) Increase engine RPM to 1800 and ensure Failure Light remains ON.

NOTE: The reference voltage used for alternator out indication is approximately one half of whatever voltage the alternator is producing. When the alternator is turned OFF, it is capable of producing some voltage which will be a function of load and RPM of unit. At high RPM such as maximum power, the residual voltage at times can exceed the fail triggering level of the alternator fail sensor, turning the Failure lights OFF; this is acceptable.

(5) With both Alternators and Battery switches ON and light electrical load of 15 amps operate both engines at idle RPM and observe that lights remain OFF without any flickering. Simultaneously increase RPM on both engines, to 1800 RPM and again observe Alternator Failure lights for any flickering.

NOTE: It is important that the RPM for both engines be as close to each other as possible. At light loads, the alternator which is operating at the higher RPM will tend to take all of the load and the alternator running at lower RPM will be at a NO load condition. This will tend to give a false alternator out indication.

(6) A false alternator out indication at low engine RPM (ground idle) with low to moderate electrical loads applied may be due to a low frequency response of the alternator out sensor. For isolation to a sensor problem refer to DC Generation Manual.

D. Inspection/Check of Alternator Hub. Refer to Cessna Multi-engine Service Bulletin MEB01-3, or latest revision.
(1) Remove left and right engine cowling as required to gain access to the alternators.
(2) Disconnect all electrical power from the airplane. Attach maintenance warning tags to the battery connections and external power receptacle stating: DO NOT CONNECT ELECTRICAL POWER - MAINTENANCE IN PROGRESS.
(3) Label alternator wiring and disconnect from alternator. Label each alternator right or left as applicable.
(4) Remove alternators from airplane. Refer to DC Generation - Removal/Installation.

CAUTION: Rubber pads or similar padding must be used between the alternator drive hub gear and vise jaws or damage to the drive gear is likely to occur.

(5) Clamp the alternator drive hub gear teeth in the protected jaws of a bench vise with the alternator shaft located in a vertical position above the vise. The drive hub gear teeth must not directly touch the surface of the vice jaws.
(6) Engage the alternator drive hub wrench (Cessna Part Number 509005-1) in the notch located on the outer perimeter of the hub to produce torque on the drive hub.
(7) Attach a spring scale to the end hole in the wrench handle and apply a pulling force of 13.5 pounds. This will produce 140 inch-pounds of torque on the drive hub. The drive hub may rotate (twist) internally up to 90 degrees when this torque is applied but should not slip.
(a) If no slippage occurs when torque is applied, proceed to step 4.
(b) If slippage occurs in the hub then replace the hub assembly. Inspect the thrust washer for signs of wear or scoring, and replace it if necessary.

NOTE: All parts to be inspected must be clean and dry.

(8) Reinstall each alternator onto the engine from which it was removed using a new gasket. Refer to DC Generation - Removal/Installation
(9) Reconnect wiring to alternator as labeled. Remove wiring labels.
(10) Reconnect electrical power to airplane. Remove maintenance warning tags from the battery connections and external power receptacle.
(11) Reinstall left and right engine cowlings.
(12) Perform a functional test of the both alternators to ensure proper operation.

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(13) Make an entry into the airplane logbook stating compliance with Service Bulletin MEB01-3, if not previously entered. Make an entry noting when the next Alternator Drive Gear Hub Elastomer Inspection is due for each alternator.

E. Operational Check of Alternator Warning System.
(1) With both engines operating at 1700 RPM and normal electrical load applied, turn both alternator switches OFF. Ensure that both Alternator Failure lights are illuminated.

F. Alternator Mechanical Failure.

NOTE: Inspect the alternator for indication of possible engine contamination, if any contamination is suspected, the propeller governor and propeller must be removed from the affected engine and inspected per the following procedures prior to further flight of the airplane.

(1) Inspect the governor gasket screen for signs of contamination. If no evidence of contamination is found, proceed to install components on engine.
(2) If evidence of contamination is found at the governor gasket screen, the governor must be disassembled and the pump gears and cavity inspected. If this inspection shows no indication of metal passing through the governor, reassemble the governor per the applicable McCauley Service Manual and install the governor and propeller on the engine.
(3) If the governor inspection shows indications of metal passing through the governor, repair or replace the governor (as required) and clean and inspect the propeller per the following:
(a) Remove cylinder from propeller and inspect piston "O" ring and cylinder walls.
(b) Using a suitable solvent, flush cylinder piston rod and rear cavity (crankshaft pilot bore end) of propeller.
(c) Assemble propeller per applicable McCauley Service Manual and install on engine.

G. Alternator Fan.
(1) Inspect alternator fan for being bent, having cracks, broken or cracked welds (Refer to Figure 601).

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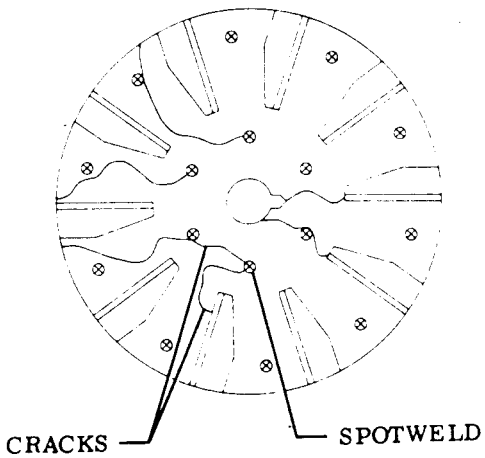

Alternator Fan Inspection
Figure 601

(2) Inspect drive belt for condition and proper tension. Refer to Chapter 24, DC Generation - Removal/Installation for tension adjustment.
(3) Check alternator mounting bolts for proper torque. Refer to Chapter 24, DC Generation - Removal/Installation.
(4) Check all electrical connections for cleanliness and security.

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4. Starter Relay

A. Inspection/Check (Airplanes 310R0001 thru 310R1200) (Refer to Figure 602).
(1) Inspect the governor gasket screen for signs of contamination. If no evidence of contamination is found, proceed to install components on engine.

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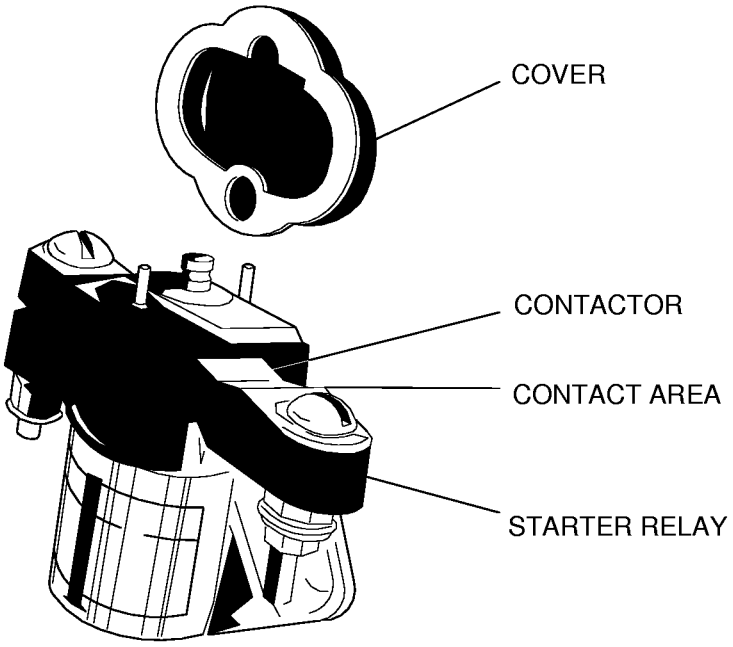

Starter Relay Inspection
Figure 602 (Sheet 1)

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DC GENERATION - CLEANING/PAINTING

1. Battery

A. Cleaning.

NOTE: Remove battery from airplane before cleaning.

CAUTION: Take special precautions to insure that battery cell filler caps are tight before cleaning the battery. Entrance of soda water into battery cells will neutralize the cell electrolyte.

CAUTION: Do not allow acid deposits to come in contact with skin or clothing. Serious acid burns may result unless the affected area is washed immediately with soap and water. Clothing will be ruined upon contact with battery acid.

(1) Clean battery with a mild solution of bicarbonate of soda (baking soda) and water to remove acid corrosion.
(2) Rinse with clear water and sponge off excess water and allow battery to dry.
(3) Clean battery terminals as needed with a wire brush to brighten the terminals for good electrical contact. Coat with Petrolatum to prevent corrosion.

2. Battery Box

A. Cleaning.

CAUTION: Do not allow acid deposits to come in contact with skin or clothing. Serious acid burns may result unless the affected area is washed immediately with soap and water. Clothing will be ruined upon contact with battery acid.

(1) Battery lead should be cleaned with a strong solution of bicarbonate of soda (baking soda) and water.
(2) Clean hard deposits of spilled acid and corrosion products using a wire brush.
(3) When all foreign materials have been removed from the box, flush it thoroughly with clean water.
(4) After cleaning battery box, flush surrounding area with clean water to ensure that all corrosive material has been removed.

B. Acid Proofing.
(1) Clean battery box; refer to Cleaning Battery Box in this section.
(2) Sand corroded area of box. Ensure all corrosion is removed.
(3) Mix polyester resin and hardener, MEK Peroxide (commercially available), per manufacturer's instructions.
(4) Apply mixture to sanded area of battery box and allow to dry.

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EXTERNAL POWER - DESCRIPTION AND OPERATION

1. External Power Receptacle

A. The DC external power system (optional) consists of an external power receptacle, located on the aft bottom surface of the left nacelle baggage compartment and an external power relay, located in the left wing at W.S. 100.50 approximately 8.60 inches forward of the rear spar. The external power system components provide a means of connecting 28 VDC external power to the airplane's electrical system.

B. The DC external power receptacle is a three-pin receptacle, housed in a plastic material. The positive and negative pins are permanently marked on the front and rear of the receptacle. Connecting the 28 VDC external power source energizes the external power relay, connecting the external power source to the battery shunt and to the bus of the circuit breaker panel.

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EXTERNAL POWER - REMOVAL/INSTALLATION

1. External Power Receptacle

CAUTION: The battery switch must remain in the OFF position while the external power receptacle is being removed or installed. If there is any possibility of the switch being turned ON during this procedure, it is advisable to disconnect the ground cable from the battery.

A. Removal (Refer to Figure 401).
   (1) Ensure Master Battery switch is positioned to OFF.
   (2) Open left-hand nacelle baggage door.
   (3) Remove cover from bracket by removing screws.
   (4) Disconnect electrical wires from external power receptacle by removing nuts and lockwashers.
   (5) Remove external power receptacle from bracket by removing attaching screws and nuts.

B. Installation (Refer to Figure 401).
   (1) Position external power receptacle in bracket and secure with screws and nuts.
   (2) Identify and connect electrical wires to external power receptacle, using washers, lockwasher and nuts.
   (3) Install cover, using screws.
   (4) Replace battery ground cable, if it was disconnected.
   (5) Close baggage door.

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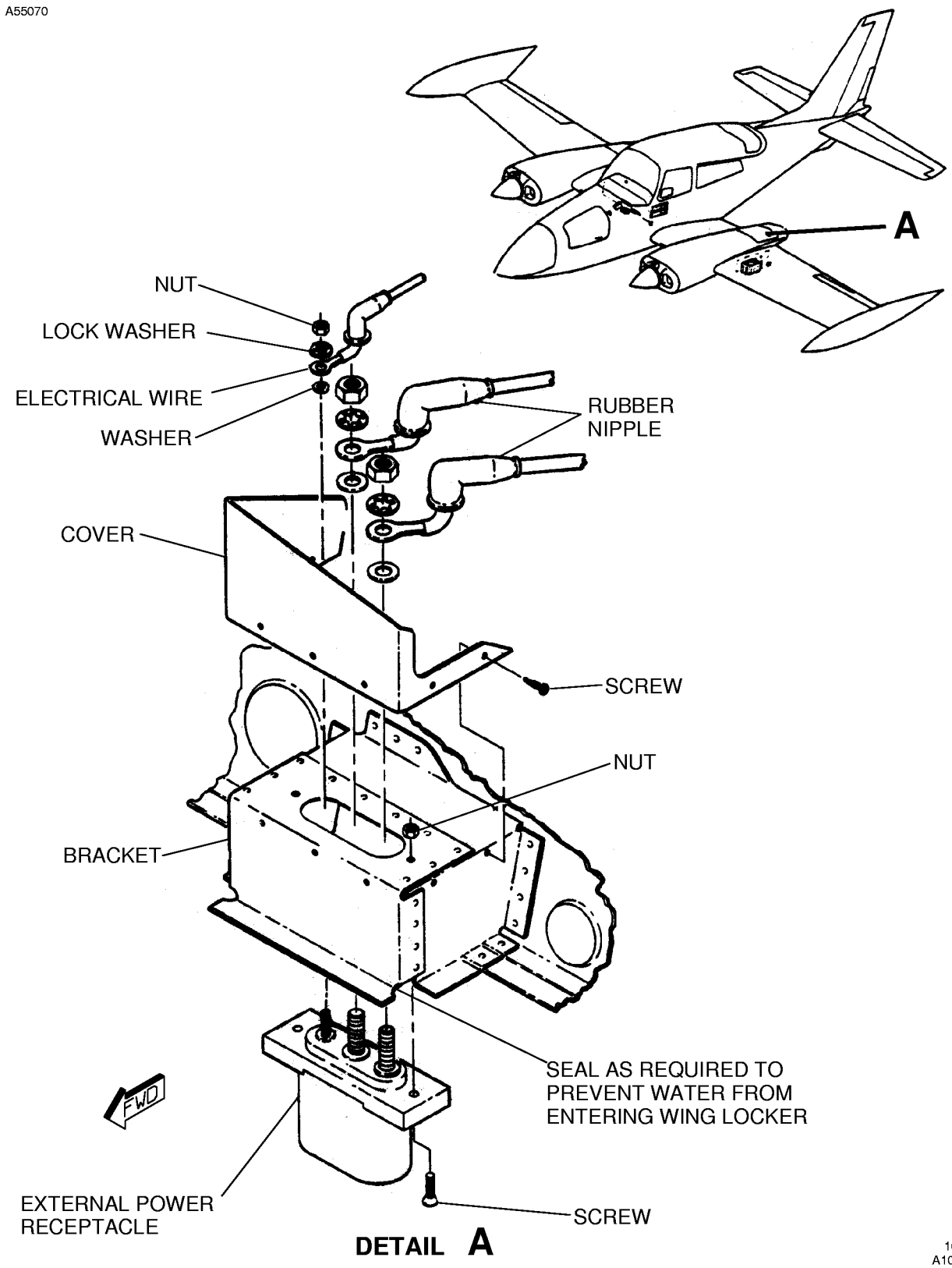

External Power Receptacle Installation
Figure 401 (Sheet 1)

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WIRING DIAGRAMS - DESCRIPTION AND OPERATION

1. Wiring Diagrams

A. This section contains wiring diagrams arranged according to airplane systems as follows: Battery, Ignition, and Alternator Diagrams - Description and Operation, Junction Boxes, Circuit Breakers, and External Power Diagrams - Description and Operation, Lighting Diagrams - Description and Operation, Indicating and Recording Systems Diagrams - Description and Operation, Fuel, Oil, and Propeller Systems Diagrams - Description and Operation, Flight Controls and Landing Gear Diagrams - Description and Operation, Deice System Diagrams - Description and Operation, and Communications and Interior Systems Diagrams - Description and Operation, all provide electrical wiring diagrams for airplane systems.

2. Electrical Load

A. An electrical load chart is provided to give the load in amps for airplane equipment.

Table 1. Electrical Load

STANDARD EQUIPMENT - MAXIMUM CONTINUOUS LOAD

EQUIPMENT	NO. PER AIRPLANE	AMPS PER UNIT	TOTAL AMPS	SEE NOTE
Main Boost Pump	2	5.5	11.0	
Battery Relay	1	.60	.60	
Voltage Reg	2	1.0	2.0	1
Heater, Wing Locker Vent	2	.29	.58	
Cabin Heater	1	15.0	15.0	
Pitot Heat	1	3.85	3.85	
Stall Warn Htr	1	3.9	3.9	
Rotating Becon Lt Lwr	1	1.8	1.8	
Rotating Becon Lt Upr	1	1.8	1.8	
Nav Lts Wings	2	.93	1.86	
Tail Nav Lt	1	1.02	1.02	
Ldg Lt Lh	1	9.0	9.0	
Ldg Gr Dn Lts	4	.04	.16	
Post Lts Inst Pnl	37	.04	1.48	
Ckt Bkr Pnl Lts	4	.17	.68	
Compass Lt	1	.04	.04	
Prop Sync Control	1	1.0	1.0	
Engine Gage	2	.32	.64	
Fuel Qty Gage	1	.10	.10	
T & B Ind Lh	1	.15	.15	
Oat Ind	1	.08	.08	

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Table 1. Electrical Load (continued)

Elect Clock	1	.02	.02	

STANDARD EQUIPMENT - MAXIMUM INTERMITTENT LOAD

EQUIPMENT	NO. PER AIRPLANE	AMPS PER UNIT	TOTAL AMPS	SEE NOTE
Starter	2	150	150	2
Starter Relay	2	2.0	2.0	
Starter Vibrator	1	2.5	2.5	
Ldg Gr Motor	1	25	25	
Ldg Gr Relay	1	.45	.45	
Flap Motor	1	10	10	
Cabin Dome Lt	1	1.20	1.20	
Flood Lights	2	.52	1.04	3
Map Lights	2	.52	1.04	3
Reading Lights	4	.30	1.20	3
Nacelle Compt Lt.	2	.52	1.04	
Landing Lt Motor	1	1.25	1.25	7
Ail Fail Lt	4	.04	.16	3
Htr Ovht Lt	2	.04	.08	3
Ldg Gr Warn Sys	1	.60	.60	
Stall Warn Horn	1	.20	.20	
Fuel Boost Relay	2	.09	.18	
Cigar Lighter	1	6.7	6.7	

OPTIONAL EQUIPMENT - MAXIMUM CONTINUOUS LOAD

EQUIPMENT	NO. PER AIRPLANE	AMPS PER UNIT	TOTAL AMPS	SEE NOTE
Taxi Light	1	3.64	3.64	
Ldg Light Rh	1	9.0	9.0	
Post Lights	20	.04	.80	
Wing Strobe Lts	2	1.5	3.0	
Tail Strobe Lt	1	1.02	1.02	
Heated Wshild	1	18	18	
Prop De-Ice Boots	6	5.0	15	4
Prop De-Ice Timer	1	.15	.15	

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Table 1. Electrical Load (continued)

Stat Source Htr	4	.36	1.44	
Pitot Heat	1	3.85	3.85	
Nac Fuel Pumps	2	1.9	3.8	
Alcohol W/S De-Ice	1	.40	.40	1
Angle of Attack	1	.06	.06	7
T & B Ind Rh	1	.15	.15	
Flt Hour Rcdr	1	.04	.04	
Digital Clock	1	.40	.40	
Stereo Player	1	1.0	1.0	

OPTIONAL EQUIPMENT - MAXIMUM INTERMITTENT LOAD

EQUIPMENT	NO. PER AIRPLANE	AMPS PER UNIT	TOTAL AMPS	SEE NOTE
Electric Trim	1	.85	.85	
Surf De-Ice Ind	2	.04	.08	
Surf De-Ice Valve	2	.90	1.80	
Wing Ice Lts	2	.70	1.40	
Ldg Lt Mtr Rh	1	1.25	1.25	6
Aux Power Relay	1	.60	.60	

OPTIONAL AVIONICS EQUIPMENT

EQUIPMENT	NO. PER AIRPLANE	AMPS PER UNIT	TOTAL AMPS	SEE NOTE
400 ADF		1.00		
400 DME		2.50		
400 Enc Altm		.35		
400 Glideslope		.35		
400 IFCS		5.15	14.15	5
400 Mkr Bcn		.35		
400 Nav/Com		1.60	4.00	5
400 Nav-O-Matic		3.60	12.60	5
400 RMI		.35		
400 R-Nav		1.00		
400 Xpdr		2.00		
800 Alt Alert		.64		

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Table 1. Electrical Load (continued)

800 DME	2.70		
800 Enc Altm	.35		
800 IFCS	5.35	14.35	5
800 R-Nav	1.00		
800 Xpdr	2.00		
1000 ADF	1.70		
1000 Comm	1.25	7.25	5
1000 Nav	1.25		
1000 Nav	1.55		
1000 Glideslope	.40		
1000 RMI	.35		
AC Inverter	1.00		
Audio	.50		
High Freq Comm	1.90	16.00	5
HST - (3 Inch)	1.25		
Radio Altm	.60		
Radio Altm	1.80		
Slaved D. G.	.40		
Weather Radar	3.50		
Yaw Damper	1.50	6.00	5
300 ADF	1.30		

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Table 1. Electrical Load (continued)

300 Nav/Com		.75	2.00	5
Avionics Cooling Fan	1	.5	.5	
Avionics Cooling Blower	1	1.5	1.5	

NOTE 1: Regulator current is for maximum alternator load. Voltage regulator current may vary from 1.00 amp to 2.5 amps, depending on alternator speed and load.

NOTE 2: Starter current given is average current drawn during a normal start. Cold weather starting will draw more than 150 amperes from the battery.

NOTE 3: Although these items are generally regarded as intermittent loads, they may be considered continuous loads, depending on pilot and passengers usage of these items.

NOTE 4: Current is cycled to the deicer heaters at timed intervals, first to the three inner heaters of the same before switching itself to the left propeller to complete a total of four phases in turn.

NOTE 5: When transmitting, current increases to the amount shown in the total amps column.

NOTE 6: The landing light motor loads are not used in the computations due to it being of less value than the lamp loads, which are considered continuous load. The lamp and motor load cannot occur simultaneously.

NOTE 7: AOA heater load is the same as that used on standard stall warning. Only computer load is used for optional load computations.

NOTE: Equipment that is continually cycling ON and OFF, or is cycling a majority of the time in a given flight configuration, is considered a continuous load. (Example -- Prop deice and windshield deice.)

NOTE: System normal voltage is 27.5 volts, +.25 or -.25 volts. All current requirements are at 95 percent of normal voltage. The maximum line voltage drop that could be experienced from the DC bus to any component within the electrical system is 1.25 volts.

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BATTERY, IGNITION, AND ALTERNATOR DIAGRAMS - DESCRIPTION AND OPERATION

1. Wiring Diagrams

A. This section contains wiring diagrams for battery, ignition, and alternator systems.
   (1) Starter, Ignition, and APU
   (2) Power Distribution (STD)
   (3) Power Distribution (Opt. C.B.)

B. Reference Designator Code.
   (1) Reference designators are used in these diagrams to more quickly identify and locate a part or assembly used in any electrical system. A part is identified by reference number on a diagram. The reference number called out in wiring reference designators identifies the description and diagram figure number.

   NOTE: Part Numbers referred to on Wiring Diagrams are for reference only. When ordering spare or replacement parts, refer to applicable Parts Catalog.

   (2) The wiring diagrams contained in this section clearly show the complete wiring on each item of electrical components listed in each Wiring Diagram. The first portion of wire number indicates the Airplane System, the center portion indicates Wire Number, and the last portion indicates Wire Gauge Size. Each wiring diagram contains part number and nomenclature for each component.

Reference	Figure	Description
AR5	2	Alternator 50 Amp
AR6	2	Alternator 50 Amp
AR7	2	Alternator 100 Amp
AR8	2	Alternator 100 Amp
B8	1	R Starter
B9	1	L Starter
BB7	1	Bus Bar
BB21	2	Bus Bar
BB22	2	Bus Bar
BB23	2	Bus Bar
BB24	3	Bus Bar
BB25	3	Bus Bar
BB26	3	Bus Bar
BB27	3	Bus Bar
BT3	2	Battery
CB3	1	CB Start Relay
CB49	2, 3	CB L Alt 100A
CB50	2, 3	CB L Alt 100A
CR4	2	Diode
CR5	2	Diode
CR6	2	Diode Assy

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Reference	Figure	Description
CR7	2	Diode Assy
CR8	2	Diode
CR9	2	Diode
CR10	2	Diode
CR11	3	Diode
DS41	2, 3	LH Alt Lt
DS42	2, 3	RH Alt Lt
DS90	3	Ind. Lt Low Volt Monitor
E4	2, 3	O.V. Relay
E5	2, 3	O.V. Relay
F1	2, 3	Amp Fuse
F2	2, 3	Amp Fuse
F3	2, 3	Amp Fuse
F4	2, 3	Amp Fuse
F5	2, 3	Amp Fuse
F6	2, 3	Amp Fuse
F7	2, 3	Amp Fuse
F8	2, 3	Amp Fuse
F9	2, 3	Emer Fld Fuse
FB1	2	Fuse Block
G1	1	L Magneto
G2	1	Magneto
G3	1	R Magneto
G4	1	Magneto
G5	1	Start Vibrator
J3	1	Recpt
J32	1	Recpt
J33	1	Recpt
J70	3	Jack Low Volt Monitor
K2	2, 3	Battery Relay
K5	1	Start Relay
K6	1	Start Relay
K7	1	APU Relay
M11	2, 3	Volt Meter
MT30	3	Low Volt Probe
P32	1	Plug

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Reference	Figure	Description
P33	1	Plug
P70	3	Plug Low Volt Monitor
R7	2	Batt Shunt
R8	2, 3	Resistor
R11	2	LH Alt Shunt
R12	2	RH Alt Shunt
S18	3	Switch
S29	1	Switch
S30	1	Switch
S31	1	Switch
S32	1	Switch
S33	1	Switch
S34	1	Switch
S35	2, 3	Switch
S36	2, 3	Switch
S37	2, 3	Switch
S38	2, 3	Switch
SR13	1	Diode
ST3	2, 3	Alt Fail Sensor
ST4	2, 3	Alt Fail Sensor
VR1	2, 3	Volt Reg
VR2	2, 3	Volt Reg

C. Diagrams

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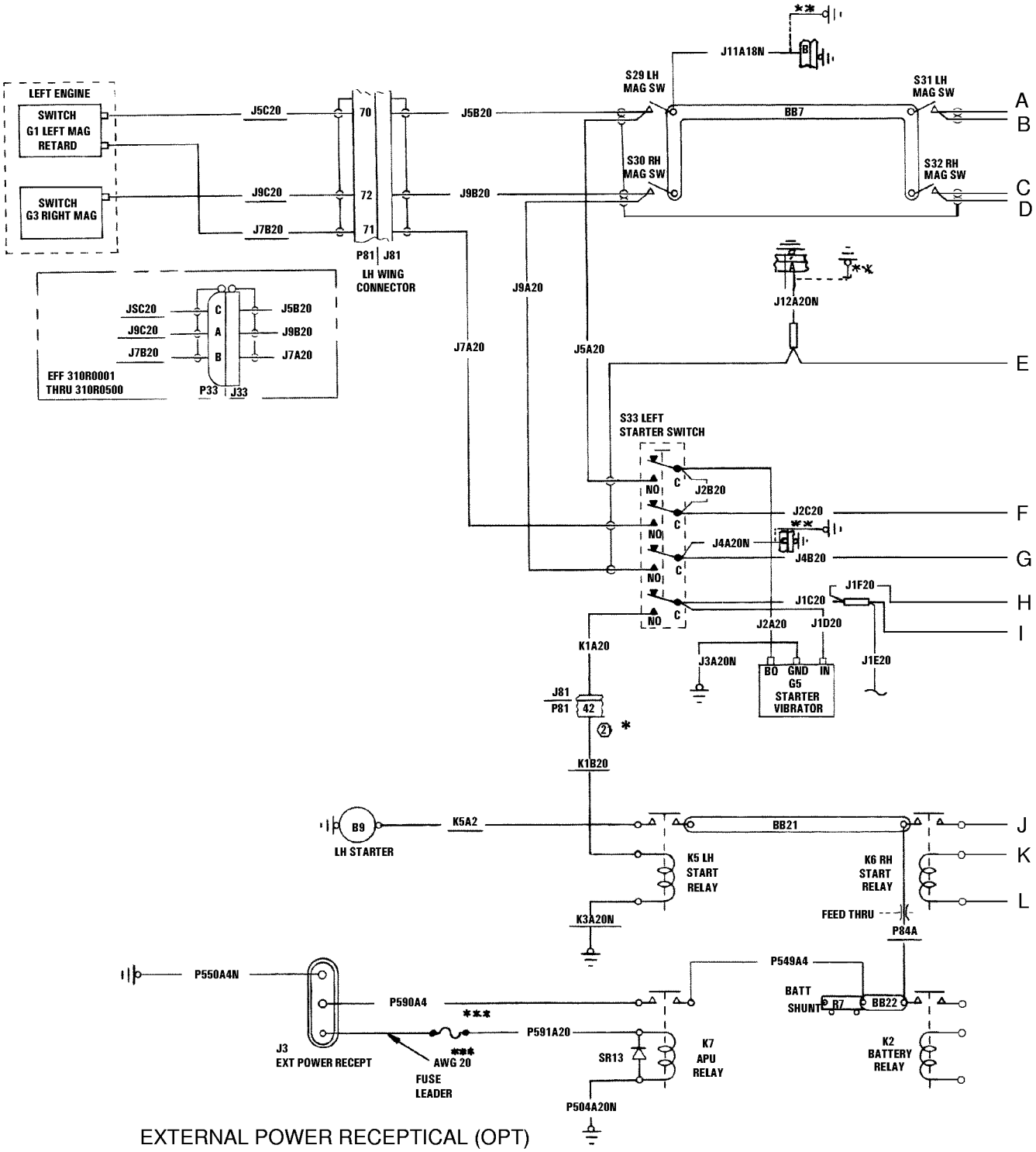
A55085



EXTERNAL POWER RECEPTICAL (OPT)

*** 310R1885 AND ON

Starter, Ignition, and APU
Figure 1 (Sheet 1)

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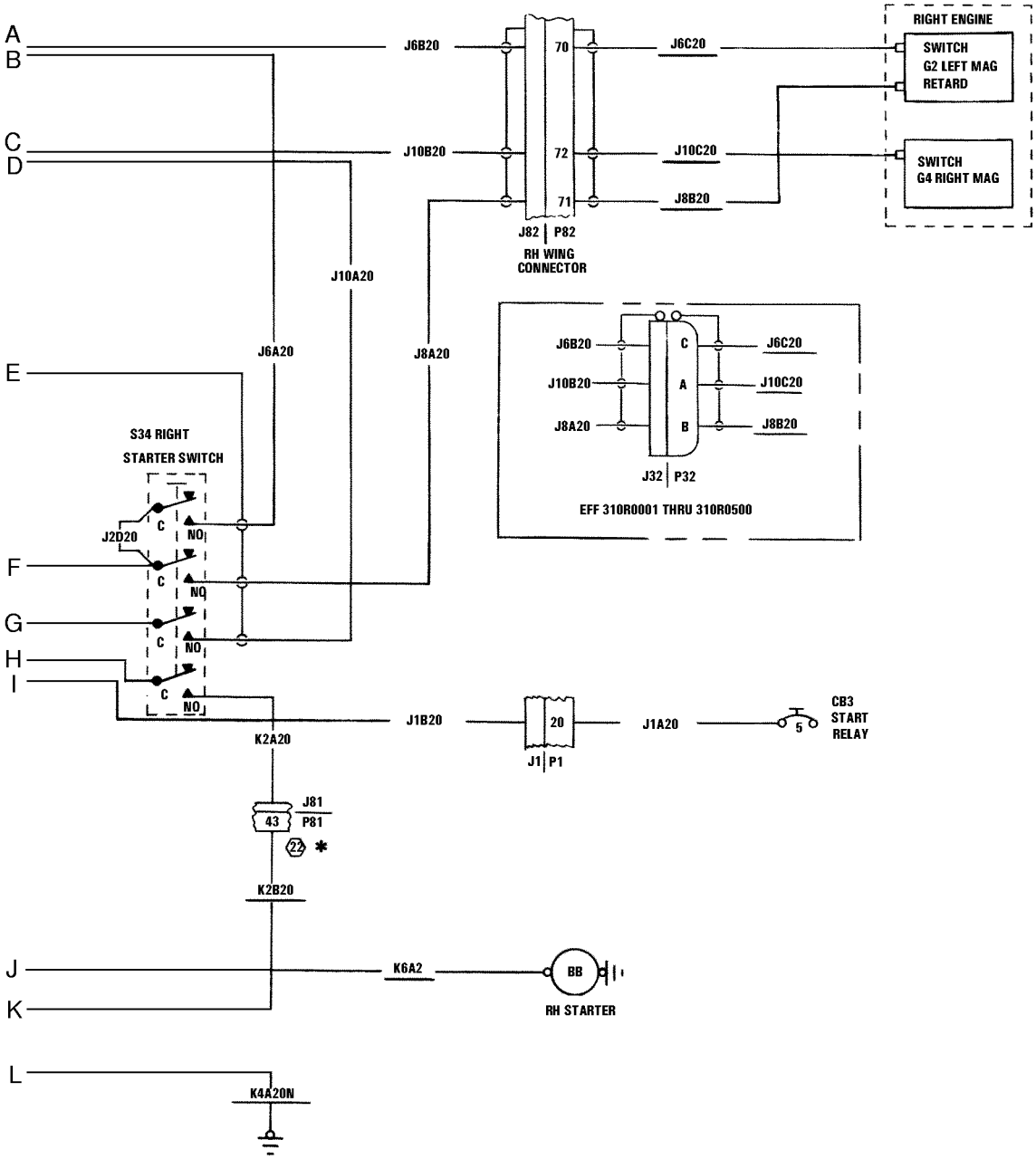

* NUMBER IN HEXAGON REFERS TO CONNECTION ON JB1 OR JB2 (REFER TO 24-60-02)

Starter, Ignition, and APU
Figure 1 (Sheet 2)

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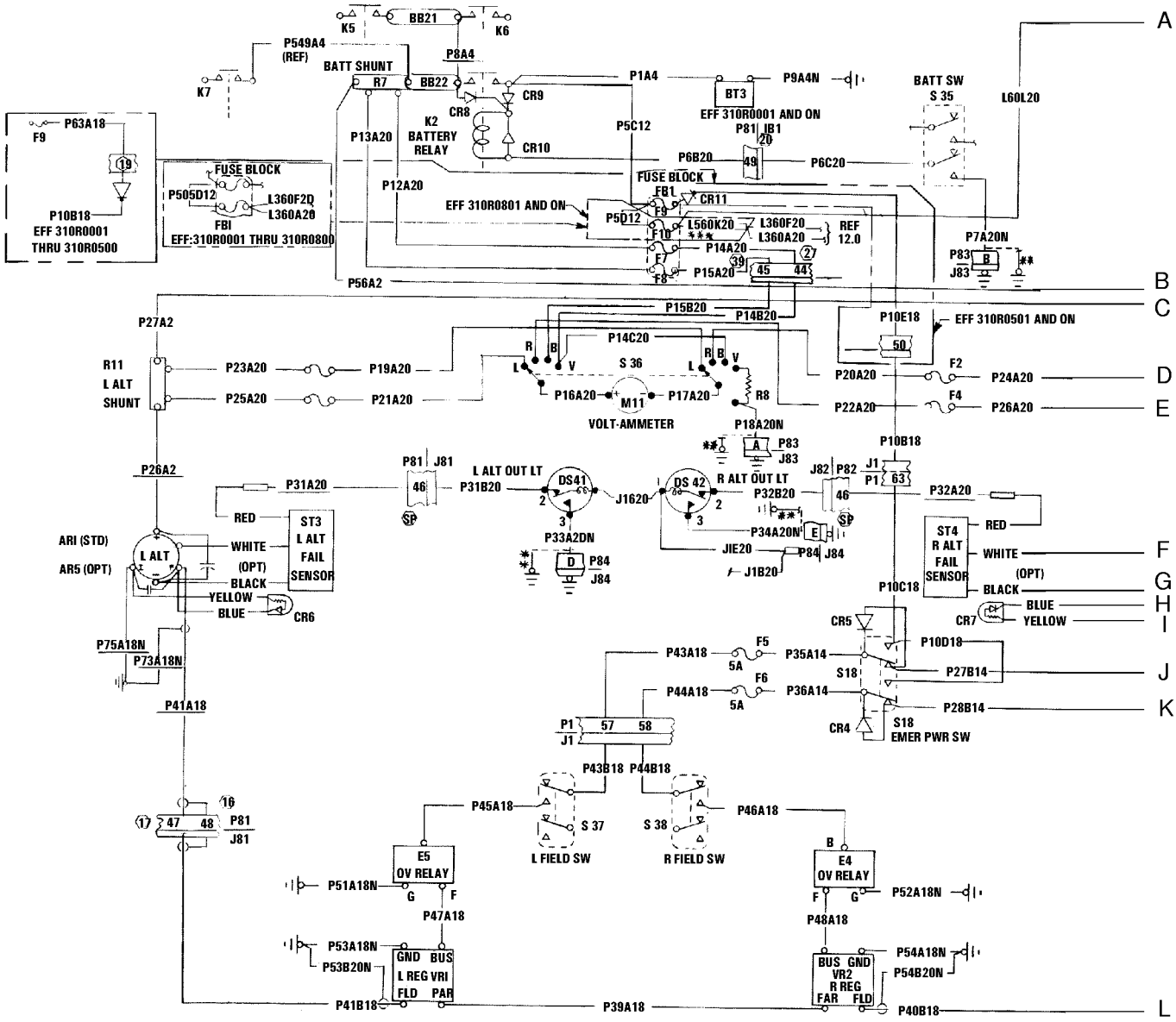
A55087



Power Distribution (STD)
Figure 2 (Sheet 1)

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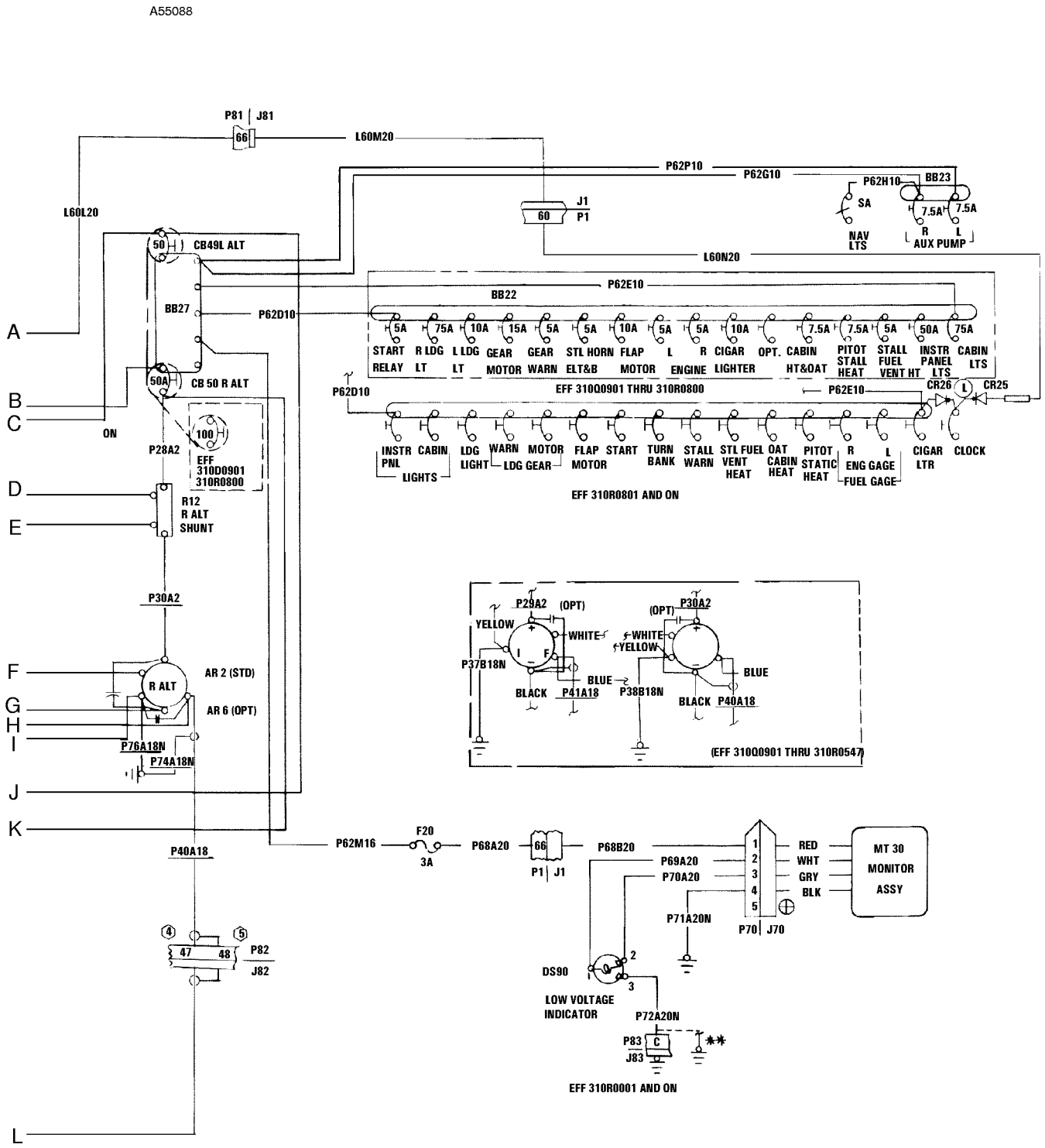

* NUMBER IN HEXAGON REFERS TO CONNECTION ON JBI OR JB2 (REFER TO 24-60-02)

Power Distribution (STD)
Figure 2 (Sheet 2)

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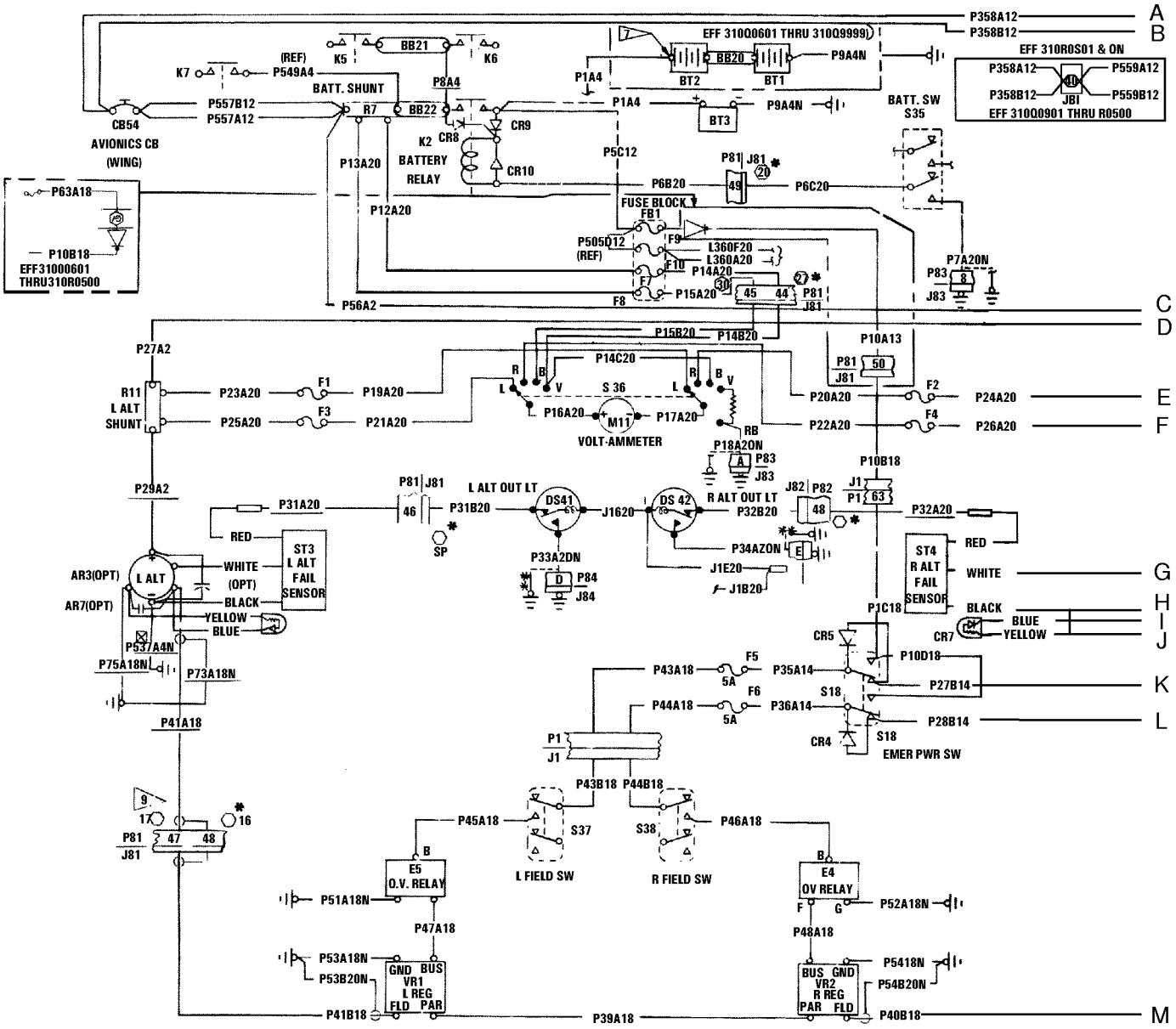
A55089



☒ (P537A2N AND P538A2N, P537A4N AND P538A4N) USED ON 100 AMD OPT ONLY

* NUMBER IN HEXAGON REFERS TO CONNECTION ON JB1 OR JB2 (REFER TO 24-60-02)

Power Distribution (Opt. C.B.)
Figure 3 (Sheet 1)

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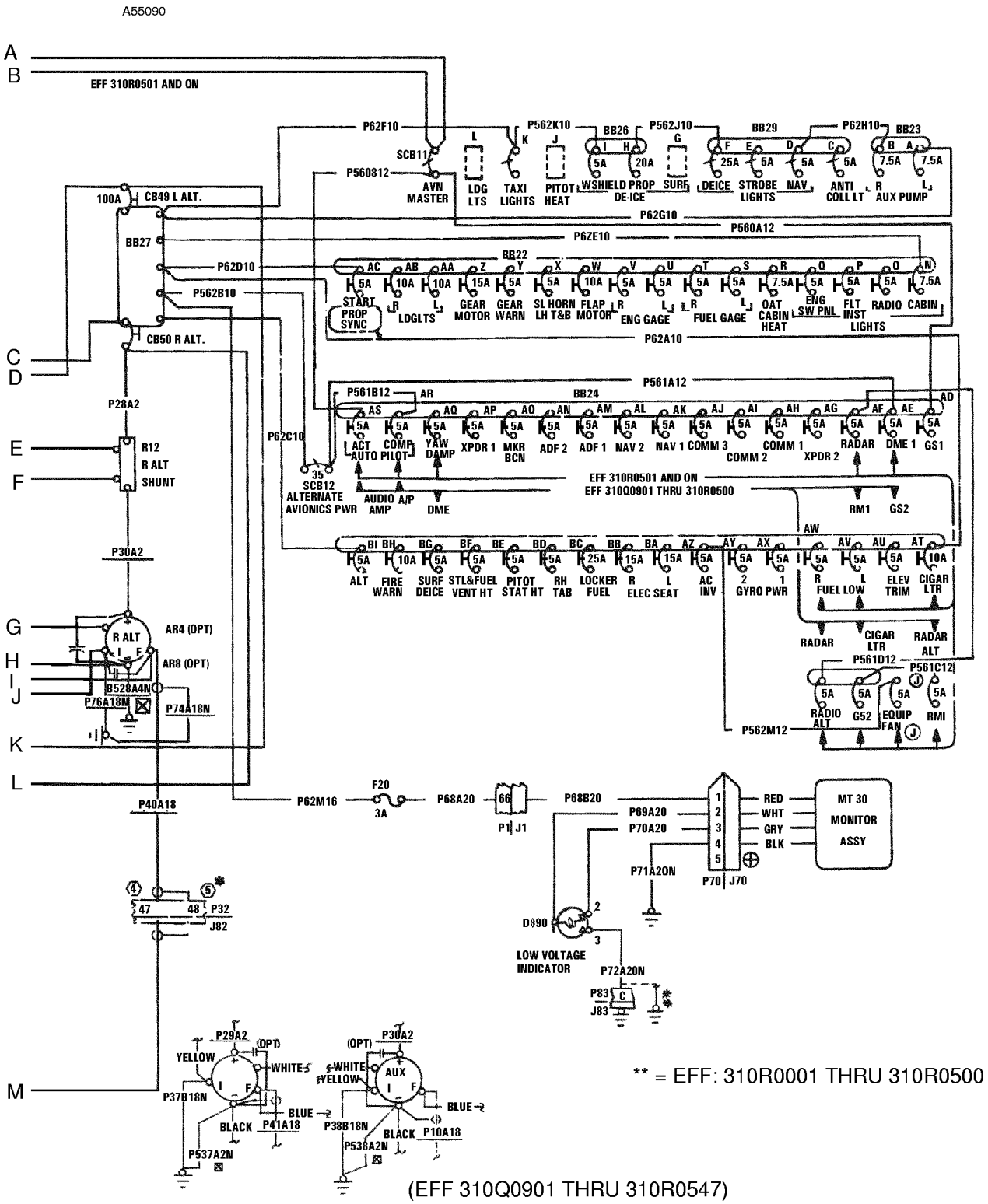

Power Distribution (Opt. C.B.)
Figure 3 (Sheet 2)

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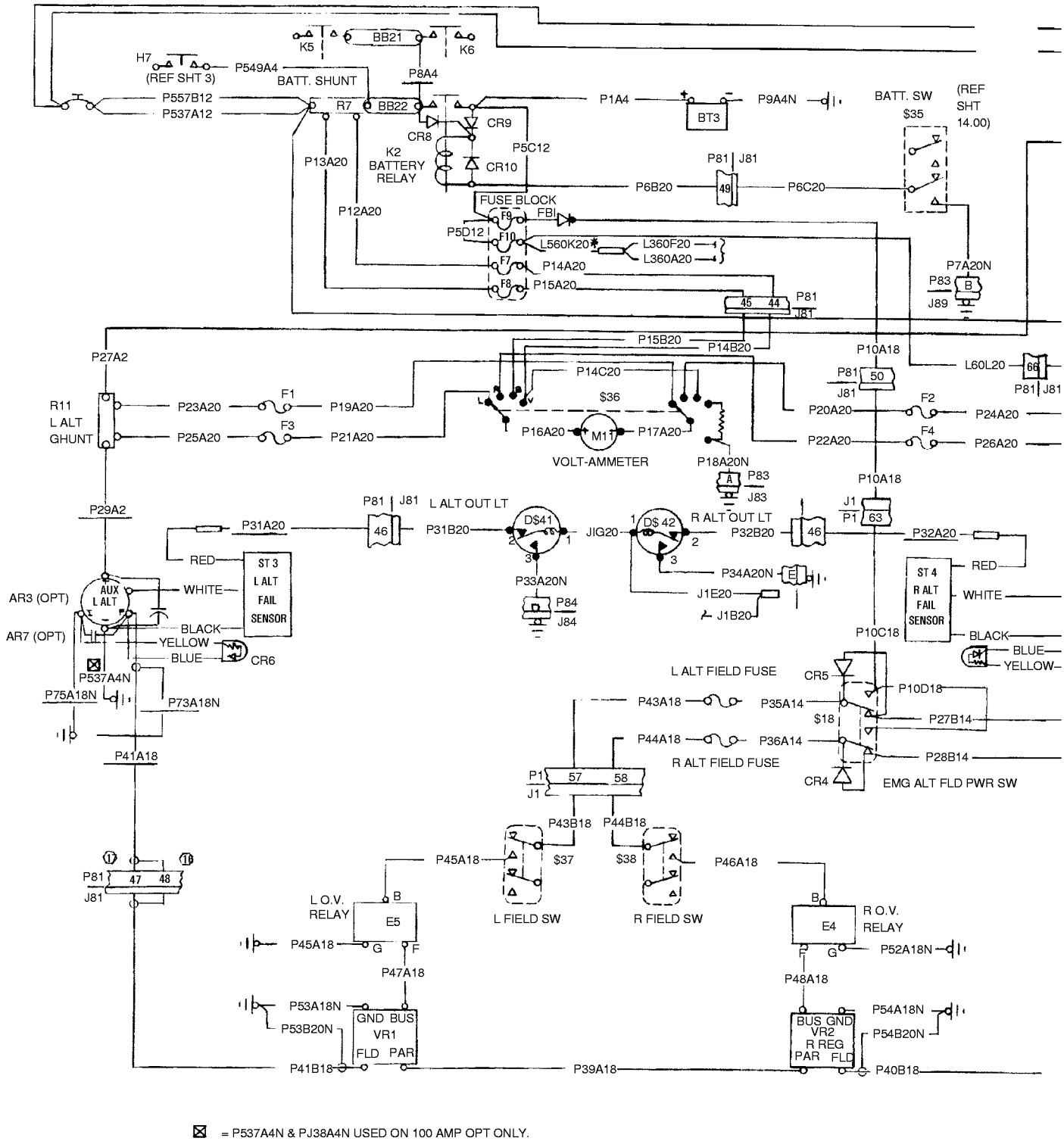
A55091



☒ = P537A4N & PJ38A4N USED ON 100 AMP OPT ONLY.

Power Distribution (Opt. C.B.)
Figure 3 (Sheet 3)

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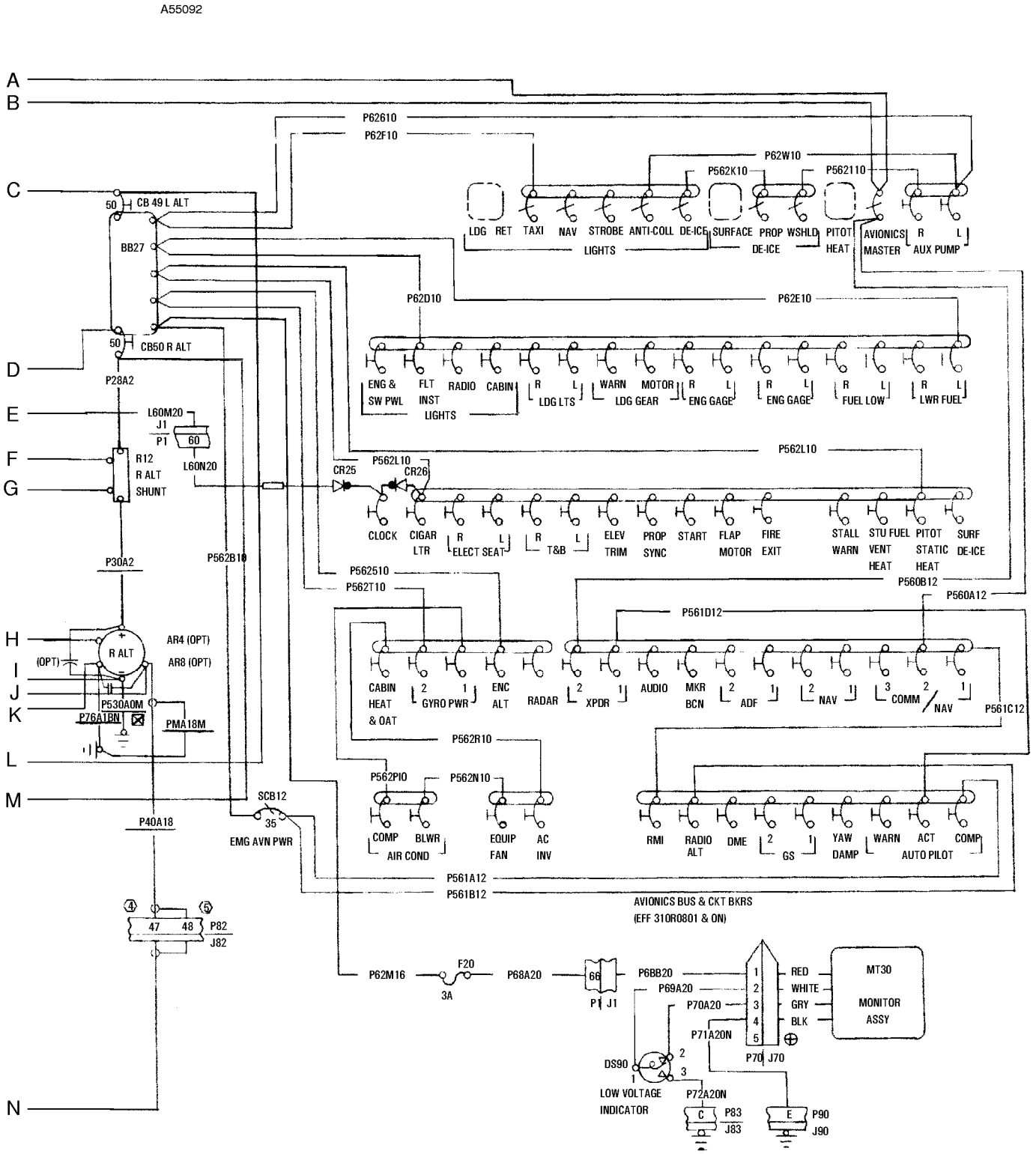

Power Distribution (Opt. C.B.)
Figure 3 (Sheet 4)

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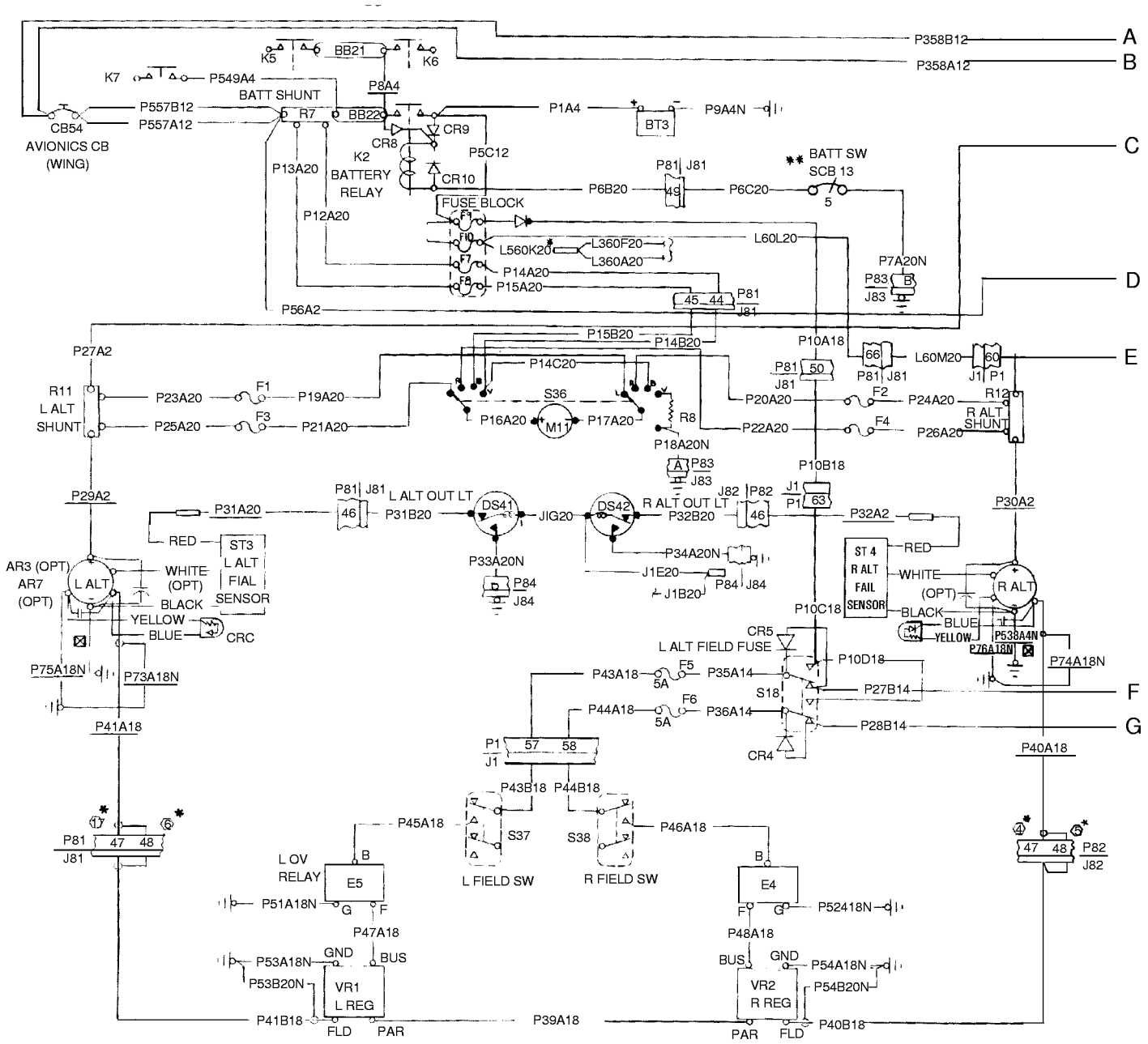
A55093



☒ =P537A4N AND P538A4N USED ON 100 AMP ONLY

NUMBER IN HEXAGON REFERS TO CONNECTION ON JB1 OR JB2 (REFERENCE 24-60-02 FIGURES 1 AND 2)

*WIRE L560K20 NOT TO BE INSTALLED ON FUSE BLK UNLESS THE OPTIONS ARE REQD. IF ONLY ONE OF THE OPTIONS IS REQD THEN CUT THE UNREQUESTED WIRE FROM THE SPLICE AND CAP AND STORE.

Power Distribution (Opt. C.B.)
Figure 3 (Sheet 5)

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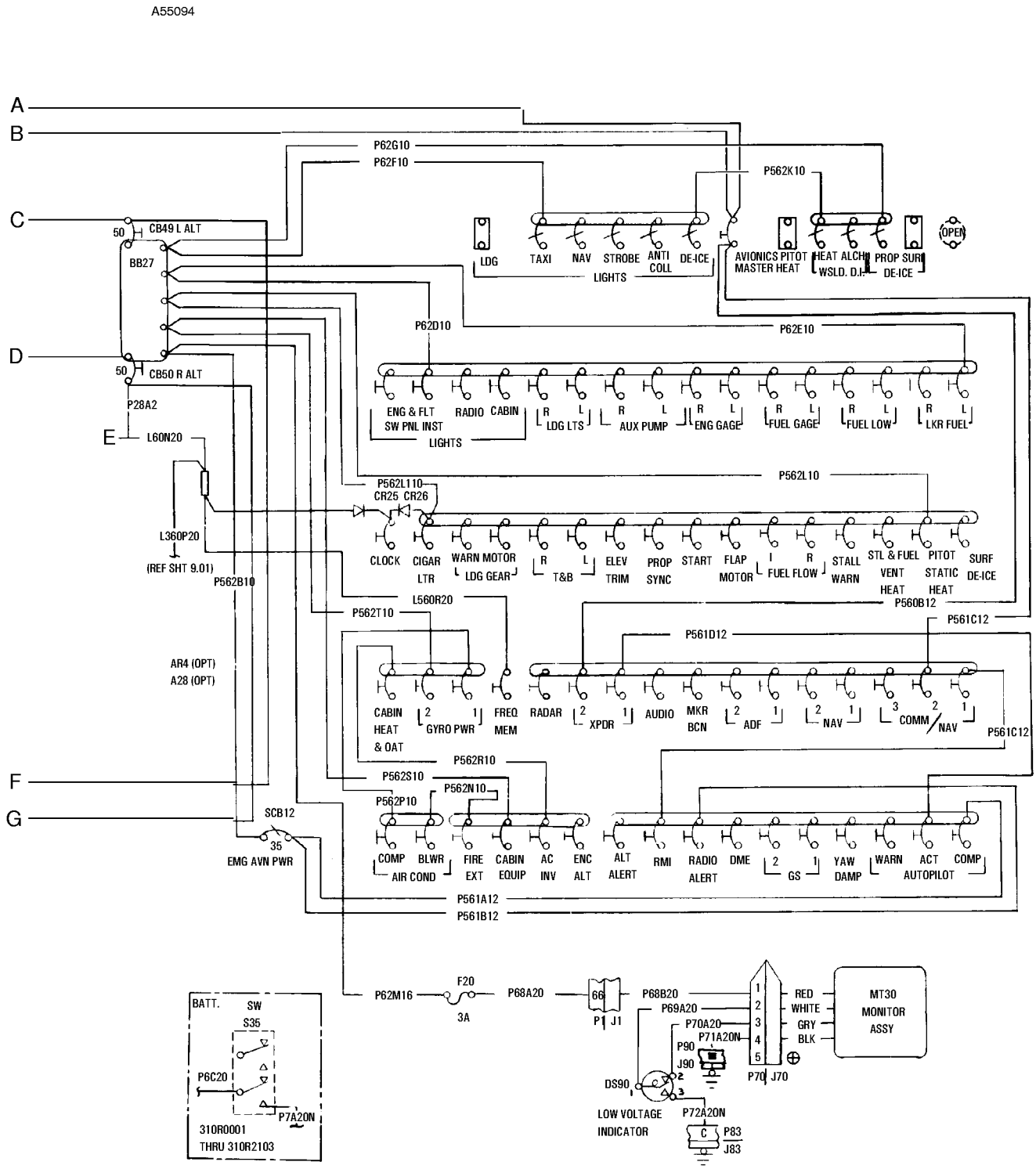

EFF 310R1201 AND ON
** 310R2104 AND ON

Power Distribution (Opt. C.B.)
Figure 3 (Sheet 6)

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JUNCTION BOXES, CIRCUIT BREAKERS, AND EXTERNAL POWER DIAGRAMS - DESCRIPTION AND OPERATION

1. Wiring Diagrams

A. This section contains wiring diagrams for the junction boxes, circuit breakers, and external power systems.
   (1) Connectors.
   (2) Terminal Boards (Junction Box Connections).

B. Reference Designator Code
   (1) Reference designators are used in these diagrams to more quickly identify and locate a part or assembly used in any electrical system. A part is identified by reference number on a diagram. The reference number called out in wiring reference designators identifies the description and diagram figure number.

   NOTE: Part Numbers referred to on Wiring Diagrams are for reference only. When ordering spare or replacement parts, refer to applicable Parts Catalog.

   (2) The wiring diagrams contained in this section clearly show the complete wiring on each item of electrical components listed in each Wiring Diagram. The first portion of wire number indicates the Airplane System, the center portion indicates Wire Number, and the last portion indicates Wire Gauge Size. Each wiring diagram contains part number and nomenclature for each component.

Reference	Figure	Description
J1	1	Recpt
J37	1	Recpt
JB1	2	LH J Box
JB2	2	RH J Box
P1	1	Plug
P37	1	Plug

C. Diagrams

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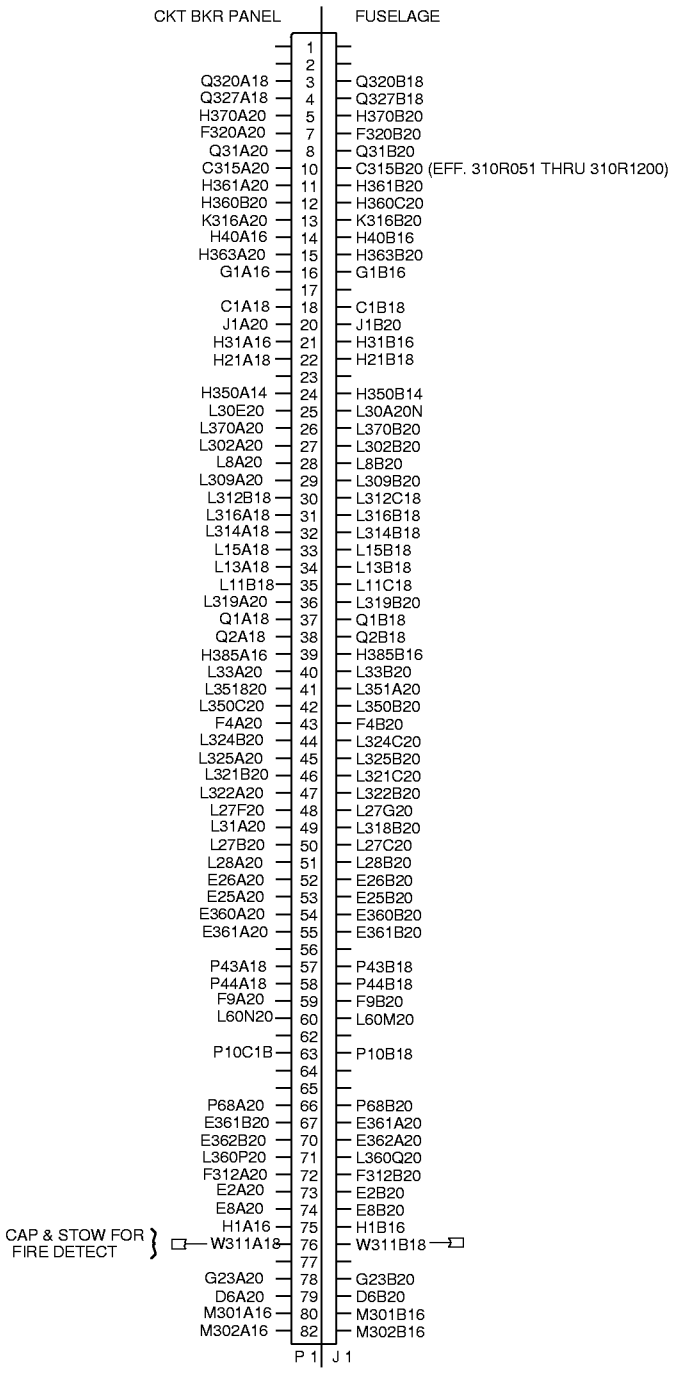
A55080



Connectors
Figure 1 (Sheet 1)

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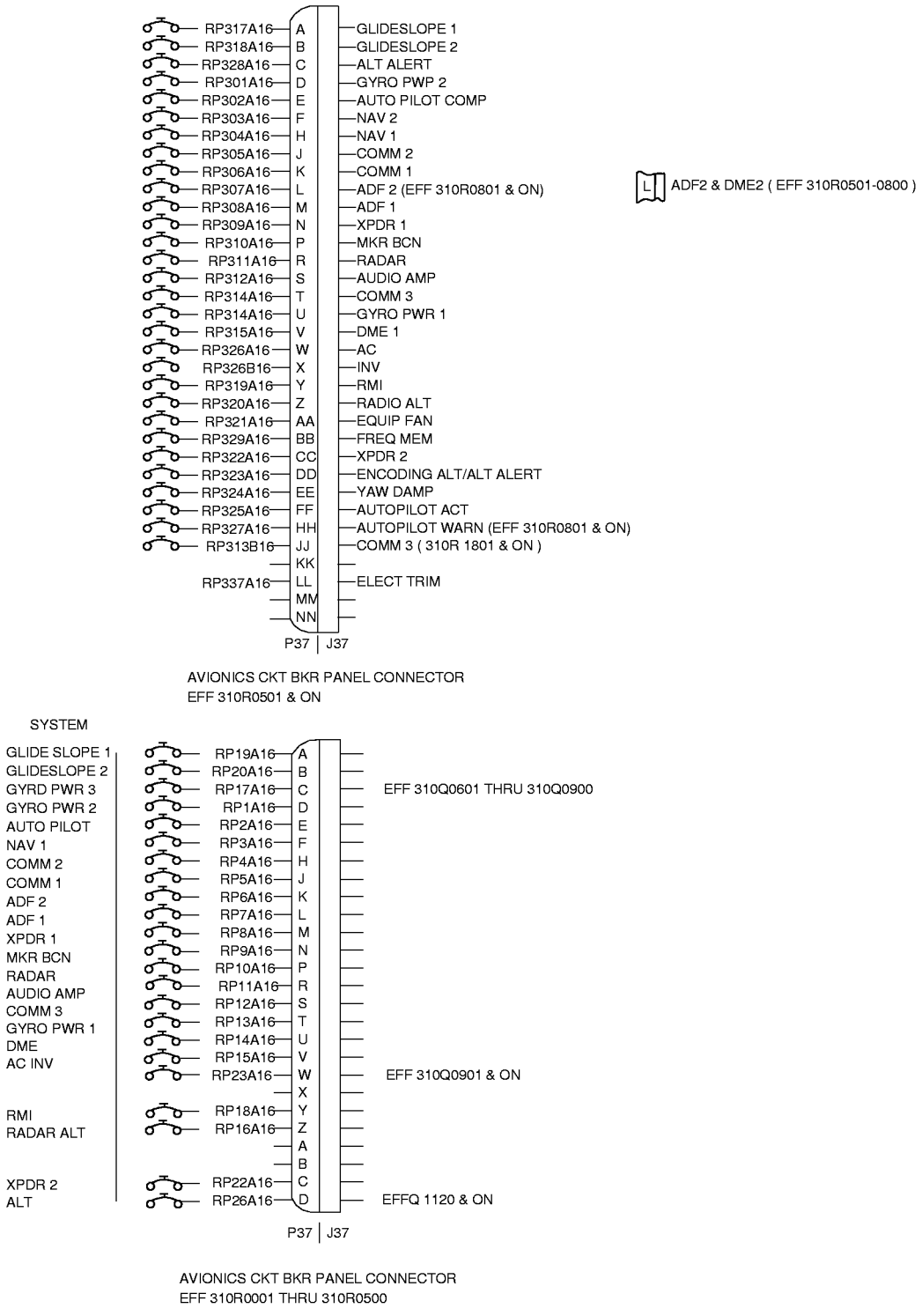
A55081



Connectors
Figure 1 (Sheet 2)

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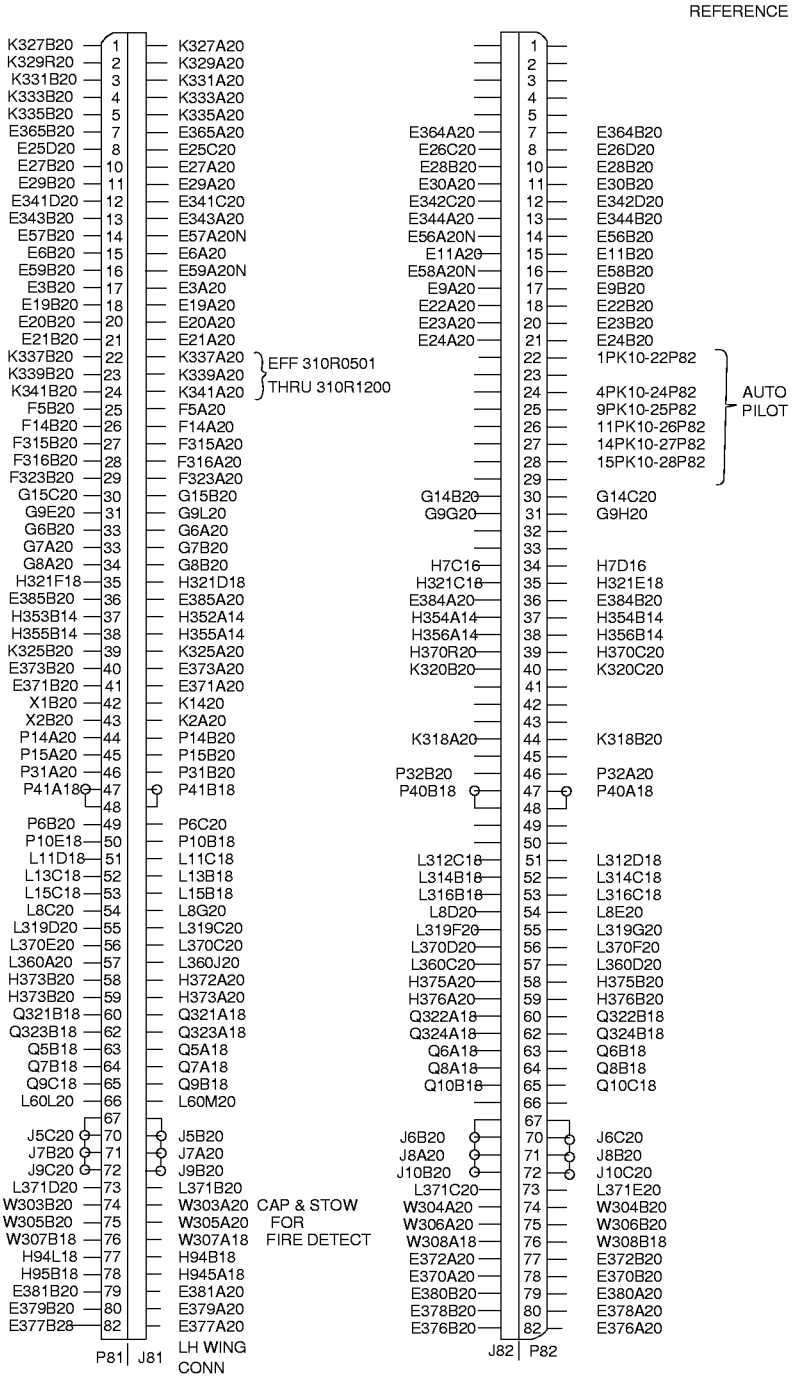
A55082



Connectors
Figure 1 (Sheet 3)

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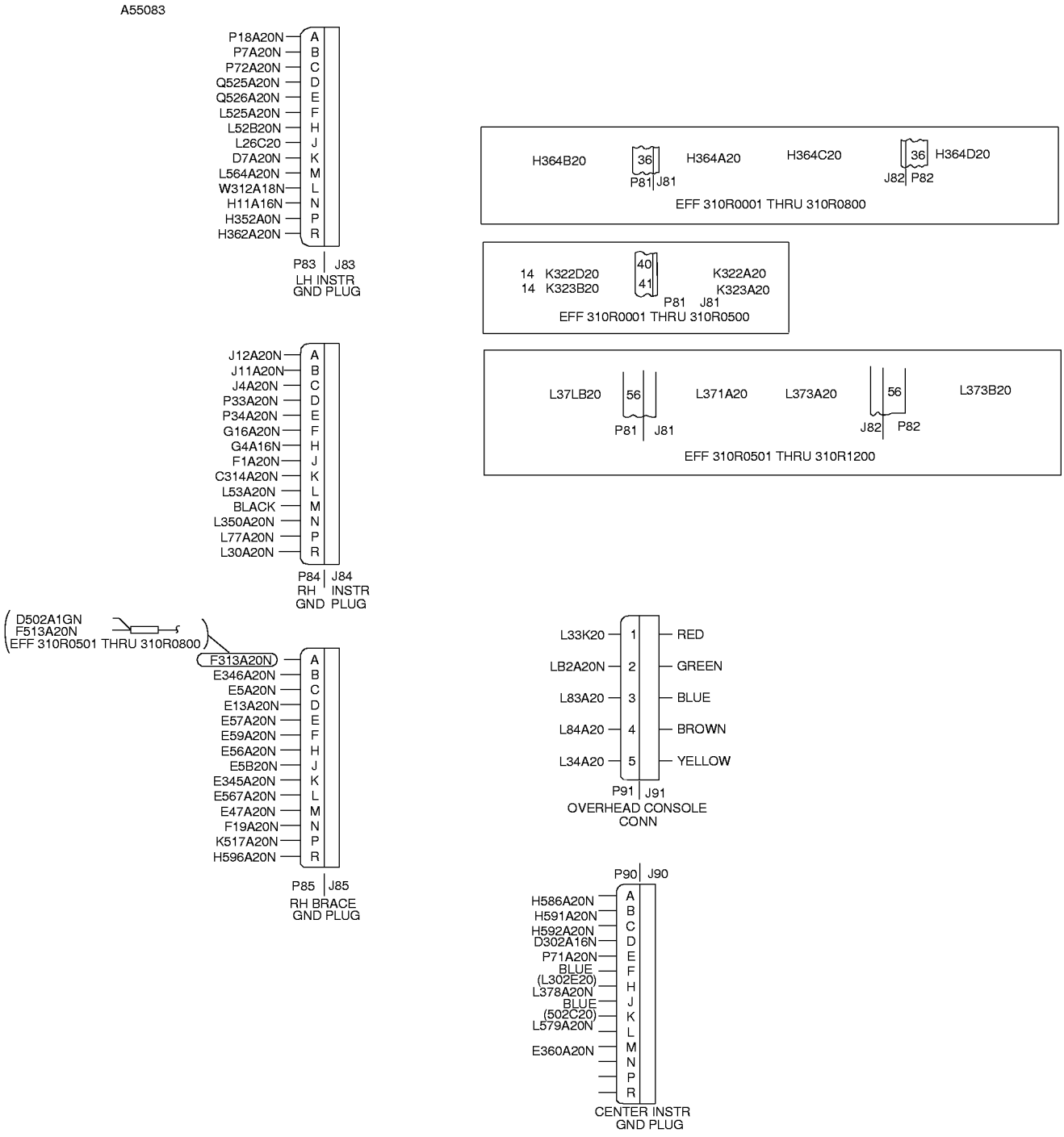

Connectors
Figure 1 (Sheet 4)

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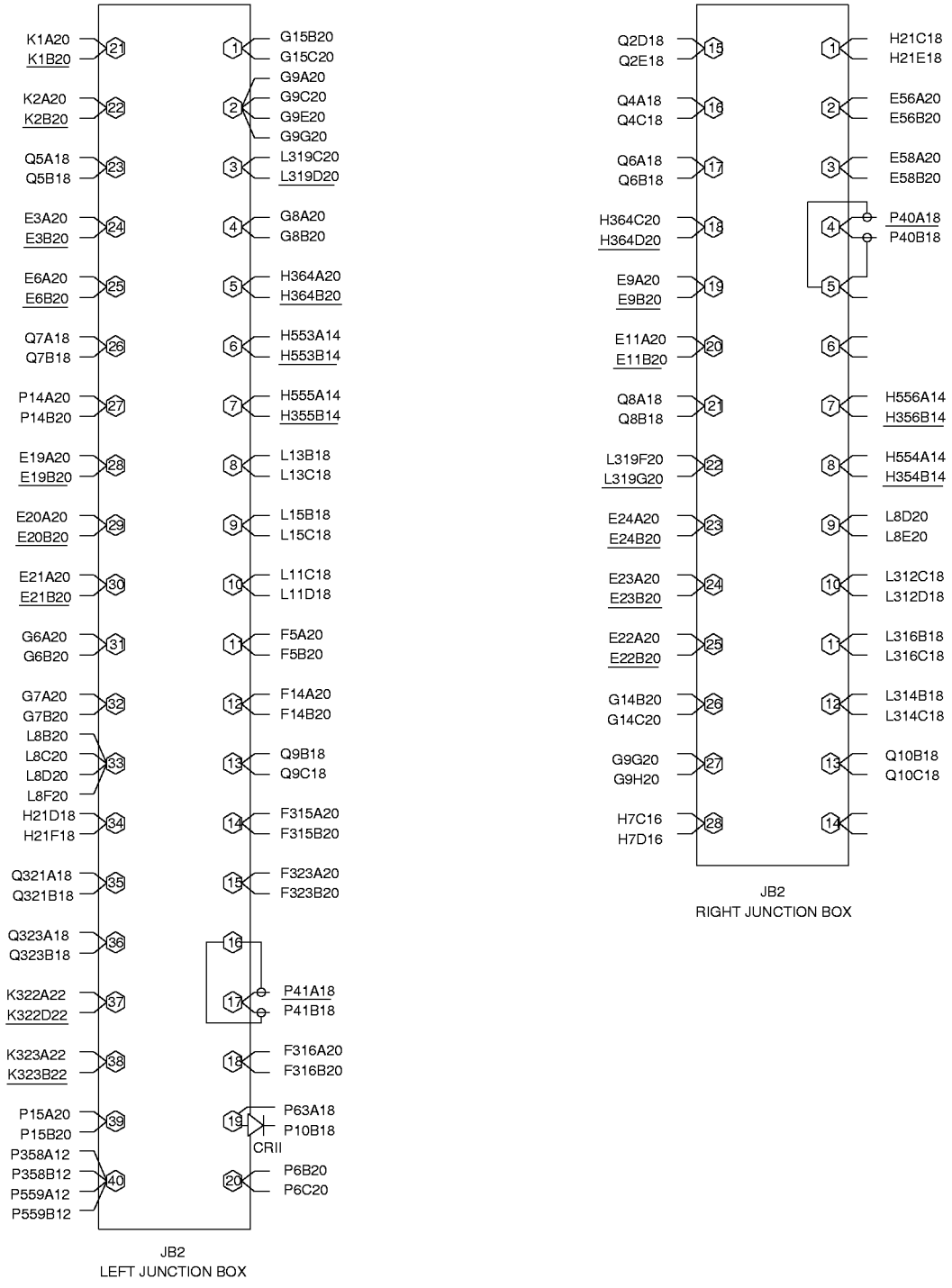
A55084



EFF 310R0001 THRU 310R0500

Terminal Boards (Junction Box Connections)
Figure 2 (Sheet 1)

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LIGHTING DIAGRAMS - DESCRIPTION AND OPERATION

1. Wiring Diagrams

A. This section contains wiring diagrams for airplane lighting systems.
   (1) Interior Lighting (Opt.)
   (2) Interior Lighting (Std.)
   (3) Exterior Lighting (Std. and Opt.)
   (4) Strobe Light (Opt.)
   (5) Courtesy Light (Opt.)

B. Reference Designator Code.
   (1) Reference designators are used in these diagrams to more quickly identify and locate a part or assembly used in any electrical system. A part is identified by reference number on a diagram. The reference number called out in wiring reference designators identifies the description and diagram figure number.

   NOTE: Part Numbers referred to on Wiring Diagrams are for reference only. When ordering spare or replacement parts, refer to applicable Parts Catalog.

   (2) The wiring diagrams contained in this section clearly show the complete wiring on each item of electrical components listed in each Wiring Diagram. The first portion of wire number indicates the Airplane System, the center portion indicates Wire Number, and the last portion indicates Wire Gauge Size. Each wiring diagram contains part number and nomenclature for each component.

Reference	Figure	Description
BB8	1	Bus
BB9	1	Bus
BB10	1	Bus
BB11	1	Bus
BB12	1	Bus
CB4	3	CB R LND LT
CB5	3	CB L LND LT
CB15	1	CB Eng Sw Lts
CB16	1	CB Flt Inst Lts
CB17	1	CB Radio Lts
CB18	1	CB Cabin Lts
DS5	3	L Nav Lt Assy
DS6	3	R Nav Lt Assy
DS7	3	T Nav Lt
DS8	3	Light Anti-Collision
DS9	3	Light Anti-Collision
DS10	3	Taxi Lt
DS11	1	Bulb
DS12	1	Bulb
DS13	1	Light

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Reference	Figure	Description
DS14	1	Light
DS15	1	Light
DS16	1	Light
DS17	3	Lamp
DS18	3	Lamp
DS20	3	Lnd Lt Assy
DS21	3	Lnd Lt Assy
DS25	3	LH Deice Lt
DS26	3	RH Deice Lt
DS27	3	Light Assy
DS28	3	Light Assy
DS30	1	Fuel Sel Lt
DS31	1	Sw Lt
DS32	1	Sw Lt
DS33	1	Sw Lt
DS34	1	Sw Lt
DS35	1	Sw Lt
DS36	1	Sw Lt
DS37	1	Sw Lt
DS38	1	Comp Lt
DS39	1	Flap Pres Lt
DS40	1	Conf Cont Lt
DS84	1	Fld Lt
DS85	1	Fld Lt
DS86	1, 2	Oxy Lt
DS87	1, 2	Sw Lt
DSS1	3	Lt Tail Strobe
DSS2	3	Lt Wing Strobe
DSS3	3	Lt Wing Strobe
EL1	1	Panel
EL2	1	Panel
EL3	1	Panel
EL4	1	Panel
EL5	1	Panel
EL6	1	Panel

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Reference	Figure	Description
EL7	1	Panel
EL8	1	Panel
EL9	1	Panel
EL10	1	Panel
EL11	1	Panel
EL12	1	Panel
EL13	1	Panel
EL14	1	Panel
EL15	1	Panel
F10	3	Fuse
F11	3	Flasher
INV1	1	Inverter
J49	1	Recpt
P20	3	Plug
P21	3	Plug
P49	1	Plug
P53	3	Plug
P66	3	Plug Flasher
PS1	3	Power Supply
Q3	1	Transistor
Q4	1	Transistor
Q5	1	Transistor
Q6	1	Transistor
Q7	1	Transistor
R15	1	Rheostat
R17	1	Rheostat
R18	1	Rheostat
R35	1, 2	Resistor
S23	1	Switch
S24	1	Switch
S25	1	Switch
S26	1	Switch
S27	3	Switch
S53	3	Switch
S54	3	Switch
S58	3	Switch

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Reference	Figure	Description
S59	3	Switch
S87	3	Switch
SCB2	3	SCB Taxi Light
SCB7	3	SCB Deice Lt
SCB8	3	SCB Strobe
SCB9	3	SCB Nav Lts
SCB10	3	SCB Anti-Collision Lts
TB14	1	Term Blk
TB15	1	Term Blk
TB16	1	Term Blk
TR1	3	Transmitter

C. Diagrams

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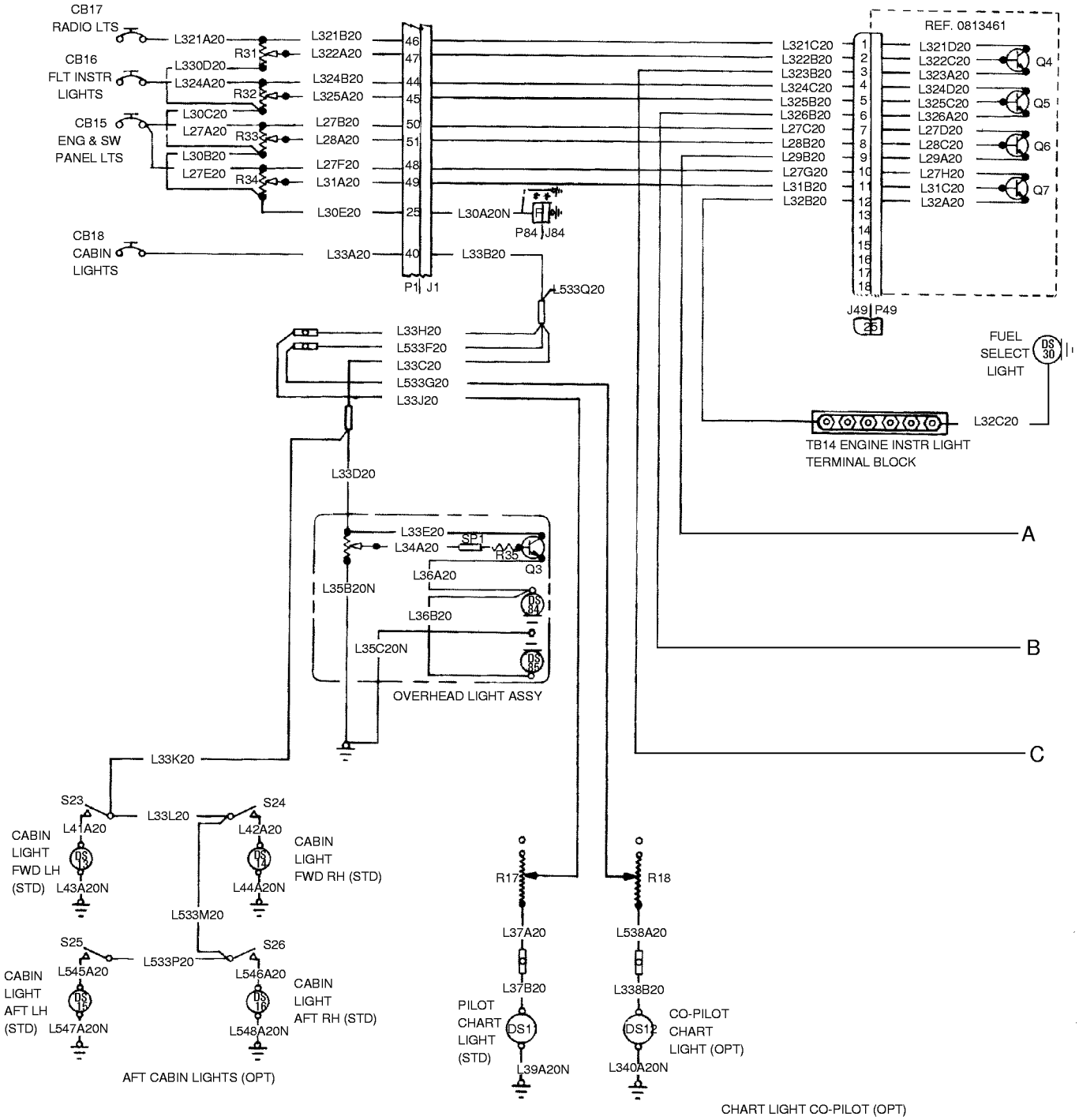
A55105



Interior Lighting (Opt.)
Figure 1 (Sheet 1)

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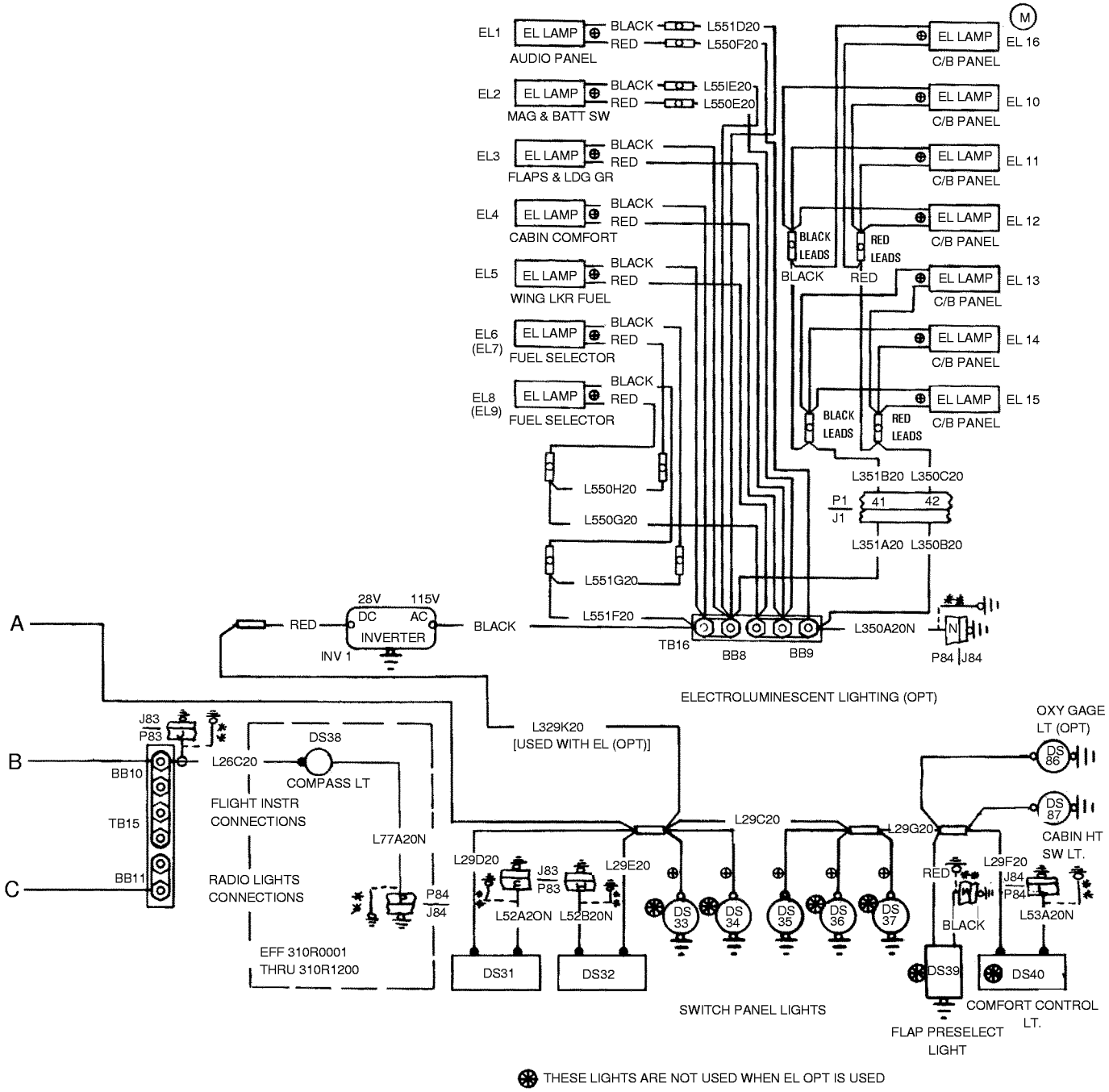

**= EFF 310R0001 THRU 310R0500

Interior Lighting (Opt.)
Figure 1 (Sheet 2)

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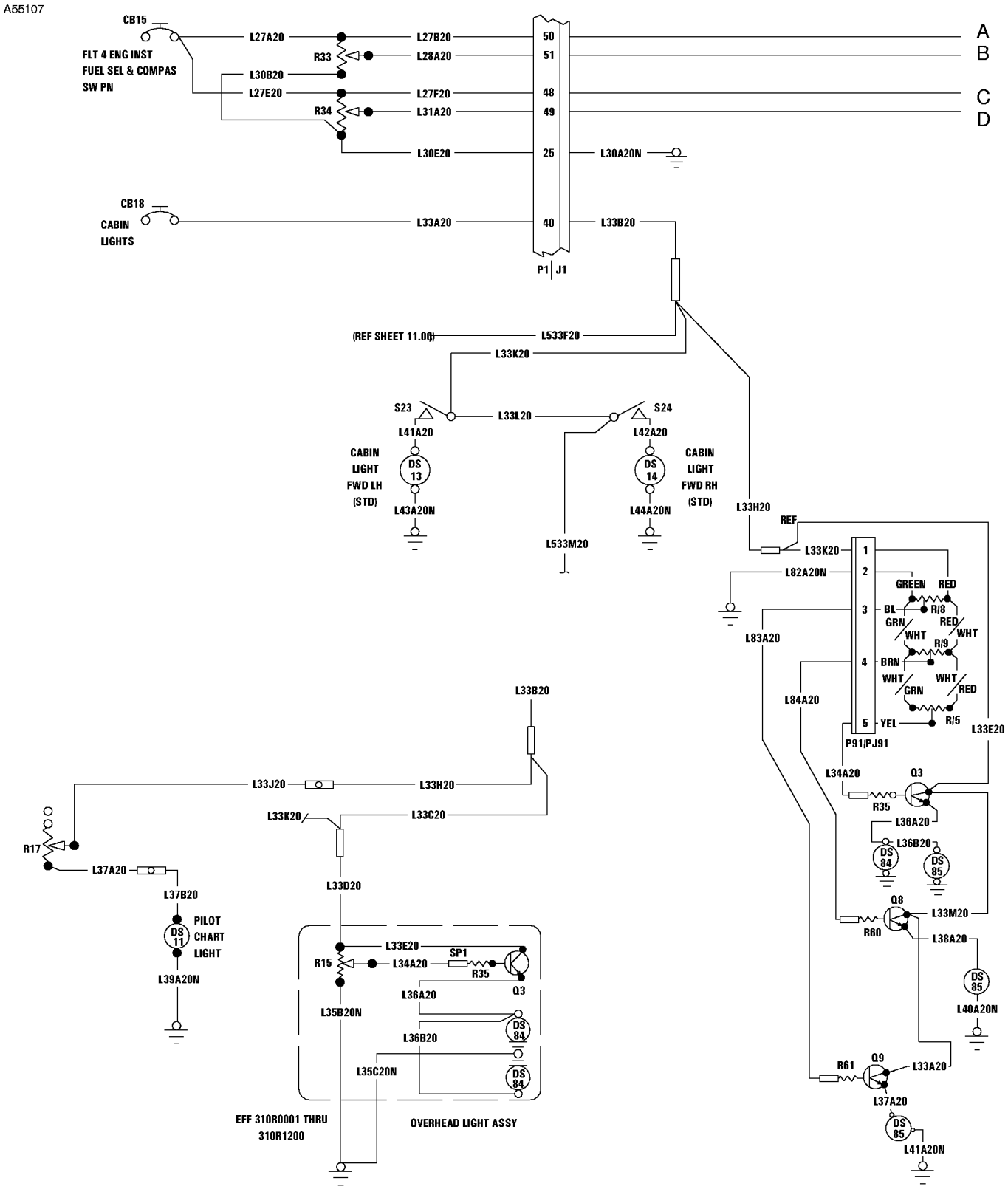

Interior Lighting (Std.)
Figure 2 (Sheet 1)

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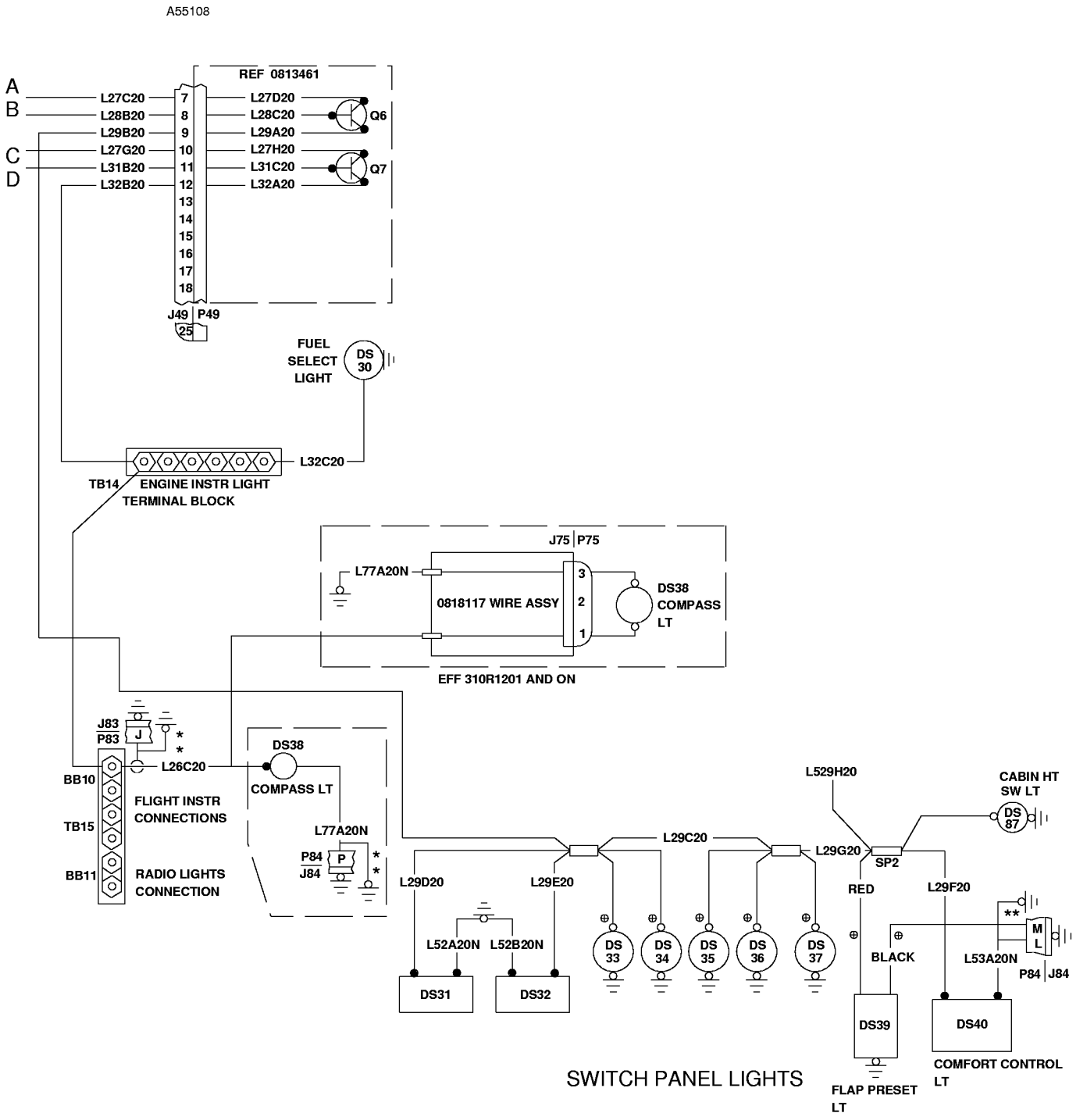

** = EFF: 310R0001 THRU 310R0500

Interior Lighting (Std.)
Figure 2 (Sheet 2)

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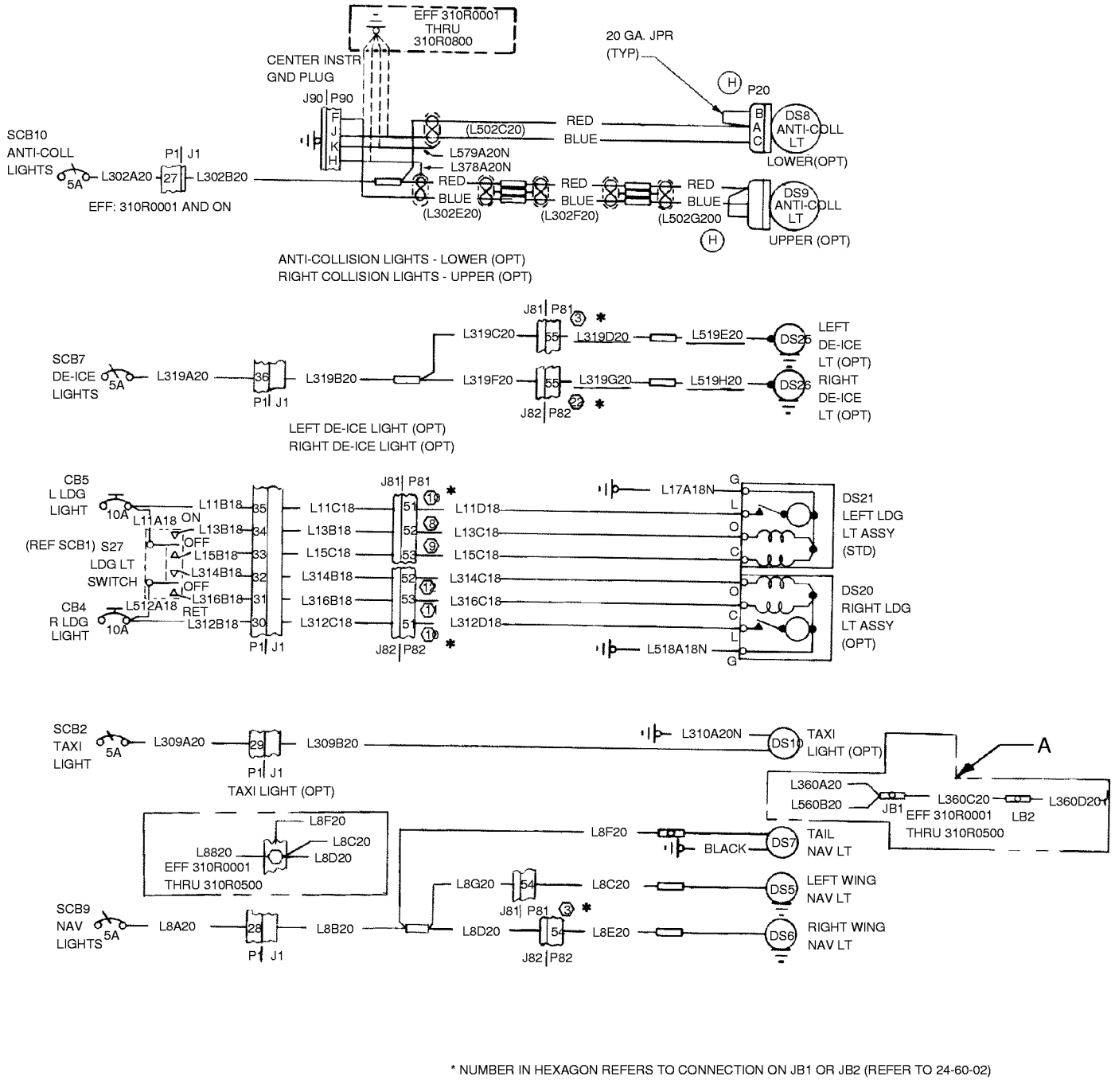

* NUMBER IN HEXAGON REFERS TO CONNECTION ON JB1 OR JB2 (REFER TO 24-60-02)

Exterior Lighting (Std. and Opt.)
Figure 3 (Sheet 1)

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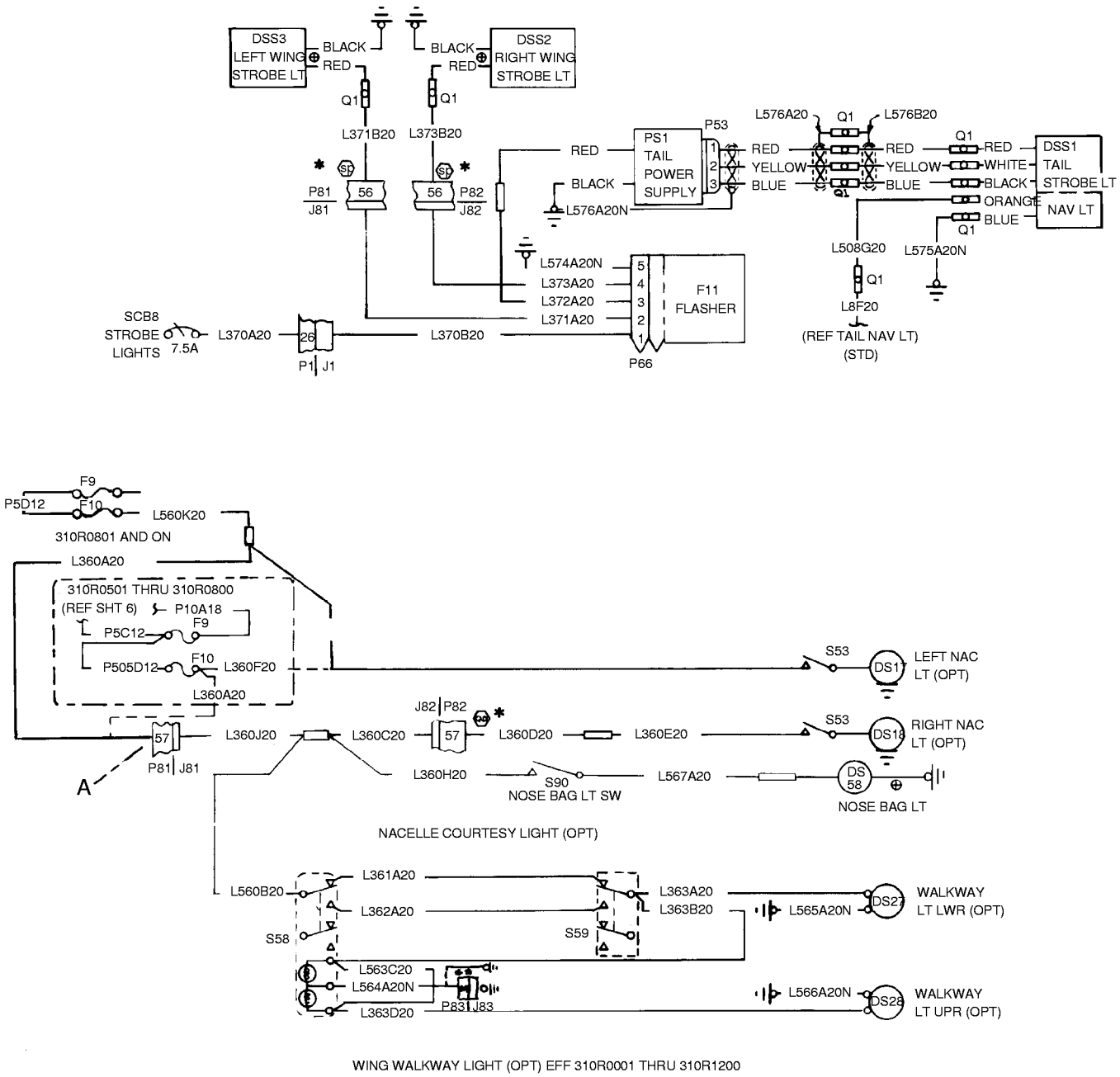

Exterior Lighting (Std. and Opt.)
Figure 3 (Sheet 2)

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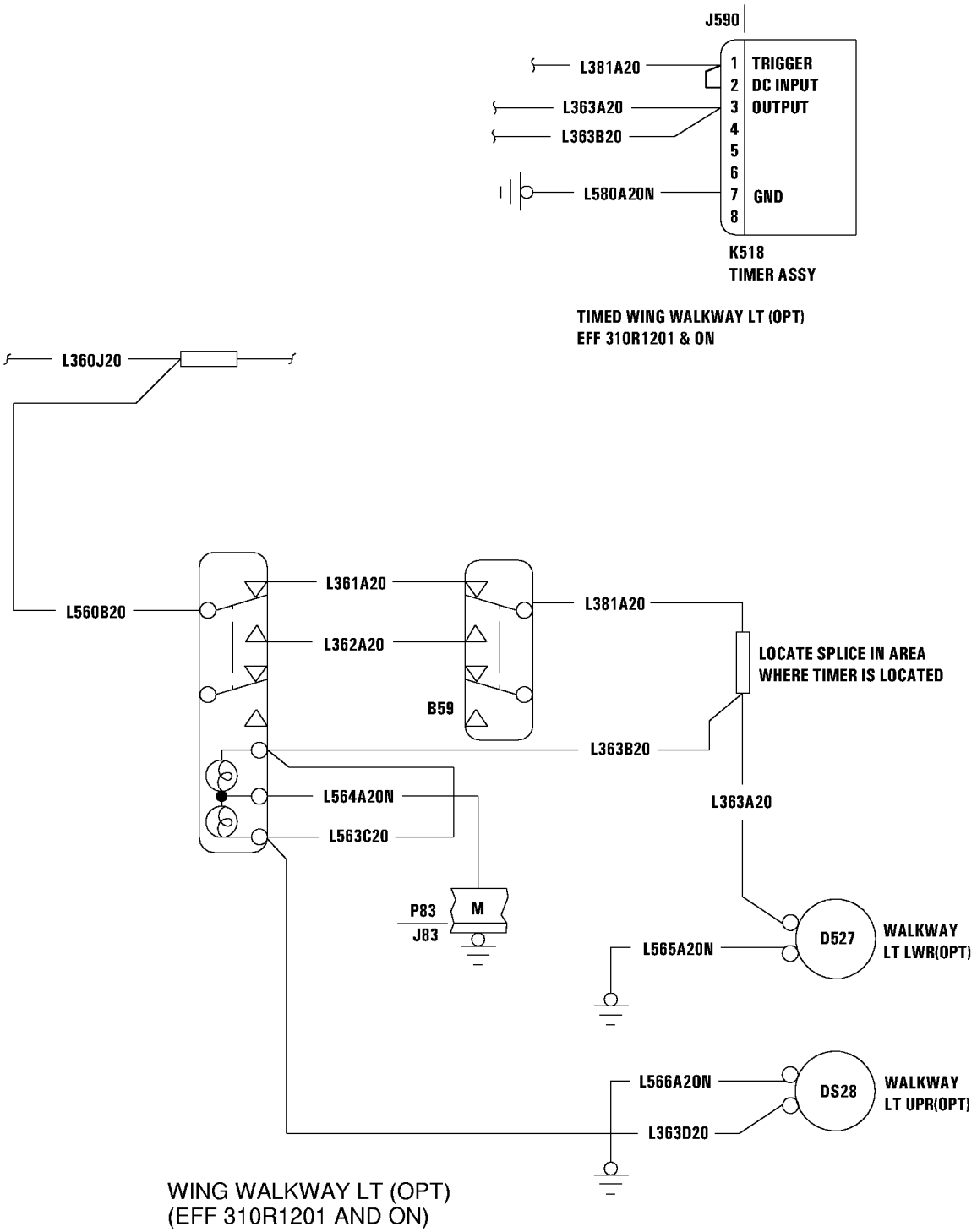

Strobe Light (Opt.) and Courtesy Light (Opt.)
Figure 4 (Sheet 1)

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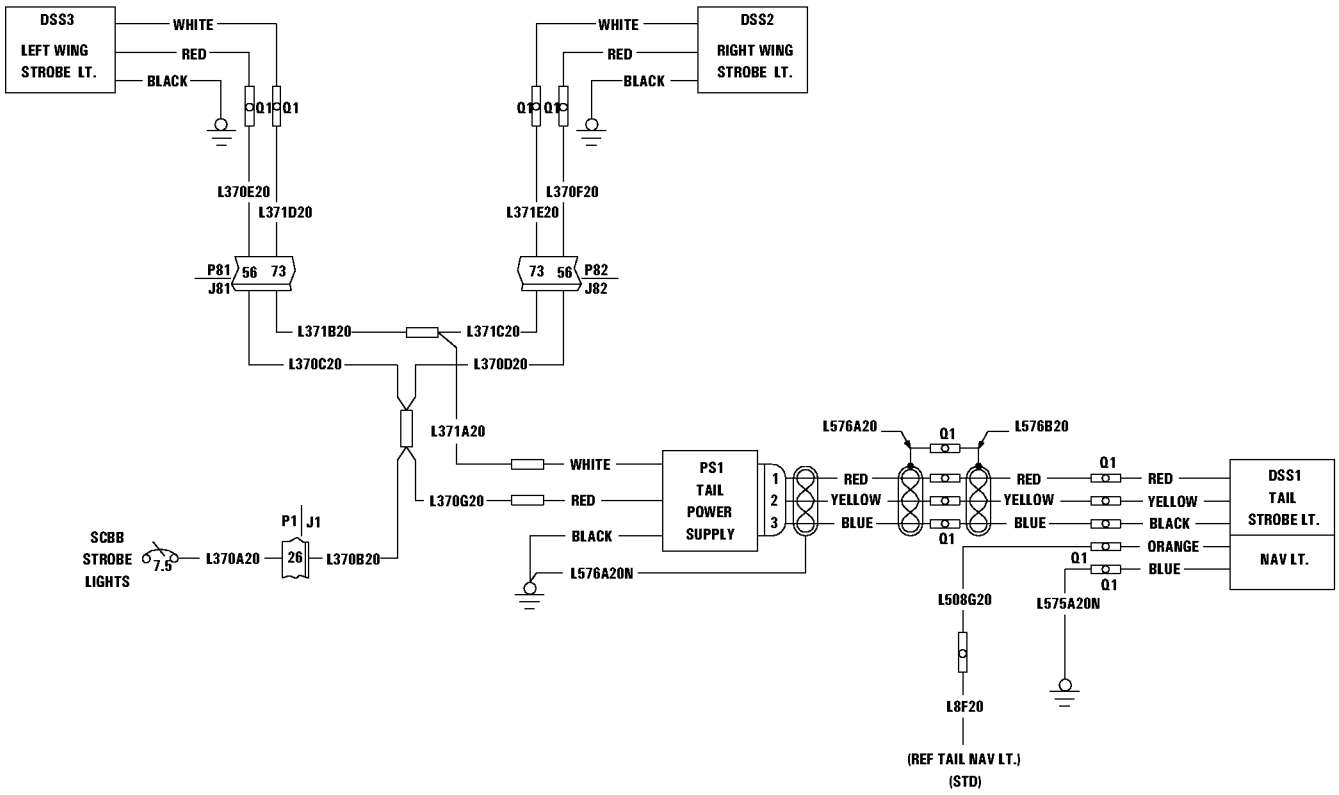

STROBE LIGHT WIRING DIAGRAM (OPT)
EFF 310R1201 AND ON

Strobe Light (Opt.) and Courtesy Light (Opt.)
Figure 4 (Sheet 2)

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INDICATING AND RECORDING SYSTEMS DIAGRAMS - DESCRIPTION AND OPERATION

1. Wiring Diagrams

A. This section contains wiring diagrams for indicating and recording systems.
   (1) Tachometer Generator
   (2) Engine Instrument
   (3) Turn and Bank (LH and RH)
   (4) Outside Air Temperature
   (5) Fuel Quantity System (Capacitance)
   (6) Stall Warning Horn
   (7) Flight Hour Recorder
   (8) Angle of Attack
   (9) Electric Clock

B. Reference Designator Code
   (1) Reference designators are used in these diagrams to more quickly identify and locate a part or assembly used in any electrical system. A part is identified by reference number on a diagram. The reference number called out in wiring reference designators identifies the description and diagram figure number.

   NOTE: Part Numbers referred to on Wiring Diagrams are for reference only. When ordering spare or replacement parts, refer to applicable Parts Catalog.

   (2) The wiring diagrams contained in this section clearly show the complete wiring on each item of electrical components listed in each Wiring Diagram. The first portion of wire number indicates the Airplane System, the center portion indicates Wire Number, and the last portion indicates Wire Gauge Size. Each wiring diagram contains part number and nomenclature for each component.

Reference	Figure	Description
AMP3	2	Signal Conditioner
AMP4	2	Signal Conditioner
B11	4	Motor
B14	3	Blower and Pump
B16	4	Actuator Assembly
B17	1	Motor
B18	1	Motor
B19	1	Elec Trim Act
B21	1	Motor
B22	1	Motor
CB8	1, 3	CB Stall horn
CB9	4	CB Flap
CB10	1	CB R Eng Gage
CB11	1	CB L Eng Gage
CB12	2	Fuel Gage
CB13	2	Fuel Gage
CB14	3	CB Cab HT and OAT

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Reference	Figure	Description
CB35	4	CB Prop Synch
CB37	4	CB Wing Deice
CB38	3	CB St1 and F1 VT HT
CB39	3	CB Dual Pitot
CB39	3	CB Pitot Ht
CB40	1	CB RH T and B
CB42	1	CB Elec Seat
CB43	1	CB Elec Seat
CB44	1	CB Elec Elev Trim
CB48	3	CB Cigar Ltr
CR1	5	Diode
CR2	5	Diode
CR12	3	Diode
CR24	3	Diode Htr
DS29	3	Light
DS43	1	Light
DS54	4	Light
DS55	4	Light
DS71	2	Light
DS72	2	Light
E3	3	Cabin Hrt
E6	4	Brush Assy
E7	4	Brush Assy
E8	4	Control Box A
E9	4	Governor
E10	4	Governor
E11	3	LH P.T. Htr
E12	3	RH P.T. Htr
E13	4	Governor
E14	4	Governor
E15	4	Brush Assy
E16	4	Brush Assy
F13	4	Fuse
HR1	3	Cigar Ltr
HR2	3	Cigar Ltr

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Reference	Figure	Description
HR5	4	Deice Boot
HR6	4	Deice Boot
HR7	4	Deice Boot
HR8	4	Deice Boot
HR9	4	Deice Boot
HR10	4	Deice Boot
HR11	3	Vent Htr
HR12	3	Vent Htr
HR13	3	Htr
HR14	3	Htr
HR15	3	Htr
HR16	3	Htr
J5	5	Jack Mic
J6	5	Jack Mic
J7	5	Jack Mic
J11	5	Jack HD PH
J12	5	Jack HD PH
J29	4	Recpt
J35	2	Recpt
J36	2	Recpt
J47	5	Mic Jack
J50	5	Conn A.O.A.
J54	5	Conn A.O.A.
J55	2	Recpt and Cable Assy
J55A	2	Recpt and Cable Assy
J56	2	Recpt and Cable Assy
J56A	2	Recpt and Cable Assy
K12	3	Relay
L1	3	Valve
L2	4	Valve
L3	4	Valve
LS2	5	Speaker
LS14	3	Stall Warn Horn
M1	1	L Engine Gage
M2	1	R Engine Gage
M3	2	Fuel Gage

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Reference	Figure	Description
M5	1	Tach Gen
M7	1	Ind OAT
M8	1	Indicator
M9	1	Indicator
M14	4	Timer Assy
M15	4	Ammeter - 3 Blade
M16	1	Tach Gen
M17	4	Recorder
M19	4	EM211-2
MT1	1	Tach Gen
MT2	1	Tach Gen
MT3	2	Fuel Probe
MT4	2	Fuel Probe
MT5	2	Fuel Probe
MT6	2	Fuel Probe
MT9	1	L Oil Temp
MT10	1	R Oil Temp
MT11	1	LH Cyl temp
MT12	1	RH Cyl Temp
MT14	1	OAT Bulb
MT17	3	Stall Act and Htr
MT21	2	Fuel Probe
MT22	2	Fuel Probe
MT23	2	Fuel Probe
MT24	2	Fuel Probe
P3	1	Plug
P4	1	Plug
P5	1	Plug
P6	1	Plug
P7	1	Plug
P8	1	Plug
P9	1	Plug
P10	1	Plug
P11	3	Plug
P12	2	Plug
P13	2	Plug

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Reference	Figure	Description
P14	1	Plug
P17	2	Plug
P18	1	Plug
P25	4	Plug
P26	4	Plug
P31	4	Plug
P35	2	Plug
P36	2	Plug
P38	3	Plug
P39	3	Plug
P43	1	Plug
P44	1	Plug
P45	2	Plug
P46	2	Plug
P50	5	Conn A.O.A.
P51	3	Plug
P52	3	Plug
P54	5	Conn A.O.A.
P55	2	Plug
P56	2	Plug
PH1	5	Boom Mic
QD3	2	Disconnect
R19	3	Resistor
R20	3	Resistor
RF1	5	Filter
RF2	5	Filter
S14	4	Switch
S15	4	Switch
S16	4	Switch
S19	4	Switch
S41	3	Thermostat
S42	3	Switch
S46	5	Switch Assy
S49	4	Switch
S50	5	Switch
S55	3	Switch

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Reference	Figure	Description
S61	1	Switch
S62	1	Switch
S63	1	Switch
S64	1	Switch
S67	4	Switch
S68	1	Switch
S69	1	Switch
S71	2	Switch
S72	4	Switch
S75	2	Switch
S76	2	Switch
S77	3	Switch
SCB4	4	SCB W/S Anti-Ice
SCB5	4	SCB Prop Deice
SR3	5	Diode
SR6	5	Diode
SR8	5	Diode

C. Diagrams

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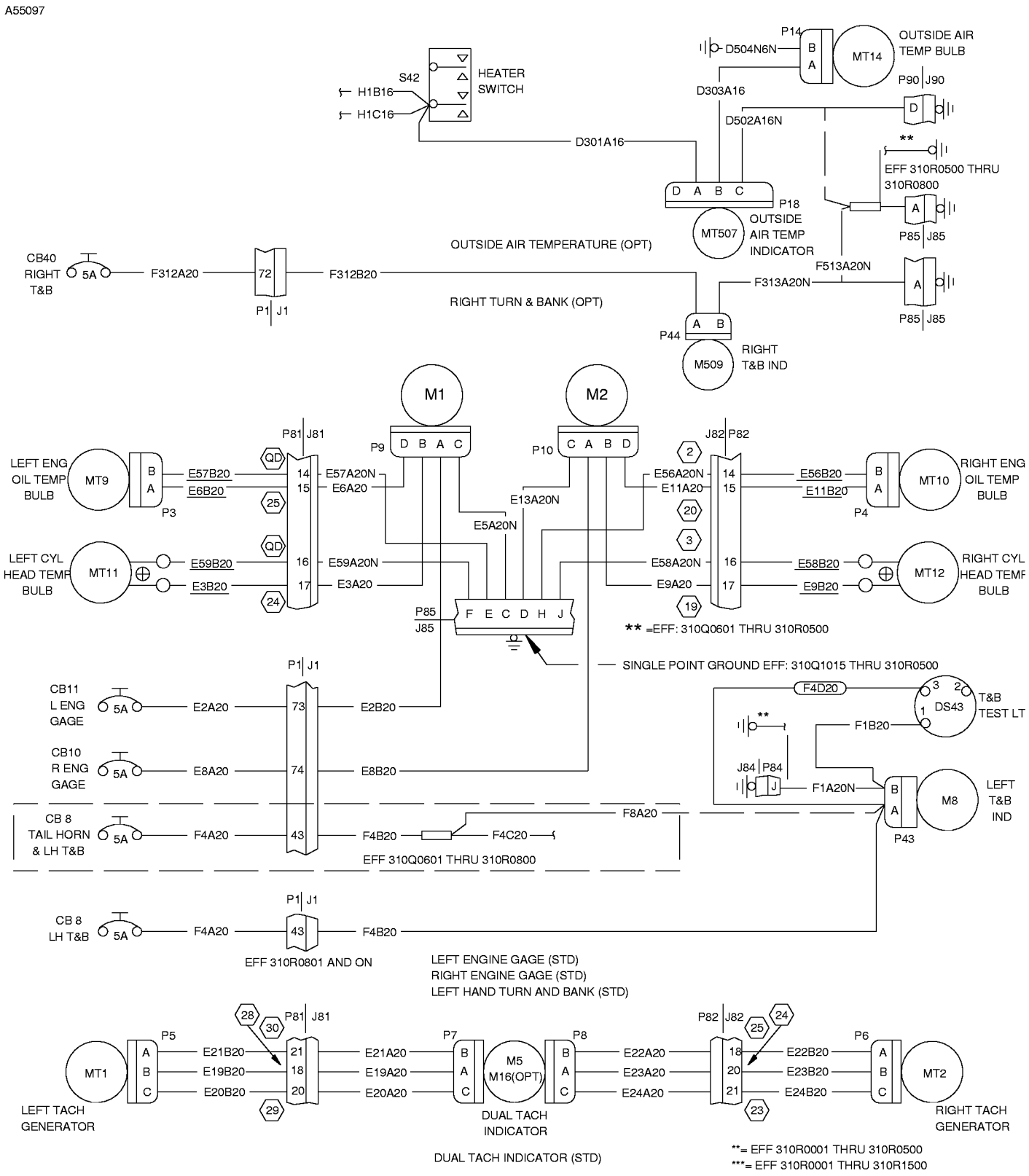

Tachometer Generator, Engine Instrument, Turn and Bank (LH and RH), and Outside Air Temperature
Figure 1 (Sheet 1)

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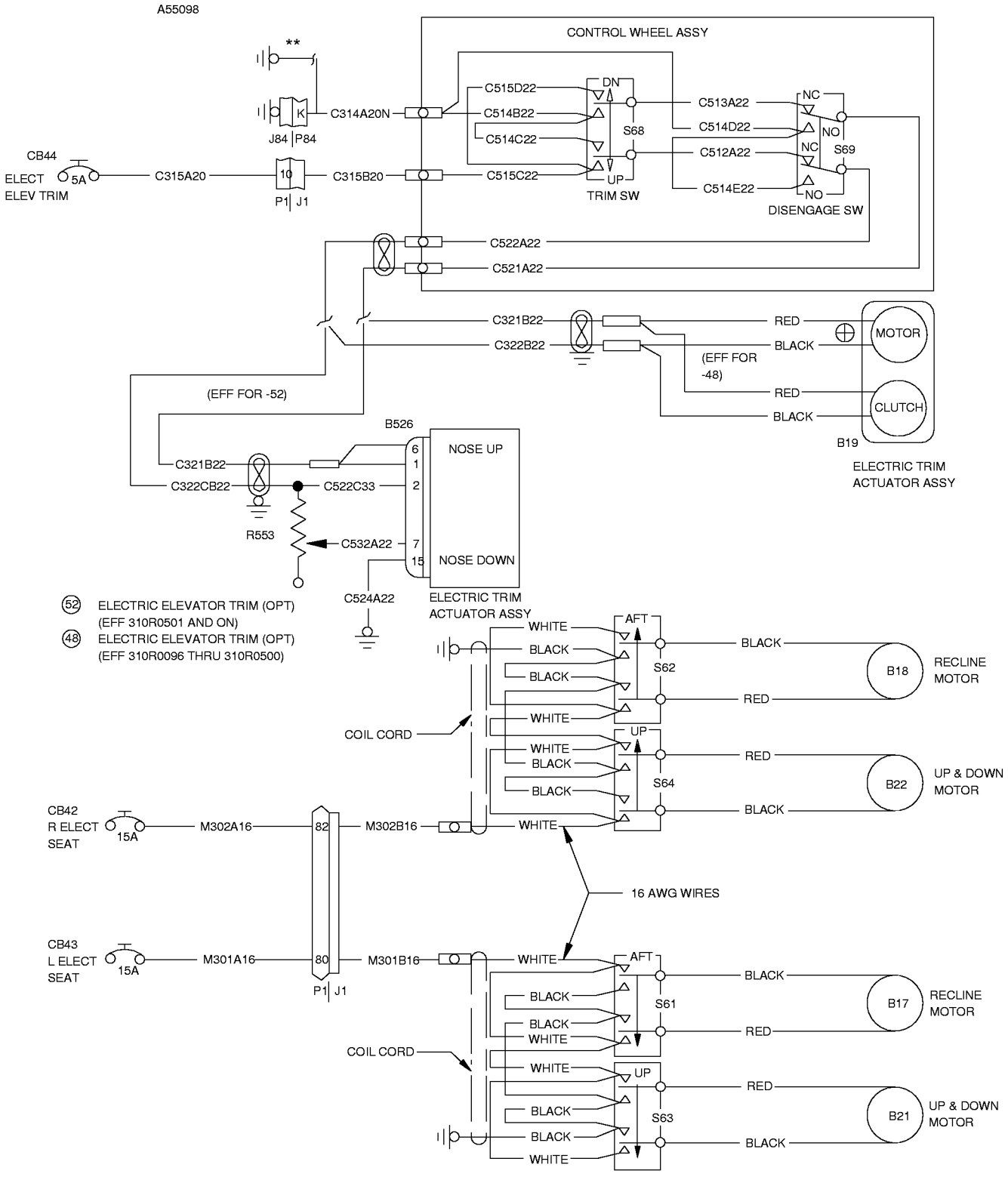

Tachometer Generator, Engine Instrument, Turn and Bank (LH and RH), and Outside Air Temperature
Figure 1 (Sheet 2)

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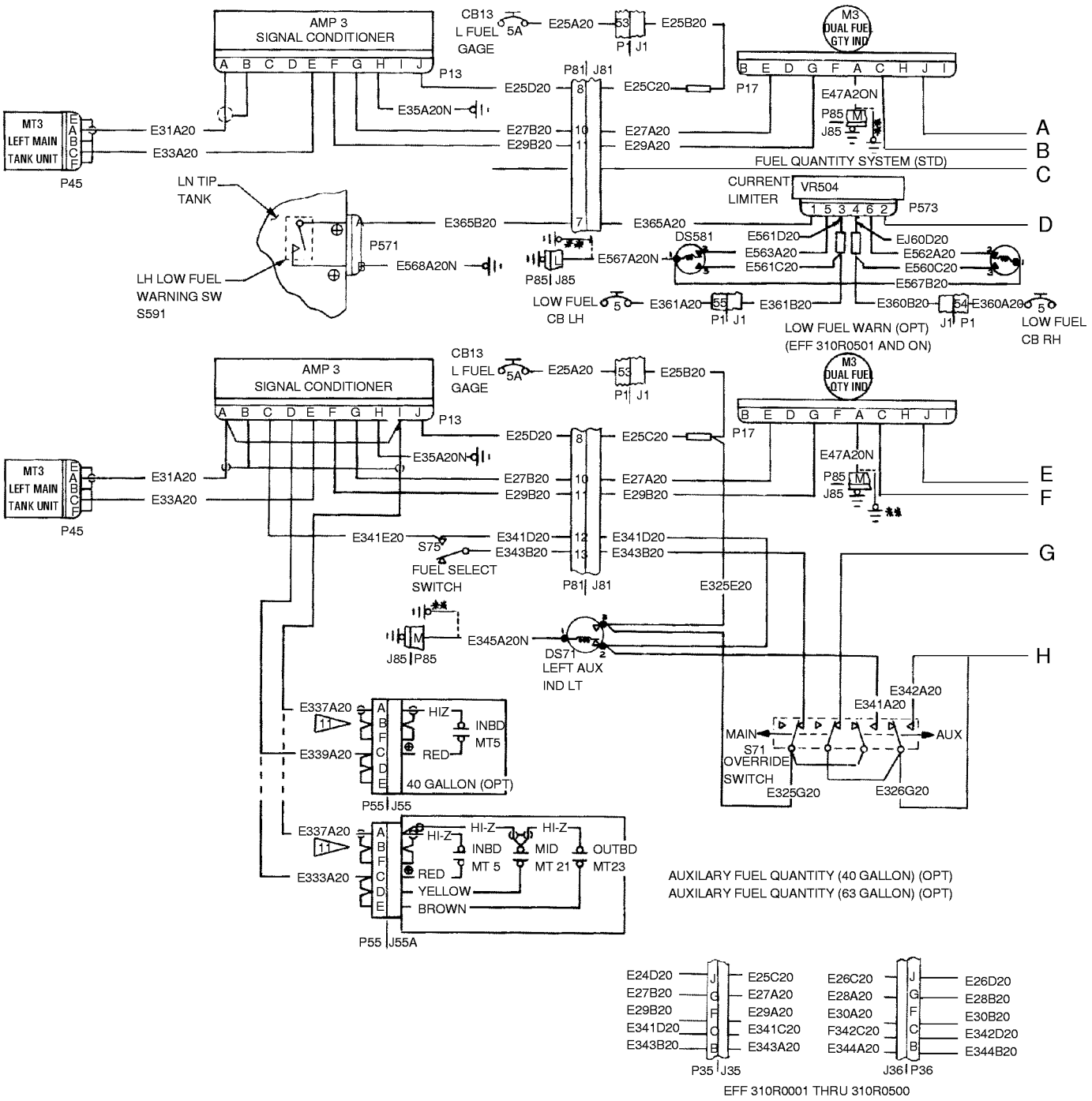

Fuel Quantity System (Capacitance)
Figure 2 (Sheet 1)

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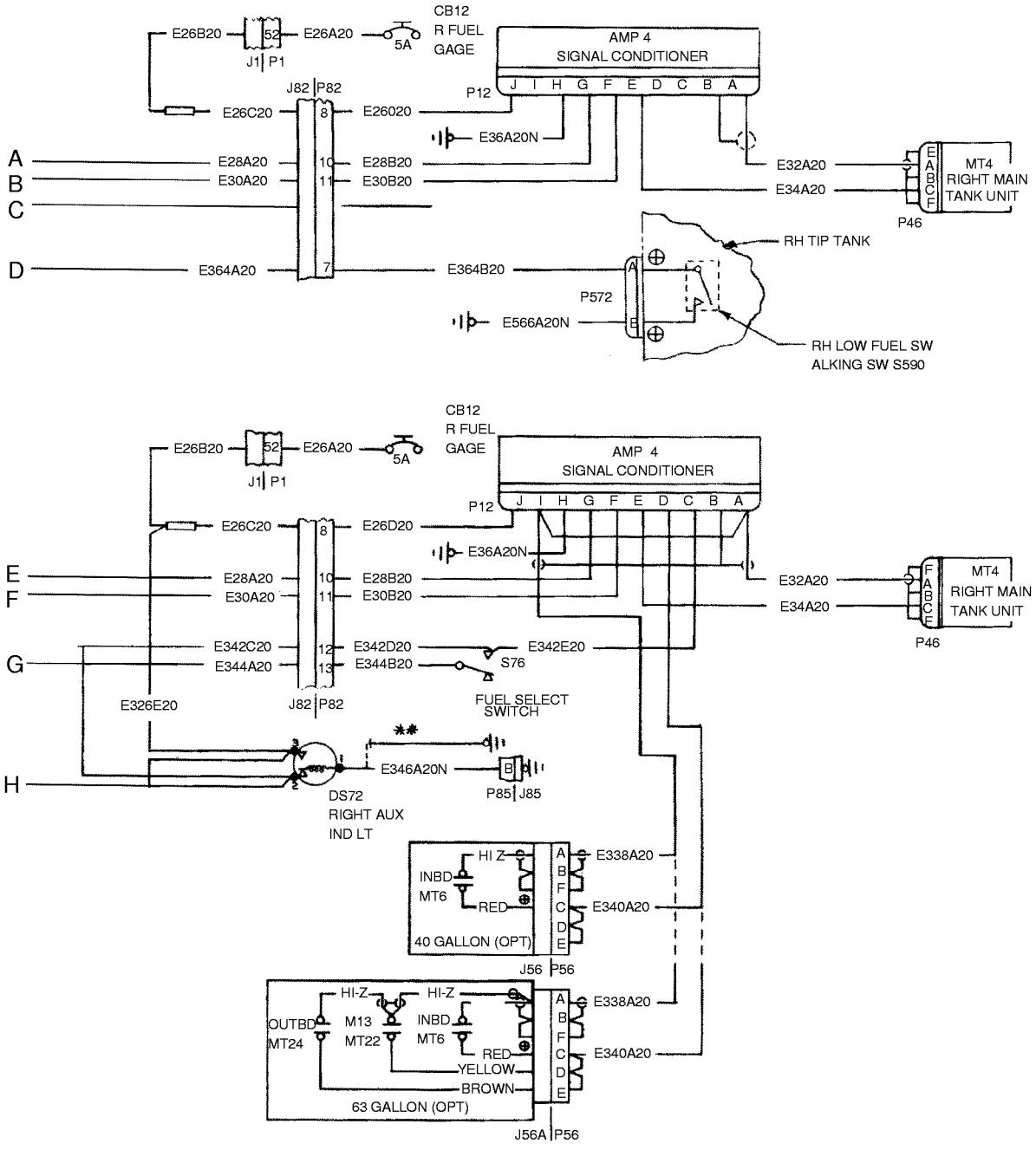

** EFF 310R0001 THRU 310R0500

Fuel Quantity System (Capacitance)
Figure 2 (Sheet 2)

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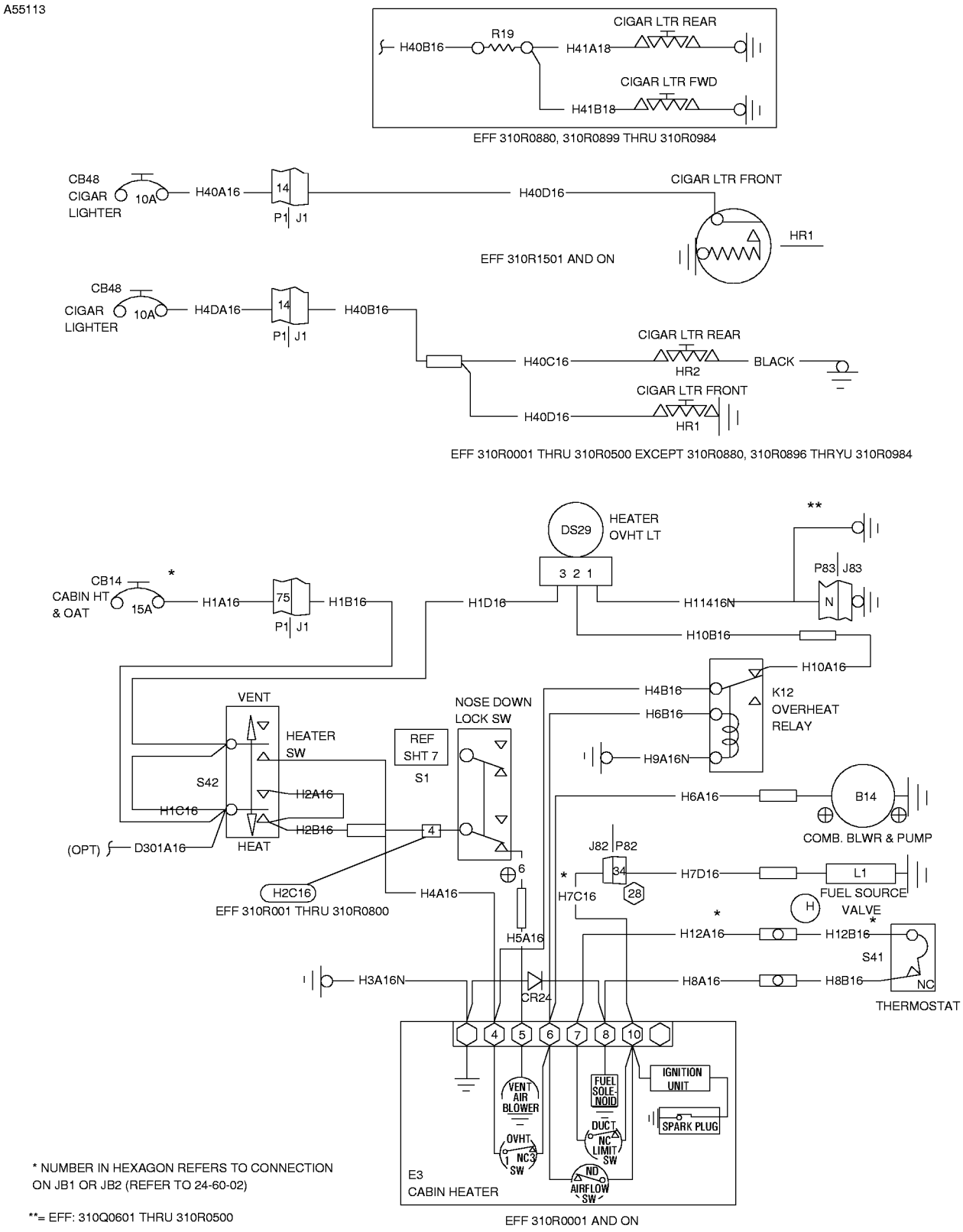

Stall Warning Horn
Figure 3 (Sheet 1)

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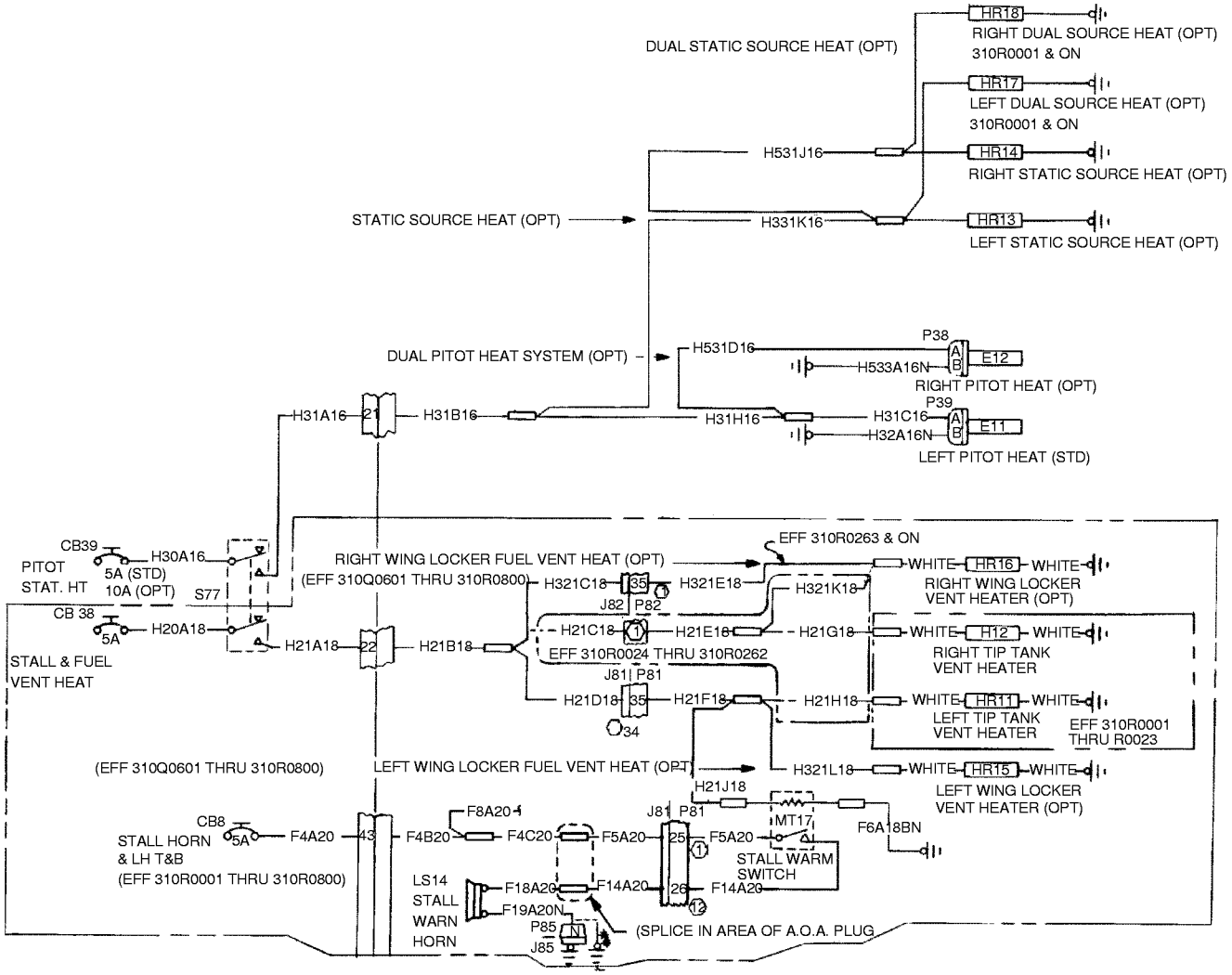

Stall Warning Horn
Figure 3 (Sheet 2)

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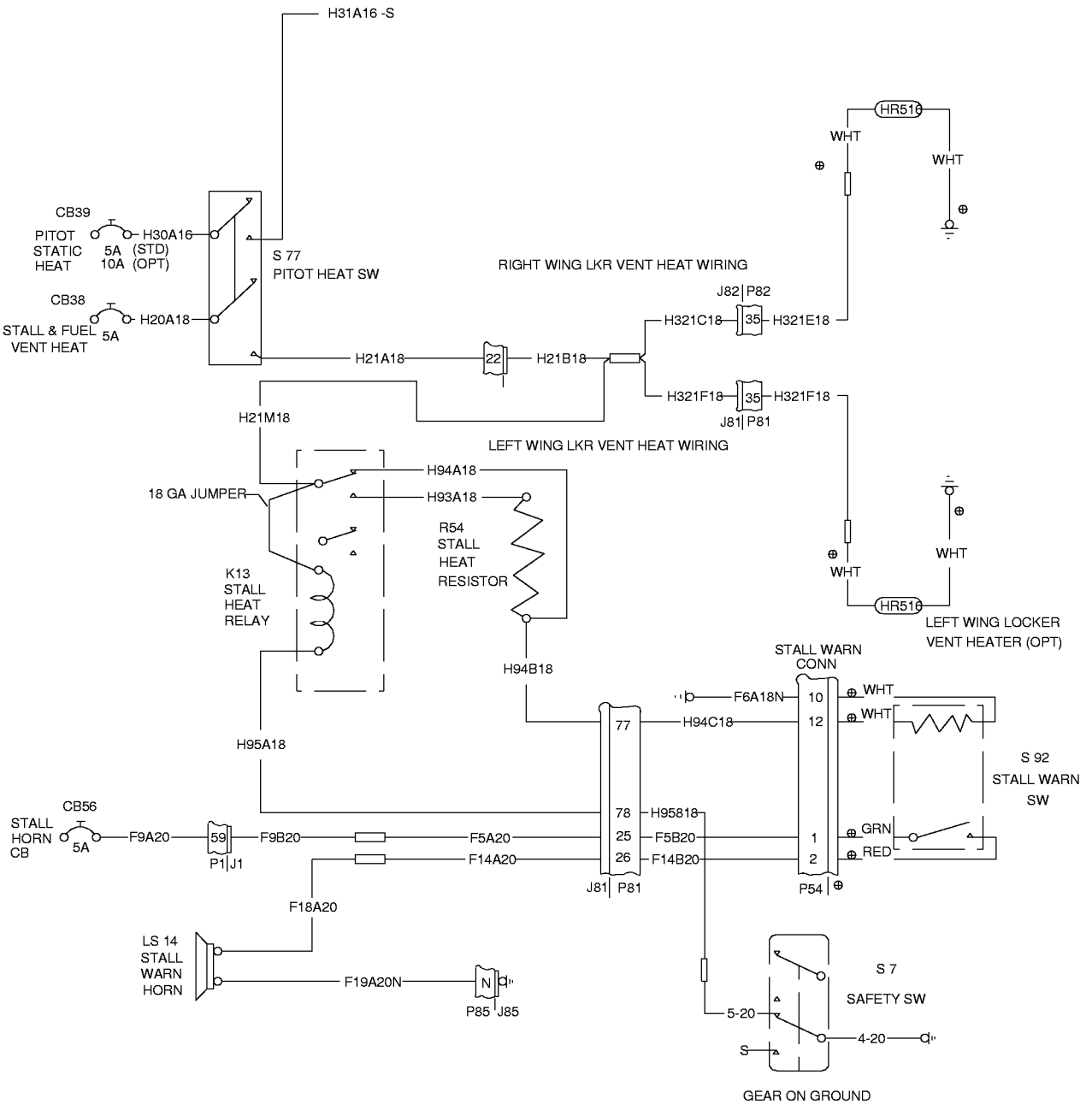

Stall Warning Horn
Figure 3 (Sheet 3)

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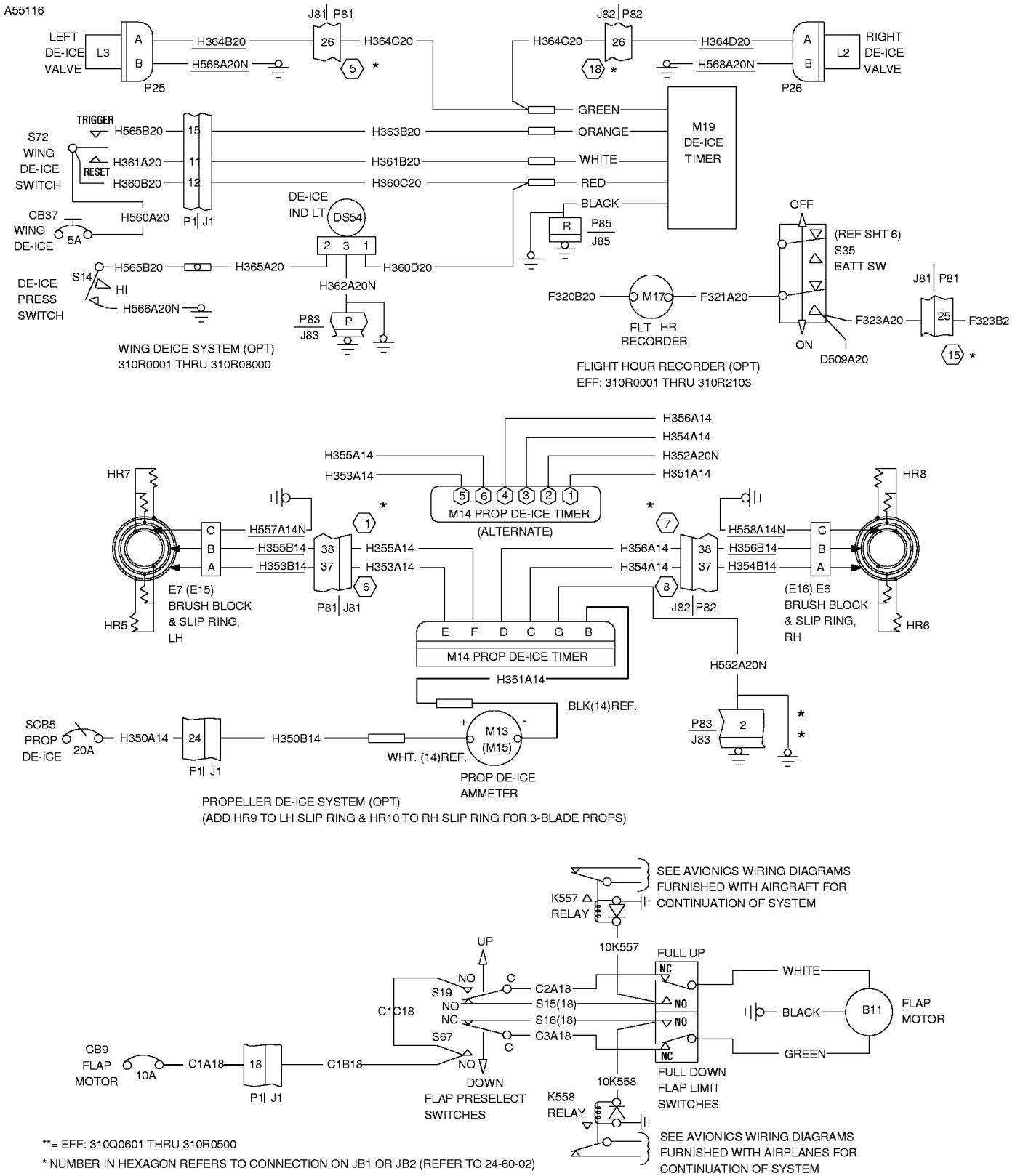

Flight Hour Recorder
Figure 4 (Sheet 1)

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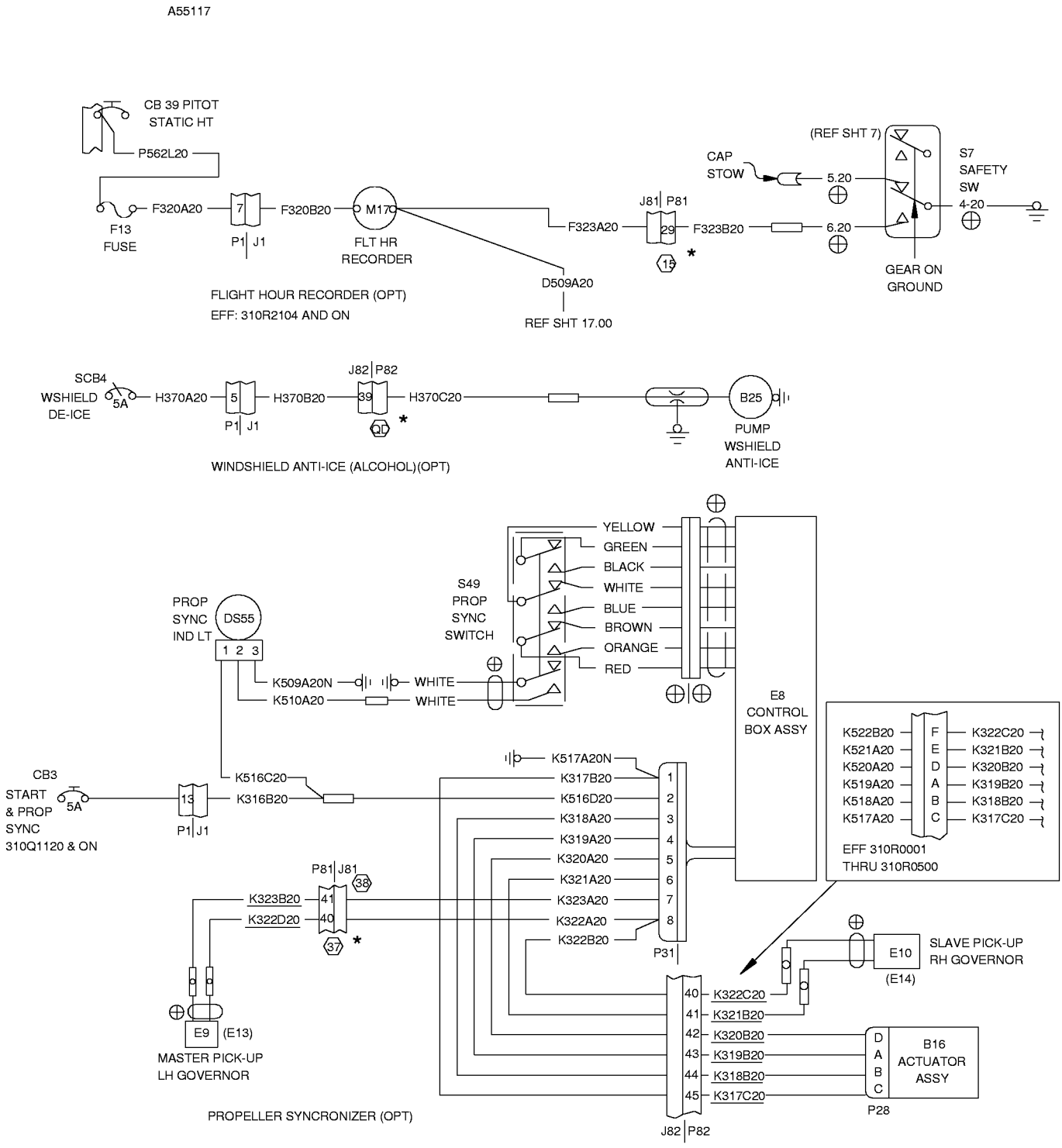

Flight Hour Recorder
Figure 4 (Sheet 2)

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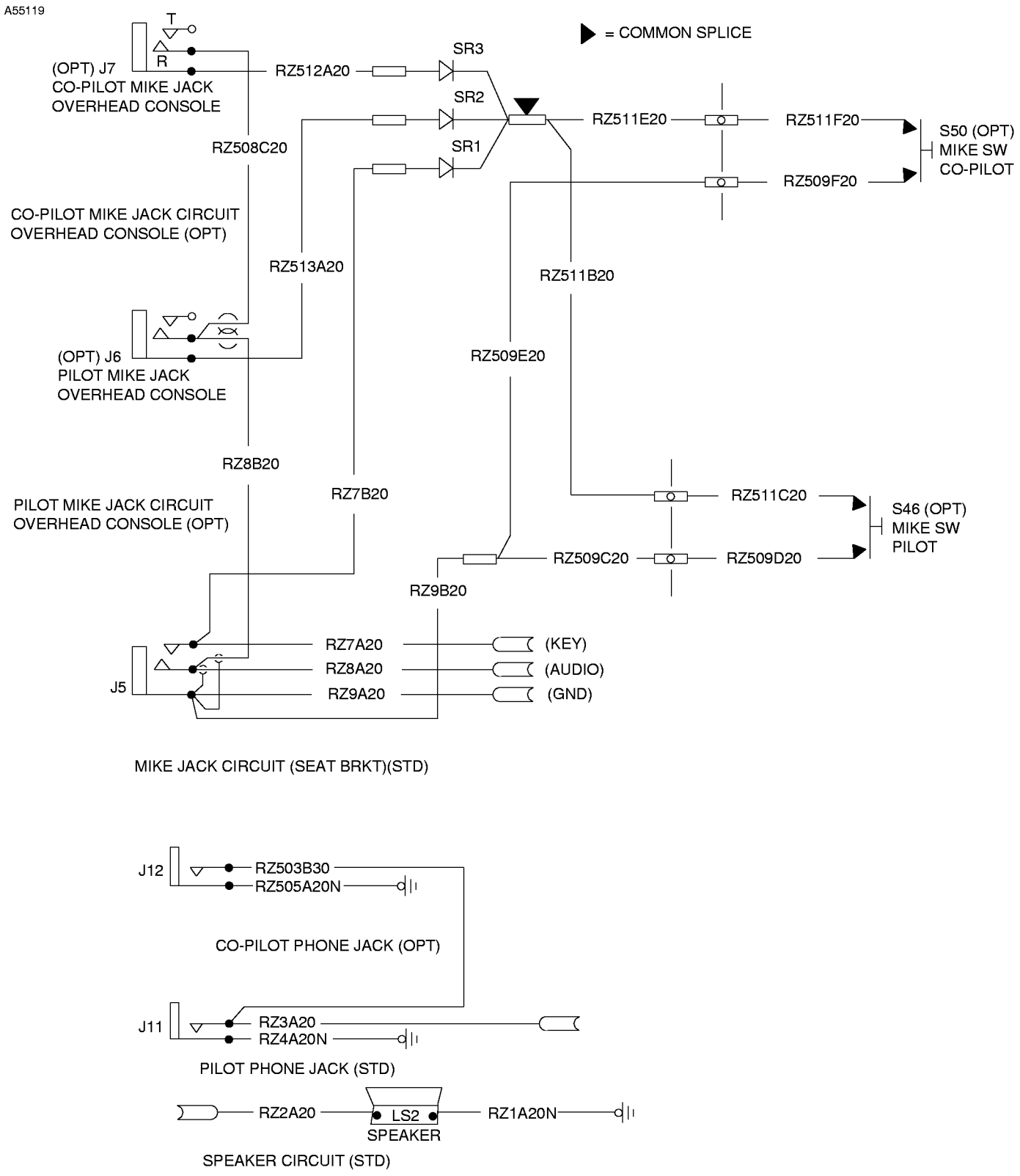

Angle of Attack
Figure 5 (Sheet 1)

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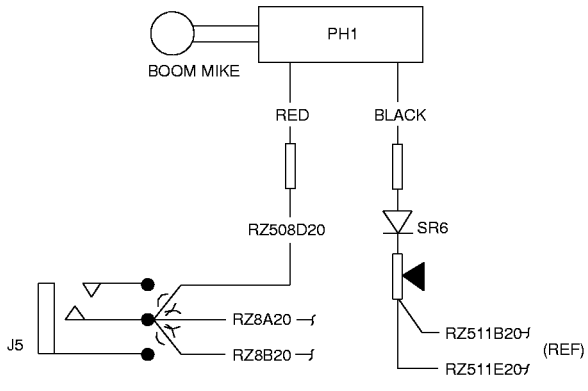
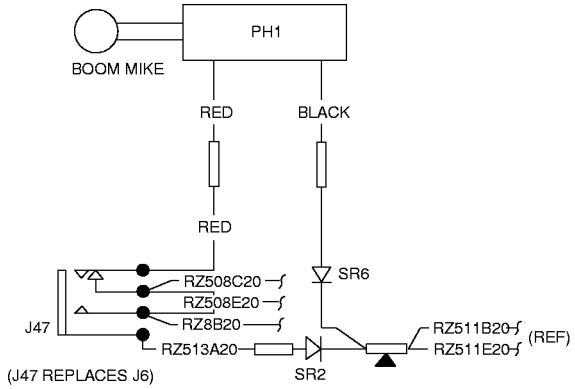
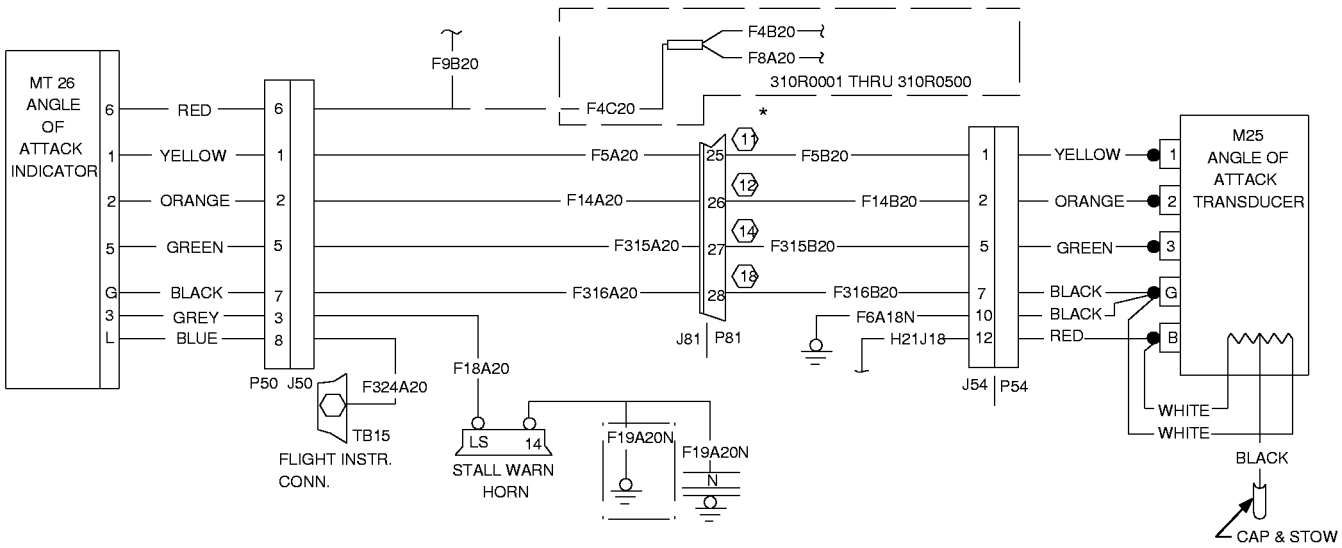


(310R0001 THRU 310R0800)
BOOM MIKE WITHOUT OXYGEN



(310R0001 THRU 310R0800)
BOOM MIKE WITH OXYGEN



ANGLE OF ATTACK INDICATOR & STALL WARNING

* NUMBER IN HEXAGON REFERS TO CONNECTION ON JB1 OR JB2 (REFER TO 24-60-02)

Angle of Attack
Figure 5 (Sheet 2)

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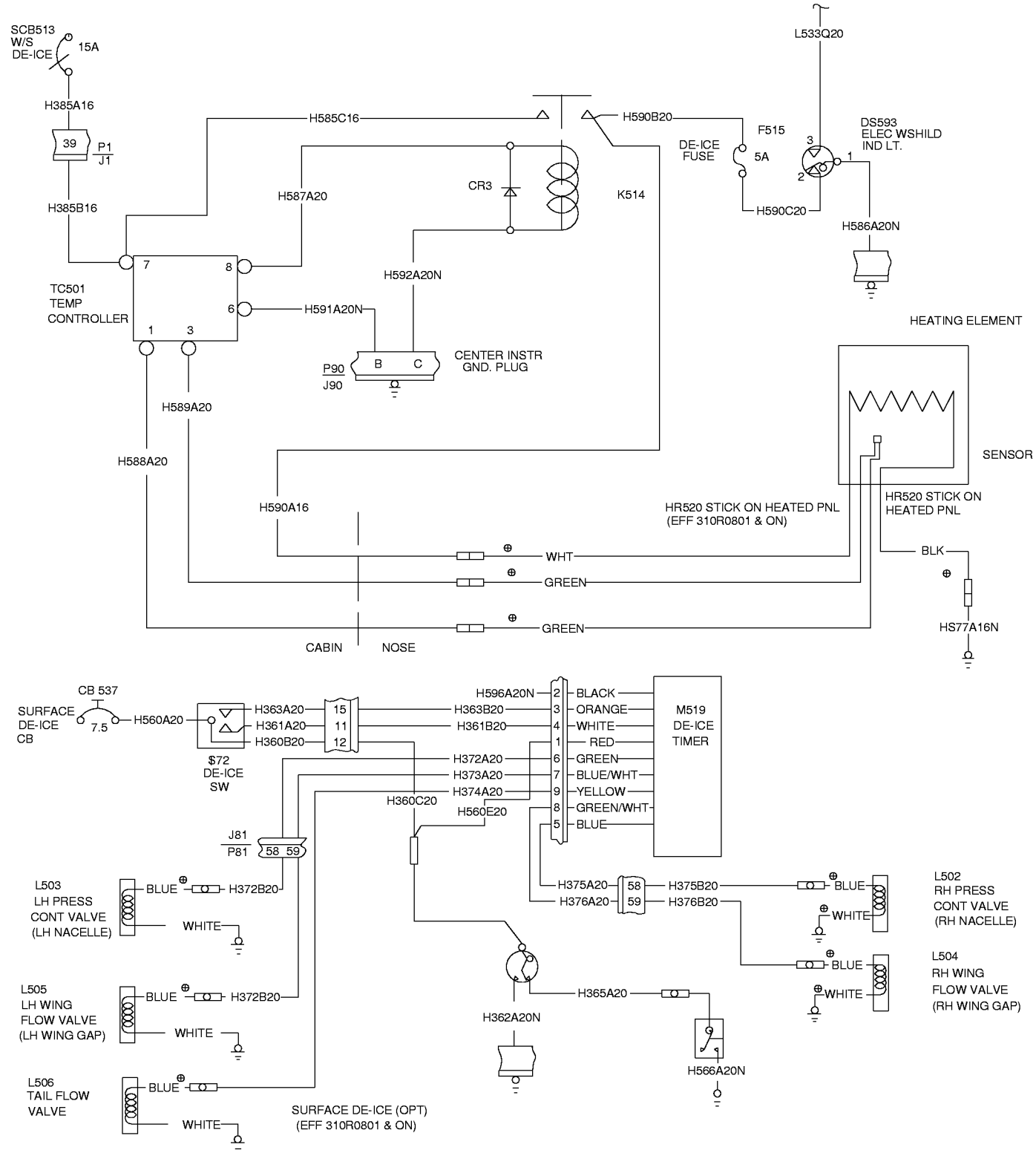

Electric Clock
Figure 6 (Sheet 1)

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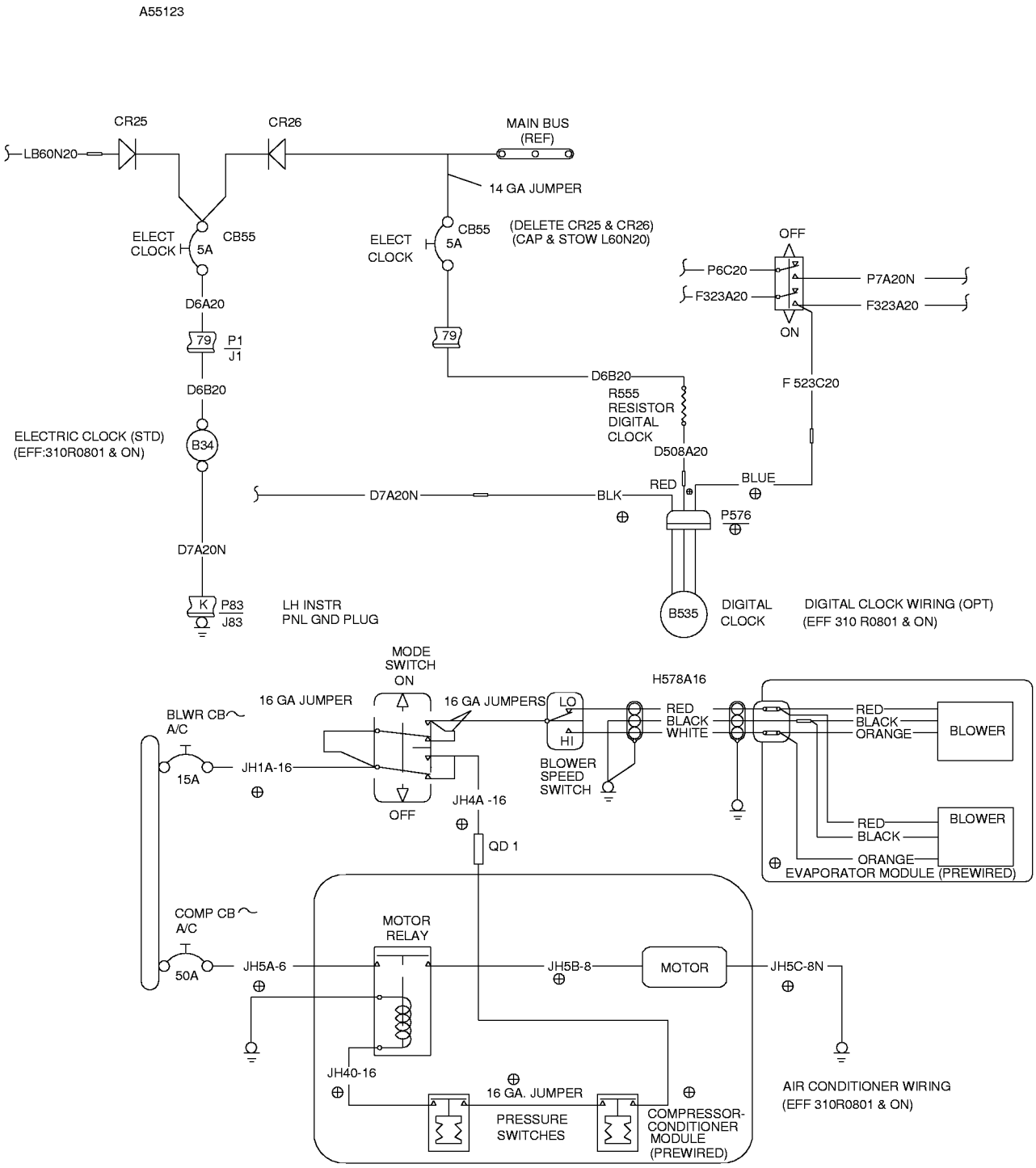

Electric Clock
Figure 6 (Sheet 2)

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FUEL, OIL, AND PROPELLER SYSTEMS DIAGRAMS - DESCRIPTION AND OPERATION

1. Wiring Diagrams

A. This section contains wiring diagrams relating to fuel, oil, and propeller systems.
   (1) Fuel Pumps (Std. and Opt.)
   (2) Fuel Pumps (Opt.)
   (3) Prop Synchronizer
   (4) Propeller Synchrophaser

B. Reference Designator Code
   (1) Reference designators are used in these diagrams to more quickly identify and locate a part or assembly used in any electrical system. A part is identified by reference number on a diagram. The reference number called out in wiring reference designators identifies the description and diagram figure number.

   NOTE: Part Numbers referred to on Wiring Diagrams are for reference only. When ordering spare or replacement parts, refer to applicable Parts Catalog.

   (2) The wiring diagrams contained in this section clearly show the complete wiring on each item of electrical components listed in each Wiring Diagram. The first portion of wire number indicates the Airplane System, the center portion indicates Wire Number, and the last portion indicates Wire Gauge Size. Each wiring diagram contains part number and nomenclature for each component.

Reference	Figure	Description
B1	1	Fuel Pump Tip Tank
B2	1	Fuel Pump Tip Tank
B5	1	Fuel Pump Wing Locker
B6	1	Fuel Pump Wing Locker
B11	3	Motor
B16	3	Actuator Assembly
B23	1	XFER Pump
B24	1	XFER Pump
B25	3	Pump W/S Anti-Ice
CB1	1	CB R Aux Pump
CB2	1	CB L Aux Pump
CB9	3	CB Flap
CB35	3	CB Prop Synch
CB37	3	CB Wing Deice
CB41	1	CB Wing L Fuel
DS44	1	Light
DS45	1	Light
DS54	3	Light
DS55	3	Light
E6	3	Brush Assy

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Reference	Figure	Description
E7	3	Brush Assy
E8	3	Control Box A
E9	3	Governor
E10	3	Governor
E13	3	Governor
E14	3	Governor
E15	3	Brush Assy
E16	3	Brush Assy
F13	3	Fuse
HR5	3	Deice Boot
HR6	3	Deice Boot
HR7	3	Deice Boot
HR8	3	Deice Boot
HR9	3	Deice Boot
HR10	3	Deice Boot
J29	3	Recpt
L2	3	Valve
L3	3	Valve
L7	1	Relay
L8	1	Relay
M14	3	Timer Assy
M15	3	Ammeter - 3 Blade
M17	3	Recorder
M19	3	EM211-2
P25	3	Plug
P26	3	Plug
P31	3	Plug
R3	1	Resistor
R4	1	Resistor
R5	1	Resistor
R6	1	Resistor
S11	1	Switch
S12	1	Switch
S13	1	Switch
S14	3	Switch

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Reference	Figure	Description
S15	3	Switch
S16	3	Switch
S20	1	Switch
S21	1	Switch
S39	1	Switch
S40	1	Switch
S49	3	Switch
S51	1	Switch
S52	1	Switch
S65	1	Switch
S66	1	Switch
S72	3	Switch
SCB4	3	SCB W/S Anti-Ice
SCB5	3	SCB Prop Deice
WC6	1	Noise Filter
WC7	1	Noise Filter

C. Diagrams

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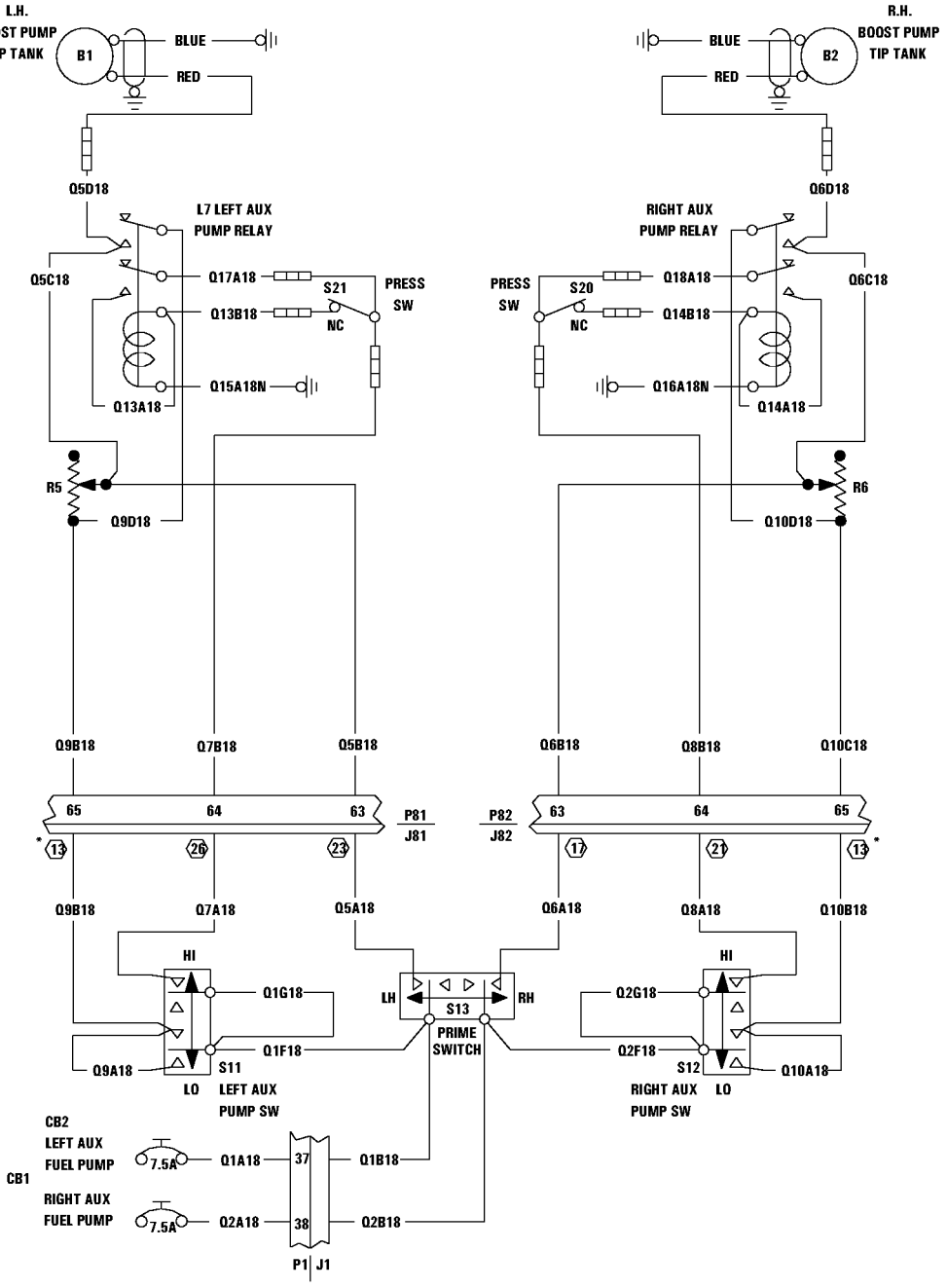

*NUMBER IN HEXAGON REFERS TO CONNECTION ON JB1 OR JB2 (REFERENCE 24-60-02)

AIRPLANES THAT HAVE NOT COMPLIED WITH MEB88-3

Fuel Pumps (Std. and Opt.)
Figure 1 (Sheet 1)

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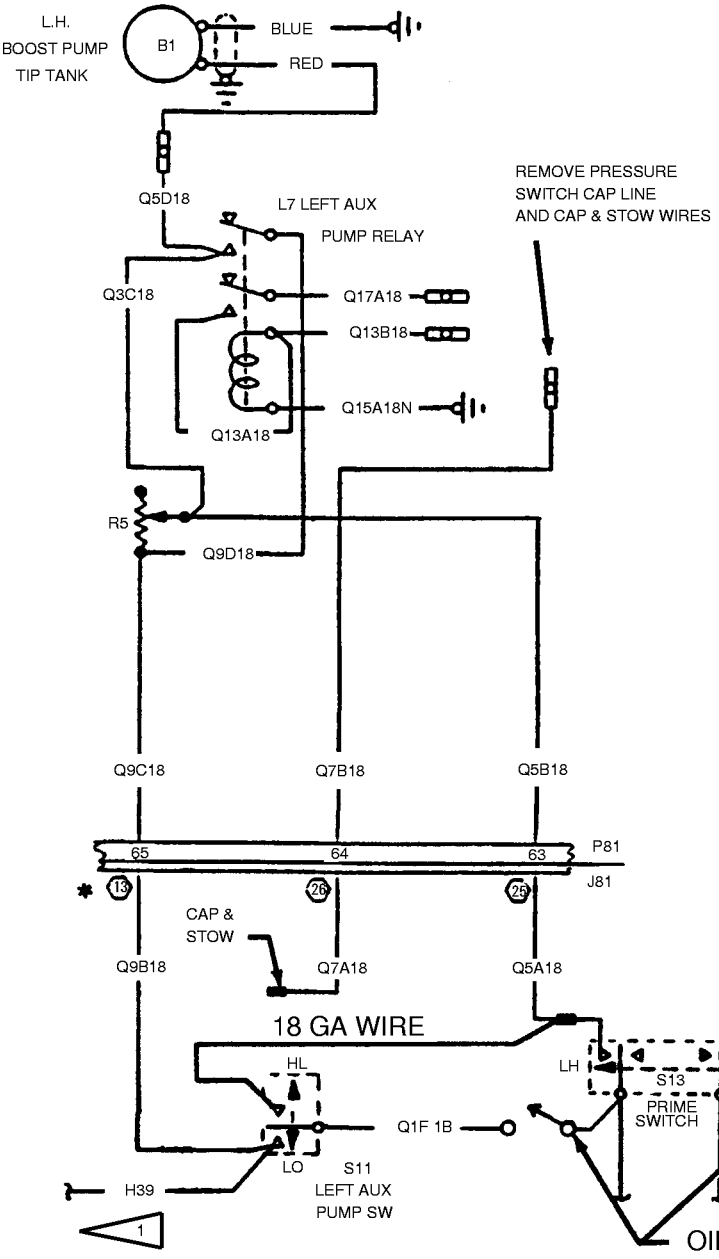
A56475

AIRPLANES THAT HAVE COMPLIED WITH MEB88-3



1 TO HEATER FUEL PUMP RELAY RIGHT SIDE ONLY, RELAY OPERATES THROUGH R5 ON HI POSITION.

TYPICAL 310I AND ON (WITH OIL PRESS SWITCH)
TYPICAL 320B AND ON (DOES NOT HAVE OIL PRESS SWITCH)

LH SHOWN, RH OPPOSITE

Fuel Pumps (Std. and Opt.)
Figure 1 (Sheet 2)

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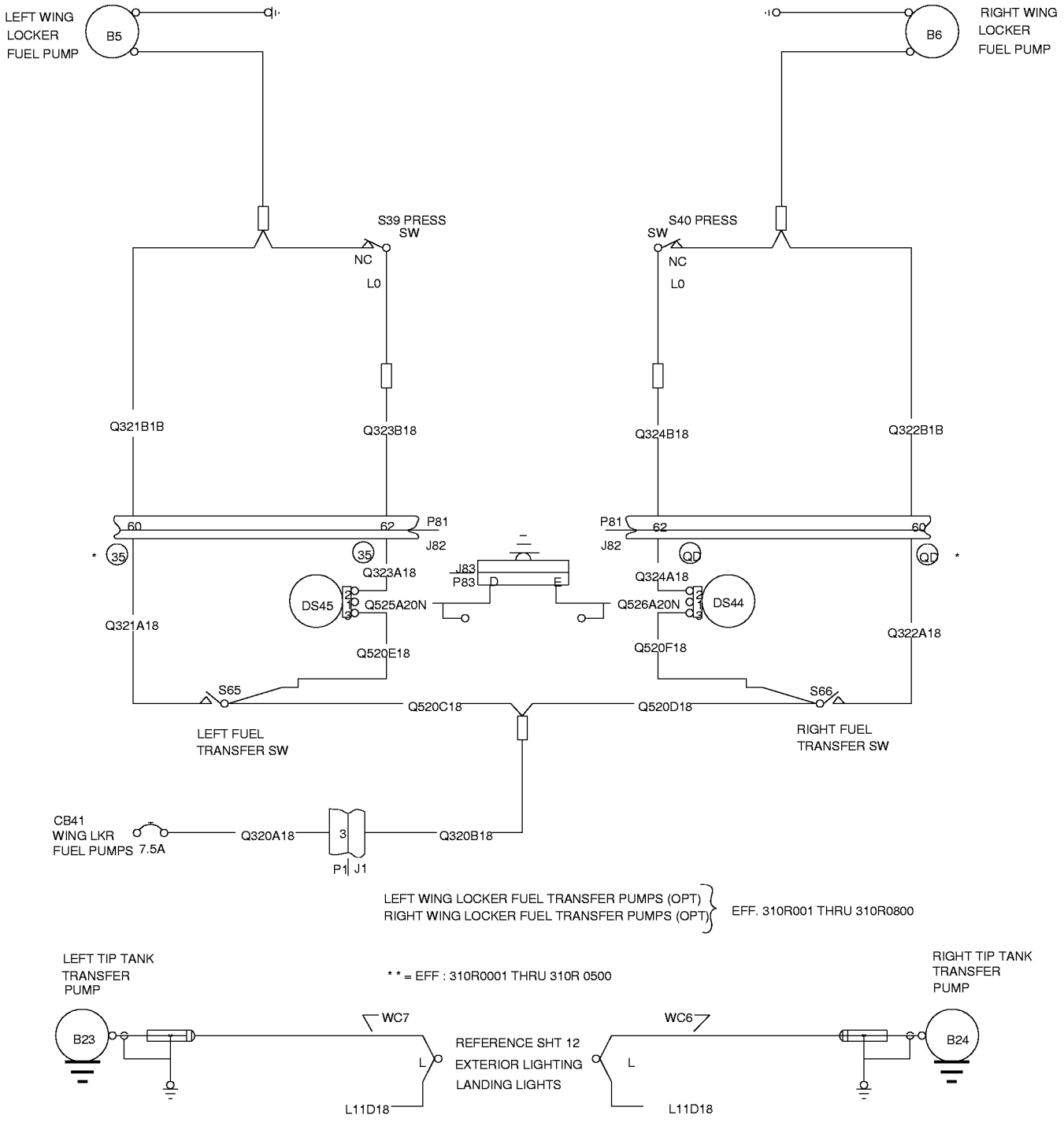
A55100



Fuel Pumps (Std. and Opt.)
Figure 1 (Sheet 3)

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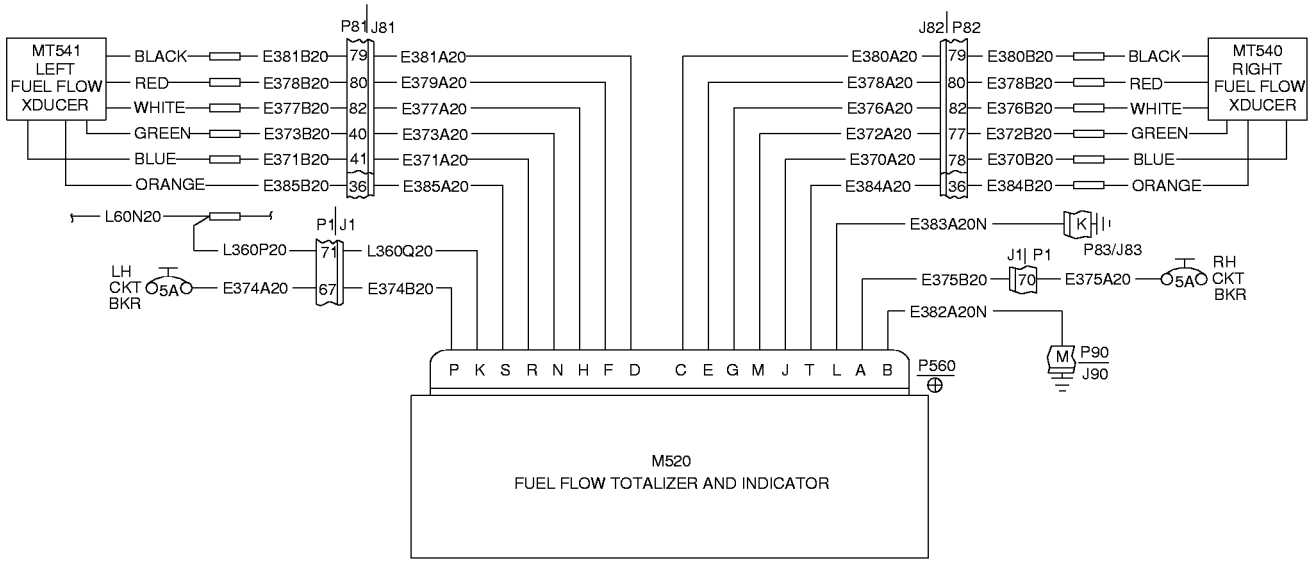
A55101



FUEL FLOW SYSTEM WIRING
EFF: 310R1201 AND ON

Fuel Pumps (Opt.)
Figure 2 (Sheet 1)

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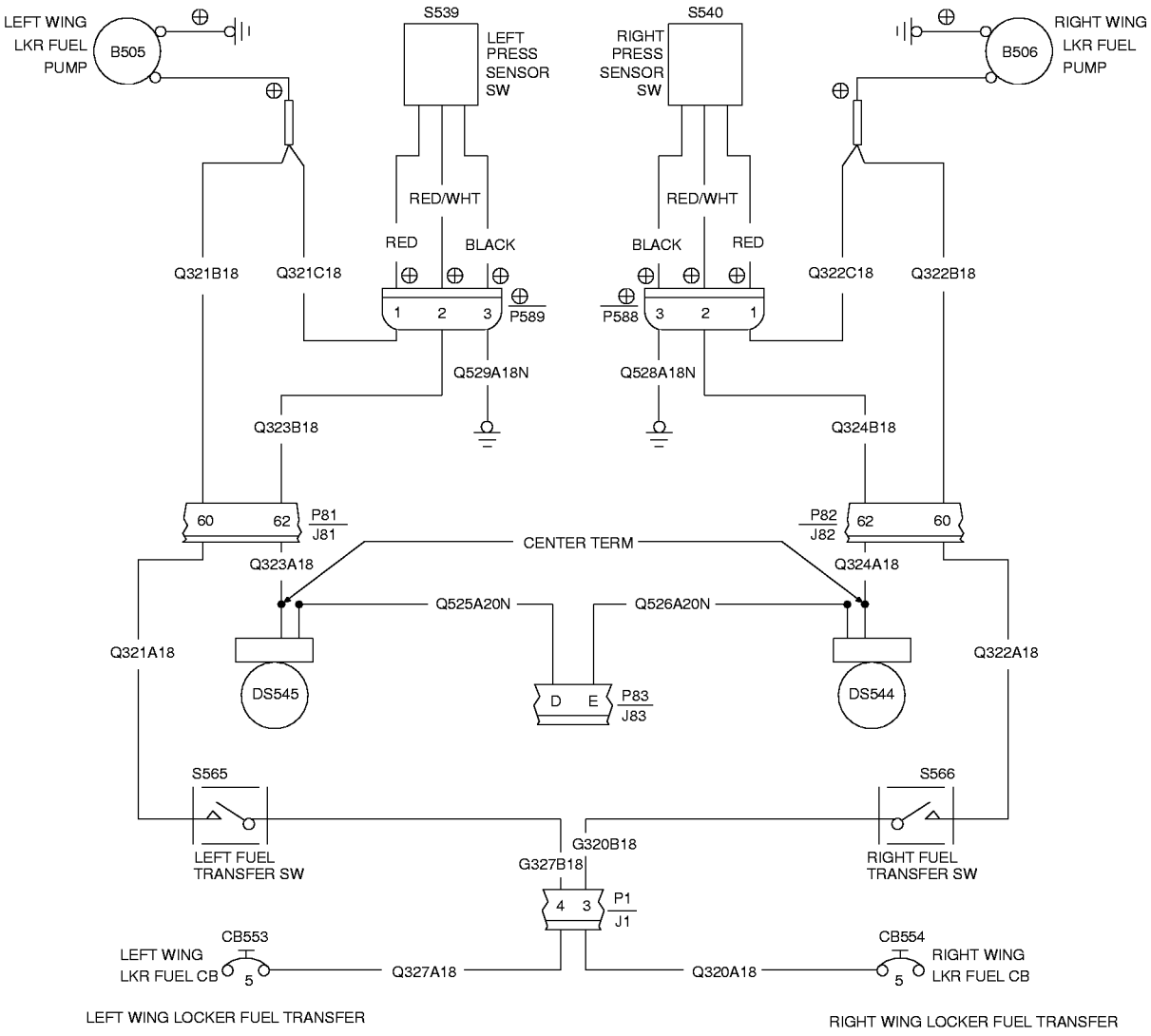
A55102



Fuel Pumps (Opt.)
Figure 2 (Sheet 2)

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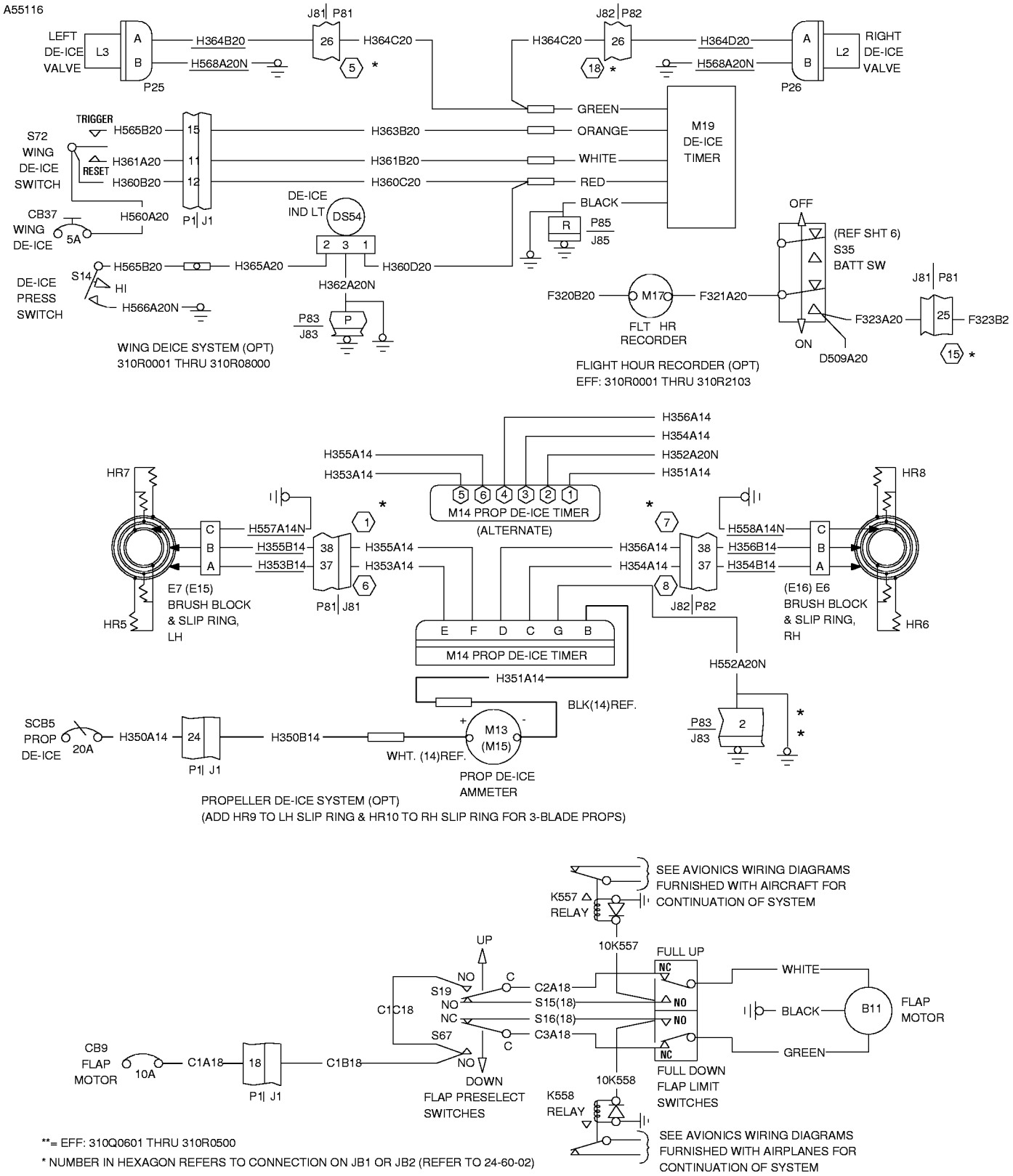

Propeller Synchronizer
Figure 3 (Sheet 1)

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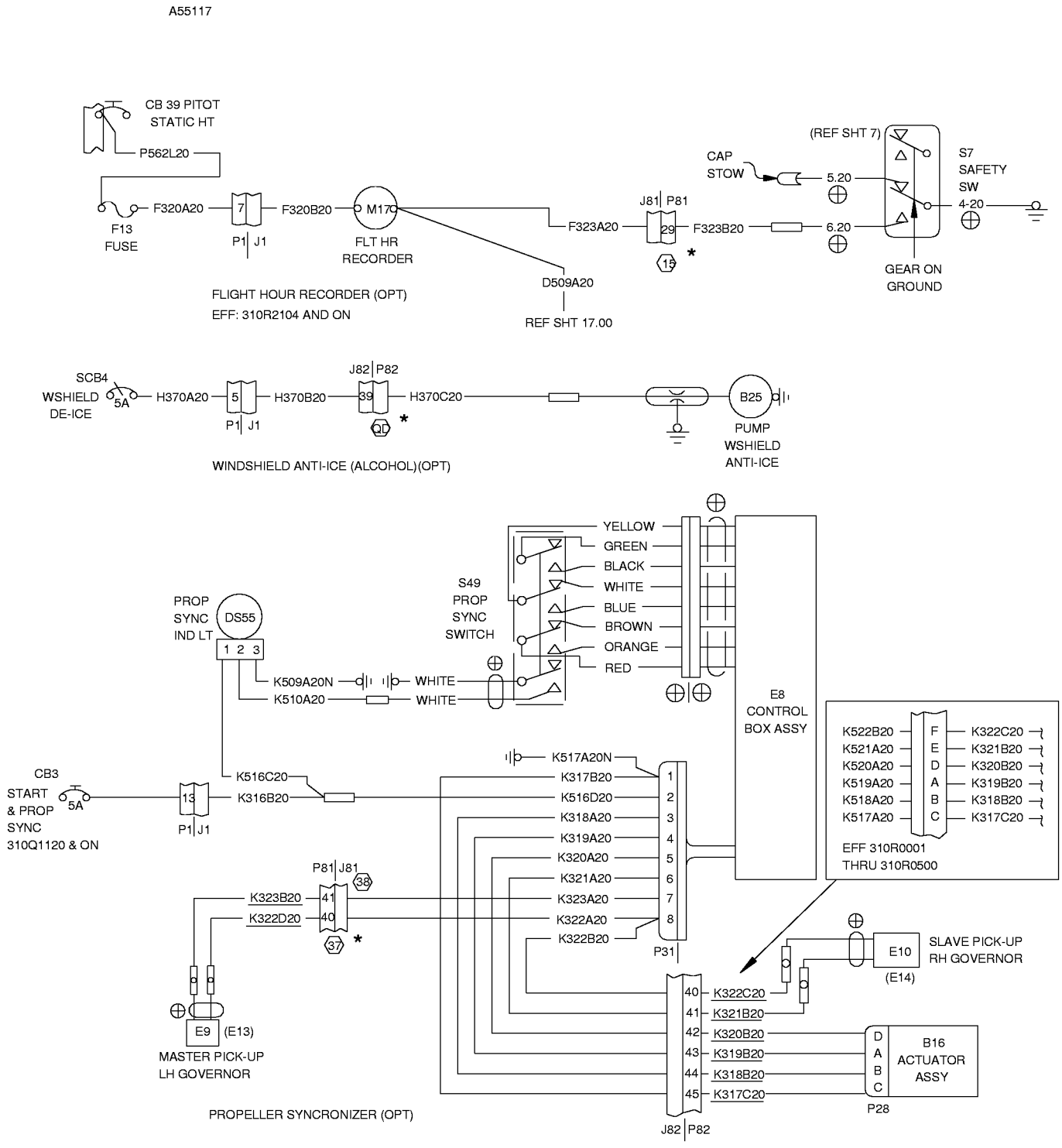

Propeller Synchronizer
Figure 3 (Sheet 2)

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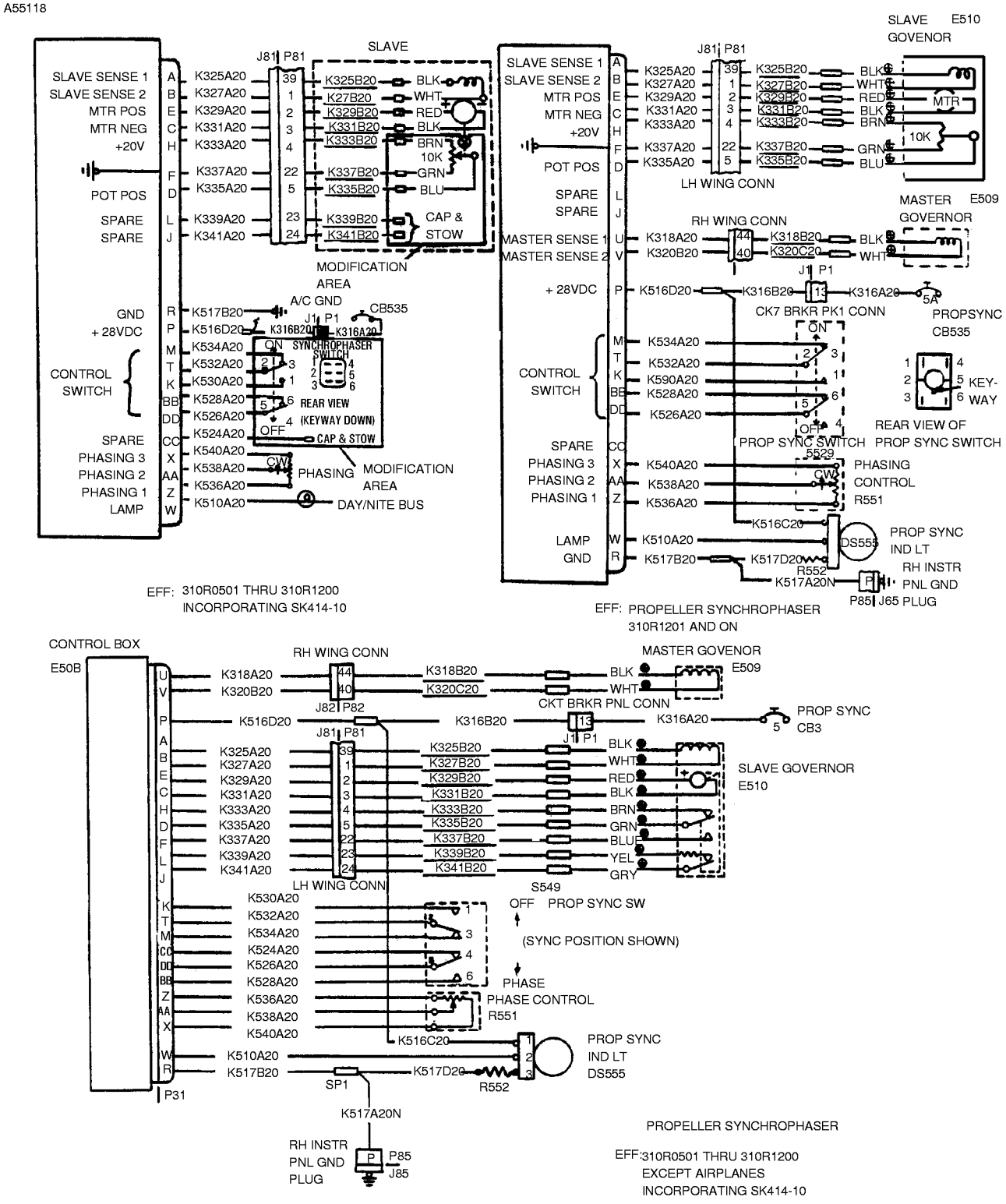

Propeller Synchrophaser
Figure 4 (Sheet 1)

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FLIGHT CONTROLS AND LANDING GEAR DIAGRAMS - DESCRIPTION AND OPERATION

1. Wiring Diagrams

A. This section contains wiring diagrams for flight controls and landing gear.
   (1) Landing Gear
   (2) Electric Trim
   (3) Flap Control
   (4) Electric Elevator Trim

B. Reference Designator Code
   (1) Reference designators are used in these diagrams to more quickly identify and locate a part or assembly used in any electrical system. A part is identified by reference number on a diagram. The reference number called out in wiring reference designators identifies the description and diagram figure number.

   NOTE: Part Numbers referred to on Wiring Diagrams are for reference only. When ordering spare or replacement parts, refer to applicable Parts Catalog.

   (2) The wiring diagrams contained in this section clearly show the complete wiring on each item of electrical components listed in each Wiring Diagram. The first portion of wire number indicates the Airplane System, the center portion indicates Wire Number, and the last portion indicates Wire Gauge Size. Each wiring diagram contains part number and nomenclature for each component.

Reference	Figure	Description
B10	1	Motor
B11	3	Motor
B16	3	Actuator Assembly
B17	2	Motor
B18	2	Motor
B19	2	Elec Trim Act
B21	2	Motor
B22	2	Motor
B25	3	Pump W/S Anti-Ice
CB6	1	CB Gear Motor
CB7	1	CB Gear Warn
CB8	2	CB Stall Horn
CB9	3	CB Flap
CB10	2	CB R Eng Gage
CB11	2	CB L Eng Gage
CB35	3	CB Prop Synch
CB37	3	CB Wing Deice
CB40	2	CB RH T and B
CB42	2	CB Elec Seat
CB43	2	CB Elec Seat

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Reference	Figure	Description
CB44	2	CB Elec Elev Trim
DS1	1	Light
DS2	1	Light
DS3	1	Light
DS4	1	Light
DS43	2	Light
DS54	3	Light
DS55	3	Light
E6	3	Brush Assy
E7	3	Brush Assy
E8	3	Control Box A
E9	3	Governor
E10	3	Governor
E13	3	Governor
E14	3	Governor
E15	3	Brush Assy
E16	3	Brush Assy
F12	1	Flasher
F13	3	Fuse
HR5	3	Deice Boot
HR6	3	Deice Boot
HR7	3	Deice Boot
HR8	3	Deice Boot
HR9	3	Deice Boot
HR10	3	Deice Boot
J29	3	Recpt
K1	1	Relay
L2	3	Valve
L3	3	Valve
LS13	1	Gear Horn
M1	2	L Engine Gage
M2	2	R Engine Gage
M5	2	Tach Gen
M7	2	Ind OAT
M8	2	Indicator
M9	2	Indicator

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Reference	Figure	Description
M14	3	Timer Assy
M15	3	Ammeter - 3 Blade
M16	2	Tach Gen
M17	3	Recorder
M19	3	EM211-2
MT1	2	Tach Gen
MT2	2	Tach Gen
MT9	2	L Oil Temp
MT10	2	R Oil Temp
MT11	2	LH CYL Temp
MT12	2	RH CYL Temp
MT14	2	OAT Bulb
P3	2	Plug
P4	2	Plug
P5	2	Plug
P6	2	Plug
P7	2	Plug
P8	2	Plug
P9	2	Plug
P10	2	Plug
P14	2	Plug
P18	2	Plug
P25	3	Plug
P26	3	Plug
P31	3	Plug
P43	2	Plug
P44	2	Plug
R26	1	Resistor
R50	1	Resistor
S1	1	Switch
S2	1	Switch
S3	1	Switch
S4	1	Switch
S5	1	Switch
S7	1	Switch
S8	1	Switch

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Reference	Figure	Description
S9	1	Switch
S10	1	Switch
S14	3	Switch
S15	3	Switch
S16	3	Switch
S19	3	Switch
S49	3	Switch
S61	2	Switch
S62	2	Switch
S63	2	Switch
S64	2	Switch
S67	3	Switch
S68	2	Switch
S69	2	Switch
S72	3	Switch
SCB4	3	SCB W/S Anti-Ice
SCB5	3	SCB Prop Deice
SR29	1	Diode

C. Diagrams

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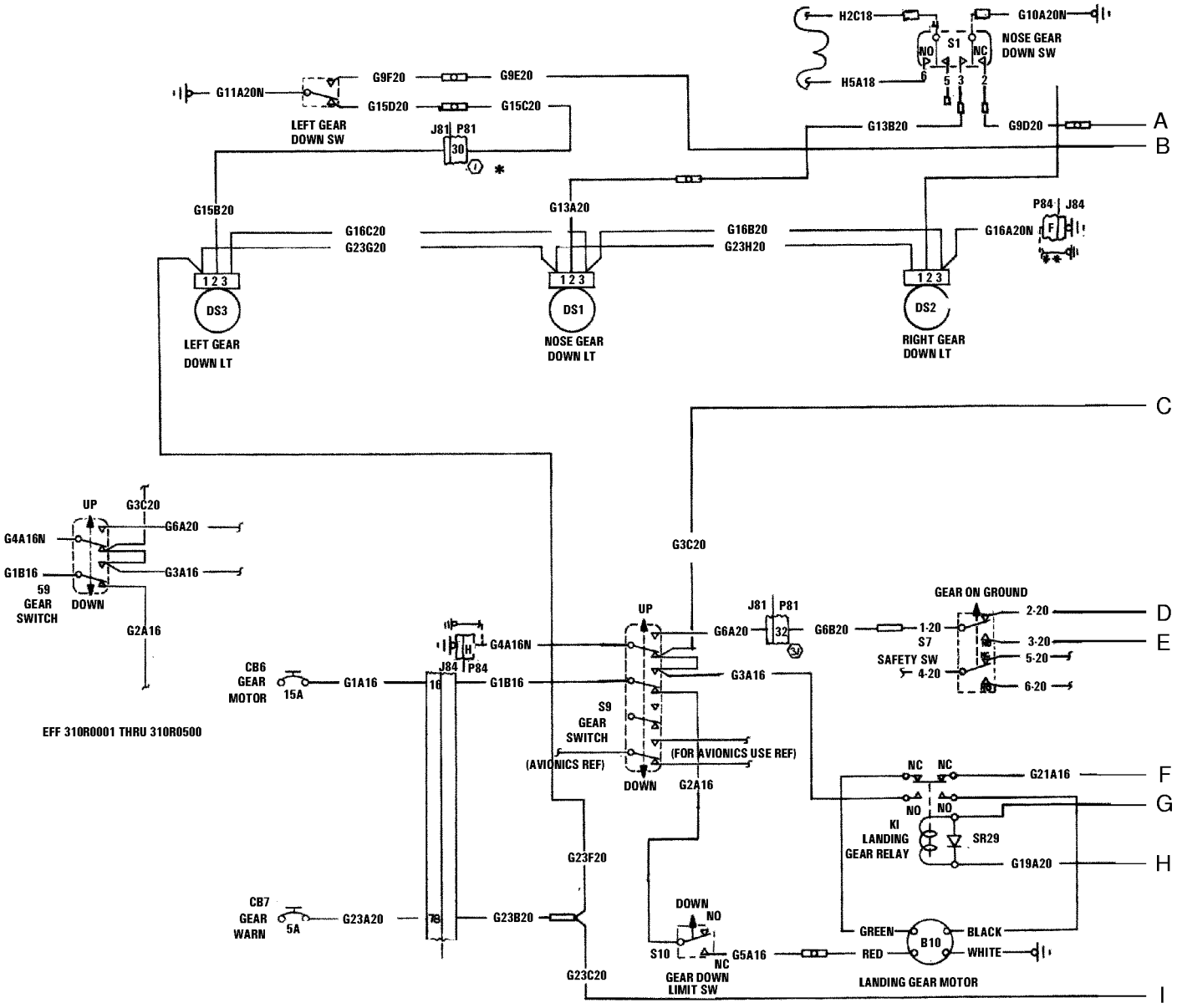
A55095



Landing Gear
Figure 1 (Sheet 1)

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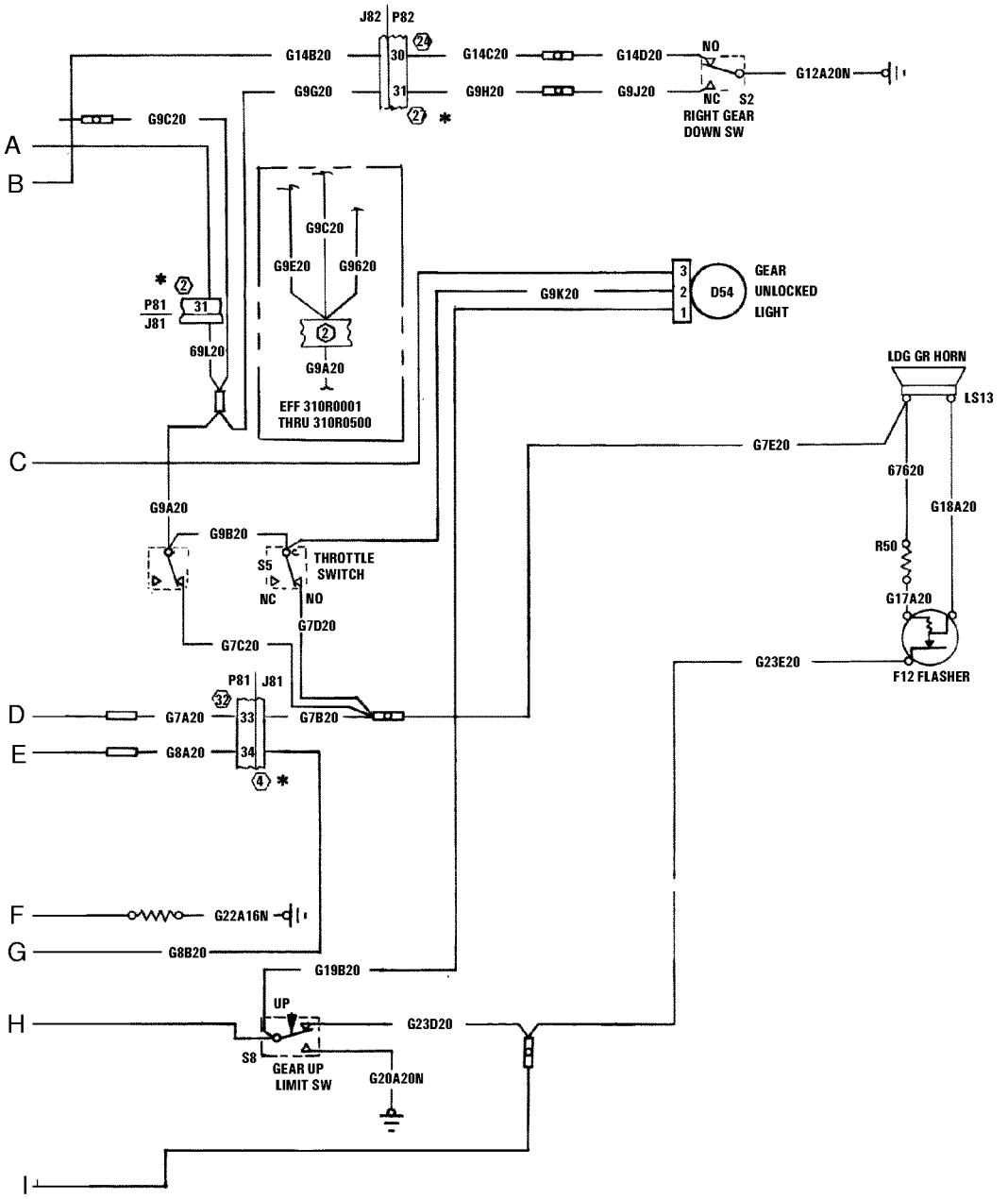

Landing Gear
Figure 1 (Sheet 2)

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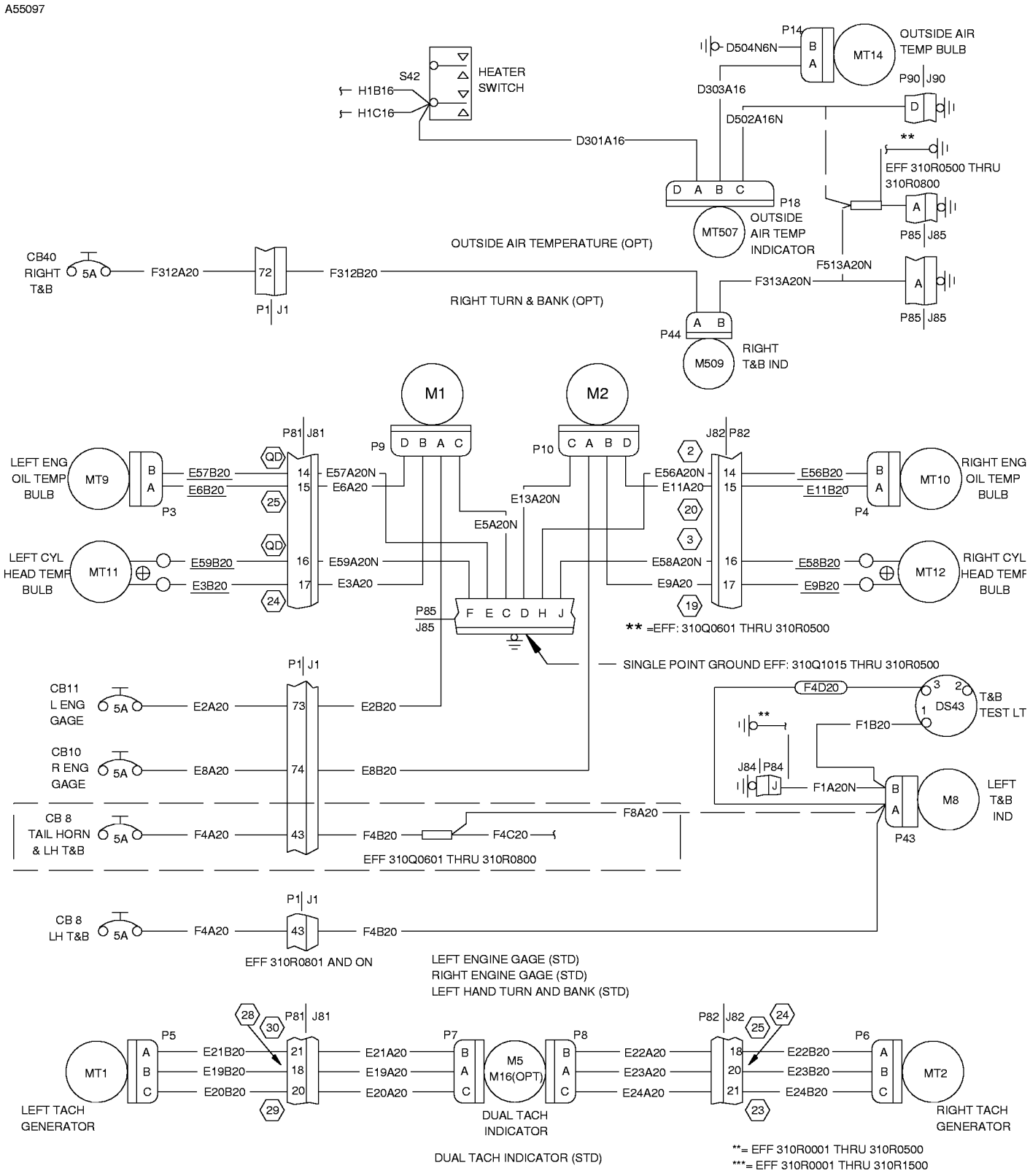

Electric Trim
Figure 2 (Sheet 1)

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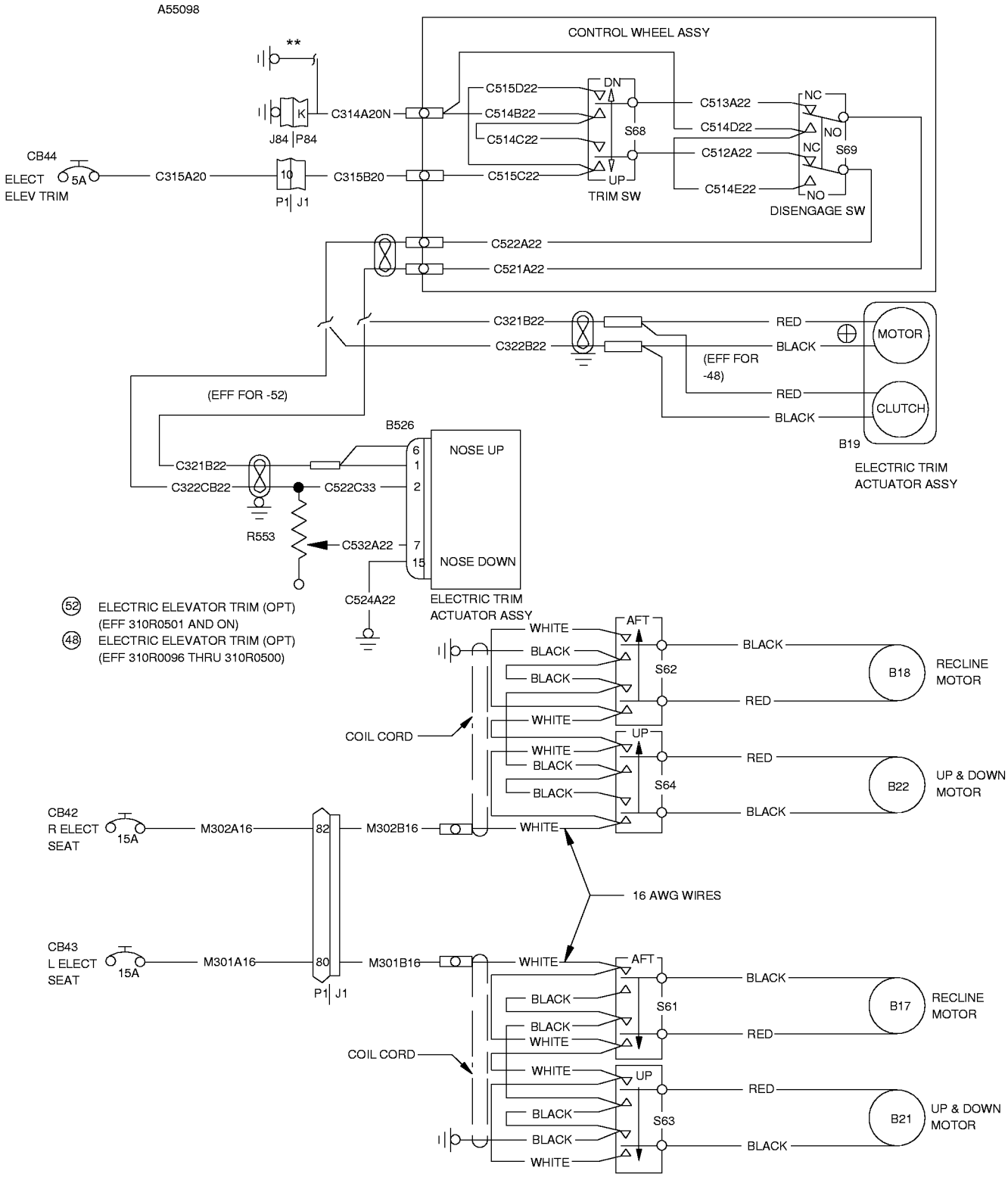

**= EFF: 310R0001 THRU 310R0500
***= EFF: 310R0001 THRU 310R1500

*NUMBER IN HEXAGON REFERS TO CONNECTION ON JB1 OR JB2 (REFER TO 24-60-02)

Electric Trim
Figure 2 (Sheet 2)

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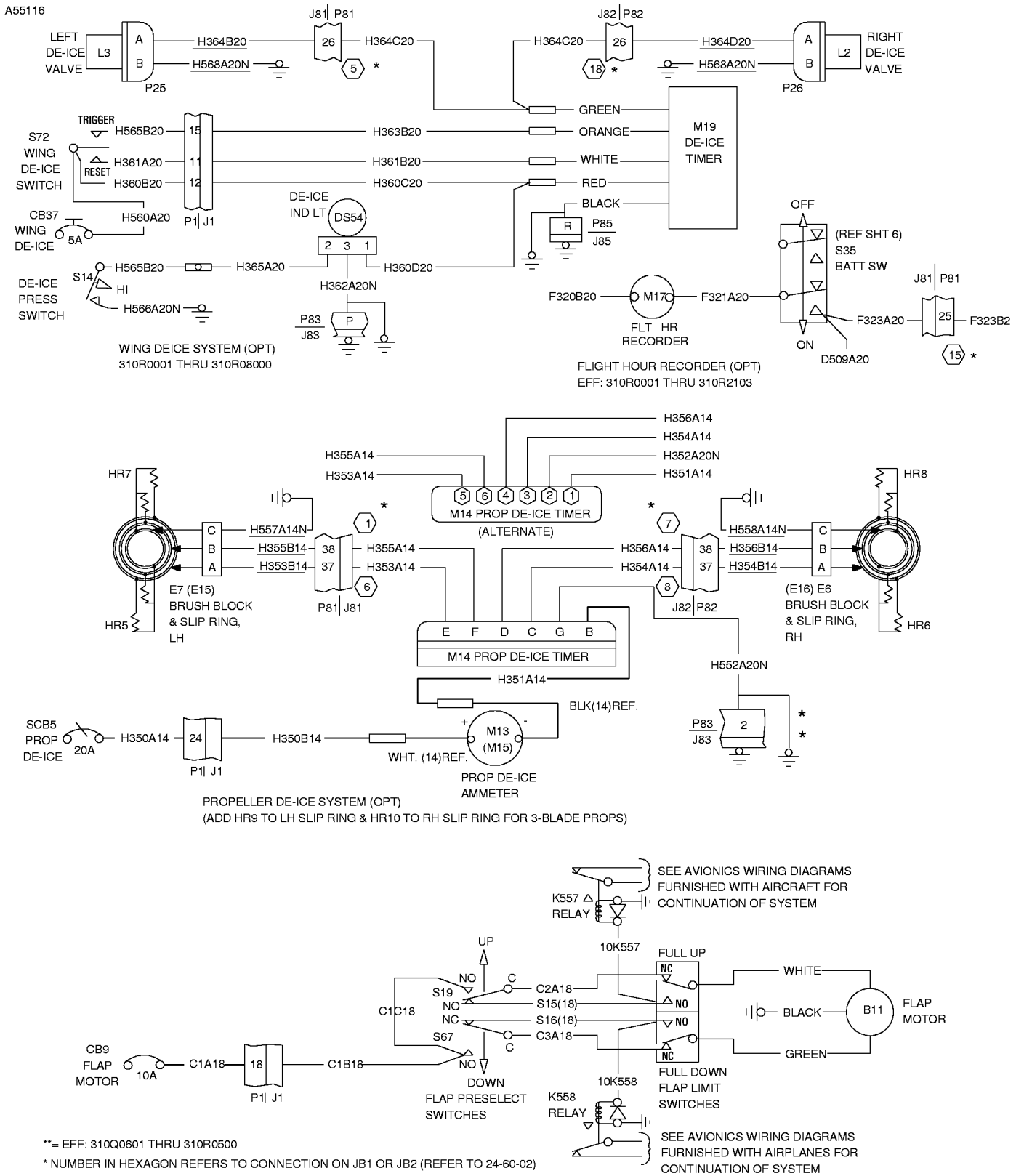

Flap Control
Figure 3 (Sheet 1)

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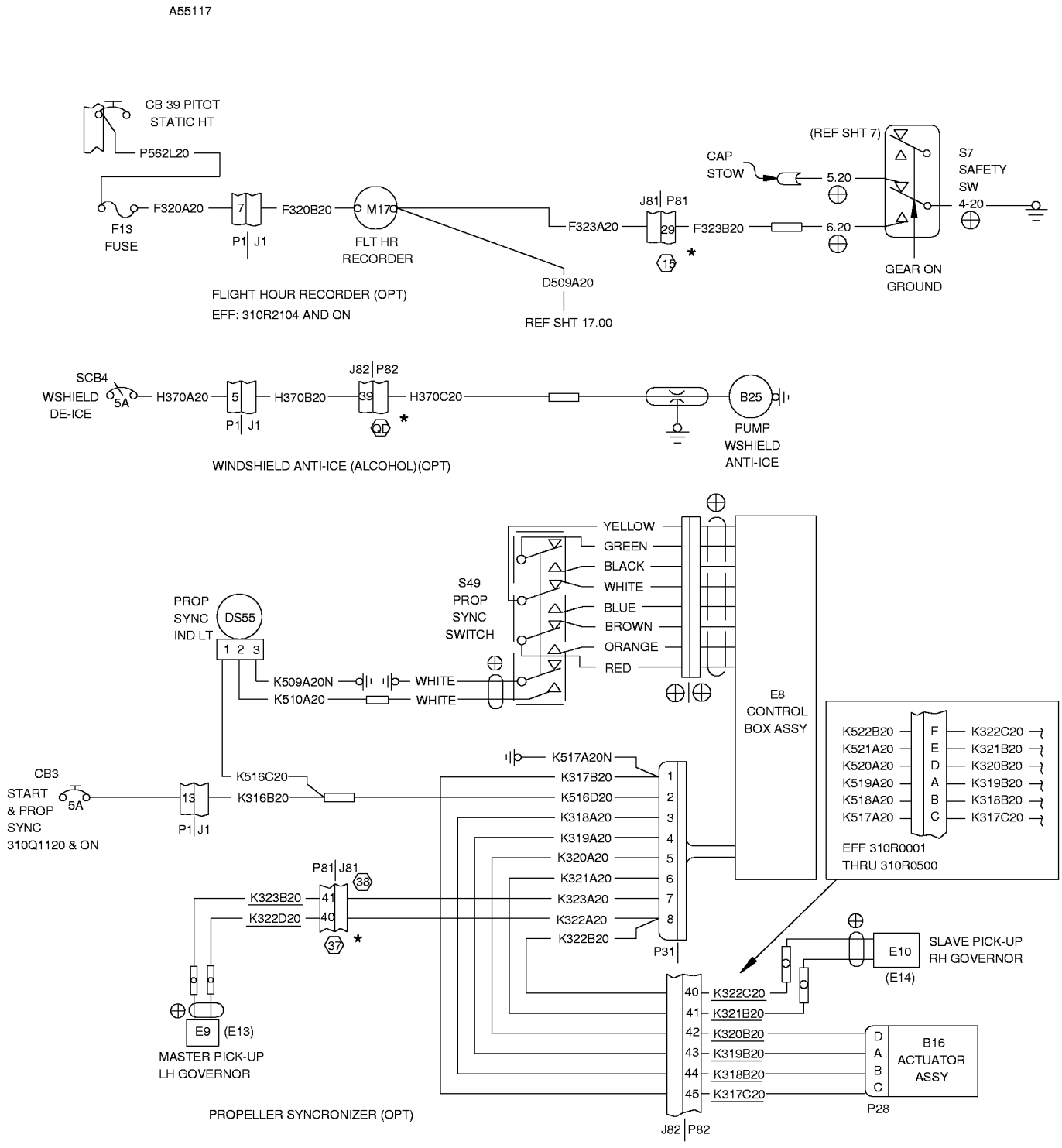

Flap Control
Figure 3 (Sheet 2)

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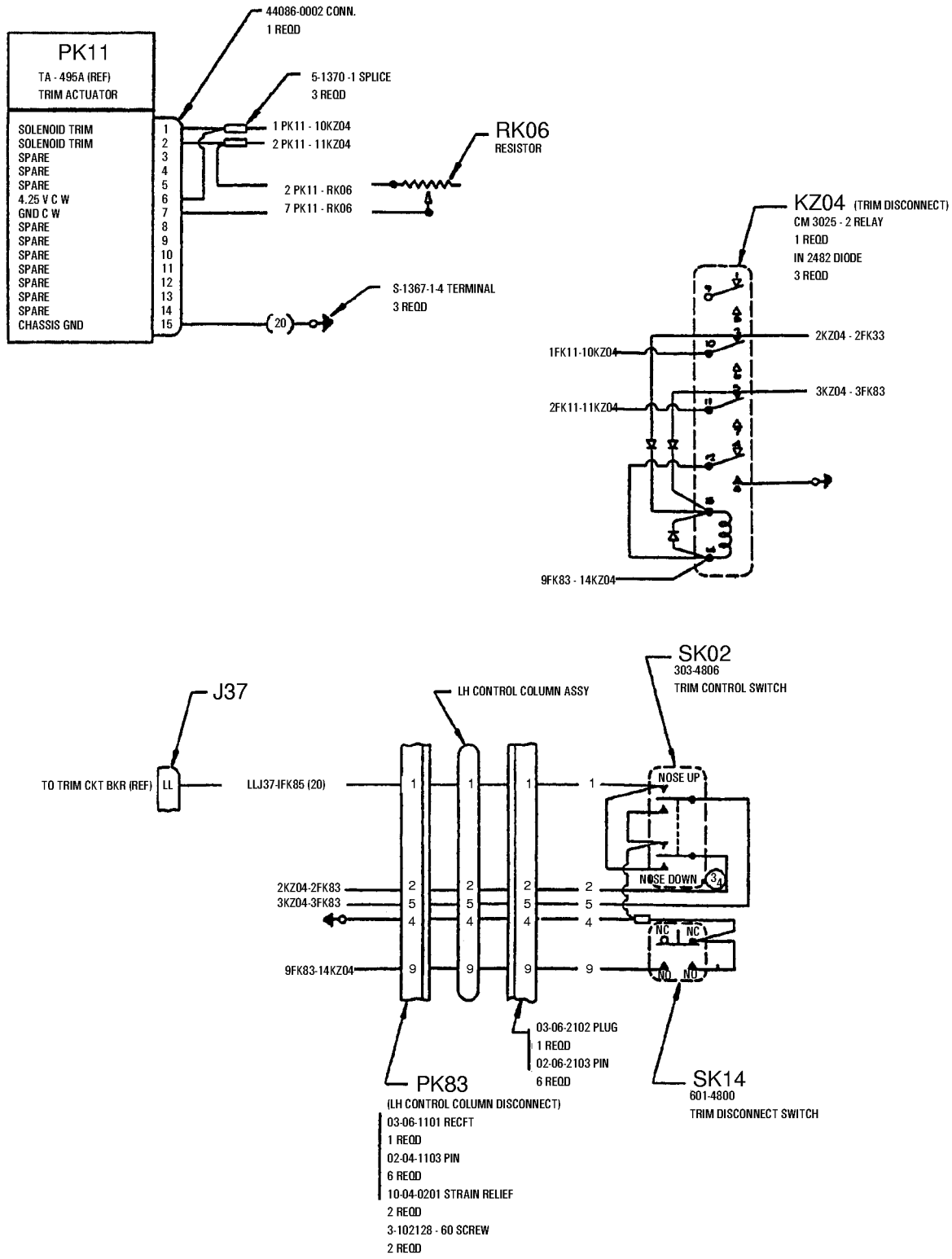
A56463



Electric Elevator Trim
Figure 4 (Sheet 1)

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DEICE SYSTEM DIAGRAMS - DESCRIPTION AND OPERATION

1. Wiring Diagrams

A. This section contains wiring diagrams for the deice system.
   (1) Pitot Static Heaters
   (2) Fuel Vent Heater
   (3) Stall Warning Heat
   (4) L and R Locker Vent Heater
   (5) Prop Deice
   (6) Wing Deice
   (7) Windshield Anti-Ice
   (8) Heated Add-On Windshield Panel
   (9) Surface Deice

B. Reference Designator Code
   (1) Reference designators are used in these diagrams to more quickly identify and locate a part or assembly used in any electrical system. A part is identified by reference number on a diagram. The reference number called out in wiring reference designators identifies the description and diagram figure number.

   NOTE: Part numbers referred to on Wiring Diagrams are for reference only. When ordering spare or replacement parts, refer to applicable Parts Catalog.

   (2) The wiring diagrams contained in this section clearly show the complete wiring on each item of electrical components listed in each Wiring Diagram. The first portion of wire number indicates the Airplane System, the center portion indicates Wire Number, and the last portion indicates Wire Gauge Size. Each wiring diagram contains part number and nomenclature for each component.

Reference	Figure	Description
B11	3	Motor
B14	1	Blower and Pump
B16	3	Actuator Assembly
B25	3	Pump W/S Anti-Ice
CB8	1	CB Stall Horn
CB9	3	CB Flap
CB14	1	CB Cab HT and OAT
CB35	3	CB Prop Synch
CB37	3	CB Wing De-Ice
CB38	1	CB St1 and F1 VT HT
CB39	1	CB Dual Pitot
CB39	1	CB Pitot Ht
CB48	1	CB Cigar LTR
CR12	1	Diode
CR24	1	Diode Htr
DS29	1	Light
DS54	3	Light

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Reference	Figure	Description
DS55	3	Light
E3	1	Cabin Hrt
E6	3	Brush Assy
E7	3	Brush Assy
E8	3	Control Box A
E9	3	Governor
E10	3	Governor
E11	1	LH P.T. Htr
E12	1	RH P.T. Htr
E13	3	Governor
E14	3	Governor
E15	3	Brush Assy
E16	3	Brush Assy
F13	3	Fuse
HR1	1	Cigar Ltr
HR2	1	Cigar Ltr
HR5	3	Deice Boot
HR6	3	Deice Boot
HR7	3	Deice Boot
HR8	3	Deice Boot
HR9	3	Deice Boot
HR10	3	Deice Boot
HR11	1	Vent Htr
HR12	1	Vent Htr
HR13	1	Htr
HR14	1	Htr
HR15	1	Htr
HR16	1	Htr
J29	3	Recpt
K12	1	Relay
L1	1	Valve
L2	3	Valve
L3	3	Valve
LS14	1	Stall Warn Horn
M14	3	Timer Assy
M15	3	Ammeter - 3 Blade

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Reference	Figure	Description
M17	3	Recorder
M19	3	EM211-2
MT17	1	Stall Act and Htr
P11	1	Plug
P25	3	Plug
P26	3	Plug
P31	3	Plug
P38	1	Plug
P39	1	Plug
P51	1	Plug
P52	1	Plug
R19	1	Resistor
R20	1	Resistor
S14	3	Switch
S15	3	Switch
S16	3	Switch
S19	3	Switch
S41	1	Thermostat
S42	1	Switch
S49	3	Switch
S55	1	Switch
S67	3	Switch
S72	3	Switch
S77	1	Switch
SCB4	3	SCB W/S Anti-Ice
SCB5	3	SCB Prop Deice

C. Diagrams

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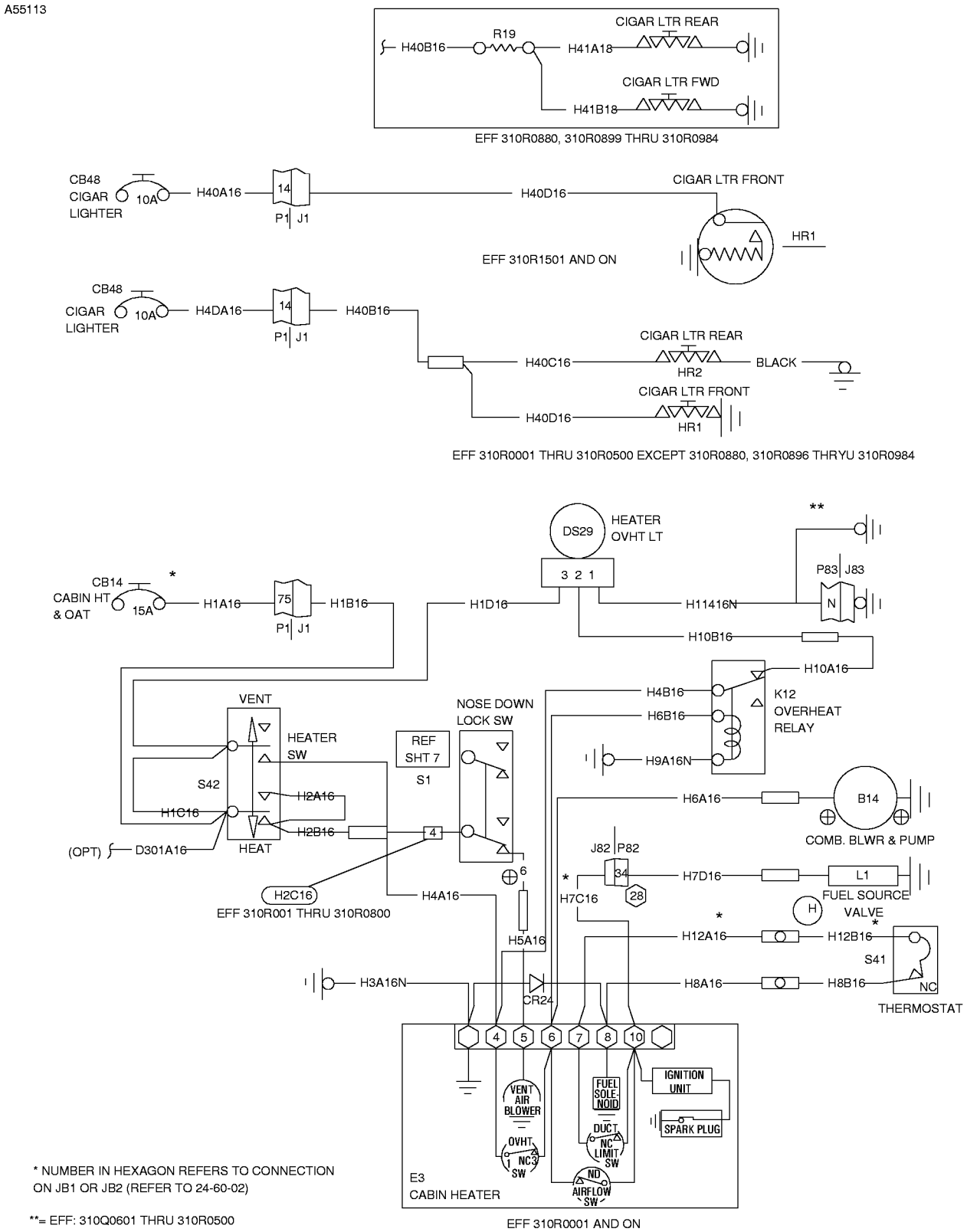

Pitot Static Heaters and Fuel Vent Heater
Figure 1 (Sheet 1)

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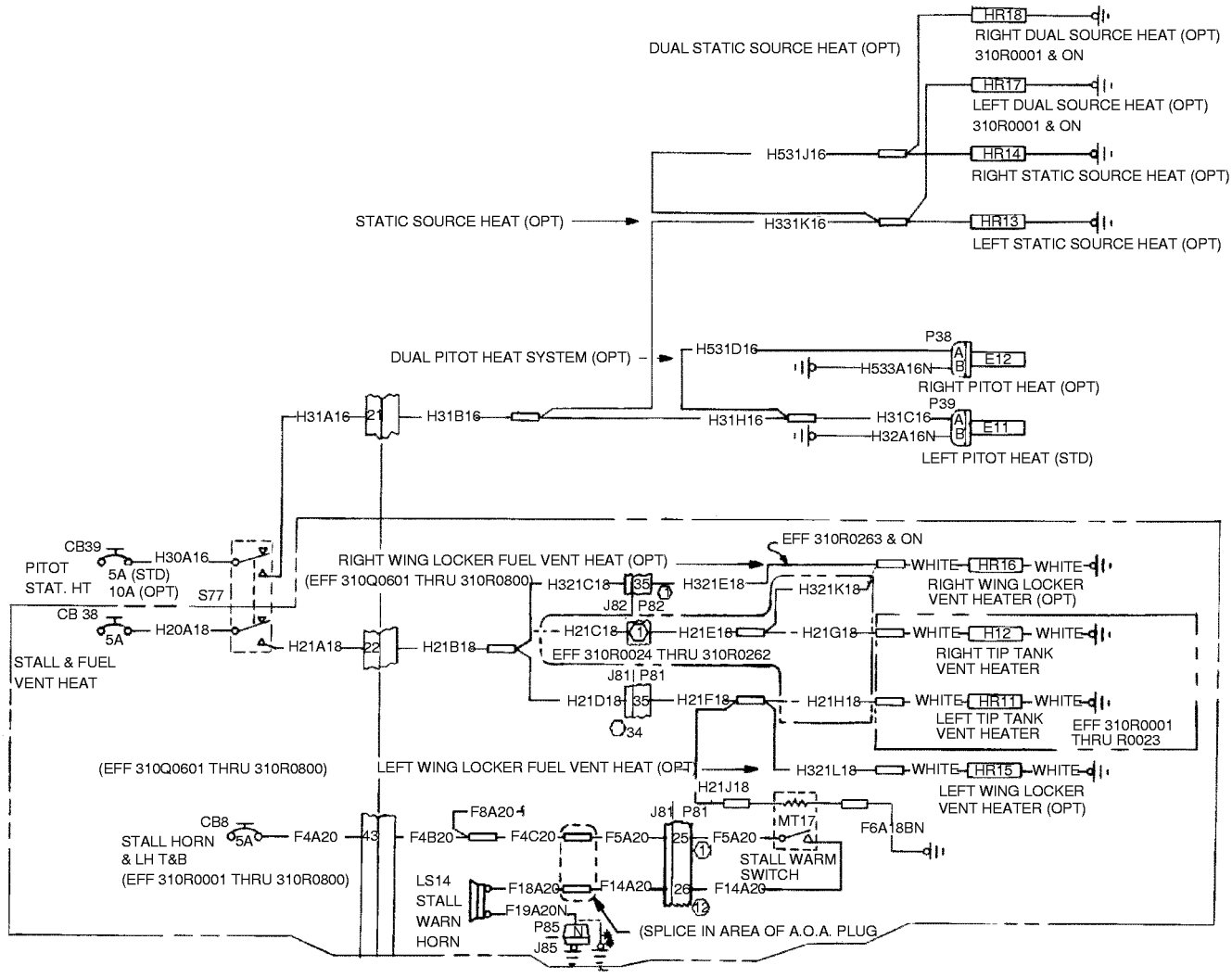

Pitot Static Heaters and Fuel Vent Heater
Figure 1 (Sheet 2)

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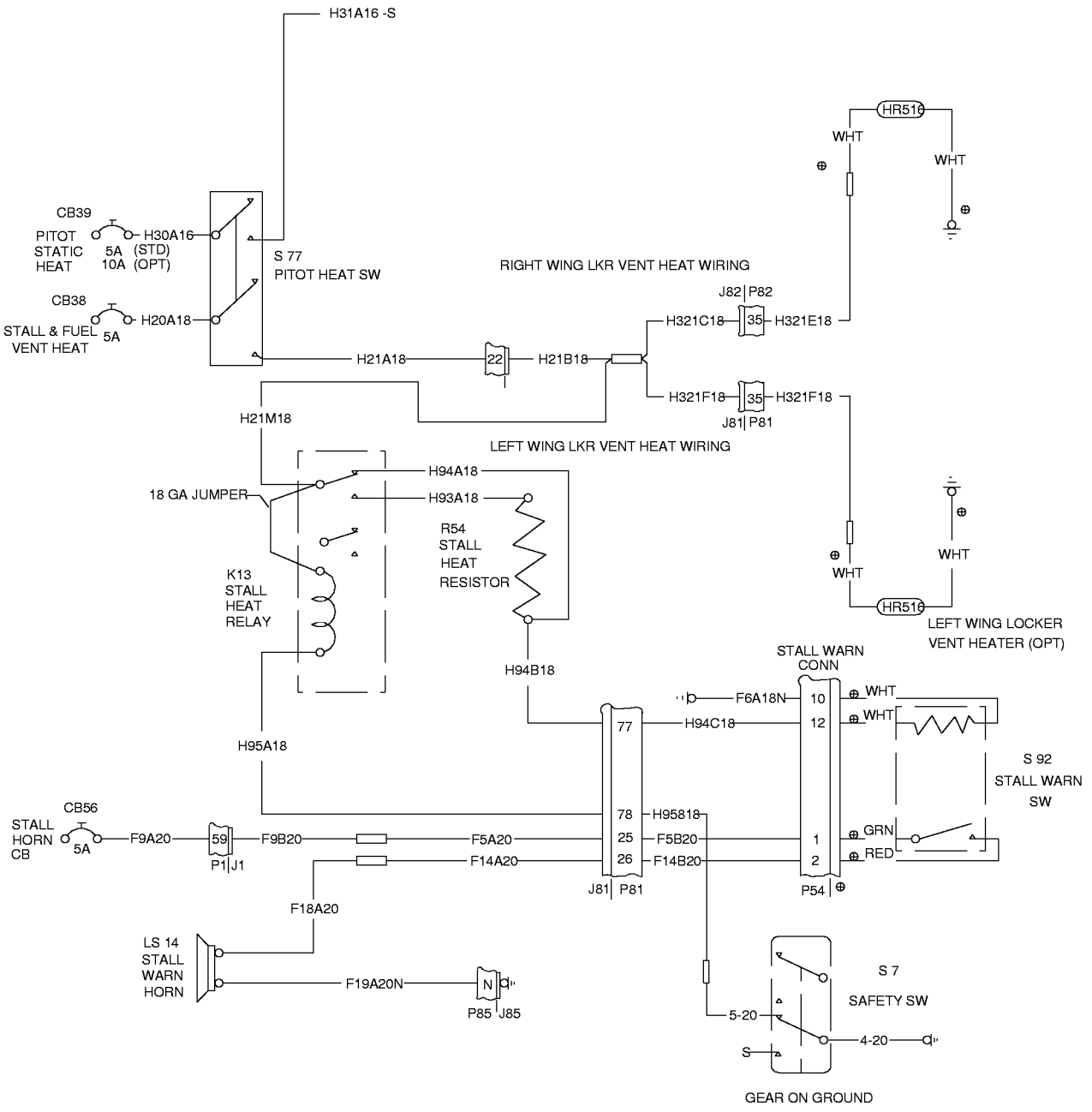
A55115



Stall Warning Heat and L and R Locker Vent Heater
Figure 2 (Sheet 1)

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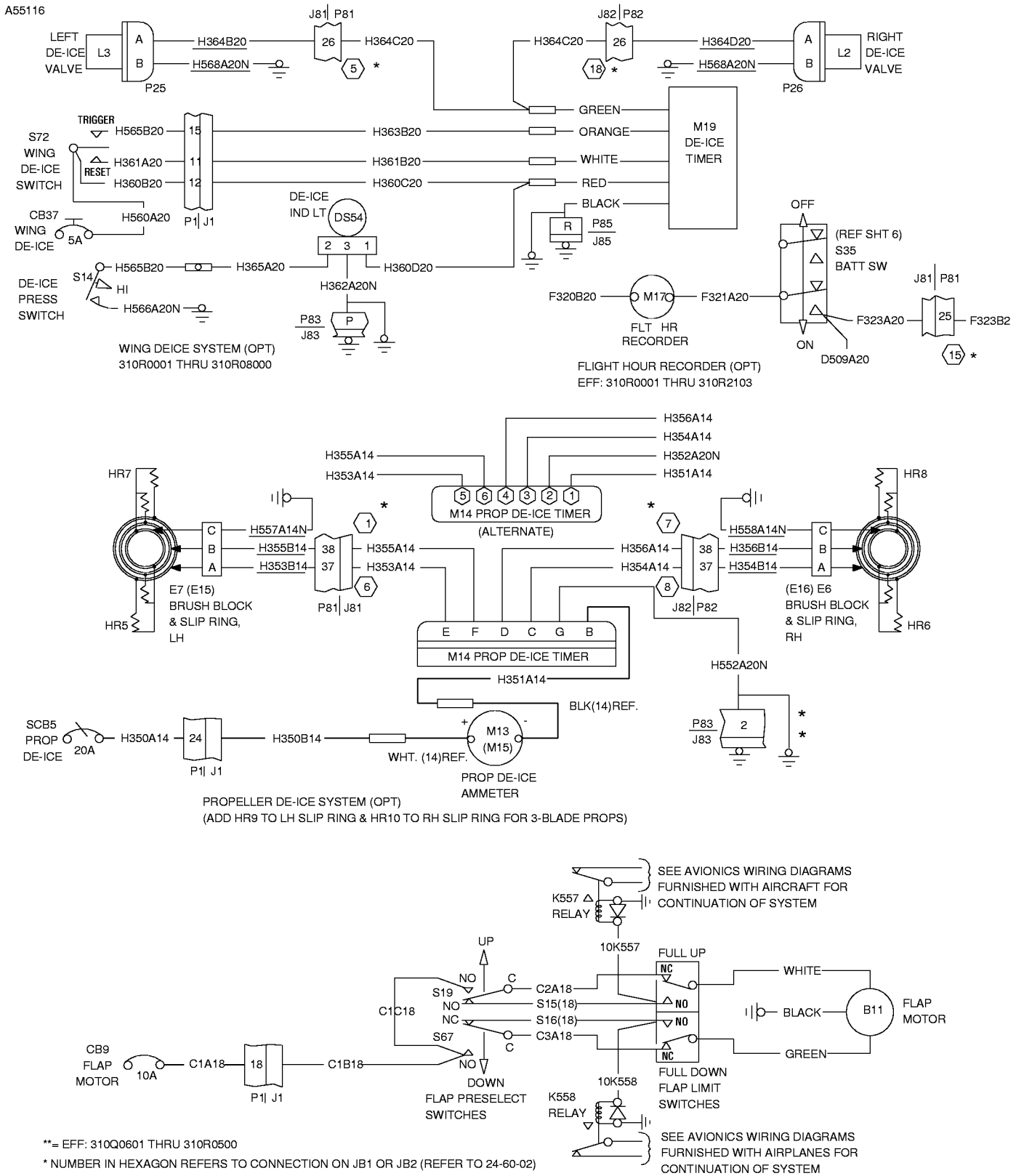

Prop Deice, Wing Deice, and Windshield Anti-Ice
Figure 3 (Sheet 1)

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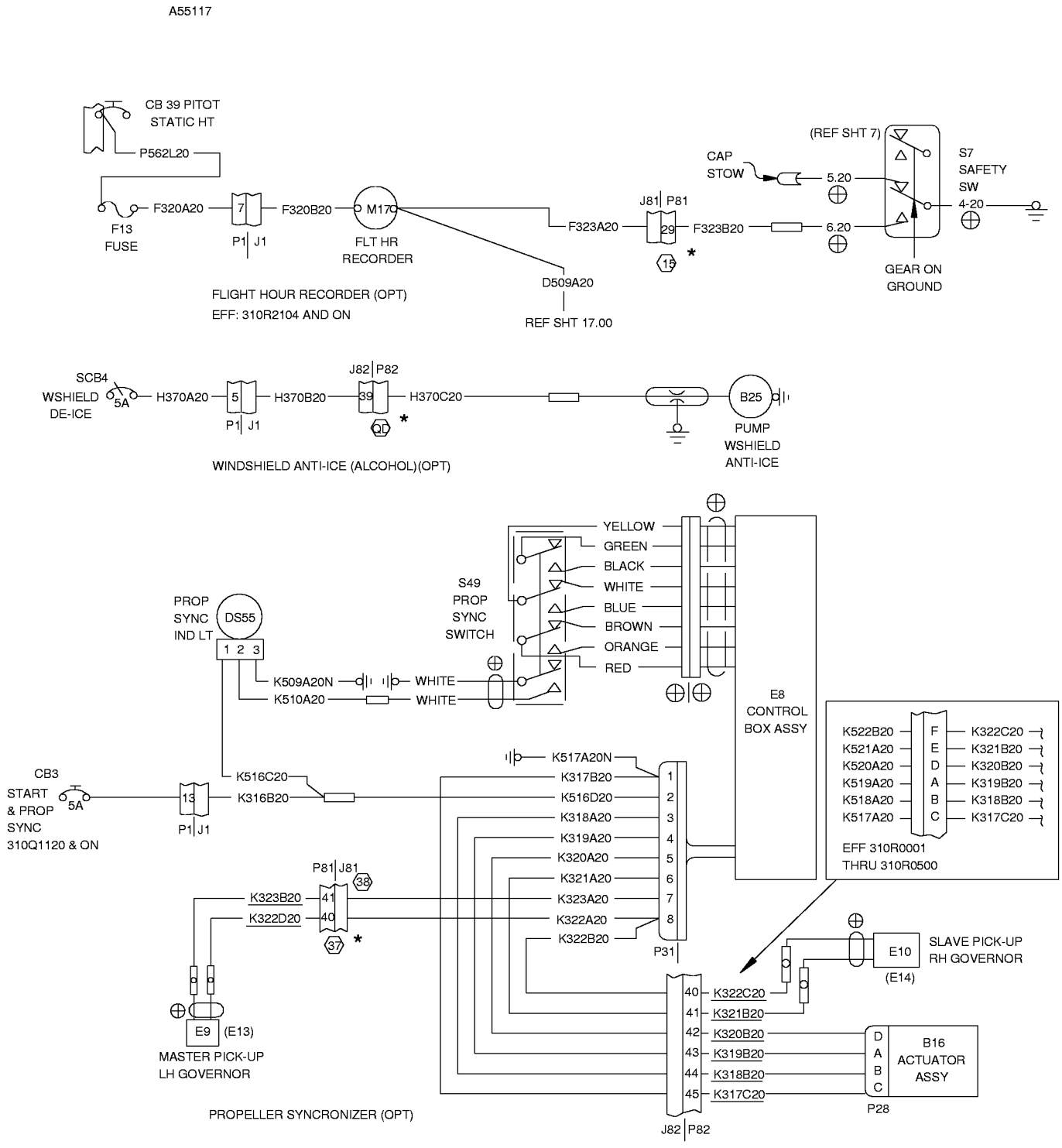

**= EFF: 310Q0601 THRU 310R0500

*NUMBER IN HEXAGON REFERS TO CONNECTION ON JB1 OR JB2 (REF TO SHT 4.00)

Prop Deice, Wing Deice, and Windshield Anti-Ice
Figure 3 (Sheet 2)

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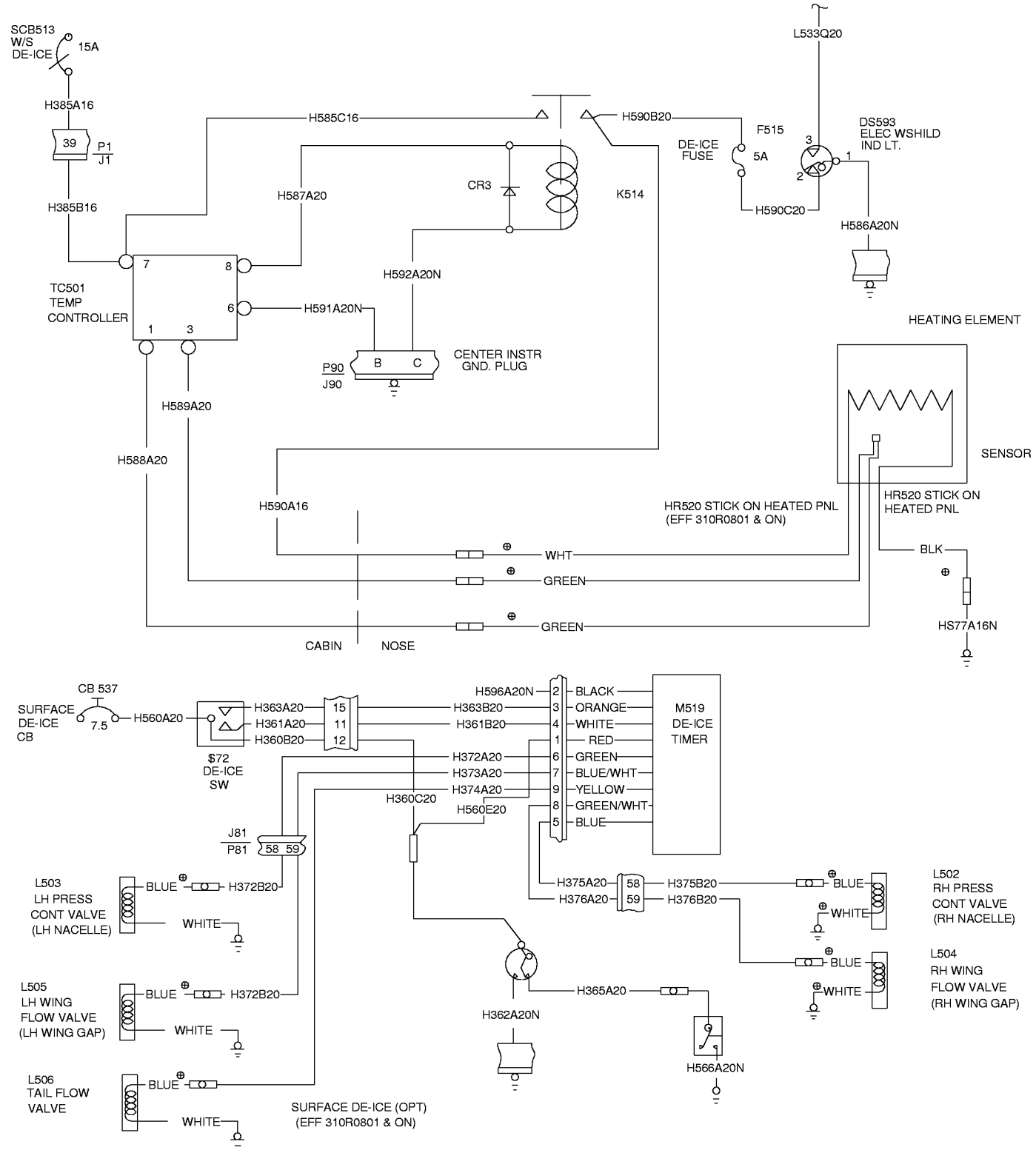

Heated Add-On Windshield Panel and Surface Deice
Figure 4 (Sheet 1)

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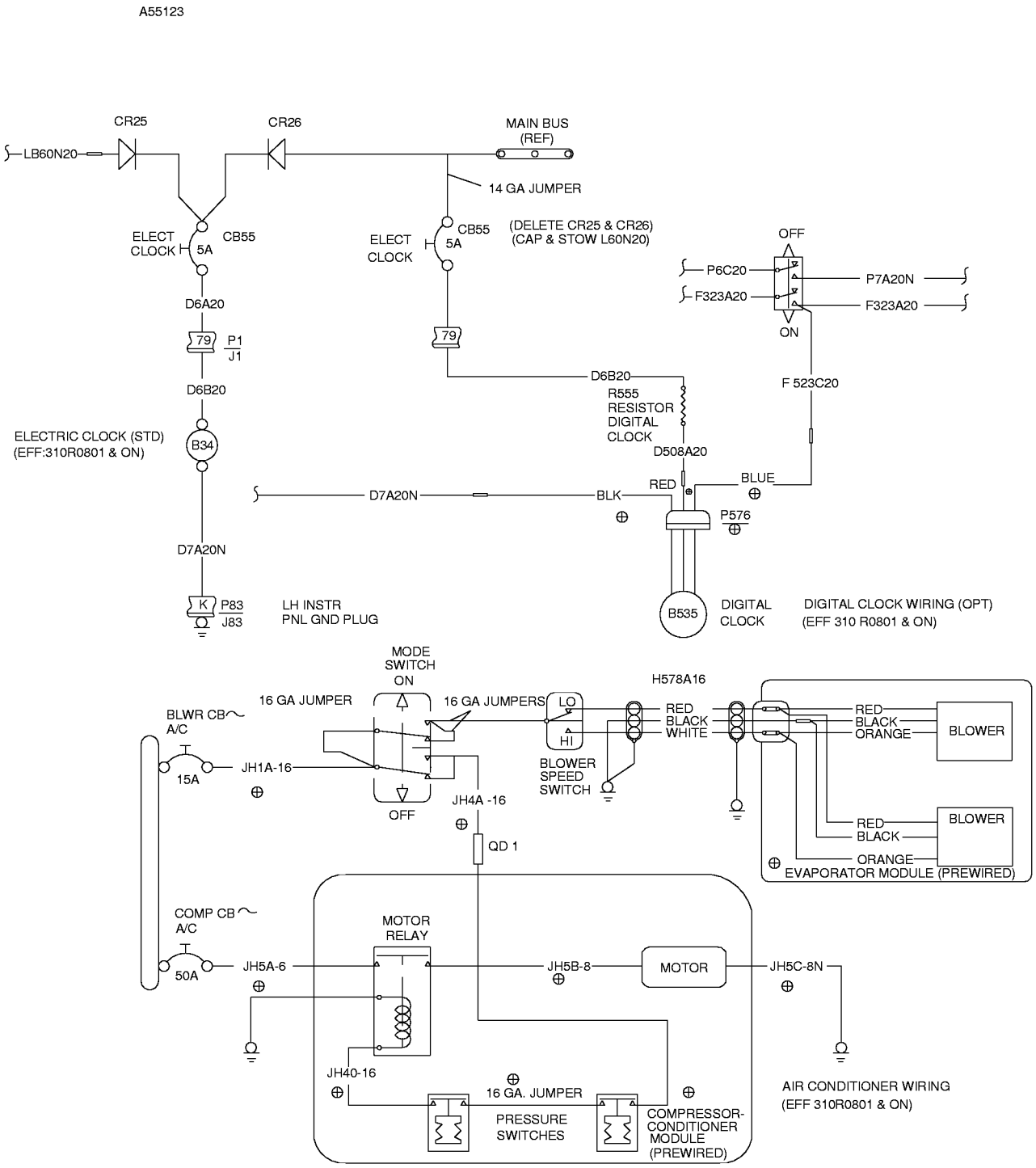

Heated Add-On Windshield Panel and Surface Deice
Figure 4 (Sheet 2)

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COMMUNICATIONS AND INTERIOR SYSTEMS DIAGRAMS - DESCRIPTION AND OPERATION

1. Wiring Diagrams

A. This section contains wiring diagrams for communications and interior systems.
(1) Electric Seat (LH and RH)
(2) Cabin Heat
(3) Cigar Lighters
(4) Speaker
(5) Phone Jacks
(6) Mike Jacks
(7) Boom Mikes
(8) Stereo - Speakers and Headsets
(9) Air Conditioning
(10) Avionics Cooling Blower
(11) Fire Detection System
(12) Stereo 8-Track

B. Reference Designator Code
(1) Reference designators are used in these diagrams to more quickly identify and locate a part or assembly used in any electrical system. A part is identified by reference number on a diagram. The reference number called out in wiring reference designators identifies the description and diagram figure number.

NOTE: Part Numbers referred to on Wiring Diagrams are for reference only. When ordering spare or replacement parts, refer to applicable Parts Catalog.

(2) The wiring diagrams contained in this section clearly show the complete wiring on each item of electrical components listed in each Wiring Diagram. The first portion of wire number indicates the Airplane System, the center portion indicates Wire Number, and the last portion indicates Wire Gauge Size. Each wiring diagram contains part number and nomenclature for each component.

Reference	Figure	Description
AMP5	4	Stereo Player
B14	2	Blower and Pump
B17	1	Motor
B18	1	Motor
B19	1	Elec Trim Act
B21	1	Motor
B22	1	Motor
CB8	1, 2	CB Stall Horn
CB10	1	CB R Eng Gage
CB11	1	CB L Eng Gage
CB14	2	CB Cab HT and OAT
CB38	2	CB ST1 and F1 VT HT
CB39	2	CB Dual Pitot
CB39	2	CB Pitot Ht
CB40	1	CB RH T and B

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Reference	Figure	Description
CB42	1	CB Elec Seat
CB43	1	CB Elec Seat
CB44	1	CB Elec Elev Trim
CB48	2	CB Cigar LTR
CR1	3	Diode
CR2	3	Diode
CR12	2	Diode
CR24	2	Diode Htr
DS29	2	Light
DS43	1	Light
E3	2	Cabin Hrt
E11	2	LH P.T. Htr
E12	2	RH P.T. Htr
HR1	2	Cigar Ltr
HR2	2	Cigar Ltr
HR11	2	Vent Htr
HR12	2	Vent Htr
HR13	2	Htr
HR14	2	Htr
HR15	2	Htr
HR16	2	Htr
J5	3	Jack Mic
J6	3	Jack Mic
J7	3	Jack Mic
J11	3	Jack HD PH
J12	3	Jack HD PH
J47	3	Mic Jack
J50	3	Conn A.O.A.
J54	3	Conn A.O.A.
K12	2	Relay
L1	2	Valve
LS2	3	Speaker
LS3	4	Speaker
LS4	4	Speaker
LS5	4	Trans Assy
LS6	4	Trans Assy

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Reference	Figure	Description
LS7	4	Trans Assy
LS8	4	Trans Assy
LS9	4	Speaker
LS10	4	Speaker
LS14	2	Stall Warn Horn
M1	1	L Engine Gage
M2	1	R Engine Gage
M5	1	Tach Gen
M7	1	Ind OAT
M8	1	Indicator
M9	1	Indicator
M16	1	Tach Gen
MT1	1	Tach Gen
MT2	1	Tach Gen
MT9	1	L Oil Temp
MT10	1	R Oil Temp
MT11	1	LH CYL Temp
MT12	1	RH CYL Temp
MT14	1	OAT Bulb
MT17	2	Stall Act and Htr
P3	1	Plug
P4	1	Plug
P5	1	Plug
P6	1	Plug
P7	1	Plug
P8	1	Plug
P9	1	Plug
P10	1	Plug
P11	2	Plug
P14	1	Plug
P18	1	Plug
P38	2	Plug
P39	2	Plug
P43	1	Plug
P44	1	Plug
P50	3	Conn A.O.A.

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Reference	Figure	Description
P51	2	Plug
P52	2	Plug
P54	3	Conn A.O.A.
PH1	3	Boom Mic
R19	2	Resistor
R20	2	Resistor
RF1	3	Filter
RF2	3	Filter
S41	2	Thermostat
S42	2	Switch
S46	3	Switch Assy
S50	3	Switch
S55	2	Switch
S61	1	Switch
S62	1	Switch
S63	1	Switch
S64	1	Switch
S68	1	Switch
S69	1	Switch
S77	2	Switch
S88	4	Switch
S89	4	Switch
SR3	3	Diode
SR6	3	Diode
SR8	3	Diode
VR3	4	Reg Assy

C. Diagrams

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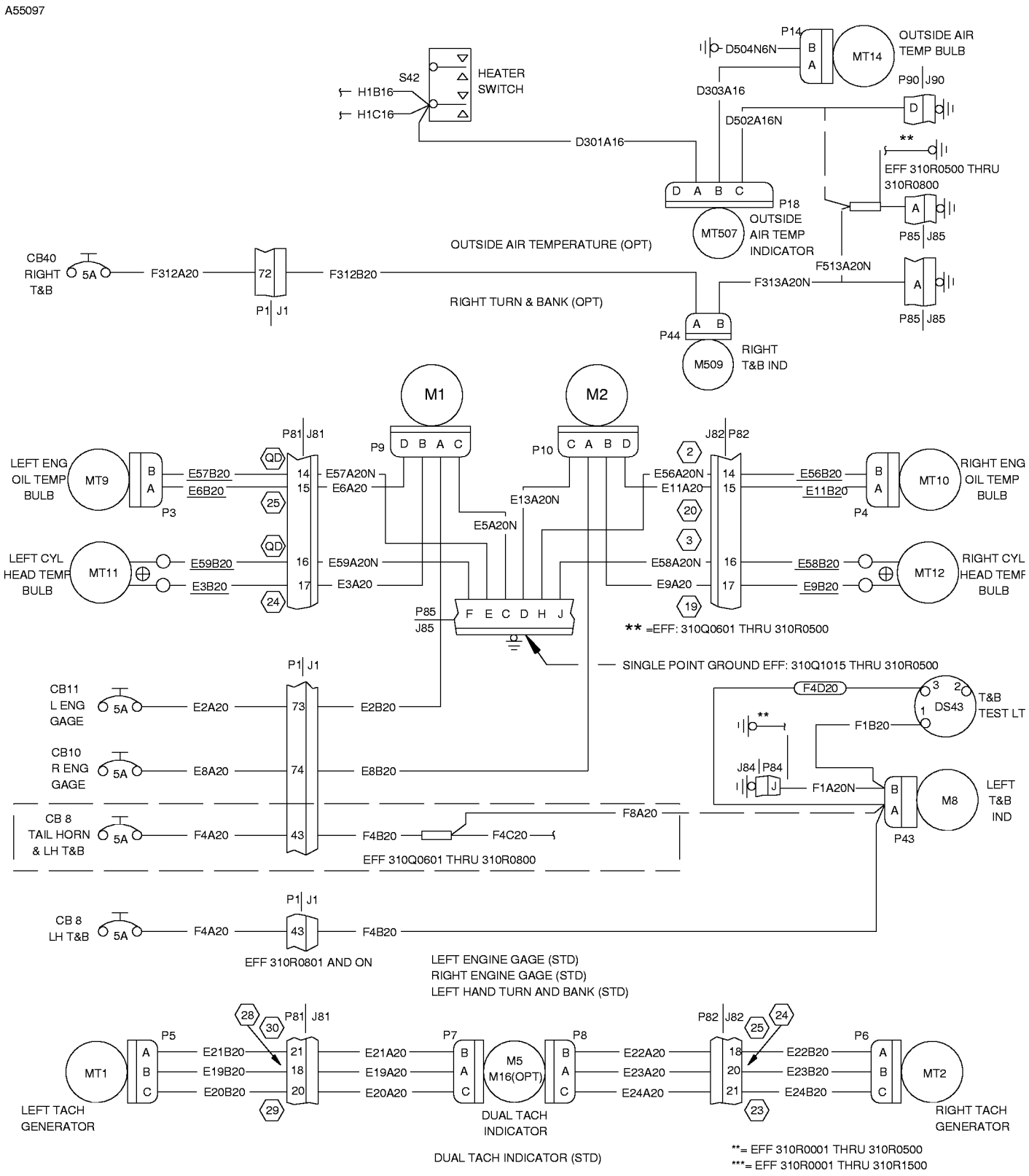

Electric Seat (LH and RH)
Figure 1 (Sheet 1)

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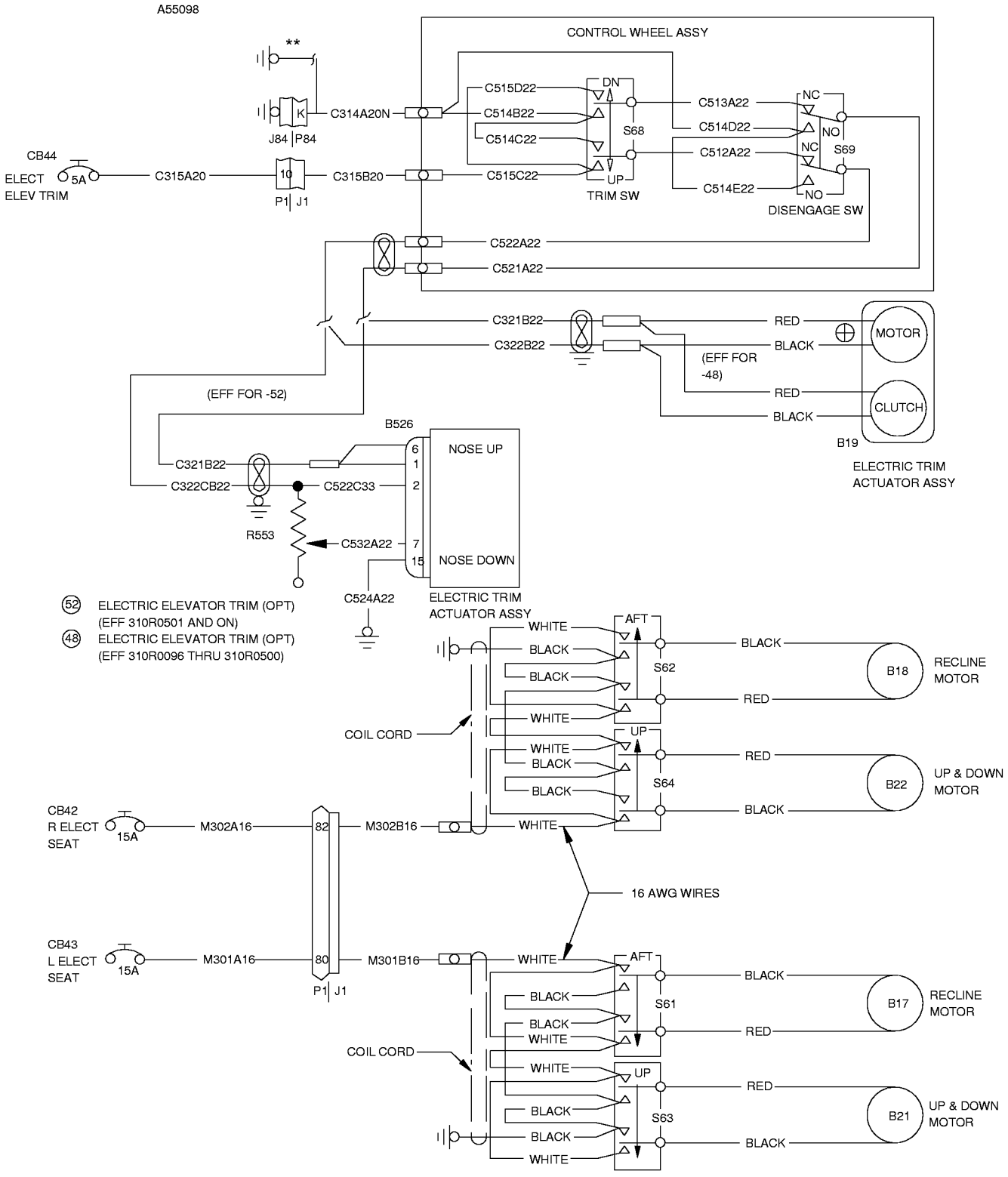

**= EFF: 310R0001 THRU 310R0500
***= EFF: 310R0001 THRU 310R1500

*NUMBER IN HEXAGON REFERS TO CONNECTION ON JB1 OR JB2 (REFER TO 24-60-02)

Electric Seat (LH and RH)
Figure 1 (Sheet 2)

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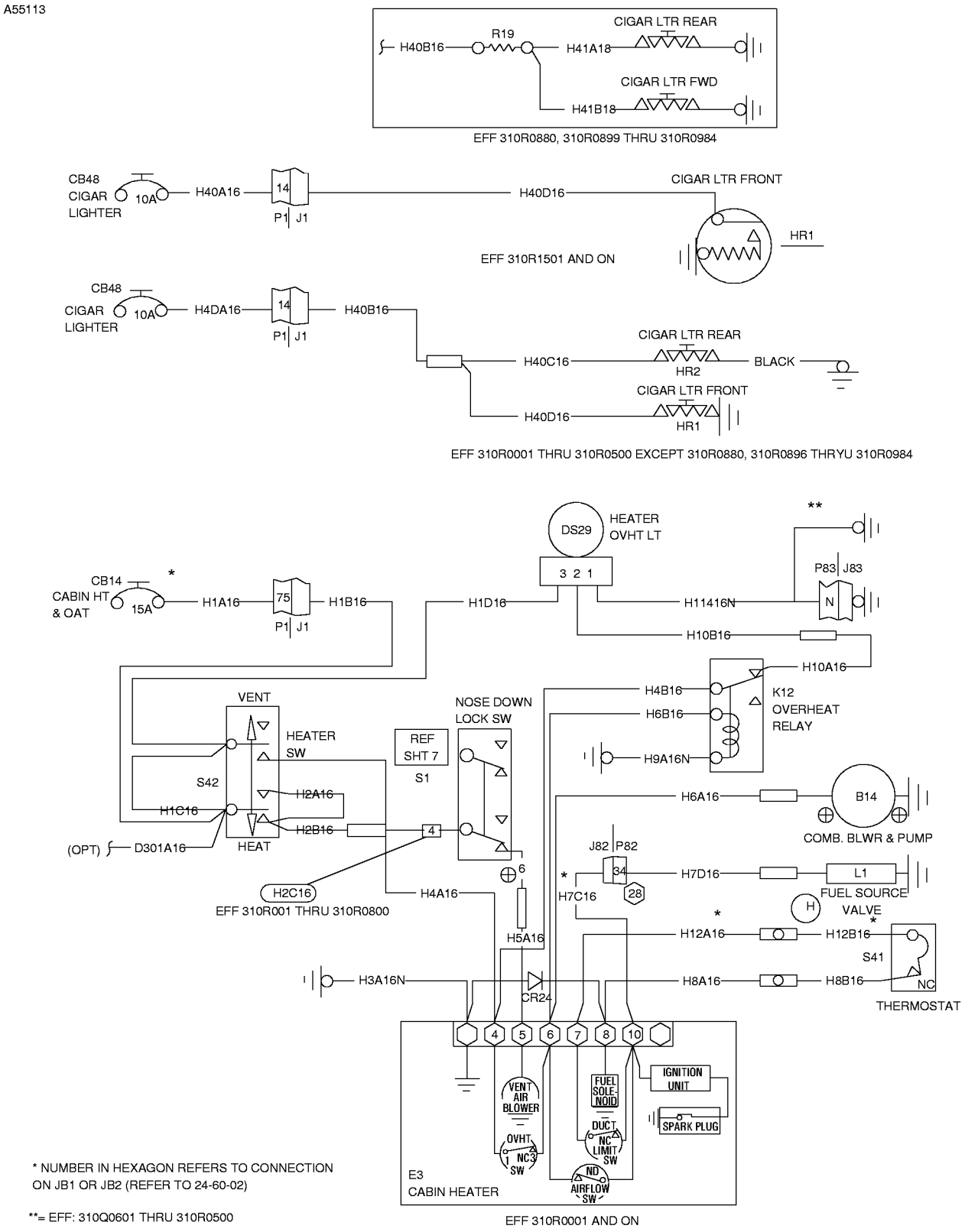

Cabin Heat and Cigar Lighters
Figure 2 (Sheet 1)

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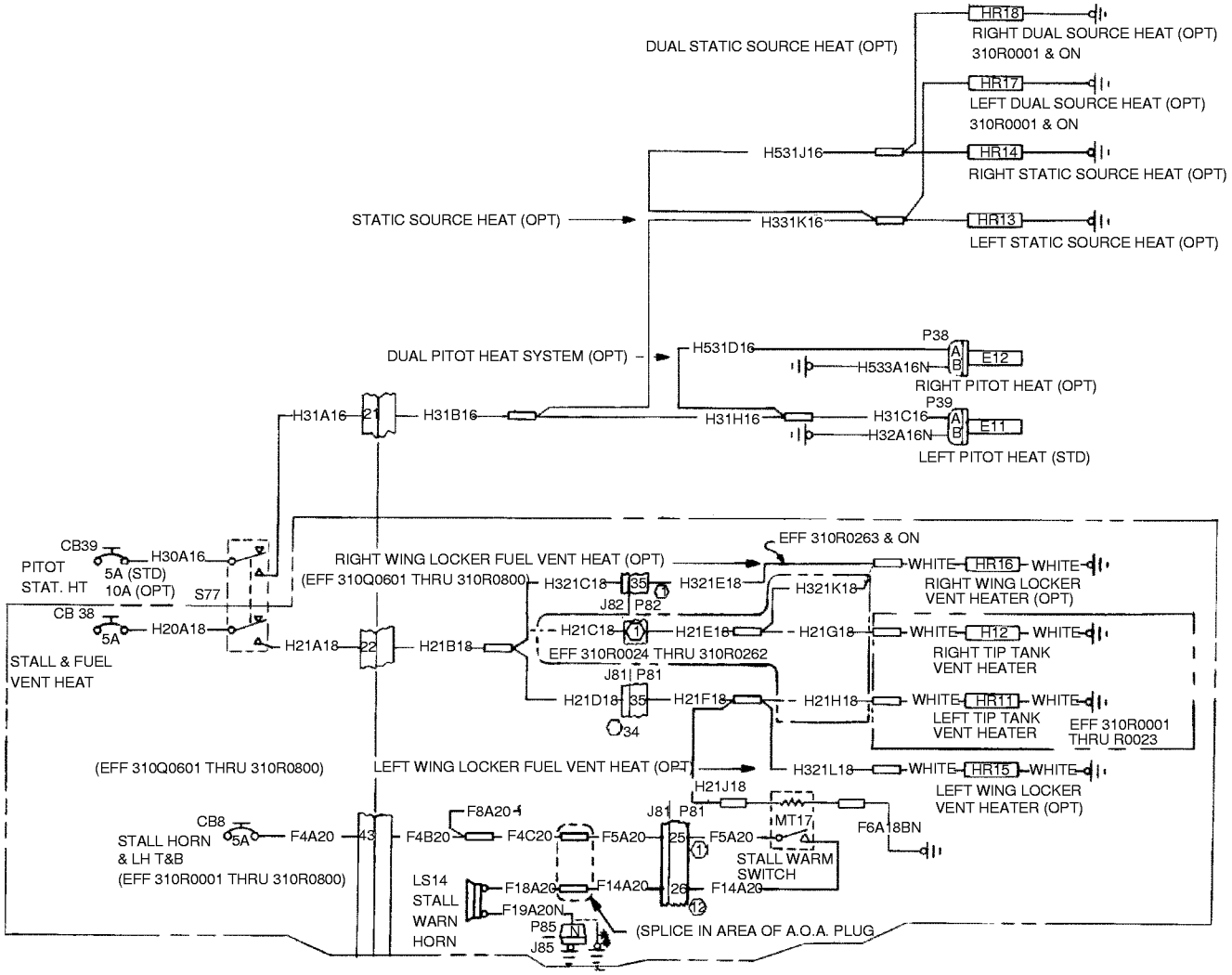

Cabin Heat and Cigar Lighters
Figure 2 (Sheet 2)

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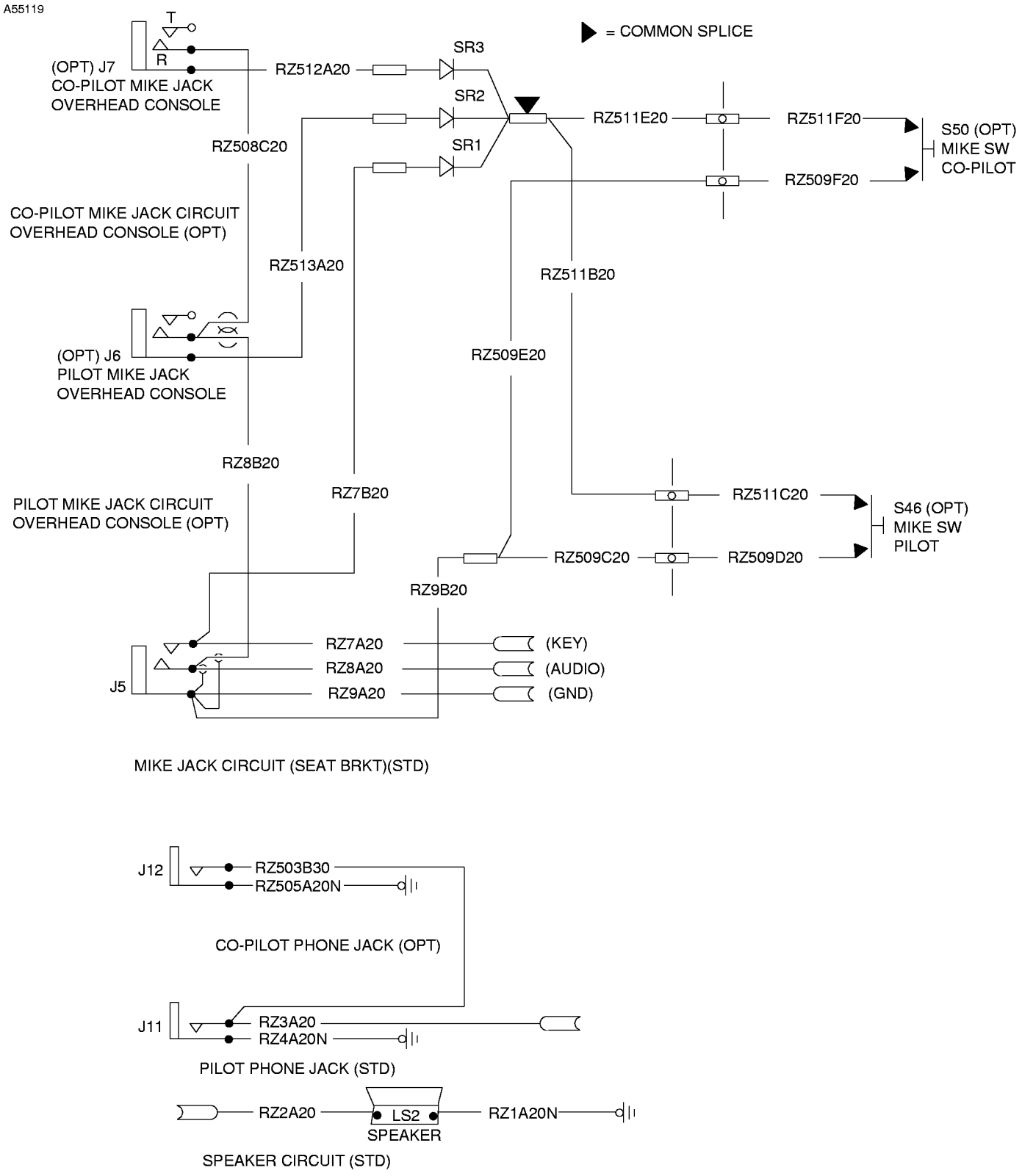

Speaker, Phone Jacks, Mike Jacks, and Boom Mikes
Figure 3 (Sheet 1)

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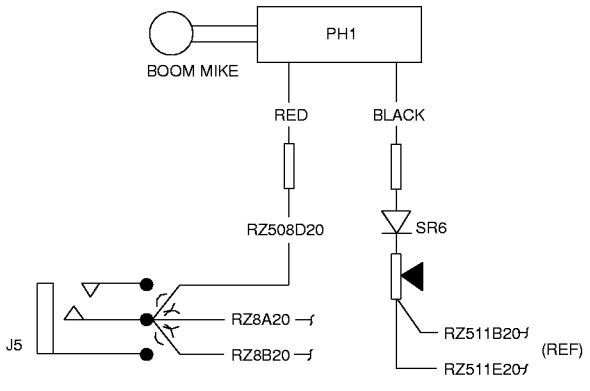
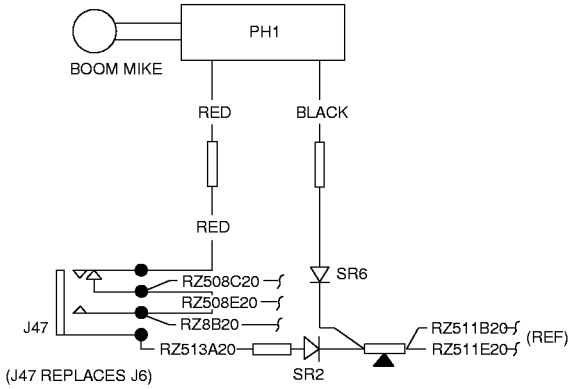
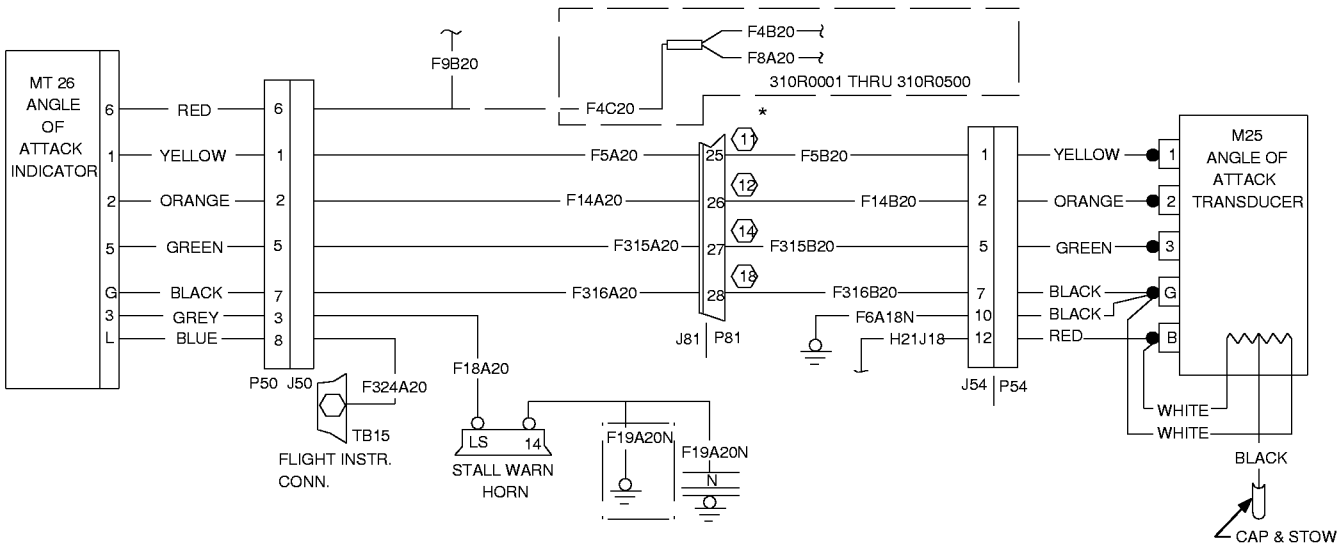


(310R0001 THRU 310R0800)
BOOM MIKE WITHOUT OXYGEN



(310R0001 THRU 310R0800)
BOOM MIKE WITH OXYGEN



ANGLE OF ATTACK INDICATOR & STALL WARNING

* NUMBER IN HEXAGON REFERS TO CONNECTION ON JB1 OR JB2 (REFER TO 24-60-02)

Speaker, Phone Jacks, Mike Jacks, and Boom Mikes
Figure 3 (Sheet 2)

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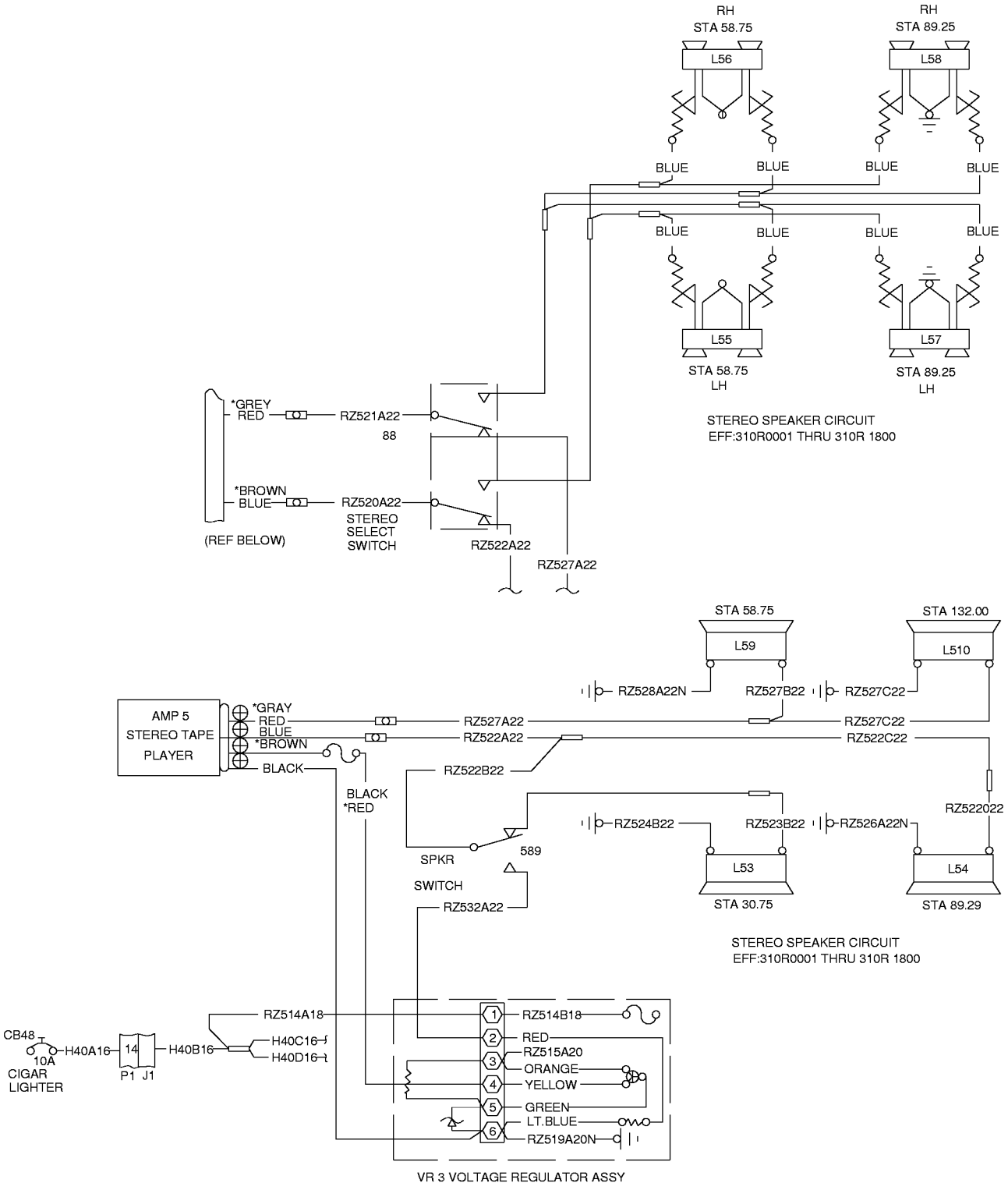

Stereo - Speakers and Headsets
Figure 4 (Sheet 1)

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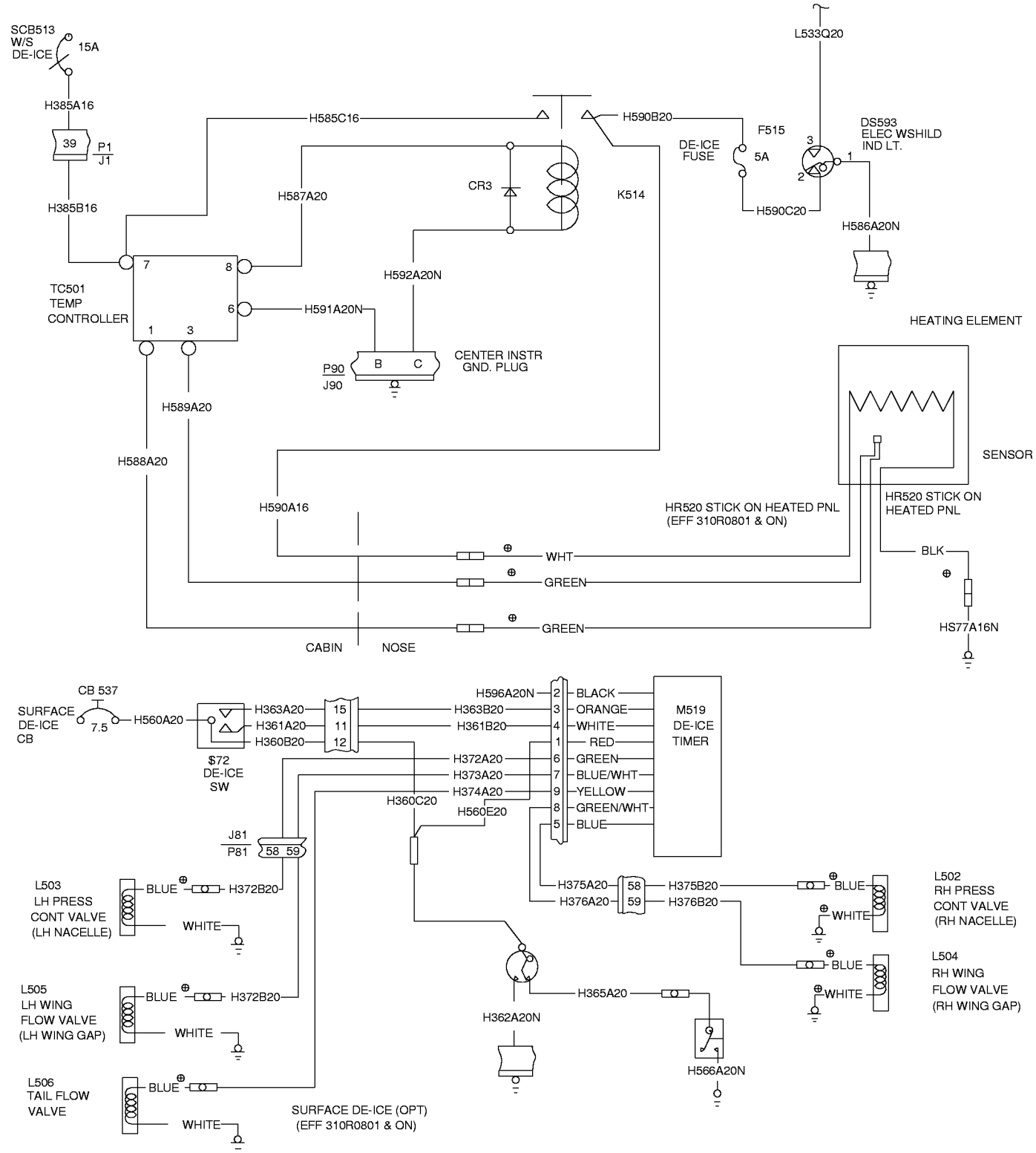

Air Conditioning
Figure 5 (Sheet 1)

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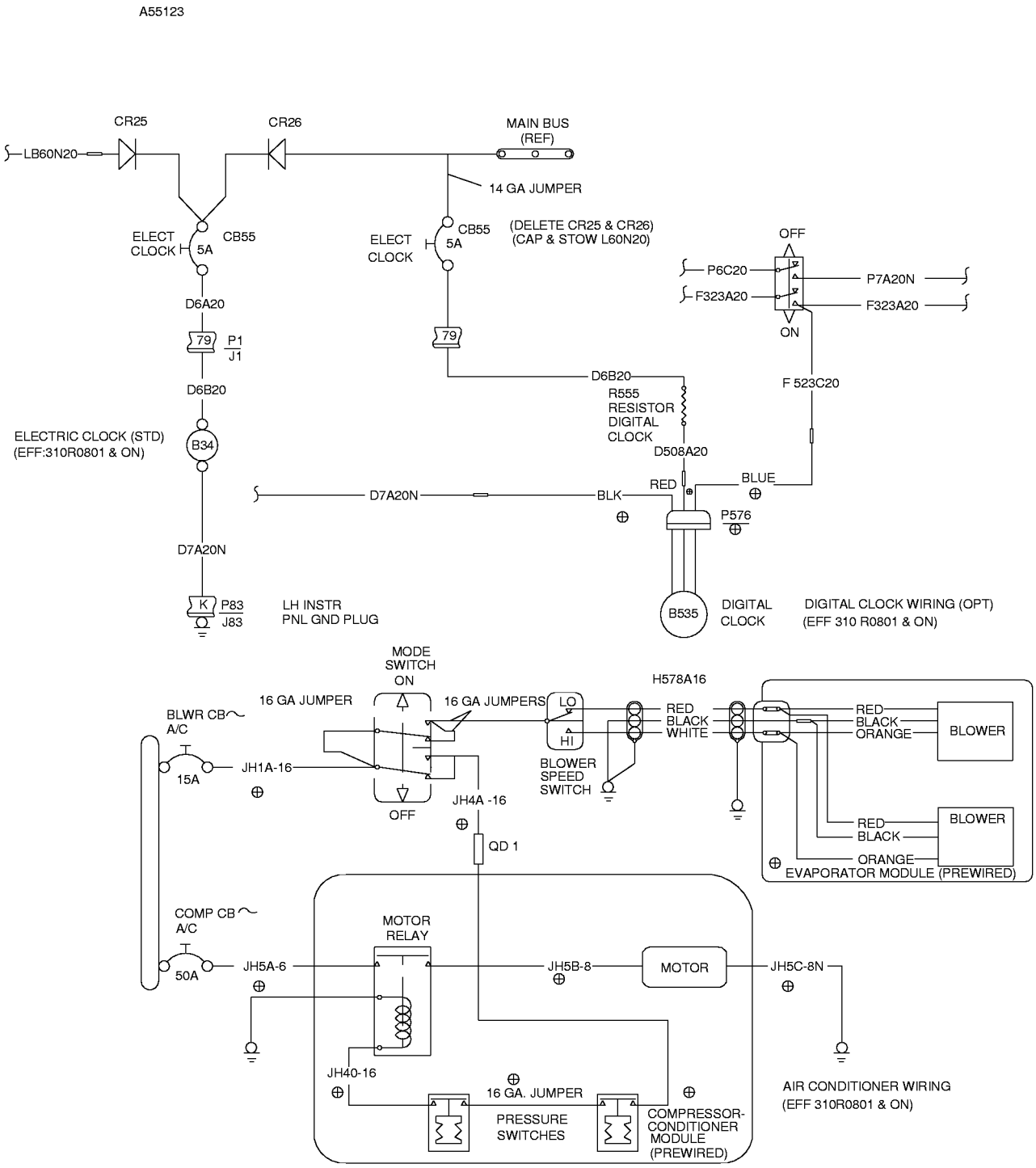

Air Conditioning
Figure 5 (Sheet 2)

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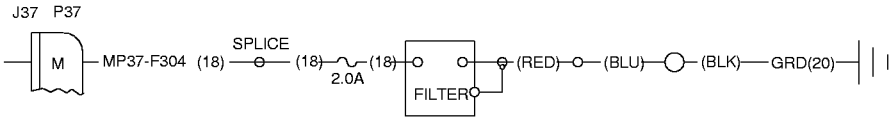
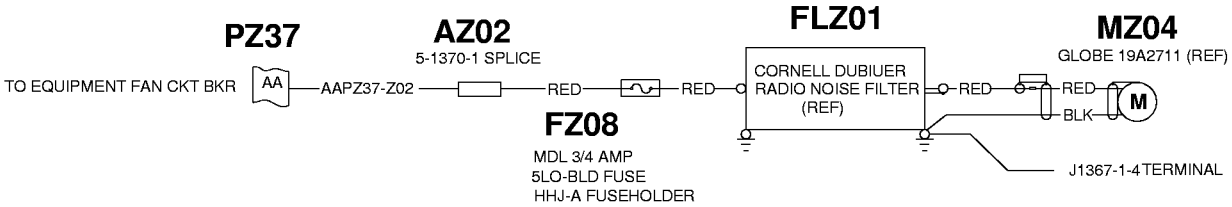
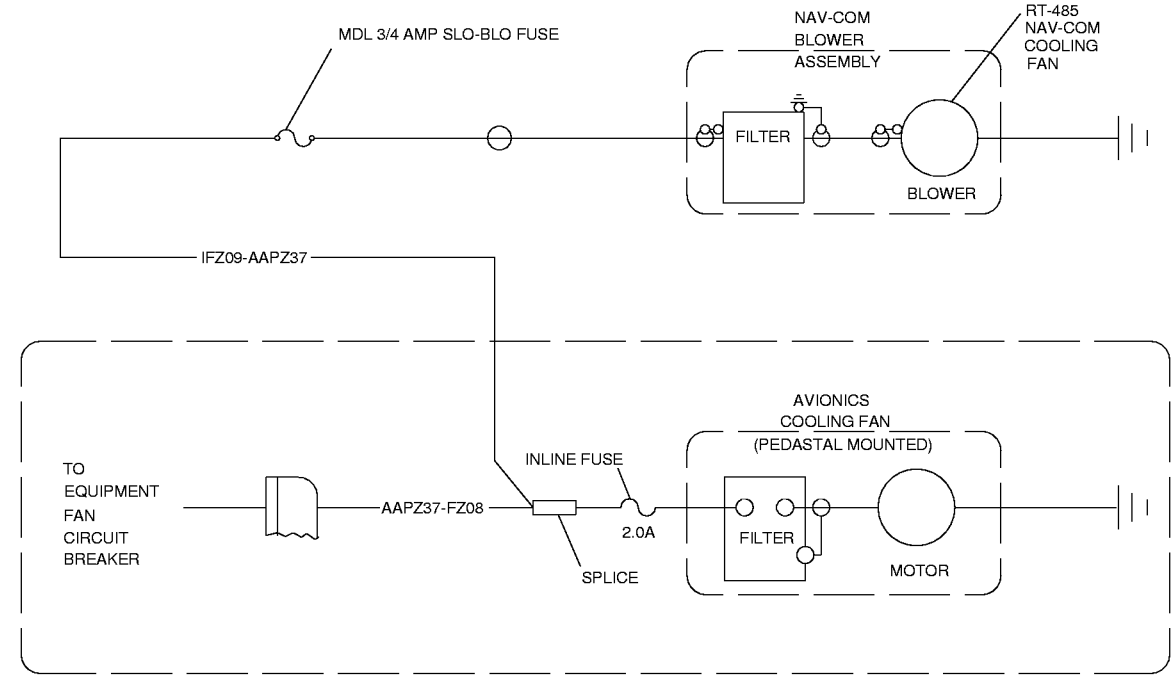


EFFECTIVITY: 310R1655 AND ON



WIRING DIAGRAM FOR BLOWER P/N 19A2711

NOSE ACCESSORY COOLING



EFFECTIVITY: 310R1393 THRU 310R2140
AND AIRPLANES 310R1210 THRU 310R1392
WHEN MODIFIED BY SK421-84

Avionics Cooling Blower
Figure 6 (Sheet 1)

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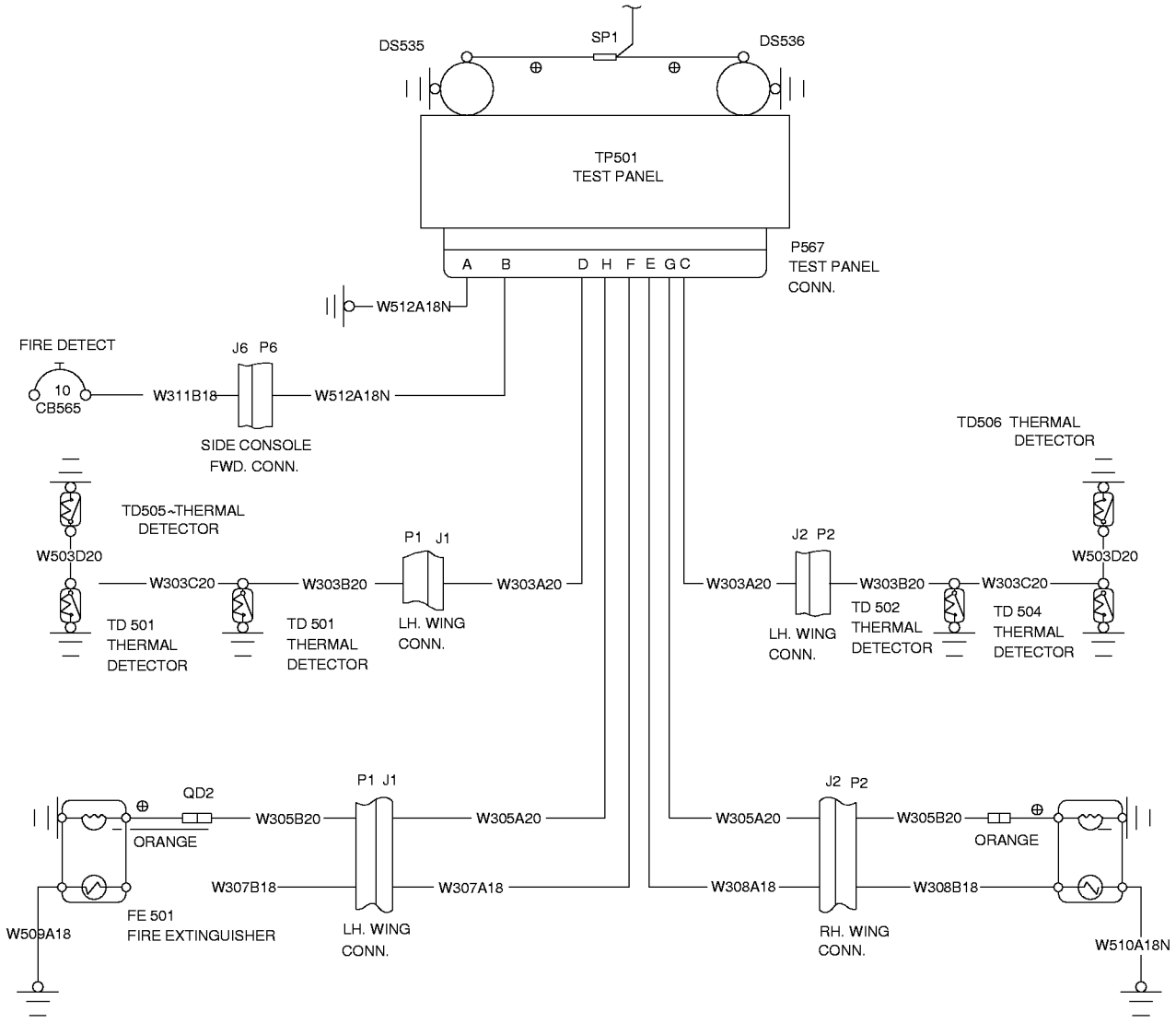

WIRING ASSY FIRE DETECT SYSTEM

5 CONNECT THIS WIRE TO SERIES OF LIGHTS BEING CONTROLLED BY THE APPLICABLE INSTRUMENT PANEL SECTION DIMMING CONTROL.

7 SPLICE WIRE SEGMENTS TOGETHER AT THIS POINT, CONNECTORS P1,J1,P2 AND J2 NOT APPLICABLE FOR 310 AIRCRAFT.

PARTS LISTS (REFERENCE ONLY)

SYMBOL	PART NO.	PART NAME
CB	7277-2-10	CIRCUIT BREAKER
FE101	30101101	FIRE EXTINGUISHER
FE102	30101101	FIRE EXTINGUISHER
SP1	S-1370-1	SPLICE
TD101	107-700	THERMAL DETECTOR
TD102	107-700	THERMAL DETECTOR
TD103	107-700	THERMAL DETECTOR
TD104	107-700	THERMAL DETECTOR
TD105	107-700	THERMAL DETECTOR
TD106	107-700	THERMAL DETECTOR
TP101	33370500	TEST FANEL

Fire Detection System
Figure 7 (Sheet 1)

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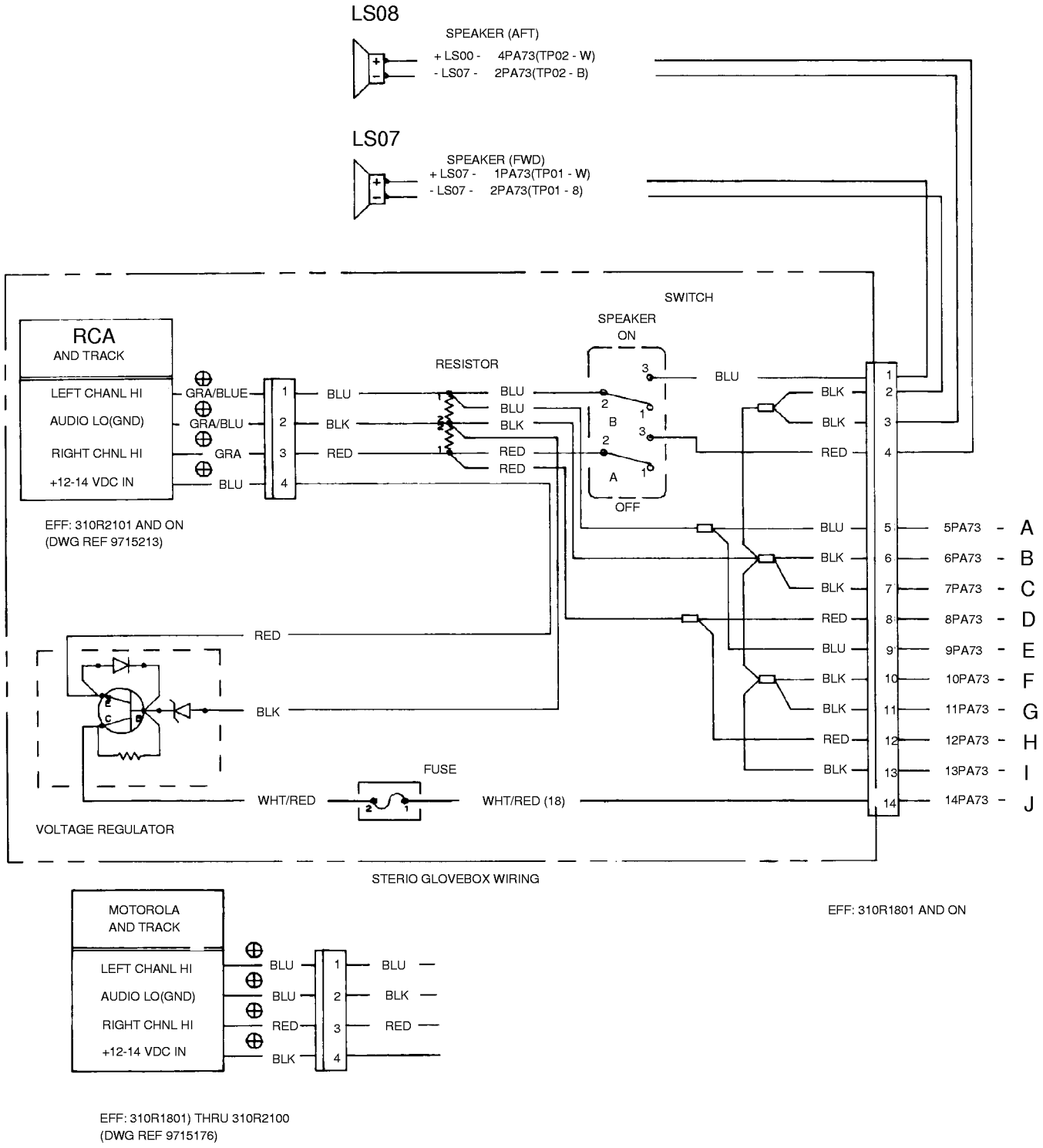

Stereo 8-Track
Figure 8 (Sheet 1)

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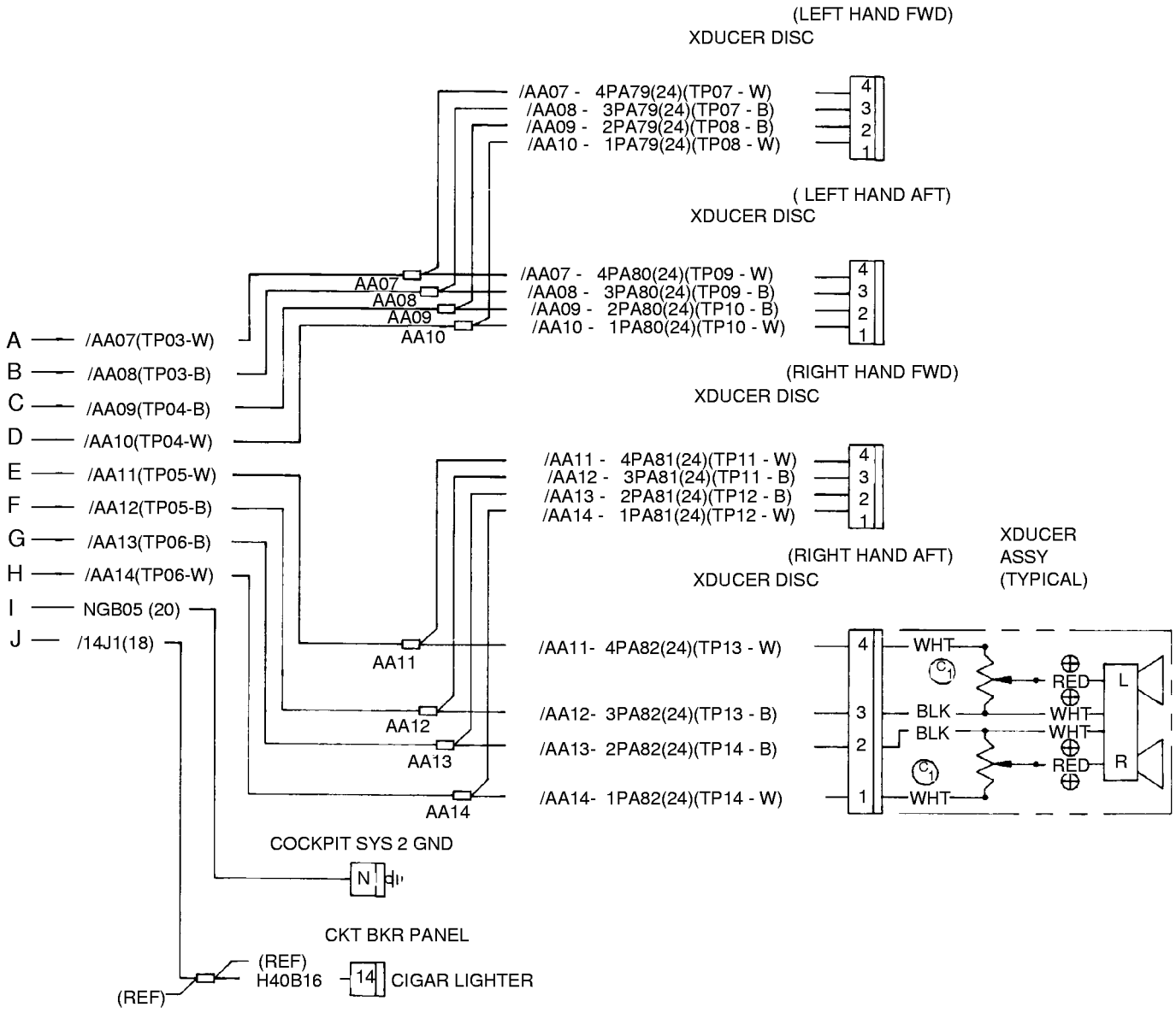

Stereo 8-Track
Figure 8 (Sheet 2)

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CHAPTER 25

EQUIPMENT/ FURNISHINGS

LIST OF EFFECTIVE PAGES

CHAPTER-SECTION-SUBJECT	PAGE	DATE
25-Title		
25-List of Effective Pages		
25-Record of Temporary Revisions		
25-Table of Contents		
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25-00-00	Pages 101-105	Jun 17/2005
25-00-00	Page 301	Jun 17/2005
25-00-00	Pages 401-410	Jun 17/2005
25-00-00	Pages 601-603	Jun 17/2005
25-10-00	Page 1	Jun 17/2005
25-10-00	Pages 401-404	Jun 17/2005
25-20-00	Page 1	Jun 17/2005
25-20-00	Pages 101-103	Jun 17/2005
25-20-00	Pages 401-404	Jun 17/2005
25-60-00	Pages 1-2	Jun 17/2005
25-60-00	Page 101	Jun 17/2005
25-60-00	Pages 401-403	Jun 17/2005
25-60-00	Page 601	Jun 17/2005

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RECORD OF TEMPORARY REVISIONS

Temporary Revision Number	Page Number	Issue Date	By	Date Removed	By

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Tool and Equipment Table . . . . . 25-00-00 Page 1

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Troubleshooting . . . . . 25-00-00 Page 101

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Center Individual Seat . . . . . 25-20-00 Page 401
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EMERGENCY EQUIPMENT - DESCRIPTION AND OPERATION . . . . . 25-60-00 Page 1
Emergency Locator Transmitter . . . . . 25-60-00 Page 1

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EMERGENCY EQUIPMENT - INSPECTION/CHECK . . . . . 25-60-00 Page 601
Emergency Locator Transmitter . . . . . 25-60-00 Page 601

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EQUIPMENT AND FURNISHINGS - GENERAL

1. Scope

A. This chapter describes those removable items of equipment and furnishings contained in the flight and passenger compartment.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Flight compartment describes equipment and furnishings located in the compartment above the floor and between the forward passenger partition and the forward pressure dome. Includes flight crew seats and glove compartment. Does not include cargo compartments.
   (2) Passenger compartment describes equipment and furnishings located in the areas where passengers are seated. Includes seats and lounges, but not dressing rooms.
   (3) Emergency equipment describes equipment carried for use in emergency procedures. Includes the emergency locator transmitter.

3. Description

A. Upholstery and Trim.
   (1) The airplane's interior upholstery and trim consists of upholstery panels, headliner, and trim. The upholstery panels and window trims are secured to the structure by screws. The headliner is attached to the structure by channels, hangers, and screws.
   (2) The main upholstery (side) panels are divided into upper and lower sections to provide for an electrical wire tunnel along the side of the fuselage. The upper and lower panels are connected together with the wire tunnel and arm rest covers.
   (3) The wing locker baggage area of each wing has upholstery installed and attached to the structure with retainers and screws. Optional nose baggage compartment upholstery may be installed in the nose section.

B. Carpet.
   (1) The airplane's carpet is installed in sections on the floor for ease of removal and installation. Screws secure the forward carpet on the floor along with covers and seat cover plates. The center and aft carpets are held in place by a hook-type fabric fastener around the outer perimeters. Screws secure the center and aft carpets on airplanes 310R0001 Thru 310R1576.

C. Cabin Stereo Equipment.
   (1) The cabin stereo equipment (optional) consists of the stereo tape player installed in the glove box, voltage regulator, headset transducer, four speakers, headset, and stereo headset case. The eight-track stereo switches automatically from track to track with continuous play or the push button control may be pressed for immediate track change.
   (2) The casette stereo player has a rewind feature, so a selection that has just been playing may be repeated, and a fast-forward feature to pass an unwanted selection, then automatically rewind at the end.

4. Tool and Equipment Table

A. Equivalent substitutes may be used for the following equipment:

Name	Number	Manufacturer	Use
Electronic Testing			
Multimeter	Model 260	Simpson Electric Co.	To measure voltage.
Ammeter	Model 1223	Simpson Electric Co.	To measure battery current.
Jackplug	P/N 750	Switchcraft Inc.	Connect to remote jack of ELT.

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Name	Number	Manufacturer	Use
General Cleaning			
Delchem Jet Wash	2271	Pennwalt Chemicals Corp. 2700 South Eastern Ave Los Angeles, CA	To wash exterior surface of the airplane.
Aerowash		Wyandotte Chemicals Corp. 8921 Dick Road Los Nietos, CA	To wash exterior surface of the airplane.
Paint Remover			
Delchem E-2	19B	Pennwalt Chemicals Corp. 2700 South Eastern Ave Los Angeles, CA	To strip paint.
Paint Remover	Turco 5556AF	Turco Products, Inc. Box 1055 Wilmington, CA	To strip paint.
Corrosion Removal			
Delchem	810	Pennwalt Chemicals Corp. 2700 South Eastern Ave Los Angeles, CA	To remove light corrosion or discoloration.
Pennwalt	715	Pennwalt Chemicals Corp. 2700 South Eastern Ave Los Angeles, CA	To remove moderate corrosion.
Quickbrite		Pennwalt Chemicals Corp. 2700 South Eastern Ave Los Angeles, CA	Corrosion removal.
Metal Glo #3, Metal Glo #4		Turco Products, Inc. Box 1055 Wilmington, CA	Corrosion removal.
Deicing Exterior Surfaces			
Deicing Fluid	WD-20	Jefferson Chemical Company Houston, TX	To remove ice and frost from control surfaces.
Pretreatment			
Iridite	14-2	Applied Research, Inc.	To protect aluminum against corrosion.
Alodine	1200S	Amchem Products, Inc.	To protect aluminum against corrosion.
Interior Cleaning			
Yosemite	Y-999	Yosemite Chemical Company 1248 Wholesale Street Los Angeles, CA	For cleaning vinyl coated fabrics, Mylar, Scotchcal murals, Polyplastex, leathers, vinyl flooring, Formica, linoleum, finished flexwood, or painted surfaces.

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Name	Number	Manufacturer	Use
Aliphatic Naphtha		Commercially Available	For cleaning vinyl coated fabrics, Mylar, Scotchcal murals, Polyplastex, leathers, vinyl flooring, Formica, linoleum, finished flexwood, or painted surfaces.
Host Dry Cleaning Compound		Host of California 2935 Coleridge Avenue Pasadena, California	For cleaning drapes, curtains, upholstery, fabrics, and carpet.
Wet Rug Shampoo		Commercially Available	For cleaning carpeting.
Perchlorethylene		Commercially Available	For spot cleaning carpet.
Stoddard Solvent	Fed Spec.	Commercially Available	For cleaning Nylon safety belts, Noryl plastic.
Mild Soap Detergent		Commercially Available	For cleaning Nylon safety belts, Noryl plastic.

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EQUIPMENT FURNISHINGS - TROUBLESHOOTING

1. Troubleshooting

A. This section contains a troubleshooting chart for the seats. Refer to Figure 101.

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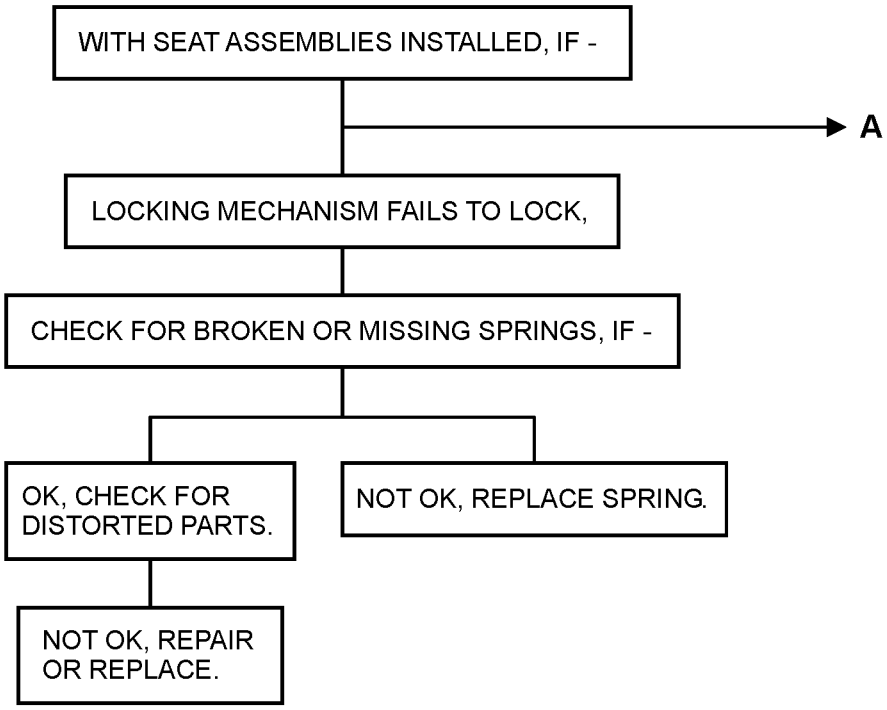

Troubleshooting Seat Assemblies
Figure 101 (Sheet 1)

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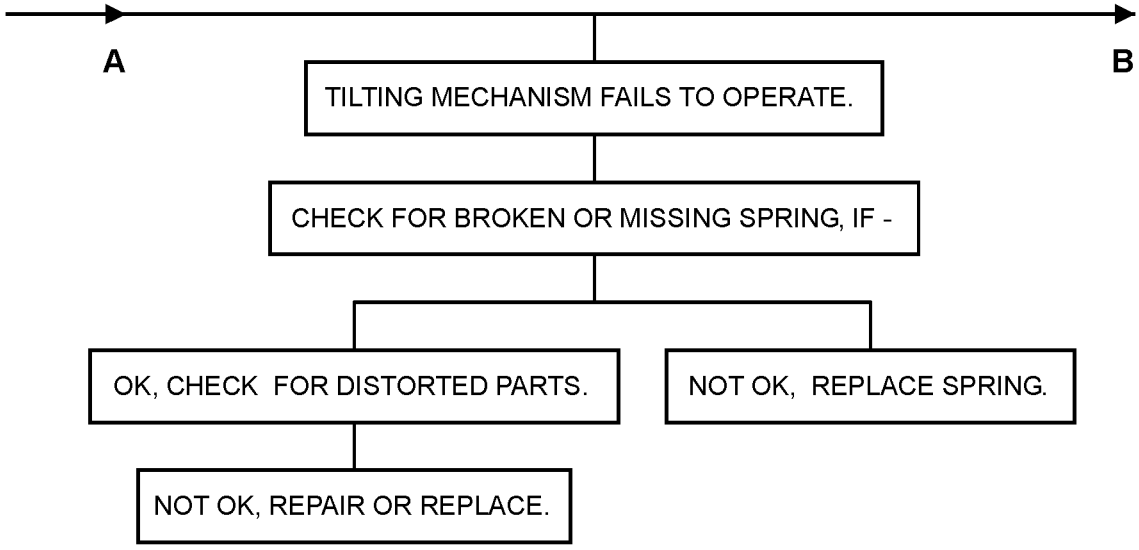

Troubleshooting Seat Assemblies
Figure 101 (Sheet 2)

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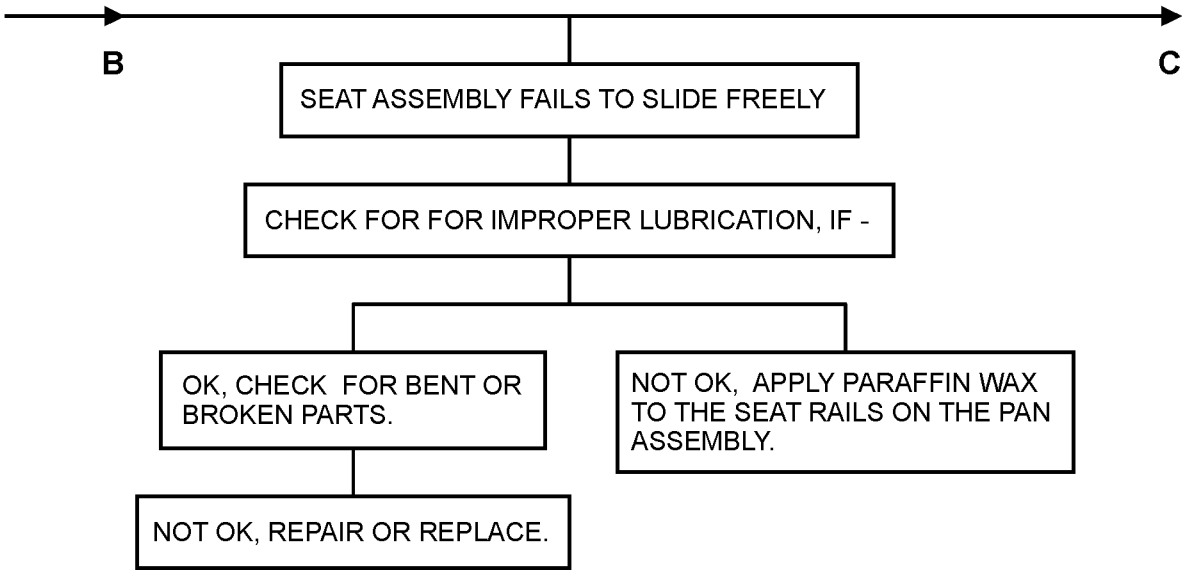

Troubleshooting Seat Assemblies
Figure 101 (Sheet 3)

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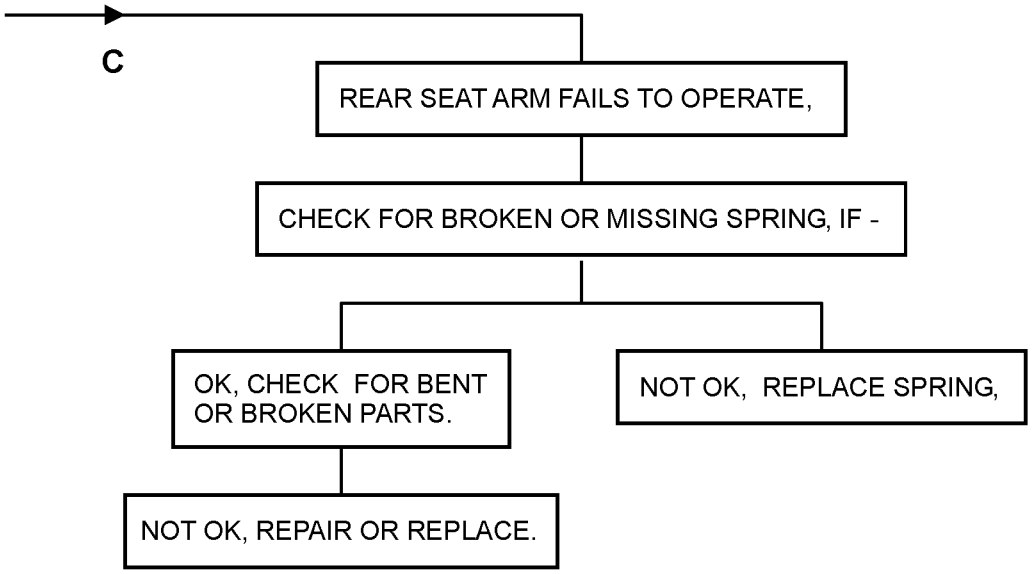

Troubleshooting Seat Assemblies
Figure 101 (Sheet 4)

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EQUIPMENT FURNISHINGS - SERVICING

1. Interior Decorative Materials

A. Clean interior decorative materials with Yosemite Y-999 (or equivalent) as follows:
   (1) Spray or wipe on over the soiled surface.
   (2) Wipe off with a clean cloth dampened in water.

B. Clean interior decorative materials with Aliphatic Naphtha as follows:
   (1) Wipe with a clean cloth dampened with naphtha and wipe dry with a clean cloth.
   (2) When removing tar, asphalt, or chewing gum; remove as much as possible with a knife. Apply naphtha to the residue and then wipe dry with a clean cloth; this has a buffing effect that eliminates the possibility of stain from the solution.

2. Rugs, Drapes, Curtains, and Upholstery Fabrics

A. Clean Rugs, Drapes, Curtains and Upholstery Fabrics as follows:
   (1) Dry-clean commercially.
   (2) Use Host dry cleaning compound:
      (a) Sprinkle the compound liberally on the soiled area.
      (b) Rub the compound into the soiled area.
      (c) Remove the compound with a vacuum cleaner.

      NOTE: This compound is nonflammable and may be used on fueled airplane.

   (3) Wet shampoo:
      (a) Remove carpet or upholstery from the airplane. If at all possible, use the spot cleaning method.
      (b) Vacuum the carpet and upholstery, removing as much dirt and dust as possible.
      (c) Place a tablespoon of shampoo in a pail and direct a jet of water into the shampoo to produce abundant foam.
      (d) Apply the foam uniformly over the surface to be cleaned.
      (e) Remove the suds by wiping with a brush or clean cotton cloth. Since there is very little moisture in the foam, wetting of the fabric or retention of moisture will not occur.

      CAUTION: Use of a mechanical shampooer may distort the carpet.

      (f) If tar, asphalt, or chewing gum is present, remove as much as possible by mechanical means; then perform steps (a) through (d).
   (4) Spot cleaning:
      (a) Spot clean tufted carpet in the airplane, if at all possible, rather than completely removing the carpet for shampooing.
      (b) Saturate a clean white or colorless cloth with Perchloroethylene solution.

      CAUTION: Do not pour Perchloroethylene solution directly on the carpet.

      (c) Hand rub the Perchloroethylene saturated cloth in a circular motion on the soiled spot.

      CAUTION: Do not use a mechanical shampooer; it will distort the carpet.

      (d) An upholstery band shampooer may be utilized on difficult to clean areas.
   (5) For cleaning acrylic plastic, refer to Cleaning Windows.

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EQUIPMENT FURNISHINGS - REMOVAL/INSTALLATION

1. Upholstery and Trim

A. Removal/Installation.
   (1) For removal and installation of upholstery and trim, refer to Figure 401 and Figure 402.

2. Carpet

A. Removal (Refer to Figure 403).
   (1) Remove front and rear seats. (Refer to Flight Crew Seats - Removal/Installation and Passenger Compartment - Removal and Installation).
   (2) Remove the regulator shield by removing attaching screws. The shield is located under the copilot's seat
   (3) Remove screws from angles securing the bulkhead carpet. Remove angles and bulkhead carpet.
   (4) Remove left and right cover plates by removing attaching screws.
   (5) Remove the scuff plates by removing the attaching screws.
   (6) Remove the control column boot, retainer, and cover by removing screws.
   (7) Remove pilot and copilot's carpet by removing attaching screws and freeing carpet from glued insulation.
   (8) Remove center carpet by lifting up the outer edges and removing carpet.
   (9) Remove the aft carpet by lifting up the outer edges and removing carpet.
   (10) For removal of nose baggage or wing locker baggage carpet, refer to Figure 403.

B. Installation (Refer to Figure 403).
   (1) Install aft carpet on floor and secure, pressing down on the outer edges.
   (2) Install center carpet on floor and secure, pressing down on the outer edges.
   (3) Install the pilot's and copilot's carpet on the floor with attaching screws.
   (4) Install left and right cover plates using attaching screws.
   (5) Install bulkhead carpet with angles and attaching screws.
   (6) Install control column cover, boot, and retainer using screws.
   (7) Install scuff plates and secure with screws.
   (8) Install the regulator shield and secure with screws.
   (9) Install front and rear seats (Refer to Flight Crew Seats - Removal/Installation and Passenger Compartment - Removal and Installation).
   (10) If nose baggage or wing locker baggage carpet is to be installed, refer to Figure 403.

3. Seat Belts

A. Removal (Refer to Figure 404).
   (1) Remove escutcheon from floorboard.
   (2) Remove cotter pin, nuts, washers, spacers, and bolts securing seat belts to structure, and remove seat belts.

B. Installation (Refer to Figure 404).
   (1) Secure seat belts to structure, using bolts, washers, spacers, nuts, and cotter pins.
   (2) Install escutcheon to floorboard.

   NOTE: Make sure seat belts are properly threaded through the seat belt bracket to assure length of seat belts can be adjusted

4. Shoulder Harness

A. Removal (Refer to Figure 404).
   (1) Remove mounting bracket cup.
   (2) Remove bolt, washer, and spacer.
   (3) Remove shoulder harness.

B. Installation (Refer to Figure 404).
   (1) Make sure shoulder strap is properly threaded through bracket.

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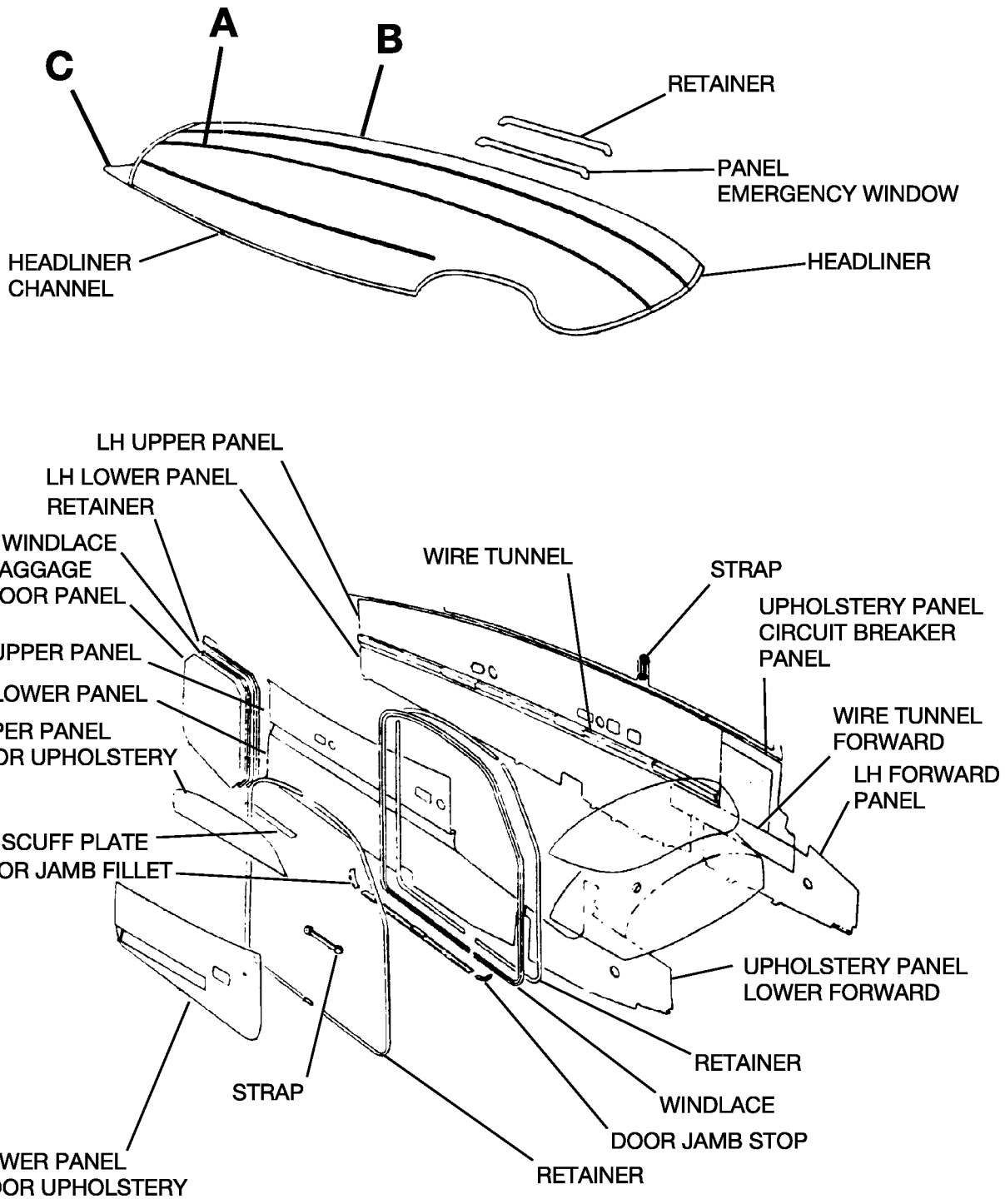

Upholstery Installation
Figure 401 (Sheet 1)

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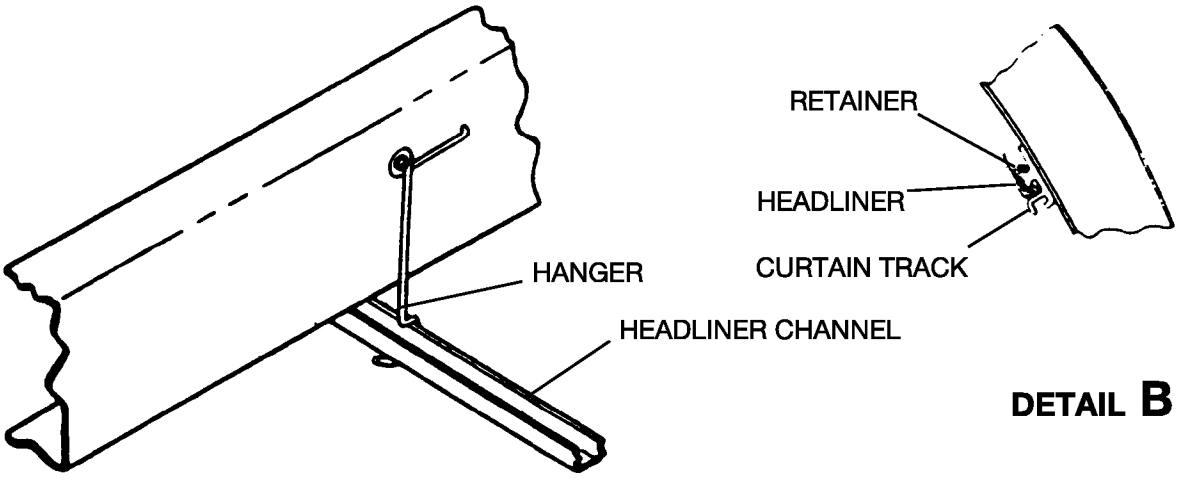
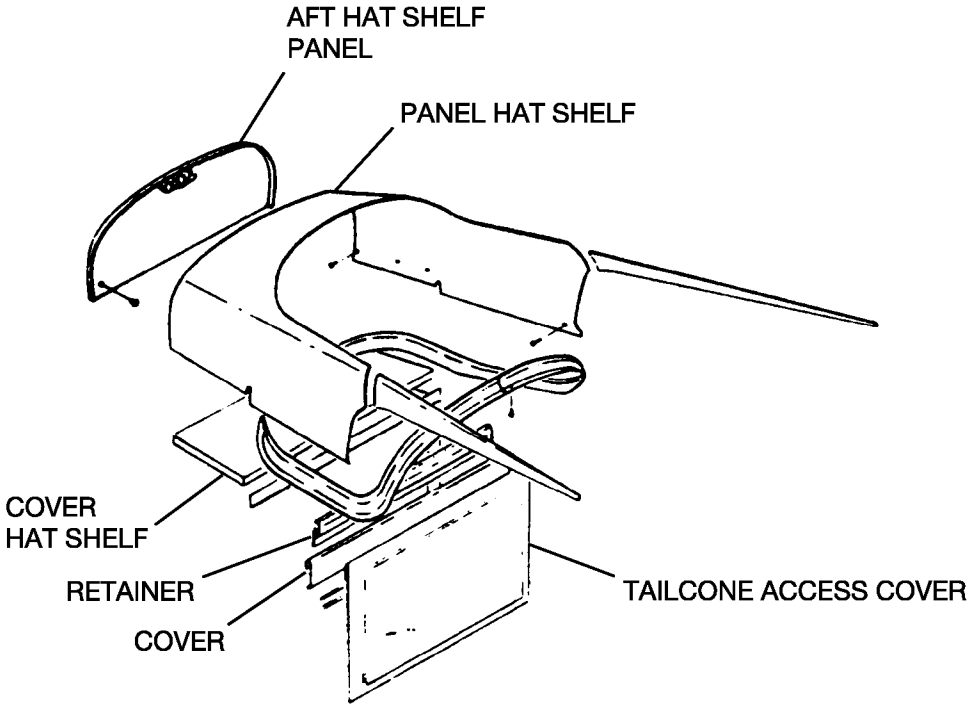


DETAIL A

DETAIL B



DETAIL C

Upholstery Installation
Figure 401 (Sheet 2)

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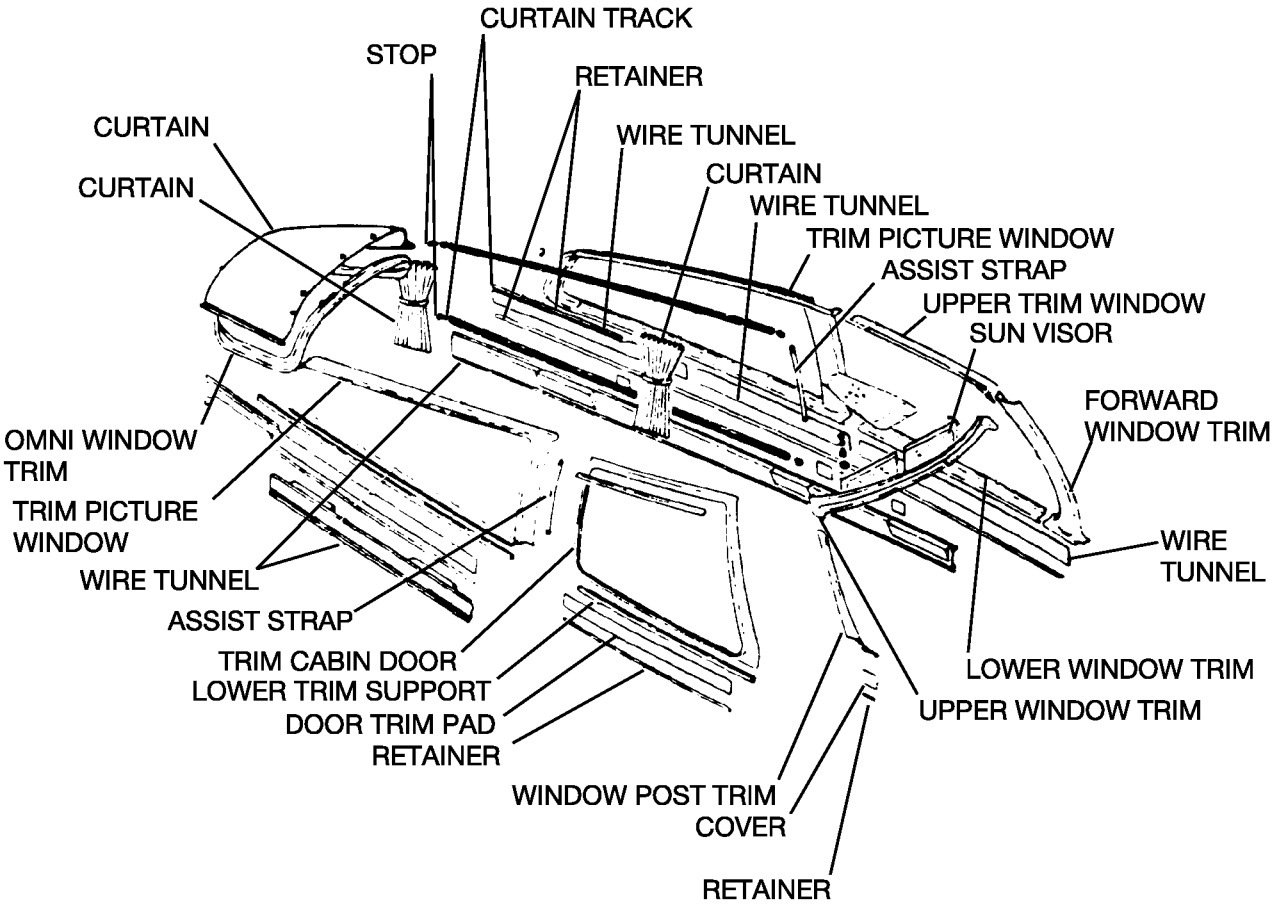

Upholstery Trim Installation
Figure 402 (Sheet 1)

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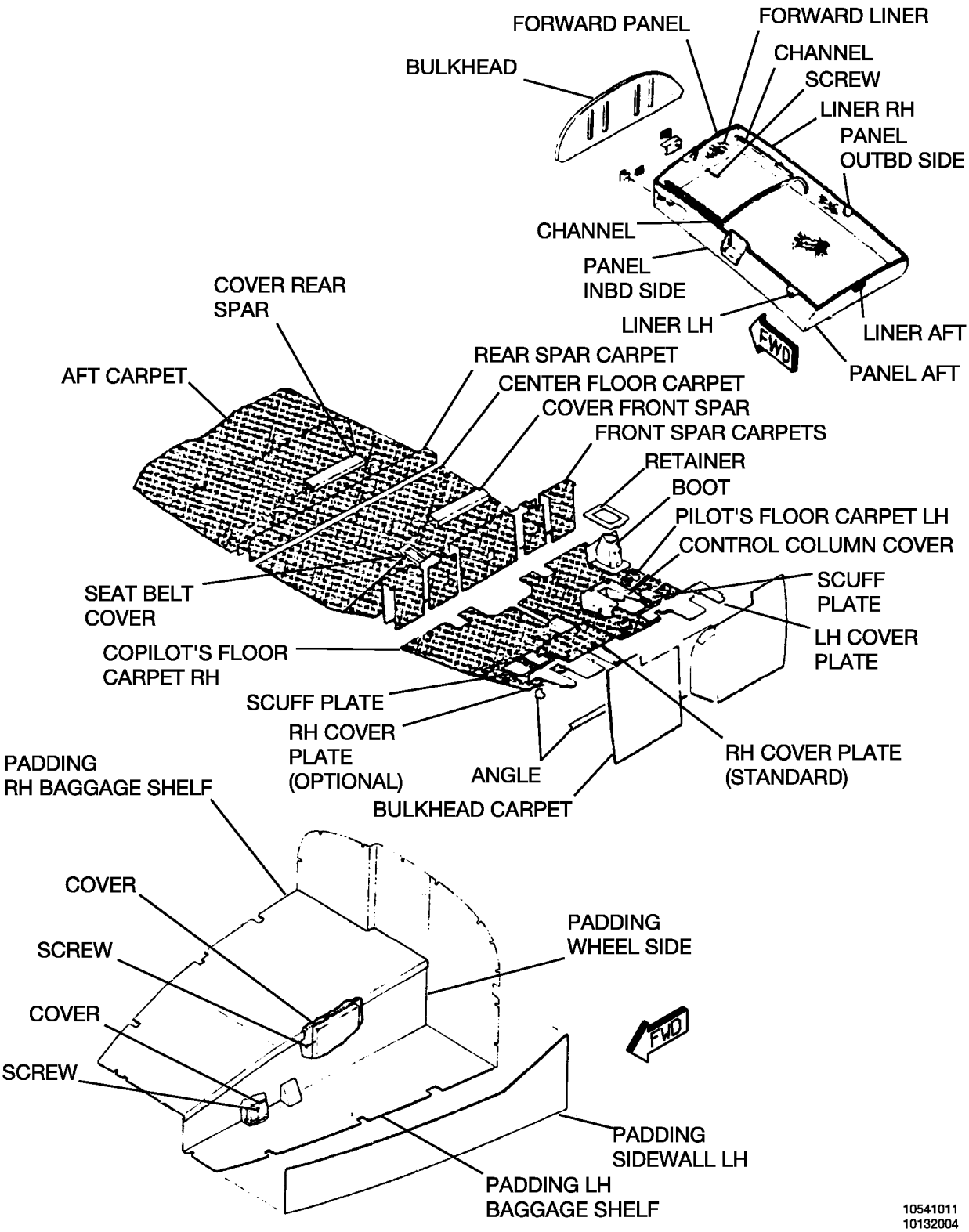

Carpet Installation
Figure 403 (Sheet 1)

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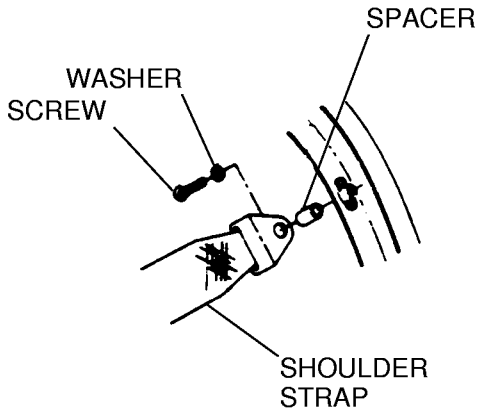
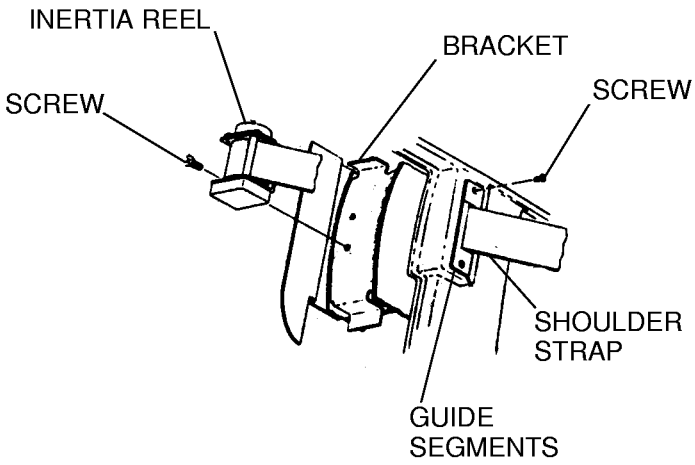
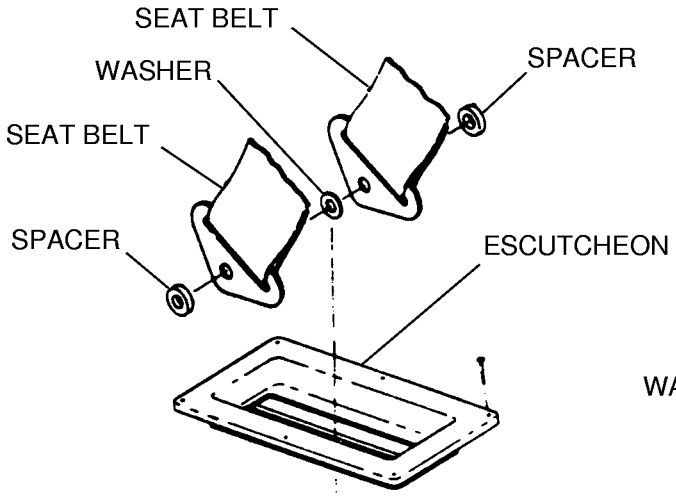
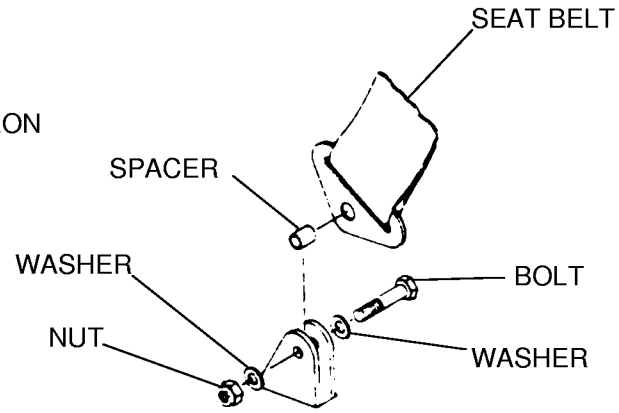


SHOULDER HARNESS INSTALLATION (STANDARD)

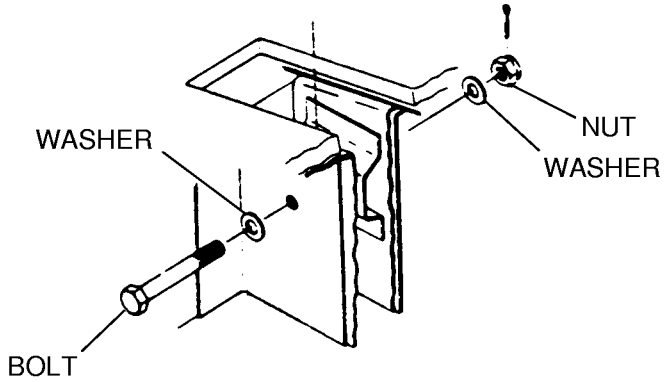


INERTIA REEL INSTALLATION (OPTIONAL)





310R0001 THRU 310R0500
SEAT BELT INSTALLATION (OUTBOARD)



310R0001 THRU 310R0500
SEAT BELT INSTALLATION (INBOARD)

Seat Belt and Shoulder Harness Installation
Figure 404 (Sheet 1)

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(2) Secure shoulder strap to structure, using screw, washer, and spacer.
(3) Install mounting bracket cup.

