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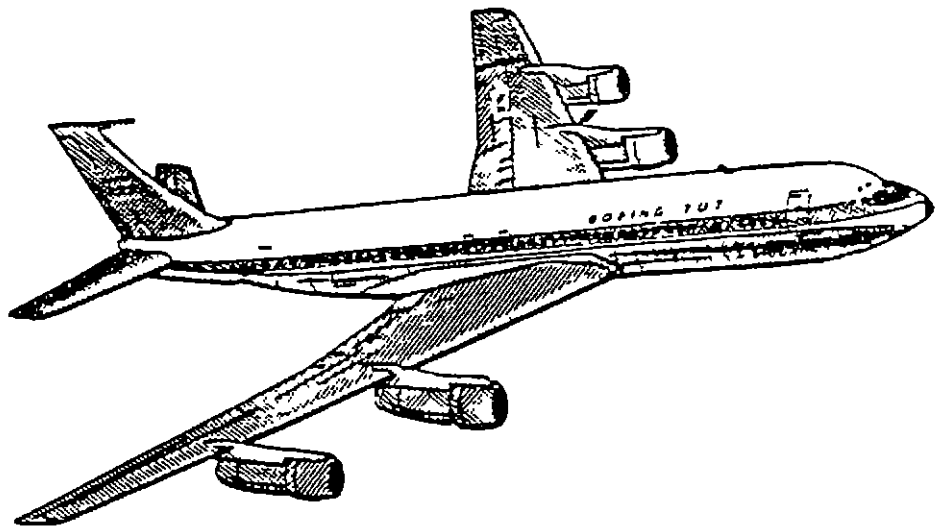

MAINTENANCE MANUAL

FOR NATO TRAINER CARGO AIRCRAFT

NATO DOC.. TCA D6-6003

SABENA REGISTRATION NO. 180 SABENA

CHAPTER

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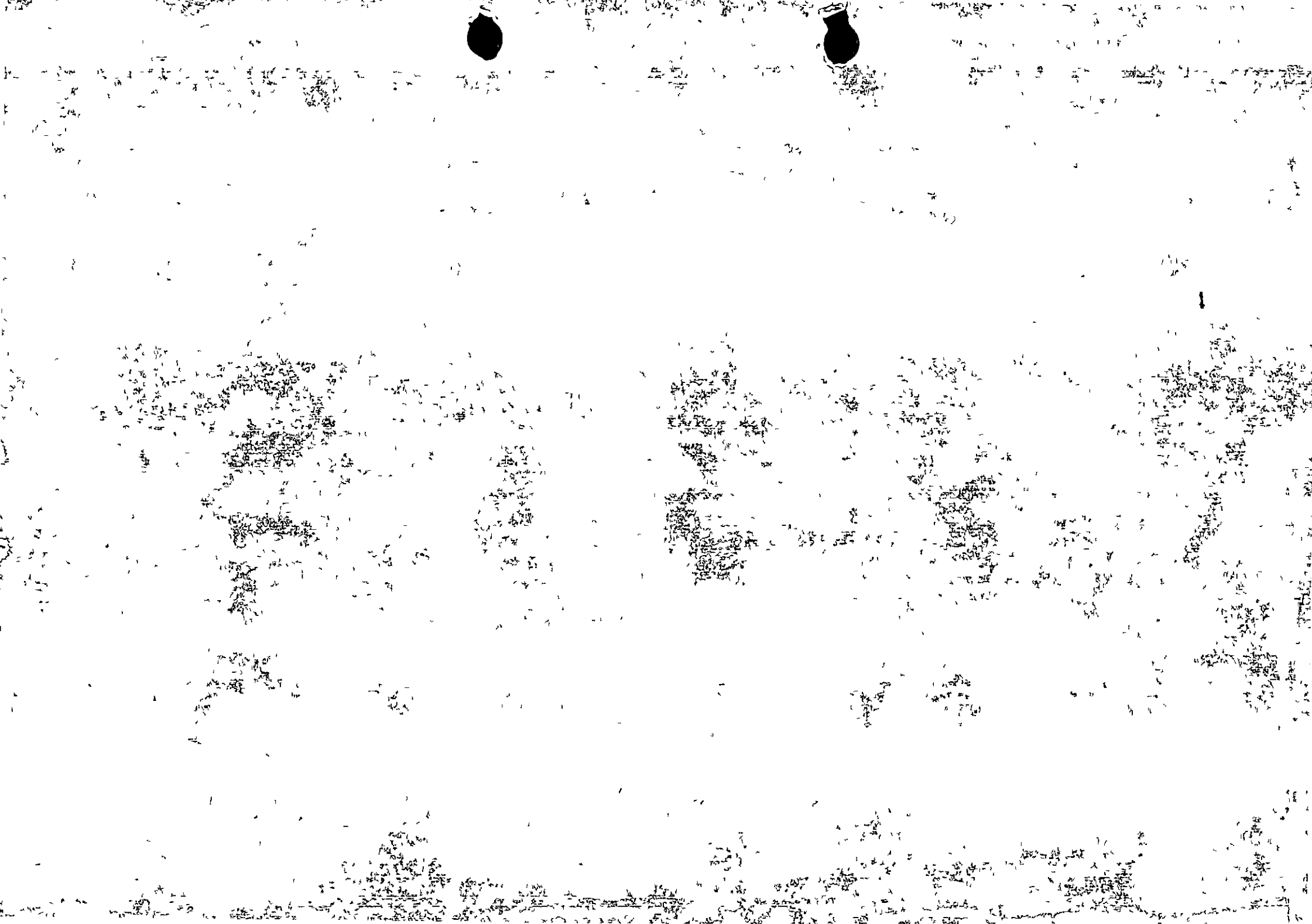

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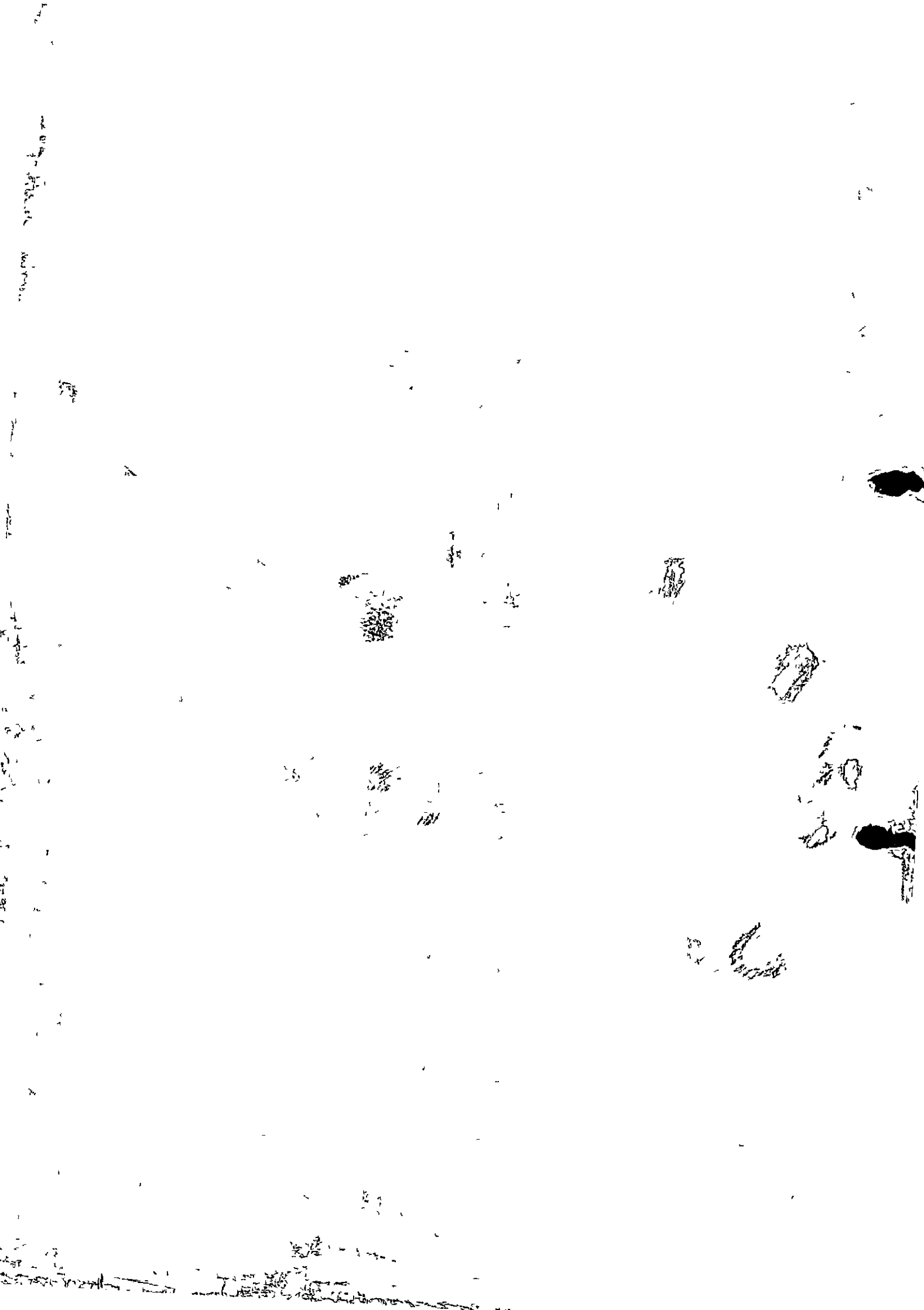

BOEING Intercontinental 707 720

MAINTENANCE MANUAL

CHAPTER 27

FLIGHT CONTROLS

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FLIGHT CONTROLS - GENERAL - DESCRIPTION AND OPERATION

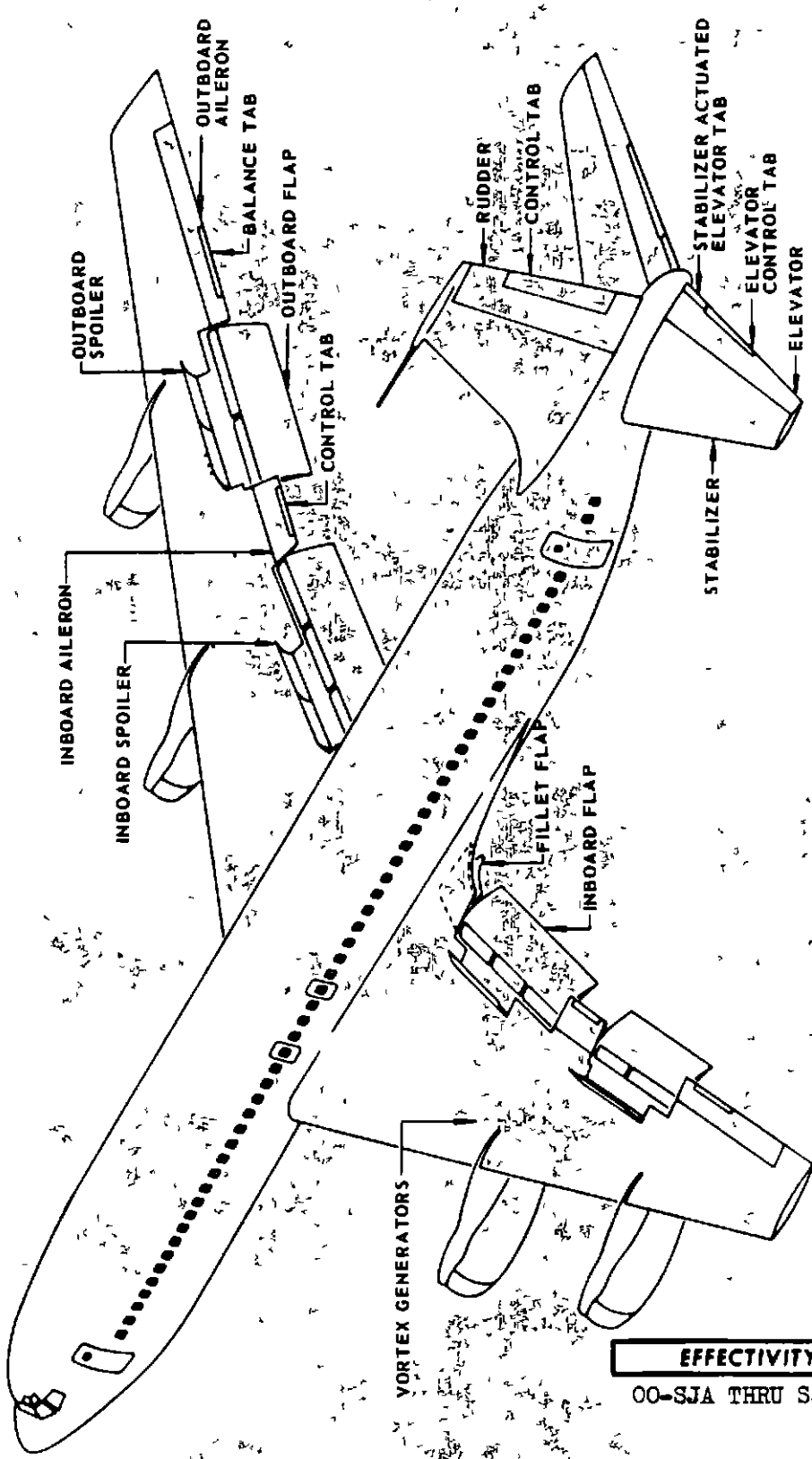
1. General

A. The primary flight controls (figure 1) are the ailerons, elevator and rudder. These surfaces control the airplane about its lateral, longitudinal and vertical axes. The primary controls are augmented by spoilers, wing flaps and an adjustable horizontal stabilizer. The ailerons and elevators are actuated by control tabs and are manually controlled through cable systems. The rudder is normally actuated by a hydraulic power unit. A manually operated cable system positions a directional control valve incorporated in the power unit to control rudder operation. In the event of hydraulic system failure, rudder actuation is accomplished through the control tab. Movement of the surfaces is assisted by a series of balance panels in cavities immediately ahead of the surface.

B. Lateral trim is obtained by using the identical control tab as used for aileron actuation. Longitudinal trim is accomplished by pivoting the adjustable horizontal stabilizer about its aerodynamic center. Vertical (directional) trim is obtained by positioning the rudder.

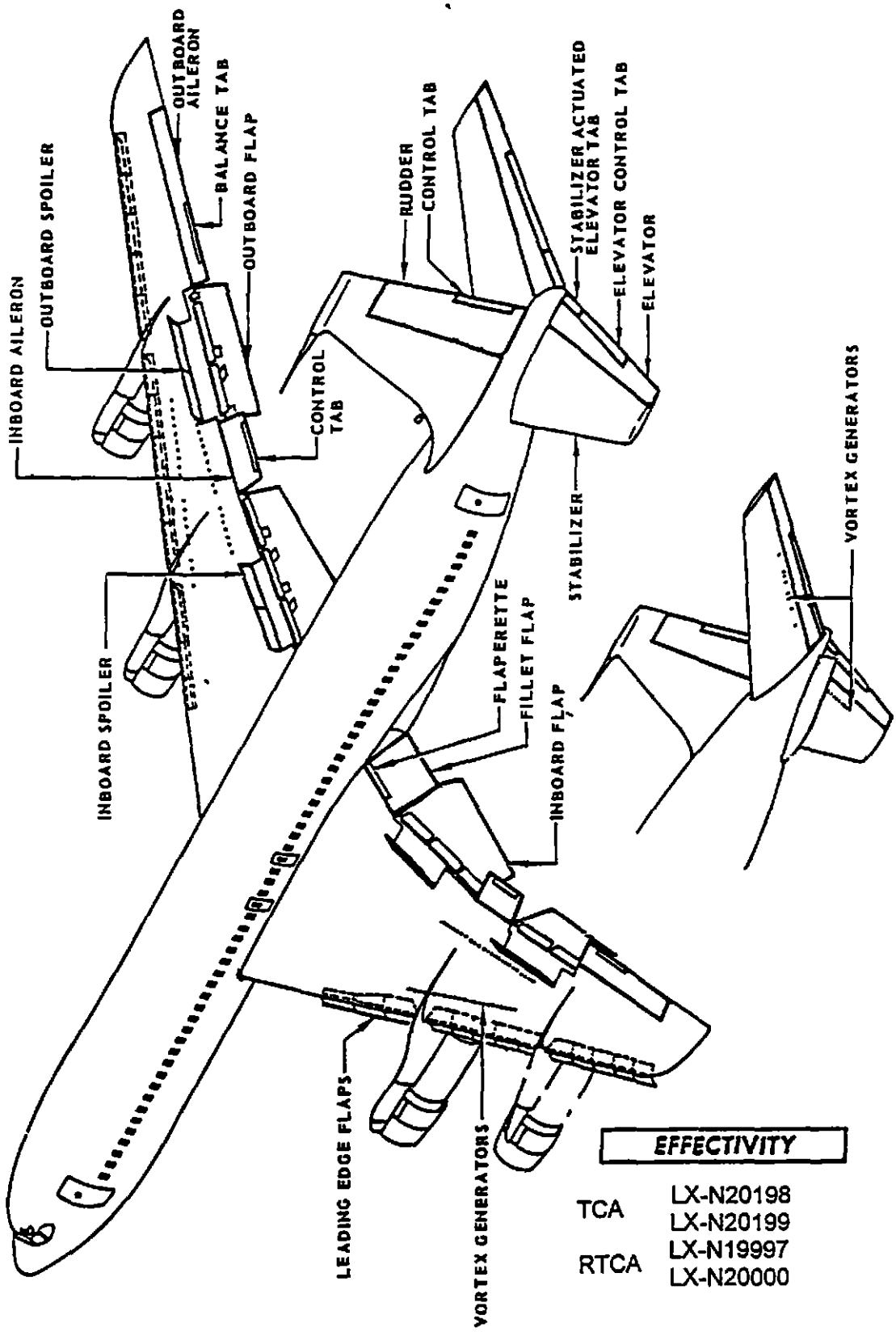
C. The flight control system chart listed below, provides a tabulation of the control surfaces along with the means of control and means of motion.

Control System	Control Surface	Means of Control	Means of Motion
Aileron Control System	Inboard Ailerons	Control Wheel	Cable-actuated Control Tab
	Outboard Ailerons	Inboard Aileron (Flaps down)	Cable
Aileron Trim System	Control Tabs	Trim Control Wheel	Cable
Spoiler Control System	Spoilers	Control Wheel	Hydraulic
Speed Brake System	Spoilers	Speed Brake Lever	Cable-Hydraulic
Wing Flap Control System	Trailing Edge Flaps	Normal Flap Lever	Cable-Hydraulic
		Emergency Flap Switches	Electric Motors



EFFECTIVITY
00-SJA THRU SJG

Control Surfaces
Figure 1 (Sheet 1 of 2)



EFFECTIVITY

TCA	LX-N20198 LX-N20199
RTCA	LX-N19997 LX-N20000

Control System	Control Surface	Means of Control	Means of Motion
	Leading Edge Flaps	Outboard Trailing Edge Flaps	Hydraulic
Elevator Control System	Elevators	Control Column	Cable-actuated Control Tab
Stabilizer Trim System	Stabilizer	Trim Switch Trim Control Wheel	Electric Motor Cable
Rudder Control System	Rudder	Rudder Pedals	Cable-Hydraulic
Rudder Trim System	Rudder	Trim Wheel	Cable

2. Control Cables System

A. Flexible, 7 x 7 or 7 x 19, control cables are used in transmitting motion from the control cabin to the respective control. Control cables are attached to the cable drums or quadrant by means of swaged terminals. Turnbuckles are used for joining cables and to obtain proper rigging tension. Rigging pins, inserted through rigging holes in the component and adjacent structure, are used for proper alignment when cables are rigged. Slack take-up cylinders are placed in cable systems where cable slack is not acceptable. Air seals are used to reduce pressure loss when cables are routed through pressurized areas.

3. Control Column

A. The control column is used for primary control of the airplane about the longitudinal and lateral axes. Fore and aft movement of control column actuates the elevators. Rotational movement of a wheel on the control column actuates the ailerons and spoilers. The control columns are cable interconnected for simultaneous movement. Stops limit control column and control wheel movement. The stabilizer trim control, microphone and autopilot disengage switches are installed on the control wheel.

CONTROL CABLES - MAINTENANCE PRACTICES

1 Unit Servicing Control Cables

A. General

(1) Control cables are lubricated in all areas which contact fairleads, air pressure seals, quadrants, pulleys, and drums Remaining cable areas are coated with corrosion preventative compound to retard corrosion

B Equipment and Materials

(1) D00024 Grease - Corrosion Preventive, BMS 3-24

(2) G01043 Cloth - Lint-Free

C Procedure

CAUTION DO NOT USE SOLVENT OR HEAT TO THIN THE GREASE ON THE CONTROL CABLES DO NOT USE SOLVENT TO CLEAN THE CONTROL CABLES THE SOLVENT REMOVES GREASE FROM THE CABLE DO NOT APPLY OR SPRAY BMS 3-23 ON THE CONTROL CABLES

(1) Use a lint-free cloth that is clean and dry to clean the control cables

NOTE Remove the old grease and dirt from the surface of the control cable Clean the control cable for the full length of the cable for the full length of travel through fairleads, air pressure seals, over pulleys, quadrants, and drums On nylon coated cables, remove compound, if any, from uncoated end at quadrants only
Do not lubricate nylon coating

(2) Lubricate the control cables

(a) Carbon Steel Cables

CAUTION THE CONTROL CABLES IN THE WING AND NACELLE AREA ARE NEAR HIGH TEMPERATURE SOURCES THE LUBRICANTS WILL DETERIORATE AT A FASTER RATE THAN ON OTHER CONTROL CABLES EXAMINE THE CONDITION OF THESE CABLES AT MORE FREQUENT INTERVALS

1) After application of grease on the cable, the cable should be wiped with a clean cloth to remove grease, but leave a thin visible film

2) Do not apply grease to these areas because they will receive grease during cable movement

a) Through the fairleads

b) Through the air pressure seals

c) On the pulleys

d) On the quadrants

e) On the drums

3) Touch the cable with a clean paper wipe to make sure there is grease in the cable

NOTE If you can see the yellow color of the grease on the paper, there is sufficient grease on the cable Do not rub the cable with the paper

(b) Stainless Steel Cables (CRES)

1) Do not apply solvents to stainless steel control cables

2) Do not aoply the grease or oil to the stainless steel control cables

2 Removal/Installation Control Cables

A General

(1) This procedure covers in a general manner the servicing of control cables Procedures for installing both prefabricated and nonprefabricated cables are included to facilitate installation of cables when portable swaging machines are availabe Air pressure seal locations are provided along with removal and instalation procedures

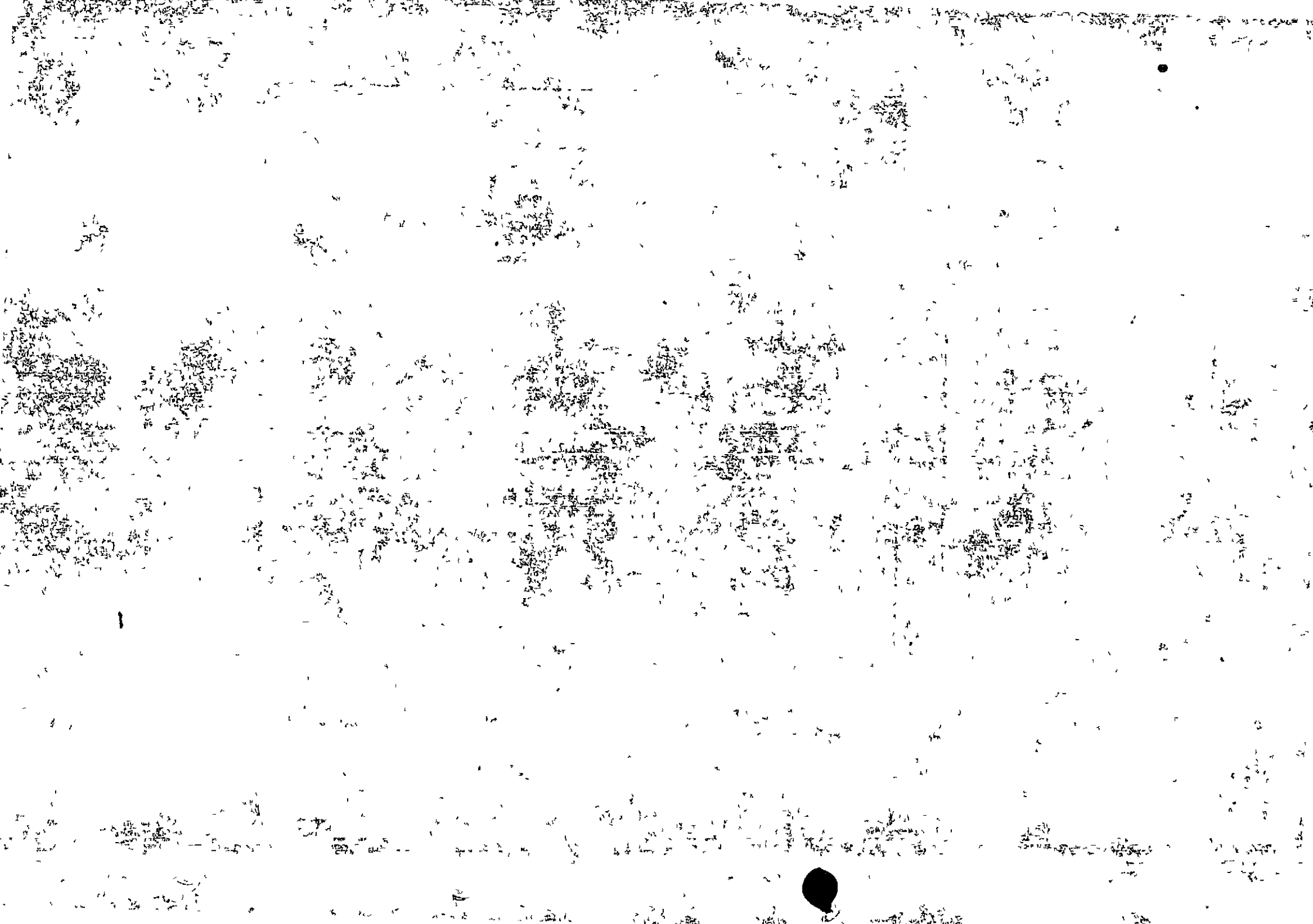
(2) Guarded pulleys in wing flap, aileron, aileron trim and speed brake cables are accessible by removing the forward cargo compartment ceiling panels, floor panels over the air conditioning distribution bay and wing center section and by opening main wheel well and cove lip doors Pulleys in the elevator, stabilizer trim, rudder and rudder trim cable systems are accessible by removing forward and aft cargo compartment ceiling panels, and floor panels over wing center section and air conditioning equipment bay See applicable system cable chart for specific location of pulleys

4. Shear Rivets

A. Shear rivets provide a means by which normal operation of essential flight systems can be maintained in the event of failure or jamming of related or interconnected secondary systems. The chart shown below contains a list of all shear rivets used in the flight control systems along with part numbers and references to sections in the maintenance manual where maintenance procedures can be found.

SHEAR RIVETS IN FLIGHT CONTROL SYSTEMS

SUBJECT NO.	RIVET TYPE	PART CONTAINING RIVET
27-4-21	MS20470D3	Inboard spoiler control valve. (2 valves per A/C ; 3 rivets per valve) .
27-4-31	MS20470D3	Outboard spoiler control valve. (2 valves per A/C ; 3 rivets per valve) .
27-4-91	MS20470D6	Inboard and outboard spoiler follow-up linkages . (4 linkages per A/C ; 3 rivets per linkage) .
27-6-101) 27-14-101)	MS20470D4	Outboard aileron lockout gearbox torque tube. (2 torque tubes per A/C ; 2 rivets per torque tube)
27-6-101	MS20470B4	Fwd. end fillet flap torque tube . (2 torque tubes per A/C ; 3 rivets per torque tube) .
27-6-161) 27-16-161)	MS20426D3	Flap position transmitter cable attaching clip on fore flap . (4 clips per A/C ; 1 rivet per clip) .
27-6-211	 MS20426B4 MS20426B5	Leading edge flap control mechanism . 2 mechanisms per A/C . 3 rivets per mechanism on SJF and SJG . 2 rivets per mechanism on SJA thru SJE .
27-14-11	MS20426D8	Inboard aileron control tab crank . (2 cranks per A/C ; 2 rivets per crank) .
27-14-81	MS20470D5	Inboard aileron control tab linkage . (2 linkages per A/C ; 3 rivets on L.H. linkage , 4 rivets on R.H. linkage) .
27-14-91	MS20470D8 MS20470D10	Outboard aileron control pushrod . (2 rods per A/C) 1 rivet per rod 2 rivets per rod



CONTROL CABLES - MAINTENANCE PRACTICES

1. Unit Servicing Control Cables

A. General

(1) Control cables are lubricated in all areas which contact fairleads, air pressure seals, quadrants, pulleys, and drums. Remaining cable areas are coated with corrosion preventative compound to retard corrosion.

B. Equipment and Materials

(1) Corrosion preventative compound (hot application) MIL-C-11796, Type L (Braycote 202).

(2) Corrosion preventative compound (cold application) MIL-C-16173, Type IV, (Petrotect Amber).

(3) Ball and roller bearing grease, Wide Temperature Range, MIL-G-25760, (Aeroshell 16).

C. Lubrication Procedure

(1) Remove the previously applied lubricant and any foreign matter from the surface of the control cable for the full length of travel through fairleads, air pressure seals, over pulleys, quadrants, and drums with a dry cloth. On nylon coated cables, remove compound, if any, from uncoated end at quadrants only.

CAUTION: DO NOT USE SOLVENT OR HEAT TO THIN GREASE. DO NOT USE SOLVENT TO CLEAN CABLES, SINCE SOLVENT DILUTES AND REMOVES GREASE FROM INSIDE CABLE STRANDS.

(2) If cables are installed in body or empennage

(a) Apply a light, even coat of grease to cable for full length of travel through fairleads, air pressure seals, over pulleys, quadrants, and drums. Grease must fill the grooves of the cable.

(b) Touch up the coating by hand or brush over the entire length of the cable. Ensure that a minimum of a visible thin ribbon of grease is in the bottom of the cable grooves in nonfriction areas. Grooves must be full in friction areas.

(3) If cables are installed on wing

(a) Lubricate control cables on all segments which pass through fairleads and pulleys only prior to installation of new cable. Do not lubricate nylon coating.

(b) Apply thin film of grease to full length of cable to retard corrosion.

(c) Wipe the cable with a dry, lint-free cloth to remove excess grease in contact areas.

(d) Touch up the cable coating outside the areas where it was removed in step C.(1) using MIL-C-16173, Type IV compound.

2. Removal/Installation Control Cables

A General

(1) This procedure covers in a general manner the servicing of control cables. Procedures for installing both prefabricated and nonprefabricated cables are included to facilitate installation of cables when portable swaging machines are available. Air pressure seal locations are provided along with removal and installation procedures.

(2) Guarded pulleys in wing flap, aileron, aileron trim and speed brake cables are accessible by removing the forward cargo compartment ceiling panels, floor panels over the air conditioning distribution bay and wing center section and by opening main wheel well and cove lip doors. Pulleys in the elevator, stabilizer trim, rudder and rudder trim cable systems are accessible by removing forward and aft cargo compartment ceiling panels, and floor panels over wing center section and air conditioning equipment bay. See applicable system cable chart for specific location of pulleys.

B. Equipment and Materials

(1) Cable Clamps

(2) Ball and Roller Bearing Grease, Wide Temperature Range, MIL-G-25760 (Aeroshell 16)

(3) Model A Cable Tester-Mine Safety Appliances, Pittsburg, Pennsylvania

C Remove Control Cables

(1) Red tag affected control in cockpit.

(2) Slightly loosen turnbuckles to release tension.

(3) Install cable clamps on affected cable not being removed such that slight tension is maintained on cables. If cable can be isolated between rigging pin locations, install rigging pins through appropriate drum or quadrant.

NOTE Slight tension on affected cables which are not being removed will prevent unwrapping on cable drums and prevent cables from jumping pulley guides.

B Equipment and Materials

(1) Cable Clamps

(2) Ball and Roller Bearing Grease, Wide Temperature Range, MIL-G-25760 (Aeroshell 16)

(3) Model A Cable Tester-Mine Safety Appliances, Pittsburg, Pennsylvania

C Remove Control Cables

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NOTE Slight tension on affected cables which are not being removed will prevent unwrapping on cable drums and prevent cables from Jmping pulley guides

(4) Mark disconnected cable with masking tape or paint so that original rigged position may be used as reference when rigging.

D. Install Control Cables

(1) If installing a prefabricated cable, proceed as follows

(a) Remove necessary pulleys, and pressure seals. See figure 201 for air pressure seal location.

(b) Use old cable as guide to pull in new cable.

(c) Reinstall pulleys and pressure seals. Fill pressure seals with ball and roller bearing grease.

(2) If installing nonprefabricated cable, proceed as follows.

(a) Identify cable being removed.

(b) Prepare new cable per applicable system. Allow some extra cable length.

(c) Install only those fittings that will permit cable installation.

(d) Apply proof load per following table to cable and installed fittings to check swagging and to prestretch cable.

NOTE. If prestretched cable is used entire cable length does not require proof loading.

Swagging of fittings may be checked using suitable means other than proof load.

(e) Mark positions of fittings not installed on cable prior to installation.

(f) Wrap old cable so it will not unravel.

(g) Cut off cable end fitting of old cable and splice old cable to new cable.

NOTE: Splice must be of minimum diameter and strong enough not to break when pulled through. Recommend splicing only center strands.

(h) Pull old cable out maintaining slight tension on new cable.

(1) Install remaining fittings and apply proof load to fittings per following table.

CABLE TYPE	CABLE DIAMETER - INCHES						
	1/16	3/32	1/8	5/32	3/16	7/32	1/4
	PROOF LOADS - POUNDS						
7X7	288-313	552-577					
7X19			1200-1260	1680-1765	2520-2645	3360-3530	4200-4410

NOTE Swagging of fittings may be checked using suitable means other than proof load.

(3) Lubricate control cable per paragraph 1.

(4) Install turnbuckles with right-hand thread up, aft or inboard. The turnbuckle barrel shall be screwed an equal distance onto both threaded terminals with not more than three threads showing outside the barrel.

(5) Remove clamps and rig pins from cable and drums and tag from cockpit.

(6) Tighten cable according to applicable system cable temperature-tension chart. If new cable is installed the affected system must be cycled 25 times, with cables tightened to twice the working tension. Make final rigging adjustments.

NOTE: Use tensiometer to check cable tension. Apply tensiometer to cable at least 6 inches from terminal or other fitting. Cables may touch floor beam grommets but there must be no cable bend at grommet when cable is loaded.

(7) Lockwire all turnbuckles disturbed.

(8) Operate controls through full travel and check for absence of binding or excessive force.

(9) Check for proper installation and full movement of surface.

3. Removal/Installation Control Cable Air Pressure Seal

A. Equipment and Materials

(1) Ball and Roller Bearing Grease, Wide Temperature Range - MIL-G-25760 (Aeroshell 16)

B. Remove Control Cable Air Pressure Seal.

(1) Remove two restraining rings (1, figure 201) on pressurized side of bulkhead and one restraining ring on unpressurized side of bulkhead.

(2) Pull seal out of bulkhead from unpressurized side.

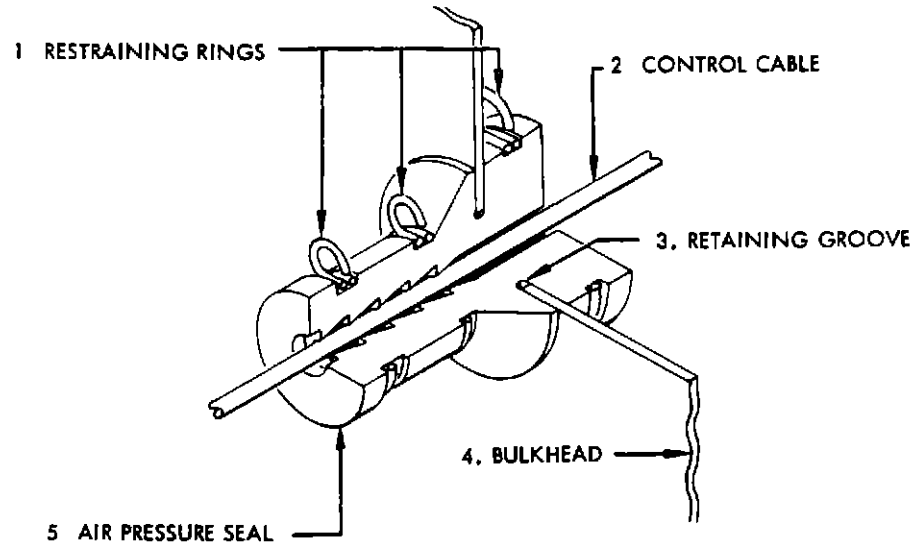
(3) Bend seal open and remove from cable.

C. Install Control Cable Air Pressure Seal

(1) Fill seal with grease MIL-G-25760.

(2) Lubricate cable for full length of travel within seal with grease MIL-G-25760.

(3) Bend seal open and place on cable on unpressurized side of bulkhead with small end of seal toward bulkhead.



CABLE SYSTEM	NO OF SEALS	LOCATION	ACCESS PANEL NO
LH ELEVATOR CABLES	2	AFT PRESSURE DOME	1185
RH ELEVATOR CABLES	2	AFT PRESSURE DOME	1185
RUDDER CABLES	2	AFT PRESSURE DOME	1185
RUDDER TRIM CABLES	2	AFT PRESSURE DOME	1185
STABILIZER CABLES	2	AFT PRESSURE DOME	1185
SPEED BRAKE CABLES	2	RH WHEEL WELL ROOF	RH WHEEL WELL DOOR
FLAP CONTROL CABLES	2	RH WHEEL WELL ROOF	RH WHEEL WELL DOOR
RH AILERON CABLES	2	RH WHEEL WELL ROOF	RH WHEEL WELL DOOR
LH AILERON CABLES	2	LH WHEEL WELL ROOF	LH WHEEL WELL DOOR

(4) Insert seal in bulkhead hole so that bulkhead web is entirely within the retainer groove (3, figure 201) of the seal and the small end of the seal is in the pressurized section.

CAUTION: CARE SHOULD BE TAKEN TO INSTALL THE PROPER SIZE SEAL FOR THE BULKHEAD HOLE SIZE AND TO USE THE PROPER SIZE RESTRAINING RINGS.

(5) Install two restraining rings (1) on seal on pressurized side and one restraining ring on the unpressurized side of bulkhead.

4. Turnbuckle Installation Procedures

A. General

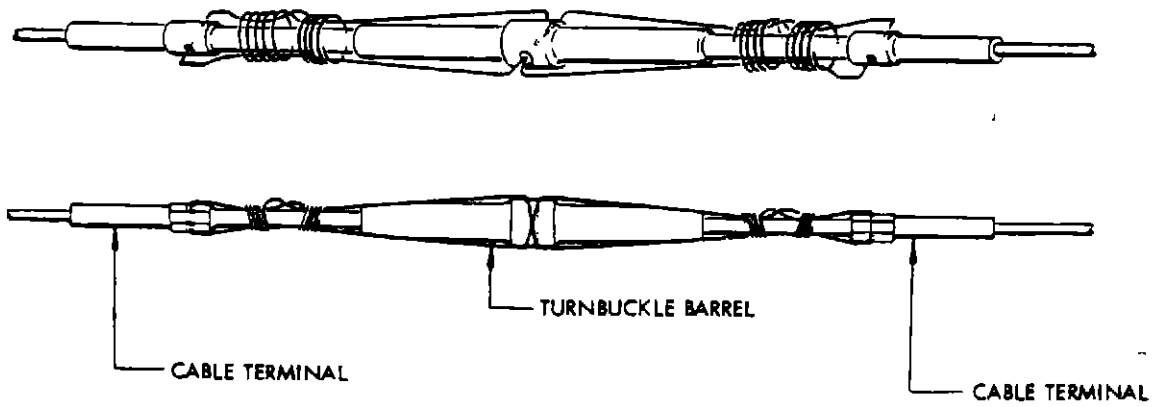
(1) Procedures are given for installation of turnbuckles which are safetied with lockwire and with locking clips. Locking clips shall be used only when turnbuckle barrel and both terminals have slots to install clips. All other turnbuckles shall be safetied with lockwire.

B. Equipment and Materials

(1) Corrosion Preventive Compound - MIL-C-16173, Grade 2, or equivalent

C. Install Turnbuckle Assembly (Safetied with lockwire)

(1) Apply a thin coat of corrosion preventive compound to threads of turnbuckle barrel and cable terminals. See figure 202.



Turnbuckle Installation
Figure 202

(2) Engage turnbuckle barrel equally with cable terminals and turn barrel until not more than three threads are exposed outside the barrel and proper cable tension is reached.

(3) Pass two wires through the hole in the center of the turnbuckle barrel and bend the ends of each 90° towards opposite ends of the turnbuckle barrel as shown in figure 202.

(4) On swaged terminals one of the wires shall be passed through the hole in each terminal and looped over the free end of the other wire, prior to wrapping the ends around the terminal shank in opposite directions.

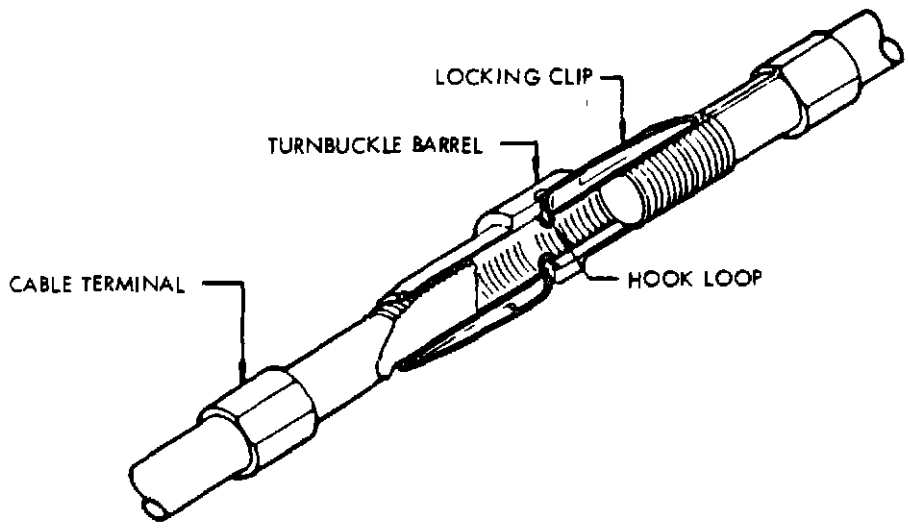
NOTE: On the opposite end of the turnbuckle assembly either wire may pass through the terminal safety hole.

(5) Bend wire ends back toward the center of the turnbuckle and wrap each one around the terminal shank four times in opposite directions.

D. Install Turnbuckle Assembly (Safetied with locking clips)

(1) Apply a thin coat of corrosion preventive compound to threads of turnbuckle barrel and cable terminals. (See figure 203.)

(2) Engage turnbuckle barrel equally with cable terminals and turn barrel until not more than three threads are exposed outside the barrel and proper cable tension is reached.



Clip Locking Turnbuckle Installation
Figure 203

(3) Align the slot in the barrel with the slot in the cable terminal.

(4) Insert the straight end of the locking clip into the aperture formed by the aligned slots.

CAUTION. DO NOT REUSE LOCKING CLIPS.

(5) Place the hooked end of the locking clip over the hole in the center of the turnbuckle barrel and seat the hook loop into the hole.

(6) Application of pressure to the hook shoulder will engage the hook lip in the turnbuckle barrel and complete locking one terminal.

(7) Repeat steps (2) thru (5) to lock the other terminal.

NOTE. Both locking clips may be inserted in the same turnbuckle barrel hole.

(8) Check turnbuckle locking clips for proper engagement of the hook lip in the turnbuckle barrel hole by applying a slight pressure in the disengaging direction.

5. Inspection/Check Control Cable Air Pressure Seal

A. Check Air Pressure Seals

(1) Remove cable seals per paragraph 3.B. Clean grease and cable preservative compound from inner race.

(2) Spread cable seal open and examine visually for deterioration (figure 204). Seals require replacement if evidence of cracking or checking, abnormal softness or swelling is noted.

(3) Use replacement cable seals of ozone resistant rubber; new part No. S11K--RA. Install per paragraph 3.C.

6. Inspection/Check Control Cables

A. Check Control Cables

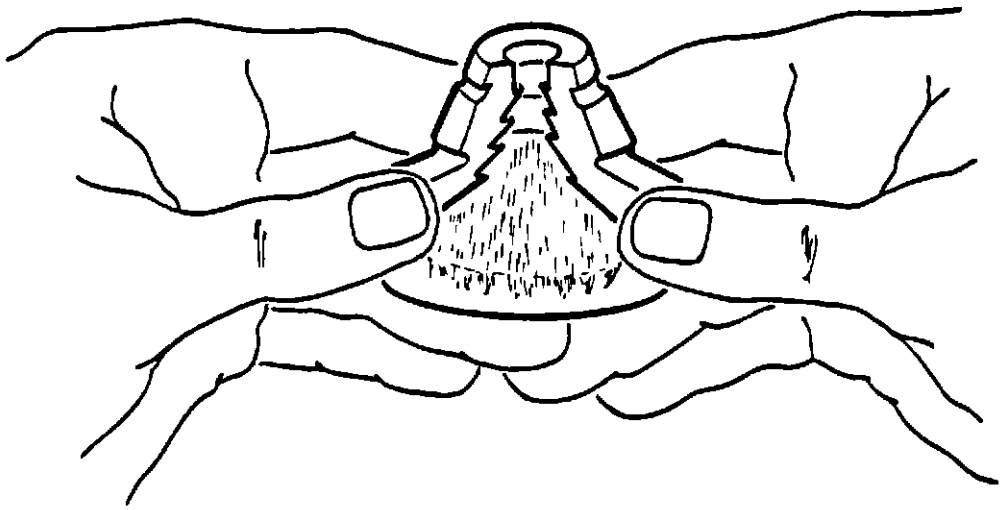
(1) Examine control cables for wear per figure 205.

(2) Nylon covered cables should be replaced immediately if

(a) Bare cable is showing due to worn or split nylon jacket.

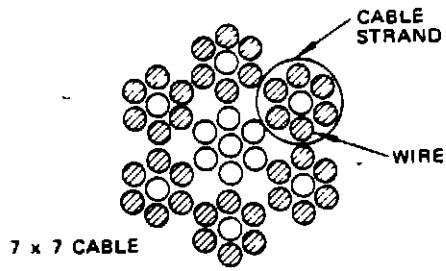
(b) Broken wire ends protrude through the jacket.

(3) Nylon covered cables should be replaced at next convenient occasion if there are cracks, blisters, bubbles, or voids in the jacket.

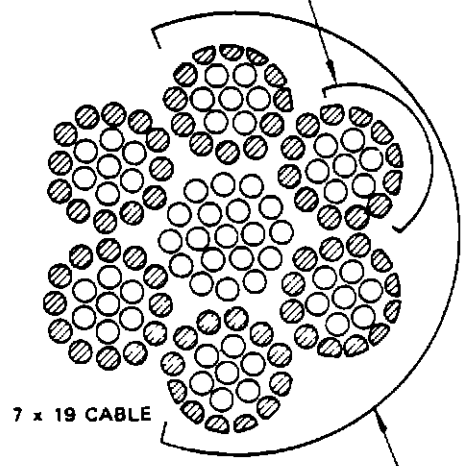


Typical Checking Deterioration of Rubber Control Cable Seals
Figure 204

SYSTEM	CABLE SIZE	PERCENT ALLOWABLE WEAR OF OUTER WIRES BEFORE REPLACEMENT
RUDDER (RA & RB)	1/8 7 x 19	50
RUDDER TRIM (RTA & RTB)	3/32 7 x 7	50
RUDDER SERVO (RSA & RSB)	1/8 7 x 19	50
ELEVATOR (EA & EB)	1/8 7 x 19	40
ELEVATOR SERVO (ESA & ESB)	1/8 7 x 19	50
STABILIZER TRIM (STA & STB)	1/8 7 x 19	50
AILERON (AA & AB)	1/8 7 x 19	50
AILERON (ABSA)	3/16 7 x 19	100
AILERON BUS (ABSB)	1/8 7 x 19	100
AILERON TRIM (ATA & ATB)	3/32 7 x 7	50
AILERON CONTROL BUS (ACBA & ACBB)	1/8 7 x 19	50
AILERON SERVO (ASA & ASB)	1/8 7 x 19	50
SPEED BRAKE (SBA & SBB)	1/8 7 x 19	50
WING FLAP (WFA & WFB)	3/32 7 x 7	40
WING FLAP (WFFA & WFFB)	3/32 7 x 7	50



TYPICAL OUTER WIRE WEAR AREA ON CABLE STRAND HAIRLINE CRACKS BETWEEN WIRES OR FULLY BLENDED SURFACE APPEARANCE OF APPROXIMATELY SIX WIRES PER OUTER CABLE STRAND INDICATES 50 PERCENT WIRE WEAR IF THIS APPEARANCE IS VISIBLE THE CABLE SHOULD BE REPLACED



OUTER WIRES INDICATED BY CROSS HATCHING

TYPICAL CABLE WEAR MAY OCCUR ON ONE SIDE ONLY OR ON FULL CIRCUMFERENCE AND MAY EXTEND ALONG THE CABLE FOR A DISTANCE EQUAL TO NORMAL CABLE MOVEMENT

NOTE ANY BROKEN WIRE IS CAUSE FOR CABLE REPLACEMENT

WHENEVER CABLE WEAR IS FOUND CAUSE FOR WEAR MUST BE DETERMINED AND CORRECTED

Control Cable Wear Limits
Figure 205

WEAR ON OUTER WIRES BEYOND 50% NOTE HOURGLASS SHAPE OF WEAR PATTERN ON SOME WIRES PLUS BLENDED APPEARANCE ON OTHERS NOTE ALSO THE BROKEN WIRES CABLE SHOULD BE REPLACED IMMEDIATELY

WEAR ON OUTER WIRES 40% TO 50% NOTE BLENDED APPEARANCE OF WIRES INDIVIDUAL WIRES SOMETIMES HARD TO DISTINGUISH CABLE SHOULD BE REPLACED AT NEXT CONVENIENT OCCASION

WEAR ON OUTER WIRES LESS THAN 40% NOTE SHINY FLAT SPOTS INDIVIDUAL WIRES EASILY DISTINGUISHABLE CABLE DOES NOT REQUIRE REPLACEMENT

Control Cable Wear Limits
Figure 205 (Sheet 2)

CONTROL COLUMN - MAINTENANCE PRACTICES

1. General

A Do not attempt any disassembly other than that covered in this publication on the aileron control column when the control column is installed in the airplane. Damage to equipment and restriction of the control of the airplane could result. Complete instructions for disassembling the control column are contained in the overhaul manual.

B. Replacement of the control wheel is authorized for some airplanes. See Approved Repairs.

2. Removal/Installation Control Column

A. Equipment and Materials

(1) Bubble protractor, F52485-500 or equivalent

(2) Hole filling compound, BMS 5-16A or equivalent

B. Remove Control Column

(1) Remove dust seal retaining bolts (1, figure 201) and remove dust seal (5).

(2) Install AN395 rigging pin or AN5 bolt in forward elevator control quadrant.

(3) Disconnect electrical cable (10) at terminal strip. Remove clamps as necessary to free cable.

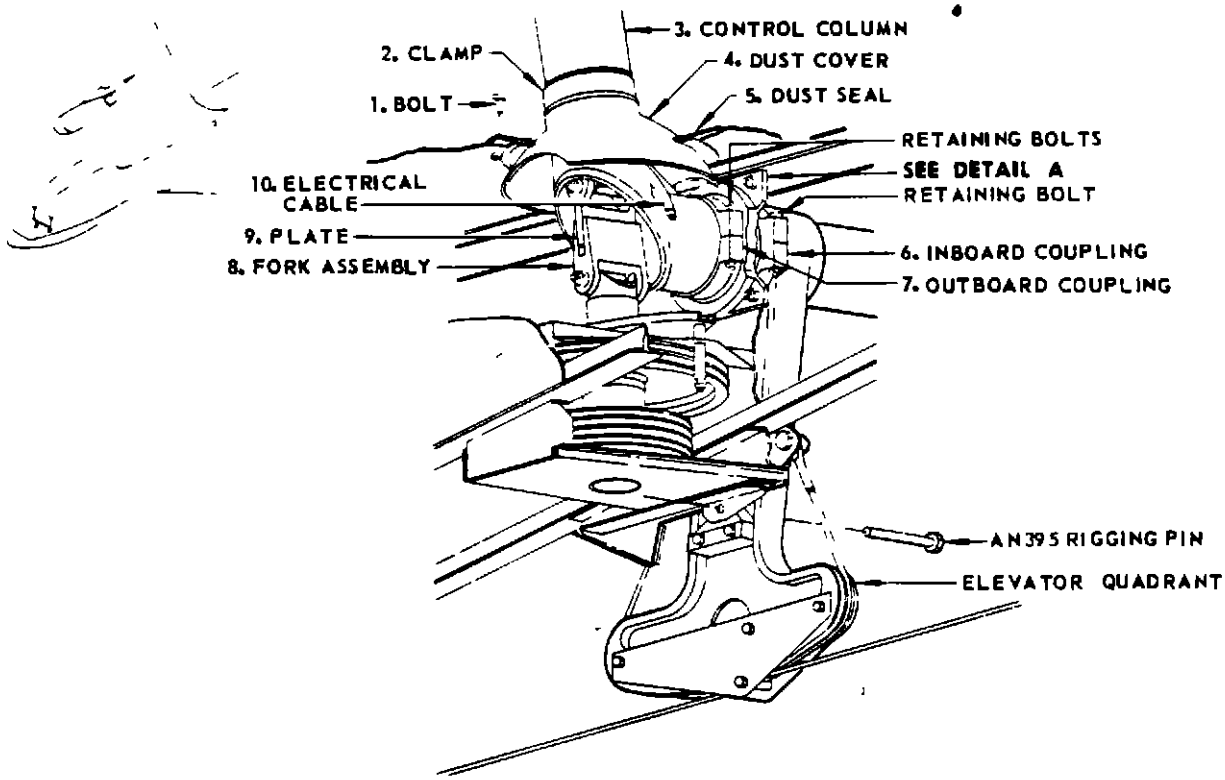
(4) Remove retaining bolts and remove outboard coupling (7).

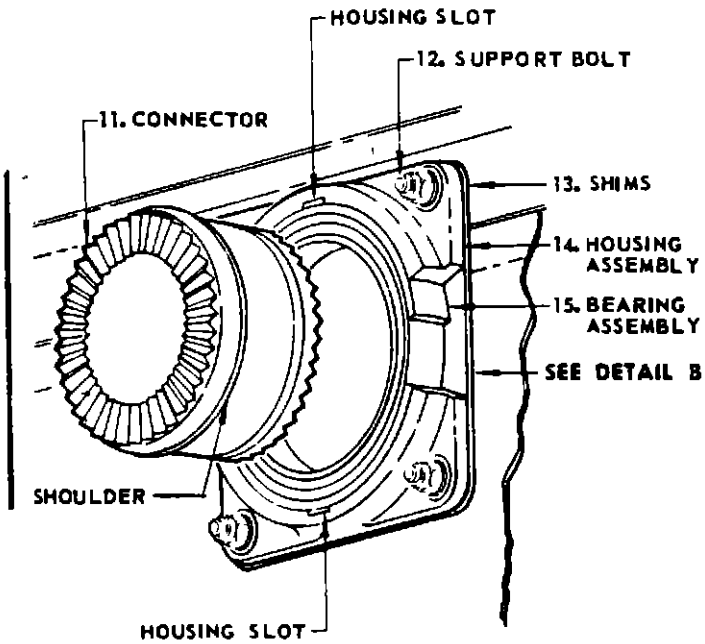
CAUTION: CONTROL COLUMN IS FREE TO FALL AS COUPLING IS REMOVED AND MUST BE SUPPORTED FROM TIME THE NUTS ARE LOOSENED UNTIL COLUMN IS REMOVED.

(5) Lift control column through opening until plate (9) clears fork assembly (8).

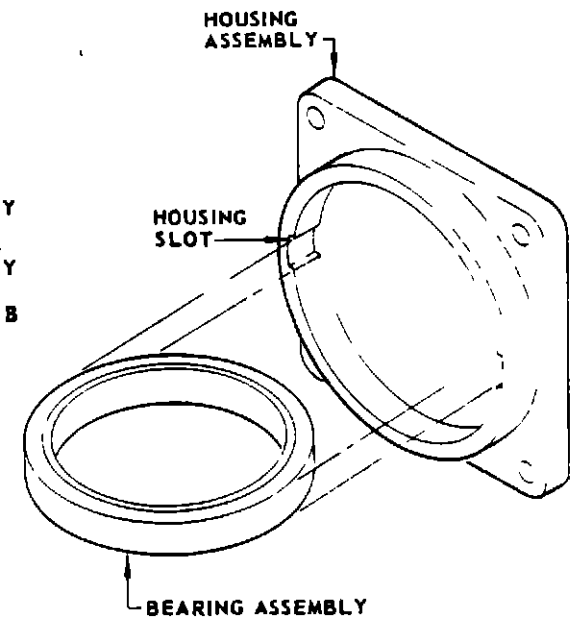
C. Install Control Column

(1) Lower control column (3, figure 201) into position and engage plate (9) with fork assembly (8).





DETAIL A



DETAIL B

Control Column Support Bearing Installation
Figure 201

(2) Locate control column as shown in figure 202. The reference angle is taken from a line perpendicular to the deck

NOTE One tooth either side of the correct engagement will change this angle by 9 degrees.

(3) Position outboard coupling (7, figure 201) and install retaining bolts Tighten bolts until gap on each side is equal. Gap should be 1/16 to 7/32 inch Check angle between control column and a line perpendicular to the deck is as shown in figure 202.

(4) Attach wiring from electrical cable (10, figure 201) to terminals in lower nose compartment Install clamps to secure cable.

(5) Install dust seal (5) to deck with bolts (1). Fill gaps between dust seal halves with hole filling compound.

(6) Adjust dust cover (4) to obtain snug fit with dust seal by raising or lowering clamp (2). Position clamp with bolts aft of column.

(7) Remove rigging pin from forward elevator control quadrant.

(8) Test control column.

3. Adjustment/Test Control Column

A. Equipment and Materials

(1) Insulation tester, (Megger or equivalent)

B. Test Control Column

(1) Test electrical circuits for continuity.

(2) Check that control wheel range of travel full clockwise and counterclockwise from neutral is 105 to 110 degrees.

(3) Check that column movement is 11 (+0.25/-1.0) degrees forward from neutral and is 27 5 (+1.0/-0.25) degrees between forward and aft column stops.

(4) Remove control wheel terminal cover.

(5) At the terminal block in the control wheel, check that the resistance to ground, or wire to wire, while rotating the control wheel from stop to stop, is at least 100 megohms at the following points.

(a) Between each wire and ground, and between wires VIOLET to RED, VIOLET to ORANGE, VIOLET to BLACK-ORANGE, RED to BLACK-ORANGE, RED to ORANGE, and BLACK-ORANGE to ORANGE.

(6) Install terminal cover.

4. Approved Repairs Control Column

A. Replace Control Column Support Bearing

(1) Remove control column.

(2) Install AN395 rigging pin or AN5 bolt in forward elevator control quadrant.

(3) Relieve elevator cable tension.

(4) Support elevator control quadrant and remove inboard coupling (6, figure 201) by removing retaining bolts.

CAUTION: STRUCTURAL DAMAGE MAY RESULT TO FORWARD ELEVATOR CONTROL QUADRANT IF NOT SUPPORTED WHEN INBOARD COUPLING IS REMOVED.

(5) Remove support bolts (12), shims (13), housing (14), and connector (11).

(6) Rotate bearing assembly (15) at right angle to housing. Align bearing with slots in housing and pull bearing free.

(7) Install bearing assembly by positioning assembly at right angle to bearing housing. Slide bearing assembly into slots in housing and turn into position.

(8) Position shims and housing and install support bolts.

(9) Insert connector into bearing from outboard side.

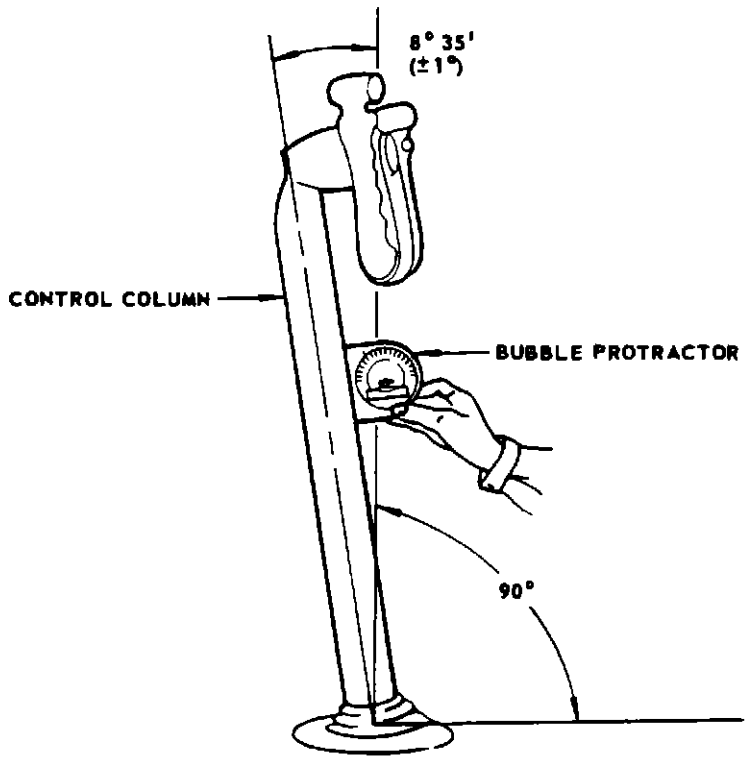
(10) Align forward elevator control quadrant with connector and install inboard coupling (6). Tighten bolts until gap on each side is equal. Gap should be 1/16 to 7/32 inch.

(11) Check that 0.01 to 0.03 inch clearance exists between shoulder of connector and bearing inner race to prevent shear loading of the bearing. Measure clearance on one side with other connector shoulder against bearing. Add or remove shims as required to obtain the necessary clearance.

(12) Adjust elevator cable tension per chart. (See 27-7-0, figure 202.)

(13) Install control column.

(14) Test control column per paragraph 3.



Control Column Adjustment
Figure 202

B. Replace Control Wheel

NOTE. Replacement of the control wheel is authorized on all SABENA airplanes.

(1) Remove medallion from control wheel. (See figure 203.)

(2) Remove terminal cover from control wheel.

(3) Remove cotter pin, wheel retaining nut, medallion retainer, and special washer.

(4) Remove control wheel from control column.

(5) Mark wire bundle to identify clamp location inside control wheel hub. Remove clamp.

(6) Disconnect the four pairs of stabilizer trim control switch leads at the terminal block.

(7) Remove retainer from autopilot disconnect switch and carefully pull switch assembly from control wheel.

(8) Remove the two screws which retain the interphone switch and trigger assembly and carefully pull this assembly from control wheel.

NOTE: The radio transmit switch is part of this assembly, if installed.

(9) Note and mark arrangement of color coded wires and unsolder wires from terminals of autopilot disconnect, interphone, and radio transmit switches. See figure 204 for wiring configurations.

(10) Pull wire bundle from control wheel.

(11) Using leader wire, pull wire bundle into replacement control wheel.

NOTE. This procedure does not allow replacing wire bundle in control column. If replacement of wire bundle is required see Overhaul Manual for procedure and test. Replacement wheel is assumed to have stabilizer trim switch installed with terminal block in place and cover on inboard horn. See 27-10-1 for stabilizer trim switch installation procedure, if required.

(12) Locate and solder proper color coded wires to autopilot disconnect, interphone, and radio transmit switches.

NOTE: Pull wires away from switch holes and install teflon sleeves before soldering. Tape and stow unused wires.

(13) Position interphone switch and trigger assembly in control wheel and secure with two screws. (See figure 203.)

(14) Position autopilot disconnect switch in control wheel and secure with retainer and one screw.

(15) Position clamp at mark on wire bundle and secure bundle in control wheel hub with clamp.

CAUTION. PROPER WIRE BUNDLE LENGTH BETWEEN COLUMN AND WHEEL MUST BE MAINTAINED TO INSURE CONTROL WHEEL TRAVEL IS NOT RESTRICTED.

(16) Wrap wire bundle 3 turns around control wheel hub and mate splines to position control wheel on control column.

(17) Secure control wheel using special washer (chamfered side forward), medallion retainer and nut. Tighten nut to torque value of 85 to 140 pound-inches. Install cotter pin.

(18) Check that control wheel will rotate at least 108° in each direction from neutral. Operation of wheel must be smooth and free from binding.

(19) Match wire colors and connect the four pairs of stabilizer trim control switch leads at the terminal block. Secure with washer, lock washer and nut.

(20) Test control column per paragraph 3.

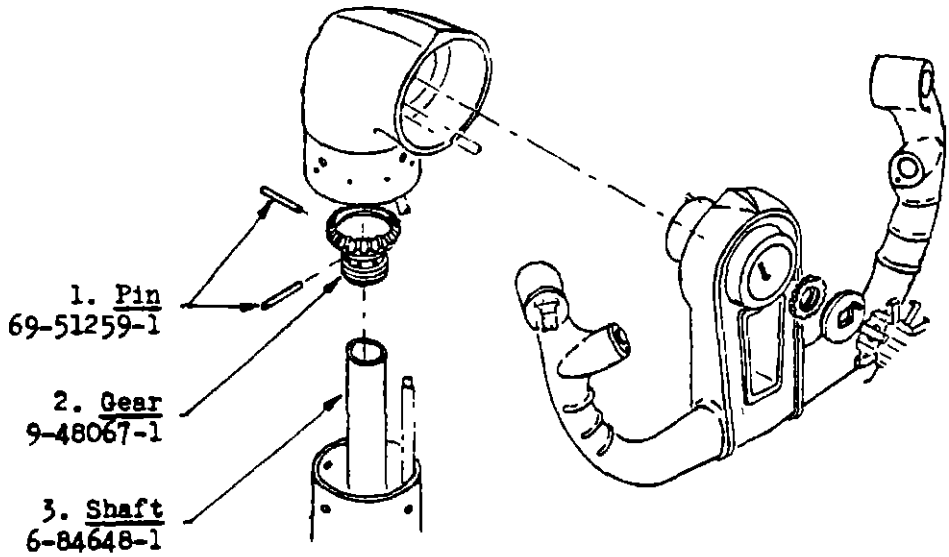
(21) Install terminal cover and secure with two screws.

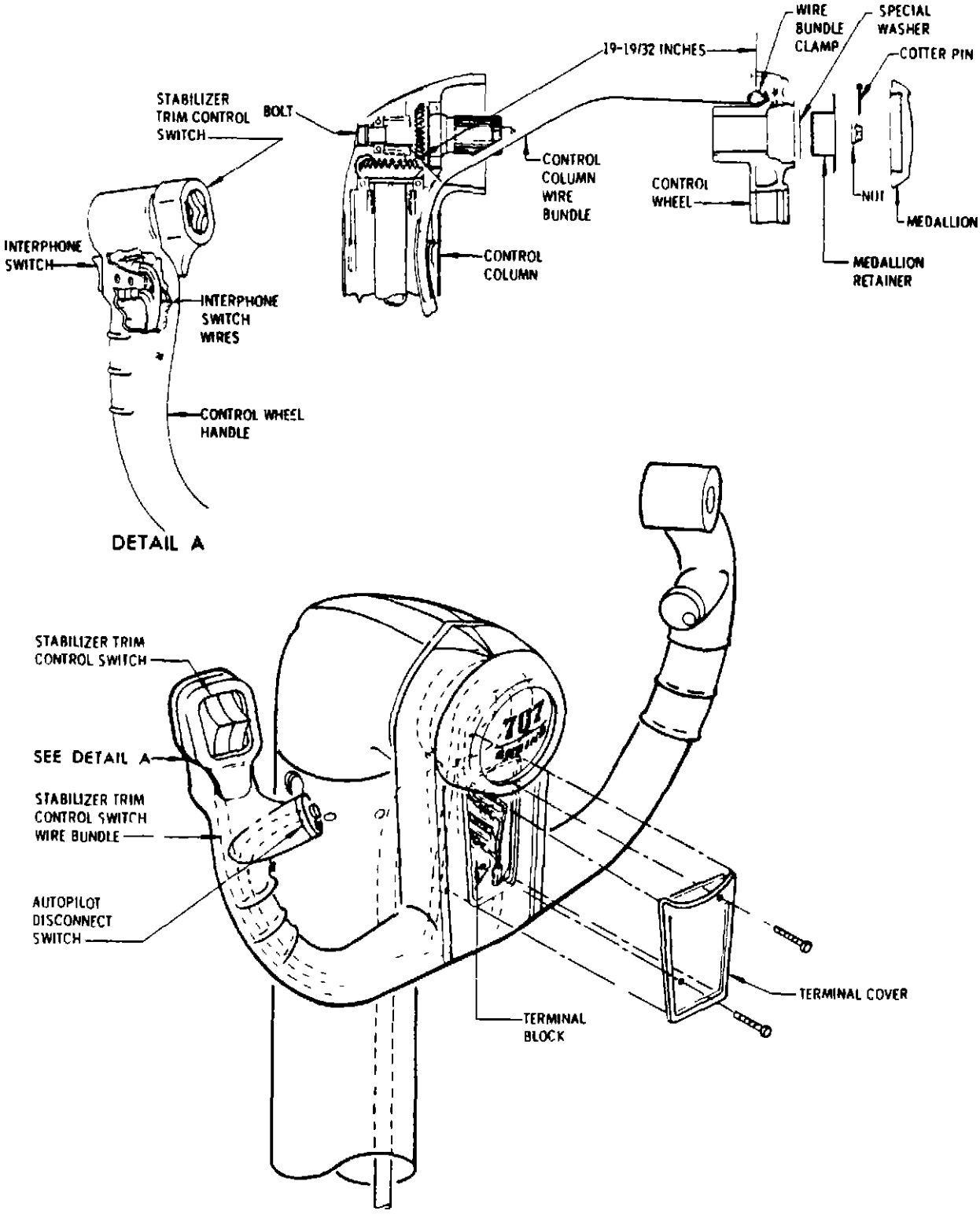
(22) Install medallion on control wheel.

C. Control Column Gear and Shaft Rework

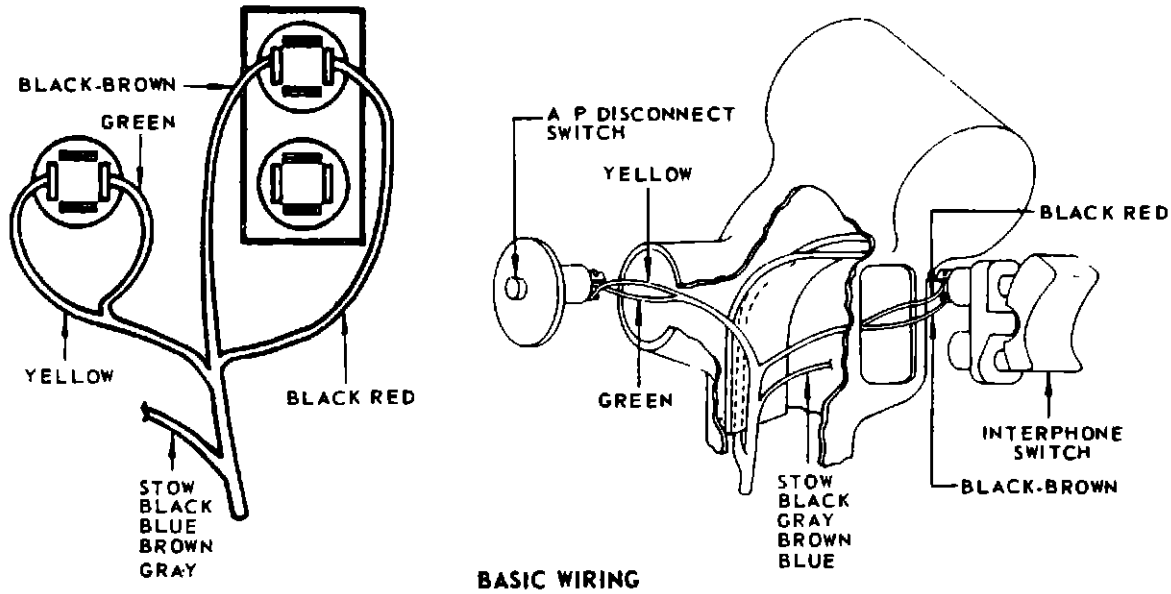
(1) Enlargement of pin hole diameter to maximum .1840 inch in gear (2) and shaft (3) is authorized.

(2) Fabricate pin identical to 69-51259-1 (or 1-7304, SAB 707/511), except the outside diameter should be sized to achieve a .0012 interference to .0005 loose fit.

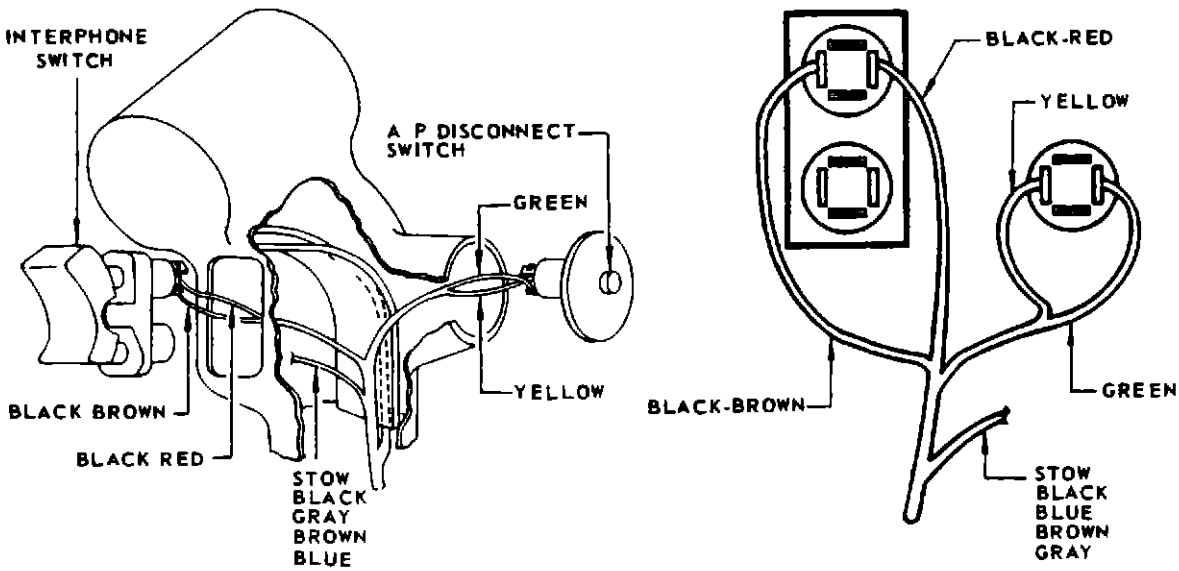




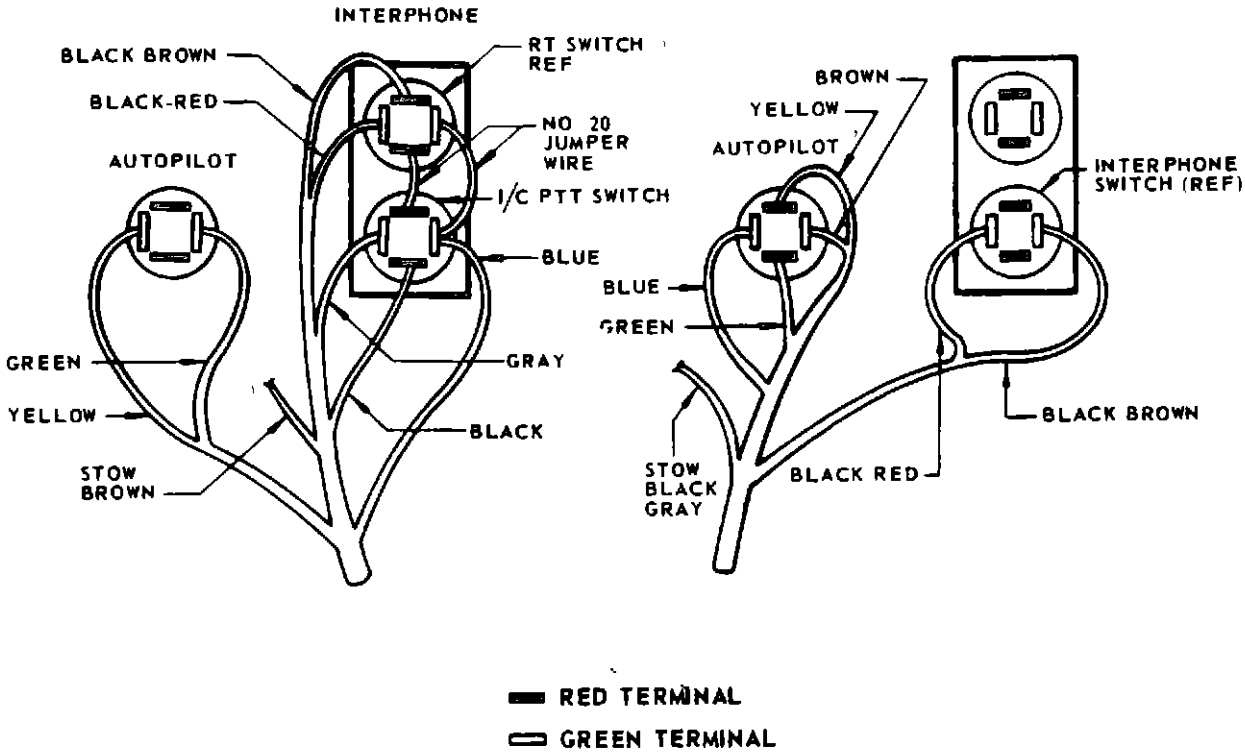
Control Wheel Installation
Figure 203

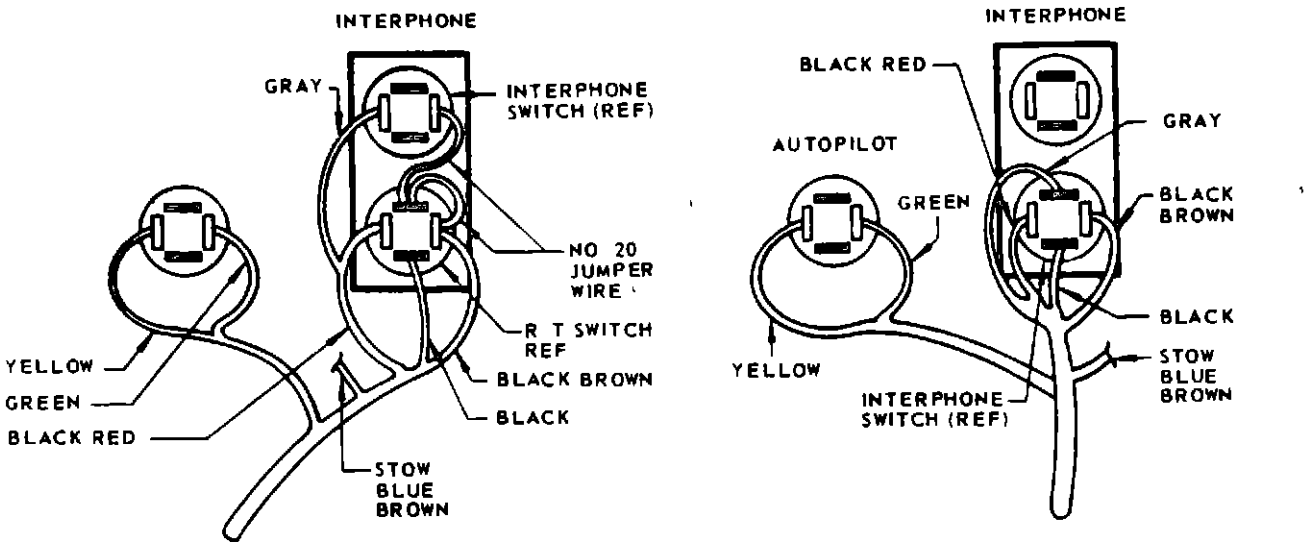


BASIC WIRING
CONFIGURATION
FOR LEFT HAND CONTROL COLUMN



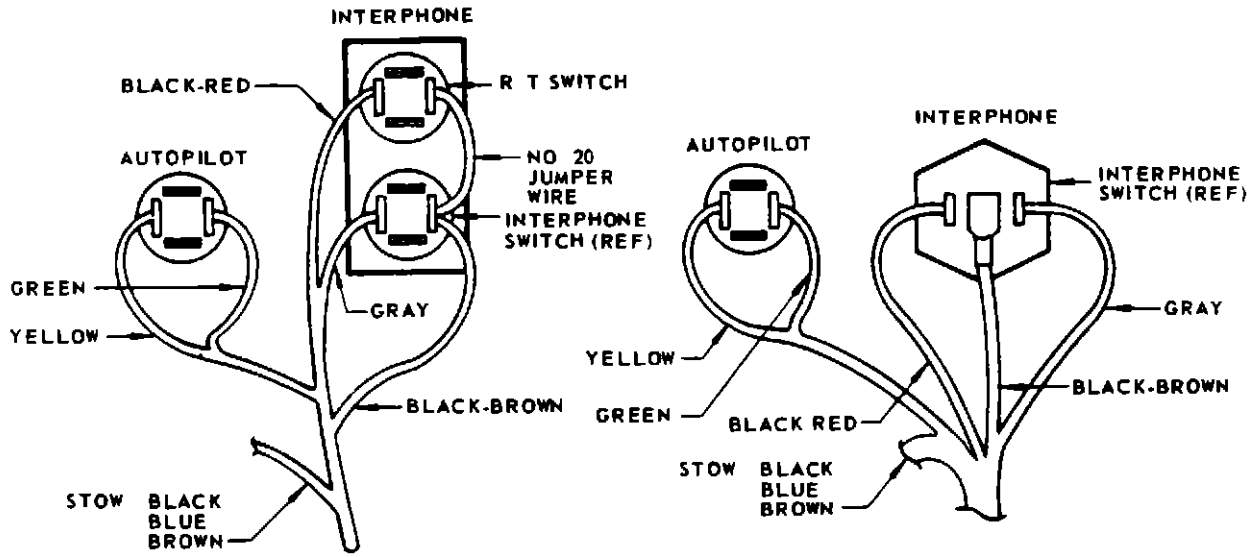
BASIC WIRING
CONFIGURATION
FOR RIGHT HAND CONTROL COLUMN





ALTERNATIVE SWITCH WIRING
FOR LEFT AND RIGHT HAND CONTROL COLUMN

LEFT HAND SHOWN, RIGHT HAND OPPOSITE



ALTERNATIVE SWITCH WIRING
FOR LEFT AND RIGHT HAND CONTROL COLUMN
LEFT HAND SHOWN, RIGHT HAND OPPOSITE

FLIGHT CONTROLS TRIM CORRECTION - ADJUSTMENT/TEST

1. General

A. During flight tests following vertical fin or rudder repair or replacement, it may be found that an out-of-trim condition exists. If an out-of-trim condition exists, a new rudder neutral position may be established. The rudder neutral position may be relocated ± 0.50 inch maximum. To establish a new rudder neutral position in flight the procedure below should be followed. If flight check indicates additional rudder trim is required, adjust control tab. The actual amount of required adjustment must be determined by trial.

2. Trim Correction Adjustment

A. Equipment and Materials

(1) Rudder Position Instrumentation Test Kit - F70134-37

B Prepare Airplane for Adjustment

(1) Depressurize auxiliary hydraulic system.

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN. WHEN POWER ON TESTS OR ADJUSTMENTS ARE REQUIRED, PERSONNEL AND EQUIPMENT MUST BE KEPT CLEAR OF RUDDER.

(2) Install Rudder Position Instrumentation Test Kit per kit instructions. On airplanes with rudder position indicator, the kit is not required.

(3) Pressurize auxiliary hydraulic system.

(4) Determine adjustment required

(a) Prior to check flight determine that all control surfaces have been rigged within the allowable tolerances for position and symmetry. Refer to applicable flight control sections.

(b) During check flight with symmetrical thrust settings and fuel loadings, position the rudder to neutral (0 degrees) as indicated by the position indicator.

(c) Operate aileron trim system to establish a wings level attitude.

(d) While maintaining the wings level the rudder will be positioned using the trim system (power on) to center the ball in the turn and bank indicator. Aileron trim may have to be reduced to maintain the needle and ball of the indicator in a centered position.

(e) Record the final aileron trim position and rudder position.

NOTE: Observe inservice trim limits as established by the airline. Boeing uses the following maximum allowable trim units for straight and level flight.

Aileron trim ± 1 unit
Power-on rudder trim ± 1 unit.

C. Adjust for Trim Correction

(1) Adjust for directional trim correction.

NOTE: If the final recorded position of the rudder found during the check flight differs from the neutral position (0 degrees) the rudder neutral position will be changed to the recorded position. The rudder neutral position may be relocated ± 0.50 inch maximum.

(a) Depressurize auxiliary hydraulic system.

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN. WHEN POWER-ON TEST OR ADJUSTMENTS ARE REQUIRED, PERSONNEL AND EQUIPMENT MUST BE KEPT CLEAR OF RUDDER.

(b) Adjust power control unit input until the rudder assumes the recorded position found during the check flight. Refer to 27-17-0, Rudder, Rudder Control Tab and Rudder Control System - Maintenance Practices.

(c) Pressurize auxiliary hydraulic system and turn rudder switch ON. Check that rudder assumes the recorded position. If rudder does not assume recorded position, depressurize auxiliary hydraulic system and adjust power control unit input until condition in step (b) is met.

(d) Relocate chevron to new rudder neutral position.

(e) Fair the control tab to the rudder per 27-17-0,Rudder,Rudder Control Tab and Rudder Control System - Maintenance Practices.

NOTE: If flight check indicates additional rudder trim is required, the control tab may be repositioned within adjustment limits.

(2) Adjust for lateral trim correction.

NOTE: If more than one unit aileron trim was required to maintain straight and level flight, adjust inboard flap.

(a) Adjust appropriate inboard flap. Flap adjustment of 0.20 inch below wing chord plane corrects approximately 1 unit aileron trim.

NOTE: Correct wing heavy condition by lowering inboard flap on heavy wing and/or raising inboard flap on opposite wing. Remain within flap rigging tolerances.

D. Restore Airplane to Original Configuration.

SPOILERS AND SPOILER CONTROL SYSTEM - DESCRIPTION AND OPERATION

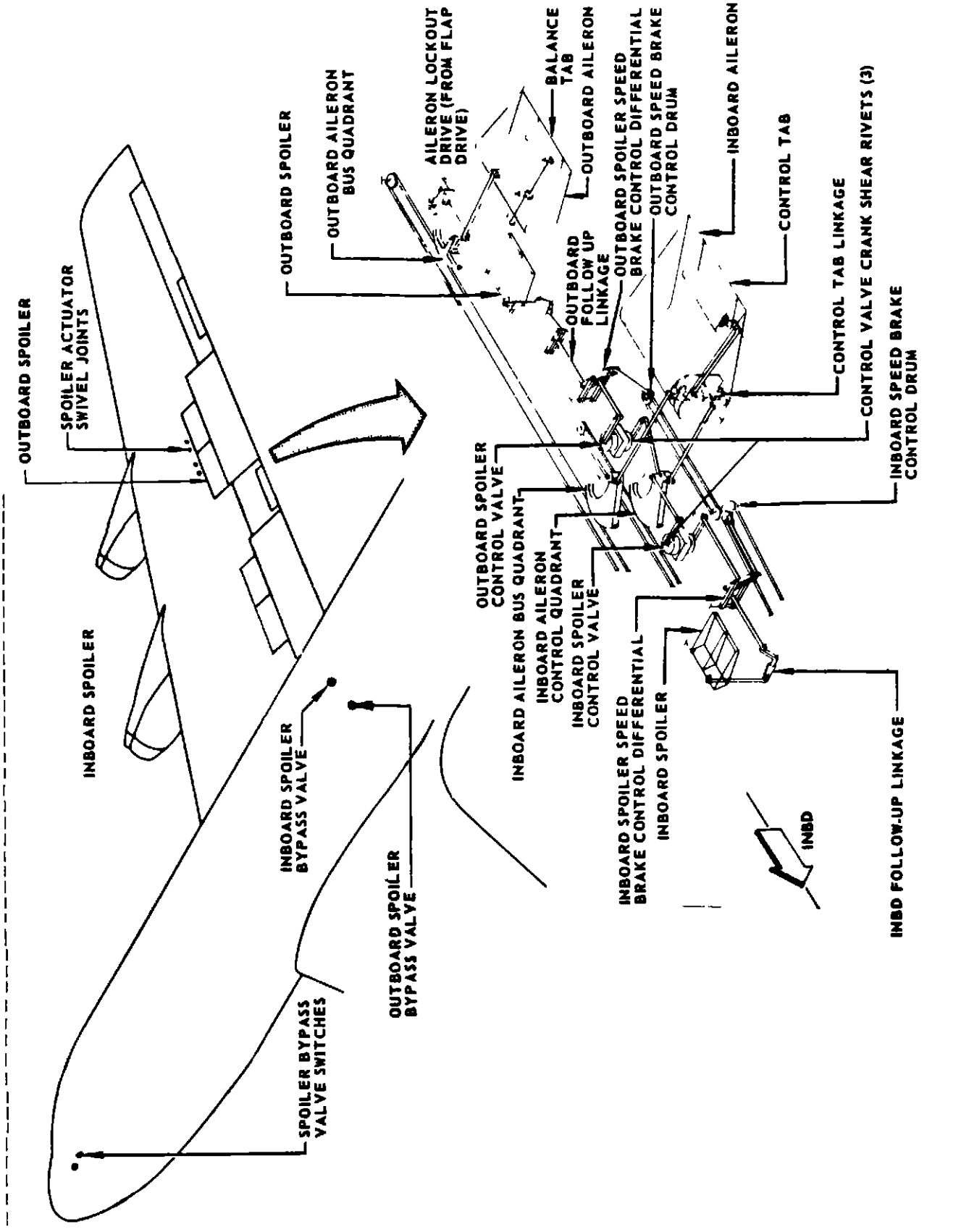
1. General

A The spoilers (figure 1), operate with the ailerons to provide lateral control about the roll axis of the airplane Four spoilers are located in the upper surface of each wing The spoilers are mounted in pairs, with one pair forward of each of the main flaps. The spoilers are positioned hydraulically, and are controlled directly from the aileron control system. The spoilers also serve as speed brakes, and, when used for this purpose, are controlled by a speed brake control lever located on the control stand See Speed Brake Control System, 27-5-0

B Hydraulic power to operate the outboard spoilers is obtained from the 3000 psi utility hydraulic system The 3000 psi auxiliary hydraulic system provides power to operate the inboard spoilers. Hydraulic pressure and return lines are routed to the inboard and the outboard spoiler control valves in each wing. Each valve controls the operation of the two spoiler actuators which position each spoiler pair. Swivel joints are installed in the hydraulic lines to the actuators to permit rigid tubing to be connected to the movable actuators The control valves are positioned through spoiler control linkages which connect each valve to the inboard aileron control quadrant Movement of the inboard aileron control quadrant, caused by rotation of the aileron control wheel, will position the control valves causing the spoilers to be positioned proportional to aileron control signal When the spoilers have reached the desired position, a spoiler follow-up linkage which is connected to the spoilers will close the control valve. The spoilers will then remain in this position until another signal is introduced into the system. When the speed brakes are used, a differential linkage, in conjunction with the follow-up linkage, provides additional control to the spoilers.

C. One bypass valve controls both outboard spoiler pairs. A single bypass valve is installed in the pressure line that supplies both inboard spoiler pairs. In the event of malfunction, either the outboard or the inboard spoilers can be removed from the system by actuation of the appropriate valve switches. Two switches on the pilot's overhead panel actuate the bypass valves for inboard and outboard spoilers. The switches are placarded "NOSE UP" and "NOSE DOWN" so the connected set of spoilers may be selected for making pitch corrections to the airplane in the event of a jammed stabilizer. Activation of the inboard spoilers only will provide airplane nose down trim. Activation of the outboard spoilers only will provide airplane nose up trim.

D. Failsafe protection is provided in the system by shear rivets in the spoiler valve input crank. The shear feature in the inboard and outboard spoiler follow-up cranks has been eleminated by replacing shear rivets with structural rivets.



Spoiler Control System
Figure 1

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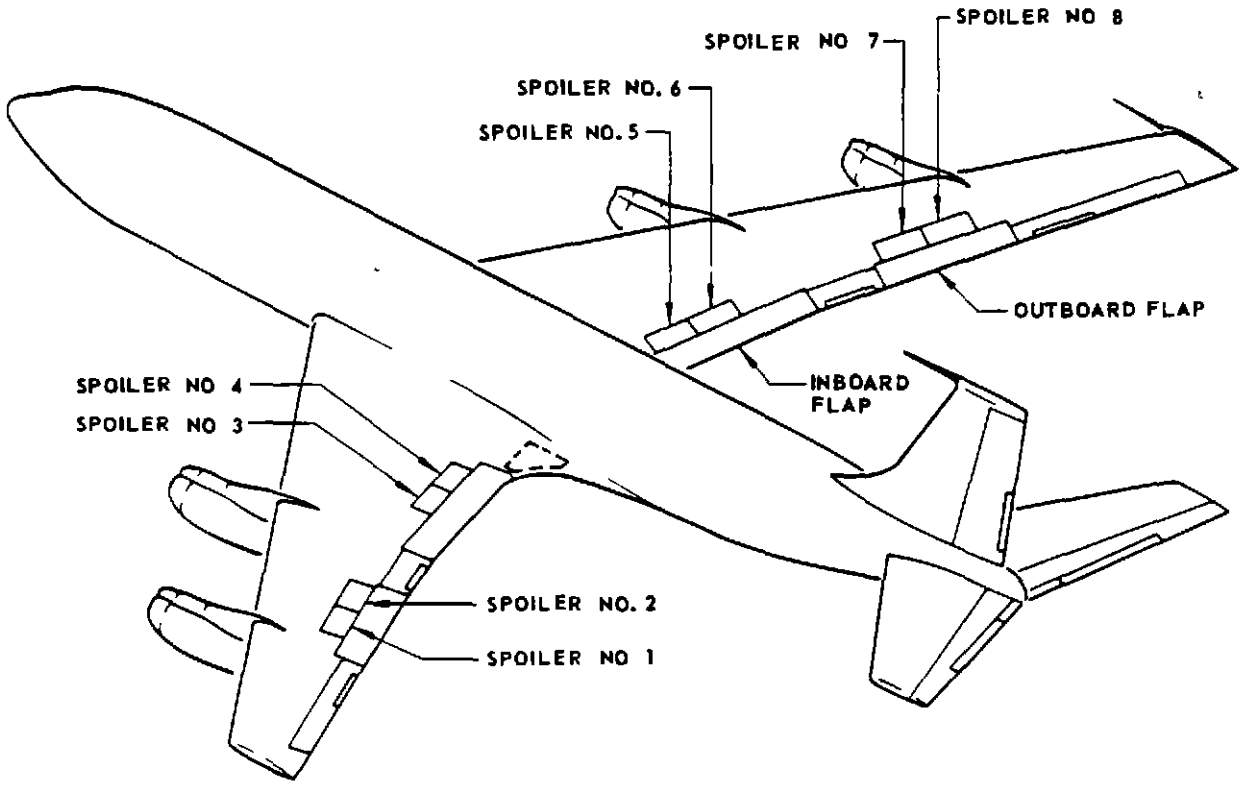
SAB REV 17 JAN 1967

2. Spoilers

A. The lower skin of all spoilers is aluminum. Upper inboard and outboard skin panels of all spoilers are aluminum on 00-SJA through 00-SJG. Upper inboard skin panel is aluminum and upper outboard skin panel is magnesium on all spoilers on 00-SJH and on. The underside of the spoiler is recessed at one side to provide a mounting area for the spoiler actuator. A solid trailing edge filler is used between upper and lower skin surfaces. Mounted to the aft underside of the spoiler is a mohair seal. The spoiler leading edge contains three self aligning hinge bearings.

B. The spoilers have a built-in warp at the trailing edge so that the area opposite the actuator contacts the wing first during retraction. The spoiler actuator pulls the spoiler into the faired position (straining it slightly) providing a tight seal.

C. The eight spoilers are grouped together in pairs. (See figure 2.) Each spoiler pair is held together by a cross-connect fitting at the trailing edge. Inboard spoilers are located forward of the inboard flaps and are attached by three hinge supports to wing structure aft of the rear spar. Outboard spoilers are located forward of the outboard flaps and are attached by three hinge supports on the rear spar. The spoiler actuators are attached between spoiler structure and the wing structure. Bonding jumpers provide an electrical connection between the spoiler and the wing.



Spoiler Location
Figure 2

D. Spoiler hinge and spoiler actuator attach bolt diameters are increased on OO-SJH and on. Also, spoiler hinge cutouts in the wing upper skin are eliminated, the spoiler leading edge seal is a continuous strip, and spoiler hinge fittings are shaped to provide skin and seal clearance with spoilers up. End seals are Skydrol - resistant rubber.

3. Spoiler Control Valve Linkage

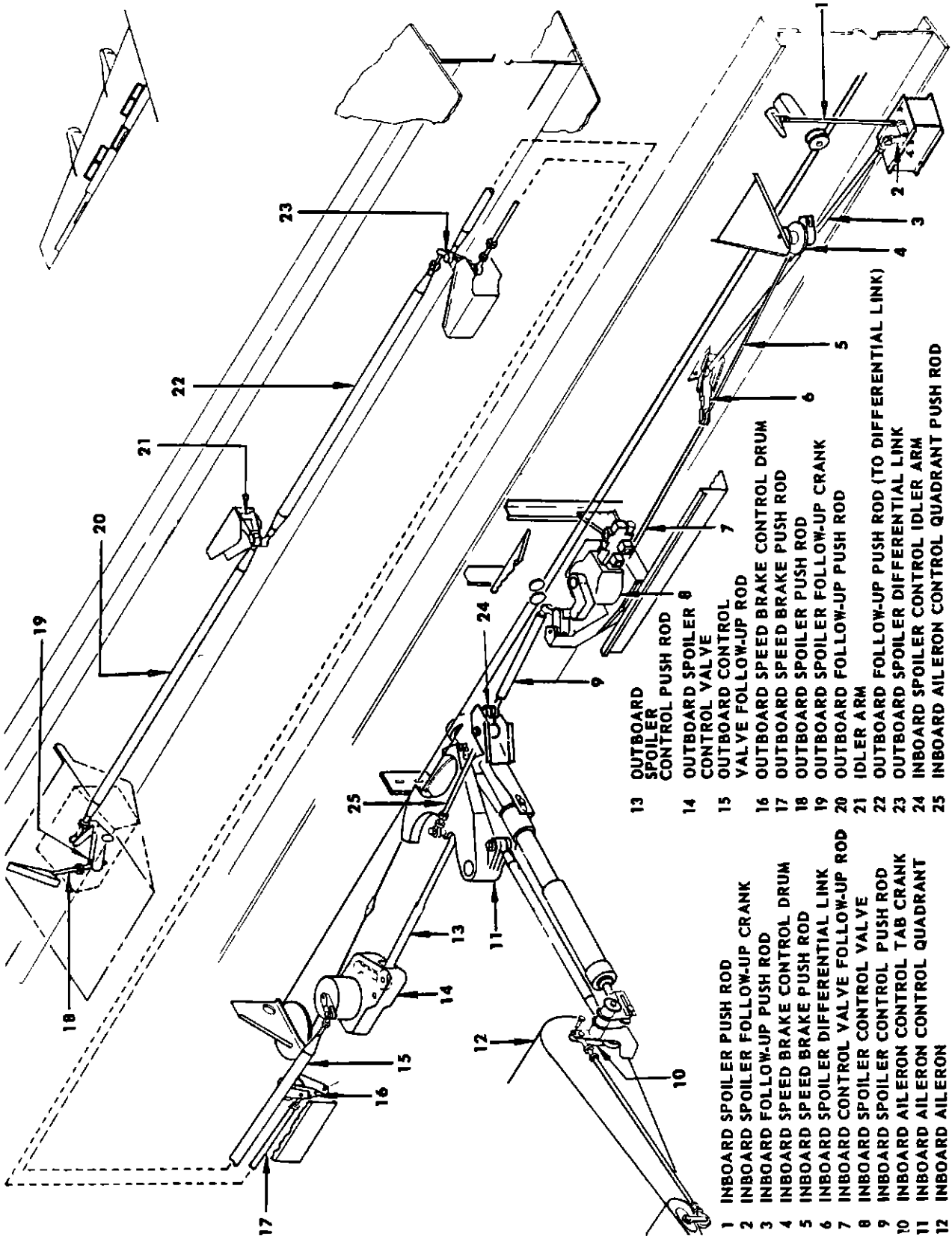
A. The control valve linkage (figure 3) starts at the inboard aileron control quadrant, from which motion is carried to the input shafts of the spoiler control valves. This linkage causes the spoilers to operate with the ailerons. The inboard control valve linkage consists of two pushrods, an idler, a pushrod control crank, a connecting rod and a valve crank. The outboard control valve linkage consists of a pushrod, a pushrod control crank, a connecting rod and a valve crank.

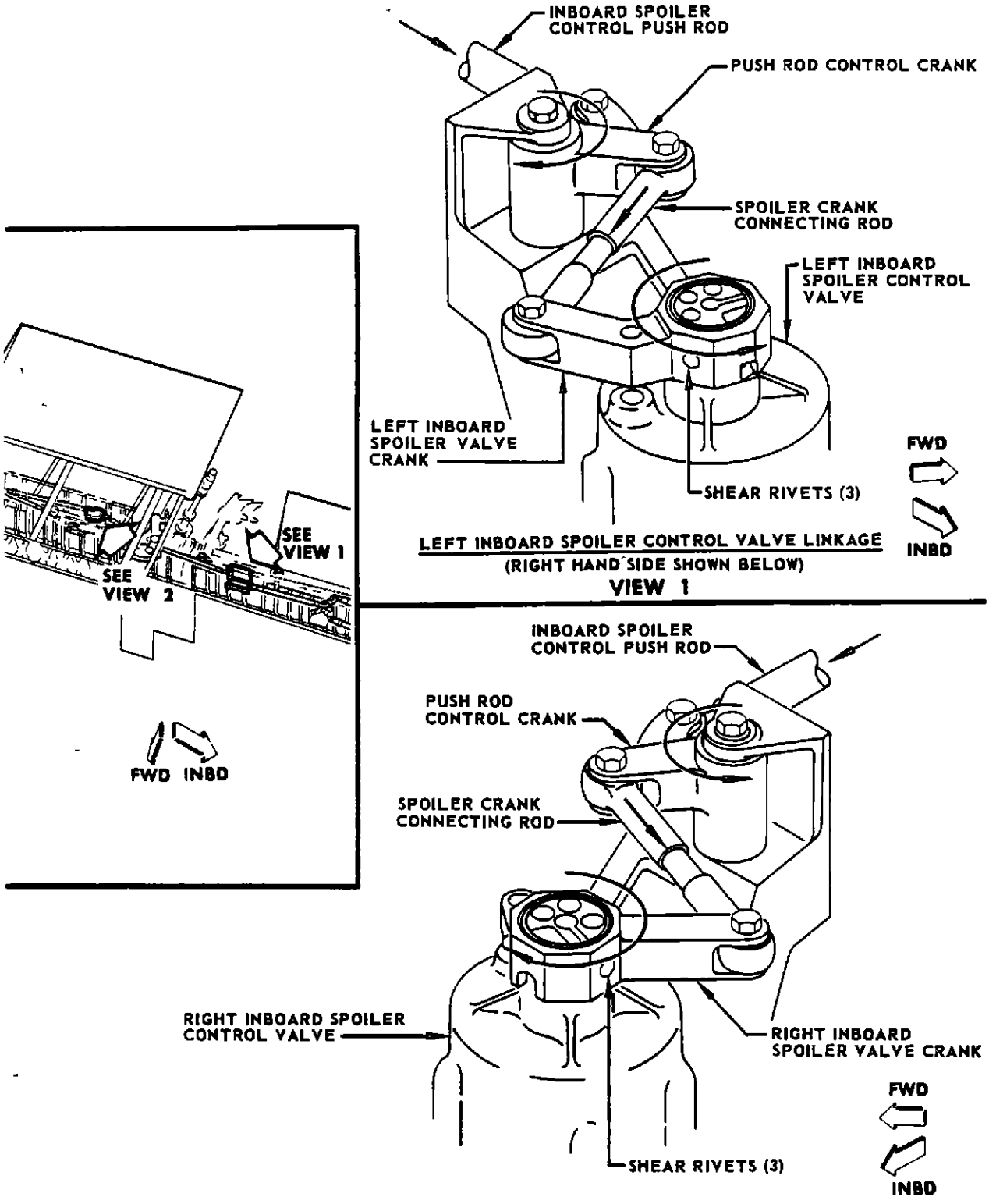
B. Failsafe protection is provided by shear rivets which attach the valve cranks to the input shafts of the control valves. If jamming occurs within the system, increased pressure at the aileron control wheel will shear the rivets and allow continued normal aileron operation.

C. The inboard control valve linkage is located aft of the wing rear spar and is accessible through the inboard cove lip doors. The outboard control valve linkage is located forward of the inboard aileron balance panel chamber, and is accessible through the wing lower access panels.

4. Spoiler Control Valves

A. There is one spoiler control valve (figure 4) for each pair of spoiler actuators. The valve consists of two main sections, the gear housing and the valve body. The housing contains two bevel gears and two pinion gears, which together constitute a differential gear assembly. The bevel gears rotate with the input and follow-up shafts. The pinion gears are connected, via a crank and link to the metering piston in the valve body. One of the pinion gears is mounted to a spring loaded swinging arm to eliminate back lash in the gear train, thus ensuring rapid response. The axes of the pinion gears converge upon, and rotate about, the axis of the bevel gears. The valve body contains a filter at the fluid inlet port, a metering piston, and a sleeve. Ports are provided in the valve body for fluid passage to and from the spoiler actuators. The metering piston has three basic positions, extreme in, extreme out, and neutral. When a signal is received at the input shaft, the bevel gear will rotate the pinion gear assembly because the follow-up bevel gear is held stationary by the spoiler. As soon as the input signal has terminated, the input bevel gear becomes the stationary member of the differential, leaving the spoiler controlled follow-up bevel gear free to rotate the pinion gear assembly in the opposite direction. When the pinion gear assembly has moved the metering piston an equal but opposite amount to its original travel, it assumes the neutral position and prevents fluid flow through the control valve.

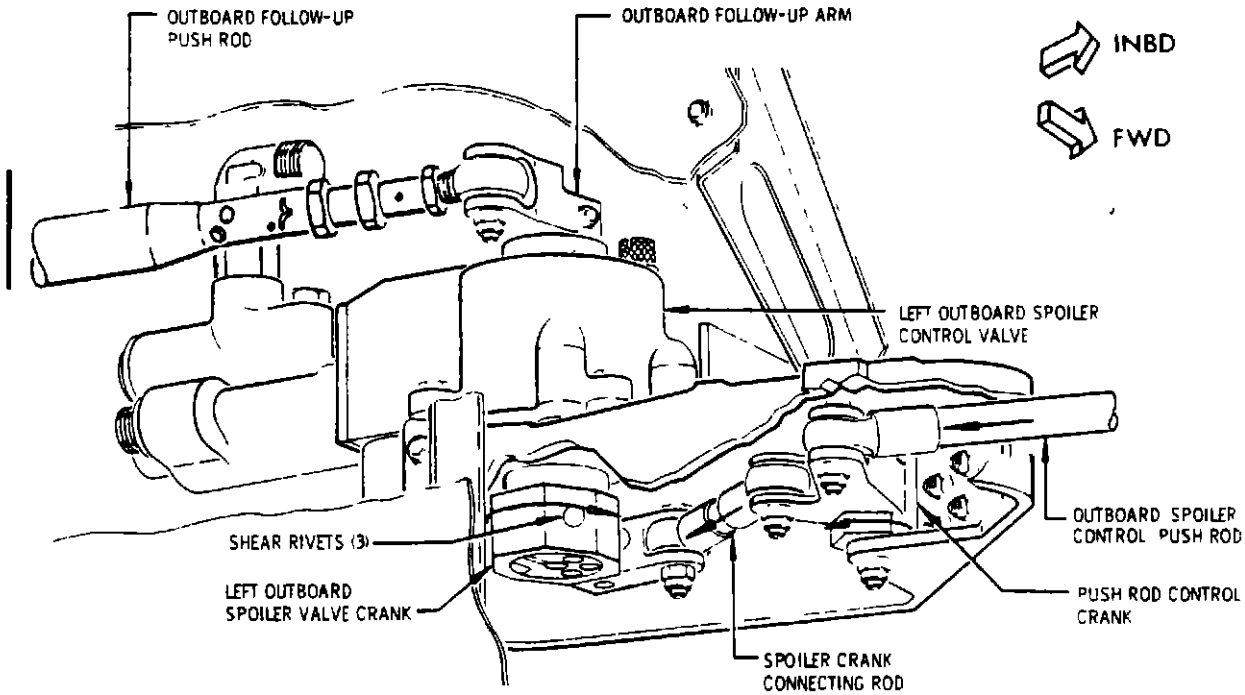

1 INBOARD SPOILER PUSH ROD
2 INBOARD SPOILER FOLLOW-UP CRANK
3 INBOARD FOLLOW-UP PUSH ROD
4 INBOARD SPEED BRAKE CONTROL DRUM
5 INBOARD SPEED BRAKE PUSH ROD
6 INBOARD SPOILER DIFFERENTIAL LINK
7 INBOARD CONTROL VALVE FOLLOW-UP ROD
8 INBOARD SPOILER CONTROL VALVE
9 INBOARD SPOILER CONTROL PUSH ROD
10 INBOARD AILERON CONTROL TAB CRANK
11 INBOARD AILERON CONTROL QUADRANT
12 INBOARD AILERON
13 OUTBOARD SPOILER CONTROL PUSH ROD
14 OUTBOARD SPOILER CONTROL VALVE
15 OUTBOARD CONTROL VALVE FOLLOW-UP ROD
16 OUTBOARD SPEED BRAKE CONTROL DRUM
17 OUTBOARD SPEED BRAKE PUSH ROD
18 OUTBOARD SPOILER PUSH ROD
19 OUTBOARD SPOILER FOLLOW-UP CRANK
20 OUTBOARD FOLLOW-UP PUSH ROD
21 IDLER ARM
22 OUTBOARD FOLLOW-UP PUSH ROD (TO DIFFERENTIAL LINK)
23 OUTBOARD SPOILER DIFFERENTIAL LINK
24 INBOARD SPOILER CONTROL IDLER ARM
25 INBOARD AILERON CONTROL QUADRANT PUSH ROD



LEFT INBOARD SPOILER CONTROL VALVE LINKAGE
(RIGHT HAND SIDE SHOWN BELOW)
VIEW 1

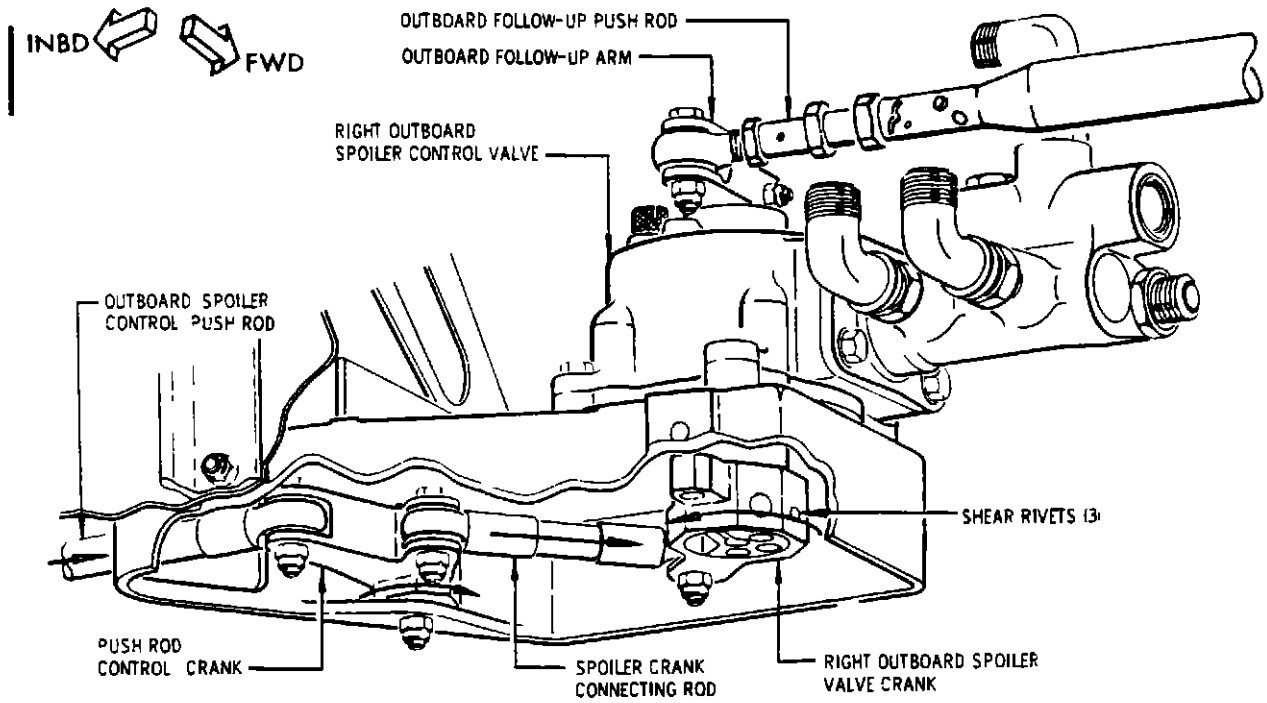
RIGHT INBOARD SPOILER CONTROL VALVE LINKAGE

Spoiler Control Linkage
Figure 3 (Sheet 2 of 3)

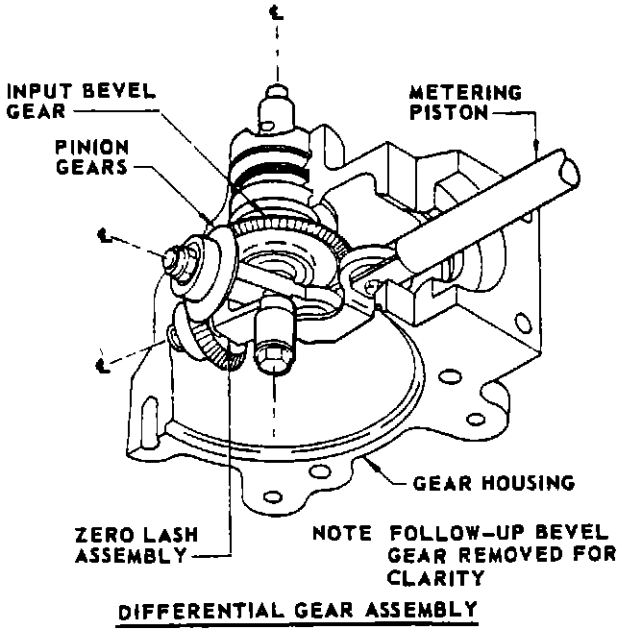


LEFT OUTBOARD SPOILER CONTROL VALVE LINKAGE
(RIGHT-HAND SIDE SHOWN BELOW)

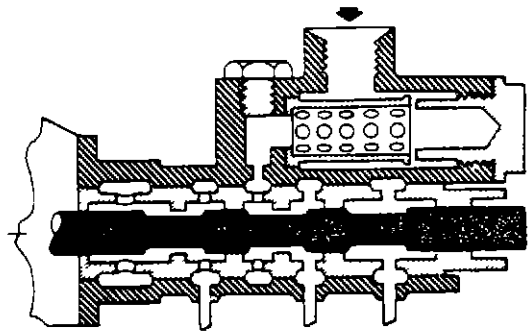
VIEW 2



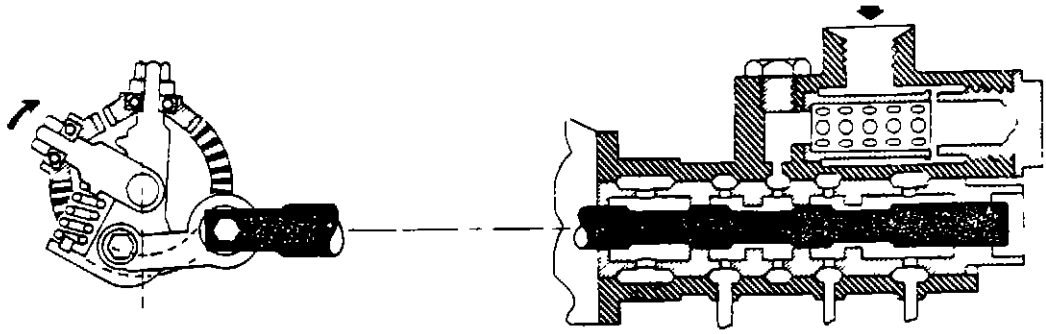
RIGHT OUTBOARD SPOILER CONTROL VALVE LINKAGE



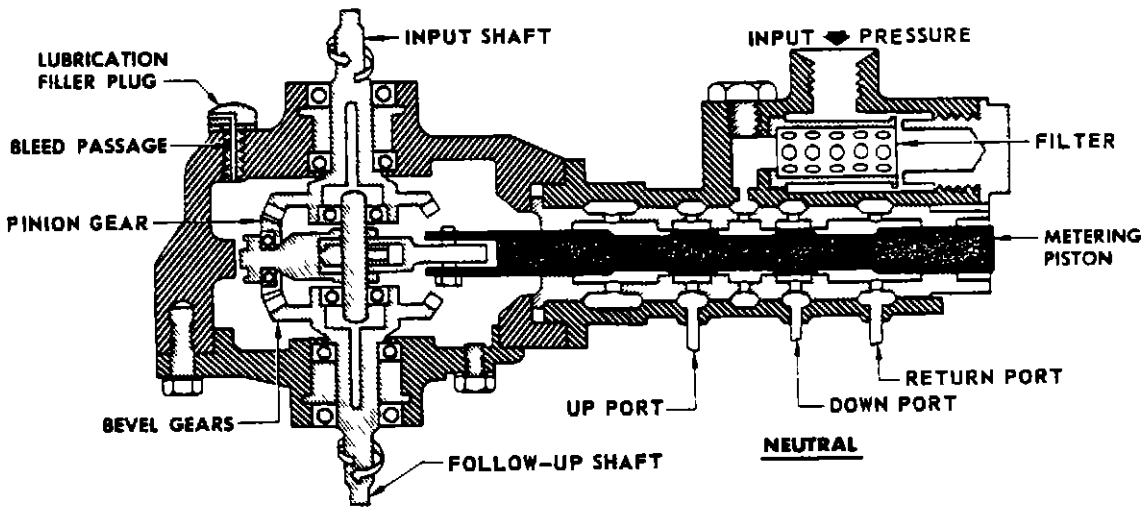
DIFFERENTIAL GEAR ASSEMBLY



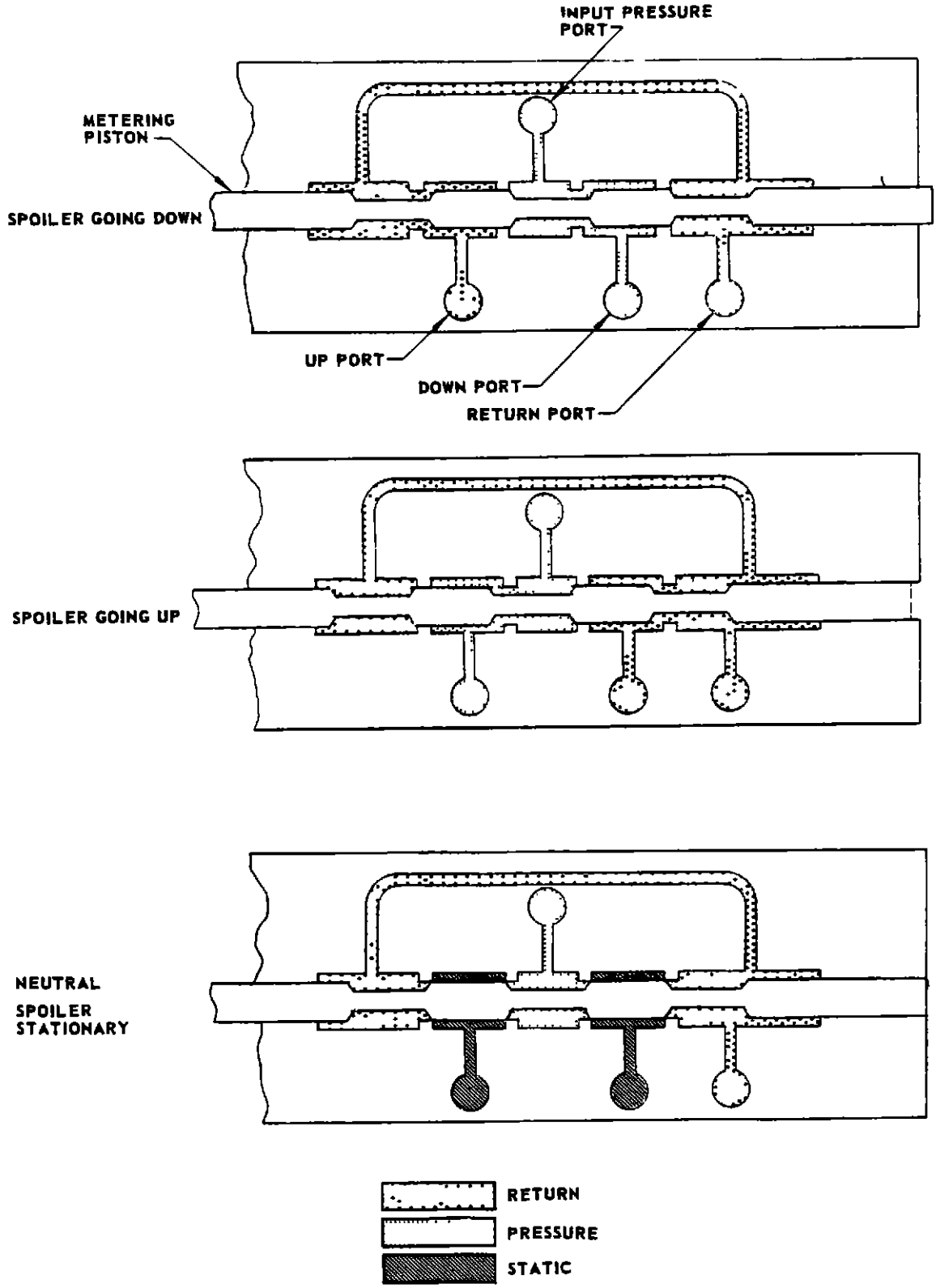
SPOILER GOING DOWN



SPOILER GOING UP



Spoiler Control Valve Schematic
Figure 4 (Sheet 1 of 2)



Spoiler Control Valve Schematic
Figure 4 (Sheet 2 of 2)

B. The inboard spoiler control valves are located aft of the wing rear spar and are accessible through the inboard cove lip doors. The outboard control valves are located forward of the inboard aileron balance panel chambers, and are accessible through the wing lower access panels.

5. Spoiler Follow-Up Linkage

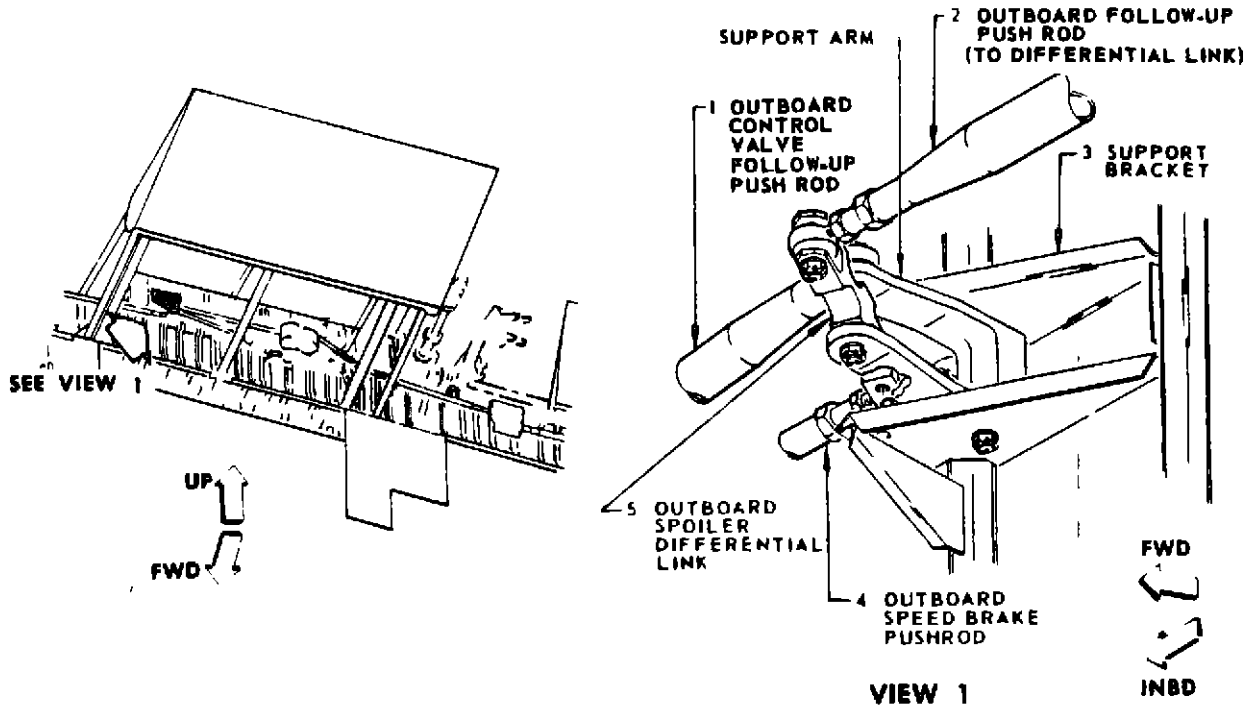
A. The follow-up linkage extends from the spoilers to the differential link assembly, and transmits the position of the spoiler to the control valve. The inboard follow-up linkage consists of two pushrods and a follow-up crank, and the outboard consists of three pushrods, a follow-up crank, and an idler arm. The shear feature is eliminated and shear rivets are replaced by structural rivets in each follow-up crank.

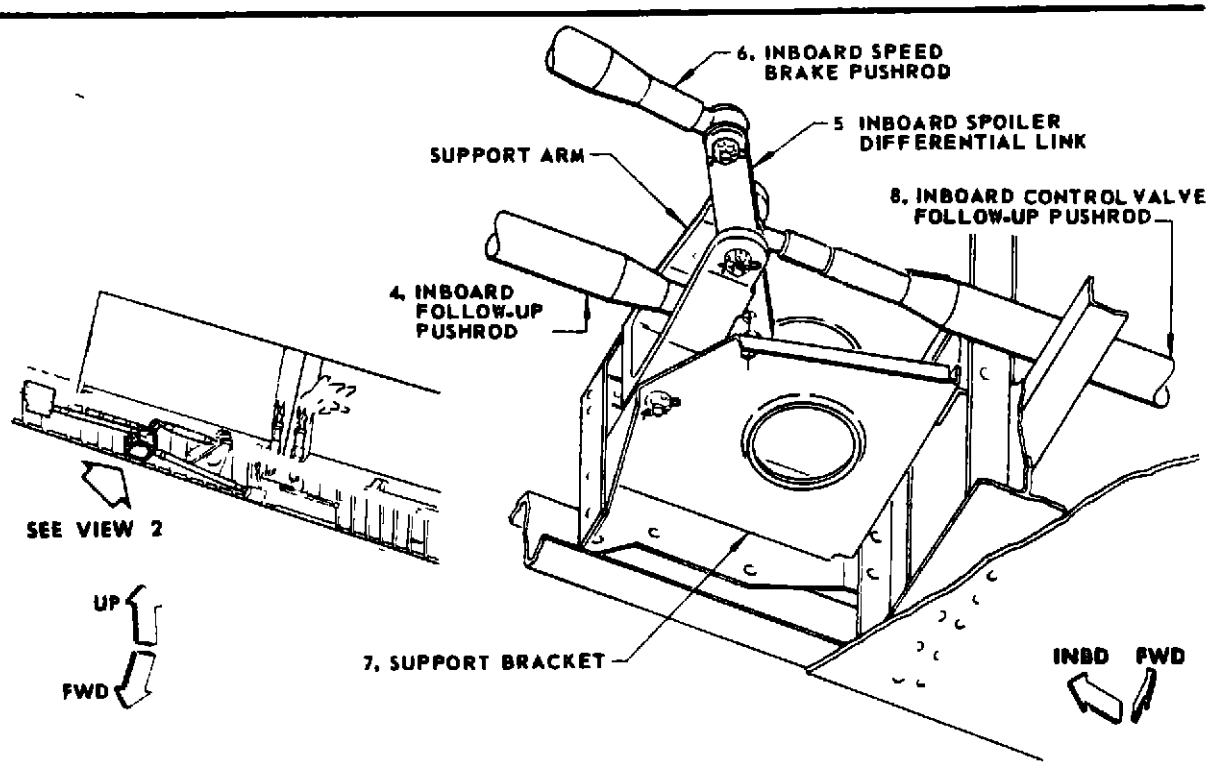
6. Spoiler Differential Linkage

A. The differential linkage (figure 5), extends from the speed brake control drum and the follow-up linkage, to the spoiler control valve. The differential system permits motion from both the follow-up linkage and the speed brake control lever to be induced into the follow-up shaft of the control valve, via a single pushrod. Each linkage consists of two pushrods, a differential link and a pivoted support arm.

7. Spoiler Bypass Valves

A. Not applicable to SABENA aircraft.


SUPPORT ARM
2 OUTBOARD FOLLOW-UP PUSH ROD (TO DIFFERENTIAL LINK)
1 OUTBOARD CONTROL VALVE FOLLOW-UP PUSH ROD
3 SUPPORT BRACKET
SEE VIEW 1
UP
FWD
5 OUTBOARD SPOILER DIFFERENTIAL LINK
4 OUTBOARD SPEED BRAKE PUSHROD
FWD
INBD
VIEW 1


6. INBOARD SPEED BRAKE PUSHROD
5 INBOARD SPOILER DIFFERENTIAL LINK
SUPPORT ARM
8. INBOARD CONTROL VALVE FOLLOW-UP PUSHROD
4. INBOARD FOLLOW-UP PUSHROD
SEE VIEW 2
UP
FWD
7. SUPPORT BRACKET
INBD
FWD
VIEW 2

(4)

B. Spoiler Bypass Valves.

(1) The spoiler bypass valves (figures 9 and 10) isolate the spoilers from the lateral control system in the event of spoiler control system malfunction, or hydraulic fluid leaks.

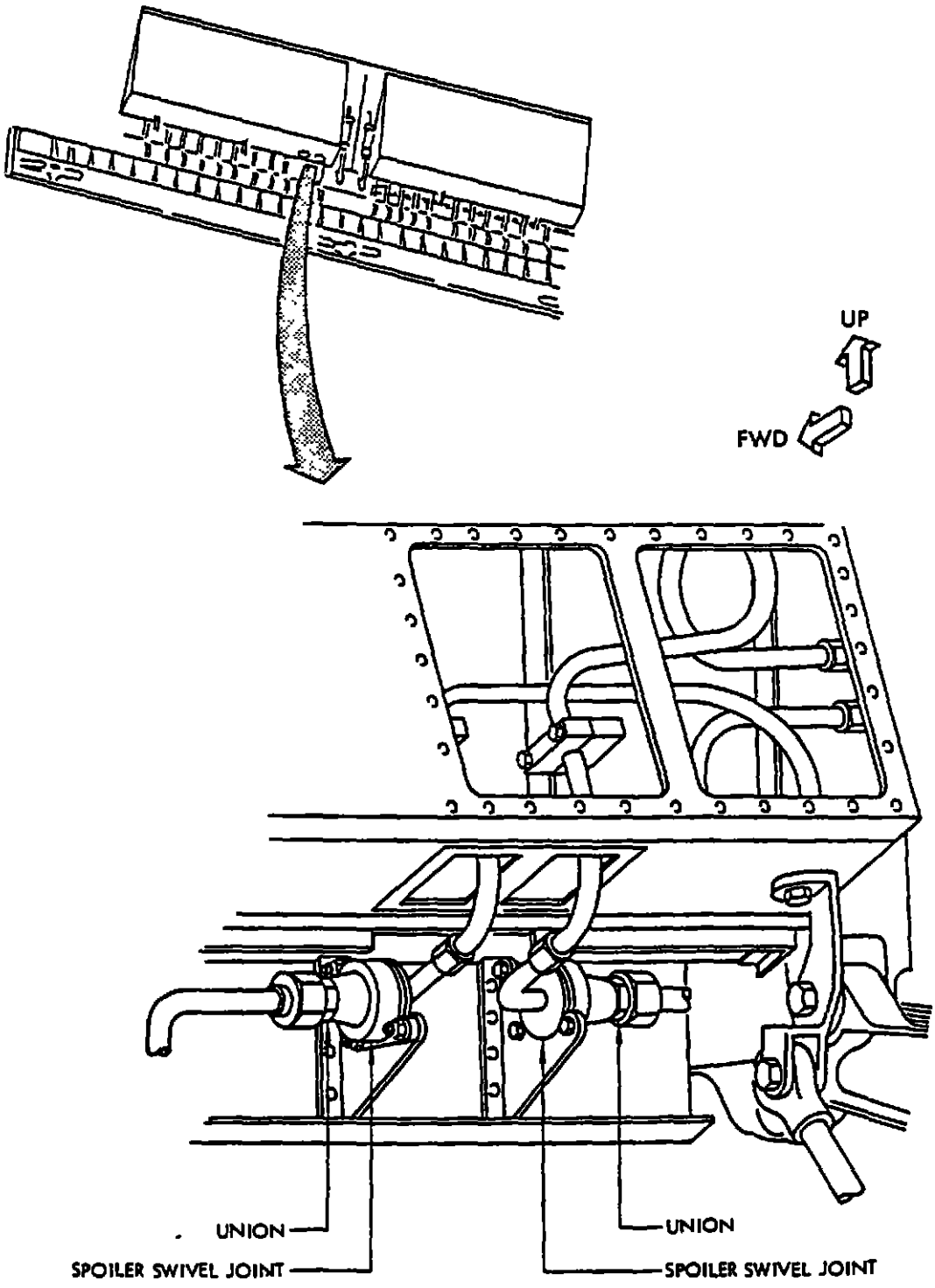
(2) The bypass valve consists of an electric motor-operated, three-way, two-position bypass valve. Three external hydraulic fittings are located on the valve body. A manual override handle is provided on the valve for operating the valve on the ground without electrical power.

(3) There is one bypass valve for both outboard spoiler pairs in the utility pressure line, and one bypass valve for both inboard spoiler pairs in the auxiliary pressure line. The inboard valve is located near the forward bulkhead in the right main gear wheel well. The outboard valve is located near the forward bulkhead in the left main gear wheel well.

(4) Two switches on the pilot's overhead panel actuate the bypass valve for inboard or outboard spoilers. Each switch completes a circuit from a circuit breaker (located in overhead radio and T-R circuit breaker panel) to the valve motor. Closing a spoiler bypass switch energizes the bypass valve motor which turns the three way rotor bypass valve to seal the flow passage for high pressure fluid through the valve.

8. Spoiler Swivel Joints

A. Swivel joints (figure 6) in the spoiler control system hydraulic lines allow segments of lines to rotate with the spoilers. The swivel joints have hydraulic fittings at each end and internal seals to prevent fluid leakage. Each spoiler has two swivel joints in the hydraulic lines leading to the actuators. These swivel joints are located on the spoiler hinge lines and are mounted to wing structure. The swivel joints are accessible when spoilers are extended.


UP
FWD
UNION
SPOILER SWIVEL JOINT
UNION
SPOILER SWIVEL JOINT

9. Spoiler Actuators

A. One spoiler actuator is used for each spoiler, the rod end being attached to the wing structure and the cylinder end to the spoiler. Actuators are accessible when the spoilers are extended.