5. Inertia Reel (Optional)

A. Removal (Refer to Figure 404).
(1) Remove screws securing guide segments and remove guide segments.
(2) Remove window trim.
(3) Pull out on shoulder strap to gain access to screws securing inertia reel to bracket and remove inertia reel.

B. Installation (Refer to Figure 404).
(1) Secure inertia reel to bracket with screws.
(2) Install window trim.
(3) Install guide segments to window trim, using screws.

6. Seat Belt Bushing

A. Replacement.

NOTE: The following procedure applies to restraint systems with the connector rivet on the seat belt buckle as well as those with the connector rivet on the shoulder harness assembly.

(1) Refer to Figure 405. If the bushing or plastic washer and O-ring(s) are missing, proceed to step (3).
(2) Completely remove the damaged bushing or plastic washer and O-ring(s) from the stem of the connector rivet, being careful not to scratch the surface or create burrs on the surface of the rivet that will contact the new bushing.
(3) Clean the rivet stem of any dirt, grease, or other foreign material.

WARNING: Use care when working with hot liquid to prevent injury.

(4) Heat the new replacement S-2237-3 bushing by suspending it in boiling water for one minute.
(5) Remove the bushing from boiling water.
(6) Refer to Figure 405. Using gloves, stretch the new bushing over the rivet head and onto the stem.
(7) Allow the installed bushing to cool to ambient temperature.
(8) With the bushing installation complete, check the shoulder harness to seat belt connection engagement friction. If the connector is loose (friction is not sufficient into ensure the shoulder harness and seat belt are held together), replace the restraint system assembly.

7. Stereo Tape Player

A. Removal (Refer to Figure 406).
(1) Remove screw securing stereo to bracket.
(2) Disconnect electrical connector from stereo.
(3) Remove stereo from glove box.

B. Installation (Refer to Figure 406).
(1) Position stereo in glove box and connect electrical connector.
(2) Install stereo in bracket and secure with screw and washers.
(3) Check operation of stereo.

8. Stereo Speakers

NOTE: Removal and installation for the stereo speakers are typical.

A. Removal (Refer to Figure 406).
(1) Remove headliner as necessary to gain access to stereo speakers.
(2) Remove screw securing speaker to baffle and remove speaker.

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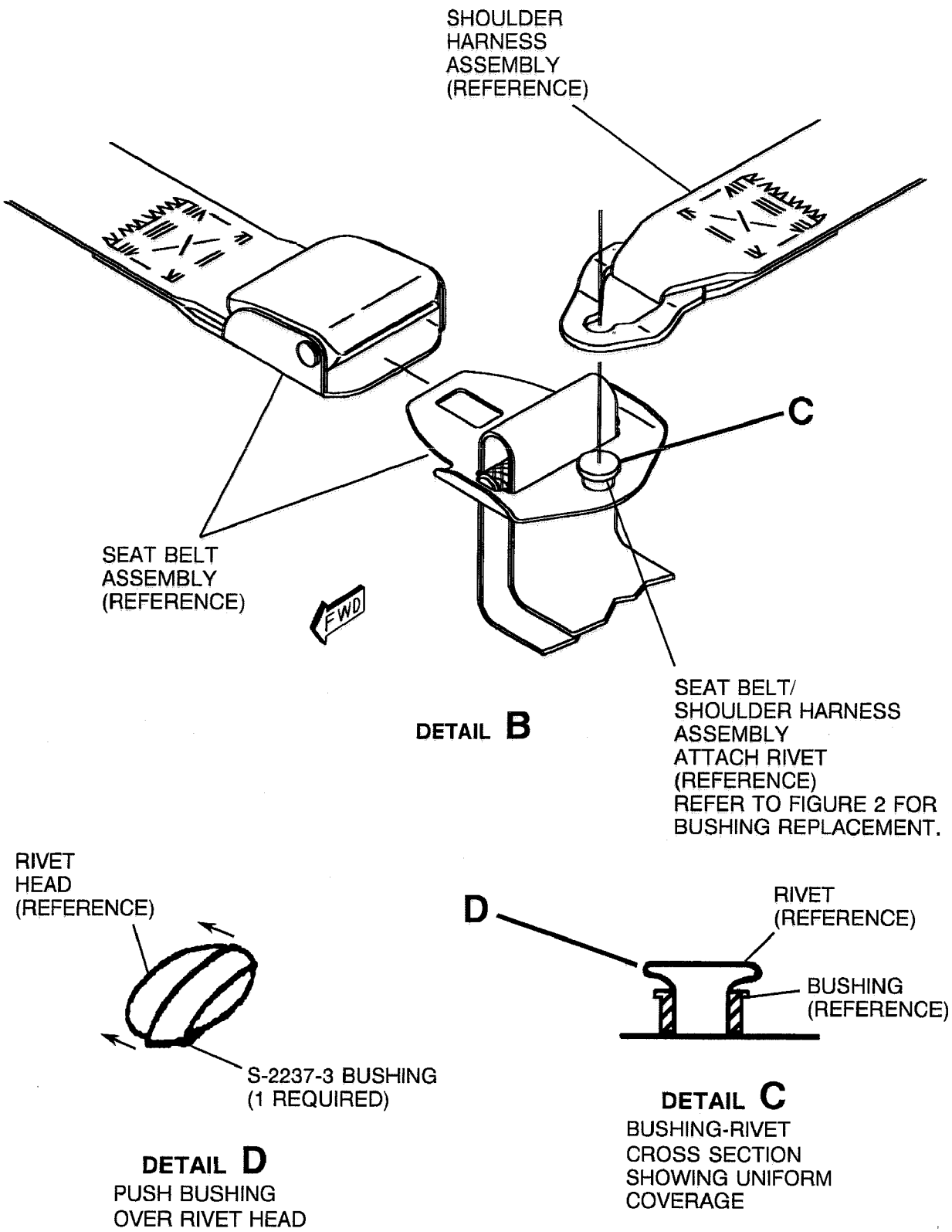

Restraint system Connector Rivet (Rivet in seat belt buckle shown. Rivet in shoulder harness similar.)
Figure 405 (Sheet 1)

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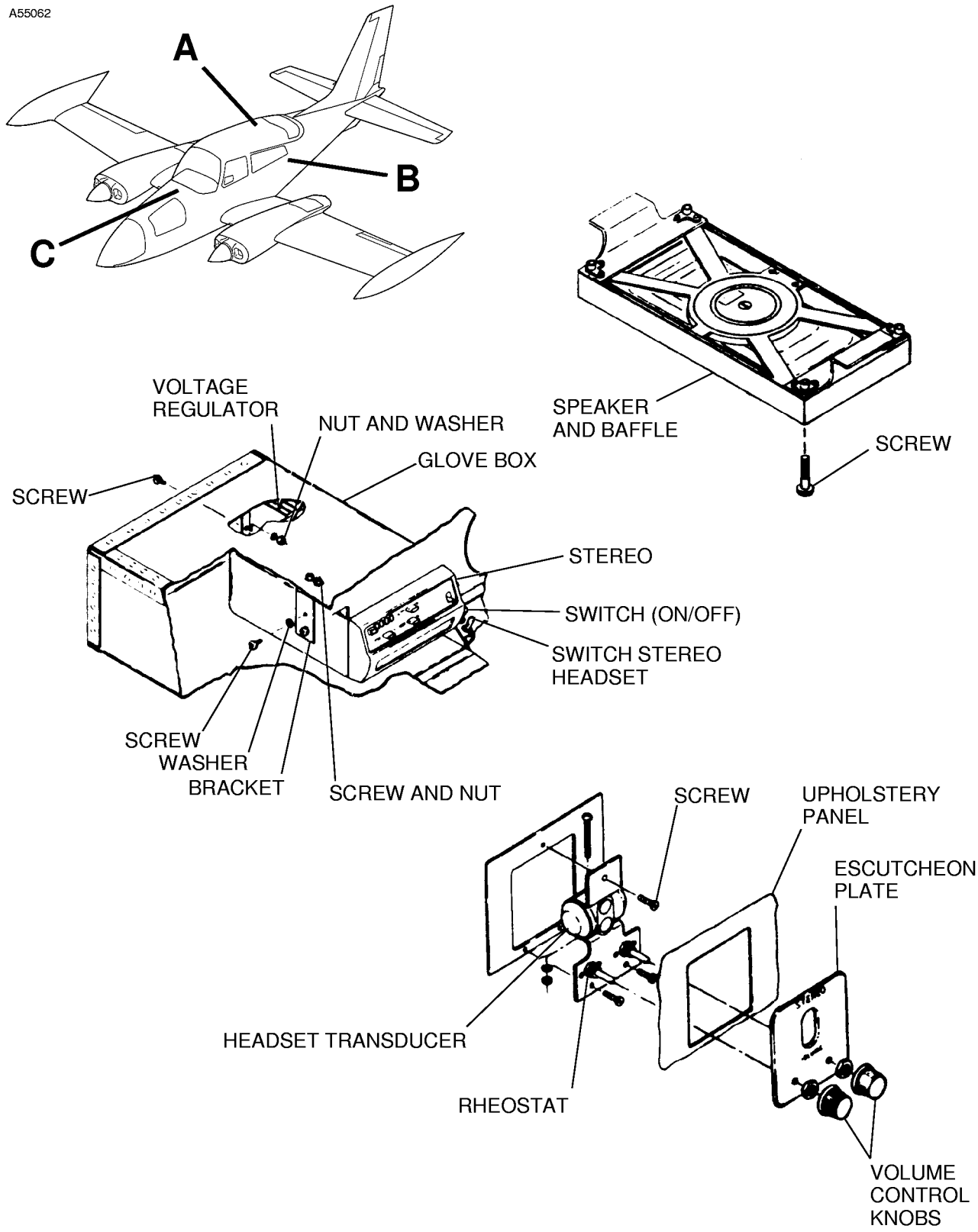

Stereo Components
Figure 406 (Sheet 1)

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(3) Tag and disconnect speaker wires.

B. Installation (Refer to Figure 406).
(1) Connect speaker wires and remove tags.
(2) Position speaker in baffle and secure with screws.
(3) Reinstall headliner.

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EQUIPMENT FURNISHINGS - INSPECTION/CHECK

1. Carpet

A. Inspection.
(1) Clean carpet (Refer to Equipment/Furnishings - Servicing).
(2) Inspect carpet for excessive wear and security to the floorboard.

2. Seats

A. Inspection.
(1) Clean seats (Refer to Equipment/Furnishings - Servicing).
(2) Inspect the front seats for binding on seat rails.
(3) Inspect for proper functioning of adjusting-handles and tilting mechanism.
(4) If electrically operated seats are installed (optional), actuate switches and observe for smooth operation. Replace components which show evidence of excessive wear or binding.
(5) Lubricate seat base rollers with oil as required. Wax seat rails with automotive wax to reduce friction between seat rollers and seat rails.

3. Seat Belts

A. Inspection.
(1) Clean seat belts (Refer to Equipment/Furnishings - Servicing).

CAUTION: Never use thinner or strong solutions on seat belts.

(2) Inspect webbing material for fraying.
(3) Inspect seat belt installation for security.
(4) For seat restraint systems which incorporate the connector rivet in the seat belt buckle, as shown in Figure 601, inspect each assembly at the bushing surrounding the connector rivet.

NOTE: The purpose of this bushing is to hold the shoulder restraint belt securely to the seat belt portion of the restraint system.

(a) Refer to Figure 601. Inspect for a missing, worn, cracked, broken, or loose bushing. Determine if the belts remain held together by the bushing friction when the two are engaged.
(b) If the bushing is missing, worn, cracked, broken, or does not provide sufficient friction to hold the shoulder harness belt connector onto the seat belt connector rivet, then the bushing should be replaced. Refer to Equipment Furnishing - Removal/Installation.
(5) For seat restraint systems which incorporate the connector rivet in the shoulder harness buckle, as shown in Figure 602, inspect the shoulder harness to seat belt connection for excessive looseness and O-ring condition.
(a) Refer to Figure 602. Inspect for a missing, worn, cracked, broken, or loose plastic washer and/or O-ring(s) under the washer. Determine if the belts remain held together by the washer/O-ring friction when the two are engaged
(b) If the plastic washer and/or O-ring(s) under the washer are missing, worn, cracked, broken, or do not provide sufficient friction to hold the shoulder harness belt connector rivet onto the seat belt connector, then the plastic washer and O-ring(s) under the washer should be replaced with a new S-2237-3 bushing. Refer to Equipment Furnishing - Removal/ Installation.

4. Upholstery

A. Inspection.
(1) Clean upholstery (Refer to Equipment/Furnishings - Servicing).
(2) Inspect upholstery for general condition and wear. Observe areas where chafing from other equipment might occur, thus damaging the upholstery panels.

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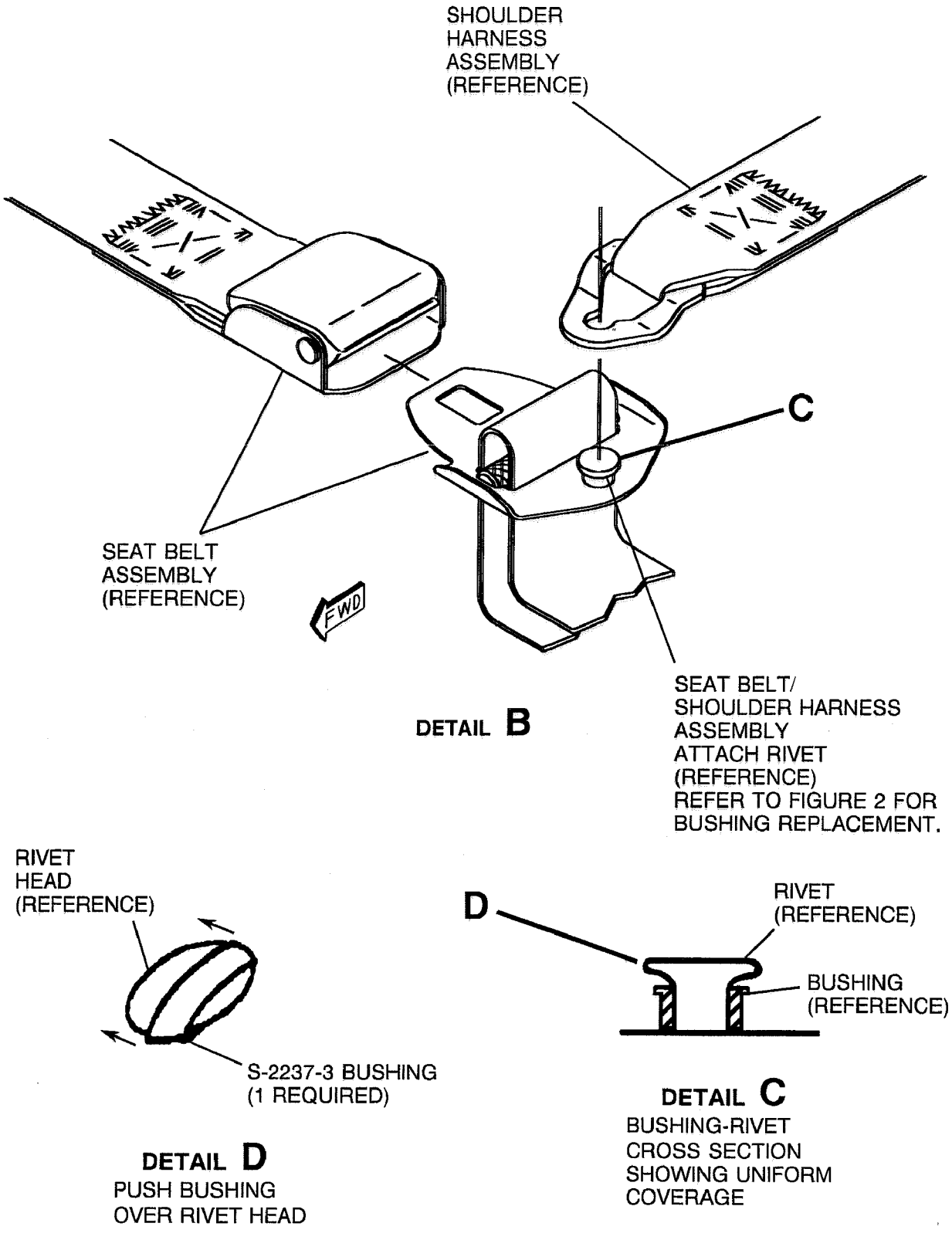

Restraint System with Connector Rivet in Seat Belt Buckle.
Figure 601 (Sheet 1)

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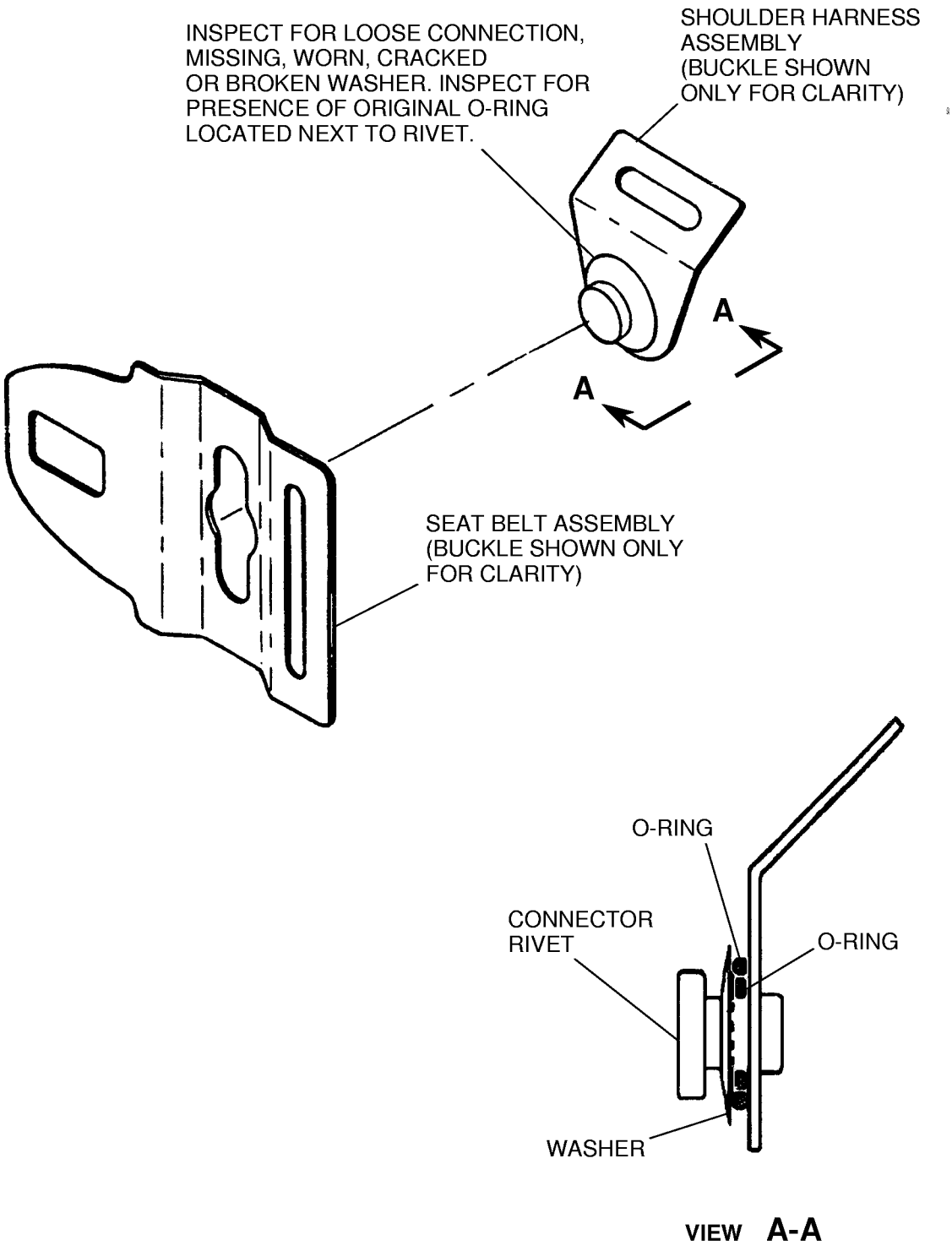

Restraint System with Connector Rivet in Shoulder Harness Assembly.
Figure 602 (Sheet 1)

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FLIGHT COMPARTMENT - DESCRIPTION AND OPERATION

1. Pilot/Copilot Seats

A. The standard pilot and copilot seats are identical. The seats are adjustable to the forward/aft and recline position by the two knobs located on the front of the seat.

2. Pilot/Copilot Manual and Electrical Adjustable Seat

A. Two different optional pilot and copilot seats can be installed in the airplane, either manual or electrical operated. The difference between the manual and electrical is the electrical seat utilizes electric motors in lieu of the manual cranks for the up and down and tilting movements.

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FLIGHT COMPARTMENT - REMOVAL/INSTALLATION

1. Pilot/Copilot Seats

A. Removal (Refer to Figure 401).
(1) Pull on seat right-hand handle and tilt the seat back as far as possible.
(2) Remove two bolts and nuts securing the seat front stop plates on both sides of the seat pan.
(3) Remove stop plates.
(4) Pull up on the fwd and aft adjusting knob and slide the seat aft to remove it from the tracks.
(5) Remove the seat from the aircraft and disassemble and assemble front seat in accordance with Figure 401.

B. Installation (Refer to Figure 401).
(1) Pull up on seat right-hand adjusting handle and tilt the seat as far as possible.
(2) Install seat pan assembly on floorboard seat supports.
(3) Pull up on the left-hand adjusting handle and slide seat forward until the rear seat stops comes to rest against the seat supports.
(4) Install the front stop plates on seat pan with bolts and nuts.

WARNING: After seat has been installed, ensure that stop plate has been installed properly and that the seat adjustment mechanism functions properly.

2. Pilot/Copilot Manual and Electrical Adjustable Seat

A. Removal (Refer to Figure 402).
(1) Raise seat to the highest position.
(2) Remove front seat stops on each side of the rail by removing nuts and bolts.
(3) If electric seat is installed, tag and disconnect wiring.
(4) Pull up on seat stop handle and slide seat aft and remove seat from its mountings.
(5) If disassembly and assembly are required, refer to Figure 402.

B. Installation (Refer to Figure 402).

NOTE: Prior to installation, it is recommended that seat back reinforcing straps be installed in accordance with Service Bulletin MEB89-3, if not already accomplished (Refer to Figure 403).

(1) Insert seat on seat rails and slide forward.
(2) Pull up on seat stop handle and allow seat to move forward far enough to install front seat stops.
(3) If electric seat is being installed, connect wiring and remove tags.
(4) Install front seat stops with bolts and nuts.
(5) If seat is electrical, turn on electrical power and check seat operation.
(6) If seat is not electrical, check operation using cranks provided on the front of the seat.

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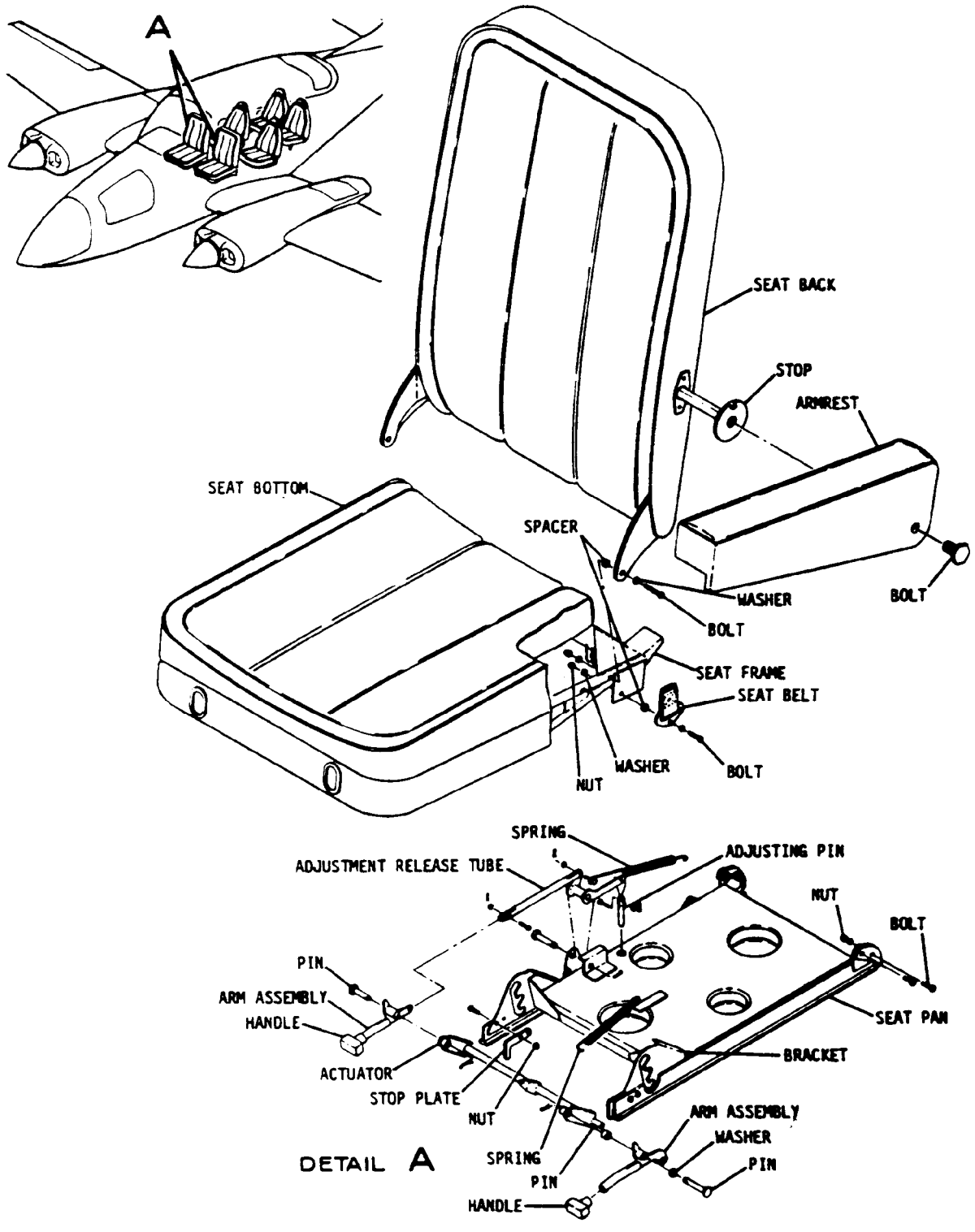

Pilot/Copilot Seat Installation
Figure 401 (Sheet 1)

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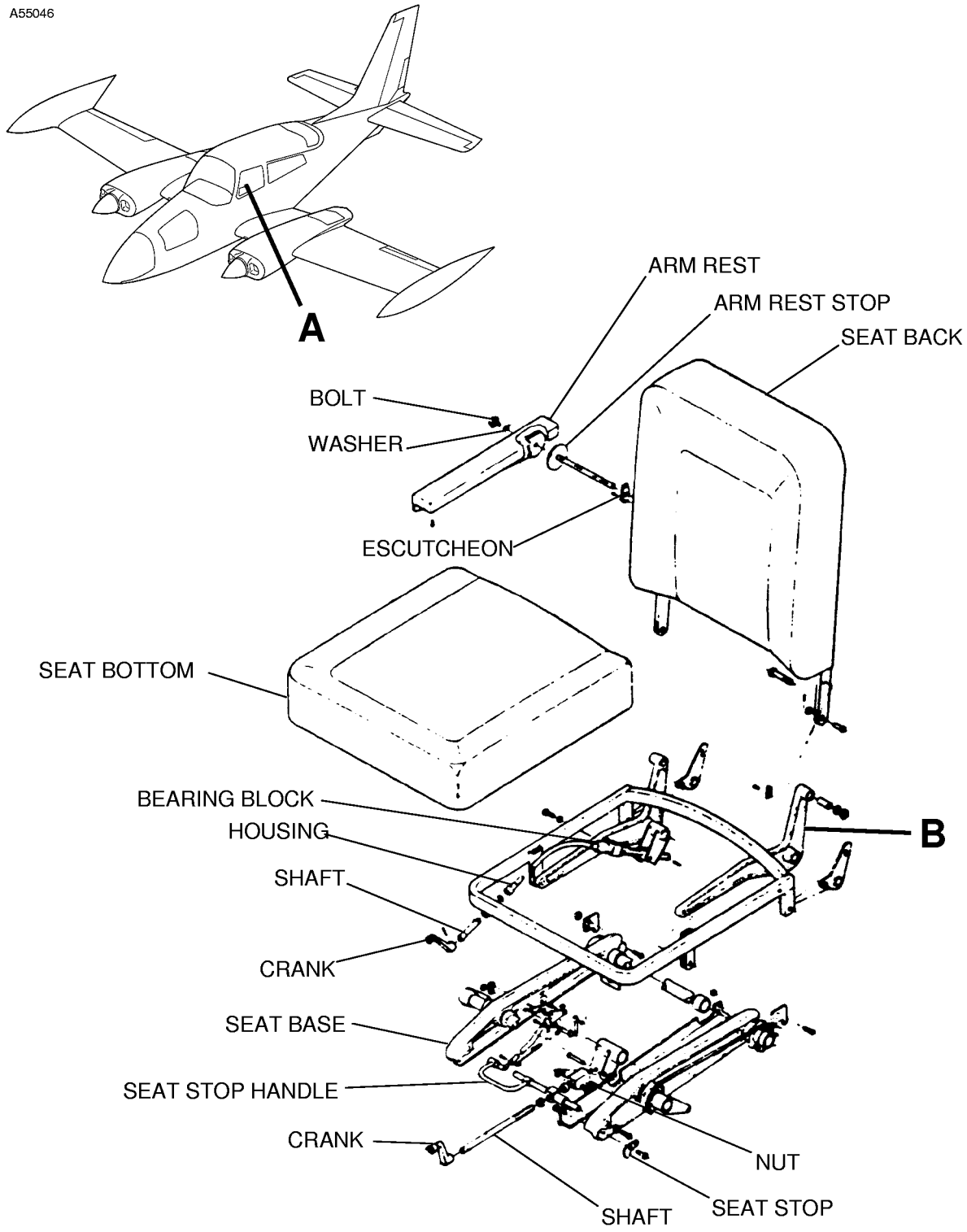

MANUAL ADJUSTABLE SEAT
DETAIL A

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Pilot/Copilot Manual and Electrical Adjustable Seat
Figure 402 (Sheet 1)

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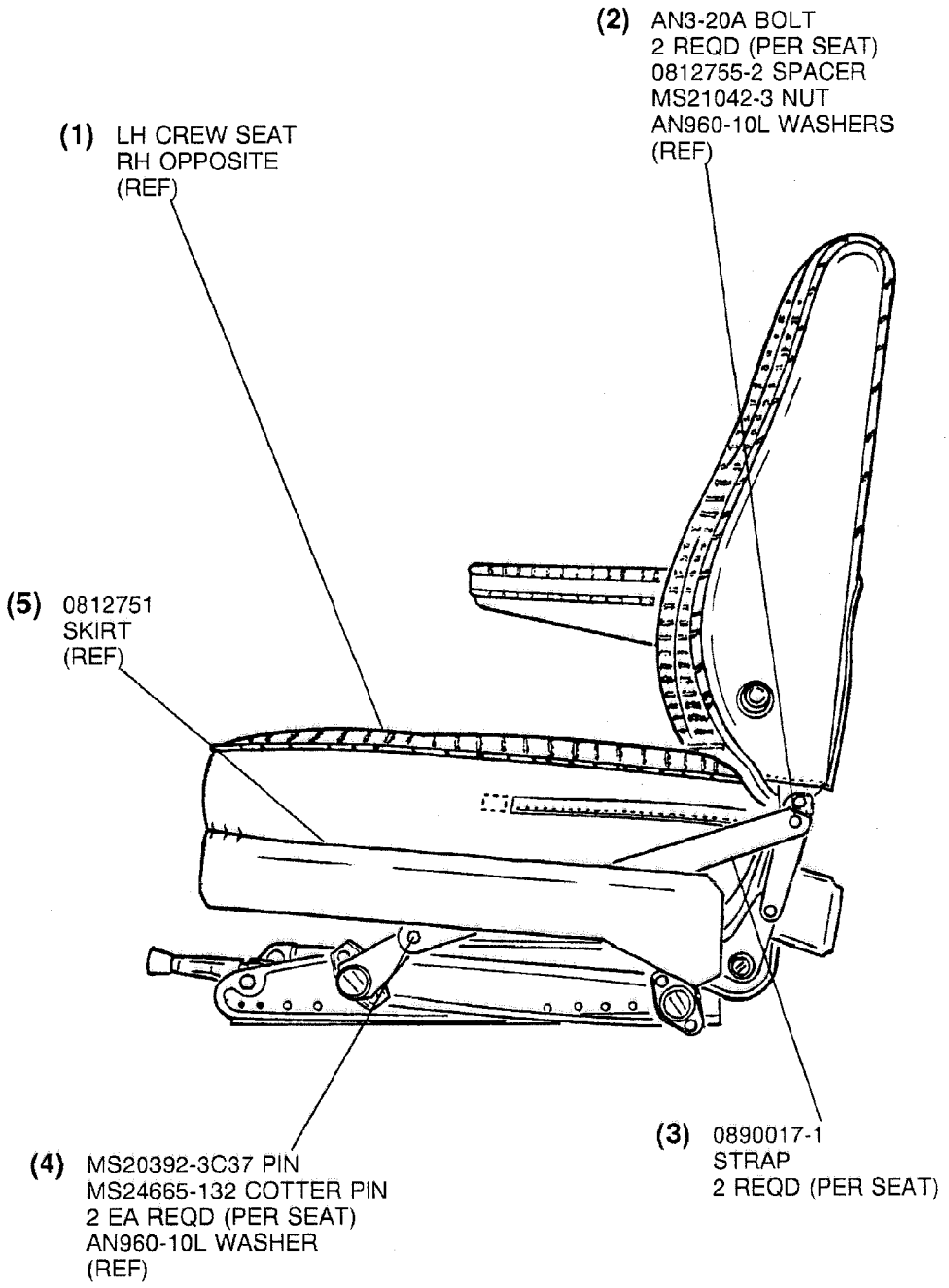

Seat Back Reinforcing Strap Installation (Airplanes Incorporating MEB89-3).
Figure 403 (Sheet 1)

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PASSENGER COMPARTMENT - DESCRIPTION AND OPERATION

1. Reclining Rear Seat

A. The rear seat is a double seat incorporating individual seat reclining adjustments. The seat is secured to the floor structure with bolts.

2. Center Individual Seats

A. Individual center seats are optional. The seats are mounted on seat tracks and may be adjusted forward and aft.

3. Aft Seats

A. The individual aft seats are optional. The seats are secured to the floor structure with quick-disconnect fasteners. Each seat incorporates an adjustable mechanism and may be adjusted to the recline position.

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PASSENGER COMPARTMENT - TROUBLESHOOTING

1. Troubleshooting Reclining Rear Seat

A. This section contains a troubleshooting chart for the reclining rear seat. Refer to Figure 101.

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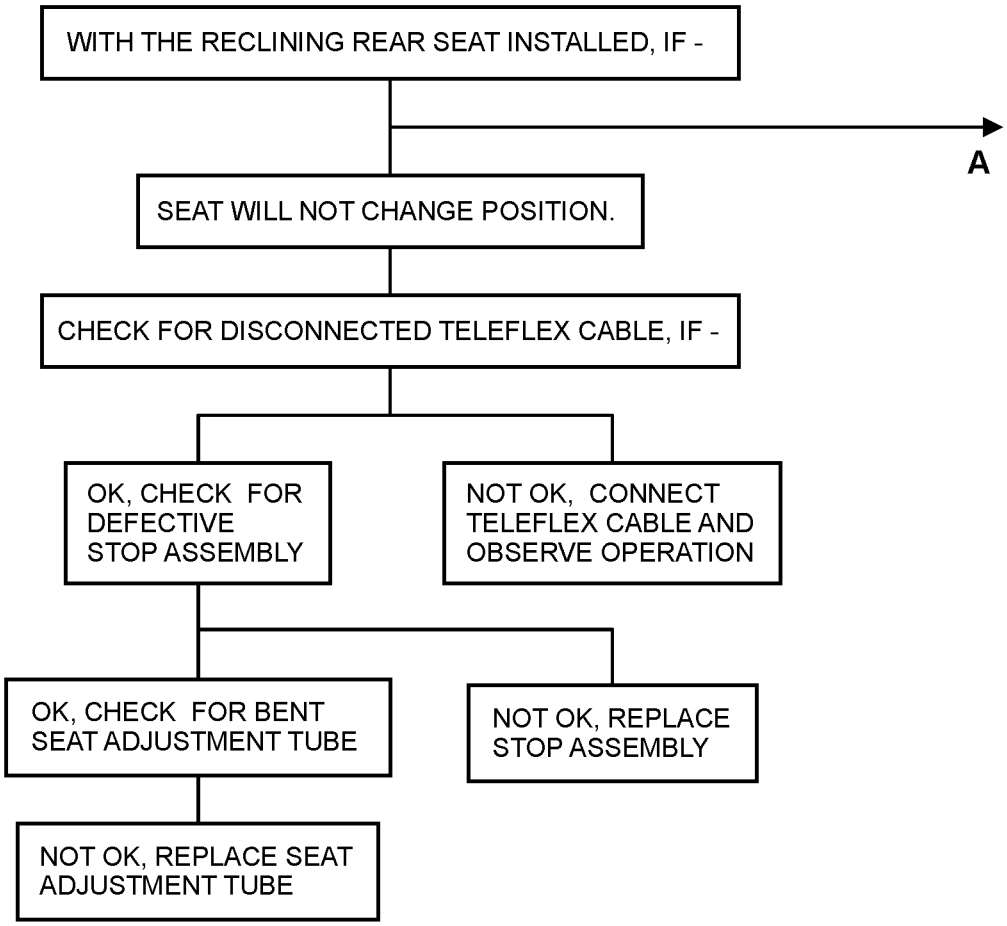

Troubleshooting the Reclining Rear Seat
Figure 101 (Sheet 1)

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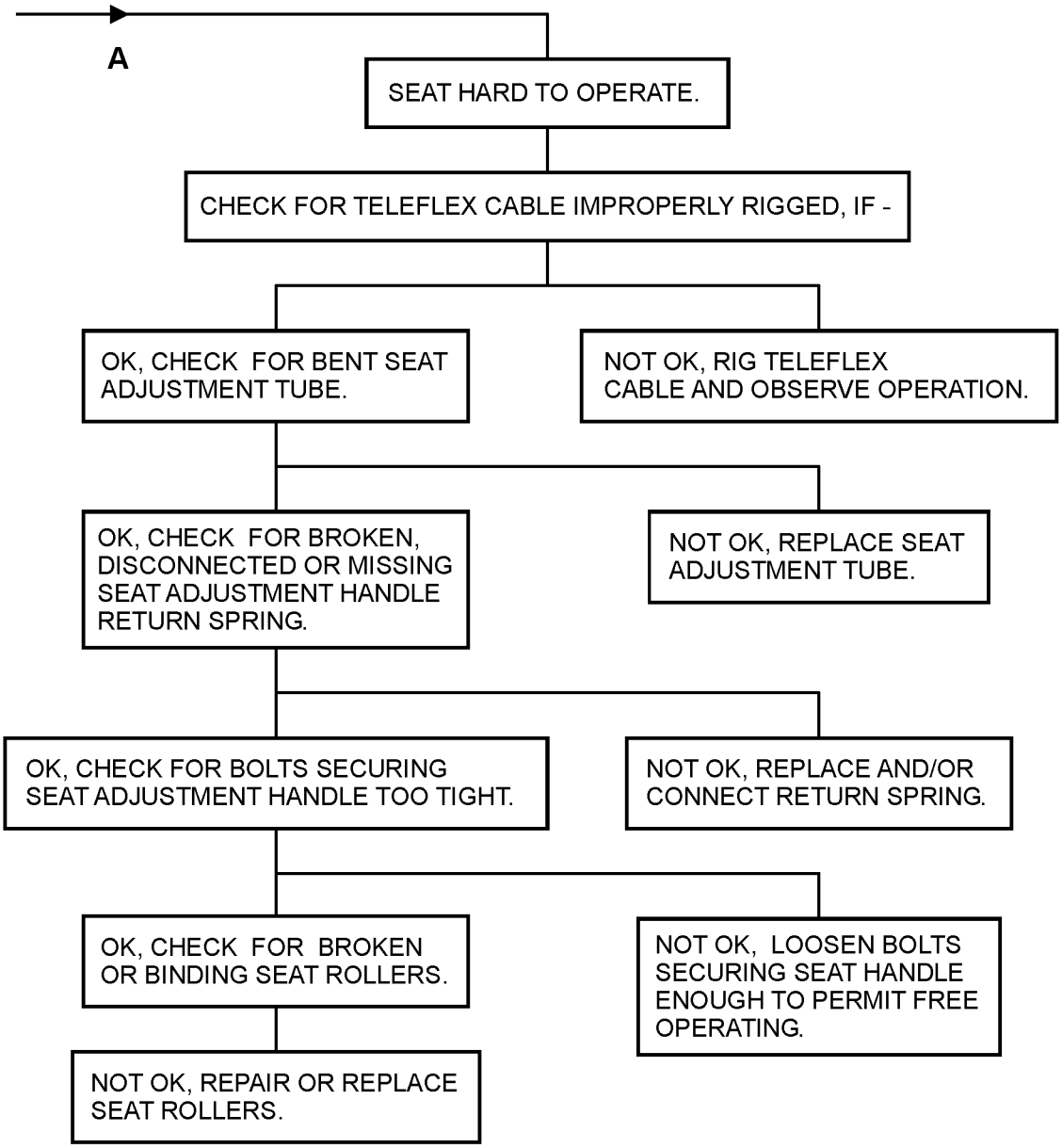

Troubleshooting the Reclining Rear Seat
Figure 101 (Sheet 2)

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PASSENGER COMPARTMENT - REMOVAL/INSTALLATION

1. Reclining Rear Seat

A. Removal (Refer to Figure 401).
   (1) Enter the baggage compartment and unfasten snaps securing the upholstery at the bottom of the seat backs.
   (2) Remove bolts securing seat back to seat frame.
   (3) Tilt the seat back forward and remove the two bolts securing the seat back to the seat bottom.
   (4) Remove the seat back from the airplane.
   (5) Repeat this procedure to remove the other seat back.
   (6) Remove the two seat belts by removing nuts, washers, spacers and bolts.
   (7) Tilt the seat bottoms as far forward as possible.
   (8) Remove the three bolts securing the seat frame to the airplane structure.
   (9) Remove the seat frame, with seat bottoms attached, from the airplane.

B. Installation (Refer to Figure 401).
   (1) Position seat frame with seat bottoms attached and secure seat to structure using bolts.
   (2) Install the seat belts using nuts, washers, spacers, and bolts.
   (3) Install the seat backs on the seat.
   (4) Secure the upholstery at the bottom of the seat backs.

2. Center Individual Seat

A. Removal (Refer to Figure 402).
   (1) Pull up on left-hand adjusting knob and move front seat as far forward as possible.
   (2) Remove bolt and stop from seat track.
   (3) Pull up on left-hand adjusting knob and move center seat forward until it clears the support assemblies.
   (4) Remove center seat from airplane through cabin door. If desired, disassemble and assemble in accordance with Figure 402.

B. Installation (Refer to Figure 402).
   (1) Slide seat on the seat tracks.
   (2) Install bolt and stop.

3. Aft Seats

A. Removal (Refer to Figure 403).
   (1) Recline seat back to aft position.
   (2) Use a long screwdriver inserted through gap between seat back and seat base to turn slotted screws on fastener plate and lift seat from floor.

B. Installation (Refer to Figure 403).
   (1) Align the four round-headed studs with the receptacle in the fastener plates.
   (2) Apply pressure downward on the seat until the studs snap into position.

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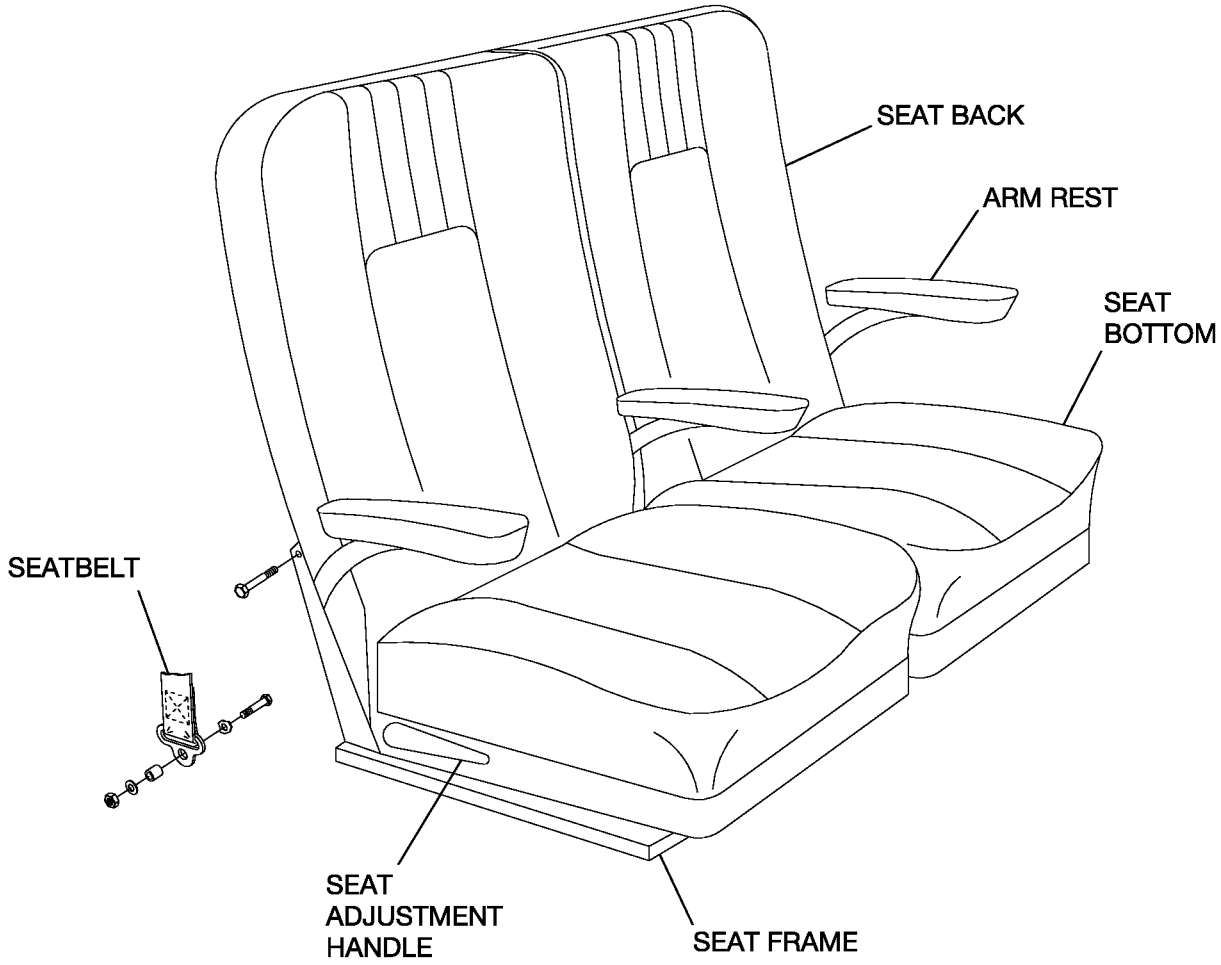

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Reclining Rear Seat
Figure 401 (Sheet 1)

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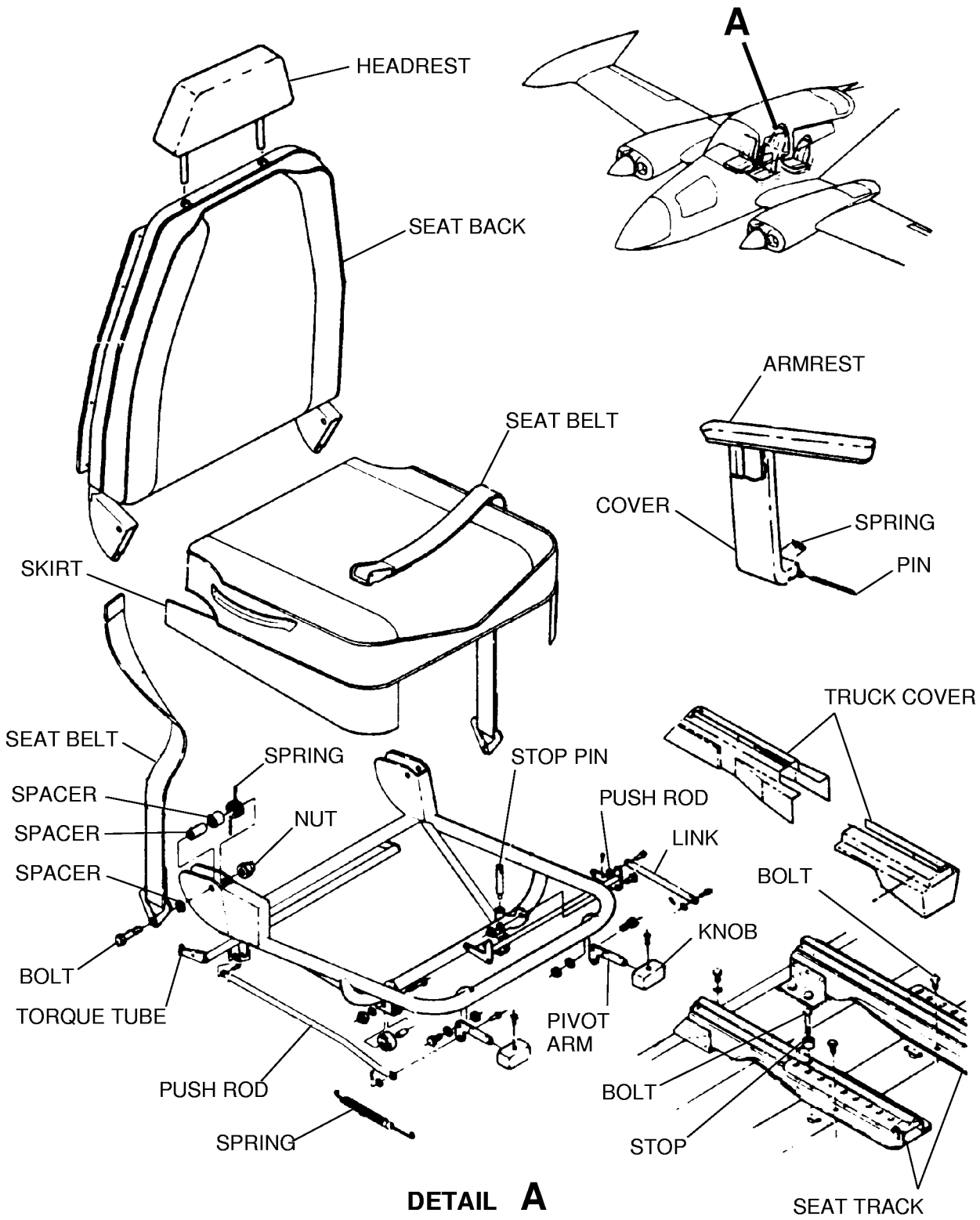

DETAIL A

Center Seat Installation
Figure 402 (Sheet 1)

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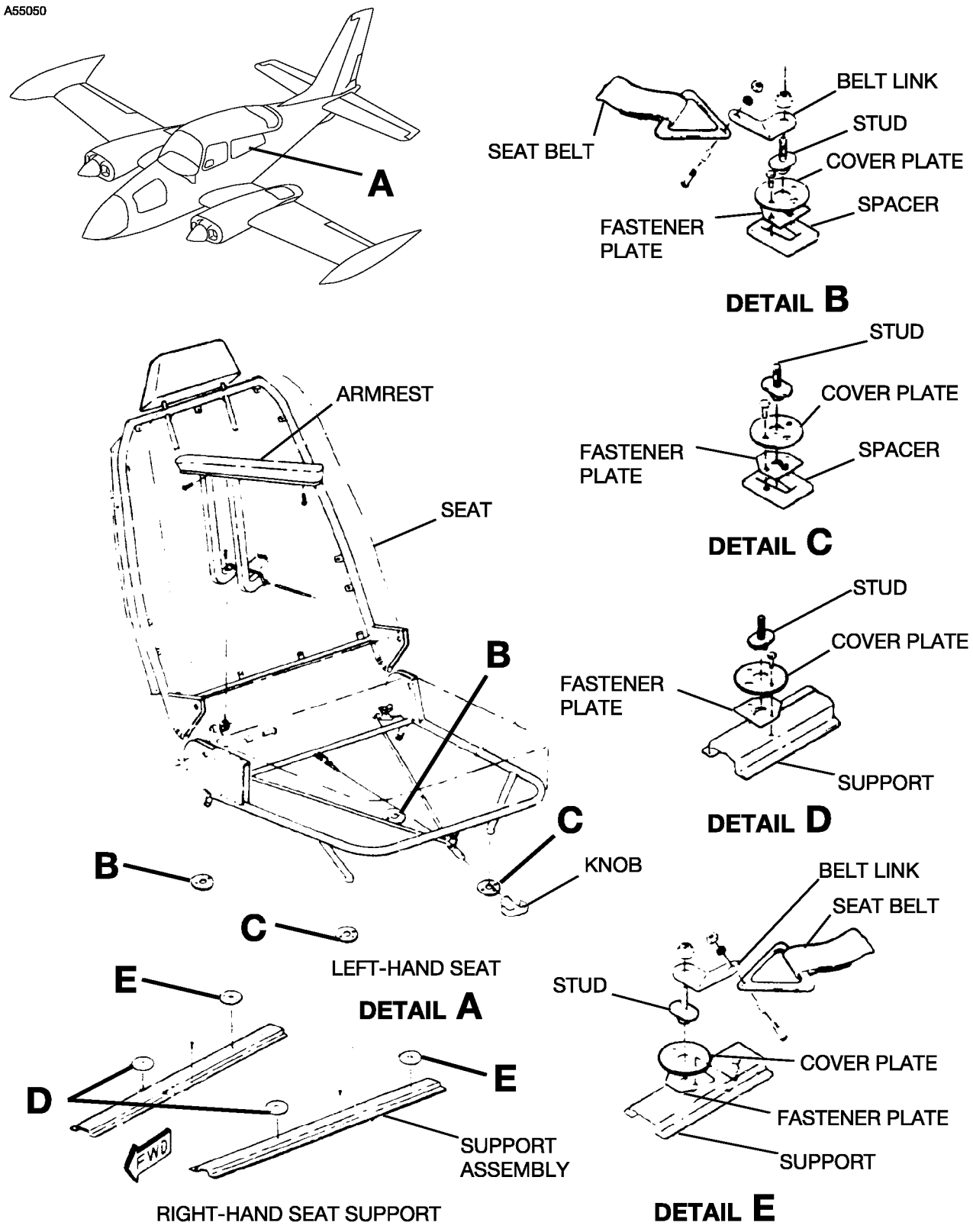

Aft Seat Installation
Figure 403 (Sheet 1)

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EMERGENCY EQUIPMENT - DESCRIPTION AND OPERATION

1. Emergency Locator Transmitter

A. The emergency locator transmitter (ELT) is a self-contained, solid-state unit, having its own power supply with an external mounted antenna. The transmitter is designed to transmit on dual emergency frequencies of 121.5 and 243.0 megahertz simultaneously. The locator beacon, provided for operation in Canada, transmits on 121.5 megahertz only. The emergency locator transmitter is mounted in the tailcone on the side of the fuselage. Refer to Figure 1

B. The transmitter is entirely portable, operating on the power supplied by a battery pack containing dry cell batteries wired in series. The battery pack service life is placarded on the batteries and also on the outside of the cover on the end of the transmitter.

C. The transmitter broadcast tone is audio modulated in a swept manner over the range of 1600 to 300 Hz and is a distinct, easily recognizable distress signal for reception by search and rescue personnel, and others monitoring the emergency frequencies.

D. Under favorable conditions, a distress signal from the ELT can be intercepted at a distance of 100 miles. It exhibits line of sight transmission characteristics which correspond approximately to 100 miles at a search altitude of 10,000 feet.

E. When battery inspection and replacement schedules are adhered to, the transmitter will broadcast an emergency signal at rated power, for a continuous period of at least 48 hours at temperatures from +55°C to -20°C after an emergency landing.

F. The military monitors 243.0 MHz. The 121.5 MHz frequency is monitored by the general aviation airplane as well as C.A.P., D.O.T., F.A.A. and some commercial airplane.

G. A three-position switch on the forward end of the unit controls operation. Placing the switch in the ON position will energize the unit to start transmitting emergency signals. In the OFF position, the unit is inoperative. Placing the switch in the ARM position will set the unit to start transmitting emergency signals only after the unit has received a 50 (tolerances are +2.0 G and -0.0 G) impact force.

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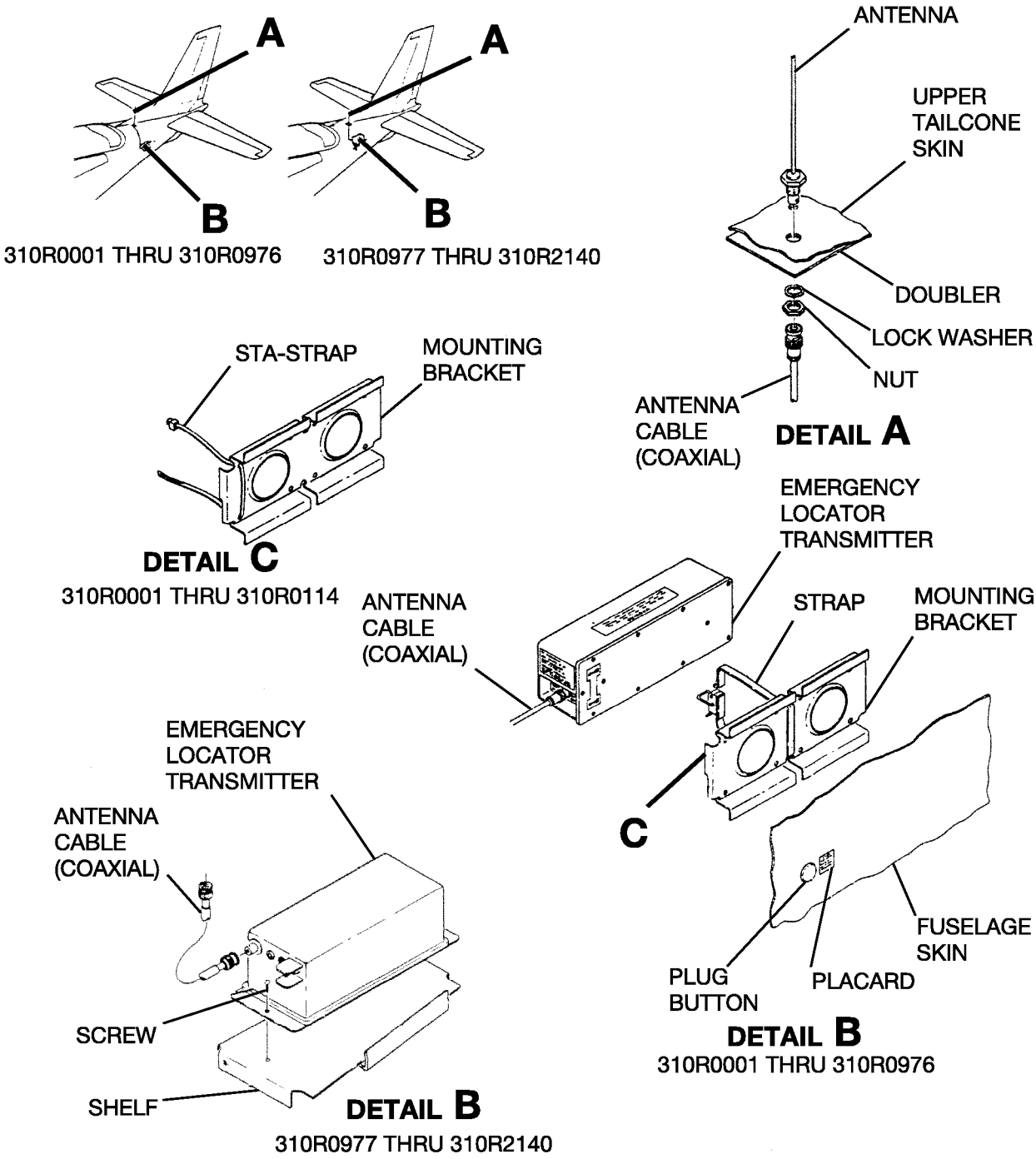

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10143092
A10142041
B10142041
B10142053
C14142021

Emergency Locator Transmitter
Figure 1 (Sheet 1)

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EMERGENCY EQUIPMENT - TROUBLESHOOTING

1. Emergency Locator Transmitter

A. Troubleshooting
(1) For troubleshooting the emergency locator transmitter, refer to Table 101.

CAUTION: In order to protect your warranty, troubleshooting should be conducted without removing the unit cover.

CAUTION: Do not leave the ELT in the ON position longer than 10 seconds. This could initiate downed airplane search procedures by C.A.P., D.O.T., or F.A.A. personnel.

Table 101. Emergency Locator Transmitter Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
LOW OUTPUT POWER.	Low battery voltage.	Check battery voltage. Set toggle switch to off. If battery voltage is 10.7 volts or less, replace battery pack.
	Coaxial cable is unserviceable.	Remove multimeter and connect ammeter. Set toggle switch on and observe ammeter drain. If range is 0 - 50 MA, check antenna for high resistance joints. Replace cable if resistance is high.
	Transmitter does not operate.	Remove multimeter and connect ammeter. Set toggle switch on and observe ammeter drain. If range is 0 - 50 MA, check antenna for high resistance joints. Replace transmitter if joint resistance is okay.
LOCATOR BEACON DOES NOT OPERATE.	Antenna or antenna coax cable is unserviceable.	Check antenna and antenna coax for continuity or short. Repair or replace antenna or antenna coax if faulty.
	Locator beacon does not operate.	Repair or replace locator beacon.

B. It is possible to a limited degree to isolate the fault to a particular area of the equipment.

C. In performing the troubleshooting to test peak effective radiated power, you will be able to determine if battery replacement is necessary or if the unit should be returned to your dealer for repair.

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EMERGENCY EQUIPMENT - REMOVAL/INSTALLATION

1. Emergency Locator Transmitter

A. Removal (Refer to Figure 401).
   (1) Remove rear upholstery panel (Refer to Equipment and Furnishings- Removal and Installation).
   (2) Disconnect antenna cable from end of transmitter.
   (3) Cut sta-straps, unfasten strap or remove screws securing transmitter, and remove transmitter from mounting bracket or shelf.

B. Installation (Refer to Figure 401).
   (1) Assure that the direction of flight arrows (placarded on the transmitter) are pointing towards the nose of the airplane.
   (2) Secure transmitter to mounting bracket or shelf with new sta-straps, strap, or screws.

      NOTE: On airplanes 310R0115 Thru 310R2140, install strap with latch on side of transmitter case (not across cover plate) on center of transmitter.

   (3) Connect antenna cable to transmitter.
   (4) Check operation of emergency locator transmitter.
   (5) Position ON-OFF switch to ARM.
   (6) Install rear upholstery panel.

2. Emergency Locator Transmitter Antenna

A. Removal (Refer to Figure 401).
   (1) Remove rear upholstery panel. (Refer to Equipment and Furnishings- Removal and Installation).
   (2) Disconnect antenna cable from base of antenna.
   (3) Remove antenna by removing nut and lockwasher.

B. Installation (Refer to Figure 401).
   (1) Secure antenna to tailcone skin, using lockwasher and nut.
   (2) Connect antenna cable to base of antenna.
   (3) Install rear upholstery panel.

3. Emergency Locator Transmitter Battery Pack

A. Removal.
   (1) Remove emergency locator transmitter.
   (2) Remove screws attaching the cover to the case and remove cover. Remove rubber gasket to gain access to battery pack.
   (3) Disconnect battery pack and remove.

B. Installation.

   NOTE: Lithium battery packs originally used in the emergency locator transmitter are no longer in use. When replacing the lithium battery pack with the alkaline battery pack, refer to Service Kits SK421-86 and SK421-89.

   NOTE: Before installing the new battery pack, check to ensure that its voltage is 10.8 volts or greater.

   (1) Install the new battery in the transmitter.
   (2) Install the transmitter cover by positioning the rubber gasket on the cover, pressing the cover and case together, and securing with screws. Care should be taken to avoid trapping the gasket and overtightening the screws.
   (3) Remove the old battery placard from the end of transmitter and replace with new battery placard supplied with the new battery pack.

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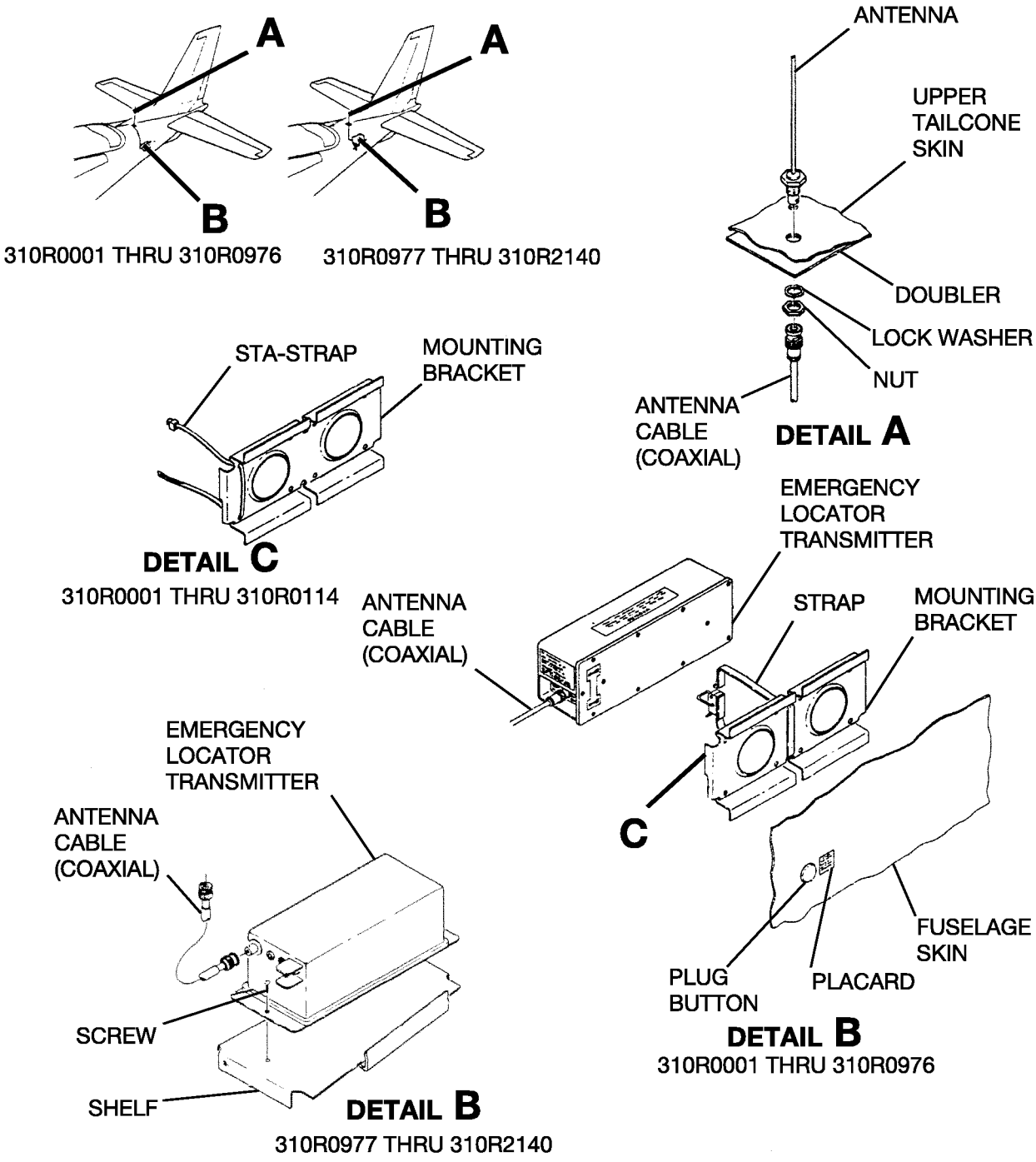

10143021
10143092
A10142041
B10142041
B10142053
C14142021

Emergency Locator Transmitter and Antenna Installation
Figure 401 (Sheet 1)

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CAUTION: Be sure to enter the new battery pack expiration date in the airplane records.

(4) Install transmitter.
(5) Check operation of the ELT.

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EMERGENCY EQUIPMENT - INSPECTION/CHECK

1. Emergency Locator Transmitter

WARNING: Operational testing of an ELT shall be performed only during the first five (5) minutes of each hour. If the operational test must be made at a time not included within the first five minutes after the hour, the tests should be coordinated with the nearest FAA tower or flight service station. Reference FAA Advisory Circular AC-91-44A.

NOTE: It is recommended that operational testing of an ELT be performed within a metal hangar with the doors closed to avoid inadvertent distress signal transmissions. It is also recommended that operational testing be performed for no more than 10 second intervals, with 60 seconds between tests.

A. Monthly Inspection
(1) Turn airplane master switch ON.
(2) Turn airplane transceiver ON and set frequency to local tower frequency.
(3) Contact local tower personnel and alert them of the proposed test.
(4) Place the ELT function selector switch in the ON position until the emergency tone is heard on the airplane radio (not over 10 seconds). Immediately place the function selector switch in the ARM position. (Ensure that the transmitter has been deactivated).

WARNING: Dispose of unserviceable battery pack properly. Do not incinerate or compact.

CAUTION: Battery packs are not interchangeable and transmitters can use only the recommended battery pack, as the operating life and/or signal strength of the transmitter will be seriously degraded. In some cases, changes in the mechanical configuration may make the transmitter prone to failure due to vibration and corrosion.

CAUTION: Ensure new battery pack expiration date is entered in airplane records. It is also recommended that expiration date be placed in emergency locator transmitter owners manual for quick reference.

NOTE: After accumulated test or operation time equals 1 hour, battery pack replacement is required.

(5) Inspect the transmitter case for corrosion. If evidence of corrosion is found, replace the transmitter with a new unit.
(6) Inspect mounting structure and airplane structure in area around the transmitter for any corrosion which may have accumulated due to battery vapors or deterioration. Refer to Corrosion - Approved Repairs for corrosion treatment.

B. Yearly Inspection.
(1) Check the Emergency Locator Transmitter for the following:
(a) Power output.
(b) Carrier frequency.
(c) Modulation.
(d) Sweep.
(e) Sweep rate.
(f) Operation of "g" switch.
(g) Replacement of battery pack.
(h) Mounting security.

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CHAPTER

26

FIRE PROTECTION

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FIRE PROTECTION - GENERAL

1. Scope

A. This chapter describes those fixed and portable units which detect and indicate fire or smoke, and store and distribute fire extinguishing agent to all protected areas of the airplane.

2. Hand Fire Extinguisher (Optional)

A. Description.
(1) The fire extinguisher (optional) mounted on the floor, just forward of the copilot's seat, contains a pressurized dry chemical charge. The fire extinguisher may be used on combustible material, liquid, or electrical fires. The charge is non-toxic and non-corrosive. The fire extinguisher may be recharged by most fire equipment dealers.

3. Engine Compartment Fire Extinguisher (Optional)

A. Description.
(1) The engine compartment fire extinguisher (optional) consists of three major components: the annunciator panel, thermal detectors, and the extinguisher unit. The annunciator panel is mounted in a standard three-inch instrument hole. Three thermal detectors are mounted in the high heat areas of each engine nacelle and the extinguisher unit is mounted in the aft section of the nacelle. An exit line is routed from the extinguisher into the forward section of the engine where the freon gas is expelled. A smaller discharge hose which routes off the large discharge hose expels freon gas from the center of the nacelle area towards the inboard side of the nacelle.

NOTE: The test switch does not check the detector system.

(2) A test function is provided to test the system circuit. When the test switch is pushed, all lights on the annunciator panel should illuminate.
(3) If an overheat condition is detected, the appropriate FIRE light will annunciate the engine to be extinguished. The extinguisher is activated by opening the appropriate guard and pressing the FIRE light. The E light (amber) will illuminate after the extinguisher has been discharged and will continue to show empty until a new bottle has been installed. The FIRE light will remain illuminated until the temperature in the compartment cools.

NOTE: Only one discharge is available per engine.

4. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Multimeter	Model 260	Simpson Electric Co.	Voltage and continuity checks.
Lubricant	DC-5	Dow Corning Corp. Midland, Mich.	Lubricate seals and threads.
Cleaning Solvent (MPK)	MIL-M-81351	Approved Source	Cleaning.
Discharge Tool		HTL Industries Inc. 373 S. Fair Oaks Drive Pasadena, Calif. 91105	Discharge container.

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Name	Number	Manufacturer	Use
Shunt Wire			Shorting bar between terminals of cartridge.
Test Stand		Fabricate Locally	Discharge agent from container.
Test Port	Thread size to match cartridge	Fabricate Locally	Discharge cartridge.

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FIRE PROTECTION - TROUBLESHOOTING

1. Engine Fire Extinguisher

A. Troubleshooting.
(1) For troubleshooting the engine compartment fire extinguisher, refer to Table 101.

Table 101. Engine Fire Extinguisher System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
ALL LIGHTS FAIL TO COME ON WHEN TEST SWITCH IS DEPRESSED.	Open or unserviceable wiring.	Depress circuit breaker. If lights still fail to come on, remove panel and check voltage between pin A & B of connector harness (A is ground). If no voltage, check wiring for open line and repair.
	Indicator panel does not operate.	Replace indicator panel.
GREEN "OK" LIGHT(S) FAIL TO COME ON WHEN TEST SWITCH IS DEPRESSED.	Light bulb does not come on.	Replace light bulb.
	Cartridge is unserviceable	Disconnect wire from bottom stud of cartridge. Ground wire. If "OK" light lights up, cartridge is faulty. Replace cartridge.
	Open circuit in wire.	Check wire up to connector for open circuit. If open circuit, repair wire and reconnect to cartridge.
	Indicator panel does not operate.	Replace indicator panel.
RED "FIRE" LIGHT(S) FAIL TO COME ON WHEN TEST SWITCH IS DEPRESSED.	Faulty light bulb.	Replace light bulb.
	Faulty indicator panel.	Replace indicator panel.
AMBER "E" LIGHT(S) FAIL TO COME ON WHEN TEST SWITCH IS DEPRESSED.	Light bulb does not operate.	Replace light bulb.
	Indicator panel does not operate.	Replace indicator panel.
RED "FIRE" LIGHT(S) COME ON WHEN TEST SWITCH IS NOT DEPRESSED.	Short in detector or detector wiring.	Check for shorted detectors or shorts in detector wiring by checking between pin C or O of harness connector and ground. If short found, repair or replace wiring and replace detector if required.
	Indicator panel does not operate.	Replace indicator panel.
GREEN "OK" LIGHT(S) LIGHTED WHEN TEST SWITCH IS NOT DEPRESSED.	Indicator panel does not operate.	Depress test switch. If light(s) stay on, replace indicator panel. Check affected cartridge for bridgewire resistance.

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Table 101. Engine Fire Extinguisher System Troubleshooting (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
AMBER "E" LIGHT(S) FLICKER WHEN TEST SWITCH IS NOT DEPRESSED.	Container unserviceable.	Unscrew cartridge, scratch some anodize off cartridge thread and reinstall. If light still intermittent or out, ground sensor wire to aircraft. If light goes out, replace container.
	Open wire.	Check for open wire between sensor wire and connector pin N or G. If open wire, repair wire.
	Indicator panel does not operate.	Replace indicator panel.
AMBER "E" LIGHT(S) ON WHEN TEST SWITCH IS NOT DEPRESSED.	Pirex container discharged.	Check status of Pirex container. If container is discharged, replace container.
	Container is unserviceable	Unscrew cartridge, scratch some anodize off cartridge thread and reinstall. If light still intermittent or out, ground sensor wire to aircraft. If light goes out, replace container.
	Open wire.	Check for open wire between sensor wire and connector pin N or G. If open wire, repair wire.
	Indicator panel does not operate.	Replace indicator panel.

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FIRE PROTECTION - SERVICING

1. Fire Extinguisher Container

A. Discharging.
   (1) Remove the container from the airplane.
   (2) Secure the container in the test stand so the fill fitting is facing down.
   (3) Remove cartridges from the container, refer to Fire Protection - Removal/Installation.
   (4) Screw the discharge tool Part Number 83000003 into the fill fitting until the extinguishing agent starts bleeding.

WARNING: The extinguishing agent shall be bled in a well ventilated area.

   (5) Allow all extinguishing agent to be expelled; check pressure gage. Remove discharge tool from the fill fitting.
   (6) Remove fire extinguishing container from the test stand.

B. Charging.
   (1) Ship container to authorized FAA service and overhaul repair station or to manufacturer of fire extinguisher, for charging container.

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FIRE PROTECTION - REMOVAL/INSTALLATION

1. Fire Extinguisher Container

A. Removal (Refer to Figure 401 and Figure 402).
(1) Turn electrical power OFF.
(2) Remove engine cowling.

WARNING: Install a shunt wire between ground terminal and squib terminal before attempting to remove a charged fire extinguisher container or cartridge.

(3) Tag and disconnect wiring from fire extinguisher.
(4) Disconnect discharge hose (1) by disconnecting mounting clamps.
(5) Loosen mounting clamp (4) from fire extinguisher container and remove fire extinguisher container (5) and discharge hoses (1) out of nacelle.

B. Installation (Refer to Figure 401 and Figure 402).
(1) Position fire extinguisher container in mounting clamp (4), tighten clamps and route discharge hoses in place.

WARNING: Do not remove shunt wire from fire extinguisher container or cartridge until installation is complete in engine nacelle.

(2) Clamp discharge hoses (1) in place with mounting clamp, bolts, and nuts.

WARNING: Before connecting electrical terminals to cartridge, check connectors with a multimeter to ensure no voltage is present at connector.

(3) Connect electrical wires.
(4) Turn ON electrical power and check the following:
(a) Annunciator lights are out.
(b) Press the test switch and determine that lights come ON.
(5) Install engine cowling.

2. Fire Extinguisher Cartridge

A. Removal.

NOTE: Prior to removal of the cartridge, personnel shall carefully read all instructions and study illustrations.

(1) Before proceeding with removal procedure, connect a shunt wire between the two terminals of the cartridge. The shunt wire must remain connected while container is being serviced or is in storage.

WARNING: The cartridge is a pyrotechnic device. Inadvertent detonation of the cartridge can cause personnel injury. For safe handling, the electrical contacts must be shorted together.

(2) Remove safety wire from the housing assembly and cartridge.
(3) Remove the cartridge from the housing assembly by unscrewing the cartridge while holding the hexagonal head of the housing assembly.

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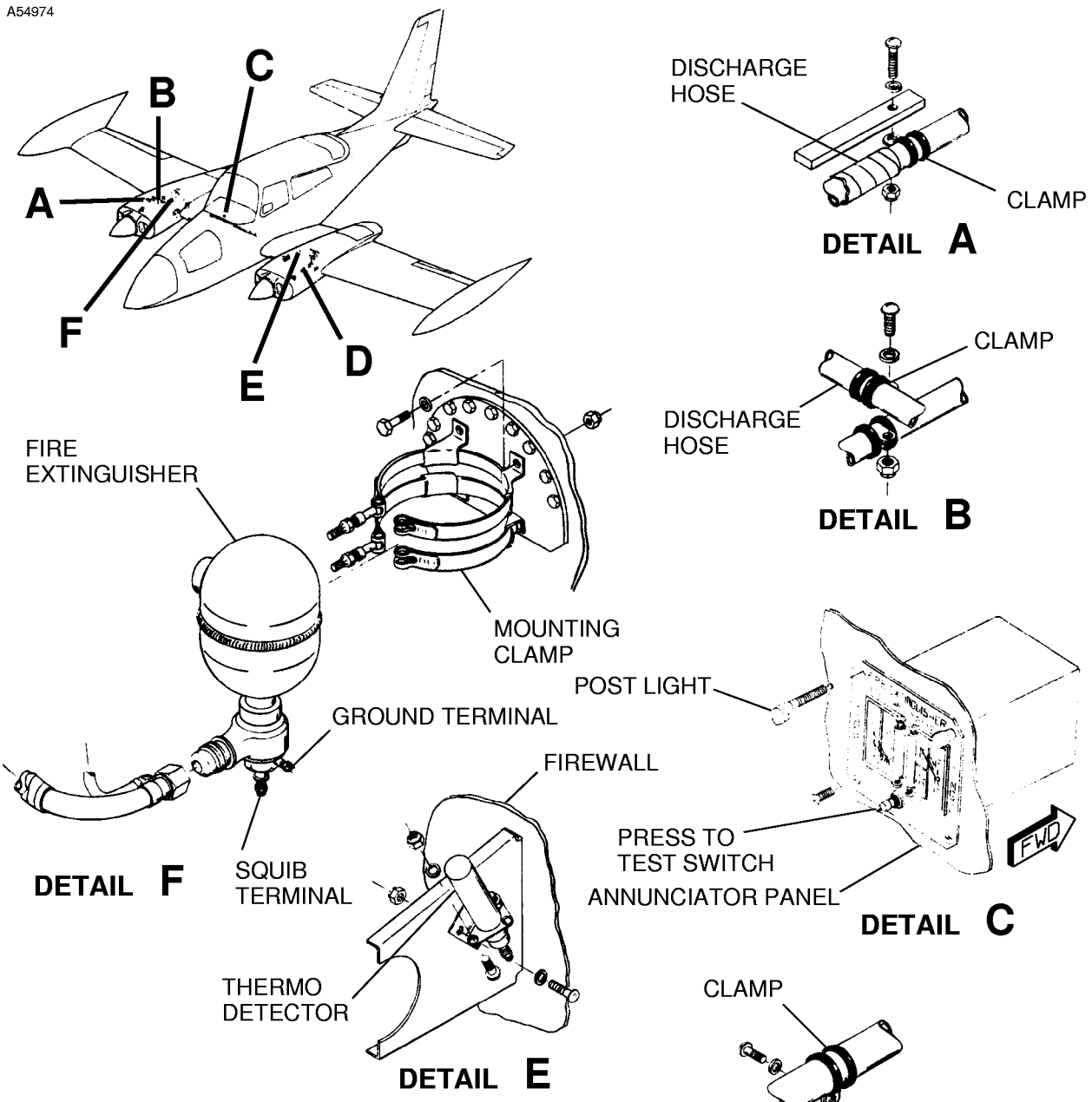

LEGEND	COLOR	CAUSE OF ILLUMINATION
FIRE	RED	FIRE CONDITION EXISTING IN ENGINE COMPARTMENT
E	AMBER	FIRE EXTINGUISHER CONTAINER ENPTY
OK	GREEN	FIRE CARTRIDGE AND ASSOCIATED WIRING IS IN OPERATIONAL CONDITION

10543006
A10542001
B10542001
C10141044
D10542004
E10542001
F10542006

Engine Compartment Fire Extinguisher
Figure 401 (Sheet 1)

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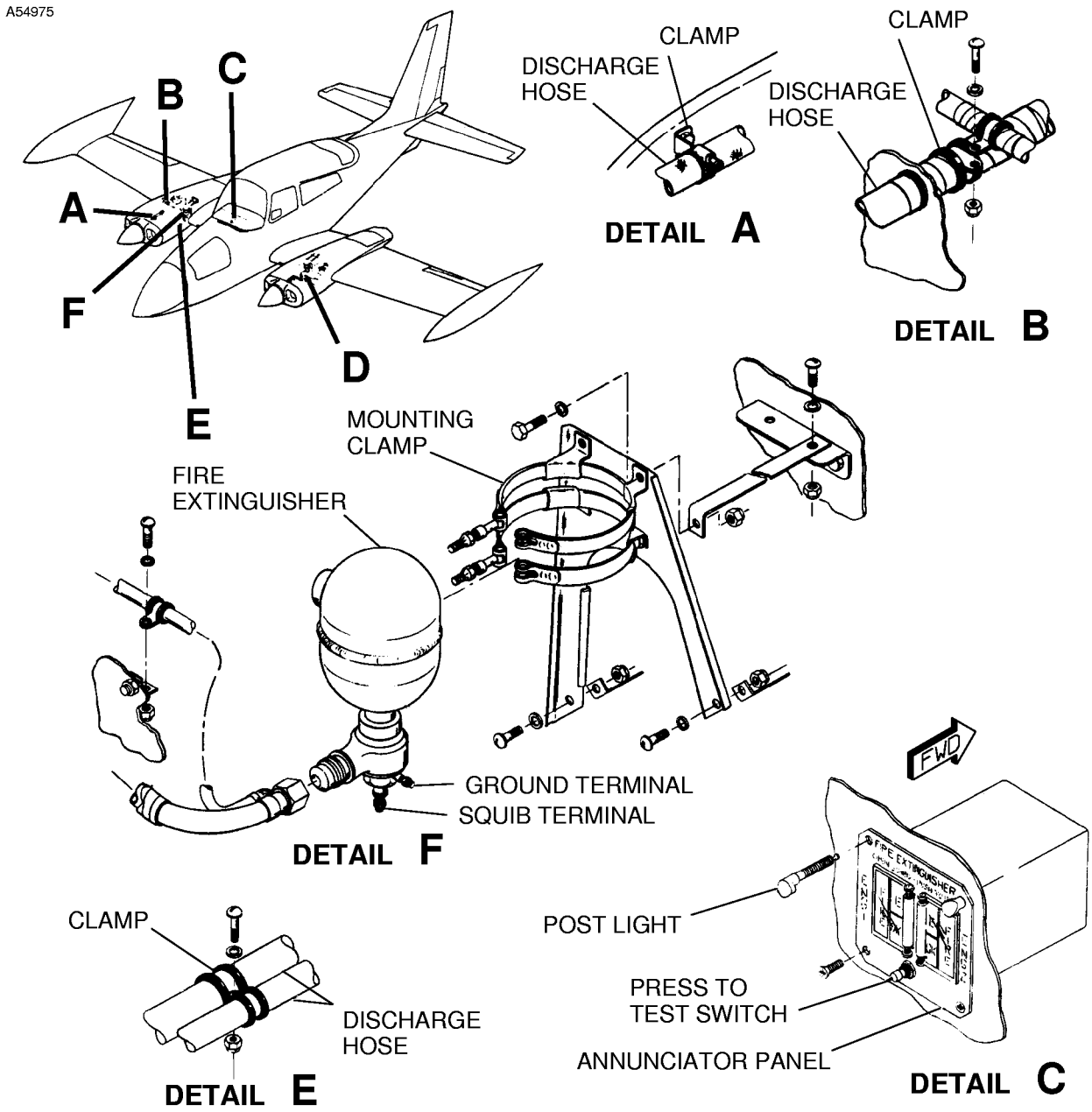

TURBO 310

LEGEND	COLOR	CAUSE OF ILLUMINATION
FIRE	RED	FIRE CONDITION EXISTING IN ENGINE COMPARTMENT
E	AMBER	FIRE EXTINGUISHER CONTAINER ENPTY
OK	GREEN	FIRE CARTRIDGE AND ASSOCIATED WIRING IS IN OPERATIONAL CONDITION

10543005
A10542004
B10542004
C10141044
D10542004
E10542004
F10542002

Engine Compartment Fire Extinguisher
Figure 402 (Sheet 1)

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WARNING: Do not loosen the housing assembly if the container is pressurized. This may cause the container to discharge and cause serious injury.

(4) Disposition of the cartridge.
(a) If the cartridge has service life remaining, properly tag cartridge, wrap in aluminum foil, place in a properly identified carton and store in a cool dry place. Return the cartridge to service as soon as possible.
1 Once installed, the service life of the cartridge begins regardless of how many times or how long the cartridge is separated from the fire extinguisher container.
a Life of the cartridge is a combination of shelf life and service life. Combination of shelf life and service life cannot exceed five years. Shelf life - If the cartridge is carefully wrapped in aluminum foil and kept in a well-sealed container, the shelf life may be three years. If the cartridge is stored in a box, the shelf life is reduced to two years. Service life - Service life of three years provided that the shelf life requirements described above have been met and the unit has been stored for two years maximum.
(b) If the cartridge has exceeded the shelf life and/or service life, dispose of the cartridge.
1 Install cartridge into a fixture specifically designed to withstand the detonation of the cartridge. If the fixture is not available, dispose of cartridge in accordance with local regulations governing disposition of Class "C" explosives.

NOTE: There is approximately 150 grains of powder in the cartridge.

WARNING: Before applying voltage to the cartridge, visually inspect the fixture for damage.

2 Remove the shorting bar (shunt wire); apply 24 volts DC to the cartridge terminals.

B. Installation.
(1) Install new seal on cartridge.
(2) Apply lubricant to the cartridge threads.
(3) If the cartridge does not have a shunt wire, install shunt wire.
(4) Install cartridge in housing assembly.
(5) Hold hexagonal head of housing assembly with a wrench and tighten cartridge. Torque cartridge to approximately 100 inch-pounds.

NOTE: Do not let the hexagonal head of the housing assembly rotate while torquing cartridge; excessive torque on housing assembly will result.

(6) Safety wire cartridge and housing assembly.

3. Thermo Detectors

A. Removal (Refer to Figure 401).
(1) Turn electrical power OFF.
(2) Remove engine cowling.
(3) Loosen and remove nuts, washers, and bolts attaching thermo detector to bracket or clamp.
(4) Tag and disconnect electrical wire from detector.
(5) Remove detector from nacelle.

B. Installation (Refer to Figure 401).
(1) Position thermo detector in place and secure with bolt, washers, and nuts.
(2) Connect electrical wire to detector and remove tag.
(3) Install engine cowling.

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4. Annunciator Panel

A. Removal (Refer to Figure 401).
(1) Turn electrical power OFF.
(2) Disconnect electrical connector.
(3) Disconnect wiring from post lights and remove post lights.

B. Installation (Refer to Figure 401).
(1) Position annunciator panel in place and install the lower screws.
(2) Install the two post lights in upper mounting holes and connect electrical wiring.
(3) Connect electrical connector to annunciator panel.
(4) Turn ON electrical power and check the operation of annunciator panel.

5. Hand Fire Extinguisher

A. Removal (Refer to Figure 403).

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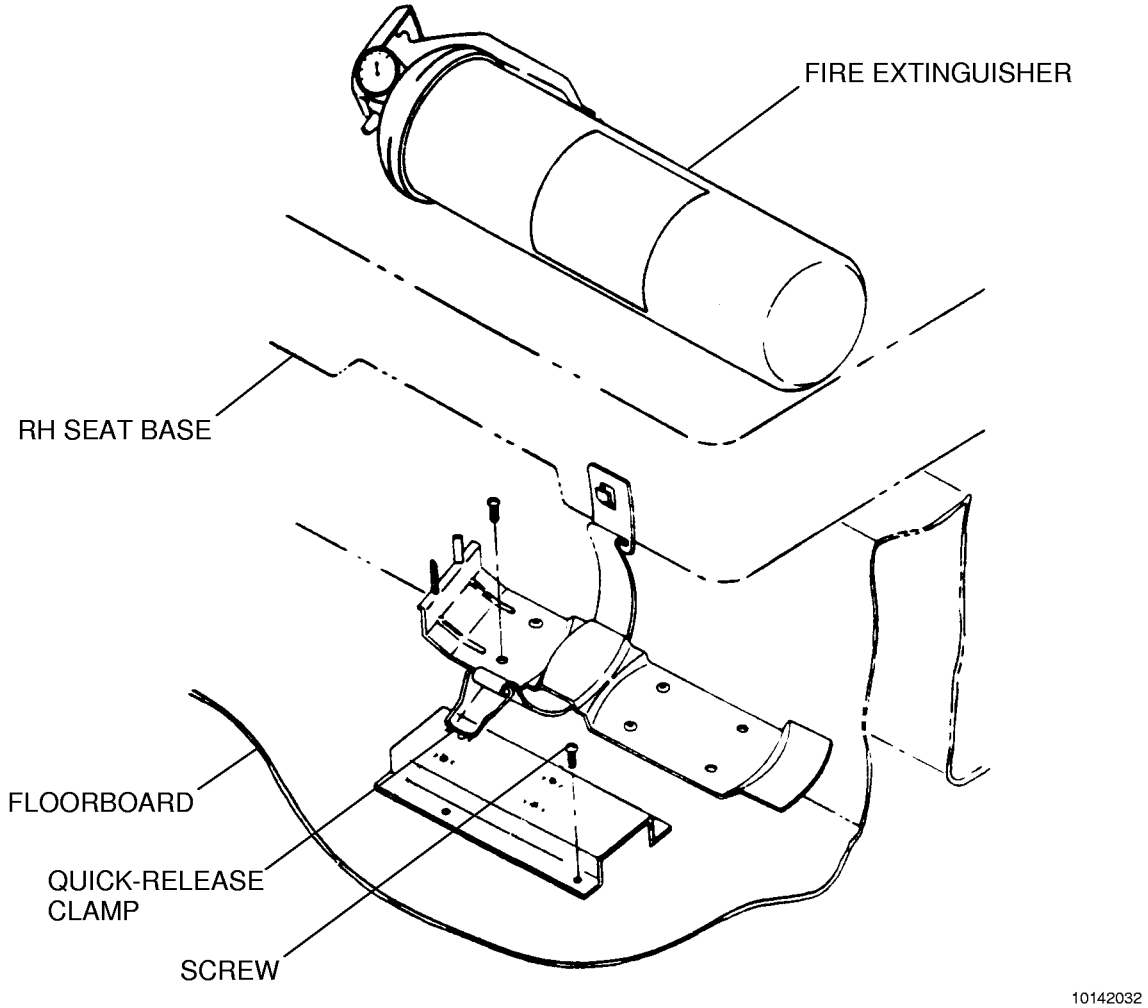

Hand Fire Extinguisher Installation
Figure 403

(1) Release quick-release clamp.
(2) Remove fire extinguisher from mounting bracket.

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B. Installation (Refer to Figure 403).
   (1) Position fire extinguisher in mounting bracket.
   (2) Secure fire extinguisher to mounting bracket with quick-release clamp.

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FIRE PROTECTION - ADJUSTMENT/TEST

1. Fire Extinguisher Container

A. Testing.
(1) Check out engine compartment fire extinguisher container .
(a) With all wiring connected, apply power to the system by closing the circuit breaker. All panel lights should be out.
(b) Press the test switch. All panel lights should light.
(c) Release test switch. All lights should go out.
(d) Engine 1 (Left Engine):
1 Detector check. Short both terminals of each detector. "FIRE" light should light for each detector.
2 Discharge sensor check. Disconnect orange wire at quick disconnect. Amber "E" light should light. Reconnect wire.

NOTE: If amber light does not light, but green light stays out when test button is depressed, this indicates that the sensor and cartridge wires have been interchanged.

3 Cartridge wiring check. Disconnect W307818 wire from cartridge button stud.

NOTE: If amber light lights, sensor and cartridge wires have been interchanged.

a Press test switch. "OK" light should not light.
b Connect voltmeter across disconnected W307818 wire and ground. Open guard and press Engine 1 light switch. Voltmeter should read aircraft voltage (28 VOC).
4 Reconnect wire.
(e) Engine 2 (Left Engine):
1 Detector check. Short both terminals of each detector. "FIRE" light should light for each detector.
2 Discharge sensor check. Disconnect orange wire at quick disconnect. Amber "E" light should light. Reconnect wire.

NOTE: If amber light does not light, but green light stays out when test button is depressed, this indicates that the sensor and cartridge wires have been interchanged.

3 Cartridge wiring check. Disconnect W308818 wire from cartridge button stud.

NOTE: If amber light lights, sensor and cartridge wires have been interchanged.

a Press test switch. "OK" light should not light.
b Connect voltmeter across disconnected W308818 wire and ground. Open guard and press Engine 1 light switch. Voltmeter should read aircraft voltage (28 VOC).
4 Reconnect wire.
(f) Press the test switch. All panel lights should light.
(g) Turn power OFF.

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FIRE PROTECTION - INSPECTION/CHECK

1. Engine Compartment Fire Extinguisher

A. Inspection.
(1) Remove upper engine cowling.
(2) Remove fire extinguisher container access plate in leading edge of wing.
(3) Clean fire extinguisher container with a clean dry cloth.
(4) Inspect the fire extinguisher container for damage, container operating pressure, and security of electrical connections.
(5) Inspect the deployment tubes for security and obstructions. Repair of components is limited to replacement of parts.
(6) Refer to Manual CGA-C6 (Visual Inspection of Cylinders) for inspection requirements.
(7) If no damage is present but container pressure is low (refer to Pressure-Temperature Correction Table) and the container still is within the five-year inspection time, the container can be refilled and returned to service.

Table 601. Pressure-Temperature Correction Table

F° TEMP	**-60**	**-40**	**-20**	**0**	**+20**	**+40**	**+60**	**+80**	**+100**	**+120**
IND	110	127	148	174	207	249	304	367	442	532
PRESSURE	134	155	180	212	251	299	354	417	492	582

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CHAPTER

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FLIGHT CONTROLS

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FLIGHT CONTROLS - GENERAL

1. Scope

A. This chapter describes those units and components which furnish a means of manually controlling the flight attitude characteristics of the airplane, including items such as ailerons, rudder, elevators, and flaps.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Aileron describes that portion of the system which controls the position and movement of the ailerons and tabs.
   (2) Rudder describes that portion of the system which controls the position and movement of the rudder and rudder tabs.
   (3) Elevator describes that portion of the system which controls the position and movement of the elevator and tabs.
   (4) Flaps describes that portion of the system which controls the position and movement of the trailing edge flaps.

3. Control Column

A. Description.
   (1) The control column "Y" assembly internally houses the forward aileron control system cables, chains, and sprockets. Externally attached to the control column "Y" assembly are the elevator forward push-pull tube and bob-weight assemblies. The pilot's and copilot's (optional) control wheels are attached to individual tubes which extend through the instrument panel and connect to a universal joint on the control column "Y" assembly.

4. Control Cables and Pulleys

A. Description.
   (1) The chromium nickel steel wire is helically twisted into strands and the strands laid about other strands forming the flexible steel cable. The number of wires and the number of strands in the cable is determined by the diameter of the cable.

B. Construction of Cables
   (1) Cable diameter 1/32 inch, 3 by 7 construction - Cable of this construction shall consist of three strands of seven wires each. There shall be no core in this construction. The cable shall have a length of lay of not more than eight times nor less that five times the nominal cable diameter.
   (2) Cable diameter 1/16 inch and 3/32 inch, 7 by 7 construction - Cable of this construction shall consist of six strands of seven wire each, laid around a core strand of seven wires. The cable shall have a length of lay of not more than eight times nor less that six times the nominal cable diameter.
   (3) Cable diameter 1/8 inch through 3/8 inch, 7 by 19 construction - Cable of this construction shall consist of six strands laid around a core strand. The wire composing the seven individual strands shall be laid around a central wire in two layers. The single core strand shall consist of a layer of 6 wires laid around the central wire in a right-hand direction, and a layer of 12 wires laid around the 7 wire strand in a right-hand direction. The 6 outer strands of the cable shall consist of a layer of 6 wires laid around the central wire in a left-hand direction, and a layer of 12 wires laid around the 7 wire strand in a left-hand direction.
   (4) Lubrication - A pressure type friction-preventive compound having non-corrosive properties is applied during construction as follows:
      (a) Friction-preventive compound is continuously applied to each wire as it is formed into a strand so that each wire is completely coated.
   (5) Definitions - The following definitions pertain to flexible steel cable.
      (a) Wire - Each individual cylindrical steel rod or thread shall be designated as a wire.
      (b) Strand - Each group of wires helically twisted or laid together shall be designated as a strand.

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(c) Cable - A group of strands helically twisted or laid about a central core shall be designated as a cable. The strands and the core shall act as a unit.
(d) Diameter - The diameter of cable is the diameter of the circumscribing circle.
(e) Wire Center - The center of all strands shall be an individual wire and shall be designated as a wire center.
(f) Strand Core - A strand core shall consist of a single straight strand made of preformed wires, similar to the other strands comprising the cable in arrangement and number of wires.
(g) Preformed Type - Cable consisting of wires and strands shaped, prior to fabrication of the cable, to conform to the form or curvature which they take in the finished cable, shall be designated as preformed types.
(h) Lay or Twist - The helical form taken by the wires in the strand and by the strands in the cable is characterized as the lay or twist of the strand or cable respectively. In a right-hand lay, the wires or strands are in the same direction as the thread on a right-hand screw, and for a left-hand lay, they are in the opposite direction.
(i) Pitch (or length of lay) - The distances, parallel to the axis of the strand or cable, in which a wire or strand makes one complete turn about the axis, is designated as the pitch (or length of lay) of the strand or cable respectively.

5. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Inclinometer	SE716	Cessna Aircraft Co. Wichita, Kansas	To measure travel of control surfaces.
Tensiometer	T5-2002-101	Pacific Scientific Co. Los Angeles, Calif.	To measure cable tension.
Tensiometer	T60-100-1	Pacific Scientific Co. Los Angeles, Calif.	To measure flap return cables.
Hunter Spring Gage	Type L-30	Ametex Testing Equipment System Lansdale, PA	To measure friction forces.
Silicone Grease (Light Consistency)	No. 33	Dow Corning Corp. Midland, Michigan	To lubricate screw housing and threads in aileron trim tab actuator.
Low Temperature Grease	MIL-G-21164		To lubricate clutch assembly.
Multimeter	Model 260	Simpson	To measure voltage and resistance in electrical circuits.

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FLIGHT CONTROLS - REMOVAL/INSTALLATION

1. Control Column

A. Removal (Refer to Figure 401).
(1) Remove the following items in accordance with removal procedures:
(a) Pilot and passenger seats.
(b) Bulkhead, pilot's floor, and center carpets.
(c) Boot, retainer, and cover from lower control column.
(2) Remove shock-mounted instrument panel, refer to Chapter 31, Instrument and Control Panels - Removal/Installation.
(3) Drill out rivets and remove upper and lower instrument panel braces on right side only.
(4) Remove access covers just forward of rear spar and just aft of nose wheel well on underside of fuselage.
(5) Remove turnbuckle clips and loosen turnbuckles (2) on aileron cables (4) to relieve tension on aileron control system (Refer to Figure 402).
(6) Disconnect bob-weight assembly and push-pull tube from control column assembly, refer to Elevators - Removal/Installation.
(7) Remove control wheels from control column assembly by removing nuts (19), bushings (4), and bolts (3) attaching control tube (2) to universal joint (5).

NOTE: If autopilot, IFCS, electric trim, mic button is installed, disconnect electrical wires from control tube assembly at the quick disconnects.

(8) Disconnect chain assembly (26) from aileron cable assembly (37) by removing cotter pins, nuts, and bolts.
(9) Remove cotter pin (39), nut (40), washer (41), spacers (43), and bolt (42) attaching control column assembly to fuselage structure.
(10) Carefully work control column assembly from beneath RH side of stationary instrument panel.

B. Disassembly (Refer to Figure 401).
(1) On lower control column assembly, remove spacers, washers, bearings, and sprockets by removing nut (27) and bolt (36).
(2) Disengage chain assembly (26) from sprocket assembly and remove chain assembly from control column assembly.
(3) Remove triple sprocket (23) from control column assembly by removing nut (25), washers (24 and 38), and bolt (20).
(4) Disconnect chain assembly (21) by removing turnbuckle (22) and routing chain assembly over sprockets (11).
(5) Remove cotter pin (15) and nut (16) from shaft (13).
(6) Remove nuts (17) from bolts (6 and 12) and remove bolts from adapter (7) and sprocket (11).
(7) Remove shaft (13), bearing (8), adapter (7), and universal joint (5) from control column assembly.

NOTE: Safety wire shaft (13), adapter (7), and universal joint (5) to each other so that they may be retained together as a matched set.

(8) Refer to Figure 401 for further disassembly of control column components as necessary.

C. Assembly (Refer to Figure 401).
(1) Place control column assembly in a suitable padded fixture (such as a vise) facing bob-weight bracket away from the assembler.

NOTE: The following procedure is given for airplanes with dual control wheels installed; single control wheel airplanes need only install upper LH chain assembly (21) and lower chain assembly (26).

(2) Install washer (38) and triple sprocket (23) inside control column assembly using a long thin bolt or heavy gauge wire to support components temporarily.

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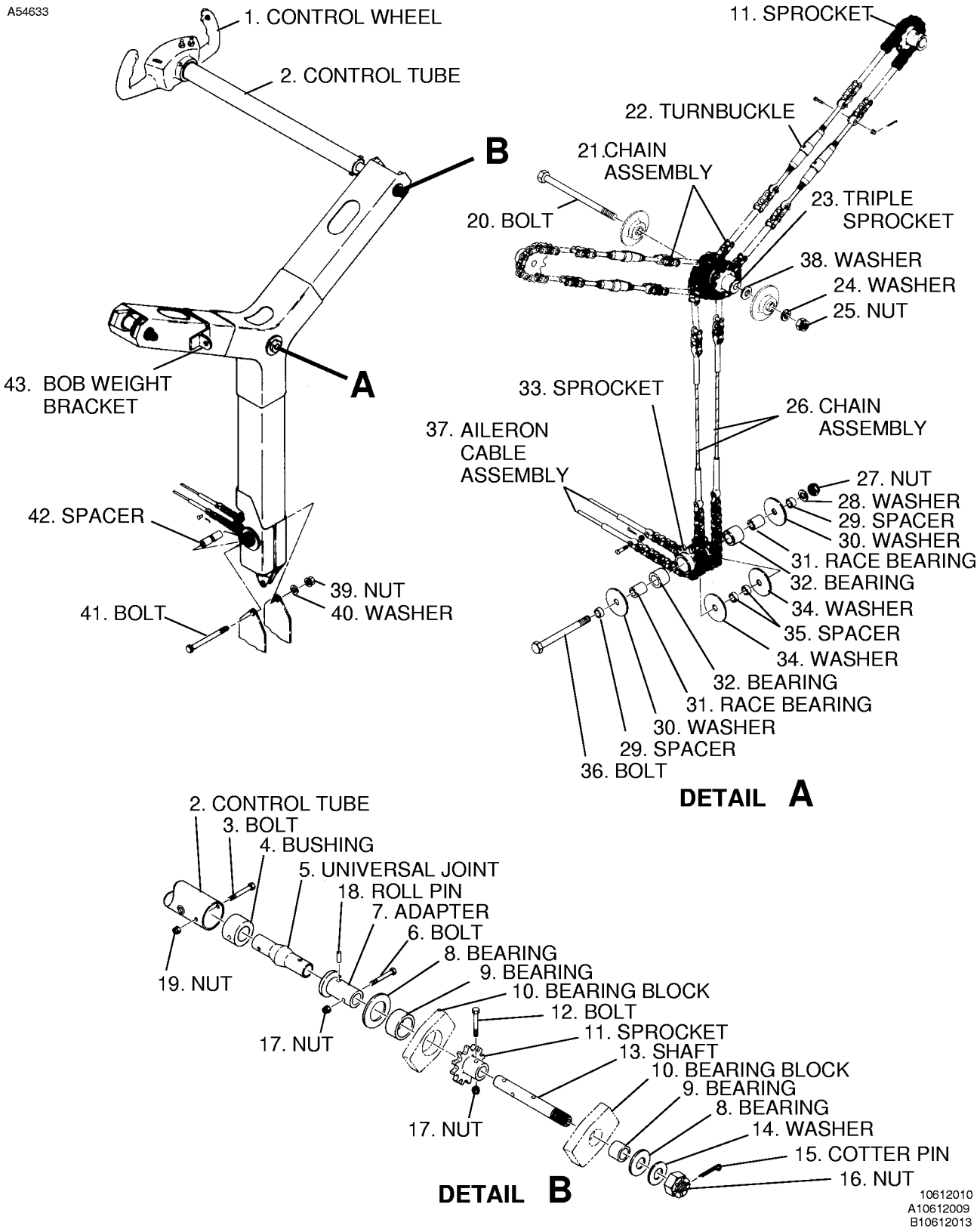

Control Column Installation
Figure 401 (Sheet 1)

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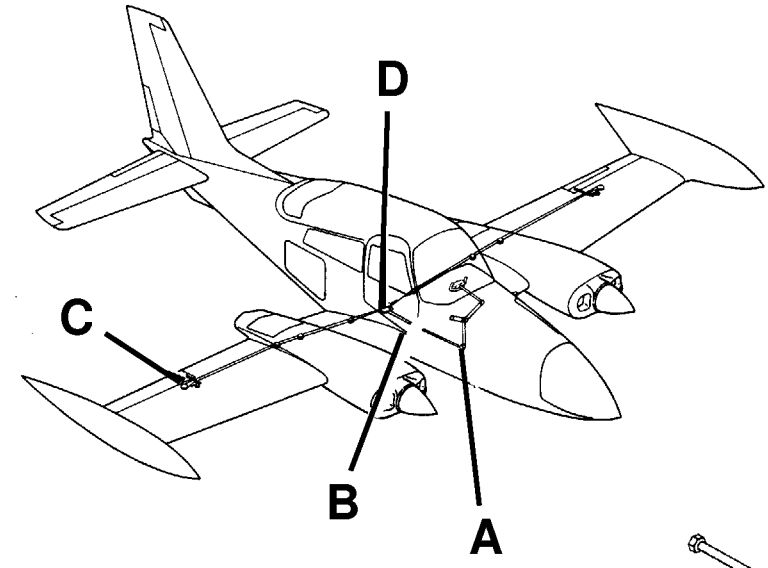
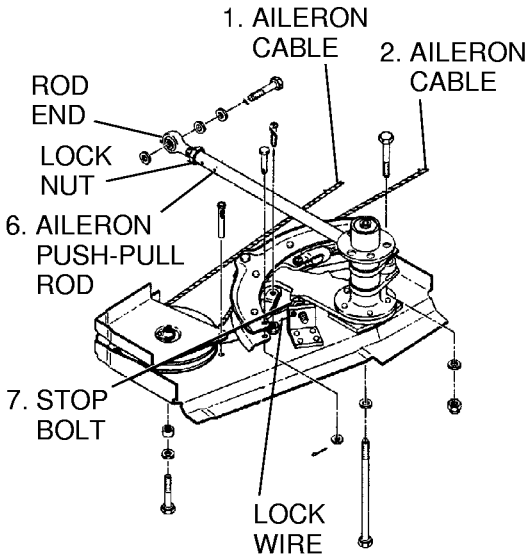
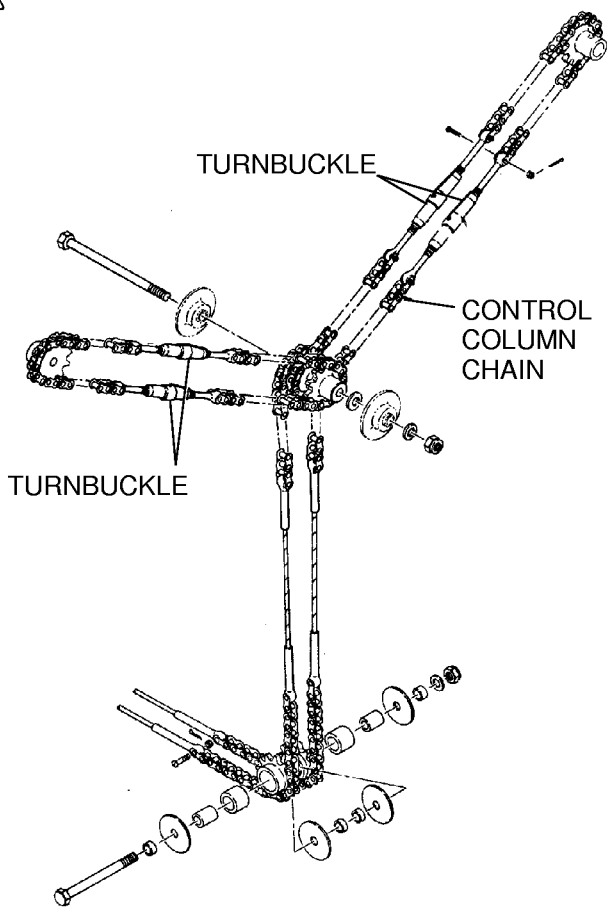
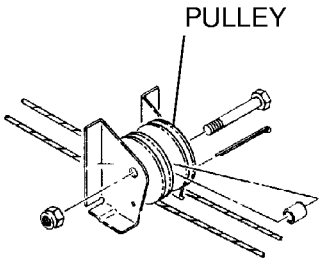




DETAIL C



DETAIL A



DETAIL B

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Aileron Control System
Figure 402 (Sheet 1)

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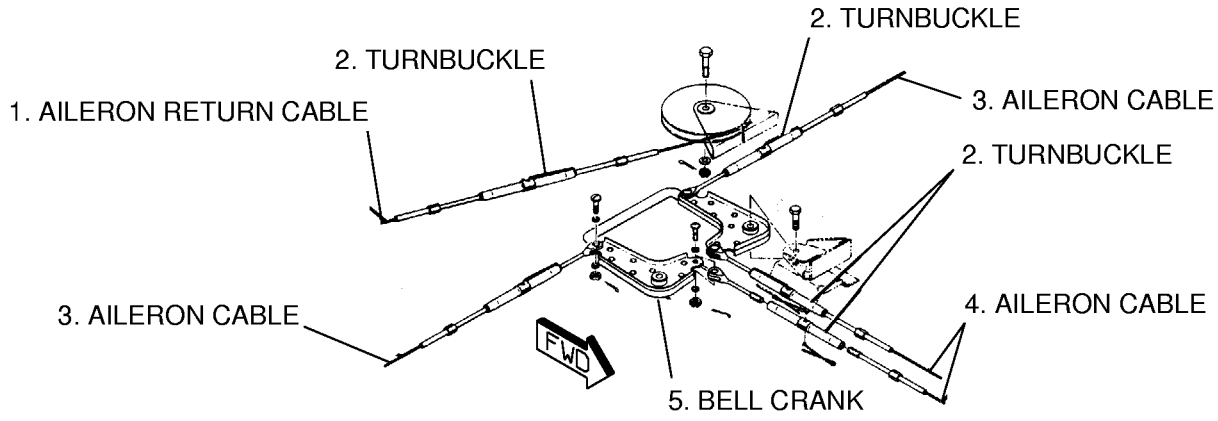
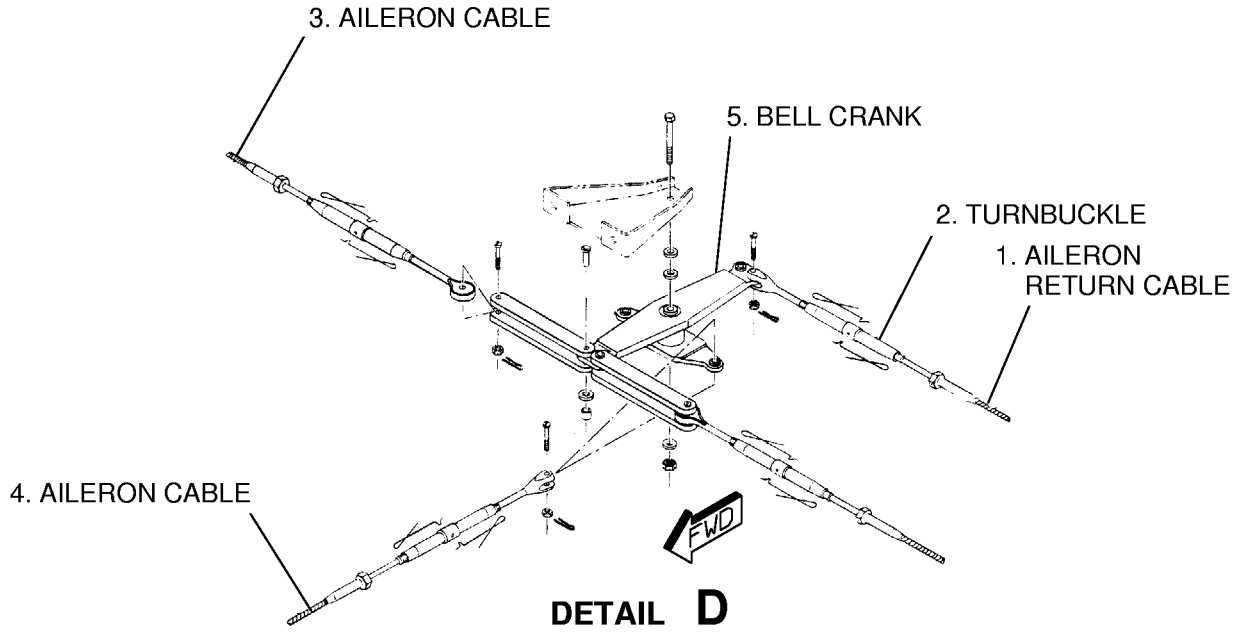


DETAIL D
310R0001 THRU 310R0500



DETAIL D
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Aileron Control System
Figure 402 (Sheet 2)

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(3) If disassembled, assemble the long (twenty link) chains and the short (fourteen link) chains into chain assemblies (21) using turnbuckles (22). Observe that the terminal ends are equal in length after turnbuckles are installed.

NOTE: If the assembly of long and short chains into chain assembly (21) was correct, the index link (red) on the long chain should be nine links from the now open end of the chain assembly (21) with all bolt heads facing in the same direction.

(4) Attach guide wires to each end of chain assembly (21) and route the long chain under the center sprocket on triple sprocket (23) to LH leg of control column assembly.
(5) Assemble into LH leg of control column the following components:
(a) Insert shaft (13) into universal joint (5) and secure with roll pin (18).
(b) Place adapter (7) over universal joint (5) and shaft (13).

NOTE: Adapter (7), universal joint (5), and shaft (13) are drilled as a matched set and cannot be interchanged with other like components.

(c) Place bearing (8) over adapter (7) and position adapter, universal joint, shaft, and sprocket (11) into LH leg of control column assembly with universal joint facing aft.

NOTE: Install sprocket (11) with collar of sprocket facing away from adapter (7).

(d) Align holes and install bolt (6) through adapter (7) and shaft (13); secure with nut.
(e) Align holes and install bolt (12) through sprocket (11) and shaft (13); secure with nut.
(f) Place bearing (8) on shaft (13); secure shaft (13) to control column assembly with washer (14), nut (16), and cotter pin (15).
(6) Route the short chain of chain assembly (21) over the top of the sprocket (11) and align index mark (red) on sprocket with index link (red) on chain.
(7) Secure chain assembly (21) together with turnbuckle and tighten just enough to take up slack. Observe that the terminals on chain are equal in length after turnbuckles are installed.
(8) Assemble and install components in leg of RH control column assembly as described above, except position collar on sprocket (11) butted against adapter (7).
(9) Install lower chain and cable assembly (26) on aft sprocket of triple sprocket (23) and align index mark (red) on chain link with index mark (red) tooth of sprocket.
(10) Replace temporary bolt or heavy gauge wire which was used to support triple sprocket (23) during assembly with attaching bolt (20), washer (24), and nut (25).

NOTE: Care should be taken to ensure that the washer (38) between triple sprocket (23) and wall of control column "Y" remains in place when bolt (20) is installed.

(11) Using a bolt or pin as a rigging pin, insert through tube assembly attachment holes in universal joints (5) and tighten turnbuckles (22) on upper chain assemblies (21) until bolts or pins are parallel with vertical leg of control column "Y".

NOTE: After rigging upper chain assemblies (21), safety wire last link on lower chain assemblies (26) to control column "Y"; thus preventing chain assemblies from accidentally moving off index tooth on sprocket during installation of control column "Y" in airplane.

(12) Insert bolt (36) through lower control column "Y" tab and assemble component part as shown in Figure 401; secure with washer (28) and nut (27).
(13) Install control column assembly.
(14) Rig aileron control cables, refer to Ailerons - Adjustment/Test.

D. Installation (Refer to Figure 401).
(1) Carefully work control column assembly into position from the RH side of instrument panel.
(2) Secure control column assembly to fuselage structure with bolt (42), spacers (43), washers (41), nut (40), and cotter pin (39).

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(3) Connect chain assembly (26) to aileron cable assembly (37) with bolts, nuts, and cotter pins.
(4) Install control wheel (1) and control tube (2) on control column assembly with bolts (3), bushings (4), and nuts (19).

NOTE: If autopilot, IFCS, electric trim, mic button is installed, connect electrical wires to control tube assembly at the quick disconnects.

(5) Connect bob-weight assembly and push-pull tube to bracket (44) on right leg of control column assembly, refer to Elevators - Removal/Installation.
(6) Install upper and lower instrument panel braces using rivets.
(7) Install shock-mounted instrument panel, refer to Chapter 31, Instrument and Control Panels - Removal/Installation.
(8) Rig aileron control cables, refer to Ailerons - Adjustment/Test. Safety turnbuckles.
(9) Replace access covers.
(10) Install the following items:
  (a) Control column assembly boot, retainer, and cover.
  (b) Center, pilot's floor and bulkhead carpets.
  (c) Pilot and passenger seats (middle, individual optional).
(11) Move the control column through full travel forward and aft. Ensure that all wiring and structures are clear and secured.

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FLIGHT CONTROLS - INSPECTION/CHECK

1. Control Column

A. Inspection.
(1) Use a clean cloth dampened with a suitable solvent to remove grease and dirt. Inspect control column for security, looseness, and wear. Check rigging between pilot and copilot's controls. Check freedom of movement of controls and bob-weight. Visually inspect turnbuckles for proper safety. Check control wheel, control locks for condition and operation. Repairs are made by replacing all worn or damaged components.

2. Cable System Routing

A. Inspection.
(1) Examine cable runs for incorrect routing, fraying, twisting, wear at fairleads, wear at rub blocks, wear on guard pins, and wear at pulleys. Look for interference with adjacent structure, equipment, wiring, plumbing, and other controls.
(2) Check cable movement for binding and full travel. Observe cables for slack when moving the corresponding controls.

3. Cable Fittings

A. Inspection.
(1) Check swaged fitting reference marks for an indication of cable slippage within the fitting. Inspect the fitting for distortion, cracks, and broken wires at the fitting.
(2) Check turnbuckles for proper thread exposure. Also, check turnbuckle locking (clip or wire).

4. Control Cables

A. The chromium nickel steel wire is helically twisted into strands and the strands laid about other strands forming the flexible steel cable. The diameter of the cable is determined by the number of wires and the number of strands in the cable.
(1) Construction of Cables
(a) Cable diameter, 1/32 inch, 3 by 7 construction - Cable of this construction shall consist of three strands of seven wires each. There shall be no core in this construction. The cable shall have a length of lay of not more than eight times nor less than five times the nominal cable diameter.
(b) Cable diameter, 1/16 inch and 3/32 inch, 7 by 7 construction - Cable of this construction shall consist of six strands of seven wires each, laid around a core strand of seven wires. The cable shall have a length of lay of not more than eight times nor less than six times the nominal cable diameter.
(c) Cable diameter, 1/8 inch through 3/8 inch, 7 by 19 construction - Cable of this construction shall consist of six strands laid around a core strand. The wire composing the seven individual strands shall be laid around a central wire in two layers. The single core strand shall consist of a layer of 6 wires laid around the central wire in a right direction, and a layer of 12 wires laid around the 7 wire strand in a right direction. The 6 outer strands of the cable shall consist of a layer of 6 wires laid around the central wire in a left direction, and a layer of 12 wires laid around the 7 wire strand in a left direction.
(d) Lubrication - A pressure type friction preventative compound, having noncorrosive properties, is applied during construction as follows:
- Friction preventative compound is continuously applied to each wire as it is formed into a strand so that each wire is completely coated.
- Friction preventative compound is continuously applied to each strand as it is formed into a cable so that each strand is completely coated.

(e) Definitions - The following definitions pertain to flexible steel cable:
- Wire - Each individual cylindrical steel rod or thread shall be designated as a wire.
- Strand - Each group of wires helically twisted or laid together shall be designated as a strand.

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- Cable - A group of strands helically twisted or laid about a central core shall be designated as a cable. The strands and the core shall act as a unit.
- Diameter - The diameter of cable is the diameter of the circumscribing circle.
- Wire Center - The center of all strands shall be an individual wire and shall be designated as a wire center.
- Strand Core - A strand core shall consist of a single straight strand made of preformed wires, similar to the other strands comprising the cable in arrangement and number of wires.
- Preformed Type - Cable consisting of wires and strands shaped, prior to fabrication of the cable, to conform to the form or curvature which they take in the finished cable, shall be designated as preformed types.
- Lay or Twist - The helical form taken by the wires in the strand and by the strands in the cable is characterized as the lay or twist of the strand or cable respectively. In a right lay, the wires or strands are in the same direction as the thread on a right screw, and for a left lay, they are in the opposite direction.
- Pitch (or length of lay) - The distances, parallel to the axis of the strand or cable, in which a wire or strand makes one complete turn about the axis, is designated as the pitch (or length of lay) of the strand or cable respectively.

B. Inspection of Cable System.

NOTE: For tools and equipment used in checking and rigging, refer to the appropriate Troubleshooting sections of Chapter 27.

(1) Routing
  (a) Examine cable runs for incorrect routing, fraying and twisting. Look for interference with adjacent structure, equipment, wiring, plumbing and other controls.
  (b) Check cable movement for binding and full travel. Observe cables for slack when moving the corresponding controls.

(2) Cable Fittings.
  (a) Check swaged fitting reference marks for an indication of cable slippage within the fitting. Inspect the fitting for distortion, cracks and broken wires at the fitting.
  (b) Check turnbuckles for proper thread exposure. Also, check turnbuckle locking clip. Refer to Chapter 20, Safetying - Maintenance Practices.

(3) Inspection of Control Cable.
  (a) The control cable assemblies are subjected to a variety of environmental conditions and forms of deterioration that ultimately may be easy to recognize as wire/strand breakage or the not-so-readily visible types of corrosion and/or distortion. The following data will aid in detecting an unserviceable cable condition:
  (b) Broken Wire.
    1 Examine cables for broken wires by passing a cloth along the length of the cable. This will detect broken wires, if the cloth snags on the cable. Critical areas for wire breakage are those sections of the cable which pass through fairleads, across rub blocks and around pulleys. If no snags are found, then no further inspection is required. If snags are found or broken wires are suspected, then a more detailed inspection is necessary, which requires that the cable be bent in a loop to confirm the broken wires. Refer to Figure 601 for an example. Loosen or remove the cable to allow it to be bent in a loop as shown. While rotating cable, inspect the bent area for broken wires.
    2 Wire breakage criteria for the cables in the flap, aileron, rudder, and elevator systems are as follows:
      a Individual broken wires are acceptable in primary and secondary control cables at random locations when there are no more than three broken wires in any given 10-inch (0.254 m) cable length.
    3 Corrosion.
      a Carefully examine any cable for corrosion that has a broken wire in a section not in contact with wear producing airframe components, such as pulleys, fairleads, rub blocks, etc. It may be necessary to remove and bend the cable to

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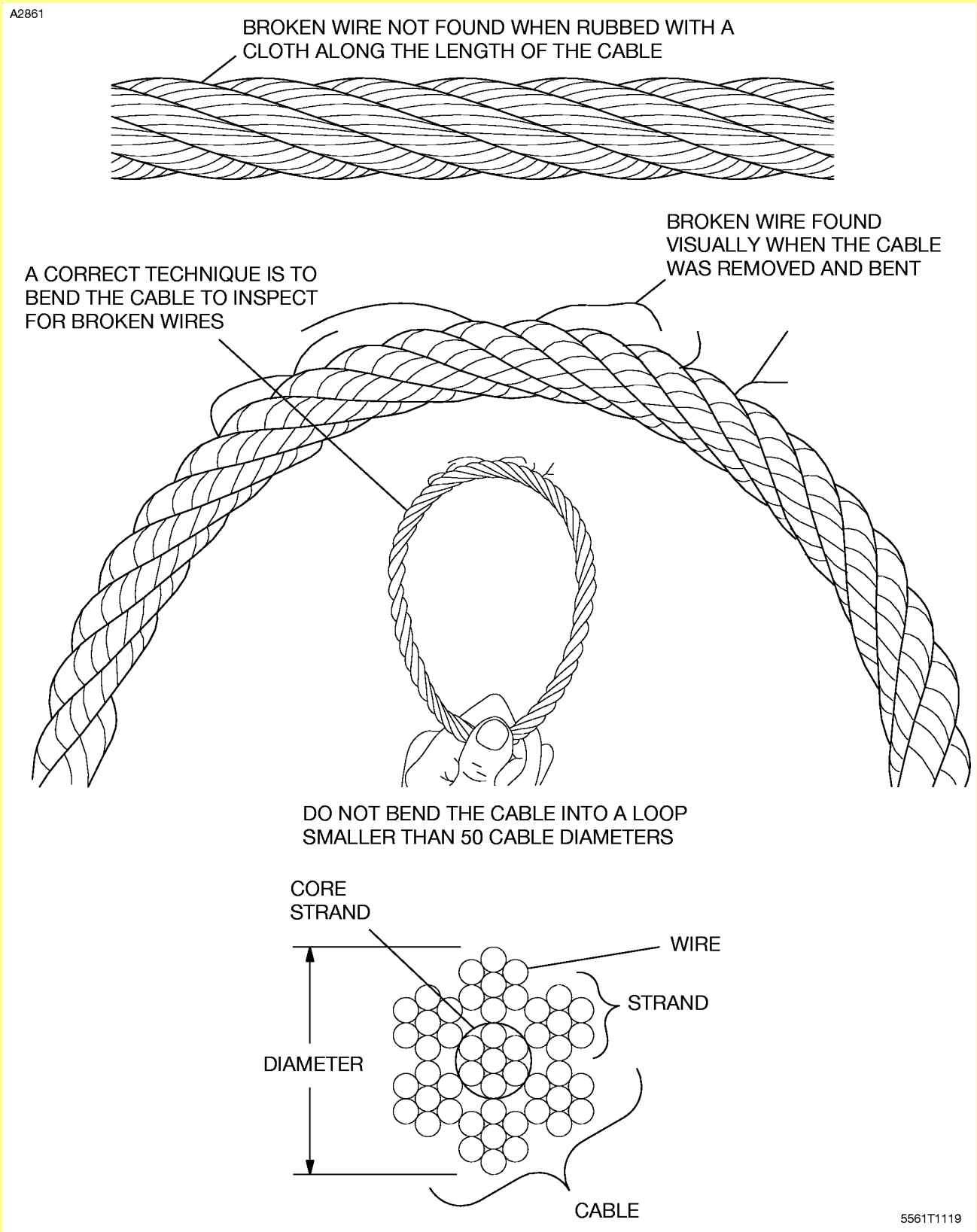

Cable Broken Wires and Pulley Wear Patterns
Figure 601 (Sheet 1)

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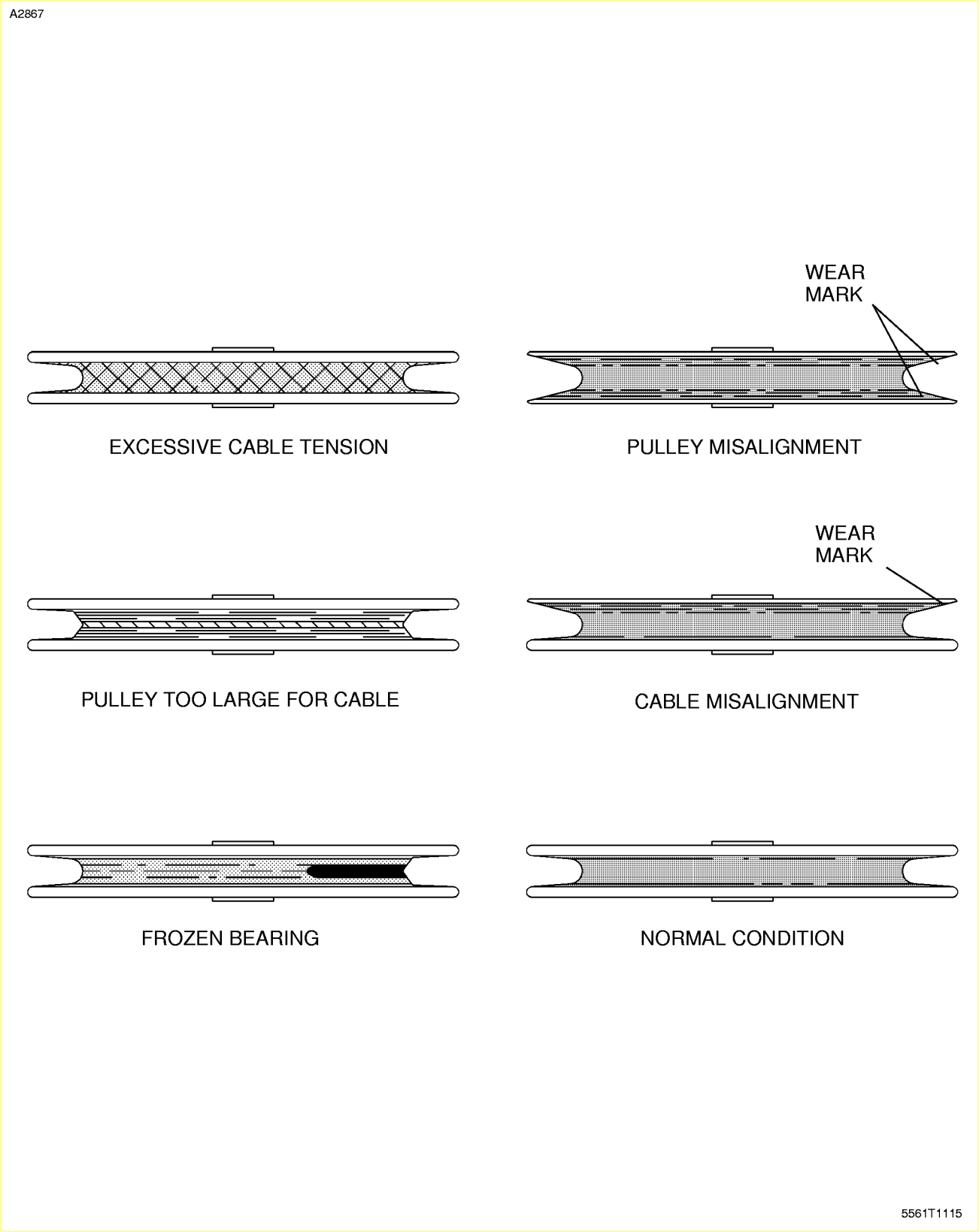

Cable Broken Wires and Pulley Wear Patterns
Figure 601 (Sheet 2)

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properly inspect it for internal strand corrosion, as this condition is usually not evident on the outer surface of the cable. Replace cable if internal corrosion is found. For description of control cable corrosion, refer to Chapter 51, Corrosion - Description and Operation .

b Areas conducive to cable corrosion are below the refreshment center, in the wheel well, and in the tailcone. Also, if a cable has been wiped clean of its corrosion preventative lubricant and metal-brightened, the cable must be examined closely for corrosion.

(4) Pulleys

(a) Inspection of Pulleys.

1 Inspect pulleys for roughness, sharp edges and presence of foreign material embedded in the grooves. Examine pulley bushings or bearings to ensure smooth rotation, freedom from flat spots, and foreign material.

2 Periodically rotate pulleys, which turn through a small arc, to provide a new bearing surface for the cable.

3 Check pulley alignment. Check pulley brackets and guards for damage, alignment and security. Various failures of the cable system may be detected by analyzing pulley conditions. Refer to Figure 601 for pulley wear patterns; these include such discrepancies as too much tension, misalignment, pulley bearing problems and size mismatch between cable and pulley.

(5) Cable Storage

(a) Cable assemblies shall be stored straight or in a coil. When stored in coil form, the coil inside diameter shall not be less than 150 times the cable diameter or bent in a radius of not less than 75 times the cable diameter. Coils shall not be flattened, twisted or folded during storage. Storage requirements shall apply until the cable is installed in its normal position in the airplane. If only a part of the cable is installed in an assembly, cable storage requirements apply to the uninstalled portion of the cable.

(6) Flight Control Cable Inspection

(a) General Information

WARNING: If the flight control cable system(s) are removed, disconnected, or cable section(s) are replaced, make sure that all rigging, travel checks, cable tensions, and control surface checks are done in accordance with Chapter 27, Flight Controls for the affected flight control system.

NOTE: Unless specifically required, flight control cable inspections are normally performed without removing or disconnecting any part of the flight control system.

(b) Cable Inspection Procedure

1 Each flight control cable must be visually inspected along its entire length for evidence of broken wires, corrosion, fraying or other damage. Visual inspection may be via direct sight, mirror and flashlight or borescope.

2 Visually check for proper routing along entire length of cable. Make sure that cables, pulleys, attaching sectors, and bell cranks are free and clear of structure and other components

NOTE: Some systems use rub blocks, it is permissible for control cables to rub against these blocks.

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3 Each flight control cable will be physically inspected, by passing a cloth along the cable, at all pulley, fairlead, bulkhead seal locations and other locations where the cable may be subject to chafing or wear.

NOTE: It may be necessary to have a second person move the flight control system being inspected to ensure that the entire cable run in an affected area is checked.

4 Any flight control cable which snags the cloth due to broken wires is to be slackened (if not previously slackened) and a loop test performed to identify number and location of individual broken wires. Wire breakage criteria is as follows for all cable systems:

a Individual broken wires are acceptable in any cable provided that no more than three individual wires are broken in any given ten-inch (0.254 m) cable length. If number of individual broken wires cannot be determined, cable is to be rejected. Any amount of cable or wire wear is acceptable, provided the individual broken wire criteria is met.

b Reject any cable if corrosion is found which appears to have penetrated into interior of cable. If extent of corrosion cannot be determined, cable is to be rejected.

5 Inspect all cable termination fittings (clevises, turnbuckles, anchors, swagged balls, etc.) for security of installation, proper hardware and evidence of damage.

a All turnbuckles are required to be safetied. Safety wire or prefabricated clips are acceptable. Refer to Chapter 20, Safetying - Maintenance Practices.

6 Inspect cable pulleys.

a Inspect all pulleys for security of installation, evidence of damage and freedom of rotation.

b Pulleys which do not rotate with normal cable movement due to internal bearing failure are to be rejected.

c Pulleys with grooving etc., due to normal in-service use, are deemed serviceable, as long as overall function is not impaired.

7 Restore cable system as required following cable teardown (if performed).

a Tension tasks and other tasks specific to individual systems are described under applicable individual tasks.

b Any flight control cable system which has been torn down requires a flight control rigging check prior to release of airplane for flight.

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FLIGHT CONTROLS - INSPECTION/CHECK

1. Control Column

A. Inspection.
(1) Use a clean cloth dampened with a suitable solvent to remove grease and dirt. Inspect control column for security, looseness, and wear. Check rigging between pilot and copilot's controls. Check freedom of movement of controls and bob-weight. Visually inspect turnbuckles for proper safety. Check control wheel, control locks for condition and operation. Repairs are made by replacing all worn or damaged components.

2. Cable System Routing

A. Inspection.
(1) Examine cable runs for incorrect routing, fraying, twisting, wear at fairleads, wear at rub blocks, wear on guard pins, and wear at pulleys. Look for interference with adjacent structure, equipment, wiring, plumbing, and other controls.
(2) Check cable movement for binding and full travel. Observe cables for slack when moving the corresponding controls.

3. Cable Fittings

A. Inspection.
(1) Check swaged fitting reference marks for an indication of cable slippage within the fitting. Inspect the fitting for distortion, cracks, and broken wires at the fitting.
(2) Check turnbuckles for proper thread exposure. Also, check turnbuckle locking (clip or wire).

4. Control Cables

A. Inspection.
(1) The control cable assemblies are subjected to a variety of environmental conditions and forms of deterioration that ultimately may be easy to recognize as wire/strand breakage or the not-so-readily visible types of wear, corrosion, and/or distortion. The following data will aid in detecting the deficient cable condition.
(2) Broken Wire.
(a) Critical areas for wire breakage are those sections of the cable which pass through fairleads, across rub blocks, and around pulleys. Examine cables for broken wires by passing a cloth along the length of the cable. This will detect broken wires if the cloth snags on the cable. When snags are found, closely examine the cable to determine the extent of the damage.
(b) The absence of snags is not positive evidence that broken wires do not exist. Refer to Figure 601 for detecting broken wires. The damage became readily apparent when the cable was removed and bent in a loop as depicted in the illustration.
(c) A single broken wire in one technique bend loop (as illustrated) is not justification for rejection unless successive or adjacent bend loops reveal broken wire. If a few broken wires appear in one cable but spread over the length of cable, and not have broken wires in successive or adjacent bend loops, the cable is considered serviceable. On a cable that has broken wires but considered serviceable, monitor the condition of that cable at a frequency more often than a cable with no broken wires.
(3) External Cable Wear Patterns.
(a) Wear will normally extend along the cable equal to the distance the cable moves at that location and may occur on one side of the cable only or on its entire circumference. Replace cables when the individual wires in each strand appear to blend together. External cable wear less than having the wires blend together are considered serviceable, however, monitor the condition of that cable shall be at a frequency more often than a cable experiencing no external wear.

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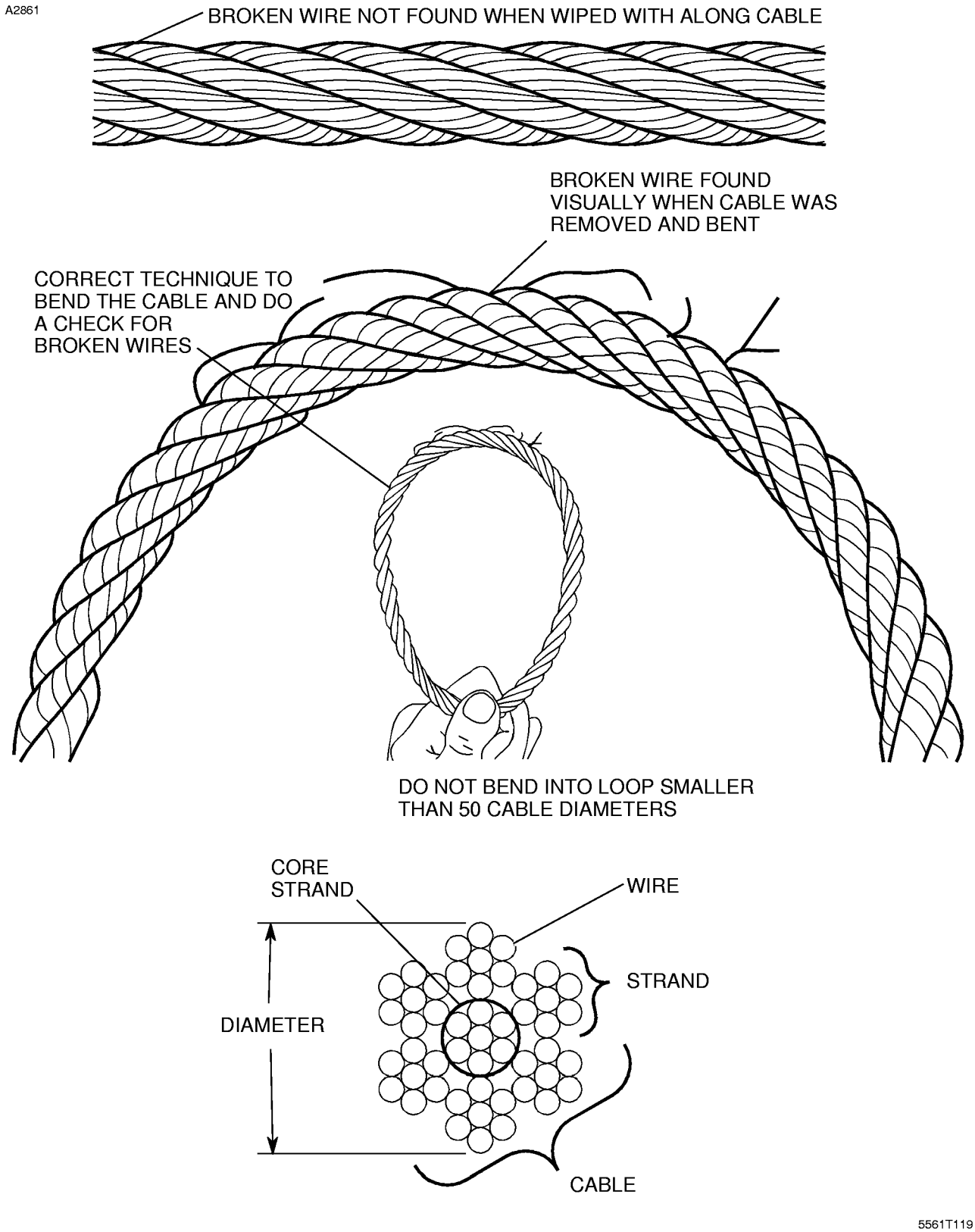

Cable Wear
Figure 601 (Sheet 1)

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(4) Internal Cable Wear Pattern.
  (a) As wear is taking place on the exterior surface of a cable, the same condition is taking place internally, particularly in the sections of the cable which pass over pulleys, quadrants, and sectors. This condition is not easily detected unless the strands of the cable are separated. Wear of this type is a result of the relative motion between inner wire surfaces. Under certain conditions, internal cable wear can be greater than external cable wear. Replace cable if internal wear can be identified.

(5) Corrosion.
  (a) Carefully examine any cable for corrosion that has a broken wire in a section not in contact with wear producing airframe components such as pulleys, fairleads, rub blocks, etc. It may be necessary to remove and bend the cable to properly inspect it for internal strand corrosion as this condition is usually not evident on the outer surface of the cable. Replace cable if internal corrosion is found.
  (b) Areas conducive to cable corrosion are below refreshment center, in the wheel well, and in the tailcone. Also, if a cable has been wiped clean of its corrosion preventive lubricant and metal-brightened, the cable shall be monitored closely for corrosion.

5. Pulleys

A. Inspection.
(1) Inspect pulleys for roughness, sharp edges, and presence of foreign material embedded in the grooves. Examine pulley bushings or bearings to assure smooth rotation, freedom from flat spots, and foreign material.
(2) Periodically rotate pulleys, which turn through a small arc, to provide a new bearing surface for the cable.
(3) Check pulley alignment. Check pulley brackets and guards for damage, alignment, and security. Various cable system malfunctions may be detected by analyzing pulley conditions. Refer to Figure 602 for pulley wear patterns; these include such discrepancies as too much tension, misalignment, pulley bearing failure, and size mismatch between cable and pulley.

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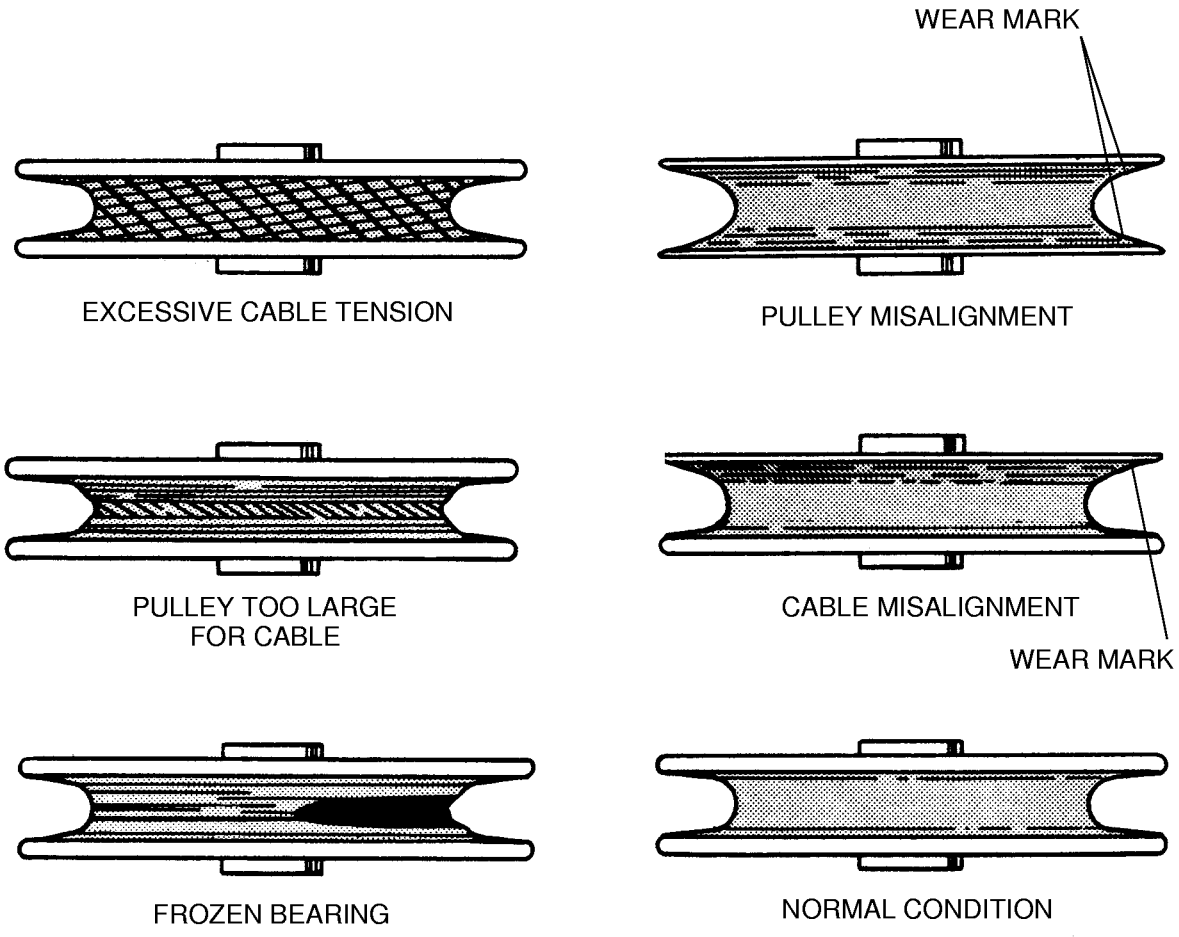

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Pulley Wear Patterns
Figure 602

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AILERONS - DESCRIPTION AND OPERATION

1. Aileron System

WARNING: Upon completion of all control system installation and/or rigging, ensure that all bolts, nuts, fittings, connections, etc. are tightened and secured properly.

A. Description.

(1) The aileron system consists of the control wheels, control column "Y" assembly, ailerons, and the cable assemblies. The ailerons are attached to the rear spar of each wing outboard of the flaps. When either the pilot's or copilot's (optional) control wheel is rotated, the control column "Y" assembly transmits the wheel rotation by universal joint and cables to the bellcrank in the fuselage, rotating the bellcrank. The bellcrank rotation is transmitted by cables to the quadrant assemblies of each wing, which positions one aileron up and the opposite aileron down. Stop bolts located on the quadrant support prevent overtravel of the ailerons.

2. Aileron Trim Tab System

A. Description.

(1) The aileron trim tab system consists of one trim tab on the trailing edge of the left aileron, the aileron trim control wheel and mechanism on the pedestal, system control cables, and an actuator inboard of the left aileron. The system is controlled mechanically by a trim control wheel on the lower face of the pedestal. When the trim control wheel is rotated, the cable system transmits the movement to the trim tab actuator. As the actuator sprocket rotates, an internal screw in the actuator rotates, driving the actuator screw to push the trim tab up or down. Stop blocks, located in the left wing, prevent overtravel of the trim tab.

CAUTION: Primary and secondary flight control cables, push-pull tubes, bellcranks and mountings on late model airplanes use dual locking fasteners. The lock nuts for these fasteners incorporate a fiber lock, and are castellated for safetying with a cotter pin. When any of these areas are disconnected on any airplane, new dual locking fasteners should be installed. See the Airplane Illustrated Parts Catalog for part numbers and location of these fasteners.

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AILERONS - TROUBLESHOOTING

1. Aileron and Tab System

A. Troubleshooting.

(1) Troubleshooting the aileron and tab system is accomplished initially by determining whether the trouble exists in the aileron control system or the aileron trim control system, refer to Table 101 and Table 102 for troubleshooting charts.

Table 101. Aileron Control System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
LOST MOTION BETWEEN CONTROL WHEEL AND AILERON WHEN CONTROL WHEEL ROTATED RIGHT OR LEFT.	Improperly routed cables.	Reroute cables properly on pulleys.
	Pulleys, pulley guards are unserviceable or aileron is installed incorrectly.	Replace unserviceable pulleys and guards. Install aileron correctly.
	Aileron bell crank assembly or aileron quadrant assembly do not operate correctly.	Replace unserviceable aileron bell crank assembly or aileron quadrant assembly.
	Cable tension is not correct.	Adjust cable tension.
BINDING OR JUMPY MOVEMENT OF CONTROL WHEELS WHEN CONTROL WHEEL IS ROTATED TO THE RIGHT OR LEFT.	Friction forces or deflection is not correct.	Check friction forces. Perform aileron and trim tab deflection check. Make necessary corrections.
	Cables are not routed correctly.	Reroute cables properly.
	Faulty pulleys, bell crank assembly or quadrant assembly.	Replace faulty pulleys, bell crank assembly or quadrant assembly as necessary.
	Aileron binding.	Manually move aileron through full travel. Check for binding against adjacent structure. Adjust or replace aileron as necessary.
	Improper lubrication.	Lubricate system friction points.
AILERON TRAVEL IS INCORRECT WHEN CONTROL WHEEL IS ROTATED TO THE RIGHT OR LEFT.	Improperly adjusted aileron control stops.	Check and adjust aileron control stops.
	Improper cable tension.	Check and adjust cable tension.
CONTROL WHEELS ARE NOT SYNCHRONIZED.	Incorrect interconnect assembly adjustment or cable tension.	Check rigging of control column upper chain assembly. Correct interconnect assembly adjustment and adjust cable tension.
	Improperly installed control wheel columns.	Check control wheel and column for proper installation, including chain. Properly install control wheel, column, and chain.

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Table 102. Aileron Trim Control System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
TRIM CONTROL WHEEL MOVES WITH EXCESSIVE RESISTANCE WHEN ROTATED.	Improper friction forces or deflection.	Check friction forces. Perform aileron and trim tab deflection check. Make necessary corrections.
	Improper cable tension.	Check cable tension. Adjust as necessary.
	Improperly routed cable, binding pulleys.	Check pulleys for binding or rubbing. Replace binding pulleys and correct rubbing or cable installation. Correct cable routing.
	Faulty miter gear assembly.	Replace miter gear assembly.
	Faulty trim actuator.	Repair or replace trim actuator.
	Trim tab hinge binding.	Lubricate or replace hinge.
LOST MOTION BETWEEN TRIM CONTROL WHEEL AND TRIM TAB EXISTS WHEN ROTATED.	Improper cable tension.	Adjust cable tension.
	Faulty pulleys or incorrect cable routing.	Check for defective pulleys and correct cable routing. Replace defective pulleys or correct cable routing.
	Excessive backlash or miter gear assembly.	Repair or replace miter gear assembly.
	Trim actuator worn.	Repair or replace trim actuator.
TRIM TAB TRAVEL NOT CORRECT WHEN ROTATED.	Improper cable tension.	Check cable tension. Adjust cable tension as necessary.
	Improper adjustment of stop blocks.	Adjust stop blocks.
	Improper adjustment of actuator.	Adjust actuator screw.
	Indicator incorrectly engaged with wheel track.	Adjust indicator. Refer to rigging procedures.

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AILERONS - REMOVAL/INSTALLATION

1. Aileron

A. Removal (Refer to Figure 401).

NOTE: Removal and installation procedures for left-hand aileron and right-hand aileron are typical, except for the right-hand aileron, which does not incorporate a trim tab.

(1) Position the aileron trim tab to UP position to gain access to trim tab push-pull tube (9) at aft attach point.
(2) Remove cotter pin (10), nut (11), bolt (8), and spacer (7) securing push-pull tube (9) to trim tab.
(3) Lower flaps and disconnect aileron push-pull rod (4) by removing bolt (2) and washer (3).
(4) Disconnect bonding strap from aileron by removing attaching screw.
(5) Remove bolt (2) attaching aileron to hinge assembly (1).

CAUTION: Support aileron when hinge bolt is removed.

(6) Move aileron aft, clearing hinge assembly, and slightly inboard until outboard hinge pin (12) is free of bearing.

B. Installation (Refer to Figure 401).
(1) Guide aileron trim tab push-pull tube (9) through opening in aileron.
(2) Insert hinge pin (12) in the outboard bearing.
(3) Secure aileron to hinge assembly (1) with bolt (2).
(4) Connect aileron push-pull rod (4) by installing bolt (2) and washers (3).
(5) Safety wire bolts (2).
(6) Secure bonding strap with attaching screw.
(7) Connect trim tab push-pull tube (9) to trim tab with bolt (8), spacer (7), nut (11), and cotter pin (10).
(8) Check aileron and trim tab for proper operation and correct travel. If necessary, rig in accordance with Ailerons - Adjustment/Test.

2. Aileron Trim Tab

A. Removal (Refer to Figure 401).
(1) Position the trim tab UP to gain access to trim tab push-pull tube (9) at aft attach point.
(2) Remove cotter pin (10), nut (11), bolt (8), and spacer (7) securing push-pull tube (9) to trim tab.
(3) Remove cotter pins (6); pull hinge pin (5) and remove trim tab.

B. Installation (Refer to Figure 401).
(1) Position trim tab in hinge; insert hinge pin (5).
(2) Secure hinge pin (5) with cotter pins (6).
(3) Connect trim tab push-pull tube (9) to trim tab using bolt (8), spacer (7), nut (11), and cotter pin (10).
(4) Check trim tab for proper operation and travel. If necessary, rig in accordance with Ailerons - Adjustment/Test.

3. Aileron Bell Crank

A. Removal (Refer to Figure 402).
(1) Remove rear seats. Refer to Chapter 25, Passenger Compartment - Removal/Installation.
(2) Remove carpets. Refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(3) Remove floorboard access cover just forward of rear spar. Refer to Chapter 53, Floor Panels - Removal/Installation.
(4) Remove turnbuckle clips from turnbuckles (2) and loosen tension on aileron return cable (1).
(5) Disconnect aileron cables (4 and 7) from bell crank (6) by removing cotter pins (12), nuts (13), and bolts (14).
(6) Remove bell crank (6) by removing bolt (5).

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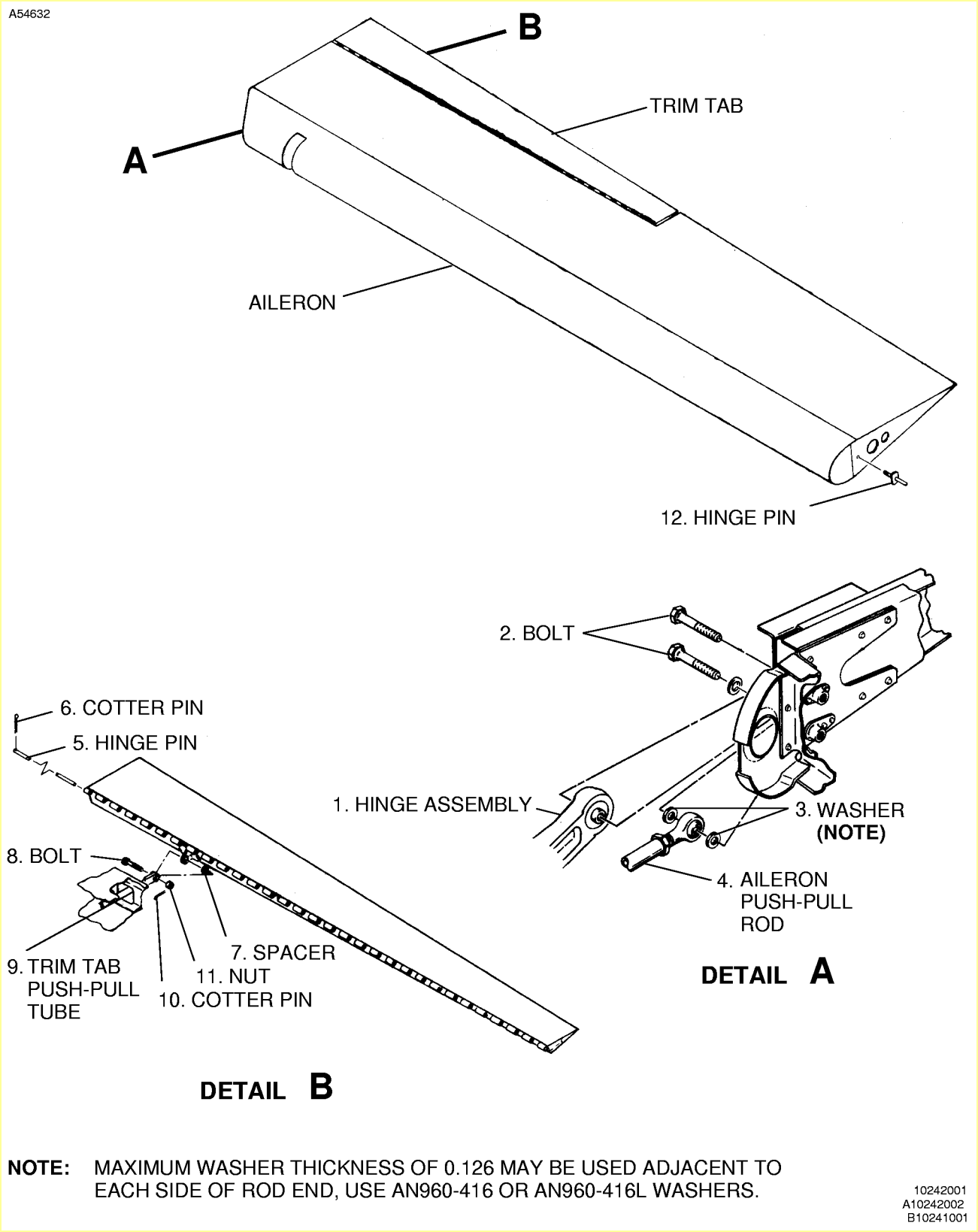

Aileron and Trim Tab Installation
Figure 401 (Sheet 1)

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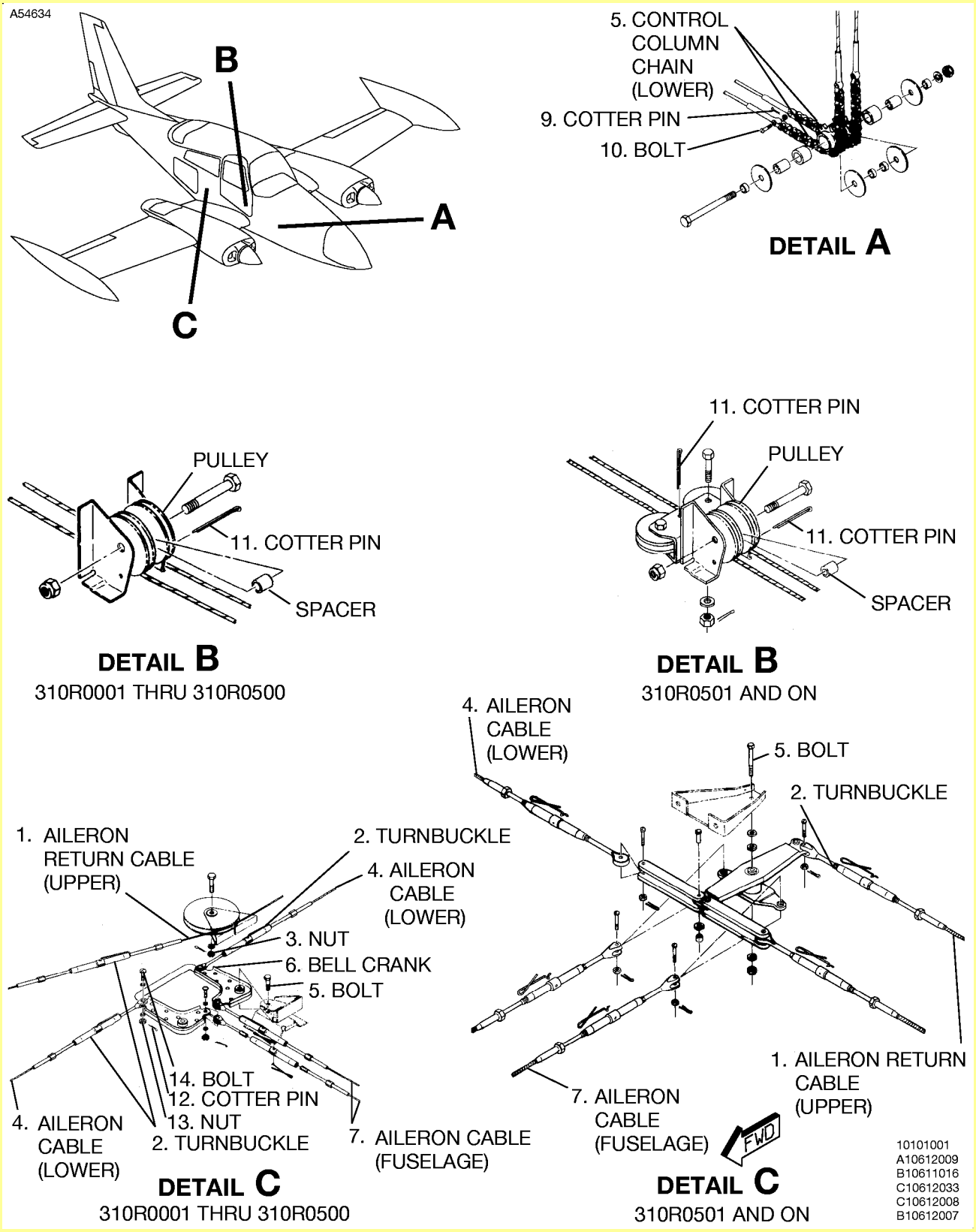

Aileron Control System (Fuselage)
Figure 402 (Sheet 1)

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B. Installation (Refer to Figure 402).
(1) Position bell crank (6) and secure with bolt (5). On Airplanes 310R0501 thru 310R2140, safety wire bolt head to bracket.
(2) Connect aileron cables (4 and 7) to bell crank (6) with bolts (14), nuts (13), and cotter pins (12).

CAUTION: Ensure that aileron cables are in place on aileron quadrants and pulleys in both wings before rigging tension on aileron system. Wing structure can be damaged by the aileron cables if rigging tension is applied and the cables are not properly in place on the aileron quadrants or pulleys.

(3) Rig aileron control system, refer to Ailerons - Adjustment/Test.
(4) Install turnbuckle clips on turnbuckles (2).
(5) Install floorboard access cover, refer to Chapter 53, Floor Panels - Removal/Installation.
(6) Install carpets, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(7) Install rear seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.

4. Aileron Fuselage Cables

A. Removal (Refer to Figure 402).

NOTE: The following procedure is for removing the aileron cables with turnbuckles attached to the cables and pulley cable guard cotter pin removed. If desired, turnbuckle barrels may be unscrewed to leave the turnbuckle forks attached to the fuselage bell crank.

(1) Remove the following items from the airplane:
(a) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(b) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(c) Front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(d) Rear upholstery panel if autopilot (optional equipment) is installed, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove boot, retainer, and cover from lower control column.
(3) Remove floorboard and access covers, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) At the fuselage bell crank (6), disconnect aileron cables (7) by removing attaching cotter pins (12) nuts (13), and bolts (14).
(5) Disconnect aileron cables (7) from lower control column chains (8) by removing attaching cotter pins (9), washers, and bolts (10).

NOTE: Attach guide wire to ends of cables before removal.

(6) Route aileron fuselage cables (7) aft to bell crank, and remove from airplane.

NOTE: Leave guide wires in airplane to facilitate installation.

B. Installation (Refer to Figure 402).
(1) Secure aileron fuselage cables (7) to guide wires and route cables from bell crank (6) to lower control column chains (8).
(2) Remove guide wires from cables.
(3) Secure aileron fuselage cables to lower control column chains (8) with bolts (10), washers, and cotter pins (9).

NOTE: Ensure fuselage cables are not crossed and routed on the underneath side of pulley.

(4) Install cable guard cotter pin (11) on fuselage pulleys.
(5) Secure aileron cables (7) to bell crank (6) with attaching bolts (14), nuts (13), and cotter pins (12).
(6) Rig aileron control system, refer to Ailerons - Adjustment/Test.

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(7) Install boot, retainer, and cover on lower control column.
(8) Install the following items:
  (a) Rear upholstery panel if autopilot (optional equipment) is installed, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
  (b) Front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
  (c) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
  (d) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.

5. Aileron Quadrant

A. Removal (Refer to Figure 403).
(1) Remove the following items from the airplane:
  (a) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
  (b) Rear carpet, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
  (c) Rear upholstery panel if autopilot (optional equipment) is installed, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove aft floorboard access covers and wing access cover above quadrant, refer to Chapter 53, Floor Panels - Removal/Installation.
(3) If autopilot (optional) is installed, disconnect autopilot cables from aileron cables.
(4) Remove turnbuckle clips from turnbuckles (2) on cables (1 and 3) and disconnect cables at bell crank (4).
(5) Remove aileron pulley (9) outboard of aileron quadrant (18) by removing cable guard pin (8), bolt (11), and washer (10).
(6) Attach guide wires to cables (1 and 3) to be used as guides on installation.
(7) Disconnect aileron push-pull tube (7) from aileron quadrant (18) by removing attaching cotter pins (15), nut (16), washer (17), and bolt (19).
(8) Remove bolt (12) and washer (13) attaching aileron quadrant (18) to wing structure.
(9) Remove aileron quadrant (18) from wing by working quadrant and cables through wing access hole.

NOTE: To prevent routing cables (1 and 3) through entire wing, disconnect cable ends from quadrant as near to the wing access hole as working room will permit. Care also should be taken to prevent bushing (14) from falling during removal.

(10) Disconnect aileron cables from quadrant by removing cotter pins, cable guard pins (6), nuts, washers, and bolt (5).

B. Installation (Refer to Figure 403).
(1) Place aileron quadrant (18) near aft wing access hole and connect aileron cables (1 and 3) to quadrant using bolts (5), washers, and nuts; secure cables in position with cable guard pins (6) and cotter pins.

NOTE: Position cable (1) on bottom groove of quadrant and cable (3) on upper groove of quadrant.

(2) Install quadrant (18) in wing and secure with washer (13), bolt (12), and safety wire to pulley bracket.

CAUTION: Ensure bushing (14) is reinstalled with quadrant or serious binding will occur during rigging.

(3) Connect aileron push-pull tube (7) to quadrant with attaching bolt (19), washer, nut, and cotter pin.
(4) Install pulley (9) (outboard of aileron quadrant) with bolt (11), washer (10), and cable guard cotter pin (8).
(5) Route aileron cable (3) to bell crank (4), connect cable to turnbuckle fork with turnbuckle (2).
(6) Route cable (1) to center fuselage and connect with turnbuckle (2).

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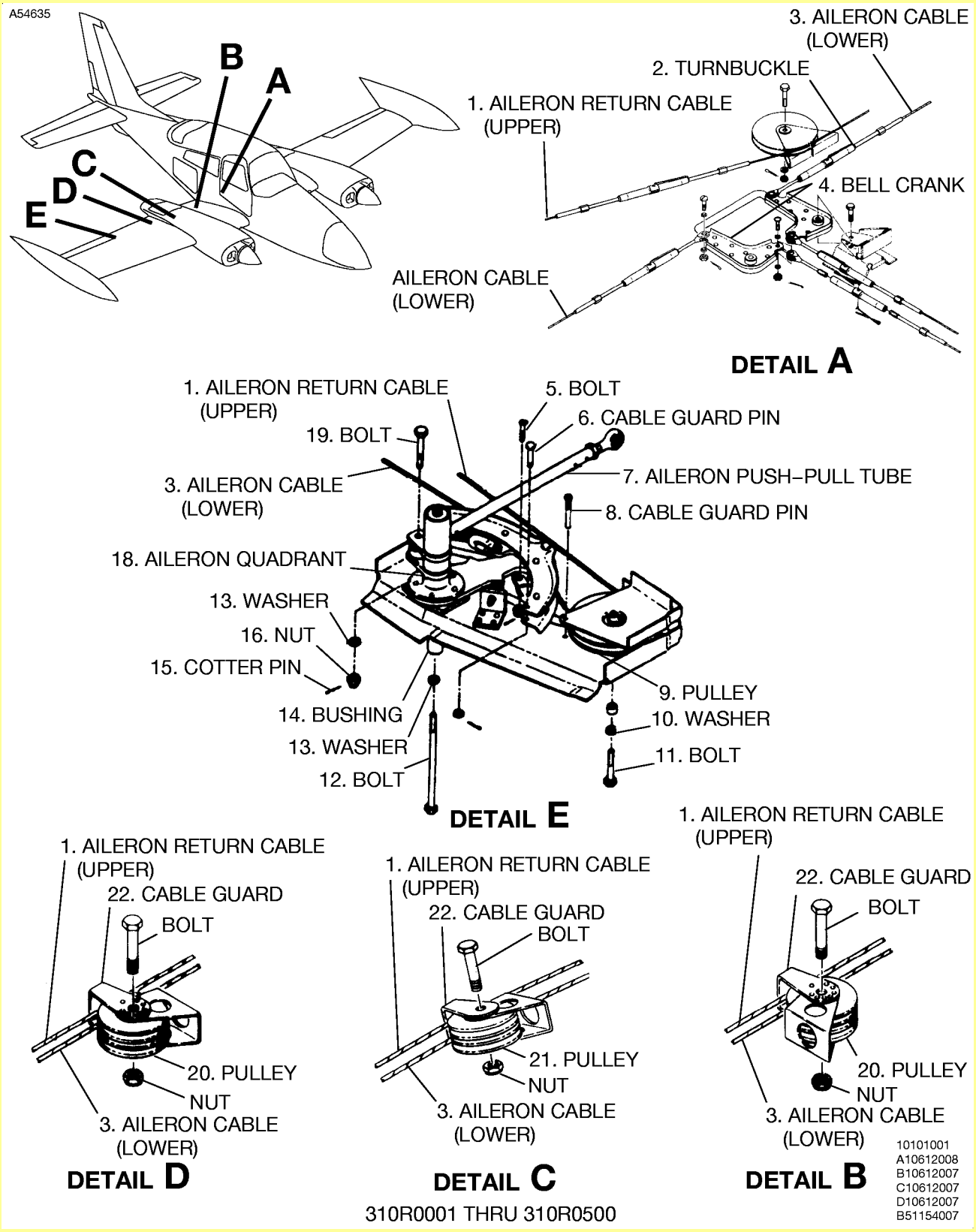

Aileron Control System (Wing)
Figure 403 (Sheet 1)

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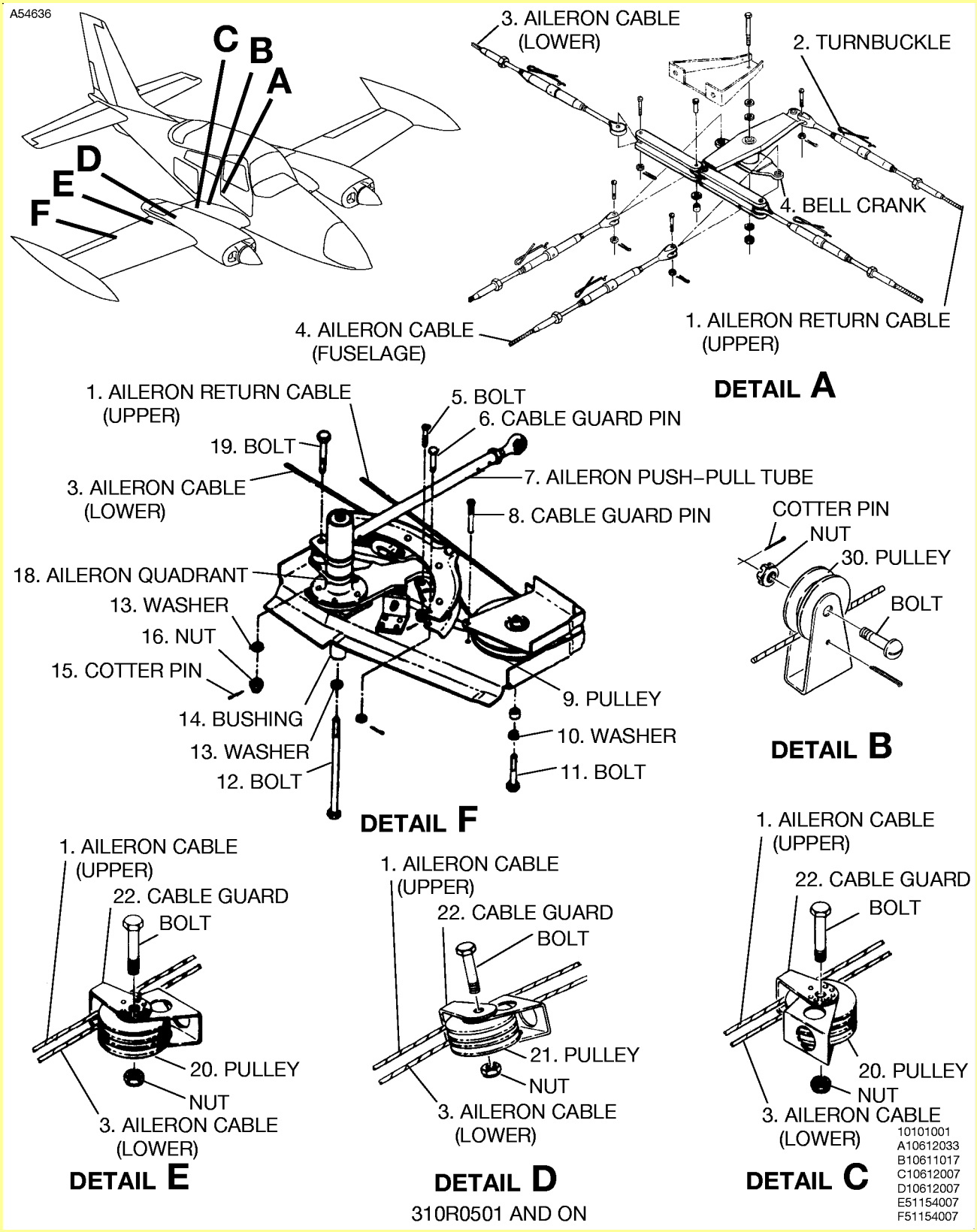

Aileron Control System (Wing)
Figure 403 (Sheet 2)

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(7) Rig aileron control system, refer to Ailerons - Adjustment/Test.

CAUTION: Ensure that aileron cables are in place on aileron quadrants and pulleys in both wings before rigging tension on aileron system. Wing structure can be damaged by the aileron cables if tension is rigged on the cables while not properly in place on aileron quadrants or pulleys.

(8) If autopilot (optional equipment) is installed, connect autopilot cables to aileron cables with attaching clamps.
(9) Install wing access covers and floorboard access covers.
(10) Install removed carpets and seats.

6. Aileron Wing Cables

A. Removal (Refer to Figure 403).

NOTE: The following procedure is for removing the aileron wing cables with turnbuckles attached to the wing direct cables and pulley cable guard cotter pins removed. If desired, turnbuckle barrels may be unscrewed to leave the turnbuckle forks attached to the fuselage bell crank.

(1) Remove the following items from the airplane:
  (a) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
  (b) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
  (c) Front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
  (d) Rear upholstery panel if autopilot (optional equipment) is installed, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove floorboard and access covers, access panel located on rear spar adjacent to aft wheel well, lower aft wing root fillets, and aileron quadrant access cover, refer to Chapter 53, Floor Panels - Removal/Installation.
(3) Remove turnbuckle clips and disconnect turnbuckle (2) to right and left-hand cables (1).
(4) Relieve tension on aileron wing cable (3) by loosening turnbuckle at the fuselage bell crank (4).
(5) At the fuselage bell crank (4), disconnect aileron wing cables (3) by removing attaching cotter pins, nuts, and bolts.
(6) If an autopilot (optional) is installed, disconnect autopilot cables from aileron cables (3).
(7) Remove aileron pulley (9) outboard of aileron quadrant by removing cable guard pin (8), attaching bolt (11), and washer (10).
(8) Disconnect aileron push-pull tube (7) from aileron quadrant (18) by removing cotter pin (15), nut (16), washer (17), and bolt (19).
(9) Remove two sets of pulleys (21) aft of the wheel well and one set (20) in each wing root by removing cable guards (22), and attaching nuts and bolts.
(10) Remove pulleys (23) by removing bolt and nut.

NOTE: When removing control cables, tie guide wires to ends of cables before removal.

(11) Remove bolt (12) and washer (13) attaching aileron quadrant (18) to wing structure.
(12) With aileron cables (1 and 3) attached to aileron quadrant, remove quadrant and cables from wing using aileron quadrant access hole.

NOTE: Leave guide wires in wing and fuselage to facilitate installation.

B. Installation (Refer to Figure 403).
(1) Secure aileron cables (1 and 3) to guide wires, and route cables and quadrant into position.
(2) Remove guide wire from cables.
(3) Install quadrant (18).

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CAUTION: Be sure bushing (14) is installed with quadrant or serious binding will occur during rigging.

NOTE: Cables must be installed on proper pulley as pulleys and guards are being installed. Position aileron cables (3) on lower pulleys and cables (1) on upper pulleys. Make sure cables are parallel and not twisted. Cables must be routed on aft side of wing pulleys.

(4) Install cables, two sets of pulleys (21) and cable guards on pulley brackets aft of the wheel well and secure with attaching bolts and nuts.
(5) Install cables, one set of pulleys (20) and cable guards on lower aft wing root pulley brackets and secure with attaching bolt and nut.
(6) Install pulley (23) on lower cable (3) in fuselage.
(7) Secure aileron cables (1 and 3) to fuselage bell crank (4) with attaching bolts, nuts, and cotter pins.

CAUTION: Ensure that aileron cables are in place on aileron quadrants and pulleys in both wings before rigging tension on aileron system. Wing structure can be damaged by the aileron cables if tension is rigged on the cables while not properly in place on aileron quadrants or pulleys.

(8) If an autopilot (optional equipment) is installed, attach to the aileron cables and rig in accordance with rigging procedures.
(9) Install lower aft wing root fillets, fuselage floorboard access covers, aft underside wing access covers, and quadrant access cover.
(10) Install the following items:
  (a) Rear upholstery panel if autopilot (optional equipment) is installed, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
  (b) Front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
  (c) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
  (d) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.

7. Aileron Trim Tab Actuator

A. Removal (Refer to Figure 404).
(1) Remove the following items from the airplane:
  (a) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
  (b) Rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(2) Remove floorboard access covers above landing gear actuator and from aileron quadrant access cover on left wing, refer to Chapter 53, Floor Panels - Removal/Installation.
(3) Remove turnbuckle clip from turnbuckle (15) and disconnect.
(4) Remove left aileron.
(5) Remove aileron trim tab push-pull tube (20) from actuator (25) by removing cotter pin (23), nut (24), washer (22), and bolt (29).
(6) Remove chain guard (26) from actuator (25) by removing nuts and screws.
(7) Disengage chain from actuator sprocket.
(8) Remove clamp (31) by removing nut (21) and screw (30).
(9) Remove clamps (27) by removing bolts and nuts and remove actuator (25) from wing.

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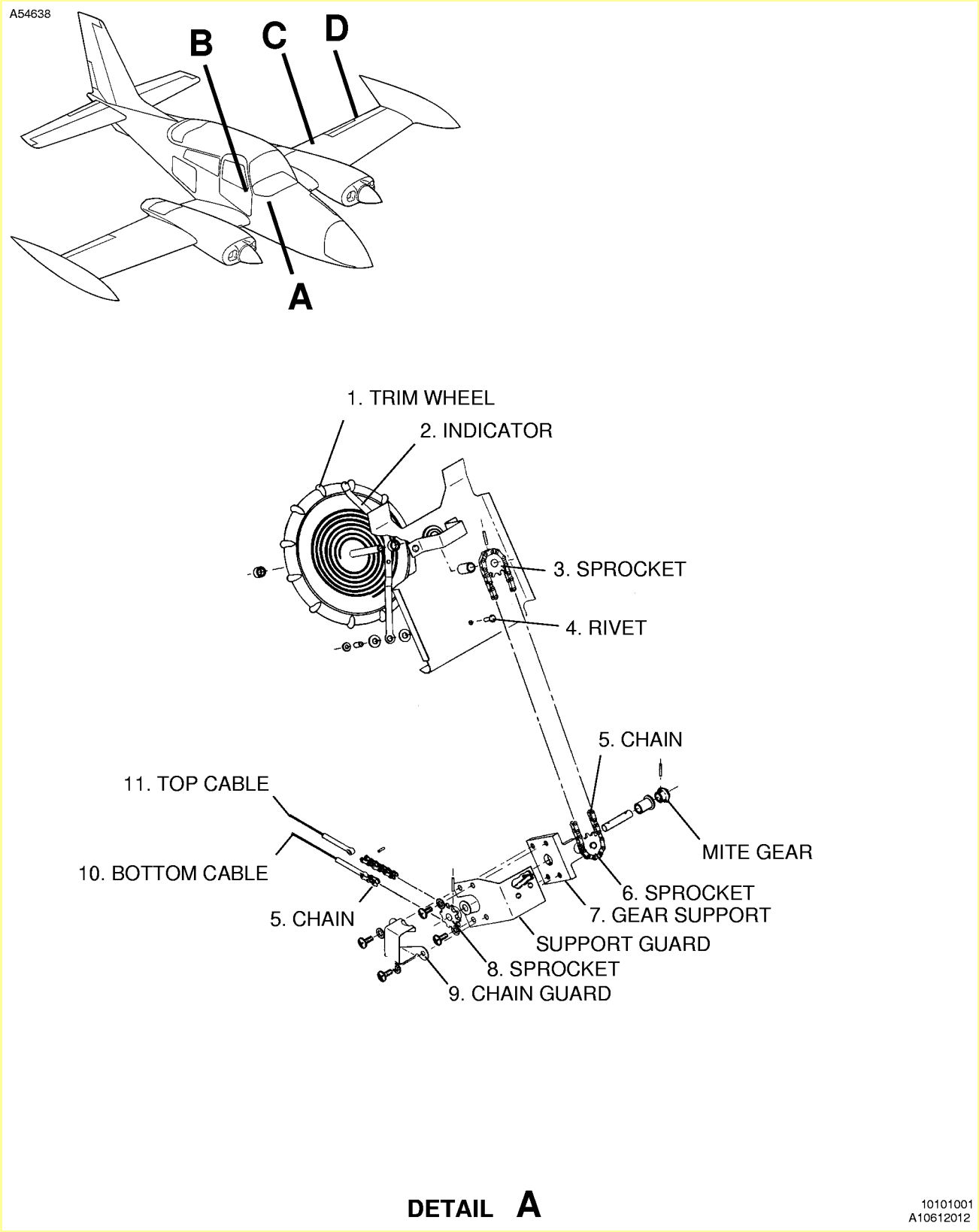

Aileron Trim Tab Actuator and Cable Installation
Figure 404 (Sheet 1)

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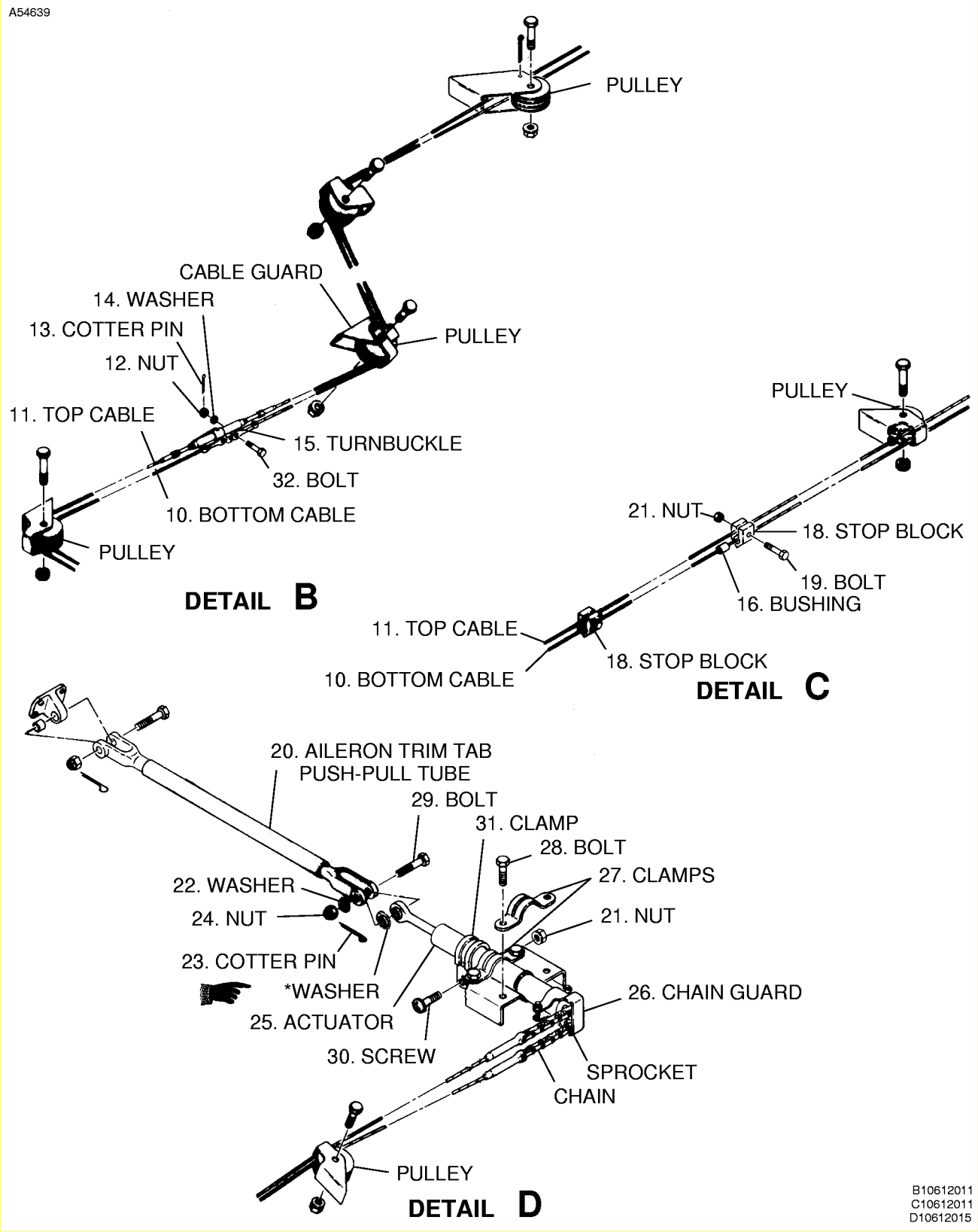

Aileron Trim Tab Actuator and Cable Installation
Figure 404 (Sheet 2)

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B. Disassembly (Airplanes 310R0001 thru 310R0860 - Rudder and Aileron and Airplanes 310R0001 thru 310R1500 - Elevator) (Refer to Figure 405).

NOTE: Secure actuator and with dial indicator or other similar instrument against sprocket, measure internal free play by pushing and pulling on the external screw. If internal free play is more than 0.005 inch at room temperature of 77°F, +5 or -5°F, both collars must be replaced.

(1) Disassemble aileron trim tab actuator assembly in accordance with Figure 405. This view clearly illustrates the proper relationship of all component parts.
(2) Do not remove bearing (4) from screw (3) unless replacement of parts is required.
(3) Clean all component parts, except bearing (4), by washing in suitable solvent. Do not clean sealed bearing (4).
(4) Inspect all component parts for obvious indications of damage such as stripped threads, cracks, deep nicks, and dents.

NOTE: If any free play exists in screws (3 and 10), replace screws.

(5) Check bearings (5 and 12) and screws (3 and 10) for excessive wear and scoring. Dimensions of parts shall be as follows:

Front bearing (12) ID	0.373 in. min.
	0.380 in. max.
Rear bearing (5):	
Small hole ID	0.248 in. min.
	0.253 in. max.
Large hole ID	0.373 in. min.
	0.380 in. max.
Screw (3) OD (Shank)	0.242 in. min.
	0.246 in. max.
Screw (10) OD	0.367 in. min.
	0.370 in. max.

NOTE: Relative linear movement between internal thread screw (10) and bearing (5) should be 0.003 inch minimum and 0.005 inch maximum for the rudder and aileron trim tab actuators on Airplanes 310R0001 thru 310R0860 and 0.010 inch maximum on Airplanes 310R0861 Thru 310R2140, when set at room temperature.

NOTE: Relative linear movement between internal thread screw (10) and bearing (5) should be 0.003 inch minimum and 0.005 inch maximum for the elevator trim tab actuator on Airplanes 310R0001 thru 310R1500 and 0.010 inch maximum on Airplanes 310R1501 Thru 310R2140, when set at room temperature.

(6) Examine screws (3 and 10) for damaged threads or dirt particles that may impair smooth operation.
(7) Check sprocket (13) for broken, chipped, and/or worn teeth.
(8) Check bearing (4) for smoothness of operation.

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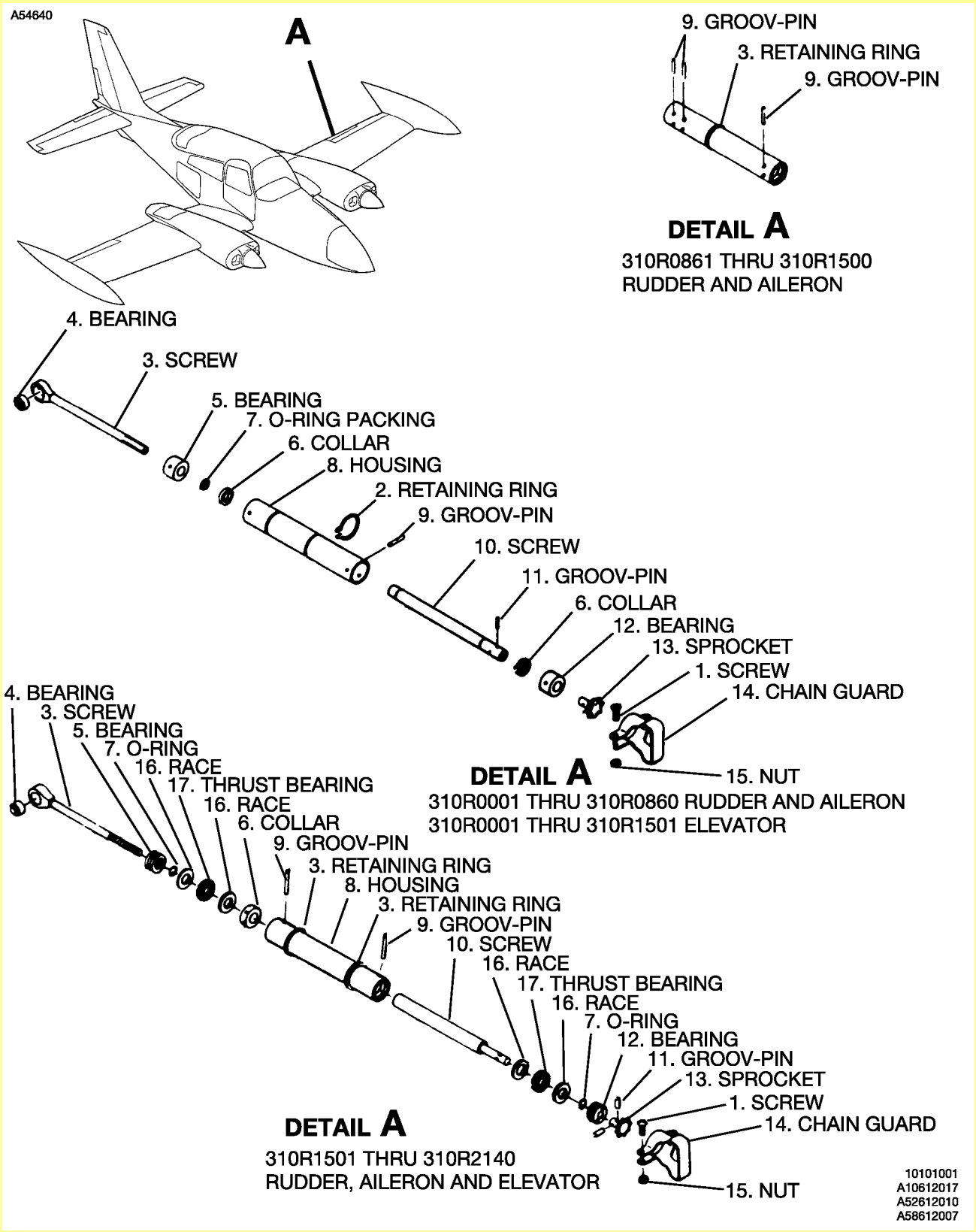

Trim Tab Actuator
Figure 405 (Sheet 1)

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CAUTION: Do not attempt to repair damaged or worn parts of the actuator. Discard all unserviceable items and install new parts during reassembly.

(9) If new parts are required, press bearing (4) into boss at end of screw (3). Be sure force bears against outer race of bearing. Turn screw (3) in housing (8) and screw (10).
(10) Install retaining rings (2) in grooves provided in outside of housing (8).
(11) Test actuator assembly by rotating sprocket (13) with fingers while holding bearing end of screw (3). Screw (3) should travel in and out of housing (8) smoothly, with no indication of binding.
(12) Check internal free play after actuator is assembled. If excessive, replace bearing (12) making sure bearing is held tightly against screw when holes are drilled for the retaining pins.

NOTE: When replacing collars or bearings, fabricate a shim of 0.003 thickness and fit on end of internal screw forward of the aft collar before the new pin holes are drilled in the collar. After the pin holes are drilled, remove and discard the 0.003 shim.

NOTE: If groove-pin hole (0.078) is worn oversize, drill out to 0.094, +0.003 or -0.000 and install 0.094 diameter roll pin to hold bearing in place.

C. Disassembly (Airplanes 310R0861 Thru 310R2140 - Rudder and Aileron and Airplanes 310R1501 Thru 310R2140 - Elevator) (Refer to Figure 405).

NOTE: Secure actuator and with dial indicator or other similar instrument against sprocket, measure internal free play by pushing and pulling on the external screw. If internal free play is more than 0.010 at a room temperature of 77°F, +5 or -5°F, collar must be replaced.

(1) Disassemble aileron trim tab actuator assembly as shown in exploded view, Figure 405.
(2) Remove pins (9 and 11), and remove sprocket (13) from screw (10).
(3) Bearings (5 and 12) have right-hand threads; remove bearing (5 and 12) from housing (8) using a suitable spanner wrench.
(4) Pull screw assembly (3) and screw (10) aft from housing (8).

NOTE: When disassembling actuator assembly, keep forward bearings (12 and 17), and races (16), separate from aft bearings (5 and 17) and races (16) to prevent misalignment on reassembly of actuator.

(5) Mark (identify) the forward end of collar (8) to ensure proper reassembly and remove screw assembly (3) from screw (10) by turning screw assembly (3) counterclockwise.
(6) Do not remove bearing (4) from screw assembly (3) unless replacement parts are required.
(7) Clean all component parts, except bearing (4), by washing in suitable solvent. Do not clean bearing (4).
(8) Inspect all component parts for excessive wear or damage, such as deep nicks, dents, cracks, and stripped threads.

CAUTION: The condition of the internal screw has been found to parallel the condition of the external screw and is to be replaced whenever the external screw is replaced because of thread condition.

NOTE: If any free play exists between screws (3 and 10), replace screws.

(9) Check bearings (5 and 12), screw assembly (3), and screw (10) for excessive wear and pitting. Dimensions of parts shall be as follows:

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Bearing (5 and 12) ID	0.248 in. max.
	0.247 in. min.
Screw Assembly (3) OD Shank	0.246 in. max.
	0.245 in. min.
Screw (10) Forward End OD	0.246 in. max.
	0.245 in. min.
Screw (10) Aft End OD	0.430 in. max.
	0.429 in. min.
Collar (6) ID	0.432 in. max.
	0.431 in. min.
Collar (6) OD	0.699 in. max.
	0.698 in. min.
Or	
Collar (6) OD	0.686 in. max.
	0.684 in. min.

(10) Examine screw assembly (3) and screw (10) for damaged threads or dirt particles that may impair smooth operation.
(11) Check sprocket (13) for broken, chipped, and/or worn teeth.
(12) Do not attempt to repair damaged or worn parts of the actuator assembly. Discard all unserviceable items and install new parts during reassembly.

D. Assembly (Airplanes 310R0001 Thru 310R0860 - Rudder and Aileron) (Refer to Figure 405).

NOTE: Discard the following items and install new parts during assembly: nuts (15), pins (9 and 11) and O-ring packing (7).

NOTE: During reassembly, lubricate collars (6) and screw (10) with No. 33 silicone grease.

(1) Press sprocket (13) into hollow end of screw (10), making sure pin holes are aligned. Press new groove-pins (11) into pin holes.
(2) Slip bearing (12) and collar (6) on screw (10) and slide down against sprocket (13).
(3) Insert screw (10), with assembled parts, into housing (8).

NOTE: Locate sprocket (13) at the end of housing (8) which is farthest from the groove for retaining ring (2).

(4) Align pin holes in bearing (12) and housing (8). Press new groove-pin (9) into pin holes.
(5) Insert collar (6), new O-ring (7), and bearing (5) into end of housing (8). Align pin holes in bearing and housing and install new groove-pin (9).
(6) If new parts are required, press bearing (4) into boss at end of screw (3). Be sure force bears against outer race of bearing. Install screw (3) in housing (8) and screw (10).
(7) Install retraining rings (2) in grooves provided on outside of housing (8).
(8) Test actuator assembly by rotating sprocket (14) with fingers while holding bearing end of screw (3). Screw (3) should travel in and out of housing (8) smoothly, with no indication of binding.

NOTE: After reassembly, check internal free play.

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E. Assembly (Airplanes 310R0001 Thru 310R2140 - Elevator and Airplanes 310R0861 Thru 310R2140 - Rudder and Aileron) (Refer to Figure 405).

NOTE: Discard the following items and install new parts during assembly: nuts (15), pins (9 and 11) and O-ring packing (7).

NOTE: During reassembly, lubricate bearings (17), races (16), collar (6), and screw (3 and 10) with No. 33 silicone grease.

(1) Insert collar (6) in aft end of housing (8), ensure forward end of collar is positioned forward, align holes and secure collar with new groove-pin (9).
(2) Install new O-ring packing (7) in groove of bearings (5 and 12).
(3) Install forward races (16) and bearings (17 and 5) on shank of screw (10) as shown, and insert assembled parts in housing (8) with aft end of screw (10) seated in installed collar (6).
(4) If new parts are required, press bearing (4) into boss at end of screw assembly (3). Be sure force bears against outer race of bearing.
(5) Install aft bearing (5), races (16), and bearing (17) on screw assembly (3) as shown.

CAUTION: Pushing the screw into the actuator can damage the O-ring packing which would require disassembly and repair of the actuator.

(6) Turn screw assembly (3) into housing (8) and turn screw (3) clockwise until it is fully engaged in screw (10).
(7) Screw bearing (5 and 12) into housing (10), align holes and install new groove-pin (9) to secure each bearing (5 and 12).
(8) On reassembly of actuator assembly, if bearing (5 and 12) or collar (6) is replaced, drill 0.062 hole in new part to match existing applicable hole in housing after adjustment to obtain free play tolerance. Any portion of groove-pin extending beyond the surface of the housing (8) shall be removed.

NOTE: If groove-pin hole (0.078) is worn oversize, drill out to 0.094, +0.003 or -0.000 and install 0.094 diameter roll pin to hold bearing in place.

(9) Slip sprocket (13) on forward end of screw (10); align holes and install new groove-pins (11).

NOTE: After reassembly, check internal free play.

F. Installation (Refer to Figure 404).
(1) Place actuator (25) in position, seat retainer ring(s) firmly in bracket grooves, align clamps (27) and secure with bolts and nuts.
(2) Install clamp (31) on actuator (25) and secure with screw (30) and nut (21).
(3) Engage chain on actuator sprocket and install chain guard (26) with screws and nuts.
(4) Connect turnbuckle (15) to fuselage and wing tip cable (11), and rig trim tab cable tension in accordance with Ailerons - Adjustment/Test.
(5) Connect aileron trim push-pull tube (20) to actuator (25) with bolt (29), washer (22), nut (24), and cotter pin (23).
(6) Install left aileron in accordance with installation procedures.
(7) Rotate aileron trim control wheel to neutral position and align aileron with trailing edge of wing.
(8) With trim tab in neutral, adjust actuator screw so that push-pull tube (20) is aligned with hole in trim tab horn; install attaching bolt, spacer, nut, and cotter pin (Refer to Figure 401).
(9) Refer to Ailerons - Adjustment/Test and check trim tab for rigging, correct travel, and operation.
(10) Install access covers, carpet, and seats.

8. Aileron Trim Tab Cables

A. Removal (Refer to Figure 404).
(1) Remove the following items from the airplane:
(a) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.

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(b) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(c) Front and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.

(2) Remove side panels from control pedestal.
(3) Remove floorboard access covers, bottom fuselage access cover aft of nose wheel well, aileron quadrant access cover on left wing, and aft left wing root fillet, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) In the fuselage, remove turnbuckle clip and disconnect turnbuckle (15) connecting the top cables (11) together.
(5) In the fuselage, remove cotter pin (13), nut (12), washer (14), and bolt (32) connecting bottom cables (10) together.
(6) Remove pulleys in wing and fuselage by removing nuts, bolts, and cable guard pins.
(7) Remove chain guard (26) from actuator (25) by removing nuts and screws. Remove chain.
(8) Remove stop blocks (18) and bushings (16) by removing nuts (17) and bolts (19).
(9) Remove cables from wing by pulling out through aileron quadrant access hole in wing.

NOTE: When removing cables, tie guide wires to ends of cables before removal. Leave the wire in the airplane to facilitate installation.

(10) Remove chain guard (9) by removing attaching screws and washers, and pull fuselage cables (10 and 11) out through access hole.
(11) Remove chain from around sprockets on gear support (7) and trim wheel (1) by disconnecting at master link.

NOTE: If during removal or installation of chain the indicator reaches its extreme travel, it can be disengaged from trim wheel track by inserting a screwdriver beneath indicator (2) and prying out of track. This permits indicator to be moved to a different position or wheel to be turned, before indicator is re-engaged with track.

B. Installation (Refer to Figure 404).
(1) Install chain around sprockets on gear support (7) and trim wheel (1) by connecting chain ends with master link.
(2) Secure fuselage cables (10 and 11) to guide wires and pull aft into position, then remove guide wires.
(3) Rotate trim wheel (1) to center indicator (2), engage lower chain with sprocket (8) so that ends of chain are equal in length and install chain guard (9) with screws and washers.
(4) Secure wing cables (10 and 11) to guide wires and route from actuator to fuselage connections, then remove guide wires.
(5) Align aileron with trailing edge of wing; then rotate sprocket on actuator (25) to move trim tab to neutral. Engage chain with sprocket so that ends of chain are equal in length, install chain guard (26) with attaching screws and nuts.
(6) Install pulleys in wing and fuselage with bolts and nuts. Position cables in pulley tracks and install guard pins.
(7) Connect fuselage and wing top cables (11) together with turnbuckle (15).
(8) Connect fuselage and wing bottom cables (10) together, using bolt (32), washer (14), nut (12), and cotter pin (13).
(9) Install stop blocks (18) and bushings (16) on cables (10 and 11) between ribs at wing stations 100.5 and 111.5 with bolts and nuts.
(10) Rig the trim tab system, refer to Ailerons - Adjustment/Test. Safety turnbuckle (15).
(11) Install aft wing root fillet, and access covers on underside of fuselage aft of nose wheel well, aft underside of left wing, and cabin floor.
(12) Install side panels on control pedestal.
(13) Install passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(14) Install pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.

9. Trim Tab Actuator Screw Assembly

A. Removal/Installation (Refer to Figure 406).

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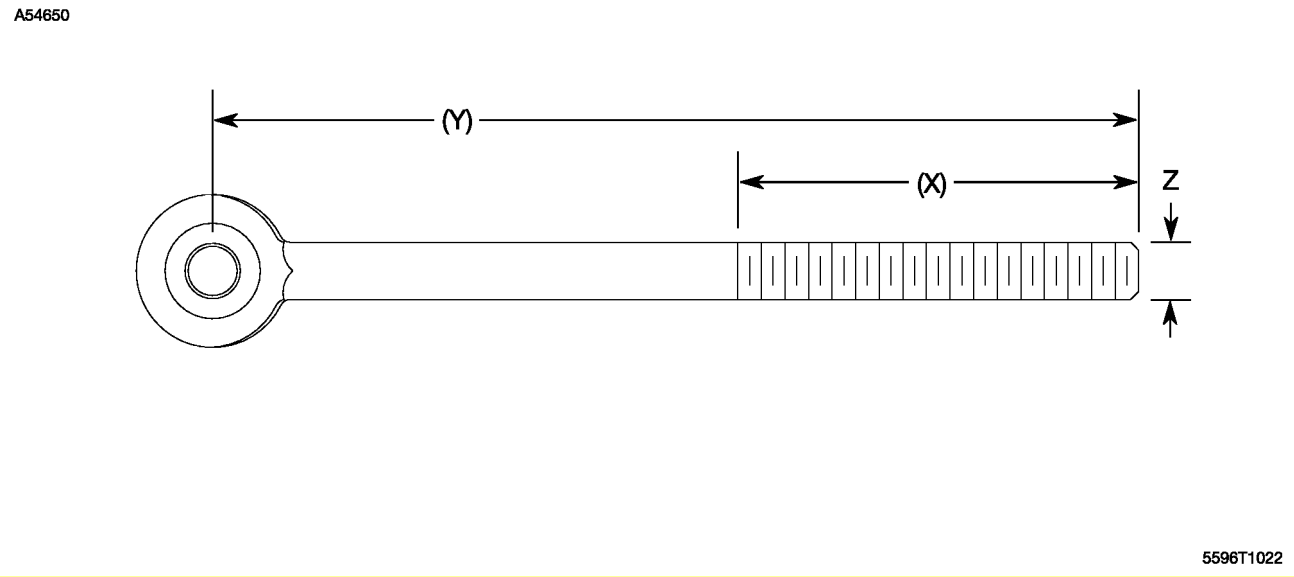
WARNING: Ensure proper screw is installed in actuator assembly. Do not substitute or intermix.

Table 401. Trim Actuator

Actuator Assembly	Screw Assembly	Used On
1260074-3	0310362-7	310R0001 thru 310R0906
0831278-1	0831282-3	310R0907 thru 310R0952 and spares replacement for 310R0001 thru 310R0906
0831278-4	0831282-3	310R0953 thru 310R1222 and spares replacement for 310R0001 thru 310R0952
0831278-7	0831282-3	310R1223 thru 310R1500 and spares replacement for 310R0001 thru 310R1222
0831278-11	0831282-3	310R1501thru 310R1823 and spares replacement for 310R0001 thru 310R1500
0831278-13	0831282-14	310R1824 thru 310R2140 and spares replacement for 310R0001 thru 310R1823



Trim Tab Actuator and Screw Data
Figure 406

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Table 402. Dimensions

DIMENSIONS			
Screw Assembly Part No.	X	Y	Z
0310362-7	2.312	6.22	0.245+ 0.001, -0.000
0831282-3	1.75	4.50	0.245+ 0.0005, -0.0000
0831282-14	1.75	4.50	0.245+ 0.0005, -0.0000

NOTE: This listing is not to be used for ordering parts. Spares replacement data is obtained from the airplane Illustrated Parts Catalog.

NOTE: When removal of the trim tab actuator screw assembly is required for lubrication, replacement, etc., the following procedure should be used to ensure the screw assembly is installed in its original location.

(1) Position the trim tab and control surface assembly as necessary to allow removal of the push rod and the screw assembly. Disconnect push rod at the trim tab end. Accurately, count and record the number of turns necessary to remove the push rod and screw assembly. Gently pull on the push rod during removal to ascertain the exact point when the threads become disengaged. Note this position accurately and also note the position of the bolt head that attaches the push rod to the screw assembly. This is necessary in order to replace the push rod and screw assembly in the exact same position as before removal.

WARNING: Do not mix or substitute screw assemblies in trim tab actuators. Always check rigging after removal of screw assembly.

(2) Install push rod and screw assembly with the bolt head in the exact same position as noted in step (1). Turn the push rod to the left (counterclockwise) 1/8 of a turn. Apply pressure on the push rod and screw assembly in a forward direction and turn to the right (clockwise) the same number of turns as noted in step (1). Check the direction of the bolt that attaches the push rod to the screw assembly to ensure that it is located properly as shown (bolt head outboard).

NOTE: The screw assembly has a quad lead type thread. Following the above procedures exactly will ensure the trim tab screw assembly has been installed in the exact same position.

10. Aileron Trim Gear Assembly

A. Removal (Refer to Figure 404).
(1) Remove front seats, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(2) Remove left front carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(3) Remove access covers from forward cabin floor, aft cabin floor above the landing gear actuator, and underside of fuselage just aft of the nose wheel well, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) Remove turnbuckle clip from turnbuckle (15) and disconnect turnbuckle.
(5) Remove chain guard (9) by removing screws and washers and disengage chain (5) from sprocket (8).
(6) Remove sprocket (8) from shaft by removing roll pin.
(7) Remove screws and washers attaching gear assembly support (7) and support guard in fuselage.
(8) Rotate forward side of gear support upward, disengage upper chain from sprocket (6) and remove support guard and gear support (7) through access hole in cabin floor.
(9) If further disassembly of gear support assembly is desired, refer to Figure 404.

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B. Installation (Refer to Figure 404).
   (1) Insert gear assembly support (7) and support guard through access hole in cabin floor, and engage upper chain (5) with sprocket (6).
   (2) With support guard in position, align mounting holes in gear assembly support (7) and install screws and washers. Use the two mounting holes that are not utilized to attach chain guard (9).
   (3) Attach sprocket (8) to shaft in gear support assembly (7) by installing roll pin.
   (4) Engage chain (5) with sprocket (8) and install chain guard (9) with screws and washers.
   (5) Connect cables (11) together with turnbuckle (15).
   (6) Rig trim tab control system, refer to Ailerons - Adjustment/Test.
   (7) Safety turnbuckle (15).
   (8) Install access hole covers on forward cabin floor, aft cabin floor, and underside of fuselage aft of nose wheel well.
   (9) Install carpets and pilot's seats.

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AILERONS - REMOVAL/INSTALLATION

1. Aileron

A. Removal (Refer to Figure 401).

NOTE: Removal and installation procedures for left-hand aileron and right-hand aileron is typical, except right-hand aileron does not incorporate a trim tab.

(1) Position the aileron trim tab to UP position to gain access to trim tab push-pull tube (9) at aft attach point.
(2) Remove cotter pin (10), nut (11), bolt (8), and spacer (7) securing push-pull tube (9) to trim tab.
(3) Lower flaps and disconnect aileron push-pull rod (4) by removing bolt (2) and washer (3).
(4) Disconnect bonding strap from aileron by removing attaching screw.
(5) Remove bolt (2) attaching aileron to hinge assembly (1).

CAUTION: Support aileron when hinge bolt is removed.

(6) Move aileron aft, clearing hinge assembly, and slightly inboard until outboard hinge pin (12) is free of bearing.

B. Installation (Refer to Figure 401).
(1) Guide aileron trim tab push-pull tube (9) through opening in aileron.
(2) Insert hinge pin (12) in the outboard bearing.
(3) Secure aileron to hinge assembly (1) with bolt (2).
(4) Connect aileron push-pull rod (4) by installing bolt (2) and washers (3).
(5) Safety wire bolts (2).
(6) Secure bonding strap with attaching screw.
(7) Connect trim tab push-pull tube (9) to trim tab with bolt (8), spacer (7), nut (11), and cotter pin (10).
(8) Check aileron and trim tab for proper operation and correct travel. If necessary, rig in accordance with Ailerons - Adjustment/Test.

2. Aileron Trim Tab

A. Removal (Refer to Figure 401).
(1) Position the trim tab UP to gain access to trim tab push-pull tube (9) at aft attach point.
(2) Remove cotter pin (10), nut (11), bolt (8), and spacer (7) securing push-pull tube (9) to trim tab.
(3) Remove cotter pins (6); pull hinge pin (5) and remove trim tab.

B. Installation (Refer to Figure 401).
(1) Position trim tab in hinge; insert hinge pin (5).
(2) Secure hinge pin (5) with cotter pins (6).
(3) Connect trim tab push-pull tube (9) to trim tab using bolt (8), spacer (7), nut (11), and cotter pin (10).
(4) Check trim tab for proper operation and travel. If necessary, rig in accordance with Ailerons - Adjustment/Test.

3. Aileron Bellcrank

A. Removal (Refer to Figure 402).
(1) Remove rear seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(2) Remove carpets, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(3) Remove floorboard access cover just forward of rear spar, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) Remove turnbuckle clips from turnbuckles (2) and loosen tension on aileron return cable (1).
(5) Disconnect aileron cables (4 and 7) from bellcrank (6) by removing cotter pins (12), nuts (13), and bolts (14).
(6) Remove bellcrank (6) by removing bolt (5).

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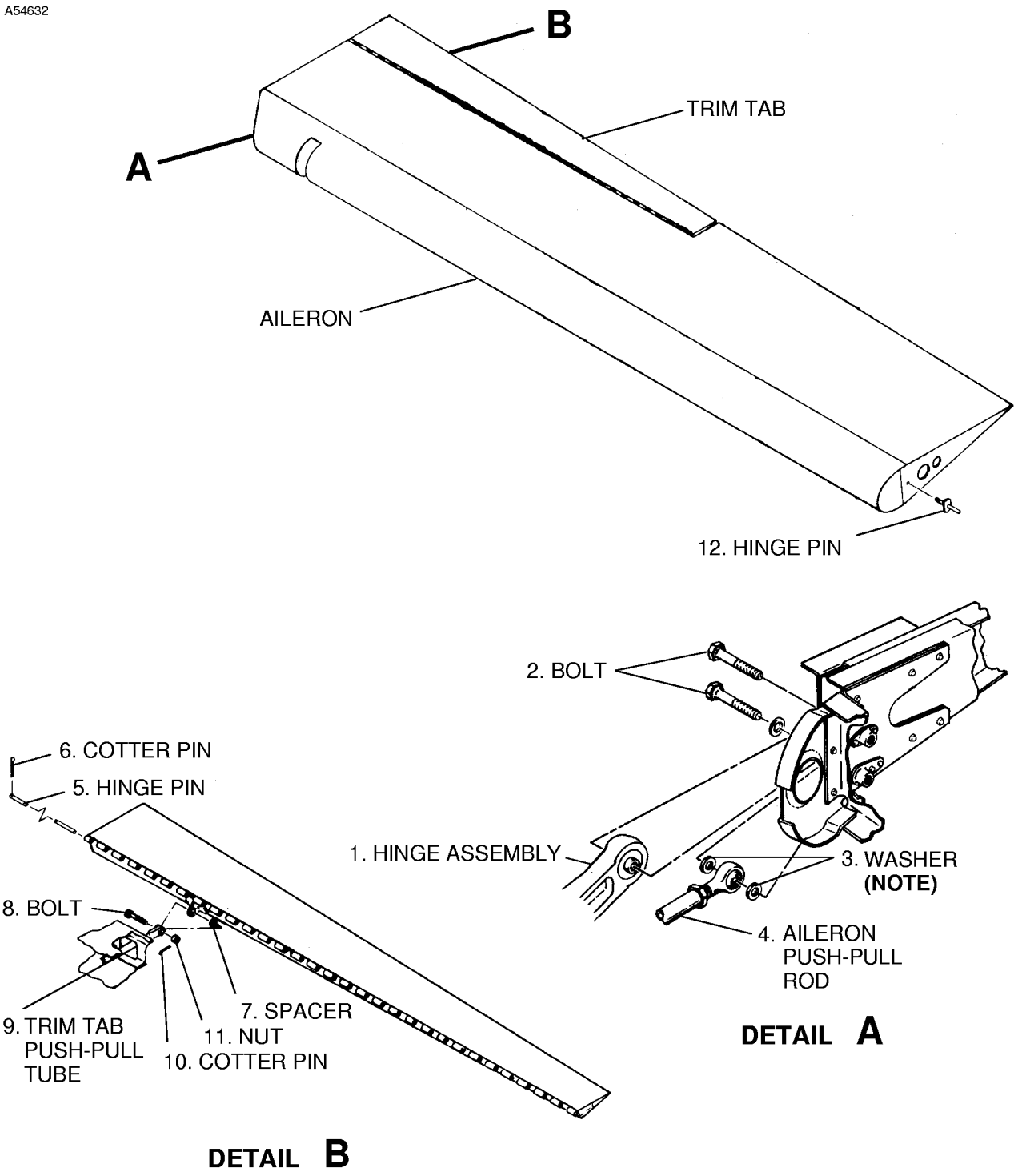

NOTE: MAXIMUM WASHER THICKNESS OF 0.126 MAY BE USED ADJACENT TO EACH SIDE OF ROD END, USE AN960-416 OR AN960-416L WASHERS.

10242001
A10242002
B10241001

Aileron and Trim Tab Installation
Figure 401 (Sheet 1)

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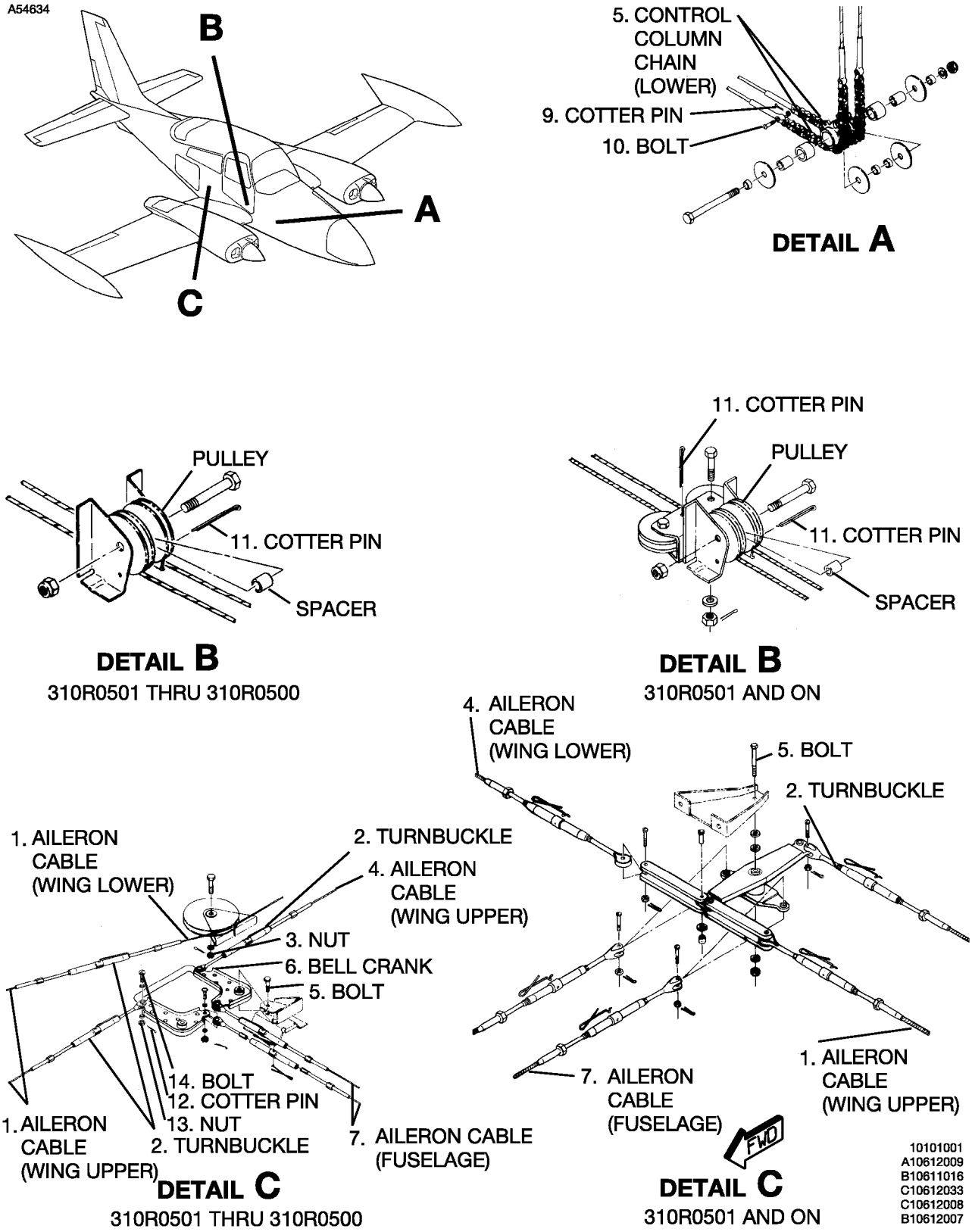

Aileron Control System (Fuselage)
Figure 402 (Sheet 1)

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B. Installation (Refer to Figure 402).
(1) Position bellcrank (6) and secure with bolt (5). On Airplanes 310R0501 thru 310R2140, safety wire bolt head to bracket.
(2) Connect aileron cables (4 and 7) to bellcrank (6) with bolts (14), nuts (13), and cotter pins (12).

CAUTION: Ensure that aileron cables are in place on aileron quadrants and pulleys in both wings before rigging tension on aileron system. Wing structure can be damaged by the aileron cables if tension is rigged on the cables while not properly in place on aileron quadrants or pulleys.

(3) Rig aileron control system, refer to Ailerons - Adjustment/Test.
(4) Install turnbuckle clips on turnbuckles (2).
(5) Install floorboard access cover, refer to Chapter 53, Floor Panels - Removal/Installation.
(6) Install carpets, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(7) Install rear seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.

4. Aileron Fuselage Cables

A. Removal (Refer to Figure 402).

NOTE: The following procedure is for removing the aileron cables with turnbuckles attached to the cables and pulley cable guard cotter pin removed. If desired, turnbuckle barrels may be unscrewed to leave the turnbuckle forks attached to the fuselage bellcrank.

(1) Remove the following items from the airplane:
(a) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(b) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(c) Front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(d) Rear upholstery panel if autopilot (optional equipment) is installed, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove boot, retainer, and cover from lower control column.
(3) Remove floorboard and access covers, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) At the fuselage bellcrank (6), disconnect aileron cables (7) by removing attaching cotter pins (12) nuts (13), and bolts (14).
(5) Disconnect aileron cables (7) from lower control column chains (8) by removing attaching cotter pins (9), washers, and bolts (10).

NOTE: Attach guide wire to ends of cables before removal.

(6) Route aileron fuselage cables (7) aft to bellcrank, and remove from airplane.

NOTE: Leave guide wires in airplane to facilitate installation.

B. Installation (Refer to Figure 402).
(1) Secure aileron fuselage cables (7) to guide wires and route cables from bellcrank (6) to lower control column chains (8).
(2) Remove guide wires from cables.
(3) Secure aileron fuselage cables to lower control column chains (8) with bolts (10), washers, and cotter pins (9).

NOTE: Ensure fuselage cables are not crossed and routed on the underneath side of pulley.

(4) Install cable guard cotter pin (11) on fuselage pulleys.
(5) Secure aileron cables (7) to bellcrank (6) with attaching bolts (14), nuts (13), and cotter pins (12).
(6) Rig aileron control system, refer to Ailerons - Adjustment/Test.
(7) Install boot, retainer, and cover on lower control column.

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(8) Install the following items:
  (a) Rear upholstery panel if autopilot (optional equipment) is installed, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
  (b) Front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/ Installation.
  (c) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
  (d) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.

5. Aileron Quadrant

A. Removal (Refer to Figure 403).
(1) Remove the following items from the airplane:
  (a) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
  (b) Rear carpet, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
  (c) Rear upholstery panel if autopilot (optional equipment) is installed, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove aft floorboard access covers and wing access cover above quadrant, refer to Chapter 53, Floor Panels - Removal/Installation.
(3) If autopilot (optional) is installed, disconnect autopilot cables from aileron cables.
(4) Remove turnbuckle clips from turnbuckles (2) on cables (1 and 3) and disconnect cables at bellcrank (4).
(5) Remove aileron pulley (9) outboard of aileron quadrant (18) by removing cable guard pin (8), bolt (11), and washer (10).
(6) Attach guide wires to cables (1 and 3) to be used as guides on installation.
(7) Disconnect aileron push-pull tube (7) from aileron quadrant (18) by removing attaching cotter pins (15), nut (16), washer (17), and bolt (19).
(8) Remove bolt (12) and washer (13) attaching aileron quadrant (18) to wing structure.
(9) Remove aileron quadrant (18) from wing by working quadrant and cables through wing access hole.

NOTE: To prevent routing cables (1 and 3) through entire wing, disconnect cable ends from quadrant as near to the wing access hole as working room will permit. Care also should be taken to prevent bushing (14) from falling during removal.

(10) Disconnect aileron cables from quadrant by removing cotter pins, cable guard pins (6), nuts, washers, and bolt (5).

B. Installation (Refer to Figure 403).
(1) Place aileron quadrant (18) near aft wing access hole and connect aileron cables (1 and 3) to quadrant using bolts (5), washers, and nuts; secure cables in position with cable guard pins (6) and cotter pins.

NOTE: Position cable (1) on bottom groove of quadrant and cable (3) on upper groove of quadrant.

(2) Install quadrant (18) in wing and secure with washer (13), bolt (12), and safety wire to pulley bracket.

CAUTION: Ensure bushing (14) is reinstalled with quadrant or serious binding will occur during rigging.

(3) Connect aileron push-pull tube (7) to quadrant with attaching bolt (19), washer, nut, and cotter pin.
(4) Install pulley (9) (outboard of aileron quadrant) with bolt (11), washer (10), and cable guard cotter pin (8).
(5) Route aileron cable (3) to bellcrank (4), connect cable to turnbuckle fork with turnbuckle (2).
(6) Route cable (1) to center fuselage and connect with turnbuckle (2).
(7) Rig aileron control system, refer to Ailerons - Adjustment/Test.

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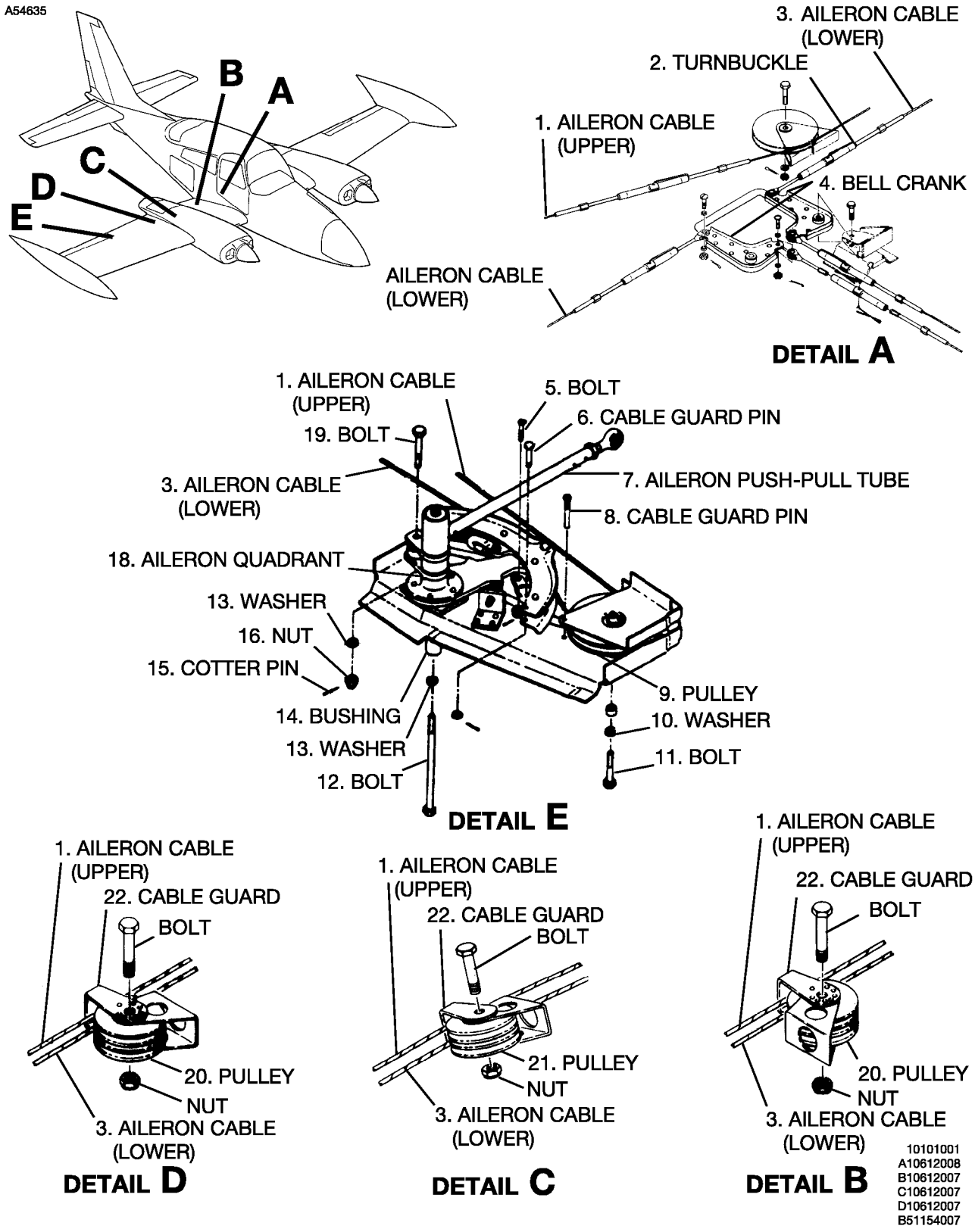

Aileron Control System (Wing)
Figure 403 (Sheet 1)

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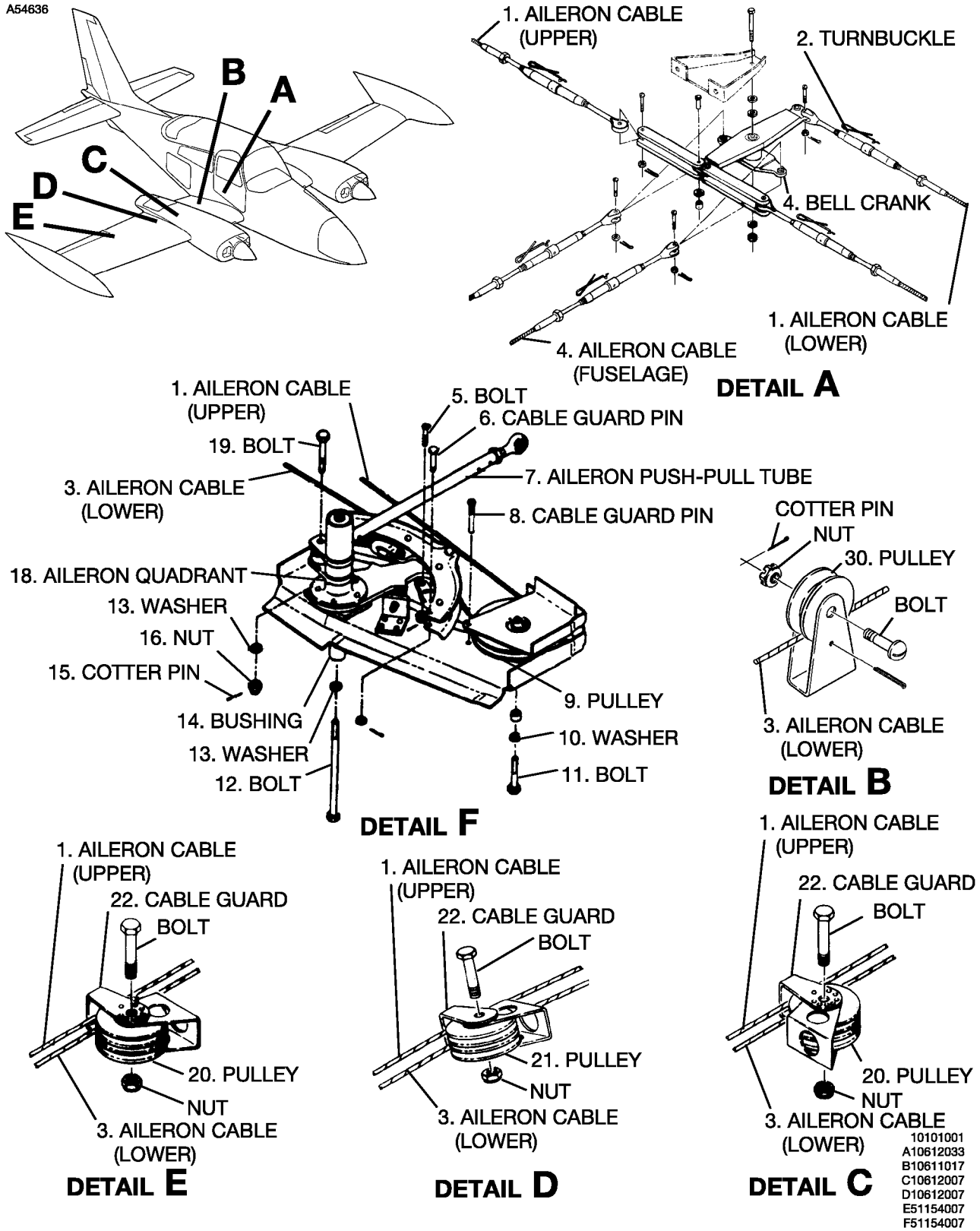

Aileron Control System (Wing)
Figure 403 (Sheet 2)

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CAUTION: Ensure that aileron cables are in place on aileron quadrants and pulleys in both wings before rigging tension on aileron system. Wing structure can be damaged by the aileron cables if tension is rigged on the cables while not properly in place on aileron quadrants or pulleys.

(8) If autopilot (optional equipment) is installed, connect autopilot cables to aileron cables with attaching clamps.
(9) Install wing access covers and floorboard access covers.
(10) Install removed carpets and seats.

6. Aileron Wing Cables

A. Removal (Refer to Figure 403).

NOTE: The following procedure is for removing the aileron wing cables with turnbuckles attached to the wing direct cables and pulley cable guard cotter pins removed. If desired, turnbuckle barrels may be unscrewed to leave the turnbuckle forks attached to the fuselage bell crank.

(1) Remove the following items from the airplane:
  (a) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
  (b) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
  (c) Front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/ Installation.
  (d) Rear upholstery panel if autopilot (optional equipment) is installed, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove floorboard and access covers, access panel located on rear spar adjacent to aft wheel well, lower aft wing root fillets, and aileron quadrant access cover, refer to Chapter 53, Floor Panels - Removal/Installation.
(3) Remove turnbuckle clips and disconnect turnbuckle (2) to right and left-hand cables (1).
(4) Relieve tension on aileron wing cable (3) by loosening turnbuckle at the fuselage bell crank (4).
(5) At the fuselage bellcrank (4), disconnect aileron wing cables (3) by removing attaching cotter pins, nuts, and bolts.
(6) If an autopilot (optional) is installed, disconnect autopilot cables from aileron cables (3).
(7) Remove aileron pulley (9) outboard of aileron quadrant by removing cable guard pin (8), attaching bolt (11), and washer (10).
(8) Disconnect aileron push-pull tube (7) from aileron quadrant (18) by removing cotter pin (15), nut (16), washer (17), and bolt (19).
(9) Remove two sets of pulleys (21) aft of the wheel well and one set (20) in each wing root by removing cable guards (22), and attaching nuts and bolts.
(10) Remove pulleys (23) by removing bolt and nut.

NOTE: When removing control cables, tie guide wires to ends of cables before removal.

(11) Remove bolt (12) and washer (13) attaching aileron quadrant (18) to wing structure.
(12) With aileron cables (1 and 3) attached to aileron quadrant, remove quadrant and cables from wing using aileron quadrant access hole.

NOTE: Leave guide wires in wing and fuselage to facilitate installation.

B. Installation (Refer to Figure 403).
(1) Secure aileron cables (1 and 3) to guide wires, and route cables and quadrant into position.
(2) Remove guide wire from cables.
(3) Install quadrant (18).

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CAUTION: Be sure bushing (14) is installed with quadrant or serious binding will occur during rigging.

NOTE: Cables must be installed on proper pulley as pulleys and guards are being installed. Position aileron cables (3) on lower pulleys and cables (1) on upper pulleys. Make sure cables are parallel and not twisted. Cables must be routed on aft side of wing pulleys.

(4) Install cables, two sets of pulleys (21) and cable guards on pulley brackets aft of the wheel well and secure with attaching bolts and nuts.
(5) Install cables, one set of pulleys (20) and cable guards on lower aft wing root pulley brackets and secure with attaching bolt and nut.
(6) Install pulley (23) on lower cable (3) in fuselage.
(7) Secure aileron cables (1 and 3) to fuselage bellcrank (4) with attaching bolts, nuts, and cotter pins.

CAUTION: Ensure that aileron cables are in place on aileron quadrants and pulleys in both wings before rigging tension on aileron system. Wing structure can be damaged by the aileron cables if tension is rigged on the cables while not properly in place on aileron quadrants or pulleys.

(8) If an autopilot (optional equipment) is installed, attach to the aileron cables and rig in accordance with rigging procedures.
(9) Install lower aft wing root fillets, fuselage floorboard access covers, aft underside wing access covers, and quadrant access cover.
(10) Install the following items:
  (a) Rear upholstery panel if autopilot (optional equipment) is installed, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
  (b) Front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
  (c) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
  (d) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.

7. Aileron Trim Tab Actuator

A. Removal (Refer to Figure 404).
(1) Remove the following items from the airplane:
  (a) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
  (b) Rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(2) Remove floorboard access covers above landing gear actuator and from aileron quadrant access cover on left wing, refer to Chapter 53, Floor Panels - Removal/Installation.
(3) Remove turnbuckle clip from turnbuckle (15) and disconnect.
(4) Remove left aileron.
(5) Remove aileron trim tab push-pull tube (20) from actuator (25) by removing cotter pin (23), nut (24), washer (22), and bolt (29).
(6) Remove chain guard (26) from actuator (25) by removing nuts and screws.
(7) Disengage chain from actuator sprocket.
(8) Remove clamp (31) by removing nut (21) and screw (30).
(9) Remove clamps (27) by removing bolts and nuts and remove actuator (25) from wing.

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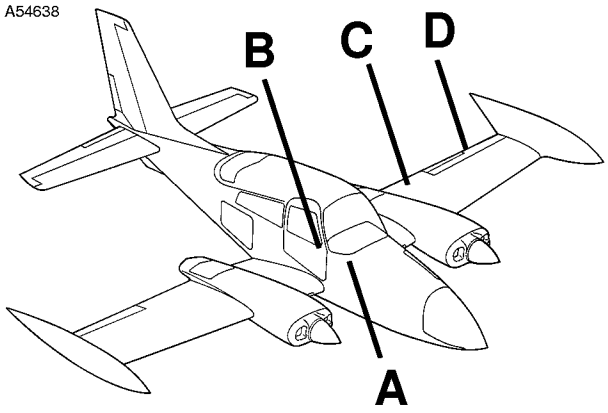

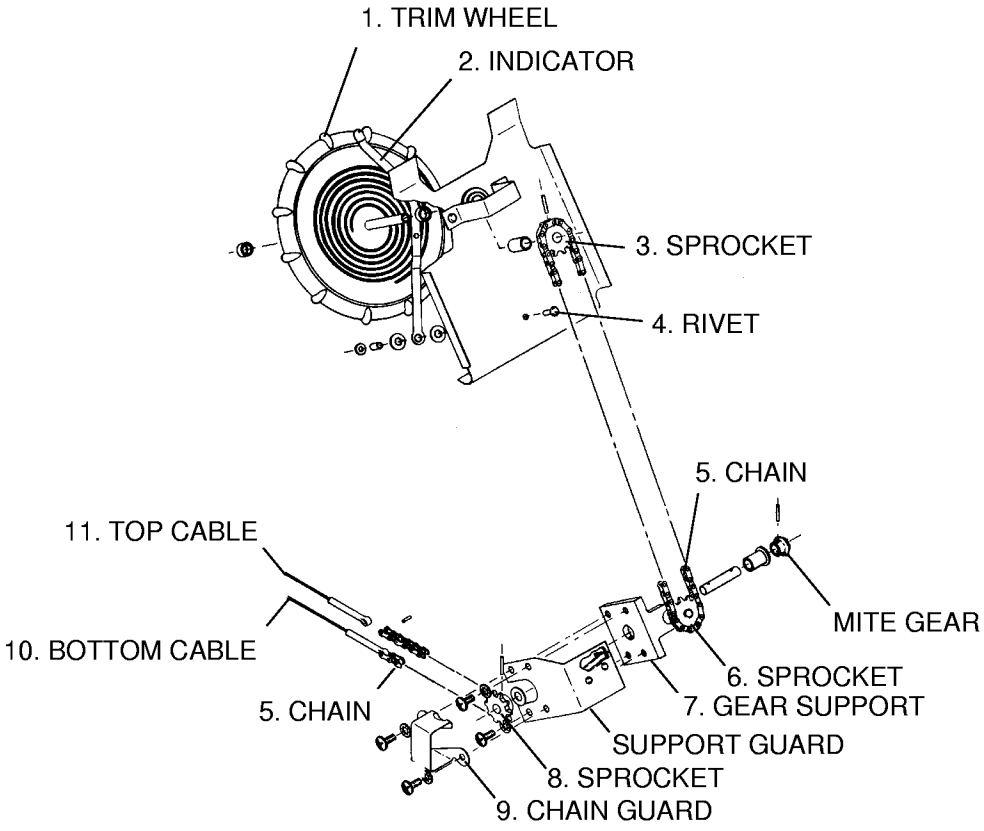

DETAIL A

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Aileron Trim Tab Actuator and Cable Installation
Figure 404 (Sheet 1)

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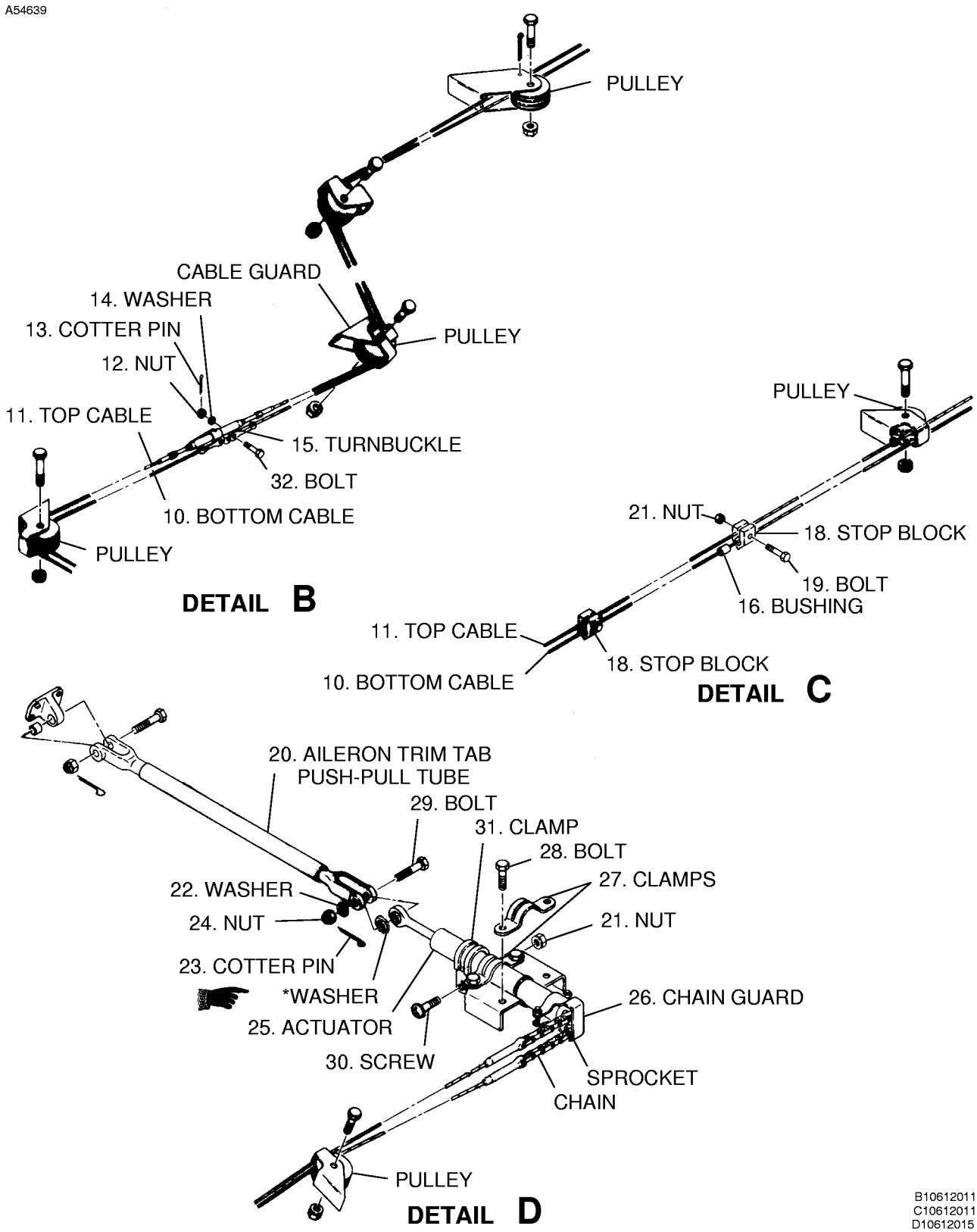

Aileron Trim Tab Actuator and Cable Installation
Figure 404 (Sheet 2)

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B. Disassembly (Airplanes 310R0001 thru 310R0860 - Rudder and Aileron and Airplanes 310R0001 thru 310R1500 - Elevator) (Refer to Figure 405).

NOTE: Secure actuator and with dial indicator or other similar instrument against sprocket, measure internal free play by pushing and pulling on the external screw. If internal free play is more than 0.005 inch at room temperature of 77°F, +5 or -5°F, both collars must be replaced.

(1) Disassemble aileron trim tab actuator assembly in accordance with Figure 405. This view clearly illustrates the proper relationship of all component parts.
(2) Do not remove bearing (4) from screw (3) unless replacement of parts is required.
(3) Clean all component parts, except bearing (4), by washing in suitable solvent. Do not clean sealed bearing (4).
(4) Inspect all component parts for obvious indications of damage such as stripped threads, cracks, deep nicks, and dents.

NOTE: If any free play exists in screws (3 and 10), replace screws.

(5) Check bearings (5 and 12) and screws (3 and 10) for excessive wear and scoring. Dimensions of parts shall be as follows:

Front bearing (12) ID	0.373 in. min.
	0.380 in. max.
Rear bearing (5):	
Small hole ID	0.248 in. min.
	0.253 in. max.
Large hole ID	0.373 in. min.
	0.380 in. max.
Screw (3) OD (Shank)	0.242 in. min.
	0.246 in. max.
Screw (10) OD	0.367 in. min.
	0.370 in. max.

NOTE: Relative linear movement between internal thread screw (10) and bearing (5) should be 0.003 inch minimum and 0.005 inch maximum for the rudder and aileron trim tab actuators on Airplanes 310R0001 thru 310R0860 and 0.010 inch maximum on Airplanes 310R0861 Thru 310R2140, when set at room temperature.

NOTE: Relative linear movement between internal thread screw (10) and bearing (5) should be 0.003 inch minimum and 0.005 inch maximum for the elevator trim tab actuator on Airplanes 310R0001 thru 310R1500 and 0.010 inch maximum on Airplanes 310R1501 Thru 310R2140, when set at room temperature.

(6) Examine screws (3 and 10) for damaged threads or dirt particles that may impair smooth operation.
(7) Check sprocket (13) for broken, chipped, and/or worn teeth.
(8) Check bearing (4) for smoothness of operation.

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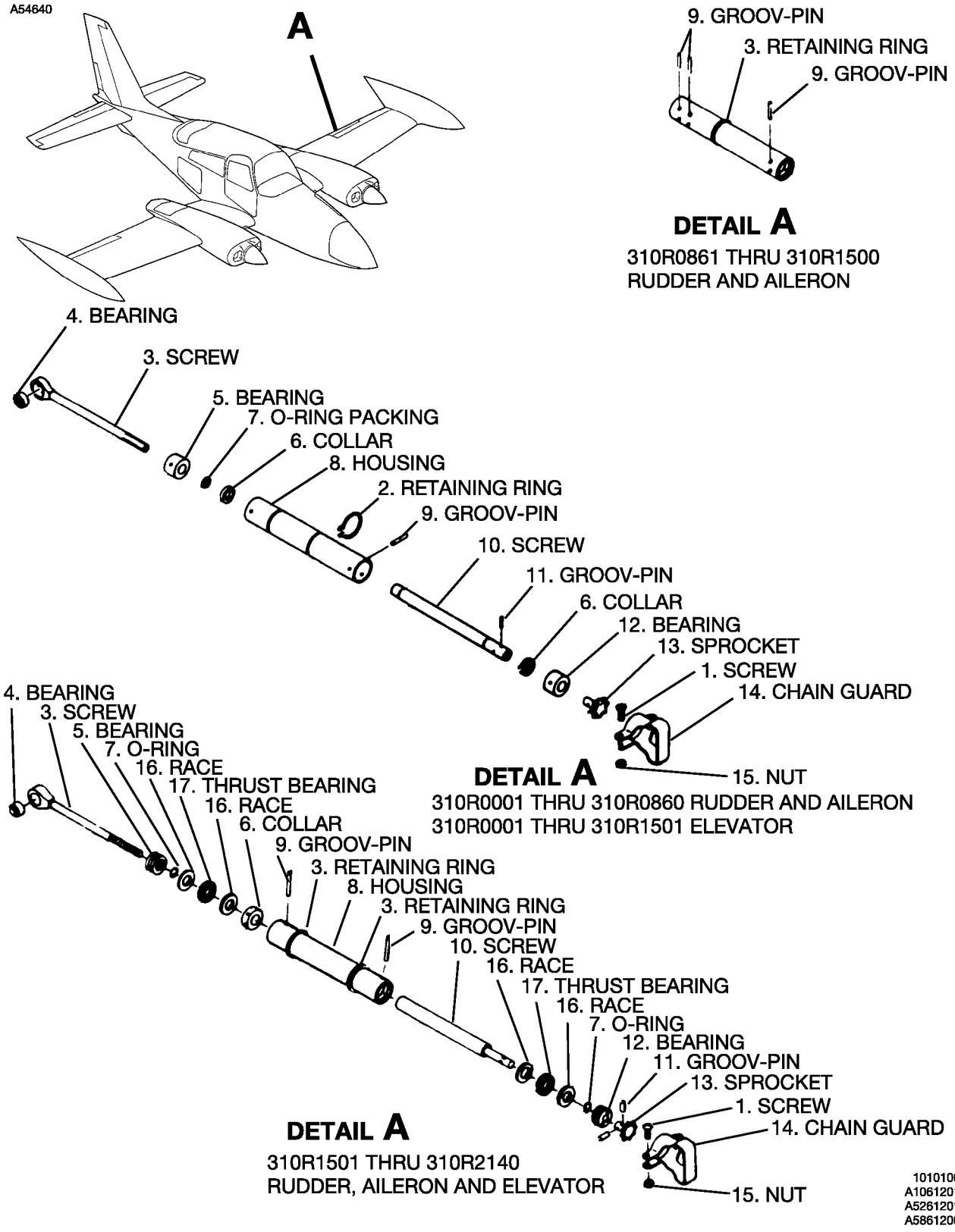

Trim Tab Actuator
Figure 405 (Sheet 1)

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CAUTION: Do not attempt to repair damaged or worn parts of the actuator. Discard all defective items and install new parts during reassembly.

(9) If new parts are required, press bearing (4) into boss at end of screw (3). Be sure force bears against outer race of bearing. Turn screw (3) in housing (8) and screw (10).
(10) Install retaining rings (2) in grooves provided in outside of housing (8).
(11) Test actuator assembly by rotating sprocket (13) with fingers while holding bearing end of screw (3). Screw (3) should travel in and out of housing (8) smoothly, with no indication of binding.
(12) Check internal free play after actuator is assembled. If excessive, replace bearing (12) making sure bearing is held tightly against screw when holes are drilled for the retaining pins.

NOTE: When replacing collars or bearings, fabricate a shim of 0.003 thickness and fit on end of internal screw forward of the aft collar before the new pin holes are drilled in the collar. After the pin holes are drilled, remove and discard the 0.003 shim.

NOTE: If groove-pin hole (0.078) is worn oversize, drill out to 0.094, +0.003 or -0.000 and install 0.094 diameter roll pin to hold bearing in place.

C. Disassembly (Airplanes 310R0861 Thru 310R2140 - Rudder and Aileron and Airplanes 310R1501 Thru 310R2140 - Elevator) (Refer to Figure 405).

NOTE: Secure actuator and with dial indicator or other similar instrument against sprocket, measure internal free play by pushing and pulling on the external screw. If internal free play is more than 0.010 at a room temperature of 77°F, +5 or -5°F, collar must be replaced.

(1) Disassemble aileron trim tab actuator assembly as shown in exploded view, Figure 405.
(2) Remove pins (9 and 11), and remove sprocket (13) from screw (10).
(3) Bearings (5 and 12) have right-hand threads; remove bearing (5 and 12) from housing (8) using a suitable spanner wrench.
(4) Pull screw assembly (3) and screw (10) aft from housing (8).

NOTE: When disassembling actuator assembly, keep forward bearings (12 and 17), and races (16), separate from aft bearings (5 and 17) and races (16) to prevent misalignment on reassembly of actuator.

(5) Mark (identify) the forward end of collar (8) to insure proper reassembly and remove screw assembly (3) from screw (10) by turning screw assembly (3) counterclockwise.
(6) Do not remove bearing (4) from screw assembly (3) unless replacement parts are required.
(7) Clean all component parts, except bearing (4), by washing in suitable solvent. Do not clean bearing (4).
(8) Inspect all component parts for excessive wear or damage, such as deep nicks, dents, cracks, and stripped threads.

CAUTION: The condition of the internal screw has been found to parallel the condition of the external screw and is to be replaced whenever the external screw is replaced because of thread condition.

NOTE: If any free play exists between screws (3 and 10), replace screws.

(9) Check bearings (5 and 12), screw assembly (3), and screw (10) for excessive wear and pitting. Dimensions of parts shall be as follows:

Bearing (5 and 12) ID	0.248 in. max.
	0.247 in. min.
Screw Assembly (3) OD Shank	0.246 in. max.

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	0.245 in. min.
Screw (10) Forward End OD	0.246 in. max.
	0.245 in. min.
Screw (10) Aft End OD	0.430 in. max.
	0.429 in. min.
Collar (6) ID	0.432 in. max.
	0.431 in. min.
Collar (6) OD	0.699 in. max.
	0.698 in. min.
Or	
Collar (6) OD	0.686 in. max.
	0.684 in. min.

(10) Examine screw assembly (3) and screw (10) for damaged threads or dirt particles that may impair smooth operation.
(11) Check sprocket (13) for broken, chipped, and/or worn teeth.
(12) Do not attempt to repair damaged or worn parts of the actuator assembly. Discard all defective items and install new parts during reassembly.

D. Assembly (Airplanes 310R0001 Thru 310R0860 - Rudder and Aileron) (Refer to Figure 405).

NOTE: Discard the following items and install new parts during assembly: nuts (15), pins (9 and 11) and O-ring packing (7).

NOTE: During reassembly, lubricate collars (6) and screw (10) with No. 33 silicone grease.

(1) Press sprocket (13) into hollow end of screw (10), making sure pin holes are aligned. Press new groove-pins (11) into pin holes.
(2) Slip bearing (12) and collar (6) on screw (10) and slide down against sprocket (13).
(3) Insert screw (10), with assembled parts, into housing (8).

NOTE: Locate sprocket (13) at the end of housing (8) which is farthest from the groove for retaining ring (2).

(4) Align pin holes in bearing (12) and housing (8). Press new groove-pin (9) into pin holes.
(5) Insert collar (6), new O-ring (7), and bearing (5) into end of housing (8). Align pin holes in bearing and housing and install new groove-pin (9).
(6) If new parts are required, press bearing (4) into boss at end of screw (3). Be sure force bears against outer race of bearing. Install screw (3) in housing (8) and screw (10).
(7) Install retraining rings (2) in grooves provided on outside of housing (8).
(8) Test actuator assembly by rotating sprocket (14) with fingers while holding bearing end of screw (3). Screw (3) should travel in and out of housing (8) smoothly, with no indication of binding.

NOTE: After reassembly, check internal free play.

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E. Assembly (Airplanes 310R0001 Thru 310R2140 - Elevator and Airplanes 310R0861 Thru 310R2140 - Rudder and Aileron) (Refer to Figure 405).

NOTE: Discard the following items and install new parts during assembly: nuts (15), pins (9 and 11) and O-ring packing (7).

NOTE: During reassembly, lubricate bearings (17), races (16), collar (6), and screw (3 and 10) with No. 33 silicone grease.

(1) Insert collar (6) in aft end of housing (8), insure forward end of collar is positioned forward, align holes and secure collar with new groove-pin (9).
(2) Install new O-ring packing (7) in groove of bearings (5 and 12).
(3) Install forward races (16) and bearings (17 and 5) on shank of screw (10) as shown, and insert assembled parts in housing (8) with aft end of screw (10) seated in installed collar (6).
(4) If new parts are required, press bearing (4) into boss at end of screw assembly (3). Be sure force bears against outer race of bearing.
(5) Install aft bearing (5), races (16), and bearing (17) on screw assembly (3) as shown.

CAUTION: Pushing the screw into the actuator can damage the O-ring packing which would require disassembly and repair of the actuator.

(6) Turn screw assembly (3) into housing (8) and turn screw (3) clockwise until it is fully engaged in screw (10).
(7) Screw bearing (5 and 12) into housing (10), align holes and install new groove-pin (9) to secure each bearing (5 and 12).
(8) On reassembly of actuator assembly, if bearing (5 and 12) or collar (6) are replaced, drill 0.062 hole in new part to match existing applicable hole in housing after adjustment to obtain free play tolerance. Any portion of groove-pin extending beyond the surface of the housing (8) shall be removed.

NOTE: If groove-pin hole (0.078) is worn oversize, drill out to 0.094, +0.003 or -0.000 and install 0.094 diameter roll pin to hold bearing in place.

(9) Slip sprocket (13) on forward end of screw (10); align holes and install new groove-pins (11).

NOTE: After reassembly, check internal free play.

F. Installation (Refer to Figure 404).
(1) Place actuator (25) in position, seat retainer ring(s) firmly in bracket grooves, align clamps (27) and secure with bolts and nuts.
(2) Install clamp (31) on actuator (25) and secure with screw (30) and nut (21).
(3) Engage chain on actuator sprocket and install chain guard (26) with screws and nuts.
(4) Connect turnbuckle (15) to fuselage and wing tip cable (11), and rig trim tab cable tension in accordance with Ailerons - Adjustment/Test.
(5) Connect aileron trim push-pull tube (20) to actuator (25) with bolt (29), washer (22), nut (24), and cotter pin (23).
(6) Install left aileron in accordance with installation procedures.
(7) Rotate aileron trim control wheel to neutral position and align aileron with trailing edge of wing.
(8) With trim tab in neutral, adjust actuator screw so that push-pull tube (20) is aligned with hole in trim tab horn; install attaching bolt, spacer, nut, and cotter pin (Refer to Figure 401).
(9) Refer to Ailerons - Adjustment/Test and check trim tab for rigging, correct travel, and operation.
(10) Install access covers, carpet, and seats.

8. Aileron Trim Tab Cables

A. Removal (Refer to Figure 404).
(1) Remove the following items from the airplane:
(a) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.

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(b) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(c) Front and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/ Installation.

(2) Remove side panels from control pedestal.
(3) Remove floorboard access covers, bottom fuselage access cover aft of nose wheel well, aileron quadrant access cover on left wing, and aft left wing root fillet, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) In the fuselage, remove turnbuckle clip and disconnect turnbuckle (15) connecting the top cables (11) together.
(5) In the fuselage, remove cotter pin (13), nut (12), washer (14), and bolt (32) connecting bottom cables (10) together.
(6) Remove pulleys in wing and fuselage by removing nuts, bolts, and cable guard pins.
(7) Remove chain guard (26) from actuator (25) by removing nuts and screws. Remove chain.
(8) Remove stop blocks (18) and bushings (16) by removing nuts (17) and bolts (19).
(9) Remove cables from wing by pulling out through aileron quadrant access hole in wing.

NOTE: When removing cables, tie guide wires to ends of cables before removal. Leave the wire in the airplane to facilitate installation.

(10) Remove chain guard (9) by removing attaching screws and washers, and pull fuselage cables (10 and 11) out through access hole.
(11) Remove chain from around sprockets on gear support (7) and trim wheel (1) by disconnecting at master link.

NOTE: If during removal or installation of chain the indicator reaches its extreme travel, it can be disengaged from trim wheel track by inserting a screwdriver beneath indicator (2) and prying out of track. This permits indicator to be moved to a different position or wheel to be turned, before indicator is re-engaged with track.

B. Installation (Refer to Figure 404).
(1) Install chain around sprockets on gear support (7) and trim wheel (1) by connecting chain ends with master link.
(2) Secure fuselage cables (10 and 11) to guide wires and pull aft into position, then remove guide wires.
(3) Rotate trim wheel (1) to center indicator (2), engage lower chain with sprocket (8) so that ends of chain are equal in length and install chain guard (9) with screws and washers.
(4) Secure wing cables (10 and 11) to guide wires and route from actuator to fuselage connections, then remove guide wires.
(5) Align aileron with trailing edge of wing; then rotate sprocket on actuator (25) to move trim tab to neutral. Engage chain with sprocket so that ends of chain are equal in length, install chain guard (26) with attaching screws and nuts.
(6) Install pulleys in wing and fuselage with bolts and nuts. Position cables in pulley tracks and install guard pins.
(7) Connect fuselage and wing top cables (11) together with turnbuckle (15).
(8) Connect fuselage and wing bottom cables (10) together, using bolt (32), washer (14), nut (12), and cotter pin (13).
(9) Install stop blocks (18) and bushings (16) on cables (10 and 11) between ribs at wing stations 100.5 and 111.5 with bolts and nuts.
(10) Rig the trim tab system, refer to Ailerons - Adjustment/Test. Safety turnbuckle (15).
(11) Install aft wing root fillet, and access covers on underside of fuselage aft of nose wheel well, aft underside of left wing, and cabin floor.
(12) Install side panels on control pedestal.
(13) Install passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(14) Install pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.

9. Trim Tab Actuator Screw Assembly

A. Removal/Installation (Refer to Figure 406).

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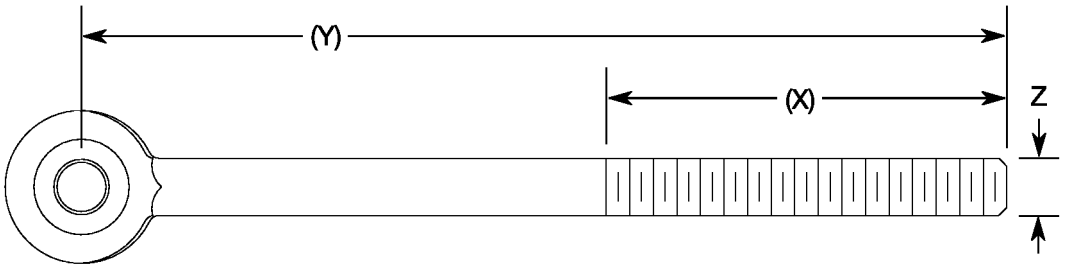
WARNING: Insure proper screw is installed in actuator assembly. Do not substitute or intermix.

Table 401. Trim Actuator

Actuator Assembly	Screw Assembly	Used On
1260074-3	0310362-7	310R0001 thru 310R0906
0831278-1	0831282-3	310R0907 thru 310R0952 and spares replacement for 310R0001 thru 310R0906
0831278-4	0831282-3	310R0953 thru 310R1222 and spares replacement for 310R0001 thru 310R0952
0831278-7	0831282-3	310R1223 thru 310R1500 and spares replacement for 310R0001 thru 310R1222
0831278-11	0831282-3	310R1501thru 310R1823 and spares replacement for 310R0001 thru 310R1500
0831278-13	0831282-14	310R1824 thru 310R2140 and spares replacement for 310R0001 thru 310R1823

A54650



5596T1022

Trim Tab Actuator and Screw Data
Figure 406

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Table 402. Dimensions

DIMENSIONS			
Screw Assembly Part No.	X	Y	Z
0310362-7	2.312	6.22	0.245+ 0.001, -0.000
0831282-3	1.75	4.50	0.245+ 0.0005, -0.0000
0831282-14	1.75	4.50	0.245+ 0.0005, -0.0000

NOTE: This listing is not to used for ordering parts. Spares replacement data is obtained from the airplane Illustrated Parts Catalog.

NOTE: When removal of the trim tab actuator screw assembly is required for lubrication, replacement, etc., the following procedure should be used to ensure the screw assembly is installed in its original location.

(1) Position the trim tab and control surface assembly as necessary to allow removal of the push rod and the screw assembly. Disconnect push rod at the trim tab end. Accurately, count and record the number of turns necessary to remove the push rod and screw assembly. Gently pull on the push rod during removal to ascertain the exact point when the threads become disengaged. Note this position accurately and also note the position of the bolt head that attaches the push rod to the screw assembly. This is necessary in order to replace the push rod and screw assembly in the exact same position as before removal.

WARNING: Do not mix or substitute screw assemblies in trim tab actuators. Always check rigging after removal of screw assembly.

(2) Install push rod and screw assembly with the bolt head in the exact same position as noted in step (1). Turn the push rod to the left (counterclockwise) 1/8 of a turn. Apply pressure on the push rod and screw assembly in a forward direction and turn to the right (clockwise) the same number of turns as noted in step (1). Check the direction of the bolt that attaches the push rod to the screw assembly to ensure that it is located properly as shown (bolt head outboard).

NOTE: The screw assembly has a quad lead type thread. Following the above procedures exactly will ensure the trim tab screw assembly has been installed in the exact same position.

10. Aileron Trim Gear Assembly

A. Removal (Refer to Figure 404).
(1) Remove front seats, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(2) Remove left front carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(3) Remove access covers from forward cabin floor, aft cabin floor above the landing gear actuator, and underside of fuselage just aft of the nose wheel well, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) Remove turnbuckle clip from turnbuckle (15) and disconnect turnbuckle.
(5) Remove chain guard (9) by removing screws and washers and disengage chain (5) from sprocket (8).
(6) Remove sprocket (8) from shaft by removing roll pin.
(7) Remove screws and washers attaching gear assembly support (7) and support guard in fuselage.
(8) Rotate forward side of gear support upward, disengage upper chain from sprocket (6) and remove support guard and gear support (7) through access hole in cabin floor.
(9) If further disassembly of gear support assembly is desired, refer to Figure 404.

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B. Installation (Refer to Figure 404).
   (1) Insert gear assembly support (7) and support guard through access hole in cabin floor, and engage upper chain (5) with sprocket (6).
   (2) With support guard in position, align mounting holes in gear assembly support (7) and install screws and washers. Use the two mounting holes that are not utilized to attach chain guard (9).
   (3) Attach sprocket (8) to shaft in gear support assembly (7) by installing roll pin.
   (4) Engage chain (5) with sprocket (8) and install chain guard (9) with screws and washers.
   (5) Connect cables (11) together with turnbuckle (15).
   (6) Rig trim tab control system, refer to Ailerons - Adjustment/Test.
   (7) Safety turnbuckle (15).
   (8) Install access hole covers on forward cabin floor, aft cabin floor, and underside of fuselage aft of nose wheel well.
   (9) Install carpets and pilot's seats.

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AILERONS - ADJUSTMENT/TEST

1. Aileron Control System

A. Rigging (Refer to Figure 501).
(1) Remove rear seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(2) Remove rear carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(3) Remove floorboard access cover forward of rear spar and wing access covers above aileron quadrant, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) Align control wheels horizontal and tape a straightedge to lower edge of both control wheels to insure alignment during rigging.

NOTE: Dual control wheels are optional equipment. If only one control wheel is installed, it must be kept in the horizontal position during rigging.

(5) Remove turnbuckle clips from all turnbuckles at the bellcrank (5).
(6) Adjust turnbuckles (2) on aileron cables (3 and 4) as necessary to bring bellcrank (5) to a neutral position.

NOTE: When rigging aileron cables, flap motor access panel must be installed to prevent deflection of bellcrank brackets.

NOTE: During all aileron rigging adjustments, maintain 25 pounds, +5 or -5 pounds tension on both the wing and fuselage cables.

NOTE: Cable tension should be adjusted when ambient temperature is 65°F to 95°F. Allow airplane temperature to stabilize for a period of 4 hours.

(7) Adjust turnbuckles connecting wing cables (3) to bellcrank and turnbuckle connecting cables (1) so that the ailerons align with the trailing edges of the wings.

NOTE: If length of aileron push-pull rod (6) has been changed, or new push-pull rods are being installed, adjust rod ends so that push-pull rod is as short as possible prior to alignment of ailerons with trailing edge of wings.

(8) Safety turnbuckles and remove straightedge which was taped to control wheels during rigging.
(9) Adjust quadrant stop bolts (7) so that aileron travel is 20 degrees, +1 or -0 degrees up and 20 degrees, +1 or -0 degrees down. Safety wire stop bolts after adjustment.

WARNING: Ensure that ailerons move in the proper direction when operated by the control wheel.

(10) Install access covers on wing and in fuselage.
(11) Install carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(12) Install rear seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.

2. Aileron Trim Control System

A. Rigging (Refer to Figure 502).
(1) Remove the following items from the airplane:
(a) Front seats, refer to Chapter 25, Flight Crew Seats- Removal/Installation
(b) Middle and rear seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(c) Front and center carpets, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove access cover from underside of the fuselage just aft of the nosewheel well, the fuselage floorboards above the landing gear actuator, the spar access covers aft of main wheel wells, and the access cover above the aileron quadrant, refer to Chapter 53, Floor Panels - Removal/Installation.

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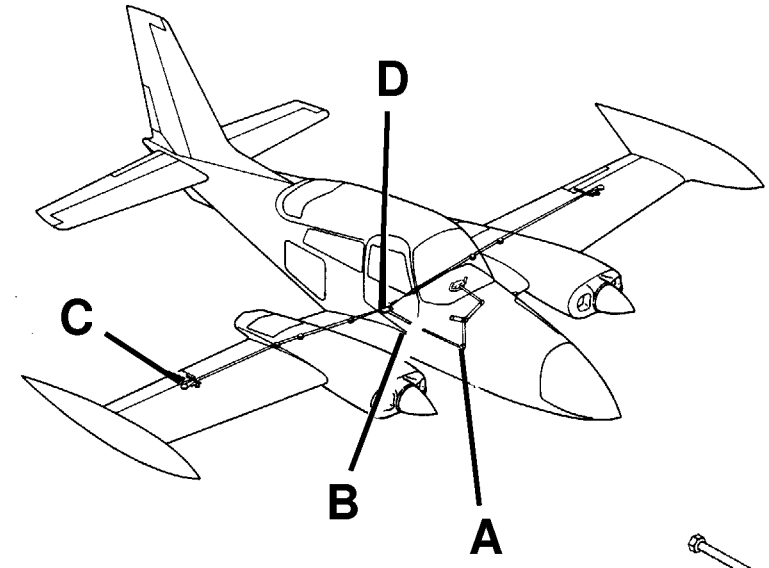
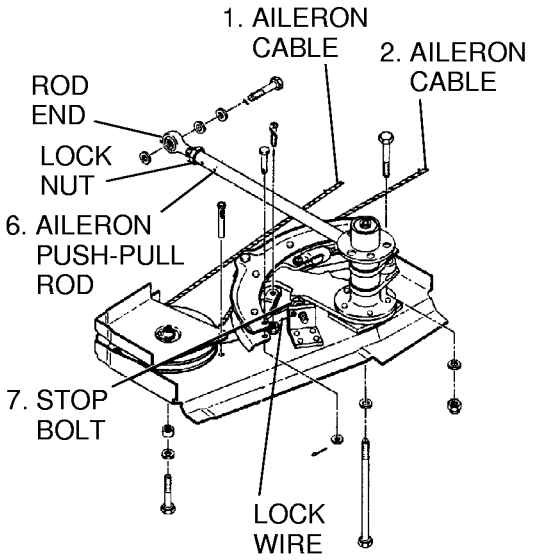
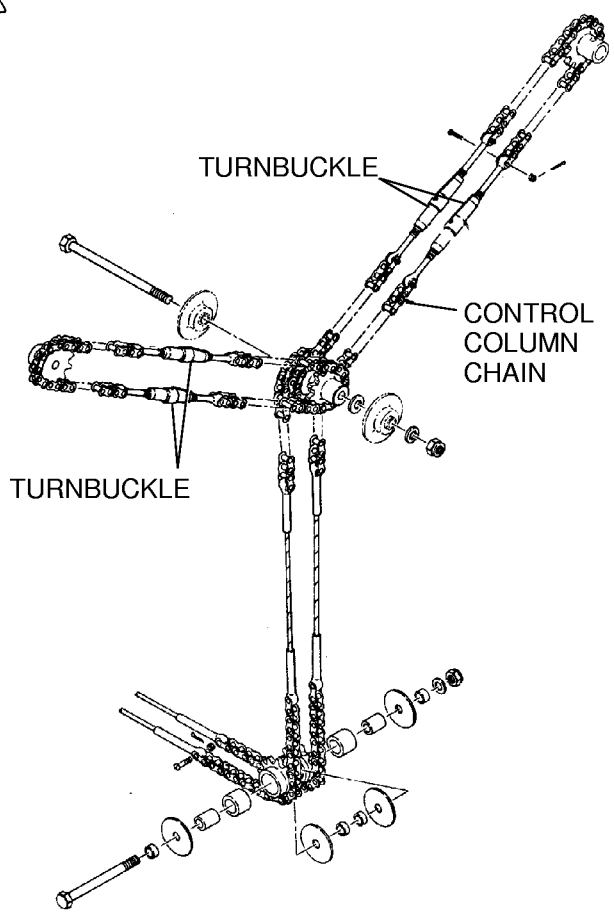




DETAIL C



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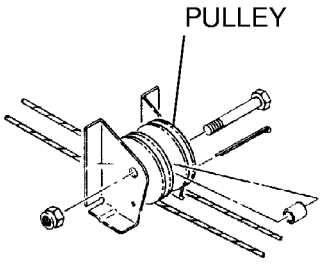

DETAIL B

10603005
A10612009
B10612007
C51154007

Aileron Control System
Figure 501 (Sheet 1)

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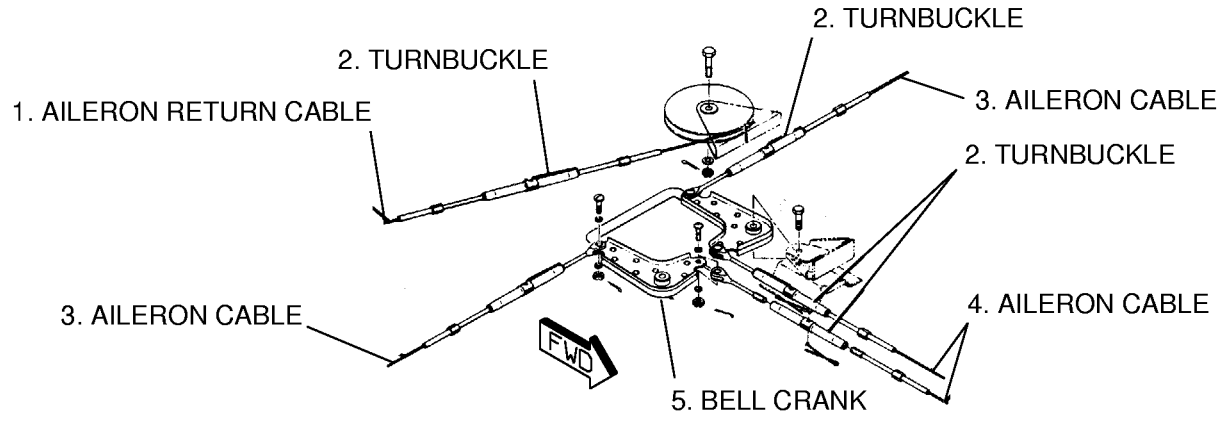
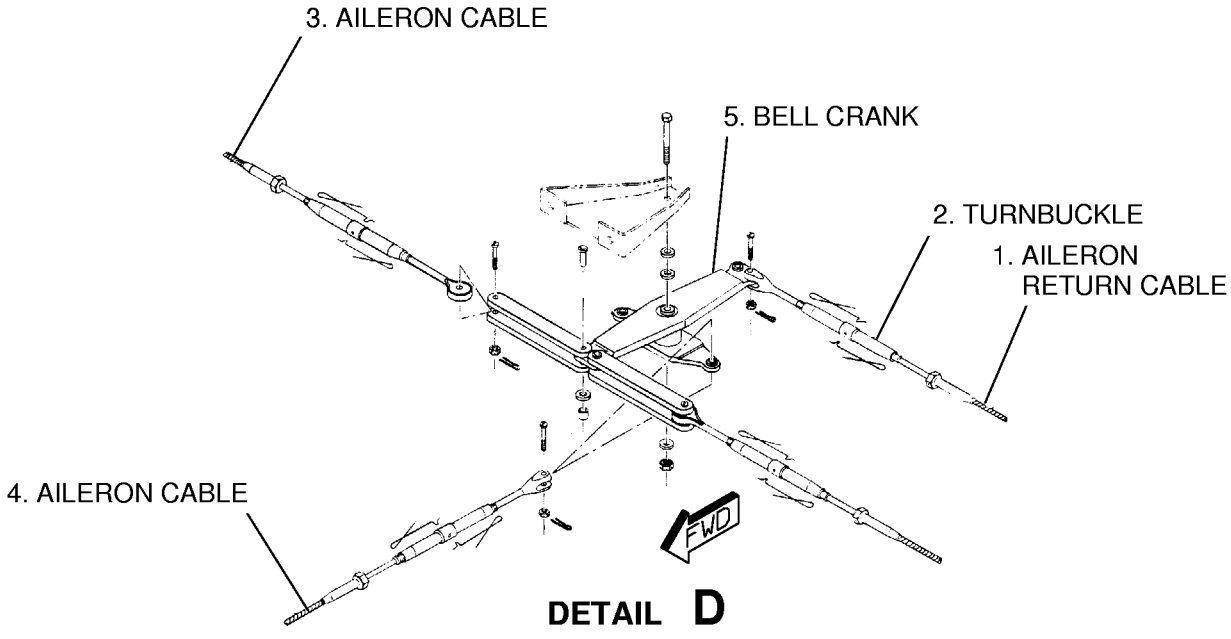


DETAIL D
310R0001 THRU 310R0500



DETAIL D
310R0501 AND ON

D10612008
D10612033

Aileron Control System
Figure 501 (Sheet 2)

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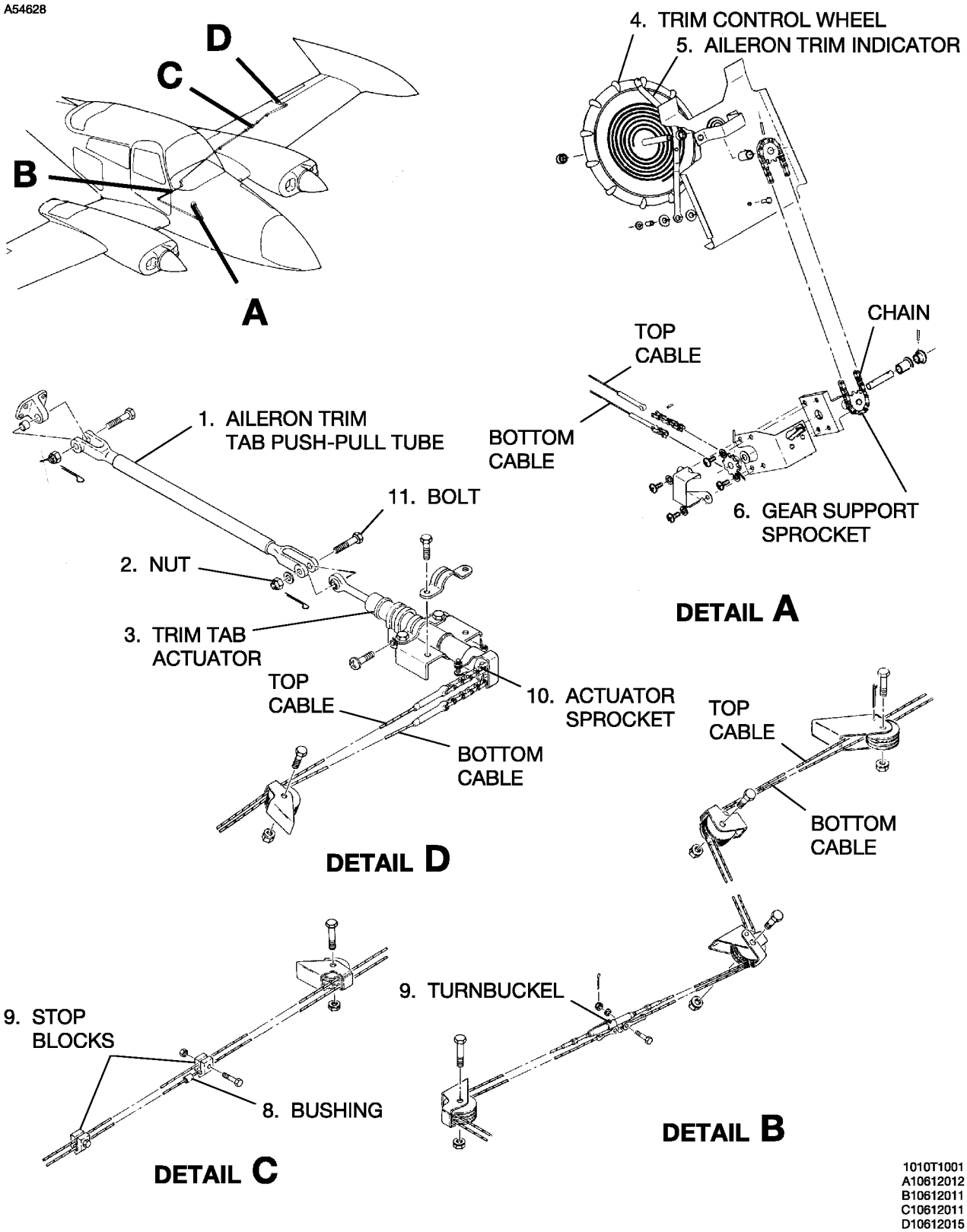

Aileron Trim Tab Control System and Adjustment
Figure 502 (Sheet 1)

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(3) Remove turnbuckle clip from turnbuckle (7) connecting aileron trim control cables; adjust to 10 pounds, +3 or -3 pounds tension, and resafety turnbuckle.

NOTE: Cable tension should be adjusted when ambient temperature is 65°F to 90°F. Allow airplane temperature to stabilize for four hours.

(4) Move aileron trim control system to neutral by rotating trim control wheel (4) so that the chain on actuator sprocket (10) is equal in length, and the chain on gear support sprocket (6) is equal in length.
(5) Adjust aileron trim indicator (5) to neutral by inserting a screwdriver beneath indicator and prying out of track in trim control wheel, moving the indicator to neutral, and re-engaging with track.
(6) Remove cotter pin, nut, bolt, and spacer attaching push-pull tube to aileron trim tab (Refer to Figure 503).
(7) Align aileron with trailing edge of wing and place trim tab in neutral.
(8) Adjust actuator screw (refer to Figure 504) so that aft hole in push-pull tube is aligned with hole in trim tab horn; attach push-pull tube to trim tab horn with bolt, spacer and nut, and cotter pin (Refer to Figure 503).
(9) Loosen stop blocks (9), move trim tab to 20 degrees DOWN, slide outboard stop block against outboard rib (Wing Station 111.5), and tighten stop block.

NOTE: Stop blocks (9) should be installed so that bottom cable passes through bushings (8), and top cable is clamped by stop blocks.

(10) Move trim tab to 20 degrees UP, slide inboard stop block against inboard rib (Wing Station 100.5), and tighten stop block.
(11) Tolerance for aileron trim tab travel is plus one degree and minus zero degrees.

WARNING: Ensure that aileron trim tab moves in the proper direction when operated by the trim control wheel.

(12) Install access covers, carpets, and seats.

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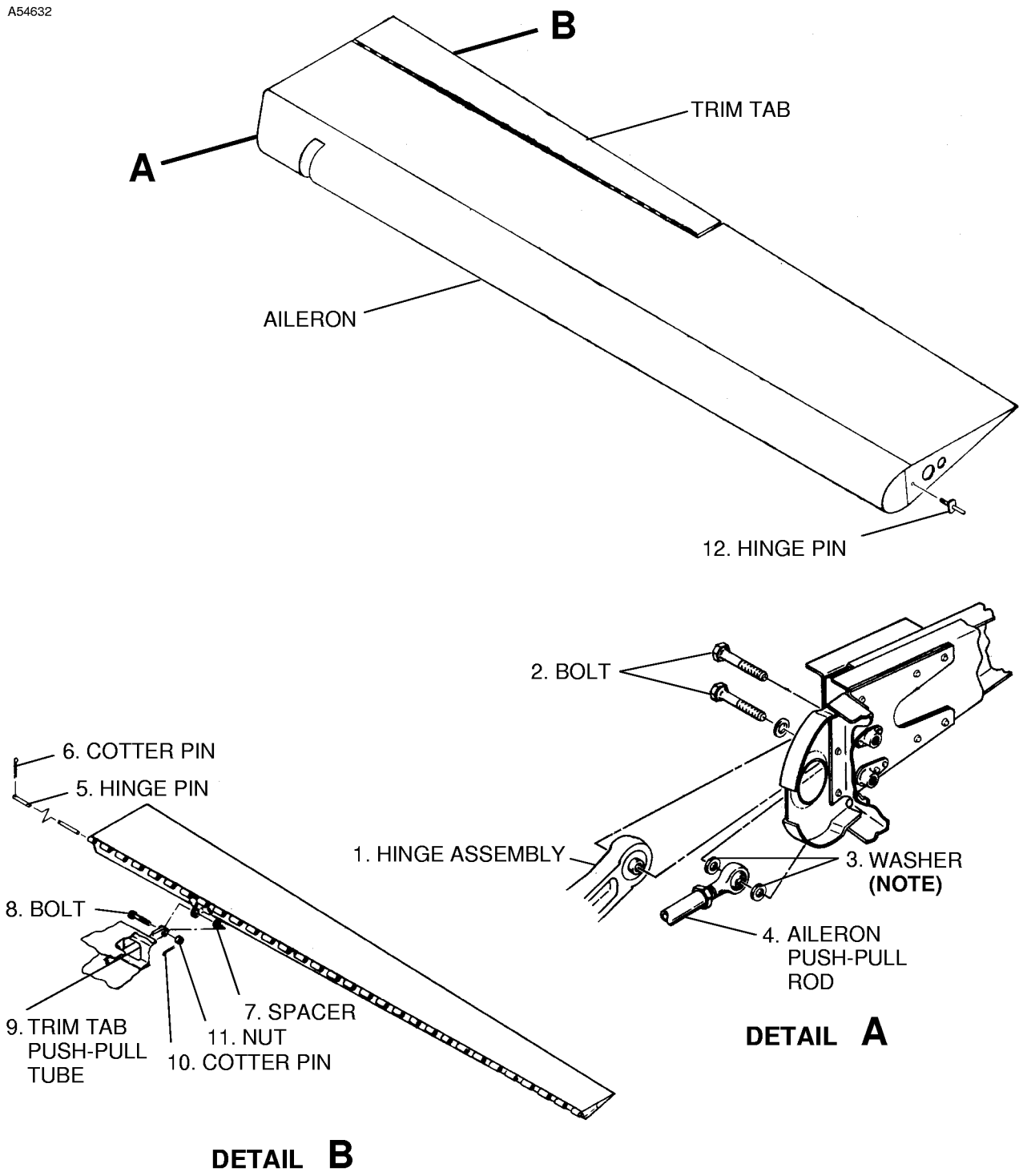

NOTE: MAXIMUM WASHER THICKNESS OF 0.126 MAY BE USED ADJACENT TO EACH SIDE OF ROD END, USE AN960-416 OR AN960-416L WASHERS.

10242001
A10242002
B10241001

Aileron and Trim Tab Installation
Figure 503 (Sheet 1)

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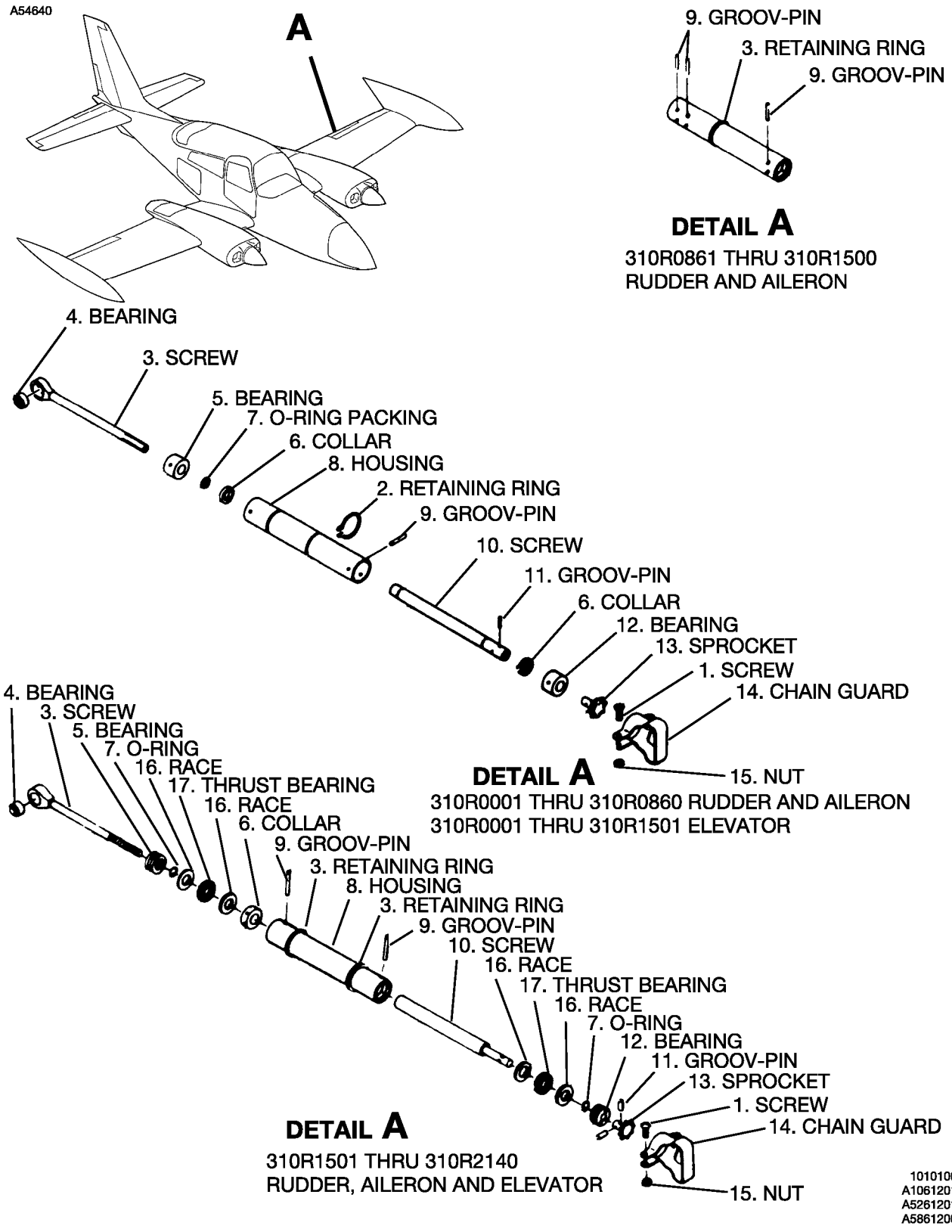

Trim Tab Actuator
Figure 504 (Sheet 1)

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AILERONS - INSPECTION/CHECK

1. Aileron Control System

A. Inspection.
(1) Visually inspect the aileron skins for cracks and loose rivets, hinges, hinge bolts, hinge bearings, hinge attach fittings, and bonding jumpers for evidence of damage or wear, failed fasteners, and security. Visually inspect the aileron hinge bolts for proper safety of nuts with cotter pins.
(2) Visually inspect aileron quadrant for condition, security, corrosion, evidence of damage to quadrant, stop bolts, and support bracket. Inspect aileron quadrant bolt and stop bolts for proper safety wire installation. Check cables for deterioration and lubrication. Inspect cables for fraying, chafing, cleanliness, cable tension, and turnbuckle safetying.
(3) Visually inspect bellcrank for security, cleanliness, corrosion, evidence of damage to guard pins, guides, and cable attach points. Inspect fuselage and control column cables including the wing cables from the bellcrank to fuselage for fraying, chafing, cleanliness, cable tension, and turnbuckle safetying.
(4) Inspect control wheel for evidence of damage and security. Operate control wheel and check for freedom of movement and proper rigging.

2. Aileron Trim Tab System

A. Inspection.
(1) Visually inspect trim tab skins and hinges for cracks, loose rivets and security, hinge for security and evidence of damage. Hinge pin for proper installation at hinge pin retainer. Inspect horn and push rod for evidence of damage and security. Inspect push rods for cracks and wear, bolts for condition and proper safety of nuts with cotter pins.
(2) Visually inspect actuator, mounting clamp for cracks and structure for evidence of damage and security. Check actuator mounting bolts for security.
(3) Visually inspect clamps for proper fit on actuator. Clamps must be firmly seated on the actuator.
(4) Visually inspect snap rings for complete and proper engagement in snap ring groove of actuator. Check that snap rings are properly seated in positioning slot on the mounting bracket. Check structure for evidence of damage, cracks, and security.
(5) Check that mounting clamp bolts or screws are torqued properly by evidence of torque putty.
(6) If the torque putty is broken or cracked, remove the putty, torque bolts 20-25 inch-pounds and apply white lacquer torque putty to bolts for future inspections.
(7) Visually inspect guard for condition and attachment.
(8) Visually inspect control and indicator for security and evidence of damage. Operate control and check aileron trim tab for freedom of movement. Inspect cables routed from turnbuckles to indicator for fraying, chafing, cleanliness, and turnbuckle safetying. Inspect guide block for evidence of damage and security. Inspect chains for proper safety at all points and chains for proper alignment on indicator sprocket.

NOTE: Individual broken wires are acceptable in primary and secondary control cables at random locations when no more than one broken wire occurs per inch, and no more than five broken wires in 10 inches. Additionally, in any area of broken wires, e.g., one inch each side of a broken strand, wear on adjacent wires in the strand may not exceed 40%.

(9) When servicing-remove screw assembly from trim tab actuator and inspect threads for rust, wear, and damage, and bearing for binding and damage, corrosion, or dirt particles that may impair smooth operation. Lubricate threads and install screw assembly.

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3. Aileron and Aileron Trim Tab

A. Cable Check.

NOTE: Angular dimensions for ailerons and trim tab are measured by placing inclinometer on aileron and trim tab surfaces. The aileron is in neutral position when the trailing edge is streamlined with flap trailing edge. The trim tab is in neutral position when streamlined with the aileron trailing edge.

(1) Place ailerons in neutral position. Install control lock.
(2) Place tensiometer on aileron fuselage cables and aileron wing cables and read cable tension.

NOTE: Access to the aileron fuselage and aileron wing cables is gained by removing floorboard and wing access panels.

(3) Place tensiometer on the aileron trim cable and read cable tension.

NOTE: Access to the aileron trim tab cables is gained by removing the floorboard and wing access panels and extending flaps.

B. Inspection.
(1) Extend flaps.
(2) Remove access plate on control pedestal, wing, and floorboard access covers as required to provide visual inspection of cables and pulleys.
(3) Install access plate on pedestal, floorboard, and wings.

C. Deflection Check.
(1) Rotate control wheel counterclockwise until stops contact. Hold aileron in this position and make the following checks:
(a) Check that right aileron is 20 degrees, +1 or -0 degrees below neutral position.
(b) Check that left aileron is 20 degrees, +1 or -0 degrees above neutral position.
(2) Rotate control wheel clockwise until stop contact. Hold aileron in this position and make the following checks:
(a) Check that left aileron is 20 degrees, +1 or -0 degrees below neutral position.
(b) Check that right aileron is 20 degrees, +1 or -0 degrees above neutral position.
(3) Return ailerons to neutral position.
(4) Rotate aileron trim control knob clockwise until stop contact. Check that trim tab is 20 degrees, +1 or -0 degrees above neutral position.
(5) Rotate aileron trim control wheel counterclockwise until stop contact. Check that trim tab is 20 degrees, +1 or -0 degrees below neutral position.
(6) Return trim tab to neutral position.
(7) Check aileron trim tab deflection (free play) as follows (Refer to Figure 601):

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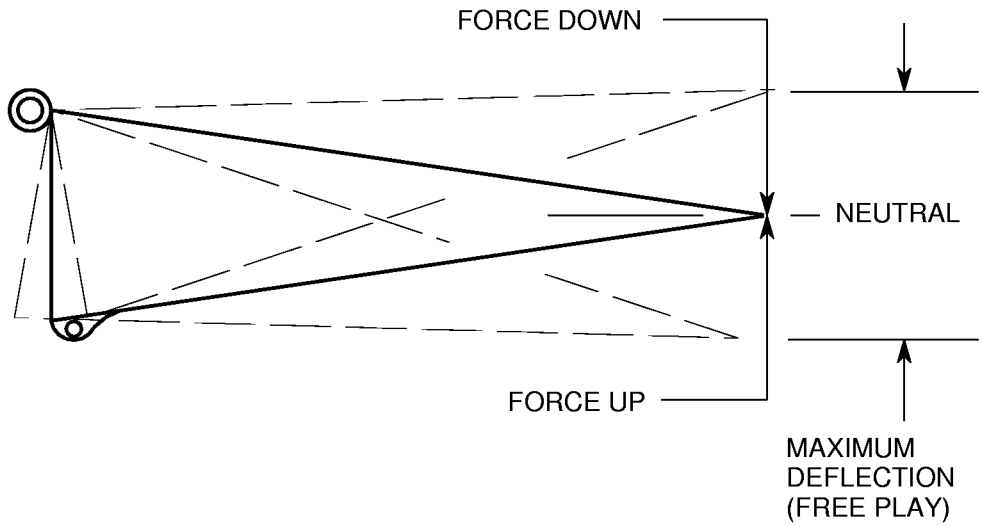

Trim Tab Deflection
Figure 601

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(a) With aileron and aileron trim tab in neutral position, restrain the aileron control surface and manually deflect the tab at the trailing edge at the point where the actuator push-pull rod is located. Using approximately one pound of force, deflect the tab one direction and measure the deflection from neutral using the control surface as a reference, then measure the deflection from neutral in the opposite direction. The sum of the two deflections must not exceed 0.050 inch at the outboard trailing edge. If the sum of the two deflections exceeds 0.050 inch, replace the bolts in the pushrod with NAS464 bolts of equivalent diameter and grip length and recheck; if unacceptable, replace bearing in actuator screw end and recheck; if unacceptable, replace trim tab pushrod bearing and recheck; if still unacceptable, adjust actuator to remove end play. Actuator is adjusted by removing groov-pins, rotating bearing past existing groov-pin holes then applying pressure to force bearing inward, then drilling new groov-pin holes in the bearing from existing holes in housings install groov-pins and safety wire to actuator. If trim tab deflection is still unacceptable, replace the trim tab actuator and insure areas are properly safetied.

D. Alignment Check During Flight.

(1) Conditions.

(a) With fuel loading and wing locker loading laterally balanced, trim the airplane in level flight at an altitude of between 5000 and 15,000 feet at a 75 percent power setting. Ailerons shall be within 0.5-inch above or below the wing trailing edge at the inboard end of the aileron and the trim tab shall be within 0.25-inch above or below the aileron trailing edge at the outboard end of the tab.

(b) Check that control wheel cock is within 2 degrees from level. If optional autopilot or yaw damper is installed, check for proper centering position.

NOTE: If the ailerons or trim tab exceed the specified tolerance, confirm that the airplane is laterally balanced. Additionally, it must be confirmed that the ailerons and trim tab, flaps and landing gear doors are properly rigged, and that flap, aileron, and trim tab cable tensions are properly adjusted. Check the airplane for any visible damage such as bent or loose skins, worn parts, and loose or foreign objects that might cause air turbulence over the control surfaces. Check the trim tab and ailerons to confirm they are not bent or warped. If the ailerons or trim tab exceed the specified tolerance after all of the above checks have been made, contact the Cessna Services Department for disposition instructions.

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RUDDER - DESCRIPTION AND OPERATION

1. Rudder Control System

A. Description.

(1) The rudder and trim tab system is mechanically actuated and provides directional control of the airplane about the vertical axis. The system consists of two subsystems: a rudder control system and a rudder trim tab system.

(2) The rudder control system consists of rudder, rudder pedals, bellcrank, rudder pedal position cables, and control system cables. The rudder is operated by the movement of the rudder pedals. The pedals are connected to torque tubes which have link arms for the attachment of the rudder cables. The rudder cables are attached to the torque tube link arm and routed forward over pulleys and then aft under the floorboards and through the tailcone by pulleys to the adjustable turnbuckles attached directly to the bellcrank on the bottom of the rudder torque tube. The rudder travel stops, consisting of bolts mounted in brackets attached to the lower hinge bracket, are provided for the recommended travel adjustment. The position cable is attached to the left rudder pedal torque tube and routed aft around a pulley then forward to the right rudder pedal torque tube to complete the rudder control system. Nose gear steering cables are also attached to right and left rudder pedal torque tubes and routed forward to springs and then to the nose gear steering yoke.

2. Rudder Trim Tab System

A. Description.

(1) The rudder trim tab system consists of control wheel, cable assemblies, stop blocks, rudder trim tab actuator, and tab. The rudder trim tab is operated by the control wheel on the pedestal. The control wheel is attached to a torque tube and sprockets which drives the chains and cables. The cables connect to a chain below the pedestal, and then routed aft under the floor through pulleys into the tailcone to turnbuckles. In the tailcone, the cables are routed aft to pulleys, then up through the vertical stabilizer, to a chain which operates the trim tab actuator. The trim tab push-pull tube connects the trim actuator to the trim tab horn on the trim tab, which is mounted to the rudder by a continuous hinge. The stop blocks are located in the tailcone for adjustment of the rudder trim tab travel.

CAUTION: Primary and secondary flight control cables, push-pull tubes, bellcranks, and mountings on late model airplanes use dual locking fasteners. The lock nuts for these fasteners incorporate a fiber lock and are castellated for safetying with a cotter pin. When any of these areas are disconnected on any airplane, new dual locking fasteners should be installed. Refer to the Airplane Parts Catalog for part numbers and location of these fasteners.

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RUDDER - TROUBLESHOOTING

1. Rudder and Trim Tab System

A. Troubleshooting.

NOTE: When troubleshooting rudder and rudder trim system, release gust locks, if installed, and center rudder in accordance with Rudder - Adjustment/Test.

(1) Troubleshooting the rudder and trim tab system is determining if the trouble exists in the rudder control system or the rudder trim tab control system (Refer to Table 101 and Table 102).

NOTE: Perform Rudder Control System troubleshooting with rudder pedals actuated.

Table 101. Rudder Control System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
LOST MOTION BETWEEN RUDDER PEDALS AND RUDDER.	Improperly adjusted rudder cable tension.	Check rudder cable tension. Adjust as required.
	Improperly routed cables.	Check for proper routing cables. Reroute cables on pulleys as required.
	Faulty pulleys.	Replace faulty pulleys.
	Loose bolts.	Tighten bolts attaching rudder to bellcrank.
INCORRECT RUDDER TRAVEL.	Improperly adjusted travel stops.	Adjust rudder travel stops.
	Rudder pedals contacting fuselage bulkhead.	Rig position cable, nose wheel steering cables and rudder cables.
RUDDER PEDALS NOT NEUTRAL WHEN RUDDER STREAMLINED.	Incorrect aft rudder cable rigging.	Properly rig cables.

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Table 101. Rudder Control System Troubleshooting (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
EXCESSIVE RESISTANCE TO RUDDER PEDAL MOVEMENT.	Improper friction forces.	Check friction forces. Refer to rudder and trim tab deflection check.
	Improperly adjusted rudder cable tension.	Check rudder cable tension. Adjust as required.
	Improperly routed cables.	Check for proper routing of cables. Reroute cables on pulleys as required.
	Faulty pulleys.	Replace faulty pulleys.
	Faulty or improperly installed cable guards.	Replace faulty guards. Install guards properly.
	Rudder binding, faulty bindings or bent hinge.	Check for rudder binding, faulty bearings or bent hinge. Replace faulty bearings and/or hinges.
	Misaligned or improperly lubricated rudder pedal torque tube bearings.	Check rudder pedal torque tube bearings for misalignment or need of lubrication. Correct bearing alignment and/or lubricate.
	Bent rudder.	Repair or replace rudder.

NOTE: Perform Rudder Trim Tab Control System troubleshooting with rudder trim tab actuated.

Table 102. Rudder Trim Tab Control System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
EXCESSIVE RESISTANCE TO TRIM CONTROL WHEEL MOVEMENT.	Improper friction forces.	Check friction forces. Refer to rudder and trim tab deflection check.
	Improperly adjusted cable tension.	Check cable tension. Adjust as required.
	Binding or rubbing on pulleys.	Check pulleys for binding or rubbing. Replace as required.
	Incorrect cable routing.	Check cable routing. Reroute as required.
	Faulty miter gear assembly.	Replace miter gear assembly.
	Faulty trim actuator.	Replace trim actuator.
	Trim tab hinge binding.	Check trim tab hinge for binding. Lubricate hinge or replace as required.
	Bent rudder trim torque tube in pedestal.	Replace rudder trim torque tube.

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Table 102. Rudder Trim Tab Control System Troubleshooting (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
INCORRECT TRIM TAB TRAVEL.	Improperly adjusted cable tension.	Check cable tension. Adjust as required.
	Improper adjustment of stop blocks.	Check for proper adjustment of stop blocks. Adjust stop blocks as required.
	Improper actuator adjustment.	Check for proper adjustment of actuator. Adjust actuator screw as required.
	Indicator incorrectly engaged with wheel track.	Adjust as required. Refer to rigging procedures.
LOST MOTION BETWEEN TRIM CONTROL WHEEL AND TRIM TAB.	Improper cable tension.	Check cable tension. Adjust cable tension as required.
	Faulty pulleys.	Replace faulty pulleys.
	Incorrect cable routing.	Correct cable routing.
	Excessive backlash on miter gear assembly.	Check miter gear assembly. Repair or replace miter gear assembly.
	Worn trim actuator.	Repair or replace trim actuator.
	Worn universal joint in rudder trim torque tube in pedestal.	Replace universal joint.

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RUDDER - REMOVAL/INSTALLATION

1. Rudder

WARNING: Upon completion of all control system installation and/or rigging, ensure that all bolts, nuts, fittings, connections, etc. are tightened and secured properly.

A. Removal (Refer to Figure 401).
   (1) Place a suitable support beneath the tailcone at station 132.00.
   (2) Refer to Chapter 53, Fuselage Stinger - Removal/Installation and remove stinger.
   (3) Remove cotter pin, nut, washer, and bolt (9) from rudder trim tab push-pull tube (10).
   (4) Remove cotter pins, nuts, washers, and bolt (5) attaching rudder torque tube (4) to bellcrank (7).
   (5) Disconnect bonding straps (3) from vertical stabilizer.
   (6) Support rudder and remove cotter pins, nuts, washers, and bolts (1) from center and upper hinges.
   (7) Remove rudder from vertical stabilizer by pulling aft and guiding rudder trim tab push-pull tube (10) through rudder.

B. Installation (Refer to Figure 401).
   (1) Place rudder into position, guide rudder trim tab push-pull tube (10) through rudder and align mounting holes on upper and center hinges with vertical stabilizer.
   (2) Attach rudder to vertical stabilizer at the upper and center hinges with bolts (1), washers, nuts, and cotter pins.
   (3) Attach bonding straps (3) to vertical stabilizer.
   (4) Attach rudder torque tube (4) to bellcrank with bolts (5), washers, nuts, and cotter pins.
   (5) Connect rudder trim tab push-pull tube (10) to trim tab horn (11) with bolt (9), washer, nut, and cotter pin.
   (6) Remove support from beneath tailcone and check rudder and rudder trim tab for proper operation and correct travel. If rigging is necessary, refer to Rudder - Adjustment/Test.
   (7) Refer to Chapter 53, Fuselage Stinger - Removal/Installation and install stinger.

2. Rudder Bell Crank

A. Removal (Refer to Figure 401).
   (1) Refer to Chapter 53, Fuselage Stinger - Removal/Installation and remove stinger.
   (2) Loosen rudder cables (3 and 6) at turnbuckles (7) (Refer to Figure 402).
   (3) Disconnect the cable links from left and right side of bell crank (1) by removing cotter pins, nuts, washers, and bolts.

      NOTE: Tag the cable links to aid reinstallation.

   (4) Remove cotter pin, nut, washer, and bolts (6), securing bell crank (7) to lower bell crank hinge bracket.
   (5) Remove cotter pins, nuts, washers, and bolts (5), securing bell crank to torque tube (4). Remove bell crank.

B. Installation (Refer to Figure 401).
   (1) Align bell crank (7) to torque tube (4) and secure with bolts (5), washers, nuts, and cotter pins.
   (2) Secure bell crank (7) to bell crank hinge bracket using bolt (6), washer, nut, and cotter pin.
   (3) Identify cable links and attach cable links to bell crank (1) with bolts, washers, nuts, and cotter pins (Refer to Figure 402).
   (4) Rig rudder system, refer to Rudder - Adjustment/Test.
   (5) Install turnbuckle clips on turnbuckles (7).
   (6) Install stinger.

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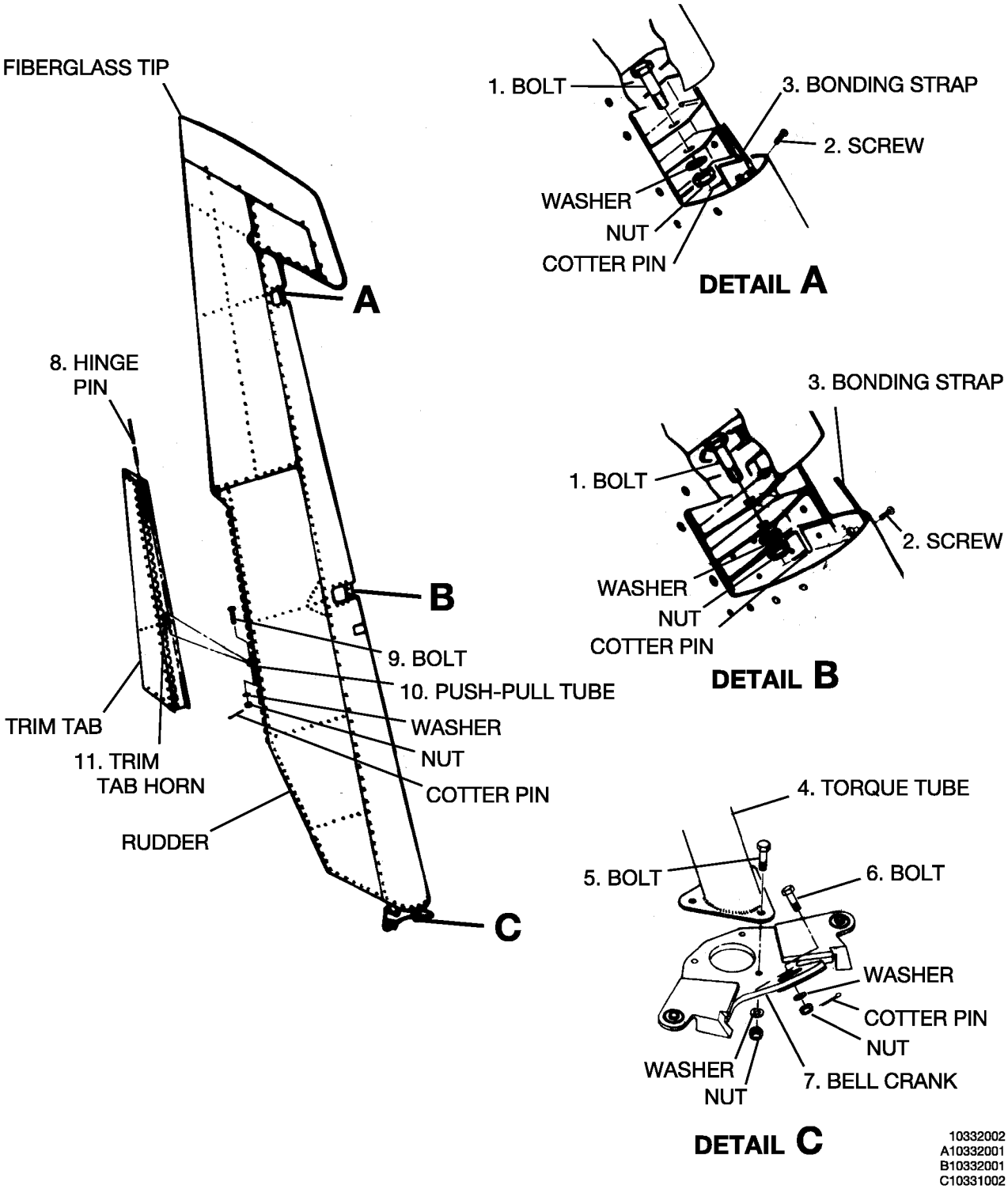

Rudder and Trim Tab Installation
Figure 401 (Sheet 1)

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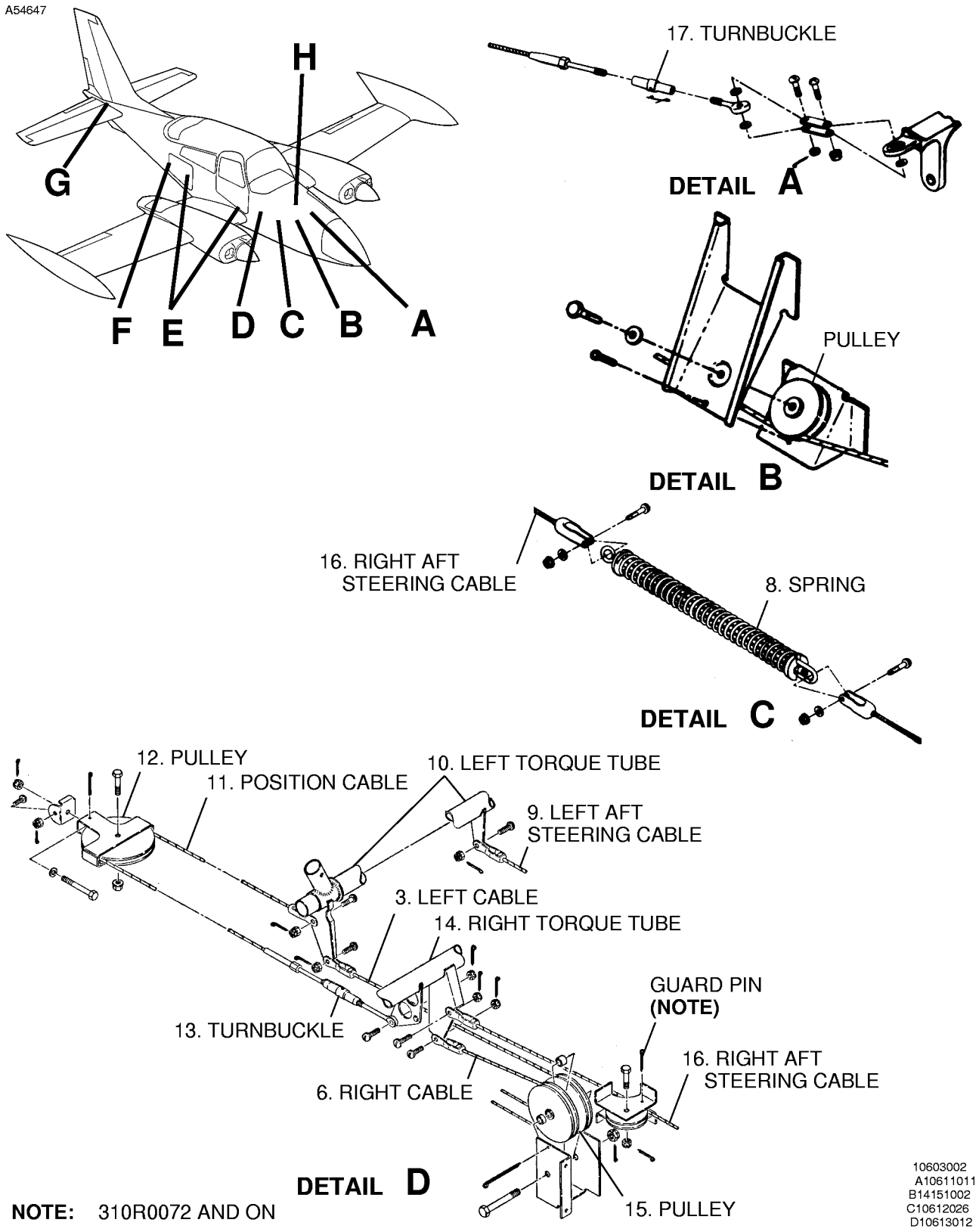

NOTE: 310R0072 AND ON

Rudder Pedal Installation
Figure 402 (Sheet 1)

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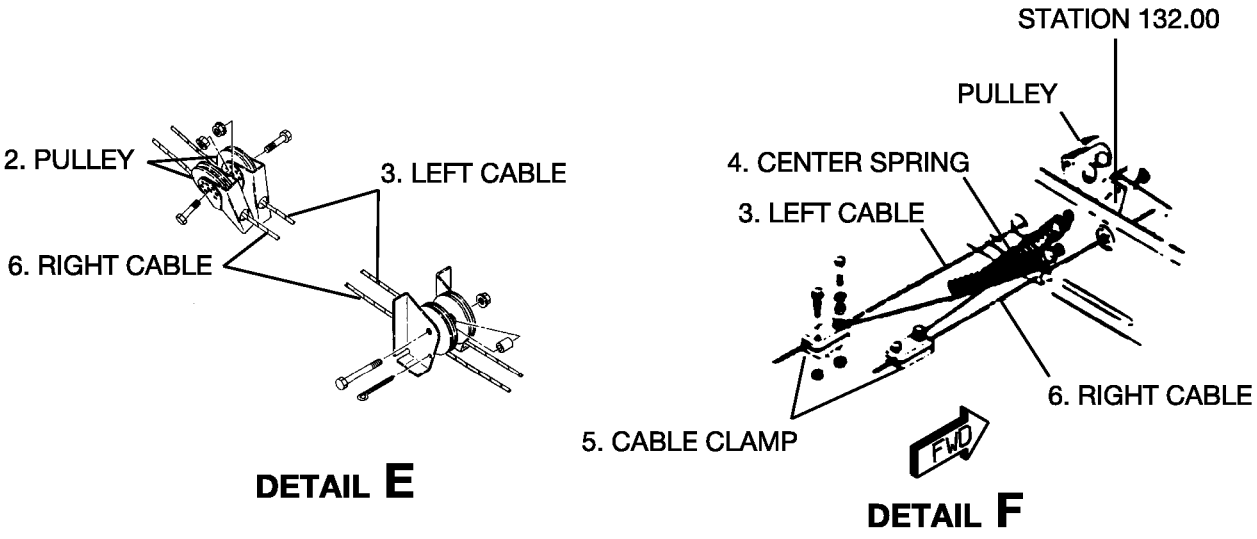

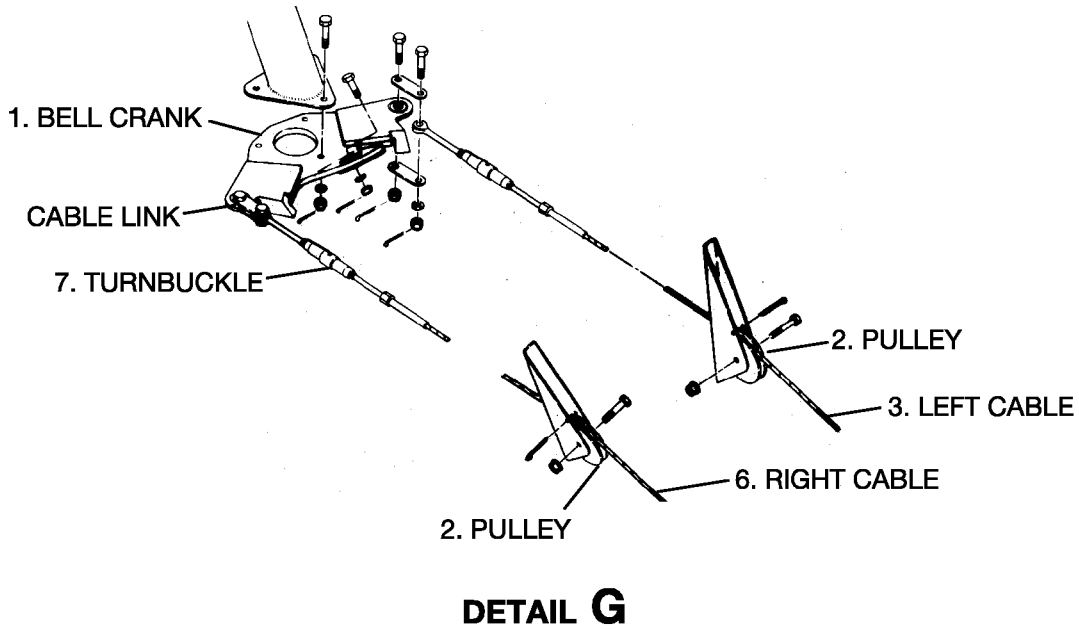

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F10613004
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Rudder Pedal Installation
Figure 402 (Sheet 2)

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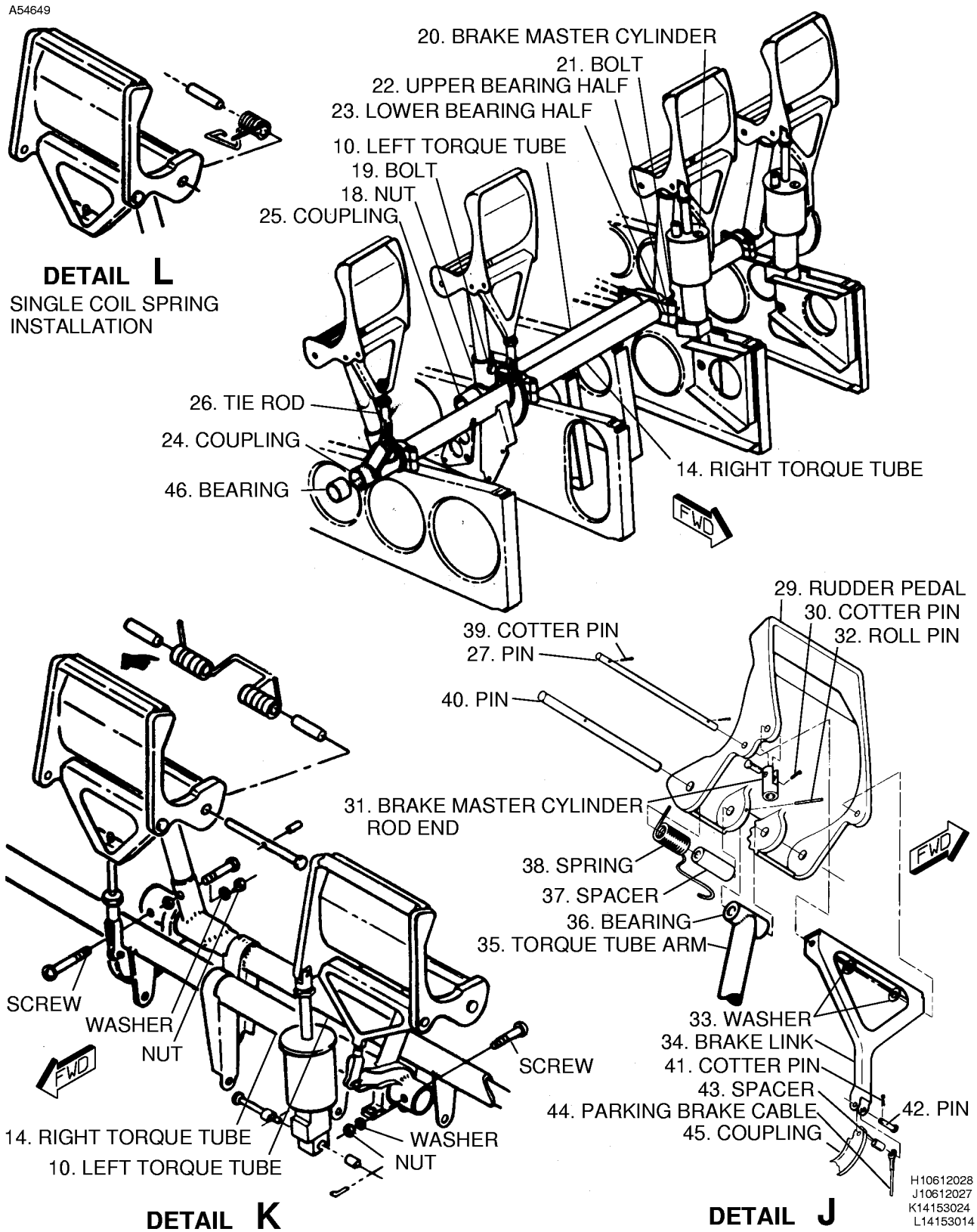

Rudder Pedal Installation
Figure 402 (Sheet 3)

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3. Rudder Pedal Assembly

NOTE: The following procedure describes rudder pedals through the tailcone to the rudder cable turnbuckles, located at rudder bellcrank.

A. Removal (Refer to Figure 402).
(1) Remove pilot's seats, refer to Chapter 25, Flight Crew Seats - Removal/Installation.
(2) Remove front carpet, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(3) Remove boot, retainer and covers from lower control column.
(4) Remove access covers from forward cabin floorboards, refer to Chapter 53, Floor Panels - Removal/Installation.
(5) Release tension on nose wheel steering cables by loosening turnbuckles (17).
(6) Disconnect rudder position cable (11) and right aft nose wheel steering cable (16) from torque tube (14) by removing cotter pins, nuts, and bolts.
(7) Disconnect left aft nose wheel steering cable (9) from torque tube (10) by removing cotter pin, nut, and bolt.
(8) Disconnect rudder cables (3 and 6) from torque tubes (10 and 14) by removing cotter pins, nuts, and bolts.
(9) Disconnect brake master cylinders (20) from the pilot's rudder pedals by removing cotter pins (30) and pins (28).
(10) Disconnect two parking brake cables (44) and brake links (34) from rudder pedal torque tubes (10 and 14) by removing cotter pins (41), spacers (43), and pins (42).
(11) Remove copilot's rudder pedals by removing nuts (18) and bolts (19).
(12) Remove upper and lower bearing halves (22 and 23) by removing bolts (21). Remove rudder pedal assembly from airplane.

NOTE: The upper and lower halves of each bearing are matched parts and should be tagged and kept in pairs.

B. Disassembly (Refer to Figure 402).
(1) Remove brake links from rudder pedals (29) by removing cotter pins, washers, and pins (27).
(2) Remove rudder pedals by driving out roll pins (32) and removing springs, spacers, and pins (40).

NOTE: Springs and spacers are not used on copilot's rudder pedals.

(3) Remove couplings (24 and 25) from brake torque tubes by removing cotter pins and pins.
(4) Remove brake torque tubes from rudder pedal torque tubes (10 and 14).

NOTE: Bearings (46) in rudder pedal torque tubes and bearings (36) in rudder pedal torque tube arms (35) are a press fit and should be removed for replacement only.

C. Assembly (Refer to Figure 402).
(1) Insert brake torque tubes into rudder pedal torque tubes (10 and 14).
(2) Install couplings (24 and 25) on ends of brake torque tubes with attaching pins and cotter pins.
(3) Install rudder pedals on rudder pedal torque tube arms (35) with spacers, springs, and pins (40). Secure with roll pins (32).

NOTE: Springs and spacers are not used on copilot's rudder pedals.

(4) Attach brake links (34) to rudder pedals (29) with pins, washers, and cotter pins.

NOTE: To facilitate installation, do not attach copilot's rudder pedal assemblies to rudder pedal torque tubes prior to installation.

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D. Installation (Refer to Figure 402).
(1) Place rudder pedal assembly in position, remove identification tags from bearing halves (22 and 23). Position bearing halves on torque tubes (10 and 14) and secure with bolts (21).

NOTE: During installation of rudder pedal assemblies, lubricate in accordance with the Lubrication Diagram located in Chapter 12, Servicing - General. Rudder pedal torque tubes must rotate freely in bearing halves (22 and 23).

(2) Install copilot's rudder pedal assemblies on torque tubes (10 and 14) with bolts (19 and 18).
(3) Connect two parking brake cables (44) and brake links (34) to torque tubes (10 and 14) with pins (42), spacers (43), and cotter pins (41).
(4) Connect brake master cylinders (20) to pilot's rudder pedals with pins (28) and cotter pins (30).
(5) Connect rudder cables (3 and 6) to torque tubes (10 and 14) with bolts, nuts, and cotter pins.
(6) Connect left aft nose wheel steering cable (9) to torque tube (10) with bolt, nut, and cotter pin.
(7) Connect right aft nose wheel steering cable (16) and position cable (11) to torque tube (14) with bolts, nuts, and cotter pins.
(8) Connect nose wheel steering cables (9 and 16) to springs (8).
(9) Rig rudder control system, refer to Rudder - Adjustment/Test.
(10) Install access covers.
(11) Install boot, retainer, and covers on lower control column.
(12) Install front carpet, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(13) Install pilot's seats, refer to Chapter 25, Flight Crew Seats- Removal/Installation.

4. Rudder Control Cables

NOTE: The following procedure describes rudder cables through the tailcone to the rudder cable turnbuckles, located at rudder bellcrank.

A. Removal (Refer to Figure 402).
(1) Remove the following items in accordance with removal procedures:
(a) Pilot's seat, refer to Chapter 25, Flight Crew Seats - Removal/Installation.
(b) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(c) Front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(d) Rear upholstery panel to tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove stabilizer fairings; access covers on cabin floor as necessary to gain access to rudder cables, pulleys, and attachment points, refer to Chapter 53, Floor Panels - Removal/Installation.
(3) Disconnect rudder cables (3 and 6) from bellcrank (1) by disconnecting turnbuckles (7).
(4) Remove pulleys (2 and 15) by removing attaching nuts, washers, spacers, and bolts.

NOTE: Attaching nut and bolt for pulleys (15) must be removed from inside nose wheel well.

(5) Remove fairleads through hole which rudder cables pass at fuselage rear spar and fuselage station 132.00.
(6) Disconnect rudder centering springs (4) from cable clamps (5) by removing nuts, spacers, washers, and bolts.
(7) Remove cable clamps (5) by removing attaching nuts and bolts.
(8) Disconnect rudder cables (3 and 6) from rudder pedal torque tubes (10 and 14) by removing cotter pins, nuts, and bolts.
(9) Tie guide wires to forward ends of rudder cables (3 and 6) and remove cables from airplane by routing them out through stabilizer fairing.

NOTE: If an autopilot (optional) is installed, disconnect from rudder cables by removing attaching clamps.

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(10) Release tension on nose wheel steering cables (9 and 16) as follows:
   (a) Manually turn nose wheel to an extreme right or left position to release tension on spring (8).
   (b) Disconnect nose wheel steering cables (9 and 16) by either separating nose wheel steering spring components or removing cotter pins, nuts, washers, and bolts.

CAUTION: Tension on nose wheel steering cables must be released before rudder position cable (11) is disconnected.

(11) Disconnect rudder position cable (11) from torque tubes (10 and 14) by removing cotter pins, nuts, and bolts.
(12) Remove pulley (12) by removing nut and bolt.
(13) Tie guide wire on position cable (11) and route from underneath floorboard.

B. Installation (Refer to Figure 402).
(1) Tie guide wire to position cable (11) and pull into position under floorboard. Position cable around pulley (12) and secure pulley with bolt and nut.
(2) Connect rudder position cable (11) to torque tubes (10 and 14) with cotter pins, nuts, and bolts.
(3) Connect nose wheel steering cables (9 and 16) and springs (8) in accordance with the method used to release tension.
(4) Tie rudder cables (3 and 6) to guide wires, pull cables into position, and remove guide wires.

NOTE: When installing pulleys (15), the pulleys and spacers must be aligned and held in position from inside the cabin while attaching bolt and nut are installed from inside the nose wheel well.

(5) Connect rudder cables (3 and 6) to torque tubes (10 and 14) and secure with bolts, nuts, and cotter pins.
(6) Install pulleys (2) in fuselage and tailcone and secure with bolts, spacers, and nuts.
(7) Connect rudder cables (3 and 6) to bellcrank (1) by installing turnbuckle (7).
(8) Install fairleads through which rudder cables pass at fuselage station 132.00 and rear spar.
(9) Install cable clamps (5), attach centering springs (4), and rig springs, refer to Rudder - Adjustment/Test.
(10) Rig rudder cables, refer to Rudder - Adjustment/Test.

NOTE: If an autopilot (optional) is installed, the autopilot cables must be connected to the rudder cables.

(11) Install access covers and stabilizer fairings.
(12) Install upholstery panel, front, center, and rear carpets, and seats.

5. Rudder Trim Tab

A. Removal (Refer to Figure 401).
(1) Turn rudder trim control wheel on pedestal until indicator is pointing to full right position.
(2) Disconnect rudder trim tab push-pull tube (10) by removing cotter pin, nut, washer, and bolt.
(3) Remove trim tab from rudder by removing cotter pins and hinge pin (8).

B. Installation (Refer to Figure 401).
(1) Attach rudder trim tab to rudder with hinge pin (8) and secure with cotter pins.
(2) Connect rudder trim tab push-pull tube (10) to trim tab with bolt, washer, nut, and cotter pin.
(3) Check rudder trim tab for proper operation and correct travel. If necessary, rig in accordance with Rudder - Adjustment/Test.

6. Rudder Trim Tab Actuator

A. Removal (Refer to Figure 403).
(1) Remove rear upholstery panel to tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.

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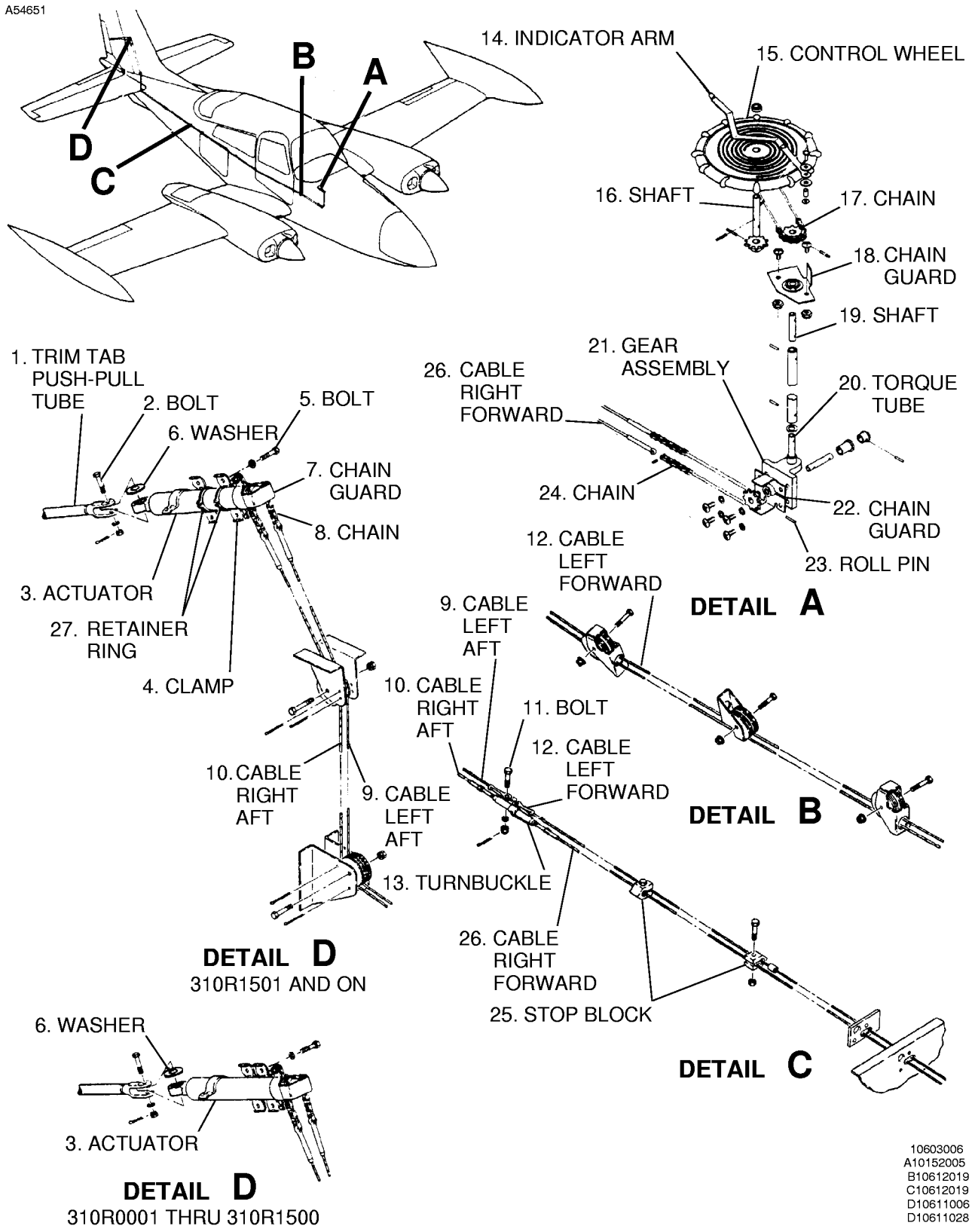

Rudder Trim Control Installation
Figure 403 (Sheet 1)

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(2) Remove access hole cover from vertical stabilizer adjacent to rudder trim tab actuator (3), refer to Chapter 53, Floor Panels - Removal/Installation.
(3) Unsafety turnbuckle (13) and disconnect aft cables (9 and 10) from forward cables (12 and 26) by removing turnbuckle (13), cotter pin, nut, washer, and bolt (11).
(4) Remove chain guard (7) by removing nuts and screws.
(5) Disengage chain (8) from actuator sprocket and tie chain to screw hole in vertical fin.
(6) Disconnect trim tab push-pull tube (1) from actuator (3) by removing cotter pin, nut, washer, and bolt (2).
(7) Remove clamps (4) by removing bolts (5) and washers. Remove the trim tab actuator (3).

B. Disassembly/Assembly.
(1) The instructions for disassembly and assembly of the aileron trim tab actuator given in Ailerons - Removal/Installation, also applies to the rudder trim tab actuator.

C. Installation (Refer to Figure 403).
(1) Insert the rudder trim tab actuator (3) into position in vertical stabilizer and install clamps (4) with bolts (5) and washers. On Airplanes 310R1501 thru 310R2140, position actuator with retainer rings seating in bracket grooves.
(2) Attach the trim tab push-pull tube (1) to the actuator (3) with bolt (2), washer, nut, and cotter pin.
(3) Rotate actuator sprocket so that rudder trim tab is in the neutral position and engage chain (8) equal in length from the sprocket.
(4) Install the chain guard (7) with screws and nuts.
(5) Connect the aft cable (9) to forward left cable (12) with bolt (8), washer, nut, and cotter pin.
(6) Connect the aft cable (10) to forward right cable (26) with turnbuckle (13).
(7) Rig the rudder trim tab system, refer to Ailerons - Removal/Installation.
(8) Install rear upholstery panel to tailcone.
(9) Install access hole cover on vertical stabilizer.

7. Trim Tab Actuator Screw

A. Removal (Refer to Figure 404).

WARNING: Insure proper screw is installed in actuator assembly. Do not substitute or intermix.

Table 401. Trim Tab Actuator Screw

Actuator Assembly	Screw Assembly	Used On
1260074-6	0310362-11	310R0001 thru 310R0906
0831278-2	0831282-4	310R0907 thru 310R0952 and spares replacement for 310R0001 thru 310R0906
0831278-5	0831282-4	310R0953 thru 310R1222 and spares replacement for 310R0001 thru 310R0906
0831278-8	0831282-4	310R1223 thru 310R1500 and spares replacement for 310R0001 thru 310R1222
0831278-12	0831282-4	310R1501 thru 310R1823 and spares replacement for 310R0001 thru 310R1500
0831278-15	0831282-15	310R1824 thru 310R2140 and spares replacement for 310R0001 thru 310R1823

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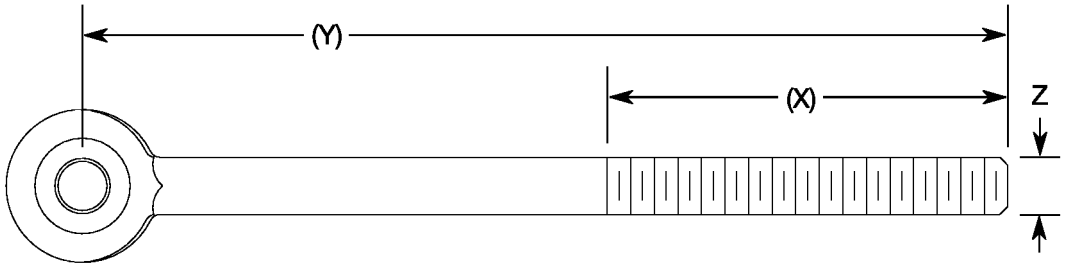

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Trim Tab Actuator and Screw Data
Figure 404

Table 402. Dimensions

DIMENSIONS			
Screw Assembly Part No.	X	Y	Z
0310362-11	2.312	5.125	0.245 +0.001 or -0.000
0831282-4	1.25	5.12	0.245+0.0005, -0.0000
0831282-15	1.25	5.12	0.245 +0.0005, -0.0000

NOTE: This listing is not to be used for ordering parts. Spares replacement data is obtained from the airplane Illustrated Parts Catalog.

NOTE: When removal of the trim tab actuator screw assembly is required for lubrication, replacement, etc., the following procedure should be used to ensure the screw assembly is installed in its original location.

(1) Position the trim tab and control surface assembly as necessary to allow removal of the push rod and the screw assembly. Disconnect push rod at the trim tab end. Accurately, count and record the number of turns necessary to remove the push rod and screw assembly. Gently pull on the push rod during removal to ascertain the exact point when the threads become disengaged. Note this position accurately and also note the position of the bolt head that attaches the push rod to the screw assembly. This is necessary in order to replace the push rod and screw assembly in the exact same position as before removal.

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WARNING: Do not mix or substitute screw assemblies in trim tab actuators. Always check rigging after removal of screw assembly.

B. Installation (Refer to Figure 404).

(1) Install push rod and screw assembly with the bolt head in the exact same position as noted in step A(1). Turn the push rod to the left (counterclockwise) 1/8 of a turn. Apply pressure on the push rod and screw assembly in a forward direction and turn to the right (clockwise) the same number of turns as noted in step A(1). Check the direction of the bolt that attaches the push rod to the screw assembly to ensure that it is located properly as shown (bolt head outboard).

NOTE: The screw assembly has a quad lead type thread. Following the above procedures exactly will ensure the trim tab screw assembly has been installed in the exact same position.

8. Rudder Trim Cables

A. Removal (Refer to Figure 403).

(1) Remove the following items from the airplane:
(a) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(b) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(c) Front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(d) Rear upholstery panel to tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.

(2) Remove side panel from control pedestal, stabilizer fairings, vertical stabilizer access cover at actuator, and floorboards.

(3) Unsafety turnbuckle (13) and disconnect aft cables (9 and 10) from forward cables (12 and 26) by removing turnbuckle, cotter pin, nut, washer, and bolt (11).

(4) Remove aft pulleys by removing nuts, bolts, and cable guard cotter pins. Pull cables aft into tailcone.

(5) Remove chain guard (7) from actuator (3) by removing nuts and screws.

(6) Disengage chain (8) from sprocket of actuator (3), attach a guide wire to the chain and remove cables and chain from vertical fin. Disconnect guide wire and leave in vertical fin to facilitate installation.

(7) Remove stop blocks (25) by removing nuts and bolts.

(8) Remove forward pulleys from forward cables (12 and 26) by removing nuts, washers, and bolts.

(9) Disengage chain (24) from sprocket of gear assembly (21).

NOTE: Chain guards are flexible enough to allow chain to be disengaged without removing chain guards.

(10) Remove forward cables (12 and 26) by pulling out through access hole in forward cabin floor.

NOTE: To facilitate installation, tie guide wires to aft ends of cables and leave guide wires in the fuselage.

(11) Remove chain (17) by disconnecting master link.

NOTE: If, during the removal or installation of the chain, the indicator arm (14) reaches its extreme travel, disengage from control wheel track by inserting a screwdriver beneath the indicator arm and prying out of track. This permits the indicator to be moved, or wheel to be turned, before indicator is reengaged with track.

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(12) The above procedure does not include removal of rudder trim control wheel, indicator, torque tube, or miter gear assembly, because their removal is not recommended. However, removal of these components is possible by the following methods:
   (a) Trim control wheel (15) and indicator arm (14) can be removed by drilling out the rivets which attach the wheel bracket to the control pedestal and the rivet around which the indicator pivots.
   (b) Torque tube (20) can be removed by removing upper roll pin and lower roll pin.

      NOTE: To gain access to the lower roll pin, it may be necessary to remove the control pedestal, or to drill out the rivets which attach the lower right side panel.

   (c) The upper sprocket and shaft (19) can be removed by removing the roll pin. Chain guard (18) can be removed by removing nuts and screws.
   (d) The gear assembly (21) can be removed by removing the control pedestal and drilling out enough attaching rivets to allow the section of the floor above the gear assembly to be lifted for access.

B. Installation (Refer to Figure 403).
   (1) Install chain (17) on upper sprockets and connect with master link.
   (2) Tie ends of cables (12 and 26) to the guide wires, pull into position, and remove guide wires.
   (3) Rotate control wheel (15) to center indicator arm (14), and engage forward chain (24) with sprocket so that the ends of the chain are equal in length from the sprocket.
   (4) Install forward pulleys with bolts, washers, and nuts, ensure that the cables are correctly in place as pulleys are installed. Install guide pins.
   (5) Tie chain (8) to the guide wire, pull into position in the vertical fin, and remove the guide wire.
   (6) Rotate actuator sprocket so that rudder trim tab is in neutral and engage chain (8) with sprocket so that the ends of the chain are equal in length from the sprocket.
   (7) Install the chain guard (7) with screws and nuts.
   (8) Install aft pulleys with bolts, nuts, and pulley guide pins.
   (9) Connect aft left cable (9) to forward left cable (12) with bolt (11), washer, nut, and cotter pin.
   (10) Connect aft right cable (10) to forward right cable (11) with turnbuckle (13).
   (11) Install the stop blocks (25) with bolts and nuts.
   (12) Rig the trim control system, refer to Rudder - Adjustment/Test.
   (13) Install access covers on vertical fin, cabin floor, and stabilizer fairings.
   (14) Install side panel on control pedestal, rear upholstery panel to tailcone, front, center, and rear carpets, and front seats.

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RUDDER - ADJUSTMENT/TEST

1. Rudder Control System

A. Rigging (Refer to Figure 501).

NOTE: Cable tension should be adjusted when ambient temperature is 65°F to 95°F. Allow airplane temperature to stabilize for a period of four hours.

(1) Position the nose wheel fore and aft in neutral position.
(2) Remove pilot's seats, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(3) Remove front carpet, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(4) Remove access covers on floorboard and stabilizer fairings, refer to Chapter 53, Floor Panels - Removal/Installation.
(5) Remove turnbuckle safety clips from any turnbuckle which must be adjusted during rigging.
(6) Adjust the position cable which is a “balance” cable, used to close the rudder system. Adjust the position cable turnbuckle so that the pivot point of the pilot's pedals is 8.90 inches from the forward cabin bulkhead as shown in Figure 501.
(7) With nose wheel and rudder pedals in neutral, adjust tension on nosewheel steering cables to 20 pounds, +5 or -5 pounds.
(8) With nose wheel and rudder pedals in neutral, adjust aft rudder cable turnbuckles so that rudder is in neutral (streamlined) and tension on rudder cables is 25 pounds, +5 or -5 pounds, measured forward of centering springs at fuselage station 132.00 or 45 pounds, +5 or -5 pounds aft of centering springs. With rudder in neutral, each centering spring should be extended 2 inches, +0.10 or -0.10 inches, and clamped to rudder cables.

NOTE: The tension on the nosewheel steering cables and the aft rudder cables operates in the same direction. If either cables are adjusted, it will be necessary to recheck the tension on the cables which were not adjusted.

(9) Adjust rudder bellcrank stop bolts so that rudder travel is 34 degrees left and 34 degrees right (measured perpendicular to hinge line). Resafety bolts. Refer to Figure 501 for alternate method of measuring travel.
(10) Safety all turnbuckles from which safety clips were removed.
(11) Adjust clevis rod ends on brake master cylinders so the tips of the pilot’s rudder pedals are aligned. Adjust right brake link tie rods so that tips of copilot’s rudder pedals are aligned.

WARNING: Ensure that rudder moves in the proper direction when operated by the rudder pedals.

(12) Install access covers and stabilizer fairings.
(13) Install carpets and pilot's seats.

2. Rudder Trim Control System

A. Rigging (Refer to Figure 502).

NOTE: Cable tension should be adjusted when ambient temperature is 65°F to 95°F . Allow airplane temperature to stabilize for a period of four hours.

(1) Remove pilot's seats, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(2) Remove passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(3) Remove front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(4) Remove rear upholstery panel in tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(5) Remove floorboard access covers and cover on vertical stabilizer adjacent to rudder trim tab actuator.

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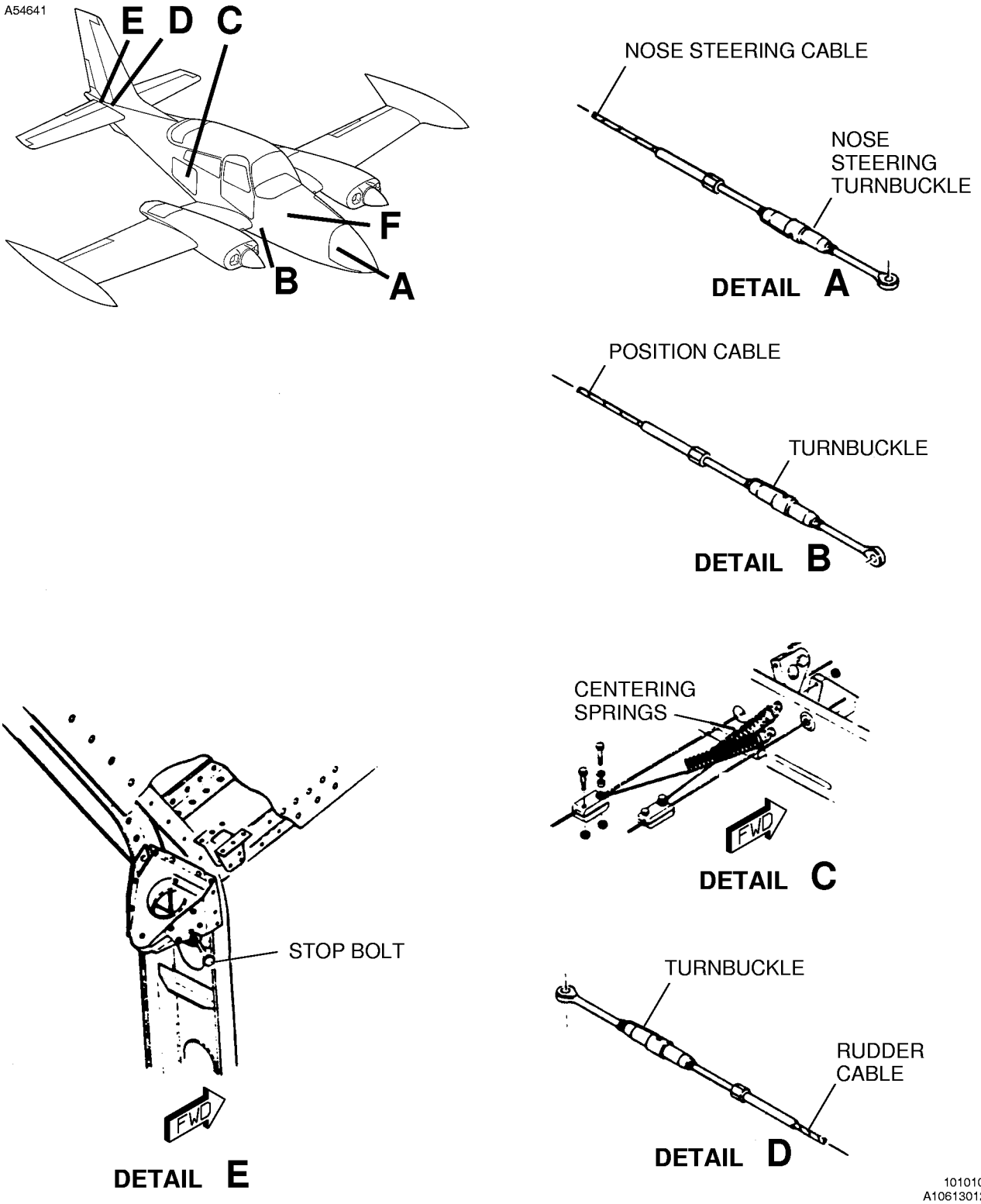

Rudder Control System and Adjustment
Figure 501 (Sheet 1)

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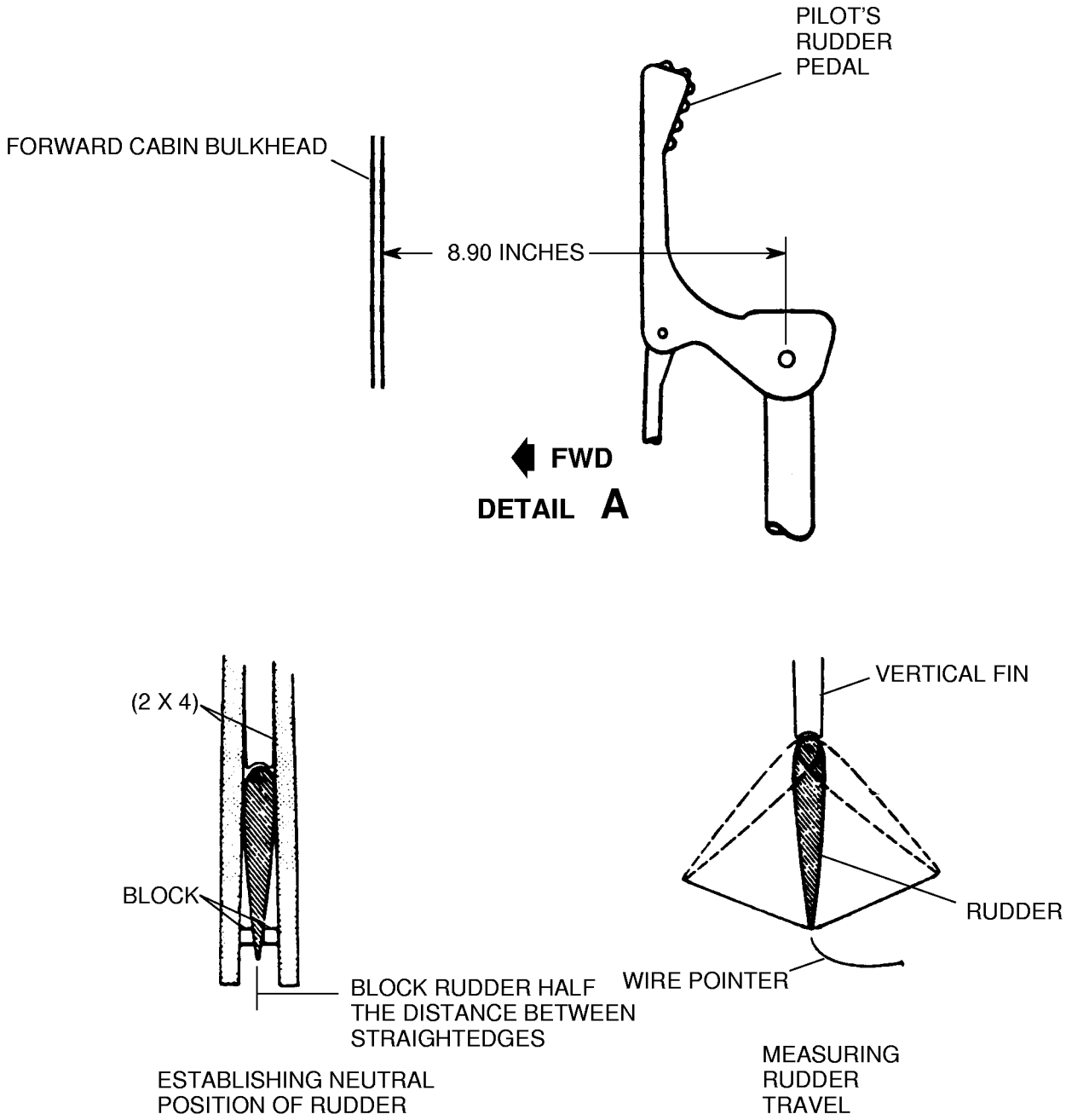

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Rudder Control System and Adjustment
Figure 501 (Sheet 2)

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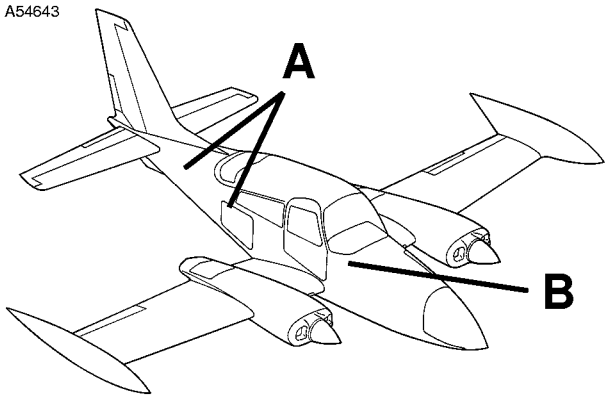

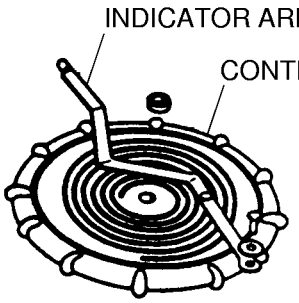

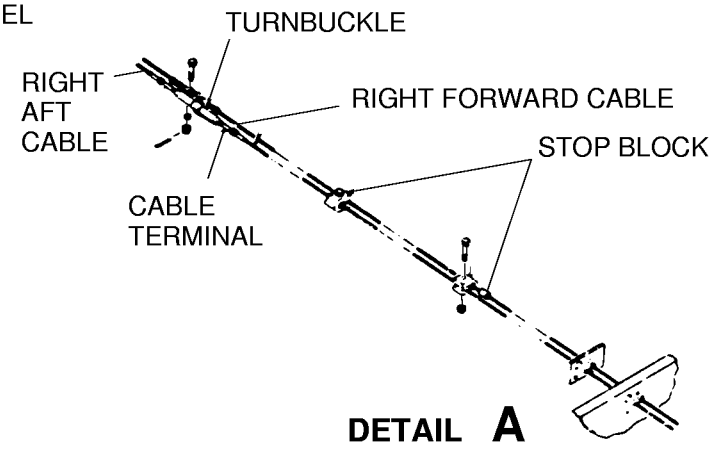

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Rudder Trim Tab Control System and Adjustment
Figure 502 (Sheet 1)

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(6) Remove turnbuckle clips from turnbuckle connecting right forward and aft cables, adjust turnbuckle to 10 pounds, +3 or -3 pounds tension. Reinstall turnbuckle clip.
(7) Move rudder trim control system to neutral by rotating the trim control wheel so that the ends of the chain at the actuator are equal in length from actuator sprocket and the ends of the forward chain are equal length from the sprocket at the gear assembly.
(8) Adjust indicator arm to neutral position by inserting a screwdriver beneath the indicator arm and prying out of track in the trim control wheel, moving the indicator to neutral, and reengaging with track.
(9) Remove cotter pin, nut, washer, and bolt attaching trim tab push-pull tube to the rudder trim tab.
(10) Place the rudder and rudder trim tab in neutral position. Adjust the actuator screw so that the aft hole in the trim tab push-pull tube is aligned with the hole in the trim tab horn, attach with bolt, washer, nut, and cotter pin.
(11) Loosen stop blocks and move the rudder trim tab to 20 degrees, +1 or -0 degrees right (measured perpendicular to hinge line). Locate aft stop block adjacent to cable terminal and tighten.
(12) Move the rudder trim tab to 25 degrees, +1 or -0 degrees left (measured perpendicular to hinge line). Slide forward stop block against aft stop block and tighten.
(13) Install floorboard access covers and cover on vertical stabilizer.
(14) Install rear upholstery panel to tailcone, rear, center and front carpets, and seats.

WARNING: Ensure that the rudder trim tab moves in proper direction when operated by the trim control wheel.

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RUDDER - INSPECTION/CHECK

1. Rudder Control System

A. Inspection.
(1) Visually inspect the rudder skins for cracks and loose rivets, hinges, hinge bolts, hinge bearings, hinge attach fitting, and bonding jumpers for evidence of damage or wear, failed fasteners, and security. Visually inspect the rudder hinge bolts for proper safety of nuts with cotter pins.
(2) Visually inspect bellcrank stop bolts for corrosion, evidence of damage, and security. Visually inspect cable seals for deterioration, lubrication, fraying, chafing, routing, cleanliness, cable tension, and turnbuckle safetying. Check rudder pedals and rudder for freedom of movement.

2. Rudder Trim Tab System

A. Inspection.
(1) Visually inspect trim tab skins and hinges for cracks, loose rivets and security, hinge for security, evidence of damage, and tab free play, hinge pin for proper installation and proper cotter pin safetying at both ends. Inspect horn and pushrod for evidence of damage, security, and free play. Visually inspect pushrod for cracks and wear, bolts for condition and proper safety of nuts with cotter pins.
(2) Rudder Trim Tab Actuator - Visually inspect actuator for security and evidence of damage. Inspect actuator attach bolts, mounting clamps, and mounting structure for evidence of damage, cracks, and security of installation.
(3) Visually inspect clamps for proper fit on actuator. Clamps must be firmly seated on the actuator.
(4) Visually inspect snap rings for complete and proper engagement in snap ring groove of actuator. Check that snap ring is properly seated in positioning slot on the mounting bracket.
(5) Check that mounting clamp bolts or screws are torqued properly by evidence of torque putty.
(6) If the torque putty is broken or cracked, remove putty, torque bolts 20-25 inch-pounds and apply white lacquer torque putty to bolts for future inspections.
(7) Inspect chain guard for condition and attachment.
(8) Visually inspect cable for deterioration and lubrication. Inspect travel stop blocks for security. Inspect cables for fraying, chafing, routing, cleanliness, cable tension, and turnbuckle safetying. Inspect chains for proper safety at all points and chains for proper alignment on actuator sprockets.

NOTE: Individual broken wires are acceptable in primary and secondary control cables at random locations when no more than one broken wire occurs per inch, and no more than five broken wires in 10 inches. Additionally, in any area of broken wires, e.g., one inch each side of a broken strand, wear on adjacent wires in the strand may not exceed 40%.

(9) When servicing, remove screw assembly from trim tab actuator and inspect threads for rust, wear and damage, end bearing for binding and damage, corrosion, or dirt particles that may impair smooth operation.

3. Rudder Trim Tab Actuator

A. Inspection.
(1) Inspect for security and wear damage. Inspect attaching parts, linkage, and attachments for security, wear, and damage.

NOTE: Individual broken wires are acceptable in primary and secondary control cables at random locations when no more than one broken wire occurs per inch, and no more than five broken wires in 10 inches. Additionally, in any area of broken wires, e.g., one inch each side of a broken strand, wear on adjacent wires in the strand may not exceed 40%.

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4. Rudder and Rudder Trim Tab

A. Rudder and Rudder Trim Tab Check.

NOTE: Angular dimensions for rudder and trim tab are measured perpendicular to rudder and trim tab hinge. The rudder is in neutral position when the nose wheel and rudder are fore and aft. The trim tab is in neutral position when streamlined with the rudder trailing edge.

(1) Place rudder and rudder trim tab in neutral position.
(2) Place tensiometer on rudder cables and read tension.

NOTE: Access to the rudder cables is gained by removing the rear upholstery panel.

(3) Place tensiometer on the rudder trim cable and read cable tension.

NOTE: Access to rudder trim cable is gained by removing the rear upholstery panel.

B. Rudder and Rudder Trim Tab Travel and Deflection Check.
(1) Place the rudder and rudder trim tab in trail position.
(2) Depress the rudder pedal to full left rudder. The rudder shall deflect 34 degrees to the left.
(3) Depress the rudder pedal to full right rudder. The rudder shall deflect 34 degrees to the right.
(4) Rotate the rudder trim control wheel to full nose left. The rudder trim tab shall deflect 20 degrees, +1 or -0 degrees to the right.
(5) Rotate the rudder trim control wheel to full nose right. The rudder trim tab shall deflect 25 degrees, +1 or -0 degrees to the left.
(6) Check rudder trim tab deflection (free play) as follows (Refer to Figure 601):

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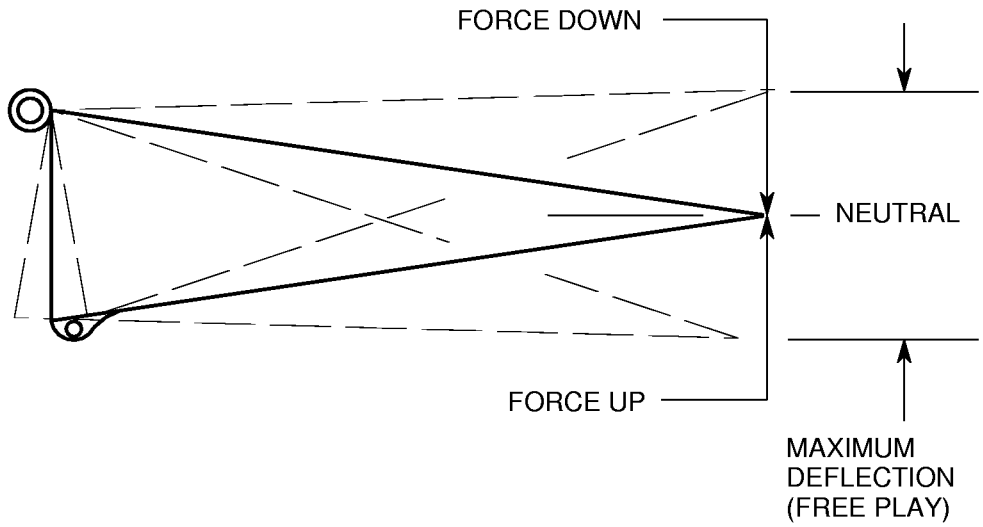

Trim Tab Deflection
Figure 601

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(a) With rudder and rudder trim tab in neutral position, restrain the rudder control surface and manually deflect the tab at the trailing edge at a point where the actuator push-pull rod is located. Using approximately one pound of force, deflect the tab in one direction and measure the deflection from neutral using the control surface as a reference, then measure the deflection from neutral in the opposite direction. The sum of the two deflections must not exceed 0.070 inch at the upper end of tab. If the sum of the two deflections exceeds 0.070 inch, replace the bolts in the pushrod with NAS464 bolts of equivalent diameter and grip length and recheck; if unacceptable, replace bearing in actuator screw end and recheck; if unacceptable, replace trim tab horn bearing and recheck; if still unacceptable. adjust actuator to remove end play from actuator. Actuator is adjusted by removing groov-pins, rotating bearing past existing groov-pin holes then applying pressure to force bearing inward, then drilling new groov-pin holes in the bearing from existing holes in housing; install groov-pins and safety wire to actuator. If trim tab deflection is still unacceptable, replace the trim tab actuator and insure areas are properly safetied.

C. Rudder and Rudder Trim Tab Inspection.
(1) Remove access plate on pedestal, cabin floorboards, rear upholstery panel to tailcone, vertical stabilizer fairings and access cover to provide visual inspection of cables and pulleys.
(2) Install access covers, fairings, and floorboards.

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ELEVATORS - DESCRIPTION AND OPERATION

1. Elevators

A. Description.
(1) The elevator system which is mechanically operated, provides longitudinal control of the airplane. The elevator trim system is operated mechanically and/or electrically.

2. Elevator Control System

A. Description.
(1) The elevator control system consists of: two elevator assemblies, forward and aft bellcranks with push-pull tubes attached; elevator torque tubes which are attached to a pylon. Each elevator is attached to the rear spar of the horizontal stabilizer at two hinge points. Each elevator tip incorporates balance weights inside the fiberglass tip. Each elevator is 100 percent static balanced with the elevator trim tab attached, at the time of installation. The elevators are operated by the fore and aft movement of the control column. The elevator cable assemblies and adjustable turnbuckles are attached to the forward bellcrank and then routed under the floor, through pulleys to the aft bellcrank in the tailcone. Two push-pull tubes are utilized, one connects from the bottom of the control column to the forward bellcrank, and the other push-pull tube connects from the aft bellcrank to the pylon, which is connected to each elevator torque tube. Elevator travel stops, which are mounted in the aft bellcrank bracket, provide the maximum travel adjustment for the elevators. A bob weight is attached to the control column by a push-pull tube. The bob weight is utilized to stabilize the airplane in flight. An elevator down spring is connected to the aft bellcrank by cables to provide for better elevator balance during flight.

3. Elevator Trim Tab

A. Description.
(1) The elevator trim tab is operated by a control wheel mounted on the left side of the pedestal. The control wheel is attached to a sprocket which drives a chain and cables. The chain and cables are routed through pulleys under the floorboard and aft to the tailcone of the airplane. In the tailcone, the cables are routed up and through the right horizontal stabilizer to a chain which operates the trim tab actuator. The trim tab push-pull tube connects the trim tab actuator to the elevator trim tab, mounted to the right elevator by a continuous hinge. Adjustable turnbuckles are located in the tailcone for cable tension adjustment. Stop blocks are located in the tailcone for adjustment of the elevator trim tab travel.

4. Electric Elevator Trim Control System (Optional)

A. Description.
(1) The electric elevator trim control system (optional) consists of: electric trim disengage switch, electric trim control switch; and an electric actuator assembly mounted on a support in the tailcone; a control cable attached to the left forward elevator trim control cable and routed around the actuator clutch assembly drum then aft connecting to the left aft trim control cable; and associated electrical wiring. The system is energized when the electric trim control switch (slider switch) on the left-hand control wheel is positioned forward (DOWN) or aft (UP) position. The actuator motor drives the clutch assembly, which moves the elevator trim control cables and places the elevator trim tab in the corresponding UP or DOWN position. Manual override of the system can be accomplished by operating the elevator trim control wheel, mounted on the left side of the pedestal. The electric trim disengage switch, located on the left control wheel, may be used to disengage the electric trim circuit.

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CAUTION: Primary and secondary flight control cables, push-pull tubes, bellcrank, and mountings use dual locking fasteners. The lock nuts for these fasteners incorporate a fiber lock, and are castellated for safetying with a cotter pin. When any of these areas are disconnected new dual locking fasteners should be installed. Refer to the Airplane Illustrated Parts Catalog for part numbers and location of these fasteners.

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ELEVATORS - TROUBLESHOOTING

1. Elevator and Tab System

A. Troubleshooting.

(1) Troubleshooting the elevator and tab system is to determine if the trouble exists in the elevator control system or in the elevator trim control system. Remove the control column lock when troubleshooting (Refer to Table 101, Table 102, and Table 103).

NOTE: Perform elevator system troubleshooting with control wheel moved fore or aft.

Table 101. Elevator System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
LOST MOTION BETWEEN CONTROL WHEEL AND ELEVATOR.	Improperly routed cables.	Check for proper routing cables. Reroute cables on pulleys as required.
	Unserviceable pulleys or guards.	Replace unserviceable pulleys or guards.
	Improperly installed elevator.	Check elevator installation and correct as required.
	Disconnected bellcrank push-pull tube.	Connect bellcrank push-pull tube.
	Unserviceable elevator bellcrank assemblies.	Replace unserviceable elevator bellcrank assemblies.
	Improper cable tension.	Adjust cable tension.
RESISTANCE TO ELEVATOR CONTROL MOVEMENT.	Improper friction forces.	Check friction forces. Refer to elevator and trim tab deflection check.
	Improper cable tension.	Check cable tension. Adjust cable tension as required.
	Bent elevator or hinge.	Repair or replace elevator or hinge.
	Unserviceable pulleys or bellcrank assemblies.	Replace unserviceable pulleys or bellcrank as required.
	Binding control column pivot bearings.	Lubricate friction points.
CORRECT ELEVATOR TRAVEL CANNOT BE OBTAINED BY ADJUSTING BELLCRANK STOPS.	Improperly rigged cables.	Check for properly rigged cables. Rig cables.
	Control column contacting fuselage bulkhead or instrument panel.	Check for contact. Adjust length of forward elevator push-pull tubes.
	Incorrect positioning of elevator bellcranks.	Re-rig elevator system.
INCORRECT ELEVATOR TRAVEL.	Improperly adjusted elevator control stops.	Adjust elevator control stops.
	Improper cable tension.	Check and adjust cable tension as required.

NOTE: Perform elevator trim troubleshooting with trim control wheel rotated.

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Table 102. Elevator Trim Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
EXCESSIVE RESISTANCE TO THE CONTROL WHEEL.	Improper friction forces.	Check friction forces. Refer to elevator and trim tab deflection check.
	Improperly adjusted cable tension.	Check cable tension. Adjust as required.
	Improperly routed cables.	Check for proper routing of cables. Reroute cables on pulleys as required.
	Unserviceable pulleys.	Replace unserviceable pulleys.
	Pulleys binding or rubbing.	Correct binding or rubbing.
	Trim tab hinge binding.	Lubricate or replace trim tab hinge.
	Unserviceable trim actuator.	Repair or replace trim actuator.
INCORRECT TRIM TAB TRAVEL.	Incorrect stop block position.	Check for correct stop block position. Rig correctly.
LOST MOTION BETWEEN TRIM CONTROL WHEEL AND TRIM TAB.	Improper cable tension.	Check cable tension. Adjust as required.
	Improperly routed cables.	Check for proper routing of cables. Reroute cables on pulleys as required.
	Unserviceable pulleys.	Replace unserviceable pulleys.
	Trim tab hinge binding.	Lubricate or replace trim tab hinge.
	Worn trim tab actuator.	Repair or replace.
TRIM INDICATOR FAILS TO INDICATE CORRECT TRIM POSITION.	Damaged indicator.	Check for damage. Straighten or replace indicator.
	Indicator incorrectly engaged with wheel track.	Check and adjust as required.

NOTE: Perform elevator electric trim troubleshooting with normal voltage applied and trim switch actuated.

Table 103. Elevator Electric Trim Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
TRIM TAB ACTUATOR WILL NOT ACTUATE.	Circuit breaker not engaged.	Check circuit breaker. Reset or replace circuit breaker as required.
	Unserviceable wiring or switches.	Perform continuity check on system electrical wiring. Refer to Chapter 24, Electrical Power. Repair or replace electrical wiring or switches as required.
	Unserviceable actuator motor.	Check actuator motor. Replace actuator motor as required.

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Table 103. Elevator Electric Trim Troubleshooting (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
TRIM TAB OPERATES BUT TRIM TAB FAILS TO MOVE.	Improper chain installation.	Check chain for proper installation. Connect or replace chain.
	Unserviceable actuator.	Check actuator. Replace actuator as required.
	Unserviceable clutch solenoid.	Check clutch solenoid. Replace clutch solenoid assembly as required.
	Improperly adjusted clutch tension.	Check clutch tension. Adjust clutch assembly as required.

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ELEVATORS - REMOVAL/INSTALLATION

1. Elevators

A. Removal (Refer to Figure 401).
(1) Refer to Chapter 53, Fuselage Stinger - Removal/Installation and remove stinger.
(2) Disconnect elevator trim tab push-pull tube (3) by removing cotter pin, nut, washer, and bolt.
(3) Disconnect elevator torque tubes (22) from elevator pylon (21) by removing nuts, washers, and bolts (23).
(4) Disconnect bonding straps (8) by removing attaching screws.
(5) Remove fiberglass tips (7) by removing attaching screws.
(6) Remove each elevator by removing cotter pins, nuts, washers, and bolts (9).
(7) When removing right elevator, guide elevator trim tab push-pull tube (3) out through elevator.

B. Installation (Refer to Figure 401).
(1) Place elevators in position, guiding elevator trim tab push-pull tube (3) through opening in right elevator, and align mounting holes.
(2) Attach each elevator (6) to horizontal stabilizer with bolts (9), washers, nuts, and cotter pins.
(3) Attach elevator torque tubes (22) to elevator pylon (21) by installing bolts (23), washers, and nuts.
(4) Attach bonding straps (8) with attaching screws.
(5) Install fiberglass tips (7) with attaching screws.
(6) Attach elevator trim tab push-pull tube (3) to trim tab (1) with bolt, washer, nut, and cotter pin.
(7) Refer to Elevators - Adjustment/Test and check elevators and elevator trim tab for proper operation and travel.
(8) Install stinger.

2. Aft Bell Crank

A. Removal (Refer to Figure 402).
(1) Remove pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(2) Remove front carpet, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(3) Remove rear upholstery panel to tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(4) Remove access covers from cabin floor above forward bell crank (12), refer to Chapter 53, Floor Panels - Removal/Installation.
(5) Unsafety and loosen either turnbuckle (11) to release tension on elevator cables.
(6) Disconnect elevator cables (5 and 7) from aft elevator bell crank (8) by removing cotter pins, nuts, and bolts.

NOTE: If an autopilot (optional) is installed, disconnect from aft elevator bell crank.

(7) Disconnect aft elevator push-pull tube (10) from elevator bell crank (8) by removing cotter pin, nut, and bolt.
(8) Release tension on elevator down spring cables (4) by either disconnecting elevator down spring (2) or blocking elevator down spring channel assembly (3) forward.
(9) Disconnect elevator down spring cables (4) from elevator bell crank (8) by removing cotter pin, nut, washers, spacer, and bolt.
(10) Remove aft elevator bell crank (8) by removing cotter pin, nut, spacers, and bolt.

B. Installation (Refer to Figure 402).
(1) Place aft elevator bell crank (8) in position, and install with bolt, spacers, nut, and cotter pin.
(2) Connect elevator down spring cables (4) to elevator bell crank (8) with bolt, spacer, washers, nuts, and cotter pins.
(3) Connect elevator down spring (2) or remove block aft of elevator down spring channel assembly (3) in accordance with the method used to release tension on elevator down spring cables.
(4) Attach aft elevator push-pull tube (10) to elevator bell crank (8) with bolt, nut, and cotter pin.

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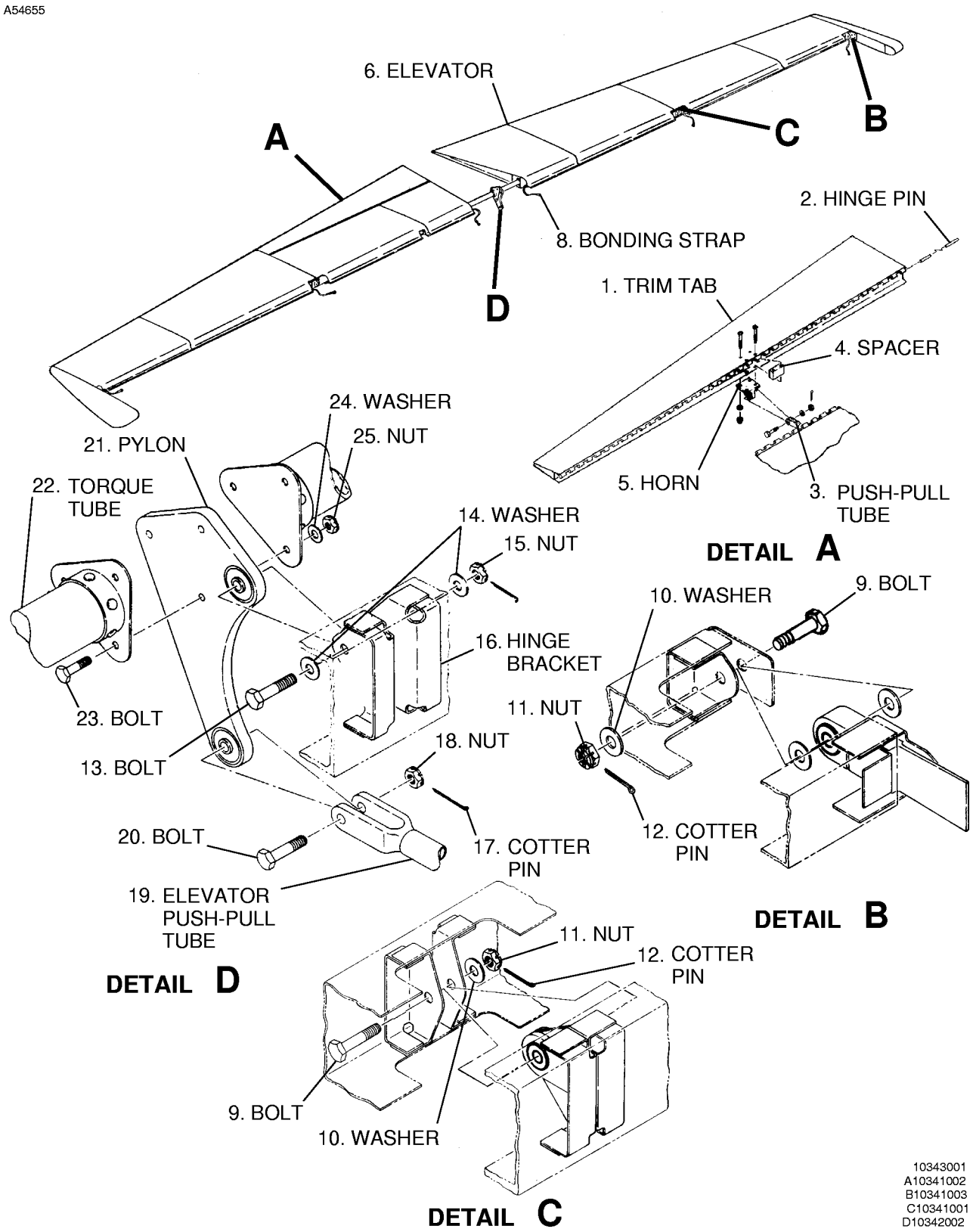

Elevator and Trim Tab Installation
Figure 401 (Sheet 1)

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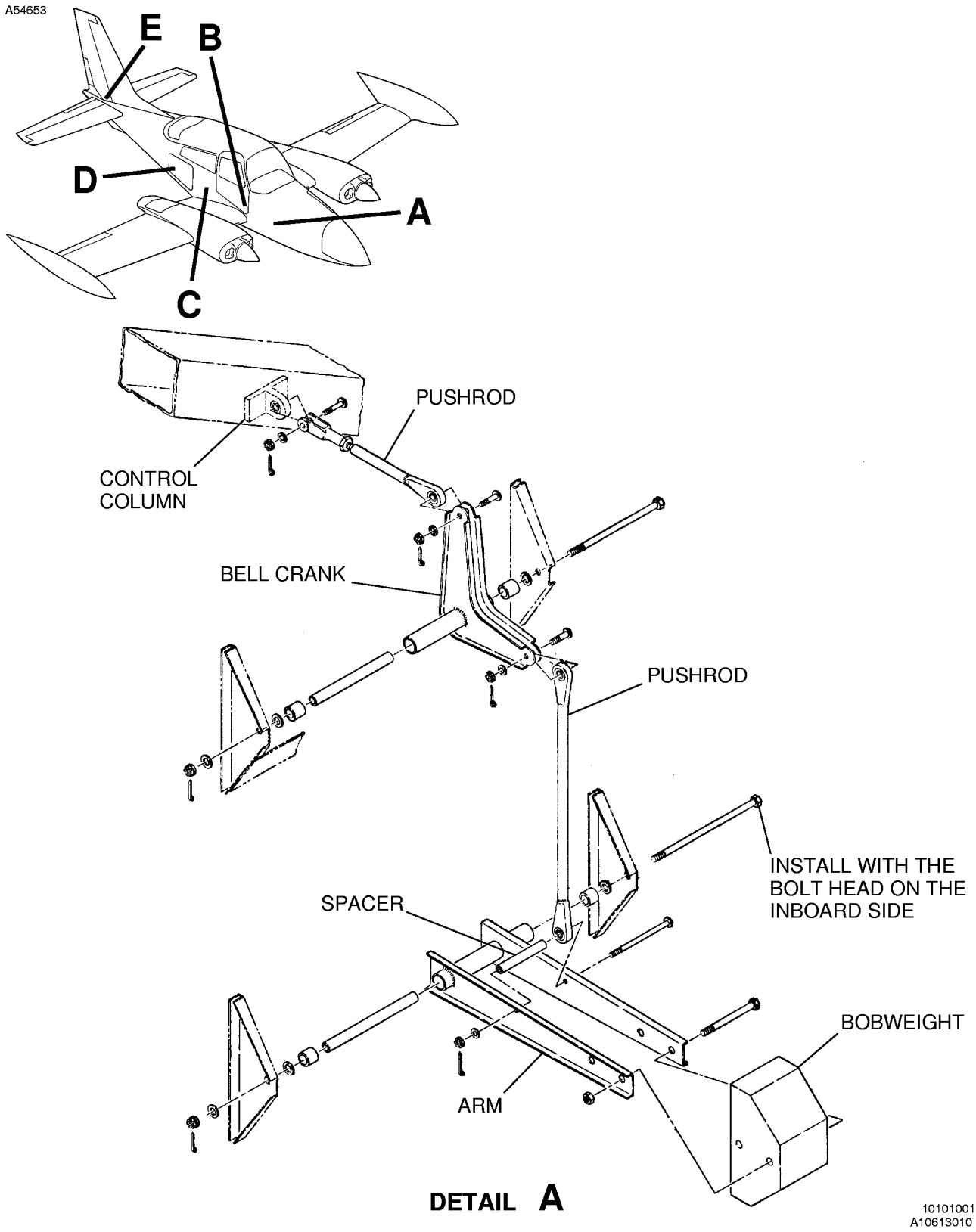

Elevator Control System Installation
Figure 402 (Sheet 1)

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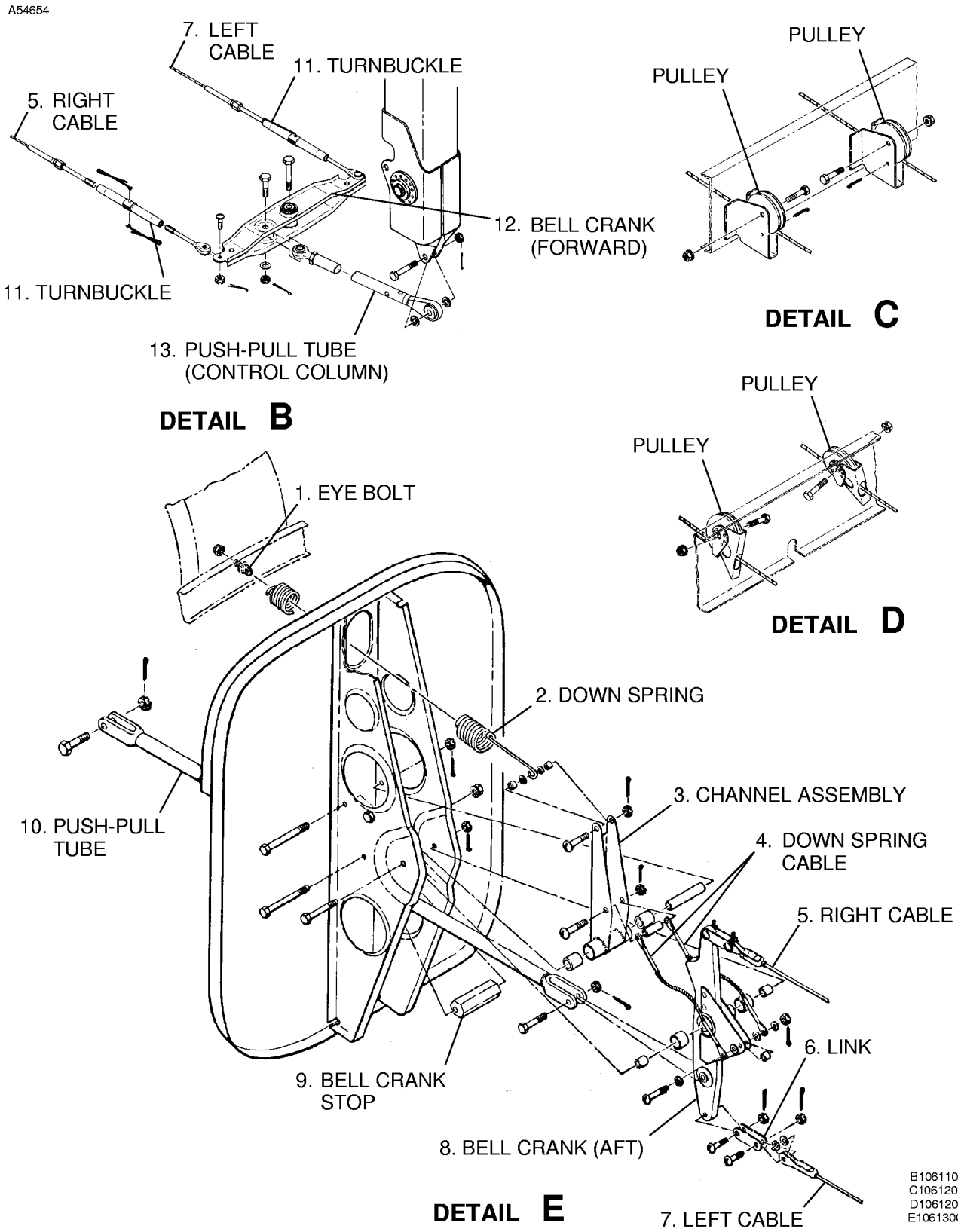

Elevator Control System Installation
Figure 402 (Sheet 2)

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(5) Attach elevator cables (5 and 7) to elevator bell crank (8) with bolts, nuts, and cotter pins.

NOTE: If an autopilot (optional) is installed, connect to aft elevator bell crank.

(6) Rig elevator control system, refer to Elevators - Adjustment/Test.
(7) Install access cover above forward elevator bell crank.
(8) Install rear upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(9) Install front carpet, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(10) Install front seats, refer to Chapter 25, Flight Crew Seats- Removal/Installation.

3. Elevator Pylon

A. Removal (Refer to Figure 401).
(1) Refer to Chapter 53, Fuselage Stinger - Removal/Installation and remove stinger.
(2) Disconnect aft elevator push-pull tube (19) by removing cotter pin, nut, and bolt (20).
(3) Remove nuts, washers, and bolts (23) attaching elevators to elevator pylon (21). Remove nut, washers, and bolt (13) attaching elevator pylon (21) to hinge bracket (16) and remove pylon by sliding aft.

B. Installation (Refer to Figure 401).
(1) Position elevator pylon (21) in hinge bracket (16) and secure with bolt (13), washers, and nut.
(2) Connect torque tubes (22) to pylon (21) with bolts (23), washers, and nuts.
(3) Connect elevator push-pull tube (19) to pylon (21) with bolt (20), nut, and cotter pin.
(4) Install stinger.

4. Elevator Down Spring and Channel Assembly

A. Removal (Refer to Figure 402).
(1) Remove rear upholstery panel to tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove stabilizer fairings, refer to Chapter 53, Floor Panels - Removal/Installation.
(3) Stretch elevator down spring (2) aft and unhook from eyebolt (1).
(4) Remove elevator down spring (2) from channel assembly (3) by removing cotter pin, nut, washers, spacers, and bolt.
(5) Disconnect elevator down spring cables (4) by removing cotter pin, nut, spacer, and bolt.
(6) Remove channel assembly (3) by removing nut, spacer, and bolt.

B. Installation (Refer to Figure 402).
(1) Install channel assembly (3) with bolt, spacer, and nut.
(2) Connect down spring cables (4) using bolt, spacer, nut, and cotter pin.
(3) Assemble down spring (2) to channel assembly (3) using bolt, spacers, washers, nut, and cotter pin. Leave spring free to rotate.
(4) Stretch down spring (2) aft and hook to eyebolt (1).
(5) Install stabilizer fairings and rear upholstery panel to tailcone.

5. Forward Elevator Bell Crank

A. Removal (Refer to Figure 402).
(1) Remove pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(2) Remove front carpet, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(3) Remove access covers from cabin floor above forward elevator bell crank, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) Unsafety and loosen either turnbuckle (11) to release tension on elevator cables (5 and 7).
(5) Disconnect elevator cables (5 and 7) from forward elevator bell crank (12) by removing cotter pins, nuts, and bolts.
(6) Disconnect push-pull tube (13) from forward bell crank (12) by removing cotter pin, nut, washer, and bolt.
(7) Remove forward bell crank (12) by removing bolt.

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B. Installation (Refer to Figure 402).
(1) Place forward elevator bell crank (12) in position, and install with bolt.
(2) Attach push-pull tube (13) to forward bell crank (12) with bolt, washer, nut, and cotter pin.
(3) Attach elevator cables (5 and 7) to forward bell crank (12) with bolts, nuts, and cotter pins.
(4) Rig elevator control system, refer to Elevators - Adjustment/Test.
(5) Install access covers on cabin floor.
(6) Install front carpet and front seats.

6. Forward Elevator Push-Pull Tube

A. Removal (Refer to Figure 402).
(1) Remove pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(2) Remove front carpet, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(3) Remove access covers from cabin floor above forward elevator bell crank (12) and from underside of the fuselage aft of nose wheel well, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) Disconnect push-pull tube (13) from forward bell crank (12) by removing cotter pin, nut, washer, and bolt.
(5) Disconnect push-pull tube (13) from control column by removing cotter pin, nut, spacers, and bolt.

B. Installation (Refer to Figure 402).
(1) Connect push-pull tube (13) to control column using bolts, spacers, nuts and cotter pin.
(2) Connect aft end of push-pull tube (13) to forward bell crank (12) using bolt, washer, nut, and cotter pin.

NOTE: If length of push-pull tube (13) has been changed or a new push-pull tube is being installed, adjust length to approximately 12 inches, measured between centerlines of the rod end bolt holes.

(3) Check elevator system for proper operation and correct travel. If necessary, rig system, refer to Elevators - Adjustment/Test.
(4) Install access covers.
(5) Install front carpet and front seats.

7. Elevator Control Cables

A. Removal (Refer to Figure 402).
(1) Remove the following items from the airplane:
(a) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(b) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(c) Front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(d) Rear upholstery panel to tailcone, refer to Equipment/Furnishings - Removal/Installation.
(2) Remove access hole covers from floor as necessary to gain access to cables, pulleys, and attachment points, refer to Chapter 53, Floor Panels - Removal/Installation.
(3) Unsafety turnbuckles (11) and disconnect elevator cables (5 and 7) from forward elevator bell crank (12) by removing turnbuckles.
(4) Remove pulleys by removing nuts, bolts, and cable guards.
(5) Remove fairleads through which elevator cables pass at fuselage rear spar.
(6) Disconnect elevator cables (5 and 7) from aft elevator bell crank (8) by removing cotter pins, nuts, washers, and bolts.
(7) Tie guide wires to forward ends of elevator cables (5 and 7), remove cables by pulling them out aft of baggage compartment, and disconnect guide wires.

B. Installation (Refer to Figure 402).
(1) Tie elevator cables (5 and 7) to guide wires, pull into position, and remove guide wires.
(2) Install fairleads through which elevator cables pass at fuselage rear spar.

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(3) Install pulleys with bolts, cable guards, and nuts, ensuring that cables are correctly in place as pulleys are installed.
(4) Attach elevator cables (5 and 7) to aft elevator bell crank (8) with bolts, washers, nuts, and cotter pins.
(5) Connect elevator cables (5 and 7) to forward elevator bell crank (12) with turnbuckles (11).
(6) Rig the elevator control system, refer to Elevators - Adjustment/Test.
(7) Install removed access panels.
(8) Install the necessary upholstery panels, carpets, and seats.

8. Elevator Trim Tab

A. Removal (Refer to Figure 401).
(1) Disconnect elevator trim tab push-pull tube (3) from horn (5) by removing cotter pin, nut, washer, and bolt.
(2) Remove cotter pins from hinge pin (2) and detach trim tab (1) from elevator (6) by removing hinge pin (2).

B. Installation (Refer to Figure 401).
(1) Attach trim tab (1) to elevator (6) with hinge pin (2) and safety in place with cotter pins.
(2) Connect elevator trim tab push-pull tube (3) to trim tab horn (5) with bolt, washer, nut, and cotter pin.
(3) Check elevator trim tab for proper operation and correct travel, refer to Elevators - Adjustment/Test.

9. Elevator Trim Tab Actuator

A. Removal (Refer to Figure 403).
(1) Remove rear upholstery panel from tailcone, refer to Equipment/Furnishings - Removal/Installation.
(2) Remove access cover from underside of the horizontal stabilizer beneath elevator trim tab actuator, refer to Chapter 53, Floor Panels - Removal/Installation.
(3) Unsafety and loosen turnbuckle (9) to release tension on elevator trim control cables.
(4) Remove chain guard (4) from actuator (2) by removing nuts and screws, and disengage chain (5) from actuator sprocket.
(5) Remove right elevator.
(6) Remove elevator trim tab push-pull tube from actuator (2) by removing cotter pin, nut, washer, and bolt.
(7) Remove clamps (3) by removing bolts, and remove actuator (2).

B. Disassembly (Refer to Figure 403).
(1) The instructions for disassembly and assembly of the aileron trim tab actuator, given in Ailerons - Removal/Installation, also applies to the elevator trim tab actuator.

C. Installation (Refer to Figure 403).
(1) Insert actuator (2) through access hole, place in position, seat retainer rings firmly in bracket grooves, and install clamps (3) with bolts.
(2) Attach push-pull tube (1) to actuator (2) with bolt, washer, nut, and cotter pin.
(3) Install right elevator.
(4) Engage chain (5) with actuator sprocket, and install chain guard (4) with screws and nuts.
(5) Rig elevator trim control system, refer to Elevators - Adjustment/Test.
(6) Install access hole cover on underside of horizontal stabilizer.
(7) Install rear upholstery panel to tailcone.

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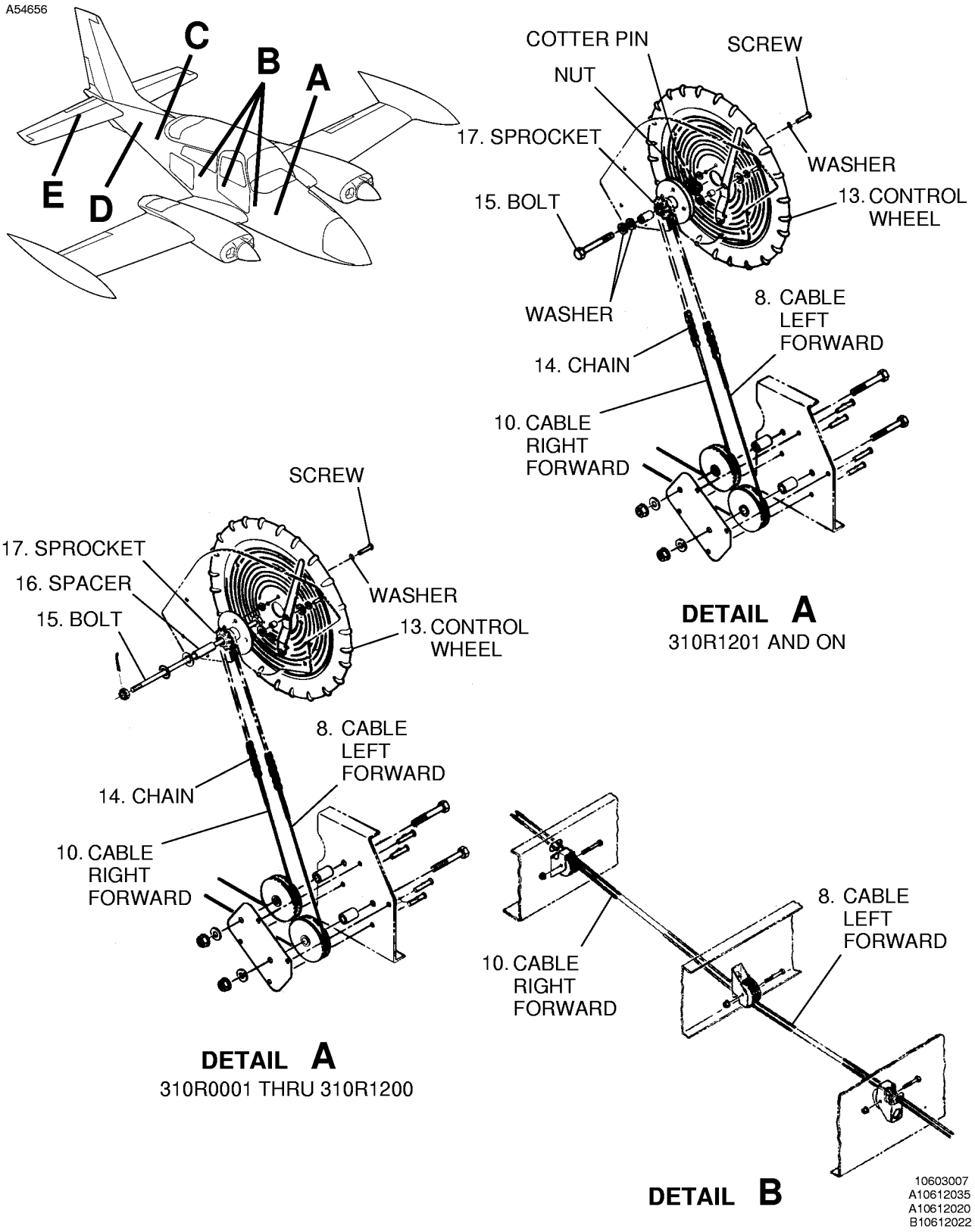

Elevator Trim Control Installation
Figure 403 (Sheet 1)

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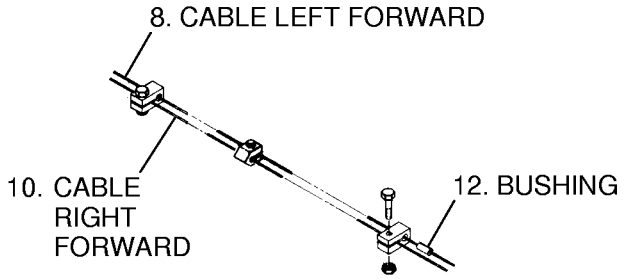
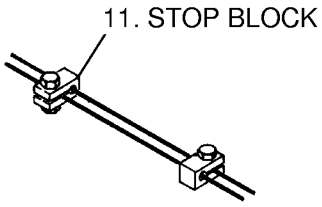
NOTE: STOP BLOCK INSTALLED WITH 400A AUTOPILOT NOT INCORPORATING ELECTRIC ELEVATOR TRIM SYSTEM



DETAIL C



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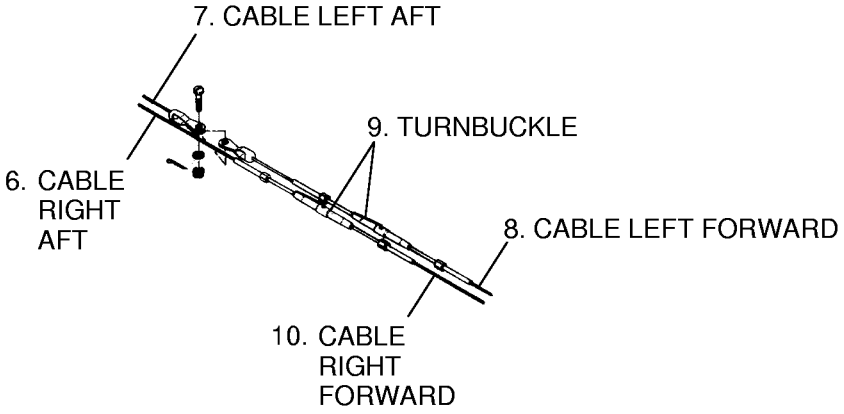

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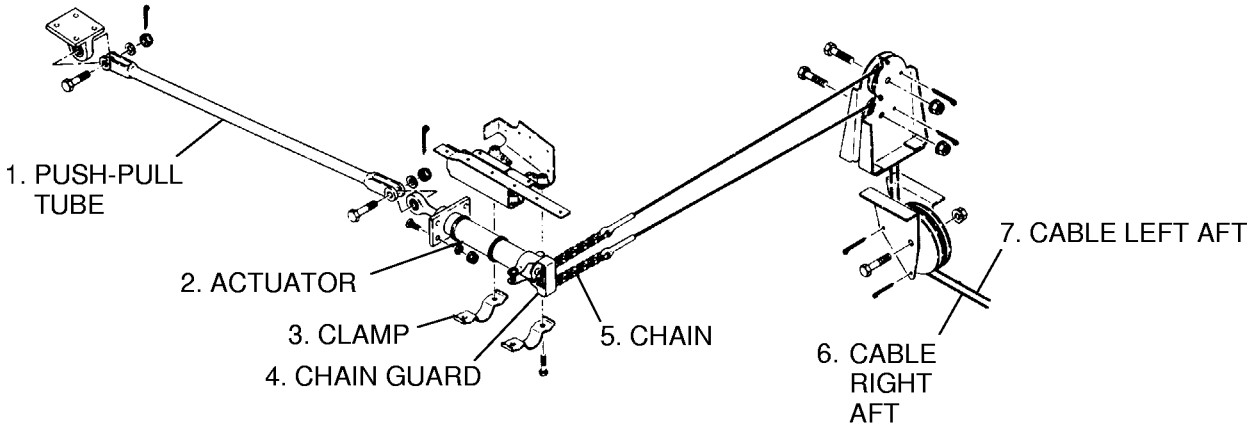

DETAIL E

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Elevator Trim Control Installation
Figure 403 (Sheet 2)

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10. Trim Tab Actuator Screw Assembly

A. Removal (Refer to Figure 404).

WARNING: Insure proper screw is installed in actuator assembly. Do not substitute or intermix.

Table 401. Trim Tab Actuator Screw Assembly

Actuator Assembly	Screw Assembly	Used On
1260074-1	0310362-5	310R0001 thru 310R1500
0815097-1	0815096-1	310R1501 thru 310R2140

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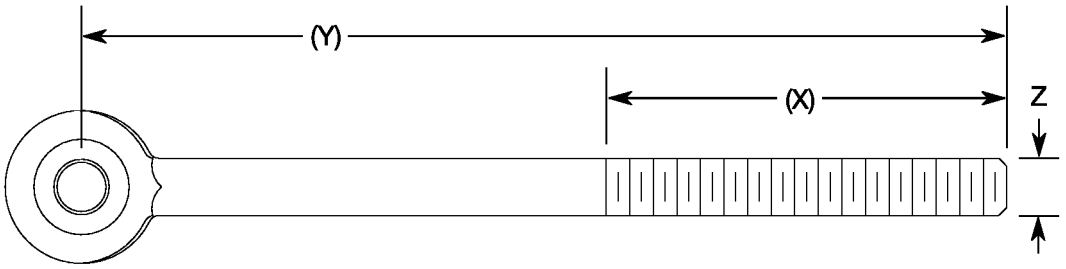

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Trim Tab Actuator and Screw Data
Figure 404

Table 402. Dimensions

DIMENSIONS			
Screw Assembly Part No.	X	Y	Z
0310362-5	2.312	5.125	0.245+ 0.001, -0.000
0815036-1	2.05	4.50	0.245+ 0.001, -0.000

NOTE: This listing is not to be used for ordering parts. Spares replacement data is obtained from the airplane Illustrated Parts Catalog.

NOTE: When removal of the trim tab actuator screw assembly is required for lubrication, replacement. etc., the following procedure should be used to ensure the screw assembly is installed in its original location.

(1) Position the trim tab and control surface assembly as necessary to allow removal of the push rod and the screw assembly. Disconnect push rod at the trim tab end. Accurately, count and record the number of turns necessary to remove the push rod and screw assembly. Gently pull on

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the push rod during removal to ascertain the exact point when the threads become disengaged. Note this position accurately and also note the position of the bolt head that attaches the push rod to the screw assembly. This is necessary in order to replace the push rod and screw assembly in the exact same position as before removal.

B. Installation (Refer to Figure 404).

WARNING: Do not mix or substitute screw assemblies in trim tab actuators. Always check rigging after removal of screw assembly.

(1) Install push rod and screw assembly with the bolt head in the exact same position as noted in step A(1). Turn the push rod to the left (counterclockwise) 1/8 of a turn. Apply pressure on the push rod and screw assembly in a forward direction and turn to the right (clockwise) the same number of turns as noted in step A(1). Check the direction of the bolt that attaches the push rod to the screw assembly to ensure that it is located properly as shown (bolt head outboard).

NOTE: The screw assembly has a quad lead type thread. Following the above procedures exactly will ensure the trim tab screw assembly has been installed in the exact same position.

11. Elevator Trim Control Wheel, Sprocket, and Indicator Assembly

A. Removal (Refer to Figure 403).
(1) Remove rear upholstery panel from tailcone, refer to Equipment/Furnishings - Removal/Installation.
(2) Unsafety and loosen turnbuckle (9) to release tension on elevator trim control system.
(3) Remove trim control wheel (13) by removing screws and washers.
(4) Remove upper left side panel from control pedestal.

NOTE: To remove the elevator trim indicator assembly, the rivets around which the indicator pivots must be removed.

(5) Disengage chain (14) from sprocket (17), remove upper right side panel from control pedestal. Remove sprocket (17) by removing cotter pin, nut, washer, spacer (16), and bolt (15).

B. Installation (Refer to Figure 403).
(1) Install sprocket (17) with bolt (15), spacer (16), washer, nut, and cotter pin.

NOTE: On Airplanes 310R1201 thru 310R2140, install AN9608516 washers as required to maintain minimum gap of 0.01 inch and maximum gap of 0.02 inch between washers and sprocket (17).

(2) Install upper right side panel on control pedestal.
(3) Engage chain (14) with sprocket (17) and install upper left side panel on control pedestal.
(4) Install trim control wheel (13) with washers and screws.
(5) Rig the elevator trim control system, refer to Elevators - Adjustment/Test.
(6) Install rear upholstery panel to tailcone.

12. Elevator Trim Cables

A. Removal (Refer to Figure 403).
(1) Remove the following items from the airplane:
(a) Pilot's seat, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(b) Passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(c) Front, center, and rear carpets, refer to Chapter 25, Equipment and Furnishings - Removal/Installation.
(d) Rear upholstery panel to tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove stabilizer fairings and stinger.

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(3) Remove access covers on floorboard as necessary to gain access to cables and access covers from underside of fuselage, aft of nose wheel well and stabilizer, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) Unsafety turnbuckle (9) and disconnect aft cables (6 and 7).
(5) Remove aft pulleys by removing nuts, bolts, and cable guard cotter pins.
(6) Remove chain guard (4) from actuator (2) by removing nuts and screws.
(7) Disengage chain (5) from actuator sprocket, attach a guide wire to the chain. Remove cables and chain by pulling out through opening in tailcone. Disconnect guide wire and leave in horizontal stabilizer to facilitate installation.
(8) Remove stop blocks (11) by removing nuts and bolts.
(9) Remove three sets of pulleys aft of pedestal.
(10) Remove trim control wheel (13) by removing screws and washers.
(11) Remove upper left side panel from control pedestal.
(12) Remove four cable guard pins.
(13) Tie guide wires to aft ends of cables (8 and 10) and pull chain and cables out through control pedestal. Disconnect guide wires and leave in position to facilitate installation.

NOTE: Pulleys below pedestal are difficult to reinstall and should be removed only for replacement.

B. Installation (Refer to Figure 403).
(1) Tie aft ends of cables (8 and 10) to guide wires, pull into position, and remove guide wires.
(2) Engage chain (14) with sprocket (17) and install upper left side panel on control pedestal.
(3) Install four cable guards.
(4) Install three sets of pulleys aft of control pedestal.
(5) Tie aft chain (5) to the guide wire, pull into position, and remove guide wire.
(6) Engage aft chain (5) with actuator sprocket and install chain guard (4) with screws and nuts.
(7) Install aft pulleys with bolts, nuts, and cable guard cotter pins, ensuring that the cables are correctly in place.
(8) Connect cables (7 and 8) and cables (6 and 10) using turnbuckle (9).
(9) Install stop blocks (11) and bushings (12) with bolts and nuts. Do not tighten at this time.
(10) Install elevator trim control wheel (14) with washers and screws.
(11) Rig elevator trim control system, refer to Elevators - Adjustment/Test.
(12) Install access covers, stinger, and stabilizer fairings.
(13) Install rear upholstery panel to tailcone; front, center and rear carpet; front and rear seats or middle and aft seats (optional equipment).

13. Electric Trim Actuator (Optional) (Airplanes 310R0001 thru 310R0500)

A. Removal (Refer to Figure 405).
(1) Remove rear upholstery panel from tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Unsafety and disconnect turnbuckle (2).
(3) Disconnect fork (6) by removing cotter pin, nut, and bolt.
(4) Remove screws (9) attaching actuator (7) to support (6) disconnect electrical wiring and remove actuator.

B. Disassembly (Refer to Figure 406).
(1) Remove screws (8 and 11) and remove top and side covers (7 and 13).
(2) Remove screws (15 and 19) and remove cover assembly (14), support assembly (2), and cable guard (10).
(3) Slide clutch assembly (16) from housing (9) and remove chain (6) from clutch assembly sprocket and sprocket (5).
(4) Remove control cable (18) from clutch assembly (16).
(5) Remove motor (1) from housing (9).
(6) Clean component parts by wiping with a clean cloth saturated with a suitable solvent.
(7) Check clutch assembly sprocket and sprocket (5) for broken, chipped or worn teeth.

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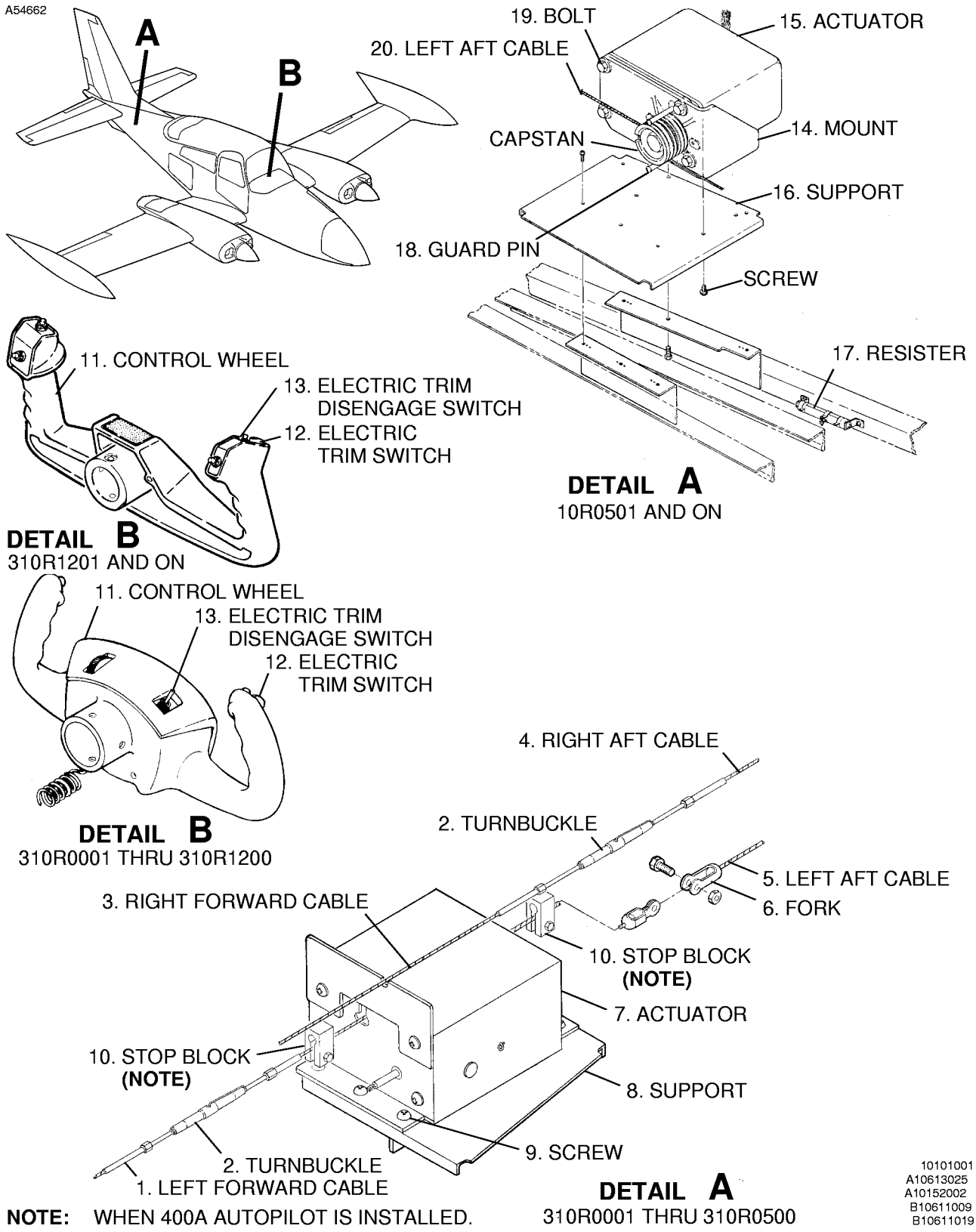

NOTE: WHEN 400A AUTOPILOT IS INSTALLED.

Electric Elevator Trim Control Installation
Figure 405 (Sheet 1)

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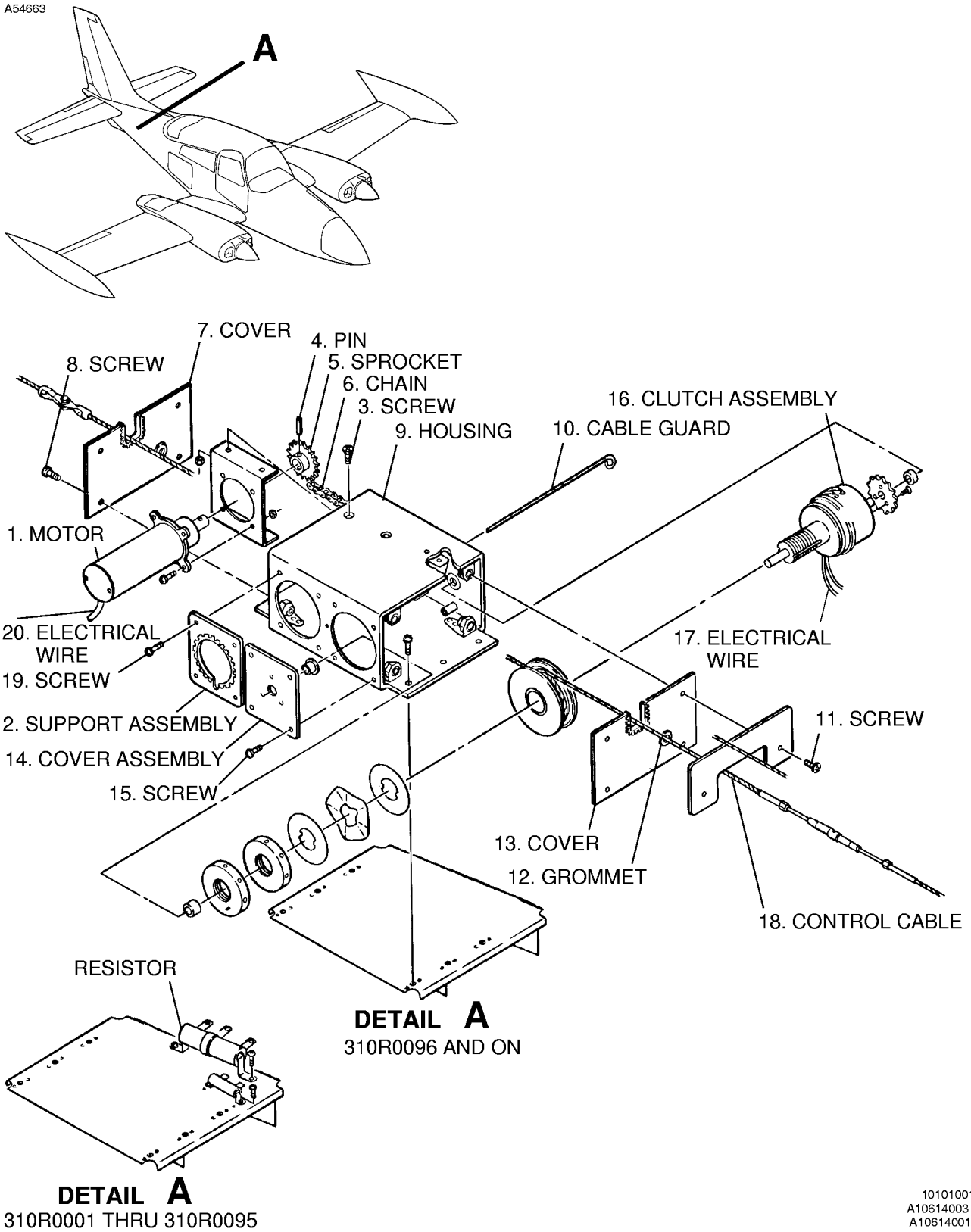

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Electric Elevator Trim Actuator Assembly
Figure 406 (Sheet 1)

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CAUTION: Do not attempt to repair damaged or worn parts of the actuator assembly. Discard all defective parts and install new parts during reassembly.

C. Assembly (Refer to Figure 406).
(1) During assembly, lubricate clutch assembly (16).
(2) Install motor (1) in housing (9).
(3) Install control cable (18) on clutch assembly (16).

NOTE: Clutch assembly cable drum and control cable shall be free of grease and oil. The control cable must make 3 full wraps around the cable drum.

(4) Install chain (6) on sprocket (5) and clutch assembly sprocket, slide clutch assembly (16) into housing (9).
(5) Install support assembly (2), cover assembly (14) and secure with screws (15 and 19).
(6) Install cable guard (10) in housing (9).
(7) Install top and side covers (7 and 13), secure with screws (8 and 11).
(8) Adjust clutch assembly (16) to slip at 25 inch-pounds, +3 or -3 inch-pounds.

D. Installation (Refer to Figure 405).
(1) Install actuator (7) on support (8) and secure with screws (9). Connect electrical wiring.
(2) Connect fork (6) to actuator control cable, using bolt, nut, and cotter pin.
(3) Connect cable (1) to actuator control cable, using turnbuckle (2).
(4) Rig electric trim control system, refer to Elevators - Adjustment/Test.
(5) Install rear upholstery panel to tailcone.

14. Electric Trim Actuator (Optional) (Airplanes 310R0501 thru 310R2140)

A. Removal (Refer to Figure 405).
(1) Ensure airplane's electrical power is OFF.
(2) Place a suitable support under tailcone.
(3) Remove tailcone access.
(4) Disconnect electrical connector from electric elevator trim actuator (15).

NOTE: The electric elevator trim actuator can be removed from the mount without disturbing the elevator trim cable tension.

(5) Remove electric elevator trim actuator (15) from mount (14) by removing bolts (19).
(6) If complete trim actuator and mounting removal is desired, proceed as follows:
(a) Remove center floor panels as necessary to gain access to the elevator trim control cable turnbuckles.
(b) Disconnect turnbuckle from left aft cable (20).
(c) Remove guard pins (18) from mount (14) and unwrap cable (20) from capstan.
(d) Remove mount (14) from support (16) by removing screws and bolt.

B. Installation (Refer to Figure 405).
(1) To install electric elevator trim actuator (15) to mount (14) proceed as follows:
(a) Align electric elevator trim actuator (15) to shaft of mount (14) and slide electric elevator trim actuator onto shaft of mount.
(b) Secure electric elevator trim actuator to mount with bolts (19). Torque bolts evenly in a crisscross pattern to 15-20 inch-pounds. Safety wire bolts.
(2) If complete trim actuator and mounting is being installed, proceed as follows:
(a) Install mount (14) to support (16) using screws and bolt.
(b) Install electric elevator trim tab cable as follows:
1 Position capstan of mount so that slot of capstan is facing forward and hold in this position using a suitable wrench on shaft of mount.
2 Position and hold elevator trim control wheel and elevator trim tab in the normal full NOSE DOWN position.
3 With parts held in position, pull slack in LH aft cable forward to actuator.

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4 Start on the aft side with the fourth groove in from end of capstan and wrap cable counterclockwise three full turns around capstan with swaged ball of cable positioned in slot on forward side of capstan.
5 Connect turnbuckle to cables.
6 Install guard pins (18).
7 Connect electrical connector to electric elevator trim actuator (15).

(3) If procedures in Step B.(1) were used for installation, check for correct trim tab deflection, refer to Elevators - Inspection/Check.
(4) If procedure in Step B.(2) were used for installation, rig elevator trim control system, refer to Elevators - Adjustment/Test.

NOTE: Operate electric elevator trim actuator through entire travel and observe that cable remains in groove and the swaged ball does not move out of the horizontal groove.

(5) Check electric elevator trim actuation time as follows:
(a) Turn elevator trim control wheel so that indicator is at the maximum NOSE UP position.
(b) Using a grease pencil or equivalent, make a reference mark on the elevator trim control wheel.

NOTE: Use external power supply and ensure voltage on airplane bus is 27.5 volts, +0.25 or -0.25 volts.

(c) With electrical power on airplane, set electrical trim switch to NOSE DOWN position and check the time in seconds to obtain three revolutions of the elevator trim control wheel. Proper time is 23 seconds, +2 or -0 seconds.
(d) Manually turn elevator trim control wheel in the opposite maximum position and repeat step (c).
(e) If the time to obtain three revolutions of the elevator trim control wheel is not 23 seconds, +2 or -0 seconds, adjust the external variable resistor and repeat steps (c) and (d).
(f) If by adjusting the external variable resistor it is impossible to obtain proper time; remove the plug button from the actuator and adjust the potentiometer inside the actuator to obtain the specified time.
(g) Recheck the elevator trim indicator for correct indication in the NOSE UP position, NOSE DOWN position, and TAKEOFF position.

WARNING: Ensure that elevator trim tab moves in the proper direction when operated by the elevator trim control wheel and the electric trim switch.

(6) Install all floor panels removed and install tailcone access panel.

15. Elevator Trim Tab Position Marker

A. Removal.
(1) Pry out marker indicating pointer travel limits.
(2) Remove screw at each end of placard.
(3) Remove placard from pedestal.

B. Installation.
(1) Place placard on pedestal.
(2) Install screw at each end of placard and limit markers in holes they were removed from.

NOTE: If a new placard is installed, use old placard as a template for drilling holes in new placard (Refer to Figure 407 for Dimensions).

(3) If a new pedestal cover is installed, perform the following (Refer to Figure 407):
(a) Set elevator tab at neutral (0 degrees) and adjust pointer (if necessary) to limits.
(b) Locate placard as shown; install screw and trim ends as required.

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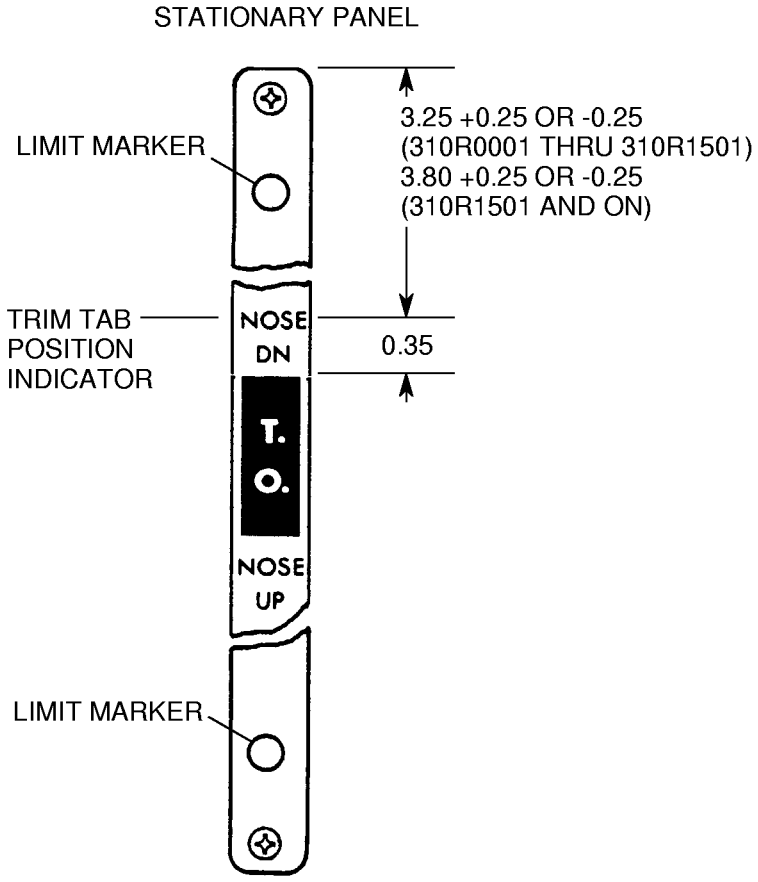

Elevator Tab Position Marker
Figure 407 (Sheet 1)

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(c) Rotate trim wheel to limits (FULL UP, FULL DOWN) and locator markers.

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ELEVATORS - ADJUSTMENT/TEST

1. Electric Trim Actuator (Optional) (Airplanes 310R0001 thru 310R0500)

A. Testing (Refer to Figure 501).

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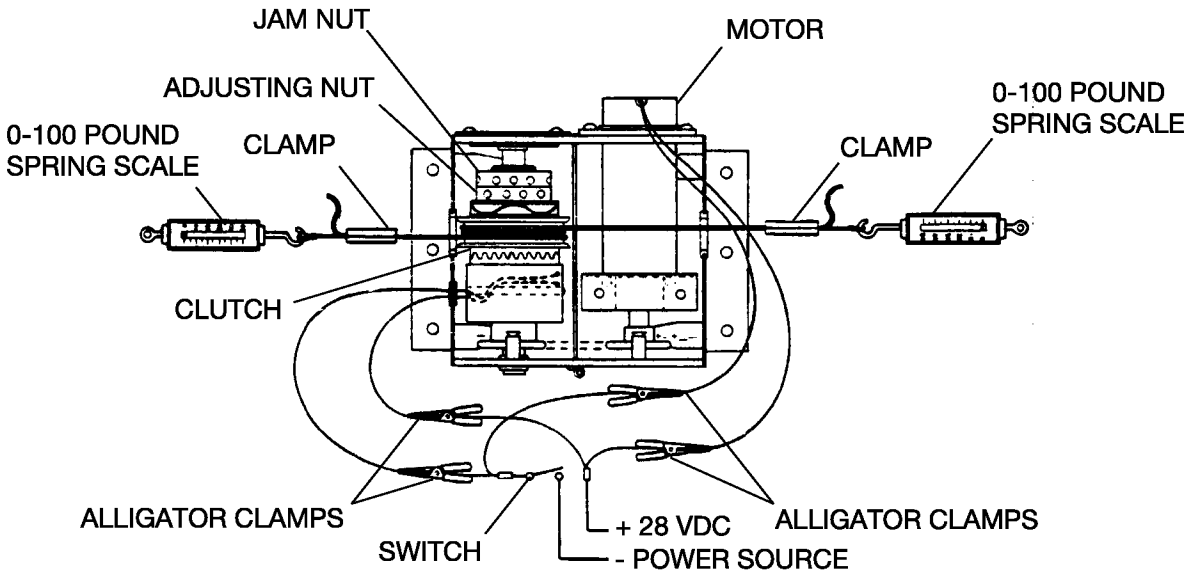

Electric Trim Actuator Test Setup
Figure 501

NOTE: It is recommended that the electric trim actuator assembly be secured to a suitable work bench and test equipment be provided as shown in Figure 501.

(1) Conduct test as follows:
  (a) Disconnect alligator clamps to clutch assembly.
  (b) Actuate switch to provide 28 volts DC to motor. Note direction of rotation of motor and clutch is disengaged. Motor drive sprocket should rotate at 7 - 7.4 RPM. Turn switch OFF.
  (c) Reverse polarity of wires to motor and actuate switch. Direction of rotation of motor should reverse. Turn switch OFF.
  (d) Connect alligator clamps to clutch wires.
  (e) Actuate switch to provide 28 volts DC to motor and clutch assembly. Motor should rotate and clutch should engage.

CAUTION: Be prepared to stop motor if clutch shows no indication of slipping before scale bottoms out.

  (f) Clutch should slip when scale indicates 25 inch-pounds, +3 or -3 inch-pounds tension. If not, adjust in accordance with step (2).
  (g) Reverse direction of rotation of motor and again check slippage tension. Scales should indicate 25 inch-pounds, +3 or -3 inch-pounds.

(2) Adjust clutch slippage as follow:
  (a) Remove side cover to gain access to adjusting nut.
  (b) Using two 1/8 inch punches as holding tools, loosen jam nut and turn adjusting nut until slippage of the drum occurs at 25 inch-pounds, +3 or -3 inch-pounds tension.

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CAUTION: Make sure electrical power is off while making adjustments.

NOTE: The inch-pound angular torque may be converted to pound tension and measured by a spring scale.

(3) When adjustment is correct, tighten jam nut while holding adjustment nut position.
(4) Install side cover.

2. Elevator Control System

A. Rigging (Refer to Figure 502).
(1) Remove pilot's seats, refer to Chapter 25, Flight Crew Seats- Removal/Installation.
(2) Remove front carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(3) Remove rear upholstery panel to tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(4) Remove access covers from cabin floor above forward elevator bellcrank (12) and tailcone access cover below aft push-pull tube (10).
(5) Install an inclinometer on trailing edge of the elevator and adjust elevator bellcrank stops (9) so that the elevator travel is 16 degrees, +1/2 or -0 degrees UP and 15 degrees, +1 or -0 degrees DOWN.

CAUTION: When checking elevator travel, do not operate elevator from the elevator tip or serious damage to the elevator may result.

NOTE: The hole through the elevator bellcrank stop (9) is drilled off-center to provide a positive means of adjusting the elevator travel. At the extreme elevator travel limits (16 degrees, +1/2 or -0 degrees UP and 15 degrees, +1 or -0 degrees DOWN), the bellcrank (8) should be tangent with the flat surface of stop (9). Adjustments (0 and 1/2 degree) are accomplished by rotating stop (9) approximately 60 degrees or until another side of the stop is encountered and tangent with bellcrank surface.

(6) Unsafety turnbuckles (11) and adjust so that tension on elevator cables (5 and 7) is 32 pounds, +5 or -5 pounds, ensuring that forward elevator bellcrank (12) does not contact the bulkhead located just forward of the bellcrank. When elevators are in either position, the forward bellcrank should clear the bulkhead by approximately 1/4 inch.

NOTE: Cable tension readings should be taken just aft of rear cabin bulkhead (fuselage station 132.00) with bob-weight push-pull tube disconnected from control column.

NOTE: Check cable tension when ambient temperature is 65°F to 95°F after temperature has stabilized for a period of four hours.

(7) Resafety turnbuckles (11).

WARNING: Ensure that elevator moves in the proper direction when operated by the control wheel.

(8) Adjust length of forward push-pull tube (13) so that control column clears instruments in aft position and fuselage bulkhead in forward position.

NOTE: When elevator system is correctly rigged, the length of push-pull tube (13) should be approximately 12 inches, measured between centerlines of the rod end bolt holes.

(9) Install access covers.
(10) Install rear upholstery panel, carpets, and pilot's seats.

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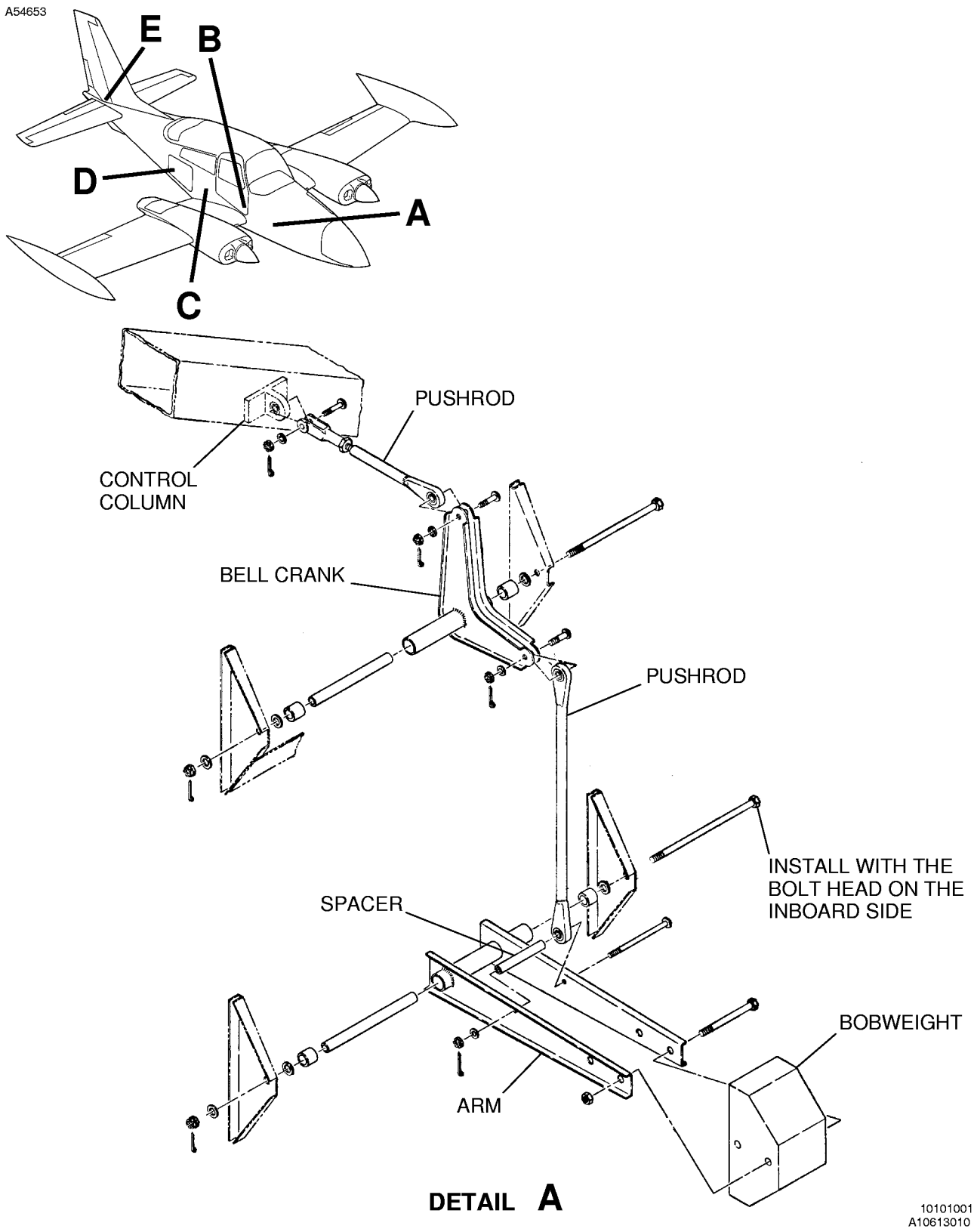

Elevator Control System Installation
Figure 502 (Sheet 1)

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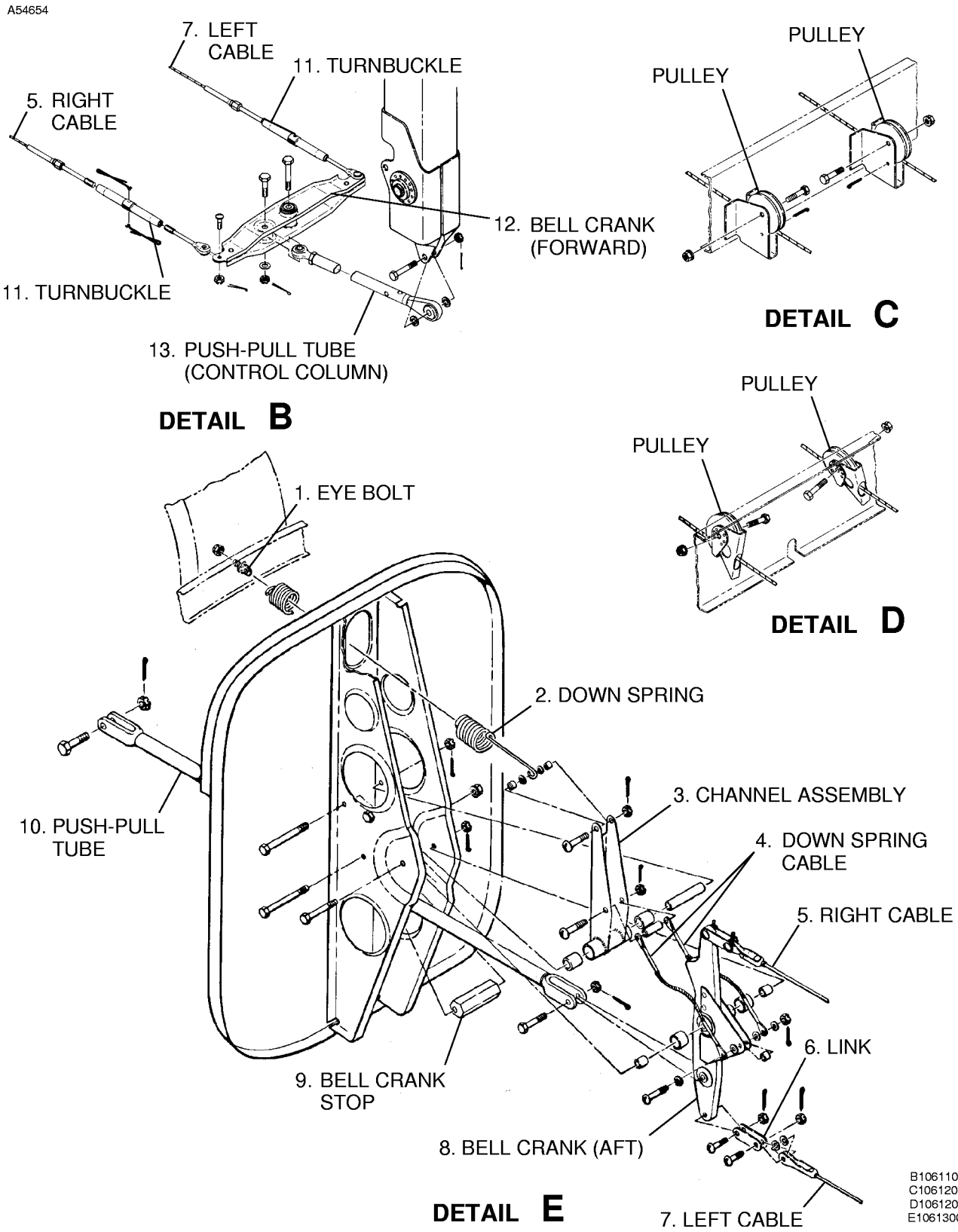

Elevator Control System Installation
Figure 502 (Sheet 2)

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3. Elevator Trim Control System

A. Rigging (Refer to Figure 503).

(1) Remove rear upholstery panel to tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.

(2) Loosen stop blocks (11) by loosening nuts.

(3) Unsafety turnbuckles (9), adjust so that tension on the elevator trim control cables is 10 pounds, +3 or -3 pounds, and resafety turnbuckle.

NOTE: If an autopilot with or without electric elevator trim is installed, adjust tension on elevator trim control cables to 19 pounds, +3 or -3 pounds.

NOTE: Cable tension should be adjusted when ambient temperature is 65°F to 95°F. Allow airplane temperature to stabilize for a period of four hours.

(4) Disconnect push-pull tube (3) from horn (5) by removing cotter pin, nut, washer, and bolt (Refer to Figure 504).

(5) Rotate elevator trim control wheel (13) forward (NOSE DOWN) until aft chain (5) and forward chain (14) have approximately two links clearing the sprockets.

NOTE: If the elevator trim indicator reaches its extreme travel during rigging, it can be relocated by removing elevator trim control wheel, moving the indicator, and reinstalling wheel.

(6) With the chains in the above position and the elevators in neutral (elevator horns aligned with stabilizer), adjust actuator (2) screw by rotating push-pull tube so that aft bolt hole in push-pull tube aligns with bolt hole in the trim tab horn when the elevator trim tab is approximately 10 degrees UP.

(7) Connect push-pull tube (3) to horn (5) with bolt, washer, nut and cotter pin (Refer to Figure 504).

(8) Rotate elevator trim control wheel so that the elevator trim tab is 26 degrees, +1 or -0 degrees DOWN. Slide forward stop block (11) against aft side of station 132.00 bulkhead and secure stop block.

NOTE: If an autopilot (optional equipment) is installed, refer to Chapter 22, Auto Flight - Adjustment/Test for rigging of stop blocks.

(9) Rotate elevator trim control wheel so that elevator trim tab is 10 degrees, +1 or -0 degrees UP, locate aft stop block (11) against forward stop block and secure stop block.

(10) When the elevator trim control system is in either extreme position, the elevator trim indicator should be in the same relative position to the NOSE UP and NOSE DOWN positions on the decal. To adjust the indicator, use the following procedures:

(a) Rotate elevator trim control wheel (13) so that elevator trim control system is in the extreme NOSE DOWN position.

(b) Remove elevator trim control wheel (13) by removing screws and washers, and place the elevator trim indicator at the NOSE DOWN position on the decal.

(c) While the elevator trim indicator is in this position, install the elevator trim control wheel (13) with washers and screws.

NOTE: The elevator trim control wheel (13) can be installed in any one of four positions. Select the position which causes the least indicator movement as it engages with the wheel track.

WARNING: Ensure that elevator trim tab moves in the proper direction when operated by the trim control wheel.

(11) Install rear upholstery panel to tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.

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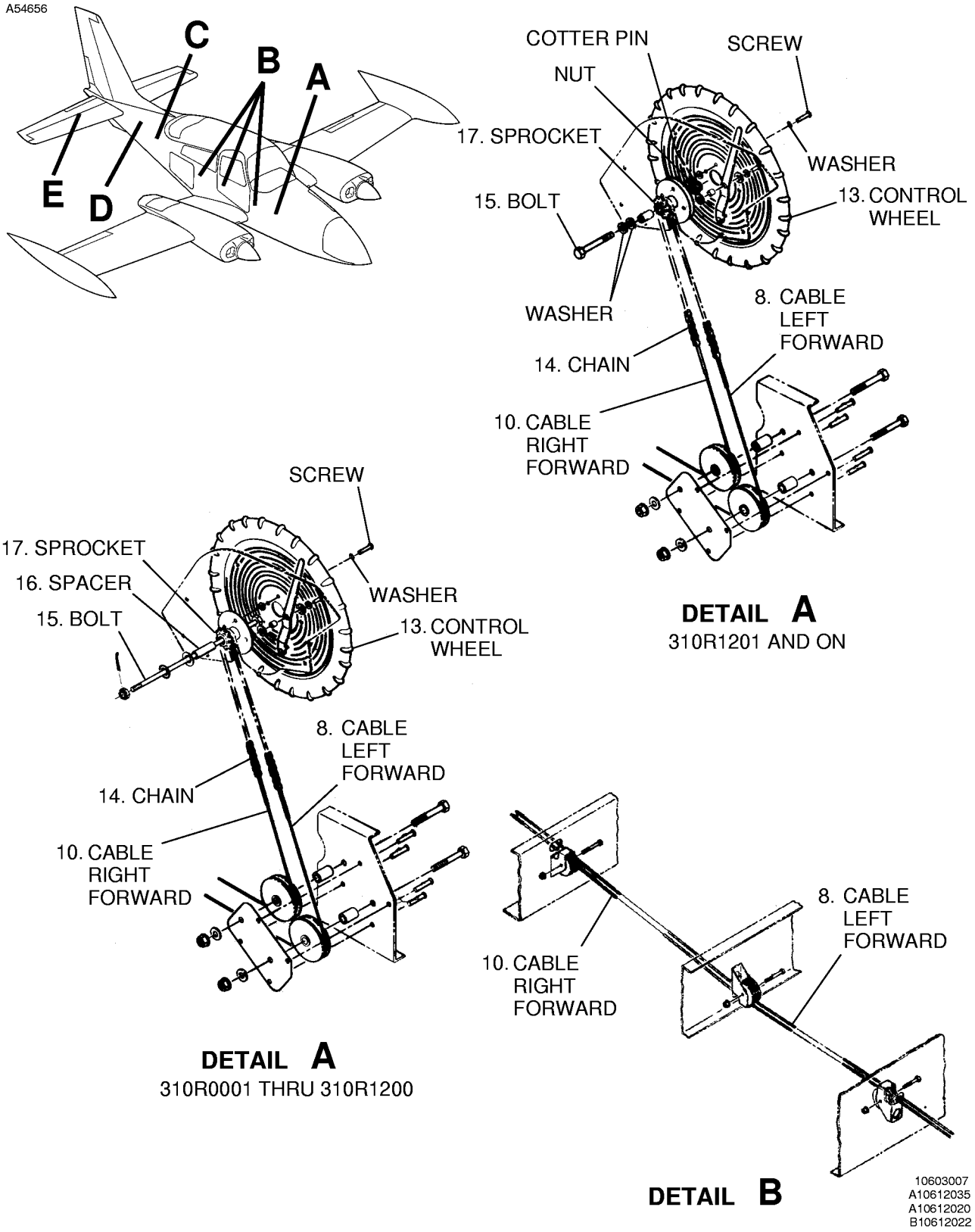

Elevator Trim Control Installation
Figure 503 (Sheet 1)

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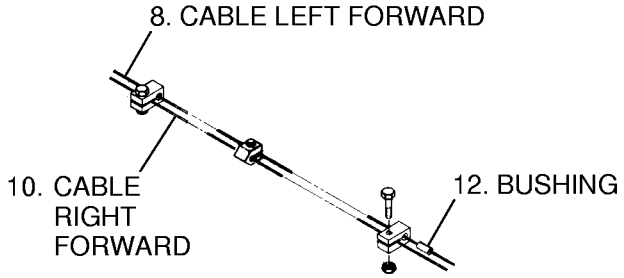
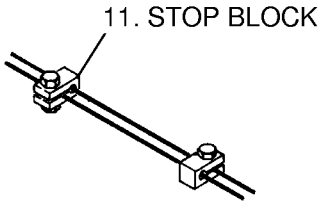
NOTE: STOP BLOCK INSTALLED WITH 400A AUTOPILOT NOT INCORPORATING ELECTRIC ELEVATOR TRIM SYSTEM



DETAIL C



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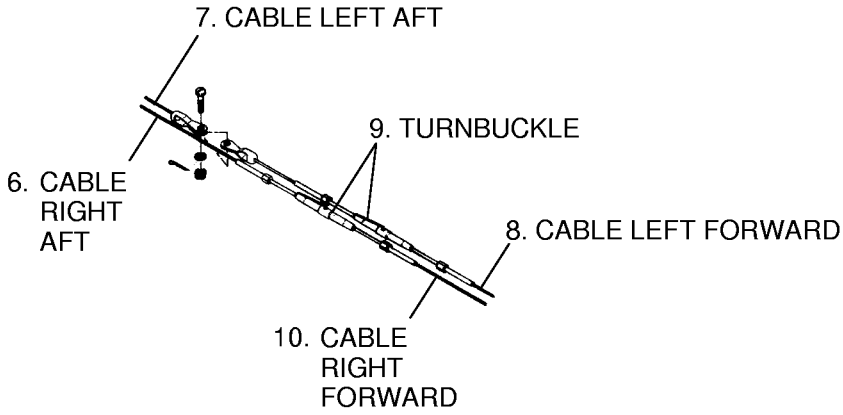

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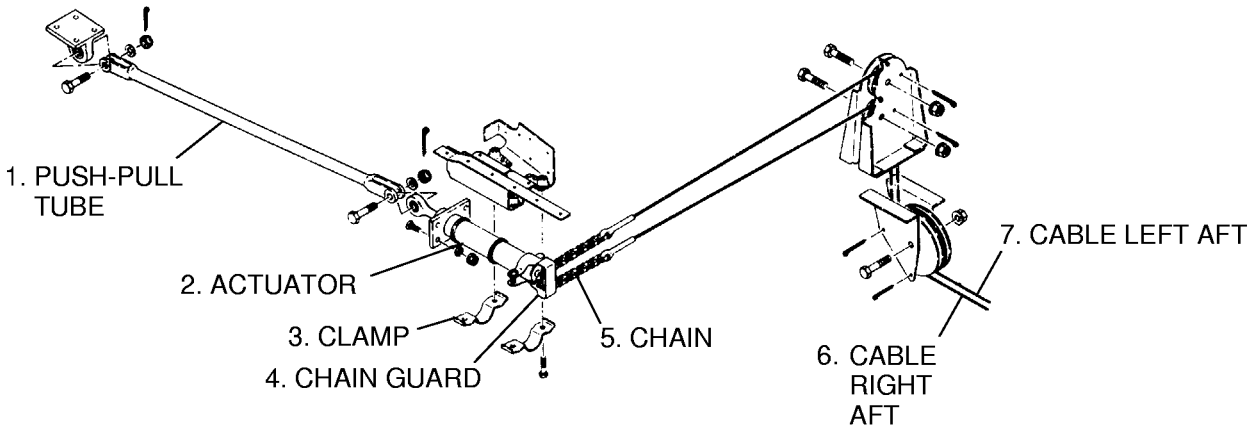

DETAIL E

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Elevator Trim Control Installation
Figure 503 (Sheet 2)

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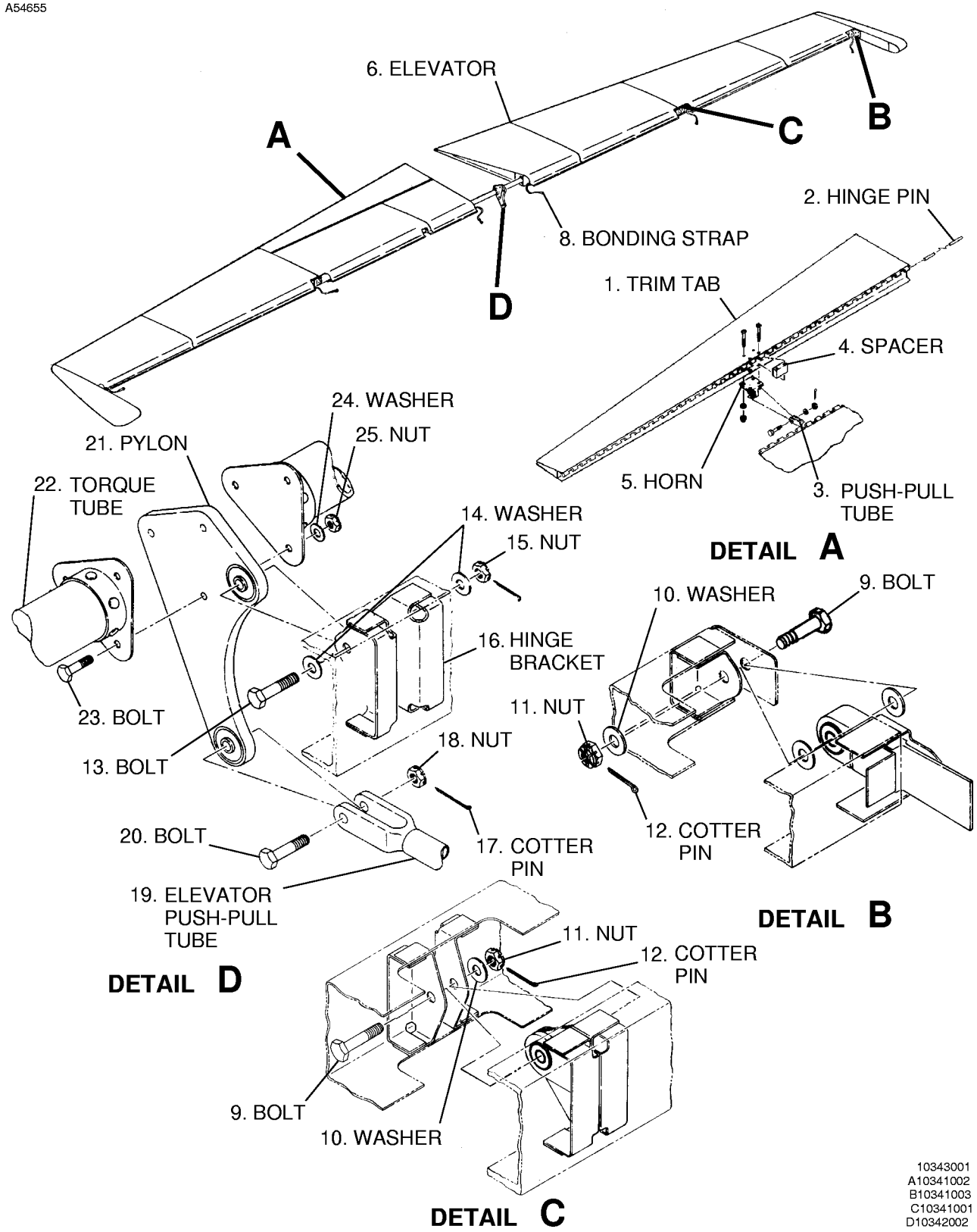

Elevator and Trim Tab Installation
Figure 504 (Sheet 1)

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4. Electric Elevator Trim Control System

A. Rigging.

(1) Remove rear upholstery panel to tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.

(2) Loosen stop blocks (11) by loosening nuts (Refer to Figure 503).

(3) Unsafety turnbuckles (2 and 4) adjust tension on elevator cables to 19 pounds, +3 or -3 pounds. Resafety turnbuckles.

NOTE: Cable tension should be adjusted when ambient temperature is 65°F to 95°F. Allow airplane temperature to stabilize for a period of four hours.

(4) Disconnect push-pull tube (3) from horn (5) by removing cotter pin, nut, washer, and bolt (Refer to Figure 504).

(5) Rotate elevator trim control wheel (13) forward (NOSE DOWN) until aft chain (5) and forward chain (14) have approximately two links clearing the sprockets (Refer to Figure 503).

NOTE: If the elevator trim indicator reaches its extreme travel during rigging, it can be relocated by removing elevator trim control wheel, moving the indicator, and reinstalling wheel.

(6) With the chains in position described in step (5) and the elevators in neutral (elevator horns aligned with stabilizer), adjust actuator (2) by rotating push-pull tube so that aft bolt hole in push-pull tube aligns with bolt hole in the trim tab horn when the elevator trim tab is approximately 26 degrees DOWN.

(7) Connect push-pull tube (3) to horn (5) with bolt, washer, nut, and cotter pin (Refer to Figure 504).

NOTE: The threaded end of bolt attaching the elevator trim tab push-pull tube to actuator screw must be inboard; therefore, exact travel adjustment is not made by this means.

(8) Rotate elevator trim control wheel so that the elevator trim tab is 26 degrees, +1 or -0 degrees DOWN. Slide forward stop block (11) (Refer to Figure 503) against aft side of station 132.00 bulkhead and secure stop block. If an autopilot (optional) is installed slide aft stop block (10) against actuator (7) and secure stop block.

(9) Rotate elevator trim control wheel so that elevator trim tab is 10 degrees, +1 or -0 degrees UP. Locate aft stop block (11) against forward stop block and secure stop block. If an autopilot (optional) is installed, slide forward stop block (10) against actuator (7) and secure stop block.

(10) When the elevator trim control system is in either extreme position, the elevator trim indicator should be in the same relative position to the NOSE UP and DOWN position on the decal. To adjust the indicator, use the following procedure (Refer to Figure 503):

(a) Rotate elevator trim control wheel (13) so that elevator trim control system is in the extreme NOSE DOWN position.

(b) Remove elevator trim control wheel (13) by removing screws and washers, and place the elevator trim indicator at the NOSE DOWN position on the decal.

(c) While the elevator trim indicator is in this position, install the elevator control wheel (13) with washers and screws.

NOTE: The elevator trim control wheel (13) can be installed in any one of four positions. Select the position which causes the least indicator movement as it engages with the wheel track.

WARNING: Ensure that elevator trim tab moves in the proper direction when operated by the trim control wheel.

(11) Install rear upholstery panel to tailcone, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.

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ELEVATORS - INSPECTION/CHECK

1. Elevator Control System

A. Inspection.

(1) Visually inspect the elevator skins for cracks and loose rivets, hinges, hinge bolts, hinge bearings, torque tube, horn, attach fittings, and bonding jumpers for evidence of damage or wear, failed fasteners, and security. Visually inspect the elevator hinge bolts for proper safety of nuts with cotter pins. Inspect elevator torque tube and torque tube end assembly for looseness. Check LH and RH elevator balance weight for looseness and tip structure for cracks.

(2) Elevator bell crank - Inspect bell crank, push rods, stop bolts, and brackets for corrosion, evidence of damage, failed fasteners, and security, proper safetying of bell crank, and push rod bolt for proper safety of nuts with cotter pins.

(3) Elevator cables - Check cable seals for deterioration. Inspect cables for fraying, routing, chafing, cleanliness, cable tension, and turnbuckle safetying.

(4) Control column - Inspect bob weights, control column for evidence of damage, failed fasteners, and security. Check control column for freedom of movement.

2. Elevator Trim Tab System

A. Inspection.

(1) Elevator trim tab - Visually inspect trim tab skins and hinges for cracks, loose rivets, security, hinge for security and evidence of damage and tab free play, hinge pin for proper security. Inspect horns and push rods for evidence of damage and security free play. Visually inspect push rods for cracks and wear, bolts for condition and proper safety of nuts with cotter pins.

(2) Elevator trim tab actuator - Visually inspect actuator attach bolts, mounting clamps, and mounting structure for evidence of damage, cracks, and security of installation.

(3) Visually inspect clamps for proper fit on actuator. Clamps must be firmly seated on the actuator.

(4) Visually inspect snap rings for complete and proper engagement in snap ring groove of actuator. Check that snap rings are properly seated in their positioning slot on the mounting bracket.

(5) Check that mounting clamp bolts or screws are torqued properly by evidence of torque putty.

(6) If the torque putty is broken or cracked, remove putty, torque bolts 20-25 inch-pounds and apply white lacquer torque putty to bolts for future inspections.

(7) Inspect chain guard for condition and attachment. Inspect the actuator rod and bearings for condition and security. Check actuator sprockets for condition and security. Inspect the actuator chains for condition. Check chain to cable attach link for security.

(8) Visually inspect cables for deterioration and lubrication. Inspect travel stop blocks for security in installation. Inspect cables for fraying, chafing, routing, cleanliness, cable tension, and turnbuckle safetying.

(9) Elevator trim tab control and indicator - Inspect control and indicator for security of installation, evidence of damage, operate tab control and check for freedom of movement. Inspect chain for proper safety to cable and alignment on indicator sprocket.

NOTE: Individual broken wires are acceptable in primary and secondary control cables at random locations when no more than one broken wire occurs per inch, and no more than five broken wires in 10 inches. Additionally, in any area of broken wires, e.g., one inch each side of a broken strand, wear on adjacent wires in the strand may not exceed 40%.

(10) When servicing remove screw assembly from trim tab actuator and inspect threads for rust, wear, and damage, end bearing for binding and damage, corrosion, or dirt particles that may impair smooth operation.

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3. Elevator and Elevator Trim Tab

A. Cable Check.

NOTE: Angular dimensions for checking elevators and elevator trim tab are measured by placing an inclinometer on the elevator or elevator trim tab surface. Elevator is in NEUTRAL position when the elevator horns align with stabilizer. The elevator trim tab is in NEUTRAL position when streamline with the elevator.

(1) Place elevator and trim tab in NEUTRAL position.
(2) With bob weight push-pull tube disconnected from control column, place tensiometer aft of station 109.00 and read cable tension.
(3) Place tensiometer aft of station 132.00 and read cable tension.

NOTE: Access to the elevator and elevator trim cables is gained through the tailcone.

(4) Reconnect bob weight push-pull tube.

B. Travel and Deflection Check.
(1) Place the elevator and elevator trim tab in NEUTRAL position.
(2) Place the inclinometer to the elevator and pull the control wheel aft. The elevator shall deflect UP 16 degrees, +1/2 or -0 degrees.
(3) Push the control wheel forward. The elevator shall deflect DOWN 15 degrees, +1 or -0 degrees.
(4) Rotate the elevator trim control wheel to full NOSE UP position. The elevator trim tab will deflect 26 degrees, +1 or -0 degrees DOWN.
(5) Rotate the elevator trim control wheel to full NOSE DOWN position. The elevator trim tab will deflect 10 degrees, +1 or -0 degrees UP.
(6) If electric elevator trim (optional) is installed:
  (a) Apply electrical power to operate the electric trim.
  (b) Operate the elevator trim control switch on the left control wheel left grip. The tab deflection shall correspond to elevator and trim tab deflection check.
(7) Check elevator trim tab deflection (free play) as follows (Refer to Figure 301):

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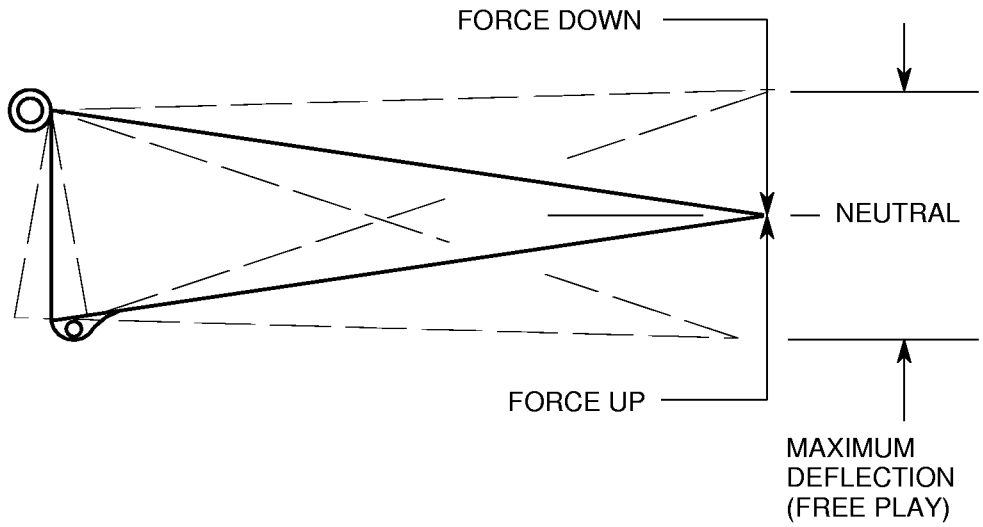

Trim Tab Deflection
Figure 601

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(a) With elevator and elevator trim tab in NEUTRAL position, restrain the elevator control surface and manually deflect the tab at the trailing edge at the point where the actuator push-pull rod is located. Using approximately one pound of force, deflect tab in one direction and measure the deflection from NEUTRAL using the control surface as a reference; then measure the deflection from NEUTRAL in the opposite direction. The sum of the two deflections must not exceed 0.070 at the outboard trailing edge. If the sum of the two deflections exceeds 0.070 inch, replace the bolts in the push rod and recheck; if unacceptable, replace bearing in actuator screw end and recheck; if unacceptable, replace trim tab horn bearing and recheck; if still unacceptable, adjust actuator to remove end play from actuator. Actuator is adjusted by removing groov-pins, rotating bearing past existing groov-pin holes, then applying pressure to force bearing inward, then drilling new groov-pin holes in the bearing from existing holes in housing; install groov-pins. If trim tab deflection is still unacceptable, replace the trim tab actuator and insure areas are properly safetied.

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FLAPS - DESCRIPTION AND OPERATION

1. Flap Control System

A. Description.

(1) The flap system is electrically actuated. The flap system provides lift to the wing when partially extended and increases drag to reduce speed when fully extended during landing. The system consists of a flap preselect assembly and flap actuator assembly. The flap actuator assembly is an electric motor which drives a gear reduction unit. Sprockets (two), connected in tandem to the reduction unit output shaft; drive two chain cables. The chain cables actuate four bellcranks in each wing. The bellcranks are interconnected by push-pull tubes. The flap preselect assembly consists of a preselect lever assembly mounted on the instrument panel and a flap preselect control cable. The flap preselect control cable is attached to the preselect lever assembly and routed aft under the floor board and connected to the right flap return cable. When the preselect lever assembly is placed in the 0 degrees (UP), 15 degrees or 35 degrees (DOWN) positions, microswitches attached to the preselect lever assembly arm actuates the flap motor, which drives the flaps until the corresponding flap position is reached. As the flaps reach the preselected position, the preselect micro switches are de-energized. Also, a flap and landing gear warning switch is mounted on the preselect bracket to provide an aural warning any time the flap preselect lever is lowered past the 15 degree position with the landing gear not extended and locked.

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FLAPS - TROUBLESHOOTING

1. Flap Control System

A. Troubleshooting.
(1) Troubleshooting the flap control system is determining if the trouble exists in the flap preselect system or flap actuator system.
(2) For a guide to troubleshooting the flap control system, refer to Table 101.

NOTE: Perform flap control system troubleshooting with normal voltage applies and preselect handle positioned in selected flap position.

Table 101. Flap Control System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
FLAPS FAIL TO MOVE.	Circuit breaker disengaged.	Check and engage flap motor circuit breaker.
	Improperly adjusted limit switches in the preselect assembly.	Check limit switches. Rig the preselect system.
	Improperly adjusted limit switches at the flap motor.	Check limit switches. Adjust as required.
	Unserviceable wiring or limit switches.	Check continuity of flap system circuitry. Repair wiring and/or replace limit switches as required.
	Unserviceable flap actuator assembly, cables, bellcranks, and/or push-pull tubes.	Check components and replace as required.
FLAPS FAIL TO EXTEND OR RETRACT IN RESPONSE TO PRESELECT HANDLE MOVEMENT.	Improperly adjusted limit switches in the preselect system.	Check for improperly adjusted limit switches in the preselect assembly. Rig flap preselect system as required.
	Improperly adjusted up and down limit switches at flap motor.	Check for improperly adjusted up and down limit switches at flap motor. Adjust as required.
FLAPS FAIL TO EXTEND COMPLETELY.	Improperly adjusted down limit switches.	Check for improperly adjusted down limit switches. Adjust as required.
	Improperly rigged chain and cable.	Check chain and cable rigging. Re-rig as required.
	Improperly adjusted push-pull tube.	Check for improperly adjusted push-pull tube. Adjust as required.
FLAPS ON ONE SIDE FAIL TO OPERATE.	Broken chain or cable pin.	Replace chain and/or pins.
	Inoperative drive sprocket.	Check drive sprocket for inoperative side for security to reduction unit output shaft. Replace pins and/or sprocket.

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FLAPS - REMOVAL/INSTALLATION

1. Flaps

A. Removal (Refer to Figure 401).

NOTE: The following is a removal procedure for the left inboard flap. Removal of the other flaps is a similar method.

(1) Extend flaps.
(2) If inboard flap is being removed, remove lower aft wing fillet.
(3) Disconnect lower scissor link (21) by removing cotter pins (13), nuts (14), washers (15), spacers (22), and bolts (20).
(4) Remove the safety from the bent end of the hinge pin (12). Detach flap by removing hinge pin (12).

NOTE: If difficulty is encountered in removing outboard flap hinge pin, it may be necessary to remove aileron to gain better access to hinge pin.

B. Installation (Refer to Figure 401).
(1) Attach flap to wing with hinge pin (12). Safety bent end of hinge pin (12).

NOTE: To facilitate hinge pin installation, check the hinges and pin for distortion, lubricate hinge pin and taper end of hinge pin.

(2) Connect lower scissor links (21) to flap by installing bolts (20), spacers (22), washers (15), nuts (14), and cotter pins (13).
(3) If lower aft wing fillet was removed, install with attaching screws.
(4) Check flap for proper operation and correct travel, refer to Flaps - Adjustment/Test for limits and tolerances.

2. Flap Bell Crank

A. Removal (Refer to Figure 401).

NOTE: Eight bell cranks are used to operate the flaps. The following procedures are for the left inboard bell crank of the left inboard flap. Remove the other bell cranks in a similar manner.

(1) Remove passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(2) Remove center carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(3) Remove access cover from above flap actuator and aft wheel well.
(4) Lower flaps several degrees to decrease tension on return cables, remove safety from turnbuckles (8), and loosen turnbuckles to release tension on cables which route to affected bell crank only (Refer to Figure 402).
(5) Disconnect flap cables (4 and 5) from bell crank by removing cotter pins, nuts, and bolts (Refer to Figure 402).

NOTE: The steps above apply only to removal of the inboard bell crank of each inboard flap. To remove any other bell crank, remove access hole covers from underside of wing adjacent to affected bell crank.

(6) Disconnect push-pull rod (3) from bell crank (8) by removing cotter pin, nut, washer, spacers, and bolt.
(7) Disconnect interconnecting push-pull tube (7) from bell crank by removing cotter pin, nut, and bolt.

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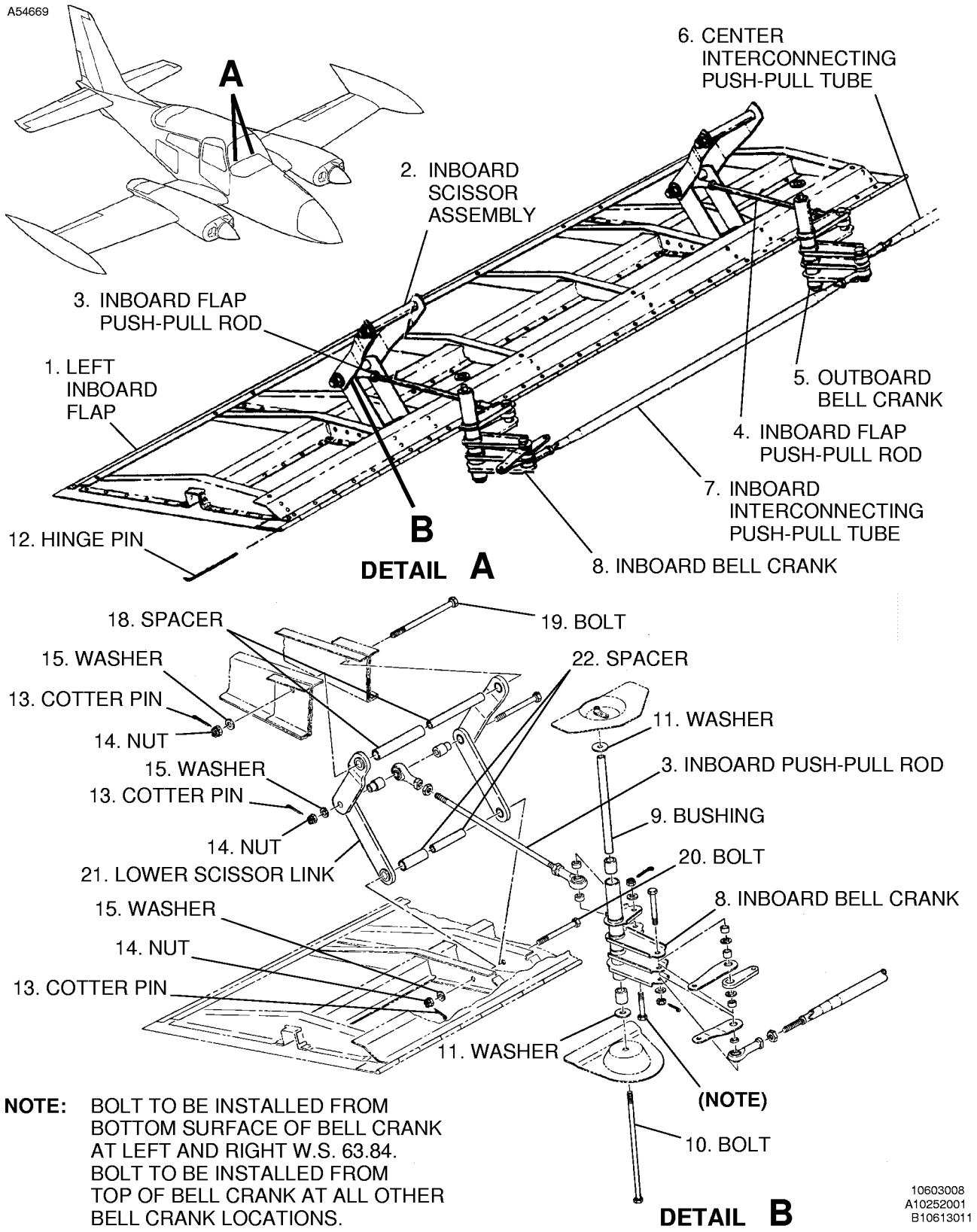

NOTE: BOLT TO BE INSTALLED FROM BOTTOM SURFACE OF BELL CRANK AT LEFT AND RIGHT W.S. 63.84. BOLT TO BE INSTALLED FROM TOP OF BELL CRANK AT ALL OTHER BELL CRANK LOCATIONS.

Flap Installation and Control System
Figure 401 (Sheet 1)

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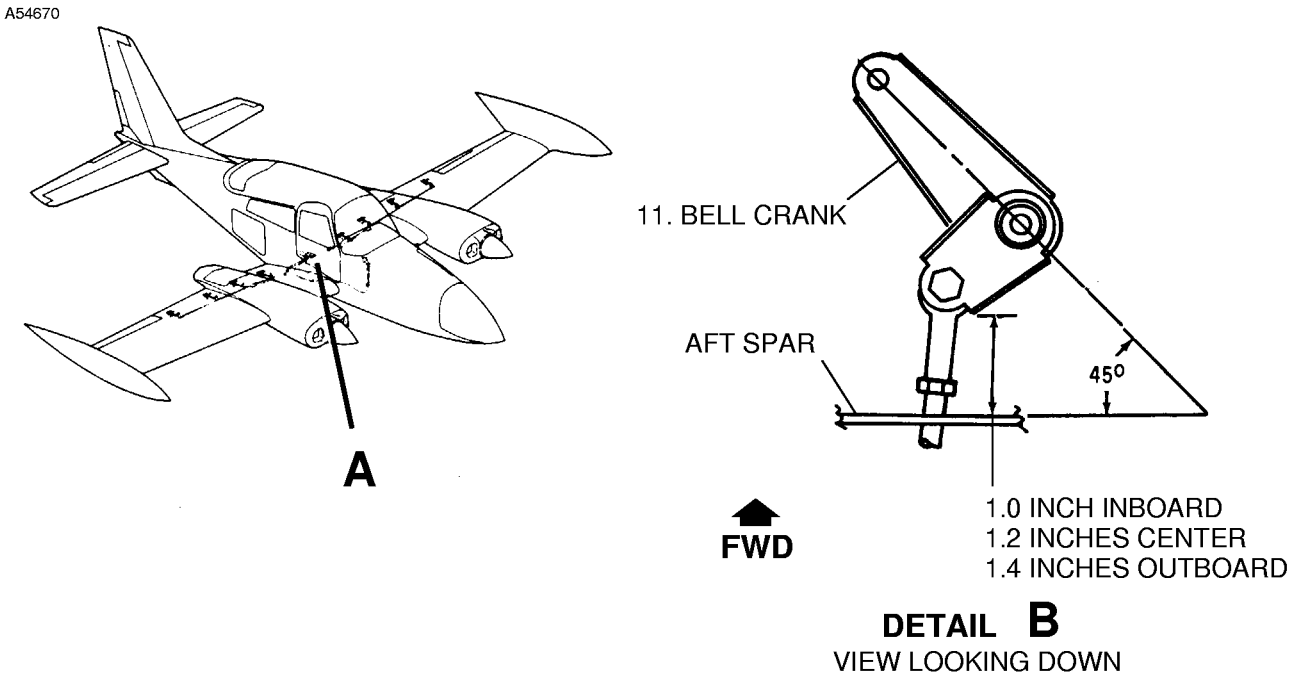

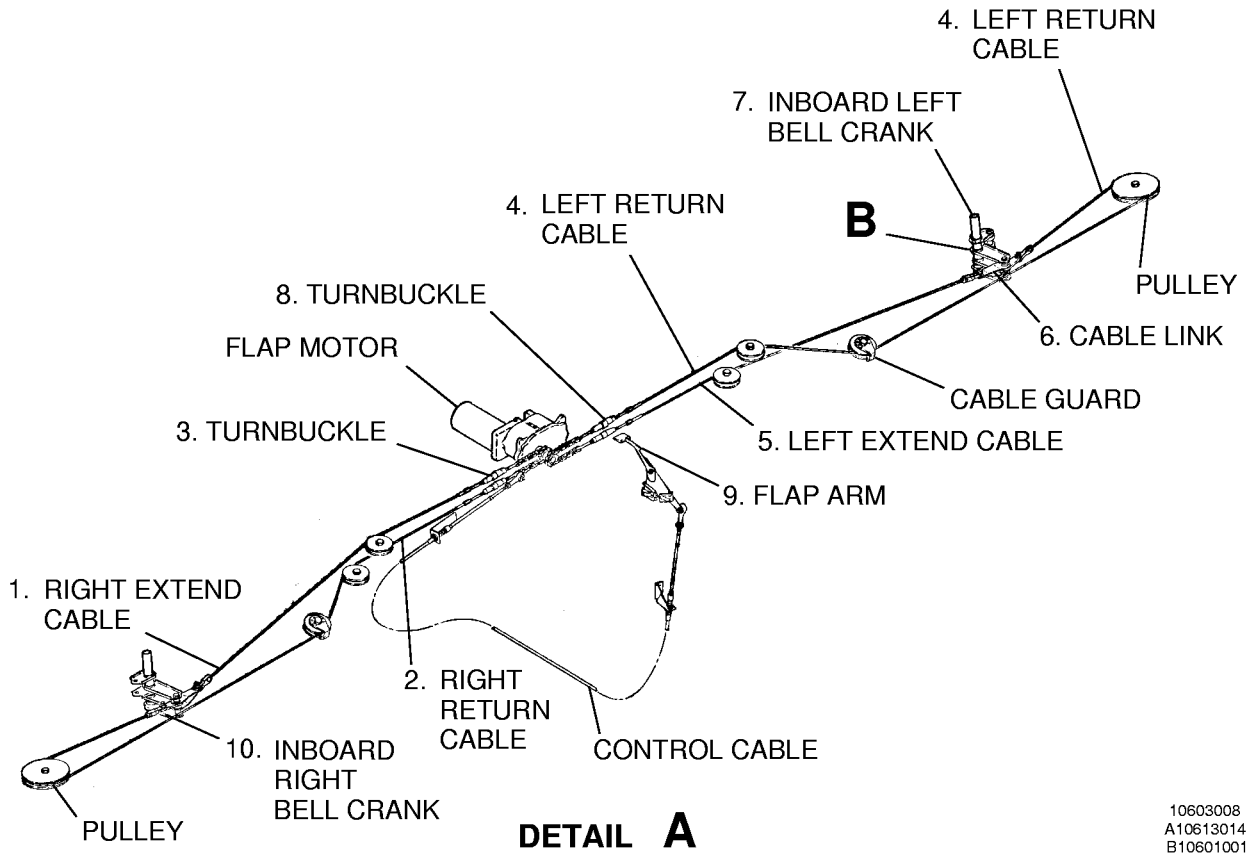

Flap Cable Installation
Figure 402 (Sheet 1)

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(8) Remove bell crank by removing safety wire from bolt (10); removing bolt (10) and washers (11), taking care that bushing (9) does not fall from bell crank during removal.

NOTE: Access to bolt is gained by removing a plug button from the underside of the wing beneath the bolt.

B. Installation (Refer to Figure 401).
(1) Insert bell crank (8) through access hole and install with washers (11) and bolt (10). Safety bolts and install plug button on underside of wing beneath bolt.

NOTE: Washers (11) and bushing (9) must be in place before installing bolt (10).

(2) Attach interconnecting push-pull tube (7) to bell crank (8) with attaching bolt, nut, and cotter pin.
(3) Connect push-pull rod (3) to bell crank (8) with attaching bolt, spacers, nut, and cotter pin.
(4) Connect flap cables (4 and 5) to bell crank (8) with bolts, nuts, and cotter pins (Refer to Figure 402).
(5) Rig flaps, refer to Flaps - Adjustment/Test.
(6) Reinstall access covers.
(7) Install center carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(8) Install passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.

3. Flap Scissors Assembly

A. Removal (Refer to Figure 401).
(1) Extend flaps.
(2) Disconnect upper and lower scissor links (16 and 21) by removing cotter pins (13), nuts (14), spacers (18 and 22), and bolts (19 and 20).
(3) Disconnect upper and lower scissor links by removing cotter pin (13), nut (14), washer (15), spacers (17), push-pull rod (4), and bolt.

B. Installation (Refer to Figure 401).
(1) Assemble scissor links (16 and 21) to push-pull rod (2) using bolt, spacers (17), washer (15), nut (14), and cotter pin (13).
(2) Connect upper and lower scissor links (16 and 21) using bolts (19 and 20), spacers (18 and 22), washers (15), nuts (14), and cotter pins (13).
(3) Check flaps for proper operation and correct travel, refer to Flaps - Adjustment/Test.

4. Flap Control Cables

A. Removal (Refer to Figure 402).
(1) Remove center seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(2) Remove center carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(3) Remove access covers above and below flap motor.
(4) Remove aft wing root fillet and aft wheel wells access cover.
(5) Lower flaps several degrees to decrease tension on return cables, remove safety from turnbuckles (3 and 8), and disconnect turnbuckles.
(6) Disconnect flap extend and return cables from bell cranks by removing cotter pins, nuts, and bolts.
(7) Remove outboard pulleys by removing nuts and bolts.

NOTE: Cable guard cotter pins are quite difficult to install and should be removed only for replacement.

(8) Remove inboard pulleys and cable guards by removing nuts and bolts.
(9) Tie guide wires to flap cables, pull out through access hole in cabin floor and disconnect guide wires.
(10) Disengage chains from reduction unit sprockets.

B. Installation (Refer to Figure 402).
(1) Tie flap extend and return cables to guide wires and pull into position.

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(2) Attach flap extend and return cables to links of bell cranks (7 and 10) with bolts, nuts, and cotter pins.
(3) Place return cables (2 and 4) in position on outboard pulleys and install with bolts, nuts, and cable guards.
(4) Install inboard pulleys using bolts, nuts, and cable guards.
(5) Engage chains with reduction unit sprockets, connect to the cables with turnbuckles (3 and 8).
(6) Rig flap system, refer to Flaps - Adjustment/Test.
(7) Install aft wing root fillet and aft wheel wells access cover.
(8) Install access covers above and below flap actuator.
(9) Install center carpet, refer to Equipment/Furnishings - Removal/Installation.
(10) Install center seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.

5. Flap Actuator Assembly

A. Removal (Refer to Figure 403).
(1) Disengage flap motor circuit breaker.
(2) Remove center seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(3) Remove center carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(4) Remove access cover above flap actuator and underside at fuselage beneath flap motor.
(5) Lower flaps several degrees to release tension on return cables. Remove safety wire from turnbuckles (3 and 8, Figure 402). Loosen the turnbuckles enough to disengage chains from sprockets (16).
(6) Identify and disconnect electrical wires from limit switches (8).
(7) If autopilot (optional) is installed, remove two screws (26) securing bracket (23) to reduction unit (18).
(8) Remove nuts (14) and screws (13) attaching reduction unit (18) to fuselage rear spar.
(9) Pull actuator assembly aft, tilt actuator, and remove through access hole.

NOTE: If an autopilot (optional) is installed, disconnect autopilot cables from clamps attaching them to aileron cables, and separate beneath flap actuator to remove actuator from airplane.

(10) If limit switch bracket (5) removal is desired, proceed as follows:
(a) Identify and disconnect flap motor (1) electrical wires from limit switches (8).
(b) Remove safety wire from bolts (2).
(c) Remove screw (3), lockwasher (4), and bolt (2).

NOTE: The lower bolt (2) attaching bracket (5) to flap motor only needs loosening. The bracket hole is slotted for removal.

(d) Remove bracket (5) with limit switches (8) attached.
(11) If further disassembly of flap actuator assembly is desired, refer to Landing Gear and Flap System Components Overhaul Parts Manual.

B. Installation (Refer to Figure 403).
(1) If limit switch bracket (5) was removed proceed as follows:
(a) Position bracket (5) with limit switches (8) attached to flap motor (1). Secure bracket with bolts (2), lockwasher (4) and screw (3). Safety wire bolts (2).
(b) Route flap motor electrical wires through grommet of bracket (5). Identify wires and connect wires to limit switches (8).
(c) Check that reduction unit output shaft (15) does not turn when 800 pound-inches torque is applied.
(d) Adjust set screw (21) to provide 0.005 maximum transfer shaft movement and secure with locknuts (22).

NOTE: Shaft movement measurement should be measured between miter gear (19) and miter gear (10).

(e) Prior to flap actuator assembly installation, ensure that limit switches (8) operate properly.

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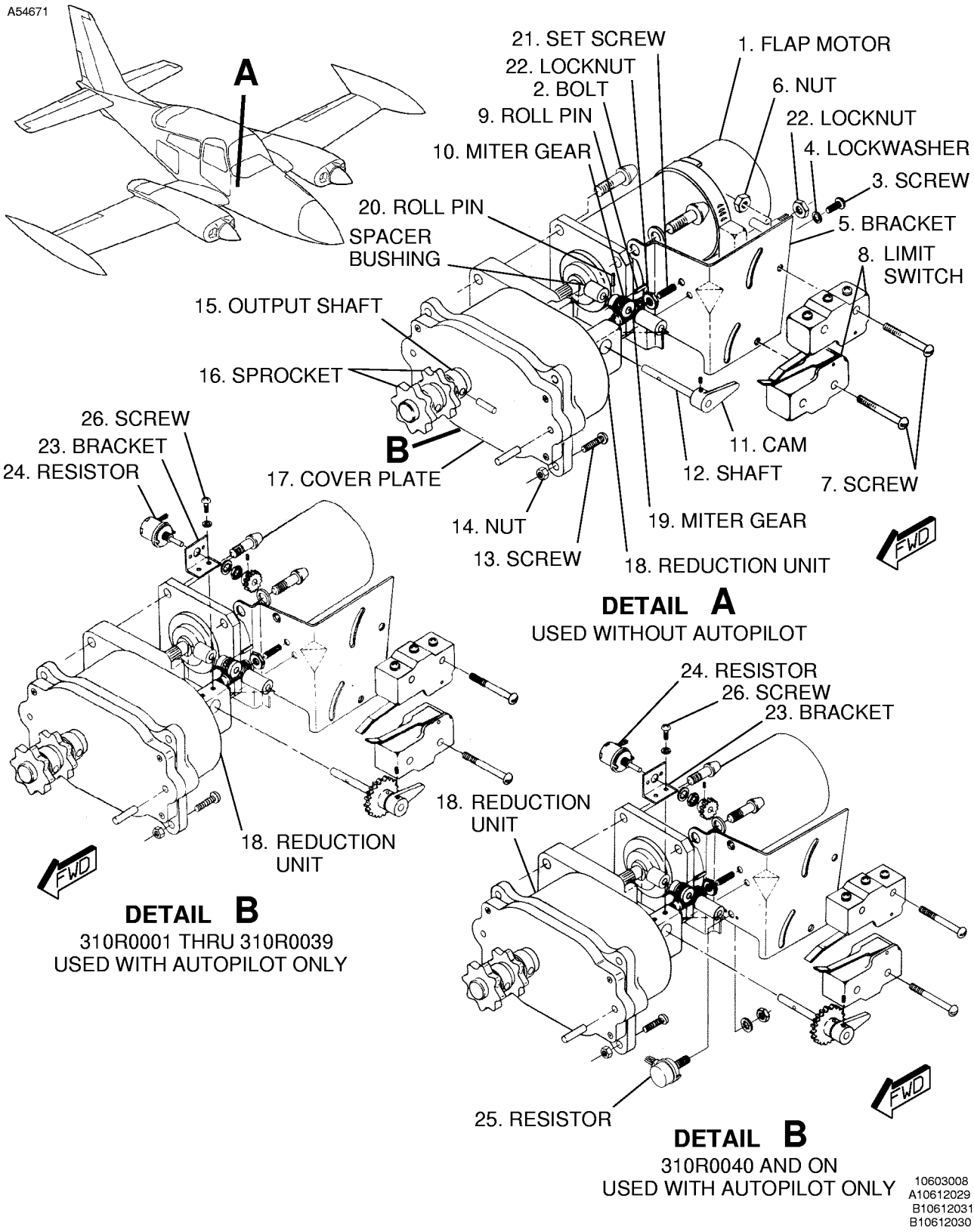

Flap Actuator Assembly
Figure 403 (Sheet 1)

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(2) Adjust limit switches (8) at the end of the adjusting slot on bracket (5) which is farthest from cam (11) to allow for travel when rigging.
(3) Identify wires to limit switches (8) and connect wires to limit switches. Connect flap motor ground.
(4) Insert flap actuator assembly through access hole in underside of the fuselage.
(5) Secure flap actuator assembly to rear spar using screws (13) and nuts (14).

NOTE: If an autopilot (optional) is installed, connect the autopilot cables to the clamps which attach them to the aileron cables.

(6) Engage chains with sprockets (16).
(7) Engage flap motor circuit breaker.
(8) Rig flap control system, refer to Flaps - Adjustment/Test.
(9) If autopilot is installed, refer to Chapter 22, Auto Flight - Adjustment/Test for rigging procedures.
(10) Install access covers above and below flap actuator.
(11) Install center carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(12) Install center seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.

6. Flap Preselect Assembly

A. Removal (Refer to Figure 404).
(1) Remove knob from lever.
(2) Disconnect control cable arm by removing nut and bolt.
(3) Remove nut and bolt securing flap preselect lever assembly to bracket. Remove preselect assembly from bracket.
(4) If further disassembly of flap preselect assembly is desired, proceed as follows:
(a) Remove washers.
(b) Remove bushings and washer from arm.
(c) Remove flap preselect switches from arm.

B. Installation (Refer to Figure 404).
(1) If preselect assembly was disassembled, proceed as follows:
(a) Install flap preselect switches on arm using screws, washers, and nuts.
(b) Assemble arm to lever using washers and bushings.
(2) Insert preselect assembly into bracket and secure with nut and bolt.

NOTE: Ensure washer is installed between lever and bracket.

(3) Connect control cable to arm using nut and bolt.
(4) Install knob on lever.
(5) Rig flap preselect assembly, refer to Flaps - Adjustment/Test.

7. Flap Preselect Control Cable

A. Removal (Refer to Figure 404).
(1) Remove necessary seats, carpet, and floorboards to gain access to flap preselect control cable.
(2) Disconnect control cable from arm by removing nut and bolt. Then remove rod end from control cable.
(3) Remove control cable from bracket by removing nut.
(4) Disconnect control cable from turnbuckle by removing cotter pin, nut, bushing, and washers.
(5) Remove control cable from bracket by removing nut.
(6) Remove nut remaining on the control cable. Remove clamps securing cable to structure and pull cable from airplane.

B. Installation (Refer to Figure 404).
(1) Route control cable through grommets in structure and secure with clamps.
(2) Install nuts on control cable and insert cable through forward and aft brackets. Install remaining nuts on control cable.
(3) Install rod ends on forward and aft end of cable.
(4) Connect forward end of control cable to arm using bolt and nut.

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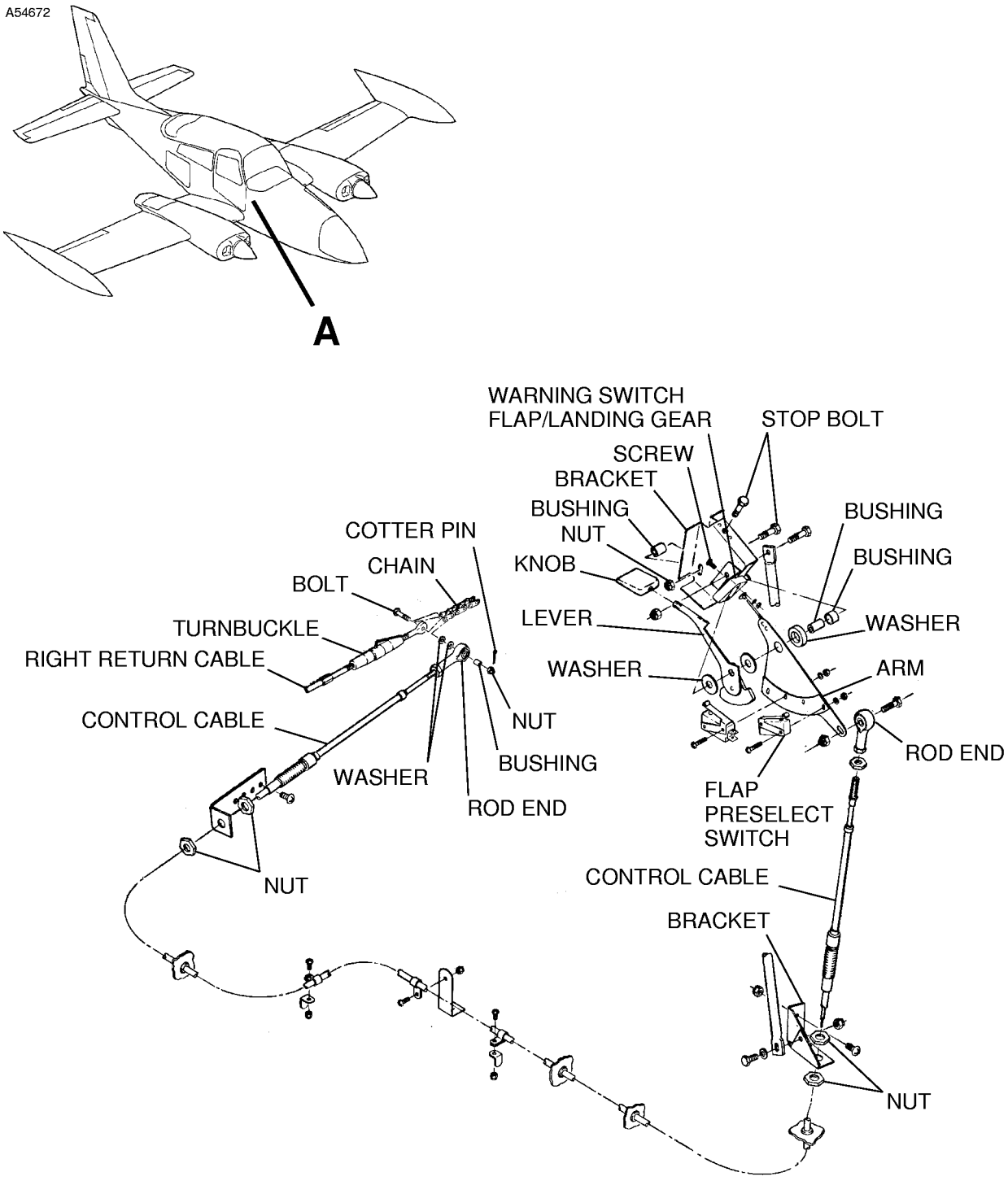

DETAIL A

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Flap Preselect System Installation
Figure 404 (Sheet 1)

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(5) Connect aft end of cable to turnbuckle using washers, bushing, nut, and cotter pin.
(6) Rig flap preselect system, refer to Flaps - Adjustment/Test.
(7) Install floorboards, carpet, and seats.

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FLAPS - ADJUSTMENT/TEST

1. Flap Control System

A. Rigging (Refer to Figure 501 and Figure 502).

NOTE: The flap control system should be rigged using a 24-volt external power source such as an A.P.U., with a two-position momentary switch, wired to the flap motor wires so the flaps may be observed during rigging. Use wires of sufficient length to allow the outboard edge of both outboard flaps to be closely observed.

CAUTION: When connecting the momentary switch, make sure the flap motor limit switches are not bypassed to avoid damage to the flap system. Connecting the switch to wiring between the flap preselect and the flap motor will ensure that the limit switches have not been bypassed (do not attach directly to the motor terminals).

CAUTION: Check operation of the momentary switch using the multimeter. If it is not desired to connect a momentary switch to the flap motor circuit, an additional technician should be located in the cockpit to operate the flap motor circuit breaker on command from the rigging technician.

(1) Remove passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(2) Remove center carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(3) Remove floorboard access panels above flap actuator assembly.
(4) Remove inspection plates forward of rear spar adjacent to wheel well.
(5) Connect a 24 volt external power source.
(6) Extend flaps and disconnect the push-pull rods from inboard and outboard flaps. Ensure push-pull rods are clear of moving parts.
(7) Adjust four inboard flap push-pull rods (3) (refer to Figure 502) to 10.45 inches.
(8) Adjust four outboard flap push-pull rods (3) to maximum length.

NOTE: Length of push-pull rods is measured between centerline of rod and bolt holes.

(9) Adjust interconnected push-pull tubes to the following lengths:

Inboard interconnect push-pull tubes	23. 80 inches
Center interconnect push-pull tubes	23. 80 inches
Outboard interconnect push-pull tubes	33. 35 inches

(10) Tighten jam nuts on interconnect tubes finger-tight to maintain these dimensions.
(11) Install interconnect tubes between bellcranks. Do not safety.

NOTE: Do not safety any parts until rigging is completed or necessary adjustments cannot be accomplished.

(12) Ensure that flap push-pull rods are free and straight. Do not attach to flaps.
(13) Adjust UP limit switches to mid-range of adjustment (refer to Figure 501). Insure flap actuator cam is tight on shaft.
(14) Operate flap actuator in UP direction until UP limit switch is actuated.
(15) Set flap chains (refer to Figure 502) in position on flap actuator sprockets.
  (a) Engage right bottom chain with aft sprocket so that approximately 3-1/2 links extend around bottom side of sprocket.
  (b) Engage left top chain with forward sprocket so that three (3) links extend around top side of sprocket.
  (c) Connect turnbuckles. Do not safety.

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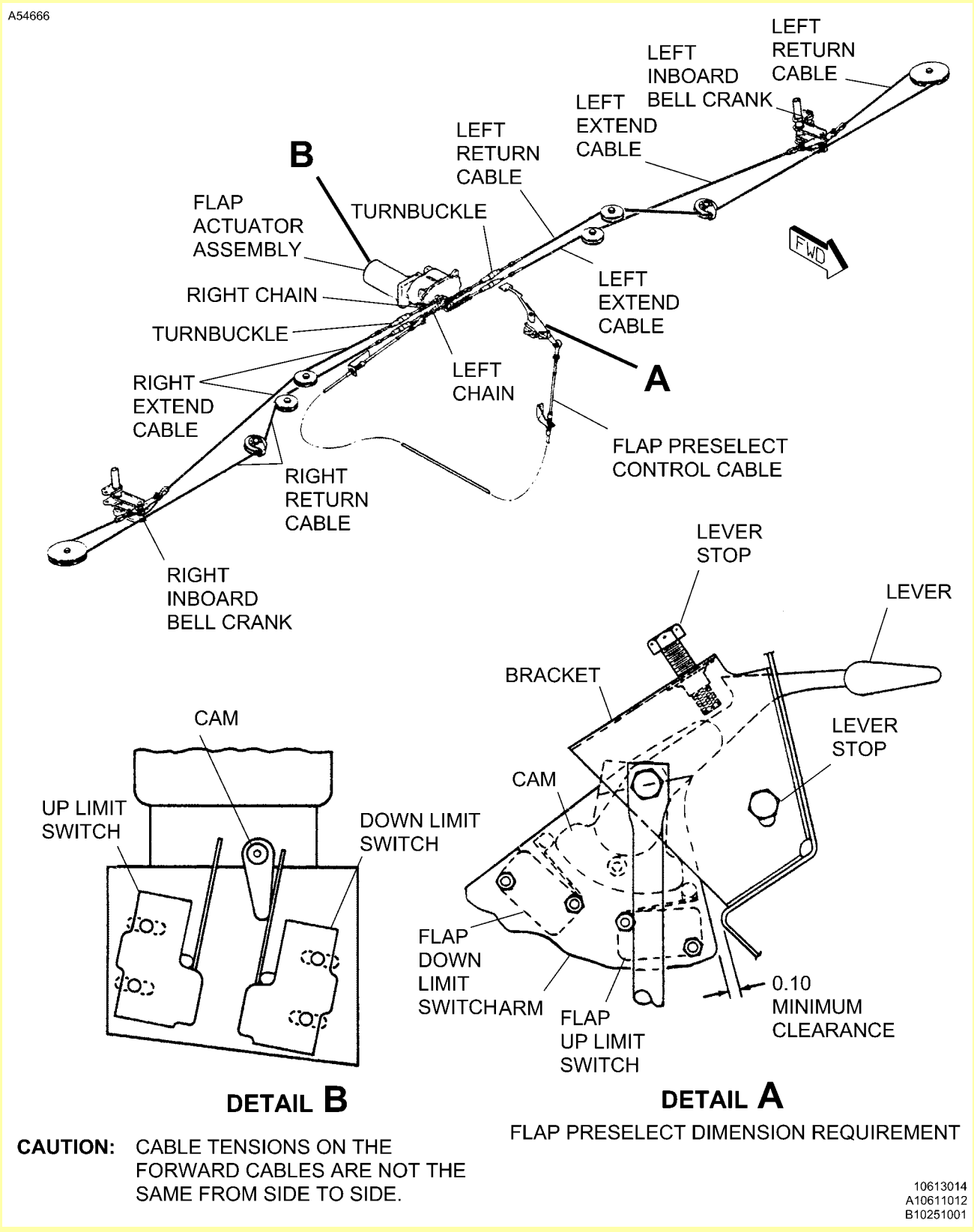

Flap Control System and Adjustment
Figure 501 (Sheet 1)

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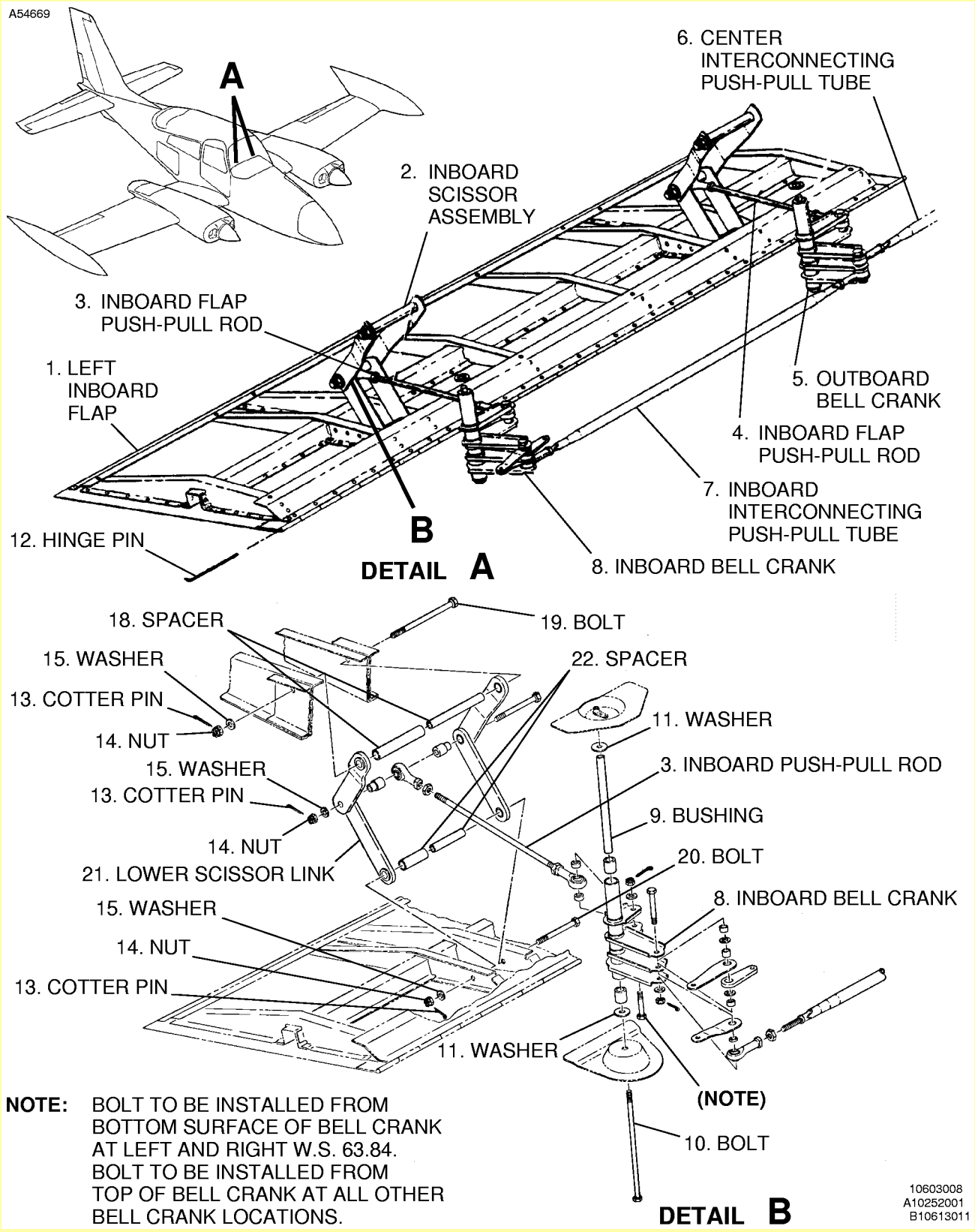

Flap Installation
Figure 502 (Sheet 1)

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(16) Adjust cables to position inboard bellcranks at 45 degrees relative to the rear spar or set to dimension (refer to Figure 503), and adjust all cables to 250 pounds tension.

CAUTION: Cable tension should be adjusted when ambient temperature is between 60°F and 90°F. Allow airplane to stabilize at or between these temperatures for at least four (4) hours. A maximum of three (3) threads allowed to extend out of turnbuckle.

(17) Adjust interconnect push-pull tubes as necessary to obtain bellcrank angle of 45 degrees or specified dimension for each remaining bellcrank (refer to Figure 503).
(18) Move flap control lever DOWN (or use momentary switch) to rotate bellcranks so that flap push-pull rods may be attached. Only a small amount of bellcrank rotation is necessary. Watch cam on flap motor. Stop motor when cam has moved no more than halfway between the limit switch arms.

CAUTION: Flap actuator DOWN switch and preselect DOWN limit switch are ineffective. Do not allow bellcranks to move any more than necessary to install flap rods or system may be damaged. Do not allow flap rods to pull up into wing or to bind on any part of the airframe or rods my be bent.

(19) Install push-pull rods to flaps.
(20) Raise flaps. When initial contact is made between flap trailing edge and wing trailing edge, stop travel and adjust rods as necessary. Do not allow flaps to close completely against wing unless both wing and flap trailing edges are parallel and flaps will fit evenly.
(21) Adjust right inboard flap and left inboard flap evenly. Do not attempt to set one side completely without setting the other side or damage to the system may result. Adjust outboard flaps in the same manner.
(22) Recheck UP limit switch for activation after each adjustment.

CAUTION: Do not allow flap panels to tighten excessively against wing. Aim a flashlight beam across flap panel skin. If skin deflects upwards after flap panel contacts wing trailing edge, flap panel is too tight. Adjust push rod as necessary.

(23) Attach an inclinometer to each flap panel using tape or other means. Be sure base of inclinometer is flat against bottom of flap panel. Check inclinometer for free operation and zero degree indication.
(24) Lower flaps using momentary switch or with a technician in the cockpit end at each wing. Look and listen for any unusual tension buildup in the cables or binding of push-pull tubes until flaps reach 37 degrees, +1 or -0 degrees, as indicated by the inclinometers.

CAUTION: Cable tensions on the forward cables are not the same from side to side.

(25) Rig both extend cables to 85 pounds, +10 or -10 pounds tension.

NOTE: Difference between right cable tension and left cable tension must not exceed 25 pounds.

(26) Adjust flap actuator DOWN limit switch to provide correct DOWN flap angle.
(27) Raise flaps to 0 degrees. Check UP limit switch for correct operation.
(28) Rig flap return cables to 225 pounds, +25 or -25 pounds tension.
(29) Disconnect 24 volt external power source.
(30) Safety all turnbuckles.

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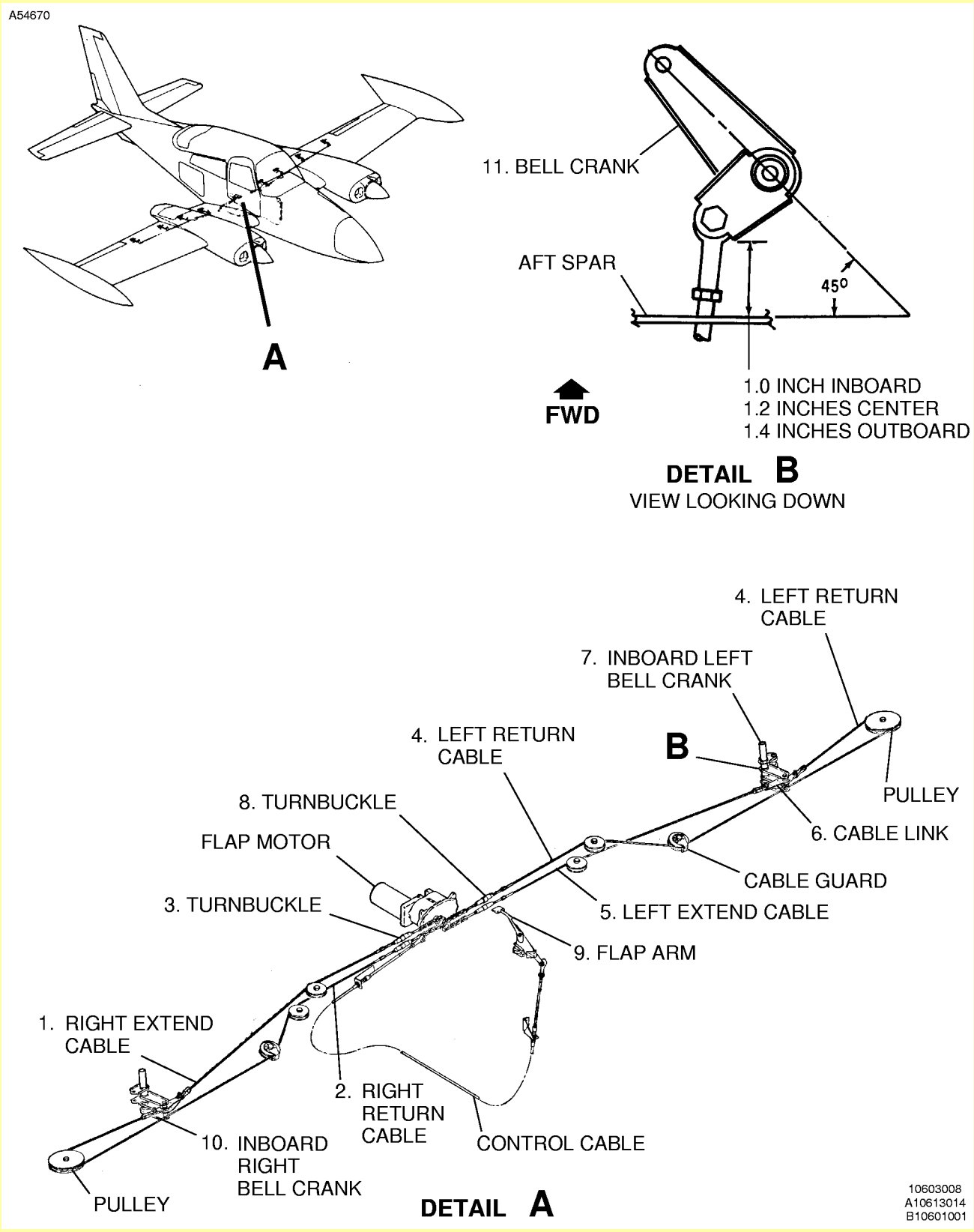

Flap Cable Installation
Figure 503 (Sheet 1)

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(31) Install floorboard.
(32) Install center carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(33) Install passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.

2. Flap Preselect System

A. Rigging.

NOTE: Verify flap control system rigging per above procedures before proceeding.

(1) Lower flaps to full DOWN position.
(2) Adjust control cable out 0.10 inch and secure clamp with bolt and nut. Clamp block must be located 0.50 inches, +0.25 or -0.25 inches from edge of flap pulley. Adjust conduit and/or cable end thread adjustment to obtain this dimension.
(3) Adjust conduit and/or cable end to position control arm to be parallel with lower edge of the lever as shown in Figure 501.
(4) Raise flaps to full UP position.
(5) Adjust both limit switches at flap preselect control such that switch rollers are snug against cam (Refer to Figure 501).
(6) Check for clearance between control arm and panel (refer to Figure 501). 0.10 inch minimum.
(7) If necessary, adjust control cable in control arm slot to obtain clearance.
(8) Move flap lever to 15 degrees detent. Loosen adjustment screw between flap preselect lever and cam (Refer to Figure 504).
(9) Check angle of flap panels. Panels must be at 15 degrees, +0 or -0 degrees. Move cam to obtain 15 degrees, +0 or -0 degrees downtravel.
(10) Tighten cam adjusting screw with flaps at this angle.
(11) Adjust pointer to 15 degree mark by bending wire (Refer to Figure 504).
(12) Match pointer arc with indicator block and guard block by adjusting block vertically. Slotted holes are provided for this adjustment.
(13) Adjust flap preselect lever UP stop bolt to limit to 0 degrees travel with 225 pounds, +25 or -25 pounds retract cable tension.
(14) Adjust lever DOWN stop bolt to limit lever to full DOWN travel, 35 degrees, +1 or -0 degree.
(15) Adjust flap/landing gear warning limit switch to activate alarm with flap handle 0.04 inch to 0.08 inch below 15 degree detent (Refer to Figure 504).
(16) Disconnect momentary switch (if used).
(17) Repeat check of flap travel, UP and DOWN. 15 degrees, +0 or -0 degrees DOWN, 15 degrees, +2 or -2 degrees UP, 35 degrees, +1 or -0 DOWN.
(18) Retract flaps. Place flap lever in full DOWN position. Note the time required for flaps to extend. This time should be nine to fourteen seconds.
(19) Place flap lever in full UP position. Time for flap retraction should be six to ten seconds.
(20) Safety all turnbuckles.
(21) Install access panels and floor panels, if required.
(22) Install carpets and seats, if required.
(23) Remove inclinometers from flap panels.

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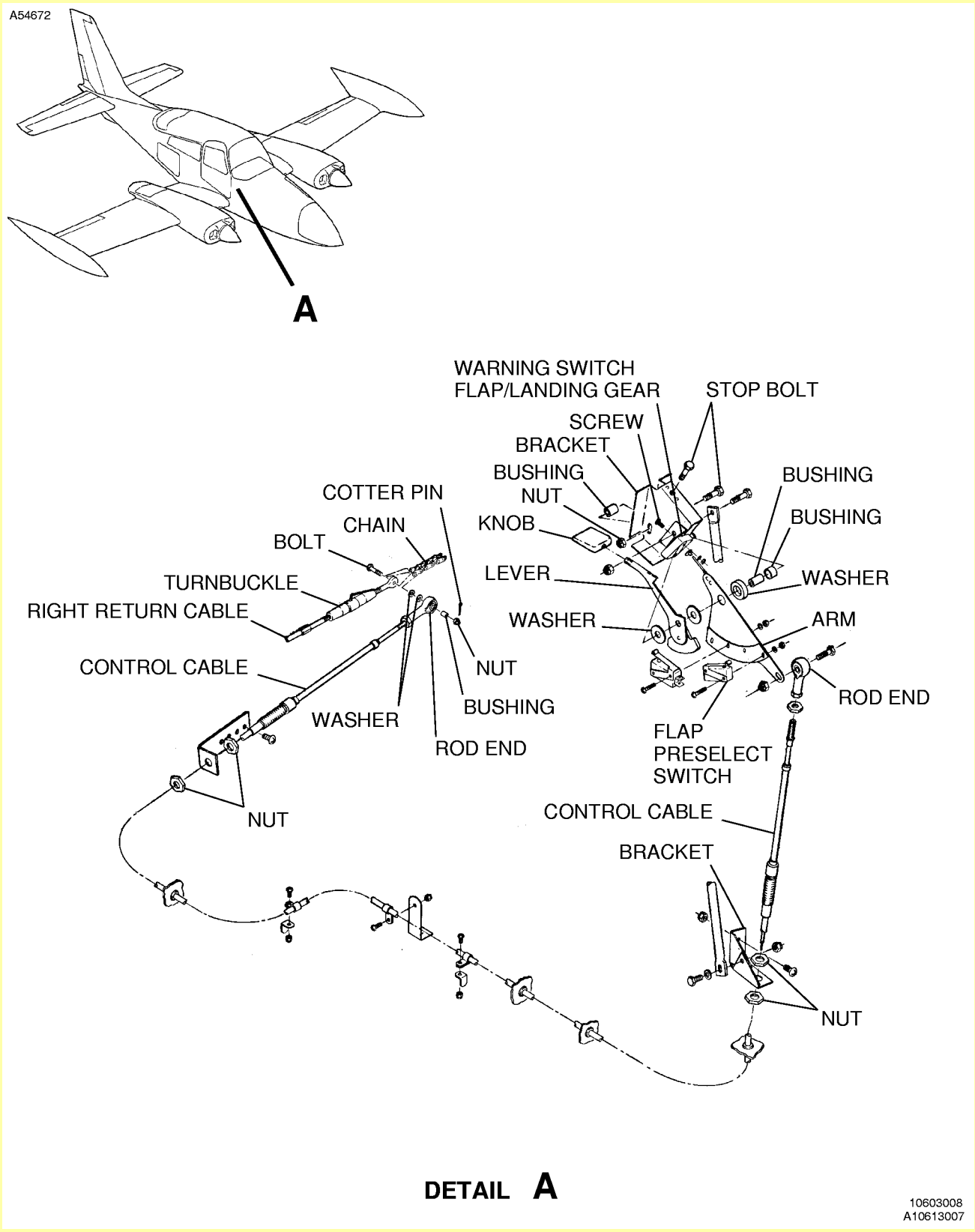

Flap Preselect System Installation
Figure 504 (Sheet 1)

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FLAPS - INSPECTION/CHECK

1. Flap Controls

A. Inspection.
(1) Inspect the flap surfaces for dents, nicks, cracks, corrosion, and proper flush fit in the UP position. Inspect flap hinges for cracked hinge sections. Acceptable limits are a maximum of two consecutive cracked sections provided a minimum of three noncracked hinge sections must exist between the cracked sections unless the discrepant hinge sections are within ten hinge sections from either end of the flap. In which case, ten hinge sections must exist between two cracked hinge sections. Inspection interval must be reduced to 50 hours while operating airplane under the acceptable limits. Replace hinge when cracks are beyond acceptable limits.
(2) Use Stoddard Solvent to remove dirt and grease in the flap scissor area. Visually inspect the flap scissors and attaching bolts for wear and security. Inspect bellcranks and push-rods for security. Check push-rods for bent rods, seized or worn bearings, loose lock nuts and use rod end inspection holes to verify sufficient thread engagement to reach inspection hole. Check cable seals for deterioration and lubrication. Pedestal end of cable does not have a seal. Check chains for excessive wear and rubbing on chain guards. Check for proper cable tensions and flap rigging. Check flap operation for proper flight operation.

NOTE: Individual broken wires are acceptable in primary and secondary control cables at random locations when no more than one broken wire occurs per inch, and no more than five broken wires in 10 inches. Additionally, in any area of broken wires, e.g., one inch each side of a broken strand, wear on adjacent wires in the strand may not exceed 40%.

2. Flap Control System Check

NOTE: Angular dimensions for checking flaps are measured by placing inclinometer on flap surface. Flap is in zero degree position when the trailing edge is streamlined with bottom surface of wing trailing edge.

A. Flap Deflection Check.
(1) Move flap lever to zero degree position, measure angle of flap.
(2) Move flap lever to 15 degrees, +0 or -0 degrees DOWN, measure angle of flap.
(3) Move flap lever to 35 degrees, +1 or -0 degrees DOWN, measure angle of flap.

B. Flap Cable Check.
(1) Remove passenger seats, refer to Chapter 25, Passenger Compartment - Removal/Installation.
(2) Remove carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(3) Remove aft interspar floorboards, refer to Chapter 53, Floor Panels - Removal/Installation.
(4) Place tensiometer on the return cables and read cable tension.
(5) Extend flaps, place tensiometer on the extend cables and read cable tension.
(6) Reinstall floorboards, passenger seats, and carpet.

C. Flap Inspection.
(1) Extend flaps.
(2) Remove seats, carpets, and floorboards as required to provide visual inspection of flap actuator assembly, cables, and pulleys.
(3) Install floorboards, carpets, and seats.

3. Operational Check Flap System

A. Flight Operational Check.
(1) Check flap operation for proper operating times as follows:
(a) Flight check to verify that flaps fully extend in 9 - 14 seconds, and retract in 6 - 10 seconds. Check extension and retraction times at 140 KIAS.
(b) If during flight check, the flaps will not extend and retract within the time limits described in step (a), remove the flap actuator motor and perform the following no load test:
1 Mount motor securely in a horizontal position.

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2 Connect motor as shown in Figure 601, to a variable 30 volt DC power supply.

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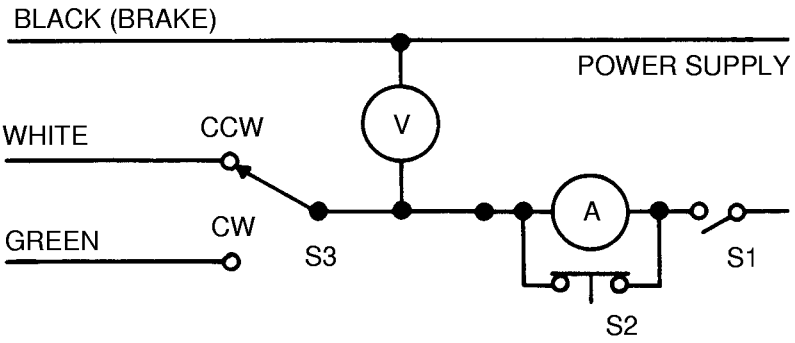

V = VOLTMETER, DC, 7.5/30/75, TYPE DP-11,
NO. 50-202011 RCPF
A = AMMETER, DC 5/20/50, TYPE DP-11,
NO. 50-202111 RXPS
S1 = SWITCH, SPST 30 AMPERE CAPACITY,
NO. 707
S2 = SWITCH - PUSH BUTTON NO. CR2940-UA202B
S3 = SWITCH, DPDT NO. 2565K5

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Schematic Test Connection Diagram
Figure 601

3 Close switch S3 for either direction.
4 Open switch S2 to read ammeter.
5 Close switch S1 to start motor.
6 Gradually increase voltage from zero until the brake releases.

NOTE: The brake releasing may be indicated either by sound or the armature starting to turn.

7 Read voltmeter when brake releases. Brake must release at or less than 18 volts.
8 Stop motor, close switch S3 for opposite rotation and repeat steps 3 thru 7.
9 Voltage must be within the same limits as previous rotation.
10 If the voltage is not within the same limits, refer to Flaps - Troubleshooting.
11 Run motor in each direction as shown connected in Figure 601, with 24 volts DC applied.
12 Open switch S2 and read ammeter current. The ammeter should read approximately 3.5 amperes under no load, when the RPM is approximately 1100 RPM.
13 Stop motor, close switch S3 for opposite rotation and repeat step 12.
14 Motor should operate within limits as described in step 12.
15 If the motor does not operate within the limits as described in step 12, refer to Flaps - Troubleshooting.

(c) If the motor will not meet operating requirements after performing no load test, replace motor and repeat step (a).
(d) If the flaps still will not meet flight check requirements, check system for binding or interference.
(e) If no evidence of binding or interference is found, flap actuator must be replaced or overhauled in accordance with Cessna Landing Gear and Flap System Components Overhaul/Parts Manual.

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CHAPTER 28

FUEL

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FUEL SYSTEM - GENERAL

1. Scope

A. This chapter describes those units and components which store and deliver fuel to the engine.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Storage describes that portion of the system which stores fuel.
   (2) Distribution describes that portion of the system which is used to distribute fuel from the filler connector to the storage system.
   (3) Indicating describes that portion of the system which is used to indicate the quantity, temperature, and pressure of the fuel.

3. Description

A. Fuel System. (Refer to Figure 1).
   (1) The fuel system consists of the main fuel supply (50 gallons usable each side) housed in wing tip tanks located on each wing tip. Two optional wing auxiliary fuel systems can be installed in addition to the main fuel system, providing either 40 or 63 usable gallons of additional fuel and an optional wing locker fuel system (20 gallons usable each side) may be installed in the forward section of each wing locker. Dual or single wing locker fuel system installations may be made. The entire fuel system has a maximum capacity of 203 gallons usable. The fuel capacities for all the different fuel systems are specified in Chapter 12, Fuel - Servicing.
   (2) Fuel may be fed from either main tank to either engine. Right and left auxiliary wing tanks are fed directly to their respective engines. Wing locker fuel is transferred to the main tanks where it is fed to the engines. Fuel transfer switches for wing locker fuel tanks are located on the panel and an indicator light illuminates when the corresponding wing locker fuel has been transferred.

B. Component Location Chart.

Component	Location
Drain Valves	Wing Gap Area and Under Each Fuel Tank
Boost Pump Relays	Wing Root LH and RH Transfer Pump
Transfer Pump	On Rib Outboard of Engine Nacelle
Pressure Switch	Engine Nacelle Aft Side of Engine
Selector and Strainer	Outboard of Engine Nacelles in Wing Leading Edge
Signal Conditioner	Outboard of Nacelle in Each Wing
Tank Vent Heaters	End of Vent Lines Below Fuel Tanks
Wing Locker Transfer Pumps	Outboard of Engine Nacelle

4. Tools and Equipment

NOTE: Equivalent substitute may be used instead of the following:

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Name	Number	Manufacturer	Use
Fuel Quantity Tester	Model 387991-003	Simmonds Precision Products, Inc. Panton Road Vergennes, VT 05491	Calibrate and test fuel quantity system.
Fuel Quantity Tester	Model TF20	Consolidated Airborne Systems 900 Third Avenue New Hyde Park Long Island, NY	Calibrate and test fuel quantity system.
Fuel Quantity Tester	Model TF889	Consolidated Airborne Systems	Calibrate and test fuel quantity system.
Fuel Quantity Tester	Model TF1820	Consolidated Airborne Systems	Calibrate and test fuel quantity system.
Fuel Quantity Tester	Model GTF-12	Gull Airborne Instrument, Inc. 55 Engineers Rd. Smithtown, NY	Calibrate and test fuel quantity system.
Fuel Quantity Tester	Model 2548GA	Barfield Instrument Corp. Miami, FL 23142	Calibrate and test fuel quantity system.
Fuel Quantity Tester	Model MD-2A	Consolidated Airborne Systems	Calibrate and test fuel quantity system.
Fuel Quantity Tester	Model 387016-1	Simmonds Precision Products, Inc.	Calibrate and test fuel quantity system.
Fuel Quantity Tester	Model 472090-003	Simmonds Precision Products, Inc.	Calibrate and test fuel quantity system.
Fuel Quantity Tester	Model 472090-007	Simmonds Precision Products, Inc.	Calibrate and test fuel quantity system.
Fuel Quantity Tester	Model 399000-005	Simmonds Precision Products, Inc.	Calibrate and test fuel quantity system.
Fuel Quantity Tester	Model MD-1	General Radio	Calibrate and test fuel quantity system.
Test Harness	991011-11 (See Note 1)	Cessna Aircraft Co. Wichita, KS 67277	Check fuel system signal conditioner and associated wiring.
Test Harness	101-00411	Barfield Instrument Corp. Miami, FL 23142	To individually check fuel system probes on Airplanes 414-0352 and On
Adapter	5190508-14	Cessna Aircraft Co.	This adapter required to interconnect Cessna harness with all test sets made by Conair-Bendix, Simmonds, Gull and General Radio.
Adapter	112-0007 (See Note 1)	Barfield Instrument Corp.	This adapter required to interconnect Cessna harness with Barfield test set.
Adapter	2234-000-A000-20	Delta Electronics Beverly, MA	Alternate for 5190508-14
Multimeter	Model 260	Simpson Electro Ld.	To check continuity.

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Name	Number	Manufacturer	Use
Fuel Flow Breakout Box	5890010-1	Cessna Aircraft Co.	Check System.
Harness	5890010-4	Cessna Aircraft Co.	Use in conjunction with 5890010-1.
DVM (Digital Volt Meter)	804A	John Fluke Mfg. Co., Inc. P.O. Box 43210, MS #2B Mountain Lake Terrance, WA 98043	Use in conjunction with 5890010-1.
Frequency Counter		Commercial	Used in conjunction with 5890010-1.

NOTE: Supplied with each Barfield test set sold through Cessna Supply Division.

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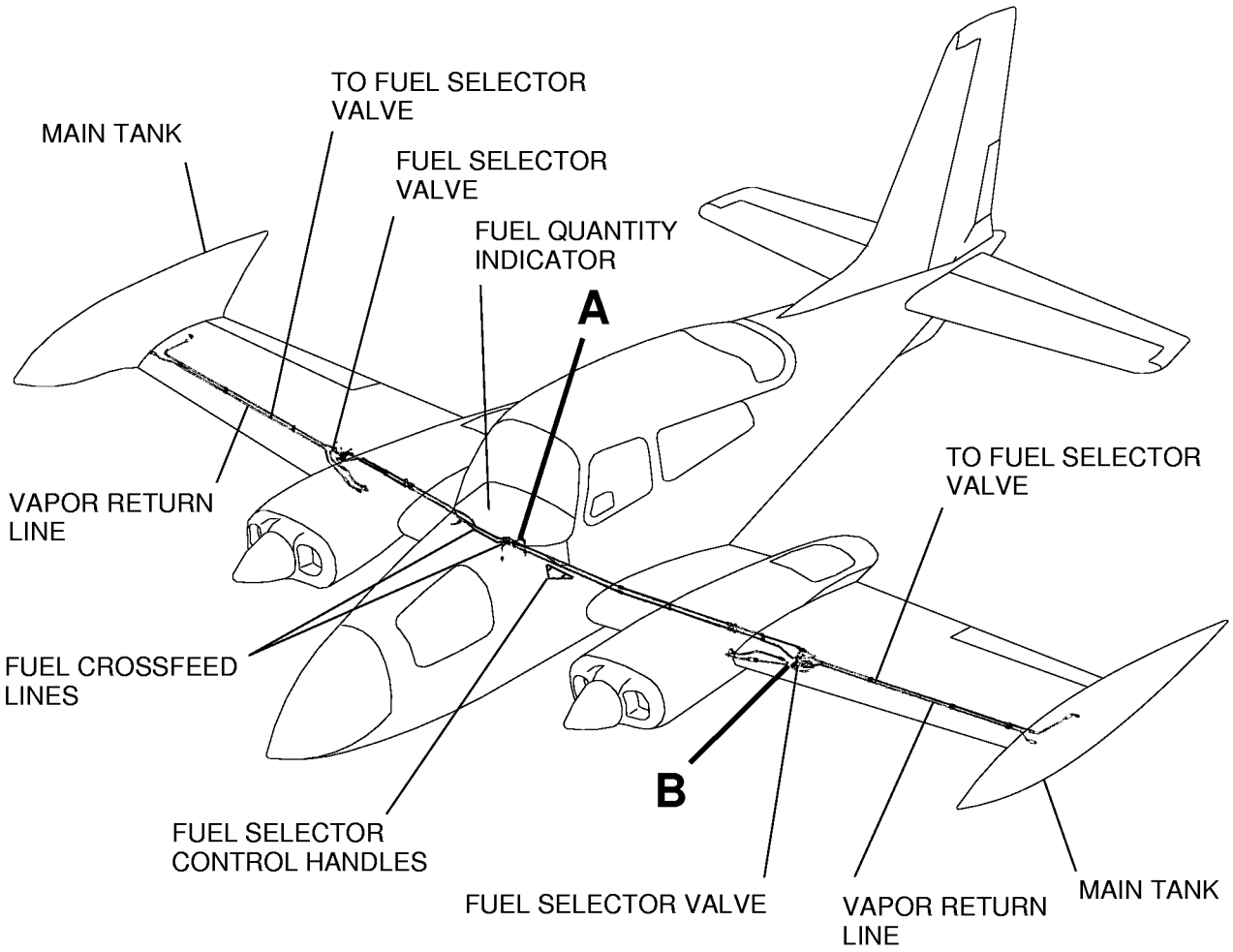

Main Fuel System and Plumbing Installation
Figure 1 (Sheet 1)

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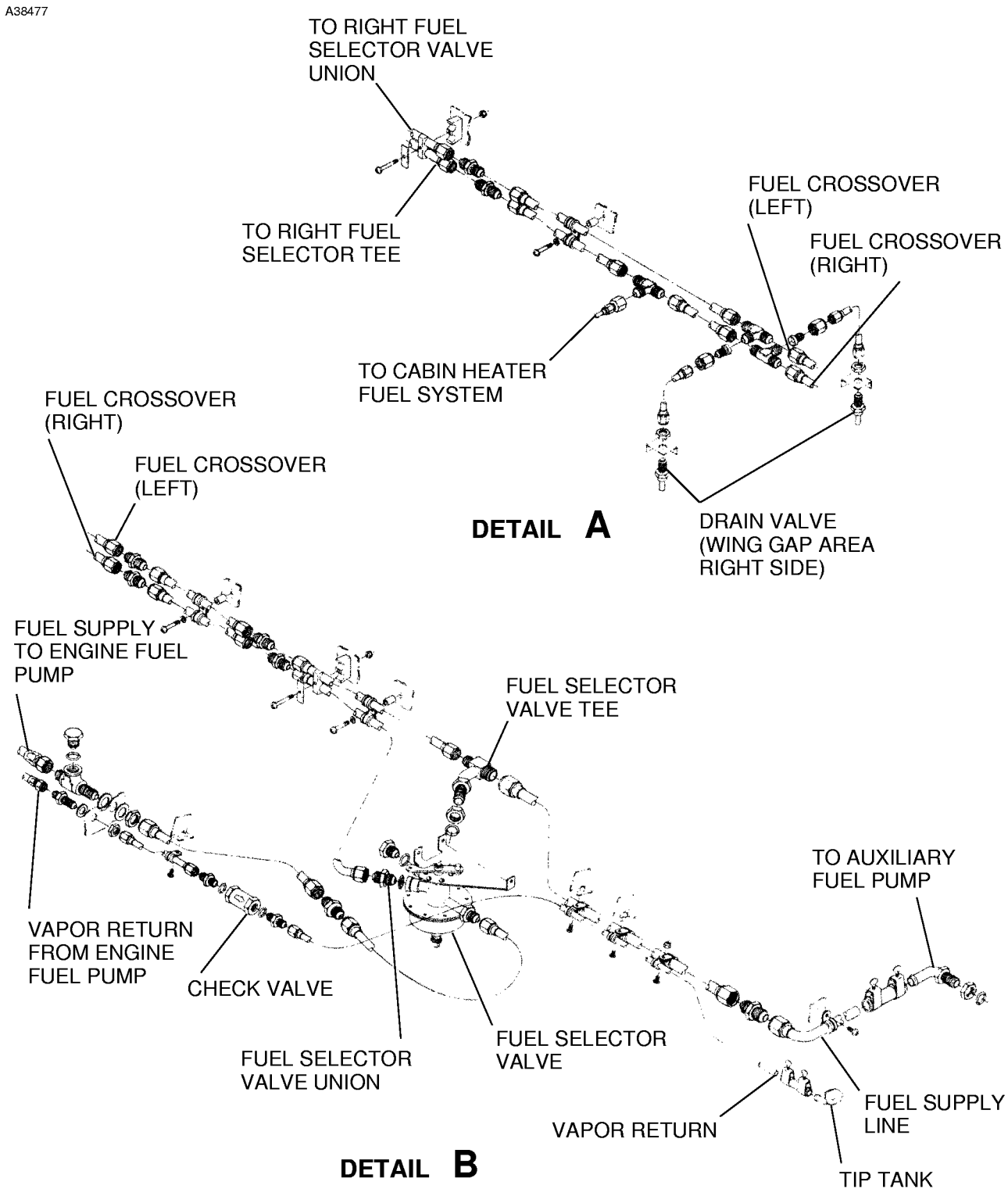

Main Fuel System and Plumbing Installation
Figure 1 (Sheet 2)

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FUEL SYSTEM - TROUBLESHOOTING

1. Troubleshooting

A. Troubleshooting the fuel system, is a matter of knowing what part of the-system can cause the trouble; isolating the trouble, correcting the system or replacing the components.
(1) For a guide to troubleshooting the fuel system, refer to Table 101.

NOTE: Perform fuel system troubleshooting with normal voltage applied. Actuate all necessary switches and circuit breakers.

Table 101. Fuel System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
AUXILIARY FUEL PUMP RUNS AT SLOW SPEED WITH AUXILIARY PUMP SWITCH ON AND ENGINE NOT RUNNING.	Unserviceable fuel pressure switch.	Replace fuel pressure switch.
AUXILIARY FUEL PUMP RUNS AT HIGH SPEED WHEN SWITCH IS MOVED TO "ON" POSITION WITH ENGINES RUNNING.	Unserviceable fuel pressure switch.	Replace fuel pressure switch.
AUXILIARY FUEL PUMP INOPERATIVE IN PRIME POSITION.	Auxiliary pump circuit breaker open.	Check that appropriate fuel auxiliary pump circuit breaker is closed.
	Open circuit between pump and circuit breaker.	Repair open circuit.
	Unserviceable auxiliary fuel pump.	Replace auxiliary fuel pump.
WING LOCKER FUEL PUMP INOPERATIVE.	Open circuit breaker.	Check that circuit breaker is closed.
	Open circuit.	Check for open circuit. Repair open circuit.
	Unserviceable wing locker fuel pump.	Replace wing locker fuel pump.
MAIN FUEL TANK TRANSFER PUMP FAILS TO OPERATE.	Landing light circuit breaker open.	Check that appropriate landing light circuit breaker is closed.
	Open circuit between pump and circuit breaker.	Repair open circuit.
	Unserviceable main tank transfer pump.	Replace main tank transfer pump.
WING LOCKER FUEL TRANSFER LIGHTS INOPERATIVE.	Burned out bulbs.	Replace burned out bulbs.
	Open circuit.	Check for open circuit. Repair open circuit.
	Unserviceable pressure switch.	Replace pressure switch.

(2) For a guide to troubleshooting the indicating system, refer to Table 201.

NOTE: Perform fuel quantity indicating system troubleshooting with normal voltage applied. Actuate necessary switches and circuit breakers.

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WARNING: Do not use ohmmeter for checking probe and probe wiring in airplane. Always use the capacitance fuel system test box for maintenance and troubleshooting the fuel indicating system.

Table 102. Fuel Quantity Indicating System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
NO FUEL QUANTITY INDICATOR.	Low fuel.	Check fuel tank capacity. Fill tank as required.
	Unserviceable indicator.	Replace indicator with known good indicator. Replace indicator if unserviceable.
	Loose connections or open circuit.	Check circuitry and correct as required.
	Unserviceable signal conditioner.	Check for unserviceable signal conditioner. Replace as required.
	Unserviceable fuel sensor.	Replace fuel sensor.
INDICATOR READS INACCURATE FUEL QUANTITY.	Improperly calibrated fuel system.	Check fuel system calibration. Adjust as required.
	Unserviceable adjustment fuel indicating system.	Replace signal conditioner.
	Unserviceable indicator.	Replace indicator.
POINTERS CHANGE READING WHEN OTHER AVIONICS ARE OPERATED.	Hi Z shield shorted to ground.	Check for Hi Z shield shorted to ground. Correct circuitry.
	Unserviceable indicator.	Replace indicator.
	Unserviceable signal conditioner.	Replace signal conditioner.
ERRATIC INDICATOR READINGS.	Unserviceable indicator.	Check indicator. Replace if unserviceable.
	Incorrect system grounds.	Check all system grounds. Correct as required.
	Unserviceable tank sensor.	Replace tank sensor.

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FUEL STORAGE - DESCRIPTION AND OPERATION

1. Description

A. Main Fuel System.

(1) The main fuel system consists of the main tanks, auxiliary fuel pumps, fuel transfer pumps, fuel selector control system, indicating system, overboard vent, and necessary fuel plumbing.

(2) The main fuel tanks (wing tip tanks) integrally sealed (wet) are, located at the tip of each wing. Each tank consists of: a tail cap, nose cap, fuel filler, auxiliary fuel pump, fuel transfer pump, fuel sensor, drain valve, plumbing and electrical wiring. A sniffle valve is located on top of each tank aft of the filler cap. The valve will vent the tank should the overboard vent become clogged or obstructed. The main tank, also, incorporates a vapor return line, routed from the tank to the engine-driven fuel pump, the line is utilized to return unused fuel from the engine-driven fuel pump to the main tank.

(3) The auxiliary fuel pump, which is electrically operated, is located at the bottom of each main tank. The fuel pump provides fuel under pressure when activated by the pilot from a switch on the control panel. The pump feeds fuel to the selector valve and in turn the selector valve routes fuel to the engine-driven fuel pumps. The auxiliary pump is controlled by two switches, one for each main tank (left and right). The switches are both a three-position, center OFF switch. When placed in the LOW position, the auxiliary pump provides pressure for purging. When the auxiliary pump switch is placed in the HIGH position, the auxiliary pump operates at high speed.

(4) The fuel transfer pump, which is electrically operated, is mounted on the aft bulkhead access cover of each main tank. Transfer pump access is gained by removing the tail cap. The pump transfers fuel from the nose section of the main tank to the center baffle area, where the fuel is picked up and routed to the engine by either the engine-driven fuel pump or the main tank auxiliary fuel pump. The fuel transfer pump prevents the possibility of fuel starvation to the engine during steep angles of descent with a low quantity of fuel.

(5) The fuel selector control system consists of left and right fuel selector controls located between the front seats on the cabin floor; a left and right fuel selector valve, located in each wing just forward of the main spar, and outboard of the nacelle. Each selector valve has four positions which allows fuel to flow to the respective engine from the left tank, right tank, the auxiliary tank (optional), or stop all fuel flow through the valve. Each fuel selector valve has a fuel strainer located on the bottom of the valve, and a quick-drain valve to remove moisture and sediment. Each selector is connected to the corresponding fuel selector control by a flex cable.

(a) The fuel selector control on the right, controls fuel flow to the right engine through the corresponding selector valve by allowing fuel to be used from right main tank, right auxiliary tank (optional) or through the crossfeed system, from left main tank. The fuel selector control on the left, controls fuel flow to the left engine through the corresponding selector valve by allowing fuel to be used from the left main tank, left auxiliary tank, or through the crossfeed system from the right main tank. The fuel selection controls are rotary-type and operate mechanically through a 270 degree range by a gear arrangement and a flex cable to each fuel selector valve. The fuel selector control has four positions. The positions are: LEFT MAIN, RIGHT MAIN, LEFT AUXILIARY and OFF; RIGHT MAIN, LEFT MAIN, RIGHT AUXILIARY and OFF. The fuel selector control handles indicate the position of the selector valves. The fuel selector control handles are protected by a guard to prevent the possibility of switching or movement by pilot's or copilot's feet.

(6) The main and auxiliary (optional) fuel systems have a capacitance type fuel quantity indicating system that is compensated for specific gravity and reads in both pounds and gallons. The system consists of: an indicator, a fuel indicator selector switch mounted in the bottom of each wing outboard of the nacelle; one, fuel sensor mounted in each main tank. If auxiliary (63 gallon) fuel tanks (optional) are installed, two fuel sensors are located in the inboard tank and one fuel sensor in the outboard tank. Each fuel sensor unit consists of two concentric electrodes. The inner electrode consists of a main body of insulating material with two conducting surfaces, separately insulated, around the outboard surface of the sensor unit. One conducting surface is grounded to a single point ground in the indicator and the other surface is connected to the signal conditioner input bridge. The outer electrode is an aluminum tube coated with insulating material on the outside. Openings in the sensor unit allow fuel to flow between electrodes to the

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same level as that in the tank. Fuel between the electrodes is the variable dielectric factor of the capacitor. Capacitance of the sensor units which are part of the system bridge circuit provides a continuous signal to the signal conditioner and is amplified to the fuel quantity indicator.

(a) The fuel quantity indicator is a dual indicator, providing a left and right-hand indication for the main fuel system as well as left and right-hand indication for the auxiliary fuel tanks (optional). When the fuel selector control handle is placed in the MAIN position, the fuel quantity indicator will indicate fuel in the main tanks. When the fuel selector control handle is placed in the AUXILIARY position, an indicator light located under the indicator will be illuminated, indicating that the fuel selector valve is in the auxiliary position and the fuel quantity indicator will indicate auxiliary fuel. An override switch is provided for monitoring the fuel quantity in the opposite system. When the fuel selector control handles are placed in the MAIN position and the override switch is positioned to "AUX" the fuel quantity indicator will read AUXILIARY FUEL. When the fuel selector control handles are placed in the AUXILIARY position, the light will illuminate and the indicator will indicate AUXILIARY FUEL. If the override switch is placed in the MAIN position the fuel quantity indicator will indicate MAIN FUEL. The auxiliary indicator lights are illuminated any time the selector switches are in the AUXILIARY position, regardless of the position of the override switch.

(7) The fuel low level warning system is an optional system consisting of warning lights in the annunciator panel, a weed type switch mounted on the sending unit of each main fuel tank and associated wiring. A corresponding warning light will illuminate when the remaining fuel in the right or left main tank is sixty pounds or below.

(8) Airplanes 310R0001 thru 310R0023, a vent heater is utilized on each main tank overboard vent line. The vent heater is electrically operated and prevents the vent line from freezing. Airplanes 310R0024 thru 310R2140, a vent scoop is utilized on the overboard vent line to prevent the forming of ice.

B. Auxiliary Fuel System (40 Gallon).

(1) The auxiliary fuel system (optional) consists of: a rubber fuel cell, just outboard of the nacelle of each wing; two fuel sensor units, one in each fuel cell; a fuel drain in each fuel cell; fuel filler caps, fuel select switch, override switch and necessary plumbing. The auxiliary fuel system plumbing connects to the fuel selector valve in each wing and the system is vented by plumbing to each wing main tank. The fuel select switches are mounted on a bracket on top of each fuel selector valve. When the fuel selector control handles are positioned to AUXILIARY, the fuel select switches will actuate and illuminate the corresponding auxiliary fuel indicator light regardless of the position of the fuel indicating override switch. The fuel indicating override switch is mounted on the instrument panel. The switch is normally positioned to OFF and has two momentary positions MAIN and AUX. The override switch is utilized in the system to provide a means for reading auxiliary fuel quantity when the fuel selector control handles are in MAIN or reading main fuel quantity when the fuel select control handle are in AUXILIARY position.

C. Auxiliary Fuel System (63 Gallon).

(1) The auxiliary fuel system (optional) consists of: two auxiliary fuel cells, located outboard of each wing nacelle; three fuel senior units (two in the inboard fuel cell and one in the outboard fuel cell); fuel filler caps, fuel select switch, override switch, fuel drains (inboard fuel cell), and necessary plumbing. The auxiliary fuel system plumbing connects the two fuel cells of each wing together, then routes the fuel from the inboard fuel cell to the corresponding fuel selector valve. The system is vented by plumbing to each wing main tank. At the inboard fuel cell bottom surface a drain valve is utilized to drain residual fuel from the cell. The fuel select switches are mounted on a bracket on top of each fuel selector valve. When the fuel selector control handles are positioned to AUXILIARY, the fuel select switches will actuate and illuminate the corresponding auxiliary fuel indicator light regardless of the position of the fuel indicating override switch. The fuel indicating override switch is mounted on the instrument panel. The switch is normally positioned to OFF and has two momentary positions, MAIN and AUX. The override switch is utilized in the system to provide a means for reading auxiliary fuel quantity, when the fuel selector control handles are in MAIN or reading main fuel quantity when the fuel select control handles are in AUXILIARY position.

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D. Sniffle Valve (Refer to Figure 1).
   (1) The sniffle valve is located In the top of each main tank aft of the filler cap. This valve will vent the tank should the overboard vent become clogged or obstructed

E. Wing Locker Fuel System.
   (1) The wing locker fuel system (optional) consists of: a fuel cell mounted in the forward portion of each wing locker; an electrically operated, manually controlled fuel transfer pump; a pressure switch to control the panel indicating lights and transfer switches; a drain valve, check valve, vent, heater, and necessary plumbing. There are no separate fuel selector controls or fuel quantity indicator for the wing locker fuel system. Fuel is pumped directly into the corresponding wing main fuel tank with independent fuel transfer pumps. There are no fuel return lines installed in the wing locker fuel system; therefore, it is necessary the airplane be flown with the fuel selector control handles on MAIN until thirty gallons of fuel remains in the main tanks, before transferring fuel from the wing locker fuel cells. Switches are provided on a panel mounted on the instrument panel to control the individual wing locker fuel transfer pumps. Individual indicator lights (press to test) are mounted directly below each transfer switch. The indicator light for each wing locker fuel cell will illuminate, indicating that fuel from that fuel cell has been transferred when the fuel pressure from that fuel cell drops actuating the fuel pressure switch.

F. Fuel Vent Heaters.
   (1) Vent heaters installed on each vent tube prevent the vent from freezing of vapors.

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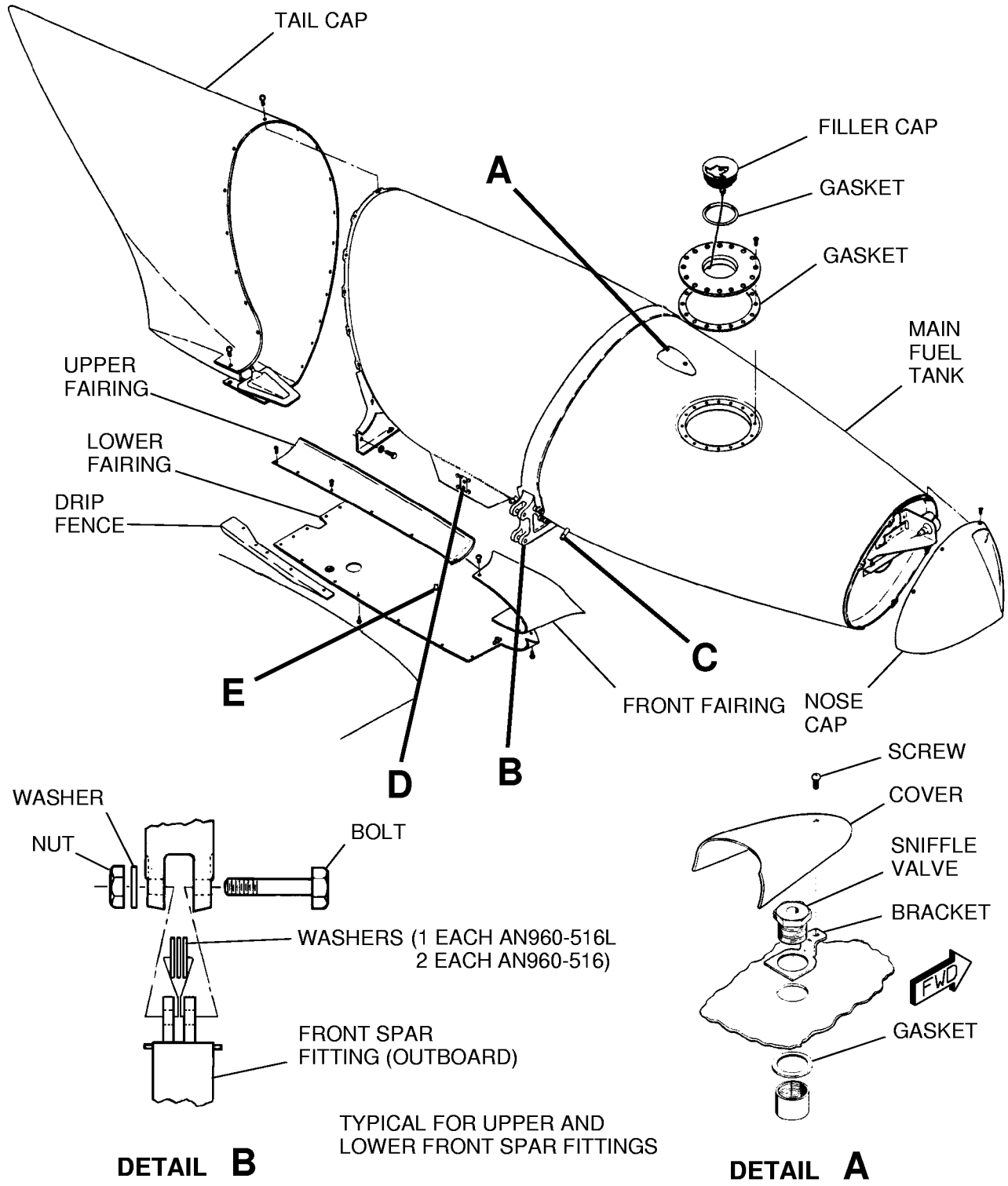

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Main Fuel Tank Installation
Figure 1 (Sheet 1)

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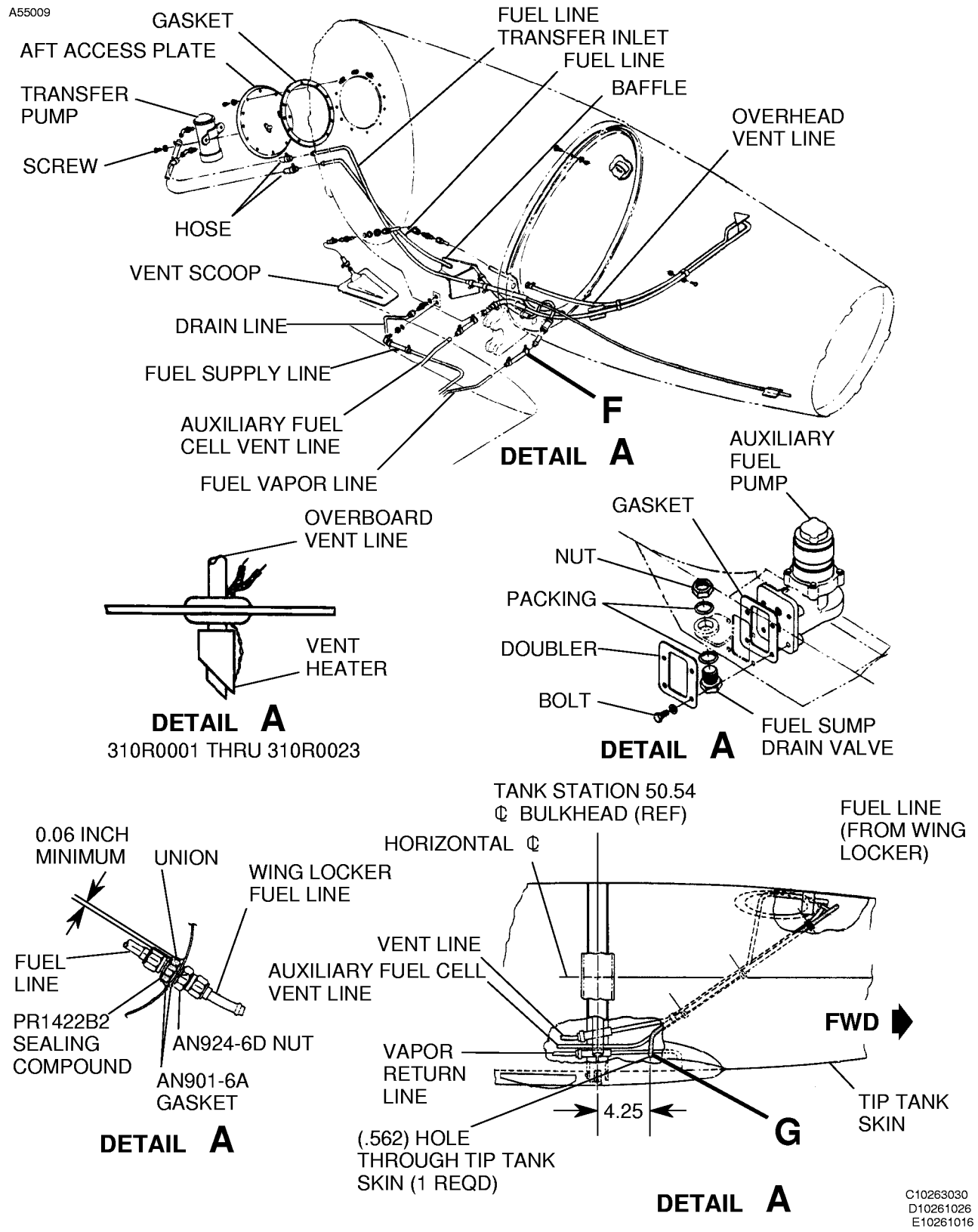

Main Fuel Tank Installation
Figure 1 (Sheet 2)

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FUEL STORAGE - SERVICING

1. Defueling

A. General.
(1) The fuel tanks can be defueled by the gravity method or using the defueling pump on the service truck. It is recommended the defueling truck be used prior to using the gravity method to expedite defueling. Procedures are the same for either left or right wing.

B. Defueling.

CAUTION: During defueling, ensure the nozzle is grounded to the airplane.

CAUTION: During all defueling procedures, fire fighting equipment must be available. Two ground wires from different points on the airplane to separate approved ground stakes shall be used to prevent ungrounding of the airplane, due to accidental disconnection of one ground wire.

(1) Turn OFF all electrical power.
(2) Turn fuel selector valve handles OFF.
(3) Remove fuel filler cap and insert defueling nozzle.
(4) Remove as much fuel as possible through the filler opening.

WARNING: Residual fuel accumulation in the wing is a fire hazard. Use care to prevent the accumulation of such fuel.

(5) Remove drain valves from bottom side of tank and drain remaining fuel in a clean. open container. Use defuel pump to remove fuel from container. Drain right hand crossover drain lines at wing gap.

2. Flushing Fuel System

A. General.
(1) After removal and installation of fuel system components or repairs to the main tank, the system should be purged prior to servicing main tank.

B. Flushing Fuel System.

CAUTION: During flushing, ensure the nozzle is grounded to the airplane.

(1) Ensure all electrical power is OFF.
(2) Mixture levers CLOSED.
(3) Remove engine cowling on applicable side of airplane where repairs were made or maintenance was performed.
(4) Disconnect fuel supply line at engine-driven fuel pump and connect defueling pump in accordance with defueling procedures.
(5) Attach a clean flexible hose with an (8) eight micron filter in line to the disconnected fuel supply hose and return this line to main tank filler opening.
(6) Add a minimum of (40) forty gallons of fuel to main tank.

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CAUTION: During all defueling procedures, fire fighting equipment must be available. Two ground wires from different points on the airplane to separate approved ground stakes shall be used to prevent ungrounding of the airplane, due to accidental disconnection of one ground wire.

(7) Connect an external power source.
(8) Flush main fuel line from left main tank to left-hand engine by setting the left fuel selector to LEFT MAIN and right fuel selector to OFF, and operating left auxiliary fuel pump approximately (5) five minutes.

NOTE: Observe fuel return to main tank. A solid stream of fuel should be observed.

(9) Flush main fuel line from left main to right-hand engine by setting left-hand fuel selector to OFF and right-hand fuel selector to LEFT MAIN. Operate left auxiliary pump (5) five minutes.
(10) Repeat steps 8 and 9 for opposite engine.

3. Purging Fuel Cell

WARNING: During fuel system maintenance practices, two ground wires attached from different points on the airplane to separate approved grounding stakes shall be used to prevent ungrounding of the airplane, due to accidental disconnection of one ground wire.

WARNING: Residual fuel draining from the lines is a fire hazard. Care should be exercised in disposal of such fuel when lines are disconnected to prevent its accumulation in the wing.

NOTE: During removal/installation of fuel system components, all openings or fittings shall be capped or plugged.

NOTE: When removing/installing lines at bulkhead fittings, insure that fitting is secured to prevent twisting line on opposite side from one being installed. Hold fitting with wrench while loosening/tightening line connection.

A. General.
(1) To reduce the possibility of an explosion during repair, purge fuel tanks and fuel cells with an inert gas such as Argon. Since Argon is heavier than air, it will remain in the fuel tank or cell during the repair. Repairs shall be made using nonsparking tools (air motors, plastic scrapers, etc.). The use of a portable vapor detector (Mine Safety Appliance Explosimeter, Model 5 Indicator) to detect the presence of explosive gases is also recommended.

B. Purging Fuel Cell.
(1) Defuel the airplane. Refer to Defueling .
(2) Insert hose through filler opening into fuel tank.
(3) Attach hose to inert gas container and allow inert gas to flow into the fuel tank until all explosive gas vapors are dissipated.

NOTE: The length of time required to fill the fuel tank with inert gas is dependent upon rate of flow and tank capacity.

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FUEL STORAGE - REMOVAL/INSTALLATION

1. Main Fuel Tank

A. Removal (Refer to Figure 401).

WARNING: During fuel system maintenance practices, two ground wires attached from different points on the airplane to separate approved grounding stakes shall be used to prevent ungrounding of the airplane due to accidental disconnection of one ground wire.

NOTE: During removal/installation of fuel system components, all openings or fittings shall be capped or plugged.

NOTE: When removing/installing lines at bulkhead fittings, insure that fitting is secured to prevent twisting line on opposite side from one being installed. Hold fitting with wrench while loosening/tightening line connection.

NOTE: Removal/Installation procedures are the same for either tank

(1) Defuel the airplane. Refer to Fuel Storage - Servicing.
(2) Remove fairings drip fence (Airplanes 310R0024 thru 310R2140) and tail cap to gain access to attach points.
(3) Open drain valve and drain residual fuel from tank.
(4) Disconnect hoses and electrical connections.
(5) Remove main tank by removing nuts, washers and bolts.
(6) If tank disassembly is desired, disassemble tank as shown in Figure 401.

B. Installation (Refer to Figure 401).
(1) If tank was disassembled, reassemble as shown in Figure 401. If a new tip tank is being installed and the airplane has been fitted with optional wing locker fuel, locate and drill a (.562) hole aft and on the same horizontal plane as the existing vapor return line using dimensions as shown. Refer to Figure 401.

NOTE: Ensure area inside tip tank is dry, then form a trap or container inside tip tank at (.562) hole location using tape to minimize the possibility of burrs or cuttings entering cavity.

(a) Remove all burrs and tape. Sand edge of hole slightly to obtain a smooth edge. Clean all surfaces to be sealed with a low moisture solvent, using a lint free cloth for solvent applications.

NOTE: Do not allow cleaning solvent to evaporate; wipe dry.

(b) Mix sealant Pro-Seal 890 per manufacturer's instructions or if Semkits are used refer to Chapter 56, Windows - Removal/Installation for cartridge (Semkit) mixing instructions.
(c) Apply sealant over all seams, rivets, fittings and possible leak areas.
(d) Check for leaks as follows:
1 Seal off all hose and access holes in tank. Close vent hole by covering with tape.
2 Apply 2 PSI air pressure to tank and apply a soap solution to outside.

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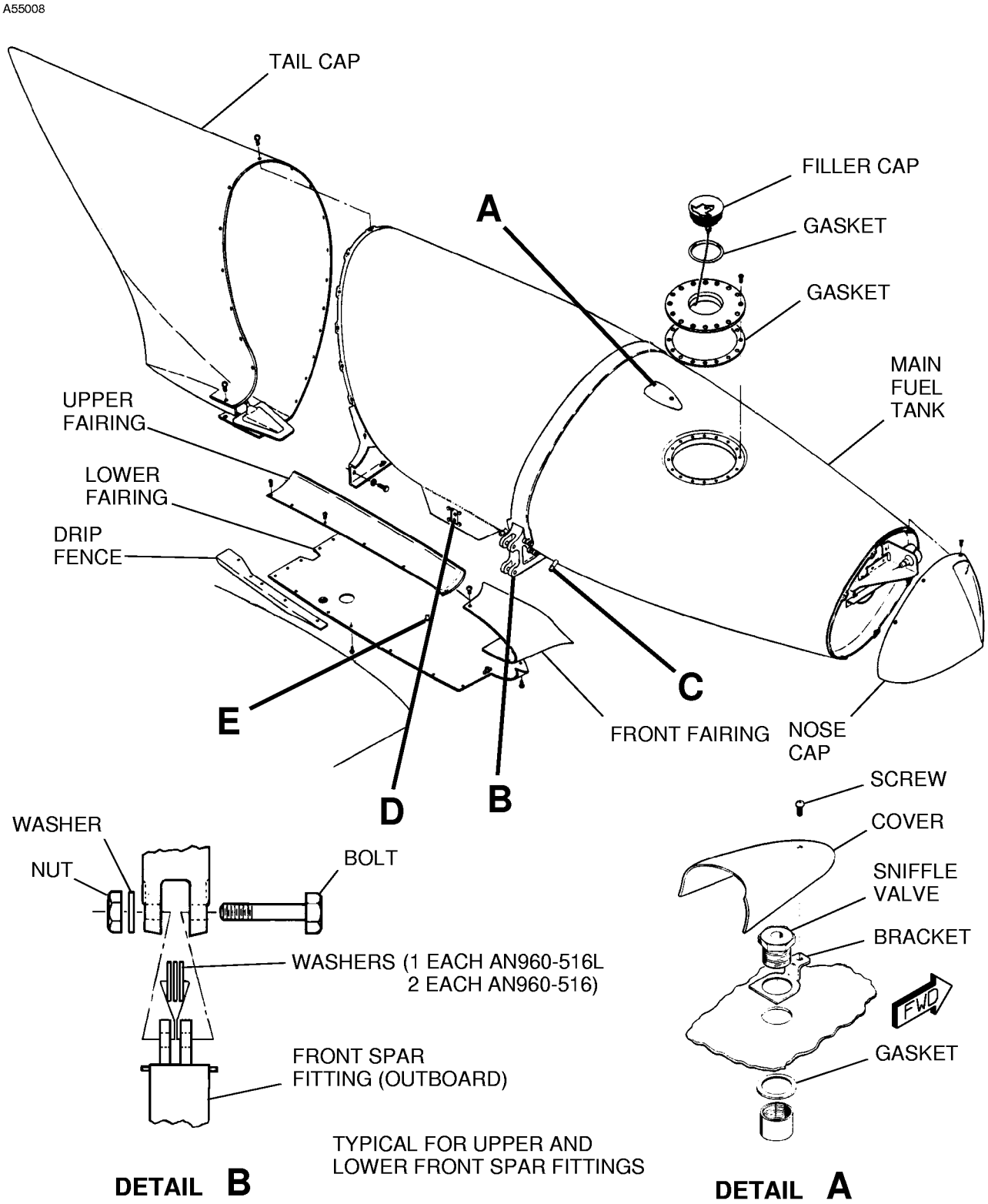

Main Fuel Tank Installation
Figure 401 (Sheet 1)

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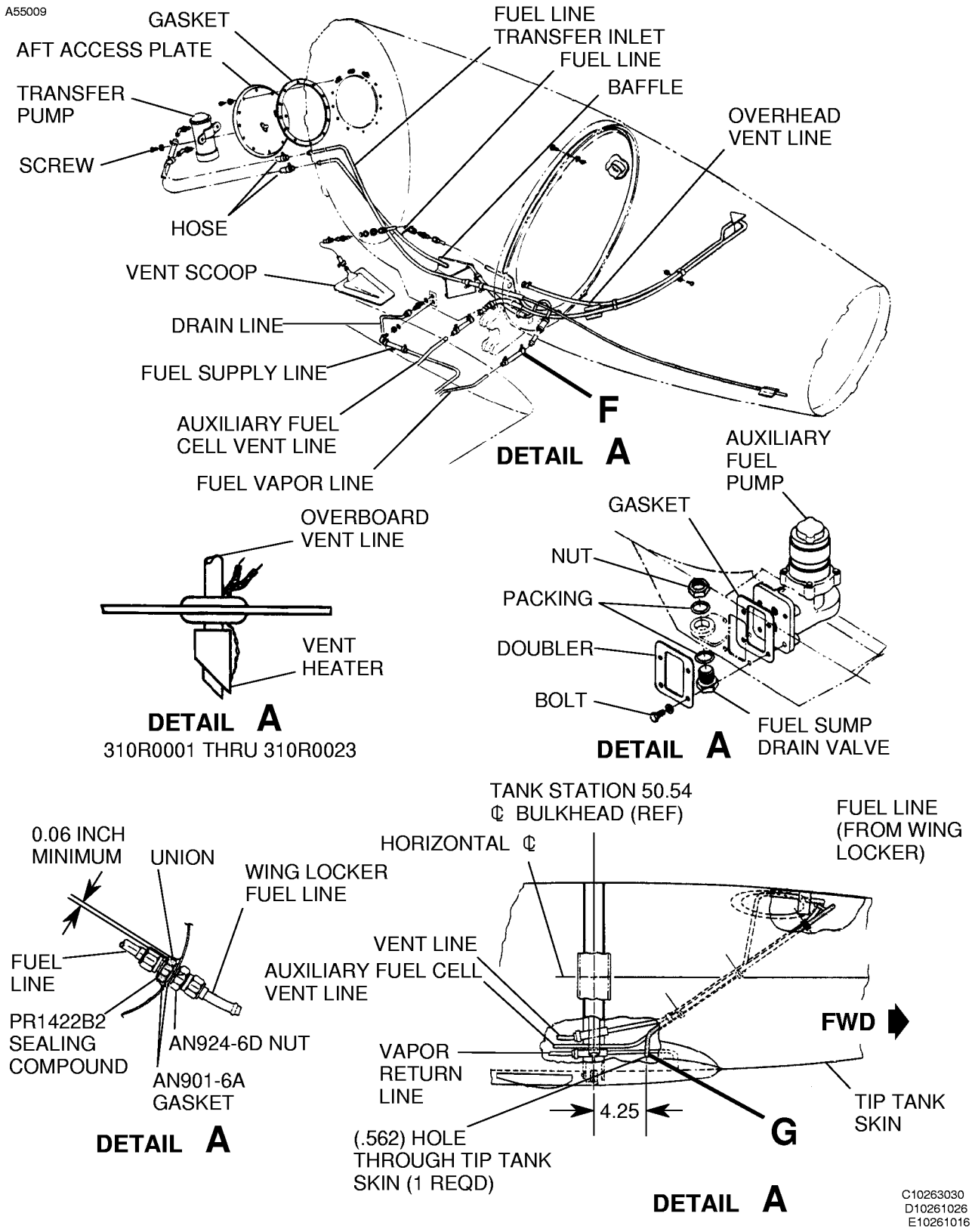

Main Fuel Tank Installation
Figure 401 (Sheet 2)

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WARNING: After leak check, remove all tape and materials used for sealing.

(2) Position main tank on wing tip and secure with bolts, washers and nuts. Torque front spar mounting bolts to 120 inch-pounds, +20 or -20 inch-pounds and aft spar mounting bolt to 60 inch-pounds, +10 or -10 inch-pounds.

NOTE: Make sure washers are properly installed between wing front spar fitting as shown in Figure 401.

(3) Connect hoses and electrical connections.
(4) Install tail cap drip fence (Airplanes 310R0024 thru 310R2140) and fairings.

CAUTION: Airplanes 310R0024 thru 310R2140, apply sealant (Pro-Seal 890, Class B) on joints between lower fairing, tail cap and drip fence, to prevent discharge fuel from vent scoop from entering wing structure.

(5) Close drain valve.

2. Sniffle Valve

NOTE: Removal/Installation procedures are the same for either main tank sniffle valve.

A. Removal (Refer to Figure 401).

CAUTION: Care should be taken to guard against foreign matter entering tank.

(1) Defuel the main tank. Refer to Fuel Storage - Servicing.
(2) Remove screw securing cover.
(3) Holding top half of sniffle valve, remove bottom of valve, washer and gasket.

B. Installation (Refer to Figure 401).

CAUTION: Care should be taken to guard against foreign matter entering tank.

(1) Position top half of sniffle valve in tank. Secure with bottom half of valve, washer and gasket.
(2) Install cover and secure with screw.

3. Fuel Vent Heater

A. Removal (Refer to Figure 401).
(1) Removal of the vent heater is not recommended. If heater is removed, refer to installation procedure.

B. Installation (Refer to Figure 401).
(1) Clean vent tube surface in the area where heater is to be installed with 280 grit sandpaper and Ketone (MEK).
(2) Bond vent heater to vent tube per dimensions shown, using epoxy cement Epon 834 with curing agent TTA in accordance with the manufacturer's instructions.
(3) Pot heater wires with Hysol EA9309 (Hysol Corp.) per manufacturer's instructions, to prevent damage.
(4) Connect heater electrical wires to airplane wiring. Refer to Chapter 24, Electrical Power.
(5) Check vent heater operation.

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4. Auxiliary Fuel Cell (40 - Gallon)

A. Removal (Refer to Figure 402).

NOTE: Removal/Installation procedures are the same for either fuel cell. However, on the left side the battery box must be removed.

(1) Position fuel selector control handles to OFF.
(2) Defuel wing affected. Refer to Fuel Storage - Servicing.
(3) Refer to Chapter 6, Dimensions and Areas. Remove access panels to gain access to fuel selector valve, sensor unit, and other wing access panels as required to gain access to fuel plumbing connections.
(4) Remove the fuel cap assembly and gasket by removing the attaching screws.
(5) Remove the fuel sensor unit. Refer to Fuel Indicating - Removal/Installation for removal and installation of fuel sensor unit.
(6) Remove the flange at outboard end of fuel cell by removing nuts, washers, doubler, gasket and flange (with electrical cable attached).
(7) (Refer to Figure 403). Loosen clamps and disconnect fuel strainer and vent line from fuel cell.
(8) (Refer to Figure 403). Remove the screws, securing the drain adapter to the lower skin.
(9) Disconnect the fuel cell fasteners and remove the fuel cell through the upper wing opening, vacated by the fuel cap assembly.
(10) If repair of the fuel cell is desired, refer to Fuel Storage - Approved Repairs for Fuel Cell Repair.

B. Removal (Refer to Figure 402).

NOTE: Inspect gaskets for damage prior to installation, if necessary replace.

(1) Before installing the fuel cell, inspect carefully the interior of the fuel cell cavity and cell bulkheads or supports for possible damage or corrosion.

NOTE: Tape the edges of all 1.0" and 1.5" diameter fuel transfer holes. Tape all internal rivet ends, sheet metal edges and irregularities which might damage the fuel cell bladder, with 1.25" wide Y-5425 Tape (3M Co.).

(2) Ensure drain assembly is installed on tank and secured with clamp.
(3) Insert fuel cell through fuel cap assembly opening. Arrange the cell in the correct position.
(4) Secure the fuel cell in place with fasteners.
(5) (Refer to Figure 403). Attach drain assembly to the lower wing skin with screws.
(6) Install fuel strainer and vent line to fuel cell with clamps.
(7) Install flange (with electrical cable attached) in the outboard fuel cell opening, using gasket, doubler, washers and nuts.
(8) Install fuel sensor unit. Refer to Fuel Indicating - Removal/Installation for removal and installation of fuel sensor unit.
(9) Install fuel cap assembly, using gasket and screws.
(10) Check fuel calibration. Refer to Fuel Distribution - Adjustment/Teat.
(11) Refer to Chapter 12, Servicing. Service the fuel system and leak check.
(12) Install access panels.

5. Inboard Auxiliary Fuel Cell (63 Gallon)

A. Removal (Refer to Figure 404).

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WARNING: During fuel system maintenance practices, two ground wires attached from different points on the airplane to separate approved grounding stakes shall be used to prevent ungrounding of the airplane, due to accidental disconnection of one ground wire.

WARNING: Residual fuel draining from the lines is a fire hazard. Care should be exercised in disposal of such fuel when lines are disconnected to prevent its accumulation in the wing.

NOTE: During removal/installation of fuel system components, all openings or fittings shall be capped or plugged.

NOTE: When removing/installing lines at bulkhead fittings, insure that fitting is secured to prevent twisting line on opposite side from one being installed. Hold fitting with wrench while loosening/tightening L.S. connection.

NOTE: Removal/Installation procedures are the same for either fuel cell. However, on the left side the battery box must be removed.

NOTE: The following torques are to be applied to all clamped nipple fittings:

FITTING ID	TORQUE IN/LB
.25 THRU .50	12-16
.75 THRU 1.00	15-20
1.50	25-30
2.00	30-35
3.00	35-40

(1) Position fuel selector control handles to OFF.
(2) Defuel applicable wing. Refer to Fuel Storage - Servicing.
(3) Refer to Chapter 6, Dimensions and Areas. Remove access panels to gain access inboard and outboard sensor units, fuel selector valve, and other wing access panels as required to gain access to fuel plumbing connections.
(4) Remove inboard fuel cell cover plate by removing screws and gasket.
(5) Remove the fuel sensor units. Refer to Fuel Storage - Removal/Installation for removal and installation of fuel sensor units.
(6) (Refer to Figure 405). Loosen clamps and disconnect strainer, vent line and fuel lines from fuel cell.
(7) Remove the screws, securing the drain assembly adapter to the lower skin.
(8) Disconnect the fuel cell fasteners and remove the fuel cell through cover plate opening.
(9) If repair of the fuel cell is desired, refer to Fuel Cell Repair, in Fuel Storage - Approved Repairs.

B. Installation (Refer to Figure 404).

NOTE: Inspect gaskets for damage prior to installation, if necessary replace.

(1) Before installing the fuel cell, inspect carefully the interior of the fuel cell cavity and cell bulkheads or supports for possible damage or corrosion.

NOTE: All internal rivets and protrusions must be protected by the proper type tape (one inch-wide P/N Y9265 3M Co. or equivalent).

(2) Ensure drain assembly is installed on tank and secure with clamp.
(3) Insert fuel cell through cover plate opening. Arrange the fuel cell in the correct position.

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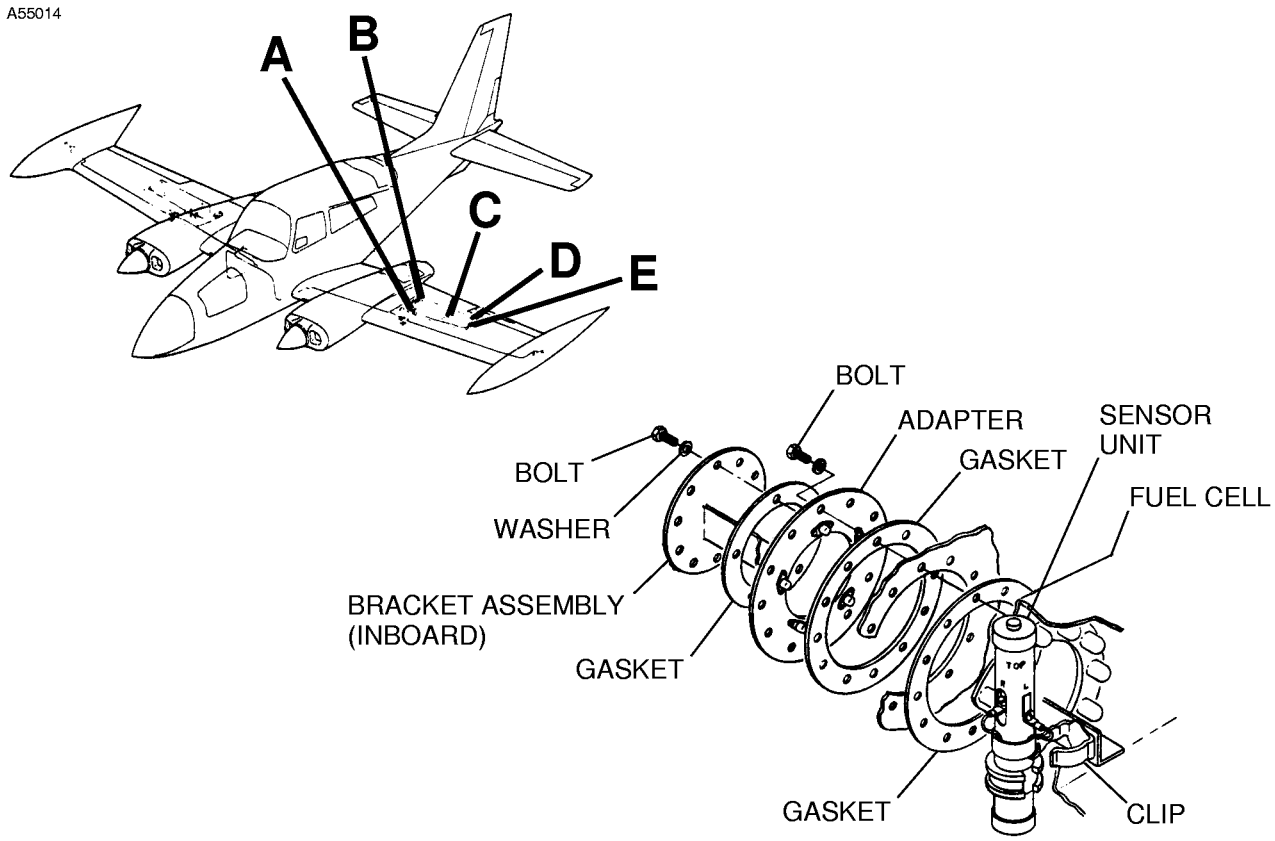
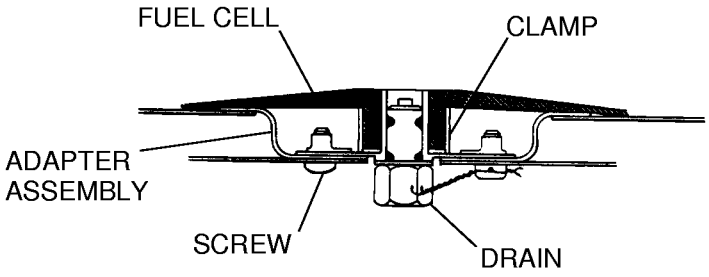


DETAIL A



DETAIL B

10263015
A10261021
B10261023

Auxiliary Fuel Cell (40 - Gallon) Installation
Figure 402 (Sheet 1)

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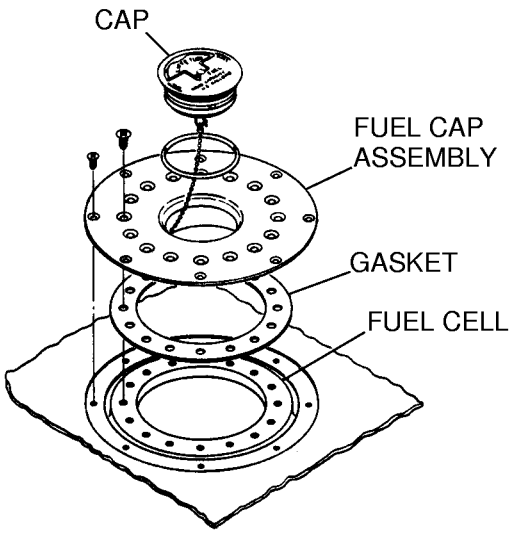
A55015



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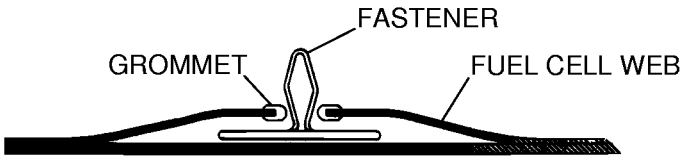
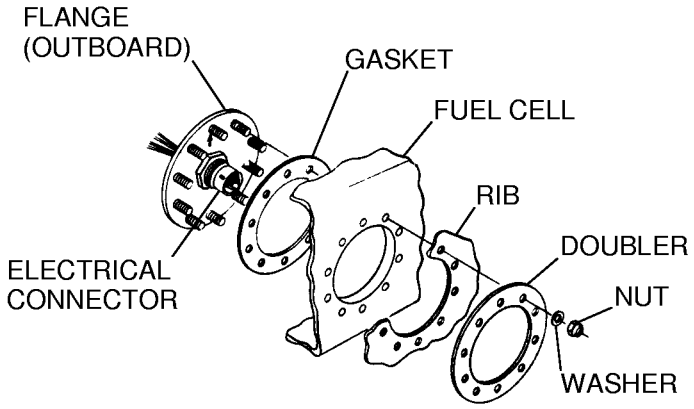


DETAIL D



DETAIL E

C10262010
D10261023
E10261020

Auxiliary Fuel Cell (40 - Gallon) Installation
Figure 402 (Sheet 2)

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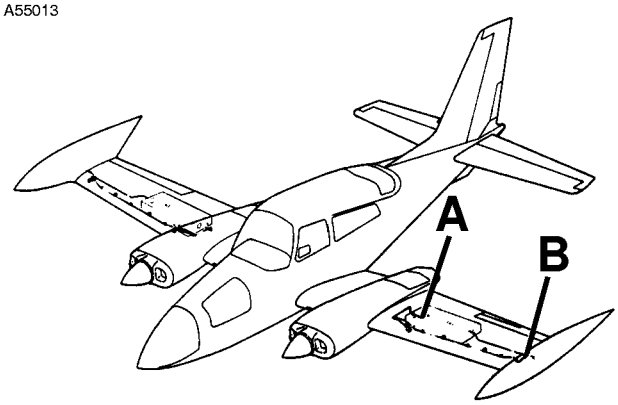
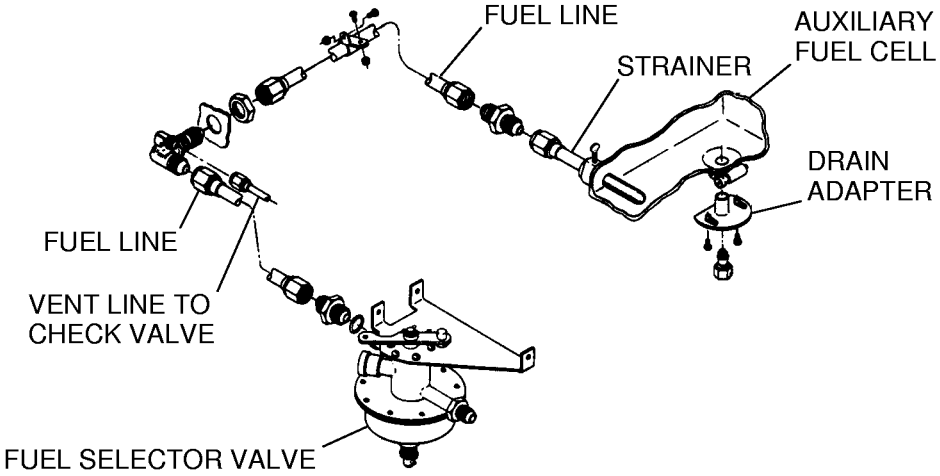
A55013





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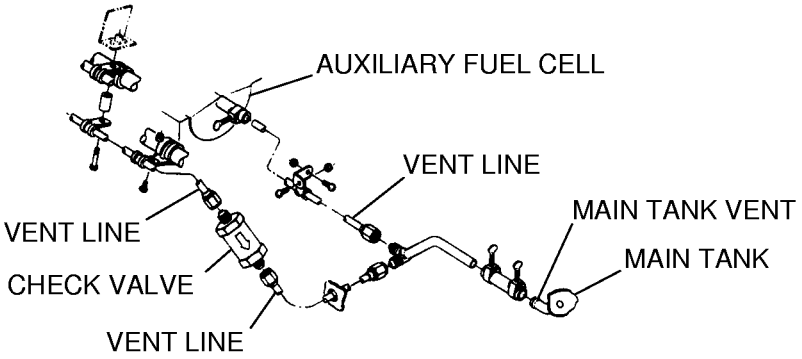

DETAIL B

10263016
A10262011
B10261018

Auxiliary Fuel System (40 Gallon) and Plumbing Installation
Figure 403 (Sheet 1)

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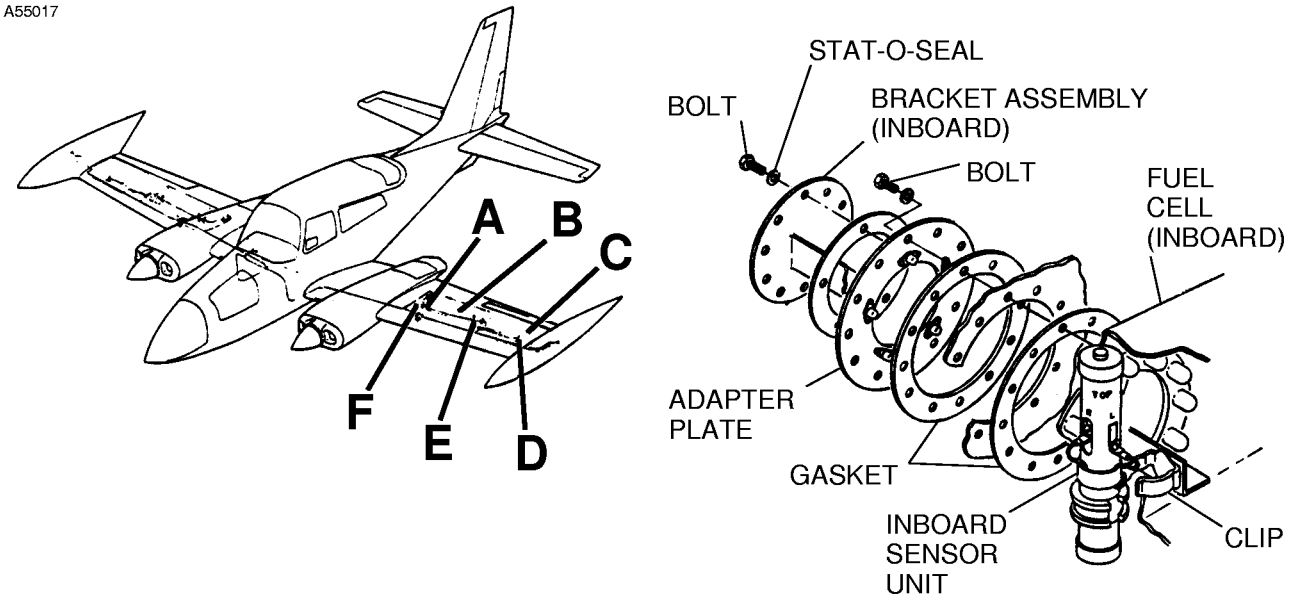

10263014
A10261021
B10262010
C10262010

Auxiliary Fuel Cell (63 Gallon) Installation
Figure 404 (Sheet 1)

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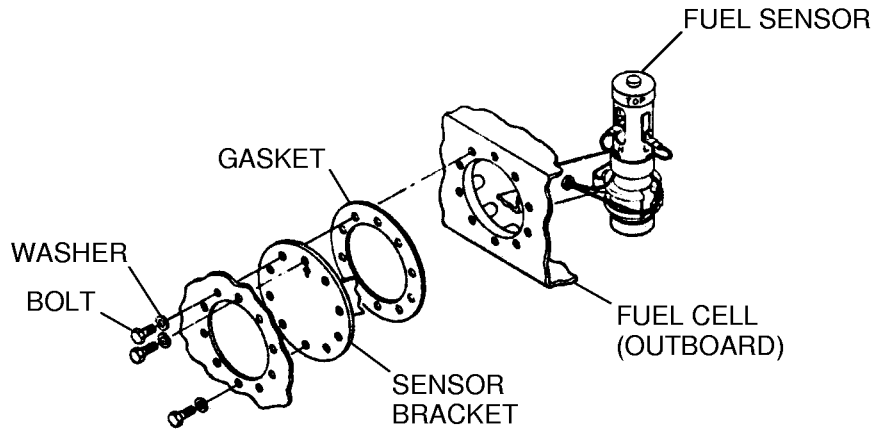
A55018



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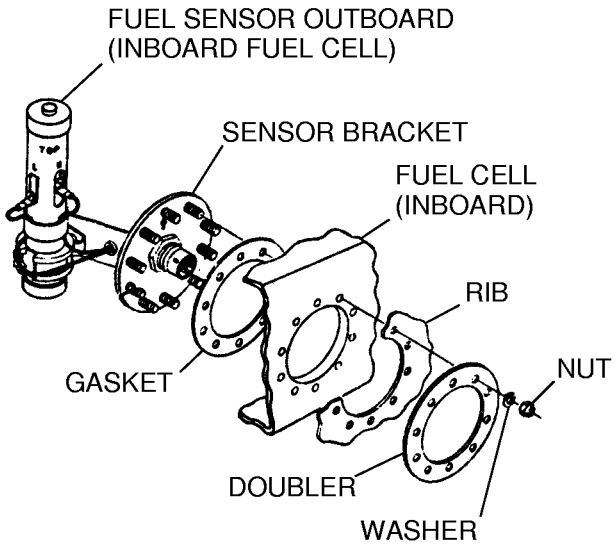
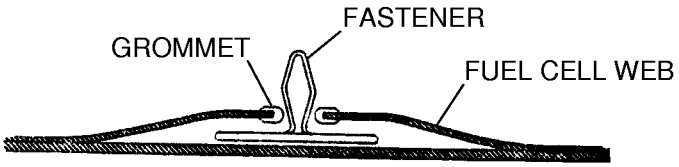


DETAIL E



DETAIL F

D10261022
E10261007
F10261023

Auxiliary Fuel Cell (63 Gallon) Installation
Figure 404 (Sheet 2)

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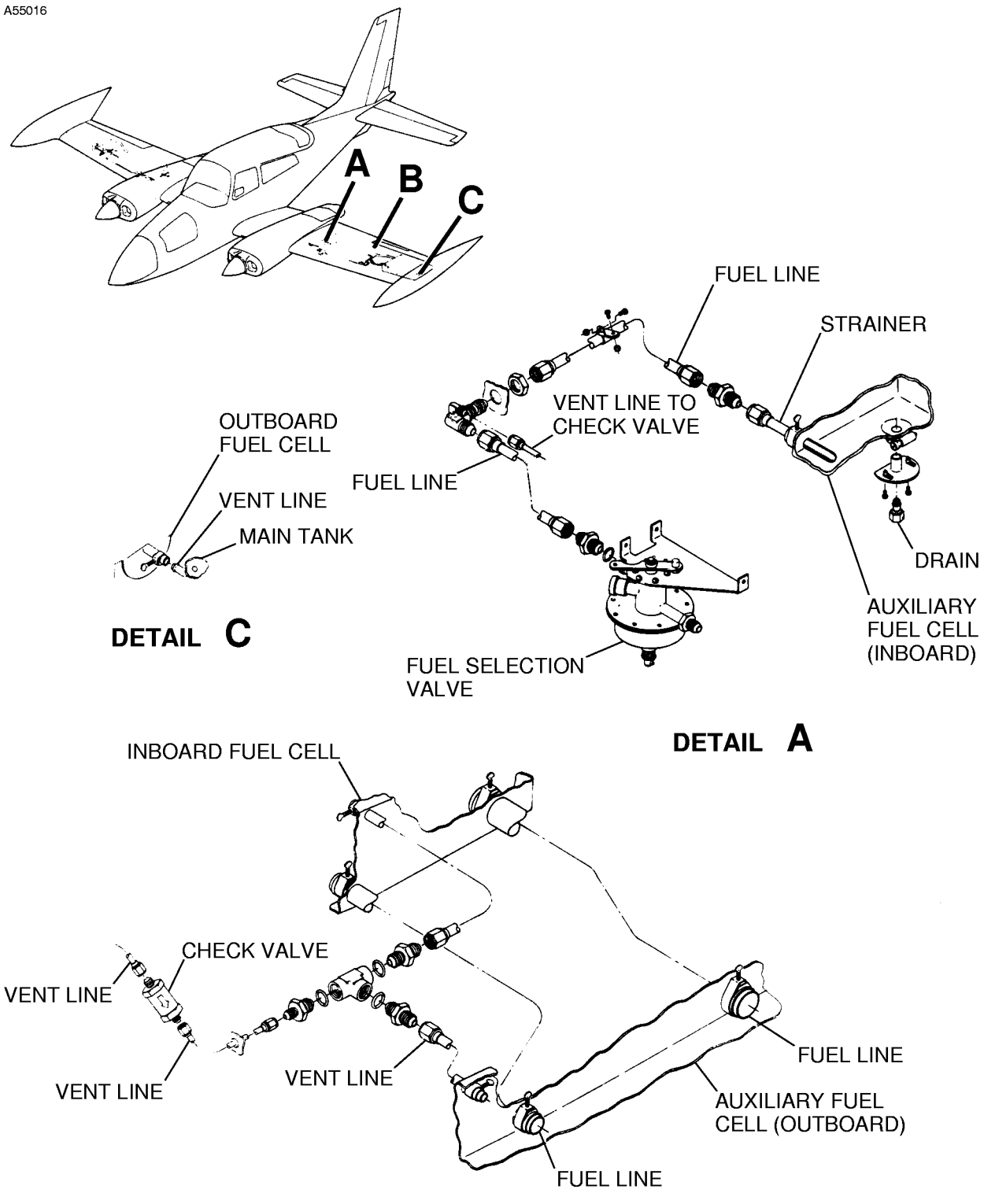

Auxiliary Fuel System (63 Gallon) and Plumbing Installation
Figure 405 (Sheet 1)

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(4) Secure the fuel cell in place with fasteners.
(5) (Refer to Figure 405). Attach drain assembly to the lower wing skin with screws.
(6) Install strainer, vent lines and fuel lines to fuel cell with clamps.
(7) Install fuel sensor units. Refer to Fuel Storage - Removal/Installation for removal and installation of fuel sensor units.
(8) Install cover plate, using gasket and screws.
(9) Check fuel calibration. Refer to Fuel Storage - Inspection/Check.
(10) Refer to Chapter 12, Servicing. Service the fuel system and leak check.
(11) Install access panels.

NOTE: Improper hose clamp positioning can result in nipple fitting damage. Always position hose clamps on internal nipple fittings in such a manner to allow the screw body to travel freely as the screw is tightened. Never allow the screw body to wedge between the nipple fitting O.D. and the tank wall. This can result in false torque readings, leaks and/or damage to the nipple fitting.

6. Outboard Auxiliary Fuel Cell (63 Gallon)

NOTE: Removal/Installation procedures are the same for either fuel cell.

A. Removal (Refer to Figure 404).
(1) Position fuel selector control handles to OFF.
(2) Defuel applicable wing. Refer to Fuel Storage - Servicing.
(3) Refer to Chapter 6, Dimensions and Areas. Remove wing access panels and fairings to gain access to outboard fuel cell sensor, and to fuel plumbing as necessary.
(4) Remove fuel cap assembly by removing screws and gasket.
(5) Remove the fuel sensor unit. Refer to Fuel Storage - Removal/Installation for removal and installation of fuel sensor units.
(6) (Refer to Figure 405). Loosen clamps and disconnect vent lines and fuel lines from the fuel cell.
(7) Disconnect the fuel cell fasteners and remove the fuel cell through the fuel cap assembly opening.
(8) If repair of the fuel cell is desired, refer to Fuel Cell Repair, in Fuel Storage - Approved Repairs.

B. Installation (Refer to Figure 404).

NOTE: Inspect gaskets for damage prior to installation, if necessary replace.

(1) Before installing the fuel cell, inspect carefully the interior of the fuel cell cavity and cell bulkheads or supports for possible damage or corrosion.

NOTE: All internal rivets and protrusions must be protected by the proper type tape (1 1/4 inch wide P/N Y5425 3M Co. or equivalent).

(2) Carefully insert fuel cell through the fuel cap assembly opening. Arrange the fuel cell in the correct position.
(3) Secure the fuel cell in place with fasteners.
(4) Connect the vent lines and fuel lines to the fuel cell and secure with clamps.
(5) Install the fuel sensor unit. Refer to Fuel Storage - Removal/Installation for removal and installation of fuel sensor units.
(6) Install the fuel cap assembly, using gasket and screws.
(7) Check fuel calibration. Refer to Fuel Storage - Inspection/Check.
(8) Refer to Chapter 12, Servicing. Service the fuel system and leak check.
(9) Install all access panels and main tank fairings.

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7. Wing Locker Fuel Cell (Airplanes 310R0001 Thru 310R0800)

WARNING: During fuel system maintenance practices, two ground wires attached from different points on the airplane to separate approved grounding stakes shall be used to prevent ungrounding of the airplane, due to accidental disconnection of one ground wire.

WARNING: Residual fuel draining from the lines is a fire hazard. Care should be exercised in disposal of such fuel when lines are disconnected to prevent its accumulation in the wing.

NOTE: During removal/installation of fuel system components, all openings or fittings shall be capped or plugged.

NOTE: When removing/installing lines at bulkhead fittings, insure that fitting is secured to prevent twisting line on opposite side from one being installed. Hold fitting with wrench while loosening/tightening line connection. Refer to Chapter 20,Tubing, Hose and Fluid Fittings Maintenance Practices for expanded installation procedures.

NOTE: The removal/installation procedures are the same for either left or right wing locker fuel cell.

A. Removal (Refer to Figure 406).
   (1) Defuel applicable wing locker fuel cell. Refer to Fuel Storage - Servicing.

      NOTE: If main tank fuel quantity is low, wing locker fuel can be transferred by the wing locker transfer pump to the main tank.

   (2) Turn OFF all power.
   (3) Refer to Chapter 6, Dimensions and Areas. Remove wing access panels as required to gain access to plumbing connections.
   (4) Remove fuel cap assembly by removing screws and gasket.
   (5) Loosen clamps and remove fuel strainer, vent line and drain line from fuel cell.
   (6) Pull fuel cell fasteners DOWN; carefully fold the cell and remove cell through filler opening.

B. Removal (Refer to Figure 406).
   (1) Ensure fuel cell is clean, free from dirt and foreign material.
   (2) Carefully insert fuel cell through the filler opening and arrange the cell in the correct position by fastening the fasteners in place.
   (3) Install fuel strainer, drain line and vent line into fuel cell and tighten with clamps.

      NOTE: When tightening clamps, be careful not to overtorque.

   (4) Install fuel cap assembly, using gasket and screw.
   (5) Refer to Chapter 12, Servicing. Service the fuel system and leak check.
   (6) Install access panels.

8. Wing Locker Fuel Cell (Airplanes 310R0801 thru 310R2140)

A. Removal (Refer to Figure 407).

   NOTE: The removal/installation procedures are the same for either left or right wing locker fuel cell.

   (1) Defuel applicable wing locker fuel cell. Refer to Fuel Storage - Servicing.

      NOTE: If main tank fuel quantity is low, wing locker fuel can be transferred by the wing locker fuel transfer pump to the main tank.

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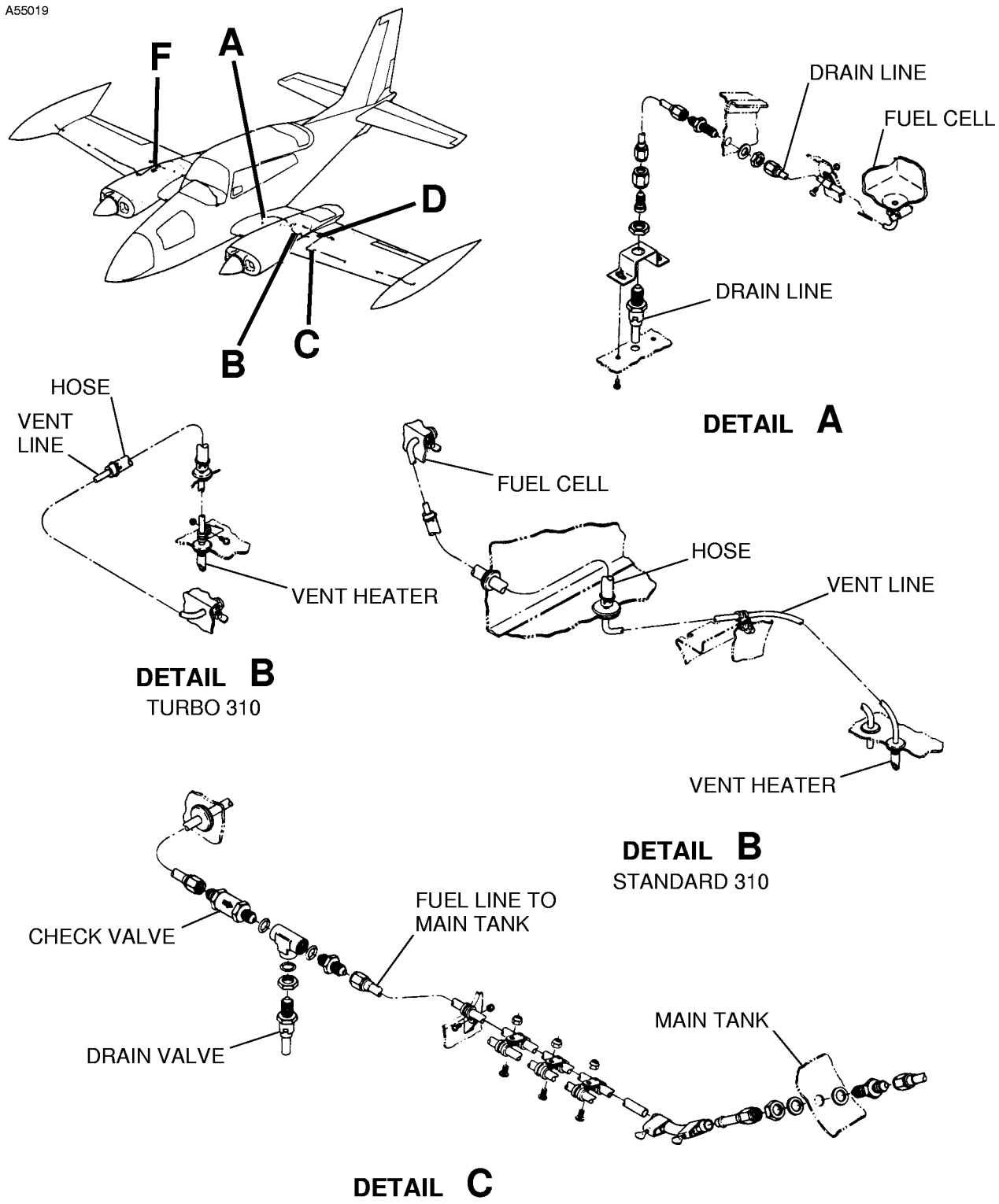

10263028
A10261024
B10263025
C10263027

AIRPLANES 310R0001 THRU 310R0800

Wing Locker Fuel System
Figure 406 (Sheet 1)

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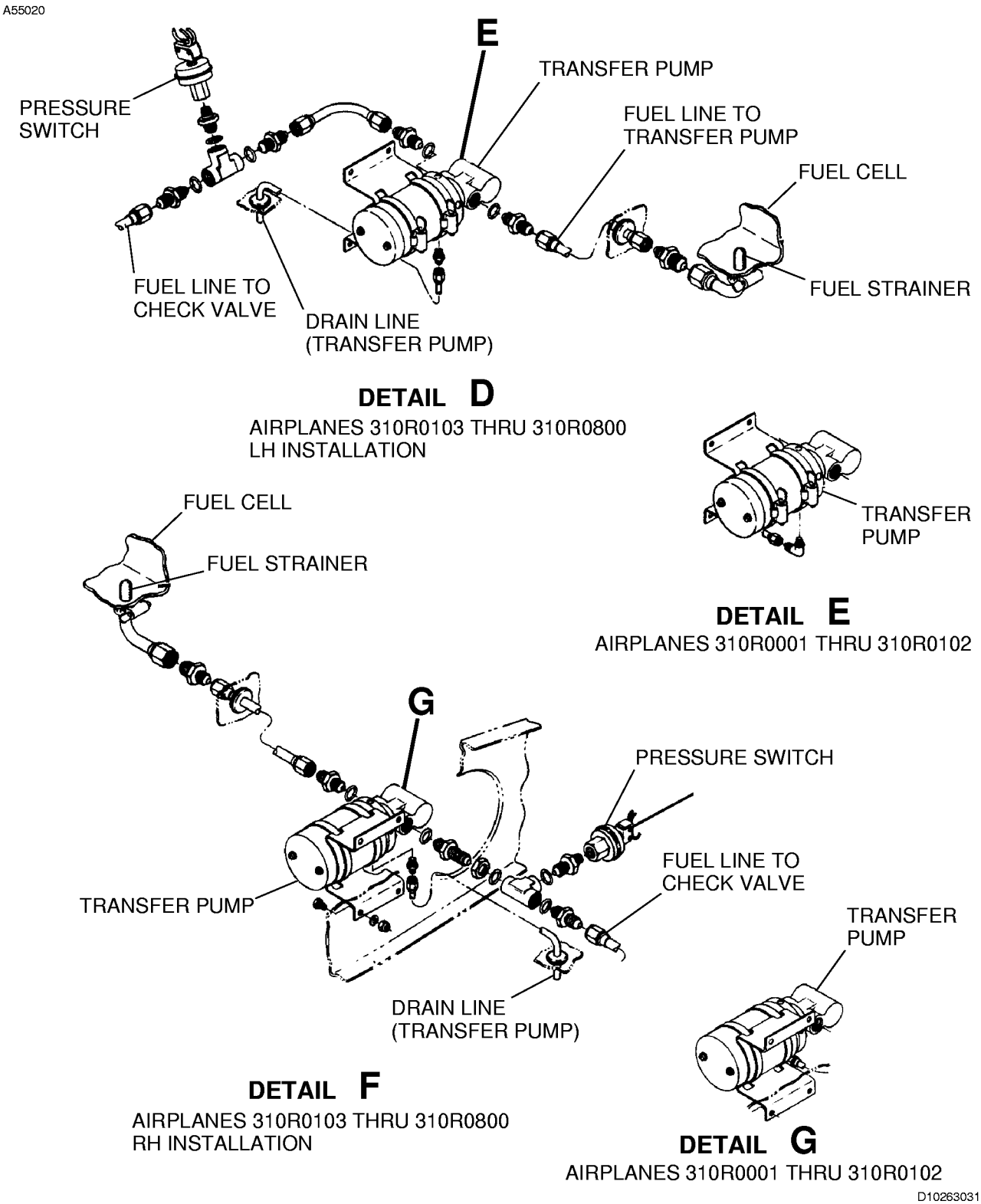

AIRPLANES 310R0001 THRU 310R0800

Wing Locker Fuel System
Figure 406 (Sheet 2)

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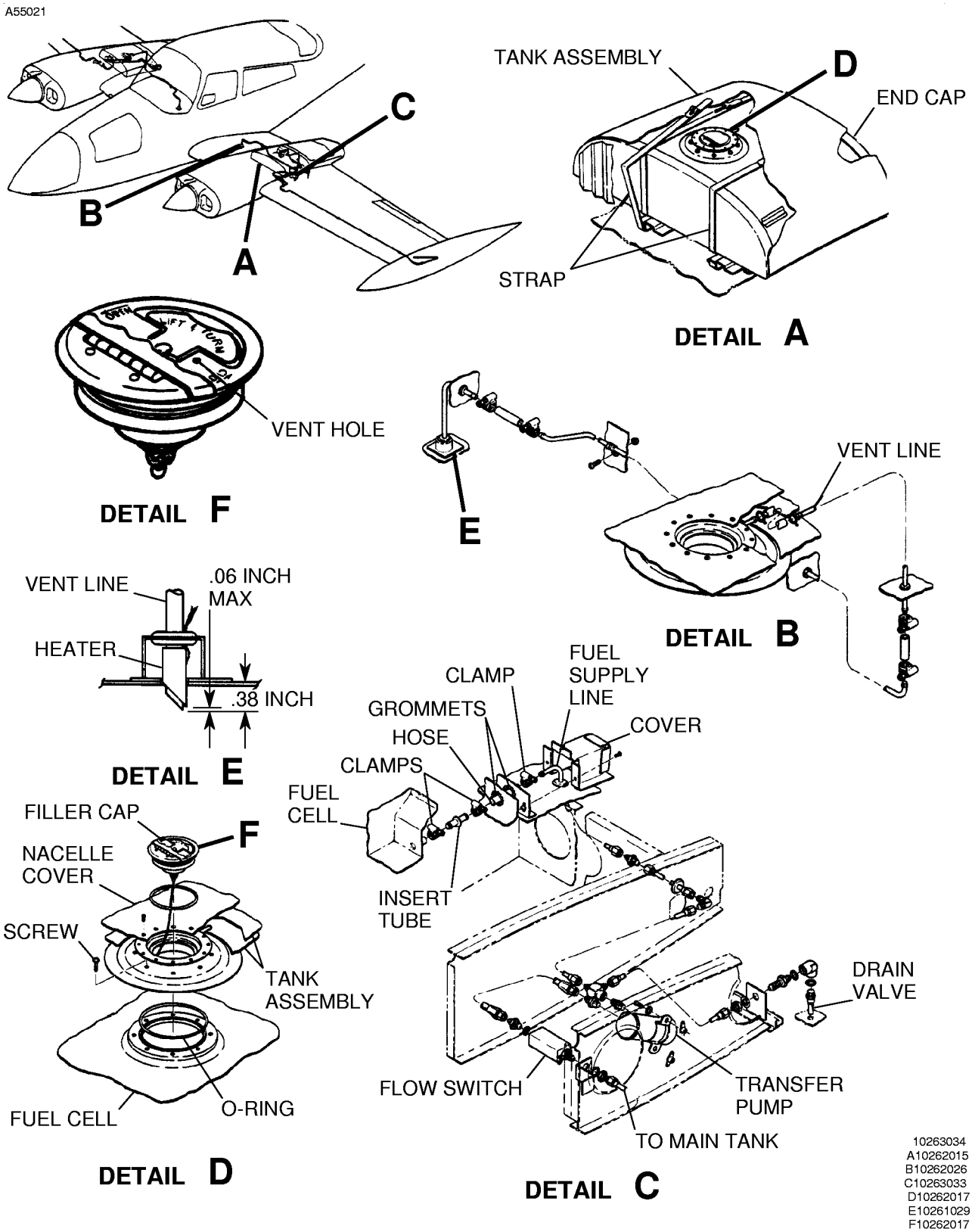

Wing Locker Fuel System
Figure 407 (Sheet 1)

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(2) Turn OFF all power.
(3) Refer to Chapter 6, Dimensions and Areas. Remove access panels as required to gain access to plumbing connections.
(4) Remove cover from fuel supply line.
(5) Remove nacelle cover by removing attaching screw.
(6) Remove vent line and fuel supply line by loosening clamps and sliding hoses from lines.
(7) Disconnect straps securing tank assembly and lift tank from nacelle.
(8) Remove fuel cell from tank assembly as follow:
    (a) Remove screws securing fuel cell to filler adapter.
    (b) Remove tank end cap.
    (c) Pull fasteners securing cell to tank top apart and slide cell from tank.

B. Installation (Refer to Figure 407).
(1) Install fuel cell in tank assembly as follow:
    (a) Make sure inside of tank is clean and free of foreign material. Cover rough edges and rivets with electricians tape.
    (b) Slide fuel cell into tank and press fasteners together to secure fuel cell to tank top.
    (c) Install O-ring in recess of fuel cell fitting and secure fuel cell to tank filler with screws. Safety wire screw.
    (d) Install end cap.
(2) Make sure fire screen is in place at forward end of nacelle tank cavity. Position tank assembly in nacelle and secure in place with straps.
(3) Connect fuel supply line and vent line with hoses and clamps.
(4) Install cover over fuel supply line.
(5) Install nacelle cover with attaching screw.
(6) Refer to Chapter 12, Servicing. Service fuel system and check for leaks.
(7) Install access panels.

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FUEL STORAGE - INSPECTION/CHECK

1. Fuel System - Main

A. Inspection/Check.
(1) Visually inspect filler cap gasket.
(2) If crushed or damaged, replace filler gasket.
(3) Remove main tank nose cap, visually inspect area for evidence of fuel leakage.
(4) If fuel leakage is evident, defuel the main tank and replace the stat-a-seals and/or panel gaskets as required.

NOTE: When installing new stat-o-seals and gaskets, apply a small amount of rubber lubricant or petroleum jelly to the new stat-o-seal or gaskets. This will prevent damage to the-seals when screws are tightened and will allow the seals to seat evenly.

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FUEL STORAGE - APPROVED REPAIRS

1. Fuel Cell

A. Repair Fuel Cell.

(1) The fuel cells installed in the wings are a bladder-type constructed of Vithane, manufactured by Goodyear Tire and Rubber Company.

NOTE: The appropriate repair manual number is stenciled on the fuel tank exterior surface. All repairs must be performed per repair manual.

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FUEL DISTRIBUTION - DESCRIPTION AND OPERATION

1. Description

A. Fuel Pumps. Refer toFigure 1 .
   (1) Each engine is provided fuel pressure by an engine-driven pump. In addition, each main tank contains an auxiliary fuel pump which is pilot activated from a switch on the control panel.

B. Main Tank Fuel Transfer Pump.
   (1) Fuel transfer pumps are installed in each main tank. The fuel transfer pump transfers fuel from the forward end of the main tank to the center baffle area, where the fuel is picked up and routed to the engine by either the engine-driven pump or the auxiliary fuel pump.

C. Fuel Selector Control System.
   (1) Fuel selection and fuel flow to the engine-driven fuel pumps is controlled by the fuel select control handles, located in the forward cabin area between the pilot's and copilot's seats. Each control handle operates a fuel selector valve (in each wing) by a flex cable and positions the respective selector valve to the desired fuel tank as indicated at the control handle.

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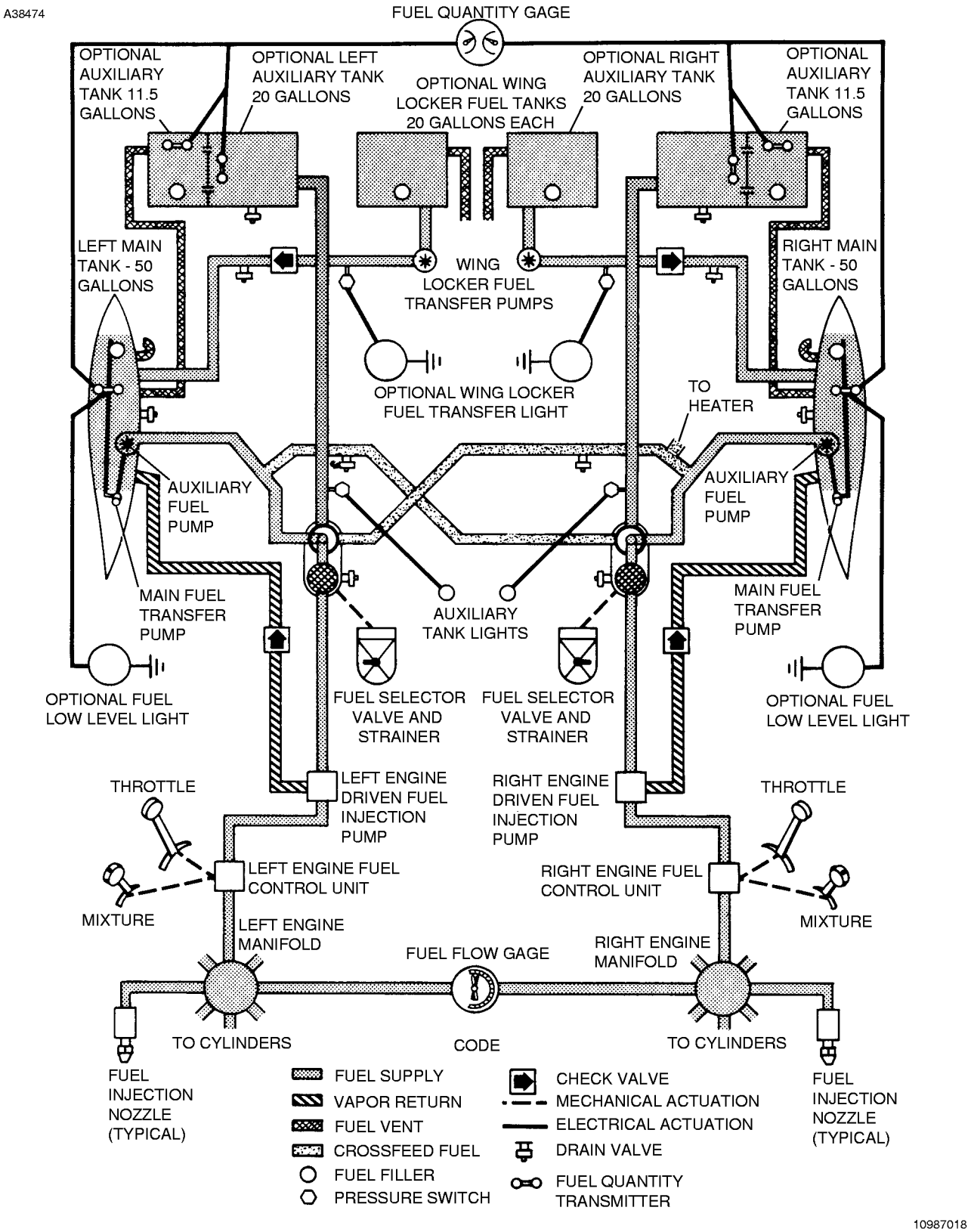

Fuel System
Figure 1 (Sheet 1)

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FUEL DISTRIBUTION - SERVICING

1. Fuel Selector Valve

A. Cleaning, refer toFigure 301.
   (1) Fuel selector valve handles OFF.
   (2) Drain fuel from sediment bowl with quick-drain.
   (3) Remove the lower access plate.
   (4) Remove the screws securing sediment bowl and filter assembly.
   (5) Clean filter in fresh solvent and air dry.
   (6) Inspect quick-drain valve, gasket, filter, and fuel selector for nicks, dents, scratches, dirt accumulation, and other foreign matter.
   (7) Reinstall filter and new gasket. Filter installed with large hole facing up, engaging spring.

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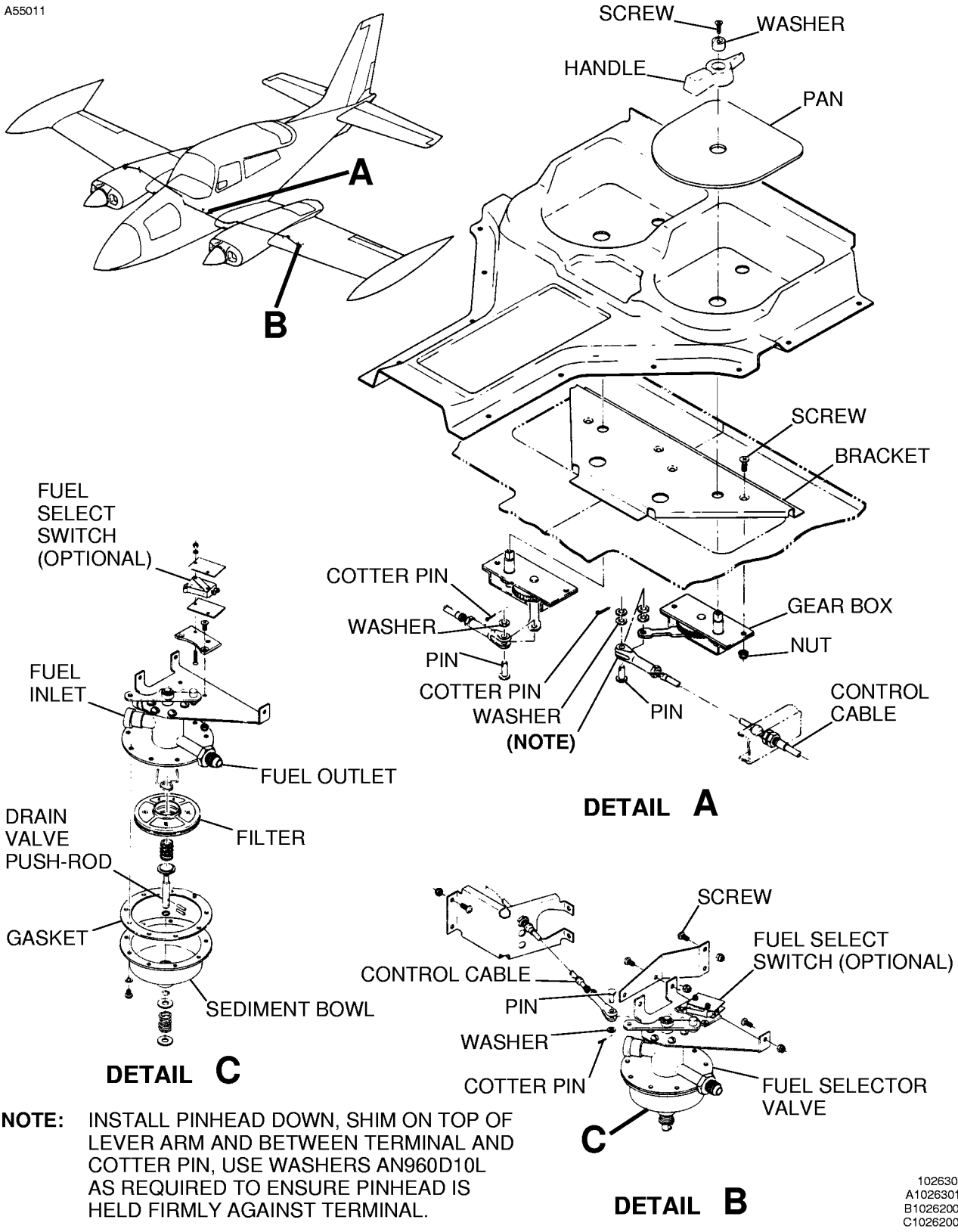

NOTE: INSTALL PINHEAD DOWN, SHIM ON TOP OF LEVER ARM AND BETWEEN TERMINAL AND COTTER PIN, USE WASHERS AN960D10L AS REQUIRED TO ENSURE PINHEAD IS HELD FIRMLY AGAINST TERMINAL.

Fuel Selector Control
Figure 301 (Sheet 1)

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FUEL DISTRIBUTION - REMOVAL/INSTALLATION

1. Auxiliary Fuel Pump

NOTE: Removal/Installation procedures are the same for either auxiliary fuel pump.

A. Removal (Refer to Figure 401).

CAUTION: Care should be taken to guard against foreign matter entering tank.

(1) Ensure fuel selector control handles are OFF.
(2) Defuel applicable main tank. Refer to Fuel Storage - Servicing.
(3) Remove wing fairings.
(4) Disconnect electrical wiring.
(5) Remove drain line, hose connecting fuel line, elbow and nipple.
(6) Remove tail cap and fuel transfer pump. Refer to Fuel Transfer Pump Removal.
(7) Remove aft access plate and gasket.
(8) Remove the mounting bolts, securing auxiliary pump and remove pump from the main tank.

B. Installation (Refer to Figure 401).

NOTE: Anytime the auxiliary fuel pump has been replaced or altered, the auxiliary fuel pump low adjustment must be performed. Refer to Fuel Distribution - Adjustment/Test.

(1) Insert auxiliary fuel pump into main tank. Secure the pump to mounting, using gasket and bolts.
(2) Install elbow to auxiliary pump, using nut and new packing.
(3) Connect fuel line to elbow, using hose and clamps.
(4) Connect drain line to fuel pump, using nipple and new packing.
(5) Install gasket and access cover.
(6) Install fuel transfer pump. Refer to Fuel Transfer Pump Installation.
(7) Install tail cap.
(8) Connect electrical wiring and install wing fairings.

2. Fuel Selector Valve

A. Removal (Refer to Figure 402).

WARNING: Residual fuel draining from the lines is a fire hazard. Care should be exercised in disposal of such fuel when lines are disconnected to prevent its accumulation in the wing.

NOTE: Removal/Installation procedures are the same for either selector valve.

(1) Drain all fuel from wing. Refer to Fuel Storage - Servicing.
(2) Remove upper and lower access cover plates.
(3) Disconnect fuel lines and fittings.
(4) Remove fuel select switch mounting bracket by removing screws and nuts (installed with auxiliary fuel system).
(5) Disconnect flex cable from selector valve by removing cotter pin, washer and pan.
(6) Remove bolts securing selector valve mounting bracket. Remove valve from wing.

B. Installation (Refer to Figure 402).
(1) Install fittings in selector valve and clock to correct position.
(2) Install selector valve and secure in position with bolts.
(3) Secure fuel selector switch bracket to fuel selector bracket with screws and nuts.
(4) Connect fuel lines to the fuel selector valve fittings.
(5) Connect flex cable to fuel selector valve, using pin, washer and cotter pin.
(6) Install access plates.

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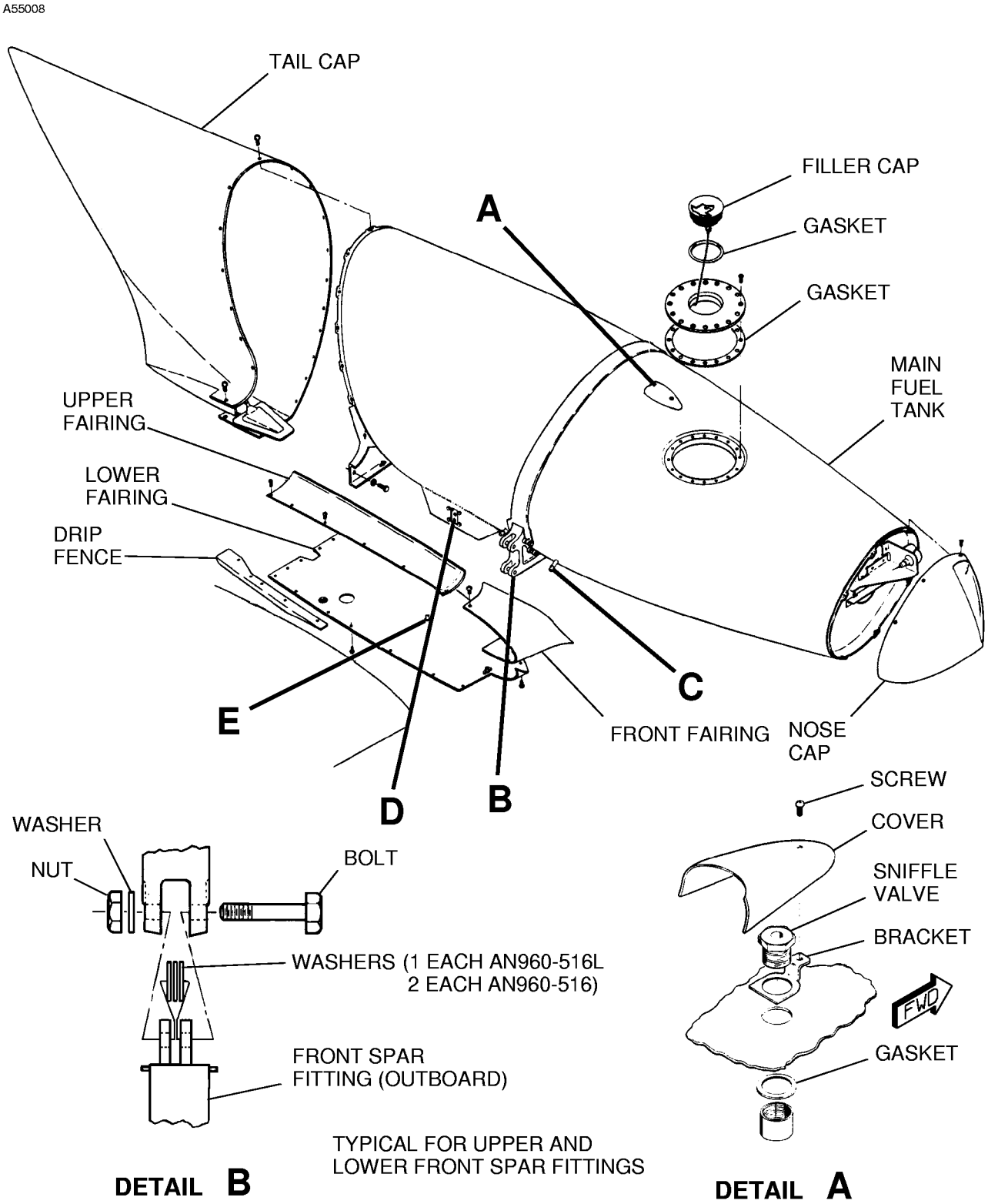

Main Fuel Tank Installation
Figure 401 (Sheet 1)

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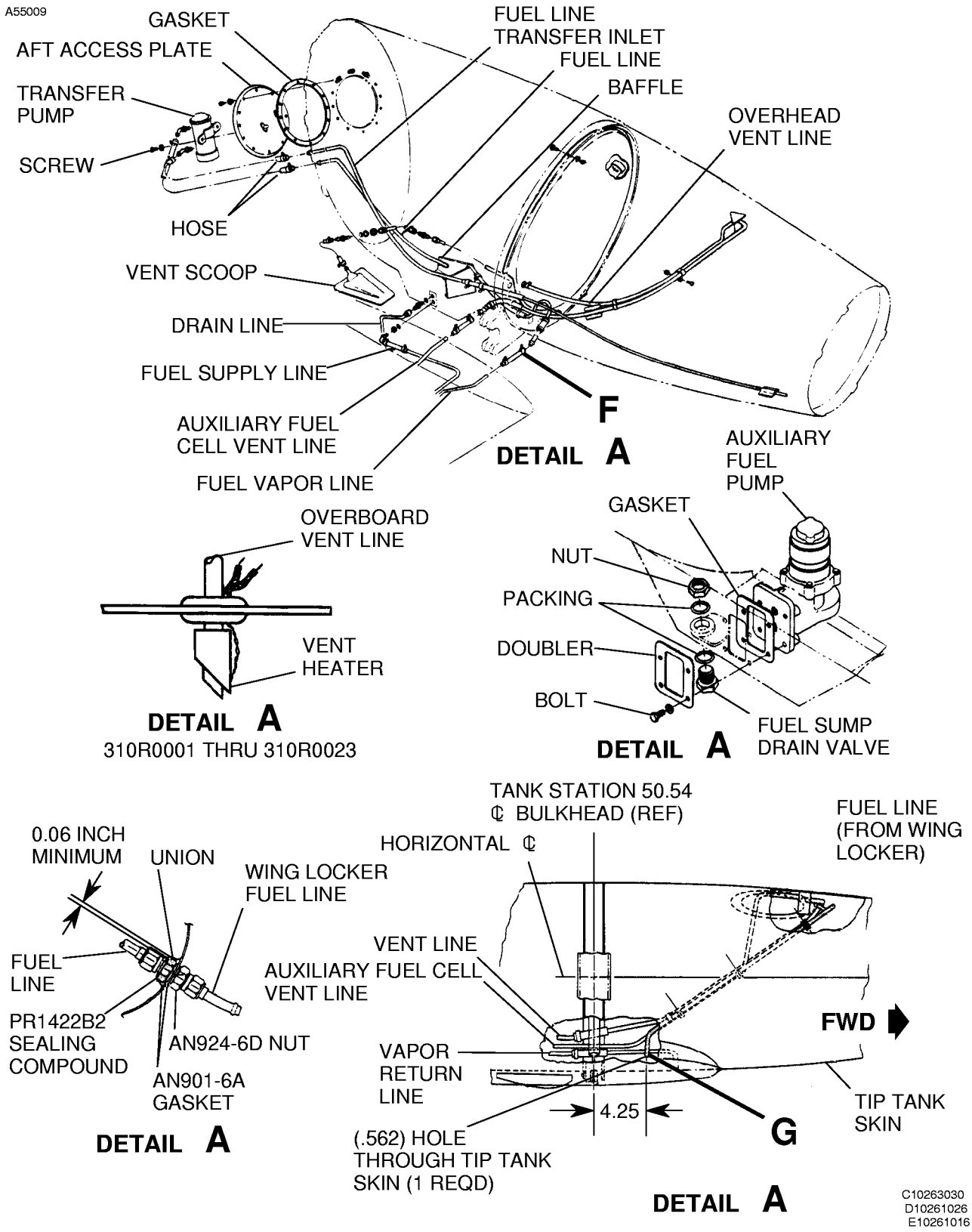

Main Fuel Tank Installation
Figure 401 (Sheet 2)

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3. Fuel Selector Gear Box

NOTE: Removal/Installation of the fuel selector gear box is same for either fuel selector gear box.

A. Removal (Refer to Figure 402).
   (1) Position fuel selector control handles to OFF.
   (2) Remove front seats and front carpet. Refer to Chapter 25, Equipment and Furnishings.
   (3) Remove fuel selector control handles by removing screws and washers. Remove fuel selector pan.
   (4) Remove access covers forward of gearbox. Refer to Chapter 6, Dimensions and Areasfor location.
   (5) Disconnect flex cable from gear box by removing pin, washer and cotter pin.

B. Installation (Refer to Figure 402).
   (1) Remove gear box from bracket by removing nuts and screws.
   (2) Attach gear box to bracket, using screw and nuts.
   (3) Connect flex cable to gear box lever, using pin, washer and cotter pin. Check operation of system and rig fuel control system if necessary. Refer to Fuel Distribution - Adjustment/Test.
   (4) Install access covers on floorboard.
   (5) Place carpet into position and install fuel pan.
   (6) Install control handles, using washers and screw.
   (7) Install front seats.

4. Fuel Selector Control Systems Flex Cable

NOTE: Removal/Installation of the flex cables are the same for either cable.

A. Removal (Refer to Figure 402).
   (1) Position fuel selector control handles to OFF.
   (2) Remove front seats and carpet. Refer to Chapter 25, Equipment and Furnishings.
   (3) Remove fuel selector control handles by removing screw and spacers. Remove fuel selector cover.
   (4) Refer to Chapter 6, Dimensions and Areas. Remove the access cover to fuel selector gear box, bottom and upper fuel selector valve access panel, wing to fuselage fairings and leading edge access panels as required.
   (5) Disconnect flex cable at the fuel selector gear box and valve by removing pins, washers and cotter pins.
   (6) Remove cable terminals and jam nuts and pull the cable out through the wing gap area.

B. Installation (Refer to Figure 402).

   NOTE: The end of cable which goes in fuselage is identified by a yellow strip of tape.

   (1) Route flex cable in wing and fuselage and install jam nuts at this time.
   (2) Connect the flex cable to the fuel selector gear box and valve, using pins, washers and cotter pins.
   (3) Rig the fuel control system. Refer to Fuel Distribution - Adjustment/Test.
   (4) Ensure flex cable jam nuts are tight.

      NOTE: Support and security of the fuel selector flex cables is most essential to provide the optimum fuel selector valve operation. Inspect the fuel control valve support joints for adequate tightness and security.

   (5) Install all access cover, access panel and wing fairing.
   (6) Install carpet and fuel selector cover.
   (7) Install fuel control handle with spacers and screw.
   (8) Install front seats.

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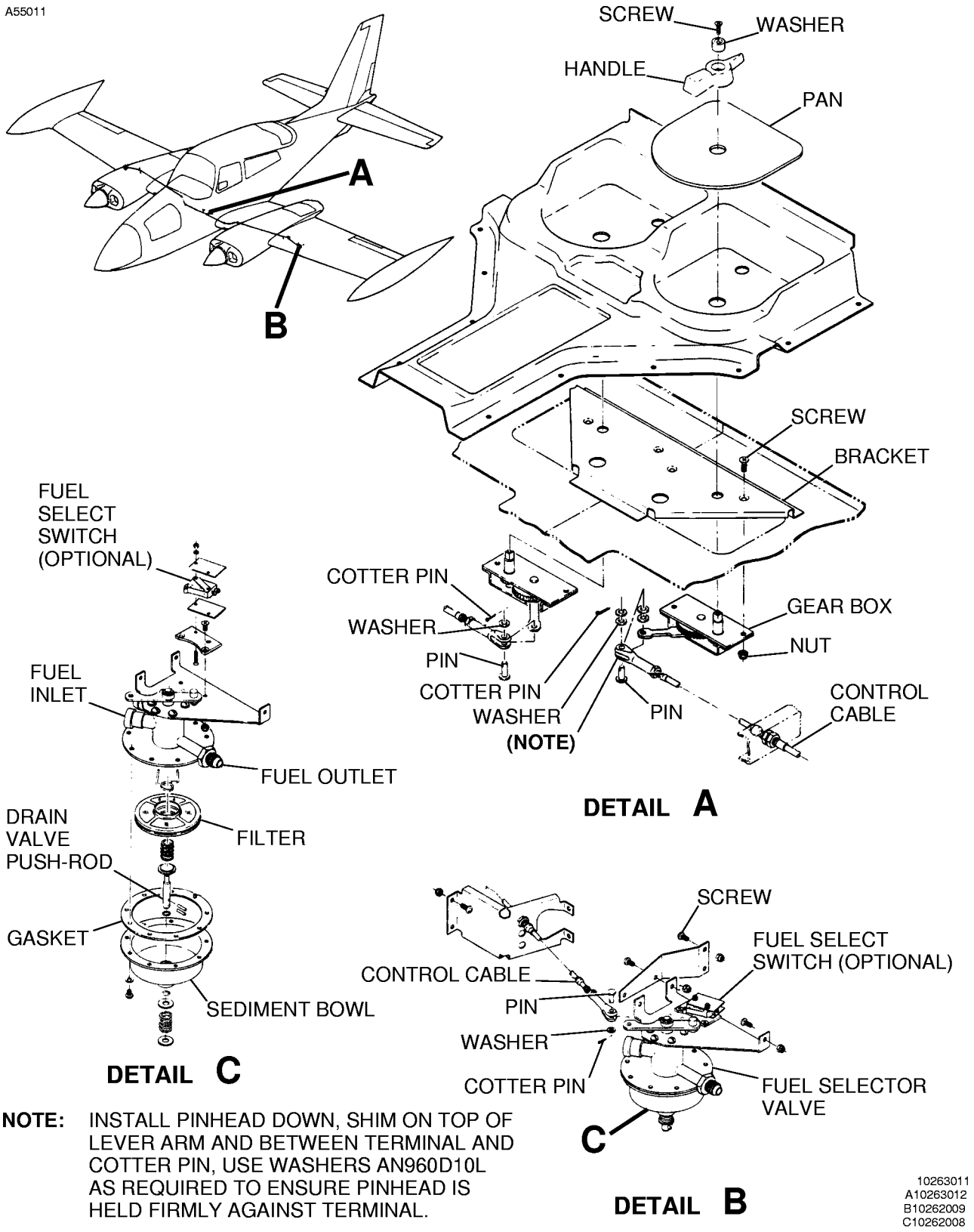

Fuel Selector Control Installation
Figure 402 (Sheet 1)

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5. Fuel Transfer Pump (Main Fuel System)

NOTE: Removal/Installation procedures are the same for either fuel transfer pump.

A. Removal (Refer to Figure 401).
(1) Position fuel selector control handles to OFF.
(2) Defuel applicable main tank. Refer to Fuel Storage - Servicing.
(3) Remove wing fairings and tail cap.
(4) Disconnect electrical wiring to fuel transfer pump.
(5) Disconnect fuel lines from fuel transfer pump.
(6) Remove screws attaching fuel transfer pump to access plate and remove pump.
(7) If further disassembly of fuel transfer pump is desired, refer to Disassembly/Assembly procedures.

B. Installation (Refer to Figure 401).
(1) Secure fuel transfer pump to access plate, using screws.

CAUTION: Observe in and out markings on pump relative to lines being connected for correct installation. Outlet port must be UP. The transfer pump must be pumping from forward section of main tank to the center baffle area.

(2) Connect fuel lines to fuel transfer pump, using hoses, clamps, and fittings.
(3) Connect electrical wiring.
(4) Perform the following operational check of transfer pump:
(a) Pour approximately 5 gallons of fuel into main tank.
(b) Turn master switch ON.
(c) Observe that transfer pump is functioning properly.
(5) Install tail cap and wing fairings.
(6) Refuel airplane.

C. Disassembly (Refer to Figure 403).

NOTE: The interrupter end of the main tank fuel transfer pump is sealed (air has been removed and an atmosphere of a special dry gas injected). Should any of the electrical components become inoperative, the fuel pump must be replaced. A gas seal is located in the center of the mounting bracket and no attempt should be made to break this seal, as it would render the pump useless.

(1) Hold the pump body securely in one hand and release the bottom cover from the bayonet fittings by rotating it counterclockwise with a 5/8 inch wrench.
(2) Remove the gasket from the cover.
(3) Carefully remove the filter screen.
(4) Remove the screws that hold the plunger spring cup to the pump body.
(5) Remove the gasket and plunger spring.
(6) Carefully withdraw the plunger from the pump body. Do not drop or damage the plunger.
(7) Clean and inspect the transfer pump as follows:
(a) Wash the plunger assembly in Stoddard Solvent or gasoline. If it fails to become thoroughly clean or if any rough spots are present, dress the surface carefully with crocus cloth. Rinse thoroughly to remove all foreign material.
(b) Dip the pump body in clean solvent, shake it lightly, then remove it and dry with compressed air.
(c) Blow out the plunger tube with compressed air and check for any rough spots, deposits or foreign material. If not smooth, wrap a piece of cloth around a wooden dowel, dip cloth in Stoddard Solvent (Federal Specification P-D-680), and swab the plunger tube until clean.
(d) Rinse remaining parts in the solvent and dry with compressed air. Exercise care when drying the screen to prevent damage.
(e) Inspect all parts visually for damage.

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(f) Inspect the fuel pump electrical resistance by connecting an ohmmeter between the connector terminal and ground on the pump housing. Resistance should be between 19.0 and 19.5 ohms. If the resistance is not within limits, replace the pump assembly.

D. Assembly (Refer to Figure 401).
(1) Insert the plunger assembly in the tube with buffer-spring end first. Check for proper fit by slowly raising and lowering the plunger in the tube; it should move freely without any tendency of sticking. A click should be heard each time the plunger approaches the top of the tube. If this click cannot be heard, the interrupter assembly in the sealed portion of the pump is not functioning properly, and the pump assembly must be replaced.
(2) Install the plunger spring.
(3) Place the spring cup gasket in position on the plunger spring cup and carefully attach this assembly to the pump body, with the screws. Tighten screws securely.
(4) Carefully install the screen, place cover gasket in position in cover and attach the cover to the pump body.
(5) Hold the pump body securely with one hand and tighten the cover in place on the pump body bayonets with a 5/8 inch open-end wrench or box socket.

6. Fuel Transfer Pump (Wing Locker Fuel System)

A. Removal (Refer to Figure 403).

NOTE: The removal/installation procedures are the same for either fuel transfer pump.

(1) Defuel wing locker fuel cell. Refer to Fuel Storage - Servicing.
(2) Refer to Chapter 6, Dimensions and Areas. Remove access panels as required to gain access to transfer pump.
(3) Tag and disconnect transfer pump electrical wiring.
(4) Disconnect fuel lines and drain line from transfer pump.
(5) Remove fuel pump by removing nuts, washers and bolts.

B. Installation (Refer to Figure 403).
(1) Secure transfer pump to structure, using bolts, washers and nuts.
(2) Connect fuel lines and drain line to transfer pump.

NOTE: Airplanes 310R0103 thru 310R2140, install nipple in transfer pump, finger tight and torque 1/4 turn.

(3) Identify and connect electrical wiring to fuel pump.
(4) Refer to Chapter 12, Fuel - Servicing. Service fuel system and leak check.
(5) Install access panels.

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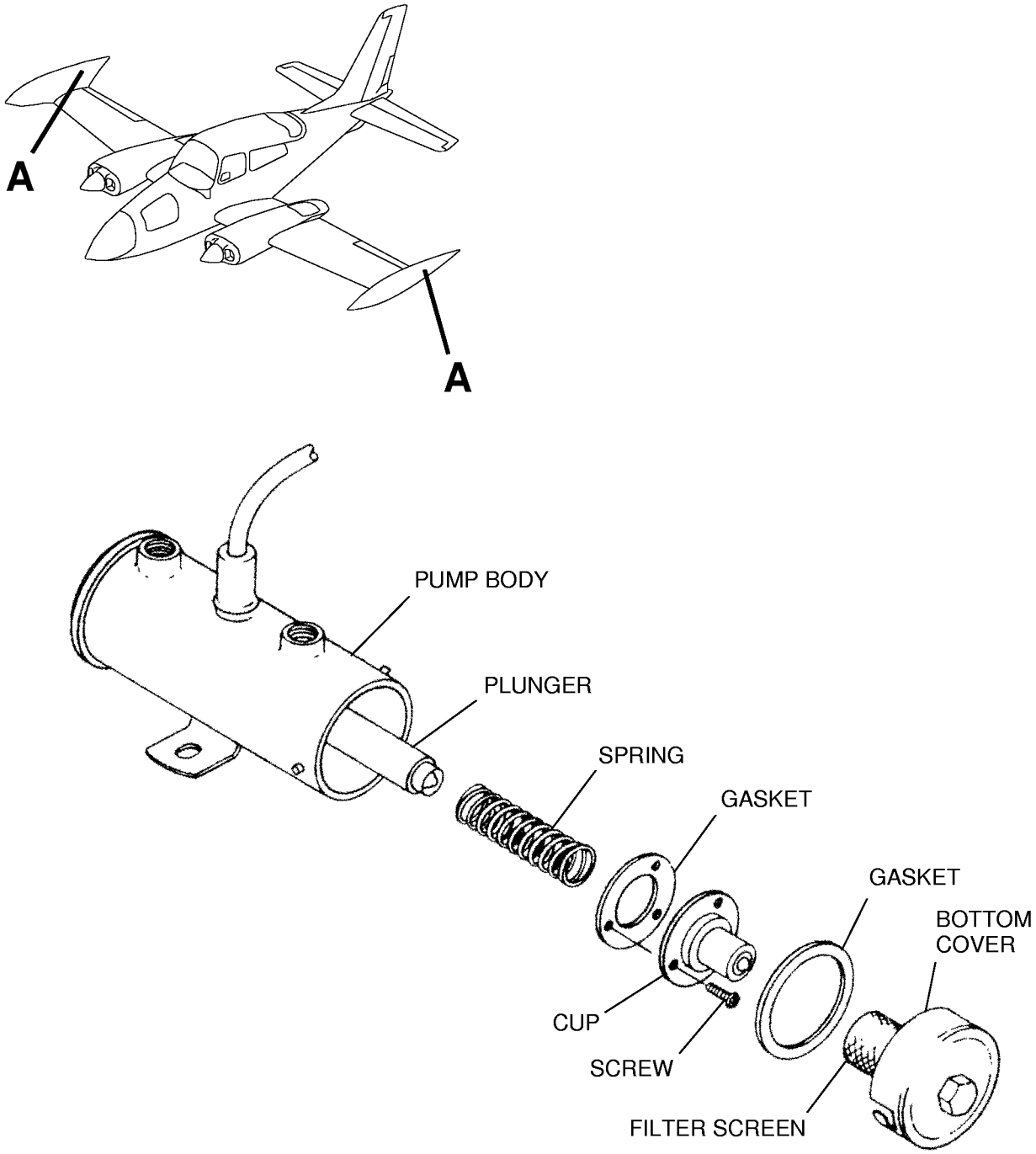

DETAIL A

Fuel Selector Control Installation
Figure 403 (Sheet 1)

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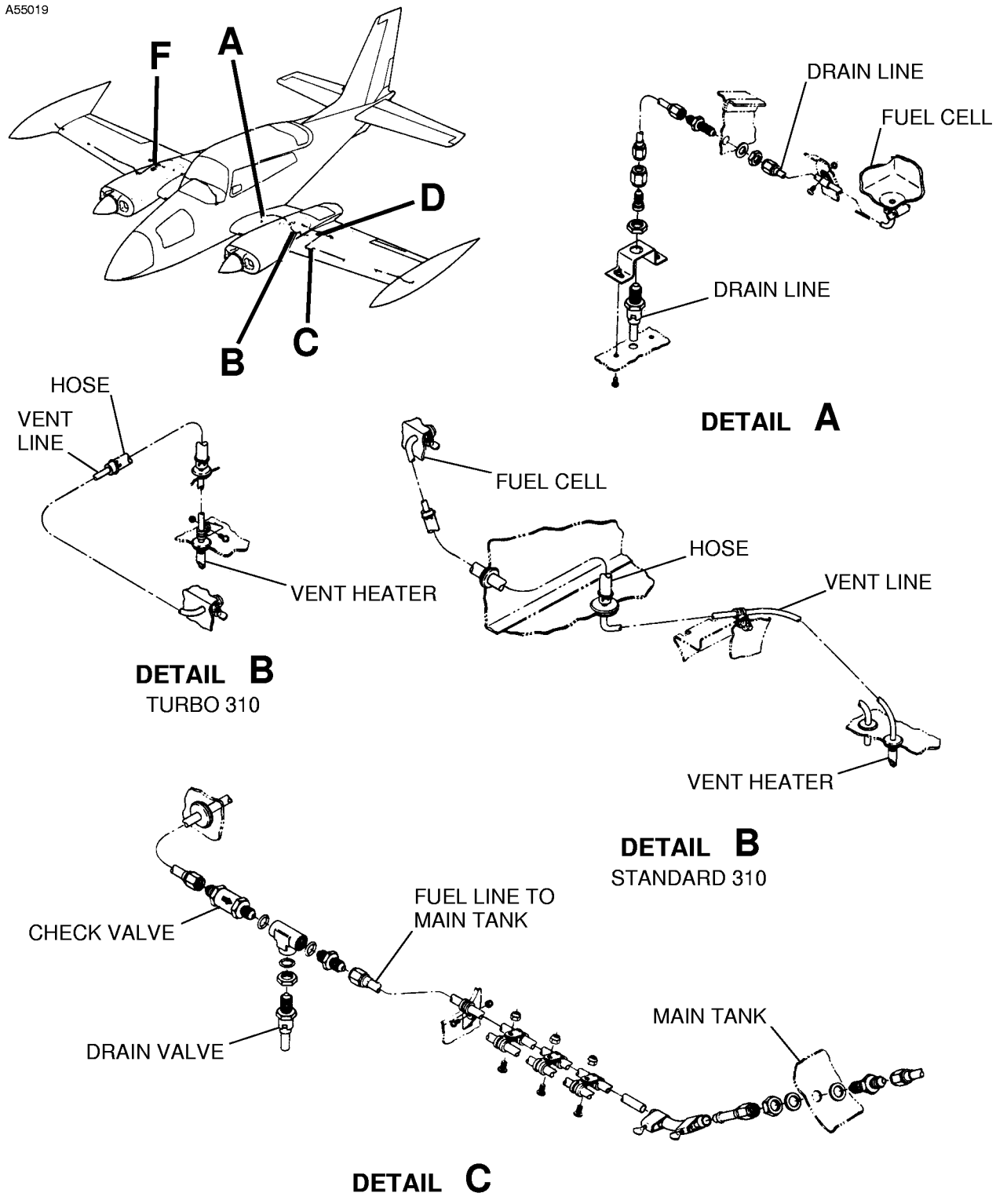

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AIRPLANES 310R0001 THRU 310R0800

Wing Locker Fuel System
Figure 404 (Sheet 1)

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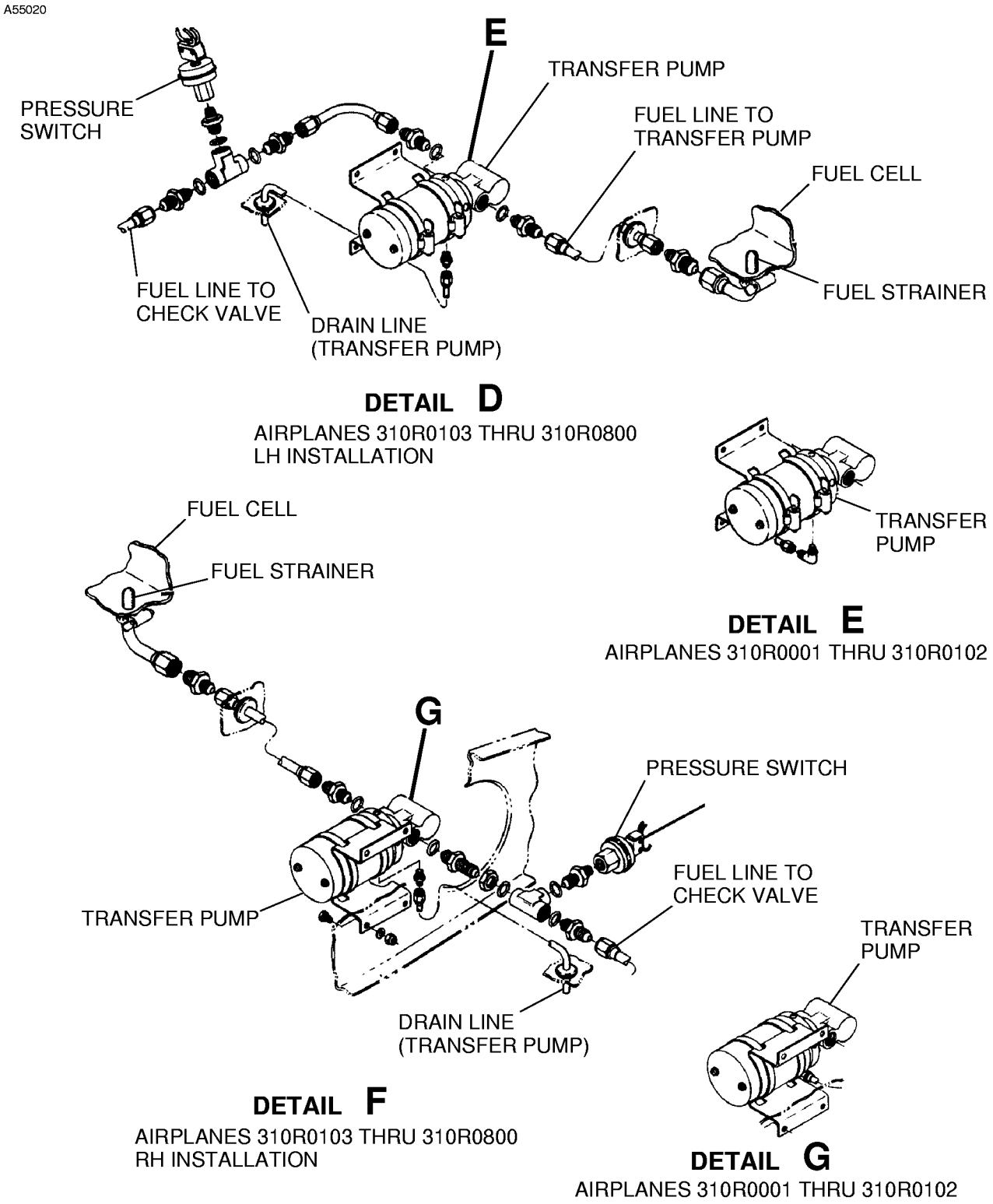

AIRPLANES 310R0001 THRU 310R0800

Wing Locker Fuel System
Figure 404 (Sheet 2)

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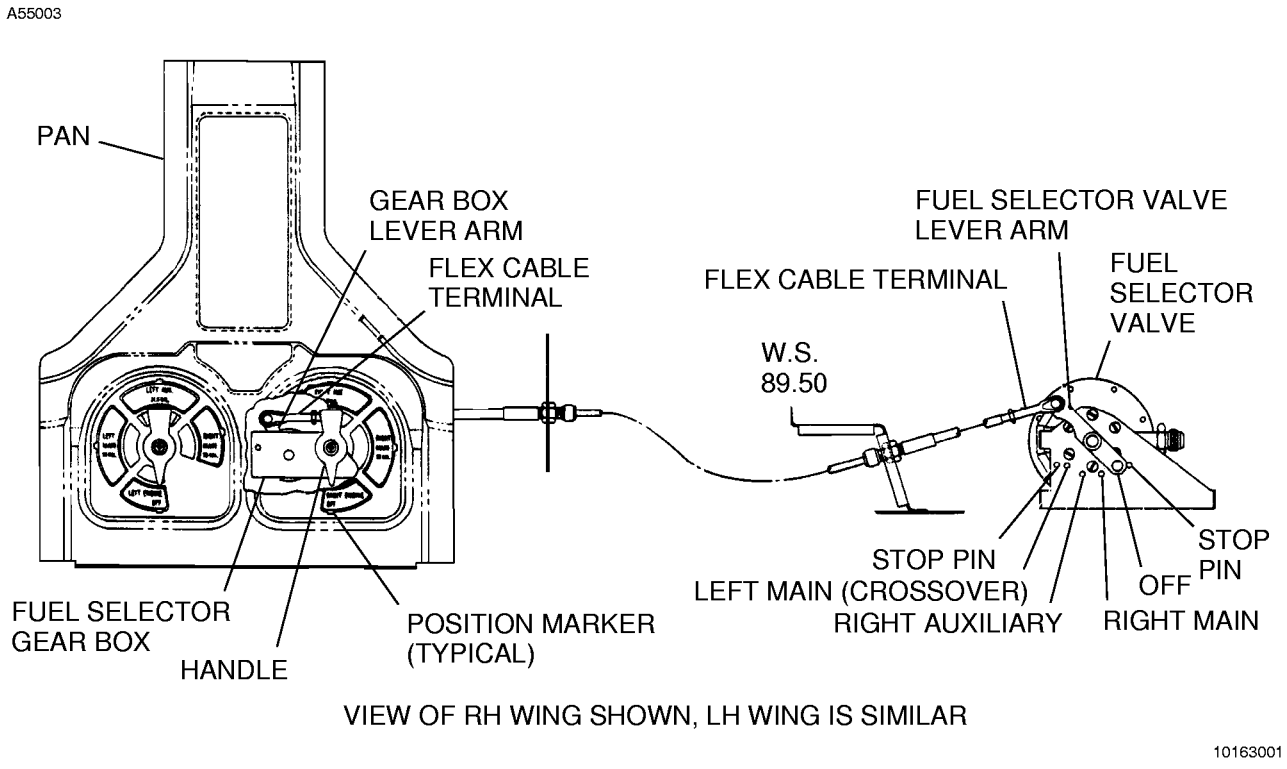
FUEL DISTRIBUTION - ADJUSTMENT/TEST

1. Adjustment/Test

A. Fuel Selector Valve (Refer to Figure 501).



Adjustment Fuel Selector Valve
Figure 501

NOTE: Adjustment procedures are for the right fuel selector valve. Procedures are the same for the left fuel selector valve.

(1) (Refer to Figure 502) Remove control handles by removing screws and washers.
(2) Remove the fuel selector pan by removing attaching screws.
(3) Loosen carpet and pull back just enough to gain access to floorboard access covers and remove access covers.
(4) Disconnect control cable from gear box by removing cotter pin, washer and pin.
(5) Refer to Chapter 6, Dimensions and Areas. Remove access covers at the fuel selector valve.
(6) Disconnect control cable from selector valve by removing cotter pin, washer and pin.
(7) Position lever arm on fuel selector valve in wing to the most outboard detent and resting against the stop pin.

NOTE: Observe that the attaching hole in lever arm is pointing inboard.

(8) Connect terminal of control cable to the fuel selector valve lever arm with pin, washer and cotter pin.
(9) On the cabin floorboard, rotate (counterclockwise for LH and clockwise for RH) the handle on the gear box until lever arm comes to rest against gear box bracket.

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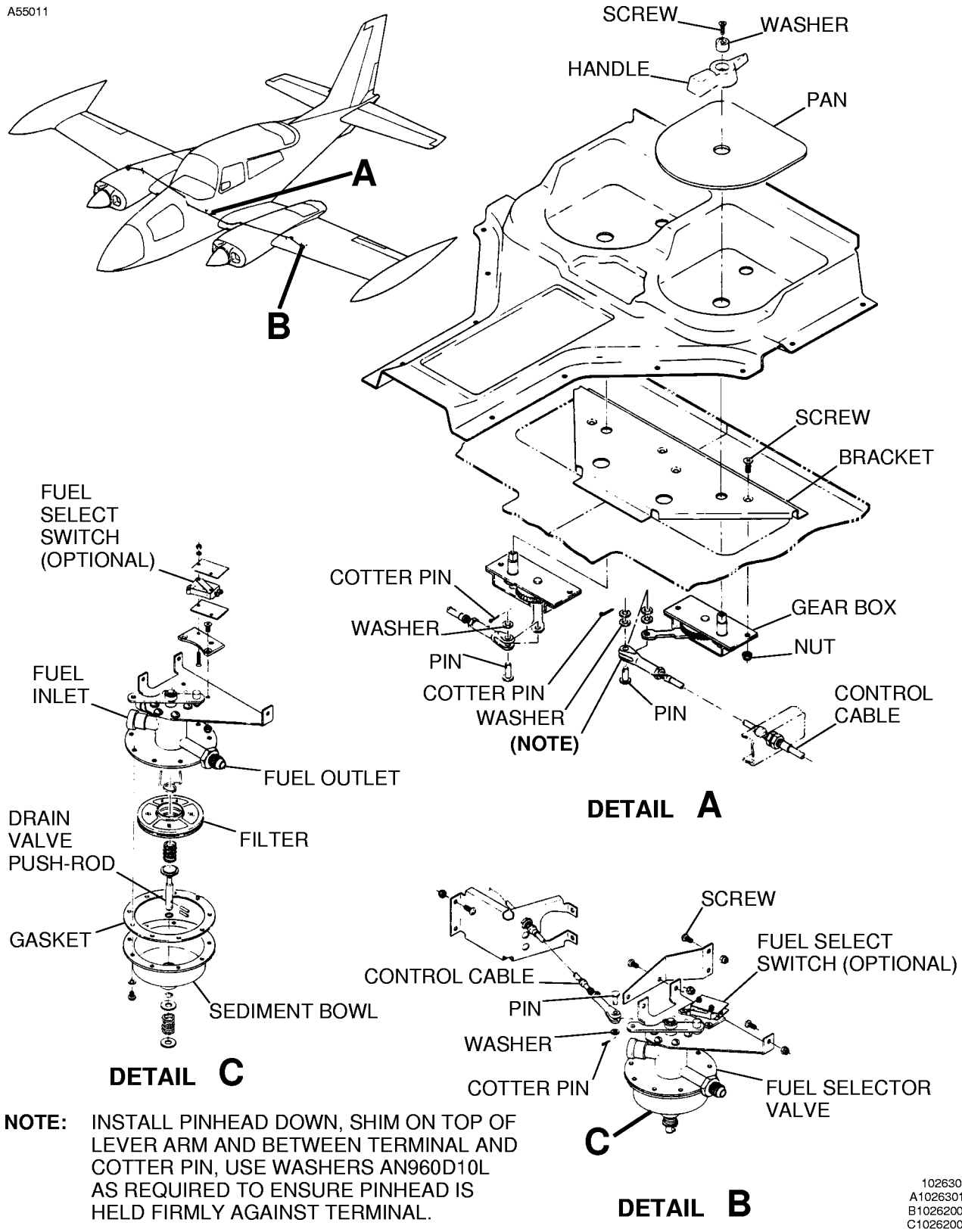

NOTE: INSTALL PINHEAD DOWN, SHIM ON TOP OF LEVER ARM AND BETWEEN TERMINAL AND COTTER PIN, USE WASHERS AN960D10L AS REQUIRED TO ENSURE PINHEAD IS HELD FIRMLY AGAINST TERMINAL.

Fuel Selector Control Installation
Figure 502 (Sheet 1)

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CAUTION: Observe that the handle is parallel with the centerline of airplane and pointer on handle is indexed to the OFF position (aft).

(10) Rotate handle (clockwise for LH and counterclockwise for RH) approximately 5 degrees until pointer on handle is aligned with the OFF position marker.
(11) With the handles in the position described in step (10), adjust terminal and nuts of the control cable until attach holes on gear box lever arm and cable terminal are aligned.
(12) Connect terminal to gear box lever arm with pin, washer and cotter pin.
(13) Start from the OFF position and rotate (clockwise for LH and counterclockwise for RH) the handle to the RIGHT MAIN.
(14) Observe that the pointer end of handle nearly aligns with marker on placard after traveling approximately 90 degrees from the OFF position and the fuel selector valve lever arm seats in the main tank detent on the fuel selector valve.
(15) If the fuel selector valve lever arm has not seated in proper detent after handle has been rotated 90 degrees from the OFF position, lengthen or shorten terminals and/or control cable as necessary to achieve proper rigging.
(16) Continue from the RIGHT MAIN position, rotate handle to RIGHT AUXILIARY.
(17) Observe that pointer end of handle nearly aligns with marker on placard after crawling approximately 180 degrees from the OFF position and the fuel selector valve lever arm seats in the auxiliary tank detent on the fuel selector valve.
(18) If the fuel selector valve lever arm has not seated in proper detent after handle has been rotated 180 degrees from OFF position, lengthen or shorten terminals and/or control cable as necessary to achieve proper rigging.
(19) Continue from the RIGHT AUXILIARY position, rotate handle to LEFT MAIN (crossover).
(20) Observe that the pointer end of handle nearly aligns with marker on placard after traveling approximately 270 degrees from the OFF position and the fuel selector lever arm seats in the inboard crossover tank detent on the fuel selector valve and against stop pin.
(21) If the fuel selector valve lever arm has not seated in proper detent after handle has been rotated 270 degrees from the OFF position, lengthen or shorten terminals and/or control cable as necessary to achieve proper rigging.
(22) Install all access covers and panels.
(23) Position the front carpet and install fuel selector pan with screws.
(24) Assemble control handles to gear box levers, using placard covers, washers and screws.

B. Main Tank Auxiliary Fuel Pump (Refer to Figure 503).

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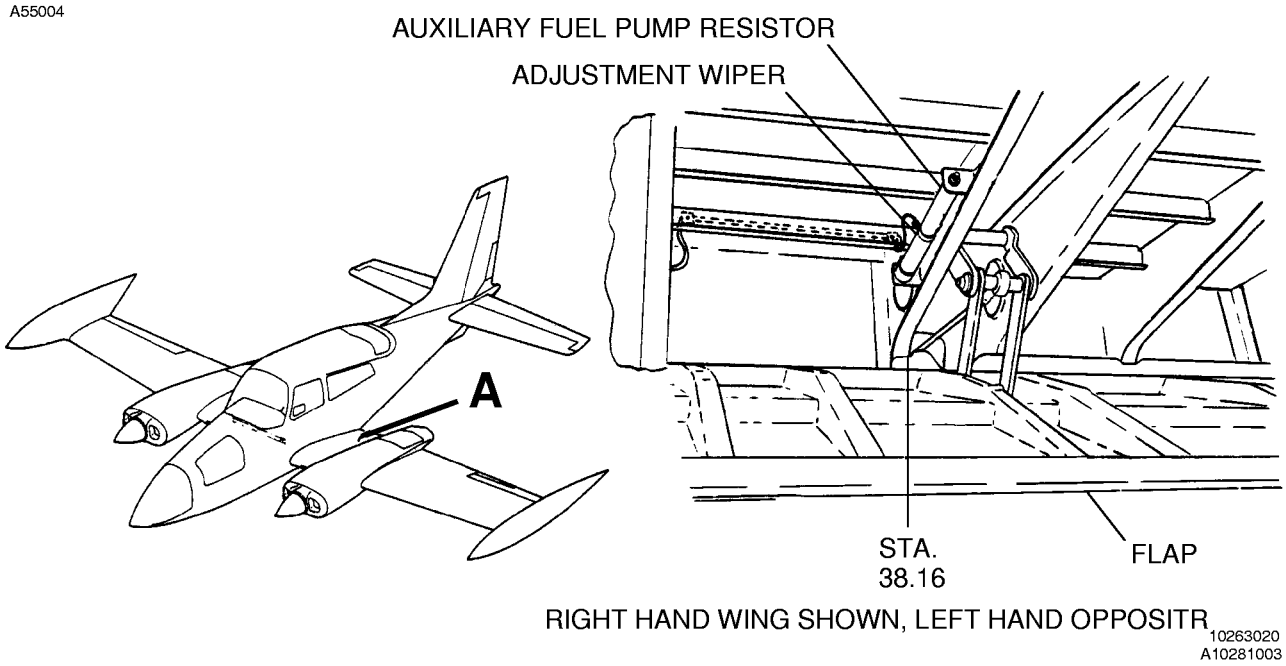

Adjustment Auxiliary Fuel Pump
Figure 503

NOTE: Adjustment procedures are for the right auxiliary fuel pump. Procedures are the same for left auxiliary pump.

(1) Service the fuel system.
(2) Lower the flaps.
(3) Place fuel selector control handles to the desired tank.
(4) Refer to Chapter 73, Distribution - Adjustment/Test for Unmetered Fuel Test Hook-Up, and connect test pressure gage at engine-driven fuel pump inlet line.
(5) Connect a 28 volt DC auxiliary power unit to airplane or run opposite engine at 1500 RPM with no other electrical equipment on to assure full electrical bus voltage.
(6) Position right auxiliary fuel pump to LOW and check test pressure gage connected to engine-driven inlet line for 5.5 PSI of fuel pressure.
(7) If fuel pressure is not 5.5, adjust auxiliary fuel pump resistor, until required pump pressure is obtained.

NOTE: Cool resistor with air blast, while making adjustment.

(8) Turn all switches OFF, place fuel selector control handle to OFF position.
(9) Remove test pressure gage.

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FUEL DISTRIBUTION - INSPECTION/CHECK

1. Fuel Selector Valve

A. Operational Check.

(1) Place the LEFT fuel selector valve handle in the LEFT MAIN position, and the RIGHT fuel selector valve handle in the OFF position. Start the LEFT engine. When the engine is sufficiently warmed up, advance the throttle to 1500 RPM. Observe the fuel flow gage to assure there are no radical fluctuations and for proper fuel flow. Observe the engine for a proper short continuous run. Place the LEFT selector valve handle to the RIGHT MAIN position, repeat the above steps and observations. With engine at idle RPM place the LEFT fuel selector valve handle to the OFF position. The engine should run momentarily, then fail. Check the RIGHT fuel selector valve handle in the RIGHT MAIN position, and LEFT fuel selector valve handle in the OFF position. Start the RIGHT engine and check the RIGHT selector valve in accordance with above procedures for the LEFT fuel selector valve.

NOTE: The crossfeed system allows fuel to be used from the opposite main tanks only. There are no provisions to crossfeed fuel from auxiliary fuel tanks.

2. Main Tank Auxiliary Fuel Pump

A. Ground Check.

(1) Turn master switch ON.
(2) Position auxiliary fuel pump switch to LOW position. Make audible check of pump for low speed operation.
(3) Momentarily position auxiliary fuel pump switch to ON position. Check pump operation for high speed.
(4) Start engines and run at 1000 RPM.
(5) Position auxiliary fuel pump switch to ON and check pump operation for low speed.
(6) Momentarily position mixture lever to IDLE CUTOFF. Make audible check for pump going to high speed.

NOTE: If pump goes to high speed, fuel pressure switch is functioning normally.

(7) Turn auxiliary fuel pump switch OFF when pump goes to high speed.
(8) If auxiliary fuel pump does not go into high speed, proceed as follows:
  (a) Auxiliary fuel pump switch OFF.
  (b) With the engine not running, momentarily position the auxiliary fuel pump switch to ON, make audible check of pump for high speed operation.

NOTE: If auxiliary fuel pump goes into high speed, the fuel pressure switch and pump are functioning normally.

3. Tubing

A. Inspection/Check.

NOTE: Nicks and scratches not exceeding the following limitations may be repaired by polishing out the damaged area, using fine grade of emery cloth and oil. Finish polishing with crocus cloth and oil. Flush and clean all grit from line assembly.

(1) Replace steel tubing which has nicks or scratches deeper than 10 percent of tube wall thickness.
(2) Replace aluminum tubing which has nicks or scratches deeper than 20 percent of tube wall thickness.
(3) Replace pressure and return tubes which have dents deeper than 5 percent of tube outside diameter.

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FUEL INDICATING - DESCRIPTION AND OPERATION

1. Fuel Indicator System

A. Description.

(1) The fuel indicating system is a capacitance type system. The system consists of a fuel quantity indicator, fuel sensor units (one in each main tank) and two signal conditioners (one in each wing). The number of fuel sensor units installed in the fuel system will vary depending on the optional auxiliary fuel system installed in the airplane. The fuel quantity indicator displays the fuel quantity in both pounds and gallons. In addition, when the 40 gallon or 63 gallon auxiliary fuel systems (optional) are installed, a fuel quantity switch and indicator lights are utilized to provide a means of reading the fuel quantity of the main fuel system in AUXILIARY position or auxiliary fuel in the MAIN position.

2. Dual Fuel Flow Indicator

A. Description.

(1) The standard engine fuel indicating system consists of a dual fuel flow gage calibrated in pounds per hour and gallons per hour. The dual fuel flow gage senses the pressure as delivered to the fuel injector assemblies. On Airplanes 310R1201 thru 310R2140, a optional engine fuel flow indicating system may be installed on the airplane.

(2) The optional indicating system consists of a dual indicator and fuel flow transducer for each engine. The fuel flow transducer generates electrical pulses, which represents a measure of fuel flow rate and transmits these pulses to the indicator as input frequency. The indicator then converts the frequency signal into an analog output which is displayed by the indicator as fuel flow in pounds per hour. In addition, these pulses provide information which drives a totalizer within the indicator. The indicator has a memory circuit that stores the quantity of fuel remaining or consumed even if power is removed from the normal power input circuit.

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FUEL INDICATING - TROUBLESHOOTING

1. Troubleshooting

A. Fuel Quantity Indicator System.
(1) For a guide to troubleshooting the indicating system, refer to Table 101.

NOTE: Perform fuel quantity indicating system troubleshooting with normal voltage applied. Actuate necessary switches and circuit breakers.

WARNING: Do not use ohmmeter for checking probe and probe wiring in airplane. Always use the capacitance fuel system test box for maintenance and troubleshooting the fuel indicating system.

Table 101. Fuel Quantity Indicating System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
NO FUEL QUANTITY INDICATION.	Low fuel.	Check fuel tank capacity. Fill tank as required.
	Unserviceable indicator.	Replace indicator with known good indicator. Replace indicator if unserviceable.
	Loose connections or open circuit.	Check circuitry and correct as required.
	Unserviceable signal conditioner.	Check for unserviceable signal conditioner. Replace as required.
	Unserviceable fuel sensor.	Replace fuel sensor.
INDICATOR READS INACCURATE FUEL QUANTITY.	Improperly calibrated fuel system.	Check fuel system calibration. Adjust as required.
	Unserviceable adjustment fuel indicating system.	Replace signal conditioner.
	Unserviceable indicator.	Replace indicator.
POINTERS CHANGE READING WHEN OTHER AVIONICS ARE OPERATED.	Hi Z shield shorted to ground.	Check for Hi Z shield shorted to ground. Correct circuitry.
	Unserviceable indicator.	Replace indicator.
	Unserviceable signal conditioner.	Replace signal conditioner.
ERRATIC INDICATOR READINGS.	Unserviceable indicator.	Check indicator. Replace if unserviceable.
	Incorrect system grounds.	Check all system grounds. Correct as required.
	Unserviceable tank sensor.	Replace tank sensor.

B. Dual Fuel Flow Indicator.
(1) Air or vaporized fuel in the indicator line may cause erroneous readings or fluctuations. Lines must be bled when the system is opened and if vaporization occurs when high temperatures are reached, usually during ground operation in hot weather. Turn OFF battery and alternator switches to reduce the possibility of a spark igniting fumes during bleeding. The pressure line

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may be loosened on the back of the gage. Airplanes 310R0840 thru 310R2140 have bleed lines installed and caps may be loosened at the bracket on the side of the glove box (refer to Figure 101) while pumps are running. Have a fire extinguisher available.

(2) For a guide to troubleshooting Electrical System (Optional), refer to Table 102. Refer to Fuel System - General for testing equipment.

Table 102. Electrical Fuel Flow Indicating System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
INDICATOR READING IS NOT ACCURATE.	Invalid indicator readings.	Set up breakout box and perform indicator reading verification per Inspection/Check Procedure. Repair or replace unserviceable indicator.
	Unserviceable indicator system.	Set up breakout box for fuel flow indicator system check. Repair or replace as required.
	Improper wiring or unserviceable connectors.	Set up breakout box for fuel system engine to indicator wiring and transducer check. Repair or replace wiring and/or connectors as required.
	Unserviceable transducer.	Replace transducer.

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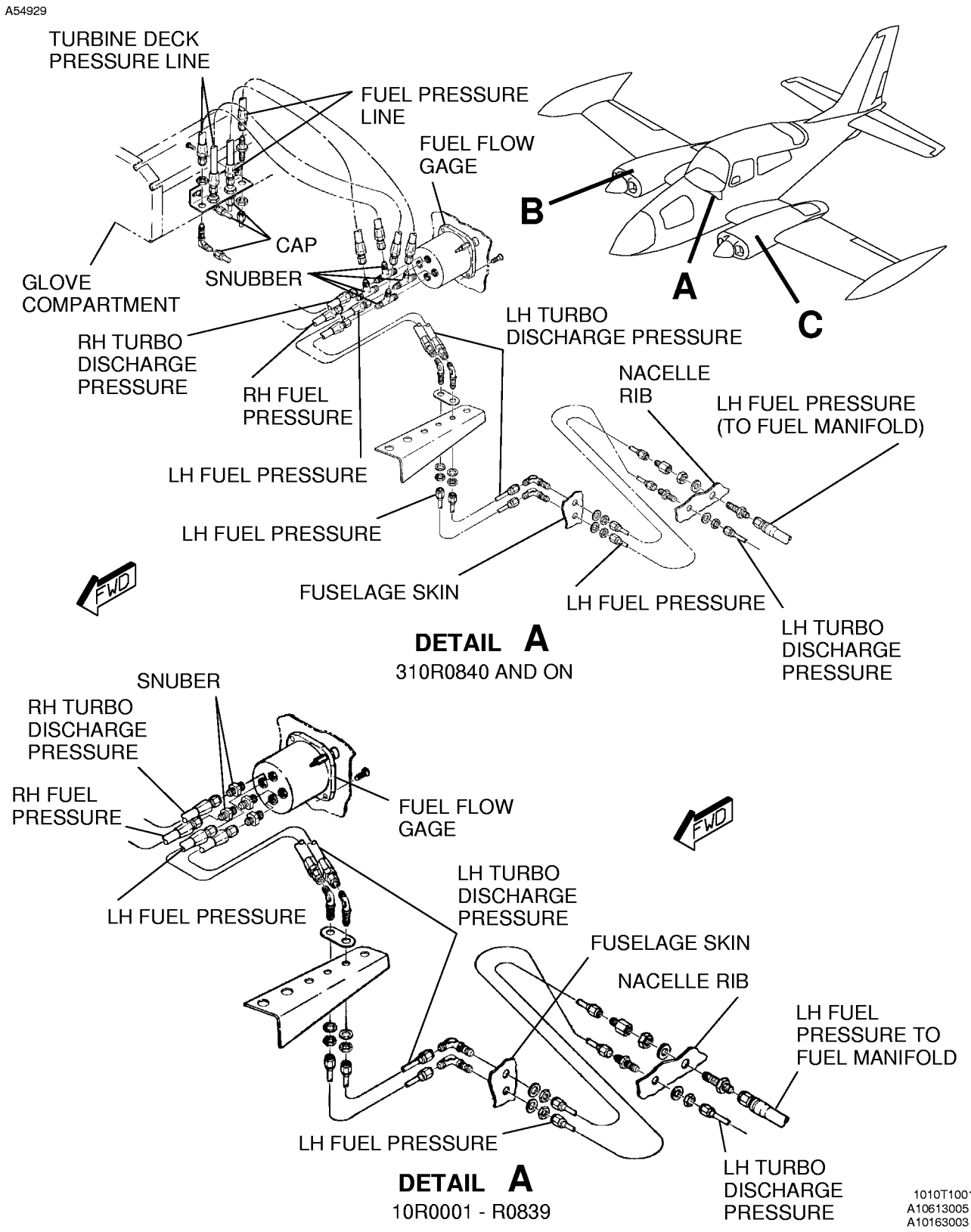

Engine Fuel System and Plumbing
Figure 101 (Sheet 1)

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FUEL INDICATING - REMOVAL/INSTALLATION

1. Fuel Indicating System (Standard and Optional)

NOTE: When removing/installing lines at bulkhead fittings, insure that fitting is secured to prevent twisting line on opposite side from one being installed. Hold fitting with wrench while loosening/tightening line connection. Refer to Chapter 20, Tubing, Hose And Fluid Fittings - Maintenance Practices, for expanded installation procedures.

A. Removal (Standard) (Refer to Figure 401, Figure 402 and Figure 403).

NOTE: Plug or cap all disconnected lines and fittings.

(1) Tag and disconnect lines at fuel flow gage and remove gage in accordance with typical instrument removal. Refer to Chapter 31, Indicating and Recording Systems.

B. Installation (Standard) (Refer to Figure 401, Figure 402 and Figure 403).
(1) Install fuel flow gage in accordance with typical instrument installation. Refer to Chapter 31, Indicating and Recording Systems.
(2) Connect fuel lines at fuel flow gage and remove tags.

C. Removal (Optional) (Refer to Figure 401, Figure 402 and Figure 403).
(1) Turn electrical power OFF.
(2) Remove engine cowling to gain access to fuel flow transducer.
(3) Disconnect electrical connector at fuel flow transducer.
(4) Disconnect and cap fuel line at fuel flow transducer.
(5) Remove fuel flow transducer by removing screws, washers and nuts securing transducer to bracket.
(6) Disconnect electrical connector from fuel flow indicator and remove fuel flow indicator in accordance with typical instrument removal. Refer to Chapter 31, Indicating and Recording Systems.

D. Installation (Optional) (Refer to Figure 401, Figure 402 and Figure 403).
(1) Install fuel flow indicator in accordance with typical instrument installation. Refer to Chapter 31, Indicating and Recording Systems. Connect electrical connector to fuel flow indicator.
(2) Install fuel flow transducer on bracket and secure with screws, washers and nuts.
(3) Uncap and connect fuel lines to fuel flow transducer.
(4) Connect electrical connector to fuel flow transducer. Reinstall engine cowling.

2. Fuel Signal Conditioner

NOTE: Removal/Installation for the signal conditioner is the same for either side.

A. Removal (Refer to Figure 404).
(1) Remove access plate on bottom surface of wing outboard of nacelle, refer to Chapter 6,Dimensions and Areas.
(2) Disconnect electrical connector from signal conditioner.
(3) Remove signal conditioner from access plate by removing nuts, washer, screws and bonding jumper.

B. Installation (Refer to Figure 404).
(1) Assemble signal conditioner to access plate, using screws, washers, bonding jumper and nuts.
(2) Install electrical connector to signal conditioner.
(3) Check fuel calibration. Refer to Fuel Indicating - Inspection/Check.
(4) Install access plate.

3. Fuel Quantity Indicator

A. Removal (Refer to Figure 404).
(1) Remove the deck cover from the instrument panel. Refer to Chapter 31, Indicating and Recording Systems.

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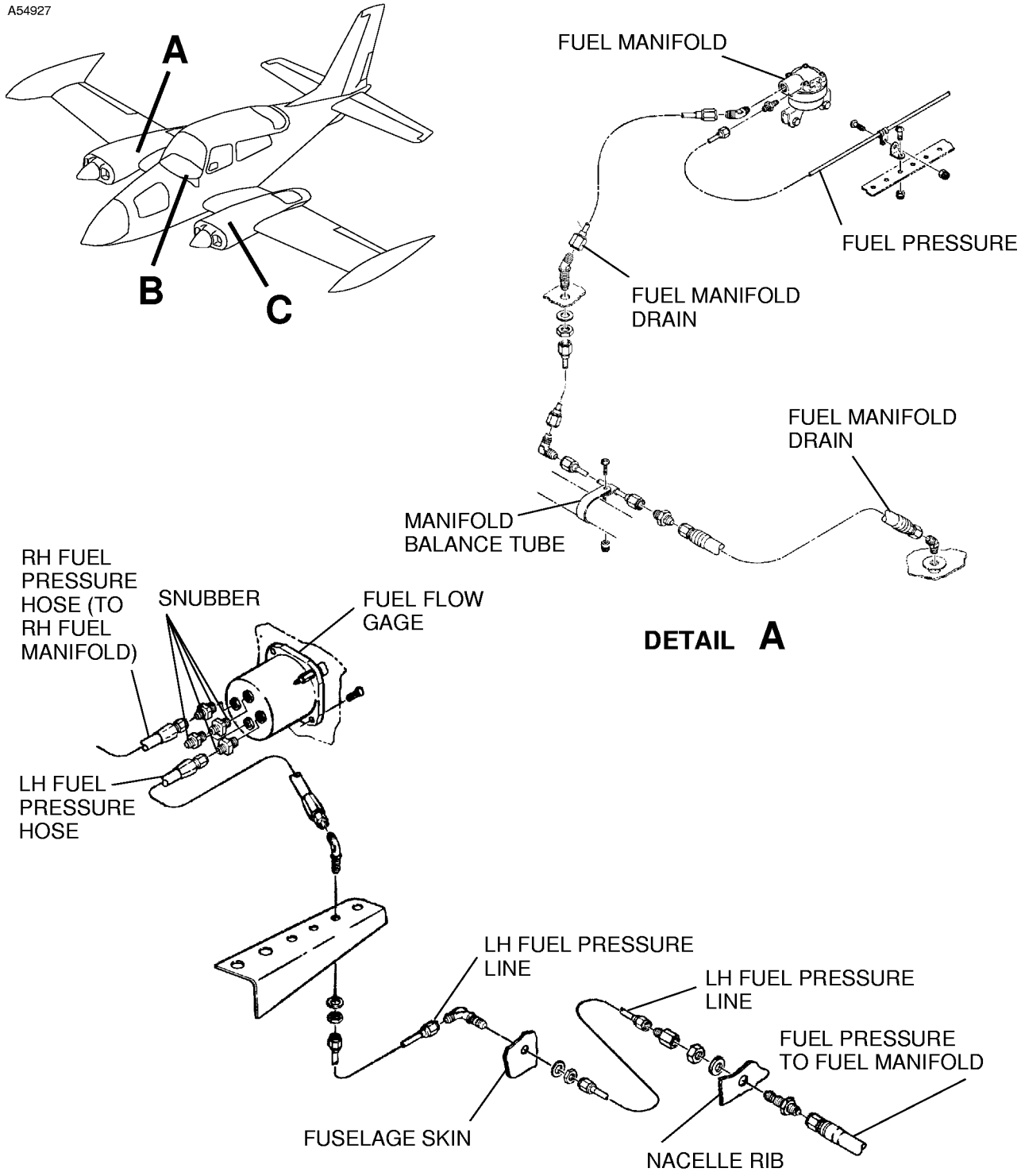

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Engine Fuel System and Plumbing
Figure 401 (Sheet 1)

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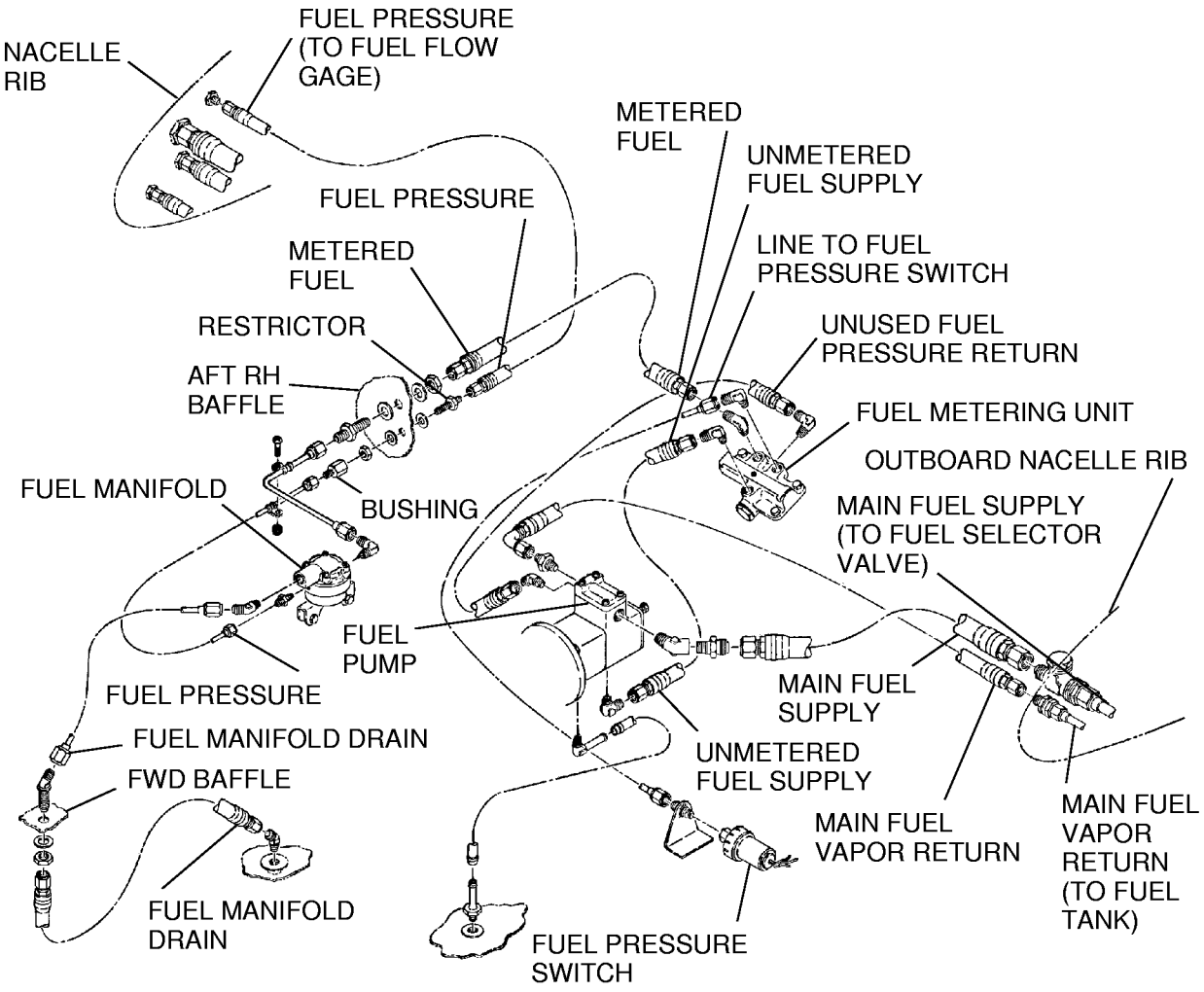

DETAIL C

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Engine Fuel System and Plumbing
Figure 401 (Sheet 2)

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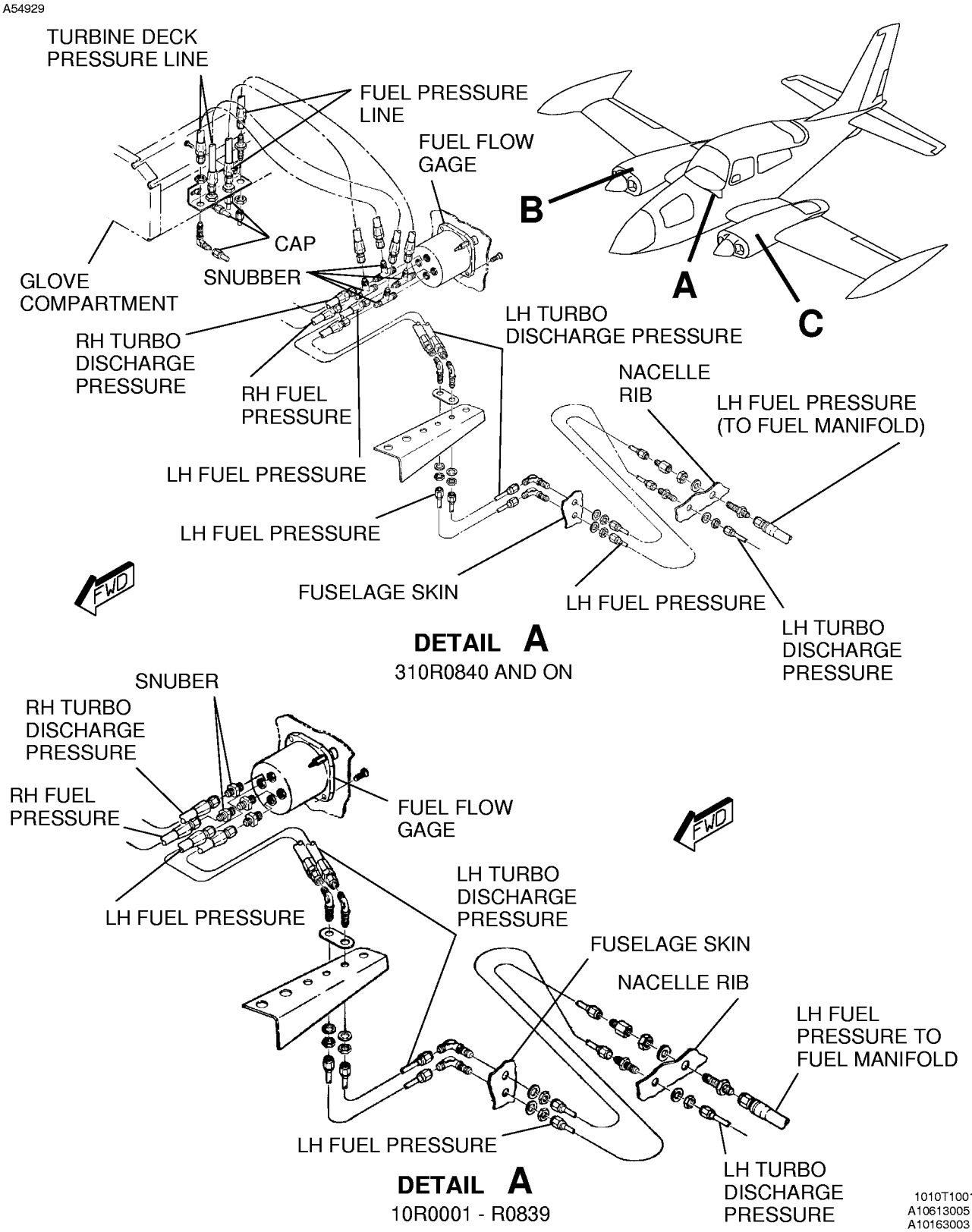

Engine Fuel System and Plumbing (Turbo 310)
Figure 402 (Sheet 1)

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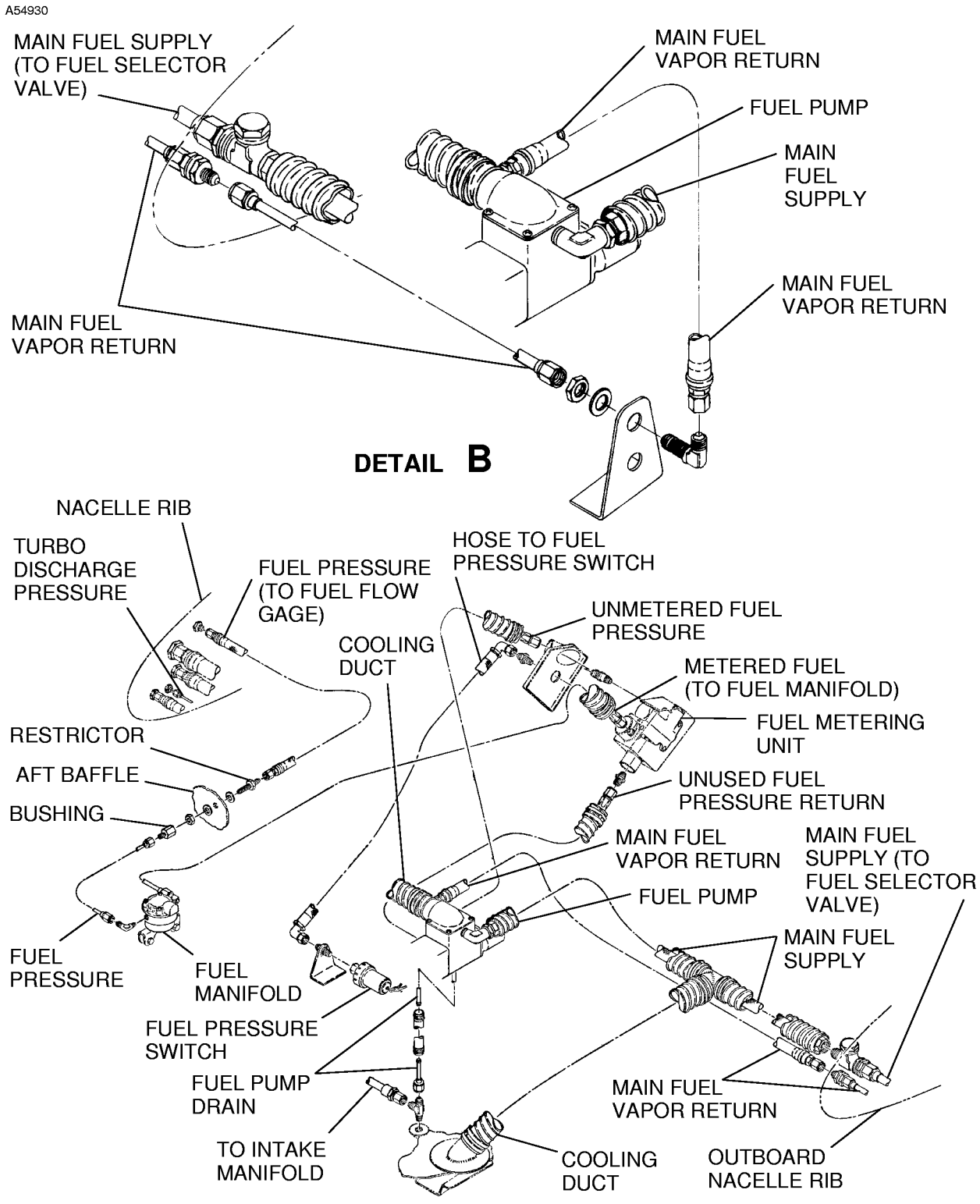

Engine Fuel System and Plumbing (Turbo 310)
Figure 402 (Sheet 2)

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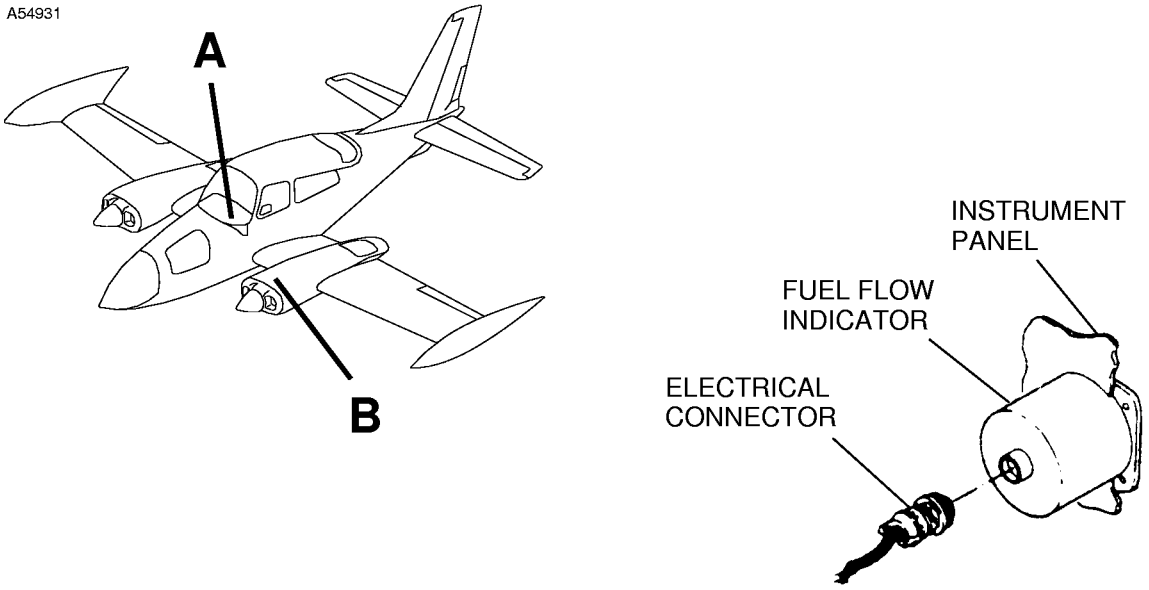

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Fuel Flow Totalizer and Indicator Installation (Optional)
Figure 403 (Sheet 1)

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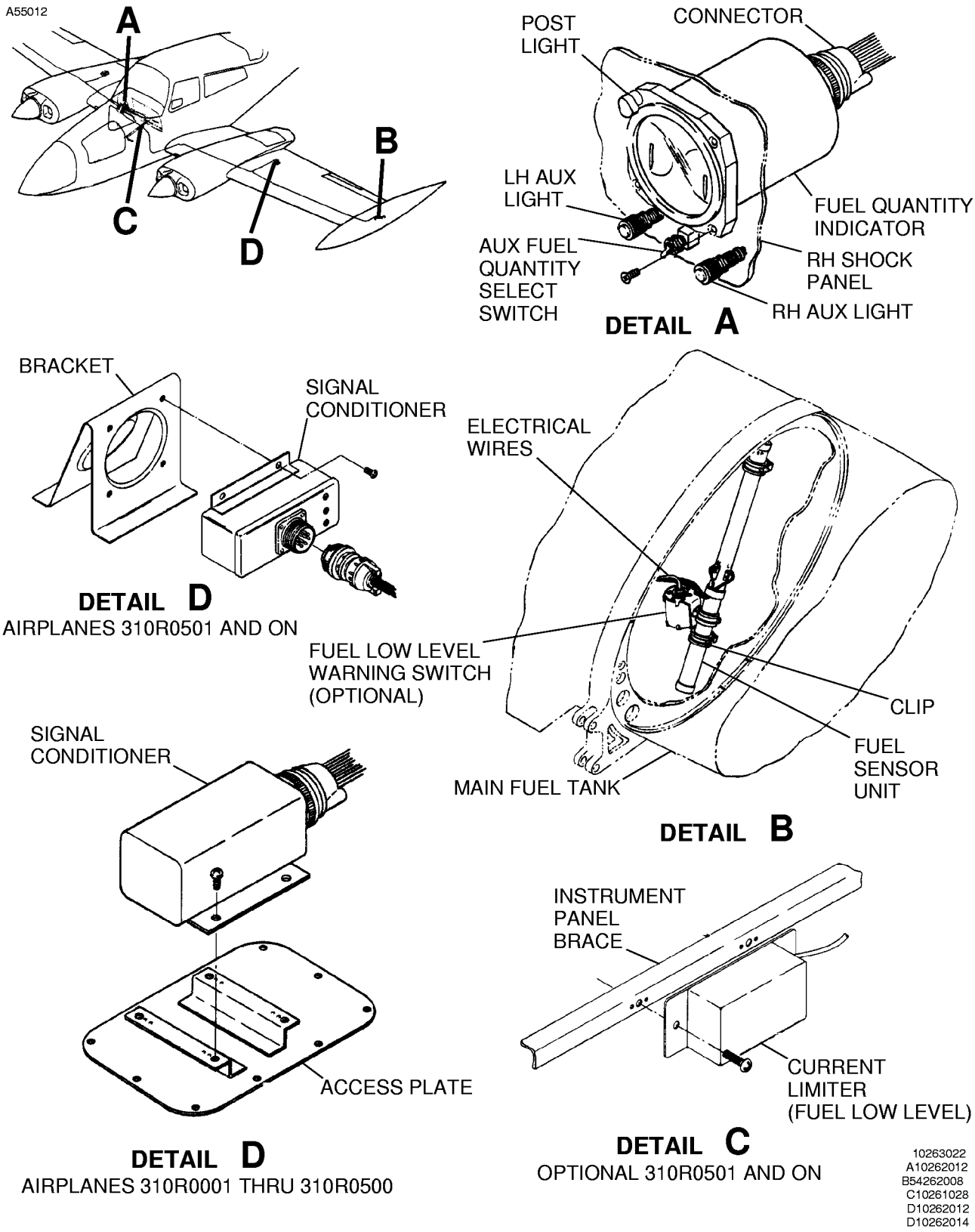

Main Fuel Indicating System Installation
Figure 404 (Sheet 1)

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(2) Insure electrical power is OFF.
(3) Disconnect the electrical connectors at the fuel indicator and post light.
(4) Remove post light and screws, securing fuel indicator to shock panel. Remove the fuel indicator.