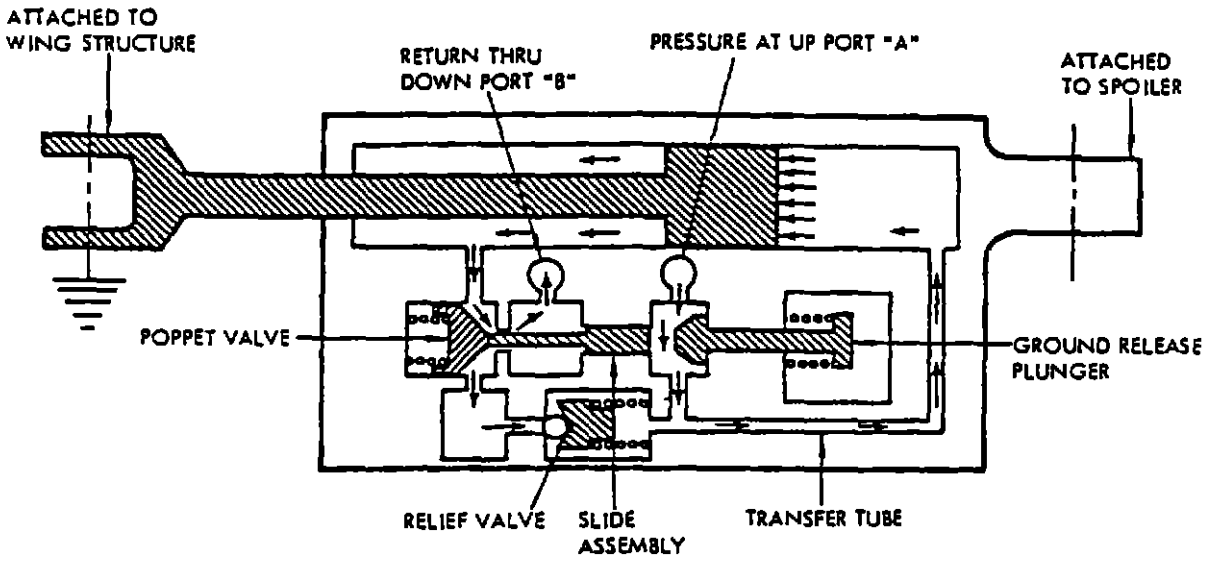
B. On OO-SJA through OO-SJG, the actuator includes a cylinder, piston and rod assembly, poppet valve, slide assembly, relief valve, ground release plunger, restrictor and transfer tube. To extend this actuator, fluid at 3000 psi enters port "A" and is fed to the piston face, via the transfer tube; also, fluid acts upon the slide assembly which forces open the poppet valve, allowing fluid at the rod side of the piston to flow out through port "B". To retract the actuator, pressurized fluid enters port "B", forces open the poppet valve and acts upon the rod side of the piston. Fluid from the piston face side flows out of port "A" via the transfer tube. If, during retraction or when the spoilers are down, the fluid pressure exceeds 3300 psi, the relief valve opens to allow fluid to pass out through the restrictor and port "A". The ground release plunger permits manual extension of the spoilers without hydraulic power. Depressing the plunger moves the slide assembly to force open the poppet valve, thus allowing fluid from the rod side of the piston to flow out through port "B".

C. On TCA LX-N20198, LX-N201999 and RTCA LX-N19997, LX-N20000, the actuator includes a cylinder and a piston and rod assembly. The other components required for spoiler operation are located in a spoiler modular package. These components are shared by adjacent spoiler actuators.

10. Spoiler Modular Package

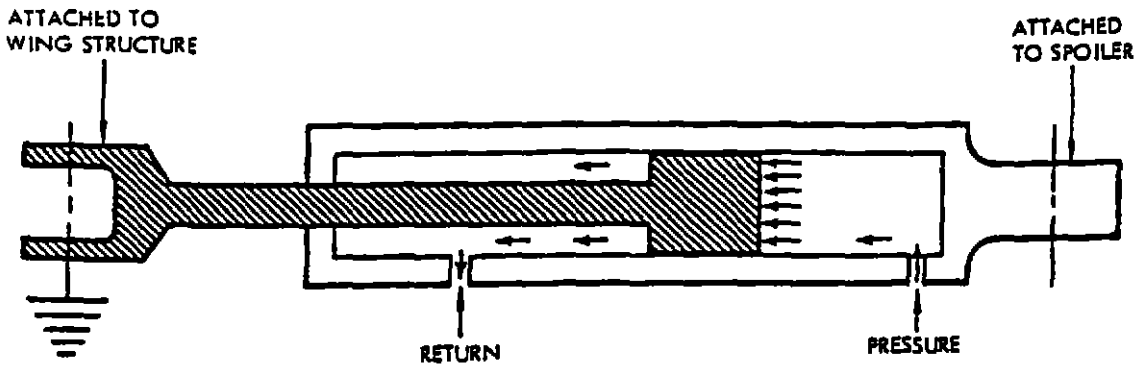
A. Four identical spoiler modular packages are installed on each airplane, one for each pair of spoiler actuators. Each modular package hydraulically interconnects the pair of spoiler actuators to provide pressure relief, antifloat and manual release functions. The modular packages are bracket mounted at the wing rear spar.

B. The modular package is a housing which contains a relief valve, two check valves, and a pressure-operated valve. The pressure-operated valve contains a poppet valve, a slide assembly, and a ground release plunger. The housing has five ports for hydraulic system pressure and return lines, spoiler actuator up and down lines, and a spoiler control valve down line. (See figure 10.)



SABENA 00-SJA thru 00-SJG

VIEW 1



TCA LX-N20198, LX-N20199. RTCA LX-N19997, LX-N20000.

SB.2376

VIEW 2

Spoiler Actuator Schematic
Figure 7

C. Hydraulic system pressure enters the modular package at port 4 and moves the slide to open the poppet valve connecting ports 1 and 2 of the modular package. This connects the spoiler control valve down line to the spoiler actuators. Spoiler up pressure from the control valve is directed to the face of both spoiler actuator pistons and to port 3 of the modular package. If the pressure at port 3 exceeds system pressure due to excessive airloads on the spoiler panels, fluid will flow through the check valve and out port 4. This will allow excessive airloads to blow the spoilers down. When the spoilers are moving up, the fluid at the rod side of both actuator pistons is routed from port 2 of modular package through the poppet valve to port 1. The fluid is then routed through the control valve to hydraulic system return. During spoiler down travel, the hydraulic fluid flow through the modular package is reversed. If the pressure at port 2 exceeds system pressure, due to flap loads on the spoilers, fluid will flow through the poppet and check valves and out port 4. This will allow the spoilers to move up, preventing structural damage to the spoilers and the flaps.

D. When hydraulic pressure is off, the poppet valve is closed, blocking hydraulic flow at port 2. This action retains the fluid on the rod side of the spoiler actuators preventing spoiler float. If the pressure at port 2 exceeds 3350 psi, due to thermal expansion, the relief valve will allow fluid to flow out port 5 to hydraulic system return.

E. With hydraulic power off, the spoilers may be raised manually by using the manual release button. Depressing the manual release button will open the poppet valve allowing hydraulic fluid to flow from port 2 to port 1. Manually lifting the spoiler panels will cause fluid to flow from the rod side of the actuator through the modular package and spoiler control valves into the system pressure lines. Hydraulic fluid from the system return lines will flow through the control valve to the other side of the actuators.

11. Operation

A. When an up aileron signal is received at an inboard aileron control quadrant, linkage operates the spoiler control valves. Hydraulic power is directed to the actuators, and so positions the spoilers relative to the ailerons. The inboard spoilers on the up aileron wing will extend to 41° and the outboard spoiler to 42° when the control wheel is rotated hard over. (See figures 9 and 10.)

B. As the spoilers extend, the follow-up linkages return the spoiler control valves to their neutral positions, thus arresting spoiler movement until another aileron signal is received.

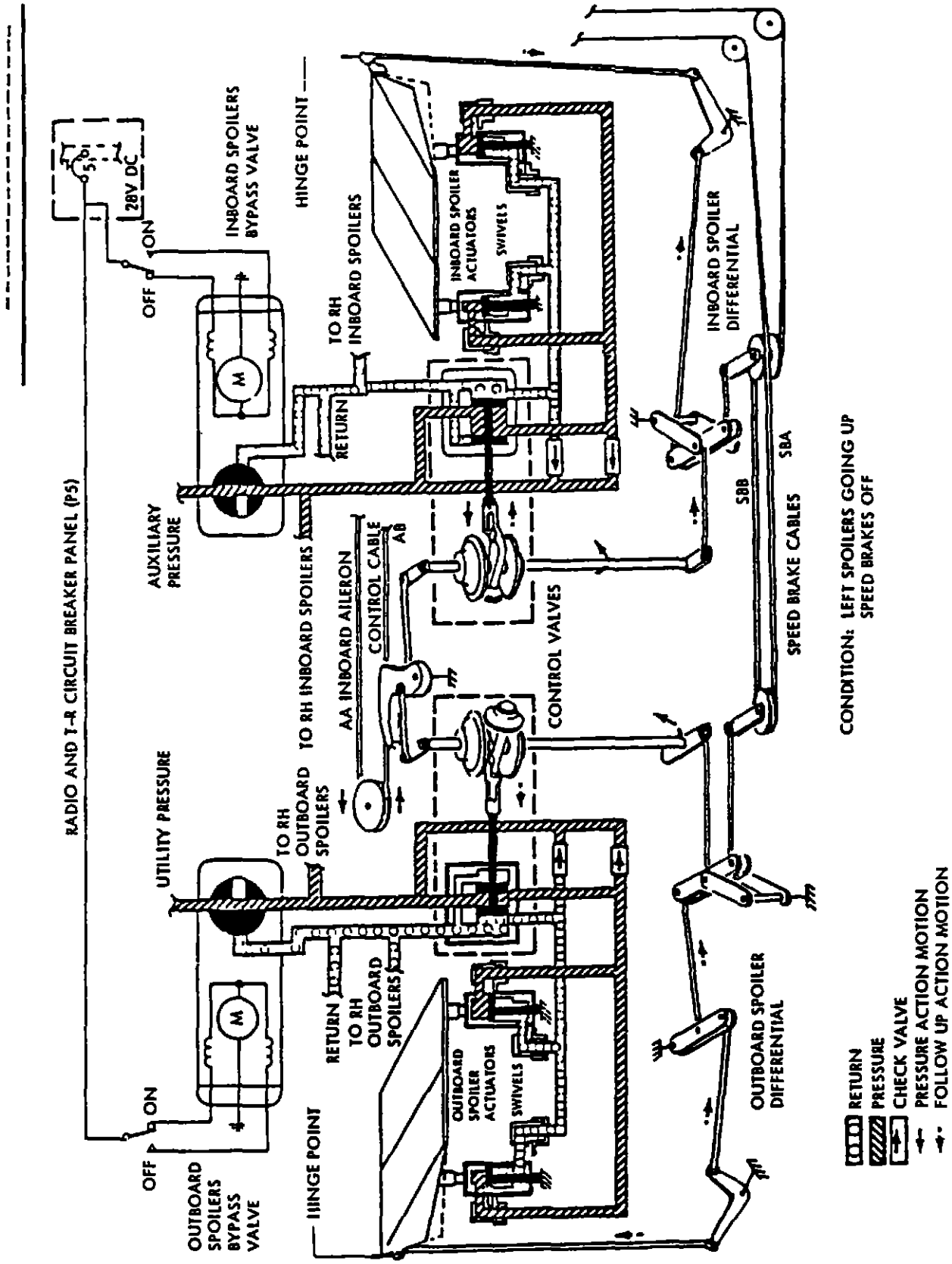
C. When the speed brakes are used, aileron induced motion to the spoilers is controlled by the differential linkage. The spoilers have no motion when the ailerons are faired, except through a speed brake signal. With ailerons faired, a speed brake signal extends all spoilers equally on both wings, up to a maximum of 60 degrees. With a 60 degree speed brake setting, flaps up and 93 degrees rotation of the control wheel, the spoilers will extend 60 degrees on the up aileron wing; on the down aileron wing, inboard spoilers will extend 19 degrees and outboard spoilers 18 degrees. See figure 11 for other settings.

D. With spoilers extended, a down inboard aileron signal will cause the actuators to retract the spoilers. When the spoilers are faired, the actuators are at the limit of their travel, and any further down aileron signal will result in the buildup of fluid pressure in the actuators which will open the poppet valves and so recirculate fluid to the return line of the hydraulic system.

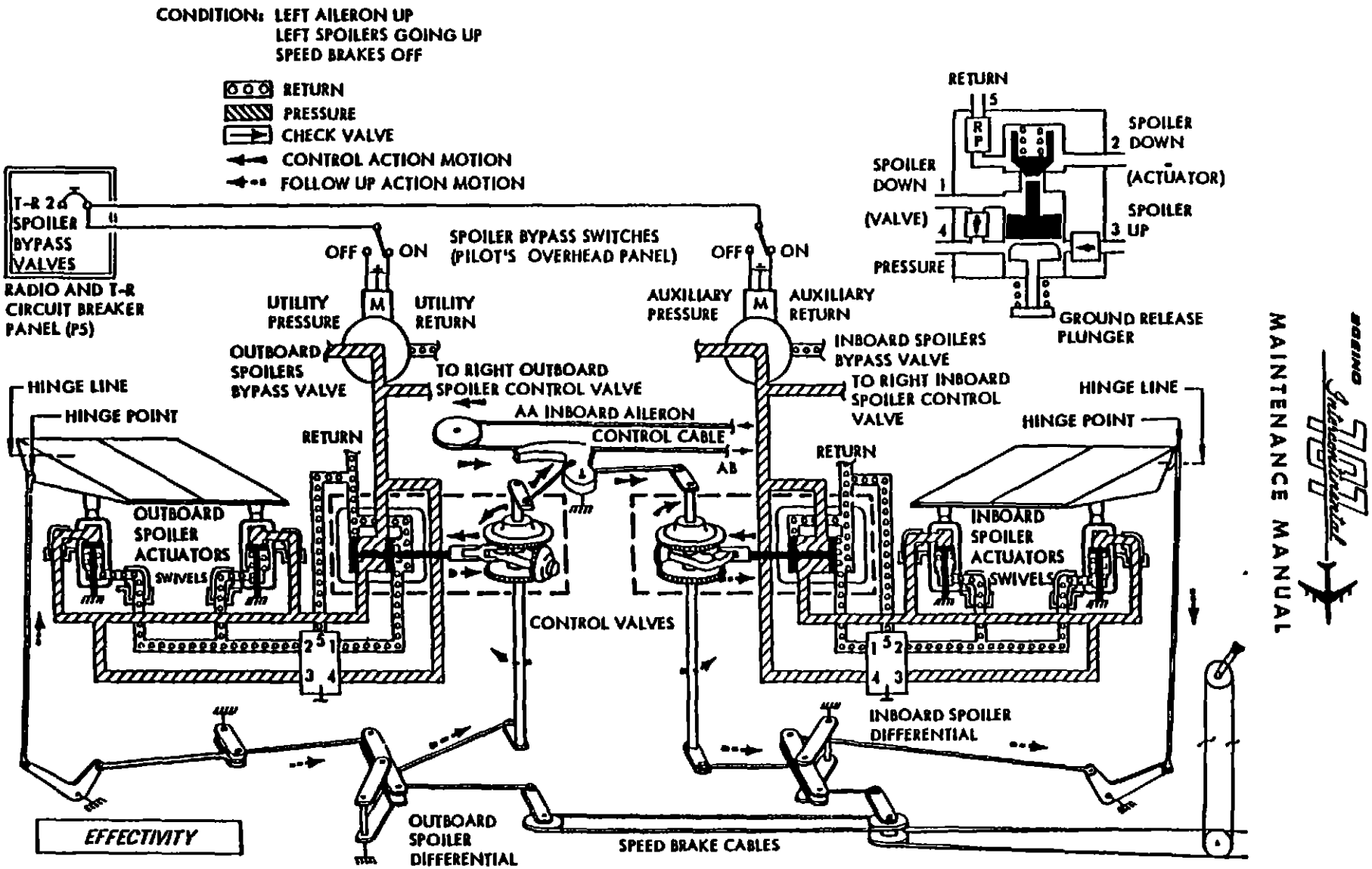
E. Inboard or outboard spoilers may be removed from the flight control system by the pilot. Closing the required spoiler bypass switch on the pilot's overhead panel will stop hydraulic power to the spoiler actuators, and open the piston face side of the actuators to the return line; the spoilers will then blow down.

F. Check valves are placed in the spoiler hydraulic circuit to control fluid flow in one direction. (See figures 9 and 10.) When the pressure in the hydraulic lines to the actuators exceeds the input pressure of 3000 psi, fluid will flow through the check valves into the pressure line and so be governed by the main system relief valves. The utility and auxiliary relief valves open at 3450 to 3550 psi and close at no less than 3150 psi. Such pressures can develop when high aerodynamic forces act upon the spoilers.

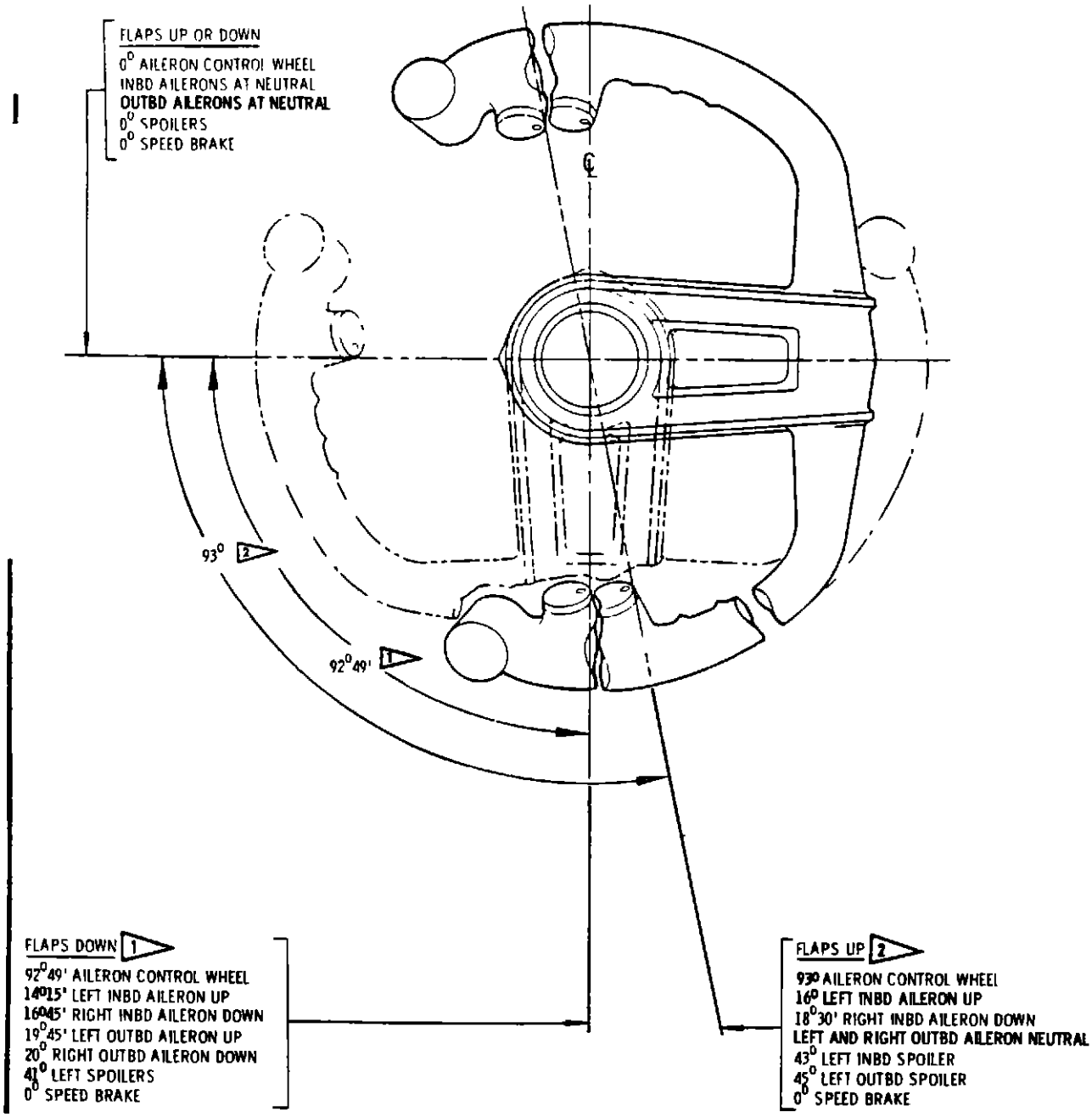
NOT APPLICABLE TO SABENA AIRCRAFT.



Spoiler Control System Schematic
Figure 9



TCA LX-N20198
LX-N20199
RTCA LX-N19997
LX-N20000



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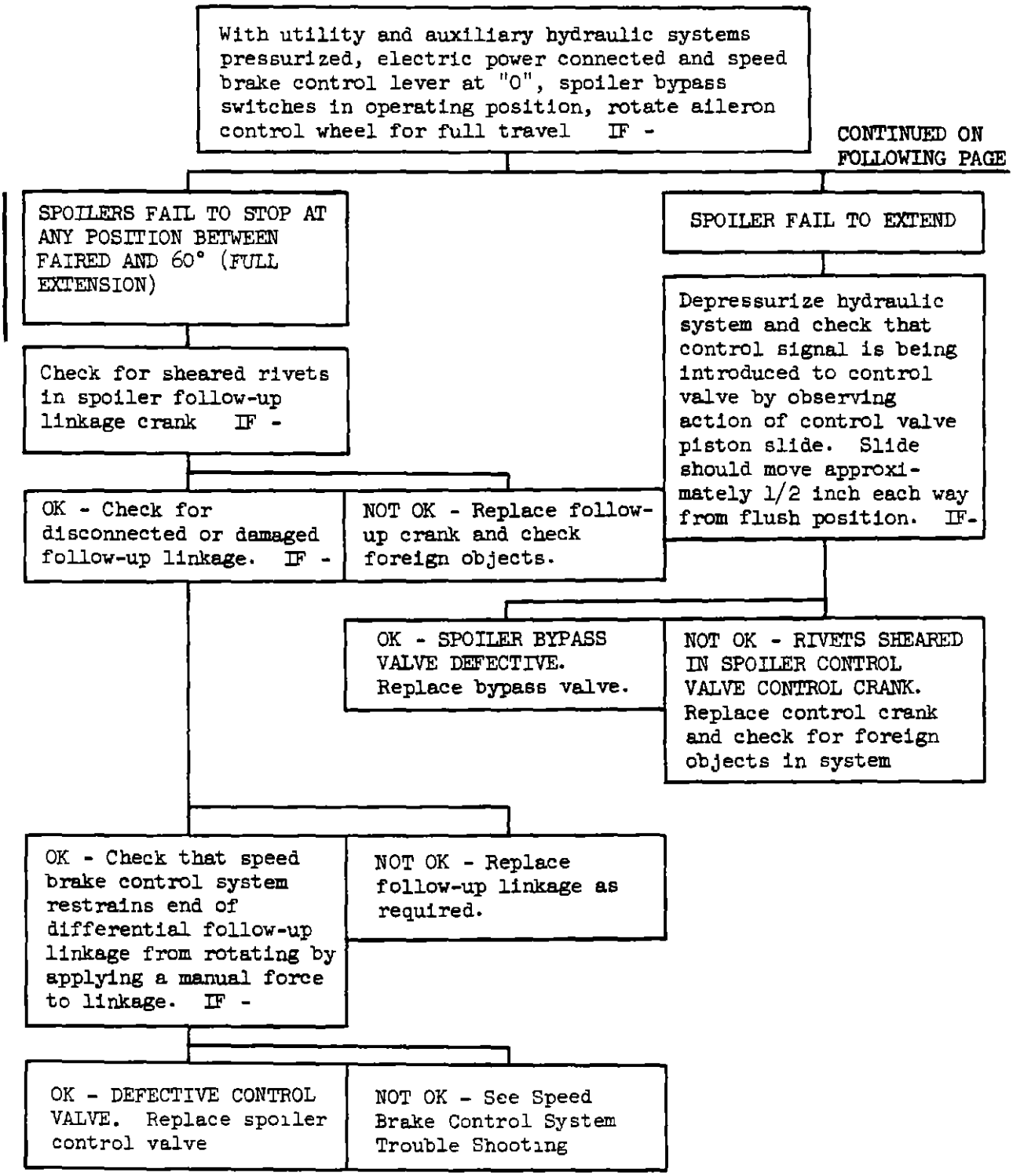
Spoiler and Aileron Relative Position Diagram
Figure 11

SPOILERS AND SPOILER CONTROL SYSTEM - TROUBLE SHOOTING



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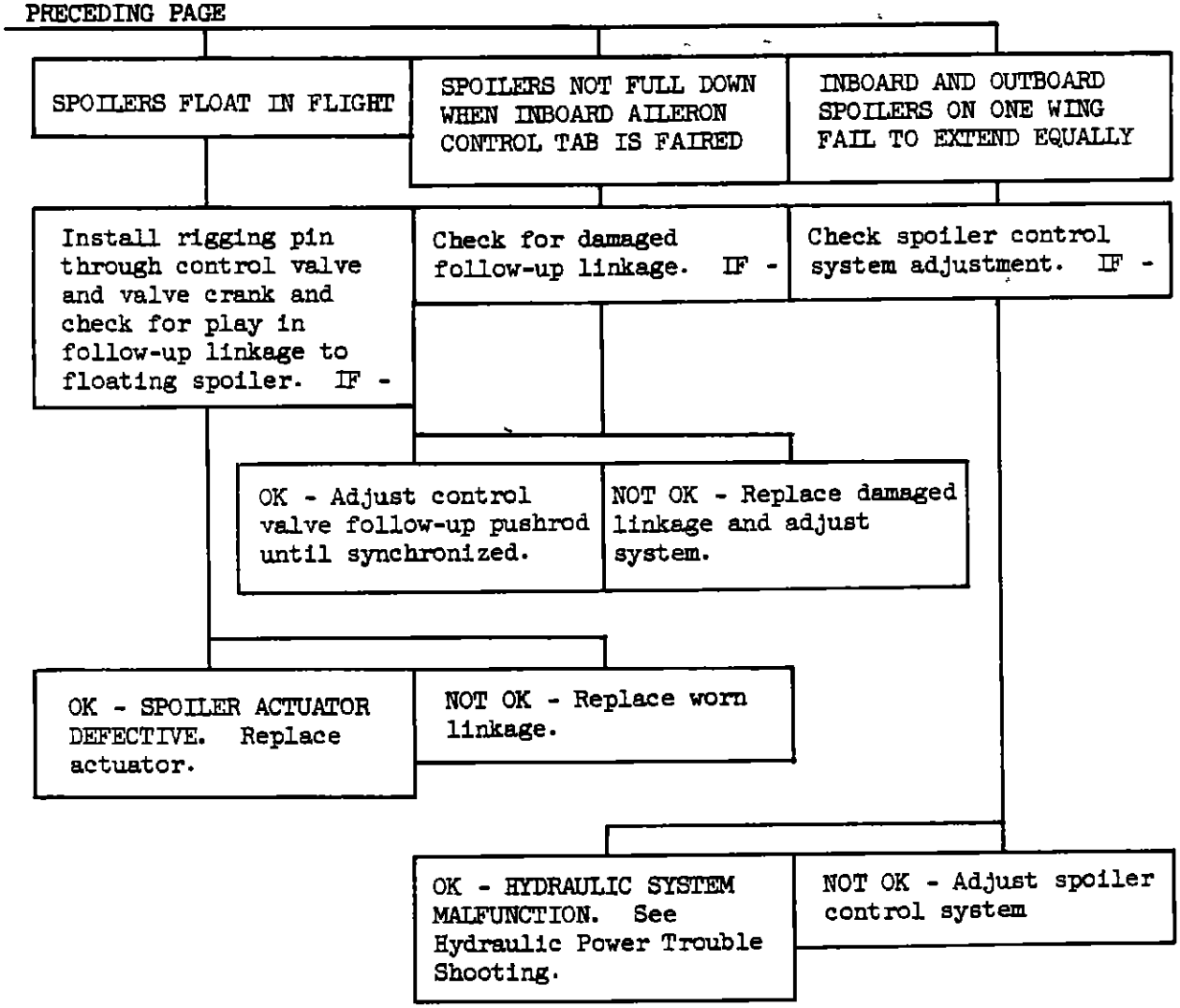


SPOILERS AND SPOILER CONTROL SYSTEM - MAINTENANCE PRACTICES

1. General

A. The spoiler panels may be secured in the raised position by use of spoiler actuator lock assembly F71264-500 or F71264-501. Each lock assembly will secure one pair of spoiler panels by locking both actuators in the extended position.

CAUTION FAILURE TO LOCK BOTH ACTUATORS MAY CAUSE SPOILER KEY DAMAGE IF HYDRAULIC POWER IS APPLIED.

2. Unit Servicing Spoilers and Spoiler Control System

A. Lubricate Spoiler Control System

(1) Lubricate spoilers per figure 201 on Turbojet airplanes.

(2) There are no lubrication provisions on the airplane for spoiler and spoiler actuator mountings and spoiler control system on Turbofan airplanes. Sealed antifriction bearings are used at these points.

3. Adjustment/Test Spoilers and Spoiler Control System

A. Special Tools and Equipment

(1) Protractor Assembly - F52485-500 or equivalent

(2) Stand Assembly - F71292-17 or equivalent

(3) Control surface clamp

B. Prepare for Adjustment

NOTE: The speed brake control system must be adjusted before proceeding with the spoiler adjustment. See 27-5-0, Speed Brake Control System - Maintenance Practices.

(1) Connect electrical power to airplane.

(2) Pressurize utility hydraulic system.

(3) Position flap control lever to 50° FLAP DOWN.

(4) Unlatch inboard cove lip door latches simultaneously and lower doors.

(5) Remove wing lower access panels 1355, 1356, 1357, and 1358. (See Access Doors and Panels, Chapter 12.)

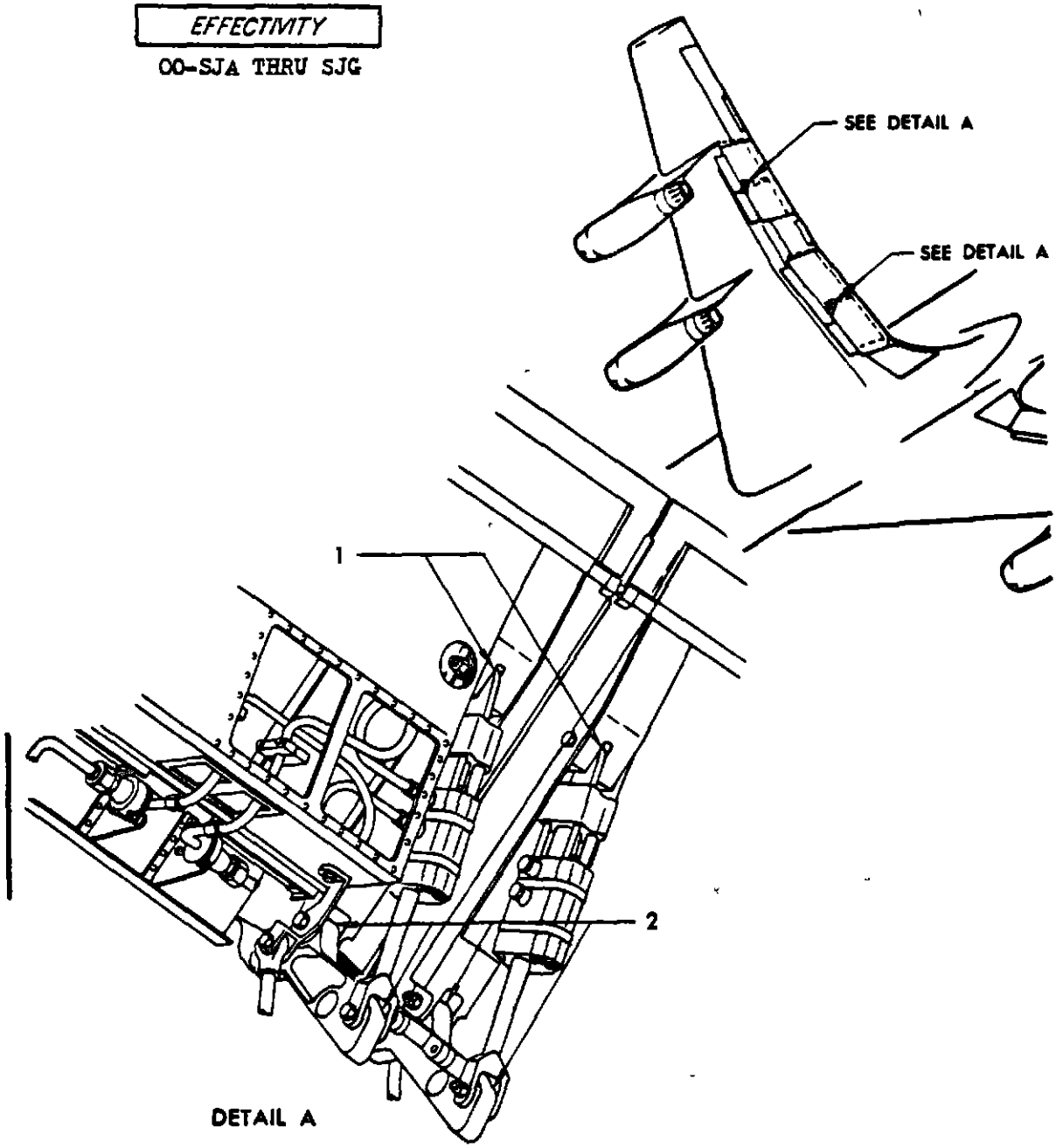
(6) Depressurize hydraulic systems.

(a) Manually position the utility system bypass valve to BYPASS.

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	SPOILER ACTUATOR	Apply grease, Aeroshell 17, to flush fittings (1 place each actuator)
2	SPOILER ACTUATOR AND HINGE SUPPORT	Apply grease, Aeroshell 17, to flush fittings (4 places each actuator)
—	SPOILER CONTROL VALVE	If external leakage is evident, fill with Skydrol 500B to 3/4 inch below filler plug boss.

EFFECTIVITY

00-SJA THRU SJG



Spoiler Control System Lubrication
Figure 201

(b) Connect the utility and auxiliary hydraulic systems by operating the interconnect switch on the copilot's panel.

WARNING: TO PREVENT INJURY TO MAINTENANCE PERSONNEL THE HYDRAULIC POWER TO SPOILERS AND SPOILER CONTROL SYSTEM MUST BE DEPRESSURIZED WHILE RIGGING SYSTEM.

(7) Set aileron trim control wheel at "0."

(8) Remove inboard aileron hinge access panel 1383.

(9) Prepare ailerons for spoiler adjustment.

NOTE: Aileron control and bus systems must be properly adjusted before proceeding. (See 27-14-0.)

(a) Clamp both inboard ailerons in neutral position so that aileron mean trailing edge is 0.75 (± 0.05) inch below wing chord plane.

NOTE. Aileron tab will not fair with aileron.

(b) Clamp straight edge across four thumb rests of aileron control wheels. Wheels are in neutral when one thumb rest contacts straight edge and other is within 0 to .050 inch of contact on each wheel.

(10) Remove cover from inboard spoiler control valve.

(11) Ready speed brakes for spoiler adjustment.

(a) Position speed brake control handle in the "OFF" detent and insure that inboard speed brake control drum crank is fully against off stop.

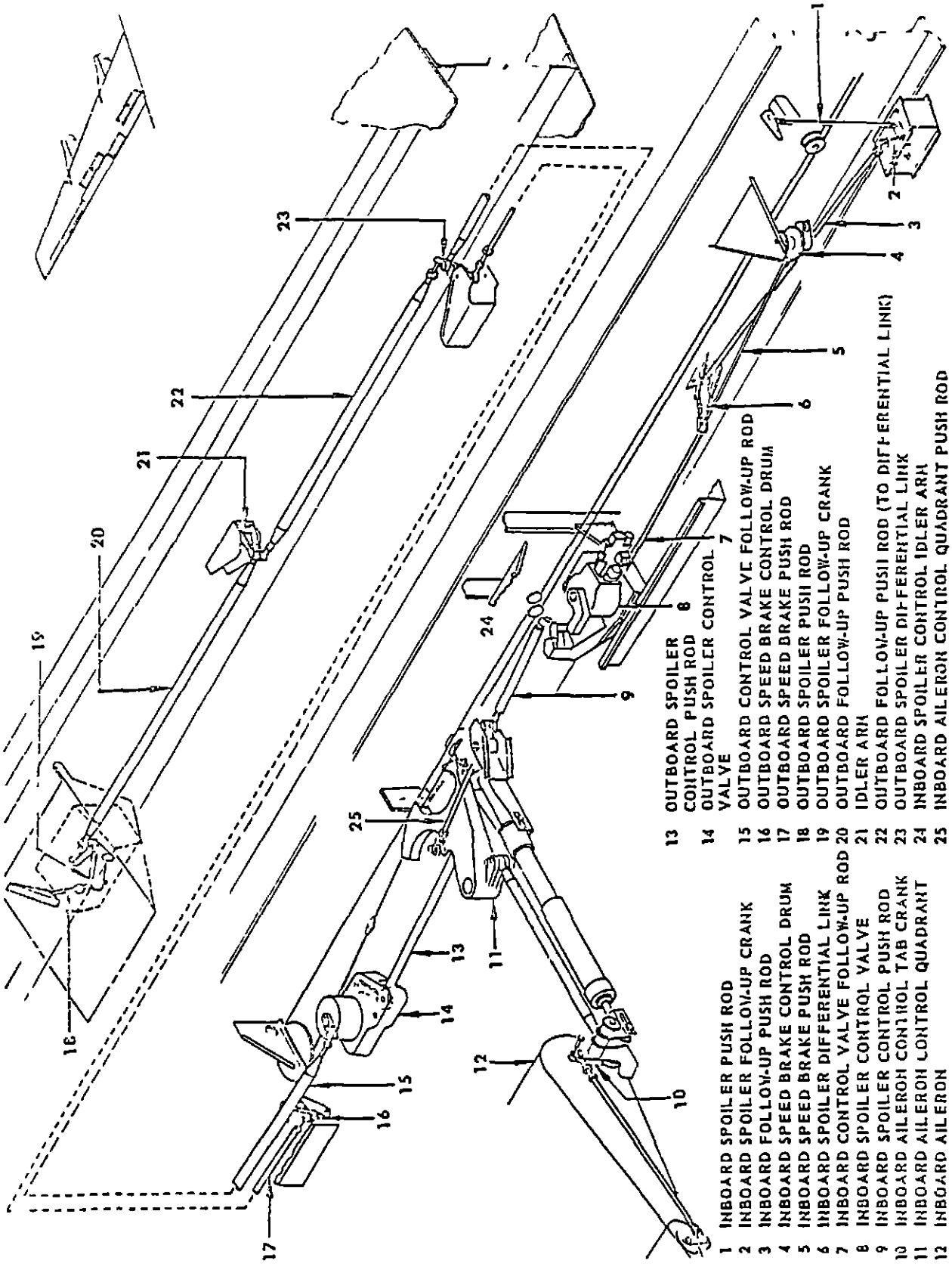
C. Adjust Spoilers and Spoiler Control System

(1) Adjust inboard spoilers.

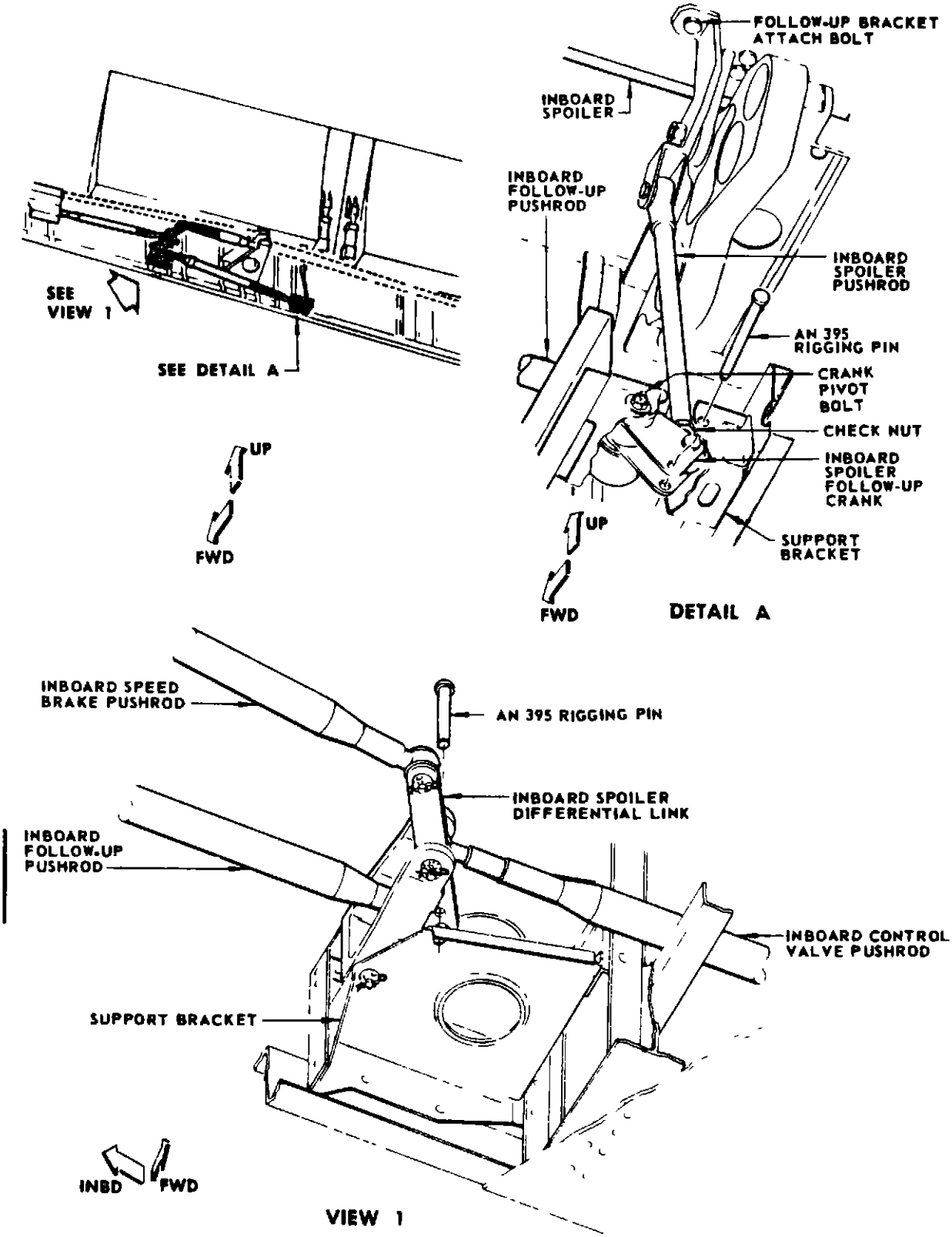
(a) Adjust inboard spoiler pushrod (detail A, figure 203) until AN395 rigging pin or AN5 bolt can be freely inserted through inboard spoiler follow-up crank and support bracket, with inboard spoiler down.

CAUTION: BOLT ATTACHING SPOILER PUSHROD TO SPOILER FOLLOW-UP CRANK MUST BE INSTALLED WITH BOLT HEAD IN AFT DIRECTION TO PREVENT INTERFERENCE BETWEEN BOLT AND SUPPORT BRACKET AS SPOILERS ARE OPERATED.

(b) Adjust inboard spoiler follow-up pushrod and inboard speed brake pushrod until AN395 rigging pin or AN5 bolt can be freely inserted through inboard spoiler differential link and support bracket.



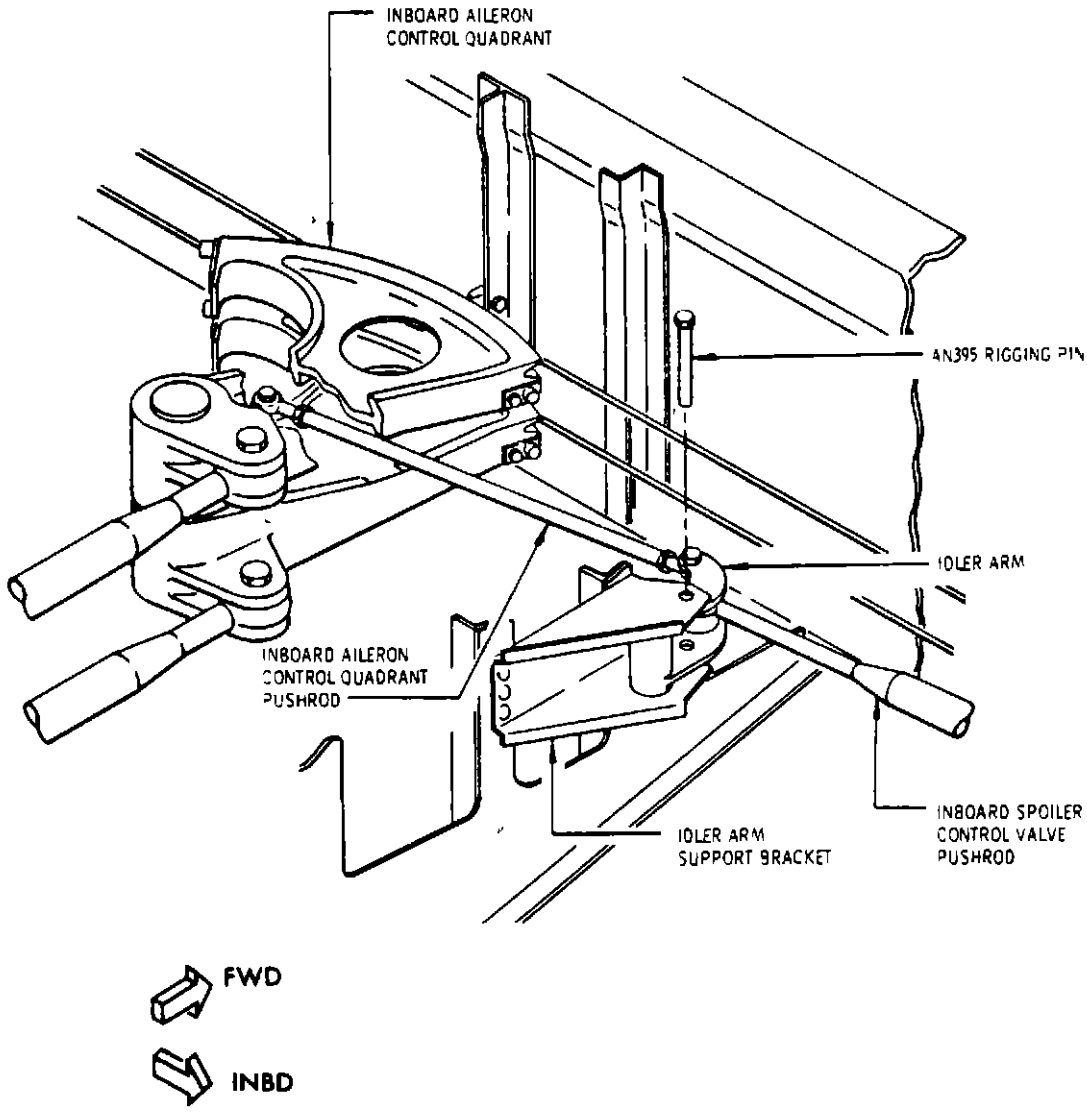
Spoiler Control System
Figure 202



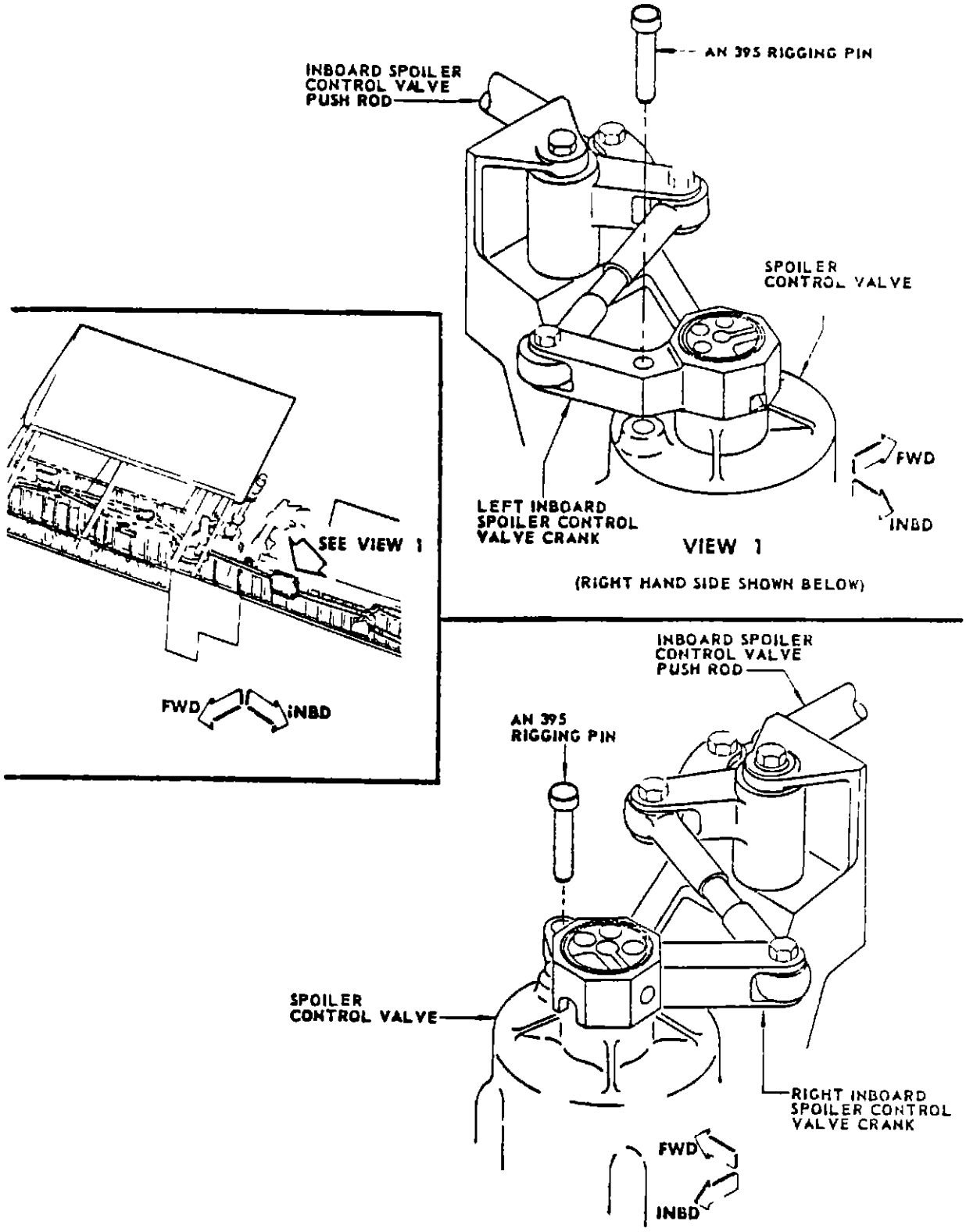
Inboard Spoiler Follow-up Crank and Differential Link Adjustment
Figure 203

(c) Adjust inboard aileron control quadrant pushrod (figure 204) until AN395 rigging pin or AN5 bolt can be freely inserted through idler arm and support bracket.

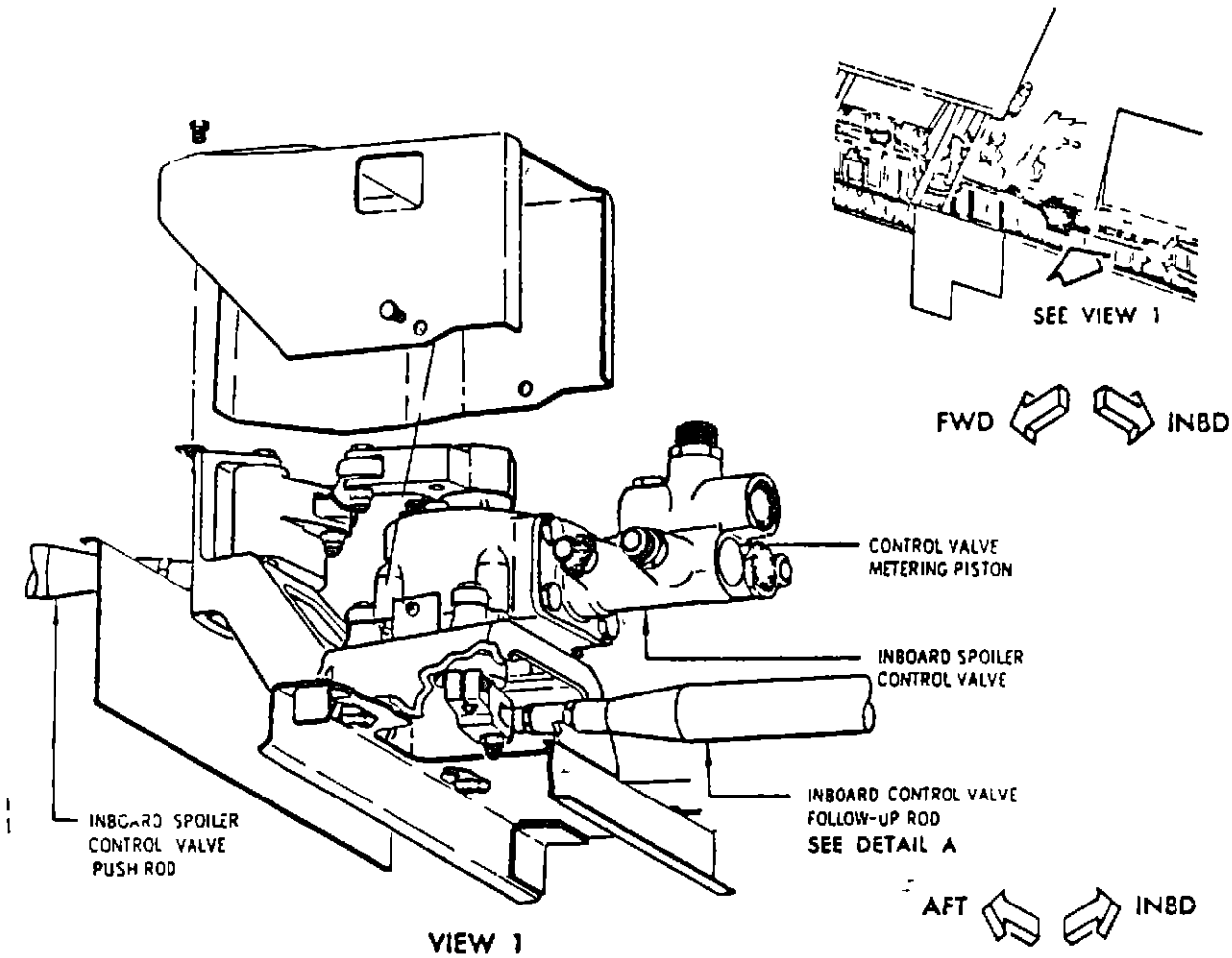
(d) Adjust inboard spoiler control valve pushrod (figure 205) until AN395 rigging pin or AN5 bolt can be freely inserted in the inboard control valve crank and control valve.



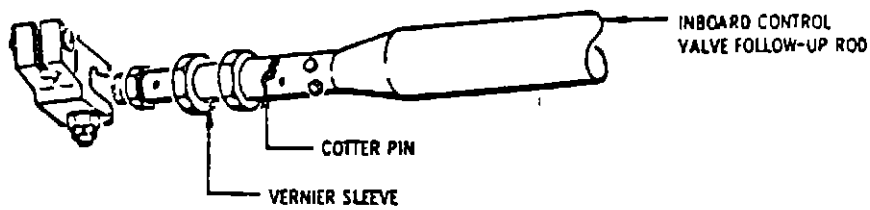
Inboard Aileron Control Quadrant Pushrod and Idler Arm Adjustment
Figure 204



Inboard Spoiler Control Push Rod Adjustment
Figure 205



VIEW 1



DETAIL A

SAB 707/379

(e) Adjust inboard control valve follow-up rod (figure 206) to position control valve metering piston flush with end of valve body sleeve within ± 0.015 inch. The follow-up rod shown in Detail A has a vernier adjustment at the inboard spoiler control valve. Observe the following items when adjusting this rod.

1) Check that threads are visible through inspection holes in both vernier sleeve and rod body.

2) Install cotter pin and check that it prevents vernier rotation.

3) Tighten both check nuts.

(2) Adjust outboard spoiler.

(a) Adjust outboard spoiler pushrod (figure 207) until AN395 rigging pin or AN5 bolt can be freely inserted through outboard spoiler follow-up crank and support bracket with outboard spoiler down.

(b) Adjust outboard follow-up pushrod until AN395 rigging pin or AN5 bolt can be freely inserted through idler arm and support bracket.

(c) Adjust outboard follow-up pushrod (to differential link), (figure 208) and outboard speed brake pushrod until AN395 rigging pin or AN5 bolt can be freely inserted through outboard spoiler differential link and support bracket.

(d) Adjust outboard spoiler control valve pushrod (figure 209) until AN395 rigging pin or AN5 bolt can be freely inserted in the outboard control valve crank arm and control valve.

(e) Adjust outboard control valve follow-up rod (figure 210) to position the control valve metering piston flush with end of valve body sleeve within ± 0.015 inch. The follow-up rod shown in Detail A has a vernier adjustment at the outboard spoiler control valve. Observe the following items when adjusting this rod.

1) Check that threads are visible through inspection holes in both vernier sleeve and rod body.

2) Install cotter pin and check that it prevents vernier rotation.

3) Tighten both check nuts.

(f) Remove all rigging pins.

CAUTION. STRUCTURAL DAMAGE MAY OCCUR TO FOLLOW-UP LINKAGE IF ALL RIGGING PINS ARE NOT REMOVED PRIOR TO APPLYING HYDRAULIC PRESSURE TO THE SPOILER CONTROL VALVES.

(3) Prepare to adjust spoiler control system.

(a) Pressurize hydraulic systems.

(b) Remove clamps from inboard ailerons.

(4) Adjust spoiler control system.

(a) Attach control surface protractor to spoiler panel.

(b) Apply hydraulic pressure to spoiler control valves.

(c) Remove straight edge from aileron control wheel.

S NOTE: **Aileron control wheel is in neutral position when centered.**

(d) Rotate aileron control wheel at least 15° clockwise to insure spoiler panels No. 2 and No. 3 are down.

(e) Set control surface protractor at zero position with spoiler panel fully down as in step (d).

(f) Hold or clamp the left inboard aileron so that trailing edge is 3-3/4° above aileron faired position.

(g) Rotate aileron control wheel 20° counterclockwise from neutral and hold this position.

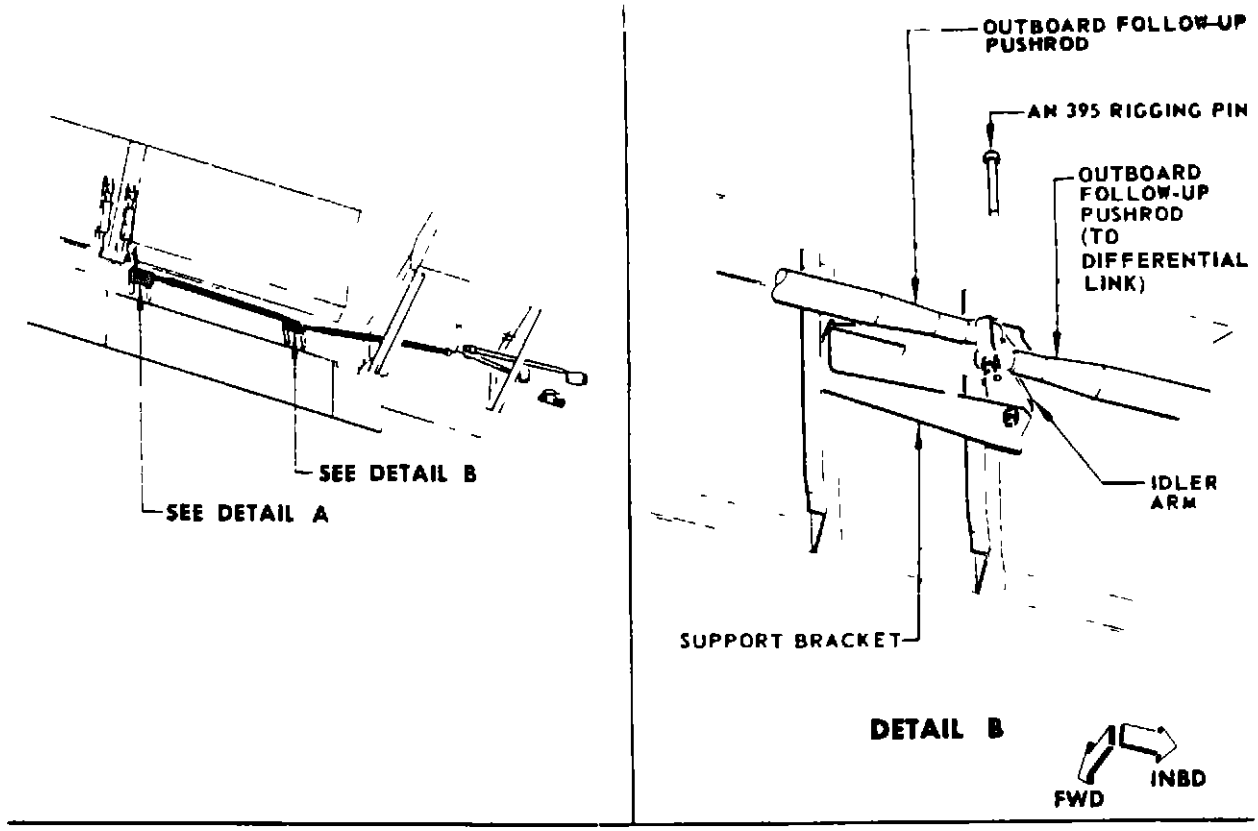
NOTE Do not overshoot 20° wheel position. If control wheel is rotated beyond 20°, repeat wheel rotation from neutral.

(h) After holding wheel at 20° position for at least 20 seconds, measure and record angular position of No. 2 and No. 3 spoilers.

(i) Rotate control wheel to 50° counterclockwise from neutral, then return to 20° counterclockwise and hold this position.

NOTE. Do not overshoot 20° wheel position. If control wheel is rotated through 20° position, repeat wheel rotation from at least 50° counterclockwise.

(j) Measure and record angular position of No. 2 and No. 3 spoiler panels.



Outboard Spoiler Follow-up Crank and Idler Arm Adjustment
Figure 207

(k) If spoiler panels are not within 8° (+1°/-30') from full down when the control wheel reaches 20° from either direction, adjust inboard and outboard control valve follow-up rods as necessary.

1) Deleted

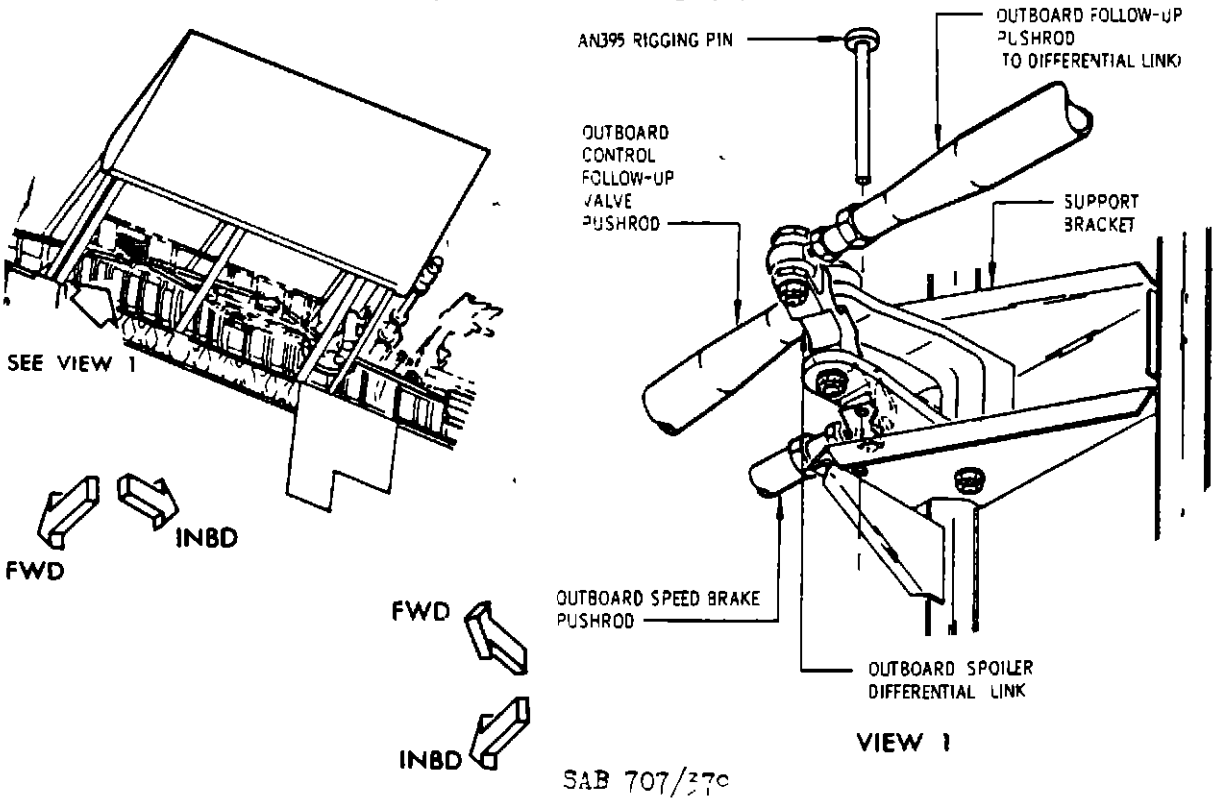
2) The follow-up rod shown in Detail A, figure 206, has a vernier adjustment. Observe the following items when adjusting the rod. Check that threads are visible through inspection holes in both vernier sleeve and rod body. Install cotter pin and check that it prevents vernier rotation. Tighten both check nuts.

(l) Rotate aileron control wheel to neutral. Spoiler panels shall be full down.

(m) Remove clamp from left inboard aileron.

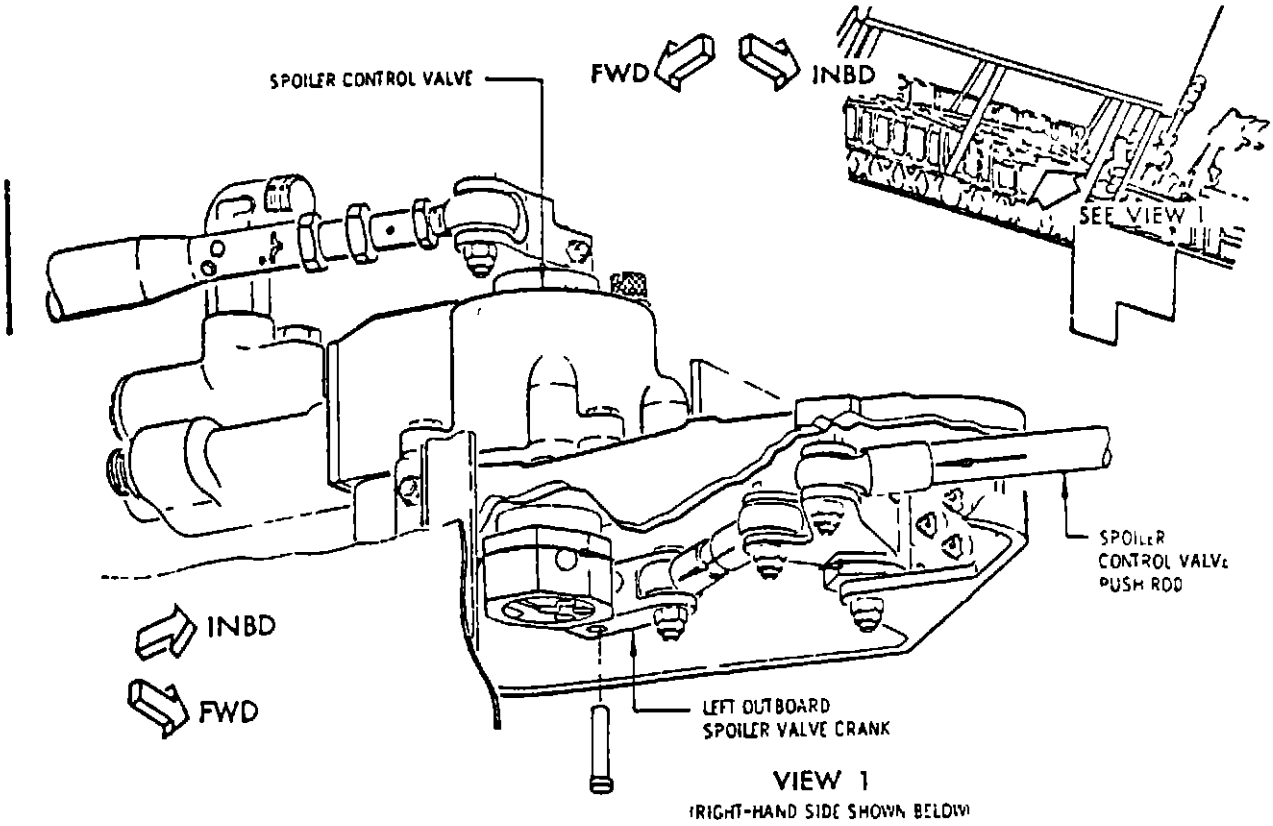
(n) Rotate aileron control wheel at least 15° counterclockwise to insure spoiler panels No. 6 and No. 7 are down.

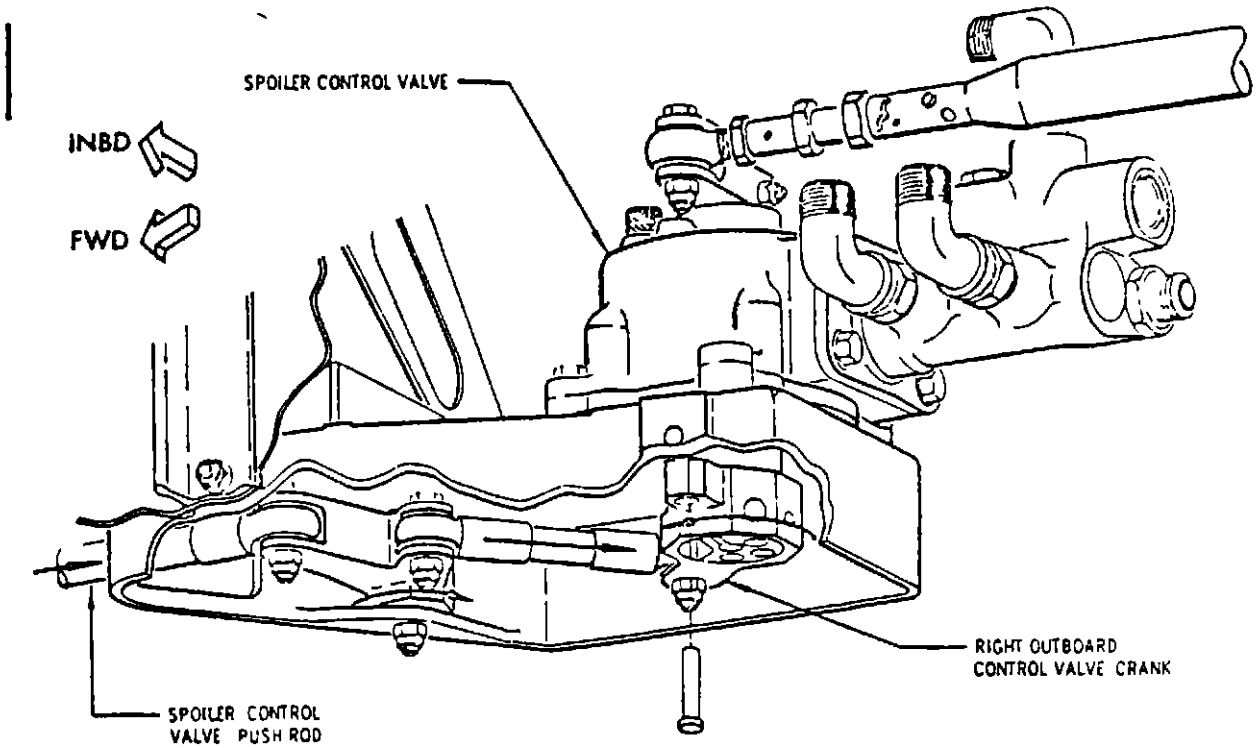
(o) Set control surface protractor at zero position with spoiler panel fully down as in step (n)

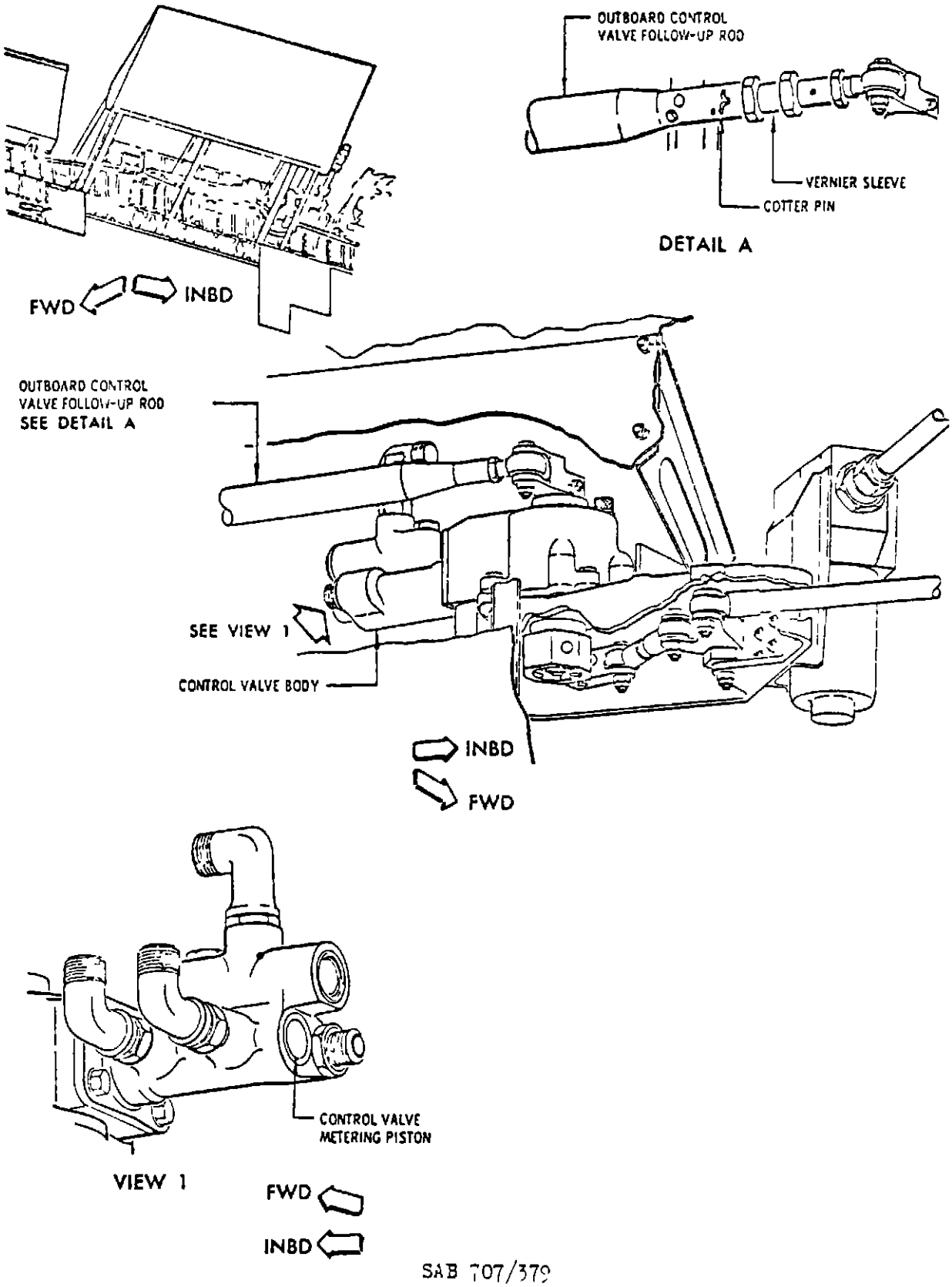


SAB 707/37c

Outboard Follow-up Pushrod Adjustment
Figure 208


SPOILER CONTROL VALVE
FWD
INBD
SEE VIEW 1
SPOILER CONTROL VALVE PUSH ROD
INBD
FWD
LEFT OUTBOARD SPOILER VALVE CRANK
VIEW 1
(RIGHT-HAND SIDE SHOWN BELOW)


SPOILER CONTROL VALVE
INBD
FWD
RIGHT OUTBOARD CONTROL VALVE CRANK
SPOILER CONTROL VALVE PUSH ROD



SAB 707/379

Outboard Spoiler Control Valve Metering Piston Adjustment
Figure 210

(p) Hold or clamp the right inboard aileron so that trailing edge is 3-3/4° above aileron faired position.

(q) Rotate aileron control wheel 20° clockwise from neutral and hold this position.

NOTE Do not overshoot 20° wheel position. If control wheel is rotated beyond 20° position, repeat wheel rotation from neutral.

(r) After holding wheel at 20° position for at least 20 seconds, measure and record angular position of No. 6 and No. 7 spoilers.

(s) Rotate wheel to 50° clockwise, then return to 20° clockwise from neutral and hold this position.

NOTE: Do not overshoot 20° wheel position. If control wheel is rotated through 20° position, repeat wheel rotation from at least 50° clockwise.

(t) Measure and record angular position of No. 6 and No. 7 spoiler panels.

(u) If spoiler panels are not within 8° (+1°/-30') from full down when the control wheel reaches 20° from either direction, adjust inboard and outboard control valve follow-up rods as necessary.

1) Deleted

2) The follow-up rod shown in Detail A, figure 206, has a vernier adjustment. Observe the following items when adjusting the rod. Check that threads are visible through inspection holes in both vernier sleeve and rod body. Install cotter pin and check that it prevents vernier rotation. Tighten both check nuts.

(5) Close up and return systems to normal configuration.

(a) Install inboard spoiler control valve cover

(b) Remove aileron clamps.

(c) Replace all access panels

(d) Raise and latch cove lip doors.

(e) Position flap control lever to "UP "

D Prepare for test.

(1) Position aileron control wheels to neutral with a straight edge across thumb rests.

(2) Set aileron trim control wheel at "0."

(3) Check that each spoiler fairs with fixed wing structure within ± 1/4 inch.

(4) Align projection on hub of control wheel with projection on hub of control column

(5) Determine and mark the following aileron control wheel positions 1°, 2°, 3°, 5°, 20°, 30°, 40°, 50°, 60°, 70°, 85°, 87°, 93°, and 99° (See figure 211)

(a) Place mark on a piece of masking tape to represent neutral. From neutral mark, measure positions according to values shown below

AILERON CONTROL WHEEL POSITION CHART

Degrees	Inches
1°	1/32
2°	1/16
3°	3/32
5°	5/32
20°	5/8
30°	15/16
40°	1-1/4
50°	1-9/16
60°	1-7/8
70°	2-3/16
85°	2-21/32
93°	2-29/32
99°	3-3/32

(b) Place tape around control column with neutral mark aligned with projection on hub of control column

E. Test spoilers and spoiler control system.

NOTE: Aileron control wheel is in neutral position when centered.

(1) Test spoilers and spoiler control system with speed brake lever full forward (inboard speed brake control drum cranks against stop).

(a) Rotate aileron control wheel hard over clockwise with force applied to inboard ailerons to prevent aileron control cranks from contacting stops.

(b) Check that the right inboard spoilers extend 38° to 44° and right outboard spoilers extend 39° to 45°. Measure spoiler angle with protractor and stand assembly.

(c Check that left spoilers are full down.

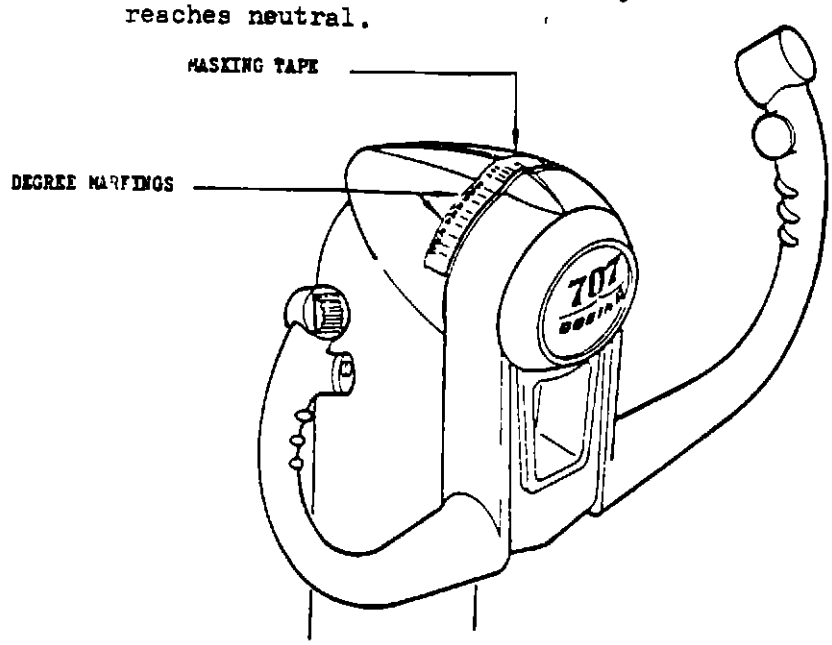
(d) Slowly rotate aileron control wheel to neutral. The right spoilers shall be full down before or just as the control wheel reaches neutral.

(e) Rotate aileron control wheel hard over counterclockwise with force applied to inboard ailerons to prevent aileron control cranks from contacting stops.

(f) Check that left inboard spoilers extend 38° to 44° and left outboard spoilers extend 39° to 45°.

(g) Check that right spoilers are full down.

(h) Slowly rotate aileron control wheel to neutral. The left spoilers shall reach full down before or just as the control wheel reaches neutral.



Control Wheel Marking For Positioning Spoilers
Figure 211

(i) Clamp the left inboard aileron trailing edge 3- ° above aileron faired position.

(j) Rotate aileron control wheel 20° counterclockw. e from neut.al and hold this position.

(k) After holding wheel at 20°-position for at least 20 seconds, check that left spoilers are 7-1/2° to 9° from full down.

NOTE: Deleted

(l) Rotate control wheel to 50° counterclockwise, then return to 20° and hold this position.

(m) After holding wheel at 20° position for at least 20 seconds, check that left spoilers are 7-1/2° to 9° from full down.

(n) Remove clamp from left inboard aileron.

(o) Clamp the right inboard aileron trailing edge 3-3/4° above aileron faired position.

(p) Rotate aileron control wheel 20° clockwise from neutral and hold this position.

(q) After holding wheel at 20° for at least 20 secon s, check that right spoilers are 7-1/2° to 9° from full down.

(r) Rotate control wheel to 50° clockwise, then return to 20° and hold this position.

(s) After holding wheel at 20° position for at least 20 seconds, check that right spoilers are 7-1/2° to 9° from full down.

(t) Remove clamps from inboard ailerons.

(u) Check spoiler pick-up point

1) Speed brake lever shall be full forward.

2) Slowly rotate aileron control wheel counterclockwise until left spoilers start to rise.

3) Check that aileron control wheel is 3° to 5° counterclockwise from the centered position.when inboard and outboard spoilers start to rise.

4) Repeat steps 1) through 3) for the right spoilers, turning the aileron control wheel clockwise.

(2) Test spoilers and spoiler control system with speed brakes.

(a) Position aileron control wheel to neutral. Set aileron trim at neutral.

(b) Move speed brake handle to full aft (full on) position.

(c) Rotate aileron control wheel to 93 ± 6° clockwise with force applied to inboard ailerons to prevent aileron control cranks from contacting stops, except at full aileron travel.

(d) Check that left inboard spoilers have moved down 38° to 44° and the left outboard spoilers have moved down 39° to 45°.

(e) Check that the right spoilers remain up.

(f) Rotate aileron control wheel counterclockwise to neutral. The left spoilers shall return to their initial position when the aileron control wheel is within ± 2° of neutral position.

(g) Rotate aileron control wheel to 93° ± 6° counterclockwise with force applied to inboard ailerons to prevent aileron control cranks from contacting stops, except at full aileron travel.

(h) Check that the right inboard spoilers have moved down 38° to 44° and the right outboard spoilers have moved down 39° to 45°.

(i) Check that left spoilers remain up.

(j) Rotate aileron control wheel clockwise to neutral. The right spoilers shall return to their initial position when the aileron control wheel is within ± 2° of neutral position.

(k) Position speed brake handle full forward.

(l) Rapidly oscillate aileron control wheel through angle of 20° with center of arc at 30° clockwise.

(m) Check that the spoilers do not chatter and that there is no motion of spoilers after control wheel oscillations have stopped.

(n) Repeat steps (l) and (m) with center of arc at 60° clockwise, 30° counterclockwise, and 60° counterclockwise.

(3) Test spoilers and spoiler control electrical system.

(a) Position outboard spoiler bypass switch to "OFF".

(b) Check that outboard spoilers do not respond to aileron control wheel movement.

(c) Depressurize utility hydraulic system.

(d) Position interconnect valve switch to "CLOSE".

(e) Position auxiliary hydraulic pump switch to "ON".

(f) Check that inboard spoilers respond to aileron control wheel movement.

(g) Position inboard spoiler bypass switch to "OFF".

(h) Check that inboard spoilers do not respond to control wheel movement.

(4) Test spoiler hold down capability.

(a) Position auxiliary hydraulic pump switch to "OFF".

(b) Check that spoiler panels can not be raised manually. Spoilers which may be lifted off are to be replaced.

(5) Return systems to normal configuration

(a) Position auxiliary hydraulic pump switch to "OFF".

(b) Position inboard and outboard spoiler switches to "ON".

(c) Disconnect hydraulic power source.

(d) Disconnect electrical power source.

4. Inspection/Check Spoilers and Spoiler Control System

A. Prepare for Check

(1) Pressurize utility hydraulic system.

(2) Position flap control lever to "DOWN."

(3) Unlatch cove lip door latches simultaneously and lower outboard cove lip doors 1362 and 1363 on turbojet airplanes; 1261 and 1262 on turbofan airplanes. (See "Access Doors and Panels," Chapter 12.)

(4) Remove wing lower access panels 1355, 1356, 1357, and 1358.

B. Check spoilers and spoiler control system.

(1) Check spoiler control valve crank rivets for shear (figure 212). For approved repairs see 27-4-21 and 27-4-31.

(2) The shear feature has been eliminated on inboard and outboard spoiler follow-up cranks by replacing shear rivets with structural rivets.

(a) Check alignment of inspection hole (detail B, figure 212) and for play between crank arms. For approved repairs see 27-4-91

(3) Check spoilers for wear per figure 213. (For removal see 27-4-1.)

(4) Check that the outboard edge of each outboard spoiler does not droop more than one inch below adjacent fixed wing structure.

(5) Check that drilled bolt heads are lockwired on follow-up bracket attach bolt and crank pivot bolt on inboard spoilers. (See figure 203.)

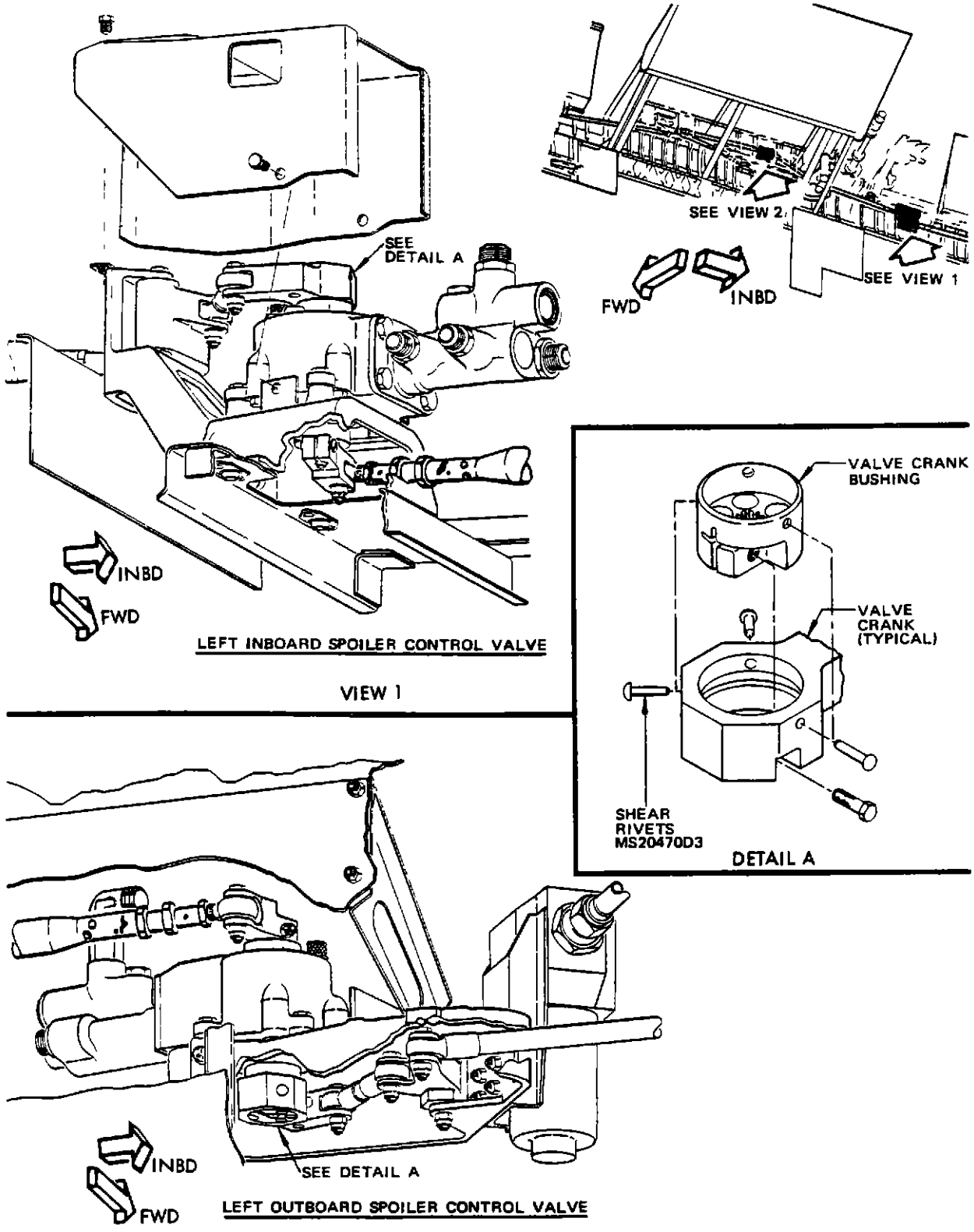
C. Close up and return systems to normal configuration.

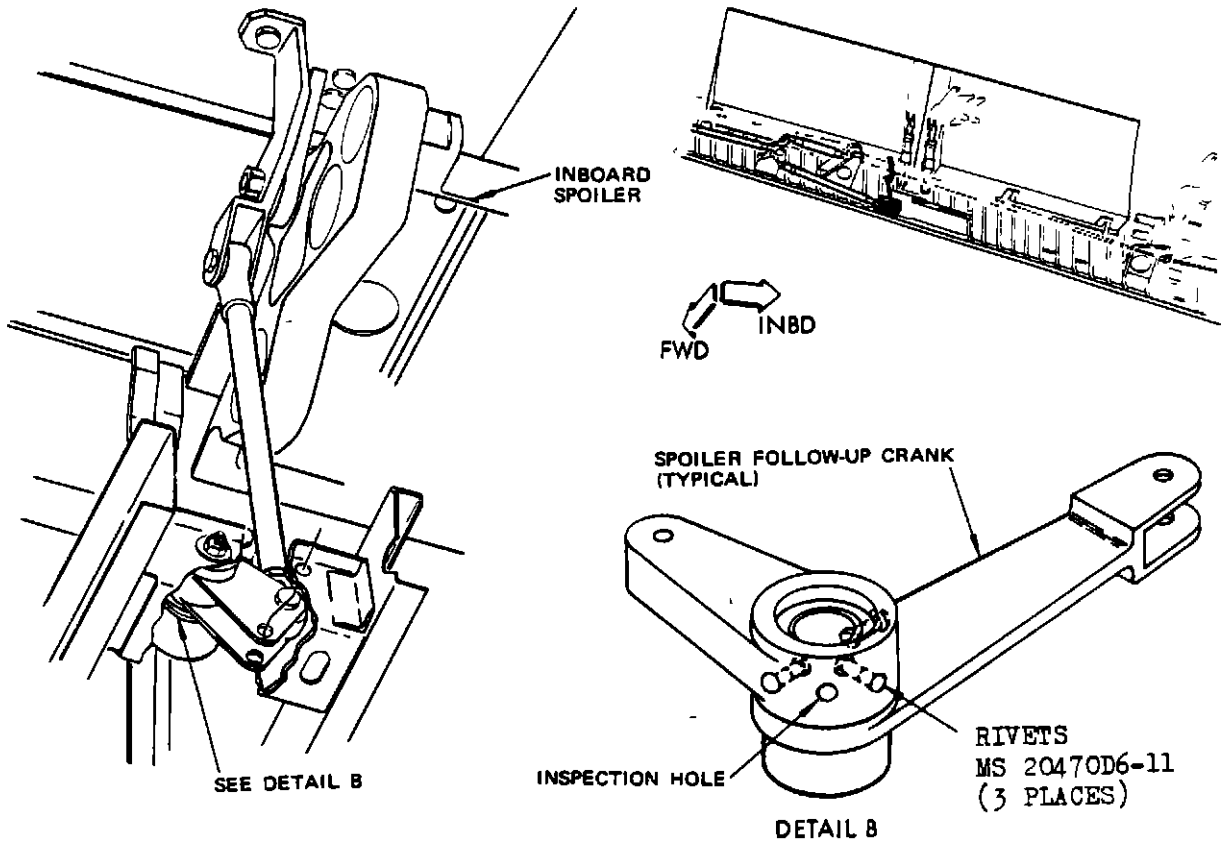
(1) Raise and latch cove lip doors and replace all access panels.

(2) Position flap control lever to "UP."

(3) Disconnect hydraulic pressure source.

(4) Disconnect electrical power source.


SEE VIEW 2
SEE VIEW 1
FWD
INBD
SEE DETAIL A
INBD
FWD
LEFT INBOARD SPOILER CONTROL VALVE
VIEW 1
VALVE CRANK BUSHING
VALVE CRANK (TYPICAL)
SHEAR RIVETS MS20470D3
DETAIL A
SEE DETAIL A
INBD
FWD
LEFT OUTBOARD SPOILER CONTROL VALVE
VIEW 2



EFFECTIVITY

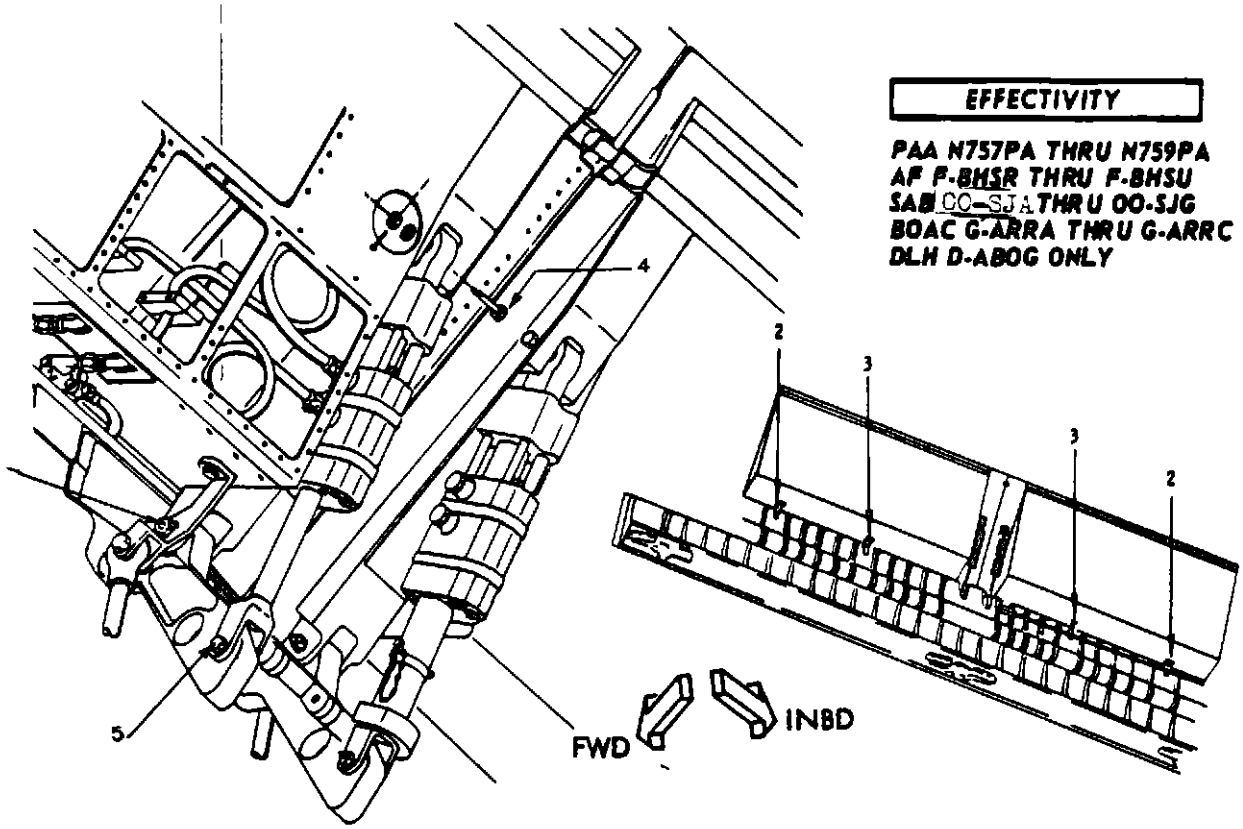
SABENA 00-SJA thru 00-SJG

Spoiler System Shear Rivets
Figure 212 (Sheet 2)

D E L E T E D

EFFECTIVITY

PAA N757PA THRU N759PA
AF F-BHSR THRU F-BHSU
SAB OO-SJA THRU OO-SJG
BOAC G-ARRA THRU G-ARRC
DLH D-ABOG ONLY



INDEX NO.	DIM.	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX.	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX. DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL.	OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE MIN.	BUSHING INTERFERENCE MAX.
1	ID	.3737	.3752	.3772	.0030	x*		[1]	[2]	.0003	.0016
	OD	.3735	.3745	[4]							
2	ID	.2500	.2540	.2572	.0080	x		[1]	[2]	.0002	.0013
	OD	.2485	2495	[4]							
3	ID	.3130	.3170	.3200	.0083	x		[1]	[2]	.0002	.0013
	OD	.3110	3120	[4]							
4	ID	.3737	.3752	.3775	.0030	x		[3]	[3]	.0005	.0017
	OD	.3735	.3745	[4]							

[1] 7075-T6 Bushing

[2] No oversize bolt allowed

[3] 4130 Cadmium plated steel bushing, heat treated 125,000 - 140,000 psi 0.495 max. ID -(Ref: Wear and Rework, p 1-26a).

[4] Replace bolt when cadmium plating is worn off

Spoiler Service Wear Limits
Figure 213A

SAB REV 17 DEC 1966
Dec 15/64

* Max. allowable ID for rework is 0.625 inch.

FIG 213 A		DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
INDEX N°	DIM	DIAMETER		MAX WEAR DIM	MAX DIAM CLEARANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTERFERENCE	
		MIN	MAX			YES	NO	MTL		MIN	MAX
5	ID	0 375	0 379		0 010						
	OD	0 3735	0 3745	④							

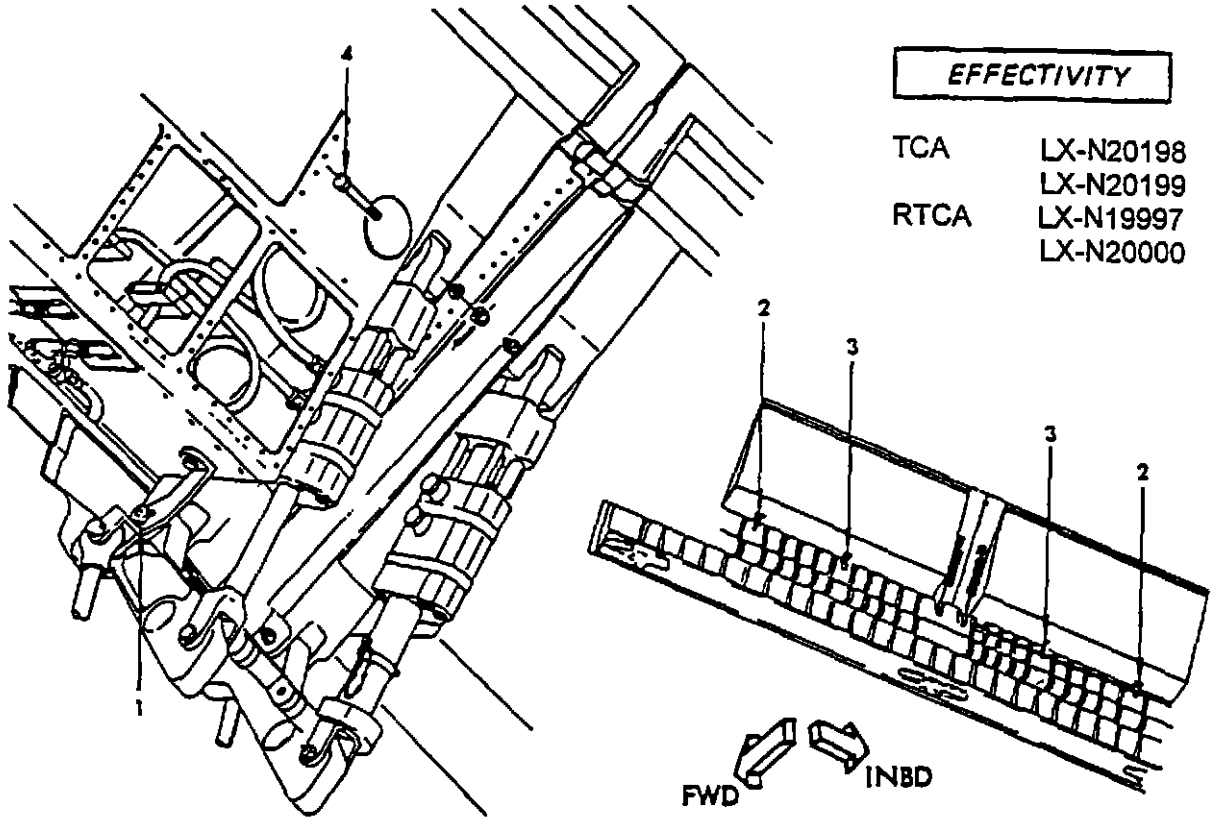
④ Replace bolt when cadmium plating is worn off

Ref OM 27-4-1 page 7 table II

SAB. REV. 17 DEC 1966

EFFECTIVITY

TCA LX-N20198
LX-N20199
RTCA LX-N19997
LX-N20000



INDEX NO.	DIM.	DESIGN LIMITS DIAMETER MIN.	DESIGN LIMITS DIAMETER MAX.	WEAR LIMITS MAX. WEAR DIM.	WEAR LIMITS MAX. DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL.	OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE MIN.	BUSHING INTERFERENCE MAX.
1	ID	.4995	.5005	.5030	.0035	x		[1]	[2] .625	.0005	.0015
	OD	.4985	.4995	[3]							
2	ID	.2500	.2540	.2575	.0080	x		[3]	[2] .400	.0000	.0004
	OD	.2485	.2495	[3]							
3	ID	.3750	.3790	.3835	.0090	x		[3]	[2] .500	.0000	.0004
	OD	.3735	.3745	[3]							
4	ID	.4995	.5005	.5030	.0035	x		[4]	[2] .625	.0004	.0010
	OD	.4985	.4995	[3]							

[1] Cadmium plated steel or bronze bushing
[2] No oversize bolt allowed
[3] Replace bolt when cadmium plating is worn off
[4] Bronze bushing

SPOILERS - MAINTENANCE PRACTICES

1. Removal/Installation Spoiler

A. General

(1) Spoilers are located on the wing in pairs. Replacement of either inboard or outboard spoiler can be done without removing the adjacent spoiler.

(2) A container will be required to catch spilled hydraulic fluid when the spoiler hydraulic lines are disconnected from the swivel joint fittings. Should any fluid spill on the airplane, decontaminate the area. Refer to Cleaning and Washing, Chapter 12.

B. Equipment and Materials

(1) Spoiler Actuator Lock - F71264-500, or F71264-501 or equivalent

(2) Grease - Aeroshell 17.

C. Remove Spoiler

(1) Pressurize utility hydraulic system.

(2) For inboard spoilers, position interconnect valve to OPEN.

(3) Position flap control lever to DOWN.

(4) Position speed brake handle to 60 degrees to raise spoilers.

(5) Unlatch cove lip door latches simultaneously and lower cove lip doors under spoiler to be removed.

(6) Install spoiler actuator lock (6, figure 201) on spoiler not being removed.

(7) Depressurize utility hydraulic system.

(8) Disconnect bonding jumpers from spoiler to be removed.

(9) Disconnect hydraulic lines (12) at swivel joints (10).

(10) Disconnect spoiler actuator from wing by removing bolt (3).

(11) If connector key as shown in Detail A is installed, remove spoiler as follows:

(a) Disconnect follow-up pushrod (8) from follow-up bracket (9). Perform this step even if follow-up pushrod does not connect to spoiler which is being removed.

CAUTION: SPOILER FOLLOW-UP PUSHROD MUST BE DISCONNECTED FROM SPOILER BEFORE DETACHING SPOILER ACTUATORS TO PREVENT DAMAGE TO FOLLOW-UP LINKAGE WHEN SPOILERS ARE DEFLECTED BEYOND NORMAL 60° UP POSITION.

(b) If removing spoiler from outboard pair, disconnect autopilot position transmitter control arm from extreme outboard spoiler.

CAUTION: AUTOPILOT POSITION TRANSMITTER CONTROL ARM MUST BE DISCONNECTED FROM SPOILER PRIOR TO DETACHING SPOILER ACTUATORS TO PREVENT DAMAGE TO TRANSMITTER WHEN SPOILERS ARE DEFLECTED BEYOND NORMAL 60° UP POSITION.

(c) Remove all spoiler hinge bolts (7) from spoiler which is being removed and hinge bolt (7A) from the adjacent spoiler.

(d) Push down at hinge end (7A) of both spoilers and remove connector key (2).

(e) Remove spoiler actuator lock from adjacent spoiler. Rotate spoilers to a 40° up position and remove spoiler.

(12) If clevis pin as shown in Detail B is installed, remove spoiler as follows.

(a) Disconnect follow-up pushrod (8) from follow-up bracket (9).

NOTE: This step is applicable only for outboard spoiler of inboard pair and inboard spoiler of outboard pair.

(b) If extreme outboard spoiler is being removed, disconnect autopilot position transmitter control arm.

(c) Remove cotter pin (18) from clevis pin (17) and remove clevis pin.

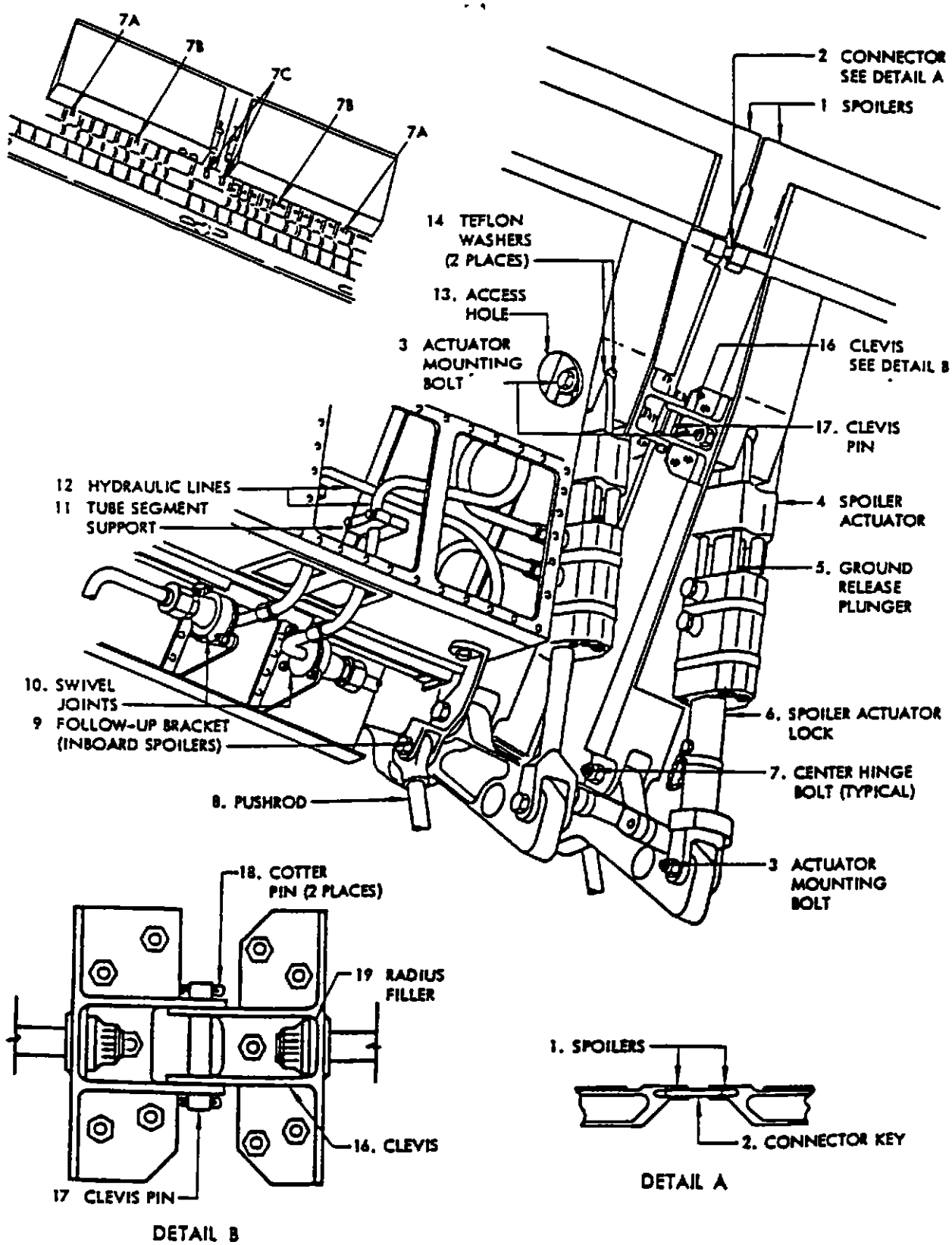
(d) Remove all spoiler hinge bolts (7) from spoiler to be detached.

(e) Remove spoiler actuator lock from adjacent spoiler. Rotate spoilers to a 40° up position and remove spoiler.

D. Prepare for installation.

(1) Remove spoiler access panels.

(2) Position two teflon washers (14, figure 201) in spoiler actuator hinge.


7A
7B
7C
7B
7A
2 CONNECTOR SEE DETAIL A
1 SPOILERS
14 TEFLON WASHERS (2 PLACES)
13. ACCESS HOLE
3 ACTUATOR MOUNTING BOLT
16 CLEVIS SEE DETAIL B
17. CLEVIS PIN
12 HYDRAULIC LINES
11 TUBE SEGMENT SUPPORT
4 SPOILER ACTUATOR
5. GROUND RELEASE PLUNGER
10. SWIVEL JOINTS
9 FOLLOW-UP BRACKET (INBOARD SPOILERS)
6. SPOILER ACTUATOR LOCK
7. CENTER HINGE BOLT (TYPICAL)
8. PUSHROD
3 ACTUATOR MOUNTING BOLT
18. COTTER PIN (2 PLACES)
19 RADIUS FILLER
16. CLEVIS
17 CLEVIS PIN
DETAIL B
1. SPOILERS
2. CONNECTOR KEY
DETAIL A

(3) Lightly coat nut and mounting bolt (3) with Aeroshell Grease 17 before installing.

(4) Align actuator (4) with spoiler (1) and install mounting bolt (3). Install radius filler (19) if clevis (16) is installed.

NOTE: If actuator has ground release plunger (5), install with plunger down. If actuator does not have ground release plunger, install with hydraulic ports toward spoiler panel.

(5) Position hydraulic lines (12) in each spoiler and attach to spoiler actuator.

(6) Connect hydraulic tube segment support (11) to spoiler.

(7) Install follow-up bracket (9) on outboard spoiler of inboard pair. Lockwire head of bolt which attaches bracket to spoiler.

(8) Install access hole cover.

E. Install spoilers

(1) Lightly coat nuts, mounting bolt (3) and hinge bolts (7) with Aerosnell Grease 17.

(2) If connector key as shown in Detail A is used:

(a) Align spoiler with rear spar and install hinge bolts (7B) and (7C).

NOTE: Position spoiler at 40 degrees up position. Ensure seal on left spoiler, of pair, overlaps right spoiler.

(b) Position spoilers at 60 degrees up position and install spoiler actuator lock on adjacent spoiler.

(c) Push down at hinge bolt location (7A) of both spoilers and install connector key (2) to engage both spoilers.

(d) Install hinge bolts (7A) on both spoilers.

(3) If clevis pin as shown in Detail B is used:

(a) Align spoiler with rear spar and install hinge bolts (7)

NOTE: Position spoiler at 40° up position. Ensure seal on left spoiler, of pair, overlaps right spoiler.

(b) Position spoilers at 60° up position and install spoiler actuator lock on adjacent spoiler.

(c) Install clevis pin (17) to connect the spoiler pair. Secure clevis pin with two cotter pins (18).

(3a) Check that through full travel of spoiler there is no interference of spoiler hinges with wing skin at skin cut-outs.

(4) Connect hydraulic lines (12) to swivel joints (10).

(5) Align spoiler actuator (4) with rear spar and install mounting bolt (3).

(6) Connect bonding jumpers to spoiler.

(7) Remove actuator lock (6) and lower spoilers.

(8) Connect follow-up pushrod (8) to follow-up bracket (9) at inboard spoiler of outboard pair of outboard spoiler of inboard pair.

(9) If installing spoiler at outboard pair connect autopilot position transmitter control arm at extreme outboard spoiler.

(10) Adjust follow-up pushrod (8) such that AN395 rigging pin or AN5 bolt can be installed freely through follow-up crank and support bracket.

CAUTION: BOLT ATTACHING SPOILER PUSHROD TO SPOILER FOLLOW-UP CRANK MUST BE INSTALLED WITH BOLT HEAD IN AFT DIRECTION TO PREVENT INTERFERENCE BETWEEN BOLT AND SUPPORT BRACKET AS SPOILERS ARE OPERATED.

(11) Remove rigging pin.

(12) Position speed brake control handle to 0°.

(13) Pressurize utility hydraulic system.

(14) If installing an inboard spoiler connect electrical power to airplane and position interconnect valve switch to "OPEN."

(15) Position speed brake handle to 60°.

(16) Check hydraulic fittings for leakage.

(17) Depressurize utility hydraulic system.

(18) Install spoiler actuator lock.

(19) Install spoiler access panels.

(20) Raise and latch cove lip doors.

(21) Pressurize utility hydraulic system.

(22) Position flap control lever to "UP."

(23) Remove spoiler actuator lock.

(24) Position speed brake lever to 0°.

(25) Check that each spoiler fairs with fixed wing structure within 1/4 inch.

(26) Check that inboard spoiler rub button contacts spoiler downstop and that spoiler trailing edge fairs with flap surface within 0.03 (+0.10/-0.00) inch. If clearance is not within limits (See figure 202.)

(a) Position speed brake control lever to 60° to raise spoilers.

(b) Position flap control lever to DOWN to lower trailing edge flaps.

(c) Remove spoiler downstop.

(d) Add or remove shim as required to obtain desired clearance.

(e) Install spoiler downstop.

(f) Position flap control lever to UP.

(g) Position speed brake control lever to 0°.

(27) Position interconnect valve switch to CLOSED.

(28) Disconnect electrical power source.

(29) Disconnect hydraulic pressure source.

2. Inspection/Check Spoilers

A. Check Spoilers

(1) Connect electrical power to airplane.

(2) Pressurize utility hydraulic system.

(3) Position interconnect valve switch to OPEN.

(4) Position speed brake handle to 60°.

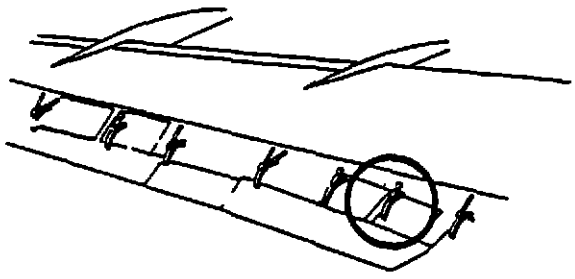
(5) Check spoiler rubbing strips and seals for deterioration.

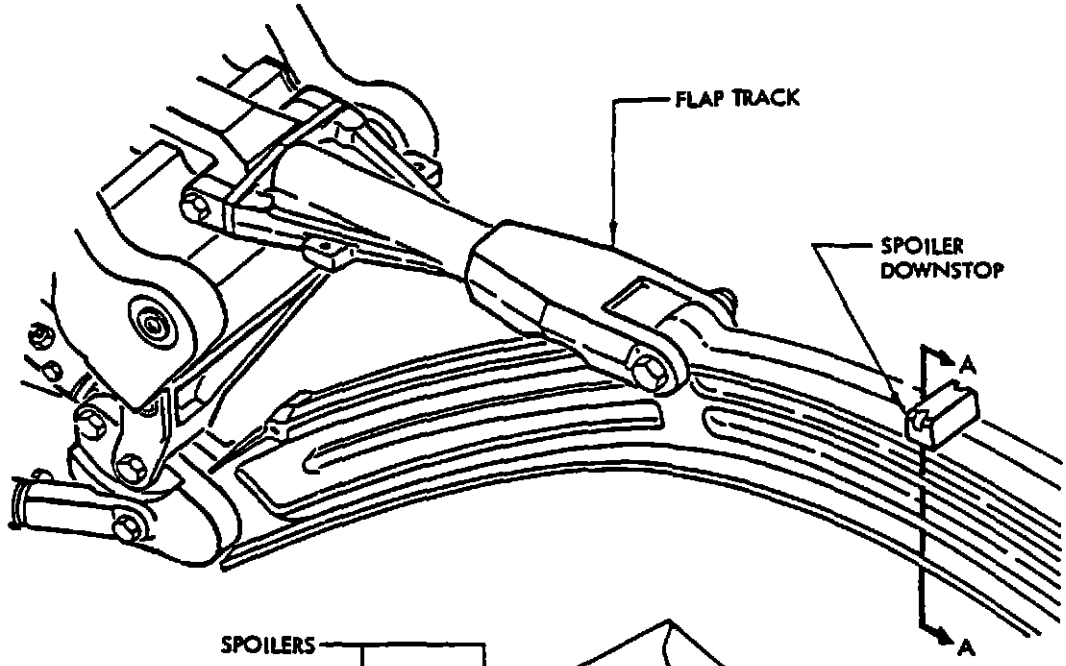
(6) Position speed brake control lever to 0°.

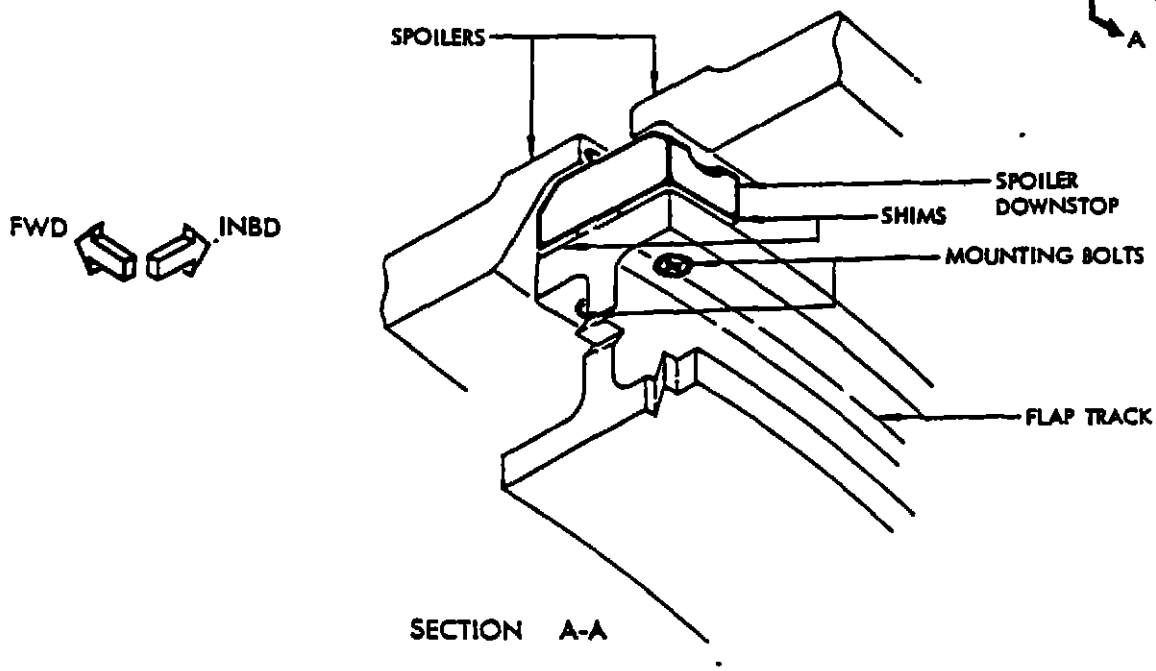
(7) Position interconnect valve switch to CLOSED.

(8) Disconnect hydraulic pressure source.

(9) Disconnect electrical power source.




FLAP TRACK
SPOILER DOWNSTOP
A
A


SPOILERS
SPOILER DOWNSTOP
SHIMS
MOUNTING BOLTS
FLAP TRACK
FWD
INBD
SECTION A-A

3. Approved Repairs Spoilers

A. General

(1) Spoiler leading edge seals on all airplanes are Skydrol resistant rubber extrusions held in place by metal retainer strips with screws and nutplates. The seal attaches to wing structure.

(2) On OO-SJA through OO-SJG, spoiler end seals are mohair strips, cemented to metal backing plates and attached to the spoiler end rib with screws and nutplates.

(3) On TCA LX-N20198, LX-N20199 and RTCA LX-N19997, LX-N20000, spoiler end seals are skydrol-resistant rubber extrusions, attached to the spoiler end rib with metal retainer strips, screws and nutplates.

(4) Deleted.

(5) Spoiler trailing edge seals are mohair strips cemented to metal backing plates and attached to the spoiler lower skin with screws and nutplates.

B. Equipment and Materials

(1) Spoiler Actuator Lock - F71264-500 or F71264-501 or equivalent

(2) Paint Stripper, MIL-R-25134 or equivalent

(3) Methyl Ethyl Ketone, TT-M-261 or equivalent

(4) Adhesive, Churchill 3C-90A, Churchill Chemical Corporation, Los Angeles, California or equivalent

(5) Adhesive, Churchill 3C-90B, Churchill Chemical Corporation, Los Angeles, California or equivalent

C. Replace Spoiler Mohair Seals

(1) Pressurize utility hydraulic system.

(2) If replacing inboard spoiler seals, connect electrical power to airplane and position interconnect valve switch to OPEN.

(3) Position speed brake control lever to 60°.

(4) Install spoiler actuator lock.

(5) Depressurize utility hydraulic system.

(6) Remove mohair seal and backing plate assembly from spoilers so equipped, and replace with new assembly.

(7) **If it is desired to rework a seal assembly by replacing the mohair strip on the old backing plate, the following procedure applies:**

(a) Scrape old seal from backing plate to expose adhesive surface.

NOTE. Steps (b) through (d) may be omitted if majority of old adhesive is scraped off, provided care is used to avoid damage to the skin surface.

(b) Apply a heavy coat of paint stripper, MIL-R-25134 to adhesive surface with brush or spatula.

NOTE Temperature must be between 50°F and 100°F and surface must be dry. Do not apply stripper in rain or hot sun.

(c) Allow stripper to set for one hour.

(d) Rinse backing plate with high pressure water to remove stripper.

(e) Dry area and apply methyl ethyl ketone, TT-M-261 to faying surface. Scrub with clean fiber brush.

(f) Using a clean oil and lint free material such as new cheesecloth, wipe solvent from area before it evaporates. Laundered returnable rags are not satisfactory.

(g) Mix 100 parts of Churchill 3C-90A with 58 parts of Churchill 3C-90B. Pot life of mixed adhesive is 30 minutes at 75°F.

(h) To cement mohair strip to backing plate:

(1) Trim trailing edge seal to allow full overlap of cloth on reverse side of metal plate.

(2) Trim end seals so cloth edges meet on reverse side of metal plate.

(3) Remove mohair pile in area of holes for attach screws.

(i) Deleted

(j) Apply adhesive to both faying surfaces with brush or spatula.

(k) Press seal firmly to backing plate, holding in position with clamps if necessary.

(l) Remove excess uncured adhesive with methyl ethyl ketone.

(m) Allow to cure for 48 hours at 75° (± 5°)F or for 3 hours at 160° (± 10°)F.

NOTE. Cure for 45 minutes at 160° (± 10°)F is adequate if polymerization has occured so that the adhesive is firm when pressed with the thumb-nail.

(n) Attach mohair seal and backing plate assembly to spoiler, where applicable.

(8) Remove spoiler actuator lock.

(9) Pressurize utility hydraulic system.

(10) Position speed brake control lever to 0°.

(11) Position interconnect valve switch to CLOSED.

(12) Disconnect hydraulic pressure source and electric power.

INBOARD SPOILER CONTROL VALVE ASSEMBLY - MAINTENANCE PRACTICES

1. General

A. When disconnecting the hydraulic lines from the fittings on the inboard spoiler control valve, a container is required to catch spilled hydraulic fluid. Should any fluid spill on the airplane, decontaminate the area. Refer to Cleaning and Washing, Chapter 12.

CAUTION: SPOILER CONTROL VALVE, 65-7018, 50-6875, OR 50-6875-1, AND FLAP CONTROL VALVE 50-6875, 65-21890-1 OR 65-40449-1 ARE INSTALLED IN THEIR RESPECTIVE CONTROL SYSTEM. THESE VALVES ARE IDENTICAL IN APPEARANCE, BUT VALVES WITH DIFFERENT PART NUMBERS ARE NOT INTERCHANGEABLE.

ON 00-SJA THROUGH 00-SJG, USE VALVES 65-7018.

ON 00-SJH AND ON, USE VALVES 50-6875-1.

WHEN REPLACING A SPOILER CONTROL VALVE, ENSURE THAT THE FOUR CONTROL VALVE PART NUMBERS MATCH.

SPOILER CONTROL VALVE CRANKS AS SHOWN IN FIGURE 201 ARE NOT INTERCHANGEABLE, AND CARE MUST BE TAKEN NOT TO INSTALL THESE CRANKS IN THE WRONG LOCATION.

2. Deleted

3. Removal/Installation Inboard Spoiler Control Valve Assembly

A. General

(1) Removal and installation of the inboard spoiler control valve assembly is facilitated by removing and installing the valve support and control valve as an assembly. Removal of the hydraulic lines from the control valve fittings requires loosening the support clamps and other fittings to provide slack in the tubing.

B. Equipment

(1) Control surface clamp

C Prepare to Remove Inboard Spoiler Control Valve Assembly

(1) Connect electrical power to airplane.

(2) Pressurize utility hydraulic system.

(3) Position flap control handle to DOWN.

(4) Position interconnect valve switch to OPEN.

(5) Depressurize utility hydraulic system.

(6) Remove wing lower access panel 1356. Refer to Chapter 12, Access Doors and Panels.

(7) Unlatch cove lip door latches simultaneously and lower inboard cove lip door 1258 on turbojet airplanes; 1249 on turbofan airplanes.

D. Remove Inboard Spoiler Control Valve Assembly

(1) Disconnect hydraulic lines from control valve

(2) Remove control valve cover (1, figure 201)

(3) Deleted

(4) Disconnect control valve follow-up push rod (9) from control valve follow-up arm (11).

(5) Disconnect inboard control valve push rod (10) from push rod control crank (15).

(6) Remove control valve support assembly mounting bolts (10) and remove control valve assembly.

(7) Position interconnect valve switch to "CLOSED."

(8) Disconnect electrical power from airplane.

E. Disassemble Spoiler Control Valve Assembly

(1) Remove vent plug (19) and drain fluid.

(2) Disconnect crank connecting rod (17) from valve crank (18).

(3) Remove control crank bolt (16) from valve support (14).

(4) Slide control crank, with crank connecting rod attached, out of valve support and remove.

(5) Remove valve crank (18).

(6) Remove follow-up arm (11).

(7) Remove control valve mounting bolts (12) and separate control valve from valve support.

(8) Remove fittings and cap all ports for shipping.

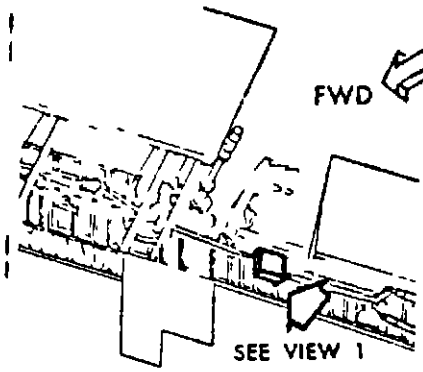
F. Assemble Spoiler Control Valve for Installation

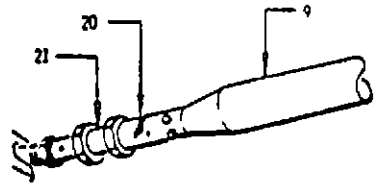
(1) Position control valve (2, figure 201) on valve support (14) and install mounting bolts (12).

(2) Install O-ring and union in control valve return port (5).

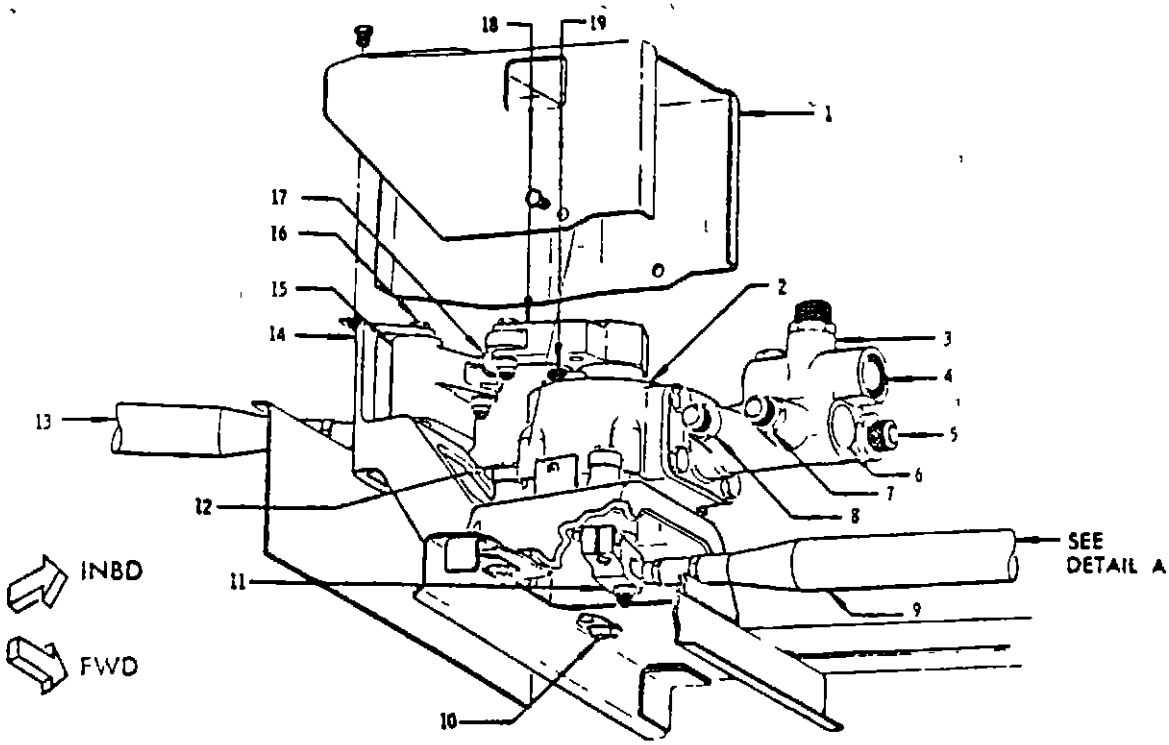
(3) Install O-ring and reducer in valve pressure port (3).

(4) On left inboard control valve, install O-ring and union in valve up (8) and down (7) ports.





DETAIL A



1 CONTROL VALVE COVER
2 CONTROL VALVE
3 PRESSURE PORT
4 FILTER PLUG
5 RETURN PORT
6 CONTROL VALVE METERING PISTON
7 DOWN PORT
8 UP PORT
9 CONTROL VALVE FOLLOW-UP PUSH ROD
10 VALVE ASSEMBLY MOUNTING BOLTS
11 FOLLOW-UP ARM
12 CONTROL VALVE MOUNTING BOLTS
13 CONTROL VALVE PUSH ROD
14 VALVE SUPPORT
15 PUSH ROD CONTROL CRANK
16 CONTROL CRANK BOLT
17 CRANK CONNECTING ROD
18 VALVE CRANK
19 VENT PLUG
20 COTTER PIN
21 VERNIER SLEEVE

VIEW 1

SAB 707/379

Unboard Spoiler Control Valve Installation — 8
Figure 201

(5) On right inboard control valve install O-ring, back-up ring, check nut and elbow in valve up and down ports. Rotate elbow to vertical position so that ports point down.

(6) Position control valve horizontally. Remove vent plug (19) and fill control valve with hydraulic fluid, Skydrol "500", to within 3/4(±3/32) inch below vent plug boss.

(7) Install follow-up arm (11) on control valve follow-up shaft.

(8) Position control valve metering piston (6) flush to within ± 0.015 inch of valve body sleeve.

(9) Align rigging pin holes on valve crank and control valve and install crank on valve shaft.

(10) Align pushrod control crank (15) with valve support (14) and install bolt (16).

(11) Connect crank connecting rod (17) to valve crank (18).

G. Install Inboard Spoiler Control Valve Assembly

(1) Position control valve and support assembly on rear spar and install valve support mounting bolts (10, figure 201).

(2) Connect hydraulic lines to control valve.

(3) Install AN395 rigging pin or AN5 bolt through inboard aileron control tab crank and crank support. (See 27-4-0, figure 202.)

(4) Clamp inboard aileron in neutral position. See 27-4-0 "Adjustment/Test Spoilers and Spoiler Control System."

(5) Connect inboard control valve pushrod (13) to pushrod control crank (15).

(6) Adjust inboard control valve pushrod (13) until AN395 rigging pin or AN5 bolt can be freely inserted in valve crank (18) and control valve (2).

(7) Install AN395 rigging pin or AN5 bolt through support bracket and inboard spoiler differential link.

(8) Connect control valve follow-up pushrod (9) to control valve follow-up arm (11).

(9) Adjust control valve follow-up pushrod to position control valve metering piston (6) flush with valve body sleeve within ± 0.015 inch.

(10) Remove all rigging pins.

CAUTION IF ALL RIGGING PINS ARE NOT REMOVED, STRUCTURAL DAMAGE MAY OCCUR TO FOLLOW-UP LINKAGE WHEN HYDRAULIC PRESSURE IS APPLIED TO CONTROL VALVE.

(11) Pressurize utility hydraulic system.

(12) Connect electrical power to airplane.

(13) Position interconnect valve switch to "OPEN."

(13 bis) Check inboard spoiler pick-up point per 27-4-0,E.(1)(u), Page 216A

(14) Clamp left inboard aileron so that trailing edge is 3-3/4° above aileron faired position.

(15) Rotate aileron control wheel 20° counterclockwise from neutral and hold this position for at least 20 seconds. Measure and record angular position of No. 3 spoiler panel.

(16) Rotate control wheel to 50° counterclockwise from neutral, then return to 20° counterclockwise and hold this position. Measure and record angular position of No. 3 spoiler panel.

NOTE: Do not overshoot 20° wheel position. If control wheel is rotated beyond 20° position in steps (15) or (16), repeat step.

(17) If spoiler panels are not within 8° (+1°-30') from full down when the control wheel reaches 20° from either direction, adjust inboard and outboard control valve follow-up rods as necessary.

1) Deleted.

2) The follow-up rod shown in Detail A, figure 201, has a vernier adjustment. Observe the following items when adjusting the rod. Check that threads are visible through inspection holes in both vernier sleeve and rod body. Install cotter pin and check that is prevents vernier rotation. Tighten both check nuts.

(18) Rotate aileron control wheel to neutral. Spoiler panels shall be full down.

(19) Remove clamp from left inboard aileron.

(20) Clamp right inboard aileron so that trailing edge is 3-3/4° above aileron faired position.

(21) Repeat steps (15) through (18) except reverse direction of aileron control wheel motion and check action of spoiler No. 6.

(22) Install inboard spoiler control valve cover.

(23) Remove clamp from right inboard aileron.

(24) Install wing lower access door 1356.

(25) Raise and latch cove lip door.

(26) Position flap control lever to "UP."

(27) Position interconnect valve switch to "CLOSED."

(28) Disconnect hydraulic pressure source.

(29) Disconnect electrical power source.

4. Inspection/Check Inboard Spoiler Control Valve Assembly

A. Check Inboard Spoiler Control Valve Assembly

(1) Connect electrical power to airplane.

(2) Pressurize utility hydraulic system.

(3) Position flap control handle to "DOWN."

(4) Remove wing lower access panel 1356. (See Chapter 12, Access Doors and Panels.)

(5) Depressurize utility hydraulic system.

(6) Remove spoiler control valve cover (1, figure 201).

(7) Check control valve crank rivets for shear.

(8) Check control valve metering piston (6) for corrosion.

(9) Check control valve filter for foreign matter.

CAUTION: OPEN END OF FILTER ELEMENT MUST BE INSTALLED FIRST. INCORRECTLY INSTALLED FILTER ELEMENT WILL RESULT IN BLOCKED FLOW.

(10) Install control valve cover.

(11) Install wing lower access panel 1356.

(12) Pressurize utility hydraulic system.

(13) Position flap control lever to UP

(14) Disconnect hydraulic pressure source.

(15) Disconnect electrical power source

5. Approved Repairs Inboard Spoiler Control Valve Assembly

A Deleted.

B. Replace Valve Crank Shear Rivets

(1) Pressurize utility hydraulic system.

(2) Position flap control lever to DOWN

(3) Remove wing lower access panel 1356.

(4) Unlatch cove lip door latches simultaneously and lower inboard cove lip door 1258 on turbojet airplanes; 1249 on turbofan airplanes.

(5) Depressurize utility hydraulic system.

(6) Remove inboard spoiler control valve cover (1, figure 201)

(7) Disconnect crank connecting rod (17) from valve crank (18)

(8) Remove retaining bolt and valve crank (18)

(9) Remove sheared rivets from valve crank and bushing (See 27-4-0, figure 212.) Check that bushing rotates freely in valve crank bore

(10) Install three MS20470D3 rivets in valve crank and bushing.

CAUTION: BECAUSE THE RIVETS PROVIDE FAIL-SAFE PROTECTION, NO SUBSTITUTE MATERIAL IS ALLOWED. THE MS20470D3 RIVET IS OF 2017-T3 MATERIAL AND 3/32 INCH DIAMETER TO INSURE COMPLETE FILLING OF THE HOLE WHEN INSTALLING, SQUEEZE RIVETING IS RECOMMENDED.

(11) Install valve crank on control valve input shaft

(12) Connect crank connecting rod (17, figure 201) to valve crank (18)

(13) Install AN395 rigging pin or AN5 bolt through inboard aileron control tab crank and crank support.

(14) Clamp inboard aileron in faired position.

(15) Adjust control valve pushrod (13) such that AN395 rigging pin or AN5 bolt can be freely inserted through valve crank (18) and control valve (2).

(16) Remove rigging pins.

(17) Remove clamp from aileron.

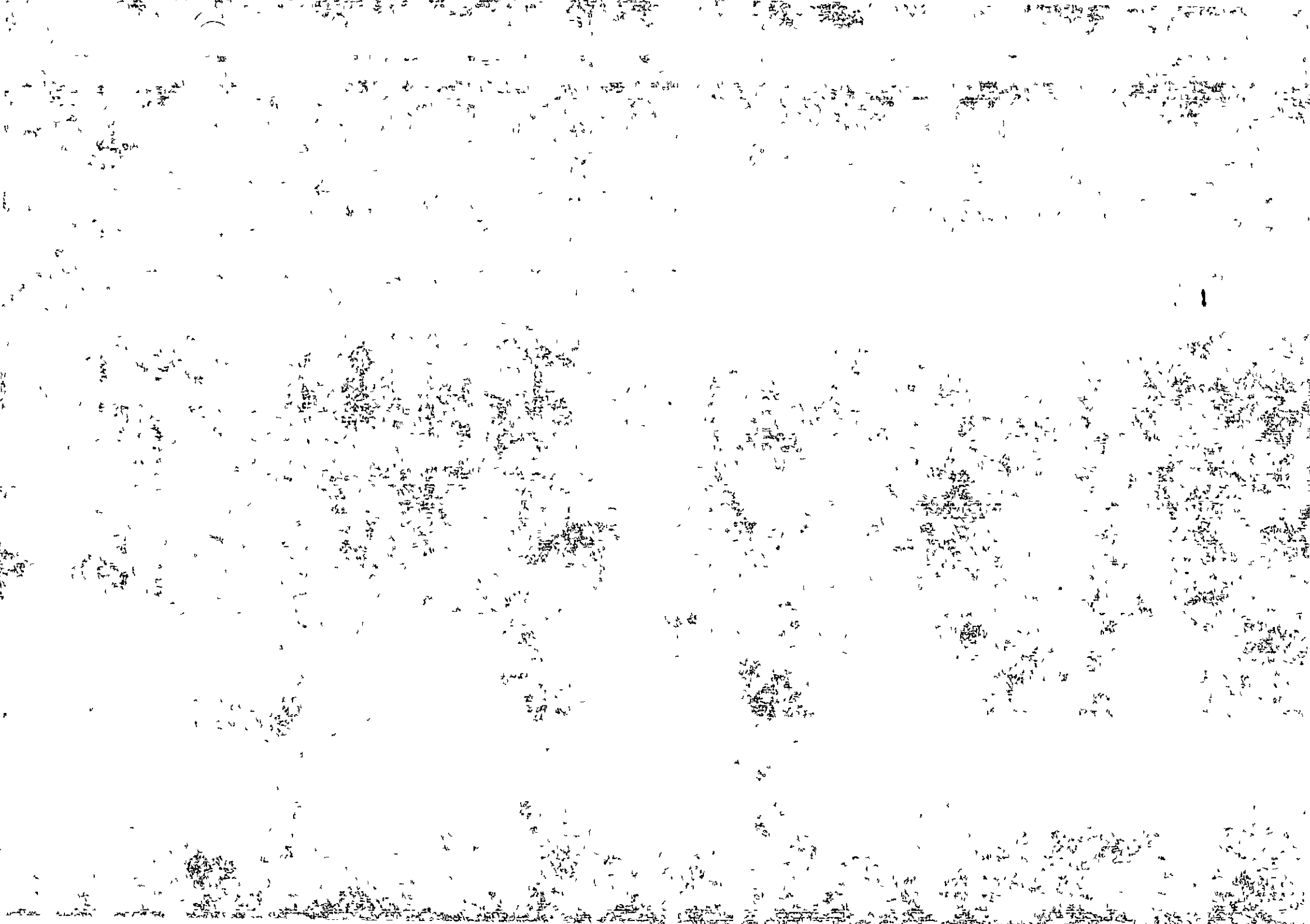
(18) Install wing lower access panel 1356.

(19) Raise and latch cove lip door.

(20) Pressurize utility hydraulic system.

(21) Position flap control handle to "UP."

(22) Disconnect hydraulic pressure source.



OUTBOARD SPOILER CONTROL VALVE ASSEMBLY - MAINTENANCE PRACTICES

1. General

A. When disconnecting hydraulic lines from the spoiler control valve fittings, a container is required to catch spilled hydraulic fluid. Should any fluid spill on the airplane, decontaminate. Refer to Cleaning and Washing, Chapter 12.

CAUTION: SPOILER CONTROL VALVE, 65-7018, 50-6875 OR 50-6875-1, AND FLAP CONTROL VALVE, 50-6875, 65-21890-1 OR 65-40449-1, ARE INSTALLED IN THEIR RESPECTIVE CONTROL SYSTEM. THESE VALVES ARE IDENTICAL IN APPEARANCE, BUT VALVES WITH DIFFERENT PART NUMBERS ARE NOT INTERCHANGEABLE.

On TCA LX-N20198, LX-N20199 and RTCA LX-N19997, LX-N20000, USE VALVES 50-6875-1.

WHEN REPLACING A SPOILER CONTROL VALVE, ENSURE THAT THE FOUR CONTROL VALVE PART NUMBERS MATCH.

SPOILER CONTROL VALVE CRANKS AS SHOWN IN FIGURE 201 ARE NOT INTERCHANGEABLE, AND CARE MUST BE TAKEN NOT TO INSTALL THESE CRANKS IN THE WRONG LOCATION.

2. Deleted

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3. Removal/Installation Outboard Spoiler Control Valve Assembly

A. General

Removal and installation of the outboard spoiler control valve assembly is facilitated by removing the valve support and control valve as an assembly. Removal of the hydraulic lines from the control valve fittings requires loosening the adjacent support clamps and other fittings to provide slack in the tubing

B. Equipment and Materials

(1) Control Surface Clamp

(2) Hydraulic Fluid, Skydrol "500"

C. Remove Outboard Spoiler Control Valve Assembly

(1) Depressurize utility hydraulic system.

(2) Remove wing lower access panel 1358. (Refer to 12-2-0.)

(3) Remove hydraulic lines as required to gain access to control valve.

(4) Disconnect hydraulic lines from control valve fittings.

(5) Disconnect outboard spoiler control valve push rod (3, figure 201) from control crank (4).

(6) Disconnect spoiler control valve follow-up push rod (12) from control valve follow-up arm (14).

(7) Remove valve support mounting bolts.

(8) Remove control valve and valve support assembly (5) from airplane.

D. Disassemble Outboard Spoiler Control Valve Assembly

(1) Disconnect crank connecting rod (6) from valve crank (7).

(2) Remove control valve mounting bolts and spacers from valve support.

(3) Remove valve crank and remove control valve from support.

(4) Remove follow-up arm retaining bolt and remove arm.

(5) Remove hydraulic fittings, tag and hold for installation.

(6) Cap or plug all valve ports for shipping.

E. Assemble Outboard Spoiler Control Valve

(1) Install gasket and union in control valve return port (10, figure 201).

(2) Install nut, backup ring and O-ring on elbow in reducer, install O-ring on reducer and install reducer in control valve pressure port (13). Rotate elbow so that inlet port is inboard.

(3) Install check nut, backup ring and O-ring on elbow and install elbow in valve down port. Rotate elbow such that discharge port is vertical.

(4) Install nut, backup ring and O-ring on elbow and install elbow in valve down port. Rotate elbow such that discharge port is vertical

(5) Position valve on valve support (5) and install mounting bolts and spacers

(6) Position control valve horizontally. Fill valve with hydraulic fluid Skydrol "500" to 3/4 (± 3/32) inch below vent plug boss.

(7) Position control valve metering piston (9) flush with valve body sleeve within 0.015 inch.

(8) Align rigging holes on valve crank (7) and control valve and install crank on control valve shaft.

(9) Connect crank connecting rod (6) to valve crank (7).

(10) Align follow-up arm (14) with valve shaft and install

F. Install Outboard Spoiler Control Valve Assembly

(1) Position control valve assembly in rear spar area.

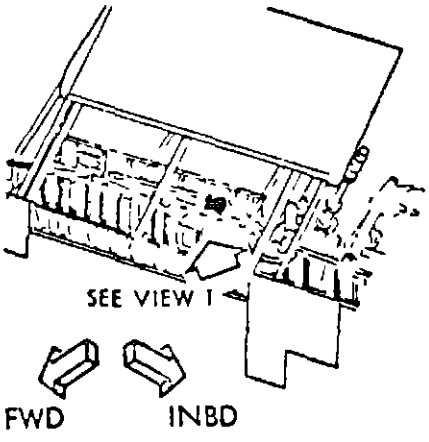
(2) Align control valve support (5) with support bracket and install mounting bolts.

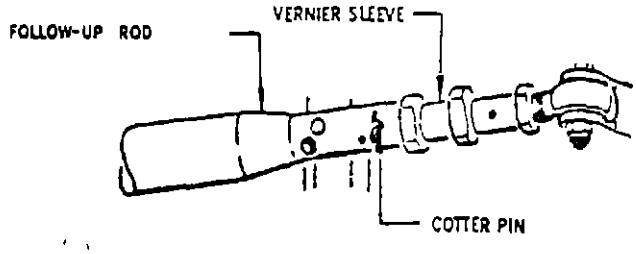
(3) Connect hydraulic lines to fittings on valve.

(4) Install AN395 rigging pin or AN5 bolt through aileron control tab crank and crank support.

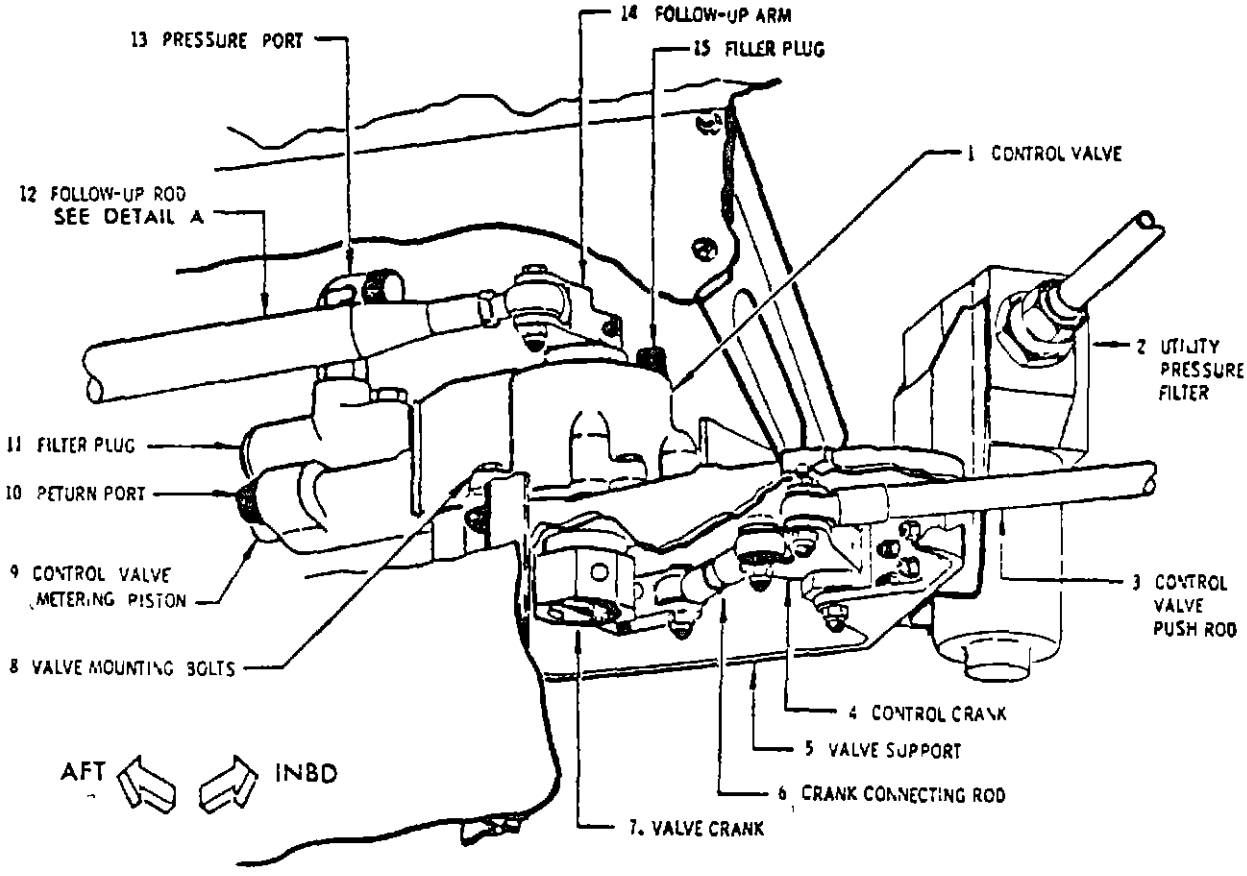
(5) Clamp inboard aileron in neutral position See 27-4-0, "Adjustment/Test Spoilers and Spoiler Control System "

(6) Connect outboard spoiler control valve pushrod (3) to control crank (4).





DETAIL A



VIEW 1

SAB 707/379

(7) Adjust control valve pushrod (3) until AN395 rigging pin or AN5 bolt can be freely inserted through valve crank (7) and control valve.

(8) Connect and adjust spoiler control valve follow-up rod (12) to position control valve metering piston (9) flush with valve body sleeve within 0.015 inch.

(9) Remove all rigging pins.

CAUTION STRUCTURAL DAMAGE MAY OCCUR TO FOLLOW-UP LINKAGE WHEN HYDRAULIC PRESSURE IS APPLIED TO CONTROL VALVE IF ALL RIGGING PINS ARE NOT REMOVED

(10) Pressurize utility hydraulic system.

(10 bis) Check outboard spoiler pick-up point per 27-4-0,E.(1)(u), page 216A.

(11) Clamp left inboard aileron so that trailing edge is 3-3/4° above aileron faired position.

(12) Rotate aileron control wheel 20° counterclockwise from neutral and hold this position for at least 20 seconds. Measure and record angular position of **No. 2 spoiler panel.**

(13) Rotate control wheel to 50° counterclockwise from neutral, then return to 20° counterclockwise and hold this position. Measure and record angular position of **No. 2 spoiler panel.**

NOTE Do not overshoot 20° wheel position. If control wheel is rotated beyond 20° position in steps (12) or (13), repeat step.

(14) If spoiler panels are not within 8° (+1/-30') from full down when the control wheel reaches 20° from either direction, adjust inboard and outboard control valve follow-up rods as necessary.

1) Deleted.

2) The follow-up rod shown in Detail A, figure 201, has a vernier adjustment. Observe the following items when adjusting the rod. Check that threads are visible through inspection holes in both vernier sleeve and rod body. Install cotter pin and check that it prevents vernier rotation. Tighten both check nuts

(15) Rotate aileron control wheel to neutral. Spoiler panels shall be full down.

(16) Remove clamp from left inboard aileron.

(17) Clamp right inboard aileron so that trailing edge is 3-3/4° above aileron faired position.

(18) Repeat steps (12) through (15) except reverse direction of aileron control wheel motion and check action of spoiler No. 7.

(19) Check control fittings for leaks.

(20) Install wing lower access panel.

(21) Remove clamp from inboard aileron.

(22) Depressurize utility hydraulic system.

4. Inspection/Check Outboard Spoiler Control Valve

A. Check Outboard Spoiler Control Valve

(1) Remove wing lower access panel 1358. (Refer to 12-2-0.)

(2) Check valve crank (7, figure 201) rivets for shear.

(3) Check control valve metering piston (9) for corrosion.

(4) Check control valve filter for foreign matter.

(5) Install wing lower access panel.

5. Approved Repairs/Outboard Spoiler Control Valve

A. Replace Valve Crank Shear Rivets

(1) Remove wing lower access panel 1358. (Refer to 12-2-0)

(2) Disconnect crank connecting rod (6) from valve crank (7).

(3) Remove valve crank retaining bolt and remove valve crank.

(4) Remove sheared rivets from valve crank (figure 212, Chapter 27-4-0) and bushing. Check that bushing rotates freely in valve crank bore.

(5) Install three MS20470D3 rivets in valve crank and bushing.

CAUTION: BECAUSE THE RIVETS PROVIDE FAIL-SAFE PROTECTION, NO SUBSTITUTE MATERIAL IS ALLOWED. THE MS20470D3 RIVET IS OF 2017-T3 MATERIAL AND 3/32 INCH DIAMETER. TO INSURE COMPLETE FILLING OF THE HOLE WHEN INSTALLING, SQUEEZE RIVETING IS RECOMMENDED.

(6) Install valve crank on control valve input shaft.

(7) Install AN395 rigging pin or AN5 bolt through aileron control tab crank and crank support

(8) Clamp inboard aileron in faired position

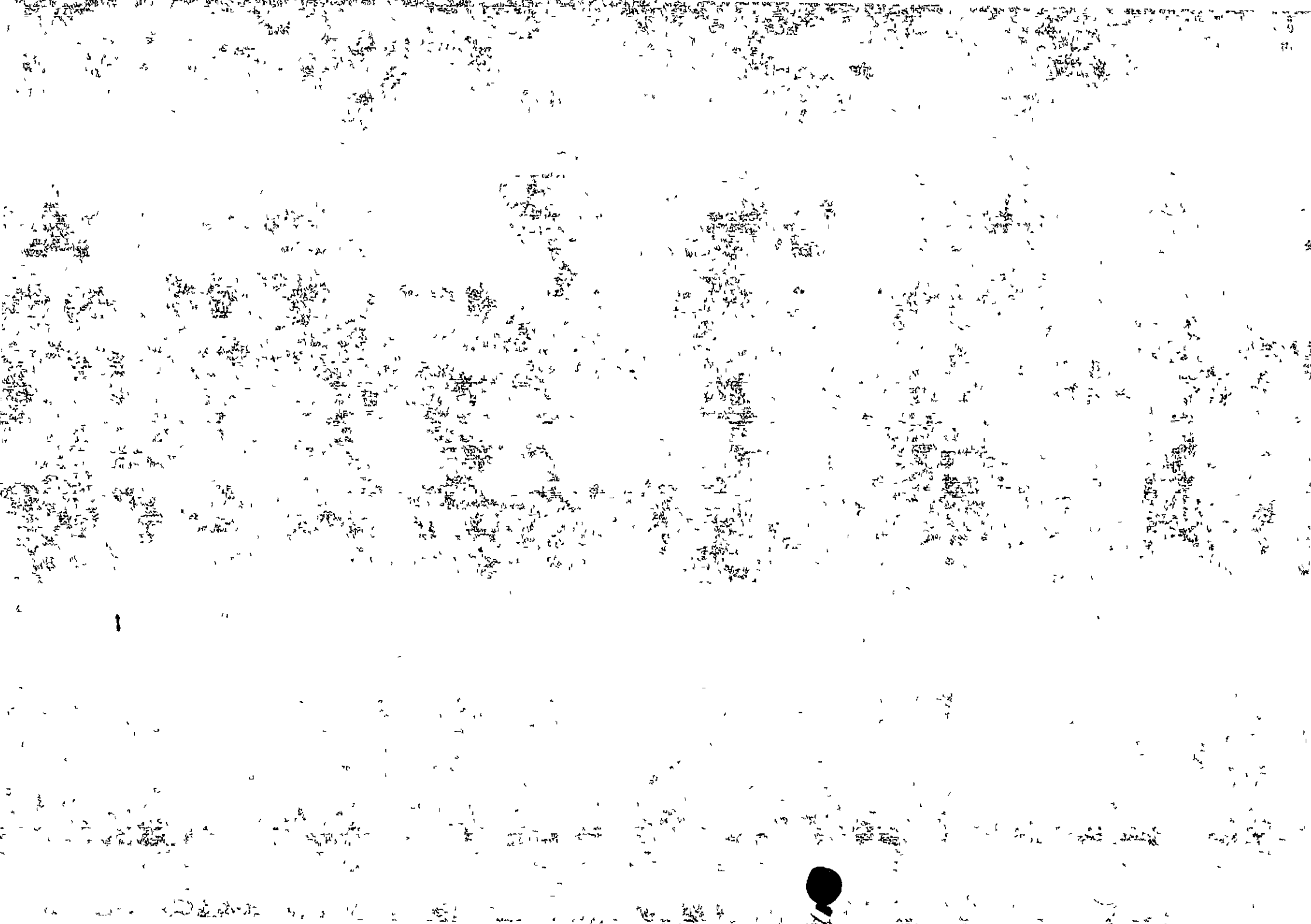
(9) Connect crank connecting rod (6, figure 201) to valve crank (7)

(10) Adjust control valve pushrod (3) until AN395 rigging pin or AN5 bolt is freely inserted through valve crank (7) and control valve (1).

(11) Remove rigging pins.

(12) Remove clamp from aileron.

(13) Install wing lower access panel 1358.



SPOILER ACTUATORS - MAINTENANCE PRACTICES

1 General

A. During maintenance practices of the spoiler actuators take necessary precautions to prevent spillage of hydraulic fluid. Should fluid spill on the airplane, decontaminate the area. Refer to Cleaning and Washing, Chapter 12.

B. Spoilers may be raised with the hydraulic system depressurized by setting the speed brake control lever at 60 degrees and then depressing the ground release plunger.

CAUTION: FAILURE TO SET THE SPEED BRAKE CONTROL LEVER AT 60 DEGREES BEFORE DEPRESSING THE GROUND RELEASE PLUNGER MAY RESULT IN DAMAGE TO THE FOLLOW-UP MECHANISM.

(1) Optional method: spoilers may be raised with hydraulic system depressurized by positioning the spoiler bypass valve to BYPASS, setting the speed brake control lever at 60 degrees, and then raising the spoilers.

2 Removal/Installation Spoiler Actuator

A. Special Tools and Equipment

(1) Spoiler Actuator Lock Assembly - F71264-500 or F71264-501 or equivalent

(2) Hydraulic Service Cart - 0 to 3000 psi, operating pressure

B. Remove Spoiler Actuator

(1) Connect external hydraulic and electrical power to the airplane.

(2) For inboard spoilers, position interconnect valve to OPEN.

(3) Raise spoilers.

(a) Extend flaps.

(b) Open applicable cove lip door

(c) Position speed brake handle to 60 degrees to raise spoilers.

(d) Install lock assembly.

(e) If removing both spoiler actuators, disconnect spoiler follow-up rods from spoiler to prevent damage to the follow-up mechanism. Spoiler position transmitter control rod must be disconnected from spoiler before detaching actuators on outboard spoilers.

CAUTION: WITH BOTH ACTUATORS DISCONNECTED OR REMOVED, A FORCE OF 10 POUNDS OR MORE UPWARD MAY DAMAGE THE FOLLOW-UP MECHANISM.

(4) Depressurize hydraulic system.

(a) Position bypass valve to BYPASS.

(5) Remove applicable access panel

(a) For inboard spoiler actuator, remove inboard access panel 1403 or outboard access panel 1404. (See Chapter 12, Access Doors and Panels.)

(b) For outboard spoiler actuator, remove inboard access panel 1405 or outboard access panel 1406.

(6) Remove access cover from spoiler door. (See figure 201.)

(7) Disconnect spoiler UP and DOWN lines at actuator.

(8) Plug hydraulic lines and cap ports of actuator.

(9) Remove mounting bolts and actuator.

C. Install Spoiler Actuator

(1) Install O-ring and union in actuator UP and DOWN ports. (See figure 201.)

(2) Extend rod end and fill actuator with hydraulic fluid.

(3) Position cap end of actuator into spoiler door fitting and install teflon washer between cap and door fitting.

(4) Lightly coat bolt (4), filler (3), washer (5), and nut (2) with Aeroshell Grease 17.

(5) Install bolt (4), filler (3), washer (5), nut (2) and cotter pin (1).

NOTE: Bolts are installed with bolt head outside of the spoiler door on turbojet airplanes. Bolts are installed with bolt head inside spoiler panel on turbofan airplanes.

(6) Connect spoiler UP and DOWN lines.

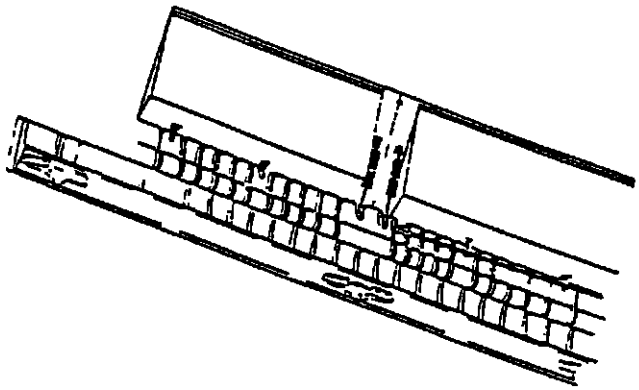
(7) Install access cover.

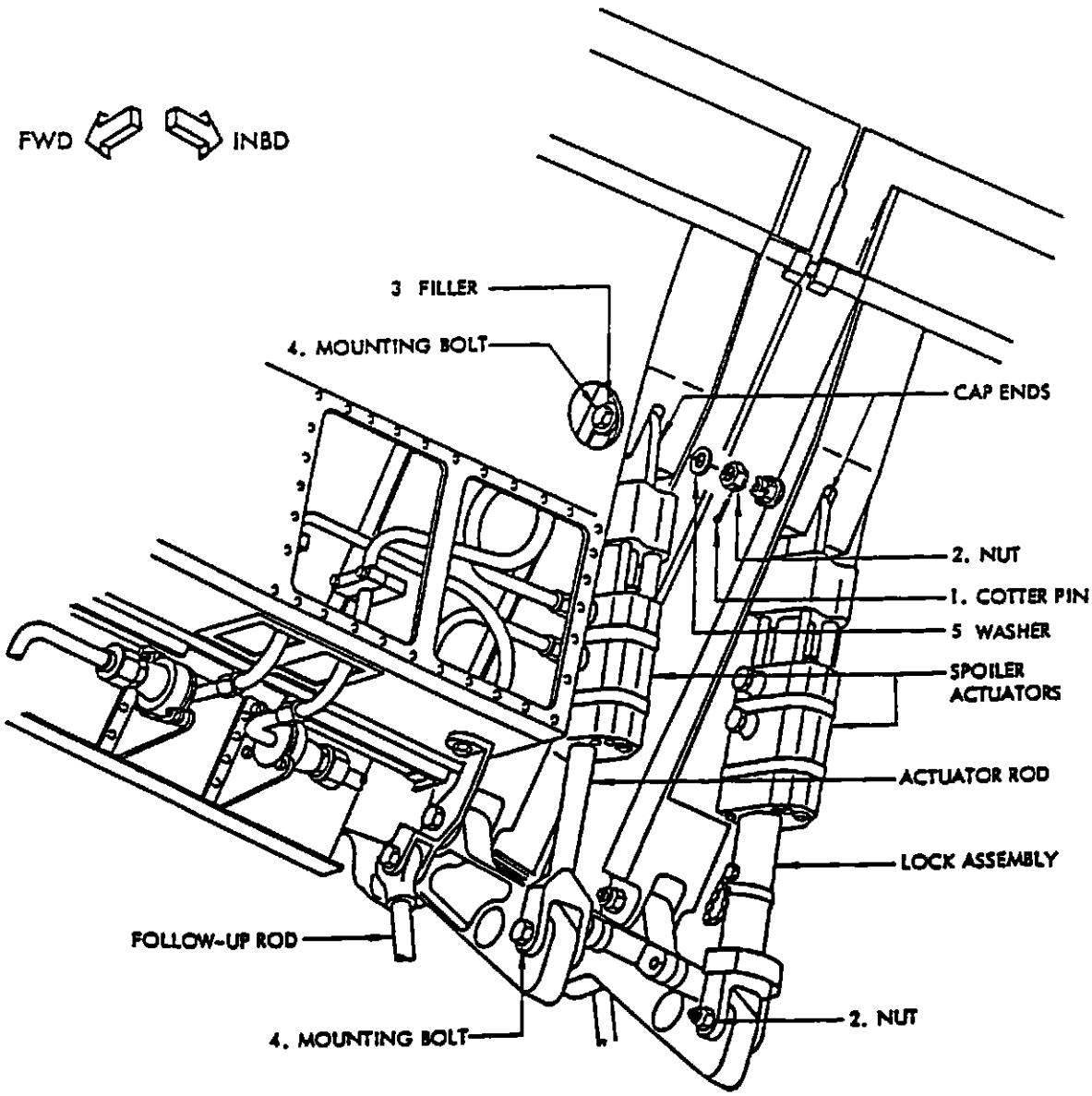
(8) Replace access panel and remove lock assembly.

(9) Connect spoiler pushrod.

(10) Test actuator per paragraph 3B.

(11) Close cove lip doors.




FWD
INBD
3 FILLER
4. MOUNTING BOLT
CAP ENDS
2. NUT
1. COTTER PIN
5 WASHER
SPOILER ACTUATORS
ACTUATOR ROD
LOCK ASSEMBLY
FOLLOW-UP ROD
4. MOUNTING BOLT
2. NUT

3. Adjustment/Test Spoiler Actuator

A. Equipment

(1) Hydraulic Service Cart - 0 to 3000 psi operating pressure

B. Test Spoilers

(1) Connect external electrical and hydraulic power to the airplane.

(2) For inboard spoilers, position interconnect valve to "OPEN".

(3) Rotate control wheel to the right and then to the left to check operation.

(4) Position speed brake to 60° and check for hydraulic leakage.

(5) Position speed brake to 0° and close interconnect valve by positioning interconnect valve switch to "CLOSED".

(6) Remove external electrical and hydraulic power from airplane.

END

BOEING Intercontinental 707

MAINTENANCE MANUAL

SPOILER MODULAR PACKAGE - REMOVAL/INSTALLATION

1. General

   A. The four spoiler modular packages are mounted at the wing rear spar. The inboard spoiler modular packages operate from auxiliary system hydraulic pressure and the outboard spoiler modular packages from utility system hydraulic pressure. The maintenance practices for all four modular packages are combined in the following procedure. A suitable container should be available to catch spilled fluid when disconnecting hydraulic lines or components.

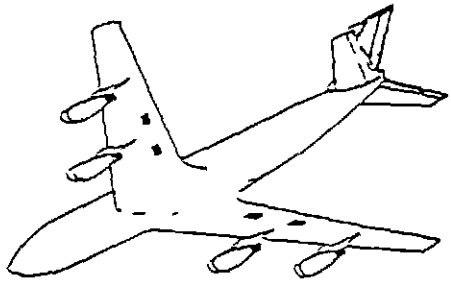
2. Remove Spoiler Modular Package

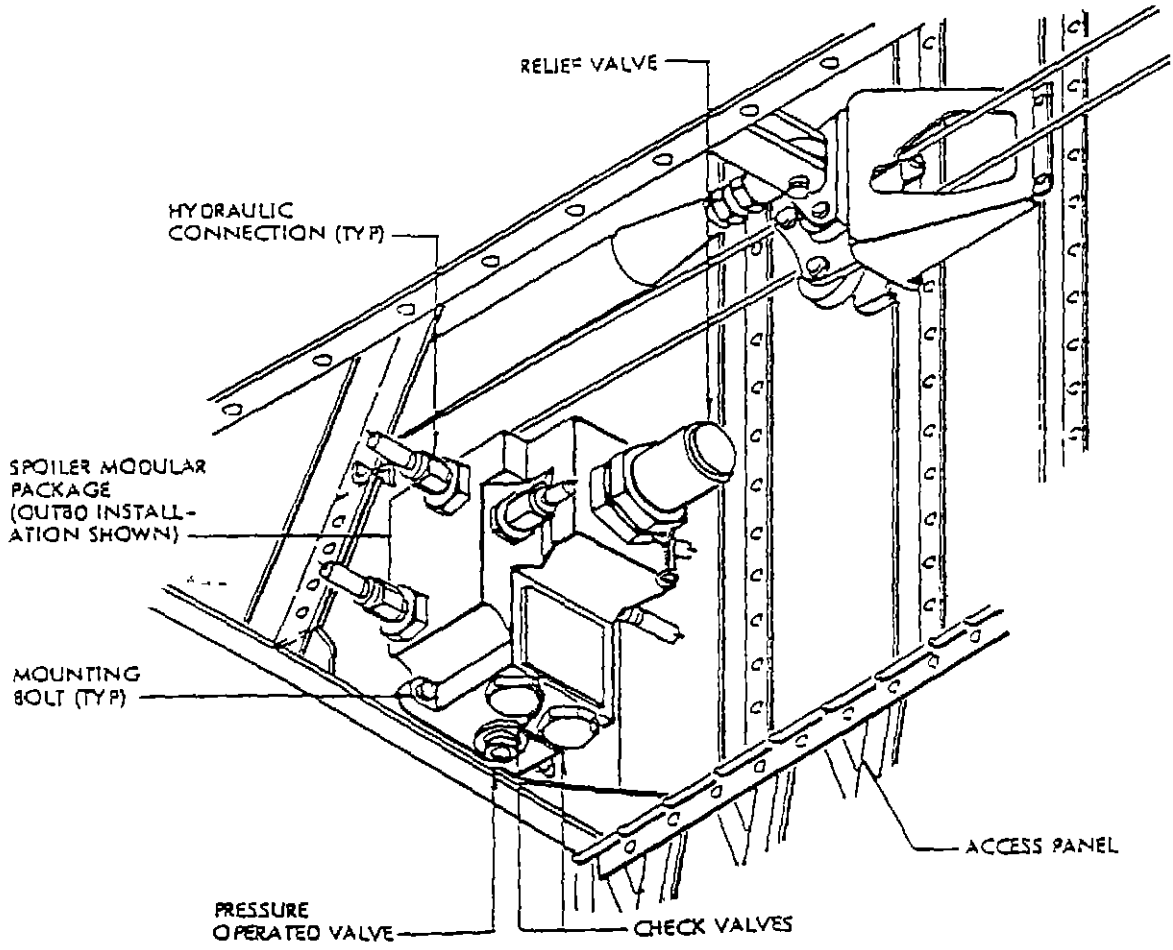
   A. Depressurize utility and auxiliary hydraulic system. Depressurize reservoirs.

   B To gain access to modular package, open wing access panels 1355 or 1358 left or right. See Chapter 12, Access Doors and Panels.

   C. Place spoiler switches in OFF position. Switches are located on the pilots' overhead panel.

   D. Open SPOILER BYPASS VALVE circuit breaker on circuit breaker panel P5.





Spoiler Modular Package Installation
Figure 401

E. Depress manual release button on pressure operated valve to relieve trapped hydraulic pressure. (See figure 401.)

F. Remove five hydraulic connections from modular package.

NOTE: When disconnecting hydraulic lines from modular package, be prepared to catch hydraulic fluid.

G. Remove three bolts securing modular package to mounting bracket and remove modular package from airplane.

H. Install protective caps on all hydraulic lines.

I. Remove hydraulic unions and O-rings from modular package. Install protective caps in open ports.

3. Install Spoiler Modular Package

A. Remove protective caps, then install O-rings and replace unions in modular package.

NOTE: Lightly lubricate O-rings with Skydrol 500 hydraulic fluid or Skydrol Assembly Lube MCS 352 prior to installation.

B. Position modular package against mounting bracket and secure using three bolts. (See figure 401.)

C. Ensure hydraulic systems are depressurized and remove caps from hydraulic lines.

D. Connect hydraulic lines to modular package.

E. Close SPOILER BYPASS VALVE circuit breaker.

F. Position the spoiler switches to ON.

G. Bleed modular package as follows:

(1) Pressurize auxiliary and utility hydraulic systems.

(2) Cycle spoiler system until movement is smooth and continuous.

(3) Check modular package hydraulic connections for signs of leakage.

H. Close wing access panels.

I. Determine whether there is any further need for electrical power on the airplane; if not, remove external power.

SPOILER MODULAR PACKAGE
PRESSURE-OPERATED VALVE - REMOVAL/INSTALLATION

1. General

   A. One pressure-operated valve is installed in each spoiler modular package. The valve contains a manual release button, which when depressed, allows manual extension of the spoiler panel. A suitable container should be available to catch spilled fluid when removing valve from modular package.

2. Remove Pressure-Operated Valve

   A. Depressurize utility and auxiliary hydraulic systems. Depressurize reservoirs.

   B. To gain access to modular package, open wing access panels 1355 or 1358 left or right. See Chapter 12, Access Doors and Panels.

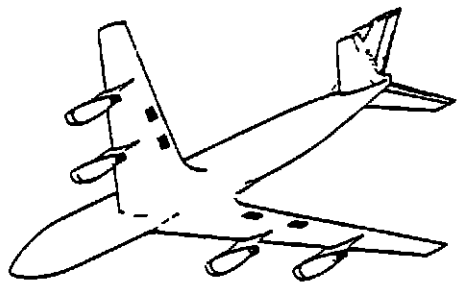
   C. Place spoiler switches in OFF position. Switches are located on the pilots' overhead panel.

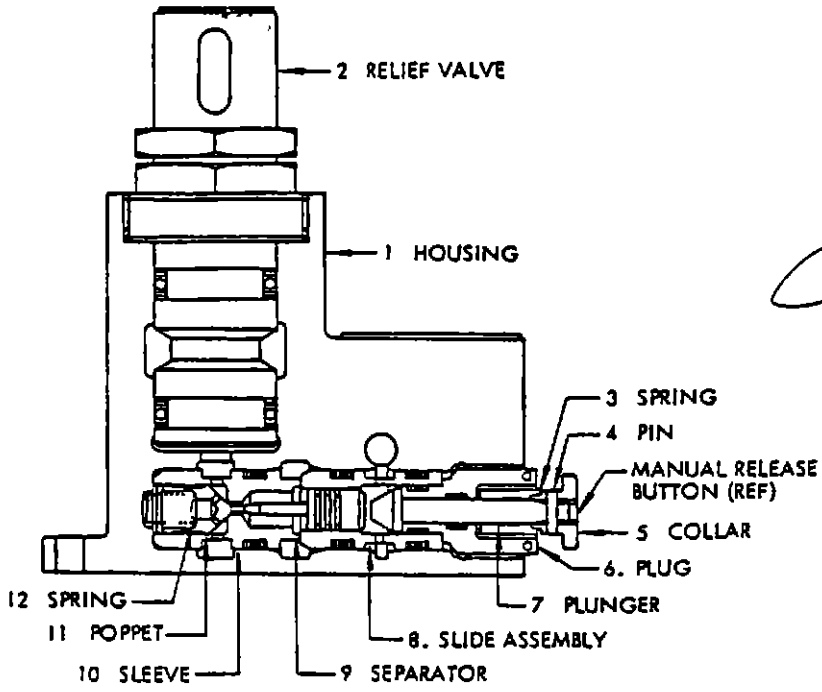
   D. Open SPOILER BYPASS VALVE circuit breaker on circuit breaker panel P5.

   E. Depress manual release button on pressure-operated valve to relieve trapped hydraulic pressure. (See figure 401.)

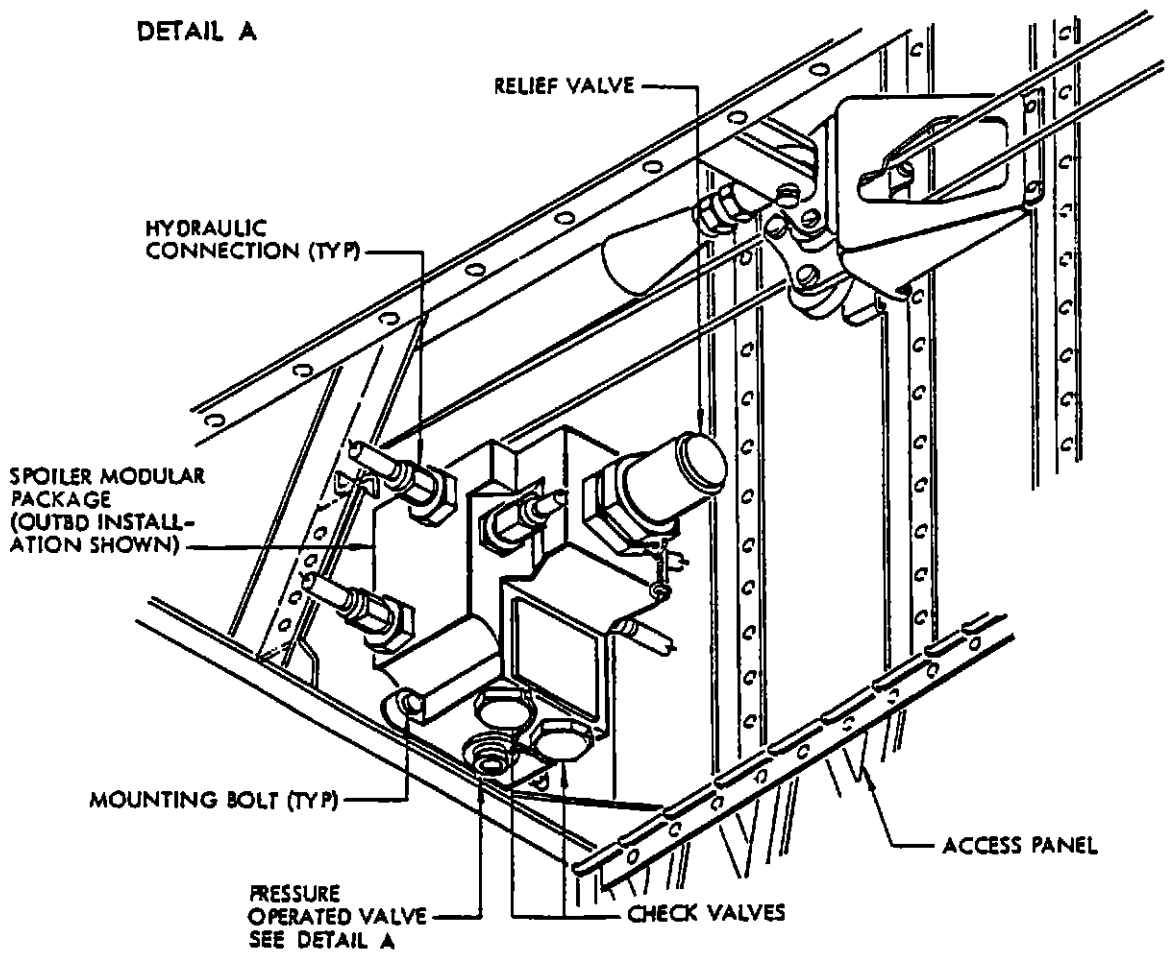
   F. Remove pressure-operated valve as follows:

      NOTE: When removing pressure-operated valve from modular package, be prepared to catch hydraulic fluid.





DETAIL A



Spoiler Modular Package Installation
Figure 401

(1) Break lockwire, unscrew plug (6) and withdraw plunger (7), collar (5), pin (4) and spring (3) from housing (1)

(2) Disassemble above components as follows:

(a) Lightly tap out pin (4) and remove collar (5) from plunger (7)

(b) Withdraw plunger (7) from plug (6) and remove O-rings and backup rings from plug.

(3) Remove slide assembly (8) and withdraw slide from sleeve. Remove O-rings and backup rings.

(4) Remove sleeve (10) and withdraw poppet (11), spring (12) and separator (9) Remove O-rings and backup rings.

(5) Install protective cap in open port.

3. Install Pressure-Operated Valve

A Fit O-ring and backup rings to sleeve (10). Assemble sleeve (10), poppet (11), spring (12) and separator (9). Remove protective cap and insert assembly of sleeve (10) into housing (1). (See figure 401.)

NOTE. Lightly lubricate all O-rings with Skydrol 500 hydraulic fluid or Skydrol Assembly Lube MCS 352 prior to installation.

B. Assemble slide and sleeve, fit new O-rings and backup rings and install slide assembly (8) in housing (1).

C. Fit new O-rings and backup rings to plug (6), replace plunger (7) spring (3), collar (5) and insert pin (4). Install assembly or plug (6) in housing (1) and tighten within 50 to 200 pound-inch torque range.

D Lockwire pressure-operated valve to check valves.

E. Close SPOILER BYPASS VALVE circuit breaker.

F. Position the spoiler switches to ON.

G Bleed modular package as follows:

(1) Pressurize auxiliary and utility hydraulic systems.

(2) Cycle spoiler system until movement is smooth and continuous.

(3) Check modular package pressure-operated valve for signs of leakage.

H Close wing access panels.

I. Determine whether there is any further need for electrical power on the airplane; if not, remove external power.

SPOILER MODULAR PACKAGE
CHECK VALVES - REMOVAL/INSTALLATION

1. General

   A. Two identical check valves are installed in each spoiler modular package. A suitable container should be available to catch spilled fluid when removing valves from modular package.

2. Remove Check Valve

   A. Depressurize utility and auxiliary hydraulic systems. Depressurize reservoirs.

   B. To gain access to modular package open wing access panels 1355 or 1358 left or right. See Chapter 12, Access Doors and Panels.

   C. Place spoiler switches in OFF position. Switches are located on the pilots' overhead panel.

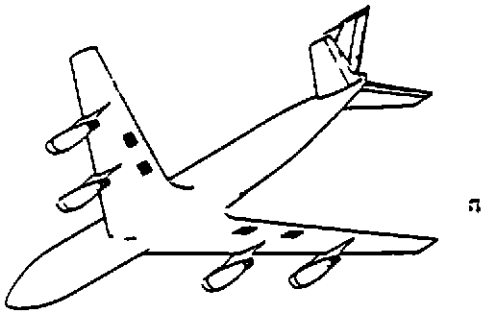
   D. Open SPOILER BYPASS VALVE circuit breaker on circuit breaker panel P5.

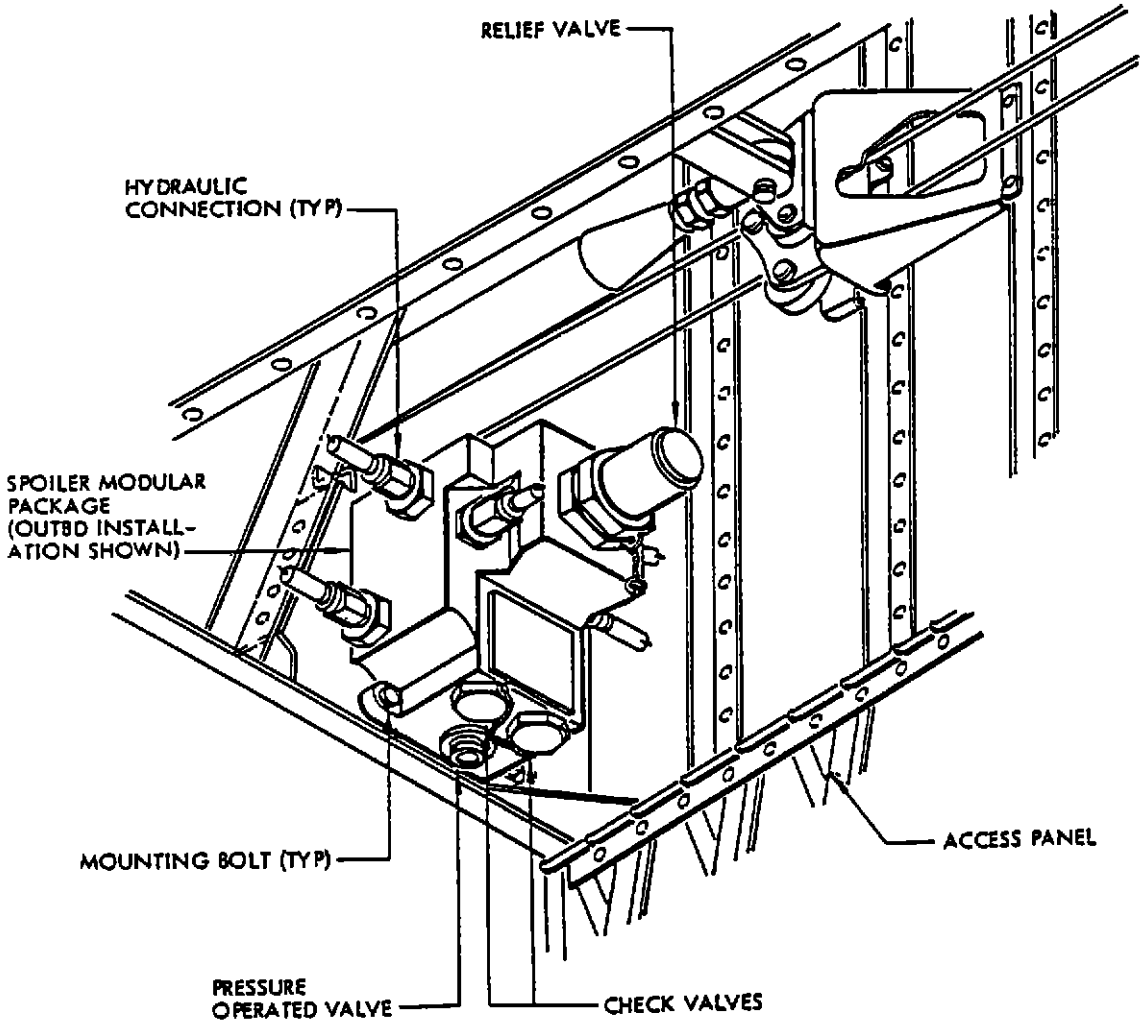
   E. Depress manual release button on pressure-operated valve to relieve trapped hydraulic pressure. (See figure 401.)

   F. Break lockwire and unscrew check valve from modular package. Remove O-rings and backup rings.

      NOTE: When removing check valve from modular package, be prepared to catch hydraulic fluid.

   G. Install protective cap in open port.





Spoiler Modular Package Installation
Figure 401

3 Install Check Valve

A Fit new O-rings and backup rings to check valve. Remove protective cap, then install check valve in modular package and tighten within 50 to 200 pound-inch torque range. (See figure 401.)

NOTE: Lightly lubricate O-rings with Skydrol 500 hydraulic fluid or Skydrol Assembly Lube MCS 352 prior to installation.

B Lockwire check valves to pressure-operated valve.

C Close SPOILER BYPASS VALVE circuit breaker.

D Position the spoiler switches to ON.

E. Bleed modular package as follows:

(1) Pressurize auxiliary and utility hydraulic systems.

(2) Cycle spoiler system until movement is smooth and continuous.

(3) Check modular package check valves for signs of leakage.

F Close wing access panels.

G Determine whether there is any further need for electrical power on the airplane; if not, remove external power.

SPOILER MODULAR PACKAGE
RELIEF VALVE - REMOVAL/INSTALLATION

1. General

   A. One relief valve is installed in each modular package. A suitable container should be available to catch spilled fluid when removing relief valve from modular package.

2. Remove Relief Valve

   A. Depressurize utility and auxiliary hydraulic systems. Depressurize reservoirs.

   B. To gain access to modular package, open wing access panels 1355 or 1358 left or right. See Chapter 12, Access Doors and Panels.

   C. Place spoiler switches in OFF position. Switches are located on the pilots' overhead panel.

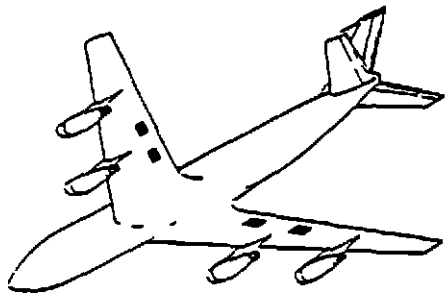
   D. Open SPOILER BYPASS VALVE circuit breaker on circuit breaker panel P5.

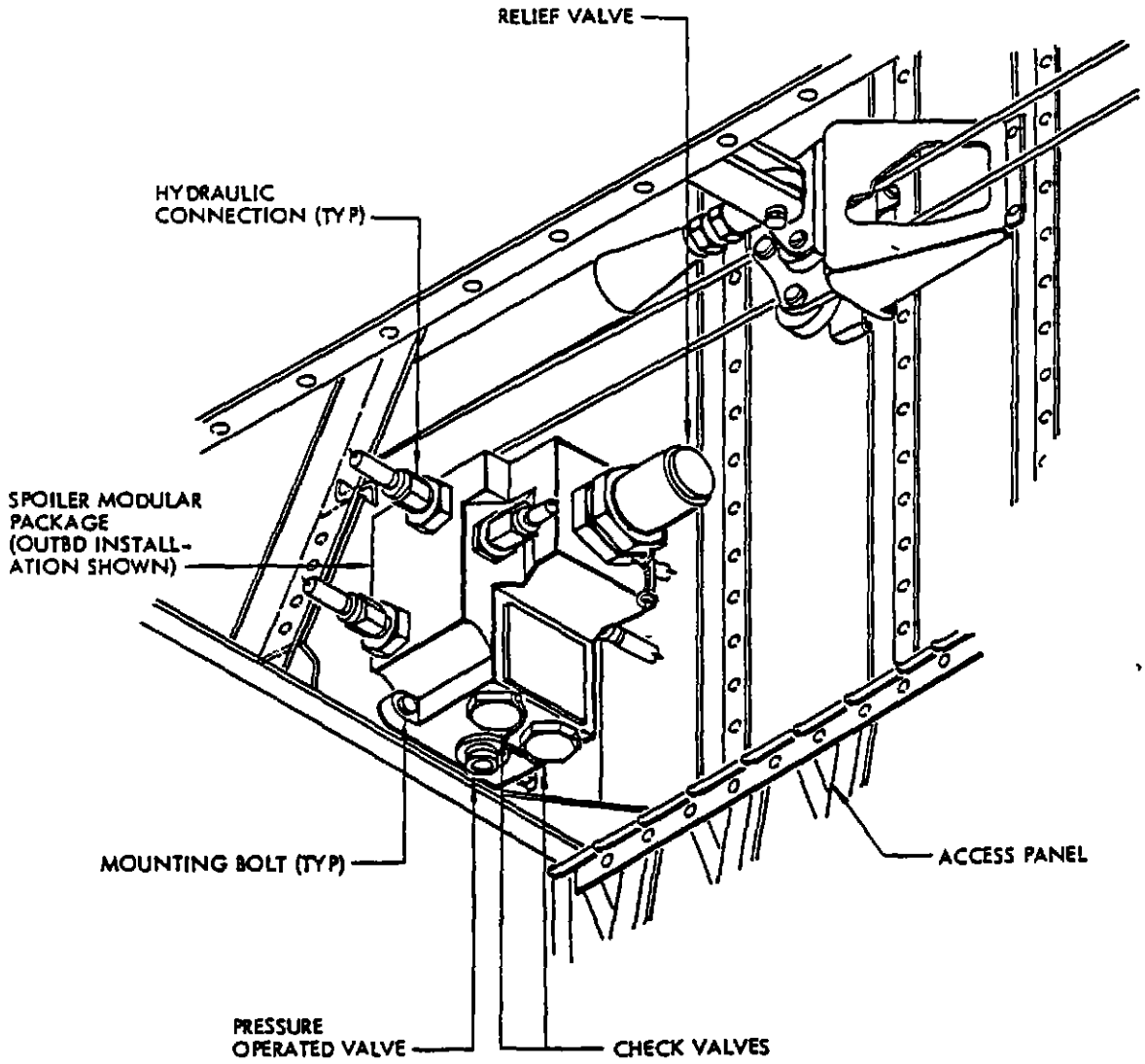
   E. Depress manual release button on pressure-operated valve to relieve trapped hydraulic pressure. (See figure 401.)

   F. Break lockwire and unscrew relief valve (2) from modular package. Remove O-rings and backup rings.

      NOTE: When removing relief valve from modular package, be prepared to catch hydraulic fluid.

   G. Install protective cap in open port.





Spoiler Modular Package Installation
Figure 401

3. Install Relief Valve

A. Fit new O-rings and backup rings to relief valve. Remove protective cap, then install relief valve in modular package and tighten within 50 to 200 pound-inch torque range. (See figure 401.)

NOTE: Lightly lubricate O-rings with Skydrol 500 hydraulic fluid or Skydrol Assembly Lube MCS 352 prior to installation.

B Lockwire relief valve to modular package body.

C Close SPOILER BYPASS VALVE circuit breaker.

D. Position the spoiler switches to ON.

E. Bleed modular package as follows:

(1) Pressurize auxiliary and utility hydraulic systems.

(2) Cycle spoiler system until movement is smooth and continuous.

(3) Check modular package check valves for signs of leakage.

F. Close wing access panels.

G Determine whether there is any further need for electrical power on the airplane; if not, remove external power.

SPOILER BYPASS VALVES - MAINTENANCE PRACTICES

1 General

A During maintenance practices of spoiler hydraulic components take necessary precautions to prevent spillage of hydraulic fluid. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, "Cleaning and Washing "

2 Removal/Installation Inboard Spoiler Bypass Valve

See figure 202

A Remove Inboard Spoiler Bypass Valve

(1) Open right main gear wheel well door.

(2) Connect external electrical power to airplane.

(3) Depressurize auxiliary hydraulic system.

(a) Position interconnect valve switch to "OPEN."

(b) Position utility manual bypass valve to "BYPASS."

(4) Remove spoiler bypass valve electrical connector.

(5) Remove and plug hydraulic lines.

(6) Remove mounting bolts and spoiler bypass valve.

(7) Remove fittings.

B. Deleted

C. Install Inboard Spoiler Bypass Valve (See figure 202.)

(1) Install O-ring and reducer in each port.

(2) Position spoiler bypass valve and install mounting bolts.

(3) Connect hydraulic lines and electrical connector.

(4) Test spoiler bypass valve per paragraph 3A.

3. Adjustment/Test Inboard Spoiler Bypass Valve

A. Test Inboard Spoiler Bypass Valve

(1) Connect external electrical power to the airplane

(2) Open right main gear wheel well door

(3) Pressurize utility hydraulic system.

(4) Position interconnect valve switch to "OPEN."

(5) Check that inboard spoiler bypass valve control switch is "ON."

NOTE: When spoiler bypass valve control switch is "ON," valve is closed.

(6) Rotate control wheel right and then left and check that inboard spoilers operate.

D E L E T E D

Inboard Spoiler Bypass Valve Installation
Figure 201

(7) Position inboard spoiler bypass valve control switch to "OFF."

(8) Rotate control wheel right then left and check that spoilers remain down.

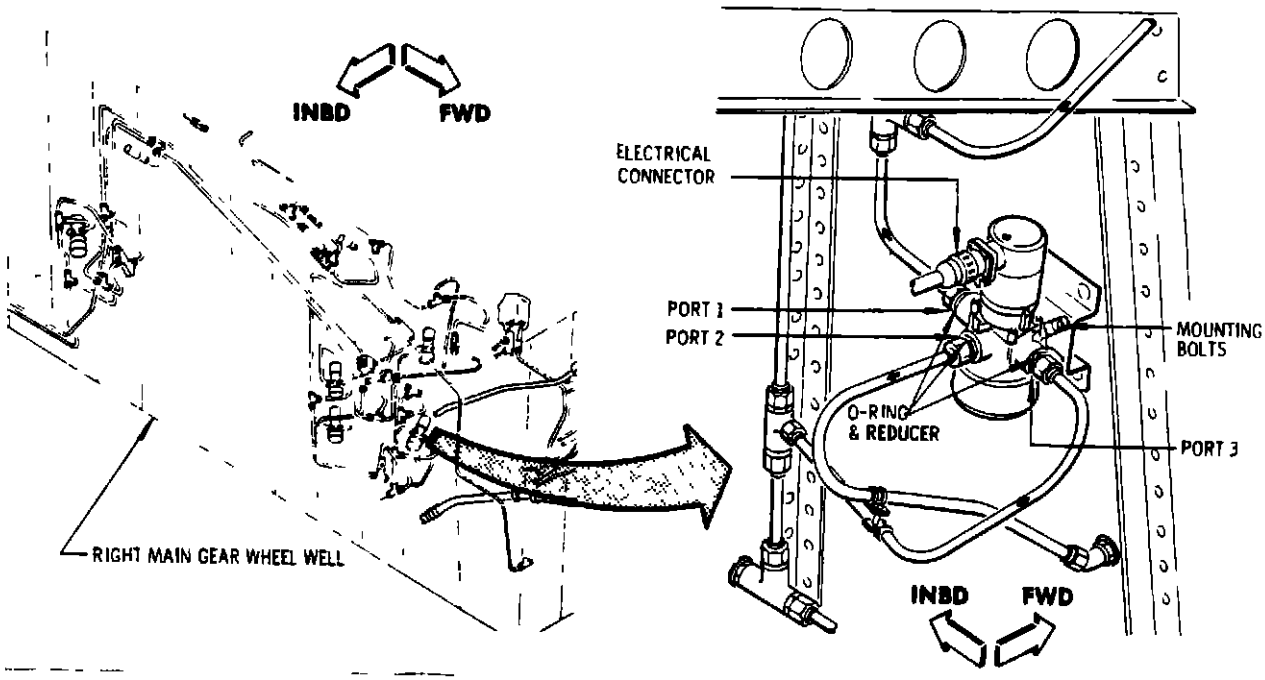
(9) Check spoiler bypass valve for leakage.

(10) Position spoiler bypass valve control switch to "ON."

(11) Position interconnect valve switch to "CLOSED."

(12) Close main gear wheel well door.

(13) Disconnect electrical and hydraulic power.



Inboard Spoiler Bypass Valve Installation
Figure 202

4. Removal/Installation Outboard Spoiler Bypass Valve

See figure 204

A. Remove Outboard Spoiler Bypass Valve

(1) Open left main gear wheel well door or wing lower access panel 1358. See Chapter 12; "Access Doors and Panels."

(2) Depressurize utility hydraulic system.

(a) Position bypass valve to "BYPASS."

(3) Remove electrical connector.

(4) Remove and plug hydraulic lines.

(5) Remove mounting bolts and valve.

B. Deleted

D E L E T E D

Outboard Spoiler Bypass Valve Installation
Figure 203

C. Install Outboard Spoiler Bypass Valve (See figure 204.)

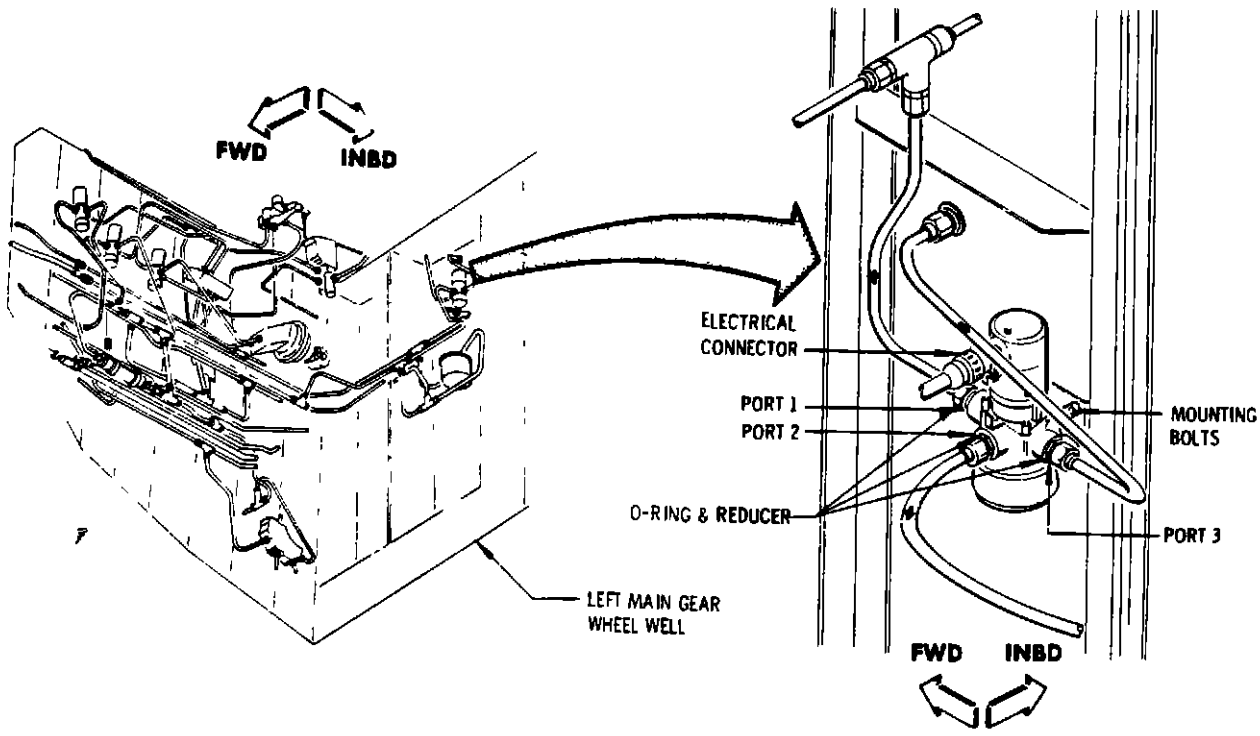
(1) Install O-ring and reducer in each port.

(2) Position outboard spoiler bypass valve and install mounting bolts.

(3) Connect hydraulic tubing and electrical connector.

(4) Test spoiler bypass valve per paragraph 5A.

(5) Close left main gear wheel well door.



Outboard Spoiler Bypass Valve Installation
Figure 204

5. Adjustment/Test Outboard Spoiler Bypass Valve

A. Test Outboard Spoiler Bypass Valve

(1) Connect external hydraulic power and pressurize utility hydraulic system.

(2) Connect external electrical power.

(3) Check that outboard spoiler control switch is "ON."

(4) Rotate control wheel to left then right, check that spoilers operate.

(5) Position outboard spoiler control switch to "OFF."

(6) Rotate control wheel and check that outboard spoilers do not operate.

(7) Open left main gear wheel well door or wing lower access panel 1358. See Chapter 12, "Access Doors and Panels."

(8) Check spoiler bypass valve for leakage.

(9) Position spoiler control switch to "ON."

(10) Remove hydraulic and electrical external power.

(11) Close access doors.

SPOILER SWIVEL JOINT - REMOVAL/INSTALLATION

1. General

   A. During removal and installation of spoiler hydraulic components take necessary precautions to prevent spillage of hydraulic fluid. Should any fluid spill on the airplane, decontaminate. Refer to Cleaning and Washing, Chapter 12.

   B. Spoilers may be raised with the hydraulic system depressurized by setting the speed brake control lever at 60 degrees and then depressing the ground release plunger on the spoiler actuator on OO-SJA through OO-SJG (see 27-4-1, figure 201), and on spoiler modular package on OO-SJH and on (see 27-4-62, figure 401, detail A).

      CAUTION: FAILURE TO SET THE SPEED BRAKE CONTROL LEVER AT 60 DEGREES BEFORE DEPRESSING THE GROUND RELEASE PLUNGER MAY RESULT IN DAMAGE TO THE FOLLOW-UP MECHANISM.

2. Equipment and Materials

   A. Spoiler Actuator Lock Assembly - F71264-500, or F71264-501 or equivalent

   B. Hydraulic service Cart - 0 to 3000 psi operating pressure.

3. Prepare for Removal

   A. Connect electrical and hydraulic power to the airplane.

   B. Pressurize hydraulic system.

   C. Position interconnect valve to OPEN to pressurize auxiliary hydraulic system.

   D. Position flap control handle to DOWN.

   E. Unlatch and lower applicable cove lip door.

   F. Position speed brake handle to 60 degrees.

   G. Depressurize hydraulic system. Position bypass valve to BYPASS.

   H. Install spoiler actuator lock assembly.

4. Remove Spoiler Swivel Joint

   A. Remove and plug hydraulic lines. (See figure 401.)

   B. Remove mounting bolt and swivel joint.

5. Install Spoiler Swivel Joint

   A. Install O-ring and union in ball assembly.

B. Position spoiler swivel joint and install mounting bolts. (See figure 401.)

C. Connect hydraulic lines.

D. Remove lock assembly.

E. Position bypass valve to CLOSED and pressurize the system.

F. Check swivel joints for hydraulic leakage.

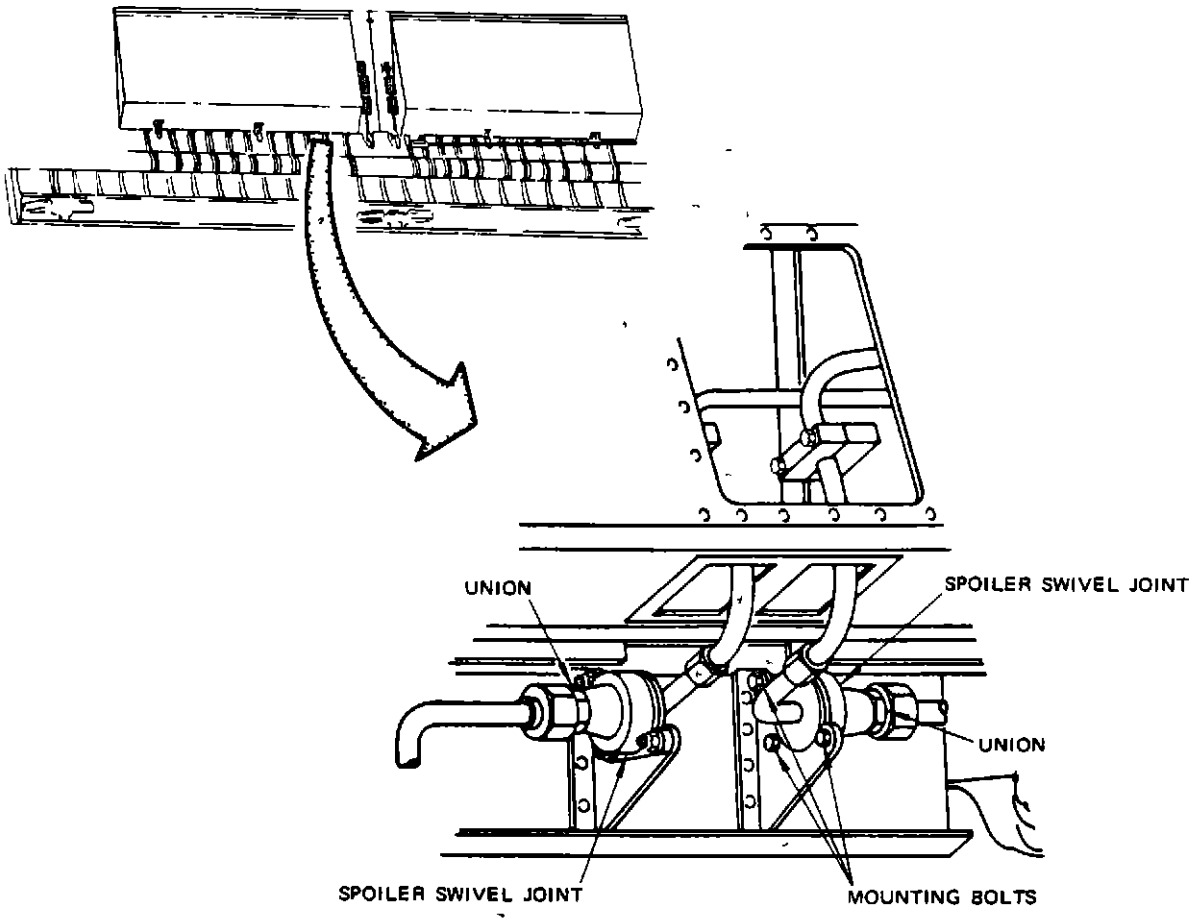
6. Restore Airplane to Normal

A. Reduce pressure to zero.

B. Retract flap and close cove lip door.

C. Position interconnect valve switch to CLOSED.

D. Remove electrical and hydraulic power.



Spoiler Swivel Joint Installation
Figure 401

SPOILER FOLLOW-UP LINKAGE - MAINTENANCE PRACTICES

1. Approved Repairs/Inboard Follow-Up Linkage

A **The shear feature has been eliminated and inboard follow-up crank shear rivets have been replaced by structural rivets.**

(1) Cornect electrical power to airplane

(2) Pressurize utility hydraulic system.

(3) Position flap control lever to "DOWN."

(4) Unlatch inboard cove lip door latches and lower doors

(5) Position hydraulic system interconnect valve to "OPEN "

(6) Position speed brake control lever to 60°.

NOTE When follow-up crank rivets are sheared, spoilers cannot be stopped in any intermediate position.

(7) Depressurize hydraulic system.

(a) Manually position the utility system bypass valve to "BYPASS."

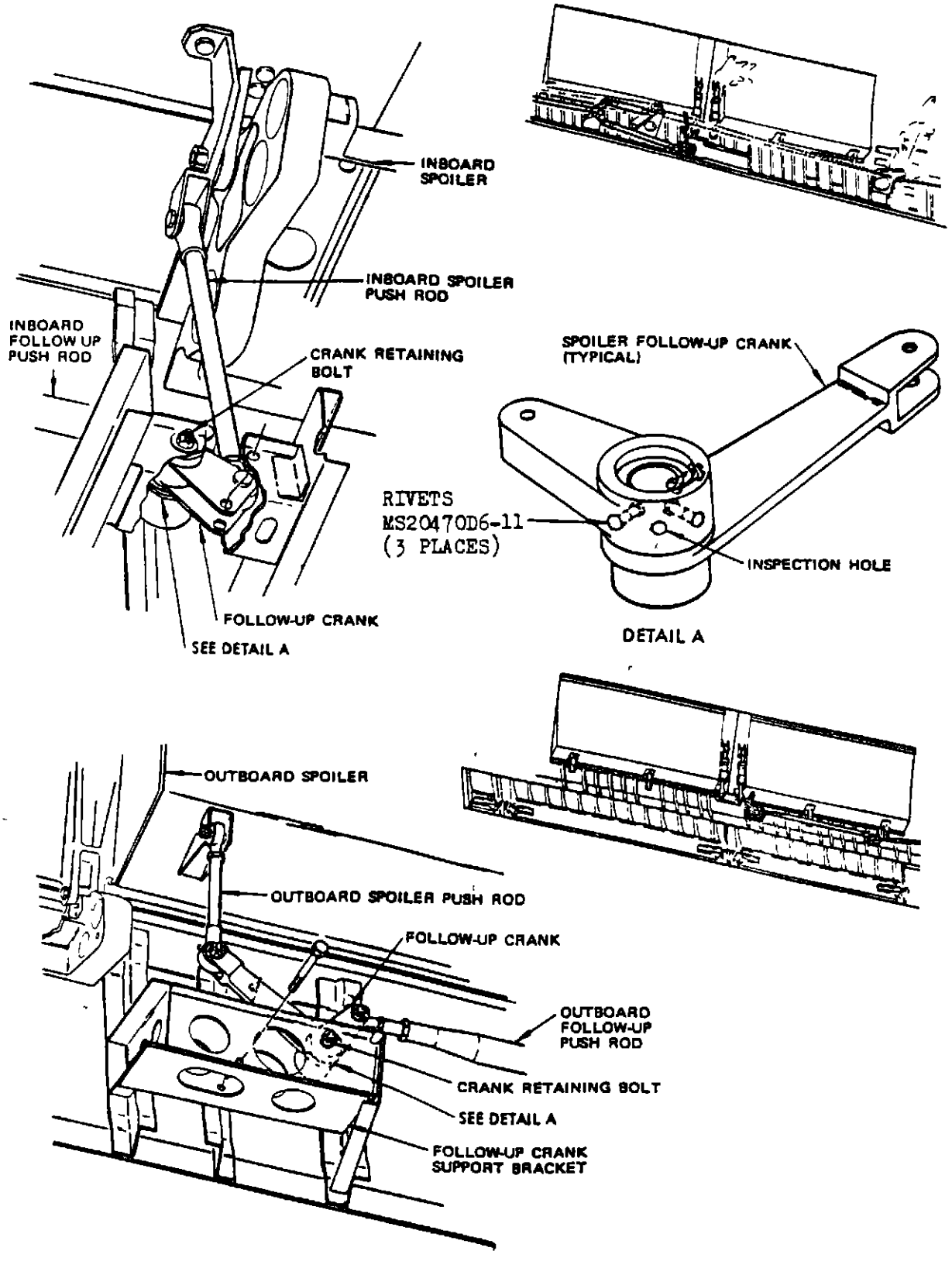
WARNING. TO PREVENT INJURY TO MAINTENANCE PERSONNEL, THE HYDRAULIC POWER TO THE SPOILER CONTROL SYSTEM MUST BE DEPRESSURIZED BEFORE DISASSEMBLY OF SPOILER SYSTEM.

(8) Disconnect inboard spoiler push rod from follow-up crank. (See figure 201.)

(9) Disconnect inboard follow-up push rod from follow-up crank

(10) Remove bolt and follow-up crank from support bracket.

(11) Remove sheared rivets from follow-up crank. Check that arm rotates freely around shaft of crank.



Spoiler Follow-Up Crank Shear Rivets
Figure 201

(12) Install (3) MS20470D6-11 rivets in crank and arm.

(13) Install follow-up crank in support bracket. Lockwire drilled head of crank retaining bolt to crank support bracket

(14) Connect inboard follow-up pushrod to follow-up crank.

CAUTION: TO AVOID STRUCTURAL INTERFERENCE, BOLT ATTACHING SPOILER PUSHROD TO FOLLOW-UP CRANK MUST BE INSTALLED WITH HEAD AFT

(15) Connect inboard spoiler pushrod to follow-up crank.

(16) Manually position the utility system bypass valve to CLOSED.

(17) Pressurize utility hydraulic system.

(18) Position speed brake control lever full forward (inboard speed brake control drum cranks against stops).

(19) Position aileron control wheel to neutral

(20) Check that spoilers fair to within 1/4 inch

(21) If spoilers do not fair within 1/4 inch, rig system per 27-4-0, Adjust Spoilers and Spoiler Control System

(22) Raise and latch cove lip doors

(23) Position flap control lever to UP

(24) Disconnect hydraulic pressure source.

(25) Position hydraulic interconnect valve to CLOSED.

(26) Disconnect electrical power.

2. Approved Repairs/Outboard Follow-Up Linkage

A. The shear feature has been eliminated and outboard follow-up crank shear rivets have been replaced by structural rivets.

(1) Pressurize utility hydraulic system.

(2) Position flap control lever to "DOWN."

(3) Unlatch outboard cove lip doors and lower doors.

(4) Position speed brake control lever to 60°.

NOTE: When follow-up crank rivets are sheared, spoilers cannot be stopped in any intermediate position.

(5) Depressurize hydraulic system.

(a) Manually position the utility system bypass valve to "BYPASS."

WARNING: TO PREVENT INJURY TO MAINTENANCE PERSONNEL, THE HYDRAULIC POWER TO THE SPOILER CONTROL SYSTEM MUST BE DEPRESSURIZED BEFORE DISASSEMBLY OF SPOILER CONTROL SYSTEM.

(6) Disconnect outboard spoiler push rod from follow-up crank. (See figure 201.)

(7) Disconnect outboard follow-up push rod from follow-up crank.

(8) Remove bolts securing follow-up crank support bracket.

(9) Remove follow-up crank retaining bolt by pulling support bracket aft from structure and rotating bracket until sufficient clearance is provided to withdraw crank retaining bolt.

(10) Remove follow-up crank.

(11) Remove sheared rivets from follow-up crank. Check that arm rotates freely around shaft of crank.

(12) Install (3) MS20470D6-11 rivets in crank and arm.

(13) Install follow-up crank in support bracket.

(14) Fasten support bracket to wing structure.

(15) Connect outboard follow-up push rod to follow-up crank.

(16) Connect outboard spoiler push rod to follow-up crank. Install bolt with head forward.

(17) Manually position the utility system bypass valve to "CLOSED".

(18) Pressurize utility hydraulic system.

(19) Position speed brake control lever full forward,(inboard speed brake control drum cranks against stop).

(20) Position aileron control wheel to neutral.

(21) Check that spoilers fair to within 1/4 inch.

(22) If spoilers do not fair with 1/4 inch, rig system per 27-4-0, "Adjust Spoilers and Spoiler Control System".

(23) Raise and latch cove lip doors.

(24) Position flap control lever to "UP".

(25) Disconnect hydraulic pressure source.

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SPEED BRAKE CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General

A. Speed brake control system (figure 1) actuates all spoilers simultaneously to create aerodynamic drag that retards airplane velocity. The control signal for speed brakes is introduced to the spoiler control valves through a differential linkage. All spoilers extend equally unless a lateral control signal has been previously introduced. The lateral control function of the spoilers remains available when these surfaces are used as speed brakes. A warning horn indicates an unsafe condition when take-off is attempted with a speed brake setting.

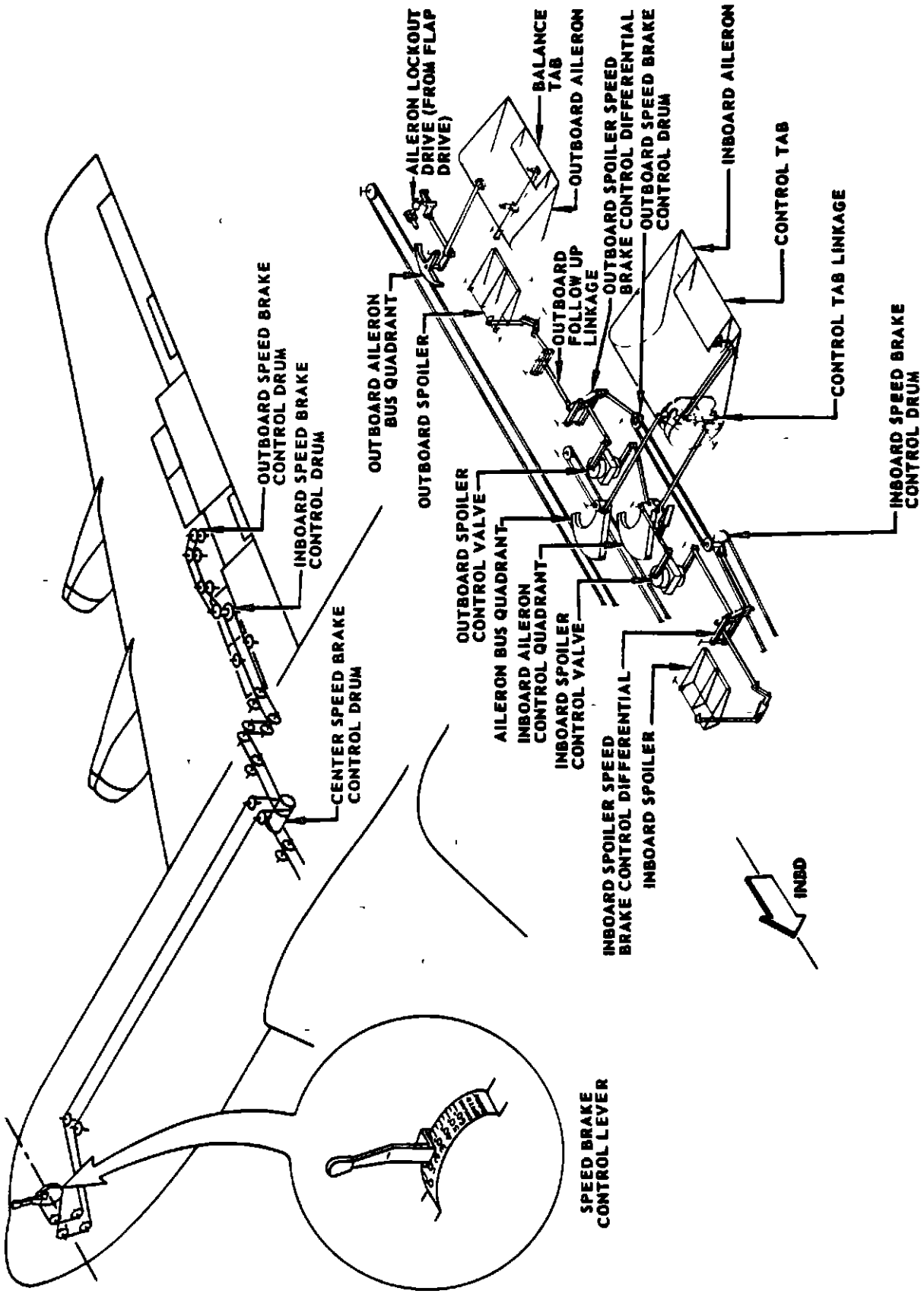
B. Components of the speed brake control system and their arrangement in the system are shown in figure 1.

C. System control is introduced at the speed brake control lever on the pilot's side of the control stand. Motion is transferred by cable to inboard and outboard speed brake control drums. These drums are connected by pushrods to the differential linkage of the spoiler control system. Spoilers are positioned in proportion to the movement of the control lever.

D. The speed brake control lever actuates a warning switch when the lever is moved from the "0" position. With the airplane on the ground, the thrust levers advanced to 75% or more thrust on OO-SJA through OO-SJG and to 50% or more thrust on OO-SJH and on, and speed brakes set, the warning horn will sound intermittantly.

2. Speed Brake Control Lever

A. The speed brake control lever introduces mechanical motion into the speed brake control system. The upper portion of the lever is a spring loaded telescoping handle. A compression spring is mounted within the handle. A small lug, which acts as a lock, projects inboard from the lower portion of the handle. An indicator on the lever points to a dial with a "0" to 60° scale divided in increments of 10°. The lower portion of the lever forms a housing that encloses a cable drum and a double acting brake. The brake consists of a shoe assembly and an alloy steel friction quadrant. Shoe pins in the shoe assembly cluster about the steel quadrant in a rectangular layout. The shoe assembly pivots on a pin that is stationary relative to the cable drum. Projecting from the periphery of the drum is a phenolic switch actuator The drum is grooved for 1/8 diameter cable and is drilled for cotter pins to secure cable terminals. A drive pin on the lower portion of the lever fits loosely through a hole in the drum. When a force is applied on this handle to rotate the lever, this loose fit between the pin and hole enables the brake to release before a positive contact is made between the lever and drum. A spring loaded roller that is always in contact with the bottom of the drum enters a detent in the drum when the lever is rotated to the 30° position.



Speed Brake Control System
Figure 1

B. The speed brake control lever is located within the control stand on the left forward side. The operating handle extends above the control stand through a cut-out in the cover. Access to the lever is available by removing the left lower side panel and control handle access panel. The thrust lever support shaft provides a bearing support for the speed brake control lever. Two speed brake control cables attach to the drum.

C. The speed brake control lever is manually rotated when speed brakes are required. Lifting the handle from the lockout detent (off position) on the control stand permits the control lever to be positioned for speed brake application. The lever rotates freely when a manual force is applied to the handle. When system feed back forces are present at the cable drum, the shoe assembly grips the steel friction quadrant to lock the lever and hold the speed brake setting. Sixty degrees of spoiler extension is possible with maximum speed brake setting.

3. Speed Brake Position Warning System

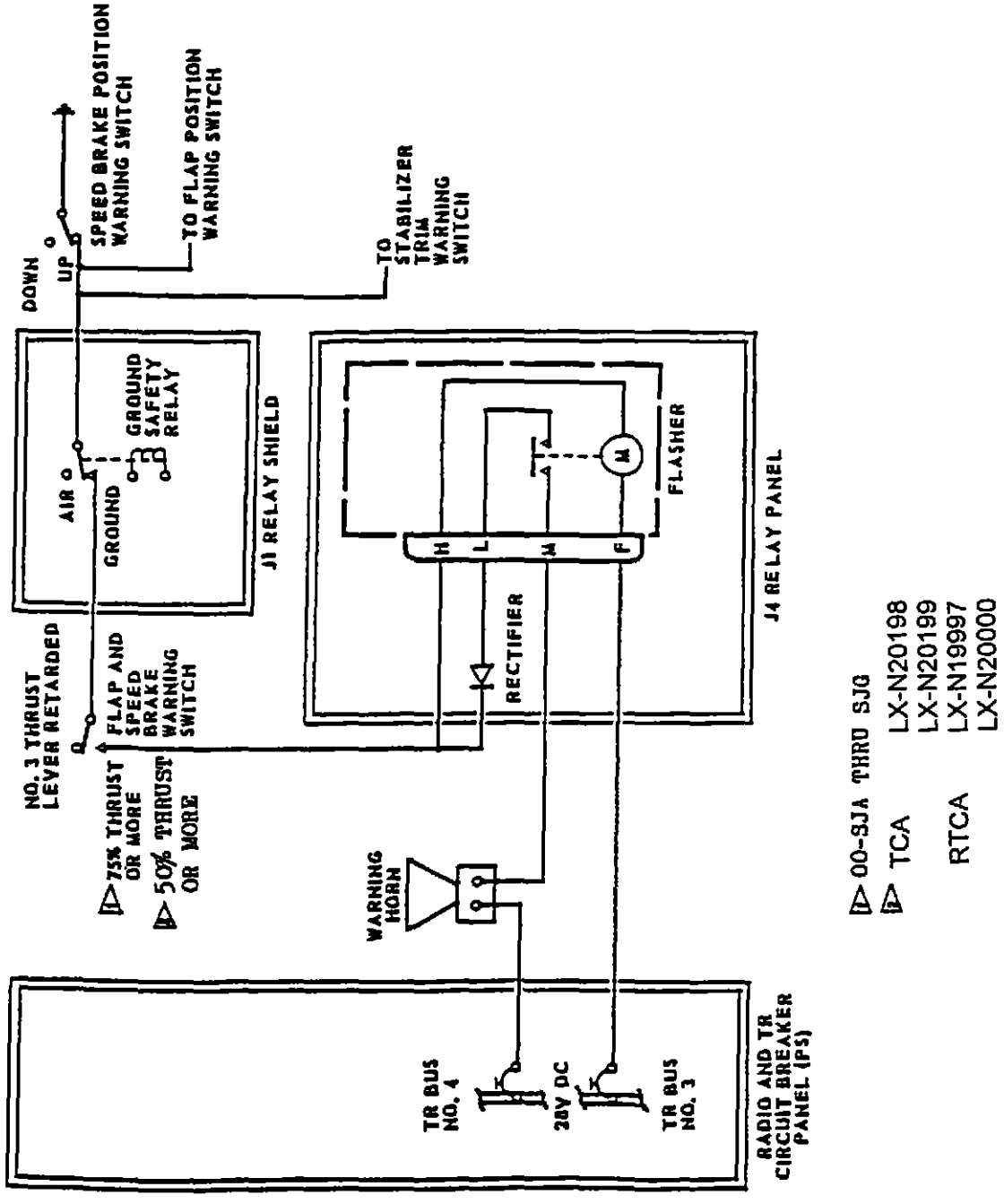
A. A warning horn is actuated by the speed brake position warning system when an unsafe condition for take-off exists. (See figure 2.)

B. The speed brake warning switch (single pole, single throw) is operated from cam motion produced by a phenolic actuator attached to the cable drum of the speed brake control lever. The switch is mounted in the left forward portion of the control stand, forward of the speed brake control lever. It is accessible by removing the left lower side panel on the control stand.

C. The speed brake warning switch completes a circuit to the ground safety relay. When the speed brake control lever is in any raised positions, No. 3 thrust lever at 75% or more thrust on OO-SJA through OO-SJG and at 50% or more thrust on OO-SJH and on, and the airplane on the ground, the warning horn will sound. A flasher unit in the J4 relay panel operates to give intermittent horn soundings. The horn cut-out switch does not eliminate a sounding horn from the system with a speed brake warning signal. Moving the speed brake control lever to the lockout (off) position opens the speed brake warning switch, interrupting current to the horn.

4. Operation

A. Lifting the speed brake lever handle on the control stand slightly will raise the lug from the detent permitting handle movement. Rotating the speed brake control lever introduces motion into the speed brake control cables to drive the center speed brake control drum. Motion divides at this drum and is transferred outboard behind the rear spar of each wing by two cables to inboard and outboard speed brake control drums. Pushrods between outboard and inboard spoiler control system differential linkage connect to outboard and inboard speed brake control drums. The spoilers extend in proportion to movement of the control handle.



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Speed Brake Position Warning System Circuit
Figure 2

B. When the control lever is moved to the 30° position, the spring loaded roller under the lever enters a detent. This indicates spoilers have reached maximum extension to be used during normal flight. Additional force on the handle frees the roller from the detent permitting an increase of 30° additional spoiler extension.

C. Push rods from wing mounted speed brake control drums act as pivots for spoiler differential linkage when motion exists in the spoiler follow-up linkage. Forces on these push rods are restrained from altering speed brake setting by the double acting brake within the control lever. Feedback forces on the push rods are returned to the speed brake control lever as unequal cable loads. A slight rotation of the cable drum pivots the shoe assembly causing the shoe pins to grip the alloy steel quadrant. Increasing cable drum torque increases the gripping action of the shoe pins resulting in a larger holding force.

D. When the cable drum is rotated by action of the control lever, the shoe assembly is held in a position, normal to the friction quadrant, that prevents any gripping of this quadrant.

E. An attempted take-off with elevated spoilers resulting from a speed brake setting constitutes an unsafe condition. When this condition exists, the speed brake warning system operates the warning horn to give an audible warning. The speed brake control switch is closed when the speed brake control lever is advanced for a brake setting. With the airplane on the ground, the ground safety relay is closed (by action of compressed landing gear) and completes a segment of the warning circuit. The remaining circuit is completed when No. 3 thrust lever is advanced to 75% or more thrust on OO-SJA through OO-SJG and to 50% or more thrust on OO-SJH and on. Current from the 28 volt d-c bus feeds through a flasher on the J4 relay panel for intermittent horn operation. Moving the speed brake control lever to the lockout (off) position opens the speed brake warning switch interrupting current to the horn. Take-off can then be completed with retracted spoilers. After the airplane is airborne, the ground safety relay opens. Then the position of No.3 thrust lever and speed brake control handle have no effect on the horn for speed brake warning.

END

SPEED BRAKE CONTROL SYSTEM - TROUBLE SHOOTING

With utility and auxiliary hydraulic systems pressurized, electrical system energized, spoiler control system in correct adjustment, rotate speed brake control lever for full travel. IF -

CONTINUED ON FOLLOWING PAGE

- EXCESSIVE FORCE REQUIRED TO ROTATE SPEED BRAKE CONTROL LEVER
- FORCE REQUIRED TO ROTATE SPEED BRAKE CONTROL LEVER DOES NOT INCREASE SUFFICIENTLY AT THE 30° POSITION.
- SPOILERS DO NOT RESPOND IN PROPER DIRECTION.
- SPEED BRAKE CONTROL SYSTEM JAMMED.

Check control cable tension If -

Check speed brake control lever detent arm assembly for broken spring. IF -

CABLES REVERSED. Adjust speed brake control system.

Check system for chafing parts and foreign objects. IF -

NOT OK - Replace broken spring and adjust tension until handle release force does not exceed 19 lb.

OK - Increase spring tension until handle release force does not exceed 19 lb.

NOT OK - Adjust cables to specified tension.

OK - Check system for chafing parts and foreign objects. IF -

NOT OK - Correct trouble and check for damage.

OK - Relieve tension in speed brake control system cables. Rotate each control drum separately and check for frozen bearing. IF -

NOT OK - Correct trouble and check for damage.

OK - Relieve tension in speed brake control cables. Rotate each control drum separately and check for binding bearings. IF -

NOT OK - Remove control drum and replace defective drum or bearing as required.

OK - Replace speed brake control lever.

NOT OK - Remove control drum and replace defective bearing or drum as required.

OK - Replace speed brake control lever.

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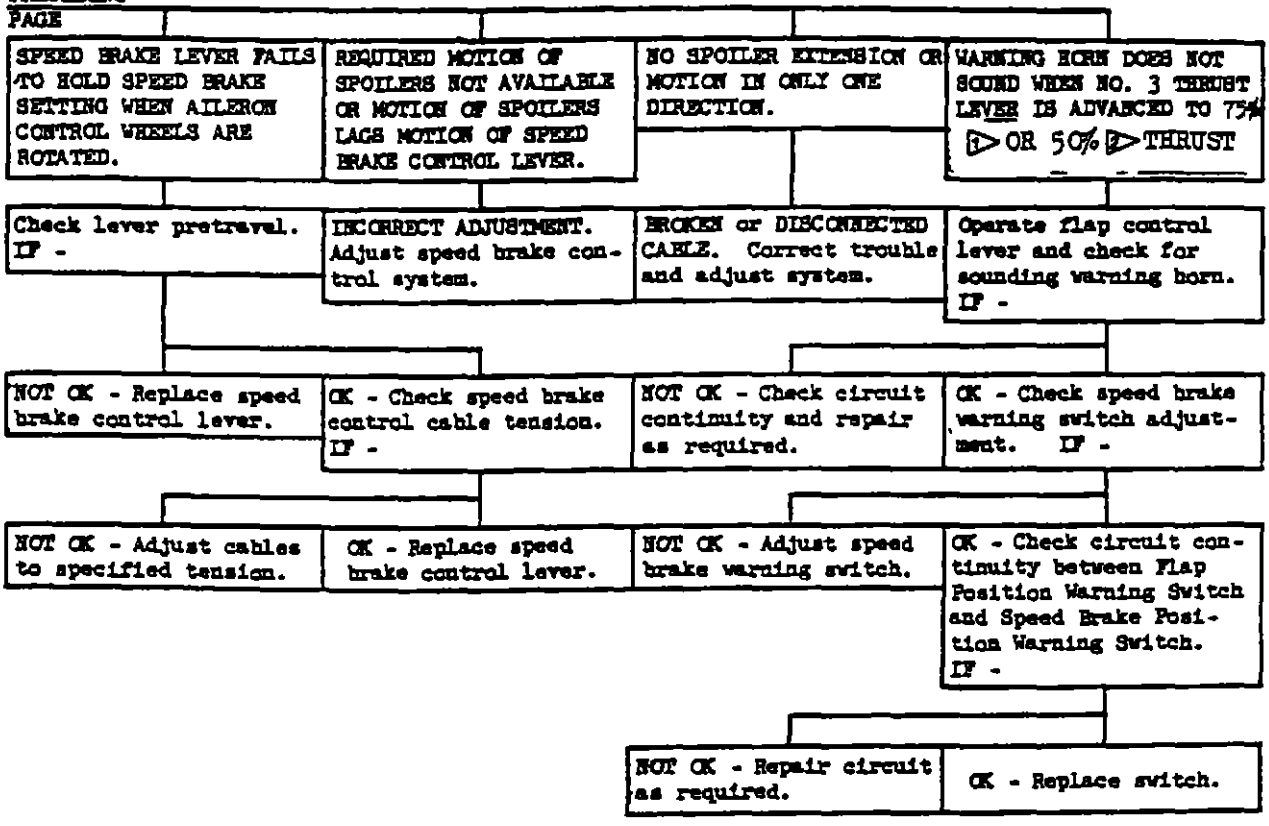


▷ OO-SJA THRU OO-SJG
75% THRUST CORRESPONDS TO
42 ± 2° FORWARD FROM IDLE

▷ TCA LX-N20198, LX-N20199. RTCA LX-N19997, LX-N20000.
50% THRUST CORRESPONDS TO
25 ± 2° FORWARD FROM IDLE

SPEED BRAKE CONTROL SYSTEM - MAINTENANCE PRACTICES

1. Adjustment/Test Speed Brake Control System

A. Equipment and Materials

(1) Tensiometer - 0 to 150 lb capacity

(2) Feeler gauge set

(3) Protractor Assembly - F52485-500 or equivalent

(4) Stand Assembly - F71292-17 or equivalent

(5) Spring Scale - 0 to 25 lb capacity

(6) Throttle warning horn protractor assembly - F70024 or equivalent

B. Prepare to Adjust Speed Brake Control System

(1) Connect electrical power.

(2) Place spoilers in faired position.

(3) Open right main gear wheel well door.

(4) Remove wing lower access panel 1358. (See Chapter 12, Access Doors and Panels.)

(5) Open middle inboard cove door 1257 on turbojet airplanes; 1248 on turbofan airplanes.

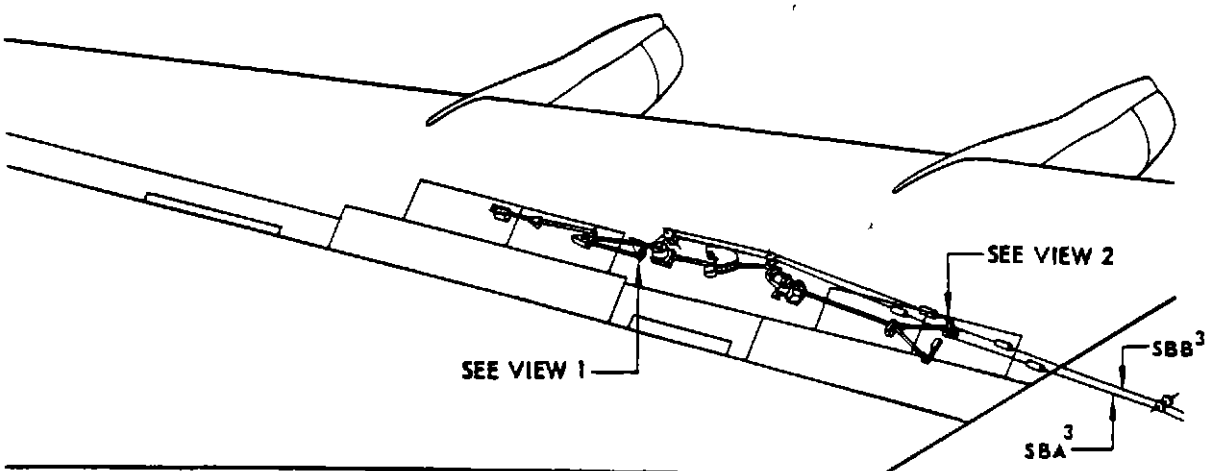
C. Adjust Speed Brake Control System

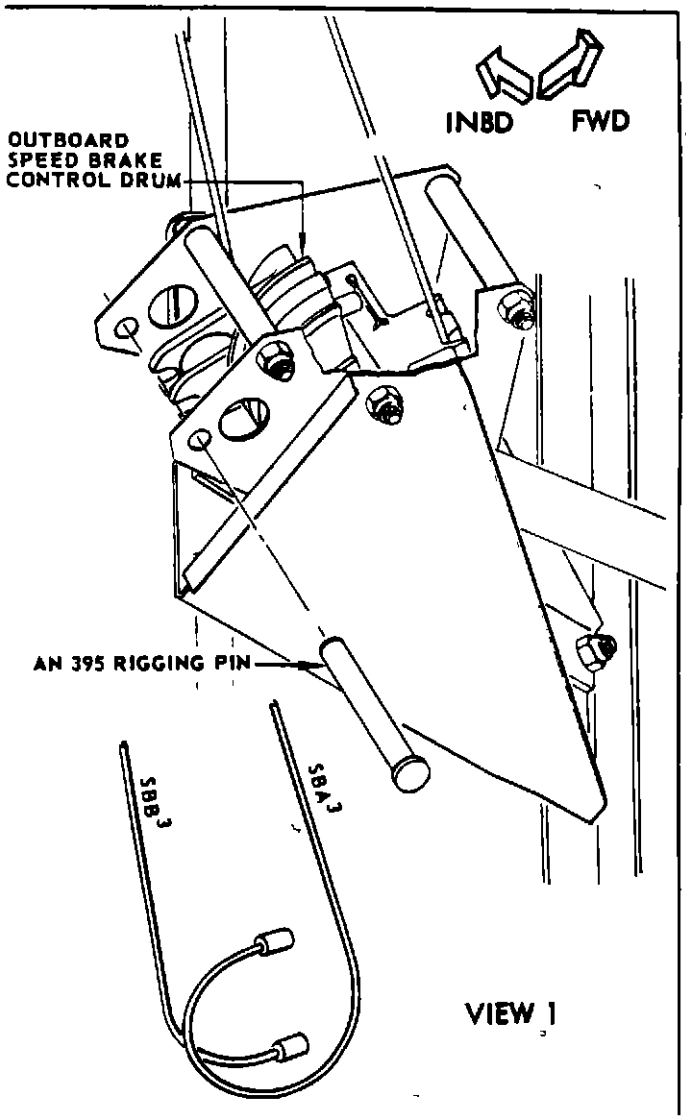
(1) Position the speed brake control lever with the forward edge of the lever catch even with the aft edge of the "OFF" detent of the indicator plate.(Figure 203)

(2) Install AN395 rigging pin or AN5 bolt (figure 202) in center speed brake control drum and cable guide support.

(3) Adjust cables between center speed brake control drum and speed brake control lever to specified tension per figure 201. Balance cable loads until rigging pin fits freely in drum.

(4) Adjust cables between center speed brake control drum and inboard speed brake control drum until clearance between stop and crank is 0.010 (+0.010/-0.005) inches when cables are rigged to specified tension.

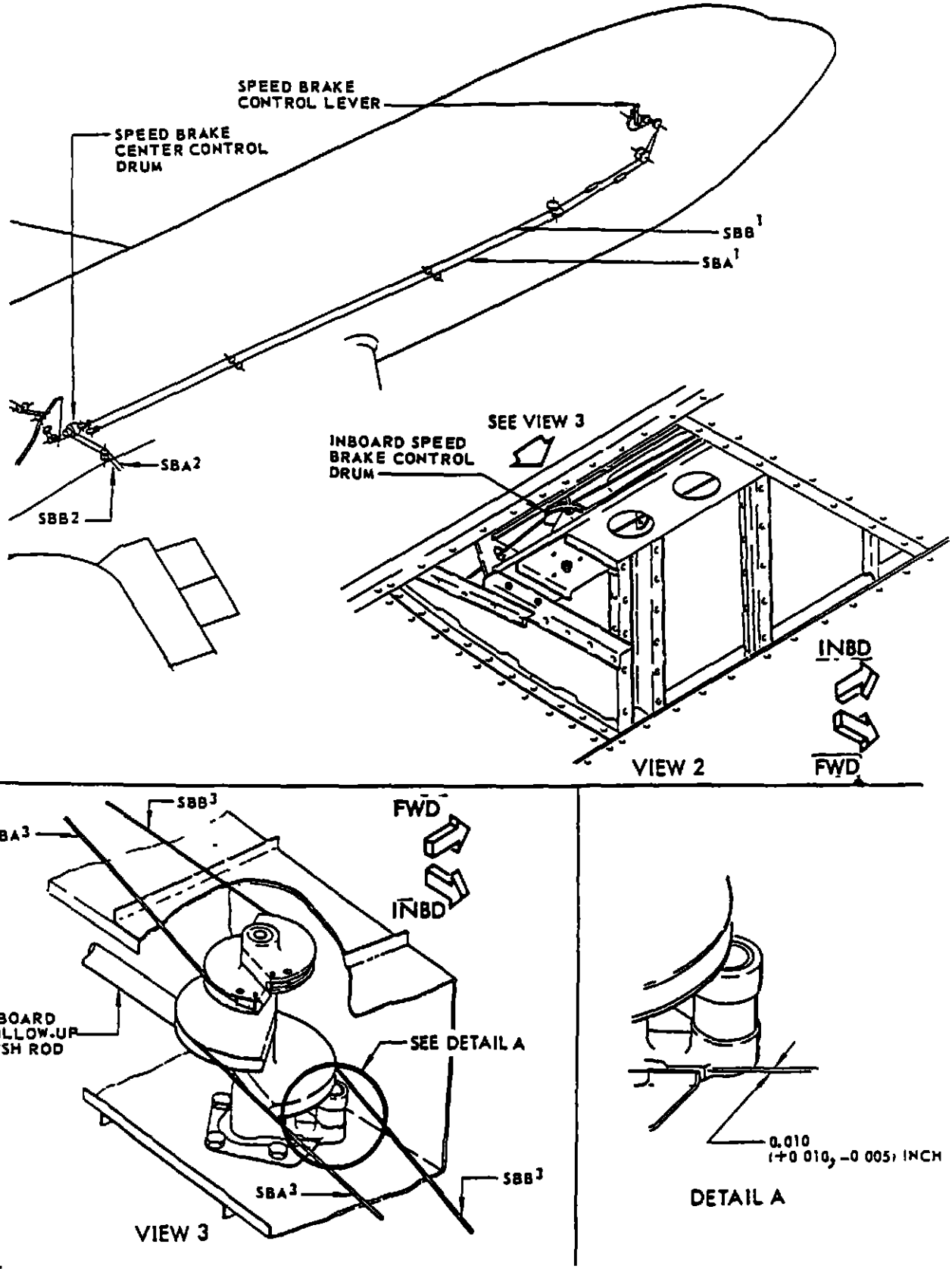




VIEW 1

TEMP (° F) ▷1	RIGGING LOAD (LB) (± 10 LBS)
110	118
90	109
70	100
50	92
30	84
10	75
-10	67
-30	59
-40	53

▷1 TO INSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF ONE HOUR AT CONSTANT AMBIENT TEMPERATURE (± 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE


SPEED BRAKE CONTROL LEVER
SPEED BRAKE CENTER CONTROL DRUM
SBB1
SBA1
SBA2
SBB2
SEE VIEW 3
INBOARD SPEED BRAKE CONTROL DRUM
INBD
FWD
VIEW 2
SBB3
SBA3
FWD
INBD
INBOARD FOLLOW-UP PUSH ROD
SEE DETAIL A
SBA3
SBB3
VIEW 3
0.010 (+0.010, -0.005) INCH
DETAIL A

(5) Install AN395 or AN5 rigging pin in outboard speed brake control drum and guide support.

(6) Adjust cables between inboard speed brake control drum and outboard speed brake control drum until rigging pin fits freely in drum when cables are rigged to specified tension.

(7) Check that clearance between inboard speed brake control drum crank and stop is 0.010 (+0.010/-0.005) inches.

(8) Remove access panel on lower left side of control stand.

(9) Loosen speed brake warning switch retaining screws in left front control stand panel.

(10) Advance NO. 3 thrust lever forward from idle, at least to 27°.

(11) Rotate speed brake control lever to a 3° (+2°/-1°) setting.

(12) Adjust speed brake control switch by regulating the position of the switch until warning horn commences sounding.

NOTE: A small wooden or plastic rod may be used to reach through the open portion of the control stand to raise the switch to the off position. Tapping lightly on the retaining screws will lower the switch to the on position. Adjust from the off (horn silent) to the on position.

(13) Tighten speed brake warning switch retaining screws.

D. Close up and return to original configuration.

(1) Replace access panel.

(2) Rotate No. 3 thrust lever to the idle position.

(3) Rotate speed brake control lever to "0."

(4) Remove external power.

(5) Test speed brake control system; see paragraph 1.E.

E. Test Speed Brake Control System

(1) Connect external hydraulic and electrical power to airplane.

(2) Position interconnect valve switch on copilot's instrument panel to "OPEN."

(3) Pressurize hydraulic systems.

(4) Rotate aileron trim control wheel to "0."

S (5) Rotate aileron control wheel to neutral (centered position).

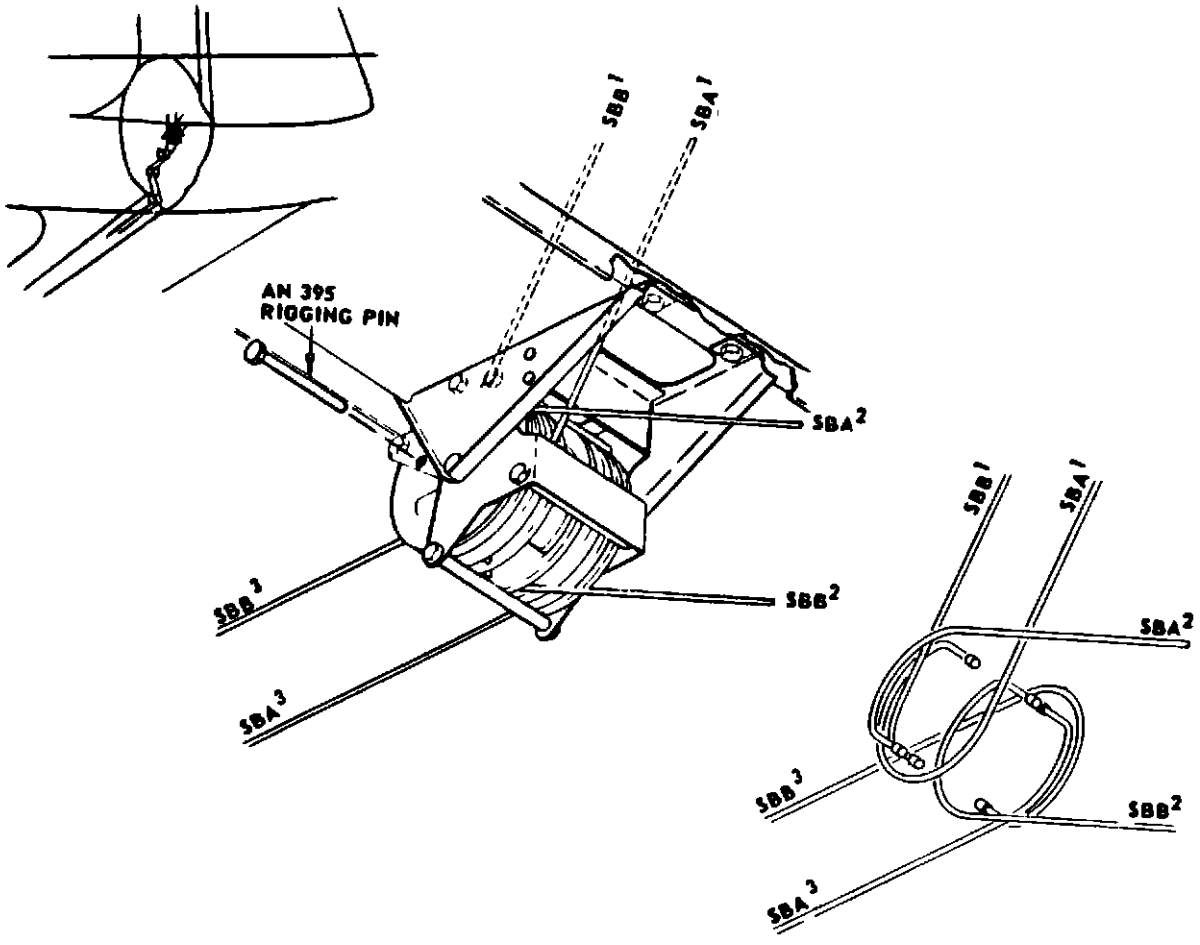
(6) Slowly position speed brake lever to "30°" position.

(7) Check angular displacement of spoiler 2, 3, 6 and 7 with protractor and stand assemblies. Spoiler panels should rise 30° (± 3°) from down position.

WARNING: SPOILER MOVEMENT IS RAPID. TO AVOID INJURY KEEP HANDS CLEAR OF AREA.

(8) Check that angular difference between any two spoilers does not exceed 5 degrees.

(9) Check that angular difference between the sum of displacement angles for spoiler 2 and 3 and the sum of displacement angles for spoiler 6 and 7 is within 8 degrees.



Center Speed Brake Control Drum Adjustment
Figure 202

(10) Slowly move speed brake lever aft until inboard speed brake control crank is fully against stop.

NOTE: The speed brake lever need not align with the 60° setting.

(11) Check angular displacement of spoilers 2, 3, 6 and 7 with protractor and stand assemblies. Spoiler panels should rise 60° (± 3°) from down position.

(12) Check that angular difference between any two spoilers is within 5 degrees.

(13) Check speed brake system force.

(a) Measure force to pull speed brake lever to "0." Use spring scale to measure force perpendicular to lever.

(b) Force shall not exceed 15 pounds.

(c) Position lever to "0."

(d) Measure force to pull lever to "60°."

(e) Force shall not exceed 15 pounds.

(f) Position lever to "30°."

(g) Measure force required to pull lever out of detent.

(h) Force shall not exceed 24 pounds to release in either direction

(i) Position speed brake lever to "40°."

(j) Measure force to pull lever to "30° "

(k) Force shall not exceed 18 pounds.

(l) Position speed brake lever to "0."

(14) Rapidly move speed brake lever from "0" to 60° position.

(15) Check that spoilers move from full down to full up in 2.7 (± 0.3) seconds.

(16) Rapidly move speed brake lever from 60° to "0" position.

(17) Check that spoilers move from full up to full down in 1.2 (± 0.3) seconds.

(18) Advance NO. 3 thrust lever forward from idle, at least to 27°.

(19) Check that speed brake warning horn will commence sounding in 2° to 5° range when speed brake control lever is rotated from "0."

(20) Return No. 3 thrust lever to idle position.

(21) Return speed brake control lever to "0."

(22) Position interconnect valve switch to "CLOSED."

(23) Disconnect external hydraulic and electrical power.

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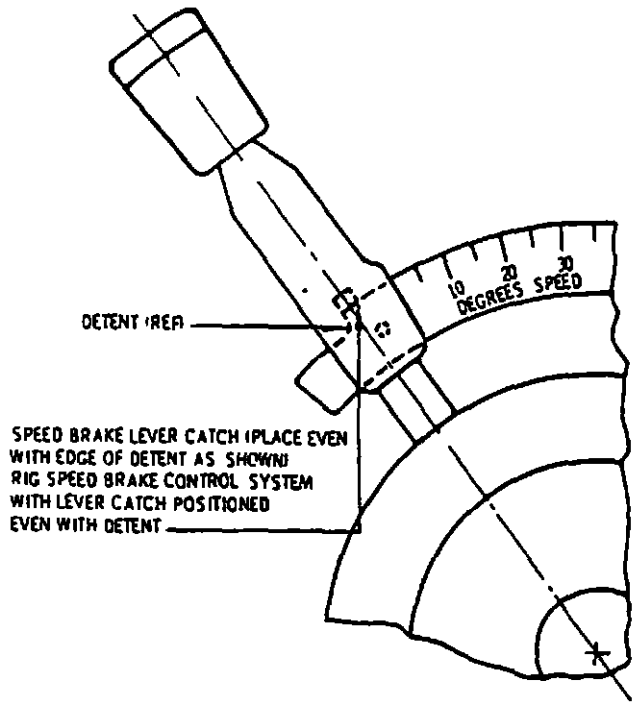


Speed Brake Lever Rigging Position
Figure 203

SPEED BRAKE CONTROL LEVER - MAINTENANCE PRACTICES

1. Removal/Installation Speed Brake Control Lever

A. Equipment and Materials

(1) Spring scale 0 to 100 lb capacity

(2) Aeroshell Grease 17.

(3) Wood or plastic dowel 1-1/2 inches in diameter and 12 inches long

B. Remove Speed Brake Control Lever

(1) Open both main gear wheel well doors and remove right cowl panel from each engine.

(2) Depressurize hydraulic system.

(a) Connect electrical power, open manual utility system bypass valve and open system interconnect valve.

(3) Cut off electrical power to speed brake warning switch by opening circuit on T-R Bus No. 3 and T-R Bus No. 4 on radio and circuit breaker panel P5.

(4) Install rigging pin through flap control valve support bracket and follow-up drum in each main gear wheel well.

(5) Install AN395 rigging pin or AN5 bolt in center speed brake control drum and drum support. (See 27-5-0, figure 202.)

(6) On turbojet airplanes only, remove nacelle strut access panels No. 1742 (for outboard engines) and No. 1708 (for inboard engines). (See "Access Doors and Panels," Chapter 12.)

(7) On turbojet airplanes only, block engine thrust and start cables.

(a) Insert AN395 rigging pin or AN5 bolt through each thrust reverse control drum and hanger. (See 76-1-0, figure 202.)

(b) Insert AN395 rigging pin or AN5 bolt through each engine start arm and bracket. (See 76-1-0, figure 204.)

(8) On turbofan airplanes only, block engine thrust and start cables at each engine. Insert AN395 rigging pin or AN5 bolt through throttle and start arms and engine rigging bracket at upper engine bellcrank. (See 76-2-0, figures 203 and 204.)

(9) Relieve tension on stabilizer trim chain assembly by adjusting support linkages to raise forward mechanism. (See 27-10-0, figure 203.)

(10) Relieve tension on wing flap control cables by loosening turnbuckles in lower nose compartment.

(11) Relieve tension and disconnect speed brake control cables at turnbuckles in lower nose compartment and tag for installation.

(12) Remove access panels in forward cargo compartment ceiling for access to engine control cables.

NOTE: Turnbuckles for outboard engines are located in lower nose compartment.

(13) Disconnect thrust cables for all engines at turnbuckles in lower nose compartment and tag for installation.

NOTE: Cables may be identified by operating control levers and observing cable action and tagged for installation.

(14) Relieve tension on all engine start cables.

(15) Remove lower control stand access panels on each side of control stand.

(16) Remove tie rod retaining nut from hub of the right stabilizer trim control wheel (15, figure 205.)

(17) Remove right stabilizer trim control wheel (5) from stabilizer trim control wheel shaft (1).

(18) Remove upper right access cover (4).

(19) Remove forward right electronic unit (13) from aft electronic panel.

(20) Remove lower right access panel (7) to gain access to the mounting nuts on upper right side panel (9).

(21) Remove mach trim cutoff switch guard (8) to gain access to bolt (14) for removal of upper right side panel.

(22) Loosen stabilizer trim indicator crank bolt from nutplate (11) on upper right side panel.

NOTE: Do not remove bolt from stabilizer trim indicator crank.

(23) Remove bolt (14) from within aft electronic panel and upper right side panel.

NOTE: Nut will be free to fall when bolt (14) is removed

(24) Remove bottom screws in upper right side panel (9) and remove splice channel (10)

(25) Remove right support shaft retaining nut (3).

(26) Remove upper right side panel (9).

NOTE Shaft key (2) may be removed at this time.

(27) Replace right control shaft nut to allow removal of spacer, stabilizer trim indicator, friction brake handle and flap handle as a unit from control stand.

(28) Remove eye bolt (4, figure 204) from friction brake crank (2) by removing bolt (3).

(29) Detach stabilizer trim indicator link (9) from stabilizer trim indicator crank (7) by removing flat headed pin (8).

(30) Remove right control shaft (1) with nut, spacer, stabilizer trim indicator, friction brake handle and flap handle as a unit.

(31) Rotate left stabilizer trim wheel until the connector link (10) in the stabilizer trim chain can be removed.

(32) Detach connector link and remove chain from sprocket. Secure chain in bottom of control stand.

(33) Remove start lever detents (11, figure 203) from cover assemblies (2).

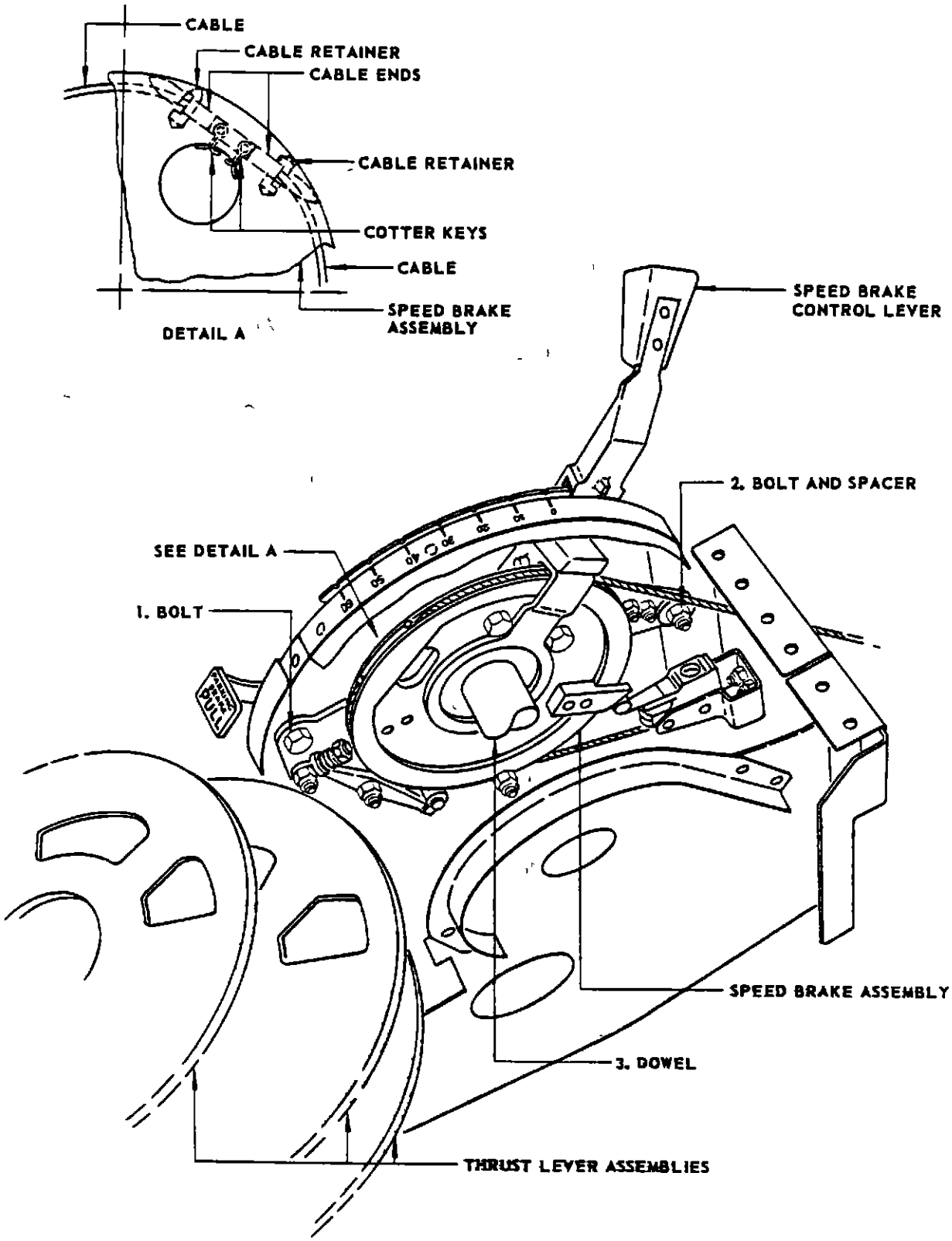
(34) Remove forward and aft cover tie straps (1 and 13).

(35) Remove forward and aft cover angles (3 and 8).

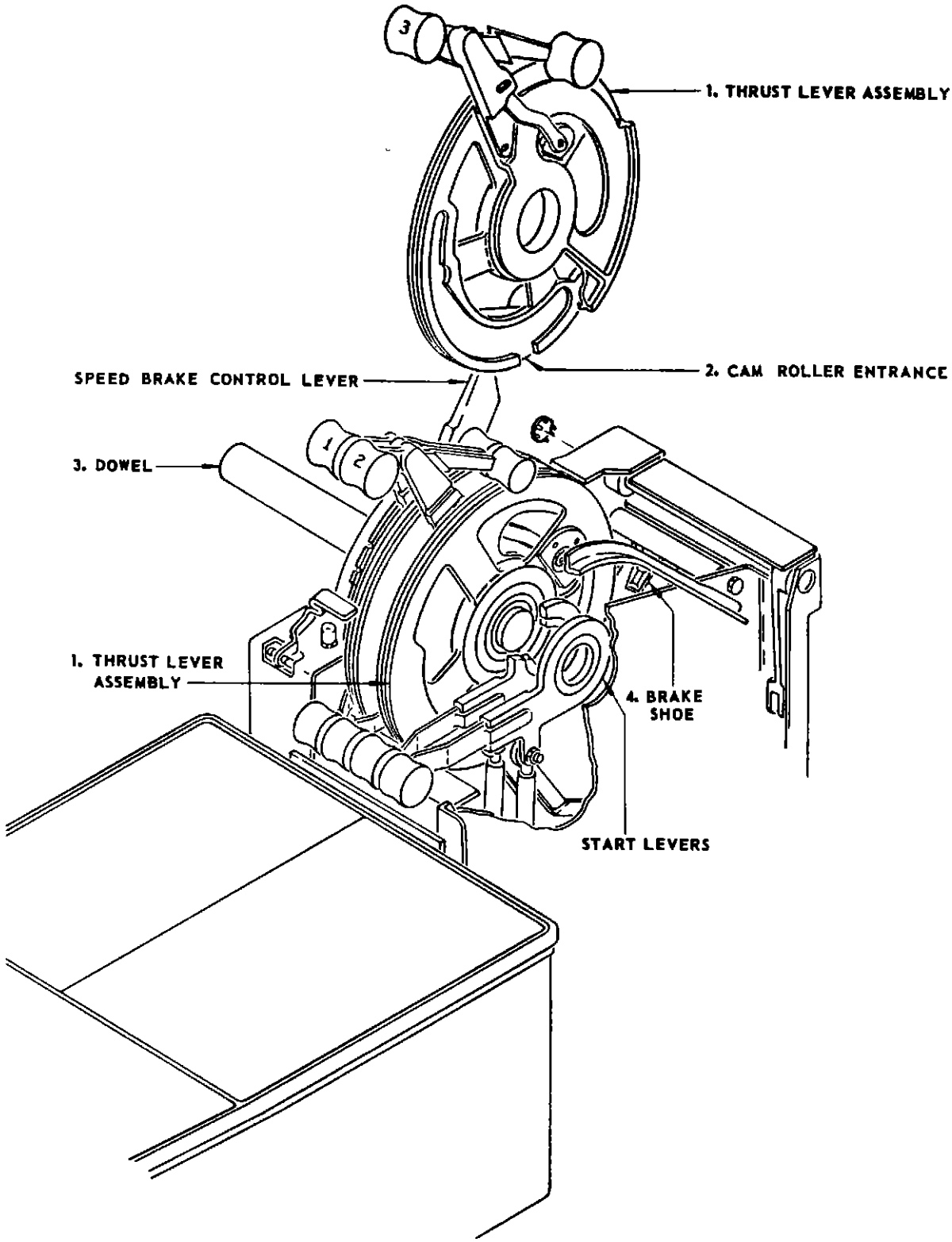
(36) Remove right transparent indicator light (14) shield and nut and push indicator light out of cover assemblies (2).

(37) Lift cover assemblies (2) from control stand.

(38) Remove switch actuator arm (4).



Control Stand Speed Brake Lever Installation
Figure 201



Installation of Thrust and Start Lever Assemblies
Figure 202

(39) Remove left stabilizer trim control wheel (12) from stabilizer trim control wheel shaft (5).

(40) Remove stabilizer trim control wheel shaft (5) and sprocket (6) from right side of control stand.

(41) Remove left control shaft nut (10) from left control shaft.

(42) Using dowel (10, figure 202), push left control shaft (7) out of control stand.

NOTE: Key (9, figure 203) will be free from left control shaft and upper left side panel when left control shaft is driven from control stand.

(43) Pull dowel to left until No. 4 thrust lever assembly can be lifted out of quadrant and placed on aft electronic boxes. Do not pull all the way out.

NOTE: Tag position of all spacers as they are removed. Position and thickness of spacers may vary in different control stands.

(44) Remove Nos. 1, 2 and 3 thrust lever assemblies. Repeat steps (42) through (44) as applicable.

(45) Pull start levers (9) aft to obtain room for removal of speed brake assembly from control stand.

(46) Remove two bolts (1 and 2, figure 201), spacer and washers and remove speed brake assembly.

(47) Remove cables from speed brake assembly by removing cotter keys and sliding cable forward and then remove cable retainer and cable. (See detail A, figure 201.)

C. Install Speed Brake Control Lever

(1) Install cables on speed brake assembly by threading cable end under cable guard and positioning above cotter key holes (detail A, figure 201), then install cable retainer and pull cable end into cable retainer and install cotter key. Repeat for second cable.

(2) Apply a light film of Aeroshell Grease 17 to all bearing surfaces in control stand assembly prior to installation.

(3) Position speed brake assembly in control stand and install with spacer, washers and bolts (1 and 2, figure 201).

(4) Position the start levers and thrust levers in the following order starting with No. 1 start lever. Position spacers and shims in the order removed and advance the dowel to hold each part in place as it is positioned. Positioning from left to right: No. 1 start lever, No. 1 thrust lever, No. 2 start lever, No. 2 thrust lever, No. 3 thrust lever, No. 3 start lever, No. 4 thrust lever, and No. 4 start lever. (See figure 202)

(5) Install left control shaft (7, figure 203).

(a) Install shaft from right to left.

(b) Push dowel out of stand with control shaft.

(c) Insure that spacers and shims are in proper positions as removed.

(6) Insert key (9, figure 203) in left control shaft and upper left side panel.

(7) Install left control shaft nut (10). Torque nut from 200 to 300 pound-inches.

(8) With friction brake handle in "OFF" position, brake shoes (7, figure 202) should just contact brake drums. The leaf springs shall be bent to obtain this position.

(9) Install stabilizer trim control wheel shaft (5, figure 203) and sprocket (6) in left control shaft (7).

(10) Place stabilizer trim chain on sprocket and install connector link (10, figure 204).

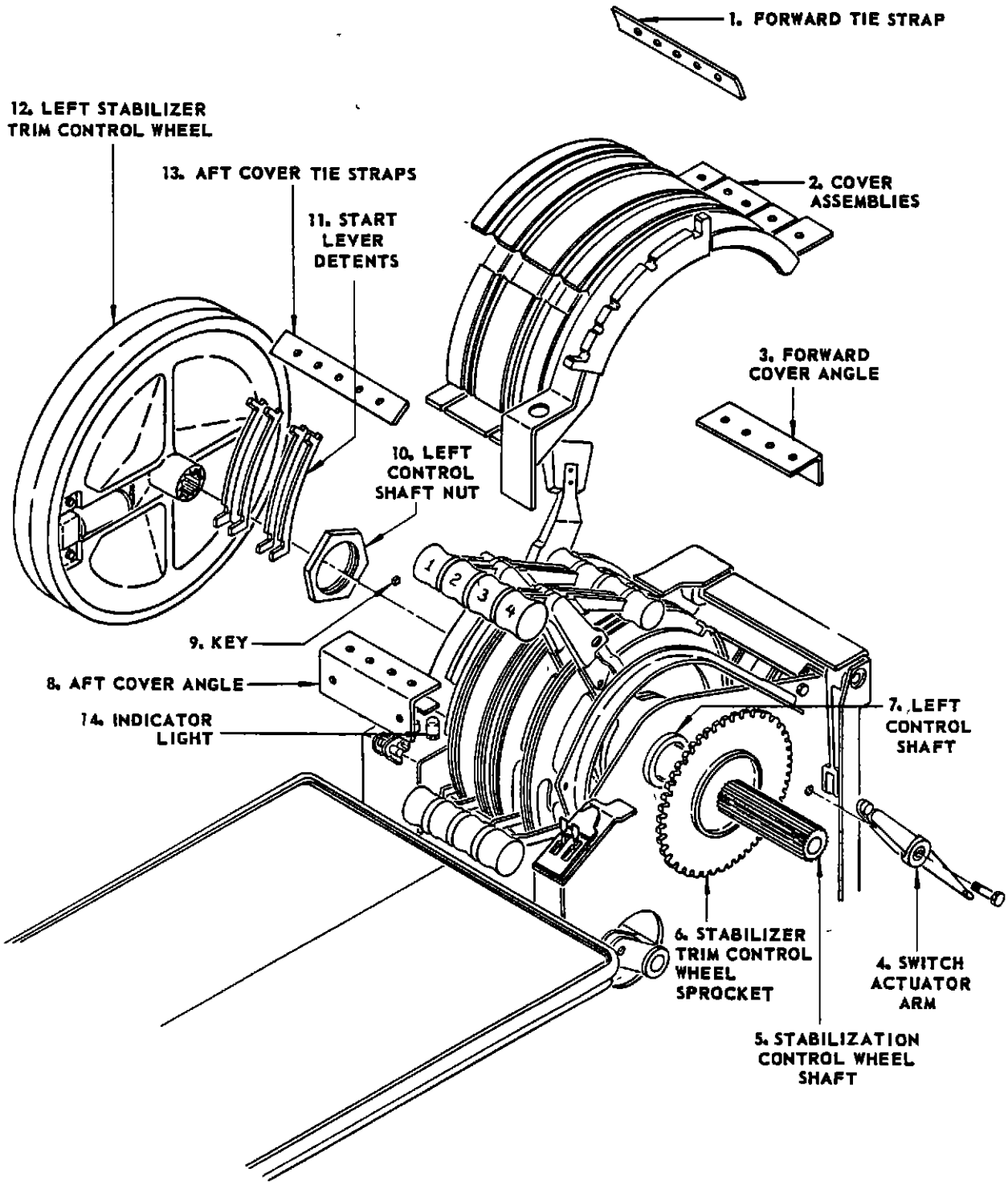
(11) Install flap position warning switch actuator arm (4, figure 203) on control stand inter-bulkhead.

(12) Install cover assemblies (2) on control stand.

(13) Install forward and aft cover angles (3 and 8) on control stands.

(14) Install forward and aft cover tie straps (1 and 13).

(15) Install indicator light (14).



Installation of Control Stand Center Components
Figure 203

(16) Install start lever detents (11).

(17) Install left stabilizer trim control wheel (12) on stabilizer trim control wheel shaft (5).

(18) Connect eye bolt (4, figure 203) on friction brake link to friction brake crank (2) by installing bolt (3).

(19) Connect stabilizer trim indicator link (9) on stabilizer trim indicator crank (7) by installing flat head pin (8).

(20) Install right control shaft (1) with nut, spacer, stabilizer trim indicator, friction brake handle and flap handle installed.