B. Installation (Refer to Figure 404).
(1) Position fuel indicator in shock panel, secure with post light and screws.
(2) Connect electrical connectors to fuel indicator and post light.
(3) Check calibration of fuel system. Refer to Fuel Indicating - Inspection/Check.
(4) Install deck cover. Refer to Chapter 31, Indicating and Recording Systems.

4. Main Fuel Tank Sensor Unit

A. Removal (Refer to Figure 404).

NOTE: Removal/Installation of the main fuel tank sensor unit is the same for either main tank.

(1) Position fuel selector control handles to OFF.
(2) Defuel applicable main fuel tank. Refer to Fuel Storage - Servicing.
(3) (Refer to Figure 405). Remove wing fairings and tail cap.
(4) (Refer to Figure 405). Disconnect fuel lines to transfer pump.
(5) (Refer to Figure 405). Remove access plate and gasket to gain access to fuel sensor.
(6) Cut safety wire and pull the fuel sensor unit from the mounting clips.
(7) Disconnect electrical wires and remove sensor unit.

B. Installation (Refer to Figure 404).
(1) Connect electrical wires to sensor unit. Wire must route through cable strain relief.
(2) Position sensor unit in mounting brackets and safety wire.
(3) (Refer to Figure 405). Install gasket and access cover.
(4) (Refer to Figure 405). Connect fuel lines to transfer pump.
(5) Service main tank. Refer to Fuel Storage - Servicing.
(6) Check for leaks.
(7) Check fuel calibration. Refer to Fuel Indicating - Inspection/Check.
(8) Install tail cap and wing fairings.

5. Auxiliary Fuel Sensor Unit (40 Gallon)

NOTE: Removal/Installation procedures are the same for either fuel senior unit. However, on the left side the battery box must be removed.

A. Removal (Refer to Figure 406).
(1) Refer to Chapter 6, Dimensions and Areas. Remove access panels, just outboard of engine nacelle, forward of inboard end of aileron.
(2) Position fuel selector control handles to OFF.
(3) Defuel applicable wing. Refer to Fuel Storage - Servicing.
(4) Remove fuel cap assembly by removing screws and gasket.
(5) Reach inside fuel cell and remove sensor unit from bracket mount.
(6) Disconnect electrical wires from sensor unit and remove sensor unit.
(7) To remove inboard bracket assembly and adapter plate proceed as follows:
(a) Remove bracket assembly by removing bolts and gasket.
(b) Remove adapter plate by removing bolts and gaskets.

B. Installation (Refer to Figure 406).
(1) Install inboard bracket assembly and adapter plate as follows:
(a) Install adapter plate to fuel cell, using gaskets and bolts. Torque bolts to 50 inch-pounds, +5 or -5 inch-pounds.
(b) Assemble bracket assembly to adapter plate, using gasket, stat-o-seals and bolts.
(2) Connect electrical wires to proper terminals (marked) on sensor unit. Ensure wires are routed through the clamp strain relief.
(3) Insert sensor unit into fuel cell and mount on bracket assembly clip. Ensure sensor unit is positioned properly in clip.

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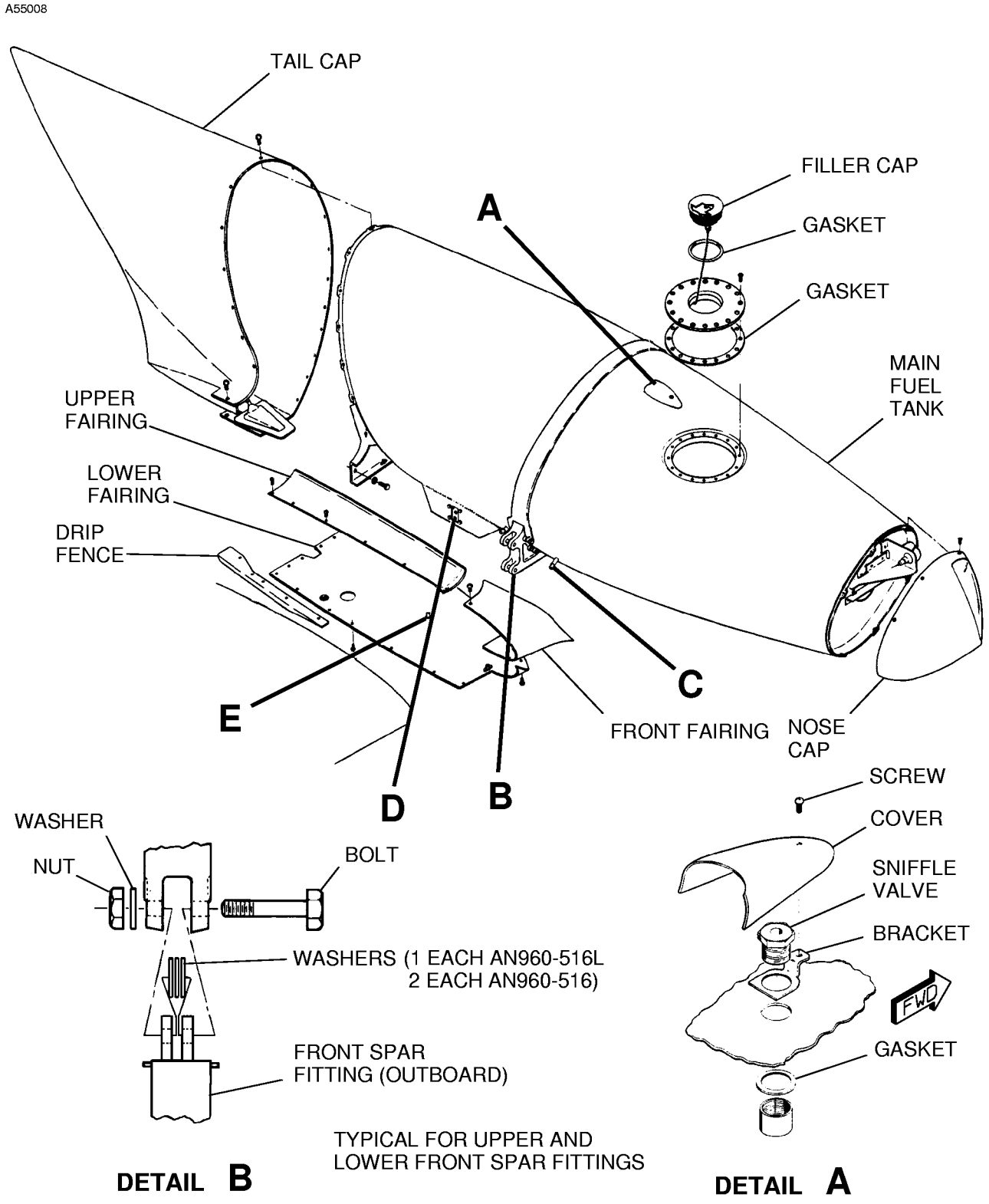

Main Fuel Tank Installation
Figure 405 (Sheet 1)

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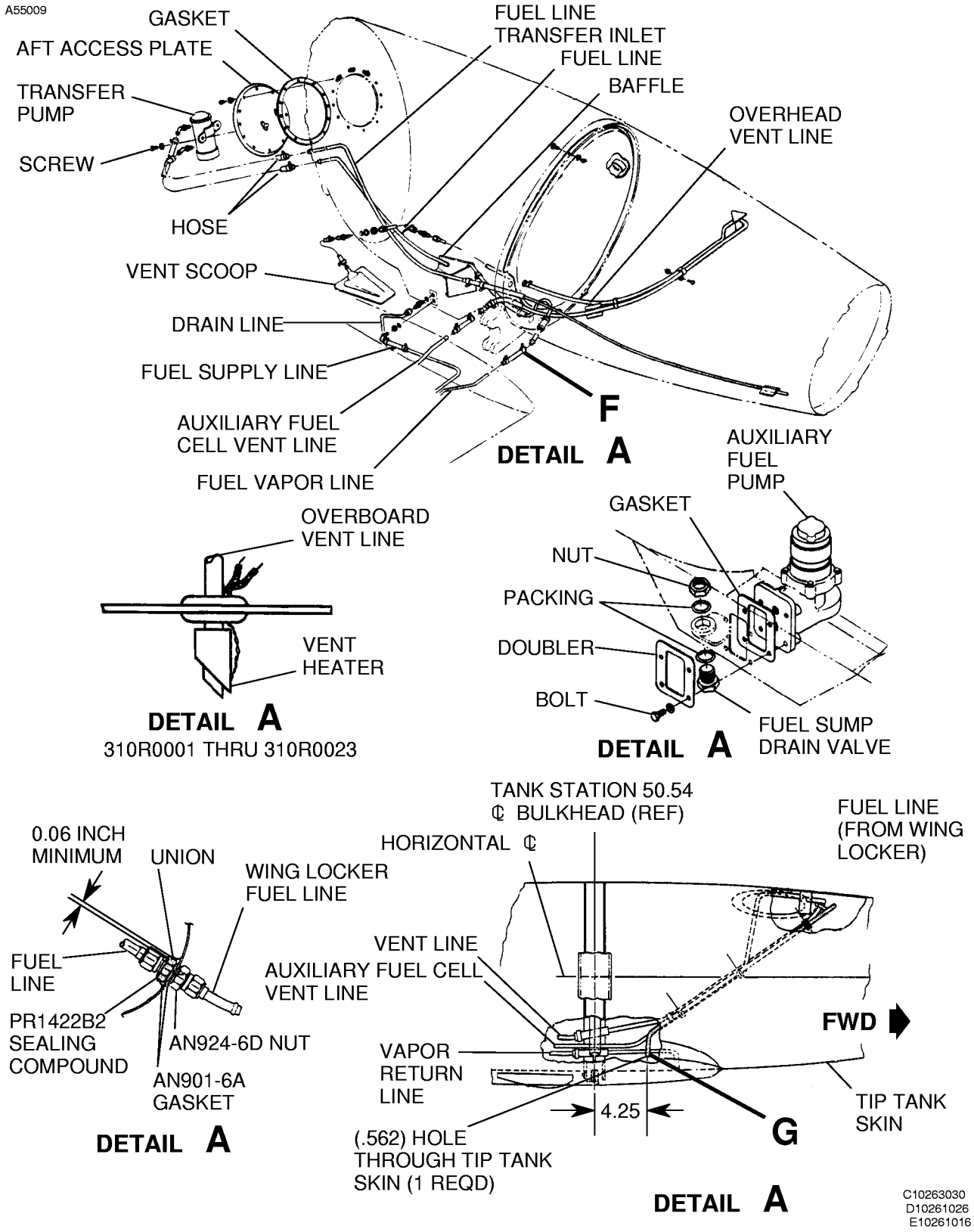

Main Fuel Tank Installation
Figure 405 (Sheet 2)

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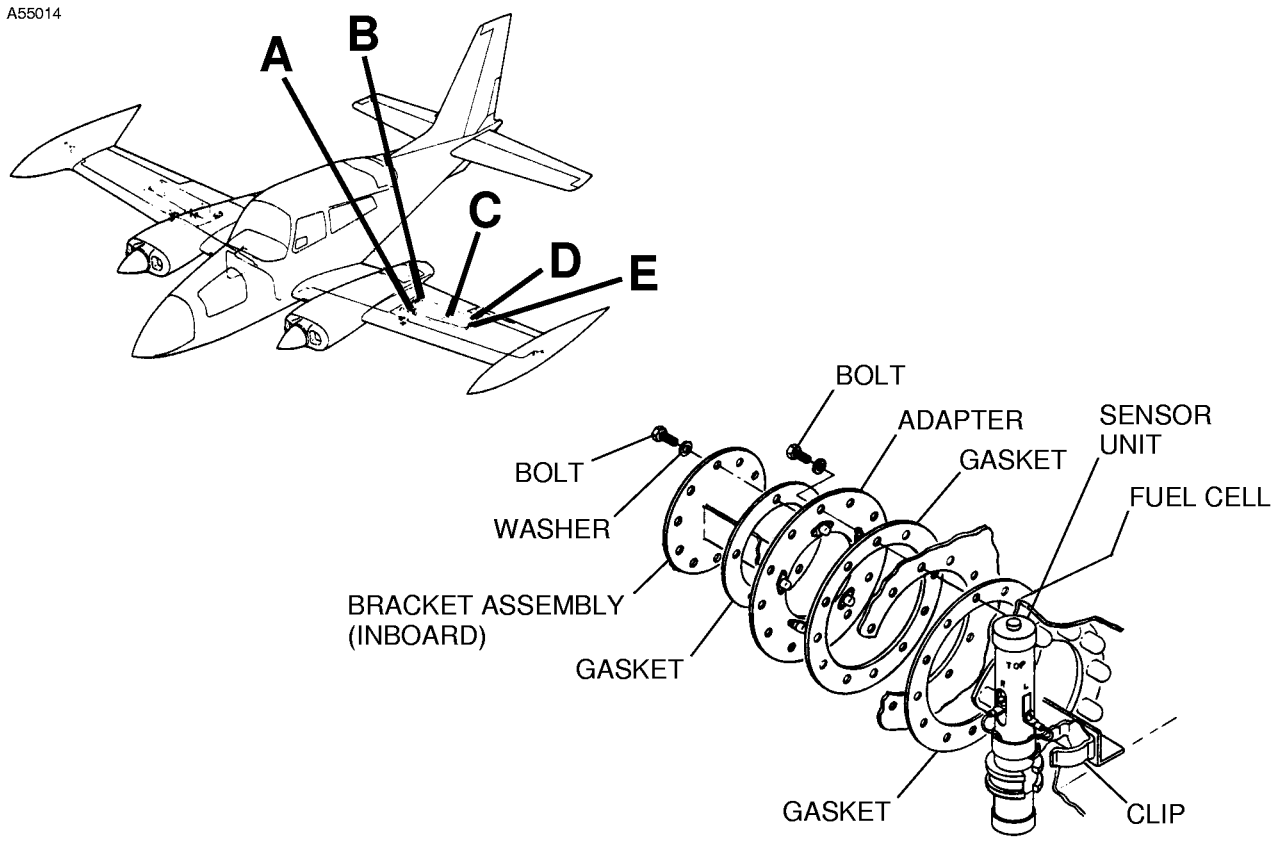
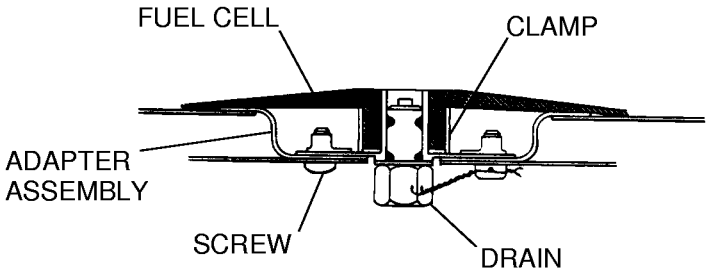


DETAIL A



DETAIL B

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A10261021
B10261023

Auxiliary Fuel Cell Installation (40 Gallon)
Figure 406 (Sheet 1)

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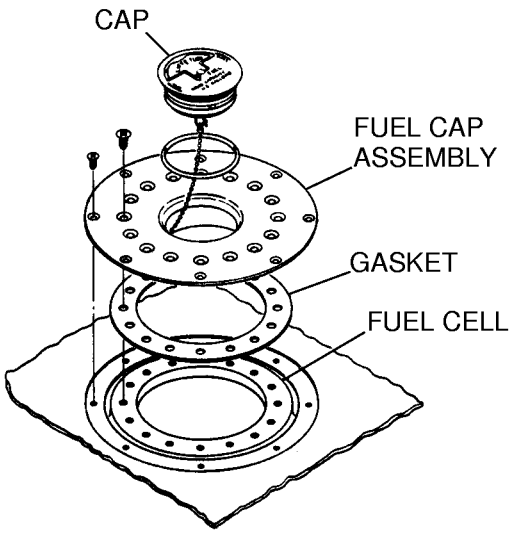

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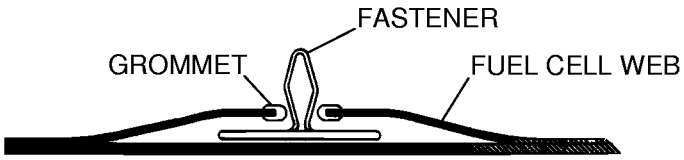

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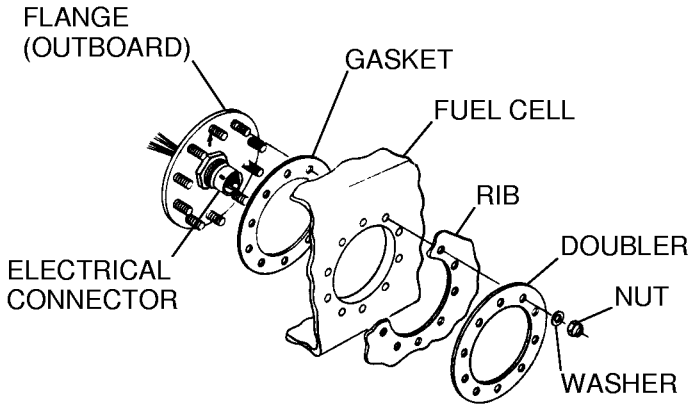

DETAIL E

C10262010
D10261023
E10261020

Auxiliary Fuel Cell Installation (40 Gallon)
Figure 406 (Sheet 2)

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(4) Assemble fuel cap assembly to fuel cell, using gasket and screws.
(5) Calibrate the fuel system. Refer to Fuel Indicating - Inspection/Check.
(6) Service fuel system, refer to Fuel Storage - Servicing. Check for leaks.
(7) Install battery box, if removed and all access panels.

6. Auxiliary Fuel Sensor Unit (63 Gallon)

NOTE: Removal/Installation procedures are the same for left and right-hand fuel sensor units. However, on the left-hand inboard fuel sensor the battery box must be removed.

A. Removal (63 Gallon) (Refer to Figure 407).
(1) Position fuel selector control handles to OFF.
(2) Defuel applicable wing. Refer to Fuel Storage - Servicing.
(3) Refer to Chapter 6, Dimensions and Areas. Remove wing access panel to gain access to fuel sensors in inboard fuel and outboard fuel cell as required.
(4) Remove inboard fuel cell sensor units as follows:
(a) Remove inboard fuel cell cover plate by removing screws and gasket.
(b) Reach inside the fuel cell and remove inboard sensor unit from bracket assembly. Disconnect electrical wires from the sensor unit and remove sensor unit.
(c) Remove inboard bracket assembly by removing bolts and gaskets.
(d) Remove adapter plate by removing bolts and gaskets.
(e) Reach inside the fuel cell and remove the outboard fuel sensor unit from the sensor bracket. Disconnect electrical wires from the sensor unit and remove sensor unit.
(f) Remove sensor bracket by removing nuts, washers, doubler and gasket. Disconnect electrical connector from bracket and remove the bracket.
(5) Remove outboard fuel cell sensor unit as follows:
(a) Remove fuel cap assembly by removing screws and gasket.
(b) Reach inside the fuel cell and remove the sensor unit from the sensor bracket. Disconnect the electrical wire from the sensor and remove sensor unit.
(c) Remove sensor bracket by removing bolts, washers and gasket.

B. Removal (63 Gallon) (Refer to Figure 407).

NOTE: Inspect gaskets for damage prior to installation, if necessary replace.

(1) Install outboard fuel cell sensor unit as follows:
(a) Assemble sensor bracket to fuel cell and structure, using bolts, washers and gasket.
(b) Route electrical wires through strain relief clamp on sensor unit and connect wires to sensor. Mount the sensor unit in the sensor bracket.
(c) Assemble fuel cap assembly to fuel cell, using screws and gasket.
(2) Install inboard fuel cell sensor units as follows:
(a) Connect electrical connector to outboard sensor bracket, using gasket and nut.
(b) Assemble sensor bracket to fuel cell and structure, using gasket, doubler, washers and nuts.
(c) Route electrical wires through strain relief clamp on sensor unit and connect wires to sensor. Mount the sensor unit in the sensor bracket.
(d) Assemble adapter plate to fuel cell using bolts and gaskets. Torque bolts to 50 inch-pounds, +5 or -5 inch-pounds.
(e) Assemble bracket assembly to adapter plate, using bolts, stat-o-seals and gasket.
(f) Route electrical wire through strain relief on sensor unit and connect wires to sensor. Mount the sensor unit in the bracket assembly.
(g) Assemble cover plate to fuel cell; using screws and gasket.
(3) Calibrate the fuel system. Refer to Fuel Indicating - Inspection/Check.
(4) Refer to Fuel Storage - Servicing. Service the fuel system and leak check.
(5) Install all access panels.

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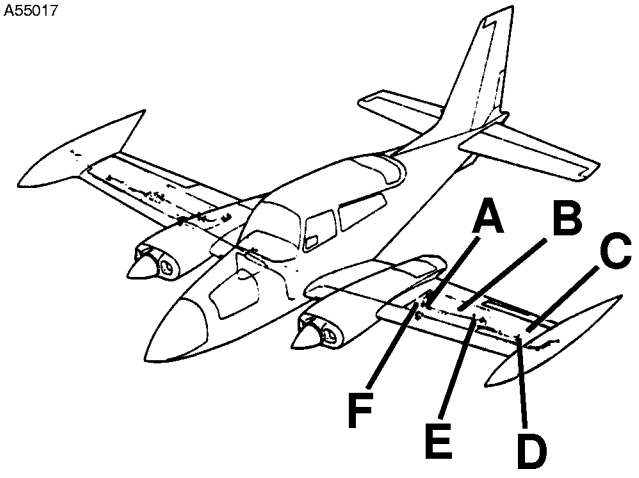

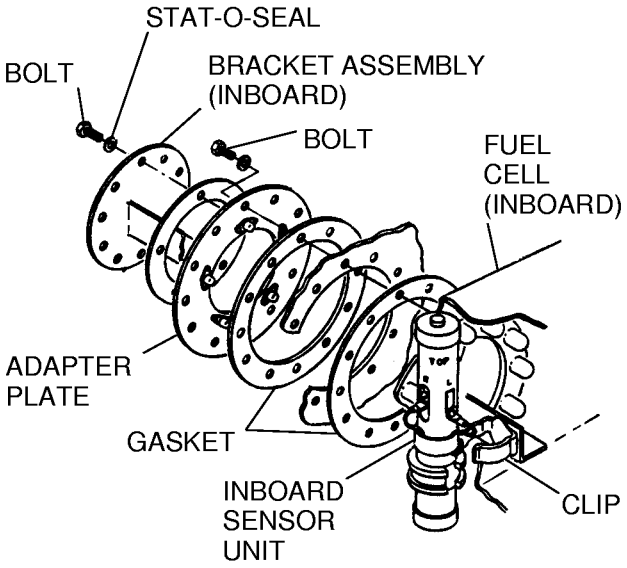

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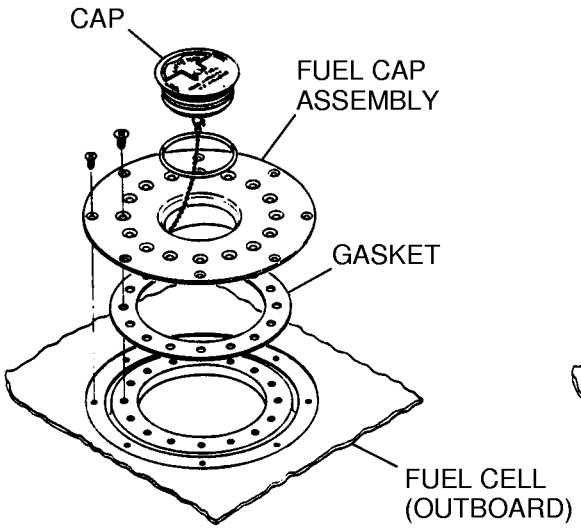

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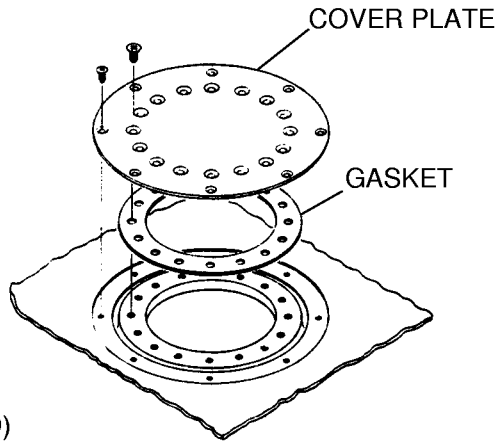

DETAIL B

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C10262010

Auxiliary Fuel Cell Installation (63 Gallon)
Figure 407 (Sheet 1)

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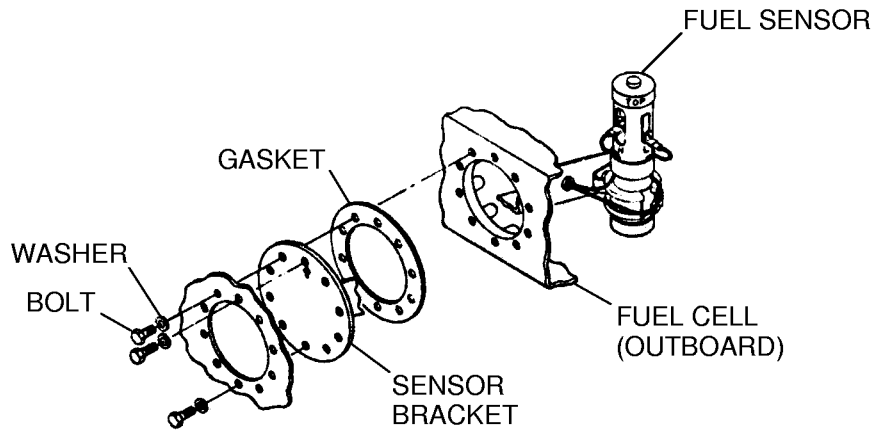
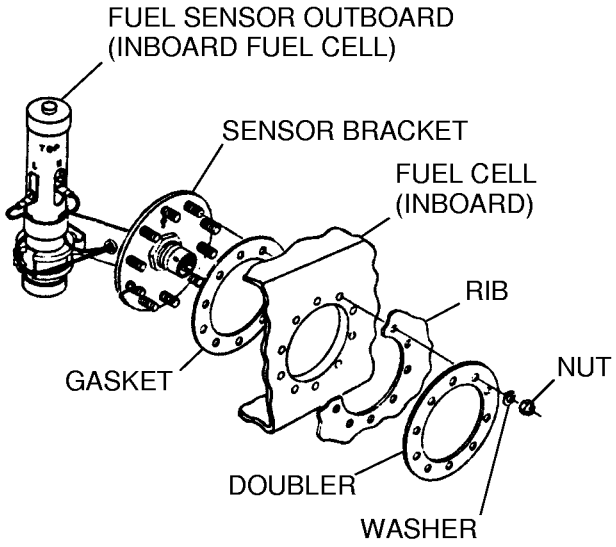


DETAIL D



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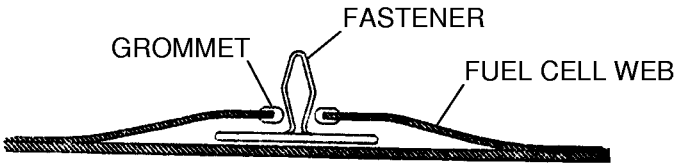

DETAIL F

D10261022
E10261007
F10261023

Auxiliary Fuel Cell Installation (63 Gallon)
Figure 407 (Sheet 2)

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FUEL INDICATING - INSPECTION/CHECK

1. Fuel Quantity Indicating System

WARNING: During all defueling and tank calibration, the airplane must be located a safe distance from other airplanes and buildings. Fire fighting equipment must be available. Two ground wires from different points on the airplane to separate approved grounding stakes shall be used to prevent accidental disconnecting of one ground wire.

A. Adjustment of indicating system requires use of capacitance fuel test box and harness assemblies. Refer to Tools and Equipment Table in Fuel System - General.

B. Indicating Accuracy Check.
   (1) To verify that the indicating system is functioning correctly a fairly accurate check can be calculated as follows:

   NOTE: Apply electrical power. If airplane battery is used, assure battery voltage is 22 volts or more.

   (2) Defuel airplane (refer to Fuel Storage - Servicing). Indicator should read "0" pounds.
   (3) Put a known quantity of fuel in the tank. Use chart (Figure 601). Select fuel density (Ref. B) for known fuel type (100/130 AVGAS or 100 LL) and temperature (Ref. A).

   NOTE: Calculate: Density multiplied by known total gallons of fuel in tank equals total quantity in pounds. Read indicator for verification.

   (4) Fill tank and read indicator. Should show FULL indication.

   NOTE: This check is not to be used for calibrating system.

C. Preparation for Calibration.
   (1) Defuel airplane. Refer to Fuel Storage - Servicing. Complete defueling from each tank by removing drain valves from the bottom side of each fuel pump located on the underside of each wing outboard of main gear.
   (2) Remove access panels to signal conditioner.

   NOTE: The fuel quantity indicator visually displays fuel quantity for each wing separately, therefore calibration procedure is repeated for the opposite wing.

   (3) Set up capacitance fuel system test box and harness assembly for insulation resistance test. Refer to Figure 601. Check insulation breakdown resistance on left and right main and auxiliary tanks. Circuit resistance should be 1000 megohms for the following circuits:
      (a) Shield to Structure Ground.
      (b) Hi Z to Lo Z.
      (c) Hi Z to Shield.
      (d) Lo Z to Shield.
      (e) Hi Z to Structure Ground.
      (f) Lo Z to Structure Ground.
   (4) Interconnect test box and harness assembly into circuit as shown on Figure 601, Fuel Quantity Capacitance Test.
   (5) Make capacitance measurements on LH and RH main and auxiliary circuits. Net gain capacitance on the circuit and probe combinations should not exceed 2.00 PF of that of the probes noted on Table 601. The 2.00 PF allowance is for additional capacitance induced by the system wiring.

   NOTE: Any discrepancies found in Steps (3) and (5) should be checked out completely and corrected before proceeding further with the calibration.

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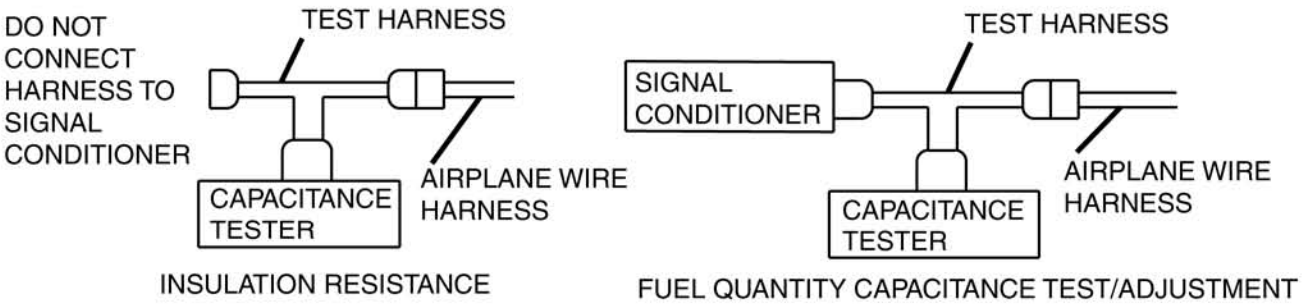

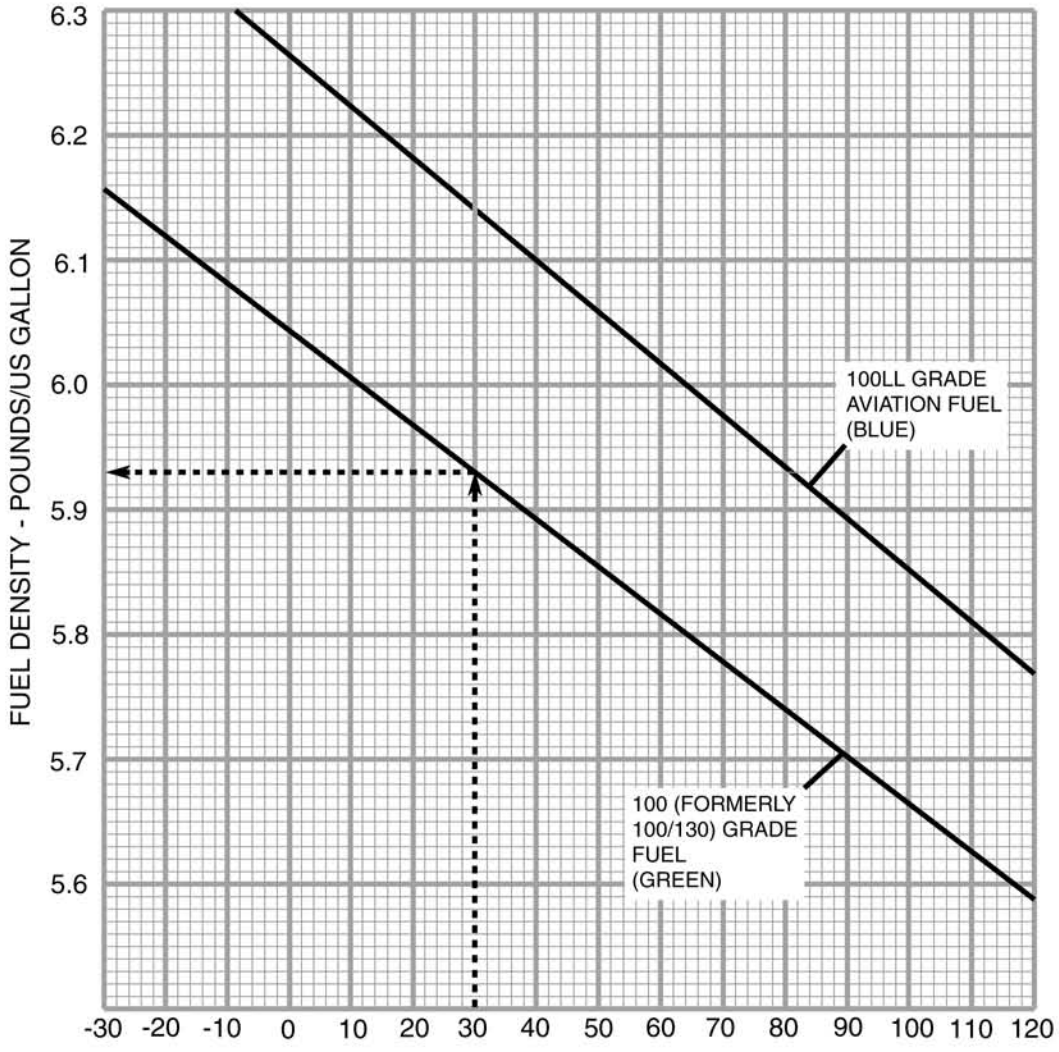

EXAMPLE: A - FUEL TEMPERATURE, 30 DEGREES F
B - FUEL DENSITY, 5.3 POUNDS PER US GALLON
DENSITY x TOTAL GALLONS
TOTAL FUEL QUANTITY IN POUNDS

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Fuel Quantity Calibration Test and Temperature Conversion Chart
Figure 601 (Sheet 1)

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(6) Restore the circuits to original configuration.

D. Calibration.
(1) Apply airplane power and assure battery is adequately charged; voltage should never be less than 22 volts when calibrating.
(2) Place fuel selector valve to MAIN position and adjust the signal conditioner MAIN EMPTY potentiometer to read exact ZERO pounds on the indicator.
(3) Place the fuel selector valve to AUX position and adjust the signal conditioner AUX EMPTY potentiometer to read exact ZERO pounds on the indicator.

NOTE: Slight tapping on the indicator may be required to overcome friction when indicator is in static condition.

(4) Place fuel selector valve to MAIN position and interconnect test box and harness assembly and adjust variable capacitance for added capacitance value. Refer to Table 601.

Table 601. Capacitance Check

MAIN TANK UNIT	CAPACITANCE VALUES					
	CAPACITANCE VALUES IN PICOFARADS				CALIBRATION VALUES	
	Inboard	Auxiliary Middle	Tank Units Outboard	Empty Total	Added Capacitance	Indicator Setting
*35.00, +05 or -0.5	13.68, +0.5 or -0.5	2.62, +0.5 or -0.5	7.55, +0.5 or -0.5	23.85, +1.5 or -1.5	32.64 PF	50 Gal. 100/130 Octane
					32.64 PF	310 Lbs. 100 Octane Low Lead

*2.00 PF Allowance for Additional System Wiring Capacitance on Main and Auxiliary Systems.

(5) Adjust signal conditioner MAIN FULL potentiometer to read 50 gallons or 310 lbs. (Refer to Table 601) on the indicator. Tap indicator slightly to insure that pointer has stabilized in final position.
(6) Disconnect rest box and harness assembly and restore circuit to original configuration.
(7) With airplane power ON and fuel selector valve in MAIN position, check main empty for any shift. It may be necessary to readjust main and auxiliary potentiometers, by switching back and forth to MAIN and AUX positions respectively, until no deviation in zero reading is noticed.
(8) Recheck MAIN FULL per steps (4) and (5). If calibration has changed, readjust FULL MAIN until a FULL indication without a change in both main and auxiliary zero indication is obtained.
(9) Repeat steps (1) through (8) for opposite side.
(10) After both LH and RH sides have been restored to original configuration, select AUX tanks by actuating the override switch located below the fuel quantity indicator on the instrument panel and verify that AUX zero corresponds to that of the main.

2. Electrical (Optional) Fuel Flow Indicating System

A. Airplane Preparation for Test/Checks.
(1) Turn ON airplane master battery switch or connect to APU. Do not operate engines.

B. Indicator Reading Verification.
(1) Turn OFF power to fuel flow system by pulling circuit breaker.
(2) Install breakout box and harness. Refer to Figure 602.

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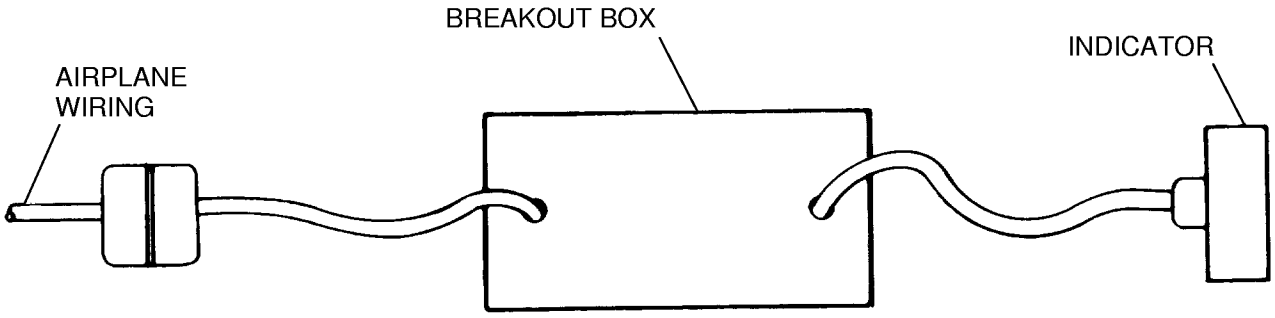

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Breakout Box Test Setup Fuel Flow Indicator Test
Figure 602

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(3) Turn breakout box LH, RH and Memory power switch ON. Observe that all three POWER ON lights illuminate.
(4) Connect frequency counter at breakout box terminals H and D for left check or G and C for right check.
(5) Monitor frequency counter and adjust frequency control knob on the breakout box to obtain a selected frequency setting. Refer to Table 602. Check TEST POINT PPH for the FREQUENCY SETTING Hz. Compare this value with the value displayed on the fuel flow indicator.

Table 602. Frequency Check

		POSITION TOLERANCE	
TEST POINT PPH	**FREQUENCY SETTING Hz**	**SCALE ERROR ± PPH**	**HYSTERESIS ± PPH**
20	79	NA	NA
50	198	NA	NA
60	237	NA	NA
70	277	3	3
*80	317	3	3
*90	356	3	3
*100	396	3	3
*110	435	3	3
*120	475	3	3
*130	515	3	3
140	554	3	3
*150	594	3	3
160	633	3	3
170	712	3	3
*180	712	3	3
190	752	3	3
*200	791	3	3
210	831	3	3
220	871	3	3
230	910	3	3
240	950	3	3
*250	989	3	3
260	1029	3	3
270	1068	3	3
280	1108	3	3

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Table 602. Frequency Check (continued)

TEST POINT PPH	FREQUENCY SETTING Hz	POSITION TOLERANCE SCALE ERROR ± PPH	POSITION TOLERANCE HYSTERESIS ± PPH

System tolerance shall be within 3% of full scale indication.

NOTE: Allowable friction error is 2% full scale indication and total error shall not exceed 4.00 PPH (180 and 200 PPH) 5.6 PPH (280 PPH).

*Test points on which data must be supplied by vendor with each indicator as applicable to indicator range.

NOTE: Test equipment accuracy and system tolerance must be considered when monitoring frequency and checking for system accuracy.

(6) Check a variety of frequency adjustments to verify indicator readings.
(7) The allowable split between left and right fuel flow is 12 PPH.

C. Fuel Flow Indicator System Check.
(1) Turn OFF all power to fuel flow system by pulling circuit breakers.
(2) Interconnect breakout box and harness per Figure 602.
(3) Turn ON power to fuel flow system by setting circuit breakers.
(4) Turn breakout box LH, RH and memory power switch ON. Observe that all three POWER ON lights illuminate.
(5) Voltage Check (Refer to Table 603).

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Table 603. Voltage Check

VOLTAGE SELECT	NOMENCLATURE	READING	ACTION REQUIRED
F(LH) / E(RH)	LH +12 V Output	12.0 ± 1.0 VDC	1. If reading is not obtained, remove pin from breakout box connector. a. If required reading is obtained, transducer or wiring is faulty. b. If required reading is not obtained, indicator is faulty.
H(LH) / G(RH)	5 to 12.0 VDC	LH FLOW Signal	1. If required voltage is not obtained, but voltage at F is correct, transducer or wiring is faulty. 2. If required voltage is not obtained, remove pin H or G from breakout box. a. If required reading is obtained, indicator is faulty. b. If required reading is not obtained, transducer or wiring is faulty.
N(LH) / M(RH)	12 ± 1.0 VDC	LH Temperature Compensator Output	1. If required voltage is not obtained, remove pin H or G from breakout box. a. If required reading is obtained, transducer or wiring is faulty. b. If required reading is not obtained, indicator is faulty.
R(LH) / J(RH)	2.93 ± .10 VDC	LH Temperature Compensator Signal	1. If required voltage is not obtained, but voltage at N is correct, transducer or wiring is faulty. 2. If required voltage is obtained, indicator is faulty. a. If required voltage is obtained, indicator is faulty. b. If required reading is not obtained, transducer or wiring is faulty.

(a) Connect DVM to the VOLTAGE MONITOR SELECT jacks on the breakout box and make tests per Table 603 to verify quick readings.

(6) Frequency Check (Refer to Table 603).
   (a) Place VOLTAGE MONITOR SELECT switch in OFF position.
   (b) Rotate both LH and RH frequency controls to the full counterclockwise stop.
   (c) Select LH frequency simulator switch to the ON position.
   (d) While applying vibration (finger tapping or equivalent) to fuel flow indicator, slowly rotate frequency control knob in the clockwise direction and note that LH indicator is advancing UP scale smoothly.

(7) Delta T Check (Refer to Table 604).

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Table 604. Temperature Check

SWITCH SETTING @ 80 PPH °C	INDICATOR READING CHANGE ± PPH	TOLERANCE ± PPH	TEMPERATURE SIMULATOR OUTPUT VDC ± .10
+60	-4	1	3.33
+50	-3	1	3.23
+40	-2	1	3.13
+30	-1	1	3.03
+20	0	1	2.93
-5	+2.5	1	2.68
-40	+6	1	2.33

(a) Set LH frequency control to read 80 PPH on the indicator.
(b) Select LH Temperature Compensation Simulator switch to the INTERNAL position
(c) While applying vibration (finger tapping or equivalent) to the indicator, rotate the temperature compensation simulator rotary from 40° to +60°C to obtain values indicated in Table 604.
(d) Return LI Temperature Compensation and frequency simulator switches to OFF position.

(8) Repeat frequency and Delta T check using RH controls on breakout box.
(9) If any discrepancies are encountered in checkout steps (6) through (8), remove the indicator for repair and replacement.
(10) Disconnect breakout box and harness, and return airplane to original configuration.

D. Fuel Flow System Engine to Indicator Wiring and Transducer/Check.

NOTE: This check is performed only when fuel flow indication discrepancy cannot be isolated to the fuel flow indicator.

(1) Remove engine cowling. Refer to Chapter 71, Engine Cowling - Removal/Installation.
(2) Turn all power OFF to fuel flow system by pulling circuit breakers.
(3) Interconnect breakout box to engine transducer wiring (refer to Figure 603).

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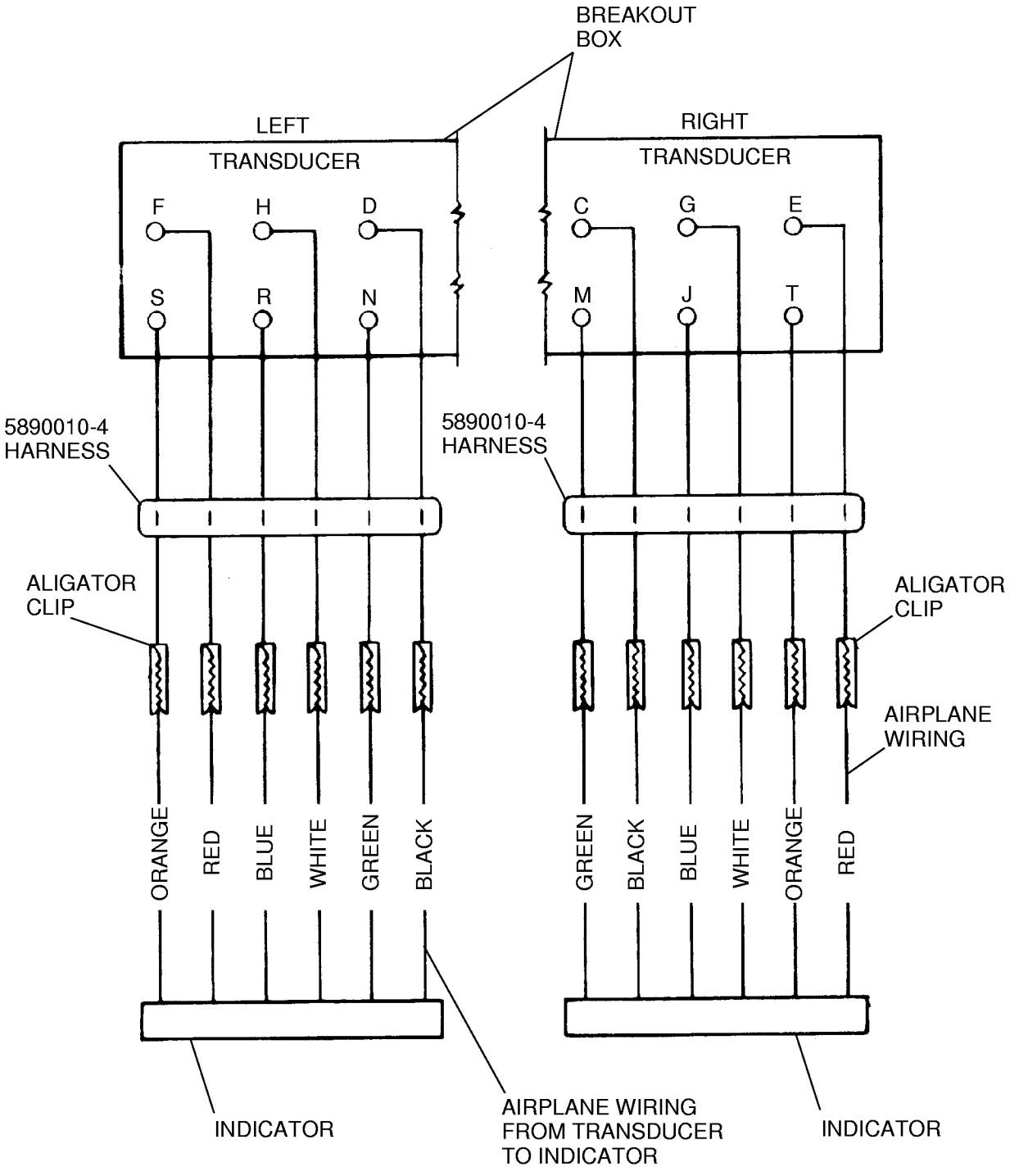

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Engine to Indicator Wiring and Transducer Check Equipment Setup
Figure 603

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NOTE: Match color coded wires of test harness with airplane wiring.

(4) Turn power ON to fuel flow by setting circuit breakers.
(5) Perform frequency and Delta T tests per fuel flow indicator system check.
(6) If discrepancies are encountered in tests, repair or replace wiring. If no discrepancies are found in tests, replace transducer.
(7) Disconnect breakout box and harness and return airplane to original configuration.

E. Engine Runup Inspection.
(1) Check indicator needles for free and smooth up and downward scale movement during engine run.
(2) Check for any EMI or RFI interference with system by observing indicator for any changes due to normal operation of radios and other onboard equipment.
(3) Check for totalizer operation by noticing that it is either subtracting from input or adding when starting at zero.

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CHAPTER

30

ICE AND RAIN PROTECTION

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30-Record of Temporary Revisions		
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ICE & RAIN - GENERAL

1. Scope

A. This chapter describes those units and components which provide a means of preventing or disposing of formation of ice and rain on various parts of the airplane. Refer to Figure 1 and Figure 2.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Airfoil describes that portion of the system which is used to eliminate or prevent the formation of ice on all airfoil surfaces.
   (2) Windshield describes that portion of the system used to eliminate or prevent the formation of ice, frost, or rain on the windshield.
   (3) Propellers describes that portion of the system which is used to eliminate or prevent the formation of ice on propellers.

3. Surface Deice System

A. Description.
   (1) On Airplanes 310R0001 thru 310R0800, a pneumatic airfoil deice system (optional) is utilized to break up ice accumulation on the outboard wing leading edge and the horizontal stabilizer leading edge. Air is routed from each engine-driven vacuum pump by tubing to the rubber boots bonded to the leading edge of the airfoils.
   (2) On Airplanes 310R0801 thru 310R2140, the pneumatic airfoil deice system (optional) is utilized to break up ice accumulation on the outboard and inboard wing leading edges and the horizontal and vertical stabilizer leading edges.
   (3) On Airplanes 310R0001 thru 310R0800, the system consists of engine-driven vacuum pumps, shuttle valve, control valves, oil separators, air filter assemblies, a pressure switch, electrical timer, and inflatable rubber deice boots. The system is electrically controlled and pneumatically operated. Air for inflation of the boots is supplied by the pressure side of each engine-driven vacuum pump. A wing deice light is incorporated on the outboard side of the left engine nacelle to provide and aid in observing ice formations during night operation.
   (4) On Airplanes 310R0801 thru 310R2140, the system consists of engine-driven pumps, control valves, flow valves, a pressure switch, electrical timer, and inflatable rubber deice boots. The system is electrically controlled and pneumatically operated.

B. Operation.
   (1) On Airplanes 310R0001 thru 310R0800, to operate the deice system, the engine(s) shall be operating to supply air. Momentarily position the surface deice switch, located on the circuit breaker panel to ACTUATE; bus voltage is applied to the timer which initiates the time circuit and supplies bus voltage to the control valves. The control valve actuates, closing the overboard port and opening the inflate port to direct pressure air through the air filter and shuttle valve to inflate the boots. The time circuit will elapse in six seconds after initiation, deactuating the control valves. The boots will deflate by bleeding the air back through the control valve dumping the air overboard. When the control valve has less than one PSI against it, the valve closes and the vacuum side of the vacuum pump holds the boots in the deflated position. The boots will remain in the deflated position until the timer is again cycled by positioning the surface deice switch to ACTUATE position. RESET position on the surface deice switch interrupts the normal cycle to return the boots to the deflated airfoil position. The pressure indicator light (amber) will illuminate when the surface deice switch is moved to ACTUATE and the system reaches 10 PSI, +2 or -2 PSI.
   (2) On Airplanes 310R0801 thru 310R2140, the engine(s) must be operating to supply air. Momentarily position the surface deice switch to ACTUATE position; bus voltage is applied to the timer which initiates the time circuit and supplies bus voltage to the control valves and flow valves. The control valve closes to direct air through a check valve, a pressure regulator and flow valves to inflate boots. The pressure regulator is set at 12 PSI, +0.25 or -0.25 PSI to control system pressure. The check valves prevent possible loss of pressure during single engine

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operation. The timer circuit inflates the empennage boots for six seconds; then inflates the wing boots for six seconds. After the six-second inflation cycle, the timer circuit will reposition the flow valves. Vacuum from the vacuum system will deflate the boots and hold them in deflated position until the timer is again cycled by positioning the surface deice switch to ACTUATE position. RESET position on the surface deice switch interrupts the normal cycle to return the boots to deflated position. The pressure indicator light (amber) will illuminate when the surface deice switch is moved to ACTUATE position and the system reaches 6-8.5 PSI.

4. Components Location Chart

A. Ice & Rain Protection.

Component	Location
Wing Deice System:	
Filter	In Each Engine Nacelle on Firewall.
Pressure Switch	Under Floorboards Aft of Front Spar LH Side of Airplane.
Windshield Anti-Ice System (Electric):	
Relay and Fuse	On Sta 0.00 Bulkhead Cabin Side.

5. Tool and Equipment Table

A. Equivalent substitutes may be used for the following equipment:

Name	Number	Manufacturer	Use
Multimeter	Model 260	Simpson Electric Co.	To measure voltage.
Methyl-N-Propyl Ketone			Clean deice boot and mating surface.
Technical Toluene	TT-T-548		Remove deice boot.
Paint and Lacquer Remover	TT-4-248		Remove paint prior to installing deice boot.
Adhesive	EC-1300-L	Minnesota Mining and Mfg. Co. St. Paul, Minnesota	To bond deice boot to wing.
Coating	78-U-1003 Enamel U-1001 Catalyst	Sterling Paint	To dress edge of deice boot.
Rymplecloth	301	Kendall Textile Division New York, NY	To clean surfaces.
Roller, Hand	74-451-73	B.F. Goodrich Co. Aerospace and Defense Products Akron, Ohio	To repair deice boot.
Carpenter's Chalk Line			
Cold Patch Repair Kit	74-451-C	B.F. Goodrich Co. Aerospace and Defense Products Akron, Ohio	Repair deice boots.
Installation Kit	P/N 156304	Sierracin/Sylmar 12780 San Fernando Road Sylmar, California 91342	Installation of heated panel.

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Name	Number	Manufacturer	Use
Cleaning Cloths		Commercially Available	Wiping residue.
Isopropyl Alcohol (Rubbing Alcohol)		Commercially Available	Solvent.
Adhesive or Aluminum-Backed Tape	1 inch wide	Commercially Available	Solvent mask.
Masking Tape	1 inch wide	Commercially Available	Solvent mask.

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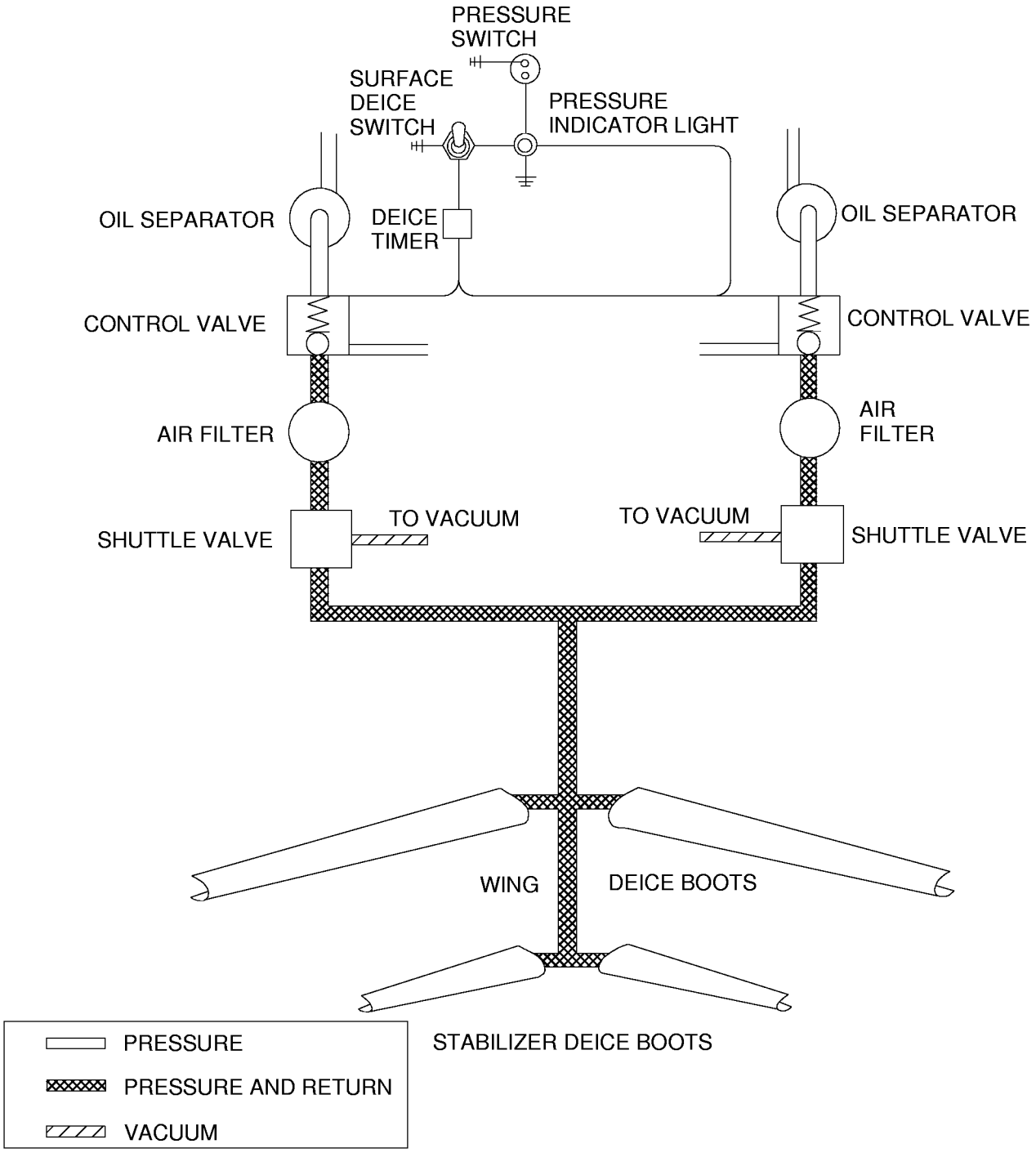

310R0001 THRU 310R0800

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Ice & Rain Protection
Figure 1 (Sheet 1)

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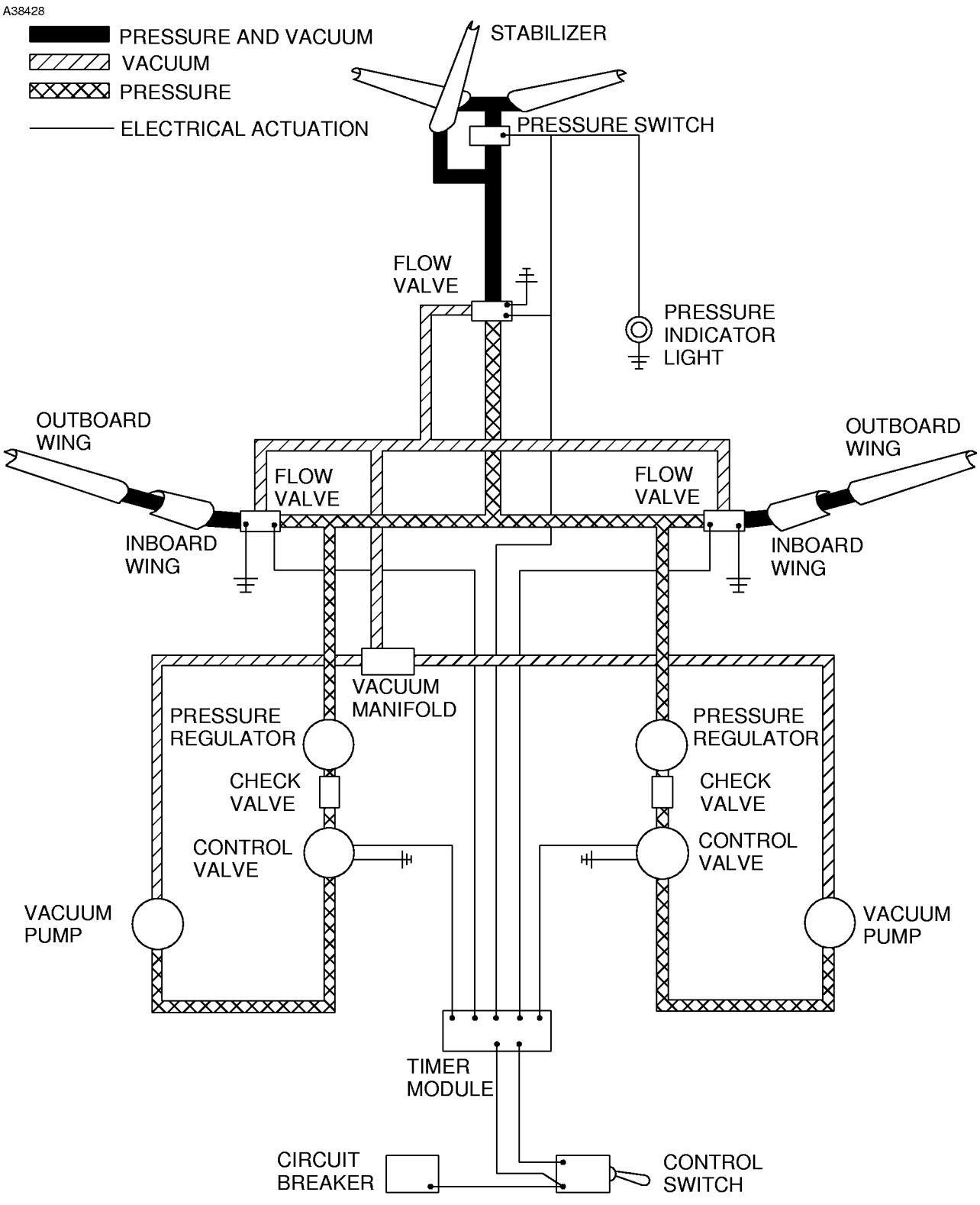

Surface Deice Schematic
Figure 2 (Sheet 1)

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ICE & RAIN - TROUBLESHOOTING

1. Surface Deice System

A. Troubleshooting.

(1) Troubleshooting the pneumatic deice system is isolating the fault to the air or the electrical part, refer to Chapter 24, Electrical Powerfor wiring diagrams.

(2) If boots inflate or deflate slowly or incompletely, recycle system with pressure gage in boot line. System should reach a minimum of 15.0 PSIG on inflation and -0.4 in/Hg on deflation. If pressure is not reached, determine cause and correct.

(3) For troubleshooting the deice system, refer to Table 101.

NOTE: Perform surface deice system troubleshooting with engine(s) operating and electrical power applied to surface deice.

Table 101. Surface Deice System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
BOOTS ARE SLOW TO INFLATE.	Loose plumbing.	Check for loose plumbing. Correct or replace plumbing as required.
	Dirty air filters.	Check for dirty air filters, if installed. Replace air filters as required.
	Unserviceable pressure regulator.	Check pressure regulator, if installed. Replace or reset pressure regulator as required.
	Unserviceable control valve.	Replace control valve.
BOOTS DO NOT INFLATE.	Improper input bus voltage to timer.	Check for input bus voltage to the timer. If input bus voltage is recorded at the timer, check timer. If no input bus voltage is recorded, check circuitry of the surface deice switch and circuit breaker.
	Unserviceable timer.	Replace timer.
	Unserviceable control valves.	Replace control valves.
	Unserviceable vacuum pump.	Replace vacuum pump.
	Circuit breaker tripped.	Check circuit breaker and reset as required.
	Unserviceable surface deice switch circuitry and/or circuit breaker.	Repair or replace surface deice switch and/or circuit breaker as required.
WING BOOTS ONLY INFLATE.	Unserviceable timer.	Check timer and replace as required.
	Unserviceable control valve.	Replace control valve.
INDICATOR LIGHT DOES NOT ILLUMINATE, BOOTS CYCLING NORMALLY.	Unserviceable pressure switch.	Press the test light. If test light functioning, replace pressure switch.
	Unserviceable bulb.	Replace test light bulb.
	Incomplete circuit.	Check circuit and correct as required.

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Table 101. Surface Deice System Troubleshooting (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
BOOT(S) FAIL TO DEFLATE.	Unserviceable timer.	Check timer and replace as required.
	Unserviceable flow valves.	Check flow valves and replace as required.
	Unserviceable control valve.	Replace control valve.

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ICE & RAIN - SERVICING

1. Surface Deice System

A. Cleaning.
(1) The deice system components can be washed down with the engine using Stoddard Solvent.

B. Inspection.
(1) Inspect the deice system for leaks. Remove filter and clean with Naptha and dry with a jet of compressed air. Repair of the deice system components is limited to the replacement of parts. For repair of the deice system boots, refer to Airfoil - Approved Repairs.

2. Deice Boots

NOTE: To prolong the life of surface and propeller deice boots, they should be washed and serviced on a regular basis. Outlined below are recommended cleaning and servicing procedures.

A. Servicing.

CAUTION: Use only the following instructions when cleaning boots. Disregard instructions which recommend petroleum base liquids (MEK, non-leaded gasoline, etc.) which can harm the boot material.

(1) Clean the boots with mild soap and water, then rinse thoroughly with clean water.

NOTE: Isopropyl alcohol can be used to remove grime which cannot be removed using soap. If isopropyl alcohol is used for cleaning, wash area with mild soap and water, then rinse thoroughly with clean water.

(2) Allow the boots to dry, then apply a coating of Age Master #1 to the boots. Application instructions for Age Master #1 are outlined on the can.

NOTE: Age Master #1 is beneficial for its ozone and weather resistance features.

(3) After the boots have been treated with Age Master #1, apply a coating of ICEX to the boots. Application instructions for ICEX are outlined on the can.

NOTE: ICEX is beneficial as an ice adhesion depressant. ICEX contains silicone, which lessens paint adhesion. Age Master #1 and ICEX are manufactured by B.F. Goodrich. Age Master #1 and ICEX coatings last approximately 150 hours on the surface deice boots and 15 hours on the propeller deice boots.

NOTE: Use care when applying ICEX protect adjacent surfaces from overspray. Overspray of ICEX will make touch-up painting almost impossible.

3. Deice System Components

A. Cleaning.
(1) The deice system components can be washed down with the engine using Stoddard Solvent.

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ICE & RAIN - REMOVAL/INSTALLATION

1. Control Valve

A. Removal (Refer to Figure 401).
(1) Remove upper cowl from engine.
(2) Disconnect electrical connector from control valve.
(3) Disconnect plumbing from the control valve.
(4) Remove bolts, washer, and nuts, securing control valve to support.
(5) Disconnect control valve from air filter and remove control valve.

B. Installation (Refer to Figure 401).
(1) Connect control valve to the air filter.
(2) Secure control valve to support, using bolts, washers, and nuts.
(3) Connect plumbing to the control valve.
(4) Connect electrical connector to control valve.
(5) Install upper engine cowl.
(6) Conduct operational check.

2. Shuttle Valve (Airplanes 310R0001 thru 310R0800)

A. Removal (Refer to Figure 401).
(1) Remove upper engine cowl.
(2) Disconnect plumbing from the shuttle valve.
(3) Disconnect shuttle valve from air filter and remove shuttle valve.

B. Installation (Refer to Figure 401).
(1) Connect shuttle valve to air filter, using union and nut.
(2) Connect plumbing to shuttle valve.
(3) Install engine cowl.

3. Air Filter (Airplanes 310R0001 thru 310R0800)

A. Removal (Refer to Figure 401).
(1) Remove upper engine cowl.
(2) Remove shuttle and control valve from air filter.
(3) Cut safety wire and remove screws and washers securing air filter to support.

B. Installation (Refer to Figure 401).
(1) Secure air filter to support, using screws and washers. Safety wire screw.
(2) Connect control valve and shuttle valve to air filter.
(3) Install engine cowl.
(4) Conduct operational check.

4. Vacuum Pump

A. Removal/Installation.
(1) For removal and installation of vacuum pump, refer to Chapter 37, Distribution - Removal/ Installation.

5. Surface Deice Boots

A. Removal (Refer to Figure 401).

NOTE: To remove or loosen an installed boot, Technical Toluene solvent shall be used to soften the bond line. A minimum quantity of solvent should be applied to the bond line while tension is carefully applied to peel back the boot. The removal should be slow enough to allow the solvent to undercut the adhesive so that the boot will not be damaged. Excessive quantities of the solvent must not be allowed on the airplane surface.

(1) If installed, remove angle of attack transducer, if not, remove stall warning transmitter.

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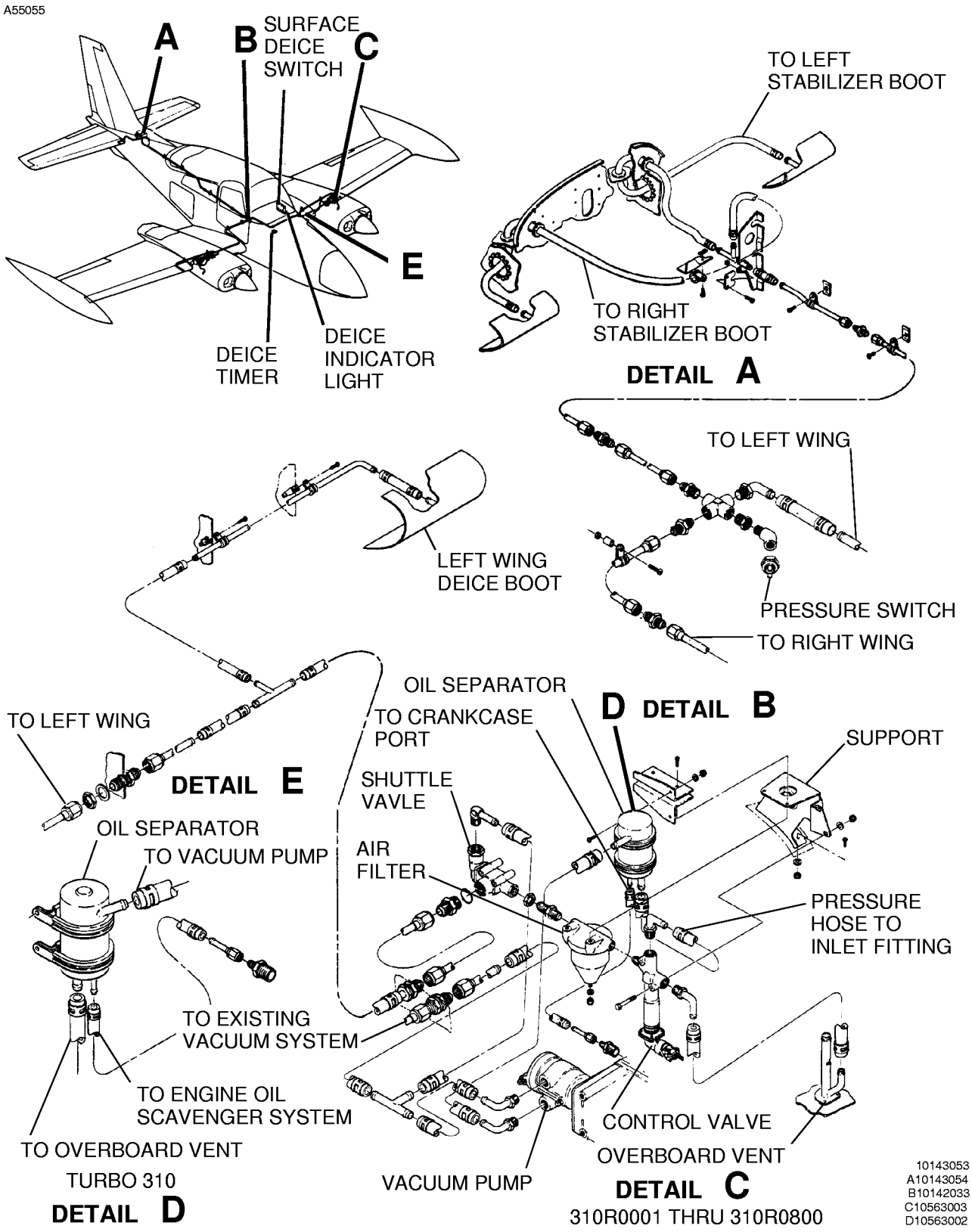

Surface Deice System Installation
Figure 401 (Sheet 1)

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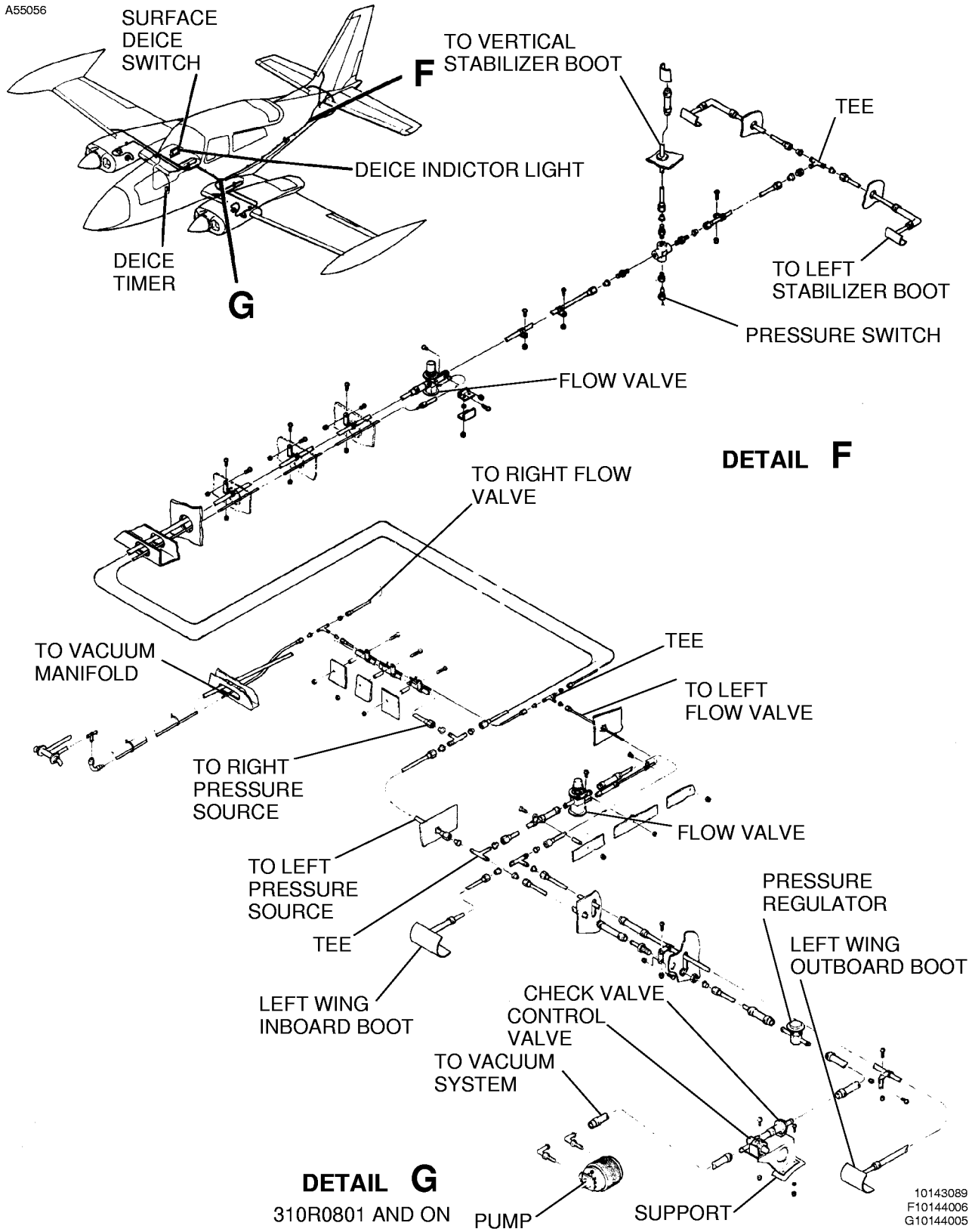

Surface Deice System Installation
Figure 401 (Sheet 2)

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(2) Remove access plates as required to remove clamp and tube from boot.
(3) Remove boot.

B. Installation (Refer to Figure 401).
(1) Requirements.
(a) Adhesives, primers, and coatings shall not be used beyond the original expiration date even though they have been retested and approved. Gelled or contaminated adhesives shall not be used.
(b) Containers for adhesives, primers, and coatings shall be kept tightly closed, when the materials are not being used, unless otherwise specified.
(c) Pre-assembly operations such as fittings, drilling, deburring, punching, trimming, masking, etc., shall be completed prior to cleaning and bonding. Lightly abrade the metal surface with a fine abrasive material in boot area.
(d) Surfaces must be clean and dry, free from dust, lint, chips, grease, oil, condensation, or other moisture and all other contaminating substances prior to the application of adhesives, primers, and coatings.
(e) Deice boots shall be cleaned with Methyl Ethyl Ketone.
(f) All paints, lacquers, primers, etc., shall be removed prior to abrading, cleaning, and bonding.
(g) Cleaning and bonding shall not be accomplished when the temperature of the structure, deice boots or bonding materials is below 60°F nor when the re lative humidity is 90 percent or more.
(h) Bonding must be accomplished before the adhesive becomes too dry on either surface. The adhesive must be tacky on both surfaces throughout the entire attachment of the deice boot.
(i) Bonds shall be free of wrinkles and entrapped air bubbles. They shall not be loose at the edges nor exhibit poor adhesion.
(j) Airplane may be flown 12 hours after bonding on pneumatic deice boots but boots shall not be operated for 48 hours after bonding.
(k) Adhesives, primers, and coatings shall be stirred thoroughly prior to application.
(l) To avoid damage to deice boots, do not use metal hand stitcher-roller over tubes in boots.
(2) Positioning.
(a) Indexing marks shall be placed on the metal surface outside of the bonding area or a chalk line shall be snapped lengthwise down the bonding area approximately on the centerline of the leading edge. The faying surface of the boot shall be marked in a similar manner if necessary, to provide for correct alignment during the installation and attachment of the boot.
(b) Either the deice boot or a pattern shall be positioned on the metal surface, to which the boot is to be bonded, in order to provide a guide for masking and to check the fit of the boot.
(c) Leaving an edge margin of approximately one-half inch from the boot or pattern, a single strip of one inch wide masking tape shall be applied to the metal surface around the periphery of the boot or pattern (masking should be accurate so that clean-up time will be minimal). The boot or pattern shall then be removed.
(3) Cleaning.
(a) All paint in the masked off area shall be removed with paint and lacquer remover. The loosened paint and remover shall be wiped off and the area shall be thoroughly rinsed with clean water and dried with rymplecloth.
(b) All surfaces to be bonded shall be clean and dry.
(c) Cleaning shall be accomplished by scrubbing the metal surface in the masked off area and the rough, unglazed faying surface of the deice boot using rymplecloth moistened with Methyl Ethyl Ketone. The cloth should not be saturated to the point where dripping will occur. Methyl Ethyl Ketone shall be wiped from the surfaces before evaporation using rymplecloth in order that oils, grease, etc., will not be redeposited.
(d) Cleaning solvent should never be poured or sprayed on a structure.

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(e) Final cleaning shall be accomplished immediately prior to bonding. The areas cleaned previously shall be thoroughly recleaned. When the area is being scrubbed with a moistened cloth in one hand, another clean dry cloth shall be held in the other hand and shall be used to dry the area. The solvent must be wiped from the surfaces before it evaporates.

(f) Bonding procedures shall be started as soon as possible after cleaning and drying the surfaces. Do not allow handling of the surfaces between the cleaning and bonding operations.

(g) Caution should be observed during cleaning and bonding. The solvents, adhesives, etc., are toxic and flammable. Fresh air masks and/or adequate ventilation are required for all closed areas. The structure shall be electrically grounded before starting any cleaning or bonding operation.

(4) Preparation and Application of Bonding Materials.

CAUTION: Do not use adhesive if it has been stored in temperatures above 80°F.

(a) Adhesive EC-1300-L must be thoroughly stirred prior to application. A uniform coat of adhesive shall be brushed onto the masked off metal surface and onto the faying surface of the deice boot. The adhesive shall be allowed to dry thoroughly and should not have any tack. A second uniform coat of adhesive shall be brushed onto each of the faying surfaces and allowed to dry until the adhesive exhibits an aggressive tack. This condition can be determined by touching the adhesive lightly, using the back of the knuckle instead of fingertips in order to minimize contamination. When the adhesive is quite tacky, but no longer transfers to the back of the knuckle, the surfaces are ready for bonding. This normally requires from 3 to 15 minutes, depending upon film thickness, humidity, and temperature. In the event that the second coat becomes too dry, the adhesive may be reactivated within 48 hours, if kept clean, by wiping lightly with clean rymplecloth slightly moistened with Technical Toluene and then tested for tack as described above. Excessive rubbing or solvent shall be avoided when reactivating so that adhesive will not be removed.

(5) Installation of Deice Boot.

NOTE: Attach a hose to the boot (routed through the hole in the skin) and apply a vacuum (15" Hg or less) to the boot a few minutes before and during installation to remove air as an assist in acquiring a smooth fit on the leading edge.

(a) Needed chalk lines and/or indexing marks, removed or covered by the cleaning and adhesive application procedures, shall again be applied.

(b) The boot shall be held near but not touching the metal surface and necessary connections and alignment shall be made. Then, while the adhesive exhibits the proper tack for bonding, the boot shall be attached down the centerline. If the boot is allowed to get off course or out of position, it shall be pulled up with a quick motion or by using Technical Toluene and then repositioned properly. A rubber roller shall be rolled firmly along the centerline of the boot and from there in spanwise strips over the entire surface. A slight tension may be required to obtain a smooth surface, being careful not to trap any air under the boot. Distortion of the boot shall be held to a minimum. Pneumatic boots shall be rubber rolled parallel to the inflatable tubes. The stitcher-roller shall be used around boot edges, air hose attachments, etc.

(c) Clean all excess adhesive from edge of boot.

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(d) Edge seal boot.

NOTE: Perform any touch up painting prior to edge sealing as edge sealing aids in protecting leading edge of paint film from erosion.

1 Apply masking parallel along edge of boot, leaving a strip for sealer to overlap a minimum of 1/4 inch on the boot and 1/2 inch on wing surface. Apply masking so that a straight line is provided on wing for finish appearance.

NOTE: Sealer will not adhere to bare metal. Apply color chemical film and Sterling Intermediate Primer to any bare metal surface in area of sealer application. Rough up painted surfaces prior to sealer application.

2 Mix the black polyurethane enamel (78-U-1003) with the catalyst (U-1001) at a ratio of 2 parts enamel to one part catalyst and apply a uniform brush coating around the periphery of the boot to edge seal.

3 Remove the masking immediately after coating is applied.

(e) Install angle of attack transducer or stall warning transmitter.

(f) Remove vacuum supply and attaching hoses and connect boot to airplane deice system.

(g) Install access plates.

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ICE & RAIN - INSPECTION/CHECK

1. Surface Deice System

A. Electrical Test.
(1) Surface deice circuit breaker CLOSED.
(2) Position surface deice control switch OFF.
(3) Position battery master switch ON.
(4) Press annunciator test switch to check light circuit and bulb.
(5) With both engines running at 1700 RPM, momentarily position surface deice switch to ON.
(6) On Airplanes 310R0001 thru 310R0800, check that timer inflates stabilizer and wing boots and then deactivates itself.
(7) On Airplanes 310R0801 thru 310R2140, check that timer inflates the boots on the stabilizers first for a period of approximately six seconds and then cycles to inflate the boots on the wings for a period of six seconds and then deactivates itself.
(8) The surface deice light will illuminate during the empennage boot cycle to indicate the system is operating.
(9) Position wing deice light switch to ON and check that wing deice light(s) are illuminated.
(10) SHUT DOWN engines and position all switches OFF.

B. Air Leakage Test - Pressure.

NOTE: This test can be performed in either the left or right nacelles. The following steps refer to the left nacelle.

(1) Disconnect pressure hose from the control valve inlet fitting.
(2) Disconnect tube from overboard port and cap the port with an AN929-10 cap assembly.
(3) Connect a source of clean air to the control valve inlet port. Include a pressure gage in the air line to observe the system pressures. Apply 28V DC to valves.
(4) Apply 14 PSIG pressure to the system and by means of a hand-operated valve, trap the pressure on the deice system. Observe the system for leakage. The leakage rate should not exceed a pressure drop below 11.75 PSI in 30 seconds.
(5) To check the pressure switch, turn on the airplane battery switch while the deice system is under pressure. The indicator light should glow.
(6) Remove 28V DC and air will dump.
(7) Remove test equipment, lubricate all threads, and replace all system components.
(8) Disassembly or rework of the operating equipment in this system should not be attempted, replace any unit which does not function correctly.

C. Air Leakage Test - Vacuum.
(1) Disconnect and plug or cap line between vacuum regulators in cabin and pumps on both sides (isolate boot vacuum from instrument vacuum system).
(2) Disconnect inlet line to vacuum pump and attach vacuum source. Apply 2.5 PSI (5.1 Hg) vacuum and secure 30 seconds. Vacuum must not drop below 2 PSI (4.1 Hg). Fix leaks as required.

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AIRFOIL - APPROVED REPAIRS

1. Cold Patch Repair of Deice Boots

A. There are four types or areas of damage that are most common to the deice boots. An outline of the cold patch repair procedure for each follows:

NOTE: When repairing the deicer boots and replacement layers are being installed, exercise care to prevent trapping air beneath the replacement layers. If air blisters appear after material is applied, remove them with a hypodermic needle. Should air blisters appear after boots have been installed for a length of time, it is permissible to cut a slit in the deicer boot, apply adhesive and repair in accordance with the following cold patch repair procedures. An alternate method of repair is to peel the deicer boot back using Ketone solvent, and reapply using normal adhesives.

(1) Scuff or Surface Damage.

(a) This type of damage is the most commonly encountered and is usually caused by scuffing the outer surface of the deice boots while using scaffolds, refueling hoses, ladders, etc. Repair is generally not necessary because the thick outer veneer provides protection to the natural rubber underneath. If the scuff is severe and has caused removal of the entire thickness of veneer (exposing the brown natural rubber underneath) the damage should be repaired as outlined below:

1 Select a patch (Part Number 74-451-16, 74-451-17, or 74-451-18) of ample size to cover the damaged area.
2 Clean the area to be repaired with a cloth dampened slightly with solvent.
3 Buff the area around the damage with steel wool so that the area is moderately but completely roughened.
4 Wipe the buffed area clean with a cloth slightly dampened in solvent to remove all loose particles.
5 Apply one even thorough coat of cement (Part Number 74-451-20) to the patch and to the corresponding damaged area of the deice boot. Allow cement to set until it becomes tacky.
6 Apply patch to the deice boot with an edge or the center adhering first, then work the remainder of the patch down, being careful to avoid trapping air pockets.
7 Roll the patch thoroughly with a stitcher-roller (Part Number 74-451-73) and allow to set for ten to fifteen minutes.
8 Wipe the patch and surrounding area from the center of the patch outward, with a cloth slightly dampened with solvent.
9 Apply one light coat of A-56-B conductive cement (Part Number 74-451-11) to the patched area.

NOTE: Satisfactory adhesion should be obtained in four hours; however, if the patch is allowed to cure for a minimum of 20 minutes, the deice boots may be inflated to check the repair.

(2) Damage to Tube Area.

(a) This type of damage consists of cuts, tears, or ruptures to the inflatable tube area and a fabric reinforced patch must be used for this repair. Damage to the tube area should be repaired as outlined below:

1 Select a patch (Part Number 74-451-16, 74-451-17, 74-451-18, or 74-451-19) of ample size to extend at least 5/8 inch beyond the damaged area.

NOTE: If none of these patches are of proper size, one may be cut to the size desired from one of the larger patches. If this is done, the edge should be beveled by cutting with the shears at an angle. These patches are manufactured so they will stretch in one direction only. Be sure to cut the patch selected so that the stretch is in the widthwise direction of the inflatable tubes.

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2 Clean the area to be repaired with a cloth dampened slightly with solvent.
3 Buff the area around the damage with steel wool so that area is moderately but completely roughened.
4 Wipe the buffed area clean with a cloth slightly dampened in solvent to remove all loose particles.
5 Apply one even thorough coat of cement (Part Number 74-451-20) to the patch and the corresponding damaged area of the deice boot. Allow cement to set until it becomes tacky.
6 Apply the patch to the deice boot with the stretch in the widthwise direction of the inflatable tubes, sticking edge of patch in place first and working remainder down with a very slight pulling action so the rupture is closed. Use care not to trap air between patch and deice surface.
7 Roll the patch thoroughly with a stitcher-roller (Part Number 74-451-73) and allow to set for ten to fifteen minutes.
8 Wipe the patch and surrounding area, from the center of the patch outward, with a cloth slightly dampened with solvent.
9 Apply one light coat of A-56-B conductive cement (Part Number 74-451-11) to restore conductivity.

NOTE: Satisfactory adhesion of patch to deice boot should be reached in four hours; however, if the patch is allowed to cure for a minimum of 20 minutes, the deice boots may be inflated to check the repair.

(3) Damage to Fillet Area.
(a) This includes any tears or cuts to the tapered area aft of the inflatable tubes. Damage to the fillet area should be repaired as outlined below:
1 Trim damaged area square and remove excess material. Cut must be sharp and clean to permit good butt joint of inlay.
2 Cut inlay from tapered fillet (Part Number 74-451-21) to match cutout area.
3 Using solvent, loosen edges of the deice boot around area approximately 1-1/2 inch from all edges.
4 Clean the area to be repaired with a cloth dampened slightly with solvent.
5 Lift back edges of cutout and apply one coat of EC-1300L cement to the underneath side of loosened portion of the boot.
6 Apply one coat of EC-1300L cement to the wing skin underneath the loosened edges of the deice boot and extending 1-1/2 inch beyond edges of deice boot into the cutout area.
7 Apply second coat of cement to underneath side of deice boot as outlined in step 5.
8 Apply one coat of EC-1300L cement to one side of a 2-inch wide neoprene coated fabric tape (Part Number 74-451-22) and allow to dry and trim to size.
9 Reactivate cemented surfaces with solvent and apply reinforcing tape to wing skin, using care to center tape under all edges of cutout.
10 Roll down tape on wing skin with stitcher-roller (Part Number 74-451-73) to assure good adhesion, being careful to avoid air pockets.
11 Apply one coat of EC-1300L cement to top surface of tape and allow to dry approximately 5 to 10 minutes.
12 Reactivate cemented surfaces with solvent. Working toward cutout, roll down the edges of the loosened deice boot, being careful to avoid trapping air pockets. The edges should overlap on the tape approximately 1 inch.
13 Roughen back surface of inlay repair material (Part Number 74-451-21, previously cut to size) with buffing stick P/N 74-451-75. Clean with solvent and apply one coat of EC-1300L cement.
14 Apply one coat of EC-1300L cement to wing skin inside of the cutout area and allow to dry.
15 Apply the second coat of EC-1300L cement to back side of inlay material and allow to dry.

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16 Reactivate cemented surfaces with solvent and carefully insert inlay material with feathered edge aft. Working from the leading edge of wing aft, roll down the inlay material carefully to avoid trapping air.

17 Roughen area on outer surface of deice boot and inlay with steel wool 1-1/2 inch on each side of the splice. Clean with solvent and apply one coat of EC-1300L cement to this area.

18 Apply one coat of EC-1300L cement to one side of 2-inch wide neoprene coated fabric tape (Part Number 74-451-22) trim to size and center tape over splice on all three sides.

19 Roll down tape on deice boot with stitcher-roller (Part Number 74-451-73) to assure good adhesion, being careful to avoid air pockets.

20 Apply one light coat of A-56-B conductive cement (Part Number 74-451-11) to restore conductivity.

(4) Damaged Veneer - Loose from Deice Boot.

(a) If the veneer should become loosened from the deice boot, repairs should be made as outlined below.

1 Peel and trim the loose veneer to the point where the adhesion of veneer to the deice boot is good.

2 Roughen the area in which veneer is removed with steel wool, rubbing parallel to cut edge of veneer ply to prevent loosening it.

3 Taper edges of veneer down to the tan rubber ply by rubbing parallel to the edges with steel wool and solvent.

4 Cut a piece of veneer material (Part Number 74-451-23) to cover the damaged area and extend at least 1 inch beyond in all directions.

5 Mask off an area 1/2 inch larger in length and width than the size of veneer patch.

6 Apply one coat of 74-451-20 cement to the damaged area and one coat to the veneer ply. Allow cement to set until it becomes tacky.

7 Roll the veneer ply to the deice boot with a 2-inch rubber roller, applying a slight tension on the veneer ply when applying to prevent trapping air.

8 Wipe the patch and surrounding area, from the center of the patch outward, with a cloth slightly dampened with solvent.

9 Apply one light coat of A-56-B conductive cement (Part Number 74-451-11) to restore conductivity.

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WINDSHIELD - DESCRIPTION AND OPERATION

1. Windshield Anti-Ice System (Alcohol)

A. Description.

(1) The alcohol windshield anti-ice system (optional) consists of: a three gallon capacity tank which provides approximately one hour anti-icing capability; an electrically operated pump actuated by a switch breaker located on the circuit breaker panel; and orificed tubes to disperse the anti-ice fluid over the windshield. A restrictor orifice is utilized in the dispersal system to meter the alcohol for maximum efficiency.

(2) The tank and electric pump are located in the aft portion of the right wing nacelle baggage compartment. A service door is provided for access to the tank filler cap. The system is serviced with isopropyl alcohol.

2. Windshield Anti-Ice System (Electric)

A. Description.

(1) An optional stick-on type heated panel is provided to prevent ice formation on the windshield in the pilot's line of vision. The system consists of an electrically heated panel attached to the windshield, a controller, and the relay mounted on the aft side of the forward cabin bulkhead.

CAUTION: Applying localized external heat to a windshield to remove frost or ice may distort the windshield and damage the electrically heated panel, if installed.

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WINDSHIELDS - TROUBLESHOOTING

1. Windshield Anti-Ice System (Alcohol)

A. Troubleshooting.
(1) For troubleshooting the windshield anti-ice system (alcohol), refer to Table 101.

NOTE: Perform windshield anti-ice system (alcohol) troubleshooting with the battery switch ON and alcohol anti-ice switch ON.

Table 101. Windshield Anti-Ice System (Alcohol) Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
ALCOHOL DOES NOT SPRAY AND THE RESERVOIR IS NOT EMPTY.	No electrical power.	Disconnect the electrical plug at the pump and check for 24 VDC. If no power, check switch, wiring and circuit breaker.
	Unserviceable switch, wiring, or circuit breaker.	Check switch, wiring and circuit breaker. Repair or replace as required.
	Clogged or closed fluid lines.	Loosen the fluid line from the reservoir to the pump and check for alcohol. Loosen the line to the W/S tubes. Check for clogged orifice tee or pinched line. Clean or replace lines as required.
	Clogged pump.	Check for clogged pump. Clean or replace pump as required.

2. Windshield Anti-Ice System (Electric)

A. Troubleshooting.
(1) For a guide to troubleshooting the windshield anti-ice system (electric), refer to Table 102.

NOTE: Perform windshield anti-ice system (electric) troubleshooting with airplane power ON and windshield anti-ice switch ON.

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Table 102. Windshield Anti-Ice System (Electric) Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
INDICATOR LIGHT ILLUMINATED AND WINDSHIELD DOES NOT HEAT.	No electrical power.	With electrical leads disconnected from heating element, check for 28 volts between white (X) and black (-) wire. If less than 28 volts, check continuity wiring between relay and heating element.
	Unserviceable wiring between relay and heating element.	Repair or replace as required.
	Unserviceable heated windshield panel.	Check resistance of heating element (1.48 to 1.93 OHMs). Check resistance across temperature sensor white and green wire (300 to 318 OHMs measured at room temperature after windshield temperature has been allowed to stabilize for a period of 1/2 hour). Replace unserviceable heated windshield panel.
	Unserviceable temperature controller.	Replace unserviceable temperature controller.

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WINDSHIELD - SERVICING

1. Windshield Anti-Ice System (Alcohol)

A. Servicing.
(1) The windshield anti-icing system reservoir is located in the aft portion of the right wing locker. The reservoir filler cap is located inside the access door.
(2) The fluid level should be checked and filled as required on preflight (Refer to Table 301).

Table 301. Windshield Anti-Ice (Alcohol) Replenishment Chart

ISOPROPYL ALCOHOL SYSTEM	U.S. GALLONS	IMPERIAL GALLONS	METRIC LITERS	NAME, NUMBER, OR TYPE
TANK CAPACITY	3.0	2.50	11.4	MILITARY Specification MIL-F-5566

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WINDSHIELD - REMOVAL/INSTALLATION

1. Windshield Anti-Ice System (Alcohol)

A. Removal (Refer to Figure 401).

NOTE: When removing/installing lines at bulkhead fittings, insure that fitting is secured to prevent twisting line on opposite side from one being installed. Hold fitting with wrench while loosening/tightening line connection.

(1) Remove aft nacelle baggage compartment upholstery panel.
(2) Extend flaps.
(3) Disconnect line (6) at elbow and using a suitable tube attached to the line, pump remaining fluid from tank (3).
(4) Disconnect line (6) from pump (4) and remove line (7).
(5) Disconnect electrical wire from pump (4) at splice.
(6) Remove pump (4) from tank (3) by removing bolts (5) and washers.
(7) Remove screws (1) securing tank (3) to structure.
(8) Lift forward end of tank (3) until vent tube clears bottom skin and carefully slide tank forward until clear of structure, then lift tank from baggage compartment.
(9) Remove RH wing gap fairings to gain access to lines.
(10) Remove clamps and remove lines (9 and 10).
(11) Remove RH forward side panel to gain access to line (11). Remove clamp and remove line.
(12) Working through nose baggage door, remove line (12), restrictor tee (15), and tubes (13 and 14).

B. Installation (Refer to Figure 401).
(1) Position tank (3) in place and secure with screws (1).

NOTE: Make certain vent extends below lower skin 0.40 inch and scarfed side is forward.

(2) Install pump (4) with two bolts (5) and washers.
(3) Install lines (9 and 10) and clamp in place.
(4) Install line (11) and clamp in place.
(5) Install line (12) and restrictor tee (15).

NOTE: Restrictor tee must be installed with restricted parts downstream.

(6) Install tubes (13 and 14) and clamp in place.

NOTE: Make certain tubes maintain a minimum gap of 0.10 inch between tubes and windshield retainer.

(7) Install nose baggage retainer.
(8) Connect electrical wire to pump.
(9) Service system, check operation and for leaks.
(10) Install aft nacelle baggage compartment upholstery panel and forward right cabin upholstery panel.
(11) Install wing gap fairings.

2. Windshield Anti-Ice System (Electric)

A. Removal (Refer to Figure 402).
(1) Ensure airplane electrical power is OFF.
(2) Disconnect electrical wiring. Identify and tag wires for installation reference.
(3) Remove controller and relay by removing screws.

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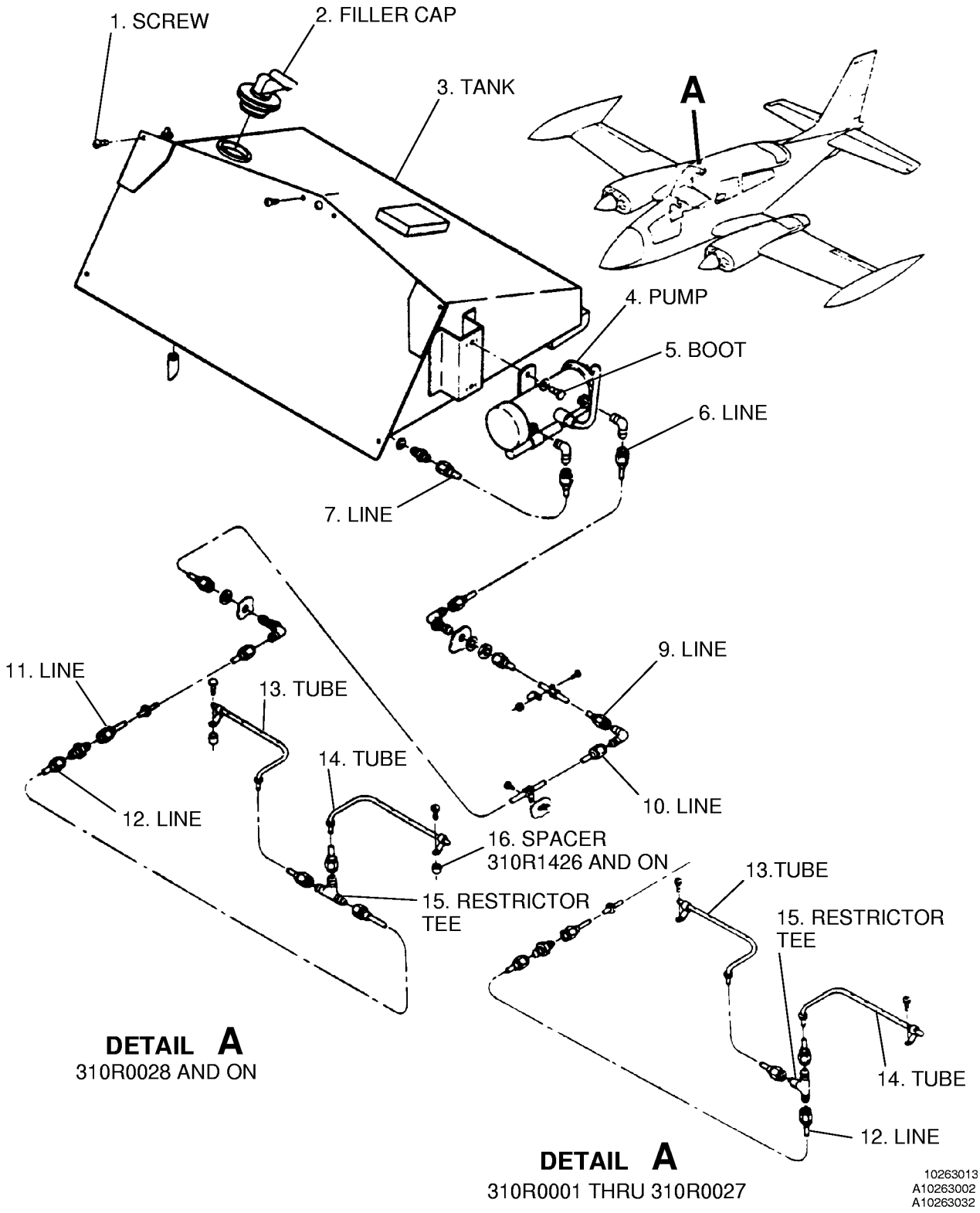

Alcohol Windshield Anti Ice System
Figure 401 (Sheet 1)

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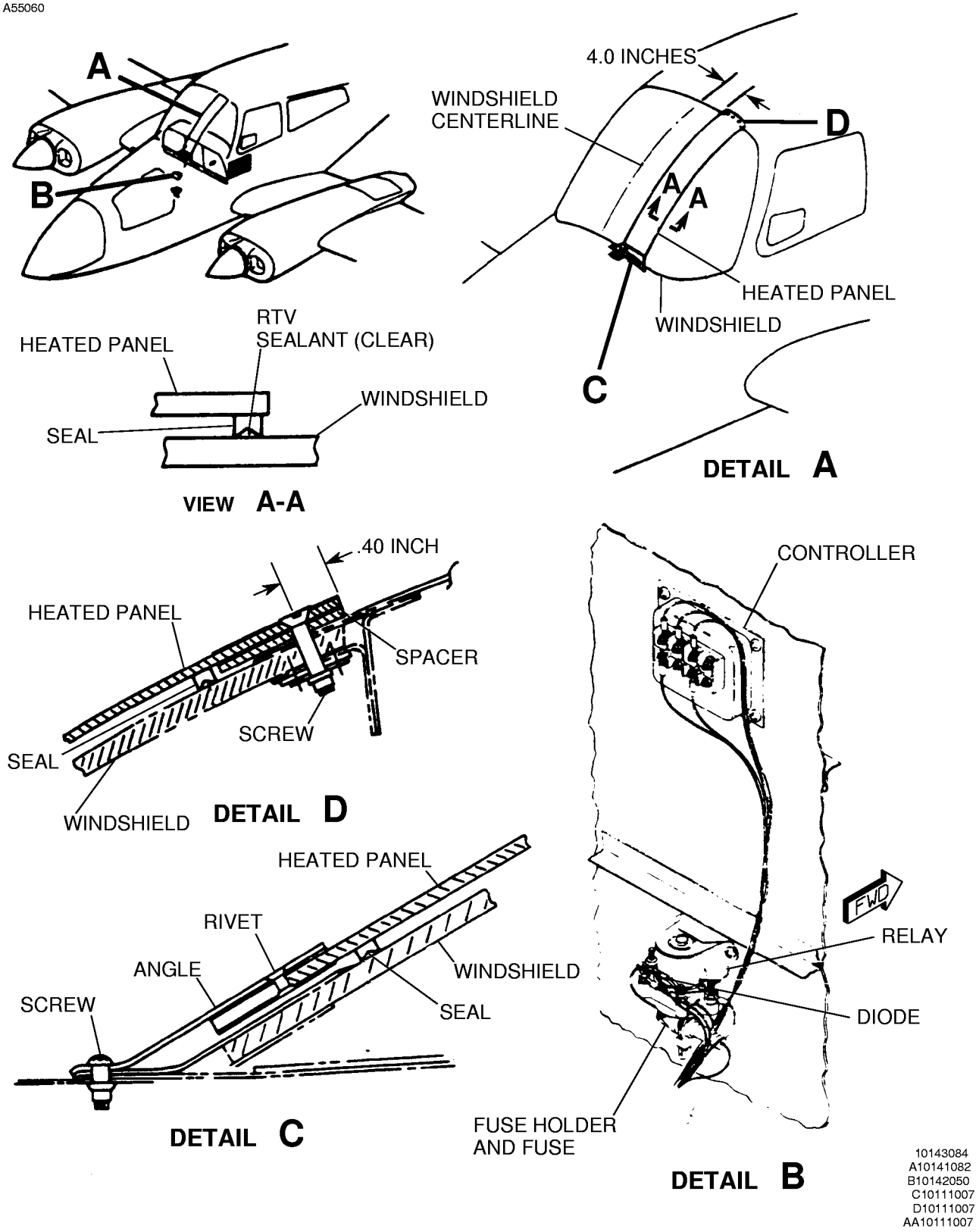

Windshield Heated Panel (Electric)
Figure 402 (Sheet 1)

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(4) Remove heated windshield panel as follows:
(a) Disconnect wiring at splices.

NOTE: Access to wiring splices is through nose baggage compartment by removal of aft baggage retainer.

(b) Remove screws from top and bottom of heated panel.
(c) Remove heated panel and the spacer at top (between panel and windshield retainer).

NOTE: Check wiring leads on new heated panel with hole in lower angle to ensure that interface is correct. If leads and hole do not match, order new angle as applicable for either LH or RH holes. If the angle can be used, remove it from the old heated panel by drilling out rivets.

(d) Remove any excess sealer off the windshield. A sharpened wood spatula may be used, exercising care.

CAUTION: Do not use any tool, abrasive, or cleaner which may damage the windshield.

B. Installation (Refer to Figure 402).
(1) Install controller and relay with screws and connect electrical wiring.
(2) Install heated windshield panel as follows:
(a) Mask windshield and heated panel for protection during installation.
(b) Mark a line on windshield masking located 4.00 inches to the left and parallel with windshield centerline, as viewed looking forward. Exercise care to prevent damage to windshield through masking. Mark a line on masking at top heated panel location running parallel with and 0.40 inch above the (3) three open fastener locations.
(c) Temporarily install angle with screws.

NOTE: If a new angle is used, place it in installation position. Lay out seven (0.171) holes, matching open holes in the windshield retainer. Drill and deburr. It may be necessary to reform the new angle to obtain a firm seal on new heated panel installation.

(d) Locate heated panel on windshield. Slide lower end of heated panel under angle. Locate the inboard side and top end of angle to the locating marks. Press heated panel firmly against windshield working from top to bottom and hold in position. Check to insure heated panel is properly located and sealed firmly against the windshield. Reform angle as necessary.
(e) Using a hole finder, locate and mark three hole locations at upper panel end common to fastener locations on windshield retainer. Mark six rivet locations at lower end of heated panel common to rivet locations in the angle.
(f) Remove the heated panel and angle. Drill three (0.193) holes at upper end of heated panel and countersink 100 degrees by 0.375 diameter. Remark the rivet locations at lower end of panel 1/8 inch up from the position as marked in step (e) and drill six (0.128) holes through heated panel. Countersink holes 100 degrees by 0.225 diameter.
(g) Rivet the angle to heated panel using MS20426A4-6 rivets. Double flush the rivets.
(h) Route heated panel lead up through grommet hole in retainer to lay on top side of retainer on installation.
(i) Remove protective masking from windshield and heated panel. Clean thoroughly with a soft cloth or tissue. Isopropyl alcohol (rubbing alcohol) may be used as a cleaner. Do not use any abrasive materials, strong acids, or bases methanol or methyl-ethyl-ketone. Rinse thoroughly and dry.
(j) After cleaning, plastic surfaces may be polished by applying a thin coat of hard polishing wax. Rub lightly with a soft cloth using a circular motion.

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(k) Apply approximately 3/16 inch diameter bead of RTV-108 sealer to groove of heated panel seal.

NOTE: Do not let bead of sealer extrude past lip of seal on installation. If this happens, remove the heated panel, wipe the sealer off the windshield and the seal on the heated panel with isopropyl alcohol. Use a smaller bead of RTV-108 sealer and reinstall the heated panel.

(l) Apply a small amount of RTV-108 sealer to retaining screws prior to installation to insure proper sealing.
(m) Place heated panel in position on windshield with spacer located between heated panel and windshield at upper end of panel. Secure the upper end of heated panel with 3 screws.
(n) Secure the lower angle using 7 screws.
(o) Route heated panel electrical leads through feed-thru on upper nose skin and connect. If the electrical wiring lead from heated panel is to the LH side (as viewed looking forward), route across the angle to align with feed through and use clamp at angle securing screw located third position from right.

NOTE: No clamp is required when heated panel electrical wiring lead is to the RH side.

(p) Seal heated panel leads at feed-thru using RTV-102 sealer. Also, seal voids on both sides of heated panel angle with RTV-102 sealer to prevent collection of moisture.
(q) Operational check in accordance with Pilot's Operating Handbook.

CAUTION: Do not cycle the heated panel while the airplane is on the ground. Serious damage to the panel could occur.

(r) Install aft baggage retainer in nose baggage compartment.

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WINDSHIELD - INSPECTION/CHECK

1. Windshield Anti-Ice System Components

A. Inspection.
(1) Inspect lines for cracks, chafing, and abrasions. Inspect lines and adjacent areas for evidence of leakage. Inspect pump for security and operation.

2. Windshield Anti-Ice System (Alcohol)

A. Operational Check.
(1) Service reservoir.
(2) Turn master switch ON.
(3) Turn windshield anti-ice switch ON.
(4) Assure alcohol flows evenly from all five holes on each side. Nominal flow rate is approximately 20 minutes per gallon.

NOTE: The left-hand spray pattern may be slightly greater than the right-hand spray pattern. Spray should extend approximately 4 to 6 inches above nozzles during ground operation.

(5) Turn windshield anti-ice switch to OFF. Alcohol flow should cease.
(6) If alcohol flow is irregular or fails to shut OFF, check pressure at pump. Pressure should be 4.0 to 4.75 PSIG.

3. Windshield Anti-Ice System (Electric)

A. Operational Check.
(1) For operational check, refer to Pilot's Operating Handbook.

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WINDSHIELD - CLEANING/PAINTING

1. Windshield Anti-Ice System Components (Alcohol)

A. Cleaning.
(1) Immerse lines in a dry cleaning solvent.

NOTE: Lines not readily removable from airplane may be flushed with cleaning solvent. Take necessary precautions to protect windshield.

(2) Dry lines with filtered compressed air.
(3) Clean pump filter screen.

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PROPELLERS - DESCRIPTION AND OPERATION

1. Propeller Deice System (Optional)

A. Description.

(1) The propeller deice system is the electrothermal type. It consists of the following components added to the propeller installation: propeller blade deice boots bonded to the propeller blades, slip ring assembly mounted to engine spinner bulkhead, brush holder assembly mounted to the engine crankcase, a repeat cycle timer, ammeter mounted in the instrument panel, a switch, and circuit breaker. The propeller blade deice boots are designed to remove ice under all probable icing conditions. Deicing is accomplished by raising the temperature of the ice and deice boot interface to a point at which centrifugal force removes the ice. The cycle timer used on the deicing system heats each propeller deice boot heating element for a specified cycle time. For example: if the timer should start on cycle number one, the deicing system heats the outer element on the right propeller, then proceeds into cycle number two which heats the inner element on the right propeller. It then cycles to the outer element on the left propeller and then to the inner element to complete cycles numbers three and four. The cycling is done in order to maintain a balance between the left and right propellers and reduce power drain on the electrical system.

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PROPELLERS - TROUBLESHOOTING

1. Propeller Deice System

A. Troubleshooting.

(1) For a guide to troubleshooting the propeller deice system, refer to Table 101.

NOTE: Perform propeller deice system troubleshooting with propeller deice switch in ON position.

Table 101. Propeller Deice System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
ONE ELEMENT IN ANY BLADE DOES NOT HEAT.	Open circuit in element.	Check element for open circuit. Replace deice boot if open circuit.
	Unserviceable timer.	Check timer for proper operation. Replace unserviceable timer.
ELEMENTS DO NOT HEAT.	Open ground or open power circuit.	Check electrical circuitry for open ground or open power circuit. Repair or replace broken or disconnected wire.
	Unserviceable timer.	Check timer for proper operation. Replace unserviceable timer.
	Brushes not making proper contact with slip ring.	Check brushes for proper contact with slip ring. Adjust brushes as required.
	Worn brushes.	Check brushes for wear. Replace brushes worn beyond wear limits.
BRUSHES MAKE CHATTERING OR SCREECHING NOISE WITH ENGINES OPERATING.	Improper alignment of brush block assembly.	Check alignment of brush block assembly. Realign brush block assembly or replace brushes as required.

(2) Refer to Chapter 24, Electrical Power, for conducting electrical continuity checks.

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PROPELLERS - REMOVAL/INSTALLATION

1. Deice Boot

A. Removal.

CAUTION: Do not use sharp tools or objects to remove boot as damage to the propeller may result.

(1) Remove deice boot from the propeller by softening the bond line of boot with Toluol until loosened.
(2) Pull deice boot slowly from propeller blade as bond line is loosened.

B. Installation.

(1) Place deice boot on hub end of propeller blade, outboard end of boot centerline, centered on blade leading edge and lead strap (terminal end) of boot aligned and against attach holes of installed terminal bracket.
(2) Mark off an area on propeller blade (using masking tape) 1/2 inch from each side and outer end of deice boot.
(3) Remove boot and clean the masked area of propeller blade using Methyl n-Propyl Ketone (MPK) cleaning solvent. For final cleaning, wipe the solvent film off quickly with a clean dry cloth before it has time to dry.

CAUTION: Methyl n-Propyl Ketone (MPK) must be used in well ventilated area: avoid prolonged breathing of fumes. During all surface cleaning operations take precaution to guard against spark or open flame in work area.

(4) Mix thoroughly the EC1300L cement and apply one brush coat evenly to the cleaned metal surface. Allow to air dry for a minimum of one hour and then apply a second coat of EC1300L cement.
(5) Moisten a clean cloth with MPK and clean the unglazed back surface of the deice boot, changing cloth frequently to avoid contamination of the area.
(6) Apply an even brush coat of EC1300L cement to the unglazed back surface of the deice boot.
(7) Allow cement to dry, then using a silver (non-graphite, greaseless) pencil, mark a centerline along the leading edge of the propeller blade and a corresponding centerline on the cemented side of the deice boot.
(8) Reactivate the surfaces of the cement using a clean, lint-free cloth, heavily moistened with Toluol solvent. Avoid excessive rubbing of cement which would remove it from surfaces.
(9) Position the outboard end of deice boot centerline on the propeller leading edge, with all marks and terminal leads aligned. Tack the deice boot centerline to the leading edge of the propeller blade.

NOTE: If the deice boot is allowed to get out of masked areas, pull up with a quick motion and reposition properly. Roll firmly along centerline with a rubber roller.

(10) Roll outwardly from the centerline to the edge. If excessive material at the edges tend to form puckers, work them out smoothly and carefully with fingers.
(11) Roll the tapered edges of the deice boot with a metal hand-stitch roller and ensure there are no bubbles entrapped under the boot and that all edges firmly adhere to the propeller.

NOTE: In the event it becomes necessary to remove or loosen installed deice boots, Toluol shall be used to soften the cement line. A minimum amount of this solvent should be applied to the cement line as tension is applied to peel back the deice boot. The removal should be slow enough to allow the solvent to undercut the cement so that parts will not be damaged.

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(12) Clean all excess adhesive from edge of boot.
(13) If touch up painting is required, perform the following:

NOTE: Perform any touch up painting prior to edge sealing as edge sealing aids in protecting leading edge of paint film from erosion.

(a) Apply masking parallel along edge of boot, leaving strip for sealer to overlap a minimum of 1/4 inch on the boot and 1/2 inch on propeller surface. Apply masking so that a straight line is provided for finish appearance.

NOTE: Sealer will not adhere to bare metal. Apply wash primer to any bare metal surfaces prior to sealer application.

(b) Remove masking and apply a new masking prior to painting.
(c) Mix the black polyurethane enamel (78-U-1003) with the catalyst (U-1001) at a ratio of two parts enamel to one part catalyst and apply a uniform brush coating around the periphery of the boot to edge seal.
(d) Remove the masking immediately after coating is applied.
(14) Edge seal boot.
(15) Clean surface of the blade with a clean cloth dampened with Toluol.

2. Slip Ring

A. Removal (Refer to Figure 401).
(1) Remove propeller, spinner bulkhead, and slip ring from engine crankshaft, refer to Chapter 61, Propellers - Removal/Installation.
(2) Remove deice wires from terminals of slip ring (2). Remove electrical cable (10) from retainer (9) or clamp (12).
(3) Remove slip ring (2) from spinner bulkhead (1) by removing attaching screws and washers.

B. Installation (Refer to Figure 401).
(1) Position slip ring (2) to spinner bulkhead (1) so that slip ring terminals align with retainers (9) or clamps (12). Secure in place with screws and washers. Safety wire screws.
(2) Place bulkhead assembly on propeller hub studs. Install propeller, refer to Chapter 61, Propellers - Removal/Installation.
(3) Connect terminals of electrical cable. Secure cable (10) to spinner bulkhead (1) with retainer (9) or clamp (12).

NOTE: Make certain that cable has sufficient clearance so that there is no tension on the cable when propeller is in feathered position.

CAUTION: Make certain clamp (11) is seated behind the anti-slip ring of cable (10) to prevent cable damage by centrifugal force.

3. Brush Holder and Mount Bracket

A. Removal (Refer to Figure 401).
(1) Disconnect electrical terminals from brush holder (5).
(2) Remove brush holder (5) from bracket (3) by removing nuts, spacers (4), washers, and screws.
(3) Remove wire bundle clamp from bracket by removing nut, washers, and screw.
(4) Remove brush holder bracket from engine by removing attaching nuts, spacers (6), washers, and bolts.

B. Installation (Refer to Figure 401).
(1) Install brush holder mounting bracket to engine with bolts, spacers (6), washers, and nuts in sequence shown.
(2) Attach brush holder (5) to mounting bracket (3) with two washers and screws. Safety wire the screw heads.
(3) Secure wire bundles to bracket with clamp, screw, washer, and nut.

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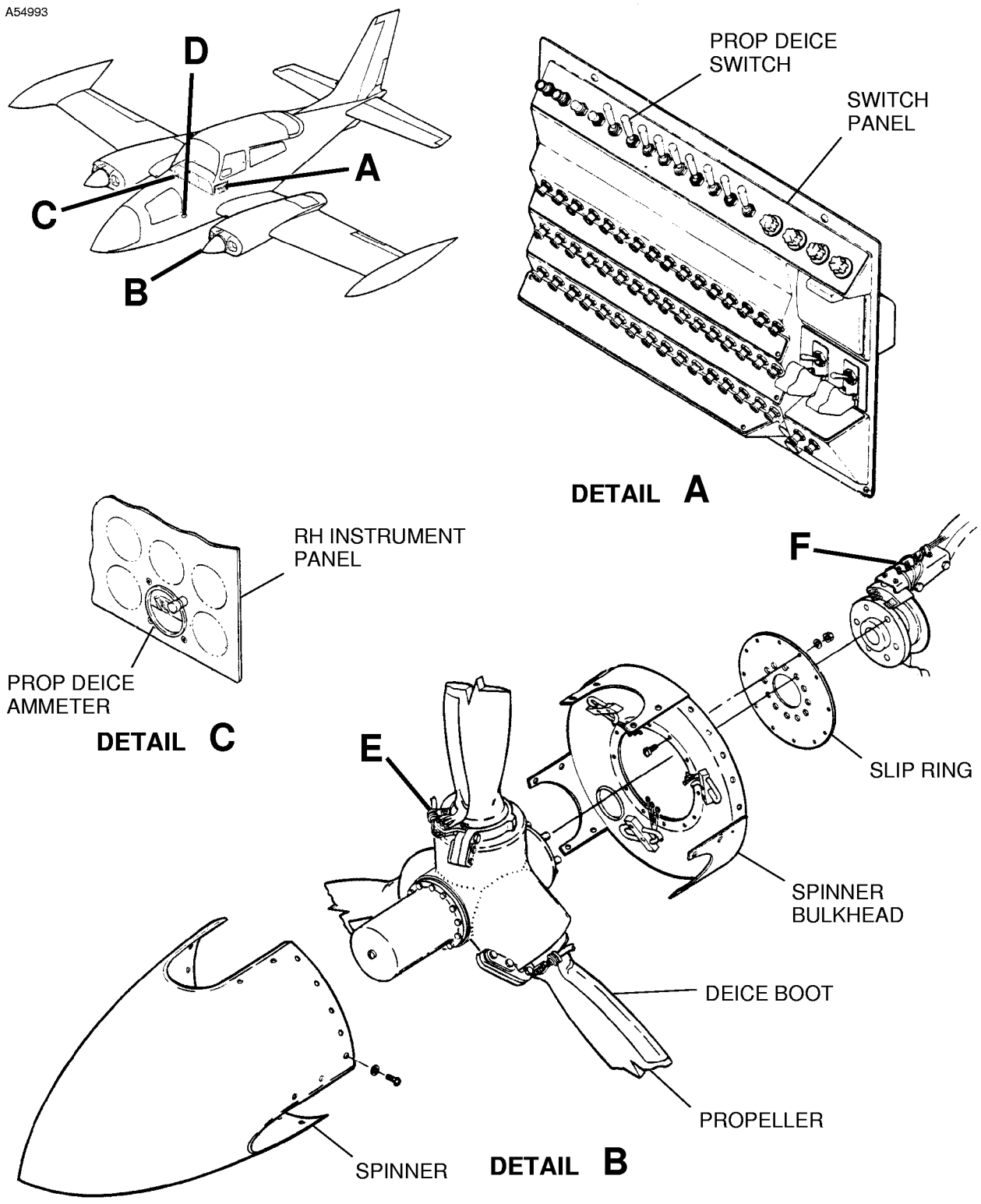

Propeller Deice System Installation
Figure 401 (Sheet 1)

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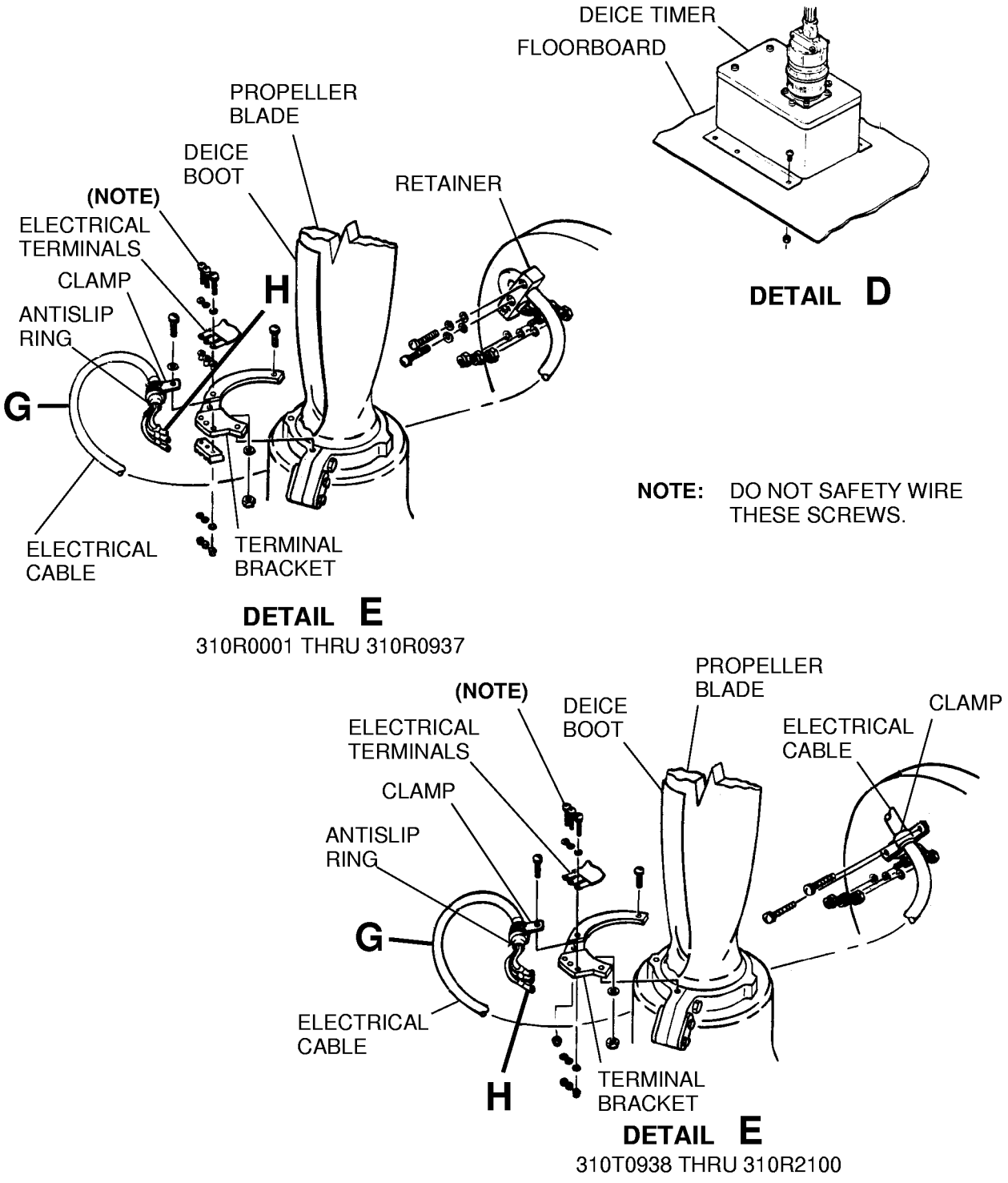

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Propeller Deice System Installation
Figure 401 (Sheet 2)

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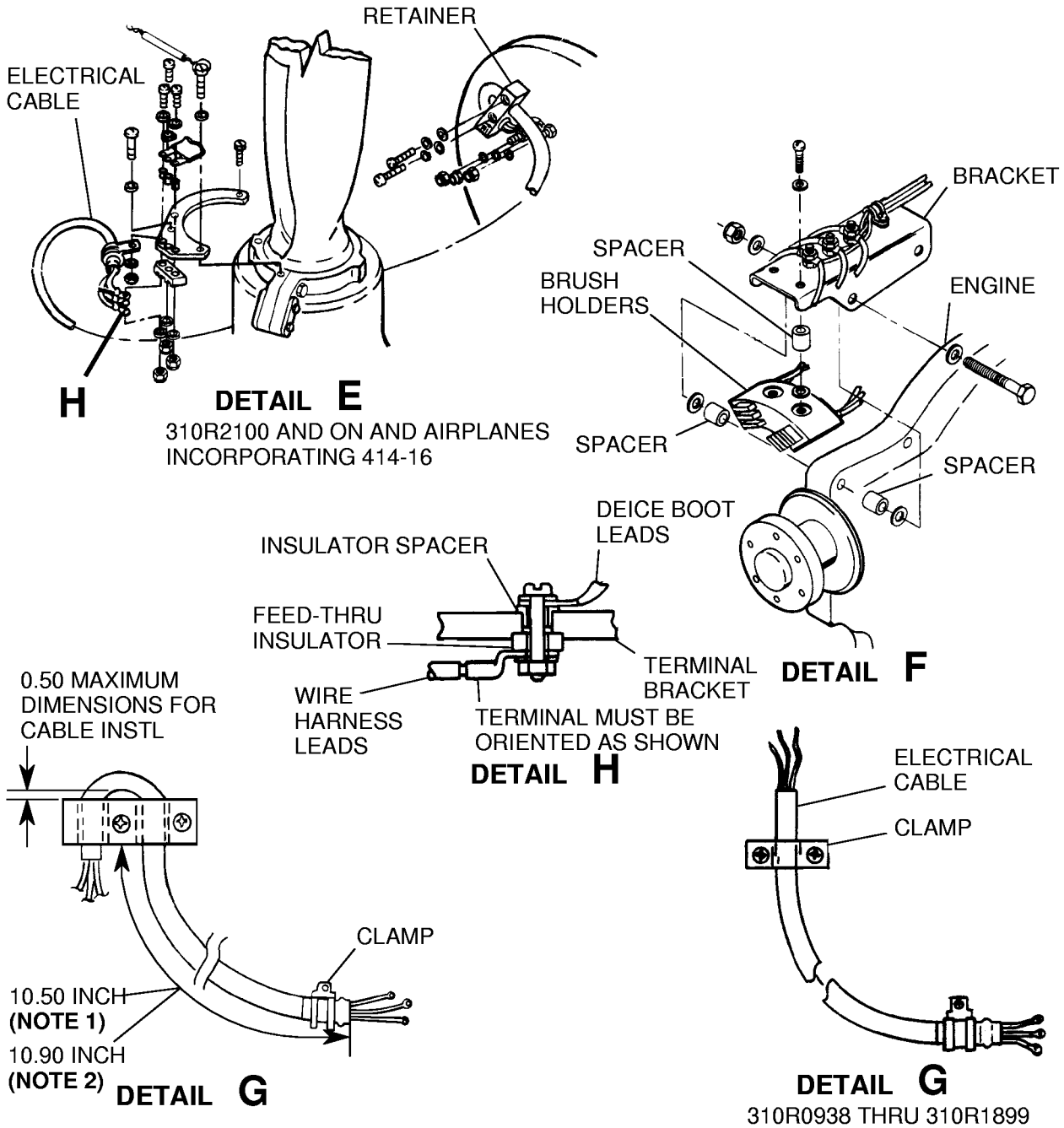

NOTE 1: 310R0001 THRU 310R0937 INCORPORATING 414-16

NOTE 2: 310R2100 AND ON AND AIRPLANES INCORPORATING 414-16

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Propeller Deice System Installation
Figure 401 (Sheet 3)

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(4) Connect brush wires to terminals.

4. Deice Timer

A. Removal (Refer to Figure 401).
(1) Locate timer at center of airplane, just aft of forward cabin bulkhead.
(2) Disconnect electrical connector from timer.
(3) Remove timer by removing four attaching screws.

B. Installation (Refer to Figure 401).
(1) Position timer in place and secure with four screws.
(2) Connect electrical connector and safety wire connector.

5. Deice Ammeter

A. Removal/Installation (Refer to Figure 401).
(1) For removal and installation of ammeter, refer to typical instrument removal/installation located in Chapter 31, Instrument & Control Panels - Removal/Installation.

6. Deice Switch

A. Removal/Installation (Refer to Figure 401).
(1) For removal and installation of deice switch, refer to typical switch removal/installation located in Chapter 31, Instrument & Control Panels - Removal/Installation.

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PROPELLERS - ADJUSTMENT/TEST

1. Brush Holder Assembly

A. Adjustment (Refer to Figure 501).

(1) When a chattering or screeching noise is emitted from the brush slip ring area, the probable cause is the improper alignment of the brushes and slip ring.

NOTE: If this chattering or screeching is noticed over idling engine noises, the trouble is severe and should be remedied immediately. A less severe chattering or screeching may be detected by pulling each propeller through slowly in the direction of rotation.

(2) The brush holder assembly should be positioned as follows:

(a) Loosen screws through bracket assembly and brush holder.

(b) Adjust brush holder assembly by twisting brush holder assembly in brackets so that the brushes are perpendicular to the slip ring surfaces.

(c) Check each brush for correct alignment with the slip ring surfaces through 360 degree rotation. Add or remove washers for correct alignment.

(d) Check for a 0.063 inch, +0.015 or -0.015 inch (nominal) clearance between the main body of the brush holder assembly and the slip ring through 360 degree rotation.

NOTE: When replacing brushes, note the type and part number of the brush block being used on engine to ensure proper replacement parts being ordered (Refer to Figure 501).

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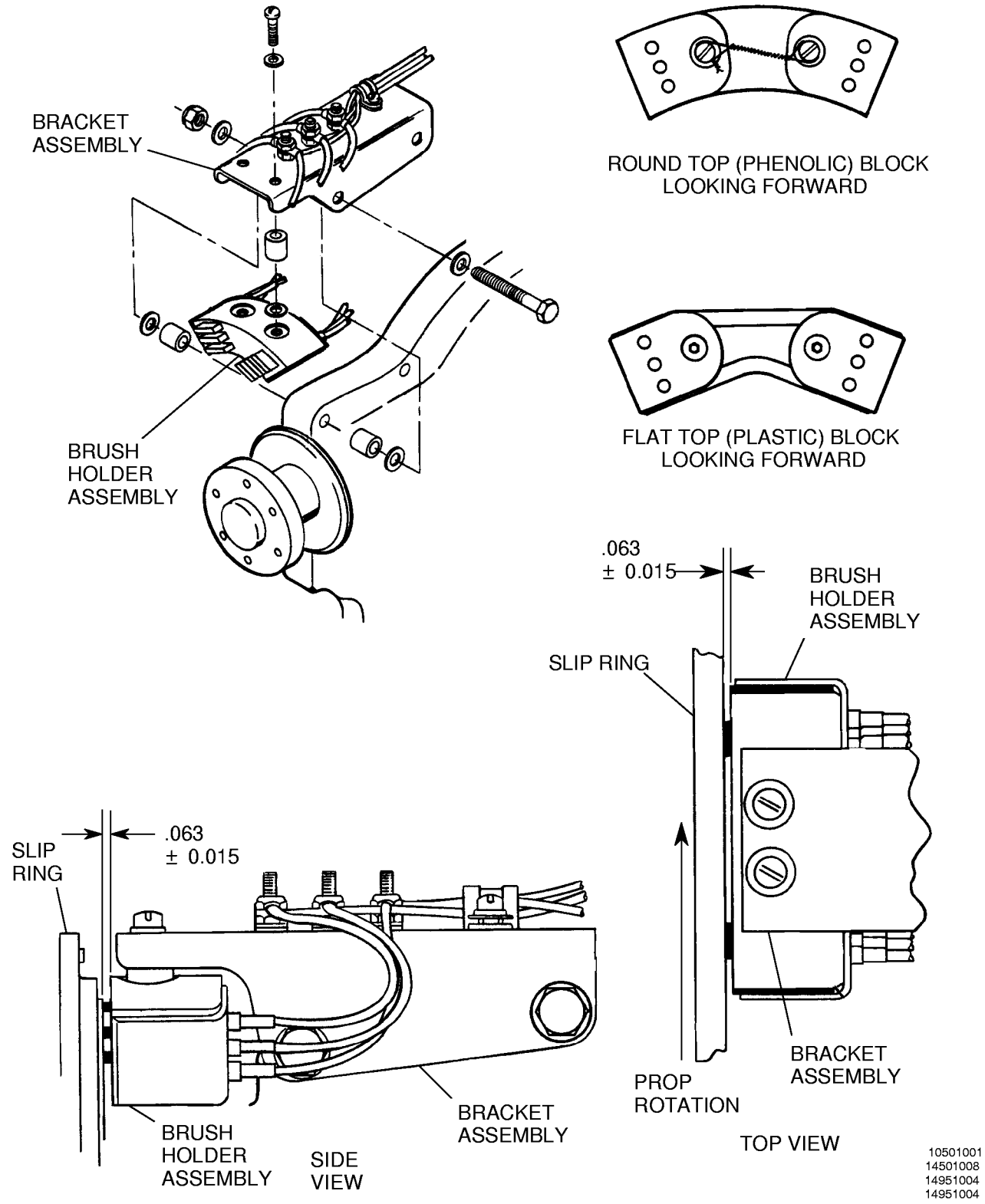

Brush Holder Alignment
Figure 501 (Sheet 1)

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PROPELLERS - INSPECTION/CHECK

1. Propeller Deice System

A. Inspection.
(1) Check propeller deicers for wrinkling or loose spots.
(2) Check wiring connections for correctness and tightness.
(3) Check continuity of wiring. Remove plug from timer. Using Ohmmeter, check continuity from:
(a) Pin C of the plug to Terminal A of one prop boot on the RIGHT engine.
(b) Pin D of the plug to Terminal B of one prop boot on the RIGHT engine.
(c) Pin E of the plug to Terminal A of one prop boot on the LEFT engine
(d) Pin F of the plug to Terminal B of one prop boot on the LEFT engine.
(e) Pin G of the plug to ground.
(f) Terminal C of one prop boot on the RIGHT engine to ground.
(g) Terminal C of one prop boot on the LEFT engine to ground.
(4) Check flatness of slip ring as follows:
(a) Mount a dial indicator on engine.
(b) Rotate slip ring through 360 degrees of rotation.
(c) Observe dial indicator for a T.I.R. (Total Indicator Reading) of 0.012 to 0.015.
(d) If reading is not in tolerance, replace slip ring.

B. System Tests.
(1) Propeller Deice Boots Resistance Check:
(a) Using an Ohmmeter, check the resistance between terminals A-C, B-C of prop boots in BOTH engines. Resistance should be 4.53 to 5.21.
(2) Timer Tests:
(a) Connect a jumper wire from Pin B of the timer receptacle to Terminal B of the connector plug and from Pin G of the timer receptacle to ground.
(b) Place the prop deice system switch in the ON position.
(c) Using a voltmeter check the DC volts to ground from Pin B of the timer. This should be approximately 24 volts DC.
(d) Check DC volts to ground from Pins, C, D, E, F; these are the points at which the system voltage is applied in sequence to cycle power to the propeller deice boots. The following cycling action of the timer should be:

CYCLE TIME

TIMING SEQUENCE	310R0001 THRU 310R0800	310R0801 THRU 310R2140	HEATING ELEMENT
PIN C	30 seconds	20 seconds	Right Engine Propeller Outboard.

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CYCLE TIME

TIMING SEQUENCE	310R0001 THRU 310R0800	310R0801 THRU 310R2140	HEATING ELEMENT
PIN D	30 seconds	20 seconds	Right Engine Propeller Inboard.
PIN E	30 seconds	20 seconds	Left Engine Propeller Outboard.
PIN F	30 seconds	20 seconds	Left Engine Propeller Inboard.

NOTE 1: Cycle time when operating on battery voltage, as in this checkout procedure, may be longer than when operating on alternator voltage.

NOTE 2: The timer does not reposition itself to start at Pin C when the system is turned OFF, but will begin its cycling at the same position in which it was last turned OFF. Cycling will then proceed in the order of C, D, E, F, as shown.

NOTE 3: Check Pins C, D, E, F, until a voltage reading of approximately 24 volts DC is obtained. Hold the voltmeter probe on the pin until the voltage drops to 0. Move the probe to the next pin in the sequence C, D, E, F. Check volts DC at each pin in sequence, 24 volts DC should be measured at each pin in the sequence C, D, E, F. When correctness of the cycling sequence is established, turn prop deice system switch OFF at the beginning of one of the on time periods and record the letter of the pin at which the voltage supply is present.

(3) Propeller Deicer Heat Test:
   (a) Remove the jumper wire installed in paragraph B.(2)(a), and replace the connector plug in the timer receptacle.
   (b) Referring to the position in which the timer was left in paragraph (B)(2)(d), have an assistant place the prop deice system switch in the ON position. As the switch is turned ON, place a hand on each of the two deice areas which should be heated per paragraph (B)(2)(d).
   (c) The assistant in the cabin should note and record the prop deice system ammeter reading. This should be from 8 to 12 amps. Keep a close watch on the ammeter needle. The ammeter needle will deflect every cycle because of the switching action of the timer. Each deflection will indicate a change in the heating areas of the prop deice boots.

NOTE: The observer in the cabin should call out these cycle interval deflections and the inspector at the propellers should change the position of his hands on the prop deicers accordingly, to check proper heating sequence of the prop deicer areas.

NOTE: If any irregularities are noted, recheck the wiring from the timer to the brush holder assembly and the prop deicer terminal connections. Make corrections as necessary and retest.

2. Propeller Deice Brushes

A. Inspection.
(1) Inspect propeller deice brushes for condition. The brushes are deemed replaceable when 1/4 inch of brush material remains. It is considered good practice, however, to replace the brushes when 3/8 inch of the brush material still remains. The brush block should be dismantled and the brush length measured periodically in order to determine usable remaining brush lengths.

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CHAPTER

31

INDICATING/ RECORDING SYSTEMS

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31-List of Effective Pages		
31-Record of Temporary Revisions		
31-Table of Contents		
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31-10-00	Pages 1-4	Jun 17/2005
31-10-00	Pages 401-409	Jun 17/2005
31-10-00	Pages 501-502	Jun 17/2005
31-20-00	Page 1	Jun 17/2005
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INDICATING AND RECORDING - GENERAL

1. Scope

A. This chapter provides procedural coverage of those systems which give visual or aural warning of conditions in unrelated systems, and units which record, store, or compute data from unrelated systems. Includes systems/units which integrate indicating instruments into a central display system and instruments not related to any specific system. Additionally, this chapter provides pictorial coverage of all instruments, instrument panels, and controls.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Instrument and control panels provides coverage of all panels fixed or movable with their replaceable components such as instruments, switches, etc.
   (2) Independent instruments describes those instruments, units, and components which are not related to specific systems.

3. Components Location Chart

A. Instruments.

Component	Location
Vacuum System - Filter	Forward 0.00 Bulkhead at Center Line of Airplane.
Vacuum System - Regulator	In Wing Gap Area.
OAT Temperature Bulb	In Fresh Air Duct in Nose.
Alternate Static Source	On Parking Brake Support Bracket.

4. Tools and Equipment

A. Equivalent substitutes may be used for the following equipment:

Name	Number	Manufacturer	Use
Multimeter	Model 260	Simpson Electric Co.	Voltage and continuity checks.

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INSTRUMENT & CONTROL PANELS - DESCRIPTION AND OPERATION

1. Instrument Panel

A. Description.

(1) The stationary instrument panel is a part of the fuselage structure and is ordinarily not considered removable. Two individual shock-mounted panels, which may be removed individually, are attached to the stationary panel by the use of spacers, an angle assembly, nuts, and screws. The LH shock mounted panel houses the flight instruments while the RH panel houses the fuel and engine operational instruments. Individual instruments are positioned behind and secured to each panel with screws, nuts, and post lights. Since all instruments are mounted in a similar manner, a typical removal and installation procedure is provided in this chapter.

2. Controls and Indicators

A. Description.

(1) The electrical power source control switches and indicators are located on the various switch panels mounted on the instrument panel.

(a) The battery master switch is located between the left and right alternator switches on the left side of the instrument panel. A switch bar is installed across the top of the three switches to permit simultaneous shutoff. When the battery switch is placed in ON position, it actuates the battery relay which connects the battery to the battery shunt.

(b) Two alternator switches marked L ALT and R ALT have two positions ON and OFF. With the alternator switch in the ON position, the alternator control for regulation, protection, and load bus connection is automatic. Placing the switch to OFF will isolate the alternator from its load bus. Should an overvoltage in the system result, causing tripping of the overvoltage relay, repositioning the respective alternator switch from ON to OFF, back to ON will reset the overvoltage relay.

(c) A voltameter, located on the instrument panel, is provided to monitor alternator current output, battery charge or discharge rate, and bus voltage. An AMP METER SELECT switch, labeled L ALT, R ALT, BAT, and VOLTS is located to the left of the voltameter. Positioning the switch L ALT, R ALT, or BAT position, the respective alternator or battery amperage can be monitored. Positioning the switch to VOLTS position, the electrical system bus voltage can be monitored.

3. Indicator Lights

A. Description.

(1) The alternator failure lights, located on the instrument panel adjacent to the voltameter, will illuminate when the respective alternator system malfunctions.

(2) The battery voltage monitor light, located on the instrument panel adjacent to the turn and bank light, provides a warning when illuminated that the electrical system is operating on battery power. The battery voltage monitor system consists of a low voltage monitor assembly, located on the forward bulkhead station 0.00; the warning light, and electrical wiring. The monitor assembly will illuminate the warning light with decreasing voltage between 24.5 and 25.5 volts and remain ON with voltage lower than turn on voltage. The warning light will turn OFF with increasing voltage between 24.5 and 26.0 and remain OFF with voltage higher than turn off voltage.

(3) The airplane's major light circuits are; the interior lights and exterior lights.

(4) A stall warning system with a transmitter installed in the leading edge of the left wing, provides audio warning from a warning horn when the airplane approaches a stall.

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4. Circuit Breaker and Switches

A. Description.

(1) Electrical load distribution from the power sources to the various using systems throughout the airplane is accomplished by wiring, buses, and circuit breakers. The circuit breaker panel is located on the left cabin wall forward of the pilot's seat. Various systems of the airplane are controlled by switches, located on the instrument panel and switch panels installed on the instrument panel.

(2) Left and right junction boxes are utilized in the airplane's electrical system. The junction boxes incorporate a terminal strip in each box and provides a means of connecting the respective wing electrical wiring to the fuselage wiring for ease of removal/installation of the wing.

(3) All switches mounted on the left-hand switch panel are a two position, one hole mounting, toggle-type switch, except the starter switches, which are a button-type switch with a safety guard. Rheostats mounted on the switch panel of the circuit breaker panel provide dimming capabilities for lights on the flight instruments and radio, engine instruments, switch panels, fuel selector, and compass lights.

5. Audio Control Panel

A. Description.

(1) The audio control panel installed on the instrument panel, provides audio control; both transmission and reception for the communications and navigation equipment installed in the airplane.

(a) The microphone selector switch selects transmitter 1, 2, or 3 for audio communications. The speaker/phone toggle switches permit the operator to monitor various received signals. The received signal (by the selection on speaker/phone switches) may be audible on the headphone or the speaker. To receive a signal the toggle shall be positioned to either the speaker or phone.

(b) The audio control panel incorporates an automatic speaker and phone toggle switch. This switch is used with the microphone select switch to provide automatic audio through the speaker or headphone. When the Com 1, 2, or 3 toggle switches are OFF, transmit selections for Com 1, 2, or 3 are made at the microphone select switch.

(2) To operate the audio system, apply power to the system.

(a) Transmit - The speaker/headphone toggle switches have three positions, SPEAKER, OFF, and HEADPHONES. Position a switch to SPEAKER, the received audio in that system will be audible in the speaker. Position a switch to HEADPHONE, the received audio in that system will be audible in the headphone. The OFF position prevents received audio from entering the speaker or headphones. Also, audio may be received at the speaker or headphone automatically when the AUTO SPEAKER/PHONE switch is in the desired position (toggle switches OFF) and selection is made at the MIC SEL switch. Audio volume is controlled at the respective transmitter for both speaker and headphone.

6. Slaved Directional Gyro and Flux Detector

A. Description.

(1) The slaved directional gyro includes a single, synchro-driven pointer and in some gyros, a dual pointer for use with ADF/VOR inputs to provide continuous indication of the bearing to specific ground stations. The slaved directional gyro operates with a slaving meter and a flux detector to produce input to the electronic compass circuit in the gyro.

(2) The slaving meter is a zero-center-scale meter mounted on the instrument panel used to monitor heading displacement between a slaved directional gyro and a flux detector. When an error exists between the two heading signals, the slaving meter deflects in either direction depending on the polarity of the error. As the gyro slaving circuit acts to correct the error, the needle slowly returns to the CENTER position of the meter. A null position of the meter needle indicates that the gyro heading indication is correct.

(3) The flux detector is a remotely mounted device mounted in the horizontal or vertical stabilizer, depending on the avionics package. The flux detector furnishes long-term information to maintain the slaved directional gyro position properly with the earth's magnetic field. The flux

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detector is a sealed unit. When the unit is installed in the airplane and aligned with the line of flight, it usually requires no further servicing. Electrical interface with the unit is provided by an attached cable and connector plug. Slotted cutouts in the mounting flange are used for mounting.

(4) For location of slaved directional gyro and slaving meter, refer to Figure 1.

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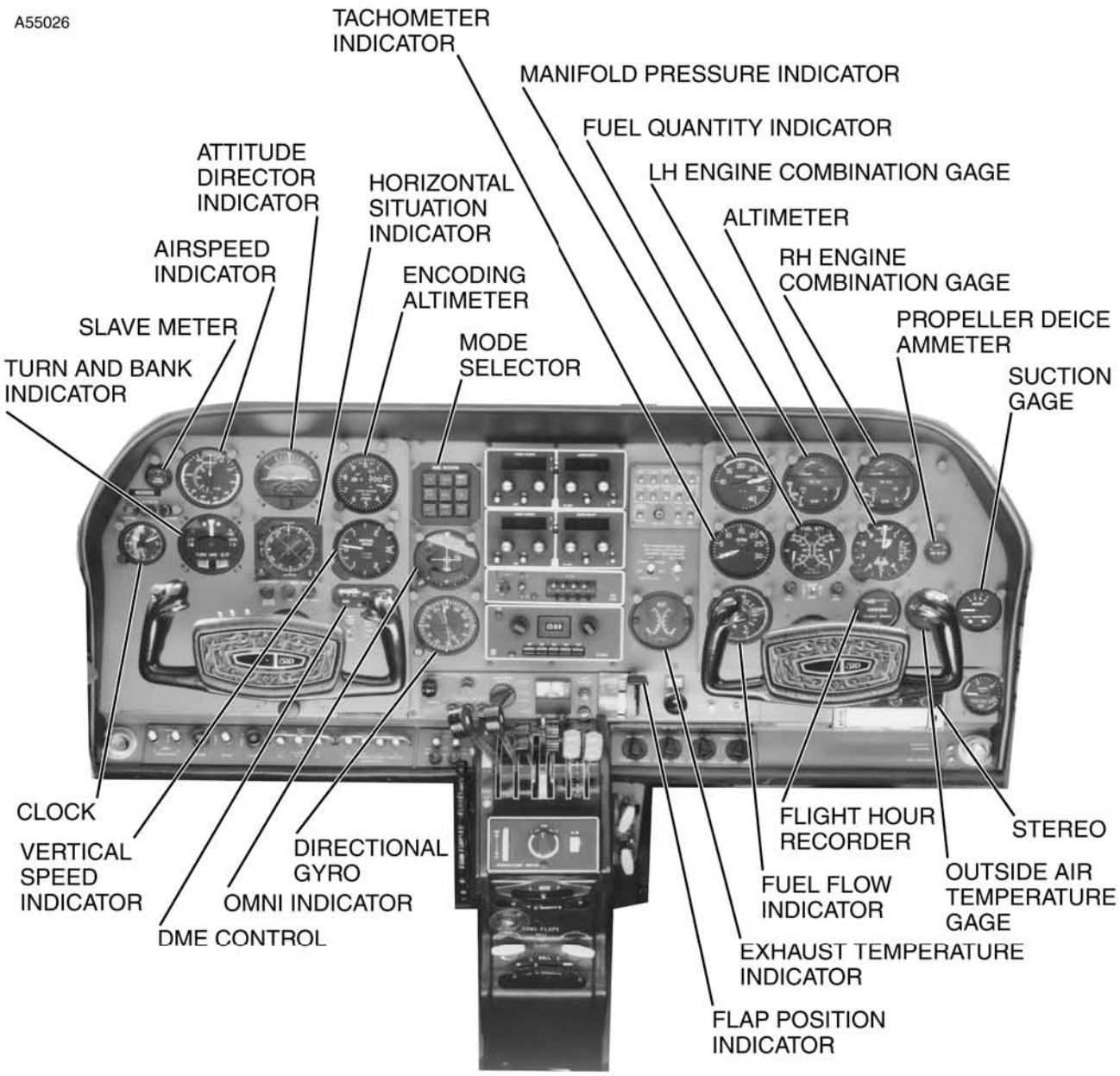

NOTE: THIS INSTRUMENT PANEL ILLUSTRATION IS A "TYPICAL" INSTRUMENT LOCATION ARRANGEMENT. PANEL ARRANGEMENT IS OPTIONAL.

Instrument Panel
Figure 1 (Sheet 1)

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INSTRUMENT & CONTROL PANELS - REMOVAL/INSTALLATION

1. Typical Instrument

A. Removal (Refer to Figure 401).
(1) Remove the glare shield and deck cover.
(2) Tag and disconnect electrical wires and hoses from back of instrument being removed.
(3) Plug all hoses and cap fittings to prevent the entry of foreign matter.
(4) Remove the connectors, nuts, and lockwashers.
(5) Remove lower attaching nuts and screws.

NOTE: If the instrument is to be replaced, remove the hose fittings or attaching hardware and install on replacement unit.

B. Installation (Refer to Figure 401).

NOTE: Lubricate straight threads with VV-P-236 petrolatum; tapered threads with JAN-A-669 anti-seize compound. Apply lubricant to male threads only, omitting the first two threads.

(1) Position instrument on back of shock panel and secure with screws and nuts.
(2) Install lighting fixtures and rubber washers, secure with lockwashers and nuts.
(3) Attach connectors to lighting fixtures.
(4) Identify and connect hose or electrical connector as tagged at removal.
(5) Install deck cover and glare shield.

2. Shock-Mounted Instrument Panel

A. Removal (Refer to Figure 402).
(1) Disconnect lines and tubing to instruments and tag.

NOTE: When removing/installing lines at bulkhead fittings, insure that fitting is secured to prevent twisting line on opposite side from one being installed. Hold fitting with wrench while loosening/tightening line connection. Refer to Chapter 20 for expanded installation procedures on Tubing and Hose.

NOTE: Most hose fittings are more accessible if disconnected from the forward bulkhead.

(2) Remove screws and pull shock panel away from stationary panel enough to disconnect electrical leads.

NOTE: Tag all electrical leads.

(3) Plug hoses and cap all fittings to prevent entry of foreign matter.
(4) Remove shock panel from airplane.

B. Installation (Refer to Figure 402).
(1) Remove plugs and caps in all lines and fittings.
(2) Connect electrical leads.
(3) Connect all hoses and lines to instruments.
(4) Secure shock panel to support angles with screws, spacers, washers, and nuts.

3. Circuit Breaker Panel

A. Removal (Refer to Figure 403).

NOTE: For identification and connection of electrical wires to components, refer to wiring diagrams in Chapter 24, Electrical Power.

(1) Master battery switch OFF.

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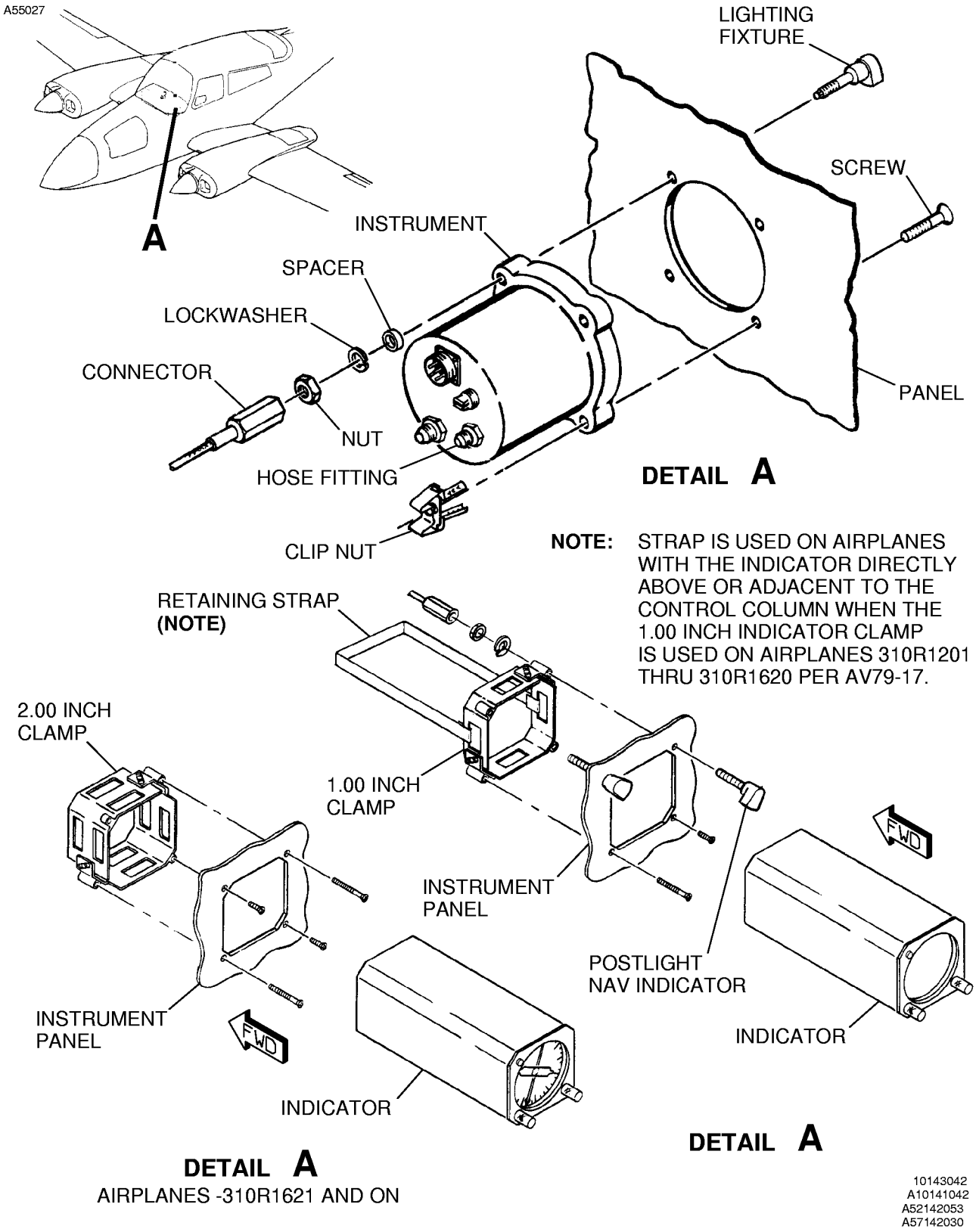

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Typical Instrument Installation
Figure 401 (Sheet 1)

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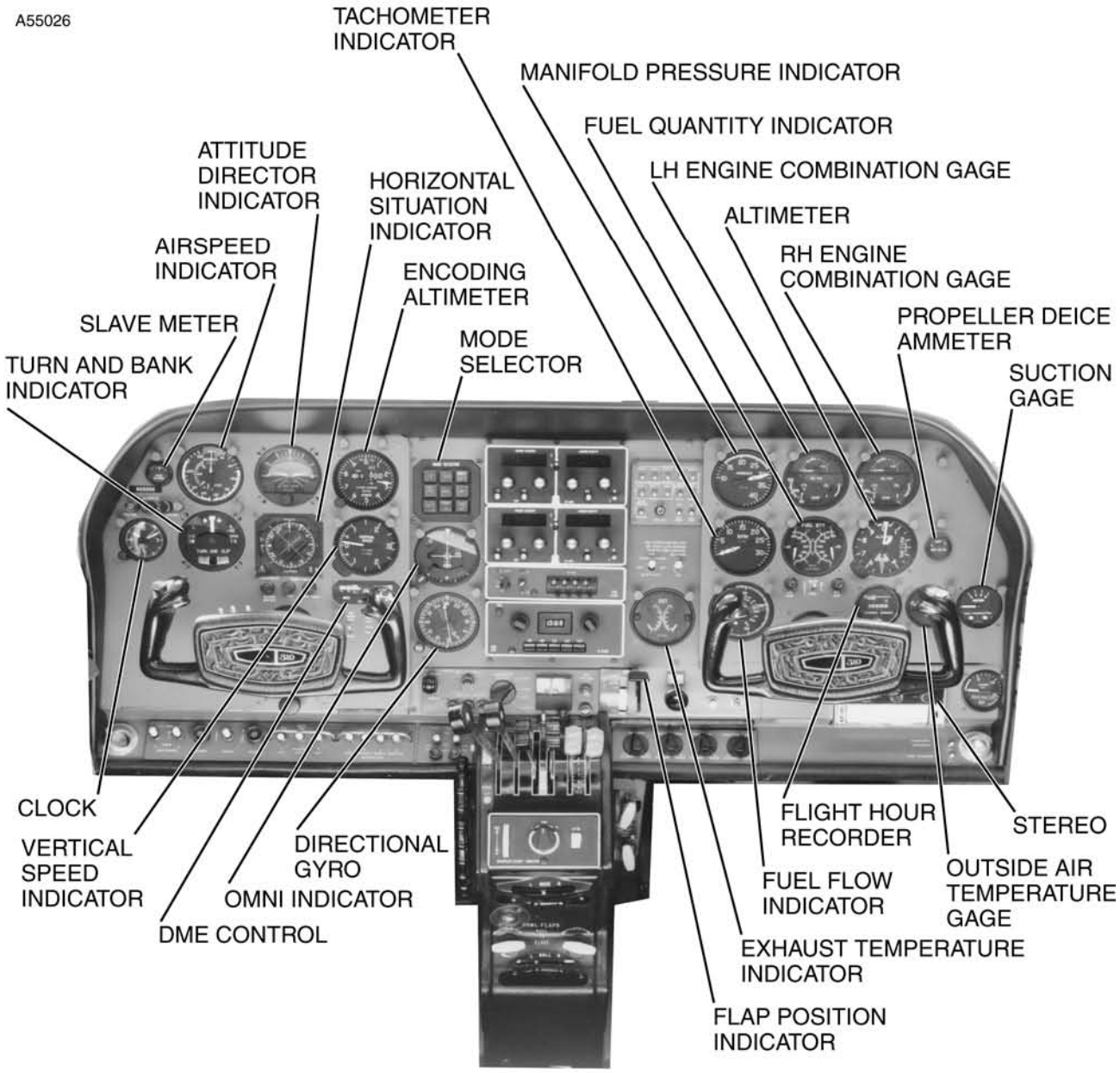

NOTE: THIS INSTRUMENT PANEL ILLUSTRATION IS A "TYPICAL" INSTRUMENT LOCATION ARRANGEMENT. PANEL ARRANGEMENT IS OPTIONAL.

Instrument Panel
Figure 402 (Sheet 1)

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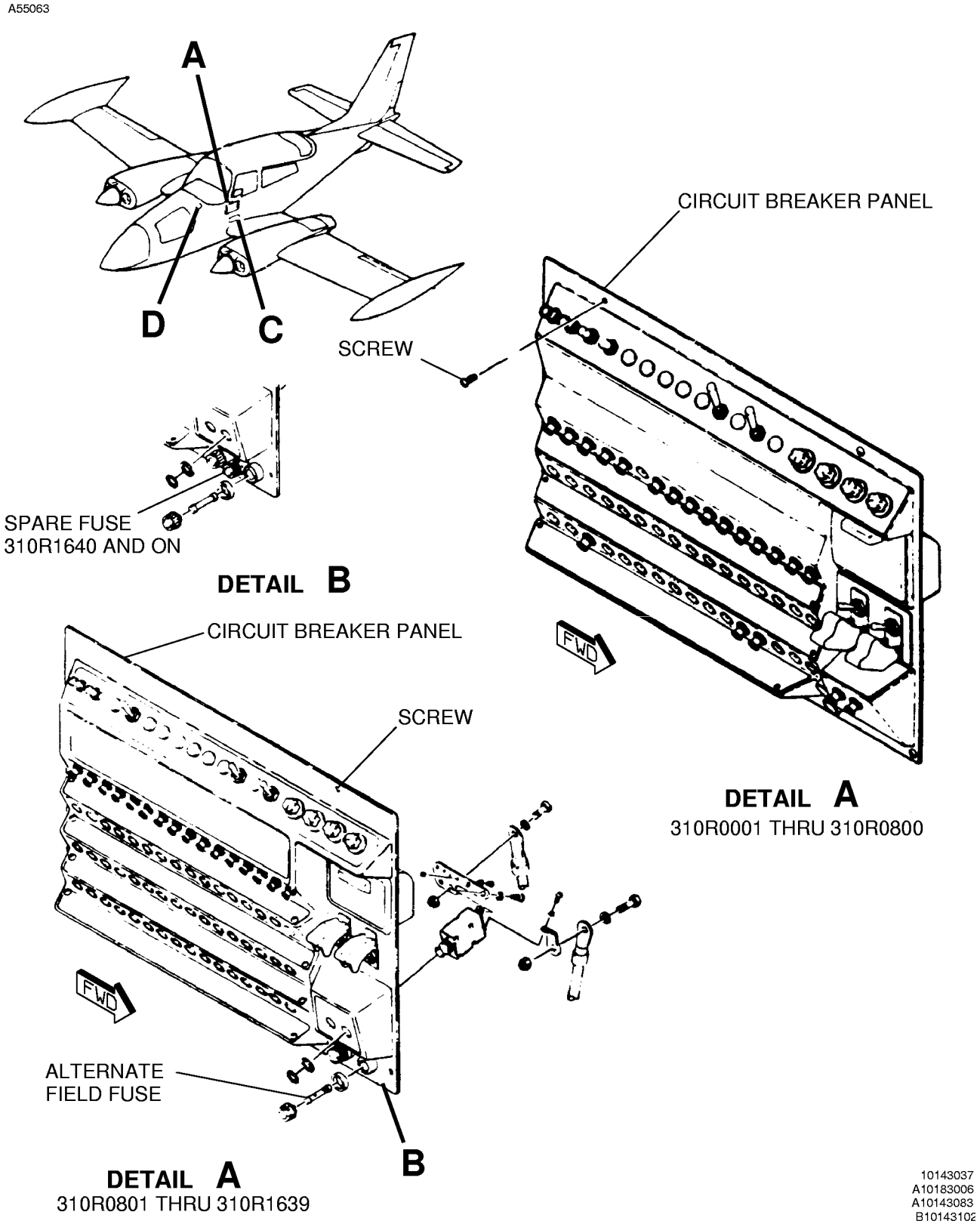

Circuit Breaker and Junction Box Installation
Figure 403 (Sheet 1)

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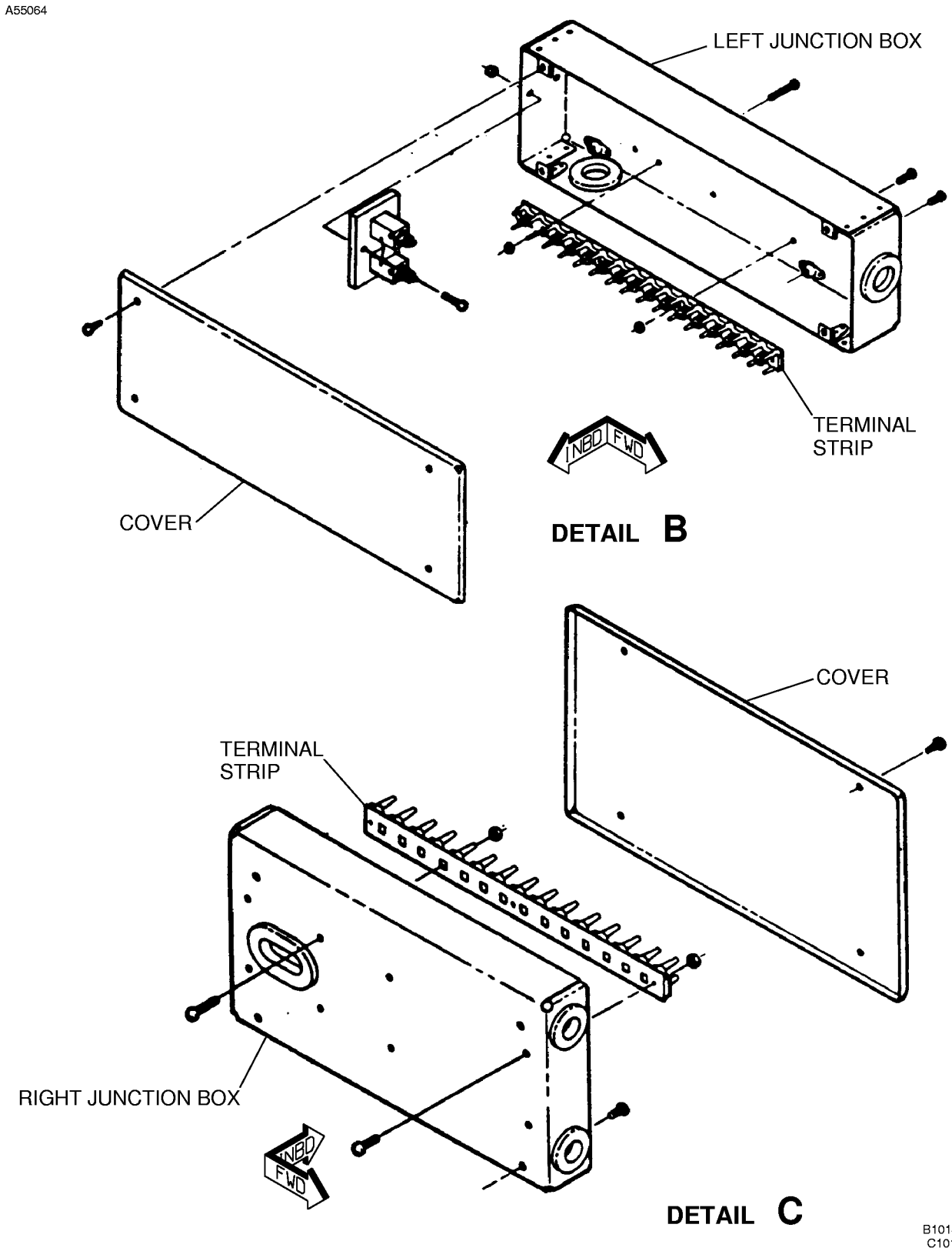

Circuit Breaker and Junction Box Installation
Figure 403 (Sheet 2)

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CAUTION: When removing the circuit breaker panel, the master battery switch shall remain in the OFF position or ground cable should be disconnected from the battery.

(2) Remove the screws from the front of the circuit breaker panel. If complete removal of the panel is desired, remove the breakers from the panel or disconnect the wiring from the breakers and bus bars.

B. Installation (Refer to Figure 403).
(1) Install or connect wiring to circuit breakers and bus bars.
(2) Secure circuit breaker panel to structure using screws.

4. Junction Box

A. Removal (Refer to Figure 403).
(1) Master battery switch OFF.
(2) Access to the left junction box is accomplished by grasping the upholstery panel (small panel containing the map pocket) and pushing it down to disengage it from the upholstery along the left cabin wall.
(3) Access to the right junction box is accomplished by removing screws along the forward end of the upholstery retaining strip (adjacent to the lower cabin door jam) and pulling the small upholstery panel from under the retaining strip and away from the right cabin wall.
(4) Remove the junction box cover by removing screws securing cover and pulling cover from the box.
(5) Remove the bundled electrical leads from the junction box by removing the small nuts securing the leads to the terminal strip. Pull the bundled leads from the junction box.
(6) Remove the wing fairing to gain access to the screws that secure the left junction box to the fuselage. Removing the screws will allow the left junction box to be removed. The screws that mount the right junction box are accessible from inside the cabin.

B. Installation (Refer to Figure 403).
(1) Secure junction box to structure using screws.
(2) Using wiring diagrams, connect electrical wires to terminal strip using nuts.
(3) Install cover on junction box and secure with screws.
(4) Reinstall upholstery.
(5) If left junction box was removed, install wing fairings.

5. Battery, Alternator, and Ignition Switches

A. Removal (Refer to Figure 404).

WARNING: During removal of any switch except the battery switch, the battery switch must remain OFF. When removing the battery switch, disconnect the battery ground cable at the battery to prevent an accidental short circuit.

(1) Master battery switch OFF.
(2) Remove cotter pin securing switch bar to switch bar bracket.
(3) Remove nut securing switch to left control panel.
(4) Remove the wires from the switch.

B. Installation (Refer to Figure 404).
(1) Connect the wires to the proper switches.
(2) Insert switch in proper position in the switch panel and secure with nut. Ensure switch bar bracket is installed on applicable switch.
(3) Install switch bar using pin and cotter pin.

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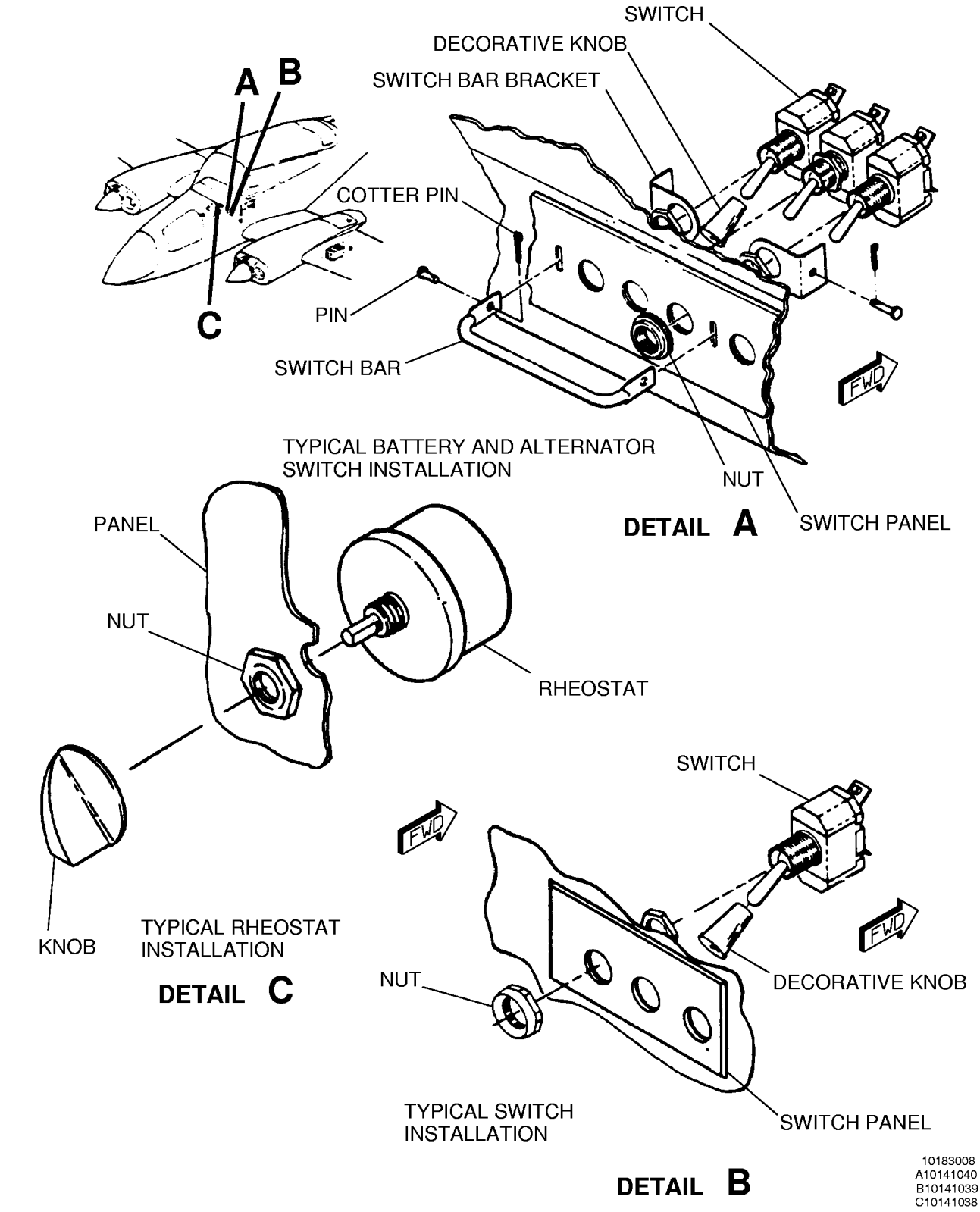

Typical Switch and Rheostat Installation
Figure 404 (Sheet 1)

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6. Typical Switch

A. Removal (Refer to Figure 404).
(1) Master battery switch OFF.
(2) Remove nut securing switch to the switch panel.
(3) Remove switch.
(4) Disconnect wires from switch.

B. Installation (Refer to Figure 404).
(1) Connect wires to switch.
(2) Install switch in switch panel.
(3) Secure switch with nut.

7. Rheostats

A. Removal (Refer to Figure 404).
(1) Master battery switch OFF.
(2) Loosen set screw securing rheostat knob and remove knob.
(3) Remove nut securing rheostat to switch panel and remove rheostat.
(4) Disconnect the wires from the rheostat.

B. Installation (Refer to Figure 404).
(1) Connect wires to rheostat.
(2) Secure rheostat to panel using nut.
(3) Install knob on rheostat.

8. Audio Control Panel

A. Removal.
(1) Turn electrical power OFF.
(2) Remove screws securing audio control panel to instrument panel.
(3) Pull audio control panel aft and disconnect electrical plug.

B. Installation.
(1) Connect electrical plug to audio control panel.
(2) Position audio control panel in instrument panel and secure with screws.
(3) Perform operational check, refer to Instrument & Control Panel - Adjustment/Test.

9. Flux Detector

A. Removal (Refer to Figure 405).
(1) Remove access cover from stabilizer.
(2) Disconnect electrical cable from flux detector.
(3) Remove screws securing flux detector.

NOTE: Mark position of flux detector for reinstallation.

(4) Remove flux detector.

B. Installation (Refer to Figure 405).
(1) If new flux detector is not being installed, align flux detector to index mark and secure with screws.
(2) Connect electrical cable to flux detector.
(3) If new flux detector is being installed, refer to Instrument & Control Panel - Adjustment/Test.
(4) Install access cover.

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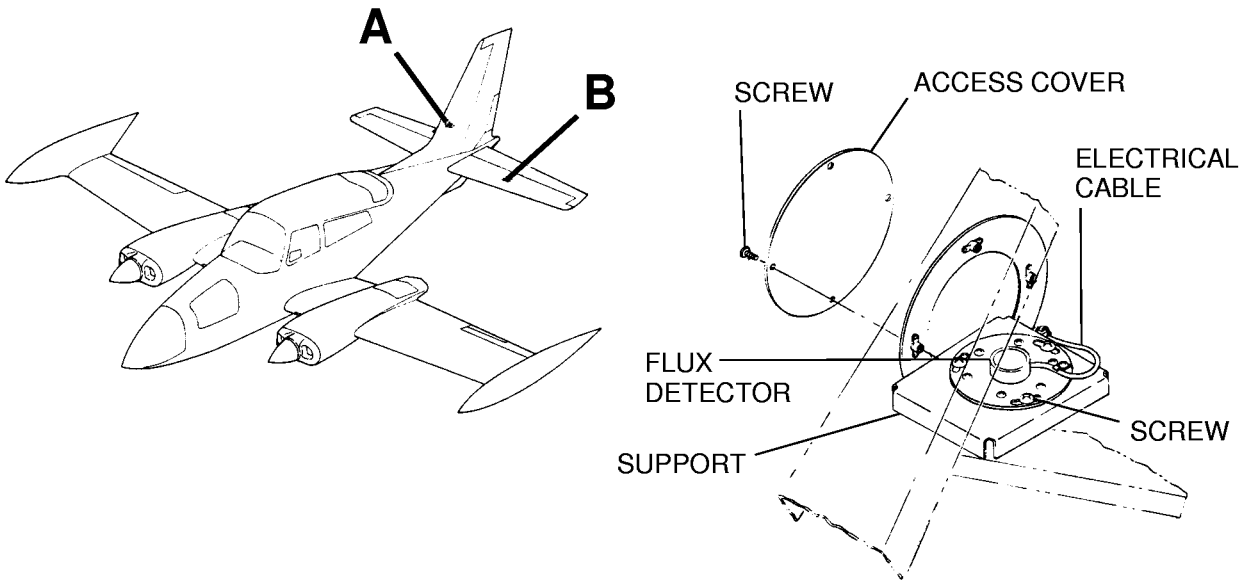
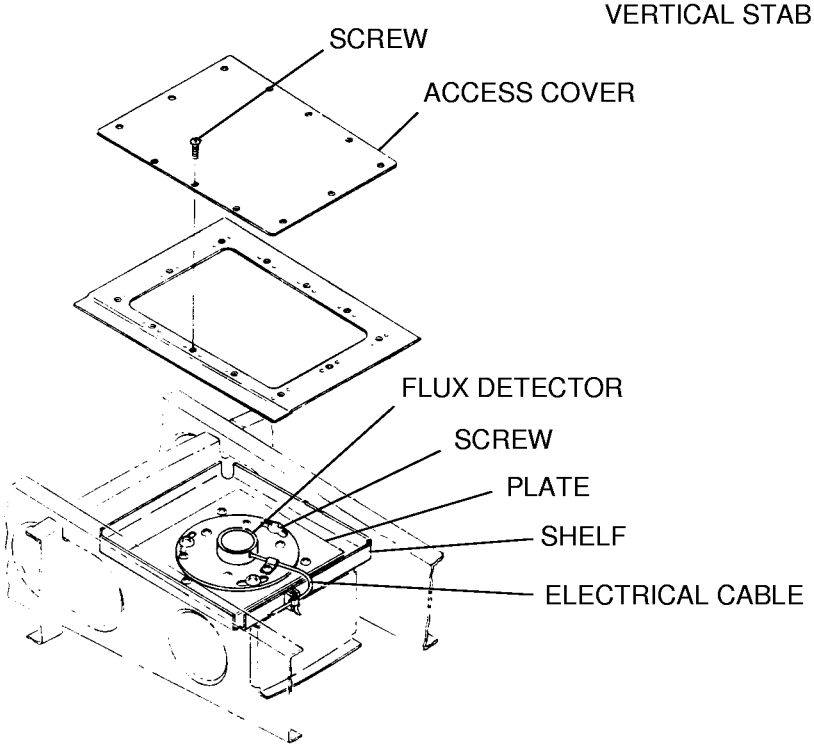


DETAIL A
VERTICAL STABILIZER INSTALLATION



DETAIL B
HORIZONTAL STABILIZER INSTALLATION

10143039
A14143048
B14143048

Flux Detector Installation
Figure 405 (Sheet 1)

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INSTRUMENT & CONTROL PANELS - ADJUSTMENT/TEST

1. Audio Control Panel

A. Adjustment/Test.
(1) Turn ON battery switch or connect external power unit. Turn all radios ON and tune to a transmitting frequency.
(2) Turn microphone select switch to COM 1 and then to COM 2 positions, communicate with another station on both radios.
(3) Move each receiver switch to SPEAKER and HEADPHONE positions. Each radio should be heard in the speaker and headphone as switches are moved.
(4) Turn OFF each receiver switch to radios.
(a) Turn microphone selector switch to COM 1, COM 2, or COM 3 (if installed) communicate with another station or radios.
(b) Move automatic receiver switch to SPEAKER and HEADPHONE positions. Each radio should be heard in the speaker and headphone as switch is moved.

NOTE: If radio receiver switch was left in SPEAKER position and automatic receiver switch is in HEADPHONE position, audio will be heard at speaker and headphone or vice versa.

2. Slaved Directional Gyro

A. Compass Alignment.

NOTE: The compass alignment shall be performed on a calibrated compass rose.

(1) Ensure compensator adjustments are set to NEUTRAL position. The compensators are located on the flux detector.
(2) Using a hand-held magnetic compass, check all ferrous material parts for magnetism near the flux detector.
(3) Degauss any parts within two feet which cause greater than 10 degree deflection of the magnetic compass, and any parts within four feet which cause greater than 90 degree deflection of the magnetic compass.
(4) Ensure that each of the applicable systems are controlled from the proper circuit breakers, and the corresponding HDG flag appears when the circuit breaker is disengaged.
(5) Ensure slave meter is operative.
(6) Ensure the systems fast slave circuitry is operational.
(7) Ensure all electrical instruments for the airplane are installed and operative.
(8) Ensure other airplanes and vehicles are a safe out of the way distance.
(9) Position airplane on the 270 degree heading of the compass rose.
(10) With both engines running 1000 RPM, turn ON the following:
(a) All circuit breakers.
(b) Inverters.
(c) All lights except landing lights and reading lights.
(d) All avionics systems.
(e) All electrical systems except pitot heat, stall, and static heaters.
(f) Allow slaved gyro system to stabilize (stabilization speed may be increased by using fast slave).
(g) Record the slaved gyro system error in degrees and direction with the slave meter nulled.

NOTE: High readings are positive errors, low readings are negative errors.

(h) Position airplane on the 360 degree heading of the compass rose and repeat steps (a) thru (g).
(i) Position airplane on the 90 degree heading of the compass rose and repeat steps (a) thru (g).
(j) Position airplane on the 180 degree heading of the compass rose and repeat steps (a) thru (g).

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B. Index Error Alignment.

NOTE: This alignment should ensure that the compass system flux detector is positioned for minimum index error.

(1) Algebraically sum the four cardinal heading errors obtained in paragraph A, steps (10)(a) thru (10)(g).
(2) Divide the sum obtained by four. This result is the index error correction and direction of rotation of the flux detector.
(3) Rotate flux detector the direction and amount as calculated in steps (1) and (2). CCW rotation of the flux detector is required to correct a positive error.

NOTE: Approximately five degrees rotation equals approximately 1/8 inch distance measured on the outer circumference of the flux detector.

(4) Repeat compass alignment procedure steps (10)(a) thru (10)(g).
(5) The remaining error at the cardinal headings as received in step (4) should equal the difference between the initial cardinal heading errors obtained originally in Compass Alignment procedure steps (10)(a) thru (10)(g).
(6) Recalculate error and assure the remaining error is 0 degrees, +0.5 or -0.5 degrees.

C. Compensation Adjustment.
(1) If the corrected error as calculated in index error alignment paragraph B, step (1) is greater than +2 or -2 degrees the compensators must be adjusted. The errors obtained in the compass alignment procedure steps (10)(a) thru (10)(g) will be used to determine the required amount and degree of compensation.

D. Compensation Calculations.
(1) Using cardinal heading errors calculated in index error alignment paragraph B, step (5), algebraically sum the north and south errors, divide this sum by two and change the sign of the result. The resulting number is the amount and direction of north/south compensator adjustment.
(2) Repeat step (1) for east/west errors.

E. Compass Compensation.
(1) At one cardinal heading, adjust the appropriate compensator the amount calculated in the compensation calculations paragraph D, Step (1).
(2) Rotate the airplane 90 degrees and adjust the appropriate compensator the amount calculated.
(3) Rotate the airplane to the next two cardinal headings and ensure that no errors greater than two degrees are present.
(4) With normal airplane power, all electrical systems ON, rotate the airplane in 30 degree increment headings (including cardinals). Stop on each heading long enough to allow the gyro to stabilize and the slave meter to null.
(5) Observe and record the headings indicated by the slaved gyro system.
(6) There shall be no error greater than two degrees at any heading indicated by the slaved gyro.

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INDEPENDENT INSTRUMENTS - DESCRIPTION AND OPERATION

1. Outside Air Temperature Gage (Optional)

A. Description.
(1) The outside air temperature gage (optional) is located on the right-hand panel. The gage is calibrated in degrees Fahrenheit and operated electrically from a free air temperature bulb located in the fresh air duct in the nose of the fuselage.

2. Clock

A. Description.
(1) The clock is a standard eight-day airplane clock with a sweep second hand. A winding stem is provided in the lower left-hand portion of the case.

3. Davtron Digital Clock

A. Description.
(1) Davtron digital clock removal/installation is typical. The clock may be located at various locations including different panels. The electrical cable assembly routing will vary according to the clock location. Battery replacement is accomplished by splicing electrical leads.

4. Flight Hour Recorder (Optional)

A. Description.
(1) The flight hour recorder (optional) instrument mounted on the right-hand panel, is activated by the landing gear safety switch. When the landing gear strut is extended, the switch is activated allowing the flight hour recorder to operate.

NOTE: It is possible, during maintenance when airplane is on jacks, for the flight hour recorder to operate when the battery switch is positioned to ON. The flight hour recorder fuse (located behind the circuit breaker panel) should be removed to deactivate flight hour recorder.

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INDEPENDENT INSTRUMENTS - REMOVAL/INSTALLATION

1. Davtron Digital Clock

A. Removal.
(1) Remove electrical power; pull circuit breaker.
(2) Disconnect electrical connector.

NOTE: It is permissible to remove instrument panel screws and move panel aft to gain access to electrical connector.

(3) Remove clock mounting screws and remove clock.

B. Installation.

NOTE: The clock should be checked for accuracy before installing, refer to Pilot's Operating Handbook.

(1) Position clock in instrument panel and install mounting screws.
(2) Connect electrical connector.
(3) Secure instrument panel if disturbed during removal.
(4) Reset circuit breaker and check clock display lighting.

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INDEPENDENT INSTRUMENTS - ADJUSTMENT/TEST

1. Davtron Digital Clock

A. Adjustment/Test.
(1) For adjustment of digital Davtron clock controls, refer to Pilot's Operating Handbook.

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CHAPTER

32

LANDING GEAR

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LANDING GEAR - GENERAL

WARNING: Anytime a landing gear retraction or extension system component has been removed, replaced or the tension on the downlocks adjusted, the entire landing gear system must be re-rigged.

1. Scope

A. This chapter describes those units and components which furnish a means of supporting and steering the airplane on the ground and make it possible to retract and store the landing gear in flight. Refer to Figure 1.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Main gear and doors describes that portion of the system which provides the major support for the airplane while on the ground.
   (2) Nose gear and doors describes that portion of the system which supports the nose of the airplane while the airplane is on the ground.
   (3) Extension and retraction describes that portion of the system which is used to extend and retract the landing gear and open and close the landing gear doors.
   (4) Wheels and brakes describes that portion of the system which provides for rolling and stopping the airplane while on the ground and stopping wheel rotation after retraction.
   (5) Steering describes that portion of the system which is used to control the direction of movement of the airplane on the ground.
   (6) Position and warning describes that portion of the system which is used to indicate and warn of the position of the landing gear.

3. Landing Gear

A. Description.
   (1) The landing gear is a fully retractable gear consisting of the main gear located aft of each engine nacelle and a nose gear located in the nose section of the fuselage. Each gear is mechanically connected to a single gear box driven by an electric motor. Each main gear consists of a pneumatic-hydraulic strut assembly, wheel and tire assembly, and a disc type brake assembly. Landing gear retraction linkage is provided to synchronize the operation of the main gear, nose gear, and main gear doors.

      NOTE: Anytime the landing gear system components have been removed, replaced, or the tension on the downlocks adjusted, the entire landing gear system must be rigged.

   (2) The brake system consists of a master cylinder for each main wheel brake and plumbing. Each master cylinder contains its own hydraulic fluid reservoir.
   (3) The parking brake system on Airplanes 310R0001 thru 310R0500 is manually operated through a pull handle and cable arrangement to draw the master brake cylinders into a brake ON condition. The parking brake system on Airplanes 310R0501 thru 310R2140 incorporates a parking brake valve in each main brake line. When pressure is applied to the brake system and the parking brake control is pulled, the valve locks pressure on the brake assemblies until released by pushing the control in.
   (4) The landing gear warning and indicator system provides visual indications of a safe landing gear condition and aural warnings of unsafe conditions. A position indicator switch is located on each gear to actuate indicator lights when the gear is DOWN and locked. A safety switch located on the left main gear prevents accidental retraction while weight of the airplane is on the gear. A gear warning system provides an aural and visual warning any time the gear is in transit or any time the throttles are retarded below a specified manifold pressure setting while gear is in the UP

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position. A flap-gear warning provides an aural and visual warning when flaps are lowered below 15 degrees while the gear is in the UP position regardless of throttle setting. A press-to-test light circuit is incorporated in each light to test the lamp at any time power is ON.

(5) For replacement of press set type bearings, refer to Chapter 20.

NOTE: Tire and wheel balancing may be accomplished by using a balancer manufactured by Goodyear, P/N 9781-754, available from Cessna Supply Division.

4. Components Location Chart

A. Landing Gear.

Component	Location
Actuator and Motor	Aft of Front Spar Under Floorboards.
Down Indicator Switch	On Landing Gear Side Lock Link in Each Wheel Well.
Flap-Gear Warning Switch	In Control Quadrant on Flap Lever Bracket.
Gear Relay	Under Floorboard Aft of Actuator.
Gear Warning Components, Horn, Flasher, and Resistor	At Station 0.00 Bulkhead on Cabin Side.
Limit Switches	On Top of Actuator.
Safety Switches	Left Main Gear Torque Link.
Throttle Microswitch	On Bracket in Control Quadrant at Throttle Lever Position.

5. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Main Gear Door Rigging Tool	0880001-1	Cessna Aircraft Co. or Local Manufacturer	Measuring door actuator arm tension.
Spring Scale	0-50 lbs.	Commercially Available	Measuring door actuator arm tension.
Spring Scale	Model 140	John H. Chatillon and Son 83-28 Kew Gardens Kew Gardens, New York	Measuring gear down lock tension.
Straight Edge		Commercially Available	Checking toe-out.
Carpenters Square		Commercially Available	Checking toe-out.
Grease Plates		Local Manufacturer	Checking toe-out.
Ring Pack Support Tool	0880004-1	Cessna Aircraft Co. or Local Manufacturer	To insert ring pack support.
Reamer	FT 251	Cessna Aircraft Co. Wichita, Kansas	To line ream torque link bushings.
Hydraulic Fluid	MIL-H-5606	Commercially Available	To lubricate parts and fill strut.

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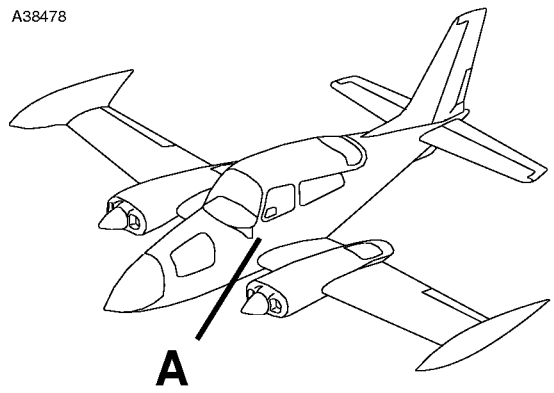

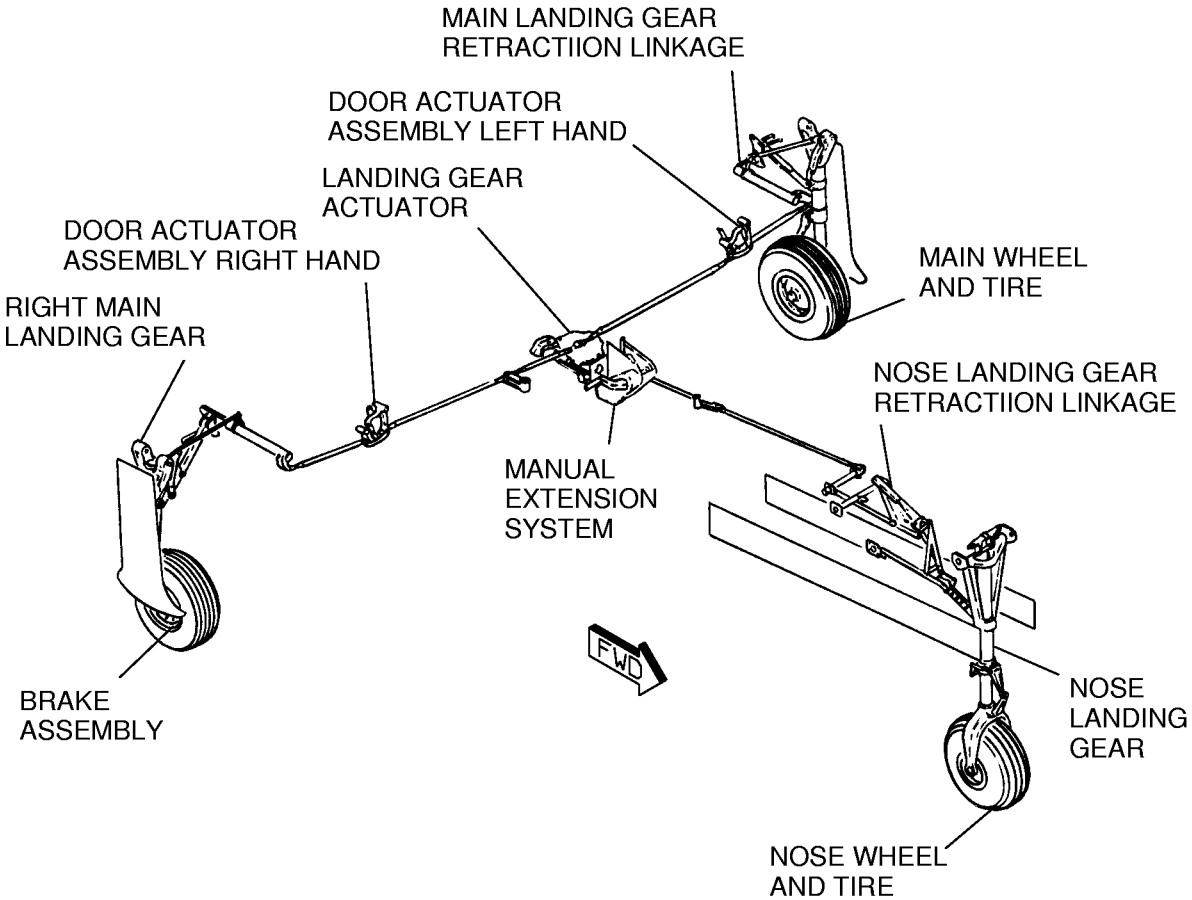

DETAIL A

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Landing Gear
Figure 1 (Sheet 1)

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LANDING GEAR - TROUBLESHOOTING

1. Landing Gear System

A. Troubleshooting.

(1) For a guide to troubleshooting the landing gear system, refer to Table 101. For troubleshooting the electrical functions of the landing gear and landing gear warning, refer to the appropriate wiring diagrams in Chapter 24.

NOTE: Perform landing gear system troubleshooting with normal voltage applied and landing gear actuated.

Table 101. Landing Gear System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
LANDING GEAR FAILS TO RETRACT OR EXTEND COMPLETELY.	Circuit breaker tripped.	Check that circuit breaker is not tripped due to overload caused by incorrect rigging. Reset circuit breaker and re-rig landing gear system as required.
	Limit switches out of adjustment.	Check adjustment of actuator UP and DOWN limit switches. Readjust switches as required.
LANDING GEAR FAILS TO EXTEND OR RETRACT.	Circuit breaker not engaged.	Check that circuit breakers are engaged. Reset circuit breaker as required.
	Improperly stowed crank or rigged position.	If actuator motor turns, but gear fails to respond, check manual extension crank for properly stowed or rigged position. Stow crank or re-rig system as required.
	Unserviceable landing gear actuator.	Refer to troubleshooting landing gear actuator.
ONE LANDING GEAR FAILS TO RETRACT OR EXTEND COMPLETELY.	Unserviceable linkage.	Check for unserviceable linkage to affected gear. Replace linkage as required.
	Improperly rigged gear.	Re-rig affected gear in extend or retract position.

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LANDING GEAR - ADJUSTMENT/TEST

1. Landing Gear Safety Switch

A. Adjustment (Refer to Figure 501).

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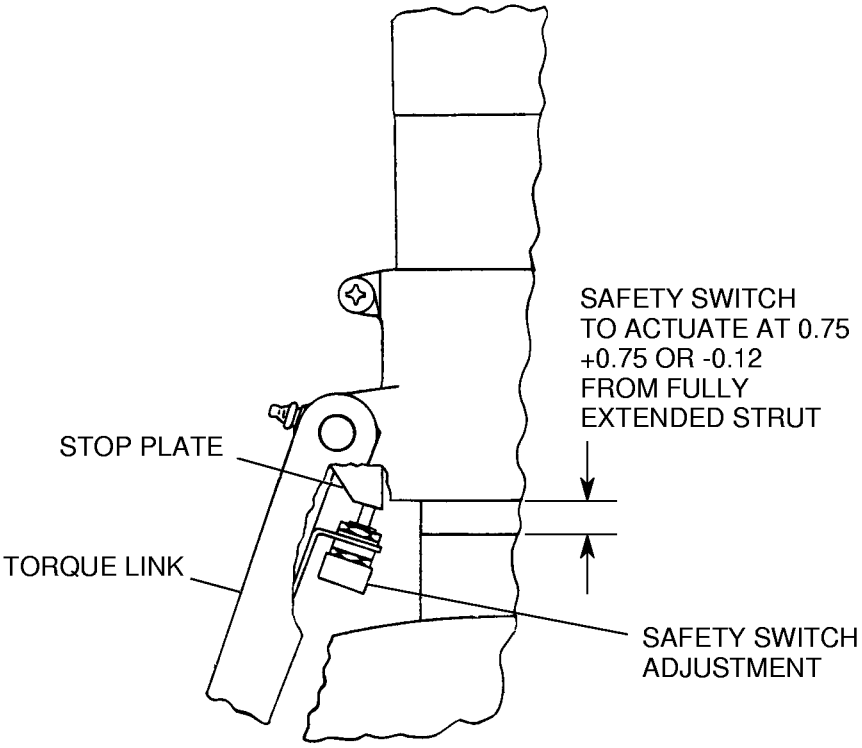

Adjustment of Landing Gear Safety Switch
Figure 501

NOTE: The landing gear safety switch is located on the aft side of the left main gear and is actuated by the upper torque link.

(1) Jack airplane in accordance with Chapter 7, Jacking - Description and Operation.
(2) Place landing gear switch in the DOWN position.
(3) Insure that battery switch is OFF.
(4) Adjust the landing gear safety switch to operate on the center line of the stop plate.
(5) Place jack under the axle and raise strut to 0.75 inch, +0.75 or -0.12 inch from full extended position. Cut safety wire and adjust the switch to actuate at this position.

NOTE: To ensure switch is actuating at position described above, refer to Chapter 24, Electrical Power, and make a continuity check.

(6) Tighten jam nuts at safety switch and safety wire nuts.
(7) Remove jack from under axle.
(8) Conduct operational check of landing gear system.

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LANDING GEAR - INSPECTION/CHECK

1. Landing Gear System

A. Inspection.
(1) Inspect landing gear for proper operation, security of all nuts, and installation of cotter pins where required.

2. Landing Gear Actuator

A. Inspection.
(1) Clean exterior surface. Visually inspect assemblies externally for visible damage such as cracks, nicks, dents, and scratches. Inspect upper and lower bell cranks, and splines on the protruding portions of sector shaft for visible damage. Check actuator for proper operating times. Perform an operational check of the system, refer to Extension and Retraction - Inspection/Check.

3. Emergency Manual Extension System

A. Inspection.
(1) Inspect miter gears and sprockets for visible damage such as chipped or broken teeth, nicks, dents, cracks, or deep scratches. Inspect around all welds for cracks. Perform an operational check of system.

4. Nose and Landing Gear Assemblies

A. Inspection.
(1) Inspect all components for excessive wear, cracks, dents, nicks, and scratches. Inspect outer barrel of the lower strut assembly for any defects that may damage seals.

5. Nose and Main Gear Retracting Linkage

A. Inspection.
(1) Clean linkage component with a suitable solvent. Do not clean sealed bearings or needle bearings which do not have provisions for lubrication. Visually inspect linkage for damage such as cracks, nicks, dents, scratches, and excessive wear. Repair is limited to replacement of parts, smoothing out of minor nicks, scratches, and repainting of areas where paint is missing.

6. Nose and Main Wheel and Tires

A. Inspection.
(1) Clean surface. Inspect wheel castings for cracks, nicks, dents, scratches, and corrosion. Inspect disc drive keys for damage, looseness, and excessive wear. Visually inspect bearing cups for damage and wear (Do not remove bearing cups unless replacement is required). Visually inspect bearing cones for damage. Inspect retainers and snap rings for damage and distortion, straighten or replace as necessary. Inspect the tire for breaks, cuts, foreign objects imbedded in tread, and flat spots and/or exposed cords.

CAUTION: Breaks, flat spots, exposed cords, and cuts that damage cords are cause for immediate rejection of tire. Should there be any doubt about a tires reliability, don't hesitate to reject it.

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MAIN LANDING GEAR - DESCRIPTION AND OPERATION

1. Main Landing Gear

A. Description.

(1) Each main landing gear consists of a lower piston assembly, cantilever axle, upper trunnion assembly, and torque links. The air-oil shock strut contains an orifice and tapered metering pin which varies the resistance to shock according to severity. During retraction and extension, the landing gear pivots on heavy-duty needle bearings by means of trunnion shafts attached to the upper trunnion assembly.

2. Main Landing Gear Doors

A. Description.

(1) The main landing gear is equipped with wheel well doors and strut doors. Each strut door, pivoting on a continuous hinge located at its outboard end, is operated by a door link attached to the main landing gear strut. Each wheel well door, pivoting on forged aluminum hinges located at its inboard end, is operated by a bellcrank and push-pull tube, which is connected to the landing gear retracting linkage. The operating mechanism is so arranged that the wheel well door is closed when the main gear is either fully extended or fully retracted.

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LANDING GEAR - TROUBLESHOOTING

1. Landing Gear System

A. For a guide to troubleshooting the main landing gear, refer to Table 101.

Table 101. Main Landing Gear Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
MAIN LANDING GEAR STRUT FAILS TO REMAIN INFLATED.	Leaking valve body packing.	Check valve body packing for air leakage. Replace packing as required.
	Leaking orifice tube packing.	Check orifice tube packing for leaking. Replace packing as required.
	Strut assembly leaking oil.	Check strut assembly for leaking oil. Check for oil leakage outside of piston. Replace packing and poly pak seal of ring pack support as required.
	Oil leaking down inside of piston.	Replace metering pin packing and seal support packing.

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MAIN LANDING GEAR - SERVICING

1. Main Landing Gear Shock Struts

A. Servicing.
(1) Jack airplane, refer to Chapter 7, Jacking - Description and Operation.
(2) Deflate strut by loosening valve body 2-1/2 turns (maximum).
(3) With strut fully compressed, remove valve and fill with hydraulic fluid (MIL-H-5606A).
(4) Stroke strut slowly three times (minimum).
(5) Top off fluid with strut compressed.
(6) Replace valve and inflate strut to 320 PSI with tire clear of ground.
(7) When airplane is on the ground, service strut to approximately 3.00 inches extension until strut can be serviced on jacks.

2. Main Landing Gear Tires (Size 6.50 x 10)

A. Servicing.

NOTE: Tire air pressure will decrease somewhat as the temperature drops, but excessive deflation could indicate a leak at the air valve. Avoid unnecessary pressure checks. If it is necessary to check tire inflation in cold climates always apply heat to air valve when checking and adding air.

(1) Tire pressure should be maintained at 60 PSI.

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MAIN LANDING GEAR - REMOVAL/INSTALLATION

1. Main Landing Gear

A. Removal (Refer to Figure 401).
(1) Jack the airplane, refer to Chapter 7, Jacking - Description and Operation.
(2) Remove wheel and tire assembly.
(3) Remove screws, clamps, and spacers securing brake line (16) and wire bundle (17) to strut assembly.
(4) Remove brake assembly from axle flange and leave suspended by supporting safety wire or place on a box out of the immediate work area.

NOTE: Using the method outlined in step (4), it is not necessary to drain brake fluid and bleed brakes.

(5) Remove safety switch (13) and tie so switch will not interfere with gear removal.
(6) Release tension on retracting linkage by engaging manual extension crank and operating a few turns toward the UP position.
(7) Disconnect door link (21) by removing nut and washer.
(8) Disconnect drag link (12) from trunnion assembly (10) by removing nut (20), washers, spacers, and bolt.
(9) Disconnect bell crank (9) from trunnion assembly (10) by removing nut and bolt. Retain spacer in bell crank (9). Break down lock of drag brace and bell crank assembly and tie assemblies where they will not interfere with gear removal.

NOTE: Remove grease plugs (21) before attempting to remove pins (8).

(10) Remove grease plugs (21) and pins (8) from trunnion assembly (10) and shaft (7) and insert an AN6 bolt or puller tool in shafts (7).

NOTE: Note the number and location of washers between bearing (6) and trunnion (10). These washers should be installed exactly as they were located before removal to insure proper alignment of side link assemblies.

(11) Support the gear and pull attaching shafts (11). Remove gear from airplane.

NOTE: Needle bearings (6) in which the attaching shafts pivot are a press fit and should be removed only for replacement. Inspect the bearing for protruding inner race, cracked inner race flange, or other indications or mechanical failure. Check bearing for smooth function, by sliding shaft (7) into bearing, and turning, while applying side loading by hand. Refer to Figure 402 for removal of bearing.

B. Disassembly (Refer to Figure 403).
(1) Completely deflate strut. After air is expelled, remove valve body (1) and drain fluid.
(2) Remove piston assembly (10) from trunnion assembly (32) and disassemble as follows:

CAUTION: Tag washers (34) (P/N 5045018) during removal to assure proper installation position.

(a) Disconnect torque link at apex by removing cotter pin, nut (35), washers (34), clamp (16), spacer (18), and bolt (33).

WARNING: Make certain all air is expelled from strut assembly before proceeding to the next step.

(b) Remove internal lock ring (24), lock ring (25), and scraper ring (26). Withdraw piston assembly against ring pack support (28) to remove ring pack support and piston from upper trunnion.

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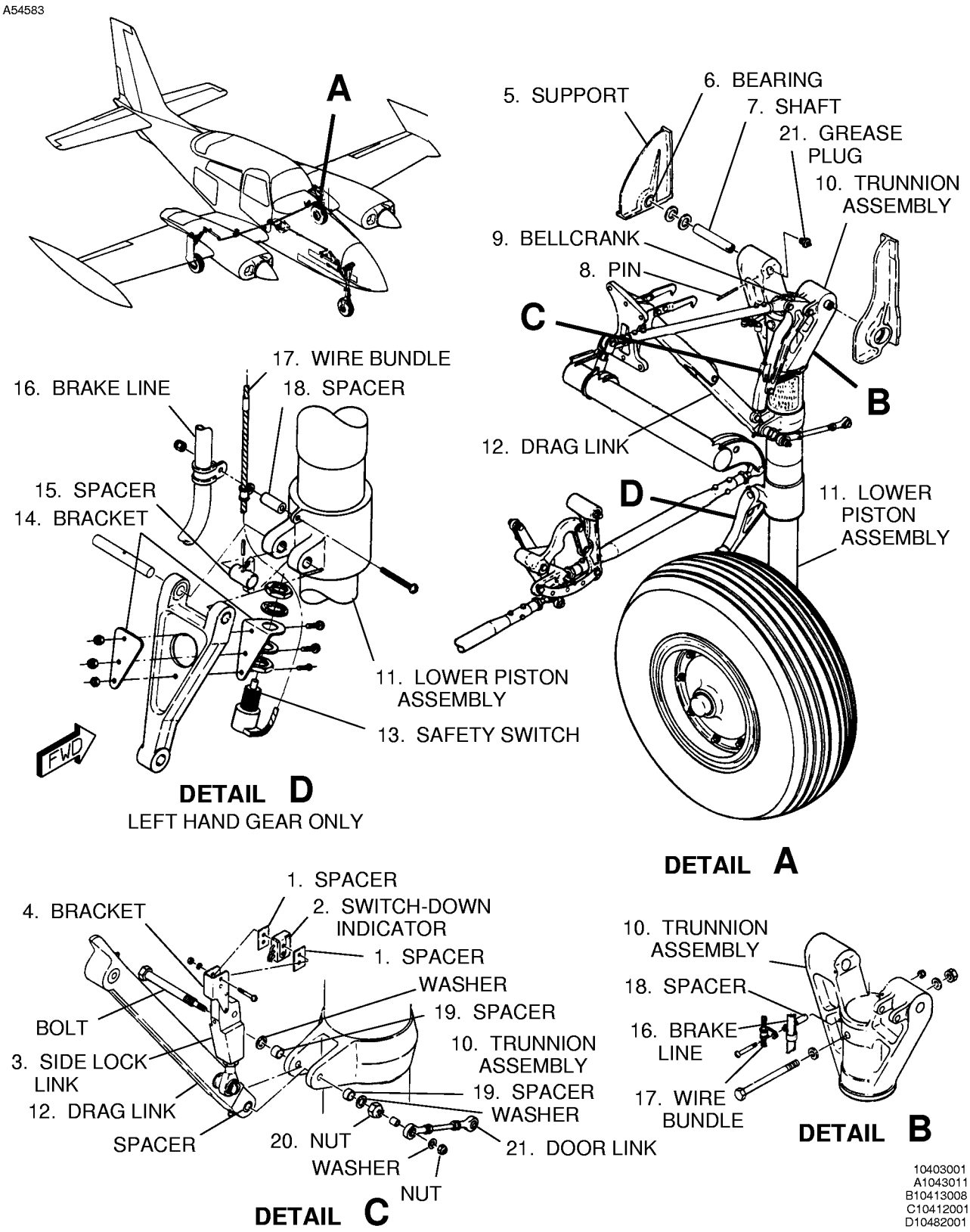

Main Landing Gear Installation
Figure 401 (Sheet 1)

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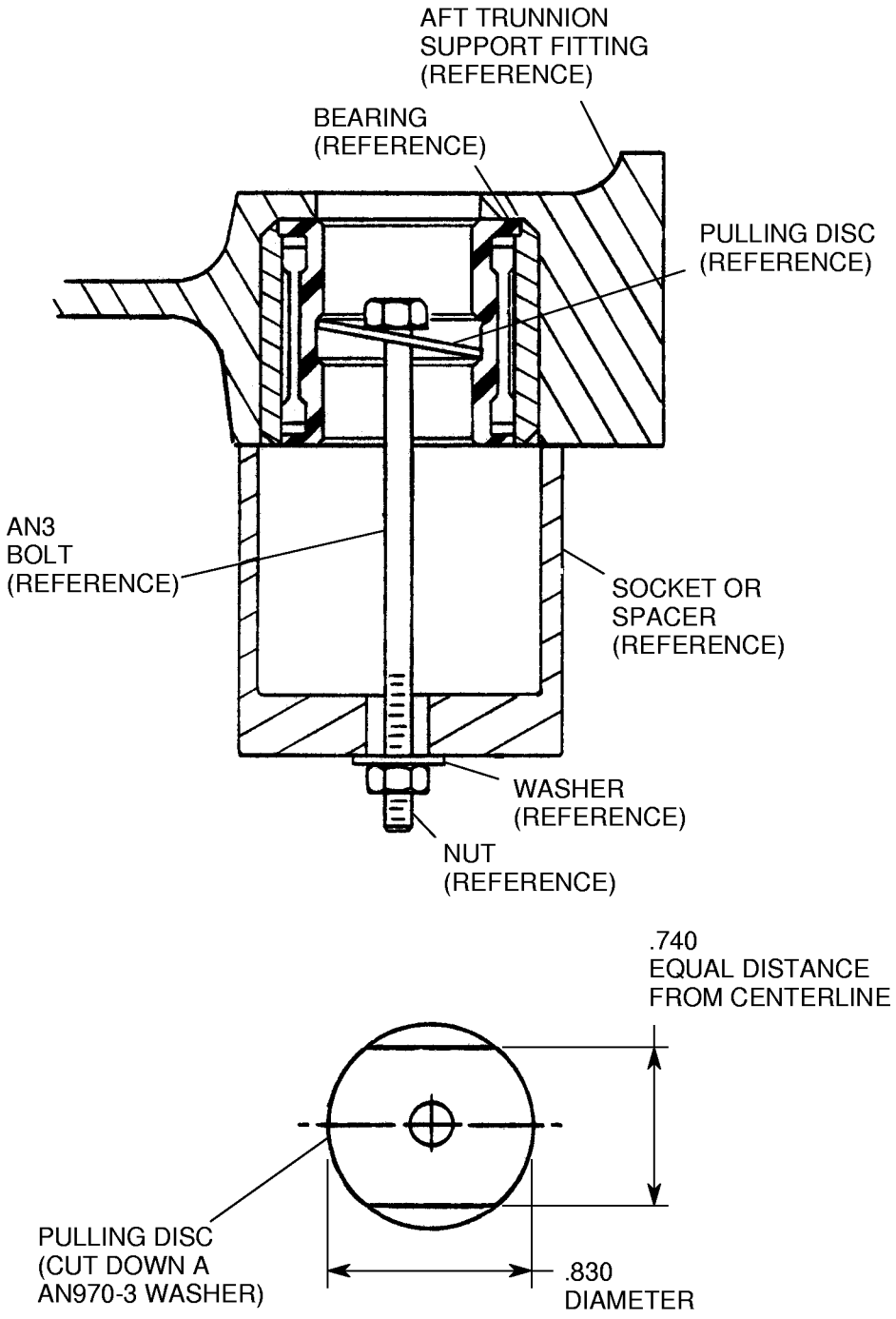

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Bearing Replacement
Figure 402 (Sheet 1)

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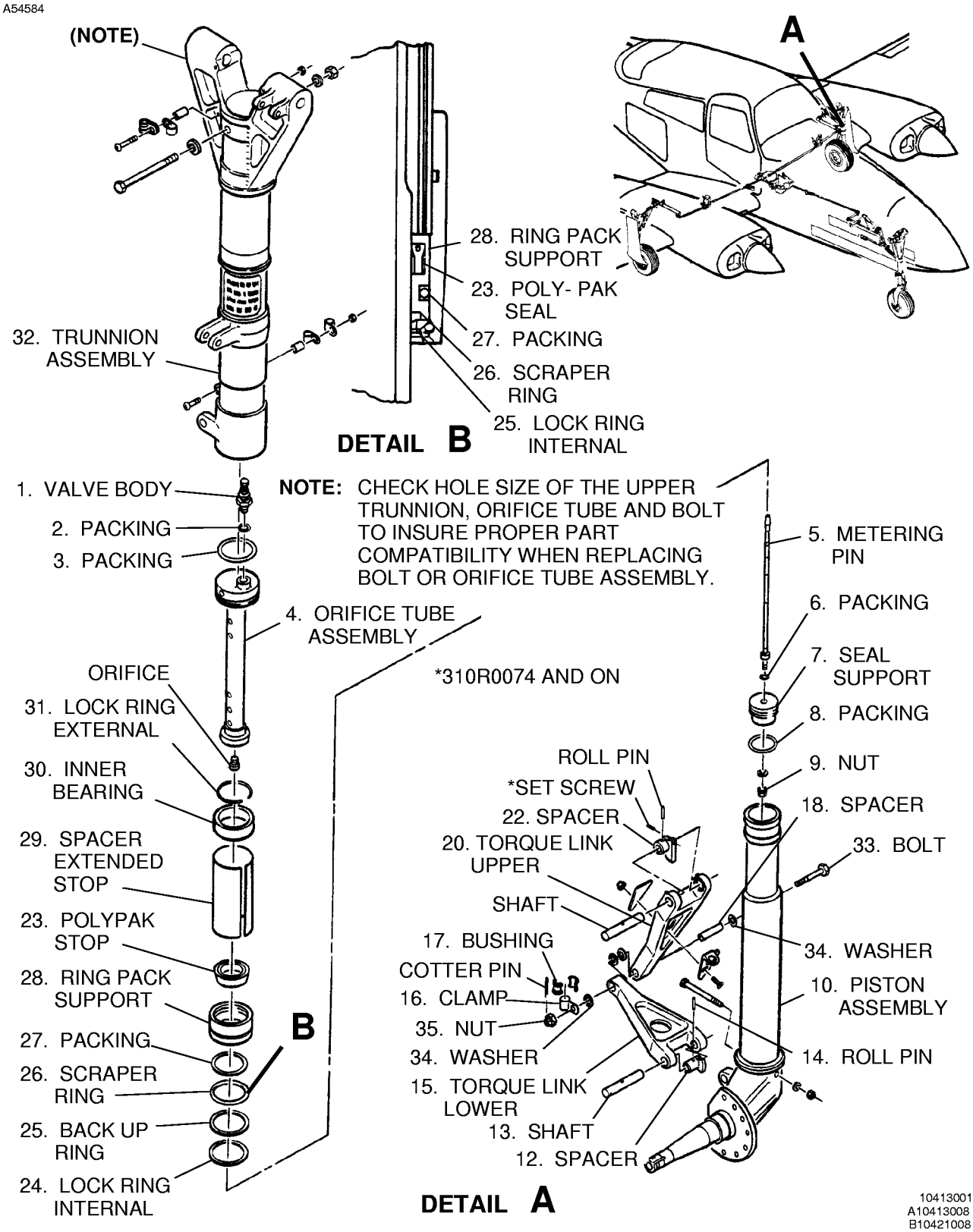

Main Landing Gear Strut
Figure 403 (Sheet 1)

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CAUTION: Removal and handling of the lower piston assembly should be done with care to prevent the possibility of damage to exposed parts.

(3) Remove external lock ring (31) from piston assembly (10) and remove inner bearing (30), extended stop spacer (29) and ring pack support (28).
(4) Remove poly pak seal (23) from ring pack support.
(5) Remove lower torque link (15) and spacer (12) by removing roll pin (14) and shaft (13).

NOTE: Lower piston and axle fitting is a press fit and drilled on assembly. Disassembly is not recommended.

(6) If further disassembly of torque links is required, the bushings may be pressed out for replacement.
(7) Remove upper torque link (15) and spacer (22) from trunnion assembly by removing roll pin and shaft.
(8) Remove orifice tube assembly (4) from trunnion assembly by removing nut, washers, and bolt and pull orifice tube straight out from the trunnion.
(9) Press metering pin (5) and seal support assembly from piston assembly.

C. Assembly (Refer to Figure 403).

NOTE: Torque link bushing diameters and flange interfaces may be dressed to provide free nonbinding operation.

(1) Assemble lower torque link (15) and spacer (12) to piston assembly (10) with shaft (13). Secure shaft in place with roll pin (14) through shaft and spacer. Safety wire roll pin with wire through center of roll pin and around shaft.

NOTE: Stop plate on spacers (12 and 22) must be positioned toward landing gear piston assembly.

(2) Carefully work packing (6) over the threads of metering pin (5) and install on seal support (7) with nut (9). Install packing (8) in groove on outside of seal support (7).

NOTE: Lubricate packings, seals, and mating parts liberally with clean MIL-H-5606 hydraulic fluid before installation and assembly.

(3) Press metering pin (5) and seal support (7) assembly into piston assembly (10). Make certain the seal support is completely seated.
(4) Assemble upper torque link (20) and spacer (22) to trunnion assembly (32) with shaft. Secure shaft in place with roll pin through shaft and spacer. Safety wire roll pin with wire through center of pin and around shaft.
(5) Carefully work packing (3) into groove in orifice tube (4) and insert into trunnion assembly (32) from the bottom end to avoid damage to the packing that usually happens when passing the holes at the top.
(6) Leave bottom end of orifice tube exposed to aid in the alignment of metering pin.
(7) Slide internal lock ring (24), lock ring (25), and scraper ring (26) on piston assembly (10).

CAUTION: Install scraper ring with groove DOWN (toward back-up O-ring), refer to Detail B, Figure 403.

(8) Install poly-pak seal (23) on inside of ring pack support (28), work packing (27) over outside into groove on ring pack support, and slide ring pack support assembly on piston assembly (10).

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CAUTION: Install poly pak seal with wide lip UP (toward pressure side).

(9) Install spacer (29) on piston assembly (10).
(10) Install inner bearing (30) on piston assembly and secure with external lock ring (31).

CAUTION: Install inner bearing with chamfered end UP in order to seat against external lock ring (31).

(11) Compress spacer (29) with hose clamp or other suitable item that may be opened up and removed after piston is started into trunnion assembly.
(12) Carefully work piston assembly into trunnion assembly and install ring pack support. Secure ring pack support with scraper ring (26), lock ring (25), and internal lock ring (24). Make certain lock ring is seated in the retaining groove.

NOTE: To prevent damage to piston assembly and ring pack support during installation, a ring pack support tool P/N 0880004-1 should be used (Refer to Figure 404).

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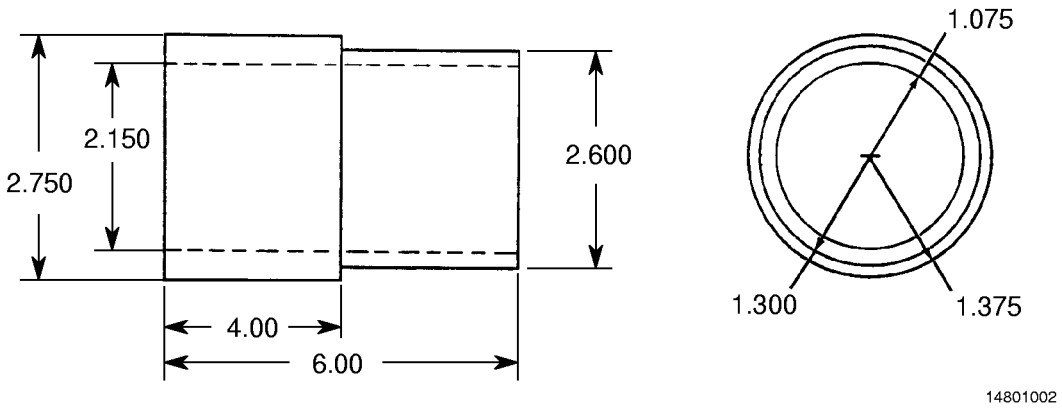

Landing Gear Ring Pack Support Tool
Figure 404

(13) Align holes at top of orifice tube (4) and install bolt, washers, and nut.
(14) Connect torque links (15 and 20) with bolt (33), washer (34) P/N 5045018-1, spacer (18), clamp (16), washer (34), and nut. Torque nut to firm plus one castellation and install cotter pin.

NOTE: Install AN960-716, AN960-716L, and NAS70CL453-750 washers as required to control gap between torque links to 0.004 to 0.020 inch.

(15) If new bushings (19) were installed in torque links (15 and 20), line ream bushings as follows:
  (a) Align torque links using same number of retained washers positioned between braces in the same order that they were removed.
  (b) Using a 0.4300 diameter pilot (bolt or rod), align torque links and washers.
  (c) Clamp torque links in position using two small "C" clamps.
  (d) Using a standard 29/64 (0.453) inch reamer having a 0.75 inch length, 0.4300 pilot, or FT251 reamer. Ream bushings to ensure a straight, true hole in both parts.
  (e) Remove clamps, and clean torque links with a suitable solvent.

D. Installation (Refer to Figure 401).

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CAUTION: Use care when pressing bearings into gear support to avoid damage to retainer.

NOTE: When using the alternate bearing listed in the Parts Catalog, the spacer listed must be used also. When converting back to original bearing, be sure spacer is also removed.

(1) If needle bearings (6) were removed, install as follows:
   (a) Press needle bearings into landing gear supports. Bearings must seat against shoulders provided in supports. When pressing bearings into trunnion support settings modified by bonded on insert (Refer to Figure 405), use care not to break insert loose.

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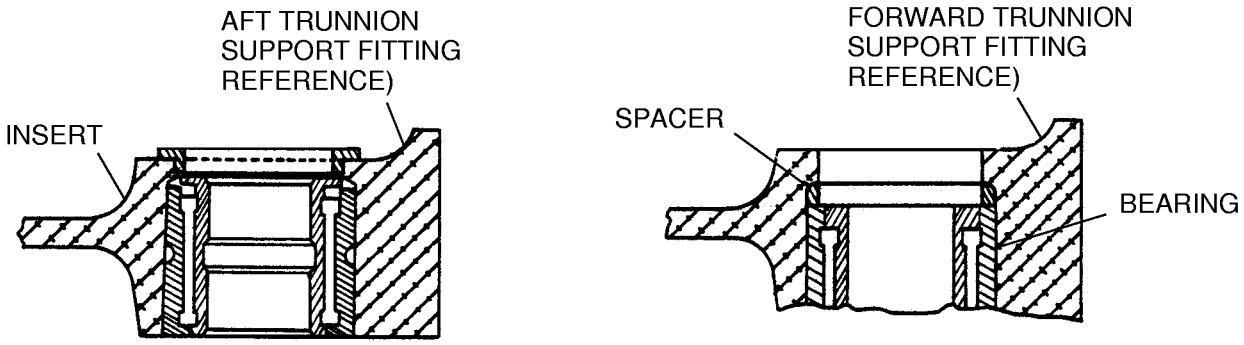

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Main Landing Gear Trunnion Support Fittings
Figure 405

(2) Position gear in place and insert shafts (7) making sure washers (10), are in place and pin holes in shaft (7) and trunnion assembly (10) are aligned.

CAUTION: Install grease plugs (21) only after installation of pins (8). Torque plugs 25 to 30 inch-pounds.

(3) Remove AN6 bolt used in removal of shafts and install pin (8). Safety wire pin by wiring through center of pin around trunnion.
(4) Connect bellcrank (9) to trunnion assembly (10) with nut and washer. Make certain spacer (9) is installed in bellcrank.
(5) Connect drag link to trunnion assembly (10) with bolt, washers, spacers (19), and nut (20). Torque nut (20) to 190 inch-pounds, +5 or -5 inch-pounds.
(6) Install safety switch (13).
(7) Install brake assembly to axle flange.
(8) Attach brake line (16) and wire bundle (17) to strut assembly with screws, spacers, and nuts.
(9) Install wheel and tire assembly.
(10) Check setting of safety switch (13).
(11) Check alignment of main landing gear.

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2. Main Landing Gear Doors

A. Removal/Installation.

(1) For removal and installation of the main landing gear doors, refer to Chapter 52, Landing Gear Doors - Removal/Installation.

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MAIN LANDING GEAR - ADJUSTMENT/TEST

1. Main Landing Gear

A. Alignment (Refer to Figure 501).

(1) Position the airplane with the main wheels resting on grease plates.

NOTE: For each set of grease plates, use two aluminum sheets approximately 18 inches square with sufficient grease spread between them to permit the top plates to slide freely on the bottom plates.

(2) Set a straightedge in place against the main wheel tires at axle height as illustrated.

(3) Place one leg of a carpenter's framing square against the straightedge, with the other leg against the inboard side of the wheel being checked. Measure the distance from framing square leg adjacent to wheel, to wheel rim, at extreme aft circumference of wheel rim. The difference between the two measurements will be the toe-in or toe-out for that wheel. Toe-out for either wheel is 0.06 inches, +0.05 or -0.05 inches. Toe-out must remain in tolerance throughout the entire range of free play in the system. If tolerance cannot be retained, replace bushings.

NOTE: Remove weight from gear by jacking airplane before attempting to add or remove washers to torque links.

(4) Reposition washers between torque links to correct for excessive toe-in. Wheel alignment after adjustment must be within limits prescribed in step (3).

NOTE: Washers are used as shims between the upper and lower torque links. Combinations of thick and thin washers can be used between the torque links to obtain the correct wheel alignment. Washers that are added or removed between the torque links must also be removed or added to the outside end of the spacer to maintain a 0.004 to 0.020 inch side play of the torque links. Be sure that the spacer washers are centered on the spacer as the nut is being tightened to the appropriate torque.

B. Rigging (Refer to Figure 502).

NOTE: The following landing gear rigging procedure is designed specifically for the Model 310. A faithful following of this procedure will result in a properly rigged and efficient operating system. Before starting the rigging, the toe-out should be checked in accordance with main landing gear alignment procedures, the tires inflated to proper pressures and main gear door link tube should be checked for proper adjustment, in accordance with Chapter 52, Landing Gear Doors - Adjustment/Test.

(1) Jack airplane, refer to Chapter 7, Jacking - Description and Operation.

(2) Remove seats, carpet, floorboard panels, and access panels as required to gain access to landing gear actuator and linkage.

CAUTION: Any time the floorboards are removed a temporary protective cover should always be used to prevent damage and improper settings of the landing gear actuator switches.

(3) Disconnect main wheel well doors from door actuators, refer to Chapter 52, Landing Gear Doors - Removal/Installation.

(4) Disconnect nose gear doors, refer to Chapter 52, Landing Gear Doors - Removal/Installation.

(5) Disconnect nose gear retracting linkage in the nose gear wheel well by removing nuts and bolts attaching nose push-pull tube (6) to fork bolt (7) and connector link (3) and removing push-pull tube (6) (Refer to Figure 503).

(6) Disconnect the inboard end of both outboard drive tubes (15) by removing nut, spacers, and bolt (Refer to Figure 502).

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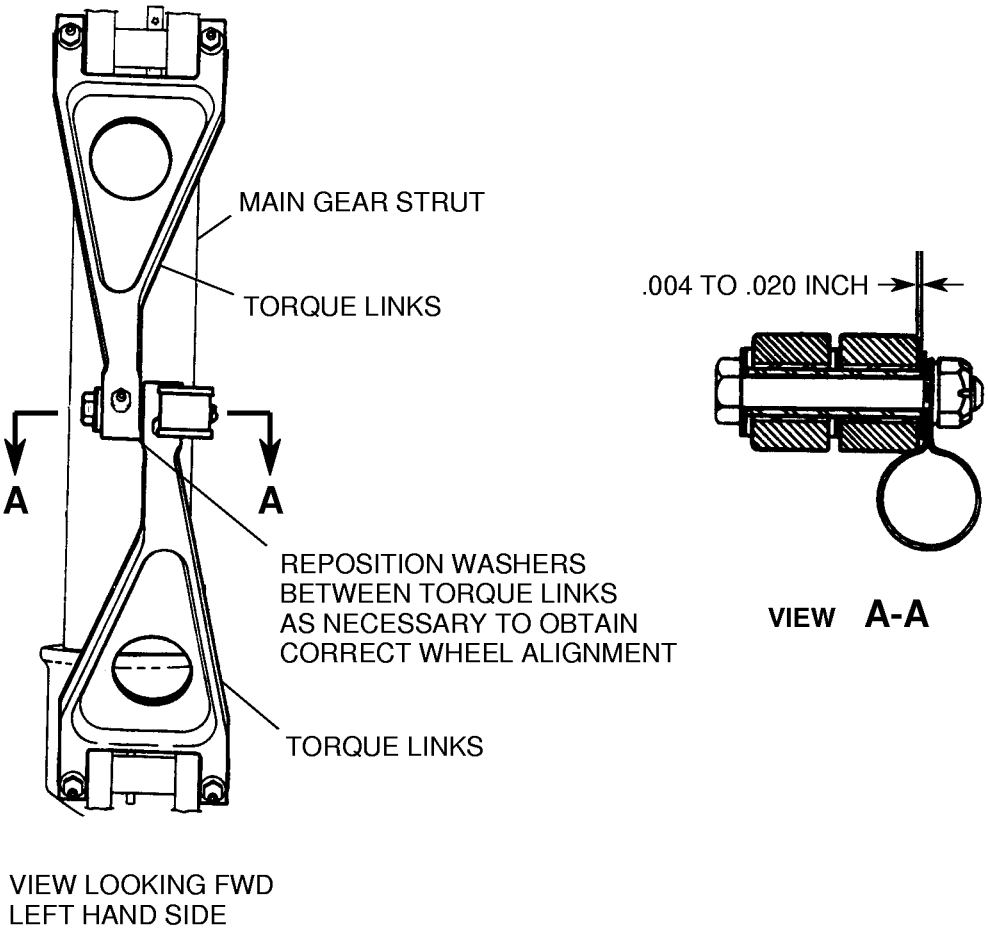

Main Wheel Alignment
Figure 501 (Sheet 1)

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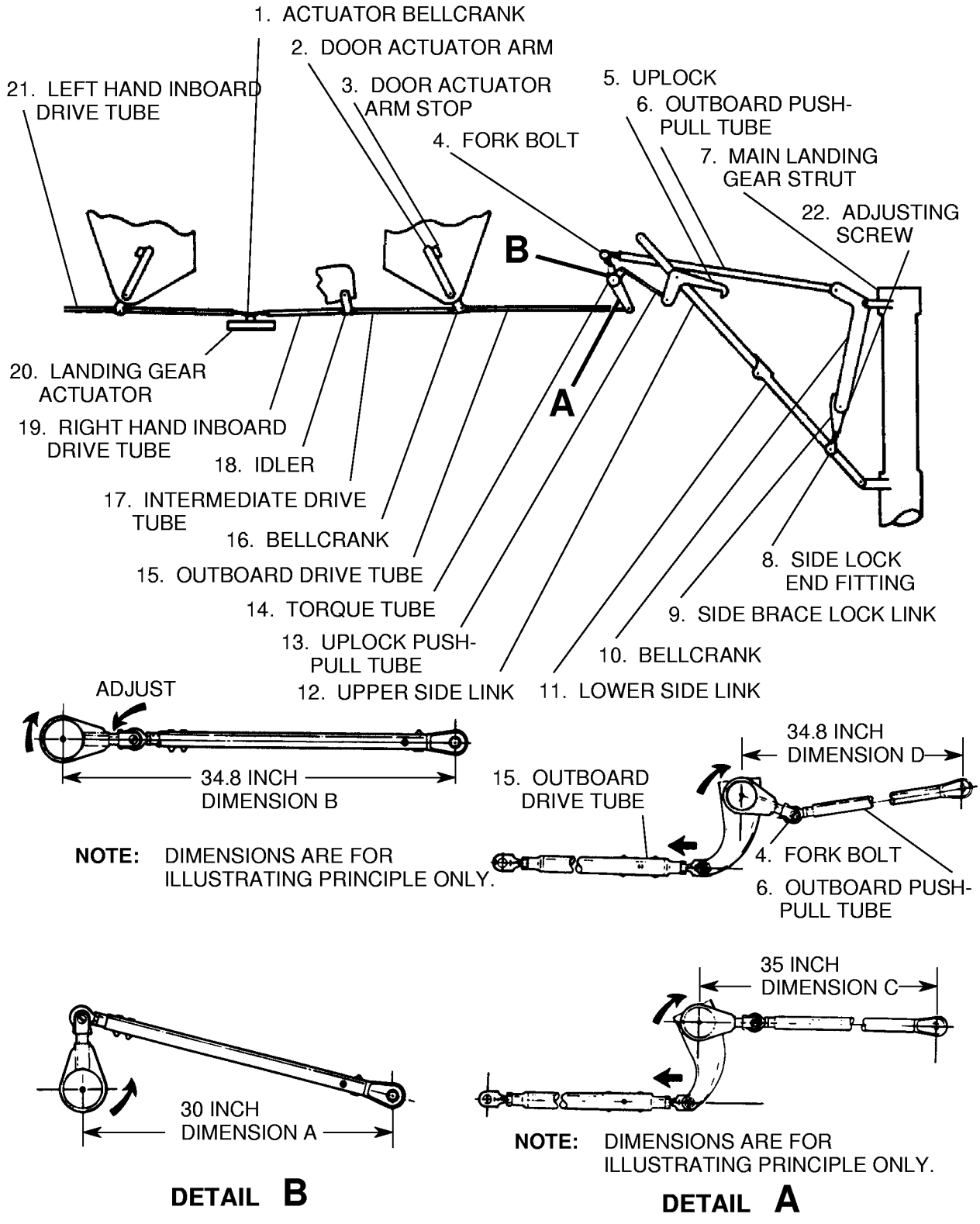

Rigging Main Landing Gear Retraction Linkage
Figure 502 (Sheet 1)

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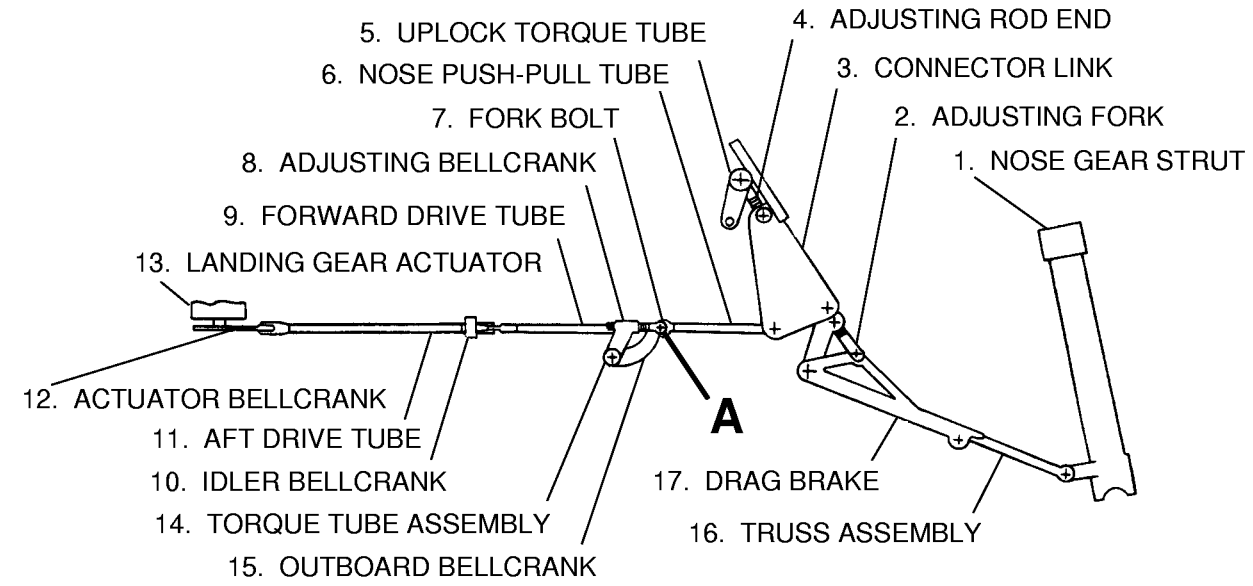

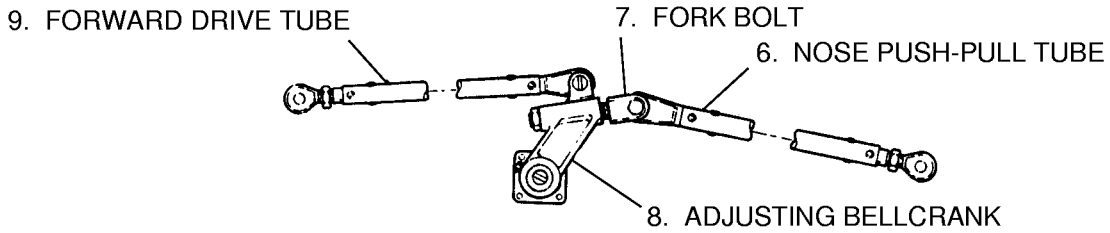

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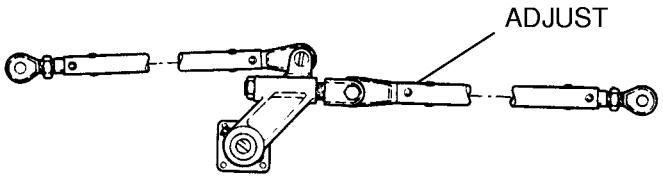

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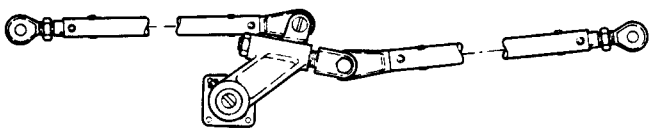

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DETAIL A
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Rigging Nose Gear Retracting Linkage
Figure 503 (Sheet 1)

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(7) Disconnect LH inboard drive tube (21) and RH intermediate drive tube (17) at idler bell cranks (16).

CAUTION: During operation of landing gear actuator be prepared to stop to prevent any possible damage.

CAUTION: It is recommended that the inboard drive tubes be held during actuation to prevent damage to the structure. It may be necessary to install a length of safety wire in the drive tube ends to help hold tubes in position during operation.

(8) Adjust the UP and DOWN limit switches (10 and 24) on the landing gear actuator as follows (Refer to Figure 504):

(a) Adjust both limit switches to the end of their adjusting slots in a direction which will permit maximum bell crank travel.

NOTE: When adjusting either limit switch, align switch so that roller is contacted squarely by the bell crank or drive tube.

(b) Engage manual extension crank and operate toward the UP position until the internal stop in the actuator is reached. To prevent possible damage to the actuator, do not force against the internal stop.

(c) Note the angular position of the crank when internal stop is reached, back crank off toward the DOWN position 2 turns of the hand crank, then advance crank 1/2 turn toward the UP position. Adjust the UP limit switch (10) so that it is just actuated at this point.

(d) Engage manual extension crank and operate toward the DOWN position until the internal stop in the actuator is reached. Do not force against the internal stop.

(e) Note the angular position of the crank when internal stop is reached, back crank off toward the UP position 2 turns of the hand crank, adjust the DOWN limit switch (24) so that it is just actuated at this point.

(f) After these preliminary adjustments to the limit switches have been made, stow the manual extension crank and operate the actuator electrically to the UP position until the UP limit switch is actuated.

CAUTION: Caution must be observed during actuation to insure that no damage is incurred by the disconnected ends of the main drive tubes.

NOTE: To facilitate rigging of the landing gear, a two-position momentary ON switch with suitable lengths of electrical wires can be connected to the landing gear electrical circuit in such a manner that the landing gear can be observed while being operated during rigging. The use of an external power source is also recommended.

(g) Engage the manual extension crank and note the angular position of the crank. Operate crank toward the UP position noting the number of turns required to reach the internal stop in the actuator. The minimum number of turns required in the UP position is three-fourths of one turn. The desired is 1-1/2 turns. If necessary, adjust the UP limit switch to obtain this requirement.

(h) Stow the manual extension crank and operate the actuator electrically to the DOWN position until the DOWN limit switch is actuated.

(i) Engage the manual extension crank and note the position of the crank. Operate crank toward the DOWN position and note the number of turns required to reach the internal stop in the actuator. The minimum number of turns required in the DOWN position is one and the maximum (and desired) number of turns is two turns. If necessary, adjust the DOWN limit switch to meet this requirement.

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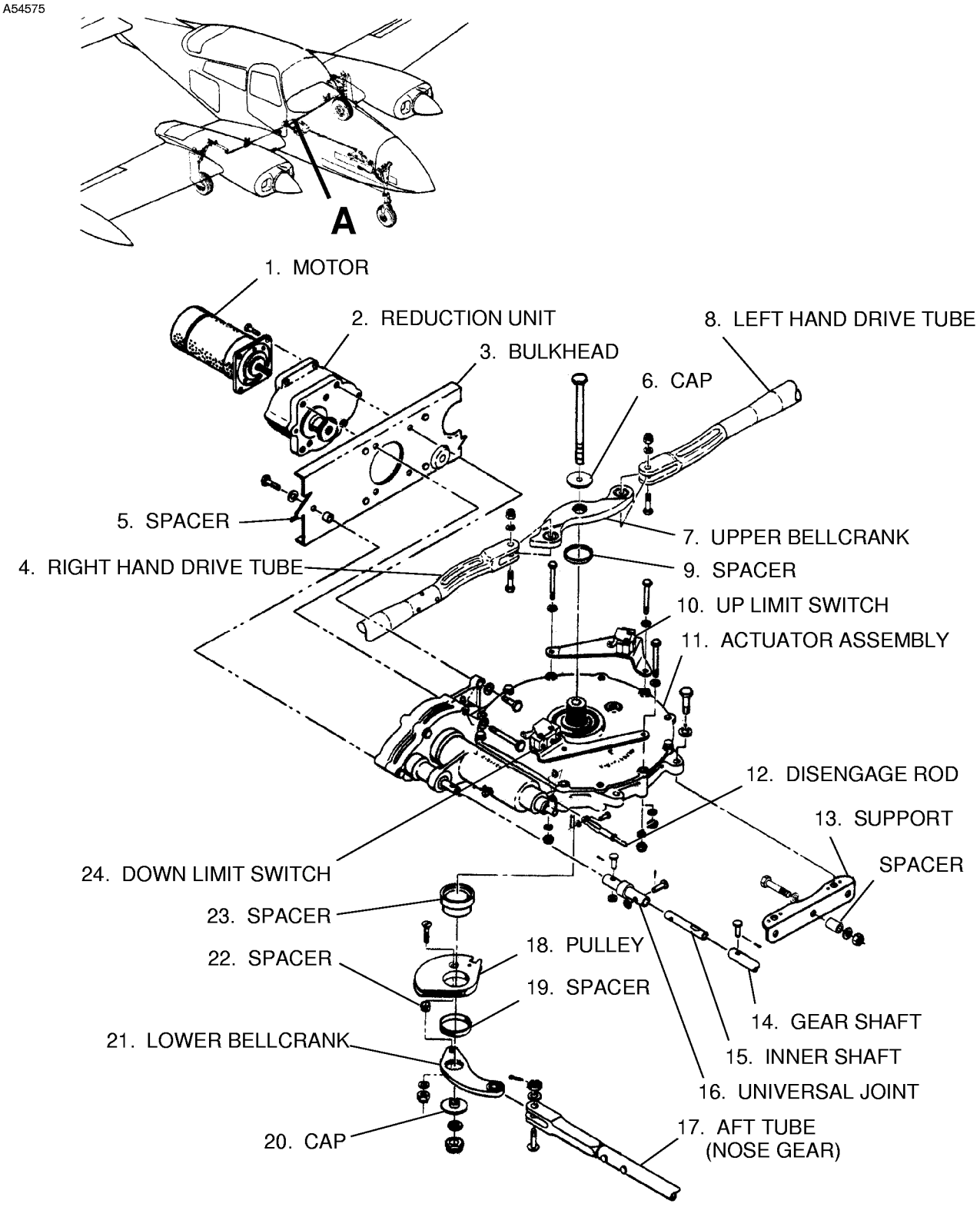

Landing Gear Actuator
Figure 504 (Sheet 1)

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(j) Actuate gear electrically to the DOWN position. Manually place the door actuator arm (2) against its stop. Adjust RH intermediate drive tube (17) and LH inboard drive tube (21) to align with hole in idler bell cranks (16); then lengthen the rod ends on the drive tubes (17 and 21) two turns. Actuate gear electrically toward the UP position as required to install bolts, washers, and nuts (Refer to Figure 502).

CAUTION: Bolts must be installed with head of bolt forward.

(k) Actuate gear electrically to the DOWN position and check the pull force required to move the door actuator arms from their stops as illustrated (Refer to Figure 505).

NOTE: The pull required to move door actuator arm from stop must be measured at a right angle to the arm.

(l) Adjust the length of both inboard drive tubes (19 and 21) as necessary to obtain a force of 25 pounds, +10 or -10 pounds required to move door actuator arms (2) from stops (3) in the DOWN position (Refer to Figure 502).

(m) Actuate gear electrically to the UP position and adjust the UP limit switch as necessary to obtain force of 25 pounds, +10 or -10 pounds and a maximum difference of 10 pounds from the DOWN position required to move the door actuator arms (2) from stop (3) in the UP position.

NOTE: If the UP limit switch is readjusted, recheck the minimum turn requirement in step (g).

(9) Adjust side brace lock links (9) as follows:

(a) With landing gear in the DOWN position, adjust side lock end fitting (8) so that lower side link (11) and upper side link (12) are held firmly in overcenter position when side brace lock link (9) is firmly overcenter.

(b) During retraction check for clearance between bell crank (10) and push-pull tube (6). It may be necessary to add or subtract washers to provide clearance.

(c) Manually break the lock link from its overcenter position and move the landing gear to a position five to six inches inboard from the DOWN and LOCKED position, then release. The landing gear must free fall and lock when released from this position.

(d) Shorten adjusting screw (22) in small increments until the gear will free fall down and locked. Double safety wire screw in adjusted position.

(e) Adjust both main landing gear side brace lock links in this manner.

NOTE: After the preceding steps have been completed the main landing gear retracting system is rigged from the limit switches through the door actuator bell cranks, and both side brace lock links are adjusted at the landing gear. The following procedure is to rig the retraction system from the door actuator bell cranks to the side brace lock links.

(10) Make the following preliminary preparations:

(a) Remove uplocks (5) and uplock push-pull tubes (13) by removing attaching bolts.

(b) Adjust the length of outboard drive tubes (15) to 1/4 inch from as short as possible and install.

NOTE: Attaching bolts must be installed with head of bolt forward.

(c) Disconnect outboard push-pull tube (6) from fork bolt (4).

(d) Screw fork bolts (4) into torque tubes (14) as far as possible.

(e) Operate landing gear actuator to DOWN position.

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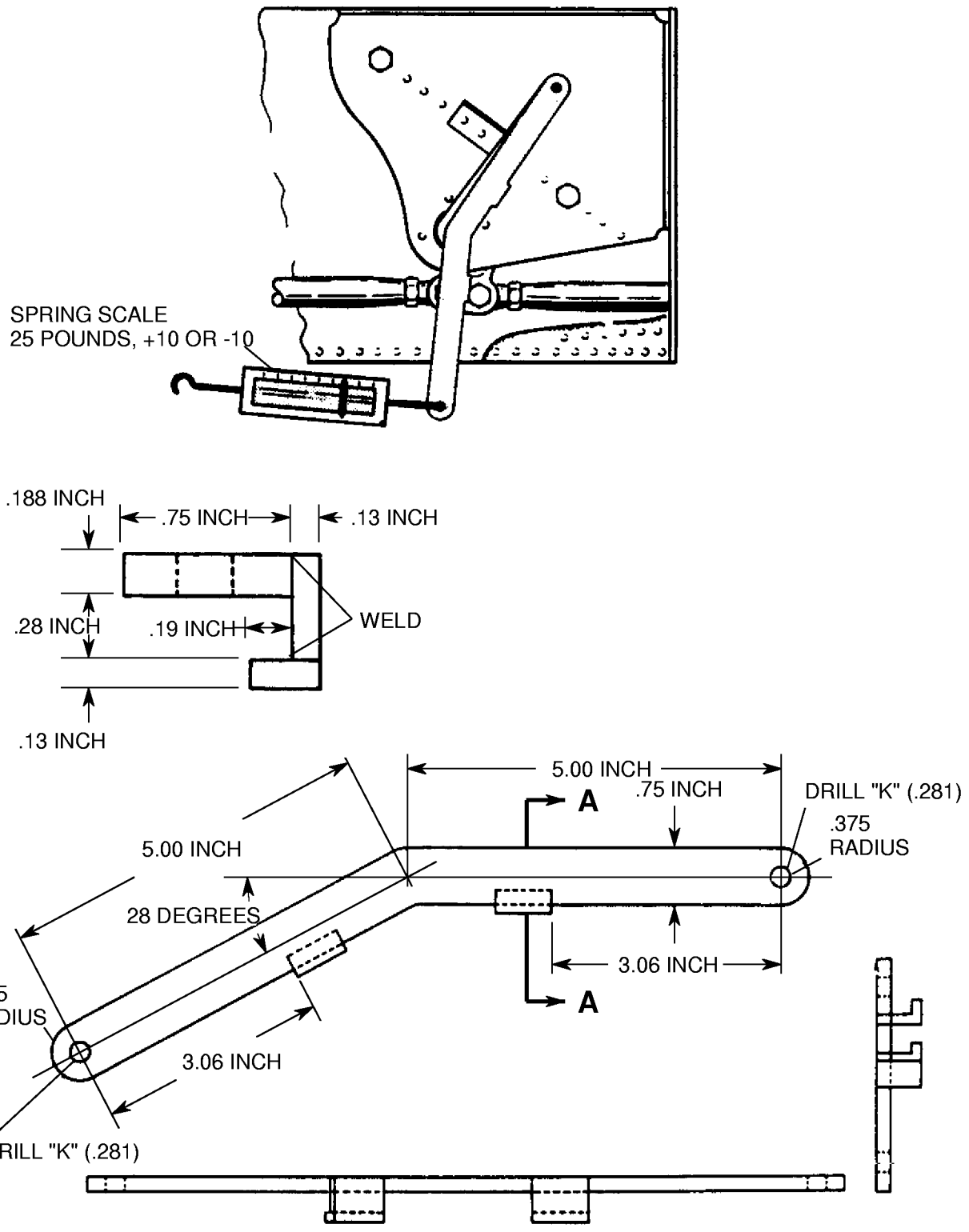

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Main Gear Rigging Tool - Fabrication and Usage
Figure 505 (Sheet 1)

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(f) With landing gear DOWN, adjust length of outboard push-pull tubes (6) so that rod end holes align with the holes in fork bolts (4), then shorten one turn. Operate landing gear actuator toward the UP position far enough to permit installation and install outboard push-pull tubes (6). Install with the collar-end of the hi-shear rivets pointing down for clearance.

CAUTION: The bolt installing outboard push-pull tube (6) to the fork bolt (4), must be installed with the bolt head forward.

NOTE: The preceding preparations will result in incomplete retraction, thus eliminating the possibility of damage to the wing structure caused by retracting too far.

(11) Operate landing gear to the UP position and observe the highest position reached by the gear during retraction and the amount of drop-off.

(12) Adjust the highest position reached by the gear during retraction as follows:

(a) Lengthen fork bolt (4) in half-turns to increase the highest position during retraction.

NOTE: Detail A illustrates this adjustment. Lengthening the fork bolt increases dimension "B", the longer dimension "B" is, the higher the gear will retract.

(b) The axle dust cover should make light contact with the corrugated reinforcement at the top of wheel well, then drop down a specified distance (drop-off).

(13) Adjust the amount of drop-off as follows:

(a) Determine whether drop-off is too little or too much. The minimum and desired amount of drop-off, measured at the center of the wheel, is 1/8 inch. The maximum is 1/4 inch.

(b) If drop-off is too much, lengthen outboard drive tube (15) in half-turn increments until drop-off is correct.

(c) If drop-off is too little, shorten outboard drive tube (15) in half-turn increments until drop-off is correct.

(d) Adjust the amount of drop-off for both main landing gears in this manner.

NOTE: Detail B illustrates the principle used to obtain drop-off. Notice that dimension "C" is 35 inches. If we continue to rotate the torque tube fork bolt past its parallel position with the push-pull tube, dimension "C" will decrease as illustrated by dimension "D". Dimension "C" represents the highest position reached by the main landing gear during retraction. If the fork bolt is rotated past its parallel position, we actually cause the main gear to start extending. This slight past center extension is defined as drop-off.

(14) Adjust the downlock tension as follows:

(a) Operate the landing gear to the DOWN position. The main landing gear down lock tension should be 40 to 50 pounds (Refer to Figure 506).

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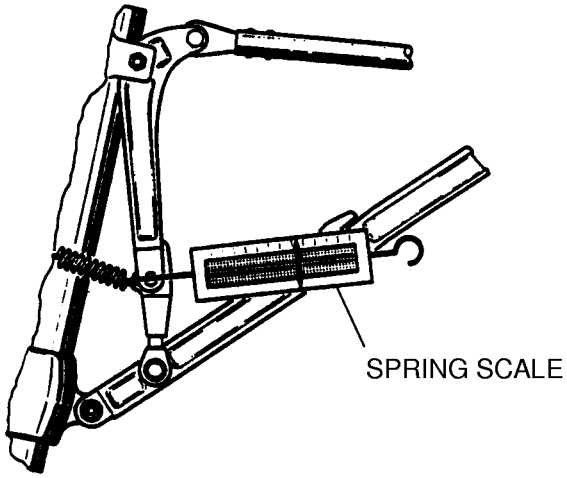

40-50 POUNDS DURING RIGGING
40-60 POUNDS FOR ROUTINE IN-SERVICE INSPECTION

Main Landing Gear Down Lock Requirements
Figure 506

(b) If downlock tension is too high, lengthen outboard push-pull tube (6) until the correct downlock tension is obtained.
(c) If downlock tension is too low shorten outboard push-pull tube (6) until the correct downlock tension is obtained.

NOTE: Since the highest position during retraction is controlled by the combined length of the outboard push-pull tube (6) and the fork bolt (4), this combined length must remain unchanged to maintain the correct highest position. When adjusting the push-pull tube to obtain the specified downlock tension, the fork bolt must be readjusted a corresponding amount in the direction that will not change the combined length of the push-pull tube and fork bolt.

(d) Adjust the downlock tension for both main landing gears in this manner.

(15) Adjust uplocks as follows:
(a) Adjust uplock push-pull tubes (13) to a preliminary length of 5.15 inches and attach to torque tube (14) with bolts, washers, and nuts.
(b) Operate landing gear to the UP position.

CAUTION: Use caution when landing gear nears the UP position before adjustment of uplock push-pull tubes has been completed. If necessary, readjust the push-pull tube and/or uplock hooks to prevent damage.

(c) Adjust uplock push-pull tubes so that uplock assemblies fully engage the spacers provided on the landing gear and tighten nuts.

NOTE: Elongated slots are provided in the uplock hooks so that each uplock hook can be adjusted vertically to contact the spacers.

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(d) Operate the landing gear several times, observing uplock assemblies. Uplock hooks must engage fully with the spacers provided on the gear and must engage and disengage freely and smoothly with no indication of binding.

NOTE: Visually check the alignment of all rod ends to insure that they align with their attach fittings.

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MAIN LANDING GEAR - CLEANING/PAINTING

1. Main Landing Gear Assembly

A. Cleaning.

(1) Clean all metal parts with a suitable solvent.

CAUTION: If metal parts are not to be assembled immediately, coat with system hydraulic fluid to prevent rusting. Before assembly it will be necessary to again clean with solvent.

(2) Clean all O-rings and seals with system hydraulic fluid.

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MAIN LANDING GEAR - APPROVED REPAIRS

1. Main Landing Gear

A. Approved Repairs.
(1) Repair is limited to replacement of parts, smoothing out of minor scratches, nicks, and dents, and repainting of areas where paint has chipped or peeled.

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NOSE GEAR - DESCRIPTION AND OPERATION

1. Nose Landing Gear

A. Description.

(1) The nose landing gear consists of a wheel and tire assembly, fork, axle, lower piston assembly, upper trunnion assembly, torque links, and shimmy damper. The air-oil shock strut contains an orifice and tapered metering pin which vary the resistance to the shock according to the severity. During extension and retraction, the nose gear pivots on heavy-duty needle bearings by means of lugs on the trunnion assembly. A wheel straightener and steering mechanism are provided so that the nose wheel is steerable while taxiing, but is straightened during retraction.

2. Nose Gear Shimmy Damper

A. Description.

(1) The shimmy damper provided for the nose gear offers resistance to shimmy by forcing hydraulic fluid through small orifices in the piston. The outer housing is attached to the upper nose strut and moves as the strut turns, while the piston and piston rod are attached to the trunnion assembly which does not turn, thus causing motion between the housing and the piston.

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LANDING GEAR - TROUBLESHOOTING

1. Nose Gear Shimmy Damper

A. For a guide to troubleshooting the nose gear shimmy damper, refer to Table 101.

Table 101. Nose Gear Shimmy Damper Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
LANDING GEAR SHIMMIES DURING FAST TAXI, TAKEOFF, OR LANDING.	Shimmy damper mounting.	Check shimmy damper mounting. Replace parts as required and secure shimmy damper.
	Fluid level in shimmy damper.	Check fluid level in shimmy damper. Service as required.
	Internal bypassing of fluid.	Check for internal bypassing of fluid. Replace unserviceable parts in shimmy damper as required.
	Unserviceable roll pin.	Check roll pin through piston. Replace unserviceable roll pin in shimmy damper.
	Unserviceable shimmy damper.	Replace shimmy damper.
	Unbalanced tires.	Check tire balance. Balance tires as required.
	Unserviceable wheel bearings.	Check wheel bearings. Replace unserviceable wheel bearings.
	Excessive torque line clearance.	Check for excessive clearance between upper and lower torque lines. Replace unserviceable parts.

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NOSE GEAR - SERVICING

1. Nose Gear Shock Strut

A. Servicing.
(1) Jack airplane, refer to Chapter 7, Jacking - Description and Operation.
(2) Deflate strut by loosening valve body 2-1/2 turns (maximum).
(3) With strut fully compressed, remove valve and fill with hydraulic fluid (MIL-H-5606A).
(4) Stroke strut slowly three times (minimum).
(5) Replace valve and inflate strut to 49 PSI with tire clear of ground.
(6) When airplane is on the ground, service strut to approximately 1.60 inches extension until it can be serviced on jacks.

2. Nose Gear Shimmy Damper

A. Servicing.
(1) Using the tow bar, turn the nose wheel strut to the extreme left position against the 55 degree stop. This will place the shimmy damper piston to the rear of the cylinder and eliminate the possibility of entrapped air in the cylinder.
(2) Remove the filler plug and fill with hydraulic fluid (MIL-H-5606A).
(3) Replace filler plug and turn nose wheel strut through its entire travel several times.
(4) Return strut to the extreme left position against the 55 degree stop.
(5) Remove filler plug and add whatever fluid is needed to fill the cylinder.
(6) Replace and safety filler plug.

3. Nose Landing Gear Tires (Size 6.00 x 6)

A. Servicing.

NOTE: Tire air pressure will decrease somewhat as the temperature drops, but excessive deflation could indicate trouble at the air valve. Avoid unnecessary pressure checks. If it is necessary to check tire inflation in cold climates always apply heat to air valve when checking and adding air.

(1) Tire pressure should be maintained at 40 PSI.

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NOSE GEAR - REMOVAL/INSTALLATION

1. Nose Gear

A. Removal (Refer to Figure 401).
(1) Jack airplane in accordance with Chapter 7, Jacking - Description and Operation.
(2) Remove taxi light (optional).
(3) Release tension on retracting linkage by engaging manual extension crank and operating a few turns toward the UP position.
(4) Disconnect nose gear doors.
(5) Disconnect drag link (1) from trunnion assembly (2) by removing nut, washer, and bolt.
(6) Disconnect gimbal assembly (13) from trunnion assembly (2) by removing nut, washer, and bolt. Retain spacer (12) in place.
(7) Remove mud guard (15) and support (16) from nose gear fork by removing washers and bolts securing mud guard braces to the nose gear fork and mud guard support to the nose gear fork.

NOTE: On small lug (1.19 diameter) trunnions, note location and amount of shims (6) between trunnion and bearing assembly. These shims should be reinstalled exactly as they were.

B. Bearing Assembly and Bearing Replacement (Refer to Figure 401).
(1) Remove the bearing (5) from bearing assembly (7) using a press or large vise as follows:
(a) Place the flanged side of the bearing assembly (7) against a surface with a hole slightly larger than the diameter of the bearing (5).
(b) Using a rod or shaft from 1.35 to 1.80 inch diameter and at least 1.00 inch in length, place on the end of the bearing assembly (7).
(c) Press on the rod or shaft steadily and continually without stopping until the bearing (5) is removed.
(2) Clean inside bore of the bearing assembly (7) and the outside diameter of the replacement bearing with Methyl-Ethyl-Ketone (MEK).
(3) Apply a thin coating of Loctite 601 to the inside bore of the bearing assembly (7) and the outside diameter of the replacement bearing (5).
(4) Press the replacement bearing into the bearing assembly (7) using a press or vise. Use a flat plate over the replacement bearing while installing to ensure bearing (5) is installed flush with the surface (smallest) of the bearing assembly (7).

C. Disassembly (Refer to Figure 402).
(1) Completely deflate strut. After air has been expelled, remove valve assembly and drain fluid.
(2) Remove cotter pin, washer, and pin (30) from upper barrel. Separate trunnion (24) from upper barrel (31) approximately half way; then, remove shimmy damper bracket from upper barrel.
(3) Disconnect shimmy damper from trunnion by removing nut, washer, and bolt.
(4) Remove snap ring (21) and stop (27), then pull trunnion (24) from upper barrel (31).
(5) Remove stop spacers (23) by removing nut and bolt.
(6) Remove packing (25) and bearing (26) from upper barrel.
(7) Disconnect torque links (32 and 36) at apex by removing cotter pin, nut, washers, and spacer (34).

WARNING: Make certain all air is expelled from strut before proceeding to the next step.

(8) Remove lock ring (20) and separate piston barrel (1) from upper barrel (31).
(9) Remove orifice tube assembly (9) from piston barrel (1), then unscrew orifice (10) from orifice tube (9).

NOTE: Orifice (10) is staked in and should only be removed for replacement.

(10) Remove lock ring (11) from piston barrel and remove bearing (12).
(11) Slide spacer (13), shim (14), ring pack support (16), scraper ring (18), and ring pack retainer (19) from piston barrel (1).

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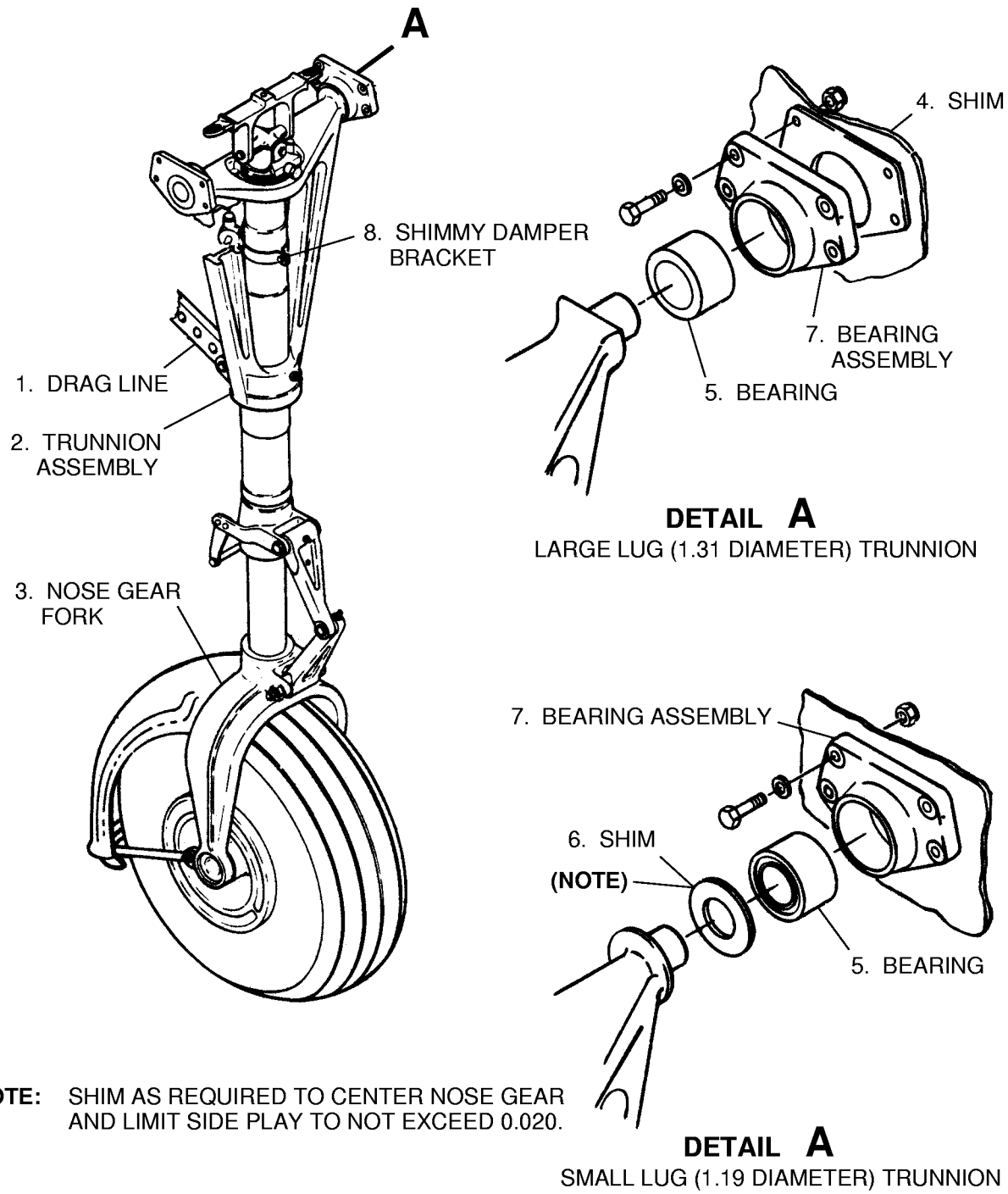

NOTE: SHIM AS REQUIRED TO CENTER NOSE GEAR AND LIMIT SIDE PLAY TO NOT EXCEED 0.020.

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Nose Gear Installation
Figure 401 (Sheet 1)

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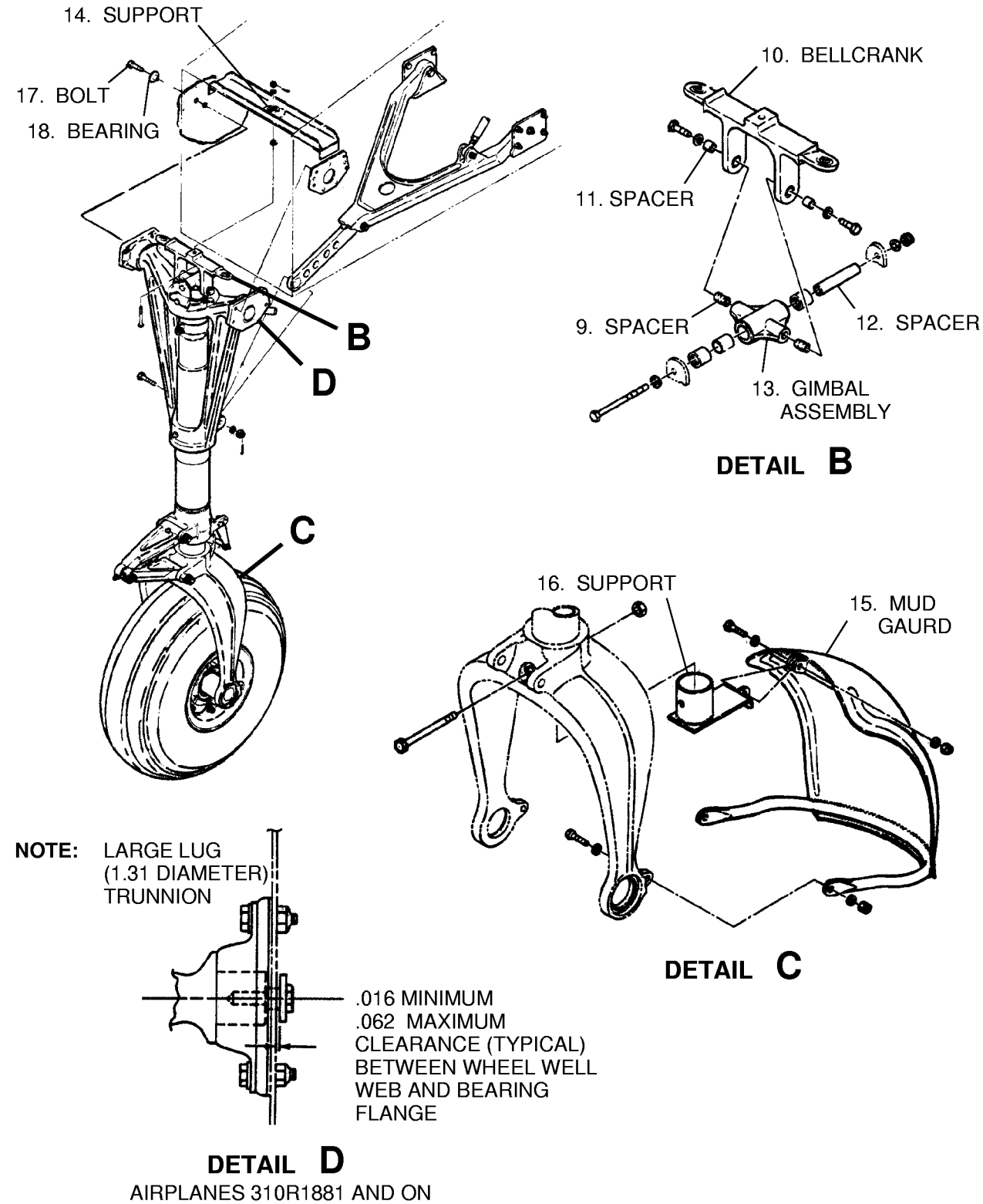

Nose Gear Installation
Figure 401 (Sheet 2)

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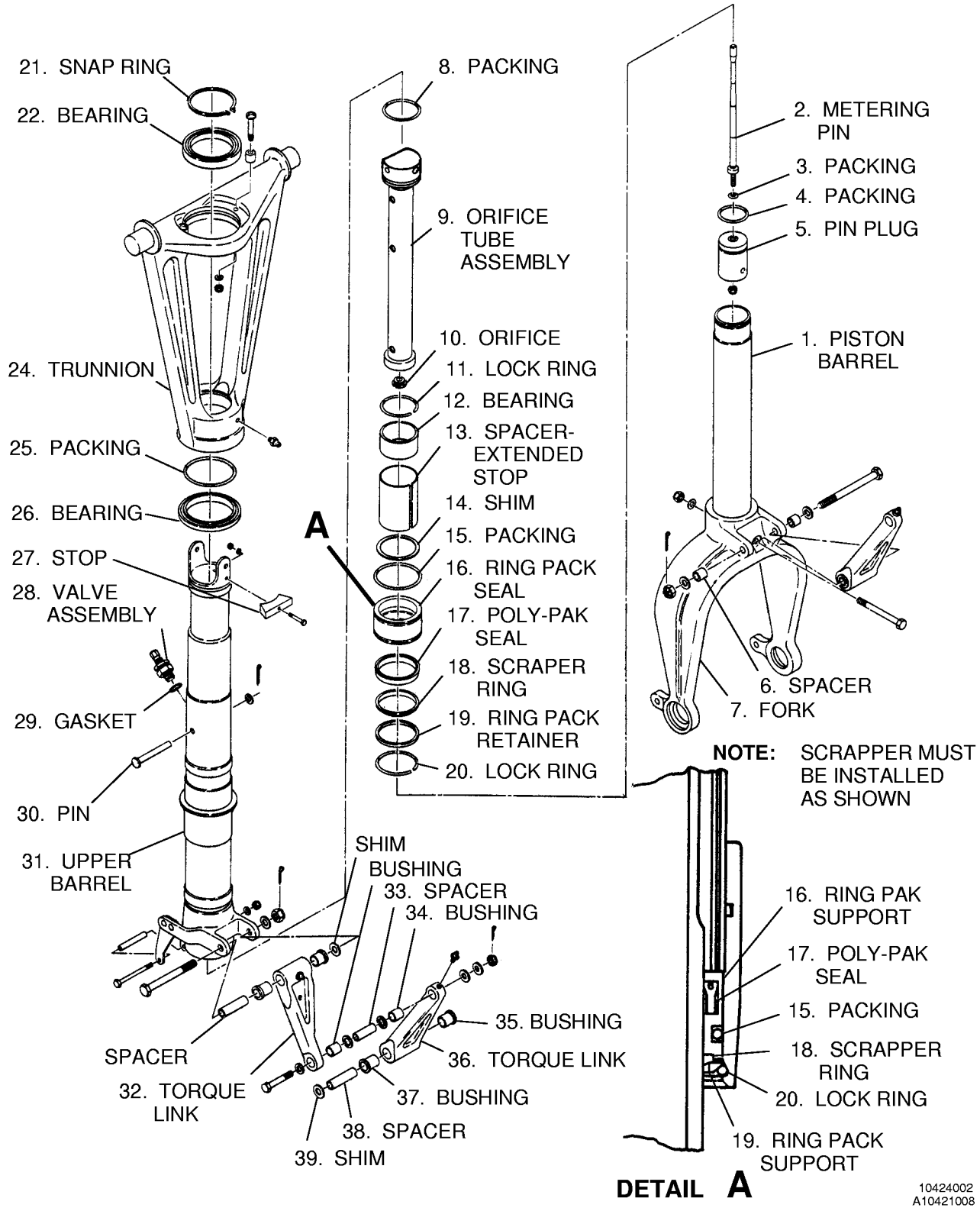

Nose Landing Gear
Figure 402 (Sheet 1)

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(12) Remove nut, washer, and bolt and drive pin plug (5) from piston barrel (1).
(13) Remove metering pin (2) from pin plug (5) by removing nut.

NOTE: Piston barrel (1) and fork (7) are a press fit and drilled on assembly. Disassembly is not recommended.

(14) Remove torque links (32 and 36) from upper barrel (31) and fork (7) by removing cotter pins, nuts, washers, spacers (38), and bolts.

NOTE: The bushings in the torque links are a press fit and should be removed only for replacement.

D. Assembly (Refer to Figure 402).

WARNING: Do not apply air or nitrogen charge to strut until it is properly serviced with hydraulic oil.

(1) If removed, install bushings (34, 35, and 37) in each torque link. Ensure that holes in bushings align with grease fittings.
(2) Assemble torque link (36) to fork (7) with bolt, spacers (38 and 6), shim (39), washer, and nut. Torque nut to firm plus one castellation and install cotter pin.

NOTE: Install shims (39) as required to provide a gap of 0.004 to 0.019 inch between attachment fittings and torque links. Ensure that shims are centered over spacer.

(3) Assemble torque link (32) to upper barrel (31) with bolt, spacer, shim, and nut. Torque nut to firm plus one castellation and install cotter pin.

NOTE: Lubricate packings, seals, and mating parts liberally with clean MIL-H-5606 hydraulic fluid before installation and assembly.

(4) Install packings (3 and 4) and install metering pin (2) into pin plug (5) and secure with nut.
(5) Install metering pin assembly in piston barrel (1). Secure in place with bolt through fork (7), piston barrel (1), and pin plug (5).
(6) Slide lock ring (20), ring pack retainer (19), and scraper ring (18) on piston barrel (1).
(7) Install poly-pak seal (17) inside of ring pack support (16) and packing (15) in the groove on the outside.

CAUTION: Install scraper ring with groove DOWN (toward ring pack retainer), refer to Figure 402.

NOTE: Install poly-pak seal with wide lip UP (toward the pressure side).

(8) Slide the ring pack support assembly on piston barrel (1), then install shim (14) and spacer (13).
(9) Install bearing (12) on piston barrel (1) and install lock ring (11).

NOTE: Install bearing with chamfered end UP in order to seat against external lock ring.

(10) If orifice (10) was removed, screw orifice into bottom of orifice tube (9) and stake in place.
(11) Install packing (25) and bearing (26) in trunnion.
(12) Install bearing (22) in trunnion. Install spacer stop (23). Coat bearing area and O-ring packing in lower end of trunnion using MIL-G-21164C grease or equivalent.

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(13) Start lower end of trunnion over end of upper barrel assembly and slide on approximately half way. Start shimmy damper attach bracket and shimmy damper over end of upper barrel assembly; then, slide trunnion into position against lower bearing and install bearing, spacers, stop bolts, and snap ring at upper end of the nose gear assembly and the grease fitting at the lower end of the trunnion.

NOTE: Position the shimmy damper on upper barrel assembly with filler plug UP and on the side of the trunnion that has the shimmy damper attaching lug. Ensure that new trunnion is properly indexed on the upper barrel assembly prior to tightening of shimmy damper bracket. With the nose gear scissors forward, the trunnion must be positioned with the shimmy damper attaching lug on the aft side.

(14) Install packing (8) on orifice tube assembly (9) and insert assembled tube into upper barrel (31); align holes and install pin (30), washer, and cotter pin securing piston and orifice tube assembly in upper barrel assembly.

NOTE: Use of a tapered pin or punch may be required to align piston and orifice assembly in upper barrel assembly.

NOTE: To prevent damage to piston barrel and ring pack support during installation, a ring pack support tool P/N 0880004-2 should be used.

(15) Install assembled piston barrel assembly into upper barrel (31). Carefully work scraper ring (18) and ring pack retainer (19) into place and secure with lock ring (20).

(16) Connect torque links (32 and 36) with bolt, washers, spacer (33), and nut. Torque nut to firm plus one castellation and install cotter pin.

NOTE: Install AN960-716 and AN960-716L washers until a gap of 0.004 to 0.019 inch exists between torque links. Ensure that washers are centered over spacer (33).

(17) Locate shimmy damper bracket on upper barrel assembly with locating pin inserted in hole on upper barrel assembly. Install washer on bolt head, insert bolt through clamping ears of bracket, and install washer and nut. Connect shimmy damper rod assembly to lug on aft side of trunnion using existing bolt, washers, and nut. Torque both nuts 20 to 25 inch-pounds.

(18) Install stop (27) on upper barrel assembly using existing bolt, washer, and nut. On Airplanes 310R0001 thru 310R1918, if a new upper barrel is installed, a new stop block installation will be incorporated allowing the stop block to be mounted at a lower position on the barrel. This installation requires mounting a stop block clip on each side of the trunnion (Refer to Figure 403).
   (a) When upper barrel and trunnion are assembled, locate the stop block clip on each inboard side of trunnion to serve as a bumper for the stop block.
   (b) Apply adhesive (EA9309) to clips when they are mounted on trunnion for extra security.
   (c) Remove the existing turn limits placards or paint marks as applicable. Touch up the paint to match the nose gear trunnion and upper barrel.
   (d) Paint two red marks onto the lower portion of the trunnion per dimensions shown.
   (e) Determine the center position of the upper barrel by turning the nose gear to the right until the stop is reached. Place a temporary mark on the upper barrel adjacent with the trunnion and aligned with grease fitting. Repeat with the nose gear against the LH stop. Remove the adhesive backing from the placard and install with the red mark on the placard centered between the temporary marks just made. Secure in place using the two screws and nuts. Remove the temporary alignment marks.

(19) With strut fully deflated, fill with MIL-H-5606 hydraulic fluid and install gasket (29) and valve body (28).

E. Installation (Refer to Figure 401).

(1) On small lug trunnion (1.19 diameter), install shims (6) on trunnion pivots as required so that when nose gear is installed side movement between trunnion assembly (2) and bearing assembly (7) does not exceed 0.020 inch.

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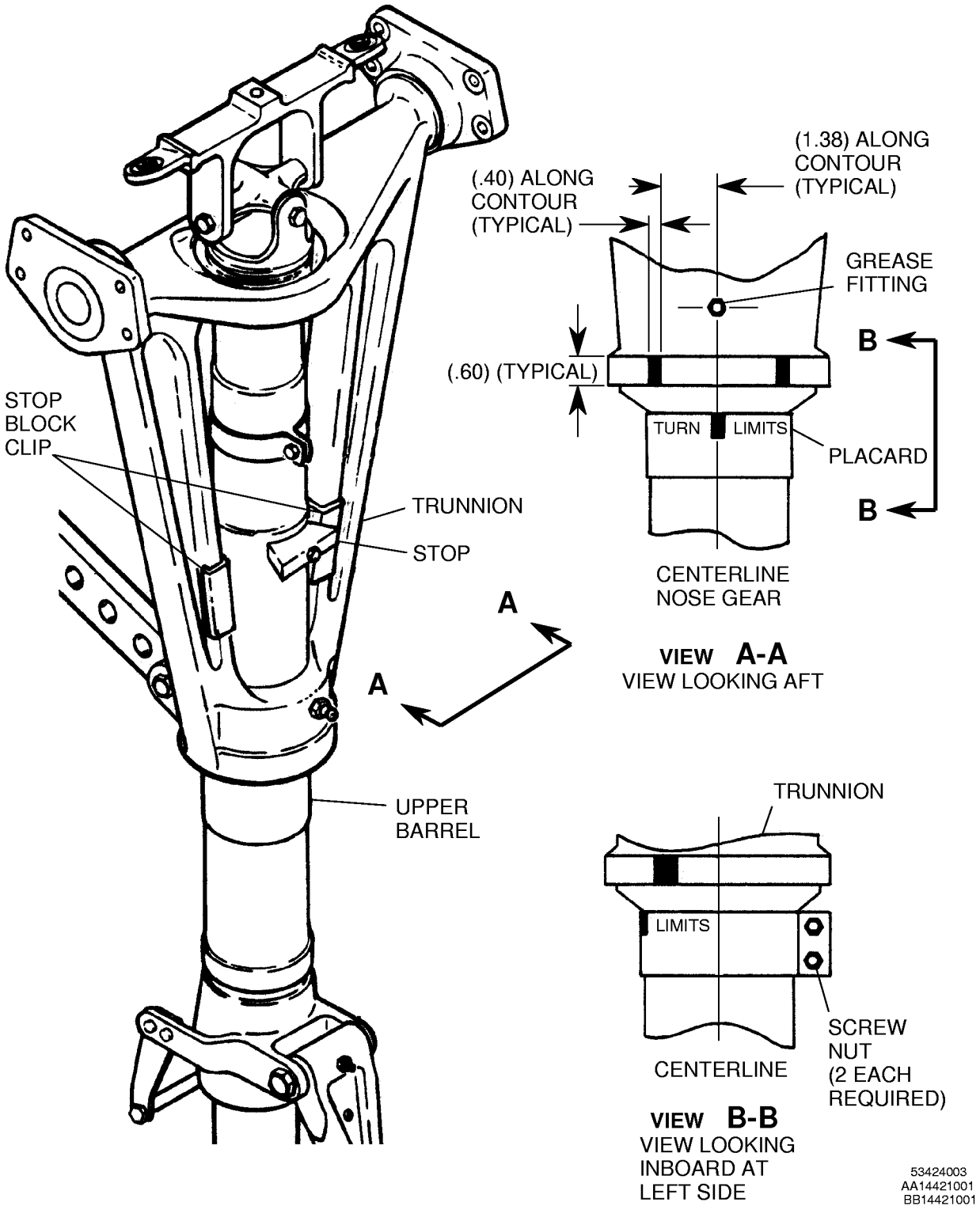

Stop Block and Turn Limit Installation
Figure 403 (Sheet 1)

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(2) Place bearing assembly (7) on trunnion assembly (2) and place nose gear assembly in wheel well. Install mounting bolts and washers.
(3) On large lug trunnion (1.31 diameter), place bearing assembly (7) on trunnion (2) and place nose gear assembly on wheel well. Install shim (4) between bearing assembly (7) and wheel well web so that side movement of the trunnion does not exceed 0.020 inch and install bolts and washers.
(4) Install bolts, washers, and nuts securing bearing assembly (7) to structure. Torque bolts to 85 inch-pounds, +15 or -15 inch-pounds.
(5) For Airplanes 310R1919 thru 310R2140, reinstall trunnion bolt (17) and bearing (18). Bolt and bearing install from the outside of the nose wheel well.
(6) Secure drag link to trunnion assembly with bolt, washer, and nut.
(7) If gimbal assembly (13) were removed and disassembled, assemble and install as follow:
  (a) Attach bellcrank (10) to gimbal (13) with bolts, washers, and spacers. Torque bolts 50 to 70 inch-pounds.
  (b) Secure bellcrank and gimbal assembly to support (14) with bolt, washers, and nut. Direction of bolt is optional.
(8) Install spacer (15) in gimbal and secure strut to gimbal with bolt, washers, and nut.
(9) Install mud guard (15) to strut fork with support (16), bolts, washers, and nuts.

WARNING: Ensure bolts attaching mud guard braces to nose gear fork bolts are installed with nut on outside of nose gear fork.

2. Nose Gear Doors

A. Removal/Installation.
(1) For removal and installation of the nose gear doors, refer to Chapter 52, Landing Gear Doors - Removal/Installation.

3. Nose Gear Shimmy Damper

A. Removal (Refer to Figure 404).
(1) Disconnect piston rod (16) from trunnion assembly by removing cotter pin, nut, washers, and bolt.
(2) Remove shimmy damper from strut by removing nut, washer, bolt, and bushing (17).

B. Disassembly (Refer to Figure 404).
(1) Push piston rod (16) into shimmy damper, remove filler plug (1) and packing (2) and drain fluid.
(2) Remove lock ring (15) from the forward end of shimmy damper and pull bearing head (13), piston, and rod assembly from barrel (3).
(3) Remove lock ring (7) from aft end of barrel (3) and pull bearing head (6) from barrel.
(4) Remove packings (4, 14, 5, and 12) from bearing heads (6 and 13).
(5) Drive roll pin out and remove piston (9) from piston rod (16).
(6) Remove packing (11) and retainer (10) from piston.

C. Assembly (Refer to Figure 404).

NOTE: Before starting assembly of shimmy damper, thoroughly clean each component then lubricate with MIL-H-5606 hydraulic fluid.

(1) Install packings (4, 14, 5, and 12) on bearing heads (6 and 13).
(2) Install bearing head (6) and lock ring (7) on aft end of barrel (3).
(3) Slide bearing head (13) onto piston rod (16).
(4) Install retainer (10) and packing (11) on piston (9).
(5) Install piston (9) on piston rod (16) and insert roll pin (8) through piston and piston rod.
(6) Insert piston and piston rod assembly into barrel (3), slide bearing head (13) into place and secure with lock ring (15).

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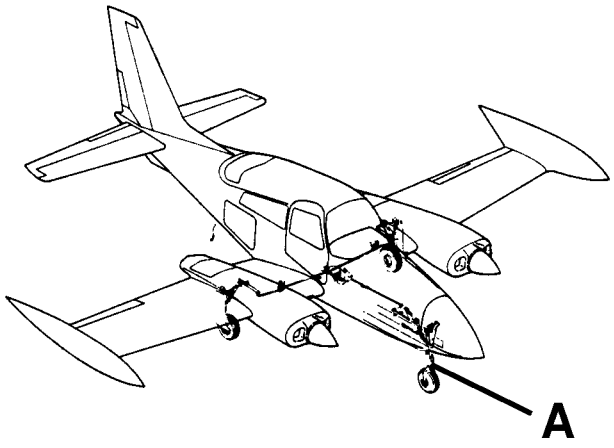

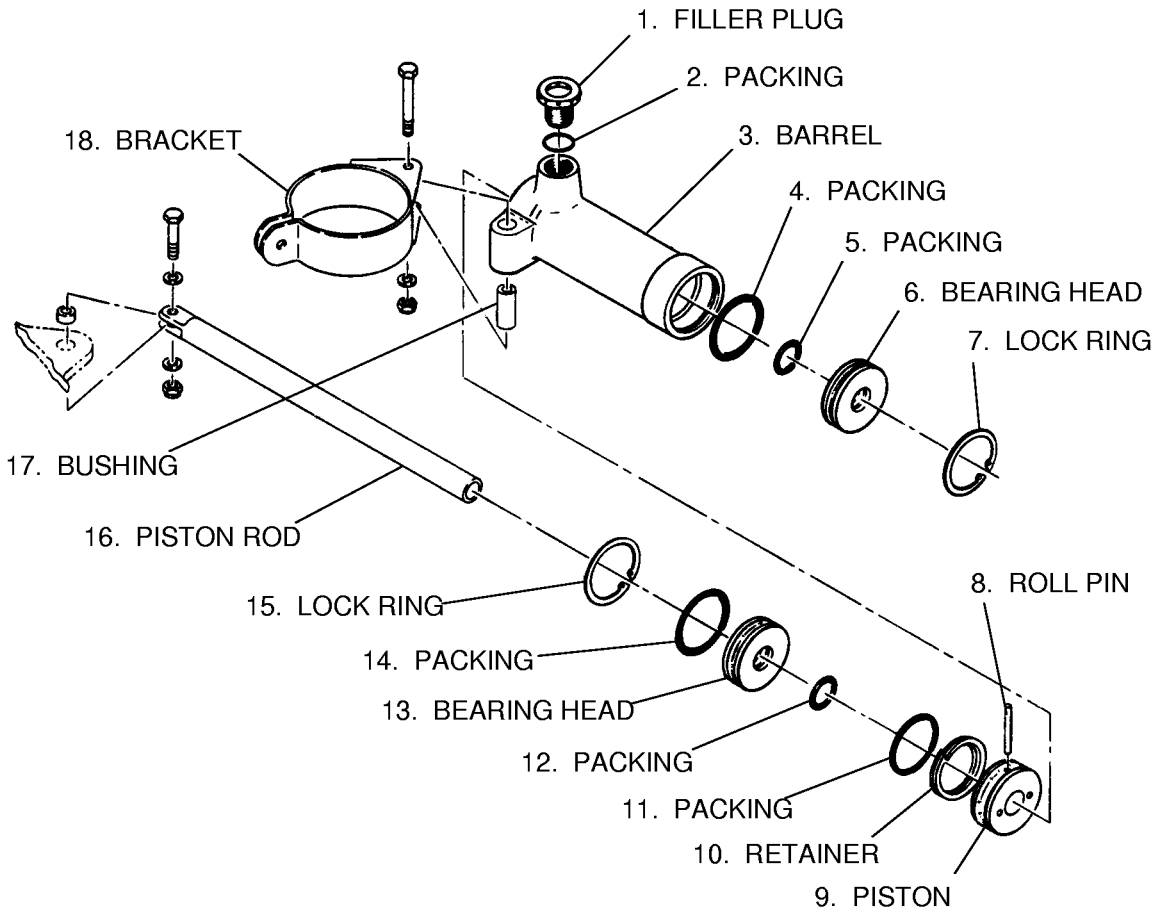

DETAIL A

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Shimmy Damper
Figure 404 (Sheet 1)

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CAUTION: Insert piston and piston rod assembly with care to prevent damage to packings.

(7) Completely fill shimmy damper with MIL-H-5606 hydraulic fluid and install packing (2) and filler plug (1).

NOTE: For proper operation, shimmy damper must be completely full of hydraulic fluid, with no trapped air present.

D. Installation (Refer to Figure 404).

NOTE: Lubricate bushing (17) and attaching bolts with light oil during installation.

(1) Place bushing (17) in barrel (3), align mounting holes and secure in place with bolt, washer, and nut.
(2) Secure piston rod to trunnion assembly with bolt, washers, nut, and cotter pin.

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NOSE GEAR - ADJUSTMENT/TEST

1. Nose Landing Gear Linkage

A. Rigging (Refer to Figure 501).

NOTE: Because the aft drive tube (11) is a fixed length, the idler bellcrank (10) is correctly positioned to the actuator bellcrank (12).

(1) Jack airplane, refer to Chapter 7, Jacking - Description and Operation.
(2) Remove seats, carpet, floorboard panels, and access panels as required to gain access to landing gear actuator and linkage.

CAUTION: Any time the floorboards are removed a temporary protective cover should always be used to prevent damage and improper settings of the landing gear actuator switches.

(3) Operate the actuator to the DOWN position, then adjust the length of the forward drive tube (9) as follows:
  (a) Disconnect assist spring (14).
  (b) Disconnect forward drive tube (9) from outboard bellcrank (15).
  (c) Adjust the length of forward drive tube (9) so that fork bolt (7) is parallel with the upper flange of the wheel well former adjacent to the fork bolt. The forward end of the fork bolt will point downward any amount caused by less than one turn of the threaded end of the forward drive tube (9). Detail "A" illustrates three possible conditions. The straight configuration is most desired. The fork bolt must never point up.

CAUTION: The collar-end of the forward horizontal hi-shear rivet must point inboard for clearance.

(4) Make the following preliminary adjustments:
  (a) Screw fork bolt (7) into adjusting bellcrank (8) as far as possible.
  (b) Screw adjusting rod end (4) into uplock torque tube (5) as far as possible.
  (c) Shorten adjusting fork (2) as much as possible. Adjust uplock hook to the end of its adjusting slots in the direction that will prevent hook from fully engaging.
(5) Adjust connector link (3) as follows:
  (a) With nose gear DOWN, check the overcenter position of connector link (3).

NOTE: A slight force (3 to 7 pounds) should be required to snap connector link into its overcenter position.

  (b) Lengthen adjusting rod end (4) in half-turn increments to increase the force required to snap connector link overcenter; shorten to decrease.
  (c) Manually place nose gear UP, push upward on door actuator arm to lock connector link overcenter and check the retracted position.

NOTE: The nose gear should retract to a position that will align the center of the uplock hook with the spacer provided on the gear for hook engagement.

  (d) If the retracted position is too low, lengthen adjusting rod end (4) and shorten adjusting fork (2) in half-turn increments.

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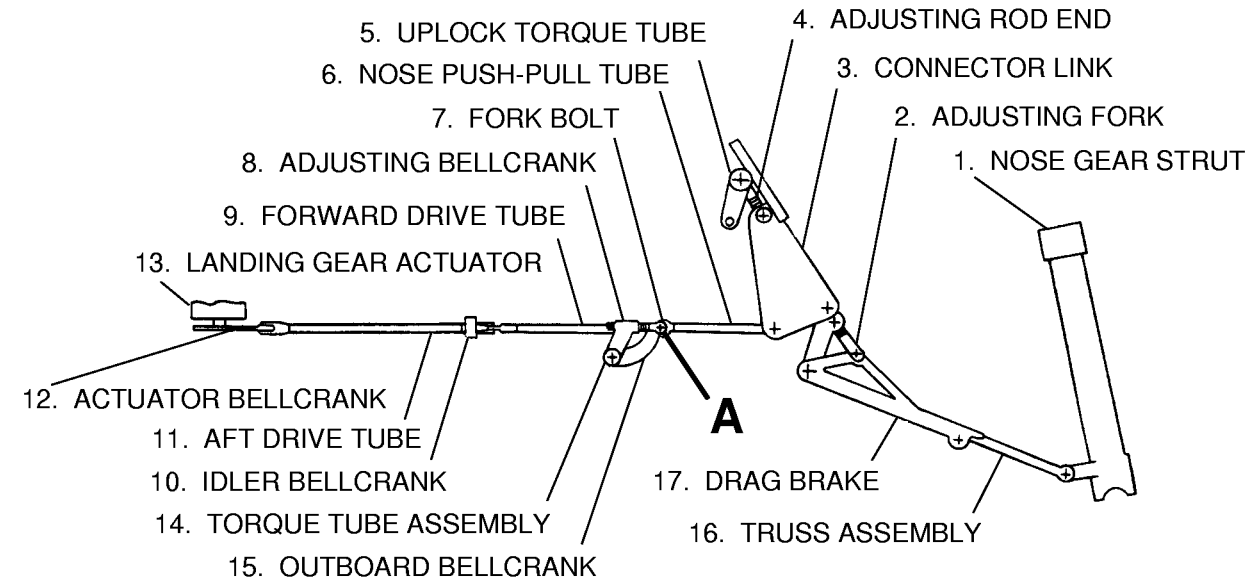

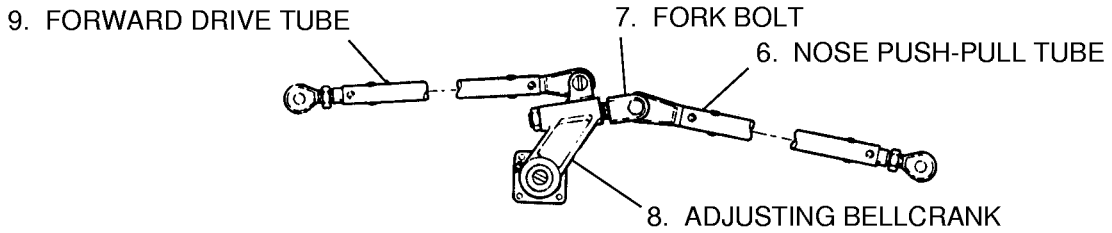

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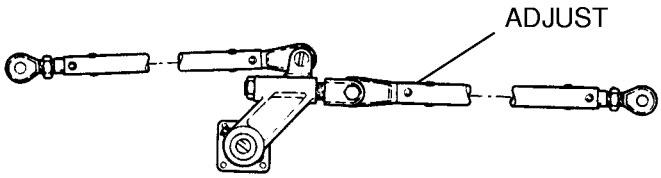
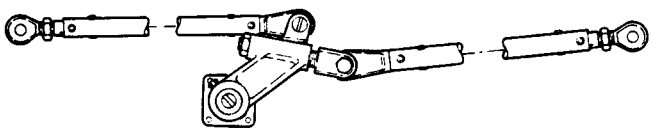


DESIRED

FWD



ACCEPTABLE

DETAIL A
VIEW LOOKING OUTBOARD

14422002
A14423001

Rigging Nose Gear Retracting Linkage
Figure 501 (Sheet 1)

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(e) If the retracted position is too high, shorten adjusting rod end (4) and lengthen adjusting fork (2) in half-turn increments.

NOTE: Since the combined length of adjusting rod end (4) and adjusting fork (2) determines the force required to snap link overcenter in the DOWN position, this combined length must remain unchanged. When changing the length of adjusting rod end (4) to obtain the correct retracted position, change the length of adjusting fork (2) a corresponding amount in the direction that will not change their combined length.

(6) Adjust uplock and downlock tensions as follows:
(a) Lengthen nose push-pull tube (6) as much as possible. Insure rod end is visible through the inspection hole for thread engagement.
(b) Temporarily install nose push-pull tube (6).
(c) Retract landing gear electrically.
(d) Check the uplock tension at the nose gear door actuator arm, as illustrated in Figure 502. The force required to move the connector link from its position against uplock torque tube must be 75 pounds, +10 or -15 pounds.

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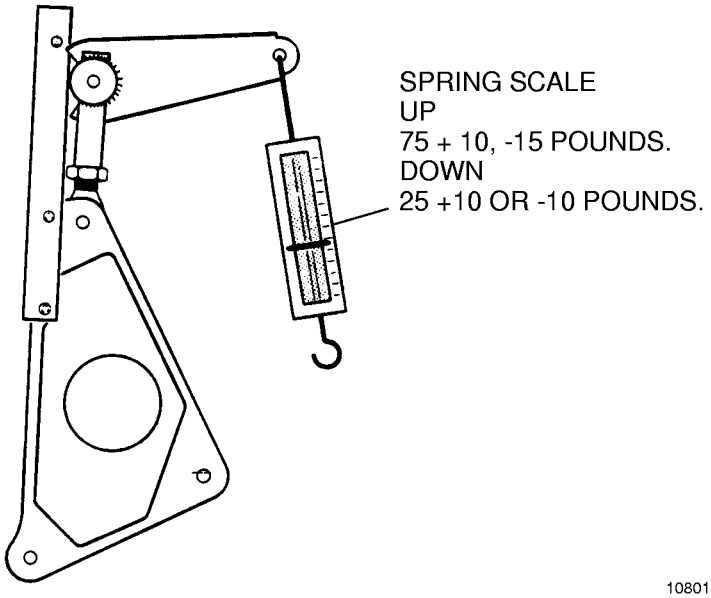

Nose Gear Tension Requirements
Figure 502

(e) Shorten nose push-pull tube (6) in half-turn increments to increase uplock tension; lengthen to decrease.
(f) Operate landing gear to the DOWN position and check the downlock tension in the same manner. The force required to move the connector link from its position against the uplock torque tube must be 25 pounds, +10 or -10 pounds.
(g) Lengthen fork bolt (7) in half-turn increments to increase downlock tension; shorten to decrease. Do not adjust nose push-pull tube (6).

NOTE: Detail "A" illustrates the principle for adjusting the uplock and downlock tension. Adjust length of nose push-pull tube for uplock tension and the length of the fork bolt for downlock tension.

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(h) Operate landing gear to the UP position and recheck the uplock tension. If necessary, readjust nose push-pull tube (6) in accordance with step (e).

NOTE: Since the combined length of fork bolt (7) and nose push-pull tube (6) determines the downlock tension, this combined length must remain unchanged. When changing the length of the nose push-pull tube to obtain the correct uplock tension, change the length of the fork bolt to a corresponding amount in the direction that will not change their combined length.

(7) Adjust the uplock hook as follows:
(a) With landing gear in the UP position, check the clearance between uplock hook and the spacer on the strut with which the hook engages.

NOTE: An access cover is provided in the top of the nose gear wheel well to check uplock hooks in the gear UP position with doors closed.

(b) Adjust uplock hook to obtain a minimum clearance of 0.003 to 0.060 inch and a maximum clearance of 0.06 inch at the closest point, which should be at the underside of the spacer near the fully engaged position of the hook.

NOTE: For adjustment of uplock hook, elongated holes are provided in the supports to which the hook is attached.

(c) Operate landing gear several times to observe the uplock hook. The hook must engage and disengage freely, with no indication of binding between the hook and the spacer.
(8) Connect downlock assist spring (14) and cycle landing gear. The spring must cause no interference with gear operation.
(9) Connect door link tubes with bolts and nuts and rig nose gear doors in accordance with Nose Gear Door Rigging Procedures.
(10) Connect main wheel well door link tubes with washer and nut. Rig doors in accordance with Chapter 52, Landing Gear Doors - Adjustment/Test.
(11) Reinstall floorboards, seats, carpet, and access covers. Insure that landing gear is DOWN and locked, then remove jacks.

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NOSE GEAR - CLEANING/PAINTING

1. Nose Gear Assembly

A. Cleaning.

(1) Clean all metal parts with a suitable solvent.

CAUTION: If metal parts are not to be assembled immediately, coat with system hydraulic fluid to prevent rusting. Before assembly it will be necessary to again clean with solvent.

(2) Clean all O-rings and seals with system hydraulic fluid.

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NOSE GEAR - APPROVED REPAIRS

1. Nose Gear Assembly

A. Approved Repairs.
(1) Repair is limited to replacement of parts, smoothing out of minor scratches, nicks, and dents, and repainting of areas where paint has chipped or peeled.

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EXTENSION AND RETRACTION - DESCRIPTION AND OPERATION

1. Main Landing Gear Retracting Linkage

A. Description.

(1) The main landing gear retracting linkage consists of push-pull tubes, bellcranks, torque tubes, braces, and links interconnected between the landing gear actuator and the main landing gear. A positive downlock is obtained by rigging the main side links to an overcenter position. The link assemblies which hold the main side links in an overcenter position are also rigged overcenter. Downlock springs, which apply spring tension to the overcenter position of the link assemblies, are provided as an added safety feature. Hook-type mechanical locks are provided to support the landing gear in the retracted position. The main landing gear retracting linkage also operates the main landing gear door operating mechanism.

2. Nose Gear Retracting Linkage

A. Description.

(1) The nose gear retracting linkage consists of a drag brace, truss assembly, bellcranks, torque tubes, push-pull tubes, and drive tubes interconnected between the landing gear actuator and the nose gear. A positive downlock is obtained by rigging the drag brace to an overcenter position. The connector link assembly which holds the drag brace in an overcenter position is also rigged overcenter. A downlock spring which applies tension to the overcenter position of the link assemblies is provided as an added safety feature. A hook-type mechanical lock is provided to support the nose gear in the retracted position. The nose gear retracting linkage also operates the nose gear doors.

3. Landing Gear Actuator

A. Description.

(1) The landing gear actuator consists of an electric motor, reduction unit, and a worm and sector gear assembly. The actuator is normally operated by the electric motor, however, linkage is provided to disengage the motor driven reduction unit and engage a manual extension system. A bellcrank to operate main landing gear drive tubes is attached to the upper end of the sector shaft, which extends vertically through the actuator assembly, and a bellcrank to operate the nose gear drive tube is attached to the lower end of the sector shaft. Adjustable limit switches are provided to obtain correct landing gear travel. The actuator motor incorporates a brake to prevent an overtravel of the landing gear.

4. Manual Extension System

A. Description.

(1) The manual extension system consists of a hand crank, which is connected to the landing gear actuator by an arrangement of chain and sprockets, bellcrank, miter gears, and push-pull rods. The hand crank located at the right of the pilot's seat is normally in a stowed position. When unfolded into its operation position the hand crank disengages the normal landing gear operating system and allows the gear to be operated manually. A release button is provided to unlock the hand crank so that it may be unfolded and stowed.

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EXTENSION AND RETRACTION - TROUBLESHOOTING

1. Landing Gear Actuator

A. Troubleshooting.
(1) For a guide to troubleshooting the landing gear actuator, refer to Table 101.

NOTE: Perform landing gear actuator troubleshooting with normal voltage applied and landing gear actuated.

Table 101. Landing Gear Actuator Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
LANDING GEAR DOES NOT RETRACT OR EXTEND AND GEAR MOTOR DOES NOT OPERATE.	Tripped circuit breaker.	Check for tripped circuit breaker. Reset circuit breaker.
	Low battery voltage.	Check battery voltage. Recharge battery as required.
	Lack of continuity in electrical system.	Conduct a continuity check of landing gear electrical system. Refer to Chapter 24, Electrical Power. Repair open circuits, replace defective relay or switches as required.
	Improperly adjusted switches.	Check adjustment of gear safety switches and limit switches. Adjust as required.
	Unserviceable gear motor.	Replace gear motor.
LANDING GEAR FAILS TO RETRACT OR EXTEND AND GEAR MOTOR OPERATES.	Manual extension crank improperly stowed.	Check that manual extension crank is properly stowed. Stow crank properly.
	Reduction unit output shaft pin sheared.	Check reduction unit output shaft pin for shearing. Replace pin as required.
	Unserviceable landing gear actuator.	Replace landing gear actuator.

2. Manual Extension System

A. Troubleshooting.
(1) For a guide to troubleshooting the manual extension system, refer to Table 102.

Table 102. Manual Extension System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
WITH LANDING GEAR RETRACTED, MANUAL EXTENSION SYSTEM FAILS TO EXTEND LANDING GEAR.	Manual extension crank not fully engaged.	Check manual extension crank for full engagement. Adjust manual extension linkage and replace unserviceable parts as required.
	Improperly adjusted landing gear retraction linkage or actuator.	Check landing gear retraction linkage and actuator for adjustment or unserviceable parts. Adjust linkage and replace unserviceable parts as required.
	Improperly rigged landing gear.	Re-rig landing gear.

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EXTENSION AND RETRACTION - REMOVAL/INSTALLATION

1. Main Landing Gear Retracting Linkage Components (Inboard)

A. Removal (Refer to Figure 401).
(1) Jack the airplane, refer to Chapter 7, Jacking - Description and Operation.
(2) Release tension on retracting linkage by engaging hand crank and operating a few turns toward the UP position.
(3) Remove access hole covers and wing gap fairings as necessary to remove linkage.
(4) Remove seats, carpet, and floorboards as necessary to gain access to the landing gear actuator.
(5) Remove the inboard drive tubes from landing gear actuator as follows:
(a) Engage manual extension system and operate gear toward the UP (approximately 2 turns) position until the main gear doors open sufficiently to disconnect main wheel well door link (9) from door actuator arm (12).
(b) Disconnect the LH inboard drive tube (4) from idler bellcrank (11). Disconnect the RH inboard drive tube (3) from idler (7).

NOTE: For ease of bolt removal, support the main gear by hand to remove shear load from bolt. After bolt is removed, gently lower gear to its free fall position.

(c) Hand crank the gear toward the UP position until nose gear drive tube attaching bolt is accessible through the lower access hole. Support nose gear while removing cotter pin, nut, washer, and bolt. Gently lower nose gear to its free fall position.
(d) Manually crank gear toward the DOWN position until the upper bellcrank on the landing gear actuator is in approximately a lateral position.
(e) Remove nut, washer, caps, and bolt attaching the upper and lower bellcranks to the sector shaft.
(f) Lift upper bellcrank enough to clear sector shaft. Remove upper bellcrank, RH inboard drive tube, and LH inboard drive tube as a unit by pulling inboard until LH tube clears fuselage skin.
(6) Remove idler bellcrank (11) and door operating linkage as follows:
(a) Remove nut, washer, and bolt attaching rocker arm lower link (16) to door actuator arm (12). Remove four nuts, washers, and screws securing arm assembly (12) to web. Remove nut securing door actuator arm assembly to spar web. Remove arm assembly and thrust washer through access in web.

NOTE: The door actuator arm assembly is a matched set and disassembly is not recommended.

(b) Remove thrust washers and bolt attaching idler bellcrank (11) to front spar and support web.
(c) Remove thrust washers and bolt securing bellcrank rocker arm (14) to the front spar and support web. Pull bellcrank and attaching links from between front spar and support web.
(d) Retain spacers (15) from bellcrank rocker arm (14) and idler bellcrank (11).
(e) Remove upper connecting links (10) by removing nuts, washers, and bolts.
(f) Remove rocker arm lower links (16) by removing nuts, washers, and bolts.

B. Installation (Refer to Figure 401).
(1) Install idler bellcrank (11) and door operating linkage as follows:
(a) Attach rocker arm lower link (16) to bellcrank rocker arm (14) with bolt, washer, and nut.
(b) Attach upper connecting links (10) to bellcrank rocker arm (14) and idler bellcrank (11) with bolts, washers, and nuts.
(c) Install spacers (15) in idler bellcrank (11) and bellcrank rocker arm (14).
(d) Place bellcranks and attached linkage in position between front spar and support web.
(e) Secure bellcrank rocker arm (14) with bolt and thrust washers (13).
(f) Secure idler bellcrank (11) with bolt and thrust washers.
(g) Insert door actuator arm assembly (12) through bracket, thrust washer, and spar web. Secure to spar web with washer and nut.

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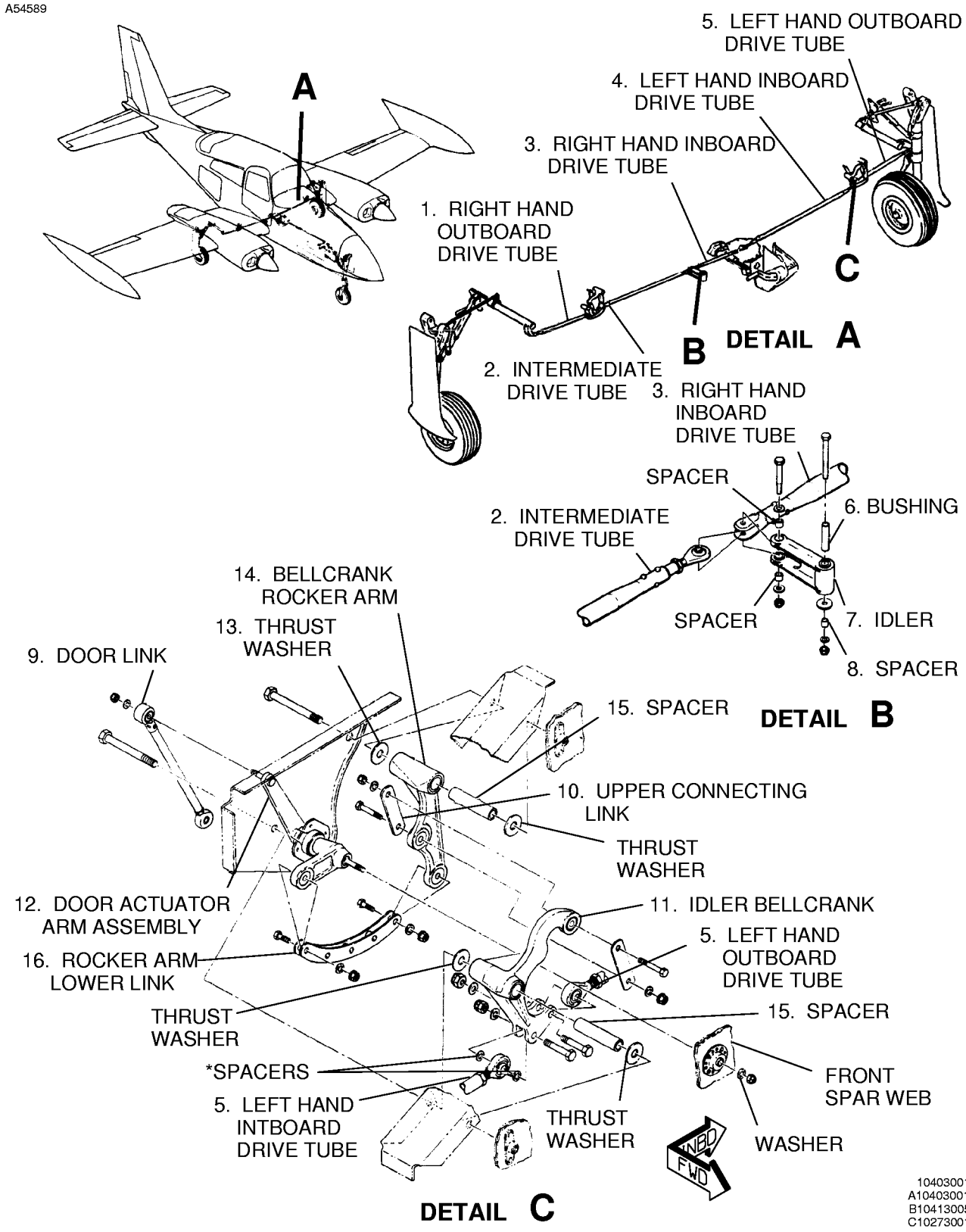

Main Landing Gear Retracting Linkage - Inboard Components
Figure 401 (Sheet 1)

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(h) Secure bearing flange of door actuator arm assembly to support with four screws, washers, and nuts.

NOTE: Washers must be under head of screws and screws installed in direction shown.

(i) Attach rocker arm lower link (16) to door actuator arm assembly (12) with bolt, washer, and nut.
(j) At landing gear actuator insert LH and RH inboard drive tubes (3 and 4) through fuselage and slide tubes outboard to idler bellcrank (11) and idler (7).
(k) Install upper and lower bellcranks to actuator sector shaft, using bolt, caps, washers, and nut.
(l) Secure nose drive tube to lower bellcrank, using bolt, washer, nut, and cotter pin.
(m) Connect LH inboard drive tube (4) to idler bellcrank (11), using bolt, spacers, washer, and nut.
(n) Connect RH inboard drive tube (3) to idler (7) and intermediate tube using bolt, washer, spacers, washer, and nut.
(o) Rig the landing gear system.
(p) Install floorboards, carpet, seats, access panels, and wing gap fairings.

2. Main Landing Gear Retracting Linkage Components (Outboard)

A. Removal (Refer to Figure 402).
(1) Remove outboard push-pull tube (8) as follows:
(a) Disconnect the push-pull tube from bellcrank (7) by removing cotter pin, nut, washer, and bolt.
(b) Disconnect outboard push-pull tube (8) from torque tube (23) by removing nut, washer, and bolt. Remove outboard push-pull tube.
(2) Remove bellcrank (7) and side brace lock link (13) as follows:
(a) Remove DOWN indicator switch (10) and spacers (11) by removing nuts and screws.
(b) Remove downlock spring (12).
(c) Disconnect side brace lock link (13) from lower side link (20) by removing nut, washer, and bolt.
(d) Remove side brace lock link (13) from bellcrank (7) by removing setscrew (14) and pin (9).
(e) Remove bellcrank (7) from strut upper barrel by removing cotter pin, nut, and bolt. Retain spacer (6).
(3) Remove uplock assembly as follows:
(a) Disconnect uplock push-pull tube (5) from uplock assembly by removing cotter pin, nut, washer, and bolt.
(b) Remove uplock assembly (4) from upper side link (3) by removing screw.
(4) Remove side links (3 and 20) as follows:
(a) Disconnect lower side link (20) from strut upper barrel by removing door link, nut (17), spacers (18 and 19), washers, and bolt. Retain spacer (22) in place.
(b) Disconnect upper side link (3) from support (1) by removing cotter pin, nut, washer, and bolt. Retain spacer (2).
(c) Separate upper side link (3) from lower side link (20) by removing cotter pin, nut, washer, and bolt. Retain spacer (21).
(5) Remove torque tube (23) as follows:
(a) Disconnect push-pull tube (8) from torque tube (23) by removing cotter pin, nut, washer, and bolt.
(b) Disconnect outboard drive tube (25) from torque tube by removing nut, washer, and bolt.
(c) Remove nut, washers, and bolt securing torque tube to support (24).
(d) Remove nut, washers, and bolt securing torque tube to support (26).

B. Installation (Refer to Figure 402).
(1) Install torque tube (23) as follows:
(a) Attach torque tube (23) to support (24) with bolt, washers, and nut.
(b) Attach torque tube to support (26) with bolt, washers, and nut.
(c) Connect uplock push-pull tube (5) to torque tube (23) with bolt, washer, nut, and cotter pin.

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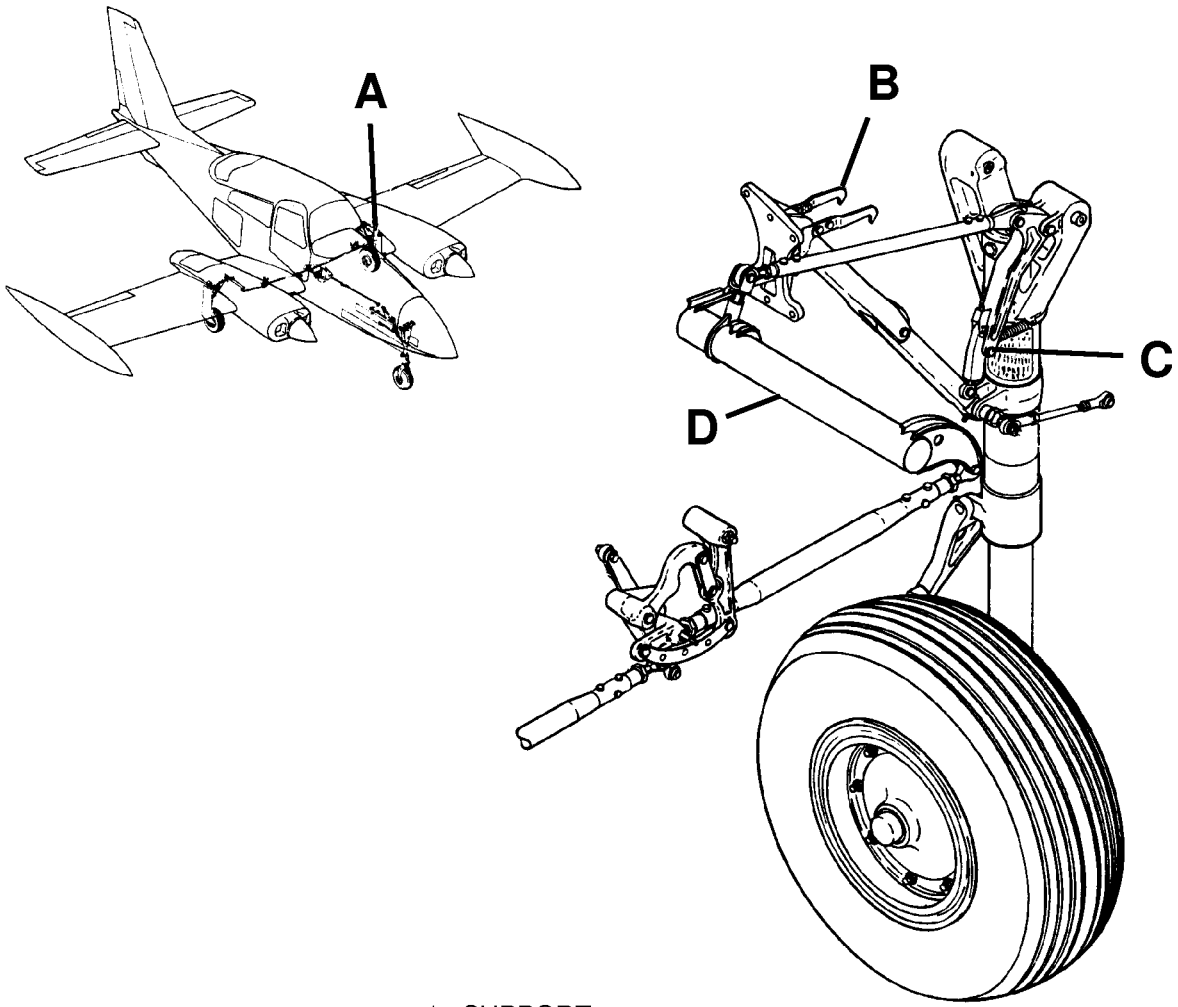

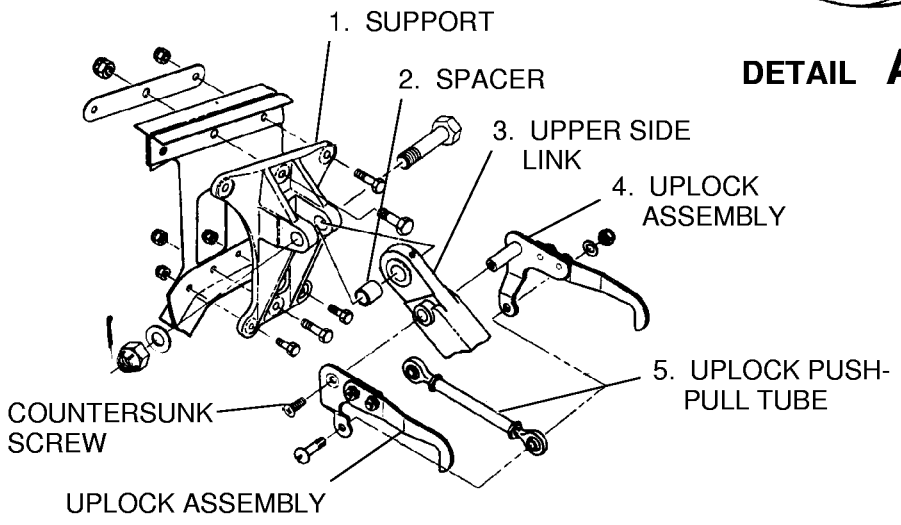

DETAIL A

DETAIL B

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B14411001

Main Landing Gear Retracting Linkage - Outboard Components
Figure 402 (Sheet 1)

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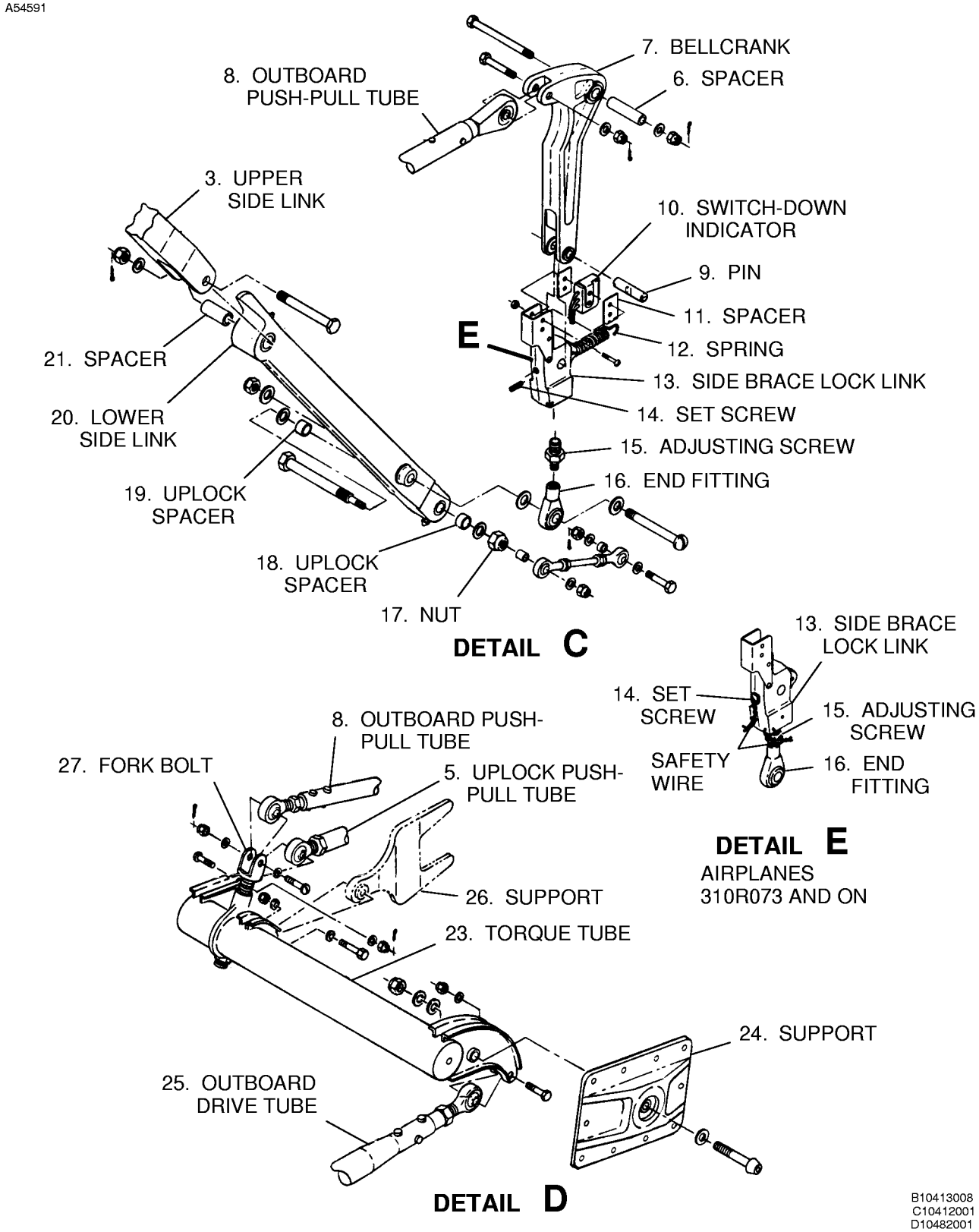

Main Landing Gear Retracting Linkage - Outboard Components
Figure 402 (Sheet 2)

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(d) Connect outboard push-pull tube (8) to torque tube (23) with bolt, washer, nut, and cotter pin.

(2) Install side links (3 and 20) as follows:
   (a) Insert spacer (22) in lower side link and secure upper side link (3) to lower side link (20) with bolt, washer, and nut. Torque nut to 110 inch-pounds, +5 or -5 inch-pounds. Install cotter pin.
   (b) Insert spacer in upper side link (3) and secure upper link to support (1) with bolt, washer, and nut. Torque nut to 200 inch-pounds, +25 or -25 inch-pounds. Install cotter pin.
   (c) Insert spacer (22) in lower side link (20) and secure lower side link to strut upper barrel with bolt, washers, uplock spacers (19 and 18), and nut (17). Torque nut (17) to 110 inch-pounds, +5 or -5 inch-pounds. Install door link.

(3) Install uplock assembly as follows:
   (a) Insert uplock assembly (4) through upper side link (3) and secure uplock assembly with screw.
   (b) Attach uplock push-pull tube (5) to uplock assembly (4) with bolt, washer, nut, and cotter pin.

(4) Install bellcrank (7) and side brace lock link (13) as follows:
   (a) Assemble side brace lock link (13) to bellcrank (7) with pin (9). On Airplanes 310R0001 thru 310R0734, secure setscrew (14) and stake. Do not stake over existing stakes. On Airplanes 310R0735 thru 310R2140, safety wire setscrew (14) to side brace lock link (13).

NOTE: Ensure arrow (indicating flat surface) located on end of pin (9) is aligned towards set screw (14).

3. Nose Gear Retracting Linkage

A. Removal (Refer to Figure 403).

(1) Jack airplane, refer to Chapter 7, Jacking - Description and Operation.
(2) Remove seats, carpet, floorboards, and access covers as required to gain access to retracting linkage and remove plug button from wheel well web.
(3) Disconnect nose gear doors.
(4) Release tension on retracting linkage by engaging manual extension crank and operating a few turns toward the UP position until bolt head aligns with hole in wheel web.

NOTE: Prior to any operation of the nose gear by the manual extension crank, assure that there is no electrical power on the airplane; or that the landing gear switch is in the NEUTRAL position.

(5) Remove forward push-pull tube (6) as follows:
   (a) Remove cotter pin, nut, and bolt attaching push-pull tube (6) to fork bolt (7).
   (b) Remove cotter pin, nut, and bolt attaching push-pull tube to connector link assembly (17).

NOTE: During removal of nose gear linkage, manually move gear as required for access to attaching bolts and nuts.

(6) Remove nose gear drive tube (1) as follows:
   (a) Disconnect nose gear drive tube (1) from landing gear actuator bellcrank.
   (b) Move drive tube (1) forward as far as possible to gain access to idler bellcrank (5) attachment point and remove nut, washer, spacers, and bolt.

(7) Remove intermediate push-pull tube (4) as follows:
   (a) Remove nut, washer, spacers, and bolt attaching push-pull tube to idler bellcrank (5).
   (b) Remove cotter pin, nut, and bolt attaching push-pull tube (4) to outboard bellcrank (12).

(8) Remove idler bellcrank (5) by removing bolt and washers. Leave spacer (3) installed.
(9) Remove torque tube (11) as follows:
   (a) Remove adjusting bellcrank (8) by removing cotter pin and pin. Fork bolt (7) and adjusting bellcrank may be removed as a unit.
   (b) Remove inboard support bearing (9) by removing four nuts and bolts.

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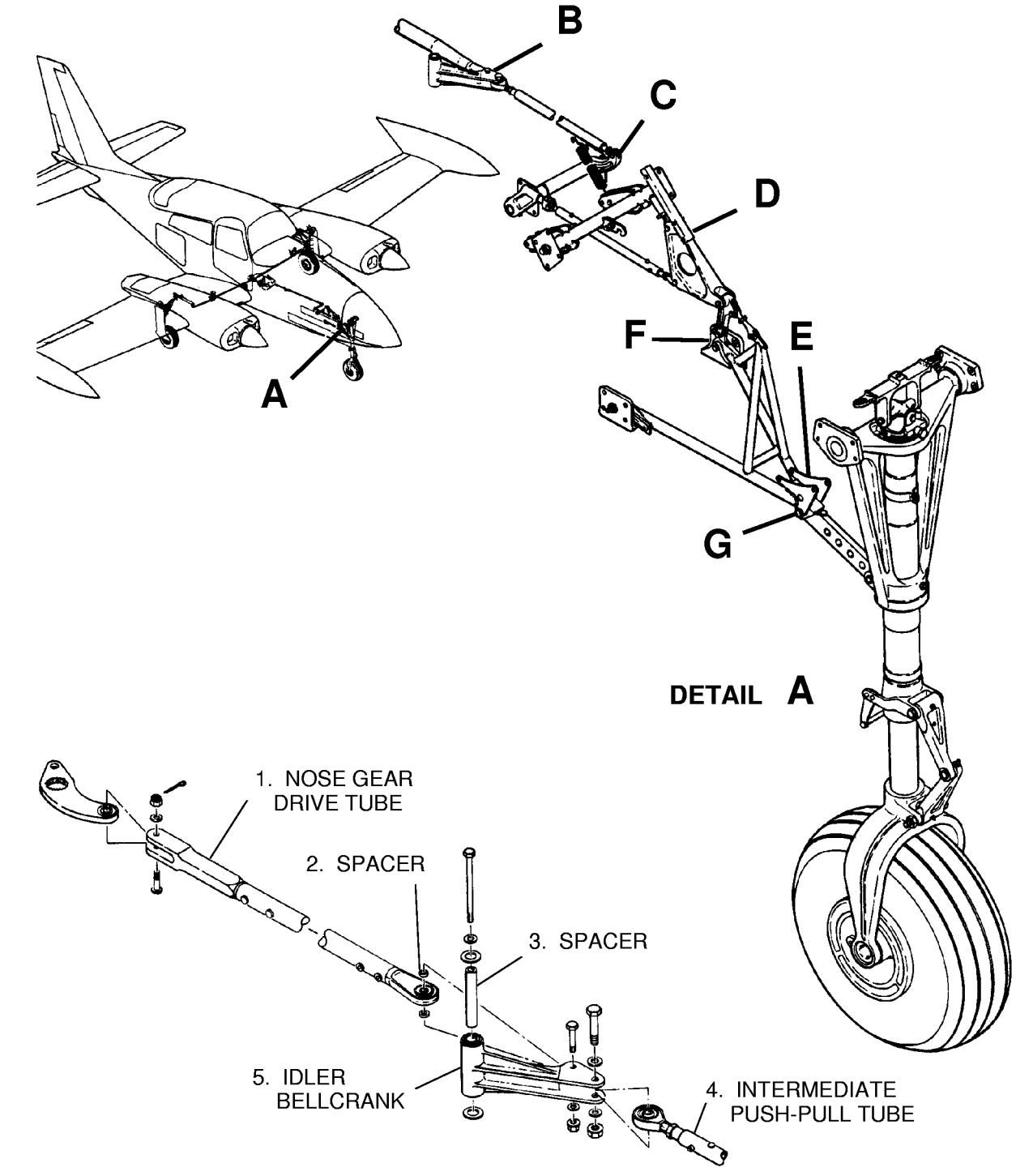

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Nose Gear Retracting Linkage
Figure 403 (Sheet 1)

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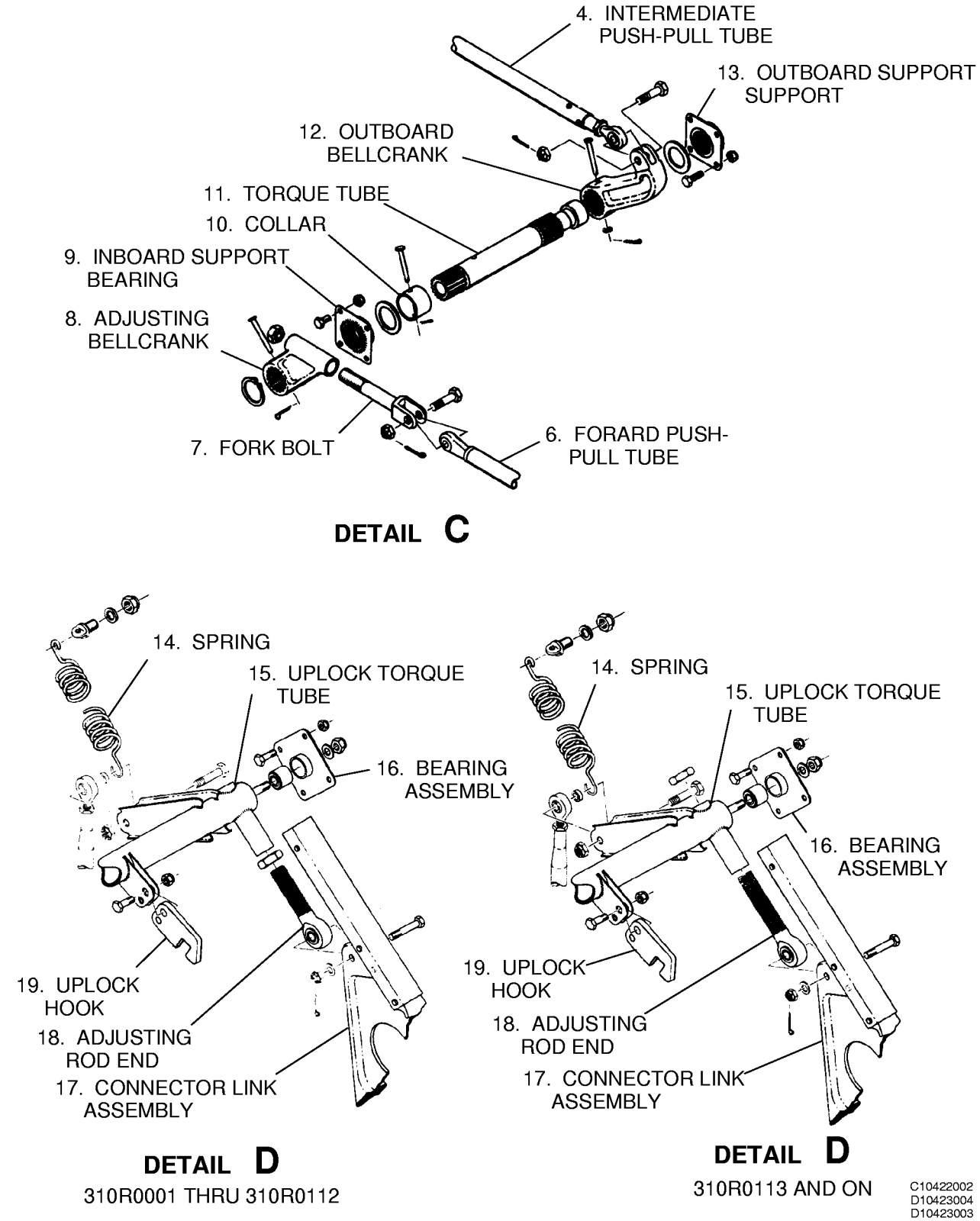

Nose Gear Retracting Linkage
Figure 403 (Sheet 2)

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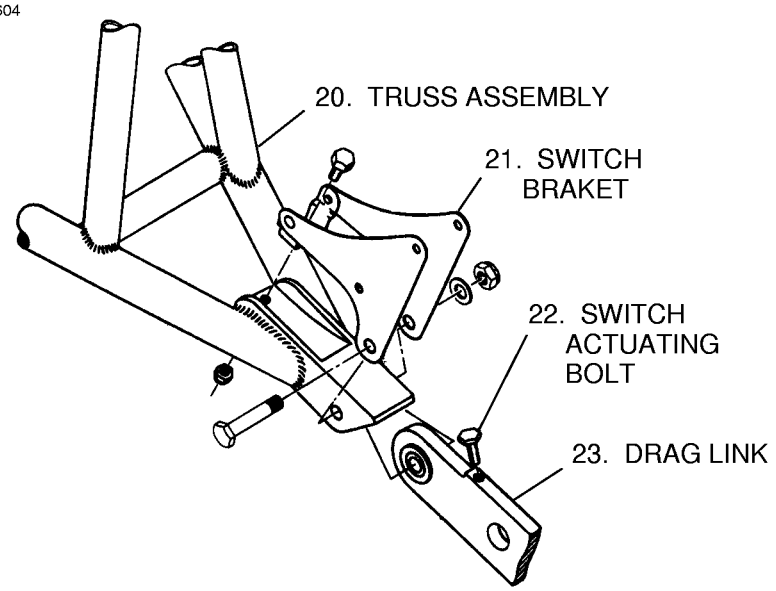
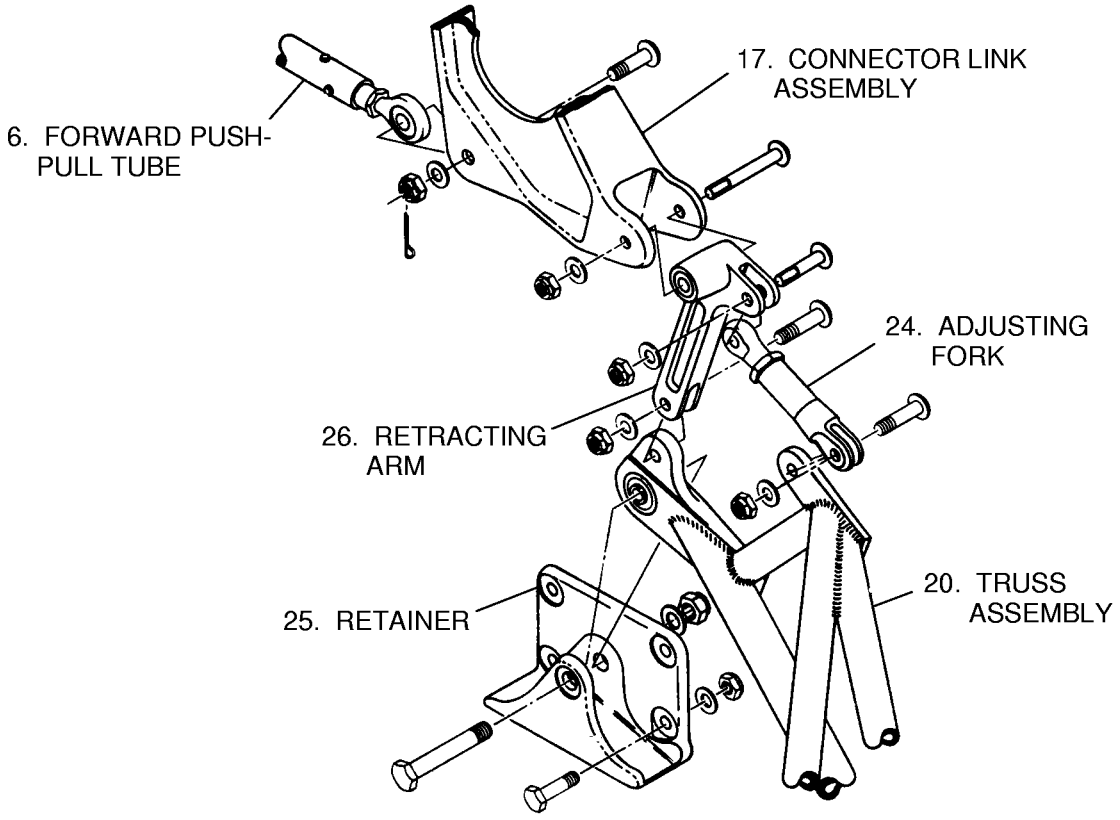


DETAIL E
AIRPLANES 310R0001 THRU 310R0500



DETAIL F
AIRPPLANES 310R0001 THRU 310R0500

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Nose Gear Retracting Linkage
Figure 403 (Sheet 3)

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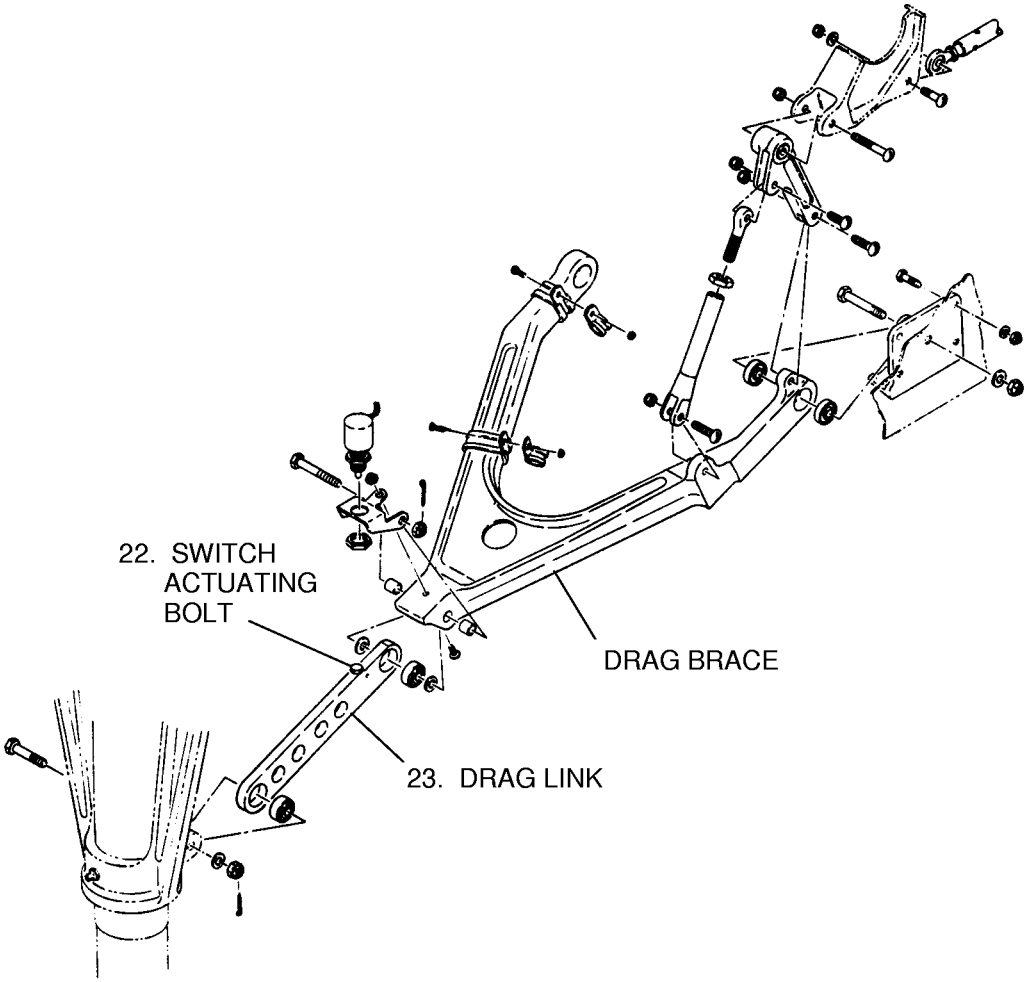

DETAIL G
AIRPLANES 310R0501 AND ON

G10424003

Nose Gear Retracting Linkage
Figure 403 (Sheet 4)

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(c) Pull torque tube (11) inboard until it clears the outboard support bearing (13), then tilt the outboard end upward and remove from nose section.
(d) Remove stop collar, if desired, by removing cotter pin and pin.