(21) Remove right control shaft nut (6) from right control shaft (1).

(22) Position upper right side panel (9, figure 205) and install screws only on each side.

(23) Position splice channel (10) at bottom edge of upper right panel (9) and install bottom screws through upper right side panel and splice channel.

(24) Install key (2) in upper right side panel (9) and right control shaft (12).

(25) Install right control shaft nut (3). Torque nut from 200 to 300 pound-inches

(26) Install bolt (14) through aft electronic panel and upper right side panel.

(27) Install switch guard (8).

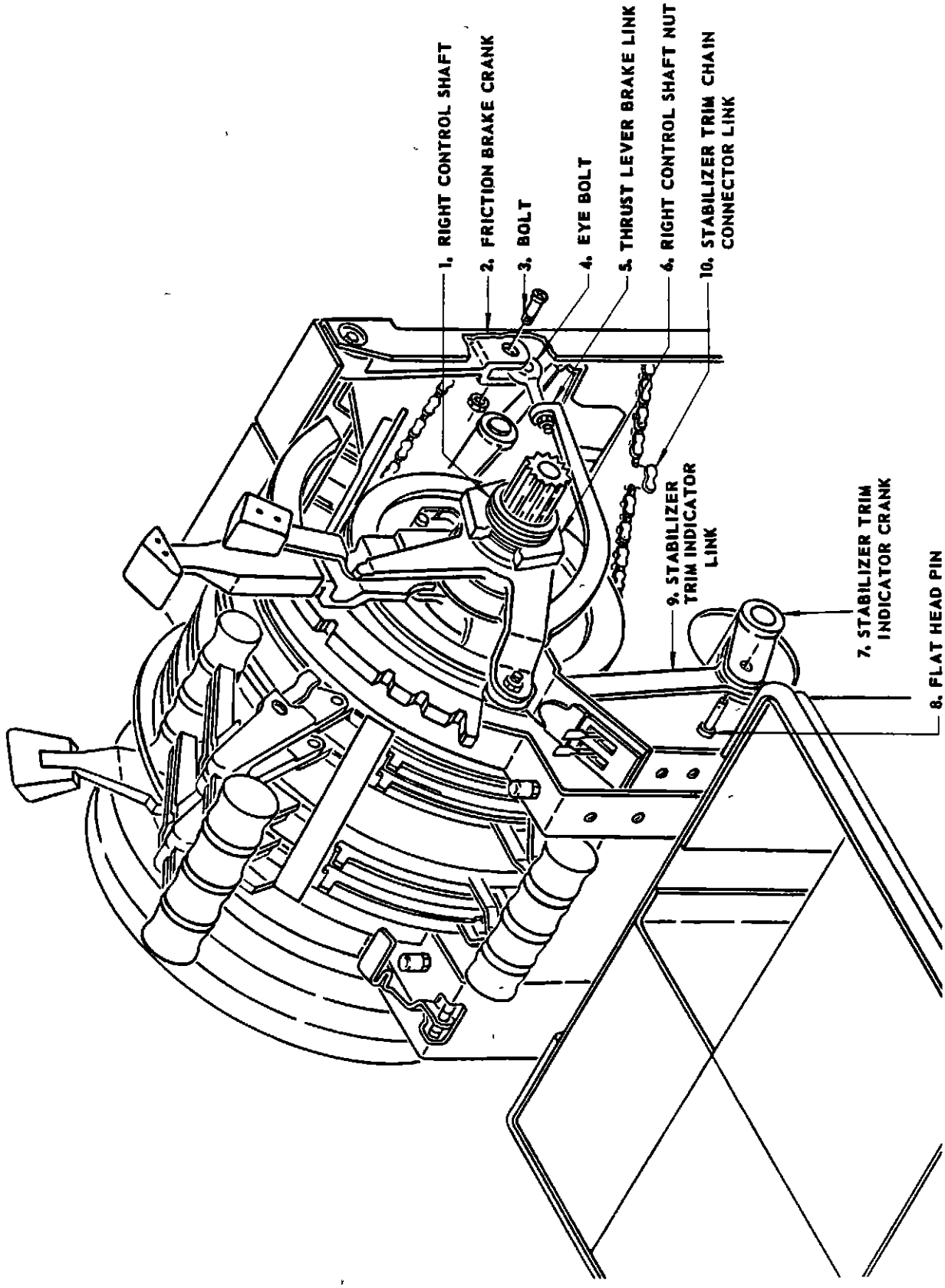
(28) Replace forward right electronic unit (13) in aft electronic panel.

(29) Install right access cover (4) on control stand.

(30) Install lower right access panel (7) on control stand.

(31) Install right stabilizer trim control wheel (5) on stabilizer trim control wheel shaft (1).

NOTE. Handles on stabilizer trim control wheels should be 90 (± 5) degrees apart when installed on control stand.



Installation of Stabilizer Trim Indicator Components
Figure 204

(32) Install stabilizer trim control wheel tie rod (6).

(33) Install left stabilizer trim control wheel nut (15).

(34) In lower nose compartment, tension trim chain assembly by adjusting support linkages to lower forward mechanism. (See 27-10-31, figure 201.)

(35) Check that stabilizer trim indicator position agrees with position of stabilizer. If out of adjustment, see "Adjustment/Test Stabilizer Trim System", 27-10-0.

(36) Connect speed brake control cables at turnbuckles in lower nose compartment and tension (per 27-5-0, figure 201).

(37) Tension wing flap control cables by adjusting turnbuckles in lower nose compartment.

(38) Tension thrust control cables by adjusting turnbuckles. (See 76-1-0, figure 201 for turbojet airplanes, and 76-2-0, figure 201 for turbofan airplanes.)

(39) Tension engine start cables by adjusting turnbuckles. (See 76-1-0, figure 201 for turbojet airplanes, and 76-2-0, figure 201 for turbofan airplanes.)

(40) Remove AN 395 rigging pin from flap control valve support bracket and follow-up drum in each main gear wheel well.

(41) Remove AN395 rigging pin from center speed brake control drum and support in right wheel well. (See 27-5-0, figure 202.)

(42) On turbojet airplanes, remove AN395 rigging pin from each thrust reverser control drum and hanger (see 76-1-0, figure 202) and from start arm and bracket (see 76-1-0, figure 204).

(43) On turbojet airplanes, replace nacelle strut access panels No. 1742 (for outboard engines) and access panels No. 1708 (for inboard engines). (See "Access Doors and Panels", Chapter 12.)

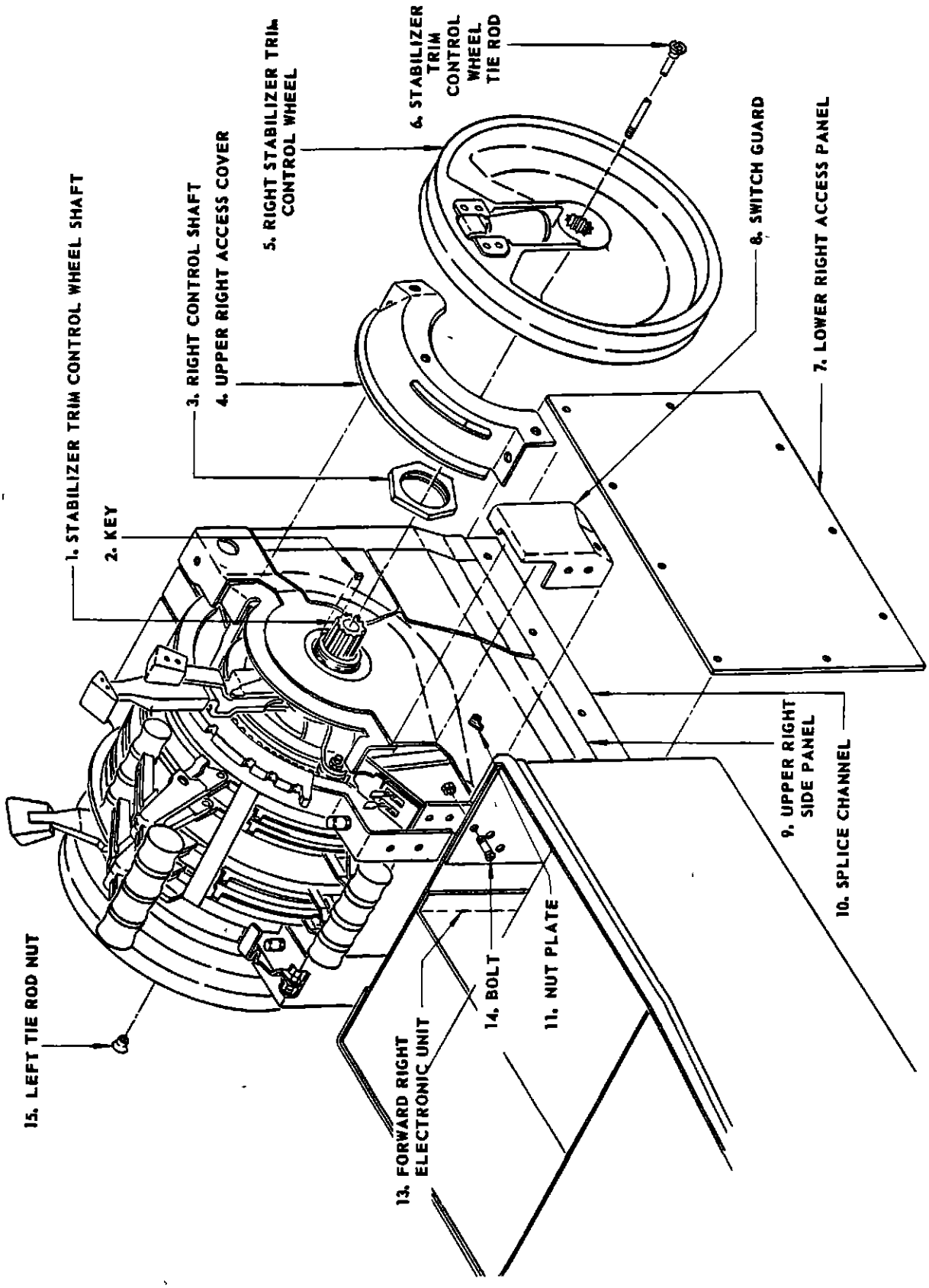
(44) On turbofan airplanes, remove rigging pin from throttle and start arms and bracket at upper engine bell crank on all engines. (See 76-2-0, figures 203 and 204.)

(45) Disconnect utility and auxiliary hydraulic systems by operating the interconnect switch on the copilot's instrument panel.

(46) Manually position the utility bypass valve to "CLOSED".

(47) Disconnect electrical power.

(48) Replace engine side cowl panels and close main landing gear doors.



Installation of Control Stand Access Panels
Figure 205

2. Adjust Speed Brake Control Lever

A. Equipment and Materials

(1) Dial indicator.

(2) Enamel-Glyptol 120, or equivalent.

B Adjust speed brake control lever.

(1) Remove left stabilizer trim control wheel (2, figure 206).

(2) Remove control handle access cover (1).

(3) Drive spring pin (5) from speed brake handle (6) and remove handle.

NOTE: Spring (4) is free to fall as handle is removed.

(4) Install dial indicator at a location 0.75 inch below end of metal portion of lever (3). This location is 5.0 inches from center of rotation of lever

(5) Back off lock release adjustment screws (8)

(6) Apply Glyptol 120 to threads of lock release screws and check nuts.

(7) In the lower nose compartment apply a 7-pound differential load to the speed brake control cables.

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(8) **Adjust lock release screws (8) such that total free play of lever between screws (8), measured by dial indicator, is 0.019 (± 0.001) inch.**

(9) **Reverse differential cable load and check total free play of lever is still 0.019 (± 0.001) inch. Adjust lock screws if required.**

(10) **Repeat steps (7) thru (9) at 3 different lever positions.**

NOTE: Total free play of lever shall be maintained in the 0.019 (± 0.001) inch range in the positions adjusted.

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(11) Tighten check nuts on lock release screws.

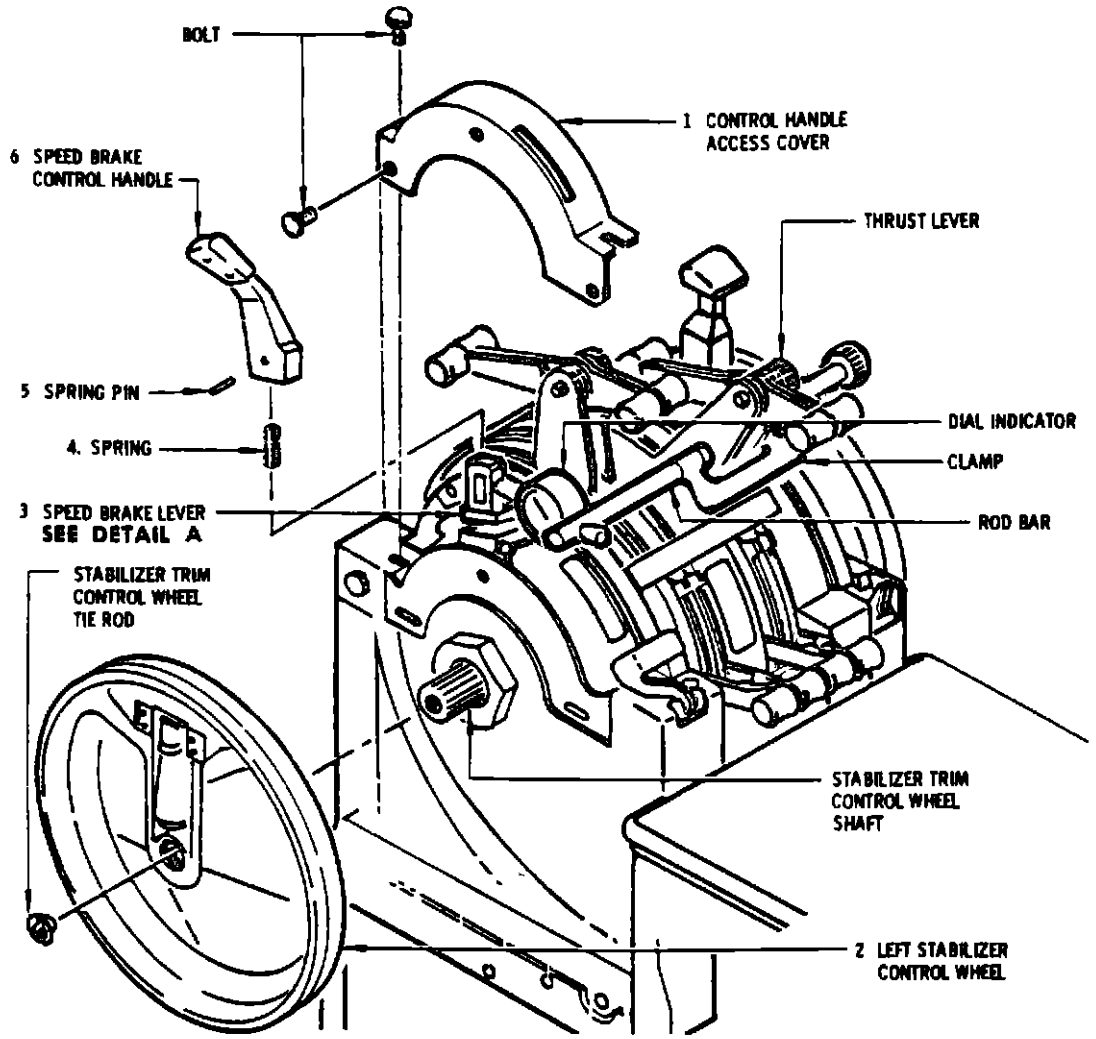
(12) Remove dial indicator from control stand.

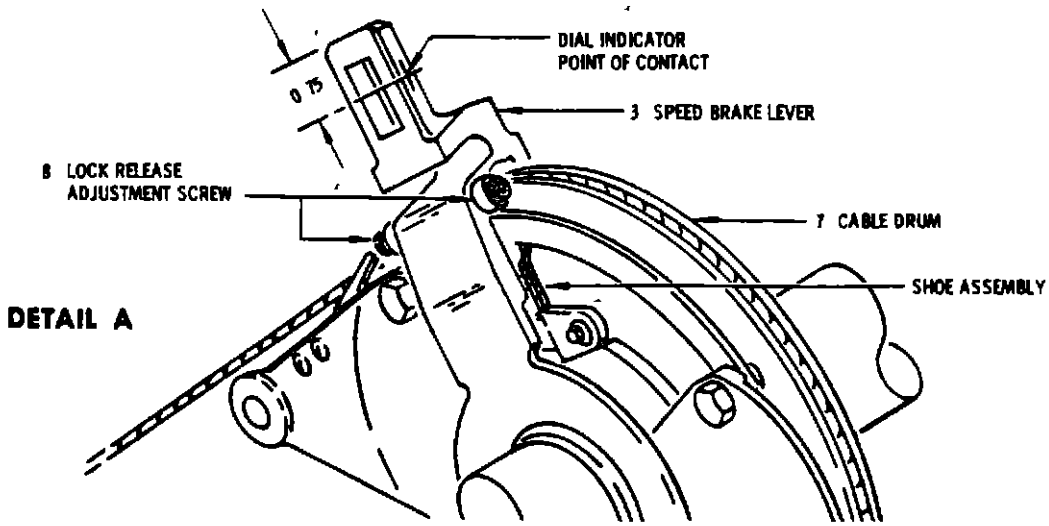
(13) Install control handle access cover.

(14) With spring (4) positioned in speed brake lever, install speed brake handle (6) using spring pin (5).

(15) Install stabilizer trim control wheel.

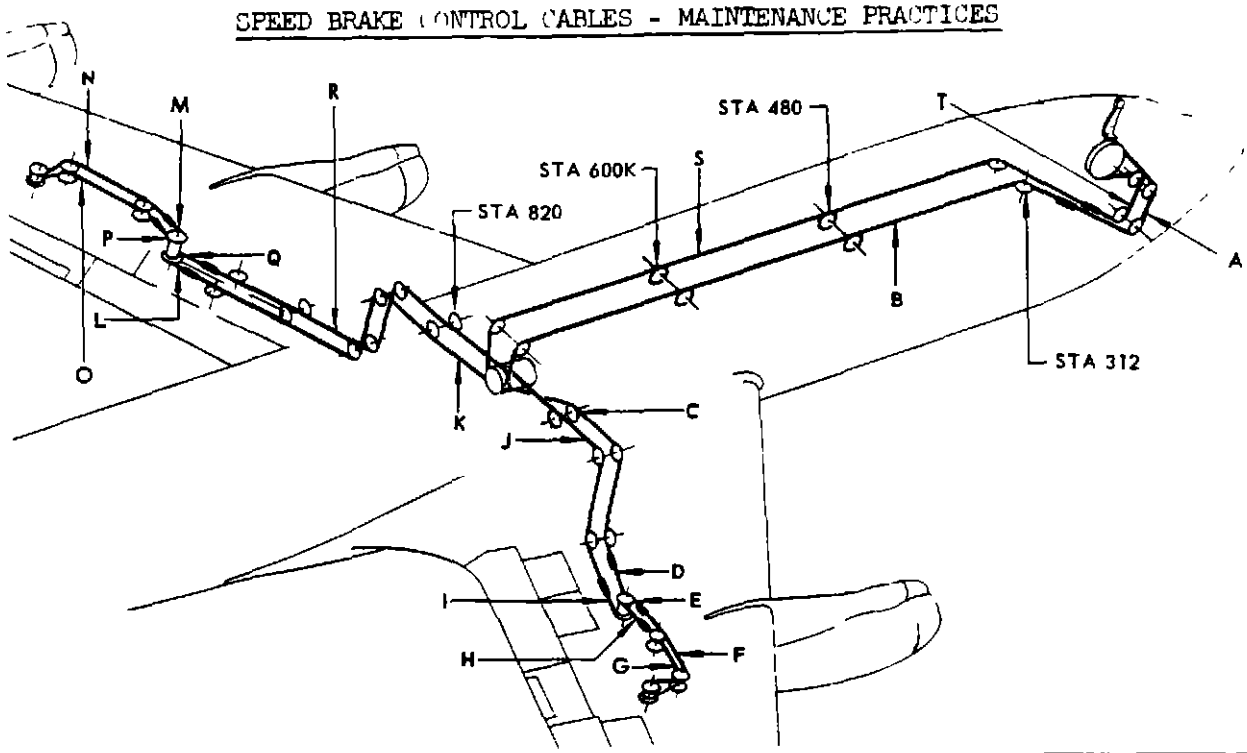
NOTE: Handles on stabilizer trim control wheels should be 90 (± 5) degrees apart when installed on control stand.





Control Stand Speed Brake Adjustment
Figure 206

SPEED BRAKE CONTROL CABLES - MAINTENANCE PRACTICES



CABLE REF.	DRAWING NO.	NO. REQ.	LENGTH	CABLE SIZE	FITTINGS 1.	2.	3.
A	BAC-C13G-469-1037	1	103.7	1/8 7 x 19	AN669L4LH	BAC-T14A-4	
B	BAC-C13G-468-8046	1	804.6	1/8 7 x 19	AN669L4RH	BAC-T14A-4	
C	BAC-C13G-469-1940	1	194 0	1 8 7 x 19	AN669L4LH	BAC-T14A-4	
D	BAC C13G-468-450	1	45 0	1/8 7 x 19	AN669L4RH	BAC-T14A-4	
E	BAC-C13G-469-459	1	45 9	1/8 7 x 19	AN669L4LH	BAC-T14A-4	
F	BAC-C13G-468-1419	1	141 9	1/8 7 x 19	AN669L4RH	BAC-T14A-4	
G	BAC-C13G-468-1338	1	133 8	1/8 7 x 19	AN669L4RH	BAC-T14A-4	
H	BAC-C13G-469-561	1	56 1	1/8 7 x 19	AN669L4LH	BAC-T14A-4	
I	BAC-C13G-468-326	1	32.6	1/8 7 x 19	AN669L4RH	BAC-T14A-4	
J	BAC-C13G-469-2040	1	204 0	1 8 7 x 19	AN669L4LH	BAC-T14A-4	
K	BAC-C13G-468-2927	1	292 7	1 8 7 x 19	AN669L4RH	BAC-T14A-4	
L	BAC-C13G-469-326	1	32.6	1/8 7 x 19	AN669L4LH	BAC-T14A-4	
M	BAC-C13G 468 459	1	45 9	1/8 7 x 19	AN669L4RH	BAC-T14A-4	
N	BAC-C13G-469-1419	1	141 9	1/8 7 x 19	AN669L4LH	BAC-T14A-4	
O	BAC-C13G-469-1338	1	133.8	1/8 7 x 19	AN669L4LH	BAC-T14A-4	
P	BAC-C13G-468-561	1	56.1	1/8 7 x 19	AN669L4RH	BAC-T14A-4	
Q	BAC-C13G-469-450	1	45 0	1/8 7 x 19	AN669L4LH	BAC-T14A-4	
R	BAC-C13G-468-2822	1	282 2	1/8 7 x 19	AN669L4RH	BAC-T14A-4	
S	BAC-C13G-468-8105	1	810.5	1/8 7 x 19	AN669L4RH	BAC-T14A-4	
T	BAC-C13G-469-865	1	86 5	1/8 7 x 19	AN669L4LH	BAC-T14A-4	

ELEVATOR, ELEVATOR CONTROL TABS AND ELEVATOR CONTROL SYSTEM - DESCRIPTION AND OPERATION

1 General

A The elevator control system (figure 1) provides primary control of the airplane about its lateral axis. The elevator control system allows the pilot to move control tabs which position the elevators without the need of any electrical or hydraulic power boost. The elevator assemblies are balanced to allow aerodynamic forces to assist the pilot in elevator movement during high speed flight. The elevator control system allows direct movement of elevators without aid of tabs or balanced panels during certain flight conditions and for ground operation.

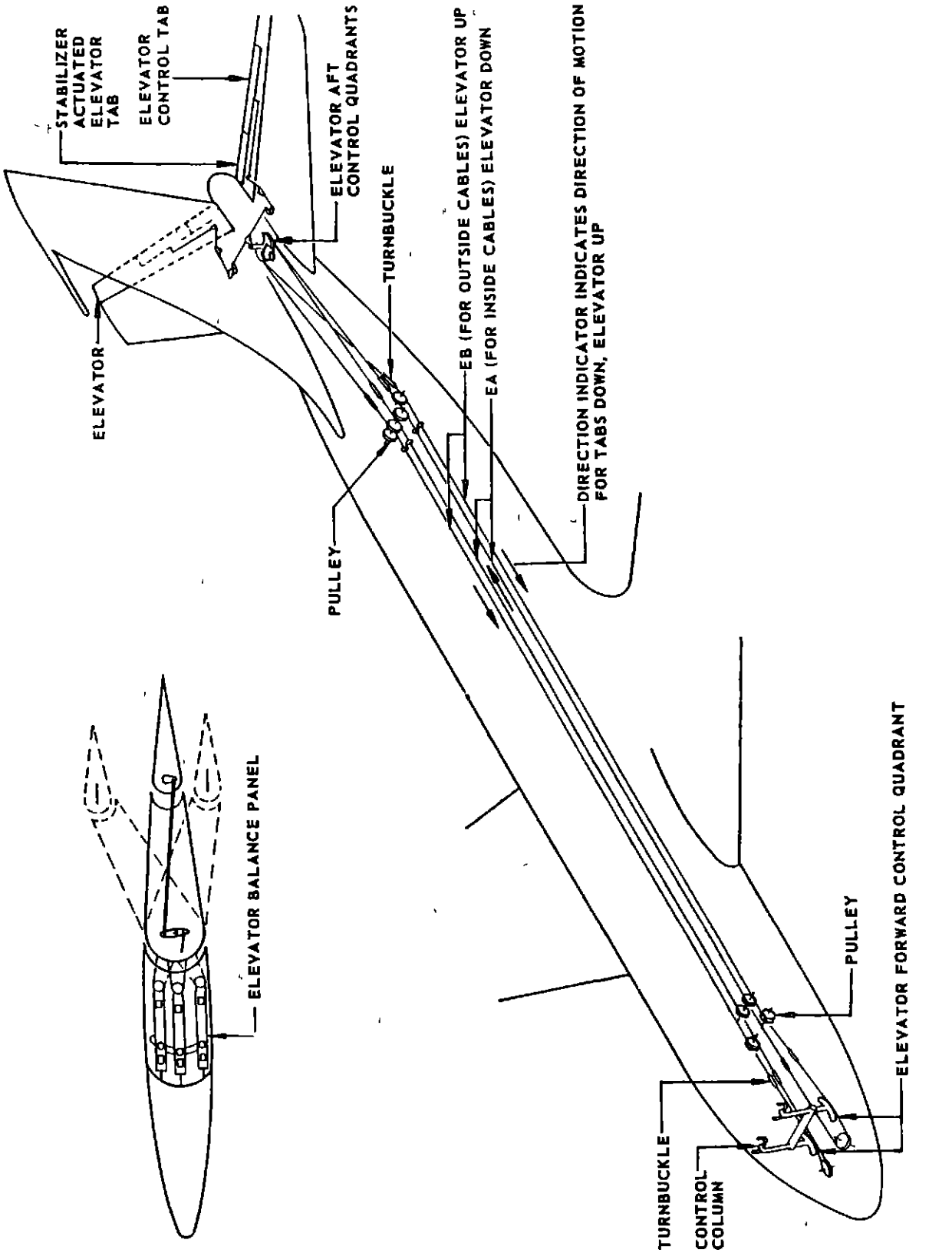
B The control columns are interconnected by a torque tube above the elevator forward control quadrants. A pair of cables attached to each quadrant extend aft and are attached to the aft control quadrant. The elevator tab actuating mechanism connects the aft control quadrant to the control tabs.

C Control column movement positions the control tabs. Aerodynamic forces on the control tabs and balance panels cause elevator displacement. A centering spring in the elevator control tab actuating mechanism helps provide artificial feel of elevator action. The stabilizer actuated elevator tab keeps the elevator in proper alignment with the adjustable stabilizer. Snubber assemblies provide the stops which limit elevator travel with respect to the stabilizer. The snubbers also control the angular rate of rotation of the elevator and provide protection from wind gusts.

D For ground operation or during certain flight conditions, direct control of the elevator is required. This is accomplished through the elevator control tab actuating mechanism.

2 Elevator

A Each elevator (figure 2) is a monospar surface with aluminum alloy frame construction and flush riveted clad aluminum skin. Seven hinge fittings, of which one is a thrust fitting, are attached to the elevator spar. These fittings attach to stabilizer rib structures and provide support of the elevator. The elevator nose extends forward between the hinge points and is connected to six balance panels. Each panel is enclosed in a separate bay in the stabilizer. The perimeters of the balance panels and the sides of each elevator nose projection carry aerodynamic seals which control air escapement around these edges in the balance bays. The complete elevator and balance panel assembly without the tabs is statically balance about the elevator hinge centerline.



Elevator Control System Equipment Location
Figure 1

B. Each elevator functions independent of the other through its individual tab and linkage arrangement. There is no direct mechanical connection between the right and left elevators except through the common tab linkage connection to the aft control quadrant bell crank. The efficiency of each elevator depends on adequate static and aerodynamic balance and on the performance of the tabs.

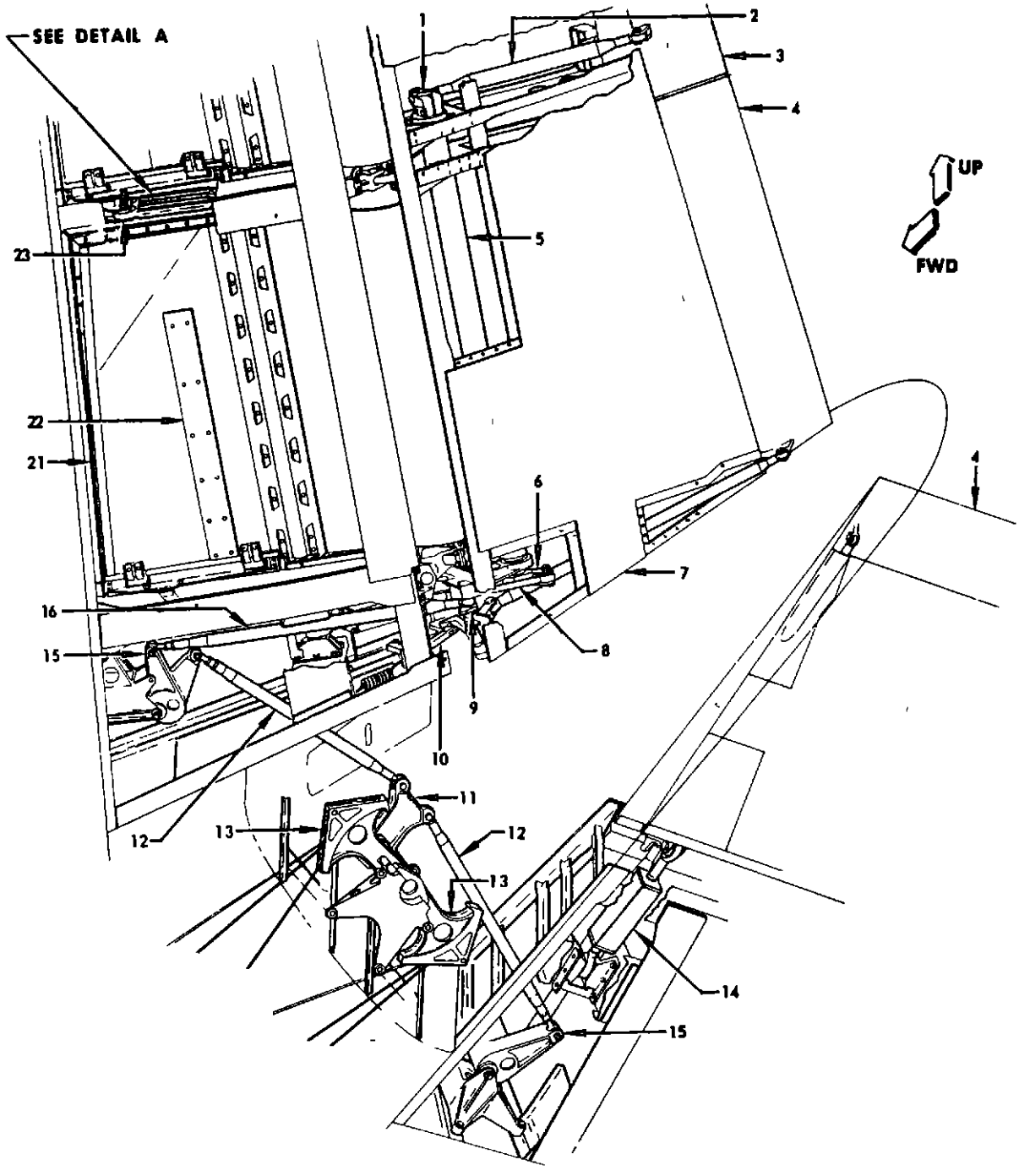
3 Elevator Control Tabs

A The elevator control tabs convey aerodynamic forces to assist the pilot in moving the elevators. The elevator control tab (3, figure 2) is a thin tapered lightweight clad aluminum surface with aluminum honeycomb core It is statically balanced about the tab hinge center line by means of nose weights which extend forward into cavities in the trailing edge of the elevator The control tab is balanced into the elevator assembly by means of an adjust weight attached to the lower surface of the No 2 balance panel The control tab is attached in the outboard tab position to the rear spar of the elevator with six low friction hinges. The outboard hinge takes thrust loads The control rod attaches to a horn fitting located between second and third inboard hinges. Fore and aft movement of the control column causes up and down rotation respectively of the tab

4 Elevator Balance Panels and Seals

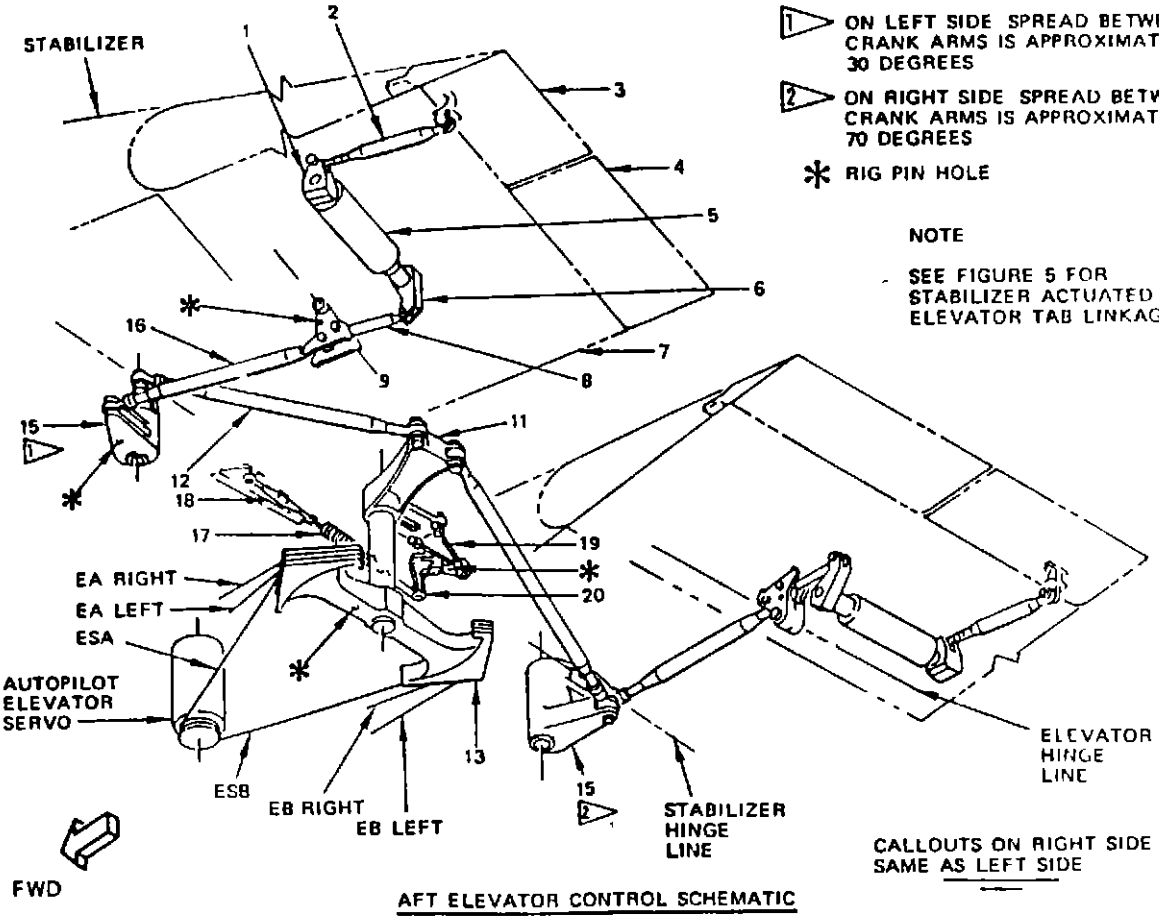
A Six balance panels (21, figure 2) are attached to each elevator nose by means of continuous hinges The panels project into separate bays in the stabilizer located between the elevator hinges. Balance panels are supported on two edges only, aft by the hinge on the elevator nose and along the inboard side by a support linkage. Rigid torque box construction is used for the balance panels. Continuous hinges in bays No 1, No 2, and No 3 are of archetectual bronze to obtain weight needed for static balance of the elevator. In other bays the hinges are of aluminum. Track grips (28, Detail A) permit the panels to slide somewhat fore and aft relative to the support linkage. Silicone rubber seals, bonded to fabric and mounted in aluminum channels, are attached to the sides and forward edge of each balance panel. Hole filling compound is used to close openings adjacent to seals. A fabric strip on the lower side of the continuous hinge seals against air leakage through the hinge

B. Access to the balance panels is through balance bay access panels on the lower surface of the stabilizer. Inboard balance panels No. 0 and No 2 have orange painted adjust weights attached to balance the stabilizer actuated tab and the elevator control tab respectively about the elevator

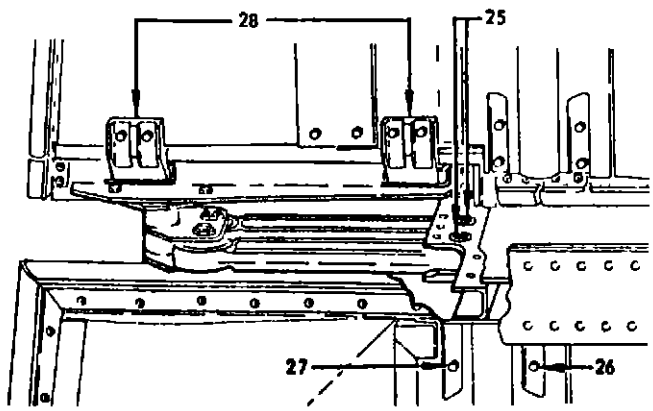


1 OUTBOARD TORQUE TUBE CRANK
2 CONTROL TAB PUSH ROD
3 ELEVATOR CONTROL TAB
4 STABILIZER ACTUATED ELEVATOR TAB
5 TORQUE TUBE
6 INBOARD TORQUE TUBE CRANK
7 ELEVATOR
8 TORQUE TUBE PUSH ROD
9 FOLLOW-UP CRANK
10 STABILIZER ACTUATED ELEVATOR TAB LINKAGE
11 QUADRANT CRANK
12 CONTROL PUSH ROD
13 AFT ELEVATOR CONTROL QUADRANTS
14 ELEVATOR SNUBBER

Aft Elevator Controls
Figure 2 (Sheet 1 of 2)



AFT ELEVATOR CONTROL SCHEMATIC



DETAIL A

15 CONTROL CRANK
16 CRANK PUSH ROD
17 CENTERING SPRING
18 TURNBUCKLE
19 CENTERING CABLES
20 CENTERING CRANK
21 ELEVATOR BALANCE PANEL
22 STABILIZER ACTUATED ELEVATOR TAB ADJUST WEIGHT
23 BALANCE PANEL LINKAGE
24 DELETED
25 LINKAGE MOUNTING BOLTS
26 AFT HINGE MOUNTING BOLTS
27 FORWARD HINGE MOUNTING BOLTS
28 TRACK GRIPS

hinge line. These adjust weights are part of the tab assembly. Each weight must be used or replaced whenever its corresponding tab is used or replaced. Any time a No. 0 or No. 2 balance panel is replaced the tab adjust weights must be shifted as required to keep the weights and tabs correctly paired.

C The support linkage causes the elevator balance panels to move parallel to the stabilizer chord plane when the elevator is rotated up or down. During flight air pressure above and below the panels is unequal whenever the elevator is displaced Air flow through the elevator vent gaps and controlled leakage past the balance panel forward seals produce a force against the panel which acts on the elevator nose to assist the tabs in positioning the elevator. (See figure 3.)

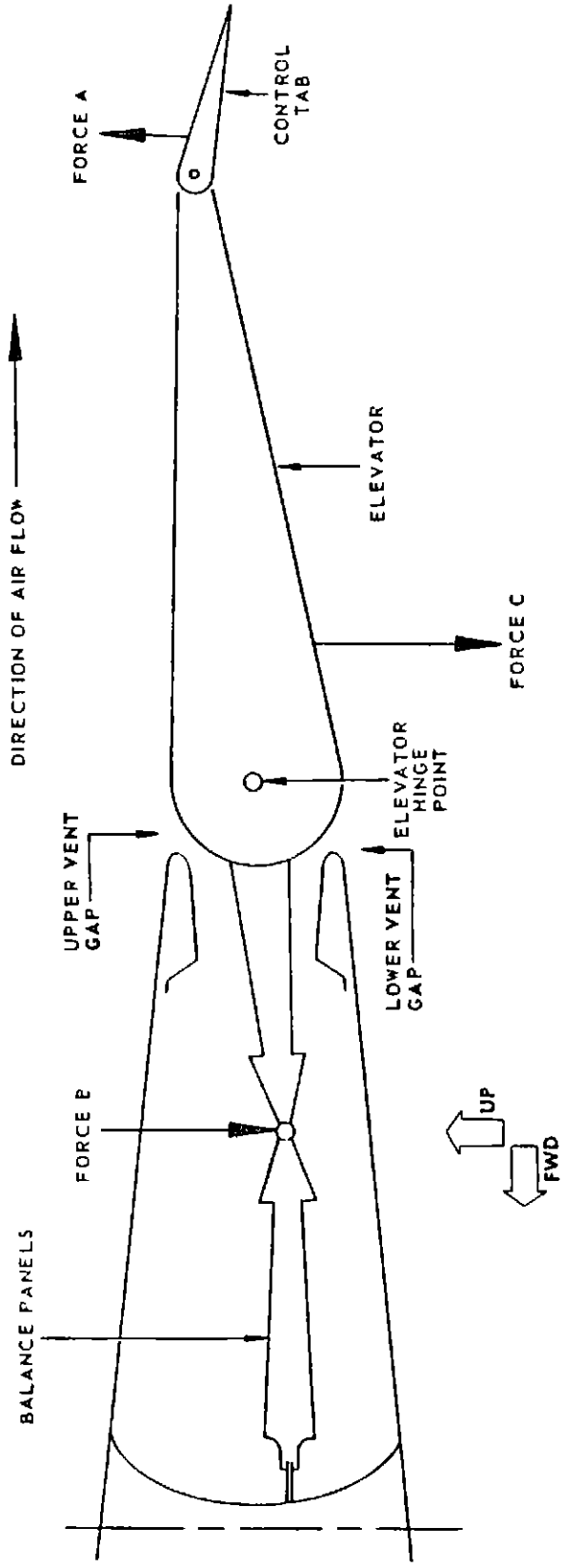
5 Elevator Control Cables

A Four elevator control cables provide a separate set of tab and elevator control connections for both the pilot and the copilot. Cables are also used to connect the autopilot servo motor drum to the aft control quadrant and for connecting the centering spring crank to the aft quadrant crank arm. Cables are made of stranded high strength carbon steel and are rigged over pulleys and idlers to minimize flexing and prevent chafing The cables are located under the floor and connect the two forward control quadrants to the aft control quadrant assembly in the tail compartment. Access to the forward end of the elevator cables is made through the lower nose compartment, and to the aft ends through the tail cone access opening. Turnbuckles for disconnecting and rigging are located fore and aft in these access compartments. The elevator down cables connect the forward quadrants to the upper and lower grooves in the left aft quadrant, and the up cables connect to the upper and lower grooves in the right aft quadrant.

6 Elevator Control Tab Actuating Mechanism

A The control tab actuating mechanism (figure 2) positions the tabs and moves the elevators. The aft control quadrant changes fore and aft cable motion to right and left movement of the elevator control push rods The follow-up crank (9) allows direct control of the elevator during ground operation and certain flight conditions.

B The mechanism consists of the quadrant crank (11, figure 2), two control push rods to a right and left control crank, a follow-up crank and an inboard torque tube crank linked together with push rods. The torque tube connects the inboard and outboard torque tube cranks The control tab push rod connects the outboard torque tube crank to the elevator control tab horn fitting A centering spring linkage, consisting of two cables, a centering crank, a spring and a turnbuckle, connects the quadrant crank to tail compartment structure.



1 FORCE A INDUCED BY AIR PRESSURE DIFFERENTIAL ON CONTROL TAB INITIATES ROTATION OF ELEVATOR
2 FORCE B INDUCED BY AIR PRESSURE DIFFERENTIAL ON BALANCE PANELS, AS ELEVATOR IS DISPLACED BY TAB MOVEMENT
3 FORCE C AS INDUCED BY AIR PRESSURE DIFFERENTIAL ON ELEVATOR OPPOSING FORCES A AND B
4 ALL FORCES ARE PROPORTIONAL TO ANGULAR DISPLACEMENT OF SURFACES FOR ANY GIVEN TAB DISPLACEMENT, ELEVATOR ROTATES UNTIL THE MOMENT OF FORCE C IS EQUAL TO THE SUM OF THE MOMENTS OF FORCES A AND B
5 A CONTROLLED AIR LEAKAGE IS PROVIDED AT THE ENDS OF THE ELEVATOR TO PROPORTION FORCE B WITH DISPLACEMENT OF ELEVATOR

Balance of Forces Diagram
Figure 3

C. When the aft control quadrant (13, figure 2) is rotated by the cables, the quadrant crank transmits motion outboard to each control crank through the control pushrods. The control crank transmits motion aft to the follow-up crank and to the torque tube cranks. Rotation of the outboard torque tube crank moves the control tab pushrod and control tab Additional movement of the follow-up crank contacts and moves the elevator, if elevator is not positioned by the control tab.

D. A centering cable connects the quadrant crank to the centering crank to which a centering spring is attached. (See figure 2.) The opposite end of the spring is connected to airplane structure. A rotating force on the quadrant crank in either direction increases tension in the spring. Releasing the force on the quadrant crank allows the spring to return the crank to a neutral setting.

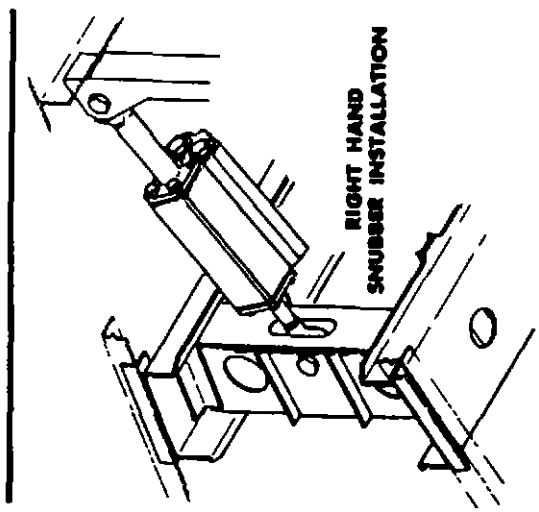
E. The elevator control tab actuating mechanism is located in the tail compartment forward of the tail cone, and extends into the horizontal stabilizers along the leading edge of the elevators (figure 2). The mechanism can be reached through the tail cone access panel and tab control access panels and fairings on the lower side of the stabilizer and elevator.

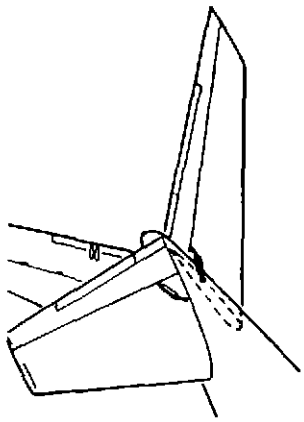
7. Elevator Snubber Assembly

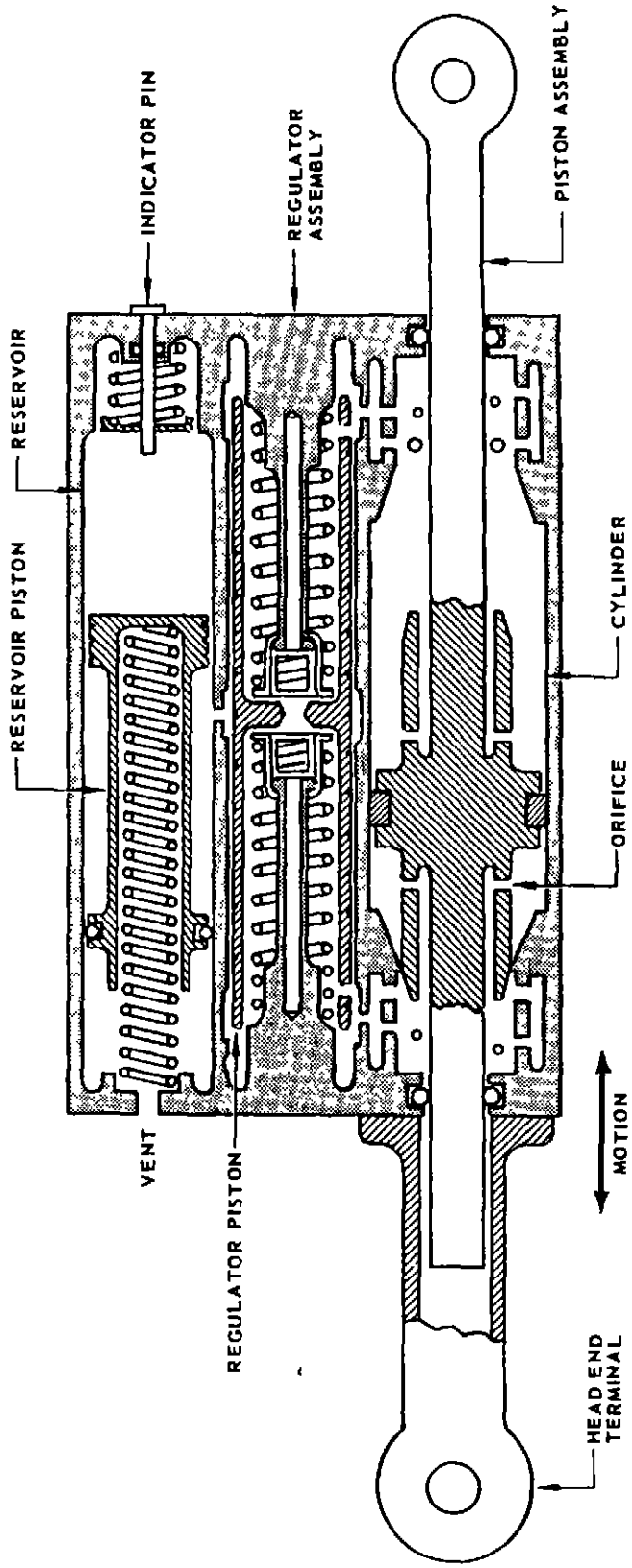
A. The hydraulic elevator snubber assembly (figure 4) functions as a positive elevator stop and as a gust damper The snubber eliminates the need for ground surface locks and protects the elevator on parked airplanes from wind gusts up to 70 miles per hour. The snubber assembly consists of a dual acting piston, a regulator, a reservoir and a low fluid level indicator. The snubber is filled with hydraulic fluid, MIL-H-5606. One snubber assembly is located in the inboard aft corner of each stabilizer and may be reached by removing the elevator tab control access panel and the elevator thrust hinge access panel. It is installed with the piston rod end terminal attached to stabilizer structure and the head end terminal attached to elevator structure.

B. The spring loaded reservoir piston maintains fluid within the cylinder and regulator assembly regardless of snubber position. When the reservoir piston has displaced most of the fluid in the reservoir it unseats an indicator pin. Any perceptible clearance under the head of the pin indicates low fluid supply, and the snubber should be replaced.

C. Rotation of the elevator moves the piston assembly forcing fluid from the cylinder through the regulator assembly. The circulating fluid causes the regulator piston to move in the regulator assembly reducing the size of the fluid path thus increasing restriction to fluid flow and rapid motion of the piston assembly. As the piston assembly approaches its travel limit, projections on the piston close off the major area of fluid flow from the cylinder. Hydraulic fluid is then compelled to flow through small orifices in the cylinder greatly increasing resistance to piston motion. The orifice area is further diminished as the piston







Elevator Shubber Assembly
Figure 4

assembly moves to extreme travel limits. This increases damping action and prevents damage caused by sudden bottoming of the stops at the end of the chambers. These stops allow the elevator to rotate up 23° and down 14-1/2° from faired position.

8. Stabilizer Actuated Elevator Tabs

A. The stabilizer actuated elevator tabs have a double purpose. During nose down position of the stabilizers the tabs help lift the elevators to an approximately faired position in relation to the stabilizers. The second purpose of the stabilizer actuated elevator tabs is to provide an approximately constant force gradient in the elevator control system.

B. The stabilizer actuated elevator tab has an aluminum honeycomb core with a clad aluminum surface tapered toward the trailing edge. The tab is hinged to the rear spar of the elevator at three points At the lower inboard end of the tab is a horn fitting for attachment to a pushrod.

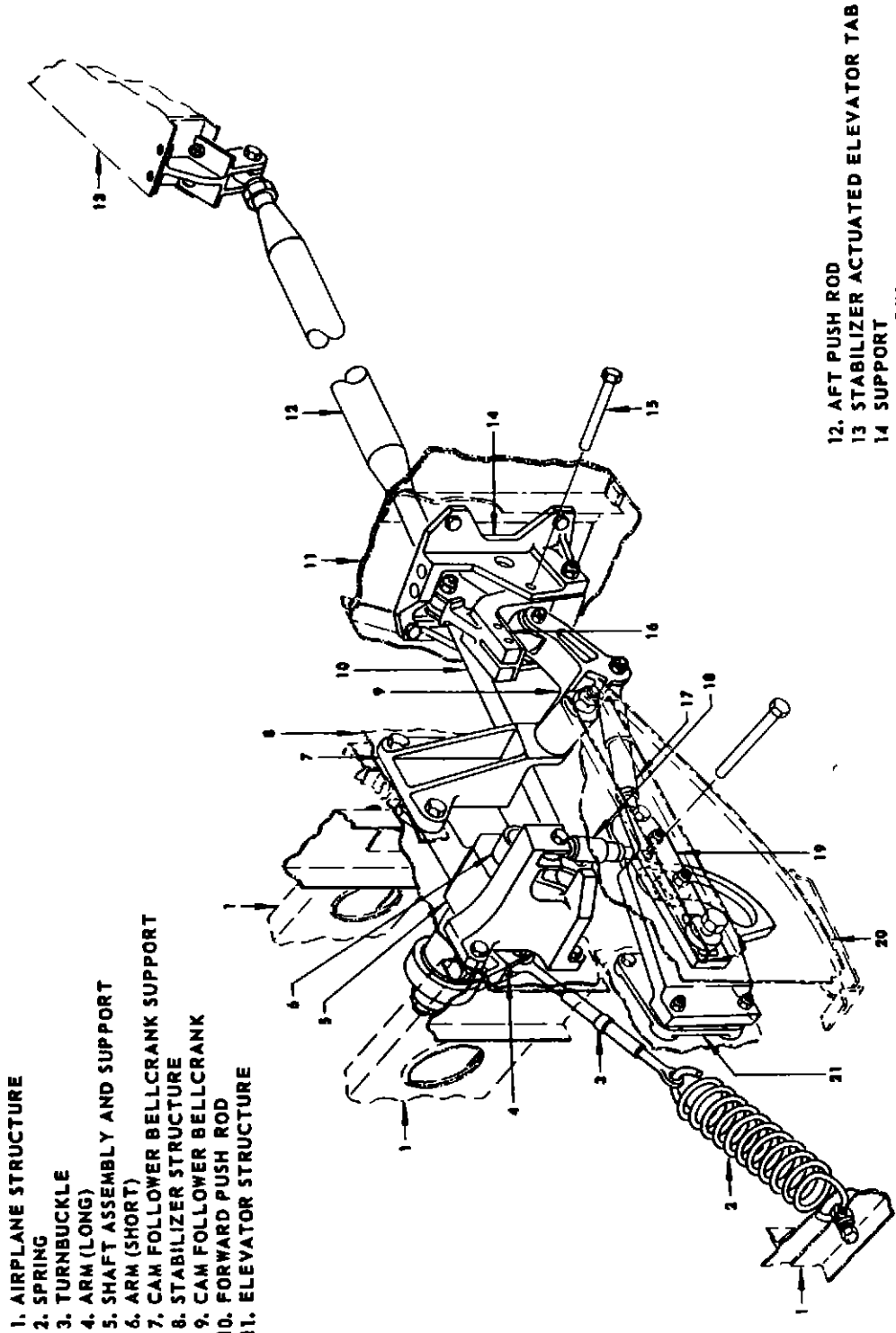
C. The stabilizer actuated elevator tab is controlled by a pushrod connected to the horn fitting. The pushrod is moved by positioning the stabilizer to push the tab downward when stabilizer nose is turned down Between approximately 3-1/2 units airplane nose down to 5 units airplane nose up trim, the tab moves to maintain an approximately constant force gradient on the control column when the elevator is moved up.

9. Stabilizer Actuated Elevator Tab Mechanism

A. The stabilizer actuated elevator tab mechanism (figure 5) has the sole purpose of positioning the stabilizer actuated elevator tab to provide a constant force gradient on the control column when the elevator is raised, while the stabilizer trim is between the previously mentioned limits (trim).

B. The mechanism consists of a crank and shaft assembly (5) attached to airplane structure, a cam follower bell crank (9) connected with the stabilizer and a cam bell crank assembly (16) attached to the elevator structure.

C. The stabilizer actuated elevator tab mechanism is located in the tail compartment forward of the tail cone and extends into the horizontal stabilizer and the elevator on each side of the airplane. The mechanism can be reached through the tail cone access panel and tab control access panels on the lower side of the stabilizer and elevator.



Stabilizer Actuated Elevator Tab Mechanism
Figure 5

D. A cam engages a roller on the cam follower bell crank when the elevator is being raised while the airplane is between 3-1/2 units nose down and 5 units nose up trim The mechanism then moves the aft push rod to position the stabilizer actuated elevator tab to provide an approximately constant force gradient in the control column

10 Operation

A The elevator tabs and elevators are actuated from the control columns, which extend into the lower nose compartment where they are bussed together and attached to the two forward quadrants Fore and aft movement of either control column transmits cable motion from the forward quadrants to the aft control quadrant assembly in the tail compartment Rotation of the aft control quadrant assembly rotates the quadrant crank (11, figure 2) which causes the elevator control cranks (15) to rotate The control crank transmits the motion aft to the follow-up crank. Motion of the follow-up crank is transmitted to the inboard torque tube crank (6) by the torque tube push rod (8) Rotation of the torque tube (5) actuates the outboard torque tube crank (1) which positions the elevator control tab (3) through the push rod acting on the tab horn fitting

B During flight, when the elevator control tab is moved down from the faired position, aerodynamic forces act on the tab and move the elevator up (See figure 3.) As the elevator is moved up from the faired position, the air pressure at the upper vent gap becomes greater than the pressure at the lower vent gap. This differential in air pressure results in a force which moves the balance panel down assisting the elevator control tab in moving the elevator up The balance panels which are hinged to the leading edge of the elevator nose sections act also as balance weights to statically balance the elevators about the hinge center line

C The elevators are moved by a direct control linkage connection on the ground through a follow-up crank which contains two angularly spaced pawls This pawl spacing provides both upper and lower limits to tab travel relative to the elevators and permits positioning the tabs without direct linkage contact with the elevators When the tabs reach their maximum position, a pawl on the follow-up crank engages elevator structure for direct elevator control During high speed flight the tabs move the elevator and the pawl on the follow-up crank does not overtake the contact point on structure

D The elevator control tabs are returned to the faired position by the centering spring linkage The spring (17, figure 2) acts through the centering crank (20) and two cables (19) attached to a crank on the quadrant crank (11) When the aft elevator control quadrants are rotated away from the center position tension is added to the spring When the torque on the aft quadrants is released spring tension returns the aft control quadrant to the center position

E The stabilizer actuated elevator tabs help lift the elevators to an approximately faired position in relation to the stabilizers during nose down position of the stabilizers Between approximately 3-1/2 units airplane nose down to 5 units airplane nose up trim, the stabilizer actuated elevator tab mechanism will be actuated to position the tab to provide a constant force gradient on the control column

F Each elevator is prevented from oscillating by a hydraulic snubber (14, figure 2) connected to elevator and stabilizer structure at the inboard trailing edge The snubber contains the mechanical stops which limit elevator travel The snubber also acts as a gust damper when the airplane is parked

END

ELEVATOR, ELEVATOR CONTROL TABS AND ELEVATOR CONTROL SYSTEM - TROUBLE SHOOTING

With an observer at the elevators, operate the control column through the full range of travel in both directions IF -

Cont on page 102

CONTROL TAB MOVES IN ONE DIRECTION ONLY

Inspect the cable runs, control quadrants and control tab linkage for a disconnection (missing bolt) or a broken component Repair or replace as required

EXCESSIVE CONTROL FORCES ARE REQUIRED

Check cable tension IF -

Cont on page 103

OK - Disconnect aft control cable turnbuckles and check rotation of aft control quadrant IF -

OK - Remove cables from forward quadrant and check control column for binding IF -

OK - Check for jammed control cables by pulling on cables at forward end IF -

NOT OK - Check cable runs and repair as required

THE SYSTEM IS JAMMED

Inspect the cable runs, control quadrants, balance panel cavities and control tab linkage for foreign objects, defective bearings and unremoved rigging pins IF -

NOT OK - Remove object and repair damage or replace bearings

NOT OK - Adjust elevator control tab actuating mechanism

OK - Check control column and replace as required

CONTROL TAB DOES NOT MOVE DOWN WHEN CONTROL COLUMN IS PULLED AFT, OR DOES NOT MOVE UP WHEN COLUMN IS PUSHED FORWARD

CABLES REVERSED - Rig the system

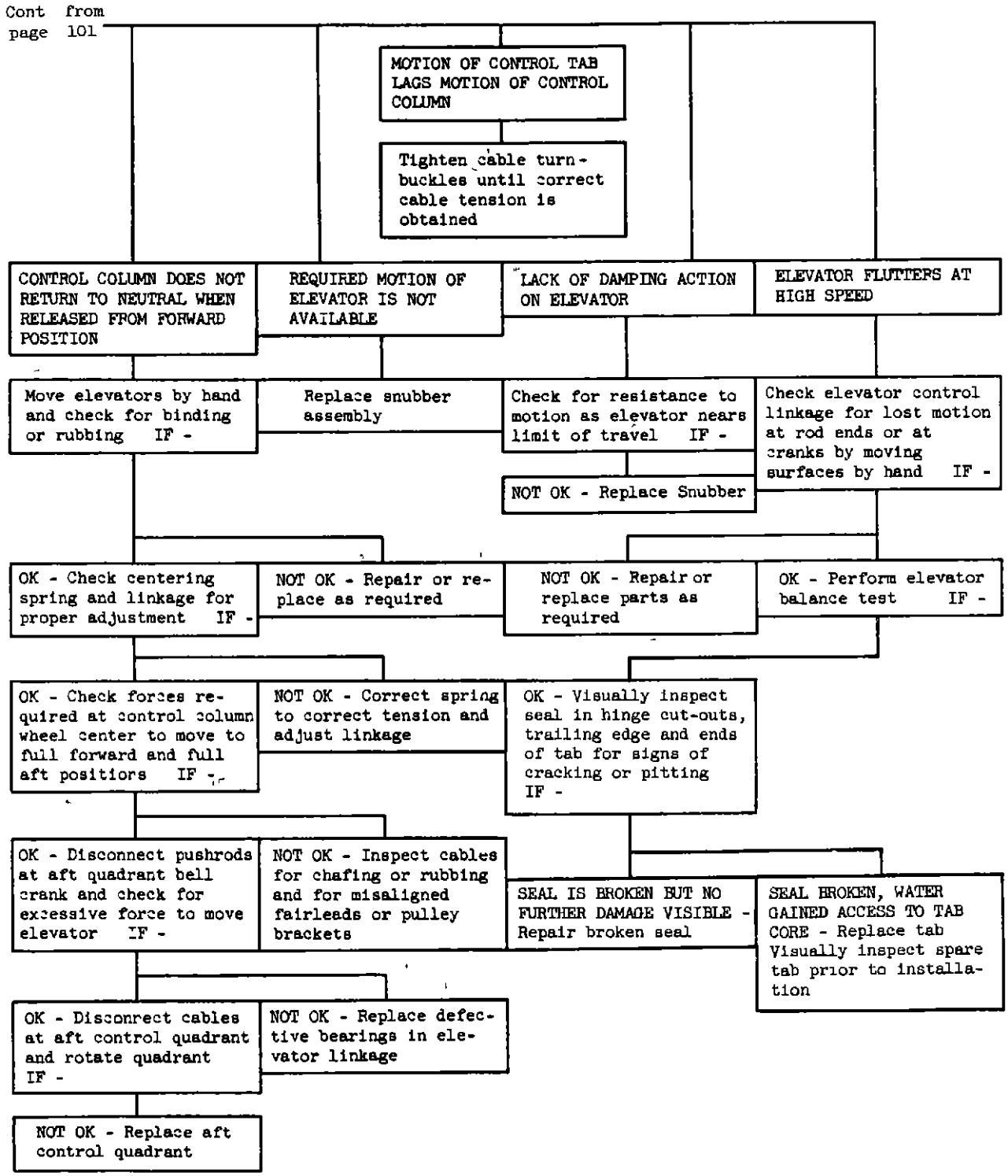
OK - Check if rigging pin fits easily in aft control quadrant IF -

NOT OK - Adjust to obtain correct position Rig system with rigging pins in both forward and aft control quadrants

REQUIRED MOTION OF CONTROL TAB IS NOT AVAILABLE

Clamp control tabs in neutral position Check if rigging pin fits easily in forward control quadrant IF -

NOT OK - Adjust elevator control linkage to correct position


Cont from page 101
MOTION OF CONTROL TAB LAGS MOTION OF CONTROL COLUMN
Tighten cable turnbuckles until correct cable tension is obtained
CONTROL COLUMN DOES NOT RETURN TO NEUTRAL WHEN RELEASED FROM FORWARD POSITION
REQUIRED MOTION OF ELEVATOR IS NOT AVAILABLE
LACK OF DAMPING ACTION ON ELEVATOR
ELEVATOR FLUTTERS AT HIGH SPEED
Move elevators by hand and check for binding or rubbing IF -
Replace snubber assembly
Check for resistance to motion as elevator nears limit of travel IF -
Check elevator control linkage for lost motion at rod ends or at cranks by moving surfaces by hand IF -
NOT OK - Replace Snubber
OK - Check centering spring and linkage for proper adjustment IF -
NOT OK - Repair or replace as required
NOT OK - Repair or replace parts as required
OK - Perform elevator balance test IF -
OK - Check forces required at control column wheel center to move to full forward and full aft positions IF -
NOT OK - Correct spring to correct tension and adjust linkage
OK - Visually inspect seal in hinge cut-outs, trailing edge and ends of tab for signs of cracking or pitting IF -
OK - Disconnect pushrods at aft quadrant bell crank and check for excessive force to move elevator IF -
NOT OK - Inspect cables for chafing or rubbing and for misaligned fairleads or pulley brackets
SEAL IS BROKEN BUT NO FURTHER DAMAGE VISIBLE - Repair broken seal
SEAL BROKEN, WATER GAINED ACCESS TO TAB CORE - Replace tab Visually inspect spare tab prior to installation
OK - Disconnect cables at aft control quadrant and rotate quadrant IF -
NOT OK - Replace defective bearings in elevator linkage
NOT OK - Replace aft control quadrant

Cont from page 101

OK - Inspect cable runs for chafing or rubbing and for misaligned fairleads or pulley brackets IF -

TOO HIGH - Adjust turnbuckles for correct tension

OK - Check Control Column for excessive force required by disconnecting cables at forward quadrant and actuating control column IF -

NOT OK - Correct, repair or replace as required

OK - Check for excessive force required to move elevator at trailing edge IF -

NOT OK - Repair, replace control column as required

OK - Check aft control quadrant for binding by rotating manually IF -

NOT OK - Replace defective bearings in elevator linkage

OK - Check stabilizer actuated tab mechanism spring for tension IF -

NOT OK - Eliminate cause, repair, replace as required

TENSION BETWEEN 39 AND 49 POUNDS - Check cam bell crank and cam follower bell crank for foreign matter, corrosion IF -

TENSION HIGHER THAN 49 POUNDS - Adjust spring
TENSION LOWER THAN 39 POUNDS - Check shear rivets in inboard crank IF -

OK - Visually inspect seal in hinge cut-outs, trailing edge and ends of tab for signs of cracking or pitting IF -

NOT OK - Remove, repair or replace as required

OK - Adjust spring

NOT OK - Remove crank assembly replace rivets and rerig system

SEAL IS UNBROKEN - Check balance panel tracks, supporting parallelogram linkages for interference or rubbing on structure rib bulkheads by moving elevators by hand and observing clearances IF -

NOT OK - Repair or replace as required.

NOT OK - Repair or replace as required

IF AIRPLANE EXHIBITS PORPOISING CHARACTERISTICS DURING FLIGHT.

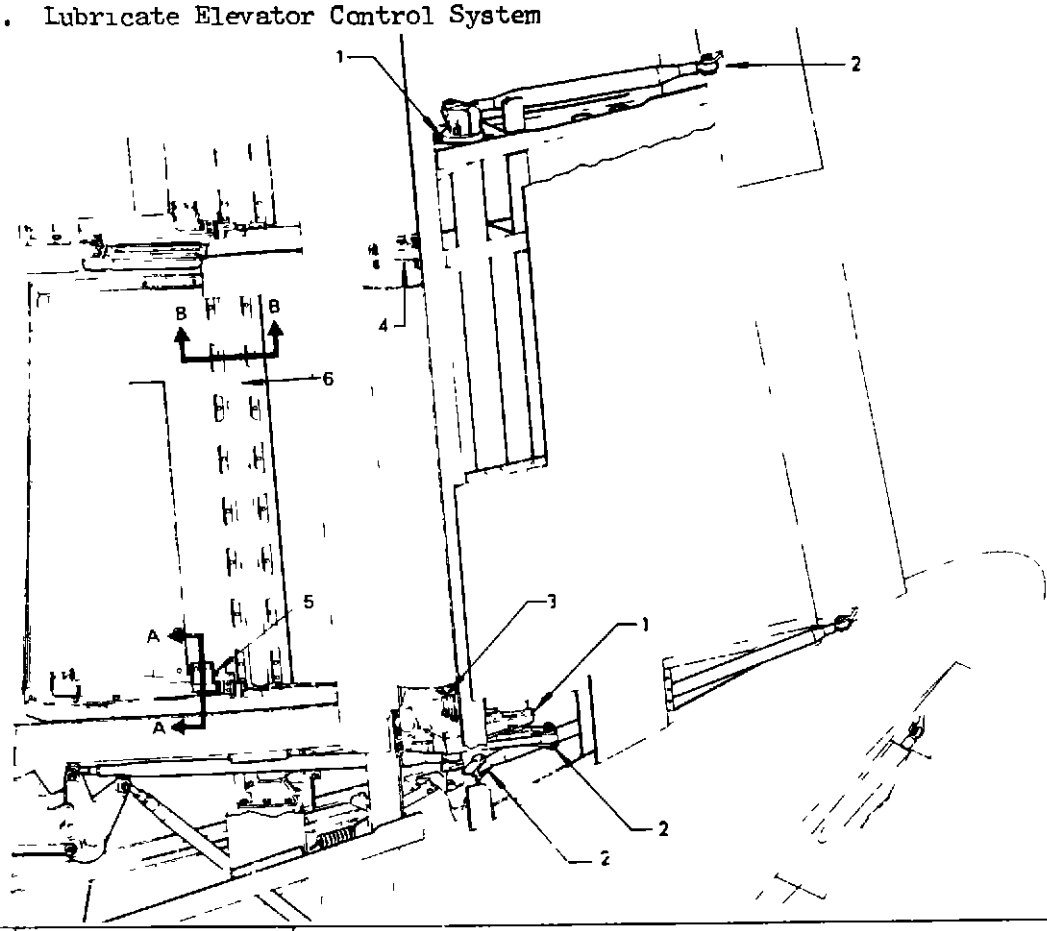
Check adjustment of elevator control tab centering spring IF -

NOT OK - Adjust centering spring and test elevator control system

ELEVATOR, ELEVATOR CONTROL TABS AND ELEVATOR CONTROL SYSTEM - MAINTENANCE PRACTICES

1. Unit Servicing Elevator Control System (See figure 201.)

A. Lubricate Elevator Control System



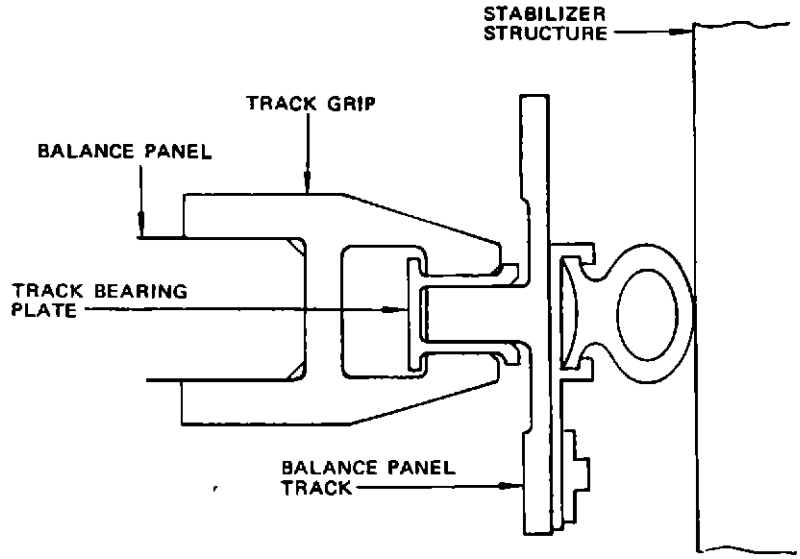
INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	TORQUE TUBE SUPPORT BEARINGS	Apply Aeroshell Grease 17 through flush fittings (2 places)
2	ROD END BEARINGS	Apply Aeroshell Grease 17 through flush fittings (5 places)
3	THRUST HINGE FITTING	Apply Aeroshell Grease 17 through flush fitting
4	HINGE BEARINGS	Apply Aeroshell Grease 17 through flush fittings (6 places)
5,6	TRACK GRIP AND PIANO HINGE	Apply grease per paragraph 1.B.

B. Lubricate Elevator Balance Panels

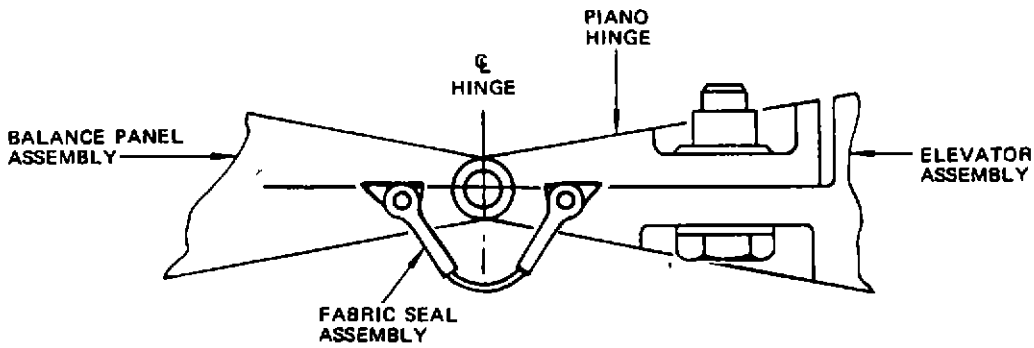
(1) Equipment and Materials

(a) Grease - Aeroshell 15

(b) Solvents, MEK or aliphatic naphtha



SECTION A-A



SECTION B-B

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(2) Lubrication Method (Squirt Can Method)

(a) Mix greaseAeroshell 15 with methyl ethyl ketone or aliphatic naphtha to a consistency suitable for application with a squirt type oil can. Oil can should have flexible spout approximately 3 feet long.

(b) Position elevator trailing edge in the full up position (elevator nose down).

(c) Apply a moderate coat of lubricant, noted above, evenly over the upper surface of the piano hinge for each balance panel. Access to the hinge may be obtained through the air gap between the elevator nose and stabilizer upper skin.

NOTE: Only sufficient grease should be applied to fill the gaps between hinge halves in order to prevent entrance of moisture. Excessive amounts of grease will accumulate dirt and grit.

(d) Apply the same lubricant on either side of both balance panel track grips located on the inboard side of each balance bay. Insert flexible spout of oil can through the inspection hole on stabilizer upper surface and guide spout to the forward and aft side of each track grip. This operation may be facilitated by shining a light through the air gap at the inboard end of the bay.

(e) Inspect the above areas after solvent has evaporated from grease to ensure a good coverage of lubricant.

(3) Not applicable to SARENA aircraft.

2. Adjustment/Test Elevator Control System

A. General

(1) The elevator control system is adjusted to a neutral configuration with the stabilizer set at its mid travel position, the elevator held two degrees down from the stabilizer, and the elevator control tab adjusted to fair with the elevator. The control tab actuating system is rigged from forward to aft. Rigging pins are used to isolate sections of the control system and align parts during adjustment.

(2) The stabilizer actuated elevator tab is adjusted independently of the elevator control tab actuating system.

(3) When new cables are installed the initial yield must be taken up before the control cables are rigged to normal operating tension. Rig new "EA" and "EB" cables to 250(+10/-30) pounds and cycle the system 25 times without lockwiring cable turnbuckles. After cycling reduce cable tension to the appropriate tension for ambient temperature per table on figure 202, and lockwire turnbuckles.

CAUTION: DO NOT OPERATE ELEVATOR OR CONTROL WITH RIGGING PINS INSTALLED.

(4) When adjusting or testing the control system for one elevator, the opposite elevator should be in a relatively similar position. This will prevent displacement of the tab linkage due to feedback from the opposite elevator contacting its tab linkage stops.

B. Equipment and Materials

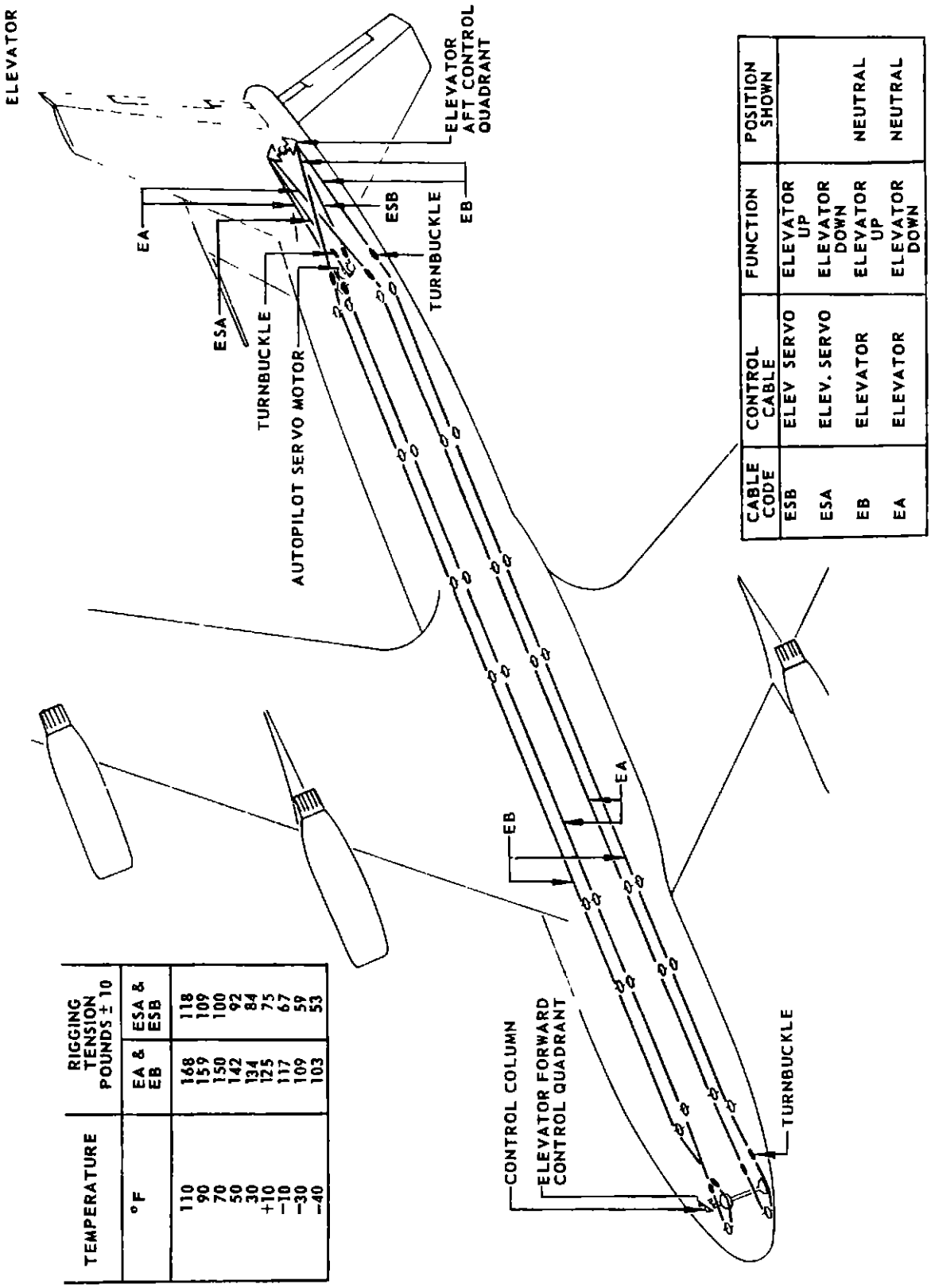
(1) Protractor Assembly - F52485-500, with Clamp Assembly - F71292-16 or MIT50-9784 elevator tab protractor, and sickle protractor 3MIT5-72322-1 and 4MIT5-72322-2 with base assemblies MIT50-8286-1 and -2, or equivalents.

(2) Tensiometer - 0 to 200 pounds capacity

(3) Steel Scale - 0 to 3 feet graduated in inches and sixteenths

(4) Spring Scale - 0 to 100 pounds

(5) Cleaning Solvent P-S-661b, Type 1



CABLE CODE	CONTROL CABLE	FUNCTION	POSITION SHOWN
ESB	ELEV SERVO	ELEVATOR UP	NEUTRAL
ESA	ELEV. SERVO	ELEVATOR DOWN	
EB	ELEVATOR	ELEVATOR UP	
EA	ELEVATOR	ELEVATOR DOWN	NEUTRAL

TEMPERATURE °F	RIGGING TENSION POUNDS ± 10 EA & EB	ESA & ESB
110	168	118
90	159	109
70	150	100
50	142	92
30	134	84
+10	125	75
−10	117	67
−30	109	59
−40	103	53

Elevator Control System Rigging
Figure 202

(6) Corrosion preventative compound, MIL-C-11796A, grade 3

(7) Rigging pin, MS20392-4

C. Adjust Elevator Control System

(1) Check control column travel.

(a) Connect external electrical power to airplane.

(b) Position stabilizer at 8 (± 1) units airplane nose up trim as shown on pilots' stabilizer trim indicator.

(c) Place control column in neutral position.

(d) Rotate control column forward from neutral until column stop is contacted. Check that column has rotated 10°57' (± 15').

(e) Rotate control column aft until column stop is contacted. Check that column has rotated 27°29' (± 15') between stops.

(2) Connect external electrical power and position stabilizer so that jackscrew dimension "A" is 19-9/32 (± 3/32) inches. (See 27-10-0, figure 202.)

(3) Adjust elevator control cables.

(a) Install rigging pin or AN5 bolt in elevator forward control quadrant. (See figure 203.)

(b) Remove tail cone access panel 1076 or 1188. See Chapter 12, Access Doors and Panels.

(c) Install rigging pin or AN5 bolt in elevator aft control quadrant. (See figure 204.)

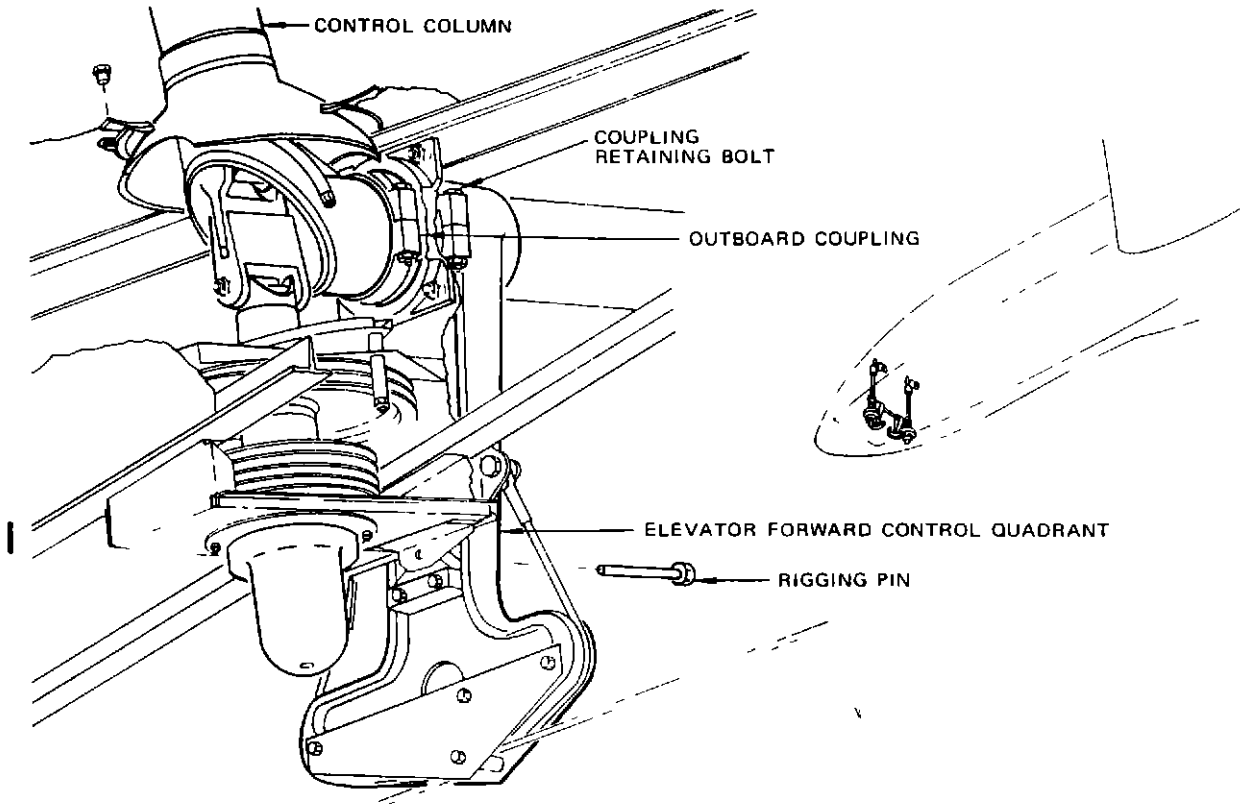
(d) Adjust tension in cables EA and EB to values shown in figure 202. Use tensiometer to measure tension loads.

NOTE: Lockwire turnbuckles after adjustment.

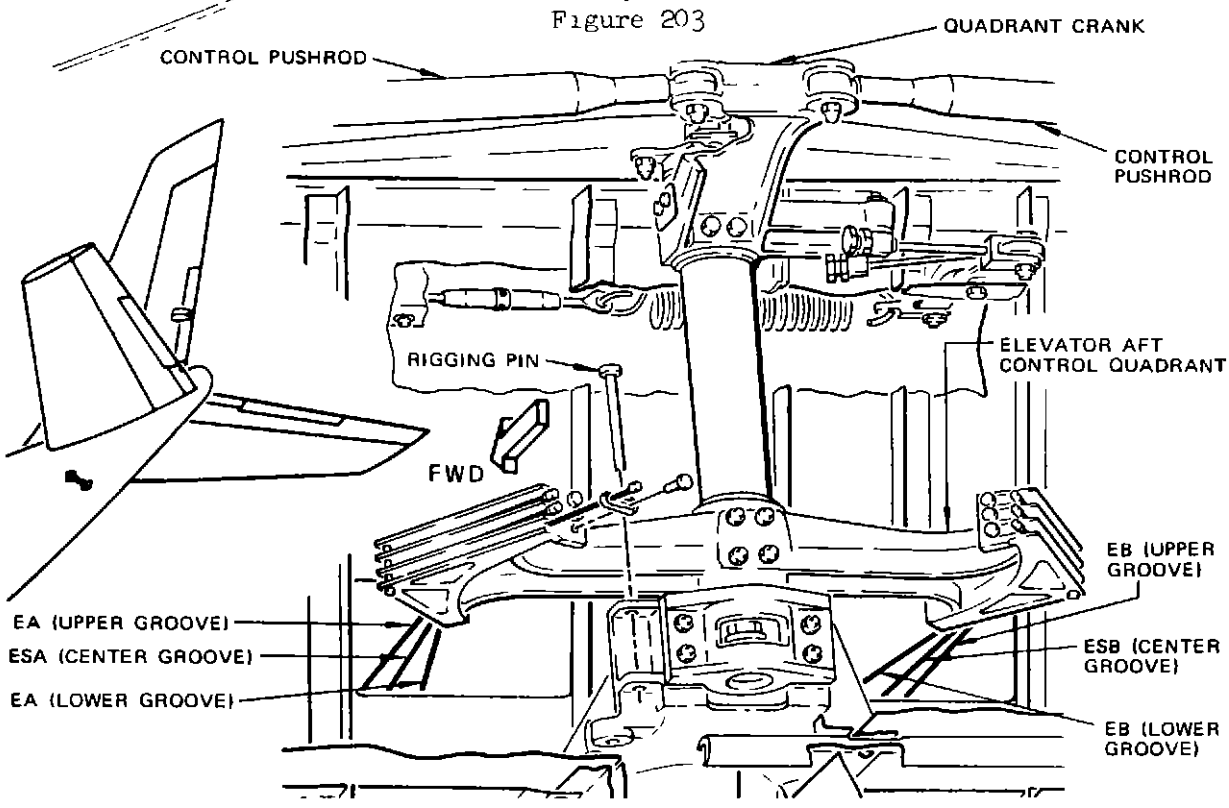
(4) Adjust elevator control tab actuating mechanism.

(a) Remove elevator trim tab control access panel 1612 and elevator tab control access panels 1614 and 1629. See Chapter 12, Access Doors and Panels.

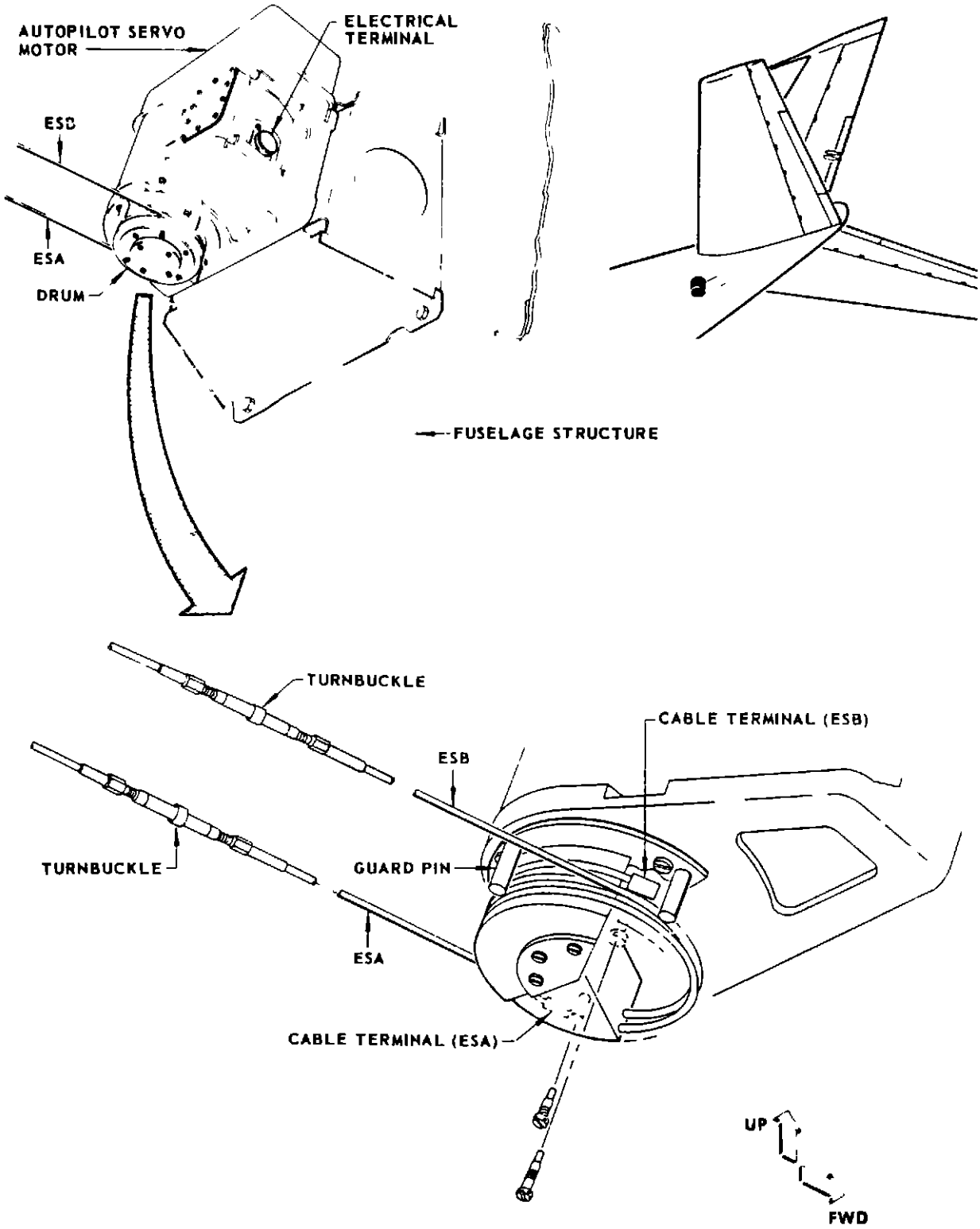
(b) Install MS20392-4 rigging pins in elevator aft control quadrant (figure 204) and in control crank in each stabilizer. (See figure 206.)

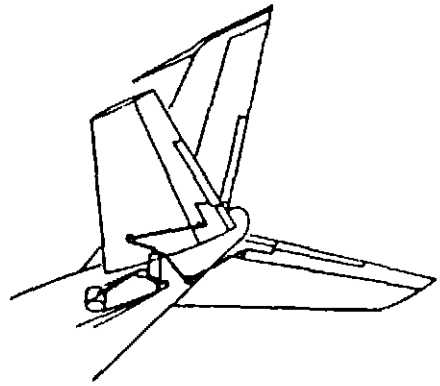


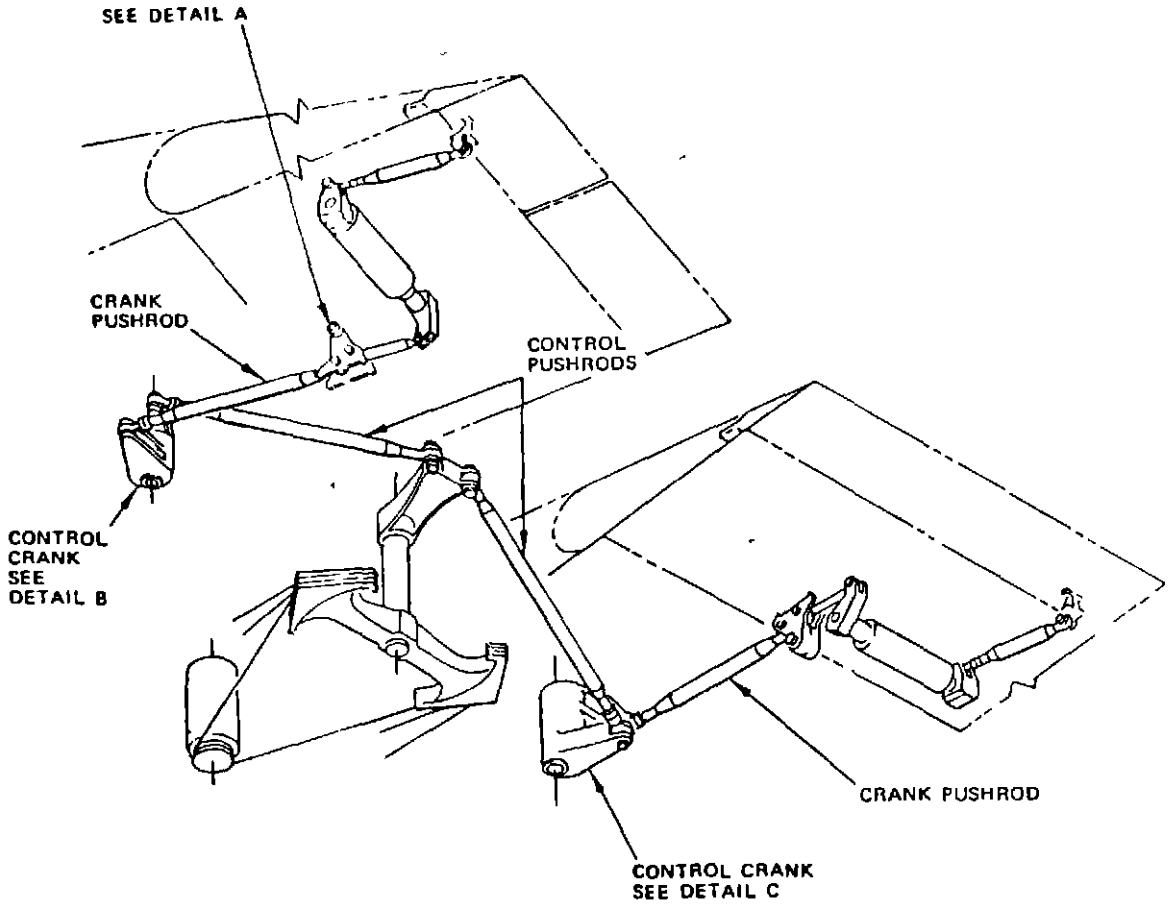
Forward Control Quadrant Installation
Figure 203



Aft Control Quadrant Installation
Figure 204


AUTOPILOT SERVO MOTOR
ELECTRICAL TERMINAL
ESB
ESA
DRUM
FUSELAGE STRUCTURE
TURNBUCKLE
TURNBUCKLE
CABLE TERMINAL (ESB)
ESB
GUARD PIN
ESA
CABLE TERMINAL (ESA)
UP
FWD





Elevator Control Linkage Installation
Figure 206 (Sheet 1)

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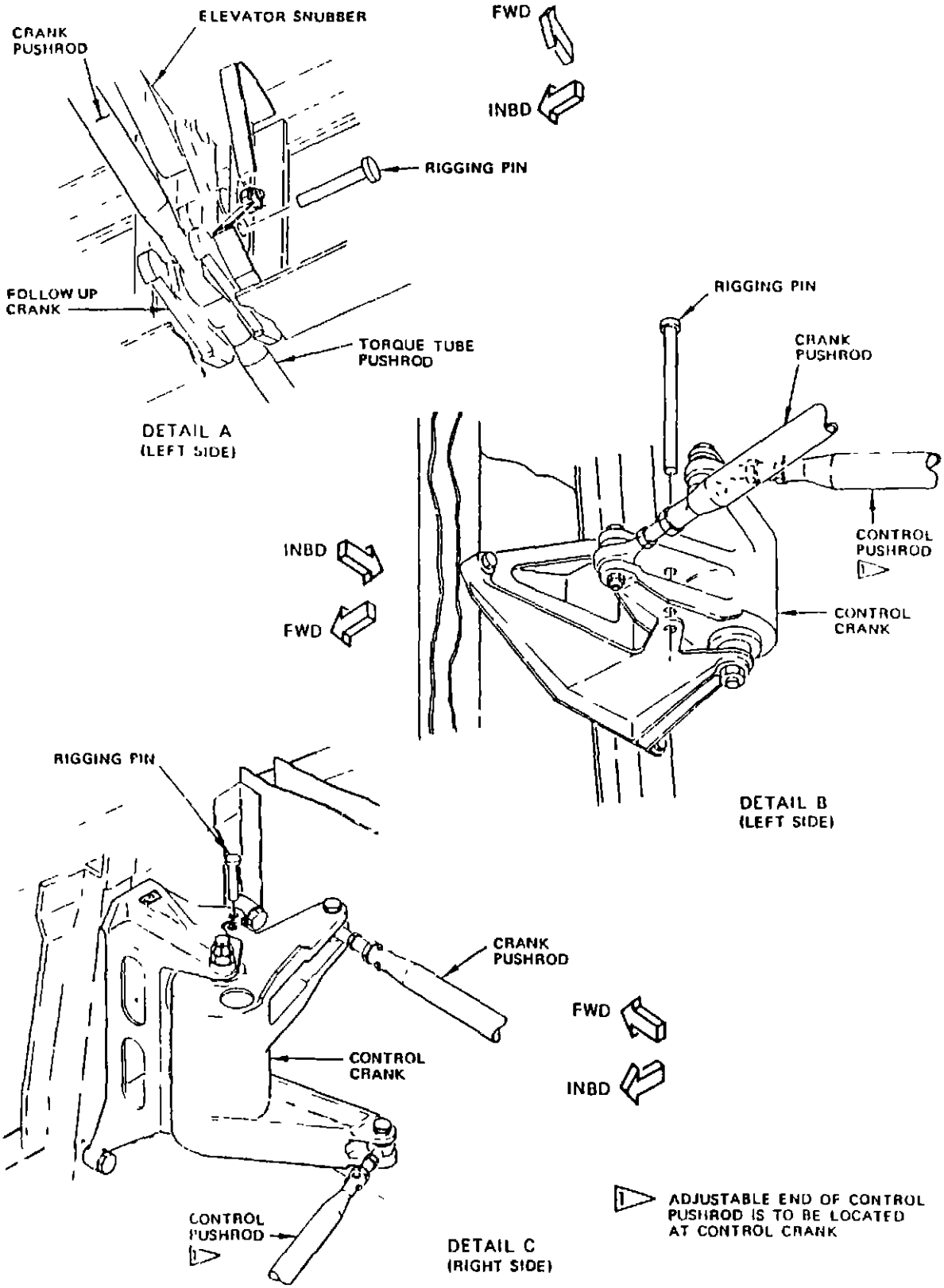

ELEVATOR SNUBBER
CRANK PUSHROD
FWD
INBD
RIGGING PIN
FOLLOW UP CRANK
TORQUE TUBE PUSHROD
DETAIL A
(LEFT SIDE)
RIGGING PIN
CRANK PUSHROD
CONTROL PUSHROD
CONTROL CRANK
INBD
FWD
DETAIL B
(LEFT SIDE)
RIGGING PIN
CRANK PUSHROD
FWD
CONTROL CRANK
INBD
CONTROL PUSHROD
DETAIL C
(RIGHT SIDE)
ADJUSTABLE END OF CONTROL PUSHROD IS TO BE LOCATED AT CONTROL CRANK

(c) Adjust length of each control pushrod so that pushrod mounting bolt fits freely through mounting hole. Tighten checknut after adjustment.

(d) Position elevator 2° (± 1/4°) down with respect to stabilizer and hold while adjusting control tabs.

(e) Adjust length of each crank pushrod so that a MS20392-4 rigging pin fits freely in follow-up crank (figure 206). Tighten checknut after adjustment and connect pushrod to crank.

(f) Leave the MS20392-4 rigging pin in the follow-up crank.

(g) Remove elevator control tab access panels 1614 and 1629. See Chapter 12, Access Doors and Panels.

(h) Check that each elevator is 2° (± 1/4°) down from faired position.

(i) Adjust length of control tab pushrod until elevator control tab is faired with elevator trailing edge within ± 1/8 inch. Tighten checknut after adjustment and connect pushrod to tab.

(5) Adjust cables to autopilot servomotor.

(a) Provide one turn wrap around servomotor drum for ESA and ESB cables. (See figure 205.)

(b) Adjust tension in cables ESA and ESB to appropriate value from table on figure 202. Lockwire turnbuckles after adjustment.

(6) Remove rigging pins from both follow-up cranks, both control cranks, aft control quadrant and forward control quadrant.

(7) Disconnect snubber from each elevator and rotate elevator by hand. Elevator shall rotate a minimum of 25° up and 16° down. In the maximum down position, check for physical interference between the balance bay covers (especially honeycomb covers) and balance weights, or bolts along the balance panel hinge. Any interference is to be corrected by relocating balance weights, reversing screws or bolts, or locally trimming covers, as appropriate. Connect snubbers.

(8) Adjust stabilizer actuated elevator tab mechanism.

(a) Adjust turnbuckle (3, figure 208) to place spring (2) in tension so that a 39 to 49-pound pull force is required to move outboard crank (6) away from stop "A." Apply force at center of bolt hole in lower end of spring crank arm (4).

(b) Position stabilizer so that jackscrew dimension "A" is 37-3/4 (± 3/32) inches. (See 27-10-0, figure 202.)

CAUTION: DO NOT OPERATE STABILIZER OR ELEVATOR WITH RIGGING PINS INSTALLED.

(c) Install rigging pin (15) in cam bell crank (16) and adjust aft push rod (12) at tab connection so that the stabilizer actuated elevator tab (13) is at an angle of 3° (± 30') up with respect to the elevator. Tighten check nut after adjustment

(d) Remove rigging pin from cam bell crank and with forward push rod (10) and cam follower bell crank linkarm (17) disconnected, move stabilizer actuated tab between full up and full down. Check that travel is limited at both extremes by stops on cam bell crank without other structural interference.

(e) Hold elevators at 0° (± 30') with respect to stabilizer and adjust forward push rod (10) so that rigging pin can be inserted easily in cam bell crank (16). Tighten check nut after adjustment.

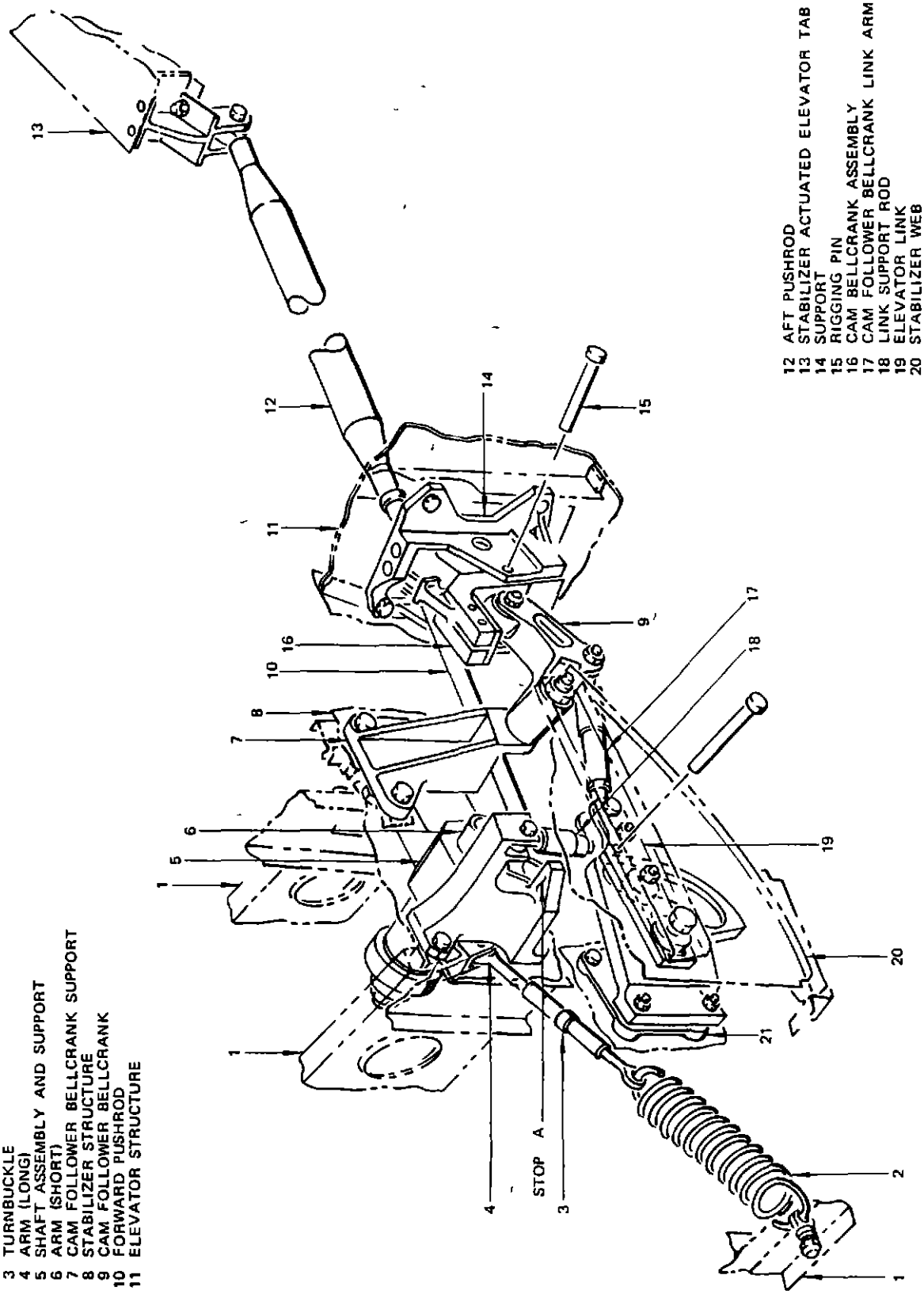
NOTE. Crank arm (6) will remain against stop. To maintain 3° (± 30') angle of the stabilizer actuated tab and to meet the test requirements a 0.010 to 0.200 inch shim may be bonded to the support shaft assembly (5) where crank arm (6) contacts the stop. Use shim only if required to meet test requirements.

(f) Adjust link support rod (18) so that an MS20392-4 rigging pin fits without forcing through elevator link (19). Tighten check nut after adjustment.

(g) Remove rigging pins from cam bell crank and elevator link

(h) Position stabilizer so that dimension "A" is 34-13/32 (± 3/32) inches

(i) Hold elevator at 4° (± 30') up with respect to stabilizer and adjust cam follower bell crank link arm (17) so that roller on cam follower bell crank (9) is 0.001 (+0 019/-0) inches from contact with cam bell crank (16). Tighten check nut after adjustment



Stabilizer Actuated Elevator Tab Linkage Installation
Figure 208

(9) Check control column forces.

NOTE: Control system, control column, surfaces and components shall have been adjusted prior to test.

(a) Remove tail cone access panel 1076 or 1188. See Chapter 12, Access Doors and Panels.

(b) Disconnect centering spring (6, figure 209) from turnbuckle (5).

(c) Attach spring scale to center of control wheel. Determine that force required to move control column aft within full range of elevator travel does not exceed 8 pounds and 2 pounds moving forward.

NOTE: A manual force will be applied to both elevators to prevent follow-up crank from contacting elevator spar.

(d) Determine that force required to move control column aft from neutral does not exceed 7 pounds and 1 pound moving forward.

NOTE: Align rigging pin holes in elevator forward control quadrant to position control column in neutral. (See figure 203.)

(10) Deleted.

(11) Adjust centering spring linkage.

(a) Remove centering spring (6, figure 209) from airplane.

(b) Measure length of spring with a 16.0 (± 1.0) pound tension load applied to the spring. Use spring scale to apply load.

(c) Install centering spring in airplane.

(d) Install rigging pin in elevator aft control quadrant (see figure 204) and through centering spring crank (9) and crank support bracket (8).

(e) Adjust turnbuckle (5) until the spring length determined in step (b) is established within 1/32 inch.

(f) Adjust one centering cable (1) by adjusting cable retainer (4) until rigging pin through crank (9) and bracket (8) can be easily removed.

(g) Lockwire turnbuckle (5).

(h) Adjust remaining cable (1) by adjusting cable retainer (4) until rigging pin in aft control quadrant can be easily removed, and rigging pin can be easily reinstalled through centering spring crank (9) and crank support bracket (8).

(i) Repeat step (h) until rigging pins conditions are met.

(j) Remove rigging pins.

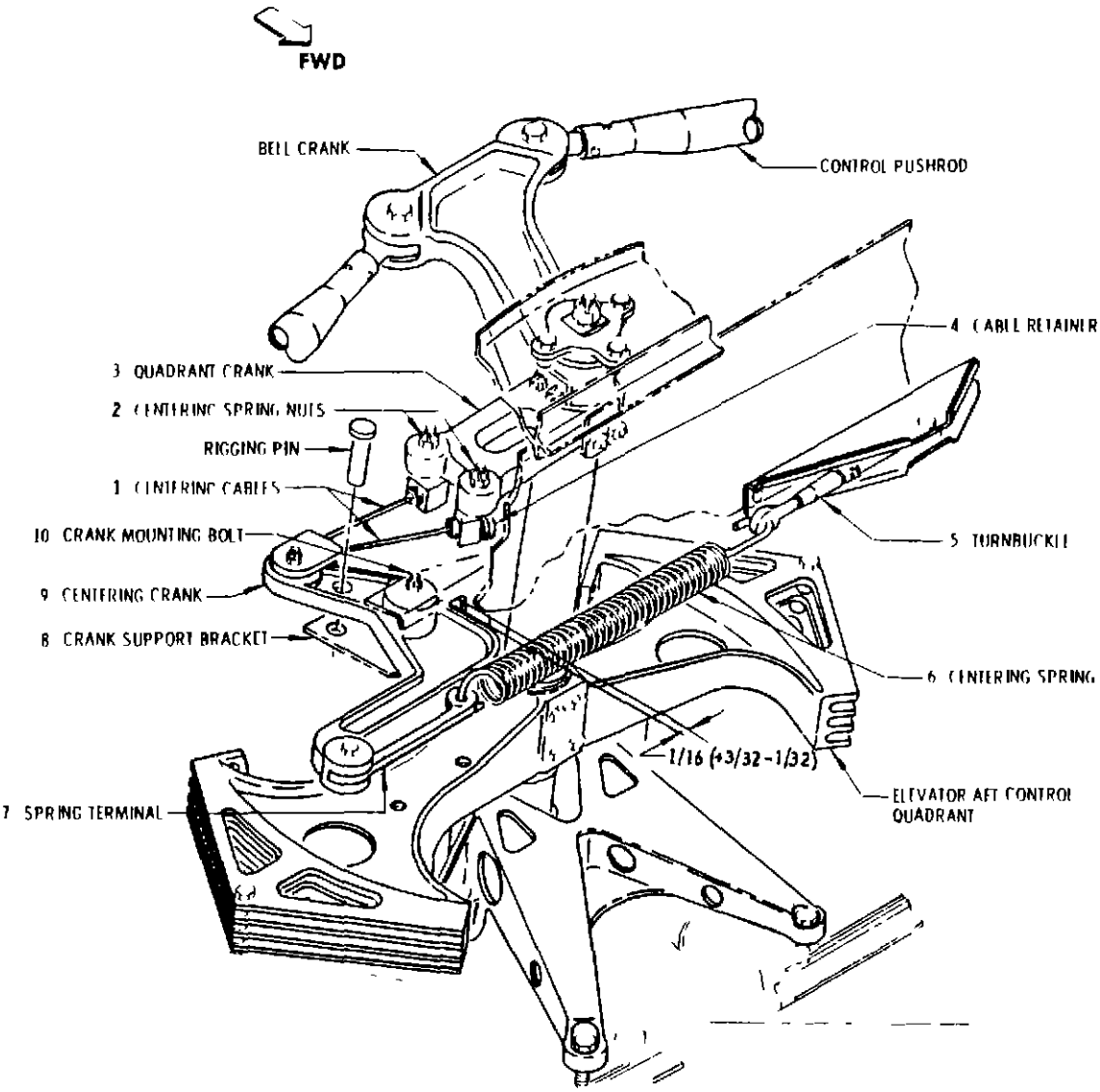
(12) Check control column breakaway force and centering.

(a) Hold both elevators in neutral position.

(b) Determine that force required to breakaway control column forward and aft from neutral does not exceed 8-1/2 pounds nor is less than 5 pounds. The column position for neutral is that which causes both elevator centering cables to be in tension.

NOTE: Control column breakaway is equivalent to 3/32 to 5/32 inch deflection of elevator control tab.

(c) Rotate control column aft from neutral until control tab trailing edge has deflected 13/16 (± 1/16) inch from faired position.



Centering Spring Installation
Figure 209

(d) Force required to move control column shall be between 8 and 13 pounds

(e) Repeat steps (c) and (d) with control column being rotated forward from neutral

(f) Release control column. Column shall return to neutral within ± 2°

(13) Test elevator control system per paragraph D.

(14) If access panels are magnesium.

(a) Remove old corrosion preventative compound from access panels and mounting screws with cleaning solvent P-S-661b and clean cloth. Check panels.

(b) Apply coat of corrosion preventative compound MIL-C-11796A, Grade 3 (soft film) under heads of screws and on faying surfaces of access panels.

(15) Install all access panels.

D. Test Elevator Control System

(1) General

(a) The pilots' stabilizer trim indicator is utilized to show stabilizer position when testing the elevator control system. If problems arise in obtaining proper test results exact stabilizer position should be used. See 27-10-0, figure 202.

(2) Test control column forces and travel.

NOTE: Test control column forces and travel not necessary if adjustment has been accomplished by previous section "Adjust Elevator Control System" which includes these checks. Control system, control column, surfaces and components shall have been adjusted prior to test.

(a) Remove tail cone access panel 1076 or 1188. See Chapter 12, Access Doors and Panels.

(b) Disconnect centering spring (6, figure 209) from turnbuckle (5).

(c) Attach spring scale to center of control wheel. Determine that force required to move control column aft within full range of elevator travel does not exceed 8 pounds and 2 pounds moving forward.

NOTE: A manual force will be applied to both elevators to prevent follow-up crank from contacting elevator spar.

(d) Determine that force required to move control column aft from neutral does not exceed 7 pounds and 1 pound moving forward.

NOTE: Align rigging pin holes in elevator forward control quadrant to position control column in neutral. (See figure 203.)

(e) Adjust centering spring.
(f) Hold both elevators in neutral position.
(g) Determine that force required to breakaway control column forward and aft from neutral does not exceed 8-1/2 pounds nor is less than 5 pounds.

NOTE: Control column breakaway is equivalent to 3/32- to 5/32-inch deflection of elevator control tab.

(h) Rotate control column aft from neutral until control tab trailing edge has deflected 13/16 ±1/16 inch from faired position.
(i) Force required to move control column shall be between 8 and 13 pounds
(j) Repeat steps (h) and (i) with control column being rotated forward from neutral.
(k) Release control column. Column shall return to neutral within ± 2 degrees.
(l) Connect external electrical power to airplane.
(m) Position stabilizer at 8 ±1 units airplane nose up trim as shown on pilots' stabilizer trim indicator.
(n) Place control column in neutral position.
(o) Rotate control column forward from neutral until column stop is contacted Check that column has rotated 10°57' ±15'.
(p) Rotate control column aft until column stop is contacted. Check that column has rotated 27°29' ±15' between stops.
(q) Check for control wheel and control column binding.
1) Move column repeatedly fore and aft between stops and simultaneously move control wheel repeatedly left and right between steps.
2) Hold control wheel left against stop and move control column fore and aft between stops.
3) Hold control wheel right against stop and move control column fore and aft between stops.
4) Hold control column full forward and move control wheel left and right between stops.
5) Hold control column full aft and move control wheel left and right between stops.

(3) Test elevator and control tab motion and travel
(a) Test elevator and control system neutral setting.
1) Set stabilizer jackscrew dimension A at 19-9/32 ±3/32 inches. (See 27-10-0, figure 202)

CAUTION DO NOT OPERATE STABILIZER OR ELEVATOR WITH RIGGING PINS INSTALLED.

2) Move elevators down by hand until control tabs are 0 to 0.82 degree (0 to 0.125 inch trailing edge up) and check that each elevator is down 2 ±1/4 degrees from faired position.
(b) Set stabilizer at 8 ±1 trim units airplane nose up.

(c) Pull control column aft until one or both elevator snubber stops have contacted and hold column.

(d) Check elevator and control tab travel.

1) The angle of the elevator on which both control tab linkage (follow-up crank) and snubber stop have contacted shall be 23° (+1°30'/-0°) up from the stabilizer.

2) The angle of the other elevator shall be 23° (+1°30'/-2°) up from the stabilizer. The control tab linkage stop (follow-up) crank on this elevator shall be bottomed.

NOTE: A light down load may be applied to this elevator, but it shall not be sufficient to move the opposite elevator or the control tab linkage on the opposite elevator away from their stops.

3) The control tabs on both elevators shall be 25° (± 1°) down 3-3/4 (+1/8, -5/32) inches from the elevators. Measure offset normal to a straight edge held against the elevator lower surface

NOTE: Some difficulty may be encountered in meeting the above three requirements in high or gusty winds.

(e) Push control column forward until one or both elevators have contacted snubber stops and hold column.

(f) Check elevator and control tab travel.

1) The angle of the elevator on which both follow-up crank and snubber stop have contacted shall be 14°30' (+ 1°30'/ -0°) down from the stabilizer.

2) The angle of the other elevator shall be 14°30' (+ 1°30'/ -2°) down from the stabilizer. The follow-up crank shall be bottomed.

NOTE: A light up load may be applied to this elevator, but not enough to move the opposite elevator or the control tab linkage on the opposite elevator away from their stops.

3) Control tabs on both elevators shall be 15° (± 1°) up 2-9/32 (±5/32) inches from the elevators.

NOTE: High or gusty winds may make these conditions difficult to meet.

(g) Disconnect subber from elevator and rotate elevator by hand. Elevator shall rotate a minimum of 25° up and 16° down. In the maximum down position, check for physical interference between the balance bay covers (especially honeycomb covers) and balance weights,or bolts along the balance panel hinge. Any interference is to be corrected by relocating balance weights, reversing screws or bolts, or locally trimming covers, as appropriate.

NOTE: Steps (g) and (h) not required if previously accomplished as called out in Adjust Elevator Control System.

(h) Connect snubber and install access panels.

(4) Test elevator follow-up motion.

(a) Remove tailcone access panels 1076 or 1188 and tab control access panels 1614 and 1629. See Chapter 12, Access Doors and Panels.

(b) Install rigging pin in elevator aft control quadrant (See figure 204.)

(c) Raise elevators until pawl of follow-up crank just contacts elevator front spar. (See figure 206.)

CAUTION: USE OF EXCESSIVE FORCE TO POSITION THE ELEVATOR WILL DAMAGE THE AFT CONTROL QUADRANT AND RIGGING PIN

(d) Check that each elevator is 13° (± 1°) up from faired and each elevator control tab is 15° (± 1°) or 2-9/32 (± 5/32) inches up with respect to elevator.

(e) Rotate elevator down until snubber stop is contacted

(f) Check that each elevator is 14°30' (+1°30'/-0°) down from faired and each elevator control tab is 12°30' (+1°30'/-0°) or 1-27/32 (+5/32,-0) inches down with respect to the elevator.

NOTE: Offset dimension must be measured normal to a straight edge placed on elevator and held normal to trailing edge. Measure offsets near inboard edge of control tab.

(g) Remove rigging pin.

(h) Install access panels.

(5) Test stabilizer actuated elevator tab motion.

(a) Position stabilizer to 1 unit airplane nose down as shown in stabilizer trim indicator.

CAUTION: ALLOW 13 MINUTES FOR COOLING FOR EVERY 2 MINUTES OF STABILIZER TRIM MOTOR OPERATION.

(b) Check that stabilizer actuated elevator tabs assume positions relative to the elevators as shown in the following table.

Elevator Position	Tab Angle	Tab Offset Inches
Full up against stop	22° 30'(+1°40'/-0°40') up	3-3/8 (+1/4, -3/32)
4° (± 0° 30') up	3° 20' (± 0°30') up	1/2 (± 5/64)
Full down against stop	6° 30' (± 1°) up	1 (± 5/32)

(c) With elevator held at 4° (± 1/2°) up, check that clearance between roller and cam bell crank is 0.001 (0.001 to 0.020) inches.

(d) Rotate stabilizer trim control wheel in "AIRPLANE NOSE UP" trim direction until stabilizer trim jackscrew gearbox lower stops contact.

(e) Check that stabilizer actuated elevator tabs assume positions relative to the elevators as shown in the following table

Elevator Position	Tab Angle	Tab Offset Inches
Full down against stop	21° (± 1°) down	3-5/32 (± 5/32)
0° (± 0° 15')	21° (± 1°) down	3-5/32 (± 5/32)
Full up against stop	18° (+1°30'/-0°30') down	2-25/32 (± 5/32)

(f) Position stabilizer full up against jackscrew stop (3-1/2 units airplane nose down trim).

(g) Hold elevator so that clearance between roller and cam is between 0 001 and 0.020 inches and check that elevator angle is 3°30' (± 0°30') up with respect to the stabilizer.

(6) Cycle elevator control system through full range of travel and check that tabs are not binding.

CAUTION: DO NOT OPERATE ELEVATOR OR STABILIZER WITH RIGGING PINS INSTALLED.

(7) Replace all access panels.

(8) Disconnect electrical power.

3. Inspection/Check Elevator Control System

A. Examine Elevator Control Tab Linkage

(1) Remove the following access panels. See Chapter 12, Access Doors and Panels.

(a) Elevator tab control access panels 1614 and 1629.

(b) Elevator thrust hinge access panel 1613.

(c) Elevator trim tab access panel 1612.

(d) Elevator hinge access panels 1618 through 1623 and 1666.

(e) Elevator access panel 1609.

(2) Check linkage for loose objects, evidence of rubbing, and insecure connections.

(3) Check elevator control linkage, stabilizer mounted elevator hinge halves, and elevator control tab hinges for evidence of wear. See figure 210 for linkage and hinge wear tolerances.

B. Examine Elevator Balance Bays

(1) Remove balance bay access panels 1624 through 1628 and 1615.

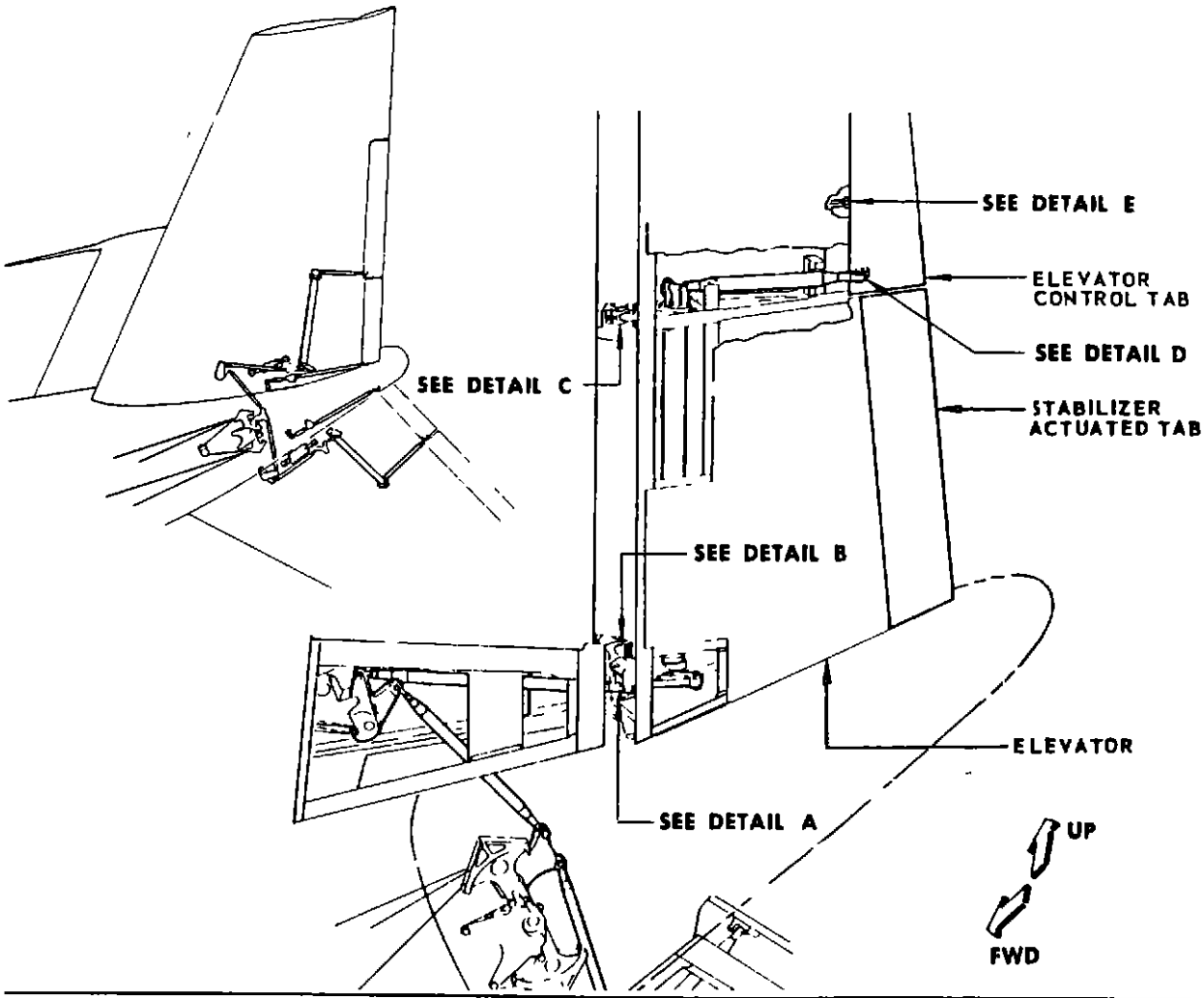
(2) Check interior of balance bay for loose hinge bolts, worn or insecure balance panel seals, and binding of balance panel support track.

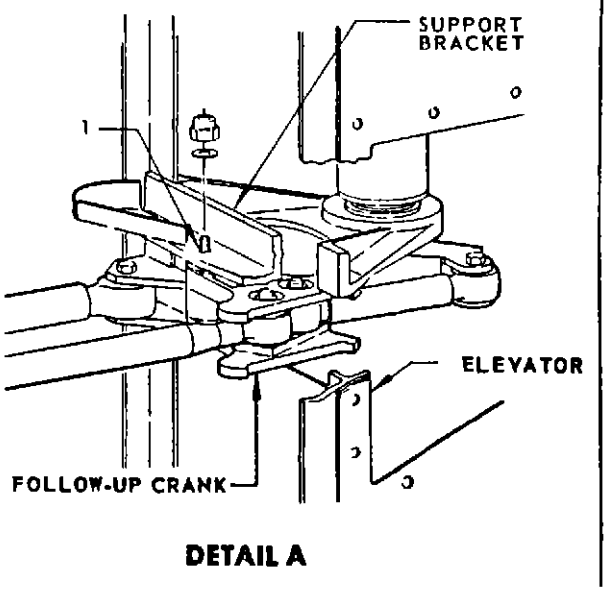
(3) Check stabilizer trailing edge rib stainless steel rub strip for excessive wear in area contacted by balance panel support linkage. If excessive wear is evident, remove and replace rub strip.

(4) Check balance panel hinge, and track grips for wear. See figure 211 for balance panel wear tolerances.

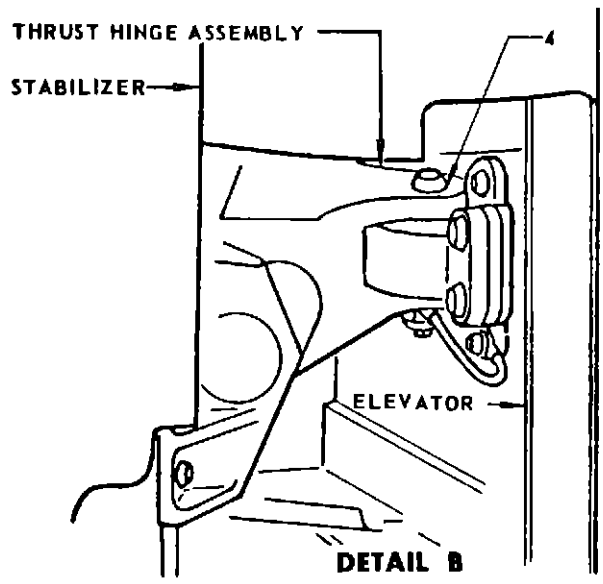
C. Examine Elevator Snubbers

(1) Check snubbers for low oil level which is indicated by clearance under head of indicator pin.



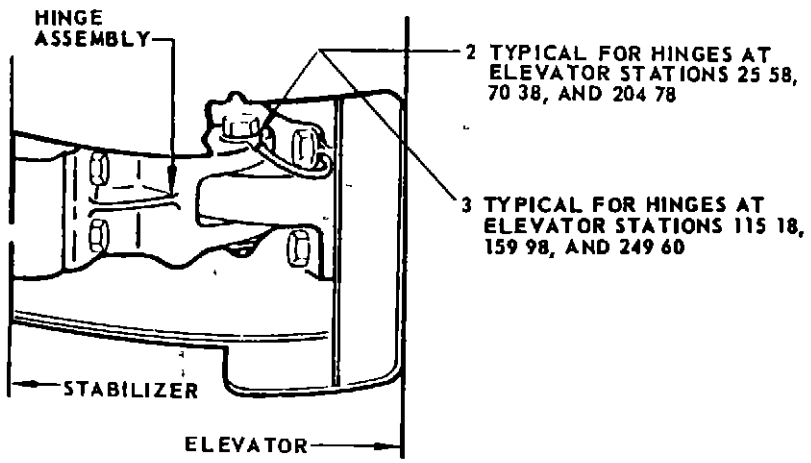


DETAIL A

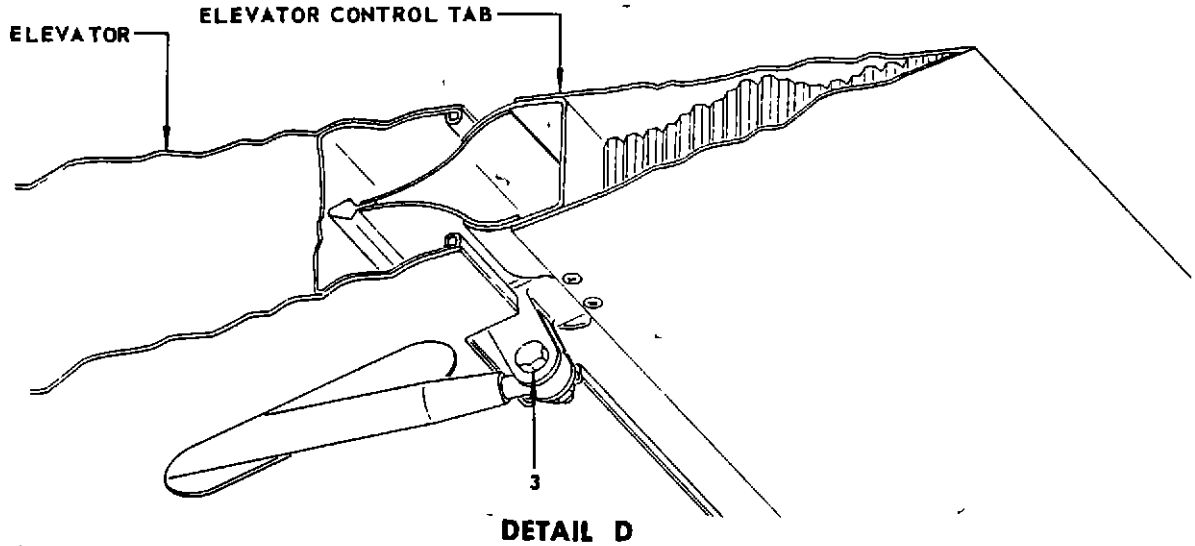


DETAIL B

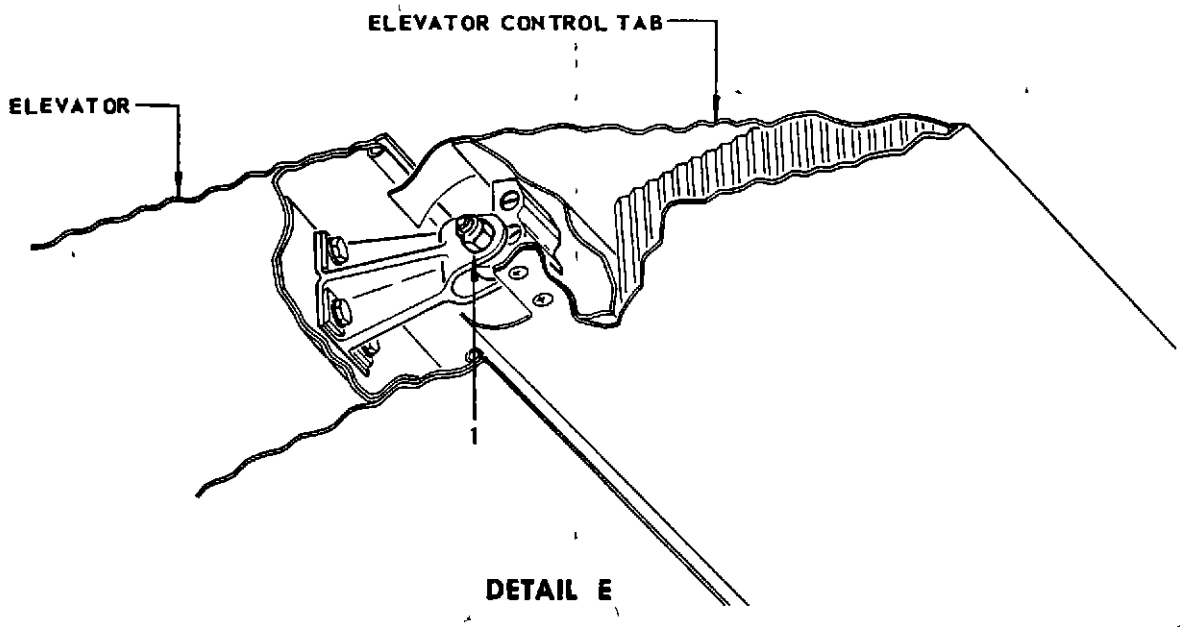
Elevator Control Tab Linkages Wear Tolerances
Figure 210 (Sheet 1 of 3)



DETAIL C



DETAIL D



DETAIL E

Elevator Control Tab Linkage Wear Tolerances
Figure 210 (Sheet 2 of 3)

(2) Check snubber operation by observing resistance to elevator rotation.

(3) Check snubber support brackets for indications of wear. See figure 212 for snubber mounting bracket bolt hole wear tolerances.

D. Examine Stabilizer Actuated Elevator Tab Linkage.

(1) Remove elevator control rod fairing 1611.

(2) Connect external electrical power to airplane.

(3) Position stabilizer at 3 units airplane nose down as shown on pilots' stabilizer trim indicator.

(4) Rotate elevator to neutral 0° (± 2°) and hold this position.

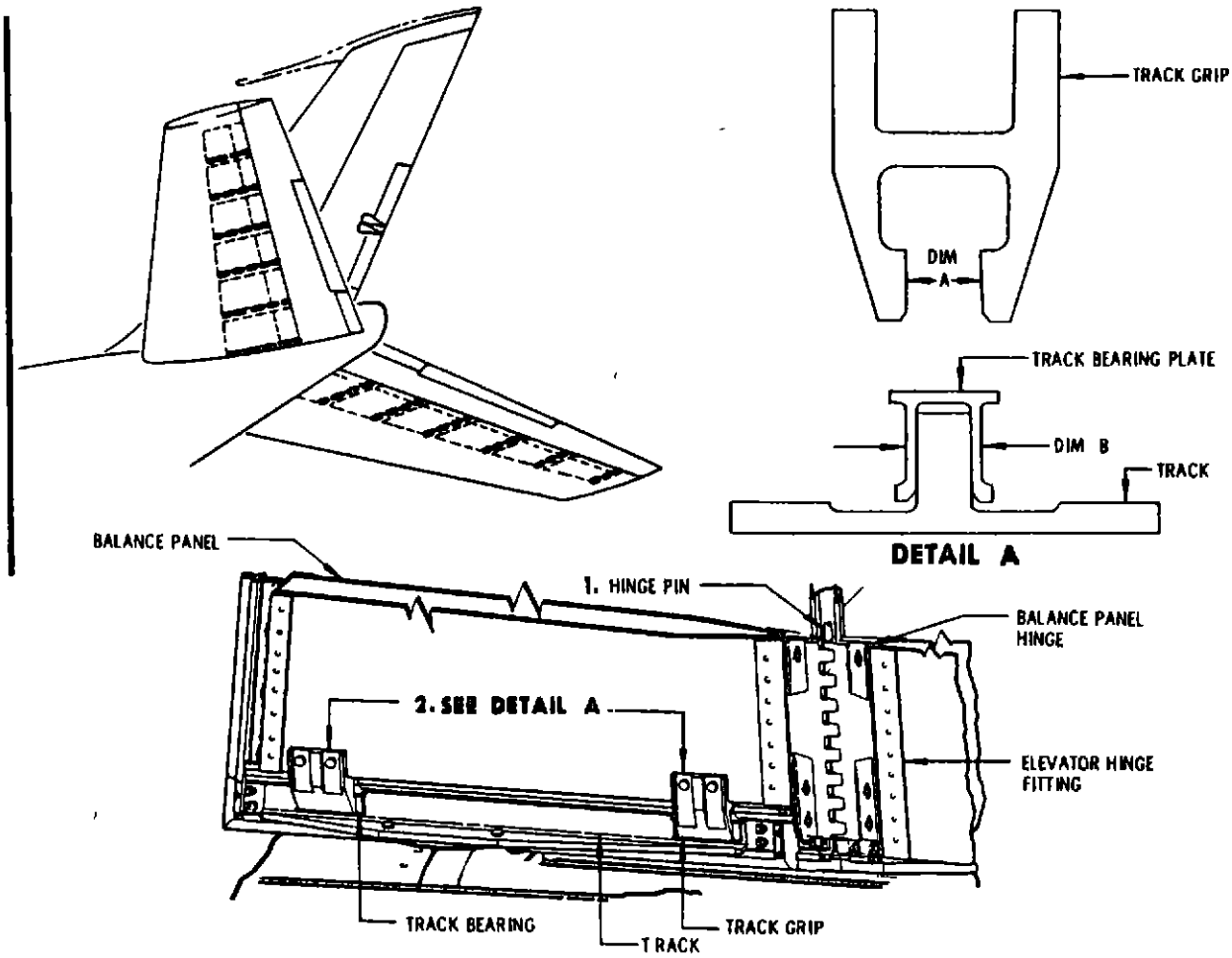
(5) Measure amount of play at outboard trailing edge of tab with an applied load of 13 to 15 pounds.

(6) Check tab linkage and hinge for evidence of wear if tab movement exceeds 11/32 inch. See figure 213 for wear tolerances.

INDEX NO.	DIM.	DESIGN LIMITS DIAMETER MIN.	DESIGN LIMITS DIAMETER MAX.	WEAR LIMITS MAX. WEAR DIM.	WEAR LIMITS MAX. DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	NO	MTL	OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE MIN.	MAX.
1	1D	0.2487	0 2497	0.2517	0.0025	X		[1]		0.0002	0.0013
	OD	0.2483	0.2492	0.2479							
2	1D	0.3112	0.3122	0.3144	0.0027	X		[2]		0.0002	0 0013
	OD	0.3108	0.3117	0.3104							
3	1D	0.3112	0.3122	0.3144	0.0027	X		[1]		0.0002	0.0013
	OD	0.3108	0.3117	0.3104							
4	1D	0.3737	0.3752	0.3782	0.0040	X		[1]		0.0003	0.0016
	OD	0.3727	0 3742	0.3723							

[1] NAS537 CAD PLATED BRONZE BUSHING.
REAM HOLE TO SIZE ON INSTALLATION.

[2] NAS537 CAD PLATED STEEL BUSHING.
REAM HOLE TO SIZE ON INSTALLATION.

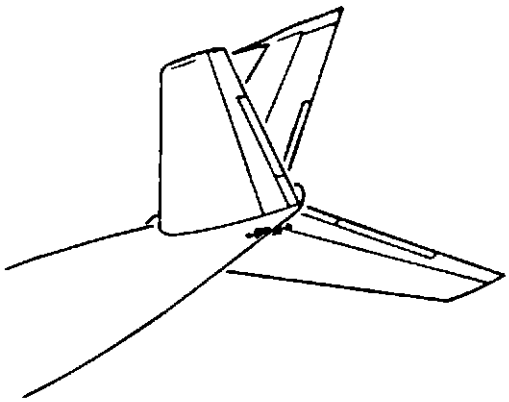


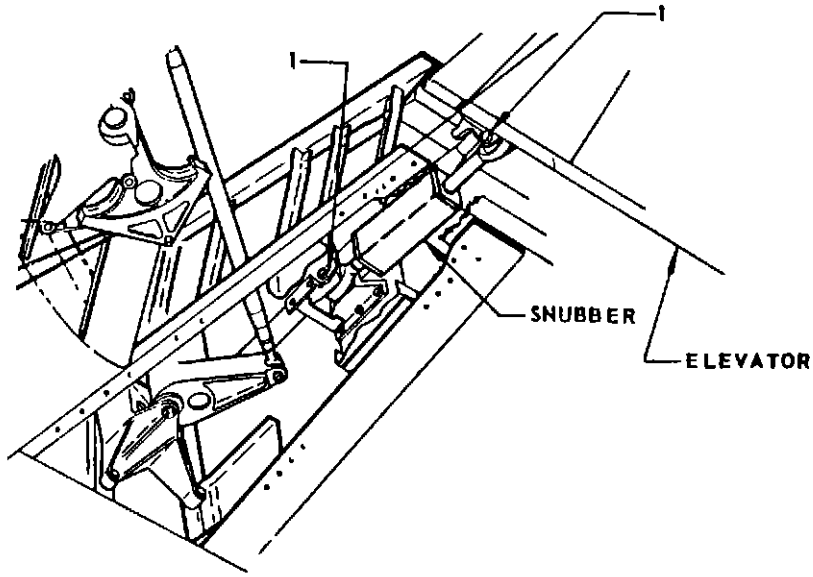
INDEX NO	DIM	DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
		DIAMETER OR WIDTH		MAX WEAR DIM.	MAX DIAM. OR WIDTH CLEARANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE	
		MIN	MAX.			YES	NO	MTL.		MIN	MAX.
1	ID	0.183	0.188	[1]	[3]		X				
	OD	0.178	0.180	[1]			X				
2	A	.697	.700	735	.078						
	B	.692	.695	657							

[1] 0.215 INCH FOR 1/8 OF HINGE LENGTH INBOARD FROM EACH END.
0.205 INCH FOR REMAINING LENGTH IN CENTER OF HINGE.

[2] 0.170 INCH FOR 1/8 OF HINGE LENGTH INBOARD FROM EACH END.
0.175 INCH FOR REMAINING LENGTH IN CENTER OF HINGE.

[3] 0.045 INCH FOR 1/8 OF HINGE LENGTH INBOARD FROM EACH END.
0.030 INCH FOR REMAINING LENGTH IN CENTER OF HINGE.

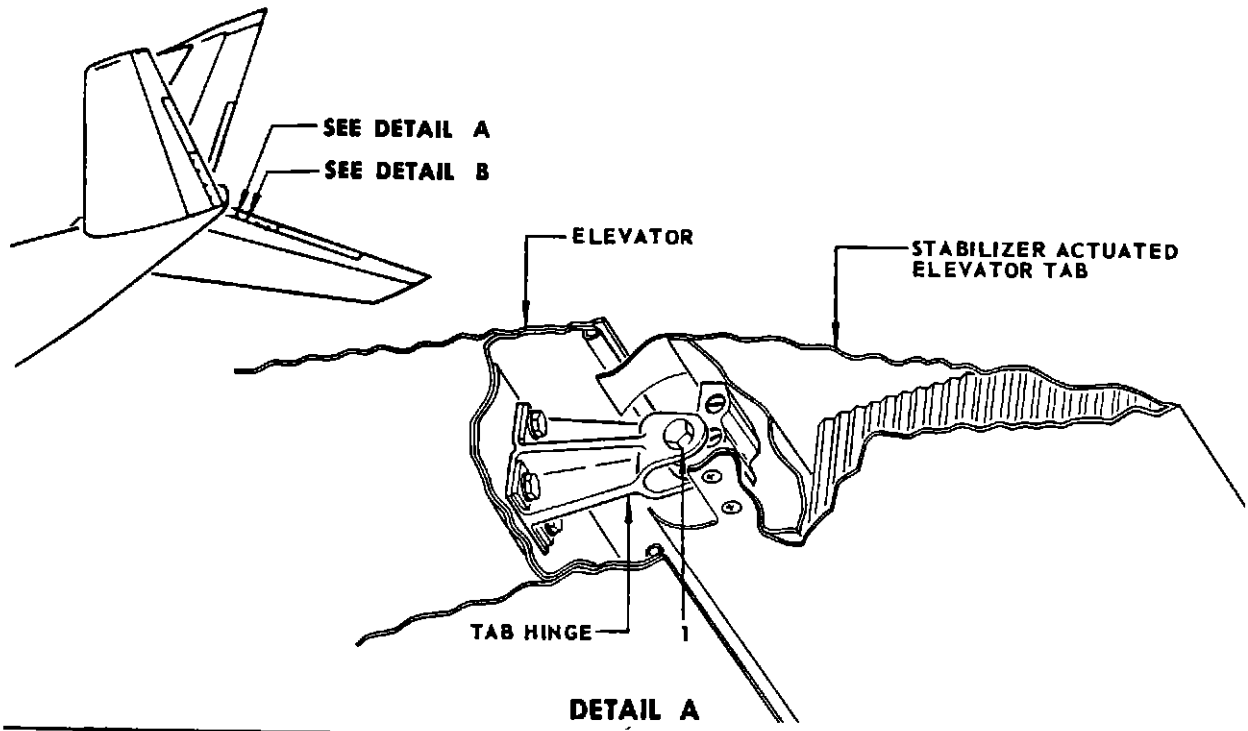




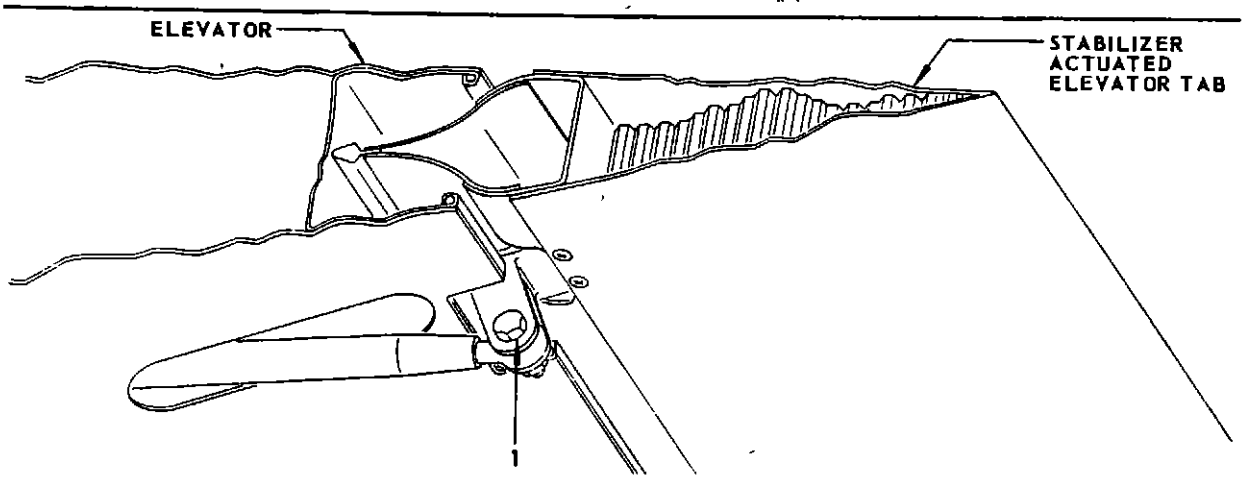
INDEX NO.	DIM	DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
		DIAMETER		MAX WEAR DIM	MAX DIAM. CLEARANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP	BUSHING INTERFERENCE	
		MIN.	MAX			YES	NO	MTL	MAX.	MIN	MAX.
1	ID	0 4986	0 5001	0 5026	0.0035	x		[1]		0 0003	0 0015
	OD	0.4982	0.4991	0.4978							

[1] NAS 537 CAD PLATED BRONZE BUSHING. REAM HOLE TO SIZE ON INSTALLATION.

Elevator Snubber Wear Tolerances
Figure 212



DETAIL A



DETAIL B

INDEX NO	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX.	WEAR LIMITS MAX. WEAR DIM.	WEAR LIMITS MAX. DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	NO	MTL	OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE MIN.	MAX
1	ID	0 2487	0.2497	0.2517	0.0025	X		[1]		0.0002	0.0013
	OD	0.2483	0.2492	0.2479							

[1] NAS537 CAD PLATED BRONZE BUSHING. REAM HOLE TO SIZE ON INSTALLATION.

Stabilizer Actuated Elevator Tab Wear Tolerances
Figure 213

ELEVATORS - MAINTENANCE PRACTICES

1. Removal/Installation Elevator

A. General

(1) To remove an elevator, the balance panels must be disconnected. Balance panels need not be removed from balance panel bays. The elevator control tab and stabilizer actuated elevator tab can remain attached to the elevator provided a sling assembly with three surface mounted attachment fittings is used to support the elevator.

B. Equipment and Materials

(1) Sling, elevator hoisting - F71144-501 or equivalent

(2) Hoist - capable of lifting 300 pounds at a height of 20 feet

(3) Hole filling sealant, BMS 5-12, Type B or equivalent

(4) Fillet gun (sealant)

(5) Corrosion preventative compound, MIL-C-11796A, Grade 3

5 (6) Grease, Aeroshell 15.

(7) Cleaning solvent P-S-661b, Type I

(8) Cement, BMS 5-55 or equivalent

(9) Scale - 0 to 3 feet graduated in inches and sixteenths

(10) Spring scale - 0 to 25 pounds

(11) Solvent, methyl ethyl ketone, or equivalent

C. Remove Elevator

(1) Remove tailcone and the following access panels. See Chapter 12, "Access Door and Panels."

(a) Elevator hinge upper panels 1600 through 1606 and 1665, and lower panels 1618 through 1623 and 1666.

(b) Elevator thrust hinge access panel 1613.

(c) Elevator trim tab control access panel 1612.

(d) Elevator tab control access panels 1614 and 1629.

(e) Six elevator balance panels 1624 through 1628 and 1615.

(2) Disconnect six balance panels

(a) Remove seal retainer attaching screws (figure 203) aft of hinge centerline at each end of hinge. Pull hinge seal free of seal retainer.

(b) Support balance panel and disconnect balance panel hinge fitting by removing aft row of retaining bolts.

CAUTION: BALANCE PANEL MUST BE SUPPORTED DURING REMOVAL OF SCREWS TO PREVENT EXCESSIVE LOADING ON REMAINING SCREWS AND TRACK ASSEMBLY.

(3) Disconnect control linkage by detaching crank pushrod (figure 202) from elevator follow-up crank.

(4) Disconnect snubber assembly from elevator.

(5) Disconnect stabilizer actuated elevator tab linkage by detaching forward end of forward push rod from short arm of spring crank

(6) Disconnect third and fifth hinges (figure 201) from inboard end of elevator by removing four bolts attaching forward hinge half to stabilizer. Hinges will be removed with elevator.

(7) Replace upper hinge access panels at third and fifth hinges from inboard edge of elevator. Replace two forward screws only.

NOTE Part of access panel may be used as spacer between elevator and hoist attachment fittings Hoist attachment fittings are secured to elevator by using two aft holes of access panel.

(8) Install two forward sling attachment fittings on sling to elevator at third and fifth hinges with bolts provided. Install fitting to elevator in direction indicated on fitting

(9) Install aft attachment fitting of sling to top surface of elevator at fourth control tab hinge point from inboard end with bolts provided.

(10) With elevator supported by sling and hoist, disconnect remaining hinges. Hinges are removed with elevator.

(11) Pull elevator aft, until all elevator structure clears stabilizer and hoist elevator free.

D. Install Elevator

(1) Install hinge fittings with bonding jumpers to elevators. (See figure 201)

(2) With elevator supported on ground, install aft attachment fitting of sling to top surface of elevator at fourth control tab hinge point from inboard end with bolts provided.

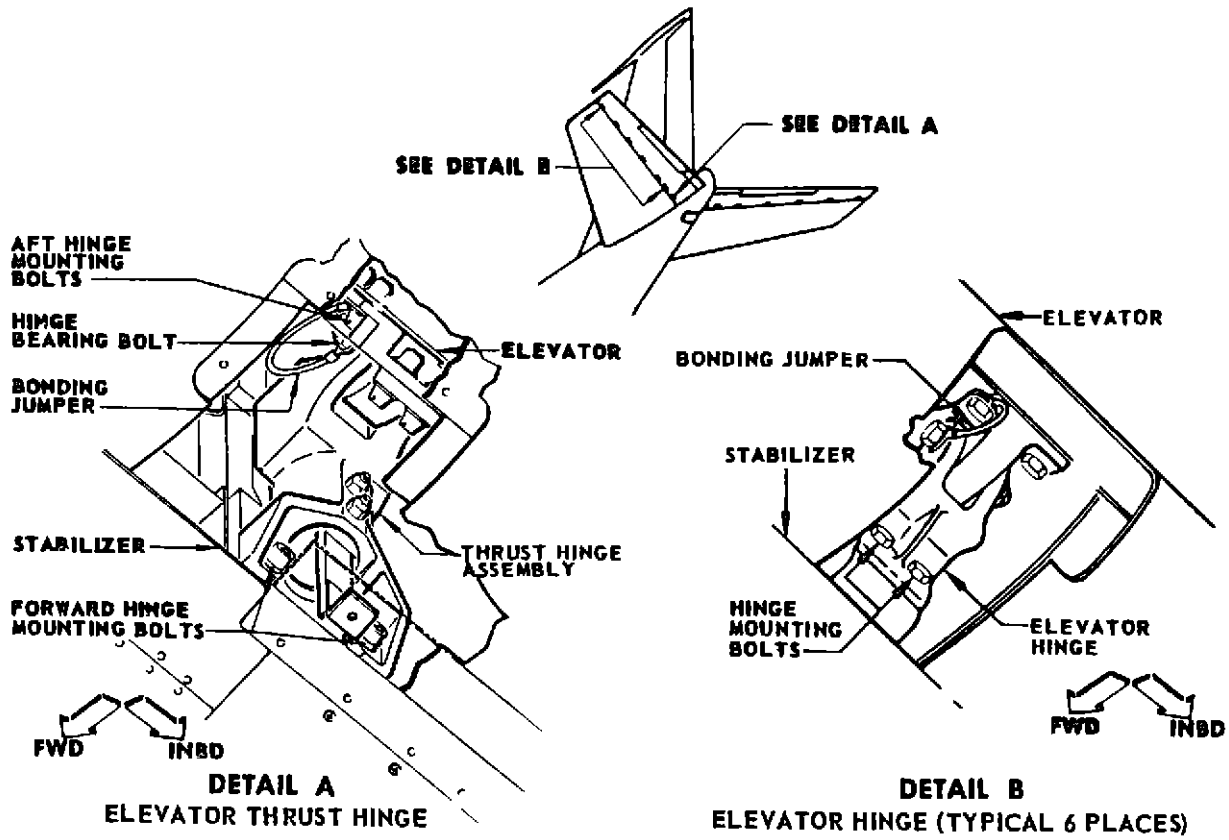
(3) Replace upper hinge access panels at third and fifth hinges from inboard edge of elevator using two forward screws only.

NOTE: Access panels serve as spacers between elevator and hoist attachment fittings, which will be secured by screws in the two aft holes.

(4) Install two forward sling attachment fittings on sling to elevator at third and fifth hinges with bolts provided. Install each sling fitting to elevator in direction indicated on fitting.

(5) Hoist elevator into position aft of stabilizer and push elevator forward into mounting position.

CAUTION. CARE MUST BE TAKEN TO PROPERLY ALIGN MATING PARTS AS ELEVATOR IS PUSHED INTO POSITION TO PREVENT DAMAGE TO COMPONENTS.



(6) Attach elevator hinges (figure 201) to stabilizer with hinge mounting bolts. Torque bolts per 27-7-41, "Install Stabilizer Mounted Elevator Hinge Assembly."

(7) Connect stabilizer actuated elevator tab linkage by attaching forward end of forward pushrod (figure 202) to short arm of spring crank.

(8) Attach snubber assembly to elevator.

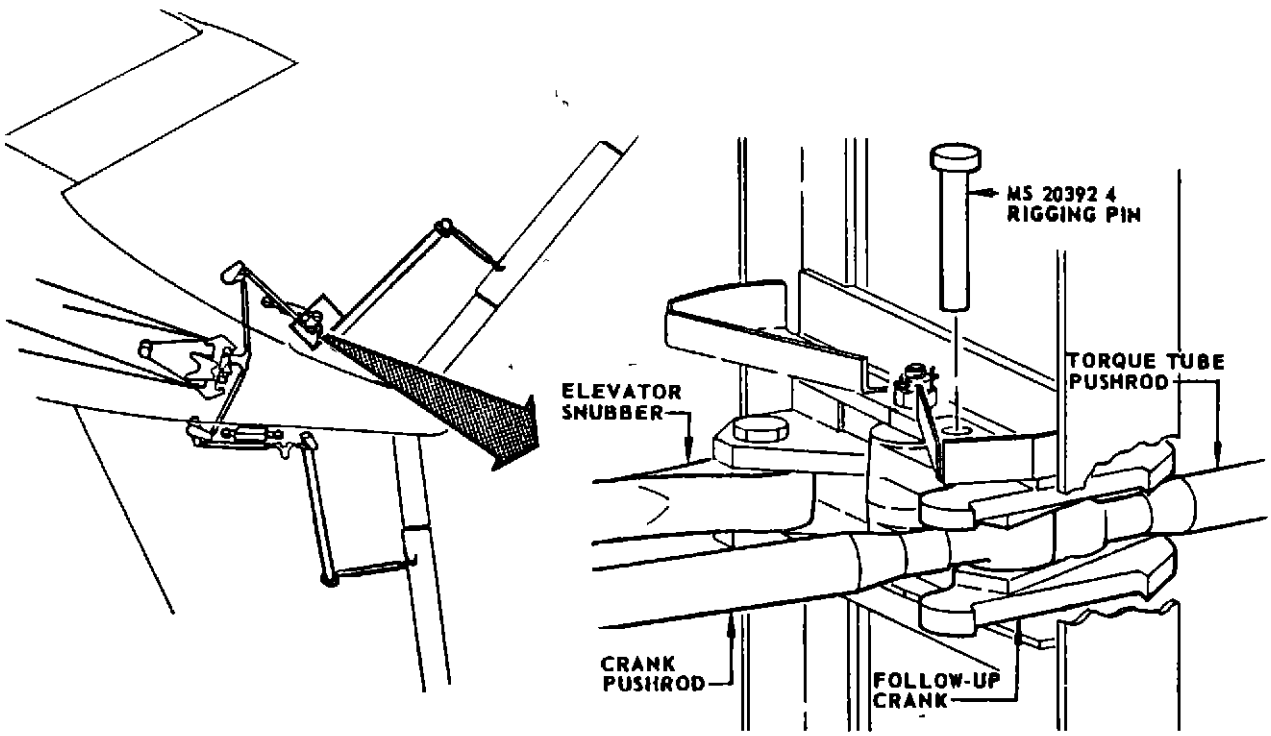
(9) Attach crank pushrod to elevator follow-up crank.

CAUTION. INSTALL BOLT WITH HEAD INBOARD TO PREVENT INTERFERENCE.

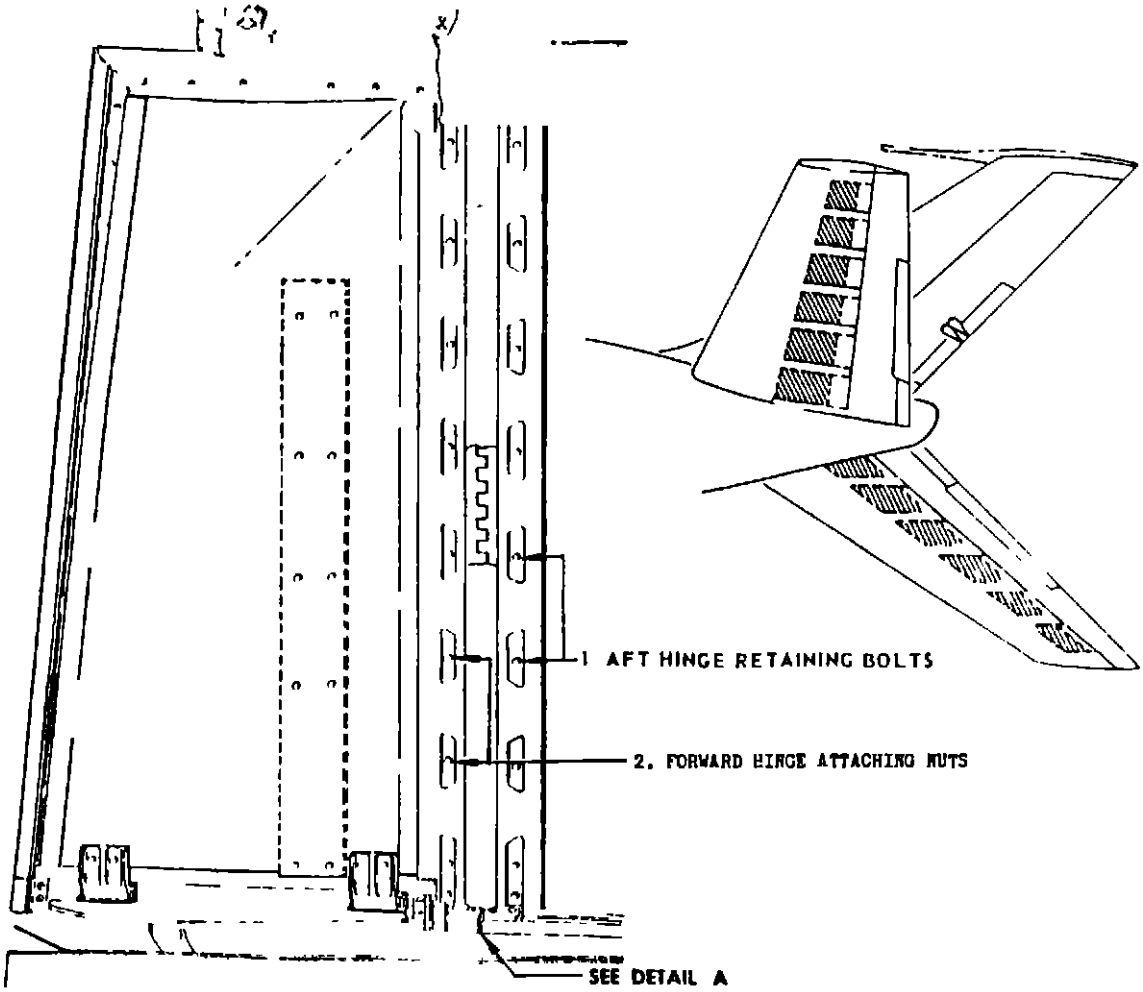
(10) Attach all balance panels to elevator nose section. See 27-7-31 for procedure.

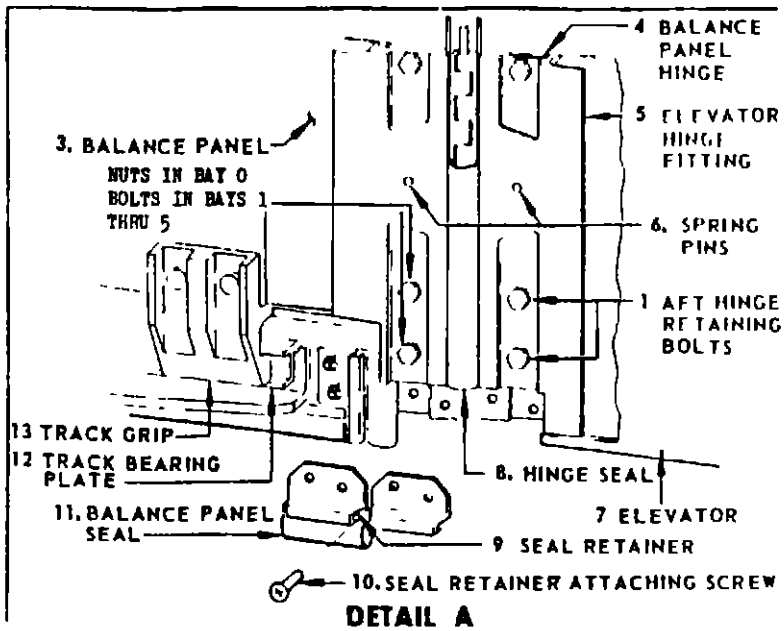
CAUTION. IF THE ELEVATOR AND TABS ARE REPLACED AS A UNIT, THE TAB ADJUST WEIGHTS (PAINTED ORANGE) ON THE LOWER AFT SURFACES OF BALANCE PANELS NO. 0 AND NO. 2 MUST BE REPLACED WITH WEIGHTS SUPPLIED WITH THE NEW TABS.

(a) Clean balance panel track bearing plate (12, figure 203) and track grip (13) with methyl ethyl ketone and remove any corrosion on track grip with fine crocus cloth.



Elevator Follow-Up Crank Installation
Figure 202


1 AFT HINGE RETAINING BOLTS
2. FORWARD HINGE ATTACHING NUTS
SEE DETAIL A


4 BALANCE PANEL HINGE
5 ELEVATOR HINGE FITTING
3. BALANCE PANEL
NUTS IN BAY 0
BOLTS IN BAYS 1 THRU 5
6. SPRING PINS
1 AFT HINGE RETAINING BOLTS
13 TRACK GRIP
12 TRACK BEARING PLATE
8. HINGE SEAL
11. BALANCE PANEL SEAL
7 ELEVATOR
9 SEAL RETAINER
10. SEAL RETAINER ATTACHING SCREW

DETAIL A

(b) Apply Aeroshell Grease 15 to surfaces of bearing plate and track grip (13) and to both sides of each half of balance panel hinge (4). Fill hinge slots.

(c) Attach hinge half to elevator hinge fitting by installing aft hinge retaining bolts (1). The edge of hinge seal must be completely contained in groove between hinge and elevator hinge fitting as screws are tightened.

(d) Slide end of hinge seal under seal retainer at each end of hinge. Align holes in hinge seal with holes in seal retainer and replace seal retainer attaching screws.

(11) Move elevator to faired position (0° elevator). Align elevator surface with stabilizer surface by using 3 foot scale or equivalent as straightedge, if necessary.

(12) Adjust seals on elevator nose ribs by measuring amount of shim stock to be added or removed, removing seal, loosening screws, and peeling off or adding fiberglass shims between retainer and structure to proper thickness required. Retighten screws, replace seal and install lockwire. See 27-7-31 for procedure.

(13) After seal adjustment fill slots and holes between seal retainers and structure with hole filling sealant. Apply sealant with fillet gun using various sealant gun nozzles and finish where necessary with spatula. Where seals appear loose, laminated aluminum shims may be cemented with BMS 5-55 or equivalent cement, to inside of seal retainers, and may be peeled to adjust seal to fit.

CAUTION SEALANT SHOULD NOT BE ALLOWED TO CONTACT BULB SECTION OF SEALS, SINCE FLEXIBILITY OF SEALS MUST BE MAINTAINED.

(14) If access panels are magnesium

(a) Clean old corrosion preventative compound from heads of panel mounting screws and faying surfaces of access panels with cleaning solvent and clean cloth.

(b) Apply corrosion preventative compound under heads of all panel mounting screws, and on faying surfaces of access panels.

(15) Install tailcone and access panels.

(16) Adjust elevator per 27-7-0, Adjustment/Test Elevator Control System.

(17) Test elevator per paragraph 2.

2. Adjustment/Test Elevator

A. General

(1) Friction testing is required after each installation of an elevator.

(2) Elevator-stabilizer misfair and vent gap and tab-elevator misfair test procedures must be followed after elevator installation. These tests can be made at any time to determine the existence of conditions requiring corrective action.

WARNING ERRATIC PITCHING OF AIRPLANE MAY OCCUR IF MISFAIR AND VENT GAP REQUIREMENTS ARE NOT OBSERVED.

B. Test elevator friction and balance.

(1) Position stabilizer between 6 and 11 units airplane nose up as indicated on stabilizer trim indicator.

(2) Place elevator in faired position, then release. Measure breakaway forces as follows:

(a) If elevator rotates down from faired position, elevator is out of balance or seals are improperly adjusted. Investigate for water in elevator or tab honeycomb, check for missing balance weights on balance panels and if necessary, adjust seals. Rebalance per Chapter 51 of Structural Repair Manual.

(b) If elevator rotates up from faired, measure force required to restrain elevator in faired position. Subtract this force from that required to move elevator approximately 1 inch down from faired position. Difference of these two forces shall not exceed 10 pounds. Use spring scale and apply at inboard trailing edge of stabilizer actuated elevator tab.

(c) If elevator remains faired, measure breakaway force required to move elevator approximately 1 inch in each direction from faired position. Sum of these two forces shall not exceed 10 pounds.

NOTE If up force exceeds down force in preceding step, elevator is either out of balance or seals improperly adjusted. Correct this condition and repeat step (2).

(2a) Disconnect elevator snubber and repeat step (2). Sum or difference of forces shall not exceed 7.5 lbs.

(3) Connect elevator snubber. Disconnect control tab pushrod from elevator control tab.

(4) Check that force required to rotate elevator between full up and full down against snubber stops does not exceed 14 pounds in either direction.

NOTE: Measure forces at stabilizer actuated elevator tab trailing edge.

(5) Install rigging pins in elevator aft control quadrant and elevator follow-up crank.

(6) Connect control tab pushrod to elevator control tab.

(7) Remove rigging pins from elevator aft control quadrant and elevator follow-up crank.

C. Test elevator upper and lower surface to stabilizer misfair, and elevator vent gaps

(1) Equipment and Materials

(a) Misfair Measuring Tool - 6M1765-6088

(b) Straightedge with feeler gage, if required (Detail C, Fig. 204)

(c) Alodine (Ref 13-1-4)

(d) Primer - BMS 10-11, Type I (Ref 13-1-4)

(e) Tapered Shim - laminated shim stock BAC1524, or equivalent alclad 2024-T3 or T4 sheet per QQ-A-250/5 or AMS 4041

(f) Shim - 0.032 x 2.7 x 3.7 inch 2024-T3 per QQ-A-250/5

(g) Sealant - BMS 5-95 (Ref 13-1-1)

(2) Test elevator upper surface to stabilizer misfair

(a) Set elevator in 1 to 1-1/2-degree TE down position and secure

(b) Calibrate misfair measuring tool to read 0.000 when points A, B, and C are in a straight line (Section A-A, Fig. 204)

(c) Position misfair measuring tool at each of elevator stations listed in Table I, Fig. 204, and make and record misfair measurements. Adjust point A on tool to line up with forwardmost row of rivets in trailing edge beam. Adjust point C to obtain most negative reading to ensure that measurement is taken at high point on rounded leading edge of elevator. Locate tool within ± 1.00 inch of elevator stations and between rivets to obtain a reading for point C that is within or closest to desired limits of 0.000 to minus 0.150 fair.

NOTE: A negative reading is obtained when elevator upper surface is above stabilizer trailing edge beam and a positive reading is obtained when elevator upper surface is below stabilizer trailing edge beam (Section A-A, Fig. 204).

If trailing edge beam is dished, dented or concave at one of elevator stations and this deformation would cause misfair measuring tool to give erroneous readings, it is permissible to use a straightedge and feeler gage to measure fair condition (Detail C, Fig. 204).

(d) Algebraically, add positive misfairs to negative misfairs. Divide resulting sum by 12 to obtain average misfair. Check that average misfair is within 0.000 to minus 0.050 inch.

(e) Check that sum of positive misfair readings in bays 0, 1, and 2 (Fig. 204) does not exceed 0.150 inch.

(f) Check that sum of positive misfair readings in bays 3, 4, and 5 (Fig. 204) does not exceed 0.150 inch.

(g) List negative misfair readings. Maximum allowable negative misfair at any station where a reading was taken is minus 0.150 inch.

(h) In order to lessen effect of one large out-of-tolerance fair reading in a balance bay, following averaging technique may be used.

1) Take two additional fair measurements in affected bay at points midway between existing measurement locations.

2) Replace large out-of-tolerance reading with average of two new readings.

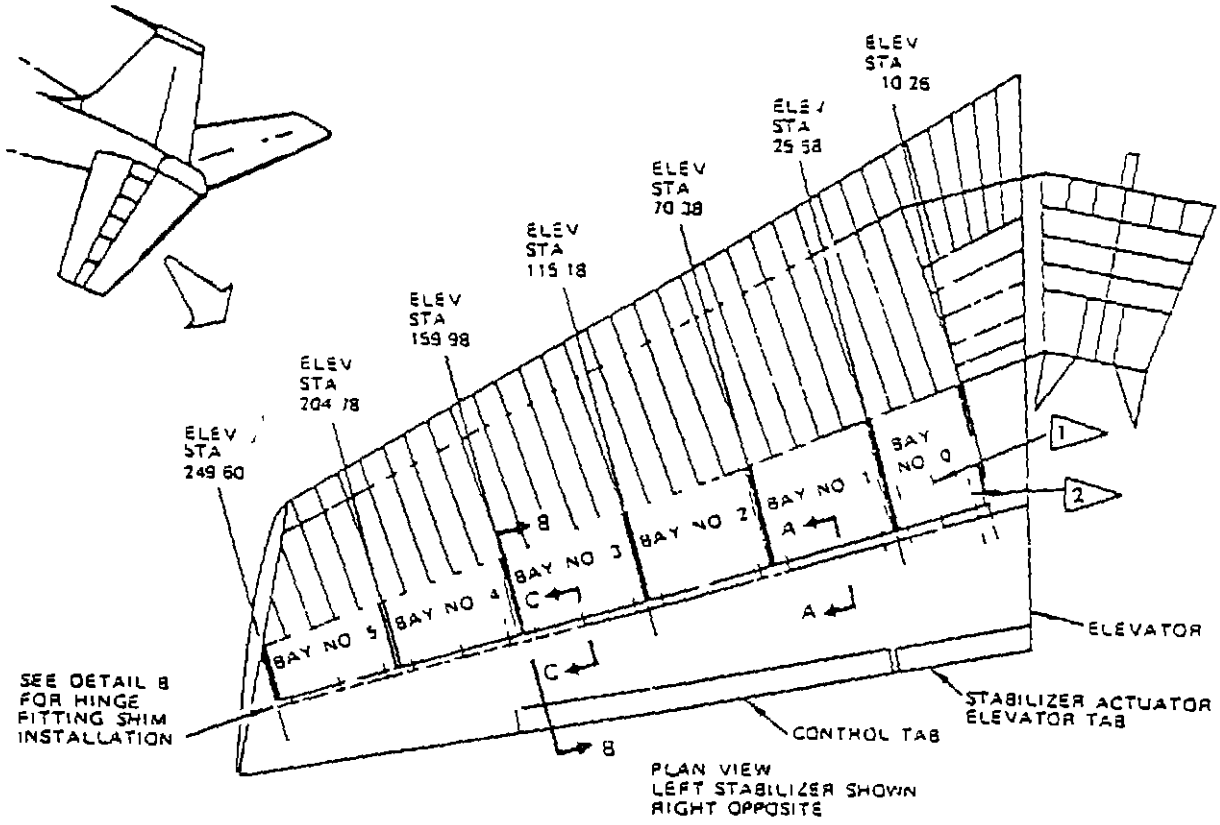
NOTE: Use this averaging technique only once per bay and only to adjust requirements of steps (d), (e), and (f).

(i) Measure and record upper and lower vent gaps per bar (3), step (a)1). Alternately, elevator may be left in 1 to 1-1/2-degree TE down position.

NOTE: Do not take vent gap measurements for full up or full down elevator positions at this time. Do not determine average vent gap or deviation at this time. These measurements and calculations may be accomplished later if it is determined that vent gap is significantly altered by adjustments made to trailing edge beam during fair correction.

(j) Inspect misfair readings. If requirements in steps (d) thru (g) are not met, determine in which bays maximum positive misfairs occur, and adjust per following steps.

(k) If moved to neutral, restore elevator to 1 to 1-1/2-degree TE down secured position.



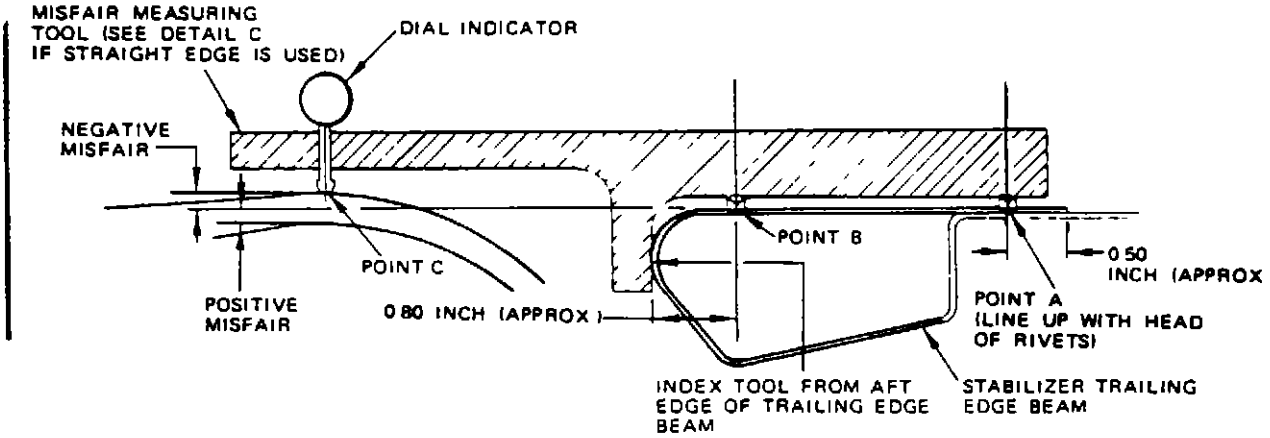
1 LOCATE TYPICAL STATION FOR MEASURING MISFAIR 6 PLACES AT BAY MIDPOINT (SEE TABLE I)

2 TYPICAL STATION LOCATION FOR MEASURING MISFAIR 12 PLACES (SEE TABLE I) APPROXIMATELY 6 INCHES TO EACH SIDE OF TRAILING EDGE RIB

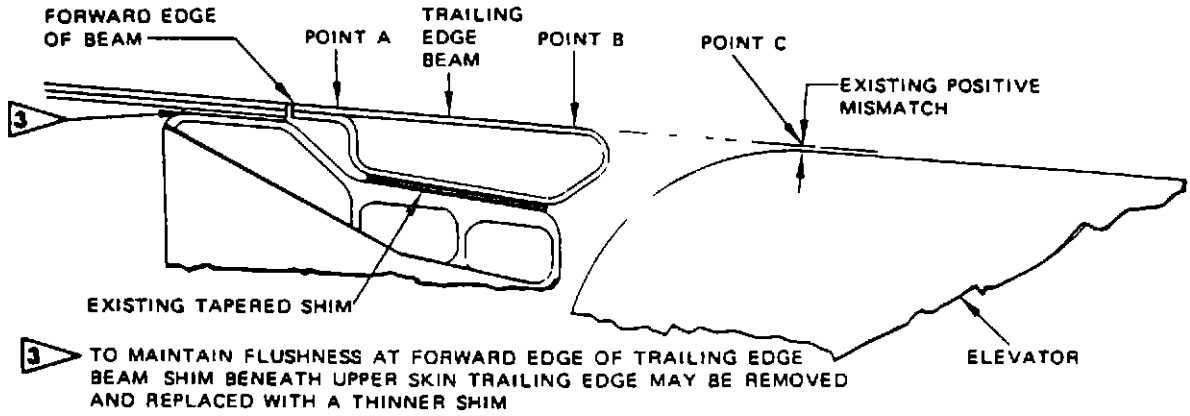
	ELEV STA ±1.00 INCH
BAY 0	-4 26 7 66 19.58
BAY 1	31 58 47 98 64 38
BAY 2	76 38 92 78 109 18
BAY 3	121 18 137 58 153.98
BAY 4	165 98 182 38 198.78
BAY 5	210.78 227 19 242.60

TABLE I
SEE PLAN VIEW FOR LOCATION OF STATIONS

T.B. 27-284 SAB. REV 17 AOUT 1975
Elevator-to-stabilizer fair equirements 6
Figure 201 (Sheet 1) May 15/75

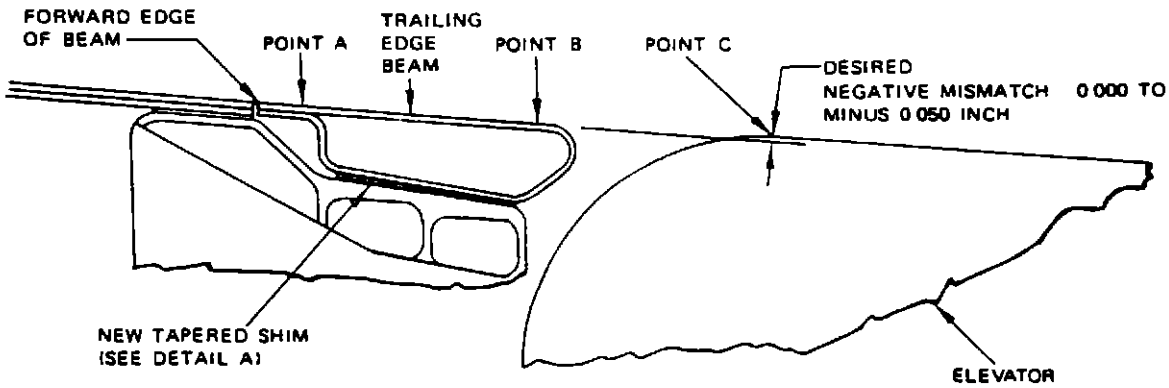


SECTION A A (TYPICAL)



UPPER SURFACE BEFORE REWORK

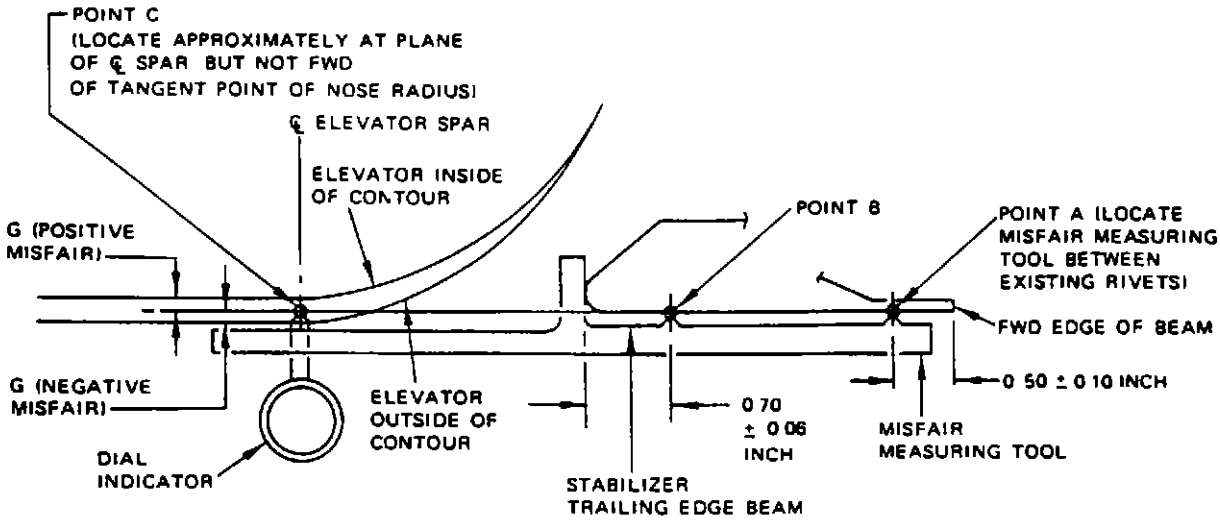
SECTION B B



UPPER SURFACE AFTER REWORK

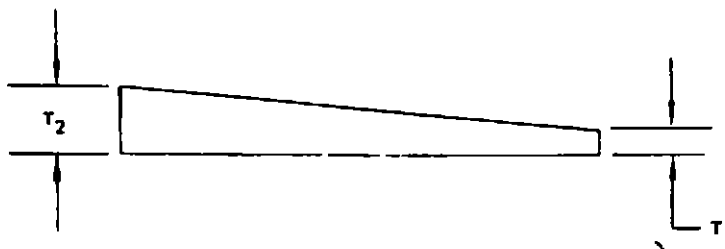
SECTION B B

SAB REV 17 AOUT 1975 T.R. 27-284



LOWER ELEVATOR SURFACE TO STABILIZER MISFAIR

SECTION C C (TYPICAL)



FOR T1

$T1 = (\text{EXISTING SHIM THICKNESS}) \pm \frac{(\text{REQUIRED CHANGE AT PT C})}{2}$

FOR T2

$T2 = (\text{EXISTING SHIM THICKNESS}) \pm (\text{REQUIRED CHANGE AT PT C}) \times \frac{13}{A}$

USE MINUS IF DECREASE IN SHIM THICKNESS IS DESIRED USE PLUS IF INCREASE IN SHIM THICKNESS IS DESIRED

NEW TAPERED SHIM CALCULATION FOR DIMENSIONS T_1 AND T_2

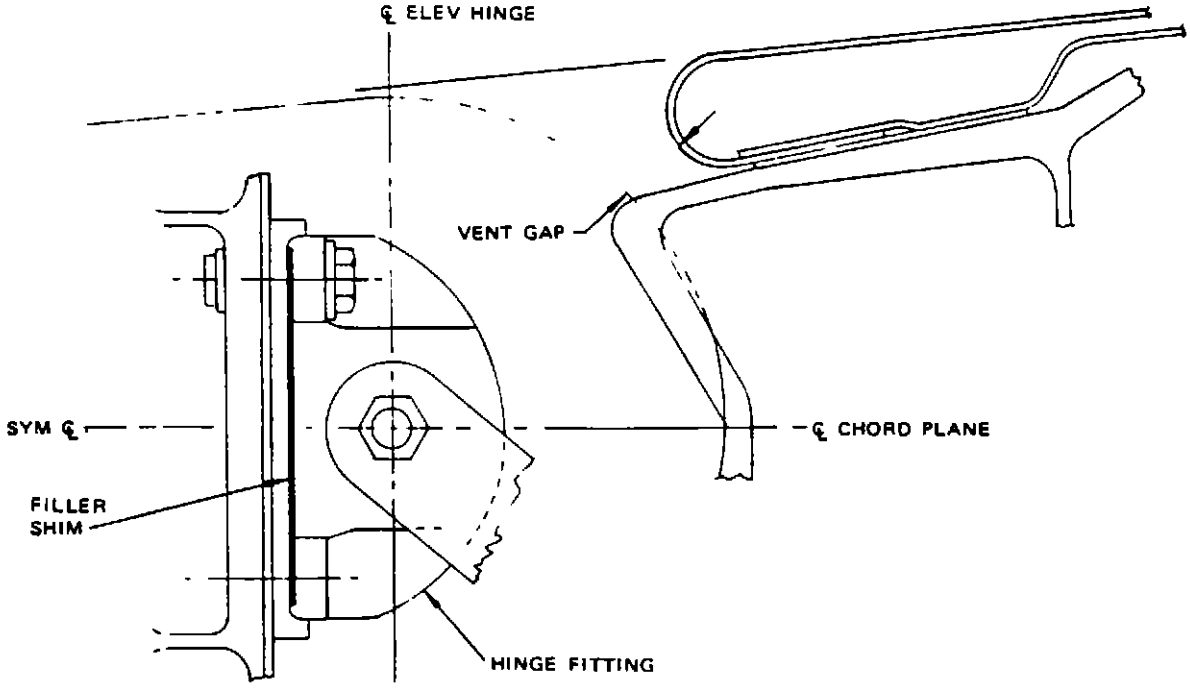
DETAIL A

ELEV STA	A
-10 26	9 80
25 58	9 31
70 38	8 70
115 18	8 08
169 98	7 46
204 78	6 84
249 60	6 23

TABLE II

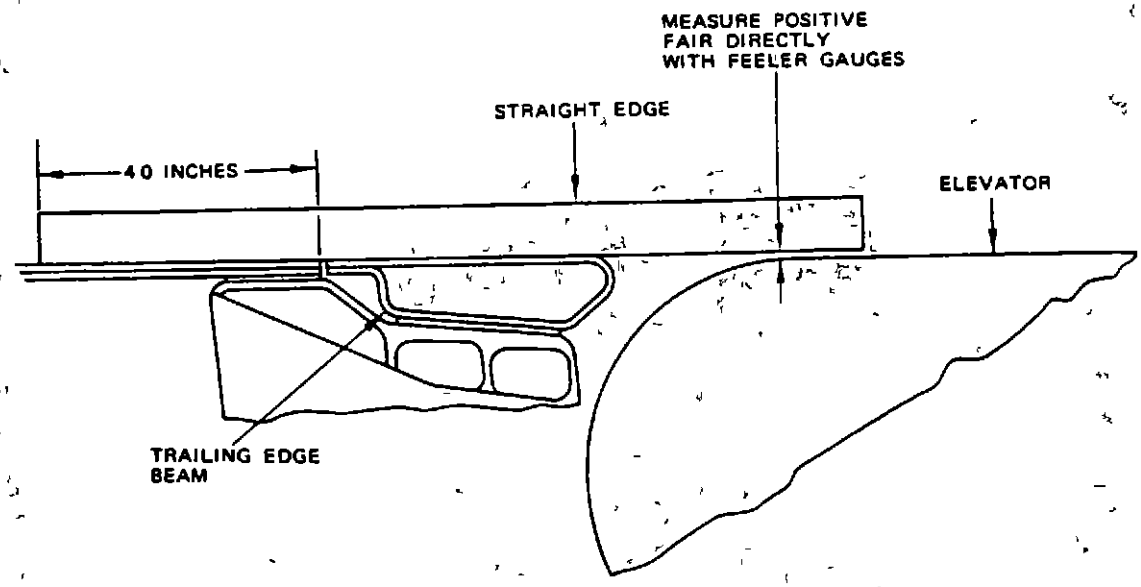
T.R. 27-284
Elevator-to-Stabilizer Fair Requirements
Figure 204 (Sheet 3)

SAB. REV.17 AOUT 1975
6
May 15/75

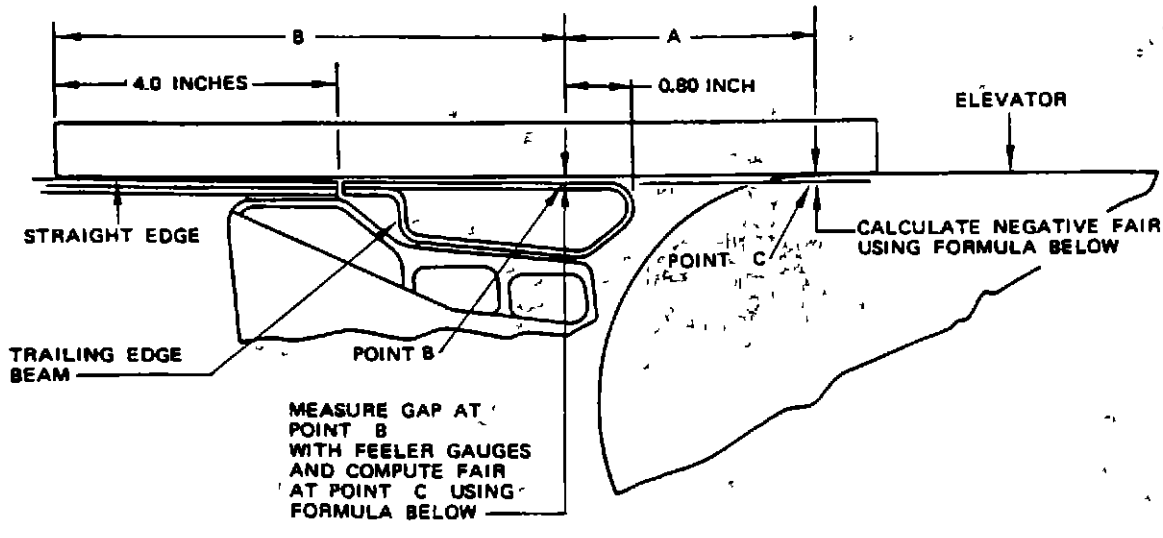


HINGE FITTING SHIM INSTALLATION
(TYPICAL AT EACH HINGE

DETAIL B



POSITIVE FAIR USING STRAIGHT EDGE



NEGATIVE FAIR = $\left(\frac{A+B}{B}\right)$ (GAP AT POINT B.)

NEGATIVE FAIR-USING STRAIGHT EDGE

DETAIL C

T.R. 27-284

SAB. REV 17 AOUT 1975

Elevator-to-Stabilizer Fair Requirements
Figure 204 (Sheet 5)

6
May 15/75

(1) At rib or ribs adjacent to affected bays, remove shim (Section B-B, Fig 204). Measure and record thickness of shim removed at each affected rib location.

NOTE For ribs at elevator stations 25.58, 70.38, 115 18, and 159.98, remove balance panel access panels and balance panels per 27-7-31, Maintenance Practices.

For ribs at elevator stations -10.26, 204 78, and 249.60, remove elevator These ribs have side panels covering rib cutouts where attachment bolt nuts are located.

(m) Fabricate new tapered shim per detail A and Table II, Fig. 204 Apply one coat of Alodine and one coat of primer.

NOTE: Thickness of new shim at thin end of taper will depend on: (1) Existing positive misfair, (2) Amount of desired negative misfair, (3) Thickness of existing shim, and (4) Vent gap.

Since lowering trailing edge beam will decrease vent gap, take lowering of beam into account by referring to vent gap measurements made in step (i) and vent gap requirements in Table I, Fig 205. Vent gap decreases approximately half of shim thickness reduction. That is, if 0.050 inch tapered shim was removed, vent gap in vicinity can be expected to decrease by approximately 0.025 inch. If possible, lower beam such that vent gap requirements can be met. If vent gap requirements cannot be met, shimming is allowed at hinge fittings per par (3)(d).

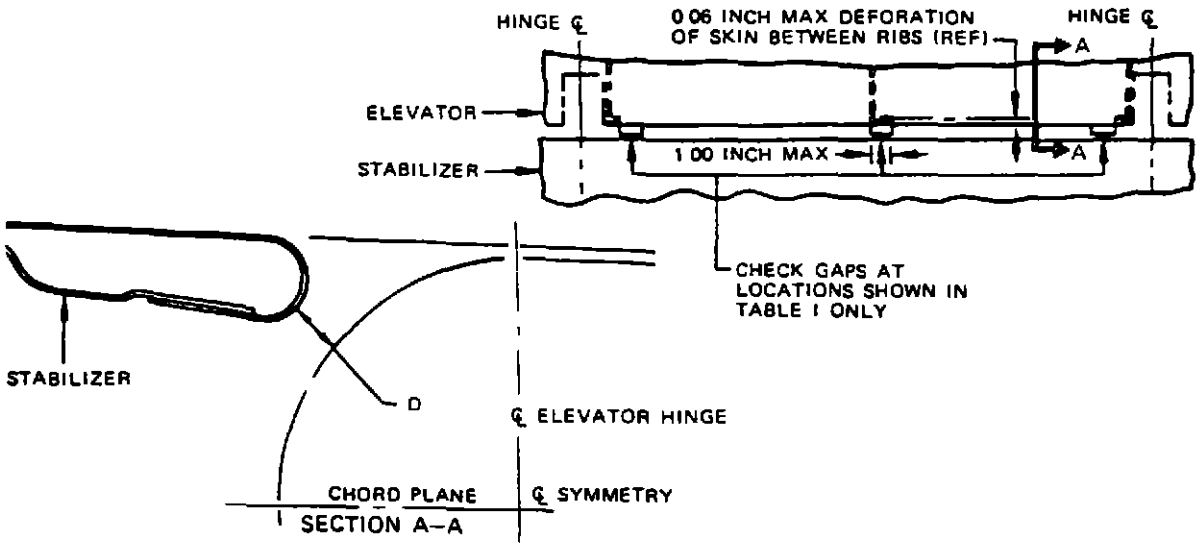
(n) Install new tapered shim with wet primer.

(o) After adjustments have been made, install elevator if removed, and repeat elevator upper surface to stabilizer misfair test. Make further corrections as required.

(3) Test elevator vent gaps

(a) Secure elevator at neutral position.

1) Measure upper and lower vent gaps at elevator locations specified in Table I, Fig. 205 Check that each vent gap measurement D (Fig. 205) is within ± 0.12 inch of D nominal given in Table I, Fig. 205.



TYPICAL VENT GAP DIMENSIONAL CHECK AT EACH BAY

TABLE I

BAY	ELEVATOR LOCATION POINTS (INCHES) TOLERANCE ±1 00 INCH	D NOMINAL (INCH)	D AVERAGE (INCH)
0 INBD	2–13/16 OUTBD OF ℄ NO 1 HINGE 2–13/16 INBD OF ℄ NO 2 HINGE	0.85 0 78	0.810
1	2–13/16 OUTBD OF ℄ NO 2 HINGE 22–13/32 OUTBD OF ℄ NO 2 HINGE 2–13/16 INBD OF ℄ NO 3 HINGE	0 78 0.75 0 72	0.750
2	2–13/16 OUTBD OF ℄ NO 3 HINGE 22–13/32 OUTBD OF ℄ NO 3 HINGE 2–13/16 INBD OF ℄ NO 4 HINGE	0 72 0 695 0 67	0.695
3	2–13/16 OUTBD OF ℄ NO 4 HINGE 22–13/32 OUTBD OF ℄ NO 4 HINGE 2–13/16 INBD OF ℄ NO 5 HINGE	0.67 0.65 0 63	0.650
4	2–13/16 OUTBD OF ℄ NO 5 HINGE 22–13/32 OUTBD OF ℄ NO 5 HINGE 2–13/16 INBD OF ℄ NO 6 HINGE	0 63 0 615 0 60	0.615
5 OUTBD	2–13/16 OUTBD OF ℄ NO 6 HINGE 22–13/32 OUTBD OF ℄ NO 6 HINGE 2–13/16 INBD OF ℄ NO 7 HINGE	0.60 0.59 0.58	0 590

TABLE II

BAY	WEIGHTING FACTOR
0	2
1	2
2	3
3	2
4	2
5	1

EXAMPLE OF FINDING AVERAGE WEIGHTED DEVIATION

BAY	DEV INCH	WEIGHTING FACTOR AS SHOWN IN TABLE II	PRODUCT OF DEVIATION AND WEIGHTING FACTOR
0	+ 0 02	2	+0.04
1	+ 0 02	2	+0.04
2	0.06	3	0.18
3	0 05	2	0.10
4	+ 0.03	2	+0.06
5	0 02	1	0.02

SUM OF PRODUCTS = + 0.14 0.30 = -0 16
AVERAGE WEIGHTED DEVIATION = -0 16/12 = -0.013

T.R. 27-284
Elevator Vent Gap Tolerances
Figure 205

SAB. REV. 17 AOUT 1975

2) Check that vent gap for each bay (summation of upper gap and lower gap measurements divided by number of measurements) is within ± 0.06 inch of D average given in Table I, Fig. 205

3) Check average weighting factor deviation for each bay See example for finding average weighted deviation in Fig 205 At each bay take deviation of average vent gap from D average in step 2) and multiply it by weighting factor shown in Table II, Fig. 205. Add these products for six bays and divide by 12. Check that resulting value is not greater than ± 0.04 inch.

(b) Set elevator in full up position Measure upper and lower vent gaps at elevator locations specified in Table I, Fig 205. Check that each vent gap measurement taken is within ± 0 12 inch of D nominal given in Table I, Fig. 205.

(c) Set elevator in full down position. Repeat check made in step (b).

(d) If insufficient vent gap exists after lowering stabilizer trailing edge beam, install a 0.032-inch filler shim at each elevator hinge per detail B, Fig. 204 Apply Alodine and primer to elevator hinge attachment pad before installation Install shim with corrosion inhibiting faying surface sealant

WARNING: IF FILLER SHIM IS USED, INSTALL SHIM AT ALL HINGES TO MAINTAIN HINGE ALIGNMENT. INSTALL SHIMS ONLY ONE TIME PER AIRPLANE.

(4) Test elevator lower surface to stabilizer misfair.

(a) Secure elevator in 1 to 1-1/2-degree TE up position.

(b) Check that misfair measuring tool is calibrated to read 0 000 when points A, B, and C are in a straight line (Section C-C, Fig. 204).

(c) Measure misfair G (Section C-C, Fig. 204) at elevator stations specified in Table I, Fig 204, using misfair measuring tool

NOTE: Dimension G is positive if elevator lower surface is inside stabilizer trailing edge beam lower surface, and dimension G is negative if elevator lower surface is outside stabilizer trailing edge beam lower surface.

(d) Algebraically, add positive misfairs to negative misfairs, then divide sum by 18 to find average misfair

(e) Check that average misfair does not exceed ± 0.050 inch and that misfair at any station does not exceed ± 0 150 inch.

(f) Release elevator from secured position.

D. Test fair of control tab and stabilizer actuated elevator tab with elevator.

(1) Equipment and Materials

(a) Gap measuring tool (Fig. 206)

(2) Test fair of control tab with elevator

(a) Align tab with elevator fixed trailing edge.

NOTE. Clamping is allowed. Do not clamp in any way that will damage elevator or tab.

(b) At locations shown in Fig. 206, place gap measuring tool on surface of tab at 90 ±5 degrees to tab hinge line.

(c) Measure gap between tool and elevator trailing edge at aft edge of trailing edge.

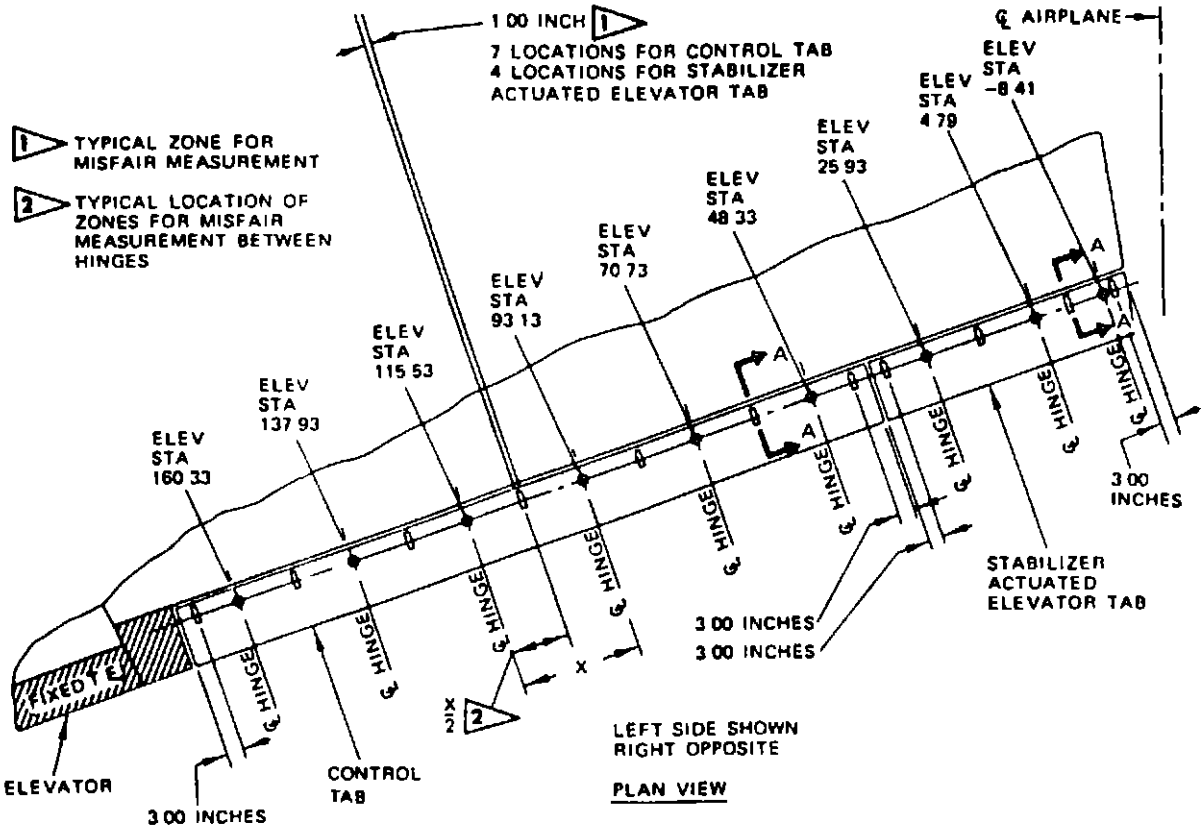
(d) Check that gap requirements per Detail A, Fig. 206, are met

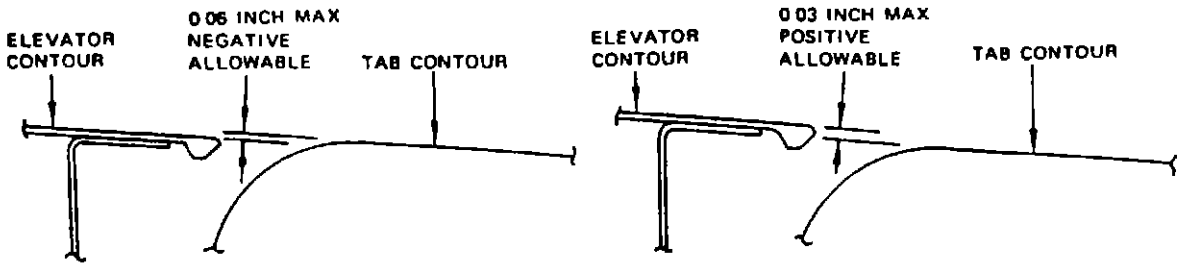
NOTE: Take tool dimension T into account when measuring actual gap.

(3) Test fair of stabilizer actuated elevator tab with elevator.

(a) Repeat par. (2), steps (a) thru (d).

(4) Correct out-of-fair condition and remove clamps, if installed.

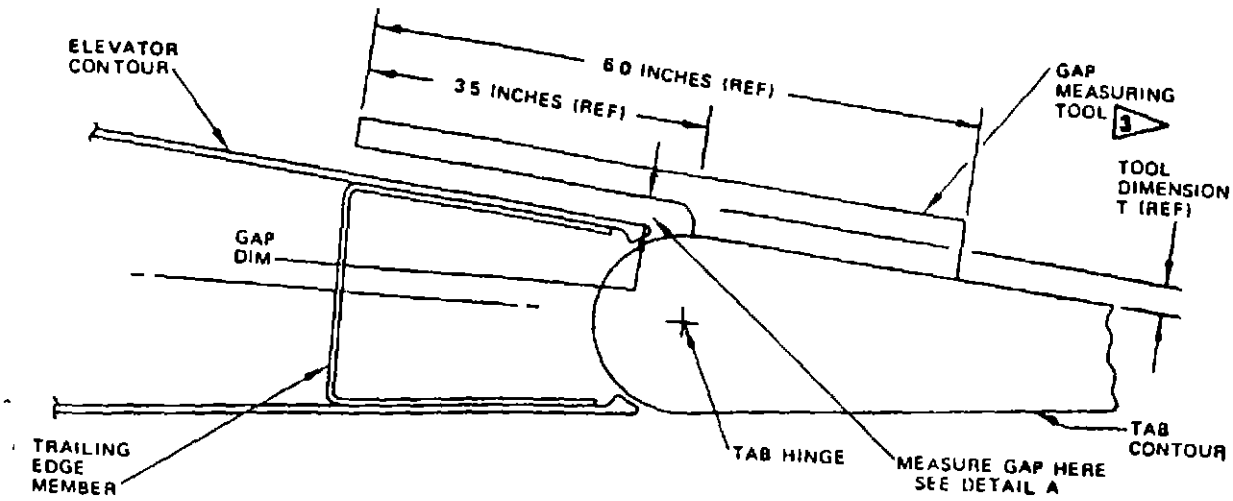




ELEVATOR – TAB CONTOUR MISFAIR
(TYP – UPPER AND LOWER SURFACE)

DETAIL A

3 ANY SUITABLE TOOL WHICH WILL INDEX ON TAB SURFACE MAY BE USED



(TYPICAL)
SECTION A A

ELEVATOR CONTROL TABS - MAINTENANCE PRACTICES

1. Removal/Installation Elevator Control Tab

A. General

(1) Each elevator control tab is balanced into its elevator system with a selected adjust weight which is attached to the under side of the No. 2 balance panel. A new adjust weight is supplied with each new tab. When a new tab is installed the new adjust weight must be installed in place of the old one.

B. Equipment and Material

(1) Protractor Assembly - F52485-500 with Clamp Assembly - F71292-16 or equivalents

(2) Spring scale - 0 to 25 pounds

(3) Steel scale - 0 to 3 feet graduated in inches and sixteenths

(4) Corrosion preventative compound MIL-C-11796A Grade 3

(5) Cleaning solvent P-S-661b

C. Remove Elevator Control Tab

(1) Disconnect control tab push rod from elevator control tab.

(2) Disconnect bonding jumper for each hinge by removing bolt in tab upper surface. (See figure 201.)

(3) Remove upper and lower tab retaining bolts at each hinge point and slide tab aft to clear elevator.

NOTE Support tab while removing retaining bolts.

(4) If a new tab is to be installed remove No. 2 balance bay access panel 1625 (see Access Doors and Panels, Chapter 12) and remove adjust weight.

D. Install Elevator Control Tab

NOTE. Elevator tab hinge fitting bolts are to be tightened to a torque of 20 to 25 pound-inches following installation of hinge fitting. (See figure 201.)

(1) Position control tab aft of elevator and slide tab forward onto hinge fittings.

(2) Install upper and lower tab retaining bolts at each hinge point. Torque bolts 12 to 15 pound-inches. (See figure 201.)

(3) Connect bonding jumper to control tab at each hinge point.

(4) Connect control tab pushrod to control tab horn fitting.

(5) Install new adjust weight supplied with new tab on lower side of No. 2 balance panel.

(6) Adjust and test control tab per paragraph 2.

(7) If access panel is magnesium.

(a) Remove old corrosion preventative compound from access panel mounting screws and faying surfaces. Use cleaning solvent P-S-661b, and clean cloth.

(b) Apply coat of corrosion preventative compound, MIL-C-11796A, Grade 3, to heads of mounting screws and faying surfaces of balance bay access panel.

(8) Install balance bay access panel.

2. Adjustment/Test Elevator Control Tab

A. Adjust Elevator Control Tab

(1) Connect external electric power.

(2) Position stabilizer to mid travel position so that jackscrew dimension "A" is 19-9/32 (± 3/32) inches. See 27-10-0, figure 202.

CAUTION: DO NOT OPERATE STABILIZER WITH RIGGING PINS INSTALLED.

(3) Remove access panel 1612. See Chapter 12, Access Doors and Panels. Insert an MS20392-4 rigging pin in the follow-up crank.

NOTE The elevator will be about 2° down from the stabilizer.

(4) Adjust control tab pushrod so that control tab is faired to the elevator within ± 1/8 inch. Tighten checknut after adjustment and connect rod to tab.

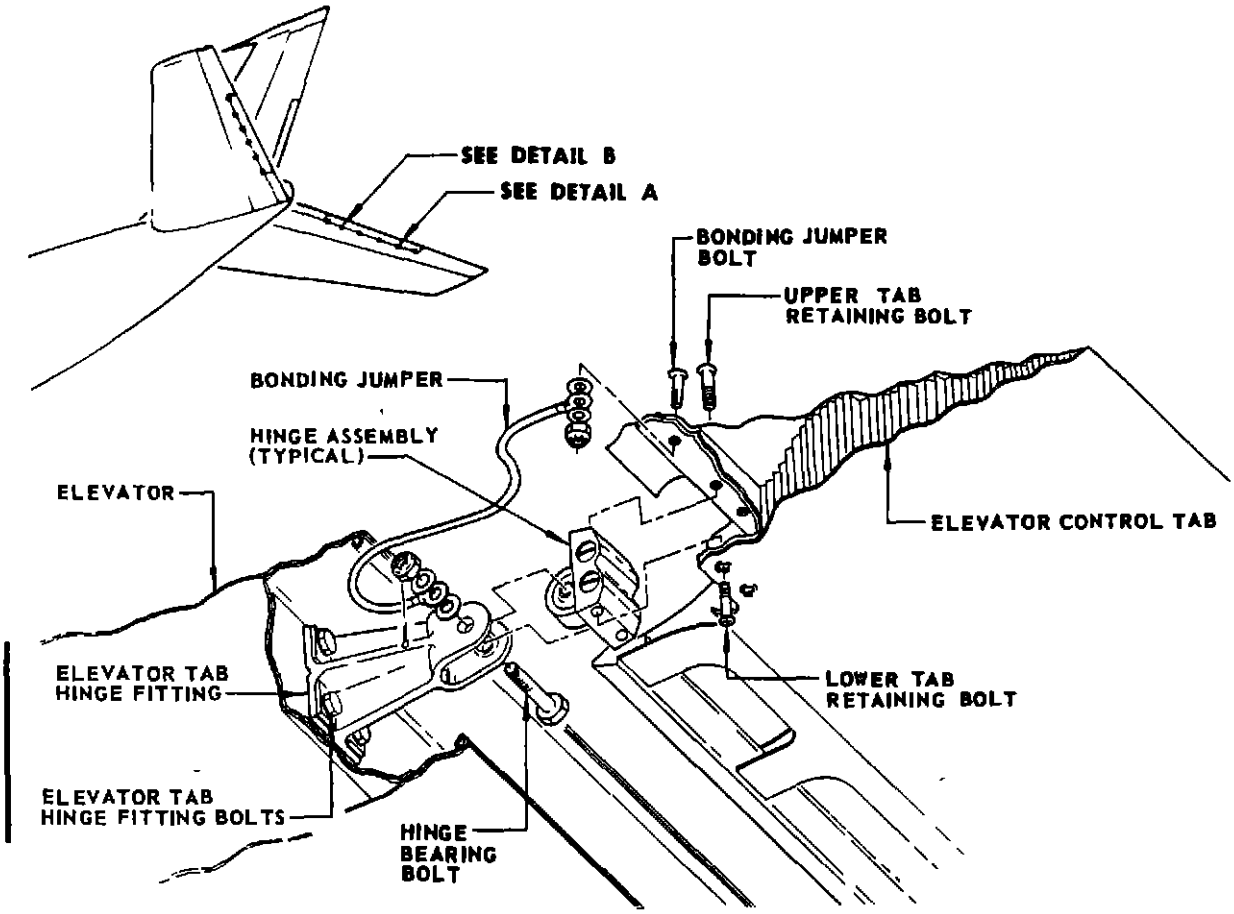
(5) Remove rigging pin from follow-up crank.

(6) Replace access panels.

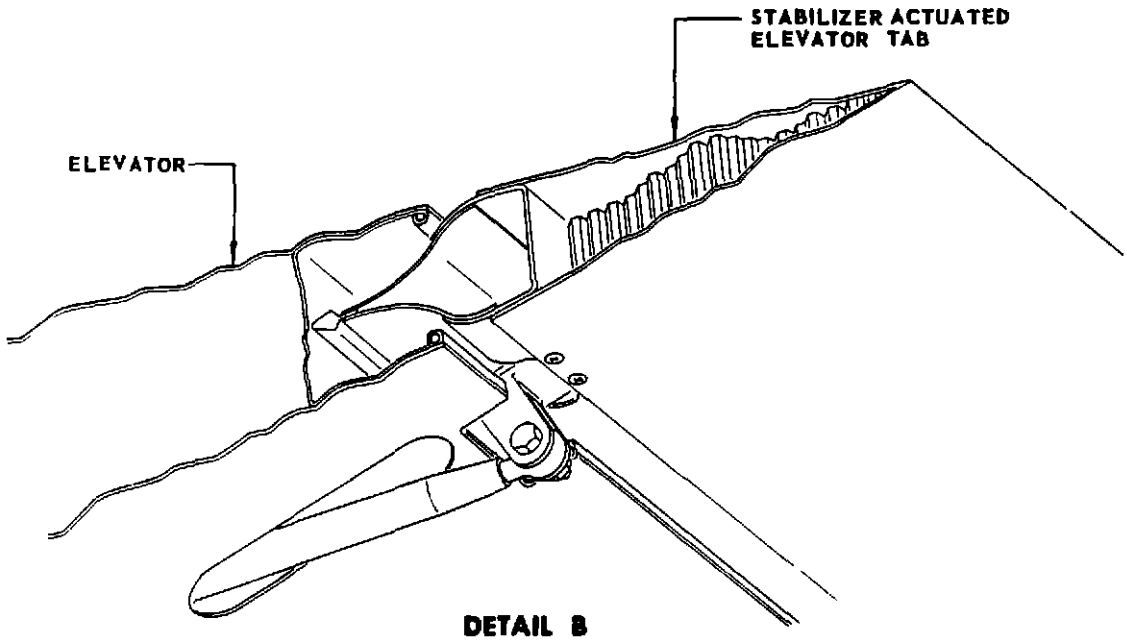
(7) Disconnect external electric power.

B. Test Elevator Control Tab

(1) Remove tail cone access panel 1076 or 1188 and elevator trim tab control access panel 1612. See Chapter 12, Access Doors and Panels.



DETAIL A



DETAIL B

(2) Set stabilizer at 8 (± 1) units airplane nose up trim as shown on pilot's stabilizer trim indicator.

(3) Move the control column aft until elevator is full up with snubber stop contacted and follow-up crank pawl engaging elevator front spar. Tab should be rotated 25° (± 1°) down with respect to elevator, clear of structure and free from binding.

(4) Move the control column forward until elevator is full down with snubber stop contacted and follow-up crank pawl engaging elevator front spar. Tab should be 15° (± 1°) up with respect to elevator, clear of structure and free from binding.

(5) Install MS20392-4 rigging pin or AN5 bolt in elevator aft control quadrant. (See 27-7-0, figure 204.)

(6) Rotate elevator up until pawl of follow-up crank contacts elevator front spar. (See 27-7-0, figure 206.) Check that elevator control tab is 15° (± 1°) or 2-9/32 (± 5/32) inches up with respect to elevator.

NOTE: Measure tab offsets at inboard trailing edge of control tab.

(7) Rotate elevator down until snubber stop is contacted. Check that elevator control tab is 12°30' (+ 1°30'/-0°) or 1-27/32 (+ 5/32, -0) inches down with respect to the elevator.

(8) Remove rigging pin in aft control quadrant.

(9) Install access panels.

STABILIZER ACTUATED ELEVATOR TAB - MAINTENANCE PRACTICES

1. Removal/Installation Stabilizer Actuated Elevator Tab

A. General

(1) Each stabilizer actuated elevator tab is supplied with a selected tab adjust weight which is treated as a part of the tab. Replacement of a stabilizer actuated elevator tab requires replacement of the tab adjust weight, which is mounted to the lower side of No. 0 balance panel in the stabilizer.

(2) During removal of a tab, the hinges are removed at the tab and remain attached to the elevator.

B. Equipment and Materials

(1) Protractor Assembly - F52485-500 with Clamp Assembly F71292-16 or equivalent

(2) Cleaning solvent P-S-661b

(3) Corrosion preventative compound, MIL-C-11696A Grade 3

(4) Spring scale 0 to 75 pounds capacity

C. Remove Stabilizer Actuated Elevator Tab

(1) Disconnect tab push rod from stabilizer actuated elevator tab.

(2) Disconnect bonding jumper for each hinge by removing bolt in tab upper surface. (See figure 201.)

(3) Remove upper and lower tab retaining bolts at each hinge point and slide tab aft to clear elevator.

NOTE Support tab while removing retaining bolts.

(4) If a different tab is to be installed, remove No. 0 balance bay access panel 1615 (see Access Doors and Panels, Chapter 12) and remove tab adjust weight.

D. Install Stabilizer Actuated Elevator Tab

(1) Position stabilizer actuated tab aft of elevator and slide tab forward onto hinge fittings.

(2) Install upper and lower tab retaining bolts at each hinge point. (See figure 201.) Torque bolts 12 to 15 pound-inches.

(3) Connect bonding jumper to control tab at each hinge point.

(4) Connect tab push rod to stabilizer actuated elevator tab horn fitting.

(5) Mount adjust weight supplied with new tab to lower side of No. 0 balance panel.

(6) Adjust and test stabilizer actuated elevator tab per paragraph 2.

(7) If inboard elevator balance panel cover is magnesium:

(a) Remove old corrosion preventative compound from balance panel covers and mounting screws with solvent P-S-661b and clean cloth.

(b) Cover faying surface of inboard elevator balance panel cover and heads of mounting screws with corrosion preventative compound, MIL-C-11796A, Grade 3.

(8) Install inboard elevator balance panel cover.

2. Adjustment/Test Stabilizer Actuated Elevator Tab

A. General

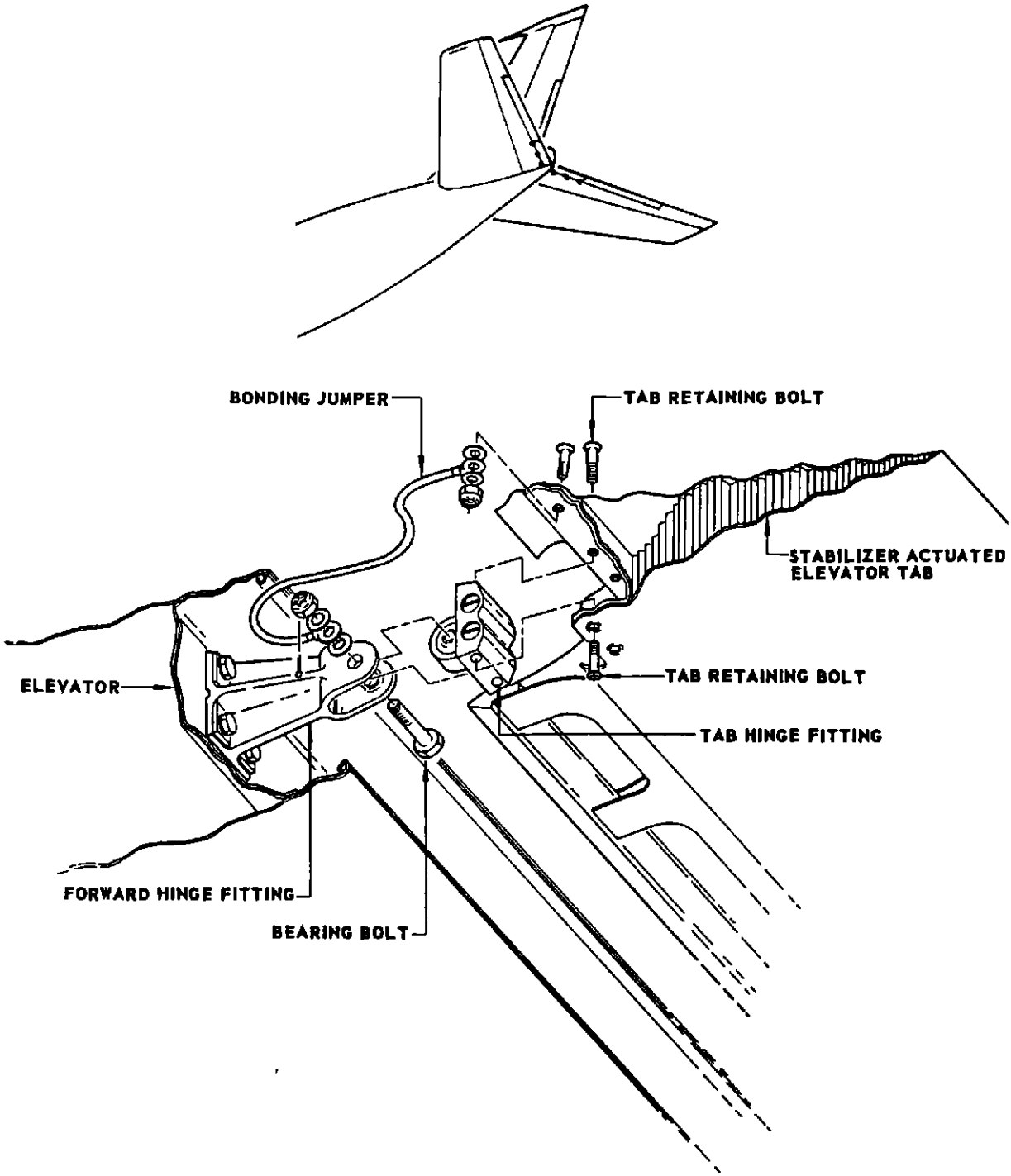
(1) Stabilizer position is altered during adjustment and test of the stabilizer actuated elevator tabs. During tab adjustment and rigging the stabilizer must be set to jackscrew dimension "A" (see 27-10-0, figure 202). During testing the stabilizer position may be set to airplane trim indicator readings.

B. Special Tools and Materials

(1) Protractor Assembly - F52485-500 with Clamp Assembly F71292-16 or equivalent

(2) Cleaning solvent P-S-661b

(3) Corrosion preventative compound, MIL-C-11696A Grade 3



Stabilizer Actuated Elevator Tab Installation
Figure 201

(4) Steel scale - 0 to 40 inch, graduated in inches and sixteenths.

C. Adjust Stabilizer Actuated Elevator Tab

(1) Remove access panel 1612. (See Access Panels and Doors, Chapter 12.)

(2) Position stabilizer so that dimension "A" is 37-3/4 (± 3/32) inches. (See 27-10-0, figure 202 for dimension "A.")

CAUTION: DO NOT OPERATE STABILIZER WITH RIGGING PINS INSTALLED.

(3) Clamp elevator in faired position to stabilizer (± 0° 15').

(4) Insert rigging pin in tab cam bell crank. (See 27-7-91, figure 201.)

(5) Disconnect the aft control rod and adjust length so that the stabilizer actuated elevator tab is 3° (± 1/2°) up with respect to the elevator. Tighten check nut after adjustment.

(6) Reconnect aft control rod to the tab cam bell crank.

(7) Remove clamp from elevator and rigging pin from cam bell crank.

(8) Test stabilizer actuated elevator tab per paragraph 2.D.

D. Test Stabilizer Actuated Elevator Tab

(1) Set stabilizer to 1 unit airplane nose down as shown on stabilizer trim indicator (dimension "A" 34.40 inches).

CAUTION DO NOT OPERATE STABILIZER OR ELEVATOR WITH RIGGING PINS INSTALLED.

(2) Check that stabilizer actuated elevator tab deflections correspond to the following table:

Elevator Position	Tab Angle	Tab Offset (inches)
Full up against stop	22° 30' (+1° 40'/ -0° 40') up	3-3/8 (+1/4, -3/32)
4° (± 0° 30') up	3° 20' (± 0° 30') up	1/2 (± 5/64)
Full down against stop	6° 30' (± 1°) up	1 (± 5/32)

(3) With elevator held at 4° (± 1/2°) up, check that clearance between roller and cam bell crank is 0.001 (+0.019/-0) inches.

(4) Rotate stabilizer trim control wheel in "AIRPLANE NOSE UP" trim direction until stabilizer trim jackscrew gearbox lower stops contact.

(5) Check that stabilizer actuated elevator tab deflections correspond to the following table:

Elevator Position	Tab Angle	Tab Offset (inches)
Full down against stop	21° (± 1°) down	3-5/32 (± 5/32)
0° (± 0°15')	21° (± 1°) down	3-5/32 (± 5/32)
Full up against stop	18° (+1°30'/-0°30') down	2-25/32 (± 5/32)

(6) Position stabilizer full up against jackscrew stop (3-1/2 units airplane nose down trim).

CAUTION: ALLOW 13 MINUTES FOR COOLING FOR EVERY 2 MINUTES OF STABILIZER TRIM MOTOR OPERATION.

(7) Hold elevator so that clearance between roller and cam is between 0.001 and 0.020 inches and check that elevator is 3°30' (± 0°30') up with respect to the stabilizer.

(8) Move elevators to full up and full down positions and check that stabilizer actuated elevator tab is clear of structure and free from binding.

ELEVATOR BALANCE PANELS AND SEALS - MAINTENANCE PRACTICES

1. Removal/Installation Elevator Balance Panel

A. Equipment and Materials

(1) Corrosion preventative compound, MIL-C-11796A, Grade 3.

(2) Cleaning solvent - Federal Specification P-S-661b, Type I or equivalent.

(3) Solvent, methyl ethyl ketone, or equivalent.

(4) Grease, Aeroshell 15.

B. Remove Elevator Balance Panel

(1) Remove balance bay access panels 1624 through 1628 and 1615 as required. See Chapter 12, "Access Doors and Panels."

(2) Remove forward hinge seal (25, figure 201) from inboard hinge pin retainer (26, detail B) by removing two seal retainer attaching screws (27).

(3) Remove outboard hinge pin retainer (17, detail A) from outboard end of balance panel continuous hinge (20) by removing hinge pin retainer screws (16).

(4) Support balance panel (7) and remove forward hinge attaching nuts (4) and (in bays 1 through 5 only) two retaining bolts.

CAUTION: THE BALANCE PANEL MUST BE SUPPORTED DURING REMOVAL OF RETAINING BOLTS TO PREVENT EXCESSIVE LOADING OF REMAINING BOLTS AND THE SUPPORT TRACK.

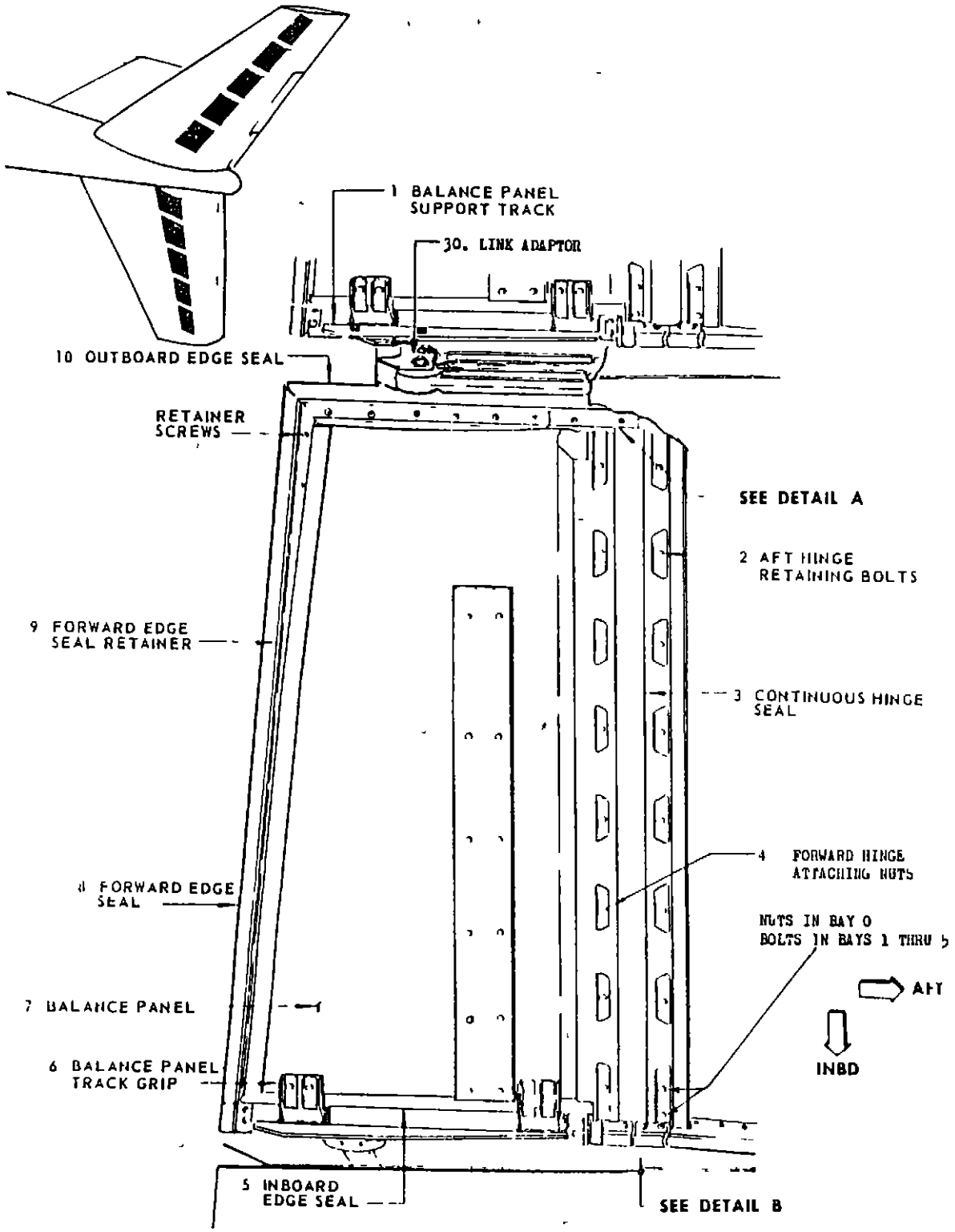
(5) Remove inboard hinge pin retainer (26) when removing forward hinge retaining bolts.

(6) Rotate elevator to full down position to provide adequate space for removing balance panel.

(7) Remove support track aft seal (28) from support track (1).

(8) Slide balance panel (7) aft until track grips (6) clear track bearing plates (29).

NOTE: Additional balance panel seals and seal retainers may be removed as required to provide clearance for removal of balance panel.



SAB 707/407

Elevator Balance Panel and Seal Installation
Figure 201 (Sheet 1)

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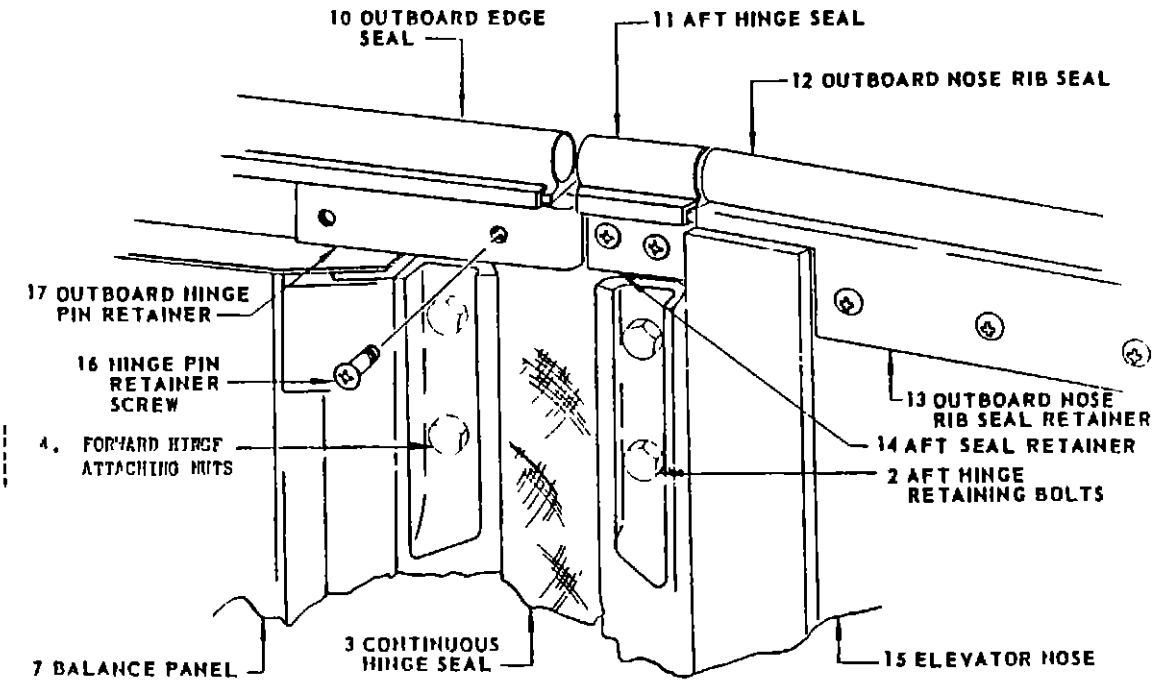
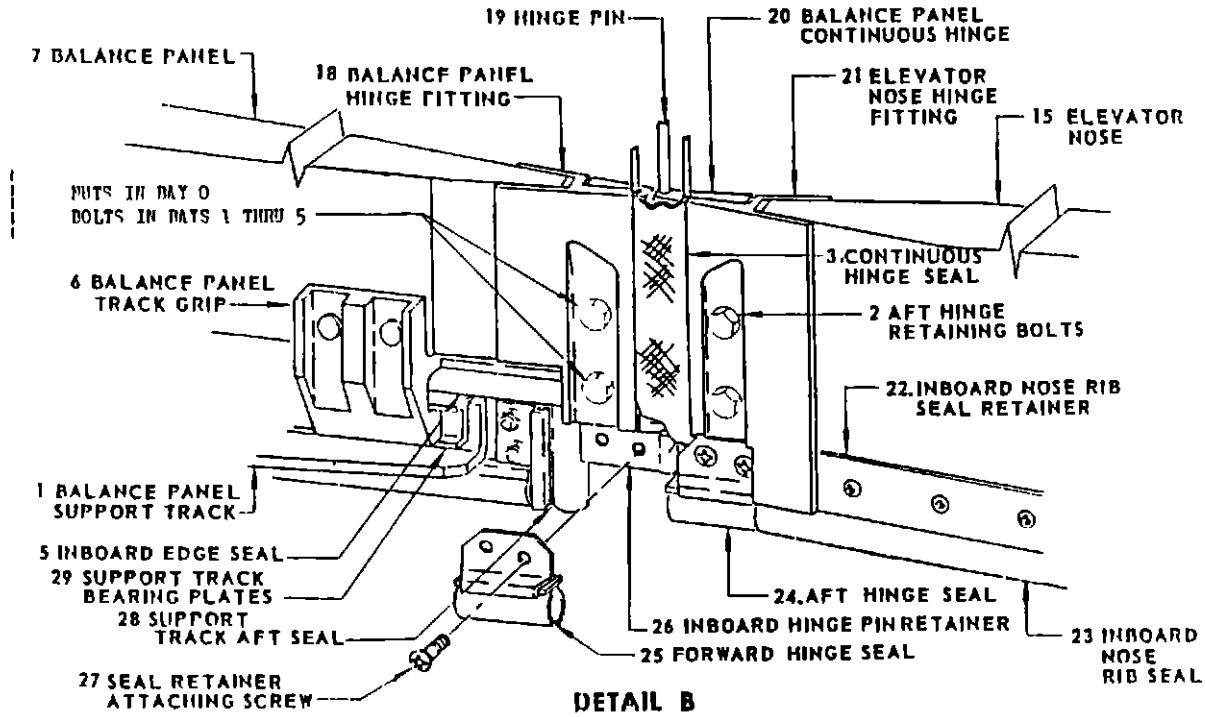


DETAIL A



DETAIL B

SAB 707/407

Elevator Balance Panel and Seal Installation
Figure 201 (Sheet 2 of 2)

(9) Remove balance panel from bay by raising outboard end of balance panel to extreme up position, then lower inboard end of panel from track. Remove balance panel from airplane.

C. Install Elevator Balance Panel

(1) Clean balance panel track bearing plates (29, figure 201) and track grips (6) with methyl ethyl ketone and remove any corrosion with fine crocus cloth.

(2) Apply Aeroshell Grease 15 to surfaces of bearing plate and track grip (6) and to both sides of each half of balance panel continuous hinge (20). Fill hinge slots.

(3) Rotate elevator to extreme down position to provide maximum space for installation of balance panel (7).

(4) Install balance panel by lifting outboard end of panel into upper aft corner. Then raise inboard end of panel to align with support track (1).

(5) Hold balance panel horizontal then slide panel forward until both track grips (6, detail B) engage track bearing plates (29).

(6) Install support track aft seal (28) on support track (1).

(7) Attach balance panel to continuous hinge (20).

(a) Engage forward edge of continuous hinge seal (3) in groove between continuous hinge and balance panel hinge fitting (18).

(b) Install forward hinge attaching nuts (4) and (in bays 1 through 5 only) two retaining bolts.

(c) Install inboard hinge pin retainer (26) when installing attaching nuts.

(8) Install forward hinge seal (25) on inboard hinge pin retainer (26).

(a) Align hole in tab of contiuous hinge seal (3) with hole in pin retainer.

(b) Place seal retainer in position and install attachig screws (27).

(9) Slide tab of hinge seal under outboard hinge pin retainer (17). Align hole in seal tab and install attaching screws (16).

(10) Adjust elevator balance panel seals.

(11) Test balance panel seals.

(12) If balance bay access panels are magnesium:

(a) Remove old corrosion preventative compound from balance panel cover mounting screws and faying surfaces. Use cleaning solvent and clean cloth.

(b) Apply coat of corrosion preventative compound under heads of all access panel mounting screws, and on faying surfaces of balance bay access panels.

(13) Install balance bay access panels.

2. Adjustment/Test Elevator Balance Panels and Seals

A. Adjust Elevator Balance Panels and Seals

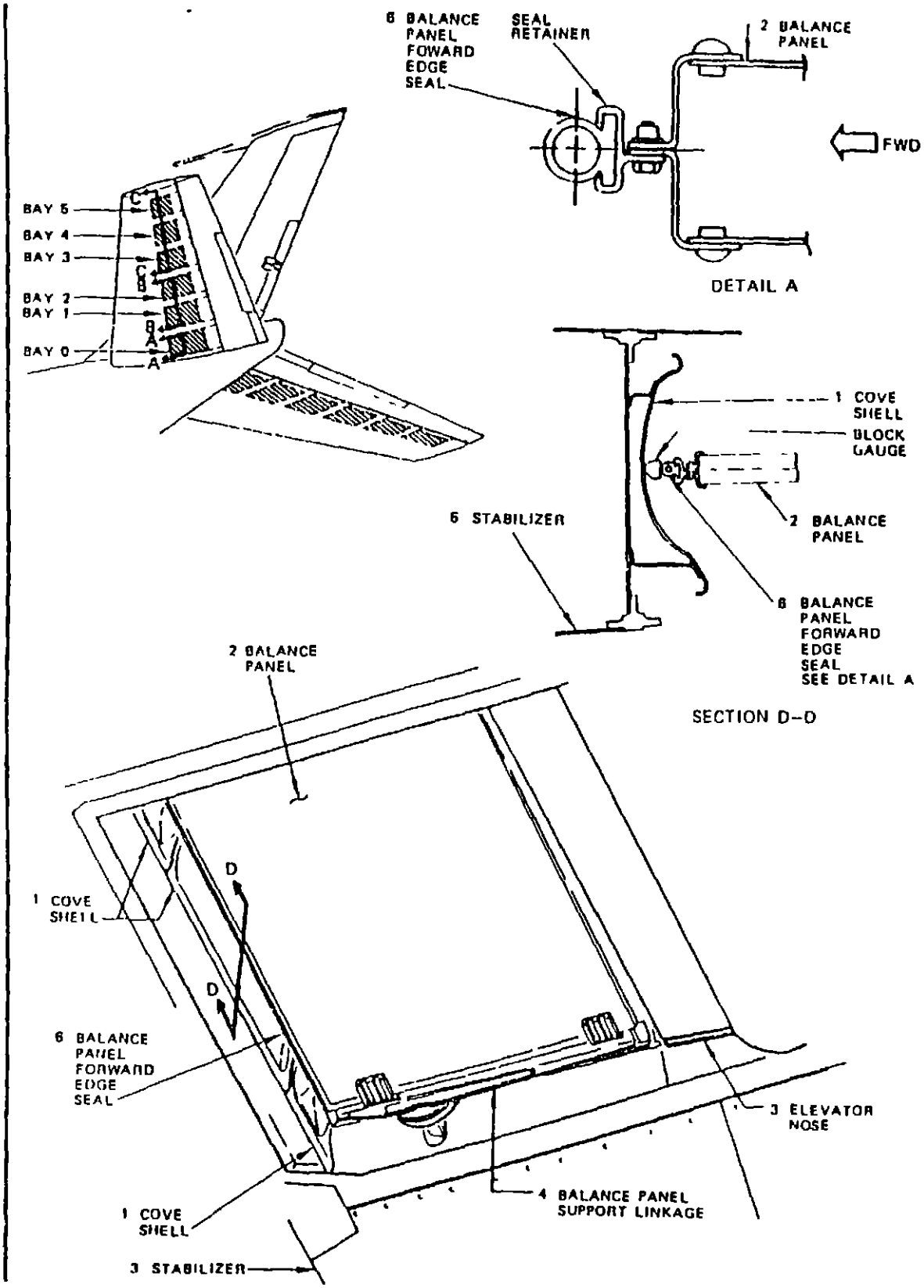
(1) General

(a) On airplanes listed in ▷1◁, Fig. 202:

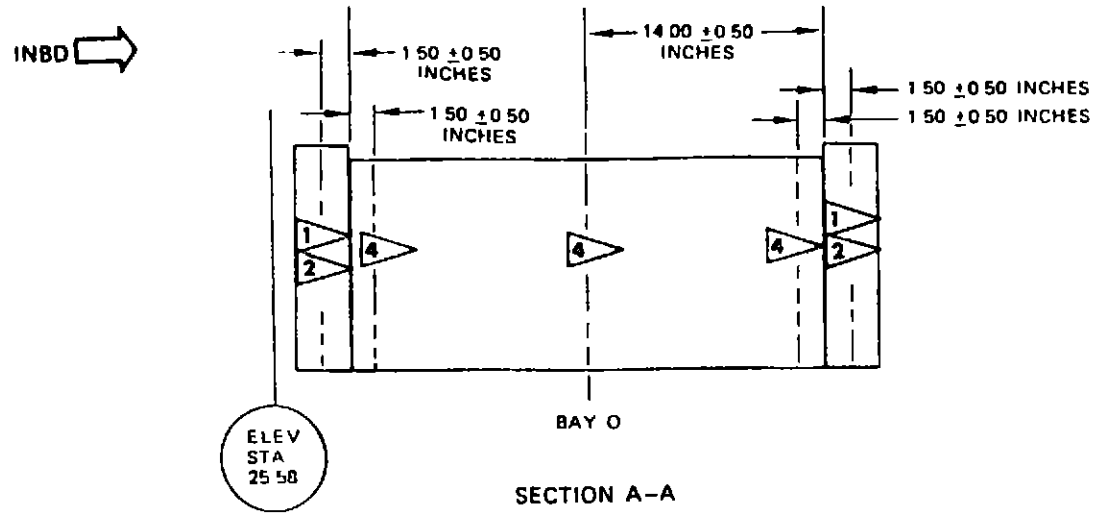
1) Gap adjustment between balance bay seals and adjacent structure must be accomplished on all seals with exception of seals at forward and aft ends of balance panel support tracks and at inboard edge of balance panels.

2) Seals at forward part of elevator nose ribs, outboard edge of balance panels, and inboard face of support tracks are adjusted with elevator at 0° (faired) position. With elevator in any position, gap clearance between seals and balance bay wall must be 0.00 ±0.02 inch for 75% of any given seal length and gap for remaining length of any seal must not exceed 0.06 inch. Whatever seal compression exists after required adjustment of all seals is permissible.

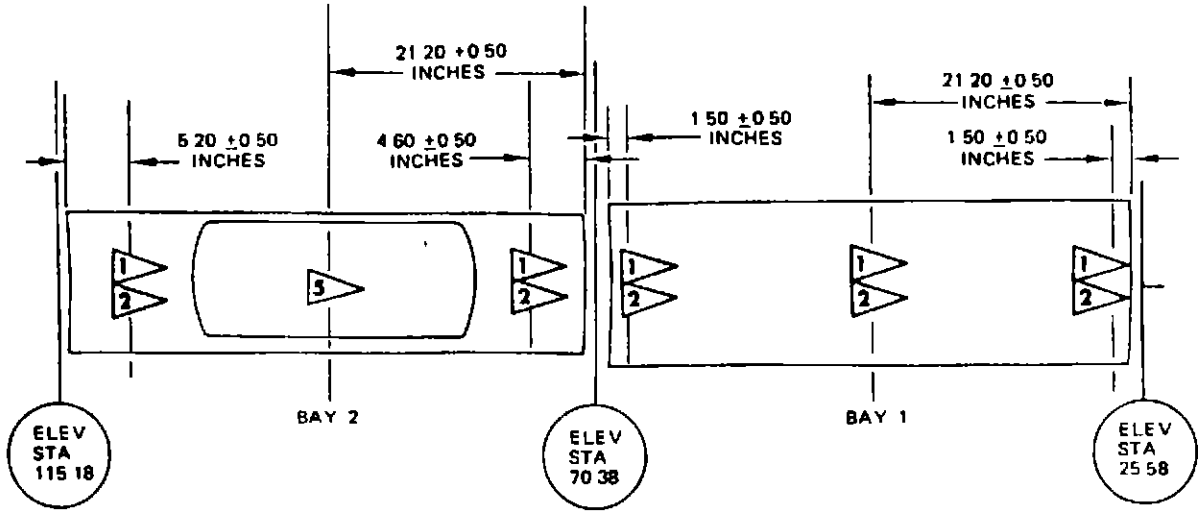
3) In balance bay 0, seals at aft part of elevator nose ribs are adjusted as in previous step.



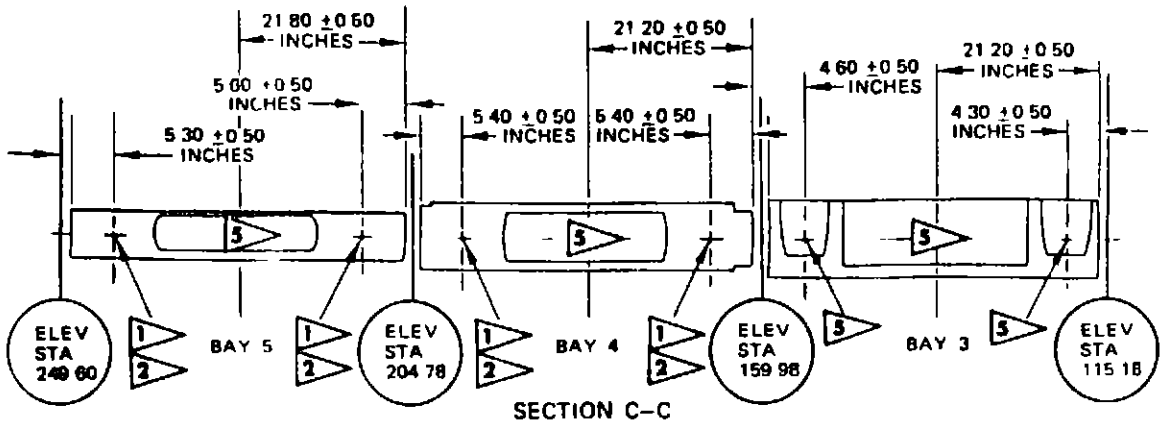
Balance Panel Forward Seal Adjustment
Figure 202 (Sheet 1)
T R 27-279



SECTION A–A



SECTION B–B



SECTION C–C

BAY NO	0			1			2			3		
ELEVATOR POSITION	COVE SHELL			COVE SHELL			COVE SHELL			COVE SHELL		
	INBD	(4) CENTER	OUTBD	INBD	CENTER	OUTBD	INBD	(5) CENTER	OUTBD	(5) INBD	(5) CENTER	(5) OUTBD
10° DOWN	(1)(2)	1 16	(1)(2)	(1)(2)	(1)(2)	(1)(2)	(1)(2)	1 15	(1)(2)	1 04	0 66	1 04
0° NEUTRAL		1 16						1 28		0 92	0 66	0 95
15° UP		1 16						0 88		0 12	0 42	0 08
23° UP		0 77						0 13		0 00 (3)	0 11	0 00 (3)
— OR —												
23½° UP		0 74						0 00 (3)		0 00 (3)	0 10	0 00 (3)

BAY NO	4			5		
ELEVATOR POSITION	COVE SHELL			COVE SHELL		
	INBD	(5) CENTER	OUTBD	INBD	(5) CENTER	OUTBD
10° DOWN	(1)(2)	0 60	(1)(2)	(1)(2)	0 72	(1)(2)
0° NEUTRAL		0 80			0 84	
15° UP		0 62			0 52	
23° UP		0 12			0 08	
— OR —						
23½° UP		0 00 (3)			0 00 (3)	

TABLE 1
COVE GAP MEASUREMENT (INCHES)

(1) ON AIRPLANES NOT INCORPORATING SB 3164 MAXIMUM SEAL GAP IS 0 02 INCH WHATEVER SEAL COMPRESSION EXISTS AFTER REQUIRED ADJUSTMENT OF ALL SEALS IS PERMISSIBLE MEASURE IN LOCATIONS SHOWN IN SECTION A–A B–B OR C–C

(2) ON AIRPLANES INCORPORATING SB 3164, SEAL GAP REQUIREMENT IS 0 002 TO 0 020 INCH NO SEAL COMPRESSION IS ALLOWED WITHIN ±2 1/2° OF 0° (FAIRED) ELEVATOR POSITION WHATEVER SEAL COMPRESSION EXISTS AT OTHER ELEVATOR SETTINGS IS PERMISSIBLE IF ELEVATOR FRICTION REQUIREMENTS IN THIS SUBJECT ARE MET MEASURE IN LOCATIONS SHOWN IN SECTION A–A B–B OR C–C

(3) MAXIMUM SEAL GAP IS 0 05 INCH WHATEVER SEAL COMPRESSION EXISTS AFTER REQUIRED ADJUSTMENT OF ALL SEALS IS PERMISSIBLE

(4) MEASURE CENTER IN THREE LOCATIONS PER SECTION A A TOLERANCE IS ±0 05 INCH

(5) MEASURE IN LOCATION PER SECTION B-B OR C C TOLERANCE IS +0 05 INCH

4) In balance bays 1 thru 5, seals at aft part of elevator nose ribs are adjusted with elevator at 0° (faired) position. With elevator in any position, following seal gap requirements must be observed.

a) Seal gap clearance must be 0.00 ±0.02 inch for full length except in area of elevator hinge fitting at stations 70.38, 115.18, 159.98, 204.78, and 249.60 where no seal requirements exist.

b) At station 25.58, gap clearance must be 0.00 ±0.02 inch for full length except for cutouts in hinge fittings.

c) Whatever seal compression exists after required adjustment of all seals is permissible.

5) Gap clearance for seals at forward edge of balance panel 1 measured according to Table 1, Fig. 202. Initial seal gap is preferably adjusted with elevator placed at 15° up.

(b) On airplanes listed in 2, Fig. 202.

1) Gap adjustment between balance bay seals and adjacent structure must be accomplished on all seals with exception of seals at forward and aft ends of balance panel support tracks and at inboard edge of balance panels.

2) Seals at forward part of elevator nose ribs, outboard edge of balance panels, and inboard face of support tracks are adjusted with elevator at 0° (faired) position. Gap clearance between seals and balance bay walls must be from 0.002 to 0.020 inch for 75% of any given seal length and gap for remaining length of any seal must be from 0.002 to 0.060 inch. No seal compression is allowed within ± 2-1/2° of 0° (faired) elevator position. Whatever seal compression exists at other elevator settings is permissible if elevator friction requirements in this subject are met.

3) In balance bay 0, seals at aft part of elevator nose rib are adjusted as in previous step.

4) In balance bays 1 thru 5, seals at aft part of elevator nose ribs are adjusted with elevator at 0° (faired) position. Adjust as follows:

a) Seal gap clearance must be from 0.002 to 0.020 inch for full length except in area of elevator hinge fitting at stations 70.38, 115.18, 159.98, 204.78, and 249.60 where no seal requirements exist.

b) At station 25.58, gap clearance must be from 0.002 to 0.020 inch for full length except for cutouts in hinge fittings.

c) No seal compression is allowed within ± 2-1/2° of 0° (faired) position. Whatever seal compression exists at other elevator settings is permissible if elevator friction requirements in this subject are met.

5) Gap clearance for seals at forward edge of balance panels is measured according to Table 1, Fig. 202 Initial seal gap is preferably adjusted with elevator placed at 15° up.

(2) Equipment and Materials

(a) Corrosion preventative compound, MIL-C-11796, Grade 3 (Ref 13-1-2)

(b) Cleaning Solvent, Federal Specification P-S-661, Type I or equivalent (Ref 13-1-3)

(c) Cleaning Solvent, BMS 11-7 or equivalent (Ref 13-1-3)

(d) Sealing Compound, BMS 5-12, Type B or equivalent (Ref 13-1-1)

(e) Semco Sealing Gun, No. 250 or equivalent

(f) Block Gap Gauges, CF 65-5647

(3) Adjust elevator balance panel forward seals.

(a) Remove balance bay access panel covers 1624 through 1628 and 1615 as required (Ref Chapter 12).

(b) Rotate elevator up 15° from faired position and hold.

(c) Loosen screws holding balance panel forward edge seal retainer (13, Fig. 201).

(d) Move retainer in slotted screw holes until required clearance is obtained between seal (6, Fig. 202) and forward cove shell (1). See Table 1 for required clearances.

NOTE: The forward balance panel seal retainer is nonsymmetrical with respect to its mounting flange. Insure that the seal assembly is installed with the seal retainer flange offset downward, so that the center of the seal is on the balance panel centerline, as shown in detail A.

Gap measurements must be taken perpendicular to cove shell.

(e) Tighten retainer screws.

(f) Rotate elevator to other positions given in Table 1 and measure gap between forward seal (6) and cove.

NOTE: If seal gaps at these positions do not meet requirements of Table 1, the basic gap adjustment made with elevator 15° up may be varied within allowable tolerances to meet requirements of step (f).

(g) Test elevator balance panel forward seal gap per par. 2.B.(3) if requirements of step (f) cannot be met.

(h) Repair hole sealing compound per par. 4.B.(9) in areas where sealant has been broken during seal adjustment.

(4) Adjust elevator balance panel outboard seal.

(a) Place elevators in faired position.

(b) Loosen retainer screws holding balance panel outboard edge seal (10, Fig. 201).

(c) Adjust clearance between outboard edge seal and balance bay wall by moving retainer in slotted screw holes. Tighten screws.

NOTE: Inboard edge seals (5) require no adjustment.

(d) Adjust forward hinge seal (25) and aft hinge seals (11) and (24) per step (c).

(e) Repair hole sealing compound per paragraph 4.B. (9) in areas where sealant has been broken during seal adjustment.

(5) Adjust Elevator Nose Rib Seals

(a) Loosen retainer screws holding outboard nose rib seal retainer (13, figure 201) and inboard nose rib seal retainer (22).

(b) Move retainer in slotted screw holes until required clearance is obtained between seals (12) and (23) and balance bay wall. Tighten screws.

(c) Repair hole sealing compound per paragraph 4.B.(9) in areas where sealant has been broken.

(6) Adjust Elevator Balance Panel Support Track Seals.

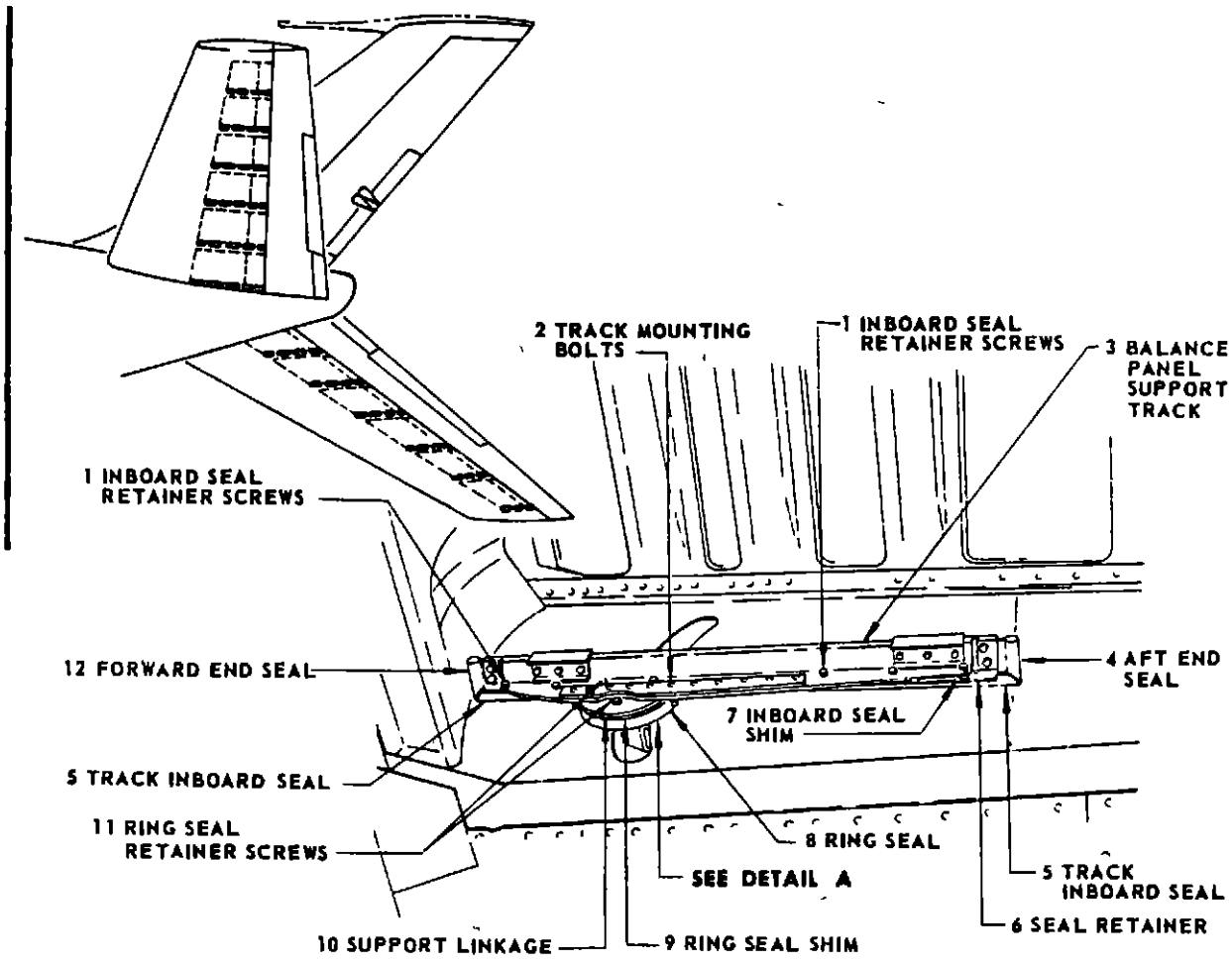
(a) Measure and record shim thickness required to correctly locate track inboard seals (5, figure 203) on inboard face of support tracks (3).

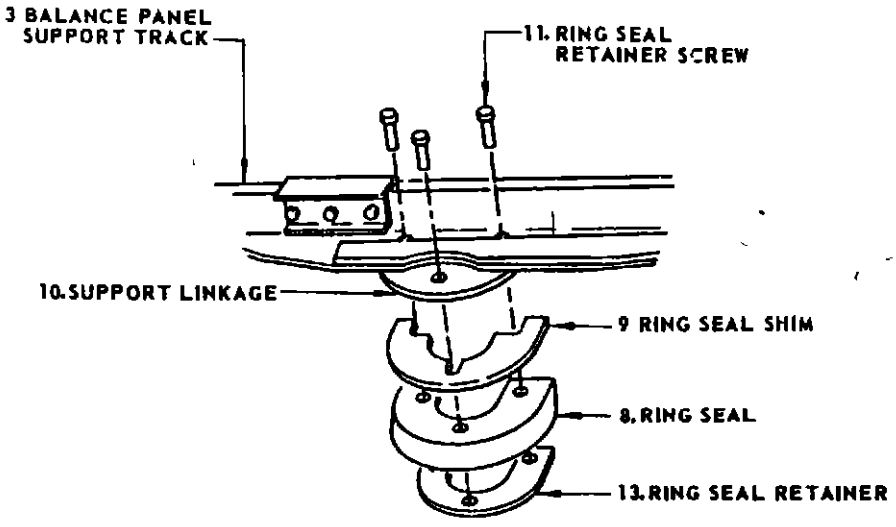
(b) Measure and record shim thickness required to correctly locate ring seal (8) on inboard face of support linkage (10).

(c) Remove hole sealing compound as required from seal retainers (6).

(d) Adjust inboard seal by loosening seal retainer screws (1) and adding or removing laminated shim (7) as determined in step (a). Tighten screws.

(e) Adjust ring seal (8) by loosening ring seal retainer screws (11) and adding or removing laminated ring seal shim (9) as determined in step (b). Tighten screws.


2 TRACK MOUNTING BOLTS
1 INBOARD SEAL RETAINER SCREWS
3 BALANCE PANEL SUPPORT TRACK
1 INBOARD SEAL RETAINER SCREWS
12 FORWARD END SEAL
4 AFT END SEAL
7 INBOARD SEAL SHIM
5 TRACK INBOARD SEAL
11 RING SEAL RETAINER SCREWS
8 RING SEAL
SEE DETAIL A
5 TRACK INBOARD SEAL
6 SEAL RETAINER
10 SUPPORT LINKAGE
9 RING SEAL SHIM


3 BALANCE PANEL SUPPORT TRACK
11. RING SEAL RETAINER SCREW
10. SUPPORT LINKAGE
9 RING SEAL SHIM
8. RING SEAL
13. RING SEAL RETAINER

DETAIL A

(f) Check support track seals and ring seal for required clearance with balance bay wall.

NOTE. Seals (12) and (4) on forward and aft ends of support track require no adjustment.

(g) Fill slots and holes between support track seal retainers (6) and support track per par. 4.B.(9).

(h) If balance bay access panels are magnesium:

1) Remove old corrosion preventative compound from balance panel cover mounting screws and faying surfaces with cleaning solvent.

2) Apply coat of corrosion preventative compound under heads of all access panel mounting screws and on faying surfaces of balance bay access panels.

(i) Install balance bay access panels.

B. Test Elevator Balance Panels and Seals

(1) General

(a) The balance panels forward seal gap test is used to determine if certain local seal gap deviations beyond allowable tolerances may be allowed to exist after seal adjustment. The test is not to be used on a required basis but rather as a prelude to any cove shell repair or replacement due to the inability to meet seal clearances at all four required elevator settings.

(2) Equipment and Materials

(a) Block Gap Gages - CF65-5647

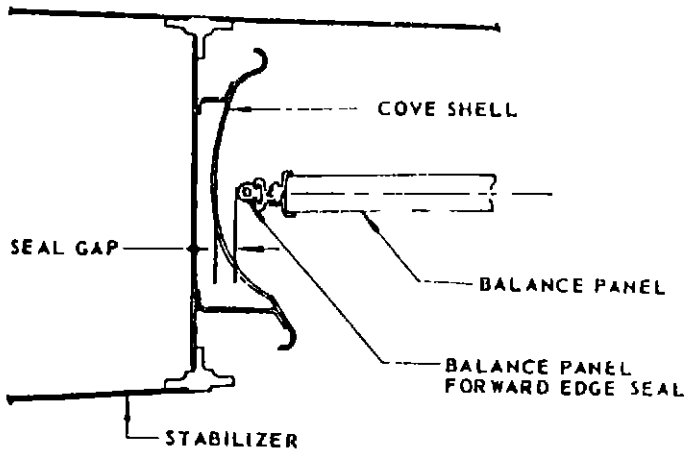
(b) Spring scale - 0-25-pound capacity

(3) Test elevator balance panel forward seal gap.

(a) Remove balance bay access panel covers 1624 thru 1628 and 1615 (Ref Chapter 12).

(b) Rotate elevators up 15 degrees and hold.

(c) Measure and record seal gap between balance panel forward seal (6, Fig. 202) and center cove shell (1, section D-D) in balance bay 0.



VIEW I

BAY	WEIGHTING FACTOR
0	2
1	2
2	3
3	2
4	2
5	1

TABLE I
SEAL GAP WEIGHTING FACTORS

LARGEST LOCAL SEAL GAP DEVIATION		MAXIMUM ALLOWABLE WEIGHTED SEAL GAP AVERAGE
15° ELEVATOR UP	0° 10° DOWN & 23 1/2° UP	
±0 05	±0 05	±0 05
±0 06	±0 07	±0 04
±0 07	±0 09	±0 03
±0 08	±0 11	±0 02

TABLE II
WEIGHTED SEAL GAP AVERAGE LIMITS

BAY	0	1	2	3	4	5
MEASURED GAP "X"	1 22	0 05	0 80	0 46	0 61	0 55
REQUIRED GAP "Y" (SEE TABLE 1, FIGURE 202)	1 16	0 00	0 88	0 42	0 62	0 52
LOCAL DEVIATION = "X Y"	+0 06	+0 05	−0 08	+0 06	−0 01	+0 03
WEIGHTING FACTOR	2	2	3	2	2	1
WEIGHTED DEVIATION	+0 12	+0 10	−0 24	+0 12	−0 02	+0 03

SUM OF WEIGHTED DEVIATIONS = (+ 0 37) + (0 26) = + 0 11
WEIGHTED AVE = 0 11/12 = 0 009
LARGEST LOCAL DEVIATION = 0 08 (SEE BAY 2)
MAX ALLOWABLE WEIGHTED AVE = ± 0 02 (SEE TABLE II)

0 009 IS LESS THAN 0 02; THEREFORE DEVIATION 0 08 IS PERMISSIBLE

EXAMPLE CALCULATION

Balance Panel Forward Seal Gap Deviation
Figure 204

(d) Subtract required seal gap measurement for center cove of bay O, as shown in Table 1, Fig. 202, from measurement taken in step (c).

NOTE: The result of step (d) is the local deviation of seal gap for bay O.

(e) Multiply local seal gap deviation found in step (d) times weighting factor for bay O as shown in Table I, Fig. 204.

NOTE The result of step (e) is the weighted seal gap deviation for bay O.

(f) Repeat steps (c) thru (e) for balance panel bays 1 thru 5.

(g) Add the weighted seal gap deviations for all six balance bays and divide by 12. See example on Fig. 204.

NOTE: The result of step (g) is the weighted seal gap average for the elevator at 15 degrees up.

(h) Determine the largest single seal gap deviation that exists in all six bays.

NOTE Largest deviation in example on Fig. 204 is -0.05 and exists in bay number 2.

(i) Find the maximum allowable weighted seal gap average. See third column in Table II on line opposite quantity determined in step (h).

(j) Determine that weighted seal gap average from step (g) does not exceed maximum allowable weighted seal gap average from step (i)

CAUTION: THE BALANCE BAY COVE SHELL MUST BE REPAIRED OR REPLACED IF WEIGHTED AVERAGE EXCEEDS MAXIMUM ALLOWABLE AVERAGE.

(k) Repeat test procedure steps (c) thru (j) with elevator at 23 or 23-1/2 degrees up, 0 degrees neutral, and 10 degrees down.

(l) Test elevator balance panel forward seal clearances on opposite elevator.

(m) Install balance bay access panels.

(4) Friction Test Elevator.

(a) Position stabilizer at 6 to 11 units airplane nose up trim as indicated on pilot's stabilizer trim indicator.