(10) Remove connector link assembly (17) as follows:
(a) Remove nut and bolt attaching connector link assembly (17) to retracting arm (26).
(b) Remove cotter pin, nut, washer, and bolt attaching connector link assembly (17) to adjusting rod end (18).

(11) Remove drag brace (23) as follows:
(a) Remove nut, washer, and bolt attaching drag brace (23) to truss assembly (20).
(b) Remove nut, washer, and bolt attaching drag brace to strut.

(12) Remove uplock torque tube (15) as follows:
(a) Remove cotter pin, nut, and washer at each end of torque tube.
(b) Remove bearing assemblies (16) by removing attaching nuts and bolts.

NOTE: Bearings are a press fit and should be removed only for replacement.

(13) Remove truss assembly (20), retracting arm (26), and adjusting fork (24) as an assembly as follows:
(a) Remove nut and bolt attaching switch bracket (21) to truss assembly (20).
(b) Remove clamps attaching electrical wires to retracting linkage and tie switch where it will not interfere with linkage removal.
(c) Remove nuts, washers, and bolts securing truss assembly (20) to retainers (25). Pull truss assembly forward and remove from airplane.
(d) If desired, retracting arm (26) and adjusting fork (24) may be removed from truss assembly by removing attaching nuts and bolts.

B. Installation (Refer to Figure 403).
(1) Install truss assembly (20) as follows:
(a) If removed, install retracting arm (26) and adjusting fork (24) on truss assembly with attaching bolts and nuts.

NOTE: Install bolts as shown for proper clearance. Lower retracting arm attaching bolt is inaccessible after truss assembly is installed.

(b) Place truss assembly in position and attach to retainers with bolts, washers, and nuts.
(c) Install clamps attaching electrical wires to retracting linkage and attach switch bracket (21) to truss assembly (20) with bolt and nut.

(2) Install uplock torque tube (15) as follows:
(a) If removed, install uplock hook (19) and adjusting rod end (18) to uplock torque tube.
(b) Install left bearing assembly (16), then place uplock torque tube in position and install right bearing assembly. Secure bearing assemblies with bolts and nuts.
(c) Install washer, nut, and cotter pin on each end of uplock torque tube assembly.

(3) Install drag brace (23) as follows:
(a) Attach drag brace to truss assembly (20) with bolt, washer, and nut.

NOTE: When installing bolt, insure that down indicator switch bracket (21) is properly in place.

(b) Connect drag brace (23) to strut with attaching bolt, washer, and nuts.

(4) Install connector link assembly (17) as follows:
(a) Attach connector link assembly to retracting arm (26) with bolt and nut.
(b) Attach connector link assembly to adjusting rod end (18) with bolt, washer, nut, and cotter pin.

(5) Install torque tube (11) as follows:
(a) Install collar (10) with pin and cotter pin.

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(b) If removed, install outboard support bearing (13) with bolts and nuts.

NOTE: Torque nuts attaching inboard and outboard support bearings to 13.5 pound-inches, +1.5 or -1.5 pound-inches.

(c) Install outboard washer on torque tube and place in position.

NOTE: Insert inboard end of torque tube through the inboard mounting hole from the left, pull into wheel well area until outboard end of torque tube can be inserted into outboard bearing assembly.

(d) Place inboard washer, then inboard support bearing (9) on inboard end of torque tube. Install support bearing with bolts and nuts.
(e) If removed, install fork bolt (7) in adjusting bellcrank (8).
(f) Install adjusting bellcrank (8) on torque tube with pin and cotter pin.

NOTE: Splines must align so that pin can be installed, and bellcranks (8 and 12) both extend forward from torque tube.

(6) Insert spacer (3) into idler bellcrank (5), place bellcrank into position and secure with bolt and washer.
(7) Attach intermediate push-pull tube (4) as follows:
(a) Attach intermediate push-pull tube to outboard bellcrank (12) with bolt, nut, and cotter pin.

NOTE: The collar end of the forward horizontal hi-shear rivet must point inboard for clearance.

(b) Attach intermediate push-pull tube (4) to idler bellcrank (5) with bolt, washer, and nut.

NOTE: To gain access to idler bellcrank attachment points, rotate bellcrank as far forward as possible.

(8) Install nose gear drive tube (1) as follows:
(a) Attach nose gear drive tube to idler bellcrank (5) with bolt, washer, spacers (3), and nut.
(b) Attach drive tube to landing gear actuator bellcrank.
(9) Install forward push-pull tube (6) as follows:
(a) Using the manual extension system, operate gear to the DOWN position, then crank gear a few turns toward the UP position.
(b) Attach push-pull tube (6) to connector link assembly (17) with bolt, washer, nut, and cotter pin.
(c) Attach push-pull tube (6) to fork bolt (7) with bolt, nut, and cotter pin.
(10) Rig nose gear retracting linkage, refer to Chapter 32, Nose Gear - Adjustment/Test.
(11) Connect and rig nose gear doors, refer to Chapter 52, Landing Gear Doors - Adjustment/Test.
(12) Install floorboards, carpet, seats, and access covers.
(13) Insure that landing gear is DOWN and locked then remove airplane from jacks.

4. Landing Gear Actuator

A. Removal (Refer to Figure 404).
(1) Remove inboard drive tubes (5 and 8) in accordance with removal procedures for inboard retracting linkage components.
(2) Remove lower bellcrank (21) and pulley (18) as a unit from sector shaft; leave step cable and aft nose gear drive tube (17) connected.
(3) Disconnect manual extension disengage rod (12) by removing cotter pin and pin.
(4) Disconnect manual extension drive tubes by removing three cotter pins, washers, and pins. To disconnect, slide universal joint (16) aft and inner shaft (15) forward.
(5) Remove safety wire from all bolts which must be removed.

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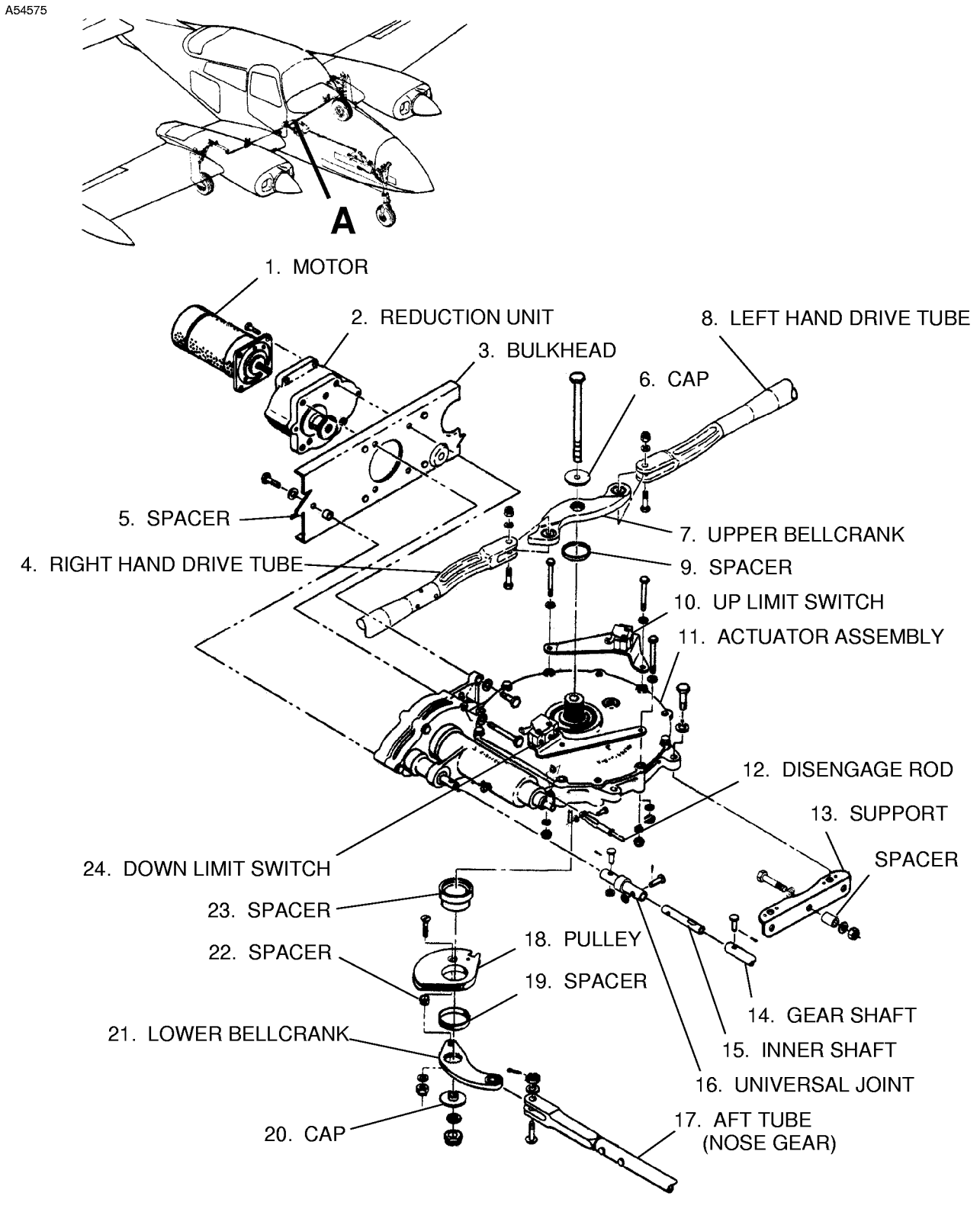

Landing Gear Actuator
Figure 404 (Sheet 1)

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(6) Remove four bolts and washer attaching reduction unit (2) and actuator assembly (11) to bulkhead (3).

NOTE: To remove reduction unit (2) or motor (1) from airplane, remove four bolts. When removing motor, disconnect and tag electrical wires at the relays to ensure proper reinstallation.

(7) Remove four nuts, washers, and bolts attaching switches (10 and 24) and brackets to actuator assembly (11). Do not disturb switch settings except to replace switches or brackets.
(8) Remove bolts and washers attaching actuator assembly (11) to support (13).
(9) Remove remaining bolt, washer, and spacer (4) and remove actuator from airplane.

B. Installation (Refer to Figure 404).
(1) Position actuator assembly (11) being sure that lower bellcrank (21) and pulley (18) is positioned so as not to cause damage to lower skin. Install spacer (23) and lower bellcrank (21) on lower end of sector shaft. Universal joint (16) and inner shaft (15) must be in place before positioning actuator.

NOTE: Support entrance step in retracted position to facilitate installation of lower bellcrank and pulley. When installing lower bellcrank, align the index punch mark on the bellcrank with the chamfered spline on the sector.

(2) Install spacer (4), washer, and bolt attaching actuator to bulkhead (3).

NOTE: To facilitate installation, install all actuator assembly attaching bolts before any are tightened.

(3) Install two bolts and washers attaching actuator assembly (11) to support (13).
(4) Install switches (10 and 24) and brackets to actuator assembly (11) with bolts, nuts, and washers.
(5) Install bolts, washers, and nuts attaching actuator assembly to mounting channels.
(6) Install four bolts and washers attaching actuator assembly (11) and reduction unit (2) to bulkhead (3).

NOTE: Shim as required between reduction unit (2) and bulkhead (3) to align reduction unit gear with the drive gear in the actuator.

CAUTION: Use of bolts of improper length may cause damage or binding.

(7) If removed, install four bolts attaching motor (1) to reduction unit (2).
(8) If motor was removed, connect the electrical wires at the appropriate relay as previously marked.
(9) Tighten all nuts and bolts which were installed but not tightened.
(10) Safety wire bolts attaching motor (1) to reduction unit.
(11) Safety wire bolts attaching actuator to bulkhead.
(12) Connect manual extension drive tubes with pins and cotter pins.
(13) Connect manual extension disengage rod (12) with pin and cotter pin.
(14) Insert LH inboard drive tube (8) through opening in fuselage skin until upper bellcrank (7) is in position to be installed on sector shaft with the threads of attaching bolts in the UP position.

NOTE: If inboard drive tubes were disconnected from upper bellcrank, ensure that bow in end fittings is properly positioned.

(15) Place spacer (9) and upper bellcrank (7) on sector shaft.

NOTE: When installing upper or lower bellcrank, align the index punch mark on the bellcrank with the chamfered spline on the sector shaft.

(16) Insure that lower bellcrank (21) and spacer (19) are correctly placed and secure with bolt, caps (6 and 20), washer, and nut.

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(17) Connect RH inboard drive tube to idler with bolt, washers, spacers, and nuts.
(18) Connect LH inboard drive tube to idler bellcrank with bolt, washer, and nut.
(19) Perform an operational check of landing gear system.

5. Manual Extension System

A. Removal (Refer to Figure 405).
(1) Remove pilots seat, refer to Chapter 25, Flight Crew Seats - Removal/Installation.
(2) Remove passenger seat, refer to Chapter 25, Passenger Compartment - Removal/Installation
(3) Remove center carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(4) Remove floorboards between front and rear spar above landing gear actuator.
(5) Remove chain guards by removing attaching screws.
(6) Remove chain (12) by disconnecting at the master link.
(7) Remove crank handle and shaft assembly as follows:
(a) Remove roll pin, collar (1), and washer (2) from shaft (6).
(b) Remove cotter pin and pin attaching spool (4) to shaft (6).
(c) Pull crank handle and shaft from supports, removing spool (4) as shaft is pulled through it.
(8) If desired, disassemble crank handle and shaft by removing nut, bolt, cotter pins, and pins.
(9) Remove upper rod assembly (16) by removing cotter pins, washers, and pins attaching rod assembly to bellcranks (15 and 17).
(10) Remove upper bellcrank (15) by removing nut, washers, and bolt. Remove bushing (14) from bellcrank.
(11) Remove lower rod assembly (18) by removing cotter pins, washer, and pins attaching rod assembly to lower bellcrank and landing gear actuator.
(12) Remove lower bellcrank (17) by removing nut, washer, spacer, and bolt.
(13) Remove chain tightener (11) by removing attaching screw and washer, and adjusting screw, washers, and nut.
(14) Remove gear support bracket (21) as follows:
(a) Disconnect shafts (27 and 28) and universal joint (29) by removing the three cotter pins, washers, and pins.
(b) Slide universal joint (29) aft and inner shaft (28) forward to disconnect.
(c) Remove two bolts and nuts attaching gear support bracket to front spar.
(d) Remove two screws, washers, and nuts attaching gear support bracket to bottom of fuselage.
(15) If desired, disassemble gear support bracket as follows:
(a) Remove three roll pins attaching sprocket (23) and gears (24 and 26) to gear shafts (22 and 27).
(b) Remove snap ring (25) from gear shaft (22).
(c) Remove gear shaft (22) through the left side of the bracket, removing sprocket (23) and gear (24) as shaft is removed.
(d) Remove gear (26) and shaft (27) from gear support bracket.

NOTE: The bearings in which the gear shafts rotate are a press fit and should be removed only for replacement.

B. Installation (Refer to Figure 405).
(1) If disassembled, assemble gear support bracket (21) as follows:
(a) If removed, press bearings into gear support bracket.
(b) Assemble gear (26) to shaft (27) with attaching roll pin and insert into position in gear support bracket.
(c) Insert shaft (22) through the left side of gear support bracket, through sprocket (23) and gear (24). Install two roll pins attaching sprocket and gear to shaft, and safety all three roll pins.
(d) Install snap ring (25) on gear shaft (22).
(2) Install gear support bracket (21) as follows:
(a) Place universal joint (29) on actuator shaft (30) and slide aft.
(b) Insert inner shaft (28) into gear shaft (27) and slide forward.
(c) Position gear support bracket in airplane and attach to fuselage bottom with two screws, washers, and nuts.

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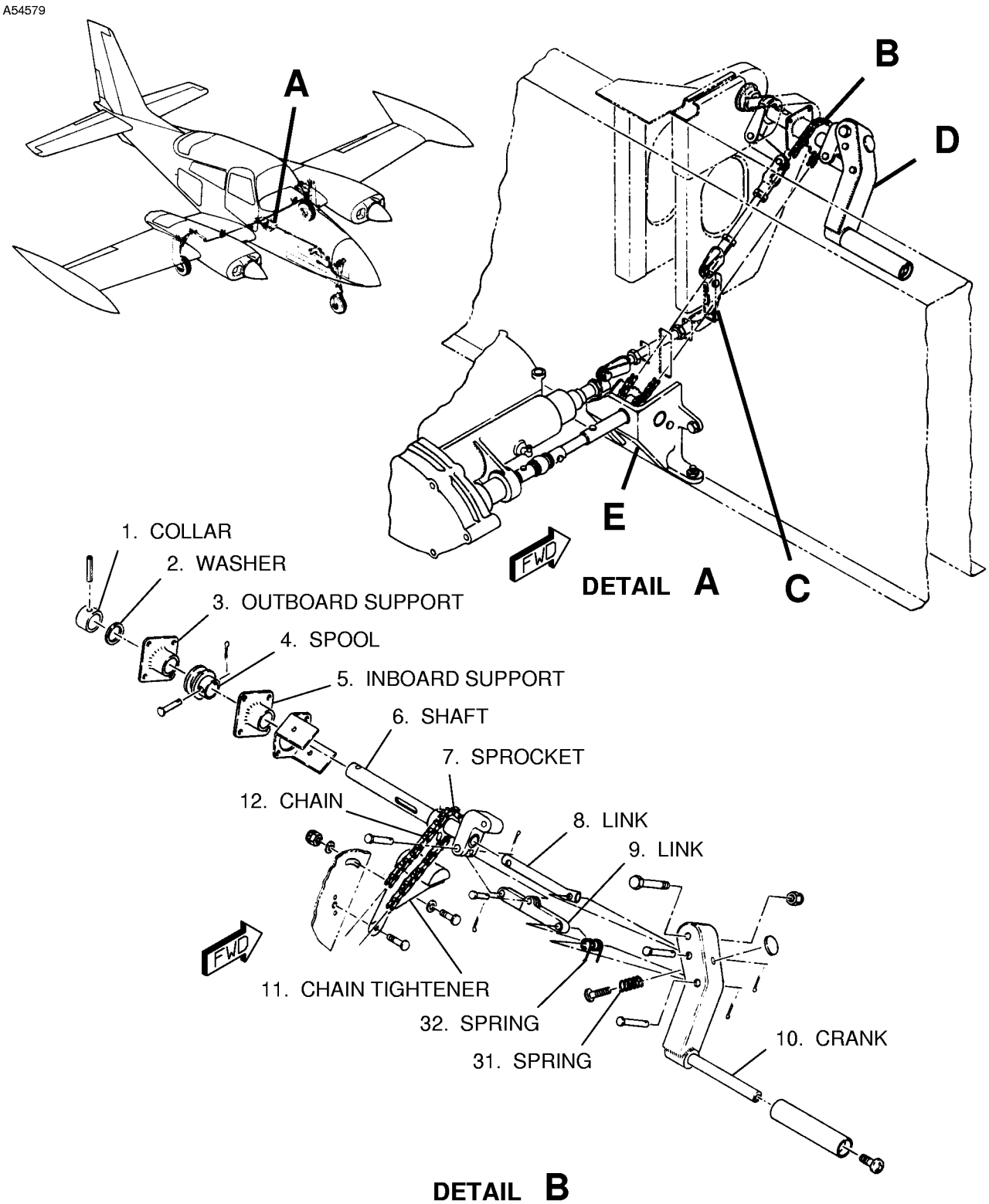

Manual Extension System
Figure 405 (Sheet 1)

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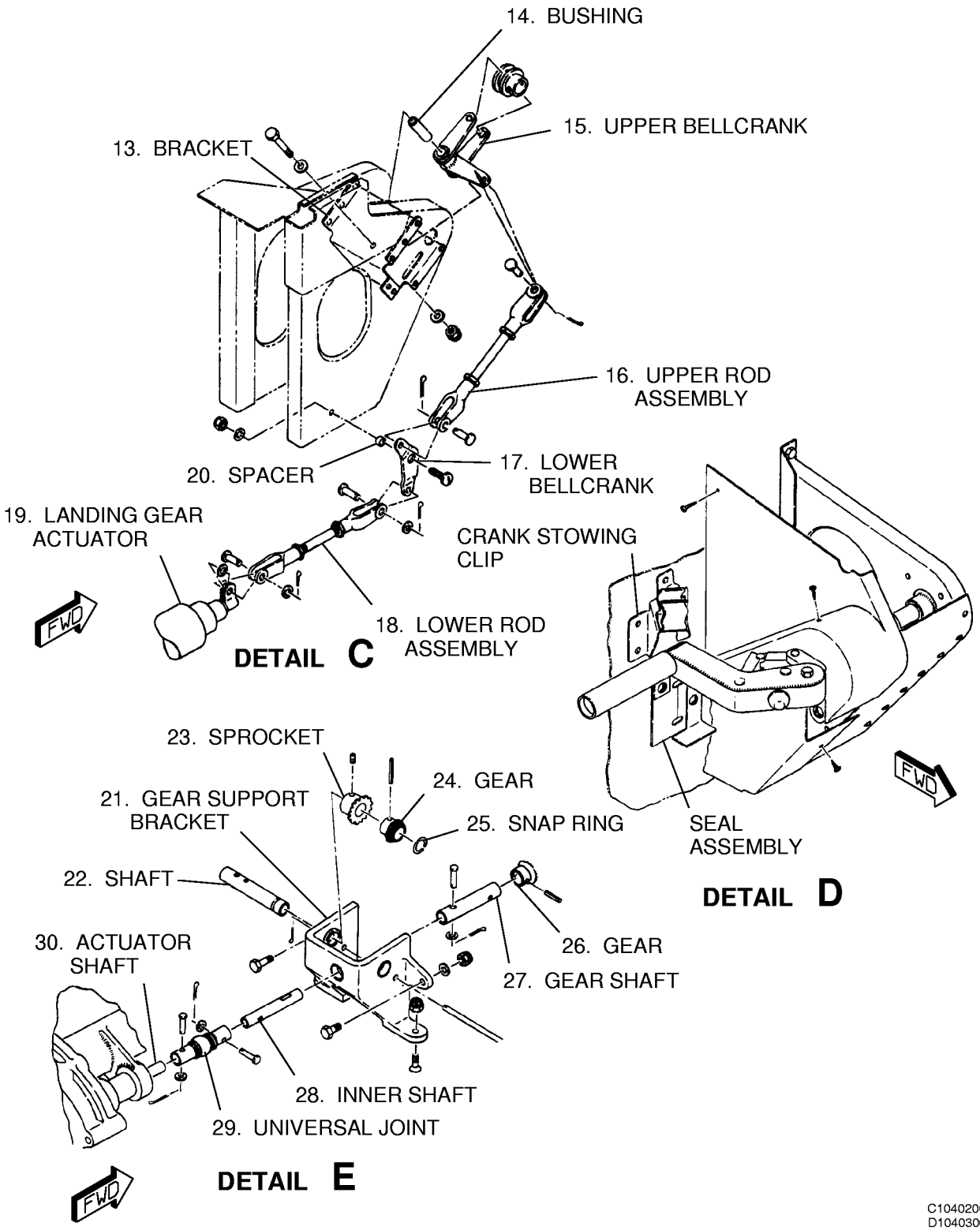

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Manual Extension System
Figure 405 (Sheet 2)

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(d) Install two bolts and nuts attaching gear support bracket to front spar.
(e) Align the holes in the shafts connecting miter gear assembly to landing gear actuator, and install pins, washers, and cotter pins.

NOTE: AN3-6A bolts, AN960-PD10 washers, and NS21042-3 nuts may be installed in lieu of pins.

(3) Install chain tightener (11) with attaching screw and washer. Install adjusting screw, washers, and nut, but do not tighten at this time.
(4) Install lower bellcrank (17) with bolt, spacer (20), washer, and nut.
(5) Insert bushing (14) into upper bellcrank (15) and install bellcrank with bolt, washers, and nut.
(6) If disassembled, reassemble crank handle and shaft with pins, cotter pins, nut, and bolt.
(7) Install crank handle and shaft assembly as follows:
(a) Insert crank handle and shaft through inboard support (5), spool (4), and outboard support (3).
(b) Engage upper bellcrank (15) with spool (4), align spool attaching holes, and install pin and cotter pin.
(c) Place washer (2) and collar (1) on shaft (6), install roll pin and safety.

NOTE: Washer (2) is used as required to eliminate end play from the shaft assembly.

(8) Install chain (12) on sprockets (7 and 23) and connect with master link. Adjust chain tightener (11), and tighten adjusting screw and nut.
(9) Attach lower rod assembly (18) to lower bellcrank (17) and landing gear actuator (19) with pins, washers, and cotter pins.
(10) Attach upper rod assembly (16) to bellcranks (15 and 17) with pins, washers, and cotter pins.
(11) Install chain guards with attaching screws.
(12) Install access covers on cabin floor above landing gear actuator.
(13) Install center carpet, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(14) Install passenger seat, refer to Chapter 25, Passenger Compartment - Removal/Installation
(15) Install pilots seat, refer to Chapter 25, Flight Crew Seats - Removal/Installation.

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EXTENSION AND RETRACTION - ADJUSTMENT/TEST

1. Manual Extension System

A. Rigging (Refer to Figure 501).

(1) Place hand crank in operating position.

(2) Adjust lower rod assembly (18) to a length of approximately 4.80 inches, measured between the center lines of rod end bolt holes, and install.

(3) Pull lower rod assembly forward until internal gear in landing gear actuator reaches the end of its travel and adjust upper rod assembly (16) so that rod end bolt holes align with holes in upper and lower bellcranks (15 and 17).

(4) Lengthen upper rod assembly (16) one-half turn and install.

NOTE: If the upper rod assembly adjustment cannot be obtained because of excessive amount of threads would be exposed, readjust lower rod assembly to obtain the desired result and repeat steps (3) and (4).

(5) Adjust chain tightener (11) to remove excessive slack from chain (12).

(6) Perform operational check of manual extension system to verify system functions properly.

CAUTION: Do not use the manual extension system to fully retract the landing gear except when manually pushing upward on all landing gear to relieve strain on manual extension system.

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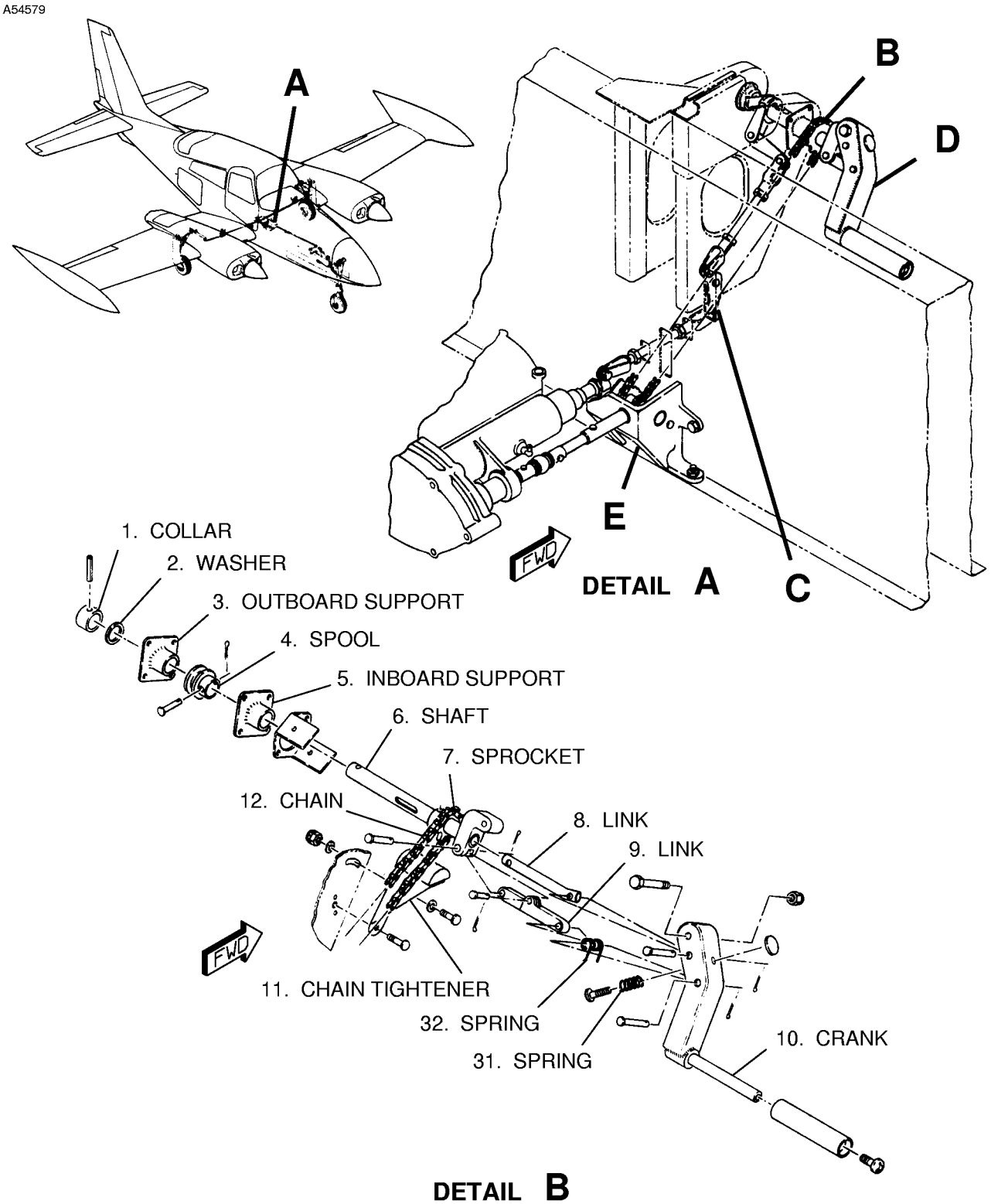

Manual Extension System
Figure 501 (Sheet 1)

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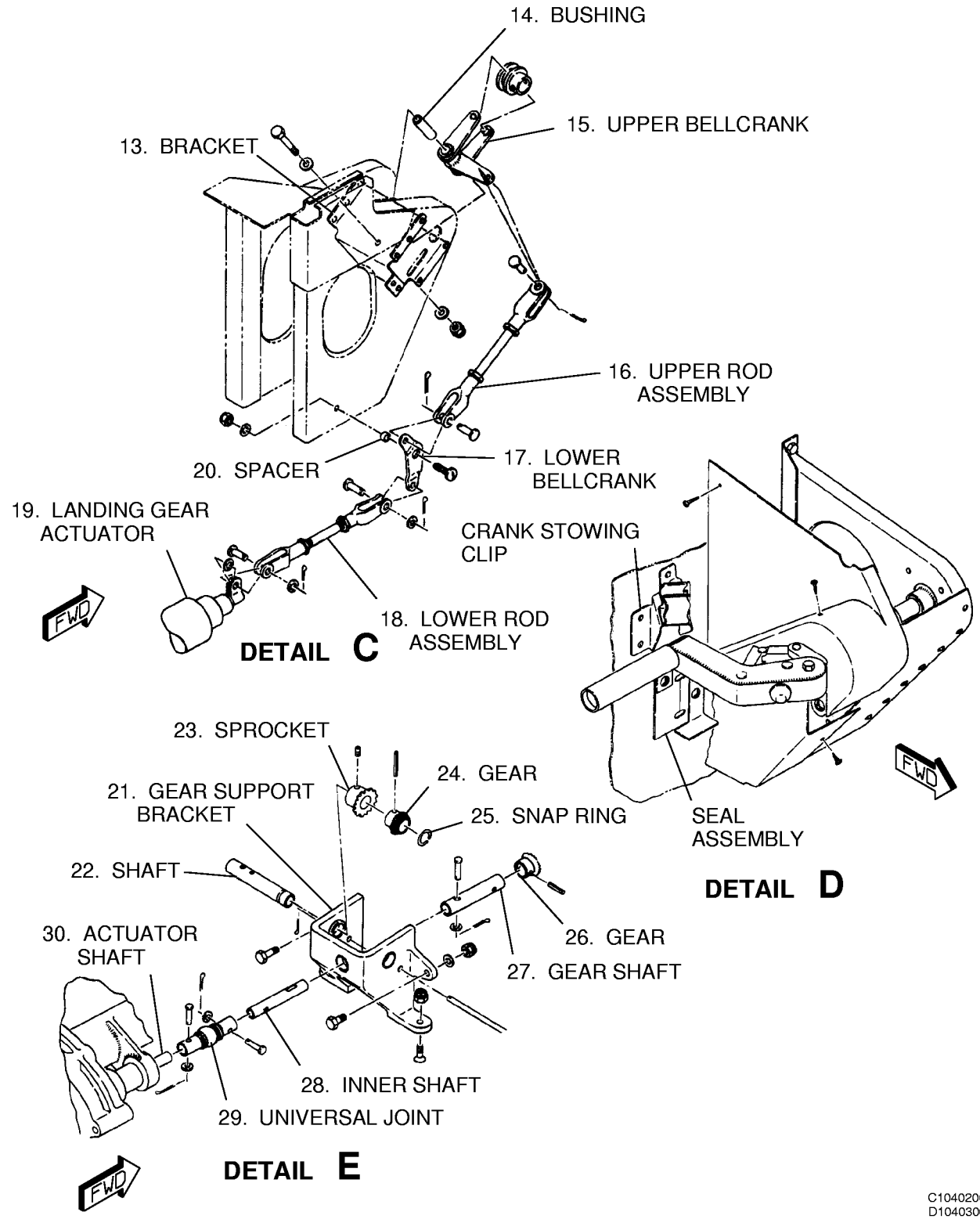

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Manual Extension System
Figure 501 (Sheet 2)

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EXTENSION AND RETRACTION - INSPECTION/CHECK

1. Landing Gear Actuator

A. Operational Check.

(1) Check landing gear actuator for proper operating times as follows:

(a) Flight check for excessive noise and for free, proper operation.

NOTE: Use maximum airspeeds placarded in airplane for extension and retraction tests.

(b) Flight check time for full retraction UP, amber light on 10 to 14 seconds. Time for full extension DOWN, green lights on 5 to 9 seconds.

(c) If during flight check, the landing gear will not retract and extend within the time limit described in step (b), remove the landing gear motor and perform the following no load test:

1 Mount motor securely in a horizontal position.

2 Connect motor as shown in Figure 601 to a variable 30 volt, DC power supply.

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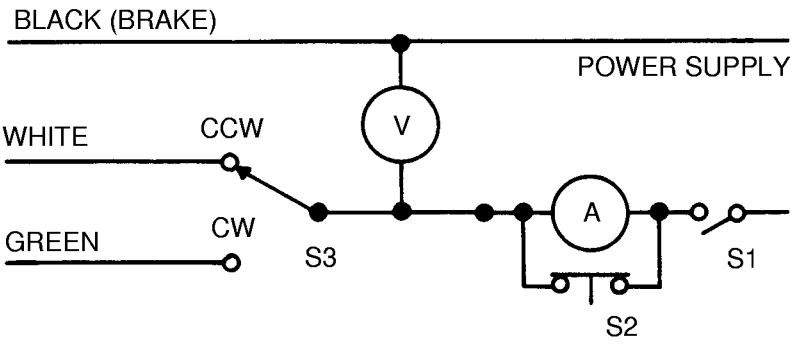

V = VOLTMETER, DC, 7.5/30/75, TYPE DP-11, NO. 50-202011 RCPF
A = AMMETER, DC 5/20/50, TYPE DP-11, NO. 50-202111 RXPS
S1 = SWITCH, SPST 30 AMPERE CAPACITY, NO. 707
S2 = SWITCH - PUSH BUTTON NO. CR2940-UA202B
S3 = SWITCH, DPDT NO. 2565K5

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Schematic Test Connection Diagram
Figure 601

3 Connect switch S3 for either direction.

4 OPEN switch S2 to read ammeter.

5 CLOSE switch S1 to start motor.

6 Gradually increase voltage from zero until the brake releases.

NOTE: The brake releasing may be indicated either by sound or the armature starting to turn.

7 Read voltmeter when brake releases. Brake must release at or less than 18 volts.

8 Stop motor, CLOSE switch S3 for opposite rotation and repeat steps 3 thru 7.

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9 Voltage must be within the same limits as previous rotation.
10 If the voltage is not within the limits as described in step 7, refer to Extension and Retraction - Troubleshooting.
11 Run motor in each direction as shown connected in Figure 601 with 24 volts DC applied.
12 OPEN switch S2 and read ammeter current. The ammeter should read approximately 7.5 amperes under no load, when the RPM is approximately 4000 RPM.
13 Stop motor, CLOSE switch S3 for opposite rotation and repeat step 11.
14 Motor should operate within limits as described in step 12.
15 If the motor does not operate within the limits as described in step 12, refer to Extension and Retraction - Troubleshooting.

(d) If the motor will not meet operating requirements after performing no load check, replace motor and repeat step (b).
(e) If the gear still will not meet flight check requirements, check all linkage and hinge points for binding or interference.
(f) If no evidence of binding or interference is found, landing gear actuator must be replaced or overhauled in accordance with Cessna Landing Gear and Flap System Components Overhaul/Parts Manual.

2. Manual Extension System

A. Operational Check.

NOTE: This check must be accomplished during flight.

(1) Place the landing gear actuator switch in OFF position.
(2) Manually extend the landing gear, counting the number of turns required to illuminate the green lights. Forty-seven to fifty-four turns are required to illuminate the lights.

3. Nose and Main Landing Gear Extension and Retraction System Check

A. Disconnecting Landing Gear Doors (Refer to Figure 602).
(1) Run the landing gear up approximately 20 to 30 degrees.
(2) Disconnect the inboard main landing gear doors at the upper attachment of the door link actuator tube. Retain attaching hardware.
(3) Disconnect the nose landing gear door at the upper attachment of the door link actuator tube. Retain attaching hardware.

NOTE: Always disconnect the door link tube from the upper connection to prevent the possibility of connecting the lower connection to the wrong side of the bell crank.

B. Actuator Up and Down Limit Switch Check (Refer to Figure 603).
(1) Disconnect the inboard drive tubes at the outboard ends on the main gear, and at the aft end of the nose gear push-pull tube.
(2) Operate landing gear to the up and locked position and turn switch OFF.
(3) Engage manual extension crank and note the angular position of the crank handle.
(4) Turn handle counterclockwise until the internal up stop is reached.

NOTE: The internal stop should be reached in approximately 3/4 to 1-1/2 turns.

(5) If the internal stop is not reached in 3/4 to 1-1/2 turns, run landing gear down halfway and adjust up limit switch until the correct number of turns are obtained.

NOTE: Each time the actuator switches are adjusted, the landing gear must be operated approximately halfway down then back up before noting the number of turns required to reach the internal stop. Always assure clearance for drive tubes and push-pull tube when operating the gear actuator up and down.

(6) Operate the landing gear to the down and locked position.

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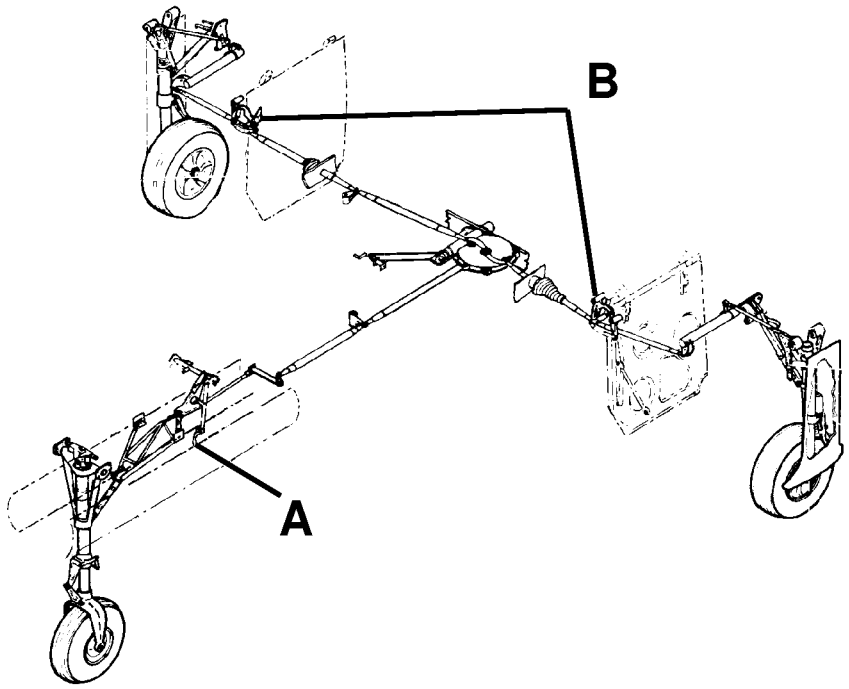
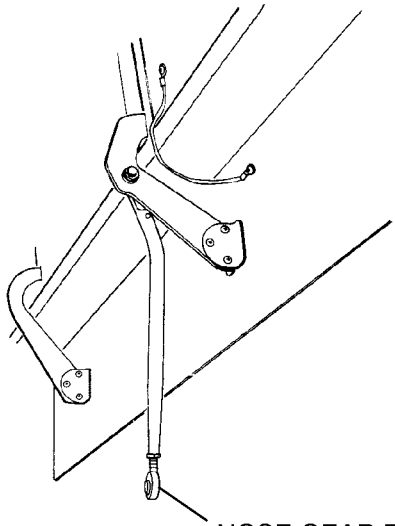
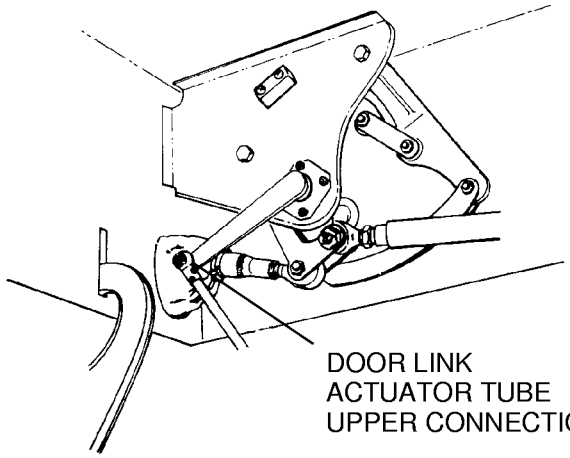




NOSE GEAR DOOR
LINK ACTUATOR
TUBE UPPER
CONNECTION

DETAIL A
NOSE GEAR DOOR LINKAGE
(LINKAGE NOT CONNECTED)



DOOR LINK
ACTUATOR TUBE
UPPER CONNECTION

DETAIL B
MAIN GEAR DOOR LINKAGE
(RIGHT SIDE SHOWN,
LEFT SIDE OPPOSITE)

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Disconnecting Landing Gear Doors
Figure 602 (Sheet 1)

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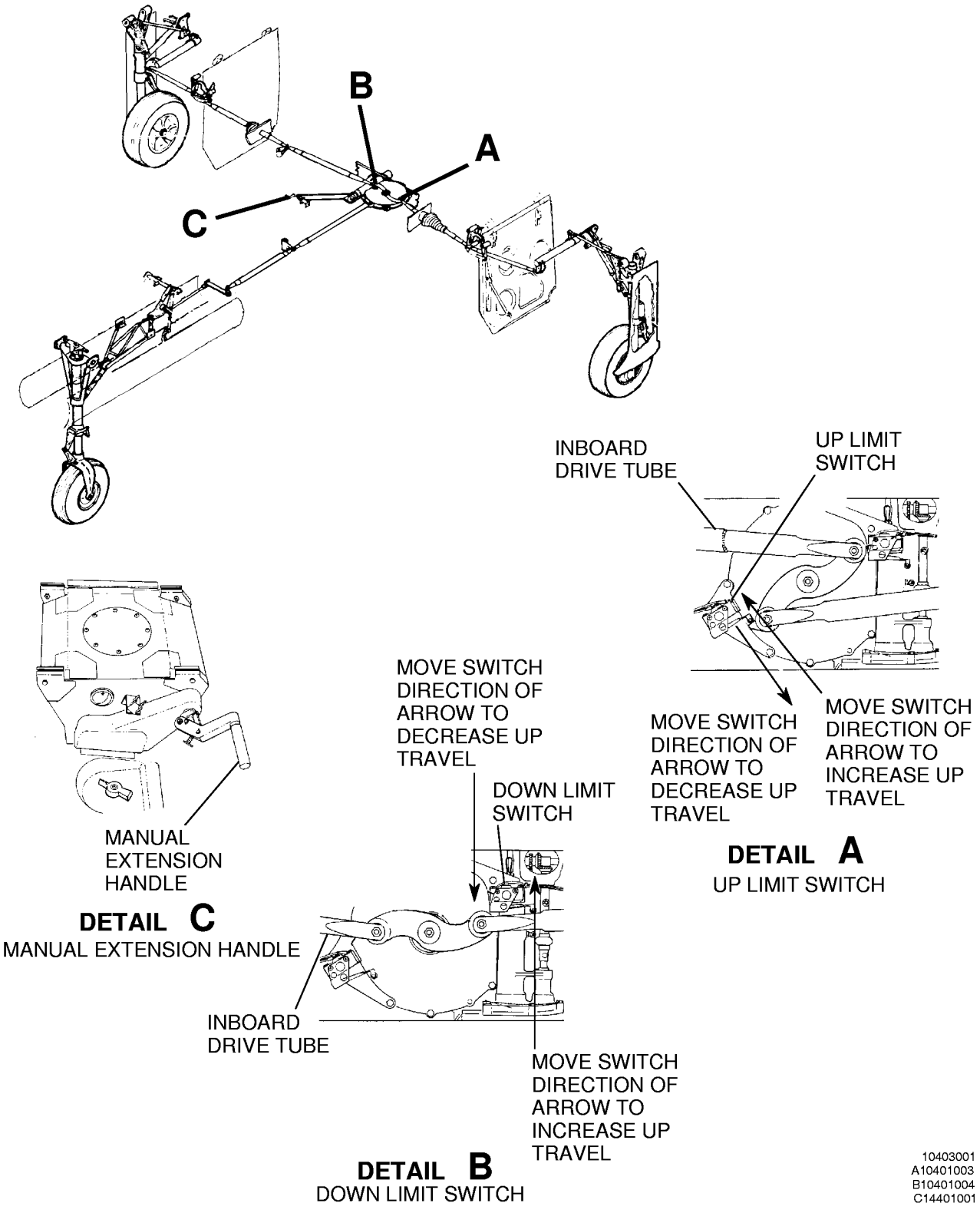

Disconnecting Landing Gear Doors
Figure 603 (Sheet 1)

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(7) Connect inboard drive tubes at the outboard ends on the main gear and at the aft end of push-pull tube on the nose gear.
(8) Engage manual extension crank and note the angular position of the crank handle.
(9) Turn handle clockwise until the internal down stop in the actuator is reached.

NOTE: The internal stop should be reached in approximately 1 to 2 turns.

(10) If the internal stop is not reached in 1 to 2 turns, the landing gear actuator down limit switch must be adjusted until the proper number of turns are obtained.

CAUTION: During manual extension of the landing gear, never release the manual extension crank, damage could result to personnel and the skirt of the pilot's seat.

C. Main Gear Door Tension (Refer to Figure 604).
(1) Check the operation of the Landing Gear
(a) Visually check the drive tubes, idlers, trunnions and wheel well areas for the following:
1 Nicks
2 Cracks
3 Dents
4 Bends
5 Looseness
6 Wear and any other visible damage.

NOTE: If any part of the landing gear system is questionable, do not hesitate to reject it.

(b) Inspect the landing gear retraction linkage for excessive wear, looseness, dents, cracks, bends or deep scratches.
(c) Check main gear trunnion roll pin in pivot shaft for looseness.

D. Main Gear Door Tension (Refer to Figure 605).
(1) Run the gear to the down position.
(2) Check main gear door tension is between 25 pounds +10 or -10 pounds.
(a) If the main gear door is not between 25 pounds +10 or -10 pounds.
1 Adjust inboard drive tube rod ends in half turn increments to obtain proper tension.
a Shortening the rod end will increase door tension.
b Lengthening the rod end will decrease door tension.
(3) The tension should be 25 pounds +10 or -10 pounds in the up position and a maximum of 10 pounds difference from the down position. Adjust up limit switch (see Detail B) to obtain proper tension.

NOTE: Check hand crank for number of turns to internal stop after obtaining tension. The hand crank should turn 3/4 to 1-1/2 turns.

E. Main Landing Gear Free Fall (Refer to Figure 606).
(1) Check the main gear free fall by breaking the main lock links as shown in Figure 606, Detail A.
(2) Raise gear inboard approximately 6 inches. Refer to Figure 606 Detail B.

NOTE: When checking main gear for free fall, the outboard drive tube must be disconnected as shown in Detail D.

(3) If the gear does free fall down and locked, disconnect end fitting and lengthen 1/2 turn, reconnect and check free fall.
(4) If the gear does not free fall to a down and lock position, visually check the following:
(a) Drive tubes for bends, breaks, binding and damage.
(b) Trunnion bolts for seizing, binding, alignment and lubrication.
(c) Lock link brace for alignment, overcenter travel, bending and breaks.

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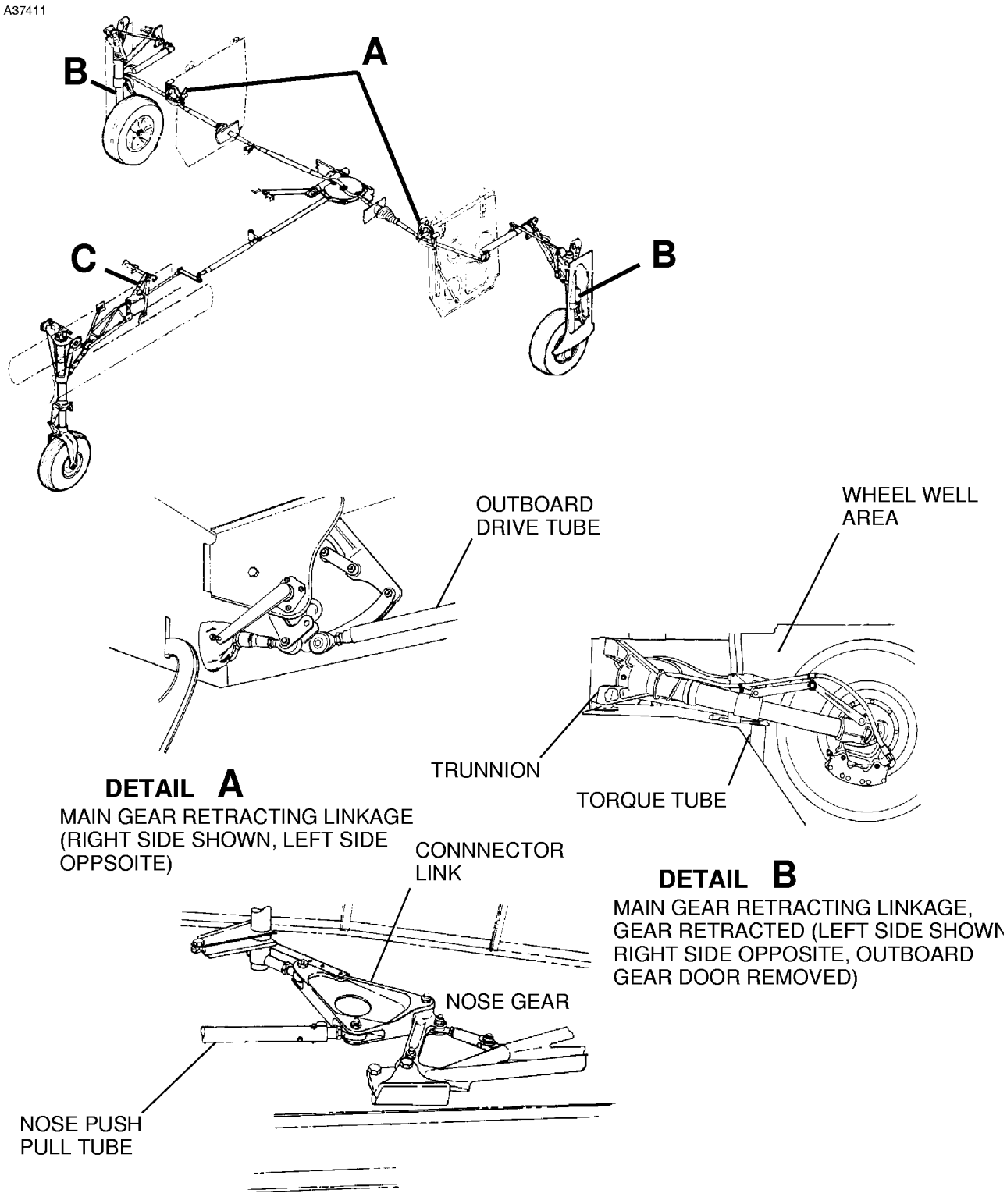

Drive Tubes, Trunnions, Retracting Linkage, and Wheel Well Check
Figure 604 (Sheet 1)

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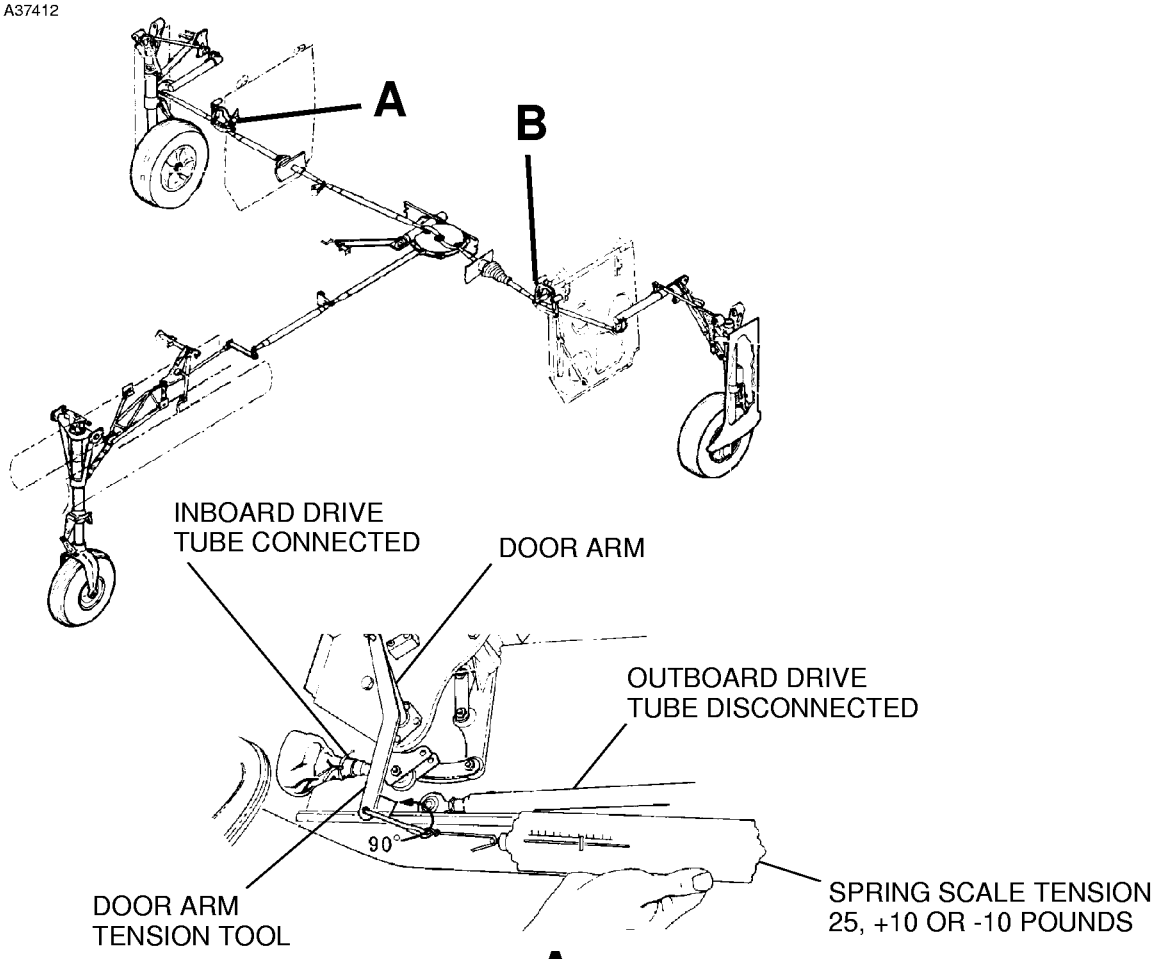
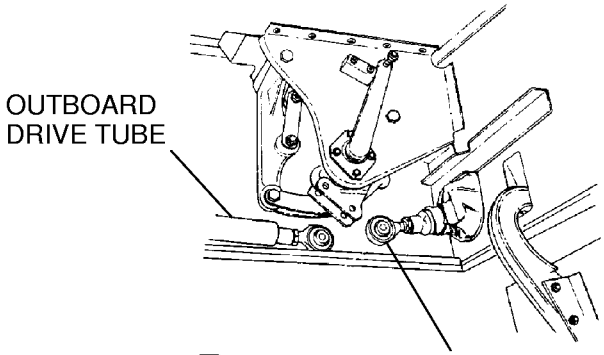


DETAIL A
MAIN GEAR DOOR TENSION CHECK
(RIGHT SIDE SHOWN, LEFT SIDE OPPOSITE)



DETAIL B
MAIN GEAR DOOR TENSION ADJUSTMENT
(LEFT SIDE SHOWN, RIGHT SIDE OPPOSITE)

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B14401003

Main Gear Door Tension
Figure 605 (Sheet 1)

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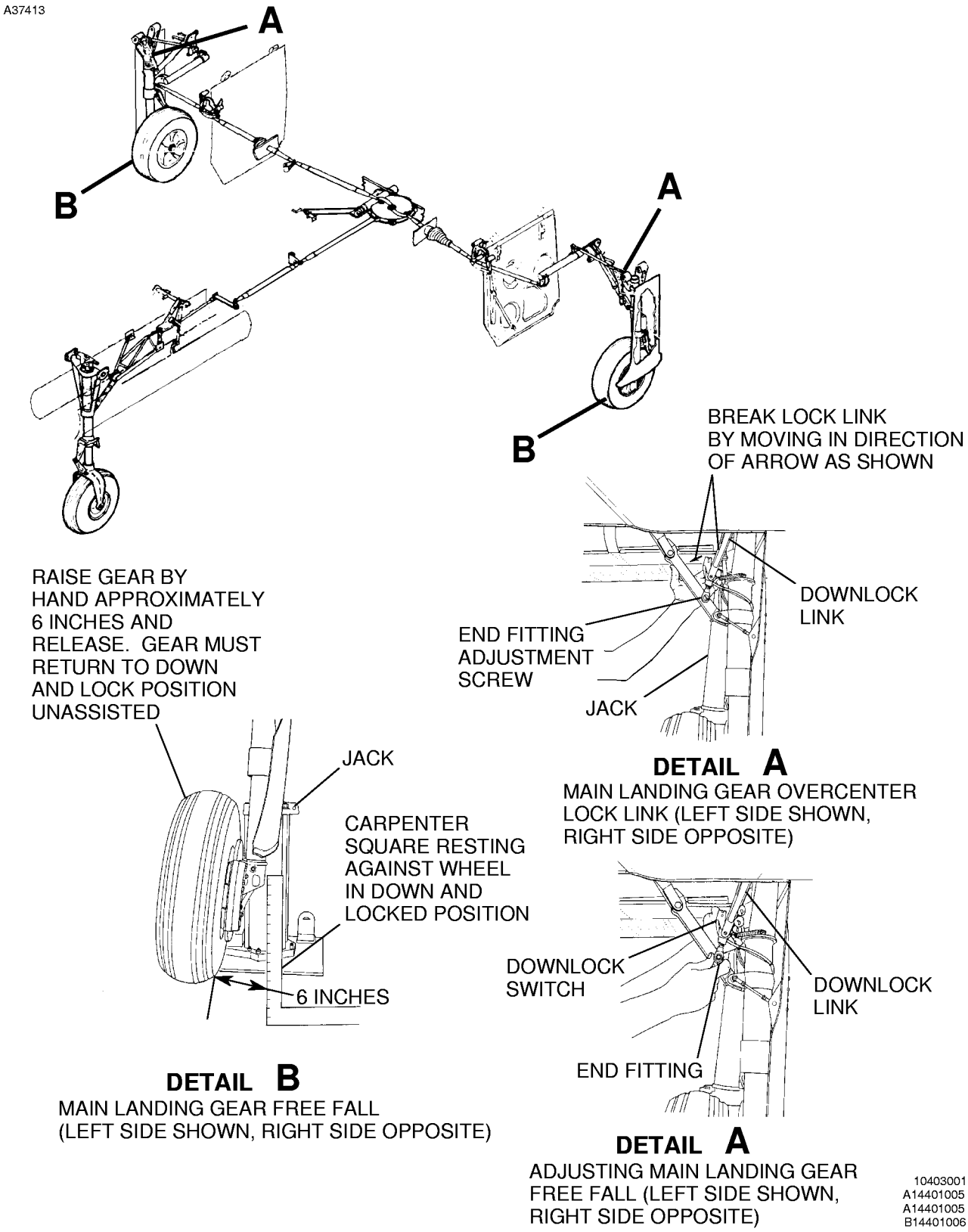

Main Landing Gear Free Fall
Figure 606 (Sheet 1)

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(d) Side brace for proper overcenter engagement, bolts for proper torque, (refer to Torque Chart, Section 1).
(e) Bolts in wheel well area for binding and interference.
(f) If Items "a" thru "e" check satisfactorily, shorten adjusting screw in small increments until gear will free-fall down and locked.

NOTE: Shorten adjustment screw in small increments to allow gear to free fall and the side brace, down links to go overcenter. Check safety and secure.

(g) After adjusting, make sure the landing gear is down and locked and the down and lock indicator light is properly adjusted. (See Detail N.)

F. Main Landing Gear Drop Off (Refer to Figure 607).
(1) Disconnect the main gear uplock push-pull tube. Refer to Figure 608.
(2) Operate the landing gear up and measure the drop off as shown. Refer to Figure 607 Detail A.
(a) If the drop off is not 1/8 to 1/4 inches, refer to Detail D-1 and adjust outboard drive tube.
1 Lengthen the outboard drive tube to decrease the amount of drop off. Shorten the outboard drive tube to increase drop off.
a Reconnect uplock hooks.

G. Uplock Hook Engagement (Refer to Figure 608).
(1) Inspect the main gear uplock hooks for proper engagement.
(a) Retract landing gear.
1 Check engagement of main gear uplock hooks to the uplock spacers.
(2) Adjustment.
(a) If the main gear uplock hooks do not engage properly, adjust the uplock hooks until the hooks make full contact with the surface of the spacers.
1 Lengthening the uplock push-pull tube counterclockwise will move the uplock hooks away from the spacers.
a Shortening the uplock push-pull tube will pull the uplock hooks in closer to the spacers.
(3) After adjustment, the uplock hooks must engage and disengage freely with no binding.

H. Main Gear Down Lock Tension (Refer to Figure 609).
(1) Inspect the main gear down lock tension for proper adjustment.
(a) Position landing gear in the down position.
(b) Check main gear down lock for proper engagement and tension (40 to 60 pounds).

NOTE: When checking down lock tension always place a finger on the down lock switch, pull scale at a right angle to the lock link and read the scale at the point when switch actuation can be felt.

(2) Adjustment.
(a) If the down lock tension is not 40 to 60 pounds, adjust push-pull tube in one half turn increments until proper tension is obtained. If the down lock tension is in excess of 60 pounds, the down lock tension should be rigged 40 to 50 pounds. Lengthening the push-pull tube decreases and shortening the push-pull tube increases tension.
1 When shortening or lengthening the outboard push-pull tube the fork bolt must be lengthened or shortened a corresponding amount of turns so that the combined length of the two parts does not change.

I. Nose Gear Connector Link Overcenter Check (Refer to Figure 610)
(1) Inspect the nose gear connector link for correct overcenter adjustment.
(a) Refer to Figure 610, Detail A.
(b) Disconnect nose gear push-pull tube.
(c) When force, 3 to 7 pounds, is applied in direction of arrow and released, link must snap firmly overcenter.
(2) Adjustment.
(a) Refer to Figure 610, Detail B.

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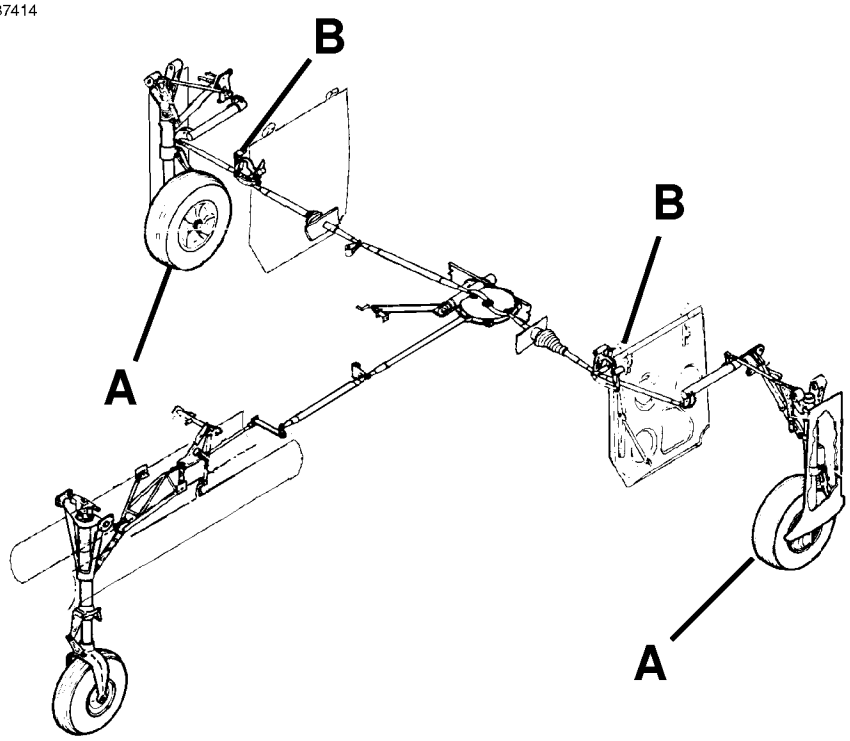
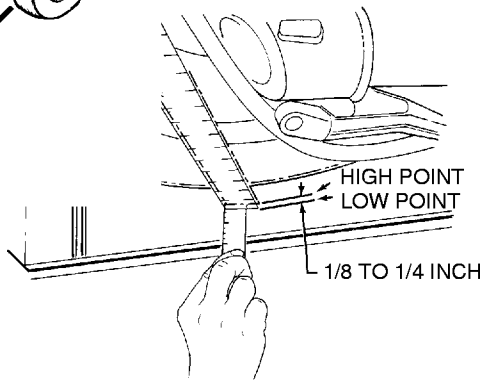
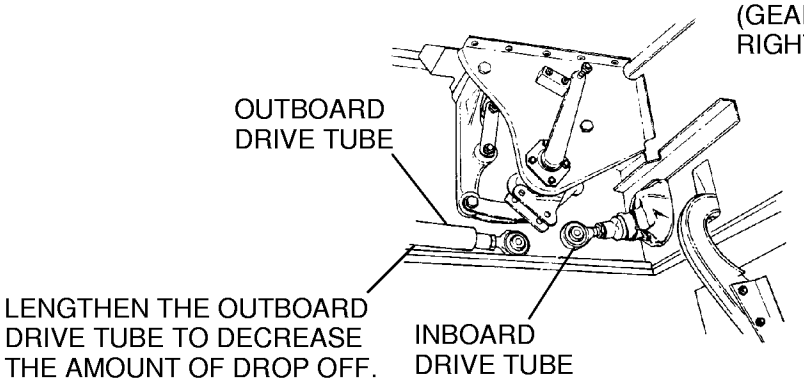
A37414





DETAIL A
MAIN LANDING GEAR DROP OFF CHECK
(GEAR RETRACTED, LEFT SIDE SHOWN,
RIGHT SIDE OPPOSITE)



DETAIL B
MAIN LANDING GEAR DROP OFF ADJUSTMENT
(LEFT SIDE SHOWN, RIGHT SIDE OPPOSITE)

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A14401013
B14401003

Main Landing Gear Drop Off
Figure 607 (Sheet 1)

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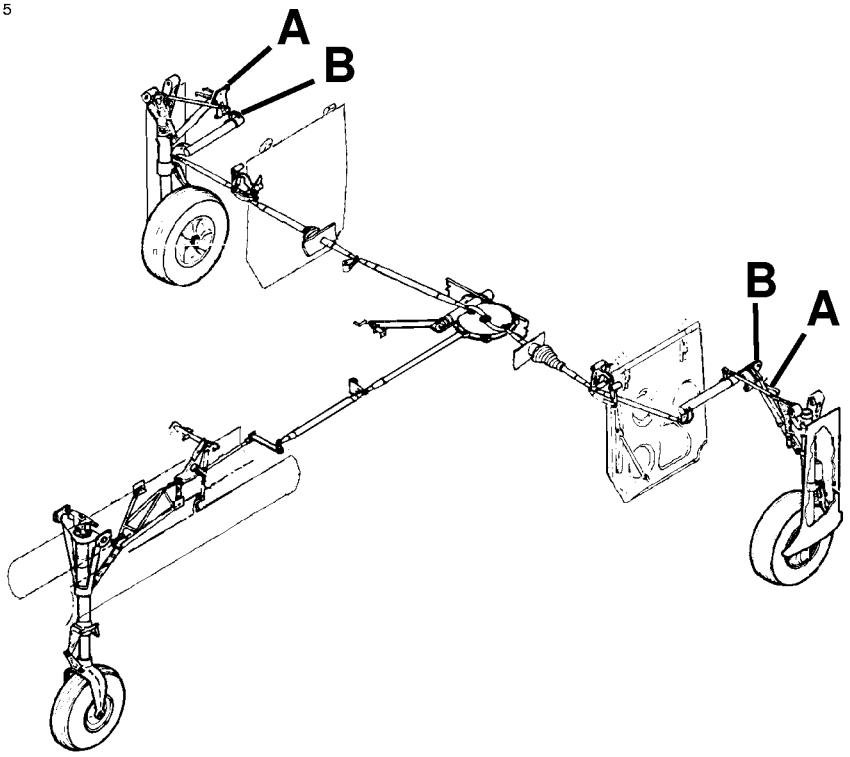
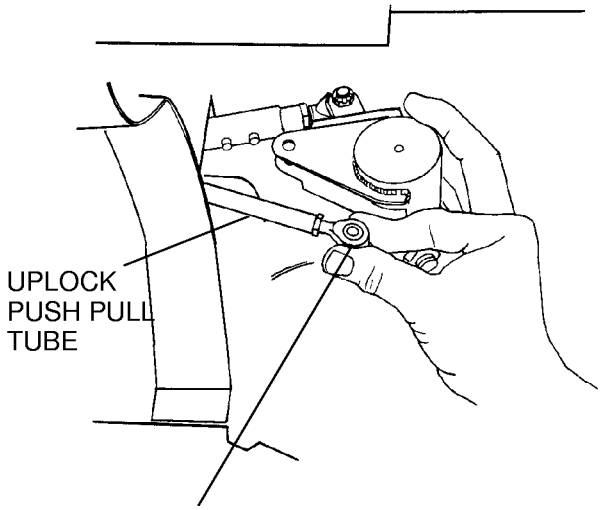
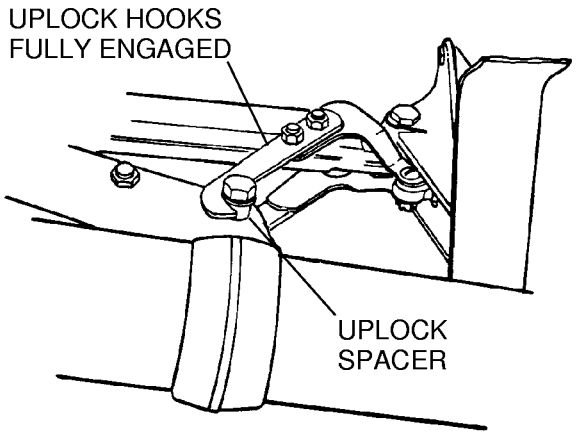
A37415





DETAIL B
MAIN LANDING GEAR UPLOCK
HOOK ENGAGEMENT ADJUSTMENT
(LEFT SIDE SHOWN, RIGHT SIDE OPPOSITE)



DETAIL A
MAIN LANDING GEAR UPLOCK
HOOK CHECK FOR ENGAGEMENT

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A14401028
B14401014

Uplock Hook Engagement
Figure 608 (Sheet 1)

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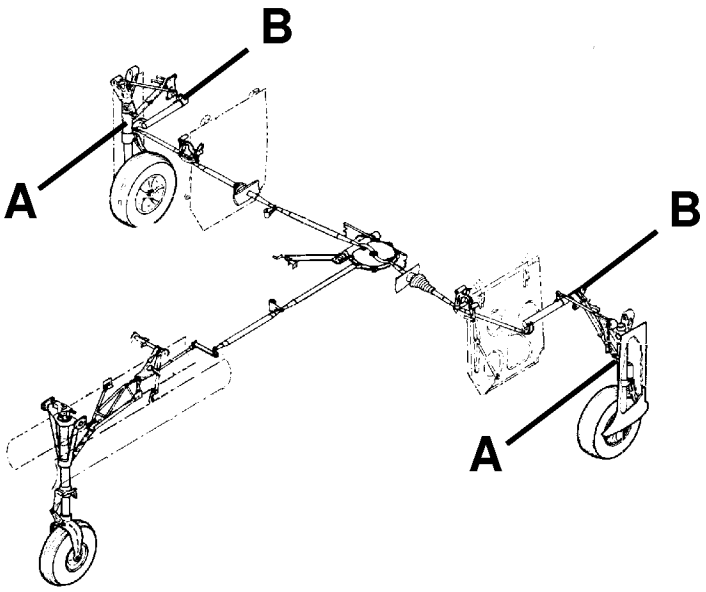
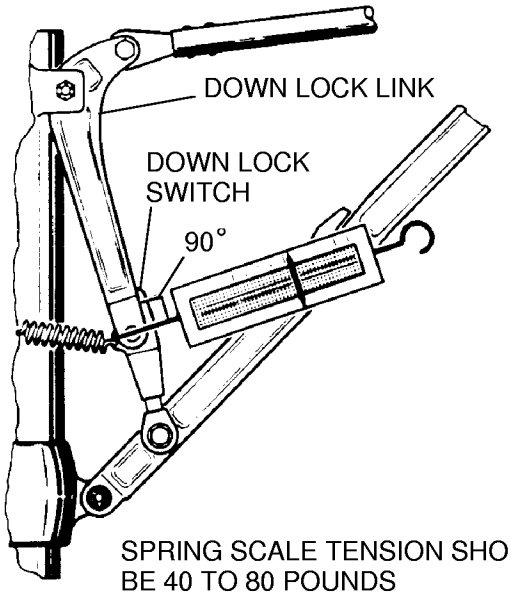
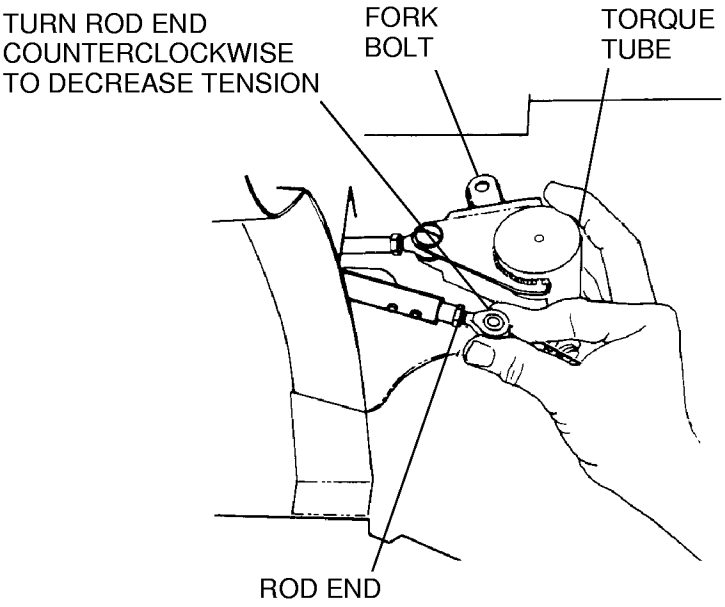




DETAIL A
MAIN LANDING GEAR DOWN LOCK TENSION CHECK



DETAIL B
MAIN LANDING GEAR DOWN LOCK TENSION ADJUSTMENT
(LEFT SIDE SHOWN, RIGHT SIDE OPPOSITE)

Main Gear Down Lock Tension
Figure 609 (Sheet 1)

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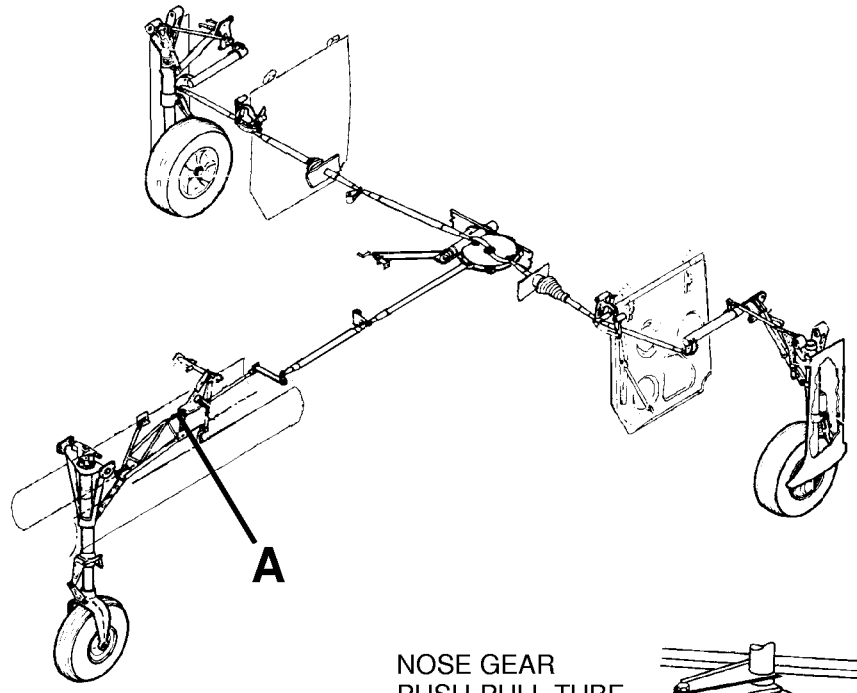
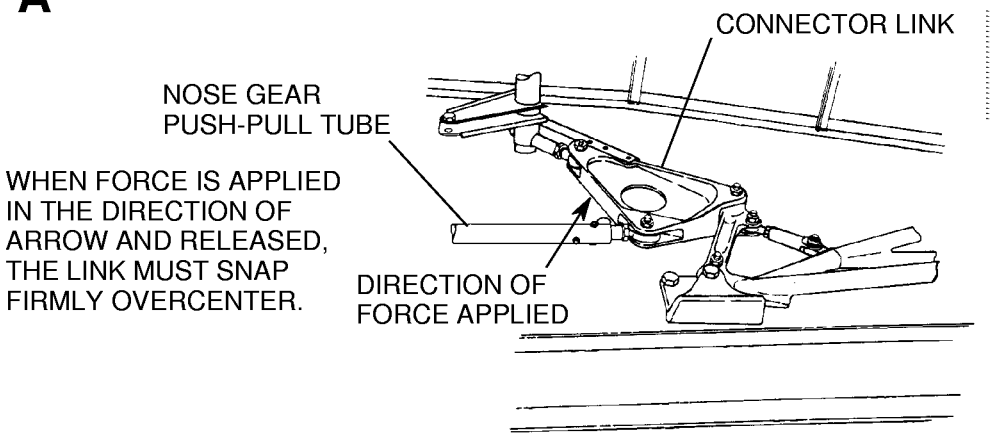
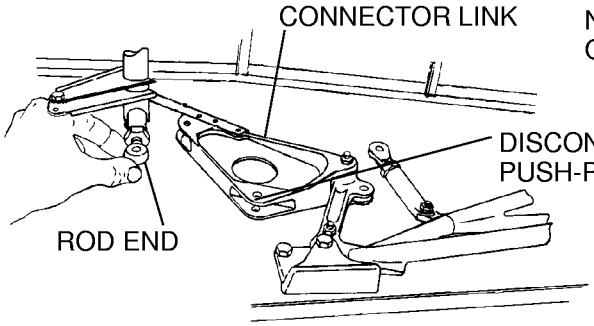
A37489





DETAIL A
NOSE GEAR CONNECTOR LINK,
OVERCENTER TRAVEL CHECK



LENGTHEN ROD END BY
TURNING COUNTERCLOCKWISE
TO INCREASE FORCE.
SHORTEN ROD END
BY TURNING CLOCKWISE
TO DECREASE FORCE.

DETAIL A
NOSE GEAR CONNECTOR LINK,
OVERCENTER TRAVEL ADJUSTMENT

10403001
A14401011
A14401024

Nose Gear Connector Link Overcenter Check
Figure 610 (Sheet 1)

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(b) Lengthen connector link rod end (turn counterclockwise) to increase force required to snap connector link overcenter.
(c) Shorten connector link rod end (turn clockwise) to decrease force required to snap connector link overcenter.

J. Nose Gear Down Lock Tension Check (Refer to Figure 611).
(1) Inspect the nose gear down lock for the correct tension.
(a) Refer to Figure 611, Detail A.
(b) Disconnect nose gear overcenter spring.
(c) Connect nose gear push-pull tube.
(d) Inspect nose gear down lock tension (25 pounds +10 or -10 pounds). Make sure the overcenter spring is disconnected when checking tensions and adjustments.
(e) If the nose gear down lock tension is (25 pounds +10 or -10 pounds), make sure the nose gear fork bolt is properly adjusted.
(2) Adjustment.
(a) Refer to Figure 611, Detail B.
(b) Adjust fork bolt in half turn increments.
1 To increase down lock tension, lengthen fork bolt (turn counterclockwise).
2 To decrease down lock tension, shorten fork bolt (turn clockwise).

K. Nose Gear Up Lock Tension Check (Refer to Figure 612).
(1) Inspect the nose gear up lock for the correct tension.
(a) Refer to Figure 612, Detail A.
(b) Retract nose gear.
(c) With the nose gear overcenter spring disconnected, check tension required to break connector link overcenter.
1 The correct nose gear uplock tension is 75 pounds +10 or -15 pounds.
(2) Adjustment.
(a) Refer to Figure 612, Detail B.
(b) If the nose gear uplock tension is not 75 pounds +10 or -15 pounds, adjust nose push-pull tube in half turn increments.
1 To increase nose gear uplock tension, shorten nose push-pull tube (turn clockwise).
2 To decrease nose gear uplock tension, lengthen nose push-pull tube (turn counterclockwise).

L. Nose Gear Uplock Hook Engagement (Refer to Figure 613).
(1) Inspect the nose gear uplock hook for correct engagement.
(a) Refer to Figure 613, Detail A.
(b) Retract nose gear.
(c) Inspect nose gear uplock hook for correct engagement.
(d) Uplock hook must be fully engaged with hook against the nose strut bolt and spacer engages and disengages freely with no binding.
(e) Uplock hook must be engaged with 0.03 to 0.060 inches clearance between the spacer on the nose strut and surface of the hook.

M. Gear Down Indicator Light Check (Refer to Figure 614).
(1) Check gear down indicator lights for proper operation.
(a) Retract landing gear approximately halfway.
(b) Engage manual extension handle (refer to Detail B). Crank toward the down position and stop when green light comes on. Note the angular position of the manual extension handle.
(c) Check applicable gear of illuminated light for being down and locked with the overcenter linkage overcenter.
(d) Resume cranking toward the down position noting the number of turns required to reach the internal stop in the actuator.
(e) The number of turns required to reach the internal stop should not be less than 8 or more than 14 for the nose gear. Not less than 4 or more than 8 on the main gear.

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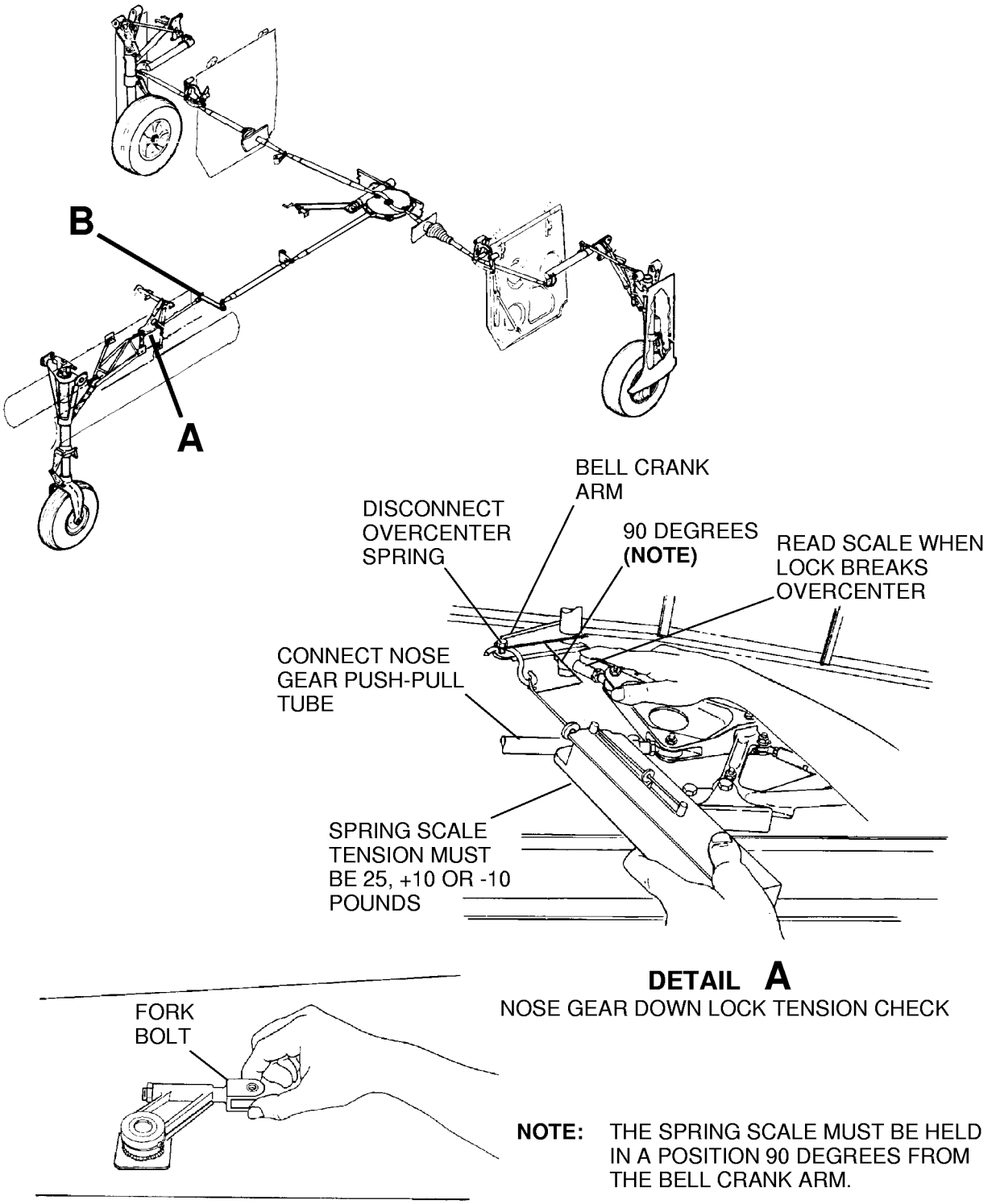

DETAIL A
NOSE GEAR DOWN LOCK TENSION CHECK

DETAIL B
NOSE GEAR DOWN LOCK TENSION ADJUSTMENT

10403001
A14401025
B14401016

Nose Gear Down Lock Tension Check
Figure 611 (Sheet 1)

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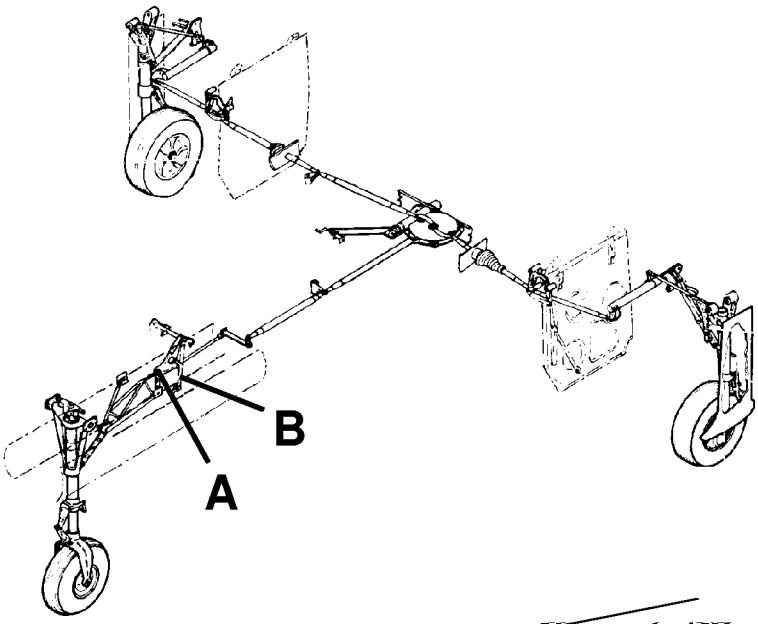
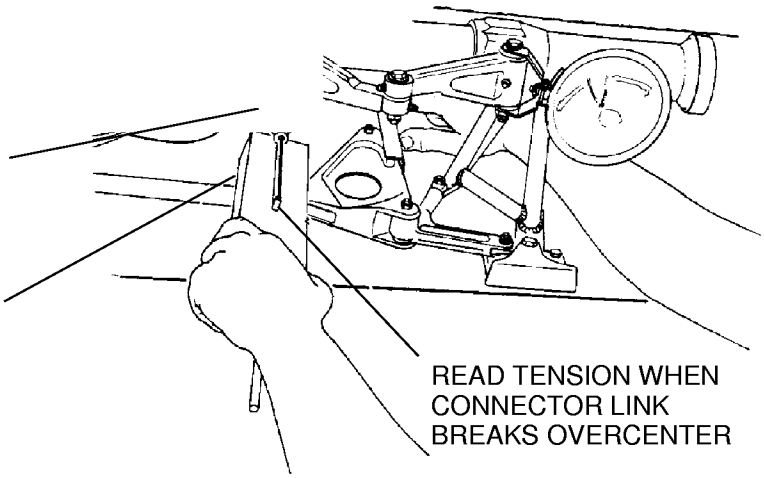
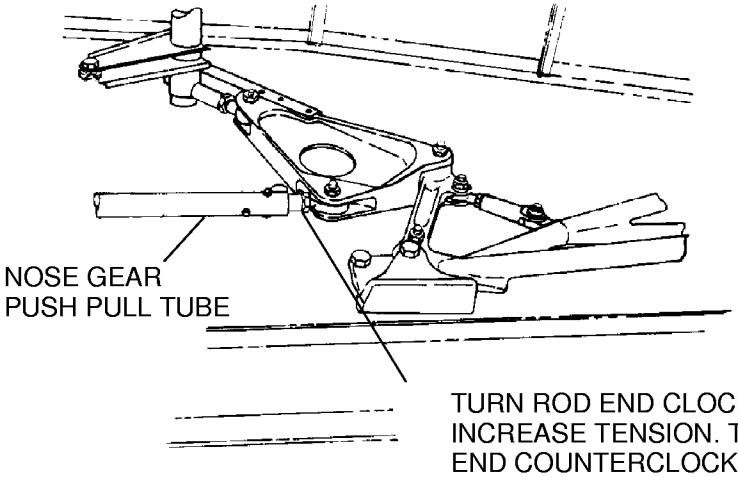
A37418





DETAIL A
NOSE GEAR UP LOCK TENSION CHECK
(NOSE GEAR RETRACTED, OVERCENTER SPRING DISCONNECTED)



DETAIL B
NOSE GEAR UP LOCK TENSION ADJUSTMENT
(NOSE GEAR EXTENDED)

10403001
A14401015
B14401011

Nose Gear Up Lock Tension Check
Figure 612 (Sheet 1)

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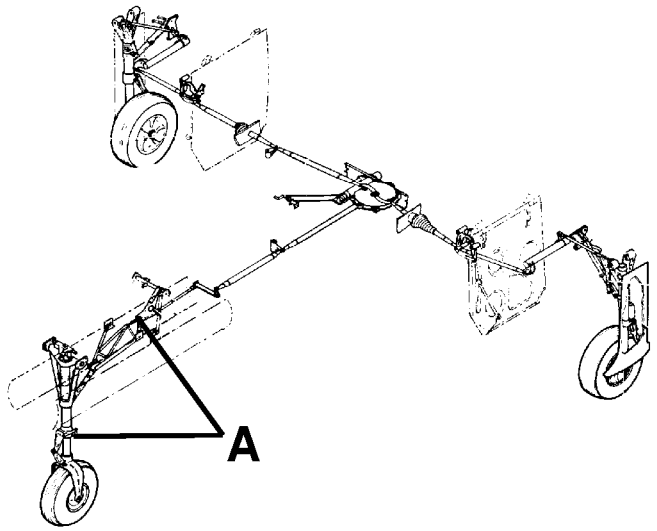
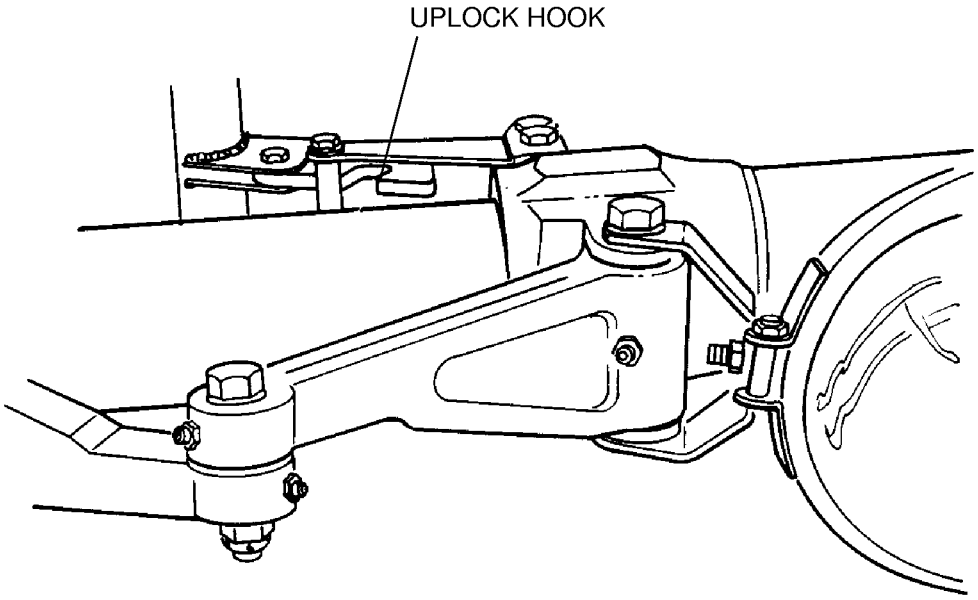
A37419





DETAIL A
NOSE GEAR UPLOCK ENGAGEMENT CHECK
(NOSE GEAR RETRACTED)

Nose Gear Uplock Hook Check
Figure 613 (Sheet 1)

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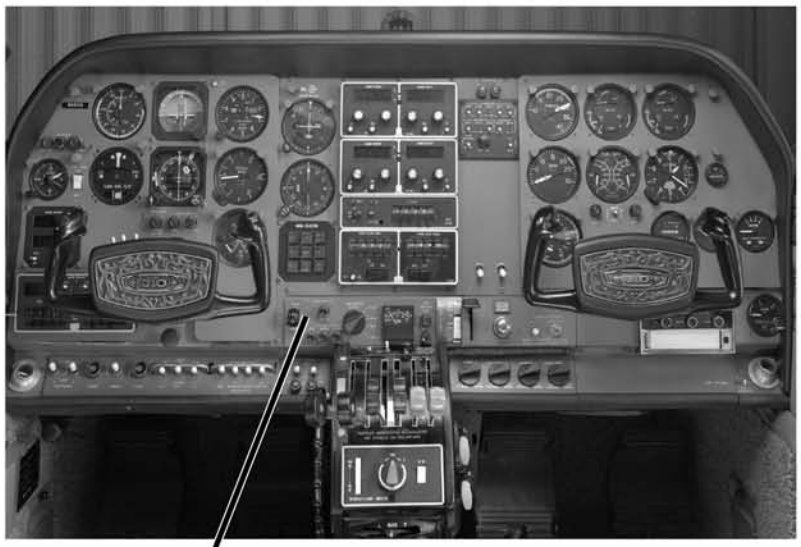
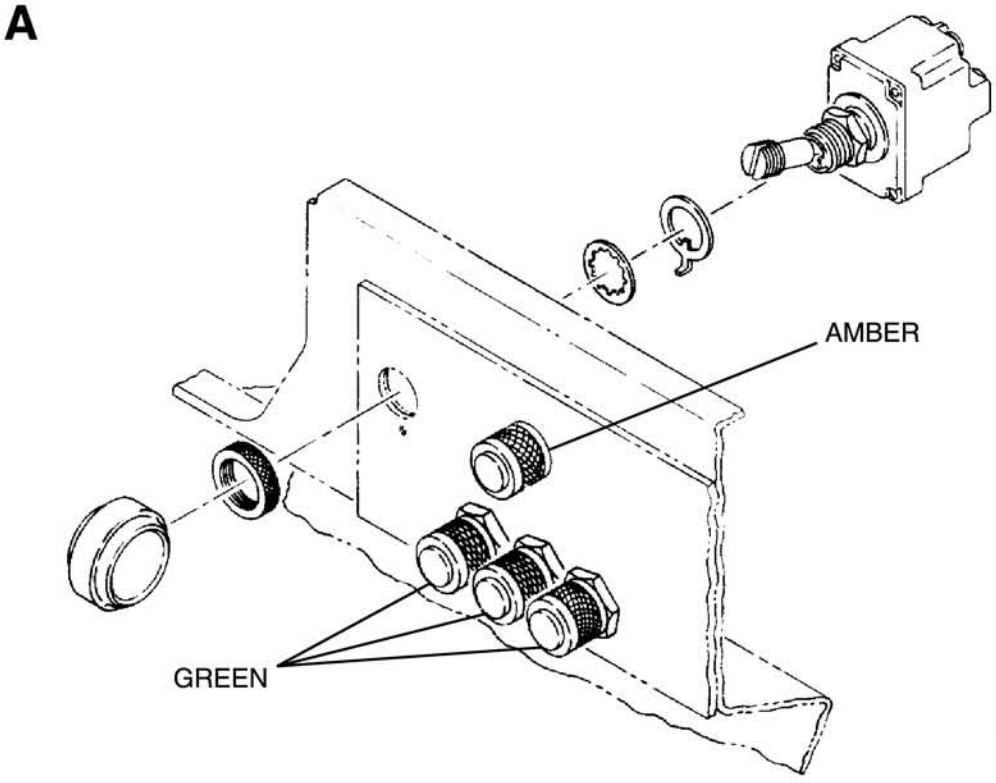
A37420





DETAIL A
LANDING GEAR INDICATOR LIGHTS

1018P1037
A10481002

Gear Down Indicator Light Check
Figure 614 (Sheet 1)

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N. Gear Down Indicator Light Switch Adjustment (Refer to Figure 615).
(1) Gear down and locked indicator light switch adjustment.
(a) Nose gear down and locked indicator light switch adjustment.
1 Adjust the switch actuating bolt.
a Turn the bolt counterclockwise to actuate the switch farther from the internal stop inside the actuator.
b Turn the bolt clockwise to actuate the switch closer to the internal stop inside the actuator.
2 Main gear down and locked indicator light switch adjustment.
3 Adjust the main landing gear switches by repositioning. Loosen mounting screws and move switch towards the bell crank to actuate switch farther from the internal stop in the actuator. Move the switch away from the bell crank to actuate it closer to the internal stop in the actuator.

NOTE: After adjusting indicator switches check to see that gear indicator lights do not illuminate before gear is down and locked by overcenter linkage.

O. Gear Door Closed Fit Check (Refer to Figure 616).
(1) Gear doors fit check.
(a) Operate the landing gear through one complete cycle.
1 Visually check nose and main landing gear doors for correct operation, fit, and damage.
(b) Operate the landing gear through one complete cycle and check the gear indicator lights and warning horn operate correctly.
1 Check for correct operation with gear extended and retracted.

P. Gear Safety Switch Check (Refer to Figure 617).
(1) Landing gear safety switch check.
(a) With gear down, check safety switch operates on the centerline of the stop plate.
(b) From full extended position, place jack under the gear and raise strut 0.75 inch.
(c) With gear raised 0.75 inch, check that gear safety switch actuates within +0.75 to -0.12 inch.
(d) Refer to Landing Gear - Adjustment/Test for instructions to adjust the landing gear safety switch.
(2) After completing the inspection, make sure the landing gear is down and locked, lubricated and power turned off.

NOTE: If adjustments were made, make sure all bolts have been torqued, cotter pins installed, and doors connected, before installing access plates, floorboards, seats, carpets, and removing the airplane from jacks.

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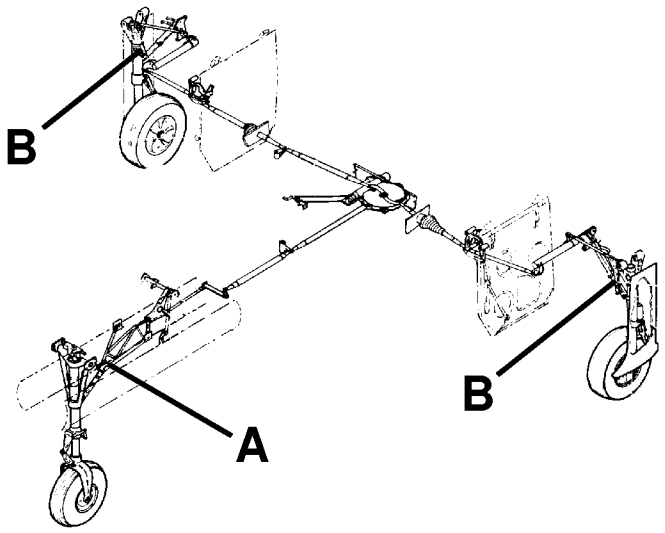
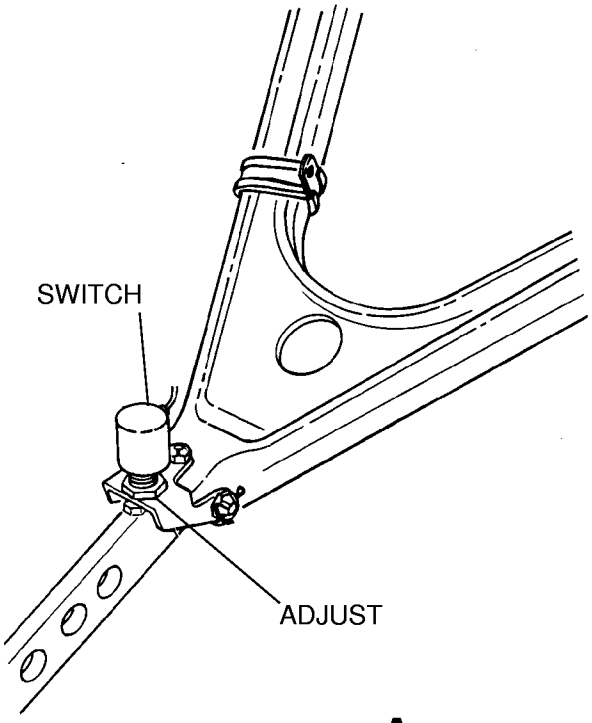
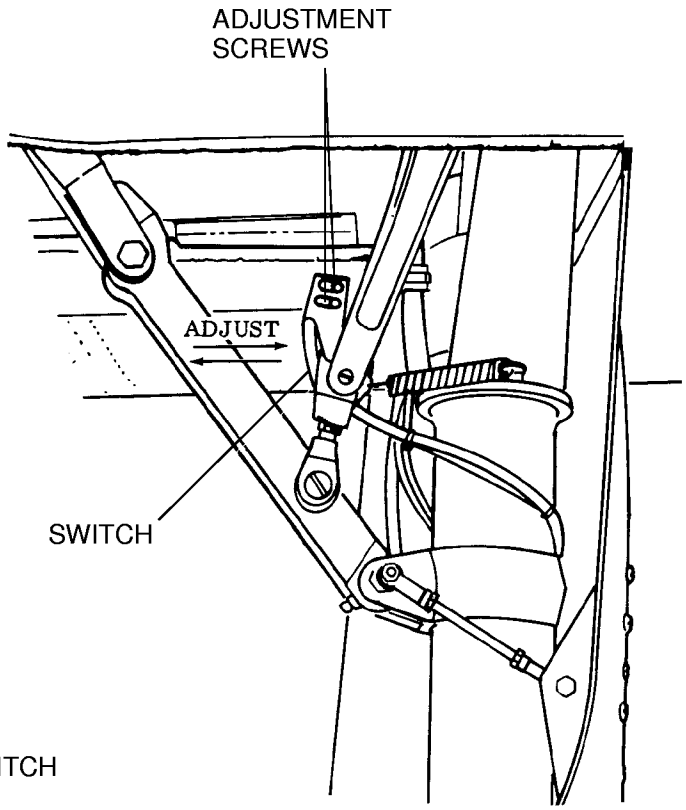




DETAIL A
NOSE GEAR DOWN INDICATOR LIGHT SWITCH
(NOSE GEAR EXTENDED)



DETAIL B
MAIN GEAR DOWN INDICATOR LIGHT SWITCH
(LEFT SIDE SHOWN, RIGHT SIDE OPPOSITE)

Gear Down Indicator Light Switch Adjustment
Figure 615 (Sheet 1)

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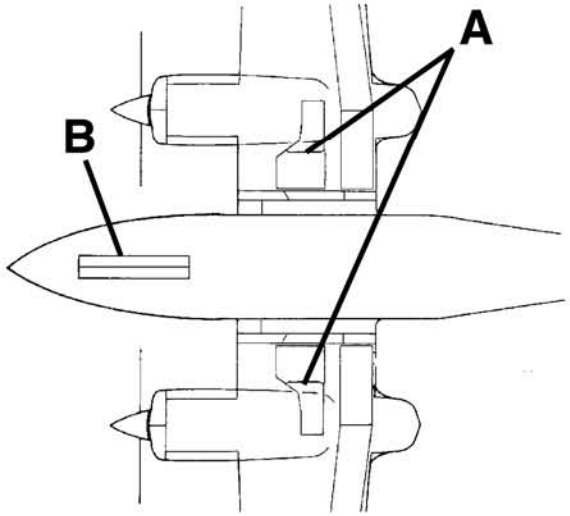
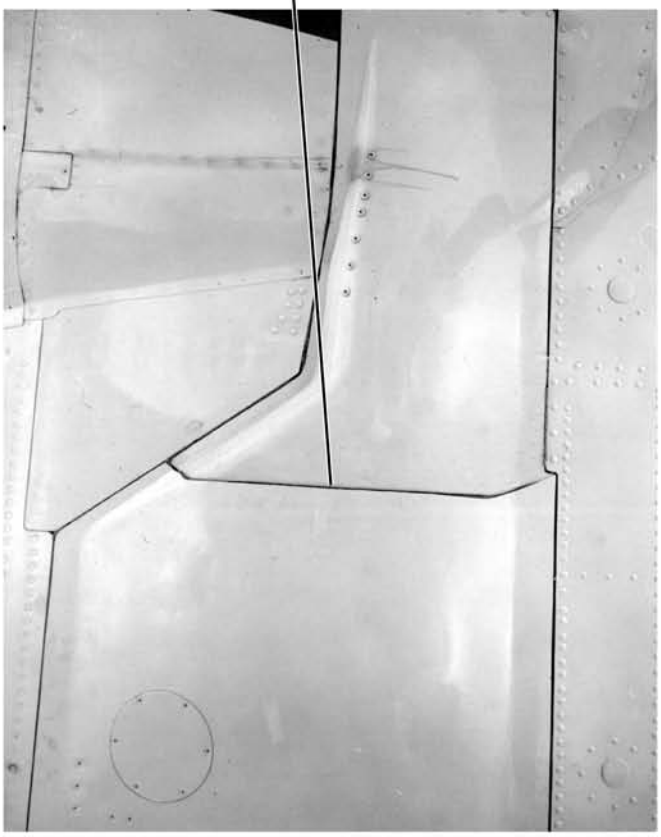
A37487



CHECK GEAR DOORS FOR PROPER FIT. DOORS SHOULD FIT TIGHT BUT MUST NOT SHOW SIGNS OF DEFORMATION.



DETAIL A
MAIN LANDING GEAR DOORS
(LEFT SIDE SHOWN, RIGHT SIDE OPPOSITE)

CHECK GEAR DOORS FOR PROPER FIT. DOORS SHOULD FIT TIGHT BUT MUST NOT SHOW SIGNS OF DEFORMATION.

DETAIL B
NOSE LANDING GEAR DOORS

1440P1021
A5440P6029
B5440P6030

Gear Door Closed Fit Check
Figure 616 (Sheet 1)

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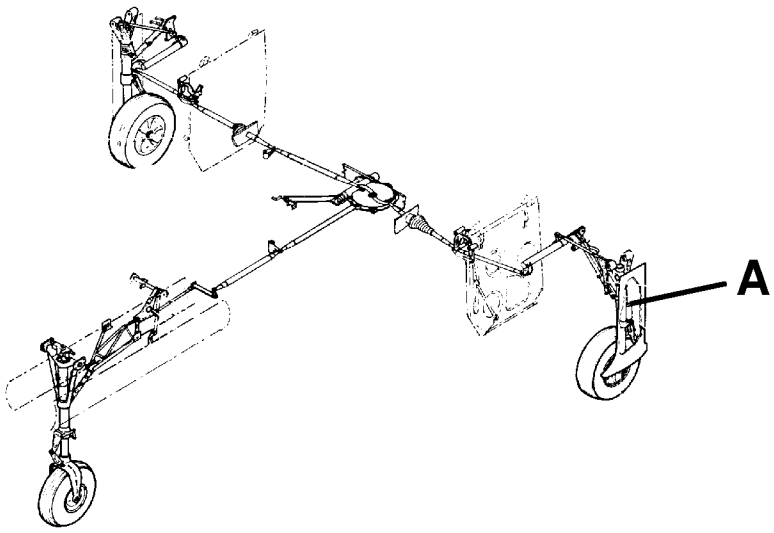

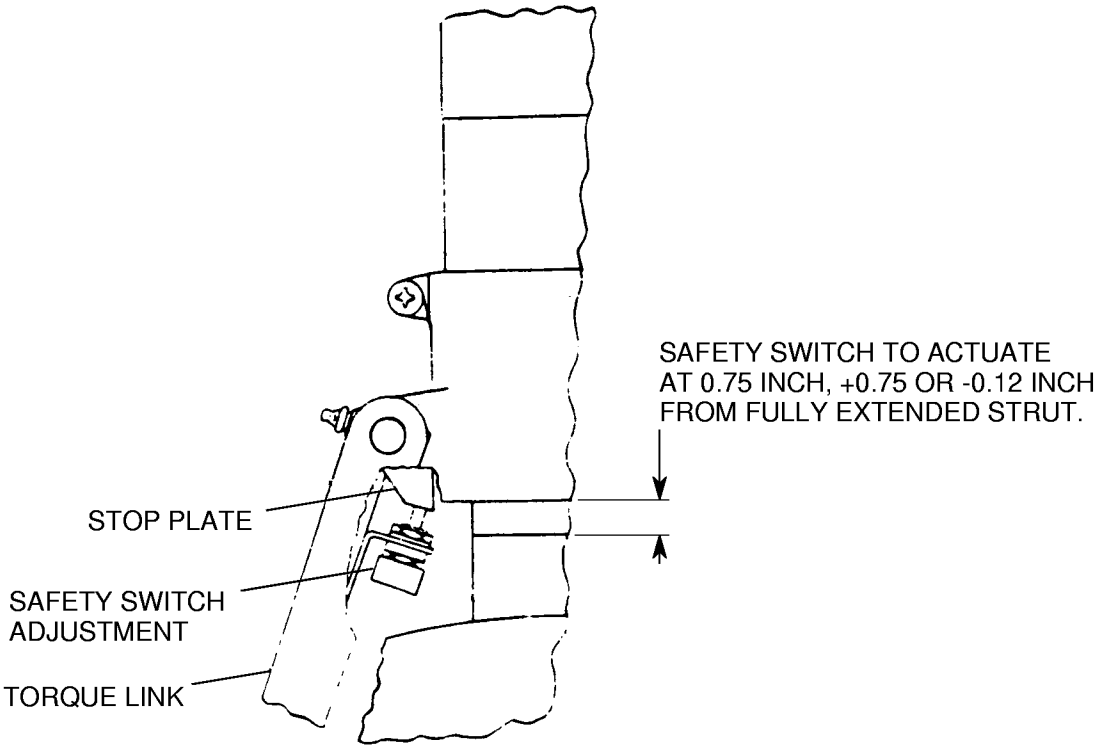

DETAIL A
LANDING GEAR SAFETY SWITCH CHECK

A10481001

Gear Safety Switch Check
Figure 617 (Sheet 1)

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WHEELS AND BRAKES - DESCRIPTION AND OPERATION

1. Main Wheels and Tires

A. Description.

(1) On Airplanes 310R0001 thru 310R0500, each main wheel consists of two magnesium wheel halves secured together with eight bolts, bearing cups, bearing cones, and a bearing seal. A 6.50 x 10, 6 ply rating, low pressure tire and 6.50 x 10 tube are installed on each main gear wheel assembly.

(2) On Airplanes 310R0501 thru 310R2140, each main wheel consists of two magnesium wheel halves and spacer secured together with nine bolts, bearing cups, bearing cones, brake disc, and bearing seal. A 6.50 x 10, 8 ply rating, low pressure tire and 6.50 x 10 tube are installed on each main gear wheel assembly.

2. Nose Wheel and Tire

A. Description.

(1) The nose wheel and tire assembly consists of the wheel assembly secured with bolts and washers, bearing cups, bearing cones, and bearing seals, a 6.00 x 6, 4-ply rating, low pressure tire, and a 6.00 x 6 tube. The wheel, tube, and tire assembly is mounted to the fork of the nose gear strut assembly.

3. Main Brake System

A. Description.

(1) The airplane has a hydraulically actuated main brake system. A hydraulic master cylinder is attached to each pilot's rudder pedal and hydraulic lines and hoses are routed from these cylinders through the cabin and through the wing to the brake assemblies on each main landing gear. The brakes are single-disc, nonself-adjusting type with actuating cylinders in each brake assembly. No manual adjustment is required. The brakes can be operated by applying pressure to either the pilot's or copilot's rudder pedals.

4. Parking Brake System

A. Description.

(1) The parking brake system on Airplanes 310R0001 thru 310R0500 consists of a manually operated handle assembly connected to the parking brake torque tube through a series of pulleys and cables. The parking brake torque tube is connected to the pilot's rudder pedal brake links by two short cables. The parking brake is set by applying pressure to both rudder pedals and then pulling the parking brake handle. To release the parking brake, turn the parking brake handle approximately 90 degrees and allow handle to move forward.

(2) On Airplanes 310R0501 thru 310R2140, the parking brake system consists of a manually operated control handle assembly connected to the parking brake valve located in the brake line to each main gear. When pressure is applied to the brake system and the parking brake control handle is pulled, the valve locks hydraulic pressure on the brake assemblies until released.

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WHEELS AND BRAKES - TROUBLESHOOTING

1. Brake System Troubleshooting

A. Troubleshooting.
(1) For a guide to troubleshooting the brake system, refer to Table 101.

Table 101. Brake System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
BRAKES FAIL TO HOLD.	Worn brake linings.	Check for brake linings worn beyond limits. Replace linings as required.
	Air in brake system.	Check for air trapped in brake system. Bleed brakes.
	Oily or greasy brake linings.	Check for oil or grease on brake linings. Clean brake linings.
	Brakes overheated.	Check for brakes too hot from extensive use. Allow time for brakes to cool.
	Improper brake pedal position.	Check for brake pedal positioned so that brakes cannot be fully applied. Reposition brake pedal.
BRAKES SPONGY.	Air in brake system.	Check for air trapped in brake system. Bleed brakes.
	Brake hose expanded.	Replace brake hose.
BRAKE PEDAL BOTTOMS.	Insufficient brake fluid.	Check for sufficient brake fluid in system. Fill system and bleed brakes as required.
	Unserviceable packings in master cylinder or brake unit.	Replace unserviceable packings.
	Brake disc warpage.	Check brake disc warpage causing excessive clearance. Replace unserviceable brake disc.
	Missing brake disc clips.	Check for missing disc clips. Replace as required.
BRAKES DRAG.	Unserviceable piston return spring in master cylinder.	Replace spring.
	Brake pedal linkage binding.	Free linkage.
	Brake disc badly dished.	Replace brake disc.
	Internally swollen hoses, seals, or packing due to improper hydraulic fluid in system.	Replace hoses, seals and packings. Flush system with denatured alcohol. Refill and bleed system.

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WHEELS AND BRAKES - SERVICING

1. Brake System

A. Bleeding.

NOTE: In order to assure proper brake action, it is necessary to have positive transfer of hydraulic pressure through the system. Any air trapped in the system must be removed. This is accomplished by bleeding, which can be done in any one of several different methods. The following recommended procedure is bleeding by pressure with a bleeder pump.

(1) Fill reservoir of bleeder pump with clean system hydraulic fluid (refer to Chapter 12, Scheduled Servicing - Description and Operation for hydraulic fluid specification).
(2) Remove filler plug from master cylinder.

NOTE: When bleeding the brake system, it is advisable to wrap the master cylinder with rags to prevent fluid from spilling or leaking on the carpet.

(3) Remove bleeder screw and OPEN bleeder valve and allow hydraulic fluid to drain from the system into a suitable container.
(4) Connect the hose from the bleeder pump to the bleeder valve on top of the brake unit.
(5) Pump slowly until fluid in master cylinder reservoir is within 1/2 inch of the top.
(6) CLOSE bleeder valve and detach bleeder pump hose connection.
(7) Check brake operation.

NOTE: If brakes are spongy and do not have a solid feel in the pedals, repeat the bleeding procedure.

(8) Install bleeder screw brake unit and replace filler plug in master cylinder.

2. Brake Master Cylinder

A. Servicing.

NOTE: The hydraulic brake reservoir is incorporated in the master cylinder. The filler cap and air vent are located on the head of each master cylinder.

(1) Remove filler cap and fill reservoir to within one-quarter inch below the filler opening with hydraulic fluid MIL-H-5606A (Red).

CAUTION: Always release parking brake before servicing master cylinder.

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WHEELS AND BRAKES - REMOVAL/INSTALLATION

1. Main Wheel and Tire Assembly (Airplanes 310R0001 thru 310R0500)

A. Removal (Refer to Figure 401).
(1) Jack airplane, refer to Chapter 7, Jacking - Description and Operation.
(2) Remove snap ring (8), cap (7), cotter pin, nut (6), and washer (5) from axle.
(3) Remove brake disc (14) clips from brake side of wheel as follows:
(a) Rotate wheel until a disc clip is opposite the brake unit.
(b) Move the brake disc to outer edge of wheel and insert a thin screwdriver, or other suitable tool, between disc clip and wheel.
(c) Pry the inner edge of disc clip out of groove inside the wheel and pull clip out.
(d) Repeat this procedure with each disc clip until all clips are removed.
(4) Remove wheel and tire assembly from axle using caution to prevent damage to axle threads and to keep bearings clean.

B. Disassembly (Refer to Figure 401).
(1) Deflate tire (1) and tube (9) by removing valve core.

WARNING: Always deflate tire and tube before separating wheel halves.

(2) Remove nuts, washers, and bolts and separate wheel halves (2 and 10). Remove wheel halves from tire.
(3) Remove tube (9) from tire (1).
(4) Bearing cups are a shrink fit and should be removed for replacement only.

NOTE: If removal of bearing cups is necessary, place wheel half in boiling water for at least 30 minutes, then remove bearing cup by tapping cup evenly from the inner side.

(5) Remove drive keys (15) if worn to a minimum width of 1.116 inches by removing attaching screw.

NOTE: Screws securing drive keys (15) are staked to the drive keys and should only be removed for replacement of keys.

C. Assembly (Refer to Figure 401).
(1) If removed, replace disc drive keys (15) and secure with screws.

NOTE: When replacing drive keys, prime the contact surfaces, torque retaining screws to 60 inch-pounds, +10 or -10 inch-pounds and stake.

(2) If removed, replace bearing cups (3 and 11).

NOTE: Bearing cups are a shrink fit in wheel. To install, place wheel in boiling water for at least 30 minutes, chill bearing cups with dry ice and tap lightly into position to ensure proper seating.

(3) Install tube (9) in tire (1).

CAUTION: Use of recapped tires is not recommended; however, if recapped tires are used on the airplane make sure there is sufficient clearance between tire and wheel well structure when landing gear is in retracted position.

(4) Place wheel halves in position on the tire and secure with bolts, washers, and nuts. Torque nuts to 90 inch-pounds. If torque in manual conflicts with placard on wheel, use placard values.

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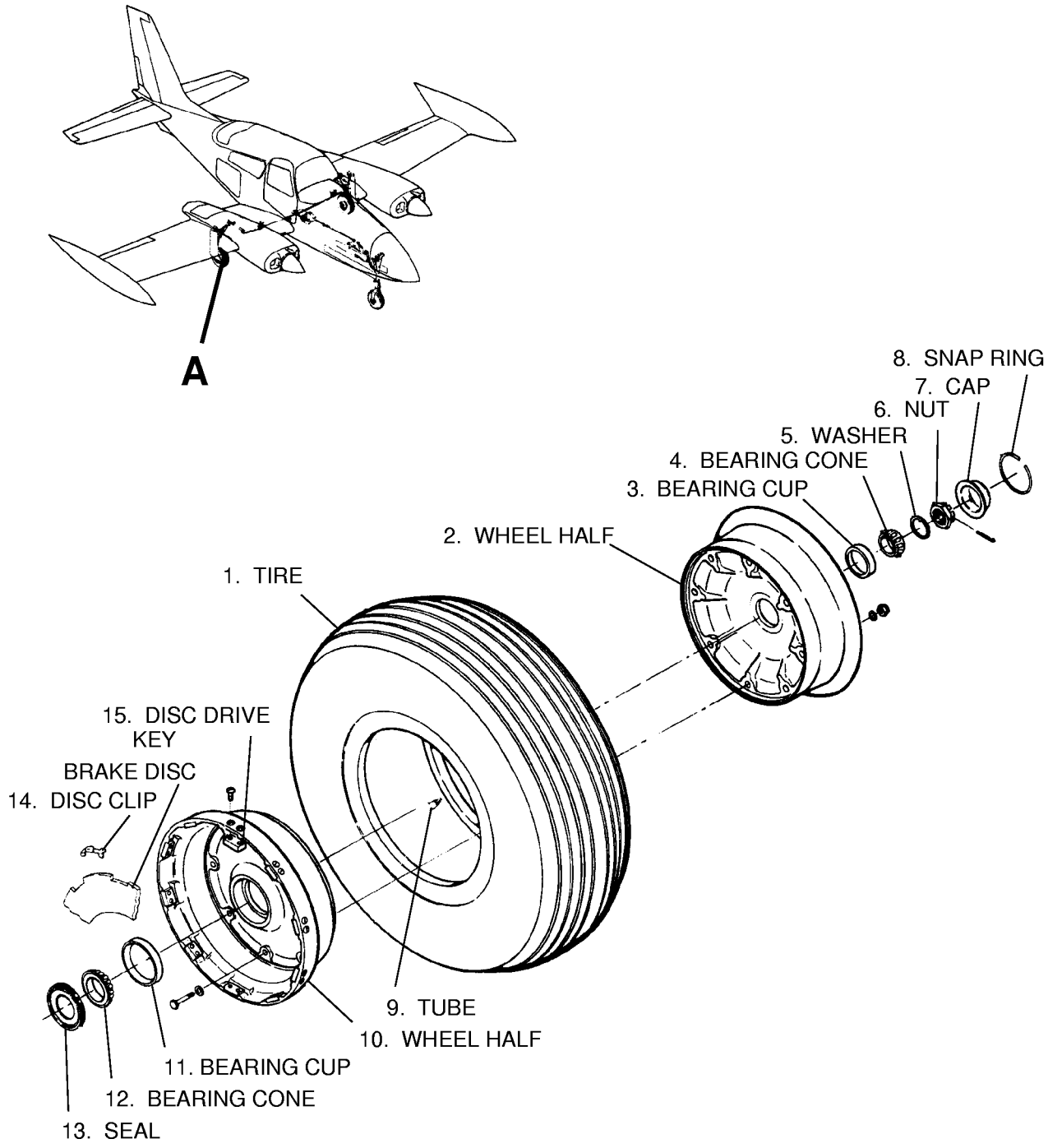

DETAIL A

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A10414001

Main Wheel and Tire Assembly (Airplanes 310R0001 thru 310R0500)
Figure 401 (Sheet 1)

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CAUTION: Tighten nuts evenly and torque correctly to lessen the possibility of bolt failure.

(5) Install valve core, then inflate tire enough to seat the beads on the wheels, deflate completely, then reinflate to operating pressure.
(6) Lubricate bearing cones. Place cone (12) in wheel assembly and secure in place with seal (13).
(7) Place bearing cone (4) in bearing cup (3) and cover with cap (7) and snap ring (8) until ready to install wheel assembly.

NOTE: If wheel is not to be installed immediately, cover wheel bearings adequately to prevent contamination of grease.

(8) Check wheel balance using Service Kit SK150-20.

D. Installation (Refer to Figure 401).

CAUTION: Ensure that bearing cones (4 and 12) are properly lubricated before installing wheel assembly.

(1) Place wheel and tire assembly in position on the axle, aligning brake disc with disc drive keys (15) in wheel half.
(2) Install outer bearing cone (4), washer (5), and nut (6).

NOTE: Tighten wheel bearing nut (6) to 40 inch-pounds while rotating wheel, then back off nut and retighten to 20 inch-pounds while rotating wheel. If the nut is not positioned to allow installation of the cotter pin at the 20-inch pound torque, continue tightening to the next locking position that will align cotter pin hole.

(3) Install cotter pin, bearing cap (7), and snap ring (8).
(4) Install brake disc clips (14) as follows:
  (a) Starting opposite the brake unit, insert disc clip between disc and wheel and between any two adjacent drive keys.
  (b) Install disc clip so that ends of clip contact the disc and the smaller of the two bent center flanges is inserted first.
  (c) Press the disc clip (14) into the wheel until the small bent flange seats in the groove provided in the drive key.
  (d) Rotate wheel and repeat the above procedure at every other drive key until five disc clips are installed.
(5) Check that all disc clips are properly installed and that wheel rotates freely.
(6) Remove jacks from airplane and inflate tire to proper operating pressure.

NOTE: To determine whether or not there is a leak in the wheel and tire assembly the tire should be reinflated after a 12 to 24 hour period. During the second period it is important to keep the tire in an area where there has been no change in ambient temperature, since change in temperature will affect tire pressure.

2. Main Wheel and Tire Assembly (Airplanes 310R0501 thru 310R2140)

A. Removal (Refer to Figure 402).
(1) Jack airplane, refer to Chapter 7, Jacking - Description and Operation.
(2) Remove snap ring (1), cap (2), cotter pin, nut (3), and bearing retaining washer (4) from axle.
(3) Remove six bolts and washer securing back plate (14), shim (11) to cylinder (7) (Refer to Figure 403).
(4) Remove wheel, tire, and brake disc assembly from axle using caution to prevent damage to axle threads and to keep bearings clean.
(5) Remove outer bearing cone (5) from wheel to prevent it from dropping out of wheel after wheel removal.

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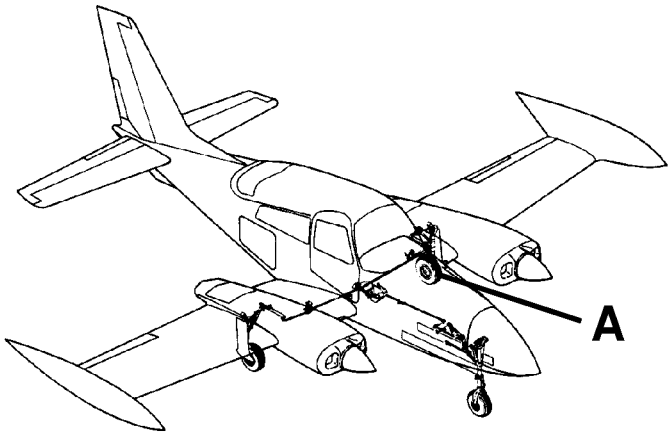

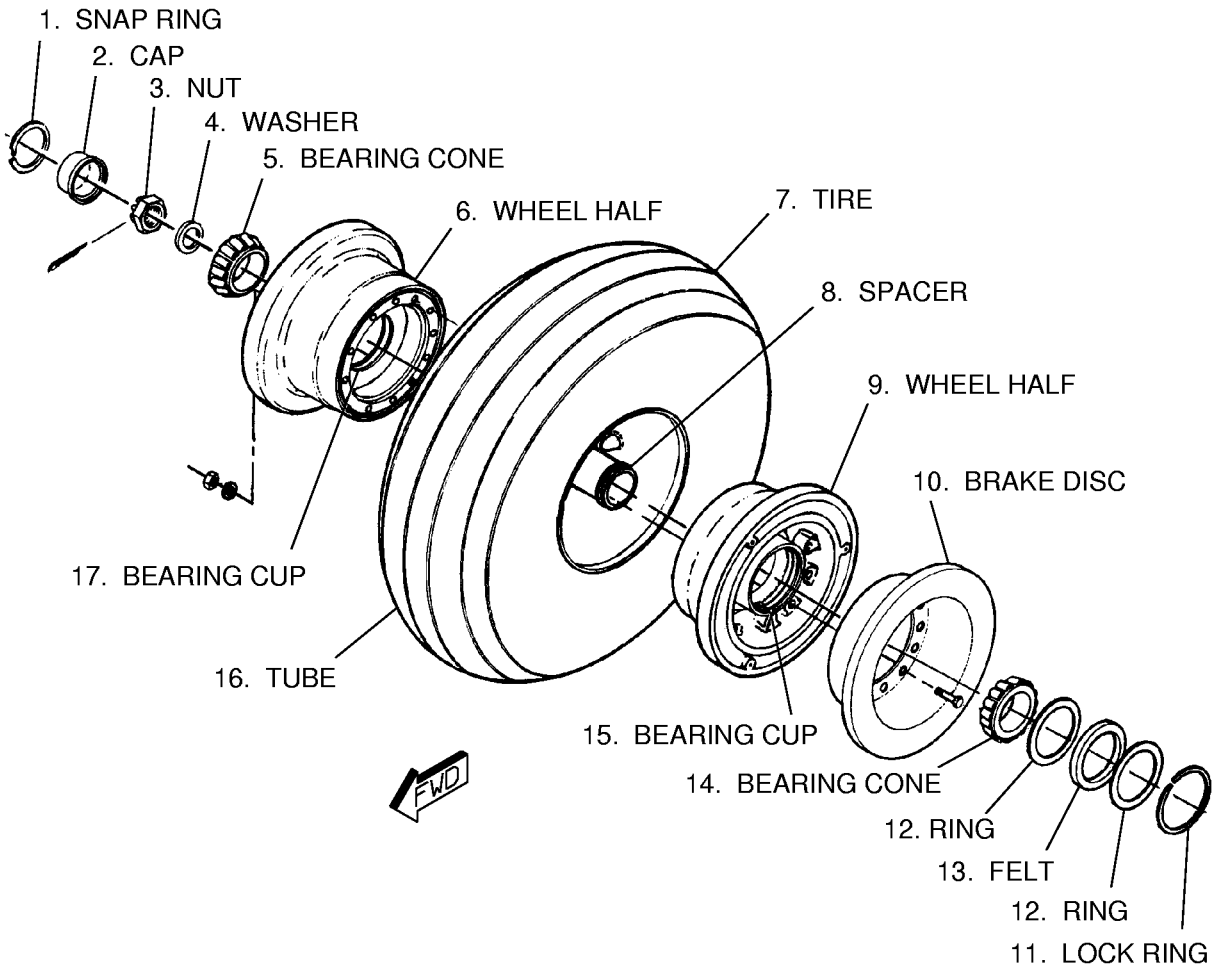

DETAIL A

Main Wheel and Tire Assembly (Airplanes 310R0501 thru 310R2140)
Figure 402 (Sheet 1)

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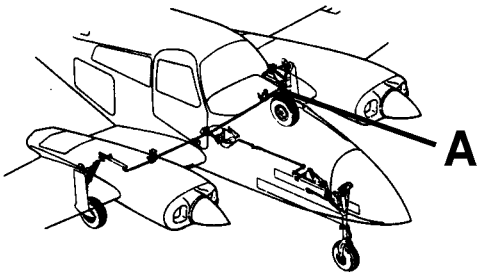

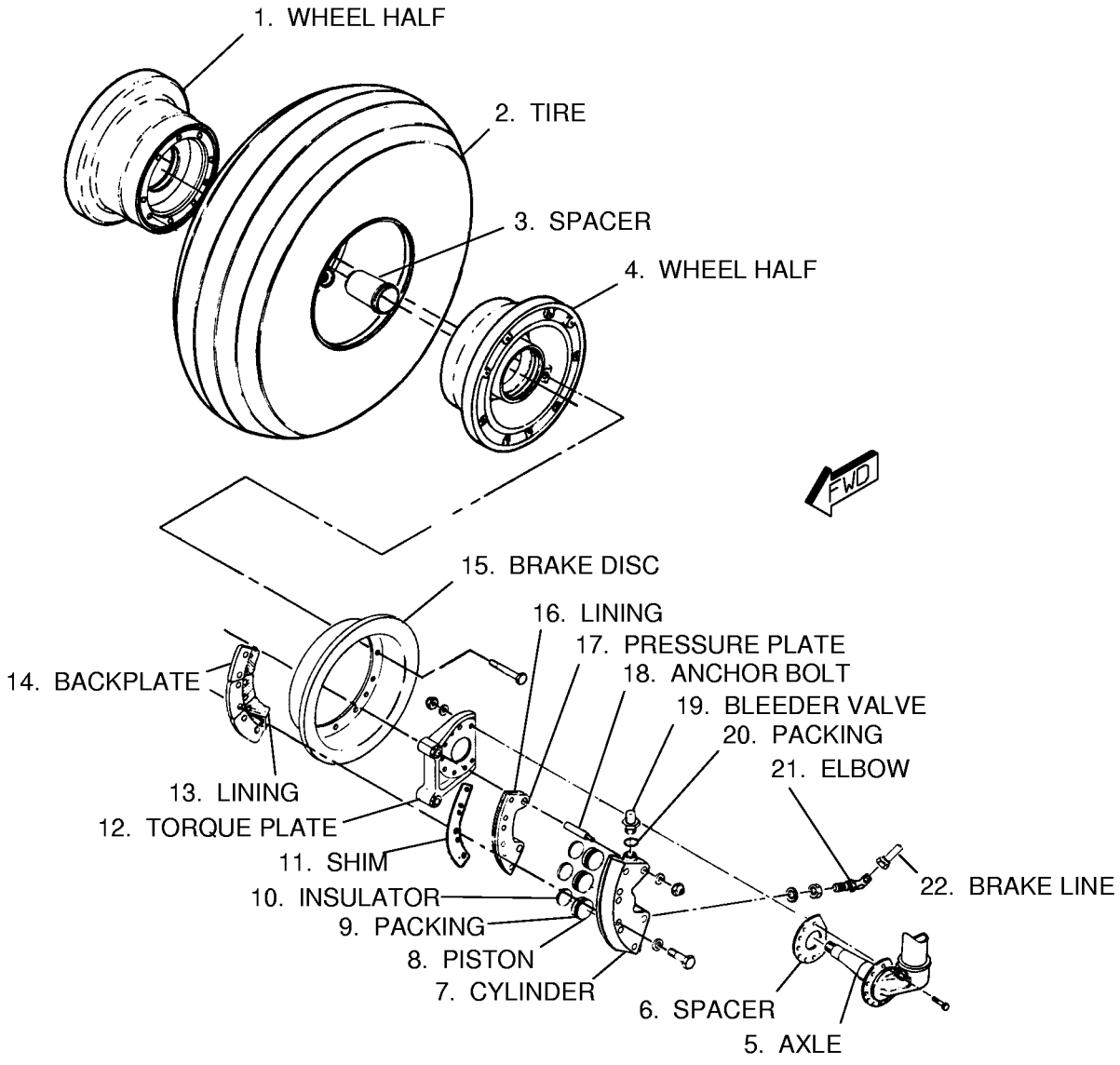

DETAIL A

Main Wheel Brakes
Figure 403 (Sheet 1)

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B. Disassembly (Refer to Figure 402).
(1) Deflate tire (7) and tube (16) by removing valve core.

WARNING: Always deflate tire and tube before separating wheel halves.

(2) Remove nuts, washers, and bolts and separate wheel halves (6 and 9). Remove wheel halves and spacer (8) from tire.
(3) Remove tube (16) from tire.
(4) Bearing cups are a shrink fit and should be removed for replacement only.

NOTE: If removal of bearing cups is necessary, place wheel half in boiling water for at least 30 minutes, then remove bearing cup by tapping cup evenly from the inner side.

C. Assembly (Refer to Figure 402).
(1) If removed, replace bearing cups (15 and 17).

NOTE: Bearing cups are a shrink fit in the wheel. To install, place wheel in boiling water for at least 30 minutes, chill bearing cup with dry ice and tap lightly into position to ensure proper seating.

(2) Install tube (16) in tire (7).

CAUTION: Use of recapped tires is not recommended; however, if recapped tires are used on the airplane make sure there is sufficient clearance between tire and wheel well structure when landing gear is retracted.

(3) Place wheel halves (6 and 9), spacer (8), and brake disc (10) in position on the tire and secure with bolts, washers, and nuts. Torque nuts to value marked on wheel half.

CAUTION: Make sure spacer is properly seated in wheel halves and tighten nuts evenly and correctly to lessen the possibility of bolt failure.

(4) Install valve core, then inflate tire enough to seat the beads on the wheel, deflate completely then reinflate to operating pressure.
(5) Lubricate bearing cones. Place bearing cone (14) in wheel assembly and secure in place with rings (12), felt (13), and lock ring (11).
(6) Place bearing cone (5) in wheel half (6) and cover with cap (2) and snap ring (1) until ready to install wheel assembly.
(7) Check wheel balance using Service Kit SK150-20.

D. Installation (Refer to Figure 402).

CAUTION: Ensure that bearing cones (5 and 14) are properly lubricated before installing wheel assembly.

(1) Place wheel and tire assembly in position on the axle with brake disc against the brake pressure plate.
(2) Secure back plate (14) and shim (11) to cylinder (7) with six bolts and washers (Refer to Figure 403).
(3) Install outer bearing cone (5), washer (4), and nut (3).

NOTE: Tighten wheel bearing nut (3) to 40 inch-pounds while rotating wheel, then back off nut and retighten to 20 inch-pounds while rotating wheel. If nut is not positioned to allow installation of cotter pin at 20 inch-pounds of torque, continue tightening nut to the next locking position that will align cotter pin hole.

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(4) Install cotter pin, cap (2), and snap ring (1).
(5) Remove airplane from jacks and inflate tire to proper operating pressure.

3. Nose Wheel and Tire

A. Removal (Refer to Figure 404).
(1) Jack airplane, refer to Jacking - Description and Operation.
(2) Remove cotter pin, nut, and bolt securing buckets (7) in place. Remove buckets and remove wheel and tire assembly from nose gear fork.
(3) Remove spacers (9) and axle tube (8) from wheel.

B. Disassembly (McCauley) (Refer to Figure 404).
(1) Remove retainer rings (1), retainers (2), felt seals (3), and bearing cones (4) from hub.
(2) Deflate tire (10) and tube (11) by removing valve core.

WARNING: Always deflate tire and tube before separating wheel halves.

(3) Remove bolts, nuts, and washers securing hub assemblies and remove hub from tire (10).
(4) Bearing cups are a shrink fit and should be removed only for replacement.

NOTE: If removal of bearing cups is necessary, place wheel hub in boiling water for at least 30 minutes, then remove bearing cup by tapping cup evenly from the inner side.

C. Disassembly (Goodyear) (Refer to Figure 405).
(1) Remove seals (1) and bearing cones (2).
(2) Deflate tire (6) and tube (5) by removing valve core.

WARNING: Always deflate tire and tube before separating wheel halves.

(3) Remove nuts, washers, and bolts and separate wheel halves (4).
(4) Remove each wheel half and remove tube (5) from tire (6).
(5) Bearing cups (3) are a shrink fit and should be removed only for replacement.

NOTE: If removal of bearing cups is necessary, place wheel half in boiling water for at least 30 minutes, then remove bearing cup by tapping cup evenly from the inner side.

D. Assembly (McCauley) (Refer to Figure 404).
(1) If removed, replace bearing cups.

NOTE: Bearing cups are a shrink fit in the wheel. To install, place wheel hub in boiling water for at least 30 minutes, chill bearing cups with dry ice and tap lightly into position to ensure proper seating.

(2) Place hub assemblies in position in tire (10) and tube (11).
(3) Install screws and washers in three piece hub assembly and torque screws to 190-200 inch-pounds. Install bolts, washers, and nuts in two piece hub assembly and torque nuts to 140-150 inch-pounds. If torque in manual conflicts with placard on wheel, use placard values.

CAUTION: Tighten screws and nuts evenly and torque correctly to lessen the possibility of screw failure.

(4) Inflate tire sufficiently to seat tire beads on the wheel assembly, deflate completely, then reinflate to operating pressure.
(5) Lubricate wheel bearing cones. Place cones in hub and secure with retainers (2), felt seals (3), and retainer rings (1).
(6) Check wheel balance using wheel balancer kit SK150-20.

NOTE: If wheel is not to be installed immediately, cover wheel bearings adequately to prevent contamination of grease.

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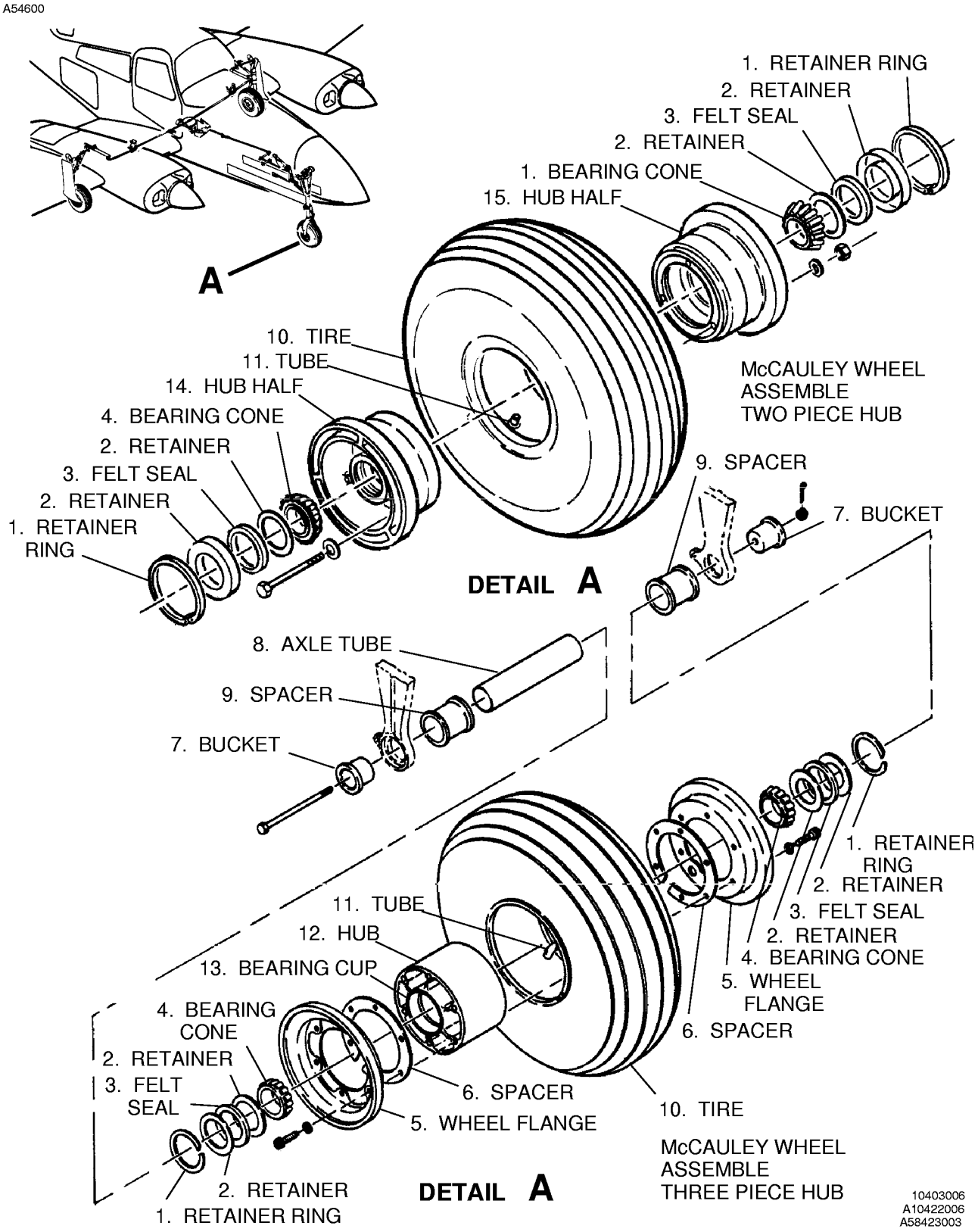

Nose Wheel and Tire Assembly (Standard)
Figure 404 (Sheet 1)

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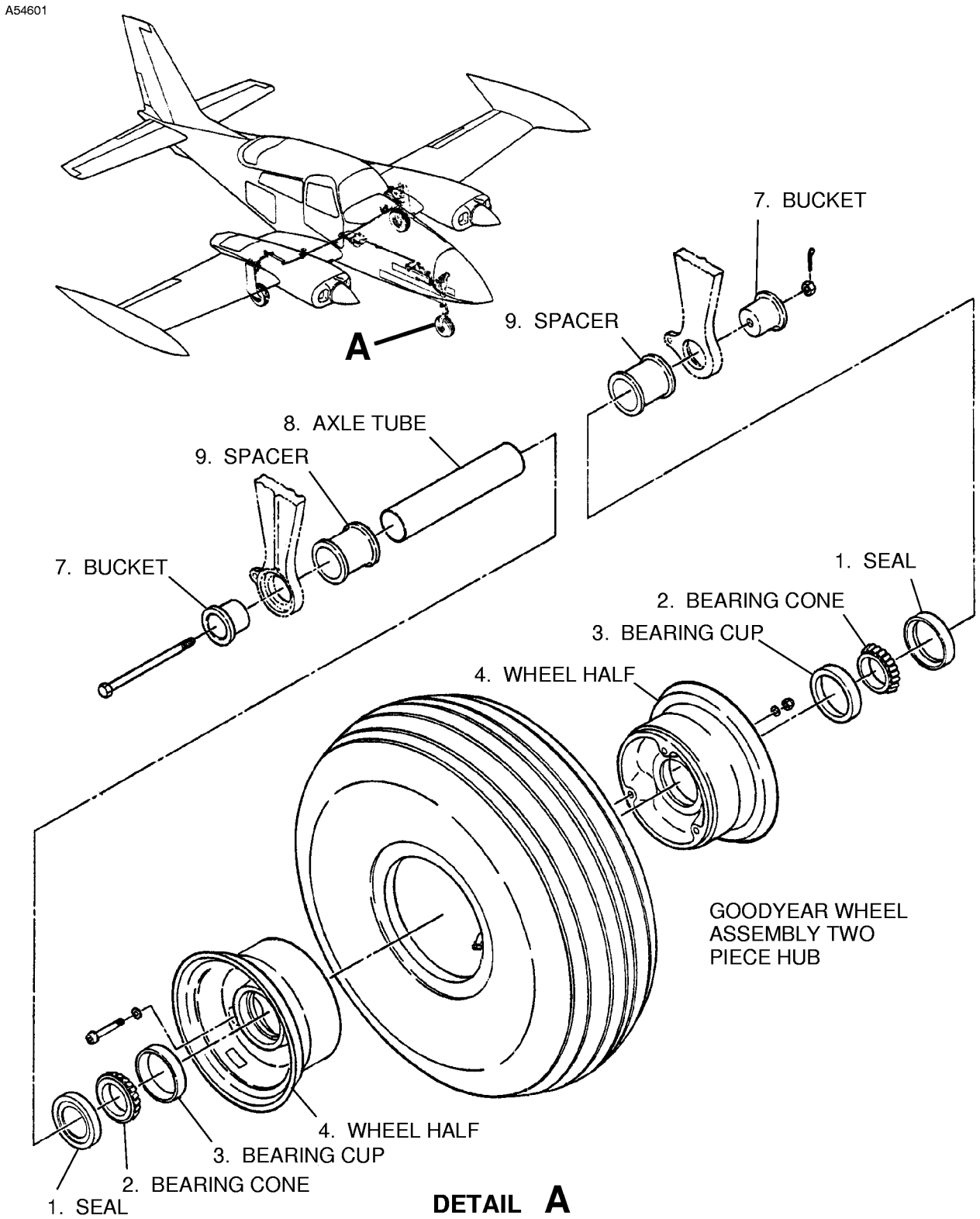

Nose Wheel and Tire Assembly (Goodyear)
Figure 405 (Sheet 1)

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E. Assembly (Goodyear) (Refer to Figure 405).
(1) If removed, replace bearing cups.

NOTE: Bearing cups are a shrink fit in the wheel. To install, place wheel in boiling water for at least 30 minutes, chill bearing cups with dry ice, and tap lightly into position to insure proper seating.

(2) Place wheel halves (4) in position on tire (6) and tube (5) and secure with bolts, washer, and nuts. Torque bolts to value marked on wheel half.

CAUTION: Tighten nuts evenly and torque correctly to lessen the possibility of bolt failure.

(3) Install valve core, then inflate tire sufficiently to seat the tire beads on the wheel assembly, deflate completely, then reinflate to operating pressure.
(4) Lubricate wheel bearing cones. Place cones in wheel assembly and secure in place with seals (1).

NOTE: If wheel is not to be installed immediately, cover wheel bearings adequately to prevent contamination of grease.

(5) Check wheel balance using wheel balancer kit SK150-20.

F. Installation (Refer to Figure 404).

CAUTION: Ensure bearing cones (2) are properly lubricated before installing wheel assembly.

(1) Insert axle tube (8) through wheel and place spacers (9) on each end of axle tube.

CAUTION: Spacers for the two piece hub assembly and the three piece hub assembly are not interchangeable. Ensure that correct spacers are used.

(2) Place wheel and tire assembly in position, align with mounting holes in nose gear fork and install axle buckets (7) and secure with bolt and nut. Tighten nut until a slight bearing drag is felt as wheel is rotated. Loosen nut to the nearest slot that will align cotter pin hole and install cotter pin.
(3) Remove jacks from airplane.

4. Master Cylinder

A. Removal (Refer to Figure 406).

NOTE: The removal procedures are typical for either right or left master cylinder.

(1) Remove pilot's seat, left scuff plate, left rudder bar shield, and carpet.
(2) Drain the hydraulic fluid from master cylinder and lines by disconnecting the line at the main wheel brake assembly.

CAUTION: Cap all open lines and fittings to prevent entry of foreign material.

(3) Disconnect clevis (1) from brake pedal (20) by removing cotter pin and pin.
(4) Disconnect lower end of body (9) from support (19) by removing cotter pin, pin, and spacers (18).
(5) Lift master cylinder high enough to disconnect hose from elbow (7). Remove cylinder.

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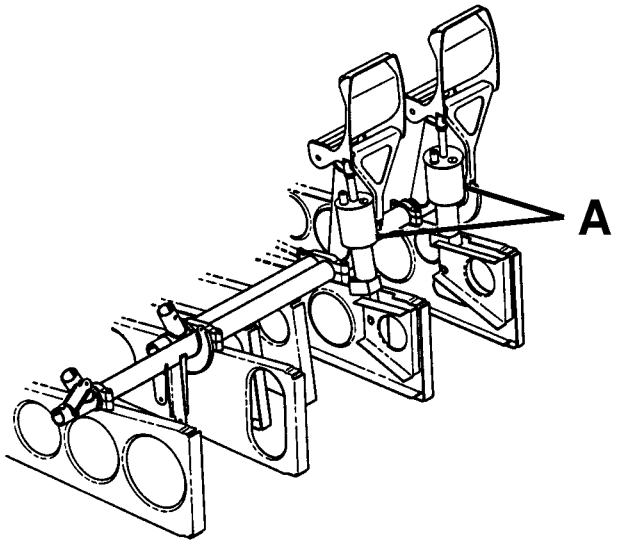
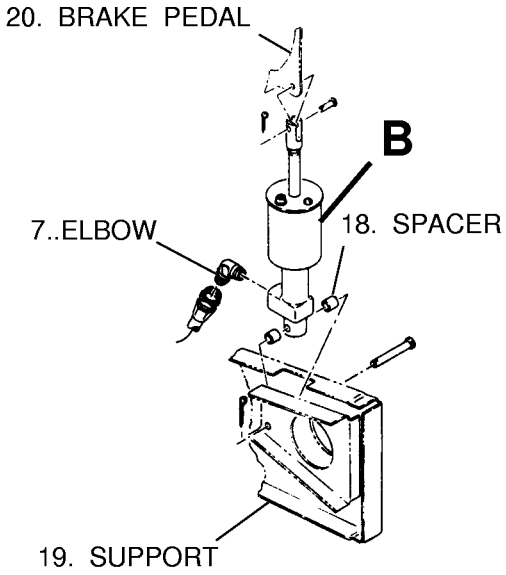
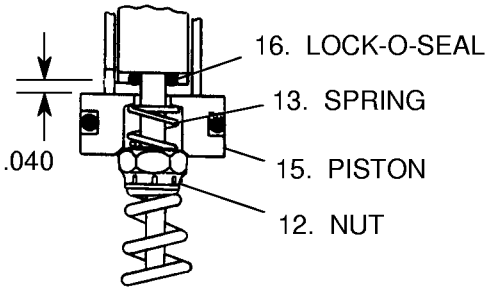
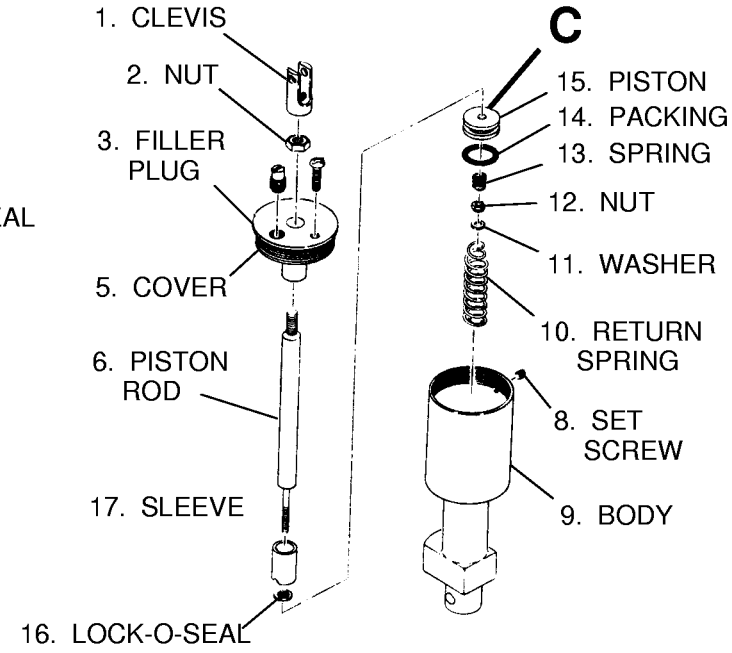




DETAIL A



DETAIL C



DETAIL B

10613019
A10473003
B10472002
C10471001

Brake Master Cylinder
Figure 406 (Sheet 1)

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B. Disassembly (Refer to Figure 406).

NOTE: For disassembly and assembly of Gerdes Model A-049-6 master cylinder, refer to Gerdes Products Company Overhaul Instructions for master cylinders.

(1) Remove filler plug (3) and drain residual hydraulic fluid from reservoir of body (9). Screw (4) serves no purpose in this assembly except as a plug for the threaded hole in the cover and need not be removed.
(2) Remove set screw (8) and unscrew cover (5) to remove cover and piston rod (6) along with the other parts which are attached to the piston rod.
(3) Remove return spring (10) and washer (11) from piston rod (6).
(4) Remove nut (12) from piston rod (6) to remove piston spring (13), piston (15), lock-o-seal (16), and compensating sleeve (17).
(5) Back off jamb nut (2) from its locking position against base of clevis (1) and remove both parts from piston rod (6).
(6) Remove packing (14) from piston (15).
(7) Remove elbow (7) from body (9), if required.

C. Assembly (Refer to Figure 406).
(1) Install lock-o-seal (16) on shank of piston rod (6).

CAUTION: Lubricate lock-o-seal with system hydraulic fluid and install carefully to prevent damage from the threaded portion of the piston rod shank.

(2) Slip packing (14) into groove in piston (15) using clean system hydraulic fluid as a lubricant.

CAUTION: Install packing carefully to prevent chipping on sharp corner of piston.

(3) Install piston (15), piston spring (13), and nut (12) on piston rod (6). With piston spring (13) compressed to seat piston (15) against nut (12), tighten nut (12) to adjust clearance between piston and lock-o-seal (16) to 0.040 inch, using a feeler gage or 0.040 wire to check measurement.

CAUTION: Be careful, when inserting feeler gage or wire, not to damage lock-o-seal.

NOTE: The 0.040 inch dimension between the lock-o-seal and the piston determines the relationship between piston rod travel and seating of the lock-o-seal to the piston. Proper master cylinder operation depends upon this dimension being set correctly.

(4) Place piston return spring (10) and washer (11) onto the threads of piston rod (6).

NOTE: If piston return spring (10) is installed incorrectly, brake dragging can occur.

(5) Lubricate cylinder walls and piston (15) with clean system hydraulic fluid and insert piston assembly into body (9).
(6) Place compensating sleeve (17) notched end toward piston, over piston rod (6). Slide cover (5) over piston rod, and tighten into body. Install set screw (8) and tighten to prevent movement of cover (5).
(7) Screw jamb nut (2) and clevis (1) onto piston rod end.
(8) Install filler plug (3) and elbow (7), if removed during disassembly.

NOTE: If elbow is being installed, use a suitable thread lubricant on threads before screwing into master cylinder. Do not allow lubricant to enter master cylinder or elbow passages.

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D. Installation (Refer to Figure 406).

NOTE: The installation procedures are typical for either right or left master cylinder.

(1) Lift hose end from its position between master cylinder mounting brackets and remove temporary cap. Attach hose to elbow (7) and tighten.
(2) Position cylinder between supports (19) and secure with pin, spacers (18), and cotter pin.
(3) Connect clevis (1) to brake pedal (20) with pin. Adjust clevis (1) to align tips of brake pedals (20) with rudder pedals in NEUTRAL position. Secure pin with cotter pin and secure clevis (1) with nut (2).

5. Brake Lines

A. Removal (Refer to Figure 407).

NOTE: When removing or installing lines at bulkhead fittings, insure that fitting is secured to prevent twisting line on opposite side from one being installed. Hold fitting with wrench while loosening or tightening line connection. Refer to Chapter 20, Tubing, Hose and Fluid Fittings - Maintenance Practices for expanded installation procedures.

(1) Remove access panels as necessary to gain access to brake lines.
(2) Disconnect left master cylinder hose (3) from elbow in web of pilot's left rudder pedal bracket, and remove through access hole.
(3) Remove left cabin brake line (12) as follows:

NOTE: As removal of this line requires its destruction, it is not recommended that it be removed except as required for replacement. Replacement of the factory installed line (12) will require two separate lines (15 and 16) joined with a union just above the floorboard on the forward side of the bulkhead.

(a) Cut line at riser portion forward of bulkhead and as close to the floorboard as practical.
(b) Loosen coupling nuts from elbows and remove each section of line.

(4) To remove right master cylinder hose:
(a) Disconnect cabin crossover brake line (11) from elbow in web of pilot’s right rudder pedal bracket.
(b) Remove attaching nut and washer from elbow to allow its removal from web or rudder pedal bracket. Remove hose (4), with elbow attached, through master cylinder mounting position.
(c) Detach hose from elbow.

(5) Disconnect cabin crossover brake line (11) from elbow in right side of control column well and remove through access hole in left floorboard.
(6) Remove intermediate cabin brake line (5) as follows:

NOTE: Due to difficulty of access, it is recommended that this line be removed only as necessary for replacement.

(a) Remove attaching nut and washers from elbow in right side of control column well to allow its withdrawal from position.
(b) Disconnect line (5) from aft elbow.

NOTE: Access to the aft coupling nut on this line is through the forward rectangular access hole in the right floorboard and through the lightening hole in the web of the copilot’s left rudder pedal bracket. A 9/16 inch crowfoot wrench and extension can be manipulated through this opening to loosen the coupling nut.

(c) Remove line through lightening hole, with elbow still attached, by manipulating forward end outboard and forward, to allow aft end to clear edge of lightening hole.
(d) Detach line (5) from elbow.

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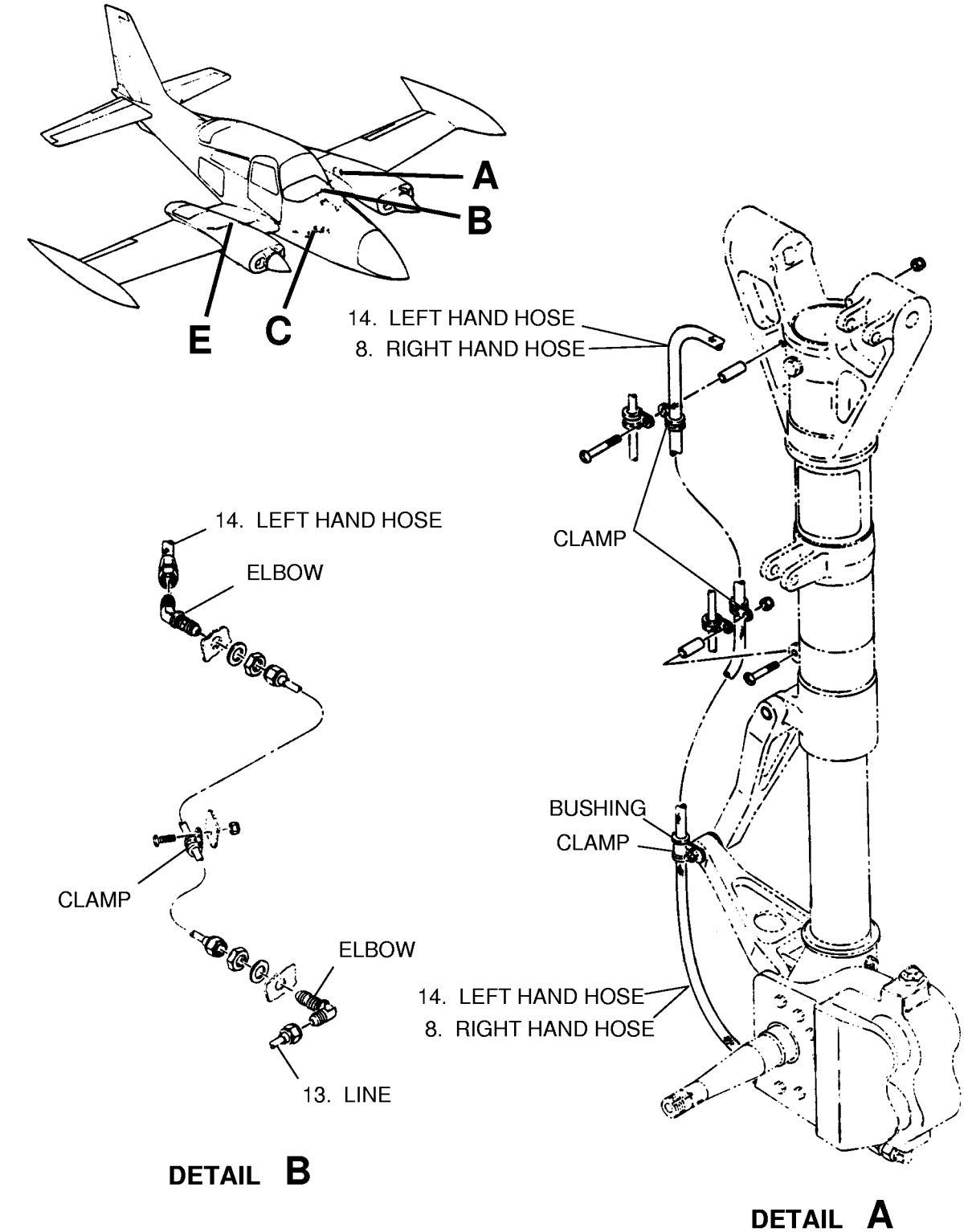

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A10473004
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Brake System Plumbing
Figure 407 (Sheet 1)

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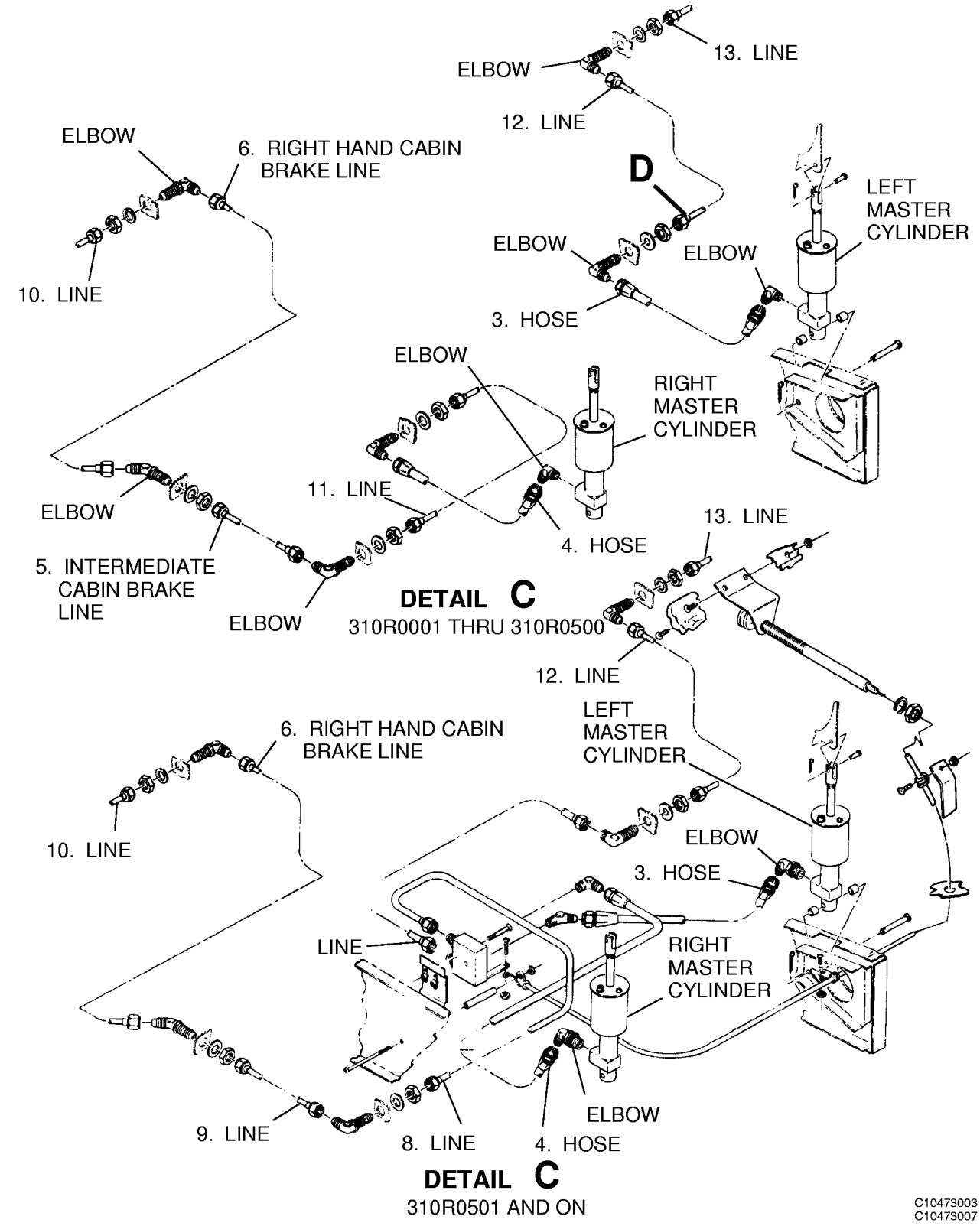

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Brake System Plumbing
Figure 407 (Sheet 2)

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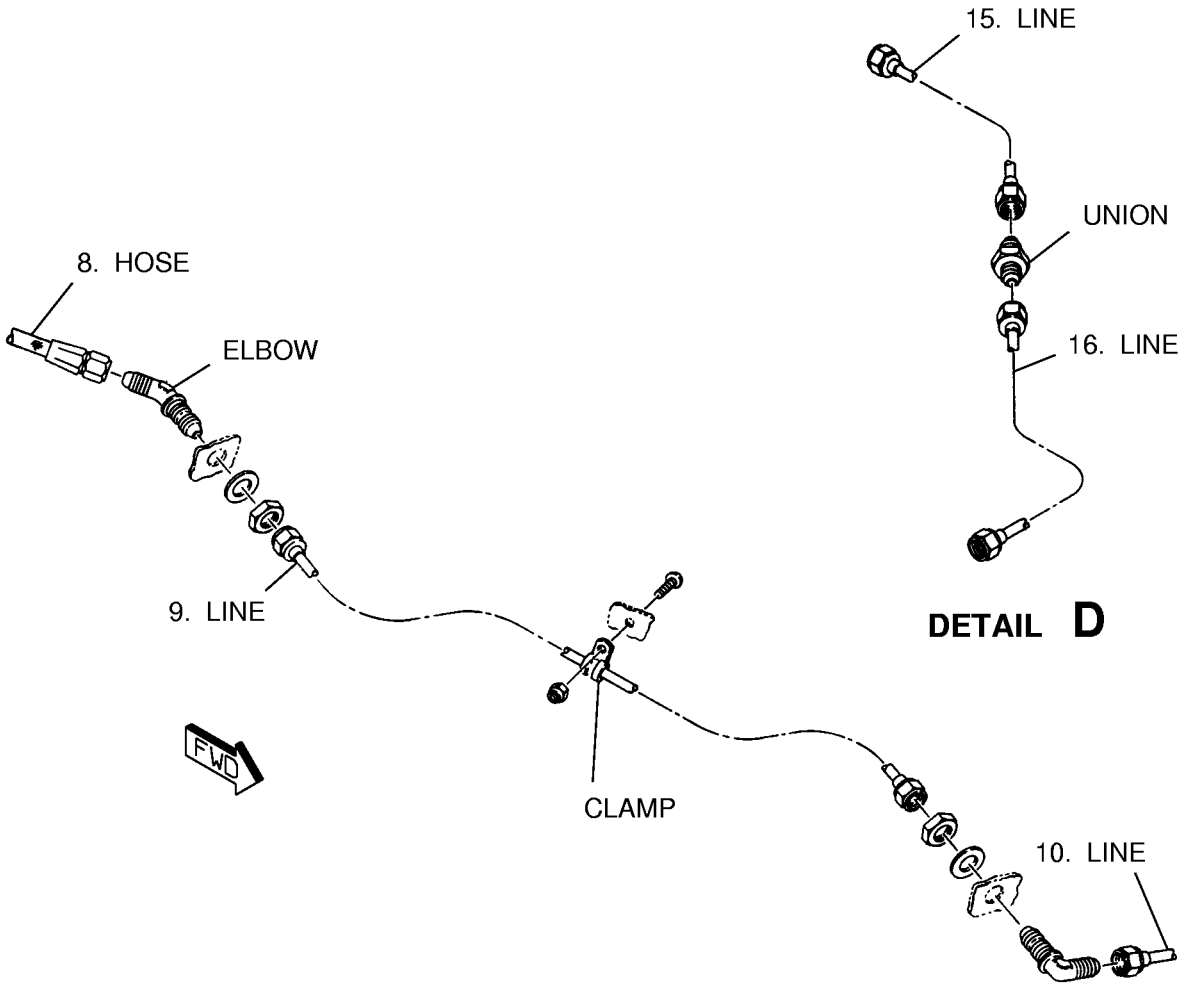

DETAIL D

DETAIL E

D10471003
E10472003

Brake System Plumbing
Figure 407 (Sheet 3)

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(7) Disconnect right cabin brake line (6) from elbows. Carefully work line from its position beneath the floorboards, and remove through access hole.

CAUTION: It may be necessary to flex this line slightly to facilitate removal. However, excessive bending should be avoided to prevent deformation or other damage to the line.

(8) Remove forward wing root fillets, and the two inboard access hole covers from underside of each wing leading edge.
(9) To remove right and left wing inboard brake lines (10 and 13), disconnect each one from fittings at both ends, and carefully work them free of adjacent lines inside the wings so that they can be removed through the rectangular access holes.
(10) Disconnect right and left wing outboard brake lines (1 and 9) from fittings at both ends, remove clamps and remove lines through main wheel wells.
(11) Disconnect right and left brake hoses (8 and 14) from elbows at their upper ends. Remove two upper hose clamps. To release hoses, remove hose clamps by removing nuts from bolts in main gear torque links. Replace nuts and secure with cotter pins after hose clamps have been removed.
(12) Remove brake hoses (8 and 14) by detaching coupling nuts from fittings in main brake assemblies. Install temporary caps over brake assembly fittings to prevent entry of foreign material.

B. Installation (Refer to Figure 407).

NOTE: Use only clean system hydraulic fluid as a lubricant for all hydraulic fittings.

(1) Remove temporary caps from fittings in brake assemblies and attach brake hoses (8 and 14) to fittings.
(2) Attach upper hose ends to elbows. Fasten hoses (8 and 14) and secure to torque link with clamps, bolts, and nuts. Secure nuts with cotter pins. Attach clamps to upper portion of hoses.
(3) Working through main wheel wells, place right and left wing outboard brake lines (1 and 9) in position and attach ends to elbows. Attach clamps.
(4) Working through wing access holes, carefully work right and left wing inboard brake lines (10 and 13) into position and attach ends to elbows as illustrated.

CAUTION: Some flexing of the lines may be necessary to work them into position. However, excessive bending should be avoided.

(5) Replace access hole covers and wing root fillets.
(6) Working through aft, right rectangular floorboard access hole, carefully work right cabin brake line (6) into position beneath the floorboard, with outboard end extending upward through routing hole in floorboard. Attach ends to elbows.

CAUTION: Some flexing of this line will be required to work it into position. However, excessive bending should be avoided.

(7) Install intermediate cabin brake line (5) as follows:
  (a) Attach elbow to forward end of line and set washer in place over elbow.
  (b) Working through forward right floorboard access hole, and through lightening hole in web of copilot's left rudder pedal bracket, work line (5) into position, with elbow extending through routing hole in right side of control column well.

  NOTE: Do not allow washer to drop from elbow while working line into position.

  (c) Using a 9/16 inch crowfoot wrench with extension, attach aft coupling nut on line (5) to elbow.
  (d) Secure elbow in place at right side of control column well with washer and attaching nut.

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(8) Working through left floorboard access hole, position U-shaped cabin crossover brake line (1) beneath left floorboard, with longer leg extending through routing hole in left side of control column well. Attach coupling nut to elbow in right side of control column well.
(9) To install right master cylinder hose (4):
  (a) Connect elbow to hose end.
  (b) Place washer over elbow, and working aft through right master cylinder mounting position, place elbow with hose attached, into position in routing hole through web of pilot's right rudder pedal bracket.

    NOTE: Do not allow washer to drop from elbow, while working elbow into position.

  (c) Secure elbow with washer and nut.
  (d) Attach coupling nut on cabin crossover line (11) to elbow.
(10) To install left cabin brake line (12):

    NOTE: If left cabin brake line (12) was removed, three parts may be fabricated to replace it. This assembly consists of a left floorboard brake line (16), a union, and a left bulkhead brake line (15).

  (a) Join union to short end of left floorboard brake line (16).
  (b) Position left floorboard brake line beneath left floorboard so that end with union attached extends upward through routing hole in floorboard. Attach coupling nut to elbow.
  (c) Position left bulkhead brake line (15) through routing hole in bulkhead, and attach coupling nuts to elbow and union.
(11) Attach coupling nut on left master cylinder hose (3) to elbow in web of pilot's left rudder pedal bracket.

6. Main Wheel Brake (Airplanes 310R0001 thru 310R0500)

A. Removal (Refer to Figure 408).
  (1) Jack airplane, refer to Chapter 7, Jacking - Description and Operation.
  (2) Remove wheel and tire assembly.
  (3) Disconnect brake line from elbow (10).
  (4) Remove brake housing (4) and brake disc (3) from axle flange (6) by removing five bolts, washers, and nuts.

B. Disassembly (Refer to Figure 408).
  (1) Remove brake disc (3) and piston linings (7 and 11) from housing.
  (2) Remove lock ring (15) from recess in housing, then remove cylinder head (14) and piston (12).
  (3) Remove packings (13) from piston and cylinder head.
  (4) Remove elbow (10), nut (9), and packing (5).
  (5) Remove bleeder valve (18), adapter (17), and packing (16).

C. Assembly (Refer to Figure 408).
  (1) Install elbow (10), nut (9), and packing (8).
  (2) Install bleeder adapter (17), packing (16), and bleeder valve (18).
  (3) Using clean hydraulic fluid as a lubricant, set new packings (13) in place on cylinder head (14) and piston (12).
  (4) Lubricate cylinder walls and pistons with clean hydraulic fluid and insert piston (12) and cylinder head (24) into cylinder.
  (5) Secure cylinder head (14) in place with lock ring (15).

    NOTE: Make certain lock ring is seated in the retaining groove.

  (6) Install new or serviceable brake linings (7 and 11), setting piston lining (11) in piston side, with smooth sides of linings facing each other.
  (7) Set brake disc (3) in place between linings.

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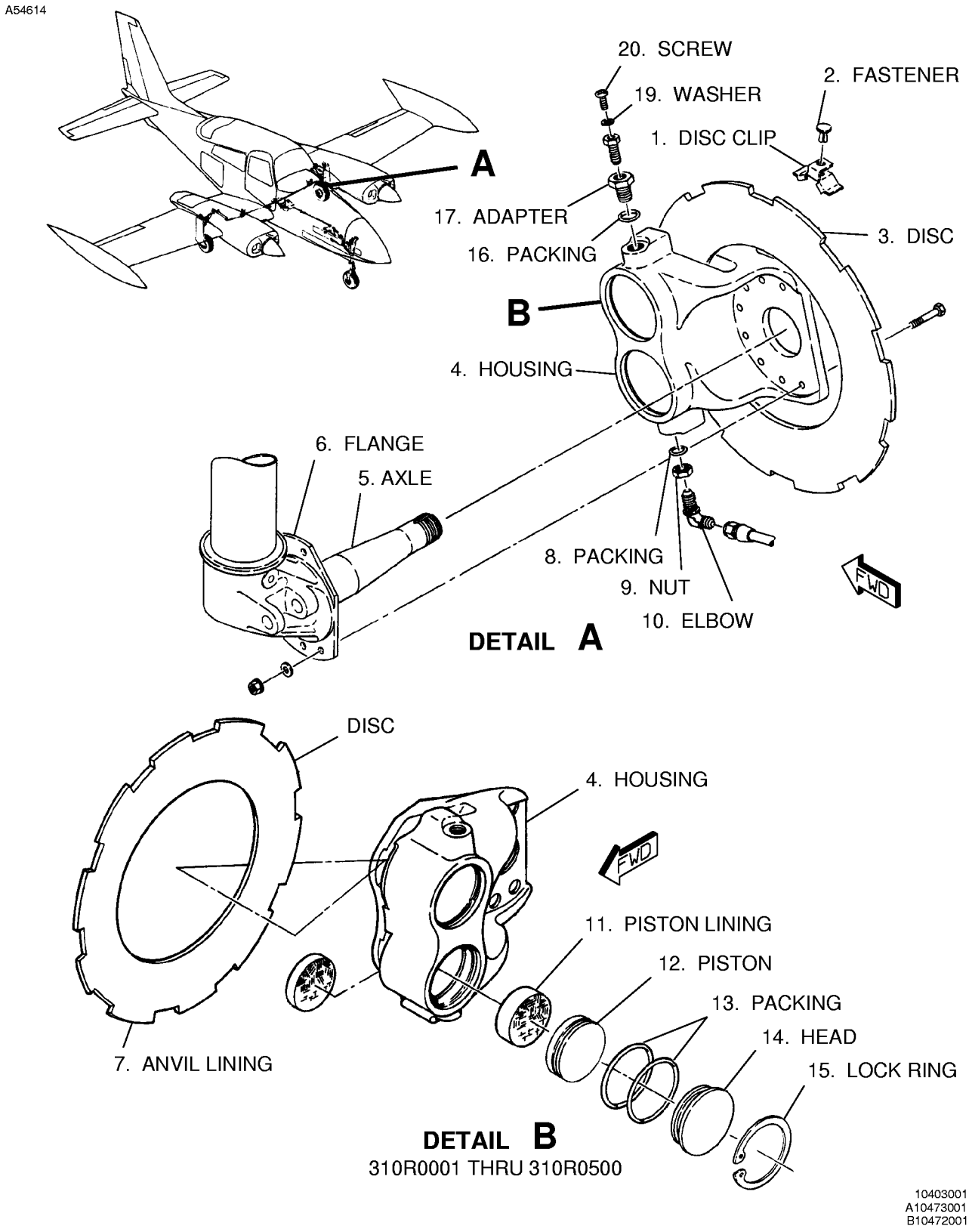

Main Wheel Brakes (Airplanes 310R0001 thru 310R0500)
Figure 408 (Sheet 1)

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D. Installation (Refer to Figure 408).
(1) Position assembled brake housing (4) and disc (3) to axle so that bleeder valve is vertical and secure with five bolts, washers, and nuts. Torque nuts to 100 inch-pounds, +10 or -10 inch-pounds.
(2) Install wheel and tire assembly.
(3) Attach brake line to elbow (10) and bleed brakes.
(4) Remove airplane from jacks.

7. Main Wheel Brake (Airplanes 310R0501 thru 310R2140)

A. Removal (Refer to Figure 409).
(1) Jack airplane, refer to Chapter 7, Jacking - Description and Operation.
(2) Remove wheel and tire assembly.
(3) Disconnect brake line (22) from elbow (21).
(4) Remove brake cylinder (7) and torque plate (12) as an assembly from axle (5) by removing eight bolts, washers, and nuts. Retain spacer (6) for reinstallation of brake assembly.

B. Disassembly (Refer to Figure 409).

NOTE: During main wheel and tire removal, back plate (14) and shim (11) was removed from cylinder (7) by removing six bolts and washers. The brake disc is assembled to the main wheel.

(1) Slide torque plate (12) and pressure plate (17) from anchor bolts (18). Anchor bolts (18) may be removed from cylinder (7) if necessary by removing nuts and washers.
(2) Remove insulators (10) and pistons (8) from cylinder (7).
(3) Remove packings (9) from pistons (8).
(4) Remove elbow (21), nut, and packing from cylinder.
(5) Remove bleeder valve and packing.

C. Assembly (Refer to Figure 409).
(1) Install packing (20) and bleeder valve (19).
(2) Install nut and packing on elbow (21) and install elbow in cylinder (7).
(3) If anchor bolts (18) were removed, install anchor bolts with washers and nuts.
(4) Using clean hydraulic fluid as a lubricant, set new packings in place on pistons (8) and insert pistons in cylinder (7).
(5) Install insulators (10) into each piston.
(6) Slide pressure plate (17) and torque plate (12) onto anchor bolts (18).
(7) Install shim (11) and back plate (14).

D. Installation (Refer to Figure 409).
(1) Position spacer (6) and torque plate-cylinder assembly to axle and secure in place with eight bolts, washers, and nuts. Torque nuts to 100 inch-pounds, +20 or -0 inch-pounds.

NOTE: The brake disc is assembled to the main wheel assembly. Refer to Main Wheels and Brakes for removal and installation of brake disc.

(2) Install wheel and tire assembly.
(3) Connect brake line (22) and bleed brakes.
(4) Remove airplane from jacks.

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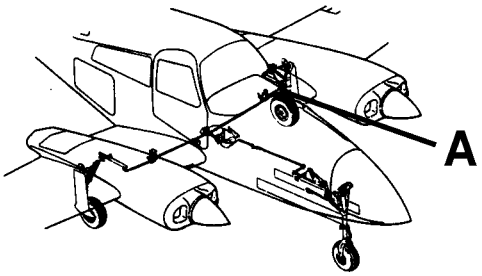

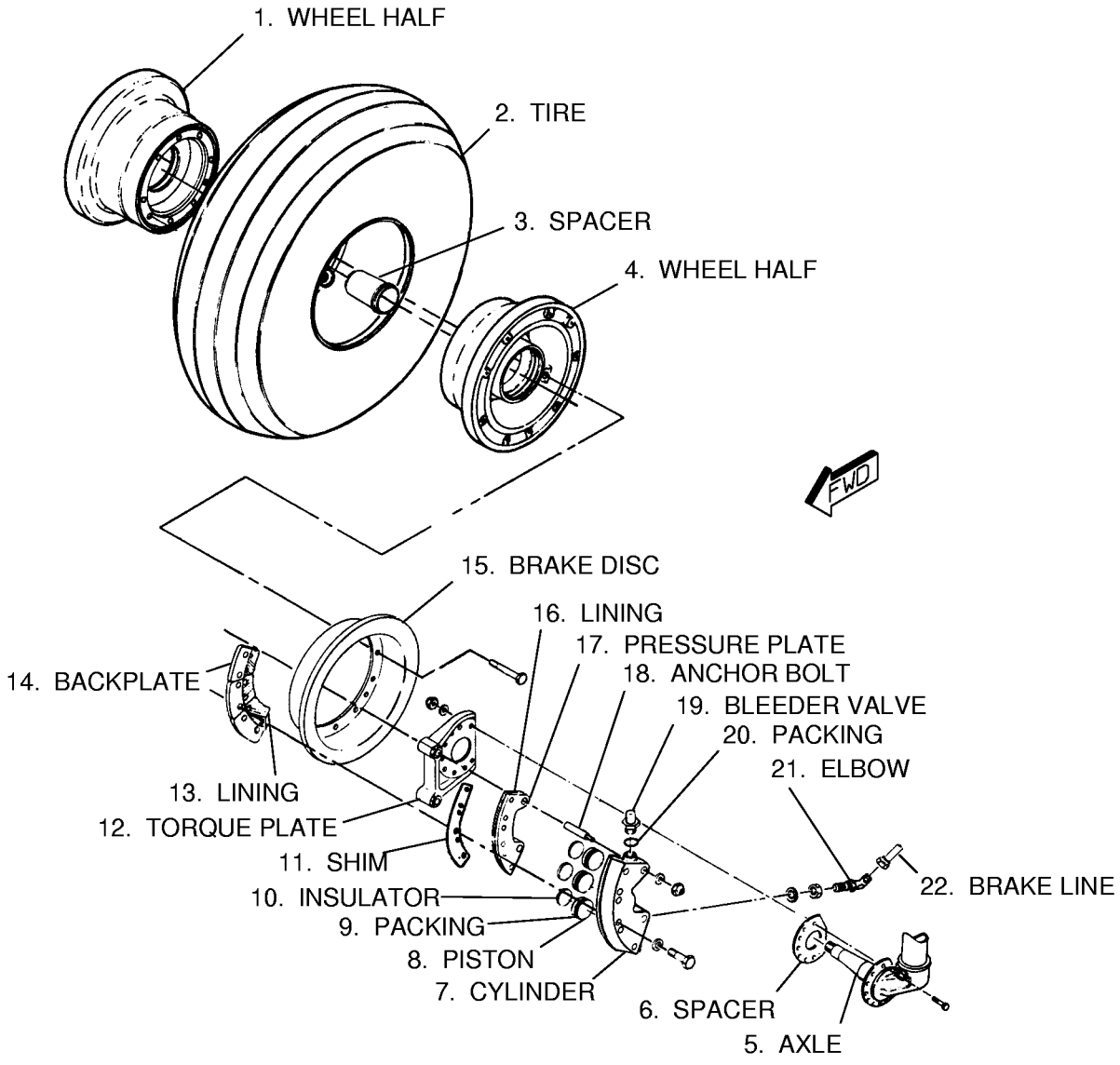

DETAIL A

Main Wheel Brakes (Airplanes 310R0501 thru 310R2140)
Figure 409 (Sheet 1)

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8. Brake Burn In - New Brakes

CAUTION: This burn in procedure must be performed by a qualified pilot using information outlined in the Pilot's Operating Handbook and FAA approved Airplane Flight Manual and who is familiar with the proper field lengths required for various acceleration and stop distances.

NOTE: Brake burn in is required to minimize glazing of the friction surfaces. Light braking can cause glazing and in turn brake noise, chatter, and vibration.

A. Brake Burn In Procedure.

CAUTION: Refer to and follow the current information from the brake manufacturer for the latest brake burn-in procedures. Use the brake manufacturer's instructions whenever there is a difference between Cessna's brake burn-in procedures and the brake manufacturer's instructions.

CAUTION: Minimize taxi braking prior to burn in of the brakes. During braking, use the brakes intermittently rather than continuously dragging the brakes.

(1) Following wheel brake installation, perform a high-speed taxi of the airplane and apply brakes at approximately 45 to 60 knots ground speed. Apply brakes firmly but not excessively and hold pedal force until the airplane decelerates to a safe taxi speed. Repeat high-speed taxi and brake application three times. This will burn in the brake friction components and remove the corrosion prevention preservatives from the friction surfaces.

NOTE: Do not set the parking brakes hot, since irregular friction surface mix transfer can result in brake chatter, noise, and vibration.

9. Parking Brake System (Airplanes 310R0001 thru 310R0500)

A. Removal (Refer to Figure 410).
(1) Remove pilot and copilot seats, carpet, and access panels as required to gain access to parking brake system.
(2) Detach left and right parking brake cables (11 and 22) by removing cotter pins and pins.
(3) Disconnect parking brake cable (6) at tube (5) by removing cotter pin and pin.
(4) Remove handle assembly from bracket (3) by removing nuts and bolts.
(5) Remove cable (6) by removing pulleys (8 and 10); remove cotter pin and pin at eye bolt (12).
(6) Remove parking brake torque tube (17) as follows:
(a) Remove cotter pin and pin attaching coupling (13) to torque tube (17) and remove from torque tube.
(b) Remove nuts and bolts attaching left torque tube support (14) to bulkhead (15) and remove support.
(c) Slide torque tube (17), with attached components, outboard to clear hole in right torque tube support (20); then work forward to clear the floorboards.
(d) Further disassembly of the torque tube may be accomplished if desired.

B. Installation (Refer to Figure 410).
(1) Assemble right parking brake coupling (19) to torque tube (17) and attach right cable (22).
(2) If removed, attach torque tube support (20) to bulkhead (21) with three screws and nuts.
(3) Position torque tube (17) between bulkheads (15 and 21) with the inboard end through hole in the right support (19). Position support (14) over the outboard end of torque tube and secure to bulkhead (15) with three bolts and nuts.
(4) Position coupling (13) over end of torque tube and secure with pin and cotter pin.
(5) If disassembled, assemble parking brake handle components as illustrated. Attach assembly to bracket (3) with two bolts and nuts.

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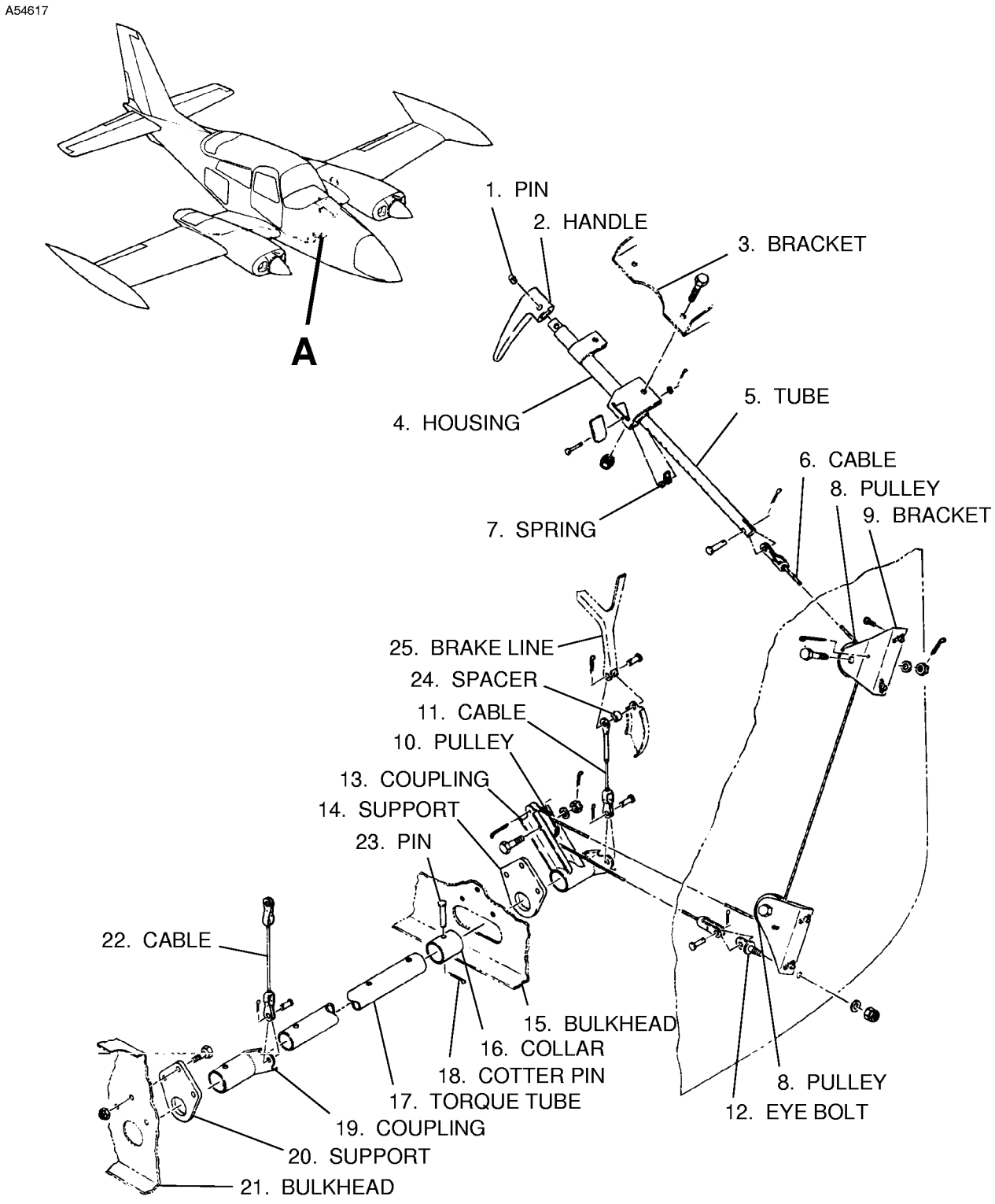

DETAIL A

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Parking Brake System (Airplanes 310R0001 thru 310R0500)
Figure 410 (Sheet 1)

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(6) Attach cable (6) to eye bolt (12) with pin and cotter pin. Route cable over pulleys (10 and 8) and secure pulleys in place with bolt and nut.

NOTE: If cotter pins used as cable guards were removed, make sure cotter pins are reinstalled.

(7) Secure end of cable (6) to tube (5) with pin and cotter pin.
(8) Route free ends of cables (11 and 22) through holes in floorboard and attach to brake links (25) with pin, spacer (24), and cotter pin.
(9) Install access panels, carpet, and seats.

10. Parking Brake System (Airplanes 310R0501 thru 310R2140)

A. Removal (Refer to Figure 411).
(1) Drain fluid from brake system by removing bleeder screw and opening bleeder valve.
(2) Remove pilot's seat.
(3) Remove carpet and scuff plate from front floorboards.
(4) Remove access panels as required to gain access to parking brake valve.
(5) Remove hoses (9 and 10) and lines (6 and 7) from parking brake valve (8). Cap and plug lines and fittings to prevent entry of foreign materials and leaking of fluid.
(6) Disconnect parking brake control (1) from valve (8) by removing screw and nut.
(7) Remove two screws securing valve (8) to support and remove valve from airplane.
(8) Remove parking brake control as follows:
(a) Remove nuts, screws, clasps (3), and spacers (4).
(b) Remove nut securing control (1) to mounting bracket (2) and route cable from airplane.

B. Installation (Refer to Figure 411).
(1) If elbows were removed from parking brake control valve (8), install elbows into valve using system hydraulic fluid as a thread lubricant. Elbows must be installed pointing forward.
(2) Position control valve to support and secure with two screws.
(3) Remove caps and plugs from lines and fittings. Connect lines (6 and 7) and hoses (9 and 10) to control valve.
(4) Install parking brake control (1) as follows:
(a) Route control (1) through bracket (2) and nut, through floorboard to valve (11). Secure control to mounting bracket with nut.
(b) Connect control (1) to valve (8) with screw and nut.
(c) With control and control valve in brakes OFF position, secure control cable to structure with clamps (3), spacers (4), screws, and nuts.
(5) Bleed and service brakes.
(6) Check parking brake for proper operation and check fittings, lines, and hoses for leaks.
(7) Install access panels, carpet, and scuff plates.
(8) Install pilot's seat.

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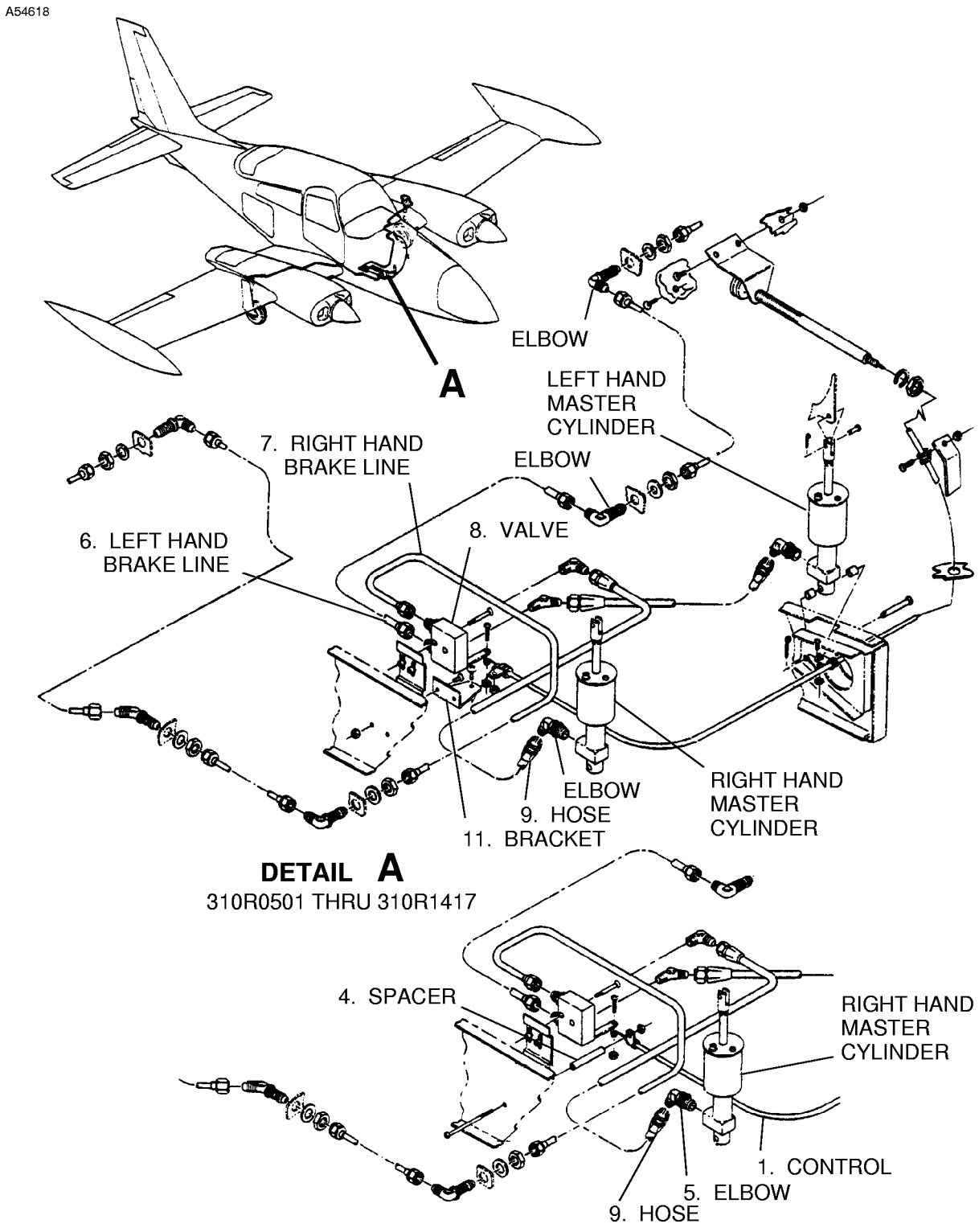

Parking Brake System (Airplanes 310R0501 thru 310R2140)
Figure 411 (Sheet 1)

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WHEELS AND BRAKES - INSPECTION/CHECK

1. Brake Assemblies

A. Inspection.
(1) Clean as required, refer to Wheels and Brakes - Cleaning/Painting. Inspect metal parts for wear and thread damage. Inspect brake disc. Inspect cylinder walls for corrosion, pitting, and scoring. For repairs, refer to Wheels and Brakes - Approved Repairs.

2. Main Wheel Brakes (Airplanes 310R0001 thru 310R0500)

A. Inspection (Refer to Figure 601).
(1) Check brake lining wear limits as follows:
(a) Set the parking brake to force the brake disc (3) against the anvil lining (7).
(b) Check clearance between outboard surface of brake disc (3) and flat surface of brake housing (4).
(c) Replace linings if space is, or exceeds, 3/8 (0.375) inch.
(2) Check brake disc wear limits as follows:
(a) Inspect disc for wear. Discard disc when worn to a thickness of 0.225 inch or less.
(b) Inspect disc for dishing. Disc must be replaced if dishing exceeds 1/16 (0.0625) inch.
(c) Inspect disc keyways for wear and battering. Replace disc if keyway width exceeds 1.188 inch.
(3) Check drive keys (15, Figure 602) for wear.
(a) If drive keys are worn to a minimum width of 1.116 inches, replace drive keys.

NOTE: Drive keys must be replaced as a set.

3. Main Wheel Brakes (Airplanes 310R0501 thru 310R2140)

A. Inspection (Refer to Figure 603).

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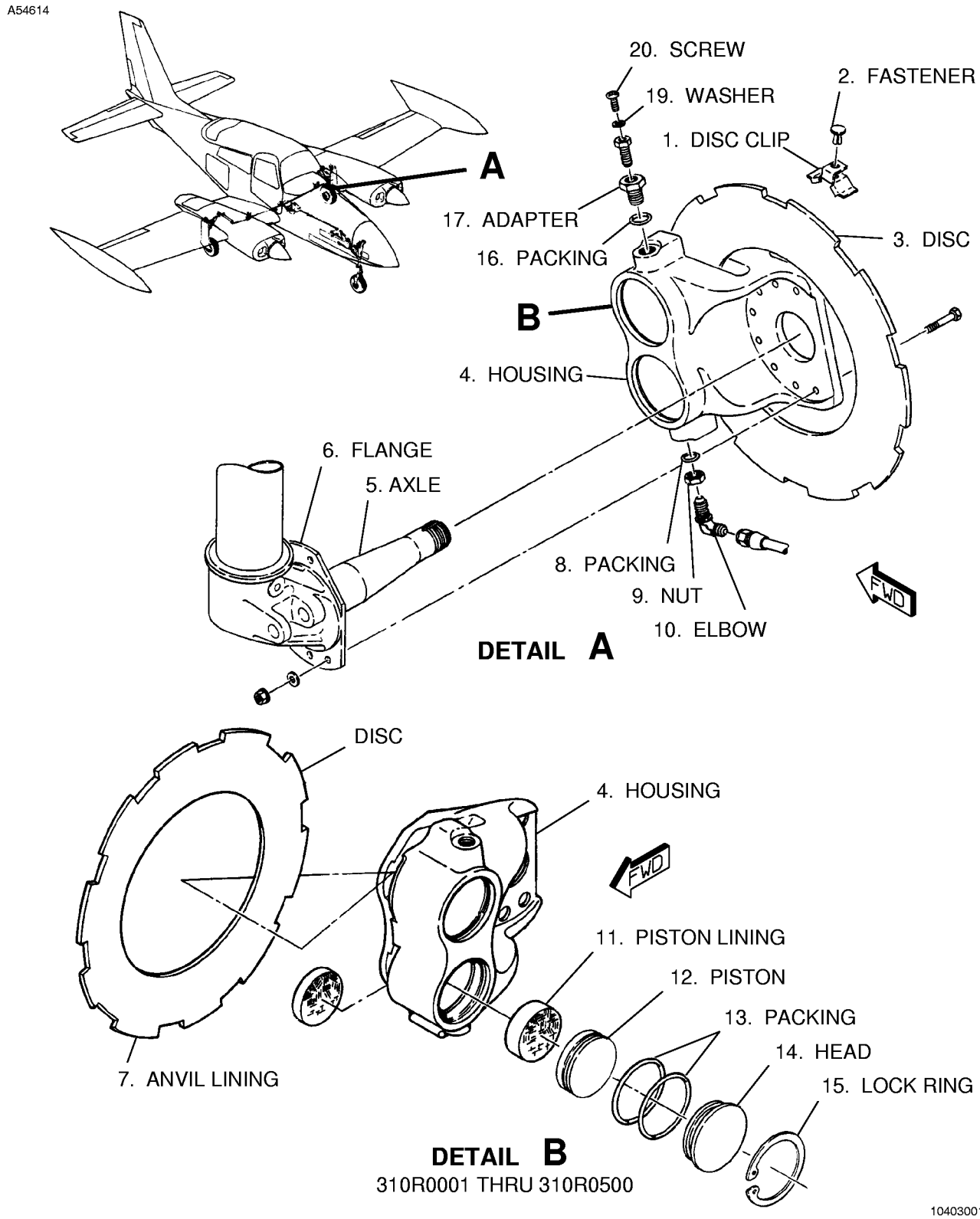

Main Wheel Brakes
Figure 601 (Sheet 1)

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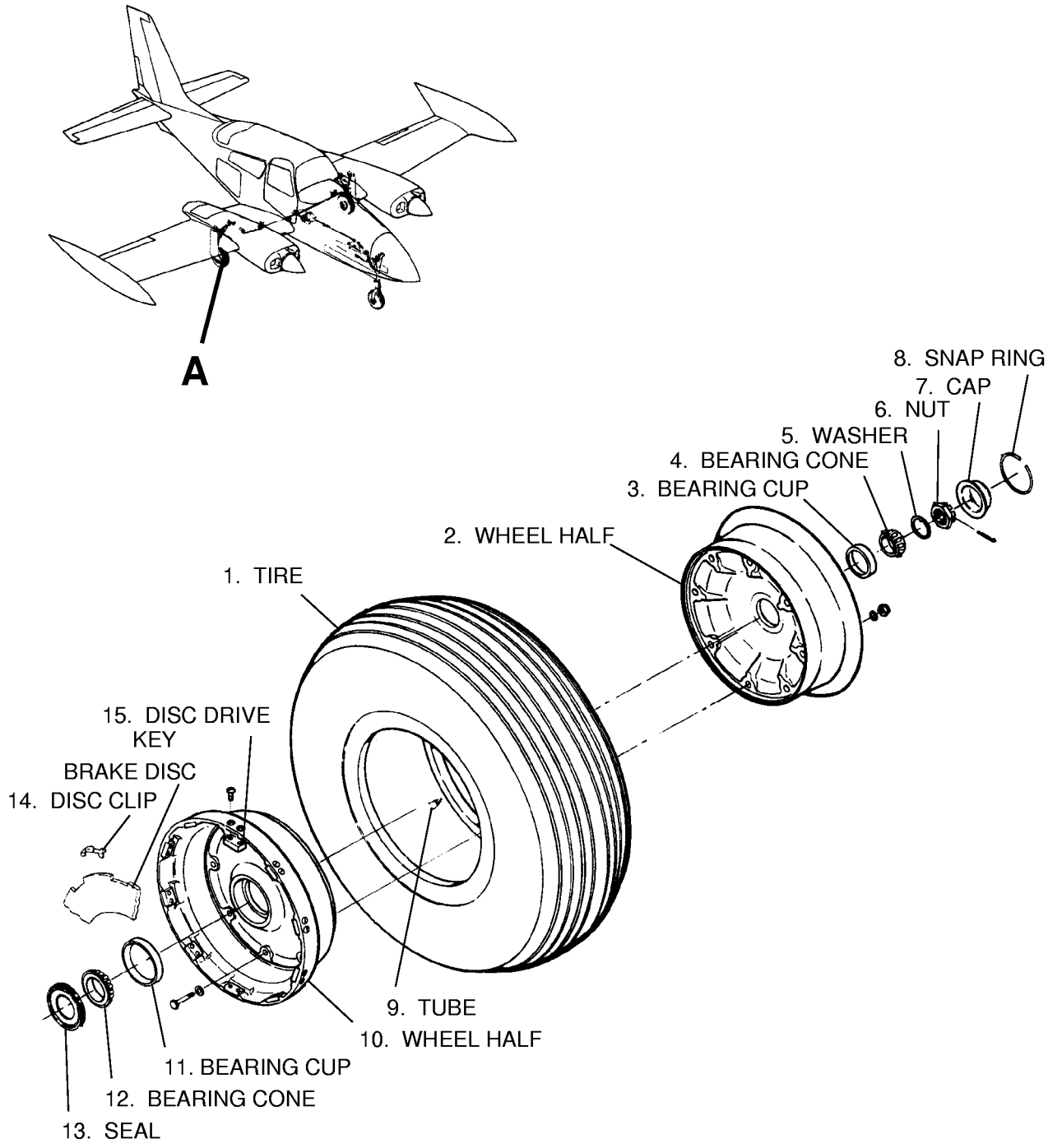

DETAIL A

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Main Wheel and Tire Assembly
Figure 602 (Sheet 1)

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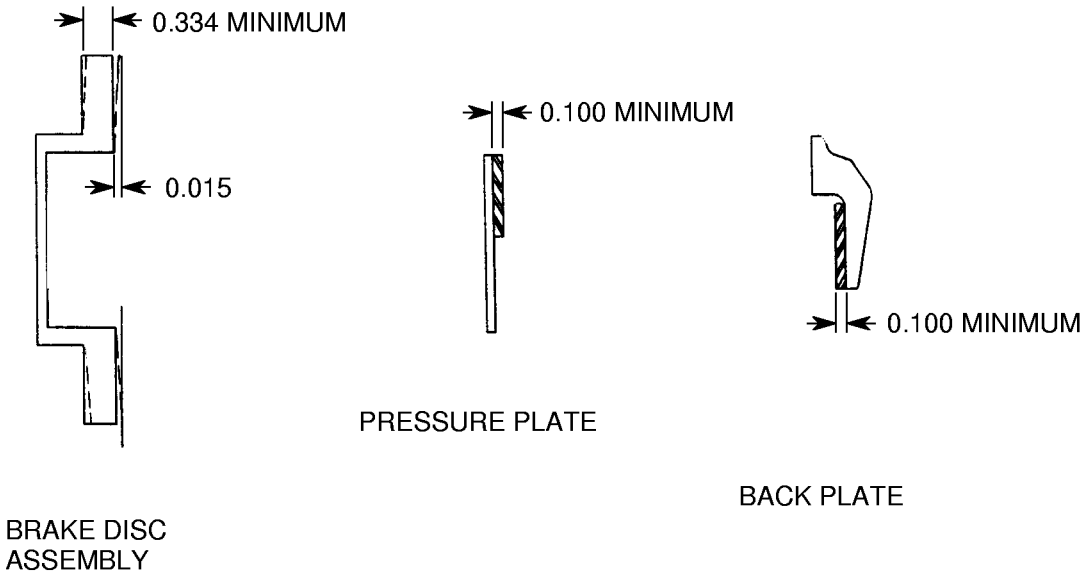

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Brake Wear Limits
Figure 603

(1) Check back plate and pressure plate linings for wear. If worn to a thickness of 0.125 to 0.100 inch, the linings should be replaced.
(2) Check brake disc for wear and dishing. The brake disc should be replaced if worn to a minimum thickness of 0.334 inch or face of disc is dished in excess of 0.015 inch.

4. Nose and Main Wheels and Tires

A. Inspection.
(1) For inspection of Nose and Main Wheels and Tires, refer to Main Landing Gear - Servicing and Nose Gear - Servicing.

5. Master Cylinder

A. Inspection.
(1) Clean all metal parts, refer to Wheels and Brakes - Cleaning/Painting. Inspect metal parts for wear and thread damage. Inspect cylinder walls for corrosion, pitting, and scores. Inspect O-ring seal and O-ring portion of lock-o-seal for swelling, chipping, or other evidence of damage. Inspect vent hole for obstruction. For approved repairs, refer to Wheels and Brakes - Approved Repairs.

6. Brake System Plumbing

A. Inspection.
(1) Clean as required, refer to Wheels and Brakes - Cleaning/Painting. Inspect fittings for damaged threads and deformed flares on ends of tubing, lines for cracks, dents, deep scratches, flattened bends, and signs of chafing, hoses for swelling, cracking, abrasions through protective plies, and leaks. Repairs to brake system plumbing should be made in accordance with best shop practice, using standard parts and procedures and conducted in compliance with applicable regulations. For repairs, refer to Wheels and Brakes - Approved Repairs.

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WHEELS AND BRAKES - CLEANING/PAINTING

1. Main and Nose Wheel Assembly

A. Cleaning.
(1) All metal parts may be cleaned with a suitable solvent.
(2) Clean felt seals and bearing cones by washing in suitable solvent and dry thoroughly. Lubricate felt seals with light oil.

2. Brake System

A. Cleaning.
(1) Clean hydraulic components with clean system hydraulic fluid or denatured alcohol.
(2) Wash metal parts in suitable solvent.
(3) Wash O-rings with clean system hydraulic fluid or denatured alcohol.
(4) If required, clean brake linings with MEK.

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WHEELS AND BRAKES - APPROVED REPAIRS

1. Main and Nose Wheel Assembly

A. Approved Repairs.
(1) Remove corrosion, refer to Chapter 51, Corrosion - Approved Repairs.
(2) Paint wheel assembly.

NOTE: Replace castings which show evidence of cracks or heavy corrosion.

2. Brake System

A. Approved Repairs.
(1) Replace worn or damaged parts.
(2) Polish out minor nicks using 400 grit wet-or-dry sandpaper with system hydraulic fluid.
(3) Replace brake linings at each engine overhaul or when wear approaches limits described in Wheels and Brakes - Inspection/Check.
(4) Replace master cylinder body when damage to cylinder wall is found.
(5) Repair to master cylinder components are not recommended, only replacement of unserviceable parts.

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STEERING - DESCRIPTION AND OPERATION

1. Nose Gear Steering

A. Description.

(1) The nose gear steering system permits nose gear steering with the rudder pedals, for angles up to 18 degrees, either right or left of center. Spring loaded nose gear steering cables permit continued resisted turning action of the nose gear for steering angles greater than 18 degrees, up to a maximum limit (limited by a mechanical stop). Steering arms welded to the rudder torque tubes are connected by the steering cables to a steering gimbal which pivots in a support mounted directly above the nose gear trunnion assembly. The gimbal allows nose gear steering when the gear is down. When gear is retracted, the gimbal serves as an idler, permitting free wheeling of the nose gear steering.

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STEERING - REMOVAL/INSTALLATION

1. Nose Gear Steering

A. Removal (Refer to Figure 401).
(1) Remove pilot's and copilot's seats, front carpet, and access covers as required to gain access to steering cables.
(2) Remove nose baggage shelf and radio equipment to gain access to steering cables.

CAUTION: Do not remove clevis pin from nose gear steering bellcrank without first releasing tension on the nose gear steering cables.

(3) Disconnect the nose gear steering cables at the forward bellcrank in the nose wheel well by loosening the turnbuckles (6).

NOTE: Removal procedures are given for the left steering cable. Procedures are the same for the right cable.

(4) Disconnect aft nose gear steering cable (10) from rudder torque tube by removing cotter pin, nut, and bolt.
(5) Remove cable guard pin (7) from bracket (3). Pull forward cable thru wheel well web into nose section and remove cable assembly.
(6) If desired, spring assembly (8) may be removed from forward and aft cables by removing cotter pins, nuts, and bolts.

B. Installation (Refer to Figure 401).
(1) If disassembled, attach spring assembly (9) to forward and aft cable with bolts, nuts, and cotter pins.
(2) Route turnbuckle end of cable through wheel well to steering bellcrank (1) and attach with links (4), bolts, nuts, washers, and cotter pins.
(3) Route aft cable (10) and spring assembly (9) through spring housing to the rudder torque tube and connect with bolt, nut, and cotter pin.

NOTE: Nose steering spring assemblies are preset at the factory to 85 pounds. Do not alter settings.

(4) Rig nose gear steering cables, refer to Steering - Adjustment/Test.
(5) Install guard pin (7).
(6) Install radio equipment and baggage shelf.
(7) Install access panels, carpet, and seats.

2. Steering Spring

A. Disassembly (Refer to Figure 402).

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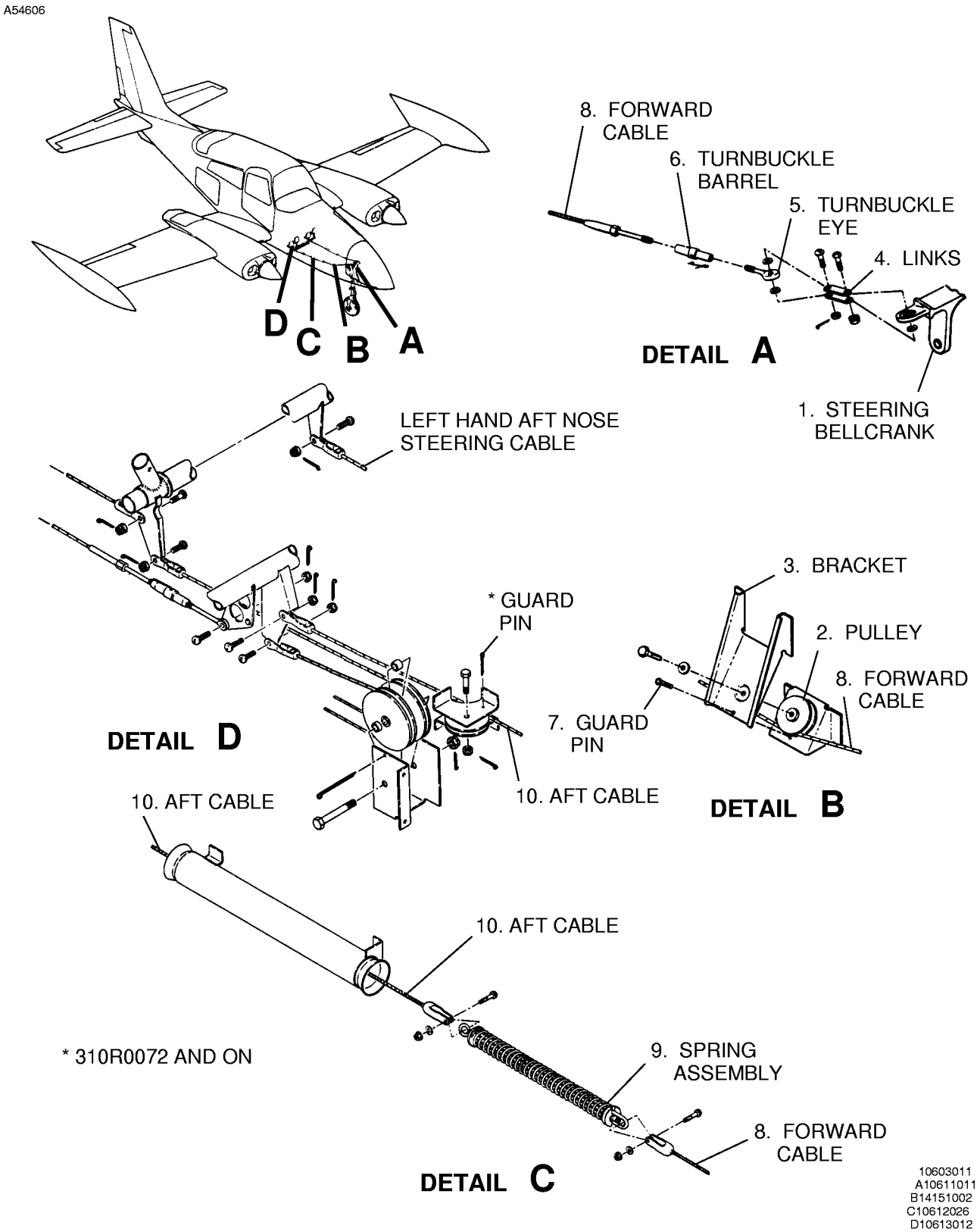

Nose Gear Steering System
Figure 401 (Sheet 1)

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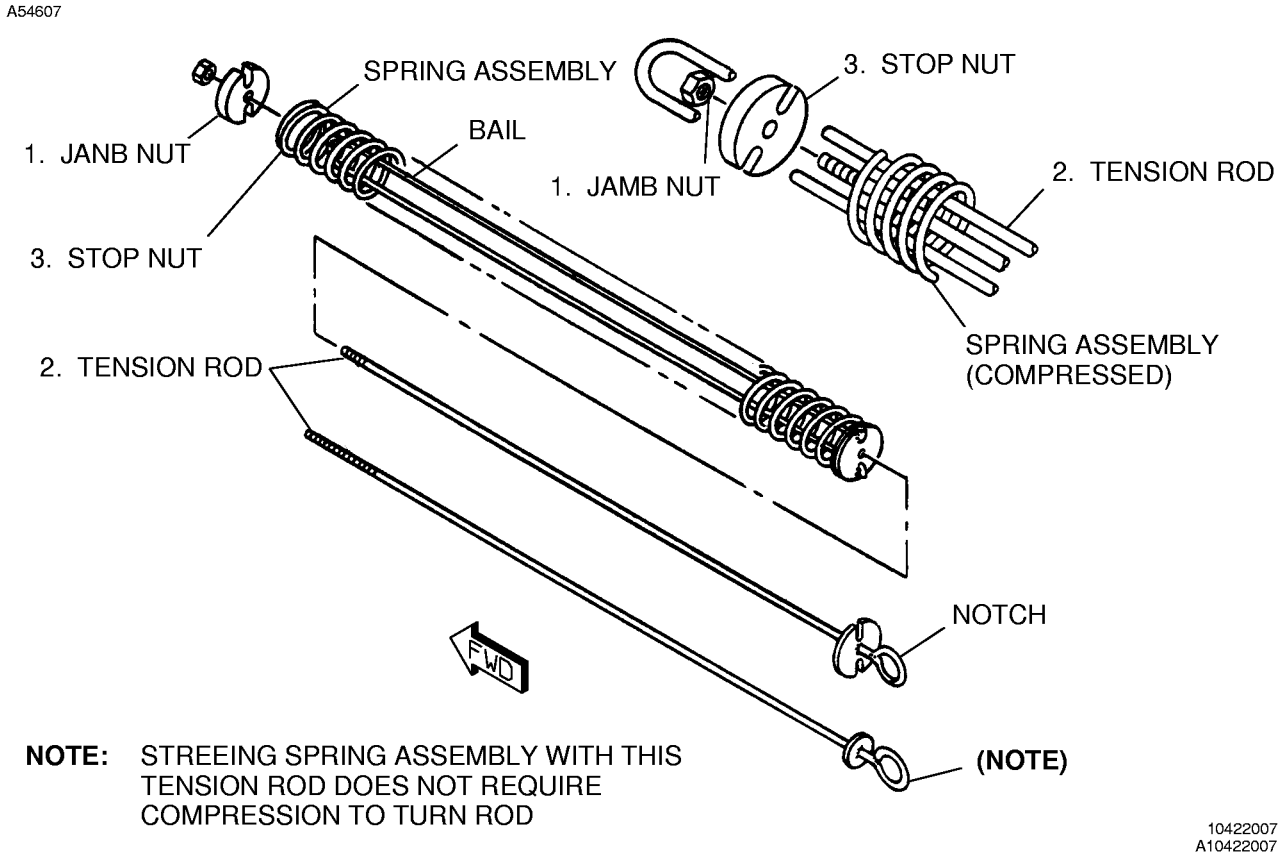

Steering Spring Assembly
Figure 402

(1) Remove jamb nut (1) at loop end.
(2) Pull tension on spring assembly to allow notches (at eye end) in tension rod (2) to clear ball end and screw tension rod out.
(3) Apply compression on spring to extend loop end to position that stop nut (3) can be turned and slipped out of loop.

NOTE: Hold housing and spring assembly securely when removing stop nut, then relieve compression pressure gradually.

B. Assembly (Refer to Figure 402).
(1) Apply compression on spring to extend loop end to position that stop nut (3) can be turned and replaced in loop.
(2) Secure tension rod (2).
(3) Secure jamb nut (1) at loop end.

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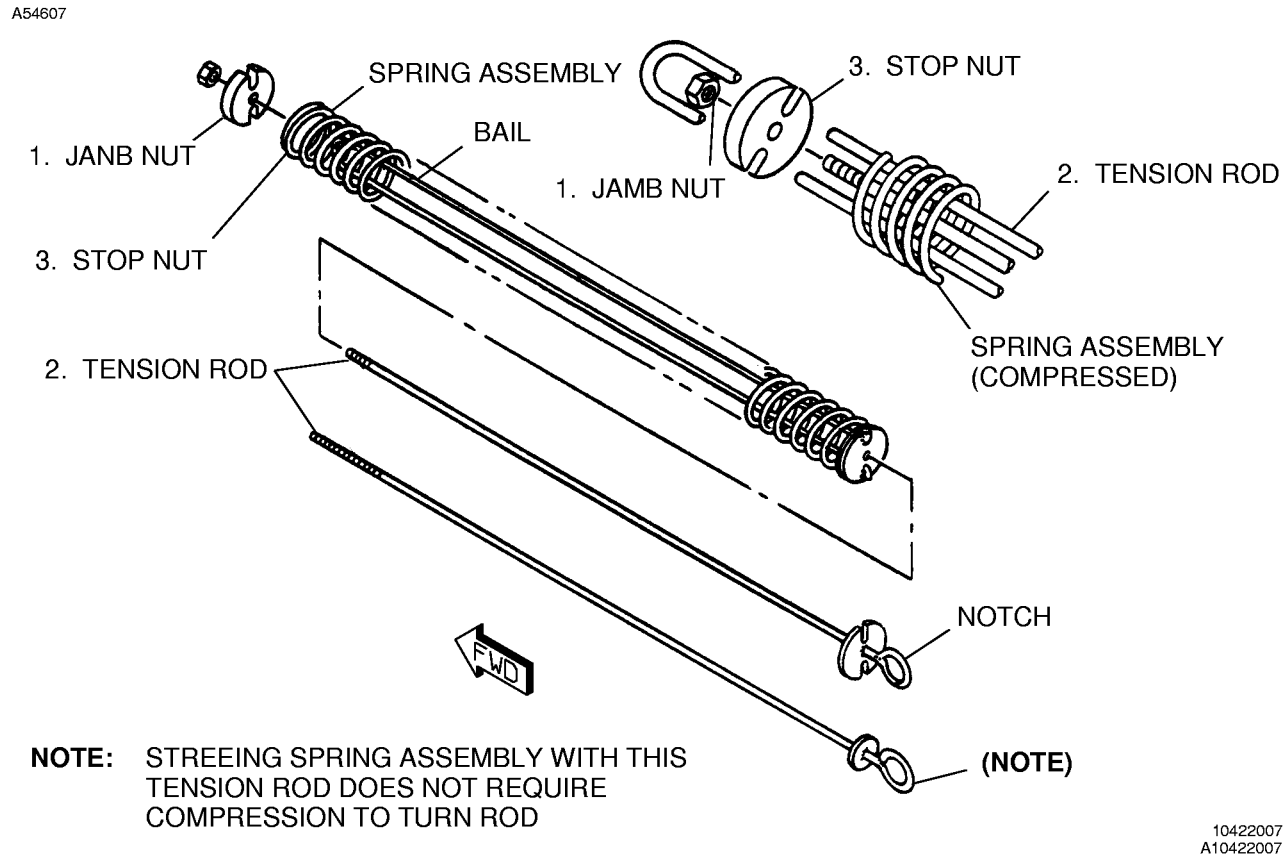
STEERING - ADJUSTMENT/TEST

1. Steering Spring

A. Adjustment (Refer to Figure 501).



Steering Spring Assembly
Figure 501

(1) Remove spring assembly from steering cables.
(2) Attach a tension scale (spring scale) to one end of spring and apply load at other end.
(3) The spring assembly should begin to compress at 85 pounds, +5 or -5 pounds.
(4) To adjust preload, loosen jamb nut (1) and pull tension on spring to clear bail end. Adjust by rotating spring ends in opposite directions (with respect to each other). Rotate clockwise to increase preload, counterclockwise to decrease preload.
(5) When preload is in adjustment, tighten jamb nut (1) and seal threads with torque putty.
(6) Rig nose gear steering cable as follows:
    (a) Check rudder cables for proper rigging.
    (b) Place rudder and nose gear tire in NEUTRAL position. Adjust nose gear cable tension to 20 pounds, +5 or -5 pounds and safety turnbuckle.
(7) Install equipment removed and baggage shelves.

2. Nose Gear Steering

A. Rigging.
(1) For rigging of the nose gear steering system, refer to Rigging of Rudder Control System located in Chapter 27, Rudder - Adjustment/Test.

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POSITION AND WARNING - DESCRIPTION AND OPERATION

1. Landing Gear Warning and Indicator System

A. Description.

(1) The landing gear warning system provides an aural and visual indication of an unsafe landing gear condition. A safe gear is indicated by three green indicator lights which illuminate when all three landing gears are DOWN and LOCKED. An unsafe gear is indicated by a red light which illuminates when any one or more gear is not in the position selected by the landing gear switch.

(2) An aural warning is provided by a warning horn when both throttle levers are retarded below a specified manifold pressure setting, while landing gear is in any other than a DOWN-AND-LOCKED condition, and when flaps are lowered below 15 degrees regardless of position of throttle levers, while landing gear is in any other than a DOWN-AND-LOCKED condition.

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POSITION AND WARNING - TROUBLESHOOTING

1. Landing Gear Warning and Indicator System

A. Troubleshooting.
(1) For a guide to troubleshooting the gear warning system, refer to Table 101.

Table 101. Landing Gear Warning and Indicator System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
LANDING GEAR UP AND THROTTLES NOT RETARDED; GEAR WARNING HORN SOUNDS WHILE AIRPLANE IS IN FLIGHT.	Incorrectly adjusted throttle warning horn microswitch.	Adjust microswitch.
	Unserviceable throttle warning horn microswitch.	Replace microswitch.
LANDING GEAR DOWN AND THROTTLES RETARDED; GEAR WARNING HORN SOUNDS WHILE AIRPLANE IS IN FLIGHT.	Incorrectly adjusted gear down switch.	Adjust gear down switch.
	Unserviceable gear down switch.	Replace gear down switch.
	Incorrectly adjusted throttle microswitch.	Adjust throttle microswitch.
	Unserviceable throttle microswitch.	Replace switch.
LANDING GEAR UP AND THROTTLES RETARDED; GEAR WARNING HORN FAILS TO SOUND WHILE AIRPLANE IS IN FLIGHT.	Open circuit breaker.	Reset circuit breaker.
	Open circuit in electrical system.	Refer to Chapter 24, Electrical Power. Correct open circuit.
	Incorrectly adjusted gear down switch.	Adjust gear down switch.
	Unserviceable gear down switch.	Replace switch.
	Incorrectly adjusted throttle microswitch.	Adjust throttle microswitch.
	Unserviceable throttle switch.	Replace switch.
	Unserviceable warning horn.	Replace horn.
GEAR UNLOCKED (RED) LIGHT FAILS TO LIGHT IN TRANSIT WITH AIRPLANE ON JACKS AND LANDING GEAR ACTUATED TO UP POSITION.	Burned out lamp.	Replace lamp.
	Loose lamp.	Repair or replace receptacle.
	Open electrical circuit.	Refer to Chapter 24, Electrical Power. Repair circuit.
	Incorrectly adjusted gear down switch.	Adjust switch.
	Unserviceable gear down switch.	Replace switch.
GEAR DOWN (GREEN) LIGHT REMAINS ON WHEN GEAR IS UP WITH AIRPLANE ON JACKS AND LANDING GEAR ACTUATED TO UP POSITION.	Unserviceable down limit switch.	Replace switch.
	Shorted circuit.	Locate and repair.

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Table 101. Landing Gear Warning and Indicator System Troubleshooting (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
GEAR UNLOCKED (RED) LIGHT REMAINS ON WHEN GEAR IS DOWN WITH AIRPLANE ON JACKS AND LANDING GEAR ACTUATED TO DOWN POSITION.	Unserviceable up limit switch.	Replace switch.
	Shorted circuit.	Locate and repair.
GEAR DOWN (GREEN) LIGHTS FLICKER WHEN GEAR IS DOWN WITH AIRPLANE ON JACKS AND LANDING GEAR ACTUATED TO DOWN POSITION.	Improperly adjusted gear down switches.	Adjust switches.
	Unserviceable gear down switch.	Replace switch.
GEAR DOWN (GREEN) LIGHT FAILS TO LIGHT WITH AIRPLANE ON JACKS AND LANDING GEAR ACTUATED TO DOWN POSITION.	Burned out lamp.	Replace lamp.
	Loose lamp.	Repair or replace receptacle.
	Open electrical circuit.	Refer to Chapter 24, Electrical Power. Repair circuit as required.
	Incorrectly adjusted down indicator switches.	Adjust switches.
	Unserviceable down indicator switch.	Replace switch.
GEAR WARNING SOUNDS WHEN BATTERY SWITCH IS TURNED ON OR AN UNRELATED SYSTEM IS TURNED ON WHILE AIRPLANE IS ON THE GROUND.	Incorrectly adjusted gear down switch.	Adjust gear down switch.
	Unserviceable gear down switch.	Replace gear down switch.
	Shorted circuit.	Locate and repair.
GEAR WARNING FAILS TO SOUND WHEN LANDING GEAR HANDLE IS PLACED IN THE UP POSITION WHILE AIRPLANE IS ON THE GROUND.	Incorrectly adjusted landing gear safety switch.	Adjust switch.
	Unserviceable landing gear safety switch.	Replace switch.
	Unserviceable warning horn and flasher unit.	Replace warning horn and flasher unit.

(2) Refer to landing gear wiring diagram, Chapter 24, Electrical Power for conducting continuity checks.
(3) Conduct a continuity check of electrical circuits before replacing a component suspected of being unserviceable.

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POSITION AND WARNING - REMOVAL/INSTALLATION

1. Gear Switch and Indicator Lights

A. Removal (Refer to Figure 401).
(1) Unscrew and remove wheel shaped knob from switch.
(2) Remove the nut holding switch to the panel and pull the switch from the rear of the panel.
(3) Tag and disconnect the wires from the switch.
(4) To remove the indicator lights, remove the lens and bulb.
(5) Loosen nut securing light to panel and pull light from panel.
(6) Unsolder and tag wires from light.

B. Installation (Refer to Figure 401).
(1) To install the indicator light, solder wires to light and remove identification tags.
(2) Install nut and lockwasher on light in sequence as shown, install light in panel and secure assembly in panel with nut.
(3) Install bulb and lens.
(4) To install landing gear switch, connect wires to switch and remove identification tags.
(5) Place nut, lockwasher, and keyed washer on light as shown and install switch through panel.
(6) Install knurled nut on switch from face of the instrument panel. Tighten only as far as necessary to obtain full thread engagement.
(7) Tighten nut on the back side of panel. Make sure keyed washer mates the key hole in the switch panel.
(8) Screw knob onto the switch toggle.

2. Gear Warning Components

A. Removal (Refer to Figure 402).

NOTE: The landing gear warning electrical components consist of a warning horn, flasher and resistor located on a support bracket on the centerline of the fuselage station 0.00 bulkhead.

(1) Locate and remove landing gear warning horn (5) as follows:
(a) Tag and disconnect electrical wires.
(b) Remove screw and lockwasher securing warning horn (5) to support (6).
(2) Remove flasher (2) as follows:
(a) Tag and disconnect electrical wires.
(b) Remove attaching screw and clamp (1).
(3) Remove resistor (4) as follows:
(a) Tag and disconnect electrical wires.
(b) Remove attaching screw and insulating washers (3).

B. Installation (Refer to Figure 402).
(1) Position resistor (4) to support (7) and secure in place with screw and two insulating washers (3) as shown.
(2) Connect electrical wires.
(3) Position flasher (2) to support (7) and secure with clamp (1) and screw.
(4) Connect electrical wires.
(5) Position landing gear warning horn (5) to support (6) and secure with lockwasher and screw.

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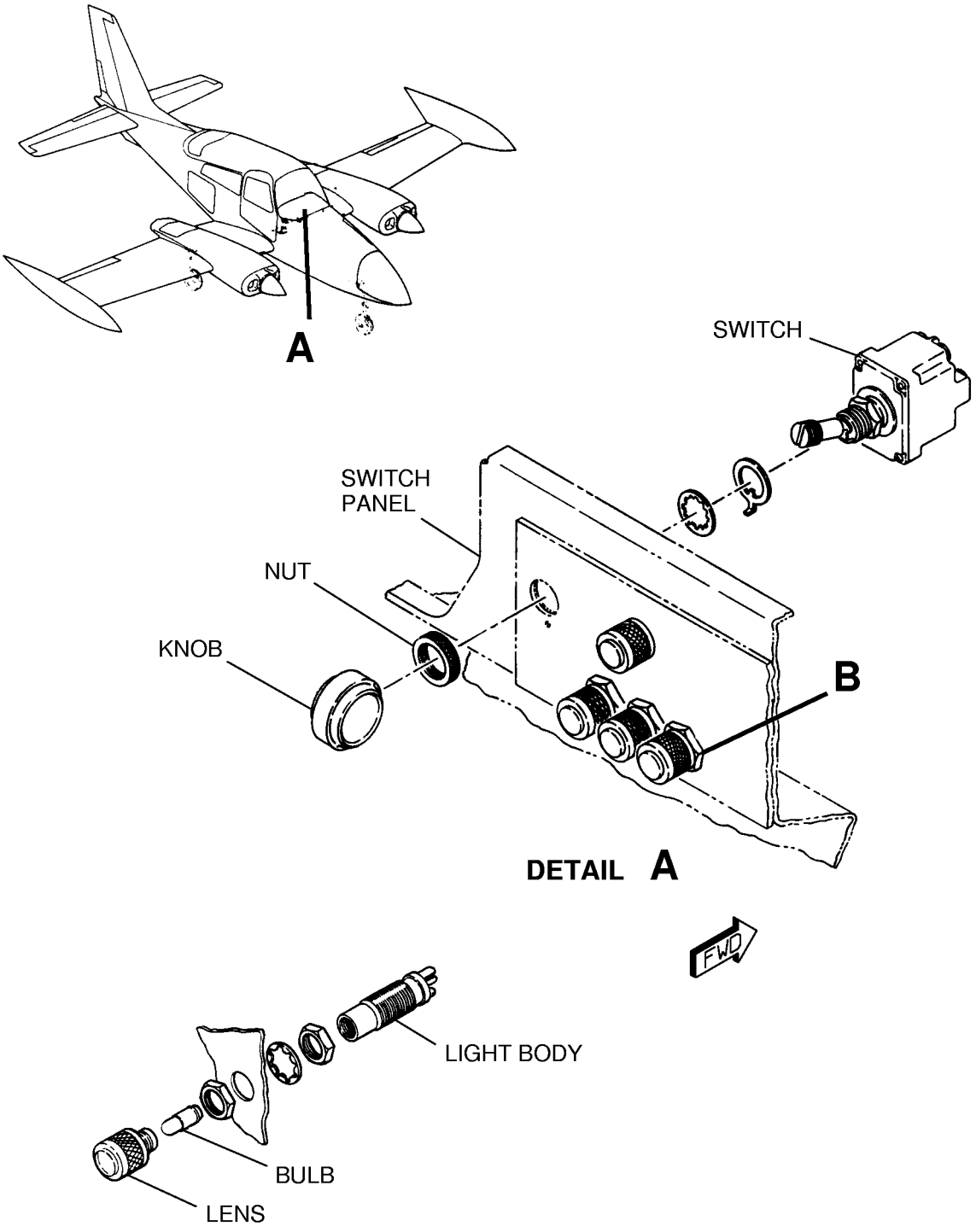

TYPICAL LANDING GEAR
POSITION INDICATOR LIGHT
INSTALLATION

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Landing Gear Switch and Indicator Light
Figure 401 (Sheet 1)

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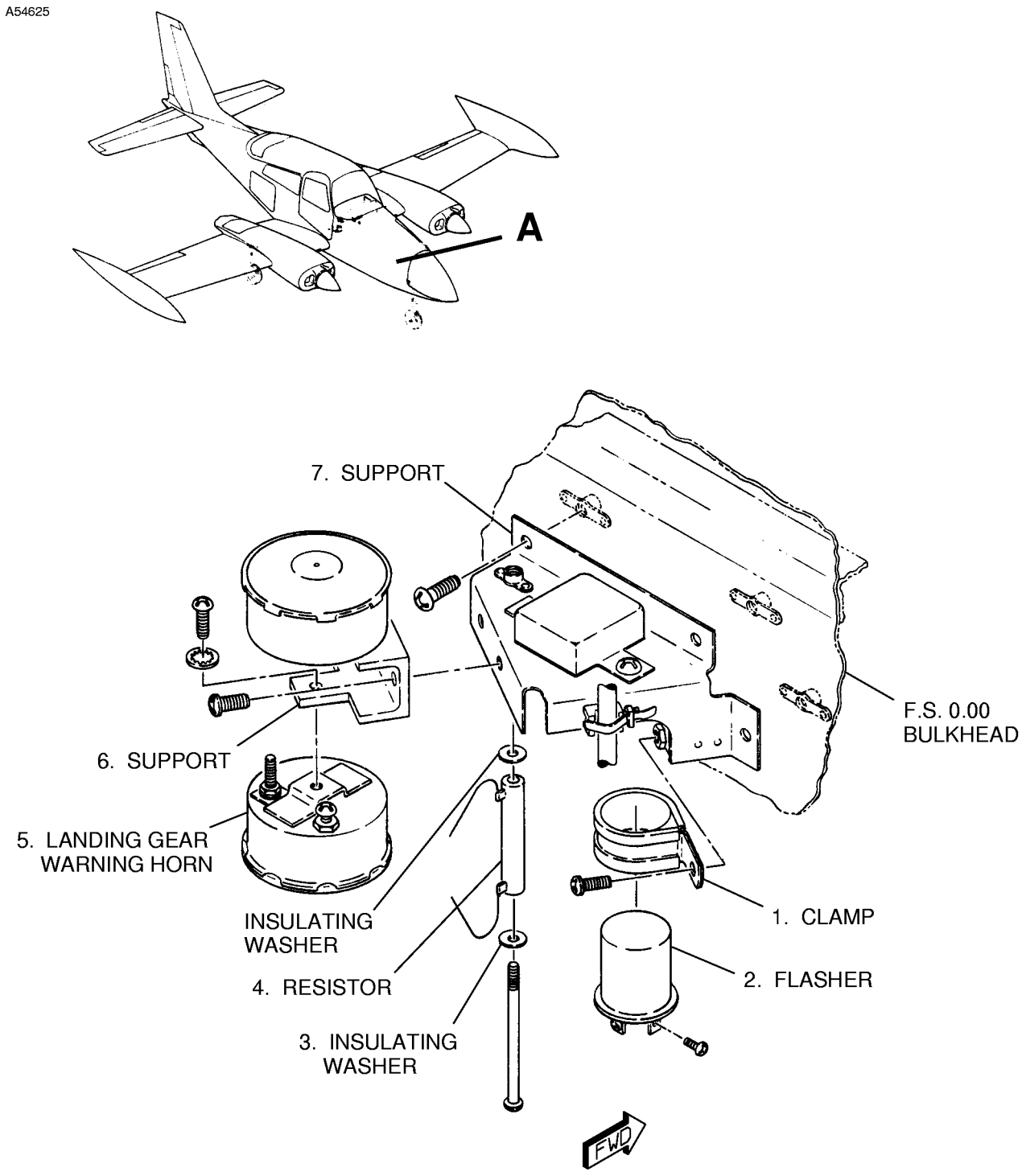

DETAIL A

10483002
A10182007

Warning Horn Components Installation
Figure 402 (Sheet 1)

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POSITION AND WARNING - ADJUSTMENT/TEST

1. Landing Gear Warning Switches

A. Adjustment (Refer to Figure 501).

(1) Adjust the throttle microswitch (3) as follows:

NOTE: To properly adjust the throttle microswitch it is necessary to fly the airplane. As a preliminary adjustment before flight, adjust microswitch to actuate when the aft edges of the throttle levers are approximately 3/16 inch aft of the word THROTTLE on the control quadrant.

(a) Obtain a pressure altitude of 2500 feet.
(b) Adjust propeller pitch levers to obtain 2300 RPM on both engines.
(c) Place mixture levers in FULL RICH.
(d) Retard throttle levers to obtain 12 inches of manifold pressure.

NOTE: If throttle levers are retarded below the specified manifold pressure, advance them and repeat the retarding procedure.

(e) Using a pencil, tape, or other suitable means of marking, index the position of the throttle levers in the control quadrant.

NOTE: The remainder of the adjusting procedure must be accomplished with the airplane on the ground.

(f) With engines not being operated, place mixture levers in FULL RICH.

WARNING: Insure that fuel selector valve handles and fuel boost pump switches are in the OFF position.

(g) Jack airplane in accordance with Chapter 7, Jacking - Description and Operation.
(h) Fully advance throttle levers (2), then retard to the position marked on the control quadrant during flight.
(i) Adjust the throttle microswitch to actuate at this position. Turn battery switch ON and check that warning horn sounds as throttle levers are retarded to this position, then turn battery switch OFF.

NOTE: For Airplanes 310R0001 thru 310R1200, elongated slots are provided for vertical adjustment and spacer washers position the microswitch horizontally.

NOTE: For Airplanes 310R1201 thru 310R2140, elongated slots are provided for vertical adjustment and an adjusting screw positions the microswitch horizontally. Access to adjusting screw is through hole in quadrant cover. If autopilot control is installed, pull out until clear of quadrant cover and remove hole plug button.

(2) Adjust flap-gear warning as follows:
(a) Fully advance throttle levers.
(b) Position flap preselect lever to 16 degrees, +2 or -0 degrees.
(c) Turn OFF electrical power.
(d) Loosen screws and adjust switch (4) to operate at this position. A definite click should be felt when switch actuates.
(e) Tighten screws and turn electrical power ON.
(f) Operate the landing gear to FULL UP position.

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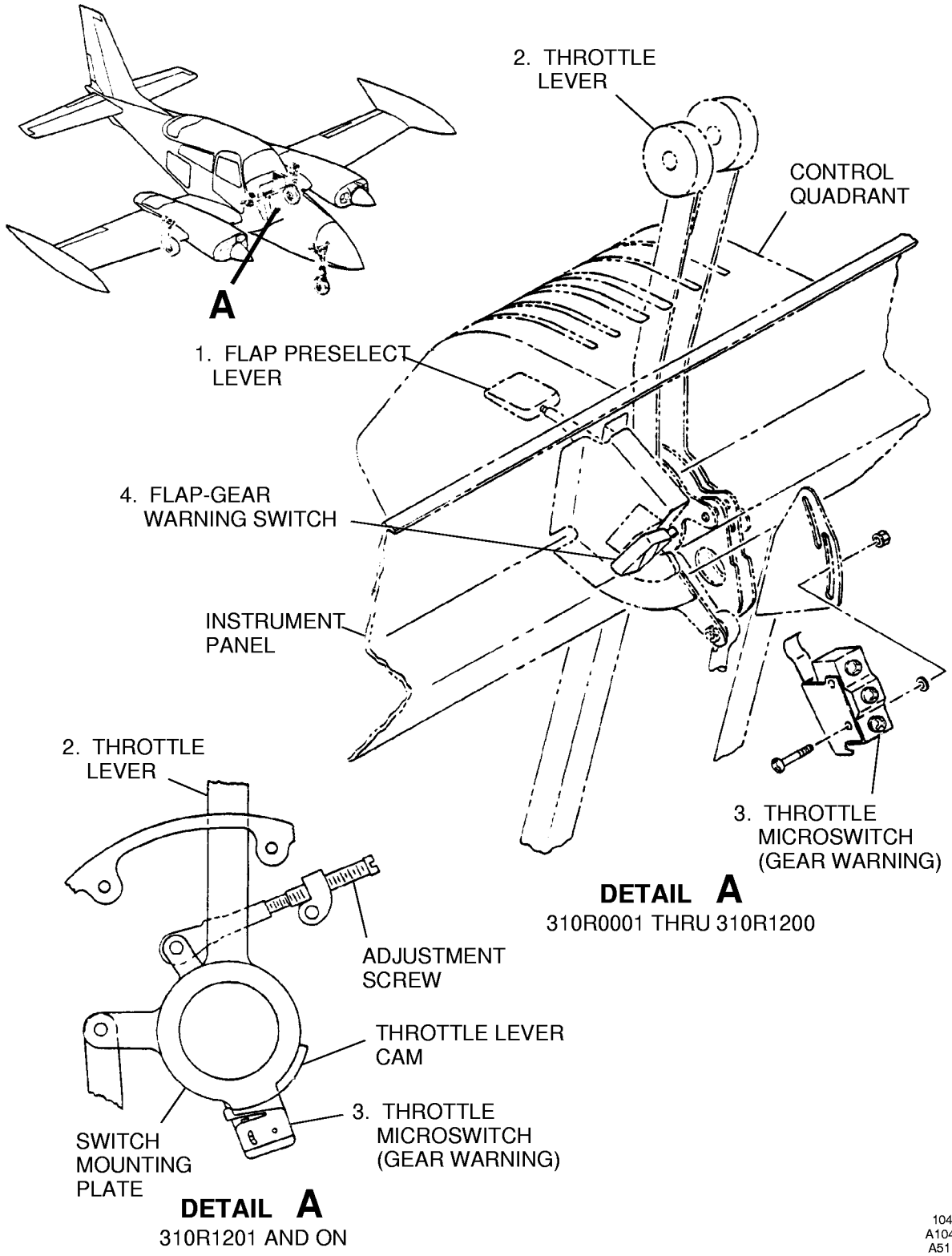

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A51181037

Adjustment of Landing Gear Warning System
Figure 501 (Sheet 1)

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(g) Operate flaps to FULL DOWN position and note flap position when warning horn sounds.

NOTE: Anytime the flap preselect lever is placed below 15 degrees detent, the landing gear warning horn should sound when flap reaches 16 degrees, +2 or -0 degrees travel.

(h) It may be necessary to repeat the steps (d) through (g) to properly adjust the landing gear warning system.

(i) After microswitch adjustment is completed, place throttle levers in the CLOSED position and the mixture levers in IDLE CUT-OFF.

2. Landing Gear Indicator Switches

A. Adjustment.

(1) Adjust DOWN indicator switches as follows:

(a) Adjust all three DOWN indicator switches so that they are not actuated until landing gear is DOWN and locked by the overcenter linkage. Adjust the main landing gear switches by repositioning. Adjust the nose gear switch by adjusting the switch actuating bolt.

(b) Using the normal landing gear retraction system, operate landing gear to the UP position.

(c) Place landing gear switch in a NEUTRAL position, engage the manual extension crank, and lower the landing gear. Stop cranking immediately when the green light illuminates, and note the exact angular position of the crank.

(d) Check that both main gear and nose gear are DOWN and locked in the overcenter position.

(e) Resume cranking toward the DOWN position noting the number of turns required, until the internal stop in the landing gear actuator is reached. The number of turns required should not be less than four, nor more than eight for the main landing gears. The number of turns should not be less than eight nor more than fourteen for the nose gear.

(f) If necessary, readjust DOWN indicator switches as required to meet the conditions of steps (a) and (e).

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CHAPTER 33

LIGHTS

LIST OF EFFECTIVE PAGES

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33-List of Effective Pages		
33-Record of Temporary Revisions		
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33-00-00	Page 101	Jun 17/2005
33-10-00	Page 1	Jun 17/2005
33-10-00	Pages 401-403	Jun 17/2005
33-40-00	Page 1	Jun 17/2005
33-40-00	Pages 301-302	Jun 17/2005
33-40-00	Pages 401-409	Jun 17/2005
33-40-00	Pages 501-502	Jun 17/2005

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LIGHTS - GENERAL

1. Scope

A. This chapter describes those units and components (electrically powered) which provide for internal and external illumination. This does not include warning lights for individual systems or self-illuminating signs. Refer to Figure 1 for internal light locations and refer to Figure 2 for external light locations.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Flight compartment describes the lighting sub-systems in the compartment above the floor and between the forward pressure dome. Does not include cargo compartment. Includes direct and indirect illumination of work areas, panels, and instruments.
   (2) Exterior describes the lighting sub-systems used to provide illumination outside of the airplane.

3. Lights

A. Description.
   (1) This text on lights presents all lights on the airplane. It is intended for use in conjunction with the wiring diagrams to maintain the light systems in the best operating condition. The text is supported by illustrations to provide additional assistance to the mechanic during maintenance. The major light circuits are the interior and exterior lights.
   (2) The light circuits require minor maintenance such as replacement of lamps or switches. Most light assemblies and components are readily accessible and can be maintained without the use of special tools.
   (3) When defective lamps, light assemblies and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

4. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Multimeter	Model 260	Simpson Electric Co.	Voltage and continuity check.
Aluminum Tape	Scotch Brand #425	Minnesota Mining & Mfg. Co., Ind. Tape Div. 3 M Center St. Paul, Minn. 55101	Cover tail strobe light lens.

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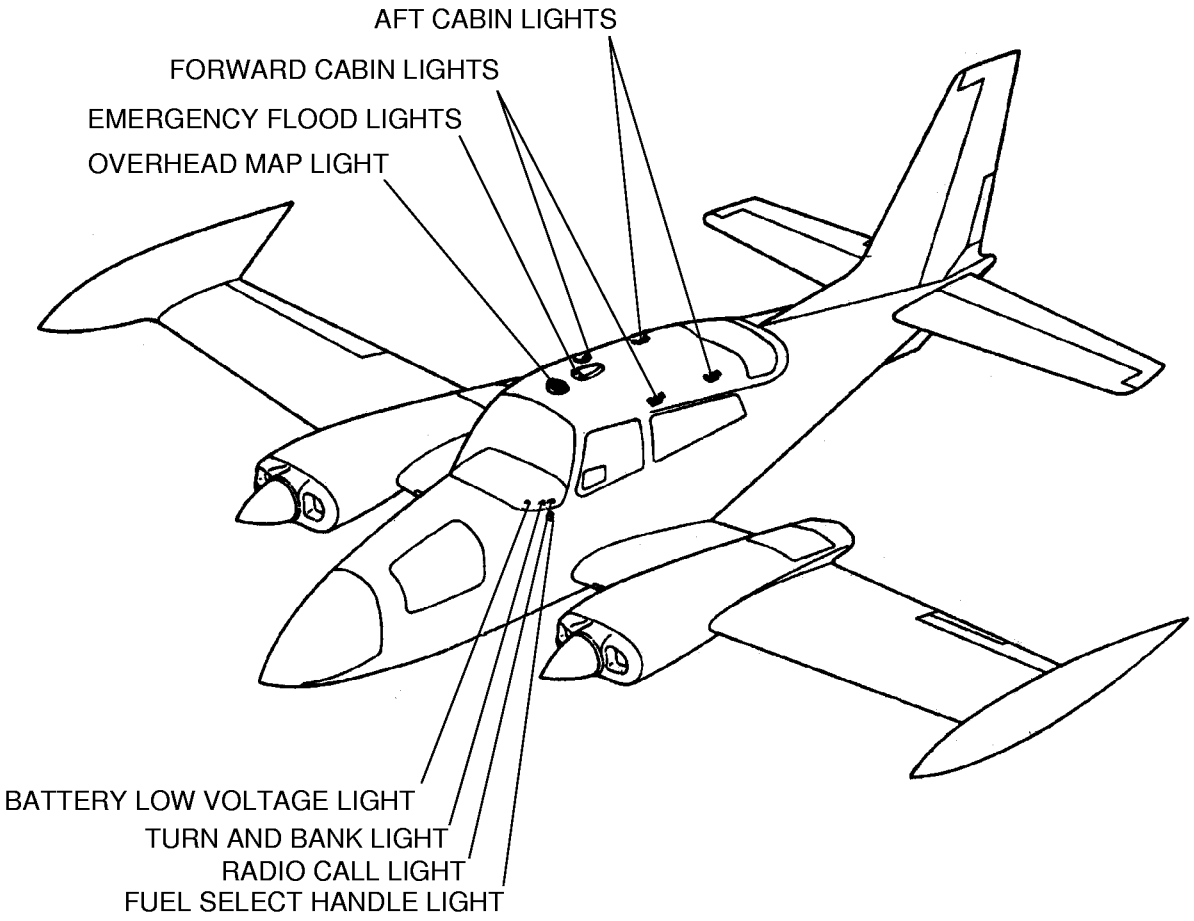

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Interior Light Location
Figure 1 (Sheet 1)

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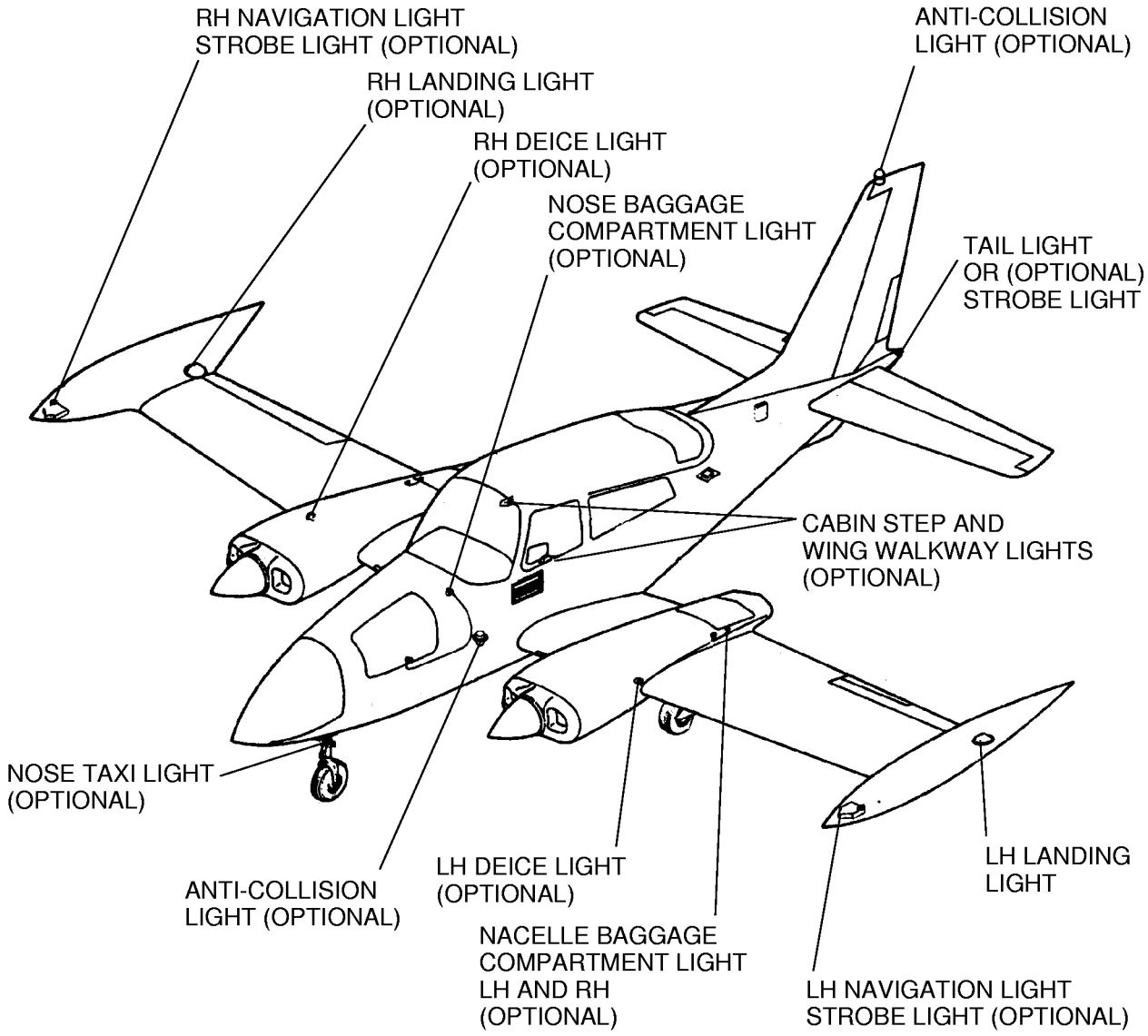

Exterior Light Location
Figure 2 (Sheet 1)

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LIGHTS - TROUBLESHOOTING

1. Lights (General)

A. Troubleshooting.

(1) Troubleshooting procedures are provided only as general troubleshooting, because most light circuits require the same steps to locate a failed component. In most cases, inoperative lamps, open circuit breakers, blown fuses, and other failed components are obvious.

2. Light Circuits

A. Troubleshooting.

NOTE: The following troubleshooting steps are provided to augment specific circuit information found in the wiring diagrams and to serve as a basis for developing the mere detailed procedures required to locate cause of infrequent light system troubles.

(1) When possible, investigate report of trouble at source to ascertain conditions leading to, and under which, trouble occurred and whether failure of other light circuits or electrical systems occurred simultaneously. Careful analysis of such information is often indicative of nature and most likely location of trouble.

(2) Study circuit wiring diagrams covering affected light system and its related power supply. A thorough understanding of the function is necessary before a troubleshooting procedure can be effectively planned and executed. By combining a knowledge of applicable circuits with information gained from trouble report, an investigation usually indicates circuit, or section of circuit, in which trouble is located.

(3) Visually inspect circuit for open circuit breakers, blown fuses, broken wiring, loose wire connections, loose electrical connectors, and evidence of shorting. Observe particularly, security of connections and presence of foreign matter.

(4) Perform continuity check. A blown fuse, burned wires, or other evidence of shorting indicates that a power-on check would create a hazardous condition. With power OFF, isolate defective circuit and check one section at a time until shorted or open circuit section is found.

(5) Perform power-on check only when it has been determined that such a check cannot create a hazardous condition. With power ON, perform operational tests to confirm report of trouble and to determine, if possible, whether cause of trouble is in light circuit or in power supply system. A voltmeter or test light may also be used for a power check at various break points in circuit, such as terminal strips and equipment input terminals, to determine if power is available at these points.

(6) Replace any light assembly or component that remains inoperative after making certain that power is available at unit and that ground connections are secure at unit.

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FLIGHT COMPARTMENT - DESCRIPTION AND OPERATION

1. Interior Lights

A. Description.

(1) The interior lights consists of instrument panel post lights, overhead flood lights, fuel select handle light, various switch panel lights, pilot's overhead map light, radio call light, forward overhead cabin lights, compass light and indicator lights of various systems. Optional interior lights consists of copilot's map light, aft overhead cabin lights, electroluminescent lighting (switch panels) and oxygen gage light. Most instrument and panel lights are dimmed by rheostats located on the circuit breaker panel. The overhead floodlights, map lights, and cabin lights are controlled by their respective switches.

2. Electroluminescent Light Panels (Optional)

A. Description.

(1) The electroluminescent light panels (optional) emanates light from crystalline powders, or phosphors, sandwiched between two electrically conducted surfaces, of which one surface is translucent. When the panel lights are illuminated, the powders absorb electrical AC energy and convert it to light without the use of starters, or ballasts and with minimal heat. Electrical power is supplied to the panels by an inverter which converts DC electrical power to 115 volt AC electrical power. The inverter is located forward of the instrument panel at station 0.00 at centerline of the airplane.

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FLIGHT COMPARTMENT - REMOVAL/INSTALLATION

1. Post Lights

NOTE: When unserviceable lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, a functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 401).
   (1) Remove connector from socket.
   (2) Remove nut and lockwasher, securing socket to panel and remove light assembly.

B. Installation (Refer to Figure 401).
   (1) Position light assembly in panel and secure with lockwasher and nut.
   (2) Connect connector to socket.

2. Electroluminescent Panels

NOTE: When unserviceable lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 401).
   (1) Turn OFF power.
   (2) Remove the necessary components, securing the panel.
   (3) Lift panel off, identify and disconnect electrical wires.

      NOTE: Operational checks on the electroluminescent panels should be performed using 120 volt, 400 cycle AC. However, panel will operate without damage on 120 volt, 60 cycle AC.

B. Installation (Refer to Figure 401).
   (1) Identify and connect panel electrical wires.
   (2) Install components to secure panel.

3. Fuel Selector Handle Light

NOTE: When unserviceable lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal.
   (1) Remove the screws, securing the light cover to the spar. Remove the cover.
   (2) Push the bulb and twist to the left to unlock it, and remove the bulb from the socket.
   (3) Straighten the tabs of the bulb socket, and push the socket DOWN and out of the socket bracket.
   (4) Loosen the small screw securing the electrical lead to the socket. Pull the lead from the socket.

B. Installation.
   (1) Position the socket of the light so that the two tabs of the socket fit up into slots provided in the socket bracket on the front spar. Bend or twist the tabs of the socket to secure it in place.
   (2) Insert the end of the light electrical lead into the socket and tighten the small lead, securing the screw.
   (3) Push the bulb into the socket and twist it to the right to lock into position.
   (4) Position the light cover and install screws to secure it in place.

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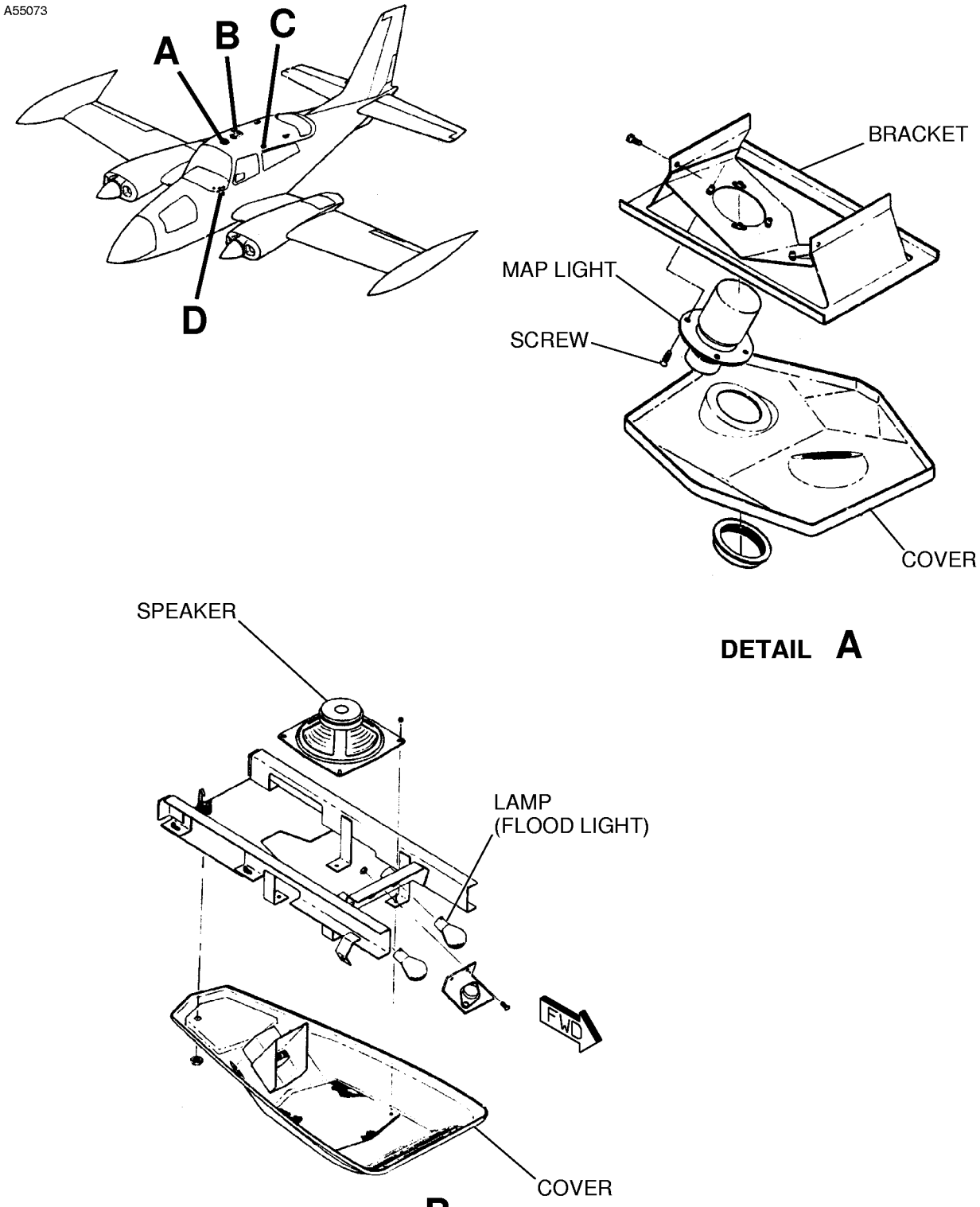

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B10143009

Cabin Interior Lighting Installation
Figure 401 (Sheet 1)

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4. Cockpit Cabin Floodlights

NOTE: When unserviceable lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 401).
   (1) Remove cover from overhead console and lower the cover.
   (2) Remove lamps.

B. Installation (Refer to Figure 401).
   (1) Install lamps.
   (2) Install cover.

5. Cabin Lights

NOTE: When unserviceable lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 401).
   (1) Remove screws, securing switch and oxygen outlet cap and remove cover.
   (2) Remove screws, securing lights to bracket; identify and disconnect electrical wire.

B. Installation (Refer to Figure 401).
   (1) Identify and connect electrical wires; secure light to bracket with screws.
   (2) Install cover with screws and install oxygen outlet cap.

6. Map Light

NOTE: When unserviceable lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 401).
   (1) Turn electrical power OFF.
   (2) Remove screws securing cover and light to bracket.
   (3) Disconnect electrical wire and remove light.

B. Installation (Refer to Figure 401).
   (1) Connect electrical wire to light.
   (2) Secure light and cover to bracket with screws.

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EXTERIOR LIGHTS - DESCRIPTION AND OPERATION

1. Exterior Lights

A. Description.

(1) The exterior lights consist of: standard navigation lights, a retractable landing light, located in the main fuel tank tail cap of the left wing. Optional exterior equipment lights include: a right-hand landing light, nose taxi light, wing deice light (left and/or right), strobe lights, anti-collision lights (one or two), baggage compartment lights (wing and nose), upper and lower wing walk lights.

NOTE: On Airplanes 310R1201 and On, an optional timer may be installed in the upper and lower wing walk lights circuitry, to automatically extinguish the lights after 15 minutes assuring the battery will not be inadvertently depleted.

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EXTERIOR LIGHTS - SERVICING

1. Landing Light

A. Lubrication.
(1) For lubrication of the landing light, refer to Figure 301.

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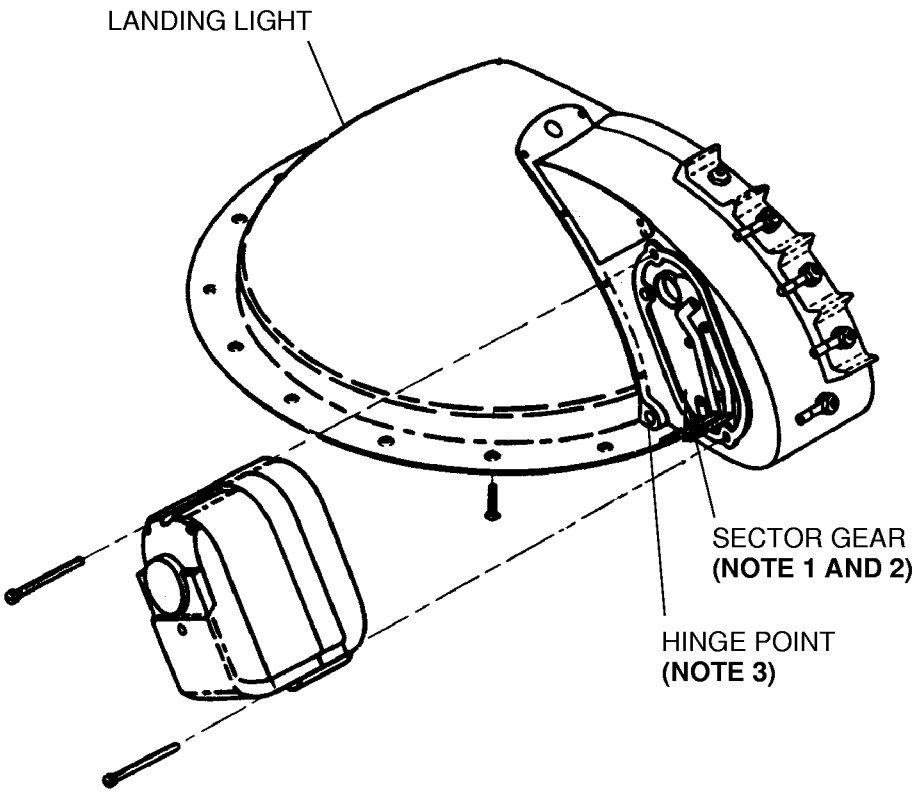

NOTE 1: EXTEND THE LIGHT TO LUBRICATE THE LARGE SECTOR GEAR. WIPE OFF EXCESS GREASE FROM GEAR BEFORE THE LIGHT IS RETRACTED.

NOTE 2: LUBRICATE THE OPTIONAL RIGHT WING LANDING LIGHT THE SAME WAY IF INSTALLED.

NOTE 3: REFER TO TABLE 301 FOR THE TYPE OF LUBRICATION.

51182010R

Landing Light
Figure 301 (Sheet 1)

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EXTERIOR LIGHTS - REMOVAL/INSTALLATION

1. Wing Navigation Lights

NOTE: When failed lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 401).
   (1) Turn off electrical power.
   (2) Remove the tip tank nose cap.
   (3) Remove screw, securing lens retainer.
   (4) Remove lens, gasket, and lamp.
   (5) Remove screws, securing bracket, disconnect electrical wire and remove light assembly.

B. Installation (Refer to Figure 401).
   (1) Install light assembly, bracket and screws; connect electrical wire.
   (2) Assemble lamp, gasket, lens, lens retainer to socket and secure with screw.
   (3) Install tip tank nose cap.

2. Tail Navigation Light

NOTE: When failed lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal.
   (1) Turn off electrical power.
   (2) Remove screws, securing the tail light assembly to the stinger.
   (3) Disconnect the electrical connector from the rear of the light assembly and remove tail light assembly.

      NOTE: If the tail light wiring is to be removed, the stinger assembly must be removed to disconnect the wires at the rear fuselage bulkhead.

B. Installation.
   (1) Connect electrical connector to tail light assembly.
   (2) Position light assembly in stinger and secure with screws.

3. Anti-Collision Lights (Optional)

NOTE: When failed lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 401).
   (1) Turn off electrical power.
   (2) To remove rudder mounted anti-collision light, proceed as follows:
      (a) Remove the screws in the rudder tip assembly and lift the anti-collision light from the tip assembly.
      (b) Disconnect electrical connector from light assembly.
   (3) To remove bottom fuselage mounted anti-collision light proceed as follows:
      (a) Remove the screws, securing mounting adapter to fuselage.
      (b) Disconnect electrical connector from light assembly.
   (4) To remove lamp, proceed as follows:

      NOTE: Removal of lamp is typical for both anti-collision lights. It is not necessary to remove the anti-collision light assembly when lamp is removed.

      (a) Loosen clamp and remove lens. Remove lamp.

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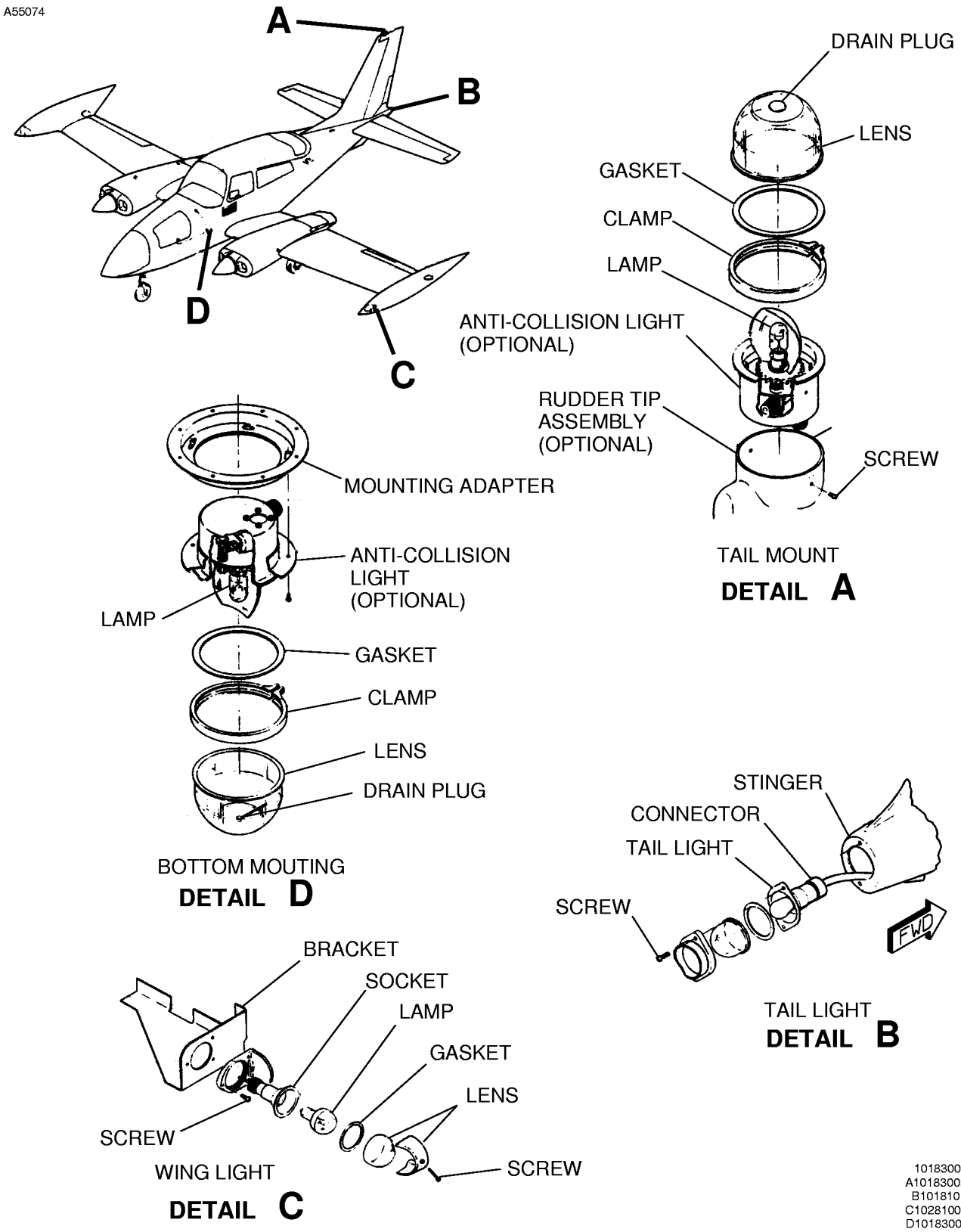

Navigation and Anti-Collision Lights Installation
Figure 401 (Sheet 1)

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CAUTION: When removing lamp, do not allow the reflector to move. Always grasp the lamp base and unscrew lamp from bayonet fittings. This will prevent motor drive spring damage.

B. Installation (Refer to Figure 401).
(1) To install rudder mounted anti-collision light, proceed as follows:
(a) Connect electrical connector to light assembly.
(b) Align mounting holes and insert anti-collision light assembly into rudder tip assembly and secure with screws.
(2) To install bottom fuselage mounted anti-collision light, proceed as follows:
(a) Connect electrical connector to light assembly.
(b) Secure anti-collision light to mounting adapter, secure mounting adapter to fuselage.
(3) To install lamp, proceed as follows:
(a) Install lamp in light assembly.

CAUTION: When replacing the lamp, do not allow the reflector to move. Always grasp the lamp base and install lamp in bayonet fittings. This will prevent motor drive spring damage.

(b) Position gasket and lens on light assembly and secure with clamp.

4. Landing Light

NOTE: When failed lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 402).
(1) Turn off electrical power.
(2) Support the light assembly and remove screw which secure lamp housing to retainer band.
(3) Lower the light assembly out of the tip tank tail cap and place on a stand of suitable height.

NOTE: The wiring to the light contains sufficient slack to permit the light assembly to be brought down below the tip tank tail cap for removal of light wiring.

(4) Tag and remove the wires from the terminal block on the light.
(5) To remove the lamp from the landing light, extend the light approximately 60 degrees and remove the lamp retainer ring. Pull the lamp from the inner canopy and disconnect the wires from the lamp.

NOTE: When the light assembly is removed from the airplane, the light nay be extended by applying a 28 volt power source across the OPEN and ground terminals.

(6) Remove the two screw securing the power unit to the housing.

B. Installation (Refer to Figure 402).
(1) Position power unit within drive housing of light assembly and secure with screws.
(2) To install a new lamp, connect the wires to the lamp and position the lamp within the canopy with the filament shield inboard. Position the lamp retainer band over the edges of the lamp and canopy with the flat side toward the apex of the canopy. Using needle nose pliers, pull the retainer band tight around the lamp and canopy and fasten the clip on the band.

NOTE: Before installing a new lamp, it will be necessary to extend the light approximately 60 degrees to gain access to the retainer band.

(3) Position the retainer ring inside the tip tank tail cap with the open side forward and tape it to the tip tank tail cap to hold it in position temporarily while the light assembly is installed.
(4) Identify and connect wires to the light assembly terminal block.

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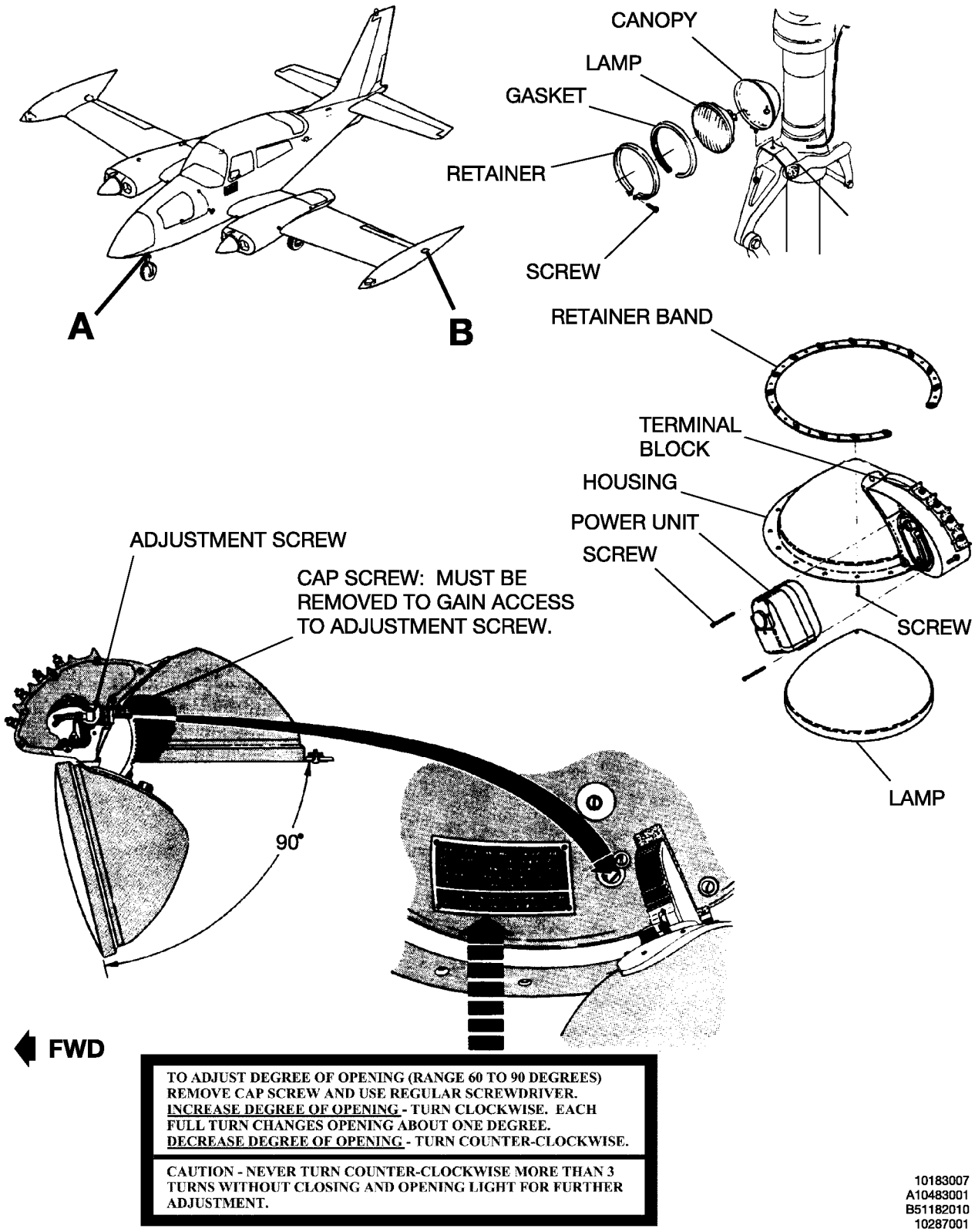

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Landing and Taxi Light Installation
Figure 402 (Sheet 1)

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(5) Place the light assembly into the tip tank tail cap and secure with screws.

CAUTION: Start all screws through the nutplates on the retainer band before attempting to tighten any of then to prevent distortion or misalignment of the band.

5. Taxi Light

NOTE: When failed lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 402).
(1) To remove lamp, remove retainer, gasket, and lamp.
(2) To remove light assembly; disconnect electrical wires to light and remove nut securing light assembly to bracket.

B. Installation (Refer to Figure 402).
(1) To install lamp; install lamp in canopy and secure with gasket and retainer.
(2) To install light assembly; position light assembly on bracket and secure with nut. Connect electrical wiring to light.

6. Deice Light (Optional)

NOTE: When failed lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 403).
(1) Remove upper cowling from engine.
(2) Remove screw securing socket assembly and clamp holding wires.
(3) Pull socket assembly apart from lamp shield to remove 1 amp.
(4) If further disassembly is required, identify and remove wires. On Airplanes 310R0001 thru 310R0853, drill out rivets securing shield assembly to nacelle skin. On Airplanes 310R0854 and On, remove nuts, washers, and screw securing shield assembly to nacelle skin.

B. Installation (Refer to Figure 403).
(1) If removed, rivet shield assembly to nacelle skin and connect wires.
(2) Install lamp in socket assembly. Secure lamp assembly to shield assembly using screws.
(3) Install upper engine cowling.

7. Strobe Light System Components (Optional)

NOTE: When failed lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 404).
(1) Remove wing strobe lights as follows:
(a) Remove nose cap on wing tip tank.
(b) To remove strobe flash tube, unsafety and remove from clips.
(c) Disconnect electrical wiring to strobe light.
(d) Remove strobe light assembly from supporting bracket.
(2) Remove power supply and flasher units as follows:
(a) Remove tailcone upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(b) Disconnect electrical wiring to flasher unit and remove flasher unit from shelf.
(c) Disconnect electrical plug and remove power supply from tailcone stringer.

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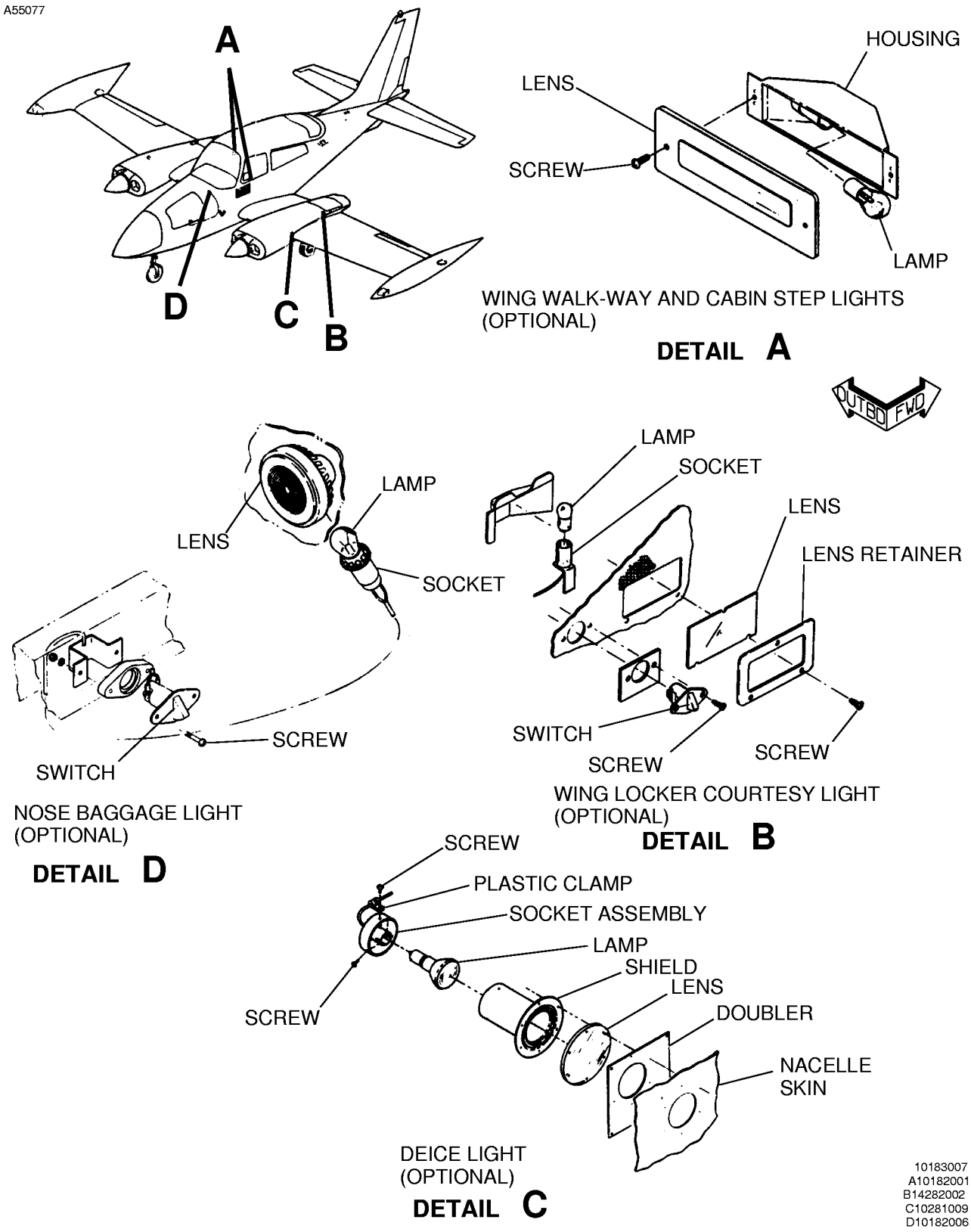

Courtesy and Deice Light Installation
Figure 403 (Sheet 1)

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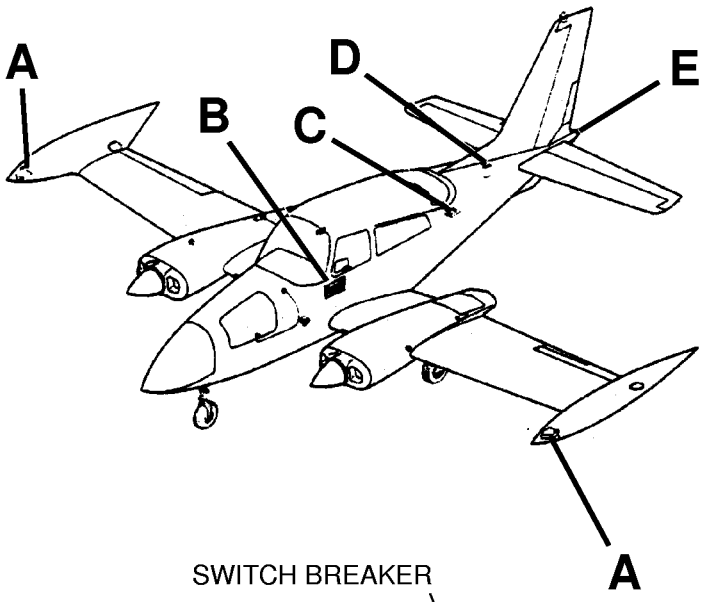
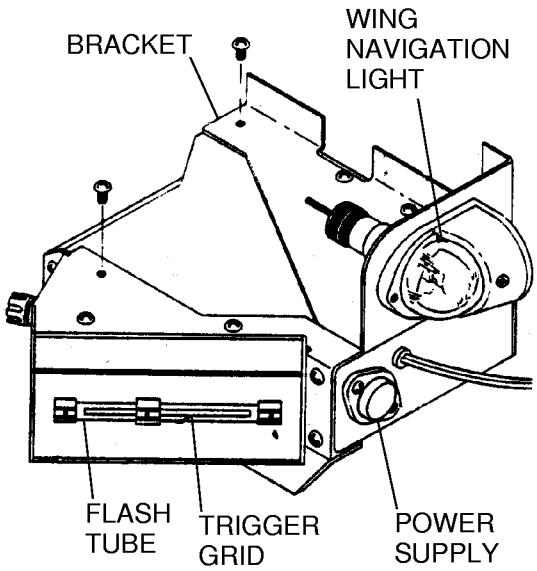
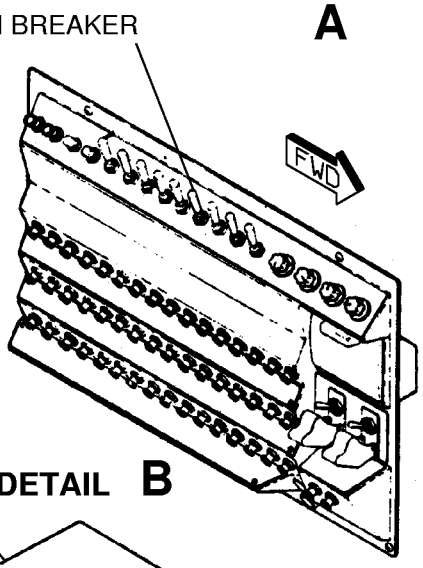
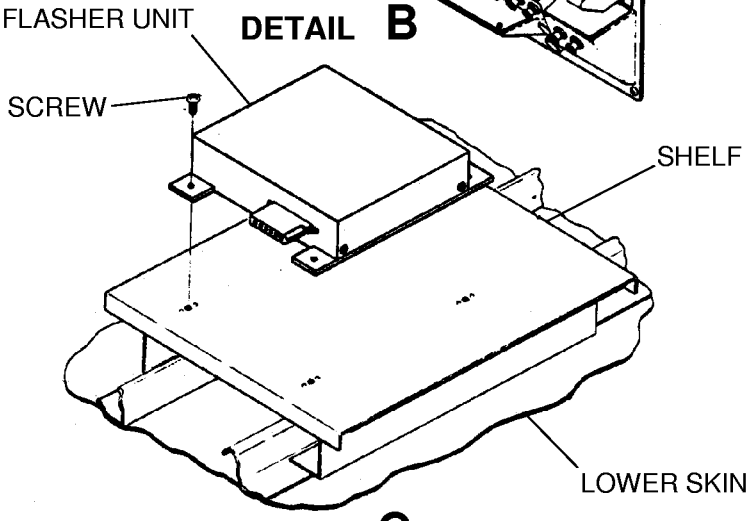




DETAIL A



DETAIL B



DETAIL C

AIRCRAFT 310R0001 THRU 310R1200

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Strobe Light System
Figure 404 (Sheet 1)

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(3) Remove tail strobe light as follows:
(a) Remove screws from retainer and remove retainer, lens, and gasket.
(b) Remove screws securing light assembly to stinger. Disconnect electrical connector and remove light assembly.

B. Installation (Refer to Figure 404).
(1) Install wing strobe light as follows:
(a) Position strobe light assembly to supporting bracket and secure with screw.

CAUTION: Clean contacting surfaces of light assembly and support bracket to provide a bond of 0.00 ohms resistance.

(b) Connect electrical wiring to light assembly.
(c) If strobe light flash tube was removed; install flash tube with trigger grid facing outward towards the lens and away from the reflector. Safety flash tube.

CAUTION: Seal light assembly, refer to SK402-30 for sealing instructions.

(d) Install nose cap on tip tank.
(2) Install power supply and flasher units as follows:
(a) Install flasher unit on shelf, using screws and connect electrical wiring.
(b) Install power supply unit to tailcone stringer, using screw and nuts. Connect electrical connector to power supply.
(c) Install tailcone upholstery panel.
(3) Install tail strobe light as follows:
(a) Connect electrical connector and secure light assembly to stinger with screw.
(b) Assemble gasket, lens, and retainer to light assembly and secure retainer using screw.
(c) If a new lens is installed use aluminum tape (Scotch Brand Pressure Sensitive Tape #425 or equivalent) and cover forward part of lens back 1.10 inch. (refer to Figure 404).
(d) Use a strip of the aluminum tape horizontally on the side overlapping the retainer, past the screw hole, so that the screw grounds the tape.

8. Cabin Step Light and Wing Walkway Light (Optional)

NOTE: When failed lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, a functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 403).
(1) Remove screw holding lens assembly.
(2) Remove lens assembly from housing assembly.
(3) Remove lamp from socket.
(4) If further disassembly is required lift out housing, remove wires from socket and tag.

B. Installation (Refer to Figure 403).
(1) Connect wires to socket and remove tags. Install housing.
(2) Install lamp and secure lens assembly with screws.

9. Wing Locker Courtesy Light (Optional)

NOTE: When failed lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 403).
(1) Remove fuel signal conditioner access panel.
(2) Remove the 5 amp fuse to the wing locker light from fuse holder.
(3) Remove screws securing the light and remove lamp.

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B. Installation (Refer to Figure 403).
(1) Install lamp into socket.
(2) Install lens and lens retainer and secure with screws.
(3) Replace fuse end check operation.
(4) Install fuel signal conditioner access.

10. Wing Locker Courtesy Light Switch (Optional)

NOTE: When failed lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 403).
(1) Remove fuel signal conditioner access.
(2) Remove 5 amp fuse to wing locker light from fuse holder.
(3) Remove screw from switch. Identify and disconnect electrical wires.

B. Installation (Refer to Figure 403).
(1) Connect electrical wires to switch and secure switch with screws.
(2) Replace fuse and check operation.
(3) Install fuel signal conditioner access.

11. Nose Baggage Light (Optional)

NOTE: When failed lamps, light assemblies, and components are replaced, equipment with identical part numbers should be installed unless substitutes have been authorized. After replacing equipment, functional test should be performed to verify proper circuit operation.

A. Removal (Refer to Figure 403).
(1) Remove upper left engine cowl.
(2) Remove 5 amp fuse to nose compartment light from fuse holder.
(3) Pull lens from baggage retainer.
(4) Remove socket and remove lamp.

B. Installation (Refer to Figure 403).
(1) Install lamp in socket and insert socket into lens.
(2) Insert lens into baggage retainer.
(3) Replace fuse and check operation.
(4) Install left engine cowl.

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EXTERIOR LIGHTS - ADJUSTMENT/TEST

1. Landing Light

A. Adjustment/Test (Refer to Figure 501).

(1) Landing lights are adjusted in the factory to extend to an angle of 90 degrees from the full retracted position. The angle of extension may be altered by means of an adjustment screw.

NOTE: Do not turn the adjusting screw counterclockwise more than three full turns without closing and opening the light before further adjustment. Excessive turns of the screw in a counterclockwise direction will distort an actuator contact within the assembly, thus changing the fixed setting which controls the light retract position.

(2) Adjust Landing Light.

(a) The angle of extension of the landing light may be checked with a bubble protractor. Check the degree of opening according to the following steps:

1 Retract the landing light and place the flat surface of the protractor across the retainer band which secures the lamp within the inner canopy.

NOTE: Two blocks of equal thickness may be placed on the retainer band to raise the protractor so it will clear the surface of the lamp for a more positive location of the protractor.

2 Run the landing light full down and measure the angle of extension. If light has not reached the desired degree of extension, turn the landing light adjustment screw in the direction necessary to achieve the desired angle of extension.

3 Retract the light to the full up position, fully extend the light, and check the angle of extension.

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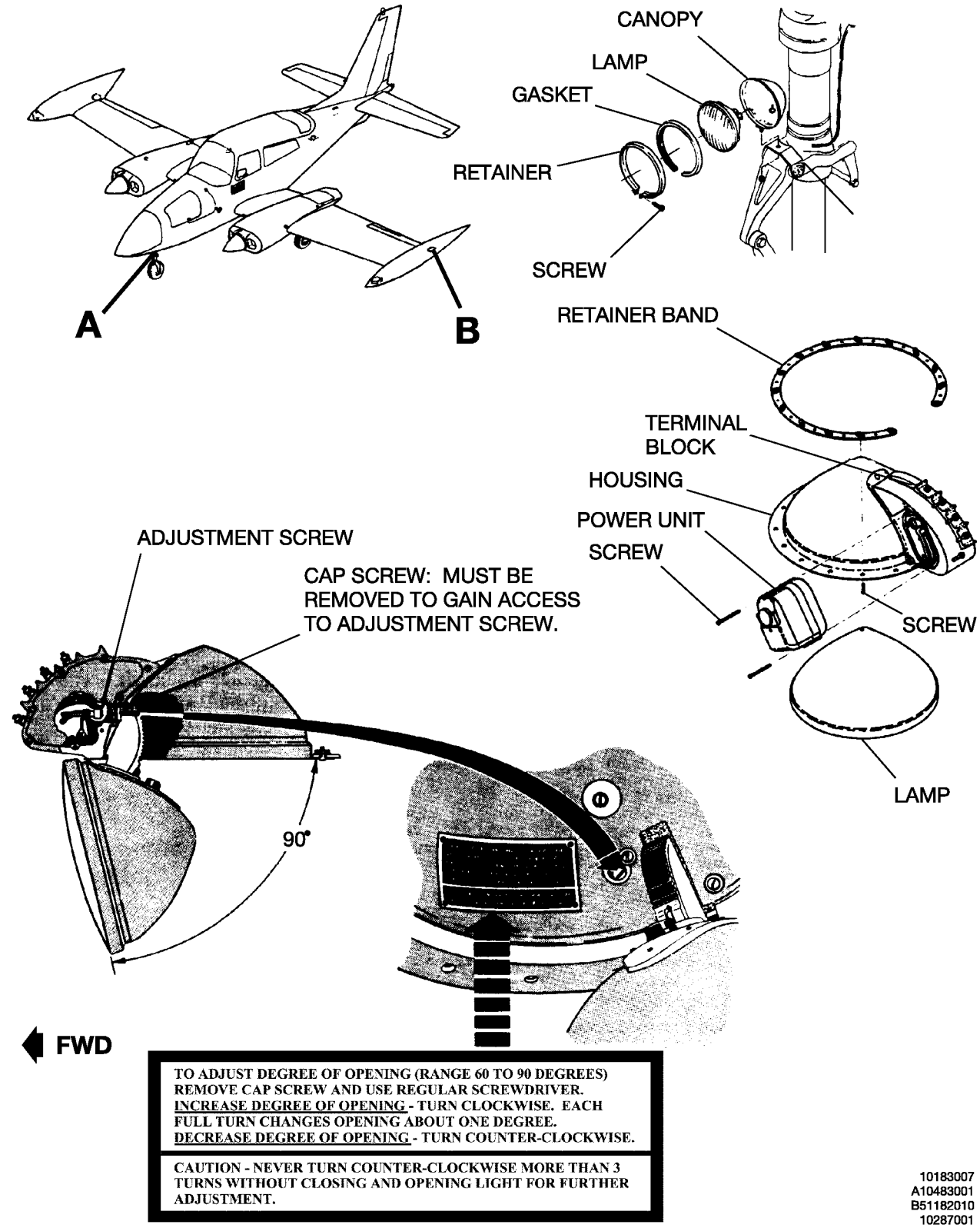

TO ADJUST DEGREE OF OPENING (RANGE 60 TO 90 DEGREES) REMOVE CAP SCREW AND USE REGULAR SCREWDRIVER.
INCREASE DEGREE OF OPENING - TURN CLOCKWISE. EACH FULL TURN CHANGES OPENING ABOUT ONE DEGREE.
DECREASE DEGREE OF OPENING - TURN COUNTER-CLOCKWISE.

CAUTION - NEVER TURN COUNTER-CLOCKWISE MORE THAN 3 TURNS WITHOUT CLOSING AND OPENING LIGHT FOR FURTHER ADJUSTMENT.

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Landing and Taxi Light Installation
Figure 501 (Sheet 1)

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CHAPTER 34

NAVIGATION

LIST OF EFFECTIVE PAGES

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34-20-00	Page 501	Jun 17/2005

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NAVIGATION - GENERAL

1. Scope

A. This chapter describes those units and components which provide airplane navigational information.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. The following is a brief description of each section.
   (1) Flight environment data describes that portion of the system which senses environmental conditions and uses the data to influence navigation.
   (2) Attitude and direction describes that portion of the system which uses magnetic or inertial forces to sense and display the direction or attitude of the airplane.

3. Sensitive Altimeter

A. Description.
   (1) The sensitive altimeter is a pressure instrument that measures the change in static pressure and by means of an indicator, translates this change into altitude above sea level. A barometric scale is incorporated in the instrument. The barometric pressure scale is calibrated in inches of mercury and is set manually by a knob on the lower left-hand corner of the altimeter case. Three pointers on the dial of the instrument indicate altitude in units of 100 feet, 1,000 feet and 10,000 feet.

4. Radio Altimeter System (Optional)

A. Description.
   (1) The radio altimeter system (optional) consists of the receiver/transmitter, indicator antennas, horn and the associated electrical connections and cables. The radio altimeter is an independent system or may be coupled to the 400B Nav-O-Matic or IFCS systems. The indicator incorporates a test function, DH (Decision Height) indicator light and the RD SET knob. The warning horn is used to alert the pilot when the airplane is out of the DH range on the indicator.

5. Encoding Altimeter System (Optional)

A. Description.
   (1) The encoding altimeter system (optional) provides altitude information and encoded information for (Air Traffic Control) when the ALT mode is selected on the transponder. The system consists of an encoding altimeter in the pilot's panel, a standard back-up altimeter in the copilot's panel and a transponder. The encoding altimeter is servo driven, using 28 VDC power. The altimeter will function whenever the battery switch is on and the altimeter failure bar is retracted from the altitude display. In addition, altitude encoding will be provided when the ALT mode is selected on the transponder. At altitudes less than 10,000 feet, a warning flag will be presented in the 10,000 foot window.

6. Airspeed Indicator

A. Description.
   (1) The airspeed indicator (standard) measures the differential between ram air, or impact air pressure taken at the pitot tube, and static air pressure. The instrument dial is calibrated in both knots and miles per hour.

7. True Airspeed Indicator (Optional)

A. Description.
   (1) The true airspeed indicator (optional) is composed of three elements; airspeed, altitude, and temperature. The altitude and temperature mechanisms are correlated to operate a rotating dial over which the indicated airspeed indicates the true airspeed. The true airspeed indicator senses changes in pressure and temperature. This combination of altitude and temperature change results in a sum total of airspeed corrections to indicate true airspeed.

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8. Vertical Speed Indicator

A. Description.
(1) The vertical speed indicator measures the rate of change in static pressure when the airplane is climbing or descending. By means of a pointer and dial it indicates the rate of ascent and descent of the airplane in feet per minute.

9. Turn and Bank Indicator

A. Description.
(1) The turn-and-bank indicator is a combination instrument located on the left-hand panel. The indicator is an electrically-driven gyro mounted in a horizontal gimbal that is attached to a pointer which indicates the rate of turn. The slip indicator consists of a curved, liquid-filled glass tube in which an inclinometer ball, moving with dampened motion, changes positions according to the gravitational and centrifugal force acting upon the airplane.

10. Angle of Attack System

A. Description.
(1) The angle of attack system (optional) continuously monitors the airplane's wing lift loading and visually displays the angle of attack by an indicator. The angle of attack system consists of an indicator incorporating a press-to-test circuit (for ground test or inflight test of the system) and a transducer. The indicator is mounted forward of the instrument panel glare shield. The transducer is located on the leading edge of the left wing and transmits electrical signals to the indicator for angle of attack display. The transducer incorporates a heater element operated by the pitot heater switch, to prevent ice from hampering the operation of the transducer. The system also incorporates a stall warning circuit which, when energized, causes the stall warning horn to sound.

11. Stall Warning System

A. Description.
(1) The stall warning system consists of a warning transmitter and warning horn. The stall warning horn is mounted behind the instrument panel and the warning transmitter is mounted on the leading edge of the left wing. The electrical circuits of the system energizes the warning horn sounding the horn when the airplane approaches a stall. The stall warning transmitter incorporates a heater element, operated by the pitot heater switch, to prevent ice from hampering its operation. On Airplanes 310R0801 and On, a relay and resistor is incorporated in the stall warning electrical circuit and wired through the landing gear safety switch to interrupt the stall warning while the airplane is on the ground.

CAUTION: Do not activate the stall warning heater while airplane is on jacks.

12. Antennas

A. Description.
(1) Antennas are provided for the navigation and communications systems which are installed as optional equipment. For identification and approximate location of antennas as provided, refer to Figure 1.

13. Tools and Equipment

Name	Number	Manufacturer	Use
Operations Installation Manual	15-3321-02	Sperry Rand, Inc. Phoenix, Arizona	Testing radio altimeter.

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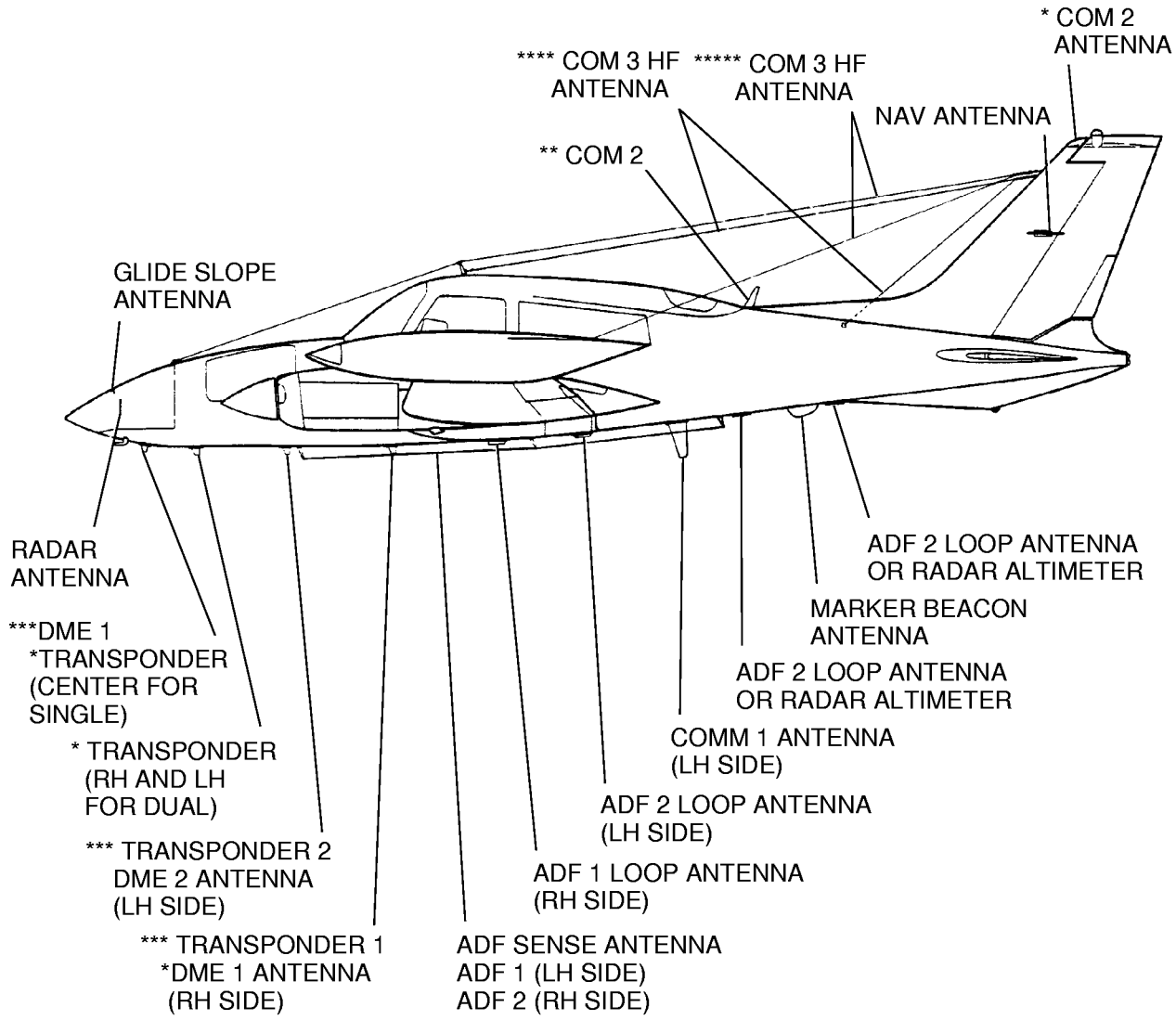

* AIRPLANES 310R0001 THRU 310R1500.

** AIRPLANES 310R0001 THRU 310R1434 WHEN MODIFIED BY SK310-102.

*** AIRPLANES 310R1501 AND ON.

**** AIRPLANES 310R1801 AND ON.

***** AIRPLANES 310R0001 THRU 310R1800.

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Antenna Locations
Figure 1 (Sheet 1)

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NAVIGATION - TROUBLESHOOTING

1. Troubleshooting Electronic Interference

NOTE: The following general troubleshooting information is presented as a guide to determine the system or systems producing the interference.

A. General.
(1) Pinpoint the particular system causing the noise by the process of elimination.
(2) Once the system causing a particular noise is isolated, investigate the particular system or systems to determine which component or components are causing the noise, by observing which components are actually operating when the noise occurs.
(3) Check the component for proper operation or damage.
(4) Check wiring connections and wiring coming in contact with moving parts.
(5) Check wire routing for proper separation.
(6) Check wire shielding where applicable.
(7) Check all system grounds.

B. Radio Noise.
(1) Radio noise is a problem of great importance to the airplane industry. A noisy radio system may actually imperil the safety of the airplane occupants. The performance of radio navigation equipment can be completely erroneous if radio noise is excessive. For this reason, radio installations should be made only by persons who are qualified. Radio noise is not generated in a properly operating radio set, but is merely presented to the listener in an audible form exactly the same way that a radio station is received. Many forms of noise can exist in any particular airplane and, ironically, sometimes certain airplanes can be amazingly quiet. This condition is unusual and even though the airplane is quiet without noise suppression, it cannot be released without proper suppression. A quiet airplane without suppression may degenerate into a noisy airplane with changes in age, temperature, and humidity. Common radio noise is generated by ordinary electrical devices in the airplane such as flap or gear motors, navigation light flashers, and ignition or alternator systems. By properly installing capacitive and inductive devices in these circuits, the noise can usually be reduced to a tolerable level. A more difficult type of noise to suppress, is that generated by friction between two components or by rectification. Another difficult problem is noise that is carried to sensitive areas by grounding loops. The following solutions have been effective for the factory. It is important to remember that each airplane may present a slightly different problem and, therefore, a "fix" on one airplane will not necessarily be effective in all cases.

C. Alternator Noise.
(1) While the alternators are relatively free from radio noise, there is the possibility the alternators will produce an audible noise in the radio and electronic systems. Inside the alternator a three phase AC voltage is applied to a full wave rectifier assembly, thus converting the AC voltage to DC. During the rectification, an AC ripple appears on top of the DC voltage, thus the bus voltage is actually fluctuating. While the battery acts as a capacitor, it is also necessary to have additional filtering. This is accomplished by the use of a capacitor from the output terminal to ground at the alternator. The use of solid state regulators reduces the possibility of regulator noise to a minimum and will not require filtering.

NOTE: If alternator noise is experienced and it is determined it is coming from the output of the alternator, the following troubleshooting steps should be accomplished before attempting to install additional filtering.

(2) Check alternator output bypass filter for broken leads or inadequate ground.
(3) Check the lead attaching to alternator power (+) terminal is as short as possible or approximately 1 to 2 inches long.
(4) Check alternator ground wire for any damage or improper contact or corrosion between terminal and grounding point.
(5) Check alternator brushes for damage that could be arcing.
(6) Check alternator brush tension for proper seating.

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D. Ignition Noise.
   (1) The sound of ignition noise is easily identified because of its timing. The 310 has a shielded magneto ignition system. Each secondary lead from the magneto to the plug is a shielded wire. Double shielded wiring is used in the primary circuit with a special suppressor in series with the switch lead. The suppressor is constructed coaxially with a shielded lead coming out of the end which is connected to the magneto cigarette cartridge. The double shielded wire is connected to the terminal end of the filter (the shield is grounded). The double shielded wire enters the cabin area through connectors in the wing root rib to prevent noise transfer to the junction box wiring. The double shielding is continued to the inside of the cabin to the magneto switch. The magneto switches are enclosed in a shielded case to which the double shield of the wire is grounded. If ignition noise is prevalent in the radio system, the entire magneto system should be checked for tight connections, especially in the root rib connectors and at the switch and suppressor. All ground connections in the circuit are critical and any oil or dirt accumulation should be cleaned from the connection and the metal should be brightened to provide the best possible ground. Ignition harness should be replaced if the shielding becomes questionable.

E. Flap and Landing Gear Motor Noise.
   (1) During a landing approach, an unfiltered motor in the flap or gear circuits can produce a startling volume of noise which is very distracting. There is also the possibility of the noise blanketing a message from the tower during the approach. It is possible that sufficient noise could be created through these circuits to blanket an ILS signal, creating a hazardous situation. For these reasons, the circuits have a filter section built into the motor. The filter should be very effective if the unit is properly grounded. If noise becomes excessive with good grounding, a motor overhaul or replacement may be necessary.

F. Auxiliary Fuel Pump Noise.
   (1) Coaxial type capacitors produce effective results when installed on the base of the fuel boost pumps. Because of the location of the fuel pump and capacitors, the connections must be kept tight to avoid any possible arcing. When proper filtering and grounding do not produce the desired filtering results, a new pump should be tried.
   (2) Insure that wiring is properly shielded.
   (3) Insure shields are properly grounded.
   (4) Check loose wiring connections for looseness and breaks.

   NOTE: If the cause of the noise cannot be eliminated, a 0.47 microfarad 50 WVLC feed-thru capacitor should be installed in the power (AX) lead as close to the pump as possible and insure the case of the capacitor is properly grounded to the airframe.

G. Lighting Circuit Noise.
   (1) All lighting components on the 310 have internal filters and usually do not require external capacity. The light wiring, however, because of its route to the extremities of the airplane can, in unusual cases, conduct noise to vital areas. The light wires and electrical wiring bundles should be routed away from the antenna and loop antenna cables to prevent picking up noise in the radio systems. Shielding should be properly grounded.

H. Voltage Regulator Noise.

   NOTE: If regulator noise is present and traced to the regulator and its associated control leads the following checks should be made before attempting to add additional filtering.

   (1) Check regulator adjustment for proper setting (27.25 to 27.75 volts).
   (2) Check regulator noise filter for damage, loose wires, broken leads, or improper connections.
   (3) Check shield wire on regulator to alternator field wires for proper termination (single point ground), shield damage. Check for adequate coverage at termination ends.
   (4) Check alternator for brush arcing.

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I. Electroluminescent Panels Inverter Noise.

NOTE: In most cases noise produced by the E.L. inverter could be due to the light capacitive load on inverter. When this problem occurs, it can be eliminated by the addition of 0.01 to 0.05 ufd 200 WV capacitor to the output terminals of the inverter. If the noise cannot be eliminated it should be determined whether the noise is due to one of the following:

(1) Radiation from AC wiring, requiring shielding.
(2) Noise conducted to the power bus by the DC input, requiring filtering.
(3) Radiation from DC power leads requiring shielding.
(4) Radiation from inverter, necessitating replacement of inverter.
(5) If the airplane has an ADF installed, the following guidelines may be used to locate electroluminescent inverter noise:
    (a) Tune ADF to a low frequency band.
    (b) Place all panel light controls in the lowest position.
    (c) Turn each panel control fully on one at a time and listen for a high pitched buzzing sound similar to an electric drill motor.
    (d) After isolation of the noise control, check panels on that control for operation.
    (e) If the inverter has a capacitor across its output terminals, check the capacitor for damage or substitute a capacitor known to be good.

J. Electric Trim Motor Noise.
(1) In the event of noise difficulties caused by the trim system motors, the following should be checked to insure standard noise suppression equipment is properly installed.
(2) Check that motor frame and actuator assembly are properly grounded.
(3) Check capacitors inside of motor for broken leads or damage.
(4) Check to make sure shielded wires are properly grounded at the actuator assembly and that the shields are not shorted in other areas to structure which could create noise loops.
(5) If the filters are good and noise is not totally eliminated the following procedures should be attempted to eliminate the noise.
    (a) Change C_1 to 0.05 microfarad.
    (b) Add a 1.0 microfarad feed-thru capacitor with shielded lead to (+) lead of the side producing the noise. Attach the housing or capacitance ground to the actuator housing assembly.
    (c) Make sure shielding wire and motor frame are making good ground.
    (d) If the motor is noisy in both directions of rotation add a 1.0 microfarad feed thru capacitor to both leads and insure that shield and housing or capacitor ground are attached to the actuator housing assembly.
    (e) The addition of larger capacitors, inductors, or RF chokes is not recommended, experience has proven no significant change in additional filtering.

K. Tip Tank Transfer Pump Noise.
(1) If the tip tank transfer pump is causing noise in the audio system, check the following:
    (a) Check capacitor case ground.
    (b) Check capacitor for damage, open circuit, short circuit, loose wiring, and damaged shielding.
    (c) Substitute a capacitor of the same value known to be good in place of the original capacitor.

L. Anti-Collision Lights Noise.
(1) If the anti-collision lights are causing noise in the audio system, the following shall be checked:
    (a) Filter for proper ground.
    (b) Lamp circuit for loose connections and wiring.
    (c) Bulb for loose socket.
    (d) Internal filter for damage.
    (e) External light for proper ground to frame or structure of airplane.

M. Strobe Light Noise.
(1) If the strobe lights are causing noise in the audio system from radiation or in-line interference, the following shall be checked:
    (a) Make sure all power supply units are grounded properly to the airframe.

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(b) Insure the shielded wires and twisted pairs from the tail light are grounded.

NOTE: Grounds must be terminated at the power supply.

(c) Insure tail nav light is adequately grounded.

N. Intermittent Radio Operation.

(1) Intermittent radio failures have been attributed to connector contact surface contamination caused by flux and/or flux residue. This contamination can be removed by washing the contact surface with one of the following cleaners:

(a) Rosin Residue Remover, available from: Alfa Solder Co., Kester Solder Co., Ersin Solder Co.

(b) GC Relay Clean.

(c) LPS Instant Contact Cleaner or any hydrocarbon or fluorocarbon cleaner followed by a second wash with alcohol.

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NAVIGATION - REMOVAL/INSTALLATION

1. True Airspeed Indicator

A. Removal (Refer to Figure 401).
(1) Disconnect clamp securing temperature probe on bottom skin.
(2) Loosen feed-thru nut on temperature tube and work tube up and into the cockpit area.

CAUTION: Avoid sharp bends, nicks, or dents in temperature tube. Incorrect readings could result.

(3) Remove indicator in accordance with typical instrument removal and installation procedures in Chapter 31, Instrument And Control Panels - Removal/Installation.
(4) Seal around feed-thru fitting after installation.

B. Installation (Refer to Figure 401).
(1) Install indicator in accordance with typical instrument removal and installation procedures in Chapter 31, Instrument And Control Panels - Removal/Installation.
(2) Replace temperature tube and secure with feed-thru nut.

CAUTION: Avoid sharp bends, nicks, or dents in temperature tube. Incorrect readings could result.

(3) Connect clamp securing temperature probe on bottom skin.

2. Radio Altimeter Indicator

A. Removal.
(1) Ensure electrical power is OFF.
(2) Tag and remove electrical connectors.
(3) Remove screws securing indicator to instrument panel.

B. Installation.
(1) Install indicator in instrument panel.
(2) Connect electrical connections.
(3) Perform preflight test (refer to vendor operation and installation manual).

3. Receiver/Transmitter

A. Removal.
(1) Ensure electrical power is OFF.
(2) Remove necessary seats, carpet, and floorboard access plates.
(3) Tag and disconnect electrical connections.
(4) Remove screws securing receiver/transmitter to shelf. Lift receiver/transmitter from airplane.

B. Installation.
(1) Position receiver/transmitter on mount and install screws.
(2) Connect electrical connections.
(3) Assure radio altimeter functions properly.
(4) Install floorboards, access plates, carpet, and seats.

4. Angle of Attack Indicator

A. Removal (Refer to Figure 402).
(1) Assure airplane electrical power is OFF.
(2) Disconnect electrical connector to indicator.
(3) Remove cover from indicator by removing screw.
(4) Remove screws securing indicator to mounting bracket.
(5) Remove grommet from deck cover; remove indicator.

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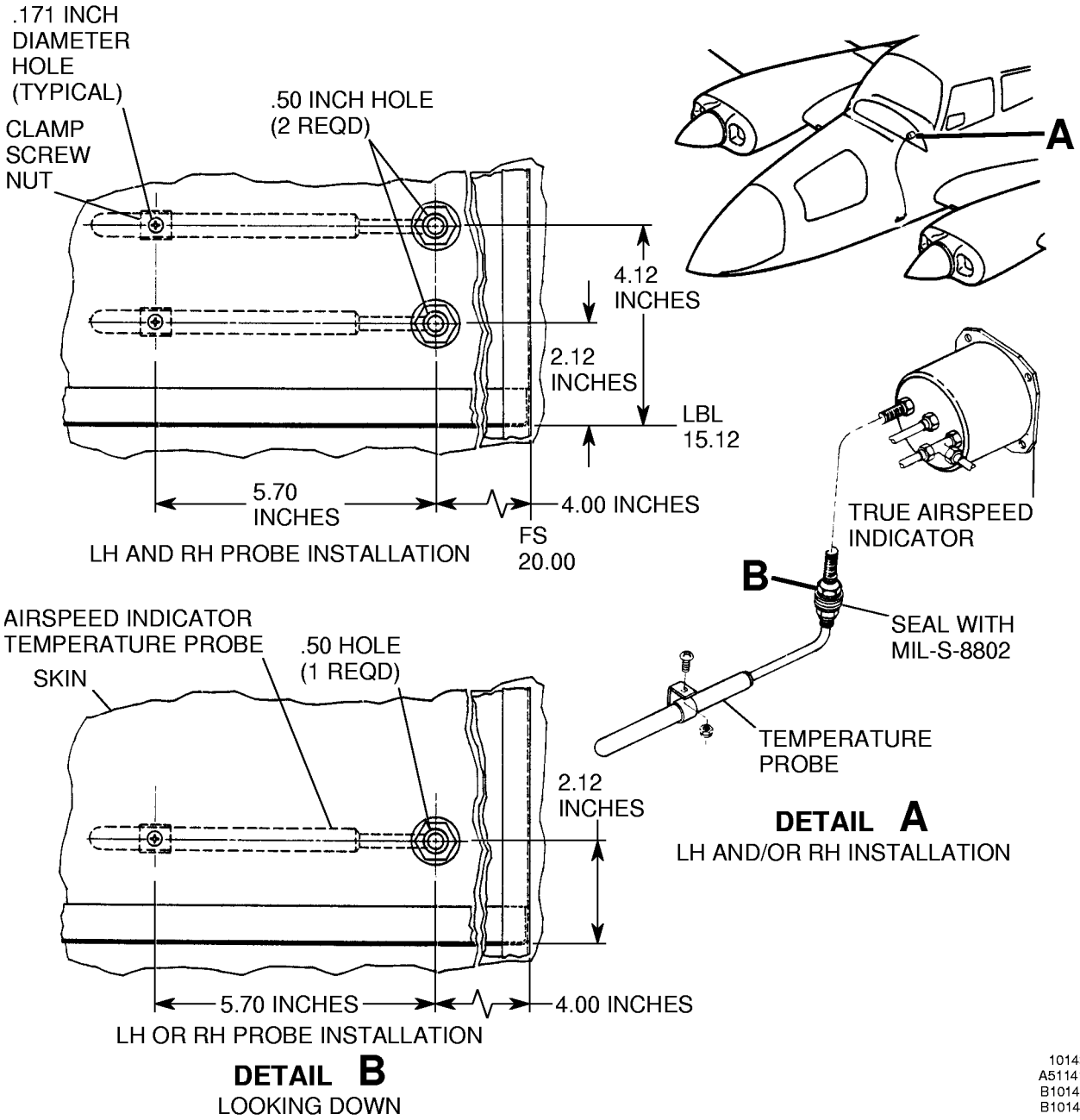

True Airspeed Indicator Installation
Figure 401 (Sheet 1)

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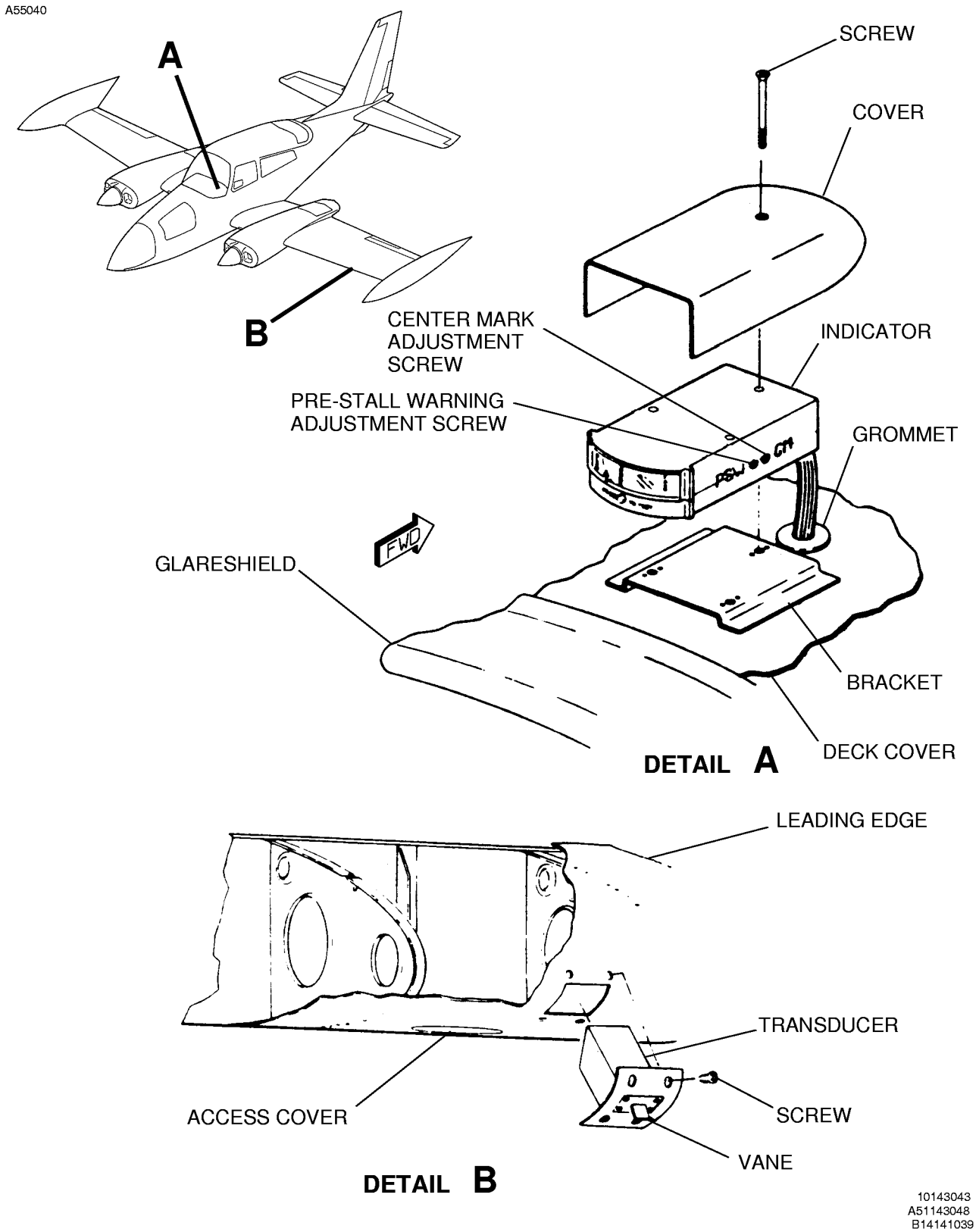

Angle of Attack System Installation
Figure 402 (Sheet 1)

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B. Installation (Refer to Figure 402).
(1) Insert wire cable of indicator through hole in deck cover.
(2) Install grommet in deck cover.
(3) Position indicator on mounting bracket and secure with screws.
(4) Install cover on indicator with screw.
(5) Reconnect electrical plug.

5. Angle of Attack Transducer

NOTE: Before removal of transducer, it is important that the exact fore-aft location of the vane be marked on the wing so that the replacement unit may be installed in the identical location.

A. Removal (Refer to Figure 402).
(1) Assure airplane electrical power is OFF.
(2) Remove access cover.
(3) Disconnect electrical plug to transducer.
(4) Remove screws securing transducer to leading edge. Remove transducer.

B. Installation (Refer to Figure 402).
(1) Insert wire cable of transducer through transducer mounting hole.
(2) Secure transducer to leading edge with screws.
(3) Reconnect transducer electrical plug.
(4) Replace access cover.

6. Stall Warning Transmitter

A. Removal (Refer to Figure 403).

NOTE: Before removal of stall warning transmitter, it is important that the exact fore-aft location of the vane be marked on the wing so that the replacement unit may be adjusted identically.

(1) Turn electrical power OFF.
(2) Remove access cover from lower surface of wing.
(3) Remove screws attaching stall warning transmitter to wing skin.
(4) Identify and disconnect electrical wires from transmitter.
(5) Remove transmitter.

B. Installation (Refer to Figure 403).
(1) Connect electrical wires to transmitter.
(2) Secure transmitter to wing skin with screws.
(3) Install access cover on lower surface of wing.
(4) Perform operational check of stall warning system.

7. Stall Warning Horn

A. Removal (Refer to Figure 403).
(1) Turn electrical power OFF.
(2) Identify and disconnect electrical wires from stall warning horn.
(3) Remove screw and lockwasher securing warning horn to support and remove warning horn.

B. Installation (Refer to Figure 403).
(1) Secure warning horn to support using lockwasher and screw.
(2) Identify and connect electrical wires to warning horn.
(3) Perform operational ground check of stall warning system.

8. Antenna

NOTE: Procedures apply to either antenna.

A. Removal.
(1) Ensure electrical power is OFF.

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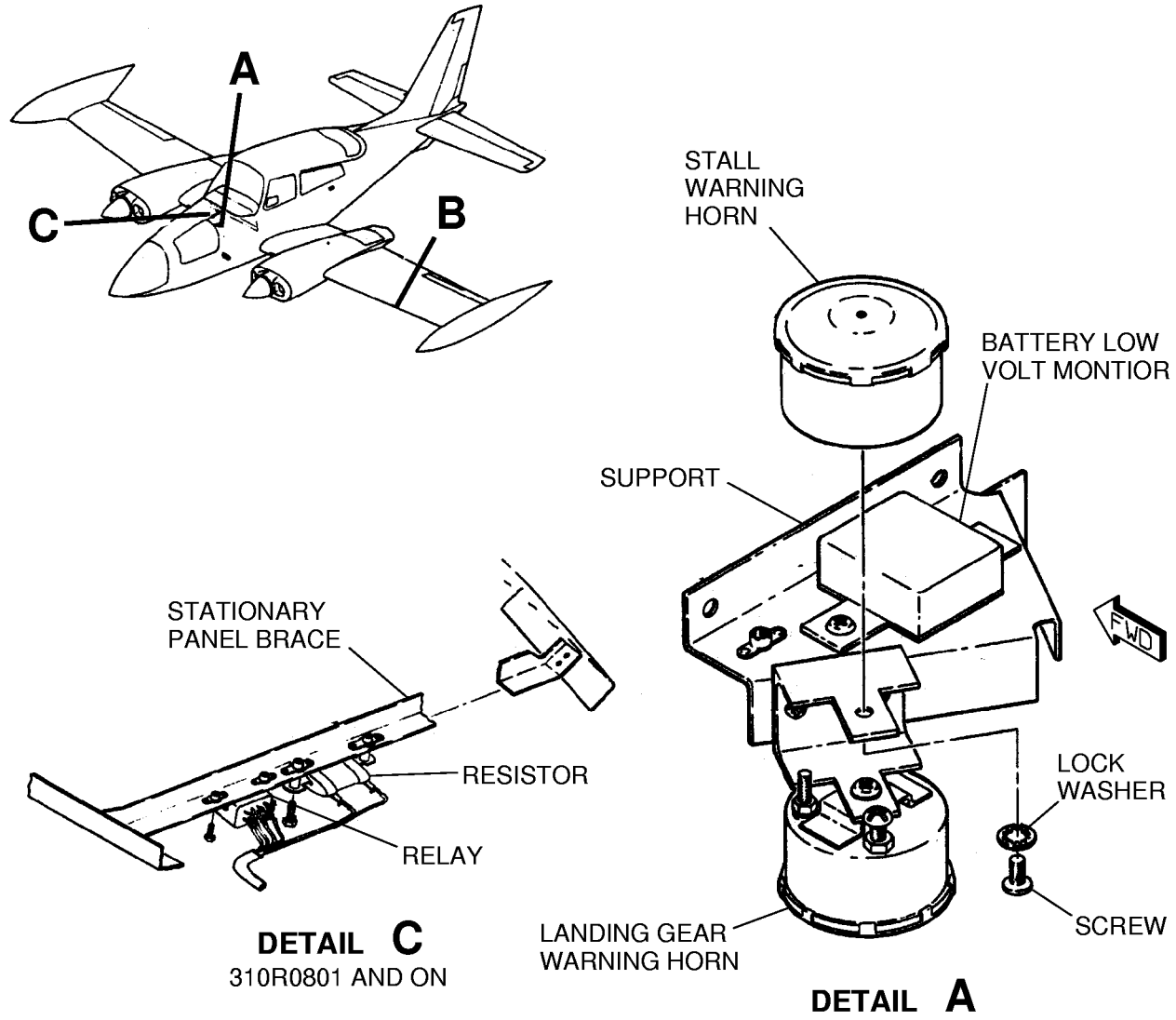

Stall Warning System
Figure 403 (Sheet 1)

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(2) Remove necessary seats and tailcone access panel.
(3) Remove coax cable and electrical connector.
(4) Remove screws securing antenna to belly skin and remove antenna.

B. Installation.
(1) Position antenna in place in the tailcone and install screws.
(2) Connect electrical connector and coax cable.
(3) Ensure radio altimeter functions properly, refer to Navigation - Adjustment/Test.
(4) Install tailcone access and floorboards.

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NAVIGATION - ADJUSTMENT/TEST

1. Angle of Attack System

A. Test.
(1) Move battery switch to ON position. Push the Press-to-Test button on the indicator.
(2) Check that the indicator needle moves to the left (SLOW) end of scale and the stall warning horn sounds with the needle in the red zone. The needle should return to the SLOW diamond when the button is released.
(3) Turn the pitot heat switch ON and check to see that the transducer mounting plate on the left wing leading edge heats up.
(4) Turn pitot heat OFF.

NOTE: The pitot heat switch should not be left on any longer than necessary to determine that mounting plate is heating.

(5) Push the transducer vane gently aft (down). Check that the needle moves to the right (FAST) end of scale. When released, the vane should return to approximate center of its travel and the needle should return to the SLOW diamond.
(6) Push the transducer vane gently forward (up). The indicator needle should move to the left (SLOW) end of scale and the stall warning horn should sound. When released, the vane should return to the approximate center of travel, the needle to the SLOW diamond, and the stall warning horn should stop.
(7) Turn battery switch OFF.

2. Stall Warning System

A. Adjustment.
(1) Using the data recorded in the Flight Check portion of Operational Check of Stall Warning System in Navigation - Inspection/Check, adjust the stall warning vane to provide a stall warning horn at 3 to 5 knots lAS prior to the idle power landing configuration stall.
(2) Raising the stall warning vane position will increase the stall warning indication and lowering the stall warning vane will lower the stall warning indication.

3. Compass

A. Alignment.

NOTE: The compass alignment shall be performed on a calibrated compass rose.

(1) Ensure compensator adjustments are set to a neutral position. The compensators are located on the lower face of compass behind the metal disc.
(2) Using a hand-held magnetic compass, check all ferrous material parts for magnetism near the magnetic compass.
(3) Degauss any parts within two feet which cause greater than 10 degrees deflection of the magnetic compass, and any part within four feet which cause greater than 90 degrees deflection of the magnetic compass.
(4) Ensure that each of the applicable systems are controlled from the proper circuit breakers, and the corresponding "'HDG" flag appears when the circuit breaker is disengaged.
(5) Ensure all electrical instruments for the airplane are installed and operative.
(6) Ensure other airplanes and vehicles are a safe out of way distance.
(7) Position airplane on the 270 degree heading of the compass rose.
(8) With both engines running 1000 RPM, turn on the following:
(a) All circuit breakers.
(b) Inverters.
(c) All lights except landing lights and reading lights.
(d) All avionics systems.
(e) All electrical systems except pitot heat, stall, and static heaters.

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(f) Record the compass error in degrees.

NOTE: High readings are positive errors, low readings are negative errors.

(9) Position airplane on the 360 degree heading of the compass rose and repeat steps (8)(a) thru (8)(f).
(10) Position airplane on the 90 degree heading of the compass rose and repeat steps (8)(a) thru (8)(f).
(11) Position airplane on the 180 degree heading of the compass rose and repeat steps (8)(a) thru (8)(f).

B. Compensation Adjustments.
(1) The errors obtained in the Compass Alignment procedure steps (8)(a) thru (8)(f) will be used to determine the required amount and degree of compensation for the compass.

C. Compass Compensation.
(1) At one cardinal heading, adjust the appropriate compensator the amount calculated in Compass Alignment procedure steps (8)(a) thru (8)(f).
(2) Rotate the airplane 90 degrees and adjust the appropriate compensator the amount calculated.
(3) Rotate the airplane to the next two cardinal headings and ensure that no error greater than five degrees is present.
(4) With normal airplane power, all electrical systems on, rotate the airplane to 30 degree headings (including cardinals). Stop on each heading long enough to allow compass to stabilize.
(5) Record the headings indicated by the compass at the 30 degree positions. No error greater than +5 or -5 degrees shall be indicated by the compass.

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NAVIGATION - INSPECTION/CHECK

1. Avionics System

A. Inspection/Check.
   (1) Inspect communications and navigation systems for proper installation, security, proper operation, and antennas for damage.

2. Angle of Attack System

A. Ground Adjustment/Check.
   (1) Before applying electrical power to the system, check the SLOW/FAST needle position. It should be at a position midway between the SLOW (left) diamond and the SLOW legend.
   (2) Turn on battery master switch. Check that the airplane voltage is at least 24 volts.
   (3) Press the test button on the front of the indicator. The needle shall move to the left end of the scale and the pre-stall warning horn shall sound. Release the test button. The SLOW/FAST needle shall return to a position near the SLOW diamond and the pre-stall warning horn shall stop.
   (4) Remove cover. Using a small screwdriver, turn the adjustment screw marked PSW (Pre-Stall Warning), located on the side of the indicator, clockwise until the pre-stall warning horn sounds. Then turn the PSW screw counterclockwise until the horn stops.
   (5) Push the vane on the lift transducer, located on the leading edge of the left wing, forward (up). The pre-stall warning horn shall sound. Release the vane and the horn shall stop. If it does not stop within 3 to 4 seconds after the vane is released, turn the PSW adjustment screw counterclockwise one complete turn. Recheck by pushing the vane forward and releasing it to ensure that the horn will stop within 3 to 4 seconds after the vane is released. The system is now ready for flight check and adjustment.

B. Flight Adjustment/Check.
   (1) The flight check should be performed in smooth air at a safe altitude to perform stalls. Using the data recorded in the Flight Check portion of the Stall Warning System, adjust the angle of attack system to provide an "on speed" indication when the indicated airspeed is within +2 knots of the approach speed determined from the Approach and Stall Speed Chart. Correct for weight at time of the test for the following configurations:
      (a) Landing gear down.
      (b) Flaps full down.
      (c) Power as required to maintain a stable rate of descent at 500 RPM.
   (2) With power off (IDLE), flaps down, gear down, trim the airplane for a speed approximately 20 knots above the stall speed determined from the Approach and Stall Speed Chart. Then slowly reduce speed to no more than 1 knot per second, and observe the speed at which the pre-stall warning horn sounds. Continue to reduce speed at no more than 1 knot per second until the airplane stalls, and observe the stall speed. The pre-stall warning horn shall sound 3 to 5 knots before stall. If it does not, proceed as in steps 3 and 4.
   (3) If the speed at which the horn sounded was greater than 5 knots before stall, turn the PSW (Pre-Stall Warning) adjustment screw on the side of the indicator counterclockwise approximately 1/2 turn for each knot the warning speed must be reduced, then repeat step (2) until the warning horn sounds at 3 to 5 knots before stall speed. Do not allow the speed to decrease at greater than 1 knot per second during these checks.
   (4) If the speed at which the pre-stall warning sounded was less than 3 knots before stall, adjustment of the lift transducer location on the wing is required. Land and loosen the screws in the slotted holes, in the corners of the lift transducer mounting plate, and slide the transducer forward (up) on the wing. Retighten screws and repeat step (2) and step (3) if necessary. Do not attempt to increase the warning horn speed by turning the PSW adjustment screw clockwise, as the maximum clockwise setting was determined in the Ground Adjustment/Check steps (4) and (5). Any further clockwise adjustment will cause the horn to sound when the airplane is at rest on the ground.
   (5) After the pre-stall warning horn is properly adjusted, determine the weight of the airplane. Using the Approach and Stall Speed Chart, find the approach speed.

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(6) With flaps and gear down, trim the airplane for level flight at speed determined in step (5). Altitude hold may be used to facilitate this adjustment, if available. Maintaining this speed, observe the position of the SLOW/FAST needle. It should be at the center mark. If the needle is to the left of the center mark, turn the adjustment screw marked CM (Center Mark), located on the side of the indicator, clockwise. If it is to the right of the center mark, turn the adjusting screw counterclockwise. Make the adjustment in steps of 2 to 3 turns in the appropriate direction, then recheck the needle position and the airspeed to ensure that the speed is being maintained at the proper value.

(7) After completion of the flight check and alignment, replace the cover on the indicator and secure in place.

3. Stall Warning System

A. Ground Check.

(1) Turn electrical power ON.

(2) Activate vane on stall warning transmitter and observe audible warning signal.

NOTE: The stall warning transmitter incorporates an electrical heating element which is activated by the pitot heat switch. Insure this switch is off when checking the transmitter.

B. Flight Check.

(1) Check the stall warning system in two configurations: landing gear up, flaps up and landing gear down, flaps full down.

(2) Check each configuration in step (1) at 65 percent power, and at idle power, and in the weight and center-of-gravity range shown in Figure 601.

(3) Approach the stall by reducing airspeed at a rate as close as possible to one knot per second. In the stall the airplane roll altitude should be controllable up to the time the airplane nose pitches downward or full up elevator stop is reached. The fuel should be managed to minimize asymmetric fuel prior to conducting the stall.

NOTE: Prior to conducting a stall, close all fresh air vents and check for presence of exhaust fumes in cockpit during approach to stall.

(4) The indicated stall speed in the landing configuration at idle power should fall within 4 knots lAS of the stall speed line (Refer to Figure 601).

(5) Record the stall speed for each configuration.

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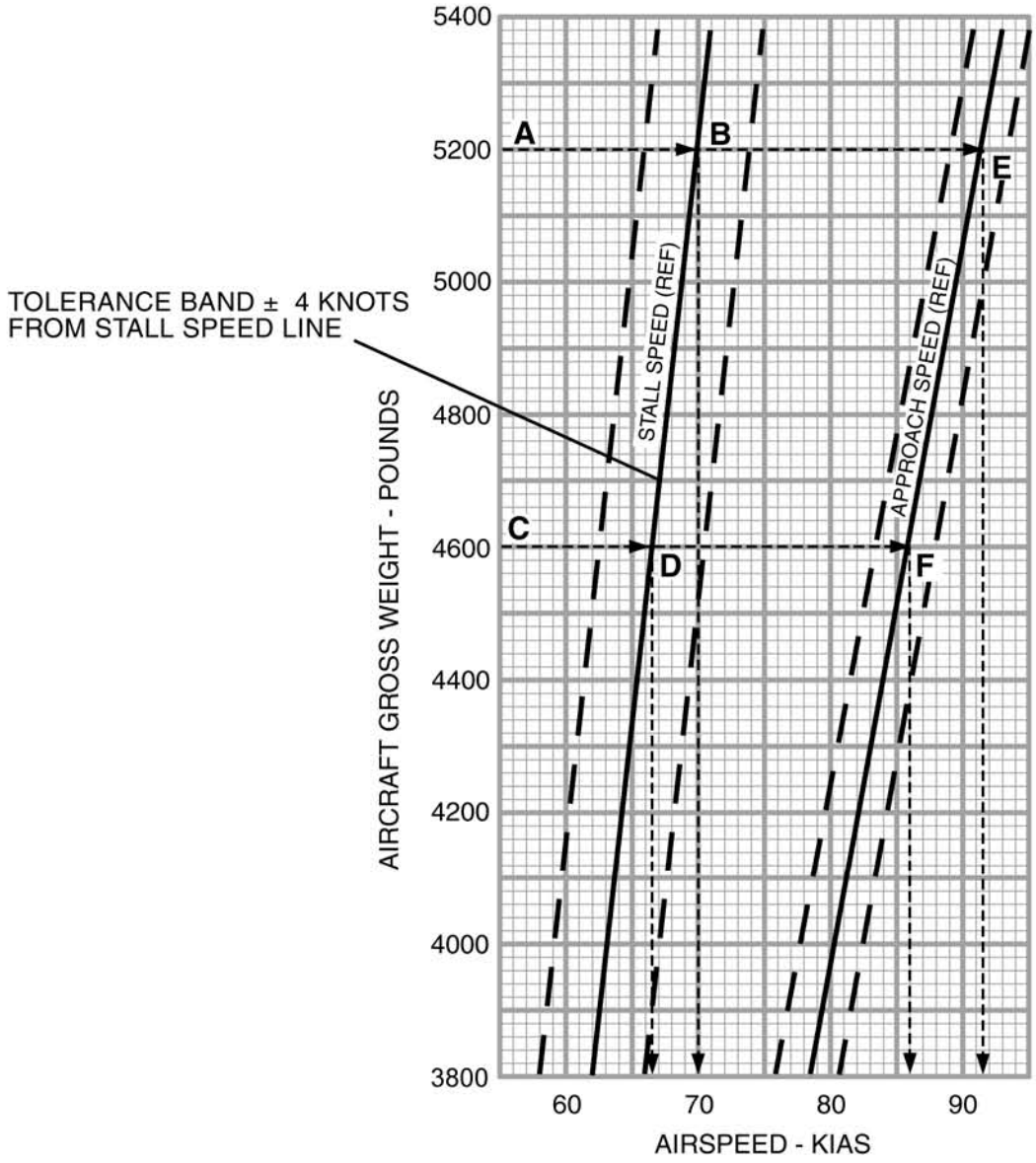
MODEL	TAKEOFF WEIGHT RANGE - LBS.	TAKEOFF C.G. RANGE - %
310	4440-5200	20-25
T310	4550-5310	19-24



EXAMPLE
"A" POINT "A" WEIGHT (HEAVY WEIGHT)
"B" STALL SPEED AT POINT "A" WEIGHT (70 KIAS)
"C" POINT "C" WEIGHT (LIGHT WEIGHT)
"D" STALL SPEED AT POINT "C" WEIGHT (66.5 KIAS)
"E" APPROACH SPEED AT POINT "A" WEIGHT (91.5 KIAS)
"F" APPROACH SPEED AT POINT "C" WEIGHT (86 KIAS)

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Approach and Stall Speed Chart
Figure 601 (Sheet 1)

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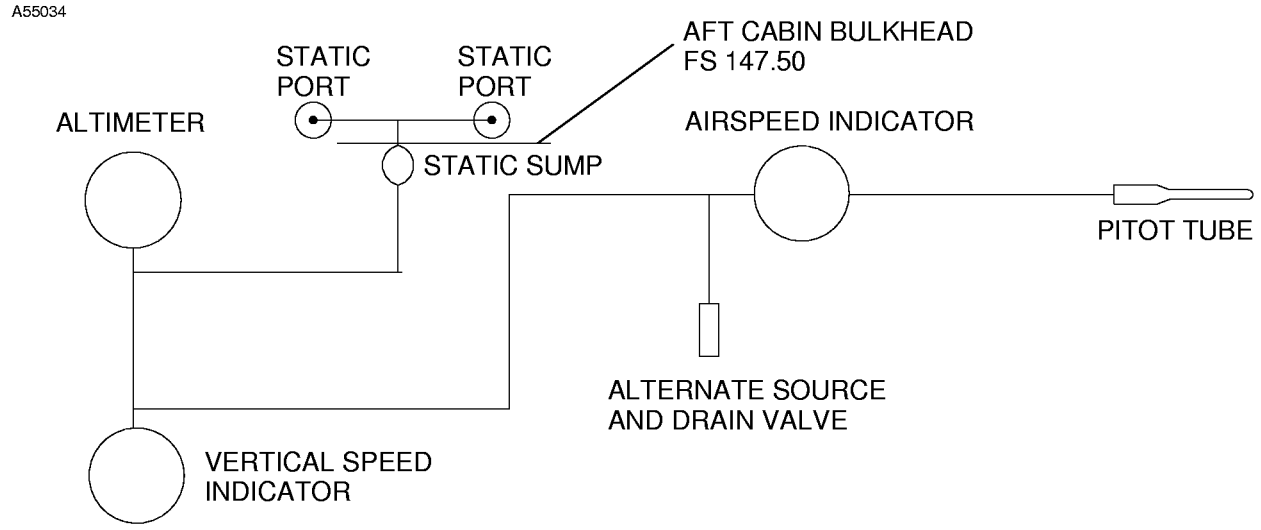
FLIGHT ENVIRONMENT DATA - DESCRIPTION AND OPERATION

1. Pitot System

A. Description (Refer to Figure 1).



Pitot-Static System Schematic
Figure 1

(1) The single pitot system (standard airplane) utilizes one pitot tube, located on the left-hand side of the nose. The pitot tube, incorporates an electrical heating element to prevent ice from obstructing the passage of ram air through the pitot tube. Ram air passing through the pitot tube is routed to the pilot's airspeed indicator through lines and hoses.