(b) Place elevator in faired position, then release. Measure breakaway forces as follows:

1) If elevator rotates down from faired position, elevator is out of balance or seals are improperly adjusted. Investigate for water in elevator or tab honeycomb, check for missing balance weights on balance panels and if necessary, adjust seals. Rebalance in accordance with Chapter 51 of the Structural Repair Manual.

2) If elevator rotates up from faired, measure force required to restrain elevator in faired position. Substract this force from that required to move elevator approximately 1 inch down from faired position. Difference of these two forces shall not exceed 10 pounds. Use spring scale and apply force at inboard trailing edge of stabilizer actuated elevator tab.

3) If elevator remains faired, measure breakaway force required to move elevator approximately 1 inch in each direction from faired position. Sum of these two forces shall not exceed 10 pounds.

NOTE: If the up force exceeds the down force in preceding step, elevator is either out of balance or seals improperly adjusted. Correct this condition and repeat step (b).

(c) Disconnect elevator snubber and repeat step (b). Sum or difference of forces shall not exceed 7.5 lbs.

(d) Connect elevator snubber.

3. Inspection/Check Elevator Balance Panels and Seals

A. Equipment and Materials

(1) Cleaning Solvent - Federal Specification P-S-661, Type I or equivalent (Ref 13-1-3)

(2) Corrosion Preventive Compound - MIL-C-17796, Grade 3 (Ref 13-1-2)

B. Examine Elevator Balance Panels and Seals

(1) Remove balance bay access panels 1624 thru 1628 and 1615 and elevator balance bay inspection covers 1649 thru 1653 and 1668 (Ref Chapter 12).

(2) Examine balance panel bays for the following:

(a) Loose seals or seal retainers.

(b) Worn or torn seals.

(c) Loose bolts in support track and continuous hinge.

(d) Interference or rubbing of balance panel support mechanism on inside walls of stabilizer trailing edge ribs.

(e) Binding of balance panel track grips on support track.

(3) If balance bay inspection covers and access panels are magnesium:

(a) Remove old corrosion preventative compound from balance panel cover and inspection cover mounting screws, and from all faying surfaces with cleaning solvent.

(b) Apply coat of corrosion preventative compound under heads of all balance panel cover and inspection cover mounting screws, and on all faying surfaces.

(4) Install all elevator balance bay inspection covers and balance bay access panels.

4. Approved Repairs Elevator Balance Panels and Seals

A Equipment and Materials

(1) Corrosion preventative compound, MIL-C-11796A, grade 3

(2) Cleaning solvent, Federal Specification P-S-661b, Type I or equivalent.

(3) Cleaning solvent, BMS11-7 or equivalent.

(4) Sealing compound, BMS5-12, Type B or equivalent.

(5) Adhesive, BMS5-55 or equivalent.

(6) Solvent, methyl ethyl ketone or equivalent.

(7) Semo sealing gun, No 250 or equivalent

(8) Spring scale, 0-25 pounds capacity.

B. Replace Elevator Balance Panel Seals

(1) Remove elevator balance bay access panels 1624 through 1628 and 1615 as required. See Chapter 12, "Access Doors and Panels "

(2) Remove balance panel.

(3) Remove forward edge seal retainer (9, figure 201) from balance panel by removing retainer screws

NOTE. Forward edge seal is removed to permit removal of outboard edge seal (10) and inboard edge seal (5).

(4) Remove lockwire from end of seals.

(5) Slide seals from retainers.

(6) Install new seals in seal retainers.

(a) If new seal is excessively loose in its retainer, remove seal and clean groove in retainer with methyl ethyl ketone and clean cheese cloth.

(b) Install shim in retainer groove using adhesive BMS5-55.

(c) Peel shim as required to obtain tight fit and replace seal in retainer.

(7) Install lockwire in end of seals.

(8) Install forward edge seal (8) and retainer on balance panel.

(9) Seal all openings between seal retainers and balance panel

(a) Clean area to be sealed with BMS11-7 solvent using clean cloth.

(b) Select sealing compound with working life to suit application conditions.

(c) Apply sealant with sealing gun and finish where necessary with a spatula. Sealant is to be applied on and above centerline of seal retainers.

CAUTION: DO NOT ALLOW SEALANT TO CONTACT BULB SECTION OF FABRIC COVERED SEALS WHICH MUST REMAIN FLEXIBLE TO FUNCTION PROPERLY.

(10) Install balance panel.

(11) Adjust and test elevator balance panels and seals.

(12) If balance bay access panels are magnesium.

(a) Remove old corrosion preventative compound from balance panel cover mounting screws and faying surfaces with cleaning solvent.

(b) Apply coat of corrosion preventative compound under heads of all access panel mounting screws and on all faying surfaces of balance bay access panels.

(13) Install elevator balance bay access panels.

C. Replace Elevator Balance Panel Continuous Hinge Seal

(1) Remove balance bay access panels 1624 through 1628 and 1615 as required. See Chapter 12, "Access Doors and Panels."

(2) Remove forward and aft hinge seals (24, figure 201) and (25) from inboard end of balance panel continuous hinge (20).

(3) Remove outboard hinge pin retainer (17) and aft hinge seal (11) from outboard end of continuous hinge.

(4) Loosen forward and aft rows of hinge retaining bolts (2) and (4).

(5) Remove continuous hinge seal (3) by pulling edges of seal containing pins from grooves between continuous hinge (20) and balance panel hinge fitting (18) and elevator nose hinge fitting (21).

(6) Install new seal by placing edges of seal containing pins in grooves along edges of continuous hinge.

(7) Install forward and aft hinge seals (24) and (25) on inboard end of continuous hinge. Allow slack in hinge seal between retainers when installing attaching screws (27).

NOTE Tab of new hinge seal must be pierced to allow installation of attaching screws nearest centerline of hinge.

(8) Install hinge pin retainer (17) and aft hinge seal (11) on outboard end of continuous hinge Allow slack in seal between retainers.

(9) Tighten forward and aft rows of hinge retaining bolts (2) and (4).

(10) If balance bay access panels are magnesium:

(a) Remove old corrosion preventative compound from balance panel covers and mounting screws with solvent and clean cloth.

(b) Apply corrosion preventative compound to balance panel cover faying surfaces and under heads of all access panel mounting screws.

(11) Install elevator balance bay access panels.

D Replace Balance Panel Support Linkage Ring Seal and Support Track Inboard Seal

(1) Remove balance bay access panels 1624 through 1628 and 1615 as required. See Chapter 12, "Access Doors and Panels."

(2) Remove required balance panel.

(3) Remove ring seal retainer screws (11, figure 203) from balance panel support track (3) and remove ring seal (8), ring seal shim (9) and ring seal retainer (13, detail A).

(4) Remove four support track mounting bolts (2) from support linkage (10) and remove support track.

(5) Remove lockwire from forward and aft track seals (12) and (4) and slide seals from retainers.

(6) Slide track inboard seals (5) from seal retainers (6).

(7) Install new track inboard seals in seal retainers.

(a) If new seals are excessively loose in retainers, remove seal and clean retainer groove with metnyl ethyl ketone and clean cheese cloth.

(b) Install shim in retainer groove using adhesive BMS5-55.

(c) Peel shim as required to obtain tight fit and replace seal in retainer.

(8) Install new end seals in retainers.

(9) Adjust seals in retainers per step (7) Replace lockwire.

(10) Install support track (3) on support linkage (10) and replace mounting bolts (2).

(11) Install new ring seal (8) with shim (9) and retainer (13, detail A) on support linkage and install retainer screws (11).

(12) Install balance panel.

(13) Adjust support track seal clearance per paragraph 2.A.(6).

(14) If balance bay access panels are magnesium.

(a) Remove old corrosion preventative compound from balance panel covers and mounting screws with solvent and clean cloth.

(b) Apply corrosion preventative compound to access panel faying surfaces and under heads of all access panel mounting screws.

(15) Install elevator balance bay access panels.

S

E. Replace Link Adapter Fitting.

(1) Upon installation of new fitting (figure 201, item 30), check that a minimum of 1/16 inch clearance exists between fitting shaft and slot and that fitting does not contact structure.

(2) Trim flange of stiffener if required to obtain adequate clearance.

S

STABILIZER MOUNTED ELEVATOR HINGE FITTINGS - MAINTENANCE PRACTICES

1 General

A Both the stabilizer mounted elevator hinge fittings and the stabilizer mounted elevator thrust hinge fittings (see figure 201) can be replaced individually The elevator must be supported by means of a sling when two or more hinges are removed at one time Access to hinge fittings is obtained by removing elevator hinge access panels 1600 through 1606 and 1665, elevator thrust hinge access panels 1624, 1612, and 1613, and lower elevator hinge access panels 1618 through 1623 and 1666 See Access Doors and Panels, Chapter 12

2 Equipment

A Torque Wrench - 0 to 400 pound-inches

3 Removal/Installation Stabilizer Mounted Elevator Thrust Hinge Assembly

A Remove Stabilizer Mounted Elevator Thrust Hinge Assembly (See figure 201)

(1) Open thrust hinge access panels.

(2) Remove forward and aft hinge mounting bolts

(3) Remove elevator thrust hinge assembly

B Install Stabilizer Mounted Elevator Thrust Hinge Assembly

(1) Position hinge assembly (see figure 201) with lubrication fitting down and install forward and aft hinge mounting bolts.

(a) Install bonding jumper on aft hinge mounting bolt and adjust jumper to prevent tension at extreme elevator positions

(2) Torque forward mounting bolts 220 to 360 pound-inches Torque aft hinge mounting bolts 130 to 180 pound-inches

(3) Replace access panels.

4 Removal/Installation Typical Stabilizer Mounted Elevator Hinge (See figure 201)

A Remove Stabilizer Mounted Elevator Hinge Assembly

(1) Open necessary access panels.

(2) Remove forward and aft hinge mounting bolts

(3) Remove elevator hinge assembly

B. Install Stabilizer Mounted Elevator Hinge Assembly

(1) Position hinge assembly (see figure 201) with lubrication fitting down and install forward and aft hinge mounting bolts.

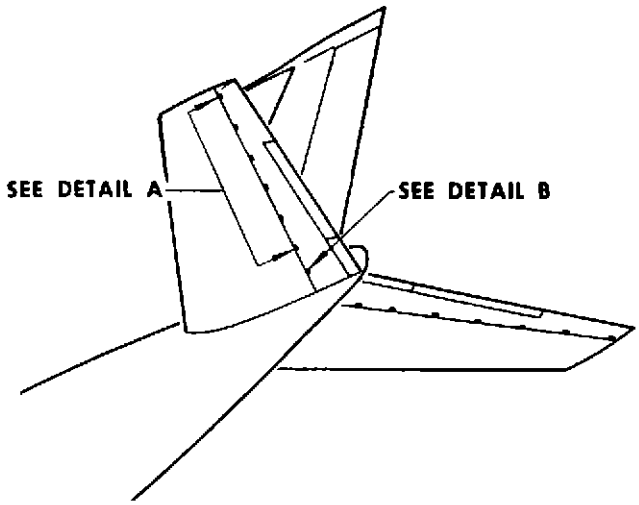
(a) Install bonding jumper on aft hinge mounting bolt and adjust jumper to prevent tension at extreme elevator positions

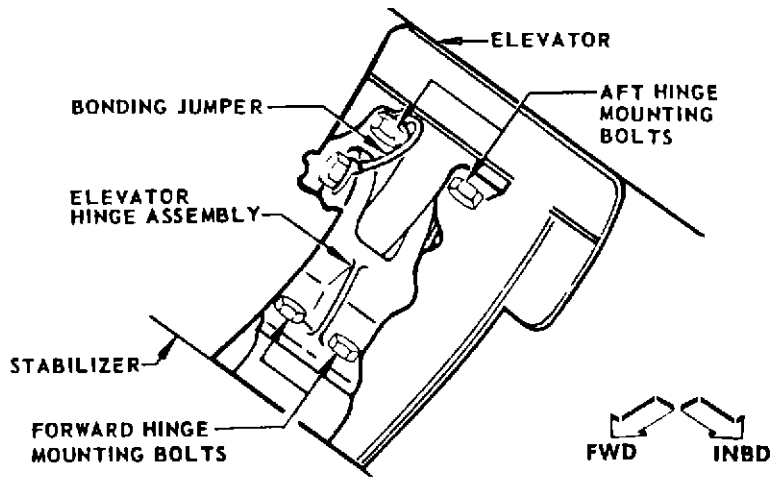
(2) Torque mounting bolts as follows

Hinge - Elevator Station	Mounting Bolts		Torque pound-inches
0 - 10.26 (thrust hinge)	forward	4	220-360
	aft	4	130-180
25 58	forward	2 upper	220-360 & lockwire together
		2 lower	100-140
	aft	4	65-90
70 38 and 204.78	forward	2 upper	220-360 & lockwire together
		2 lower	100-140
	aft	4	50-70
115.18 159 98 and 249.60	forward	4	100-140
	aft	4	50-70

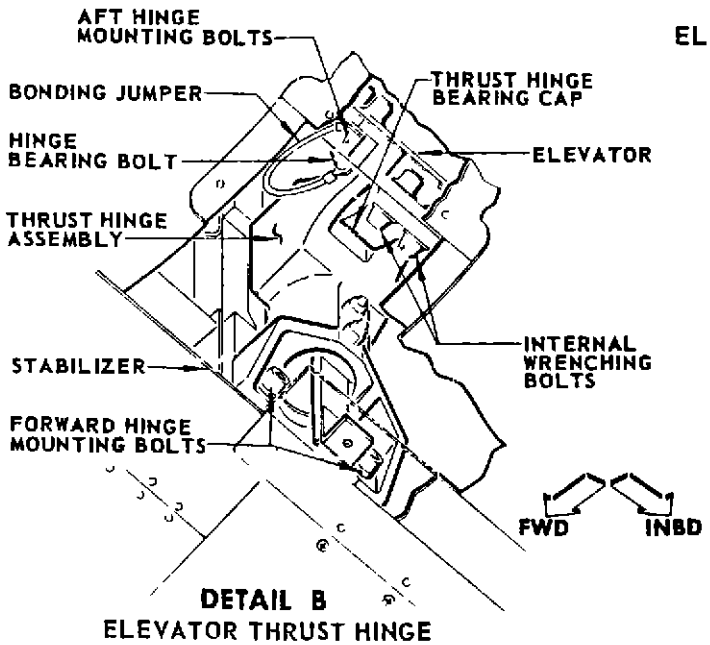
NOTE: All hinge bearing bolts except thrust hinge, should be torqued within a range of 60 to 85 pound-inches.

(3) Reinstall access panels.





DETAIL A
ELEVATOR HINGE (TYPICAL 6 PLACES)



DETAIL B
ELEVATOR THRUST HINGE

5 Approved Repairs Stabilizer Mounted Elevator Thrust Hinge Fittings

A Replace Elevator Thrust Hinge Bearing (See figure 201)

(1) Remove thrust hinge access panels.

(2) Remove aft thrust hinge fitting by removing aft hinge mounting bolts and thrust hinge bearing bolt

(3) Remove bearing by removing four internal wrenching bolts and remove thrust hinge bearing cap and bearing

(4) Install new bearing, and attach bearing cap with internal wrenching bolts Torque internal wrenching bolts, 130 to 180 pound-inches

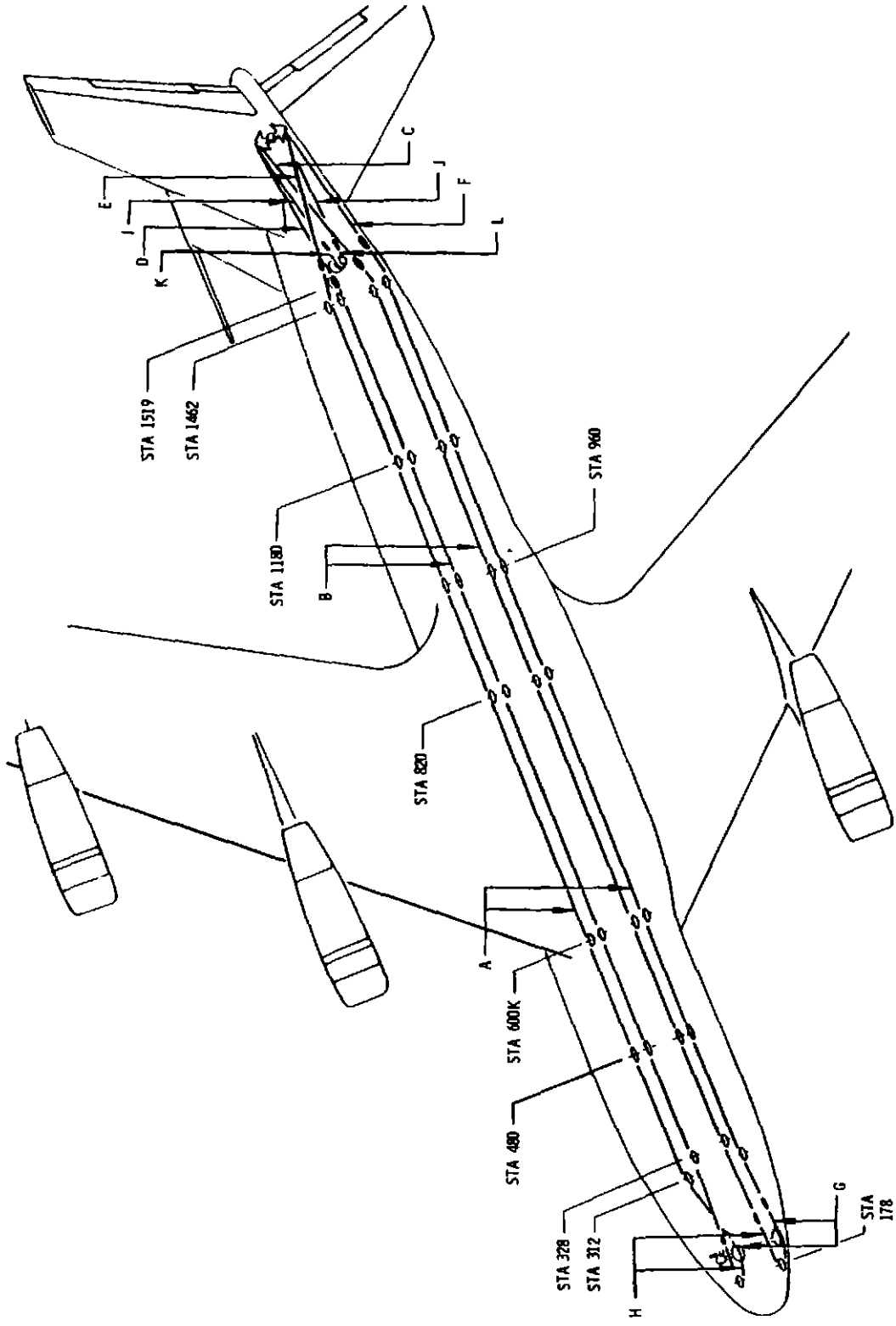
(5) Position aft thrust hinge fitting with lubrication fitting down and install aft hinge mounting bolts with bonding jumper positioned on correct one. Leave maximum slack in bonding jumper.

(6) Install thrust hinge bearing bolt Torque bearing bolt within 160 to 190 pound-inches

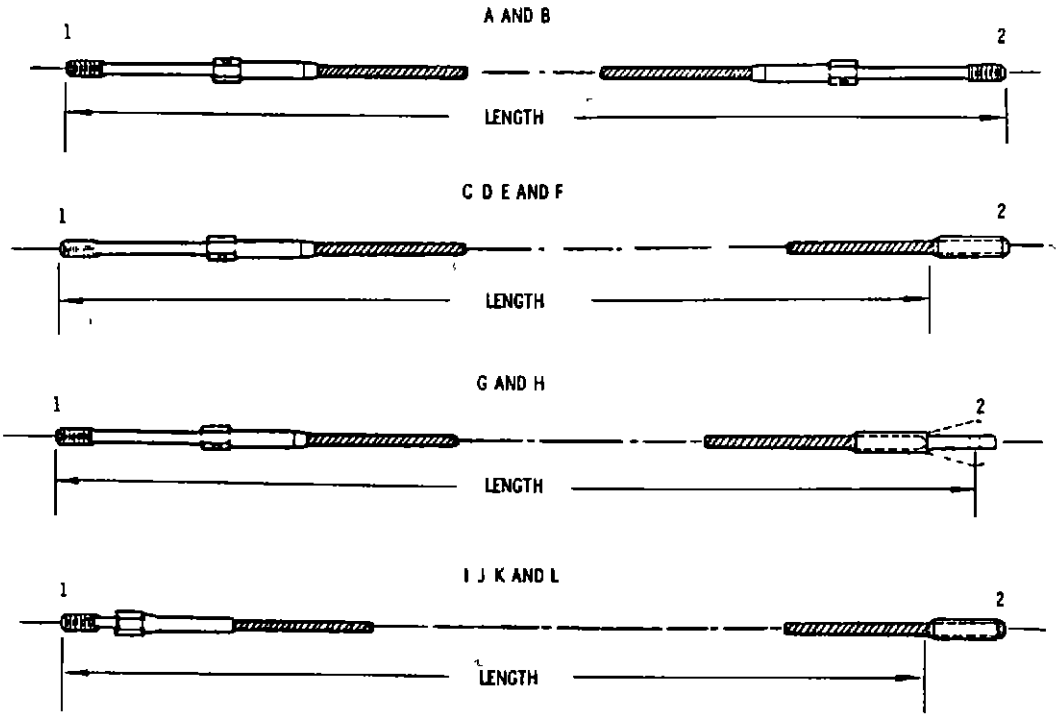
(7) Replace access panels

END

ELEVATOR CONTROL CABLES - MAINTENANCE PRACTICES



CABLE REF	DRAWING NO	NO REQ	CABLE LENGTH	CABLE SIZE	FITTINGS 1	FITTINGS 2
A	NAS304-45-14475	2	1447 6 IN	1/8 7 x 19	MS21260L4LH	MS21260L4RH
B	NAS304-45-14344	2	1434 5 IN	1/8 7 x 19	MS21260L4LH	MS21260L4RH
C	BAC-C13G-468-1366	1	136 6 IN	1/8 7 x 19	AN669L4RH	BAC-T14A-4
D	BAC-C13G-468-1353	1	135 3 IN	1/8 7 x 19	AN669L4RH	BAC-T14A-4
E	BAC-C13G-468-1160	1	116 0 IN	1/8 7 x 19	AN669L4RH	BAC-T14A-4
F	BAC-C13G-468-1125	1	112 5 IN	1/8 7 x 19	AN669L4RH	BAC-T14A-4
G	NAS304-35-414	2	41 5 IN	1/8 7 x 19	MS21260L4LH	MS20668-4
H	NAS304-35-1070	2	107 0 IN	1/8 7 x 19	MS21260L4LH	MS20668-4
I	BAC-C13G-465-705	1	70 5 IN	1/8 7 x 19	AN669S4RH	BAC-T14A-4
J	BAC-C13G-465-702	1	70 2 IN	1/8 7 x 19	AN669S4RH	BAC-T14A-4
K	BAC-C13G-466-212	1	21 2 IN	1/8 7 x 19	AN669S4LH	BAC-T14A-4
L	BAC-C13G-466-212	1	21 2 IN	1/8 7 x 19	AN669S4LH	BAC-T14A-4



Elevator Control Cables
Figure 201 (Sheet 2)

ELEVATOR CONTROL TAB ACTUATING MECHANISM - MAINTENANCE PRACTICES

1. Removal/Installation Elevator Aft Control Quadrant

A. Equipment

(1) Tensiometer - 0 to 200 pounds

(2) Torque Wrench - 200 pound-inches capacity

(3) Rigging Pin, MS20392-4, or equivalent

(4) Aeroshell Grease 17

B. Remove Elevator Aft Control Quadrant

(1) Remove tail cone access panel 1076 or 1188. See Chapter 12, Access Doors and Panels.

(2) Install rigging pin in both forward and aft elevator control quadrants.

(3) Loosen turnbuckles in six cables attached to elevator aft control quadrant (6, figure 201) and disconnect cables from aft quadrant.

NOTE: Tag each cable to assure correct installation later.

(4) Connect external electrical power to airplane.

(5) To facilitate access to centering spring turnbuckle, position stabilizer leading edge down until lower jackscrew gearbox stops contact.

(6) Loosen centering spring turnbuckle (9) and disconnect centering spring control fitting (3) from centering crank (4) by removing control fitting bolt.

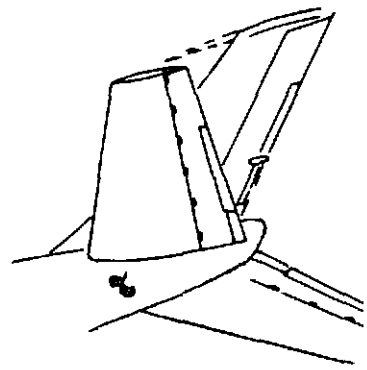
(7) Detach both control pushrods (1) from quadrant bell crank (2).

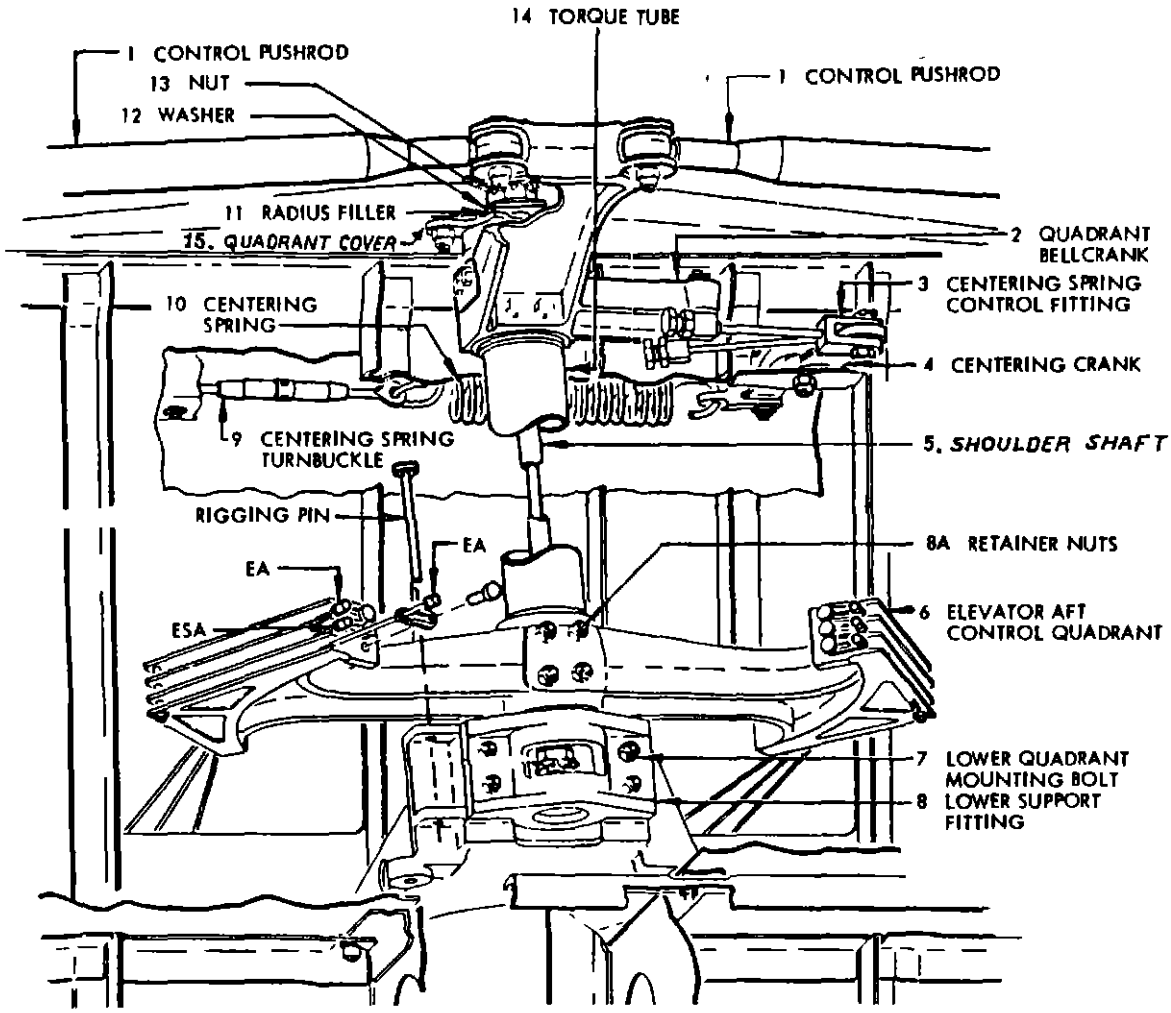
(8) Detach lower support fitting (8) by removing lower quadrant mounting bolts (7).

(9) Support quadrant and remove rigging pin, nut (13), washer (12), and radius filler (11) from upper end of shoulder shaft (5). Allow quadrant and shaft to slide down until shaft clears upper mounting bracket. Move quadrant assembly aft until clear of structure and replace radius filler, washer and nut loosely on upper end of shaft.

(10) Remove quadrant assembly from airplane through tail cone access opening.

(11) Disconnect external electrical power.





Elevator Aft Control Quadrant Installation
Figure 201

C. Install Elevator Aft Control Quadrant

(1) Assemble aft control quadrant (6, figure 201), aft torque tube (14), shoulder shaft (5), and quadrant crank (2) as a unit before placing aboard airplane. If aft control quadrant retainer nuts (8A) were removed, reinstall nuts finger tight. Do not torque nuts. Install cotter pins.

NOTE: Do not tighten nut (13), this assembly is temporary to facilitate handling during installation.

(2) Place loosely assembled unit of elevator aft control quaudrant (6) in aft fuselage compartment.

(3) Remove nut (13), washer (12) and radius filler (11) from upper end of shoulder shaft (5). Slide shaft down until upper end of shaft is flush with top of upper bearing.

(4) Hold elevator control quadrant assembly in mounted position and push shaft up through upper mounting bracket. Install radius filler, washer and nut on shaft. Check that quadrant bellcrank (2) does not interfere with quadrant cover (15). Add washers AN960-816 and/or AN960-816L between upper shoulder on shaft (5) and upper bearing to assure clearance between bellcrank (2) and cover(15). Tighten nut (13) within 100 to 200 pound-inch torque range.

(5) Install lower support fitting (8) with four bolts (7).

(6) Test elevator aft control quadrant for freedom of rotation on bearings. Assembly must rotate freely without rubbing or binding.

(7) Install rigging pin in elevator aft control quadrant and lower quadrant support bracket.

(8) Attach centering control fitting (3) to centering crank (4).

(9) Adjust centering spring linkage. See Adjustment/Test Centering Spring Linkage.

(10) Attach control cables to elevator aft control quadrant (6), and remove tags from cables.

(11) Install rigging pin in elevator forward control quadrant.

(12) Adjust tension in cables EA and EB to table given on 27-7-0, figure 202. Use tensiometer for cable tension.

(13) Adjust tension in cables ESA and ESB to table given on 27-7-0, figure 202.

(14) Remove stabilizer actuated elevator tab control access panel 1612. See Access Doors and Panels, Chapter 12.

(15) Position stabilizer so that dimension A (27-10-0, figure 202) is set at 25-3/4 to 26 inches.

(16) Install rigging pins in right and left control cranks (7, figure 203), and control crank support brackets in stabilizers.

(17) Adjust length of each control pushrod (4) so that each pushrod mounting bolt fits freely in mounting hole. Attach pushrods to quadrant crank (5).

(18) Remove all rigging pins.

(19) Adjust rod terminal bearings so that outer races are parallel with inner surfaces of forked ends of cranks.

(20) Test elevator control system. See 27-7-0, Adjustment/Test Elevator Control System.

(21) Install stabilizer actuated elevator tab control access panel and tail cone access panel.

2. Removal/Installation Elevator Control Crank

A. Equipment and Material

(1) Wood Dowel - 1/4 inch diameter

(2) Aeroshell Grease 17.

(3) Grease Gun

(4) Rigging Pins MS20392-4, or equivalent

B. Remove Elevator Control Crank (7, figure 202)

(1) Remove elevator tab control access panel 1614. See Access Doors and Panels, Chapter 12.

(2) Disconnect outboard end of control pushrod (6) and forward end of crank pushrod (8) from control crank.

(3) Remove cotter pin, nut, and washer from end of control crank shaft (15).

NOTE: Remove cotter pin through bracket and shaft of right control crank prior to removing nut from shaft.

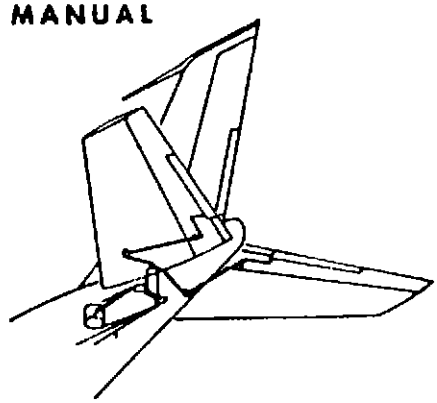
(4) Remove shaft from crank.

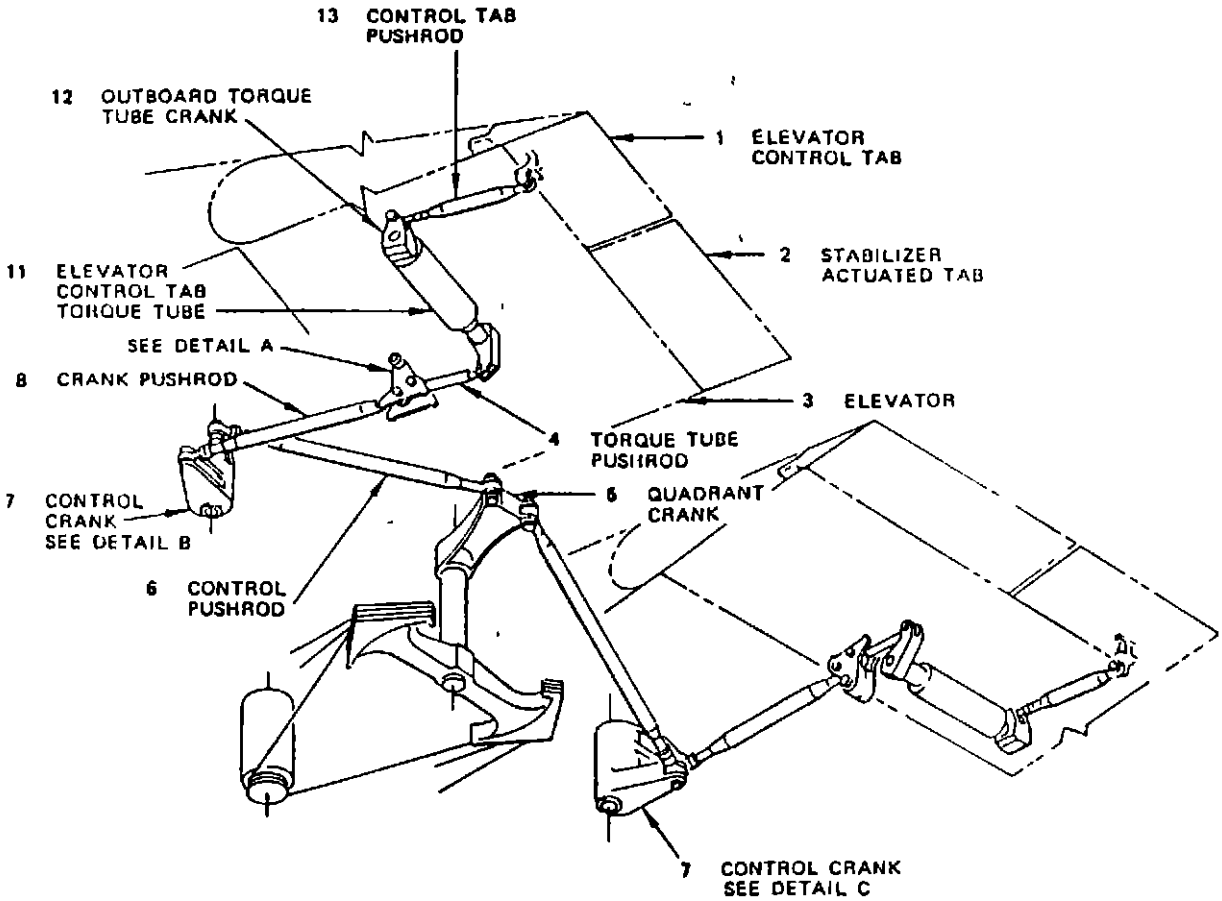
(5) Pull crank (7) free and remove from airplane. Secure loose crank bearing, spacer, and bushing when handling crank.

C. Install Elevator Control Crank

(1) Place control crank (7, figure 202) in position.

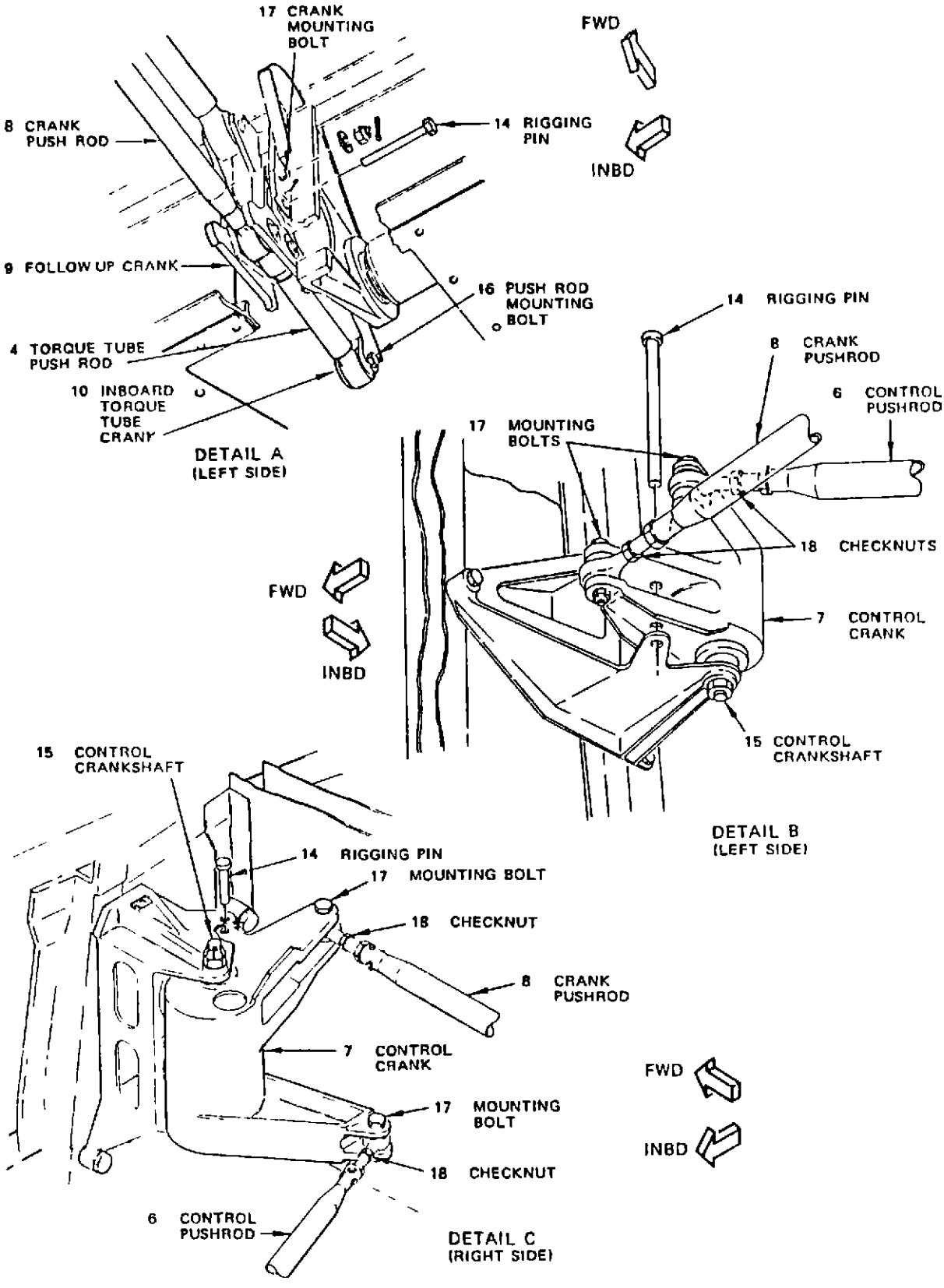
WARNING: ENSURE THAT CONTROL CRANK IS CORRECTLY ORIENTED PER DETAIL B (LEFT CONTROL CRANK) OR DETAIL C (RIGHT CONTROL CRANK), FIGURE 202. LEFT AND RIGHT CONTROL CRANKS ARE NOT INTERCHANGEABLE. ON LEFT CONTROL CRANK, SPREAD BETWEEN CRANK ARMS IS APPROXIMATELY 30 DEGREES. ON RIGHT CONTROL CRANK, SPREAD BETWEEN CRANK ARMS IS APPROXIMATELY 70 DEGREES. ON LEFT SIDE, INSTALL CONTROL CRANK SO THAT ARM WITH RIG PIN HOLE IS DOWN. ON RIGHT SIDE, INSTALL CONTROL CRANK SO THAT ARM WITH RIG PIN HOLE IS UP. INTERFERENCE AND ADVERSE EFFECT ON CONTROL SURFACE TRAVEL WILL RESULT IF CONTROL CRANKS ARE INCORRECTLY INSTALLED.





CALLOUTS ON RIGHT SIDE SAME AS LEFT SIDE

Elevator Control Linkage Installation
Figure 202 (Sheet 1)



Elevator Control Linkage Installation
Figure 202 (Sheet 2)

(2) Align spacer and bearing within crank by means of 1/4-inch wooden dowel or equivalent.

(3) Insert control crank shaft (15) through support bracket and use shaft to drive out dowel.

(4) Place nut and washer on shaft and tighten nuts so that shaft is centered.

NOTE: Install cotter pin through bracket and shaft of right control crank prior to installing nut on shaft

(5) Set stabilizer jackscrew dimension "A" at 19-9/32 (± 3/32) inches. Hold elevator down 2 (± 1/4) degrees from stabilizer while adjusting pushrods.

CAUTION DO NOT OPERATE STABILIZER OR ELEVATORS WITH RIGGING PINS INSTALLED.

(6) Install MS20392-4 rigging pins in follow-up crank and control crank.

(7) Install crank pushrod (8). Attach adjustable end to control crank (7).

(8) Hold elevator 2 (± 1/4) degrees down and adjust length of crank pushrod (8) so that mounting bolt (17) fits freely and tighten checknut (18) after adjustment. Bolt heads (1, figure 203) should be inboard.

(9) Install rigging pin in aft elevator control quadrant.

(10) Install control pushrod (6, figure 202). Attach adjustable end to control crank (7).

(11) Adjust length of control pushrod (6) so that mounting bolt (17) fits freely and tighten checknut (18).

(12) Remove rigging pins from aft control quadrant, control crank, and follow-up crank.

(13) Lubricate pushrod end bearings.

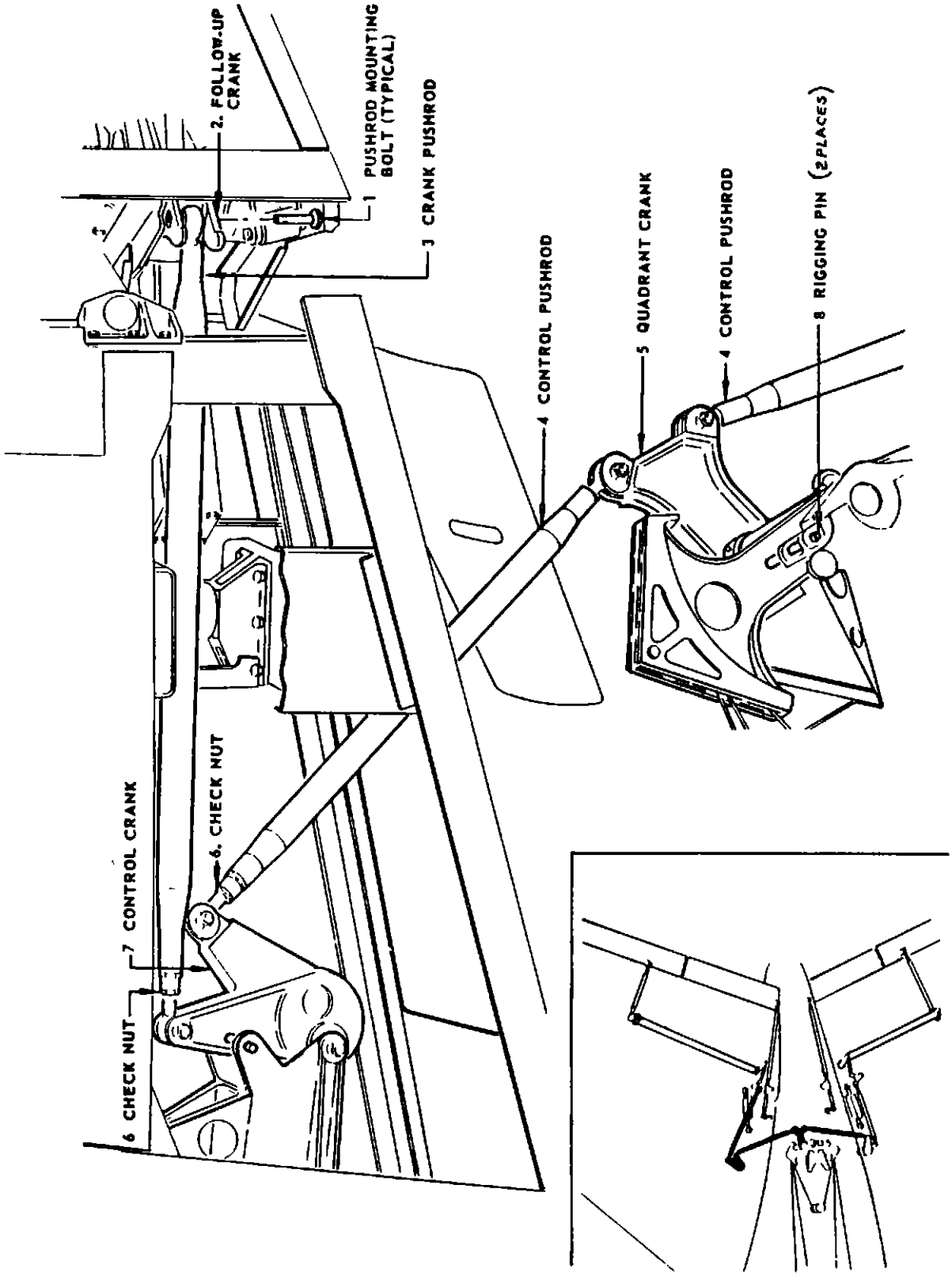
(14) Test control crank and linkage per 27-7-0, Test Elevator Control System.

(15) Install all access panels.

3 Removal/Installation Elevator Control Follow-up Crank

A. Equipment and Materials

(1) Steel scale - 0 to 3 feet graduated in inches and sixteenths



Elevator Control Crank Pushrods Installation
Figure 203

(2) Protractor assembly - F52485-500, with clamp assembly - F71292-16 or equivalents.

(3) Wood dowel - 1/4 inch diameter by 6 inches long.

(4) Aeroshell Grease 17.

(5) Grease gun

(6) Rigging pins, MS20392-4, or equivalent

B. Remove Elevator Control Follow-up Crank

(1) Remove elevator thrust hinge access panel 1606 and 1613, elevator trim tab access panel 1612, and elevator tab control access panel 1614. See Access Doors and Panels, Chapter 12.

(2) Disconnect torque tube push rod (4, figure 202) from follow-up crank.

(3) Disconnect crank push rod (8) from follow-up crank.

(4) Remove follow-up crank mounting bolt (17) nut and washer.

(5) Remove follow-up crank.

NOTE. Secure loose washers, bearing and spacer while removing follow-up crank.

C. Install Elevator Control Follow-up Crank

(1) Align bearings and spacer inside follow-up crank (9, figure 202) by means of 1/4-inch diameter wooden dowel or equivalent.

(2) Place follow-up crank in position.

(3) Insert follow-up crank mounting bolt in support bracket from inboard side using bolt to drive out dowel.

(4) Install washer and nut on mounting bolt

(5) Attach torque tube push rod (4) to follow-up crank.

CAUTION: INSTALL BOLT WITH HEAD INBOARD TO PREVENT INTERFERENCE.

(6) Apply thin coating of grease to faying surfaces at both ends of pushrods.

(7) Lubricate both bearings on torque tube pushrod.

(8) Position stabilizer so dimension A (27-10-0, figure 202) is set at 25-3/4 to 26 inches.

(9) Install rigging pins to follow-up crank and control crank (7).

(11) Check that outboard flaps extend in 1-1/2 to 3-1/2 minutes.

CAUTION FOR GROUND OPERATION, THE EMERGENCY FLAP SYSTEM IS LIMITED TO A DUTY CYCLE OF ONE COMPLETE EXTENSION AND RETRACTION, THEN 27 MINUTES OF NON OPERATION.

(12) Wait 30 seconds and position emergency flap outboard switch to "UP".

(13) Check that flap retraction time is 1-1/2 to 3-1/2 minutes.

(14) Return emergency flap control switch to "OFF".

CAUTION: IF HYDRAULIC POWER IS AVALLABLE, THE EMERGENCY FLAP DRIVE SWITCH (GUARDED SWITCH) SHALL NOT BE SWITCHED TO OFF UNTIL AFTER THE EMERGENCY FLAP SWITCHES HAVE BEEN OFF FOR A MINIMUM OF 6 SECONDS AND THE FLAP CONTROL LEVER IS AT THE ACTUAL POSITION OF THE FLAP.

(15) Disconnect electrical power

FLAP POSITION TRANSMITTER ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation Flap Position Transmitter Assembly

A General

(1) The flap position transmitter assembly can be removed and replaced as an assembly or the position transmitter can be removed separately. The inboard flap position transmitter assembly is accessible through the inboard cove lip door 1257. The outboard position transmitter assembly is accessible through the outboard cove lip door 1363. See "Access Doors and Panels", Chapter 12.

B. Remove Flap Position Transmitter Assembly

(1) Pressurize utility hydraulic system.

(2) Position flap control lever to 'DOWN".

(3) Depressurize utility hydraulic system.

(4) Lower cove lip door by unlatching spring loaded door latches.

(5) Loosen clip (5, figure 201) on fore flap (6) and disconnect cable (4) by pressing cable terminal through clip terminal slot. Do not let cable wind up too rapidly as cable may jam.

(6) Remove cover (3) from position transmitter assembly (7).

(7) Disconnect electrical connector (1) from position transmitter (2).

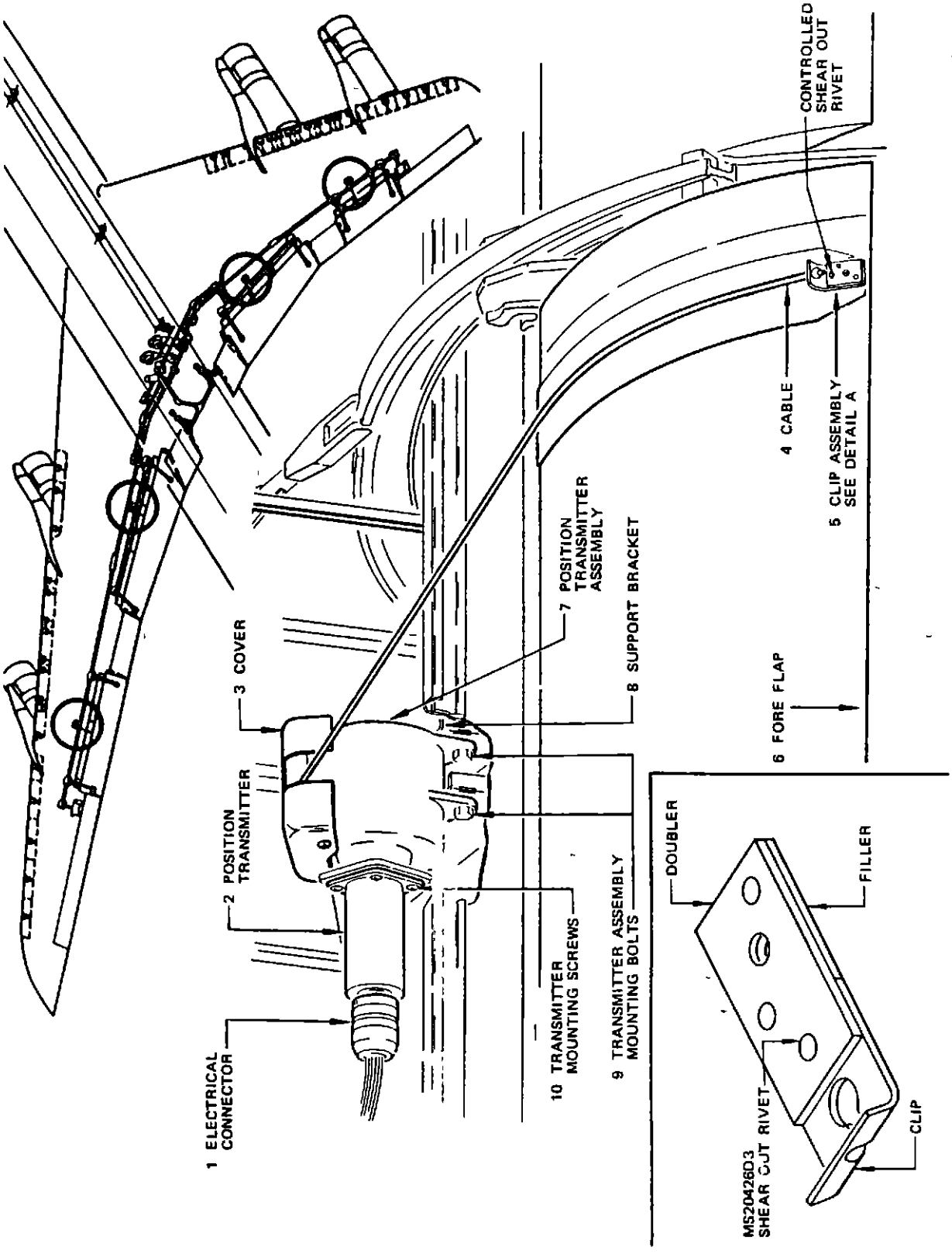
(8) Remove transmitter assembly mounting bolts (9) and remove transmitter assembly.

C Install Position Transmitter Assembly

(1) Align position transmitter assembly (7, figure 201) with support bracket (8) and install mounting bolts (9).

(2) Install cover (3).

(3) Check that cable (4) does not bind by pulling cable out and letting spring tension rewind cable slowly.



Flap Position Transmitter Assembly Installation
Figure 201

(4) Insert cable terminal through clip terminal slot on fore flap (6) and secure clip (5).

(5) Connect electrical connector (1) to position transmitter.

(6) Adjust position transmitter assembly per paragraph 2.B.

2. Adjustment/Test Flap Position Transmitter Assembly

A. General

(1) Access to the inboard flap position transmitter is provided by lowering the inboard cove lip door 1257. The outboard flap position transmitter assembly is accessible by lowering the outboard cove lip door 1363. (See "Access Doors and Panels", Chapter 12.)

B. Adjust Flap Position Transmitter Assembly

(1) Connect electrical power to airplane.

(2) Pressurize utility hydraulic system.

(3) Position flap control lever to "DOWN".

(4) Close flap position indicator circuit breakers on 28-volt a-c circuit breaker panel (P7)

(5) Lower cove lip door by unlatching spring loaded cove lip door latches

(6) Loosen nut on position transmitter assembly collet to release tension on position transmitter driveshaft.

(7) Insert screwdriver through collet and engage screwdriver slot in transmitter driveshaft. Index transmitter driveshaft so that flap position indicator indicates actual flap position within 2° at each flap control lever detent position.

(8) Secure transmitter driveshaft to insure proper indexing and torque nut at 50 to 70 pound inches.

(9) Raise and latch cove lip door.

(10) Test flap position transmitter per paragraph 2.C

C Test Flap Position Transmitter Assembly

(1) Connect electrical power to airplane

(2) Pressurize utility hydraulic system

(3) Close flap position indicator circuit breaker on 28-volt a-c circuit breaker panel (P7)

(4) Deleted

(5) Position flap control lever in the following detent positions: 0°, 14°, 25°, 40° and 50°. Check that position indicators indicate actual flap position within 2° at each detent position Check that dual pointers on each indicator are aligned within 2° for the entire range of flap travel.

(6) Position flap control lever to "UP"

(7) Disconnect hydraulic pressure source

(8) Disconnect electrical power source

3. Inspection/Check Flap Position Transmitter Assembly

A. Check Flap Position Transmitter Assembly

(1) Examine flap position transmitter cable retaining clip shear rivets for shear. (See figure 201)

4 Approved Repairs Flap Position Transmitter Assembly

A Replace Flap Position Transmitter

(1) Pressurize utility hydraulic system

(2) Position flap control lever to "DOWN"

(3) Depressurize utility hydraulic system

(4) Lower cove lip by unlatching spring loaded cove lip door latches.

(5) Loosen nut on collar (collet) to release tension on position transmitter drive shaft

(6) Disconnect electrical connector (1, figure 201) from position transmitter (2).

(7) Remove position transmitter by removing mounting screws (10).

(8) Install new position transmitter

(9) Connect electrical connector to position transmitter.

(10) Connect electrical power to aircraft.

(11) Close flap position indicator circuit breakers on 28 volt ac circuit breaker panel (P7).

(12) Insert screwdriver through collet and engage screwdriver slot in transmitter driveshaft.

(13) Index transmitter driveshaft so that position indicators indicate actual flap position within 2 degrees at each flap control lever detent position.

(14) Secure transmitter driveshaft to insure proper indexing.

(15) Torque nut on collet at 50 to 70 pound-inches.

(16) Raise and latch cove lip door.

(17) Pressurize utility hydraulic system.

(18) Position flap control lever to UP.

(19) Test flap position transmitter assembly per paragraph 2.C.

B. Replace Flap Position Transmitter Assembly Cable Retaining Clip Shear Rivet

(1) Pressurize utility hydraulic system.

(2) Position flap control lever to DOWN.

(3) Depressurize utility hydraulic system.

(4) Remove bolt attaching clip (5, figure 201) to fore flap (6).

(5) Remove sheared rivet from clip.

(6) Install MS20426D3 rivet through clip.

CAUTION: MS20426D3 RIVET PROVIDES FAIL-SAFE PROTECTION, THEREFORE, DO NOT REPLACE WITH ANY OTHER RIVET.

(7) Insert cable terminal through clip terminal slot.

(8) Install clip on fore flap.

(9) Pressurize utility hydraulic system.

(10) Position flap control lever to UP.

(11) Disconnect hydraulic pressure source.

INBOARD AND FILLET FLAP POWER UNIT - MAINTENANCE PRACTICES

1. General

A When removing the flap power unit, loosen hydraulic tubing adjacent to the hydraulic motor by loosening support clamps and other fittings to allow slack in the tubing for removal from motor fittings. A container will be required to catch spilled fluid. Should any fluid spill on the airplane, decontaminate. Refer to Cleaning and Washing, Chapter 12.

B To remove the inboard flap power unit, the flap actuating hydraulic motor must be removed to provide access to the power unit mounting bolts.

2. Removal/Installation Inboard and Fillet Flap Power Unit

A. Equipment and Materials

(1) Tensiometer

(2) Spline Coupling Spanner Wrench - F71228 or equivalent

(3) Power Unit Lubricant

(a) A mixture, by volume, of 1 part Aeroshell Grease 7A and 4 parts MIL-L-7808 lubricating oil.

(b) Deleted

(4) Control Surface Protractor Assembly - F52485-500, or equivalent

(5) Protractor Clamp Assembly - F71292-16, or equivalent

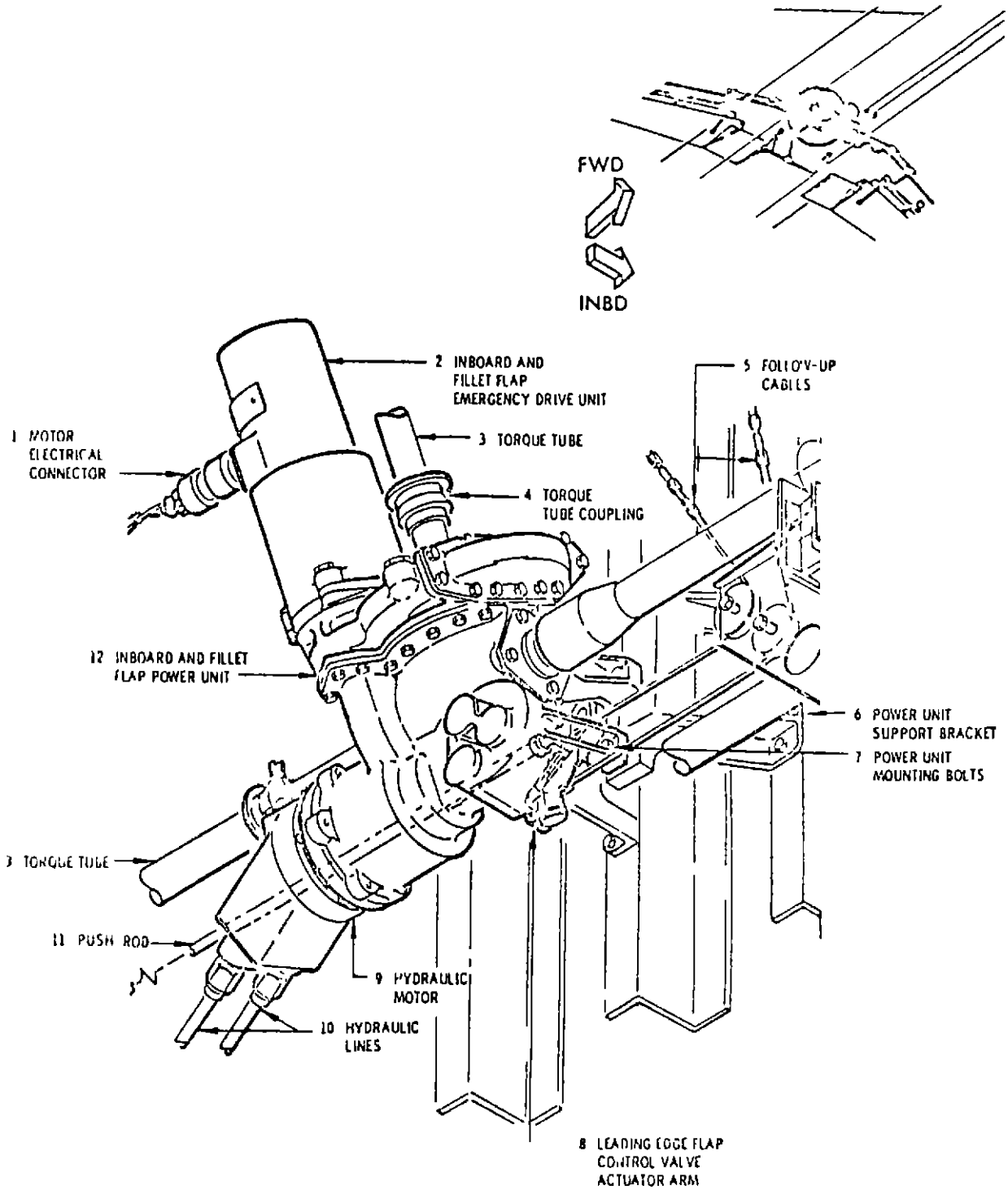
(6) Zinc Chromate Primer - MIL-P-8585, or equivalent

B. Remove Inboard Flap Power Unit

(1) Pressurize utility hydraulic system.

(2) Position flap control lever at the FLAP UP 0 detent.

NOTE: If flaps do not retract, it will be necessary to retract flaps manually and rig the entire system as outlined in 27-16-0, Adjustment/Test - Wing Flaps and Flap Control System.



Inboard and Fillet Flap Power Unit Installation
Figure 201

(3) Open main wheel well doors.

(4) Depressurize utility hydraulic system.

(5) Install AN395 rigging pin, or AN5 bolt, through inboard flap control valve follow-up drum and valve support bracket. Hang a red WARNING - DO NOT OPERATE tag on flap control lever.

(6) Disconnect electric power from inboard and fillet flap emergency drive motor (2, figure 201).

(7) Disconnect torque tubes (3) from each side and from top of flap power unit (12). Disconnect inboard torque tube at angle gearbox in right main gear wheel well and pull outboard to disengage from power unit

(8) Loosen turnbuckles to provide slack in follow-up cables (5).

(9) Remove bolt attaching sheave to follow-up drive shaft and slide sheave off follow-up shaft.

(10) Disconnect pushrod (11) extending from power unit to leading edge flap control valve.

(11) Disconnect hydraulic lines (10) at hydraulic motor on power unit.

(12) Remove bolts attaching hydraulic motor (9) to casting and remove motor.

(13) Remove four bolts (7) attaching power unit to support bracket (6) and remove power unit.

(14) Remove inboard and fillet flap emergency drive unit (2) from power unit.

(15) Loosen nut and slide leading edge flap control valve arm (8) off of power unit cam shaft.

C. Install Inboard and Fillet Flap Power Unit

(1) Install leading edge flap control valve arm (8, figure 201) on power unit cam shaft and tighten nut.

(2) Dip mounting bolts for hydraulic motor, emergency drive motor, and power unit in zinc chromate primer.

(3) Position inboard and fillet flap power unit on support bracket and install mounting bolts while primer is still wet.

(4) Install inboard and fillet flap emergency drive unit (2) on power unit while primer on mounting bolts is still wet.

(5) Install hydraulic motor (9) on power unit while bolts are still wet. Connect hydraulic lines (10).

(6) Slide sheave on power unit follow-up shaft and install bolt.

(7) Connect electric power cable to emergency drive unit.

(8) Remove filler plug and check lubricant level. Add lubricant as required to raise lubricant level to bottom of filler port. Install filler plug.

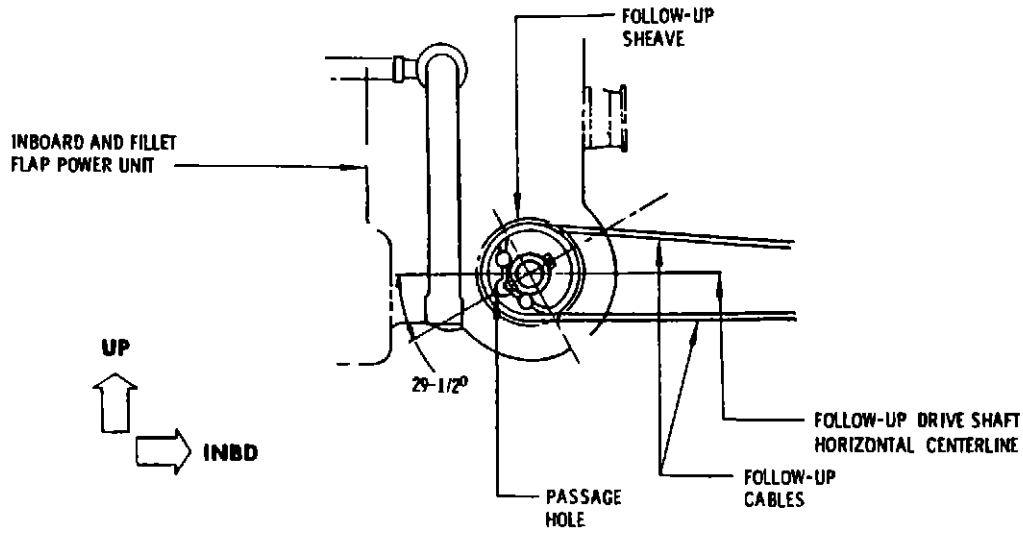
CAUTION: DO NOT MIX LUBRICANTS. MAKE SURE THAT LUBRICANT BEING ADDED IS THE SAME AS THAT IN THE GEARBOX.

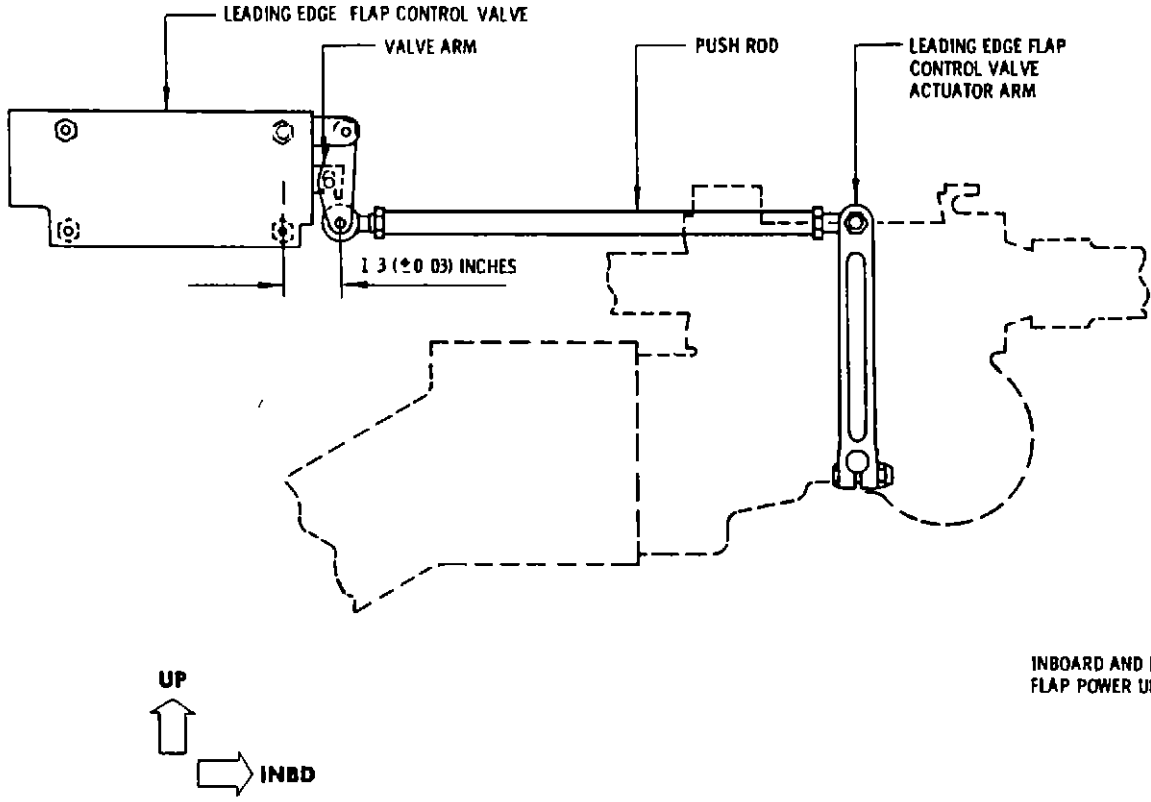
(9) Maintain a light counterclockwise load on leading edge flap control valve actuator arm (figure 202) and rotate inboard and fillet flap power unit output shaft so that actuator arm rotates to its maximum counterclockwise (vertical) position, as seen from the rear and as shown in figure 202.

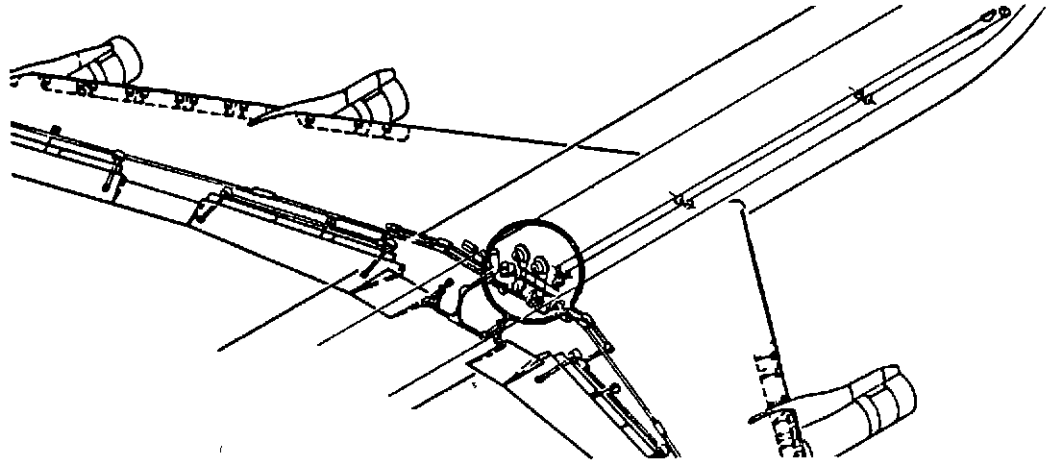
(10) Maintain light counterclockwise load on leading edge flap control valve actuating arm and adjust pushrod, between actuating arm and leading edge flap control valve, to obtain 1.30 (± 0.030) inch dimension shown in detail A, figure 202. Connect pushrod between actuating arm and valve.

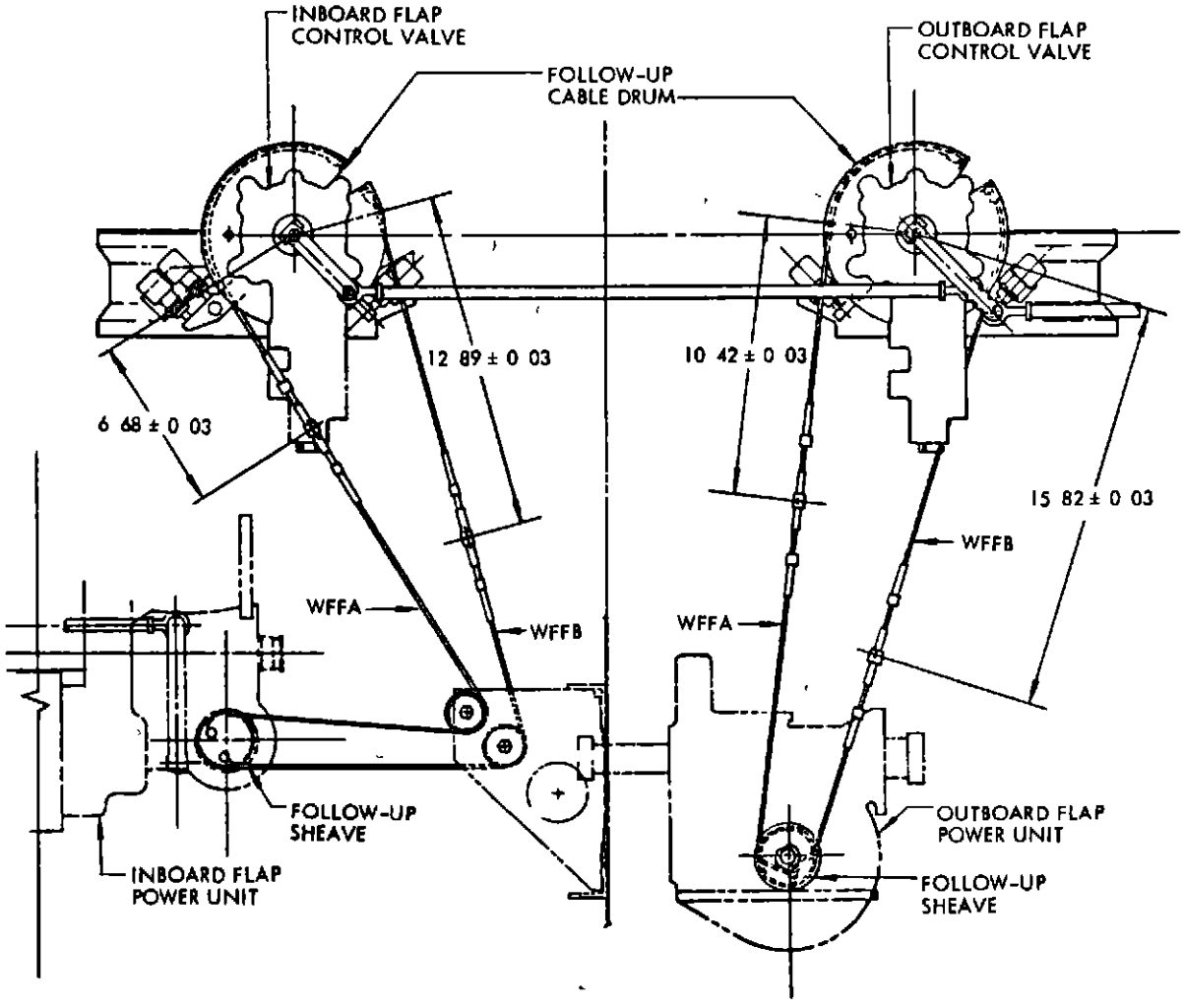
NOTE: Some slack in the leading edge flap control valve actuating arm is expected and normal. If a light counterclockwise load is maintained against the leading edge flap control valve actuating arm during adjustment, there will be no slack toward the leading edge flap control valve (to the left). Some slack may exist to the right so the actuator arm and pushrod may be shifted away from the leading edge flap control valve. This is normal and no correction is required.

(11) Continue to rotate power unit main shaft 3-1/8 turns counterclockwise to position pulley approximately as shown in figure 202. Check 29.5 degree pulley position visually.


FOLLOW-UP SHEAVE
INBOARD AND FILLET FLAP POWER UNIT
UP
INBD
29-1/2°
FOLLOW-UP DRIVE SHAFT HORIZONTAL CENTERLINE
FOLLOW-UP CABLES
PASSAGE HOLE


LEADING EDGE FLAP CONTROL VALVE
VALVE ARM
PUSH ROD
LEADING EDGE FLAP CONTROL VALVE ACTUATOR ARM
1 3 (±0 03) INCHES
UP
INBD
INBOARD AND FILLET FLAP POWER UNIT





Flap Follow-up Control Cable Adjustment
Figure 203

(12) With rig pin installed through control valve follow-up drum, tighten turnbuckles to adjust WFFA and WFFB follow-up cables (5, figure 201) to dimensions specified in figure 203, and to tension specified in figure 203, 27-16-0. Cable terminals must not contact follow-up drum or follow-up sheave.

(13) Check positions of both inboard trailing edge flaps and fillet flaps. Flaps must be in completely retracted position as described in 27-16-0, Adjustment/Test - Wing Flaps and Flap Control System. If necessary, use splined coupling spanner wrench to retract fillet flaps and each inboard main flap.

(14) With flaps in proper retracted positions, connect torque tubes (3) to power unit. Connect inboard torque tube between power unit and angle gearbox in right wheel well. **Install coupling retaining screws and lockwire** screw heads together.

(15) **Remove rigging pins from control valve follow-up drum.**

(16) Pressurize utility hydraulic system.

(17) Connect electric power to airplane.

(18) Install control surface protractor and protractor clamp assemblies on trailing edge of left main inboard flap. Adjust protractor to zero degrees.

(19) Slowly rotate flap control lever toward the down position until leading edge flap position indicating lights are illuminated. Check trailing edge flaps for extension of 5° to 9°.

(20) Position flap control lever in FLAPS DOWN 50° detent. Flaps shall extend 49° to 50°. Check right and left main inboard flaps. Fillet flaps shall extend 47° to 50°. Check that WFFA and WFFB cable terminals, adjusted in step (12), do not contact follow-up drum or sheave.

(21) Slowly rotate flap control lever toward FLAPS UP 0 until leading edge flap position indicating lights are no longer illuminated. Trailing edge flaps shall be extended 4° to 8°.

(22) Retract flaps. Flaps shall retract to faired position as described in 27-16-0, Adjustment/Test - Wing Flaps and Flap Control System. Follow-up cable terminals, adjusted in step (12), must not contact follow-up drum or sheave.

(23) Operate flaps through three complete cycles to bleed hydraulic system.

(24) Check inboard flap hydraulic drive motor, hydraulic lines and fittings, and power unit for leakage.

(25) Depressurize utility hydraulic system. Disconnect electric power from airplane.

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OUTBOARD FLAP POWER UNIT - MAINTENANCE PRACTICES

1. General

   A. When removing the flap power unit, loosen hydraulic tubing adjacent to the hydraulic motor by loosening support clamps and other fittings to allow slack in the tubing for removal from motor fittings. A container will be required to catch spilled fluid. Should any fluid spill on the airplane, decontaminate. Refer to Cleaning and Washing, Chapter 12.

2. Removal/Installation Outboard Flap Power Unit

   A. Equipment and Materials

      (1) Tensiometer

      (2) Power unit lubricant

         (a) A mixture, by volume, of one part Aeroshell Grease 7A and four parts MIL-L-7808 lubricating oil.

         (b) Not applicable to SABENA aircraft.

      (3) Pneumatic System Grease - MIL-G-4343

      (4) Zinc Chromate Primer - MIL-P-8585

      (5) Aliphatic Naphtha - TT-N-95, Standard 265, or equivalent

      (6) Delchem E-Z Strip 19-A - Turco 5351, or equivalent

      (7) Splined Coupling Spanner Wrench - F71228, or equivalent

      (8) Control Surface Protractor Assembly - F52485-500, or equivalent

      (9) Protractor Clamp Assembly - F71292-16, or equivalent

   B. Remove Outboard Flap Power Unit

      (1) Open main wheel well doors.

(2) Disconnect electric power cable from outboard flap emergency drive unit.

CAUTION: EMERGENCY DRIVE UNIT MUST BE DISCONNECTED TO PREVENT ACCIDENTAL OPERATION OF OUTBOARD FLAPS. SUCH OPERATION WITH TORQUE TUBES DISCONNECTED COULD RESULT IN DAMAGE TO THE SYSTEM AND LOSS OF ADJUSTMENT.

(3) Disconnect torque tubes (4, figure 201) from each side of power unit (5).

(4) Loosen turnbuckles to provide slack in follow-up cables (1).

(5) Remove retaining bolt from follow-up sheave (6) and remove sheave from shaft.

(6) Install AN395 rig pin, or AN5 bolt, through follow-up drum and flap control valve support bracket. If necessary, rotate drum to rig position.

NOTE: The hydraulic system should be depressurized before hydraulic lines are disconnected; however, if the flap control valve is closed (in null position), the utility system may be pressurized with the flap motor lines disconnected. If the system is to be pressurized with motor lines disconnected, the rig pin must be installed through the follow-up drum and the crank on the control cable drum must be secured against the upstop (figure 206, 27-16-0) in order to prevent any movement of the valve.

(7) Disconnect hydraulic lines from flap drive hydraulic motor (9).

(8) Remove power unit mounting bolts and remove power unit.

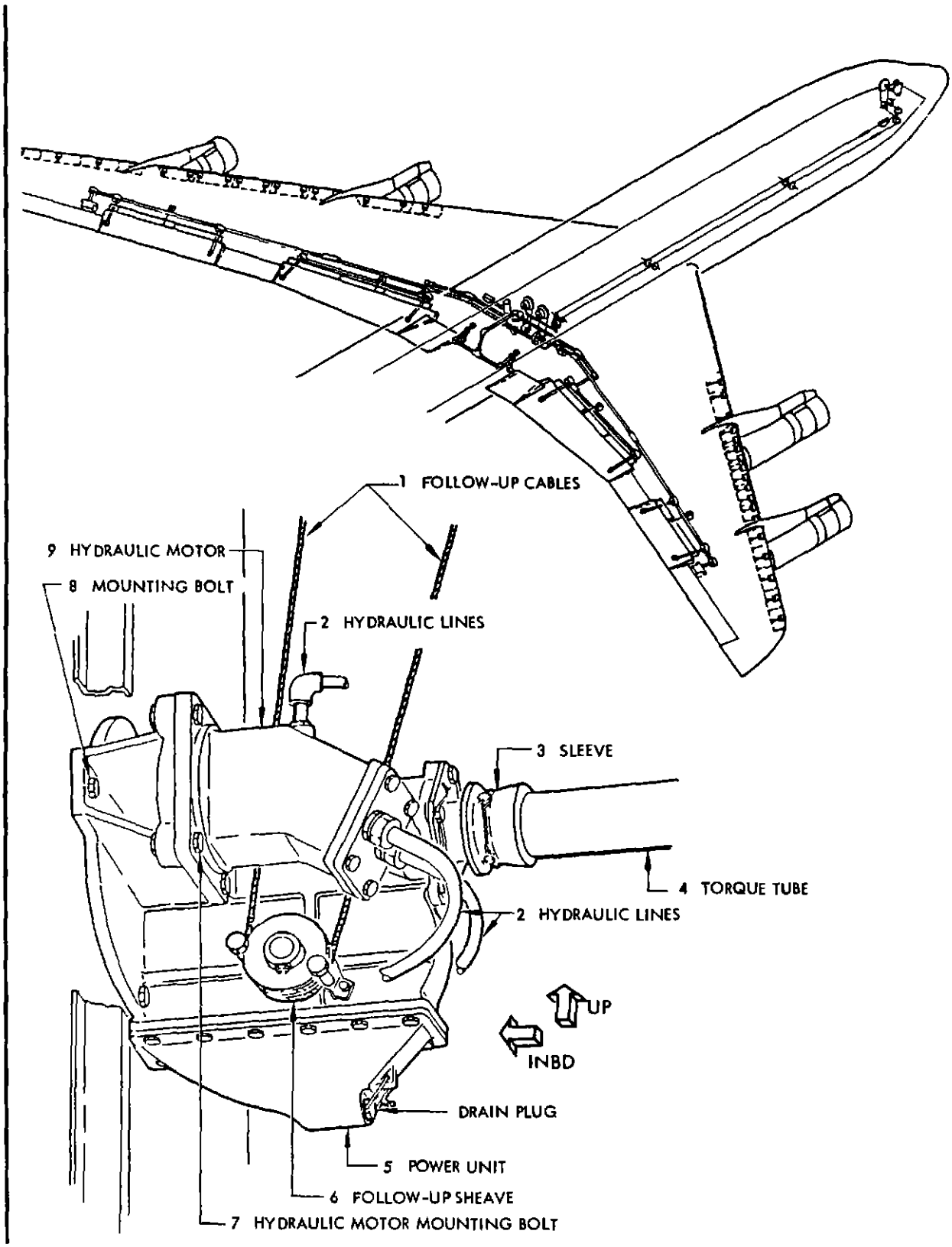
C. Install Outboard Flap Power Unit

(1) Remove filler plug from power unit (5, figure 201) and check lubricant level. Add lubricant as necessary to raise level to approximately 1-1/8 inch from top of filler port.

CAUTION: DO NOT MIX LUBRICANTS. MAKE SURE THAT LUBRICANT BEING ADDED IS THE SAME AS THAT IN THE POWER UNIT

(2) Apply a light film of grease, MIL-G-4343 on plug and install plug in filler.

(3) Dip mounting bolts (8) in Delchen E-Z Strip 19-A. Remove and rinse with water. Wipe bolts clean with cloth moistened with aliphatic naptha, TT-N-951 Standard 265 or equivalent.


1 FOLLOW-UP CABLES
9 HYDRAULIC MOTOR
8 MOUNTING BOLT
2 HYDRAULIC LINES
3 SLEEVE
4 TORQUE TUBE
2 HYDRAULIC LINES
UP
INBD
DRAIN PLUG
5 POWER UNIT
6 FOLLOW-UP SHEAVE
7 HYDRAULIC MOTOR MOUNTING BOLT

(4) Dip mounting bolts in zinc chromate primer.

(5) Position power unit on keel beam and install wet mounting bolts.

(6) Connect hydraulic lines (2) to motor.

(7) Check that rigging pin, or AN5 bolt, is installed through follow-up drum and flap control valve support bracket.

(8) Slide follow-up sheave (6) on power unit follow-up shaft; do not install bolt. Tighten turnbuckles in follow-up cables WFFA and WFFB to obtain dimensions, between centers of turnbuckles and points of tangency between cables and control valve follow-up drum, shown on figure 202 and to obtain required cable tension specified in figure 203, 27-16-0.

(9) Using splined coupling spanner wrench, rotate power unit output shaft to align bolt hole through power unit follow-up shaft with hole in follow-up sheave. Install bolt. Check that follow-up cable terminals do not contact follow-up drum or shaft.

(10) Connect torque-tubes (4), on each side of power unit. Install coupling retaining screws and lockwire screw heads together.

CAUTION: MAKE SURE THAT FLAPS ARE COMPLETELY RETRACTED TO FAIRED POSITION BEFORE CONNECTING TORQUE TUBES.

(11) Remove rig pin from control valve follow-up drum and release control cable drum crank from upstop.

(12) Connect electric power cable to outboard flap emergency drive unit.

(13) Pressurize utility hydraulic system.

(14) Install protractor and protractor clamp assemblies on trailing edge of outboard flap. With flap in faired position, set protractor at zero.

(15) Extend flaps. Outboard flaps must extend 49° to 50°. Retract flaps. Mount protractor on other outboard flap and check flap extension.

(16) Remove protractor and clamp assemblies.

(17) Operate flaps through a third complete cycle to remove all air from hydraulic lines. Check power unit for rough operation, unusual noise, loose mounting, or any other evidence of faulty unit or installation. Check all hydraulic lines and motor for leaks. Check that follow-up cable terminals, adjusted in step (8), do not contact follow-up drum or sheave.

(18) Depressurize utility hydraulic system.

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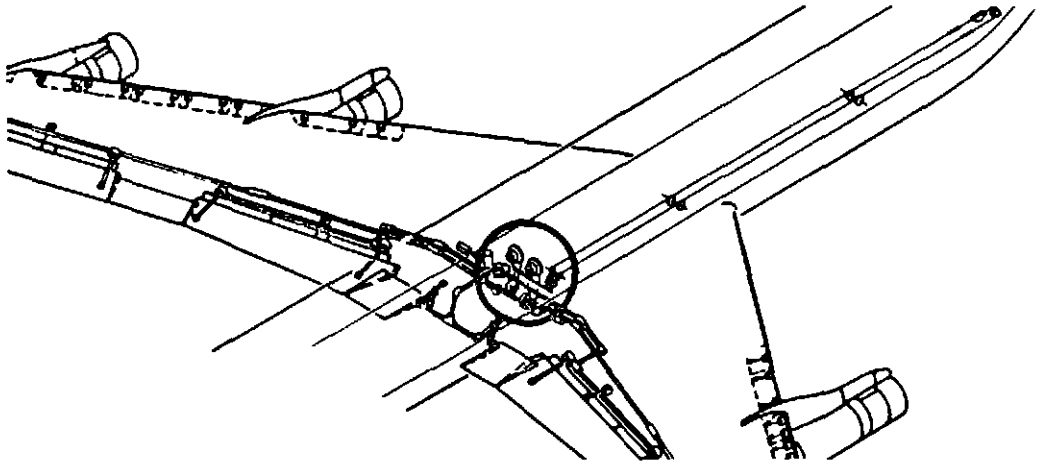

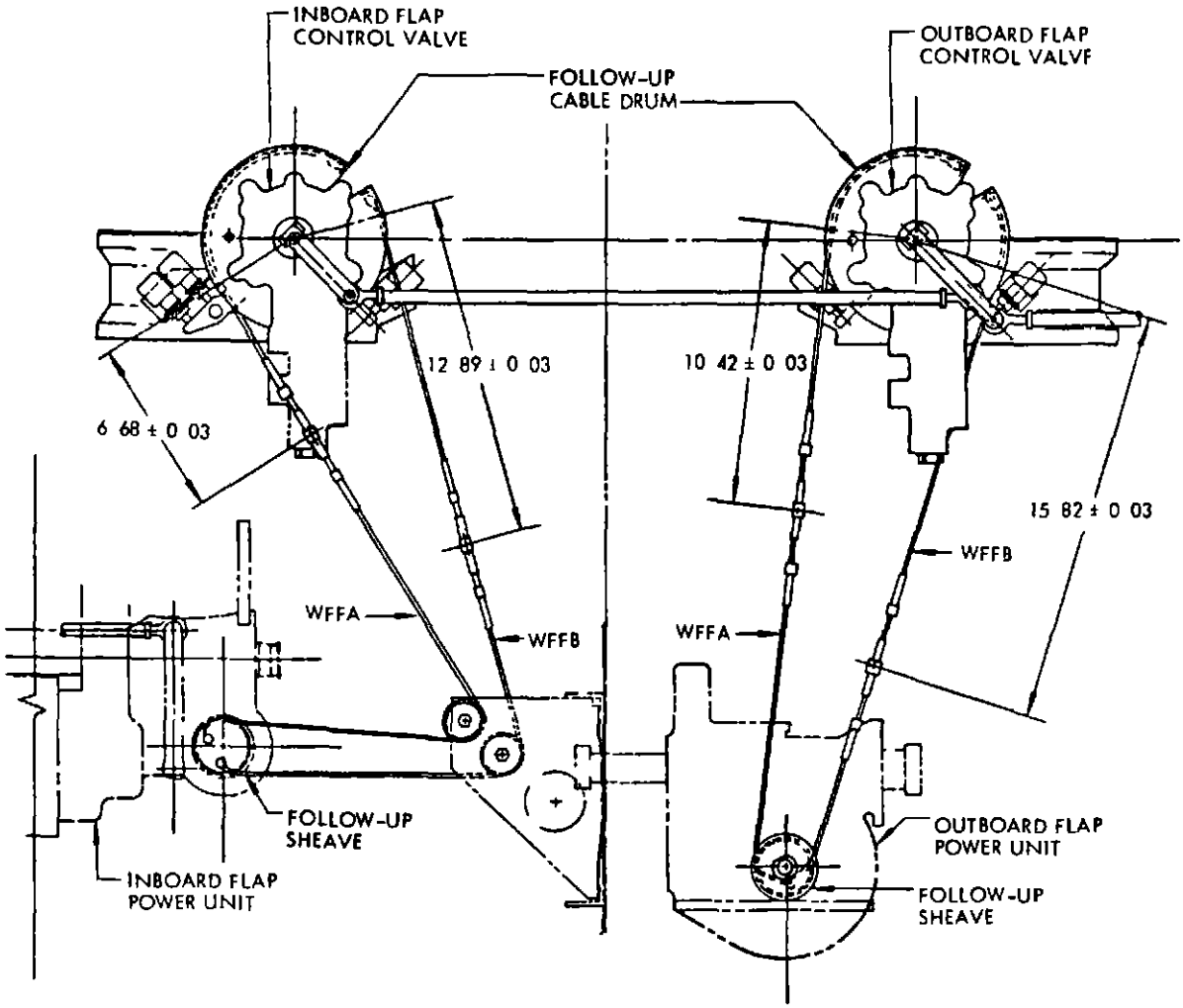

Flap Follow-up Control Cable Adjustment
Figure 202

LEADING EDGE FLAPS - MAINTENANCE PRACTICES

1. General

   A. The airplane is equipped with three leading edge flaps on each wing, located inboard and adjacent to the inboard nacelle strut. These flaps are numbered one, two and three; leading edge flap No. 1 is adjacent to the inboard nacelle, flap No. 2 and No. 3 are inboard from No. 1.

   B The leading edge flaps are hydraulically actuated. Two actuators are used to actuate each flap.

2. Removal/Installation - Leading Edge Flaps

   A. Equipment and Materials

      (1) Leading Edge Flap Lock Assembly - F70144, or equivalent

      (2) Control Surface Protractor Assembly - F52485-500, or equivalent

      (3) Protractor Stand Assembly - F71292-17, or equivalent

      (4) Zinc Chromate Primer, MIL-P-8585, or equivalent

      (5) Paint, AN23 Epoxy Enamel, Semigloss Gray (Andrew Brown Co.)

      (6) Silicone Compound, MIL-L-8660

      (7) Alodine 1200

      (8) Aerodynamic Smoother and Environmental Sealant

      (9) General Purpose Cleaning Solvent

B. Remove Leading Edge Flap

(1) Pressurize utility hydraulic system.

(2) Extend wing flaps.

NOTE: Leading edge flaps will be fully extended when main flaps are extended about 6 degrees. It is not necessary to completely extend main flaps.

(3) Install leading edge flap lock assembly.

WARNING: MAKE SURE THAT LOCK ASSEMBLY IS PROPERLY INSTALLED TO PREVENT OPERATION OF LEADING EDGE FLAPS AND SLATS. OPERATION OF SLATS DURING MAINTENANCE COULD RESULT IN DAMAGE TO THE AIRPLANE OR SERIOUS INJURY TO MAINTENANCE PERSONNEL.

(4) Depressurize hydraulic system.

(5) Disconnect bonding jumpers (1, figure 201) from clip angle on hinge fittings in wing leading edge.

(6) Disconnect forward link assembly (2) from bracket assembly on fixed leading edge structure.

(7) Remove bolts attaching leading edge flap actuators (4) to leading edge flap (9).

(8) Remove hinge bolts (3) and remove leading edge flap.

(9) Disconnect aft link assembly (8) from leading edge flap nose fairing (6).

(10) Remove bolt attaching link arm (7) to support bracket and remove link arm and forward and aft link assemblies from flap.

C Install Inboard Leading Edge Flap

(1) Install bolts and bushings to attach link arm (7, figure 201) to support bracket on leading edge flap (9).

(2) Position aft link assemblies (8) in fitting on leading edge flap fairing. Dip bushings in primer, and assemble bushings over bolts. Install bolts and bushings.

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(3) Install hinge bolts as follows:

(a) Assemble bushings over all hinge bolts.

(b) Align hinges on flap with hinge fittings in wing leading edge and install two end hinge bolts.

(c) With end hinge bolts installed, maximum permissible misalignment between center hinge holes is 0.040 inch. Align holes using bullet-nosed drift pin; tap bolt in place with a light mallet. This will eliminate possibility of damaging hinge fitting.

NOTE: If hinge bolt hole misalignment exceeds 0.040 inch, there should be no attempt to make it fit. A different flap should be used.

(d) Install two 0.032-inch thick and one 0.016-inch thick washers under nut at flap No. 1 center hinge, at flap No. 2 center hinge, and at all hinges on flap No. 3. Install one 0.032-inch thick washer under nut at flap No. 1 and No. 2 end hinges. Use washers if and as required to allow torquing as in step (e).

(e) Tighten nuts to between 290 and 410 pound-inches torque. Tighten or loosen nut as required to align cotter key holes and install cotter keys.

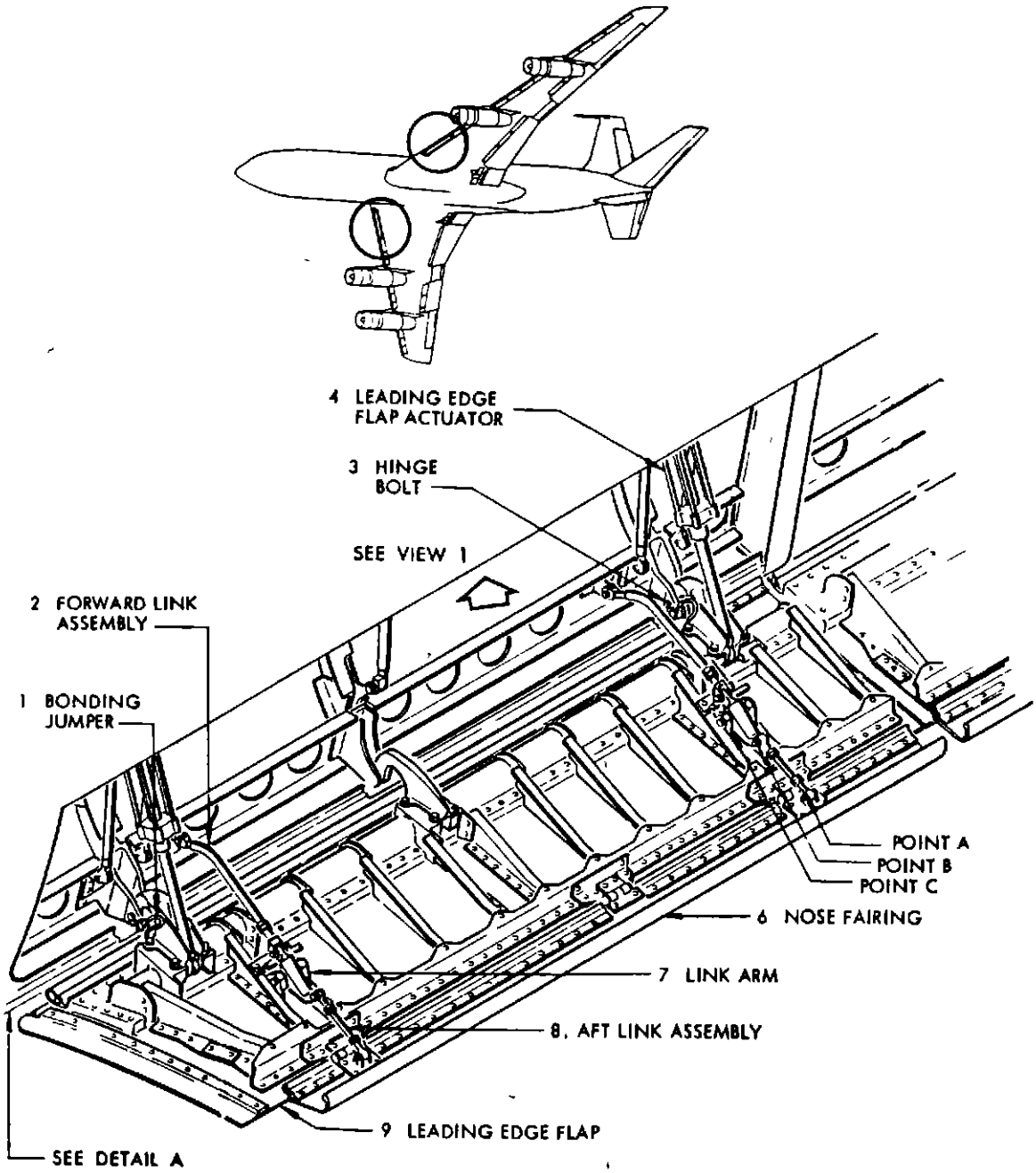
(4) Manually extend leading edge flap and check that minimum clearance between flap and leading edge skin is 0.12 inch. (See detail A, figure 201.) Trim forward edge of flap as required to provide clearance. Brush alodize reworked area of flap. Apply one coat of primer and two coats of paint to area.

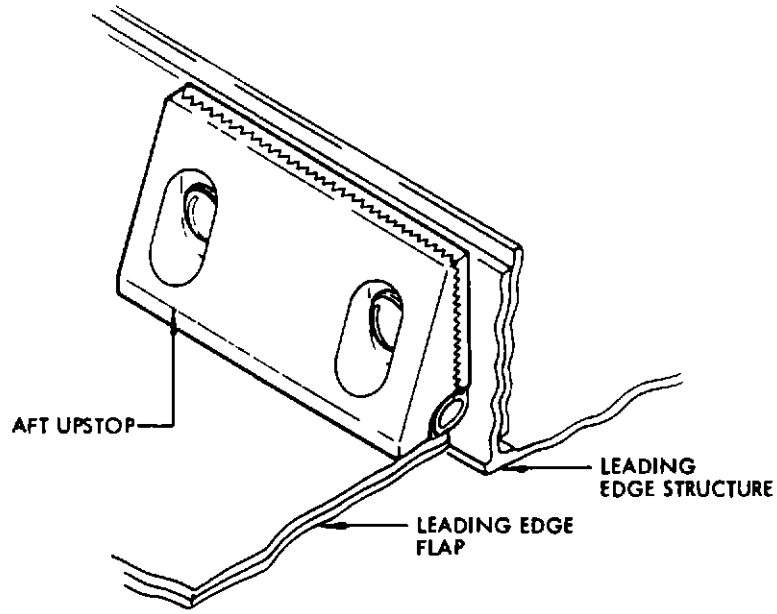
(5) Position flap actuator rod end in fitting in leading edge flap and insert bolt. Do not install nut.

(6) Extend flap manually until flap actuators bottom.

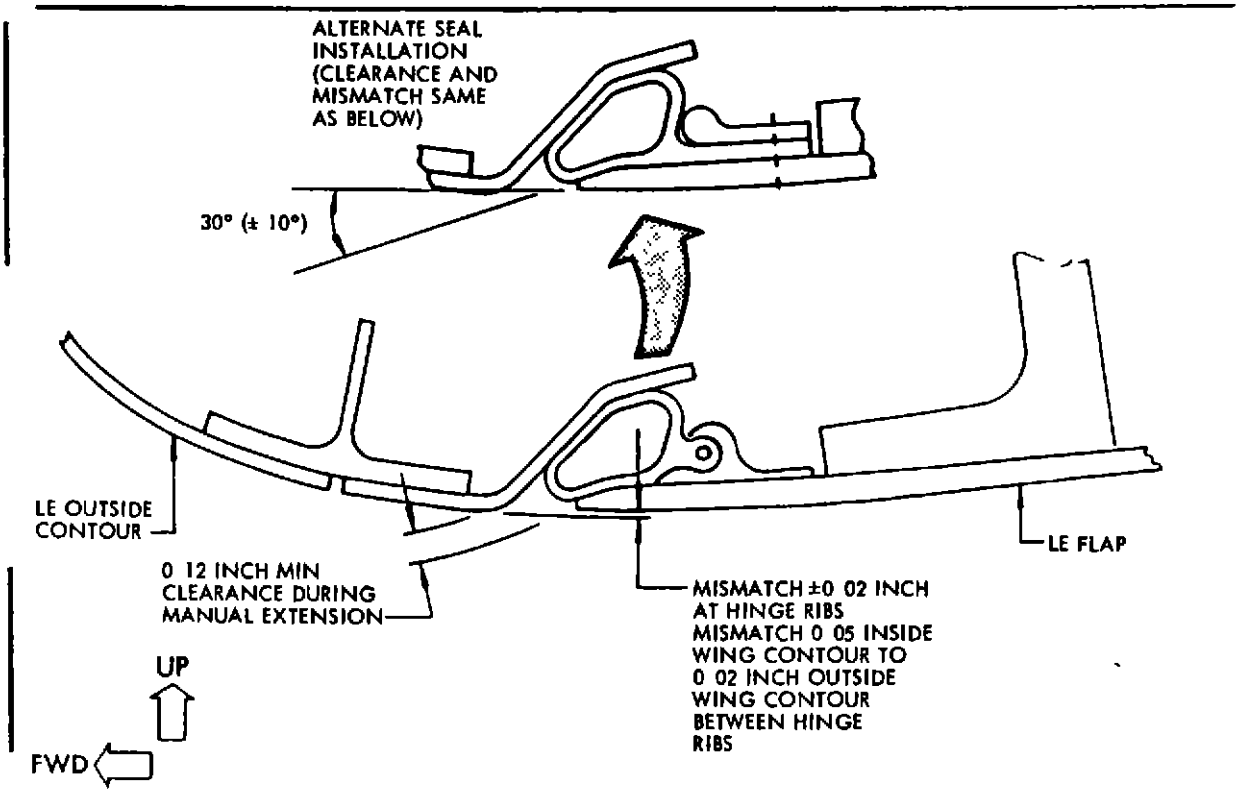
NOTE: Manual operation of leading edge flaps requires that utility hydraulic system be depressurized or that leading edge flap bypass valves be open. Bypass valves are opened by moving No. 3 reverse thrust lever to reverse thrust position and energizing the airplane electrical system, or manually by shifting applicable valve override lever to position No. 2.

(7) With flap extension adjusted, install actuator attach bolts. Do not install nuts.


4 LEADING EDGE FLAP ACTUATOR
3 HINGE BOLT
SEE VIEW 1
2 FORWARD LINK ASSEMBLY
1 BONDING JUMPER
POINT A
POINT B
POINT C
6 NOSE FAIRING
7 LINK ARM
8. AFT LINK ASSEMBLY
9 LEADING EDGE FLAP
SEE DETAIL A



VIEW I



DETAIL A

(8) Connect bonding jumpers (1) to clip angle on hinge fittings in wing leading edge.

(9) Adjust leading edge flap fairing linkage as follows:

(a) Adjust forward link assembly to dimension A (figure 202) and connect to support bracket in wing leading edge.

NOTE: Curve in forward link assembly must always be away from leading edge flap.

(b) Adjust aft link assembly to 6 22 (±0.03) inches and connect between link arm (7, figure 201) and leading edge fairing.

(c) With flap in full open position check that lower fairing surface and flap contour are aligned within 2°.

(d) If flap fairing is not parallel with flap contour, adjust aft link assembly as required to position fairing within 2° of a straight line and so that fairing will clear fixed structure by a minimum of 0.12 inch in flap closed position. (See figure 202.)

(e) Check that pivot points A, B and C are in line within 0.25 inch. (See figure 202.)

(10) Remove bolt connecting leading edge flap actuator rod end to leading edge flap hinges.

(11) Rotate flap manually to closed position and check that minimum clearance between fairing and fixed structure is 0.12 inch.

(12) Lower flap.

(13) Align each actuator rod end with leading edge flap hinge and install bolt. Install thin washer between bearing race in actuator rod end and flap hinge and thick washer under bolt head and under nut. Tighten nut to between 270 and 300 pound-inches torque on leading edge flaps Nos. 1 and 2 and to between 95 and 110 pound-inches torque on leading edge flap No. 3. Tighten or loosen nut as required to align closest cotter key hole and install cotter key.

(14) Remove flap actuator lock assemblies.

(15) Pressurize utility hydraulic system.

(16) Retract flaps.

(17) Check that gap between leading edge flaps Nos. 1 and 2 is 0.12 (+0.06/-0.03) inch at forward end and 0.18 (+0.06/-0.03) inch at aft end. Trim installed flap as required to maintain clearance. Refinish flap per step (4).

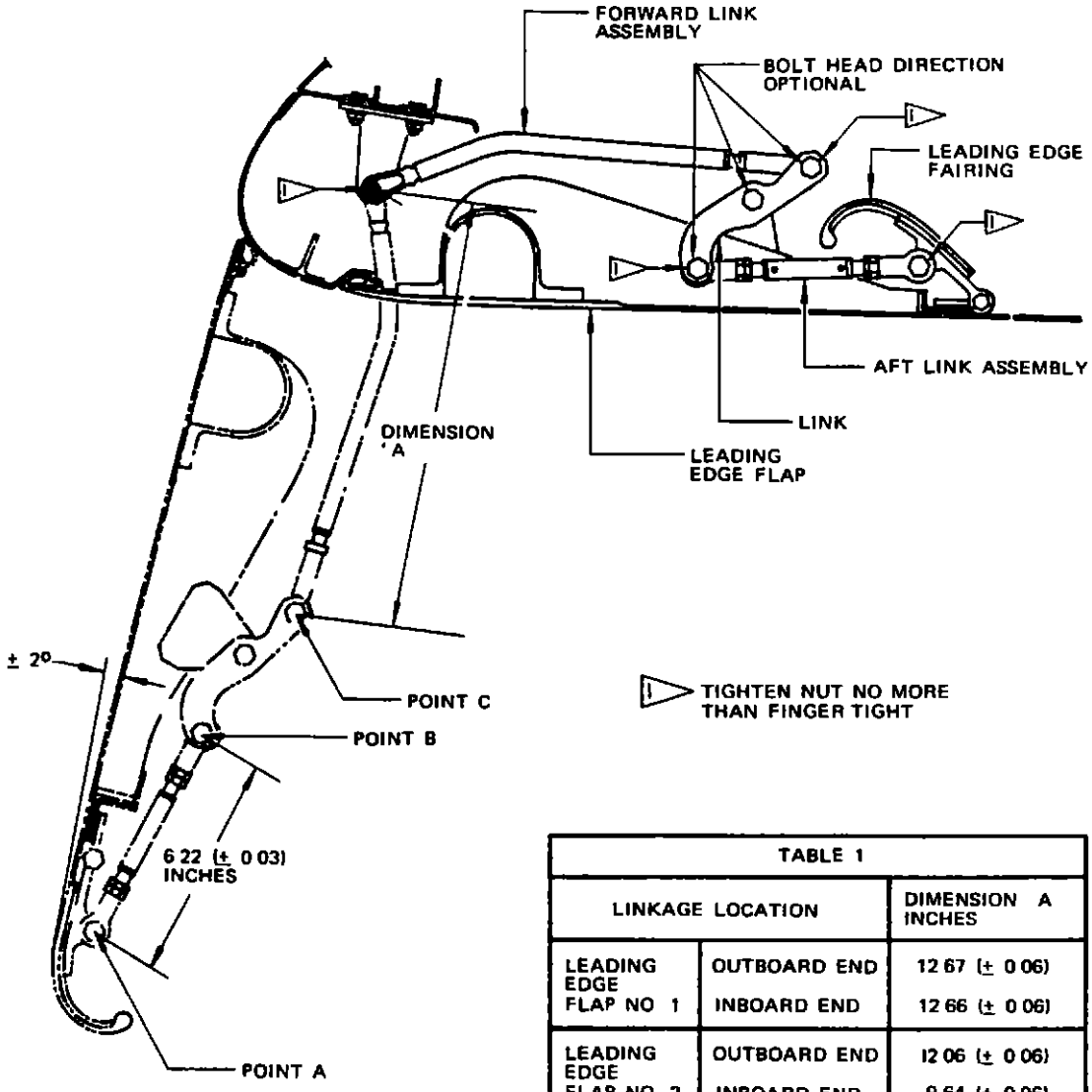


TABLE 1		
LINKAGE LOCATION		DIMENSION A INCHES
LEADING EDGE FLAP NO 1	OUTBOARD END	12 67 (± 0 06)
	INBOARD END	12 66 (± 0 06)
LEADING EDGE FLAP NO 2	OUTBOARD END	12 06 (± 0 06)
	INBOARD END	9 64 (± 0 06)
LEADING EDGE FLAP NO 3	OUTBOARD END	8 95 (± 0 06)
	INBOARD END	8 75 (± 0 06)

(18) Check that gap between outboard end of leading edge flap No. 1 and adjacent rib structure is 0.12 (+0.12/-0.06) inch. Trim skin on rib as required to maintain gap. Brush alodize reworked skin. Apply one coat of primer and one coat of paint to reworked area.

(19) Check that gap between leading edge flaps Nos. 2 and 3 is 0.12 (+0.03/-0 06) inch. Trim installed flap and refinish per step (4).

(20) Check that gap between inboard end of leading edge flap No. 3 and adjacent rib structure is 0.12 (+0.03/-0.06) inch. Trim lower rib skin as required and refinish per step (4).

(21) Check that leading edge of flap fairs with lower wing contour At hinge rib locations, within 2 inches of hinge ribs, mismatch shall not exceed 0.02 inch. Between hinge rib locations, mismatch shall be no more than 0.02 inch outside wing contour and no more than 0.05 inch inside contour. Add or remove shims under flap hinge as necessary to obtain required contour.

(22) Check that trailing edge of flap fairs with lower wing contour. At upstop location, within 2 inches of upstops, mismatch shall not exceed 0 02 inch. Between upstop locations, mismatch shall not exceed 0.05 inch outside contour or 0 02 inch inside contour. Add or remove shims as necessary at lower rib chords at each end of flap and at upstops to obtain required contour.

(23) Check that leading edge flap fairs with adjacent flap within 0.03 inch.

(24) Check that gap between trailing edge of flap and aft panel is 0.05 to 0.16 inch. Trim aft panel as required to obtain specified gap. Brush alodize reworked edge of panel. Apply one coat of primer and one coat of paint to reworked area.

(25) Extend flaps.

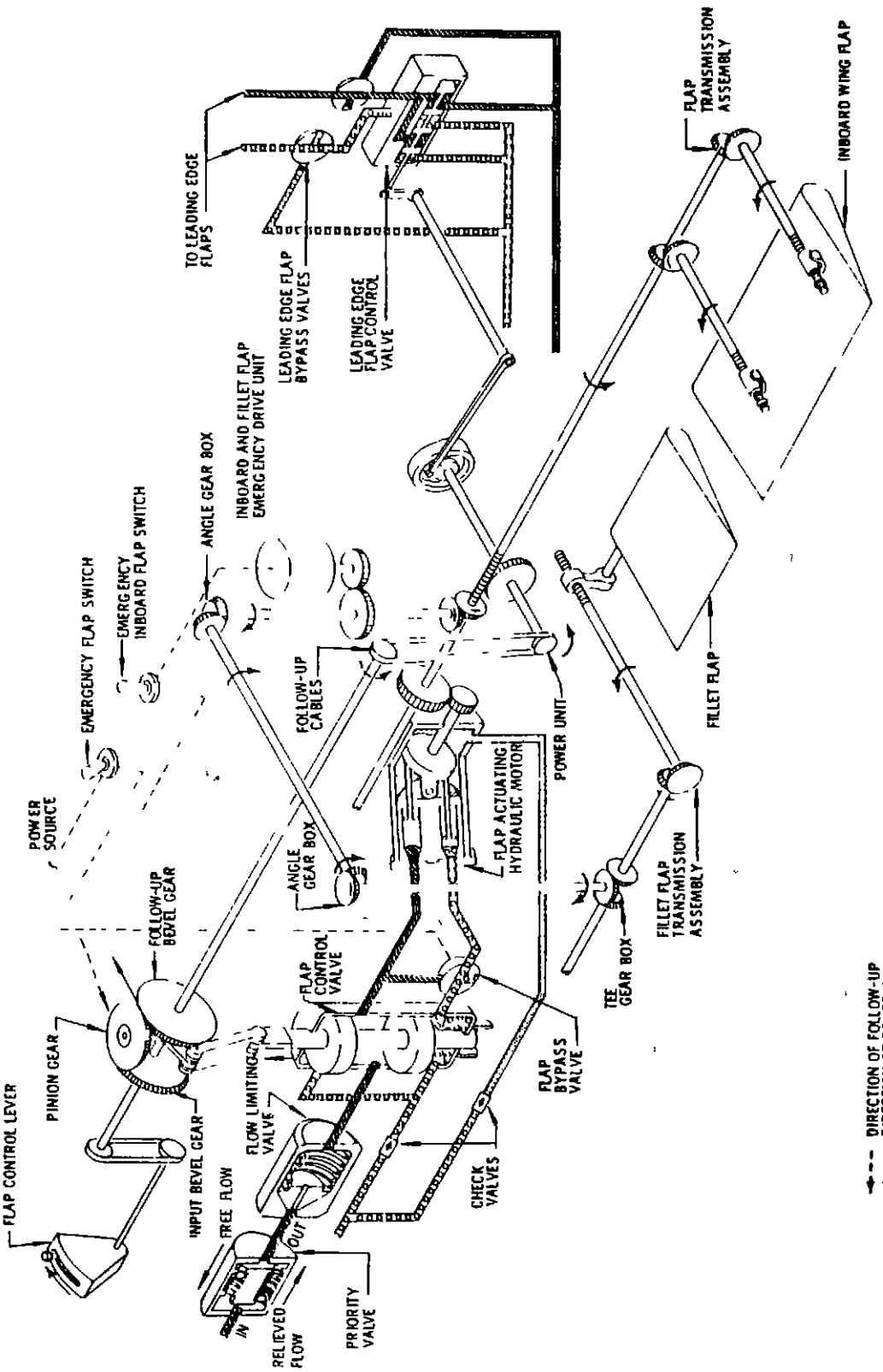
(26) Check for flap leading edge seal compression of 0.060 inch.

(27) Check that leading edge flap extends 102° 30' (± 1°).

(28) Check that gap between leading edge flap No. 1 and inboard nacelle strut is 0.50 (+0.30/-0.06) inch. Measure gap normal to nacelle strut.

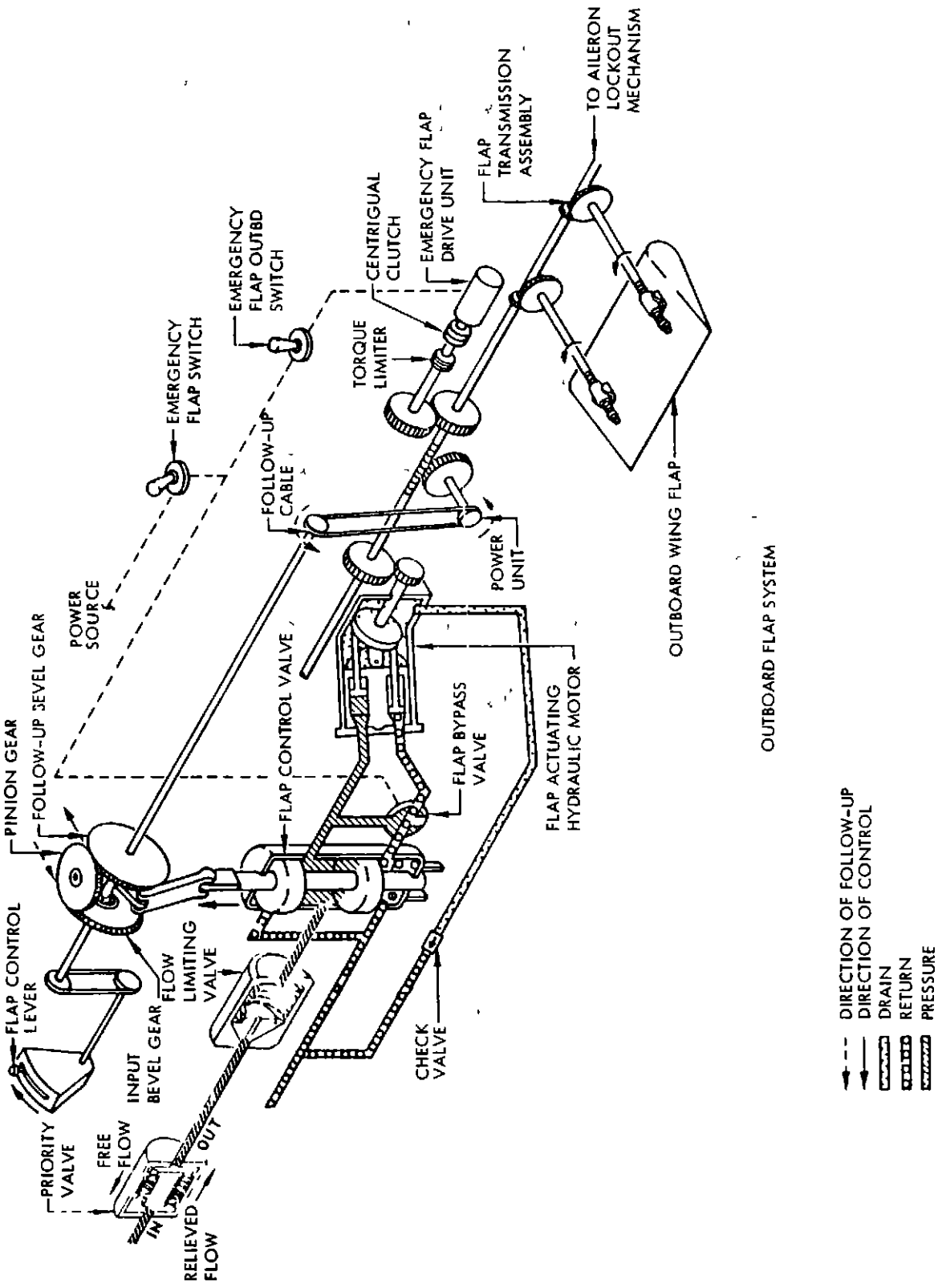
(29) Retract flaps.

(30) Disconnect hydraulic pressure source.



INBOARD FLAP SYSTEM

Wing Flap System Schematic
Figure 18 (Sheet 1 of 2)



Wing Flap System Schematic
Figure 18 (Sheet 2)

C Dual position indicators on the copilot's instrument panel register the angular position, in degrees, of each main trailing edge flap. Each indicator receives flap position information from a cable actuated position transmitter assembly located forward of each main flap The indicators and transmitters are supplied with 28 volt ac power through ac circuit breaker panel (P7) (See figure 12) Two position indicating lights indicate full extension of the leading edge flaps and slats. When the leading edge surfaces are fully extended, each set of flaps and slats closes a microswitch (figure 16) in its position indicating circuit. The lights receive 28 volt dc power through the radio and T-R circuit breaker panel (P5).

D In the event of utility hydraulic system failure, two electrically-driven emergency flap drive units provide alternate means of operating the trailing edge flaps The emergency drive units are controlled by three emergency flap switches on the overhead panel (See figure 9) When the emergency flap switch is positioned to "ON," 28 volt dc power is supplied to both flap bypass valves, causing valve actuation to the bypass position This interconnects the hydraulic motor ports to prevent a hydraulic lock during emergency flap operation At the same time 28 volt dc power is supplied to the emergency inboard and outboard flap switches Actuation of the emergency outboard flap switch to either "UP" or "DOWN" completes a circuit through the emergency outboard flap relays to supply 115 volt ac, three-phase power to the outboard emergency drive unit. The unit drives outboard flap torque tubes to operate the outboard trailing edge flaps. Actuation of the emergency inboard flap switches to "UP" or "DOWN" completes a circuit to the coil of one of the emergency inboard flap relays through a limit switch on the flap control valve and limit switch in the flap bypass valve The bypass valve limit switch prevents inboard flap operation until the bypass valve is fully opened. This completes a circuit supplying three-phase, ac power and 28 volt dc power to the inboard flap emergency drive unit. The dc power is used to pull in the electric clutch in the unit. Limit switches open to break the circuit at the extreme ends of travel. Actuation of the emergency inboard and outboard flap switches to the opposite position, pulls in the opposite relays, changing the phase sequence of the motors, and causes reverse operation The flaps may be stopped in any position desired by returning the emergency inboard and outboard flap switches to "OFF."