(2) The dual pitot system (optional) utilizes two pitot tubes, located one on each side of the nose. Both pitot tubes incorporate an electrical heating element to prevent pitot tube icing. Each pitot system is independent of the other pitot system and supplies ram air through lines and hose to the respective airspeed indicator. The left pitot system supplies ram air to the pilot's airspeed indicator. The right pitot system supplies ram air to the copilot's airspeed indicator.

2. Static System

A. Description.

(1) The single static system (standard airplane) utilizes two static ports (heated optional), static sump, drain valve, and necessary plumbing to the pilot's airspeed indicator, vertical speed indicator, and the altimeter. Static pressure is routed from the two static ports, mounted on opposite sides of the aft fuselage through the static sump to the airspeed indicator, vertical speed indicator, and altimeter. A drain valve, located in the forward left-hand cabin area is connected to the static line to release accumulated moisture and serve as an alternate static pressure source.

(2) The dual static system (optional) is used with the dual pitot system (heated optional). The static system has two independent systems, one system provides static pressure to the pilot's airspeed indicator, vertical speed indicator, and altimeter. The other static system provides static pressure to the copilot's airspeed indicator, vertical speed indicator, and altimeter. Each static system consists of two static ports, static sump, drain valve, and necessary plumbing.

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FLIGHT ENVIRONMENT DATA - SERVICING

1. Pitot System

A. Purging (Refer to Figure 301 and Figure 302).

NOTE: Each pitot system must be purged separately.

(1) Disconnect pitot hose to airspeed indicator.
(2) Connect purging source (low pressure) clean dry air to disconnected hose behind instrument panel.
(3) Blow air from the indicator end of hose toward the pitot tube.

CAUTION: Never blow air through the pitot lines toward instruments.

(4) Connect hose to airspeed indicator.
(5) Perform leak check, refer to Flight Environment Data - Adjustment/Test.

B. Cleaning.

NOTE: All pitot static components must be disconnected from instruments and removed from the airplane when cleaning.

(1) Immerse lines in dry cleaning solvent.
(2) Dry lines with filtered compressed air.
(3) Wipe exterior of lines with a clean, dry cloth.

2. Static System

A. Purging (Refer to Figure 301 and Figure 302).

NOTE: Each static system must be purged separately.

NOTE: If autopilot (optional) is installed, disconnect static line from computer.

(1) Disconnect static line to instruments from the static line drain valve tee.
(2) Cap or plug open end of tee.
(3) Open static system drain valve.
(4) Plug one static port.
(5) Purge the system from the drain valve with clean dry air for a period of at least two minutes.

CAUTION: Never blow air through the static lines toward the instruments.

(6) Plug opposite static port and repeat step (5).
(7) Remove cap or plug from static line drain valve tee.
(8) Connect static line from instruments to the tee.

NOTE: If autopilot (optional) is installed, connect static line to computer.

(9) Leak check static system, refer to Flight Navigation Data - Adjustment/Test.

B. Cleaning.

NOTE: All pitot static components must be disconnected from instruments and removed from the airplane when cleaning.

(1) Immerse lines in dry cleaning solvent.
(2) Dry lines with filtered compressed air.
(3) Wipe exterior of lines with a clean, dry cloth.

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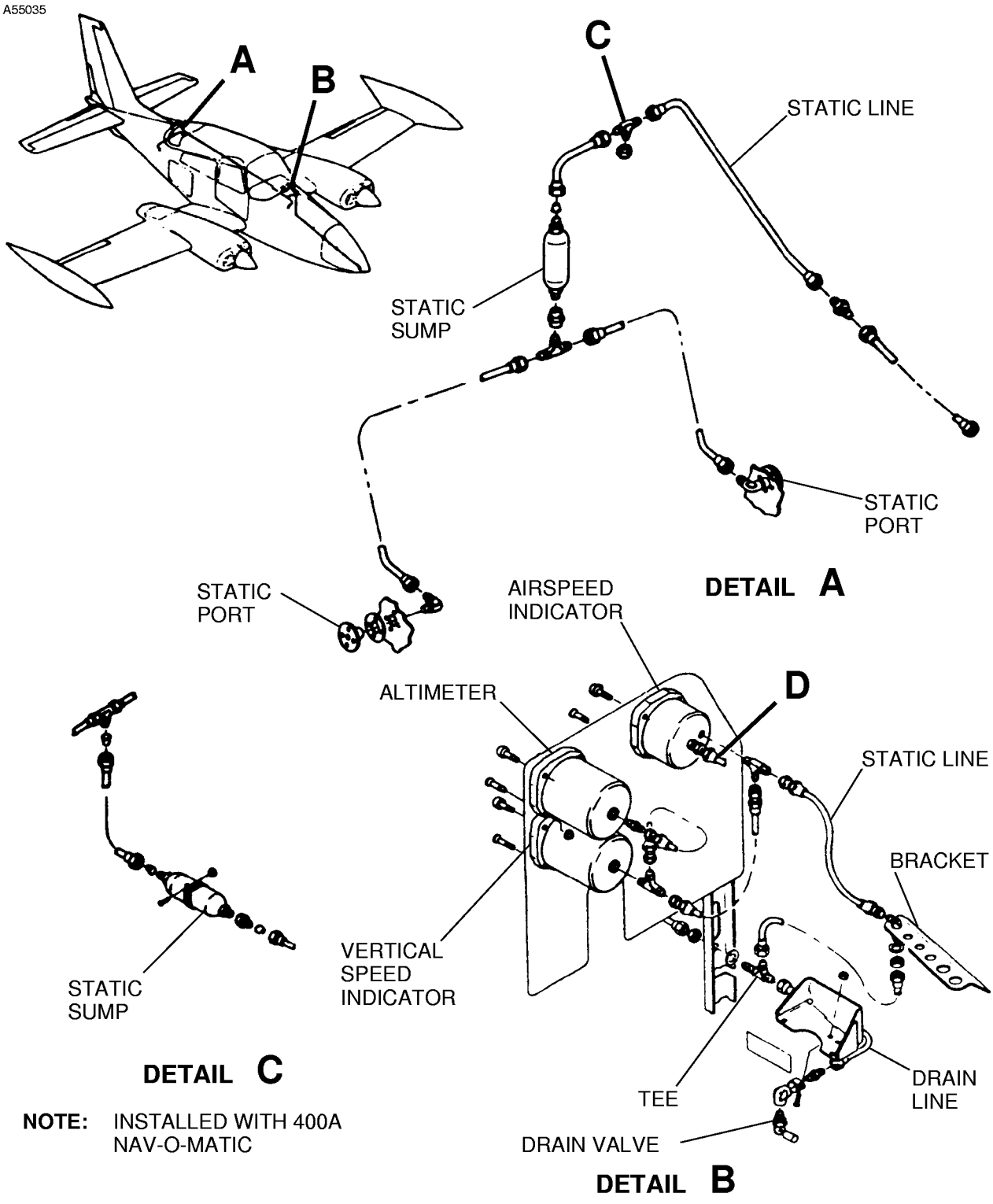

Pitot-Static System Single Installation
Figure 301 (Sheet 1)

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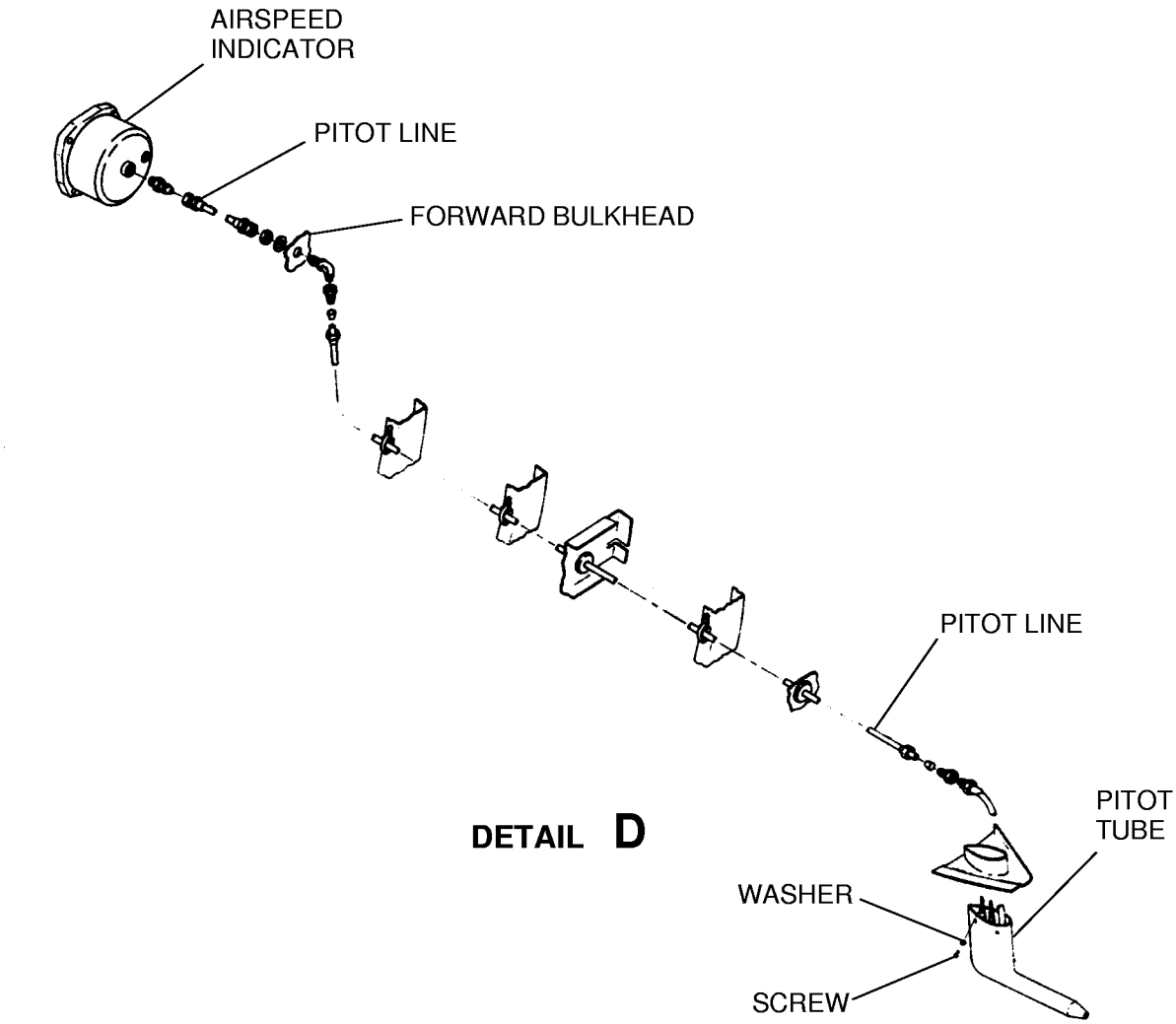

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Pitot-Static System Single Installation
Figure 301 (Sheet 2)

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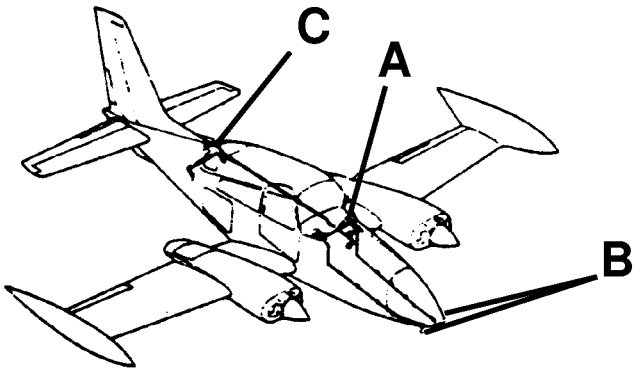

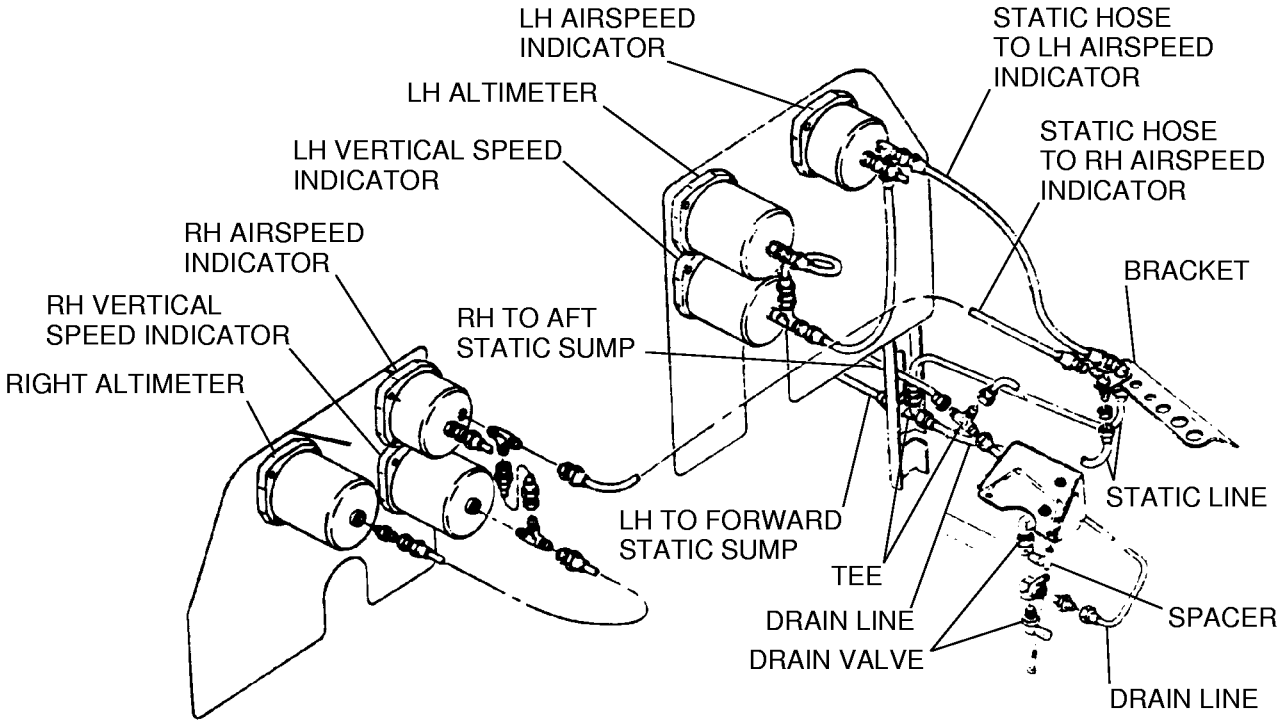

DETAIL A

Pitot-Static System Dual Installation
Figure 302 (Sheet 1)

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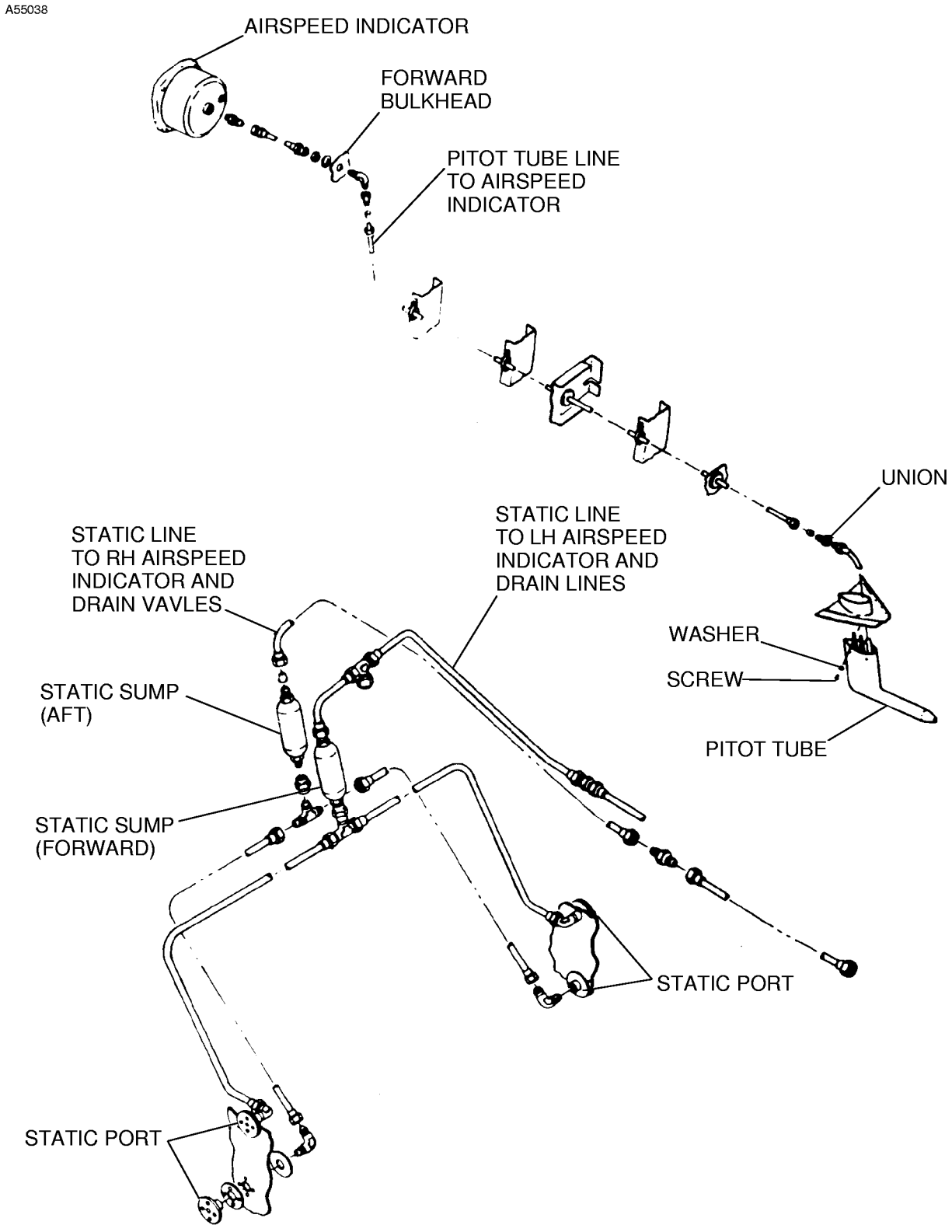

Pitot-Static System Dual Installation
Figure 302 (Sheet 2)

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FLIGHT ENVIRONMENT DATA - REMOVAL/INSTALLATION

1. Pitot Tube

A. Removal (Refer to Figure 401 and Figure 402).

NOTE: This procedure is the same for dual pitot tubes.

(1) Remove nose cap, refer to Chapter 53, Nose Cap - Removal/Installation.
(2) Remove the radio shelf.
(3) Disconnect electrical connector from pitot tube.
(4) Disconnect pitot line from pitot tube.
(5) Remove pitot tube by removing attaching screws and washers.

B. Installation (Refer to Figure 401 and Figure 402).

NOTE: This procedure is the same for dual pitot tubes.

(1) Position pitot tube in mount and secure with washers and screws.
(2) Connect pitot line to pitot tube, using union.
(3) Connect electrical plug to pitot tube.
(4) Install radio shelf.
(5) Install nose cap.

2. Pitot-Static System Instruments

A. Removal/Installation.
(1) Refer to Removal and Installation of Typical Instruments in Chapter 31, Instrument and Control Panels - Removal/Installation.

3. Pitot and Static Lines

A. Removal (Refer to Figure 401 and Figure 402).
(1) The locations of all pitot and static lines are shown in Figure 401 and Figure 402. All lines are standard aluminum tubing except for the flexible hoses attached to the instruments. All the lines and hoses are equipped with conventional fittings and may be removed when necessary.

NOTE: Static line must be cut to facilitate removal and shall only be removed if replacement is necessary.

B. Installation (Refer to Figure 401 and Figure 402).
(1) Install lines as illustrated in Figure 401 and Figure 402 using petrolatum to lubricate all male fittings, omitting the first two threads.

NOTE: Install static line through grommets. Install nut and sleeve on static line before flaring forward end of line.

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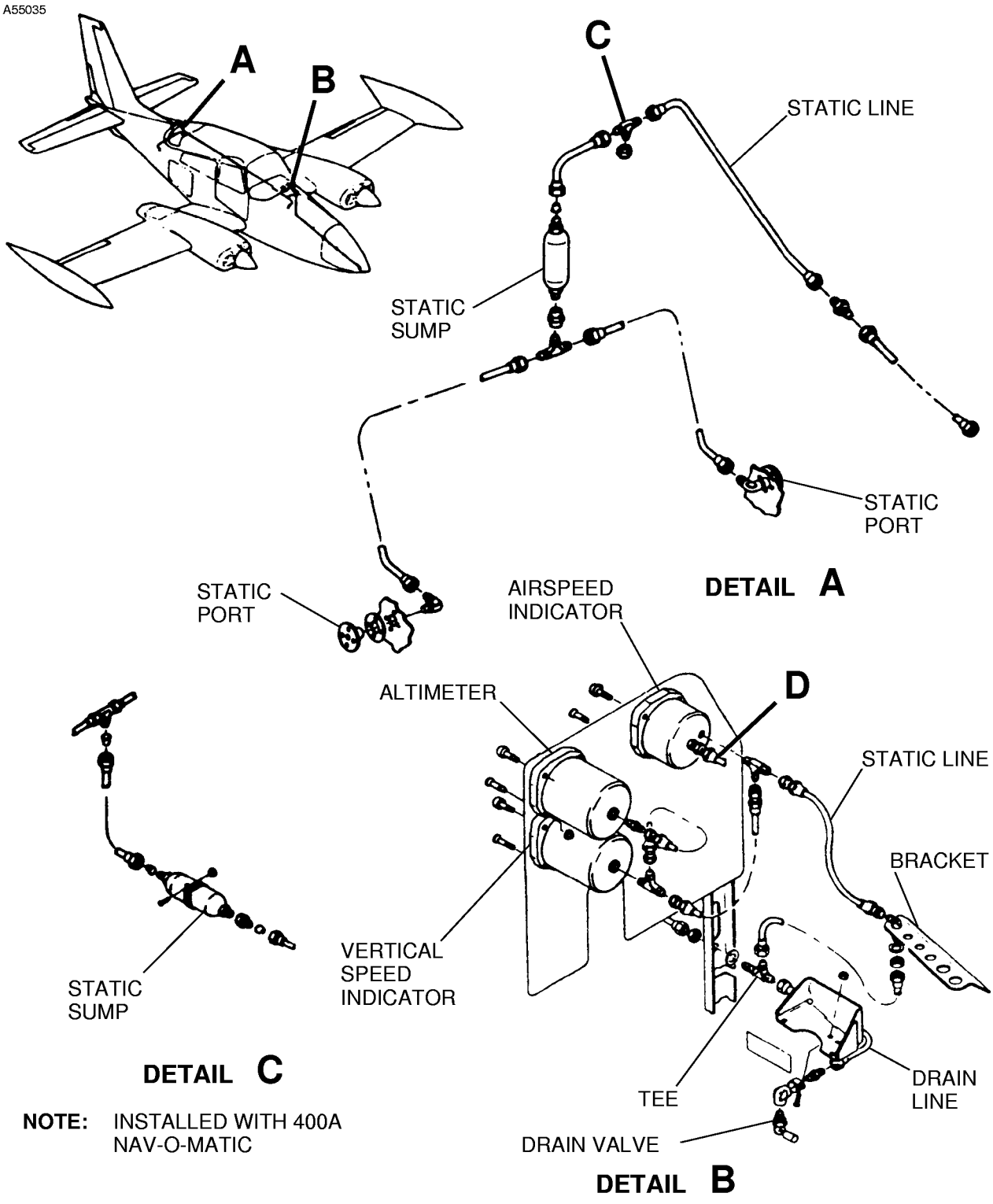

Pitot-Static System Single Installation
Figure 401 (Sheet 1)

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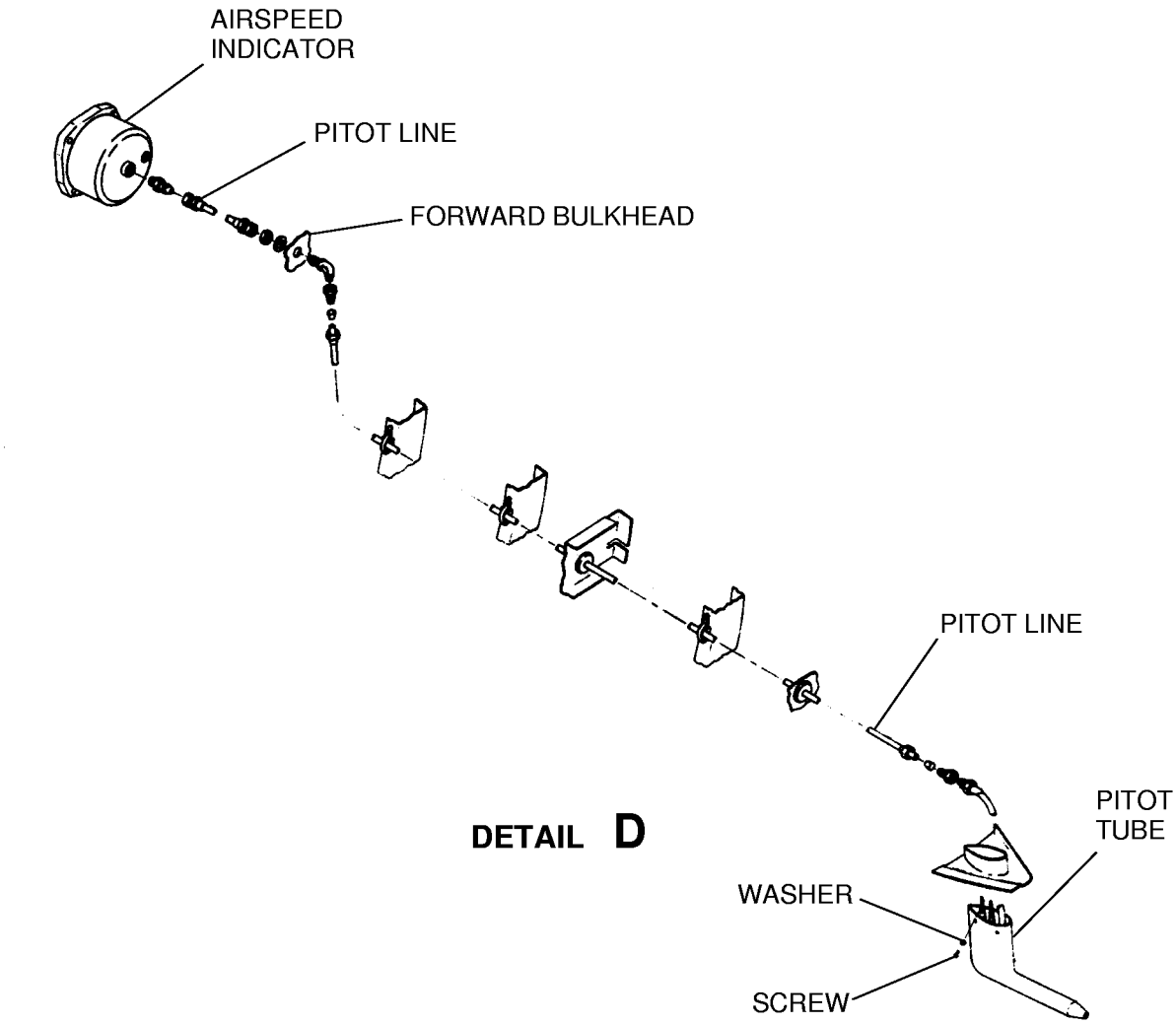

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Pitot-Static System Single Installation
Figure 401 (Sheet 2)

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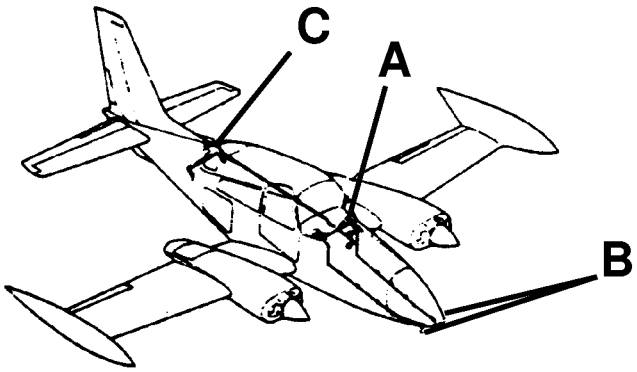

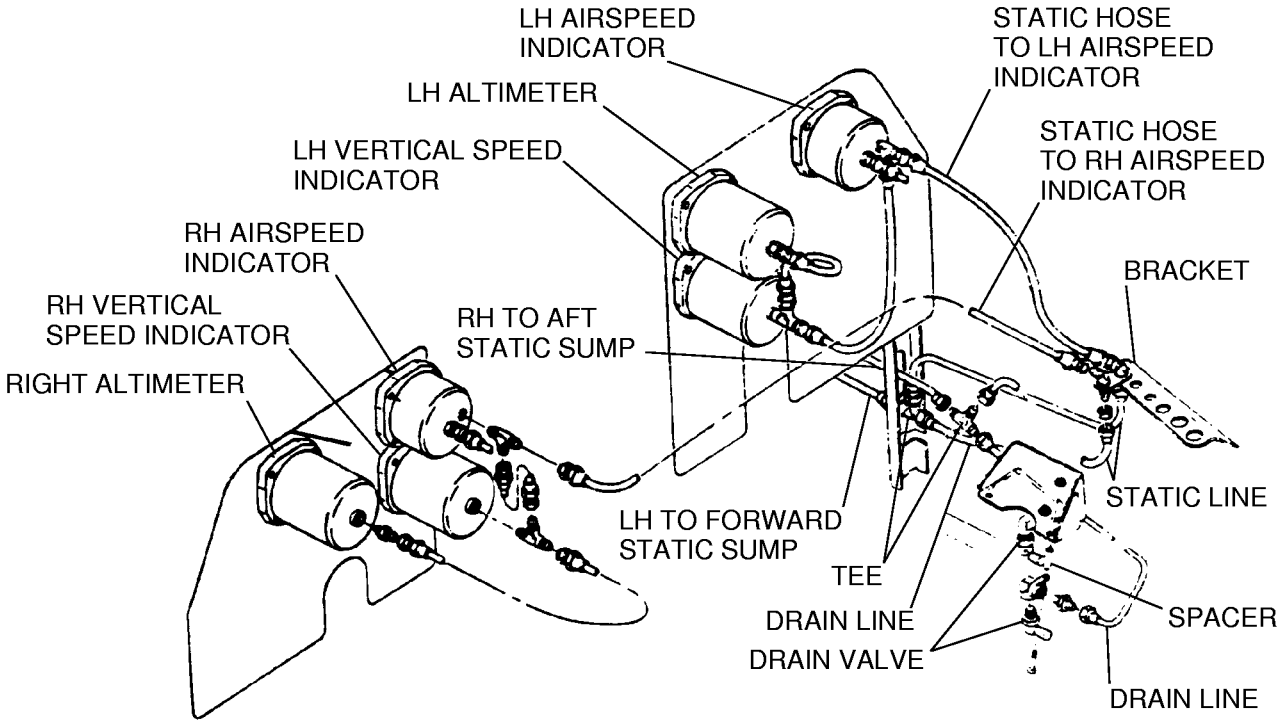

DETAIL A

Pitot-Static System Dual Installation
Figure 402 (Sheet 1)

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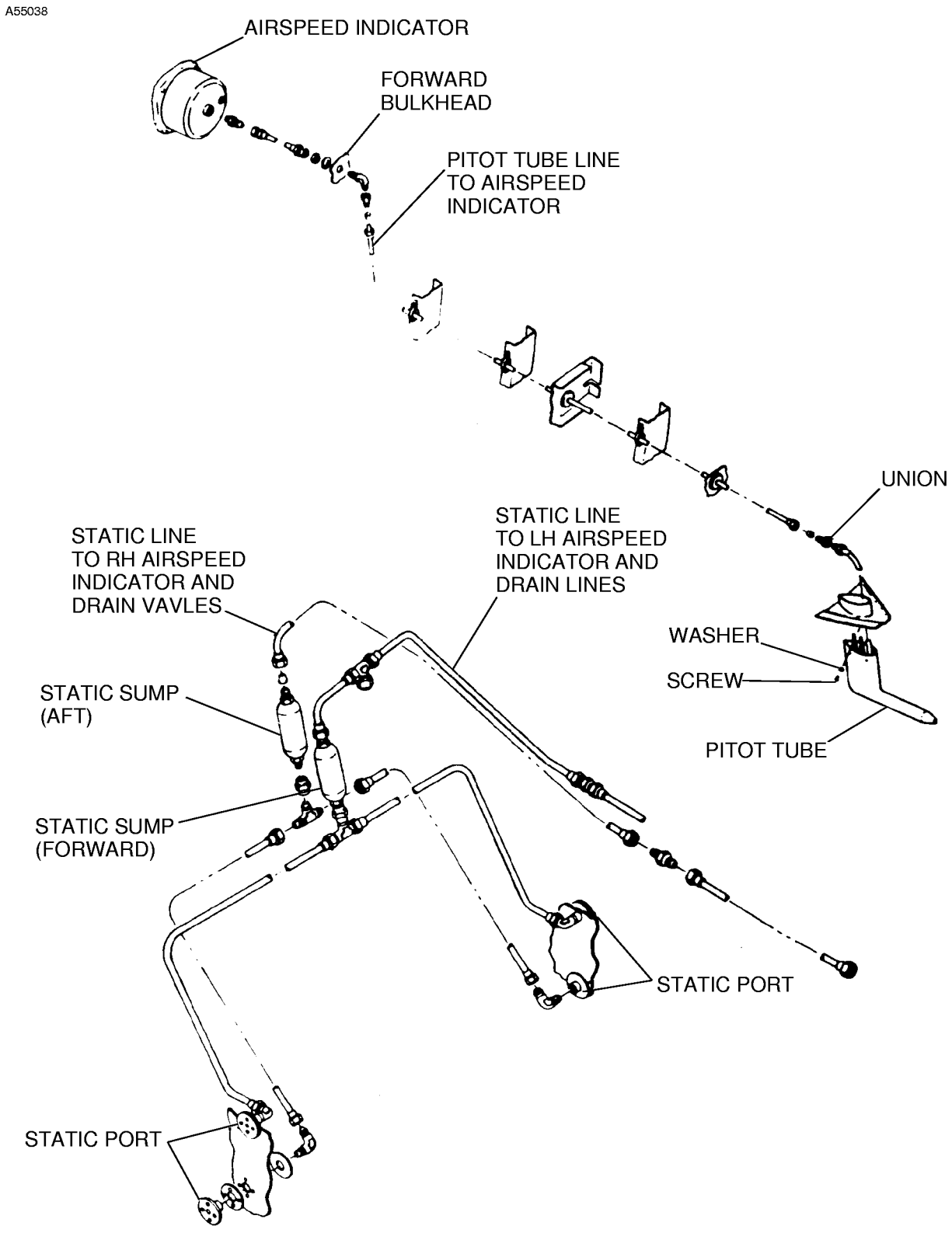

Pitot-Static System Dual Installation
Figure 402 (Sheet 2)

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FLIGHT ENVIRONMENT DATA - ADJUSTMENT/TEST

1. Pitot System

A. Test (Refer to Figure 501).

NOTE: If dual pitot system (optional) is installed, test each system separately.

(1) Connect a pressure source to opening in pitot tube.

CAUTION: Do not apply suction to pitot pressure line.

(2) Apply pressure slowly until airspeed indicator reads 150 knots. Clamp off the pressure source, hold at this point for one minute.

CAUTION: The amount of pressure required for a 150 knot indication is less than 1/2 psi. Avoid high pressure as instrument damage will result.

(3) If airspeed indicator drops more than 10 knots in one minute, disconnect hose from airspeed indicator.
(4) Plug hose and apply pressure.
(5) Coat lines and connections with a solution of soap and water to locate leak.
(6) Tighten or repair faulty connections. Connect hose to airspeed indicator and repeat test procedure.

2. Static System

A. Test (Refer to Figure 501).

NOTE: If dual static system (optional) is installed, test each system separately.

(1) Set altimeter to read 1500 feet by rotating pressure setting knob.

NOTE: Ensure that static drain valve is closed.

(2) Seal static port on one side of fuselage with masking tape.
(3) Connect a suction source to static port on opposite side of fuselage.
(4) Slowly apply suction until altimeter shows a 2000 foot increase in altitude (3500 feet reading), pinch off tube and hold for one minute.

CAUTION: When applying or releasing suction, take care not to exceed rate range of vertical speed indicator.

(5) The leak down rate should not exceed 100 feet of altitude in one minute (3400 feet reading).
(6) If leak down rate exceeds 100 feet per minute, slowly remove suction source and proceed as follows:
   (a) Disconnect static lines from altimeter, vertical speed indicator, and airspeed indicator. Plug static lines and attach a source of pressure to static port.

CAUTION: Do not apply positive pressure to static lines with instruments connected.

   (b) Apply a slight pressure and coat lines with a mild solution of soap and water to locate leak.
   (c) Tighten or repair faulty connections or replace damaged lines. Remove line plugs and pressure source and reconnect hose to respective instruments.
   (d) Repeat test procedure.

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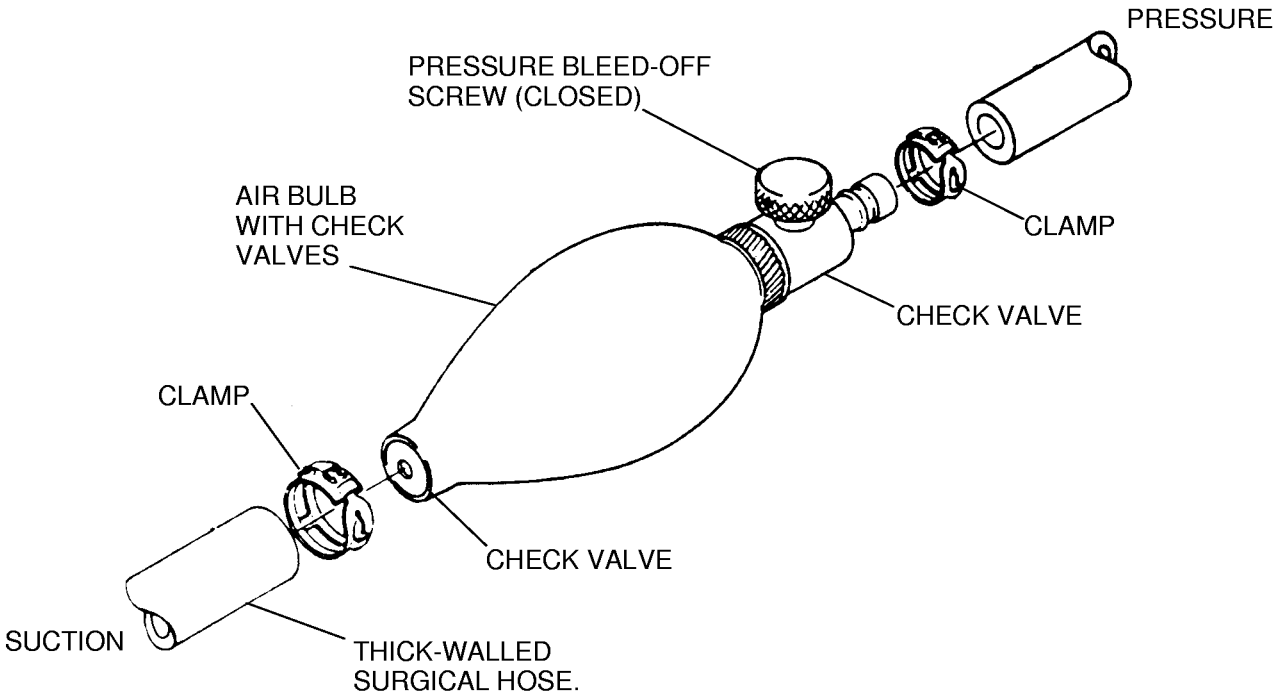

NOTE: AIR BULB WITH CHECK VALVES MAY BE OBTAINED LOCALLY FROM A SURGICAL SUPPLY COMPANY. THIS IS THE TYPE USED IN MEASURING BLOOD PRESSURE.

Fabrication Pitot-Static System Test Equipment
Figure 501 (Sheet 1)

(7) If scale drop of altimeter pointer is less than 100 feet in one minute, leak is negligible. Slowly remove static suction source.
(8) Remove tape from static port.

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FLIGHT ENVIRONMENT DATA - INSPECTION/CHECK

1. Pitot-Static System

A. Inspection/Check.
(1) For cleaning system, refer to Flight Environment Data - Servicing; for testing, refer to Flight Environment Data - Adjustment/Test. Inspect lines for cracks, chafing, and abrasions.

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ATTITUDE AND DIRECTION - DESCRIPTION AND OPERATION

1. Magnetic Compass

A. Description.

(1) On Airplanes 310R0001 thru 310R1200, the magnetic compass is located on the deck cover of the instrument panel. On Airplanes 310R1201 and On, the magnetic compass is located on the windshield. The compass consists of a pair of parallel magnetic bars surrounded by a circular calibrated compass card visible through a window in the compass case. The compass case is a metal bowl filled with liquid to dampen dial oscillation. Lighting is integral and controlled by a rheostat on the switch panel. The compass has two adjusting set screws, one for N-S headings and one for E-W headings. These set screws are located on the face of compass behind the metal disc.

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ATTITUDE AND DIRECTION - REMOVAL/INSTALLATION

1. Magnetic Compass (Airplanes 310R0001 thru 310R1200)

A. Removal (Refer to Figure 401).
   (1) Remove panel to gain access to nuts.
   (2) Remove screws and nuts securing pedestal to panel.
   (3) Identify and disconnect electrical wires.
   (4) Remove magnetic compass.

B. Installation (Refer to Figure 401)
   (1) Insert wire through grommet and connect wires.
   (2) Install pedestal to panel using screws and nuts.

      NOTE: Use non-magnetic screws and nuts for mounting compass and pedestal.

   (3) Secure panel.

2. Magnetic Compass (Airplanes 310R1201 and On)

A. Removal (Refer to Figure 401).
   (1) Disconnect electrical connector from magnetic compass.
   (2) Remove screws and washers securing magnetic compass to windshield.

B. Installation (Refer to Figure 401).
   (1) Install compass baseplate and wire assembly:
      (a) Clean baseplate bonding surface and attachment area on windshield, refer to Chapter 56 for cleaning windshield.

         NOTE: Top edge of base plate is located 5.12 inches down from top of windshield at the centerline.

      (b) Apply Locktite No. 495 adhesive to baseplate and locate in position on windshield. Allow adhesive to cure according to vendor instructions before attaching compass.
      (c) Locate wire assembly ensuring that connector at compass location can be coupled and bond in position down centerline of windshield with EC2262 adhesive.
      (d) Route wires through glareshield at bottom of windshield and connect wiring at splices, refer to interior lighting wiring diagram in Chapter 24.
   (2) Secure card holder and magnetic compass to baseplate using washers and screws.
   (3) Connect electrical connector.

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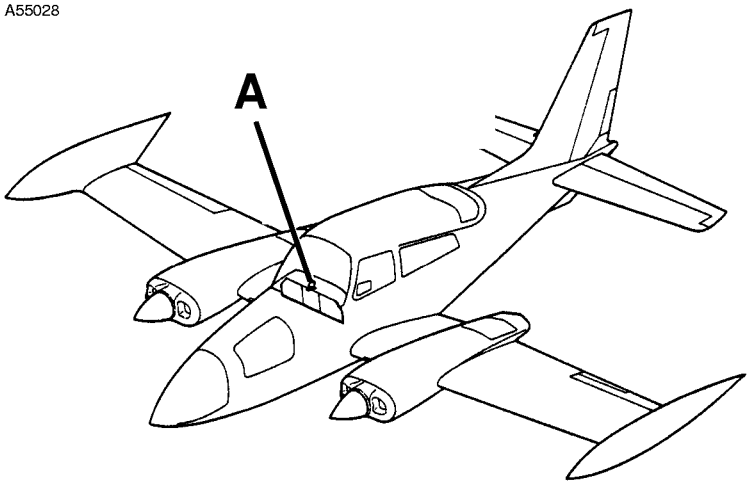
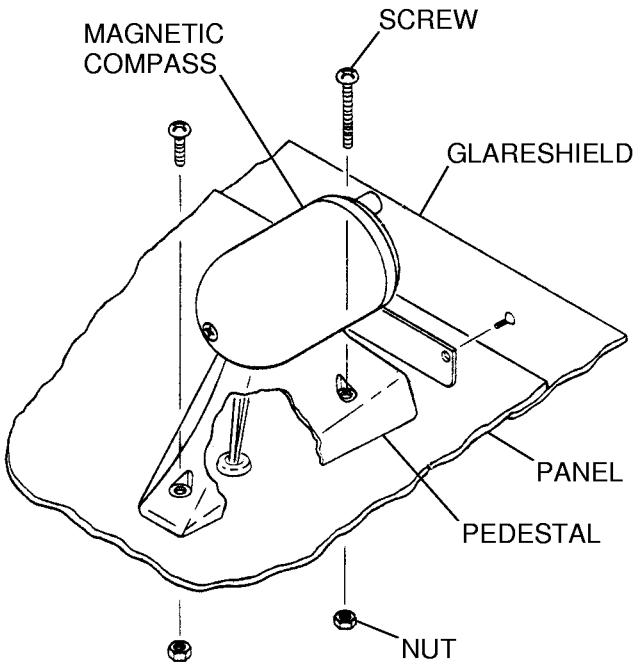
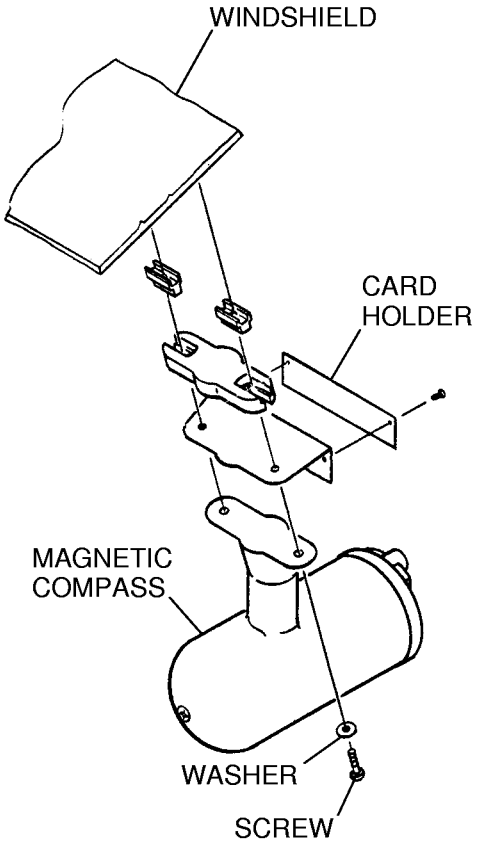




DETAIL A
AIRPLANES 310R0001 THRU 310R1200



DETAIL A
AIRPLANES 310R1201 AND ON

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Magnetic Compass Installation
Figure 401 (Sheet 1)

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ATTITUDE AND DIRECTION - ADJUSTMENT/TEST

1. Compass

A. Alignment.

NOTE: The compass alignment shall be performed on a calibrated compass rose.

(1) Ensure compensator adjustments are set to a neutral position. The compensators are located on the lower face of compass behind the metal disc.
(2) Using a hand-held magnetic compass, check all ferrous material parts for magnetism near the magnetic compass.
(3) Degauss any parts within two feet which cause greater than 10 degrees deflection of the magnetic compass, and any part within four feet which cause greater than 90 degrees deflection of the magnetic compass.
(4) Ensure that each of the applicable systems are controlled from the proper circuit breakers, and the corresponding "HDG" flag appears when the circuit breaker is disengaged.
(5) Ensure all electrical instruments for the airplane are installed and operative.
(6) Ensure other airplanes and vehicles are a safe out of way distance.
(7) Position airplane on the 270 degree heading of the compass rose.
(8) With both engines running 1000 RPM, turn on the following:
    (a) All circuit breakers.
    (b) Inverters.
    (c) All lights except landing lights and reading lights.
    (d) All avionics systems.
    (e) All electrical systems except pitot heat, stall, and static heaters.
    (f) Record the compass error in degrees.

        NOTE: High readings are positive errors, low readings are negative errors.

(9) Position airplane on the 360 degree heading of the compass rose and repeat steps (8)(a) thru (8)(f).
(10) Position airplane on the 90 degree heading of the compass rose and repeat steps (8)(a) thru (8)(f).
(11) Position airplane on the 180 degree heading of the compass rose and repeat steps (8)(a) thru (8)(f).

B. Compensation Adjustments.
(1) The errors obtained in the Compass Alignment procedure steps (8)(a) thru (8)(f) will be used to determine the required amount and degree of compensation for the compass.

C. Compass Compensation.
(1) At one cardinal heading, adjust the appropriate compensator the amount calculated in Compass Alignment procedure steps (8)(a) thru (8)(f).
(2) Rotate the airplane 90 degrees and adjust the appropriate compensator the amount calculated.
(3) Rotate the airplane to the next two cardinal headings and ensure that no error greater than five degrees is present.
(4) With normal airplane power, all electrical systems on, rotate the airplane to 30 degree headings (including cardinals). Stop on each heading long enough to allow compass to stabilize.
(5) Record the headings indicated by the compass at the 30 degree positions. No error greater than +5 or -5 degrees shall be indicated by the compass.

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CHAPTER 35

OXYGEN

LIST OF EFFECTIVE PAGES

CHAPTER-SECTION-SUBJECT	PAGE	DATE
35-Title		
35-List of Effective Pages		
35-Record of Temporary Revisions		
35-Table of Contents		
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35-00-00	Page 101	Jun 17/2005
35-00-00	Pages 201-202	Jun 17/2005
35-00-00	Page 301	Jun 17/2005
35-00-00	Pages 401-404	Jun 17/2005
35-00-00	Pages 501-502	Jun 17/2005
35-00-00	Page 601	Jun 17/2005
35-00-00	Page 701	Jun 17/2005

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RECORD OF TEMPORARY REVISIONS

Temporary Revision Number	Page Number	Issue Date	By	Date Removed	By

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OXYGEN SYSTEM - GENERAL

1. Scope

A. This chapter describes those units and components which store, regulate, and deliver oxygen to the passengers and crew.

2. Oxygen System

A. Description.

(1) The oxygen system is an optional system. The airplane owner has a choice of a 48.3 cu. ft. or 78.6 cu. ft. capacity oxygen bottle. Also, the oxygen system plumbing will vary with the seat arrangement of the airplane. The oxygen system consists of: a cylinder-regulator, altitude compensating regulator, filler valve, overboard discharge indicator, control cable, and knob, cylinder pressure gage, outlets, oxygen masks, and associated plumbing.

(a) The cylinder-regulator (oxygen bottle) is located in the nose baggage compartment on the aft left-hand side. Access to the cylinder is gained by removing the partition. The cylinder-regulator is secure into position with quick-disconnect clamps and a support. A supply regulator is attached to the cylinder to reduce high cylinder pressure to a lower constant pressure. The regulator incorporates a manual shutoff valve (cable operated); ports for a filling line, pressure gage line (capillary), outlet line (supply), and overboard discharge indicator line.

(b) The altitude compensating regulator, located on the right-hand side of the fuselage forward of the instrument panel, reduces oxygen expenditures at lower altitudes and increases oxygen duration.

(c) A control knob on the instrument panel when pulled to the ON position, provides a continuous flow of oxygen to the oxygen mask, when the mask hoses are engaged in the outlets. The mask hose contains a flow indicator for visual verification of oxygen flow. The masks, hoses, and flow indicators are stored in plastic bags where readily available.

(d) The oxygen outlets are installed in the overhead console and above the passengers seats. Each outlet contains a spring-loaded valve which prevents oxygen flow until the mask hose is engaged with the outlet.

(e) The oxygen filler valve is located inside the nose baggage compartment. The filler valve is secured to the bulkhead with rivets and consists of the valve incorporating a filter and valve cap. A check valve is installed in the high pressure line (filler line) at the regulator to prevent the escape of oxygen from the cylinder at the filler line port.

(f) The overboard discharge indicator is located on the bottom surface of the nose skin, below the oxygen bottle. A low pressure (60 PSI, +20 or -20 PSI) green disc is provided to prevent dust and contamination from entering the line. The indicator line is connected to the high pressure rupture fitting of the regulator. A disc disappearance in the indicator, indicates oxygen cylinder overpressure existed and oxygen was routed overboard.

(g) The oxygen pressure gage is located on the right-hand side of the instrument panel. The gage is electrically illuminated and the range markings are: yellow arc 0-300, green arc 1550 to 1850, and red line 2000 PSI.

3. Tools and Equipment

Name	Number	Manufacturer	Use
Sherlock Leak Detector	Type CG (MIL-L-25567A, Type 1)	Zep Aero Corp. El Segundo, CA	For leak test fluid.

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OXYGEN SYSTEM - TROUBLESHOOTING

1. Oxygen System

A. Troubleshooting.

NOTE: Before attempting maintenance, personnel should adhere to General Maintenance Precautions and Procedures described in Maintenance Practices.

(1) For a guide to troubleshooting the oxygen system, refer to Table 101.

Table 101. Oxygen System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
NO PRESSURE INDICATION ON PRESSURE GAGE.	Leak at capillary line connections.	Correct leakage.
	Crimped or damaged capillary line.	Replace line.
	Pressure gage does not work.	Replace gage.
PRESSURE INDICATION NORMAL BUT NO FLOW OF OXYGEN WITH CONTROL PULLED ON.	Cylinder regulator assembly does not work.	Replace cylinder - regulator assembly.
	Crimped or damaged lines.	Replace damaged lines.
OXYGEN DURATION IS TOO SHORT.	Leak in system.	Locate and tighten loose fittings.
		Replace altitude compensation regulator.

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OXYGEN SYSTEM - MAINTENANCE PRACTICES

1. Oxygen System

NOTE: Before any maintenance is performed on the oxygen system, personnel should read and thoroughly understand the following. Careful adherence to these instructions will result in maintaining a trouble-free system.

NOTE: If maintenance on the airplane oxygen system or on any other system in the airplane is performed, requiring removal of an oxygen system component, strict adherence to the following procedures and precautions is required.

WARNING: Do not permit smoking or open flame near airplane while maintenance is being performed on the oxygen system. Assure all electrical power is disconnected and that the airplane is properly grounded. In addition, oils, grease, and solvents may burn or explode spontaneously when contacted by oxygen under pressure.

A. Maintenance Practices.

(1) Use extreme caution to assure every port on the system is kept thoroughly clean and free of water, oil, grease, and solvent contamination.

(2) Cap all openings immediately upon removal of any component. Do not use tape or caps which will induce moisture.

(3) Lines and fittings shall be clean and dry. One of the following methods may be used to clean lines.

(a) A vapor degreasing solution of stabilized trichorethylene conforming to Specification MIL-T-7003, followed by blowing tubing clean and dry with a Jet of nitrogen gas (BB-N411) Type 1, Class 1, Grade A or Technical Argon (MIL-A-18455).

CAUTION: Most air compressors are oil lubricated, and a minimum amount of oil may be carried by the air stream. A water lubricate compressor should be used to blow tubing clean only when nitrogen or argon are not available. The air must be clean dry and filtered.

(b) Flush with naphtha conforming to Specification TT-N-95, then blow clean and dry with clean, dry, filtered air. Flush with anti-icing fluid conforming to MIL-F-5566 or anhydrous ethyl alcohol. Rinse thoroughly with fresh water and dry with a jet of nitrogen gas (BB-N-411) Type 1, Class 1, Grade A or Technical Argon (MIL-A-18455).

(c) Flush with hot inhibited alkaline cleaner until free from oil and grease. Rinse with fresh water and dry with a jet of nitrogen gas (BB-N411) Type 1, Class 1, Grade A or Technical Argon (MIL-A-18455).

NOTE: Cap all lines immediately after drying.

(d) Fabrication of pressure lines is not recommended. Lines should be replaced from the factory by part number.

(e) All compounds used on fittings must conform to MIL-T-5542. No compounds shall be used on aluminum alloy flared fittings. Tape is used only on the first three threads of male fittings. No tape is used on coupling sleeves, or outside of the flares. Use only S1465 teflon lubricating tape on threads.

(f) Maintenance personnel must assure that their hands are free of dirt or grease prior to installation of oxygen tubing or fittings.

(g) All tools used for installation of oxygen tubes or fittings must be free of dirt, grease, or oils.

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CAUTION: Use non-sparking tools.

WARNING: With oxygen bottle charged, do not move control to the on position with outlet ports (low pressure) open to atmosphere. Damage to regulator metering poppet may occur.

WARNING: Whenever a component of the oxygen system has been removed, reinstalled, replaced, or system has been disassembled in any way, the oxygen system must be leak checked and purged.

B. Inspection of the cylinder is required before charging. Do not attempt to charge the cylinder if any of the following conditions exists:
   (1) Contaminated or corroded fitting on servicing cylinder or filler valve.
   (2) Cylinder out of hydrostatic test date.
   (3) Cylinder bears no D.O.T. designation.
   (4) Cylinder completely empty after shutoff valve has been turned off for a length of time. Must be completely disassembled and inspected in an FAA approved facility before charging.

C. To assist in cylinder identification, the following information is reflected on each oxygen cylinder.
   (1) Cylinder specification followed by service pressure such as "ICC-3AA1800 or ICC-3HT1850" will be stamped on the shoulder or neck of each cylinder.

   NOTE: Effective January 1, 1970, all newly manufactured cylinders will be stamped "DOT" (Department of Transportation) in lieu of "ICC" (Interstate Commerce Commission).

   (2) Cylinder serial number will be stamped below or directly following the cylinder specification.
   (3) Hydrostatic test date will be stamped directly below the original manufacture date and shall include the month and year of the hydrostatic test date.

2. Servicing

A. Charging Oxygen System.
   (1) Refer to Oxygen System - Servicing, for charging the oxygen system.

B. Discharge Oxygen System.

WARNING: The discharging procedure should be accomplished outdoors. If the discharging is done indoors, extreme care must be exercised to protect oxygen flow from oils, grease, contaminates, and electrical sparks. The area should be roped off and no smoking or open flame allowed in or near the area.

NOTE: Discharging the oxygen system into the cabin area is not recommended.

   (1) Pull oxygen control knob to ON position.
   (2) Remove tubing from the mask end of one of the passengers oxygen masks and insert into oxygen outlet port. Route the hose outside the cabin and through the pilot's foul weather window.

C. Purge the Oxygen System.
   (1) Charge the oxygen system, refer to Oxygen System - Servicing.
   (2) Move airplane outdoors if possible. If unable to move airplane outdoors, make sure area is roped off, no smoking or open flame permitted in the area, no grease or lubricant near area, cabin door and pilot windows open.
   (3) Plug all masks into outlets and purge system by allowing the oxygen to flow for at least 10 minutes. Smell the oxygen flowing from the outlets and continue to purge until the oxygen is odorless. Refill cylinder as required during and after purging, refer to Oxygen System - Servicing.

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OXYGEN SYSTEM - SERVICING

1. Oxygen System

A. Servicing.
(1) The oxygen filler valve is located inside the nose baggage door. A pressure gage is provided on the instrument panel.
(2) The oxygen system gage should be checked for anticipated requirements before first flight each day.
(3) Whenever pressure drops below 300 PSI, refill with aviator breathing oxygen Military Specification MIL-O-27210. Kit number SK310-32B or equivalent, is used to adapt oxygen refill bottles to airplane oxygen system.

B. Charging Oxygen System.
(1) Open nose baggage door, remove oxygen filler valve cap and connect charging unit.
(2) Slowly charge the oxygen cylinder to proper PSI as indicated on cylinder placard and in accordance with oxygen cylinder Filling Pressure Table (corrected pressure using a regulated oxygen supply).

Table 301. Oxygen Cylinder Filling Pressure Table

Initial Temp °F	Filling Pressure PSIG	Initial Temp °F	Filling Pressure PSIG	Initial Temp °F	Filling Pressure PSIG
0	1600	40	1775	90	2000
10	1650	50	1825	100	2050
20	1675	60	1875	110	2100
30	1725	70	1925	120	2150
		80	1950	130	2200

NOTE 1: Table filling pressure is based on oxygen cylinder filled to 1800 PSIG at 70°F. Add 50 PSIG when filling 1850 PSIG cylinders.

NOTE 2: Initial temperature refers to ambient temperature in filling ram. A rise of approximately 25°F may be expected as a result of compression. The cylinder should be filled as quickly as possible and allowed to cool.

(3) Shut off oxygen supply, disconnect charging unit, install filler cap, and close nose baggage door.

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OXYGEN SYSTEM - REMOVAL/INSTALLATION

1. Oxygen Cylinder - Regulator Assembly

A. Removal (Refer to Figure 401).
(1) Position control knob to OFF.

WARNING: The oxygen cylinder-regulator may be removed with the cylinder charged; however, extreme care must be taken when installing or working near the cylinder-regulator to prevent damaging the cylinder.

(2) In the nose baggage compartment, remove screws and partition for access to cylinder-regulator assembly.
(3) Disconnect lines (4, 5, 6, and 7) from cylinder-regulator and cap lines.

CAUTION: Do not move control to the ON position with outlet ports (low pressure) open to atmosphere. Damage to regulator metering poppet may occur.

(4) Disconnect control cable (3) from cylinder-regulator.
(5) Loosen clamps, securing cylinder-regulator and remove cylinder-regulator.

B. Installation (Refer to Figure 401).
(1) Position cylinder-regulator and secure with clamps.
(2) Remove caps and connect lines (4, 5, 6, and 7) to cylinder-regulator.
(3) Connect control cable (3) to cylinder-regulator.
(4) Install partition and secure with screws.

2. Altitude Compensating Regulator

A. Removal (Refer to Figure 401).
(1) Move oxygen control knob to OFF position.
(2) Disconnect inlet and outlet lines from altitude compensating regulator (1). Cap all openings.

NOTE: Repair or maintenance of the compensating regulator is not recommended. If malfunction should occur, replace unit.

B. Installation (Refer to Figure 401).
(1) Remove protective caps and plugs from altitude compensating regulator (1) and oxygen lines.
(2) Connect inlet and outlet lines to altitude compensating regulator (1).

3. Oxygen Pressure Gage and Capillary Line

A. Removal (Refer to Figure 401).

NOTE: The oxygen pressure gage may be removed without discharging the oxygen system. A check valve is installed in the pressure gage outlet of the regulator to shutoff the flow of oxygen from the cylinder when the capillary line is disconnected at the oxygen cylinder-regulator.

(1) Remove partition for access to oxygen cylinder.
(2) Disconnect capillary line (6) at cylinder-regulator. The check valve should close as the line is loosened.

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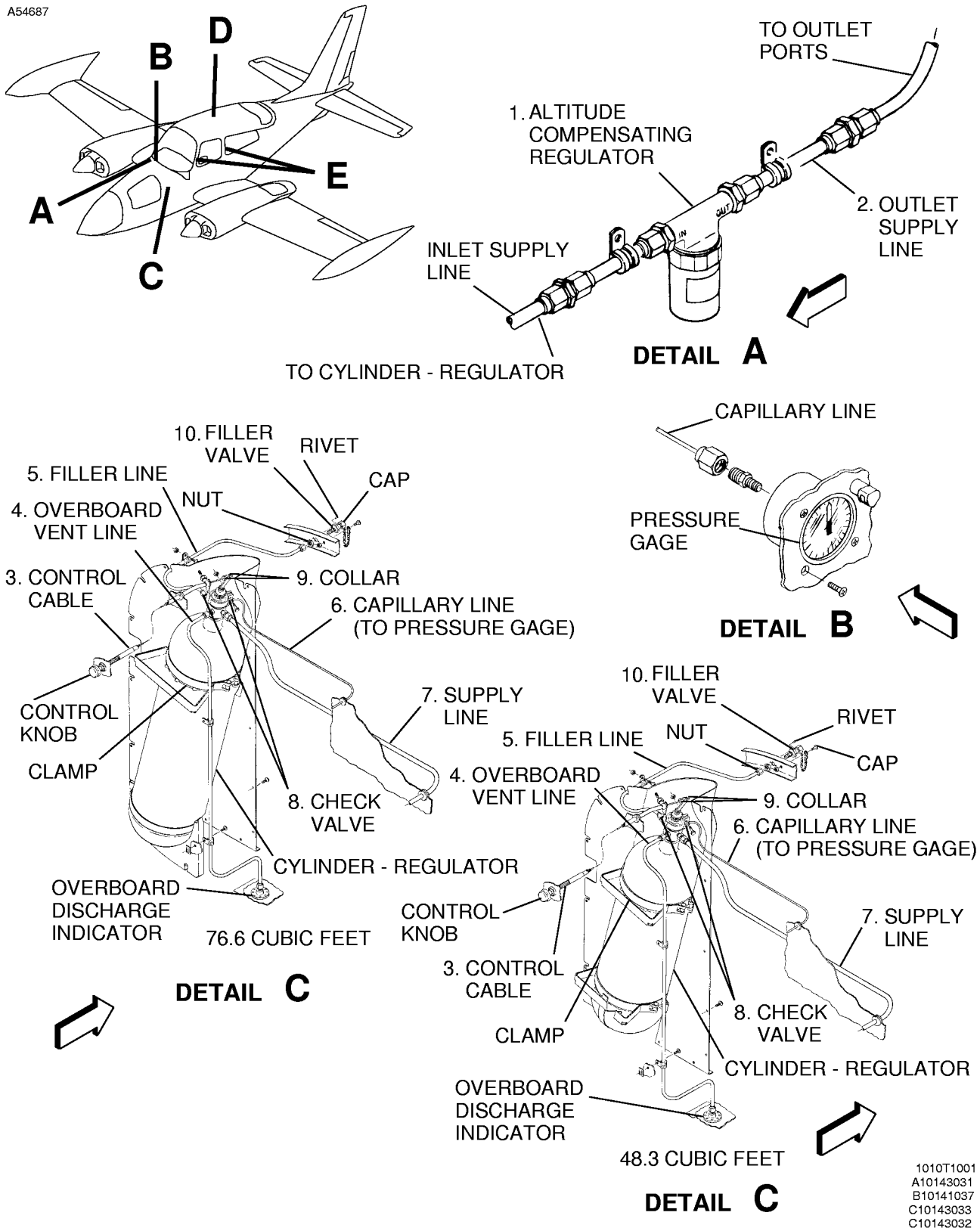

Oxygen System Installation
Figure 401 (Sheet 1)

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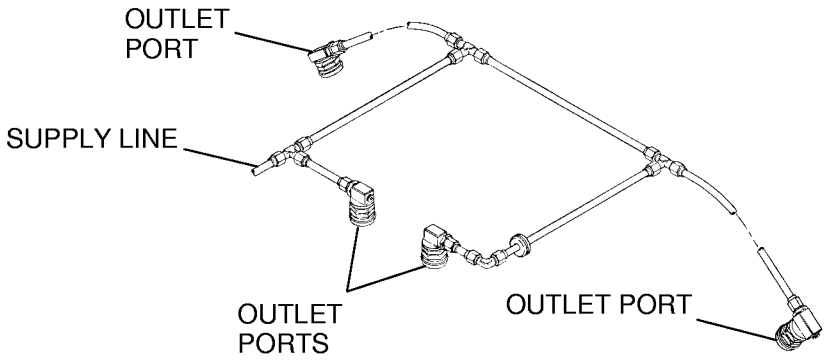
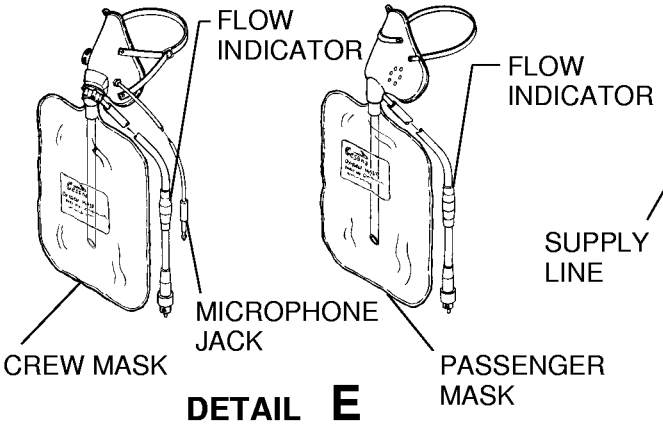
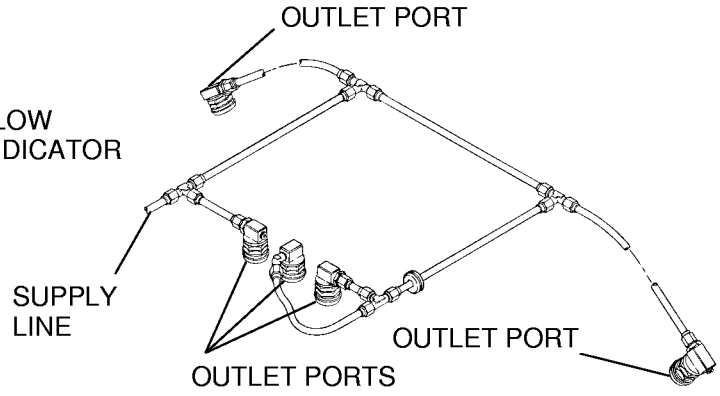


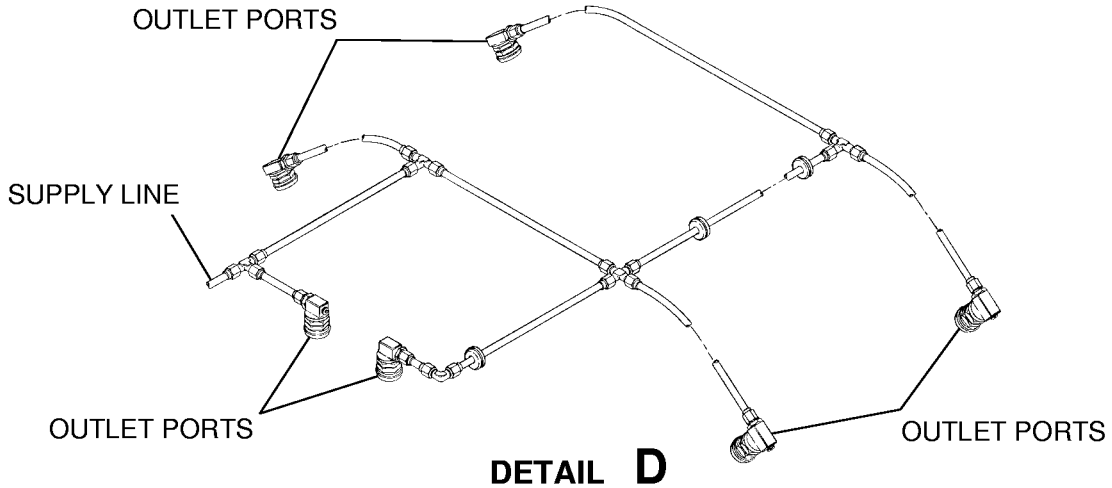
DETAIL D
4 PASSENGER CONFIGURATION



DETAIL E



DETAIL D
5 PASSENGER CONFIGURATION



DETAIL D
6 PASSENGER CONFIGURATION

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Oxygen System Installation
Figure 401 (Sheet 2)

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CAUTION: If oxygen continues to flow when capillary line is loosened, retighten line and discharge system in accordance with discharging procedures. Replace check valve.

(3) Disconnect capillary line (6) at pressure gage and route line from airplane.
(4) Check valve may be removed from cylinder-regulator if desired or if faulty by screwing valve from regulator.
(5) Remove light assembly, refer to Chapter 33. Remove screws from oxygen gage and remove gage.

B. Installation (Refer to Figure 401).
(1) Install oxygen gage with screws and light assembly.
(2) If removed, install check valve in regulator.
(3) Route capillary line (6) into place and connect line to oxygen gage.
(4) Connect capillary lime (6) to check valve and install partition.
(5) If system pressure was depleted purge oxygen system and service system.

4. Oxygen Filler Valve

A. Removal (Refer to Figure 401).

NOTE: The oxygen filler valve my be removed without discharging the oxygen system. A check valve is installed in the high pressure side of the oxygen regulator to shut off the flow of oxygen from the cylinder.

(1) Disconnect filler valve line (5) from filler valve (10).

CAUTION: If oxygen continues to flow when line is loosened, reconnect the line and discharge system in accordance with discharging procedures. Replace check valve.

(2) Remove filler valve (10) protective cap and remove retaining nut.
(3) Remove filler valve (10) from bulkhead by removing attaching rivets.
(4) Check valve may be removed if desired or if faulty by disconnecting filler line (5) from check valve, them removing check valve from regulator.

B. Installation (Refer to Figure 401).
(1) Make sure the check valve is installed and filler line is connected.
(2) Attach filler valve (10) to structure with attaching rivets and retaining nut.
(3) Connect filler line to filler valve (10).
(4) Install protective cap.

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OXYGEN SYSTEM - ADJUSTMENT/TEST

1. Oxygen System

A. Leak Test.
(1) Charge the oxygen system, refer to Oxygen System - Servicing.
(2) Allow thirty minutes for cylinder pressure to stabilize between 1750 and 1800 PSIG, indicated on pressure gage.
(3) Record the cylinder pressure and ambient temperature.
(4) After 24 hours, record cylinder pressure and ambient temperature. Maximum allowable pressure drop is 50 PSIG (correcting for temperature change, using formula of +1 or -1 degree to +3.4 or -3.4 PSIG).
(5) If the pressure drop derived from the formula in the preceding step exceeds 50 PSIG, test the oxygen system for leakage by applying detector fluid type CG-1 or equivalent to all fittings and connections and observe for formation of bubbles.
(6) Remove all traces of solution and repair or replace leaky fittings and repeat the preceding procedures.

B. Functional Test.

NOTE: Whenever the oxygen system regulator (cylinder-regulator assembly) has been replaced or overhauled, perform a flow test to determine that system functions properly.

(1) Fully charge the oxygen system, refer to Oxygen System - Servicing.
(2) Install an oxygen outlet adapter (P/N C166005-0506) into a pressure gage (calibrated in one pound increments from 0 to 100 PSIG) and insert adapter into pilot's oxygen outlet.
(3) Pull oxygen control to ON position.
(4) Insert adapters or mask line assemblies into all remaining outlets. With oxygen flowing from all outlets, the pressure should then conform to schedule below.

Altitude Above Sea Level	Gage Pressure
Sea Level	7.30 +2.5 or -2.5
1330	8.00 +2.5 or -2.5
2000	8.34 +2.5 or -2.5
3000	8.83 +2.5 or -2.5
4000	9.31 +2.5 or -2.5
5000	9.77 +2.5 or -2.5
6000	10.22 +2.5 or -2.5
8000	11.08 +2.5 or -2.5
10,000	11.89 +2.5 or -2.5
14,000	17.57 +2.5 or -2.5
17,000	21.55 +2.5 or -2.5
20,000	24.45 +2.5 or -2.5

NOTE 1: If pressure at given altitude is different then shown above, check oxygen pressure on inlet to altitude compensating regulator; it should be 70 PSIG, +10 or -10 PSIG.

(5) If pressure cannot be obtained in the schedule and pressure is 70 PSIG, +10 or -10 PSIG at line to inlet port of compensating regulator: replace compensating regulator. If pressure (70 PSIG, +10 or -10 PSIG) cannot be obtained at compensating regulator: replace cylinder regulator. Repeat test procedures.
(6) Position control to OFF and return all masks to mask case.

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(7) Recharge oxygen system as required, refer to Oxygen System - Servicing.

C. Hydrostatic Test.

(1) Standard weight (ICC or DOT-3AA 1800) cylinder must be hydrostatically tested to 5/3 their working pressure every five years starting with the data of the last hydrostatic test.

NOTE: These test requirements are established by the Intestate Commerce Commission Code of Federal Regulations, Title 49, Chapter 1, Paragraph 173.34.

(2) Standard weight (ICC or DOT-3AA 1800) cylinders have no life limitations and may be used until they fail hydrostatic tasting.

(3) Light weight (ICC or DOT-3HT 1850) cylinders must be hydrostatically tested to 5/3 their working pressure every three years starting with the date of the last hydrostatic test.

(4) Refer to Chapter 5, Component Time limits for light weight (ICC or DOT-3HT) cylinders.

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OXYGEN SYSTEM - INSPECTION/CHECK

1. Oxygen System Components

A. Inspection/Check.

(1) A careful visual inspection of the oxygen cylinder should be performed during routine maintenance and periodic inspections. If any dents, scratches or areas of corrosion are found refer to Manual CGA-C6 (Visual Inspection of Cylinders) for inspection requirements.

(2) Check mask for leaks, cracks, and deterioration. Check mask stowage compartment for cleanliness and general condition. Check flow indicator for freedom of movement, couplings and adapters for proper insertion.

(3) Examine oxygen mask supply hose for evidence that it has slipped on either side of the flow indicator. If hose has slipped, renew hose, trim off one half inch of hose, and reinstall on flow indicator. If looseness is still evident, replace hose assembly.

(4) High pressure lines should be inspected for scratches, dents, cracks, deep gouges if a leak is indicated. Lines should be tested to not less than 3000 PSIG it trouble is indicated.

WARNING: Whenever components have been removed and replaced or oxygen system has been allowed to deplete to below 50 psig, the system must be purged in accordance with purging procedures before charging the system.

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OXYGEN SYSTEM - CLEANING/PAINTING

1. Filler Valve

A. Cleaning.
(1) The filler valve should be cleaned with alcohol.

2. Regulator and Cylinder

A. Cleaning.
(1) Clean regulator and cylinder with a clean cloth.

3. Oxygen Masks and Hoses

A. Cleaning.

CAUTION: Remove microphone from pilot's mask before cleaning.

(1) Clean the oxygen masks and hoses with a mild solution of soap and water. Rinse thoroughly with clean water and allow to dry.

NOTE: Ensure all soap is removed by rinsing. Masks may be disinfected with a hospital type antiseptic spray or Zep Aero SBT-12.

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CHAPTER 37

VACUUM

LIST OF EFFECTIVE PAGES

CHAPTER-SECTION-SUBJECT	PAGE	DATE
37-Title		
37-List of Effective Pages		
37-Record of Temporary Revisions		
37-Table of Contents		
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37-00-00	Pages 101-106	Jun 17/2005
37-00-00	Page 201	Jun 17/2005
37-00-00	Pages 601-602	Jun 17/2005
37-00-00	Pages 701-702	Jun 17/2005
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RECORD OF TEMPORARY REVISIONS

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VACUUM - GENERAL

1. Scope

A. This chapter describes those units and components used to generate, deliver, and regulate negative air pressure.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Distribution describes that portion of the system which is used to distribute negative pressure air to using systems.
   (2) Indicating describes that portion of the system which is used to indicate pressure.

3. Vacuum System

A. Description (Refer to Figure 1).

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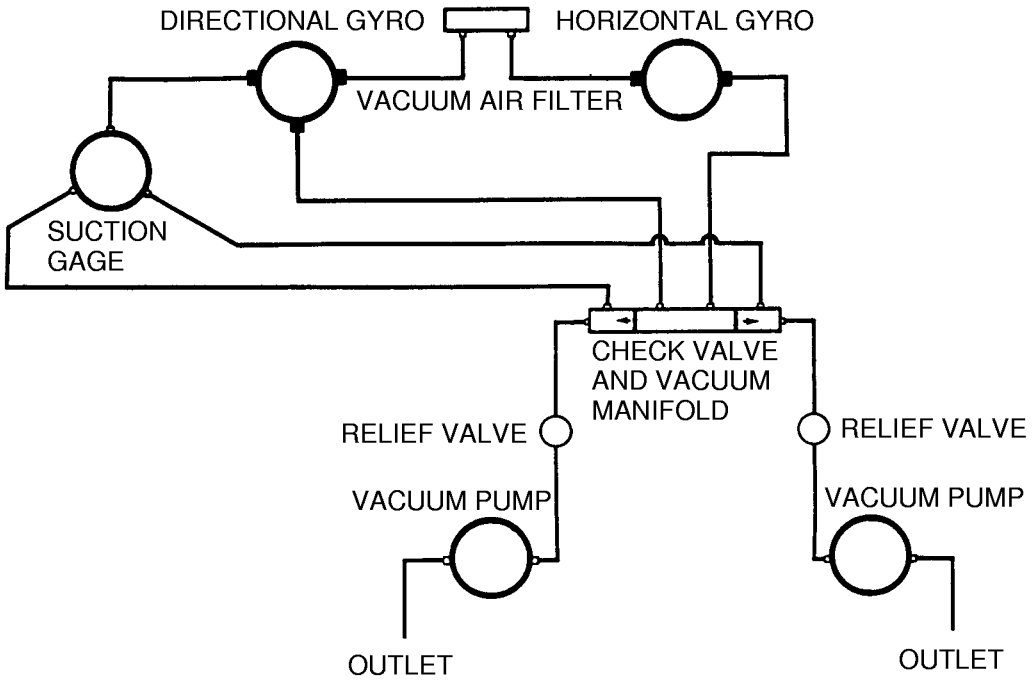

Vacuum System Schematic
Figure 1

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(1) The vacuum system consists of: A vacuum pump on each engine, two relief valves, a manifold, vacuum operated instruments, and necessary plumbing. A dry vacuum pump, which requires no lubrication of any kind, is located on the aft right accessory mount pad of each engine. The vacuum system plumbing is routed from the vacuum pumps through the nacelles and wings to the respective regulator valve in the wing gap area. The adjustable regulator valves are utilized to give the desired vacuum system pressure. From the relief valve, the plumbing of each vacuum pump is routed to the vacuum manifold located on the right side of the forward cabin bulkhead, forward of the instrument panel. The manifold has check valves included to prevent reverse flow, in the event of failure of either vacuum pump. Hoses are routed from the manifold to the directional gyro, horizontal gyro, and suction gage. Other hoses connect the gyros to the vacuum air filter and suction gage.

(a) The Airborne 1H5 series check valve manifold provides a means of coupling dual vacuum sources, and isolating these sources in the event of a failure of one source (Refer to Figure 2). The "flapper-type" check valves are spring loaded in the closed position. As airflow is pulled through the manifold, the check valves open, allowing airflow through the instruments. If airflow through one valve is stopped (i.e., one vacuum source is taken out of operation), the check valve will close in order to allow the pneumatic system to properly function using the remaining operable vacuum source.

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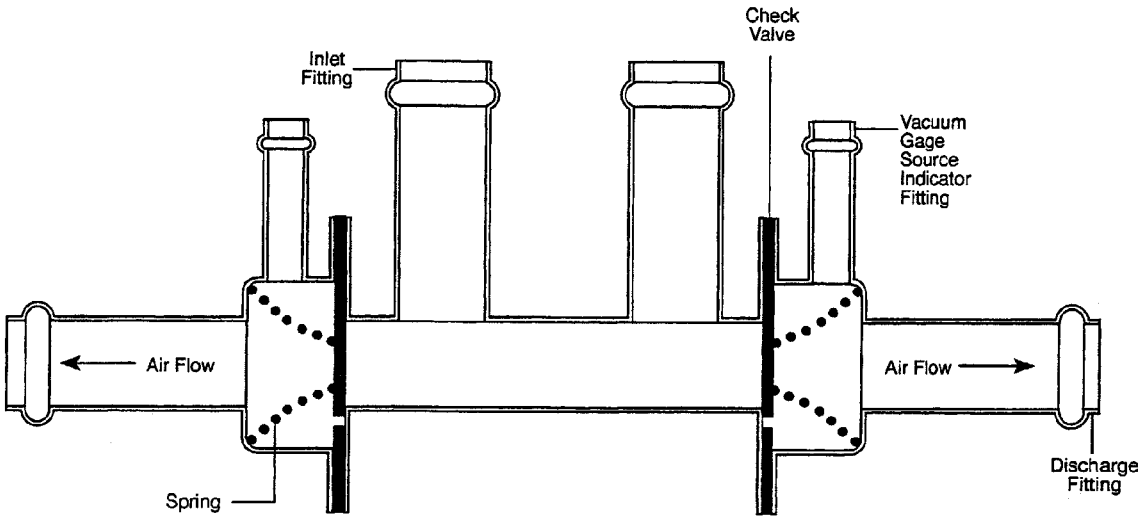

Vacuum Check Valve Manifold
Figure 2

(2) The vacuum system instruments consists of: A directional gyro, horizontal gyro, and suction gage for a standard airplanes. The optional vacuum system instruments consists of: Two directional gyros, two horizontal gyros, and the suction gage. For slaved directional gyro information, refer to Chapter 31, Instrument and Control Panels - Description and Operation.

(a) The Directional Gyro is a flight instrument incorporating an air-driven gyro stabilized in the vertical plane. The gyro is rotated at high speed by lowering the pressure in the airtight case with the engine-driven vacuum pumps and simultaneously allowing air at atmospheric pressure to enter against the gyro buckets. Due to gyroscopic inertia, the spin axis continues to point in the same direction, even though the airplane yaws to the left or right. This relative motion between the gyro and the instrument case is shown on the instrument dial which is similar to a compass card. The dial, when set to agree with the airplane's magnetic compass, provides a "dead beat" azimuth indicator that is free from "swing."

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(b) The Horizontal Gyro is essentially an air-driven gyroscope rotating in a horizontal plane. The gyro is operated by the same supply of vacuum as the directional gyro. Due to gyroscopic inertia, the spin axis continues to point in the vertical direction providing a constant visual reference to the attitude of the airplane relative to its pitch and roll axis. A bar across the face of the indicator represents the horizon and a miniature adjustable airplane is mounted to the case. Aligning the miniature airplane to the horizon bar simulates the alignment of the airplane to the actual horizon and any deviation simulates the deviation of the airplane from the true horizon. The indicator is marked from zero to 90 degrees.

(c) The Suction Gage is calibrated in inches of mercury and visually displays the amount of vacuum created by the engine-driven vacuum pumps. The suction gage has three connecting lines. The upper line is routed directly to the directional gyro to monitor vacuum. The lower lines are attached to the vacuum system manifold for the purpose of monitoring vacuum pump function. The suction gage also incorporates red inoperative indicator buttons for each engine-driven vacuum pump.

(d) Directional and attitude gyro precession. Acceptable limits for gyro drift is four degrees in either direction from a heading during a ten minute period. Excessive gyro precession can be caused by low vacuum system pressure.

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VACUUM - TROUBLESHOOTING

1. Vacuum System

A. Troubleshooting.
(1) For a guide to troubleshooting the vacuum system, refer to Figure 101 and the troubleshooting chart inTable 101.

Table 101. Vacuum Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
NO SUCTION INDICATED AT ONE SOURCE.	Vacuum pump failure.	Replace vacuum pump.
	Disconnected, broken or plugged lines or hoses.	Repair or clean lines and hoses.
	Relief valve does not function correctly.	Replace relief valve.
	Suction valve does not operate.	Replace suction valve.
LOW SUCTION.	Vacuum pump does not operate	Replace vacuum pump.
	Leaking or restricted lines or hoses.	Clean or replace lines and hoses.
	Failed or improperly adjusted relief valve.	Adjust or replace relief valve.
	Failed check valves.	Replace manifold assembly.
HIGH SUCTION.	Dirty relief valve filters.	Clean or replace filters.
	Failed or improperly adjusted relief valve.	Adjust or replace relief valve.
NO SUCTION INDICATED, BUT GYROS OPERATE NORMALLY.	Suction gage does not operate properly.	Replace suction gage.
SUCTION GAGE FLUCTUATES.	Panel, gage or plumbing vibration.	Determine cause of vibration and correct.
	Failed suction gage.	Replace suction gage.

2. Troubleshooting Vacuum System using Airborne's 343 Test Kit

NOTE: When using Airborne's 343 Test Kit, it is recommended that a large compressor with an adequate storage tank be used.

NOTE: Always try to position the airplane as close to the air compressor as possible on the side that is going to be tested for component location, refer to Figure 101.

A. Preparation for troubleshooting.
(1) Remove wing gap fairings by removing all attaching screws.
(2) Remove upper engine cowlings.
(3) Remove engine system vacuum hose (1) from vacuum pump (dry air).
(4) Combine the test kit 1H88-1 regulator with the 1H89-1 ejector.
(5) Attach vacuum system hose (1), which was removed from pump, to the 5/8-inch tube on the 1H89-1 ejector and secure with clamp.
(6) Attach shop air supply hose to the fitting on the 1H88-1 regulator.

NOTE: Air supply hose 3/8-inch I.D. minimum.

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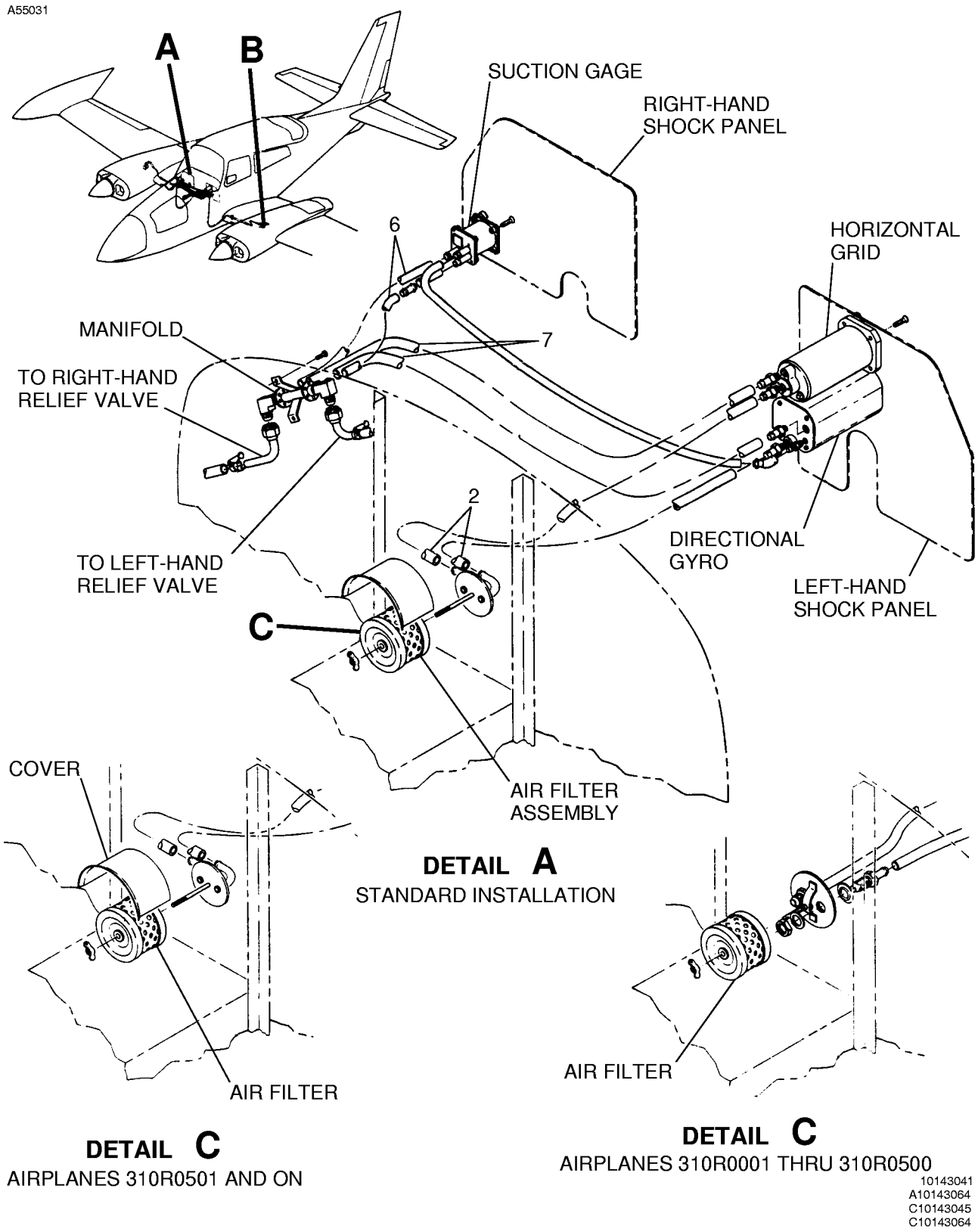

DETAIL A
STANDARD INSTALLATION

DETAIL C
AIRPLANES 310R0501 AND ON

DETAIL C
AIRPLANES 310R0001 THRU 310R0500

Vacuum System Installation
Figure 101 (Sheet 1)

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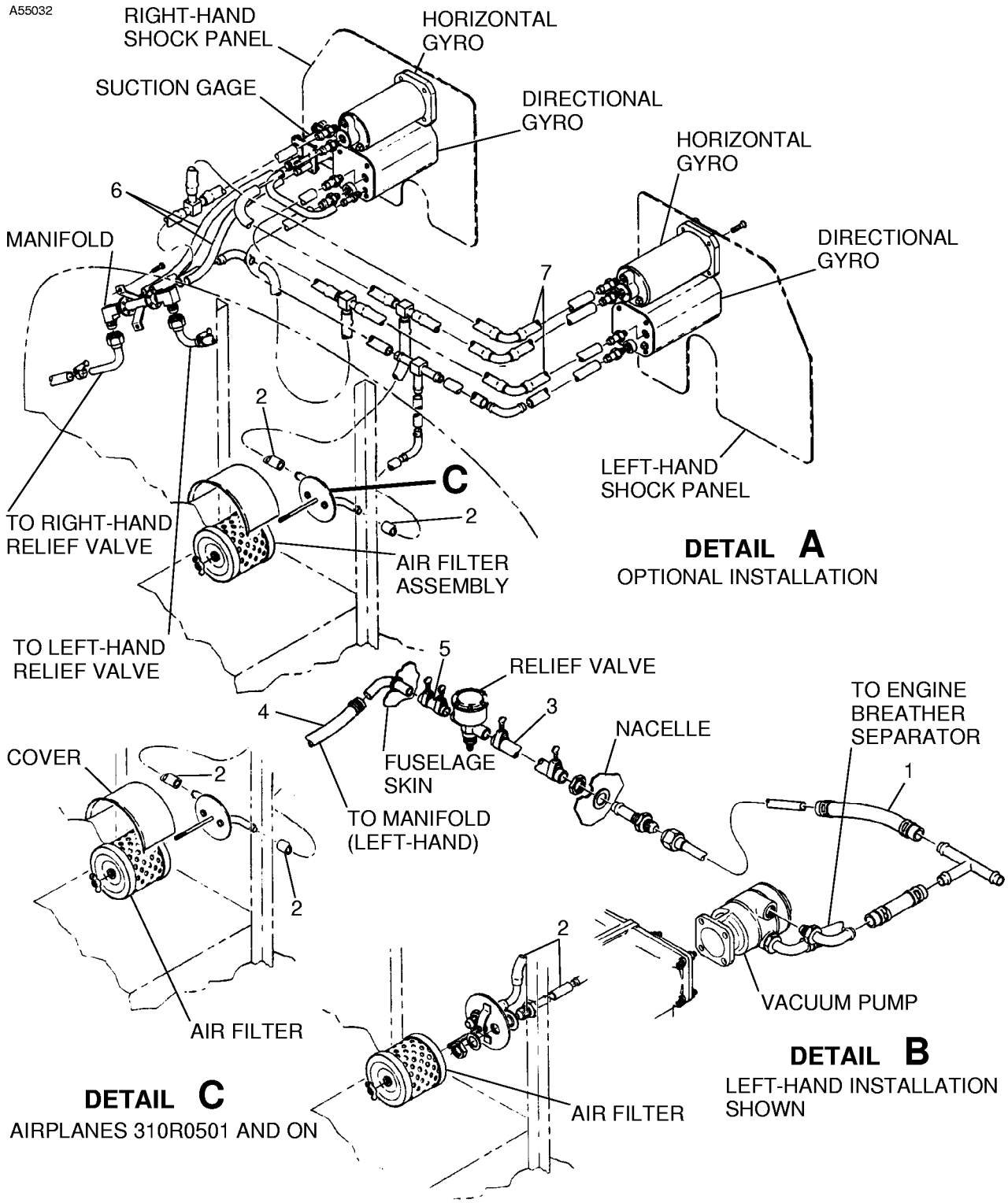

DETAIL C
AIRPLANES 310R0001 THRU 310R0500

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C10143063

Vacuum System Installation
Figure 101 (Sheet 2)

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(7) Slide the ON-OFF supply valve on the 1H88-1 regulator to the ON position, which is toward the regulator side, and screw adjustment down.
(8) Increase pressure until the 1H89-1 ejector gage peaks.
(9) If the reading on the 1H89-1 ejector is in excess of 8-inches Hg., there is some type of obstruction in the hoses. The difference between the reading at the 1H89-1 ejector gage and the airplane suction gage with two gyro installation should be no greater than 1-inch Hg. With four gyro installation, it should be no greater than 2-inch Hg.
(10) Now with the system connected, proceed to the appropriate section for troubleshooting for step by step outline.

3. Troubleshooting Guide

A. No vacuum.
(1) The system performs satisfactorily.
(a) Vacuum pump is defective. Replace vacuum pump.
(b) If the system is still inoperative, proceed to step B.
(2) System still indicates that side is inoperative but you can hear the gyros are functioning.
(a) Using the 1G31-1 gage and probe, check the source gage by inserting probe in the hose pertinent to the side that is being tested.
(b) If there is a reading of 4.8-inches Hg., then suction gage is defective.
(c) Replace suction gage.
(d) If there is no reading, proceed to step C.
(3) Using 1G31-1 gage and probe, check the system starting right after the 1H89-1 ejector and work toward the vacuum air filter.
(a) Check the reading at hose (3). If reading is at or above 4.8-inches Hg., continue to check moving up the system. If the reading is extremely high, steadily increasing, one possibility is that the relief valve may be stuck. If this situation exists, try to adjust the relief valve. If that doesn't resolve the problem replace relief valve. The other possibility is there is a partially plugged hose or line. Continue to check for a 4.8-inches Hg. reading working toward the relief valve. Once you do not get a reading, you have passed over a location of a partially plugged hose or line. Remove plugged substance from hose or line.
(b) A check should then be conducted at hose (5) to see if the relief valve is operational. If the reading is 4.8-inches Hg., then proceed to step D. If the reading is not 4.8-inches Hg., then relief valve needs to be readjusted to 4.8-inches Hg. If it will not readjust, replace with a relief valve and adjust to 4.8-inches Hg.
(c) Next check reading in hose (4) starting at the relief valve and working toward manifold to see if it is 4.8-inches Hg. If so, proceed to step D. If, when checking hose (4), you get a reading which is not consistent with the system or no reading, it is possible that you have an obstruction in the hose and it should be removed.
(d) Check the manifold for proper operation by checking vacuum at hose (6) for the side you are testing as close to the manifold as possible. The reading should be 4.8-inches Hg. If so, proceed to next step. If not, there possibly is an obstruction in the manifold. Replace manifold.
(e) Check the hose (6) from the manifold connection to the suction gage always looking for the 4.8-inches Hg. reading. If the reading is continuous all the way through the hose up to the suction gage, the gage is defective. Replace gage. If, during checking of the hose (6) you lose the 4.8-inches Hg., then, in that portion of hose from where you were getting the 4.8-inches Hg. reading to where you lose the reading, there is some type of blockage or collapsed wall in the hose. Replace hose.

B. Low vacuum.
(1) The system performs satisfactorily.
(a) Vacuum pump is defective. Replace vacuum pump.
(2) The system still indicates low vacuum.
(a) A system showing low vacuum should have all hoses checked for any loose clamps and connections. Then using the 1G31-1 gage and probe, check the system as outlined step-by-step.

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(b) Check the reading at hose (5) for 4.8-inches Hg. If it is 4.8, proceed to the next step. If it is not, then the relief valve needs to be readjusted. If it cannot be readjusted, replace relief valve.

(c) Check the manifold check valve by checking the reading at hose (4) or (6) on the opposite side from test side for any reading. If there is no reading, proceed to next step. If there is a reading, the manifold check valve is defective and is allowing ambient air to enter the system. Replace manifold check valve.

(d) Check the vacuum air filter at hose (2) for any reading. If there is none, then the filter is good, but if there is more than 1 1/4-inch Hg. reading, the filter is partially plugged and has to be replaced.

C. High vacuum.

(1) The system shows high vacuum using the 1G31-1 gage and probe. Proceed step-by-step as outlined.

(a) Check the reading at hose (5). If it is high and reads the same as suction gage, then the relief valve filter is possibly dirty. Replace filter.

(b) Another possible problem is that the relief valve is improperly adjusted. Readjust to 4.8-inches Hg. If it will not adjust, replace relief valve.

D. Suction gage fluctuates.

(1) Check for panel vibration or plumbing vibration and correct as required.

E. Erratic vacuum.

(1) This is an indication that there might be some type of fluid in the vacuum pump; i.e., oil, varsol, water, etc. Check vacuum pump exterior for any signs of oil, varsol, etc. If it is apparent that there is fluid in the pump, remove and replace pump.

F. Gyro gage follows engine RPM.

(1) To simulate a gage following engine RPM, vary the pressure on the 1H88-1 regulator with excessive pressure. If the gage fluctuates, this is an indication that the relief valve might have something in the seat. Remove the adjustment screw on the relief valve and with clean shop compressed air, blow the seat area off. Reinstall adjustment screw and readjust relief valve. If relief valve still fluctuates, replace relief valve.

G. One gyro inoperative.

(1) If one gyro operates properly while the other gyro will not erect or precesses and tumbles, use the 1031-1 gage and probe to check at the back of the inoperative gyro at the hose (7) connected to the manifold for a reading of 4.8-inches Hg. If you get a reading of 4.8-inches Hg., this is an indication that the gyro has failed. Replace gyro. If there is no reading at the back of the gyro, there must be a clogged line from the manifold to the gyro. With the 1G31-1 gage and probe, work your way toward the manifold until you get a reading. Replace that plugged segment of hose.

NOTE: Make sure that the hose (2) from the vacuum air filter (11) to the gyro is also clean and unrestricted by checking with the 1G31-1 gage and probe to ensure there is no vacuum in that line. If there is a vacuum, replace filter or hose to correct the situation.

H. Gyros will not erect.

(1) In a nondifferential gage vacuum system, when the suction gage needle is in the green arc, but the gyros will not erect, using the 1G31-1 gage and probe, check for any reading at hose (2). If there is any reading, this is an indication that the vacuum air filter is clogged or the hoses could have a plugged section in them. Replace vacuum air filter or section of plugged hose.

I. Both fail source indicators retract with one side operational.

(1) Using the 1G31-1 gage and probe, check for a reading in hose (6) on the opposite side from testing. If you get a reading, then the manifold has failed. Replace manifold.

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J. Gyro gage indicates frequent regulator adjustment.
   (1) In a differential gage system using the 1G31-1 gage and probe, check for any reading at hose (2). If there is a reading, then the vacuum air filter is partially clogged. Replace filter. Also, check for a higher than normal reading in hoses (4) and (7) which might be an obstruction in the hoses or lines. Remove obstruction.

K. Frequent vacuum pump replacement.
   (1) If it is obvious that one side is having frequent vacuum pump replacement exhibiting shorter than normal pump life, then it is very important that side be thoroughly inspected and tested using an Airborne 343 Test kit. Make sure that:
      (a) This is proper vacuum pump for application.
      (b) There are no restrictions in the discharge side of the vacuum pump.
      (c) There are no kinked or plugged lines.
      (d) Filters are all in satisfactory condition.
      (e) Vacuum pressure is set properly.

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VACUUM - MAINTENANCE PRACTICES

1. Vacuum

A. Maintenance Practices.

(1) Maintenance practices of the vacuum distribution system consist of replacing and checking the vacuum pumps (dry air), relief valves, vacuum manifold, vacuum air filter, and system plumbing.

(2) The vacuum distribution system supplies vacuum air to the various using systems.

NOTE: All flexible and fixed line fittings, clamps, regulator valves, and filters must be cleaned and suitably protected by caps or bags until installed in the airplane. The vacuum system shall not be open while awaiting the remaining parts to be installed. Prior to running of the vacuum pumps, the lines shall be flushed with air to approximately seven cubic feet per minute while alternately closing off the ends of the lines. This will create pressure pulses to dislodge and eject foreign matter.

NOTE: When removing/installing lines at bulkhead fittings, ensure that fitting is secured to prevent twisting line on opposite side from one being installed. Hold fitting with wrench while loosening/tightening line connection.

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VACUUM - INSPECTION/CHECK

1. Vacuum System

A. Inspection/Check.

WARNING: Failure to correct oil leaks may allow oil to enter the vacuum pump and cause pump failure within a short period of operation.

(1) Inspect the area around the pump pad seal and lower surface of pumps for evidence of oil.
(2) If evidence of oil exists, remove vacuum pump, replace pump pad seal in accordance with the engine manufacturers recommended procedures. Reinstall vacuum dry air pump as outlined in Distribution - Removal/Installation.
(3) Inspect the engine compartment for evidence of any other oil leaks; i.e., fittings, hoses, gaskets. etc. Replace or repair as required.
(4) Inspect vacuum pump for loose fittings. If any looseness is present, remove hose and secure fittings as outlined in Distribution - Removal/Installation. If the fitting is extremely loose resulting in truncation on the threads of the fitting, replace fitting.
(5) Check the condition of the hoses in the pneumatic system. If hoses are found to be hard, cracked, oil soaked, or brittle, replace with new hose.
(6) Check for proper hose alignment, routing, and installation that may reduce the internal diameter resulting in a restriction of the flow of air. It is important that the hoses are not collapsed, kinked or twisted, or are stressed to a point where any significant loads are imposed on system components or fittings.
(7) Check the drive coupling and make sure it is in satisfactory condition.
(8) If the vacuum pump is equipped with blast cooling, inspect for satisfactory condition of tubing/ hose and associated hardware.
(9) Check general condition of regulators and valves to ensure they are in airworthy condition. If the regulators or valves are equipped with an electric solenoid, check electrical connection and wiring.

2. Check Valve Manifold

A. Inspection.
(1) Inspect the nameplate on the vacuum check valve manifold to determine the date of manufacture. The date is encoded in the serial number The numbers 1 through 12 indicate the month (January through December) of manufacture, followed by a letter to denote the year. The letter codes are as follows:

T = 1972	E = 1979	AB = 1986	AJ = 1993	AT = 2000	BC = 2007
V = 1973	F = 1980	AC = 1987	AK = 1994	AU = 2001	BD = 2008
W = 1974	H = 1981	AD = 1988	AL = 1995	AV = 2002	BE = 2009
A = 1975	J = 1982	AE = 1989	AM = 1996	AW = 2003	BF = 2010
B = 1976	K = 1983	AF = 1990	AN = 1997	AY = 2004	BG = 2011
C = 1977	M = 1984	AG = 1991	AP = 1998	BA = 2005	BH = 2012
D = 1978	AA = 1985	AH = 1992	AR = 1999	BB = 2006	BJ = 2013

(2) If the valve is 10 years old or older, replace it. Refer to Distribution - Removal/Installation.
(3) If the valve is less than 10 years old, remove it for inspection. Refer to Distribution - Removal/ Installation.
(4) Refer to Test Set-Up #1 in Figure 601. Cap the two source indicator fittings of the check valve manifold.

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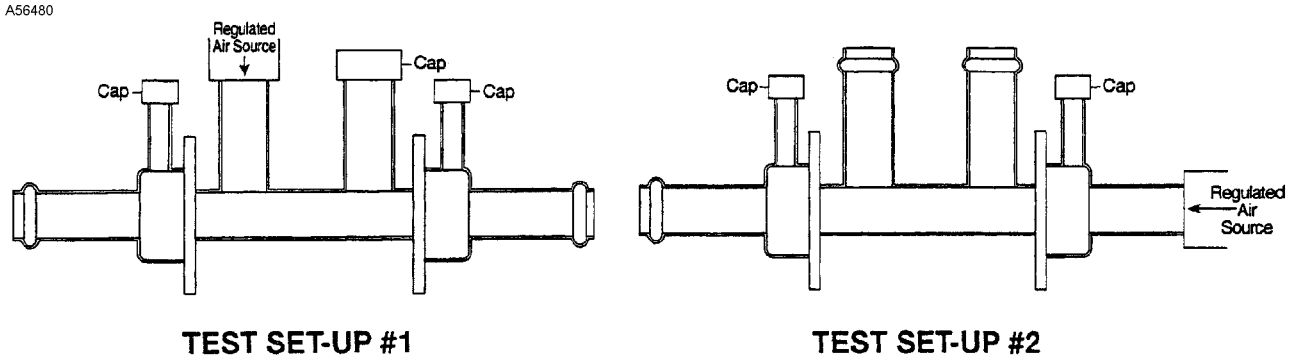

Check Valve Manifold Test Set-Up
Figure 601

(5) Connect a hose from a regulated air source to one of the inlet fittings of the check vale manifold. Cap any additional inlet fittings.
(6) Slowly apply 3 PSIG of air pressure to the check valve manifold and verify that air is released through both discharge fittings. If air is not released through both discharge fittings, replace the check valve manifold.
(7) Disconnect the air source from the inlet fitting and then connect it to one of the discharge fittings. Remove the caps which were previously installed on the inlet fittings. Refer to Test Set-Up #2 in Figure 601.
(8) Slowly apply 3 PSIG of air pressure valve manifold and inspect for leaks at all caps and hose connections.
(9) With air pressure remaining set at 3 PSIG, inspect for leaks across the internal check valve by noting any "audible" leakage out the inlet fittings or through the rivets on the housing of the check valve manifold. Any "audible" leakage at either one of the these locations is cause for replacement of the check valve manifold.
(10) Remove the air source from the check valve manifold and then repeat step 9 with the air source connected to the discharge fitting on the opposite side of the check valve manifold.
(11) Reinstall the serviceable check valve manifold. Refer to Distribution - Removal/Installation.

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VACUUM - CLEANING/PAINTING

1. Vacuum System Components

A. Cleaning.

(1) Protection of Pneumatic System Components when Cleaning the Engine Compartment.

WARNING: Failure to protect the pneumatic system components from contamination by engine cleaning solvents may result in failure of the vacuum pump within a short period of operation.

(a) Prior to washing down engine compartment, the following precautions must be taken to assure expected service life of the pneumatic system components.

1 Vacuum pump coupling.

CAUTION: Do not blast the vacuum pump coupling area or other pneumatic system components with cleaning solvent under high pressure. Do not allow protective covering around the coupling or filters to become saturated with solvent.

(b) Protect the coupling area between the vacuum pump mounting flange and the vacuum pump housing by wrapping a protective covering around that area during engine cleaning.

NOTE: The seals in the front frame of the housing behind the coupling are designed to keep out foreign material; such as dirt, dust, and light fluid. However, fluid under high pressure can be forced by the seals and enter the vacuum pump combining with the carbon dust to create a gumming condition which will cause vacuum pump failure.

1 Vacuum pump fittings.

a Before washing the engine off, check the vacuum pump fittings for looseness of the threaded fittings. Fluid can seep through loose threads and enter the vacuum pump.

2 Vacuum pump discharge hose (Vacuum Instrument System).

a Recommendation is to plug the end of the hose or the fitting and flag it with a red REMOVE BEFORE RUNNING ENGINE tag, then clean the engine.

CAUTION: Remove plug prior to running engine.

3 Deice control valve.

a If the deice control valves are in the engine compartment, install some protective devices before the airplane engine and area are cleaned.

CAUTION: Make sure the protective devices are removed after the engine and area are cleaned.

b Check the area in and around the valves to ensure they are dry and free of any cleaning fluids prior to running the engine.

4 Vacuum system lines and hoses.

a The vacuum system lines and hoses may be cleaned by immersing them in dry cleaning solvent and then internally dried by using filtered dry compressed air.

b Wipe exterior of lines and hoses with a clean, dry cloth.

c Clean vacuum air filter with clean, dry air and tap lightly while blowing air over the filter.

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d Clean vacuum relief valve as required by removing old filter and blasting with filtered dry compressed air.

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DISTRIBUTION - REMOVAL/INSTALLATION

1. Vacuum Pumps

A. Removal (Refer to Figure 401).
(1) Remove upper engine cowl.
(2) Loosen the two hose clamps securing hoses to vacuum pump fittings and disconnect hoses.
(3) Remove vacuum pump by removing nuts and washers securing pump to engine accessory pad.

CAUTION: Do not clean vacuum pump in solvent. Clean by wiping with a clean cloth.

B. Installation (Refer to Figure 401).

NOTE: If a new vacuum pump is being installed, remove the serviceable fittings from the old pump. Discard twisted fittings.

(1) Pad Inspection.
(a) Check the condition of the pad seal. If the seal shows any signs of oil leakage, replace the seal. Replace seal if there is any doubt as to its serviceability.
(2) Installation of Vacuum Pump.

CAUTION: Never install a vacuum pump that has been dropped.

NOTE: Consult the applicable parts catalog to verify that the vacuum pump is the correct model for the engine and/or system.

(a) Place the vacuum pump mounting flange in a jaw-protected vice with the drive coupling downward. Protect the vacuum pump mounting flange with soft metal or wood.

CAUTION: Vacuum pump housing should never be placed directly in a vise since clamping across the center housing will cause an internal failure of the carbon rotor.

(b) Spray the fitting threads with silicone and let dry. DO NOT use teflon tape, pipe dope, or thread lube.
(c) Install fittings in the vacuum pump. Hand tighten.
(d) Use only a box wrench to tighten fittings to desired position. Do not make more than one and one half (1-1/2) turns beyond hand-tight position.
(e) Install new vacuum pump mounting gasket (supplied with new vacuum pump).
(f) Align splines on the vacuum pump drive with splines on the engine drive. Slide vacuum pump into position so the ports are facing to the right.
(g) Always replace ALL locking washers when installing a new vacuum pump. Tighten all four (4) mounting nuts to approximately 50 to 70 pounds.
(3) Inspection of Hoses.
(a) Before installing hoses, inspect each hose carefully to make sure it is clean and free of all debris, oils, or solvents. Use vacuum or air pressure to clean the lines. Remove the hoses from the airplane if necessary.
(b) Replace old, hard, cracked or brittle hose, particularly on the vacuum pump inlet. Sections of the inner layers may separate causing a pump failure.
(c) Where hose clearance is tight making it difficult to reinstall it onto the vacuum pump fitting, spray the fitting at the hose end with silicone. Let dry, then install hose by pushing it straight on.

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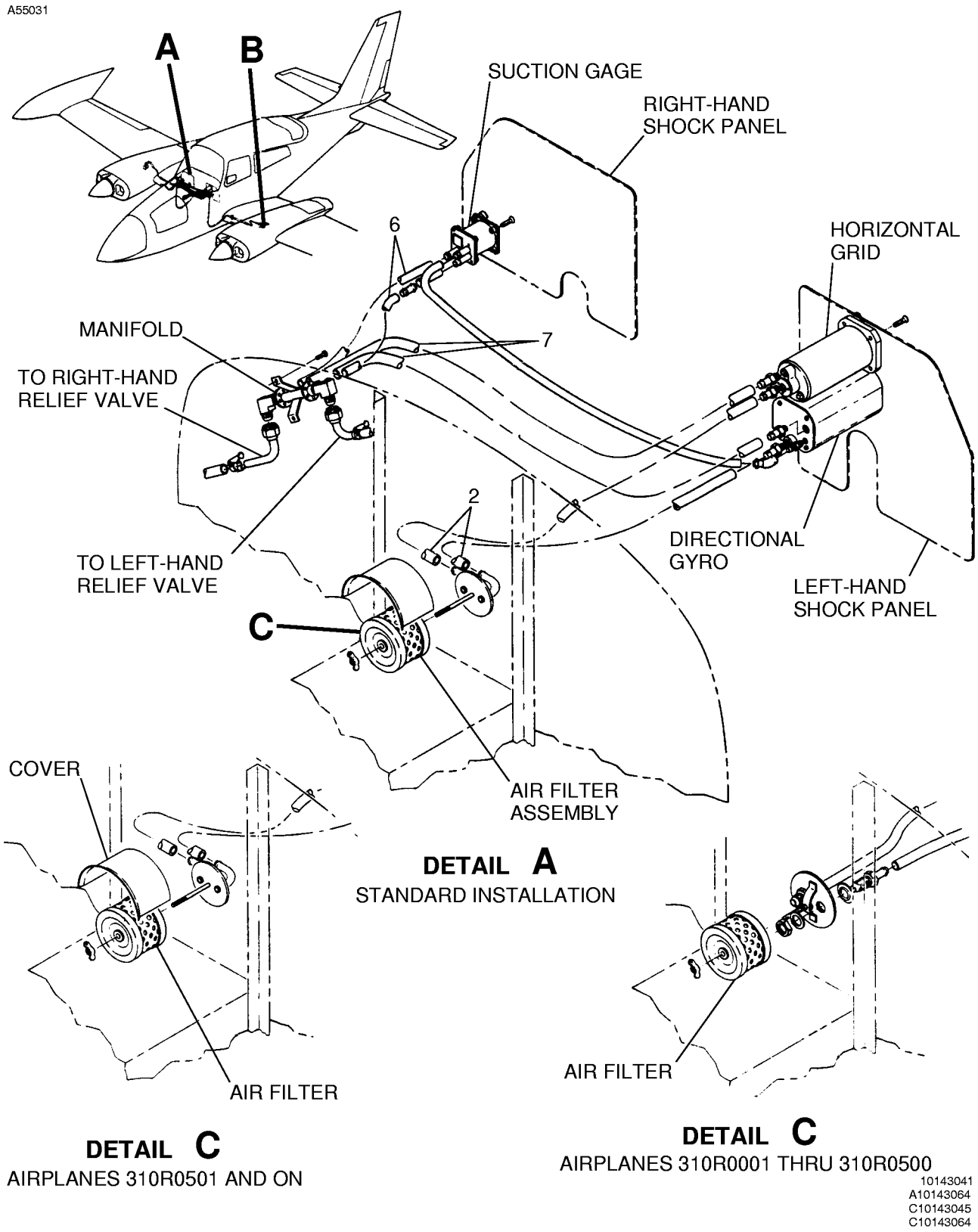

Vacuum System Installation
Figure 401 (Sheet 1)

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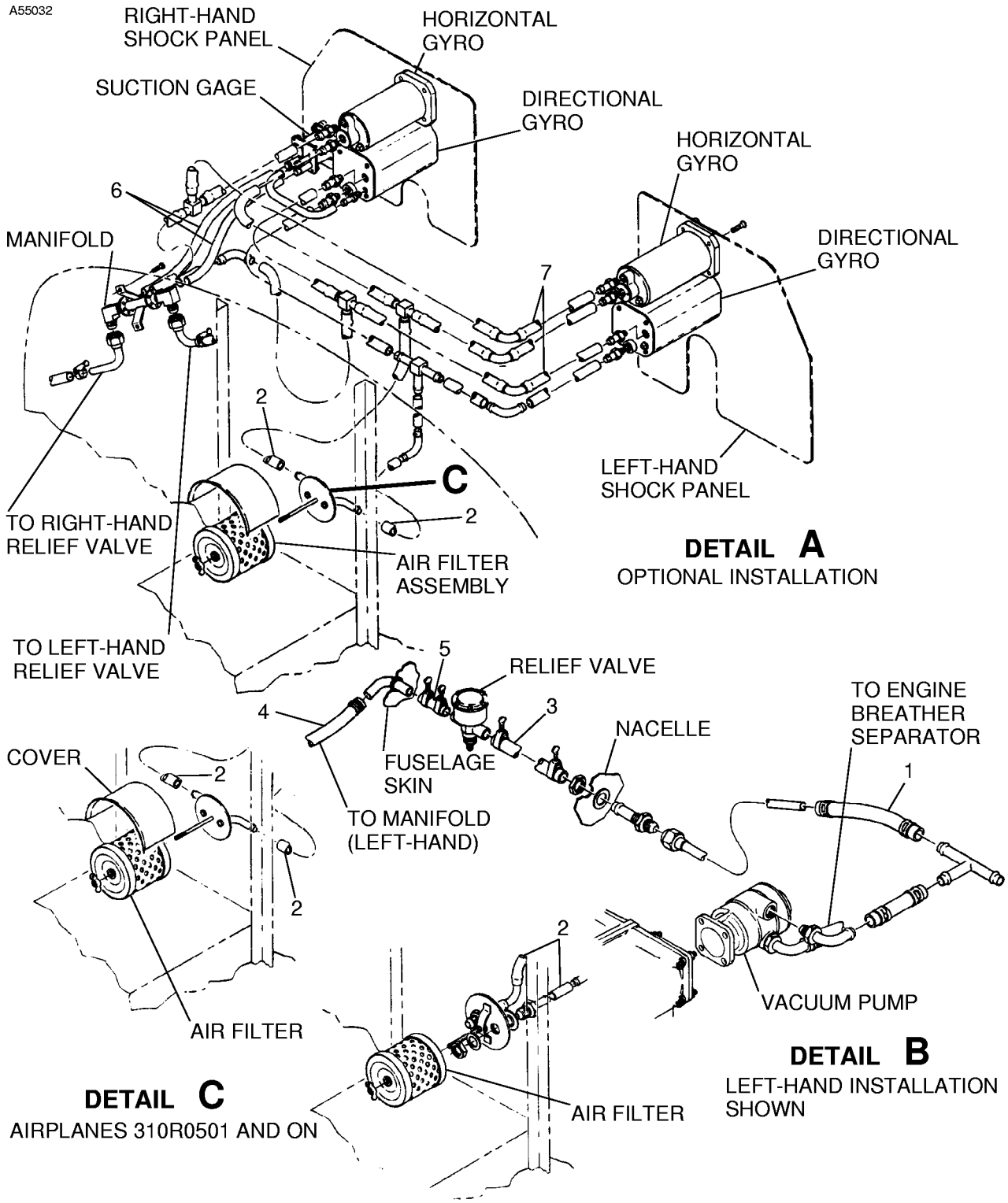

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Vacuum System Installation
Figure 401 (Sheet 2)

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CAUTION: Do not wiggle hose from side to side. Wiggling could cause particles to be cut from hose I.D. These particles will damage the vacuum pump.

(d) Make certain that hoses are connected to the correct fittings. Incorrect installation will cause damage to the gyro system.

(4) Filters.

CAUTION: Replace all the filters in the system.

(a) Clogged filters will restrict the flow of air required for proper vacuum pump operation and cooling. Premature pump failure or shortened pump life may result.

(5) Install upper engine cowl.

2. Vacuum Air Filter Element

A. Removal (Refer to Figure 401).
(1) Open nose baggage compartment.
(2) Remove upholstery panel at forward bulkhead (optional).
(3) Remove wing nut and remove air filter element.

B. Installation (Refer to Figure 401).
(1) Install air filter element and secure with wing nut.
(2) Install upholstery panel to bulkhead.

3. Vacuum Relief Valve

A. Removal (Refer to Figure 401).
(1) Remove inboard wing lower access covers by removing attaching screws.
(2) Remove clamps attaching hoses to relief valve and remove the relief valve.

B. Installation (Refer to Figure 401).
(1) Position the relief valve and connect the hoses to the valve using clamps.
(2) Adjust the vacuum relief valve, refer to Distribution - Adjustment/Test.
(3) Install wing access covers with screws.

4. Vacuum Manifold

A. Removal (Refer to Figure 401).
(1) Identify and disconnect hoses from the manifold.
(2) Remove manifold by removing screws.

B. Installation (Refer to Figure 401).
(1) Secure manifold to bulkhead using screws.
(2) Identify and connect hoses to manifold using clamps.

5. Vacuum System Plumbing

A. Removal/Installation (Refer to Figure 401).
(1) For removal/Installation of vacuum distribution system, refer to Figure 401.

CAUTION: All disconnected hoses and fittings must be plugged and capped to prevent foreign matter from entering openings.

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DISTRIBUTION - ADJUSTMENT/TEST

1. Vacuum Relief Valve

A. Adjustment.

NOTE: Since a relief valve is used for each vacuum source, each relief valve must be adjusted separately.

(1) Remove wing gap fairings by removing attaching screws and remove safety wire from adjusting screw locknut.
(2) Start the engines and idle the right engine. Operate left engine so tachometer reads 1700 RPM, the suction gage should read 4.8 inches Hg.
(3) Adjust the left relief valve by bending down the lock tabs and adjusting to obtain the desired vacuum reading. Clockwise rotation of the adjusting screw increases the vacuum.
(4) Idle the left engine and operate the right engine so tachometer reads 1700 RPM.
(5) Adjust the right relief valve by bending down the lock tabs and adjusting to obtain the 4.8 inches Hg. vacuum reading. Clockwise rotation of the adjusting screw increases the vacuum.
(6) With both engines operating at tachometer RPM of 1700, the suction gage should read 5.00 inches, +0.25 or -0.25 inches Hg.

NOTE: If the suction gage reading is not within limits described, both relief valves should be readjusted to those limits.

(7) Shut down both engines and check that the lock tabs are turned back up, locking the adjustment screw in place.
(8) Install wing gap fairings.

B. Adjustment using Airborne's 343 Test Kit (Refer to Figure 501).

NOTE: Since a relief valve is used for each vacuum source, each relief valve must be adjusted separately.

(1) Position airplane as close to the shop compressor as possible.

NOTE: When using the 1H89-1 ejector, a large supply of air is required. A large compressor with a large storage tank is recommended.

(2) Remove wing gap fairings by removing attaching screws.
(3) Remove upper engine cowlings.
(4) Remove engine system vacuum line from vacuum pump.
(5) Combine the 1H88-1 regulator to 1H89-1 ejector at quick disconnect.
(6) Attach vacuum system line (1) which was removed from pump, to the 5/8-inch tube on the ejector and secure with clamp.
(7) Attach shop air supply hose to the fitting on the 1H88-1 regulator.

NOTE: Minimum shop air supply hose is 3/8-inch I.D.

(8) Slide the ON-OFF valve on 1H88-1 regulator to the ON position towards the regulator side.
(9) Increase regulator adjustment screw until 1H89-1 ejector gage peaks.
(10) With the 1H89-1 ejector peaked, the suction gage should read 4.80 inches Hg.
(11) If the suction gage does not read 4.8 inches Hg., loosen the locking device on the adjustment screw on the relief valve and rotate adjustment screw clockwise to increase and counterclockwise to decrease until the desired setting of 4.8 inches Hg. is reached on the suction gage.
(12) After system is adjusted, remove vacuum system line (1) from 1H89-1 ejector and resecure to vacuum pump and tighten clamp.
(13) To adjust other side of system, perform steps (4) through (12).
(14) Reinstall engine cowlings.

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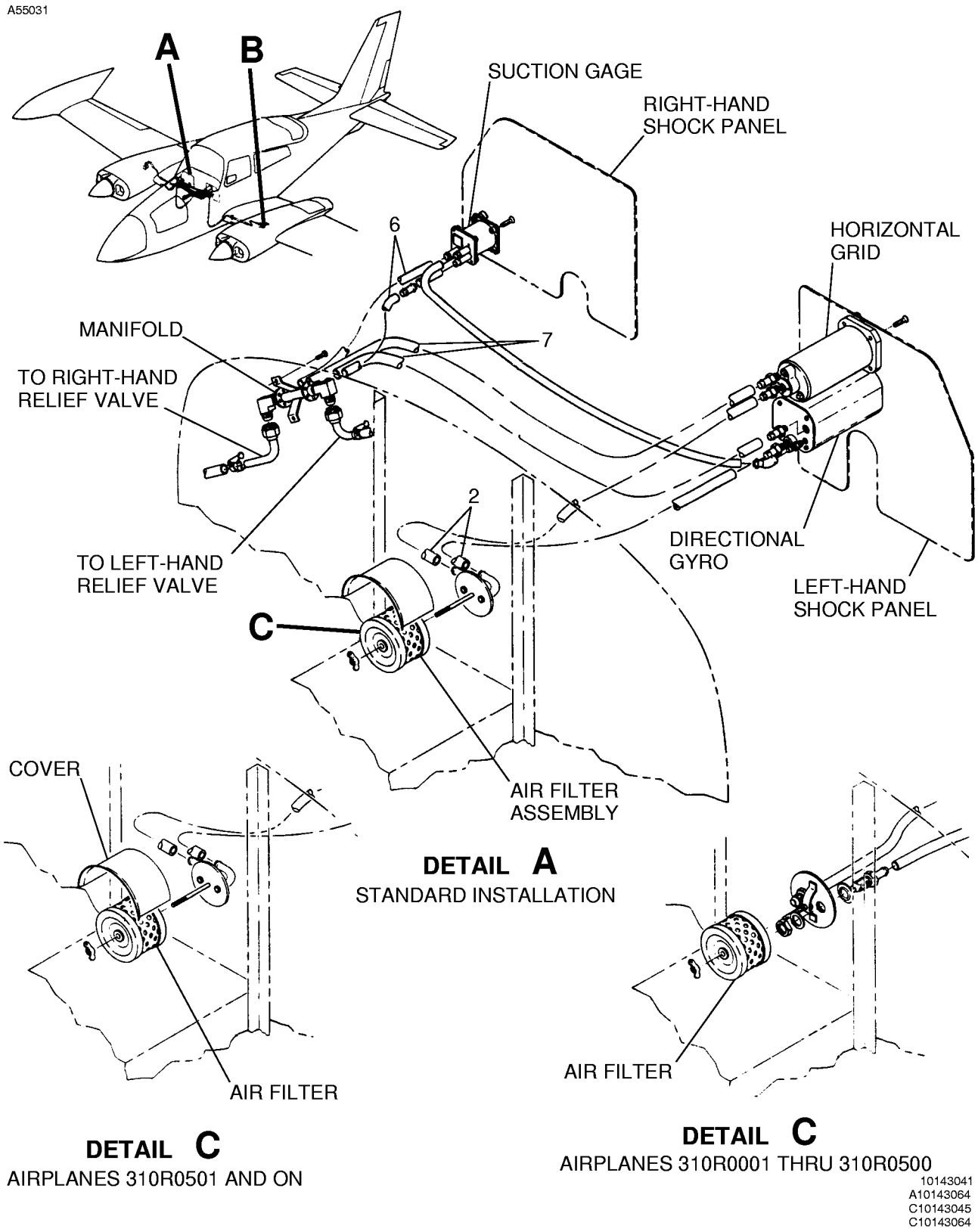

Vacuum System Installation
Figure 501 (Sheet 1)

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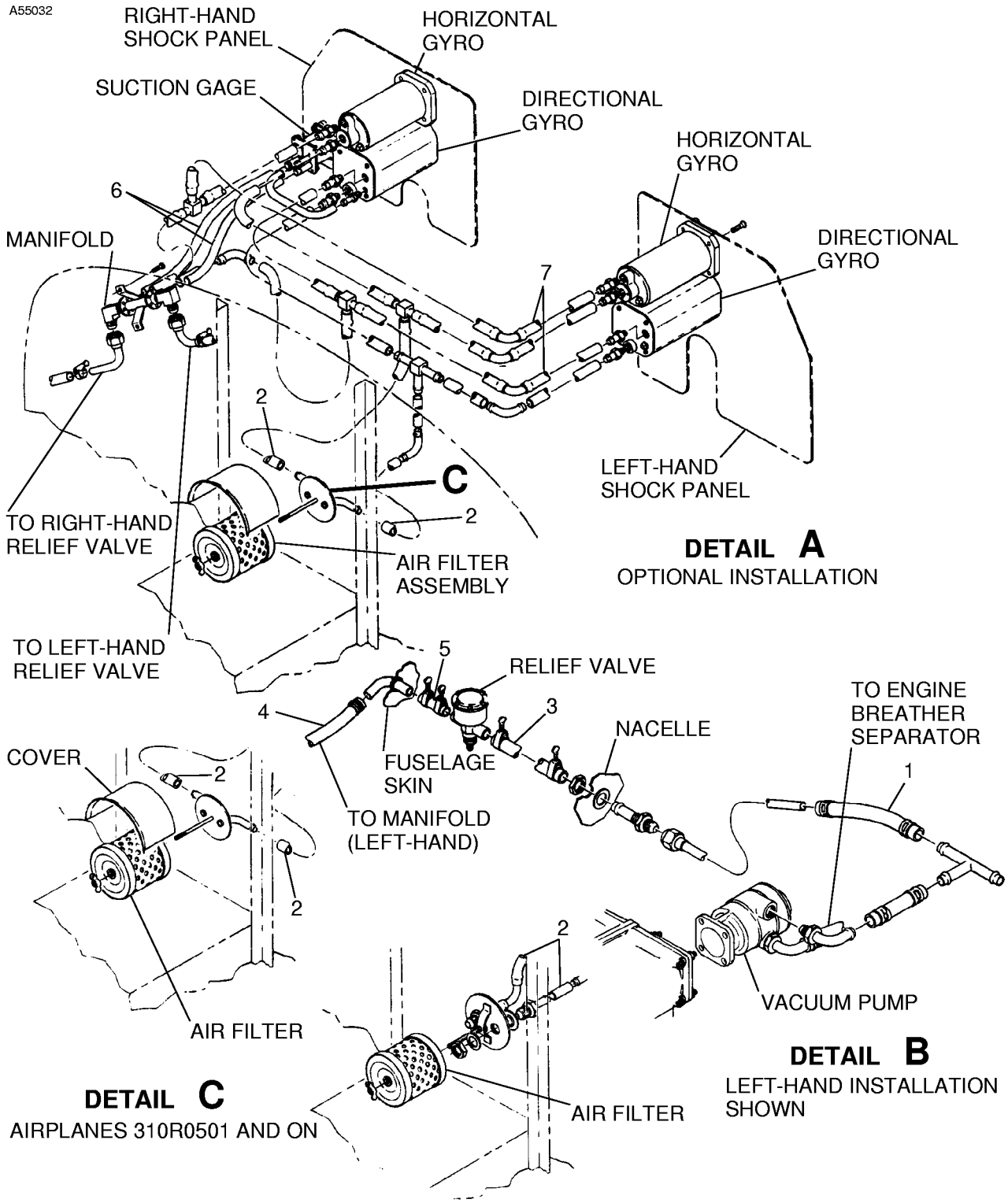

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Vacuum System Installation
Figure 501 (Sheet 2)

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(15) Position airplane in a suitable place to run both engines.
(16) With both engines operating at tachometer RPM of 1700, the suction gage should read 5.00 inches, +0.25 or -0.25 inches Hg.

NOTE: If the suction gage reading is not within limits described, both relief valves should be readjusted to maintain these limits.

(17) Shut down both engines and check that the relief valve locking devices are secure.
(18) Reinstall wing fairings.

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INDICATING - REMOVAL/INSTALLATION

1. Vacuum System Instruments

A. Removal/Installation.

(1) For removal/installation of vacuum system instruments, refer to Chapter 31, Instrument and Control Panels - Removal/Installation.

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CHAPTER 51

STANDARD PRACTICES - STRUCTURES

LIST OF EFFECTIVE PAGES

CHAPTER-SECTION-SUBJECT	PAGE	DATE
51-Title		
51-List of Effective Pages		
51-Record of Temporary Revisions		
51-Table of Contents		
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51-10-00	Pages 801-855	Jun 17/2005
51-10-01	Pages 801-804	Jun 17/2005
51-40-00	Pages 201-208	Jun 17/2005

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RECORD OF TEMPORARY REVISIONS

Temporary Revision Number	Page Number	Issue Date	By	Date Removed	By
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"	51-12-00:1-7	"	"		

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STRUCTURES - GENERAL

1. Scope

A. This chapter describes standard practices, general procedures, and typical repairs applicable to more than one chapter.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Investigation, cleanup, and aerodynamic smoothness provides definitions of damage classifications.
   (2) Fasteners provides descriptions of fastener types, materials, and sizes.

3. Type of Construction

A. Description.
   (1) The airplane is all-metal of semimonocoque type construction with the skin carrying a portion of all structural loads. The fuselage is comprised of a forward cabin section and a tailcone. It is constructed of formed bulkhead stringers and stiffeners all of which are riveted to the external skin. The wing, horizontal stabilizer, and vertical fin are built up around two main spars, with ribs, formers, and riveted skin forming the basic structure. Torsional stiffness of this structure is afforded by the skin closure of areas between the spars forming enclosed “boxes.” Each movable surface consists of a hinge support spar with ribs, formers, and riveted outer covering skin. Typical repair illustrations are shown in the chapter.
   (2) The airplane structure features all metal construction, conventional design, incorporating aluminum alloys, steel, and other materials as appropriate.
   (3) The fuselage structure is based on a semimonocoque design consisting of bulkheads, stringers, and skin. The fuselage consists of the nose section, center section, and tail section. Two spars (one forward and one rear) pass through the fuselage and incorporate attach fittings for attaching the wings.
   (4) Doors are provided for the cabin, cabin baggage compartment, nose baggage, and wing locker baggage. All doors are flush fitting and open outward.
   (5) Windows are provided in the fuselage and permit 360 degrees of visible vision. The windows consist of the windshield, pilot side window, cabin door window, foul weather window, picture windows, and omni window.
   (6) The empennage structure consists of the horizontal and vertical stabilizers. The stabilizers consist of spars, ribs, skin panels, and access panels to respective stabilizer components.
   (7) The wings are attached to the forward and rear spars of the fuselage. Wing structure consists of the two spars, ribs, and skins. The wing structure provides attach fittings for the main landing gear, aileron, flap, main fuel tanks, and engine nacelle.
   (8) The airframe primary structure consists of frames, bulkheads, formers, longerons, stringers, carry-thru spars, wing spars and skins, fuselage and wing skin, and frames around openings.
      (a) Transverse frames throughout the fuselage made of aluminum alloy make up the backbone of the fuselage. Aluminum alloy bands and doublers installed between the frames and skin are fastened together with skin fasteners.
      (b) Longerons and bulkheads located throughout the fuselage and wing are connected to the wing spars and fuselage bulkheads by metal fasteners to provide a frame work for skin attachment.
      (c) The wing spars, carry-thru spars provide support and attachment of the wings engine nacelle structure, and main landing gear attach fittings.
      (d) The nosewheel well structure constructed of webs, angles, and doublers, provide nose gear trunnion support and attachment, nose gear door, and uplock support and attachment.

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(9) The airframe secondary structure consists of nose baggage compartment shelves, avionics shelves, fore and aft bulkheads, center pedestal, and flight and passenger compartment floor panels.
   (a) The nose baggage compartment shelves and dividers are located in the nose compartment. The shelves and dividers are attached to supporting structure with screws and nuts. The avionics shelves are fastened to supporting structure and bulkheads with screws.
   (b) The fore and aft cabin bulkheads are located at the ends of passenger and crew compartments and are made up of angles, channels, formers, and webs.
   (c) The center pedestal is located at the forward end of the flight compartment between the crew seats. The pedestal contains the engine controls, autopilot flight controller, audio system terminal blocks, and the trim tab control wheels for all three flight axes.
   (d) The floor panels consist of various lengths and widths throughout the passenger and flight crew compartment.

4. Ground Handling

A. Description.
   (1) Leveling, jacking, and other ground handling details are covered in Jacking - Description and Operation.

5. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Structural Adhesive	EA9309	The Dexter Corporation Hysol Division Pittsburg, California 94565	Bonding wing skin to front spar lower aft cap during blind rivet replacement.

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INVESTIGATION, CLEANUP, AND AERODYNAMIC SMOOTHNESS - APPROVED REPAIRS

1. Damage

A. Investigation of Damage.

(1) After a thorough cleaning of the damaged area, all structural parts should be carefully examined to determine the extent of damage. Frequently the force causing the initial damage is transmitted from one member to the next, causing strains and distortions. Abnormal stresses incurred by shock or impact forces on a rib, bulkhead, or similar structure may be transmitted to the extremity of the structural member, resulting in secondary damage such as sheared or stretched rivets, elongated bolt holes, canned skin plate or bulkheads. Points of attachment should be examined particularly for distortion and security of fastenings in the primary and secondary damaged areas.

B. Definition of Damage.

NOTE: Typical skin repairs are illustrated in Figure 801, Figure 802, Figure 803, and Figure 804.

(1) Structural Damage to the airplane is divided into the following classifications:

(a) Negligible Damage shall be considered damage that will not affect the airworthiness of the airplane and can be permitted to exist as is or can be corrected with a simple repair such as removing dents, burnishing scratches, and stop drilling cracks in non-structural parts.

(b) Damage Repairable by Patching will be considered damage that may be repaired by covering or reinforcing a portion of the airplane.

(c) Damage Repairable by Insertion will be considered damage requiring replacement of a section with the correct repair material.

(d) Damage Necessitating Replacement of Parts will be considered as damage not repairable by patching or insertion, but that may be repaired by installing a new or reconditioned part. If a part or area of an assembly is damaged to the extent that it requires replacement, and a replacement cannot be made because of tooling or jig requirements, the entire assembly must be replaced.

C. Preparing Damaged Area for Repairs.

(1) To prepare an area for repair, examine and classify the damage. Make a thorough check before beginning repairs. In some cases a damaged part may be classified as needing replacement; however after removal, closer inspection indicates the part may be repaired. Take more time for the damage estimate and save man-hours on repairs. To prepare a damaged area for patch or inserting repairs:

(a) Remove all ragged edges, dents, tears, cracks, punctures, and similar damages.

(b) Leave edges, after removal of damaged area, parallel to any square or rectangular edges of the unit.

(c) Round all square corners.

(d) Smooth out abrasions and dents.

(e) Brush Iridite all rough edges and scratches with a solution of Iridite mixed in a ratio of 1 ounce of Indite to 1 gallon of water and rinse thoroughly.

(f) Apply two coats of zinc-chromate primer to all internal surfaces and edges lapping over another.

NOTE: Damage adjacent to a previous repair requires removal of the old repair and inclusion of the entire area in the new repair.

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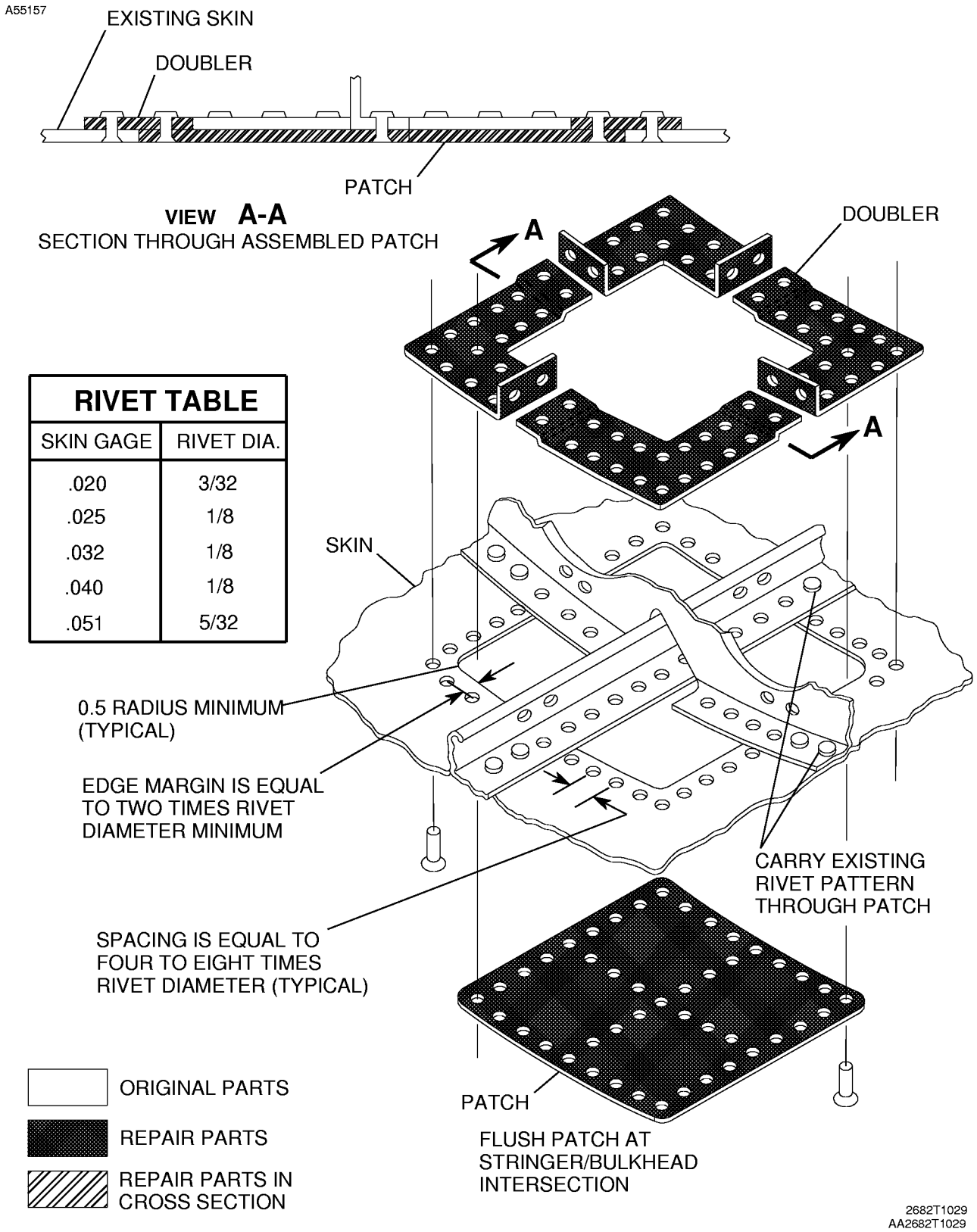

Typical Over-Structure Skin Repair
Figure 801 (Sheet 1)

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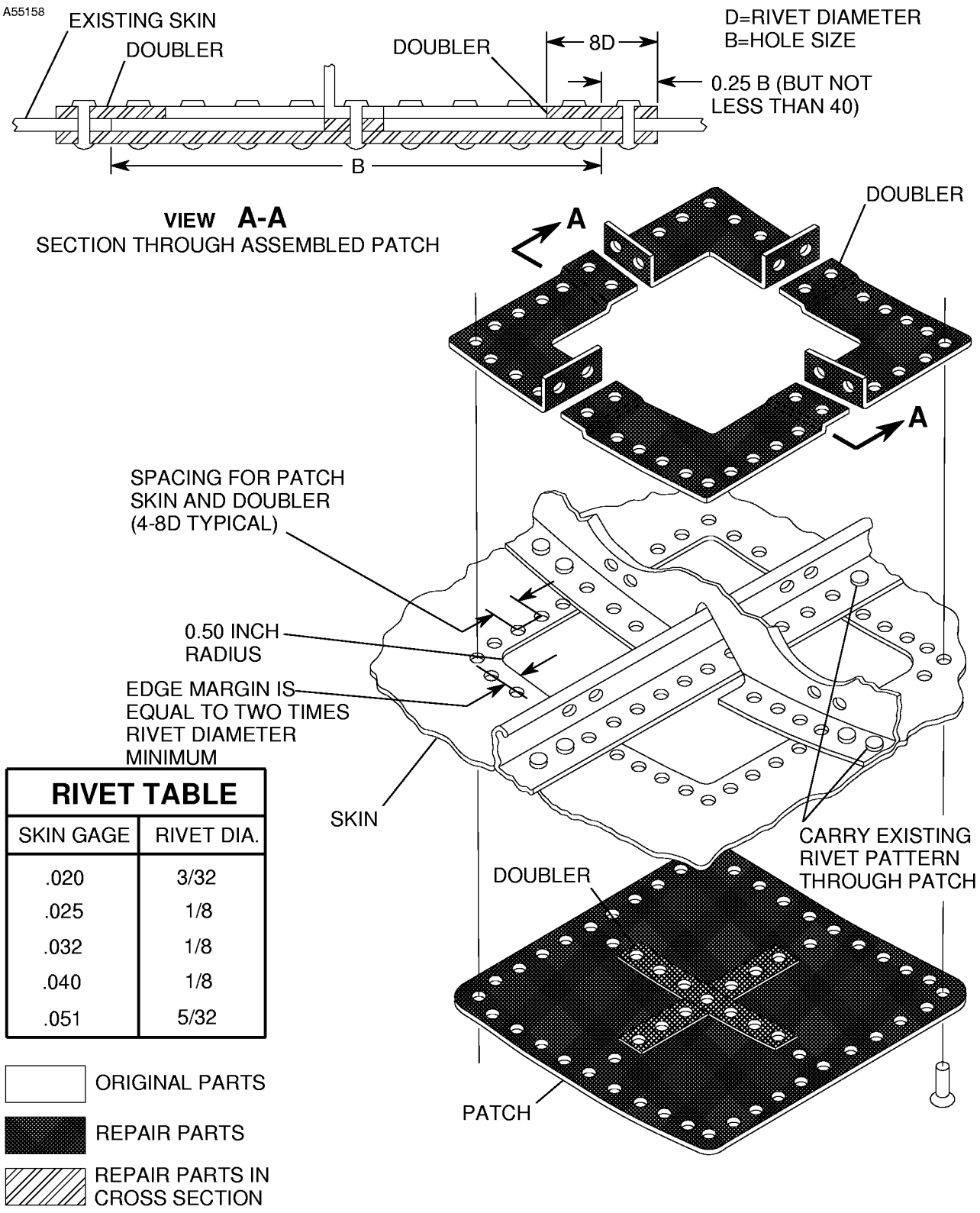

RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	3/32
.025	1/8
.032	1/8
.040	1/8
.051	5/32

Typical Over-Structure Skin Repair
Figure 801 (Sheet 2)

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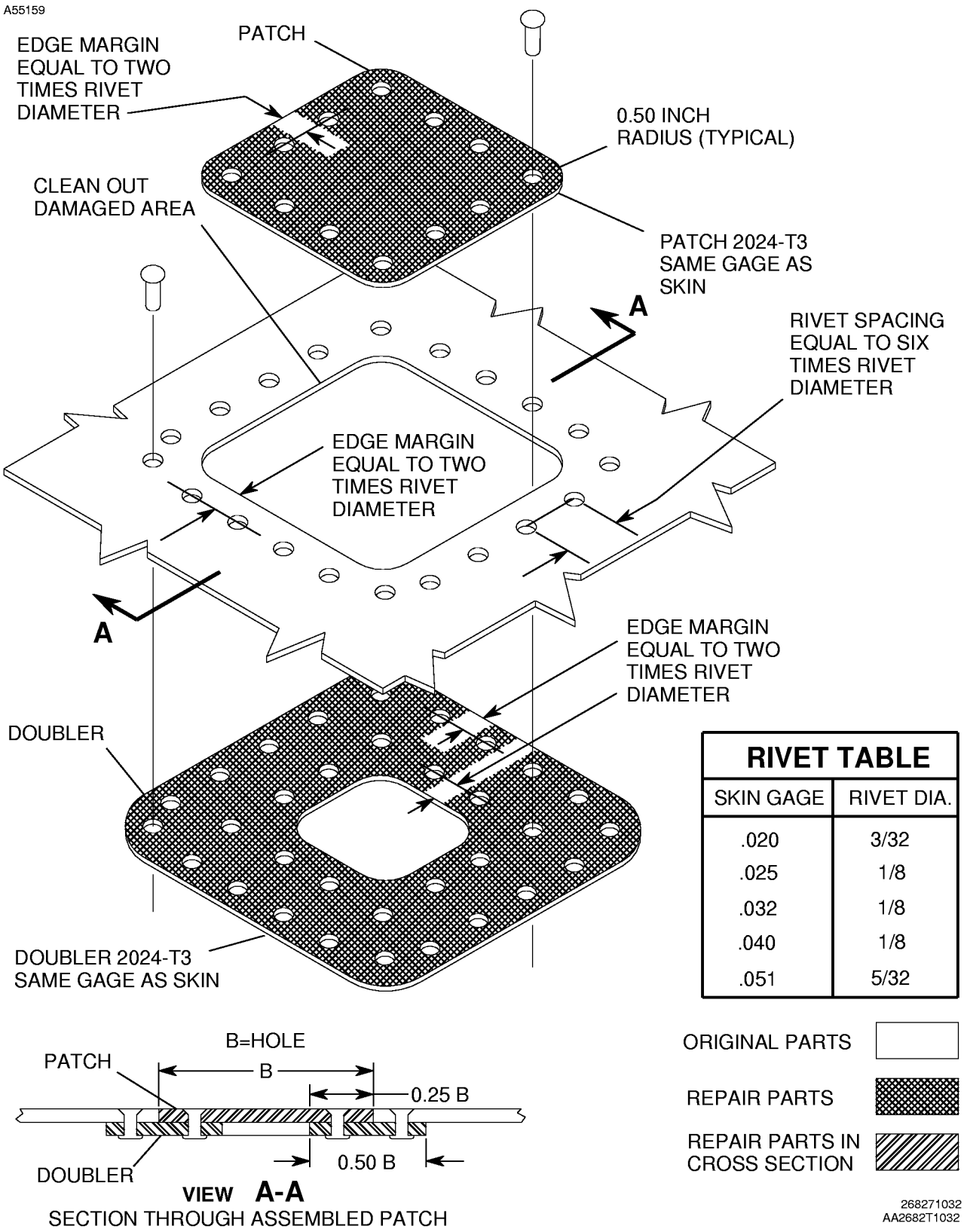

RIVET TABLE

SKIN GAGE	RIVET DIA.
.020	3/32
.025	1/8
.032	1/8
.040	1/8
.051	5/32

Typical Clear-of-Structure Skin Repair
Figure 802 (Sheet 1)

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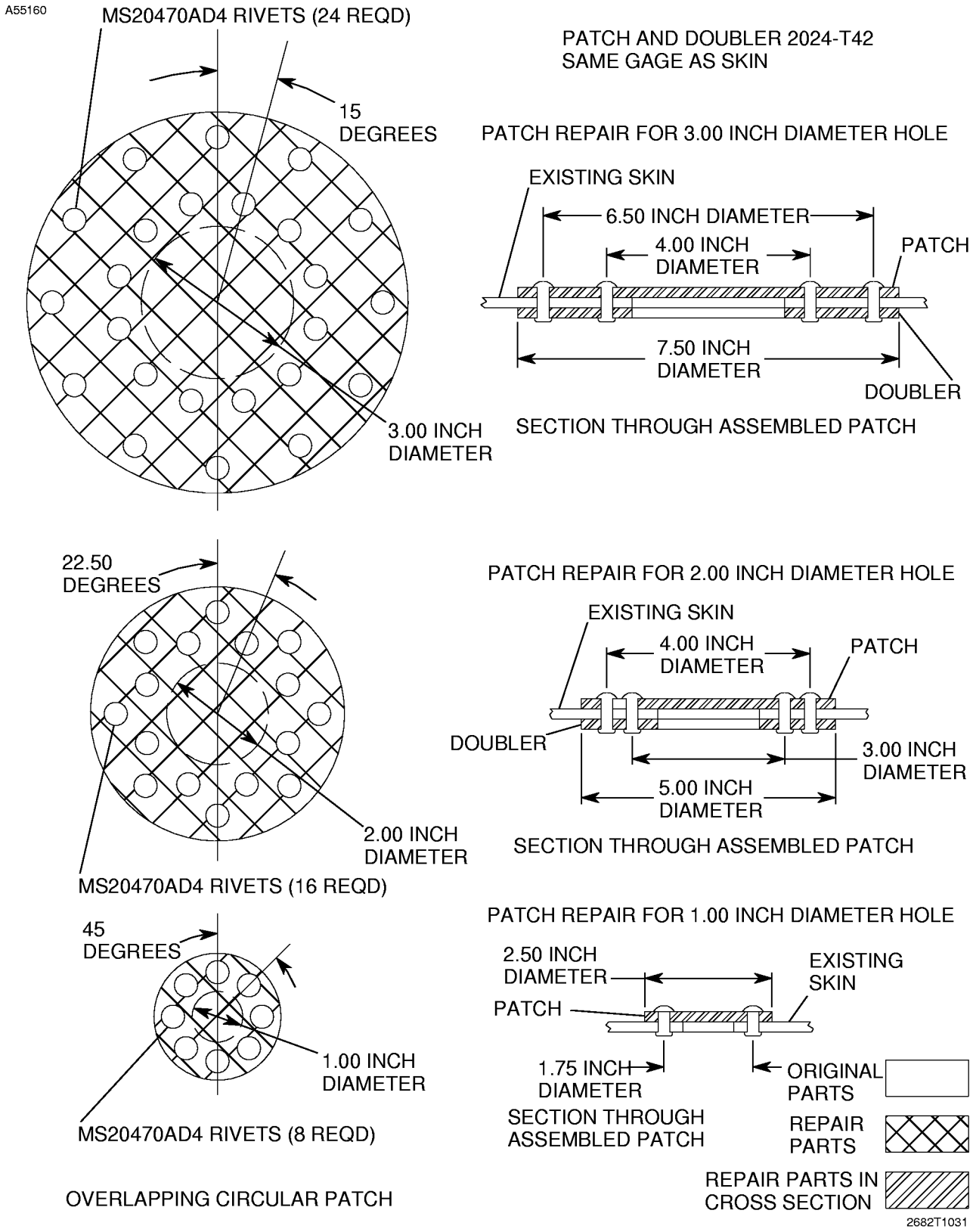

Typical Patch Repair of Circular Holes
Figure 803 (Sheet 1)

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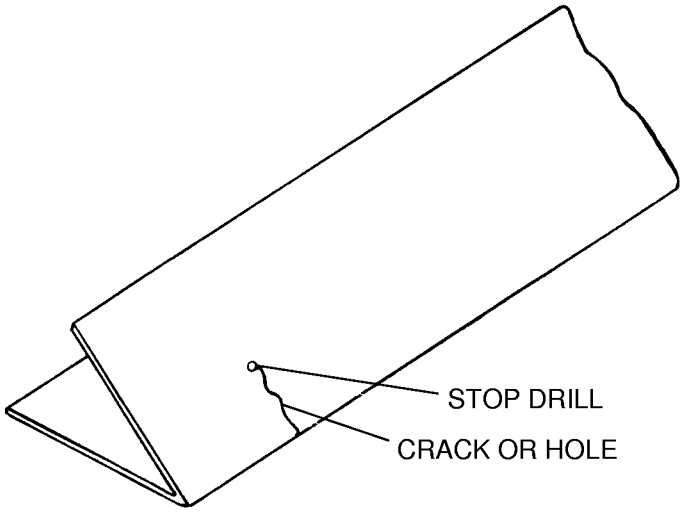

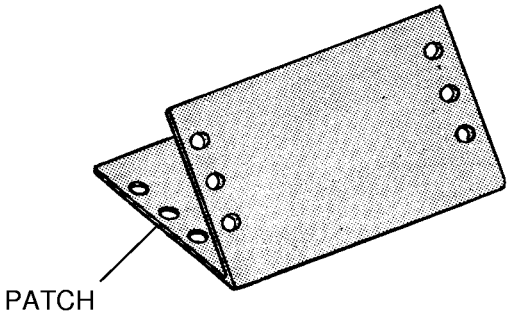

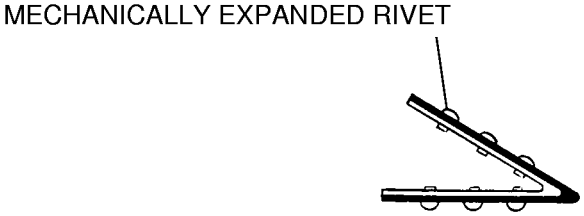

ORIGINAL PARTS
REPAIR PARTS
REPAIR PARTS IN CROSS SECTION

Typical Repair of Trailing Edge of a Control Surface
Figure 804 (Sheet 1)

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WARNING: Small particles and fine shavings of magnesium ignite easily and present an extreme fire hazard. Magnesium dust is highly flammable and in the proper concentration, may cause an explosion. Water in contact with molten magnesium presents a steam explosion hazard. Extinguish fires of magnesium with absolutely dry talc, calcium carbonate, sand, or graphite by applying the powder to a depth of one-half inch or more over the burning metal. Do not use foam, water, carbon tetrachloride, or carbon dioxide.

2. Wing Group

A. Wings.
(1) The wings are all-metal, full cantilever, semimonocoque type construction, utilizing two main spars. Each wing consists of a wing panel, aileron, flaps, engine nacelle, wing tip fuel tank, and main landing gear. The landing gear is attached to and retracts into the wing.

B. Wing and Horizontal Stabilizer Angle of Incidence.
(1) Angle of incidence is defined as the angle between the wing or stabilizer chord line and airplane waterline (airplane level longitudinally). Stabilizers do not have twist. Wings have a constant rate of twist from the wing root rib to the tip rib. All twist is between these two ribs. The amount of twist between these points is the difference between the angle of incidence at the root rib and the angle of incidence at the tip. Refer to Checking Wing Twist and Location of Thrust Line to check wing twist.

C. Wing Skin.
(1) All wing, aileron, and flap skin thickness and temper are listed in Figure 805.
(2) Negligible Damage.
(a) Any smooth dents in the wing skin that are free from cracks, abrasions, and sharp corners, which are not stress wrinkles and do not interfere with any internal structure or mechanism may be considered as negligible damage. In areas of low stress intensity, cracks, deep scratches, or deep sharp dents, which after trimming or stop drilling can be enclosed by a two-inch circle, can be considered as negligible if the damaged area is at least one diameter of the enclosing circle away from all existing rivet lines. Stop drilling is considered a temporary repair.
(3) Repairable Damage.
(a) Skin damage ahead of the front spar and also where the optimum appearance is desired, should be repaired by the insertion method. Typical insertion repairs are illustrated in Figure 806. Skin damage aft of the front spar which exceeds the negligible damage limit, but is not extensive enough to necessitate replacement of a skin panel, can be repaired by patching.
(4) Damage Necessitating Replacement of Parts.
(a) In case the skin is extensively damaged, repairs should be made by replacing an entire sheet panel from one structural member to the next. The repair seam should be made to lie along stiffening members, or bulkheads, and each seam should be made exactly the same in regard to rivet size, spacing, and rivet pattern as the manufactured seam at the edges of the original sheet. If the two manufactured seams are different, the stronger one should be copied.

D. Wing Ribs.
(1) All ribs except those exposed to the wheel well contain flanged lightening holes. Flanged upper and lower edges of all ribs serve as cap-strips in addition to providing rigidity to the rib. The skin riveted directly to each rib flange provides the cellular strength for each successive rib bay. The nose, center, and trailing edge rib segments are riveted together through the front and rear spars to form the basic airfoil sections. Spanwise alclad stringers stiffen the skin between ribs.
(2) Negligible Damage.
(a) Refer to Negligible Damage paragraph under Wing Skin.

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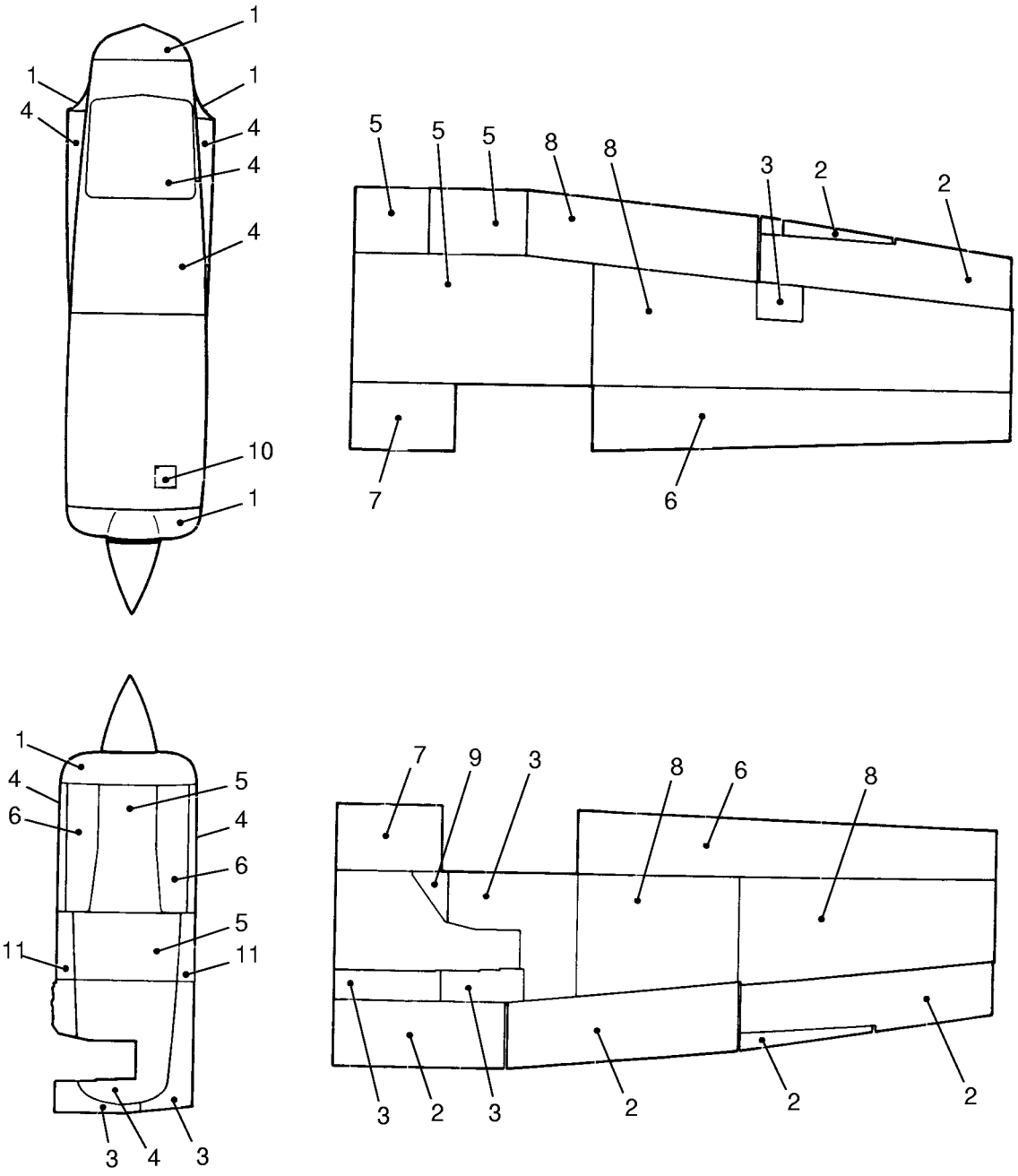
A55149

1. FIBERGLASS
2. .016 INCH 2024 T3 ALCLAD
3. .025 INCH 2024 T3 ALCLAD
4. .025 INCH 2024 T42 ALCLAD
5. .032 INCH 2024 T3 ALCLAD
6. .032 INCH 2024 T42 ALCLAD
7. .040 INCH 2024 T42 ALCLAD
8. .020 INCH 2024 T3 ALCLAD
9. .040 INCH 2024 T3 ALCLAD
10. HONEYCOMB
11. .020 INCH 2024 T42 ALCLAD



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Wing Skin
Figure 805 (Sheet 1)

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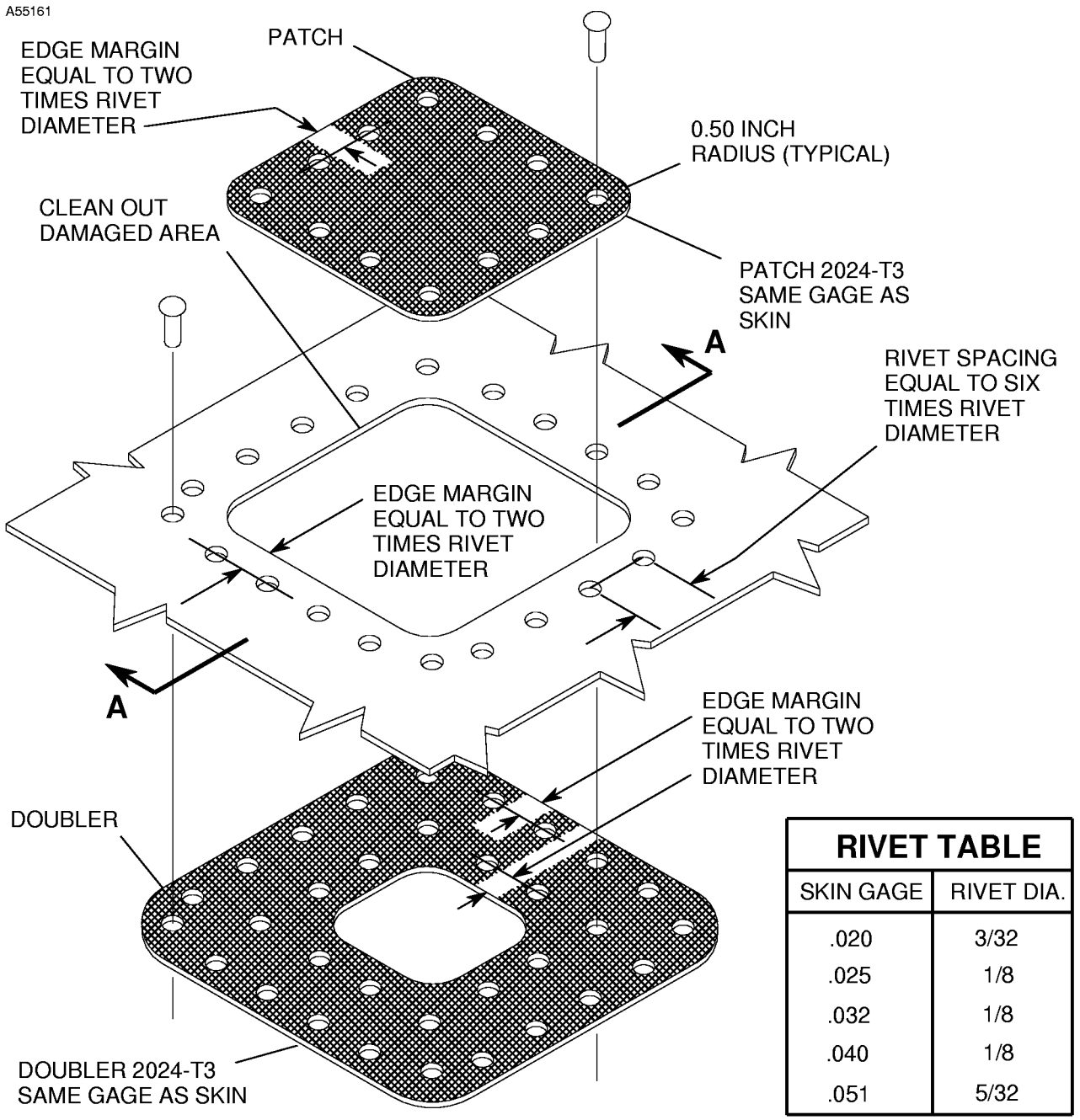
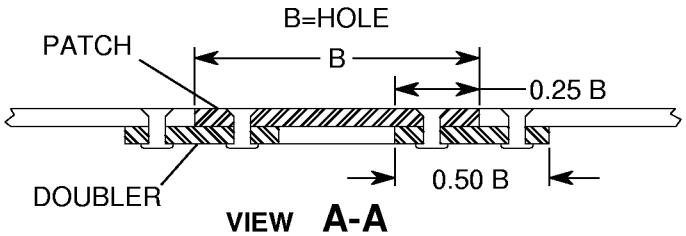


RIVET TABLE	
SKIN GAGE	RIVET DIA.
.020	3/32
.025	1/8
.032	1/8
.040	1/8
.051	5/32



VIEW **A-A**
SECTION THROUGH ASSEMBLED PATCH

ORIGINAL PARTS
REPAIR PARTS
REPAIR PARTS IN CROSS SECTION

268271032
AA2682T1032

Typical Insert Patch
Figure 806 (Sheet 1)

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(3) Repairable Damage.
(a) Repairs for wing rib webs and flanges are shown in Figure 807, Figure 808, and Figure 809. Before repair is attempted, all cracks or deep scratches must be stop-drilled with a 3/32-inch drill, and all sharp corners and ragged edges must be trimmed and deburred.
(4) Damage Necessitating Replacement of Parts.
(a) Parts such as stiffeners, small ribs, clips, and brackets should be replaced if their damage exceeds that specified as negligible. These parts, due to their size, are usually impractical to repair. In many instances, the time required to replace the damaged part may be considerably less than the time required to repair it. This should be considered carefully prior to making any repair whether it be only a small part or a complete component.

E. Wing Spars.
(1) Repair of spar damage affecting the alignment of the wing spar should not be attempted in the field. Permissible spar repairs are illustrated in Figure 810, Figure 811, and Figure 812.
(2) Repair of spar damage caused by exhaust corrosion should be done in accordance with Figure 813.
(a) Tools and Equipment

Number	Item	Manufacturer	Use
AutoSigma 3000	Conductivity Instrument and 0.5 inch diameter 60kHz probe	Krautkramer, Inc. 50 Industrial Park RD P.O. Box 350 Lewis Town, PA 17044 Phone: 717-242-0327 Fax: 717-242-2606	Perform Conductivity Inspection
See paragraph (d)1 a for requirements	Calibration Standards	Any	Calibrate Instrument

(b) Wing spar caps damaged by exhaust gas corrosion can be repaired within the following limits:
1 Removal of up to 20 percent of the upper spar cap flange thickness is permissible. If the repair requires removal of more than 20 percent of the upper spar cap flange material or if the corrosion is in the vicinity of the rear spar splice, spar cap replacement will be required. For an alternative to spar cap replacement, contact Cessna Propeller Aircraft Product Support for an evaluation of the corrosion damage prior to replacement of the spar cap. An alternative repair may be possible.
2 Removal of up to 10 percent of the lower spar cap flange thickness is permissible. If the repair requires removal of more than 10 percent of the lower spar cap flange material or if the corrosion is in the vicinity of the rear spar splice, spar cap replacement will be required. For an alternative to spar cap replacement, contact Cessna Propeller Aircraft Product Support for an evaluation of the corrosion damage prior to replacement of the spar cap. An alternative repair may be possible.
(c) Repair Instruction
1 Remove corrosion including pits, using 320 grit sandpaper or equivalent material while maintaining limits in steps (a)1 and (a)2.
2 Blend the damaged area to get a smooth length-to-depth ratio between the corrosion damage and the immediate surrounding area. Remove all corrosion. Make sure that only enough material is removed to get a lengthwise blending transition ratio of 20 to 1 and along the width with a blending width-to-depth ratio of 5 to 1.
a Example:
If corrosion depth equals 0.005 inch
Length of blended area = 0.005 inch X 20 = 0.1 inch
Width of blended area = 0.005 inch X 5 = 0.025 inch
3 Polish the blended area to a high luster.

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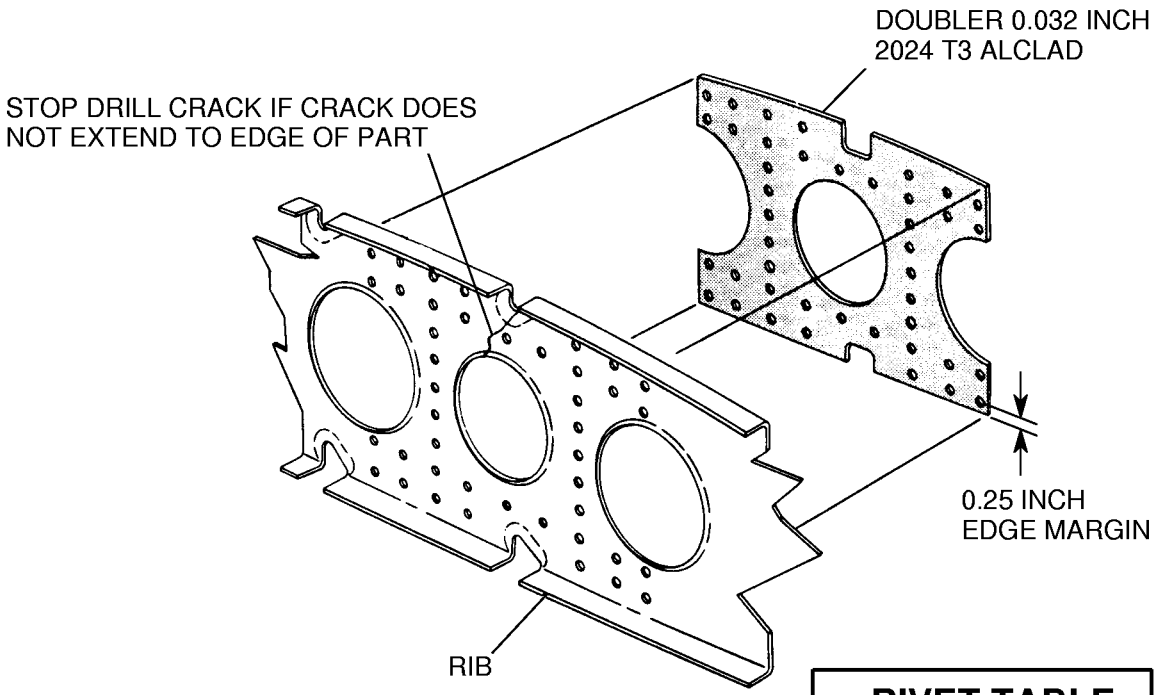

RIVET TABLE	
SKIN GAGE	RIVET DIA.
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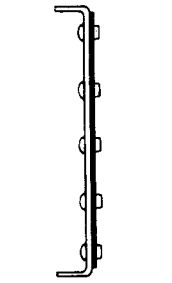
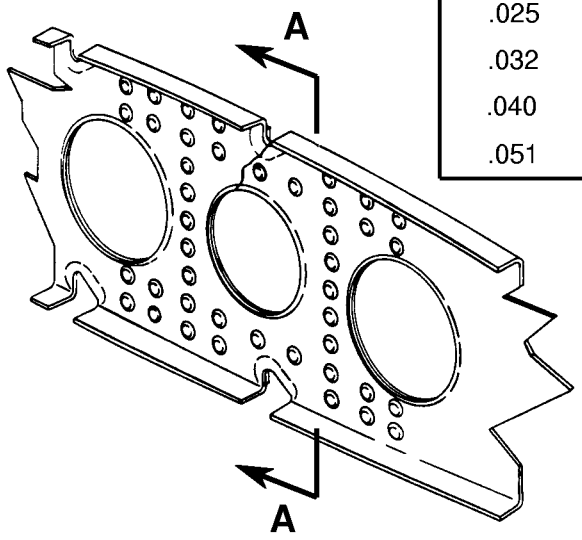
.025	1/8
.032	1/8
.040	1/8
.051	5/32



VIEW **A-A**



ORIGINAL PARTS
REPAIR PARTS
REPAIR PARTS IN CROSS SECTION

Typical Rib Web Repair
Figure 807 (Sheet 1)

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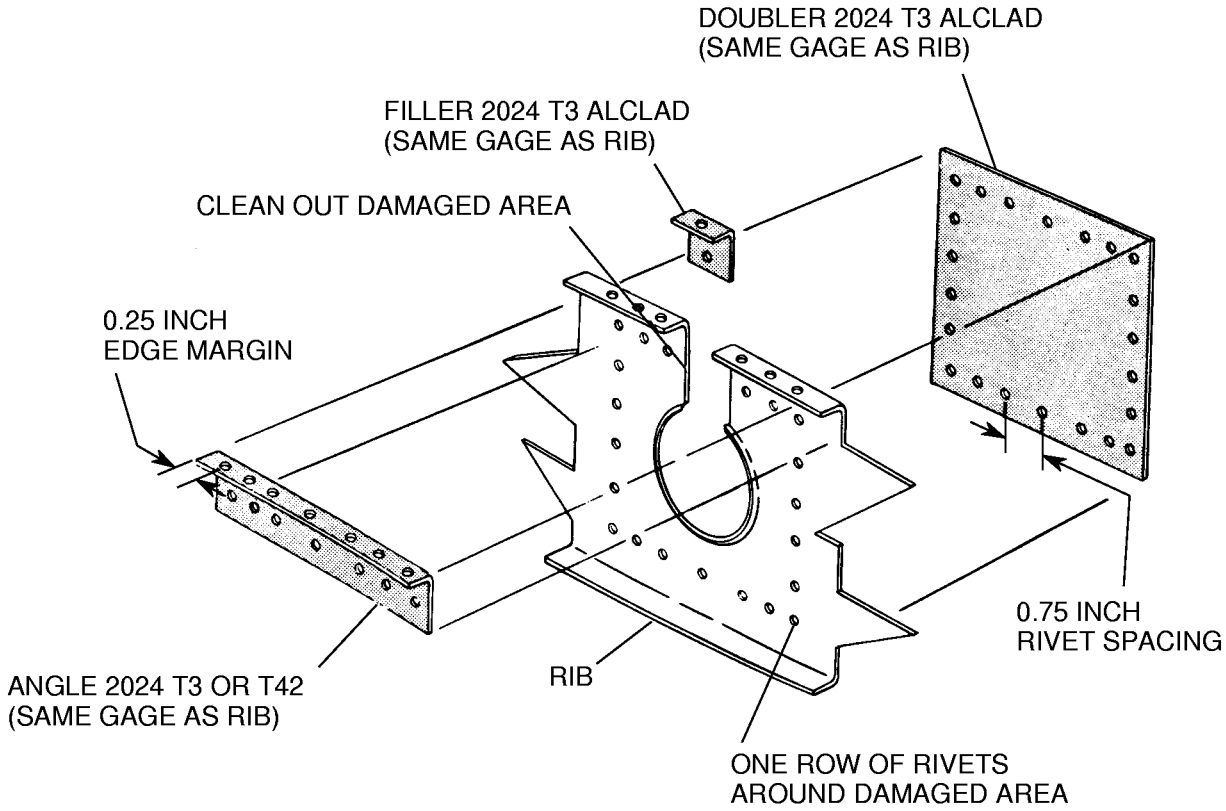
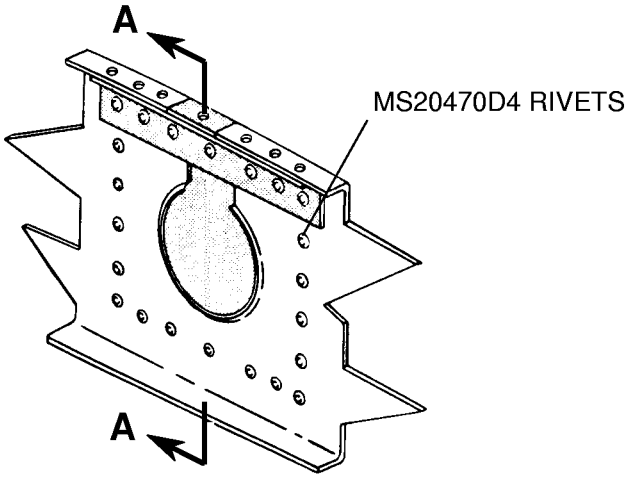
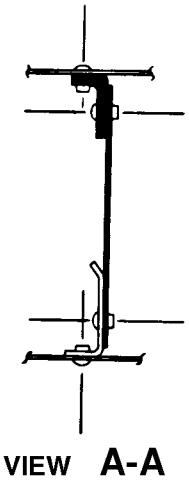
A55171







ORIGINAL PARTS
REPAIR PARTS
REPAIR PARTS IN CROSS SECTION

Typical Rib Flange Repair
Figure 808 (Sheet 1)

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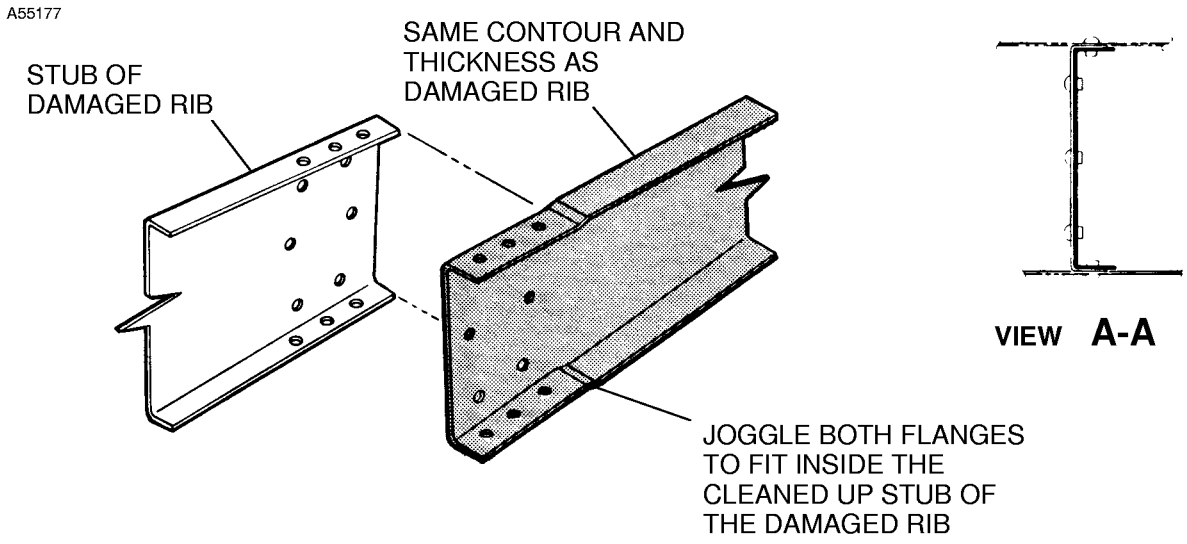
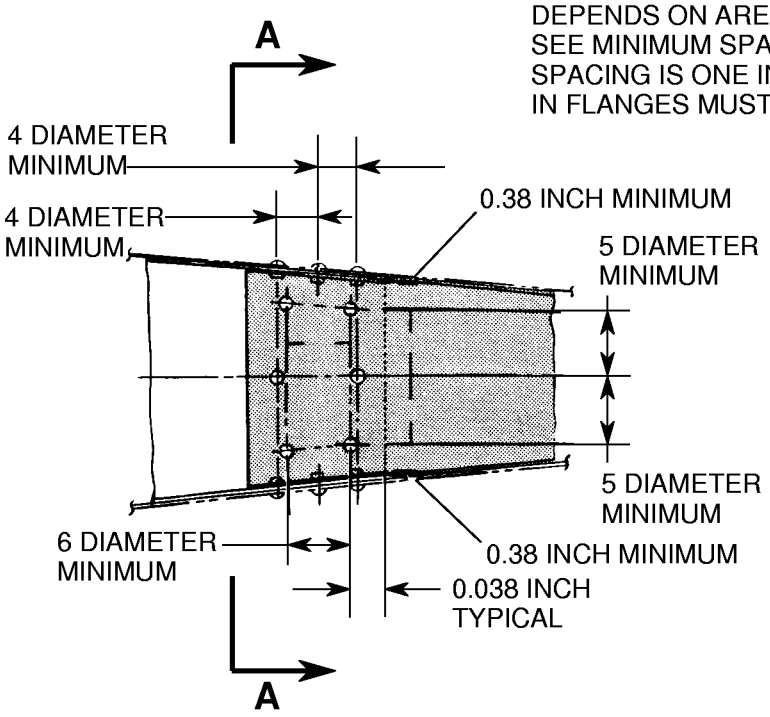


NOTE: NUMBER OF ROWS OF RIVETS IN WEB DEPENDS ON AREA AVAILABLE. SEE MINIMUM SPACING. MAXIMUM SPACING IS ONE INCH. RIVETS IN FLANGES MUST BE AS SHOWN.



NOTE: FOR RIB THICKNESS OF .032 OR LESS USE AD-3 RIVETS AND FOR THICKER MATERIAL USE AD-4.

ORIGINAL PARTS
REPAIR PARTS
REPAIR PARTS IN CROSS SECTION

Typical Repair of Control Surface Rib
Figure 809 (Sheet 1)

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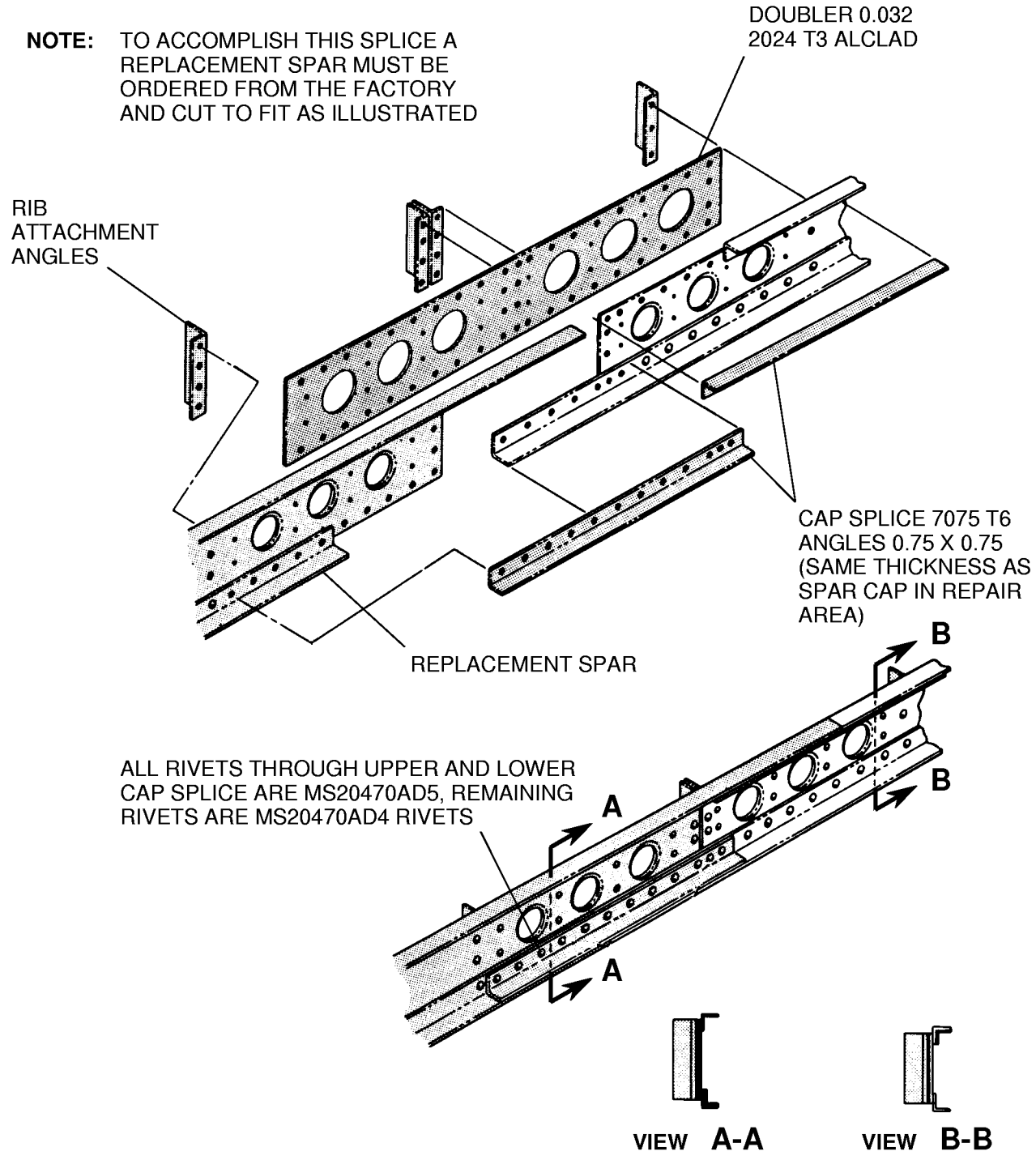
A55173



Typical Rear Spar Repair (Station 111.12 and Outboard)
Figure 810 (Sheet 1)

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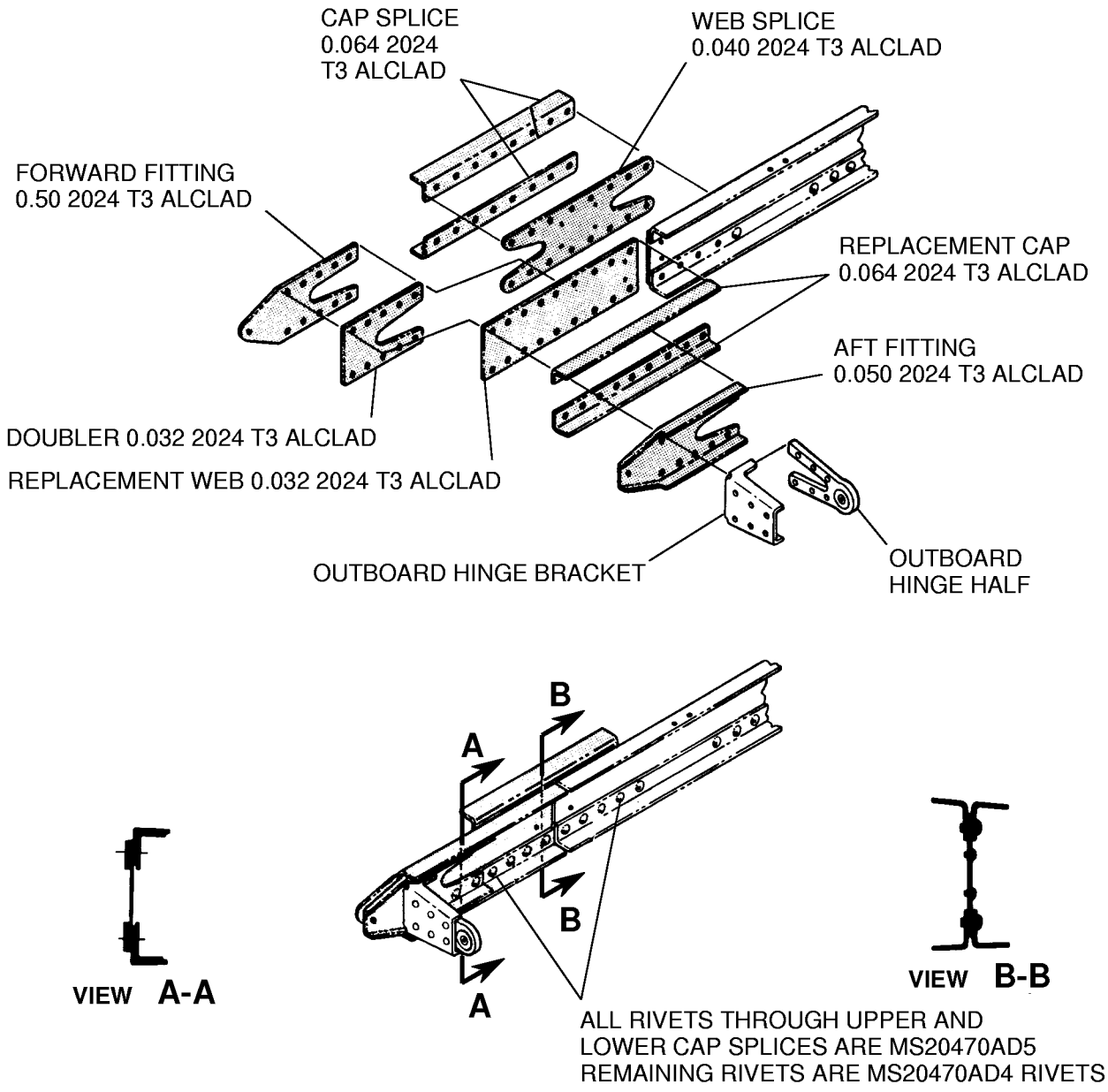

Typical Rear Spar Repair (Station 189.20 and Outboard)
Figure 811 (Sheet 1)

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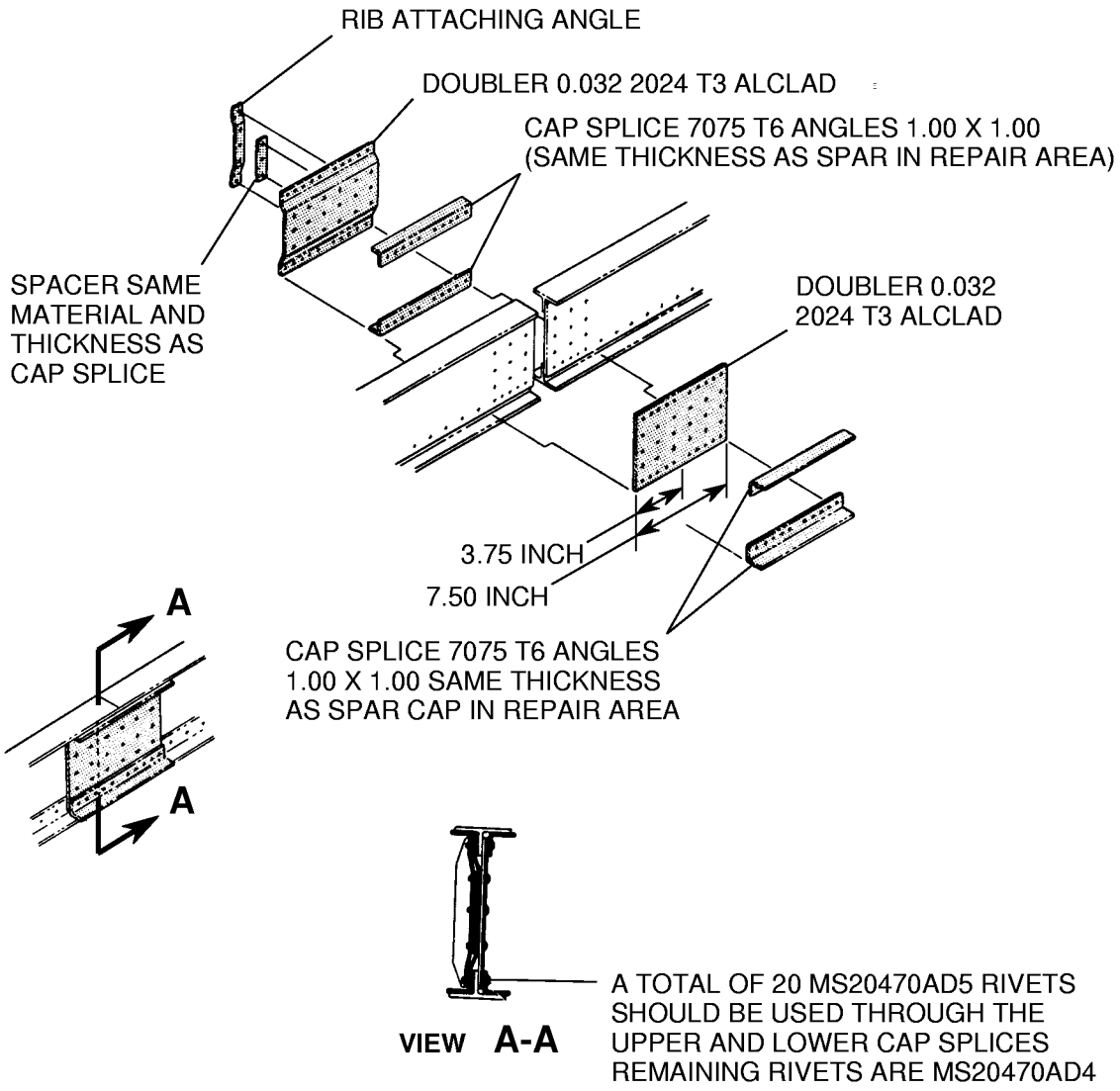
A55175



Typical Front Spar Repair (Station 168.75 and Outboard)
Figure 812 (Sheet 1)

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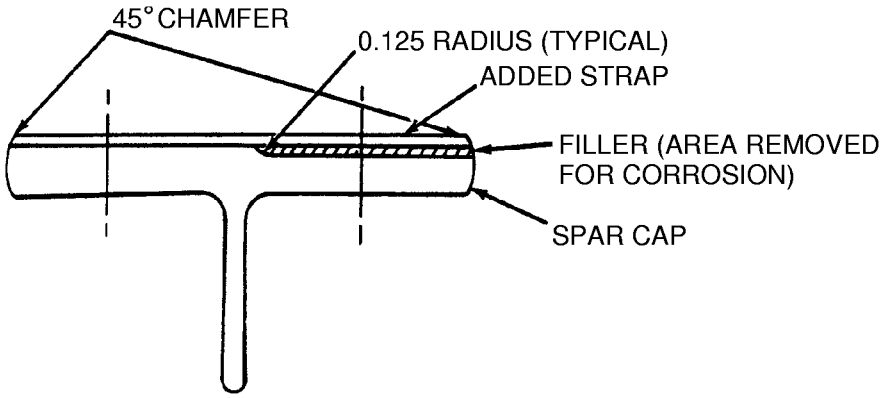
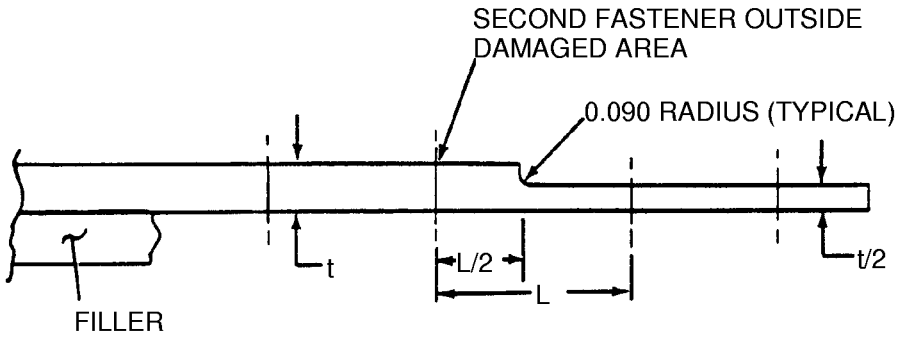
A52252

TYPICAL SPAR CAP REPAIR FOR FRONT AND REAR,
UPPER AND LOWER SPAR CAPS.





IF THE BLENDED OUT REPAIR AREA DOES NOT EXCEED THE REWORK LIMITS AND THE SPAR CONDUCTIVITY IS IN THE ACCEPTABLE RANGE, APPLY CORROSION-RESISTANT PRIMER TO BLENDED AREA. ADD A STRAP AND FILLER AS SHOWN FOR DAMAGE IN INDICATED AREA. STRAP SHALL HAVE A MINIMUM THICKNESS OF 0.050 INCH, BUT NOT TO EXCEED 0.063 INCH. LENGTH OF THE STRAP SHALL BE DETERMINED BY THE REQUIREMENT TO PICK UP SIX EXISTING FASTENERS PER FLANGE ON EITHER SIDE OF DAMAGED AREA. STRAP AND FILLER SHALL BE MADE FROM 2024-T3 OR 7075-T73 WITH GRAIN DIRECTION PARALLEL TO SPAR. THE SAME TYPE AND SIZE FASTENERS ARE TO BE USED AT ALL LOCATIONS UNLESS REQUIRED TO GO TO THE NEXT SIZE DIAMETER. A MINIMUM EDGE DISTANCE OF 1.5 TIMES DIAMETER IS TO BE MAINTAINED. ALL FAYING SURFACES SHOULD BE CLEANED WITH NAPATHA AND BONDED WITH EA9309 ADHESIVE. APPLY CORROSION-RESISTANT PRIMER TO STRAP AFTER INSTALLATION.

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Repair for Exhaust Gas Corrosion on Wing Spar Caps
Figure 813 (Sheet 1)

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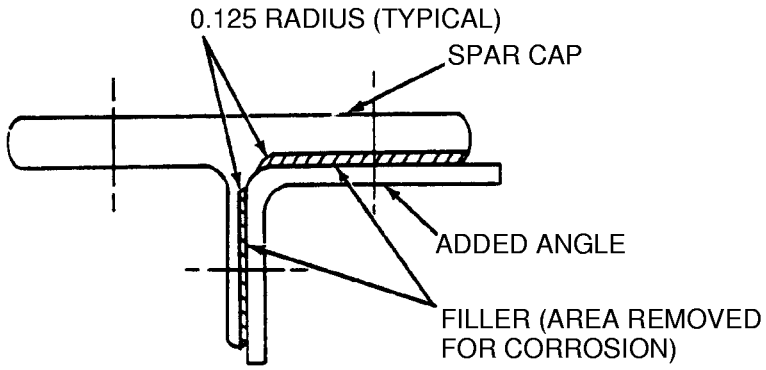
A52253

TYPICAL SPAR CAP REPAIR FOR FRONT AND REAR,
UPPER AND LOWER SPAR CAPS.



IF THE BLENDED OUT REPAIR AREA DOES NOT EXCEED THE REWORK LIMITS AND THE SPAR CONDUCTIVITY IS IN THE ACCEPTABLE RANGE, APPLY CORROSION-RESISTANT PRIMER TO BLENDED AREA. ADD ANGLE, AS SHOWN, FOR DAMAGE IN INDICATED AREA. THE FILLER SHALL REPLACE MATERIAL REMOVED AND BE MADE FROM THE SAME MATERIAL AS ANGLE.

GRAIN DIRECTION OF ANGLE SHALL BE PARALLEL TO THE SPAR. LENGTH OF ANGLE IS DETERMINED BY THE REQUIREMENT TO PICK UP SIX EXISTING FASTENERS PER FLANGE BEYOND THE DAMAGED AREA AT BOTH ENDS OF THE ANGLE. FORMED ANGLE SHALL BE BENT WHILE IN THE ANNEALED CONDITION (2024-0) TO A BEND RADIUS OF 0.16 INCH; THEN HEAT TREATED TO THE T42 CONDITION. THE SAME TYPE AND SIZE FASTENERS ARE TO BE USED AT ALL LOCATIONS UNLESS REQUIRED TO GO TO THE NEXT SIZE DIAMETER. A MINIMUM EDGE DISTANCE OF 1.5 TIMES DIAMETER IS TO BE MAINTAINED. ALL FAYING SURFACES SHOULD BE CLEANED WITH NAPTHA AND BONDED WITH EA9309 ADHESIVE. APPLY CORROSION-RESISTANT PRIMER TO ADDED ANGLE AFTER INSTALLATION.

Repair for Exhaust Gas Corrosion on Wing Spar Caps
Figure 813 (Sheet 2)

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(d) Electrical conductivity test of repaired wing spar
1 Instrument calibration. The instrument calibration shall reflect the conductivity range of the components to be inspected.
a Calibration shall be accomplished using low and high conductivity standards possessing conductivity ranges of 25.0% to 32.0% International Annealed Copper Standard (I.A.C.S.) and 38.0% to 62.0% Internationa Annealed Copper Standard (I.A.C.S.), respectively.
b The ambient temperature differential of the area to be inspected and the test system (test instrument, probe and standards) shall not exceed plus 5 degrees Fahrenheit or minus 5 degrees Fahrenheit prior to calibration and inspection
c Instrument calibration shall be in accordance with the manufacture's instructions.
d Instrument calibration shall be verified after completion of the inspection.
2 Perform conductivity inspection of repaired wing spar. (Refer to MIL-STD-1537, Electrical Conductivity Test foe Measurement of Heat Treatment of Aluminum Alloy, Eddy Current Method).
a Record values of conductivity mapping in the repaired areas.
b With a properly calibrated instrument, obtain electrical conductivity values on the wing spar in the repaired area. This value should fall between 30.0% and 35.0% IACS. If the value does not fall within this range, obtain another measurement from an adjacent area. If the second value is below 30.0% or above 35.0% IACS, mark the area and spar cap replacement will be required. For an alternative to spar cap replacement, contact Cessna Propeller Aircraft Product Support for an evaluation of the corrosion damage prior to removing and replacing the spar cap.
c Install strap or angle on spar in area of corrosion removal. (Refer to Figure 813.

F. Flaps and Ailerons.
(1) Negligible Damage.
(a) Minor skin dents and nicks are considered negligible and can be worked out by burnishing.
(2) Repairable Damage.
(a) Skin damage exceeding that considered negligible damage can be repaired by patching. Typical skin repairs are illustrated in Figure 801, Figure 802, Figure 803, and Figure 804.
(3) Damage Necessitating Replacement of Parts.
(a) Warped and cracked skin, ribs, hinge brackets, and torque tubes are replaceable items. Any damage that covers more than half of the unit will require replacement of the entire unit.

3. Tail Group

A. The all-metal tail group is of full cantilever design, consisting of the conventional arrangement of vertical fin and rudder, horizontal stabilizer, and elevators. The right elevator and rudder both contain flight adjustable trim tabs, actuated by a system of cables and pulleys controlled from the pilots tab control wheels.

B. Vertical Fin and Dorsal Group (Refer to Figure 814 and Figure 815).
(1) The vertical fin and dorsal area are constructed jointly to form a single unit. Basically the unit consists of formed sheet metal spars and ribs to which the outer skin is attached. The front spar is reinforced at its root end and drilled to facilitate the installation of two attachment bolts. Stiffness to the entire fin and dorsal assembly is provided by the attachment of the skins and the forward leading edge skin.
(2) Negligible Damage.
(a) Refer to Negligible Damage paragraph under Wing Skin.
(3) Repairable Damage.
(a) Repair of the skins, ribs and spars can be accomplished as illustrated in Figure 801, Figure 802, Figure 803, and Figure 804. Access to the internal fin structure is best gained by removing the skin attaching rivets on one side of the rear spar and springing back the skin.

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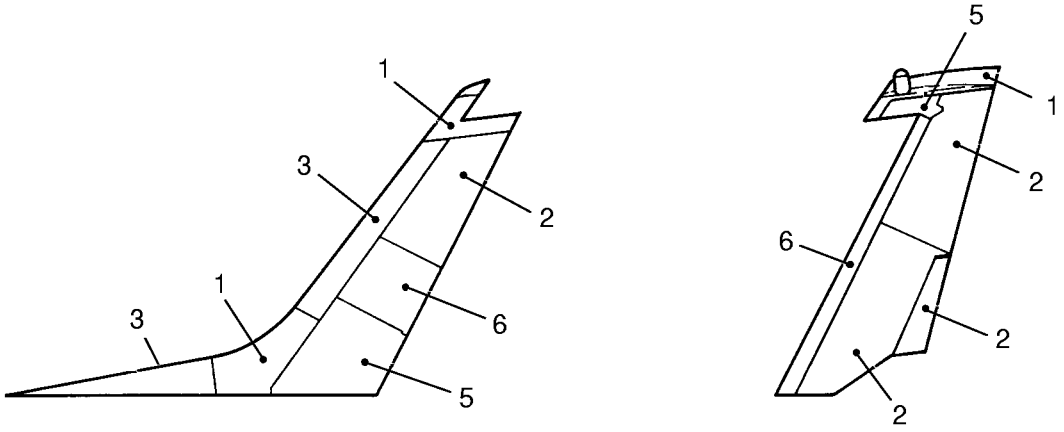
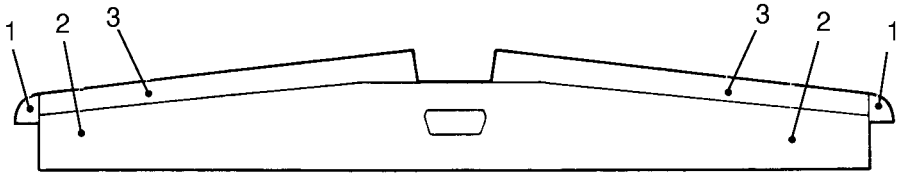
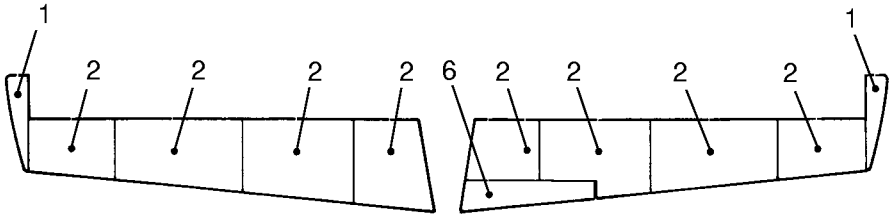
1. FIBERGLASS
2. .016 INCH 2024 T3 ALCLAD
3. .025 INCH 2024 T3 ALCLAD
4. .025 INCH 2024 T42 ALCLAD
5. .032 INCH 2024 T3 ALCLAD
6. .020 INCH 2024 T3 ALCLAD



VERTICAL FIN AND RUDDER



HORIZONTAL STABILIZER



ELEVATORS

TRIM TAB

10302001

Empennage Skin
Figure 814 (Sheet 1)

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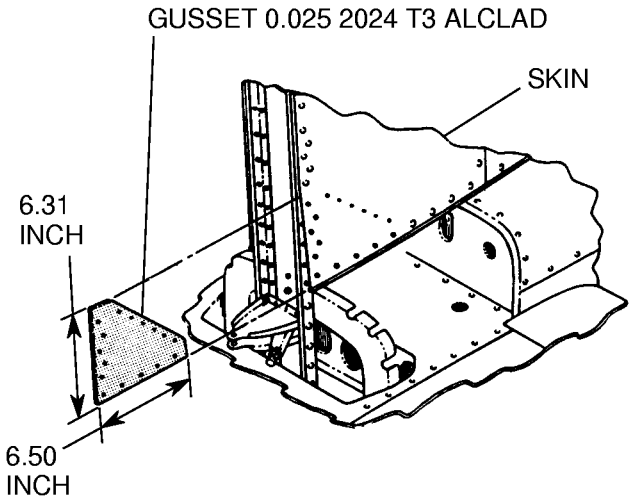
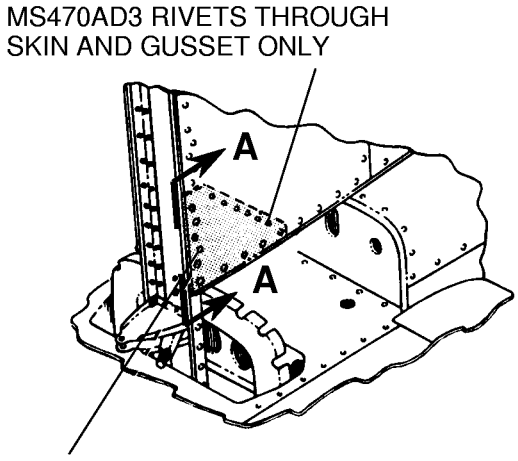


VIEW **A-A**



ORIGINAL PARTS
REPAIR PARTS
REPAIR PARTS IN CROSS SECTION

Typical Vertical Fin Repair
Figure 815 (Sheet 1)

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(4) Damage Necessitating Replacement of Parts.
(a) Extrusion, hinge brackets, and small ribs should be replaced rather than repaired. In general, where parts are available, the easiest and most satisfactory repairs can be accomplished by replacing the damaged parts.

NOTE: After repairs, replacement, or painting of control surface, it must be balanced before installation.

C. Rudder.
(1) Negligible Damage.
(a) Minor skin dents and nicks are considered negligible and will be worked out by burnishing.
(2) Repairable Damage.
(a) Skin damage, exceeding that considered negligible damage, can be repaired by patching. Typical skin repairs are illustrated in Figure 801, Figure 802, Figure 803, and Figure 804.
(3) Damage Necessitating Replacement of Parts.
(a) Warped and cracked skin, ribs, hinge brackets, and torque tubes are replaceable items. Any damage that covers more than half of the rudder will require replacement of the rudder.

D. Horizontal Stabilizer.
(1) Negligible Damage.
(a) Refer to Negligible Damage paragraph under Wing Skin.
(2) Repairable Damage.
(a) Skin damage, exceeding that considered negligible damage, can be repaired by patching. Typical skin repairs are illustrated in Figure 801, Figure 802, Figure 803, and Figure 804. Repairs to spars should consist of channels formed of the same material and bend radius as the spar and extending at least three inches each side of the damaged area. Access to the internal stabilizer structure may be gained by removing a portion of the rivets along the rear spar and ribs and springing back the skin. By using the proper bucking bars through holes in the spar web, the skins may be closed with a minimum of blind rivets.
(3) Damage Necessitating Replacement of Parts.
(a) Extrusions, hinge brackets, stabilizer tab, spar, and ribs should be replaced rather than repaired. In general, where parts are available, the easiest and most satisfactory repairs can be accomplished by replacing the damaged parts.

E. Elevators.
(1) Negligible Damage.
(a) For a description of negligible damage, refer to Negligible Damage paragraph under Wing Skin. The exception to negligible damage on the elevator surfaces is the front spar, a crack appearing in the web at the hinge fittings, or in the tip rib which supports the overhanging balance weight is not considered negligible. Cracks in the overhanging tip rib, in the area at the front spar intersection with the web of the rib, also cannot be considered negligible (Refer to Figure 816).
(2) Repairable Damage.
(a) Skin damage, exceeding that considered negligible damage, can be repaired by patching. Typical skin repairs are illustrated in Figure 801, Figure 802, Figure 803, and Figure 804.
(3) Damage Necessitating Replacement of Parts.
(a) Warped and cracked skin, ribs, hinge brackets, and torque tubes are replaceable items. Any damage that covers more than half of the elevator will require replacement of the elevators.

4. Fuselage

A. The fuselage is of semimonocoque construction consisting of formed bulkheads, longitudinal stringers, reinforcing channels, and skin platings. The fuselage forward section consists of all the fuselage structure from the nose to station 109.37. Formed bulkheads, channels, roll sections, and extrusions constitute the frame members of the cabin area (Refer to Figure 817, Figure 818, Figure 819, Figure 820, Figure 821, Figure 822, and Figure 823).

B. Negligible Damage.
(1) Refer to Negligible Damage paragraph under Wing Skin.

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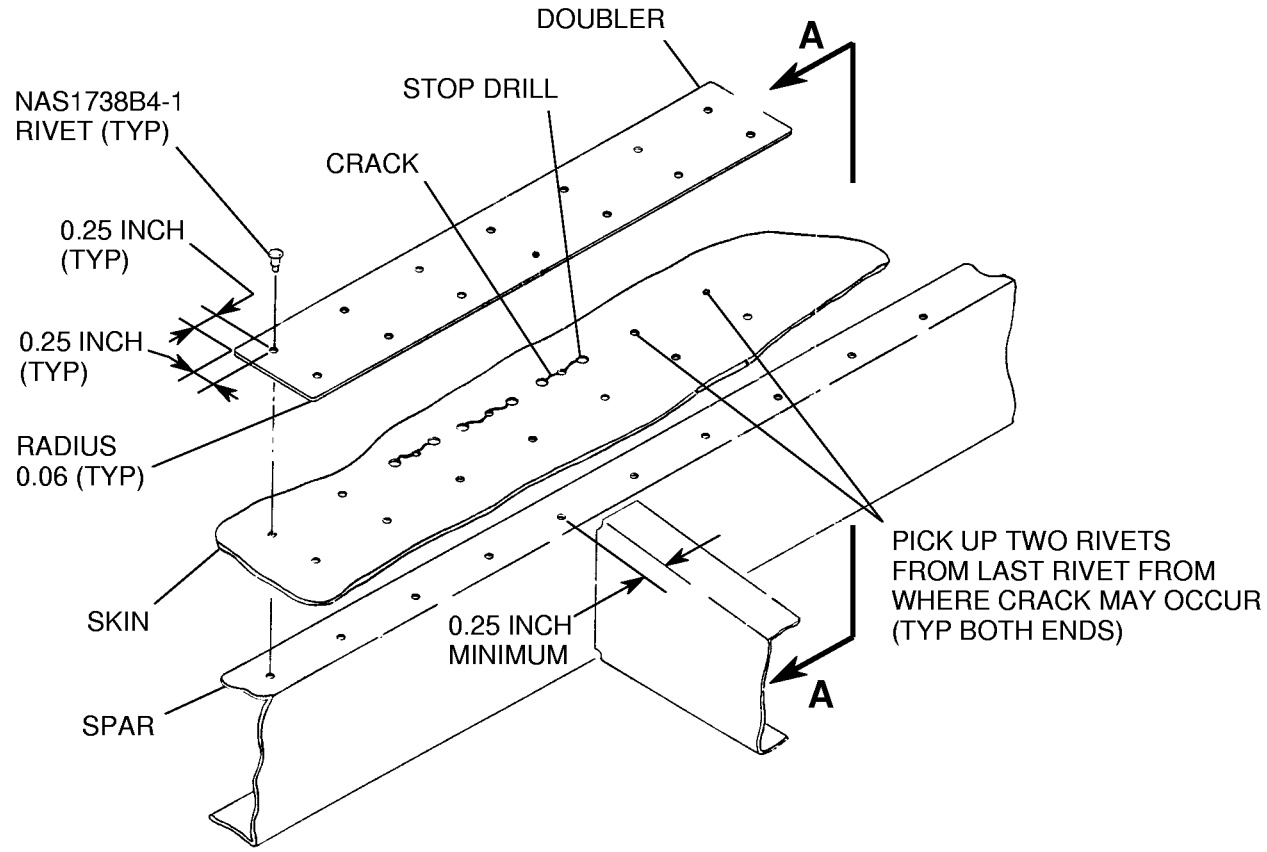
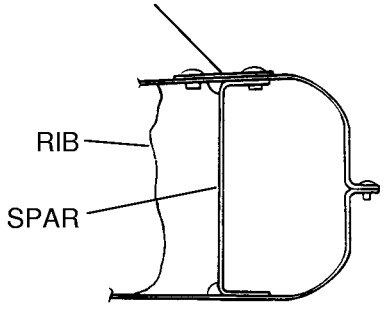


DOUBLER TO BE 0.016 X1.25 X LENGTH
AS REQUIRED 2024 T3 ALCLAD
QQ-A-250/5. DOUBLER MAY BE
INSTALLED INSIDE OR OUTSIDE OF SKIN

STOP DRILL BOTH ENDS OF CRACK WITH
0.098 DIAMETER DRILL (THRU SKIN ONLY)



VIEW A-A

51342001

Typical Elevator Skin Repair
Figure 816 (Sheet 1)

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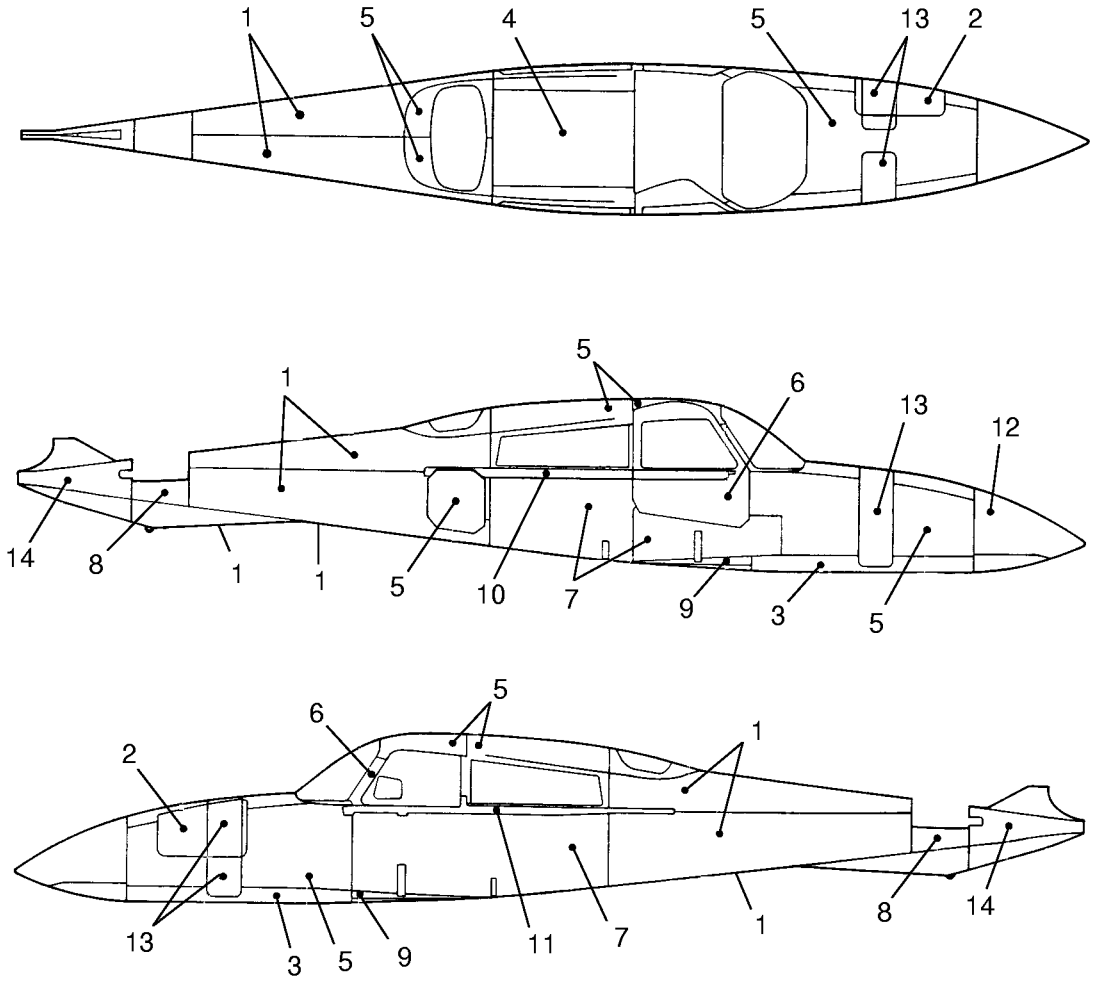
A55152

1. .016 INCH 2024 T3 ALCLAD
2. .020 INCH 2024 T3 ALCLAD(BOND ASSY)
3. .020 INCH 2024 T42 ALCLAD
4. .025 INCH 2024 T3 ALCLAD
5. .025 INCH 2024 T42 ALCLAD
6. .032 INCH 2024 T3 ALCLAD
7. .032 INCH 2024 T42 ALCLAD
8. .040 INCH 2024 T3 ALCLAD
9. .040 INCH 2024 T42 ALCLAD
10. .080 INCH 2024 T42 ALCLAD
11. .090 INCH 2024 T3 ALCLAD
12. FIBERGLASS
13. POLY-CARB
14. ROYALITE



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Fuselage Skin
Figure 817 (Sheet 1)

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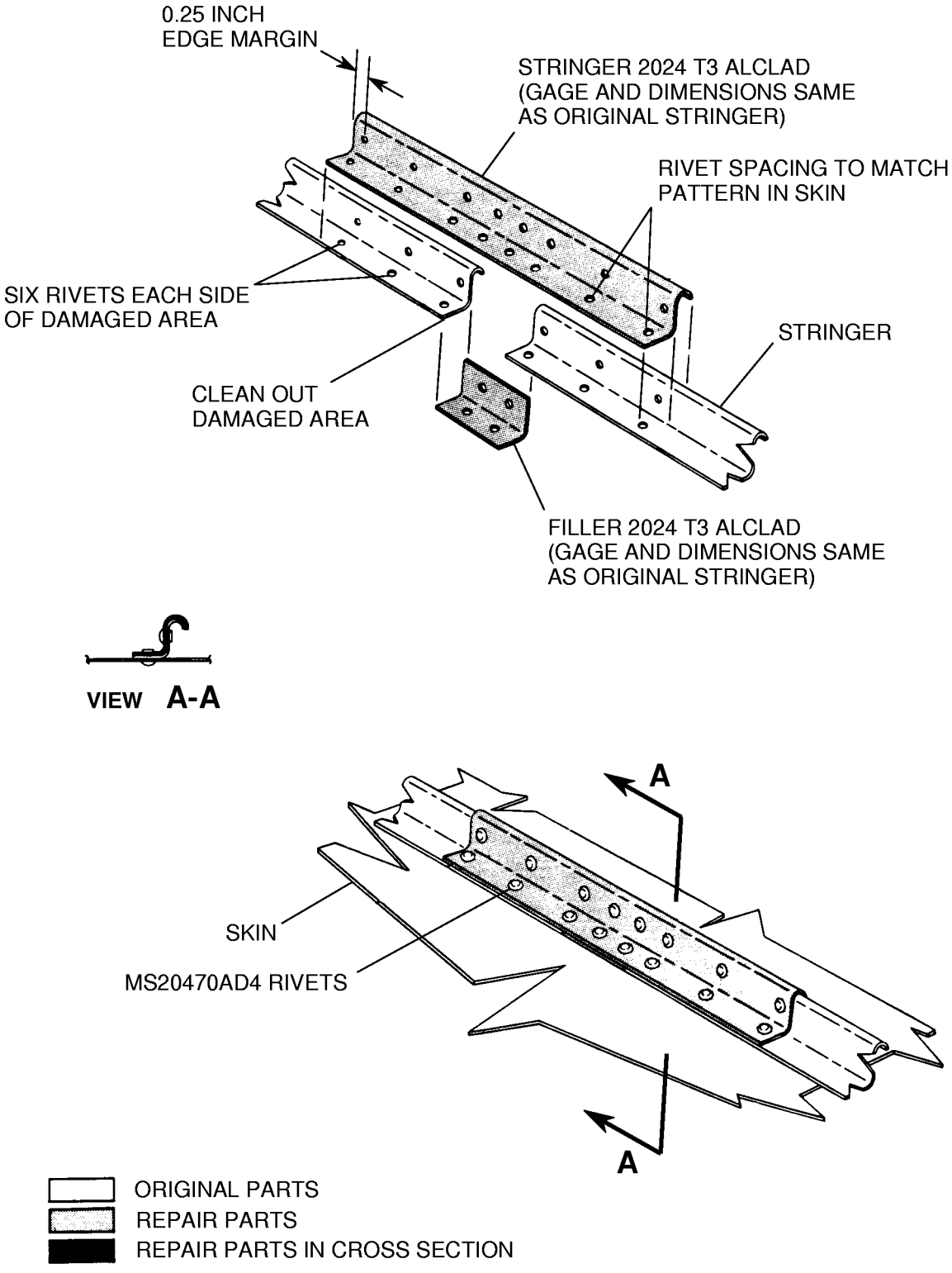

Typical Fuselage Stringer Repair
Figure 818 (Sheet 1)

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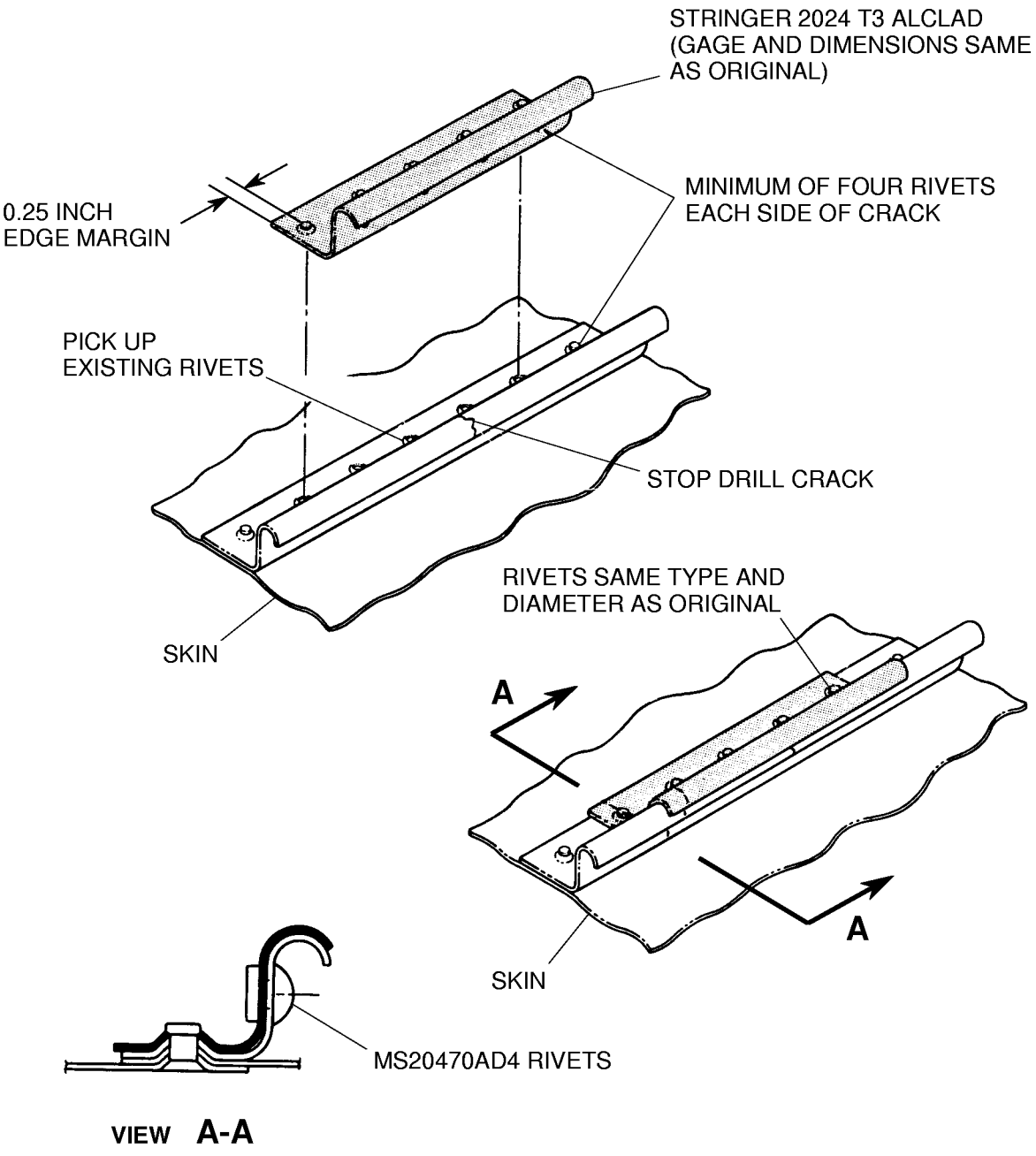

VIEW A-A

ORIGINAL PARTS
REPAIR PARTS
REPAIR PARTS IN CROSS SECTION

Typical Fuselage Stringer Repair
Figure 818 (Sheet 2)

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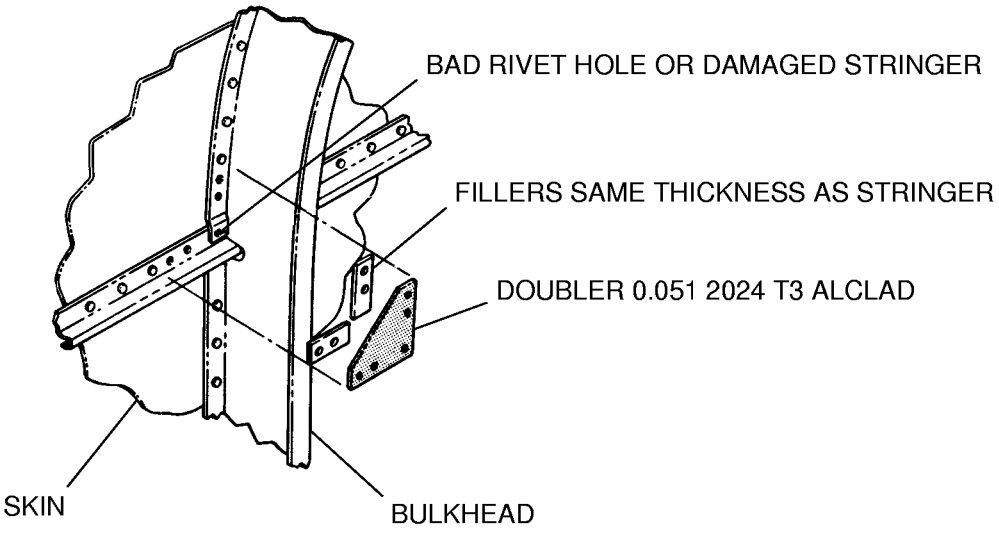
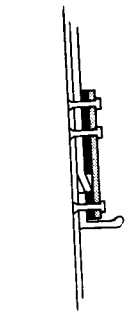
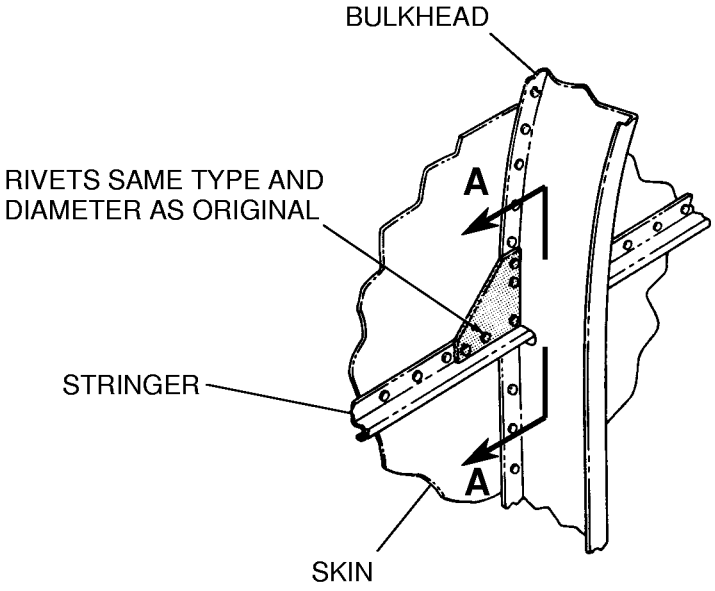
A55164





VIEW **A-A**



ORIGINAL PARTS
REPAIR PARTS
REPAIR PARTS IN CROSS SECTION

Typical Stringer to Bulkhead Repair
Figure 819 (Sheet 1)

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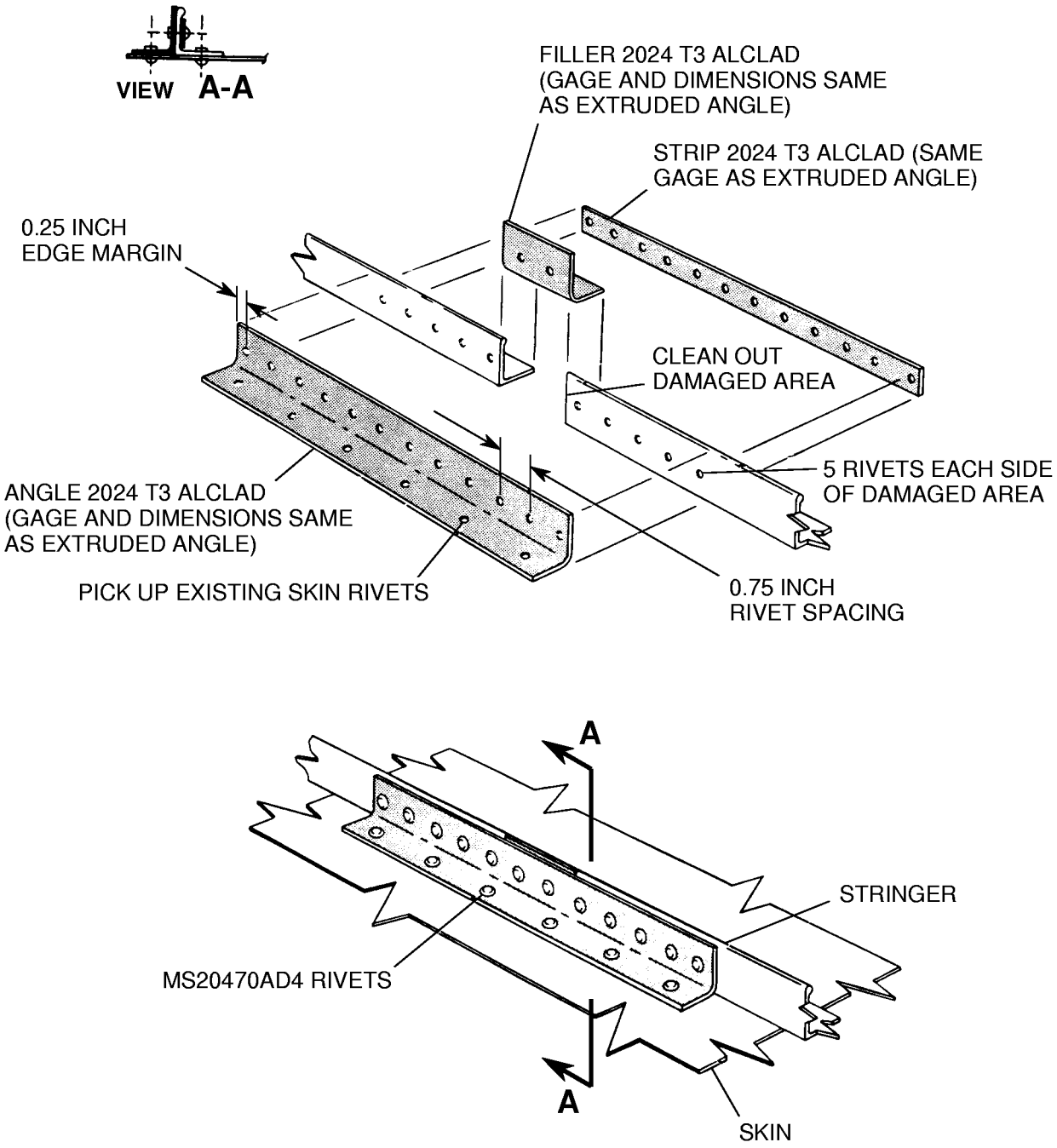

Typical Stringer Repair
Figure 820 (Sheet 1)

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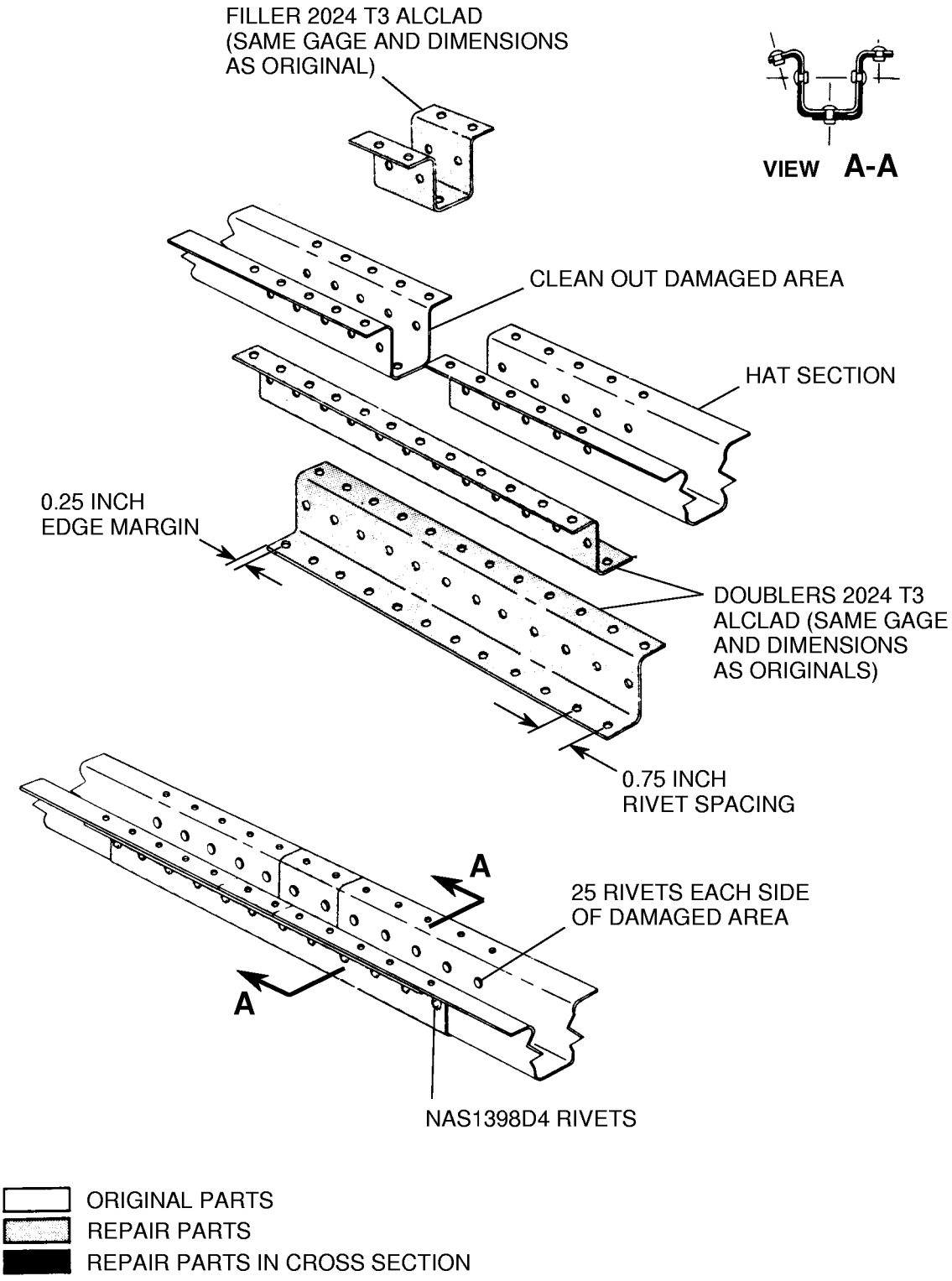

Typical Hat Section Repair
Figure 821 (Sheet 1)

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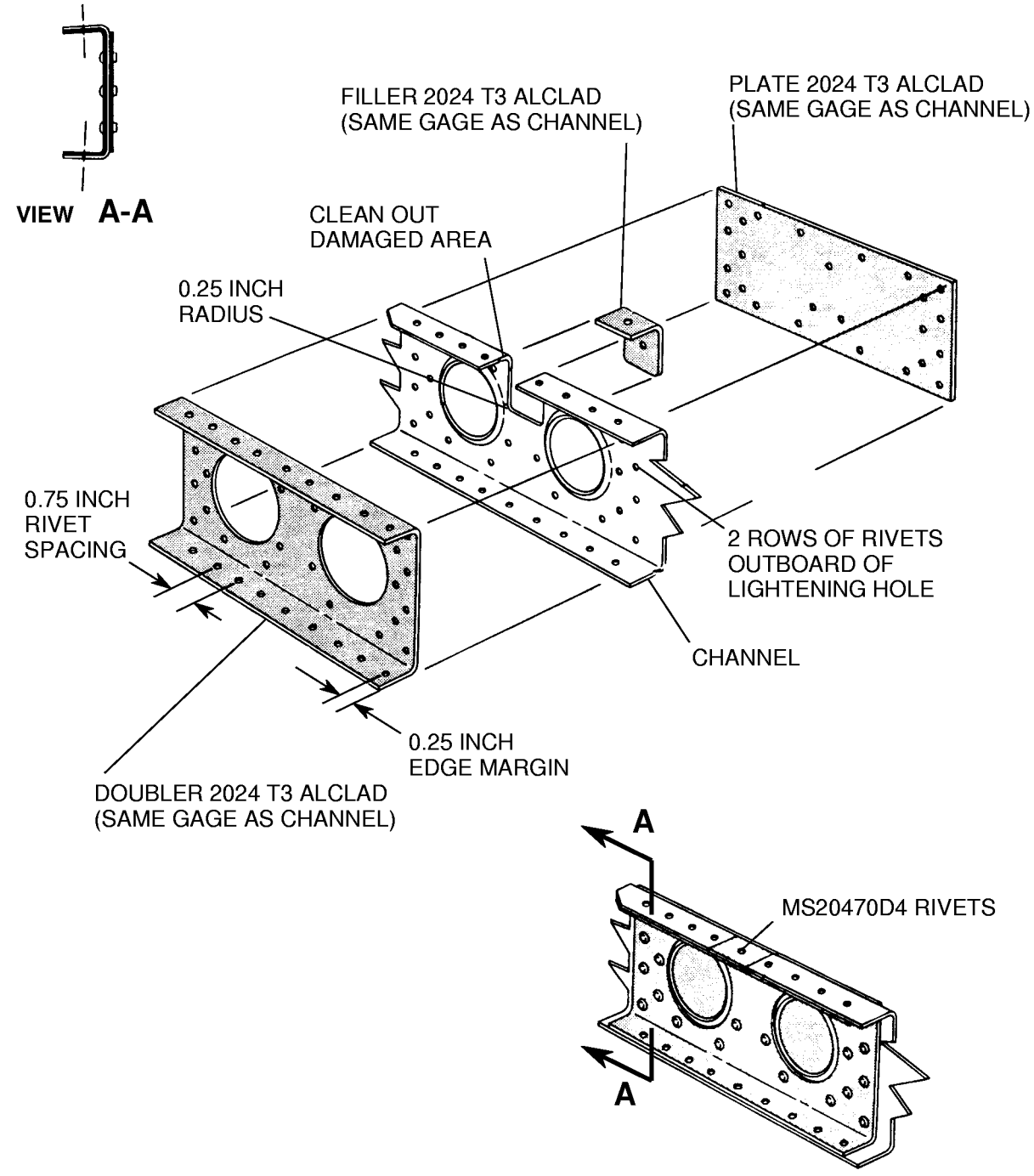

Typical Channel Flange Repair
Figure 822 (Sheet 1)

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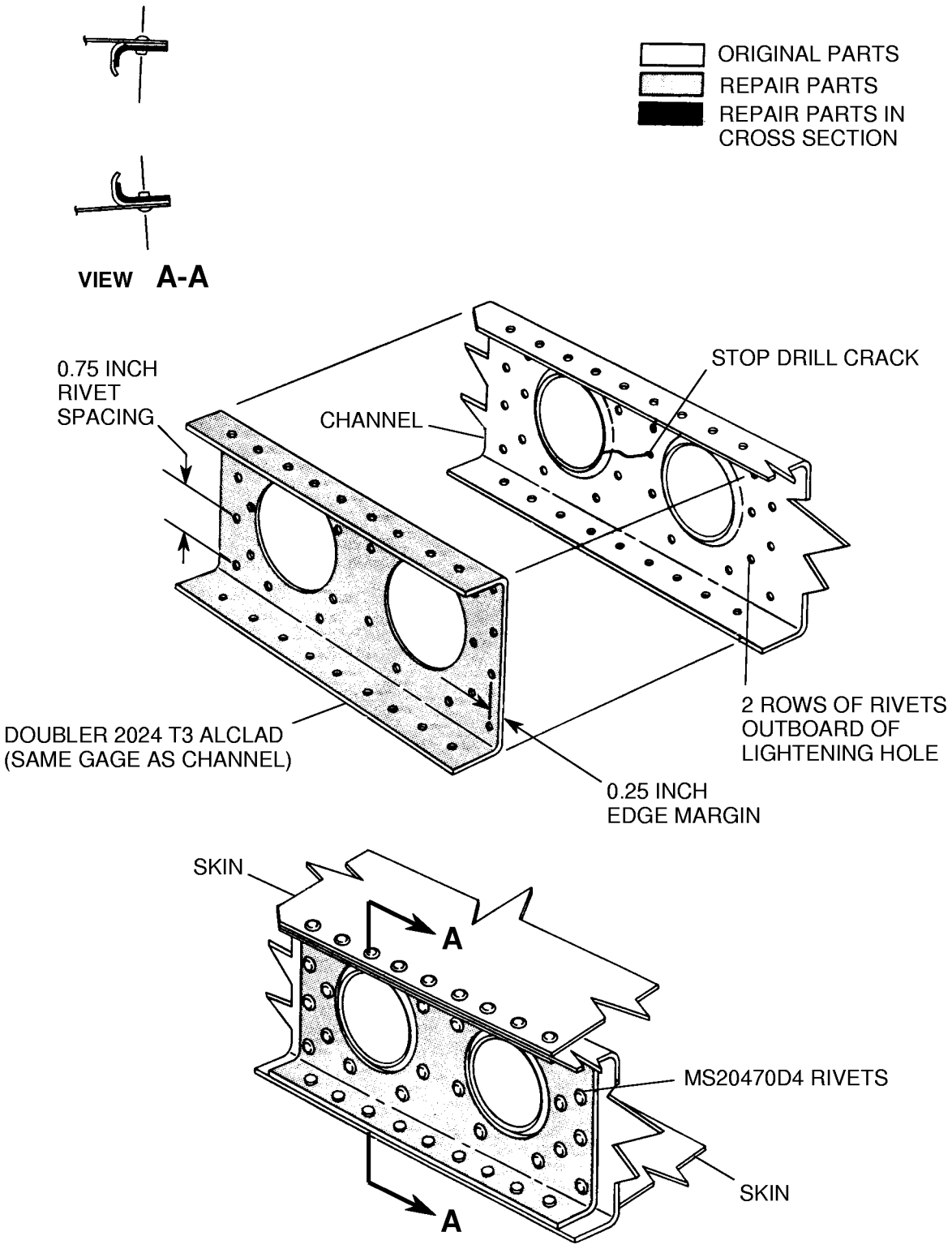

Typical Channel Repair
Figure 823 (Sheet 1)

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C. Repairable Damage.
(1) Mild wrinkles occurring in the upper or lower skin panels in the bay forward of the horizontal stabilizer and which extend through the corners (shoulder areas) may be repaired by the addition of a stringer. A wrinkle, which is hand removable, should be reinforced by a 1/2 x 1/2 x 0.050-inch 2024-T42 extruded angle. The angle should be inserted fore and aft across the center of the wrinkle and should extend to within 1/16 to 1/8-inch of the fuselage bulkheads comprising the ends of the bay. If wrinkles cannot be removed by hand, the damaged area should be repaired.

D. Damage Necessitating Replacement of Parts.
(1) All forgings and castings of any material and structural parts made of steel must be replaced if damaged. Structural members of a complicated nature that have been distorted or wrenched should be replaced. Major skin damage should be repaired by replacing the entire damaged sheet.

NOTE: When replacing entire skin panels, duplication of the forward edge of the original sheet is required. In effect, this flange is a structural member, carrying specific loads across the open areas.

5. Bulkheads

A. Bulkheads are composed of formed “U” channel sections. The principle material of construction is 2024-0 alclad aluminum alloy, which after forming is heat treated to a 2024-T42 condition. All bulkheads in the fuselage are of the formed sheet metal or the reinforced formed sheet metal type.

B. Cracked Bulkhead Webs or Flanges.
(1) Acceptable methods of repairing various types of cracks occurring in service are shown in Figure 818, Figure 819, Figure 820, Figure 821, Figure 822, and Figure 823. Small holes (3/32-inch) should be drilled at the extreme ends of the cracks to prevent further spreading. Reinforcement should be added to carry the stresses across the damaged portion and stiffen the joints. The condition causing such cracks to develop at a particular point may be stress concentration at that point, in conjunction with repetition of stress (such as produced by vibration of the structure). The stress concentration may be due to defects such as nicks, scratches, tool marks, and initial stresses or cracks from forming or heat treating operations.

NOTE: An increase in sheet thickness alone is usually beneficial, but does not necessarily remedy the conditions leading to cracking. Patch type repairs are generally employed and are usually satisfactory in restoring the original material strength characteristics.

C. Severely Bent, Kinked, or Torn Channels.
(1) If practical, severely bent, kinked, or torn portions of bulkheads should be removed and a replacement section installed and joined at the original splice joint. If this is not justified, cutting away the damaged portion and inserting a trimmed portion of the original section, adequately reinforced by splice plates or doublers, will prove satisfactory. This is known as an insertion type repair.

6. Landing Gear

A. The main gears are carried by the wings and are housed within the wing wheel wells when retracted. The nose gear retracts into the fuselage nose wheel well. Doors covering the wells are regarded as parts of the landing gear assemblies, but the wells are structural features of the wings and fuselage.

B. Repairs of Landing Gear.
(1) The landing gear assemblies are composed of parts that are not regarded as repairable. Minor repairs are permissible on the doors, but when they are reinstalled there must be no distortion that will prevent perfect operation.

7. Engine Nacelle Group

A. The engine nacelle group, located in each wing, is composed of the semicantilever bed-type mount, the stainless steel firewall, and the cowling group. The engine mount structure is made of 0.063 inch 2024-T4 aluminum and 4130 cad-plated steel. The cowling is made up of three sections; the upper,

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the lower, which includes the left and right access doors, and the two piece nose section which fastens in the center of the cowling. All sections fasten in place with Camloc quick fasteners. The nacelle firewall is made up of stainless steel sheet with a clad aluminum angle riveted around its contour.

B. Negligible Damage.
   (1) Minor dents in the firewall and cowling, if straightened, may be classified as negligible damage. Scratches and dents should be burnished out.

C. Engine Firewall.
   (1) Repair of Stainless Steel Firewall.
      (a) The firewall may be repaired by using the clear of structure-type patch, as shown in Figure 824, providing the patch is of the same thickness as the firewall and monel rivets are used. Maximum diameter on holes that can be patched is 2 inches. The holes should be routed and repaired. Cracks should be stop drilled and repaired. Parts having cracks extending to the edge of the part must be replaced. Maximum allowable length of cracks to be repaired is 3 inches.

D. Engine Firewall Sealing.
   (1) The engine firewall should be sealed with Pro-Seal #700 (Coast Pro-Seal Company) using the following procedures:
      (a) Clean area on surface to be sealed with solvent.
      (b) Mix 1 part of Pro-Seal #700 curing agent with 100 parts of Pro-Seal #700 sealant.

         NOTE: Sealant should be mixed by weight. It is important that accelerator be completely and uniformly dispersed throughout the base compound.

      (c) Using a spatula, caulking gun, or flow gun, apply a fillet of sealer along cracks, seams, joints, and rows of rivets.

         NOTE: If the sealing is done before the parts are mated, use enough sealing compound to completely fill the joint and wipe away the excess after parts are mated.

         NOTE: If the sealant is applied with a brush or a brush flow gun, more than one coat of sealant will be necessary on very porous material. The sealant should be allowed to air dry 10 minutes between coats.

E. Engine Mount.
   (1) Replacement of mount is the only recommended procedure.

F. Repair of Engine Cowling.
   (1) Skin, if damaged extensively, should be replaced with a section of original manufacture. Small damaged areas should be reinforced with a doubler installed on the inner side. Material selected should be of the same thickness and characteristics as the original part.

G. Repair of Cowling Reinforcement.
   (1) Cowling reinforcements, if damaged, should be replaced. Due to their small size and complex angles they are easier to replace than to repair.

H. Repair Procedures for Bonded Honeycomb Engine Cowls (Refer to Figure 825).
   (1) Skins using a sandwich type honeycomb construction may sometime during the life of the airplane have damage to the skin and/or honeycomb which will require repairs. In the event damage does occur, the following repair procedures have been developed with the objective of equaling, as nearly as possible, the strength of the original part with a minimum loss of aerodynamic characteristics, electrical properties, and minimize increase in overall weight.
   (2) Damages to sandwich honeycomb construction are divided into classes according to severity and possible effect upon the airframe structure. Damage classifications are as follows:
      (a) Class 1 - Dents, scars, scratches, cracks, etc., in the facings not accomplished by a puncture or a fracture.
      (b) Class 2 - Punctures or fractures on one facing only, possibly accompanied by damage to the honeycomb core, but without damage to the opposite facing.

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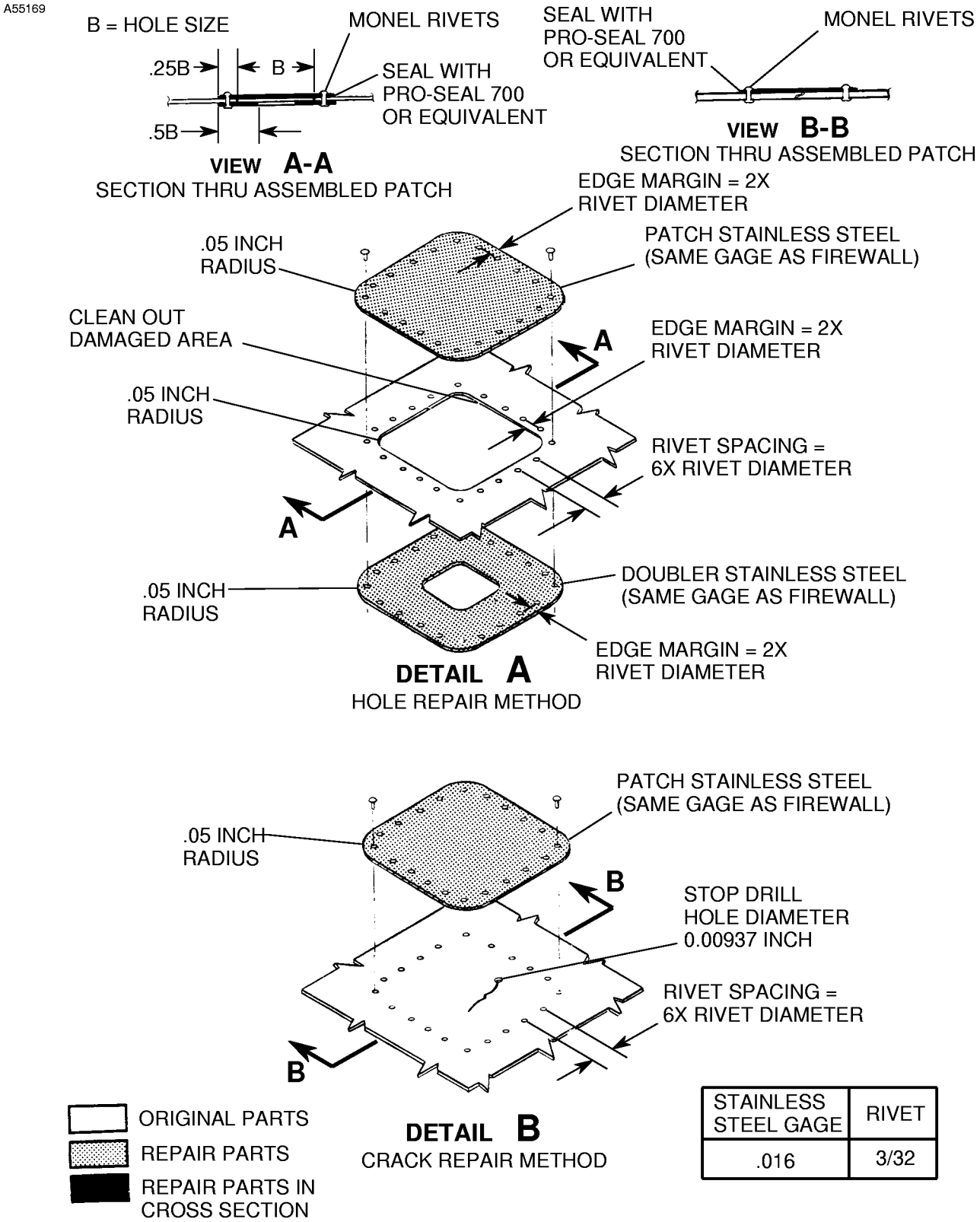

STAINLESS STEEL GAGE	RIVET
.016	3/32

Repair of Firewall
Figure 824 (Sheet 1)

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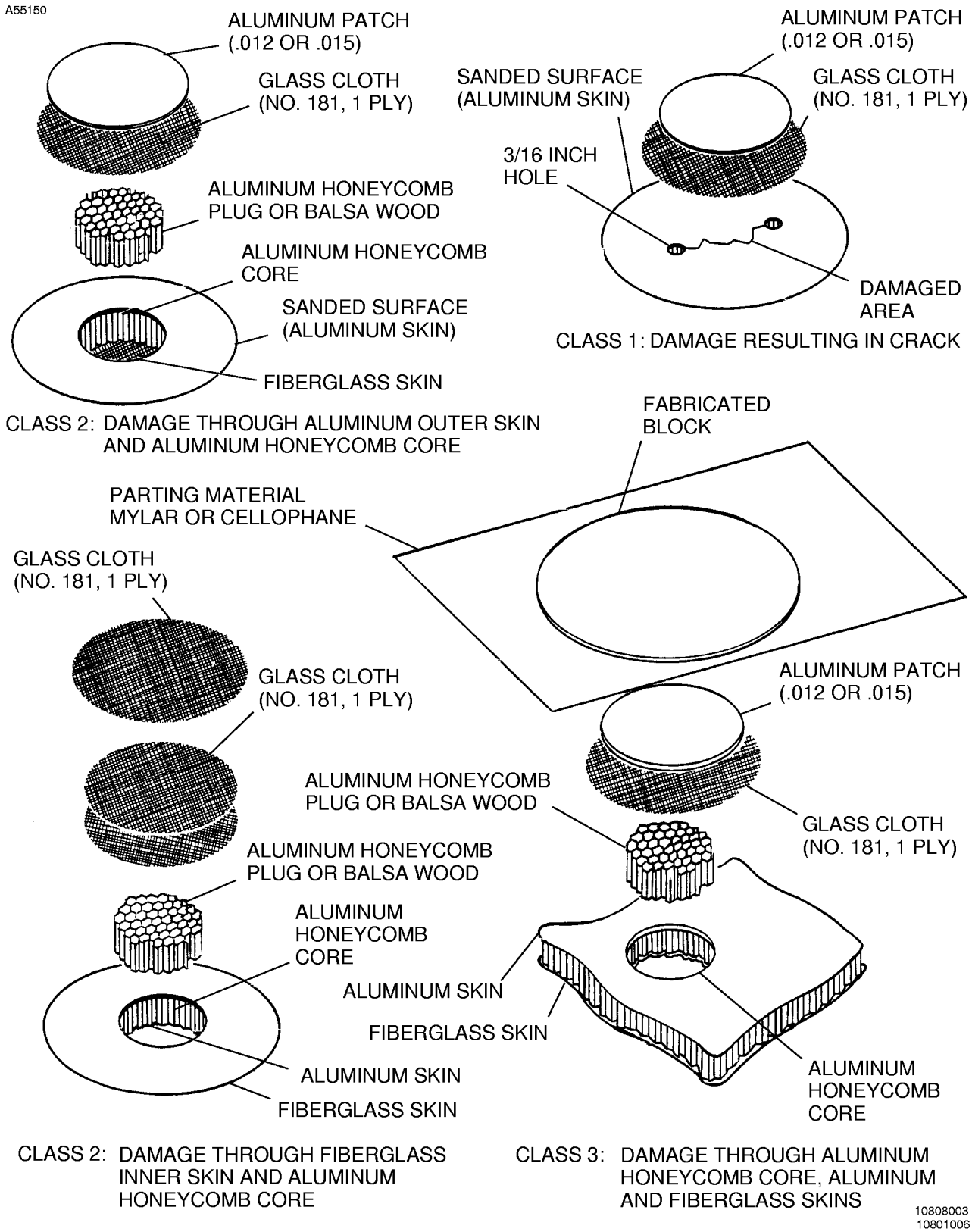

Repair of Honeycomb Skin
Figure 825 (Sheet 1)

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(c) Class 3 - Holes or damage extending completely through the sandwich, affecting both facings and the core.
(d) Class 4 - Adhesive voids between skin and honeycomb core.

WARNING: Solvents used must be stored in, transported in, and used from safety containers. Adequate ventilation must be provided in storage and usage areas. The solvents specified are flammable, and caution to prevent fires must be taken. No smoking, sparks, or open flames shall be permitted in the immediate area where the solvents are being used. Storage and usage areas shall be free from excessive heat, sparks, and open flames. When possible and practical, rubber gloves shall be worn when performing solvent operations.

(3) Repair of Class 1 damage shall be as follows:
(a) Class 1 damage resulting in a hole not exceeding 1-1/2 inches diameter, dents, scratches or scars of 0.030 inch deep shall be repaired as follows:
1 Remove paint to bare metal using either 400 or 600 grit wet sandpaper.
2 Mask area adjacent to sanded area.
3 Mix thoroughly equal portions, by volume, of Epon 828 and Versamid 125. Add aluminum powder until a thick non-flowing paste is obtained.

NOTE: Prepare only that quantity of material that will be used in 30 minutes.

4 Fill damaged area with mix and smooth with a putty knife or spatula.
5 Allow the mix to cure at room temperature until hard (approximately 4 hours).
6 Wet sand the repaired area with 400 grit wet sandpaper until smooth.
7 Clean the repaired area with a clean cloth moistened with Isopropyl Alcohol, Naphtha, or Toluene. Allow to air dry.
8 Brush a minimum of two coats of nonchromated primer over the repaired area, allowing each coat to dry.
9 Refer to Chapter 20, and paint in accordance with applicable finish specifications.
(b) Class 1 damage resulting in cracks shall be repaired as follows:
1 Stop drill crack at both ends with 3/16 inch diameter holes.
2 Prepare a circular external patch, which will extend one inch beyond damage area from 0.012 or 0.015 aluminum.
3 Remove all paint and primer around damage area by sanding with 400 to 600 grit wet sandpaper.

NOTE: Sanded area must be approximately 1/2 inch wider than aluminum patch.

4 Lightly sand entire damage area with 400 grit sandpaper until a satin finish is obtained. Mask off around damage area.
5 Wipe damage area with a clean cloth moistened with Isopropyl Alcohol, Naphtha, or Toluene. Wipe dry with a clean cloth.
6 Mix thoroughly 100 parts (by weight) Epon VIII Adhesive with 6 parts (by weight) of curing agent "A".

NOTE: Prepare only that quantity of material that will be used in two hours.

7 Work some of the prepared adhesive in the crack and drilled holes. Apply a thin film over sanded surface.
8 Prepare a one-ply No. 181 glass cloth or similar scrim cloth 1/8 inch wider than aluminum patch.

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9 Apply a thin film of the adhesive on the aluminum patch and then place cloth between patch and damaged assembly and apply sufficient pressure to assure positive contact.
10 Using mylar or cellophane over aluminum patch, place a clamping device on patch to insure complete contact of all bonding surfaces.
11 Remove excess adhesive with a clean cloth dampened with Naphtha or Toluene.
12 Cure at 150° to 200°F using heat lamps or oven.
13 Remove clamps, pressure pads, etc., and sand away remaining excessive adhesive.
14 Brush a minimum of two coats of nonchromated primer over the repaired area, allowing each coat to dry.
15 Refer to Chapter 20, and paint in accordance with applicable finish specifications.

(4) Repair of Class 2 damage shall be as follows:

(a) Class 2 damage to upper cowl resulting in damages that extend completely through the aluminum outer skin and into the aluminum honeycomb core, but without damage to the inner skin:

1 Carefully trim out skin to a circular or oval shape with a hole saw or fly cutter removing honeycomb core completely to the opposite skin.

CAUTION: Extreme care should be taken not to damage the inner skin.

2 Remove completely all the damaged honeycomb core.
3 Prepare either an aluminum honeycomb core or balsa wood replacement plug as follows:
a If balsa wood is used, fabricate plug so that the grain will be perpendicular to the skins.
b Lightly sand balsa plug with 400 grit sandpaper and wipe off dust with a clean cloth.

NOTE: Do not touch bare surface with bare hands after sanding. If the balsa wood is cut too short, the distance between shall be shimmed up until positive contact is made with all surfaces.

c Wrap balsa plug in clean waxed paper until ready for use.
d When aluminum honeycomb plug is used, the core shall be the approximate density of the original core.
e Cut aluminum honeycomb plug so that the top edge will be even with the adjacent skins and completely fills the damaged area.
4 Remove all paint and primer (approximately 1-1/2 inches larger in diameter than cutout) from around damage area with either 400 or 600 grit wet sandpaper.
5 Mask around sanded area and cutout area.
6 Mix thoroughly 100 parts (by weight) Epon VIII adhesive with 6 parts (by weight) of curing agent “A”.

NOTE: Prepare only that quantity of material that will be used in two hours.

7 If balsa plug is being used, spread the adhesive lightly over all surfaces. If aluminum plug is being used, brush or trowel adhesive on the internal side of the existing skin and where the plug will make contact with core.
8 Position balsa wood or aluminum plug into place.
9 Prepare a circular external patch, which will be one inch larger than plug hole, from 0.012 or 0.015 aluminum.
10 Prepare a one-ply circular No. 181 glass cloth or similar scrim cloth 1/8 inch larger than plug hole.
11 Apply a thin film of adhesive over sanded surface and place the No. 181 glass cloth or similar cloth over the plug.
12 Clean the bond surface of aluminum patch and coat with adhesive.

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13 Assemble patch over glass cloth and plug and apply sufficient pressure to assure positive contact.

NOTE: Care should be taken to insure that plug and glass cloth remain in place.

14 Using mylar or cellophane over aluminum patch, place a clamping device on patch to insure complete contact of all bonding surfaces.
15 Remove excessive adhesive with a clean cloth moistened with Naphtha or Toluene.
16 Cure at 150° to 200°F using heat lamps or oven.
17 Remove clamps, pressure pads, etc., and sand away excessive adhesive.
18 Brush a minimum of two coats of nonchromated primer over the repaired area, allowing each coat to dry.
19 Refer to Chapter 20, and paint in accordance with applicable finish specifications.

(b) Class 2 damage to upper cowl resulting in damage which extends completely through the fiberglass inner skin and into aluminum honeycomb core, but without damage to the outer aluminum skin.

1 Carefully trim out skin to a circular or oval shape with a hole saw or fly cutter removing aluminum honeycomb core completely to opposite skin.
2 Prepare either an aluminum honeycomb core or balsa wood replacement plug as follows:
   a If balsa wood is used, fabricate plug so that the grain will be perpendicular to the skins.
   b Lightly sand balsa plug with 400 grit sandpaper and wipe off dust with a clean cloth.

      NOTE: Do not touch bare surface with bare hands after sanding. If the balsa wood is cut too short, the distance between shall be shimmed up until positive contact is made with all surfaces.

   c Wrap balsa plug in clean waxed paper until ready for use.
   d When aluminum honeycomb plug is used, the core shall be the approximate density of the original core.
   e Cut aluminum honeycomb plug so that the top edge will be even with the adjacent skins and completely fills the damaged area.
3 Sand undamaged fiberglass skin lightly approximately 2 inches out from around the hole.

CAUTION: Do not sand through fiberglass skin.

4 Prepare two No. 181 glass fabric patches, 1/8 inch larger than hole diameter.
5 Mix thoroughly 100 parts (by weight) Epon 828 and 10 parts (by weight) Diethlenetriamine (DTA).
6 If balsa plug is being used, spread the adhesive lightly over all surfaces. If aluminum plug is being used, brush or trowel adhesive on the internal side of the existing skin and where the plug will make contact with core.
7 Impregnate the two No.181 glass patches with mixture to the content of approximately 50% and assemble patches over plug.

NOTE: Smooth out all wrinkles.

8 Prepare one No. 181 glass fabric patch large enough to cover sanded area and impregnate with mixture.
9 Assemble third patch over the two previous layers and remove all wrinkles as before.
10 Using mylar or cellophane, cover patches and apply a clamping device.
11 Cure assembly at 150° to 200°F for approximately 90 minutes.
12 Remove clamps, pressure pads, etc., and sand smooth to original contour.

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(c) Class 2 damage to side cowl which extends completely through aluminum skin and the aluminum honeycomb core shall be repaired as follows:
1 Repair damage as described in (4)(a)4, except use Bloomingdale's HT-424 or Narmco's Metlbond 302 adhesives.
2 The cure time for adhesives described above will be a minimum of 5 hours.
(d) Class 2 damage to side cowl which extends completely through fiberglass skin and aluminum honeycomb core shall be repaired as follows:
1 Repair damage as described in (4)(b)4, except use Bloomingdale's HT424 or Narmco's Metlbond 302 adhesives.
2 The skins shall be fabricated from either Cordo's Pyropreg AC, U.S. Polymeric's Poly Preg 502, or Narmco's 506 (color black).
3 The reinforcement shall be 181-150 Valan.
4 Cure time for adhesives described above will be a minimum of 5 hours.

(5) Repair of Class 3 damage is as follows:
(a) Class 3 damage to skin resulting in damage to both aluminum and fiberglass skins having a minimum damage size of 1.0 inch or maximum damage size of 4 inches.
1 Prepare surfaces, plugs, and patches as described in step (4) above.
2 Fabricate a temporary mold or block to hold the plug in place while aluminum outer skin is being repaired.
3 Repair outer aluminum skin in accordance with step (4) above.
4 Remove temporary mold or block and repair fiberglass skin in accordance with step (4) above, and flare in patch with existing skin contour.

(6) Repair of Class 4 damage is as follows:
(a) Class 4 repairs are those repairs needed to fill voids between aluminum core and skin surfaces.
1 Drill sufficient 1/8 inch holes in the fiberglass inner skin adjacent to voids.
2 Remove all burrs around drilled holes.
3 Mix thoroughly 100 parts (by weight) Epon 828 with 10 parts (by weight) curing agent "D".

NOTE: Prepare only that quantity that can be used in one hour.

4 Using a syringe or pressure gun, inject resin mix into the aluminum honeycomb cells until they become filled.
5 Wipe off excess resin with a cloth that has been dampened with MIBK or MEK and cover the holes with masking tape.
6 Position the structure so that both skins will be in positive contact with resin.
7 Cure adhesive for 2 hours at 150° to 200°F.
8 Remove masking tape and sand away excess resin.

8. Fiberglass Parts

A. The engine cowling nose caps, tail stinger, tall surface tips, fairings, heater ducts, and other parts of the airplane are made of fiberglass.

B. Repairable Damage.
(1) Damaged fiberglass parts may be repaired by the methods shown in Figure 826. Cut and trim the area just beyond the noticeable damage. If the parts are painted, remove paint and sand clear an area at least two inches beyond the edge of the cutout. Prepare the necessary size and number of patches of glass cloth. Mix a sufficient amount of resin in accordance with the manufacturer's instructions.

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WARNING: Always follow the manufacturer's mixing instructions carefully as the mixing of peroxide and cobalt together will result in a spontaneous fire.

(2) Be sure that your hands are free from oil, grease, and dirt. Apply an even coat of resin on the sanded area. Impregnate all the glass cloth patches by laying them on a clear paper and working the resin through the fabric with a small brush. Place the larger patch over the cutout area, working out all air bubbles and wrinkles. If the cutout is large enough to cause the patch to sag, place a suitable support behind the repair area. Coat the support with automobile wax or wax paper to prevent the resin from adhering to the support. Apply a second patch over the first patch, etc., working out all wrinkles and air bubbles. After all the patches have been applied, brush the area with an even coat of resin and allow to cure. Smooth the patch area with fine sandpaper until the desired finish is obtained. Repaint the finished area with matching paint.

C. Damage Necessitating Replacement of Parts.
(1) When the fiberglass parts are torn or cracked over a large area or show signs of strain through the appearance of small cracks or show signs of loss of rigidity through the use of too much pressure on the surface, then the parts shall be removed and replaced.

9. Repair of Plastic Window Surfaces

A. For repair of plastic window surfaces, refer to Chapter 56, Windows - Inspection/Check.

10. Radome Repair Procedures

A. Remove radome in accordance with Chapter 53, Radome - Removal/Installation. Repair procedures are developed with the objective of equaling as nearly as possible the electrical and strength properties of the original part with a minimum increase in weight. This can only be accomplished by repairing damaged parts with approved materials and working techniques. For convenience in presentation and for clarity in designating repair procedures to be used, damage to radomes in this procedure shall be divided into classes according to severity, as follows:
(1) Class I Repair - Surface scratches, scars, or erosion not penetrating through the first ply of fabric.
(2) Class II Repair - Punctures, delaminations, contaminates, or fractures extending through the first ply.
(3) Class III Repair - Damage extending completely through face sheets.

B. Repair Techniques.
(1) Class I Repair - Surface scratches, scars, or erosion not penetrating through the first ply shall be repaired as follows:
(a) Clean damaged area thoroughly and carefully using a clean cloth saturated with methyl-ethyl-ketone or another approved cleaning agent.
(b) Lightly sand the damaged area, using No. 280 grit sandpaper, clean the sanded surface thoroughly, using methyl-ethyl-ketone, Specification TTM-261.
(c) Apply one or two coats (depending on severity of the abrasion) of the following material to the abraded surface.

COMPOSITION:

Bostik 464-3-1 Surfacer

CA-142 Catalyst

TL-52 Thinner

VENDORS:

Bostik-Finch
Boston Street
Middleton, Mass.

MIXING PROCEDURE:

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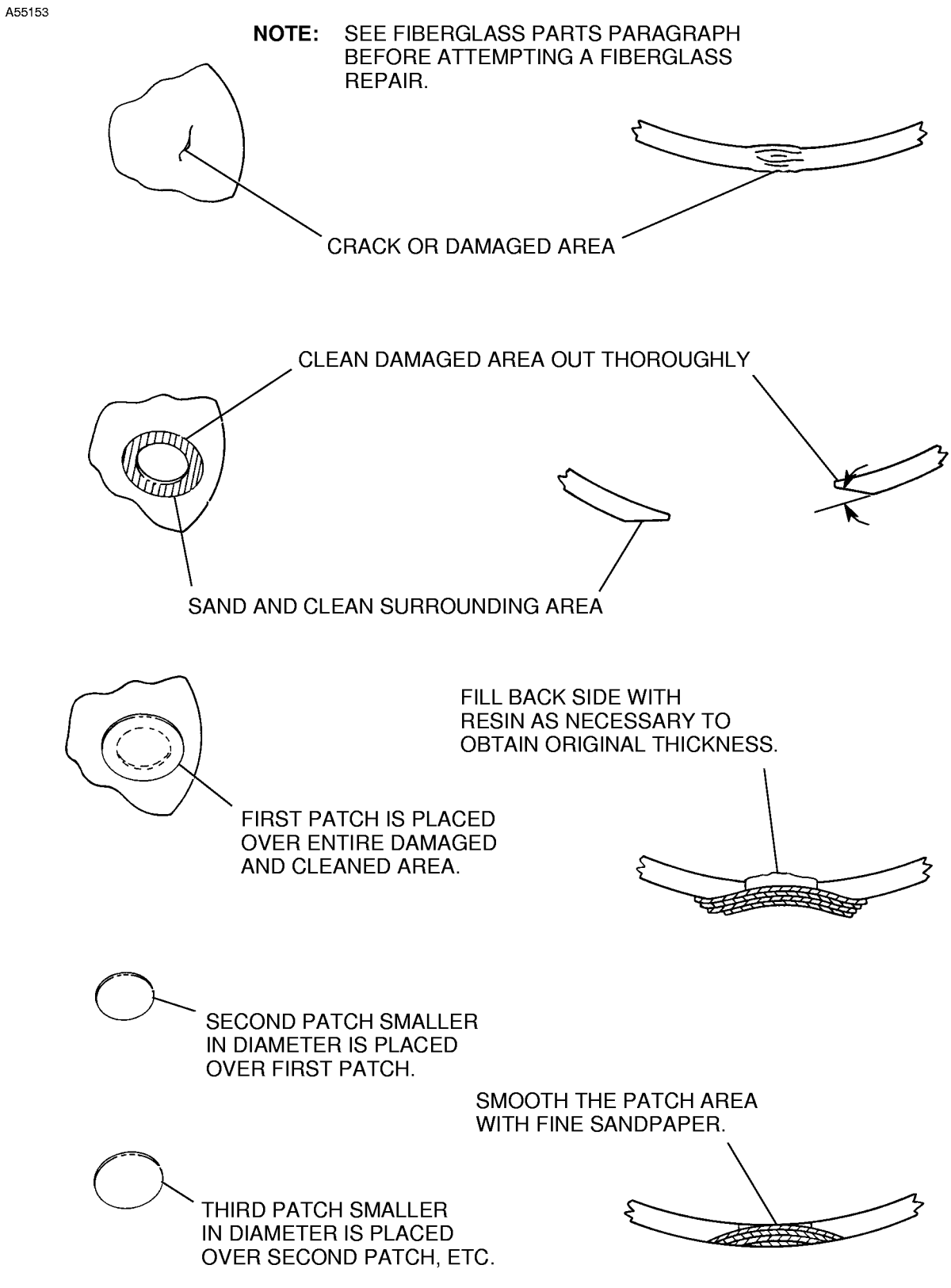

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Fiberglass Repairs
Figure 826 (Sheet 1)

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Mix in a ratio of 3 parts by volume 464-3-1 base to one part CA-142 Catalyst. Surfacer may be thinned with TL-52 to approximately 25 seconds #2 Zahn cup.

BENCH LIFE:

Approximately 30 minutes at room temperature.

(d) Material may be applied by spray gun. The coating will dry to sand in 3 hours at normal temperature. Sand with 320 grit sandpaper and reapply paint.

(2) Class II Repair - Punctures, delaminations extending through the outside face sheet.

(a) Punctures outside the radar window, not exceeding one inch in diameter.

1 Mix EA960F and apply to core area of damage. Allow to harden, sand smooth, and paint.

(b) Punctures inside the radar window, not exceeding 1/2 inch in diameter.

1 If face sheet and core are damaged beyond use, fill core area with EA960F, allow to harden, sand smooth, and paint.

2 If face sheet and core are not damaged beyond use, bond back together with the following adhesive mix:

COMPOSITION:

EA9309 Adhesive Mix

VENDOR:

The Dexter Corporation
Hysol Division
Olean, New York 14760

MIXING PROCEDURE:

Combine 100 parts "A" with 23 parts "B" by weight and mix thoroughly.

BENCH LIFE:

Approximately 40 minutes for one pound mass at 75° Fahrenheit.

3 Sand, paint, and gloss surface at least 1/2 inch around damaged area. Apply sufficient adhesive to face sheet to rebond to core. Impregnate a patch of 181 or 1581 dry glass cloth with the EA9309 adhesive mix. The patch should be 1/2 inch larger than the damaged area. Apply this patch to damaged area. Over this tape a sheet of polyethylene until adhesive hardens. Remove, sand lightly, and paint.

(c) Delaminations in the edge bond. Delamination in the attachment edge bond may be bonded back together with EA9309 adhesive. If several plies of glass cloth are damaged, remove and replace with equal number of 181 or 1581 glass. Impregnate the glass cloth with EA9309, apply and allow to harden. Sand to shape or fit and repaint.

(3) Class III Repair (Refer to Figure 827) - Damage through both face sheets. This damage covers 1/2 inch diameter in the radar window area and one inch outside the window area. Damage beyond these limits should require replacement of the radome.

(a) Remove damaged face sheet. Apply polyethylene sheet to core and backup with a thin sheet of metal. Tape in place. Apply EA960F to fill core flush. Allow to harden and remove sheet metal backup. Apply EA9309 impregnated patches over damaged area overlapping by 1/2 inch all around. Tape a polyethylene sheet over impregnated patches and rub polyethylene sheet to smooth the adhesive and remove air from patch. Allow to harden, remove polyethylene sheet and sand lightly.

11. Control Surface Balancing Fixture Fabrication

A. Fabrication of Balance Fixture (Refer to Figure 828).

(1) Fabricate balance fixture to dimensions and instructions given in Figure 828.

NOTE: The balance beam is utilized for balancing airplane models as identified in Figure 828. Refer to applicable manual for balancing instructions.

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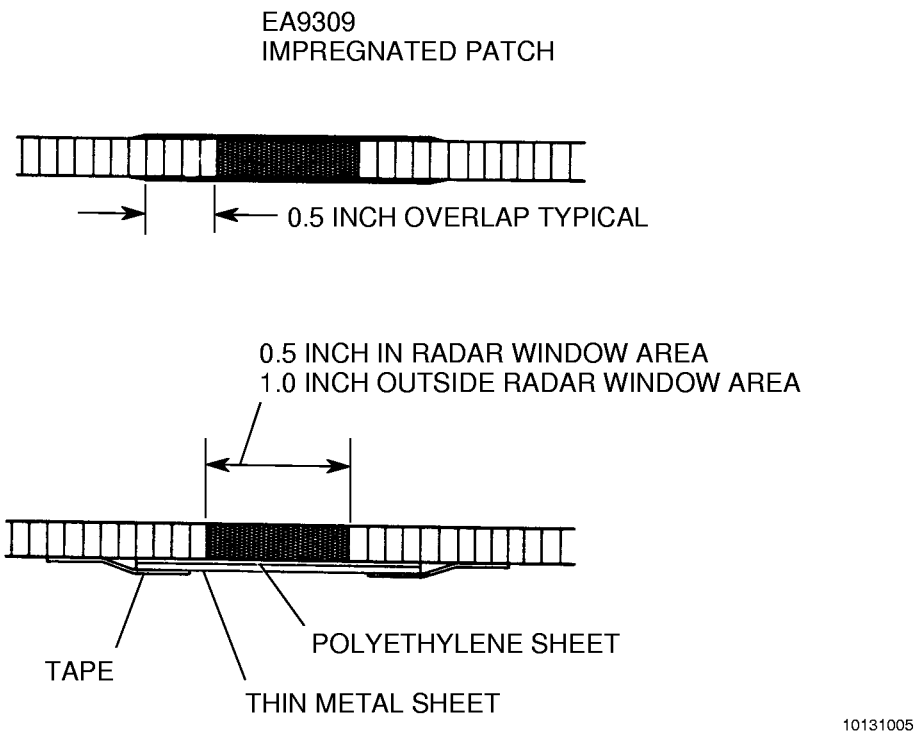

Typical Class III Radome Repair
Figure 827 (Sheet 1)

B. Balancing Procedures.

(1) It is recommended that control surface balancing be accomplished in a draft-free room/area using the balancing equipment fabricated from instructions contained in Figure 828. If the balancing fixture is not used, balancing must be within limits of allowable balance tolerances (Refer to Figure 829). The control surface hinge must be supported on a knife (minimum friction) edge and all conditions of balancing procedures shall apply.

(a) Balance the control surfaces to be within the limits specified in Table 801.

Table 801. Control Surface Balance Tolerance

Surface	Allowable Balance Tolerance
Aileron	+0.75 to -0.75 Inch-Pounds
Elevator	+0.75 to -2.00 Inch-Pounds
Rudder	+0.75 to -3.75 Inch Pounds

(2) Use only Cessna specified part numbers for add on weights. Install weights using only the existing attachment provisions. Do not alter the airplane structure except as noted for adding weights. If balancing cannot be accomplished within limitations specified by balancing procedures, it may be possible to reduce weight by stripping excessive paint and repainting. If weight cannot be corrected to allow balancing, the control surface shall be replaced.

NOTE: Be certain control surface weights are installed, surfaces are clean, all foreign matter inside control surfaces removed, painted, and hinge bolts installed. Surfaces which have trim tabs incorporated must have the tab secured in a streamlined position and push-pull rods, with attaching hardware on the trim tab, and installed before starting balancing procedures. If balancing cannot be accomplished with limitations specified by the balancing procedures with paint and surface fillers at minimum requirements, the control surface shall be replaced.

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C. Balancing Fixture.
(1) Install hanger assembly in the appropriate position for the surface being balanced.
(2) Place mandrel on a table or other suitable flat surface and center balancing beam on mandrel at the centerline of bar.
(3) Add washers to dowel pins until a balanced condition is obtained.

NOTE: When balance fixture is in balance, it must assume a level position.

D. Rudder Balancing Procedure.
(1) Remove rudder from airplane in accordance with Chapter 27, Rudder - Removal/Installation.
(2) Tape rotating beacon wire along the leading edge of the rudder.
(3) Insert hinge bolts in place and position rudder on mandrels with bolts resting on the knife edge.

NOTE: Make sure rudder control surface has freedom of movement and does not drag on mandrels and bonding wires do not interfere with movement of control.

(4) Secure the rudder trim tab in a streamlined position with a minimum amount of masking tape as required and install associated hardware.
(5) Locate the position for balancing fixture on the rudder and place balancing beam in position.

NOTE: If balancing beam position falls on a rivet line, it will be necessary to move the beam to one side to provide a flat surface for the balancing beam. The balancing beam must be perpendicular to the hinge centerline and the trailing edge of the rudder control surface must be firmly seated in the cutout of the hangar. Ensure that balance point on tool is aligned with rudder hinge centerline.

(6) If the rudder assumes position parallel with base of mandrel and the balance weight is within the Green, Blue, and Yellow range, the rudder is statically balanced.
(7) If rudder assumes a position of trailing edge up when balance weight is on aft end of range, rudder is overbalanced and needs weight removed.

NOTE: Correct overbalance by drilling holes in weight to remove material. Do not remove material within 0.25 inch of attaching bolts.

(8) If rudder control surface assumes position of trailing edge down when balance weight is on forward end of range, rudder surface is underbalanced and needs more balance weight added.

CAUTION: Total rudder balance weight, excluding attaching hardware for weights, shall not exceed 6.3 pounds.

(9) The approximate amount of weight needed for underbalance may be determined by placing small amounts of loose weight in the balance weight area.
(10) Balance weight may be added by inserting lead into existing holes of weight and tamping. If holes are not available to insert added weight, it will be necessary to install new weights.

NOTE: The rudder tip and mounting screws must be installed each time the rudder is checked for balance.

(11) Install rudder in accordance with Chapter 27, Rudder - Removal/Installation.

E. Aileron Balancing Procedure.
(1) Remove aileron from airplane in accordance with Chapter 27, Aileron - Removal/Installation.
(2) Balance the fixture for aileron control surface.
(3) Insert hinge bolt in place and position aileron on the mandrels with bolt and pin resting on the knife edge.

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CAUTION: Be sure bolt is inserted in correct hinge location (upper hole).

NOTE: Make sure aileron control surface has freedom of movement, does not drag on mandrels, and the bonding straps are free.

(4) Secure the trim tab on the left-hand aileron in a streamlined position with a minimum amount of masking tape as required and install associated hardware.
(5) Locate the position for balancing fixture on the aileron and place balancing beam in position.

NOTE: If balancing beam position falls on a rivet line, it will be necessary to move the beam to one side to provide a flat surface for the balancing beam. The balancing beam must be perpendicular to the hinge centerline, and trailing edge of the aileron control surface must be firmly seated in the cutout of the hangar. Ensure that balance point on tool is aligned with aileron hinge centerline.

(6) If the aileron assumes a position parallel with base of mandrel and the balance weight is within Green range, the aileron is statically balanced.
(7) If aileron assumes a position of trailing edge up, when balance weight is on aft end of range, the aileron is overbalanced and needs weight removed.

NOTE: Correct overbalance by drilling holes in weight to remove material. Do not remove material within 0.25 inch of attaching bolts.

(8) If the aileron assumes position of trailing edge down, when balance weight is on forward end of range, aileron is underbalanced and needs more balance weight added.

CAUTION: Balance weight for aileron excluding attaching hardware shall not exceed 1.75 pounds for the left aileron or 1.05 pounds for the right aileron. Internal balance weights shall not be altered to accomplish balancing.

(9) The approximate amount of weight added for underbalance may be determined by placing small amounts of loose weight in the balance weight area.
(10) Balance weight may be added by inserting lead into existing holes of the weight and staking. If holes are not available, it will be necessary to install new weights.

NOTE: The aileron balance weight must be removed from the aileron in order to remove excess weight.

CAUTION: Make certain bolts securing weight in place are tight before installing aileron on airplane.

(11) Install aileron in accordance with Chapter 27, Aileron - Removal/Installation.

F. Elevator Balancing Procedure.
(1) Remove elevator in accordance with Chapter 27, Elevator - Removal/Installation.
(2) Balance the fixture for elevator control surface.
(3) Insert hinge bolts in place and position elevator on the mandrels with bolts resting on the knife edge.

NOTE: Make sure elevator control surface has freedom of movement, does not drag on mandrels, and bonding straps are free.

(4) Secure the elevator trim tab on right-hand elevator in a streamlined position with a minimum amount of masking tape as required and install associated hardware.

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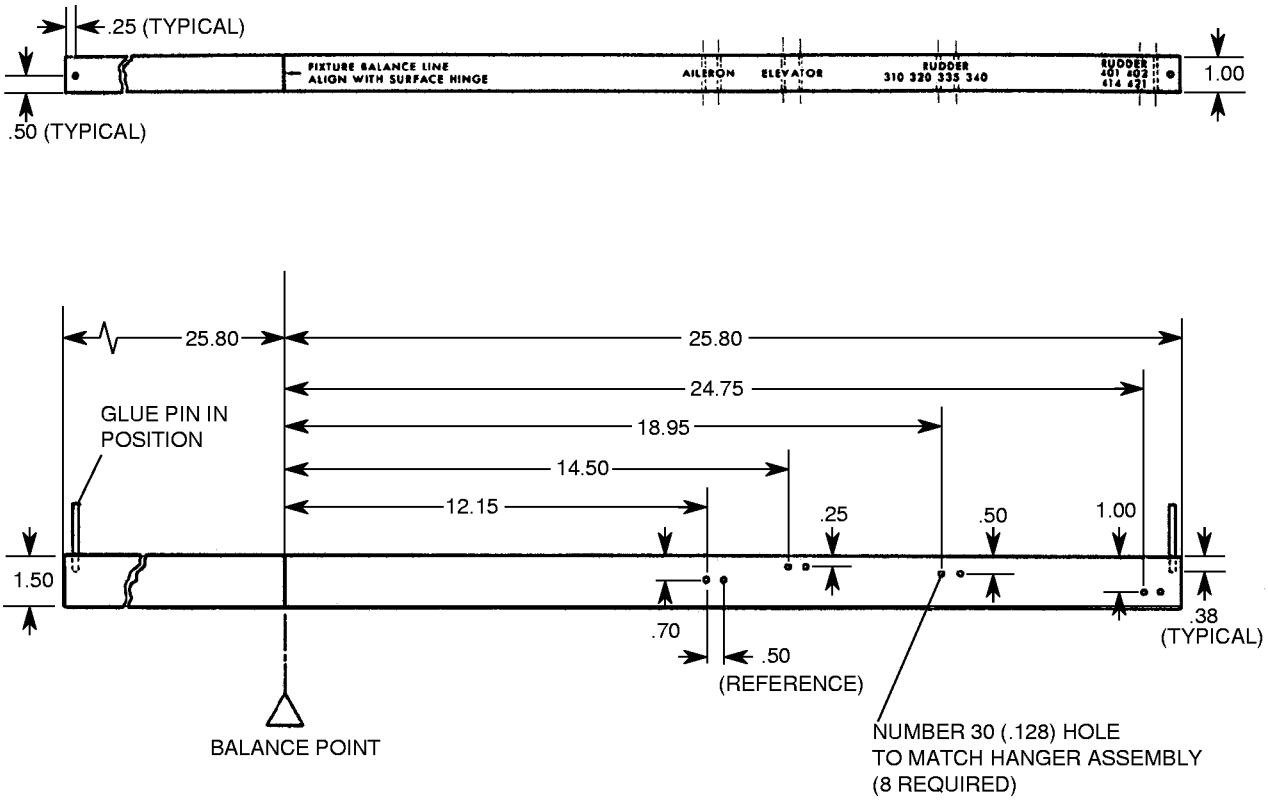
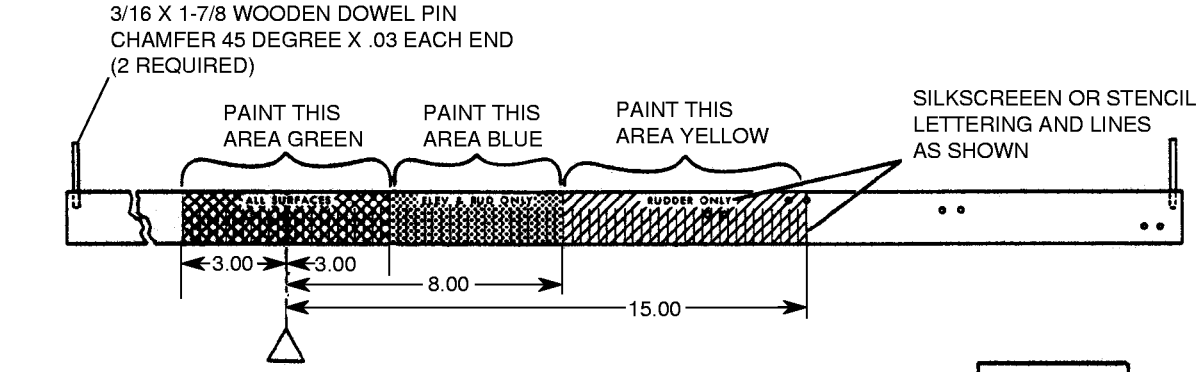
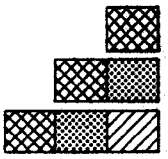




BALANCE TOLERANCE LIMITS



GREEN - AILERON

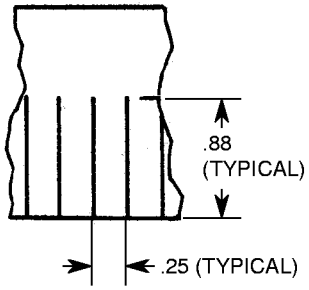
GREEN AND BLUE - ELEVATOR

GREEN, BLUE AND YELLOW - RUDDER

BEAM MATERIAL: WOOD
(PAINTED WHITE EXCEPT WHERE SHOWN)

THE BALANCE FIXTURE IS USED
FOR BALANCING CONTROL SURFACES
FOR THE FOLLOWING AIRPLANES:

310K0001 AND ON
320E0001 AND ON
335-0001 AND ON
340-0001 AND ON
401-0001 AND ON
402-0001 TO 402C0001
414-0001 TO 414A0001
421-0001 TO 421C0001



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Balancing Fixture Fabrication
Figure 828 (Sheet 1)

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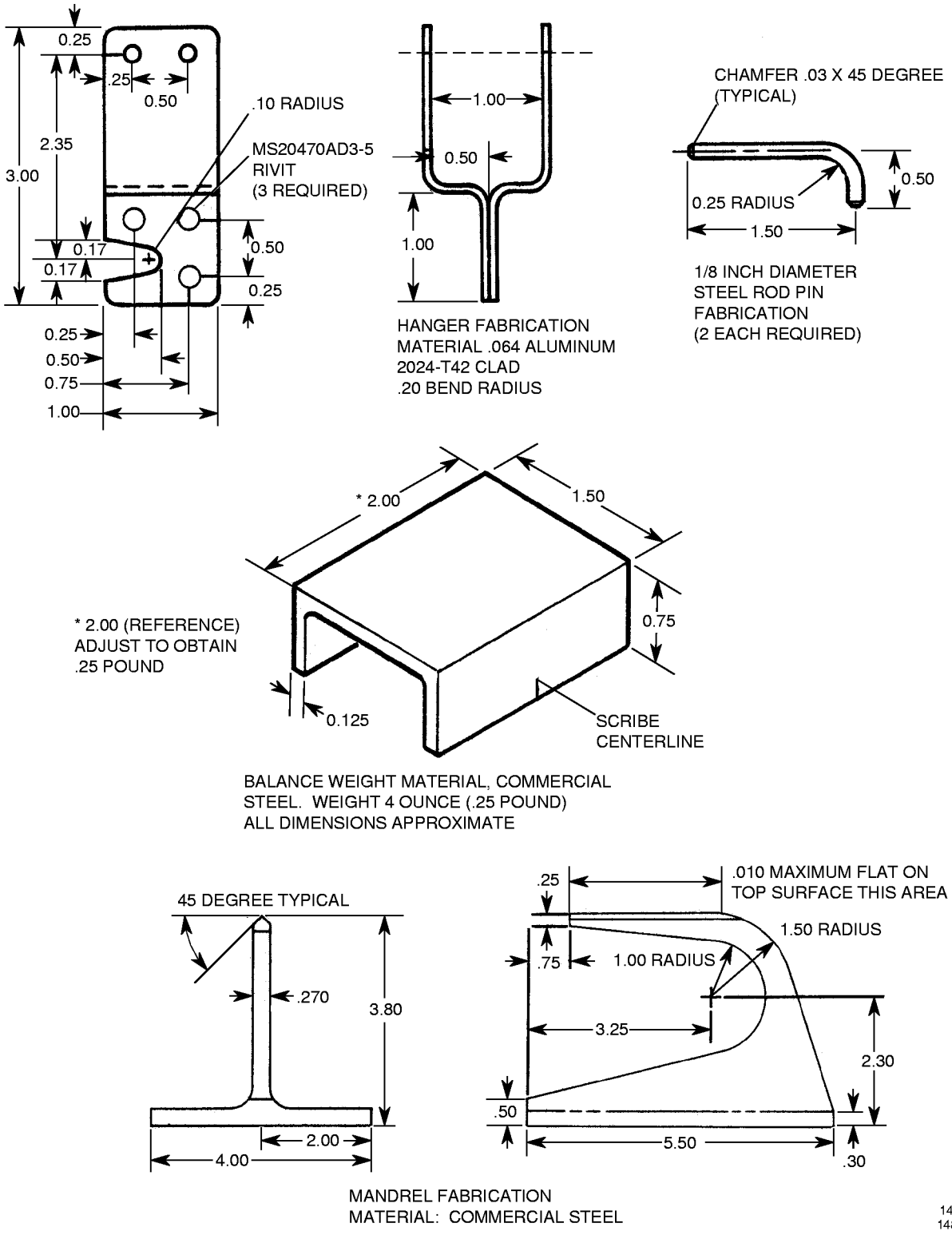

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Balancing Fixture Fabrication
Figure 828 (Sheet 2)

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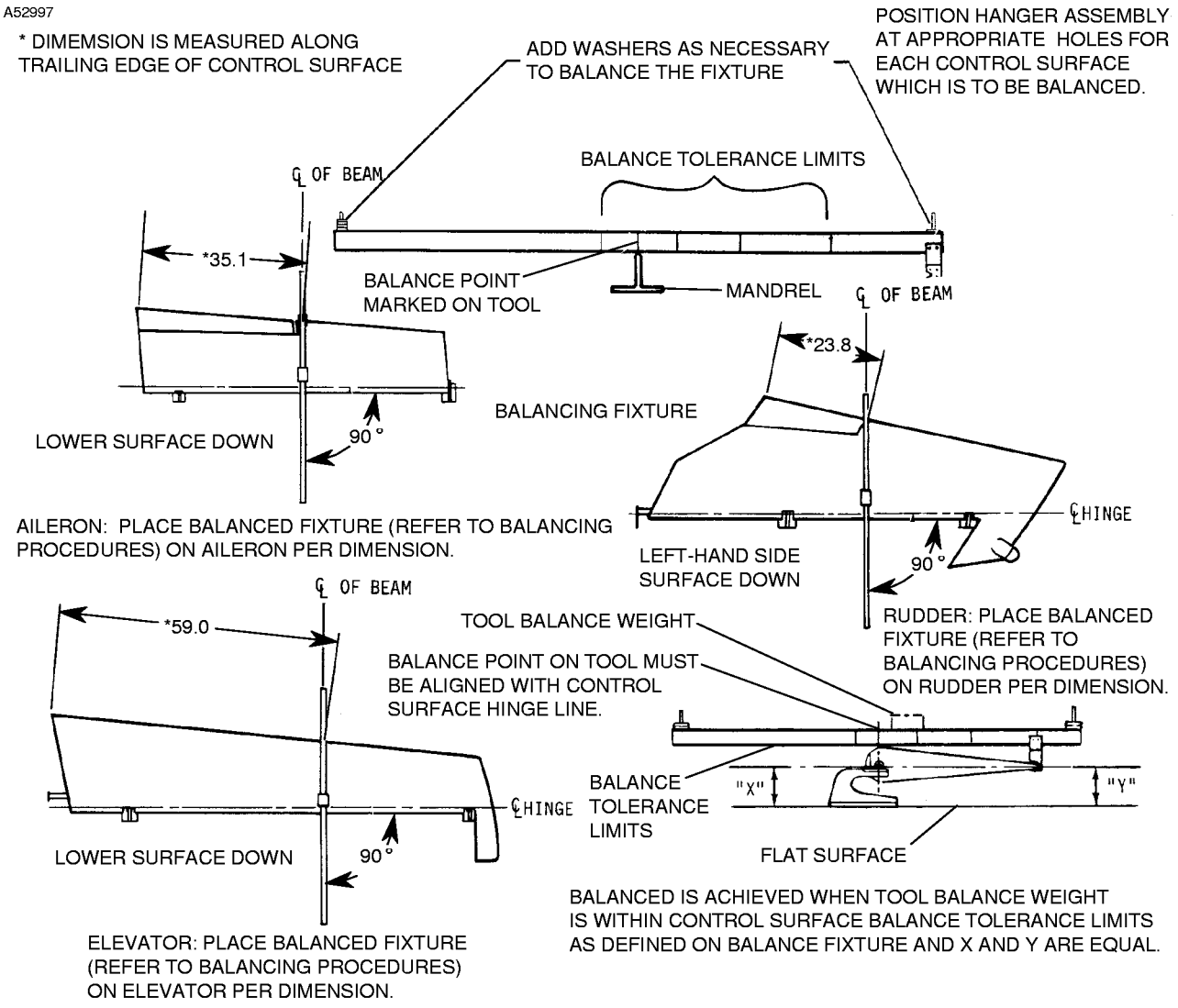
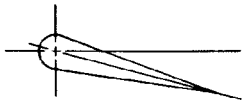


BALANCE CONDITION

OVERBALBANCE IS DEFINED AS THE CONDITION THAT EXISTS WHEN SURFACE IS LEADING EDGE HEAVY AND IS DEFINED BY SYMBOL (-)

UNDERBALANCED IS DEFINED AS THE CONDITION THAT EXISTS WHEN SURFACE IS TRAILING EDGE HEAVY AND IS DEFINED BY SYMBOL (+)



NEUTRAL - STATIC BALANCE IS DEFINED AS THE CONDITION THAT EXISTS WHEN SURFACE IS HORIZONTAL WHEN BALANCED.

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Static Balancing Aileron, Rudder, and Elevator
Figure 829 (Sheet 1)

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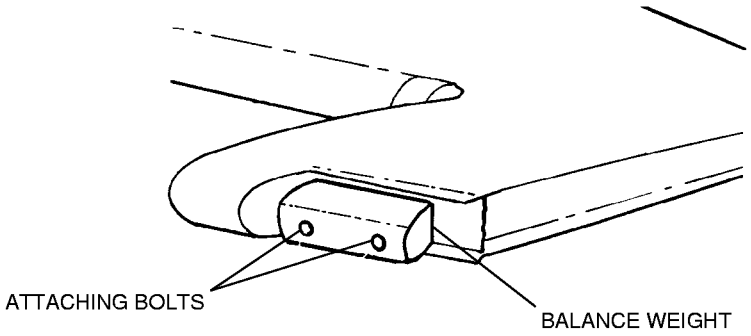
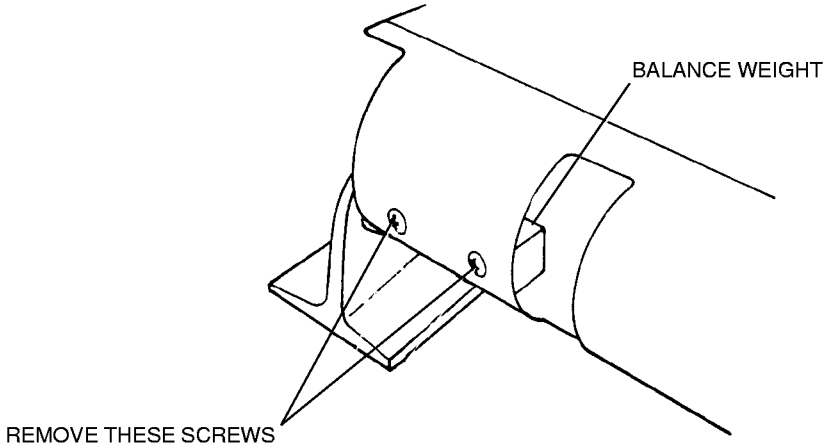
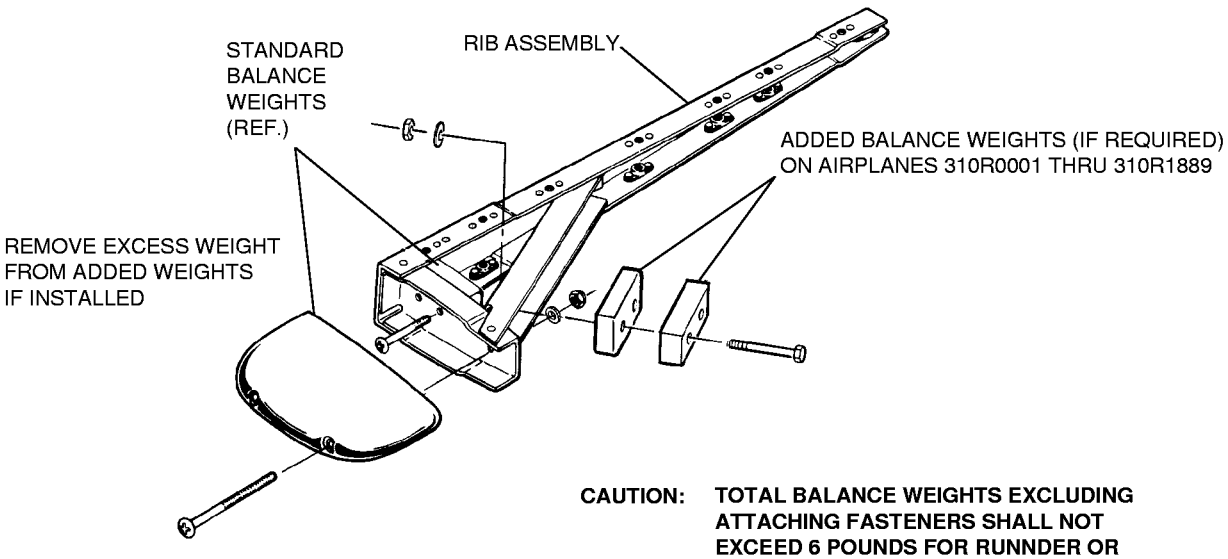


RUDDER BALANCE WEIGHT



AILERON BALANCE WEIGHT



CAUTION: TOTAL BALANCE WEIGHTS EXCLUDING ATTACHING FASTENERS SHALL NOT EXCEED 6 POUNDS FOR RUNNDER OR 9.7 POUNDS FOR ELEVATOR.

ELEVATOR BALANCE WEIGHT

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10341004

Static Balancing Aileron, Rudder, and Elevator
Figure 829 (Sheet 2)

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(5) Locate the position for balancing fixture on the elevator and place balancing beam into position.

NOTE: If balancing beam position falls on a rivet line it will be necessary to move the beam to one side to provide a flat surface for the balancing beam. The balancing beam must be perpendicular to the hinge centerline and trailing edge of the control surface must be firmly seated in the cutout of the hangar. Ensure that balance point on tool is aligned with elevator hinge centerline.

(6) If the elevator assumes a position parallel with base of mandrel, and the balance weight is within the Green and Blue range, the elevator is statically balanced.

(7) If the elevator assumes a position of trailing edge up when balance weight is on aft end of range, elevator is overbalanced and needs weight removed.

NOTE: Correct over balance by drilling holes in weight to remove material. Do not remove material within 0.25 inch of attaching bolts.

(8) If the elevator assumes position of trailing edge down when balance weight is on forward end of range, elevator is underbalanced and needs more balance weight added.

CAUTION: Total elevator balance weight, excluding attaching hardware, shall not exceed 9.7 pounds for either elevator.

(9) The approximate amount of weight needed for underbalance may be determined by placing small amount of loose weight in the balance weight area.

(10) Balance weight may be added by inserting lead wool in existing holes of the weight and tamping. If holes are not available, it will be necessary to install new weights.

NOTE: Each time the elevator is checked for weight and balance, the elevator tip must be installed and elevator tip screws must be in the proper location (short screws toward aft end of elevator).

(11) Install elevator in accordance with Chapter 27, Elevator - Removal/Installation.

12. Alignment and Symmetry Check

A. Before making an alignment and symmetry check the airplane should be defueled in accordance with Chapter 28, Fuel Storage - Servicing and leveled in accordance with Chapter 8, Leveling - Maintenance Practices. Figure 830 provides the measurements and shows the relative elevation points to be measured during the alignment symmetry check. Measurements are made with a steel tape projected between alignment points.
(1) . Refer to table

Table 802. Details and Measurements of Check Points

Point	Distance or Detail
A.	Center line of aft tail skid bolt.
L.	Left
R	Right
1.	Center line of bolt at gear strut and drag brace attachment. Center line head of bolt right side and shank of bolt left side.
2.	Skin trim line and inboard edge of tip fairing at wing forward spar upper surface.
3.	Skin trim line and inboard edge of tip fairing at wing forward spar lower surface.
4.	Center line aft rivet line or rear stabilizer at outboard edge of stabilizer upper surface.

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Table 802. Details and Measurements of Check Points (continued)

5.	Center line aft rivet line or rear stabilizer at outboard edge of stabilizer lower surface.
6.	Skin trim line at vertical stabilizer forward spar and lower edge of tip cap.
1L To 3L	18 Feet, 3.30 Inches (Tolerance +1.25 to -1.25 Inches).
1R to 3R	18 Feet, 3.30 Inches (Tolerance +1.25 to -1.25 Inches).
2L to 5L	18 Feet, 6.70 Inches (Tolerance +2.00 to -2.00 Inches).
2R to 5R	18 Feet, 6.70 Inches (Tolerance +2.00 to -2.00 Inches).
2L to A	23 Feet, 3.40 Inches (Tolerance +1.50 to -1.50 Inches).
2R to A	23 Feet, 3.40 Inches (Tolerance +1.50 to -1.50 Inches).
4L to 6L	9 Feet, 6.70 Inches (Tolerance +1.00 to -1.00 Inches).
4R to 6R	9 Feet, 6.70 Inches (Tolerance +1.00 to -1.00 Inches).
2L to 6L	24 Feet, 11.00 Inches (Tolerance +2.00 to -2.00 Inches).
2R to 6R	24 Feet, 11.00 Inches (Tolerance +2.00 to -2.00 Inches).

13. Checking Wing Twist and Location of Thrust Line

A. Remove wing, refer to Wing - Removal/Installation. Place wing on suitable supports beneath the root and tip ribs (Refer to Figure 831).

NOTE: The wing tip tank must be removed during check.

B. Locate wing datum plane as follows:
(1) Locate a line at the root rib (wing station 28.40) which is 4.52 inches up from the lower surface of the front spar, and 4.00 inches up from the lower surface of the rear spar.
(2) Locate a line at the tip rib (wing station 199.92) which is 1.44 inches up from the lower surface of the front spar, and 0.81 inches up from the lower surface of the rear spar.
(3) These two lines locate the wing datum plane, and the three degrees of twist will be present if the lines are parallel.

NOTE: The angle of incidence at the wing root is +2.5 degrees. The angle of incidence at the wing tip is -0.5 degrees. The wing twist (washout) is 3.0 degrees.

(4) Figure 831, detail A, B, and C, locate engine thrust line.
(5) Install wing and wing tip tank.

14. Repair of Ice Protection Panels

A. The following repair procedures should be used for repairing the polycarbonate type ice protection panels. The illustrations in the figure show two types of cracks and method of repair (Refer to Figure 832).

B. Repairing Crack in Ice Protection Panel.
(1) Route the crack using router bit. Route material approximately 1/32 wide and 1/2 the depth of the panel thickness.
(2) Clean routed crack with isopropyl or ethyl alcohol.
(3) Fill crack with Epibond 1331 in accordance with manufacturers instructions. Epibond 1331 may be procured from Furane Plastics, 4514 Brazil Street, Los Angeles, California 90039.

C. Repairing Combination of Cracks in Ice Protection Panel.
(1) Cracks which do not extend to the outer edge of the ice protection panel shall be drilled through the ice protection panel with a #40 drill.

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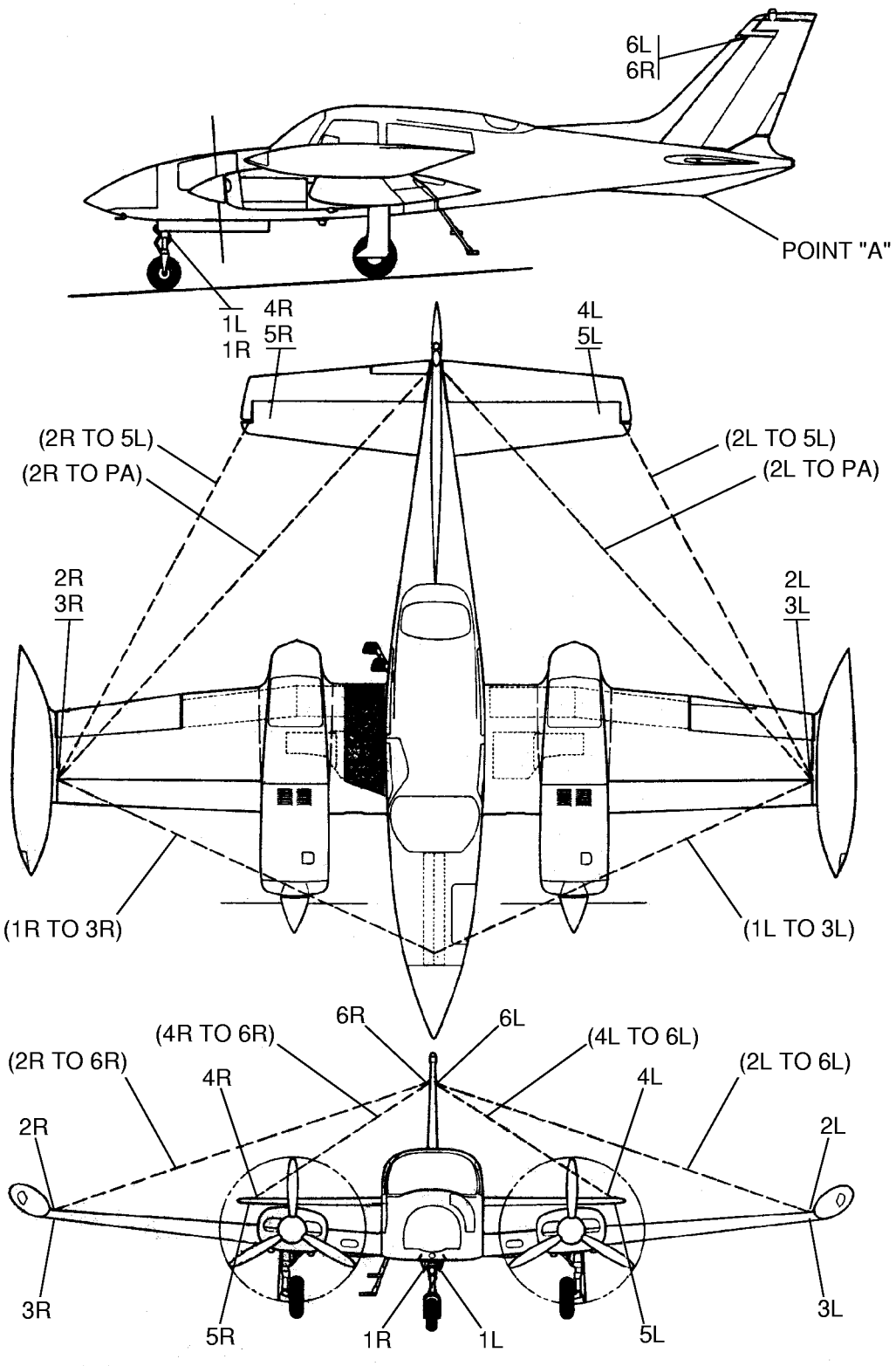

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Alignment and Symmetry Check
Figure 830 (Sheet 1)

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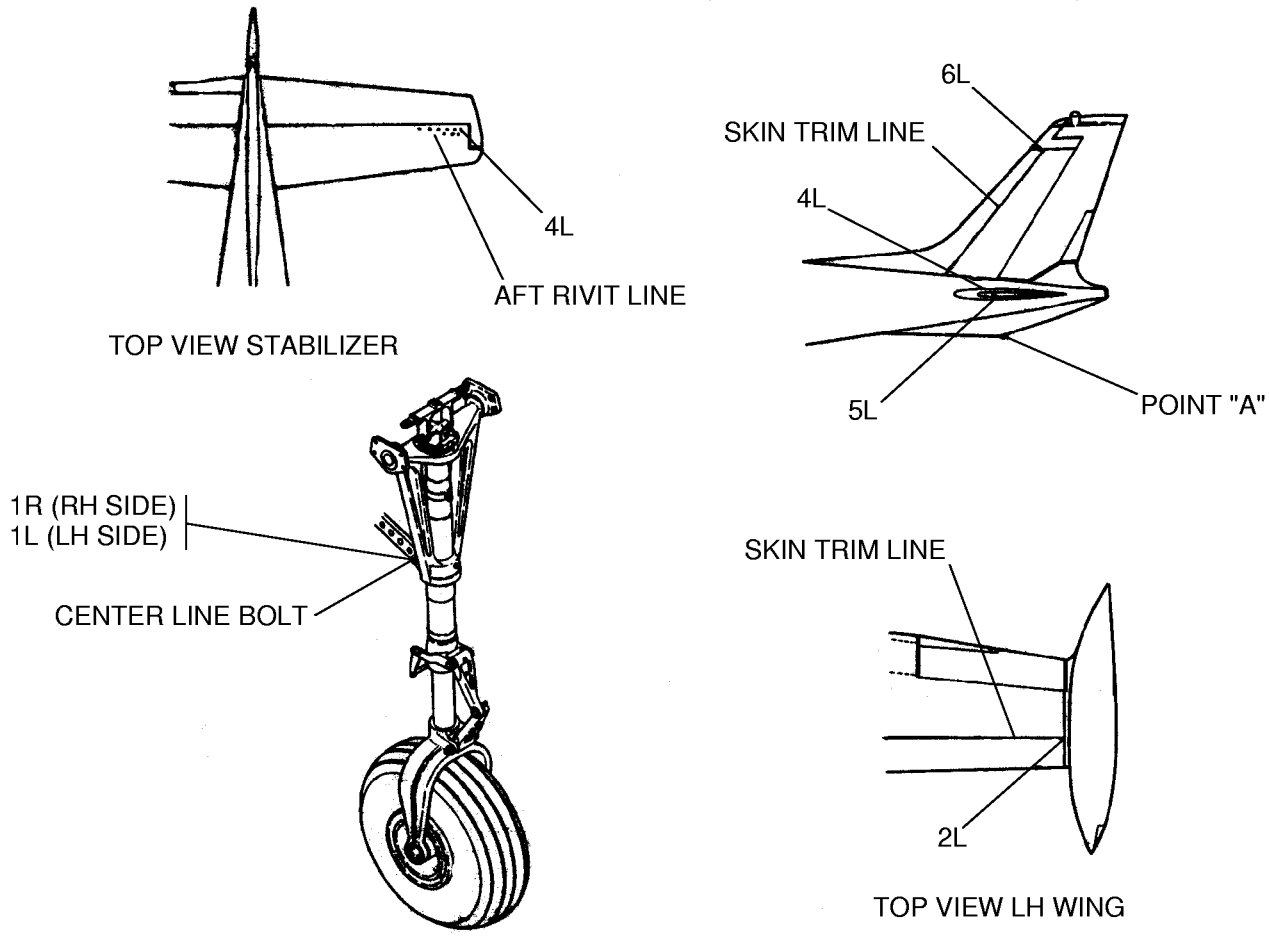

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Alignment and Symmetry Check
Figure 830 (Sheet 2)

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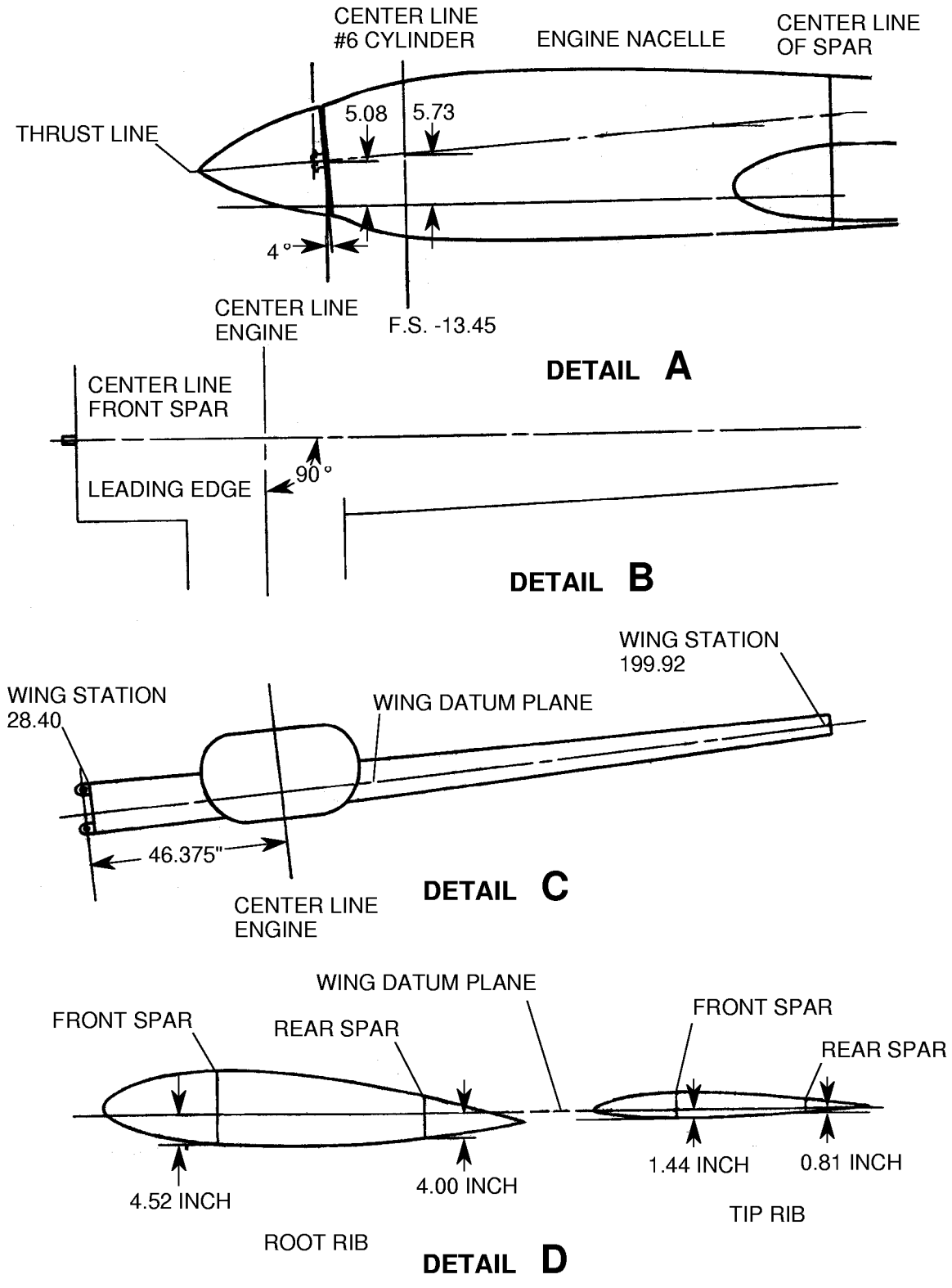

10541008
10202003
10202004

Wing Twist and Thrust Line Data
Figure 831 (Sheet 1)

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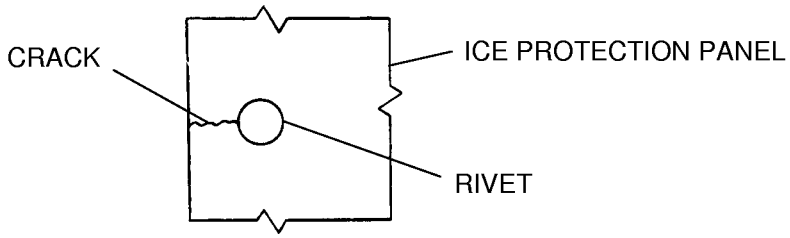
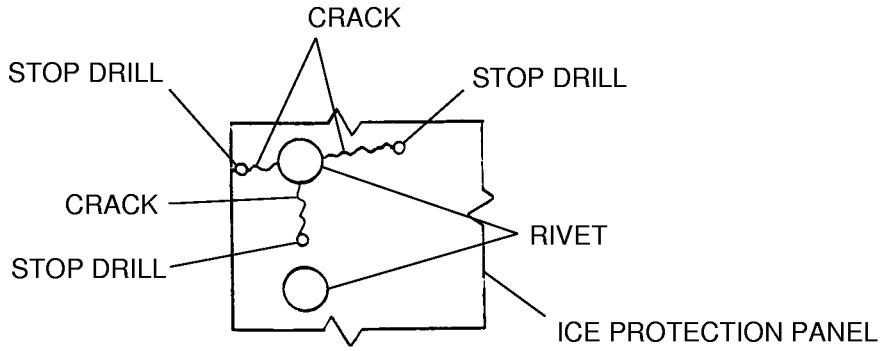


CRACK IN ICE PROTECTION PANEL



COMBINATION OF CRACKS IN ICE PROTECTION PANEL

10801001

Repairing Ice Protection Panel
Figure 832 (Sheet 1)

(2) Fill the stop drilled hole with Epibond 1331 per manufacturer's instructions.

NOTE: Bondtite or Ditzler DX-666 may be used as an alternate for Epibond 1331.

NOTE: Normal finishing, priming, and painting shall be accomplished following repairs.

15. Repair of ABS Material

A. ABS material may be repaired with a patch fabricated from ABS material or with ABS paste.

B. The ABS patch must be a little larger than the damaged area. If required, the patch may be contoured to match part by applying heat to the patch.

C. Small holes may be filled with ABS paste. The paste is fabricated by mixing MEK with ABS to form a paste-like consistency.

D. Apply ABS patch as follows:
(1) Apply MEK, MIBK, acetone, or cyclohexanone to both surfaces by brushing.
(2) Allow solvent to soften both surfaces, then immediately join the surfaces while wet.
(3) Keep the bonding surface in solid contact until the bond is set. Allow 24 hours at 77°F before applying any stress to bond.

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CORROSION - DESCRIPTION AND OPERATION

1. General

A. This section describes corrosion to assist maintenance personnel in identification of various types of corrosion and application of preventative measures to minimize corrosion activity.

B. Corrosion is the deterioration of a metal by reaction to its environment. Corrosion occurs because most metals have a tendency to return to their natural state.

2. Corrosion Characteristics

A. Metals corrode by direct chemical or electrochemical (galvanic) reaction to their environment. The following describes electrochemical reaction:
   (1) Electrochemical corrosion can best be compared to a battery cell. Three conditions must exist before electrochemical corrosion can occur:
      (a) There must be a metal that corrodes and acts as the anode (+ positive).
      (b) There must be a less corrodible metal that acts as the cathode (- negative).
      (c) There must be a continuous liquid path between the two metals, which acts as the electrolyte. This liquid path may be condensation or, in some cases, only the humidity in the air.
   (2) Elimination of any one of the three conditions will stop the corrosion reaction process.
   (3) One of the best ways to eliminate one of the conditions is to apply an organic film (such as paint, grease, or plastic) to the surface of the metal affected. This will prevent electrolyte from connecting the cathode to the anode so current cannot flow, and therefore, prevent corrosive reaction.
   (4) Other means employed to prevent electrochemical corrosion include anodizing and electroplating. Anodizing and other passivating treatments produce a tightly adhering chemical film which is much less electrochemically reactive than the base metal. Because the electrolyte cannot reach the base metal, corrosion is prevented. Electroplating deposits a metal layer on the surface of the base material, which is either less electrochemically reactive (Example: chrome on steel) or is more compatible with the metal to which it is coupled (Example: cadmium plated steel fasteners used in aluminum).
   (5) At normal atmospheric temperatures, metals do not corrode appreciably without moisture. However, the moisture in the air is usually enough to start corrosive action.
   (6) The initial rate of corrosion is usually much greater than the rate after a short period of time. This slowing down occurs because of the oxide film that forms on the metal surfaces. This film tends to protect the metal underneath.
   (7) When components and systems constructed of many different types of metals must perform under various climatic conditions, corrosion becomes a complex problem. The presence of salts on metal surfaces (sea or coastal operations) greatly increases the electrical conductivity of any moisture present and accelerates corrosion.
   (8) Other environmental conditions that contribute to corrosion are:
      (a) Moisture collecting on dirt particles.
      (b) Moisture collecting in crevices between lap joints, around rivets, bolts, and screws.

3. Types of Corrosion

A. The common types of corrosion that are encountered in airplane maintenance are described in this section. In many instances more than one form of corrosion may exist at the same time. While this makes it difficult to determine the exact type of corrosion, it should still be possible to determine that a corrosive process is taking place. If it is impractical to replace an assembly or component, contact an authorized repair shop.

B. Direct Chemical Attack.
   (1) Direct chemical attack may take place when corrosive chemicals, such as battery electrolyte, caustic cleaning solutions or residual flux deposits are allowed to remain on the surface or become entrapped in cracks or joints. Welding or soldering flux residues are hydroscopic and will tend to cause severe pitting. Any potentially corrosive substance should be carefully and completely removed whenever such spillage occurs.

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C. Pitting Corrosion.
   (1) The most common effect of corrosion on polished aluminum parts is called pitting. It is first noticeable as a white or gray powdery deposit, similar to dust, which blotches the surface (Refer to Figure 1).
   (2) When the deposit is cleaned away, tiny pits can be seen in the surface. Pitting may also occur in other types of metal alloys.

D. Intergranular Corrosion.
   (1) Intergranular corrosion (Refer to Figure 1) takes place because of the nature of the structure of metal alloys. As metals cool from the molten state, a granular structure is formed. The size and composition of the grains and the material in the grain boundaries depend on several factors including the type of alloy and rate of cooling from the molten state or cooling after heat-treating. The grains differ chemically and may differ electrochemically from the boundary material. If an electrolyte comes in contact with this type of structure, the grains and boundary material will act as anode and cathode and undergo galvanic corrosion. The corrosion proceeds rapidly along the grain boundaries and destroys the solidity of the metal.

E. Exfoliation gives the appearance of sheets of very thin metal separated by corrosion products. It is a form of intergranular corrosion. This type of corrosion is most often seen on extruded sections, where the grain thicknesses are usually less than in rolled alloy form. Most exfoliation type corrosion is found on aluminum alloy ducting.
   (1) Exfoliation shows itself by “lifting up” the surface grains of a metal by the force of expanding corrosion. This occurs at the grain boundaries just below the surface of the metal.

F. Dissimilar Metal Corrosion. (Refer to Figure 1)
   (1) Dissimilar metal corrosion occurs when dissimilar metals are in contact in the presence of an electrolyte. A common example of dissimilar metal contact involves the attachment of aluminum parts by steel fasteners.

G. Concentration Cell Corrosion. (Refer to Figure 1)
   (1) Concentration cell corrosion occurs when two or more areas of the same metal surface are in contact with different concentrations of the same solution, such as moist air, water, and chemicals.
   (2) The general types of concentration cell corrosion are identified as metal ion cells and oxygen cells. Refer to Figure 1.

H. Filiform Corrosion.
   (1) Filiform corrosion is a “concentration cell” corrosion process. When a break in the protective coating over aluminum occurs, the oxygen concentration at the back or bottom of the corrosion cell is lower than that at its open surface. The oxygen concentration gradient thus established, causes an electric current flow, and corrosion results. Filiform corrosion results when this happens along the interface between the metal and the protective coating and appears as small worm-like tracks. Filiform corrosion generally starts around fasteners, holes, and countersinks and at the edge of sheet metal on the outer surface of the airplane. Filiform corrosion is more prevalent in areas with a warm, damp, and salty environment.
   (2) To help prevent filiform corrosion development, the airplane should be:
      (a) Spray washed at least every two to three weeks (especially in a warm, damp environment).
      (b) Waxed with a good grade of water repellent wax to help keep water from accumulating in skin joints and around countersinks.

         NOTE: Wax only clean surfaces. Wax applied over salt deposits will almost guarantee a trapped salt deposit, which is capable of accumulating moisture and developing into filiform corrosion.

      (c) Keep the airplane hangared to protect it from the atmosphere.
      (d) Fly the airplane to promote aeration of enclosed parts.
      (e) Ensure all vent/drain holes are open to ventilate the interior of airplane.
   (3) To remove filiform corrosion once it has been discovered:
      (a) Remove paint from corroded area.

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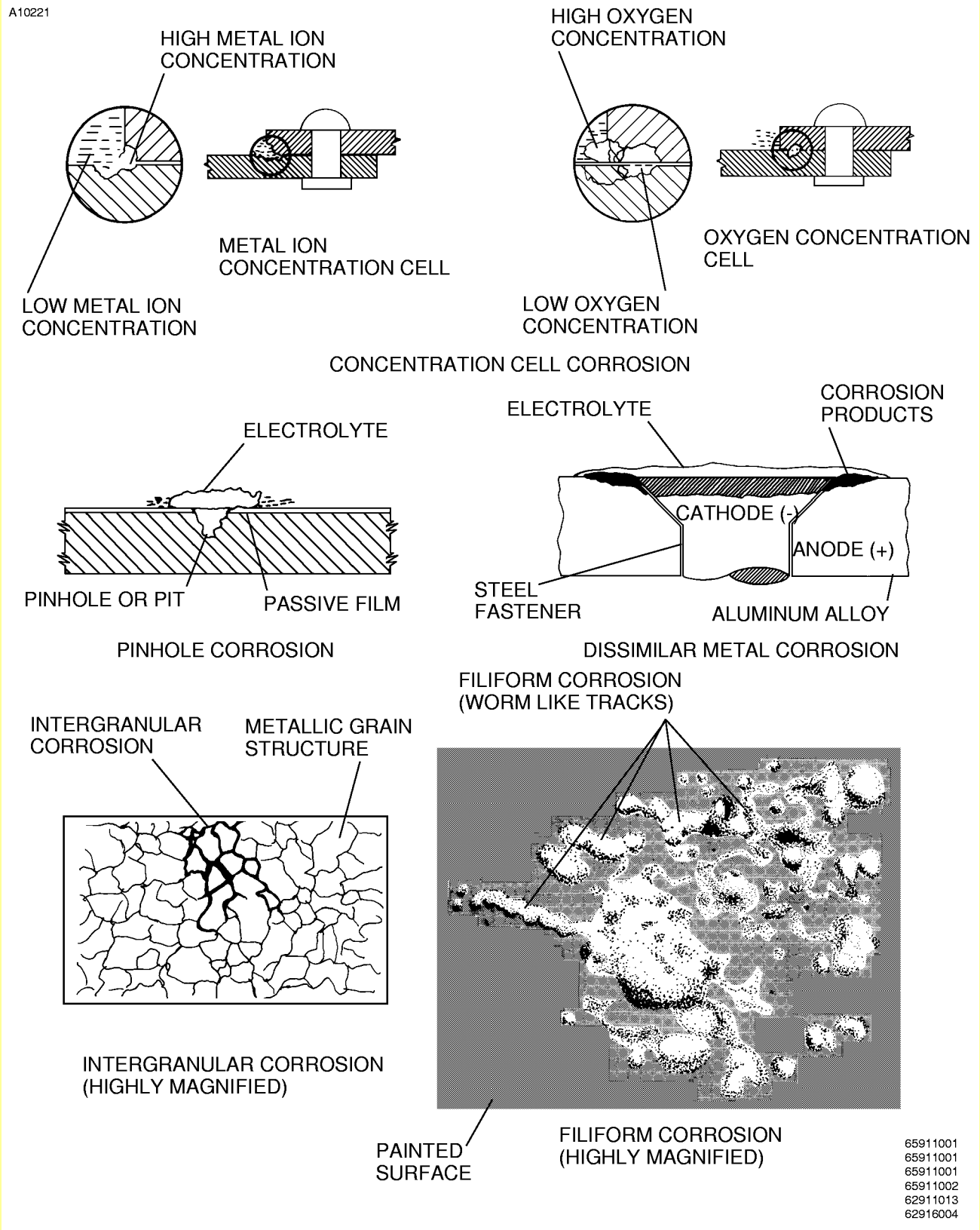

Corrosion
Figure 1 (Sheet 1)

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(b) Remove corrosion by sanding area to metal surface, using either a ScotchBrite pad or 320 grit sandpaper (aluminum oxide or silicone carbide grit).
(c) Clean and refinish surface.

I. Stress Corrosion Cracking.
(1) This corrosion is caused by the simultaneous effects of tensile stress and corrosion. The stress may be internal or applied. Internal stresses are produced by nonuniform shaping during cold working of the metal, press and shrink fitting general hardware, and those induced when pieces, such as rivets and bolts, are formed. The amount of stress varies from point to point within the component. Stress corrosion is most likely to occur at points of highest stress, which are also subject to corrosion influence.

J. Fatigue Corrosion.
(1) Fatigue corrosion is a special case of stress corrosion caused by the combined effects of cyclic stress and corrosion. An example of this kind of corrosion is unprotected engine bleed-air ducts that are exposed to moisture. They are often held in such a way that thermal expansion causes repeated twisting of the duct. This creates metal fatigue and crystallization cracks in which corrosion starts.

4. Typical Corrosion Areas

A. Aluminum appears high in the electrochemical series of elements and its position indicates that it should corrode very easily. However, the formation of a tightly adhering oxide film offers increased resistance under mild corrosive conditions. Most metals in contact with aluminum form couples, which undergo galvanic corrosion attack. The alloys of aluminum are subject to pitting, intergranular corrosion, and intergranular stress corrosion cracking.

B. Battery Electrolyte.
(1) Battery electrolyte used in nickel-cadmium batteries is composed of 30 percent potassium hydroxide and 70 percent water. When electrolyte is spilled, it should be cleaned up immediately. A weak boric acid solution may be applied to the spillage area followed by a thorough flushing with clean, cold running water. If boric acid is not available, flush the area with clean, cold water.
(2) If corrosion appears, use an approved repair method to repair the structure.

C. Steel Control Cable.
(1) Checking for corrosion on a control cable is normally accomplished during the preventative maintenance check. During preventative maintenance, broken wire and wear of the control cable are also checked.
(2) If the surface of the cable is corroded, carefully force the cable open by reverse twisting and visually inspect the interior. Corrosion on the interior strands of the cable constitutes failure and the cable must be replaced. If no internal corrosion is detected, remove loose external rust and corrosion with a clean; dry, coarse weave rag, or fiber brush.

CAUTION: Do not use metallic wools or solvents to clean installed cables. Metallic wools will embed dissimilar metal particles in the cables and create further corrosion. Solvents will remove internal cable lubricant, allowing cable strands to abrade and further corrode.

(3) After thorough cleaning of exterior cable surfaces, apply a light coat of lubricant to the external cable surface. Refer to Chapter 12, Flight Controls - Lubrication.

D. Piano Type Hinges.
(1) The construction of piano type hinges forms moisture traps as well as the dissimilar metal couple between the steel hinge pin and the aluminum hinge. Solid film lubricants are often applied to reduce corrosion problems.

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(2) Care and replacement of solid film lubricants require special techniques peculiar to the particular solid film being used. Good solid film lubricants are lubricants conforming to Specification MIL-PRF-81322.
   (a) Solid film lubricants prevent galvanic coupling on close tolerance fittings and reduce fretting corrosion. Surface preparation is extremely important to the service or wear life of solid film lubricants.
   (b) Solid film lubricants are usually applied over surfaces coated with other films, such as anodize and phosphate. They have been successfully applied over organic coatings such as epoxy primers.

CAUTION: Solid film lubricants containing graphite, either alone or in mixture with any other lubricants, should not be used since graphite is cathodic to most metals and will cause galvanic corrosion in the presence of electrolytes.

E. Requirements peculiar to faying surfaces of airframes, airframe parts, and attaching surfaces of equipment, accessories, and components.
   (1) When repairs are made on equipment or when accessories and components are installed, the attaching surfaces of these items should be protected. The following requirements are peculiar to faying surfaces on airframes, airframe parts, and attaching surfaces of equipment, accessories and components:
   (2) Surfaces of similar or dissimilar metals.
      (a) All faying surfaces, seams, and lap joints protected by sealant must have the entire faying surface coated with sealant. Excess material squeezed out should be removed so that a fillet seal remains. Joint areas, which could hold water, should be filled or coated with sealant.
      (b) Faying surfaces that are to be adhesive bonded should be treated and processed as specified in Chapter 20, Protective Treatment of Metal - Description and Operation.
   (3) Attaching Parts.
      (a) Attaching parts, such as nuts, bushings, spacers, washers, screws, self-tapping screws, self-locking nuts, and clamps, do not need to be painted in detail except when dissimilar metals or wood contact are involved in the materials being joined. Such parts should receive a wet or dry coat of primer.

NOTE: Corrosion inhibiting solid film lubricants, Specification MIL-PRF-46010 and/or MIL-L-46147, may be used to protect attaching parts from corrosion.

      (b) All holes drilled or reworked in aluminum alloys to receive bolts, bushings, screws, rivets, and studs should be treated before installation of fasteners or bushings.
      (c) All rivets used to assemble dissimilar metals should be installed wet, with sealant, conforming to Specification MIL-PRF-81733 Corrosion inhibiting sealer (Type X).
   (4) Close tolerance bolts passing through dissimilar metals should be coated before installation, with a corrosion inhibiting solid film lubricant conforming to Specification MIL-PRF-46010 and/or MIL-L-46147.
   (5) Washers made of aluminum alloy of suitable design should be used under machine screws, countersunk fasteners, bolt heads, and nuts.
   (6) Adjustable parts threads such as tie rod ends, turnbuckles, etc., should be protected with solid film lubrication conforming to Specification MIL-PRF-46010 and/or MIL-L-46147.
   (7) Slip fits should be assembled using wet primer conforming to Specification MIL-PRF-23377G or later, non-drying zinc chromate paste, or solid film lubricant conforming to Specification MIL-PRF-46010 and/or MIL-L-46147.
   (8) Press fits should be accomplished with oil containing material conforming to Specification MIL-C-11796, Class 3, and/or MIL-C-16173, Class 1, or with other suitable material that will not induce corrosion.

F. Electrical.
   (1) Bonding and ground connections should be as described by the installation procedure.

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(2) Potting compounds are used to safeguard against moisture. Corrosion in electrical systems and resultant failure can often be attributed to moisture and climatic condition.
(3) Corrosion of metal can be accelerated because of the moisture absorbed by fungi. Fungi can create serious problems since it can act as an electrolyte, destroying the resistance of electrical insulating surfaces. Specification ASTM D3955 or ASTM D295-58 outlines moisture and fungus resistant varnish to be used.

G. Exhaust Gas Corrosion.
(1) Refer to Corrosion - Approved Repairs for repair of exhaust gas corrosion.

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CORROSION - APPROVED REPAIRS

1. Corrosion Treatment

A. Description.
(1) Cleaning the airplane at regular intervals is helpful in the prevention of corrosion. Where corrosion occurs, complete removal of corrosion deposits is required to prevent recurrence. Partial removal and covering with paint will not halt continued attack, since a small amount of moisture penetrates the surface of all paint and allows corrosion to continue.
(2) When an area of corrosion is determined to exist, the area must be cleaned and the paint stripped as required. If the area is confined and the use of paint stripper is impractical because of rinsing difficulties, the paint may be removed with solvent material per Federal Specification TT-E-751 or TT-T-266. Apply solvent with soft bristle brush, allow solvent to remain until paint film is loosened, then wipe clean with a clean damp cloth.
(3) Heavy aluminum parts are susceptible to intergranular corrosion attack. Mechanical corrosion removal may be used on areas of heavy corrosion, pitted areas, or in conjunction with chemical corrosion removal. For lightly corroded areas, No. 400 aluminum grit abrasive paper or abrasive mat may be used. For heavily corroded or pitted areas, a carbide tipped scraper, fine fluted rotary file or grinder may be used. To avoid the possibility of stress concentrations, the cleaned area should be blended into the surrounding area to form a saucer-shaped depression. The cleaned area should have a width of 10 times the depth and a length of 20 times the depth when possible. Mechanical corrosion removal must be followed by chemical corrosion removal in order to thoroughly clean the surface for corrosion proofing treatment.
(4) Chemical corrosion removal is used on clad aluminum parts; such as skin, and in other areas of light corrosion. The surrounding parts and materials shall be protected from corrosion remover damage by masking or other appropriate methods. Specific caution should be exercised in areas where the corrosion remover could become entrapped or attack an uncorroded area.

2. Corrosion Removal

A. Removal of Light Corrosion and Discoloration.
(1) Apply Delchem 810 with brush or cloth.
(2) Agitate with short fiber brush or abrasive mat until all corrosion products are removed. Do not leave conditioner in contact with the surface for more than 20 minutes.
(3) Rinse off the corrosion remover with a damp cloth, rinsing frequently in water.
(4) Repeat cycle as required.
(5) After all corrosion is removed, thoroughly rinse treated area with clean water.
(6) Apply pretreatment (Iridite 14-2 or Alodine 1200S) to aluminum where corrosion was removed. Follow the manufacturer's instructions.

B. Removal of Moderate Corrosion.
(1) Dilute Pennwalt 715 with an equal volume of water in a plastic-lined container.
(2) Apply diluted Pennwalt 715 with a brush or cloth wetting the entire corroded surface thoroughly.
(3) Allow the solution to stand as long as necessary to remove the corrosion products, but never longer than 20 minutes.
(4) Scrub with a short fiber brush just before rinsing with water or a damp cloth.
(5) Repeat cycle as necessary.
(6) After all corrosion is removed, thoroughly rinse treated area with clean water and dry.
(7) Apply pretreatment (Iridite 14-2 or Alodine 1200S) to aluminum where corrosion was removed. Follow manufacturer's instructions.

C. Removal of Battery Acid Corrosion (for Lithium Batteries).
(1) Procedure 1 (Use for small areas of corrosion).
(a) Wash with mild detergent such as Lux or Ivory.
(b) Rinse thoroughly and dry.
(c) Remove corrosion with steel wool or scouring pad.
(d) Clean with MEK, acetone, or similar solvent.

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(2) Procedure 2 (Use for large areas of corrosion).
   (a) Dilute one part 225S Step A cleaner (Dupont product) with two parts water in a plastic or glass container before using.
   (b) Protect adjacent areas by using masking tape and polyurethane sheeting.
   (c) Freely apply the diluted 225S solution to the affected area. While the surface is still wet, rinse thoroughly with clear water or wipe with a clean damp cloth.
   (d) Allow surface to air dry or wipe dry with a clean cloth.
   (e) From a clean plastic container, apply 226S Step B conversion coating without dilution to the affected area. Allow to remain 2-5 minutes.
   (f) 226S should be applied to as much surface as can be coated and rinsed before the solution dries.
   (g) Flush 226S from surface with cold water or mop with a damp synthetic sponge, rinsed occasionally in cold water.

NOTE: Both 225S and 226S are Dupont products and can be obtained from any Dupont outlet. Manufacturer's safety precautions should be followed.

D. Removal of Exhaust Gas Corrosion (Refer to Figure 801).

CAUTION: Do not use steel wool, emery cloth, or wire brush to remove corrosion. Care shall be taken not to remove or damage the alclad coating in areas adjacent to corrosion. Do not apply chemical brighteners to inaccessible areas that cannot be completely flushed.

(1) Cleaning and preparation.
   (a) Strip affected area with stripper.
   (b) Take measurements of spar cap members in corroded area (to be used when determining depth of removed material for repair requirements).
(2) Corrosion removal.

NOTE: Treatment of fayed surfaces or detailed structures will require disassembly.

   (a) Remove corrosion with a nonmetallic abrasive pad (Scotchbrite) or with chemical brighteners (Quickbrite or Metal Glo #3 or #4). Follow manufacturer's instructions.
(3) Inspection for repair requirement.
   (a) Fluorescent inspect the cleaned area to ensure removal of all corroded material and that no cracks are present.
   (b) Determine the depth of material removed at corroded areas by taking measurements and comparing with those taken during cleaning and preparation. Refer to Figure 801 for maximum allowable materials which may be removed from spar cap structures.
   (c) If material removed from spar cap structures is greater than allowable in examples of Figure 801, make spar cap beefup as required. Refer to Damage - Approved Repairs for repair instructions.
   (d) If material removed from spar cap structures is within limits allowed in examples of Figure 801, the areas may be refinished. Apply a color chemical film, primer, and paint.

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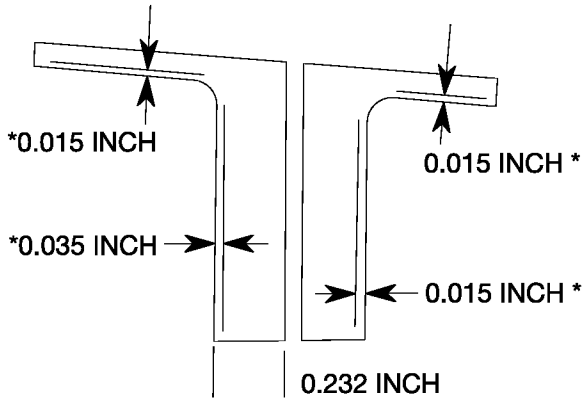
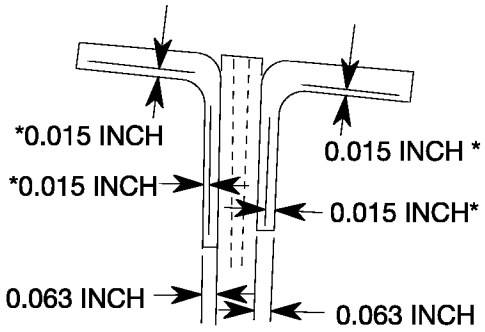
REAR SPAR
(UPPER AND LOWER CAPS)



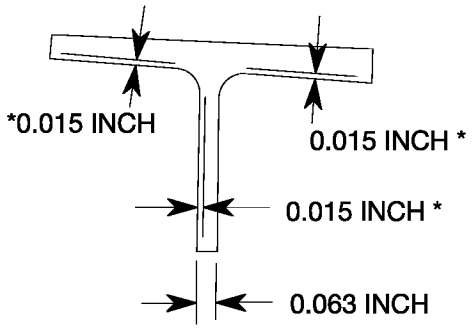
W.S. 57.5 AND INBOARD
SECTION SHOWN IS W.S. 57.5

*MAXIMUM TOTAL THICKNESS THAT CAN BE REMOVED FROM BOTH STEMS IS 0.050 INCH, BUT NOT MORE THAN 0.035 INCH CAN BE REMOVED FROM EACH SIDE
MAXIMUM THICKNESS OF 0.015 INCH CAN BE REMOVED FROM EACH HORIZONTAL FLANGE



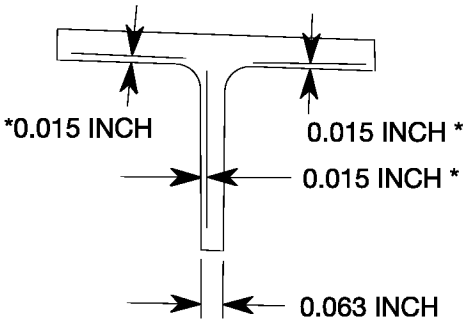
W.S. 57.5 TO 73.50
SECTION SHOWN IS W.S. 73.50

*MAXIMUM TOTAL THICKNESS THAT CAN BE REMOVED FROM BOTH STEMS IS 0.030 INCH, BUT NOT MORE THAN 0.015 INCH CAN BE REMOVED FROM EACH STEM. MAXIMUM THICKNESS OF 0.015 INCH CAN BE REMOVED FROM HORIZONTAL FLANGE



W.S. 73.54 TO 89.5

* MAXIMUM THICKNESS ALLOWED TO BE REMOVED WITHOUT BEING REINFORCED



W.S. 89.5 TO 120.0

*MAXIMUM THICKNESS ALLOWABLE TO BE REMOVED WITHOUT BEING REINFORCED

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Exhaust Gas Corrosion Allowable Material Removal
Figure 801 (Sheet 1)

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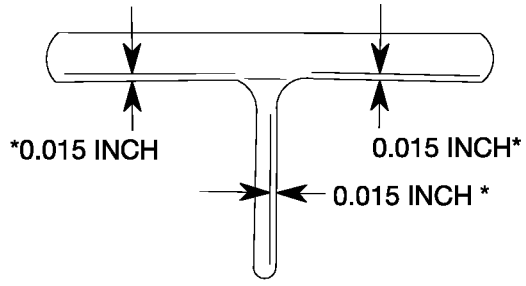
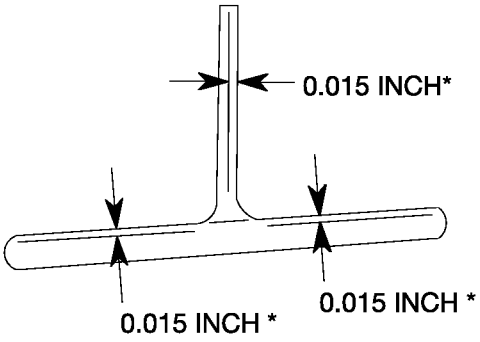
FRONT SPAR
(UPPER AND L0WER CAPS)



W.S. 28.4 TO 89.50
*MAXIMUM THICKNESS ALLOWED TO
BE REMOVED WITHOUT BEING REINFORCED



W.S. 40.12 TO 73.50
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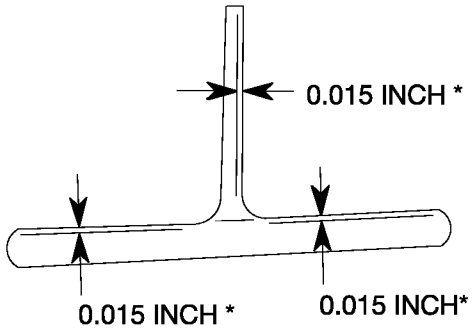

W.S. 73.50 TO 89.50
*MAXIMUM THICKNESS ALLOWED TO
BE REMOVED WITHOUT BEING REINFORCED

14142040

Exhaust Gas Corrosion Allowable Material Removal
Figure 801 (Sheet 2)

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CORROSION SEVERITY MAPS - DESCRIPTION AND OPERATION

1. General

A. This section contains maps which define the severity of potential corrosion on airplane structure.

B. Corrosion severity zones are affected by atmospheric and other climatic factors. The maps provided in this section are for guidance when determining types and frequency of required inspections and other maintenance. Refer to Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, and Figure 6.