WING FLAPS AND FLAP CONTROL SYSTEM - TROUBLE SHOOTING

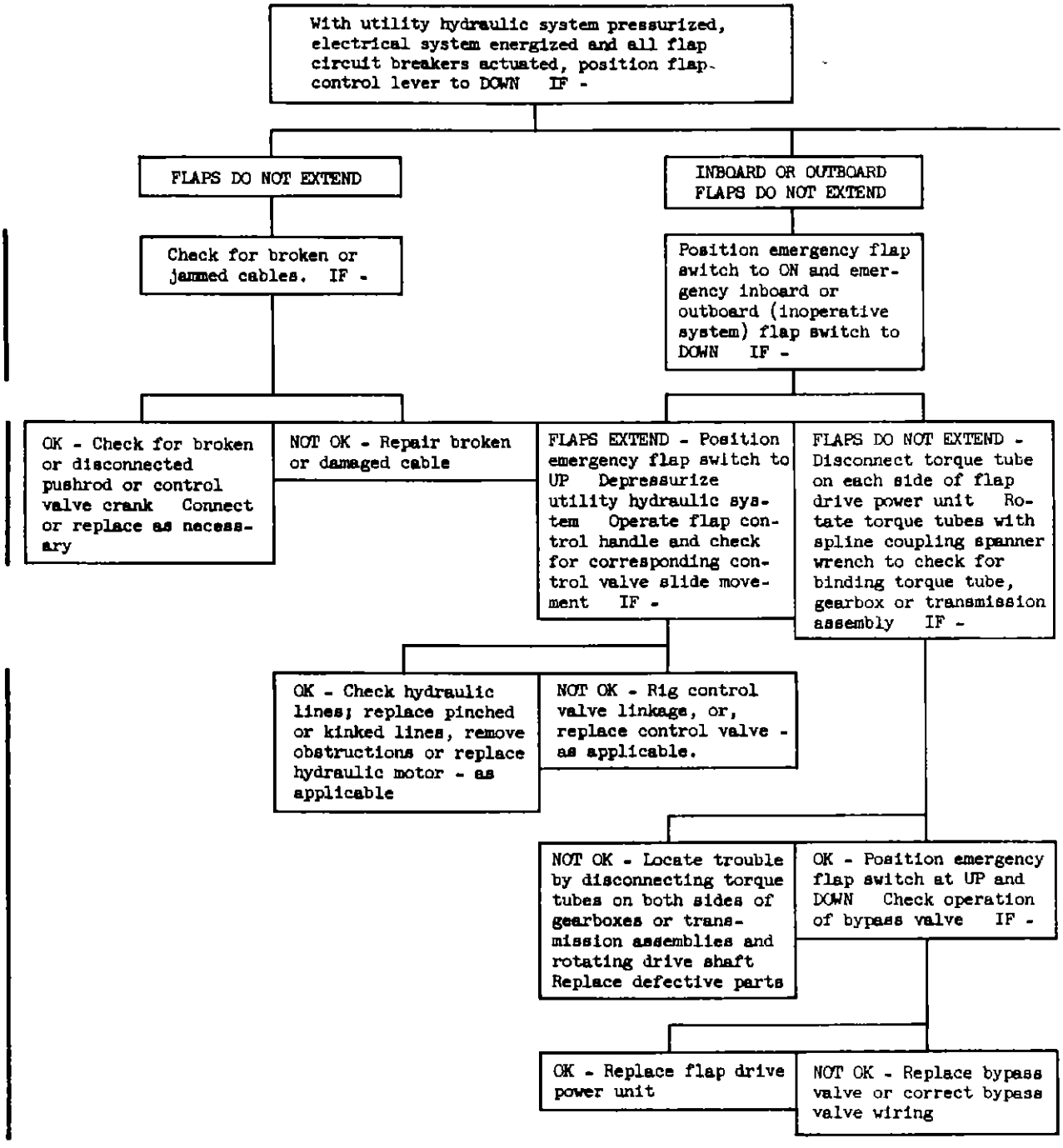
1 General

A Troubles in the wing flap control system may occur in the normal or emergency flap systems Therefore, when a malfunction is suspected in the emergency flap system, the normal flap system must be tested to determine the location of the trouble When trouble shooting the normal flap system refer to the Wing Flaps and Flap Control System Trouble Shooting Chart If trouble shooting the emergency flap system, refer to the Emergency Flap Drive System Trouble Shooting Chart

B Special Tools and Equipment

(1) Spline Coupling Spanner Wrench - F71228 or equivalent

2 Wing Flaps and Flap Control System Trouble Chart



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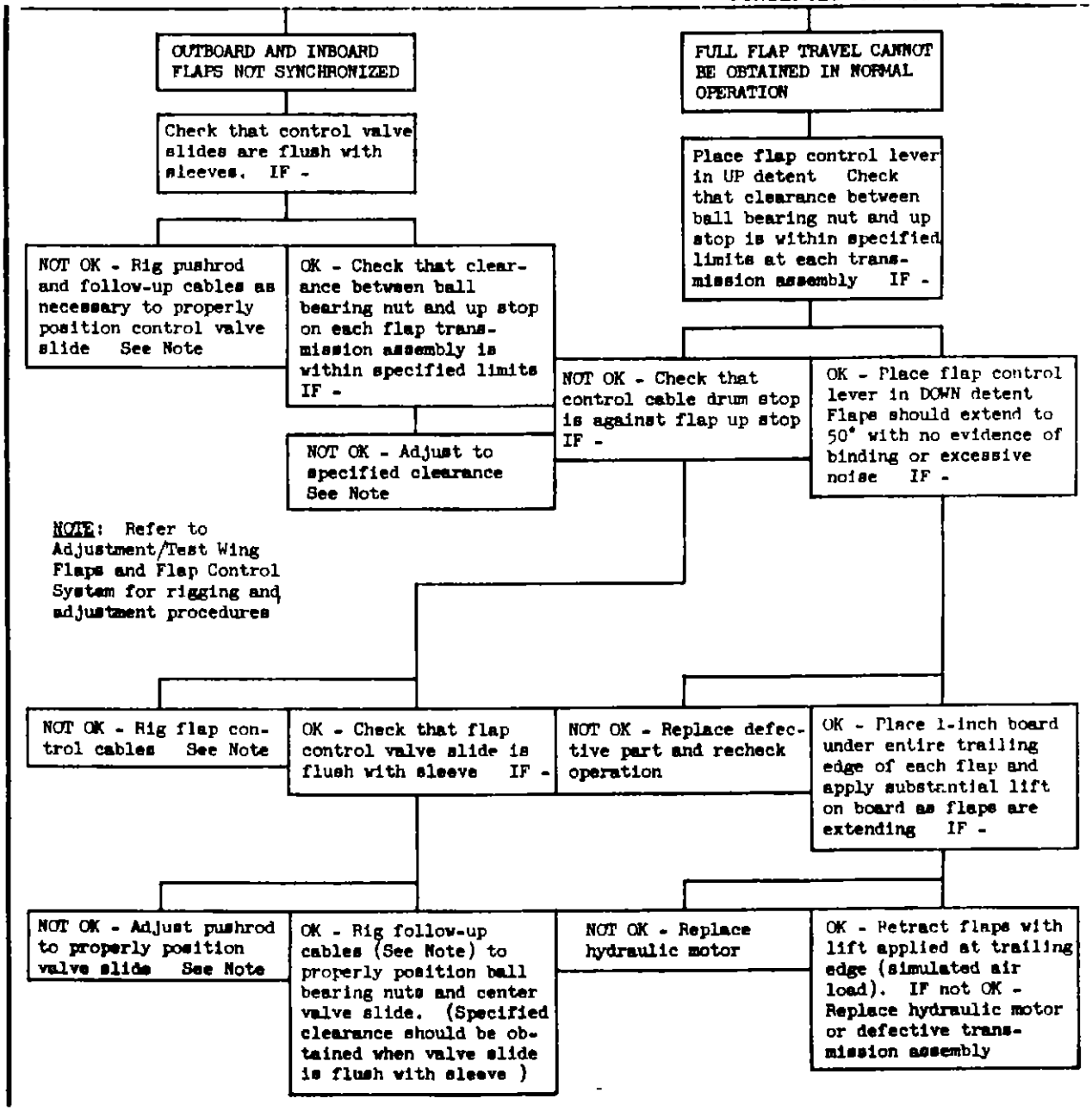

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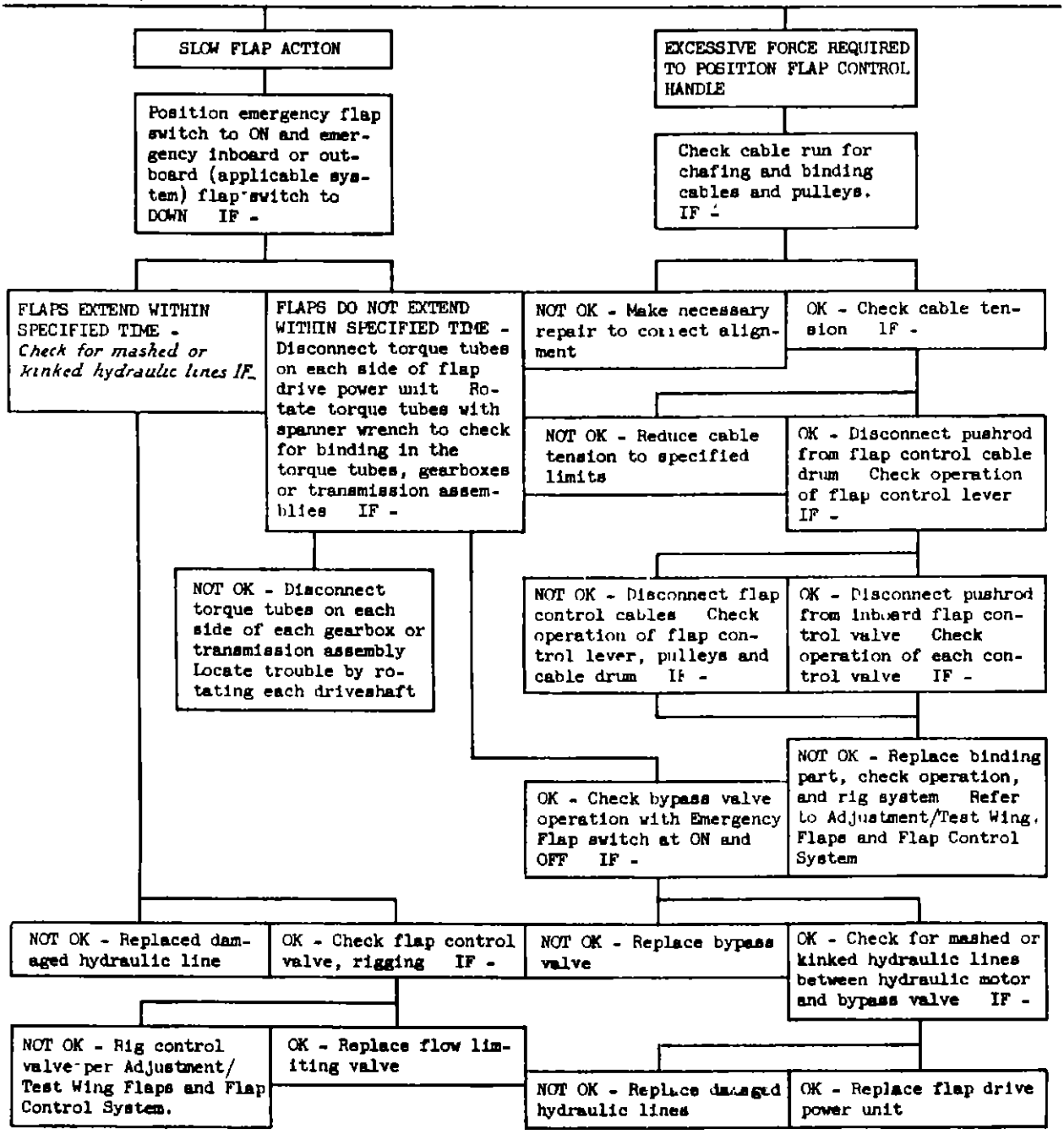

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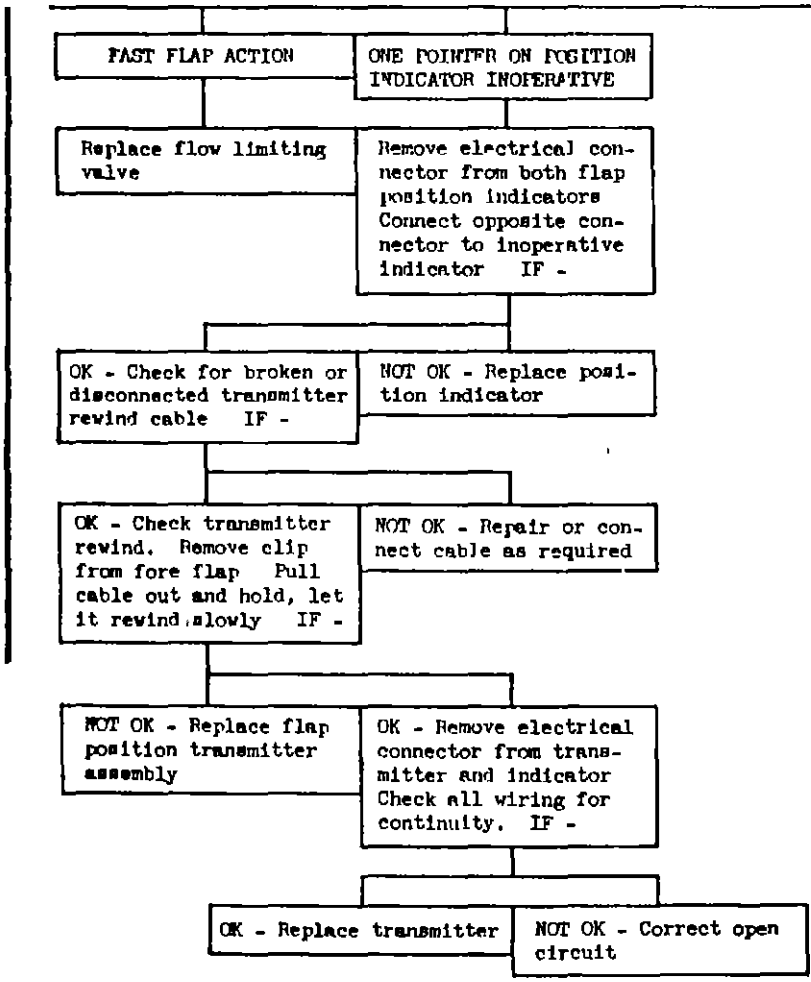

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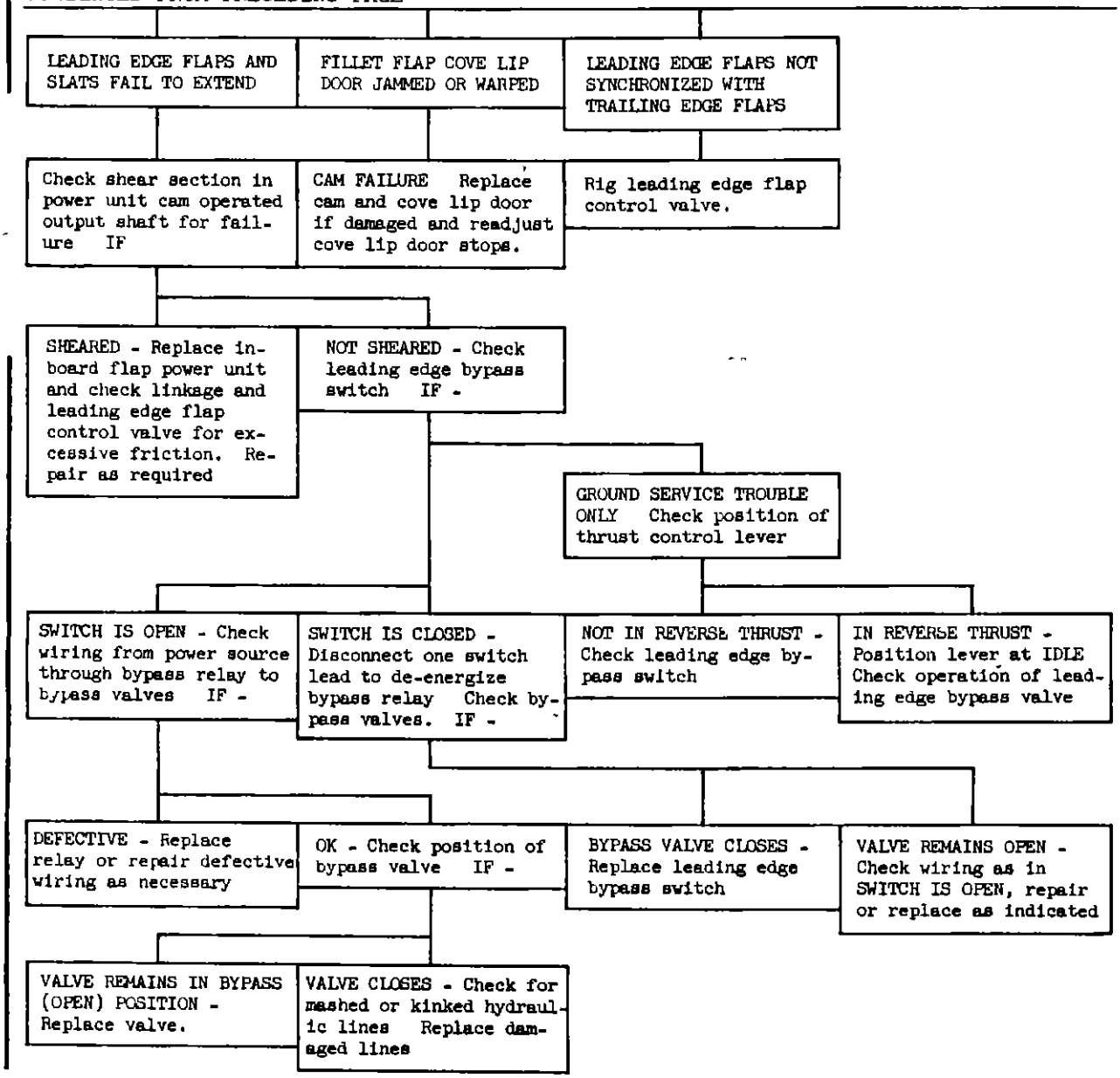
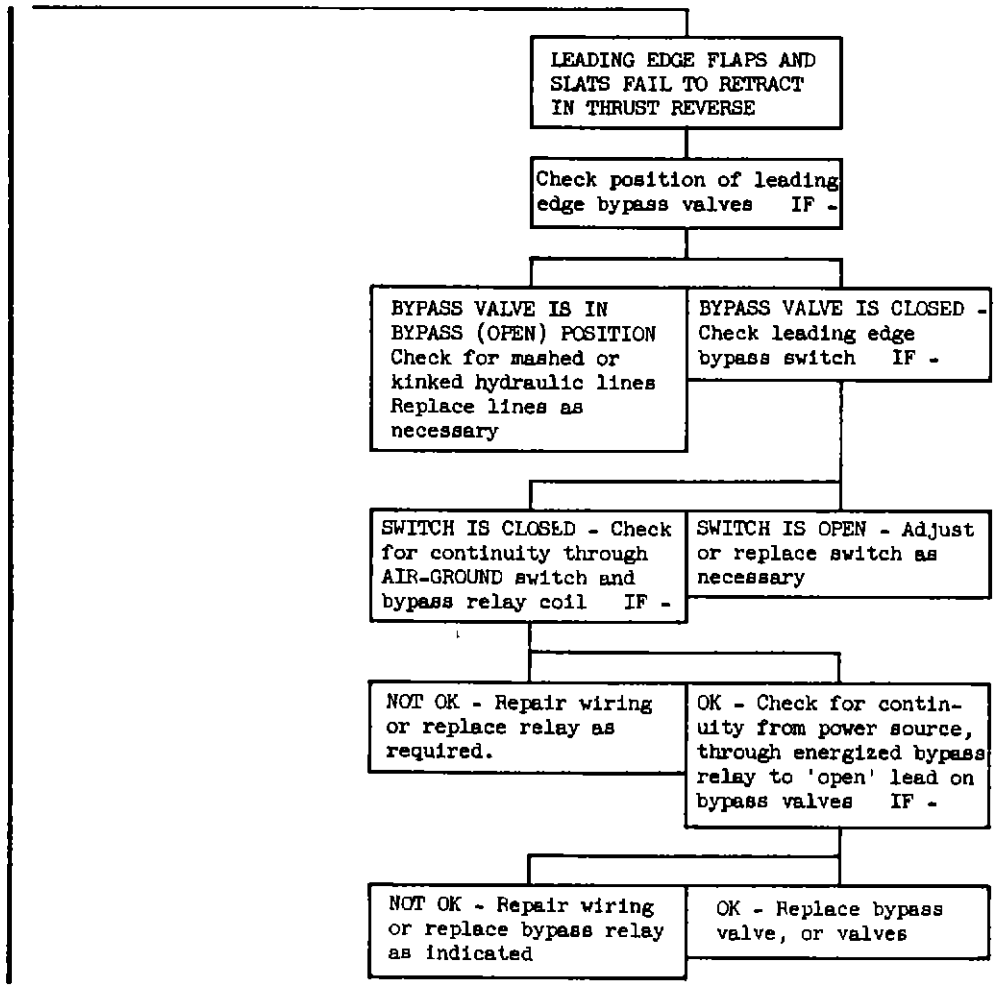
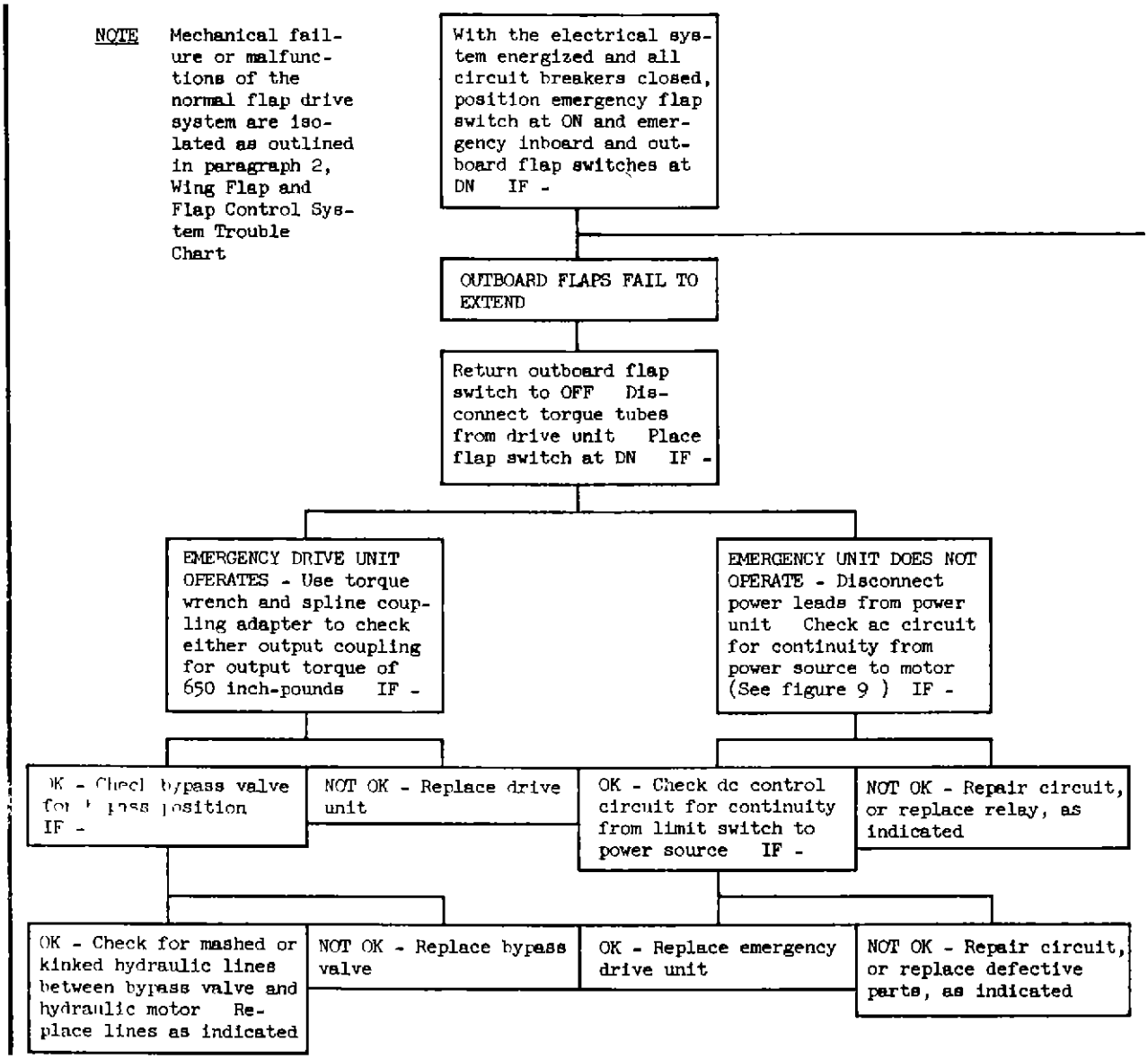



LEADING EDGE FLAPS AND SLATS FAIL TO RETRACT IN THRUST REVERSE
Check position of leading edge bypass valves IF -
BYPASS VALVE IS IN BYPASS (OPEN) POSITION Check for mashed or kinked hydraulic lines Replace lines as necessary
BYPASS VALVE IS CLOSED - Check leading edge bypass switch IF -
SWITCH IS CLOSED - Check for continuity through AIR-GROUND switch and bypass relay coil IF -
SWITCH IS OPEN - Adjust or replace switch as necessary
NOT OK - Repair wiring or replace relay as required.
OK - Check for continuity from power source, through energized bypass relay to 'open' lead on bypass valves IF -
NOT OK - Repair wiring or replace bypass relay as indicated
OK - Replace bypass valve, or valves

3 Emergency Flap Drive System Trouble Chart



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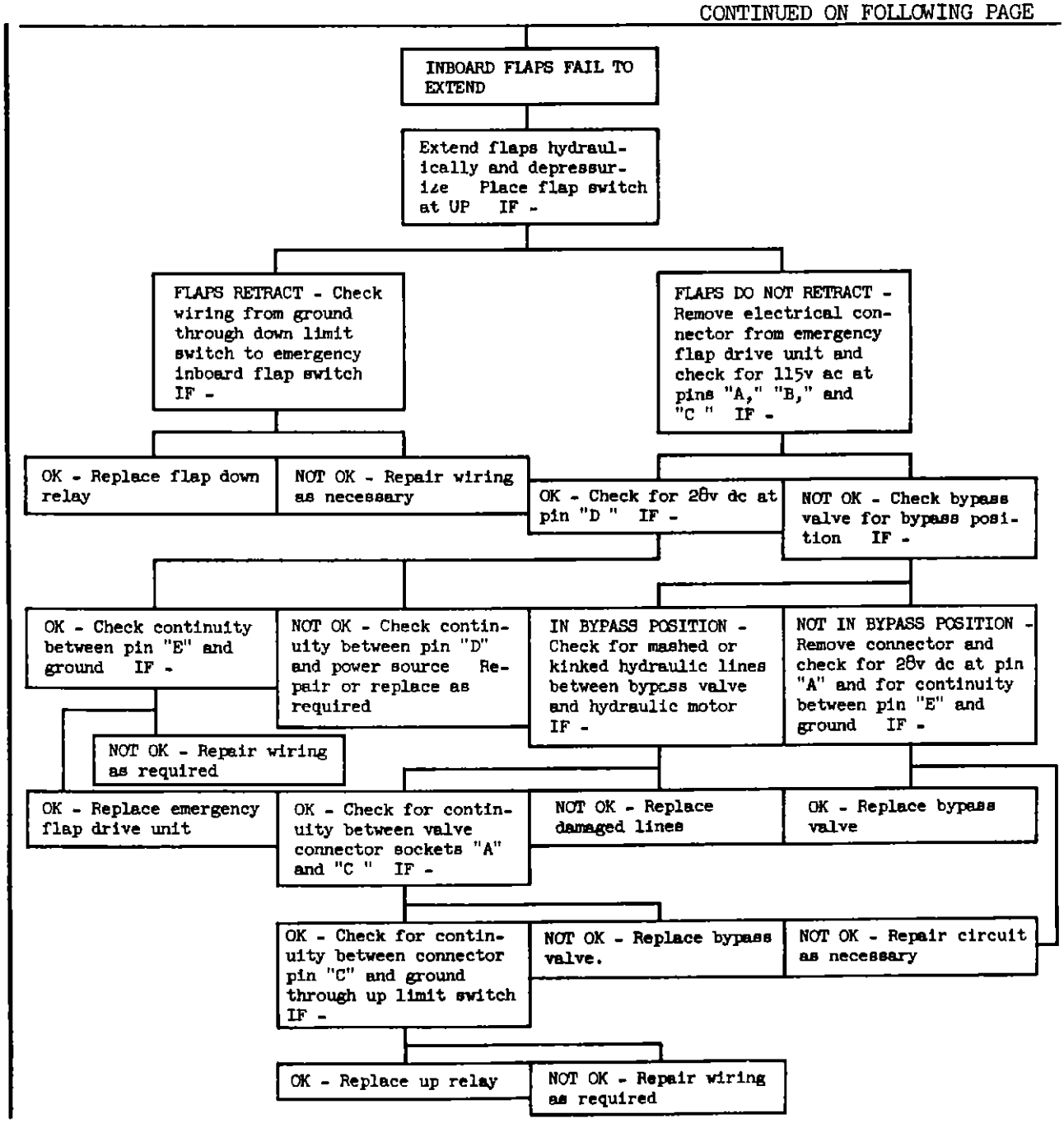

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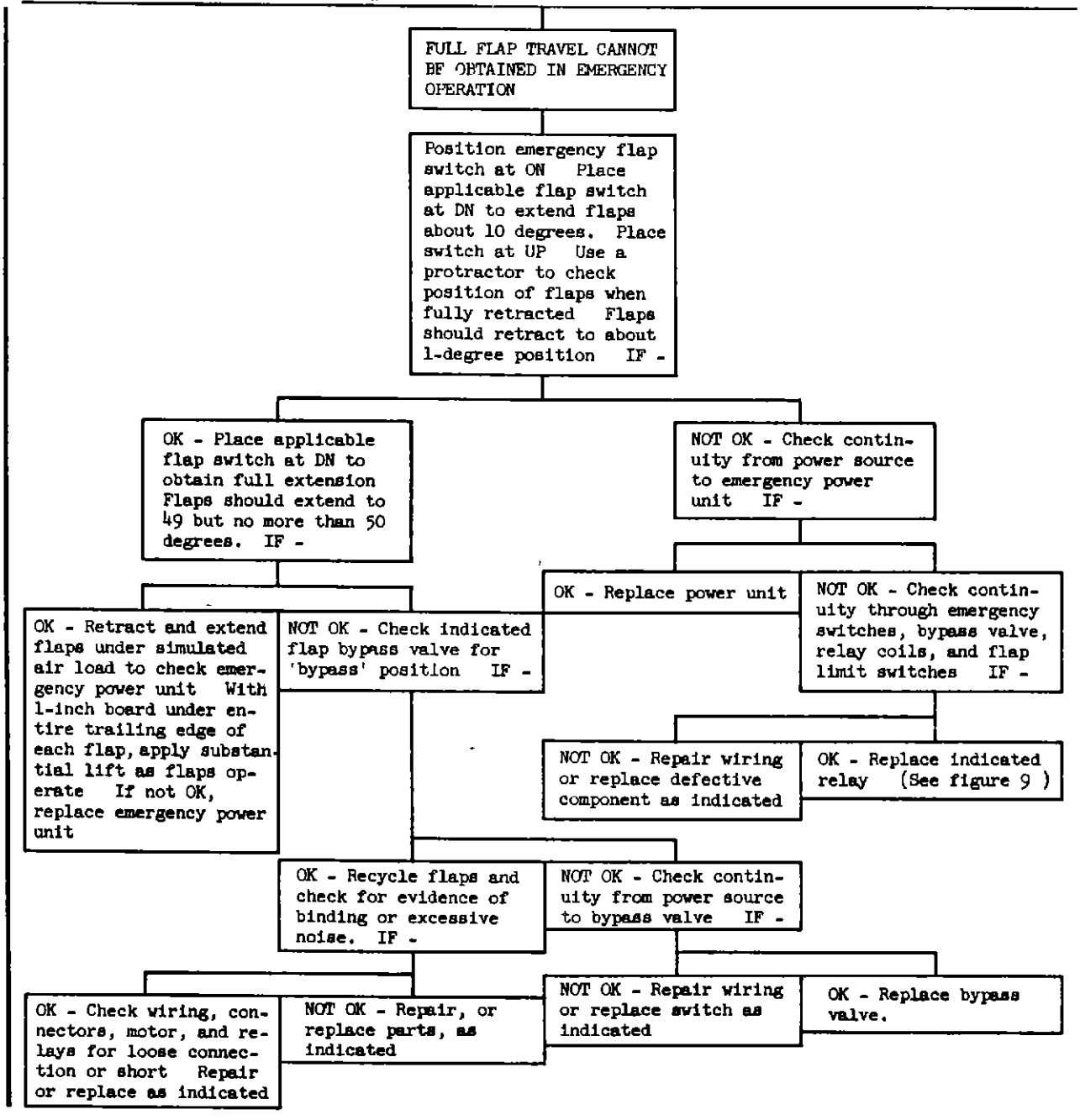


WING FLAPS AND FLAP CONTROL SYSTEM - MAINTENANCE PRACTICES

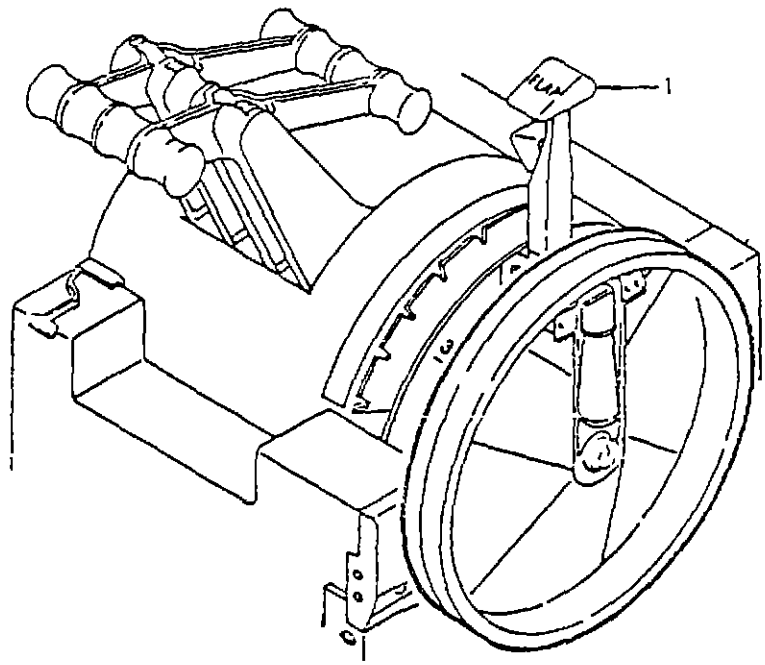
1. Unit Servicing Wing Flaps and Flap Control System

A. When filling Fillet Flap Transmission Assembly or Flap Transmission Assembly with lubricant, use a mixture, by volume, of one part MIL-G-23827 grease and four parts MIL-L-7808 lubricating oil or use MIL-H-5606 hydraulic oil depending on which lubricant is presently used in particular unit being serviced.

CAUTION: DO NOT MIX GREASE/OIL MIXTURE AND HYDRAULIC OIL. DO NOT DRAIN AND REFILL WITH DIFFERENT TYPE OIL. TRANSMISSION BRAKE MAY BE DAMAGED.

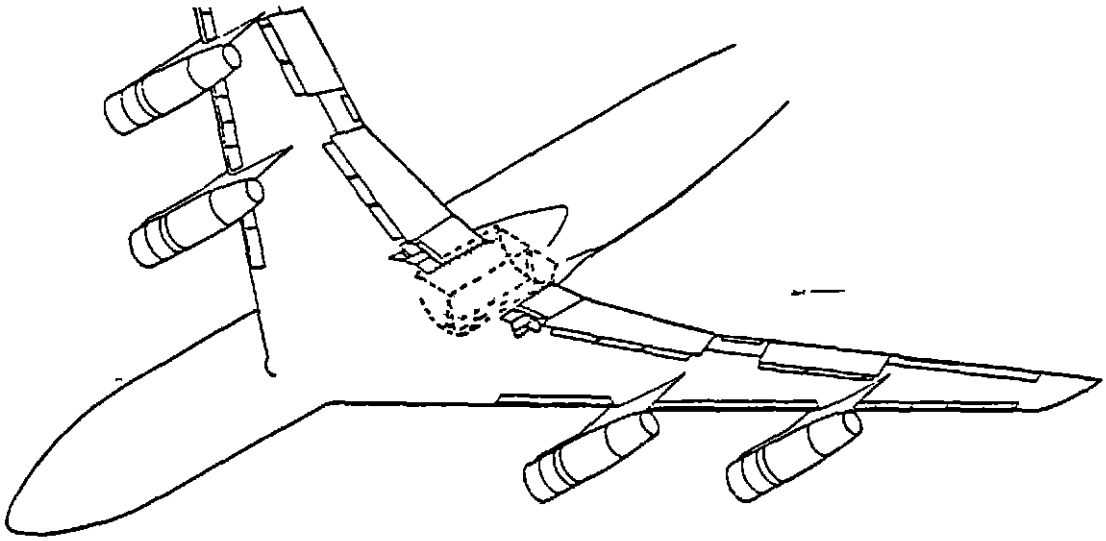
B. Lubricate Wing Flaps and Flap Control System (See figures 201 and 202)

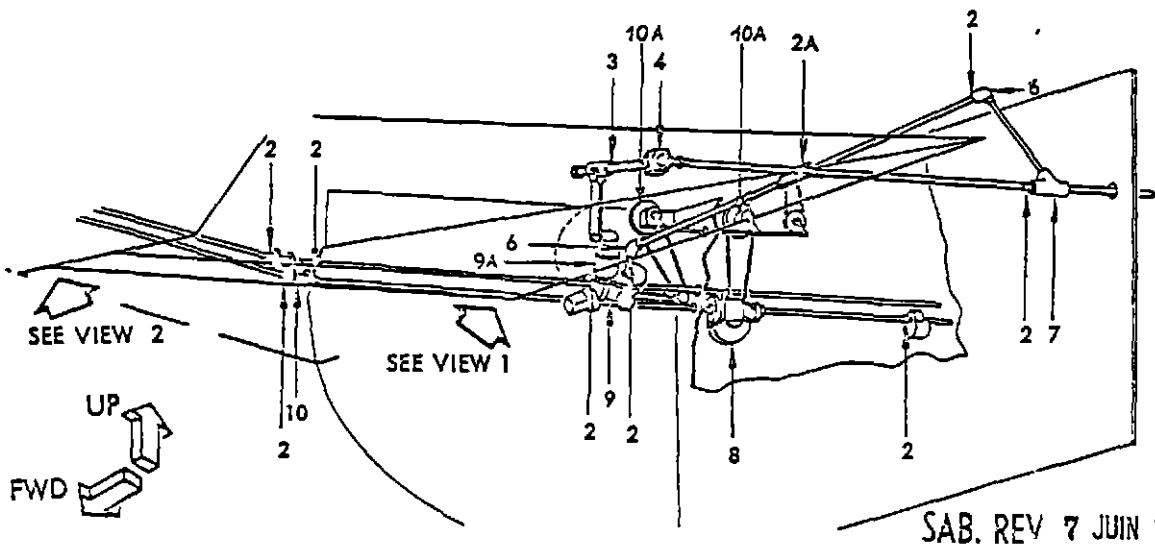
INDEX NO	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	FLAP CONTROL LEVER	Apply a light film of Aeroshell Grease 7A, to sliding surface of handle.



Wing Flaps and Flap Control System Lubrication
Figure 201

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
2	TORQUE TUBE COUPLINGS (TYPICAL)	If torque tube couplings are disconnected, clean and apply a light film of Aeroshell grease 17. Wipe off excess.
2A	FILLET FLAP TORQUE BEARING SUPPORT	Apply Aeroshell Grease 17 to flush fitting.
3	FILLET FLAP TRANSMISSION JACKSCREW	Apply Aeroshell Grease 17, at grease fitting in ball nut. (If ball nut does not have grease fitting, wipe jackscrew clean, apply a light film of oil, MIL-L-7870, operate one cycle and wipe off excess.)





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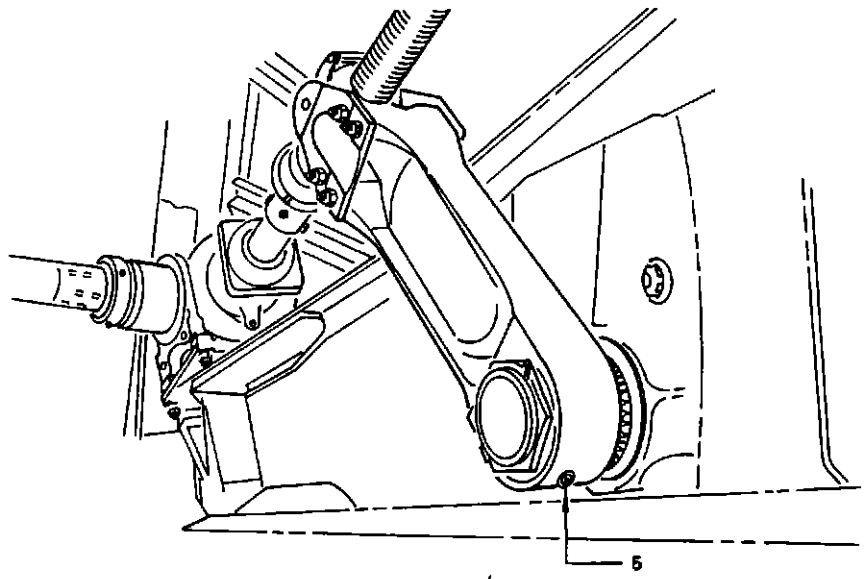
Wing Flaps and Flap Control System Lubrication
Figure 202 (Sheet 1)

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
4	FILLET FLAP TRANSMISSION ASSEMBLY	Fill to level of filler plug with lubricant. [1] Then remove 1 pint.
5	FILLET FLAP ACTUATOR ARM AND DRIVE SHAFT SPLINES	Apply MIL-G-21164
5A [3]	FILLET FLAP ACTUATION SHAFT OUTBOARD END	Apply MIL-G-21164
6	FILLET FLAP ANGLE GEARBOX	Fill to level of filler plug with lubricant. [1]
7	FILLET FLAP TEE GEARBOX	Fill to level of filler plug with lubricant. [1]
8	OUTBOARD FLAP POWER UNIT	Fill to level indicated on decal with lubricant. [1]
9	INBOARD AND FILLET FLAP POWER UNIT	Fill to level indicated on decal with lubricant. [1]
9A	INBOARD AND FILLET FLAP EMERGENCY DRIVE UNIT	Fill to level indicated on the unit with MIL-L-6085.
10	FLAP ANGLE GEARBOXES	Fill to level of filler plug with lubricant. [1]

[1] A mixture, by volume, of 1 part MIL-G-81322 and four parts MIL-L-7808 lubricating oil.



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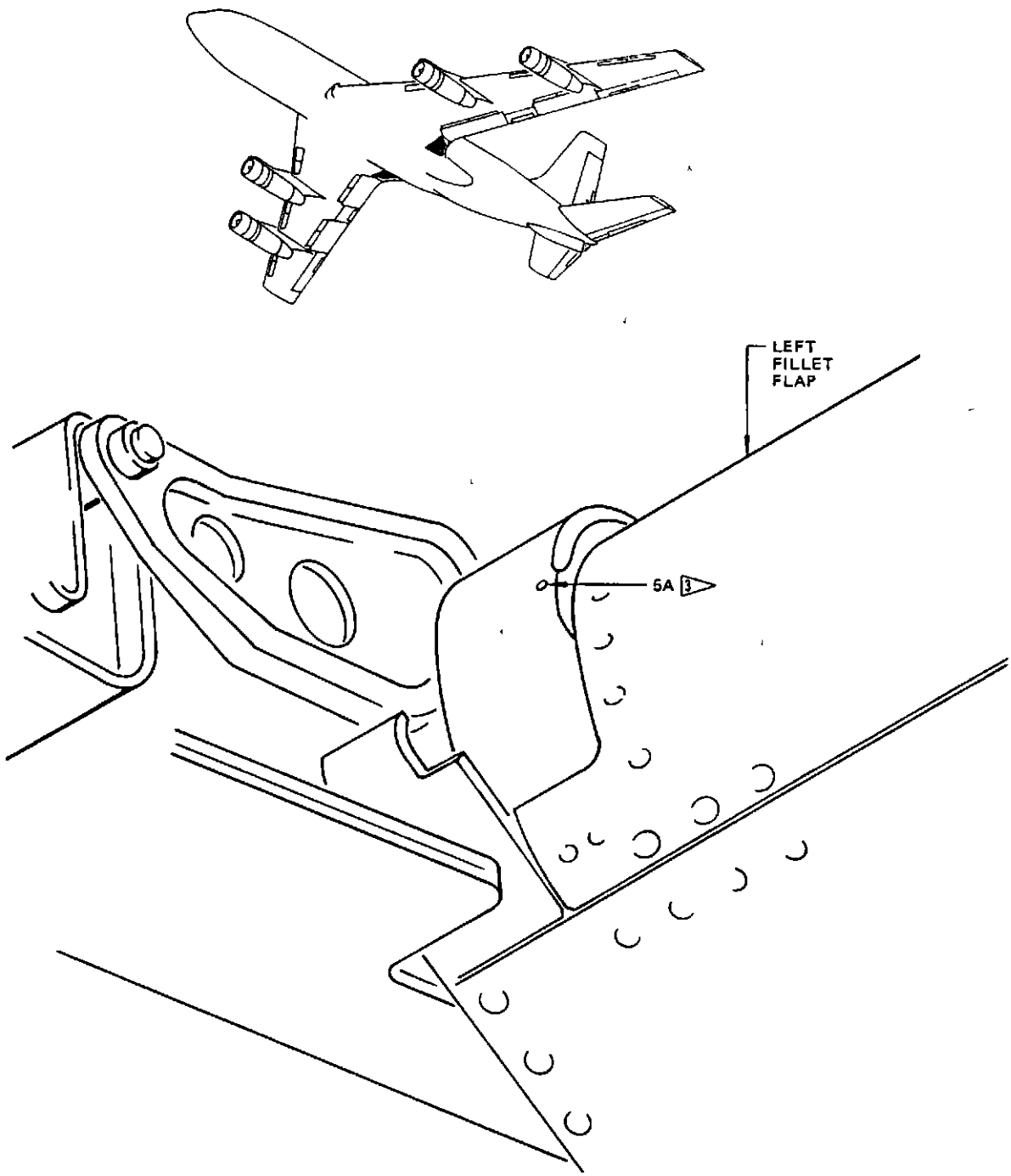

3 SABENA OO-SJM thru OO-SJO
OO-SJH, J and L after SAB. 707/531

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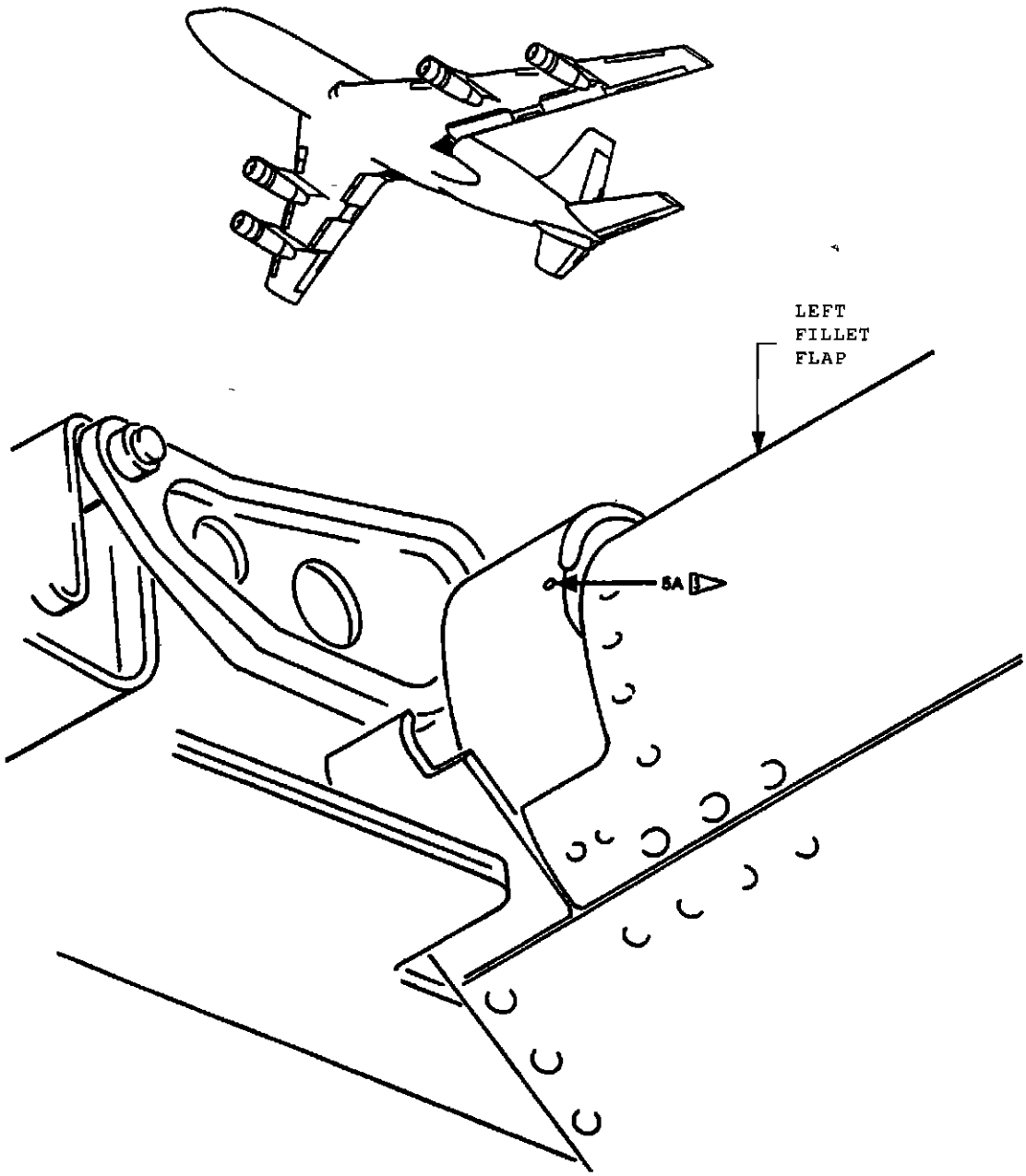
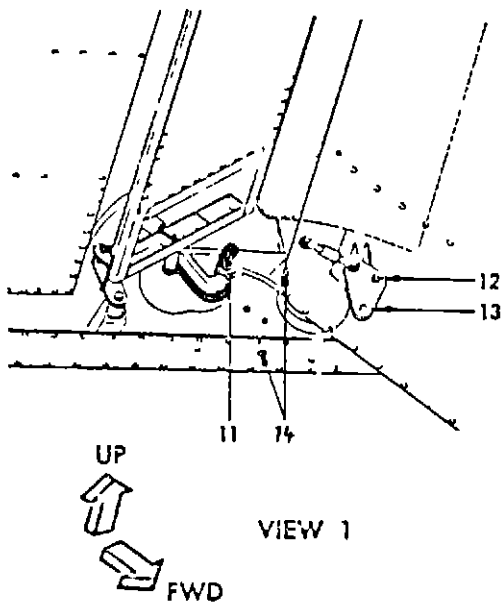
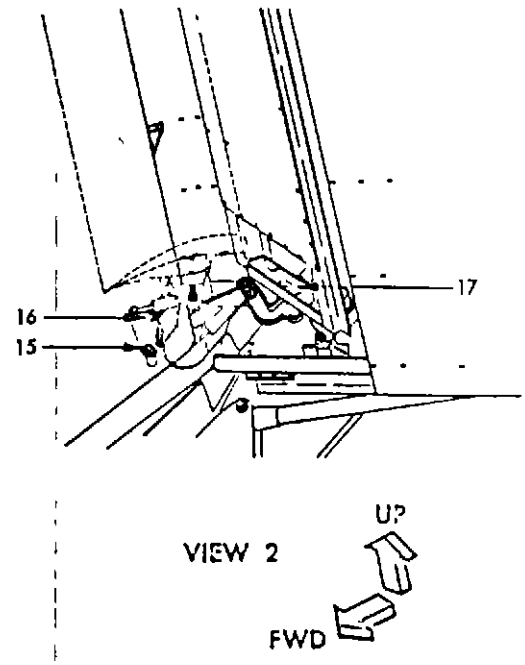


3 SABENA OO-SJM thru OO-SJO
OO-SJH, J and L after SAB 707/531
GEAF 10-01/10-04

Wing Flaps and Flap Control System Lubrication
Figure 202 (Sheet 2A)

INDEX NO	ITEM TO BE LUBRICATED	INSTRUCTIONS
11	FILLET FLAP COVE LIP DOOR INBOARD CAM FOLLOWER	Apply Aeroshell Grease 17, to flush fitting.
12	FLAPPERETTE CRANK CAM FOLLOWER	Apply Aeroshell Grease 17, to flush fittings (1 place).
13	FLAPPERETTE CRANK HINGE BOLT	Apply Aeroshell Grease 17, to flush fitting.
14	FILLET FLAP INBOARD HINGE FITTING	Apply Aeroshell Grease 17, to flush fitting. (2 places)
15	OUTBOARD FLAPPERETTE CRANK	Apply Aeroshell Grease 17, to flush fitting
16	OUTBOARD FLAPPERETTE CRANK CAM FOLLOWER	Apply Aeroshell Grease 17, to flush fitting
17	FILLET FLAP COVE LIP DOOR OUTBOARD CAM FOLLOWER	Apply Aeroshell Grease 17 to flush fitting.

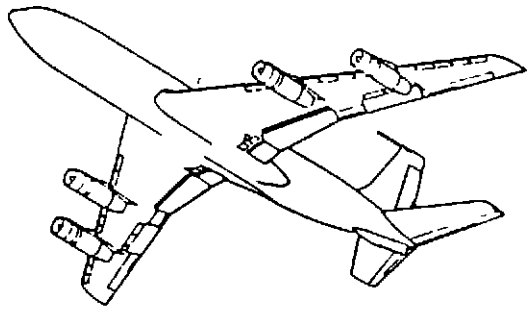


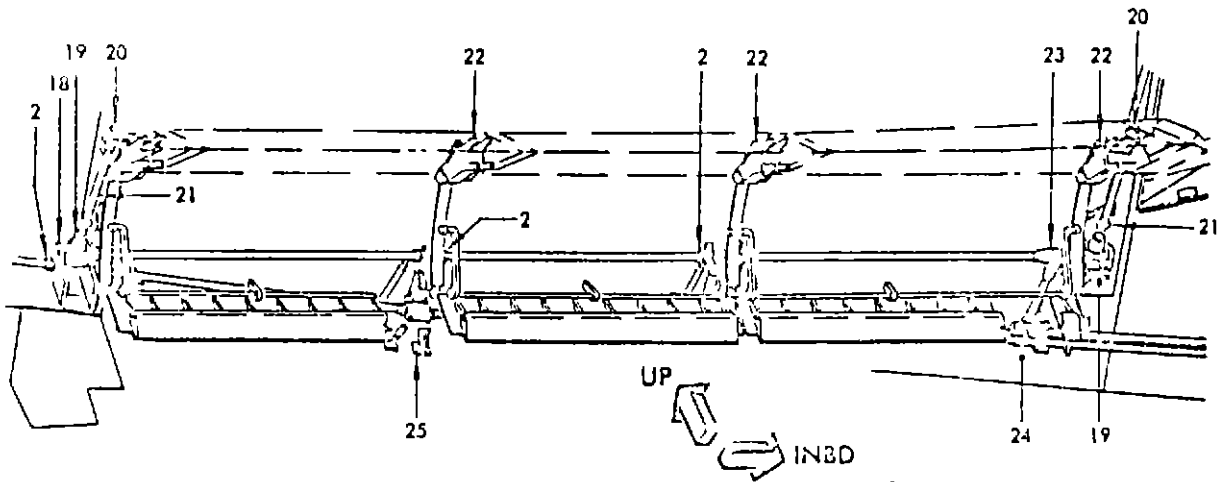


SAB. 707/531

ITEM NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
18	FLAP TRANSMISSION ASSEMBLY TRUNNION SUPPORT	Apply Aeroshell Grease 17, to flush fittings.
19	FLAP TRANSMISSION ASSEMBLY	Fill to level of filler plug with lubricant. [1]
20	FLAP SUPPORT FITTING	Apply Aeroshell Grease 17, to flush fittings (2 places each fitting)
21	FLAP TRANSMISSION ASSEMBLY JACKSCREW	Apply Aeroshell Grease 17, to grease fitting at ball nut (If ball nut does not have grease fitting, wipe jackscrew clean, apply a light film of oil, MIL-L-7870, operate one cycle and wipe off excess.)

[1] A mixture, by volume, of one part Aeroshell Grease 7, and four parts MIL-L-7808 lubricating oil.



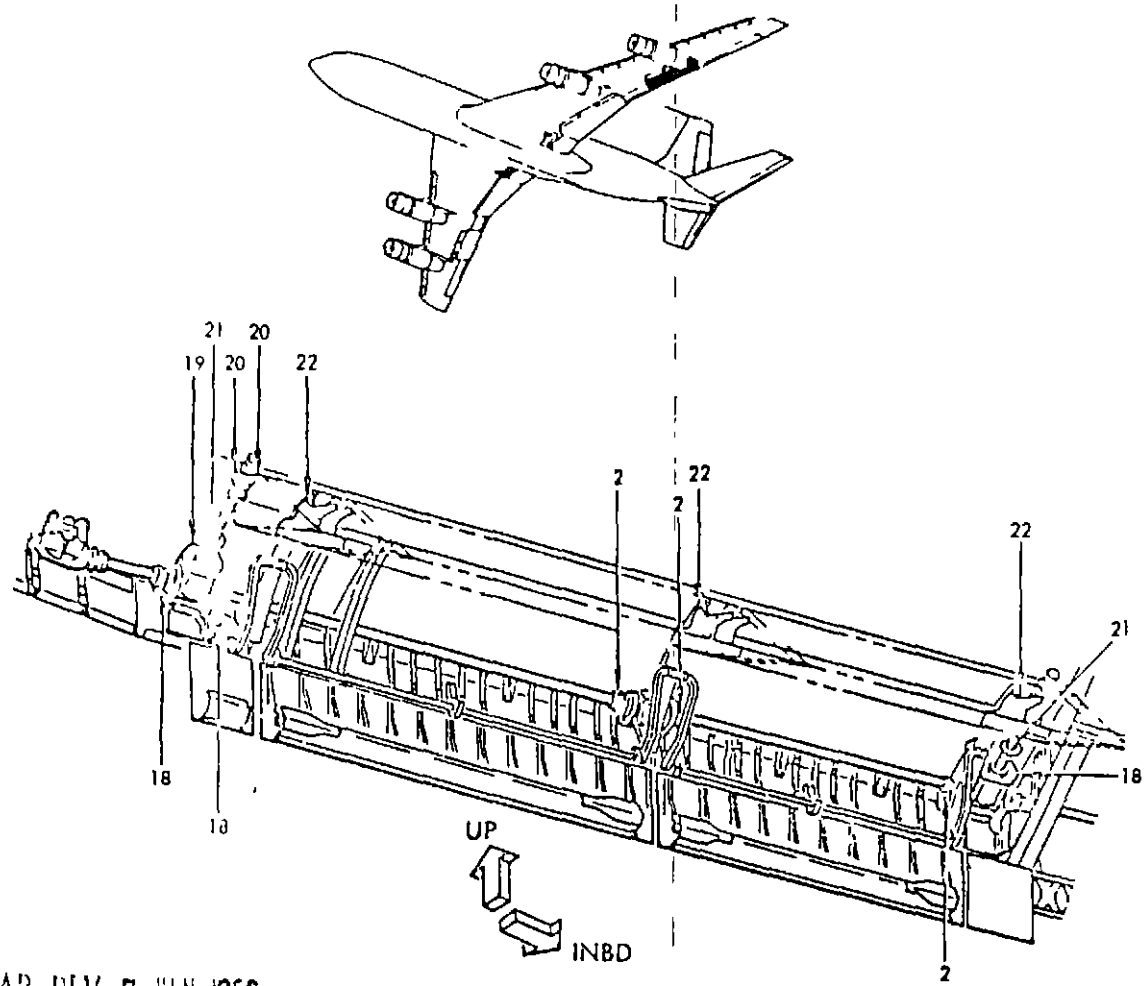


SAB 707/542
SAB REV. 7 JUN 1968

Wing Flaps and Flap Control System Lubrication
Figure 202 (Sheet 4)

INDEX NO	ITEM TO BE LUBRICATED	INSTRUCTIONS
22	FLAP CARRIAGE	Apply Aeroshell Grease 17, to flush fittings (10 place each carriage)
23	INBOARD FLAP TEE GEARBOX	Fill to level of filler plug with lubricant. [1]
24	INBOARD FLAP GEARBOX	Fill to level of filler plug with lubricant. [1]
25	OUTBOARD FLAP ANGLE GEARBOX	Fill to level of filler plug with lubricant. [1]

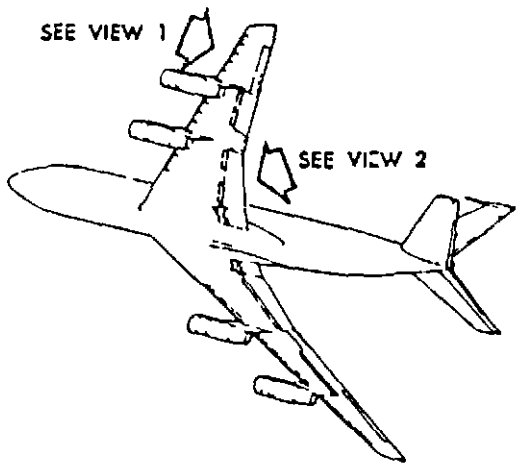
[1] A mixture, by volume, of one part Aeroshell Grease 7A and four parts MIL-L-7808 lubricating oil.

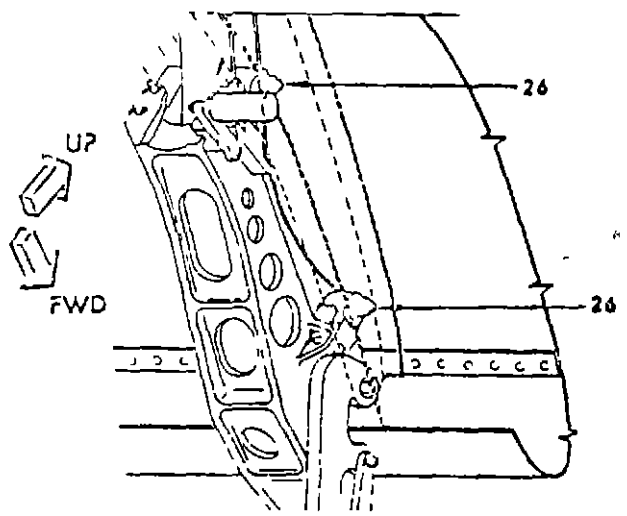


SAB REV 7 NOV 1968

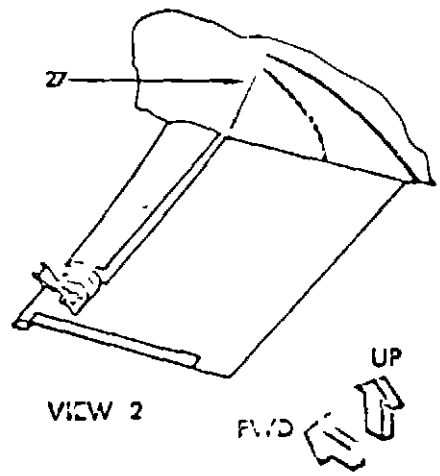
SAB 707/342
Wing Flaps and Flap Control System Lubrication
Figure 202 (Sheet 5)

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
26	OUTBOARD LEADING EDGE SLAT CARRIAGE TRUCK ROLLERS	Apply Aeroshell Grease 17, to flush fittings To lubricate, extend slats so that carriage rollers are aligned with lubrication holes in adjacent ribs. Trucks must be removed from carriage at inboard end of leading edge slat No 5 due to lack of access holes in adjacent rib.
27	FILLET FLAP FENCE TRACK ROLLER	Apply Aeroshell Grease 17, to flush fittings (2 places)





VIEW 1



VIEW 2

SAB REV 7 JUN 1968

2. Leading Edge Flap and Slats Lock Assembly Installation

A. General

(1) Leading edge flaps and slats open and close rapidly when operated. Maintenance personnel working in this area would be exposed to potential hazardous conditions if the flaps and slats were to be operated. Deactivate the leading edge flap control valve and leading edge flap bypass valves to accomplish maintenance in this area by installing the leading edge lock assembly.

B. Equipment and Materials

(1) Leading Edge Lock Assemoly - F70144

C Install Lock Assembly

(1) Pressurize utility hydraulic system.

(2) Connect external electrical source.

(3) Extend main flaps. Depressurize utility hydraulic system

NOTE Leading edge flaps are fully extended when main flaps extend to about 6 degrees.

(4) Open leading edge flap bypass valve circuit breaker on panel P5.

(5) Disconnect pushrod at control valve arm on leading edge flap control valve

(6) Place lock assembly over valve slide and install quick release pin through hole in control valve arm.

(7) Remove electrical connectors on bypass valves and replace with lock assembly dummy valve caps. Ensure that warning streamer is visible.

D Remove Lock Assembly

(1) Remove dummy valve caps on bypass valves and replace electrical connectors.

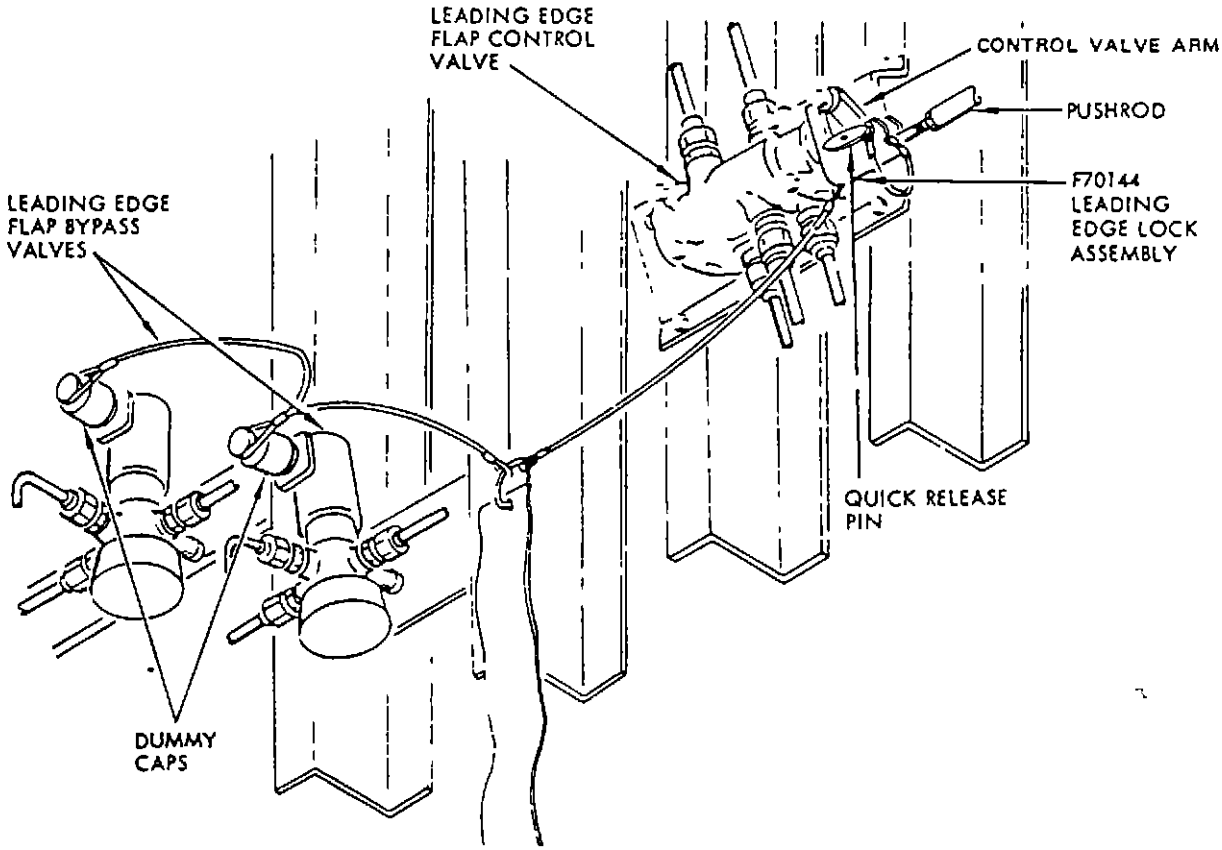
(2) Remove quick release pin and remove lock assembly.

(3) Connect pushrod to control valve arm.

E. Restore Airplane to Normal

(1) Pressurize utility hydraulic system, and close leading edge flap bypass valve circuit breaker on panel P5

(2) Retract flaps. Depressurize utility hydraulic system and remove external electrical source if no longer required



Leading Edge Lock Assembly Installation
Figure 1

CAUTION: IF ANY INBOARD FLAP DRIVE TORQUE TUBES ARE DISCONNECTED, DO NOT APPLY HYDRAULIC OR ELECTRICAL POWER TO INBOARD AND FILLET FLAP POWER UNIT. STRUCTURAL DAMAGE TO INBOARD AND FILLET FLAPS MAY BE AVOIDED BY DISCONNECTING ALL TORQUE TUBES AT POWER UNIT, OR BY RIGGING INBOARD AND FILLET FLAPS TO EXTEND AND RETRACT SIMULTANEOUSLY.

3. Wing Flaps and Flap Control System - Adjustment

A. Equipment and Materials

(1) Control Surface Protractor Assembly - F52485-500, or equivalent

(2) Protractor Clamp Assembly - F71292-16, or equivalent

(3) Protractor Stand Assembly - F71292-17, or equivalent

(4) Spline Coupling Spanner Wrench - F71228, or equivalent

(5) Torque Wrench

(6) Rigging Bar, Trailing Edge Flaps :
(a) Preferred - F70352-1
(b) Optional - 2MIT65-1063-1
(c) Optional - 8-foot straightedge - to be fabricated locally

(7) Spring Scale, 0 to 10 pound capacity

(8) Reverse Thrust Lever Protractor Assembly - F70044, or equivalent

(9) 200 psig Dry Air Source

(10) Leading Edge Flap Lock Assembly - F70144, or equivalent

(11) Follow-Up Sheave Adjusting Wrench - MIT 65-20990, or equivalent

(12) Rigging pin - 0.311 +0.000/-0.002-inch diameter, 2-inch minimum length (MS20392-4)

(13) Rigging pin - 0.248 +0.000/-0.002-inch diameter, 2-inch minimum length (MS20392-3)

B. (1) Prepare system for adjustment.

(a) Pressurize utility hydraulic system and retract flaps fully.

(b) Depressurize utility hydraulic system.

(c) Open main gear wheel well doors

(d) Remove access panels 1366 and 1367 from outboard wing lower surface

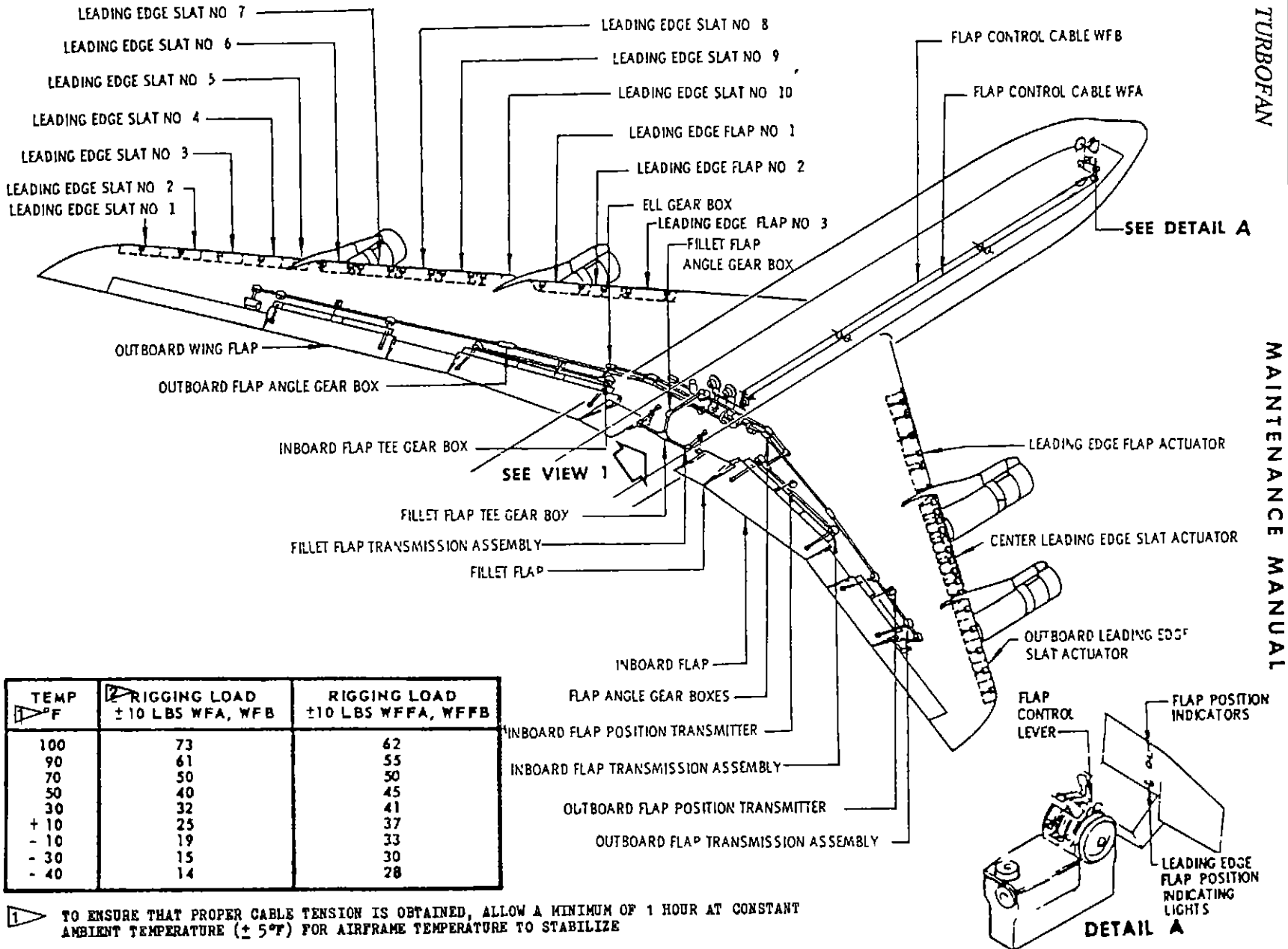
(e) Release cove lip door latches and lower the following cove lip doors: No 1247, 1248, 1249, 1261, 1262 and 1263

(f) Disconnect torque tube (6, figure 204) connecting outboard aileron lockout gearbox (8) to outboard flap transmission assembly (5) and remove from airplane

CAUTION: OUTBOARD AILERON LOCKOUT MECHANISM MAY BE DAMAGED IF TORQUE TUBE IS NOT REMOVED.

(2) Adjust flap control system.

(a) Position flap control level in rig position by inserting a 5/32-inch spacer between flap up detent and lever. Clamp lever in this position

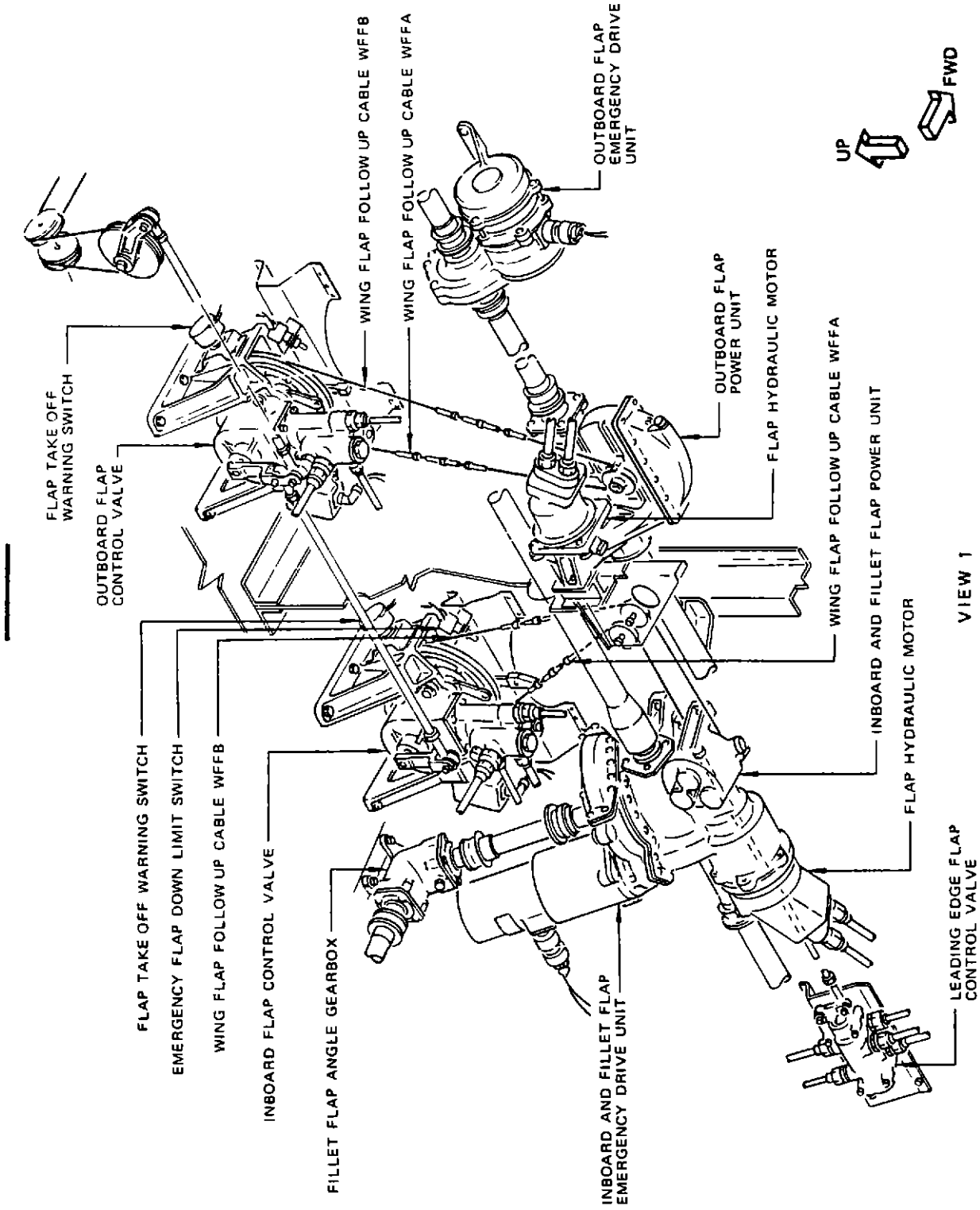


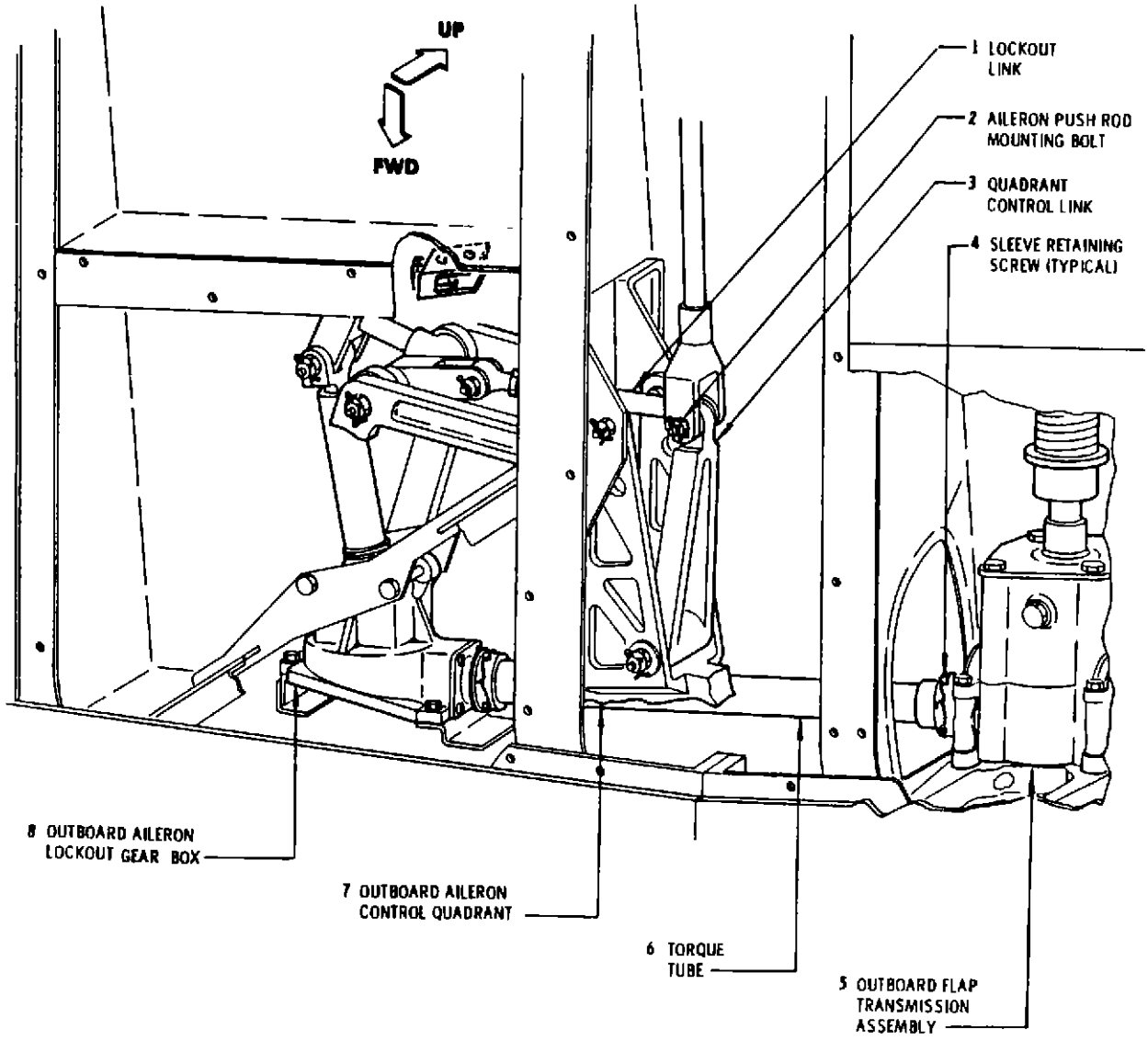
TEMP [1] °F	RIGGING LOAD [2] ±10 LBS WFA, WFB	RIGGING LOAD ±10 LBS WFFA, WFFB
100	73	62
90	61	55
70	50	50
50	40	45
30	32	41
+ 10	25	37
- 10	19	33
- 30	15	30
- 40	14	28

[1] TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF 1 HOUR AT CONSTANT AMBIENT TEMPERATURE (± 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE

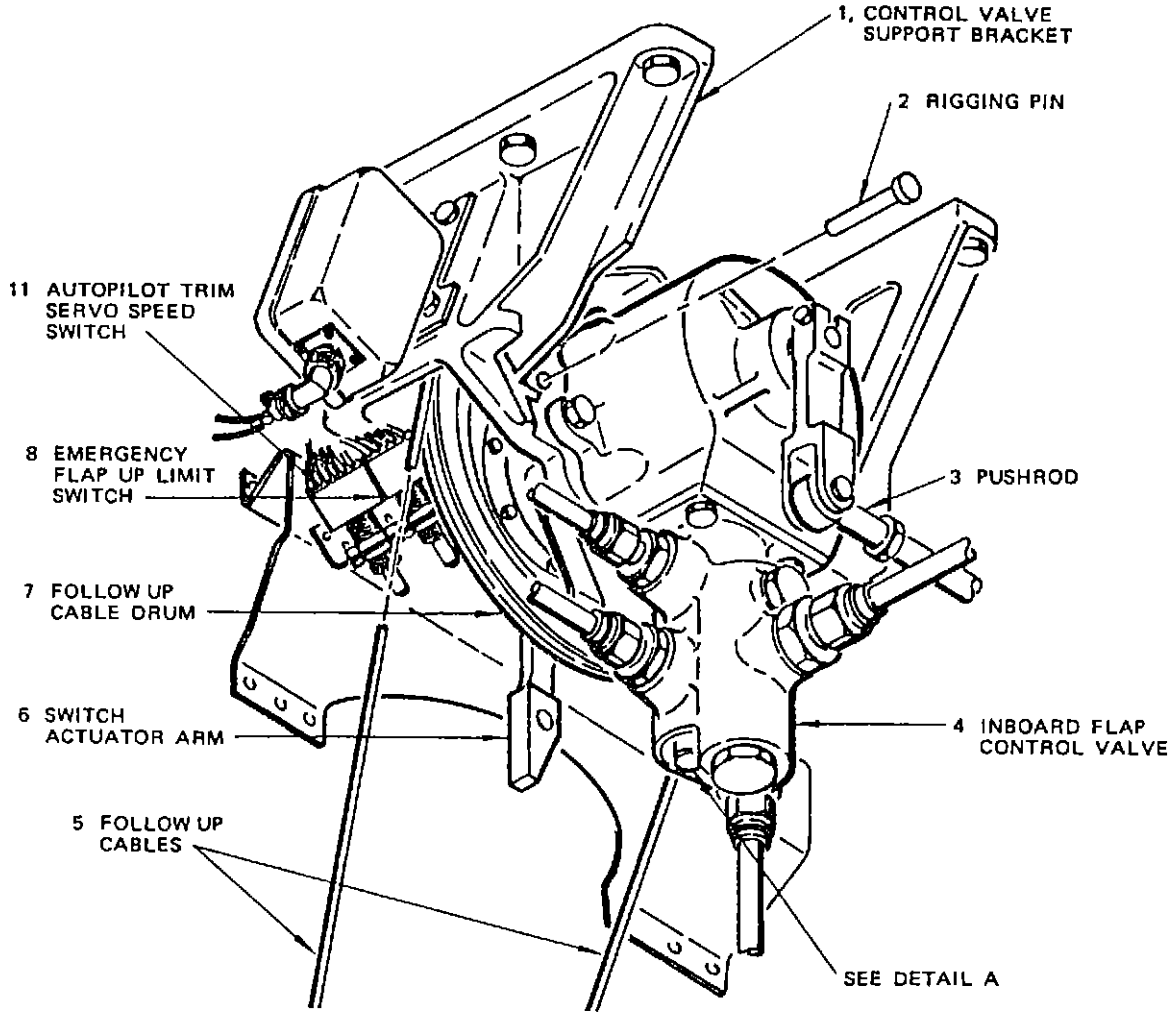
[2] CABLE LOADS MUST BE ADJUSTED WITHIN ± 10 LBS OF TABLE VALUES READJUST AFFECTED CABLE SYSTEM WHEN CABLE LOADS DEVIATE FROM TABLE MORE THAN 10 LBS

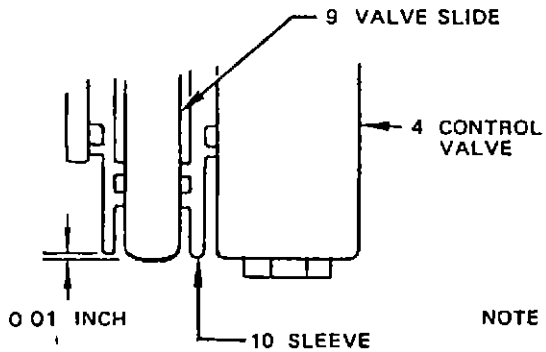
Wing Flaps and Flap Control System Rigging
Figure 203 (Sheet 1 of 2)


FLAP TAKE OFF WARNING SWITCH
OUTBOARD FLAP CONTROL VALVE
WING FLAP FOLLOW UP CABLE WFFB
WING FLAP FOLLOW UP CABLE WFFA
OUTBOARD FLAP EMERGENCY DRIVE UNIT
OUTBOARD FLAP POWER UNIT
FLAP HYDRAULIC MOTOR
WING FLAP FOLLOW UP CABLE WFFA
INBOARD AND FILLET FLAP POWER UNIT
INBOARD AND FILLET FLAP HYDRAULIC MOTOR
FLAP HYDRAULIC MOTOR
LEADING EDGE FLAP CONTROL VALVE
INBOARD AND FILLET FLAP EMERGENCY DRIVE UNIT
FILLET FLAP ANGLE GEARBOX
INBOARD FLAP CONTROL VALVE
WING FLAP FOLLOW UP CABLE WFFB
EMERGENCY FLAP DOWN LIMIT SWITCH
FLAP TAKE OFF WARNING SWITCH
UP
FWD
VIEW 1



Outboard Aileron Lockout Mechanism Adjustment
Figure 204





DETAIL A

NOTE REFER TO FIGURE 213 FOR LOCATION OF EMERGENCY FLAP DOWN LIMIT SWITCH

(b) Install MS20392 rigging pin (2, figure 205) through flap control valve follow-up drum (7) and valve support bracket (1). Loosen follow-up cables (5) to flap control valve as necessary to install rigging pins.

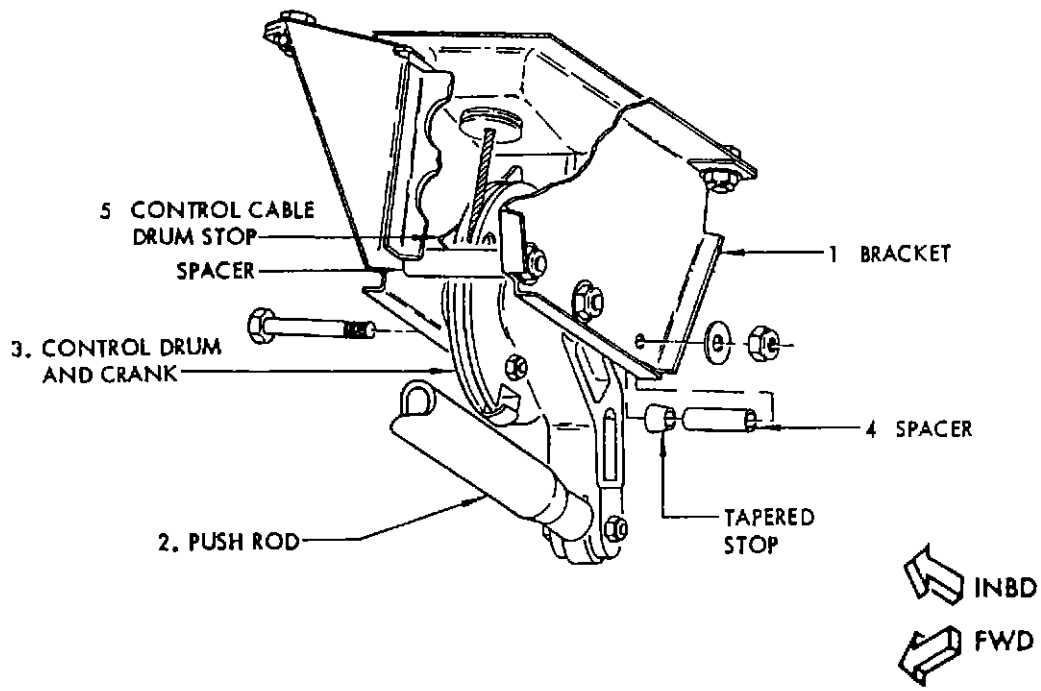
(c) Secure crank on flap control drum (3, figure 206) against up stop.

(d) Adjust turnbuckles on flap control cables WFA and WFB (figure 203) to obtain rigging load as shown in temperature tension chart. Turnbuckles are located under cabin floor in lower 41 section.

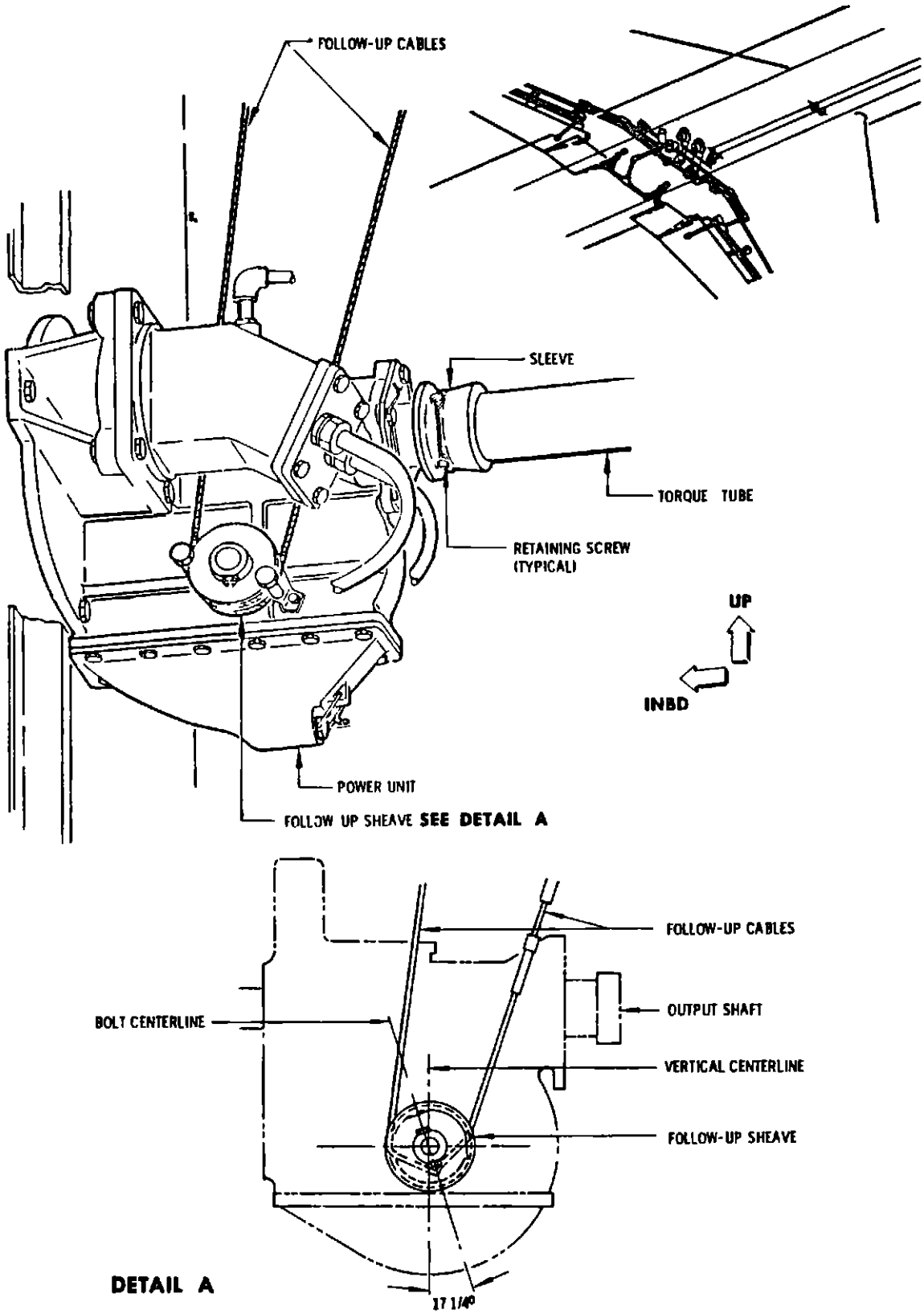
(e) Adjust pushrods (3, figure 205) to each flap control valve (4) to position control valve slide flush with sleeve (10) within 0.015 Rigging pins should fit freely in valve support bracket and follow-up drum.

(f) Disconnect torque tubes from outboard flap power unit. (See figure 207.)

(g) Adjust power unit output shaft to position centerline of bolt attaching sheave to power unit follow-up drive shaft at 17-1/4° angle from the vertical centerline. (See detail A, figure 207)



Flap Control Cable Drum Stop Adjustment
Figure 206


FOLLOW-UP CABLES
SLEEVE
TORQUE TUBE
RETAINING SCREW (TYPICAL)
UP
INBD
POWER UNIT
FOLLOW UP SHEAVE SEE DETAIL A
FOLLOW-UP CABLES
OUTPUT SHAFT
BOLT CENTERLINE
VERTICAL CENTERLINE
FOLLOW-UP SHEAVE
17 1/4°
DETAIL A

(h) Adjust turnbuckles on outboard flap follow-up cables to obtain rigging loads shown in the temperature tension chart.

(i) Disconnect torque tubes (4, figure 208) from left side and from top of inboard and fillet flap power unit (1).

(j) Disconnect right torque tube from inboard flap angle gearbox in right wheel well.

(k) Maintain a light counterclockwise load on leading edge flap control valve actuator arm (8) and rotate inboard and fillet flap power unit output shaft (5) so that arm (8) rotates to its maximum counterclockwise (vertical) position, as seen from the rear and as shown in detail figure 208.

(l) Adjust length of pushrod (3) connecting leading edge flap control valve actuator arm on power unit to leading edge flap control valve (6) so that dimension between centerline of bolts on leading edge flap control valve arm (7) and valve mounting bolts is 1.3 (± .03) inches. (See detail A, figure 208.)

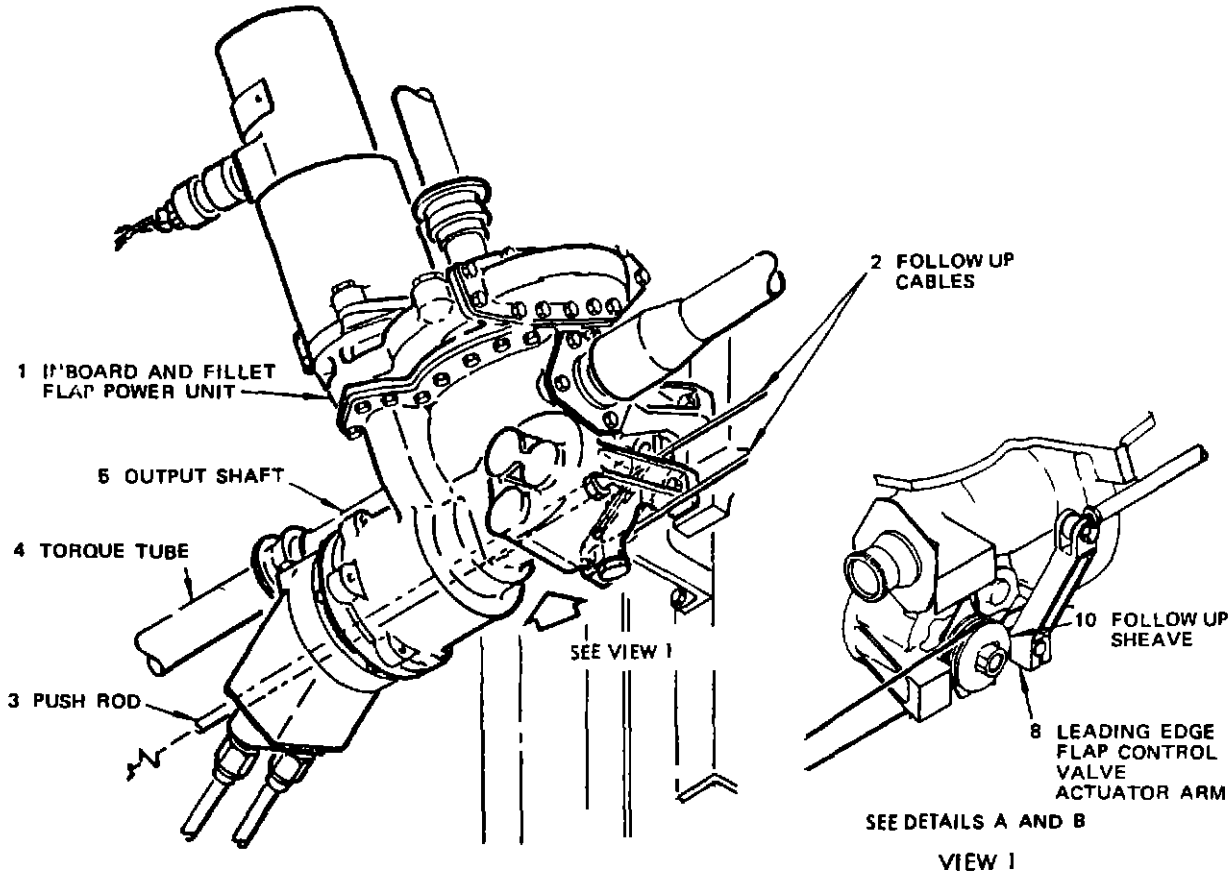
NOTE. If a light counterclockwise load is maintained against the leading edge flap control valve actuator arm while the preceding adjustment is made, there will be no slack toward the valve (left). Some slack may exist to the right so that the actuator arm and pushrod may be shifted away from the leading edge flap control valve. This is expected and normal.

(m) With actuator arm positioned as described in step (k), and using follow-up sheave adjusting wrench, rotate left main output shaft on power unit 3-1/8 turns counterclockwise. (See detail B, figure 208.)

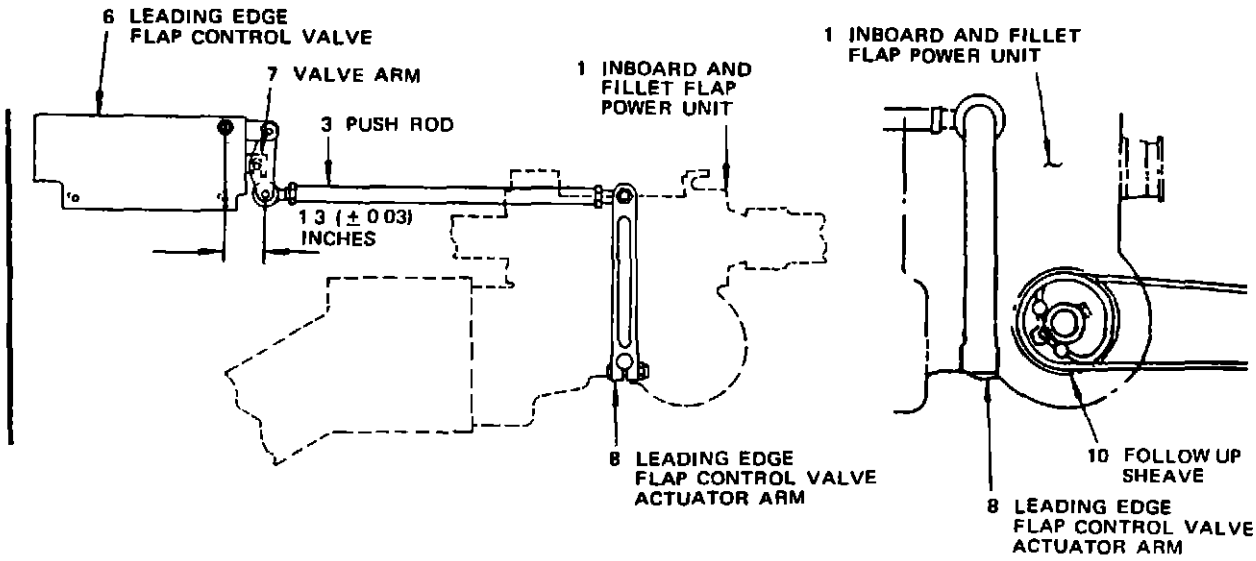
(n) Adjust follow-up cables WFFA and WFFB in left main wheel well to rigging loads as shown in temperature tension chart.

(o) Remove rig pins from each control valve support bracket. Release crank arm on control cable drum in left main wheel well.

(p) Pressurize utility hydraulic system to apply pressure to flap control valves.



VIEW 1



DETAIL A

DETAIL B

(3) Adjust inboard and fillet flaps.

(a) Perform preliminary steps as follows:

1) Pressurize utility hydraulic system and place flap control lever at FLAP UP position. Depressurize hydraulic system.

2) Disconnect torque tubes from both sides of inboard and fillet flap power unit and remove electric power connector from flap emergency drive unit.

CAUTION: NORMAL AND EMERGENCY DRIVE MUST BE DISCONNECTED TO PREVENT ACCIDENTAL OPERATION OF THE FLAP SYSTEM DURING ADJUSTMENT. OPERATION, WITH ONE OR MORE TRANSMISSION ASSEMBLIES DISCONNECTED, COULD DAMAGE THE FLAP SYSTEM.

3) Disconnect torque tube from inboard side of each flap transmission assembly.

4) Check position of flap in relation to wing chord plane.

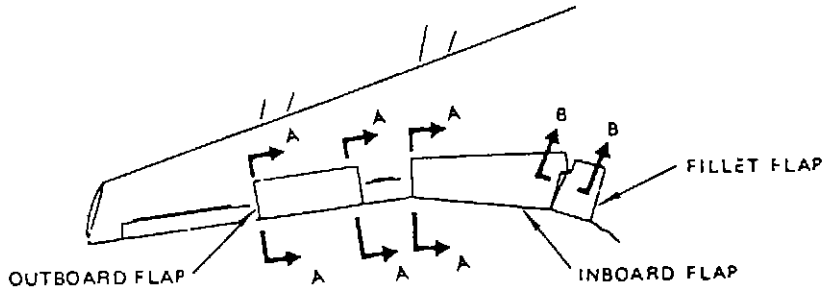
NOTE: Position of flap in relation to wing chord plane (WCP) is determined by placing straightedge along lower surface of wing and flap, at straightedge markings near outboard end of flap, and measuring gap between flap trailing edge and straightedge. Gap dimension should be equal to height of blocks on straightedge. (See figure 209.) Theoretically, the WCP passes through the flap trailing edge.

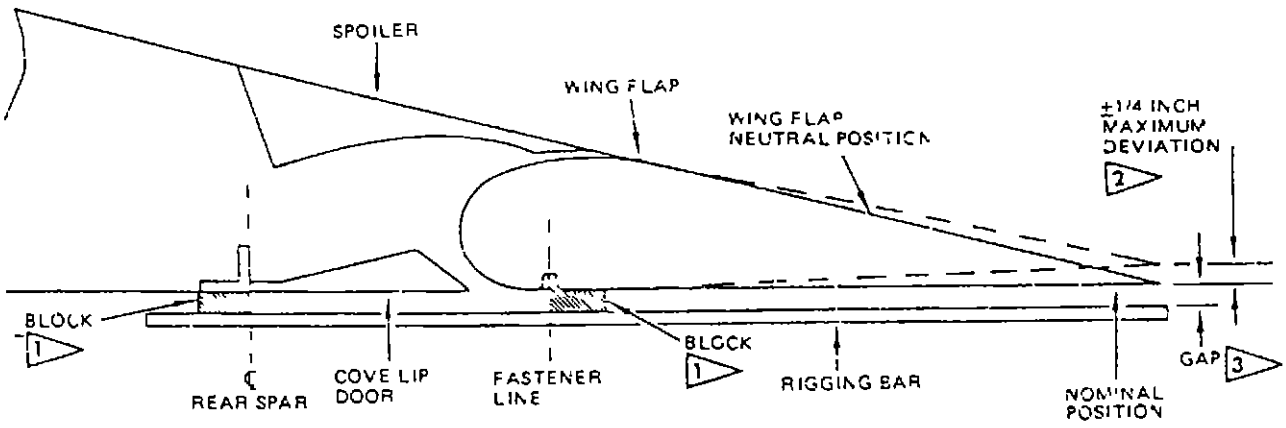
(b) Using splined coupling spanner wrench, rotate outboard transmission assembly input splined shaft as necessary to fair outboard trailing edge of flap with WCP. (See figure 209.) Lift trailing edge of flap to remove down slack.

NOTE. If inboard aileron is lifted to the faired position, flap may be adjusted to fair with aileron. Inboard aileron is rigged to droop below the WCP. The amount of droop will vary with ambient temperature.

(c) Check that angular distance between up stop dogs on jackscrew and ball bearing nut is not less than 45° on each inboard flap transmission assembly

(d) Disconnect torque tube from fillet flap transmission assembly and adjust transmission assembly input shaft to fair inboard end of fillet flap trailing edge with WCP. Flap should be fully retracted and lifted at trailing edge to remove down slack. Faired position of fillet flap may be determined by aligning lower inboard surface of flap with lower contour of adjacent inboard trailing edge beam Fillet flap trailing edge must fair with trailing edge beam within 0.30 inch.





1 USED WITH EIGHT – FOOT STRAIGHT EDGE BLOCKS MUST BE OF IDENTICAL THICKNESS

2 ALLOWABLE DEVIATION FROM NOMINAL TRAILING EDGE POSITION (DEVIATION AT OUTBOARD END OF INBOARD FLAP OR AVERAGE DEVIATION FOR OUTBOARD FLAP)

IF SPACERS HAVE BEEN INSTALLED BETWEEN INBOARD TRANSMISSION TRUNNIONS AND SUPPORT FITTING MAXIMUM DEVIATION OF 1/2 INCH IS ALLOWED PROVIDED LEFT AND RIGHT INBOARD FLAP DEVIATIONS ARE WITHIN 1/4 INCH OF EACH OTHER

3 NOMINAL POSITION OF FLAP TRAILING EDGE (GAP BETWEEN EIGHT – FOOT STRAIGHT EDGE AND TRAILING EDGE TO BE SAME AS BLOCK THICKNESS)

SECTION A–A

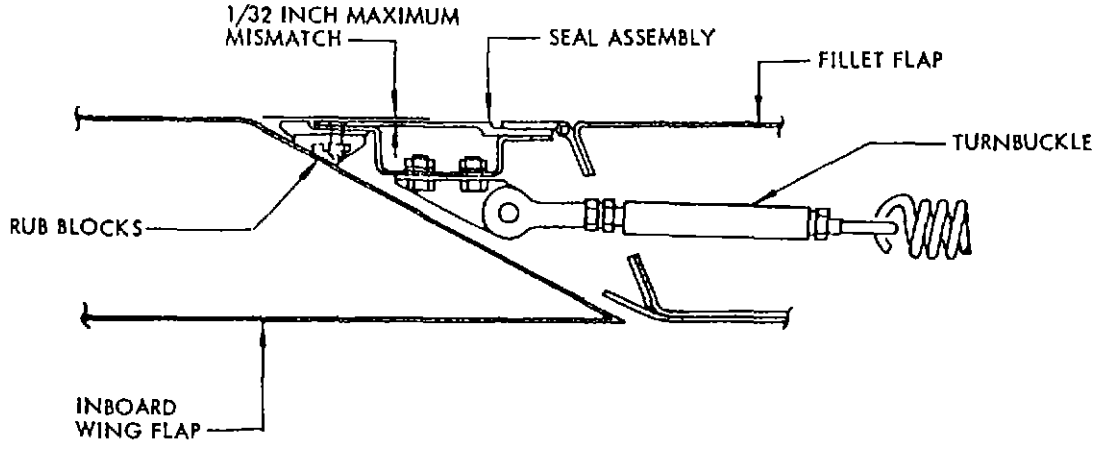
(e) Check that angular clearance between up stop dogs on ball bearing nut and jackscrew is not less than 45° on fillet flap transmission assembly

(f) If the up stop dogs on fillet flap transmission assembly contact, making it impossible to rig the fillet flap on the wing chord plane, or if there is less than the 45° minimum clearance between the stops, reset stop as follows:

1) Mark the angular position of the stop on the jackscrew. Determine number of spline teeth the stop must be rotated counterclockwise to position the dogs angularly to provide a minimum of 45° clearance. Rotating one spline tooth will provide about 6 42°.

2) For each spline tooth moved, add 0.006 inch shim thickness under stop to maintain 0.015 to 0.045 inch axial clearance between stop and nut. Maximum of 0.47 inch total shim thickness allowed. (See figure 211.)

NOTE Stop dogs on transmission assembly jackscrew are designed to absorb full flap motor torque but should not contact during normal operation



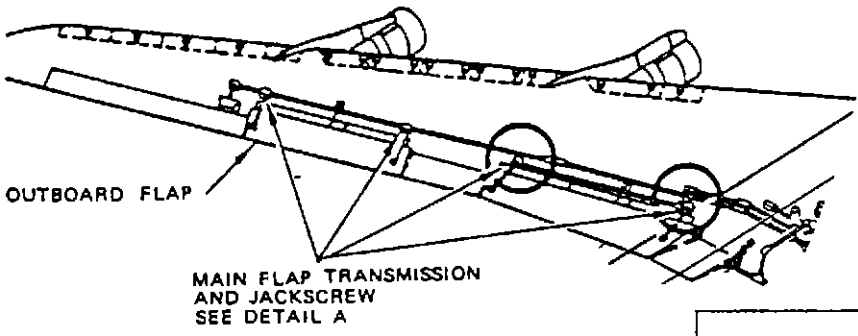
SECTION B–B

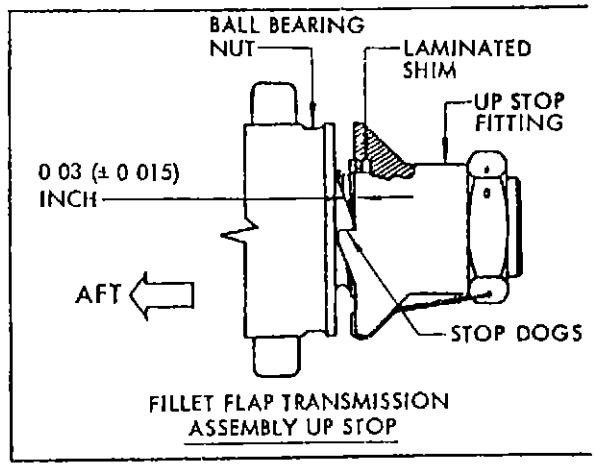
(FSM 6978-68-22, 9.7.68)

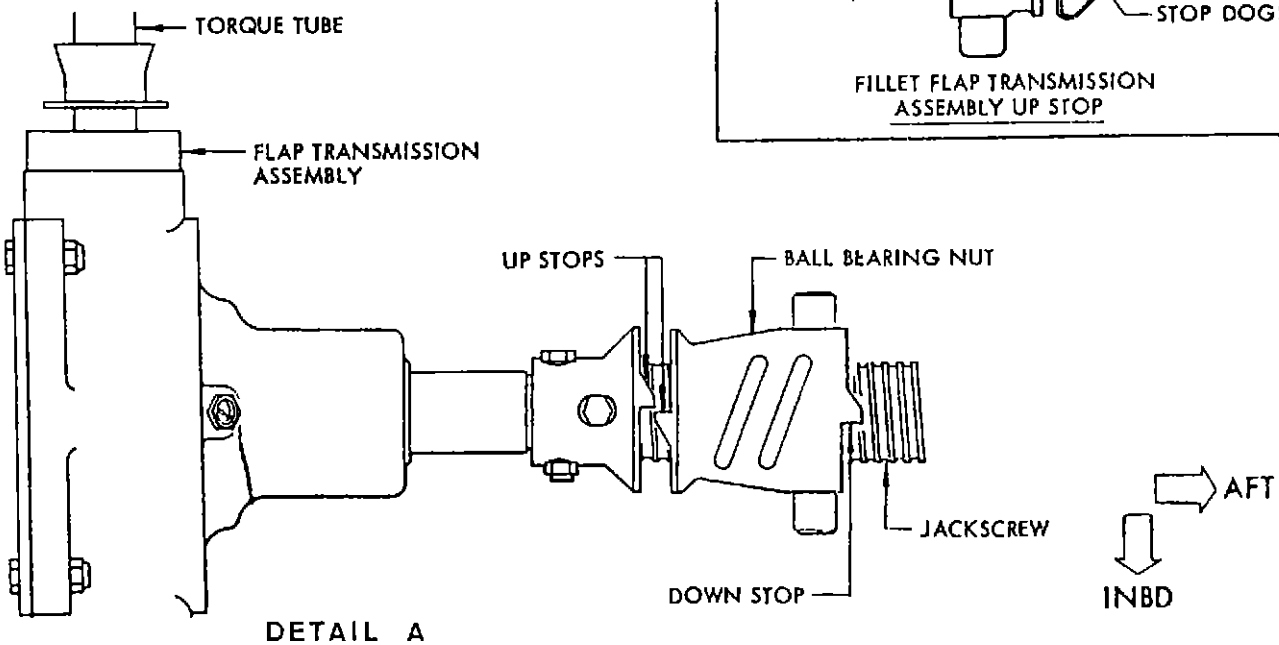
(g) With fillet flap trailing edge located as in step (d), disconnect torque tubes from transmission assembly at inboard end of inboard flap. Adjust transmission assembly to fair trailing edge of inboard flap with fillet flap Inboard flap shall not extend above fillet flap and shall not droop more than 3/4 inch below the fillet flap.

(h) Adjust rub blocks at outboard end of seal assembly until seal assembly fairs within 1/32 inch of inboard flap upper surface. (See figure 210.)

NOTE: Rubber seal on fairing must be compressed and rub blocks must rest firmly on inboard flap when checking fairing allowance.







DETAIL A

Main Wing Flap Transmission Assembly Adjustment
Figure 211

(i) Adjust length of links at each end of fillet flap until flaperette fairs with fillet flap outside contour within ± 0.05 inch (See figure 212) Rod ends of link are visable through two inspection holes in the barrel and shall never be advanced beyond this point

NOTE: Fairing allowance is measured from fillet flap outside contour at aft edge of flaperette casting. Lowest possible value shall be obtained after applying light pressure upward on fillet flap to remove down slack This is a mean dimension which is established by taking average of two readings at inboard and outboard end of flapperette

(j) Remove access panels from fillet flap fence for access to fence hinge fittings

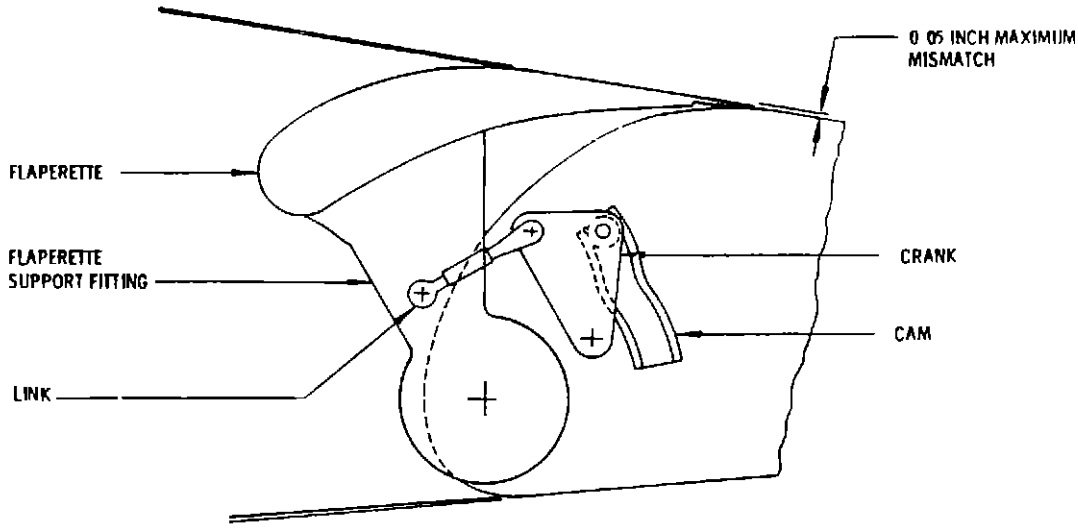
(k) Loosen hinge fittings

(l) Align coordinating holes in fence with coordinating holes in fence recess panels and install MS20392-3 rigging pin or AN4 bolt through holes to locate fence

(m) Tighten fence hinge bolts

(n) Adjust turnbuckle attaching fence recess panel to body structure to fair fence assembly with wing to body fairing within 0.02 inch at forward lower end of fence and within 0,10 inch at upper end of fence. (See figure 212A) Turnbuckle is accessible from wheel well

(o) Install access panels and remove rigging pins.



Fillet Flap Flaperette Adjustment
Figure 212

(4) Adjust outboard flap.

(a) Position outboard flap trailing edge to fair with wing chord plane within 1/4 inch by adjusting outboard flap torque tube spline couplings with spline coupling spanner wrench. Lift flap lightly at midpoints between tracks to remove downslack.

NOTE: This is a mean dimension established by taking the average of readings at straight edge markings on flap near inboard and outboard end. (See figure 209.)

(b) Check that angular distance between up stops on ball bearing nut and jackscrew is 90° (+90°/-45°) on each outboard flap transmission assembly.

(5) Connect torque tube couplings to power units, gearboxes and flap transmission assemblies. Install coupling retaining screws and lockwire screw heads together.

(6) Adjust outboard aileron lockout mechanism per 27-14-0, "Aileron Control System - Adjustment Test" and install torque tube between outboard aileron lockout gearbox and outboard flap transmission assembly. Install coupling retaining screws and lockwire screw heads together.

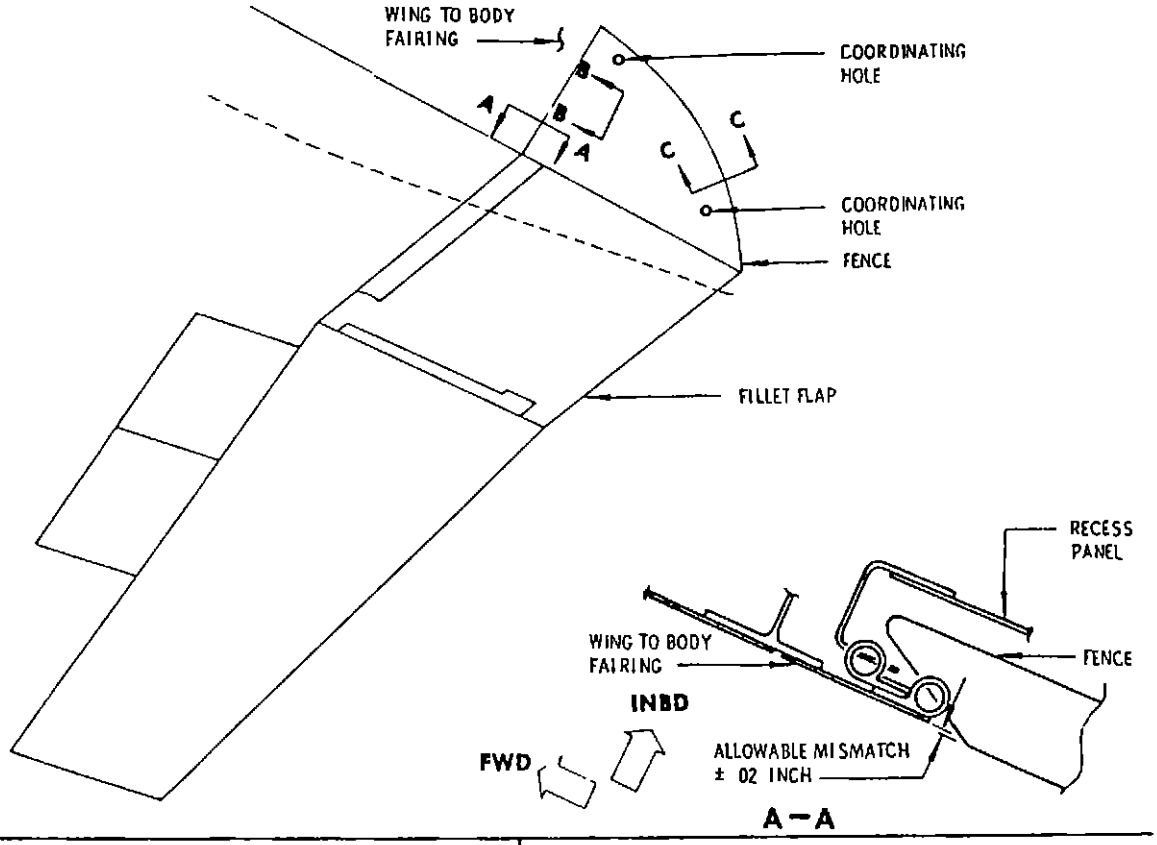
(7) Extend wing flaps to 49° (+1°/-0°).

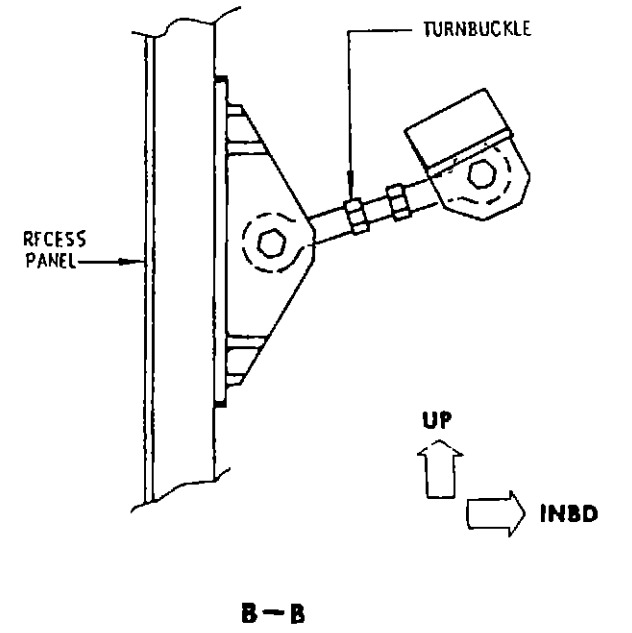
(8) Adjust stop (5, figure 206) on control drum to contact tapered spacer (4) by adding AN960 washers as required between stop and control drum (3). Add washers equally at each attachment point of drum and stop. On airplanes where bolts attaching stop to drum cannot be removed, remove bolt attaching tapered spacer to drum. Distribute washers at either thick or thin end of tapered spacer so that spacer will contact stop.

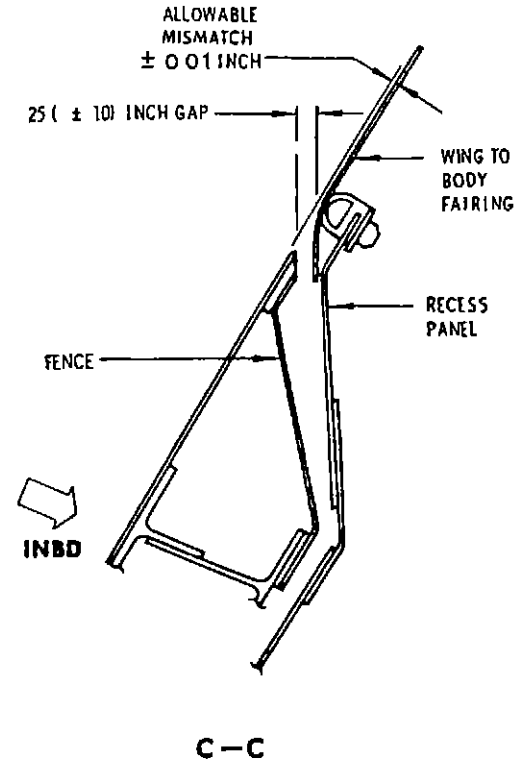
(9) Retract wing flaps.

(10) Check adjustment of fillet flap cove lip door actuating mechanism.

(a) Remove access panel from each end of cove lip door.


WING TO BODY FAIRING
COORDINATING HOLE
COORDINATING HOLE
FENCE
FILLET FLAP
A
B
C
RECESS PANEL
WING TO BODY FAIRING
FENCE
INBD
FWD
ALLOWABLE MISMATCH ± 02 INCH
A–A


TURNBUCKLE
RECESS PANEL
UP
INBD
B–B


ALLOWABLE MISMATCH ± 0 01 INCH
25 (± 10) INCH GAP
WING TO BODY FAIRING
RECESS PANEL
FENCE
INBD
C–C

(b) With flaps up, flaps at 30 degrees, and flaps down, check fillet flap cove lip door actuating mechanism clearances as follows

1) Clearance between inboard cam and structure, or heads of bolts and rivets, shall be no less than 0.100 inch.

2) Clearance between outboard cam and structure, or heads of bolts and rivets, shall be no less than 0.030 inch.

3) Clearance between bottoms of cam channels and ends of cam followers shall be no less than 0.040 inch.

(c) Disconnect fillet flap drive torque tube.

(d) Retract and extend fillet flap manually. Carefully check clearance between cove lip door and flaperette. Clearance shall be no less than 0.100 inch at any stage of flap operation. With flap fully down, reconnect torque tube. Install coupling retaining screws and lockwire screw heads together. Retract flaps.

(e) Install access panel at each end of cove lip door.

(f) If any clearance is not within limits, see 27-16-51, Fillet Flap Cove Lip Door - Maintenance Practices.

(11) Adjust main flap cove lip doors.

(a) Add or remove shims from below lower latch guides to position trailing edge of cove lip door to fair with main flap within 3/32 inch. Measure dimension by laying straight edge on the flat portion of the flap just aft of the bullnose at right angles to the door.

(12) Adjust emergency flap system limit switches.

(a) Pressurize utility hydraulic system and position wing flaps at 1/2 to 1 degree.

(b) Adjust up-limit switch (8, Fig. 205) on inboard flap control valve down toward switch actuator arm until switch actuates.

(c) Adjust switch away from arm until it snaps second time and tighten checknuts.

(d) Position flap control lever to 0-degree detent.

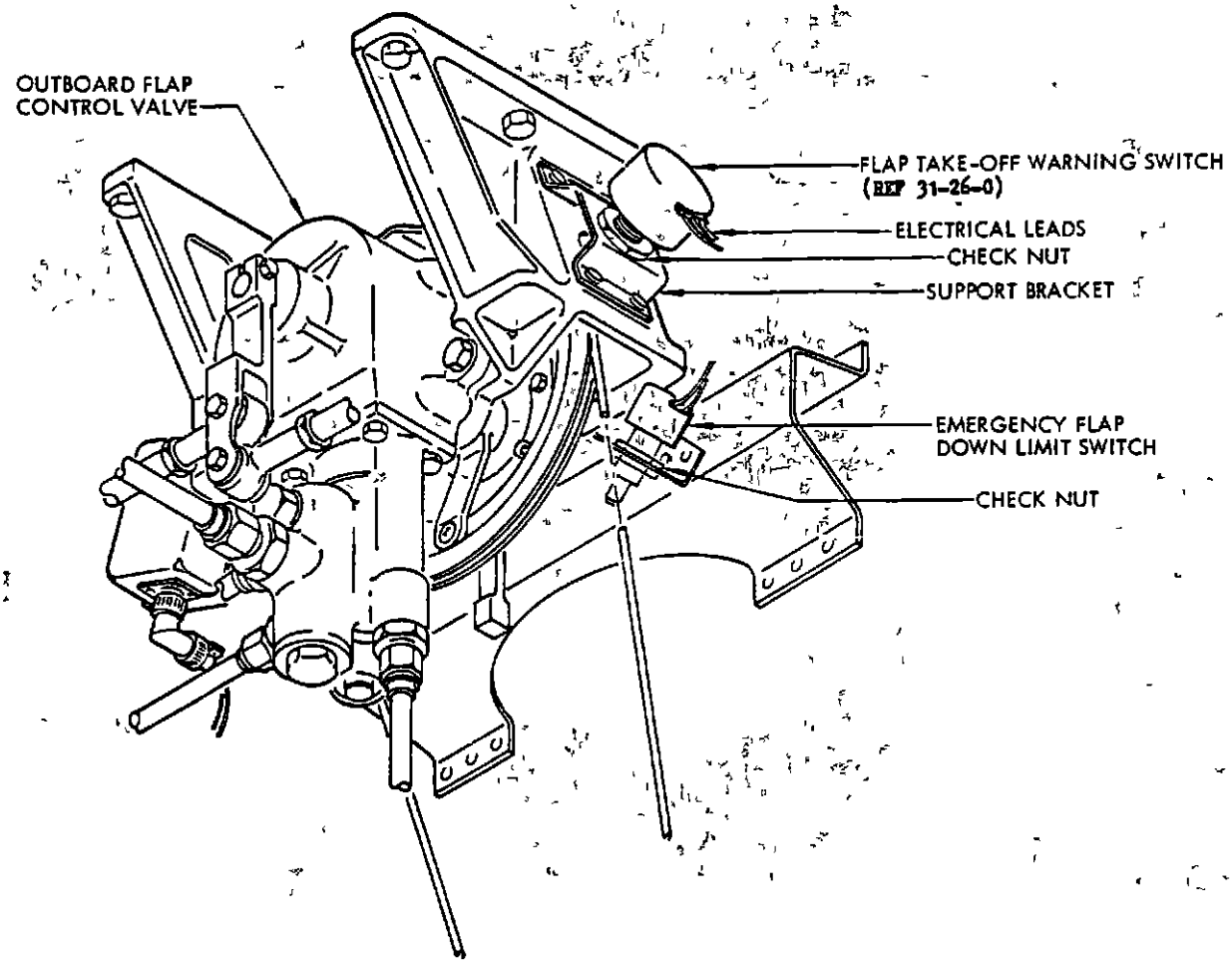
(e) Adjust up-limit switch on outboard flap control valve down toward switch actuator arm until switch actuates and tighten checknuts.

(f) Extend wing flaps to 49 +1/-0 degrees.

(g) Adjust down-limit switches on each flap control valve to actuate and tighten checknut (Fig. 213).

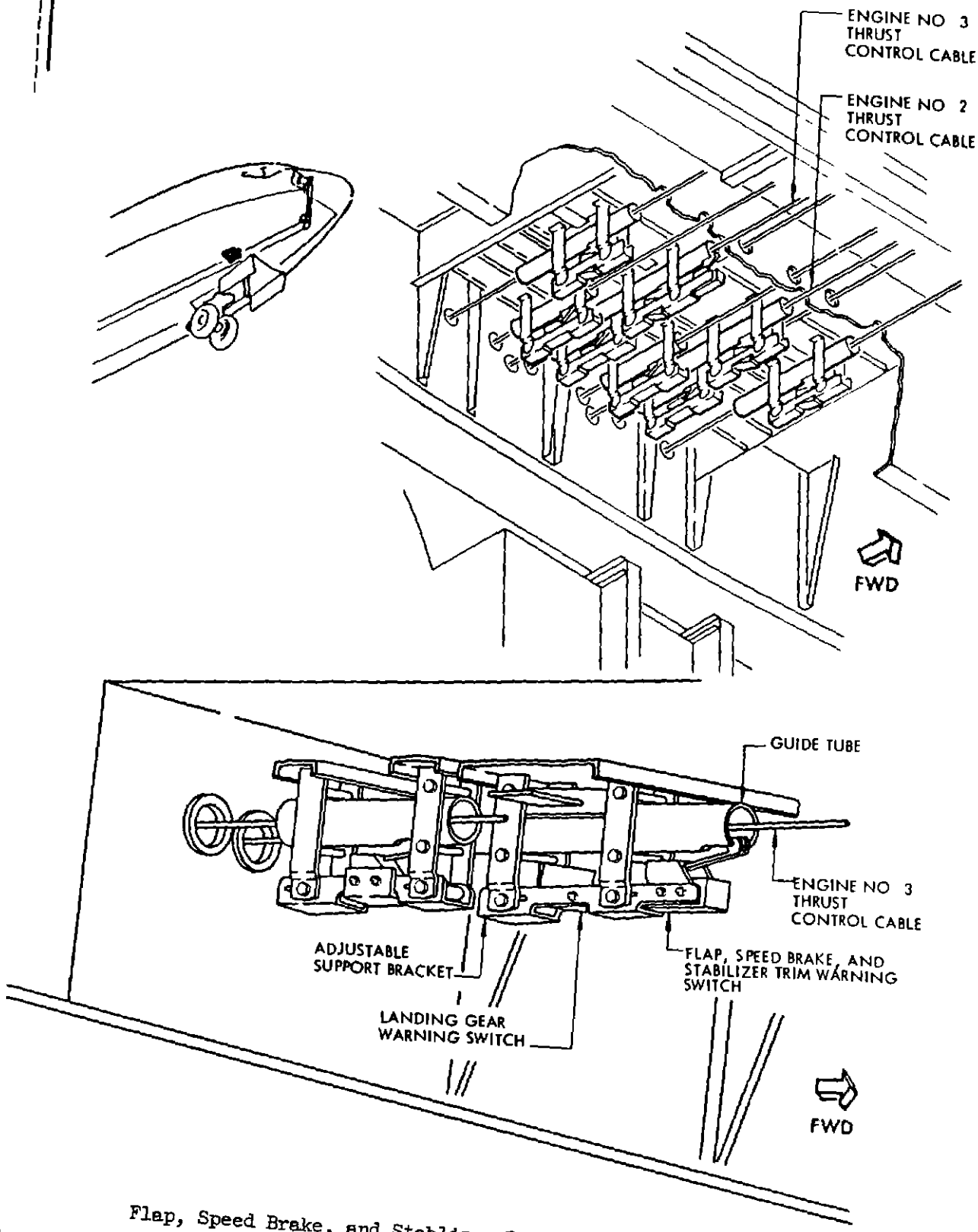
(13) Adjust flap takeoff warning switches (Ref 31-26-0, Aural Warning System - Adjustment/Test).

(14) Deleted



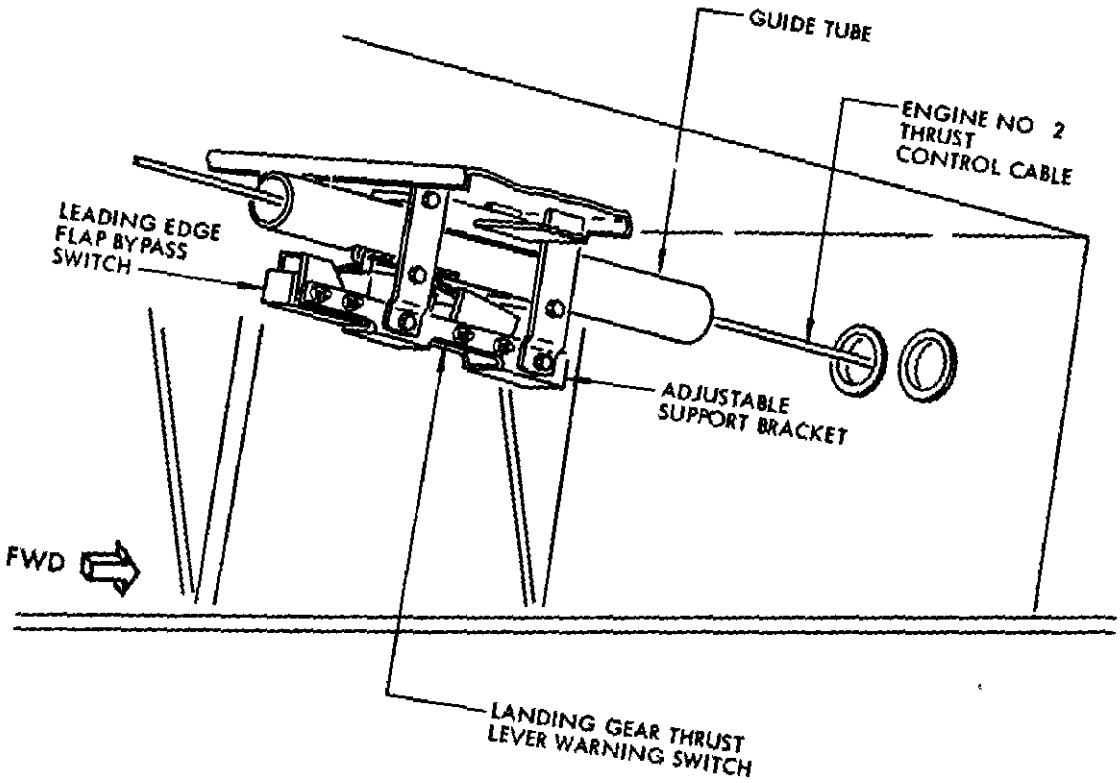
T.R. 27-340
Flap Take-off Warning Switch Adjustment
Figure 213

SAB. REV. 27 JUIN 1977.



Flap, Speed Brake, and Stablizer Trim Warning Switch and Flap Bypass Switch Installation
Figure 214 (Sheet 1)

D E L E T E D.


GUIDE TUBE
ENGINE NO 2 THRUST CONTROL CABLE
LEADING EDGE FLAP BYPASS SWITCH
ADJUSTABLE SUPPORT BRACKET
FWD
LANDING GEAR THRUST LEVER WARNING SWITCH

(15) Adjust landing gear warning flap control lever switch. See 32-6-12, Landing Gear Warning System - Maintenance Practices

(16) Adjust leading edge flap bypass switch (See figure 214)

(a) Position No 2 thrust lever 9 5 (± 2) degrees forward of idle.

(b) Loosen switch support bracket and adjust landing gear warning switch to actuate

NOTE: Correct adjustment of landing gear warning switch ensures correct adjustment of leading edge flap bypass switch since both are mounted on same support bracket.

(17) Adjust leading edge flap and slat position indicating switches (See figure 215)

NOTE: A position indicating switch is located at the inboard end of each group of leading edge flaps and slats

(a) Extend wing flaps

(b) Clamp protractor on the applicable flap or slat, index 0 and level to establish reference plane

(c) Remove bolts attaching leading edge flap or slat actuator to leading edge flap or slat

(d) Position flap or slat 5 degrees to 8 degrees from full extended position.

(e) Adjust position indicating switch so that there is electrical continuity across switch contacts

(f) Operate flap or slat through one cycle manually and check for switch actuation within limits specified in above step

(18) Adjust autopilot trim servo speed switch (11, figure 205) at flap control valve See Autopilot Trim Servo Speed Switch, Chapter 22

D Test Wing Flaps and Flap Control System

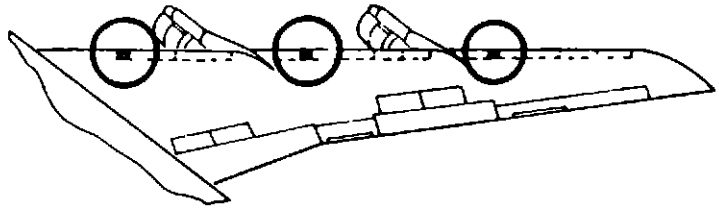
(1) Prepare system for test

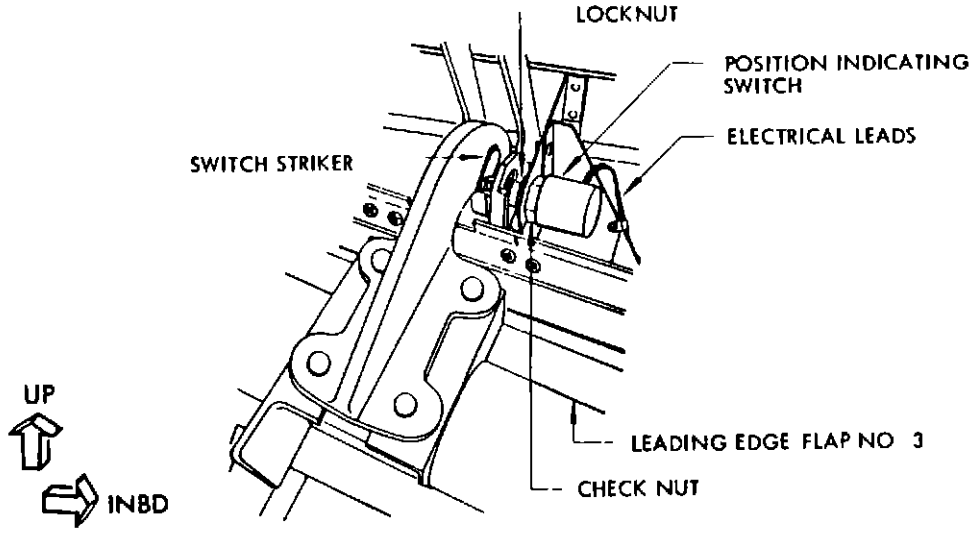
(a) Open main gear wheel wells

(b) Connect electrical power to airplane and close all flap system circuit breakers

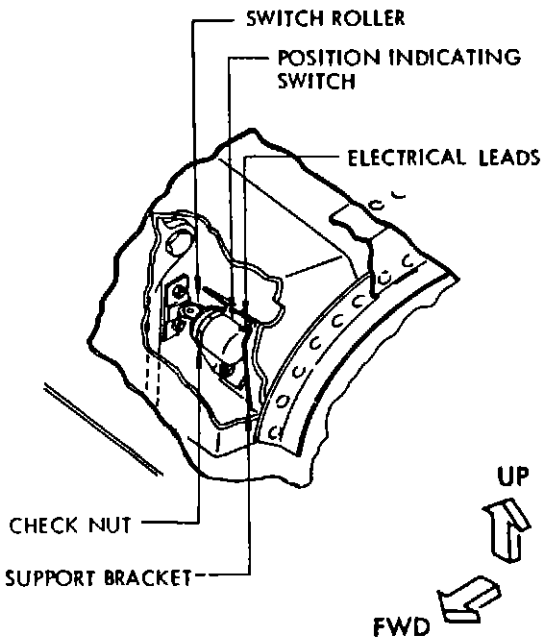
(c) Pressurize utility hydraulic system

(d) Lower main flap cove lip doors

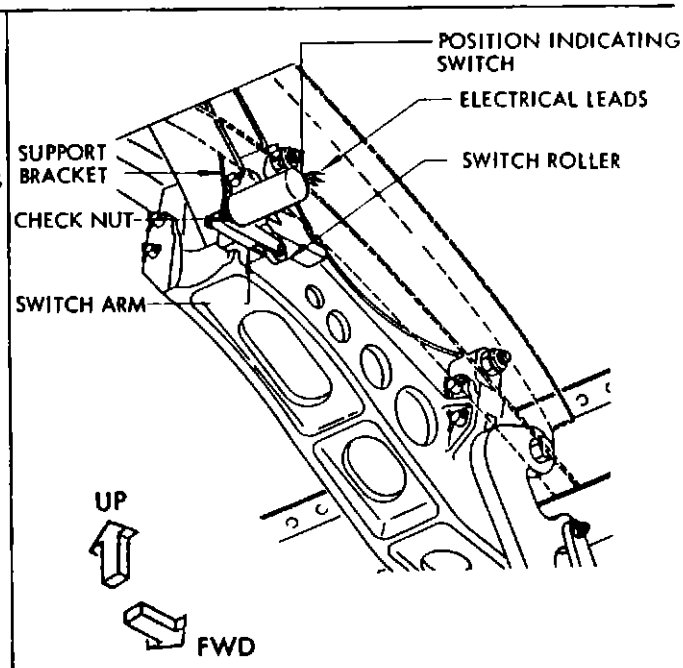




LEADING EDGE FLAP



INBOARD SLAT



OUTBOARD SLAT

10 Leading Edge Flap and Slat Position Indicating Switch Installation
Figure 215

(2) Test flap control lever operating force.

(a) Check that tangential force required to move flap control lever between detent does not exceed 3-1/2 pounds Measure force at end of lever with spring scale.

(3) Test trailing edge flap operation.

(a) Position flap control lever to DOWN.

(b) Check travel time. Flaps shall be fully extended in 25 to 35 seconds, and flaps shall slow to a gradual stop during last two revolutions of jackscrews.

NOTE: The flaps slow to a gradual stop as a result of the closing of the flap control valve and the resulting reduced flow through the flap drive motor If flaps do not slow to a gradual stop, a flap control valve malfunction is indicated.

(c) Check that angular distance between down stops on jackscrews and ball bearing nut on each main and fillet flap transmission assembly is a minimum of 1/4 turn of jackscrew.

(d) Position flap control lever to UP. Flaps shall retract in 25 to 35 seconds.

(e) After 5 minutes, check that angular distance between upstops on ball bearing nut and jackscrew is 45° to 180° on outboard flap transmission assemblies and not less than 45° on inboard flap transmission assemblies.

(f) Check that angular distance between upstops on ball bearing nut and jackscrew is 45° to 135° on each fillet flap transmission assembly.

(g) Position flap control lever to position shown in following table and check that flap travel is within defined limits. Check that flap position indicators indicate actual flap position to within 2° at each detent position and that dual needles on each indicator are aligned to within 2° throughout entire range of flap operation. With flaps in faired position indicators shall read 0 (± 2°).

Flap Control Lever Position	Right and Left Inboard and Outboard Flap Angles of Extension	Fillet Flap Angle of Extension
14°	12° to 16°	12.5° to 16°
25°	23° to 27°	23.5° to 27°
40°	38° to 42°	38° to 42°
50°	49° to 50°	47° to 50°

(h) Retract wing flaps.

(4) Test emergency flap system.

(a) Disconnect torque tubes from outboard flap emergency drive unit.

(b) Remove cap from side of emergency flap drive unit for access to hex fitting.

(c) Secure 7/16 inch hex fitting with wrench and rotate spline coupling on emergency drive unit. Check that torque limiter disengages when 1000 to 1300 pound-inches of torque is applied to spline couplings. Rotate coupling in opposite direction to re-engage torque limiter.

(d) Connect torque tubes to spline couplings on outboard flap emergency drive unit. Install coupling retaining screws and lockwire screw heads together.

(e) Install cap over hex fitting.

(f) Open emergency flap motor circuit breakers on circuit breaker panel (P1) and (P4). Flap motor control circuit breakers on circuit breaker panel (P5) shall remain closed.

(g) Actuate emrgency flap drive switch to ON position and inboard and outboard emergency flap switches to DOWN position.

(h) Check that trailing edge flaps do not respond to positioning of flap control lever.

NOTE: Hydraulic system shall be pressurized during steps (g) and (h).

(i) Repeat steps (g) and (h) with emergency flap switches positioned to UP.

(j) Reduce hydraulic system pressure to "0" psi.

(k) Close emergency flap motor circuit breakers on circuit breaker panel panel (P1) and (P4).

(l) Actuate emergency flap switches to DOWN.

(m) Check that main wing flaps extend 49° to 50°.

(n) Check that clearance between down stops on jackscrew and ball bearing nut is a minimum of 1/4 turn on each main flap transmission assembly.

(o) Actuate emergency flap switches to UP. Flaps shall retract to within 1° of normal, faired, position. It is not required that flaps retract to within 1/4 inch of wing chord plane since flap up limit switches are adjusted to actuate with the flaps extended 1/2° to 1°.