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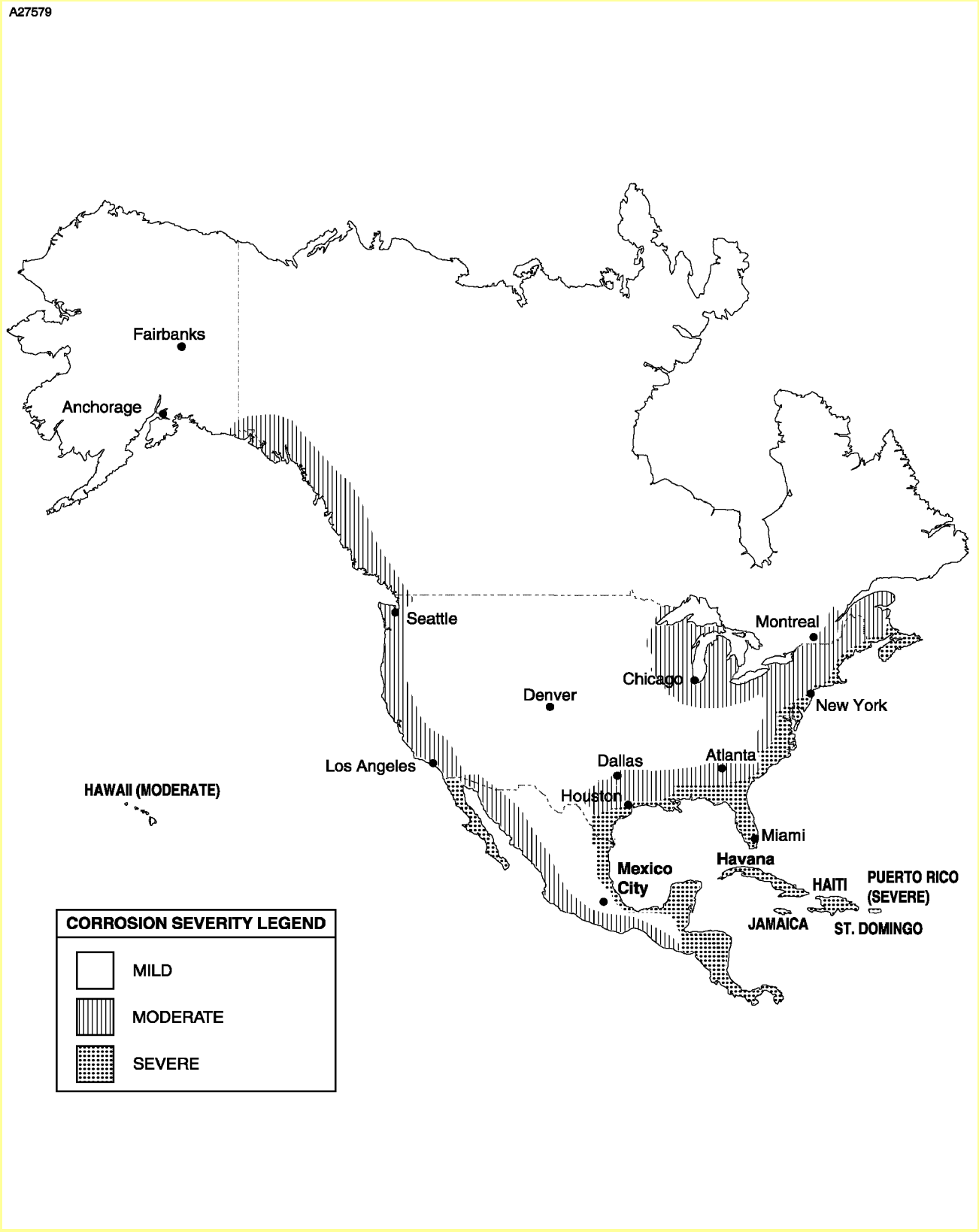

North America Corrosion Severity Map
Figure 1 (Sheet 1)

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South America Corrosion Severity Map
Figure 2 (Sheet 1)

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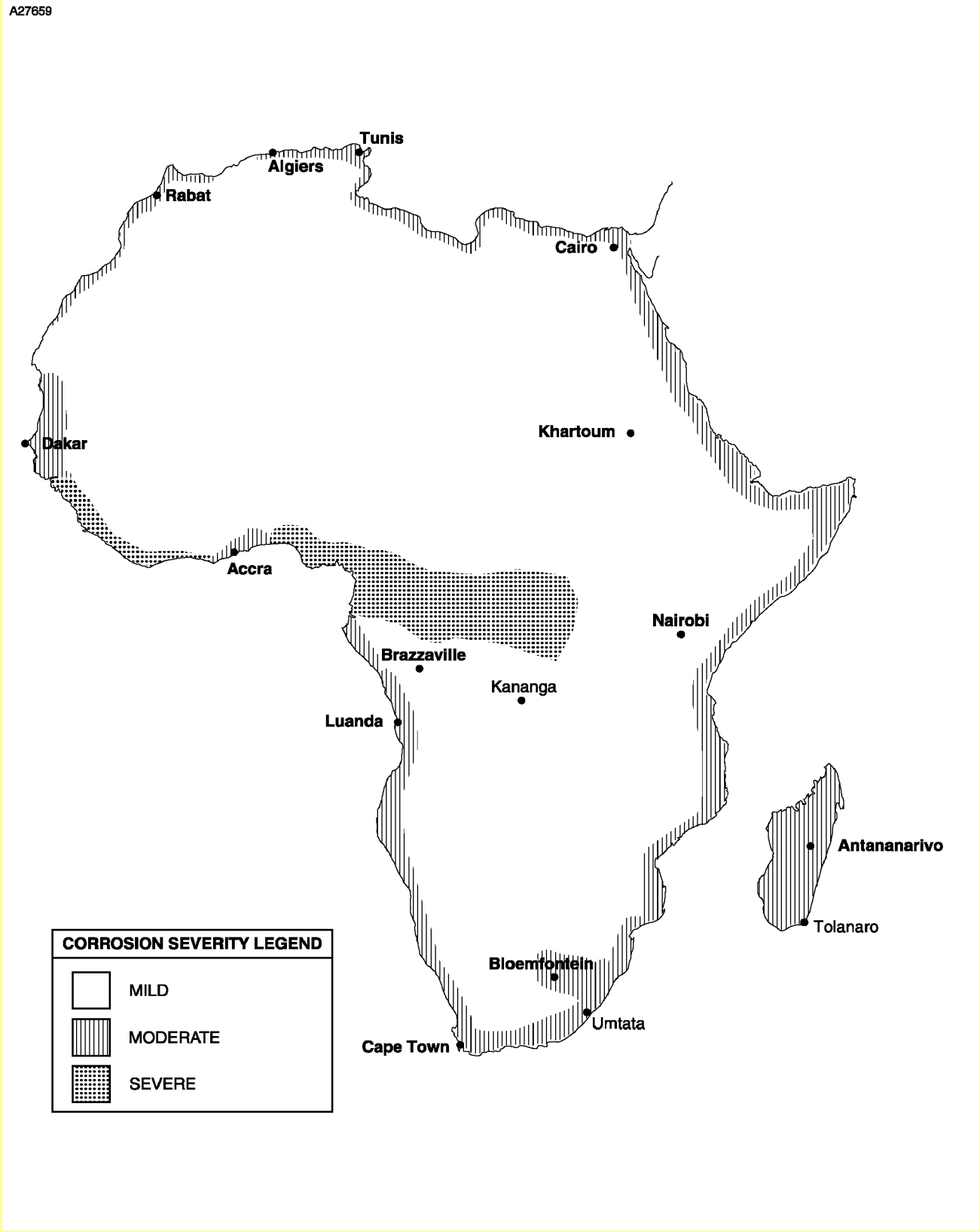

Africa Corrosion Severity Map
Figure 3 (Sheet 1)

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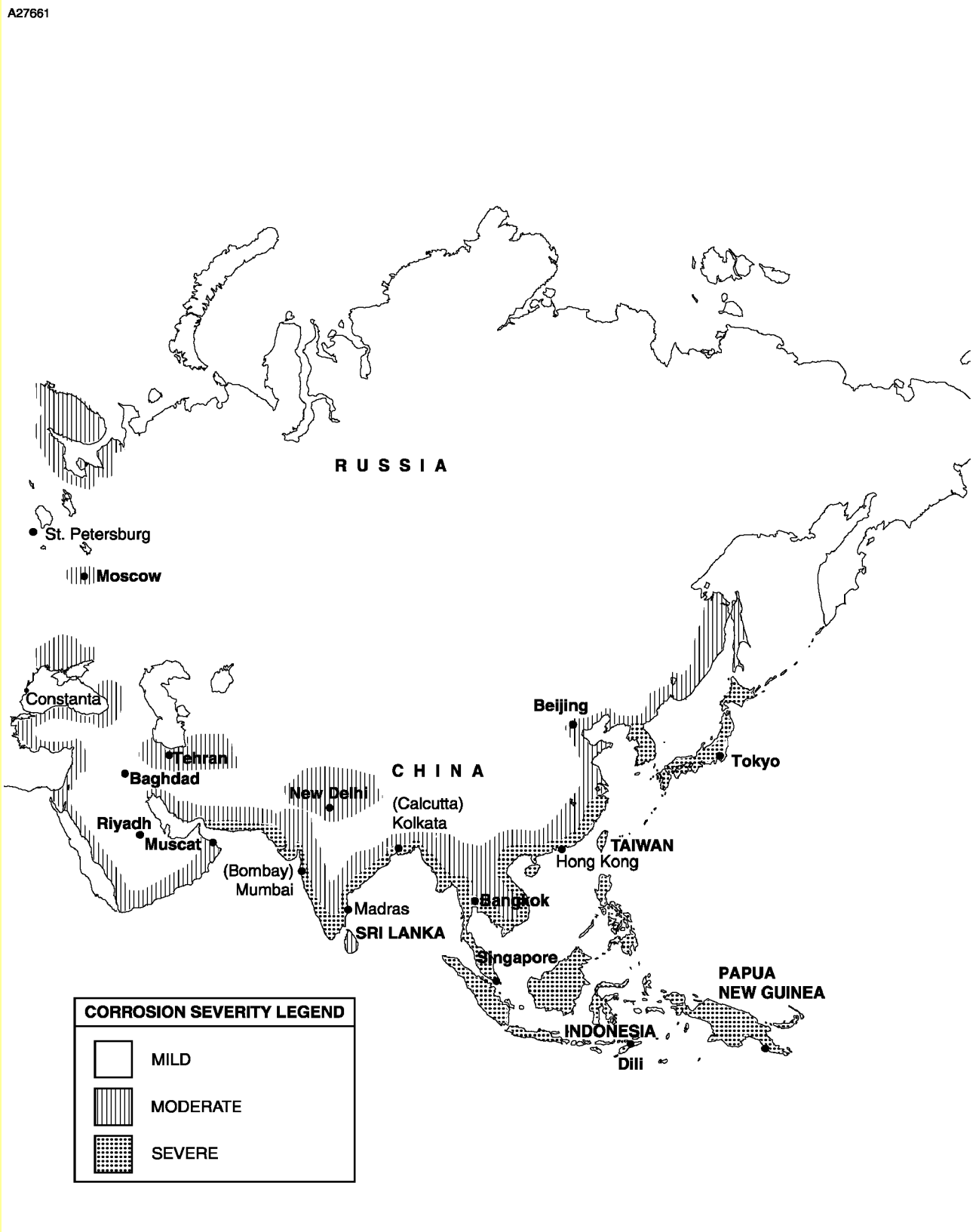

Asia Corrosion Severity Map
Figure 4 (Sheet 1)

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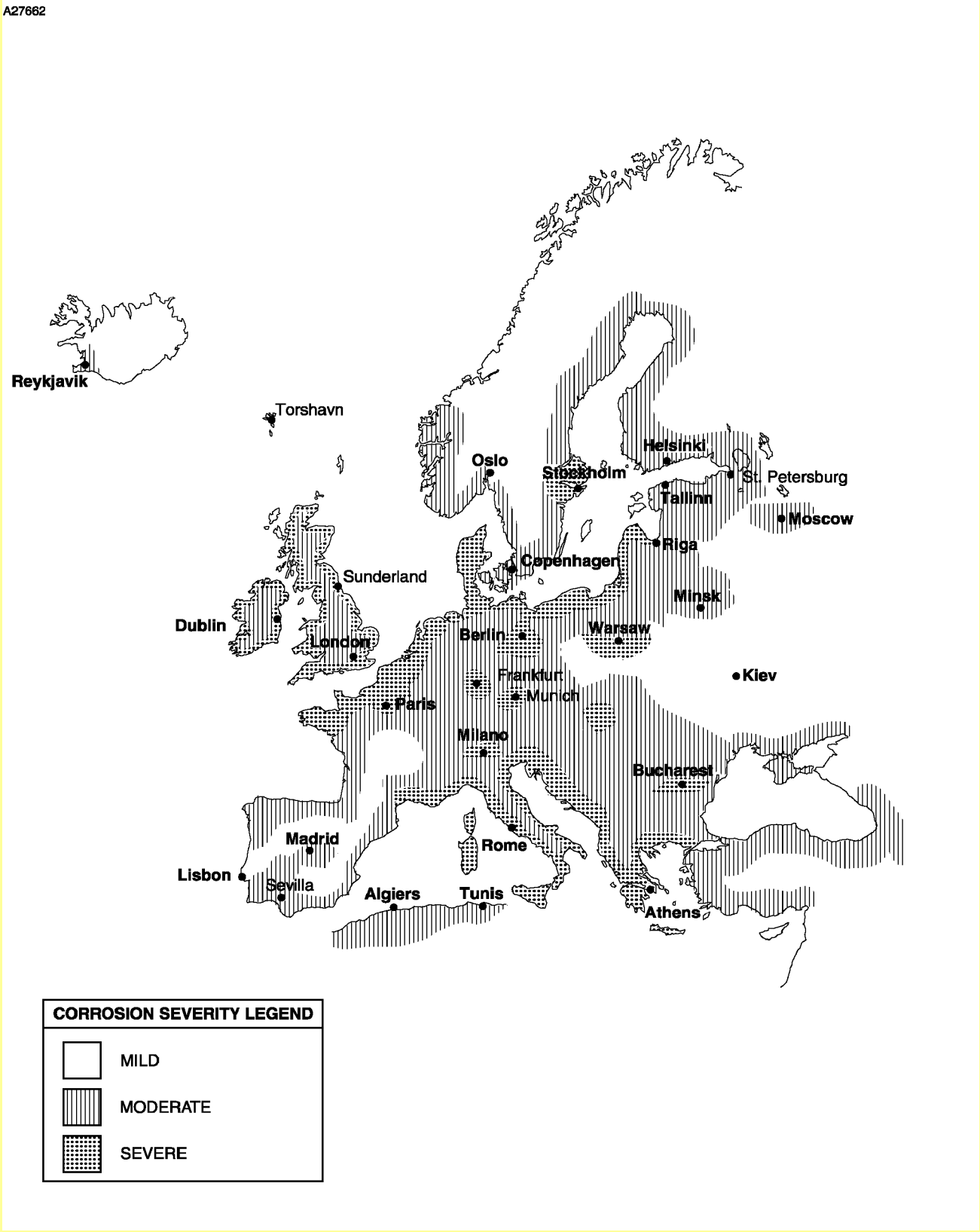

Europe and Asia Minor Corrosion Severity Map
Figure 5 (Sheet 1)

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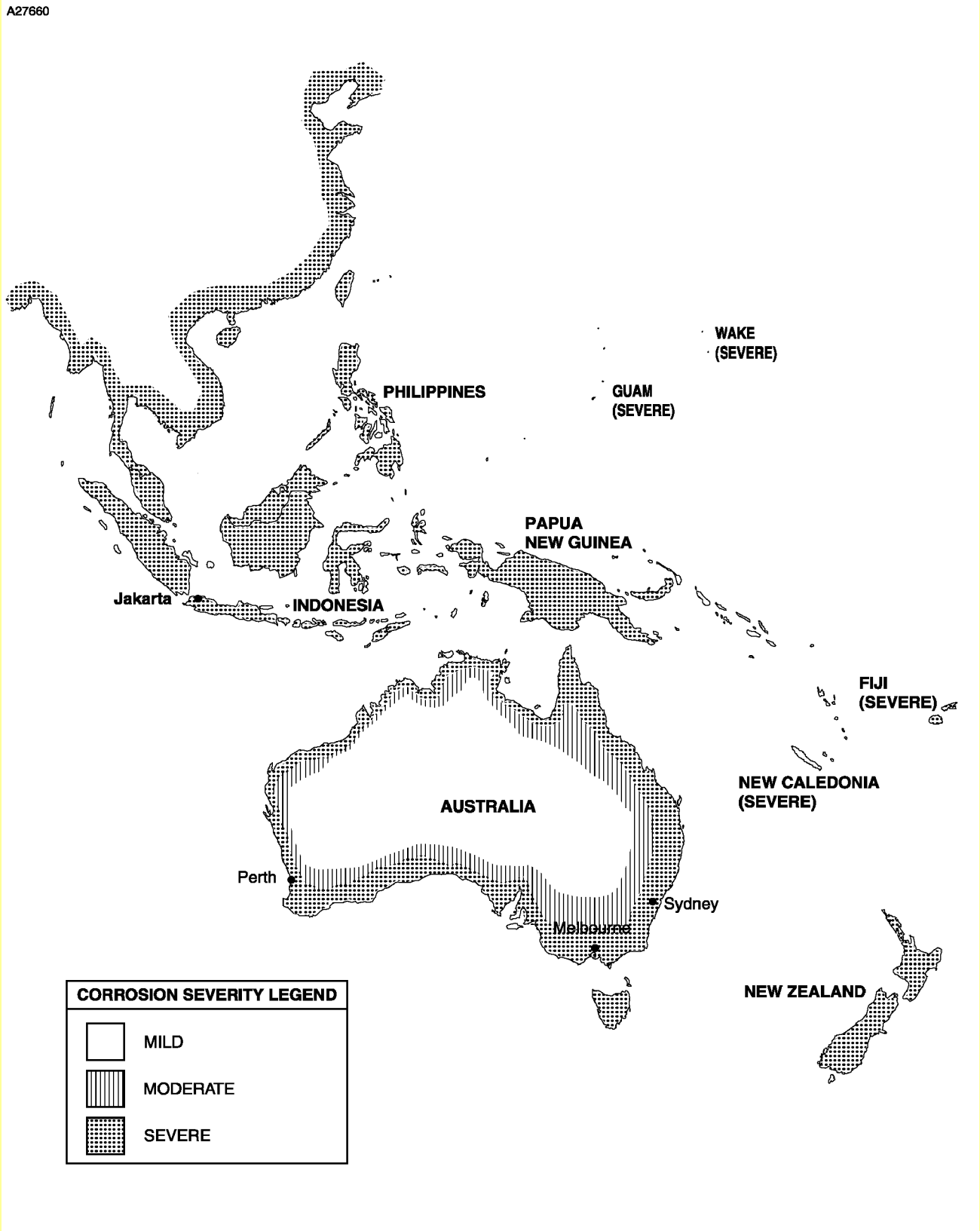

South Pacific Corrosion Severity Map
Figure 6 (Sheet 1)

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FASTENERS - MAINTENANCE PRACTICES

1. Torque Values

A. For a list of torque values, refer to Chapter 20, Table 201.

2. Rivets

A. General.
(1) The following rivets are commonly used in airplane structures: standard solid shank, hi-shear, and blind. Rivets used in airplane construction are most generally fabricated from aluminum alloys. In special cases monel, corrosion resistant steel, mild steel, copper, and iron rivets are used.

B. Types.
(1) Standard solid shank rivets are those generally used in airplane construction. They are fabricated in the following head types: roundhead, flathead, countersunk-head, and brazier-head. Roundhead rivets are generally used in the interior of airplane except where clearance is required for adjacent members. Flathead rivets are generally used in the interior of the airplane where head clearance is required. Countersunk-head rivets are used on the exterior surfaces of the airplane to minimize turbulent airflow. Brazier-head rivets are used on the exterior surfaces of the airplane where strength requirements necessitate a stronger rivet head than that of the countersunk-head rivet. Both the brazier-head and the countersunk-head rivets are used on the exterior of the airplane where head clearance is required.
(2) Hi-shear rivets are special patented rivets having a high shear strength equivalent to that of the standard AN bolts. They are used in special cases in locations where high shear loads are present, such as spars, wings, and heavy bulkhead ribs. The rivet consists of a cadmium plated pin of alloy steel and a collar of aluminum alloy. The installed rivet can be readily identified by the presence of the attached collar in place of the formed head on standard rivets.
(3) Blind rivets are used (where strength requirements permit) when one side of the structure is inaccessible making it impossible or impractical to drive standard solid shank rivets.

C. Substitution of Rivets.
(1) Standard solid shank rivets.
(a) In the replacement of rivets in installations which require the raised head rivets it is desirable to use whichever of the rivets that correspond to the type of rivet removed.
(b) Countersunk head rivets are to be replaced by rivets of the same type and degree of countersink.
(c) When rivet holes become enlarged, deformed, or otherwise damaged use the next larger size as replacement.
(d) Replacements shall not be made with rivets of lower strength material unless they are larger than those removed.
(e) In the absence of aluminum rivets, stainless, monel, or iron rivets may be used with generous application of zinc chromate primer only to permit necessary flights of the airplane. The proper replacement shall be made as soon as facilities are available.
(2) Hi-shear rivets.
(a) When hi-shear rivets are not available, replacement of sizes 3/16 or greater shall be made with bolts of equal or greater strength than the rivet being replaced and with self-locking nuts of the same diameter. The flush-type hi-shear rivet may be temporarily replaced by like diameter flush-type steel screws of equal or greater strength and self-locking nuts provided the threaded part of the screw does not extend into the material being fastened together. This latter procedure is temporary only and replacement with the hi-shear flush-type rivet must be accomplished as soon as they become available.
(3) Blind rivets.
(a) Blind rivets have higher deflection rates in shear than standard solid rivets. For this reason, it is not advisable to replace any considerable number of solid rivets in a given joint by blind rivets because this may result in over-stressing the remaining solid rivets. The following specific instructions apply:
1 The hollow blind rivet shall not be used.

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2 The blind rivet used shall be of the same or greater strength and one size larger than the rivet it replaces, except that blind rivets may be replaced size for size.

3 In cases of dimpled assembly, the rivet holes shall be drilled after the sheets are dimpled.

4 When possible, the exposed end of each clipped plug shall be coated with a 10% chromic acid solution or with zinc chromate primer.

5 Blind rivets shall not be used in hulls, floats, or tanks except in cases of absolute necessity.

6 If blind fasteners other than the blind rivets are encountered, it is recommended that replacements be made by either of these fasteners or by standard rivets.

NOTE: Cherry Max rivets are allowable substitutes for all like applications of NAS1398 and NAS1399 rivets. Cherry Max rivets are manufactured by Cherry Rivet Division of Townsend, Santa Ana, CA.

D. Diameters.
(1) Rivet diameters range from 3/32 inch to 3/8 inch. The 1/8, 5/32, and 3/16 inch sizes are the most frequently used.
(2) Since smaller rivets lack the proper structural qualities and larger rivets may dangerously reduce the splice or patch area, care must be exercised before substituting other than the specified sizes of rivet diameter.

E. Lengths.
(1) The proper length of rivet is an important part of the repair. Should too long a rivet be used, the formed head will be too large, or the rivet may bend or be forced between the sheets being riveted. Should too short a rivet be used the formed head will be too small or the riveted material will be damaged.
(2) If proper length rivets are not available, longer rivets may be cut off to equal the proper length (not grip).
(3) The rivet length is based on the grip.

F. Removal of Solid Rivets (Refer to Figure 201).
(1) When it becomes necessary to replace rivets, great care should be taken in their removal so that the rivet hole will retain its original size and not require replacement with a larger size rivet.
(2) To remove a rivet, file a flat on the manufactured head. It is always preferable to work on the original head rather than on the one that is bucked over, since the former will always be more symmetrical about the shank. Indent the flat surface with a counter-punch so the drill may be correctly centered. A drill slightly less in diameter than the rivet shank should be used to drill and weaken the head. Take care that the rivet shank does not turn with the drill and cause a tear. If the other end of the rivet is supported, the head may be sheared off with a sharp chisel. This cutting should always be done along the direction of the plate edge. If the shank is unduly tight after the removal of the head, the rivet should be drilled out completely. It may be forced out with a counterpunch of a smaller diameter than the rivet, provided the sheet is properly supported from the opposite side; however, there is greater danger of damaging the sheet and enlarging the hole when using this method. This procedure will also apply to flush rivets.

G. Riveting Installation (Refer to Figure 201).
(1) Riveting procedure. A large percentage of the riveting of airplane structures is done on thin gage aluminum alloy and the work must be so accomplished that the material is not distorted by hammer blows or injured with riveting tools. All airplane power riveting is done by upsetting or heading the rivets against a bucking bar instead of striking the shank with a hammer.
(a) To prevent deforming of its head a rivet set must be selected to fit each type. The depth of this set must be such that it does not touch the material being riveted.
(b) Parts which are to be heat-treated should be heat-treated before riveting since heat treating after this process causes warping. This is also necessary when assemblies are heated in a salt bath as the salt cannot be entirely washed out of the cracks.
(c) Rivets of a diameter smaller than three thirty-seconds inch must not be used for any structural parts, control parts, wing covering, cowling, or similar sections of airplane except where there are actual replacements.

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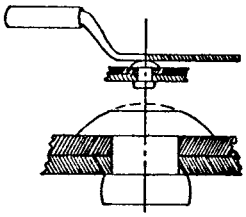
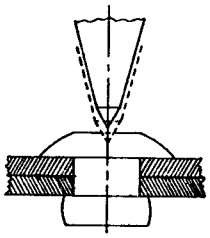
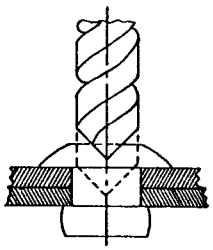


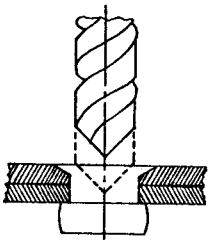
1. FILE A FLAT ON THE MANUFACTURED HEAD



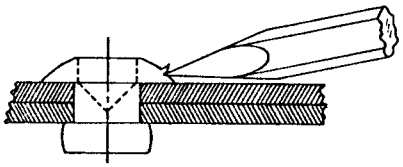
2. CENTER PUNCH THE FLAT



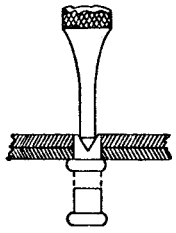
3. DRILL THROUGH HEAD USING DRILL ONE SIZE SMALLER THAN RIVET SHANK



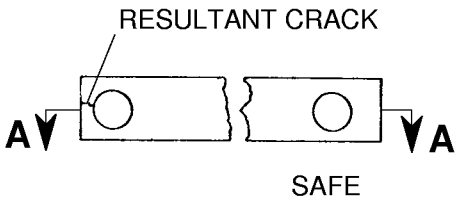
4. DRILL THROUGH DIMPLE COUNTER-SUNK OR COUNTERSUNK HEAD USING DRILL ONE SIZE SMALLER THAN RIVET SHANK

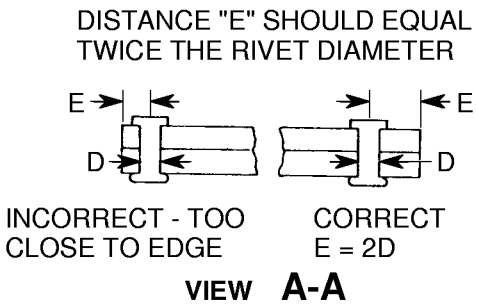


5. REMOVE WEAKENED HEAD WITH SHARP CHISEL



6. PUNCH OUT RIVET WITH MACHINE PUNCH





Rivet Removal and Rivet Edge Distance
Figure 201 (Sheet 1)

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(d) Rivets through hollow tubes, which are loaded only in shear, should be hammered just enough to form a small head. No attempt should be made to form the standard round head as the amount of hammering required often causes the rivet to buckle inside the tube, with resultant injury to the member.
(e) Aluminum alloy rivets must never be used in tension for structural, control, or other critical parts of airplane. Whenever such an installation is required, bolts should be used.
(f) The use of hollow rivets in joining highly stressed parts is not permitted. When rivets cannot be driven because of the inaccessibility of the end for bucking or driving, the next size self-plugging cherry rivet may be used.
(g) The selection of the proper rivet and proper number of rivets is very important.
(h) The rivets must be of the proper length for the total thickness of the pieces being riveted. Ordinarily, from 1-1/2 to 2 times the diameter of the rivet is about the right amount for the rivet shank to protrude through the material to form the head. For heavy material such as plates or fittings, from 2 to 2-1/2 diameters may be used.
(i) The rivet should not be too loose in the hole as this condition will cause it to bend over while being headed, and the shank will not be sufficiently expanded to completely fill the hole. A drill from 0.002 to 0.004 inch larger than the rivet should be used for sheet and plate riveting.
(j) Pieces should be held firmly together by clamps, screws, or bolts while they are being drilled and riveted.
(k) Where rivets are headed on the inside of the structure, the bucking bar is held against the end of the rivet shank. Care must be exercised doing this operation to prevent unseating the rivet by the application of too much pressure. For the first few blows the bucking bar should be held lightly against the rivet shank so that it will receive the impact of the blow through the rivet. The bucking bar must be held square with rivet to avoid turning it over.
(l) Only a sufficient number of blows should be struck to properly upset a rivet. The blows must be as uniform as possible.

(2) Sparing and diameter of rivets. There are no specific rules which are applicable to every case or type of riveting. There are, however, certain general rules which should be understood and followed.
(a) The edge distance of rivets should not be less than two diameters of the rivet measured from the edge of the sheet or plate to the center of the rivet hole (Refer to Figure 201).
(b) The spacing between rivets, when in rows, depends upon several factors, principally the thickness of the sheet, the diameter of the rivets and the manner in which the sheet will be stressed. This spacing is seldom less than four diameters of the rivet, measured between the centers of the rivet holes. Rivets spaced four diameters apart are found in certain seams of monocoque and semimonocoque fuselages, webs of built-up spars, various plates or fittings, and floats or hulls.
(c) Where there are two rows of rivets, they are usually staggered. The transverse pitch or distance between rows should be slightly less than the pitch of the rivets, 75% of the rivet pitch being the usual practice.
(d) An average spacing or pitch of rivets in the cover or skin of most structures, except at highly stressed joints, will be from 6 to 12 diameters of the rivet.
(e) The best practice in repair jobs is to make the pitch of the rivets equal to those in the original structure.

H. Loose or Working Rivets in Outboard Section of Wing.
(1) Loose or working rivets attaching skin to upper and lower front spar cap may be repaired by adding MS20470AD4 or equivalent rivets midway between and in line with existing working rivets and four rivets beyond the last loose rivet, starting repair at the wing tip and working inboard. This repair is limited to the area between the nacelle and tip tank fitting.

NOTE: Care must be taken to avoid damage to fuel tanks and wiring.

I. Loose or Working Rivets.
(1) Rivets which appear to be loose shall be checked by the use of a 0.002 feeler gage by inserting the gage around the head of the rivet in question. If the feeler gage can be inserted to the shank of the rivet, it shall be classified as a loose rivet and shall be replaced.

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(2) If the feeler gage can be inserted approximately half-way to the shank for 30% of the circumference of the rivet head, it shall not be classified as a loose rivet.
(3) The feeler gage shall be used to check the shear section between the riveted members, such as skin to spar, or different sections of skins in a similar manner to that used around the rivet head.
(4) If the skin around the brazier head or countersunk rivet can be moved by depressing the skin with finger pressure around the rivet, the rivet shall be replaced.
(5) If rivets are found to turn by applying a rotating load to the head of the rivet, they should be replaced.
(6) In areas where exterior paint has been applied to rivet heads, the paint may harden due to aging processes and show hairline cracks around the edge of the rivet heads. This should not be used as a basis for determining whether the rivet is loose or not. The hardened paint may crack at times and collect dirt or exhaust fumes which will appear as discoloration. It is not possible to detect loose rivets visually.
(7) When replacing rivets, it is desirable to replace them with like size and type. In some instances, it will be necessary to go to the next size larger diameter. For general repair practices, the spacing between the centerlines of adjacent rivet holes shall be four diameters or greater. In areas where the spacing between rivets prohibits the use of the next size larger rivets, special repair instructions and procedures shall be utilized.

J. Loose or Working Blind Rivets.
(1) Blind rivets which are found to be loose or show evidence of working, must be replaced with rivets of like-size and type. In some instances, it may be necessary to go to the next larger size rivet.

K. Installation of Blind Rivets.
(1) When installing blind rivets, it is important to observe the following:
(a) Check that rivet hole size and rivet are compatible. If rivet removed was required, it may be necessary to go to the next size larger hole. Rivet must be the proper size, length, and type.
(b) Check that proper pulling head is installed on rivet gun. Adjustment of the pulling head must be made in accordance with manufacturer's instructions.
(c) Check that proper operating air pressure is available to rivet gun.

NOTE: Blind rivets may be installed using pneumatic or mechanical guns, whichever is available.

(d) Check holes in parts being fastened are properly aligned (Refer to Figure 202).

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Rivet Alignment
Figure 202

(e) In blind clearance applications, check the manufactured head of the blind rivet is protruding above the top sheet. The rivet will pull down to the sheet as the stem is pulled. The minimum blind clearance is the "D" dimension and is listed in the manufacturer's recommended procedures (Refer to Figure 203).

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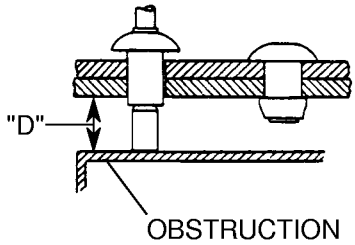

Rivet Clearance
Figure 203

(f) When placing the pulling head on the rivet stem, hold the riveter and pulling head in line with the axis of the rivet while holding the tool in a light and flexible manner (Refer to Figure 204).

A55147

Tool Alignment
Figure 204

(g) When the tool is actuated, the pulling head will pull down and seat against the rivet head.
(h) The clamping action will pull the sheets together and seat the rivet head when tool is actuated (Refer to Figure 205).

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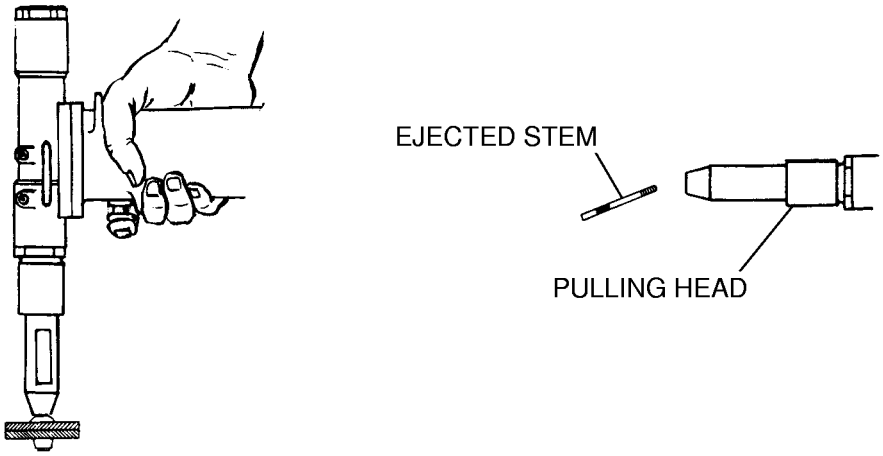

Tool Actuation
Figure 205

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(i) When the tool is actuated, the action of the rivet will automatically help to bring the tool and pulling head into proper alignment with the rivet axis.

NOTE: Pressing down with force will not allow the rivet and the tool to align themselves with the hole and could limit the head seating action of the rivet.

(j) When installing blind rivets, hold the tool in line with the rivet as accurately as possible, and apply a steady but light pressure; pull the trigger and LET THE RIVET DO THE WORK.

(k) When the rivet is completely installed, release the trigger and the pulling head will eject the pulling portion of the stem through the front end (Refer to Figure 205).

L. Front Spar Loose or Working Blind Rivets Bonding Procedures.

(1) Blind rivets in the front spar cap that have become loose or have been working may be repaired by removing the affected rivets, lifting up the skin, and cleaning the skin contact area with naphtha applying EA9309 adhesive and installing new blind rivets.

(2) It will be necessary to remove at least two (2) rivets on both sides of the affected rivets to raise the skin high enough to install adhesive material.

(3) Allow the bonded area to cure approximately 24 hours prior to flight.

3. Hi-Lok Fasteners

A. Hi-Lok fasteners are commonly used throughout the airplane structure. The Hi-Lok is basically a threaded fastener which combines the best features of a rivet and a bolt. It consists of two parts, a threaded pin and a threaded collar.

B. Removal of Hi-Lok fasteners in noninterference fit holes is easily accomplished by using standard hand tools similar to removing a nut from a bolt. Use an allen wrench to prevent the pin from rotating while collar is being unscrewed with pliers. In inaccessible areas, it is permissible to center punch the flathead of the Hi-Lok fastener pin, drill through the head using an undersize drill bit, then punch out fastener using a machine punch.

CAUTION: Take precaution to prevent enlarging or elongating holes when removing fasteners.

C. Install proper sized Hi-Lok fastener by inserting pin in the hole and manually threading the Hi-Lok collar onto the pin, approximately two threads. Insert the proper size allen hex wrench (open end or boxed) wrench on the collar hex. This prevents rotation of the pin while the collar is being installed. Hold the allen wrench hex until the collar wrenching device has been torqued off, completing the Hi-Lok fastener installation. For complete installation instructions, refer to Installation Manual 2-1520-13 which can be ordered through Cessna Dealer Organization.

D. Hole Size and Tolerance for Hi-Lok Fasteners.

Pin Diameter	Hole Size and Tolerance	Pin Diameter	Hole Size and Tolerance
5/32	.164	7/16	.438
	.161		.434
3/16	.190	1/2	.500
	.187		.496
1/4	.250	9/16	.563
	.247		.559
5/16	.313	5/8	.625

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Pin Diameter	Hole Size and Tolerance	Pin Diameter	Hole Size and Tolerance
	.309		.621
3/8	.375	3/4	.750
	.371		.746

NOTE 1: Deburr under head of fastener to allow head to seat.

4. Cotter Pin Application

A. Cotter Pin Application Chart.

	Temperature	Service
MS24665 Cotter Pins Carbon Steel	Ambient Temperatures Up to 450℉	Normal Atmospheres Cotter Pins Contacting Cadmium Plated Bolts or Nuts.
MS24665 Cotter Pins Corrosion Resistant Steel	Ambient Temperatures Up to 800℉	Non-Magnetic Requirements Cotter Pin Contacting Corrosion Resistant Steel Bolts or Nuts Corrosive Atmospheres.

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CHAPTER 52

DOORS

LIST OF EFFECTIVE PAGES

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52-List of Effective Pages		
52-Record of Temporary Revisions		
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52-10-00	Page 601	Jun 17/2005
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RECORD OF TEMPORARY REVISIONS

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DOORS - GENERAL

1. Scope

A. This chapter describes removable units used for entrance or exit, and for enclosing other structures contained within the fuselage.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Passenger/crew describes the doors used for entrance and exit of the passengers and crew to and from the airplane.
   (2) Cargo describes the exterior doors used primarily to gain access to cargo compartments.
   (3) Entrance stairs describe the stairs which operate in conjunction with (but are not an integral part of) the entrance doors.
   (4) Landing gear describes the structure of the doors used to enclose the landing gear components.

3. Doors

A. Description.
   (1) Doors are provided for cabin entry, aft baggage storage, nose baggage compartment, and wing locker baggage compartment. All doors are flush fitting and open outward. The inner surface of the cabin and aft baggage doors are covered with upholstery panels that blend with the airplane's interior decor.
   (2) The cabin door is located on the right side of the fuselage, at the forward end of fuselage. The door can be opened by either the outside or inside handle. The door is mounted on a single hinge and when it is open, a hold-open assembly on the bottom of the door frame retains the door in this position.
   (3) The aft baggage door is located on the right side of the airplane. The baggage door has two configurations, small door (standard) or large door (optional). The door is attached to the fuselage with a single hinge. The door may be opened from the outside only and incorporates a doorstop to hold the door open. The door is equipped with a key lock.
   (4) The nose baggage door is located on the left-hand side of the nose. The door is attached to the fuselage with two hinges. Two door latches installed in the bottom of the door, secures the door in place. The door incorporates a stop assembly to hold the door open. Also, the door is equipped with a key lock.
   (5) A wing locker baggage door is located on the aft nacelle portion of each wing. Each door is attached to the structure with two hinges. The door is equipped with a latch and key lock and a door stop assembly.

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PASSENGER/CREW DOORS - REMOVAL/INSTALLATION

1. Cabin Door

A. Removal (Refer to Figure 401).
   (1) Open and support the cabin door.
   (2) Remove screw, spring washer, spacer, washer, and spacer securing stop strap assembly to fuselage.
   (3) Remove cotter pins securing hinge pins.
   (4) Remove hinge pins and cabin door.
   (5) If further disassembly of cabin door is desired, refer to Disassembly/Assembly Cabin Door in this section.

B. Disassembly (Refer to Figure 401).
   (1) Remove door stop strap assembly from door by removing screws, washers, and spacer.
   (2) Press escutcheon plate enough to permit removal of setscrew securing door handle.
   (3) Pull off inside handle from cabin door and remove escutcheon plate.
   (4) Remove trim pad and retainer pad.
   (5) Remove window trim by removing screws and washers.
   (6) Remove screws securing upholstery panel.
   (7) Remove window lower retainer by removing attaching screws and nuts.
   (8) Remove window forward retainer by removing attaching screws.
   (9) Remove window upper retainer by removing attaching screws and remove window.

C. Assembly (Refer to Figure 401).
   (1) Position window in door frame. Install window retainers lower, upper, and forward using screws and nuts.
   (2) Install upholstery panel, upholstery pad, and trim pad, using attaching screws.
   (3) Install window trim using washers and screws.
   (4) Install escutcheon plate, spacer, handle, and tighten handle setscrew.
   (5) Secure stop strap assembly to door, using screw, washers, and spacer.

D. Installation (Refer to Figure 401).
   (1) Align cabin door hinge halves.
   (2) Install hinge pins and secure with cotter pins.
   (3) Secure stop strap assembly to fuselage structure, using spacer, washer, spacer, spring washer, and screw.

2. Cabin Door Latch Assemblies

A. Removal (Refer to Figure 402).
   (1) Remove cabin door; refer to Removal/Installation Cabin Door in this section.
   (2) Disassemble cabin door; refer to Disassembly/Assembly Cabin Door in this section.
   (3) Disconnect teleflex cable clevis from upper latch assembly (1) by removing cotter pin, washer, and pin.
   (4) Remove upper latch assembly by removing attaching screws.
   (5) Loosen cable assembly turnbuckles.
   (6) Remove door latch assembly as follows:
      (a) Remove cotter pins and washers, securing link (2) to the bolt and pulley (3). Remove link.
      (b) Remove screws and washers, securing plate assembly to case assembly and remove plate assembly.
      (c) Disengage cable assemblies from pulley (3).
      (d) Remove screws, securing case assembly to door structure and remove case assembly with bolt and spring.
      (e) Remove pin, securing pulley to door handle spindle and disengage pulley from door handle spindle.
      (f) Remove handle from housing by pulling outboard.
   (7) Remove lock assembly as follows:
      (a) Remove cover and gasket from housing by removing screws.
      (b) Remove screw and washer, securing cam to lock assembly.

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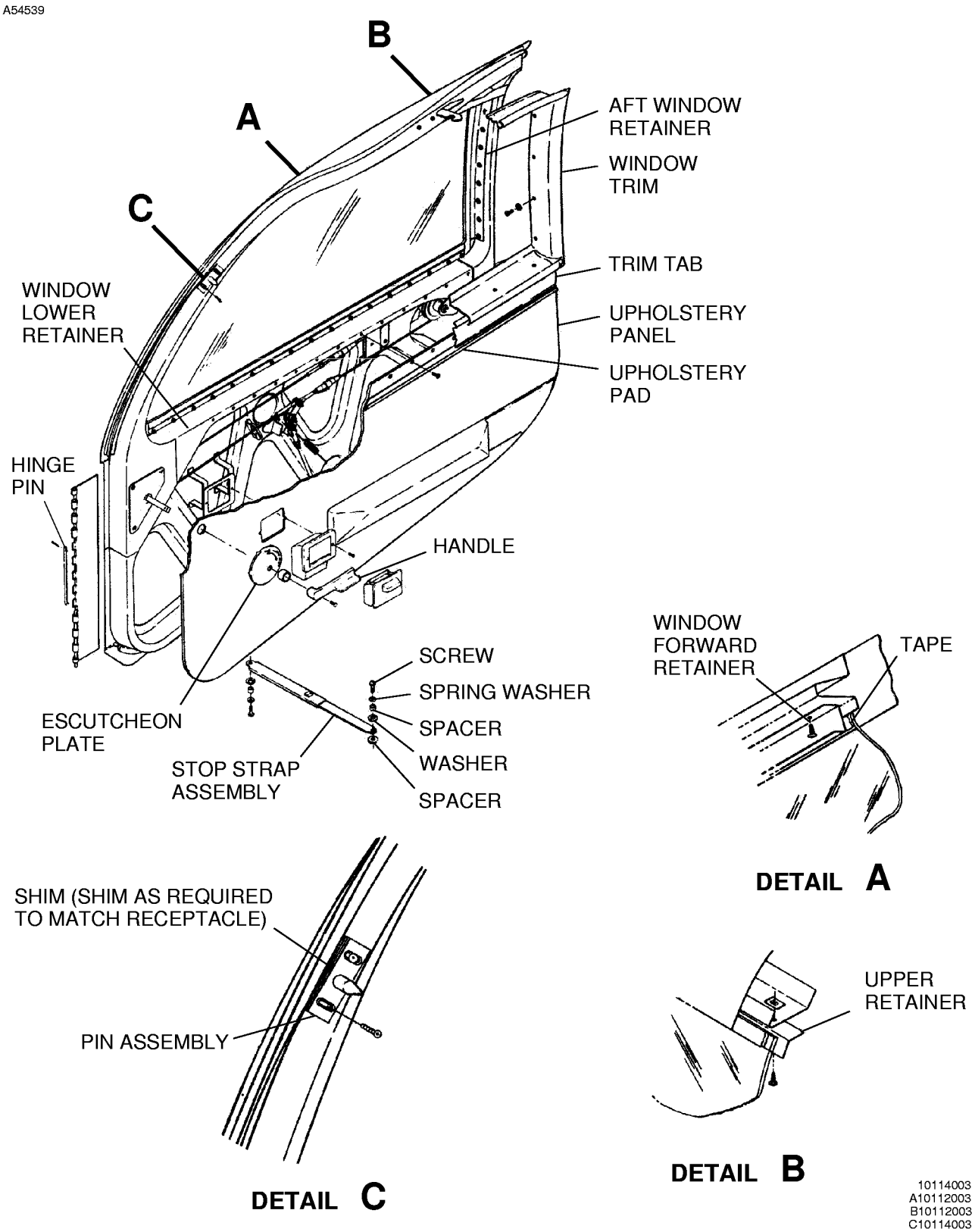

Cabin Door Installation
Figure 401 (Sheet 1)

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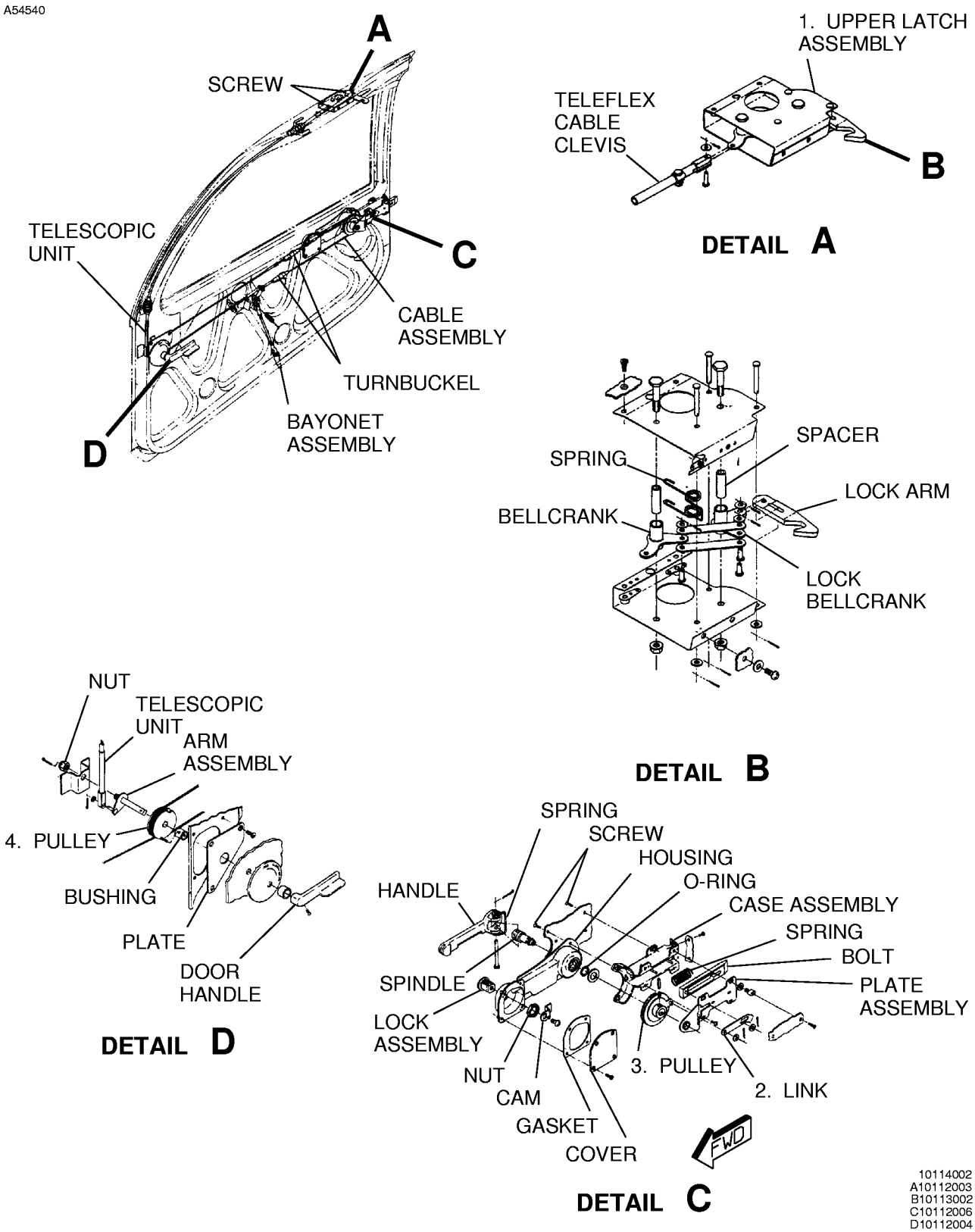

Cabin Door Latch Assembly
Figure 402 (Sheet 1)

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(c) Remove nut, securing lock assembly to housing and remove lock assembly.
(8) Remove door handle plate and slip cables from the pulley (4).
(9) Remove cotter pin and washer, securing telescopic unit to pulley (4).
(10) Remove cotter pin and nut and slip arm assembly from door.

B. Assembly/Disassembly (Refer to Figure 402).
(1) If further disassembly of latch assembly is necessary for repairs and/or replacement of components, use Figure 402 as a guide for disassembly sequence.
(2) Assembly latch assemblies using Figure 402 as a guide for assembly sequence.

C. Installation (Refer to Figure 402).
(1) Insert arm assembly into door and secure with nut and cotter pin.
(2) Secure telescopic unit to arm assembly, using washer and cotter pin.
(3) Install cables on pulley (4).
(4) Install plate using screws.
(5) Install lock assembly as follows:
(a) Insert lock assembly into housing and secure with nut.
(b) Position cam on lock assembly and secure with washer and screw.
(c) Install gasket and cover on housing, using screws.
(6) Install door latch assembly as follows:
(a) Install case assembly to housing (with bolt and spring installed in case) and secure to housing and door with screws.
(b) Insert door handle with spindle attached into housing and install O-ring.
(c) Assemble pulley (3) to spindle and install pin.
(d) Install cables on pulley (3).
(e) Install plate assembly on case assembly and spindle, secure with screws and washers.
(f) Secure link to pulley (3) and bolt, using washers and cotter pins.
(7) Install upper latch assemble (1) with screws.
(8) Connect teleflex cable to latch assembly with pin, washer, and cotter pin.
(9) Tighten cable turnbuckles.
(10) Assemble cabin door; refer to Disassembly/Assembly Cabin Door in this section.
(11) Install cabin door; refer to Removal/Installation Cabin Door in this section.

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PASSENGER/CREW DOORS - INSPECTION/CHECK

1. Cabin Door

A. Inspection/Check.

(1) Clean door by wiping all grease and dirt from door and latching mechanism, then remove upholstery panel and visually inspect component parts for excessive wear, metal breaks, improper threads, etc. Operate handle and observe proper function of component parts. Repair as required.

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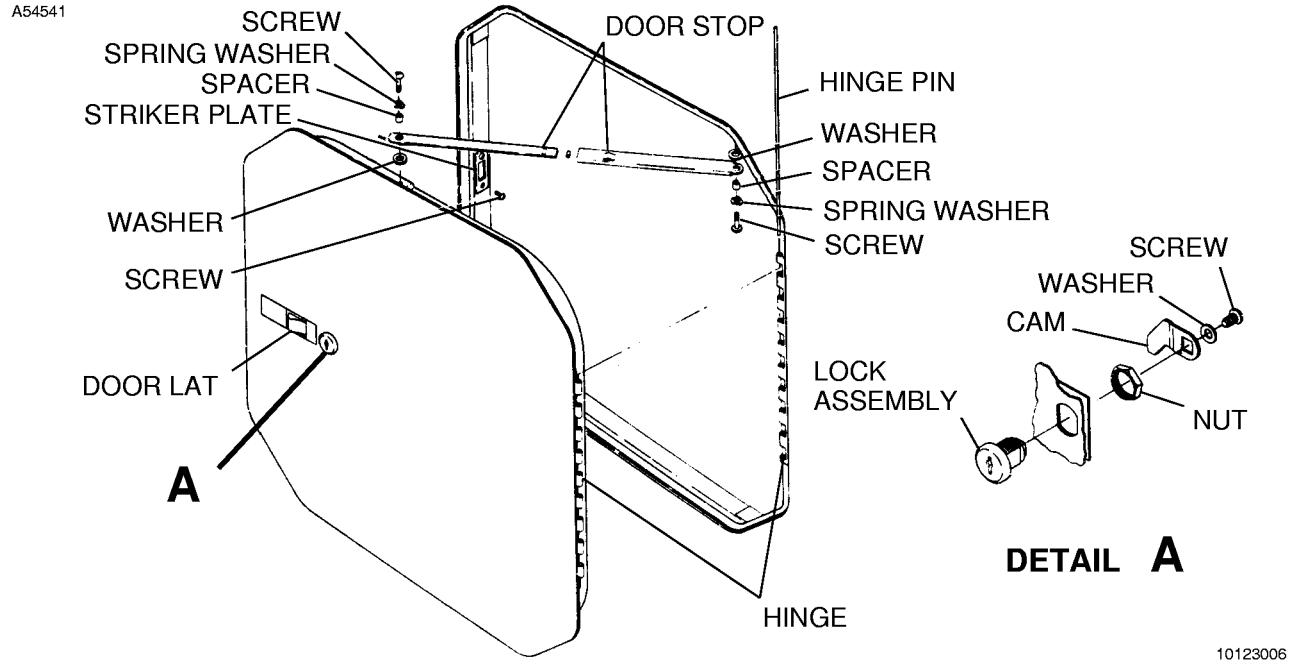
CARGO DOORS - REMOVAL/INSTALLATION

1. Small Baggage Door

A. Removal (Refer to Figure 401).



Small Baggage Door Instllation
Figure 401

(1) Remove screw, spring washer, spacer, and washer, securing door stop to fuselage.
(2) Remove door hinge pin and remove baggage door from airplane.
(3) If disassembly of baggage door is desired, refer to Disassembly/Assembly Small Baggage Door in this section.

B. Disassembly (Refer to Figure 401).
(1) Remove screw, spring washer, spacer, and washer, securing door stop to baggage door.
(2) Remove upholstery panel by releasing the attaching trimout studs.
(3) If removal of lock assembly is necessary; remove screw and washer securing cam to lock assembly.
(4) If removal of the baggage door latch is necessary; drill out the rivets attaching door latch to baggage door.

C. Assembly (Refer to Figure 401).
(1) Install baggage door latch, using rivets.
(2) Install lock assembly and secure with nut, cam, washer, and screw.
(3) Install upholstery panel on baggage door.
(4) Secure door stop to baggage door, using screw, spring washer, spacer, and washer.

D. Installation (Refer to Figure 401).
(1) Position baggage door on fuselage and install hinge pin.
(2) Secure door stop to fuselage, using screw, spring washer, spacer, and washer.

2. Large Baggage Door (Optional)

A. Removal (Refer to Figure 402).
(1) Remove door stop from baggage door by removing screw, spring washer, spacer, and washer.
(2) Remove hinge pin and remove baggage door from airplane.

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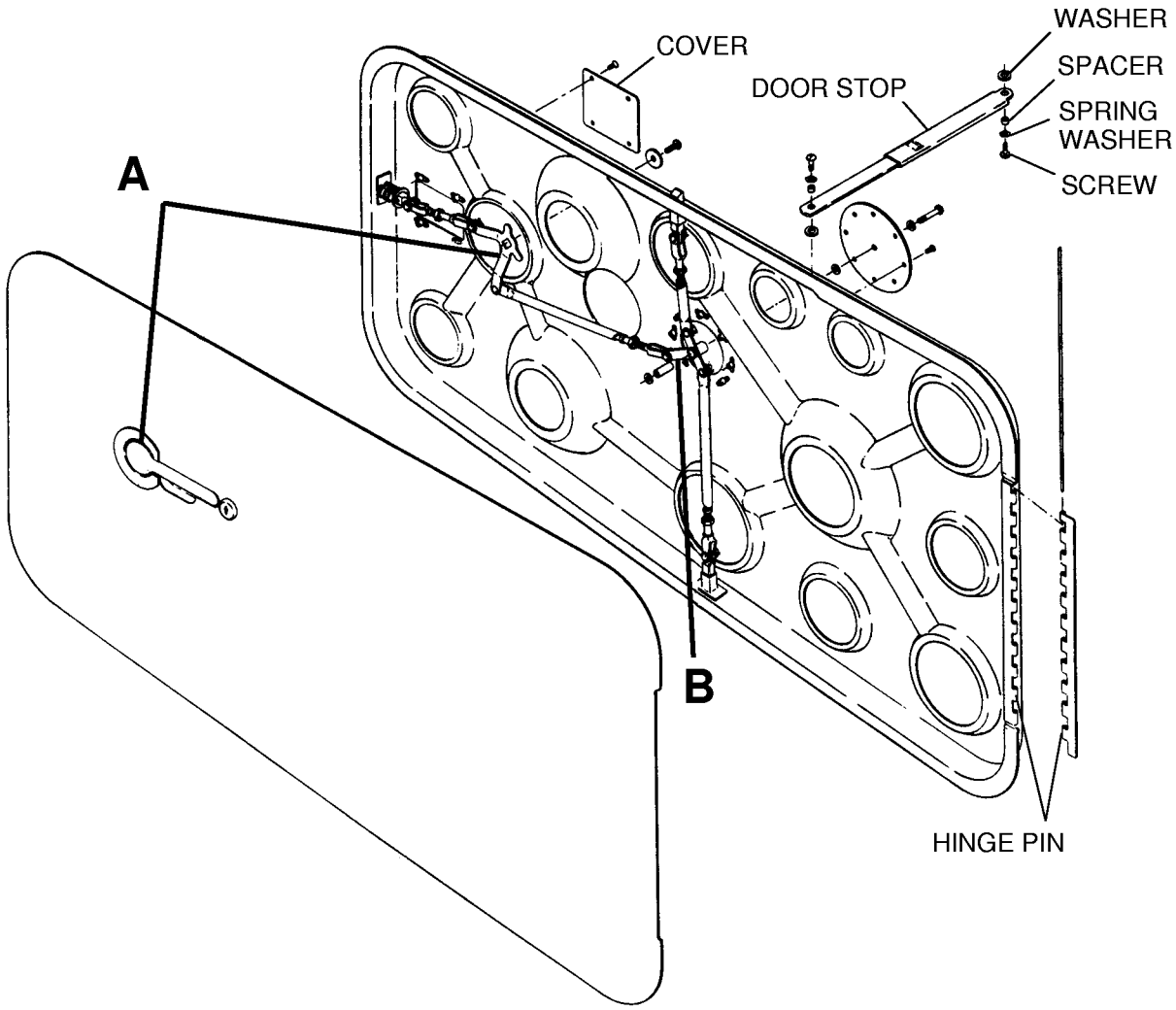

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Large Baggage Door Installation
Figure 402 (Sheet 1)

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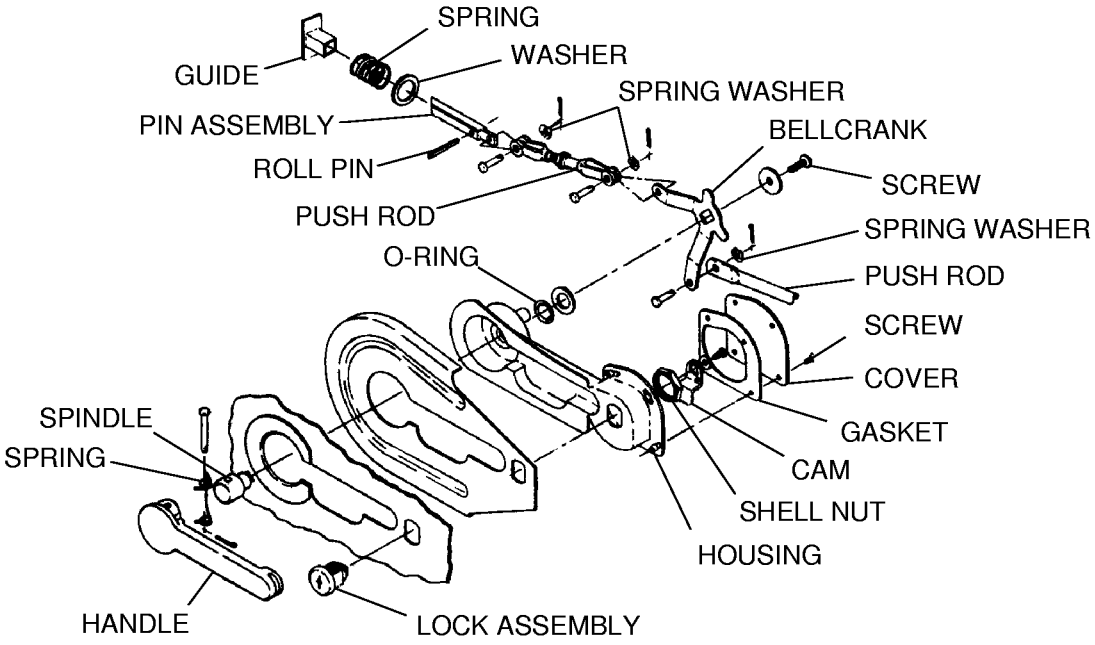
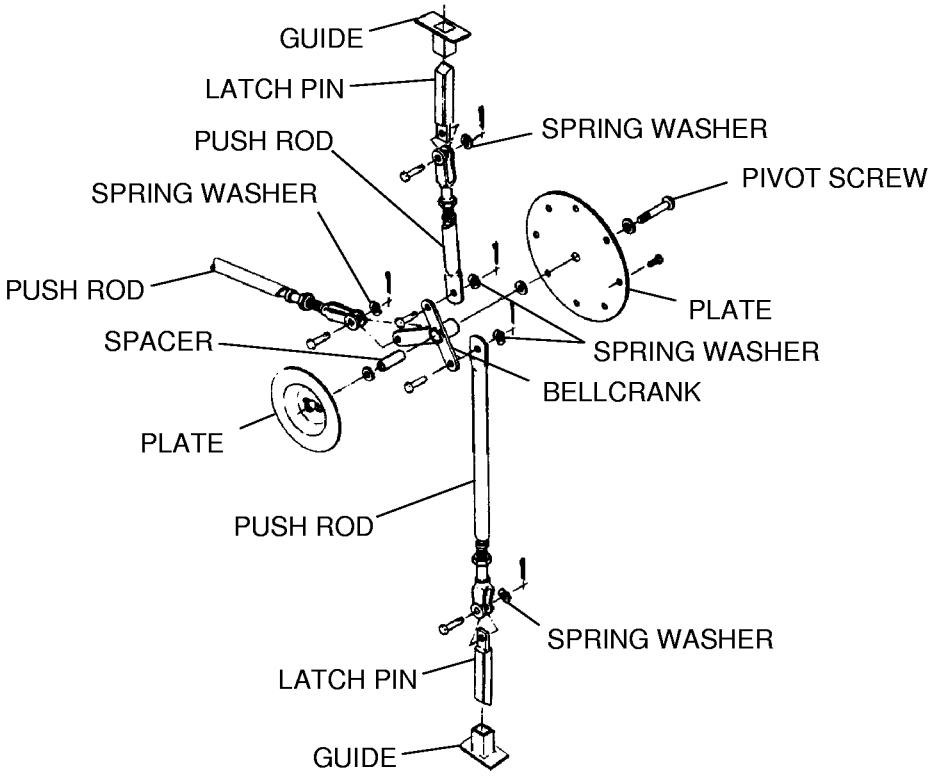


DETAIL A



DETAIL B

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Large Baggage Door Installation
Figure 402 (Sheet 2)

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(3) If disassembly of baggage door is desired, refer to Disassembly/Assembly Large Baggage Door in this section.

B. Disassembly (Refer to Figure 402).
(1) Remove upholstery panel by removing attaching studs.
(2) If removal of lock assembly is necessary, proceed as follows:
(a) Remove cover and gasket by removing screws.
(b) Remove screw and washer securing cam to lock assembly.
(c) Remove nut and remove lock assembly.
(3) If removal of door handle is necessary, proceed as follows:
(a) Remove screw and washer securing bellcrank to door handle spindle.
(b) Pull door handle and spindle free of housing.
(4) Remove cover to gain access to aft latch assembly.
(5) Remove plate by removing retaining screws and pivot screw.
(6) Using details in Figure 402, remove door latch mechanism as necessary.

C. Assembly (Refer to Figure 402).
(1) If components of door latch mechanism was removed, assemble as shown in the Figure 402.
(2) Install door handle and spindle into housing and secure to bellcrank, using O-ring, washers, and screw.
(3) Install lock assembly into door, using nut, cam, washer, and screw.
(4) Install gasket and cover at lock assembly, using screws.
(5) Rig push rods so that latch pins have 3/8 inch engagement within the upper and lower striker plates.
(6) Ensure all cotter pins are installed.
(7) Install cover at aft door latch.
(8) Install upholstery panel.

D. Installation (Refer to Figure 402).
(1) Position baggage door on fuselage and install hinge pin.
(2) Secure door stop on baggage door, using screw, spring washer, spacer, and washer.
(3) Adjust striker plates to obtain a tight seal around door.

3. Nose Baggage Door

A. Removal (Refer to Figure 403).
(1) Open baggage door and remove screws securing seal cups to structure.
(2) Disconnect stop assembly at eyebolt by removing nut, washer, spacer, washer, and screw.
(3) Remove hinge pins from hinges and remove the baggage door.
(4) If door latch removal is desired, remove latch by removing cotter pin, pin, and spacers, (Airplanes 310R0001 thru 310R0197) or screw (Airplanes 310R0198 and On).

B. Installation (Refer to Figure 403).
(1) If door latch was removed, install door latch in door and secure with pin, spacers, and cotter pin, (Airplanes 310R0001 thru 310R0197) or screw (Airplanes 310R0198 and On).
(2) Secure baggage door to hinge halves, using hinge pins.
(3) Attach door assembly to door eyebolt, using screw, washer, spacer, washer, and nut.
(4) Ensure hinge pins are centered in hinge. Secure seal cups under hinges using screws.
(5) Apply sealant (fillet) Pro-Seal 890, Class B around edges of seal cup.
(6) If adjustment of door latches is necessary, adjust the u-bolts per dimensions shown to obtain proper latch tension.

4. Wing Locker Baggage Door

A. Removal (Refer to Figure 404).
(1) Open wing locker baggage door.
(2) Remove screw, washer, and spacer from lower end of stop assembly.
(3) Remove nuts, washers, spacers, and screws from door hinge and remove door from nacelle.

B. Installation (Refer to Figure 404).
(1) Install baggage door to nacelle structure, using screw, washers, spacers, and nuts.

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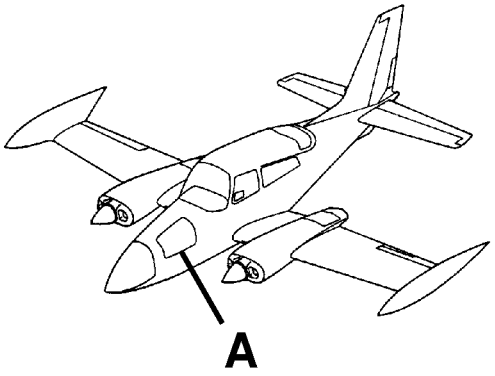
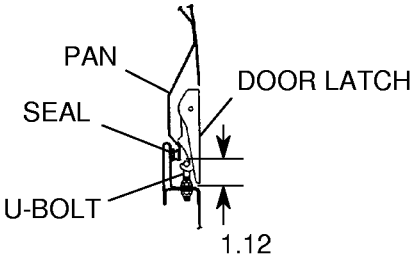
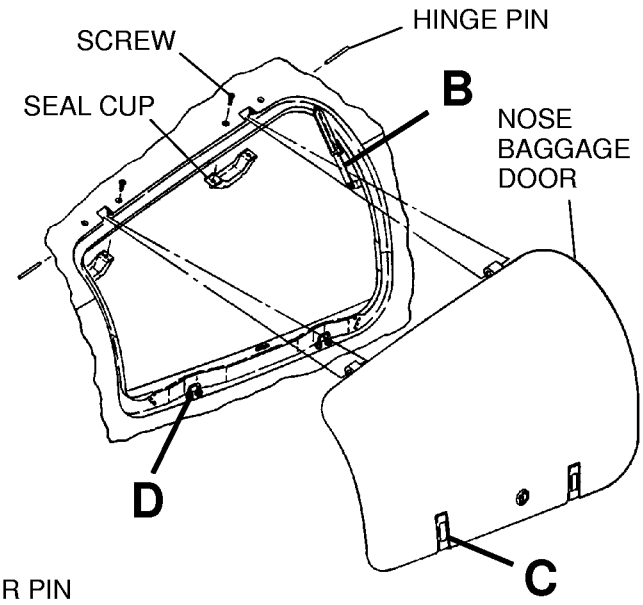
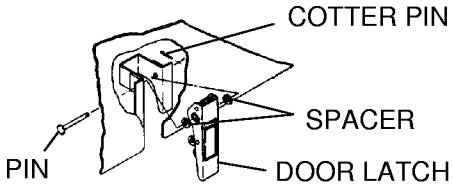




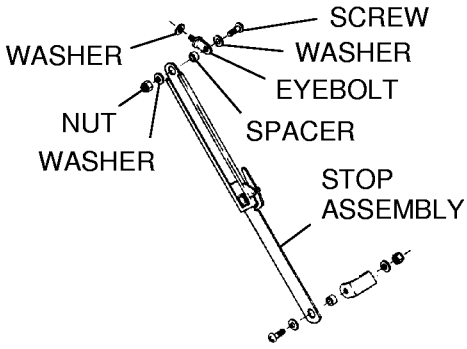
DETAIL D



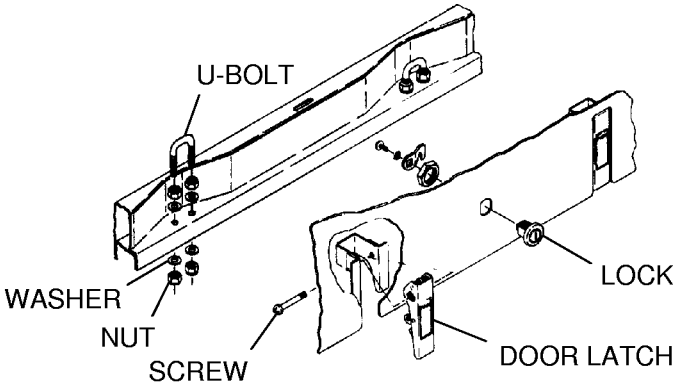
DETAIL A



DETAIL C



DETAIL B



DETAIL C

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Nose Baggage Door Installation
Figure 403 (Sheet 1)

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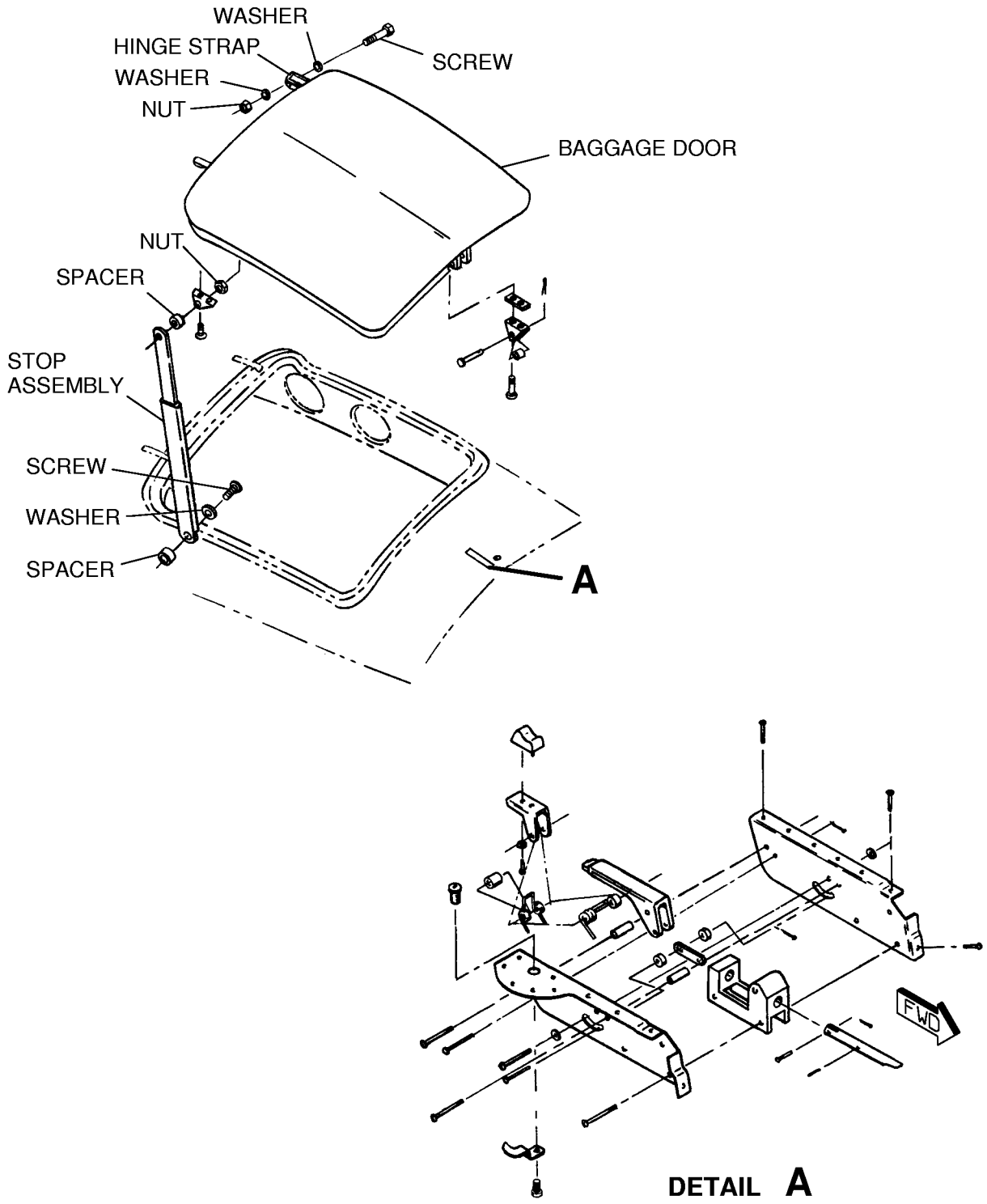

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Wing Locker Baggage Door Installation
Figure 404 (Sheet 1)

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(2) Attach lower end of stop assembly to structure with screw, washer, and spacer.

5. Wing Locker Baggage Door Latch

A. Removal/Installation (Refer to Figure 404).

(1) Removal and installation of wing locker latch is not recommended unless replacement or repair is necessary. Use Figure 404 as a guide for removal and installation.

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CARGO DOORS - ADJUSTMENT/TEST

1. Door Stop Assemblies

A. Adjustment/Test (Refer to Figure 501).
   (1) Remove stop assembly from airplane and set in a vice.
   (2) Using a spring scale (0 to 50 pounds), measure the tension required to close the stop assembly. Read tension when stop releases to close the stop assembly. Tension should read 25 pounds, +3 or -3 pounds.
   (3) If correct tension is not obtained, proceed as follows:
      (a) Place stop assembly on block. Block must be fabricated from wood or similar material.
      (b) To increase the tension on stop assembly, use a drift punch and hammer and tap on roller.
      (c) To decrease the tension on stop assembly, turn stop assembly over on block and tap on tongue with hammer.
   (4) Reinstall stop assembly on airplane.

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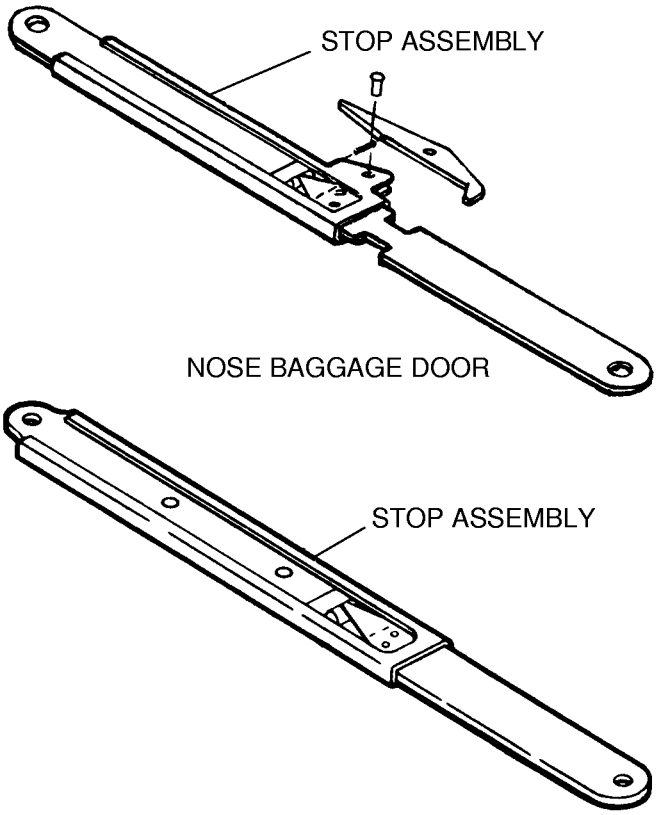
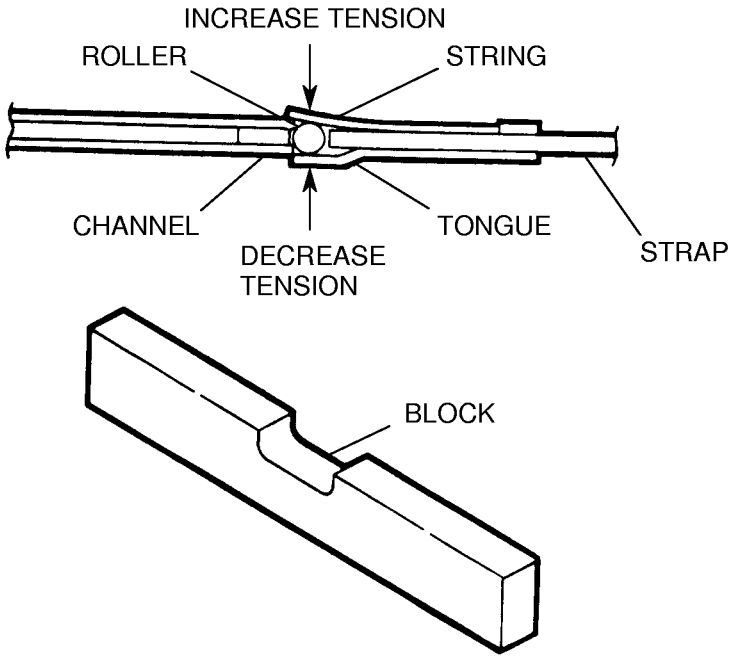


CABIN DOOR, BAGGAGE DOOR AND NACELLE BAGGAGE DOOR



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Door Stop Assembly Adjustment
Figure 501 (Sheet 1)

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CARGO DOORS - INSPECTION/CHECK

1. Baggage Door

A. Inspection/Check.

(1) Clean door by wiping all grease and dirt from door and latching mechanism, then remove upholstery panel and visually inspect component parts for excessive wear, metal breaks, improper threads, etc. Operate handle and observe proper function of component parts. Repair as required.

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ENTRANCE STAIRS - DESCRIPTION AND OPERATION

1. Cabin Step System

A. Description.

(1) During retraction of the landing gear, a cable connected to the landing gear actuator retracts the cabin step into a well provided for it in the bottom right side of the fuselage. During extension of the landing gear, spring tension forces the step to extend. Extension and retraction are simultaneous with the landing gear operation.

2. Wing Walk and Wing Walk Areas

A. Description.

(1) A non skid-surfaced wing walk, located along the inboard side of the right wing, will allow freedom of passage without damaging the wing finish. The entire inboard wing section from the cabin out to the engine nacelle is reinforced to withstand weight pressures up to 500 pounds. The inboard section of the left wing from the cabin out to the left engine is also reinforced, but precautions should be taken if the left inboard edge of the wing must be used for passage. When it is necessary to walk on the left inboard areas, be sure to cover the surfaces of the wing in order to prevent damaging the wing finish.

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ENTRANCE STAIRS - TROUBLESHOOTING

1. Cabin Step System

A. Troubleshooting.
(1) For a guide to troubleshooting the cabin step system, refer to Table 101.

Table 101. Cabin Step System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
CABIN STEP DOES NOT RETRACT.	Broken cable.	Replace cable.
	Cable disconnected.	Connect cable.
	Cable off pulley.	Verify guard pins are in place and rig cable.
CABIN STEP DOES NOT RETRACT COMPLETELY.	Cable off pulley track.	Verify guard pins are in place and rig cable.
	Failed spring cable assembly.	Replace spring.
	Cables not properly rigged.	Rig cables again.
CABLE STEP DOES NOT EXTEND.	Step assembly is binding.	Correct binding.
	Failed extend spring.	Replace failed spring.
	Cable off pulley.	Verify guard pins are in place and rig cable.

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ENTRANCE STAIRS - REMOVAL/INSTALLATION

1. Cabin Step System

A. Removal (Refer to Figure 401).

(1) Remove seats, carpet, floorboards, and access covers as required to gain access to step, step cable, and landing gear actuator.
(2) Disconnect cables at turnbuckle (2).
(3) Disconnect cable (4) from spring assembly (3) by removing cotter pins and pins.
(4) Remove cable (4) from pulley (16) by removing cotter pin, washer, pin, and clamp (17). Remove cable from airplane.
(5) Disconnect cable (5) from step assembly (12) by removing cotter pin and pin. Remove cable from airplane.
(6) Remove cabin step assembly from airplane, being careful to disengage spring (9) from step support (6) when bolt, nut, and washer are removed.
(7) Step assembly (12) may be disassembled further by removing each step from step assembly. Retain spacer (11) in place to facilitate reassembly.
(8) For removal of pulley (16) from landing gear actuator refer to Chapter 32, Removal of Landing Gear Actuator.

B. Installation (Refer to Figure 401).

CAUTION: If a space exists between step casting and tube, use AN960-10 or AN960-101 washers as required on screws to fill the space to prevent damage when tightening nuts. A 0.10 inch maximum washer buildup is allowed. If required, use longer screws to maintain proper installation length.

(1) If step assembly (12) was disassembled, assemble steps in accordance with Figure 401. Make sure spacers (11) are in place before installing attaching screws.
(2) Install step assembly with spacer (10) and spring (9) in place and secure with bolt, washer, and nut. During installation, spring (9) must be coiled to preload 160 degrees.
(3) Route forward cable (4) around pulley (14) and pulley (16). Secure ball end of cable to pulley (16) with clamp (17), pin, washer, and cotter pin.
(4) Secure aft cable (5) to step assembly (12) with pin and cotter pin. Route cable over pulley (8) and connect aft cable, center cable, and spring assembly to forward cable (4) with turnbuckle (2).
(5) Install guard pins at pulleys (8 and 14) to ensure that cables will not leave pulley track.
(6) Rig cabin step system; refer to Entrance Stairs - Adjustment/Test.
(7) Install access covers, floorboards, carpet, and seats.

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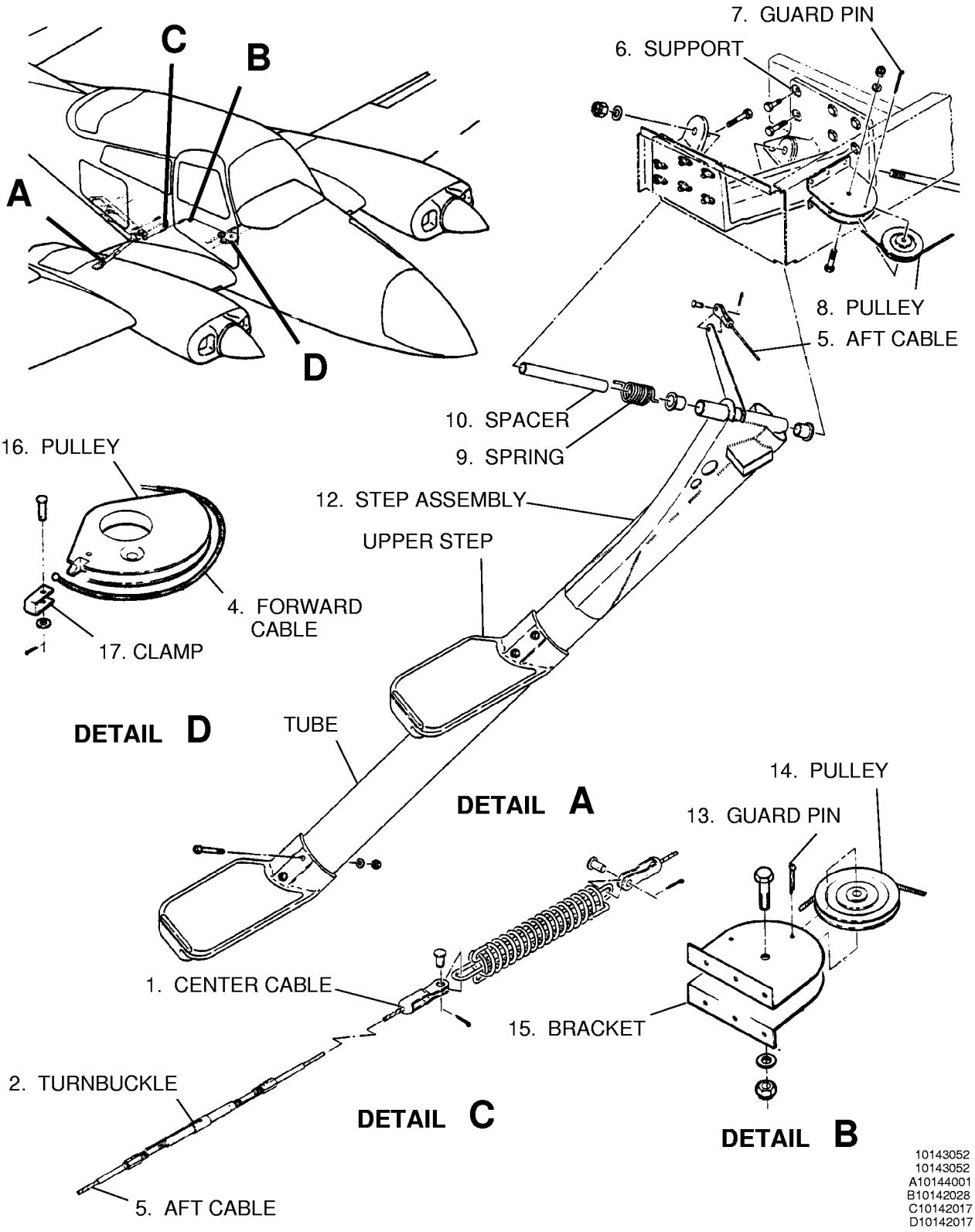

Cabin Step System
Figure 401 (Sheet 1)

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ENTRANCE STAIRS - ADJUSTMENT/TEST

1. Cabin Step System

A. Rigging (Refer to Figure 501).
   (1) Jack airplane.
   (2) Raise the cabin step assembly into the step well by hand to ensure there are no binding or obstructions and that cables will not leave the pulley tracks.
   (3) Adjust turnbuckle (2) until step assembly starts to leave the step stop when in down position.
   (4) Retract landing gear using normal retraction system.
   (5) Note that cabin step retracts fully into the step well. If step does not fully retract, refer to Entrance Stairs - Troubleshooting.
   (6) Safety wire turnbuckle.
   (7) Insure that landing gear is DOWN and remove jacks.

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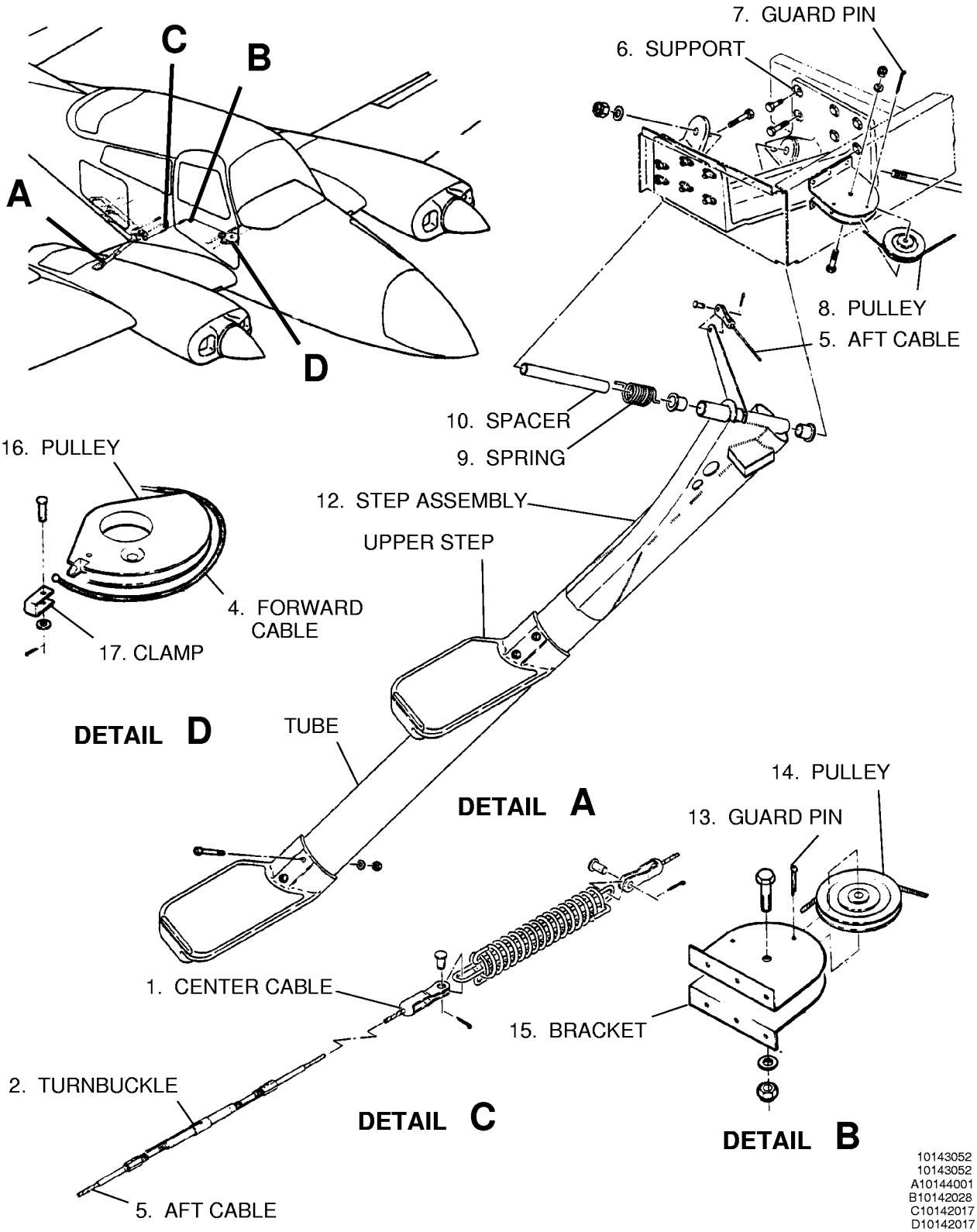

Cabin Step System
Figure 501 (Sheet 1)

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LANDING GEAR DOORS - DESCRIPTION AND OPERATION

1. Main Landing Gear Doors

A. Description.

(1) The main landing gear is equipped with wheel well doors and strut door. Each strut door, pivoting arm a continuous hinge located at its outboard end, is operated by a door link attached to the main landing gear strut. Each wheel well door, pivoting on forged aluminum hinges located at its inboard end, is operated by a bellcrank and push-pull tube, which is connected to the landing gear retracting linkage. The operating mechanism is so arranged that the wheel well door is closed when the main gear is either fully extended or fully retracted.

2. Nose Gear Doors

A. Description.

(1) Right and left nose gear doors are used to enclose the nose gear when in retracted position. The doors are connected to the nose gear retracting linkage and are hinged on continuous hinge on the outer edge of each door. The doors pivot down during gear extension and remains down while the nose gear is down.

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LANDING GEAR DOORS - REMOVAL/INSTALLATION

1. Main Landing Gear Doors

A. Removal (Refer to Figure 401).
   (1) Jack airplane, refer to Chapter 7.
   (2) Engage manual extension crank and operate toward the UP position until the main gear doors open sufficiently to disconnect link (2) from door (7) by removing nut, washer, spacers (3), and bolt.
   (3) Remove wheel well door by removing nuts, washers, and bolts attaching hinge arms to door.
   (4) Hinge arms (5) may be removed with the wheel well door as follows:
      (a) Remove lower wing root fillet and remove hinge covers (4) by removing attaching screws.
      (b) Remove hinge arms from brackets by removing nuts, washers, and bolts. Remove hinge arms from brackets. Retain spacers (6) in place.
   (5) Disconnect door link (10) from strut door (11) by removing nut, washers, and spacers.
   (6) Support door and remove screws securing door to wing assembly. Remove door.

B. Installation (Refer to Figure 401).
   (1) Position strut door (11) to lower wing and secure with attaching screws.
   (2) Connect door link (10) to strut door with bolt, washer, spacer (9), and nut.
   (3) Position main wheel well door (7) in place and secure to wing structure brackets with bolts, washers, and nuts. Make sure spacers (6) are in place.
   (4) Secure door link (2) to door (7) with bolt, spacers (3), washer, and nut.

2. Nose Gear Doors

NOTE: Removal/Installation procedures are given for the right band nose gear door. The procedures are the same for the left hand door.

A. Removal (Refer to Figure 402).
   (1) Disconnect door link (1) from bracket (3) by removing cotter pin, nut, washer, and bolt.
   (2) Remove cotter pins retaining hinge pin (4); support door and remove hinge pin. Remove door.

B. Installation (Refer to Figure 402).
   (1) Place door in position and secure in place with hinge pin (4).
   (2) Secure hinge pin in place with cotter pins at forward and aft ends.

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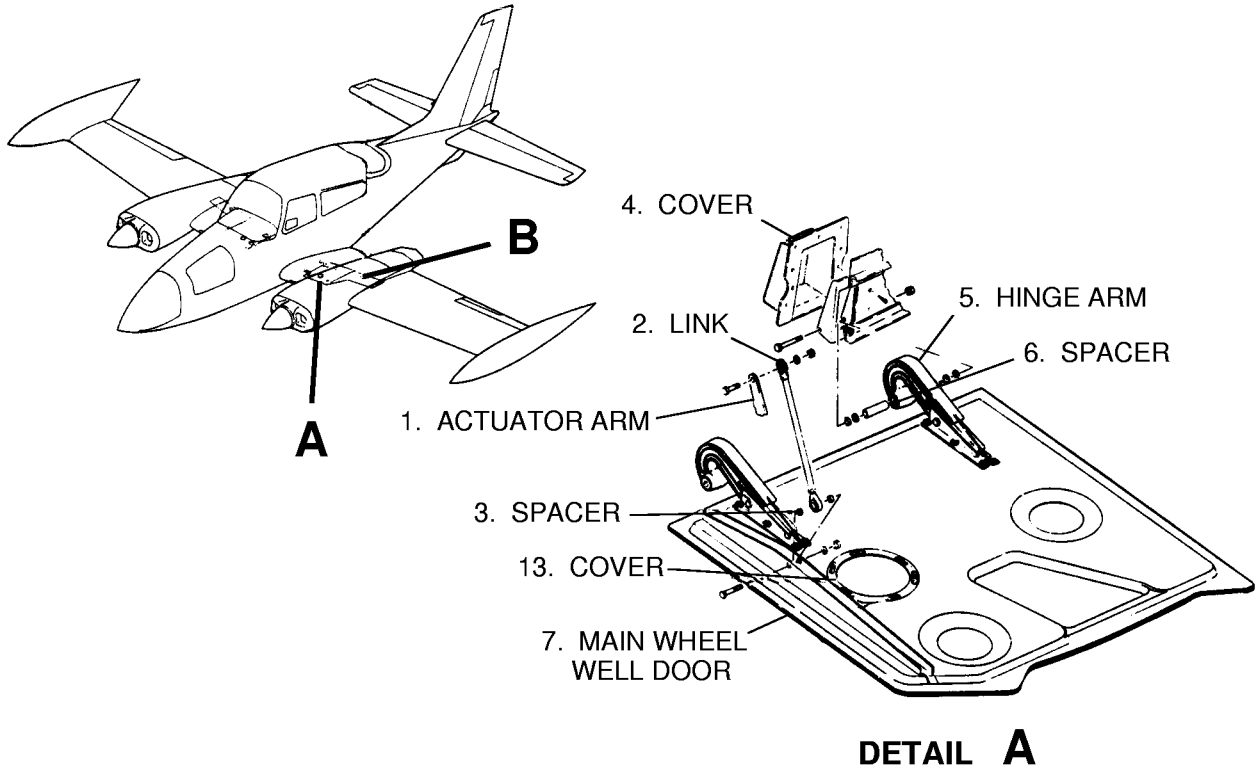

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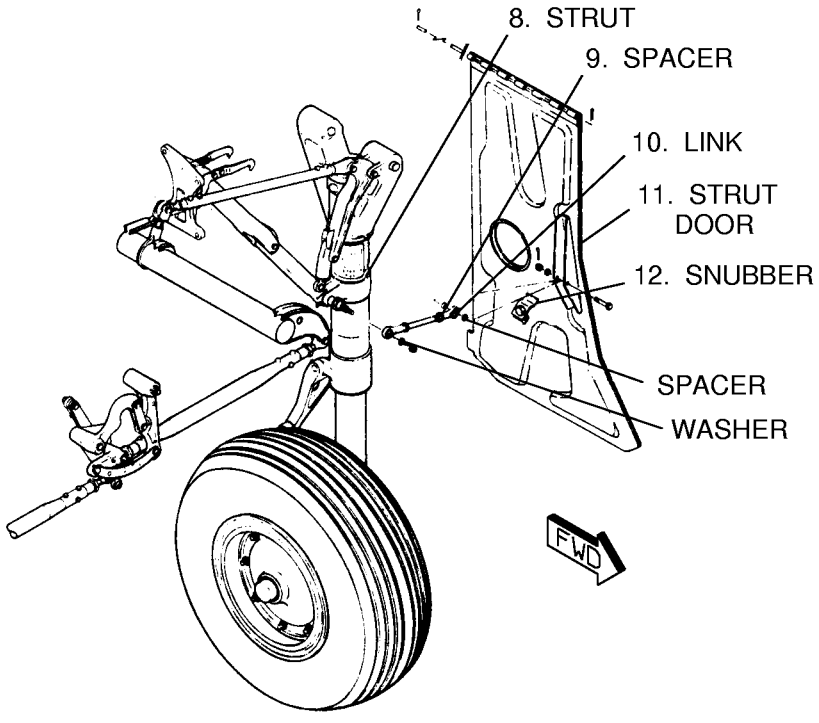

DETAIL B

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Main Landing Gear Door Installation
Figure 401 (Sheet 1)

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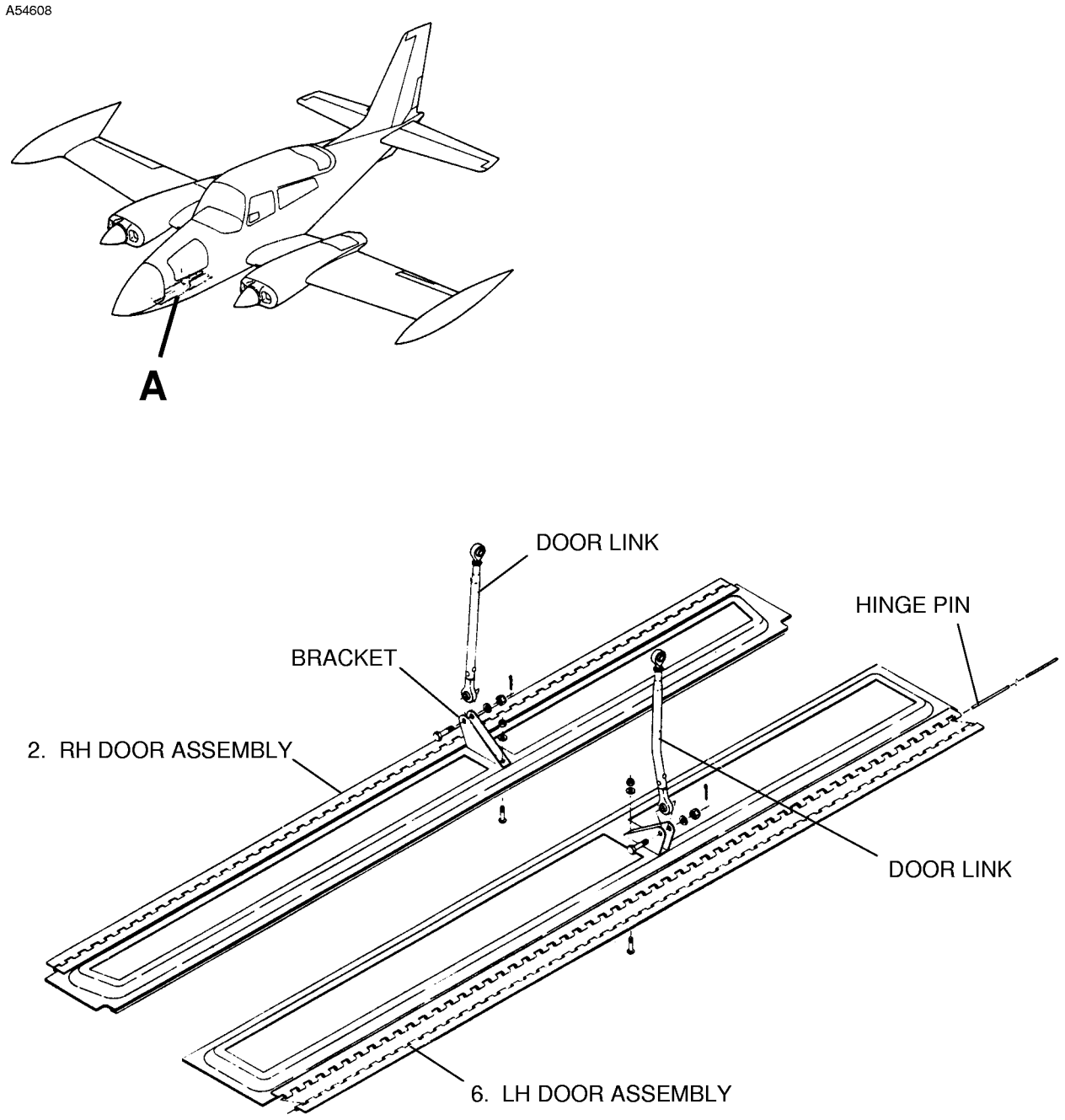

DETAIL A

10403002
A10404001

Nose Gear Doors Installation
Figure 402 (Sheet 1)

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LANDING GEAR DOORS - ADJUSTMENT/TEST

1. Main Landing Gear Doors

A. Rigging (Refer to Figure 501).
(1) Remove access hole cover (13).
(2) Jack airplane, refer to Chapter 7.
(3) Disconnect wheel well door by removing nut and bolt attaching door link to actuator arm.
(4) Disconnect strut door (11) by removing nut and washer connecting door link (10) to strut.
(5) Using normal landing gear retraction system operate gear to UP position.

NOTE: The use of an external power source is recommended for operation of electrical units. Low voltage could cause low downlock tension readings.

(6) Close strut door and adjust door link so that door fits flush.
(7) Adjust snubber (12) so there is 0 to 0.06 inch clearance between door and main gear torque link.
(8) Operate gear to DOWN position.
(9) Close wheel well door and adjust door link (2) so that door fits flush; then adjust rod end on door link one-half turn shorter and connect.

NOTE: Make sure door link adjustment does not cause deformation of door.

(10) Operate gear to the UP position.

CAUTION: When retracting gear while rigging door be prepared to stop before damage can occur.

(11) If necessary, readjust door link (2) so that door fits flush.
(12) Repeat steps (4) through (9) as necessary to obtain proper fit of doors, checking that wheel well door clears tire and wheel.
(13) The door link is to be in overcenter condition with actuator arm against its stop in both gear UP and gear DOWN position.
(14) Install access hole cover (13).
(15) Insure that the landing gear is DOWN, remove jacks.

2. Nose Gear Doors

A. Rigging (Refer to Figure 502).
(1) Jack airplane, refer to Chapter 7.
(2) Disconnect door link (1 and 5) from attachment brackets (3) by removing cotter pin, nut, washer, and bolt.
(3) Using normal landing gear retraction system, operate gear to UP position.

NOTE: The use of an external power source is recommended for operation of electrical units.

(4) Adjust rod ends on door links (1 and 5) until each door will close snugly while gear is in the UP position.
(5) Extend gear and connect both doors with bolt, washer, nut, and cotter pin.

CAUTION: When operating gear before rigging is complete, be prepared to stop before damage can occur.

(6) Retract and extend gear, check for clearance between nose tire and doors, and readjust door links as necessary for proper fit and proper clearances.
(7) Ensure landing gear is DOWN and locked, then remove airplane from jacks.

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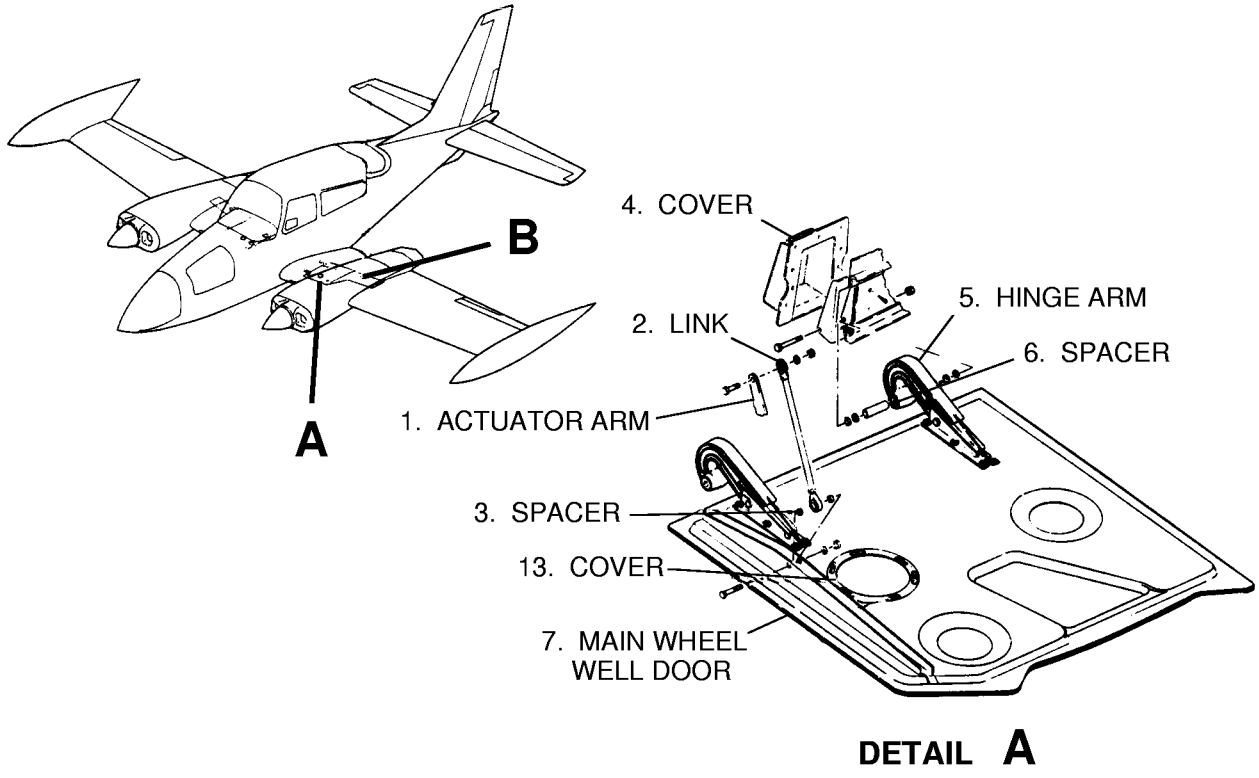
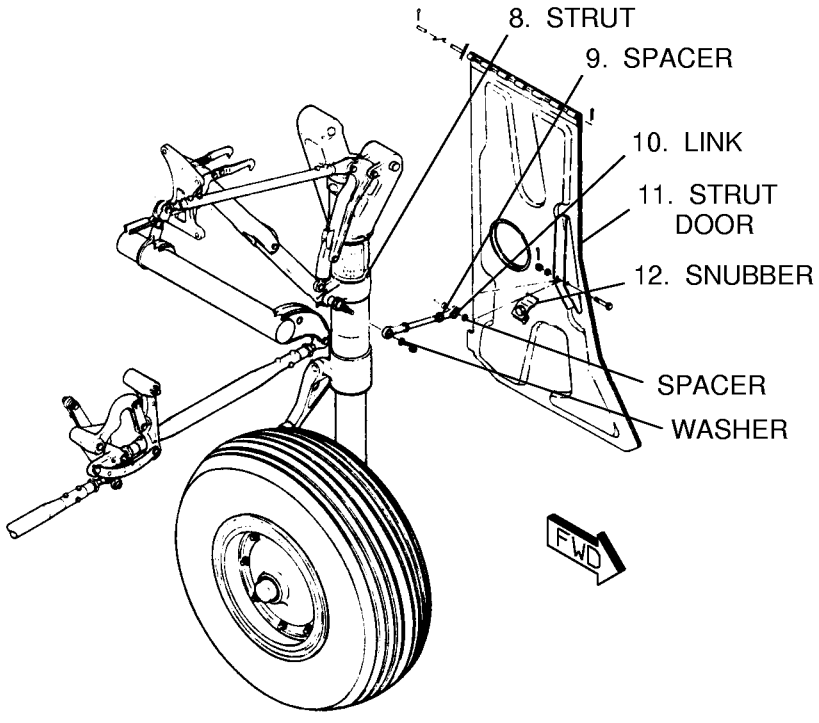


DETAIL A



DETAIL B

10273002
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Main Landing Gear Doors
Figure 501 (Sheet 1)

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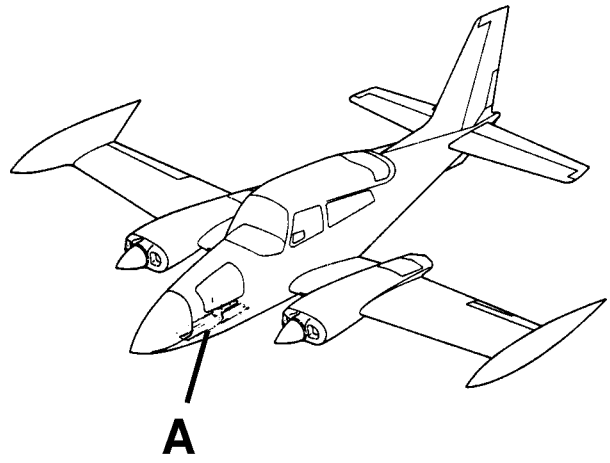

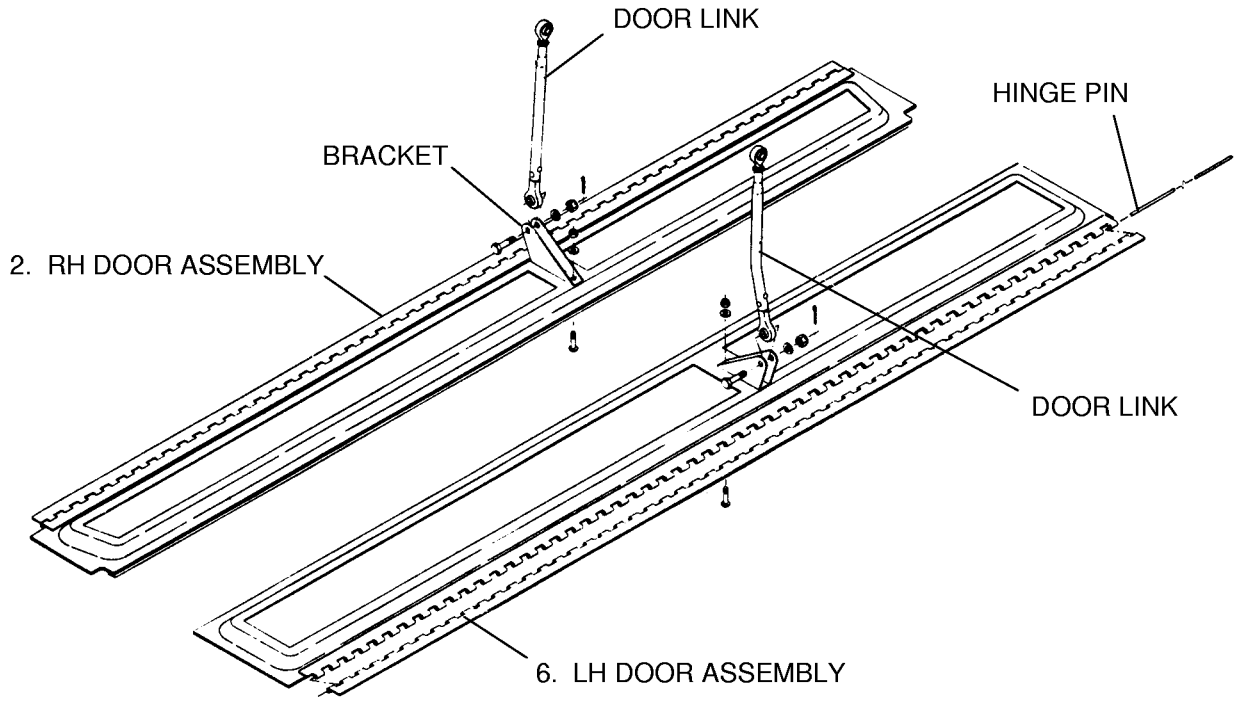

DETAIL A

10403002
A10404001

Nose Gear Doors
Figure 502 (Sheet 1)

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CHAPTER

53

FUSELAGE

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FUSELAGE - GENERAL

1. Scope

A. This chapter describes the structural units and associated components and members which make up the compartments for equipment, passengers, crew, and cargo.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Control pedestal contains removal/installation information for the control pedestal.
   (2) Fuselage contains removal/installation information for the fuselage stinger.
   (3) Nose cap contains removal/installation information for the nose cap, avionics shelves, and nose baggage shelves.
   (4) Floor panels contain removal/installation information for the floor panels.

3. Description

A. Fuselage.
   (1) The fuselage is an all metal semimonocoque structure. The fuselage consists of a nose section, cabin section, and a tail section. The nose section contains the nose gear wheel well, avionics equipment compartment, and the nose baggage compartment. The cabin section contains the flight and passenger compartment and aft baggage compartment. The tail section contains flight control cables, emergency locator beacon, and various optional components, such as electric trim, autopilot actuators, etc.
   (2) Auxiliary structure consists of the avionics and baggage shelves, floorboards and the pedestal.
   (3) The fuselage exterior covering consists of aluminum alloy skin panels of various sizes. The panels are attached to frames, stringers, and doublers with permanent fasteners.
   (4) Fittings are provided in the fuselage for the attachment of the wings, doors, seats, brackets and supports. Most of these fittings are secured to the fuselage structure with permanent fasteners.
   (5) Aerodynamic fairings on the fuselage consist of the nose cap, stinger, and wing to fuselage fairings, dorsal fin, and ventral fin. The fairings and nose cap provide an aerodynamic smoothness for the fuselage.

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FUSELAGE - INSPECTION/CHECK

1. Fuselage

A. Inspection.

(1) Clean exterior and interior surfaces. Visually inspect surfaces for damage, cracks, loose rivets, and nuts. Inspect stiffeners, stringers, doublers, bulkheads and stringers for loose screws, rivets, cracks, or damage. Check all fluid lines and hoses for leaks, cracks, dents, kinks, chafing, bleaching, or discoloration, proper radius security, corrosion, deterioration, obstructions, and foreign matter.

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CONTROL PEDESTAL - DESCRIPTION AND OPERATION

1. Control Pedestal

A. The center pedestal is located at the forward end of the flight compartment between the crew seats. The pedestal contains the engine controls, autopilot flight controller, audio system terminal blocks, and the trim tab control wheels for all three flight axes.

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CONTROL PEDESTAL - REMOVAL/INSTALLATION

1. Control Pedestal

A. Removal (Refer to Figure 401).
(1) Refer to Chapter 25. Remove the front seats, front carpet, and kick plates.
(2) Remove engine control cover.
(3) Remove elevator trim control wheel by removing screws and washers.
(4) Remove top panel, upper side panels, and center side panel by removing attaching screws and engine control handle knob.

NOTE: If autopilot (optional) is installed disconnect wire bundle from rear of control unit box.

(5) Refer to Chapter 27. Remove elevator trim control sprocket.
(6) Disconnect rudder trim control torque tube from torque tube shaft by removing roll pin.
(7) Disconnect upper aileron trim control chain at master link.
(8) Route aileron, elevator, and rudder trim control cables from pedestal.
(9) Disconnect throttle, propeller, and mixture control cables by loosening the coupling nuts.
(10) Remove alternate air control bracket from control pedestal by removing attaching rivets.
(11) Remove screws fastening upper part of control pedestal to stationary instrument panel.
(12) Remove screws which secure control pedestal to floor.
(13) Carefully lift control pedestal upward to disengage the rudder trim control torque tube from the torque tube shaft. Tilt the pedestal aft, work it free of all units, and remove from cabin.

B. Disassembly (Refer to Figure 401).

NOTE: This disassembly procedure will deal only with those parts which could normally be expected to be removed without disassembling the basic (riveted) structure. If further disassembly is required, standard shop procedure should be used. For disassembly of removed components, refer to the appropriate chapters in this manual.

(1) Remove control quadrant (22) and linkage.
(2) Remove control swivel connectors (5) and push-pull unit (4).
(3) Remove rudder trim control chain (19) by disconnecting at master link. Remove sprocket (18) and shaft (17). Remove bearing plate by removing screws and nuts.

NOTE: Removal of remaining rudder trim control components is not recommended.

C. Assembly (Refer to Figure 401).
(1) Install bearing plate using screws and nuts. Install shaft (17) and sprocket (18). Install rudder trim control chain (19) by connecting master link.
(2) Install push-pull unit (4) and attach control swivel connectors (5).
(3) Install control quadrant (22) and linkage.

D. Installation (Refer to Figure 401).
(1) Work pedestal carefully into position over control cable and rudder trim control torque tube. Lower into place to align holes in pedestal flanges with nutplates in floor, so that torque tube shaft enters into upper end of torque tube.
(2) Secure pedestal to floor with screws and to stationary instrument panel with screws.
(3) Insert rail pin through rudder trim control torque tube and shaft, and safety wire into place.

NOTE: If rudder trim tab position or cable tension has been disturbed while the torque tube was disconnected, it may be necessary to adjust the rigging of the rudder trim control system; refer to Chapter 27.

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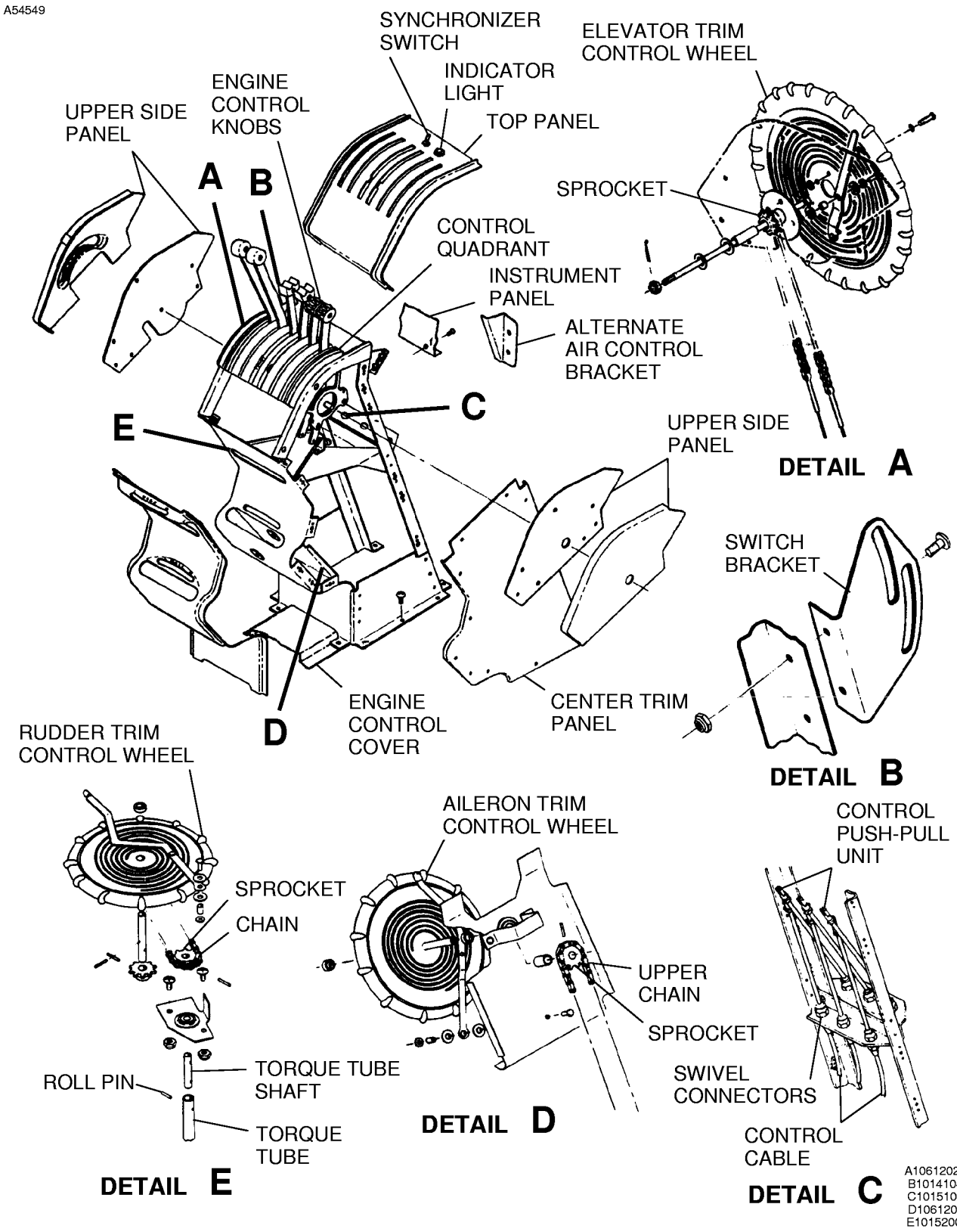

Pedestal Installation
Figure 401 (Sheet 1)

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(4) Install upper aileron trim control chain and fasten at master link.

NOTE: If aileron trim tab position or cable tension has been disturbed while chain was disconnected, it may be necessary to adjust the rigging of the aileron trim control system; refer to Chapter 27.

(5) Install elevator trim control sprocket, chain, left upper side panel and left center side panel.

NOTE: If elevator trim tab position or cable tension has been disturbed while chain was disconnected, it may be necessary to adjust the rigging of the elevator trim control system; refer to Chapter 27.

(6) Attach control cables in place by tightening the coupling nuts. (Use a suitable thread lubricant on the male threads of all connectors.)
(7) Attach all engine controls; refer to Chapter 71.
(8) Rig all engine controls; refer to Chapter 71.
(9) Install the right center side panel, the right upper side panels and the top panel.
(10) Install carpet end kick plates; refer to Chapter 25.
(11) Install control cover.
(12) Install front seats; refer to Chapter 25.

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CONTROL PEDESTAL - INSPECTION/CHECK

1. Control Pedestal

A. Inspection.

(1) Clean surfaces. Visually inspect all parts for evidence of cracking and excessive wear. Inspect the racks and ratchets stops on the mixture levers for broken teeth. Replace racks and ratchet stops and ratchet stop springs if worn or too weak to ensure positive locking.

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FUSELAGE STINGER - REMOVAL/INSTALLATION

1. Fuselage Stinger

A. Removal (Refer to Figure 401).
   (1) Remove attaching screw and move stinger aft slightly.
   (2) Disconnect electrical wires to the tail light.
   (3) Remove stinger assembly from tailcone.

   NOTE: On airplanes equipped with split stinger, the lower half may be removed without disturbing electrical wiring.

B. Installation (Refer to Figure 401).
   (1) Place stinger near tailcone.
   (2) Connect electrical wire to tail light.
   (3) Secure stinger assembly to tailcone with screws.

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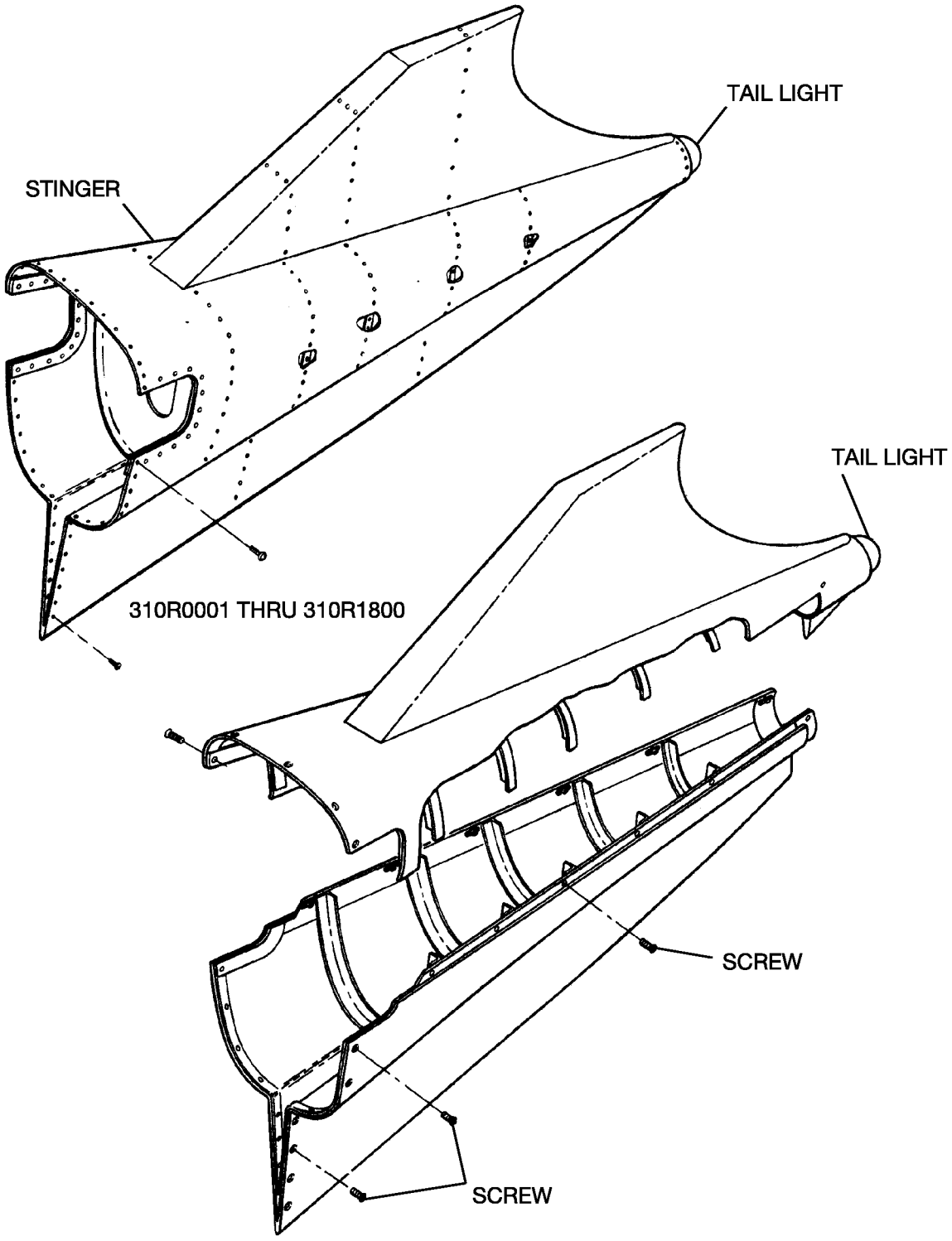

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10123007

Fuselage Stinger Installation
Figure 401 (Sheet 1)

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NOSE CAP - REMOVAL/INSTALLATION

1. Nose Cap

A. Removal (Refer to Figure 401).
   (1) Remove screws and washers, securing nose cap to nose structure.
   (2) Move nose cap forward and disconnect the antenna lead to the glide slope antenna (optional) if installed.
   (3) Remove the nose cap.

B. Installation (Refer to Figure 401).
   (1) Position nose cap to nose structure.
   (2) If installed, connect glide slope antenna lead to the glide slope antenna.
   (3) Secure the nose cap to nose structure, using screws and washers.

2. Avionics Shelves

NOTE: Avionics shelves are optional depending on the avionics package. Removal/installation procedures are for both the upper and lower shelves.

A. Removal (Refer to Figure 401).
   (1) Ensure electrical power is turned OFF.
   (2) Remove the nose cap. Refer to Removal/Installation Nose Cap in this section.
   (3) Disconnect electrical wiring to upper shelf components and remove components as required.
   (4) Remove screws and nuts securing upper shelf and remove shelf.
   (5) Disconnect electrical wiring to lower shelf components and remove components as required.
   (6) Remove screws and remove lower shelf.

B. Installation (Refer to Figure 401).
   (1) Secure lower shelf to structure with screws.
   (2) Install lower shelf components and connect electrical wiring.
   (3) Assemble support assemblies, angles, to lower shelf (if removed), using screws and nuts.
   (4) Secure upper shelf to structure, support assemblies and angles using screws and nuts.
   (5) Install upper shelf components and connect electrical wiring.
   (6) Install nose cap. Refer to Removal/Installation Nose Cap in this section.

3. Nose Baggage Shelves

A. Removal (Refer to Figure 401).
   (1) If installed, remove (optional) nose baggage compartment upholstery. Refer to Chapter 25.
   (2) Remove LH aft baggage retainer by removing screws.
   (3) Remove LH baggage shelf by removing screws.
   (4) Remove RH baggage shelf by removing screws.
   (5) Remove RH aft baggage retainer by removing screws.

B. Installation (Refer to Figure 401).
   (1) Install RH aft baggage retainer, using screws.
   (2) Install RH baggage shell, using screws.
   (3) Install LH baggage shelf, using screws.
   (4) Install LH aft baggage retainer, using screws.
   (5) If installed, refer to Chapter 25 and install nose baggage compartment upholstery.

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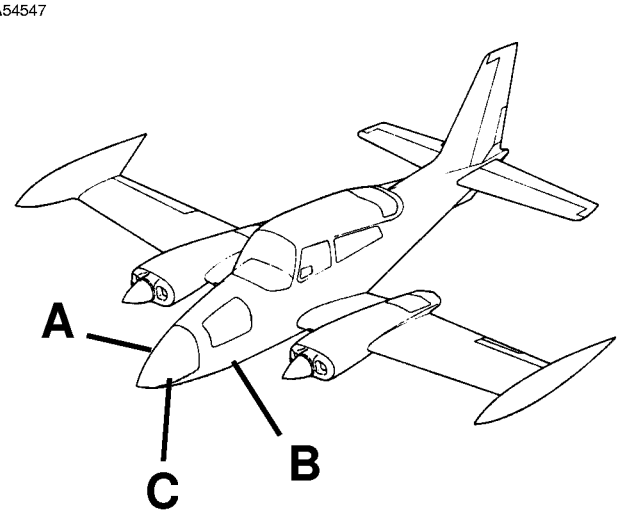

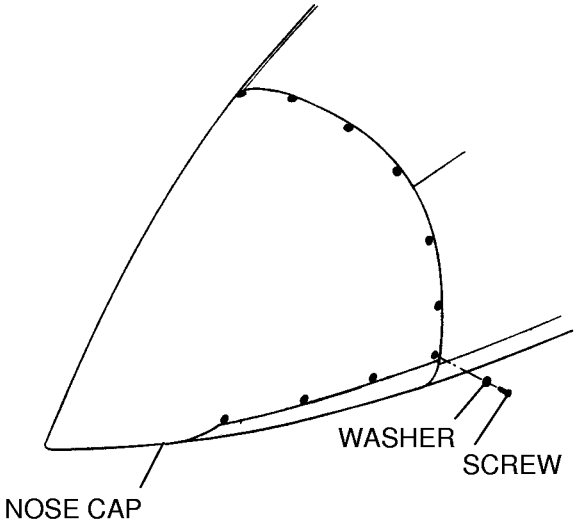

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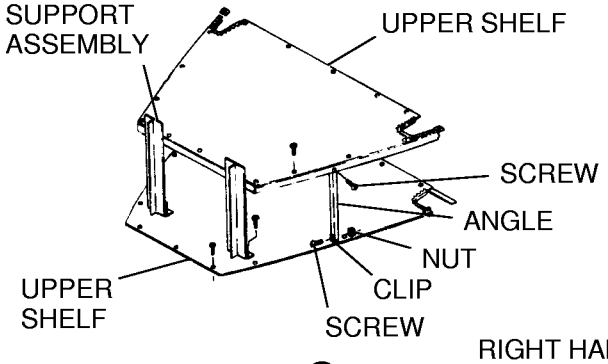
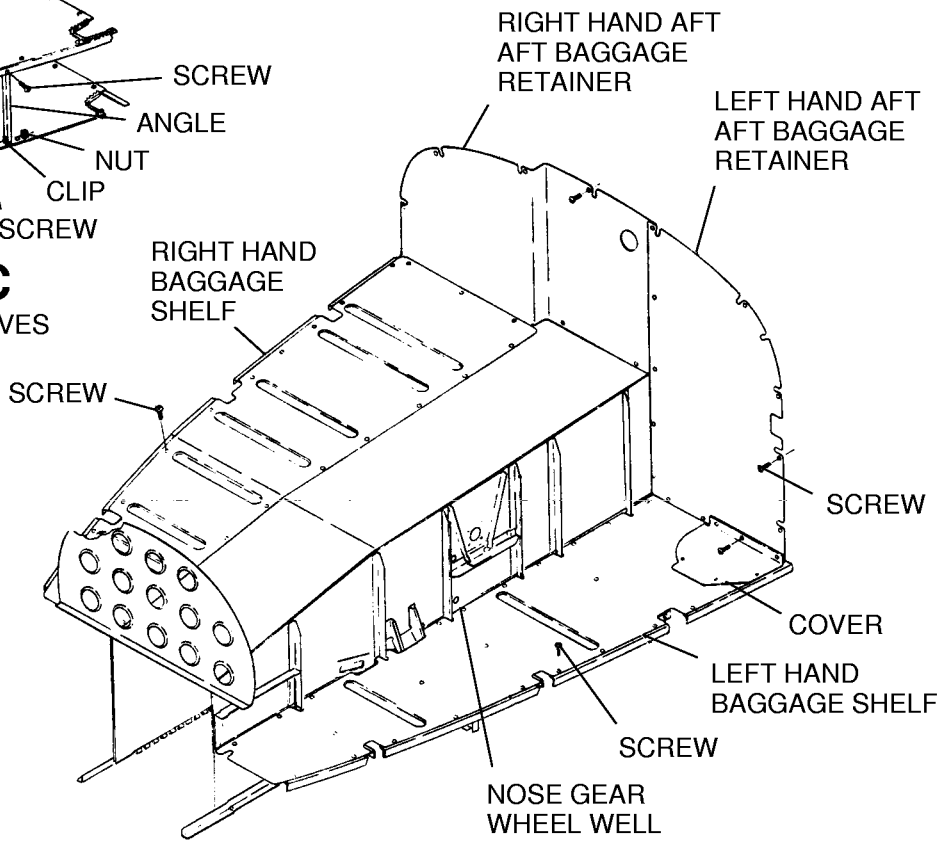


DETAIL C
AVIONICS SHELVES



DETAIL B
BAGGAGE SHELVES

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Nose Cap and Shelves Installation
Figure 401 (Sheet 1)

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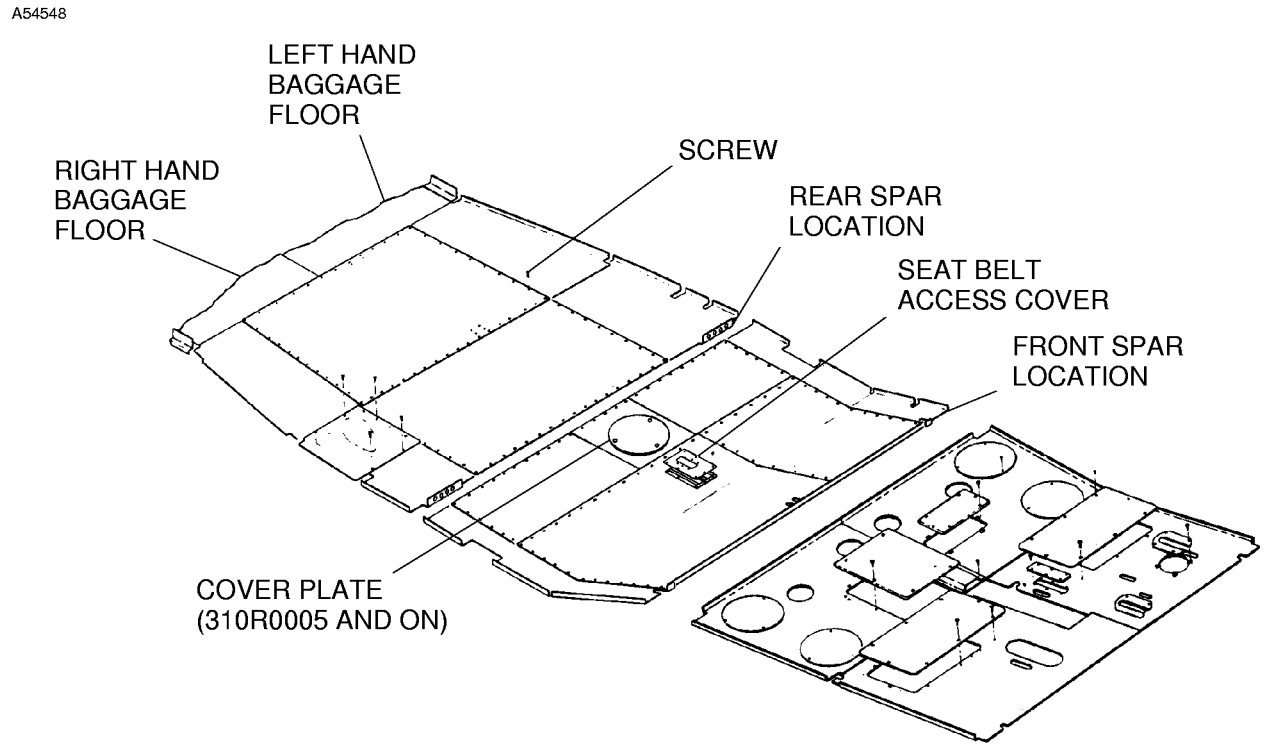
FLOOR PANELS - REMOVAL/INSTALLATION

1. Floor Panels

A. Removal (Typical) (Refer to Figure 401).



Floor Panels Installation
Figure 401

NOTE: Any furnishings that prohibit or obstruct removal of, or are attached to the floor panels, must be removed, refer to Chapter 25.

(1) Remove screws as required. Remove panel from supporting structure.

B. Installation (Typical) (Refer to Figure 401).
(1) Place floor panel in position and attach to supporting structure with screws.
(2) Install furnishings removed to facilitate removal of floor panels, refer to Chapter 25.

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CHAPTER

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STABILIZERS

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STABILIZERS - GENERAL

1. Scope

A. This chapter describes the horizontal and vertical stabilizers.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Horizontal stabilizer describes the horizontal airfoil of the tail or nose section to which the elevator is attached.
   (2) Vertical stabilizer describes the vertical airfoil to which the rudder is attached.

3. Horizontal Stabilizer

A. Description.
   (1) The horizontal stabilizer is of one-piece construction. A removable panel on the horizontal stabilizer permits access to the elevator trim tab actuator. Aerodynamically balanced elevators are hinged to the trailing edge of the horizontal stabilizer.

4. Vertical Stabilizer

A. Description.
   (1) The vertical stabilizer is constructed with a swept back design that includes the dorsal fin. A removable panel on the vertical stabilizer permits access to the rudder trim actuator. The aerodynamically balanced rudder is attached to the trailing edge of the vertical stabilizer.

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HORIZONTAL STABILIZER - REMOVAL/INSTALLATION

1. Horizontal Stabilizer

A. Removal (Refer to Figure 401).
   (1) Remove the elevator, refer to Chapter 27, Elevator - Removal/Installation.
   (2) Remove the vertical stabilizer, refer to Vertical Stabilizer - Removal/Installation.
   (3) Remove elevator and trim control cables from stabilizer, refer to Chapter 27, Elevator - Removal/Installation.
   (4) Remove tail navigation light wires by removing screws from attaching clamps and wire terminal.
   (5) If deice system (optional) is installed, disconnect and tag hoses at tee located on support bracket just forward of center bulkhead in tailcone.
   (6) Remove nuts, washers, and bolts attaching rear spar to tailcone bulkhead.
   (7) Remove bolts and washer attaching front spar to fuselage bulkhead.
   (8) Lift the rear spar until the stabilizer is at an angle of approximately 45 degrees, then remove from the airplane by lifting vertically.

B. Installation (Refer to Figure 401).
   (1) Position horizontal stabilizer on tailcone and align mounting holes.
   (2) Attach stabilizer front spar to fuselage bulkhead with bolts and washers. Torque bolts to 175 pound-inches, +15 or -15 pound-inches.
   (3) Attach stabilizer rear spar to tailcone bulkhead with bolts, washers, and nuts. Torque bolts to 120 pound-inches, +20 or -20 pound-inches.
   (4) If deice system (optional) is installed, connect hoses to tee located on support bracket forward of center bulkhead in tailcone.
   (5) Install tail navigation light wires by installing screws in attaching clamps and wire terminal.
   (6) Install elevator, refer to Chapter 27, Elevator - Removal/Installation.
   (7) Install vertical stabilizer, refer to Vertical Stabilizer - Removal/Installation.

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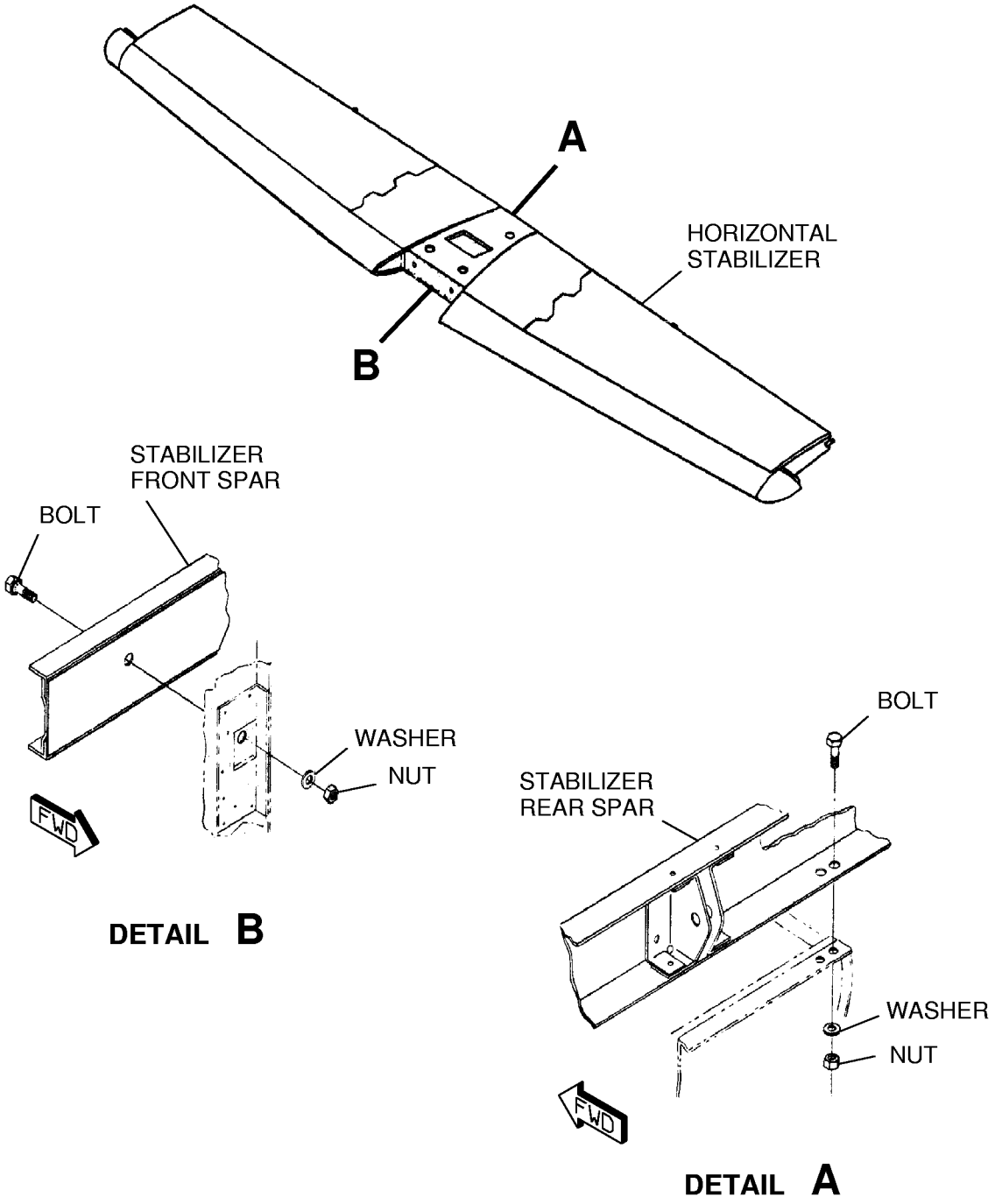

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Horizontal Stabilizer Installation
Figure 401 (Sheet 1)

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HORIZONTAL STABILIZER - INSPECTION/CHECK

1. Horizontal Stabilizer

A. Inspection.
(1) Clean interior and exterior surfaces.
(2) Check exterior surfaces for damage, cracks, loose rivets and loose nuts.
(3) Check attaching bolts and hinge attaching points for security.
(4) Check area surrounding front spar attaching bolts, attaching point fittings, webs and spars for looseness, cracks, buckles and visible damage.
(5) Check left and right outboard stabilizer tip ribs for cracks.
(6) Check left and right upper and lower aft spar caps for racks from tip inboard through outboard fitting attach holes.
(7) Check hinge brackets for cracks and loose or working fasteners.
(8) Check outboard hinge bearings for looseness

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VERTICAL STABILIZER - REMOVAL/INSTALLATION

1. Vertical Stabilizer

A. Removal (Refer to Figure 401).
(1) Place suitable support beneath tail section.
(2) Remove horizontal stabilizer fairings, refer to Chapter 53, Fuselage Stinger - Removal/Installation.
(3) If omni-antenna (optional) is installed, disconnect the coaxial cable in the aft fuselage.

NOTE: If the coaxial cable is disconnected at the vertical fin tip, a wire should be attached to the cable before removal to facilitate installation.

(4) If anti-collision light (optional) is installed, quick disconnects must be disconnected and the ground wire disconnected at the bulkhead in the aft fuselage.
(5) If flux detector (optional) is installed, disconnect the electrical wiring.
(6) Remove the following:
(a) Rudder, refer to Chapter 27, Rudder - Removal/Installation.
(b) Remove eyebolt attaching elevator down spring to vertical stabilizer rear spar, refer to Chapter 27, Elevators - Removal/Installation.
(c) Remove rudder and trim control cables, refer to Chapter 27, Rudder - Removal/Installation.
(d) Remove elevator push-pull tube, refer to Chapter 27, Elevators - Removal/Installation.
(7) Remove screws attaching forward dorsal skin to fuselage.
(8) Remove nuts and bolts attaching front spar to fuselage.
(9) Remove bolts and washers attaching rear spar to fuselage.
(10) Lift stabilizer vertically until front spar has cleared fuselage and remove from airplane.

B. Installation (Refer to Figure 401).
(1) Place vertical fin in position on fuselage and align mounting holes.
(2) Attach vertical stabilizer rear spar to tailcone bulkhead with bolts and washers.

NOTE: Torque vertical fin attaching bolts to 175 pound-inches, +15 or -15 pound-inches.

(3) Attach forward dorsal skin to fuselage with screws.
(4) Attach vertical stabilizer front spar to fuselage with bolts and nuts.
(5) Install the following:
(a) Elevator push-pull tube, refer to Chapter 27, Elevators - Removal/Installation.
(b) Elevator down spring with eyebolt, washer, and nut, refer to Chapter 27, Elevators - Removal/Installation.
(c) Install rudder to vertical stabilizer and connect rudder and trim cables, refer to Chapter 27, Rudder - Removal/Installation.
(6) If omni-antenna (optional) is installed, connect the coaxial cable in the aft fuselage.
(7) If anti-collision is installed, connect electrical wires and attach the ground wire to the bulkhead in the aft fuselage.
(8) If flux detector (optional) is installed connect electrical wires.
(9) Rig the rudder and rudder trim system and elevator system if required, refer to Chapter 27, Rudder - Adjustment/Test and Elevators - Adjustment/Test.
(10) Install horizontal fairings.
(11) Remove support from beneath tail section.

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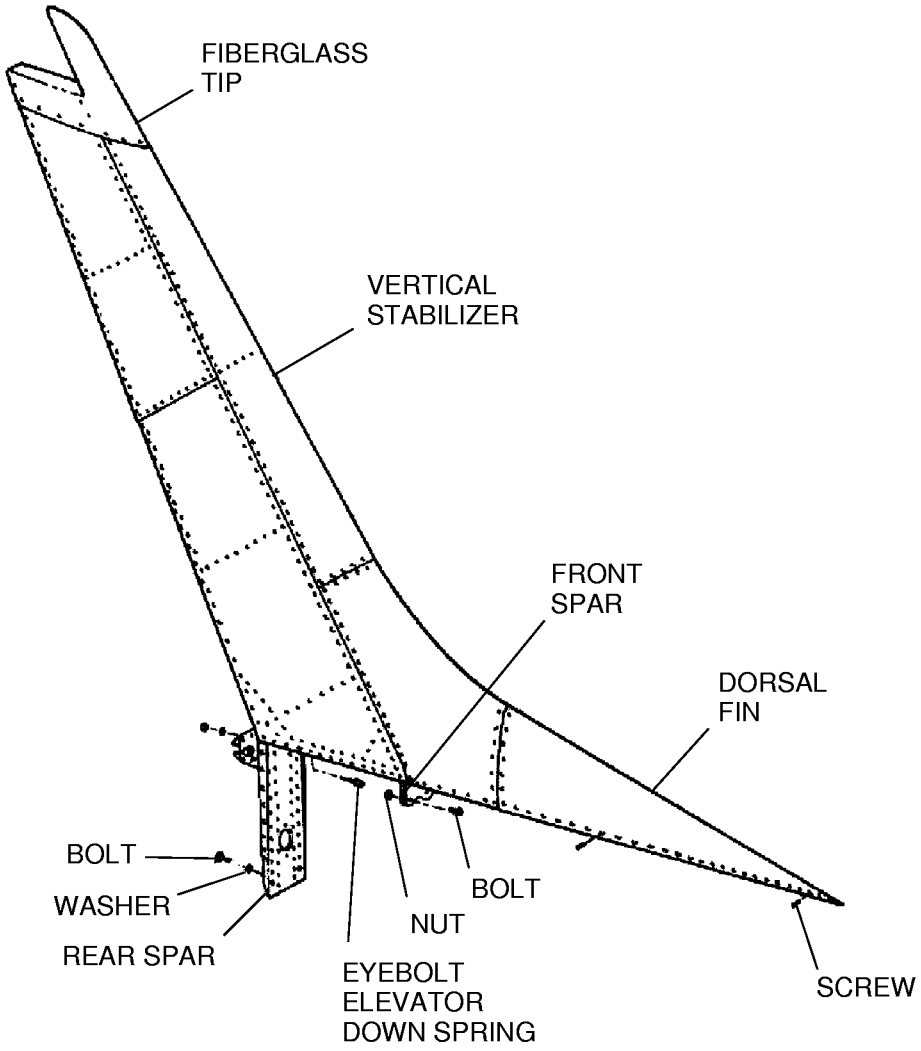

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Vertical Stabilizer Installation
Figure 401 (Sheet 1)

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VERTICAL STABILIZER - INSPECTION/CHECK

1. Vertical Stabilizer

A. Inspection.
(1) Clean interior and exterior surfaces.
(2) Check exterior surfaces for damage, cracks, loose rivets and loose nuts.
(3) Check attaching bolts and hinge attaching points for security.
(4) Check area surrounding front spar attaching bolts, attaching point fittings, webs and spars for looseness, cracks, buckles and visible damage.
(5) Check hinge brackets for cracks and loose or working fasteners.
(6) Check hinge bearings for looseness

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CHAPTER 56

WINDOWS

LIST OF EFFECTIVE PAGES

CHAPTER-SECTION-SUBJECT	PAGE	DATE
56-Title		
56-List of Effective Pages		
56-Record of Temporary Revisions		
56-Table of Contents		
56-00-00	Pages 1-3	Jun 17/2005
56-00-00	Pages 401-410	Jun 17/2005
56-00-00	Pages 601-602	Jun 17/2005
56-00-00	Page 701	Jun 17/2005
56-00-00	Pages 801-803	Jun 17/2005

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RECORD OF TEMPORARY REVISIONS

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WINDOWS - GENERAL

1. Scope

A. This chapter describes the fuselage and crew compartment windows, including the windshield.

2. Windshield

A. Description.
(1) The windshield is a single piece of formed plastic. The windshield is secured to the fuselage by rivet and screw fastened retainers. Inside and outside metal stiffeners provide support at the center of the windshield. The inside stiffener supports the magnetic compass.

3. Emergency Exit Window

A. Description.
(1) The emergency exit or pilot's window is a single window, located on the left forward side of the cabin. This window consists of a plastic panel with an integrally mounted foul weather window. The emergency exit window is mounted inside a spot-welded and riveted frame assembly. This frame assembly is secured to the main fuselage structure by catch assemblies and clips. When the emergency release pull ring is pulled, the cable assemblies release the frame assembly from the fuselage structure, thereby, the frame assembly can be pushed clear of the structure. Operating instructions are contained on a decal, located on the window panel.

4. Emergency Exit Window Release Mechanism

A. Description.
(1) The emergency release mechanism is located in the rear left upholstery panel, just aft of and below the emergency exit window. A red pull ring is secured in the royalite trim pan assembly, covered and identified by an instructional plastic cover. A finger size center hole in the plastic cover provides quick removal to expose the pull ring when an emergency condition exists. When the pull ring is pulled, the catch assembly is released and the window then can be pushed free.

5. Tools and Equipment

NOTE: The following material or equivalent is required.

Name	Number	Manufacturer
Aliphatic Naphtha Type II	TT-N-95	Commercially Available
Stoddard Super Solvent		Anderson Prichard Oil Company Liberty Bank Building Oklahoma City, Oklahoma
Wilco Anti-Static Cleaner		Wilco Company Los Angeles, California
Shell Solvent	TS-1	Shell Chemical Corporation 380 Madison Avenue New York, New York
Triton	X-200	Robin and Haas Company Washington Square Philadelphia, Pennsylvania
Kerosene		Commercially Available
DuPont Auto Wax		E.I. DuPont de Nemours & Co., Inc. Fabrics and Finishes Department Wilmington, Delaware

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Name	Number	Manufacturer
Johnson Auto Wax, Johnson Car Plate Wax, Johnson Kitchen Wax, Johnson Paste Wax	W-6000	S.C. Johnson & Son Incorporated Industrial Products Division Racine, Wisconsin
Simonize wax		Simonize Company 2100 Indiana Avenue Chicago, Illinois
Chamois Skins or Diaper Type Cloths		Commercially Available
Rymplecloth	301	Kendall Company Textile Division 111 West 40th Street New York, New York
BUFFING COMPOUNDS		
Learock	765 or 881	Lea Manufacturing Company 16 Cherry Avenue Waterbury, Connecticut
Scratch Removing Compound	351	Wilco Company 4425 Bandini Boulevard Los Angeles, California
Tripple A Buffing Compound		Goodison Manufacturing Company P.O. Box 128 Rochester, Michigan
POLISHES		
Plex-i-glo Cleaner and Polish		McAleer Manufacturing Company 101 South Waterman Detroit, Michigan
Simonize Liquid Cleaner		Simonize Company 2100 Indiana Avenue Chicago, Illinois
Turco Cleaner	L-567	Turco Products Incorporated P.O. Box 2649 Terminal Annex Los Angeles, California
DuPont	7	E.O. DuPont de Nemours & Co., Inc. Fabrics & Finishes Department Wilmington, Delaware
Mirror Glaze	MGH-7	Mirror Bright Polish Company Pasadena, California
Permatex Plastic Cleaner		Permatex Company, Inc. Kansas City, Kansas
	(Mix as follows: 4 to 5 parts by weight Permatex Plastic Cleaner, 1 part by weight Johnson's Pride)	
ABRASIVE PAPERS		

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Name	Number	Manufacturer
320 to 600A Grit Wet or Dry Type Sandpaper or Cloth		Commercially Available
Poly Sand 300-800 Grit		Poly Sand Corp., Iowa
PROTECTIVE COATINGS		
Spraylat A, Spraylat (White), Spraylat (Black)	SC-1058, SC-1072	Spraylat Corporation Mt. Vernon, New York
Scotch Brand No-Mar Protective Tape		3M Co. St. Paul, Minnesota
POLISHING CLOTHS		
Chamois Skins or Diaper Type Cloths		Commercially Available
Rymplecloth	301	Kendall Company Textile Division 111 West 40th Street New York, New York
EQUIPMENT		
Buffing Wheel - Unstitched Canton Flannel, 6-inch Diameter x 20 Ply		Commercially Available
Sealer Tape	471	3M Co.
Technical Petrolatum	VV-P-236	Commercially Available
Sealant Type II	Pro-Seal 567	Coast Pro-Seal and Mfg. Co.
Sealant Type I, Class B-2	Pro-Seal 890, SEM Kit	Coast Pro-Seal and Mfg. Co.
Nozzles	Semco #440	Semco Division of Products Research and Chemical Division Glendale, California
Sealing Gun	Semco #250 (Pneumatic) or Semco #850 (Manual)	Semco Division of Products Research and Chemical Division Glendale, California

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WINDOWS - REMOVAL/INSTALLATION

1. Windshield

A. Removal (Refer to Figure 401).
(1) Remove left and right windshield trim, refer to Chapter 25, Equipment/Furnishings - Removal/ Installation.
(2) Remove nuts and screw from windshield upper retainer and left and right side retainers.
(3) Drill rivets from right and left outside lower retainers. Remove retainers carefully to prevent sharp bends or stretching of material.
(4) Remove windshield.

B. Installation (Refer to Figure 401).

NOTE: Before installing windshield, chamfer and smooth edges of windshield and lightly countersink or deburr all holes.

(1) Apply sealer tape (471) on entire external surfaces of inner retainers that will be in contact with windshield.
(2) Insert upper edge of windshield between inner retainer and upper cabin skin.
(3) Secure windshield in place with a temporary fastener at top center and bottom center of windshield.
(4) Using a #10 (0.193) drill, mark locations of holes in upper cabin skin.
(5) Apply masking tape to windshield next to retainers to make cleaning easier after sealant application.
(6) Remove windshield and drill holes marked in step (4) with an "F" (0.257) drill.

NOTE: Sealant may be purchased in volume containers or in cartridge kit form.

(7) If sealant is obtained in volume containers, mix sealant in accordance with manufacturer's instructions. If sealant is in cartridge kit, prepare as follows:
(a) Pull dasher rod out of cartridge approximately half way.
(b) Insert rod (1/4 inch dowel or equivalent) into hole in tip of dasher rod. Push ramrod until it hits bottom. This injects curing agent into base material. Remove bottom cap.
(c) To mix, push dasher rod to bottom of cartridge and begin stroking in a spiral clockwise motion from top to bottom of cartridge. On last stroke dasher rod should be fully extended.
(d) Unscrew dasher rod (approximately 3 turns) while gripping the cartridge in area of the dasher. Remove dasher rod and discard.
(e) Screw nozzle into cartridge.
(f) Place cartridge in sealant gun for application. Total elapsed time should not exceed 6 minutes.
(g) Do not apply sealant at temperatures below 60°F.

NOTE: Application time of sealant is approximately two hours. Installation of windshield should be completed within that time.

(8) Using an extrusion gun as the preferred method of application of sealant, apply sealant to upper outer edge of windshield.
(9) Insert windshield between inner retainer and upper cabin skin and align holes. Using temporary fasteners, secure windshield in place.
(10) Apply masking tape to metal approximately 1/2 inch forward of the front edge of windshield.
(11) Using a hole filling compound (Pro-Seal 567) applied with a spatula, fill void around front edge of windshield. Fair in compound to edge of masking tape.
(12) Apply a parting agent (VV-P-236 Petrolatum) to inside of each outer retainer to be installed.
(13) After hole filling compound has set, approximately 30 minutes, apply sealant to retainers and secure side retainers in place with screws and nuts.
(14) Secure right and left lower retainers with rivets. Nuts and screws may be used in lieu of rivets if preferred.

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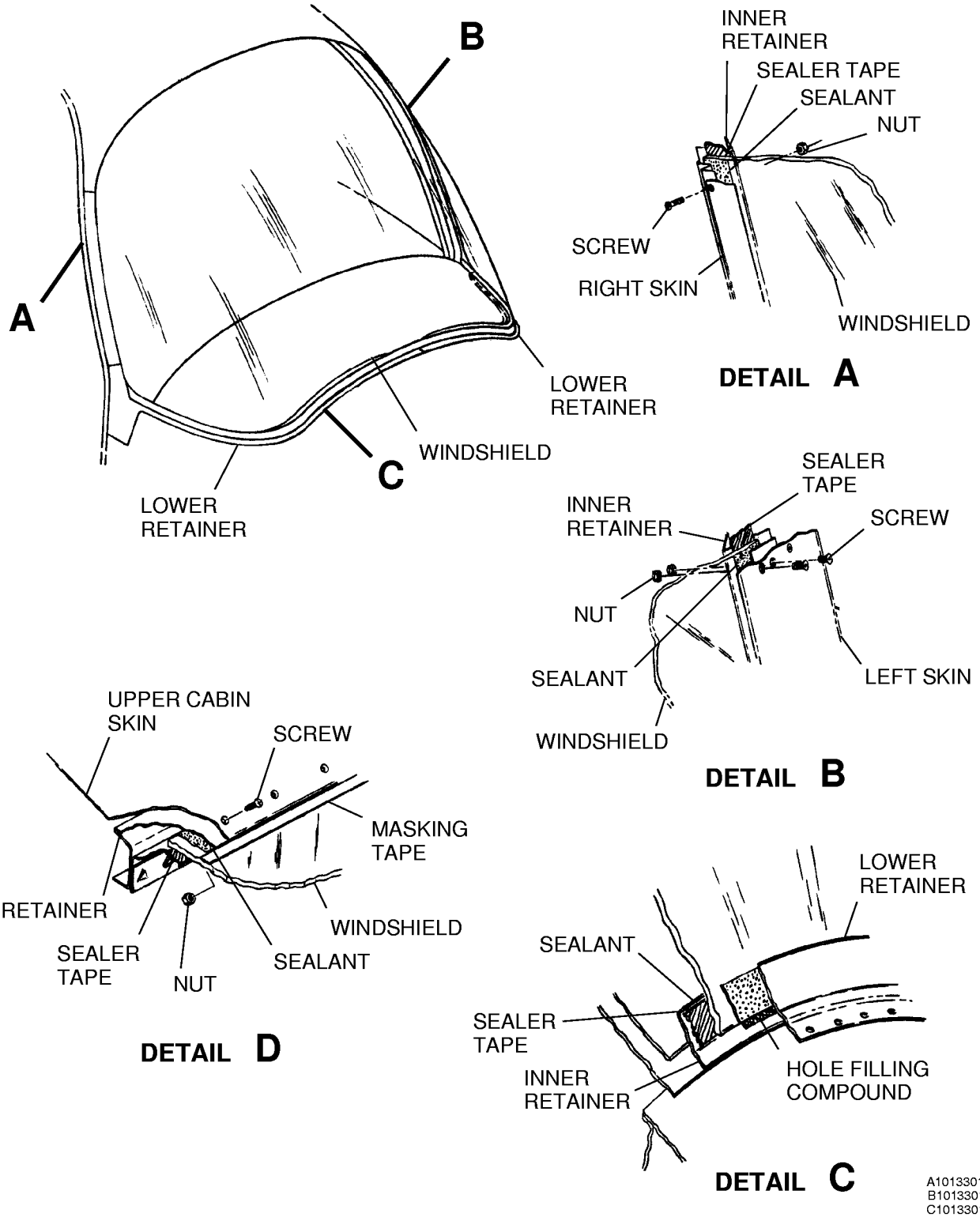

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Windshield Installation
Figure 401 (Sheet 1)

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(15) Remove excess sealant from around windshield and clean with Aliphatic Naptha (TT-N-95) or Toulene (TT-T-548).
(16) Install windshield trim.
(17) Remove temporary fasteners at upper skin and secure with screws and nuts. Do not overtorque nuts. Tighten nuts until skin starts to pull in.
(18) Install compass wire sleeve and base plate (Airplanes 310R1201 and On), refer to Chapter 34, Navigation - Removal/Installation.

2. Picture Window

A. Removal (Refer to Figure 402).
(1) Remove window trim panels, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove wire tunnels.
(3) Remove inboard window by removing aft support and attaching screws.
(4) Remove upper and lower supports from structure by removing screws.
(5) Remove forward trim retainer and forward trim support by removing screws and nuts.
(6) Remove upper and lower retainers by removing screws.
(7) Remove aft retainer by removing screws.
(8) Remove outboard window.

B. Installation (Refer to Figure 402).
(1) Position outboard window in the frame.
(2) Install aft retainer and secure with screws.
(3) Install lower and upper retainers and secure with screws.
(4) Install forward trim support and forward trim retainer, using screws and nuts.
(5) Install lower and upper supports to structure, using screws.
(6) Install inner window and moulding in frame and secure aft support, using screws.
(7) Install wire tunnels.
(8) Install window trim panels, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.

3. Emergency Exit Window

A. Removal (Refer to Figure 403).
(1) Remove window post trim, lower, upper, and forward window trim, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove emergency exit window by removing cover and actuating release ring.
(3) Supporting emergency exit window, push outwards until pivot pins and clips clear fuselage structure.

B. Installation (Refer to Figure 403).

NOTE: Before installing emergency window, replace clips (four places) if required.

(1) Hold emergency window assembly at slight angle, engage pivot pins into fuselage structure and position window in fuselage frame.

NOTE: Pivot pins are provided with adjustable, mountings. Normally the pivot pins settings are not disturbed during emergency window removal. If pivot pin settings were disturbed, it will become necessary to realign them upon installation. This is accomplished by loosening the four screws in the mounting plate and positioning emergency window in fuselage frame aligning the pivot pin with hole. Scribe an index mark along edge of mounting plate after alignment is achieved. Remove emergency window from fuselage and tighten mounting plate along scribe line with the attaching screws. Several adjustments may become necessary before positive alignment is achieved.

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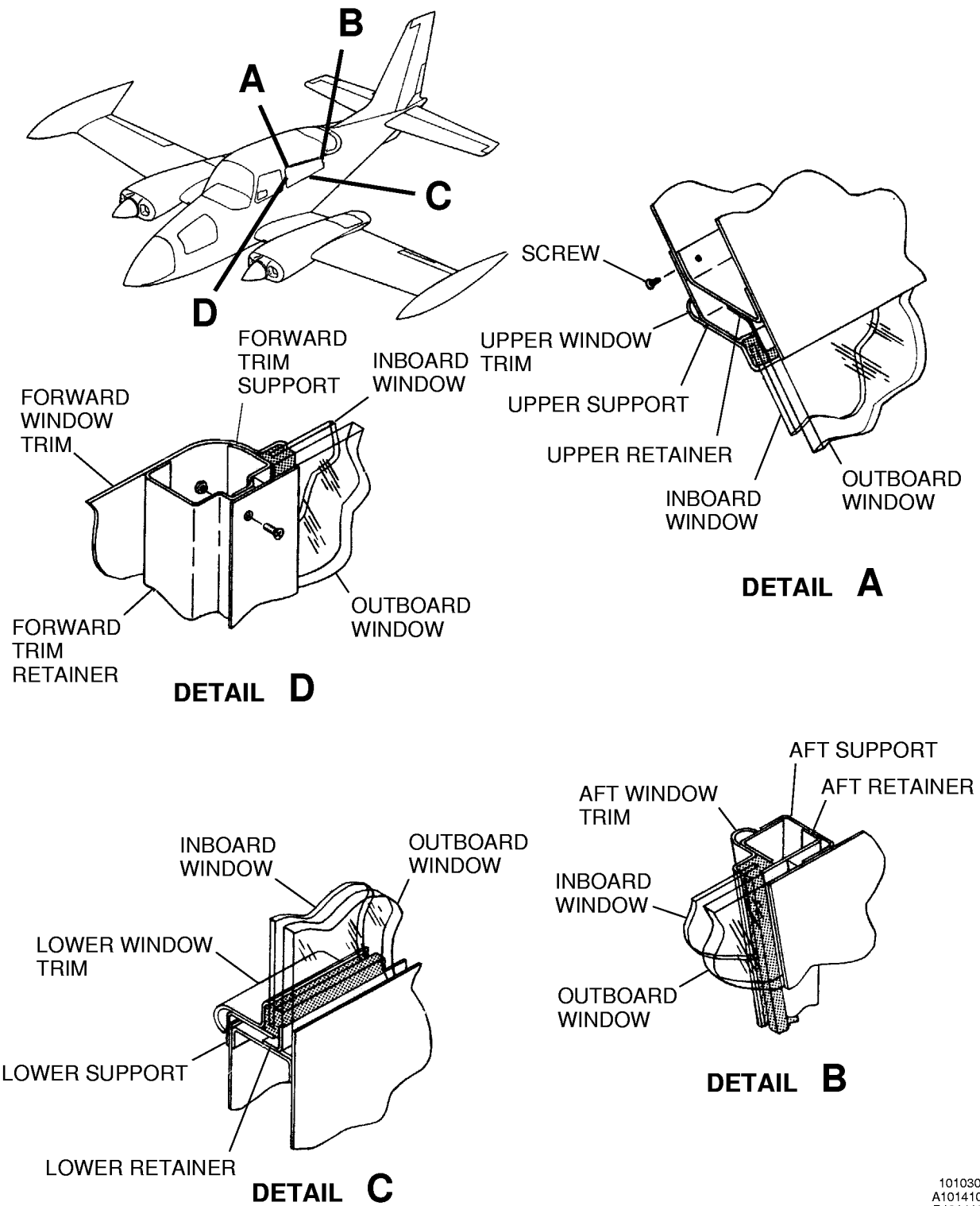

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Picture Window Installation
Figure 402 (Sheet 1)

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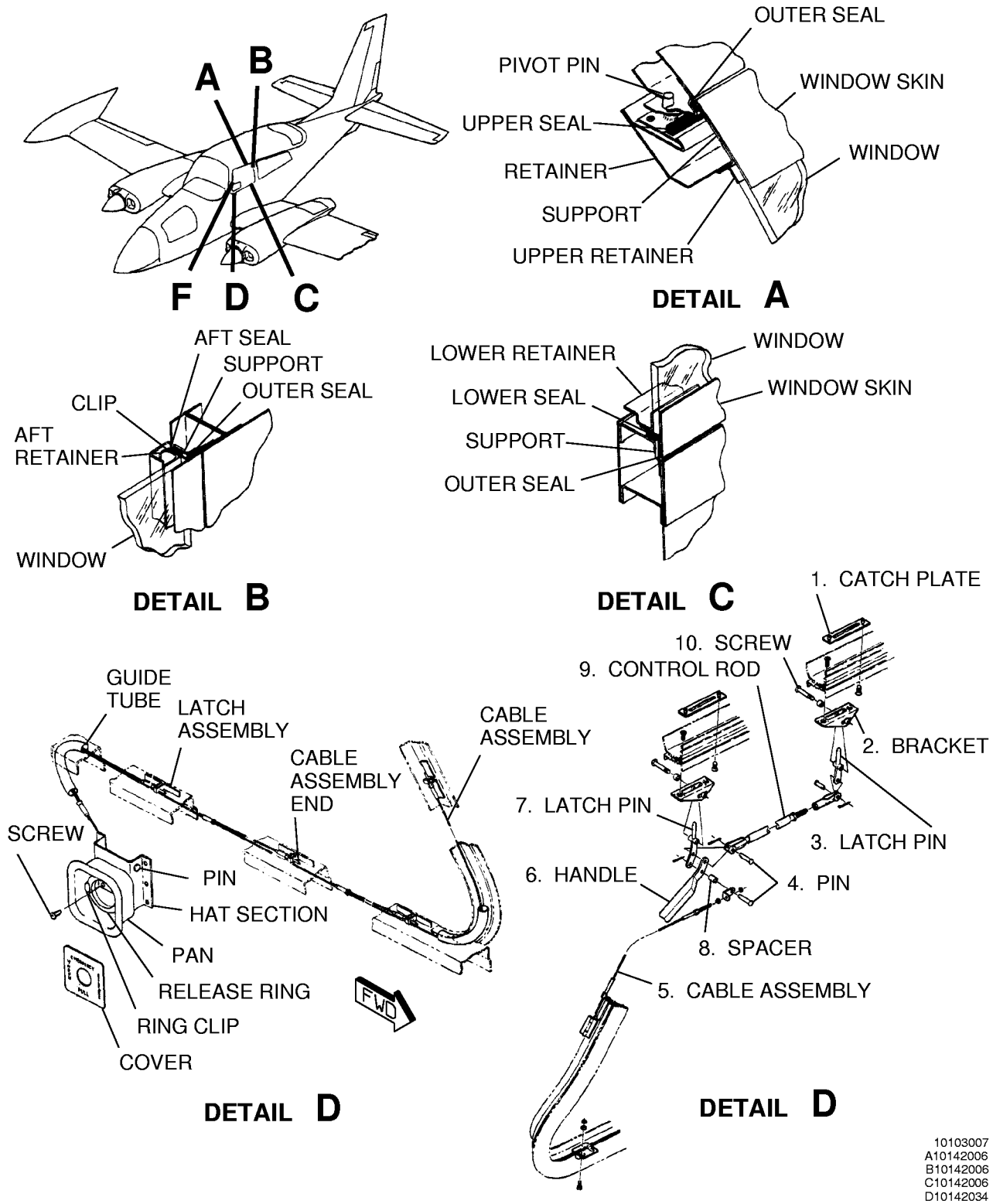

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E10142034
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Emergency Exit Window Installation
Figure 403 (Sheet 1)

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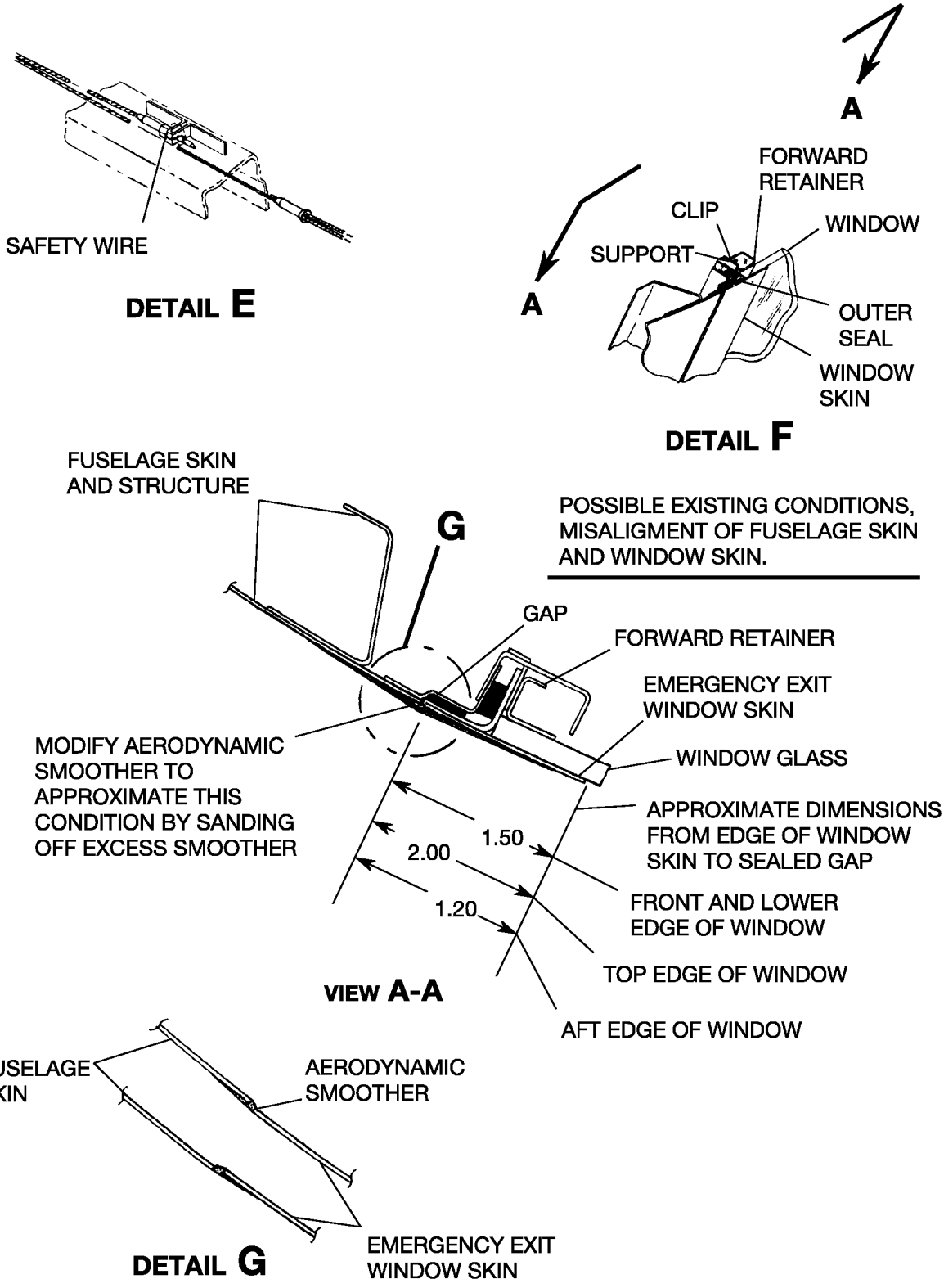

Emergency Exit Window Installation
Figure 403 (Sheet 2)

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(2) Position a person outside the emergency exit window to apply pressure on the frame at each point while cable assembly ends are being inserted through latch assemblies. Safety cable assembly ends in place using 0.011 inch copper safety wire. Only a single strand of safety wire should be used.

CAUTION: The barrel of aft emergency window cable assembly end must be housed inside guide tube or serious binding may result.

(3) Using a rubber mallet, bend exposed tab of clips over fuselage window frame.
(4) Install release ring into ring clip and replace cover.
(5) Install forward window trim, upper, lower, and window post trim, refer to Chapter 25, Equipment/ Furnishings - Removal/Installation.
(6) Using an aerodynamic sealant (579-6 sealer-extruded) seal entire joints of edge of emergency exit window assembly opening trim. Wipe off and remove all excess sealer from exterior of emergency exit window assembly and trim. Mix (Bondtite BTC 20) aerodynamic smoother and apply a light coat on outer perimeter joints of emergency exit window. This smoother should not be more than 0.02 of an inch in depth. After smoother has cured, sand lightly to fair in edges. Repaint all surfaces affected as required.

4. Emergency Window Release Mechanism

A. Removal (Refer to Figure 403).
(1) Remove window post trim, lower, upper, and forward window trim and pilot's seat, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Remove ash tray and wemac.
(3) Remove cover from pan.
(4) Remove cable assembly as follows:
(a) Remove upholstery side panel, refer to Chapter 25, Equipment/Furnishings - Removal/ Installation.
(b) Remove safety wire and disengage cable assembly ends from latch assemblies.
(c) Remove pin and ring clip by removing screws.
(d) Remove pin and route cable assembly from hat section.

B. Installation (Refer to Figure 403).
(1) Install cable assembly as follows:
(a) Route cable assembly through hat section to the latch assemblies then install pin in hat section.
(b) Install window release pin and ring clip, using screws.
(c) Install upholstery panel, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(2) Safety cable assembly ends at latch assemblies using 0.011 inch copper safety wire. Only a single strand of safety wire should be used.

NOTE: The maximum pull required to release the emergency window shall not exceed 80 pounds on the ring.

(3) Install ash tray and wemac, window post trim, lower, upper, and forward window trim and pilot's seat, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.

5. Emergency Window Release Mechanism (Airplanes 310R0801 and On)

A. Removal (Refer to Figure 403).
(1) Remove emergency exit window in accordance with removal procedures in this section.
(2) Disassemble emergency exit window release mechanism as follows:
(a) Remove cotter pins, clevis pins (4), and screws (10) from latch pins (3).
(b) Remove control tube (9).
(c) Remove clevis pin (4), spacer (8) from latch pin (7), and remove handle (6).
(d) Remove nuts securing cable assembly (5) to clip and remove cable.

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B. Installation (Refer to Figure 403).
(1) Install cable assembly (5) to clip with nuts and tighten.
(2) Install latch pin (7) and handle (6) in place using spacers (8), clevis pins (4), and assuring clip and cable assembly is connected to handle with clevis pin.
(3) Install control tube (9) in place with clevis pins and secure with cotter pins.
(4) Install latch pin (3) and adjust control tube (9) to assure both latch pins will travel perpendicular to window frame in the fully latched position. Check operation for freedom of movement and no binding.
(5) Install emergency exit window in place in accordance with installation procedures in this section.

6. Omni Window

A. Removal (Refer to Figure 404).
(1) Remove window trim by removing screws.
(2) Drill out rivets securing retainer to cabin skin and remove window.

B. Installation (Refer to Figure 404).
(1) When replacing seal, make splice joint at forward center of omni window.
(2) Install window and retainer using rivets.
(3) Install window trim, using screws.

7. Foul Weather Window

A. Removal (Refer to Figure 405).
(1) Tape or mask emergency exit window as necessary to protect the plexiglass during removal and installation of pin.
(2) Remove nuts, washers, spring, and pin.

CAUTION: When removing or installing foul weather window, use foul weather window spring tool, P/N 5090003 to prevent spring from accidentally damaging pilot's window.

(3) Refer to Figure 405 for further disassembly of the foul weather window.

NOTE: If seal is being replaced, bond to foul weather window, using Eastman 910 adhesive (Armstrong Cork Company, Lancaster, Pennsylvania), or equivalent.

B. Installation (Refer to Figure 405).
(1) Assemble foul weather window to emergency exit window, using nuts, washers, spring, and pin.
(2) Remove protective covering from window.

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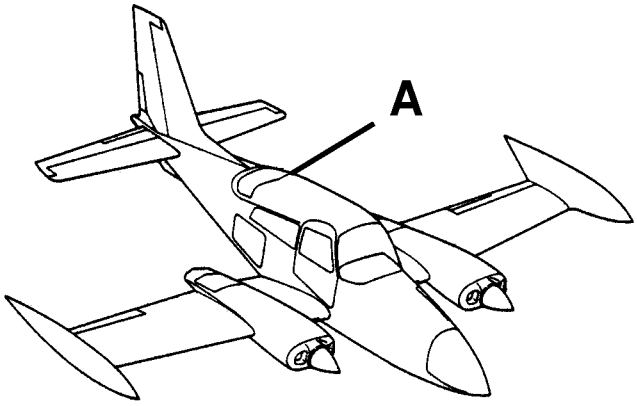

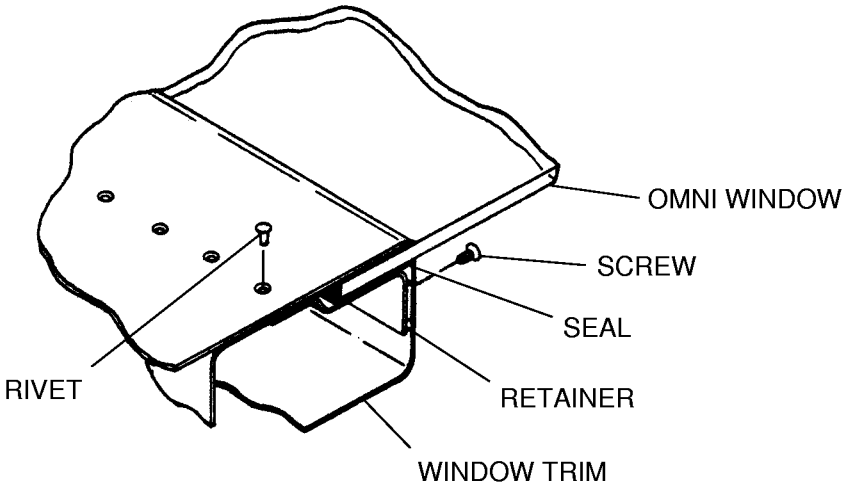

DETAIL A
TYPICAL

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Omni Window Installation
Figure 404 (Sheet 1)

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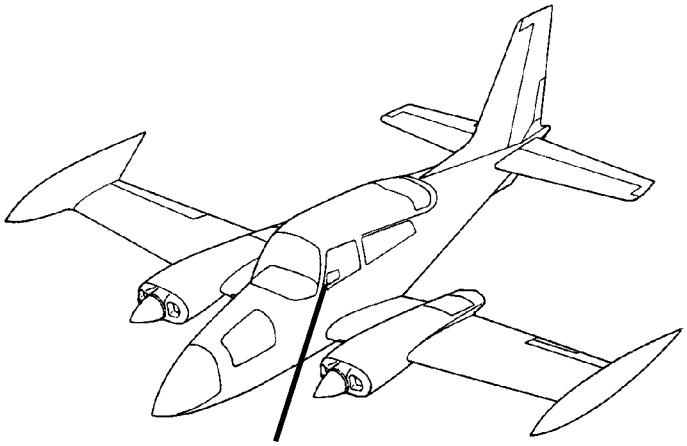

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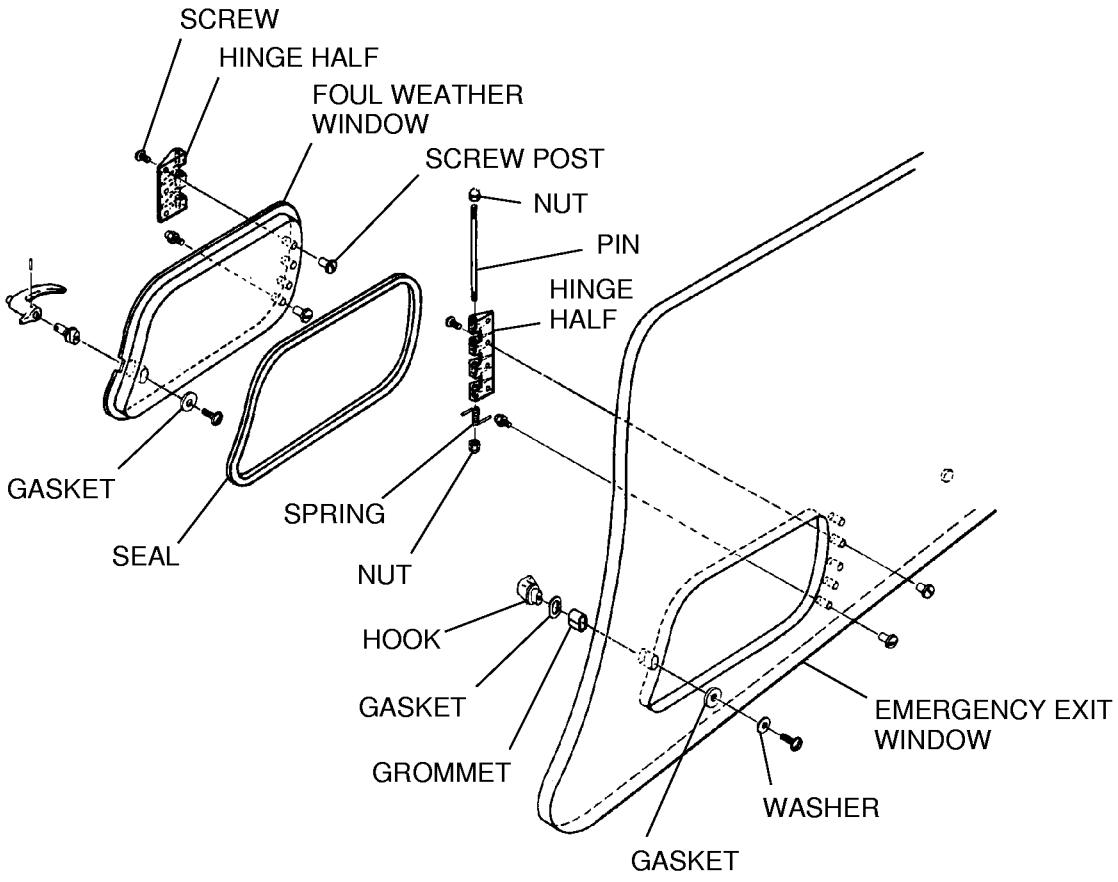

DETAIL A

xxxxxxxx

Foul Weather Window Installation
Figure 405 (Sheet 1)

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WINDOWS - INSPECTION/CHECK

1. Windshield and Windows

A. Inspection.

(1) Remove the dust and dirt from the window panels (refer to Windows - Cleaning/Painting for cleaning procedures), then visually inspect all windows for pits, scratches, crazing, and deterioration. Pay particular attention to critical vision areas (Refer to Figure 601 for windshield and window critical vision areas).

(2) Visual inspection of windows will locate most defects. Unnecessary replacements may be avoided if the cause of the defect can be eliminated, such as, improper cleaning or use of unapproved cleaning fluids.

(3) Plastic Window Inspection Criteria.

(a) Cracks - No rework required unless crack extends into vision area. If crack extends into vision area, replace windshield.

(b) Crazing and chips - Polished out when not deeper than 1/4 windshield thickness. If deeper, replace windshield. When chips extend from attach holes, be sure to remove sharp edges at hole.

(c) Nicks, scratches, and dents - Polish out when not deeper than 1/4 windshield thickness. If deeper, replace windshield.

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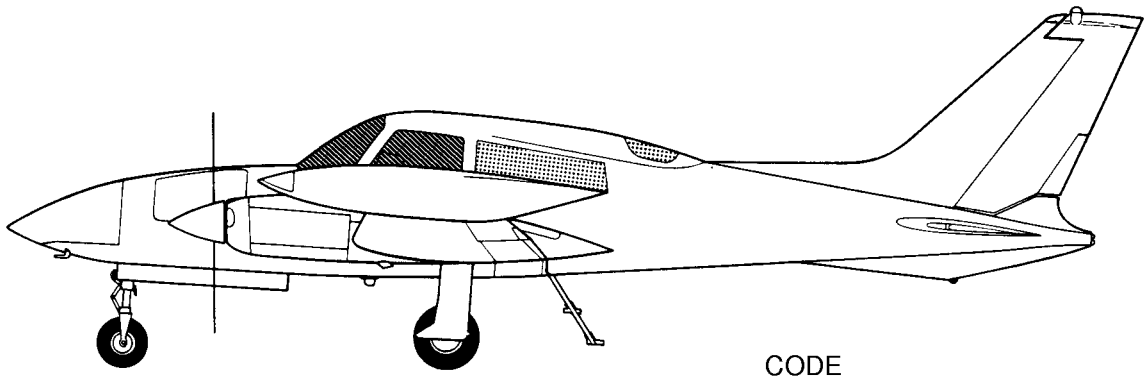

CODE

CRITICAL VISION AREA

NON-CRITICAL VISION AREA

NOTE: LEFT WINDOWS TYPICAL
FOR RIGHT WINDOWS

10102004

Critical Vision Areas
Figure 601 (Sheet 1)

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WINDOWS - CLEANING/PAINTING

1. Windows

A. Cleaning.

(1) The surface hardness of acrylic is approximately equal to that of copper or brass. Care must be exercised to avoid scratches and gouges which may be caused by dirty, hard, or rough clothes used for cleaning.

(2) Cleaning shall be done with a non-abrasive soap or detergent and water, using the bare hand to feel and dislodge any caked dirt, glue, or any other foreign materials. A soft cloth or chamois may be used as a means of carrying water to the plastic. Dry with a clean damp chamois or rymplecloth.

(3) Aliphatic naphtha or kerosene may be used for removing grease and oil.

CAUTION: Do not use the following materials on acrylic plastic: alcohol, gasoline, benzene, xylene, acetone, carbon tetraceloride, fire extinguisher or deicing fluids, lacquer thinners, or window cleaning sprays because they will soften the plastic and/or cause crazing in the plastic.

(4) Clean surfaces should be waxed, using a soft cloth to apply and polish the wax.

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WINDOWS - APPROVED REPAIRS

1. Windows

A. Approved Repairs.
   (1) Rework of acrylic windows is permissible. The approved repair instructions apply to repair of small scratches only. For temporary repair of window panel cracks, refer to Approved Repairs of Plastic Window Surfaces below.
   (2) Refer to Windows - General for tools and equipment.

2. Acrylic Windows

A. Approved Repairs.
   (1) Areas with small scratches may be polished to remove scratches.
      (a) Clean area to be polished, refer to Windows - Cleaning/Painting.
      (b) Polish with an approved compound and soft cloth.
      (c) Clean and wax polished area.
   (2) All scratches, gouges, nicks, etc., exceeding 0.003 inch depth and those less than 0.003 inch depth but having sharp enough edges to cause hanging of the fingernail should be locally rounded out or buffed. Complete blending may be accomplished in the optical area of flight compartment windows in lieu of localized buffing if such rework will improve vision.
      (a) Clean area to be repaired, refer to Windows - Cleaning/Painting.
      (b) Wrap 400A wet or dry abrasive paper around a smooth rubber or wooden block, and using generous amounts of water, lightly sand over and around the imperfection in a circular motion. An area having a diameter equal to two or three times the scratch or defect length should be sanded where optical distortion is to be minimized. Continue sanding only until the initial scratch or defect is no longer apparent. Thoroughly wash or flush the area with water.
      (c) Using 600A wet or dry abrasive paper, repeat step (b). Continue sanding only until the hairline scratches caused by the coarse sanding are no longer apparent. Sand a larger area than that covered by the original sanding operation. Thoroughly wash and dry the rework area.
      (d) Apply buffing compound to the rework area of the acrylic or to the buffing wheel. Using a buffer with a speed of 1300 foot-per-minute or less, keep the buffing wheel moving across the rework area changing direction often, using light pressure and maintaining a back and forth motion 90 degrees to wheel rotation. Buff a larger area than that covered by the final sanding. Buff until the reworked surface regains its original luster.

3. Plastic Window Surfaces

A. Approved Repairs (Refer to Figure 801).
   (1) Damaged window panels and windshield of this airplane are ordinarily removed and replaced if the damage is extensive. However, certain repairs as prescribed in the following paragraphs can be made successfully without removing the damaged part from the airplane. Three types of temporary repairs for cracked plastic are possible. No repairs of any kind are recommended on highly-stressed or compound curves where the repair would be likely to affect the pilot's or copilot's field of vision. Curved areas are more difficult to repair than flat areas and any repaired area is both structurally and optically inferior to the original surface.
   (2) When a crack appears in a panel, drill a hole at the end of the crack to prevent further spreading. The hole should be approximately 1/8 inch in diameter, depending on the length of the crack and thickness of the material.
   (3) Temporary repairs on flat surfaces can be effected by placing a thin strip of wood over each side of the surface and then inserting small bolts through the wood and plastic. A cushion of sheet rubber or airplane fabric should be placed between the wood and plastic on both sides.
   (4) A temporary repair can be made on a curved surface by placing fabric patches over the affected areas. Secure the patches with airplane dope, Specification No. MIL-D-5549, or lacquer, Specification No. MIL-L-7178. Lacquer thinner, Specification No. MIL-T-6094 can also be used to secure the patch temporarily.

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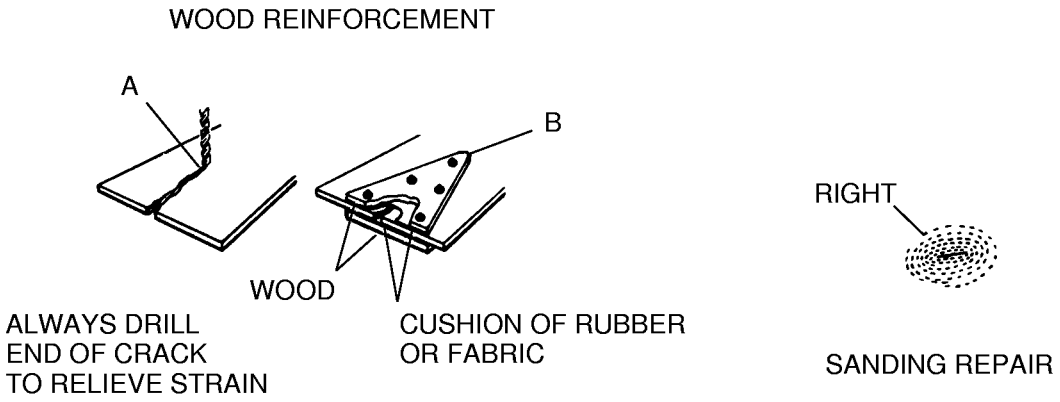

Plastic Repair
Figure 801 (Sheet 1)

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(5) A temporary repair can be made by drilling small holes along sides of the crack 1/4 to 1/8 inch apart and lacing the edges together with a soft wire. Small stranded antenna wire makes a good temporary lacing material. This type of repair is used as a temporary measure only, and as soon as facilities are available, the panel should be replaced.

(6) Scratches on transparent plastic surfaces can be removed by band-sanding operations followed by buffing and polishing, provided subsequent instructions are followed carefully. Wrap a piece of No. 320 (or finer) sandpaper or abrasive cloth around a rubber pad or wood block. Rub the surface around the scratch with a circular motion, keeping the abrasive constantly wet with clean water to prevent scratching the surface further. Use minimum pressure and cover an area large enough to prevent the formation of the "bull's-eye" or other optical distortions.

CAUTION: Do not use a coarse grade of abrasive; No. 320 is the maximum coarseness permitted.

(7) Continue the sanding operation, using progressively finer grade abrasives.

(8) When the scratches have been removed, wash the area thoroughly with clean water to remove all the gritty particles. The entire sanded area will be clouded with minute scratches which must be removed to restore transparency.

(9) Apply fresh tallow and buffing compound to a motor-driven buffing wheel. Hold the wheel against the plastic surface, moving it constantly over the damaged area until the cloudy appearance disappears. A 2000-foot-per-minute surface speed is recommended to prevent heating, distortion, or burns.

NOTE: Polishing can be accomplished by hand, but it will require a considerably longer period of time to attain the same result as produced by the buffing wheel.

(10) When buffing is finished, wash the area thoroughly and dry it with a soft flannel cloth. Allow the surface to cool and inspect the area to determine if full transparency has been restored. Then apply a thin coat of hard wax and polish the surface lightly with a clean flannel cloth.

NOTE: Rubbing a plastic surface with a dry cloth will build up an electrostatic charge which attracts dirt particles and may eventually cause scratching of the surface. After the wax has hardened dissipate this charge by rubbing the surface with a slightly damp chamois. This will also remove the dust particles which have collected while the wax was hardening.

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CHAPTER

57

WINGS

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WINGS - GENERAL

1. Scope

A. This chapter describes the center wing and outer wing structural units and associated components and members which support the airplane in flight.

2. Wings

A. Description.
(1) The wing is constructed of a forward and rear spar, with rib assemblies installed between the spars, the wing surface is covered with aluminum alloy skin panels. The wing structure provides attach fittings for the main landing gear, aileron, flap, engine nacelle, and main fuel tanks.
(2) The wing structure is designed to provide storage space for the auxiliary fuel cells (optional) when installed. Access panels are installed on the lower and upper surface for accessibility to components housed inside the wing structure.

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WINGS - REMOVAL/INSTALLATION

1. Wings

A. Removal (Refer to Figure 401).

(1) Remove battery (left wing only), refer to Chapter 24, DC Generation - Removal/Installation.
(2) Defuel the airplane, refer to Chapter 28, Fuel Storage - Servicing.

NOTE: Wings can be removed with all fuel tanks and cells installed. If fuel tank or cell removal is desired, refer to Chapter 28, Fuel Storage - Removal/Installation.

(3) Remove engine, refer to Chapter 71, Power Plant - Removal/Installation.

CAUTION: If one or both engines are removed, the airplane may become tail heavy. Therefore, to balance the airplane, place equivalent weight (shot bags or sand bags) in the engine nacelles and support the tailcone with padded support.

(4) Jack the airplane, refer to Chapter 7, Jacking - Description and Operation.
(5) Place suitable padded supports beneath cabin section and wings; then remove jacks.

NOTE: To prevent damage to skin, place padded supports beneath front and rear spars in fuselage and beneath wing ribs. If both engines were removed and weight was placed in the nacelles, remove weight after removing jacks.

CAUTION: If only one wing is being removed and the engine on the opposite wing remains installed; relieve the engine weight on opposite wing by using engine hoist before removing wing or serious damage may occur due to an overbalance tipping condition.

(6) Disconnect or remove landing gear drive tube, refer to Chapter 32, Main Landing Gear - Removal/Installation.

NOTE: Wings can be removed with main landing gear installed, if gear removal is desired, refer to Chapter 32, Main Landing Gear - Removal/Installation.

(7) Remove flap cables, refer to Chapter 27, Flaps - Removal/Installation.
(8) Remove aileron cables, refer to Chapter 27, Ailerons - Removal/Installation.
(9) On left wing only, remove aileron trim cables, refer to Chapter 27, Ailerons - Removal/Installation.
(10) Disconnect engine controls in engine nacelle, refer to Chapter 73, Controlling - Removal/Installation.
(11) Remove upholstery panels in cabin as necessary (refer to Chapter 25, Equipment/Furnishings - Removal/Installation) to gain access to junction box located on side of airplane from which wing is to be removed.
(12) At the junction box, disconnect and tag each wire to affected engine and route wire from fuselage.
(13) Disconnect, tag, or route the following items in the wing root area:
  (a) Route all flex cables to fuselage.
  (b) Disconnect electrical connectors.
  (c) Route starter cable to fuselage.
  (d) Disconnect all lines at fittings.
  (e) Route wing wiring bundle from fuselage.
  (f) If installed, disconnect deice line at fitting.
(14) Remove nuts, washers, bolts, and cotter pin (if installed) from wing attachment fittings.

NOTE: If difficulty is encountered in driving out wing bolts or disengaging fittings, it may be necessary to rock wing slightly.

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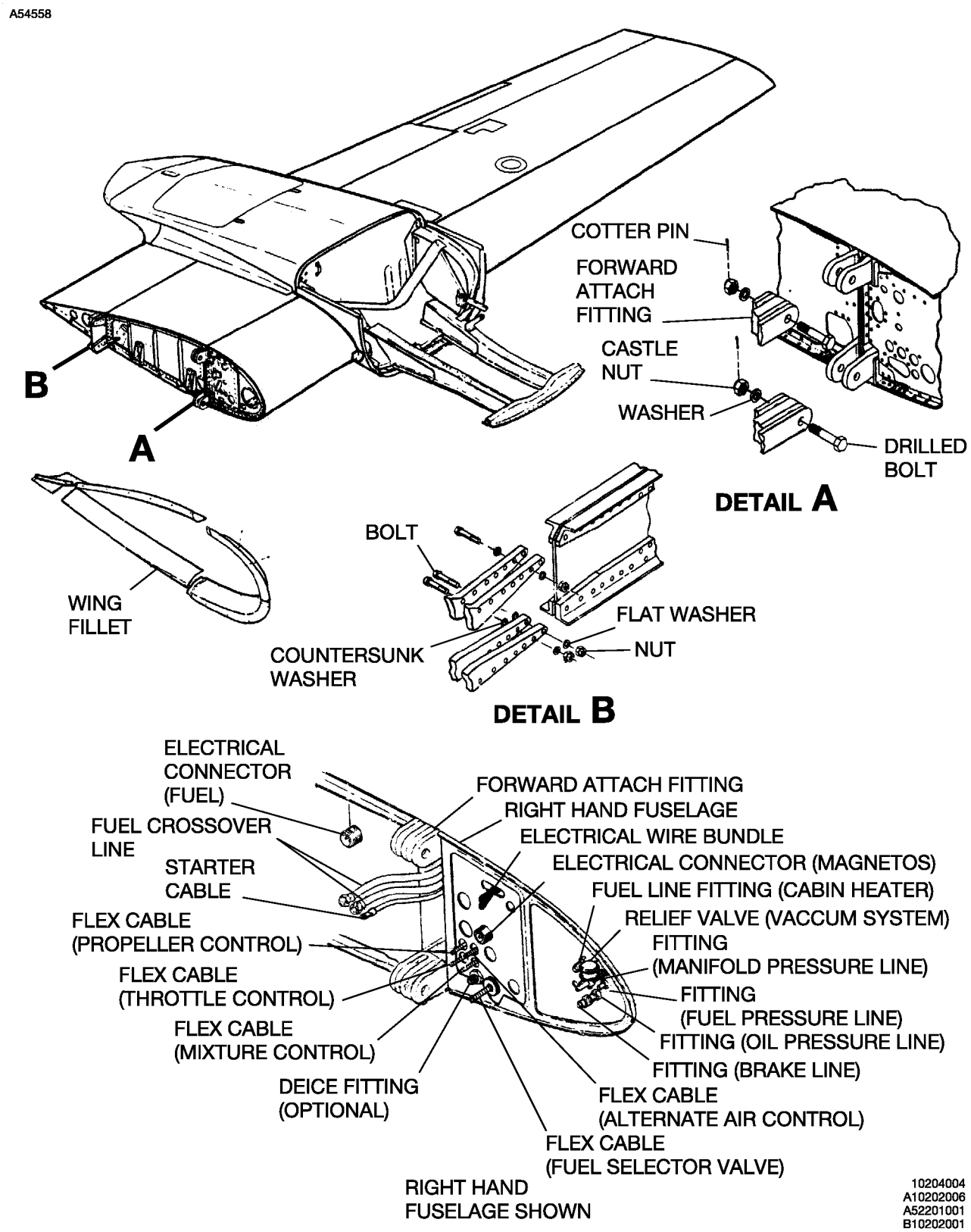

Wing Installation
Figure 401 (Sheet 1)

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(15) Move wing and padded wing supports outboard until wing attachment fittings have disengaged.

B. Installation (Refer to Figure 401).
(1) Position wing approximately one foot from fuselage.
(2) Clean and/or lubricate engine flex cables fittings, electrical wiring, and all other items relating to the wing needing servicing, refer to Lubrication Diagram located in Chapter 12, Servicing - General.
(3) Route flex cables through root rib towards their respective components. Do not secure cables to structure at this time.
(4) Move the wing toward fuselage until wing attachment fittings begin to engage, guide landing gear drive tube through opening in root rib.
(5) Align bolts in wing attachment fittings and install bolts, washers, nuts, and cotter pin (if drill bolt and castle nut are used) on forward attach fitting. Install bolts, countersunk washers, flat washers, and nuts on rear attach fitting.

NOTE: Install new bolts at front and rear spar attach locations. Install front spar bolts with heads facing forward and rear spar bolts with heads facing aft. On rear spar bolts, place countersunk washers under head of bolts. Torque front spar nuts to 25 foot-pounds, +5 or -5 foot-pounds, and rear spar nuts to 15 foot-pounds, +1 or -1 foot-pounds. On front spar bolts, back nut off until washer will turn by hand and safety with cotter pin.

NOTE: Spar bolts are installed in shear positions, DO NOT OVERTORQUE. It is possible wing spar bolts will turn if a slight torque is applied to bolt head.

CAUTION: If a gap exists between lug and fitting, insert shim the same thickness of gap during torquing.

(6) Connect the following items at the wing root area and remove tags.

NOTE: Lubricate all fittings used on fuel, oil, and air lines with suitable thread lubricant. Apply lubricant to the male fittings only, omitting the first two threads. Lubricate straight threads of hydraulic fittings with system fluid.

(a) If installed, connect deice line to respective fitting.
(b) Connect all lines to their respective fittings.
(c) Route wing wiring bundle through fuselage.
(d) Connect electrical connectors.
(e) Route starter cable to wing.
(f) Connect vacuum hose to relief valve.
(7) Connect electrical wires to proper terminals in junction box and remove tags.
(8) Install flap cables, refer to Chapter 27, Flaps - Removal/Installation and rig in accordance with Chapter 27, Flaps - Adjustment/Test.
(9) Install aileron cables, refer to Chapter 27, Ailerons - Removal/Installation and rig in accordance with Chapter 27, Ailerons - Adjustment/Test.
(10) On left wing only, install aileron trim cables, refer to Chapter 27, Ailerons - Removal/Installation and rig in accordance with Chapter 27, Ailerons - Adjustment/Test.
(11) If wing tip fuel tank was removed, refer to Chapter 28, Fuel Storage - Removal/Installation and install tip tank. Do not install lower fairing at this time.
(12) Refer to Chapter 7, Jacking - Description and Operation and jack the airplane.

CAUTION: If both engines were removed, the airplane is tail heavy. To balance the airplane, place weight (shot bags or sand bags) in engine nacelles prior to jacking.

(13) Remove padded supports from beneath cabin section, tail section, and wings.
(14) Place tailcone support beneath tailcone bumper.

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(15) If landing gear was removed, refer to Chapter 32, Main Landing Gear - Removal/Installation and install and rig landing gear.

NOTE: To facilitate rigging of landing gear, use external power source.

(16) Install engine and connect flex cables to engine, refer to Chapter 71, Power Plant – Removal/ Installation.

NOTE: To prevent serious binding, check flex cables for proper security during rigging of cables.

(17) Install flex cable at fuel selector valve and rig the fuel selector control system, refer to Chapter 28, Fuel Distribution - Removal/Installation.
(18) Remove support beneath tailcone bumper.
(19) Remove airplane jacks.
(20) Install battery, refer to Chapter 24, DC Generation - Removal/Installation.
(21) Service airplane and check for fuel leaks, especially at the fuel tank and wing root connections.
(22) Install wing root and fuel tank fairings.
(23) Install upholstery panels, refer to Chapter 25, Equipment/Furnishings - Removal/Installation.
(24) Perform an engine operation check and observe engine controls and electrical equipment for proper operation, refer to Chapter 71, Power Plant - Inspection/Check.

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WINGS - INSPECTION/CHECK

1. Wings

A. Inspection.

(1) Clean surface (Refer to Wings - Cleaning/Painting), visually inspect wing attach fittings, flap, and aileron attach fittings for cracks and visible damage. Visually inspect wing fume proofing materials, sealants, patches, and boots for leakage. When fume proofing materials have been damaged or removed, immediate replacement is required. Inspect all fluid lines and hoses for leaks, cracks, dents, kinks, chafing, bleaching, discoloration, proper radius, security, corrosion, deterioration, obstructions, and foreign matter. Inspect wing spar bolts for security and ensure they are not working (Refer to Wings - Removal and Installation for torque of spar bolts). When checking torque on spar bolts always loosen nut first then check torque while tightening nut. Inspect gear attach fittings and supporting structure for loose bolts, elongated holes, cracks, and structural member damage resulting in secondary damage such as high shear or stretched rivets.

2. Wing Lower Front Spar Fitting and Spar Cap

A. Type A Inspection.

(1) Type A inspection is an intensive visual inspection of certain critical areas or items to be inspected. When inspecting critical items it may be necessary to remove primer and dye check. Remove access doors and panels as necessary to conduct a thorough inspection. Inspect the following:

(a) Inspect lower front spar fitting for corrosion, cracks, and evidence of loose rivets. Inspect interspan bulkhead attachment bolts for evidence of looseness (Refer to Figure 601).

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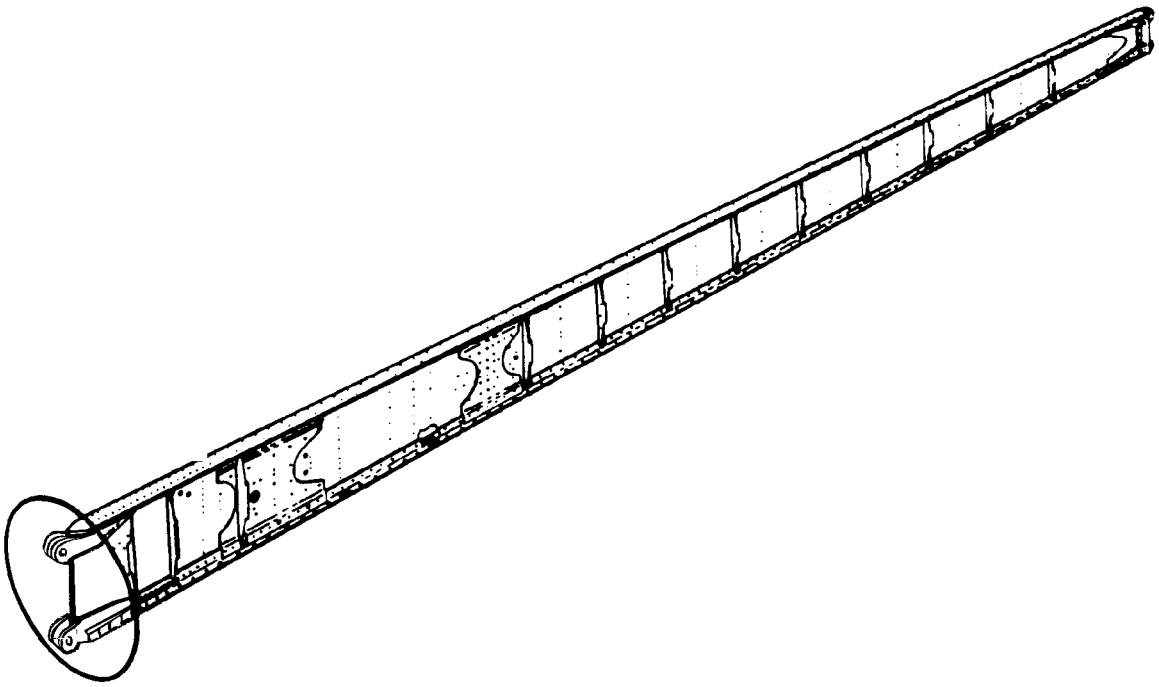

Wing Front Spar Fitting
Figure 601

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B. Wing Inspection Using Eddy Current Technique (Refer to Figure 602).
(1) The following eddy current inspection procedure has been developed to insure the continued integrity of critical wing structure areas. The intervals for performing these inspections are shown in Chapter 5. This inspection is divided into four parts as follows:
(2) Equipment required to perform inspection.
(a) Crack Detector - Eddy Current Unit Model ED-520 Kagnaflux or equivalent.
(b) Probes:
1 1/4 inch Diameter with split stem for close fit.

NOTE: To allow proper clearance between the probe collar and close-out rib when inspection bolt holes per inspection area "A", the collar should not exceed 0.475 inch diameter.

2 3/16 inch Diameter with split stem for close fit.
3 5/32 inch Diameter with split stem for close fit if available.
(3) Calibration block fabricated locally in accordance with Figure 603.
(4) Preparation for Inspection.
(a) Remove forward wing root fairing and access panels to gain access to work area.
(b) Remove two bolts as shown in Figure 602.
(c) Clean bolt holes using solvent with a nonmetallic brush or cotton swab to remove grease, dirt, metallic chips, etc.
(5) Inspection.
(a) Adjust probe depth to 0.07 inch from collar to center of coil. Standardize the eddy current instrument for balance and lift-off in accordance with the manufacturer's operator handbook, using calibration block with probe inserted from notched surface, and with coil away from notched side of hole. Make final lift-off adjustment by pushing coil away from side of fastener hole. Meter should read the same when coil is in contact or away from side of hole. Adjust sensitivity to induce 100 micro amperes, +10 or -10 micro amperes deflection when coil is rotated past notch (down scale deflection on Model ED 520).
(b) With instrument and probes calibrated in accordance with paragraph (a), inspect the fastener holes for small fatigue cracks. The up and down direction is considered most critical in inspection areas A and B, while the forward and aft direction is considered most critical in inspection area C.
(c) Scan each bolt hole with a full 360 degrees scan using the proper probe diameter and the appropriate probe depths (measured from the collar to the center of the coil) listed in Table 601. Rotate probe coil slowly while observing the meter readings. Pay particular attention to the critical areas of the holes.

NOTE: If probe passes over a crack, the meter needle will deflect rapidly and return to approximately the original reading. Carefully repeat the inspection in the opposite direction to verify the crack indication. Gradual meter needle movement up or down scale may occur due to slightly out of round holes or minor changes in the conductivity of the material. This should be disregarded.

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Table 601. Inspection Probe Depths

Inspection Area	Hole Diameter	Part To be Inspected	Probe Depth	Side To Be Inspected From
Area "A" - Two holes, lower front spar root fittings at W.S. 28.81	0.257 Inch	Aft Fitting	Setting 1 - 0.22 Inch	Aft
			Setting 2 - 0.48 Inch	Aft
			Setting 3 - 0.60 Inch	Aft
		Forward Fitting	Setting 4 - 1.20 Inch	Aft
			Setting 5 - 1.34 Inch	Aft
			Setting 6 - 1.60 Inch	Aft
Area "B" - One hole, in the vertical flange of spar cap at W.S. 36.88	0.193 Inch	Lower Spar Cap - Vertical Flange	0.30 Inch	Aft
Area "C" - Two hole, in the lower spar cap, aft flange at W.S. 48.96	0.161 Inch	Spar Cap - Aft Flange	0.14 Inches	Lower

(6) After Inspection.
(a) If cracks are detected - In the event cracks are detected, it is recommended that Cessna Customer's Services be notified for an appropriate disposition. Otherwise, replacement with like parts is to be accomplished. On initial contact with Cessna, provide the following information:
1 Airplane model, serial number, and registration number.
2 Airplane flight hours.
3 Area damage found and extent of the damage.
(b) If no cracks are found - If the three inspection areas are found to be free of damage, Cessna would appreciate the following information:
1 Results of inspection.
2 Total airplane time.
3 Typical flight parameter data, such as average takeoff weight, average cruise pressure altitude, and average flight duration flown.

C. Wing Structure Exposed to Exhaust Gases.
(1) Remove exhaust system components that are in proximity to wing structure and inspect wing structure, wing spar caps, flap panels, etc., for corrosion due to exposure to exhaust gases. If evidence of corrosion is detected, the area shall be cleaned and repaired as necessary, refer to corrosion removal, Chapter 51, Corrosion - Approved Repairs and structure repair, Chapter 51, Damage - Approved Repairs.

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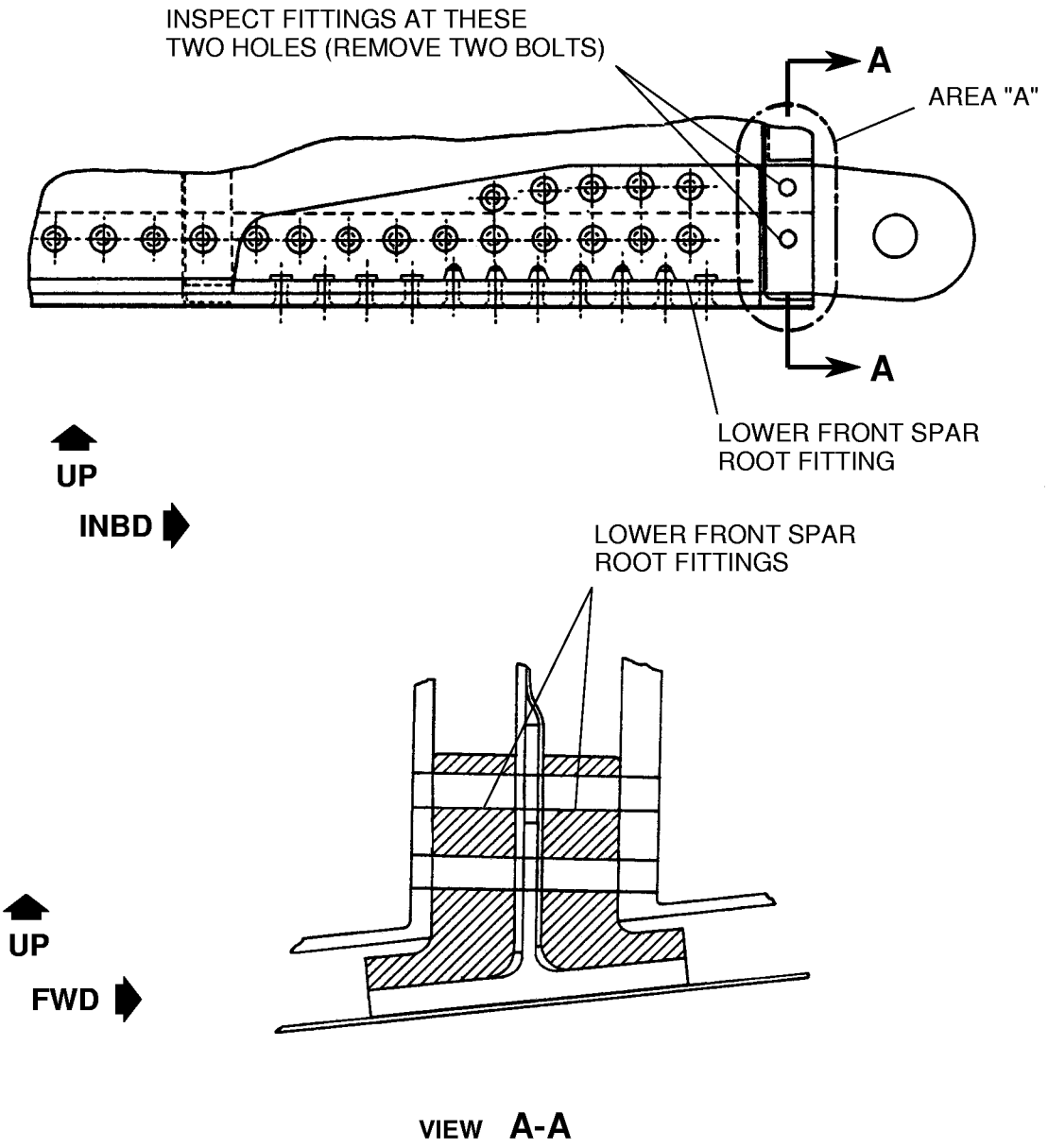

VIEW A-A

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Wing Inspection Area
Figure 602 (Sheet 1)

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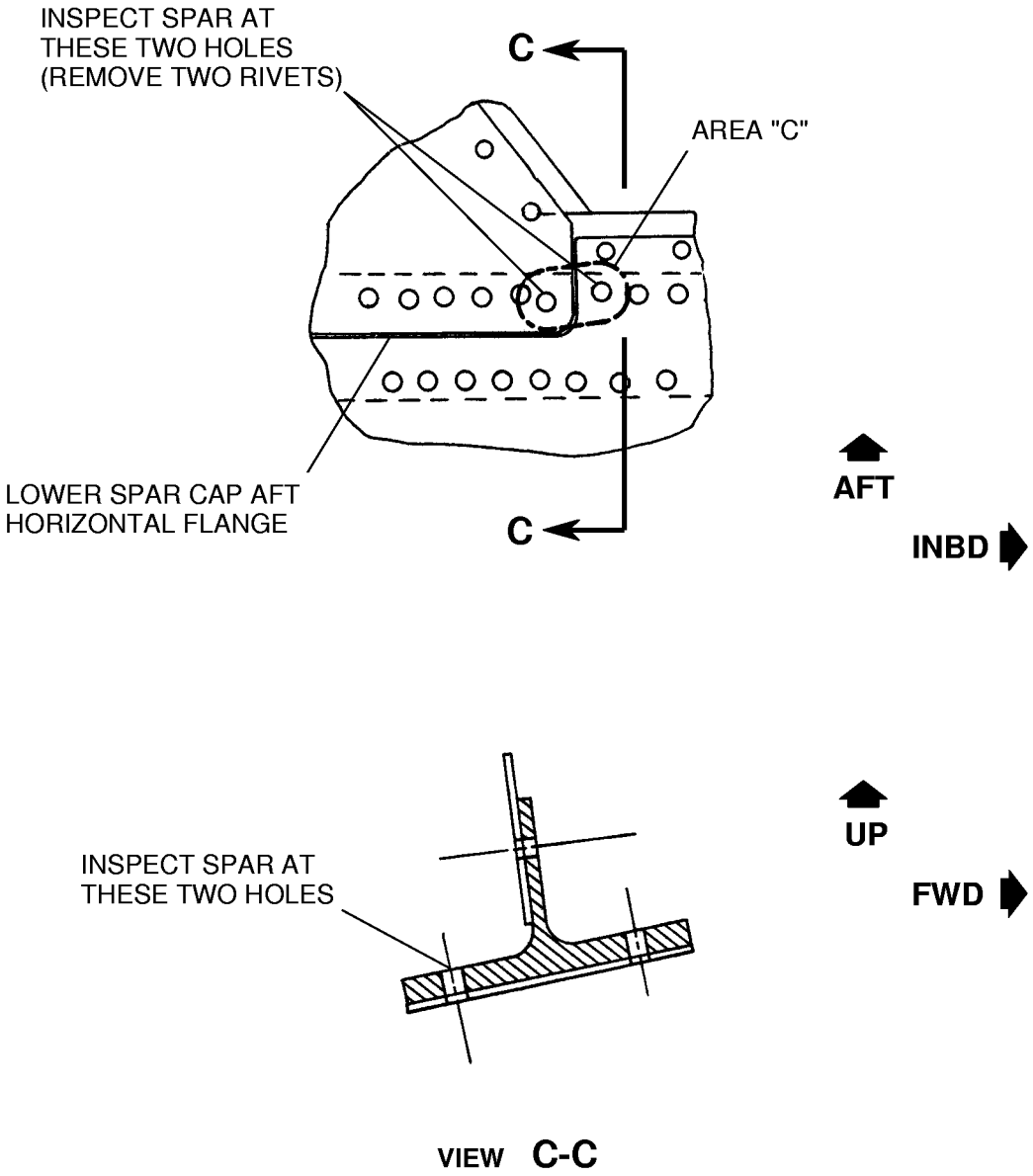

VIEW C-C

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Wing Inspection Area
Figure 602 (Sheet 2)

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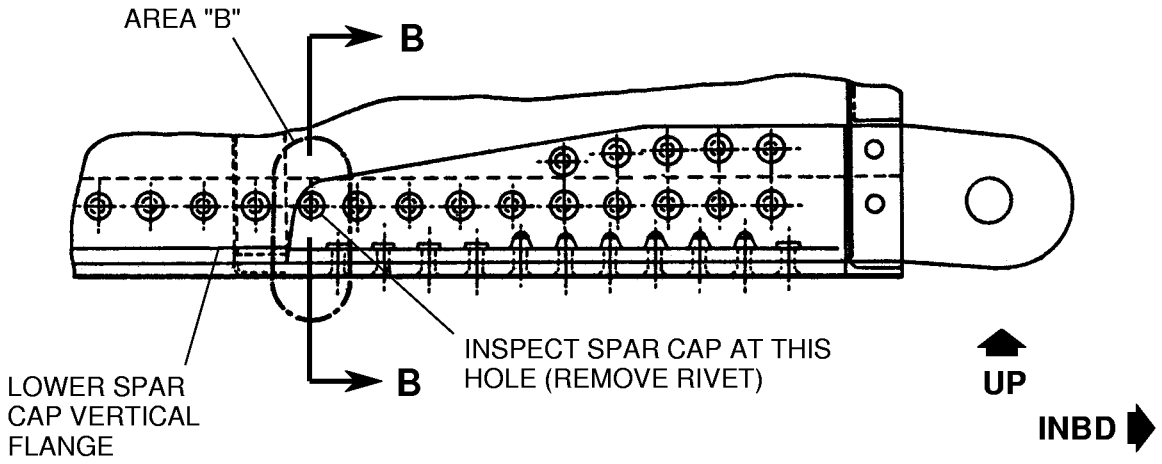

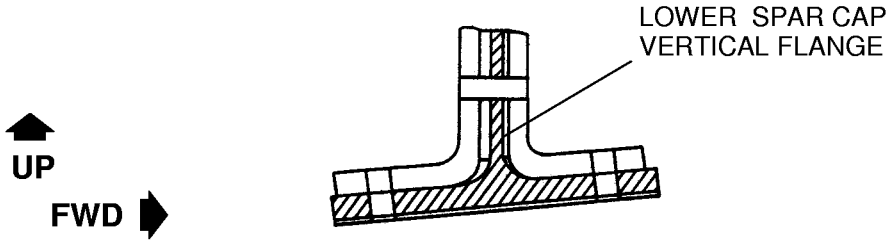

VIEW B-B

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Wing Inspection Area
Figure 602 (Sheet 3)

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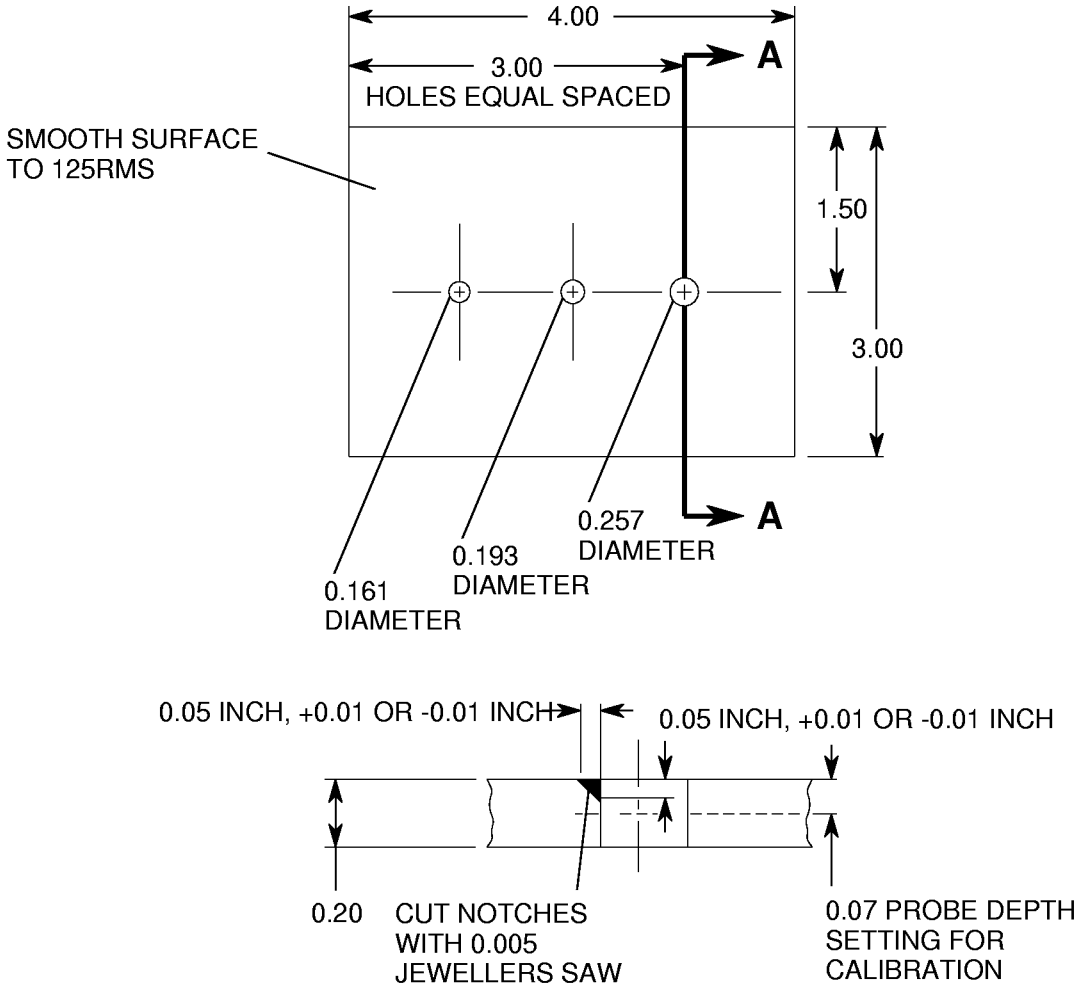

VIEW A-A
TYPICAL

NOTE:
1. MATERIAL 7075-T6 ALUMINUM ALLOY OR SIMILAR.
2. ALL DIMENSIONS ARE INCHES.
3. DRILL AND REAM HOLES TO +0.005 OR -0.005 INCH.
4. WHERE HOLES REQUIRING INSPECTION IN AIRFRAME HAVE BEEN DRILLED OVERSIZED, MANUFACTURE CALIBRATION BLOCK WITH APPROPRIATE HOLE DIAMETER.

5498T1004

Eddy Current Calibration Block
Figure 603 (Sheet 1)

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WINGS - CLEANING/PAINTING

1. Wings

A. Cleaning.

(1) Clean the wing as follows:

(a) Use a suitable solvent to remove all grease and dirt from nacelle area and landing gear area.

CAUTION: Never use gasoline, paint thinners, or ketone to remove grease. These are highly inflammable and fire could result.

(b) After washing area with suitable solvent, wash the remaining solvent off with soap and water and allow to air dry.

(c) The wing can be cleaned with any good airplane cleaner and wax.

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CHAPTER 61

PROPELLERS

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PROPELLERS - GENERAL

1. Scope

A. This chapter describes the complete mechanical or electrical propeller and those units or components external to or integral with the engine used to control the propeller blade angle.

2. Definition

A. This chapter consists of one section to aid maintenance personnel in locating information. Following is a brief description of this section.
(1) Controlling describes that portion of the system which controls the pitch of the propeller blades.

3. Propellers

A. Description.
(1) The airplane is equipped with all metal, three bladed, constant-speed, full-feathering, single-acting, and governor regulated propellers. Each propeller utilizes hydraulic pressure which opposes the forces of springs and counterweights to obtain the correct pitch for engine load. Hydraulic pressure from the engine-mounted governor urges blades toward low pitch (increasing RPM) while the springs and counter-weights urge blades toward high pitch (decreasing RPM). The source of hydraulic pressure for propeller operation is furnished by the engine oil system, boosted in pressure by the governor gear pump, and supplied to the propeller hub through engine shaft flange. When the engine is not in operation, the high pitch latch mechanism prevents the propeller blades from moving into the feathered position. To feather the propeller blades, the propeller control levers on the control pedestal must be placed in the feathered position. Unfeathering the propeller is accomplished by positioning the propeller control levers to increase RPM position and rotating the blades to the low pitch position, or by starting the engine. If installed, the optional unfeathering system uses accumulator air and oil to force the propeller to the low pitch condition (Refer to Figure 1).

4. Components Location Chart

A. Propellers.

Component	Location
Synchronizer Activator	Mounted in aft portion of RH nacelle.
Control Box	On glove box RH side.
Unfeathering Accumulator	On outboard side of engine mount.

5. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Propeller Wrench	5090006-9	Cessna Aircraft Co. Wichita, Kansas	Checking torque of propeller nuts.

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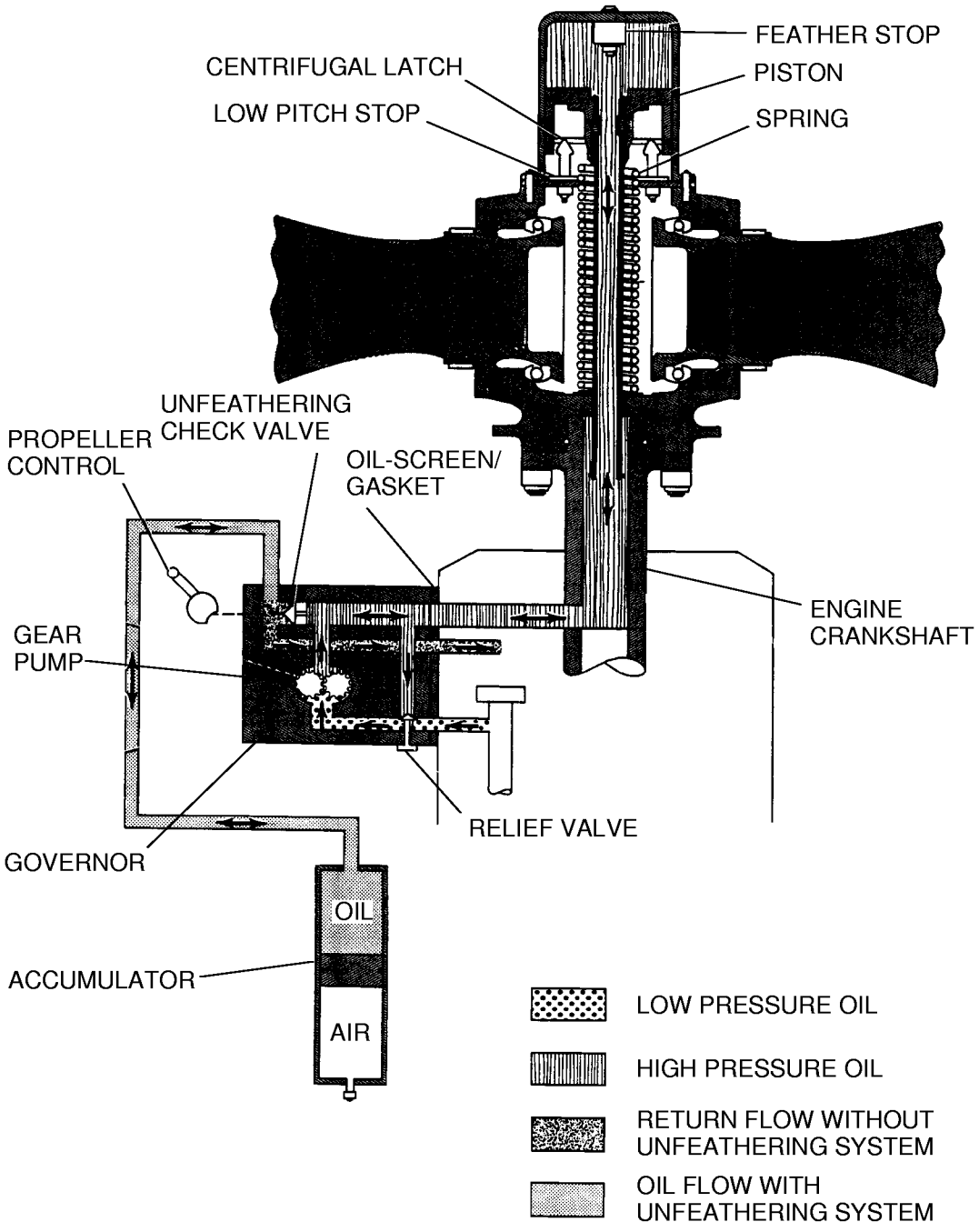

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Propeller System Schematic
Figure 1 (Sheet 1)

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PROPELLERS - TROUBLESHOOTING

1. Propellers

A. Troubleshooting.

(1) For a guide to troubleshooting the propeller system refer to the following tables:

(a) For a guide to troubleshooting the propeller system for conditions that occur with the engine operating at maximum power and oil pressure is normal, refer to Table 101.

Table 101. Propeller System Troubleshooting (Engine Operating. Throttle Full Open Oil Pressure Normal.)

TROUBLE	PROBABLE CAUSE	CORRECTION
OIL LEAKING AT PROPELLER MOUNTING FLANGE.	Damaged packing between engine and propeller.	Replace packing.
(Move control lever to RPM increase position)		
PROPELLER DOES NOT RESPOND TO CONTROL LEVER MOVEMENT.	Control linkage is disconnected.	Connect linkage.
	Incorrect governor part number.	Replace governor.
	Governor drive shaft sheared.	Replace governor.
	Screen in governor mounting gasket obstructed.	Clean or replace gasket.
	Governor speeder spring broken.	Replace governor.
	Failed propeller.	Overhaul or replace propeller.
PROPELLER DOES NOT CHANGE PITCH FULLY.	Improper rigging of governor control.	Rerig control.
	Failed governor.	Replace governor.
STATIC RPM TOO HIGH OR TOO LOW.	Governor high RPM stop set incorrectly.	Adjust high RPM stop.
	Incorrect propeller or low pitch blade angle.	Replace propeller or reset blade angle.
	Internal binding of governor components.	Replace governor.

(b) For a guide to troubleshooting the propeller system for conditions that occur with the engine operating, throttle set at 1000 RPM and oil pressure is normal, refer to Table 102

Table 102. Propeller System Troubleshooting (Engine Operating. Throttle At 1000 RPM. Oil Pressure Normal.)

TROUBLE	PROBABLE CAUSE	CORRECTION
(Move control lever to RPM decrease position.)		
MINIMUM RPM TOO HIGH OR TOO LOW.	Control cable rod end bolts installed incorrectly.	Install bolt in correct hole.
	Control lever engaging feather stop or top end too soon.	Rerig controls.
(Move control lever to feather position)		
PROPELLER FEATHERS TOO SOON.	Feathering screw not adjusted correctly.	Adjust feathering screw.

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Table 102. Propeller System Troubleshooting (Engine Operating. Throttle At 1000 RPM. Oil Pressure Normal.) (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
PROPELLER FEATHERS IN EXCESS OF NINE SECONDS.	Feathering screw not adjusted correctly.	Adjust feathering screw.
PROPELLER FAILS TO FEATHER.	Attempting to feather from too low engine RPM.	RPM is too low, increase RPM to 1050.
	Failed rigging of governor control.	Rerig control.
	Failed governor or propeller.	Replace failed component.
	Failed latching mechanism.	Repair or replace parts.
	Weak or broken feathering spring.	Repair or replace propeller.

(c) For a guide to troubleshooting the propeller system for conditions that occur in flight, refer to Table 103

Table 103. Propeller System Troubleshooting (Engine Operating In Flight.)

TROUBLE	PROBABLE CAUSE	CORRECTION
ENGINE SPEED WILL NOT STABILIZE.	Air trapped in propeller cylinder.	Exercise propeller several times to purge.
	Governor relief valve sticking.	Repair or replace governor.
	Excessive clearance in governor pilot valve.	Repair or replace governor.
	Excessive friction on propeller blades or piston.	Overhaul or replace propeller.
EXCESSIVE RPM CHANGES WITH AIRSPEED OR POWER CHANGES.	Sludge in governor.	Remove and clean governor. Drain oil, clean oil filter and service engine with proper oil.

(2) When troubleshooting a propeller-governor combination, it is recommended that a governor known to be in good condition be installed to check whether the propeller or the governor is at fault.

(3) Refer to Adjustment of Governor located in Propeller Controlling - Adjustment/Test for typical malfunctions and corrections of malfunctions of the governor.

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PROPELLERS - REMOVAL/INSTALLATION

1. Propellers

A. Removal (Refer to Figure 401).

NOTE: The removal procedure is the same for either propeller. Before removing the propeller it should be placed in the FEATHERED position. This will allow the oil in the blade actuating cylinder to drain back into the engine and will protect the blade actuating cylinder wall from damage during the removal procedure.

(1) Feather the propeller, refer to Operational Check of Propellers located in Propellers - Inspection/Check.
(2) If optional propeller unfeathering system is installed, it is necessary to relieve pressure in the propeller system with the propeller blades remaining in the feathered position. To accomplish this, proceed as follows:
  (a) After the propeller has been feathered and the engine shutdown, move propeller control out of the Feather position until blades start to unfeather, then quickly pull the control back into Feather.
  (b) Continue to “milk” pressure out of the system with the propeller control until the propeller blades will no longer move. This may require from 15 to 20 movements of the propeller control.

NOTE: Do not allow propeller blades to rotate far enough to let high pitch latches engage, or engine will have to be restarted, propeller feathered again, and the procedure repeated.

(3) Remove cowling nose cap, refer to Chapter 71, Engine Cowling - Removal/Installation.

NOTE: It is permissible to remove and install propeller without removing propeller spinner, if desired.

(4) Remove screws attaching spinner (1) to spinner bulkhead (8). Retain all spacers (3) from behind support (2).

NOTE: If the airplane is equipped with a propeller deice system, remove the deice wires from the terminals and retainer from bulkhead.

(5) Remove six attaching nuts securing the propeller hub (4) to engine crankshaft (6).

CAUTION: Support the propeller before removing the last nut, to prevent the possibility of dropping propeller.

(6) Remove propeller from engine crankshaft.
(7) Remove spinner bulkhead (8) and adapter (7) (or slip ring if propeller deice is installed) from propeller hub.

B. Installation (Refer to Figure 401).
(1) Position spinner bulkhead over propeller hub, attach studs.
(2) Wipe all dust and foreign particles from the propeller hub flange, the propeller hub oil passage, the crankshaft flange, and the crankshaft oil passage with a clean cloth.
(3) Install or check packing in the propeller hub and lubricate lightly with engine oil.
(4) Position propeller and spinner bulkhead on the crankshaft.

NOTE: Install propeller such that one blade is positioned over and aligned with T/C mark, located on flange of the engine crankshaft.

(5) Secure propeller to crankshaft with six nuts.

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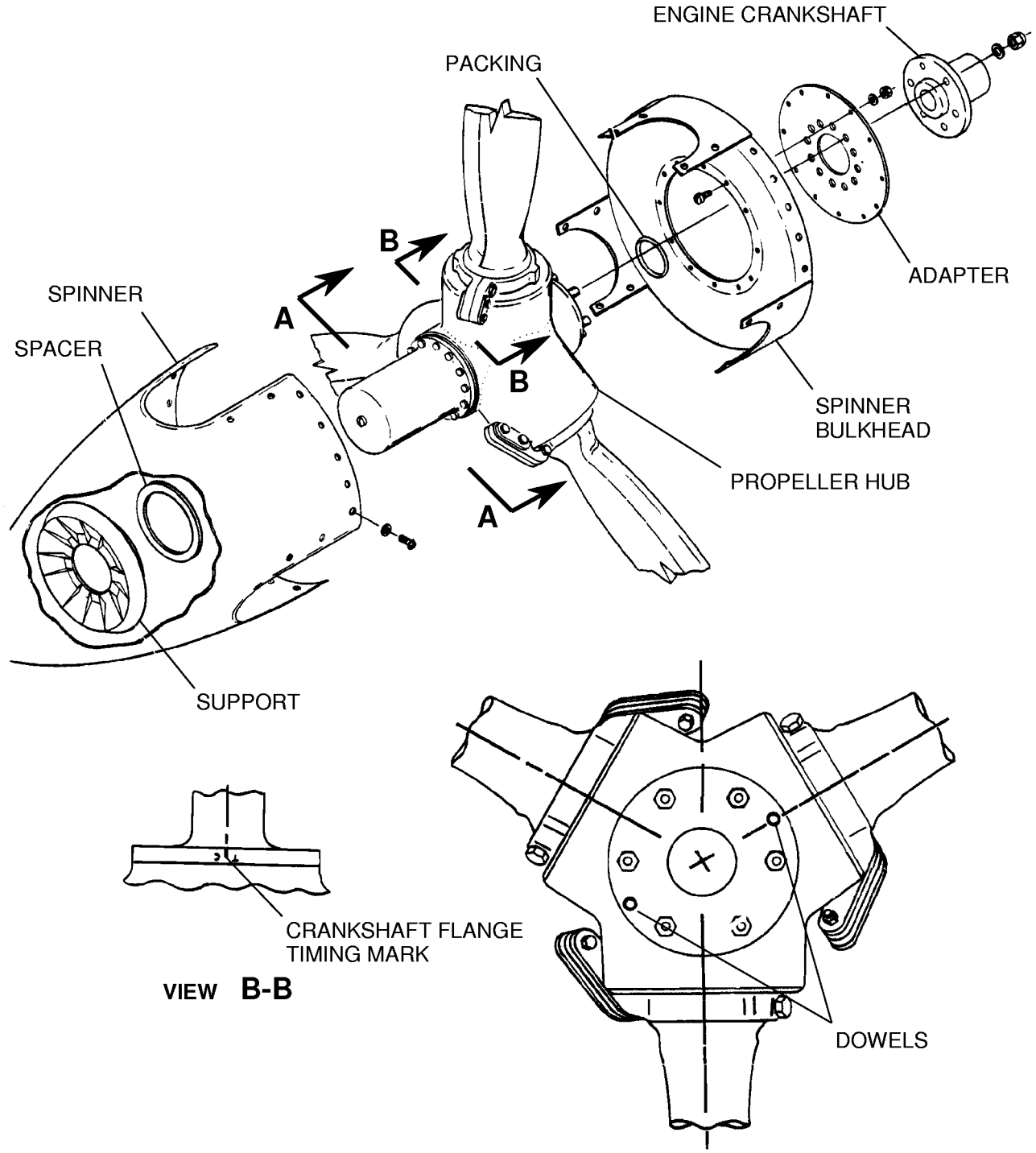

NOTE: INSTALL PROPELLER SUCH THAT ONE BLADE IS POSITIONED OVER AND ALIGNED WITH T/C MARK, LOCATED ON FLANGE OF THE ENGINE CRANKSHAFT.

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Propeller Installation
Figure 401 (Sheet 1)

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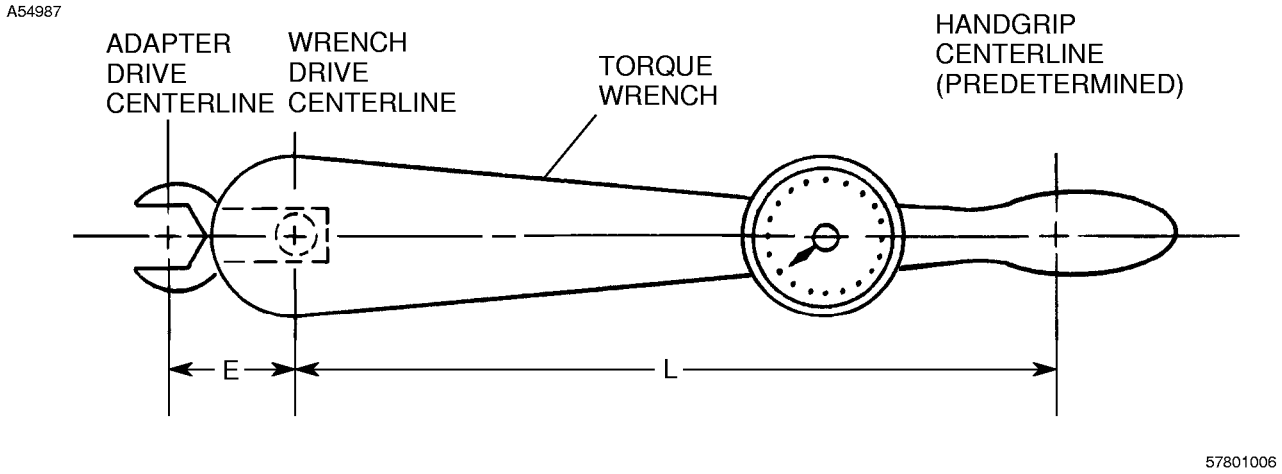
WARNING: Do not use all steel locknuts. Use only new elastic element locknuts when installing propeller.

(6) Wet torque nuts 45 to 50 lb-ft. Refer to Figure 402 and McCauley SB227, or latest revision.



Nut Torque Computation for Propeller Installation
Figure 402

(7) Lubricate the hub mounting studs with A-1637-16 (MIL-T-83483) grease.

CAUTION: Exceeding specified torque values could result in stripped nuts and of studs stripping the aluminum threads of propeller hub. Threaded surfaces must be thoroughly clean before application of lubricant.

NOTE: If the propeller is equipped with a deice system, connect the wires by connecting to terminal strip.

(8) Install spinner as follows:
   (a) Install spacer (3) and support (2).
   (b) Lightly press spinner (1) to hold snug against support and check alignment of spinner holes with bulkhead (8).
   (c) Alignment lack of 3/64 is approximate fit: add or remove shims to produce this condition.
   (d) Pushing hard on the shell, install attaching screws and washers. Remove shims, if necessary, until just possible to install screws.

(9) Replace cowling nose cap and check propeller for operation in accordance with the Operational Check procedure.

(10) If optional propeller unfeathering system is installed, charge accumulator.

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PROPELLERS - INSPECTION/CHECK

1. Propellers

A. Inspection.

(1) For cleaning of propellers, refer to Propellers - Cleaning/Painting. Refer to McCauley Propeller Systems Service Manual, for inspection. Anytime the propeller attachment has been subjected to excessive engine roughness, the propeller should be removed and dowel pins inspected for looseness, cracks, and visual damage. Check propeller attachment nuts for 80 to 85 foot-pounds torque. If torque is less than 80 foot-pounds, replace nuts with new elastic element locking nuts. Lubricate only on reassembly. Any repairs should be made as outlined in McCauley Propeller Systems Service Manual and FAA Regulations.

B. Propeller Track Check.

WARNING: Ground magnetos before starting blade track check procedures.

(1) Set up a reference point to the tip of one propeller blade. Rotate propeller and observe blade tip positions relative to the reference point. Blade track should not be off more than one sixteenth of an inch. If blade track does not meet this criteria, refer to McCauley Propeller Systems Service Manual.

C. Operational Check of Propellers.

NOTE: Operational check of propellers is provided in this manual; for additional information, refer to McCauley Service/Parts Manual.

NOTE: Anytime the propellers or propeller governor have been removed, the following check should be performed after reinstallation. This will insure that the engine-propeller-governor combination is in good operating condition and properly adjusted to give maximum performance.

(1) Face airplane into the wind. Start engines and allow to warm up with the oil temperature operating in the upper two thirds of the operating range on the oil temperature indicator.

NOTE: Avoid running up engines where loose stones or cinders can be picked up by an inflow of air and damage the propeller blades.

(2) Maximum RPM check. If local wind and ambient temperature conditions allow ground attainment of maximum RPM, verify, and/or adjust control system as follows:
   (a) Check maximum RPM 2700 RPM, +25 or -25 RPM.
   (b) Check top end of control lever for a minimum of 0.20 inches cushion. If necessary adjust control lever to obtain proper cushion.
   (c) Check override of control cable travel limits. Control cable should not reach internal stops before contact is established at governor or control quadrant stops.
   (d) If local wind and ambient temperature conditions do not allow ground attainment of maximum RPM, the airplane may be flown for flight testing only, providing the engine speed is not lower than 50 RPM from maximum RPM, and the difference between both engines does not exceed 25 RPM. For adjustment of governor, refer to Propeller Controlling - Adjustment/Test.

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CAUTION: If adjustments performed on the maximum RPM setting screw on the governor fail to provide increments of ground maximum static RPM's (as an indication of inability to attain maximum governing speeds), the governor setting screw must be returned to the original adjustment. This is required to prevent the possibility of an overspeed condition during flight.

(3) Minimum control check.
   (a) With manifold pressure maintained at 24 inches Hg., gradually retard the propeller control levers and verify that with levers firmly against the feather gate stops, the indicated engine speed drop is within the 1800-2000 RPM range. If required adjust control system as required.
   (b) Gradually advance the propeller control levers and verify that identical engine speeds are available within a half knob differential between control levers.

(4) Check control lever cushion as follows:
   (a) With engine control quadrant friction lock completely relaxed, verify that a minimum top end cushion of 0.20 inches is maintained. Any control cable system adjustments performed to correct inadequate cushion conditions, requires a new verification of maximum RPM, step (2) and minimum RPM, step (3).

(5) Check operation of feathering as follows:
   (a) With propeller control full forward and mixture control in full rich position, reduce throttle to attain 1000-1050 RPM.

CAUTION: Do not feather from a high RPM as this will cause excessive manifold pressure and possible damage to the engine.

   (b) After engine speed stabilizes between 1000-1050 RPM, place the propeller control lever behind the feather gate stop on the control pedestal. This motion must be carried at a rapid rate and feathering periods must be timed from the instant the propeller control lever reaches the feather cushion position.
   (c) Immediately retard the mixture control lever to the idle cut-off position.
   (d) Feathering periods terminate when the propeller blades cease to rotate about their axis, and must not exceed 9.0 seconds.
   (e) On airplanes incorporating an unfeathering system, move the propeller control lever to the feather gate stop position; propeller should return to the low pitch position.

D. Inspection of Propeller Unfeathering System.
   (1) Clean accumulator with suitable solvent and wipe hoses and accumulator with a clean cloth. Inspect hose assemblies for chafing and fittings for tightness. Inspect accumulator for security in mounting brackets. Always inspect filler valve after charging for leaks. Repair to propeller unfeathering system is limited to replacement of components.

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PROPELLERS - CLEANING/PAINTING

1. Cleaning of Propellers

A. Clean all metal parts in a mixture consisting of 1/3 lubricating oil, Specification MIL-L-6082, Grade 1030, and 2/3 solvent, Federal Specification P-S-661. Clean small, highly finished parts separately, exercising care not to cause damage, particularly to working surfaces.

NOTE: Inside diameter of counterweight halves and ferrule groove in which they mount, must be free of all oil. Use solvent only - not the mixture - to clean these surfaces. Should cleaning mixture or other lubricant accidentally come into contact with these surfaces, clean thoroughly prior to reassembly.

B. Clean non-metallic parts (except gaskets, packings, and seals) by wiping with a soft, lint-free cloth dampened with cleaning mixture.

C. Heavy and tightly adhering deposits may be removed with a soft brush.

CAUTION: Under no circumstances are any parts to be cleaned with a steel, other metal, or hard bristle brush, or tool of any type.

D. After cleaning, allow parts to air dry, or remove excess mixture with a gentle stream of clean, dry compressed air. Keep nozzle well away from parts.

E. Protect parts from collecting dust and dirt during storage and handling for overhaul. It is recommended that small parts be kept in transparent plastic bags.

F. Parts which are to be coated with dry film lubricant are to be cleaned with ethyl acetate immediately prior to application of lubricant (refer to McCauley Propeller Systems Service Manual).

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PROPELLER CONTROLLING - DESCRIPTION AND OPERATION

1. Propeller Governor

A. Description.
(1) A lever head, base-mounted, constant-speed, single-acting governor is installed on each engine to control the propeller pitch. The governors are engine-driven and mounted on the left side of the crankcase just below the forward cylinder. A gear type pump and relief valve is incorporated in each governor to boost engine oil pressure which, regulates airplane engine speed by varying the pitch of the propeller to match load torque to engine torque in response to changing conditions of flight. Internal flyweights are attached to a pilot valve that directs high pressure oil to the propeller piston or allows oil to drain from the piston.

2. Propeller Synchronizer System

A. Description. (Refer to Figure 1).
(1) The component parts of the propeller synchronizer system are two electrical pulse pickups, trimmer assembly, actuator motor assembly, switch, interconnecting electrical cable assemblies, and an indicator light. The control box assembly, located on the underside of the glove compartment box, contains an all transistorized circuitry. The actuator motor is a stepping-type that operates on command from the control box and is located in the right engine nacelle. The flexible rotary shaft is connected to the actuator motor and trimmer assembly to trim the right engine speed setting. Magnetic pickups are mounted in each propeller governor to provide engine speed indicators to the control box assembly. The function of the propeller synchronizer system is to automatically match the RPM between the two engines; therefore, the left engine is designated as the “master” engine while the right engine is termed the “slave” engine. The electrical pulse from both magnetic pickups are fed into the control box from the governors. Any difference in these pulse rates will cause the control box assembly to run the actuator motor and through the flexible shaft, trim the “slave” engine governor speed setting to exactly match the “master” engine RPM. Normal governor operations and functions are unchanged but the synchronizer system will continuously monitor engine RPM and reset the “slave” engine governor as required. The limited range feature prevents the “slave” engine losing more than a fixed amount of RPM in case the “master” engine is feathered with the synchronizer on.

3. Propeller Unfeathering System (Optional)

A. Description.
(1) Each optional unfeathering system consists of a dry air or nitrogen-charged accumulator, a special governor, and a hose running between the governor and the accumulator. The governor contains a spring loaded check valve which is unseated while the propeller control is in any position except FEATHER, thus permitting governor-pressurized oil to flow to and from the accumulator. When the propeller control is moved to the FEATHER position, the check valve is seated and oil under governor-pressure is trapped in the accumulator and hose. As the propeller control is moved out of the FEATHER position, the trapped oil flows back through the governor to the propeller to unfeather it.

CAUTION: Always leave propeller control in the unfeathered position when the airplane is on the ground. This procedure prevents the possibility of heat causing trapped oil to expand to pressures which could damage the accumulator.

4. Propeller Synchrophaser System

A. The propeller synchrophaser system is utilized to achieve minimum noise and vibration due to propeller speed and position. The system compares the speed and relative phase of a slave engine to that of the master engine and adjusts the speed of the slave engine to be exactly equal to that of the master. The pilot may adjust the relative phase of the slave engine by means of a control knob on the instrument panel for minimum noise and vibration. The system will not make corrections

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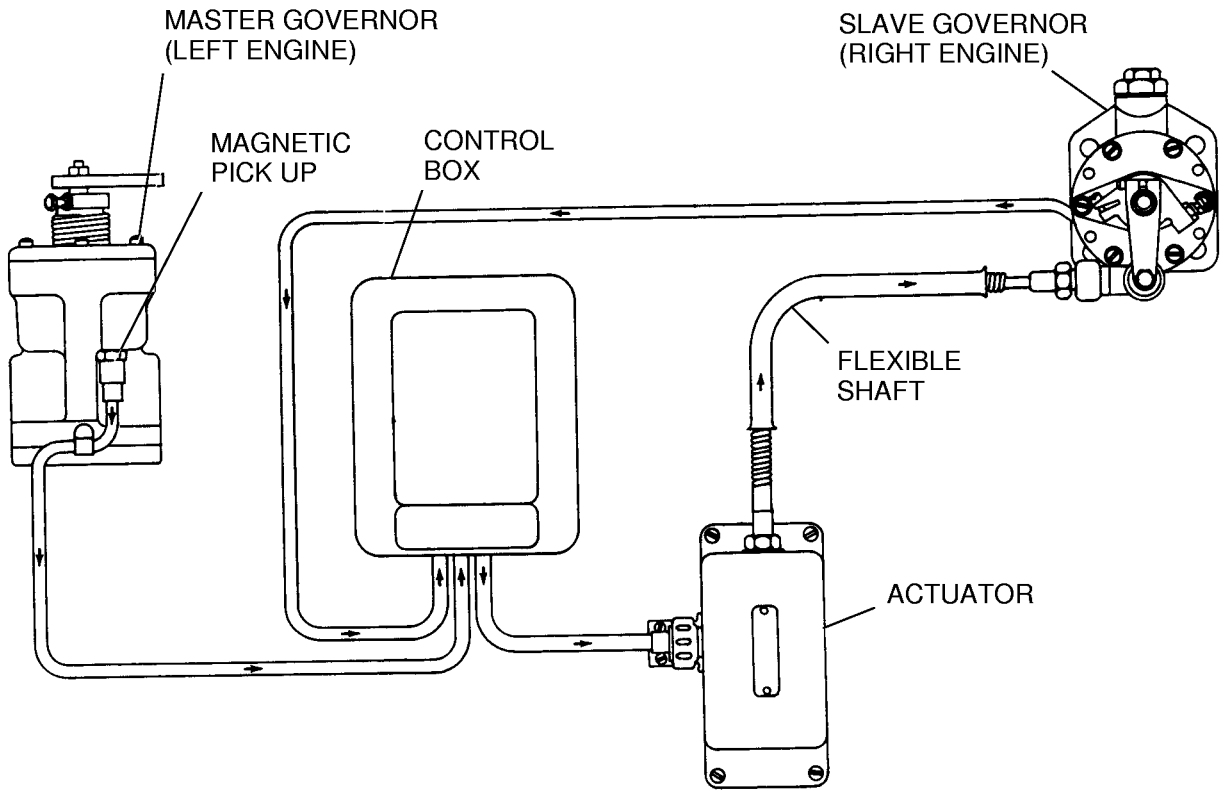

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Propeller Synchronizer Schematic
Figure 1 (Sheet 1)

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to the slave engine in case of large differences in propeller RPM such as feathering an engine while the synchrophasing system is ON. The synchrophaser system consists of a master governor. slave governor, a sensing unit, and a control panel. The governors incorporate magnetic pickup transducers. The slave governor incorporates additionally an actuator motor connected to a cam drive assembly and arm to fine trim the propeller pitch control on the slave engine. The magnetic pickup transducers provide speed and phase signals to the electronic circuits at the sensing unit. If the propeller speeds are not the same, the sensing unit supplies an error signal to the actuator motor which automatically adjusts the speed of the slave propeller, bringing it into synchronization with the master propeller. The propeller phase difference is also determined by the electronic circuits in the sensing unit, which also adjusts the propeller phase difference to the setting selected by the pilot.

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PROPELLER CONTROLLING - TROUBLESHOOTING

1. Propeller Governor Troubleshooting

A. Refer to Adjustment of Governor located in Propeller Controlling - Adjustment/Test for troubleshooting the governor.

2. Propeller Unfeathering System Troubleshooting

A. For a guide to troubleshooting the propeller unfeathering system, refer to Table 101.

Table 101. Propeller Unfeathering System Troubleshooting (After feathering propeller, move control to unfeather position.)

TROUBLE	PROBABLE CAUSE	CORRECTION
PROPELLER DOES NOT UNFEATHER.	Accumulator does not have correct pressure.	Service accumulator.
	Governor does not have correct proper feather setting.	Adjust governor.

3. Propeller Synchronizer System Troubleshooting

A. Refer to Woodward Governor Company, Rockford, Illinois, Bulletin 33049E for troubleshooting and remedial correction information.

4. Propeller Synchrophaser System Troubleshooting

A. Refer to the applicable synchrophaser system service/parts manual for troubleshooting and test procedures (SP105B and SP105B-1 Synchrophaser Systems Service/Parts Manual). If the SP105A has been modified by SK414-10, it will be identified as an SP105B-1 governor.

B. Refer to the wiring diagrams for troubleshooting the wiring circuits.

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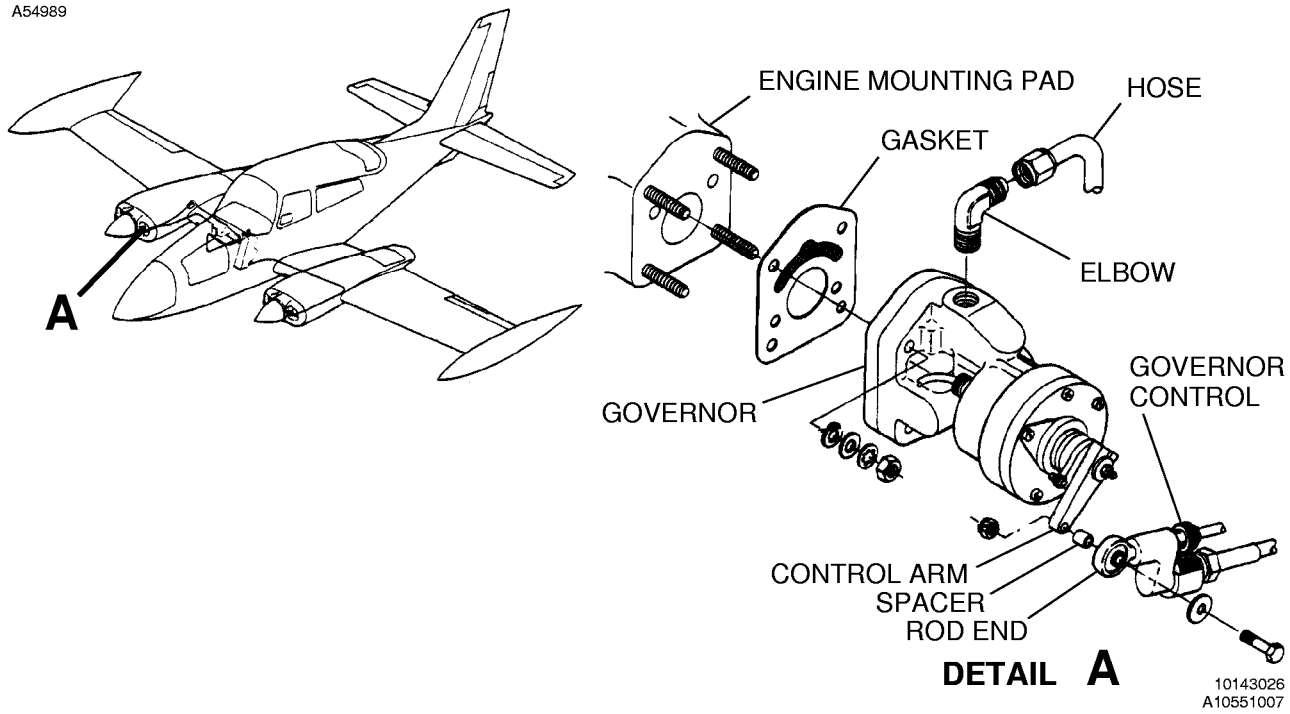
PROPELLER CONTROLLING - REMOVAL/INSTALLATION

1. Propeller Governors

A. Removal (Refer to Figure 401).



Propeller Governor Installation
Figure 401

NOTE: The removal procedure is the same for either propeller governor.

(1) Remove engine cowling and baffles as necessary to gain access to propeller governor, refer to Chapter 71, Engine Cowling - Removal/Installation.
(2) Remove rod end (3) from governor control arm (5) by removing attaching nut, spacer (4), washer, and bolt.

CAUTION: If airplane is equipped with optional unfeathering system. Release accumulator pressure prior to disconnecting hose (2).

(3) Remove governor (6) and mounting gasket (1) by removing the four nuts, internal tooth lockwashers, and plain washers.

B. Installation (Refer to Figure 401).
(1) Place mounting gasket (1) over the governor mount studs with the raised surface of gasket screen facing away from the engine.
(2) Align the splines on the governor shaft with the engine drive, and slide the governor into position.
(3) Secure the governor in place with the four plain washers, lockwashers, and nuts on the governor mount studs. Tighten nuts to 160 inch-pounds.
(4) Rig propeller governor controls in accordance with rigging procedures.
(5) Install engine baffles and cowling in accordance with installation procedures, refer to Chapter 71, Engine Cowling - Removal/Installation.
(6) Perform an operational check of propellers.

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(7) If optional propeller unfeathering system is installed, service accumulator, refer to Installation of Propeller Accumulator System.

2. Propeller Accumulator System

A. Removal (Refer to Figure 402).

CAUTION: Release system pressure by placing propeller control in unfeather position and release accumulator pressure through the filler valve.

(1) Disconnect hose (1) from governor (4) and accumulator (2). Remove clamp (3).
(2) Remove accumulator and heat shield by removing bolts attaching accumulator to engine beam.
(3) Remove governor, refer to Propeller Governors.

NOTE: The unfeathering accumulator must be overhauled by an approved propeller governor repair station.

B. Installation.
(1) Install governor. Refer to Propeller Governors.
(2) Secure accumulator (2) to engine beam with bolts.
(3) Install hose (1) and secure in place with clamp (3).
(4) Clock heat shield on accumulator and secure with clamps.
(5) Service accumulator:
(a) Place propeller control in the unfeathered position before charging the accumulator to prevent the possibility of oil under pressure being trapped in the accumulator.
(b) Although the accumulator will function properly when charged with air, dry nitrogen gas is recommended to minimize corrosion.
(c) Either too much pressure or not enough pressure in the accumulator will reduce efficiency of the unfeathering system. With a normal amount of friction within the propeller a range of 125-130 PSI is acceptable.

3. Propeller Synchronizer System

A. Removal (Refer to Figure 403).
(1) Remove flexible shaft (10) as follows:
(a) Disconnect flexible shaft from actuator (5) and trimmer assembly (11).
(b) Remove the lock ring and hex nut from either end of flexible shaft.
(c) Remove flexible shaft from engine nacelle by routing through guide tube.
(2) Remove trimmer assembly (11) from governor (4) by disconnecting flexible shaft (10), propeller control cable (9), and attaching nut, spacer, washer, and bolt.
(3) Remove actuator (5) by disconnecting flexible shaft (10) and electrical cable (6). Remove four screws attaching motor to brackets.
(4) Remove control box (2) as follows:
(a) Disconnect electrical cable (3) from synchronizer switch (13) and indicator light (14) and route from stationary instrument panel to control box assembly.
(b) Disconnect control box electrical cable at electrical connector (1).
(c) Remove four screws attaching control box (2) to glove compartment.
(5) Remove switch (13) and indicator light (14) as follows:
(a) Remove four screws attaching upper pedestal panel to pedestal.
(b) Disconnect electrical wiring.
(c) Remove switch and light in accordance with removal procedures outlined in Chapter 31, Instrument and Control Panels – Removal/Installation.

NOTE: For removal and installation of magnetic pickup, refer to Woodward Governor Company, Rockford, Illinois, Bulletin 33049E.

B. Installation (Refer to Figure 403).
(1) Secure actuator (5) to brackets with screws.
(2) Install trimmer assembly (11) to governor (4) with bolt, spacer, washer, and nut.

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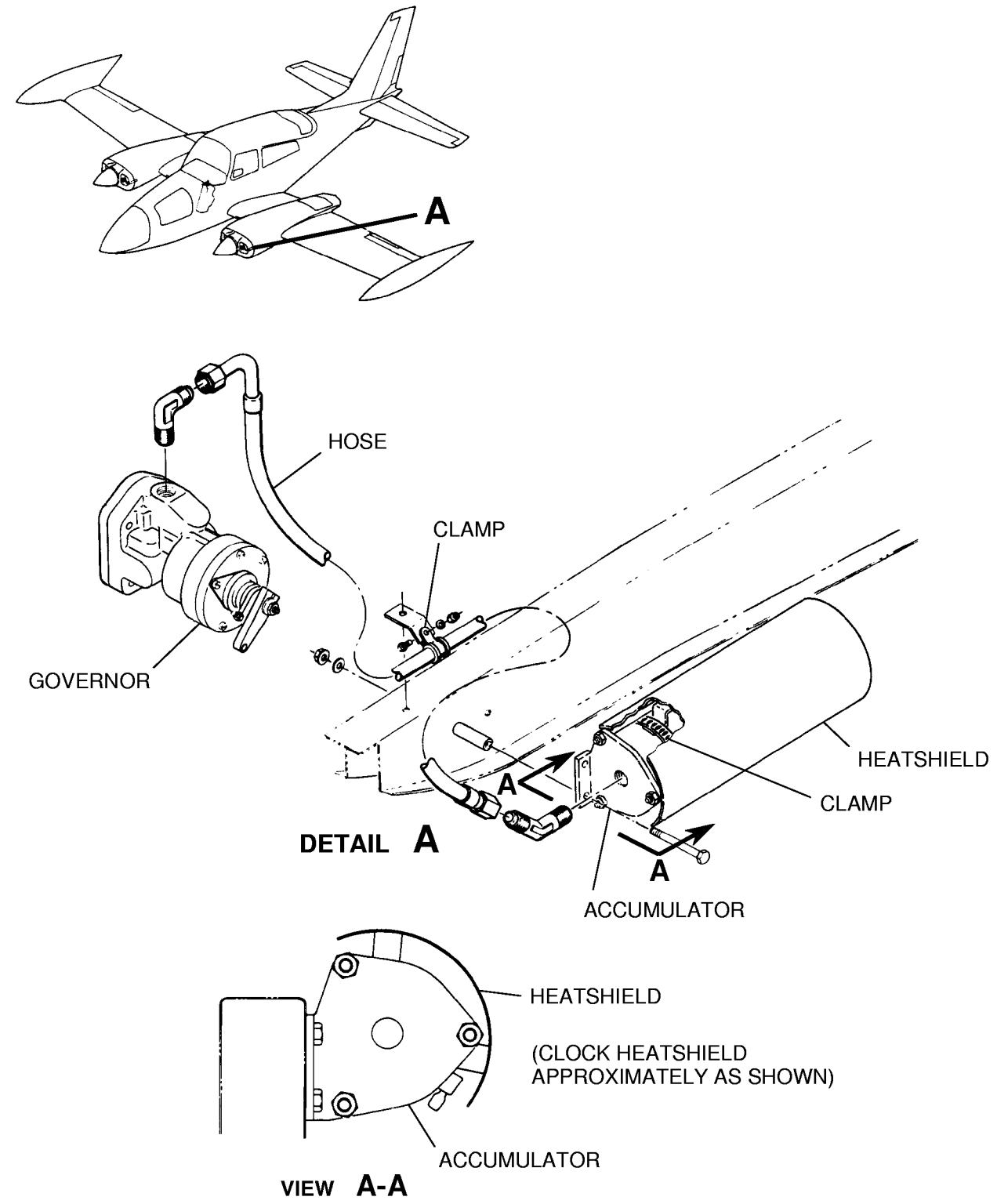

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Propeller Accumulator System Installation
Figure 402 (Sheet 1)

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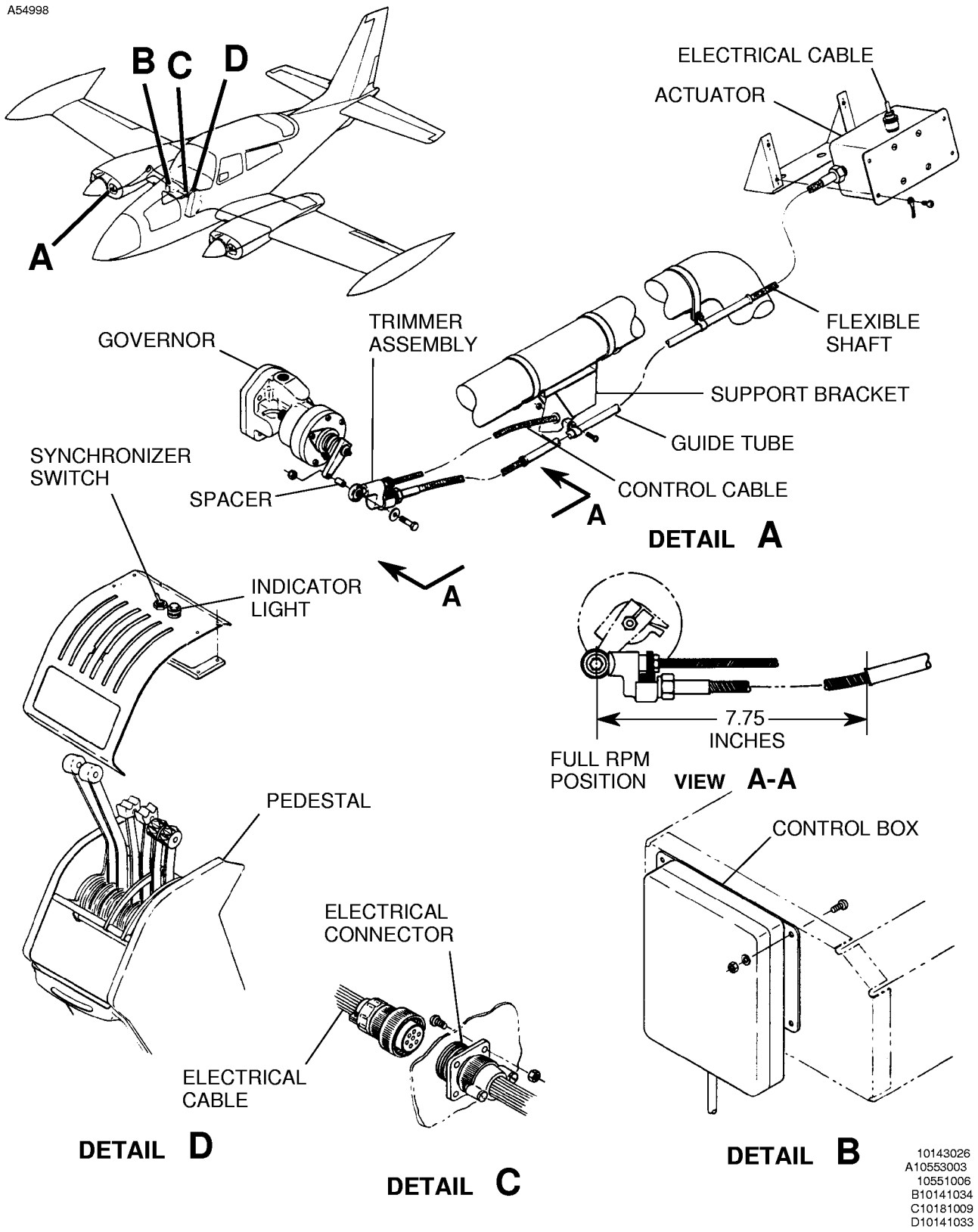

Propeller Synchronizer System Installation
Figure 403 (Sheet 1)

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(3) Route flexible shaft (10) through guide tube (7), install hex nut and secure with lock ring. Attach flex shaft to actuator and trimmer assembly.
(4) Install control box (2) to glove compartment with four screws.
(5) Install switch (13) and indicator light (14) to upper pedestal panel.
(6) Connect electrical cables and wires to light (14), switch (13), control box, and actuator.
(7) Rig synchronizer system, refer to Propeller Controlling - Adjustment/Test.
(8) Conduct operational check, refer to Propeller Controlling - Inspection/Check.

4. Propeller Synchrophaser System

A. Removal (Refer to Figure 404).
(1) Remove governors in accordance with propeller governor removal procedures.
(2) Disconnect connector from control box located on the underside of the glove box. Remove four screws and washers securing sending unit.
(3) Remove pedestal panel to gain access to switch, light assembly, and rheostat control.
(4) Disconnect wiring from electrical component to be removed and remove component as required.

B. Installation (Refer to Figure 404).
(1) Install governors in accordance with propeller governor installation procedures.
(2) Install control box on the underside of glove box with screws and washers.
(3) Install switch, light assembly, and rheostat control.
(4) Connect electrical wiring.

5. Governor Magnetic Pickup

A. Removal (Refer to Figure 404).
(1) Remove propeller governor in accordance with removal procedures.
(2) Tag and disconnect wiring to pickup.
(3) Unscrew magnetic pickup from propeller governor.

B. Installation (Refer to Figure 404).
(1) Set governor for maximum RPM, slowly rotate the governor drive shaft.
(2) Screw in pickup, tighten with fingers until pickup makes contact internally with the rotating flyweight head.

CAUTION: Do not use wrench or pliers to tighten magnetic pickup.

NOTE: When installing new pickup, always install new O-ring.

(3) Tighten the pickup 1/8 turn counterclockwise and lightly tighten locknut.
(4) Connect a 5000 Ohm/Voltmeter across the pickup leads.
(5) Drive the propeller governor at minimum cruise RPM and adjust pickup output to obtain 1.0 volt, +0.2 or -0.2 volt. Screw pickup in to increase voltage and screw pickup out to decrease voltage.

CAUTION: An output voltage in excess of 3.0 volts may damage electronic circuits sensing transducer. Make sure voltage does not exceed 3.0 volts at maximum engine RPM.

(6) Tighten pickup locknut and safety with lockwire.

CAUTION: Do not torque locknut over 25 inch-pounds.

(7) Install propeller governor in accordance with installation procedures.
(8) Connect wires and remove tags.

NOTE: Anytime the control box or the position sense potentiometer has been removed or replaced, make sure the actuator motor shaft is centered in the governor control lever slot. If it is not centered, refer to synchrophaser service/parts manual and perform centering adjustment procedures.

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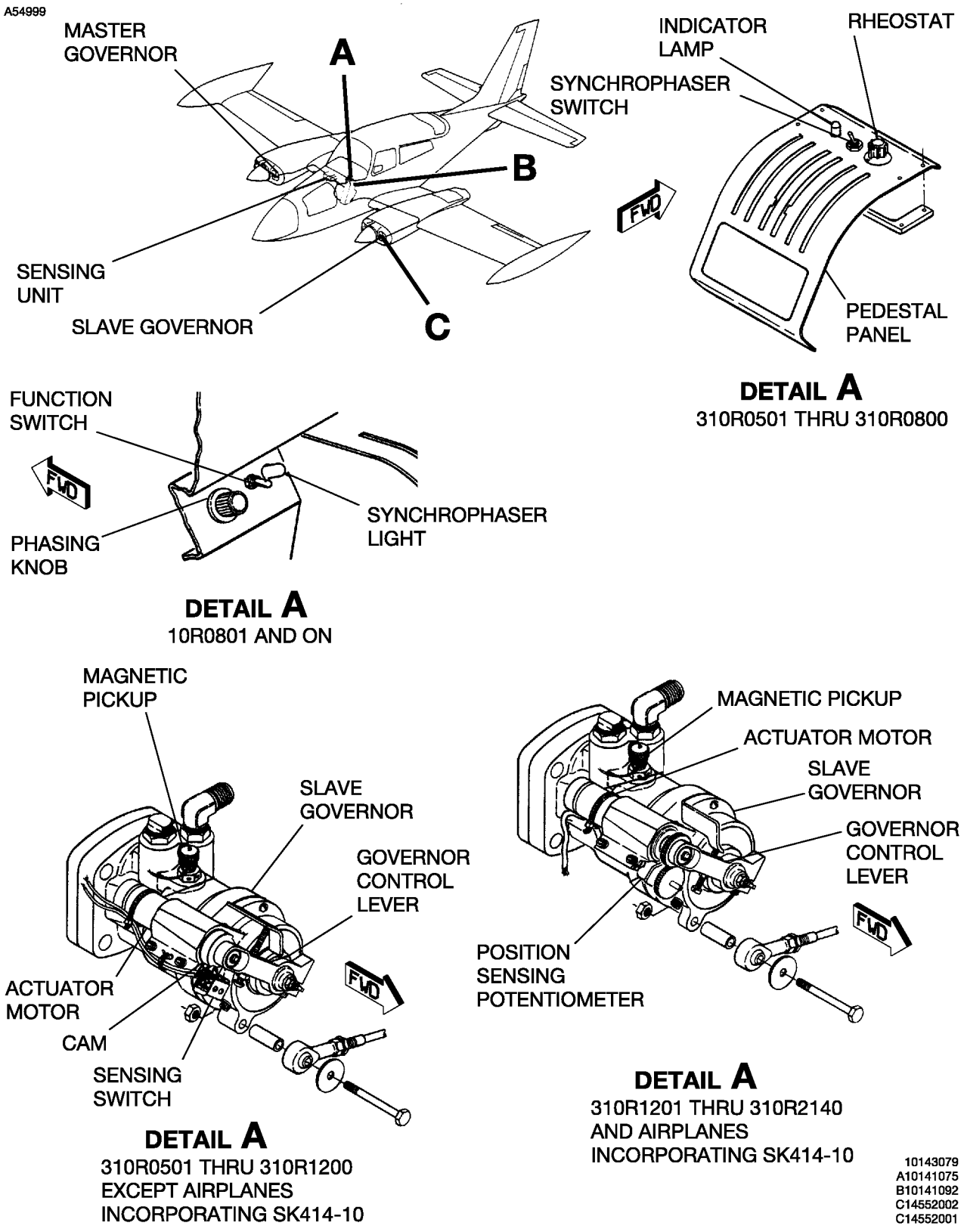

Propeller Synchrophaser System Installation
Figure 404 (Sheet 1)

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PROPELLER CONTROLLING - ADJUSTMENT/TEST

1. Propeller Governor Controls

A. Rigging (Refer to Figure 501).

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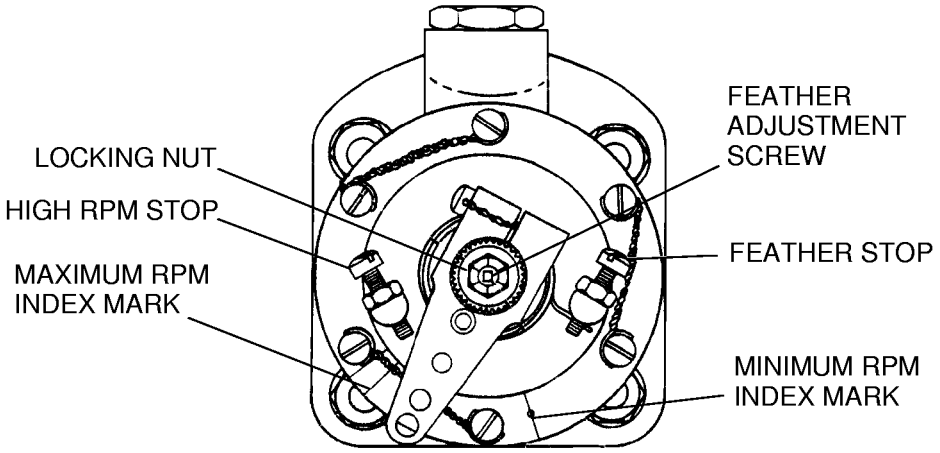

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Propeller Governor Adjustment
Figure 501

NOTE: On Airplanes 310R0001 thru 310R1285, wrap the control cables in areas adjacent to engine exhaust system. Wrap governor cables with 3M No. 363 aluminum reflective tape in all areas within 3.0 inches of exhaust system ducts or turbochargers. Tape must be installed with approximately 1.0 inch overlap on consecutive coils to insure double wrap protection, and must extend a minimum of 3.0 inches at either side of the adjacent section of exhaust ducting on turbocharger.

(1) Disconnect the propeller control rod end at the governor arm by removing nut, spacer, washer, and bolt.
(2) Move propeller control lever from maximum to minimum RPM position (against feather gate stop).
(3) Adjust control system cable rod ends, cable housing, and support bracket as required to align rod end hole with rigging pin (No. 8 drill shank or equivalent) installed and positioned over the 2000 RPM index mark (3).
(4) Remove rigging pin and install bolt, washer, spacer, and nut on outboard arm hole. On Turbo 310, install bolt in inboard hole of governor arm.
(5) Cycle propeller control lever to insure a minimum top end cushion of 0.20 inch. Make minor adjustments as required to attain minimum cushion at top end and minimum control RPM of 1800 to 2000 RPM at the lower end of lever travel.

2. Governor

A. Adjustment (Refer to Figure 501).

NOTE: Prior to governor maximum RPM adjustments, and after reaching normal operating oil temperatures, cycle the propeller control lever a minimum of six cycles to purge air from the propeller hydraulic system as follows: Advance throttle to 1700 RPM, move propeller control lever to the feather gate until engine speed is reduced to a range of 1000 to 800 RPM, and then advance propeller control to max RPM.

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CAUTION: Do not allow engine speed to fall below 800 RPM. Repeat above cycle a minimum of six times.

NOTE: If maximum RPM, low minimum RPM or propeller feathering periods are incorrect, adjust as required.

(1) If static RPM is too high, reduce by adjusting high RPM stop screw (4). Turn clockwise one revolution for each 25 RPM decrease. This reduction prevents possible overspeeding at takeoff.
(2) If static RPM is too low, it is possible that either the high RPM stop screw (4) or the propeller low pitch stop is the limiting factor. Move the propeller control lever toward decrease RPM and then to increase RPM position; if the maximum attainable RPM is reached at the same time as the governor stop, the governor is the limiting factor. Correct by adjusting the high RPM stop screw. Turn counterclockwise one revolution for each 25 RPM increase. If the maximum obtainable is reached before governor stop is reached, the propeller low pitch stop may be the limiting factor. This would require an adjustment of the propeller blades to decrease the low pitch angle.
(3) If feathering time period is in excess of 9 seconds, adjust by loosening locking nut (5) and turn feather adjustment screw (2) counterclockwise. Hold screw position while securing locknut.
(4) If propeller feathers before control lever reaches a point 0.20 inch aft of the feather gate stop position, ascertain that propeller control is properly rigged and that minimum RPM is on the high end of the 1800-2000 RPM range. If control rigging is correct, turn feather adjustment screw (2) clockwise to lower the feather position.
(5) If propeller fails to unfeather when propeller control lever is advanced forward of the feather gate stop, turn adjustment screw clockwise.
(6) For minimum RPM adjustments, adjust controls in accordance with rigging procedures.

3. Propeller Synchronizer System

A. Adjustment (Refer to Figure 502).
(1) Start rigging procedures by disconnecting flexible shaft (10) from actuator (5).
(2) Rotate free end of flexible shaft (10) counting total turns available on the “slave” governor trimmer assembly (11).
(3) Return trimmer assembly to its center range.
(4) When trimmer assembly is centered, rig governor (4) and control cable (9) in accordance with Rigging Propeller Controls.
(5) Manually rotate trimmer assembly (11) to either end of its travel.
(6) Move propeller pitch levers on the pedestal through its entire range, observing the governor speed adjusting lever to be certain it travels to the maximum and minimum RPM limits.
(7) Manually rotate the trimmer assembly (11) to opposite end of its travel.
(8) Perform step (6) again.
(9) Recenter the trimmer assembly.
(10) Insert a squared shaft into drive of actuator (5) and count total turns available.
(11) Place actuator in its center range.
(12) With both actuator and trimmer assembly centered, connect the flexible shaft to actuator motor.
(13) Check flexible shaft for binding and a clearance of 7.75 inches in the full RPM position.

4. Propeller Synchrophaser System

A. Adjustment.
(1) For adjustment and test procedures, refer to the applicable Cessna Synchrophaser System Service/Parts Manual (Types SP-105B or SP-105B-1).
(2) If the SP-105A has been modified by SK414-10, it will be identified as an SP-105B-1.

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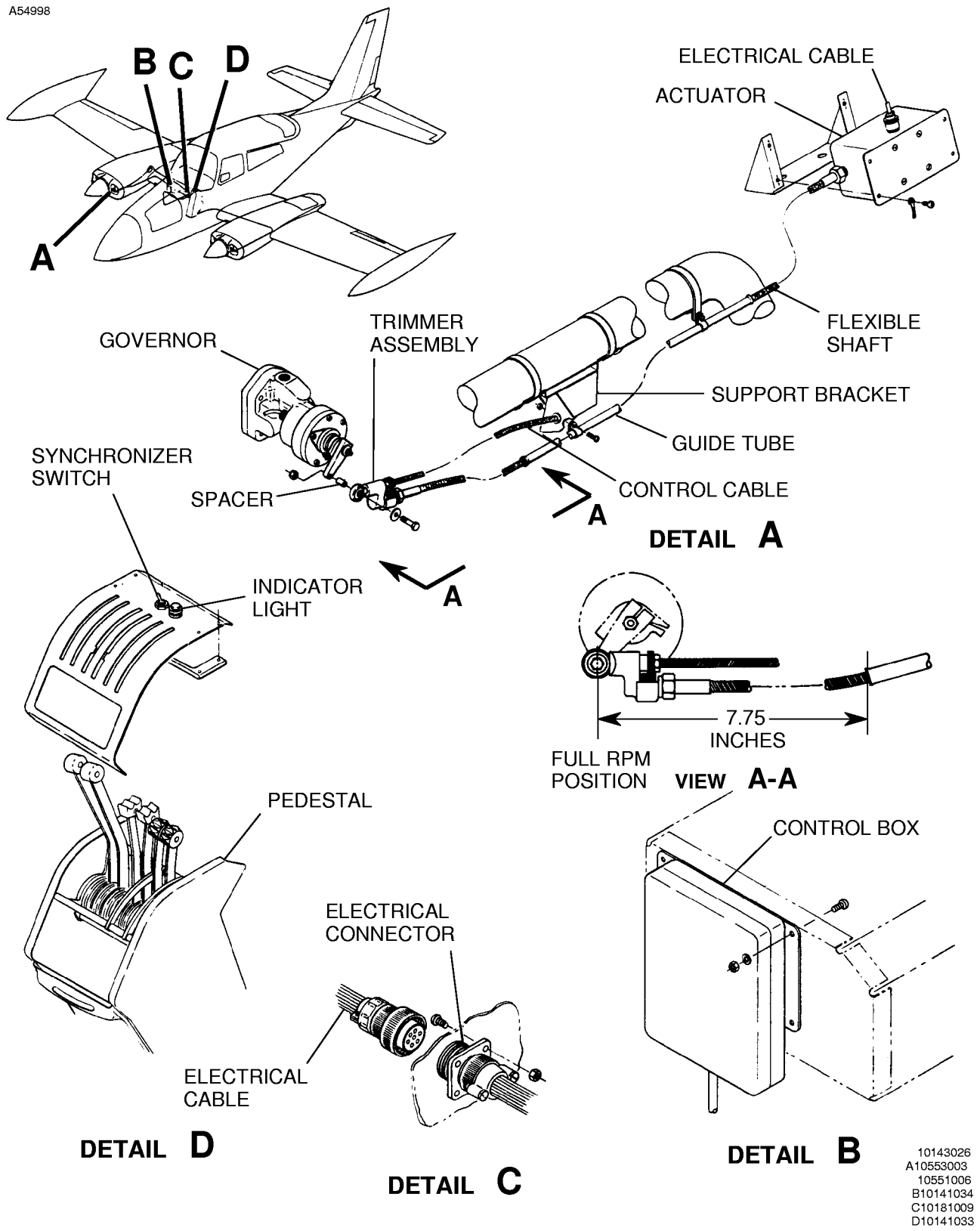

Propeller Synchronizer System Installation
Figure 502 (Sheet 1)

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PROPELLER CONTROLLING - INSPECTION/CHECK

1. Propeller Unfeathering System

A. Inspection.

(1) Clean accumulator with suitable solvent and wipe hoses and accumulator with a clean cloth. Inspect hose assemblies for chafing end fittings for tightness. Inspect accumulator for security in mounting brackets. Always inspect filler valve after charging for leaks. Repair to propeller unfeathering system is limited to replacement of components.

CAUTION: Always release system pressure by placing propeller control in unfeathering position and releasing accumulator pressure through filler valve, before disconnecting hose between accumulator and governor or removing accumulator.

2. Propeller Synchronizer System

A. Operational Check.

(1) To check the operation of the synchronizer in flight, first synchronize propellers manually and turn the synchronizer switch ON. Then slowly adjust the master engine propeller governor control lever, in small increments, to increase or decrease RPM. The RPM range over which the slave engine will remain synchronized with the master engine is the limited range mentioned above. With the synchronizer ON, move the master engine propeller governor control lever to a point which is close to the end of this limited travel. Turn the synchronizer OFF. An unsynchronized condition will develop as the actuator moves to its mid-position. When the synchronizer is turned ON again, synchronization will result. If the units do not become synchronized, the actuator has reached the end of its travel and must be recentered in this manner:

(a) Turn the switch OFF.

(b) Synchronize the engines manually.

(c) Turn the switch ON.

(2) To check electrical continuity and voltage check of the synchronizer system, refer to Woodward Governor Company, Rockford Illinois, Bulletin 33049E.

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POWER PLANT

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POWER PLANT - GENERAL

1. Scope

A. This chapter describes the overall power package inclusive of engine, mount, cowling, and intakes.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Cowling describes those removable coverings which extend over and around the power plane assembly.
   (2) Mounts describes the framework, either of build-up construction or forgings which support the engine and attach it to the nacelle or pylon.
   (3) Electrical harness describes servicing procedures for the engine wire bundles.
   (4) Air intakes describes that portion of the power plant system which directs and may or may not vary the mass air flow to the engine.

3. Engine

A. Description.
   (1) The 310 and Turbo 310 airplanes incorporate two Teledyne Continental six-cylinder, horizontally-opposed engines. The Detail Engine Specifications in Table 1 lists the engine specifications for both the IO-520M and TSIO520-B engines. Where there is a specific difference, reference will be made to individual engines.

Table 1. Detailed Engine Specifications (IO-520M and TSIO520-B)

Propeller Drive Ratio	Direct
Propeller Shaft Rotation (Looking Forward)	Clockwise
Bore, Inches	5.25
Stroke, Inches	4.00
Displacement, Cubic Inches	520
Compression Ratio	7.5:1
Oil Sump Capacity (Without Filter)	12 Qts.
Fuel System	Continental Fuel Injection
Fuel Injector	Continental Fuel Injection
Magneto Drive, Ratio to Crankshaft	1.5:1
Magnetos Rotation	Counterclockwise*
Tachometer Drive, Ratio to Crankshaft	5:1
Tachometer Drive Rotation	Counterclockwise*
Starter Drive, Ratio to Crankshaft	48:1
Starter Drive Rotation	Counterclockwise*
Alternator, Ratio to Crankshaft	3:1
Alternator Rotation	Clockwise*
Vacuum-Pressure Pump Drive, Ratio to Crankshaft	1.5:1
Vacuum-Pressure Pump Drive Rotation	Clockwise*
Propeller Governor Drive, Ratio to Crankshaft	1:1

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Table 1. Detailed Engine Specifications (IO-520M and TSIO520-B) (continued)

Propeller Governor Drive Rotation	Clockwise*
Spark Plug Type, Champion	RHB-32E
Spark Plug Type, AC	AC-273
Spark Occurs (Degrees BTC) Both MAGS	22 Degrees
Spark Plug Gap	0.016-0.018
Firing Order	1-6-3-2-5-4
Oil Pressure (Lbs. Per Sq. Inch), Normal	30 to 60
Oil Pressure (Lbs. Per Sq. Inch), Maximum	100
Oil Pressure (Lbs. Per Sq. Inch), Idling (Minimum)	10
Oil Temperature (Degrees Fahrenheit) Normal	170°
Oil Temperature (Degrees Fahrenheit) Maximum	240°
Cylinder Head Temperature (Degrees Fahrenheit) Maximum	460°
Cylinder Head Temperature (Degrees Fahrenheit) Cruise	380°
Cylinder Head Temperature (Degrees Fahrenheit) Minimum (Takeoff)	200°
Standard Engine Dry Weights (Lbs) With Turbocharger Accessories (Approximately)	477.50
Standard Engine Dry Weights (Lbs) Without Turbocharger Accessories (Approximately)	434.50

(2) Each engine is equipped with magnetos, spark plugs, ignition harness, oil pump, oil cooler, fuel pump, fuel distribution lines, starter, and alternator.

4. Components Location Chart

A. Engine.

Component	Location
Cylinder Head Temperature Bulb	Under Number Three Cylinder of Each Engine
EGT Probe	In Exhaust Stack Aft of Risers
Oil Dilution Solenoid	On Firewall RH Nacelle
Oil Temperature Bulb	Aft Side of Engine Under Oil Cooler
Tachometer Generator	Accessory Drive Aft on Engine

5. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Maintenance Stand		Fabricate Locally	Engine Build Up and/or Maintenance
Engine Mount Wrench	SE608	Cessna Aircraft Co.	Crimping Lockwasher

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Name	Number	Manufacturer	Use
Multimeter		Commercially Available	Checking Electrical Bonds and Electrical Circuits
Tool Pressure Ratio Controller	5090002-1	Cessna Aircraft Co.	Controller Adjustment
Fuel Pressure Test Kit	SK320-2	Cessna Aircraft Co.	Fuel Pressure Adjustment
Cylinder Head Calibration Kit	SK182-43	Cessna Aircraft Co.	Calibrate Cylinder Head Temperature
Hoist	4180350	Cessna Aircraft Co.	Hoist Engine
Spacer	5056010-1 - 0.125 Inch	Cessna Aircraft Co.	Shimming Engine Mount
Spacer	5056010-2 - 0.188 Inch	Cessna Aircraft Co.	Shimming Engine Mount
Spacer	5056010-3 - 0.250 Inch	Cessna Aircraft Co.	Shimming Engine Mount
0-12" Scale		Lufkin	Measure Travel Dimension
Filter Cleaner	D1400	Donaldson Company, Inc. Minneapolis, Minnesota	Clean air filters

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POWER PLANT - TROUBLESHOOTING

1. Engine Troubleshooting

A. Engine Troubleshooting
(1) For troubleshooting engine operation, refer to Table 101

Table 101. Engine Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
ENGINE WILL NOT START, ENGINE CRANKING, ALL CIRCUIT BREAKERS ENGAGED AND NECESSARY SWITCHES ACTUATED.	Fuel quantity.	Service fuel tanks.
	Engine overprimed.	Use correct starting procedures. Use correct starting procedures. **CAUTION:** If the primer switch is activated for excessive periods of time with the engine inoperative on the ground or during flight, damage may be incurred to the engine and/or airplane due to fuel accumulation in the induction system. Similar conditions may develop when the engine is shutdown with the auxiliary pump switch in the ON position.
	Leaks in induction system.	Tighten connection or replace hoses.
	Excessive starter slippage.	Replace starter.
	Fuel system malfunction.	Refer to Chapter 73, Troubleshooting Engine Fuel System.
	Ignition system malfunction.	Refer to Chapter 74 Troubleshooting Engine Ignition System.
ENGINE WILL NOT RUN AT IDLE POWER SETTING.	Propeller lever set in decrease RPM position.	Use low pitch (increase RPM) position for all ground operations.
	Improperly adjusted fuel injection system.	Adjust fuel injection system.
	Fouled spark plugs.	Clean or replace spark plugs.
	Air leak in intake manifold.	Tighten loose connection or replace damaged part.

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Table 101. Engine Troubleshooting (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
REGULAR MISSING AT HIGH SPEED.	Broken valve spring.	Replace.
	Plugged fuel nozzle.	Clean or repair.
	Warped valve.	Repair.
	Valve lifters dirty or worn.	Clean or replace.
ENGINE RUNS ROUGH AT HIGH SPEED.	Loose mounting bolts or damaged mount pads.	Tighten or replace.
	Plugged fuel nozzle.	Clean or repair.
	Propeller out of balance.	Remove and repair.
	Ignition system malfunction.	Refer to Troubleshooting Ignition System.
ENGINE RUNS TOO LEAN AT CRUISING POWER.	Improper manual leaning procedure.	Operate in full rich position below 5000 feet. Above 5000 feet, retard mixture levers until a slight drop in RPM is noted, then advance levers approximately one inch toward full rich position.
	Low fuel flow reading.	Clean fuel strainer screen.
	Fuel Injection Malfunction.	Correct fuel injection malfunction.
ENGINE IDLES ROUGH.	Improperly adjusted fuel injection system.	Adjust fuel injection system.
	Improperly adjusted fuel controls.	Adjust fuel control, refer to Chapter 73 Fuel Distribution - Adjustment/Test.
	Fouled spark plugs.	Clean or replace.
	Discharge nozzle air vent manifold restricted or failed.	Clean or replace.
	Dirty valve lifters.	Clean or replace.
	Burned or warped exhaust valves, worn seats, scored valve guides.	Repair or replace.
ENGINE RUNS RICH AT CRUISING POWER.	Restriction in air intake passage.	Remove restriction.
ENGINE SPARK PLUGS FOULING CONTINUOUSLY.	Piston rings worn excessive or broken.	Refer to manufacturer's overhaul manual and overhaul engine.
ENGINE RUNS TOO LEAN OR TOO RICH AT THROTTLE SETTINGS OTHER THAN CRUISE.	Fuel injection malfunction.	Correct malfunction.

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Table 101. Engine Troubleshooting (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
SLUGGISH OPERATION AND LOW POWER.	Throttle not opening completely.	Check rigging.
	Leaking exhaust system.	Correct.
	Restricted air intake.	Correct.
	Turbo wheel rubbing (Turbo 310).	Replace turbocharger.
	Ignition switch malfunction.	Refer to Troubleshooting Ignition System.
	Ignition system malfunction.	Refer to Troubleshooting Ignition System.
	Fuel injection system malfunction.	Refer to Chapter 73, Troubleshooting Fuel Injection System.
	Valve seats worn and leaking. Piston rings worn or stuck in grooves.	Refer to manufacturer's overhaul manual and overhaul engine.
HIGH CYLINDER HEAD TEMPERATURE.	Use of low octane fuel.	Drain and replace fuel with correct grade.
	Improper leaning procedure.	See correction under "engine runs too lean at cruising power".
	Bent or loose cylinder baffles.	Correct.
	Dirt between cylinder fins.	Clean.
	Exhaust system leakage.	Correct leakage.
	Excessive carbon deposits in cylinder head and on pistons or exhaust valves leaking.	Refer to manufacturer's overhaul manual and overhaul engine.
ENGINE OIL LEAKS.	Damaged seals, gaskets, O-ring seals and packing at location of leakage.	Repair as necessary.
ENGINE WILL NOT ACCELERATE PROPERLY.	Unmetered fuel pressure too high.	Adjust - refer to Chapter 73, Distribution - Adjustment/Test.
	Improper closing of wastegate (Turbo 310).	Refer to Turbocharger and Controls Overhaul Parts Manual.
	Leak in turbocharger discharge pressure (Turbo 310).	Repair or replace as necessary. **NOTE:** Leak in the turbocharger discharge system is characterized by the engine leaning out at idle, but when acceleration is attempted, it will not accelerate because of an over rich fuel mixture. However, when the mixture control is leaned, the maximum RPM will be low and the engine will run very rough

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Table 101. Engine Troubleshooting (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
LOW COMPRESSION	Piston rings excessively worn. Valves and seats worn and worn cylinder walls.	Refer to manufacturer's overhaul manual and overhaul engine.
SLOW ENGINE ACCELERATION ON A HOT DAY.	Mixture too rich.	Momentarily pull mixture control back until engine acceleration picks up, then move mixture control to full forward again.
ENGINE WILL NOT STOP AT IDLE CUTOFF.	Fuel manifold valve not seating tightly.	Repair or replace manifold valve.
ROUGH IDLE AT AIRFIELDS WITH GROUND ELEVATION OF 3500 FEET OR HIGHER.	Mixture too rich.	Pull mixture control back to where the engine operates the smoothest at idle RPM.
MANIFOLD PRESSURE VARIES WITH AIRSPEED. INCREASE WHEN AIRSPEED INCREASED, DECREASE WHEN AIRSPEED DECREASED.	Wastegate stuck or closed.	Adjust throttles after airspeed has increased from climb speed. **NOTE:** The left engine manifold pressure will normally increase or decrease more than right engine because of location of left engine air intake duct.
MANIFOLD PRESSURE OVERHEAT ON ENGINE ACCELERATION.	Engine acceleration too rapid from idle to full power.	Open throttle about half-way, let engine accelerate to 29 inches HG. and peak. Move throttles to full open position.
ERRATIC ENGINE OPERATION.	Manifold valve sticking part way or not free.	Repair or replace manifold valve.
SLOW ENGINE ACCELERATION AT AIRFIELDS WITH A GROUND ELEVATION OF 3500 FEET OR HIGHER.	Mixture too rich.	Pull mixture control back to where engine operates at idle RPM. Engine should accelerate normally.
MANIFOLD PRESSURE VARIES WITH INCREASING OR DECREASING FUEL FLOW.	Waste-gate closed.	Fuel flow increase the mass flow of exhaust increased, turbine turns faster more induction air furnished engine resulting in manifold pressure increase.
ENGINE WILL NOT START.	Fuel manifold valve sticking closed.	Repair or replace manifold valve.
HIGH ENGINE IDLE, PRESSURE IMPOSSIBLE TO OBTAIN.	Fuel manifold valve sticking closed.	Repair or replace manifold valve.

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Table 101. Engine Troubleshooting (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
CLIMBING TO ALTITUDE ABOVE 12,000 FEET, ENGINE QUITS WHEN POWER REDUCED.	Fuel vaporization.	Turn auxiliary fuel pumps on when climbing above 12,000 feet; when climb completed continue with auxiliary fuel pumps on until vaporization possibility is eliminated. Lean mixture during climb to proper fuel flow for power being used. Engine may quit when throttles are brought back for power adjustment after leveling off. If this occurs, lean mixture and engines will pick up again.
MANIFOLD PRESSURE BETWEEN ENGINES VARIES WITH ALTITUDE.	1,000 feet critical altitude tolerance between engines.	Advance one throttle in front of the other to keep manifold pressure the same.
FUEL MANIFOLD PRESSURE VARIES WITH ENGINE RPM.	Waste-gate closed, RPM increase, manifold pressure slight increase, RPM decrease, manifold pressure slight decrease. Normal Turbocharged engines characteristic.	Waste-gate open, RPM increase, manifold pressure slight increase, RPM decrease, manifold pressure slight decrease. Normal Turbocharged engines characteristic.

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POWER PLANT - REMOVAL/INSTALLATION

1. Engine

A. Removal (Refer to Figure 401).

CAUTION: Place a suitable padded support under fuselage bulkhead at approximately FS 132.00 to prevent airplane from tipping backwards.

NOTE: If engine is being removed to be placed in storage, proper preparatory steps as outlined in Extended Storage located in Chapter 10, Parking and Storage - Maintenance Practices must be observed. In addition to the above mentioned procedures, cover all engine and accessory vents and other openings, including the crankcase breather, with other vapor-proof material.

(1) Turn off all cockpit switches and fuel selector valves OFF.
(2) Open the battery circuit by disconnecting the battery ground cable.
(3) Remove engine cowling and upper cowl flap in accordance with removal procedures.
(4) Disconnect magneto ground wires at the magnetos and withdraw them aft through the right rear engine baffle.

WARNING: These magnetos do not have internal grounding springs. Ground the magnetos to the crankcase to prevent accidental firing.

(5) Drain the oil in accordance with Chapter 12, Scheduled Servicing - Description and Operation. Replace the drain plug.
(6) Remove the propeller in accordance with Chapter 61, Propellers - Removal/Installation .
(7) Disconnect the engine controls as follows:
  (a) Disconnect the induction air control, mixture control, and throttle control.
  (b) Disconnect the propeller control at the governor. Remove the propeller control bracket from the intake manifold by loosening the bracket clamps.
(8) If installed, remove propeller unfeathering system hose at governor.

CAUTION: The propeller unfeathering accumulator is normally pressurized, release pressure before attempting to disconnect hose from governor.

(9) Disconnect wires and cables as follows:
  (a) Disconnect oil temperature electrical connector located directly below the oil cooler. Disconnect oil temperature ground wire.
  (b) Disconnect tachometer generator electrical cable.
  (c) Disconnect starter cable.
  (d) Remove the cylinder head temperature bulb.
  (e) Disconnect alternator cables and cable shielding ground.
  (f) Disconnect fuel pressure switch and tag wires.
  (g) Disconnect wiring at radio noise filter.
  (h) Remove all clamps attaching wires or cables to the engine. Pull all wires and cables aft to clear the engine assembly.
(10) Remove engine ground strap from engine mount assembly by removing existing bolt.
(11) Disconnect lines and hoses as follows:
  (a) Separate crankcase breather line at hose connector just aft of right rear engine baffle.
  (b) Disconnect vacuum line from vacuum pump.
  (c) Disconnect fuel vapor return line from the outboard rib.
  (d) Disconnect the fuel pressure gage line from the right rear engine baffle.
  (e) Disconnect the manifold pressure hose from the intake tube at the right rear of the engine.

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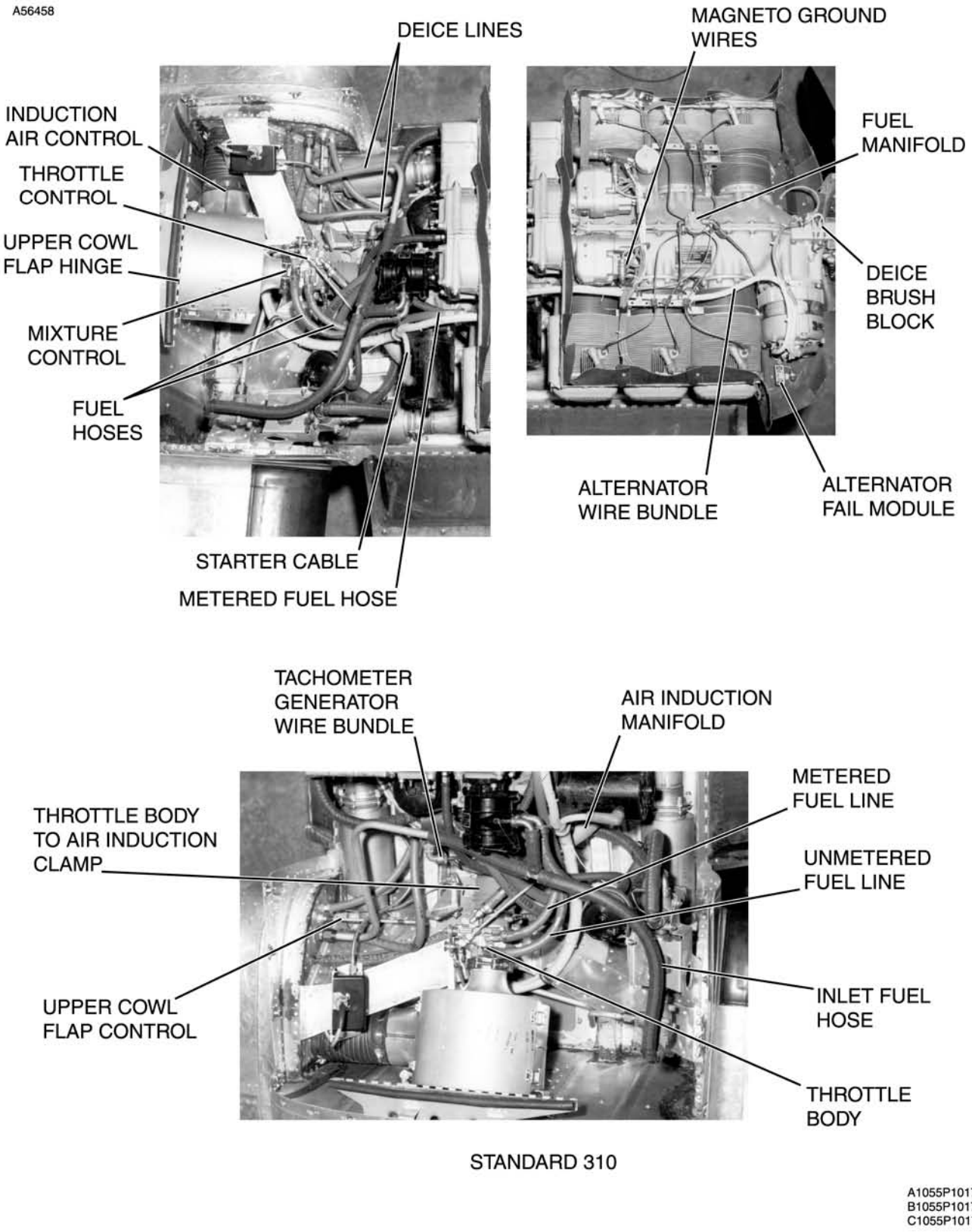

Engine Removal
Figure 401 (Sheet 1)

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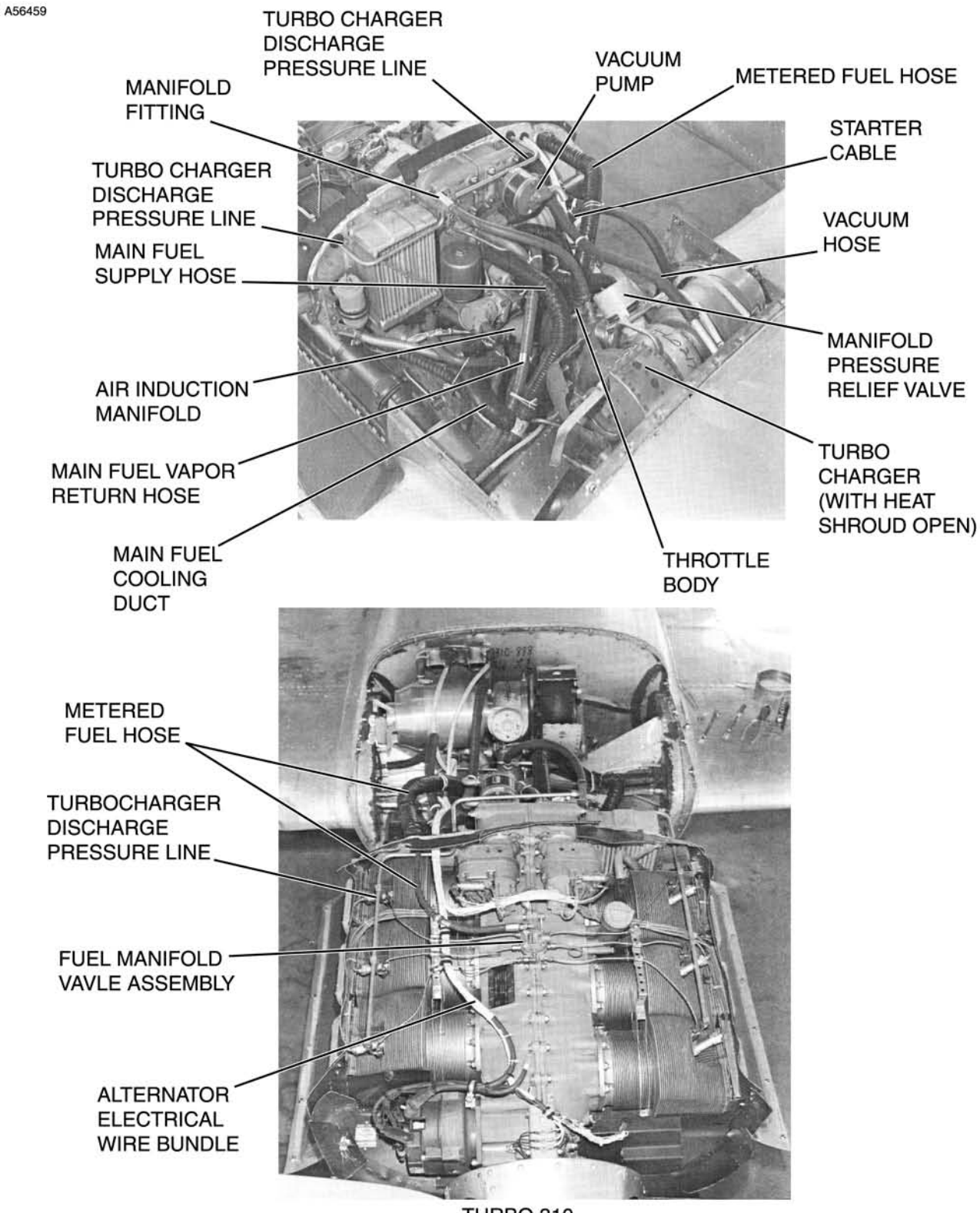

TURBO 310
(LEFT ENGINE SHOW, AIRPLANE NOT EQUIPPED WITH DEICE BOOTS)

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1055P1018

Engine Removal
Figure 401 (Sheet 2)

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(f) Disconnect oil pressure hose at the inboard nacelle rib and remove the clamp which fastens it to the canted bulkhead. Pull the hose free of the canted bulkhead.
(g) Disconnect fuel pump supply line at the fuel pump.

WARNING: Fuel and oil draining from lines and hoses is a fire hazard. Use caps and plugs in disconnected lines to prevent fuel and oil accumulation in nacelle.

(h) Disconnect the two manifold drain hoses from rear intake elbows.

(12) Disconnect exhaust stacks from each cylinder by removing attaching nuts.
(13) Disconnect turbocharger inlet duct (Turbo 310 ONLY).
(14) Attach a hoist to the lifting eye at the top center of the engine crankcase. Lift the engine just enough to relieve its weight from the engine mount.

CAUTION: Place stand under the airplane tailcone bumper before removing an engine. Removal of engine may allow the airplane to tip backwards.

(15) Remove engines as follows:
(a) Remove bolts from engine mounts.
(b) Hoist engine out of nacelle and clear of the airplane.

CAUTION: Hoist engine slowly and make certain all wires, lines, and hoses have been disconnected.

(c) Remove upper and lower engine mount (1 and 3) and spacers (2) from engine mount bracket (Refer to Figure 402).

B. Disassembly (Refer to Figure 401).

NOTE: The disassembly procedure is the same for either engine and is intended to cover only those items which could normally be expected to require removal or are not noted by Teledyne Continental Motors Corporation “Engine Overhaul” manual for specified engine.

(1) Hoist engine assembly to a convenient working height or place on engine maintenance stand.
(2) Clean engine assembly in accordance with engine manufacturers manual.

CAUTION: Care should be given to electrical components before cleaning. Solvents shall not be allowed to enter magnetos, starters, alternators, and any lubricated controls. These items must be protected with covers before saturating the engine with solvent. Any oil, fuel, or air openings on the engine accessories should be covered before washing down the engine with solvent. Caustic cleaning solutions should be used cautiously and should always be properly neutralized after their use.

NOTE: As each item is removed from the engine, place a temporary cover over the hole left by the removal of the item. This procedure should prevent the accidental entry of foreign material that could cause engine damage or serious malfunction.

(3) Remove propeller deice brush block assembly by removing engine crankcase through bolts securing brush block bracket.
(4) Remove oil separator (Turbo 310 ONLY) by removing clamps.
(5) Remove vacuum pump by removing nuts and washers.

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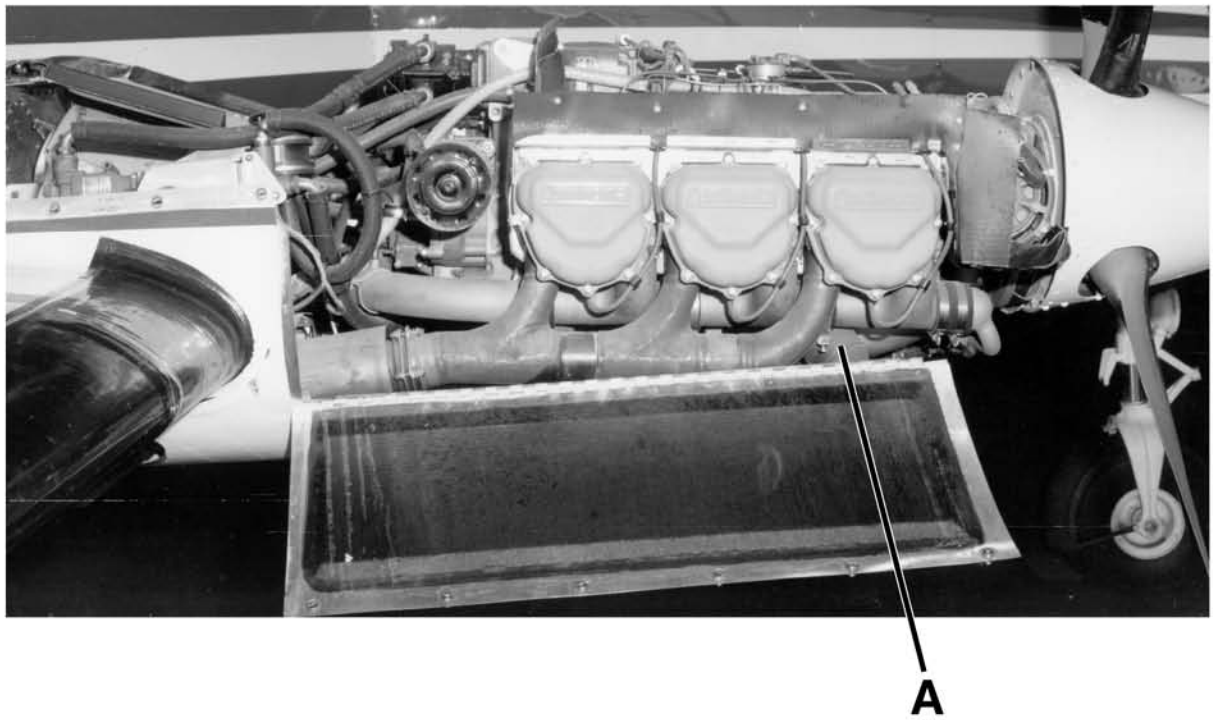

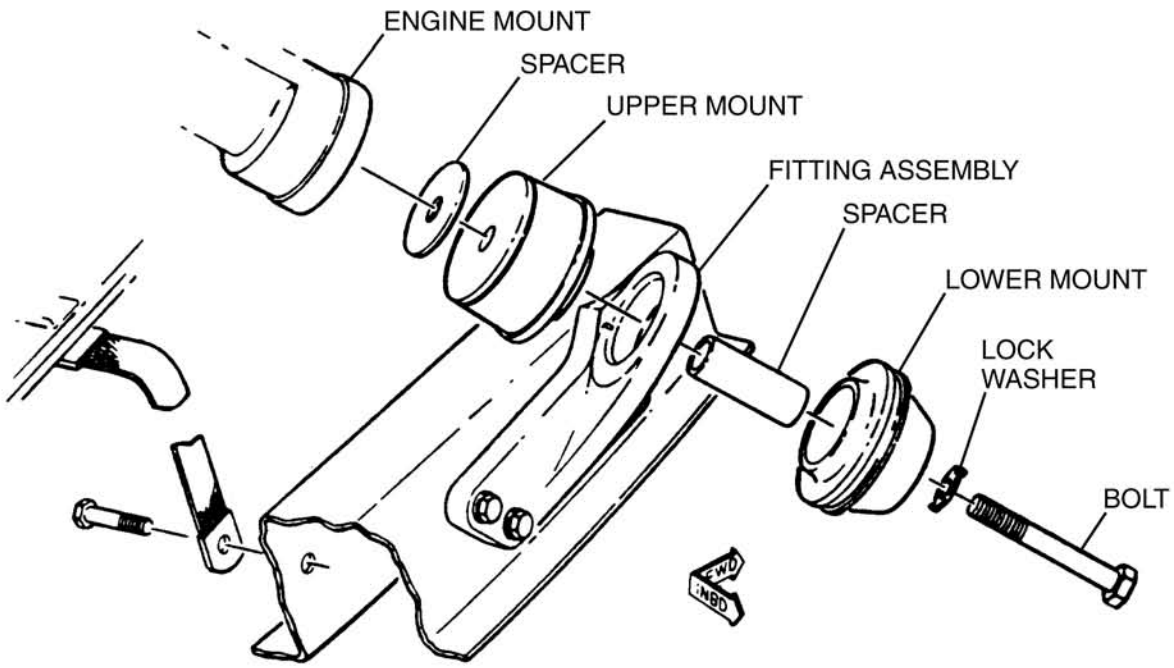

DETAIL A
ENGINE MOUNT INSTALLATION

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Engine Mount Installation
Figure 402 (Sheet 1)

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(6) Remove tachometer generator by removing four nuts and washers securing tachometer generator to the accessory case, disconnecting electrical connector and lifting tachometer generator free of drive adapter.
(7) Remove four nuts and washers securing governor to engine and remove governor.
(8) Remove engine baffles in accordance with removal procedures.
(9) Remove all other fittings, hoses, lines, and attaching parts necessary to facilitate maintenance of engine.

C. Assembly (Refer to Figure 401).
(1) Remove temporary protective covers and caps.
(2) Install all fittings, hoses, lines, and attaching parts that were removed to facilitate disassembly.
(3) Install engine baffles in accordance with installation procedures.
(4) Install (optional) propeller unfeathering line to governor and install governor to engine.
(5) Remove cover plates and install tachometer generator. Align drive adapter to tachometer shaft to assist installation.
(6) Connect electrical connector to tachometer generator.
(7) Install vacuum pump to engine accessory case and connect lines at pump if removed.
(8) Install oil separator (Turbo 310 ONLY).

NOTE: On airplanes incorporating MEB00-9, ensure that vent hole in breather line is positioned approximately 45 degrees downward from tube horizontal centerline to face center of engine nacelle.

(9) Install (optional) propeller deice brush block assembly.

NOTE: Make sure all nuts and bolts are torqued and safetied.

D. Installation (Refer to Figure 401).
(1) Attach a hoist to the lifting eye at the top center of the engine crankcase and hoist engine a sufficient height just above the nacelle.

NOTE: The installation procedure is the same for either engine. Although there is some difference in the routing of wire bundles, lines, hoses, and conduit, the following procedure is typical for either engine.

(2) Install engine mounts (Refer to Figure 402):
(a) Position upper mount (1) on fitting assembly.
(b) Attach a shop punch, or similar tool to assist in alignment, guide engine on upper mount (1) and fitting assembly.

NOTE: Align exhaust stack assemblies with engine studs as engine is being lowered on mounts.

(c) Assemble lock washer, lower mount (3), and spacer on bolt (4). Position these items on fitting assembly and index lower mount (3) with roll pin.
(d) Torque bolt (4) to 300 inch-pounds, +50 or -0 inch-pounds.
(e) Safety bolt (4) by crimping the ears on lock washer over the flat surfaces of the bolt head using engine mount wrench SE-608.
(3) Connect oil separator drain line to oil separator.
(4) Connect intake manifold hose to throttle body and secure with clamp.
(5) Secure exhaust stacks to each cylinder with attaching washers and nuts.
(6) On Turbo 310 connect drain line to intake manifold crossover tube.

NOTE: Remove all protective covers, plugs, caps, and identification tags as each item is installed or connected.

(7) Connect the following lines and hoses to the engine assembly.
(a) Oil return at the crankcase fitting.
(b) Turbocharger oil return hose to scavenger pump.

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(c) Oil cooler hose from oil cooler.
(d) Route metered fuel hose through baffle and connect to manifold valve assembly.
(e) Shroud housing metered fuel hose to baffle and securing with clamps.
(f) Line and hose assemblies to fuel pump. Slide shrouds over hoses and connect.
(g) Aft air intake manifold drain hose to intake manifold fitting.
(h) Air intake manifold pressure hose to manifold fitting.
(i) Fuel pressure hose to baffle fitting.

(8) Position and secure propeller control mounting bracket to engine intake manifold with clamps (Refer to Figure 403).
(9) Connect propeller control rod end to the governor with attaching bolt, spacers and nuts.
(10) Install propeller in accordance with Installation procedure.
(11) Connect engine ground strap to engine beam assembly with existing bolt.

NOTE: Use multimeter to assure proper bond between engine and airplane structure. Resistance should be 0.00 ohms.

(12) Connect engine wire bundle to the following components and remove tags.
(a) Cylinder head temperature bulb to adapter. Refer to engine oil and Temperature systems for location of adapters.
(b) Oil temperature bulb (located on lower oil cooler).
(c) Tachometer.
(d) Starter.
(e) Propeller deice brush holder assembly.
(f) Alternator.
(g) Magnetos.
(13) Connect starter cable to starter.
(14) Rig engine controls in accordance with rigging procedures.
(15) Make a magneto switch ground-out and continuity check. Connect magneto ground wires to the magnetos.
(16) Service the engine with oil in accordance with Chapter 12, Scheduled Servicing - Description and Operation.
(17) Close battery circuit by connecting the battery ground cable.
(18) Install upper cowl flap and connect linkage.
(19) Install engine cowling.
(20) Perform an engine operational check.

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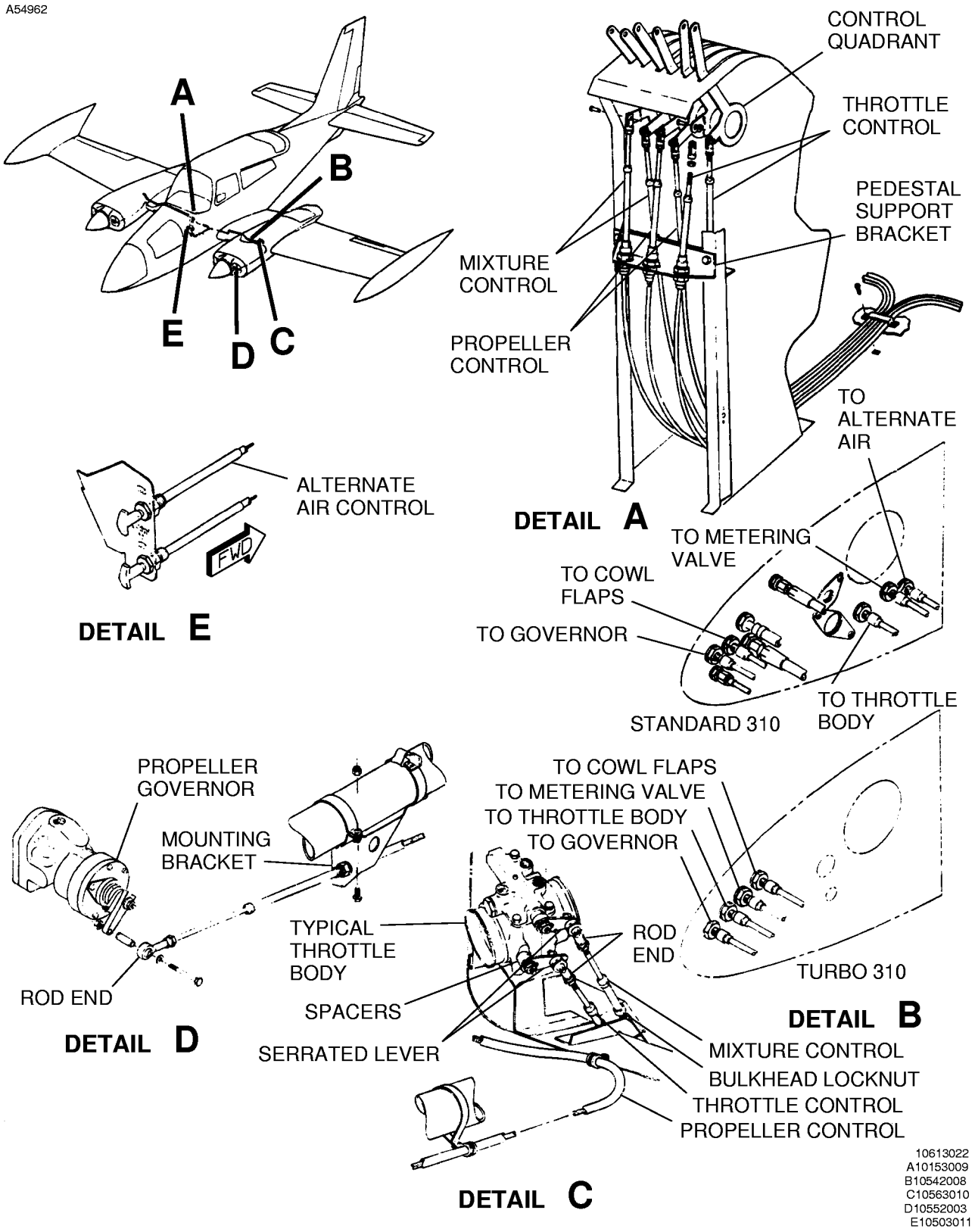

Engine Control System
Figure 403 (Sheet 1)

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POWER PLANT - INSPECTION/CHECK

1. Inspection of Engine

A. Perform the engine inspection as follows:
(1) Inspect all hoses (fuel-oil-vacuum) for deterioration, leaks, discoloration, bleaching, and stiffness.
(2) Inspect all fittings for thread damage, damage to chamfered seats, and replace fittings as necessary.
(3) Inspect oil separators for evidence of restrictions and clean as necessary. Visually inspect the engine cylinders for cracks, loose nuts and studs; baffles for cracks and security, push rod housings and rocker box covers for leaks, cracks, and security, crankcase, oil sump, and oil cooler for loose bolts, cracks, and leakage. Make necessary corrections and repairs in accordance with best shop practices and in compliance with applicable FAA regulations.
(4) Perform a cylinder compression check in accordance with the engine manufacturers operations manual. Refer to Engine Overhaul Manual for repair and servicing.

NOTE: Instructions concerning inspection of particular engine components, Refer to applicable paragraph in Engine Maintenance and Overhaul Manual, Continental Motors Corporation.

2. Engine Operational Check

CAUTION: Ground operation time should be held to a minimum to prevent overheating the engine. At no time should the engine temperatures be allowed to exceed their maximum limits. Do not operate the engine with cowling removed.

A. Perform the Engine Operational Check as follows:
(1) Park airplane with nose headed into prevailing wind and clear an area directly in front and to the rear of all objects that may be affected by the propeller and propeller slipstream.

CAUTION: Avoid engine run-up with airplane parked in an area where there is loose gravel. The propeller will pick up small stones which can damage propeller blades.

(2) Install wheel chocks and position a fire extinguisher for easy access in the event of engine fire.
(3) Release parking brake, if previously set, and test-operate brakes. Take note of any sponginess or excessive pedal travel. Reset parking brake after completion of test.

CAUTION: If parking brake action is not normal, do not perform engine run-up until corrective action is accomplished on the brake system.

(4) Refer to Owners Manual/Pilots Operating Handbook and perform ”Before Starting Engines” and “Starting Engines” procedures.
(5) Warm-up engines as follows:
(a) Throttles - 750 to 900 RPM.
(b) Fuel Flow Gage - 12 to 35 lbs/hr.
(c) Oil pressure 10 PSI minimum in 30 seconds in normal weather or 60 seconds in cold weather.
(d) Vacuum System 5.00 In. Hg., +0.25 or -0.25 In. Hg.
(e) Cowl flaps FULL OPEN.
(f) After the engine has reached normal operating cylinder head temperature and oil temperature, perform magneto ground-out check as follows:
1 Throttle engine back to idle RPM.
2 Momentarily switch both magnetos to OFF. RESULT: The tachometer will indicate a sudden RPM drop when magnetos cease firing.

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CAUTION: If magneto switches are left off for a prolonged period, after-firing may occur when they are switched back on. If the engine continues to run with switches off, stop engine by placing mixture control in idle cutoff and check magneto grounding circuit.

(g) Advance throttle to 1700 RPM and perform a magneto check as follows:
1 Place right magneto switch to OFF position and note RPM drop. Return switch to ON position. Repeat check with left magneto switch. RESULT: Engine speed should drop no more than a maximum differential between right and left magnetos of 50 RPM with no appreciable roughness.

(h) With engine at 1700 RPM, exercise the propeller as follows:
1 Retard the propeller pitch lever to obtain a 1200 RPM tachometer indication.
2 Return propeller pitch lever to HIGH RPM position. RESULT: During exercise, watch for any indication of sluggish or erratic operation.

(i) Make a mixture control check at 1000 RPM by slowly moving the mixture lever toward IDLE CUT-OFF. RESULT: When a slight drop in RPM is noted, immediately return mixture lever to FULL RICH position.

(j) Stop engine by placing the mixture lever in IDLE CUT-OFF. As soon as propeller has stopped turning, place ignition switches OFF. Turn all switches OFF.

CAUTION: Idle engines before shutting down engine to allow turbine bearings to cool. A minimum of five minutes idling should be allowed after full power run-ups or 2 to 3 minutes on run-ups of 1500 to 2000 RPM.

3. Engine/Cabin Vibration Check

NOTE: Vibration can be transmitted from the engine to the airplane structure from points of contact between engine components and the cowl, firewall, or engine mount. The following is a list of areas to be checked to ensure the engine is isolated from the airplane structure or to minimize the effect from components which must bridge between engine and structure.

A. Baffle to Cowl Clearance.
(1) Check inside of cowl for chafing; trim metal baffle as required. Repaint affected area and reinspect next flight.

B. Exhaust to Cowl.
(1) Check exhaust stack for clearance where it extends through cowl. Check stack and cowl for signs of interference. Enlarge cutout in cowl as required.

C. Induction Hose Clamps.
(1) Check induction hose clamp for clearance with the engine mount structure. Look for marks on engine mount. Rotate clamps as required.

D. Exhaust Couplings.
(1) Check exhaust couplings for clearance with the engine mount and/or nacelle structure and heat shields. Rotate couplings as required.

E. Breather and Overboard Dump Lines.
(1) Check all overboard dump lines from the engine for clearance with the firewall, cowl and/or cowl flap openings. Check cowl flap in both the open and closed positions. Reposition and reclamp to clear.

F. Engine Isolators.
(1) Check engine isolator bolt lengths. Bolts which are too long will shank out and will not apply the correct pressure to the isolator. Bolts must be removed to be properly checked. Replace with next size shorter bolt if barrel nut has shanked out.

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(2) Check isolators for aging and deterioration. Replace if rubber is separated from metal pad, there is cracking of the rubber, and/or pronounced set of the rubber pad.
(3) Check that the large snubbing washers on the lower mounts (if installed) have proper clearance with the engine mount structure.

G. Propeller.
(1) Check propeller track, refer to detailed inspection procedures.
(2) Check propeller for loose or binding blades, loose or missing attach bolts.
(3) Check propeller spinner for loose, damaged, or deformed parts and visual wobble.
(4) Check the propeller to ensure proper indexing with the engine crankshaft in compliance with Service Manuals (when applicable).
(5) Balance suspected propeller if roughness continues.

H. Engine Controls.
(1) Engine controls should be routed to provide a gentle curve between engine and firewall. They should not be stretched tight. Pull control through firewall, as required, and reclamp.
(2) Check engine controls behind engine for contact with engine. Reroute and reclamp controls, as required, to clear.

I. Starter Cable.
(1) Check starter cable for clearance with cowl and that a loop is provided for flexing.

J. Engine Condition.
(1) Check spark plugs for proper type and for fouling or improper gap.
(2) Check condition of ignition wiring.
(3) Check condition of points.
(4) Check magneto timing.
(5) Check engine compression.
(6) On fuel injection engines; check fuel injector nozzles for restriction and correct size. Check fuel pump settings and fuel distributor valve calibration and proper flow.
(7) On turbo charged engines:
(a) Check nozzle shrouds for leakage; check air induction for leaks and/or rubber couplings for proper seal.
(b) Check turbocharger for foreign object damage, binding, or worn bearing.
(c) Check exhaust slip joints for proper axial loads. Axial loads must not exceed 200 lbs.
(d) Check security of exhaust ducting.

K. Antenna Vibration.
(1) Check antenna if vibration tends to be related to airspeed rather than power setting.

L. Wheel Balance and Brake Disc Trueness.
(1) Wheel balance and brake disc trueness can be sources of vibration during the ground run on some airplanes. These should be checked as a part of the vibration diagnostic process if conditions indicate that they may be a problem.

M. Airframe Items.

NOTE: For low frequency vibration or "rumble" condition check the following:

(1) Check proper rigging of wing flaps, gear doors, and landing lights.
(2) Check external skins for excess oil canning.

N. Interior Items.

NOTE: The following interior items can amplify normal vibration levels resulting in discomfort reports.

(1) Check instrument panel for loose panels and interference among components attached to the instrument panel.
(2) Check for excessive play on control mechanisms.
(3) Check the cabin divider and attaching components for proper security.

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POWER PLANT - CLEANING/PAINTING

1. Cleaning of Engine

A. Requirements.
(1) Engine and accessories washdown for inspection and for maintaining safe operating conditions.

NOTE: External engine cleaning effective in preventive maintenance, early detection of leaks, parts chafing, etc.

B. Washdown Method.
(1) It is recommended that a low pressure (20 PSI) spray gun be used to distribute cleaning agents over engine and components.
(2) A stiff bristle fiber brush is recommended if cleaning agents do not remove excess grease and grime during spraying.

NOTE: Do not use steel brushes for cleaning operations.

C. Procedure.
(1) Remove engine cowling.

CAUTION: Do not attempt to wash an engine which is still hot or running. Allow engine to cool for a minimum of 60 minutes before cleaning. Do not proceed to wash engine down until precautions are taken to close or seal all openings or areas which may be affected by cleaning solutions or water.

(2) Enclose the starter, magnetos, overboost valve, alternator, and turbo controller with plastic bags and seal, liquid tight, with tape or rubber bands.
(3) For removal of oil or grime use a cleaning agent described in Tools and Equipment.

NOTE: The cleaning agent should never be left on engine components for an extended period of time. Failure to remove cleaning agents may cause damage to neoprene seals, silicone fire sleeves, etc.

(4) Thoroughly rinse with clean, warm water to remove all traces of cleaning agents.

2. Vacuum System Components

A. Cleaning.

WARNING: Failure to protect the pneumatic system components from contamination by engine cleaning solvents may result in failure of the dry air pump within a short period of operation.

(1) Prior to washing down engine compartment, the following precautions must be taken to assure expected service life of the pneumatic system components.
(a) Dry air pump coupling.

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CAUTION: Do not blast the air pump coupling area or other pneumatic system components with cleaning solvent under high pressure. Do not allow protective covering around the coupling or filters to become saturated with solvent.

1 Protect the coupling area between the pump mounting flange and the pump housing by wrapping a protective covering around that area during engine cleaning.

NOTE: The seals in the front frame of the housing behind the coupling are designed to keep out foreign material such as dirt, dust and light fluid. However, fluid under high pressure can be forced by the seals and enter the pump combining with the carbon dust to create a gumming condition which will cause pump failure.

(b) Dry air pump fittings.
1 Before washing the engine off, check the pump fittings for looseness of the threaded fittings. Fluid can seep through loose threads and enter the pump.

(c) Dry air pump discharge hose (vacuum instrument system).
1 Recommendation is to plug the end of the hose or the fitting, and flag it with a red REMOVE BEFORE RUNNING ENGINE tag; then, clean the engine.

CAUTION: Remove plug prior to running engine.

(d) Deice control valve.
1 If the deice control valves are in the engine compartment, install some protective devices before the airplane engine and area are cleaned.

CAUTION: Make sure the protective devices are removed after the engine and area are cleaned.

2 Check the area in and around the valves to ensure they are dry and free of any cleaning fluids prior to running the engine.

3. Engine Compartment

A. Cleaning.
(1) Spray engine compartment with a suitable solvent and allow to drain and air dry.

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ENGINE COWLING - DESCRIPTION AND OPERATION

1. Engine Cowling

A. Description.
(1) The engine nose cowling is a two piece fiberglass cowling secured to the lower section of the engine cowling and connected in the center of the nose cap.
(2) The upper engine cowling is a one piece bonded honeycomb construction, with fasteners on the four sides of cowl.

2. Engine Cowl Flaps

A. Description.
(1) Engine cowl flaps are utilized to exhaust hot air from each engine nacelle on both the 310 and Turbo 310 airplanes. The cowl flaps are operated by the push-pull controls mounted on the control pedestal.
(2) (Standard 310) The cowl flap is located below the louvers of the upper engine cowl of each engine, inside the engine compartment. The system consists of the control cable, cowl flap, and mechanical linkage.
(3) (Turbo 310) The cowl flap is located on the lower engine nacelle of each engine. The system consists of the control cable, cowl flap and mechanical linkage.

3. Engine Baffles

A. Description.
(1) The sheet metal baffles installed on each engine direct the flow of air around the cylinders and other engine components. These baffles incorporate seals at points of contact with the engine nacelle to help confine and direct the airflow-to the desired area. It is very important to engine cooling to install the baffles properly.

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ENGINE COWLING - REMOVAL/INSTALLATION

1. Engine Cowls

A. Removal (Refer to Figure 401).

NOTE: The removal procedures are the same for either engine.

(1) Release fasteners retaining side doors to upper cowl assembly.
(2) Release fasteners retaining upper cowl assembly to engine nacelle structure and nose cap and remove upper cowl assembly.
(3) Remove screws attaching lower portion of cowls to engine beam assembly.
(4) Release fasteners retaining nose cap assemblies to forward engine mount beam.
(5) Remove screws securing nose cap assemblies together and remove nose cap assemblies.

NOTE: To remove oil filler door from upper cowl section, pull hinge pin.

B. Installation (Refer to Figure 401).
(1) If removed, install oil filler door on upper cowl section with hinge pin.
(2) Install lower cowl to engine beam assembly.
(3) Assemble nose caps and install on forward engine beam with fasteners.
(4) Position upper cowl in place and secure with fasteners.
(5) Install cowl doors to upper cowl assembly.

2. Engine Cowl Flaps (Standard 310)

A. Removal (Refer to Figure 402).

NOTE: The removal procedures are the same for either engine.

(1) Remove upper engine cowl.
(2) Disconnect pushrod (21) from bracket (22) by removing nut, washer, and bolt.
(3) Remove hinge pin (11) securing cowl flap (23) and remove cowl flap.

B. Installation (Refer to Figure 402).
(1) Align cowl flap (23) to hinge half and install hinge pin (11).
(2) Connect pushrod (21) to bracket (22) using bolt, washer, and nut.
(3) Install upper engine cowl.

3. Cowl Flap Crank Assembly (Standard 310)

A. Removal (Refer to Figure 402).
(1) Remove upper engine cowl.
(2) Open cowl flap.
(3) Disconnect spring (18) from eyebolt (19).
(4) Disconnect pushrod (21) from crank assembly (20) by removing nut, eyebolt (19), washers, and spacer (RH only).
(5) Disconnect control cable (12) from crank assembly (20) by removing nut, bolt (13), spacer, and washer.
(6) Remove crank assembly (20) from bracket (16) by removing nut, washer, bolt (17), and tube (14).

B. Installation (Refer to Figure 402).
(1) Install tube (14) in crank assembly (20); position crank assembly in bracket (16) and secure with bolt, washer, and nut.
(2) Secure control cable (12) to crank assembly (20) using bolt (13), washers, spacer (RH only), and nut.
(3) Connect pushrod (21) to crank assembly (20) using eyebolt (19), washer, spacer, and nut.
(4) Connect spring (18) from tab (15) to eyebolt (19).
(5) Check for proper operation and install upper engine cowl.

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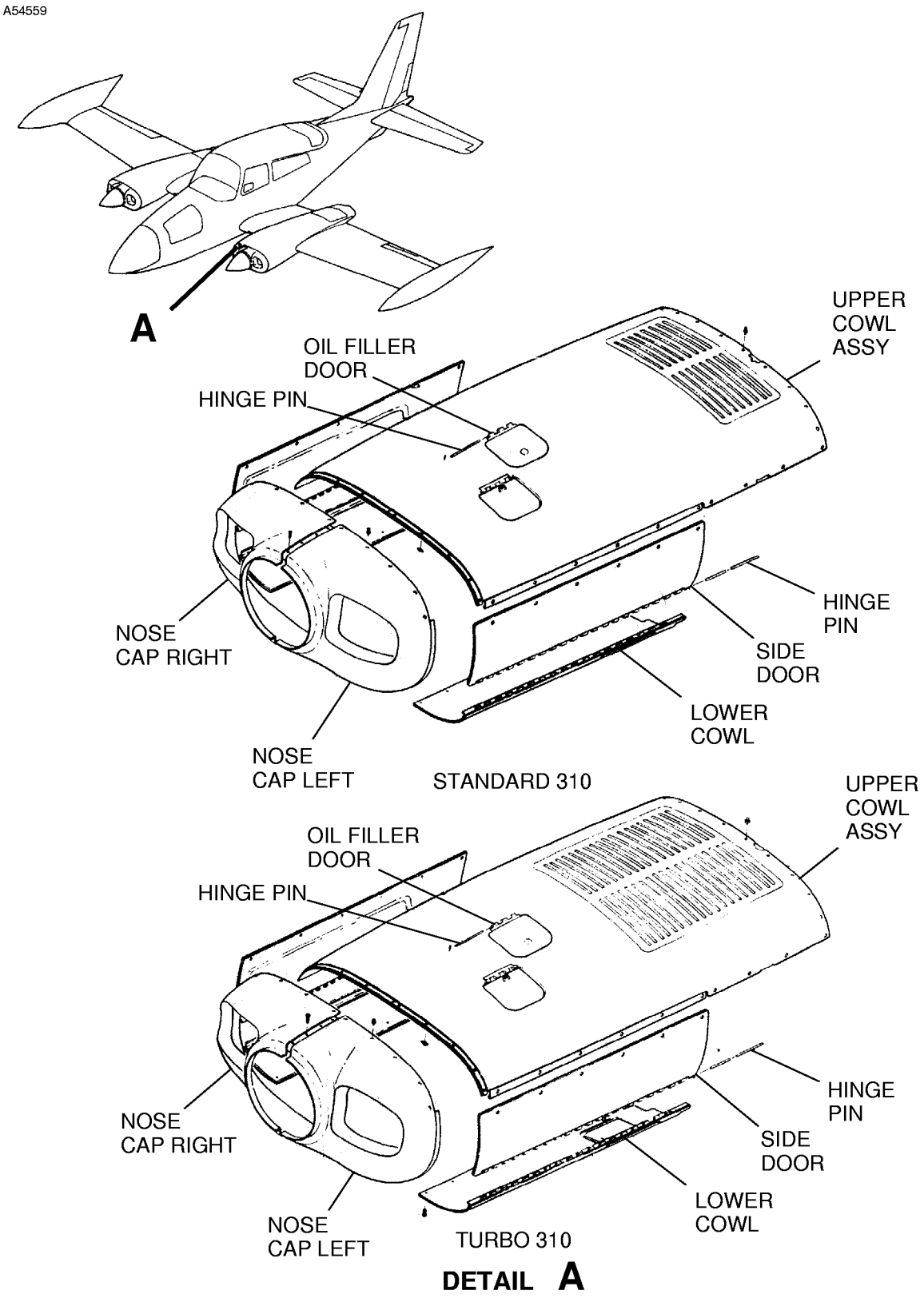

Engine Cowling
Figure 401 (Sheet 1)

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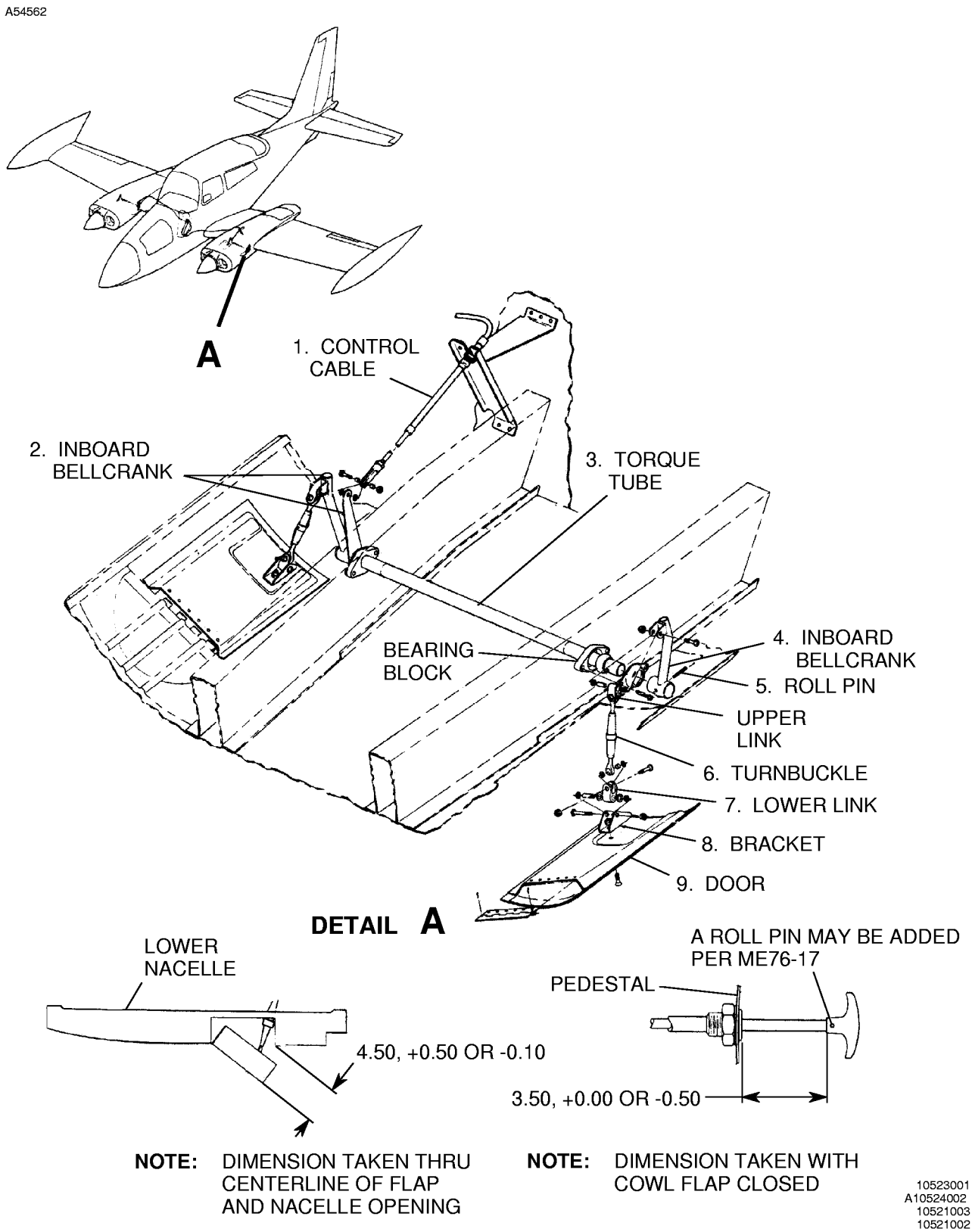

Cowl Flap
Figure 402 (Sheet 1)

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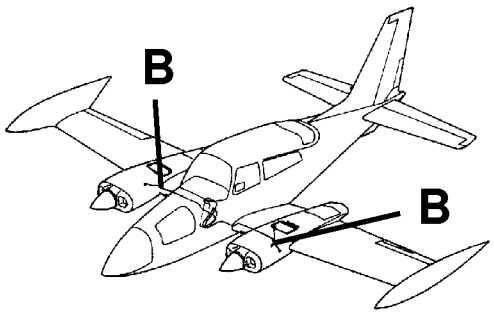

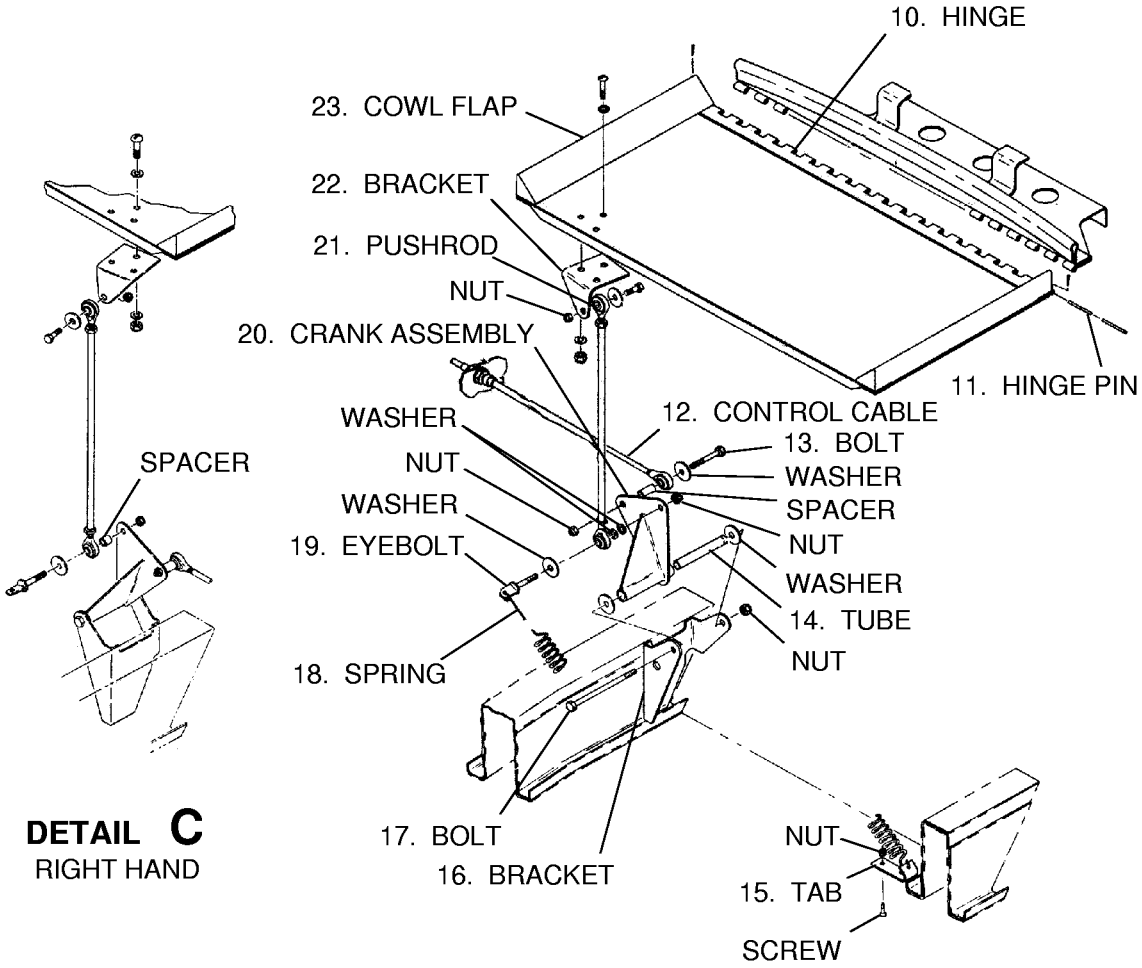

DETAIL C
RIGHT HAND

DETAIL B
STANDARD 310
LEFT HAND

10523002
B10523003
C10522005

Cowl Flap
Figure 402 (Sheet 2)

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4. Cowl Flap Control Cable (Standard 310)

A. Removal (Refer to Figure 402).
(1) Remove engine cowling.
(2) Remove center panel and control cover from control pedestal.
(3) Open cowl flaps.
(4) Disconnect clevis end of control cable (12) from crank assembly (20) by removing nut, bolt (13), washer, and spacer.
(5) Remove nuts retaining control cable (12) to nacelle rib.
(6) Loosen nut retaining control cable (12) to pedestal.
(7) Tie guide wire to control cable (12) and route from wing to pedestal.

B. Installation (Refer to Figure 402).
(1) Connect control cable (12) to guide wire and route into position from pedestal to wing.
(2) Position control cable (12) in pedestal and install nut.
(3) Install cable through nacelle rib and install nut.
(4) Connect control cable (12) to crank assembly (20) using bolt (13), washer, spacer, and nut.
(5) Refer to Engine Cowling - Adjustment/Test and rig cowl flaps.
(6) Replace access covers and engine cowl.

5. Engine Cowl Flaps (Turbo 310)

A. Removal (Refer to Figure 402).

NOTE: The removal procedures are the same for either engine.

(1) Open cowl flaps.
(2) Disconnect lower link (7) from bracket (8) on door assembly (9) by removing attaching nut and bolt.
(3) Remove hinge pin from hinge halves and remove door assembly (9) from engine nacelle.

B. Installation (Refer to Figure 402).
(1) Position door assembly (9) to engine nacelle hinge half and insert hinge pin.
(2) Connect lower link (7) to bracket (8) on door assembly (9) and install attaching bolt and nut.
(3) Secure hinge pin by installing cotter pins in hinge half.

6. Torque Tube Assembly (Turbo 310)

A. Removal (Refer to Figure 402).
(1) Position cowl flaps to OPEN.
(2) Disconnect turnbuckle (6) from inboard bellcrank assembly (2) by removing nut, bushing, washers, and screws attaching upper link to bellcrank.
(3) Disconnect control cable (1) from bellcrank (2) by removing nut, bushing, washer, and bolt.
(4) Unsafety and remove roll pin securing outboard bellcrank (4) to torque tube assembly (3).
(5) Remove torque tube assembly (3) from engine nacelle through the inboard cowl flap opening.

B. Installation (Refer to Figure 402).
(1) Insert torque tube assembly into position through the inboard cowl flap opening.
(2) Install outboard bellcrank (4) to torque tube assembly (3). Install roll pin (5) and safety wire to bellcrank (4).
(3) Connect control cable (1) to bellcrank (2) by installing bolt, bushing, washer, and nut.
(4) Connect turnbuckle (6) to inboard bellcrank assembly (2) by installing screw, bushing, washer, and nut attaching upper link to bellcrank.

7. Cowl Flap Control Cable (Turbo 310)

A. Removal (Refer to Figure 402).
(1) Remove engine cowling.
(2) Remove center panel and control cover from central pedestal.
(3) Open cowl flaps.

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(4) Disconnect clevis end of control cable (1) from inboard bellcrank (2) by removing attaching nut, bushing, washer, and bolt.
(5) Remove nuts retaining control cable (1) to nacelle bracket.
(6) Loosen nut retaining control cable (1) to pedestal.
(7) Tie guide wire to control cable (1) and route from wing to control pedestal.

B. Installation (Refer to Figure 402).
(1) Connect control cable (1) to guide wire and route into position from pedestal to wing.
(2) Position control cable (1) in pedestal and install nut.
(3) Install cable into nacelle bracket and install nut.
(4) Connect control cable (1) to inboard bellcrank (2) with bolt, washer, bushing, and nut.
(5) Refer to Engine Cowling - Adjustment/Test and rig cowl flaps.
(6) Replace access covers and engine cowling.

8. Engine Baffles

A. Removal (Refer to Figure 403).
(1) Remove upper engine cowling.
(2) Remove lower engine cowling by removing attaching screws.
(3) To remove right and left baffles (5, 6, and 7), remove the upper rocket box cover screws which attach baffles.
(4) To remove the forward left baffle (13), by removing attaching screws.
(5) Remove bolts from left and right aft supports (4) and forward intercylinder supports (10) and remove forward inboard intercylinder baffles (11), forward outboard intercylinder baffles (12), aft inboard intercylinder baffles (8), and aft outboard intercylinder baffles (9).
(6) Remove forward center baffle (14) by removing attaching screws.

NOTE: To gain access to baffle (15), remove alternator and route alternator wiring to aft nacelle section.

(7) Remove forward right baffle (15) by removing attaching screws.
(8) Remove fasteners from right aft baffle (16), remove attaching screws from baffle support and aft center baffle and remove right aft baffle (16).
(9) Remove screws securing left aft baffle from aft center baffle and bracket (2).
(10) Disconnect fuel lines, pressure lines, and oil lines necessary to remove rear baffles.
(11) Remove aft baffle (3) by removing attaching screws to oil cooler and aft cylinder rocker box cover mounting screws.

B. Installation (Refer to Figure 403).
(1) Install aft baffle (3) in position and attach to aft cylinder rocker box cover mounting screws and attaching screws around the oil cooler.
(2) Attach aft center baffle to left aft baffle with attaching screws.
(3) Install right aft baffle (16). Attach to baffle support and connect fasteners together around cylinder.
(4) Install both right and left aft side baffles (5), center baffles (6), and forward side baffles (7) by securing under rocker box cover upper mounting screws.
(5) Install aft inboard intercylinder baffles (8), aft outboard intercylinder baffles (9), and aft supports (4) with bolts.
(6) Install forward outboard intercylinder baffles (12), forward inboard intercylinder baffles (11), and forward intercylinder supports (10) with bolts.
(7) Install forward right baffle (15) with attaching screws.
(8) Install forward center baffle (14) attaching to forward right baffle (15) with attaching screws.
(9) Install forward left baffle (13) to center baffle (14) and attach with screws.
(10) Install alternator, route electrical wiring through baffles and connect.
(11) Route oil lines, fuel lines, and pressure lines and connect.
(12) Install engine cowling.

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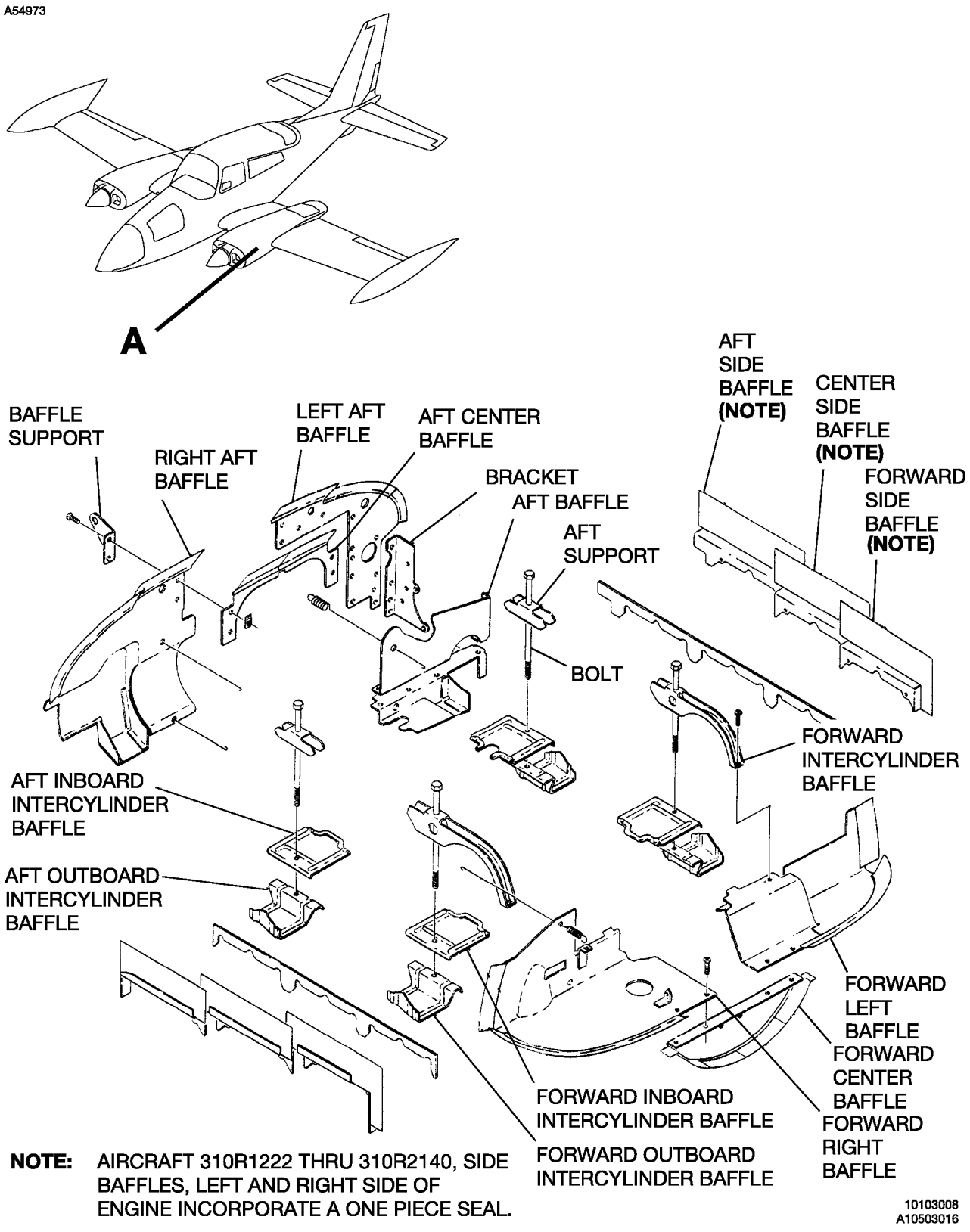

Engine Baffle Installation
Figure 403 (Sheet 1)

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ENGINE COWLING - ADJUSTMENT/TEST

1. Rigging of Cowl Flaps (Standard 310)

A. Rig the cowl flaps by performing the following (Refer to Figure 501):
   (1) Pull control cable handle to CLOSE position.
   (2) With control cable (12) disconnected from crank assembly (20), position crank assembly in bracket (16) so bottom attach bolt (17) and eyebolt (19) holes are perpendicular on the crank assembly (20). The crank assembly will be positioned to just before the overcenter condition outboard or inboard.
   (3) Adjust control cable (12) length at nacelle rib, so control cable clevis will align with crank assembly hole at position described in step (2). Tighten control cable nuts.
   (4) Connect control cable (12) to crank assembly (20) using bolt (13), washer, spacer, and nut.
   (5) Adjust pushrod (21) until cowl flap seal fits snug against the bottom surface of the cowl.
   (6) Check cowl flap for smooth and proper operation.

2. Rigging of Cowl Flaps (Turbo 310)

A. Rig the cowl flaps by performing the following (Refer to Figure 501):
   (1) Position cowl flaps to OPEN.
   (2) Locate the centerline of cowl flap door (9) and nacelle opening. Measure the distance of travel for 4.50 inches, +0.50 or -0.10 inches.
   (3) Adjust travel of flap doors by increasing or decreasing the length of clevis end on control cable (1).
   (4) Close cowl flaps.
   (5) Check the extension of control handle for not more than 3.50 inches, +0.00 or -0.50 inches of travel from control pedestal.

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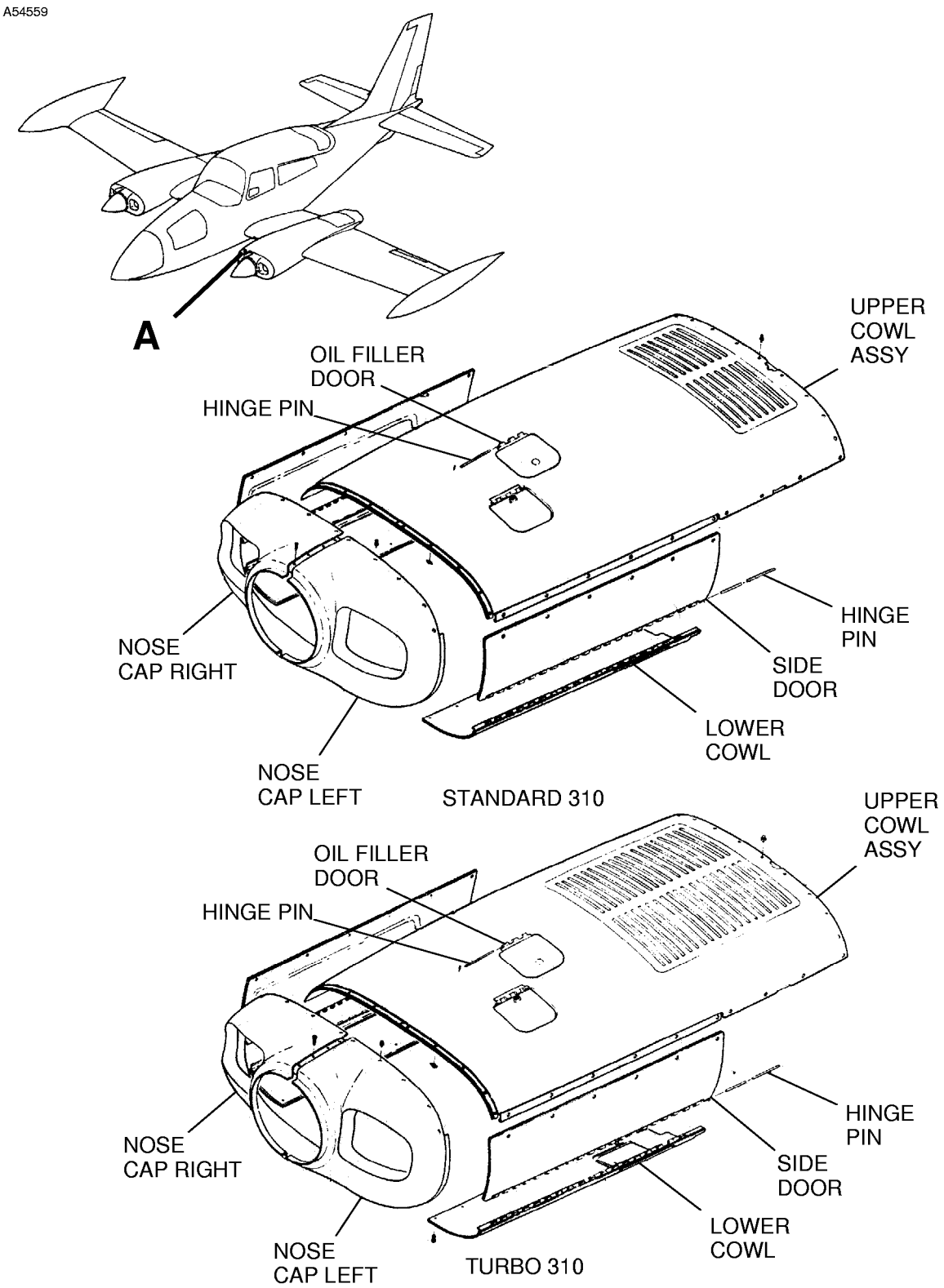

Engine Cowling
Figure 501 (Sheet 1)

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ENGINE COWLING - INSPECTION/CHECK

1. Engine Cowling

A. Inspection.
(1) Visually inspect cowling for cracks, elongated holes, abrasions, and wear due to rubbing. Refer to Chapter 51, Damage - Approved Repairs for repair of engine cowling. Check baffle for evidence of rubbing cowling, clear as required.

2. Cowl Flaps

A. Inspection.
(1) Open cowl flaps.
(2) Visually inspect cowl flap for cracks, elongated holes, abrasions, and wear due to rubbing. Refer to Chapter 51, Damage - Approved Repairs for repair of engine cowl flaps.
(3) For model T310R airplanes only.
(a) Locate the centerline of cowl flap door and nacelle opening. Measure the distance of travel for 4.50 inches, +0.50 or -0.10 inches.
(b) Check the extension of control handle for not more than 3.50 inches, +0.00 or -0.50 inches of travel from control pedestal.
(4) Check cowl flaps in closed position fits tight against the cowl.
(5) Check cowl flap for smooth operation.

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ENGINE COWLING - CLEANING/PAINTING

1. Engine Cowling

A. Painting Heat Resistant Paint Surfaces. Refer toFigure 701 .

(1) Surfaces to receive heat resistant enamel shall be chemically film treated with Iridite 14-2 in accordance with the manufacturer's instructions.

(2) Fiberglass surfaces should be lightly sanded and solvent cleaned.

(3) Heat resistant enamel paint may be reduced 1 to 2 volumes of Xylene or Toluene to 1 volume base.

(4) Heat resistant enamel should be spray coated to yield a film thickness of 0.001 to 0.0015 inch.

(5) Heat resistant enamel may be force dried by 250 to 300 degrees Fahrenheit for 45 minutes. Allow 30 minutes to air dry at room temperature prior to force drying.

NOTE: Clean spray equipment immediately with methyl propyl ketone.

NOTE: Heat resistant enamel is not required on the polyurethane finish.

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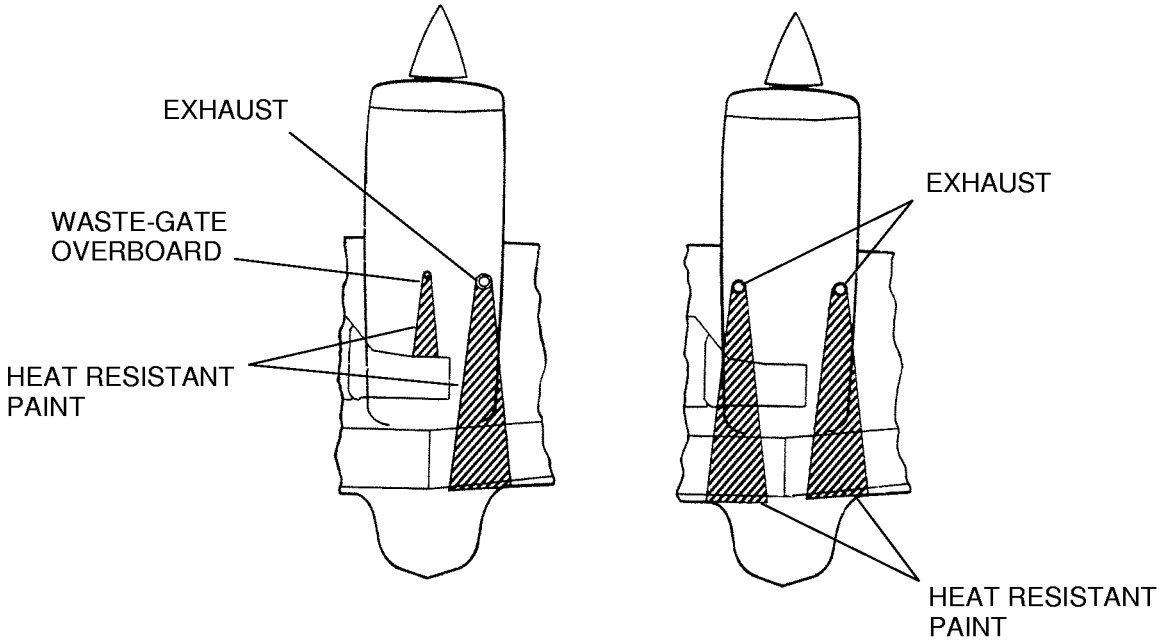

Heat Resistant Paint Locations
Figure 701 (Sheet 1)

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ENGINE MOUNTS - DESCRIPTION AND OPERATION

1. Engine Mounts

A. Description.

(1) The engine mounts consist of four mounts with each mount incorporating two rubber pads, one washer, one spacer, one bolt, and a lockwasher.

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ENGINE MOUNTS - REMOVAL/INSTALLATION

1. Engine Mounts

A. Removal (Refer to Figure 401).

NOTE: The engine must be supported with an engine hoist before attempting removal of engine mount. If engine is going to be removed, refer to Power Plant - Removal/Installation for parts to be disconnected.

(1) Remove engine cowling.
(2) Place suitable support under tailcone.
(3) Remove bolt (4) and lockwasher from mount.
(4) Disconnect hose between throttle body and engine air intake manifold.
(5) Disconnect oil separator drain hose (Turbo 310) from overboard drain tube.
(6) Disconnect intake manifold drain line from manifold.
(7) Hoist engine slowly to a height of 2 to 3 inches above normal mounting position.

NOTE: Care should be taken not to introduce adverse stresses on other items attached to engine while hoisting engine.

(8) Remove upper mount (1), spacer (2), and lower mount (3) from fitting assembly.

B. Installation (Refer to Figure 401).
(1) Install lower mount (3) to fitting assembly.
(2) Assemble upper mount (1) and spacer (2) to fitting assembly and install lockwasher and bolt (4).
(3) Torque bolt to 300 inch-pounds, +50 or -00 inch-pounds.
(4) Lower engine hoist and remove.

NOTE: Check the area between the exhaust riser of number six cylinder and the lower cowl panel. If the area does not have sufficient clearance, 0.40 inch minimum refer to shimming procedures located in Engine Mounts - Adjustment/Test and install shims to obtain proper clearance.

(5) Safety bolt (1) by using tool SE608 making sure the ears of lockwashers lock over the flat surfaces on the bolt head.
(6) Connect intake manifold drain line to manifold.
(7) Connect oil separator drain line hose to overboard drain line.
(8) Connect hose between throttle body and air intake manifold.
(9) Install cowling.

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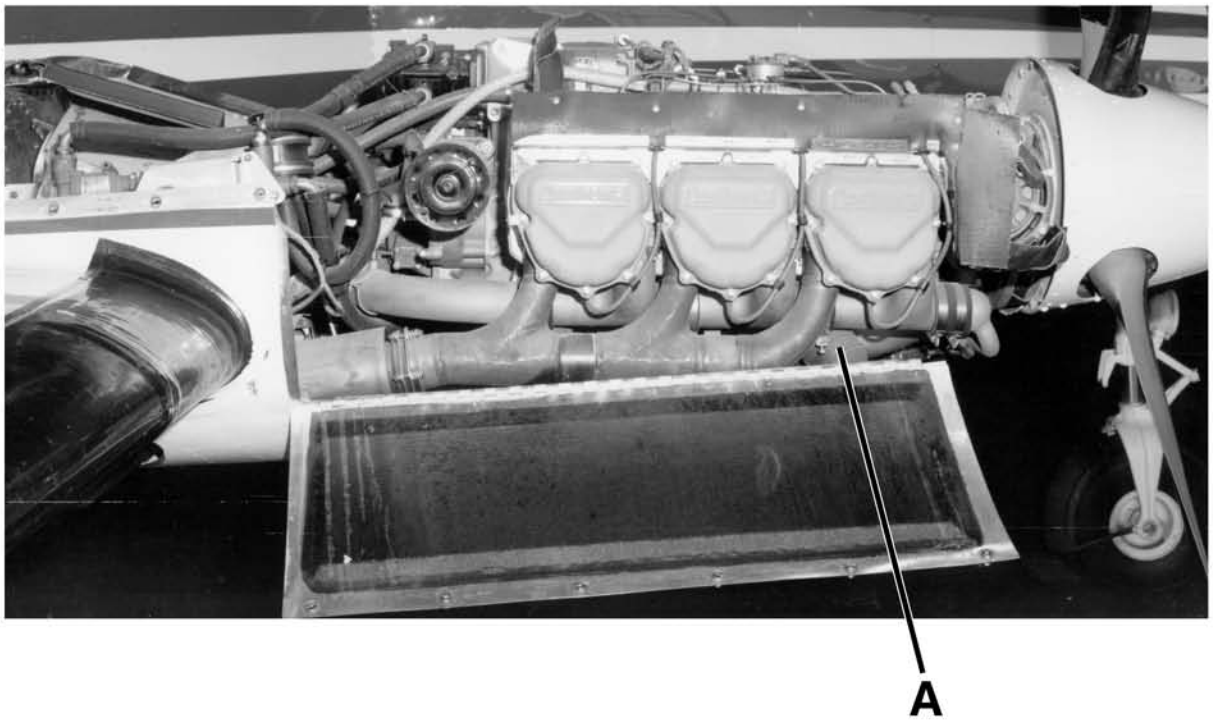

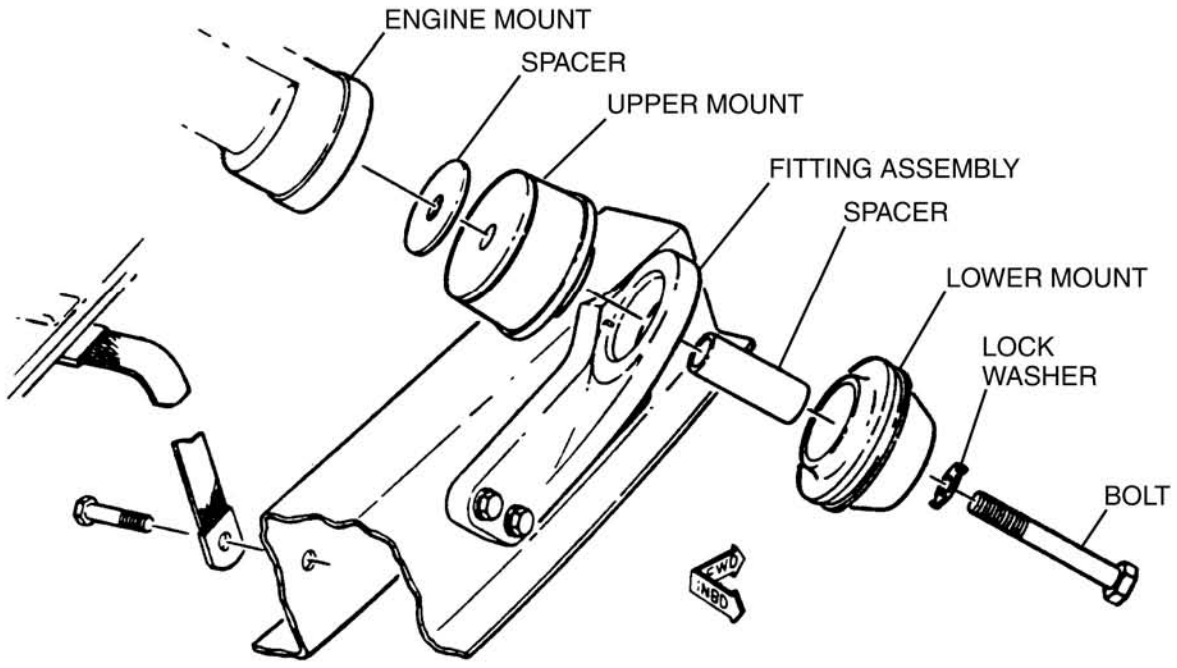

DETAIL A
ENGINE MOUNT INSTALLATION

1055P1021
A10511003

Engine Mount Installation
Figure 401 (Sheet 1)

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ENGINE MOUNTS - ADJUSTMENT/TEST

1. Shimming the Engine Mounts

A. Although engine mount sag is normal and occurs over period of time in-service, it can be corrected by shimming the mount back to its original position with spacers. Engine mount sag which has resulted in a loss of clearance between the engine mount and/or cowling components should be corrected by shimming (Refer to Figure 501).

B. If the area between the exhaust riser of number six cylinder and the lower cowl panel does not have sufficient clearance, 0.40 inch minimum, shim engine mounts as follows:
(1) Remove engine cowling.
(2) Hoist engine and support as required to insert spacers.

NOTE: Spacers may be obtained from a Cessna Service Station. Refer to the Tool and Equipment table in Power Plant - General for part number and thickness desired. If the total thickness of spacers installed on any mount exceeds 0.312 inch, the mount must be removed and inspected in accordance with Engine Mounts - Inspection/ Check.

(3) Insert spacers between the engine fitting assembly and upper mount (1) as required to obtain 0.40 inch minimum clearance.

NOTE: Align propeller spinner with cowling nose cap contours, to assist in determining correct engine mount position.

CAUTION: For each 0.125 inch spacer thickness added, it will be necessary to add the next length longer bolt in engine mount.

(4) Secure engine mount in place and safety in accordance with engine mount installation procedures.
(5) Remove engine hoist and recheck all clearances, especially in the exhaust stack area.
(6) Safety bolts (4) with lockwashers, using engine mount wrench SE608.

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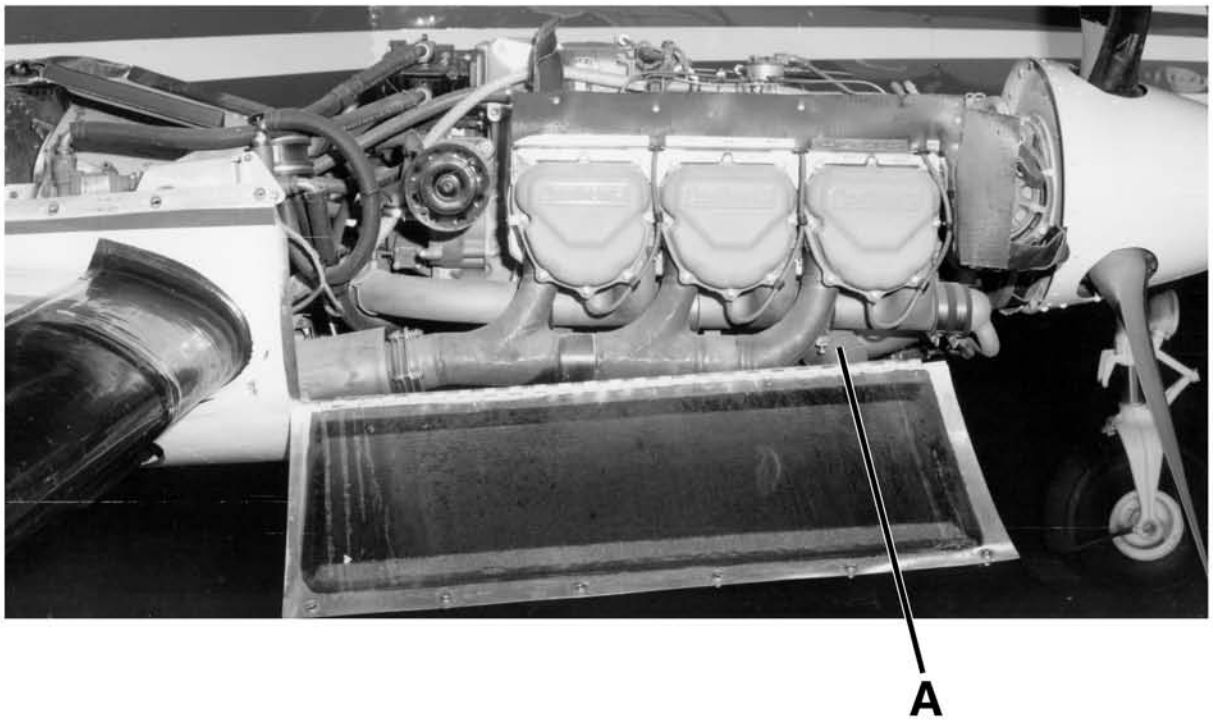

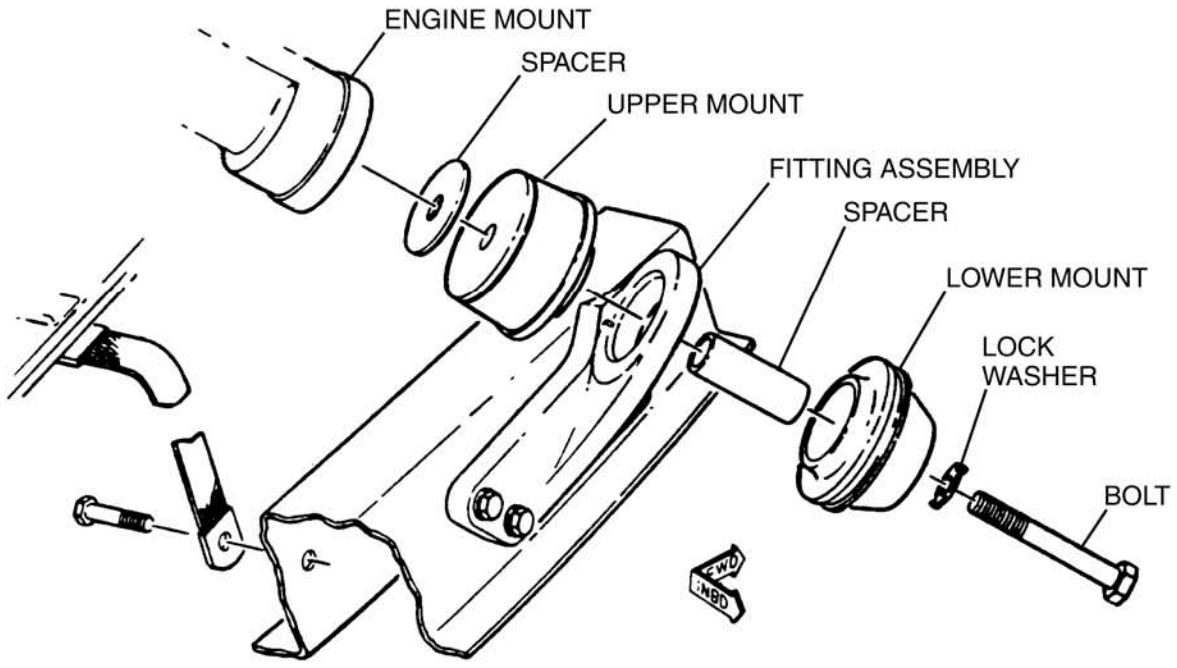

DETAIL A
ENGINE MOUNT INSTALLATION

1055P1021
A10511003

Engine Mount Installation
Figure 501 (Sheet 1)

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ENGINE MOUNTS - INSPECTION/CHECK

1. Engine Mounts

A. Inspection.

(1) Clean engine mounts, refer to Engine Mounts - Cleaning/Painting. Inspect engine mounts for security, safetying, looseness, deterioration, cracked fittings, localized burning, blistering, sagging, and end separation. Check engine sag. If the area between the exhaust riser of number six cylinder and the lower cowl panel does not have a minimum of 0.40 inch clearance, refer to Engine Mounts - Adjustment/Test and install engine mount shims. Refer to Table 601 and Figure 601 for inspection requirements. At each engine overhaul period, it is recommended that engine mounts be replaced. Engine mounts which have been replaced prior to the normal engine overhaul may be reused providing dimensions are within inspection requirements (Refer to Figure 601).

Table 601. Engine Mounts Inspection Limits

Airplane Model	Engine Model	Mount Assembly	Mount Component	Maximum "A" Eccentricity	Minimum "B" Thickness
310R	IO520M	J-9613-58	J-9612-32 J-9612-32	0.12 Inch 0.12 Inch	1.20 Inch 1.20 Inch
T310R	TSIO520B	J-9613-58	J-9612-32 J-9612-32	0.12 Inch 0.12 Inch	1.20 Inch 1.20 Inch

2. Engine Support Structure

A. Inspection.

(1) Remove the engine beam insulation blankets and visually inspect the engine beams (concentrating on the area of the beam between the canted bulkhead and the firewall), the canted bulkhead, and the firewall for any signs of distress, including corrosion, chafing, or cracking. Refer to MEB99-7.

NOTE: If the visual inspection of the specified area on an engine beam or a canted bulkhead cannot be conducted due to a structural repair covering the area, contact and provide Cessna Propeller Aircraft Product Support (Telephone (316) 517-5800, Facsimile (316) 942-9006) with detailed information of the repair.

(2) At any indication of exhaust gas leak or an engine fire, remove heat blanket, and inspect per MEB99-7. If conditions found are beyond the scope of MEB99-7, contact Cessna Propeller Aircraft Product Support for assistance.

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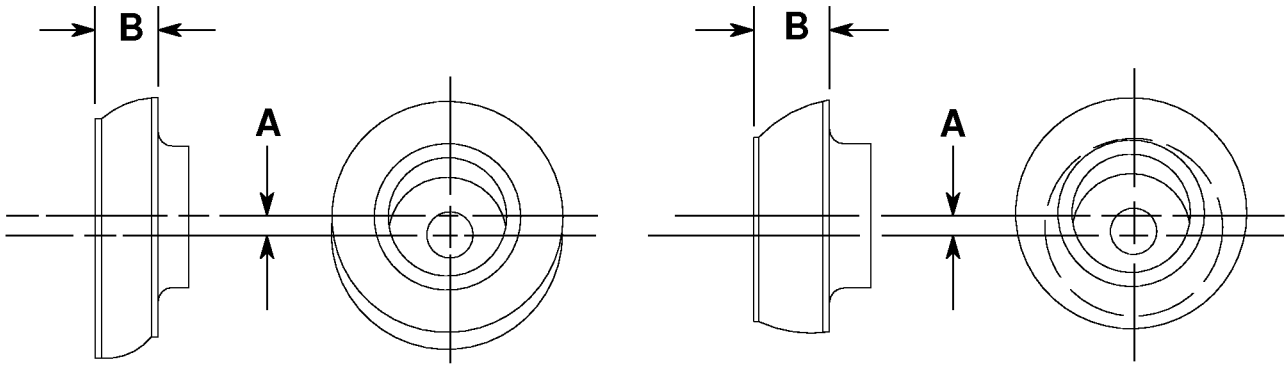

FLAT (UPPER PAD)

CONICAL (LOWER PAD)

10511001
10511002

Engine Mount Inspection Limits
Figure 601 (Sheet 1)

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ENGINE MOUNTS - CLEANING/PAINTING

1. Engine Mounts

A. Cleaning.
(1) Clean engine mounts with a suitable solvent.

NOTE: Never use a wire brush or sandpaper to clean engine mounts.

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ELECTRICAL HARNESS - INSPECTION/CHECK

1. Engine Wire Bundles

A. Inspection.

(1) Wire bundles should be wiped clean with a dry cloth. DO NOT use solvents. Inspect the wire bundles for security, chafing, burning, defective insulation, loose or broken terminals, heat deterioration, and corroded terminals. Inspect wire bundles in high heat areas, such as close proximity of exhaust stacks or turbocharger for heat damage. If wire bundles are damaged they should be replaced. Wire bundles should be clamped out of high heat areas.

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AIR INTAKES - DESCRIPTION AND OPERATION

1. Air Induction System

A. Description.

(1) The engine induction air system consists of air routed from the air canister filter assembly to the throttle body on 310 airplanes and routed from the air canister filter through the turbocharger to the throttle body on Turbo 310 airplanes. A manually controlled alternate air valve is located on the air canister to provide alternate air (heated engine compartment air) should the air induction filter become clogged or if a requirement for heated air is needed. The engine right and left manifold are interconnected by an induction air pressure balance tube. A drain line is routed from the balance tube to a drain valve. The drain valve allows raw fuel to drain from the induction manifold during period of shutdown, yet prevents induction air leaks during engine operation (Refer to Figure 1).

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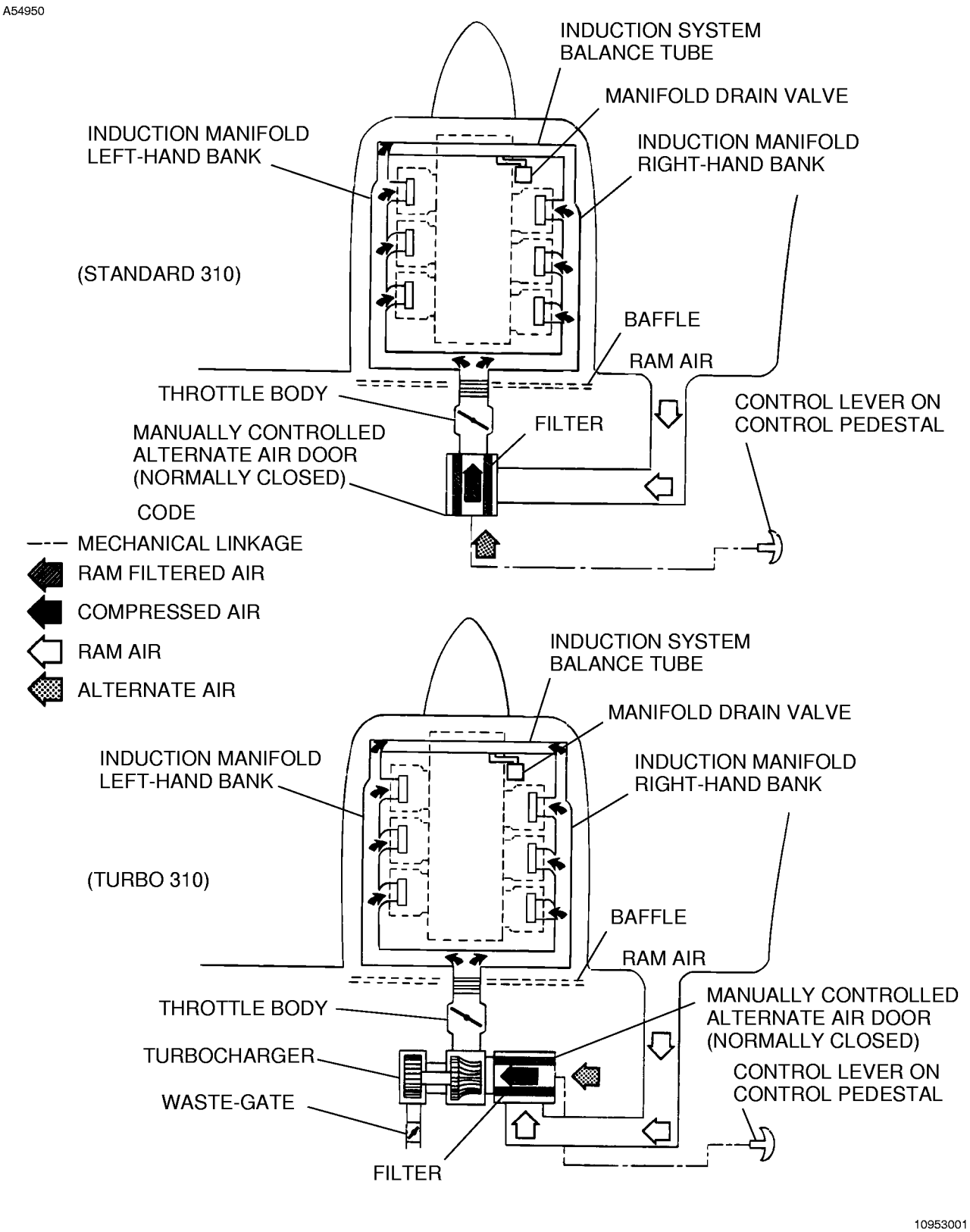

Induction Air Schematic
Figure 1 (Sheet 1)

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AIR INTAKES - TROUBLESHOOTING

1. Air Induction Troubleshooting

A. For troubleshooting engine induction air system, refer to Table 101

Table 101. Controller and Waste-Gate Actuator

TROUBLE	PROBABLE CAUSE	CORRECTION
UNABLE TO GET RATED POWER DUE TO LOW MANIFOLD PRESSURE.	Not enough oil pressure to close the waste-gate.	Check pump outlet pressure lines, oil filter, and external lines for obstructions. Clean, replace or repair as required.
	Chips under metering and/or poppet valves in controllers, holding them open.	Flush out controller or replace if necessary.
	Capillary tube in actuator is obstructed.	Clean capillary tube.
	Actuator piston seal has excessive oil leakage.	Replace actuator.
	Pressure ratio controller has too low of setting and is cutting in at altitude below 16,000 feet.	Adjust pressure ratio controller.
	Leak in exhaust system.	Replace failed exhaust system components.
	Manifold pressure relief valve is stuck open.	Replace relief valve.
	Leak in induction air system.	Repair or replace induction air system.
LOW POWER OR INSUFFICIENT MANIFOLD PRESSURE.	Leak in induction air system.	Repair or replace induction air system.
	Leak in exhaust system.	Replace or repair exhaust system.
	Improper alignment and/or obstruction of air inlet ducts, canister and filter element.	Align ducts, clean or replace filter.
	Hot nacelle air leaking into induction system.	Rig alternate induction air door.
	Waste-gate not closing properly.	Refer to Turbocharger and Controls Overhaul/Parts Manual and check rigging of waste-gate actuator.
	Wrong manifold relief valve installed.	Replace relief valve.
	Waste-gate actuator leaking oil.	Replace waste-gate actuator.
	Low engine oil pressure in flight.	Verify that engine oil pressure remains in upper half of green arc during cruise.

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Table 101. Controller and Waste-Gate Actuator (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
	CAUTION: If low oil pressure is encountered during flight check, reduce power to minimum cruise and allow oil to cool to the lower sector of the green arc. Open cowl flaps to aid in cooling the oil temperatures. Upon attainment of the cooler oil temperature, apply power and recheck the boot strapping power level. If a marked improvement is attained, correct oil pressure or isolate the overheating cause. **NOTE:** This verification can be made on the ground but must be reasserted in flight with oil temperatures in normal limits. Adjust pressure relief valve if necessary to obtain proper oil pressure.	
ENGINE SURGES OR SMOKES.	Metering valve stem seal broken in one of the controllers, leaking oil into manifold.	Replace or repair controller. Refer to Turbocharger and Control Overhaul/Parts Manual.
	Actuator bypass valve linkage binding.	Correct binding.
TURBOCHARGER NOISY, PLENTY OF POWER.	Controller is overspeeding.	Adjust controller.
	Waste-gate sticking in closed position.	Replace waste-gate, waste-gate actuator, or correct binding linkage.
	Controller drain line obstructed.	Clean or replace line.
ENGINE POWER INCREASES SLOWLY OR SEVERE FLUCTUATIONS OF MANIFOLD PRESSURE ON RAPID THROTTLE ADVANCE.	Plugged capillary line in rate of change controller.	Replace absolute pressure and rate of change controller.
	Sluggish manifold pressure relief valve.	Replace relief valve.
	Waste-gate operation sluggish.	Replace waste-gate actuator, or correct binding linkage. **CAUTION:** The absolute pressure controller, manifold pressure relief valve, and pressure ratio controllers are set at the factory and should not be tampered with except for prescribed minor adjustment to obtain rated manifold pressure. Refer to Turbocharger and Controls Overhaul/Parts Manual and set butterfly valve clearance properly.

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Table 101. Controller and Waste-Gate Actuator (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
ENGINE POWER INCREASES SLOWLY AND MANIFOLD PRESSURE OVERBOOSTS ON RAPID THROTTLE ADVANCE.	Sluggish manifold pressure relief valve.	Replace relief valve.
MANIFOLD PRESSURE OVERBOOST DURING FLIGHT.	Manifold relief valve stuck closed.	Repair or replace relief valve.
	Waste-gate actuator has sluggish operation.	Repair or replace.
	Waste-gate butterfly clearance improperly set.	Refer to Turbocharger and Controls Overhaul/Parts Manual and set butterfly valve clearance properly.

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AIR INTAKES - REMOVAL/INSTALLATION

1. Air Canister (Standard 310)

A. Removal (Refer to Figure 401).
   (1) Remove upper engine cowling.
   (2) Disconnect cowl flap, refer to Engine Cowling - Removal/Installation.
   (3) Loosen duct clamp from canister and remove.
   (4) Disconnect clamp (2) securing canister to throttle body.
   (5) On airplanes 310R0001 thru 310R1235, disconnect alternate air control from alternate air door by removing nut, washer, and screw.
   (6) On airplanes 310R1236 thru 310R2140, disconnect alternate air control from air canister by removing cotter pin, nuts, screws, washers, and clamps.
   (7) Remove four bolts from brackets securing canister to nacelle and lift canister out.

B. Installation (Refer to Figure 401).
   (1) Position air canister in place and install four washers and bolts to mounting brackets.
   (2) On airplanes 310R0001 thru 310R1235, connect alternate air control on aft side of canister with screw, washer, and nut.
   (3) On airplanes 310R1236 thru 310R2140, connect alternate air control on forward side of canister with washer and cotter pin. Secure the air control to canister with clamps, screws, washers, and nuts.
   (4) Align canister to throttle body and install clamp (2).
   (5) Install inlet air duct in place on canister and tighten clamp.
   (6) Connect cowl flap, refer to Engine Cowling - Removal/Installation.
   (7) Install engine cowling.

2. Induction Air Filter Element (Standard 310)

A. Removal (Refer to Figure 401).
   (1) Remove upper engine cowling.
   (2) Disconnect cowl flap, refer to Engine Cowling - Removal/Installation.
   (3) Release fasteners and hinge air canister top open.
   (4) Slide induction air filter element out of air canister.

B. Installation (Refer to Figure 401).

   NOTE: Insure inside of air canister is clean before installing element.

   (1) Insert induction air filter element in place in canister and close cover.
   (2) Connect cowl flap, refer to Engine Cowling - Removal/Installation.
   (3) Lock fasteners on cover.
   (4) Install upper engine cowling.

3. Induction Air Canister (Turbo 310)

A. Removal (Refer to Figure 401).
   (1) Remove upper engine cowling.
   (2) Loosen clamp securing air canister to turbocharger.
   (3) Remove quick release pin (8) from clevis (9) and disconnect control assembly (10) from arm (7).
   (4) Loosen duct clamp (6) from air canister and lift canister out of nacelle.

B. Installation (Refer to Figure 401).
   (1) Position air canister in place and install inlet air duct and secure with clamp (6).
   (2) Install air canister to turbocharger compressor and tighten clamp.
   (3) Connect control assembly (10) to arm (7) by installing quick release pin (8) in clevis (9).

   NOTE: It may be necessary to adjust control assembly (10) after installing a new air canister.

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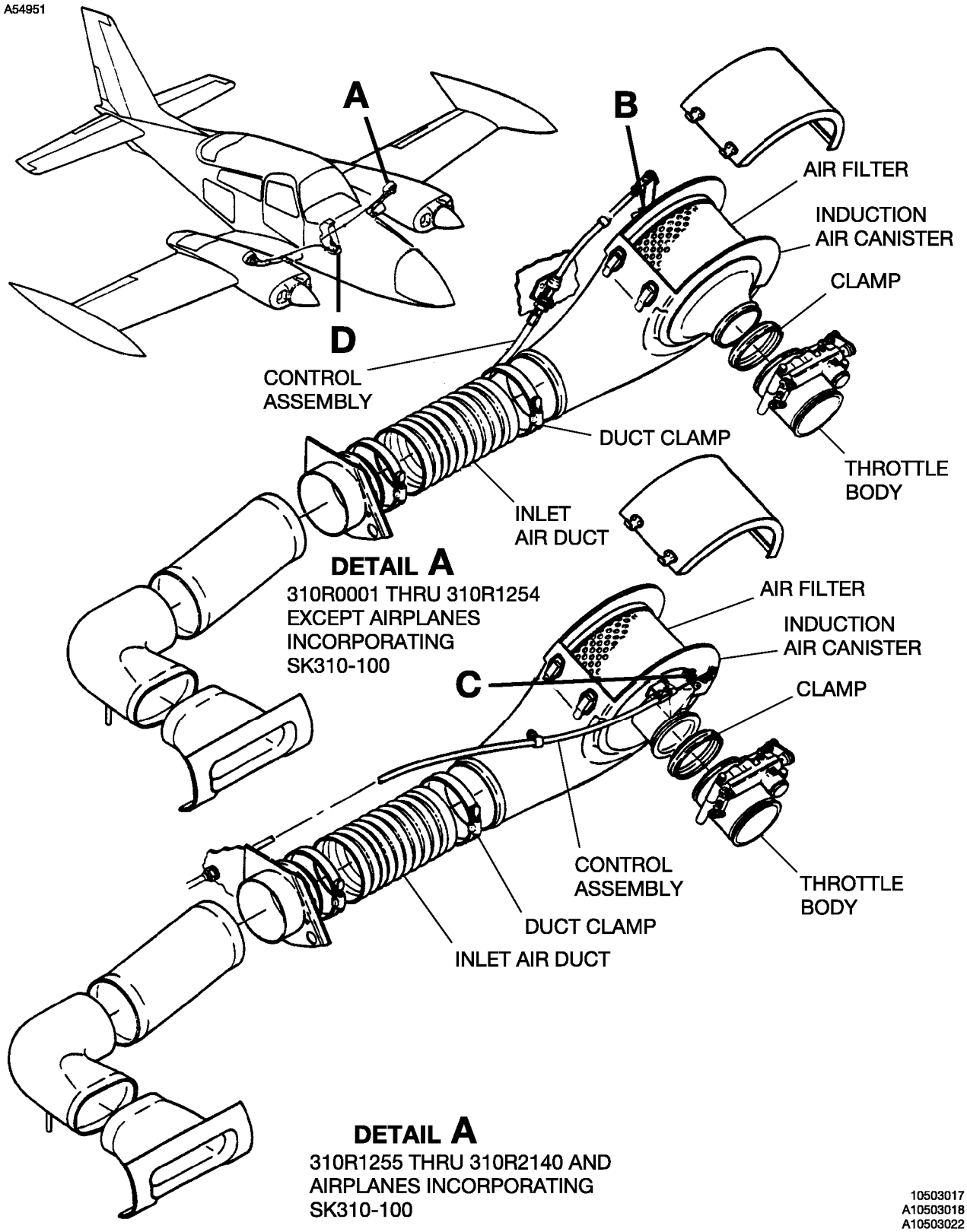

Induction Air Canister
Figure 401 (Sheet 1)

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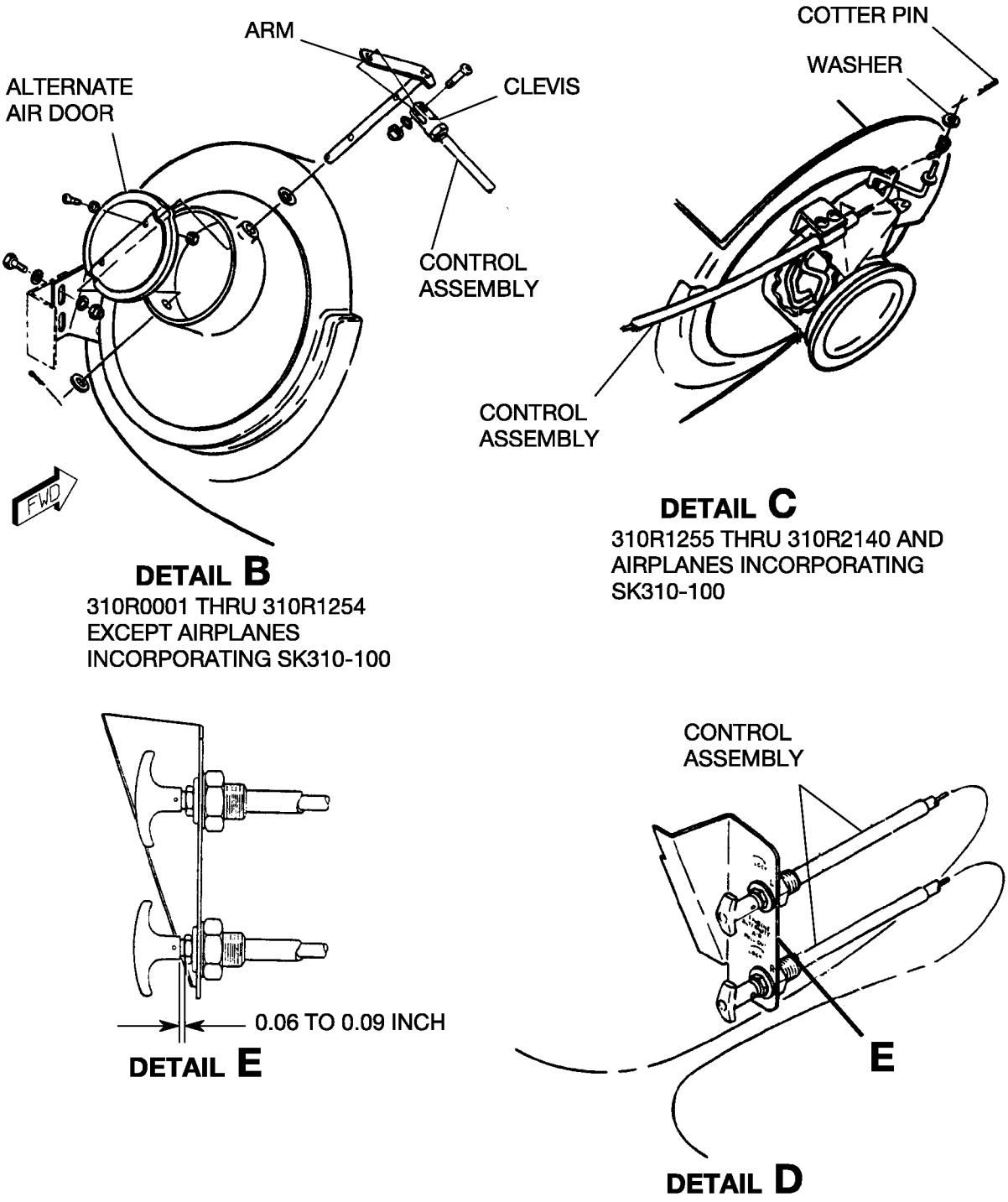

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Induction Air Canister
Figure 401 (Sheet 2)

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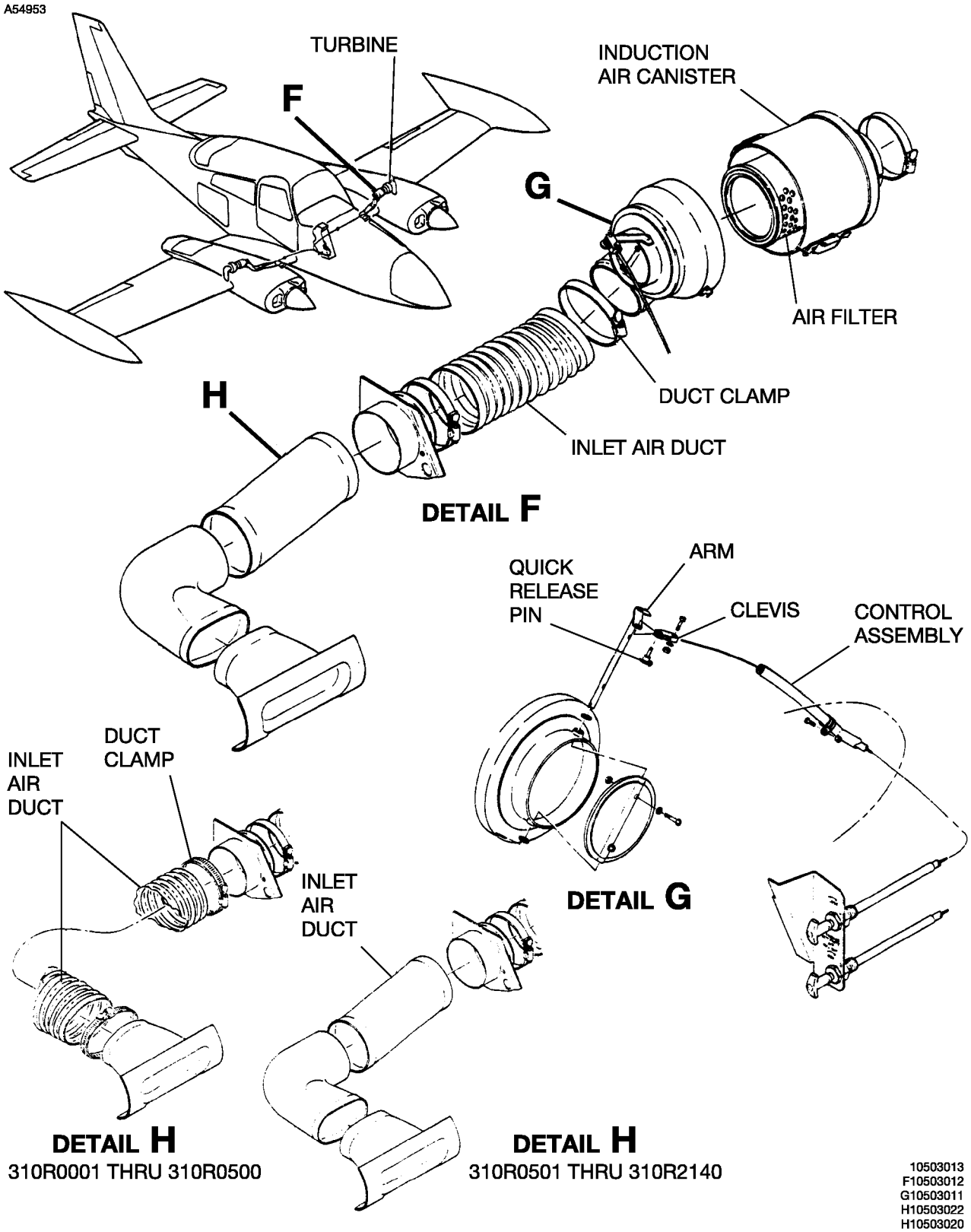

Induction Air Canister
Figure 401 (Sheet 3)

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(4) Clamp cable assembly (10) so that control handle has 0.06 to 0.09 inches cushion at the control handle in the closed position, and control operates free and no binding.
(5) Install upper engine cowling.

4. Air Canister Filter Element (Turbo 310)

A. Removal (Refer to Figure 401).
(1) Remove upper engine cowling.
(2) Release fasteners securing valve (10) on canister and slide end valve off.
(3) Remove induction air filter element.

B. Installation (Refer to Figure 401).

NOTE: Insure inside of air canister is clean before installing element.

(1) Insert induction air filter element in place in canister and install valve (10).
(2) Lock fasteners on cover.
(3) Install upper engine cowling.

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AIR INTAKES - INSPECTION/CHECK

1. Induction Air Filter

A. Inspection.
(1) Visually inspect filter for holes, cracks deterioration, and pleats for proper bonding. Refer to Chapter 5 Component Time Limits for replacement intervals.

2. Air Induction Manifold

A. Inspection.
(1) Clean the air induction manifold when washing down engine, using the same procedures. Inspect the induction manifold for security, loose connections, air leaks, and condition.

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AIR INTAKES - CLEANING/PAINTING

1. Induction Air System

A. Cleaning.

NOTE: Under extremely dusty conditions, daily maintenance of the filters are recommended.

CAUTION: Airplane engine filters are a dry filter - do not use oil.

(1) Clean the filter as follows:
(a) METHOD No. 1. - Direct dry compressed air up and down the pleats of the panel filter the opposite direction of the normal airflow until clean.

CAUTION: Air pressure at nozzle must not exceed 100 PSI. Maintain reasonable distance between nozzle and panel filter.

(b) Method No. 2. - Wash in Donaldson D1400 filter cleaner, or equivalent detergent. First follow procedure in Step (a), then soak panel filter in solution following directions on carton. Rinse and dry. D1400 is specially compounded to remove dust, carbon, and oil particles from filter elements.

CAUTION: Filter should be replaced if, when holding a light behind it, holes in the media are apparent.

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CHAPTER 73

ENGINE FUEL AND CONTROL

LIST OF EFFECTIVE PAGES

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73-List of Effective Pages		
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ENGINE FUEL AND CONTROL - GENERAL

1. Scope

A. This chapter describes those units and components and associated mechanical systems or electrical circuits which furnish or control fuel to the engine.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Distribution describes that portion of the system from the main quick disconnect to the engine which distributes fuel.
   (2) Controlling describes the main fuel control which meters fuel to the engine.

3. Fuel System

A. Description.
   (1) The engine fuel injection system is a simple, low pressure system for injecting fuel into the intake valve port in the cylinder head. It is a multi-nozzle, continuous flow type system which controls fuel flow to match engine airflow. Any change in throttle position, engine speed, or combination of both, causes changes in fuel flow in the correct relation to engine airflow.
   (2) A manual mixture control and a flow gage, which indicates metered fuel pressure, provide for precise leaning at any combination of altitude and power setting.

4. Tools and Equipment

A. Equivalent substitutes may be used instead of the following items.

Name	Number	Manufacturer	Use
Fuel Pressure Test Kit	SK320-2	Cessna Aircraft Co.	Fuel Pressure Adjustment
Screw Driver Flat Blade		Commercially Available	Adjust Fuel/Air Control Unit

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DISTRIBUTION - DESCRIPTION AND OPERATION

1. Fuel Injection Pump

A. Description.

(1) The fuel pump is a positive-displacement, rotating vane type. The pump is connected to the accessory section of the engine and is driven by a splined shaft. Fuel enters the pump at the swirl well of the vapor separator where it is separated by a swirling motion so that only liquid fuel is fed to the pump. The vapor is drawn off from the top center of the swirl well by a small pressure jet of fuel and is fed into the vapor return line and returned to the fuel tank. Since the pump is engine-driven, changes in engine RPM affect pump flow proportionally. The pump supplies more fuel than is required by the engine, therefore; a relief valve is provided to maintain a constant pressure. On the Turbo 310 a recirculation path within the pump is provided using a calibrated variable orifice (aneroid valve) and a relief valve to maintain pressure at altitude. A check valve is provided so that auxiliary pump pressure can bypass the engine-driven fuel pump for starting.

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DISTRIBUTION - REMOVAL/INSTALLATION

1. Fuel Injection Pump

A. Removal (Refer to Figure 401).
(1) Place fuel selector valve handles OFF.
(2) Remove engine cowling.
(3) Tag and disconnect all lines and fittings attached to the fuel injection pump.

NOTE: Plug or cap all disconnected lines, hoses, and fittings.

WARNING: Residual fuel draining from lines and hoses is a fire hazard. Use care to prevent the accumulation of such fuel when lines or hoses are disconnected.

(4) Remove the shroud surrounding the fuel injection pump.
(5) Remove the four nuts and washers attaching pump to the engine.
(6) Remove fuel injection pump and gasket.
(7) If a replacement pump is not being installed immediately, a temporary cover should be installed on the fuel pump mount pad to prevent entry of foreign material.

B. Installation (Refer to Figure 401).
(1) If installed, remove temporary cover.
(2) Place gasket on engine mount pad.
(3) Place fuel injector pump in position and secure with four flat washers, four internal tooth lockwashers, and nuts.

NOTE: When replacing fuel lines, use only a fuel soluble lubricant (such as engine oil) on the fitting threads. DO NOT USE ANY OTHER FORM OF THREAD COMPOUND.

(4) Install the cooling shroud on the fuel pump.
(5) Install all fittings and connect all lines as tagged and remove tags.
(6) Install engine cowling.

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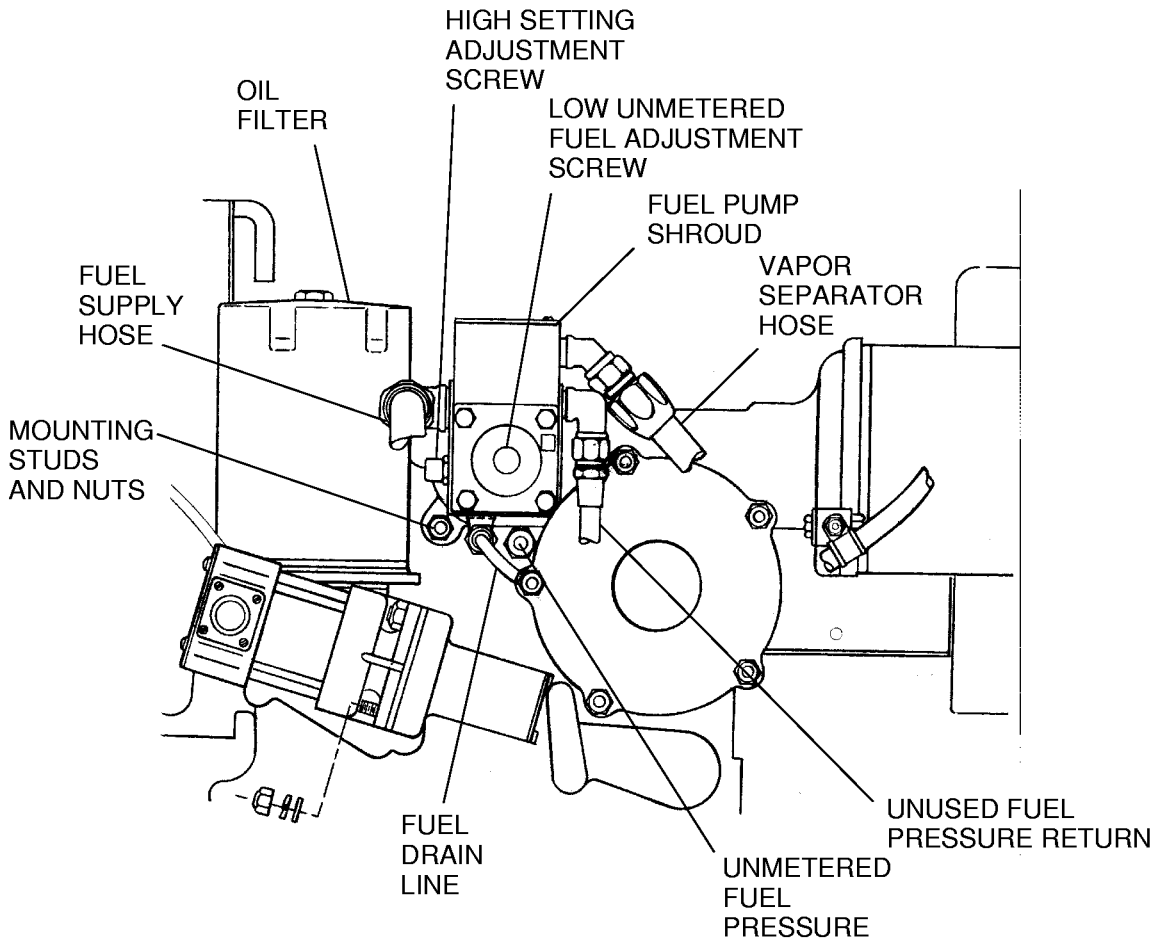

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Engine Driven Fuel Pump
Figure 401 (Sheet 1)

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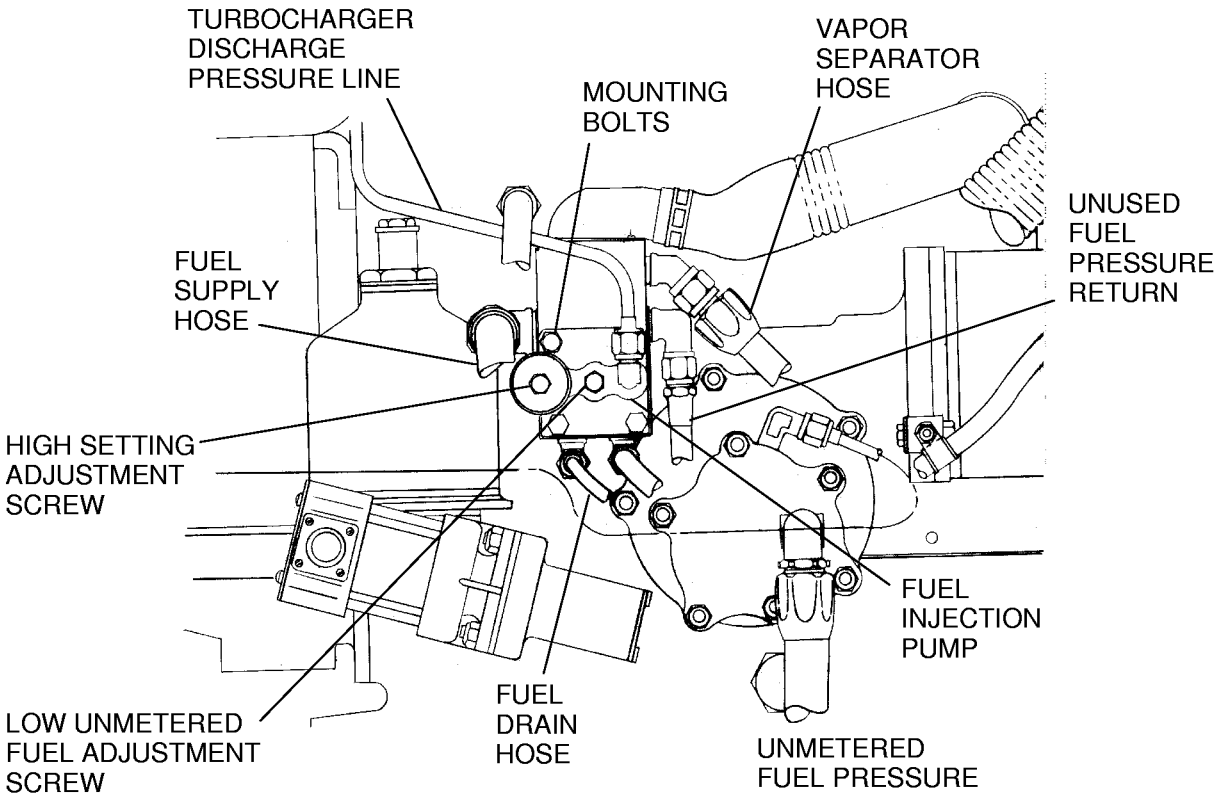

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Engine Driven Fuel Pump
Figure 401 (Sheet 2)

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DISTRIBUTION - ADJUSTMENT/TEST

1. Unmetered Fuel Test Hook-Up, Check, and Adjustment (Standard 310)

NOTE: The following procedures for adjusting and checking the unmetered fuel pressure are factory recommended and must be followed to insure the engines are properly adjusted.

NOTE: Excessive leaning is difficult to detect unless these procedures are followed.

A. Connect test gage to fuel pump as follows (Refer to Figure 501):
   (1) Place fuel selector valves in the OFF position.
   (2) Attach hose (6) to aft side of gage (7).
   (3) Install tee (5) on gage hose (6).
   (4) Attach test hose (2) to tee (5).
   (5) Disconnect unmetered fuel pressure hose (4) from the fuel pump fitting located at the rear underside of pump.
   (6) Connect the unmetered fuel pressure hose (4) to tee (5).
   (7) Connect test hose (2) to fuel pump fitting located at the rear underside of engine fuel pump.
   (8) Vent test gage to atmosphere.

B. Adjust low unmetered fuel pressure as follows:
   (1) Allow engine to warm-up, then set idle RPM to 600 and check unmetered fuel pressure. Pressure should indicate 6.5 to 7.5 PSI on test hookup pressure gage.

      NOTE: The test gage should be placed as near the same level as the fuel pump as possible or erroneous readings will result.

   (2) If unmetered fuel pressure does not indicate 6.5 to 7.5 PSI, the low unmetered fuel adjustment screw (1) must be adjusted to 6.5 to 7.5 PSI. Turn low unmetered fuel adjustment screw (1) in (CW) to increase or out (CCW) to decrease. After correct unmetered fuel pressure is obtained, position auxiliary fuel pump to LOW, observe that fuel pressure does not exceed 7.5 PSI. If fuel pressure exceeds 7.5 PSI, the auxiliary fuel pump may require adjusting. Refer to Chapter 28, Fuel Distribution - Adjustment/Test.

C. Adjust maximum fuel flow as follows:
   (1) Allow oil temperature to reach an indication in the upper 1/3 of the green arc of the oil temperature indicator, run engine at full throttle and check fuel flow gage on instrument panel. Refer to Figure 502 for proper fuel flow. If this reading is not within the prescribed tolerance, turn high setting adjusting screw located on the lower left side of the fuel pump (turn IN to increase pressure or turn OUT to decrease pressure) until proper fuel pressure is obtained.
   (2) The engines, when properly warmed, should respond to a rapid throttle acceleration without hesitation with auxiliary fuel pump on and off and mixture full rich.
   (3) After adjusting unmetered fuel pressure, check idle RPM and idle mixture in accordance with Fuel Mixture Check.
   (4) After completion of unmetered fuel adjustments; with test equipment removed and fuel lines connected in normal position, it may be necessary to purge air from the fuel pressure lines to prevent indicator needle fluctuations or erroneous readings.
   (5) Purge air from fuel pressure hoses in the following manner:

      WARNING: Fuel will run from the intake drain under each nacelle during purging. A container should be provided to catch draining fuel.

      (a) Place throttle to full open position and mixture to full rich.
      (b) Disconnect fuel pressure hoses at fuel flow gage, operate auxiliary fuel pump (primer switch) until at least one (1) pint of fuel has discharged from each pressure hose.
      (c) Reconnect hoses to flow gage, tightening "finger tight" then backing off one-half turn.
      (d) Operate auxiliary pump (primer switch) until solid fuel is discharged from gage connection. Tighten connection, with pump still operating, then turn pump off.

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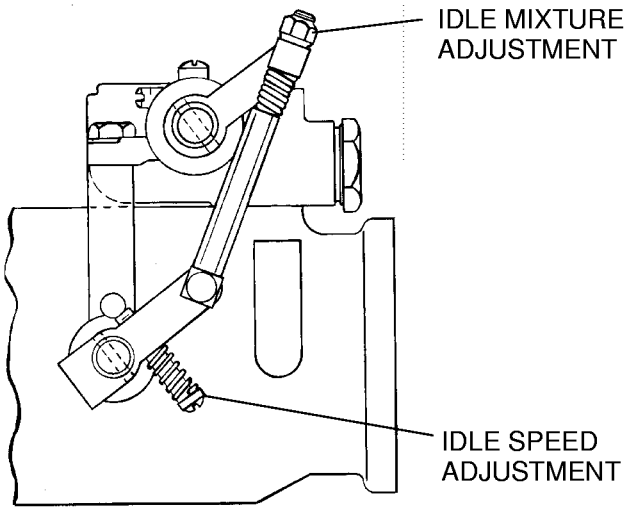
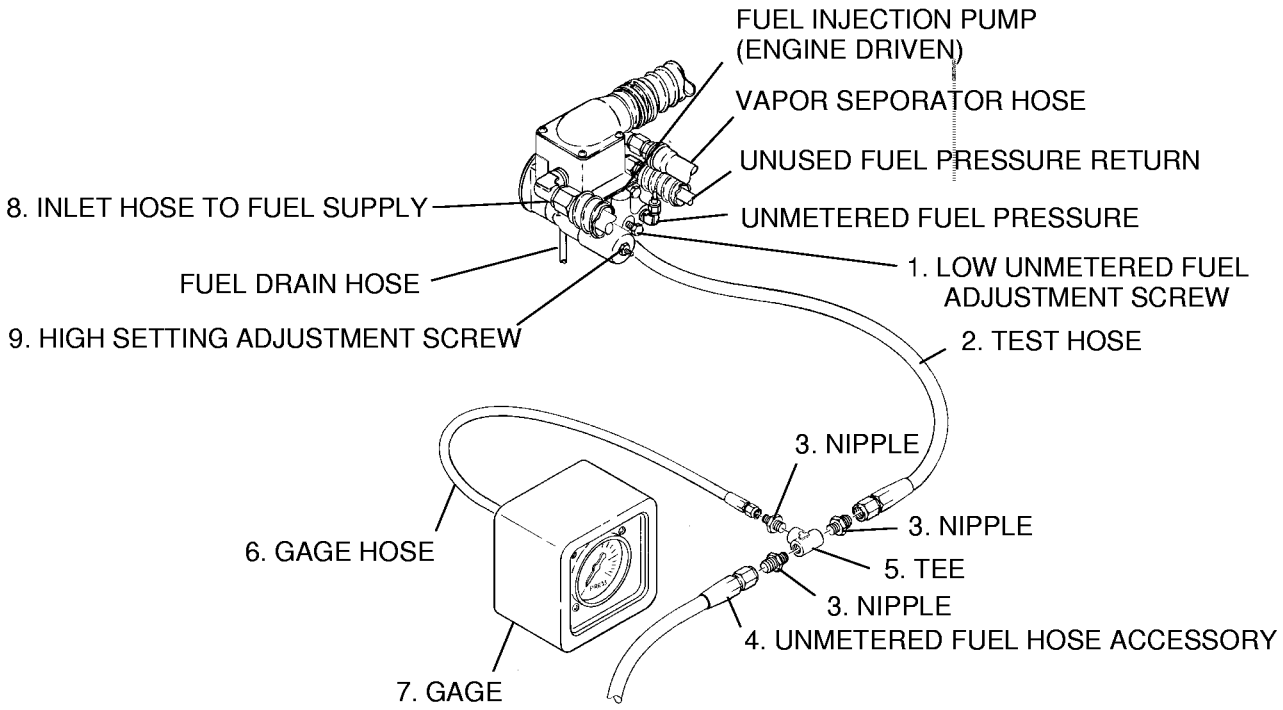


FUEL AIR CONTROL UNIT ADJUSTMENT



TYPICAL UNMETERED FUEL PRESSURE TEST EQUIPMENT FOR TURBO 310 ONLY.
ON THE STANDARD 310, THE HIGH SETTING ADJUSTMENT SCREW IS LOCATED
ON THE LOWER LEFT SIDE OF THE FUEL INJECTION PUMP.

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Fuel Injection Pump Test Hook-Up
Figure 501 (Sheet 1)

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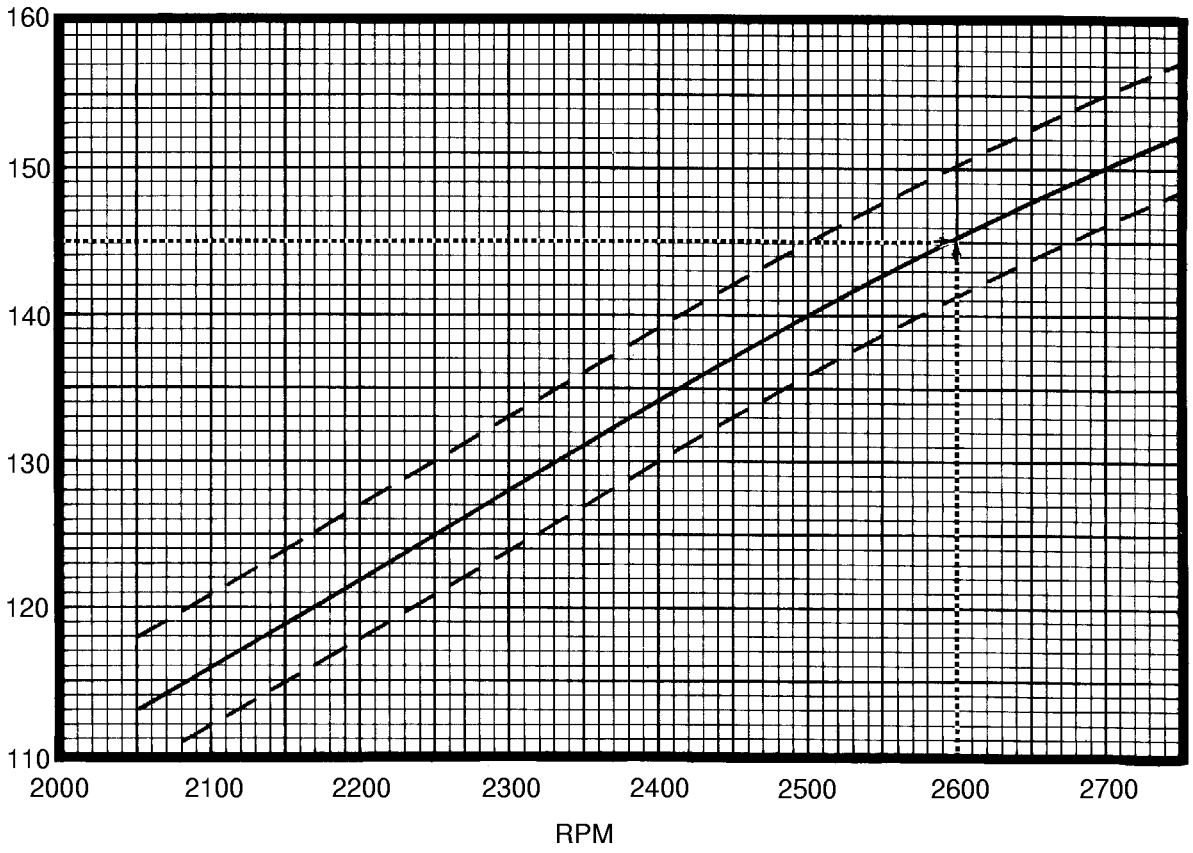

APPLICABLE TO STANDARD 310 ONLY

EXAMPLE:
"A" ENGINE RPM 2600
"B" FUEL FLOW 145 PPH
CONDITIONS:
BOOST PUMP ON
FULL THROTTLE
FLOWS SHOWN ARE NOMINAL

NOTE: 2600 RPM IS USED ONLY AS AN EXAMPLE. DUE TO GEOGRAPHICAL VARIATION IN FIELD ELEVATION, MAXIMUM FUEL FLOW AT MAXIMUM RPM ATTAINABLE.

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Fuel Flow Versus RPM
Figure 502 (Sheet 1)

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2. Unmetered Fuel Test Hook-Up, Check, and Adjustment (Turbo 310)

A. Connect test gage to fuel pump as follows (Refer to Figure 501):
(1) Place fuel selector valves in the OFF position.
(2) Attach hose (6) to aft side of gage (7).
(3) Install tee (5) on gage hose (6).
(4) Attach test hose (2) to tee (5).
(5) Disconnect unmetered fuel pressure hose (4) from the fuel pump fitting located at the rear underside of pump.
(6) Connect the unmetered fuel pressure hose (4) to tee (5).
(7) Connect test hose (2) to fuel pump fitting located at the rear underside of engine fuel pump.
(8) Vent test gage to atmosphere.

B. Adjust low unmetered fuel pressure as follows:
(1) Allow engine to warm-up, then set idle RPM to 600 and check unmetered fuel pressure. Pressure should indicate 6.0 to 7.0 PSI on test hookup pressure gage. If the indicated pressure does not indicate 6.0 to 7.0 PSI, turn low unmetered adjustment screw (1) on pressure relief valve (turn IN to increase and OUT to decrease fuel pressure) until proper fuel pressure is obtained. Position auxiliary fuel pump to LOW, observe that unmetered fuel pressure does not exceed 7.5 PSI.

C. Adjust maximum fuel flow as follows:
(1) Allow engine oil to reach a temperature indication in the upper 1/3 of green arc. With engine power setting at 2500 RPM, 32 inches Hg manifold pressure, auxiliary fuel pump OFF, and reading from the airplane's fuel flow indicator on the instrument panel; check that fuel flow is from 150 to 155 PPH. If indicated flow is not within the prescribed tolerance, loosen locknut and turn High Setting adjustment screw (9) on altitude compensator (turn OUT to increase and turn IN to decrease) until proper fuel flow is obtained. Position auxiliary fuel pump to ON, check that fuel flow does not exceed 155.0 PPH.

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DISTRIBUTION - INSPECTION/CHECK

1. Fuel Mixture Check

A. Perform a fuel mixture check as follows:
(1) Warm-up engine in accordance with owners manual and move throttles back to 600 RPM.
(2) Place mixture control to full rich and propeller control full forward.
(3) Position auxiliary fuel pump to LOW, advance throttle to 1000 RPM and slowly reduce mixture control, if both the fuel mixture control unit and fuel injection pumps are set properly, NO RPM rise will occur when the mixture control is gradually moved toward IDLE CUT-OFF.
(4) Using the above procedure set throttle to 1300 RPM and reduce mixture control slowly. If mixture control and fuel injection pumps are properly set the RPM should increase 10 RPM when mixture control is gradually moved towards IDLE CUT-OFF.

NOTE: If RPM increases when mixture is reduced, fuel mixture is too rich; conversely, if RPM diminishes rapidly when mixture is reduced, fuel mixture is too lean.

(5) If fuel mixture check indicates a too rich or too lean idle condition, refer to Fuel-Air Control Unit Adjustment located in Controlling - Adjustment/Test and adjust fuel-air control.

2. Engine Compartment Hoses

A. Inspection.
(1) Clean engine compartment hoses by washing engine compartment down with mineral spirits or a suitable solvent (non-inflammable or combustible). Inspect all engine compartment hoses for excessive wear, cracks, nicks, bulges, deterioration, discoloration, bleaching, and rubber hoses for hardening.
(2) Teflon hose assemblies exhibit considerable stiffness throughout their useful life. Reasonable stiffness is normal and does not indicate that the line should be replaced. Inspect engine compartment fuel hoses under pressure for deformation and leaks as follows: make sure throttles are in idle position and mixture controls are in idle cutoff, turn prime switch on and assure boost pumps are operating in HI position; check hoses for leaks, bulges, deterioration, and deformation. Inspect hoses in the high heat areas such as close proximity of exhaust stacks or turbocharger area for heat deterioration and hardening or cracking due to age. Inspect induction air hose clamps for rubbing and clearance. For replacement intervals of engine compartment hoses, refer to Chapter 5.

3. Fuel Pumps

A. Inspection.
(1) The fuel pumps should be washed down at the same time as the engine using the same solvent. Inspect the pumps for evidence of leaking, condition, and security. Repair of the engine-driven pumps is limited to replacement.

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CONTROLLING - DESCRIPTION AND OPERATION

1. Fuel Injection System

A. Description (Refer to Figure 1).
   (1) The engine fuel injection system is a simple, low pressure system of injecting fuel into the intake valve port in the cylinder head. It is a multi-nozzle, continuous flow type system which controls fuel flow to match engine airflow. Any change in throttle position, engine speed, or a combination of both, causes changes in fuel flow in the correct relation to engine airflow.
   (2) A manual mixture control and a flow gage, which indicates metered fuel pressure, provide for precise leaning at any combination of altitude and power setting.

2. Fuel-Air Control Unit

A. Description.
   (1) The fuel-air control unit consists of the throttle body and the metering body. This unit occupies the position ordinarily used for a carburetor at the intake manifold inlet. The function of this unit is to control engine air intake and to set the metered fuel pressure for proper fuel-air ratio. There are three control elements in this unit, one for air and two for fuel, one of which is for fuel mixture and the other for fuel metering. Main fuel enters the control unit through a strainer and passes to the metering valve. The position of the metering valve controls the fuel passed to the manifold valve and nozzles. A linkage connecting the metering valve to the air throttle proportions airflow to fuel flow. The position of the mixture valve determines the amount of fuel returned to the fuel pump. The fuel control portion of the fuel-air control is enclosed in a shroud and is blast air cooled to help prevent vapor lock. A fuel pressure switch, connected to fuel control unit, actuates to cause the auxiliary fuel pump to operate at a high speed if the engine driven fuel pump pressure drops below 4 to 5 PSI. The auxiliary fuel pump switch must be ON for the fuel pressure switch to operate.

3. Fuel-Manifold

A. Description.
   (1) The fuel manifold provides a central point for distribution of fuel to individual cylinders. In the fuel manifold, a diaphragm and plunger valve raises and lowers by fuel pressure, to open or close the individual cylinder fuel supply port simultaneously. A fine mesh screen is provided for protection of the injection nozzle against dirt or foreign matter. The fuel manifold is calibrated to operate at 4 PSI.

4. Fuel-Discharge Nozzles

A. Description.
   (1) Fuel nozzles are installed in each cylinder head outside each intake valve. An air bleed arrangement is incorporated in each nozzle. The air bleed arrangement aids in vaporization of fuel and, by breaking the high vacuum at idle, maintains fuel in the fuel lines, solidly filled and ready for instant acceleration of engine. Nozzles are stamped with a letter on the hex of the nozzle body. Each engine has matched (same letter) nozzles. Replacement nozzles must match but a matched set of nozzles of another letter may be used.

5. Manifold Drain Valve

A. Description.
   (1) A manifold drain valve is located in the bottom cowl. In the event that the engine is over primed, excess fuel is drained through a line from the balance tube through the drain valve. On airplanes 310R1899 thru 310R2140, and airplanes incorporating ME80-13, the aft inboard manifold elbow also has a line to the drain valve. The manifold drain valve is closed during engine operation; the valve opens when the engine is shut down.

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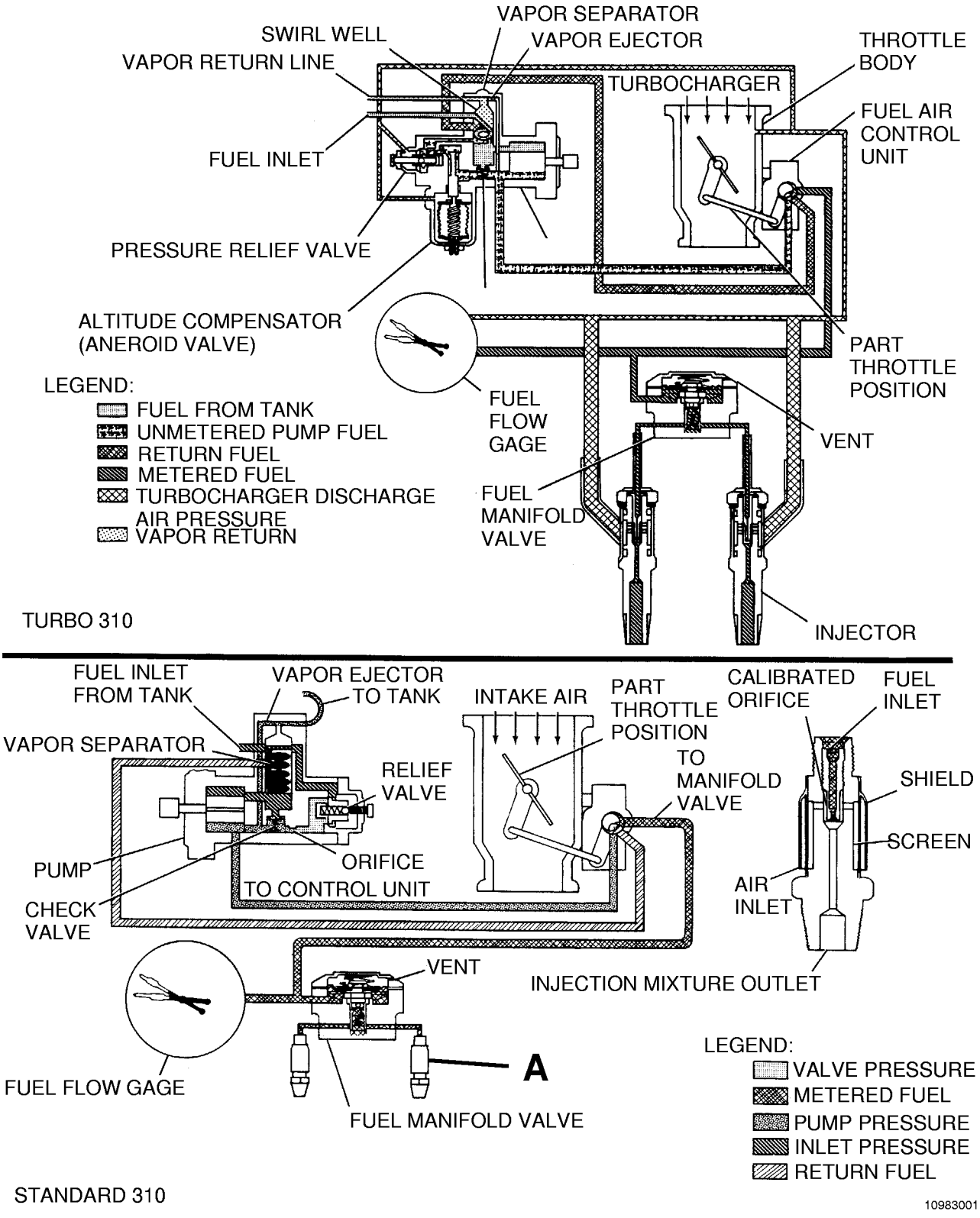

Fuel Injection System Schematic
Figure 1 (Sheet 1)

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CONTROLLING - TROUBLESHOOTING

1. Troubleshooting the Fuel Injection System

A. For troubleshooting the fuel injection system, refer to Table 101.

Table 101. Fuel Injection System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
ENGINE WILL NOT START AND NO FUEL FLOW GAGE INDICATION.	Fuel selector valve in wrong position.	Position fuel selector valve hand to main tank.
	Dirty metering unit screen.	Clean.
	Improperly rigged mixture control.	Correct rigging.
ENGINE IDLES ROUGH.	Restricted nozzle.	Clean nozzle.
	Improper idle mixture.	Adjust fuel-air control unit.
ENGINE WILL NOT START WITH FUEL FLOW GAGE INDICATION.	Engine flooded.	Reset throttle, clear engine of excessive fuel, try another start.
	No fuel in engine.	Loosen one line at fuel manifold nozzle. If no fuel shows, replace fuel manifold.
VERY HIGH IDLE AND FULL THROTTLE FUEL PRESSURE PRESENT.	Relief valve stuck or closed.	Repair or replace fuel injector pump.
ENGINE RUNS ROUGH.	Restricted nozzle.	Clean nozzle.
	Improper pump pressure.	Replace fuel injection pump.
LOW FUEL PRESSURE AT HIGH POWER.	Leaking turbocharger discharge pressure.	Repair leaking lines and fittings.
	Valve stuck open.	Repair or replace injection pump.
LOW FUEL FLOW GAGE INDICATION.	Restricted flow to metering valve.	Clean fuel filters and/or adjust mixture control for full travel.
	Inadequate fuel flow from fuel injection pump.	Adjust.
FLUCTUATING OR ERRONEOUS FUEL FLOW GAGE INDICATION.	Vapor in system.	Clear with auxiliary fuel pump. If vapor cannot be cleared, clogged ejector jet in vapor separator cover - clean with solvent.
	Air in fuel gage line.	Repair leak and purge line.
HIGH FUEL FLOW GAGE INDICATION.	Altitude compensator (aneroid valve) stuck.	Replace fuel injection pump.
	Restricted nozzle or fuel manifold valve.	Clean or replace as required.
	Recirculation passage in pump restricted.	Replace fuel injection pump.

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Table 101. Fuel Injection System Troubleshooting (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
FUEL DISCHARGING INTO ENGINE COMPARTMENT AND RELIEF VALVE WILL PROBABLY NOT OPERATE.	Leaking diaphragm.	Repair or replace injector pump.
NO FUEL PRESSURE.	Valve stuck open.	Repair or replace injector pump.
NO UNMETERED FUEL PRESSURE.	High internal orifices plugged.	Clean internal orifices in injector pump.
	Low relief valve stuck open.	Repair or replace injector pump.

2. Troubleshooting the Manifold Drain Valve

A. The following problems may be noted if drain valve does not operate correctly:
(1) If valve is stuck closed, excess fuel will not drain and can cause flooding.
(2) If valve is stuck closed and boost pumps are left on with rich mixture, over priming may cause hydraulic lock in engine cylinders.
(3) If valve is stuck open, it will cause rough engine operation, inability to adjust mixture or early bootstrapping, etc.

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CONTROLLING - REMOVAL/INSTALLATION

1. Fuel-Air Control Unit

A. Removal (Refer to Figure 401).
(1) Remove the engine cowling.
(2) Place the fuel selector valve handles OFF.
(3) Loosen clamp on ram air tube at the metering body and slide tube clear of hose connection.
(4) Remove sheet metal screws retaining cover on metering body cooling shroud.
(5) Disconnect hose to the fuel pressure switch.
(6) Slide cooling shroud cover aft and down to expose the three hose connections at the metering body. These hoses are to be disconnected at this time.

NOTE: Plug or cap all open lines, hoses, and fittings.

(7) Loosen the clamps which secure the throttle body to both the right and left intake manifold.
(8) Remove clamp securing throttle body to turbocharger compressor.
(9) Remove two forward bolts attaching throttle body to upper support.
(10) Remove two nuts attaching throttle body to the lower support braces.
(11) Disconnect the throttle and mixture controls.
(12) Remove fuel-air control unit.

NOTE: The metering body may be removed from the throttle body by removing the three special bolts which are safetied with tang washers.

B. Installation (Refer to Figure 401).
(1) Place the fuel-air control unit in position.
(2) Temporarily install upper support bolts to obtain the correct position for the fuel-air control unit.
(3) Install two lower support braces and install lockwashers and nuts.
(4) Install hose connectors and clamps which secure the unit to the intake manifold.
(5) Install clamp securing throttle body to turbocharger compressor.

NOTE: When replacing fuel lines, use only a fuel soluble lubricant (such as engine oil) on the fitting threads. DO NOT USE ANY OTHER FORM OF THREAD COMPOUND.

(6) Attach the unmetered fuel hose, the metered fuel hose, and the vapor return hose to the metering body.
(7) Slide cooling shroud cover into place and attach with sheet metal screws.
(8) Connect hose from fuel pressure switch.
(9) Slide ram air tube onto metering body cooling shroud and secure with clamp.
(10) Connect throttle and mixture controls.
(11) Inspect completed installation.
(12) Refer to Chapter 76, Engine Controls - Adjustment/Test and rig throttle control.
(13) Install engine cowling.

2. Fuel Manifold

A. Removal.

NOTE: Plug or cap all disconnected lines, hoses, and fittings.

(1) Tag and disconnect the six fuel injection lines routing to each individual cylinder and the lines and hoses routing to the fuel pump.
(2) Remove engine crankcase through bolts securing fuel manifold to engine and remove fuel manifold.

B. Installation.
(1) Position fuel manifold in place on engine and install engine crankcase through bolts.

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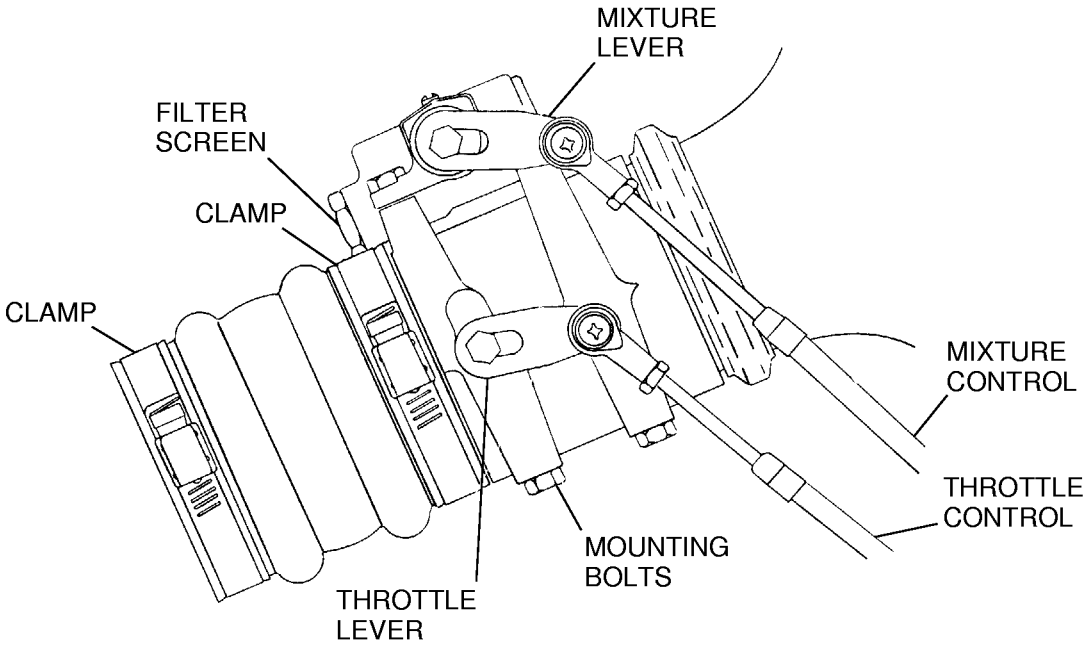
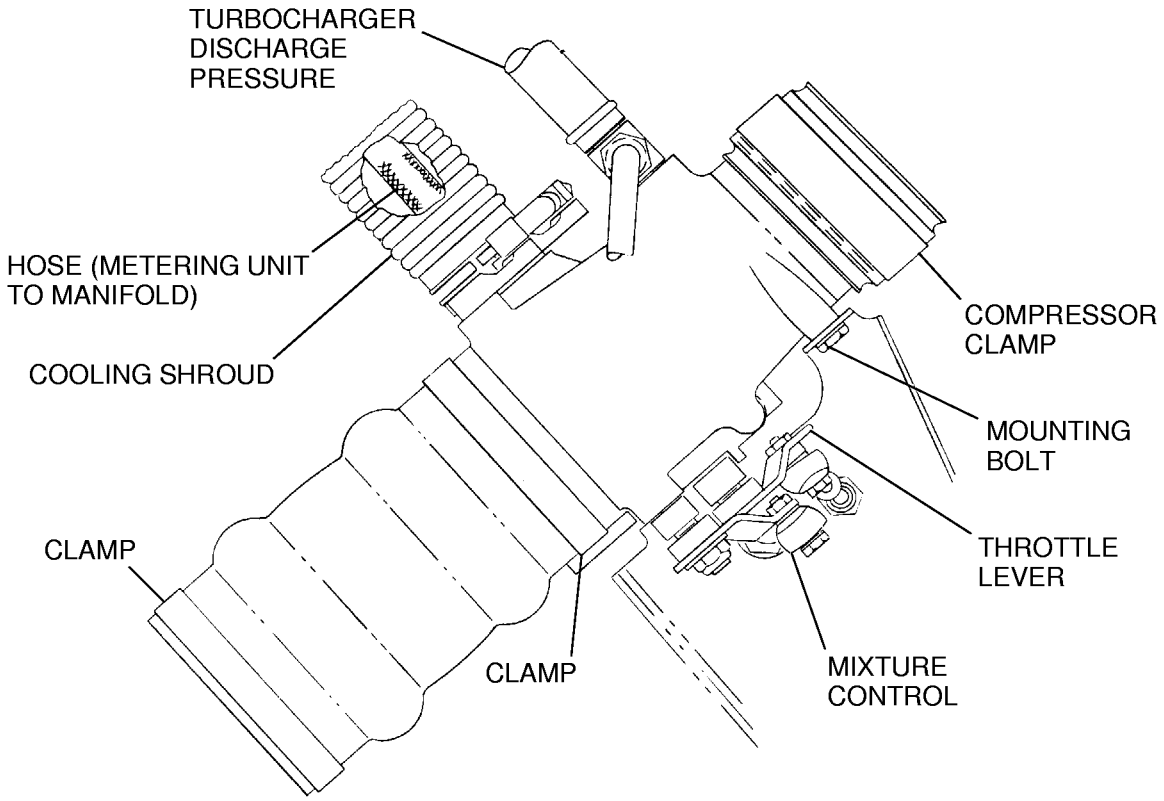


STANDARD 310



TURBO 310

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Fuel-Air Control
Figure 401 (Sheet 1)

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(2) Remove plugs and caps. Connect lines and hoses and remove tags.

NOTE: When replacing fuel lines, use only a fuel soluble lubricant (such as engine oil) on the fitting threads. DO NOT USE ANY OTHER FORM OF THREAD COMPOUND.

3. Fuel Discharge Nozzles

A. Removal.
(1) Disconnect the fuel injection lines at the fuel discharge nozzles.

NOTE: Plug or cap all disconnected lines and fittings.

(2) Remove fuel nozzles from cylinders.

B. Installation.
(1) Remove protective plugs and install fuel nozzles in cylinder.
(2) Remove plugs and caps from lines and install fuel injection lines at the fuel nozzles.

NOTE: When replacing fuel lines, use only a fuel soluble lubricant (such as engine oil) on the fitting threads. DO NOT USE ANY OTHER FORM OF THREAD COMPOUND.

4. Manifold Drain Valve

A. Removal.
(1) Open engine cowling.
(2) Disconnect hose to drain valve.
(3) Remove nut from valve and remove valve.

B. Installation.
(1) Position drain valve in hole and install nut.
(2) Connect drain hose.
(3) Close cowling.

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CONTROLLING - ADJUSTMENT/TEST

1. Fuel-Air Control Unit

A. Adjustment.

(1) The idle speed adjustment is a conventional spring-loaded screw located in the air throttle lever. The idle mixture adjustment is accomplished by the locknut at the metering valve end of the linkage. Tightening the nut to shorten the linkage provides a richer mixture. A leaner mixture is obtained by backing off the nut to lengthen the linkage. With engine running at 1000 RPM and auxiliary pumps set to the LOW position, adjust idle mixture as rich as possible without obtaining an increase in engine RPM when mixture control is slowly moved toward IDLE CUT-OFF. Check idle mixture with auxiliary pumps off to assure that idle mixture has not changed.

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CONTROLLING - INSPECTION/CHECK

1. Engine Controls

A. Cleaning and Inspection.

(1) The controls should be cleaned when the engine compartment is cleaned or washed down. Inspect the engine controls for security of mounting, sharp bends, kinks and damage which might affect operation of the control. Check engine controls to provide a gentle curve between engine and firewall (controls should not be stretched tight). Check controls through firewall for security.

(2) Inspect engine controls behind engine for contact with engine. Reroute and secure controls as required to clear. Inspect rubber seals on end of control cables for deterioration. Cowl flap and alternate air cables do not have rubber seals on pedestal ends. Repair of engine controls is limited to replacement of parts.

2. Manifold Drain Valve

A. Operational Check (Refer to Figure 601).

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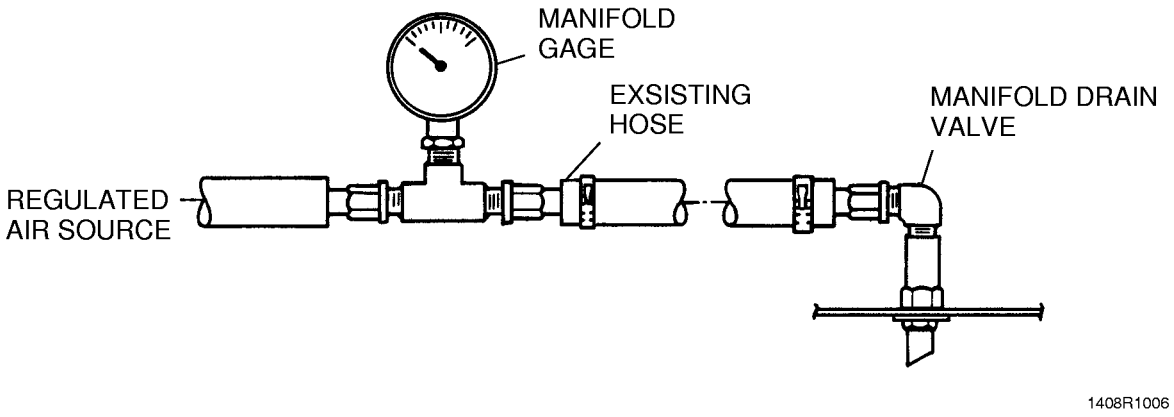

Intake Manifold Drain Valve Check
Figure 601

(1) Open engine cowling and disconnect drain hose.
(2) Install manifold pressure gage.
(3) Observing pressure on gage, slowly adding regulated air below 1 inch of mercury, indicated on gage, insure air is exiting drain valve (Valve shall remain open until 1 inch of mercury indicated on gage is applied).
(4) Slowly increase air pressure and observe manifold pressure gage. Needle will move slowly until 1 inch of mercury, indicated on gage, is applied and valve closes. After valve closes pressure gage will indicate applied pressure above 1 inch of mercury. Ensure air is not exiting drain valve above 1 inch or more of mercury indicated on gage.

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CONTROLLING - CLEANING/PAINTING

1. Fuel Manifold

A. Cleaning.
(1) Hold the top cover down against internal spring until all four attaching screws have been removed, then gently lift off the cover. Use care not to damage the spring-loaded diaphragm below it.

CAUTION: Do not attempt to remove needle or spring from inside valve. Removal of these items from the valve will disturb the 4 PSI factory calibration.

(2) Remove the flushing plug located opposite the inlet fitting.

CAUTION: The filter screen is a tight fit and may be damaged if removal is attempted. It should be removed only if a new screen is to be installed.

(3) Using clean gasoline, flush out the chamber below the screen.
(4) Flush above the screen and inside the center bore making sure that outlet passages are open. Use only a gentle stream of compressed air to remove dust and dirt and to dry.
(5) Replace flushing plug.
(6) Clean the diaphragm valve, top cover and springs in the same manner.
(7) Carefully replace diaphragm and valve in manifold body. Check that valve works freely.
(8) Place upper spring in position.
(9) Align mounting holes in body, diaphragm, and top cover locating the small vent hole in the cover to the side. Hold the cover down against the spring while installing and tighten all four screws. Safety the screws.

2. Fuel Discharge Nozzles

A. Cleaning.
(1) To clean fuel discharge nozzles, immerse in fresh cleaning solvent.

CAUTION: Do not use a wire brush or other sharp metal objects to clean orifices. This will damage orifice.

3. Fuel-Air Control Unit

A. Cleaning.
(1) Remove the fuel strainer and clean the screen in fresh cleaning solvent. Reinstall and safety.

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CHAPTER 74

IGNITION

LIST OF EFFECTIVE PAGES

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74-List of Effective Pages		
74-Record of Temporary Revisions		
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74-00-00	Page 101	Jun 17/2005
74-10-00	Page 1	Jun 17/2005
74-10-00	Pages 401-402	Jun 17/2005
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IGNITION - GENERAL

1. Scope

A. This chapter describes those units and components which generate, control, furnish, or distribute an electrical current to ignite the fuel air mixture in the cylinders of reciprocating engines or in the combustion chambers or thrust augmentor of turbine engines.

2. Definition

A. This chapter is divided into sections to aid maintenance personnel in locating information. Following is a brief description of each section.
   (1) Electrical power supply describes that portion of the system which generates electrical current for the purpose of igniting the fuel mixture in the combustion chambers and thrust augmentors.
   (2) Distribution describes that portion of the system which conducts high or low voltage electricity from the electrical power supply to the spark plugs or igniters.
   (3) Switching describes that portion of the system which provides a means of rendering the electrical power supply inoperative.

3. Engine Ignition System

A. Description.
   (1) The engine ignition system consists of the magneto, ignition cables, and spark plugs. Ignition for the engine is provided by two magnetos on each engine. The left magneto fires the upper spark plugs on the left bank of cylinders and the lower spark plugs on the right bank of cylinders. The right magneto fires the lower spark plugs on the left bank of cylinders and the upper spark plugs on the right bank of cylinders.

4. Tools and Equipment

NOTE: Equivalent substitutes may be used for the following listed items.

Name	Number	Manufacturer	Use
Spring Scale	0-30 Ounces	Commercially available	Checking Main Spring Tension on Breaker Points
Timing Light	11851	TCM Ignition System Mobile, AL	Point Gap Setting
Timing Kit	1181501	TCM Ignition System	Magneto Timing
Tester	118950	TCM Ignition System	Testing High Tension Leads

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IGNITION - TROUBLESHOOTING

1. Engine Ignition System

A. Troubleshooting.
(1) For troubleshooting the engine ignition system, refer to Table 101.

Table 101. Engine Ignition System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
ENGINE FAILS TO START.	Bad ignition switch ground wires.	Repair wires.
	Improper gap and cleanliness at spark plugs.	Clean and regap spark plugs.
	Magneto timing.	Retime magneto to engine.
	Short in condenser.	Replace condenser.
	Magneto internal timing.	Replace magneto.
ENGINE IDLES ROUGH.	Improper spark plug gap and cleanliness.	Clean and regap spark plugs.
	Weak condenser.	Replace condenser.
	Magneto breaker points in bad condition.	Replace breaker points.
	Magneto timing.	Retime magneto to engine.
SLUGGISH OPERATION AND EXCESSIVE RPM DROP.	Improper spark plug gap and cleanliness.	Clean and regap spark plugs.
	Weak condenser.	Replace condenser.
	Magneto breaker points in bad condition.	Replace breaker points.
	Magneto timing.	Retime magneto to engine.

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MAGNETO - DESCRIPTION AND OPERATION

1. Description

A. Each magneto installation consists of main breaker points, retard breaker points, starting vibrator, and ignition and starter switches. The starting vibrator is used in conjunction with the retard breaker points during starting. The magneto is a completely self-contained unit. The rotating magnet turns on two ball bearings, one located at the breaker end and the other at the drive end. The retard breaker is actuated by the same cam as the main breaker and is so positioned that its contacts open a predetermined number of degrees after the main breaker contacts open.

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MAGNETO - REMOVAL/INSTALLATION

1. Magnetos

A. Removal (Refer to Figure 401).
(1) Remove engine cowling.
(2) Disconnect the ground wire and tag.

WARNING: Magnetos are in switch on condition when ground wires have been removed.

(3) Detach the high tension outlet plate from the magneto to be removed.
(4) Rotate propeller by hand in the normal direction of rotation until the number one cylinder is coming up on its compression stroke.

NOTE: To facilitate installation of a replacement magneto, it is good practice to position the crankshaft at the advance firing angle for number one cylinder. Any standard timing device or method can be used to obtain this position, or if the magneto being removed is correctly timed to the engine, the crankshaft can be rotated to a position at which the breaker points will be just opening to fire the number one cylinder.

(5) Remove the two magneto flange clamp nuts, washer, and clamps. Pull the magneto forward from the crankcase mounting pad.

NOTE: As the magneto flange clears the crankcase hole, watch the rubber drive bushings and steel retainer in the gear hub to make sure they will not drop out.

B. Installation (Refer to Figure 401).
(1) Remove the magneto timing inspection hole plug. Rotate the magneto shaft until the timing pointer inside the magneto case is aligned with marked gear tooth.
(2) Remove either the upper or lower spark plug from number one cylinder.
(3) Remove timing inspection plug located on the side of the crankcase and forward of number six cylinder.
(4) Rotate propeller to locate timing mark scribed on ring gear through timing inspection hole, when number one cylinder is on the compression stroke.

NOTE: The number one cylinder firing position is 22 degrees BTC. This can be accomplished by rotating the propeller shaft and centering the timing mark on ring gear with the centerline of the crankcase timing inspection hole.

(5) Check magneto to assure it is internally timed for right-hand drive rotation.

NOTE: The magneto installation procedure is identical for installing either magneto on either engine.

(6) Position magneto in place on the crankcase accessory mounting pad.
(7) Attach a timing light to magneto in accordance with timing light manufacturers instructions.
(8) If the timing light is out, rotate magneto housing in direction of its magneto rotation a few degrees beyond point where light illuminates. Slowly rotate magneto in opposite direction until light is out. Tighten magneto flange clamps.
(9) Install spark plug.
(10) Install engine cowling.

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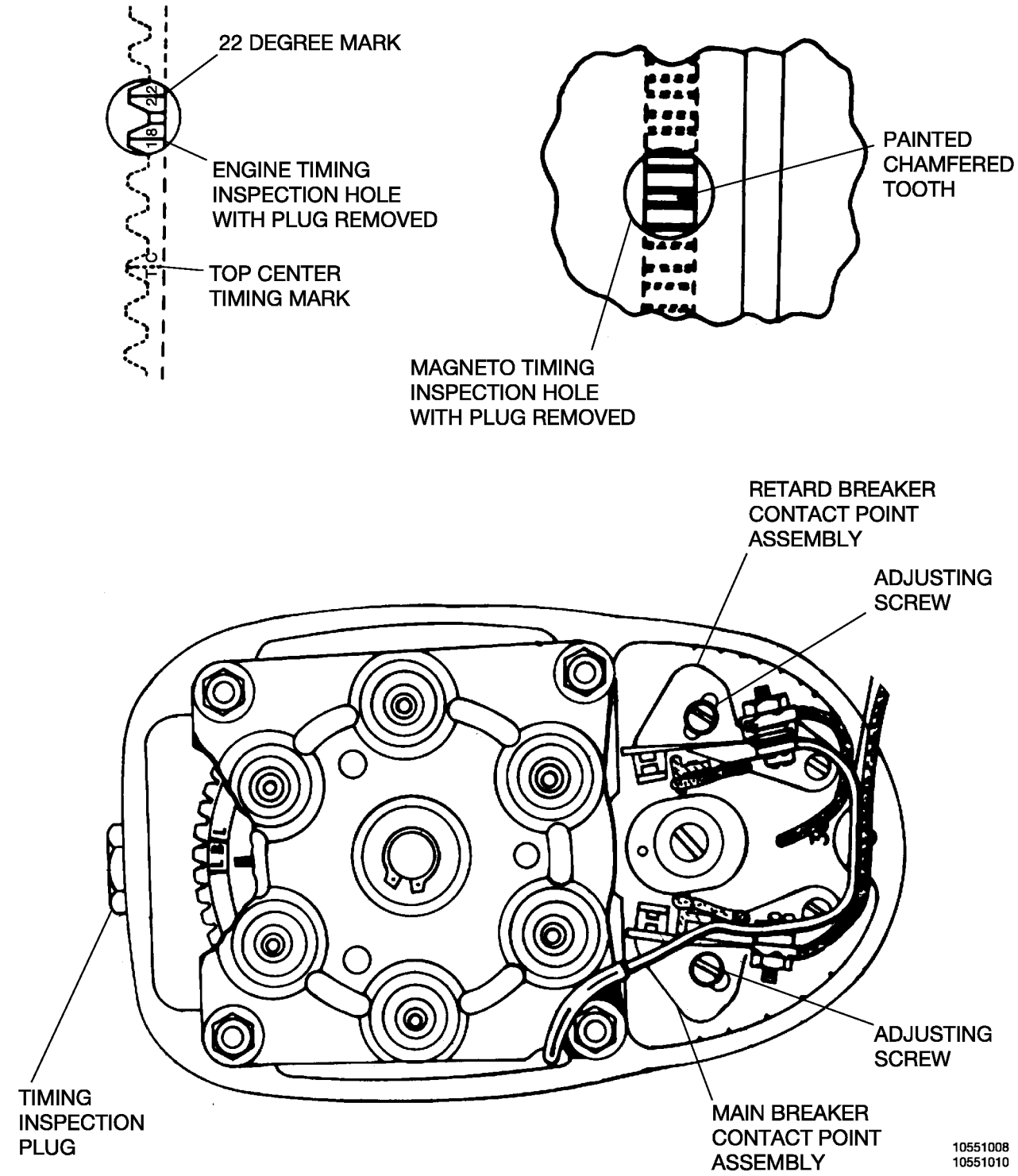

Magneto Installation
Figure 401 (Sheet 1)

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MAGNETO - ADJUSTMENT/TEST

1. Electrical Power Supply

A. Internal Timing (Refer to Figure 501).

(1) On each side of the breaker compartment are timing marks indicating "E" gap and various degrees of retard breaker timing. The marks on the left side, viewed from the breaker compartment, are for clockwise rotating magnetos. Those on the right side are for counterclockwise rotating magnetos. The rotation of the magneto is determined by viewing the magneto from the drive end. The point in the center of the "E" gap boss indicates the exact "E" gap position. The width of the boss on either side of this point is allowable tolerance of +4 or -4 degrees. In addition to these marks, the cam has an indented line across its end for locating "E" gap position of the rotating magnet when aligned with the mark at the top of the breaker housing.

(2) Fabricate a timing pointer by soldering a piece of soft wire to a flat washer similar to the one used with cam screw (Refer to Figure 501).

(3) Remove timing window plug from top of magneto.

(4) Turn engine crankshaft in its normal direction of rotation until painted chamfered tooth of distributor gear is just becoming visible in window. Continue turning slowly until line on end of cam is aligned with mark at top of breaker housing.

(5) Affix timing pointer to cam screw so that it indexes in center of "E" gap mark on breaker housing.

(6) Connect timing light across main breaker. Adjust main breaker contacts to open at this point. Turn engine crankshaft until cam follower is on high point of cam lobe and measure contact clearance. If clearance is not 0.018 inches, +0.006 or -0.006 inches, readjust breaker and verify that contacts will open within "E" gap tolerance of +4 or -4 degrees. Replace breaker assembly if both "E" contact opening point tolerance and contact clearance cannot be obtained.

(7) On retard breaker magnetos, the retard breaker is set to open a predetermined number of degrees after the main breaker opens. To adjust retard breaker, turn engine crankshaft until it is back to the point of main breaker opening. Position pointer at 0 degree mark. Continue turning crankshaft until pointer is over required retard degree mark.

NOTE: When 25 degree retard is required on magnetos with cast in timing marks, advance pointer until it is over the 20 degree mark. Then rotate engine crankshaft until pointer is over the 45 degree mark. This will give a total of 25 degree retard.

(8) Connect timing light across retard breaker. Adjust retard breaker contacts to open at this point. Turn engine crankshaft until cam follower is on high point of cam lobe and measure contact clearance. If clearance is not 0.018 inches, +0.006 or -0.006 inches, readjust breaker and verify that contacts open at retard degree marks on housing. A tolerance of 1/16 inch rotation past this mark (+2 or -0 degrees) is allowed to make contacts open. Replace breaker assembly if both retard breaker opening point and contact clearance cannot be obtained.

(9) Certain magnetos may not incorporate timing marks in the breaker compartment. To check internal timing of these magnetos, install timing kit to breaker compartment and follow the procedure outlined in steps (3) through (8).

CAUTION: If cam screw was removed for installation of pointer, replace flat washer, lockwasher, and screw with nylon patch screw. Tighten to 21-25 inch-pounds of torque. If nylon patch screw is removed at any time. Always replace with a new screw and torque to specified value.

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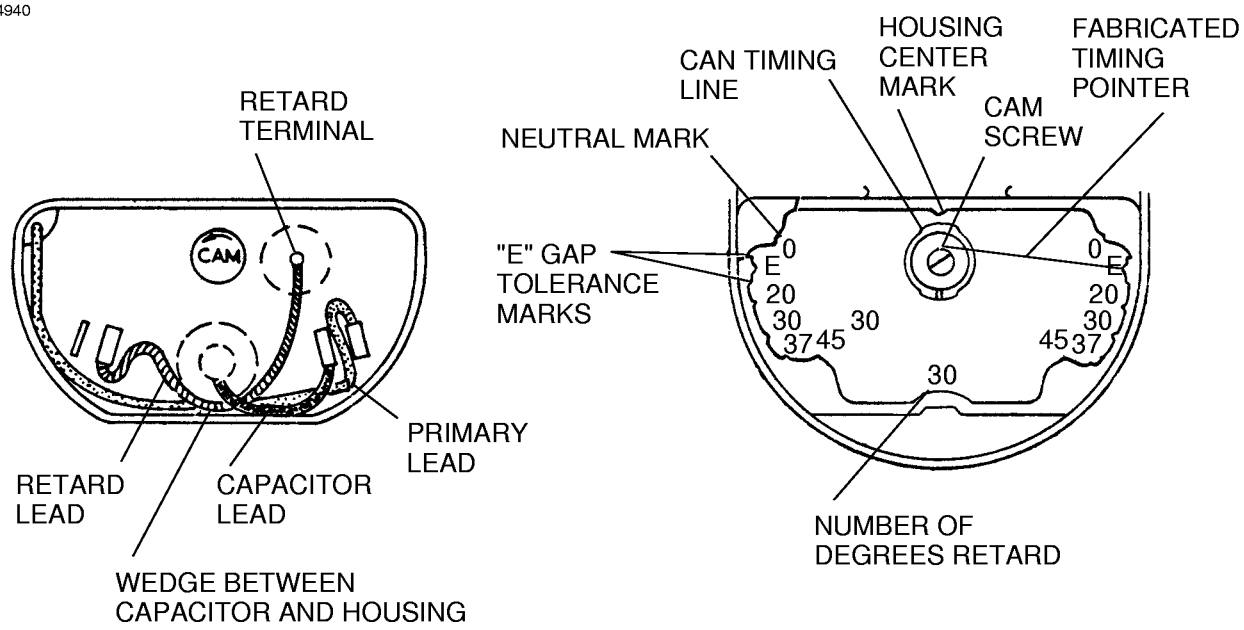

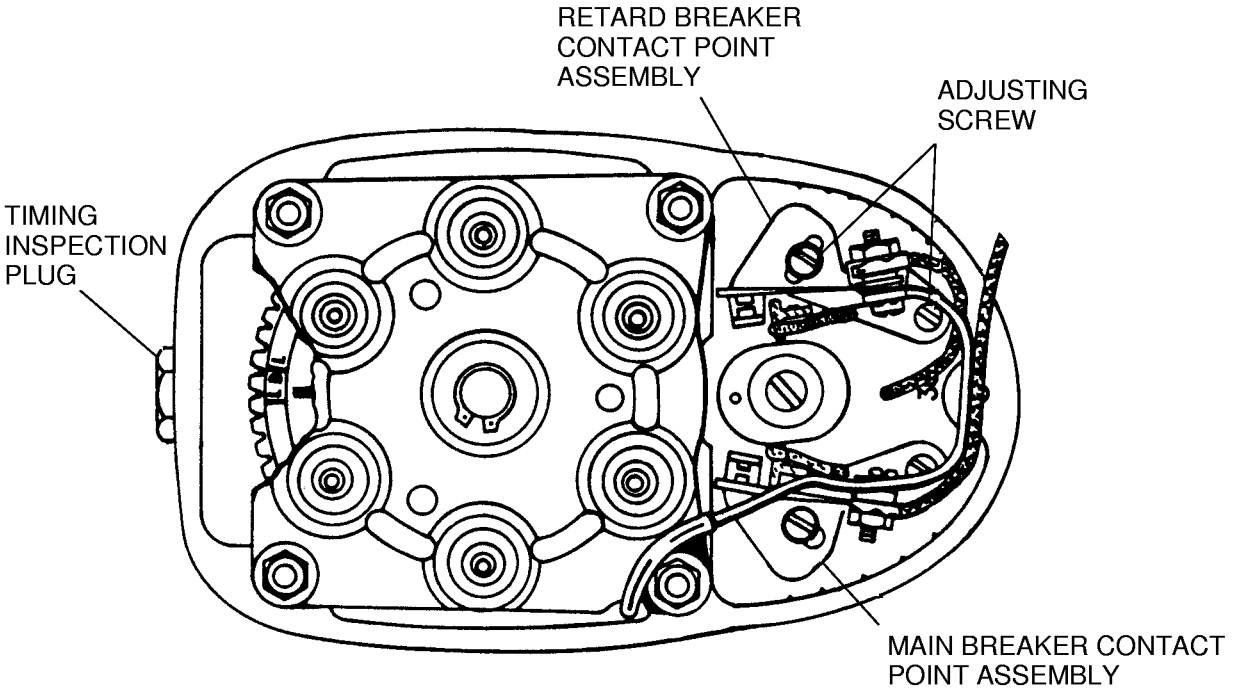

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Magneto Timing Adjustment
Figure 501 (Sheet 1)

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MAGNETO - INSPECTION/CHECK

1. Inspection/Check

A. Magneto.
(1) Remove engine cowling.
(2) Remove magneto breaker point cover plate.
(3) Clean the magnetos with a suitable solvent such as Stoddard solvent and dry with dry compressed air.
(4) Inspect the magneto for proper breaker point gap, and evidence of moisture and arcing.

2. Breaker Assembly

A. Main Spring Scale Check.

NOTE: Check the main springs of the breaker assemblies for proper tension. Tension must be between 12 and 24 ounces at the instant the breaker opens.

(1) Check that the cam follower is securely riveted to the follower spring and that the screw which holds the parts of the breaker is tight. Torque breaker assembly screw for 10 to 12 inch-pounds.
(2) Examine the contact points for excessive wear or burning.

NOTE: Normal points will show a dull, slightly rough contact surface. Points which have deep pits or excessively burned areas should be discarded. If any part of the breaker is defective, the complete breaker assembly must be replaced.

NOTE: Magneto timing to the engine must be rechecked after any replacement of contact breakers or gap adjustments.

NOTE: Magneto timing should never be advanced beyond engine timing specifications.

3. Moisture Check

A. At the first 50-hour inspection and at each 100-hour inspection thereafter, the breaker compartment should be inspected.

NOTE: If ignition trouble should develop, spark plugs and ignition wiring should be checked first. If the trouble appears definitely to be associated with a magneto, the following may be used to help disclose the source of trouble without overhauling the magneto.

(1) Moisture Check.
(a) Remove the high-tension cable outlet plate, cables, and rubber grommets, and inspect these parts for moisture.
(b) Inspect the distributor block high-tension outlet side for moisture.

CAUTION: Do not use gasoline or any other solvent as these will remove the wax coating on some parts and could cause electrical leakage.

(c) If any moisture is evident, lightly wipe with a soft, dry, clean, lint-free cloth.

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IGNITION HARNESS - DESCRIPTION AND OPERATION

1. Ignition Cables

A. Description.

(1) The ignition harness for each engine consists of twelve shielded, high tension cable assemblies with attaching brackets. Six cables are routed from the left magneto, three routing to the upper spark plugs on the left bank of cylinders, three routing between number one and number three cylinders to the lower spark plugs on the right bank of cylinders. The remaining six cables are similarly routed from the right magneto, with three cables going to the upper spark plugs on the right bank of cylinders and the remaining three being routed between number two and number four cylinders to the lower left spark plugs.

2. Spark Plugs

A. Description.

(1) There are two spark plugs in each cylinder. The spark plugs are 18mm short reach type and screw into heli-coil inserts in the cylinders. The spark plugs are shielded to prevent radio interference and have an internal resistor to provide longer gap life. An average life of 200 hours can be expected, however, this time will vary with operating conditions. The proper gap setting is 0.015 to 0.018 inches.

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IGNITION HARNESS - SERVICING

1. Ignition Cables

A. Inspection.
(1) Clean spark plugs (refer to Ignition Harness - Cleaning/Painting). Inspect spark plugs for proper gap 0.015 to 0.018 inch. Inspect porcelain for cracks and evidence of arcing. Rotate spark plugs top right to bottom left, and top left to bottom right.

2. Spark Plugs

A. Inspection.
(1) Clean ignition cables (refer to Ignition Harness - Cleaning/Painting). Inspect the ignition cable for damaged insulation and the end fitting for evidence of cracks and damage.

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IGNITION HARNESS - REMOVAL/INSTALLATION

1. Ignition Cables

A. Removal.
(1) Remove engine cowling.
(2) Remove the cables from spark plug and withdraw the contactor from the spark plug barrel.

NOTE: Whenever spark plug wire terminal ends are withdrawn from plugs, inspect, clean, and lubricate per Teledyne Continental Engine Service Bulletin M80-4.

(3) Loosen attaching clamps.
(4) Remove screws which secure high tension plate to magnetos.
(5) Remove the slotted-head screw and brass washer from plate grommet base which is in line with cable to be detached.
(6) Withdraw cable.

B. Installation (Refer to Figure 401).
(1) All cables can be installed in the same manner. If a new cable is being installed, check it for correct length by comparing it with the cable which is being replaced.
(2) By using good ignition maintenance practices in addition to the Dos and Don'ts listed herein, the normal life expectancy of the harness can be reached. Avoid sloppy installation and maintenance to gain full harness service life. Don't let poor practices reduce reliability.

DO	DON'T
Use the TCM 11-8950 High-Tension Lead Tester to avoid unnecessary handling and replacement of leads.	
Route leads to avoid all contact with engine, engine components, oil lines, airframes. etc.	Allow leads to chafe on engine, engine components, oil lines, airframes, etc.
Make necessary bends as gradual as possible. Keep leads straight wherever possible. Use an elbow clamp, screw and nut where a bend at the spark plug is required.	Make sharp bends or stretch leads.
Torque spark plug coupling nuts accurately: 90-95 inch-pounds for 5/8" -24 nut and 110-120 inch-pounds for the 3/4" -20 coupling nut.	Don't over-torque or under-torque spark plug coupling nuts. Always use a torque wrench.
Hold the hex-shaped crimped portion of the spark plug terminal ferrule with a crescent wrench. This will prevent the ferrule from turning and twisting the lead while tightening or loosening the coupling nut. A four-inch crescent-type wrench is about the right size.	Allow the leads to twist while coupling. Twisting leads may rupture the insulating material.
Use as many clamps and wire bundle ties as necessary. When in doubt, use another clamp or tie.	
Redress harnesses when engines are mounted in their nacelles to prevent chafing against airframe components, etc. Change nylon ties or clamps if they will hold better in a new position. Check harnesses, ties and clamps when other checks are being made on the engine.	Allow leads and wire bundles to hang loosely from their clamps. Don't allow leads to come near the exhaust manifold - keep them as far away as possible. Retighten or reposition clamps or ties if they are loosened for any reason.

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DO	DON'T
Check lead terminals, especially bottom cylinder plug terminals (which seem to run the hottest). The heat may cause the insulating sleeve of the plug terminal to stick in the barrel of the spark plug. If stuck, the insulating sleeve should be removed from the spark plug in such a manner as to protect the silicone insulation on the lead as much as possible. The insulating sleeve, which is readily replaceable, will receive most of any damage incurred during removal.	Bend and twist the spark plug lead until the insulation is damaged or cut by the edge of the terminal ferrule. Do not damage the 5 mm high-tension wire by allowing a screwdriver blade or other sharp tool to pierce it.
Remember to clean the spark plug well ceramic and terminal insulating sleeve. Clean with cloth dampened in alcohol.	Touch the terminal insulating sleeve after washing.
Use a high-temperature mold (115-122 Fluorocarbon Spray, Miller-Stepenson Chemical Co., Inc., 16 Sugar Hollow Rd., Danbury, Connecticut), release on terminal sleeves and on grommets at the magneto cable outlet plates. This will help prevent the hotter running plug insulating sleeves from sticking.	Apply mold release to dirty plugs or insulating sleeves.

NOTE 1: During maintenance check, carefully inspect the silicone lead insulating between the braided conduit and insulating sleeve. Remove the elbow clamp, if installed, to facilitate this inspection. Any lead that is torn or cut must be replaced. A longitudinal or cross-shaped tear may be caused by spark plug leakage. This leakage usually causes a gray or black discoloration of the lead at the torn area.

(3) Connect cable to high tension outlet by inserting cable end, with ferrule and coupling nut in place, through high tension cable outlet plate and into proper hole in outlet plate grommet.
(4) Fasten cable in place with cable piercing screw and brass washer.

CAUTION: Do not over-tighten screws. Avoid bending tee lead over the edge of the harness ferrule; this may result in cutting the lead.

NOTE: Whenever a 3/4-20 spark plug is used, insure that the compression spring is fully seated in the ferrule counterbore. If this precaution is not observed, a "Z" or "S" shaped bend can occur in the lead when assembled to plug.

(5) Attach high tension outlet plate, with cables in place, to magneto with four attaching screws.
(6) Replace cable on proper spark plug.
(7) Install the engine cowling removed.

2. Spark Plugs

A. Removal.
(1) Remove engine cowling.
(2) Loosen coupling nut on spark plug ignition harness.
(3) Lift terminal sleeve out of spark plug shielding barrel well.

CAUTION: When removing terminal sleeve from spark plug, use extreme care to keep the cable terminal sleeve straight in the shielding barrel. Any misalignment could scratch or break the sleeve or the ceramic insulation in the spark plug, necessitating replacement of either or both.

(4) Unscrew the spark plug from the cylinder using a deep socket wrench of suitable size. Make certain that the copper gasket is removed with the spark plug.

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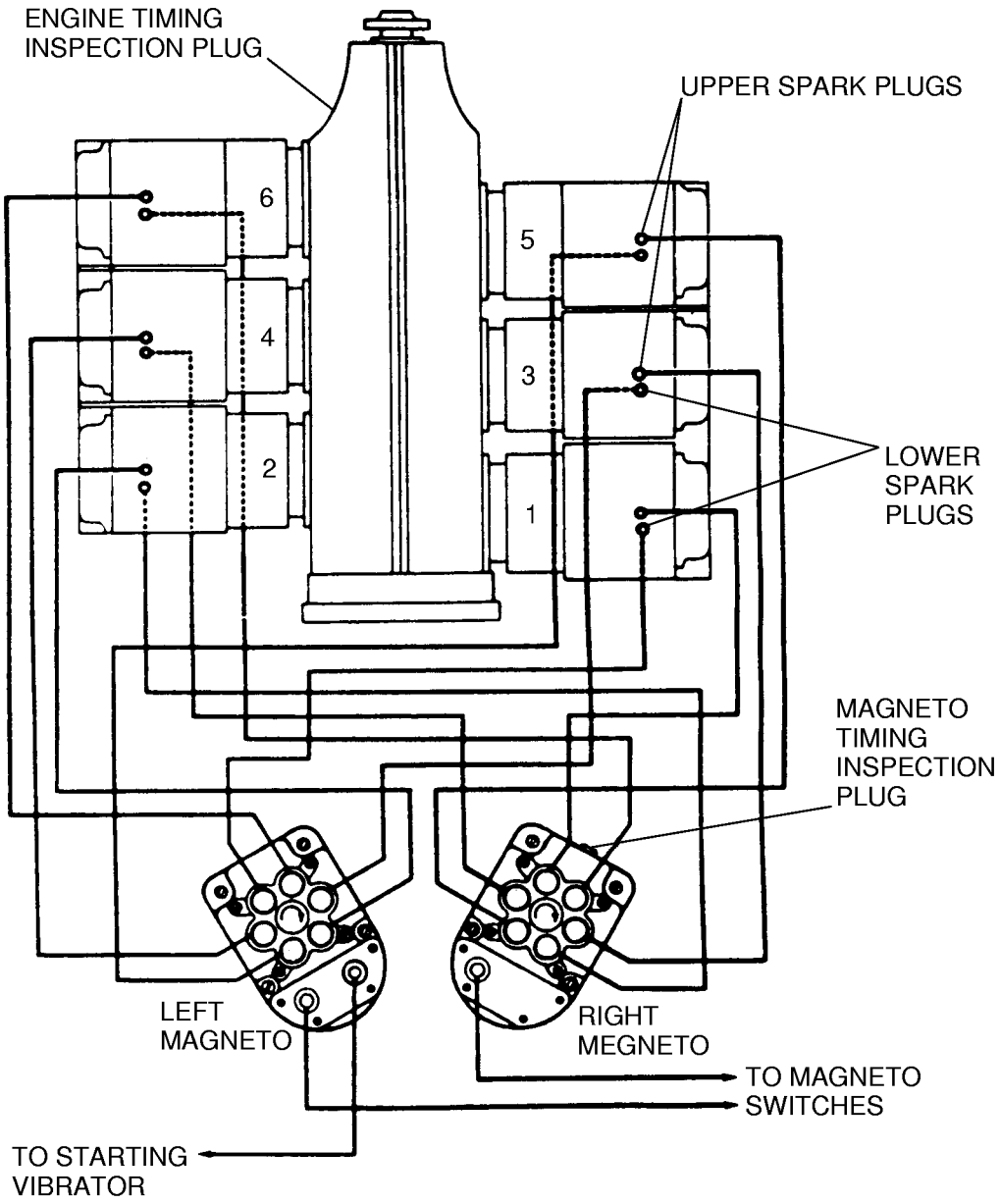

NOTE: NUMBER 1 CYLINDER LEAD IS MARKED ON MAGNETO CASE.

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Ignition Harness Installation
Figure 401 (Sheet 1)

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B. Installation.

(1) To install a spark plug, first make certain the heli-coil insert in the cylinder is undamaged and that the old copper gasket was removed along with the spark plug.

NOTE: If there is any damage to the heli-coil insert, it should be replaced before installing a spark plug.

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IGNITION HARNESS - CLEANING/PAINTING

1. Ignition Cables

A. Cleaning.
(1) The ignition cables shall be wiped clean using a clean cloth and DC4 Silicone grease.

2. Spark Plugs

A. Cleaning.

NOTE: Clean the spark plugs with an abrasive type cleaner.

(1) Apply anti-seize compound sparingly to spark plug threads, being careful not to allow any compound to get on the ground electrodes. A good practice is to leave the bottom two threads of the spark plug uncoated. The anti-seize compound is electrically conductive and any of this material on the electrodes would short out the spark plug.
(2) Screw the spark plug into the cylinders, first installing a new copper gasket. The plugs should be tightened to the specified torque, 330 inch-pounds, +30 or -30 inch-pounds using a deep socket wrench with a torque wrench.

CAUTION: Make certain that the socket is properly seated on the spark plug hexagon as damage to the plug could result if the wrench is cocked to one side when pressure is applied.

(3) Install engine cowling.

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IGNITION SWITCHES - DESCRIPTION AND OPERATION

1. Ignition Switches

A. Description.

(1) The four magneto ground circuits are controlled by four magneto switches. The switches are located on the left-hand side of the stationary instrument panel.

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CHAPTER 76

ENGINE CONTROLS

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ENGINE CONTROLS - GENERAL

1. Scope

A. This chapter describes those controls which govern operation of the engine.

2. Engine Control System

A. Description.
(1) The engine control system consists of the control quadrant, propeller controls, mixture control, cowl flap controls, alternate air controls, their cables, mounting, routing, and connection to individual components.

3. Engine Control Quadrant

A. Description.
(1) The engine control quadrant mounted in the center pedestal contains throttle levers, propeller pitch levers, and mixture levers. The components are fastened together in a manner which allows a friction control knob at the right side of the control quadrant to vary the amount of friction on the various control levers. This provides a means of locking the control levers in the desired position.

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ENGINE CONTROLS - MAINTENANCE PRACTICES

1. Recommended Control Cable Moisture Purging

A. Moisture Purging Procedures (Refer to Figure 201).

NOTE: This procedure is applicable only to control cables with rubber or plastic seals on the telescoping portion of the cable. Do not attempt to purge control cables which feature metal bulb seals on the telescoping portion at the engine end.

(1) Place airplane in heated hangar if ambient temperatures fall below 35°F, and allow ample time for moisture to thaw within the confines of the control cables.
(2) Disconnect control cables (throttle, mixture, and propeller) from engine levers.
(3) Displace elastomeric seals from swivel joints and telescopic control ends at the pedestal to allow flow of purging gas into the cabin area.
(4) Remove elastomeric seal from swivel joints and telescopic control ends in the engine compartment.
(5) Install moisture purging system shown in Figure 201 to the engine compartment control cable ends.

WARNING: Nitrogen container valve must be maintained closed until the pressure regulator is adjusted to fully closed position (0 PSIG regulated pressure).

(6) With pressure regulator on fully closed position, open the nitrogen tank valve.
(7) Gradually open the pressure regulator to establish nitrogen flow through control cable to a pressure setting of 18-20 PSIG.
(8) Cycle the corresponding pedestal control lever through its entire travel continuously while nitrogen flows within the cable. Continue this procedure for a minimum period of ten (10) minutes per cable.
(9) Repeat process with all power control cables (throttle, mixture, and propeller).
(10) Install elastomeric seals on swivel joints and telescopic end of cables at the engine compartment and connect said cables to the engine control levers.
(11) Displace elastomeric seals on swivel joints and telescopic ends of cables at the control pedestal to their original positions.
(12) Reconnect all control cables to corresponding levers and verify operation and rigging.

NOTE: Do not introduce lubricants, deicing compounds or any type of fluid to the control cables. Service experience clearly indicates that only temporary functional improvements are attained with commercial lubricants or deicers, and that said products severely degrade control cable performance over extended periods of time.

(13) Nitrogen consumption of a typical 223 cu. ft. (2200 PSI) container ranges between 10-15 PSIG per control cable purging operation.

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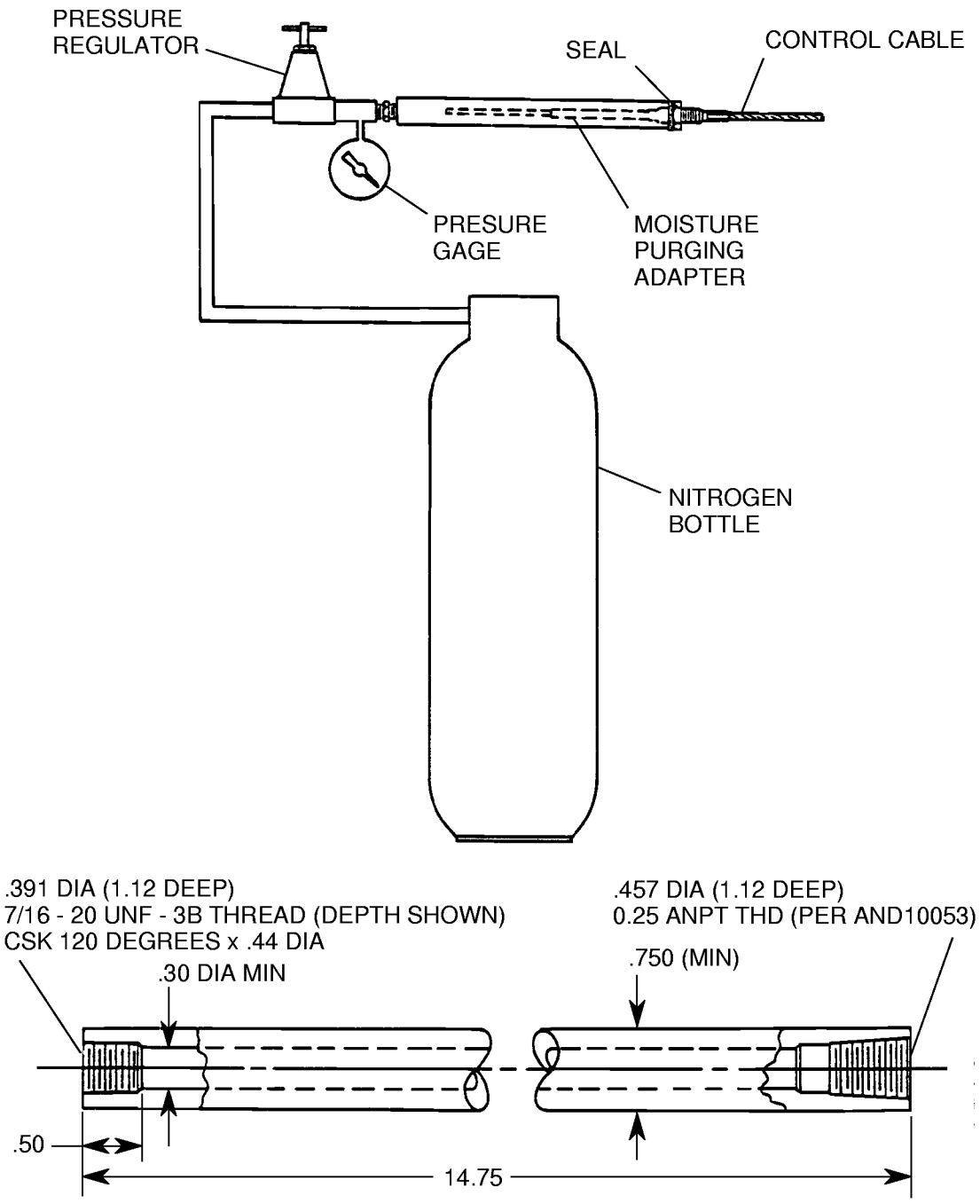

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Control Cable Moisture Purging
Figure 201 (Sheet 1)

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ENGINE CONTROLS - REMOVAL/INSTALLATION

1. Engine Control System

A. Removal (Refer to Figure 401).

(1) Remove elevator trim control wheel cover plate, friction knob, upper RH panel, and RH side panels.
(2) Disconnect throttle, propeller, and mixture control cables from control quadrant levers by removing attaching clevis pins.
(3) Remove bulkhead locknuts (7) from control cables at the control pedestal support bracket and nacelle firewall rib.
(4) Remove bulkhead locknuts (7) from propeller control cable on propeller control cable mounting bracket and disconnect rod end (6).
(5) Remove clamps securing throttle and mixture control cables to aft firewall.
(6) Disconnect rod ends (6) from serrated levers (8) on mixture and throttle control cables by removing attaching nuts, washers, and bolts.
(7) Remove rod ends (6) from control cables.
(8) Remove locknuts from throttle and mixture control cables at mounting bracket.
(9) Attach guide wires to control cables.
(10) Guide control cables from airplane pulling guide wires in place.
(11) Disconnect control cables from guide wire.

NOTE: To facilitate installation, leave guide wire in airplane.

B. Installation (Refer to Figure 401).

NOTE: When installing control cables, the following precautions must be used: Keep cable assemblies clean; do not allow shavings, dirt, grease, etc., to get on the cable and keep the cables off the floor. Keep cables straight or properly coiled and bagged during installation. Do not allow the cable to kink or twist, force sharp bends, or use pliers to pull cables.

(1) Attach guide wires to control cable ends.
(2) Route the propeller, throttle, and mixture control cables to their proper location in the engine nacelle and the control pedestal.
(3) Remove guide wires from control cables.
(4) Install rod ends (6) on mixture and throttle control cables.

NOTE: Do not connect rod ends to serrated levers at this time.

(5) Secure control cables to nacelle firewall outboard nacelle rib and control pedestal support bracket with bulkhead locknut (7).
(6) Connect control cables clevis ends to quadrant control levers with attaching clevis pins and safety with cotter pin.
(7) Route propeller cable through pedestal support bracket and secure with bulkhead locknuts (7).
(8) Secure rod end (6) to propeller cable and connect rod end to propeller governor with bolt, spacer, and nut.

NOTE: On Standard 310, secure governor control to the outboard hole on the governor control arm. On Turbo 310, secure governor control to the inboard hole on the governor control arm.

(9) Refer to Chapter 61, Propeller Controlling - Adjustment/Test and rig propeller control in accordance with rigging procedures.
(10) Connect mixture and throttle rod ends (6) to serrated levers (8) with attaching bolts, washers, spacers, and nuts. Rig in accordance with rigging procedures.
(11) Install elevator trim control wheel cover plate friction knob, upper RH panel, and RH side panel.

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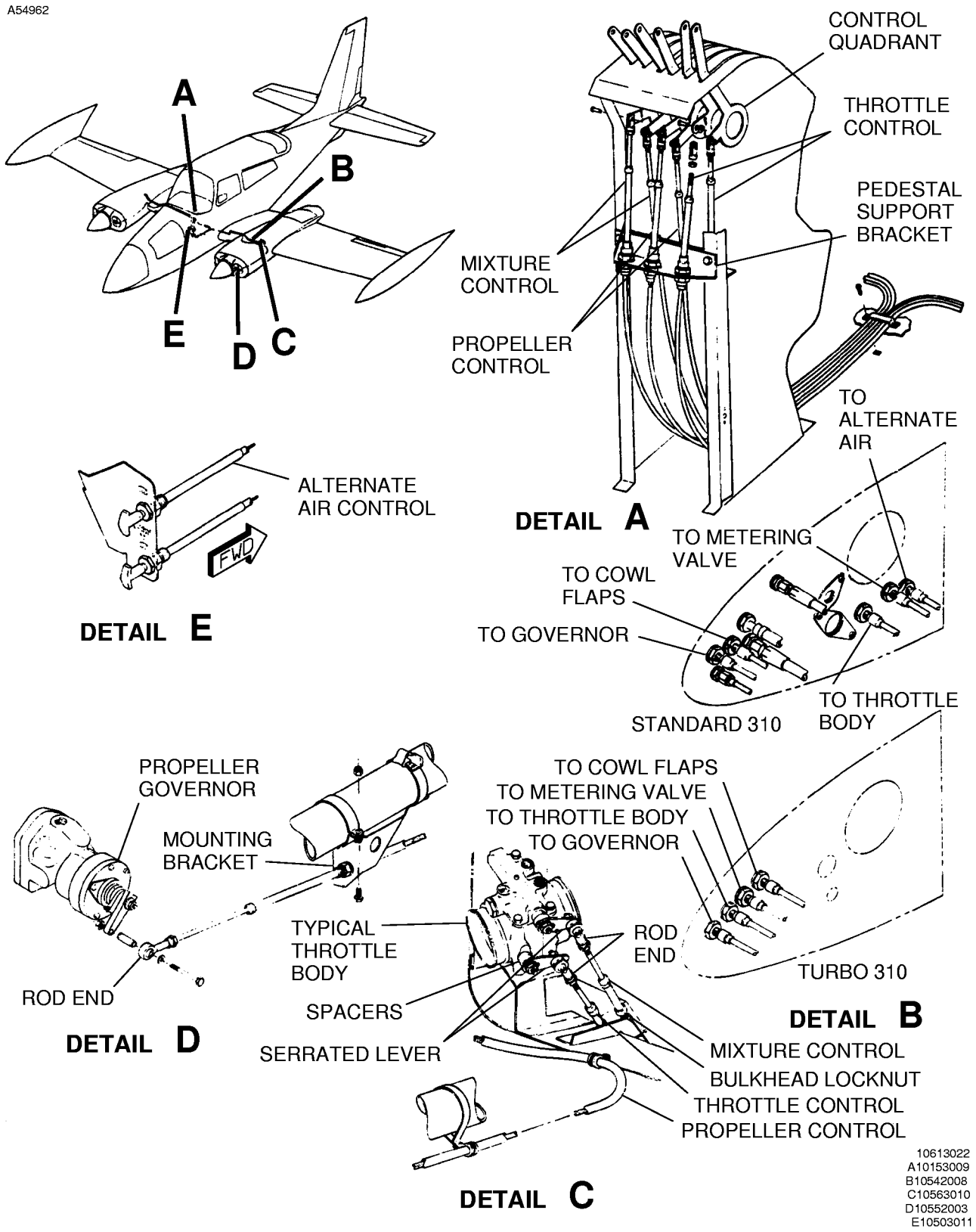

Engine Control System
Figure 401 (Sheet 1)

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2. Engine Control Quadrant

A. Removal (Refer to Figure 402).
(1) Remove LH and RH upper side panels (3), friction knob, and elevator trim control wheel.
(2) Disconnect throttle, propeller, and mixture controls from engine quadrant (2).
(3) Remove screws securing quadrant to pedestal and lift out.

B. Disassembly (Refer to Figure 403).
(1) Remove three screws (1) attaching right mounting plate (14) to guide rods (9).
(2) Remove washer (17) and spring (18) from end of center stud (16).

NOTE: Spacers 5, 7, and 8 are of different thicknesses.

(3) Remove rack (6) and spacers (8) from guide rods, then remove spacer (19), friction disc (20) and control lever (10) from hub (22). Follow this sequence and remove the remaining parts assembled on the guide rods and hub.

CAUTION: Hold the ratchet stop (11) on mixture levers down when removing the racks to prevent them from springing out of their housings.

(4) Remove three screws (1) attaching rods to left mounting plate (4) and remove guide rods.
(5) Remove lock screws (2) from left mounting plate (4) and remove hub (22) from mounting plate.
(6) Unscrew retainer (3) from hub (22) and center stud (16) from retainer, to complete disassembly.

C. Assembly (Refer to Figure 403).
(1) Screw center stud (16) into retainer (3).
(2) Screw retainer into hub (22) and install hub in left mounting plate (4). Secure hub to mounting plate with lock screw (2).
(3) Stake with a punch edge of lock screw after installing to prevent it from becoming loose and dropping out.
(4) Install three guide rods (9) on left mounting plate (4) with three attaching screws (1).

NOTE: Do not lubricate the parts to be assembled on the hub. These parts must remain dry for proper operation of the control friction lock.

(5) Assemble control levers, spacers, guides, etc., on hub and guide rods as illustrated.
(6) Install right mounting plate (14) with three screws (1), attaching mounting plate to guide rods (9).

D. Installation (Refer to Figure 402).
(1) Place quadrant in position on pedestal.
(2) Connect throttle, propeller, and mixture control to quadrant.
(3) Install screws securing quadrant in place.
(4) Install elevator trim wheel, LH and RH upper side panels (3), friction control knob, and check all controls for freedom of movement.

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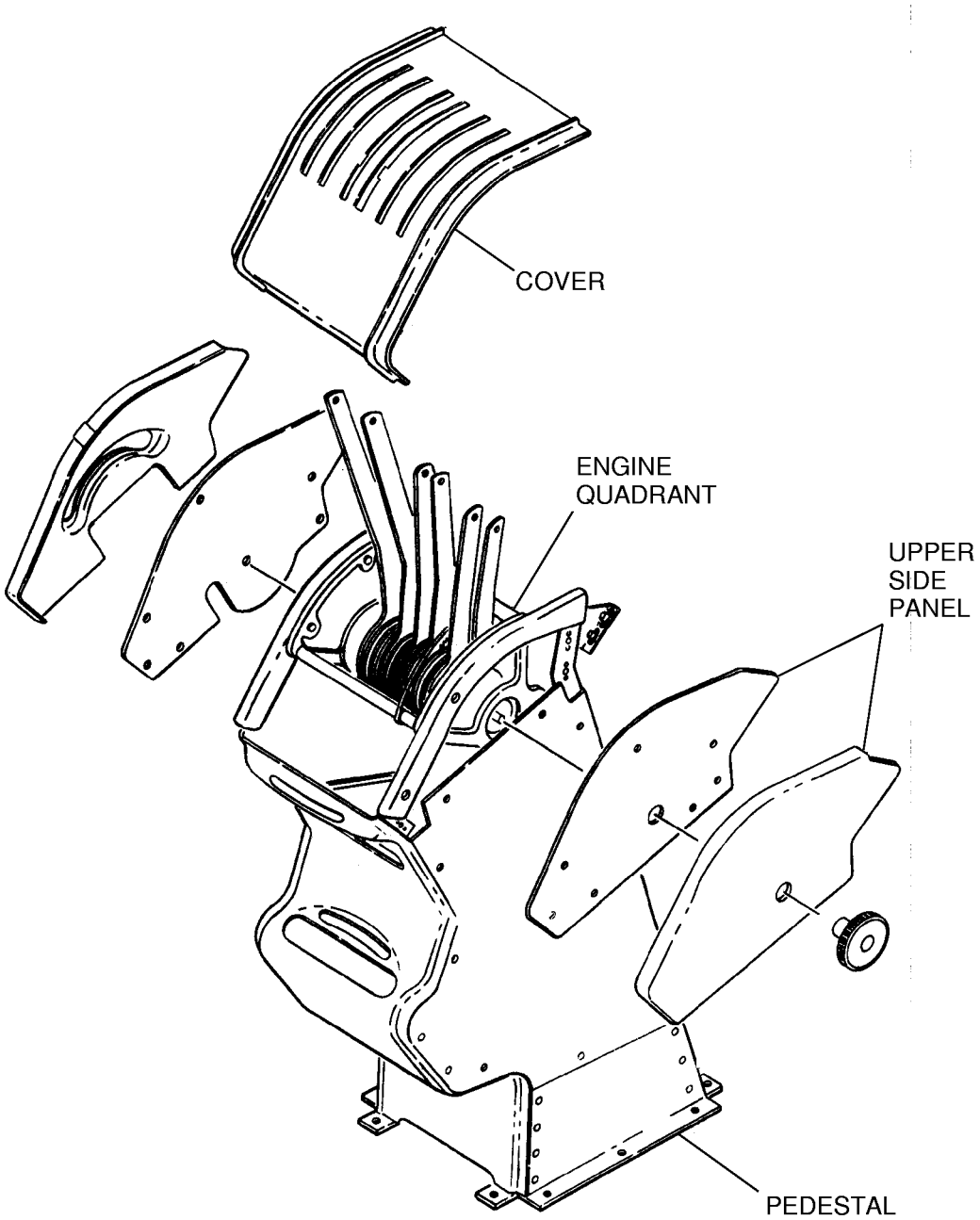

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Engine Control Quadrant Installation
Figure 402 (Sheet 1)

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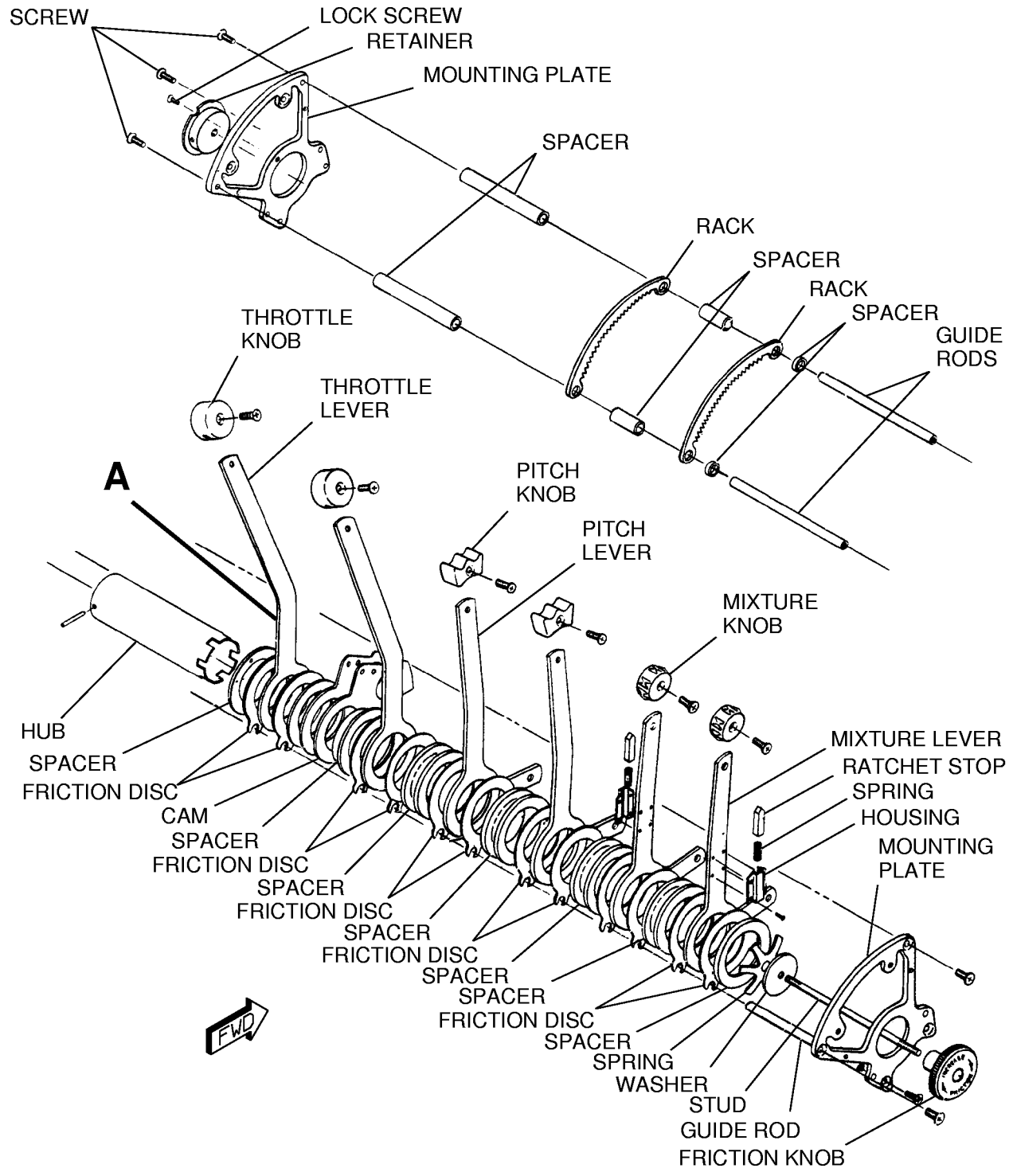

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Engine Control Quadrant Assembly
Figure 403 (Sheet 1)

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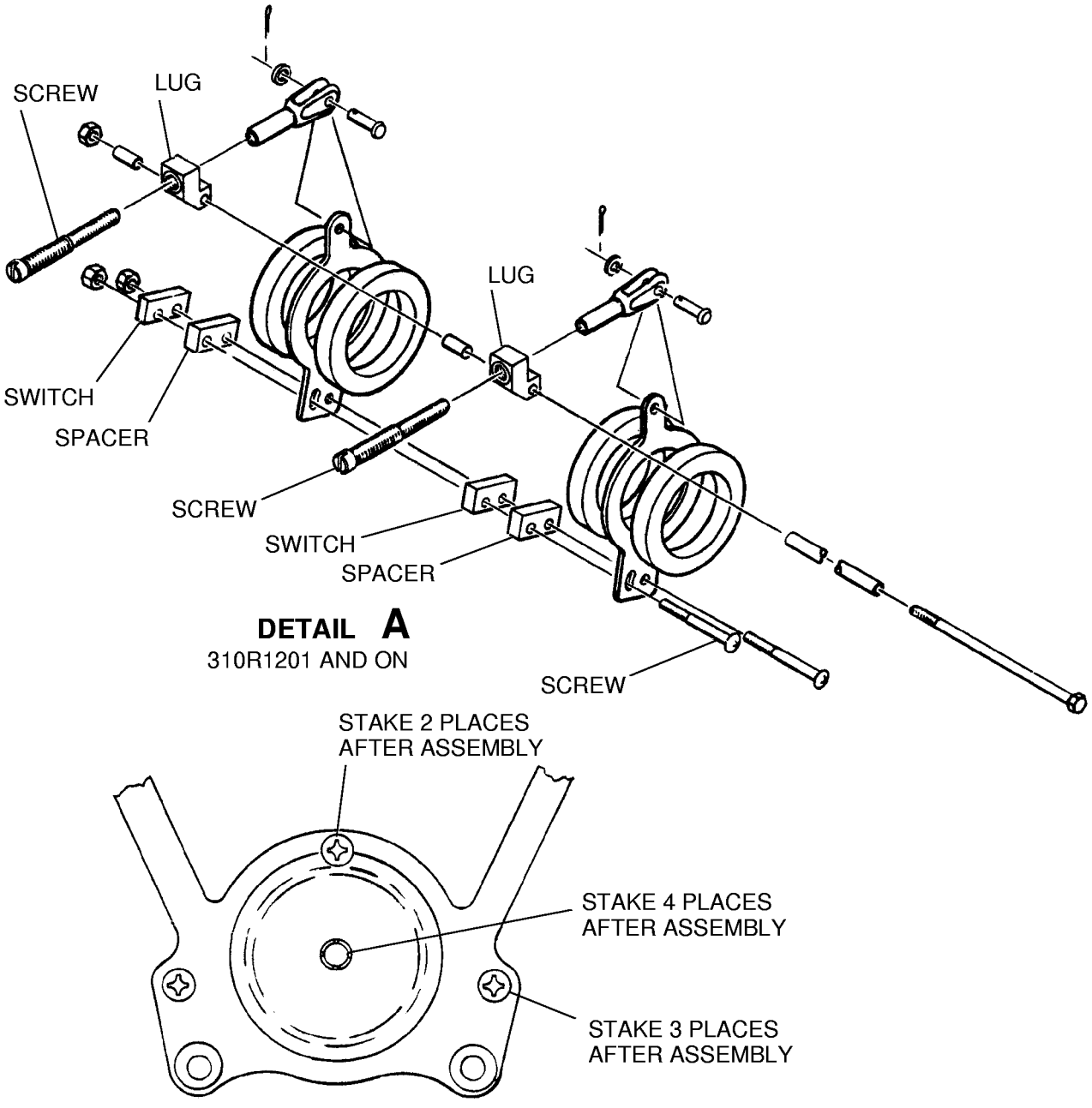

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Engine Control Quadrant Assembly
Figure 403 (Sheet 2)

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ENGINE CONTROLS - ADJUSTMENT/TEST

1. Mixture and Throttle Controls

A. Rigging (Refer to Figure 501).

(1) Rig control cables on throttle valve and metering unit.

(a) Find the neutral position of the throttle shaft by rotating the throttle shaft clockwise and then counterclockwise until the shaft comes to rest on the internal stops. Scribe an index mark on shaft and throttle body at these positions. Rotate throttle shaft to the midpoint between the marks and scribe a neutral position mark. The neutral position on the metering unit can be determined by visually positioning the pin on the metering unit shaft at the midpoint between the two stop pins. Position both the throttle and metering unit shafts to neutral.

(b) Align serrated spacers on throttle and metering unit shafts so that serration lines on the face of the spacer are perpendicular to the neutral position of the shafts.

CAUTION: Care should be exercised in order to maintain original factory setting of serrated spacers on shafts.

(c) Install levers (8) on spacers aligning the serrations.

(d) Secure levers and spacers to throttle and metering unit shafts with washers and nuts.

(e) On the control quadrant, place throttle and mixture control levers at the midpoint between stops.

(f) With the throttle and metering unit shafts in the NEUTRAL position and the throttle and mixture control levers on quadrant set at the midpoint, adjust control cables rod ends (6) so that when attached to levers (8), a 90 degree angle is formed between centerline of lever (8) and centerline of control cables.

NOTE: If throttle and mixture controls on the quadrant were not set at a true midpoint as described in step (e) above, the 1/4 inch tolerance as noted in following steps (2) and (4) will not be available. Readjustment for 1/4 inch travel (cushion) will be necessary and should be made as specified in Table 501, Rigging Procedures Chart for Mixture and Throttle Controls.

Table 501. Rigging Procedures Chart for Mixture and Throttle Controls

CONDITION	PROBABLE CAUSE	CORRECTION
MIXTURE CONTROL LEVER STOPS SHORT AT BOTH ENDS OF QUADRANT	Insufficient control travel.	Shorten travel of serrated lever (8) by resetting lever higher on serrated spacer.
MIXTURE CONTROL LEVER REACHES QUADRANT BEFORE COVERING FULL TRAVEL	Excessive control travel.	Lengthen travel of serrated lever (8) by resetting lever lower on serrated spacer.
MIXTURE CONTROL LEVER STOPS SHORT AT ONE END OF TRAVEL AND STRIKES THE QUADRANT STOP AT THE OTHER END	Uneven control travel adjustment.	Disconnect rod end (6) from lever (8) and turn rod end until desired adjustment is achieved. Connect rod end to lever.
UNEVEN MIXTURE RESPONSE BETWEEN ENGINES (MORE THAN HALF KNOB DIFFERENCE AT BALANCED FLOW METER READINGS, RPM AND MANIFOLD PRESSURE)	Different mixture control sensitivities.	Refer to Rigging Mixture and Throttle Controls.

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Table 501. Rigging Procedures Chart for Mixture and Throttle Controls (continued)

CONDITION	PROBABLE CAUSE	CORRECTION
THROTTLE CONTROL LEVER STOPS SHORT AT BOTH ENDS OF QUADRANT	Insufficient control travel.	Shorten travel of serrated lever (8) by resetting lever higher on serrated spacer.
THROTTLE CONTROL LEVER REACHES QUADRANT STOPS BEFORE COVERING FULL TRAVEL	Excessive control travel.	Lengthen travel of serrated lever (8) by resetting lever lower on serrated spacer.
THROTTLE CONTROL LEVER STOPS SHORT AT ONE END OF TRAVEL AND STRIKES THE QUADRANT STOP AT THE OTHER END	Uneven control travel adjustment.	Disconnect rod end (6) from lever (8) and turn rod end until desired adjustment is achieved. Connect rod end to lever.
UNEVEN THROTTLE SETTING RESPONSE BETWEEN ENGINES. MORE THAN 1/8 INCH DIFFERENCE BETWEEN KNOBS (AT SAME FLOW METER MANIFOLD PRESSURE AND RPM READINGS)	Different throttle control sensitivities.	Refer to Rigging Mixture and Throttle Controls.

NOTE 1: If described corrective measures do not provide adequate throttle control operation, check throttle body, control valve operation, and air intake system for leaks.

(2) Adjustment of the idle mixture is accomplished by the use of a locknut which is attached to the metering unit lever on the metering unit. Tightening locknut, to shorten the interconnecting linkage, provides a richer mixture. Adjust to obtain a slight and momentary gain in idle speed as the mixture control is moved toward IDLE CUT-OFF (If set too lean, idle speed will drop under the same condition). Mixture control levers in the cabin should end their travels approximately 1/4 of an inch before reaching the quadrant stops. At the same time, the metering unit levers on the engines should rest against the corresponding stops.

(3) Metering unit levers should be uniform within 1/2 of a knob through the cruising range. This can be checked by adjusting both flow meter readings to an identical value at uniform RPM and manifold pressure on both engines.

(4) Adjust the throttle control levers in the cabin so that their travel ends 1/4 of an inch before reaching the quadrant stops. At the same time the throttle levers on the engines should rest against the corresponding stops.

(5) Throttle control levers should be uniform within 1/8 of an inch of the knobs through the entire travel. The Rigging Procedures Chart for Mixture and Throttle Controls (Table 501) provides corrective instructions in order to meet the above control requirements.

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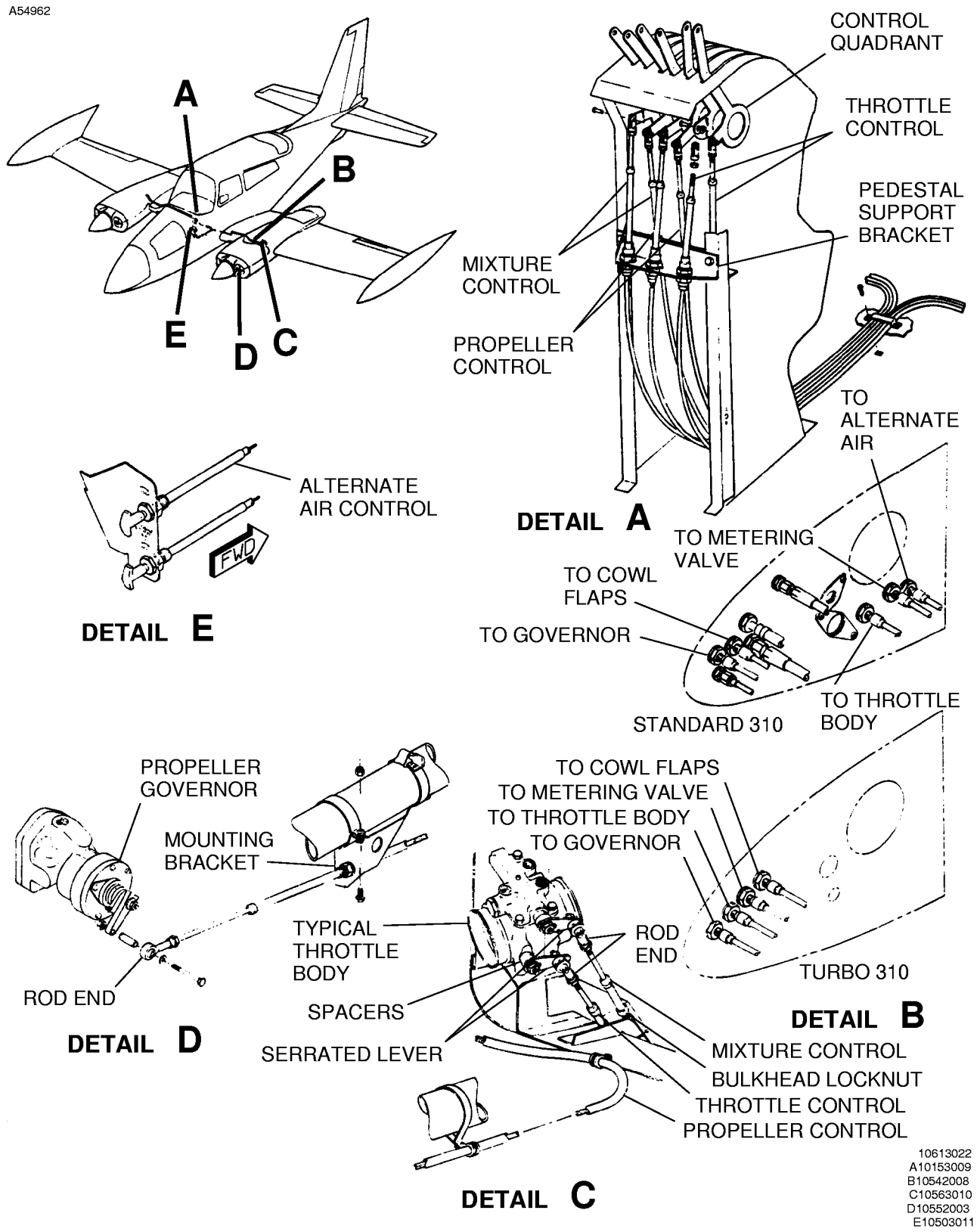

Engine Control System
Figure 501 (Sheet 1)

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ENGINE CONTROLS - INSPECTION/CHECK

1. Engine Control System

A. Inspection/Check of Engine Control System.
  (1) Preparation
    (a) Remove pedestal upper left and right side panels.
    (b) Remove front carpet.
    (c) Remove upholstery side panel.
    (d) Remove wing gap fairing.
    (e) Remove necessary access plates on underside of wing.
    (f) Remove upper engine cowling.
  (2) Check the engine controls for:
    (a) Security of mounting.
    (b) Sharp Bends and damage which might affect the operation of the controls.
    (c) Check installation between engine and firewall. Control cables should not be stretched tight between engine and firewall. Cables should not make contact with engine.
    (d) Check controls at firewall for security of installation.
    (e) Check rubber seals on the ends of control cables for deterioration.

NOTE: Cowl flap and alternate air cables do no have rubber seals on the pedestal end of the cable.

NOTE: Repair of engine controls is limited to replacement of parts.

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CHAPTER

77

ENGINE INDICATING

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ENGINE INDICATING - GENERAL

1. Scope

A. This chapter describes those units, components, and associated systems which indicate engine operation.

2. Engine Indicating System

A. Description.
(1) The engine indicating system consists of the tachometer, tachometer generator and associated wiring. The tachometer calibrates electrical current from the tachometer generator to revolutions per minute. The tachometer indicator on the instrument indicates propeller RPM.

3. Manifold Pressure Indicating System

A. Description.
(1) The manifold pressure indicating system consists of a dual manifold pressure gage mounted on the instrument panel. The manifold pressure lines are routed from the intake manifold on each engine to separate connections at the back of the gage. The gage is calibrated in inches of mercury, indicating the absolute pressure in the intake manifold of each engine.

4. Economy Mixture Indicator

A. Description.
(1) The economy mixture indicator (optional) consists of the indicator and a sensing probe connected by electrical wires. The probe mounted in the exhaust system senses temperature of the exhaust gas and is used to determine the most economical fuel-air mixture for cruising flight at a power setting of 75 percent or less. Exhaust gas temperature varies with the ratio of fuel-to-air mixture entering the engine cylinders.

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ENGINE INDICATING - TROUBLESHOOTING

1. Engine Indicating System

A. Engine Indicating System
(1) Troubleshooting.
(a) For troubleshooting the engine indicating system, refer to Table 101.

Table 101. Engine Indicating System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
ENGINE OPERATING. NO TACHOMETER INDICATION OR ERRATIC INDICATION.	Wire harness has broken wire or poor solder joint.	Repair wire harness.
	Tachometer generator connector plug has loose wire or poor solder joint.	Repair connector plug or replace tachometer generator.
	Failed tachometer indicator.	Replace indicator.

2. EGT System

A. Troubleshooting.
(1) For troubleshooting the EGT system, refer to Table 102.

Table 102. Exhaust Gas Temperature System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
ONE SIDE OF GAGE DOES NOT OPERATE.	Bad wiring.	Replace gage.
	Bad wiring in probe assembly.	Replace probe assembly.
POINTER ON GAGE FLUCTUATES.	Loose connection at gage.	Tighten connection.
	Broken or frayed probe wiring.	Replace or repair probe wiring.
	Bad wiring on gage.	Replace gage.
		Replace probe.

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ENGINE INDICATING - REMOVAL/INSTALLATION

1. Manifold Pressure Indicating System

A. Removal (Refer to Figure 401).
   (1) Remove indicator in accordance with Chapter 31, Instrument and Control Panels - Removal/Installation.
   (2) Remove indicator line (6), fuselage line (5), wing line (4), nacelle line (3), and nacelle hose (1) from intake manifold (2).

NOTE: When removing/installing lines at bulkhead fittings, insure that fitting is secured to prevent twisting line on opposite side from one being installed. Hold fitting with wrench while loosening/tightening line connection. Refer to Tubing and Hose Maintenance Practices in Chapter 20 for expanded installation procedures.

NOTE: Plug and cap all lines and fittings to prevent entry of foreign material.

B. Installation (Refer to Figure 401).
   (1) Remove all caps and plugs from lines and fittings.
   (2) Install nacelle hose (1) to intake manifold (2), wing line (4), fuselage line (5) and indicator line (6) and tighten all fittings.
   (3) Install indicator in accordance with Chapter 31, Instrument and Control Panels - Removal/Installation.

2. Economy Mixture Indicating System

A. Removal (Refer to Figure 402).
   (1) Tag and disconnect electrical leads or indicator.
   (2) Remove indicator from instrument panel by removing attaching post lights and screws.
   (3) Remove upper engine cowling.
   (4) Disconnect electrical leads at probe mounted in exhaust system and route wiring from fuselage through wing and out from nacelle.
   (5) Loosen clamp securing probe and remove.

B. Installation (Refer to Figure 402).
   (1) Install probe in position and secure with clamp.

NOTE: Do not alter length of electrical leads.

   (2) Route electrical leads from probe in nacelle through wing into the fuselage and in place forward of instrument panel.
   (3) Connect electrical leads at probe and on the rear of the instrument panel.
   (4) Install indicator in instrument panel with attaching screw and post lights.
   (5) Install engine cowling.

3. Tachometer Indicator

A. Removal/Installation (Refer to Figure 403).
   (1) Remove and install tachometer indicator in accordance with Chapter 31, Instrument and Control Panels - Removal/Installation

4. Tachometer Generator

A. Removal (Refer to Figure 403).
   (1) Remove upper engine cowling.
   (2) Disconnect electrical connector.
   (3) Remove nuts, lockwashers and washers securing tachometer generator to drive adapter and remove generator.

B. Installation (Refer to Figure 403).
   (1) Attach tachometer generator to drive adapter with mounting nuts, lockwashers, and washers.

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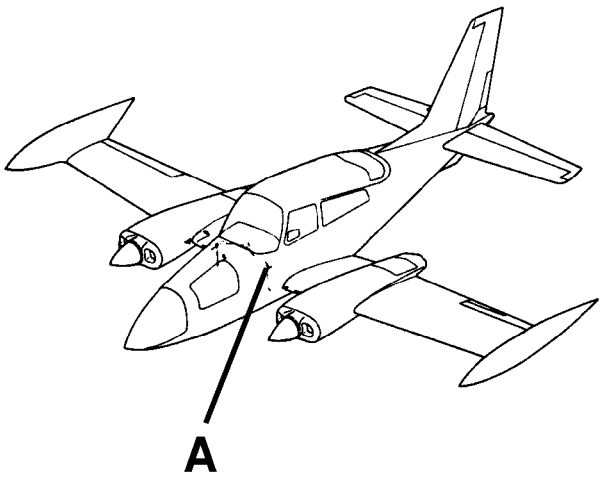

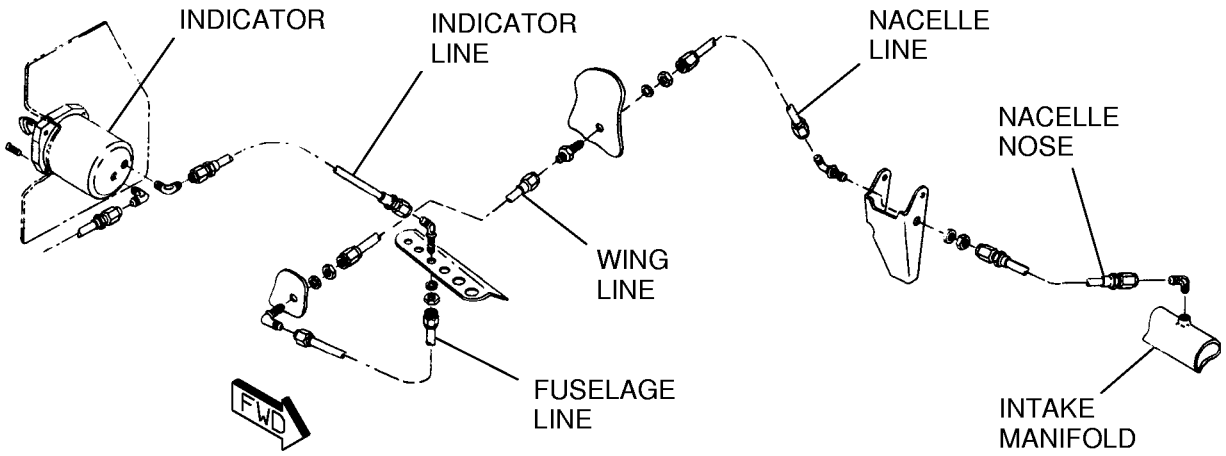

DETAIL A

10143051
A10142030

Manifold Pressure Indicating System
Figure 401 (Sheet 1)

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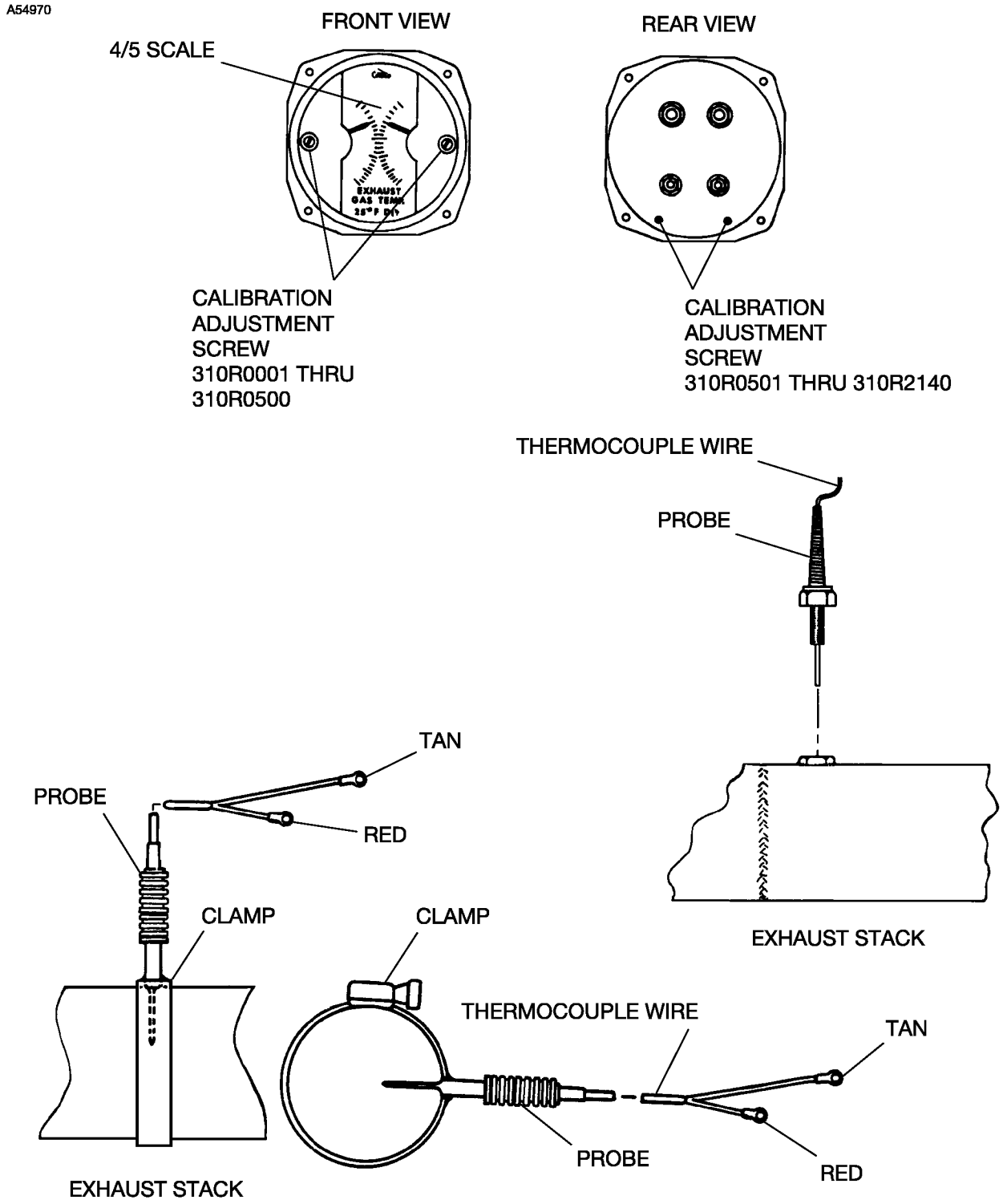

Economy Mixture Indicating System
Figure 402 (Sheet 1)

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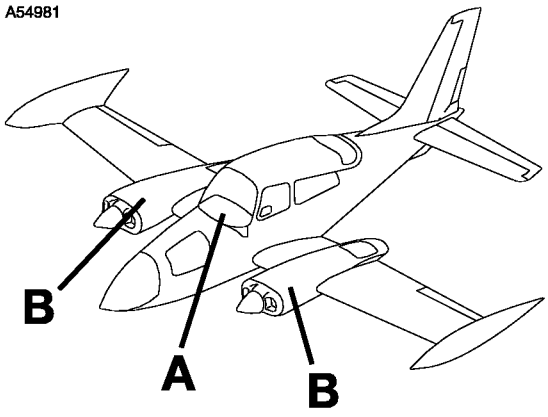
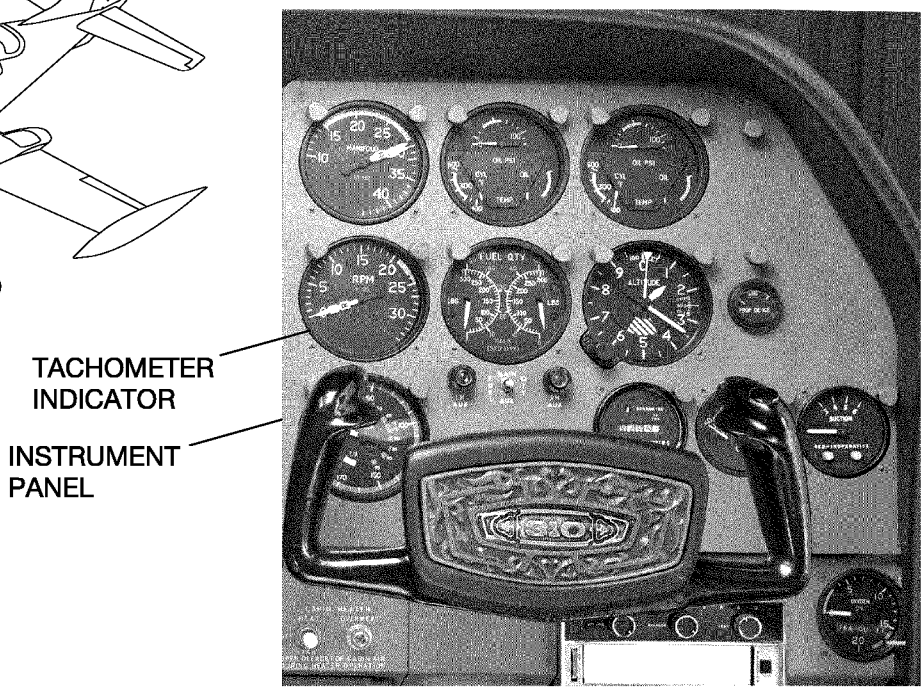
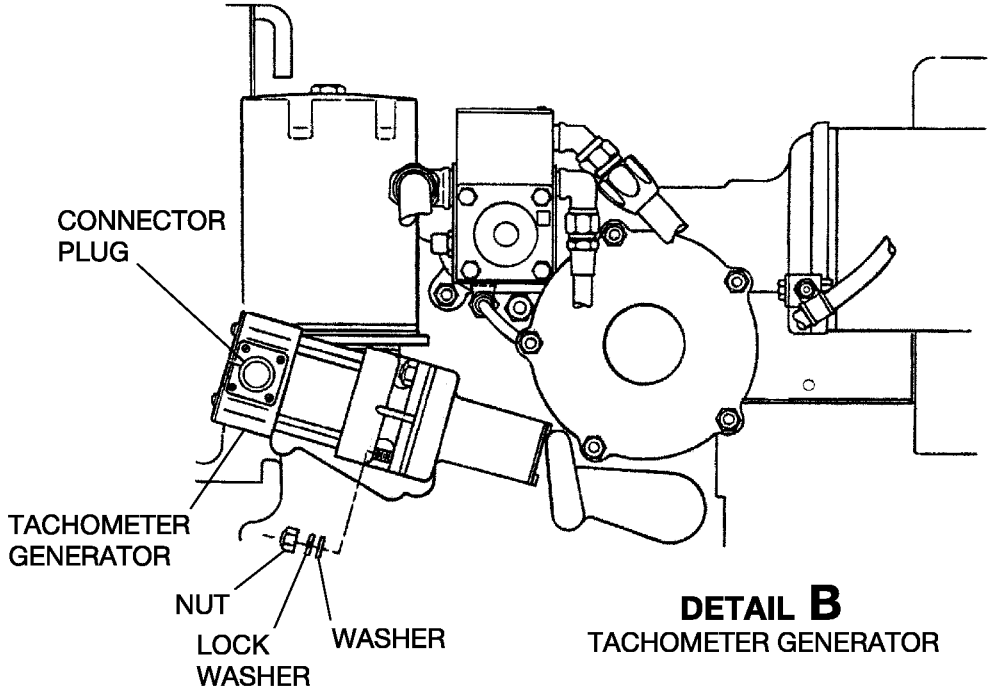




DETAIL A
INSTRUMENT PANEL, RIGHT SIDE



DETAIL B
TACHOMETER GENERATOR

1014T3056
A1018P1027
B1056R1010

Engine Indicating System
Figure 403 (Sheet 1)

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(2) Connect electrical connector to tachometer generator. Safety wire connector.
(3) Install upper engine cowling.
(4) Perform engine operation check.

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ENGINE INDICATING - ADJUSTMENT/TEST

1. Economy Mixture Indicating System

A. Calibration Check.

NOTE: To check calibration, it will be necessary to fly the airplane.

(1) Obtain an average cruise condition of 65 percent power at 7500 feet altitude and lean mixture to peak exhaust temperature on indicator.

NOTE: To obtain peak exhaust gas temperature, lean out mixture control slowly enough for pointer to follow. When the pointer stops going up and starts back down the scale, enrich mixture enough to regain peak reading.

NOTE: Operation at peak EGT is not authorized for normal continuous operation, except to establish peak EGT for reference. Operation within 25 of peak EGT is not approved.

(2) Record reading achieved after system has stabilized.
(3) Repeat step (1) to insure a positive reading has been achieved.
(4) Enrich mixture to a setting of not less than 50°F below peak exhaust gas temperature.
(5) Gage pointer should now indicate 4/5 of scale.
(6) On Airplanes 310R0001 thru 310R0500, if adjustment is required, proceed as follows:
   (a) Use adjustment screw on face of the indicator and position pointer to 4/5 scale.

   NOTE: Adjustment required should not exceed +75°F or -75°F or three divisions on the indicator scale.

   (b) If adjustment for more than +75°F or -75°F is required, proceed as follows:
      1 Gain access to rear of indicator and viewing indicator from the rear, turn calibration screws one turn clockwise for increase in indicator reading of 25°F (one division on the indicator scale) or one turn counterclockwise for 25°F decrease.
(7) On Airplanes 310R0501 thru 310R2140, if adjustment is required, comply with step (6)(b)(1) only.

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ENGINE INDICATING - INSPECTION/CHECK

1. Manifold Pressure Indicating System

A. Inspection/Check.
(1) Remove upholstery side panel.
(2) Remove necessary wing access plates.
(3) Remove engine cowling.

2. Economy Mixture Indicating System

A. Inspection/Check.
(1) Remove upper engine cowling.
(2) Refer to wiring diagrams in Chapter 24 and perform continuity check using multimeter.

B. Calibration Check.
(1) Check the indicator accuracy in accordance with the table below.

NOTE: The information in the table below contains millivolt values for use in checking calibration accuracy. Tests should be conducted at 75°F. The information corresponds to National Bureau of Standards Number 560. Refer to National Bureau of Standards monograph 125 publication.

Table 601. Scale Reading Versus Millivolt Input

SCALE INDICATION	MILLIVOLT INPUT	TEMP. REF. OF
0.00	28.37	1300
0.25	28.96	1325
0.50	29.54	1350
0.75	30.12	1375
1.00	30.70	1400
1.25	31.27	1425
1.50	31.85	1450
1.75	32.42	1475
2.00	32.98	1500
2.25	33.55	1525
2.50	34.12	1550
2.75	34.68	1575
3.00	35.24	1600
3.25	35.81	1625
3.50	36.36	1650
3.75	36.92	1675
4.00	37.48	1700
4.25	38.03	1725
4.50	38.58	1750
4.75	39.12	1775
5.00	39.67	1800

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CHAPTER 78

EXHAUST

LIST OF EFFECTIVE PAGES

CHAPTER-SECTION-SUBJECT	PAGE	DATE
78-Title		
78-List of Effective Pages		
78-Record of Temporary Revisions		
78-Table of Contents		
78-00-00	Pages 1-2	Jun 17/2005
78-00-00	Pages 401-405	Jun 17/2005
78-00-00	Pages 601-615	Jun 17/2005
78-00-00	Page 701	Jun 17/2005

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RECORD OF TEMPORARY REVISIONS

Temporary Revision Number	Page Number	Issue Date	By	Date Removed	By

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EXHAUST - CLEANING/PAINTING . . . . . 78-00-00 Page 701
Engine Exhaust System . . . . . 78-00-00 Page 701

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EXHAUST - GENERAL

1. Scope

A. This chapter describes those units and components which direct the engine exhaust gases overboard.

2. Description

A. The engine exhaust system consists of a forward, center, and aft riser connected together by slip joints, below each engine exhaust port, and then to the muffler on the 310 airplane, or on the Turbo 310 airplane to the aft slip joint and inboard and outboard exhaust tubes which are connected to the turbocharger.

B. The aft slip joint assembly is the only slip joint on the Turbo 310 airplane incorporating a seal. The seal assembly connects to the inboard and outboard exhaust tubes and the aft stack assembly by a balljoint clamped together on each end using a flange, bolt spring, washer and nut.

3. Tools and Equipment

Name	Number	Manufacturer	Use
Exhaust System Seal Replacement	SK421-40	Cessna Aircraft Co.	Replace slip joint seal in exhaust system.
FELPRO	C-5	Felt Products Mfg. Co. Chicago, Ill.	
Eddy Current Instrument	MIZ 40	Zetec, Inc. 1370 NW Mail St. P.O. Box 140 Issaquah, WA 98027-0140	To determine exhaust components material type.
Surface Probe	Z-5-125	Zetec, Inc.	To perform material type inspection.
Ultrasonic Digital Thickness Gage	25DL	Panametrics Inc. 221 Crescent St. Watham, Mass 02154-3497	Inspect for material thickness.
Ultrasonic Transducer	V208-RM	Panametrics, Inc.	Inspect for material thinning.
Calibration Standard	0880000-2 Inconel (0.0 50 inch thick)	Cessna Aircraft Company Cessna Parts Distribution 5800 East Pawnee P.O. Box 1521 Wichita, KS 67218 USA	To calibrate ultrasonic instrument for material thickness.
Calibration Standard	0880000-3 Stainless Steel (0.050 inch thick)	Cessna Aircraft Company	To calibrate ultrasonic instrument for material thickness.
Calibration Standard	0880000-4 Stainless Steel (0.018 inch thick)	Cessna Aircraft Company	To calibrate ultrasonic instrument for material thickness.

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Name	Number	Manufacturer	Use
Calibration Standard	0880000-5 Stainless Steel (0.063 inch thick)	Cessna Aircraft Company	To calibrate ultrasonic instrument for material thickness.
Solvent	Naptha PD-680, Type Ill	Commercially Available	To clean the engine support structure prior to inspection.
Crocus cloth		Commercially Available	To clean exhaust system components prior to inspection.

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EXHAUST - REMOVAL/INSTALLATION

1. Engine Exhaust System (Standard 310)

A. Removal (Refer to Figure 401)

NOTE: Removal procedures are the same for either left or right engine.

(1) Remove upper engine cowling.
(2) Remove lower portion of engine nacelle and cowling by removing attaching screws.
(3) Disconnect optional exhaust gas temperature probe if installed.
(4) Loosen clamp and disconnect from hanger.
(5) Disconnect muffler from aft riser by removing cotter pins, nuts, bolts, and springs. Remove muffler.
(6) Remove the four nuts holding each riser to its respective cylinder.
(7) Work risers down and free of cylinder studs.
(8) Separate center riser from forward and aft risers and remove from nacelle.

NOTE: If difficulty is encountered in removing an exhaust stack assembly, refer to Chapter 71, Power Plant - Removal/Installation, and raise the engine from its mounts high enough to provide removal clearance.

B. Installation (Refer to Figure 401).
(1) Position muffler in nacelle.
(2) Assemble center riser to forward and aft risers and position in place on cylinder studs.
(3) Install the four nuts on each riser and tighten. Torque four nuts on each exhaust riser to 90 inch-pounds, then retorque to 110 inch-pounds. After initial engine run, bolt torque is to be rechecked and, if necessary, retorqued to 110 inch-pounds prior to flight. Use torque sequence as shown in Figure 402.
(4) Install exhaust optional gas temperature probe if removed.
(5) Align and connect muffler to aft riser, using bolts, springs, nuts, and cotter pins. Tighten to dimension shown in Figure 401.
(6) On Airplanes 310R0001 thru 310R1286, secure muffler extension to hanger, using clamp. Tighten clamp.
(7) On Airplanes 310R1287 thru 310R2140, secure muffler extension to hanger using sleeve and clamp. Tighten clamp.
(8) Install lower portion of engine nacelle cowling with attaching screws.
(9) Install upper engine cowling.

2. Engine Exhaust System (Turbo 310).

A. Removal (Refer to Figure 403).

NOTE: Removal procedures are the same for either left or right engine.

(1) Remove engine cowling.
(2) Remove lower portion of engine nacelle and cowling by removing attaching screws.
(3) Disconnect optional exhaust gas temperature probe if installed.
(4) Remove the four nuts holding each riser to its respective cylinder.
(5) Remove the ten bolts securing slip joint (9) to aft riser (4), inboard tube (7), and outboard tube (8) by removing cotter pin, nut, washers, and springs.
(6) Compress slip joint (9) and remove.
(7) Remove the forward, center, and aft risers by pulling apart.

NOTE: If difficulty is encountered in removing an exhaust, refer to Chapter 71, Power Plant - Removal/Installation and raise the engine from its mount high enough to provide removal clearance.

(8) Refer to Chapter 71, Air Intakes - Removal/Installation, and remove air canister assembly.

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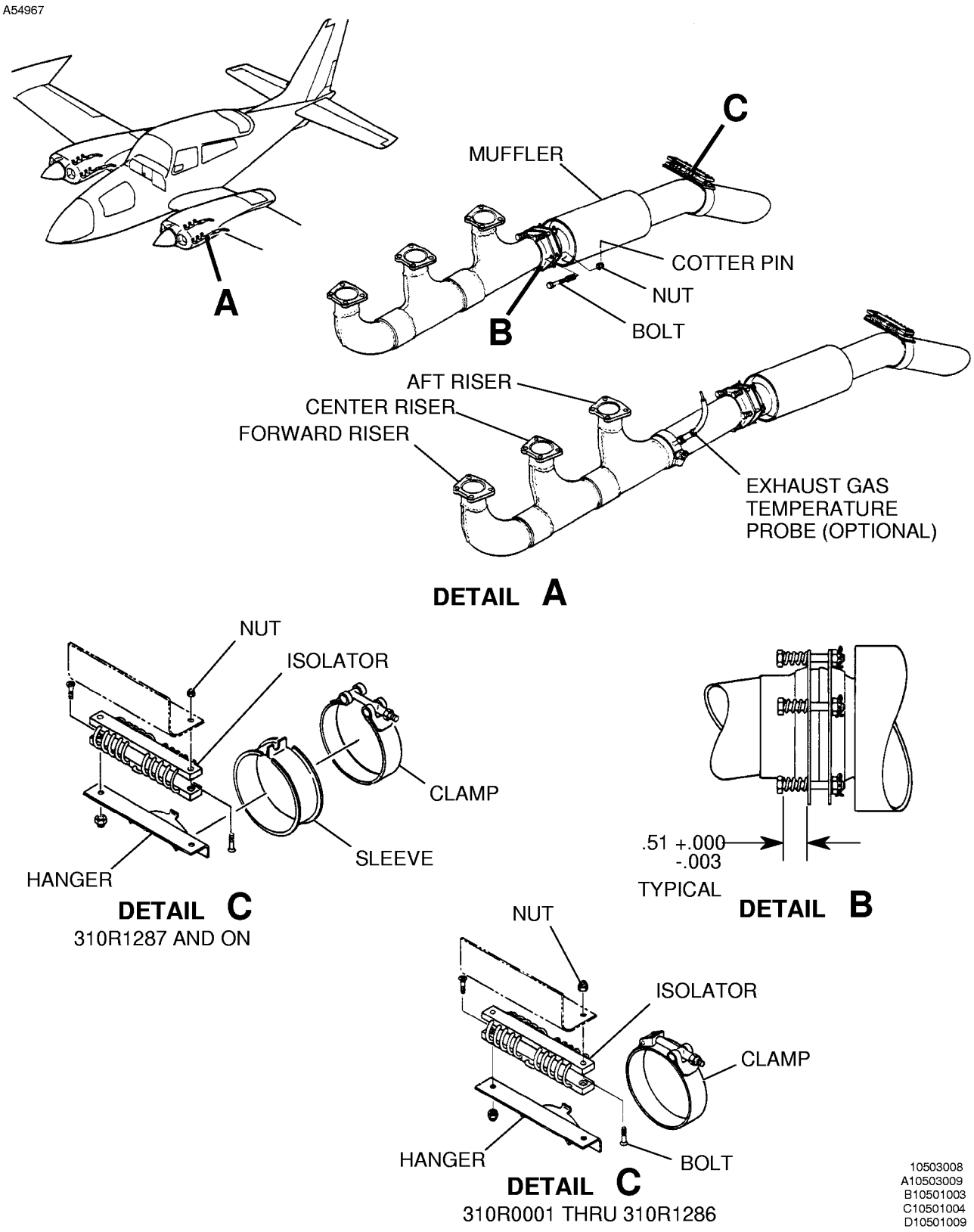

Engine Exhaust System (Standard 310)
Figure 401 (Sheet 1)

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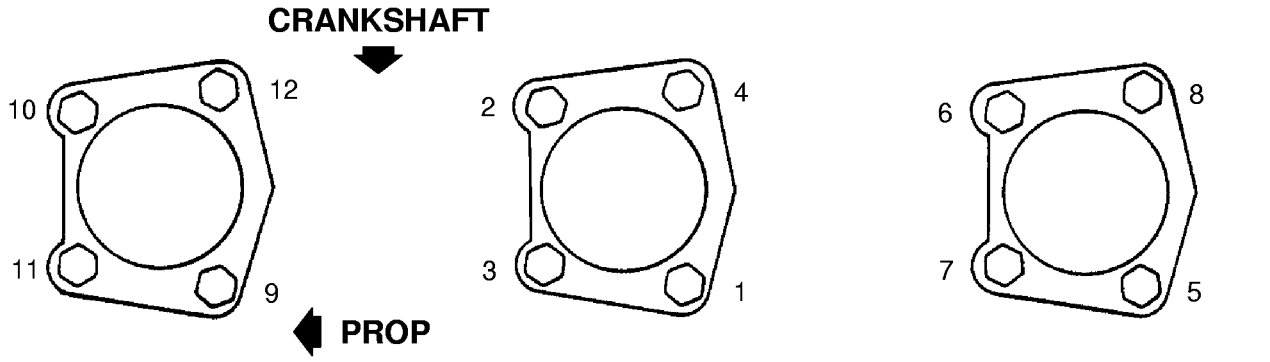

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Exhaust Riser Torque Sequence
Figure 402 (Sheet 1)

(9) Refer to Chapter 81, Turbines - Removal/Installation, and remove turbocharger.
(10) Remove shield (11) from inboard tube (7).
(11) Disconnect inboard tube (7) and outboard tube (8) from exhaust manifold header by removing clamps.
(12) Route tubes (7) and (8) through canted bulkhead and out of engine nacelle.
(13) Remove four nuts and bolts securing manifold header to waste-gate and remove from engine nacelle.

B. Installation (Refer to Figure 403).

NOTE: Apply Fel-Pro Compound to threads in high heat areas.

(1) Position manifold header in place on waste-gate and install four bolts and nuts. Torque nuts 35 inch-pounds.
(2) Route inboard tube (7) and outboard tube (8) through canted bulkhead into position.
(3) Clamp inboard tube (7) and outboard tube (B) to manifold header with clamps. Torque clamps to 35 inch-pounds.
(4) Install shield (11) on inboard tube (7).
(5) Install turbocharger in accordance with Chapter 81, Turbines - Removal/Installation.
(6) Install air canister assembly in accordance with Chapter 71, Air Intakes - Removal/Installation.
(7) Position forward, center and aft risers in place on respective cylinders and tighten nuts. Torque four nuts on each exhaust riser to 90 inch-pounds, then retorque to 110 inch-pounds. After initial engine run, bolt torque is to be rechecked and if necessary, retorqued to 110 inch-pounds prior to flight. Use torque sequence as shown in Figure 402.

CAUTION: During slip joint replacement or when a new seal has been installed, ensure the slip joint has been expanded properly, the attach springs properly compressed and the slip joint forward and aft ends are fitted properly. An improperly fitted slip joint will allow hot exhaust gases to escape causing structural damage to the airplane.

NOTE: Make sure seal (13) in slip joint (9) is good before installing. Refer to SK421-40 for replacement of seal (13) and expansion ring (12).

NOTE: Prior to installing slip joint, ensure it is to proper dimensions as outlined in SK421-40.

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(8) Compress slip joint (9) and install in position. Secure with 10 bolts, springs, washers, and nuts.

NOTE: Be sure springs are compressed the proper dimension by adding or removing washers during installation.

(9) Safety with cotter pins.
(10) If removed, connect optional exhaust gas temperature probe.
(11) Install lower portion of engine nacelle with attaching screws.
(12) Install upper engine cowling.

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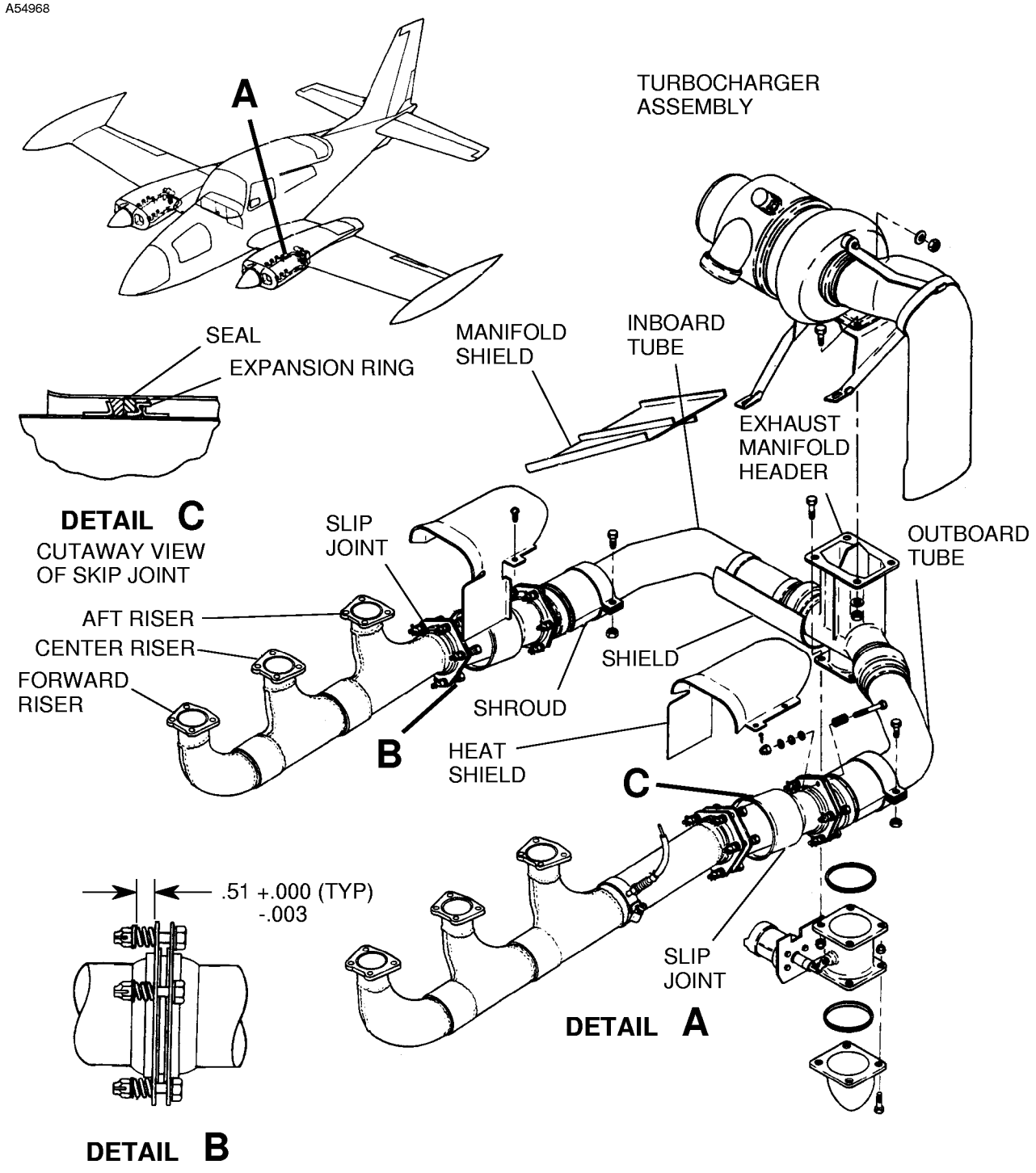

10503006
A10503007
B14501004
C14501003

Engine Exhaust System (Turbo 310)
Figure 403 (Sheet 1)

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EXHAUST - INSPECTION/CHECK

1. Engine Exhaust System

A. Inspection/Check.
(1) For inspection intervals of the engine exhaust system, refer to Chapter 5, Inspection Time Limits.

B. Engine Support Structure Inspection (Model T310R airplanes only)
(1) Inspection Procedure - Remove the engine beam insulation blankets and visually inspect the engine beams (concentrating on the area of the beam between the canted bulkhead and the firewall), the canted bulkhead, and the firewall for any signs of distress, including corrosion, chafing, or cracking. Refer to MEB99-7, or latest revision.

NOTE: If the visual inspection of the specified area on an engine beam or a canted bulkhead cannot be conducted due to a structural repair covering the area, contact and provide Cessna Propeller Aircraft Product Support [Telephone (316) 517-5800, Facsimile (316) 942-9006] with detailed information of the repair.

(2) At any indication of exhaust gas leak or an engine fire, remove heat blanket, and inspect per MEB99-7, or latest revision. If conditions found are beyond the scope of MEB99-7, or latest revision, contact Cessna Propeller Aircraft Product Support for assistance.

C. Engine Exhaust System
(1) Tools and Equipment

NOTE: Equivalent substitutes may be used for the following listed items.

Name	Number	Manufacturer	Use
Eddy Current Instrument	MIZ 40	Zetec, Inc. 1370 NW Mail St. P.O. Box 140 Issaquah, WA 98027-0140	To determine exhaust components material type.
Surface Probe	Z-5-125	Zetec, Inc.	To perform material type inspection.
Ultrasonic Digital Thickness Gage	25DL	Panametrics Inc. 221 Crescent St. Watham, MA 02154-3497	Inspect for material thickness.
Ultrasonic Transducer	V208-RM	Panametrics, Inc.	Inspect for material thinning.
Calibration Standard	0880000-2 Inconel (0.050 inch thick)	Cessna Aircraft Company Cessna Parts Distribution 5800 East Pawnee P.O. Box 1521 Wichita, KS 67218	To calibrate ultrasonic instrument for material thickness.
Calibration Standard	0880000-3 Stainless Steel (0.050 inch thick)	Cessna Aircraft Company	To calibrate ultrasonic instrument for material thickness.
Calibration Standard	0880000-4 Stainless Steel (0.018 inch thick)	Cessna Aircraft Company	To calibrate ultrasonic instrument for material thickness.

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Name	Number	Manufacturer	Use
Calibration Standard	0880000-5 Stainless Steel (0.063 inch thick)	Cessna Aircraft Company	To calibrate ultrasonic instrument for material thickness.
Solvent	Naptha PD-680, Type III	Commercially Available	To clean the engine support structure prior to inspection.
Crocus cloth		Commercially Available	To clean exhaust system components prior to inspection.

(2) Accomplishment Instructions

WARNING: All repaired components must be replaced with a new component.

WARNING: A thorough inspection of the engine exhaust system is required to detect any breaks or cracks causing leaks which might result in the loss of optimum turbocharger efficiency and engine power. A leaking exhaust system may also promote deterioration of engine compartment structure and components or could result in a fire.

WARNING: Never use lead pencils or highly flammable solvents on engine exhaust systems.

WARNING: Never use a wire brush or abrasives to clean engine exhaust systems.

NOTE: Facilities performing the nondestructive ultrasonic and eddy current inspections must hold a valid FAA repair station certificate, or international equivalent, with a specialized service rating for the applicable method of nondestructive inspection. Appropriate test equipment capable of performing the inspection(s) must be available. The minimum requirements from the American Society for Nondestructive Testing Recommended Practice Number SNT-TC-1A (1992).

NOTE: Do not use dye penetrant inspection procedures, since noncritical metal forming folds yield misleading failure indications.

NOTE: Inspect procedures for both left and right engine exhaust systems are typical.

NOTE: This inspection supersedes previously released service information concerning engine exhaust system inspections.

NOTE: Component material type (stainless steel, a mixture, unknown or inconel) referenced in this section, applies to exhaust system components located aft of the risers.

NOTE: Accomplish the following inspections when required as specified in Chapter 5.

(a) General Requirements for All Inspections. Refer to Figure 601. Open lower engine cowling doors or remove upper and lower engine cowlings, as required, to gain access to the engine exhaust system. Refer to Chapter 78 Exhaust - Removal/Installation.

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(b) Refer to Figure 601. Remove the heat shields as required which obscure visual inspection of the engine exhaust system. Remove heat shields from around the exhaust system, slip joints, multi-segment V-band clamps, and any other items which might hinder inspection of the entire exhaust system, refer to the applicable chapters of the Maintenance Manual.

NOTE: Ensure exhaust system has all required heat shields installed, refer to the Illustrated Parts Catalog.

(c) Install all hardware, any removed component(s) and connect any disturbed controls and adjust, as required, which may have been disturbed during any one of the inspections.

WARNING: Follow all safety precautions pertaining to running airplane engines, hot exhaust systems and hot exhaust gases.

(d) Install engine cowlings, as required.
(e) Perform a run and leak check of the engines and exhaust system when appropriate to ensure the integrity of the exhaust system and/or operation of related components. Refer to applicable sections of the Maintenance Manual and the Pilot's Operating Handbook and/or the Flight Manual.
(f) Refer to Chapter 5, Inspection Time Limits for required repetitive inspection requirement for the exhaust system.
(g) Identify and record in the appropriate logbook, the material types for each exhaust system component and Total Time In Service (TTIS).

(3) 50 and 100 Hour Visual Inspection.
(a) Perform a 50 Hour Visual Inspection or 100 Hour Visual Inspection of the engine exhaust system. (Refer to Figure 601).

NOTE: Aide of artificial light and a mirror will be required.

(b) Inspect the engine exhaust system for erosion, burned areas, thinning of material, bulging, looseness, cracks and integrity of welds. If any repaired components are found, they must be replaced with a new component.

WARNING: All repaired components must be replaced with a new component.

(c) Inspect exhaust system clamps for cracks and looseness.

NOTE: Particular attention should be given to condition of the multi-segment and one-piece V-band clamp flanges, multi-segment clamps outer band spot welds, and exhaust system coupling flanges.

(d) Inspect slip joints for erosion, burned areas, thinning of material, bulging, looseness, cracks and integrity of welds.
(e) Inspect exhaust slip joint springs for correct compression. (Refer to Figure 601, Detail E).
1 Measure exhaust slip joint springs installed length. Length must be 0.51 inch, +0.00 or -0.03 inch.
a Springs compressed to less than 0.45 inch must be replaced.

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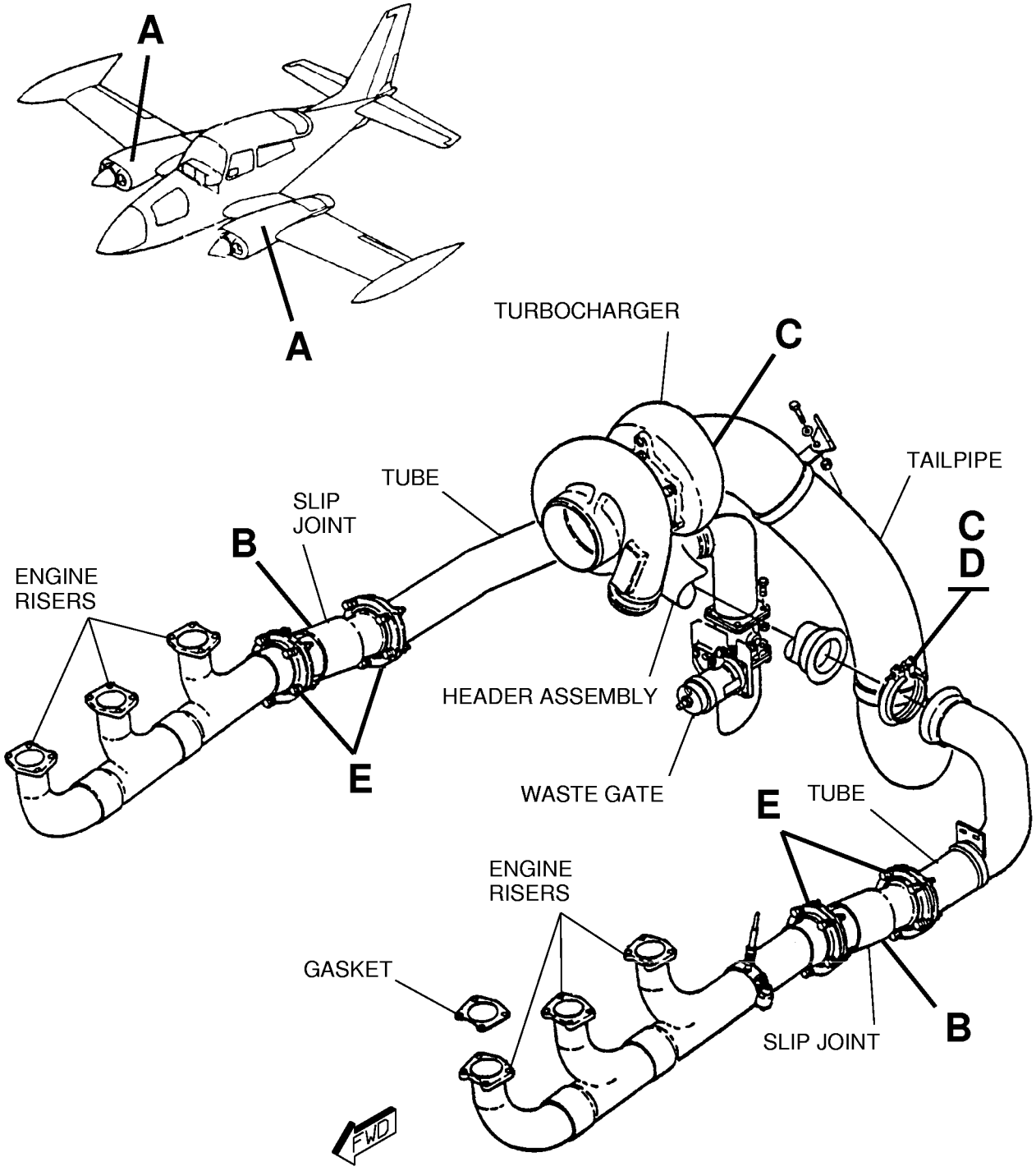

DETAIL A

1010T1006
A2655R1028

Engine Exhaust System Inspection
Figure 601 (Sheet 1)

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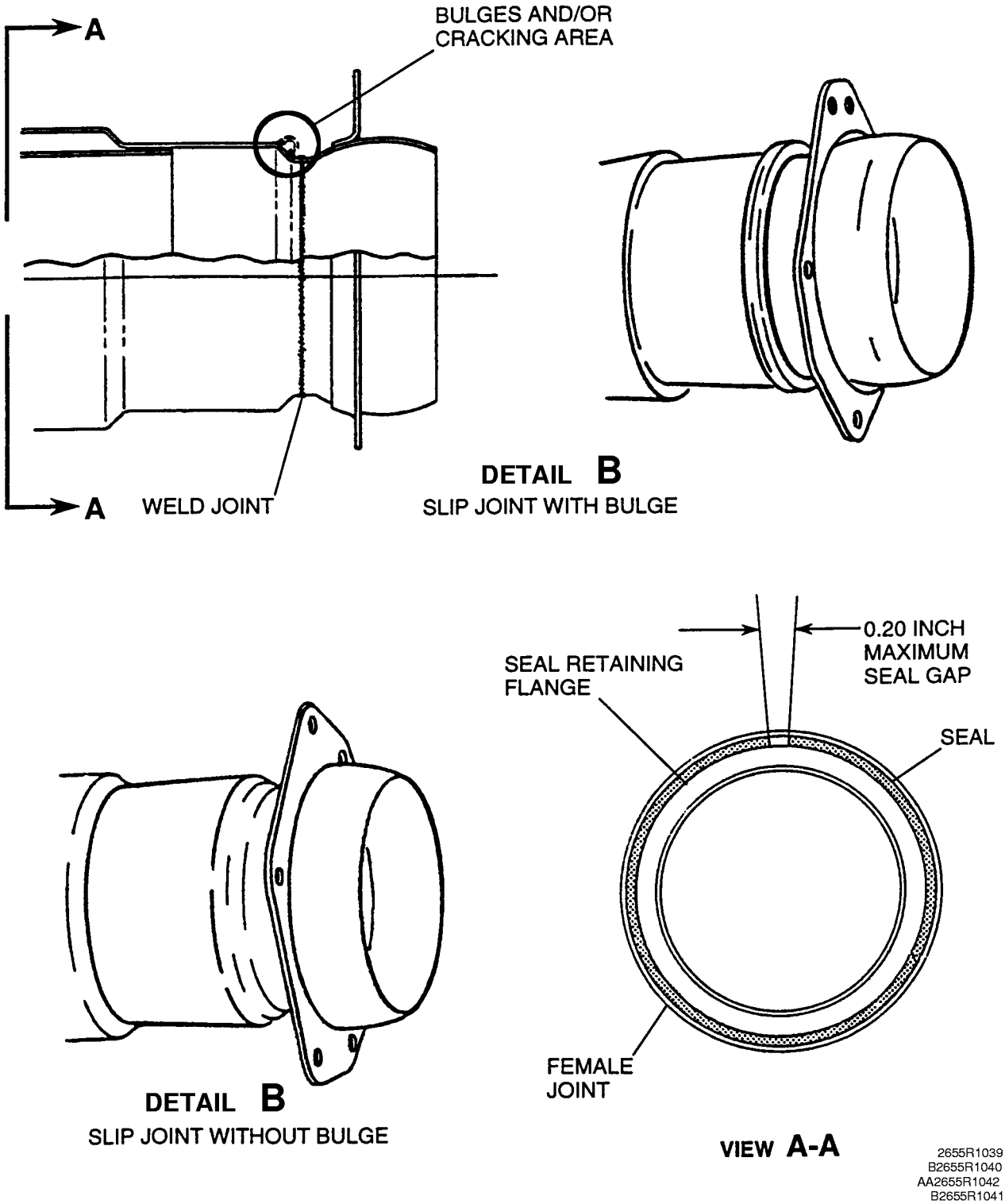
A1962



Engine Exhaust System Inspection
Figure 601 (Sheet 2)

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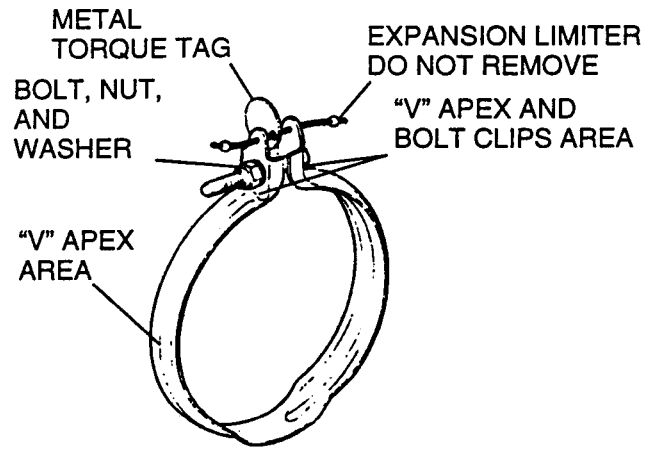
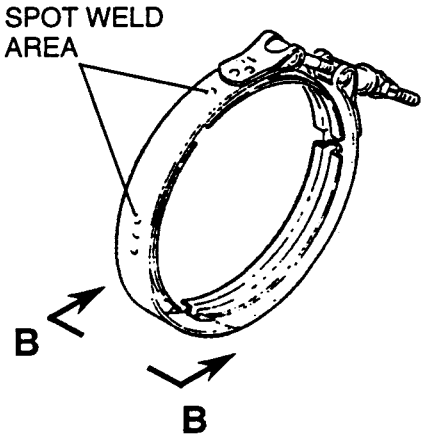
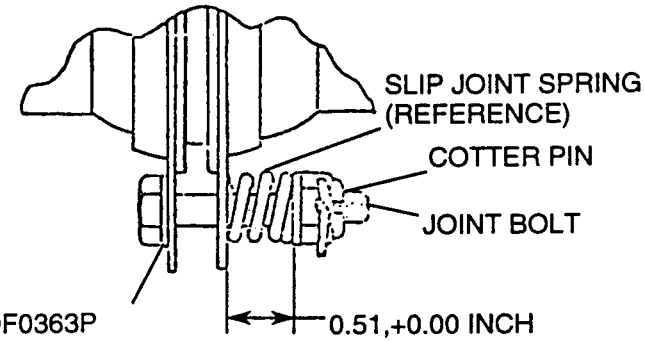


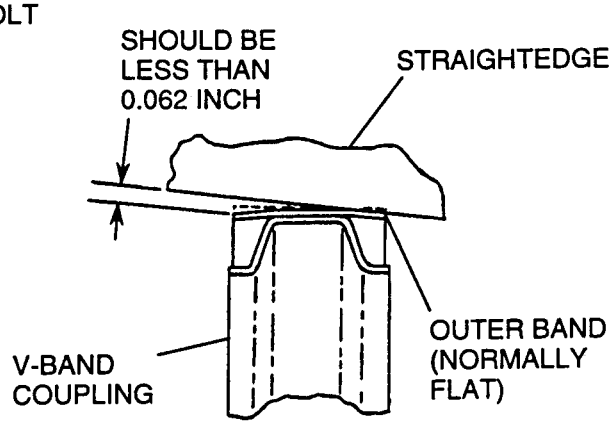
DETAIL C
ONE PIECE "V" BAND CLAMP



DETAIL D
MULTI-SEGMENT "V" BAND CLAMP



DETAIL E
TYPICAL EXHAUST JOINT
SPRING INSTALLATION



VIEW B-B
MULTI-SEGMENT "V" BAND
CLAMP OUTER BAND
DEFORMATION CHECK

C2655R1032
D2655R1031
E2655R1030

Engine Exhaust System Inspection
Figure 601 (Sheet 3)

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(f) Inspection of slip joint seal.

1 Inspect each slip joint seal per inspection schedule using a mirror and flashlight. Inspect around the entire slip joint. If an open gap or missing portion of the seal in excess of 0.20 inch (refer to Figure 601) is detected between the seal retaining flange and the female joint section, the seal must be replaced.

NOTE: Minor exhaust stains on airframe and/or surrounding accessories must be considered normal since these joints will exhibit a perceptible leakage during their entire service life.

(4) 100 Hour Disassembly Inspection.

NOTE: This inspection applies to Exhaust Systems (Stainless Steel or Partial Stainless Steel Systems, unknown or Repaired only).

(a) Perform 100 Hour Disassembly Inspection of the exhaust slip joints and the turbocharger tailpipe. (Refer to Figure 601).

(b) Inspect exhaust slip joint springs for correct compression. (Refer to Figure 601, Detail E).

1 Measure exhaust slip joint springs installed length. Length must be 0.51 inch, +0.00 or -0.03 inch.

a Installed springs compressed to less than 0.45 inch must be replaced.

(c) Remove bolts, washers, nuts, cotter pins, and springs securing the slip joints to the engine exhaust. Discard the cotter pins and retain the remaining serviceable hardware for installation.

1 After removal, springs having a free length of less than 0.57 inch must be replaced.

(d) Remove slip joints for inspection.

(e) Remove clamp securing the tailpipe to the turbocharger.

1 Remove clamp securing the tailpipe to the turbocharger.

CAUTION: Do not remove the expansion limiter.

NOTE: Retain serviceable attaching hardware for installation.

a Remove nut, washer and bolt from clamp, unseat coupling and slide clamp down tailpipe.

b Retain one piece "V" band clamp for inspection, if installed.

c If installed, replace segmented "V" band clamp at tailpipe to turbocharger junction with one-piece "V" band clamp.

(f) Inspect the removed slip joints and the turbocharger tailpipe.

WARNING: All repaired components must be replaced with a new component.

1 Using artificial light and inspection mirrors, visually inspect the inside and outside surfaces of removed components for repairs, erosion, burned areas, thinning of material, looseness, pitting on the interior of the tubes, cracks and integrity of weld joints.

a Inspect removed slip joints for cracks and bulges. (Refer to Figure 601, Detail B).

b If any of these conditions exist, the component must be replaced.

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(g) Install slip joints.
1 Install retained serviceable and/or new springs, bolts, washers and nuts.
a Tighten nut until length of installed spring measures 0.51 inch, +0.00 or -0.03 inch. (Refer to Figure 601, Detail E).

NOTE: Add NAS1149F0363P washers under head of bolts, as required to obtain correct dimensions.

NOTE: During installation, slip joint bolts should be tightened evenly and gradually and spring length checked frequently to prevent over compression of springs.

2 Install one (1) MS24665-153 cotter pin per nut.
(h) Install turbocharger tailpipe.
1 Install clamp, bolt, washer and nut and torque nut in accordance with torque requirement stamped on clamp tag (40 inch-pounds). As the clamp is tightened, lightly tap the outer band in a radial direction with a rawhide or soft rubber mallet.

(5) 500 Hour Complete Disassembly Inspection (Stainless Steel or Partial Stainless Steel Systems, Unknown or Repaired only).
(a) Perform 500 Hour Complete Disassembly Inspection of the engine exhaust system. (Refer to Figure 601 and Figure 602).

NOTE: Record position of all controls that will be disturbed by exhaust system removal.

(b) Disassembly Inspection of the exhaust slip joints and the turbocharger tailpipe. (Refer to Figure 601).
(c) Inspect exhaust slip joint springs for correct compression. (Refer to Figure 601, Detail E).
1 Measure exhaust slip joint springs installed length. Length must be 0.51 inch, +0.00 or -0.03 inch.
(d) Remove bolts, washers, nuts, cotter pins and springs securing the slip joints to the engine exhaust. Discard the cotter pins and retain the remaining serviceable hardware for installation.
1 After removal, springs having a free length of less than 0.57 inch must be replaced.
(e) Remove engine risers.
(f) Remove the turbocharger tailpipe from the turbocharger.
1 Remove clamp securing the tailpipe to the turbocharger.

CAUTION: Do not remove the expansion limiter.

NOTE: Retain serviceable attaching hardware for installation.

a Remove nut, washer and bolt from clamp, unseat coupling and slide clamp down tailpipe.
b Retain one piece "V" band clamp for inspection, if installed.
c If installed, replace segmented "V" band clamp at tailpipe to turbocharger junction with one-piece "V" band clamp.
(g) Remove the manifold header.
1 Using artificial light and inspection mirrors, visually inspect the multi-segment "V" band clamp(s) prior to removing.
a Ensure the "V" clamps are torqued to 35 inch-pounds.
b Using crocus cloth, or equivalent, clean the outer band of the multi-segment "V" band clamp(s), particular attention should be given to the spot weld areas on the clamp(s).
c Using artificial light and inspection mirrors, inspect the multi-segment "V" band clamp(s) surface(s) for signs of cracks or fractures. If cracks or fractures are visible, replace the clamp(s). (Refer to Figure 601, Detail D and View B-B).

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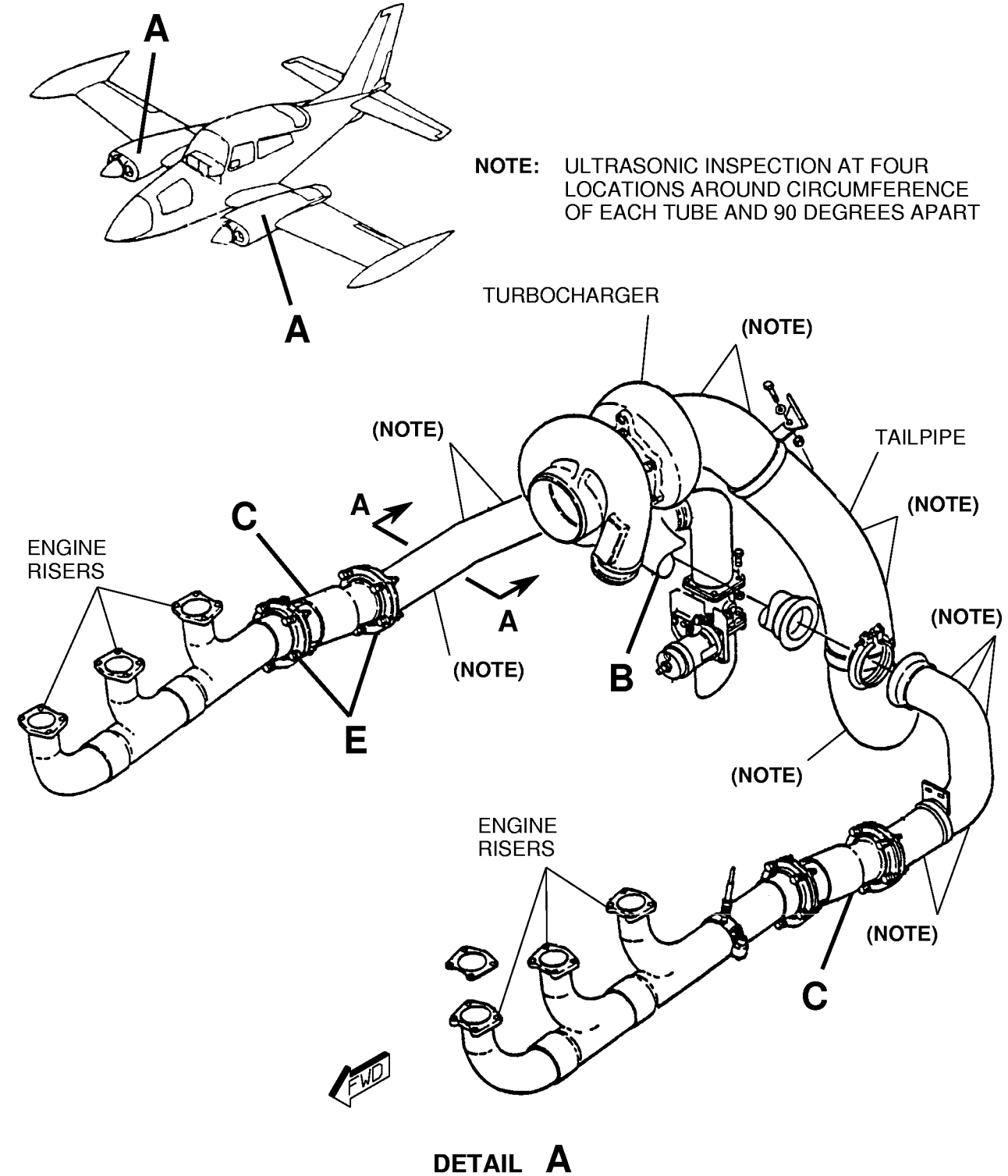

DETAIL A

1010T1006
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Exhaust System Ultrasonic Inspection Locations
Figure 602 (Sheet 1)

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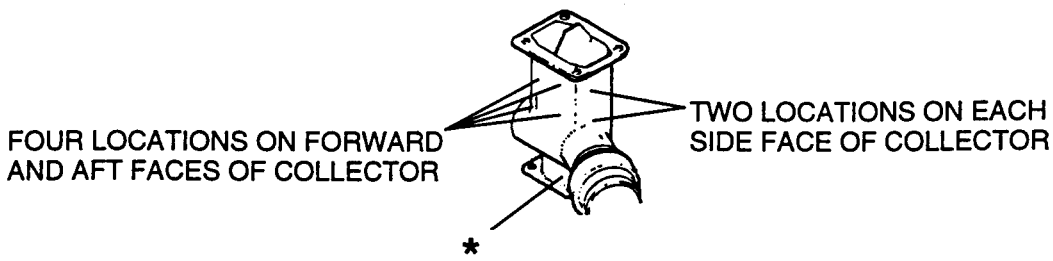
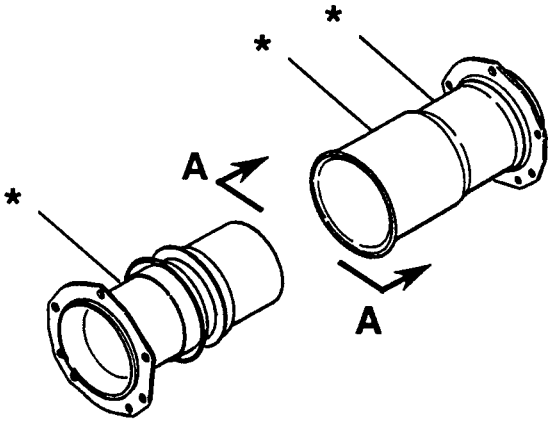
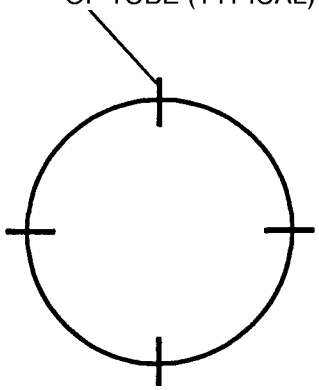


DETAIL B
VIEW LOOKING AFT AT
MANIFOLD HEADER
LEFT SHOWN, RIGHT OPPOSITE



DETAIL C
SLIP JOINT INSPECTION LOCATIONS

* FOUR LOCATIONS AROUND
CIRCUMFERENCE
OF TUBE (TYPICAL)



VIEW A-A
EXHAUST TUBE CROSS SECTION

*** NOTE:** ULTRASONIC INSPECTION AT FOUR LOCATIONS AROUND CIRCUMFERENCE OF TUBE AND 90 DEGREES APART

B2655R1035
C2655R1036
AA2655R1037

Exhaust System Ultrasonic Inspection Locations
Figure 602 (Sheet 2)

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d Inspect flatness of the outer band, especially within 2 inches of the spot welded tabs which retain the T-bolt fastener.

e Placing a straight edge across the flat part of the outer band, check the gap between the straight edge and the outer band. This gap should be less than 0.062 inch. If deformation exceeds 0.062 inch, replace the clamp(s). (Refer to Figure 601, View B-B).

2 Remove the multi-segment "V" band clamp(s) securing the inboard and outboard exhaust tubes to the manifold header. Retain components for inspection, retain serviceable attaching hardware for installation. (Refer to Figure 601, Detail D).

NOTE: Multi-segmented "V" band clamps are life limited to 400 hours prior to this inspection. Replacing the clamps during this inspection will allow the replacement interval to increase to 500 hours.

3 Remove the manifold header from the airplane.

WARNING: All repaired components must be replaced with a new component.

(h) Perform a visual inspection of the removed engine exhaust system components.

(i) Using artificial light and inspection mirrors, visually inspect the inside and outside surfaces of removed components for repairs, bulging, cracking, material deformation, warped mating surfaces, eroded flange surfaces and integrity of welds.

(j) Inspect "V" band clamp(s).

NOTE: Multi-segment "V" band clamp(s) are life limited to 400 hours. After completing this Disassembly Inspection and installation of new clamps, the clamps must be replaced on every 5600 hours of operation.

1 Using artificial light and inspection mirrors, inspect the multi-segment "V" band clamp(s) surface(s) for signs of cracks or fractures. If cracks or fractures are visible, replace the clamp(s). (Refer to Figure 601, Detail D and View B-B).

2 Using artificial light and inspection mirrors, inspect the one-piece "V" band clamp(s) surface(s) adjacent to the intersection of the "V" apex and bolt clips, and the entire length of the "V" apex of the clamp for signs of cracks or fractures. If cracks or fractures are visible, replace the clamp(s). (Refer to Figure 601, Detail C).

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WARNING: Components which do not meet the requirements shall be replaced. Wall thickness of exhaust tubes shall be no less than 0.020 inch. Wall thickness of slip joints shall be no less than 0.025 inch.

(k) Perform a Digital Ultrasonic Thickness inspection of the engine exhaust system components except risers for wall thickness. (Refer to Figure 602).

NOTE: The ultrasonic test system shall meet the minimum requirements as stated; the test equipment shall be a digital ultrasonic thickness gage capable of operating in a frequency range of 10-20 MHz. The minimum resolution of the instrument shall be 0.015 inch in steel. The transducer shall be a delay line type with a frequency between 10-20 MHz. The stand-off shall possess a maximum diameter of 0.19 inch.

1 Ultrasonic thickness gage calibration.

NOTE: Instrument calibration shall be accomplished in accordance with the manufacturer's recommendations.

a The instrument shall be calibrated using the 0880000-5 and 0880000-4 calibration standards.
b The instrument shall be calibrated for a thickness range of 0.020 inch to 0.063 inch for 321 stainless steel.
c The instrument shall be recalibrated at 30 minute intervals.

NOTE: Any change in accessories, or interruption of power supply, also require recalibration.

2 Inspect the exhaust system components for wall thickness. (Refer to Figure 602, Detail A).
a The exhaust components shall be inspected at the identified locations in Figure 602.
b Four measurements shall be taken at each location, and separated by 90°. (Refer to Figure 602, View B-B).
c Components which do not meet the requirements shall be replaced. Wall thickness of exhaust tubes shall be no less than 0.020 inch. (Refer to Figure 602, Detail A). Wall thickness of slip joints shall be no less than 0.025 inch. (Refer to Figure 602 Detail C).

(l) Using the MIZ 40 eddy current instrument, inspect the engine exhaust system aft of the risers (slip joints and aft) to determine the material type. (Refer to Figure 602).
1 Eddy current calibration. (Refer to Figure 603).
a The operating frequency of the eddy current test system shall be 2.0 MHz.
b Balance the instrument with the probe in air and adjust the "air point" on the instrument display to 10% horizontal and 80% vertical.
c Place the probe on the 0880000-3 calibration standard (301 stainless steel) reference standard. Adjust the resultant material point as depicted in Figure 603.
d Place the probe on the 0880000-5 calibration standard (321 stainless steel) reference standard. Adjust the resultant material point as depicted in Figure 603.
e Place the probe on the 0880000-2 calibration standard (601 inconel) reference standard. Adjust the resultant material point as depicted in Figure 603.
f The instrument parameters shall be adjusted to achieve a minimum vertical separation of two major divisions on the instrument display between the 601 inconel and 321 stainless steel material points.

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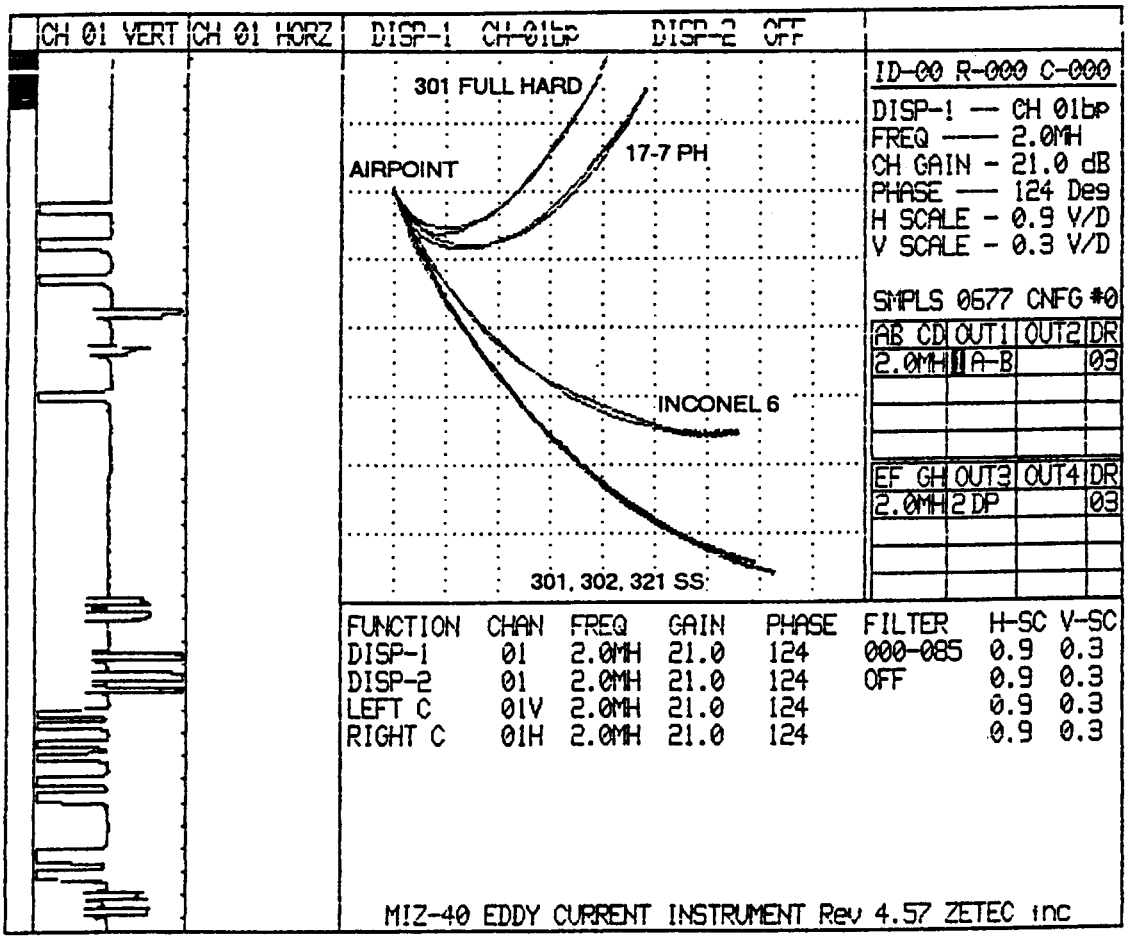

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Eddy Current Inspection Calibration Image
Figure 603 (Sheet 1)

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2 Inspect the exhaust system components aft of the risers (slip joints and aft) to determine the material type.

NOTE: Identify and record in the logbooks, the material type for each exhaust system component. Determine when the next inspection is due, based on material type.

3 Corresponding material points from the exhaust system components and the reference standards will indicate exhaust system material type. A minimum of two (2) readings shall be taken on each tube.

(m) Install exhaust system components.

WARNING: All previously repaired components must be replaced with a new component.

1 Install the manifold header using retained serviceable and new hardware, as applicable. Refer to Chapter 7, Engine Exhaust System - Maintenance Practices and the Model 310 Illustrated Parts Catalog.

2 Install engine system exhaust tubes. Refer to Chapter 78 Exhaust - Removal/ Installation.

a Position inboard and outboard exhaust tube on the manifold header.

b Install clamp, bolt, washer and nut and torque nut (torque Multi-segment "V" band clamp(s) to 35 inch-pounds, torque one-piece "V" band clamp(s) to 40 inch-pounds). As the clamp is tightened, lightly tap the outer band in a radial direction with a rawhide or soft rubber mallet.

c Install exhaust system slip joints. Refer to Chapter 78 Exhaust - Removal/ Installation.

d Install serviceable and/or new springs, bolts, washers and nuts. Refer to Illustrated Parts Catalog.

e Tighten nut until length of installed spring measure 0.51 inch, +0.00 or -0.03 inch. (Refer to Figure 601, Detail E).

NOTE: Add NAS1149F0363P washers under head of bolts, as required, to obtain correct dimensions.

NOTE: During installation, bolts should be tightened equally and gradually and spring length checked frequently to prevent over compression of springs.

f Install one (1) MS24665-153 cotter pin per nut.

3 Install turbocharger using retained serviceable and new hardware, as applicable. Refer to the Model 310 Illustrated Parts Catalog.

4 Install all exhaust system heat shields. Refer to Chapter 78 Exhaust - Removal/ Installation.

NOTE: Ensure exhaust system has all required heat shields installed.

5 Install turbocharger tailpipe and secure with serviceable and/or new one piece V-band clamp. Refer to Chapter 78 Exhaust - Removal/Installation and the Illustrated Parts Catalog.

a Install clamp, bolt, washer and nut and torque nut in accordance with torque requirement stamped on clamp tag (40 inch-pounds). As the clamp is tightened, lightly tap the outer band in a radial direction with a rawhide or soft rubber mallet.

(6) 500 Hour Partial Disassembly Inspection (Inconel Systems Only Slip Joints and Aft)

(a) Perform 500 Hour Disassembly Inspection of the exhaust slip joints and the turbocharger tailpipe. (Refer to Figure 601).

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(b) Inspect exhaust slip joint springs for correct compression. (Refer to Figure 601, Detail E).
1 Measure exhaust slip joint springs installed length. Length must be 0.51 inch, +0.00 or -0.03 inch.
a Installed springs compressed to less than 0.45 inch must be replaced.
(c) Remove bolts, washers, nuts, cotter pins, and springs securing the slip joints to the engine exhaust. Discard the cotter pins and retain the remaining serviceable hardware for installation.
1 After removal, springs having a free length of less than 0.57 inch must be replaced.
(d) Remove slip joints for inspection.
(e) Remove clamp securing the turbocharger tailpipe to the turbocharger.

CAUTION: Do not remove the expansion limiter.

1 Remove nut, washer and bolt from clamp, unseat coupling and slide clamp down tailpipe.
2 Retain one-piece "V" band clamp for inspection, if installed.
3 If installed, replace segmented "V" band clamp at tailpipe to turbocharger junction with one-piece "V" band clamp.

WARNING: All repaired components must be replaced with a new component.

(f) Inspect the removed slip joints and the turbocharger tailpipe.
1 Using artificial light and inspection mirrors, visually inspect the inside and outside surfaces of removed components for repairs, erosion, burned areas, thinning of material, looseness, pitting on the interior of tubes, cracks and integrity of weld joints.
a Inspect removed slip joints for cracks and bulges. (Refer to Figure 601, Detail B).
b If any of these conditions exist, the component must be replaced.
(g) Install slip joints.
1 Install retained serviceable and/or new springs, bolts, washers and nuts.
a Tighten nut until length of installed spring measures 0.51 inch, +0.00 or -0.03 inch. (Refer to Figure 601, Detail E).

NOTE: Add NAS1149F0363P washers under head of bolts, as required, to obtain correct dimensions.

NOTE: During installation, slip joint bolts should be tightened evenly and gradually and spring length checked frequently to prevent over compression of springs.

b Install one (1) MS24665-153 cotter pin per nut.
(h) Install turbocharger tailpipe.
1 Install one-piece V-band clamp, bolt, washer and nut and torque nut in accordance with torque requirement stamped on clamp tag (40 inch-pounds). As the clamp is tightened, lightly tap the outer band in the radial direction with a rawhide or soft rubber mallet.

(7) Engine Overhaul Disassembly Inspection (Inconel Systems Only)

NOTE: Engine Overhaul is based on the engine manufacturers current recommended time between overhaul requirement.

(a) Refer to Step 1.C.(5) 500 Hour Complete Disassembly Inspection and perform all steps in the procedure with the exception of step 1.C.(5)(l).

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EXHAUST - CLEANING/PAINTING

1. Engine Exhaust System

A. Cleaning/Painting.

(1) Spray engine exhaust system with a suitable solvent and allow to drain dry.

WARNING: Never use a flammable solvent on engine exhaust system.

(2) Wipe dry with a clean cloth.

NOTE: Never use a wire brush or abrasives to clean exhaust system.

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CHAPTER 79

OIL

LIST OF EFFECTIVE PAGES

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79-List of Effective Pages		
79-Record of Temporary Revisions		
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79-00-00	Page 601	Jun 17/2005
79-20-00	Page 1	Jun 17/2005
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79-30-00	Pages 501-502	Jun 17/2005
79-30-00	Pages 601-602	Jun 17/2005

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ENGINE OIL - GENERAL

1. Scope

A. This chapter describes those units and components external to the engine concerned with storing and delivering lubricating oil to and from the engine.

2. Definition

A. This chapter is composed of one section to aid maintenance personnel in locating information. Following is a brief description of this section.
   (1) Distribution describes that portion of the system which is used to conduct oil to and from the engine.
   (2) Indicating describes that portion of the system which is used to indicate the quantity, temperature, and pressure of the oil.

3. Description

A. The oil pressure system consists of a wet sump type pressure lubricating system. Oil temperature in each engine is controlled by a thermally operated valve which either bypasses the oil around the external mounted cooler or routes the oil through the cooler passages for cooling. Oil furnished to the propeller governor for propeller operation is also routed through internal passages. Engine oil is routed externally for use in actuating the turbocharger waste-gate and turbocharger lubrication on the Turbo 310. Engine oil is filtered through an internally mounted screen and externally mounted oil filter. A bypass valve will rotate the oil around the filter if it becomes clogged. Oil pressure is maintained by a spring-loaded adjustable pressure relief valve.

B. Oil temperature is sensed through a heat variable resistor type temperature bulb which is located in the main oil passage of the crankcase directly below the cooler. Changes in oil temperature are transmitted from the oil temperature bulb to the oil temperature gage through electrical wiring.

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ENGINE OIL - TROUBLESHOOTING

1. Engine Oil System

A. Engine Oil System
(1) Troubleshooting.
(a) For troubleshooting the engine oil system, refer to .Table 101

Table 101. Engine Oil System Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
LOW OIL PRESSURE INDICATION.	Oil supply low	Replenish oil.
	Wrong viscosity oil	Drain and replace oil.
	Weak or broken relief valve spring.	Replace spring.
	Oil pressure pump does not operate correctly.	Repair or replace pump.
HIGH OIL PRESSURE INDICATION.	Oil pressure relief valve out of adjustment.	Adjust valve.
HIGH OIL TEMPERATURE INDICATION, OTHER THAN PROLONGED GROUND OPERATION.	Low oil supply	Replenish oil.
	Wrong viscosity oil.	Drain and replace oil with correct viscosity oil.
	Oil cooler air passages obstructed.	Clean oil cooler air passages.
	Thermostat damaged or held open by solid matter.	Remove and clean valve and seat. If still not working, replace thermostat.
	Gage malfunction.	Repair or replace gage.

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ENGINE OIL - SERVICING

1. Engine Oil System

A. Servicing Engine Oil.

(1) The oil system servicing is identical on each engine. The oil sump is an integral part of the crankcase. Oil serves the lubrication requirements of the internal engine components and accessory drive gear box. Oil pressure is supplied to main bearings, journal bearings and propeller governor by the oil pump and is returned to the oil sump by the scavenge pump.

(2) Oil level in the sump is checked by the dipstick in the filler neck. The dipstick access door is located on top of the engine cowl.

(3) Draining the oil is accomplished by removing the lower nacelle access panel and sump drain plug. For removal/installation of the engine oil filter, refer to Distribution - Removal/Installation.

NOTE: Oil should be drained when the engine is warm and the oil is in the normal operating temperature range on the indicator.

(4) Use aviation grade engine oil; SAE 50 above 4.4°C (40°F), SAE 30 multiviscosity oil below 4.4°C (40°F). Use multiviscosity oil with an unrestricted temperature range is recommended for use after the first 25 hours of engine operation for improved starting and turbocharger controller operation in temperatures below 4.4°C (40°F). When operati ng temperatures overlap indicated ranges, use the lighter grade of oil. Ashless dispersant oil, conforming to the latest issue of Continental Motors Specification MHS-24, must be used. No oil additives are approved for use. Replace oil and filters every 50 hours or 6 months, whichever occurs first, on the T310 or every 100 hours or 6 months, whichever occurs first, on the Standard 310. Reduce intervals for prolonged operation in dusty areas, cold climates, or when short flights and long idle periods result in sludging conditions. Check oil level before each flight. Do not operate on less than 9 quarts.

NOTE: For faster ring seating and improved oil control, your Cessna was delivered from the factory with corrosion preventive oil conforming to MIL-C-6529, type II. This break-in oil must be used only for the first 25 hours of operation. If oil must be added during this first 25 hours of operation, use straight mineral oil conforming to MIL-L-6082.

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Table 301. Engine Oil System Replenishment Chart

QUANTITY EACH ENGINE

ENGINE OIL SYSTEM	U.S. GALLONS	IMPERIAL GALLONS	METRIC LITERS	NAME, NUMBER, OR TYPE
OIL CAPACITY (Including Filter)	3.25	2.71	11.4	Aviation Grade SAE 30 Below 40℉, SAE 50 Above 40℉. SAE 20W50 Unrestricted Temperature Range - Recommended for improved starting and turbocharge controller operation in cold weather. If oil conforms to Continental Motor Specification MHS-24.

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ENGINE OIL - INSPECTION/CHECK

1. Engine Oil System

A. Inspection/Check.
(1) For inspection/check of the engine oil system, refer to Chapter 5 Inspection Time Limits.

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DISTRIBUTION - DESCRIPTION AND OPERATION

1. Engine Oil Filter

A. Description.

(1) The engine oil filter is a full flow spin on type filter. A by-pass valve will open should the element become clogged. Oil pressure opens the by-pass valve, which is set at a predetermined pressure, so unfiltered oil will lubricate the engine and prevent oil starvation in the event the filter becomes clogged.

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DISTRIBUTION - SERVICING

1. Oil Pressure Lines

A. Cold Weather Servicing.

(1) Disconnect engine oil pressure hoses at inboard nacelle ribs and loosen connections at rear of engine gage units. Allow time for the oil lines to completely drain.

NOTE: To facilitate draining in cold weather, the airplane should either be stored in a heated hangar or the engines operated before the lines are disconnected.

(2) Attach a small hand pump filled with kerosene or instrument oil to a nacelle union and force the fluid through the oil pressure line until a few drops leak around the engine gage fitting. Tighten the hose at the gage fitting, remove pump and attach engine hose to inboard nacelle rib fitting. Repeat procedure for other engine.

2. Engine Oil Filter

A. Servicing.

(1) To check the engine oil filter for leakage, refer to Chapter 5.

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DISTRIBUTION - REMOVAL/INSTALLATION

1. Oil Filter

A. Removal (Refer to Figure 401).
   (1) Remove upper engine cowl.
   (2) Cut safety wire on oil filter.
   (3) Loosen filter and remove.

B. Installation (Refer to Figure 401).
   (1) Wipe adapter clean with a lint free dry cloth.
   (2) Install new filter and torque in accordance with instructions on the side of filter element.
   (3) Safety wire.
   (4) Install upper engine cowl.

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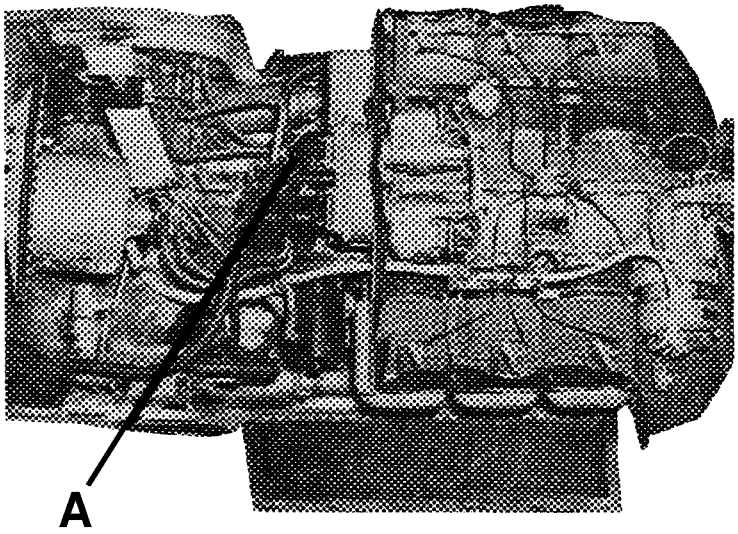

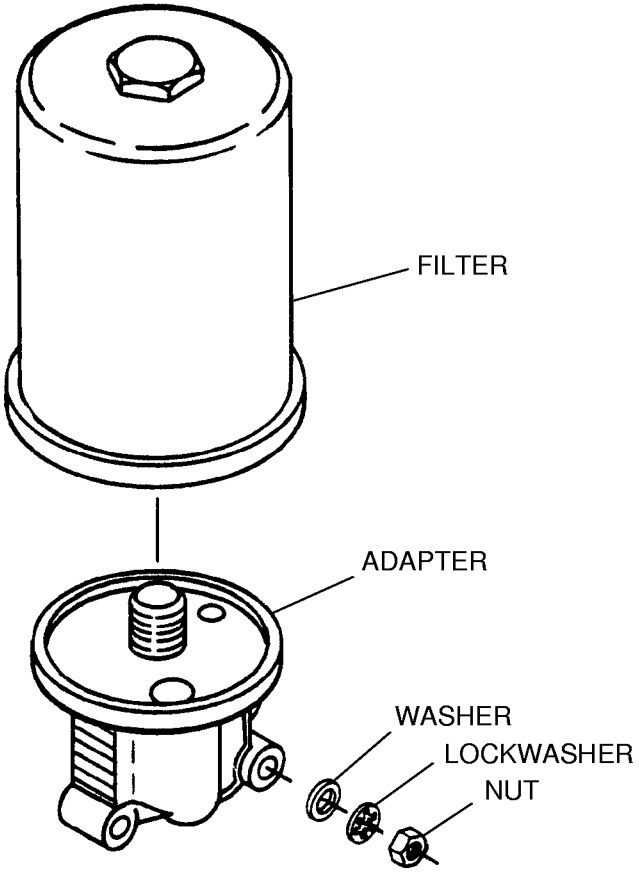

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Engine Oil Filter Installation
Figure 401 (Sheet 1)

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DISTRIBUTION - INSPECTION/CHECK

1. Engine Oil Pressure System

A. Inspection.
   (1) Start and run the engine for a few moments observing oil pressure gage for fluctuations. Shut down engine and inspect oil pressure lines and fittings for leaks. Any time the oil pressure indicating system has been removed or repairs have been accomplished, the oil pressure system shall be bled. Refer to Indicating - Removal/Installation. Inspect all overboard lines from the engine for clearance.

2. Oil Breather-Separator (310 Turbo)

A. Inspection.
   (1) Wash metal parts and element in suitable solvent.
   (2) Inspect metal parts for cracks in body and around the weld tubes. Inspect filter element for clogging and general deterioration.
   (3) On airplanes incorporating MEB00-9, ensure that vent hole in breather line is positioned approximately 45 degrees downward from tube horizontal centerline to face center of engine nacelle.

3. Oil Filter

A. Inspection/Check.
   (1) Remove upper engine cowl.
   (2) Inspect oil filter; refer to Chapter 5 for inspection procedures.

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INDICATING - DESCRIPTION AND OPERATION

1. Description

A. The engine oil and cylinder head temperature indicating system consist of the engine combination gage, oil temperature bulb, the cylinder head temperature thermocouple, along with their associated lines and wiring. The oil temperature indicator is electrically operated, connected to a temperature bulb located in the bottom of the engine oil cooler. The cylinder head temperature indicator is operated from a thermocouple inserted in the bottom of a cylinder on the left and right engine. The engine oil pressure indicator is a direct reading P.S.I. gage connected to the engine oil pressure system.

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INDICATING - REMOVAL/INSTALLATION

1. Oil Pressure Indicating System

NOTE: When removing/installing lines at bulkhead fittings, insure that fitting is secured to prevent twisting line on opposite side from one being installed. Hold fitting with wrench while loosening/tightening line connection. Refer to Tubing and Hose Maintenance Practices in Chapter 20 for expanded installation procedures.

A. Removal (Refer to Figure 401).

NOTE: Cap all openings and lines on removal.

(1) Remove engine cowling.
(2) Disconnect oil pressure hose (2) from indicator (1) and fitting in support bracket (3).
(3) Disconnect cabin oil pressure line (4) at support bracket (3) and fuselage skin elbow.
(4) Disconnect oil pressure line (10) from fuselage skin elbow and nacelle rib union.
(5) Disconnect oil pressure line (9) from nacelle rib union and tee (7) (Turbo 310).
(6) On Standard 310, disconnect oil pressure hose (9) from nacelle rib union and nipple (6).
(7) Remove indicator in accordance with Chapter 31, Instrument and Control Panels - Removal/ Installation.

B. Installation (Refer to Figure 401).
(1) On Standard 310, install oil pressure hose (8) between nipple (6) and nacelle rib union.
(2) Connect oil pressure line (9) to tee (7) and nacelle rib union (Turbo 310).
(3) Connect oil pressure line (10) to fuselage skin elbow and nacelle rib union.
(4) Connect oil pressure line (4) to fuselage skin elbow and support bracket (3) fitting.
(5) Connect oil pressure hose to fitting in support bracket (3) and indicator fitting.
(6) Install engine cowling.
(7) Any time the oil pressure indicating system has been removed or repairs have been made, bleed the oil pressure system as follows:
(a) With all connections tightened, start engine and allow time for the engine pumps to fill the oil pressure lines
(b) After a positive indication of oil pressure has been noted, loosen the hose fittings on the rear of the engine gage units and allow a few drops of oil to leak from the fittings. This will bleed the trapped air from the lines and provide an accurate oil pressure indication.

2. Oil Temperature Indicating System

A. Removal (Refer to Figure 401).

NOTE: Cap all openings and lines on removal.

(1) Remove engine cowling.
(2) Disconnect electrical connector from temperature bulb located on underside of oil cooler.

CAUTION: Place container or rags under oil cooler to prevent oil dripping in engine nacelle.

(3) Loosen oil temperature bulb and remove from oil cooler.
(4) Remove wiring from engine wire bundle.
(5) Remove indicator in accordance with Chapter 31, Instrument and Control Panels - Removal/ Installation.

B. Installation (Refer to Figure 401).
(1) Install Indicator in accordance with Chapter 31, Instrument and Control Panels - Removal/ Installation.
(2) Route wires from indicator to engine nacelle and secure to the engine wiring bundle assembly with clamps.

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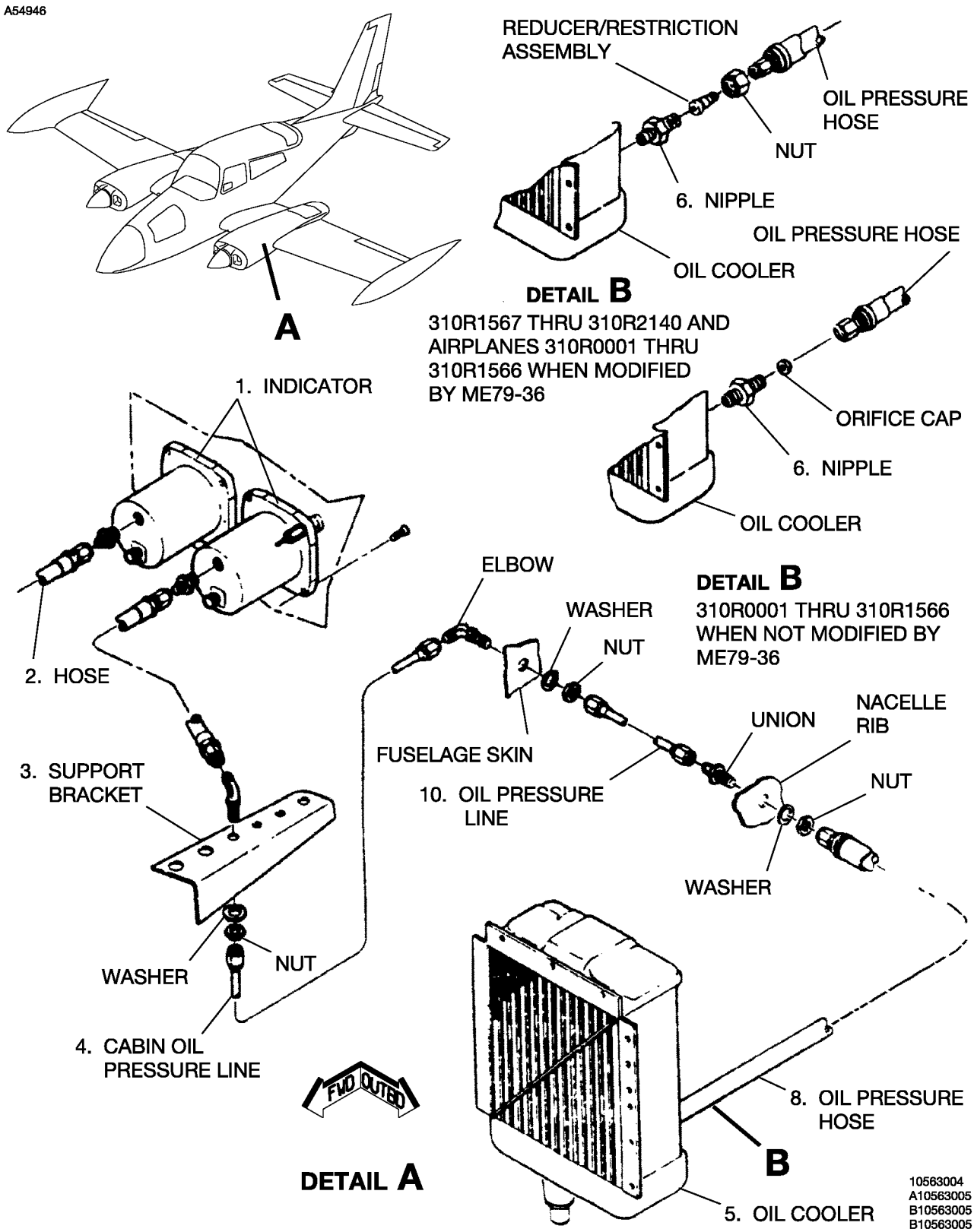

Engine Indicating System
Figure 401 (Sheet 1)

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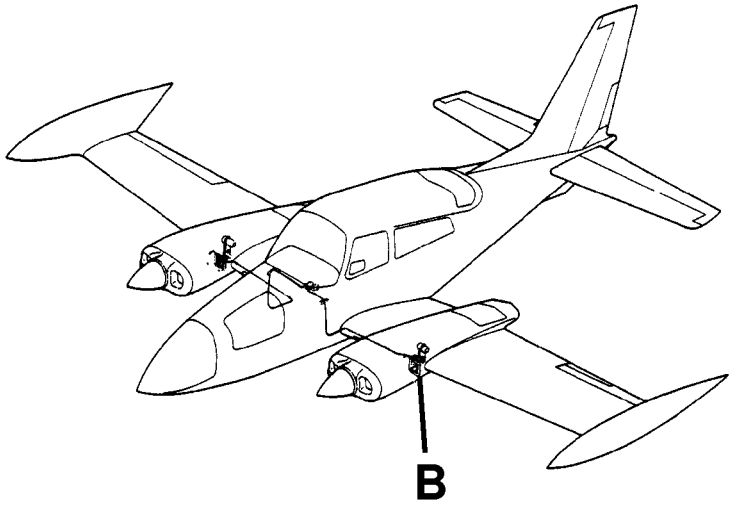

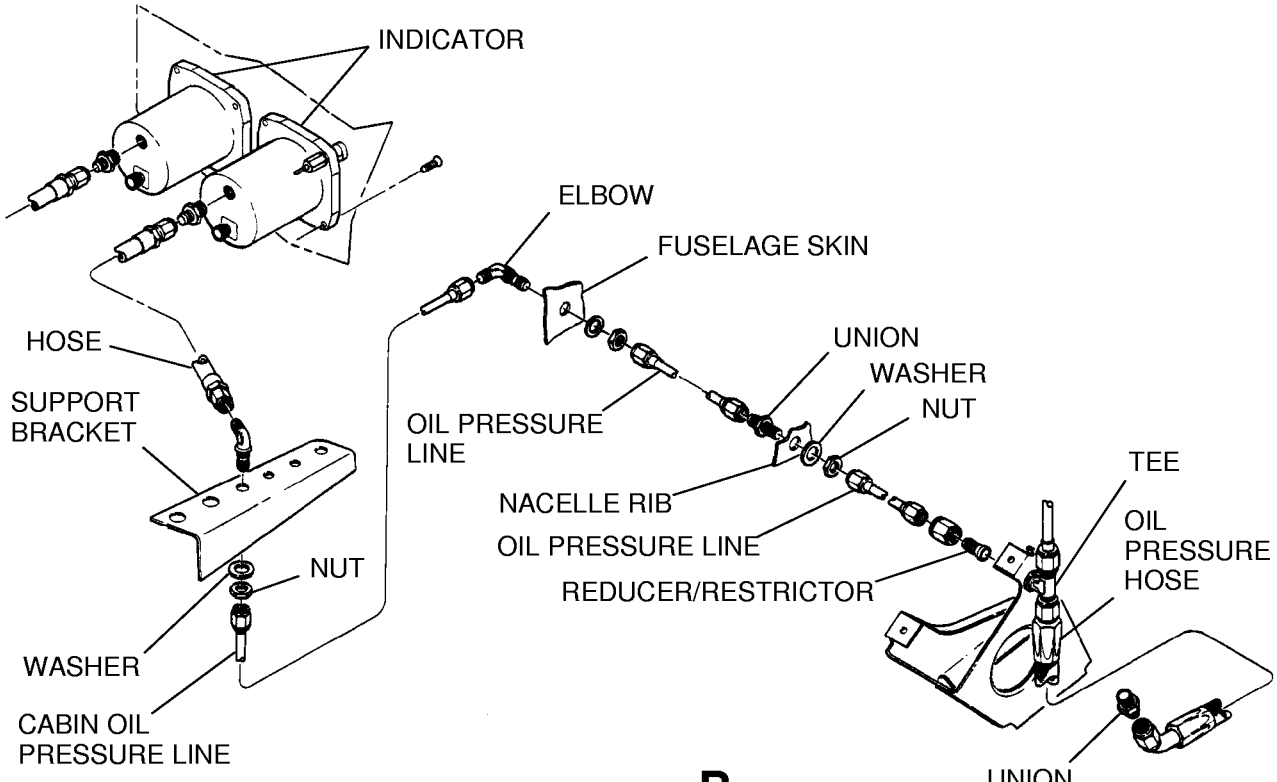

DETAIL B
TURBO 310

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Engine Indicating System
Figure 401 (Sheet 2)

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(3) Remove plug and install oil temperature bulb in oil cooler.
(4) Connect electrical connector to oil temperature bulb.
(5) Install engine cowling.

3. Cylinder Head Temperature Indicating System

A. Removal.
(1) Remove engine cowling.
(2) Disconnect quick disconnect on the lower side of number 2 cylinder on the standard 310 left and right engine or number 3 cylinder of left engine and number 4 cylinder of right engine on Turbo 310.

NOTE: Cap all fitting openings on removal of fittings.

(3) Loosen thermocouple fitting and remove.
(4) Remove thermocouple wires from engine wiring bundle.
(5) Remove indicator in accordance with Chapter 31, Instrument and Control Panels - Removal/ Installation.

B. Installation.
(1) Install indicator in accordance with Chapter 31, Instrument and Control Panels - Removal/ Installation.
(2) Route thermocouple wires from indicator to engine nacelle and secure to the engine wiring bundle with clamps.
(3) Remove cap and install thermocouple fitting.
(4) Connect quick disconnect.
(5) Install engine cowling.

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INDICATING - ADJUSTMENT/TEST

1. Oil Pressure

A. Adjustment (Refer to Figure 501).
   (1) Start engines and allow engine to warm-up. Refer to Pilot's Operating Handbook or FAA Approved Airplane Flight Manual.
   (2) Check oil pressure with engine operating 1700 RPM reading the engine gage on instrument panel.
   (3) If oil pressure is not 30 to 60 PSI, turn adjusting screw (4) to obtain correct pressure. Turn in clockwise (CW) to increase pressure, turn out counterclockwise (CCW) to decrease pressure.

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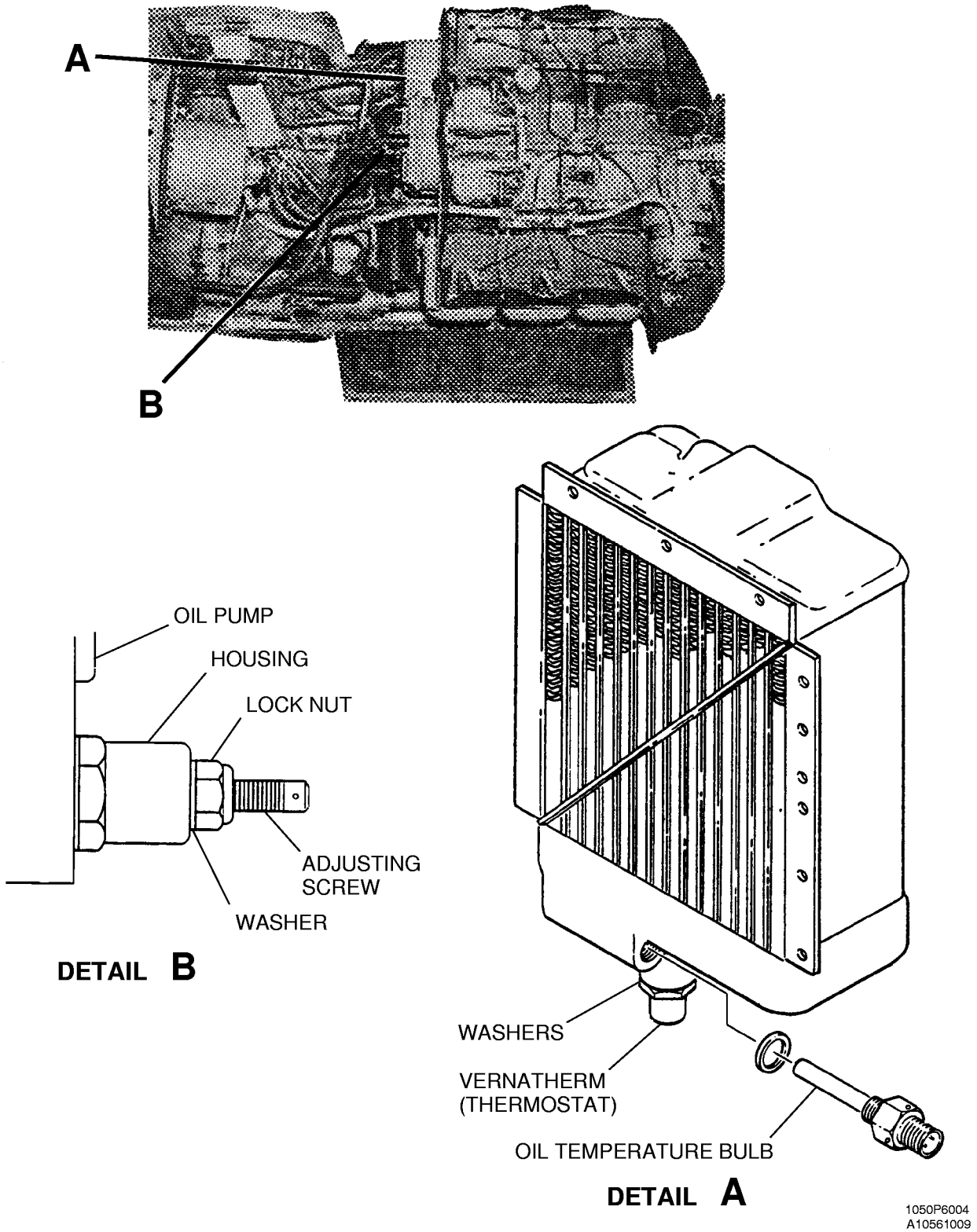

Oil Pressure and Temperature
Figure 501 (Sheet 1)

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INDICATING - INSPECTION/CHECK

1. Oil Temperature

A. Temperature Check (Refer to Figure 601).
   (1) Start engines and allow engines to warm-up. Refer to Pilot's Operating Handbook or FAA Approved Airplane Flight Manual.
   (2) Operate engines at 1700 RPM.
   (3) Oil temperature should read in upper 20% of green arc and be within 20% of opposite engine temperature indication.
   (4) If the oil temperature is not within the prescribed tolerances, refer to Engine Oil System - Troubleshooting.

2. Oil Pressure Indicating System

A. Inspection/Check
   (1) Remove upholstery side panel.
   (2) Remove necessary access plates and wing gap cover.
   (3) Remove upper engine cowling.
   (4) Inspect oil pressure indicating system; refer to Chapter 5 for inspection procedures.

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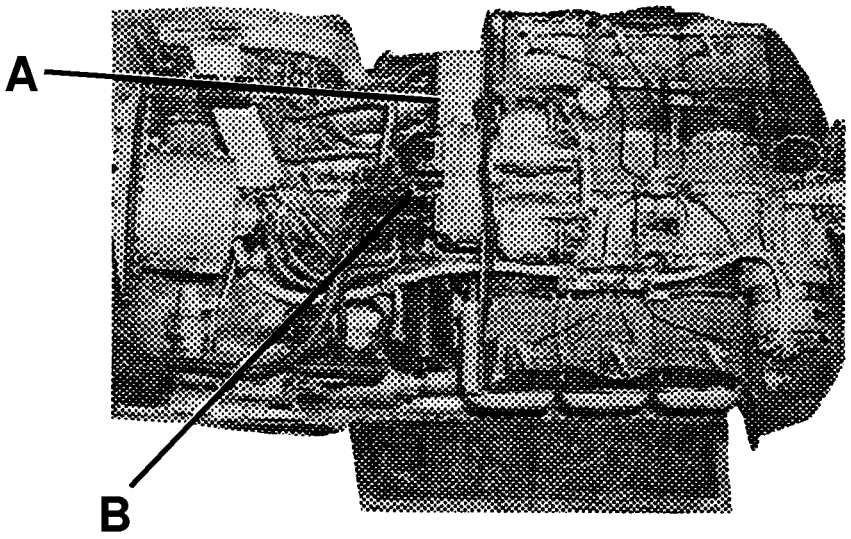
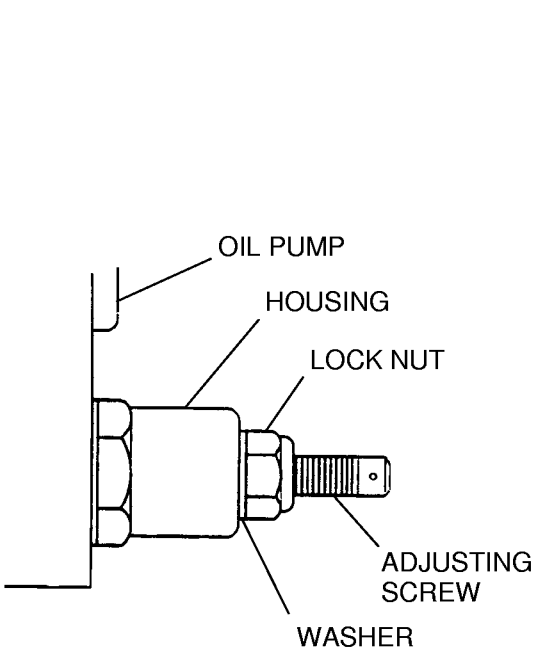
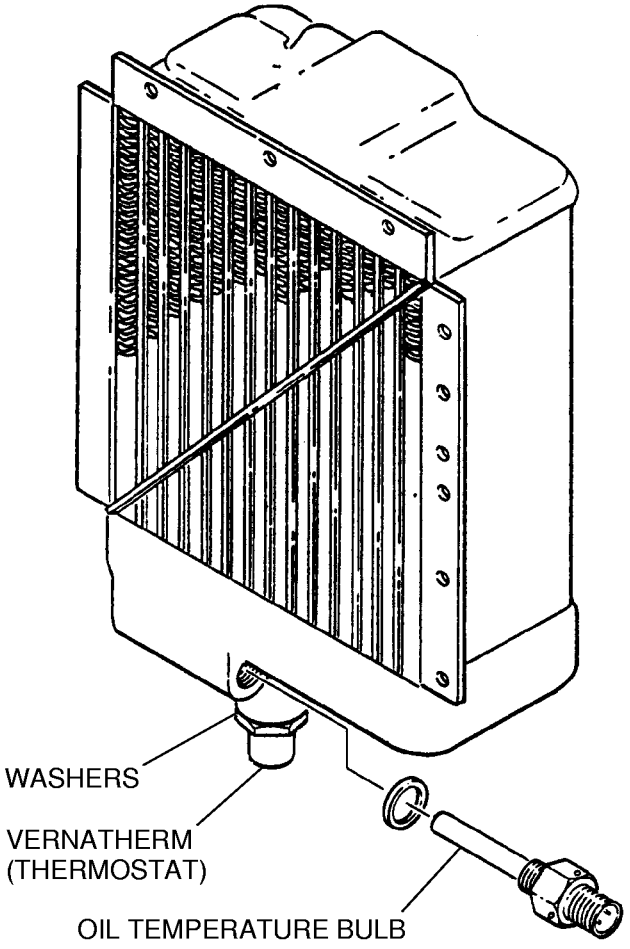




DETAIL B



DETAIL A

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Oil Temperature and Pressure
Figure 601 (Sheet 1)

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CHAPTER 80

STARTING

LIST OF EFFECTIVE PAGES

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STARTING - GENERAL

1. Scope

A. This chapter describes those units, components, and associated systems used for starting the engine.

2. Engine Starter System

A. Description.

(1) The engine starter system consists of the engine starters (24 volt DC), start switches, start relays, a starter vibrator, and associated electrical wiring. The system is protected by the start relay circuit breaker. The start relays are mounted on the left nacelle firewall. The starter vibrator is located on forward of the instrument panel on the left-band panel brace.

(2) For system operation position BATT and MAG switches to ON. Press start switch, the respective start relay for that engine will actuate, applying power to the starter for engine cranking. Simultaneously, the starter vibrator will supply ignition voltage in conjunction with the magneto retard breaker to start the engine.

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STARTING - REMOVAL/INSTALLATION

1. Engine Starter

A. Removal (Refer to Figure 1).
   (1) Turn electrical power OFF.
   (2) Remove engine cowling.
   (3) Disconnect starter cable.
   (4) Remove two mounting bolts securing starter to accessory drive and remove starter.

NOTE: If starter is not being replaced immediately, a cover should be installed to prevent entry of foreign material.

B. Installation (Refer to Figure 1).
   (1) Position starter on accessory drive and install two mounting bolts.
   (2) Connect starter cable and slide terminal boot in place.
   (3) Install engine cowling.

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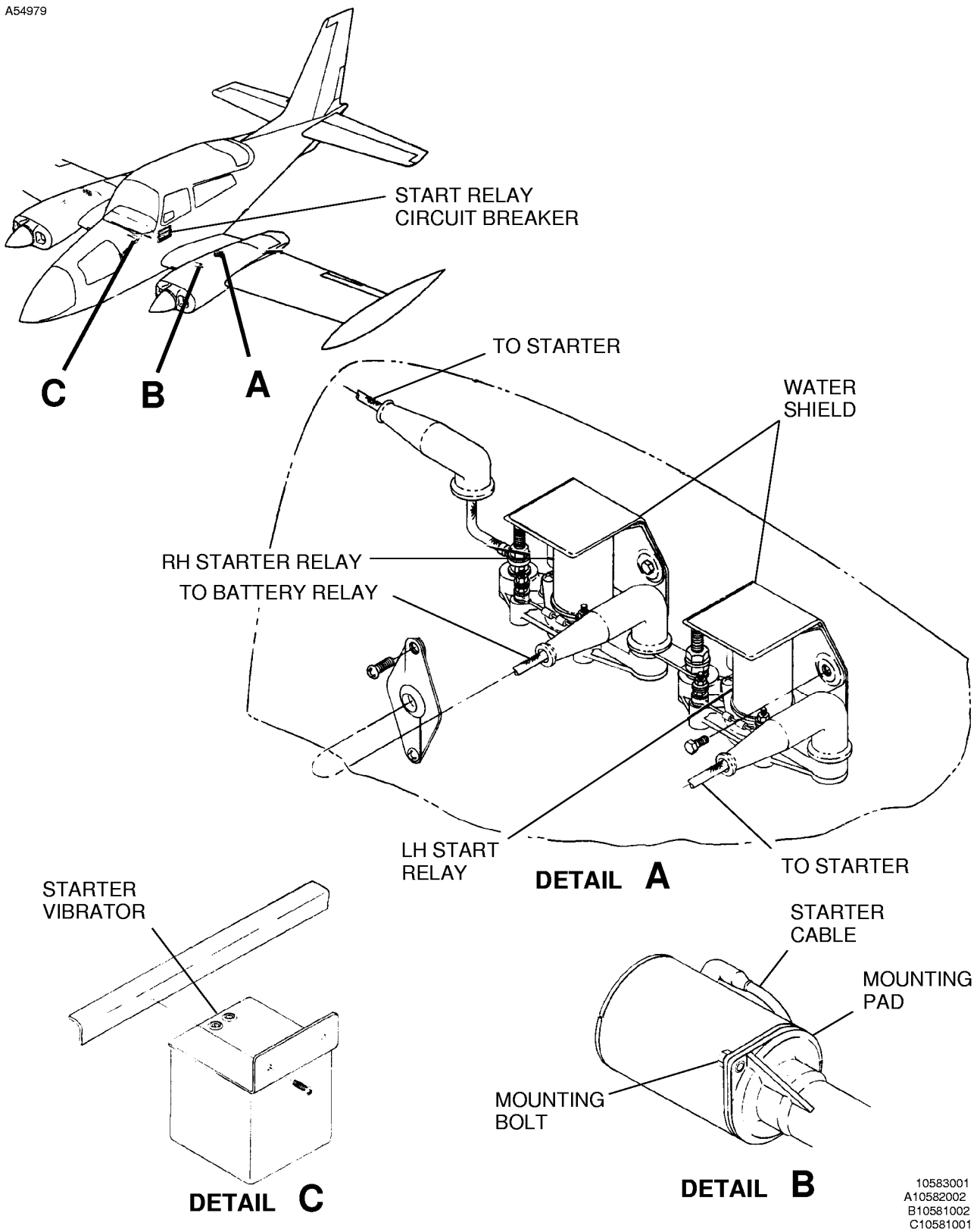

Engine Starter
Figure 401 (Sheet 1)

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STARTING - INSPECTION/CHECK

1. Engine Starter

A. Inspection/Check.
(1) For inspection of engine starter, refer to Chapter 5 Inspection Time Limits.

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CHAPTER

81

TURBINES

LIST OF EFFECTIVE PAGES

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Manifold Pressure Relief Valve . . . . . 81-00-00 Page 604

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TURBINES - GENERAL

1. Scope

A. This chapter describes the turbocharger unit. Refer to Figure 1.

2. Turbocharger

A. Description.
(1) On Turbo 310 the turbocharger is driven by exhaust gases to provide, engine induction air. An actuator positions the waste gate which allows exhaust gases to bypass the turbocharger when less pressure is required as determined by the controller.
(2) The Turbocharger shield is a two piece shield hinged together around the turbocharger turbine and held in place with Monel wire.

3. Absolute Pressure, Pressure Ratio Controller, and Waste-Gate Actuator

A. Description.
(1) The waste-gate actuator and controllers use engine oil for power supply. The turbocharger is controlled by the waste-gate and waste-gate actuator, absolute pressure controller and above critical altitudes by the pressure ratio controller. The waste-gate bypasses the engine exhaust gases around the turbocharger turbine inlet. The waste-gate actuator, which is physically connected to the waste-gate by mechanical linkage, controls the position of the waste-gate butterfly valve. The manifold pressure relief valve will open and prevent engine overboost should the engine manifold pressure exceed 34.5 inches of mercury. The absolute pressure controller controls the maximum turbocharger compressor discharge pressure (32 in. Hg., +0.5 or -0.5 in. Hg. to critical altitude, approximately 16,000 feet). The pressure ratio controller begins to function at approximately critical altitude and controls the maximum turbocharger compressor discharge pressure at a ratio of 2.2 times nacelle ambient pressure.
(2) The waste-gate actuator is spring-loaded to position the waste-gate to the normally open position when there is not adequate oil pressure in the waste-gate actuator power cylinder during engine shut down. When the engine is started, oil pressure is fed into the waste-gate actuator power cylinder through the capillary tube. This automatically fills the waste-gate actuator power cylinder and lines leading to the controllers, blocking the flow of oil by normally closed metering and/or poppet valves. As the oil pressure builds up in the waste-gate actuator power cylinder, it overcomes the force of the waste-gate open spring, closing the waste-gate. When the waste-gate begins to close, the exhaust gases are routed through the turbocharger turbine. As the engine increases its power and speed, the increase of temperature and pressure of the exhaust gases causes the turbocharger to rotate faster, raising the turbocharger compressor outlet pressure. As the compressor outlet pressure rises, the aneroid bellows in the absolute pressure controller sense the increase in pressure. When at high engine speed and load and the proper absolute pressure is reached, the force on the aneroid bellows opens the normally closed metering valve. When the oil pressure in the waste-gate actuator power cylinder is lowered sufficiently, the waste-gate actuator open spring forces the mechanical linkage to open the waste-gate. A portion of the exhaust gases then bypasses the turbocharger turbine, thus preventing further increase of turbocharger speed and holding the compressor discharge absolute pressure to the desired value. Conversely at engine idle, the turbocharger runs slowly with low compressor pressure output, therefore, low pressure applied to aneroid bellow is not sufficient to affect the unseating of the normally closed metering valve. Consequently, engine oil pressure keeps the waste-gate closed. After critical altitude is reached (approximately 16,000 feet), the absolute pressure controller is unable to maintain 32 inches, +0.5 or -0.5 inches of manifold pressure.
(3) The pressure ratio controller, which senses both nacelle ambient pressure and discharge pressure, begins the function of controlling turbocharger discharge pressure at a ratio of 2.2 times ambient pressure. When the proper discharge pressure is reached inside the pressure ratio controller, the force on the aneroid bellows opens the poppet valve and lowers the oil pressure in the waste-gate actuator power cylinder.

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4. Manifold Pressure Relief Valve

A. Description.

(1) The manifold pressure relief valve is mounted on the turbocharger compressor adapter plate and is provided to prevent engine damage from excessive intake manifold pressure. The non-adjustable manifold pressure relief valve will be actuated if the manifold pressure exceeds 36.5 in. Hg. If the relief valve is defective or malfunctions, it must be replaced.

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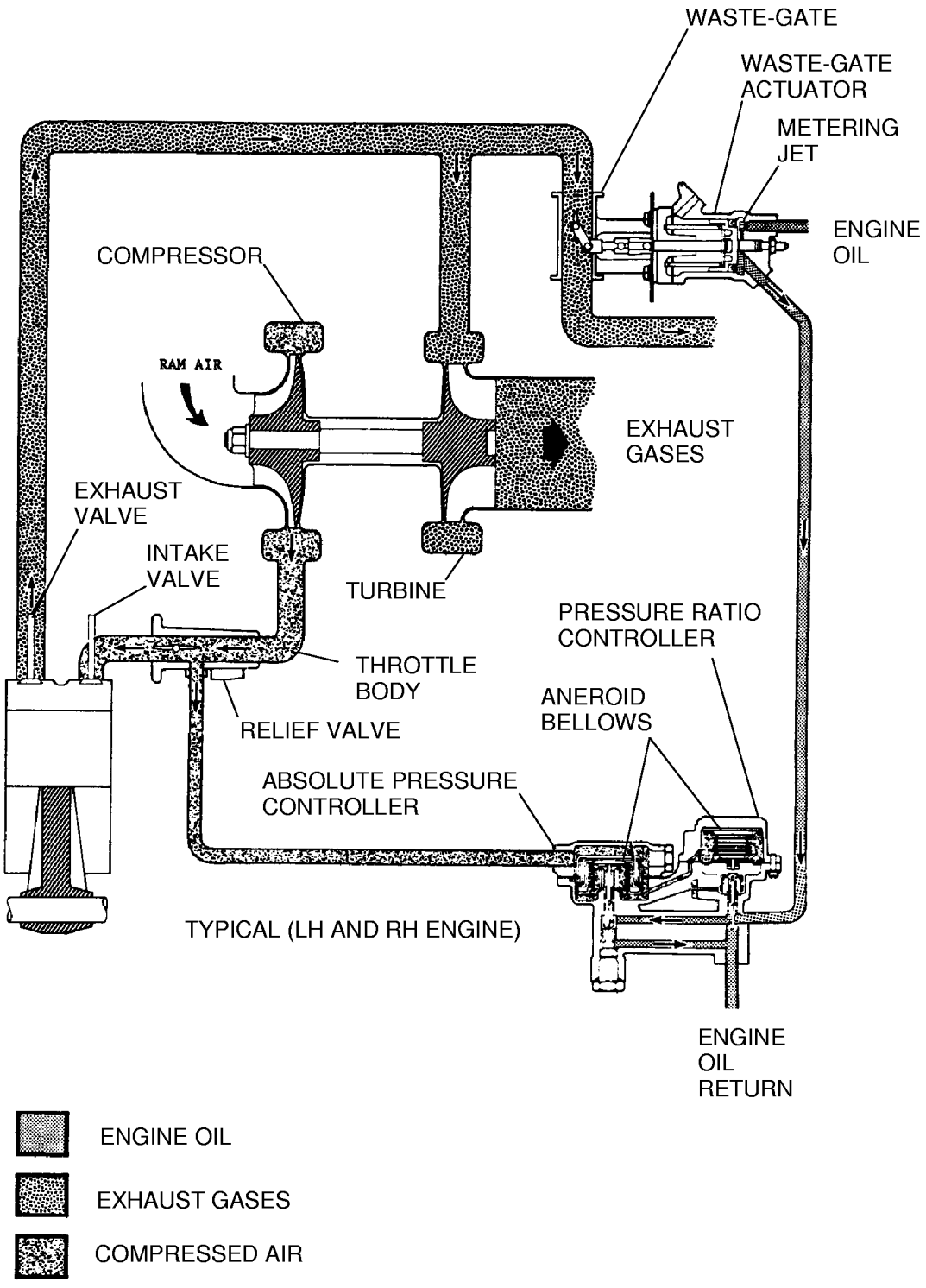

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Turbocharger Installation
Figure 1 (Sheet 1)

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AIR INTAKES - TROUBLESHOOTING

1. Air Induction Troubleshooting

A. Air Induction Troubleshooting
(1) For troubleshooting engine induction air system, refer to Table 101

Table 101. Controller and Waste-Gate Actuator

TROUBLE	PROBABLE CAUSE	CORRECTION
UNABLE TO GET RATED POWER DUE TO LOW MANIFOLD PRESSURE.	Not enough oil pressure to close the waste-gate.	Check pump outlet pressure lines, oil filter, and external lines for obstructions. Clean, replace or repair as required.
	Chips under metering and/or poppet valves in controllers, holding them open.	Flush out controller or replace if necessary.
	Capillary tube in actuator is obstructed.	Clean capillary tube.
	Actuator piston seal has excessive oil leakage.	Replace actuator.
	Pressure ratio controller has too low of setting and is cutting in at altitude below 16,000 feet.	Adjust pressure ratio controller.
	Leak in exhaust system.	Replace failed exhaust system components.
	Manifold pressure relief valve is stuck open.	Replace relief valve.
	Leak in induction air system.	Repair or replace induction air system.

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Table 101. Controller and Waste-Gate Actuator (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
LOW POWER OR INSUFFICIENT MANIFOLD PRESSURE.	Leak in induction air system.	Repair or replace induction air system.
	Leak in exhaust system.	Replace or repair exhaust system.
	Improper alignment and/or obstruction of air inlet ducts, canister and filter element.	Align ducts, clean or replace filter.
	Hot nacelle air leaking into induction system.	Rig alternate induction air door.
	Waste-gate not closing properly.	Refer to Turbocharger and Controls Overhaul/Parts Manual and Check Rigging of Waste-Gate Actuator.
	Wrong manifold relief valve installed.	Replace relief valve.
	Waste-gate actuator leaking oil.	Replace waste-gate actuator.
	Low engine oil pressure in flight.	Verify that engine oil pressure remains in upper half of green arc during cruise.
	CAUTION: If low oil pressure is encountered during flight check, reduce power to minimum cruise and allow oil to cool to the lower sector of the green arc. Open cowl flaps to aid in cooling the oil temperatures. Upon attainment of the cooler oil temperature, apply power and recheck the boot strapping power level. If a marked improvement is attained, correct oil pressure or isolate the overheating cause. **NOTE:** This verification can be made on the ground but must be reasserted in flight with oil temperatures in normal limits. Adjust pressure relief valve if necessary to obtain proper oil pressure.	
ENGINE SURGES OR SMOKES.	Metering valve stem seal broken in one of the controllers, leaking oil into manifold.	Replace or repair controller. Refer to Turbocharger and Control Overhaul/Parts Manual.
	Actuator bypass valve linkage binding.	Correct binding.
TURBOCHARGER NOISY, PLENTY OF POWER.	Controller is overspeeding.	Adjust controller.
	Waste-gate sticking in closed position.	Replace waste-gate, waste-gate actuator, or correct binding linkage.
	Controller drain line obstructed.	Clean or replace line.

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Table 101. Controller and Waste-Gate Actuator (continued)

TROUBLE	PROBABLE CAUSE	CORRECTION
ENGINE POWER INCREASES SLOWLY OR SEVERE FLUCTUATIONS OF MANIFOLD PRESSURE ON RAPID THROTTLE ADVANCE.	Plugged capillary line in rate of change controller.	Replace absolute pressure and rate of change controller.
	Sluggish manifold pressure relief valve.	Replace relief valve.
	Waste-gate operation sluggish.	Replace waste-gate actuator, or correct binding linkage. **CAUTION:** The absolute pressure controller, manifold pressure relief valve, and pressure ration controllers are set at the factory and should not be tampered with except for prescribed minor adjustment to obtain rated manifold pressure. Refer to Turbocharger and Controls Overhaul/Parts Manual and set butterfly valve clearance properly.
ENGINE POWER INCREASES SLOWLY AND MANIFOLD PRESSURE OVERBOOSTS ON RAPID THROTTLE ADVANCE.	Sluggish manifold pressure relief valve.	Replace relief valve.
MANIFOLD PRESSURE OVERBOOST DURING FLIGHT.	Manifold relief valve stuck closed.	Repair or replace relief valve.
	Waste-gate actuator has sluggish operation.	Repair or replace.
	Waste-gate butterfly clearance improperly set.	Refer to Turbocharger and Controls Overhaul/Parts Manual and set butterfly valve clearance properly.

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TURBINES - REMOVAL/INSTALLATION

1. Turbocharger Heat Shield

A. Removal (Refer to Figure 401).
   (1) Remove upper engine cowling.
   (2) Cut safety wire securing the turbocharger heat shield in place.
   (3) Open shield assembly and remove from turbocharger.

B. Installation (Refer to Figure 401).
   (1) Position heat shield (11) in place on turbine.
   (2) Install safety wire with a twisted double strand of 0.032 Monel wire.
   (3) Install upper engine cowling.

2. Turbocharger

A. Removal (Refer to Figure 401).
   (1) Remove engine cowling.
   (2) Remove turbocharger heat shield.
   (3) Disconnect oil inlet line (10) from top of turbocharger center housing and oil drain line (7) from the bottom of the center housing.
   (4) Remove clamps securing turbocharger compressor to throttle body and air canister assembly.
   (5) Remove clamp (1) securing turbocharger turbine to exhaust tube.
   (6) Remove nut (3), washer (2), and remove brace (5).
   (7) Remove the four nuts and bolts securing turbocharger assembly to exhaust manifold header (6).
   (8) Lift turbocharger straight up and remove from nacelle.

      NOTE: Cap and plug oil lines and seal turbine and compressor air openings to prevent the entry of foreign material.

B. Installation (Refer to Figure 401).
   (1) Remove plugs and caps from oil lines, fittings, turbocharger openings, and position turbocharger on exhaust manifold header (6).
   (2) Install four bolts and nuts securing turbocharger to exhaust manifold header (6).
   (3) Install washer (2) and nut (3) to brace (5).
   (4) Install clamp (1) securing exhaust tube. Torque is 40 inch-pounds.
   (5) Install clamps securing turbocharger compressor to throttle body and canister assembly.
   (6) Connect oil inlet line (10) and oil drain line (7) to center housing of turbocharger.
   (7) Install turbocharger heat shield and safety with a twisted double strand of Monel 0.032 wire.

3. Absolute Pressure, Pressure Ratio Controller

A. Removal (Refer to Figure 402).
   (1) Disconnect oil line (2), oil hose (3), and pressure hose (4) from controller (3).
   (2) Remove nuts and bolts securing controller.

      NOTE: Plug and cap all lines and hoses as they are disconnected to prevent entry of foreign material.

   (3) If controller is being replaced, the existing fittings must be removed.

B. Installation (Refer to Figure 402).
   (1) Position controller in place and remove caps and plugs.
   (2) Install bolts and nuts to secure controller.

      NOTE: If a new controller is being installed the existing fittings with new packings should be installed.

   (3) Connect oil lines (2), oil hose (5), and air pressure hose (4) and tighten.

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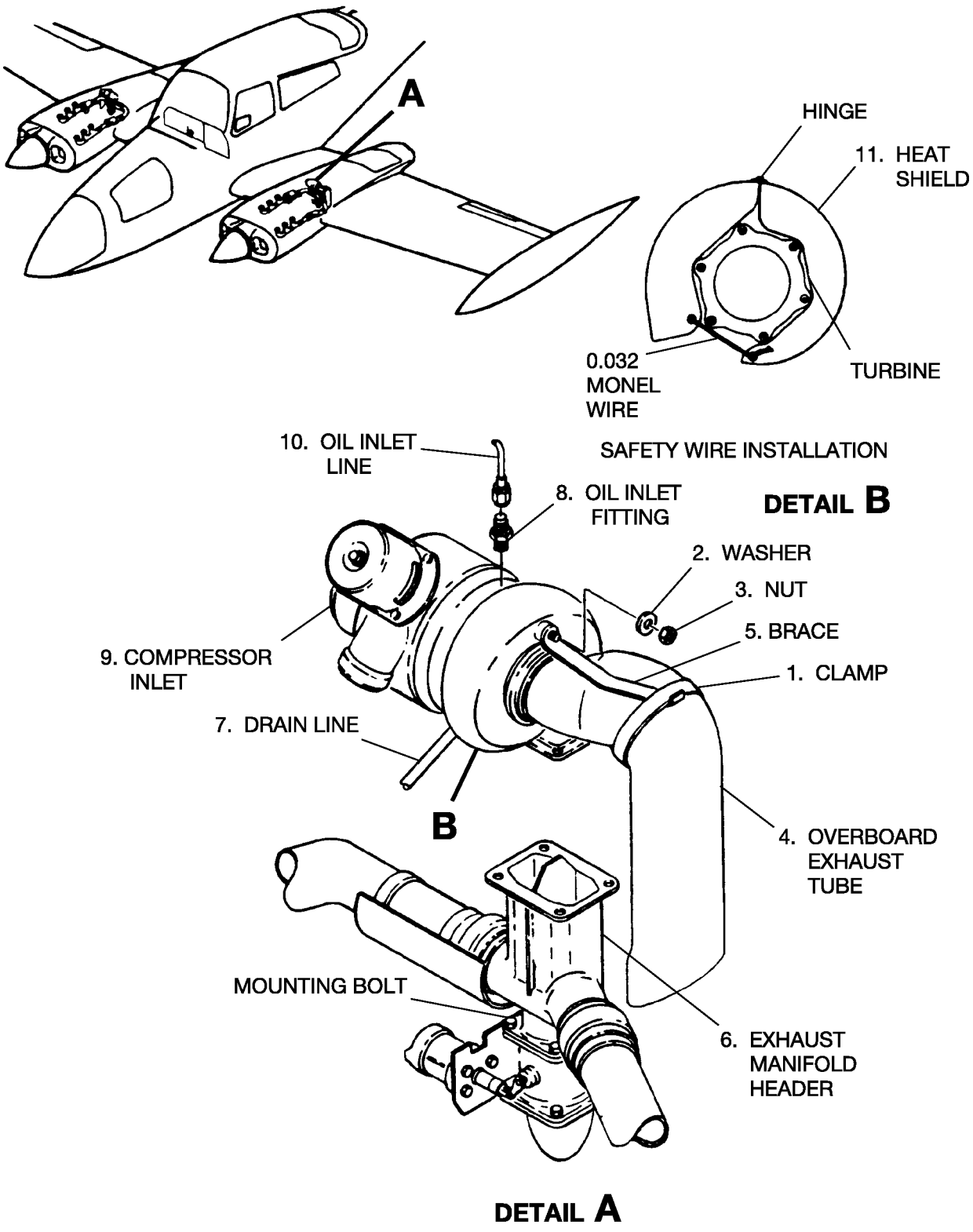

Turbocharger 310 Turbo
Figure 401 (Sheet 1)

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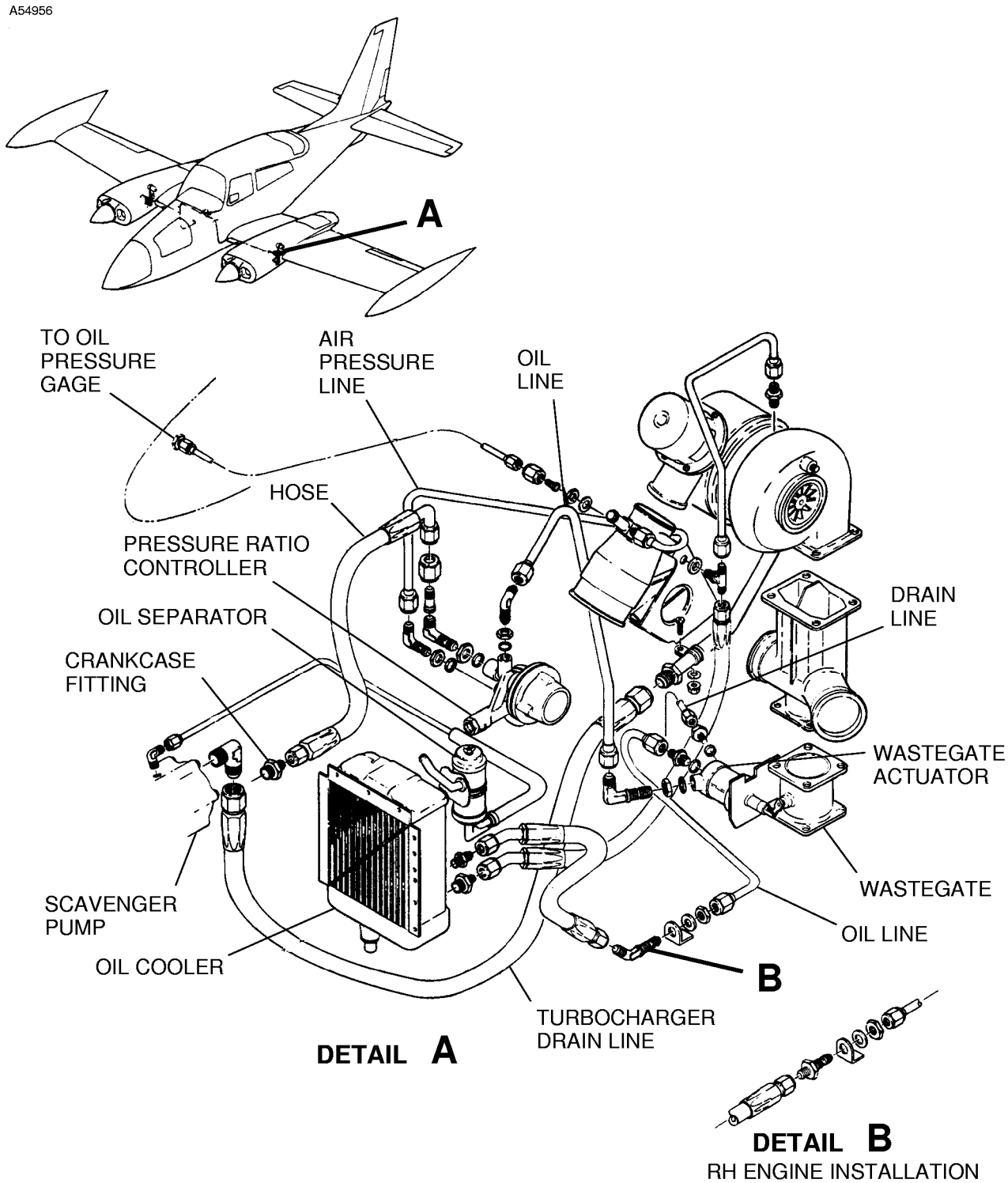

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Absolute Pressure, Pressure Controller
Figure 402 (Sheet 1)

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4. Waste-Gate and Waste-Gate Actuator

A. Removal (Refer to Figure 402).

NOTE: The waste-gate and waste-gate actuator are considered matched sets and must be removed and replaced as matched sets.

(1) Remove necessary access covers
(2) Disconnect drain line (7) and oil lines (2 and 6) from waste-gate actuator (1).

NOTE: Plug and cap all lines and openings to prevent entry of foreign material.

(3) Remove four nuts and bolts attaching waste-gate to manifold header. Allow manifold header and waste-gate actuator to rest on engine nacelle.
(4) Remove four nuts and bolts attaching waste-gate overboard tube to waste-gate. Remove waste-gate overboard tube from airplane through access hole.
(5) Rotate waste-gate and waste-gate actuator within the lower aft nacelle until the spring on the actuator is facing towards the nacelle firewall. With the waste-gate and actuator in this position, work waste-gate and actuator out through the nacelle access hole.

B. Installation (Refer to Figure 402).
(1) Position waste-gate and waste-gate actuator in place in the lower nacelle. Clock the waste-gate with the spring on the actuator facing toward the firewall.
(2) Secure waste-gate and waste-gate actuator to exhaust manifold header with bolts and nuts.

NOTE: When installing waste-gate actuator to the manifold header, always use a new gasket.

(3) Attach overboard tube to waste-gate and secure with bolts and nuts.
(4) Remove caps and plugs from lines and connect to actuator.
(5) Refer to Turbocharger and Controls Overhaul/Parts manual and rig waste-gate in accordance with rigging instructions.

5. Manifold Pressure Relief Valve

A. Removal (Refer to Figure 403).
(1) Remove engine cowling.
(2) Remove screws (1) and washers (5) from manifold pressure relief valve (2).
(3) Lift valve (2) from nacelle. Discard O-ring (3).

NOTE: If the manifold pressure relief valve is not being replaced or immediately reinstalled, protective covers must be installed to prevent entry of foreign material.

(4) On the right hand engine loosen the clamp attaching the compressor housing to the turbocharger and air canister.
(5) Remove clamp from compressor outlet.
(6) Remove compressor housing from turbocharger and lift out of nacelle.
(7) Repeat steps 1 through 3 to remove manifold pressure relief valve.

B. Installation (Refer to Figure 403).
(1) Remove protective covers and position new O-ring in place.
(2) Install manifold pressure relief valve with screws (1) and washers (5).
(3) On right hand engine install turbocharger compressor housing and connect clamps securing compressor housing to center housing and the air canister.
(4) Connect compressor outlet duct and tighten clamp.

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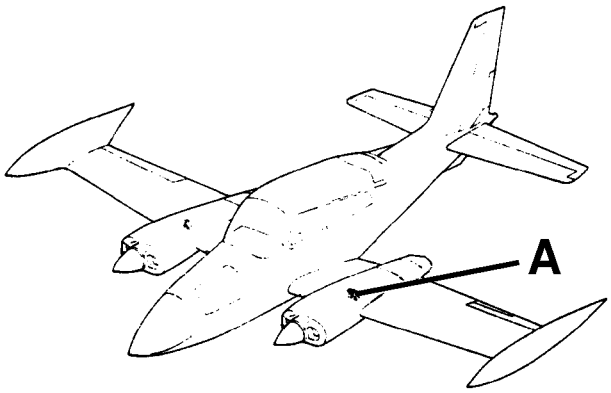

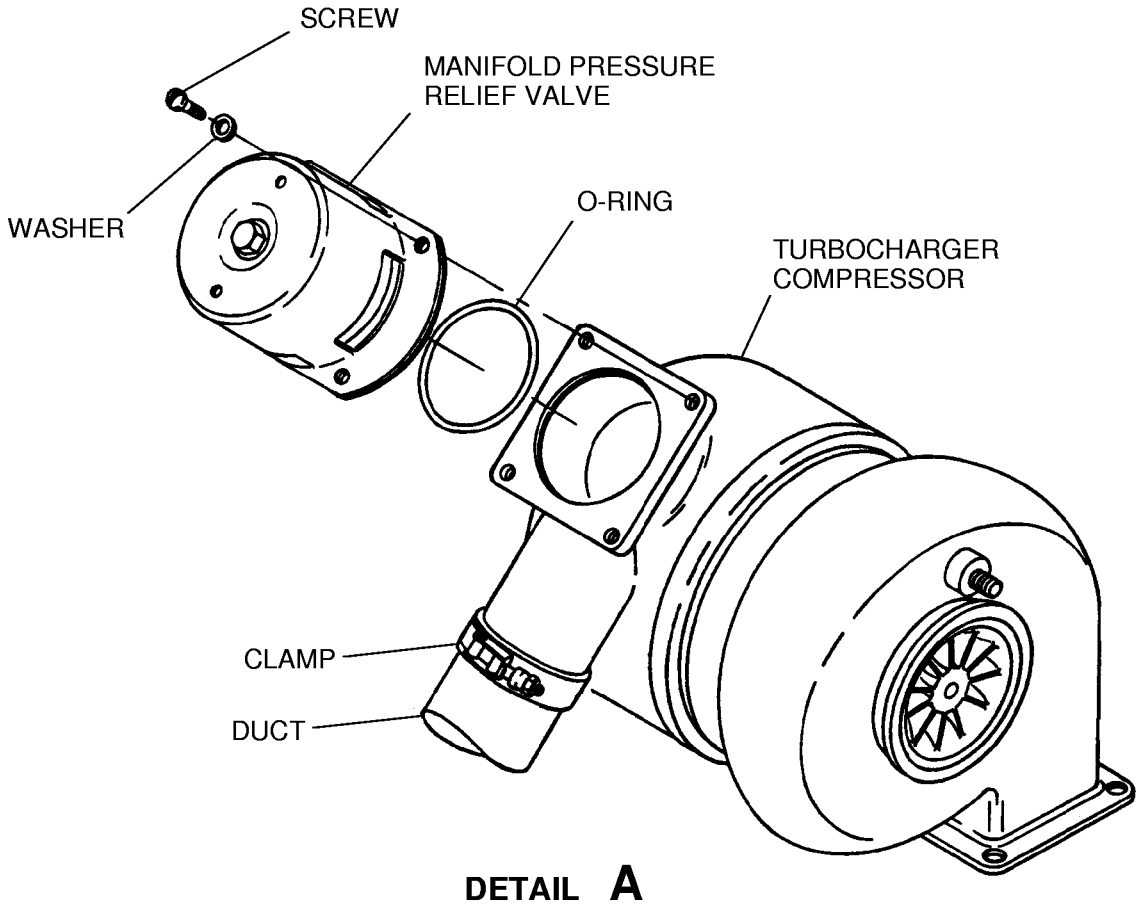

DETAIL A

10503010
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Manifold Pressure Relief Valve
Figure 403 (Sheet 1)

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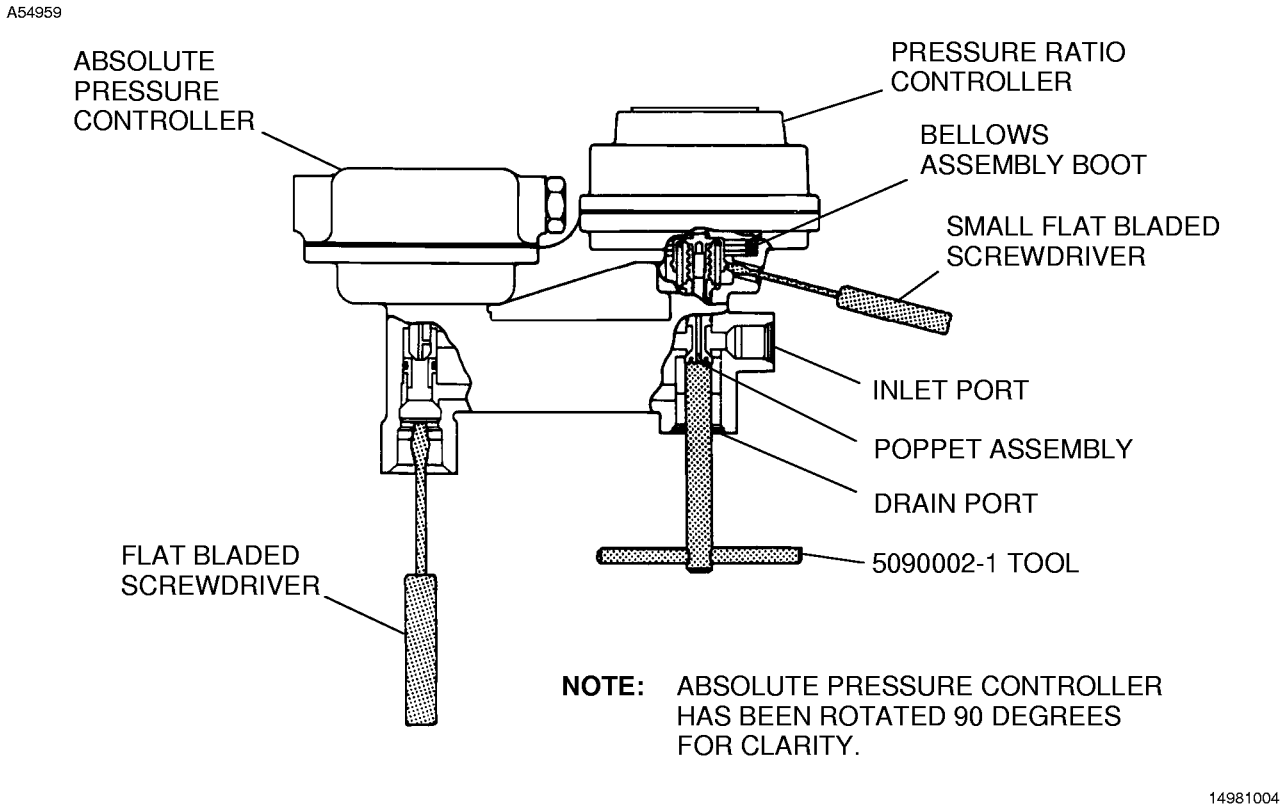
TURBINES - ADJUSTMENT/TEST

1. Absolute Pressure Controller

A. Adjustment (Refer to Figure 501).



Controller Adjustment
Figure 501

(1) Remove engine cowling.
(2) Remove adjustment plug from absolute pressure controller (Refer to Figure 502).
(3) Using a flat bladed screwdriver, rotate metering valve seat (1/16th of one full turn changes manifold pressure 1 inch Hg.), clockwise to increase or counterclockwise to decrease.
(4) Install absolute pressure controller adjustment plug (Refer to Figure 502).
(5) Install engine cowling in accordance with installation procedures.
(6) Start engine, allow engine oil to reach operating temperature (upper 1/3 of green arc), ground check manifold pressure for 32 inches Hg +0.5 or -0.5 inches Hg. at 2700 RPM.

NOTE: Several adjustments and checks may be necessary to achieve correct manifold pressure.

2. Pressure Ratio Controller

A. Adjustment (Refer to Figure 501).
(1) Remove engine cowling in accordance with removal procedures.
(2) Remove pressure ratio controller in accordance with removal procedures.
(3) Remove ambient air plug from low pressure port. Remove tee and reducer from drain port (Refer to Figure 502).

NOTE: Protect all fittings and lines to prevent entry of foreign materials.

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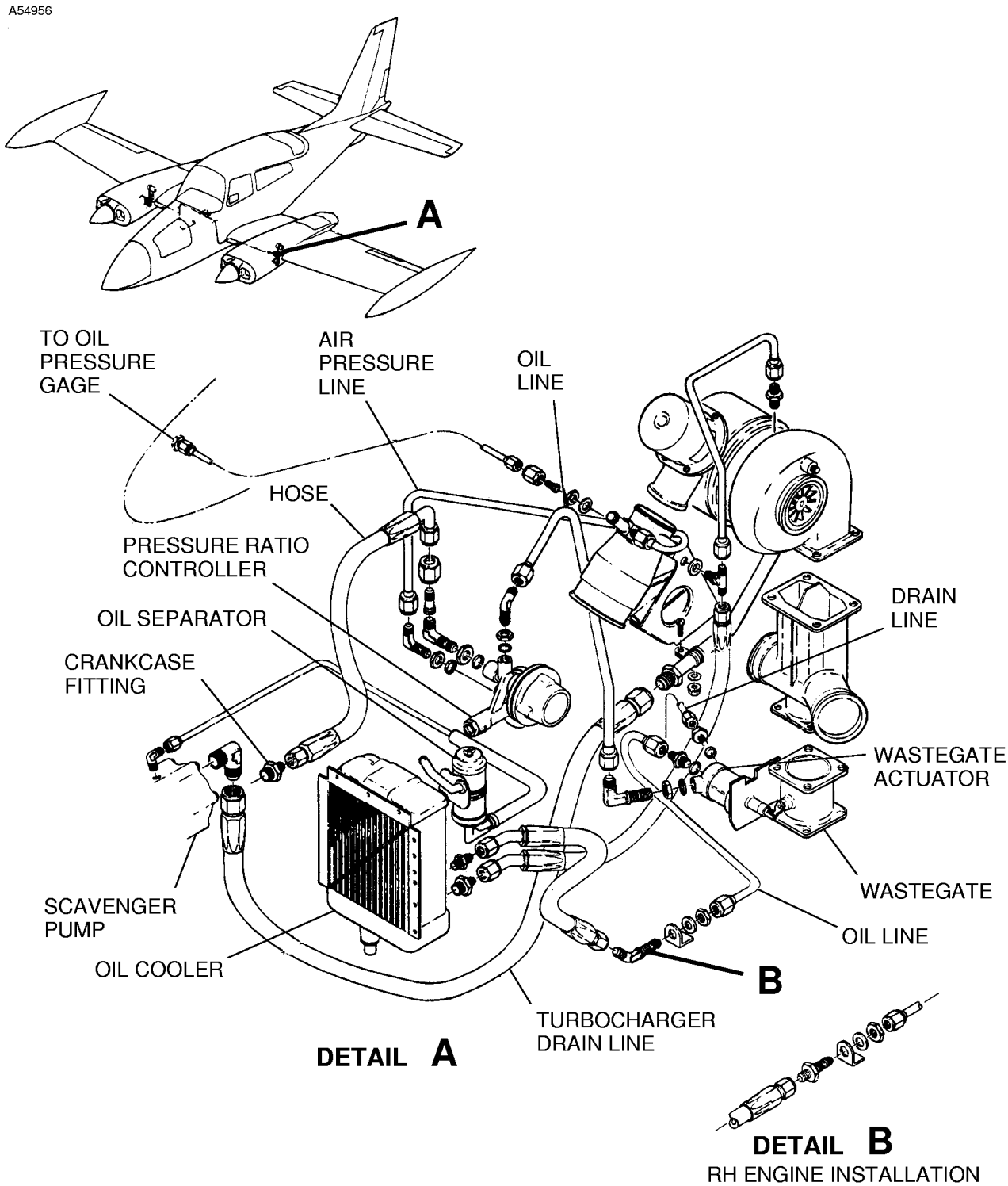

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Absolute Pressure, Pressure Ratio Controller
Figure 502 (Sheet 1)

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(4) Insert tool 5090002-1 into drain port. Insert small bladed screwdriver into low pressure port. Rotate poppet assembly until screwdriver blade engages slot provided in bellow assembly boot.
(5) Holding bellows assembly boot, rotate poppet assembly (1/16 of one full turn changes manifold pressure 1 inch Hg.), clockwise to increase, counterclockwise to decrease.
(6) Install ambient air plug reducer and tee (Refer to Figure 502).
(7) Install pressure ratio controller.
(8) Install engine cowling in accordance with installation procedures.
(9) Repeat climb-pressure ratio procedure, steps (1) through (6).

NOTE: Several adjustments may be necessary to achieve correct manifold pressure.

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TURBINES - INSPECTION/CHECK

1. Turbocharger

A. Inspection/Check.
(1) Remove engine cowling.
(2) Clean outer surface of turbocharger with a suitable solvent.
(3) Remove turbocharger heat shield from turbine and inspect housing for cracks or bulges.
(4) Remove the tailpipe from the turbine and visually inspect the impellers and visible portions of turbine for coking, carbonization, oil deposits, nicks, or dents.
(5) If cracks or bulges are present, the turbine housing must be replaced in accordance with the Turbocharger, Valves and Controllers Overhaul/Parts Manual.
(6) For removing coke and carbonized oil deposits, refer to the Turbocharger and Controls Overhaul Manual.

2. Controller Operation Flight Check Procedure

A. The flight check procedure details the method of checking the operation of the absolute pressure and pressure ratio controllers. This procedure is to be used for airplanes suspected of improper controller operation. To aid in recording the necessary flight readings, sample form, as shown in Figure 601 is provided. This sample form or one with similar content should be used in conjunction with the flight check procedure. To determine at which conditions bootstrapping is most likely to occur, refer to the Bootstrapping Tolerance Chart in Figure 602.

B. Takeoff - Absolute Controller.
(1) Cowl flaps - open.
(2) Airspeed - 105 MPH lAS.
(3) Oil temperature - upper 1/3 of green arc.
(4) Engine speed - 2700 RPM, +25 or -25 RPM.
(5) Fuel flow - 27.5 to 29.2 GPH.
(6) Full throttle M.P. - 32 in. Hg.,+0.5 or -0.5 in. Hg.

C. Climb - Absolute Controller.
(1) Cowl flaps - open.
(2) Airspeed - 120 MPH lAS.
(3) Pressure altitude - 16,000 ft.
(4) Engine speed - 2700 RPM, +25 or -25 RPM.
(5) Fuel flow - 29.0 PSI to 31.0 PSI.
(6) Full throttle M.P. - 32 in. Hg., +0.5 or -0.5 in. Hg.

D. Climb - Manifold Pressure Relief Valve.
(1) Cowl flaps - open.
(2) Airspeed - 120 lAS.
(3) Pressure altitude - below 16,000 ft.
(4) Engine speed - 2700 RPM, +25 or -25 RPM.
(5) Fuel flow - full rich.
(6) Throttle (one engine at a time).
(7) Idle until M.P. stabilizes.
(8) Rapidly advance to full throttle.

NOTE: If at full throttle maximum manifold pressure is not reached 32 inches of Hg, +0.5 or -0.5 inches of Hg. manifold pressure relief valve is operating improperly.

E. Cruise - Bootstrapping Determination.
(1) Cowl flaps - closed.
(2) Airspeed - level flight.
(3) Pressure altitude - 16,000 feet.
(4) Engine speed - 2700 RPM.
(5) Manifold pressure - 28 in. Hg.
(6) Fuel Flow - full rich. Prop controls (one engine at a time).

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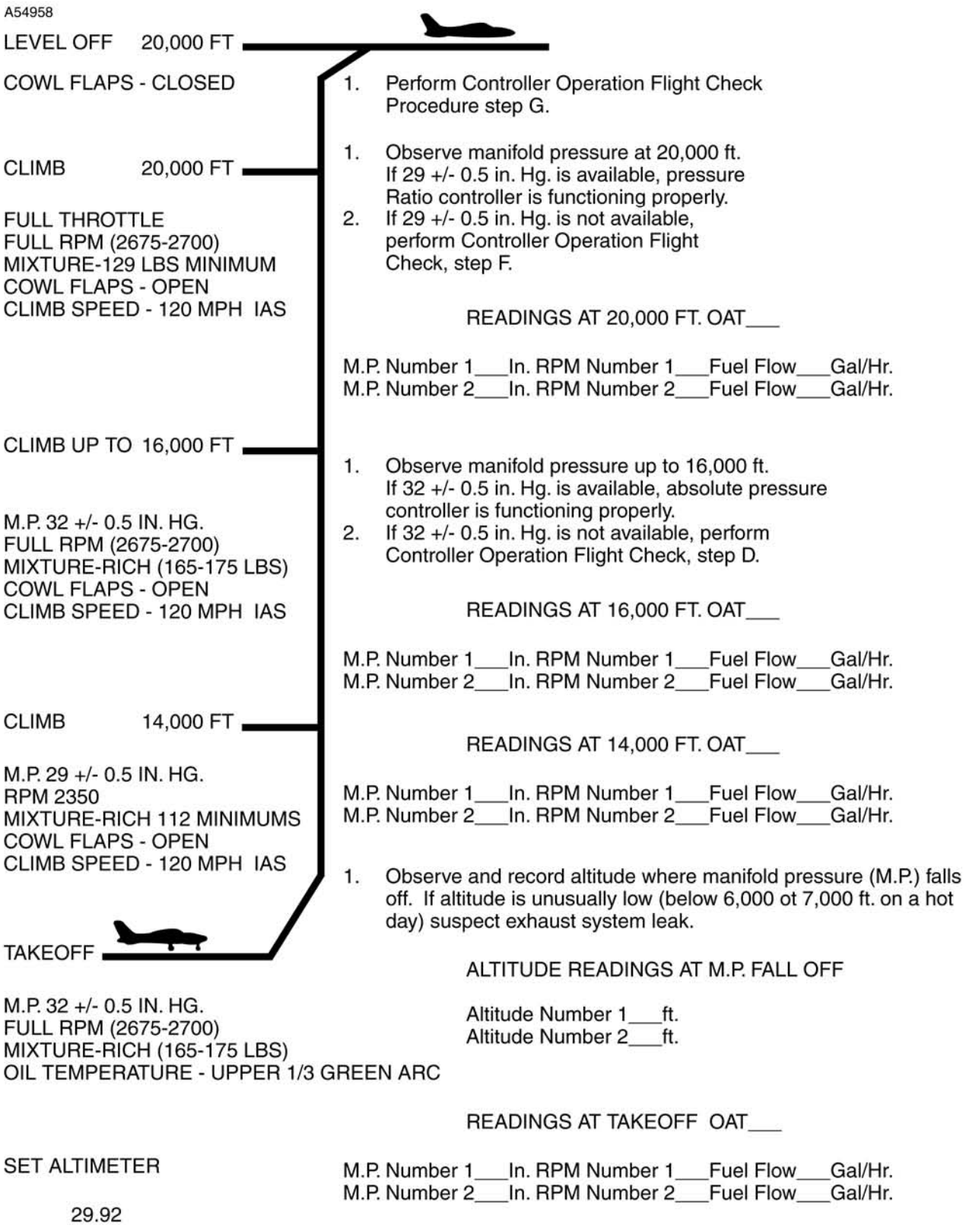

Turbocharger System Operational Check Chart
Figure 601 (Sheet 1)

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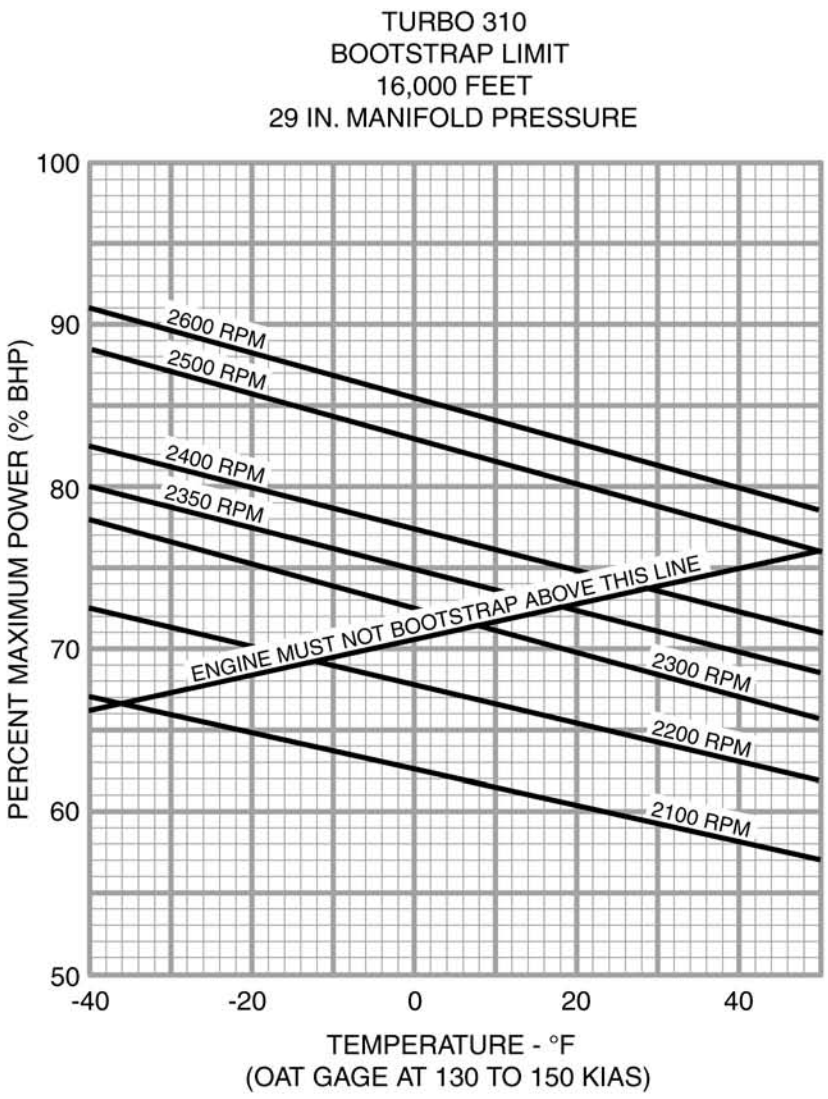

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Bootstrapping Tolerance Chart
Figure 602 (Sheet 1)

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(7) Slowly decrease RPM until M.P. drop indicates waste-gate is closed.
(8) The manifold pressure, RPM, outside air temperature and pressure altitude at the instant of waste-gate closing should be recorded.
(9) The actual power being developed when the waste-gate closed should be less than 77% power.
(10) Engine speed - increase 50 RPM.
(11) Mixture - normal lean.
(12) Engine should not bootstrap.

F. Climb - Pressure Ratio Controller.
(1) Cowl flaps - open.
(2) Airspeed - 120 MPH.
(3) Pressure altitude - 20,000 feet.
(4) Engine speed - 2700 RPM, +25 or -25 RPM.
(5) Fuel flow - full rich.
(6) Full throttle M.P. - 29 in. Hg., +0.5 or -0.5 in. Hg.

G. Cruise - Bootstrapping Determination.
(1) Cowl flaps - closed.
(2) Airspeed - level flight.
(3) Pressure altitude - 20,000 feet.
(4) Engine speed - 2700 RPM.
(5) Fuel flow - full rich.
(6) Throttle - full throttle.
(7) Prop control (one engine at a time).
(8) Slowly decrease RPM until M.P. drop indicates waste-gate is closed.
(9) The M.P., RPM, OAT, and Hp at the instant of waste-gate closing should be recorded.
(10) The actual power being developed should be less than 67.5% power.
(11) Engine speed - increase 30 RPM.
(12) Mixture - normal lean.
(13) Engine should not bootstrap.

3. Absolute Pressure, Pressure Ratio Controller and Waste-Gate and Actuator

A. Inspection/Check.
(1) Remove engine cowling.
(2) Remove necessary lower access plates.

4. Manifold Pressure Relief Valve

A. Inspection/Check.
(1) Remove Engine Cowling.
(2) Clean dirt and debris from valve, with a clean cloth.
(3) Inspect relief valve vents for obstructions or foreign material.
(4) Check for proper operation as follows:
(a) After adequate engine warm up with oil temperature at the lower third of green arc, accelerate the engine rapidly from idle to maximum RPM.

NOTE: Discontinue acceleration if manifold pressure exceeds 34.5 In. Hg. If maximum manifold pressure exceeds 34.5 In. Hg., immediately reduce power and shut down engine. Manifold pressure relief valve is faulty and must be replaced.

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