(p) Check that angular distance between up stops on ball bearing nut and jackscrew is 45° to 180° on outboard flap transmission assemblies and not less than 45° on inboard flap transmission assemblies.

(q) Actuate emergency flap switches to DOWN.

(r) Check that wing flaps extend in 1-1/2 to 3-1/2 minutes.

(s) After waiting 30 seconds, repeat steps (q) and (r) except actuate flap switches to UP.

(5) Test main cove lip door operation.

(a) Pressurize utility hydraulic system.

(b) Unlatch cove lip doors and check that each inboard flap cove lip door actuator arm roller, and at least one roller on each outboard cove lip door actuator arm, is in contact with the carriage over not less than 75% of roller width.

(c) Close and latch cove lip doors.

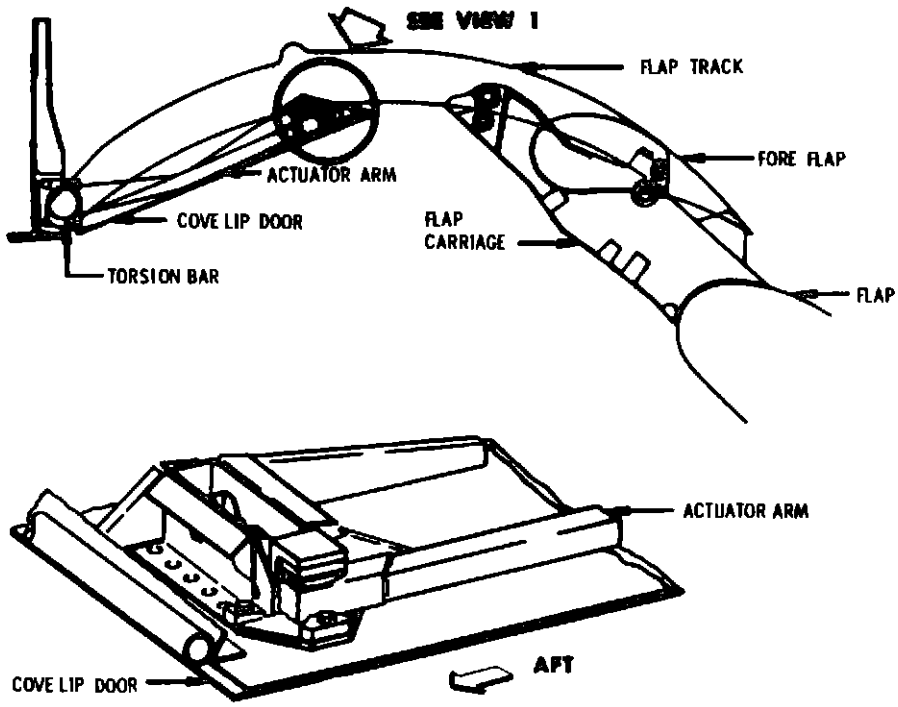
(d) Extend flaps to 50°, stopping at each flap control lever detent position. Unlatch cove lip door and check roller contact as in step (b) at each position. Close and latch cove lip doors after each check.

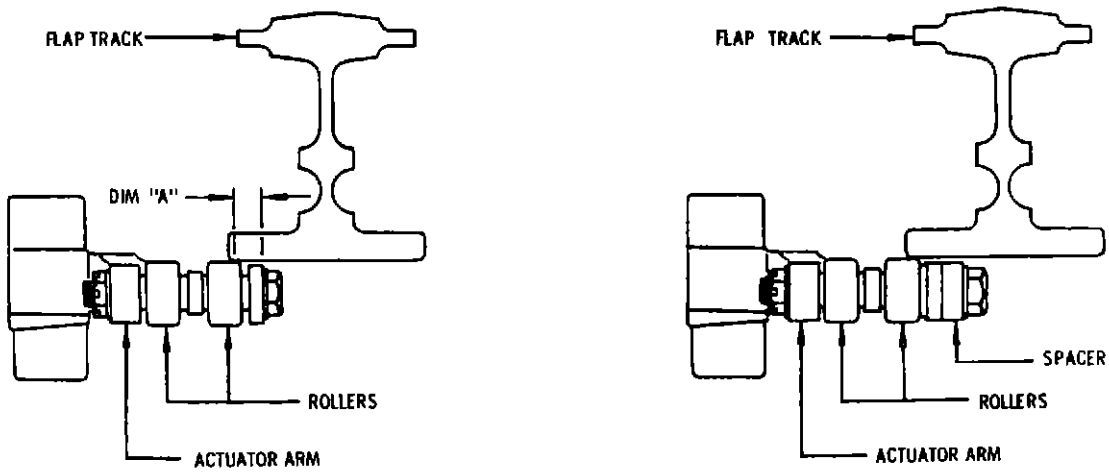
NOTE: When flaps are sufficiently extended, rollers may be visually checked without opening cove lip doors.

(e) Retract flaps.

(f) Operate flaps to 50° and back to 0°. Check that cove lip door actuator arm transfers smoothly from flap carriage to flap track and from track back to carriage.

(g) With flaps extended and cove lip door latched to actuator arm, check that actuator arm extension makes sufficient contact with flap track to insure a positive stop. For inboard cove lip door actuator arms, this may be determined by measuring distance from end of spacer on actuator arm to chamfer on flap track. A dimension of 1/2 inch or more will insure a





ORIGINAL CONFIGURATION (TYP)

ALTERNATE CONFIGURATION

VIEW 1

Outboard Flap Cove Lip Door
Actuator Arm to Flap Track Engagement
Figure 216

(g) (ctd)
positive stop. Less than 1/2 inch indicates incorrect installation. On outboard cove lip doors, measure dimension from bottom face of bolt head through actuator arm to chamfer on flap track. (See figure 216). A dimension of 1/2 inch or more will insure a positive stop. If dimension is less than 1/2 inch, remove bolt and install a longer bolt with spacer between bottom face of bolt and actuator arm. Spacer width should be 0.25 inch and diameter should be 0.84 inch.

(h) Lower cove lip doors.

(i) Raise and latch cove lip doors.

(j) Retract flaps.

(k) Check that sliding motion between cove lip door actuator arms and latch guide is not impeded by binding.

(l) Check for smooth transferral of actuator arm from flap track to flap carriage cam.

(6) Test outboard aileron lockout mechanism.

(a) Rotate inboard aileron and check that outboard ailerons do not respond to inboard aileron movement.

(b) Extend wing flaps to 50°.

(c) Rotate inboard aileron and check that outboard ailerons respond.

(7) Test leading edge slats and flaps.

(a) Retract wing flaps.

(b) Check that leading edge slats and flaps are faired with lower surface of wing.

(c) Slowly rotate flap control lever toward FLAP DOWN position until leading edge flap position indicating lights are illuminated. Check that trailing edge flap angle of extension is 5° to 9°.

(d) Check that each inboard leading edge flap extends 101° 30' to 103° 30'. Angular variation between corresponding left and right leading edge flaps shall not exceed 1°. Check at outboard end of each inboard leading edge flap.

NOTE: Measure angles from faired position.

(e) Check that each inboard leading edge slat extends 110° to 112°. Angular variation between corresponding left and right leading edge slats shall not exceed 1°. Check at inboard ends of slats No. 9 and 10 and any place on remaining slats.

(f) Check that each outboard leading edge slat extends 116° to 118°. Angular variation between corresponding left and right slats shall not exceed 1°.

(g) Position flap control lever to DOWN to fully extend trailing edge flaps.

(h) Slowly move flap control lever toward UP until leading edge flap position indicating lights are extinguished. Check that trailing edge flaps are 2° to 8° from the faired position.

(8) Test leading edge flap hydraulic lock valves.

(a) Extend wing flaps.

(b) Reduce hydraulic pressure to 0 psig and check that leading edge flaps do not retract when force is manually applied to flap in flap up direction.

(c) Increase hydraulic pressure to normal and retract the flaps and slats.

(9) Test leading edge flap retraction by thrust reverser operation.

(a) Place forward and reverse thrust levers at idle.

(b) Connect electric power to airplane.

(c) Pressurize utility hydraulic system.

(d) Apply 25 psig air pressure at engine No. 2 ground connection check valve located at lower left side of nacelle strut.

NOTE. Volume capacity of air source is important. Therefore, minimum ground air line size should be equivalent to normal thrust reverser pressure line. The gage should be located close to ground connection shuttle valve.

(e) Position flap control lever at DOWN to extend flaps.

(f) Move No. 2 reverser thrust lever away from idle and check that leading edge flaps retract before lever is 67° away from idle. Use reverse thrust lever protractor assembly to measure angle.

(g) Move No. 2 reverse thrust lever toward idle and check that leading edge flaps extend before lever is 40° from idle.

(h) Position No. 2 reverse thrust lever at idle.

(i) Retract flaps.

(10) Close up and return system to normal configuration.

(a) Raise and latch all cove lip doors.

(b) Install access panels.

(c) Close wheel well doors.

(d) Disconnect electric power.

(e) Disconnect hydraulic pressure source.

4. Inspection/Check Wing Flaps and Flap Control System

A. Check Flap System

(1) Check flaps for contour with wing trailing edge within specified limits.

(2) Check that normal flap extension and retraction time is within specified limits.

(3) Check that emergency extension and retraction time is within specified limits.

(4) Open main gear wheel wells.

(5) Check control valve screens for foreign matter.

(6) Check flap tracks for wear per figure 217.

(7) Check torque tube couplings (fig.201, chapter 27-16-101). Coupling half (10) should have no perceptible end play. Any appreciable end play of coupling half would indicate a loose or missing nut (9).

B. Examine Trailing Edge Flap Tracks

(1) Check flap track for evidence of wear.

(a) At forward end of flap carriage, measure dimension A between upper and lower rollers. (See section A-A, figure 217)

(b) Measure dimension B on flap track lower flange Dimension B is thickness of flange between maximum depth of wear of upper and lower flap carriage rollers.

(c) Subtract dimension B from dimension A. If this value is greater than 0.035 inch, replace flap track.

(2) Check flap track for evidence of corrosion pitting.

(a) If pitting is evident, lower flange of track may be machined to remove pits. Metal may be machined from either or both faces of lower flange providing thickness of flange before plating is maintained as follows:

1) Thickness of lower flange on outboard flap center track shall not be less than 0 3514 inch at any location.

2) Thickness of lower flange on other outboard flap tracks shall not be less than 0.2260 inch at any location.

3) Thickness of lower flange on all inboard flap tracks shall not be less than 0.3760 inch at any location.

(b) After flange is machined, flap track shall be cadmium plated. Cadmium plating thickness should be 0 0006 to 0.0010 inches.

(c) Flap track should be replaced if metal removal within above limits does not allow removal of all corrosion pits.

C. Check Fillet Flap Actuator Arm Lost Motion.

(1) Pressurize utility hydraulic system.

(2) Retract flaps.

(3) Depressurize utility hydraulic system, open system bypass valve

(4) Install protective cover on trailing edge of fillet flap and place a support, suitable for supporting total weight of flap, under protected trailing edge.

(5) Disconnect torque tube from input side of fillet flap transmission assembly.

(6) Using spline coupling spanner wrench, lower fillet flap to rest firmly on support.

(7) Tape transmission assembly ball bearing nut to jackscrew to prevent loss of adjustment and disconnect ball bearing nut from fillet flap actuator arm by removing inboard plate assembly.

(8) Replace inboard plate assembly; tighten two or more of the four nuts to hold plate securely.

(9) Measure lost motion with a dial indicator at the center of the bushing in the actuator arm plate assembly (20 inches from center of fillet flap drive shaft). Lost motion must not exceed 0.114 inch.

(10) If lost motion exceeds 0.114 inch, and if shaft to bushing fit (2, figure 220) is within limits, replace fillet flap drive shaft, actuator arm, or both.

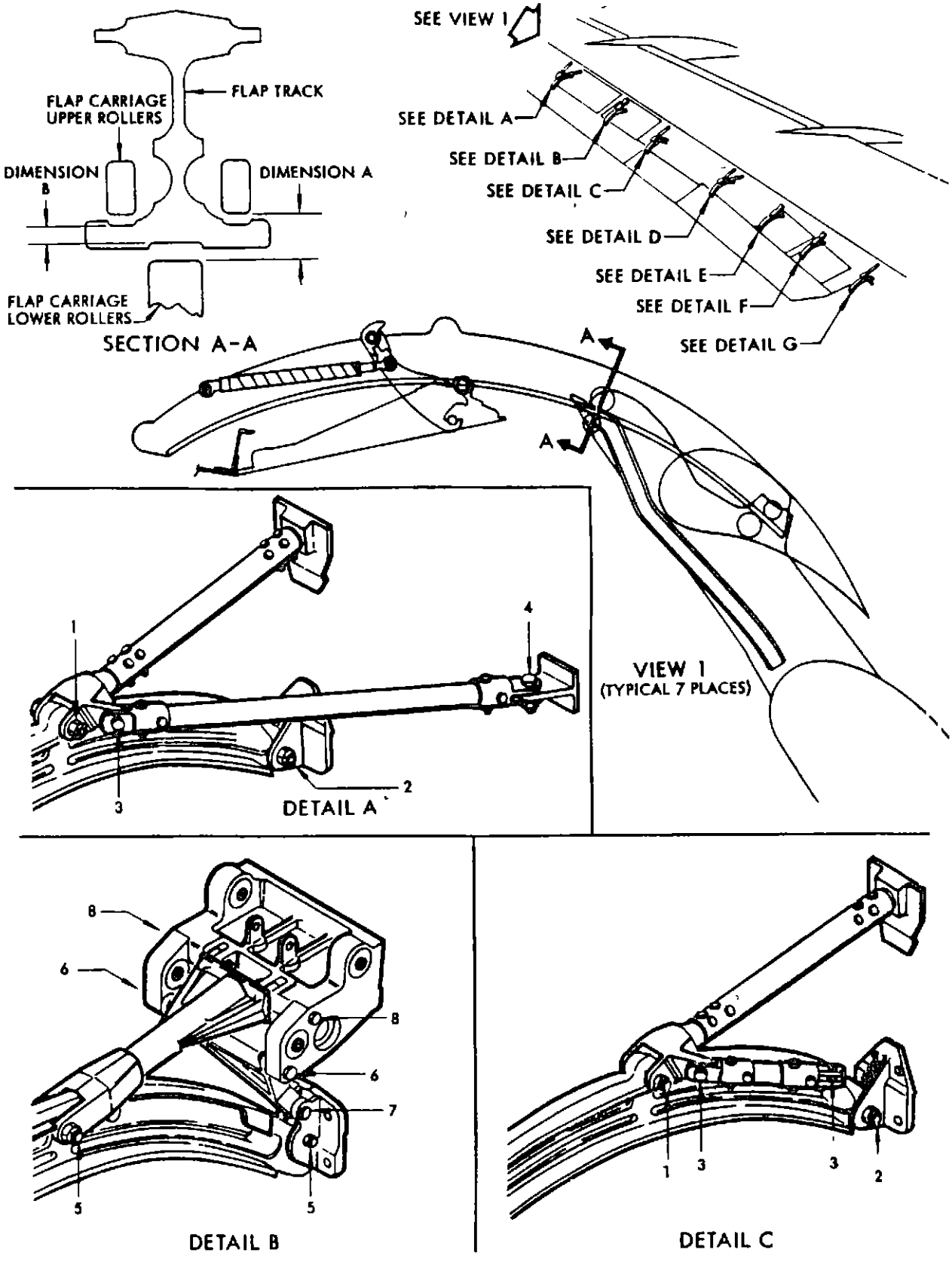
NOTE: After wear or rework, effective clearance between spline tooth and serration can be no greater than 0.0059 inch. A clearance of 0.0059 inch would allow an angular movement between shaft and arm, or between shaft and hinge fitting, of 0 degrees 9.75 minutes or a potential combined movement of 0 degrees 19.5 minutes between arm and hinge fitting. This motion can be measured at the actuator screw pick-up point on the Actuator Arm; this distance being 20.00 inches from the center of the shaft. With fillet flap held steady, this motion measured at the pick-up point would be 0.114 inch. If a movement of greater than 0.114 inch is experienced, the cadmium plating on the arm or shaft spline may be removed and replated with a maximum of 0.0025 inch electroless nickle plate. If plating of the arm or shaft spline does not reduce the motion to less than 0.114 inch at the actuator screw pick-up point, a new arm and/or shaft must be installed. If only shaft splines are nickle plated, arm splines should be tin plated instead of cadmium plated.

(11) With lost motion checked within limits, remove actuator arm inboard plate assembly, connect actuator arm to ball bearing nut, and replace plate assembly. Tighten all retaining nuts.

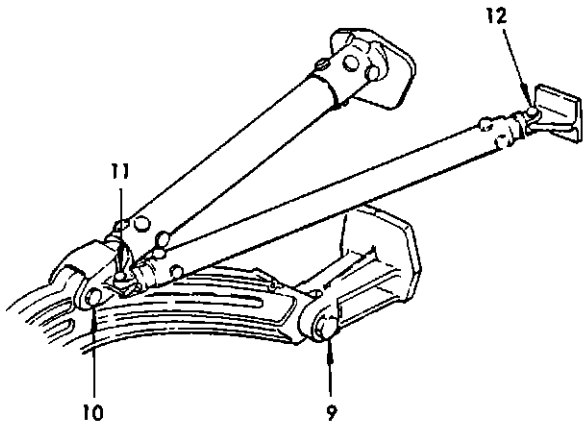
(12) Retract fillet flap to faired position using spline coupling spanner wrench. Fillet flap must fair with trailing edge beam structure within 0.03 inch with not less than 45 degrees clearance between fillet flap up stop dogs.

(13) Connect torque tube at input side of fillet flap transmission assembly. Install coupling retaining screws and lockwire screw heads together.

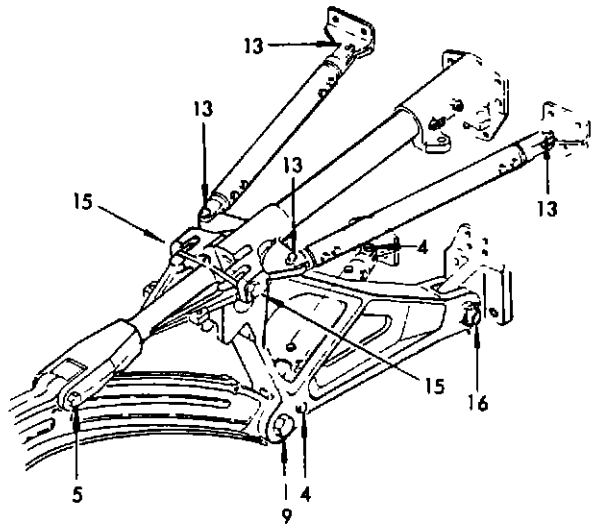
(14) Pressurize utility hydraulic system and check flap operation.



Flap Track Wear Limits
Figure 217 (Sheet 1)



DETAIL D



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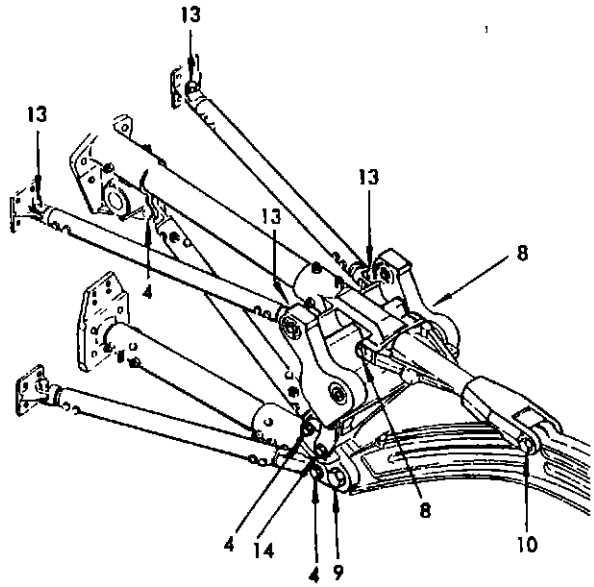

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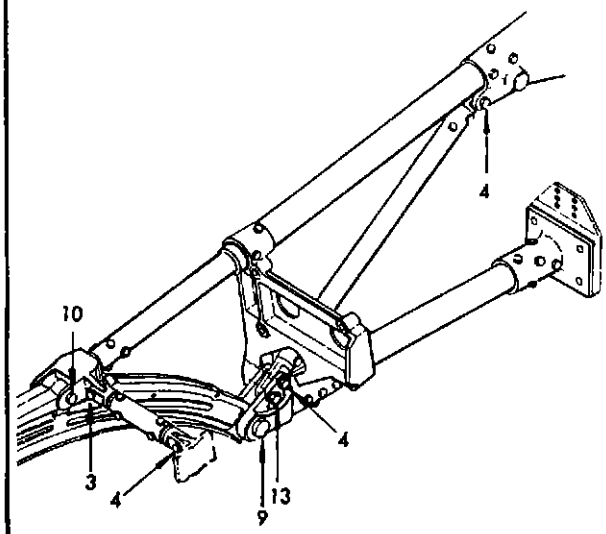

DETAIL G

INDEX NO	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX.	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	NO	MTL	OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTERFERENCE MIN	MAX
1 (4)	ID	0.5000	0 5010	0.5030	0.0035	X		(7)	0.6252	0.0005	0.0020
	OD	0.4985	0.4995	0.4965					-		
2 (4)	ID	0 5620	0.5630	0.5652	0.0037	X		(7)	0.6877	0.0005	0.0020
	OD	0.5605	0.5615	0.5583							
3 (2)	ID	0.2492	0.2502	0.2517	0.0025		(1)				
	OD	0.2483	0.2492	0.2479							
3 (3)	ID	0.2495	0.2505	0 2520	0.0025	X		(5)	0.3751	0 0005	0 0020
	OD	0.2485	0.2495	0.2481					(6)		
4 (2)	ID	0 2492	0.2502	0.2517	0.0025		(1)				
	OD	0.2483	0.2492	0.2479							
4 (3)	ID	0.2495	0.2505	0.2520	0 0025	X		(8)	0.3751	0.0005	0 0020
	OD	0.2485	0.2495	0.2481					(6)		

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Flap Track Wear Limits
Figure 217 (Sheet 3)

INDEX NO	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM	WEAR LIMITS MAX. DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL.	OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE MIN	BUSHING INTERFERENCE MAX
5 ▷4	ID	0.7195	0 7505	0 7535	0.0045	X		▷7	0.9388	0.0005	0.0020
	OD	0.7480	0 7490	0.7450							
6 ▷2	ID	0.4991	0.5001	0.5026	0 0035		▷1				
	OD	0.4982	0.4991	0.4978							
6 ▷3	ID	0 4995	0 5005	0.5030	0.0035	X		▷8	0.6252	0.0005	0 0020
	OD	0.4985	0 4995	0.4981					▷6		
7 ▷2	ID	0.4991	0 5001	0.5026	0 0035		▷1				
	OD	0.4982	0 4991	0.4978							
7 ▷3	ID	0.4995	0 5005	0 5026	0 0035	X		▷5	0.6252	0.0005	0.0020
	OD	0 4985	0 4995	0 4978					▷6		
8	ID	0 5620	0.5630	0.5652	0.0037	X		▷5	0.6877	0.0005	0 0020
	OD	0.5605	0 5615	0 5601					▷6		

INDEX NO	DIM	DESIGN LIMITS DIAMETER MIN.	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX. DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL.	OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTERFERENCE MIN	BUSHING INTERFERENCE MAX
9 [4]	ID	0.9995	1.0005	1 0045	0.0055	X		[7]	1.1883	0 0005	0.0020
	OD	0 9980	0.9990	0.9940							
10 [4]	ID	0.7495	0 7505	0 7535	0.0055	X		[7]	0.9388	0.0005	0 0020
	OD	0.7480	0.7490	0.7450							
11 [2]	ID	0 3745	0.3755	0.3772	0 0030		[1]				
	OD	0.3733	0.3742	0.3729							
11 [3]	ID	0.3749	0.3759	0.3775	0.0030	X		[5]	0.5001	0.0005	0.0020
	OD	0.3735	0.3745	0.3731					[6]		
12 [2]	ID	0.3745	0.3755	0 3772	0.0030		[1]				
	OD	0.3733	0 3742	0.3729							
12 [3]	ID	0.3749	0.3759	0.3775	0.0030	X		[8]	0.5001	0.0005	0.0020
	OD	0.3735	0.3745	0.3731					[6]		
13 [3]	ID	0.3120	0.3130	0 3147	0.0027	X		[8]	0 4376	0.0005	0.0020
	OD	0 3110	0.3120	0.3106					[6]		

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Flap Track Wear Limits
Figure 217 (Sheet 5)

INDEX NO	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL	OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE MIN	BUSHING INTERFERENCE MAX
14	ID	0 4370	0 4380	0.4400	0 0035	X		(8)	0.5636	0 0005	0 0020
	OD	0.4360	0 4370	0 4356					(6)		
15 (2)	ID	0 5616	0 5626	0 5653	0 0037		(1)		0 6877		
	OD	0 5607	0 5616	0 5603					(6)		
15 (3)	ID	0 5620	0.5630	0 5652	0 0037	X		(5)	0 6877	0 0005	0 0020
	OD	0.5605	0 5615	0.5601					(6)		
16 (3)	ID	0.7495	0 7505	0.7535	0.0045			(8)	0.9378	0 0005	0 0020X
	OD	0 7480	0.7490	0.7476							

General Notes:

In some installations, NAS464P8, NAS464P9, and NAS464P12 bolts were used optionally to NAS1108, NAS1109, and NAS1112 respectively. The NAS1100 bolts require a slightly larger hole than the NAS464 bolts as indicated in the wear chart, and are recommended as replacements for the NAS464 bolts.

When installing or replacing bushings, NAS537 bushings will be used as replacement parts unless otherwise noted. Install cadmium-plated steel bushings in steel parts and aluminum-bronze bushings in aluminum parts, except as noted.

In some installations, 69-42613, 69-42614, 69-42615 and 69-42616, chrome-plated bolts and corrosion-resistant steel bushings are used to install the flap tracks. The chrome-plated bolt and corrosion-resistant bushing are recommended as replacement parts at the indicated wear points.

1 See General Notes.

2 Wear limit for NAS464 bolt installation; not recommended for replacement.

3 Wear limit for NAS1104, NAS1105, NAS1108, NAS1109, or NAS1112 bolt installation; replacement part.

4 Wear limit for 69-42613, 69-42614, 69-42615 and 69-42616 chrome-plated, corrosion-resistant steel bolt installation, recommended replacement part.

5 Install NAS537 cadmium-plated steel bushing in steel part, and install NAS537 aluminum-bronze bushing in aluminum part, ream to size after installation.

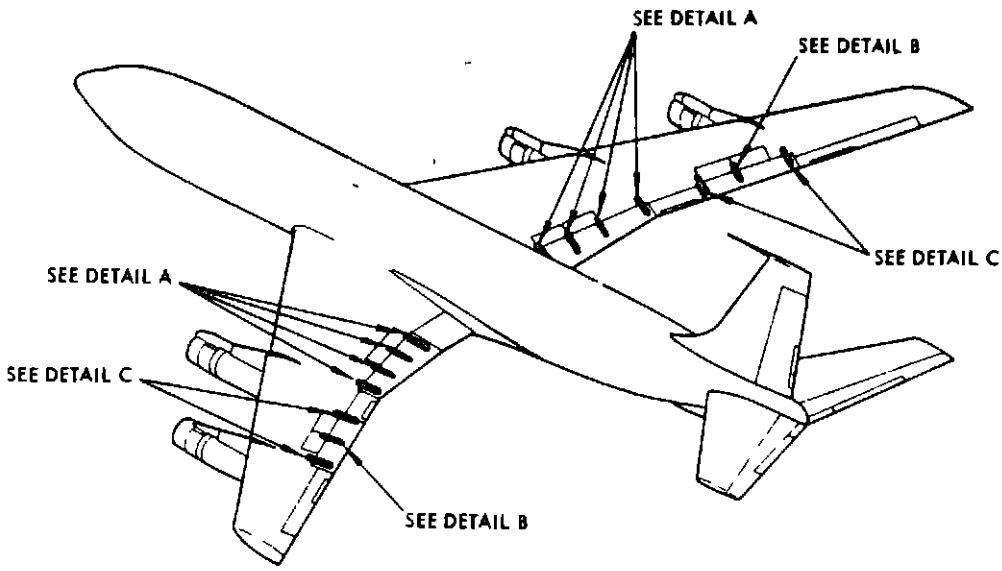
6 Bolt, up to 1/16 inch oversize, allowed when no bushing is installed in either part. Close ream hole to bolt size.

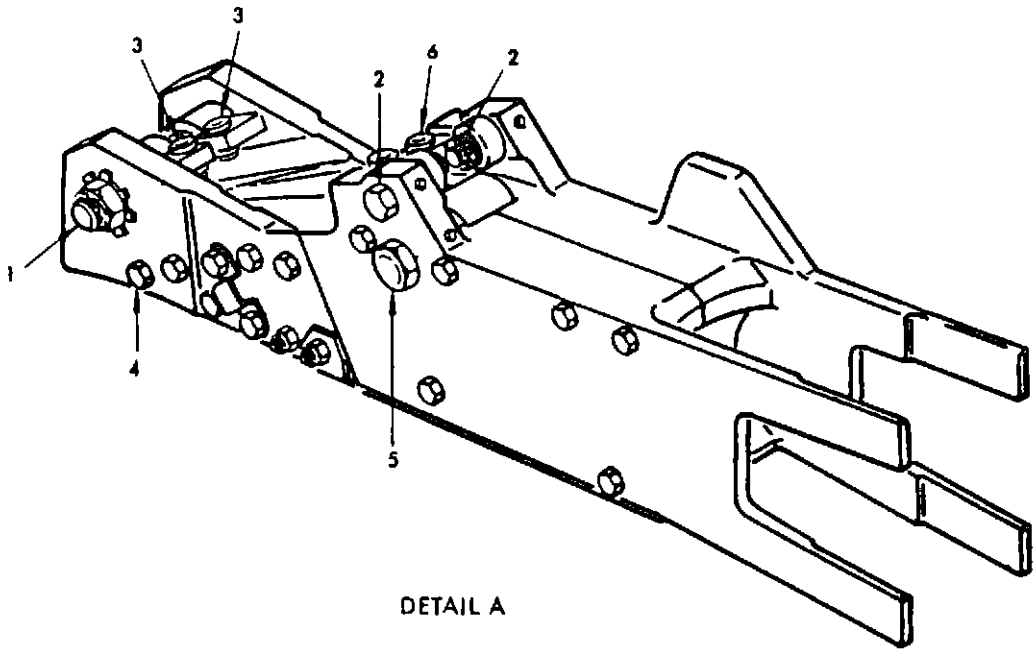
7 Install or replace, as applicable, corrosion-resistant steel BACB28U bushing in track and corrosion-resistant steel BACB28W bushing in fitting. Ream to size indicated and install chrome-plated bolt.

8 Install NAS537 aluminum-bronze bushings; ream to size after installation.

Install NAS537 cadmium-plated steel bushings; ream to size after installation.

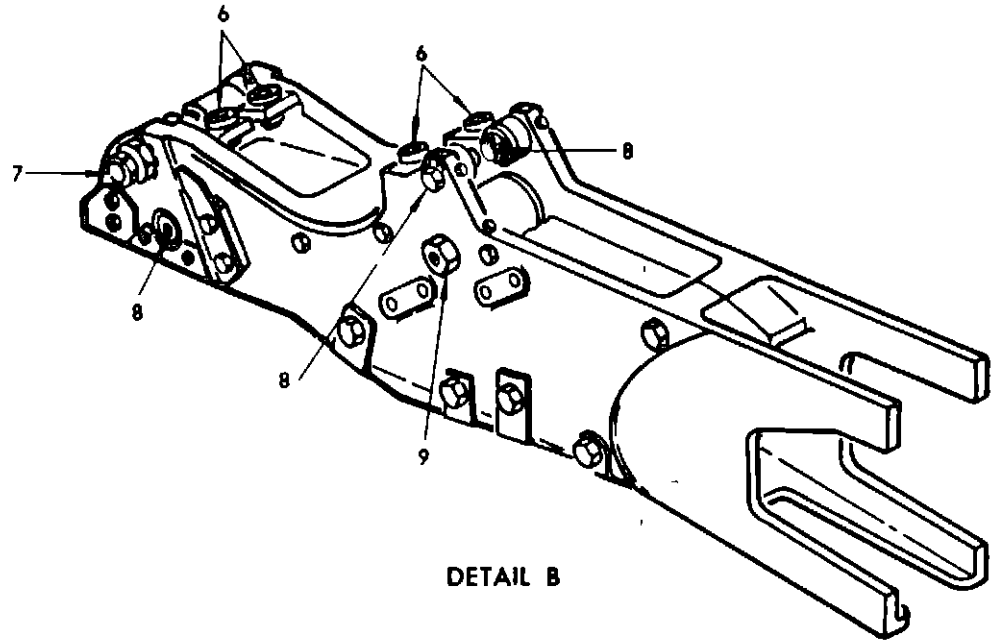
SB. 2368



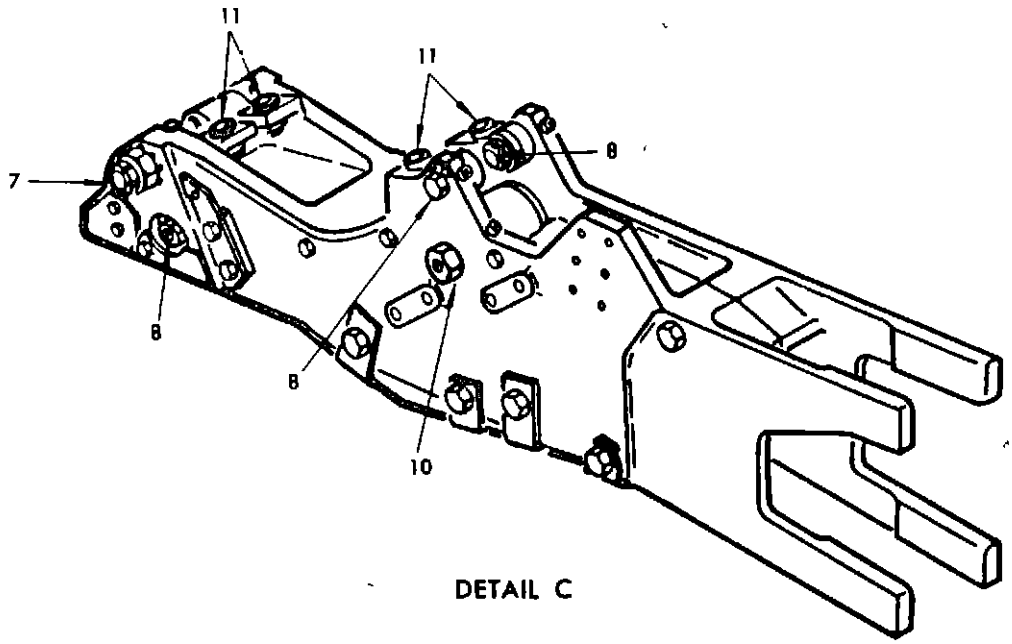


DETAIL A

Flap Carriage Wear Limits
Figure 218 (Sheet 1)



DETAIL B



DETAIL C

INDEX NO	DIM.	DESIGN LIMITS DIAMETER MIN.	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL	OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTERFERENCE MIN	BUSHING INTERFERENCE MAX.
1	ID	0.8750	0.8765	0.8795	0.0050	X		[1]	[5]	0.0005	0.0020
	OD	0 8740	0.8745	0.8736							
1 [7]	ID	0.8750	0.8765	0.8795	0.0050	X			[6] [6]	0.0005	0.0020
	OD	0.8740	0.8745	0.8736							
2	ID	0.4995	0.5005	0.5040	0 0035	X		[2]	[4] [5]	0 0005	0.0020
	OD	0 4985	0 4995	0.4981							
3	ID	0.3120	0.3160	0.3187	0.0085	X		[3]	[4] [5]	0.0005	0.0020
	OD	0.3110	0 3120	0 3106							
4	ID	0.3745	0.3755	0.3772	0.0030	X		[3]	[4] [5]	0.0005	0 0020
	OD	0.3737	0 3742	0.3733							
5	ID	0.8750	0.8765	0.8789	0.0050	X		[1]	[5]	0.0005	0.0020
	OD	0 8730	0.8740	0.8726							
5 [7]	ID	0.8750	0.8765	0.8789	0.0050	X			[6] [6]	0.0005	0.0020
	OD	0.8730	0.8740	0.8726							
6	ID	0.3120	0 3160	0.3187	0.0085	X		[2]	[4] [5]	0.0005	0.0020
	OD	0.3110	0.3120	0.3106							
7	ID	0.6240	0.6258	0.6285	0.0040	X		[2]	[4] [5]	0.0005	0 0020
	OD	0.6240	0.6245	0.6236							
8	ID	0.3742	0.3752	0.3782	0.0030	X		[2]	[4] [5]	0.0005	0.0020
	OD	0.3737	0.3742	0.3733							
9	ID	0.8737	0.8763	0.8787	0.0050	X		[2]	[4] [5]	0.0005	0 0020
	OD	0.8729	0.8737	0.8725							

Flap Carriage Wear Limits
Figure 218 (Sheet 3)

INDEX NO	DIM.	DESIGN LIMITS DIAMETER MIN.	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX. WEAR DIM.	WEAR LIMITS MAX. DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL.	OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE MIN.	BUSHING INTERFERENCE MAX.
10	ID	0.6240	0.6258	0.6285	0 0040	X		[2]	[4] [5]	0.0005	0.0020
	OD	0.6234	0 6240	0.6230							
11	ID	0.3130	0.3170	0.3187	0 0085	X		[2]	[6] [5]	0.0005	0.0020
	OD	0.3110	0.3120	0.3106							

[1] Replace NAS75 bushing.

[2] AL-Ni-Bronze bushing. Ream to size after installation (minimum wall thickness after reaming - 0.060 inch).

[3] Steel bushing, heat-treated to 125,000 to 145,000 PSI. Ream to size after installation (minimum wall thickness after reaming - 0.060 inch).

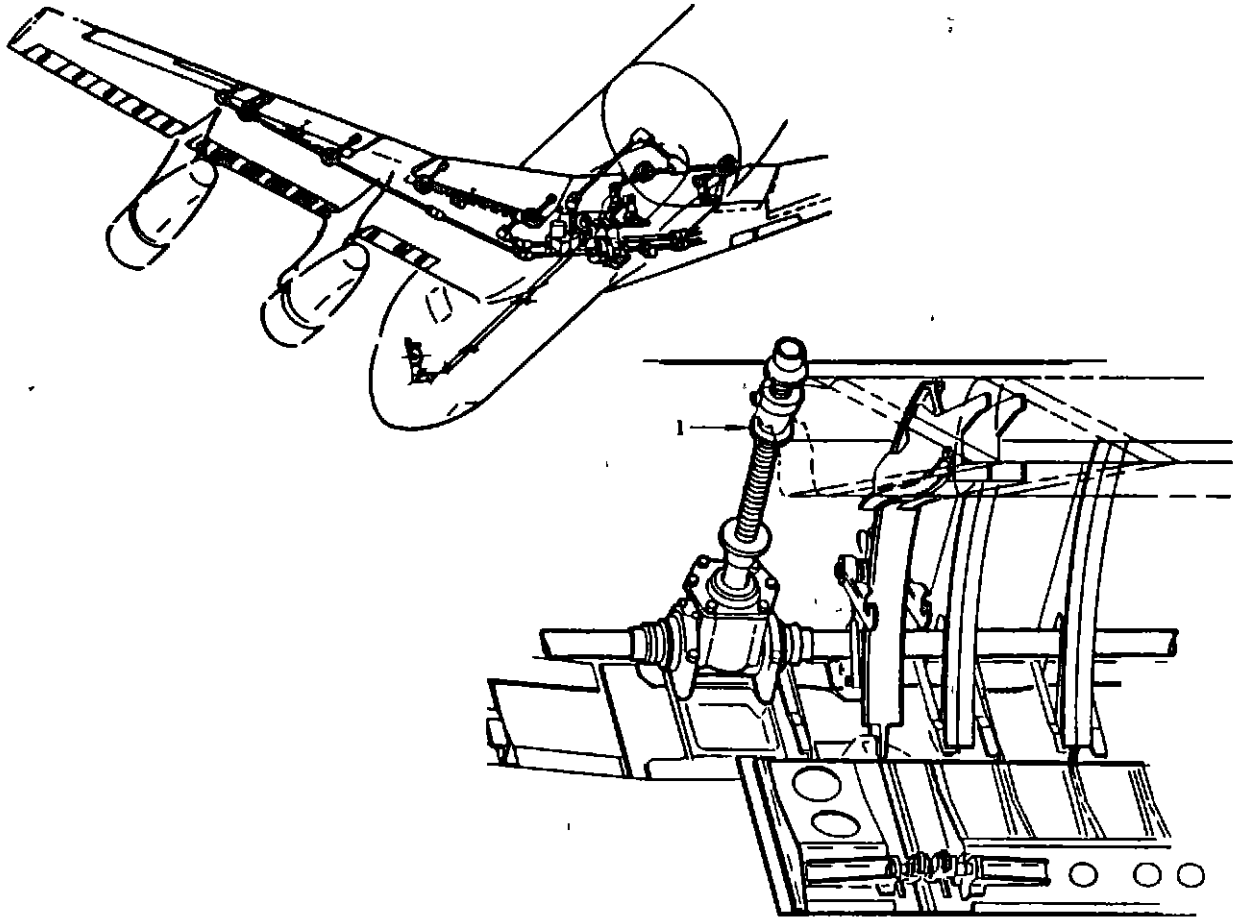
[4] Cadmium plate outside diameter of bushing; plating to be 0.0002 to 0.0004 inch thick.

[5] Coat inside of hole with primer (BMS 10-11, Type I). Shrink bushing with dry ice and alcohol or liquid nitrogen (or equivalent) immediately before installation. Install bushing with primer still wet.

[6] Coat inside of hole with Aeroshell Grease 7A . Shrink bushing with dry ice and alcohol or liquid nitrogen (or equivalent) immediately before installation.

[7] Wear limits for 66-12936 and 69-15413 cadmium, chromium plated steel bolt installation; recommended replacement part.

[8] Replace BAC-B28Y-14C-( ) bushing.



TYPICAL FLAP TRANSMISSION ASSEMBLY

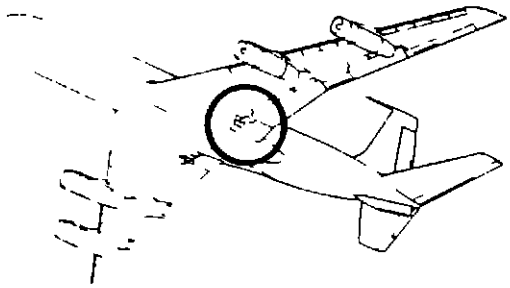
INDEX NO	DIM	DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
		DIAMETER		MAX. WEAR DIM.	MAX. DIAM. CLEARANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE	
		MIN.	MAX.			YES	NO	MTL.		MIN.	MAX
1 [1]		0 000	0 010		[3] 0.016						
1 [2]		0 000	0 005		[3] 0.014						

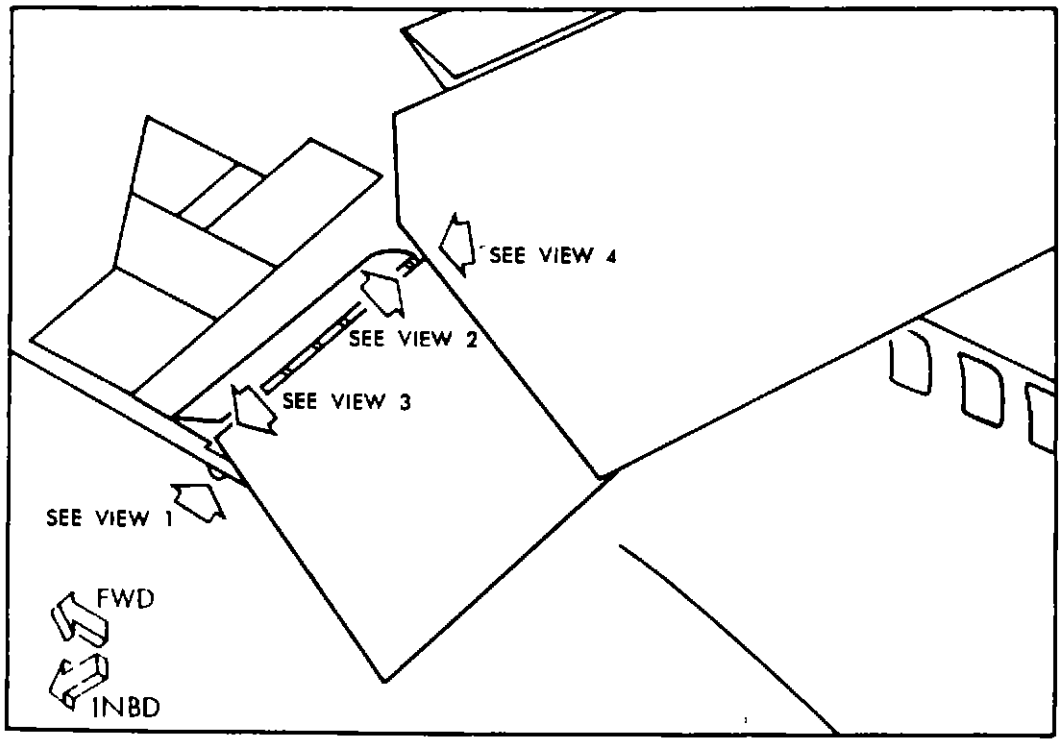
[1] Beaver Precision Products ball screw and nut assembly.

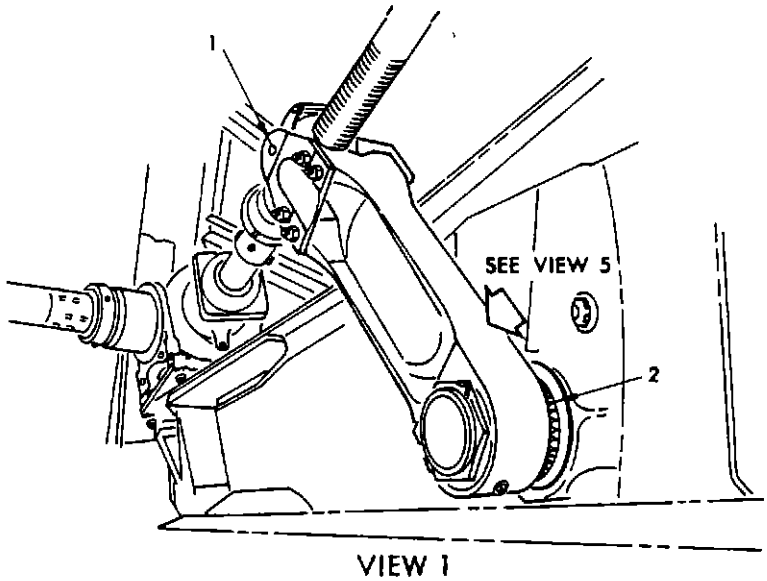
[2] Saginaw ball screw and nut assembly.

[3] Replace unit when axial backlash between ball screw and ball nut under 50 pound end load exceeds limit shown. Backlash in other transmission assembly components should not be included in the above measurement.

Flap Transmission Assembly Backlash Wear Limits
Figure 219

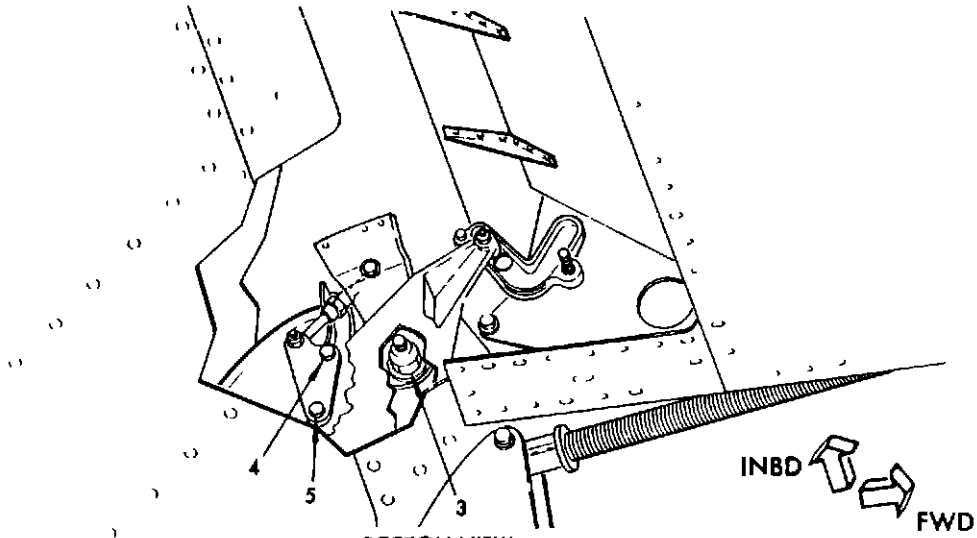




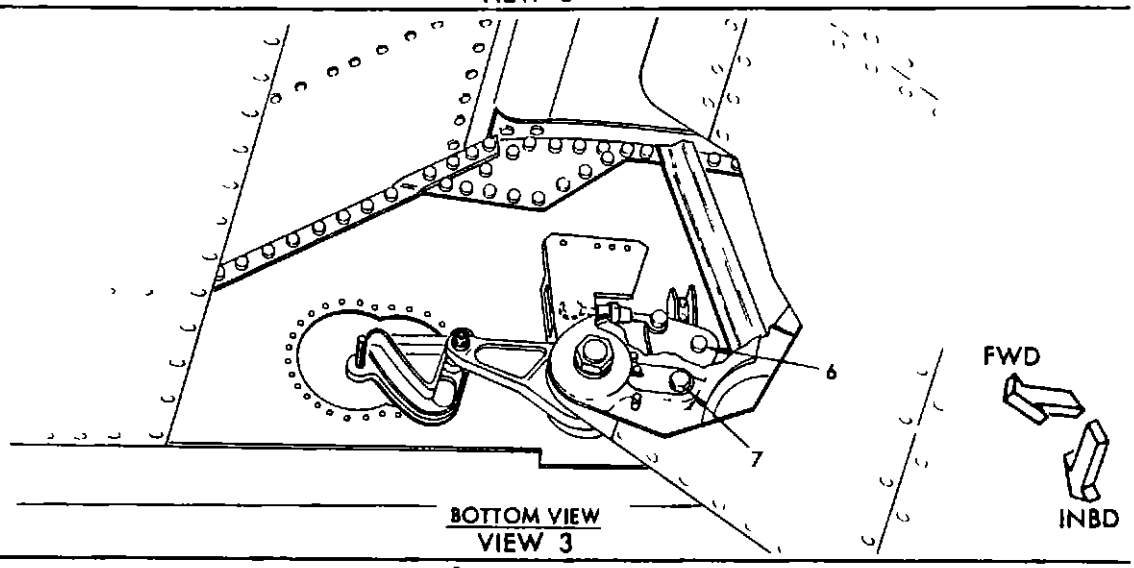


VIEW 1

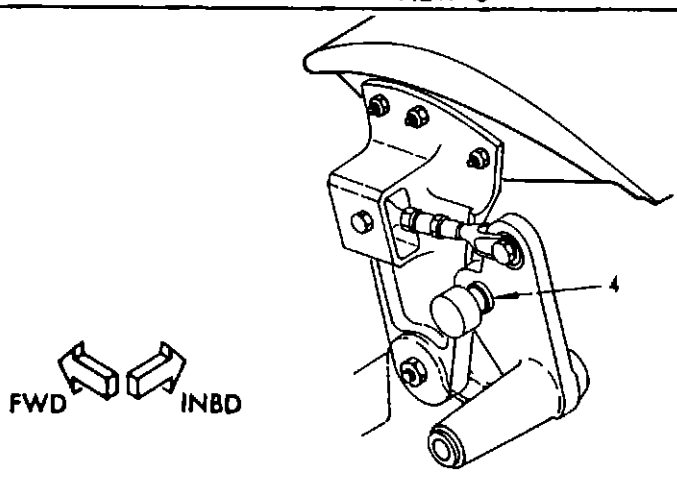
Fillet Flap Wear Limits
Figure 220 (Sheet 1)



BOTTOM VIEW
VIEW 2

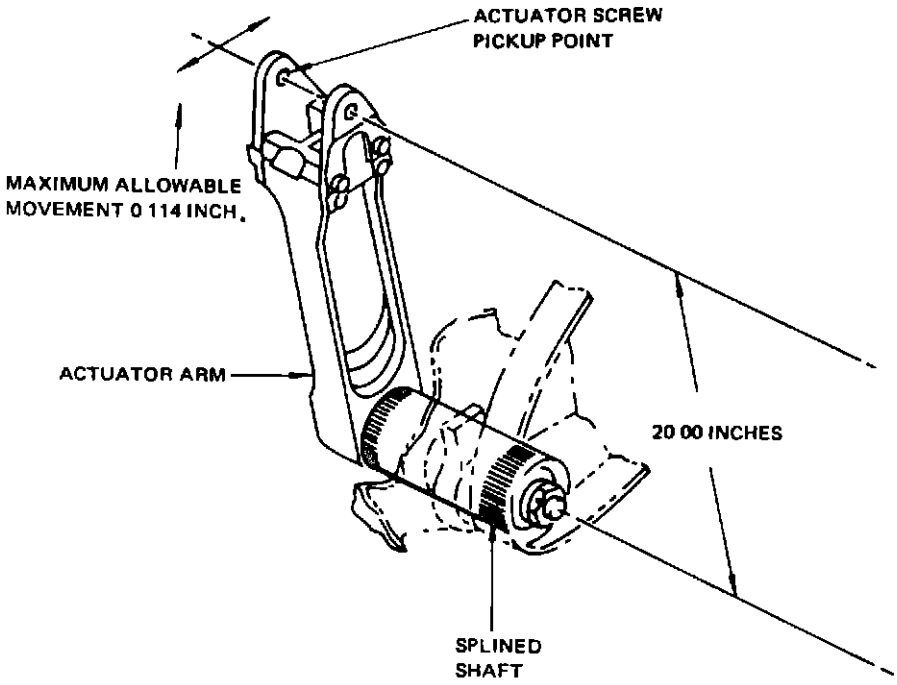


BOTTOM VIEW
VIEW 3



VIEW 4

Fillet Flap Wear Limits
Figure 220 (Sheet 2)



VIEW 5

Fillet Flap Wear Limits
Figure 220 (Sheet 3)

BOEING Intercontinental 707

MAINTENANCE MANUAL

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INDEX NO.	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL.	OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE MIN	BUSHING INTERFERENCE MAX
1	ID	0.7490	0.7500	0.7526	0.0045	[2]				0.0005	0.0020
	OD	0 7477	0.7481	0.7445		[1]			0.0050		
2	ID	4.2640	4.2700	4.2890	0.0250	[2]				0.0005	0.0020
	OD	4.2550	4.2600	4.2390		[1]					
3	ID	0.8745	0.8755	0.8795	0.0050	[2]				0.0005	0.0020
	OD	0.8730	0.8740	0.8726							
4	ID	0.4375	0.4390	0.4415	0.0045	[2]				0.0005	0.0020
	OD	0 4360	0.4370	0 4356				[3]	0.0002		
5	ID	0 4995	0.5005	0.5030	0 0035	[2]				0.0005	0.0020
	OD	0.4985	0.4995	0 4960				[4]	0.0050		
6	ID	0.5000	0.5015	0.5040	0.0040	[2]				0.0005	0.0020
	OD	0.4990	0 5000	0.4986				[3]	0.0002		
7	ID	0.6245	0 6255	0 6280	0 0040	[2]				0.0005	0.0020
	OD	0.6230	0 6240	0.6205				[4]	0 0050		
		Shaft Splines				[5]					

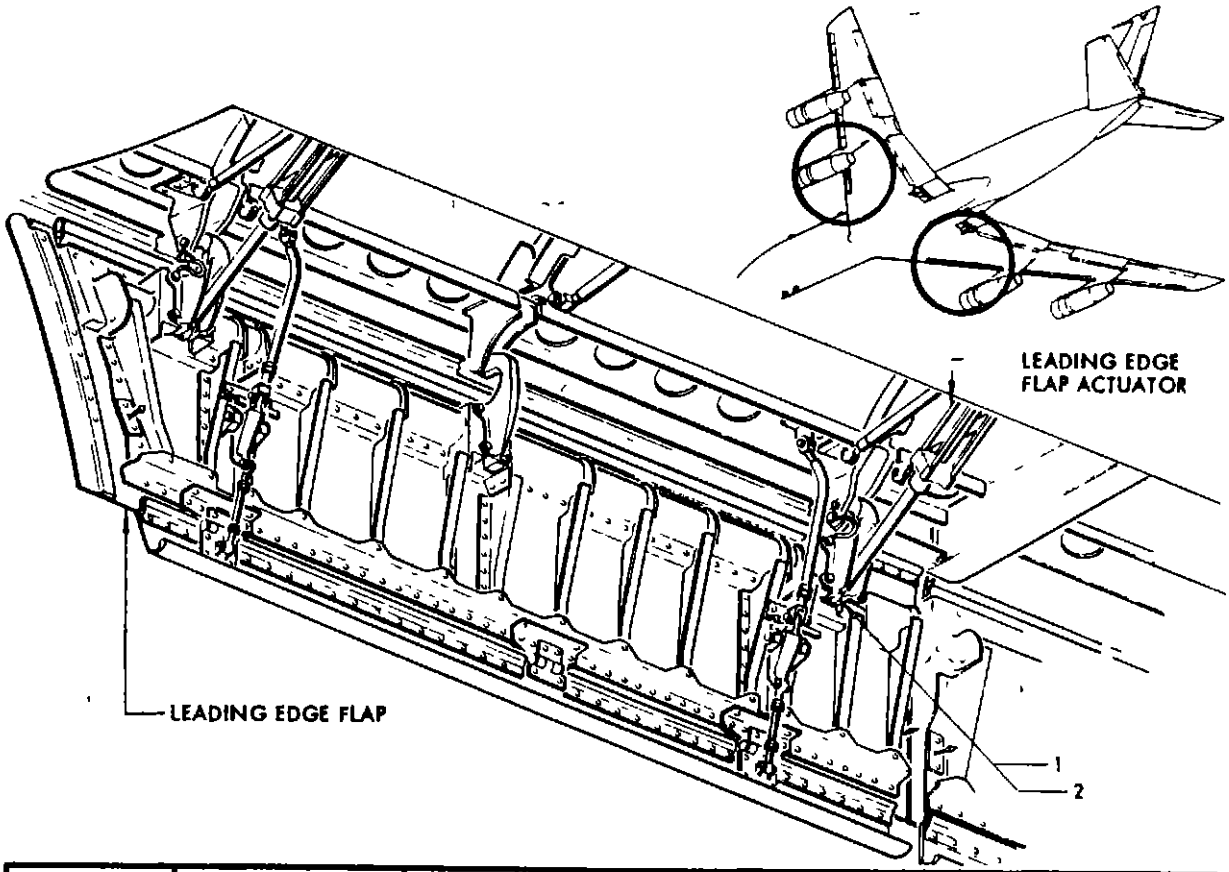
[1]
Shot peen using shot number 170-390 at 0.015A2 intensity. Clean and passivate. Chrome plate and grind to a surface finish of 8 RHR (roughness height rating), approximately 9 RMS.

[2]
Replace bushing.

[3]
Cadmium plate.

[4]
Chrome plate.

[5]
Check fillet flap actuator arm lost motion. Refer to 27-16-0, paragraph 3.C.



INDEX NO	DIM	DESIGN LIMITS DIAMETER MIN.	DESIGN LIMITS DIAMETER MAX.	WEAR LIMITS MAX. WEAR DIM	WEAR LIMITS MAX DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL.	OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTERFERENCE MIN	BUSHING INTERFERENCE MAX
1 [1]	ID	0.4370	0.4380	0.4470	0.010	X		[3]		0.0004	0.0016
	OD	0.4360	0.4370	0.4280			X	[4]			
2 [2]	ID	0.3745	0.3755	0.3825	0.009	X		[5]		0.0004	0.0016
	OD	0.3735	0.3745	0.3655			X	[4]			

[1] Wear limit for actuator attach bolts on leading edge flaps 1, 2, 5 and 6

[2] Wear limit for actuator attach bolts on leading edge flaps 3 and 4.

[3] Install NAS76 press fit bushing. Brush alodine hole and install bushing with BMS 10-11, Type 1, wet primer.

[4] Replace bolt.

[5] Replace bushing.

Leading Edge Flap Actuator Attach Bolt Wear Limits
Figure 221

FILLET FLAP - MAINTENANCE PRACTICES

1. Removal/Installation Fillet Flap

A. General

(1) The fillet flap is removed with the inboard flap fully extended. It will be necessary to raise and lower the fillet flap to various positions during removal.

(2) If any inboard flap drive torque tubes are disconnected, do not apply hydraulic or electric power to inboard and fillet flap power unit. Structural damage to inboard and fillet flaps may be avoided by disconnecting all torque tubes at power unit, or by rigging inboard and fillet flaps to extend and retract simultaneously.

(3) The leading edge of the fillet flap, outboard of the flaperette, may be finished with an abrasion resistant teflon coating. Repair or replace the teflon coating. Refer to 51-2-81, Application of Abrasion Resistant Teflon Finish.

B. Equipment and Materials

(1) Splined Coupling Spanner Wrench - F71228, or equivalent

(2) Control Surface Protractor Assembly - F52485-500, or equivalent

(3) Protractor Clamp Assembly, F71292-16, or equivalent

C. Remove Fillet Flap

(1) Remove access panels (11, figure 203).

(2) Pressurize utility hydraulic system.

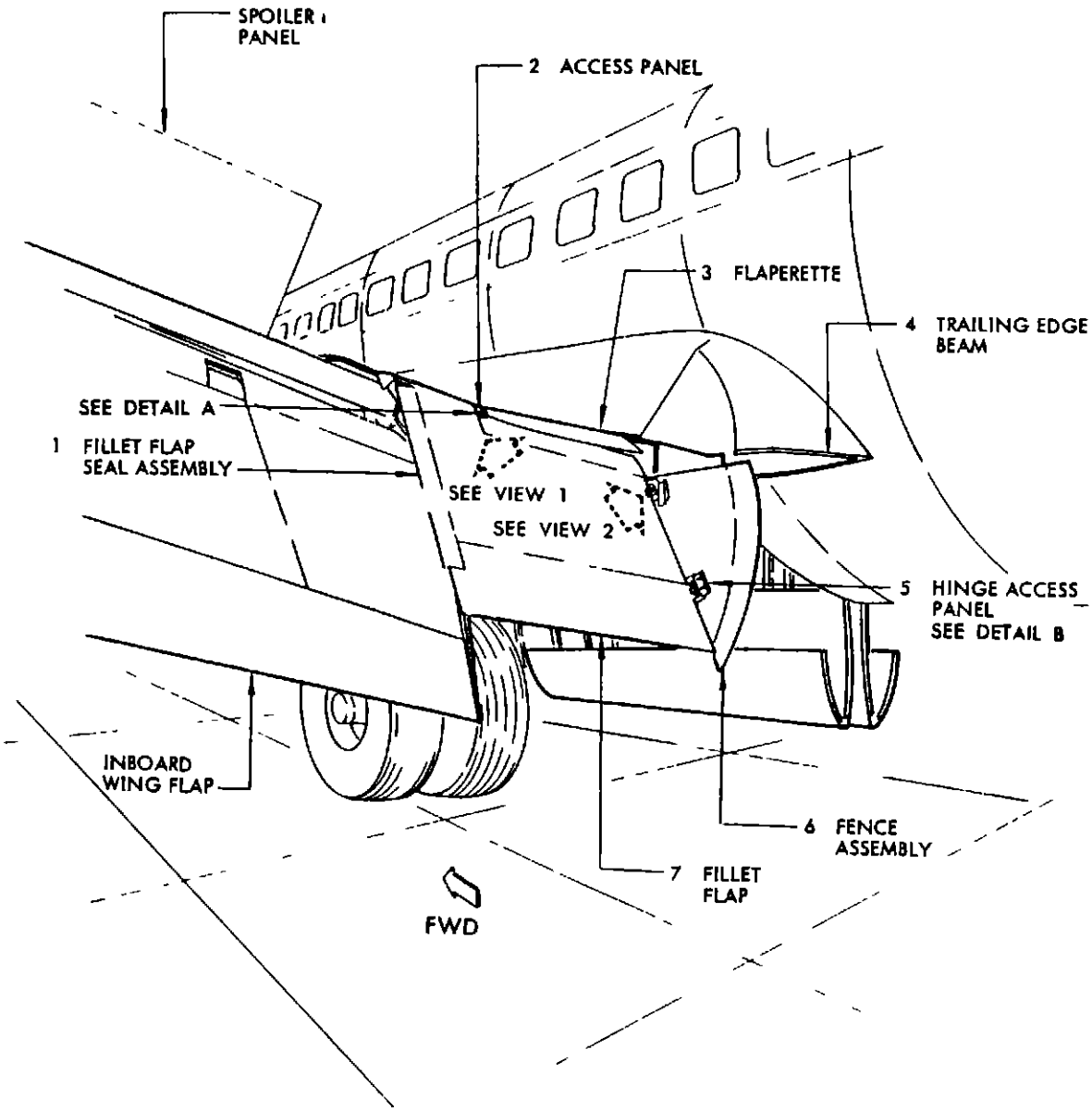
(3) Open applicable main wheel well door.

(4) Place flap control lever at DOWN.

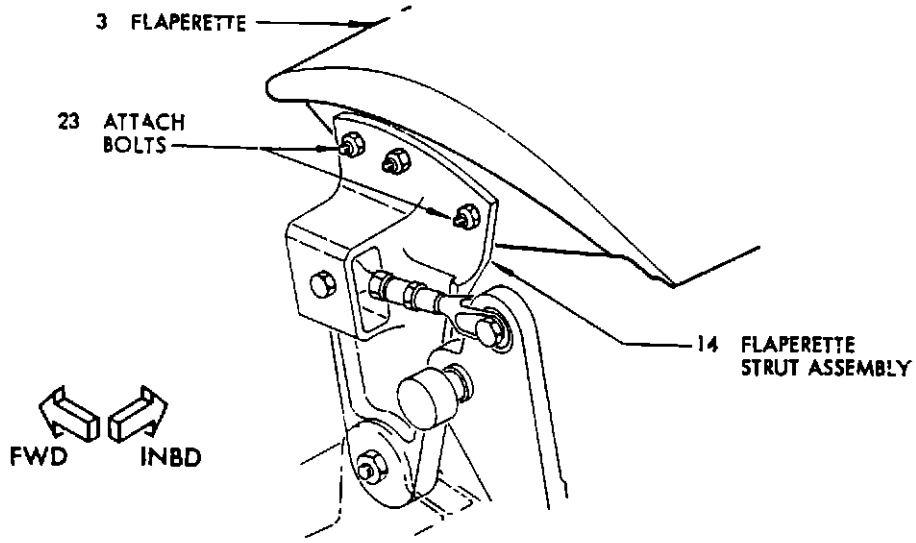
(5) Depressurize utility hydraulic system; open system bypass valve or hang a red DO NOT OPERATE tag on flap control lever.

WARNING: OPERATION OF FLAP SYSTEM DURING FLAP REMOVAL MAY RESULT IN DAMAGE TO THE SYSTEM AND INJURY TO PERSONNEL.

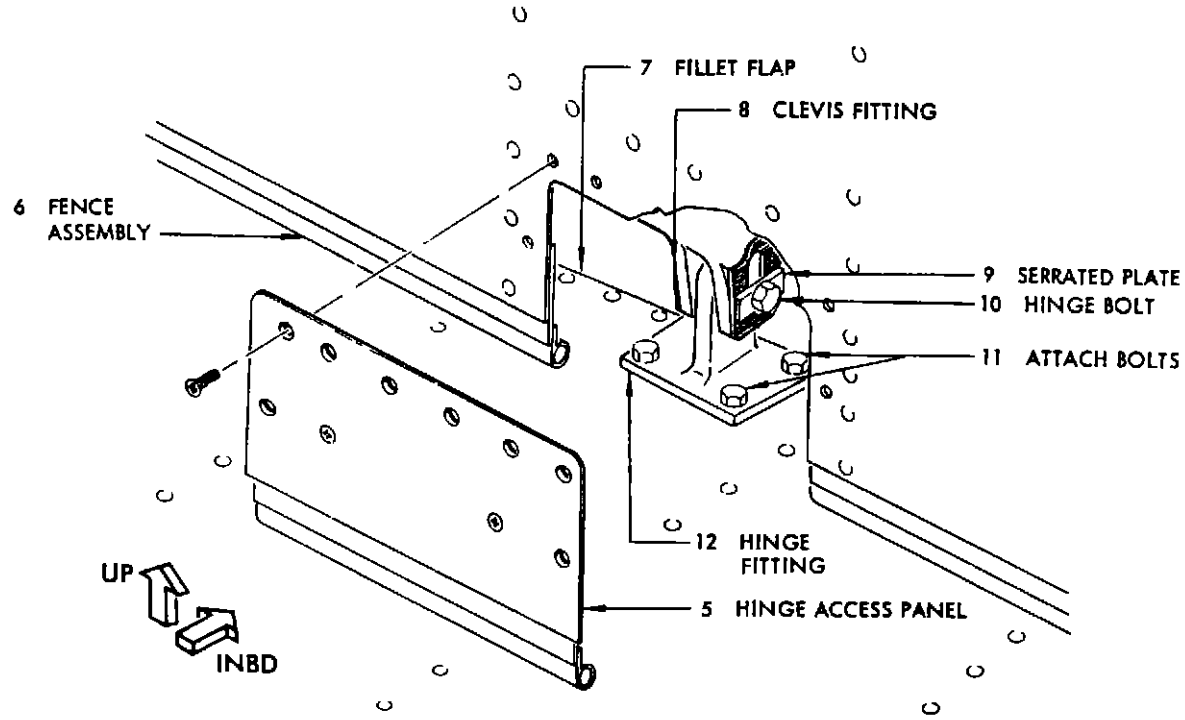
(6) Disconnect electric power from inboard and fillet flap emergency drive unit.



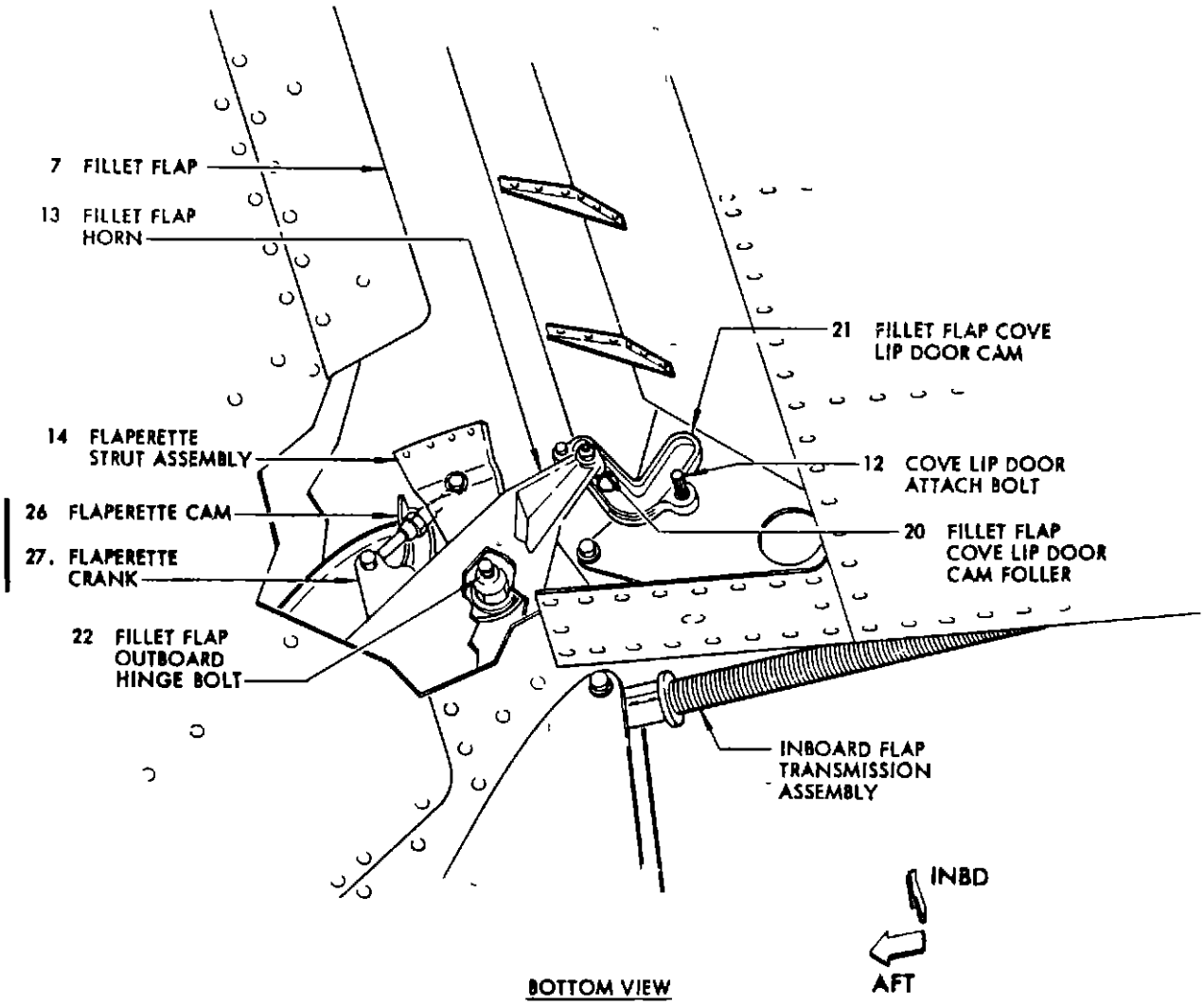
Fillet Flap Installation
Figure 201 (Sheet 1)



DETAIL A

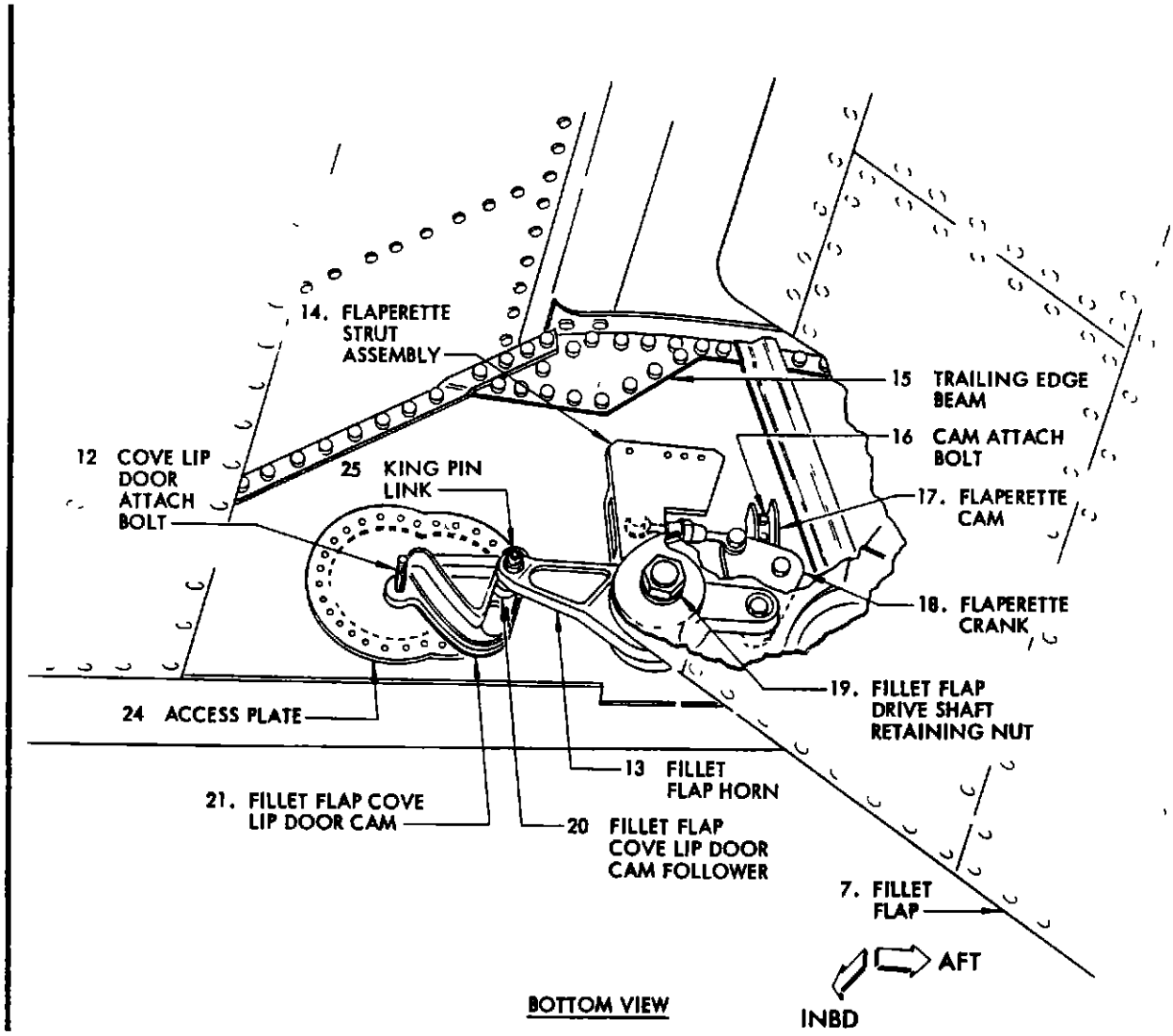


DETAIL B



BOTTOM VIEW

VIEW 1


14. FLAPERETTE STRUT ASSEMBLY
15 TRAILING EDGE BEAM
16 CAM ATTACH BOLT
12 COVE LIP DOOR ATTACH BOLT
25 KING PIN LINK
17. FLAPERETTE CAM
18. FLAPERETTE CRANK
19. FILLET FLAP DRIVE SHAFT RETAINING NUT
24 ACCESS PLATE
13 FILLET FLAP HORN
21. FILLET FLAP COVE LIP DOOR CAM
20 FILLET FLAP COVE LIP DOOR CAM FOLLOWER
7. FILLET FLAP
AFT
INBD
BOTTOM VIEW

VIEW 2

(7) Place protective cover over trailing edge of fillet flap to prevent damage during removal and for ease of handling.

(8) Disconnect cove lip door bonding jumpers from trailing edge structure

NOTE: If fillet flap was not extended with the inboard flap, the actuator arm may be disconnected as in step (16) and the flap may then be lowered manually.

WARNING. THE FILLET FLAP WEIGHS ABOUT 250 POUNDS USE CARE IN MOVING THE FLAP MANUALLY TO AVOID DAMAGE TO THE AIRPLANE OR INJURY TO PERSONNEL

(9) Remove bolts attaching links (1) to fixed structure

(10) Remove screws attaching cove lip door to cam attach fittings (6) Remove door from airplane. Do not remove cam attach fittings from cove lip door cams.

(11) Remove hinge access panels (5, figure 201) from fence assembly (6) to obtain access to hinge fittings.

(12) Remove bolts (10) and serrated plates (9) attaching fence clevis fittings (8) to fillet flap hinge fittings (12).

(13) Remove access plate from bottom surface of trailing edge beam immediately below fillet flap fence roller track slot

(14) Raise fence and pull bottom slightly outboard to clear hinge fittings on flap. Lower fence until fence roller clears track Remove fence

(15) Tape ball bearing nut on fillet flap transmission assembly (7, figure 202) to jackscrew to prevent rotation after ball nut is disconnected from flap actuator arm (4).

(16) Remove four nuts from bolts attaching plates (3) to fillet flap actuator arm Remove inboard plate and disconnect ball bearing nut from arm Raise forward (free) end of jackscrew and attach to structure or tubing to prevent interference during remainder of fillet flap removal.

(17) Remove access panels from lower forward surface of fillet flap at inboard and outboard end

(18) Remove access panel No. 1468 from outboard end of upper forward flap surface. See Chapter 12, Access Doors and Panels.

(19) Remove 13 bolts (23, figure 201) attaching flaperette (3) to flaperette struts (14), and remove flaperette.

(20) Remove access plate (24) from web of trailing edge beam.

(21) Remove bolt attaching inboard cove lip door cam to kingpin link (25) Rotate door cam into access opening and off of cove lip door cam follower (20) Remove cove lip door cam and attached cam attach fitting.

NOTE It may be necessary to partially raise the fillet flap in order to remove the inboard cove lip door cam.

(22) Manually position fillet flap to align outboard fillet flap cove lip door cam follower (20) with cutout in cove lip door cam web

(23) Remove nut from cam follower stud and remove follower from fillet flap horn through cutout in cam web

(24) Remove screws (16) attaching inboard and outboard flaperette cams (17 and 26) to support structure. Remove cams. Raise and lower fillet flap as necessary to gain access to screws (16).

NOTE: An offset phillips screwdriver will be necessary in removing the outboard cam Three small access holes in the inboard end of the fillet flap provide access through the fillet flap to the two lower screws in the inboard cam

(25) Remove nut (5, figure 202) and fillet flap actuator arm (4) from fillet flap drive shaft (6) Rotate arm and replace on drive shaft with arm pointing down at about 90 degrees to the flap lower surface Install nut (5) finger-tight

(26) Remove nut (19, figure 201) from outboard end of fillet flap drive shaft

(27) Remove nut from inboard end of fillet flap outboard hinge bolt (22)

(28) Support fillet flap in a nearly retracted position and remove outboard hinge bolt

WARNING THE FLAP WEIGHS ABOUT 250 POUNDS. MAKE SURE THAT ENOUGH SUPPORT IS PROVIDED TO PREVENT DAMAGE TO THE AIRPLANE OR INJURY TO PERSONNEL

(29) While supporting flap as in step (28), drive against actuator arm with a loaded rubber or lead mallet to remove fillet flap drive shaft from flap. Drive only enough to loosen shaft.

NOTE: A heavy steel hammer may be used to loosen the drive shaft if a heavy wood block is used against the actuator arm. Block should be at least two inches thick.

(30) Make sure enough men are available to lift the flap, remove supports and drive shaft, and carefully lower flap away from airplane.

D. Install Fillet Flap

CAUTION: IF ANY INBOARD FLAP DRIVE TORQUE TUBES ARE DISCONNECTED, DO NOT APPLY HYDRAULIC OR ELECTRIC POWER TO INBOARD AND FILLET FLAP POWER UNIT. STRUCTURAL DAMAGE TO INBOARD AND FILLET FLAPS MAY BE AVOIDED BY DISCONNECTING ALL TORQUE TUBES AT POWER UNIT, OR BY RIGGING INBOARD AND FILLET FLAPS TO EXTEND AND RETRACT SIMULTANEOUSLY.

(1) Install protective covering over fillet flap (7, figure 201) trailing edge honeycomb panel.

(2) Remove access panels from forward lower surface of fillet flap.

(3) Remove access panel No. 1468 from forward upper surface of fillet flap at outboard end for access to flaperette cam. See Chapter 12, Access Doors and Panels.

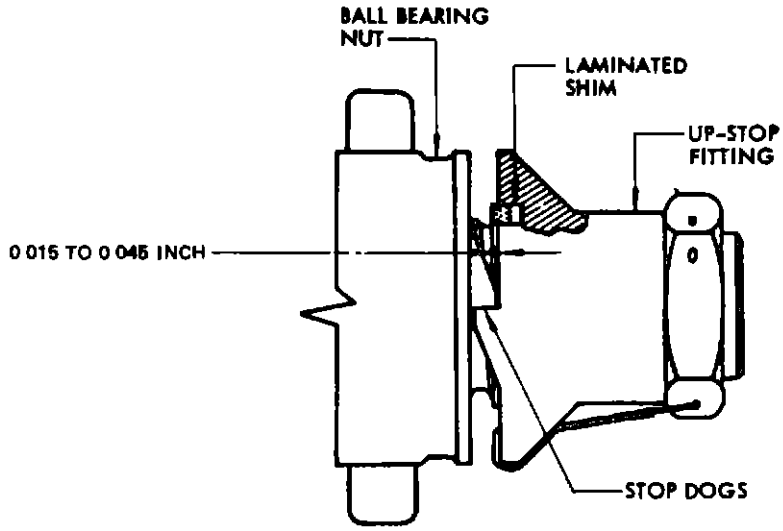
(4) Remove cove lip door cam follower (20) from outboard fillet flap horn (13). Do not remove inboard cam follower.

(5) Lift fillet flap into position, using care to avoid damaging flap or wing structure. Flap should be lifted into wing with trailing edge slightly lower than leading edge. If fixed structures interfere, withdraw flap and realign before proceeding.

(6) With trailing edge of flap slightly below retracted position, align drive shaft socket in flap with shaft hole in trailing edge beam. Install drive shaft. Make sure that outboard end of shaft extends through hole in bottom of shaft socket.

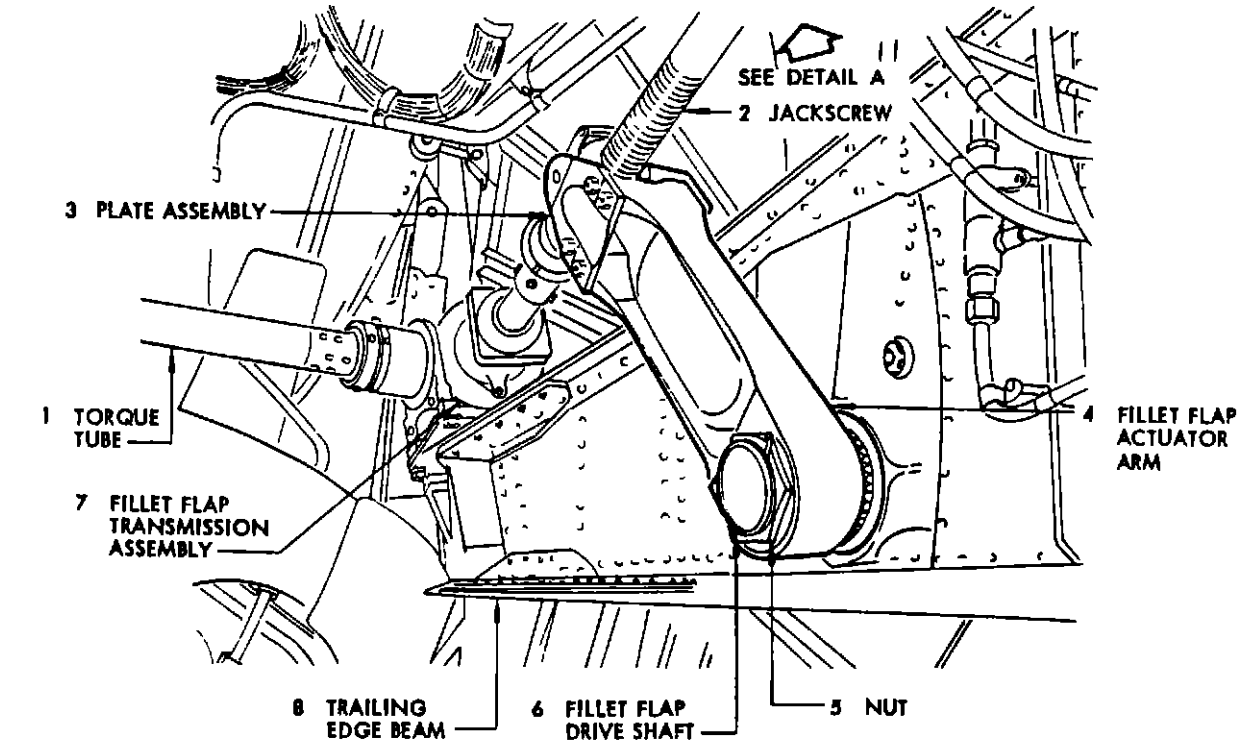
(7) Align outboard hinge fittings and install hinge bolt (22). It may be necessary to spring flap skin slightly to allow passage of bolt head. Lightly tap bolt into hinge fitting if required.

(8) Drive fillet flap drive shaft into shaft socket using a rubber or lead mallet. Make sure shaft is solidly seated. Install nut (19) on drive shaft and nut on outboard hinge bolt (22) with washers.



FILLET FLAP TRANSMISSION ASSEMBLY UPSTOP

DETAIL A



(9) Raise flap to retracted position with lower surface faired with bottom of trailing edge beam. Support flap in faired position, making sure that flap is protected against damage.

(10) Disconnect fillet flap torque tube from transmission assembly.

(11) Install outboard plate (3, figure 202) and four bolts on fillet flap actuator arm (4).

(12) Lower transmission assembly from stowed position and position ball bearing nut at up stop with 45 to 90 degrees clearance between stop dogs, and with ball return tubes on top of ball nut.

(13) Install fillet flap actuator arm (4) on end of fillet flap drive shaft so that outboard plate (3) is in position to accept gimbal assembly trunnions on ball bearing nut.

(14) Install inboard plate (3) on actuator arm (4) and position ball bearing nut trunnions in both plates (3).

(15) Check installation. Maintain a slight lift on center of flap to remove down slack. Fillet flap must be faired with trailing edge beam within 0.30 inch. There must be no less than 45 degrees clearance between fillet flap upstop dogs.

(16) Install nut (5) and nuts on bolts attaching plates (3). Tighten nut (5) to torque of 660 to 780 pound-inches.

(17) Tighten outboard hinge bolt to torque of 600 to 780 pound-inches. Tighten drive-shaft retaining nut (19) to torque of 1500 to 2100 pound-inches.

(18) Using a spline coupling spanner wrench to drive transmission assembly input spline, lower flap as necessary to align fillet flap outboard horn, and cutout in cove lip door cam, with access from inboard flap bay. Install cove lip door cam follower, (20, figure 201). Tighten cam follower retaining nut to torque of 380 to 410 pound-inches. Bend one washer tab against nut flat.

(19) Reposition flap as necessary to position fillet flap inboard horn so that it extends as far as possible over access hole in web of trailing edge beam.

(20) Install cove lip door inboard cam (21) over cam follower on fillet flap inboard horn Rotate cam into access hole as necessary to position cam on follower

(21) Install access plate (24) on trailing edge beam web Make sure that long screws are used only in aft end of plate.

(22) Install bolt to attach cove lip door cam to kingpin link (25, figure 201)

(23) Lower fillet flap to fully extended position. Check for binding, rough operation, or interference. Correct cause of any malfunction before proceeding.

(24) With flap fully extended, slide outboard flaperette cam (26) over cam follower on flaperette crank (27), align with mounting holes and install three screws An offset phillips screwdriver will be required to tighten the lower screw Tighten nuts to torque of 65 to 90 pound-inches

(25) Position inboard flaperette cam (17) over cam follower on flaperette crank (18) and align with mounting holes Install two upper mounting screws, do not tighten Reposition flap as necessary to align lower screw holes with small access holes in inboard end of flap. Install two lower screws through end of fillet flap. Tighten four mounting screws.

(26) With fillet flap at fully extended position, install flaperette as follows·

(a) Position flaperette on flaperette struts and install two bolts through each end strut; install at least one bolt through each of the two center struts Do not install nuts.

(b) Check gap between flaperette inboard and center struts and sides of mating fittings in flaperette, and between outboard strut and outboard end of flaperette Gap shall not exceed 0 002 inch at any strut.

(c) If any gap exceeds 0.002 inch, install laminated aluminum shim (0.003 inch laminations) to reduce gap to less than 0.002 inch Peel off laminations as required

(d) Install retaining bolts and nuts

(27) Position cove lip door under fillet flap. Connect bonding jumpers to fixed structure near each end of door.

(28) Install screws to attach cove lip door to cam attach fittings (6, figure 203).

(29) Install bolts through links (1) and fixed structure.

(30) Raise and lower fillet flap to check clearances and operation. There must be no evidence of binding or noise. With flap raised to fully retracted position, clearance between inboard end of fillet flap and trailing edge beam shall be 13/32 to 19/32 inch. Flap shall fair and up stops shall clear as described in step (15). Use care to avoid damage to fillet flap, fillet flap seal, inboard flap, and inboard foreflap. Check cove lip door fairing and clearances as outlined in 27-16-51, Fillet Flap Cove Lip Door, Maintenance Practices.

(31) If fillet flap transmission assembly up stop dogs contact, making it impossible to fair fillet flap with trailing edge beam, or if there is less than 45 degrees clearance between stop dogs, reset stop as follows:

(a) Mark the angular position of the stop on the jackscrew. Determine number of splines the stop must be rotated counterclockwise to position stop dogs at least 45 degrees apart.

NOTE: Rotating the stop one spline tooth will provide about 6.42 degrees angular clearance.

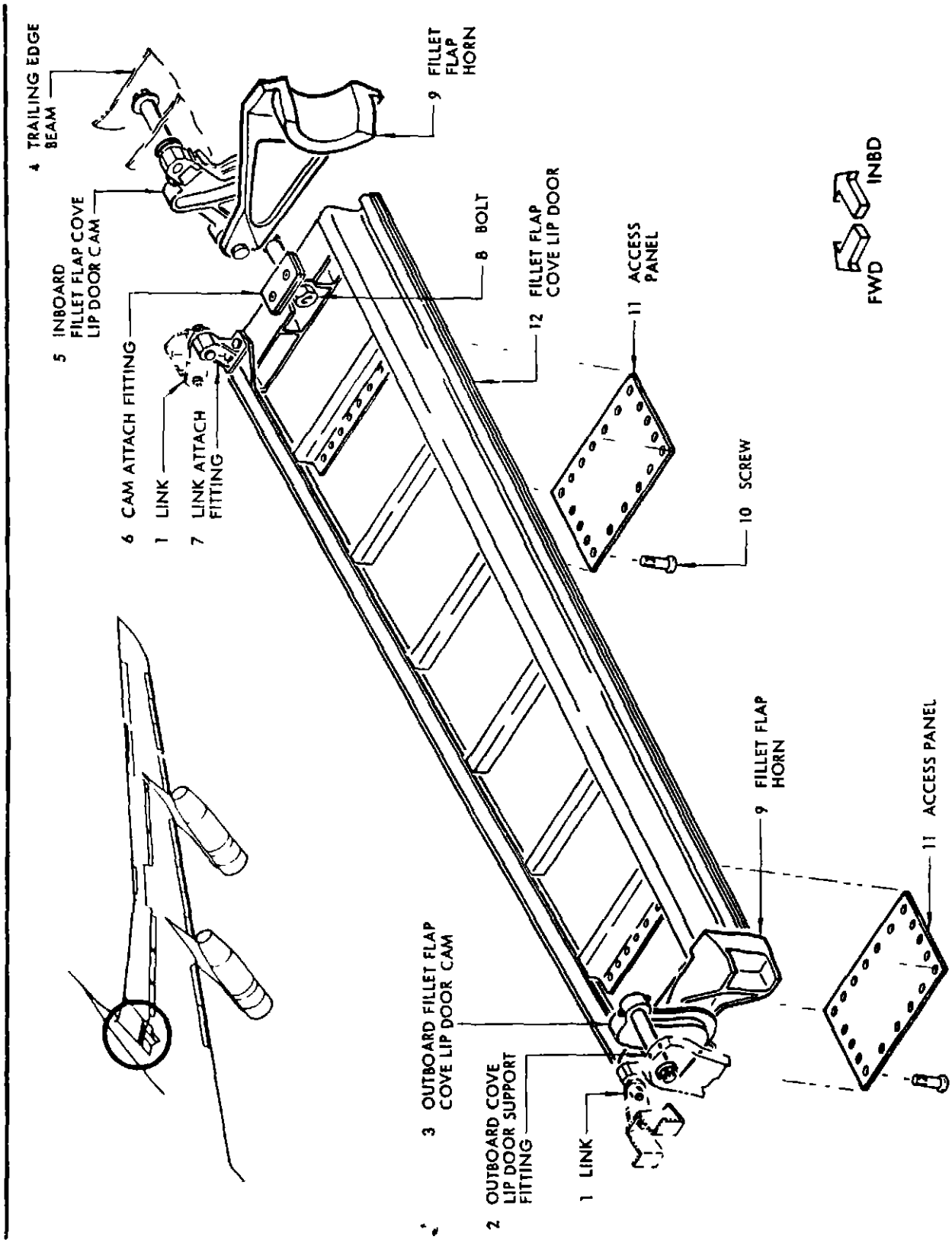
(b) Maintain axial clearance of 0.015 to 0.045 inch between ball bearing nut and stop. Add 0.006 inch shim under stop for each 6.42 degrees of stop rotation. The total shim thickness shall not exceed 0.47 inch.

NOTE: Transmission assembly stop dogs are designed to absorb full flap motor torque, however, in normal operation, these dogs should not contact.

(32) Disconnect fillet flap torque tube from fillet flap tee gearbox. Remove torque tube or stow so that end of tube is clear of gearbox.

(33) Pressurize utility hydraulic system.

(34) Retract flaps; depressurize hydraulic system.



Fillet Flap Cove Lip Door Installation
Figure 203

(35) With flaps fully retracted, check position of inboard flap. Trailing edge of inboard flap shall not be above trailing edge of fillet flap and shall be no more than 3/4 inch below trailing edge of fillet flap If necessary, adjust as follows·

(a) Disconnect torque tube from inboard side of inboard flap inboard transmission assembly.

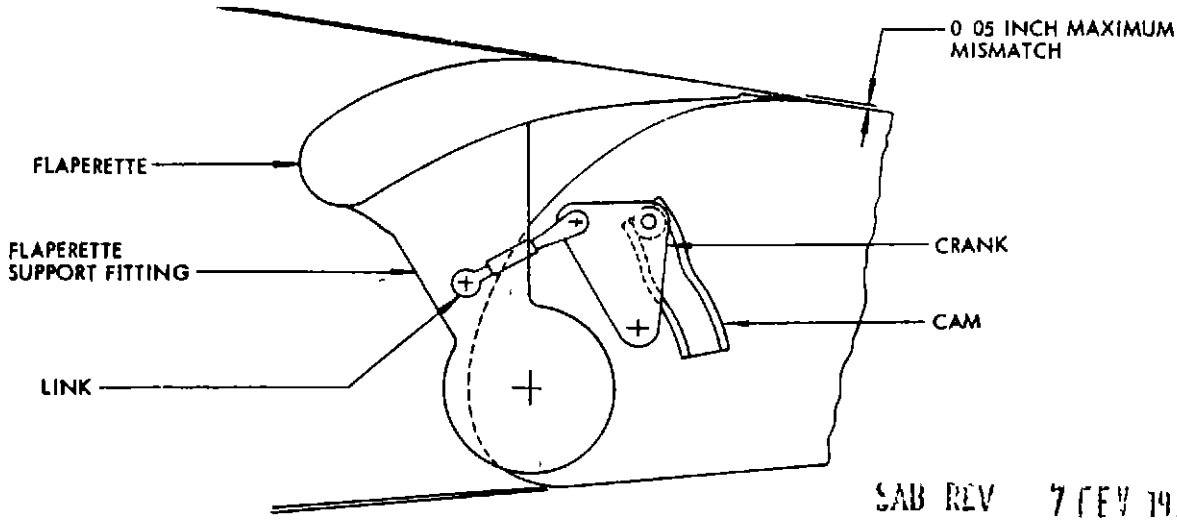
(b) Using a spline coupling spanner wrench, and maintaining slight lift on inboard flap trailing edge to remove down slack, adjust inboard flap to obtain the least possible droop below fillet flap trailing edge.

(c) Connect inboard flap drive torque tube. Install coupling retaining screws and lockwire screw heads together.

(36) With fillet flap retracted to the faired position as in steps (30) and (31), and with inboard flaps fully retracted, connect torque tube between fillet flap tee gearbox and fillet flap transmission assembly. Install coupling retaining screws and lockwire screw heads together.

(37) Adjust length of turnbuckle links at each end of flaperette to fair flaperette with fillet flap (See figure 204) Flaperette trailing edge shall fair with fillet flap contour within 0.05 inch Rod ends of link are visible through inspection holes in the barrel and shall never be extended beyond this point

NOTE· Fairing allowance is measured as illustrated in figure 204 Lowest possible value shall be obtained Mismatch shall be measured at inboard and outboard ends of flaperette. The average of these two readings shall not exceed the 0 05 inch dimension. If one end of the flaperette is 0 07 inch above contour and the other end is 0.07 inch below contour, the total mismatch is 0.14 inch The average is 0 07 inch Both ends must be adjusted to as near zero mismatch as possible so that average mismatch will be less than 0 05 inch



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Fillet Flap Flaperette Adjustment
Figure 204

(38) Pressurize utility hydraulic system.

(39) Extend flaps; check for any evidence of binding, interference, or unusual noise.

(40) Depressurize utility hydraulic system; open system bypass valve.

WARNING: OPERATION OF THE FLAP SYSTEM DURING FILLET FLAP FENCE INSTALLATION MAY RESULT IN DAMAGE TO THE AIRPLANE OR INJURY TO PERSONNEL.

(41) Check inboard flap and fillet flap jackscrew down stops. Clearance between down stop dogs on any jackscrew shall be no less than 45 degrees.

(42) Check flap travel. Fillet flap shall extend 47 to 50 degrees Inboard flap shall extend 49 to 50 degrees.

(43) Insert fillet flap fence (6, figure 201) roller in fence track and raise fence until bottom of fence clears hinge fittings on fillet flap. Lower fence clevis fittings (8) onto fillet flap fittings and install bolts (10) with bushings and plates (9) Do not tighten bolts

(44) Pressurize utility hydraulic system.

(45) Retract Flaps

(46) Depressurize utility hydraulic system, open system bypass valve

(47) Align coordination holes in fence with holes in fence recess panel Install MS20392-3 rigging pins or 1/4-inch bolts through coordination holes

(48) Check clearance between fence hinge bushings and bearings. If clearance exceeds 0.005 inch, install shims to reduce clearance to less than 0 005 inch With bushings and bearings properly shimmed, and with serrated plates loosely installed, apply light upward force at trailing edge of fillet flap. Tighten fillet flap fence hinge bolts (10)

(49) Connect bonding jumper between fillet flap fence and fillet flap

(50) Adjust turnbuckle, attaching fence recess panel to body structure, to fair fence assembly with wing-to-body fairing within 0.02 inch at forward lower end of fence and within 0.10 inch at upper end of fence. (See figure 205)

(51) Check gap between top of fence and wing-to-body fairing Gap shall be 0 25 (±0 10) inch (See figure 205.)

(52) Adjust seal at bottom of fence against fillet flap until seal deflects 7/64 to 13/64 inch. Small holes are drilled in seal assembly to facilitate adjustment

(53) Adjust rub blocks at outboard edge of fillet flap seal assembly as necessary to fair seal assembly within 1/32 inch of upper surface of inboard flap as shown in figure 206

(54) Pressurize utility hydraulic system.

(55) Extend flaps

(56) Install access panels

(57) Remove protective covering from fillet flap. Remove warning tag from flap control lever and connect electric power to emergency drive units

(58) Disconnect hydraulic pressure source

2 Removal/Installation Fillet Flap Fence Assembly

A Remove Fillet Flap Fence Assembly

(1) Pressurize utility hydraulic system.

(2) Position flap control lever to DOWN to fully extend flaps.

(3) Depressurize utility hydraulic system.

(4) Remove hinge access panels (5, figure 201) from fence assembly for access to hinge fittings.

(5) Remove bolts (10) and serrated plates (9) attaching fence clevis fittings (8) to fillet flap hinge fittings (12)

(6) Disconnect bonding jumper.

(7) Raise fence and pull bottom slightly outboard to clear hinge fittings on flap. Lower fence until fence roller clears track and remove from airplane

B Install Fillet Flap Fence Assembly

(1) With flaps fully extended, insert fillet flap fence (6, figure 201) roller into bottom of fence roller track in fence recess panel Raise fence until fence clears hinge fittings (12) on fillet flap (7). Lower fence to position hinge fittings in flap hinge fittings (12) Install serrated plates (9), hinge bolt bushings and hinge bolts (10). Do not tighten bolts

(2) Connect bonding jumper between fillet flap and fillet flap fence.

(3) Pressurize utility hydraulic system

(4) Place flap control lever at UP to retract flaps Monitor loosely installed fence to detect binding or interference

(5) Depressurize hydraulic system; open system bypass valve. Disconnect electric power from inboard flap emergency drive motor.

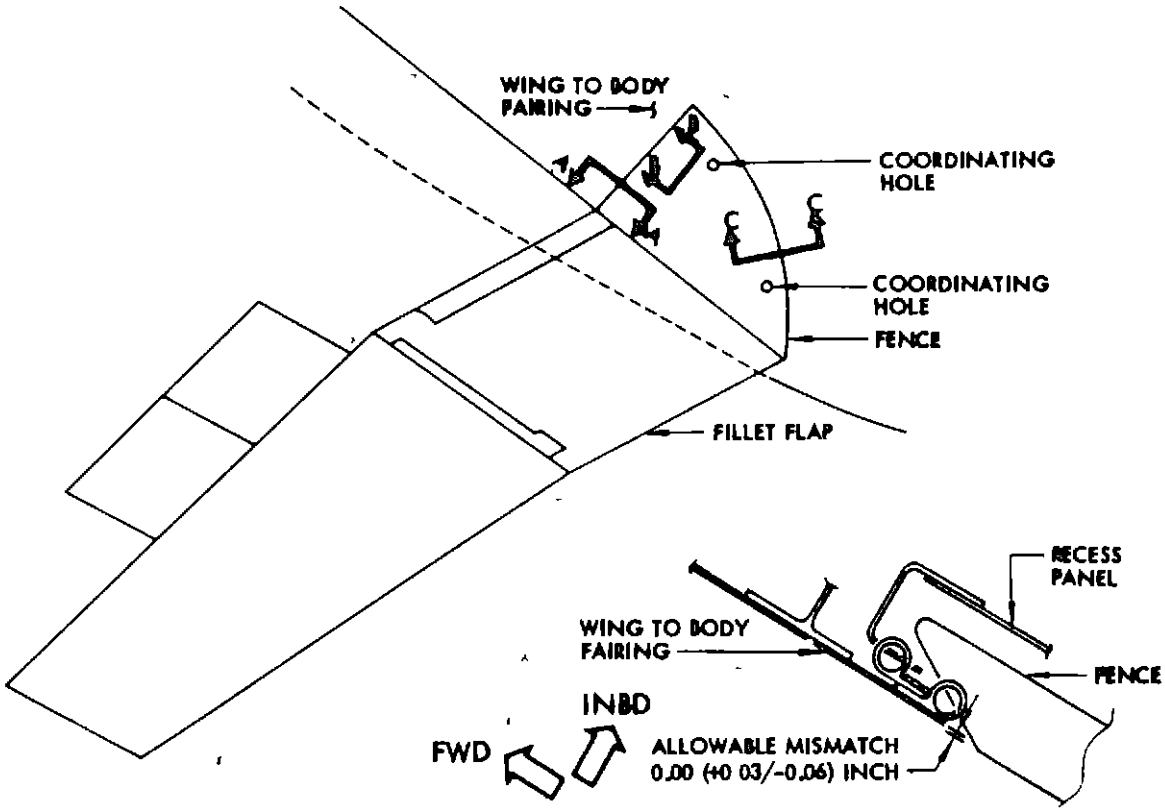
CAUTION: OPERATION OF FLAPS WITH RIGGING PINS INSTALLED THROUGH FENCE WILL DAMAGE FENCE AND RECESS PANEL.

(6) Align coordinating holes in fillet flap fence with those in fence recess panel. Install 1/4-inch rigging pins, MS20392-3 pins, or 1/4-inch bolts, through fence and into recess panel

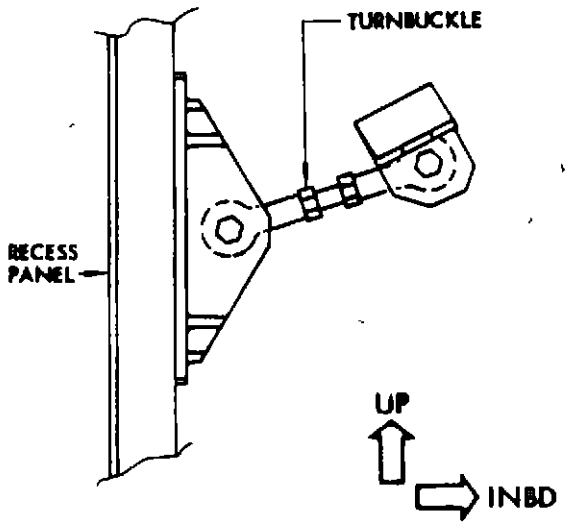
(7) Check gap between fence hinge bearings and adjacent bushings on bolts (10) If gap exceeds 0.005 inch, install shims to reduce gap to less than 0 005 inch. Apply light, upward force at trailing edge of fillet flap to remove down slack and tighten bolts (10)

(8) Adjust turnbuckle between fence recess panel and body structure to fair fence assembly with wing-to-body fairing Mismatch shall not exceed 0.02 inch at forward-lower edge of fence or 0.10 inch at upper-forward edge. (See figure 205.)

(9) Check gap between top of fence and wing-to-body fairing Gap shall be 0 25 (± 0 10) inch



SECTION A-A



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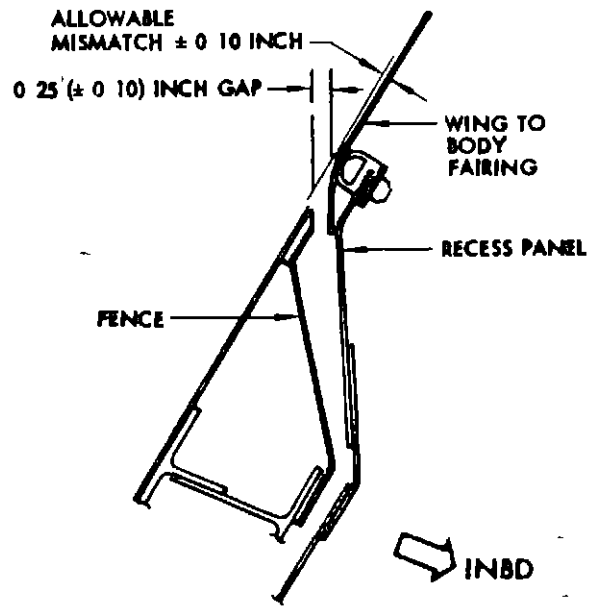


SECTION C-C

Fillet Flap Fence Adjustment
Figure 205

(10) Adjust seal at bottom of fence against fillet flap to obtain seal deflection of 7/64 to 13/64 inch. Slotted holes are provided in the seal assembly to allow vertical adjustment

(11) Pressurize utility hydraulic system

(12) Slowly move flap control lever toward DOWN stopping at each detent position Carefully check fence roller for any evidence of binding or unusual noise Fence roller must remain clear of fence roller track sides

(13) Install fillet flap fence hinge access panels

(14) Retract flaps, recheck fence roller clearance.

(15) Disconnect hydraulic pressure source

3 Removal/Installation Fillet Flap Seal Assembly

A Remove Fillet Flap Seal Assembly

(1) Open main gear wheel well door

(2) Pressurize utility hydraulic system

(3) Position flap control lever to 50°.

(4) Depressurize hydraulic system

(5) Remove access panel from outboard upper surface of fillet flap adjacent to seal assembly (1, figure 206)

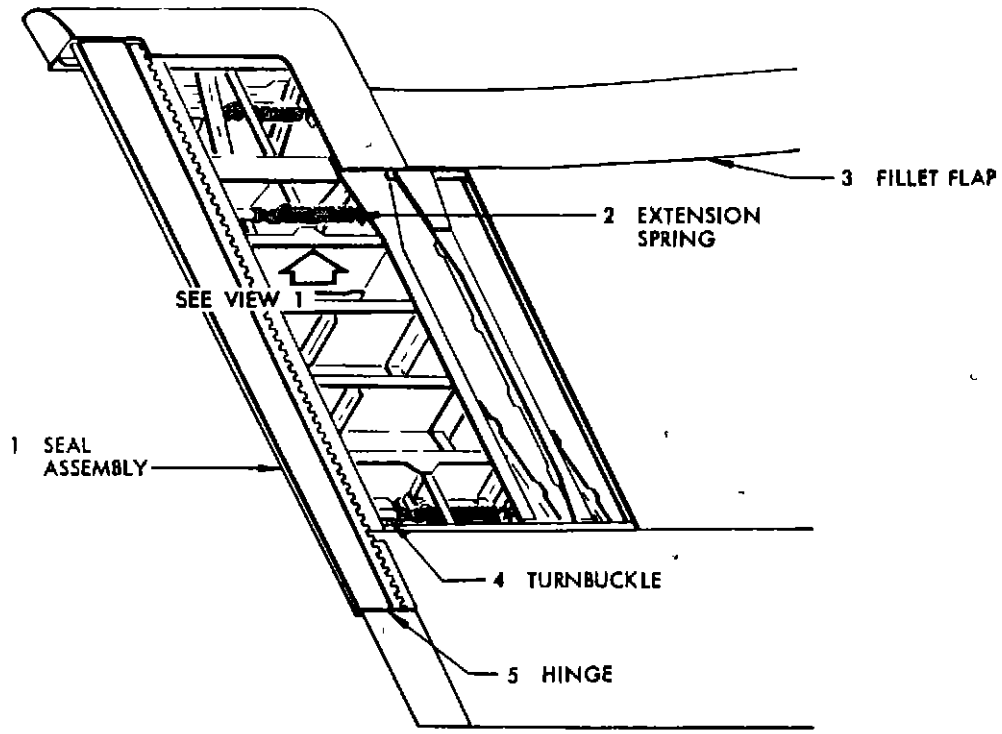
(6) Adjust turnbuckle barrels (8) to relieve tension in extension springs (2).

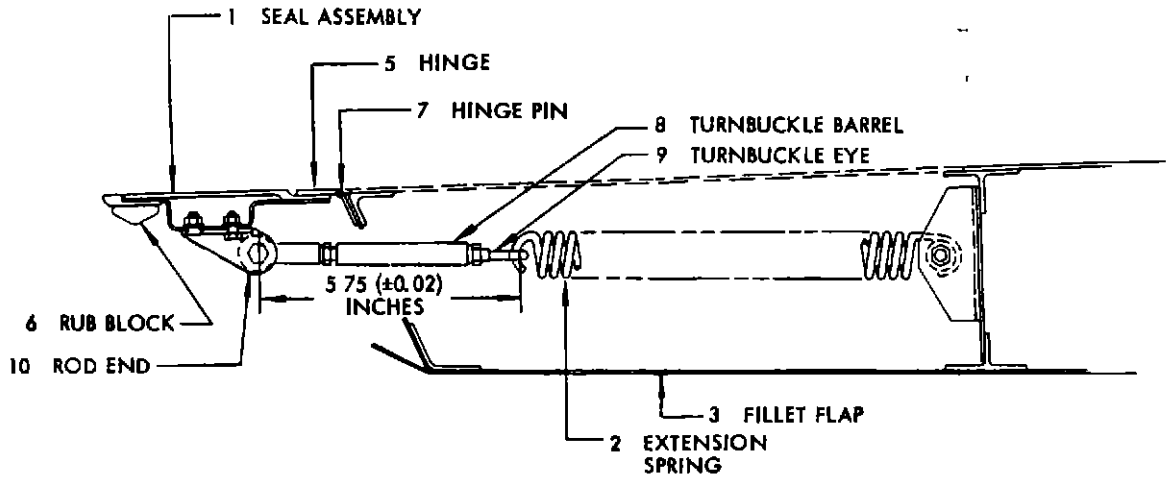
(7) Remove bolts connecting rod ends (10) on turnbuckles to fittings on seal assembly.

(8) Remove slotted pins from each end of hinge assembly (5)

(9) Disconnect bonding jumper.

(10) Pull hinge pins (7) from hinge assemblies and remove seal assembly





VIEW 1

Fillet Flap Seal Assembly Installation
Figure 206

B. Install Fillet Flap Seal Assembly

(1) Align hinge half on seal assembly (1, figure 206) with hinge half on fillet flap (3) and install hinge pin (7).

(2) Connect bonding jumper

(3) Install slotted pin through holes in hinge assembly at each end of hinge pin

(4) Install bolts connecting rod end (10) of each turnbuckle (4) to fitting on fillet flap seal.

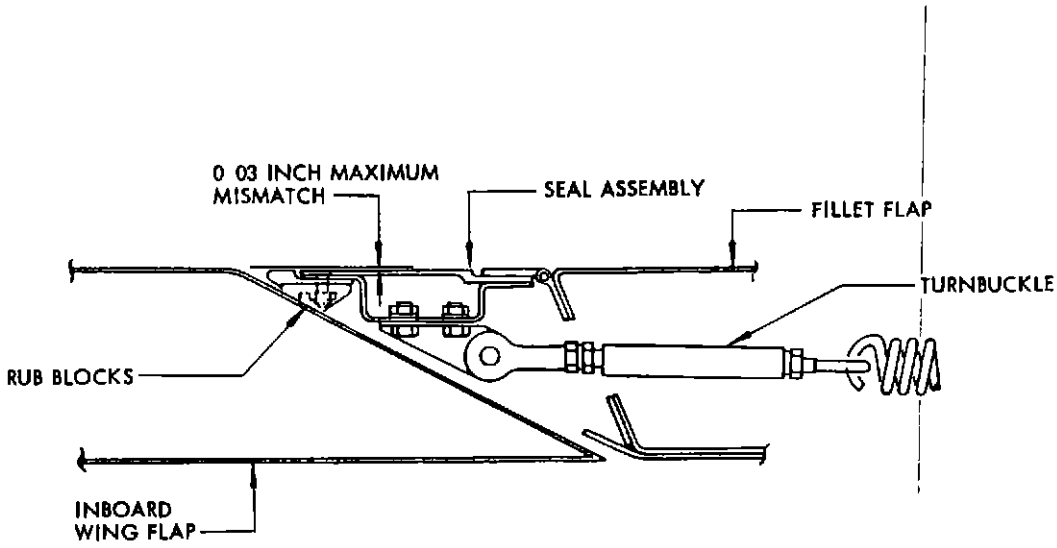
(5) Adjust each turnbuckle barrel (8) to provide 5 75 (± 0 02) inch between centerline of bolt through rod end and inboard side of hole through turnbuckle eye (9).

(6) Pressurize utility hydraulic system

(7) Retract flaps

(8) Adjust rub blocks at outboard end of fillet flap seal assembly until seal fairs within 0 03 inch of inboard flap upper surface (See figure 207)

(9) Disconnect hydraulic pressure source



INBOARD WING FLAP - MAINTENANCE PRACTICES

1. Removal/Installation Inboard Wing Flap

A. General

(1) To remove or install the inboard wing flap, the main landing gear shock strut must be inflated or the aft outboard wheel removed from the landing gear truck. This is required to prevent the wing flap from striking the landing gear truck when the flap is rolled off the flap track.

(2) If any inboard flap drive torque tubes are disconnected, do not apply hydraulic or electric power to inboard and fillet flap power unit. Structural damage to inboard and fillet flaps may be avoided by disconnecting all torque tubes at power unit, or by rigging inboard and fillet flaps to extend and retract simultaneously.

B. Equipment and Materials

(1) Splined Coupling Spanner Wrench - F71228, or equivalent

(2) Control Surface Protractor Assembly - F52485-500, or equivalent

(3) Protractor Clamp Assembly - F71292-16, or equivalent

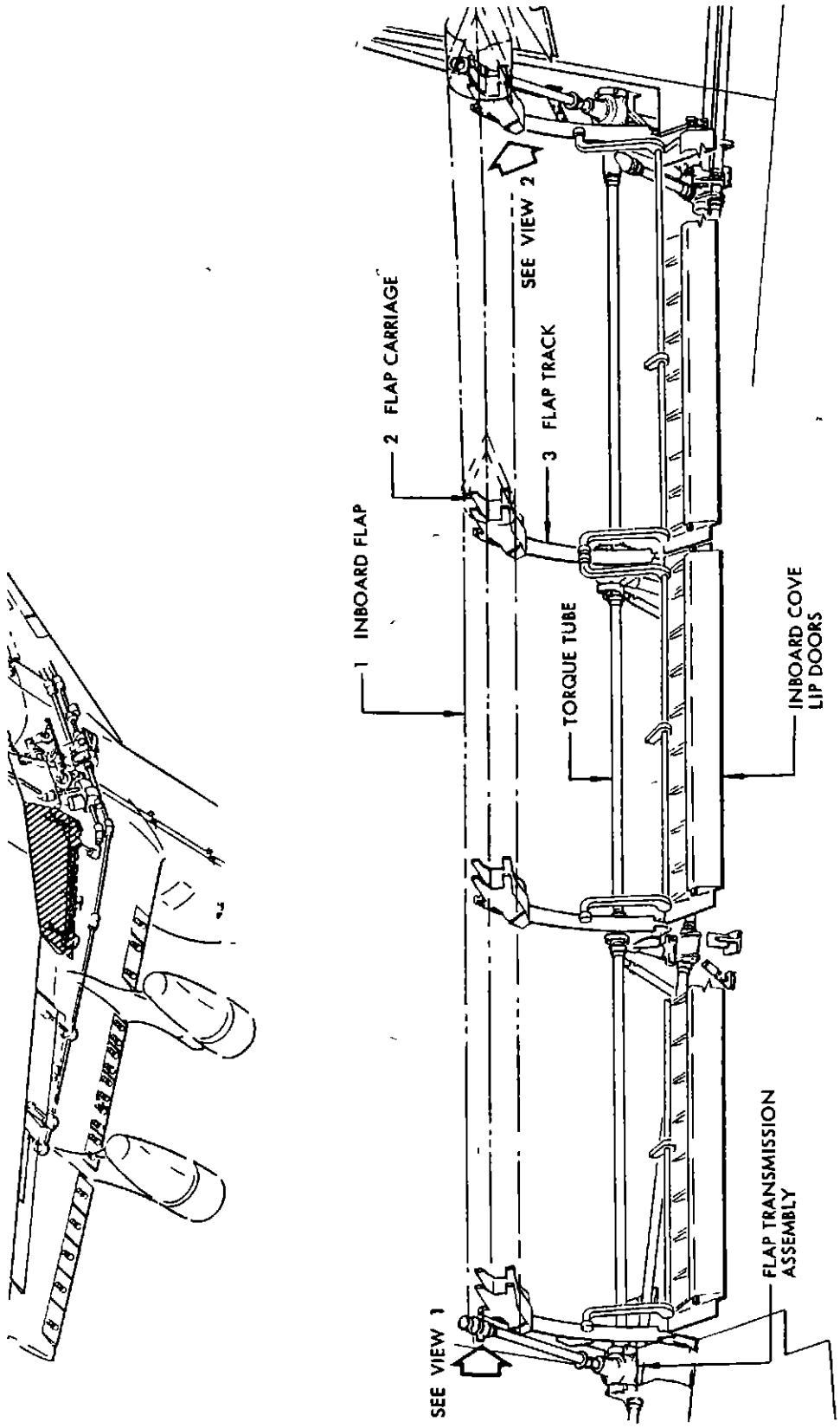
(4) Inboard Flap Assembly Sling - ME65-1063-1, or equivalent

C. Remove Inboard Wing Flap

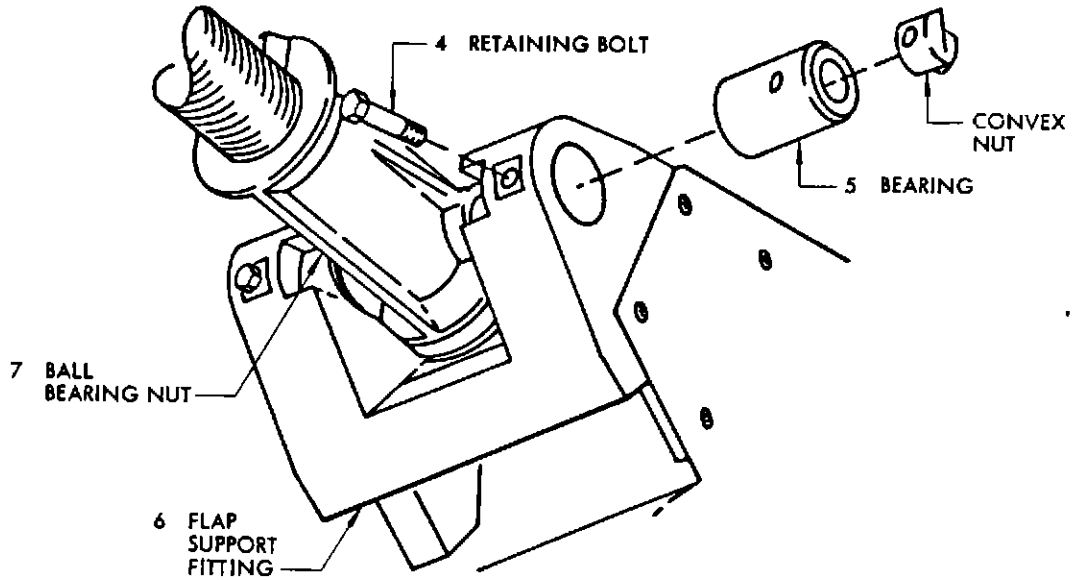
(1) Pressurize utility hydraulic system.

(2) Place flap control lever at 30 degree detent.

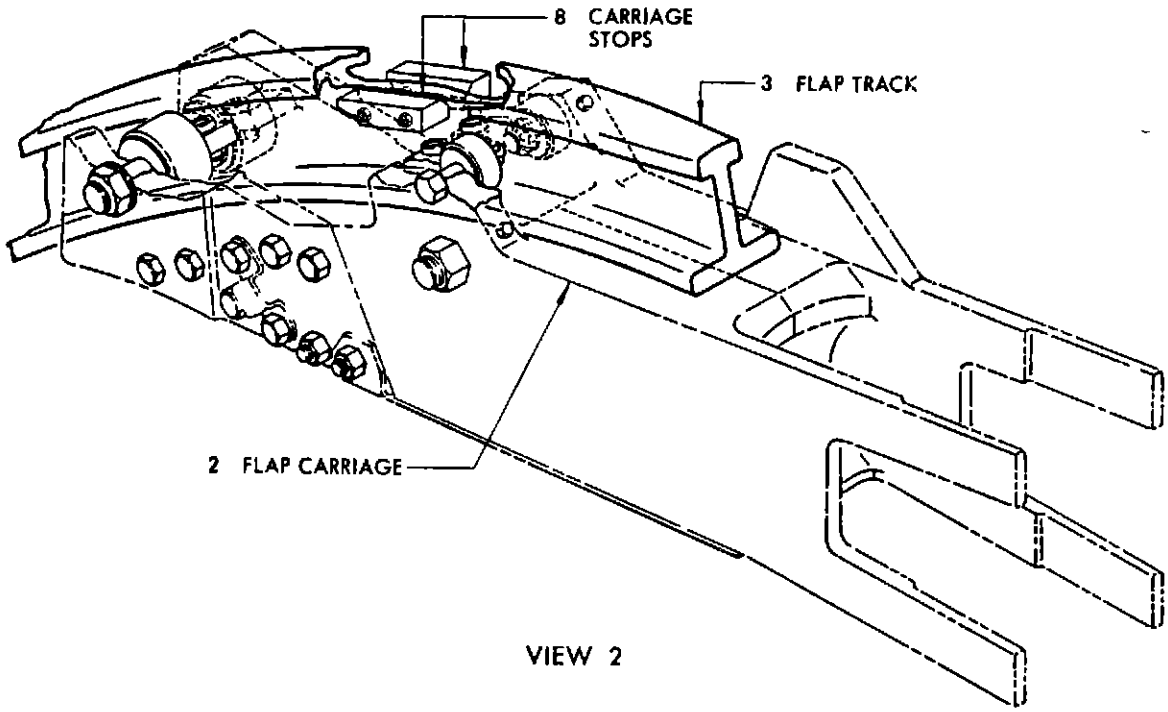
NOTE: If damage or a defective component prevents extension of flaps, it will be necessary to extend the damaged flap manually. With spoilers fully extended, flap transmission assemblies may be disconnected from the flap in the retracted position; the flap may then be lowered manually. Spline coupling spanner wrenches may be used at the transmission assemblies to extend the flap if torque tubes are disconnected from both transmission assemblies. Care should be taken to avoid "cocking" the flap.



Inboard Wing Flap Installation
Figure 201 (Sheet 1)


4 RETAINING BOLT
CONVEX NUT
5 BEARING
7 BALL BEARING NUT
6 FLAP SUPPORT FITTING

VIEW 1


8 CARRIAGE STOPS
3 FLAP TRACK
2 FLAP CARRIAGE

VIEW 2

(3) Depressurize utility hydraulic system; open system bypass valve. Disconnect electric power from inboard and fillet flap emergency drive unit. If hydraulic system must remain pressurized, hang a red DO NOT OPERATE tag on flap control lever.

CAUTION: OPERATION OF THE EMERGENCY FLAP DRIVE, WITH TORQUE TUBES OR TRANSMISSION ASSEMBLIES DISCONNECTED, MAY DAMAGE FLAP DRIVE SYSTEM.

(4) Unlatch and lower inboard cove lip doors.

(5) Install protective cover on trailing edge of flap.

(6) Inflate main landing gear shock strut or remove aft outboard wheel from main landing gear truck. Refer to Chapter 32, Main Landing Gear.

NOTE: Inflation of the shock strut or removal of the aft outboard wheel is required to provide clearance for the trailing edge of the flap when the flap is removed from the flap track.

(7) Remove position transmitter retaining clip from trailing edge of foreflap; do not release transmitter cable. Allow cable to rewind slowly.

(8) Remove flap carriage stops (8, figure 201) from inboard and outboard flap tracks.

(9) Support flap with a sling, or other suitable means, capable of supporting and lifting more than 750 pounds.

(a) Locate eight fasteners on inboard flap that are circled with a black painted ring to indicate hoist positions. Remove all eight fasteners.

(b) Install sling at the eight hoist positions using bolts supplied with flap sling.

(10) Remove two retaining bolts (4) from each flap support fitting (6).

(11) Disconnect torque tube from inboard side of inboard transmission assembly.

(12) Remove inboard bearing (5) from inboard support fitting.

(13) Make sure that flap is suitably supported and, with splined coupling spanner wrench, lower flap to 50-degree position.

(14) Remove outboard bearing (5) from inboard support fitting and both bearings from outboard support fitting.

(15) Roll flap aft and off flap track, using care to avoid damage to flap or flap structure.

D. Install Inboard Wing Flap

(1) Adjust ball bearing nut (7, figure 201) on each transmission assembly to obtain clearance of not less than 1/4 turn of jackscrew between downstop dogs on ball bearing nut and jackscrew.

NOTE: Inboard bearing (5) may be installed in the inboard support fitting before the flap is installed on the flap track. It will then be necessary to shift the bearing as far inboard as possible when connecting the transmission assembly in step (2).

(2) With ball bearing nuts adjusted as in step (1) and with ball bearing return tubes on top side of each nut, lift flap (1) onto flap tracks. Roll flap forward on track, position ball bearing nuts in flap support fittings (6), and install three bearings (5).

(3) With torque tube connected between inboard flap transmission assemblies, use a spline coupling spanner wrench to retract flap just far enough to clear carriage stop mounting areas on flap tracks and to obtain access to inboard side of inboard support fitting. Install inboard bearing (5).

(4) Install two retaining bolts (4) and nuts in each flap support fitting.

(5) Install carriage stops (8)

(6) Install position transmitter cable and retaining clip on trailing edge of foreflap.

(7) Manually extend flap to 50 degree position. Clearance between downstop dogs on each transmission assembly must be at least 1/4 turn of jackscrew, as in step (1).

(8) Connect input torque tube to inboard transmission assembly. Install coupling retaining screws and lockwire screw heads together.

(9) Service main landing gear shock strut or install aft, outboard main landing wheel. Refer to Chapter 32, Main Landing Gear.

(10) Adjust inboard wing flap as outlined in paragraph 2.B.

2. Adjustment/Test Inboard Wing Flap

A. Equipment and Materials

(1) Spline Coupling Spanner Wrench - F71228, or equivalent

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(2) Control Surface Protractor Assembly - F52485-500, or equivalent

(3) Protractor Clamp Assembly -F71292-16, or equivalent

(4) Eight-Foot Straightedge

B. Adjust Inboard Wing Flap

(1) Pressurize utility hydraulic system

(2) Position flap control lever at UP.

NOTE: Leave control lever in UP position for five minutes with pressure on to ensure that flaps are up.

(3) Depressurize utility hydraulic system. Open utility system bypass valve or hang red DO NOT OPERATE warning tag on flap control lever.

(4) Disconnect electric power from inboard and fillet flap emergency drive unit.

CAUTION: OPERATION OF EMERGENCY FLAP DRIVE, WITH TORQUE TUBES DISCONNECTED, MAY DAMAGE FLAP DRIVE SYSTEM.

(5) Unlatch spring-loaded latches and lower inboard flap cove lip doors.

(6) Disconnect torque tube from inboard flap outboard transmission assembly. (See figure 201.)

(7) Position outboard end of flap trailing edge to fair with wing chord plane within 1/4 inch by adjusting outboard transmission assembly spline coupling with spline coupling spanner wrench. (See figure 202.) Lift flap lightly at midpoints between flap tracks to remove download. Connect torque tube to inboard flap outboard transmission. Install coupling retaining screws and lockwire screw heads together.

NOTES: (a) Inboard flap faired position is determined by placing straightedge flush along lower surface of wing and flap at straightedge markings, and measuring gap. Gap should equal height of blocks on straightedge. Take measurements as shown in figure 202. Theoretical wing chord plane passes through wing trailing edge.

(b) Under certain tolerance conditions, and due to the installation of plate shims on the inboard transmission gear box support fitting, mismatch between the flap surface trailing edge and the wing chord plane may exceed the 1/4 inch maximum limit. If this occurs, it is acceptable to have a maximum mismatch up to 1/2 inch provided the left hand and right hand flaps are within 1/4 inch of each other.

(8) Adjust inboard trailing edge of inboard flap to fair with fillet flap trailing edge. Inboard flap shall not extend above fillet flap and shall not droop more than 3/4 inch below fillet flap.

NOTE: If the mismatch between the inboard and fillet flap cannot be adjusted within jackscrew travel limits, readjustment of the adjacent fillet flap should permit surface fairing within the allowable limit.

(9) Adjust rub blocks at outboard edge of fillet flap seal assembly until seal assembly fairs within 1/32 inch of inboard flap upper surface.

NOTE Rubber seal on fairing must be compressed and rub blocks must rest firmly on inboard flap when checking fairing allowance.

(10) Check that angular distance between upstops on jackscrew and ball bearing nut is 90° (+90°/-45°) on each inboard flap transmission assembly. (See figure 203.)

NOTE Flap transmission assembly stops are designed to absorb full hydraulic motor torque but should not contact during normal operation.

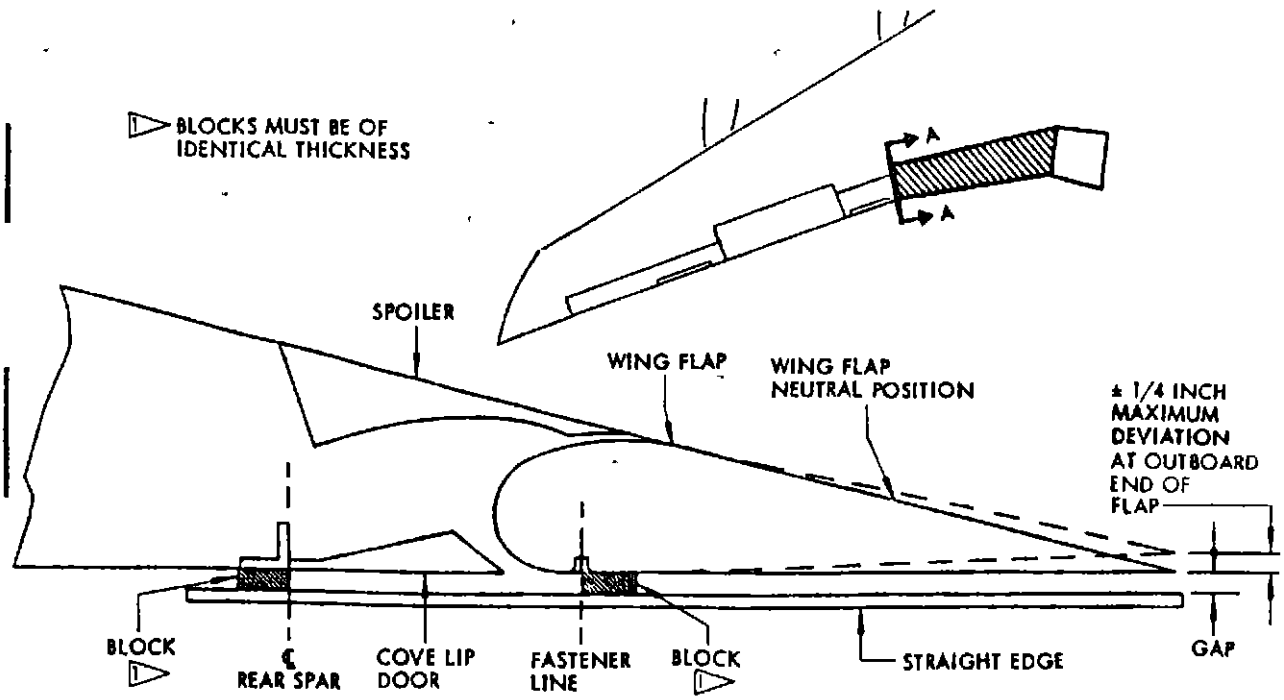
(11) Install electric power connector on emergency inboard and fillet flap drive unit.

(12) Pressurize utility hydraulic system.

(13) Position flap control lever to DOWN.

(14) Check that flap angle of extension is 49° to 50°.

(15) Check that clearance between downstops, on ball bearing nut and jackscrew, is not less than 1/4 turn of jackscrew on each transmission assembly.



A-A

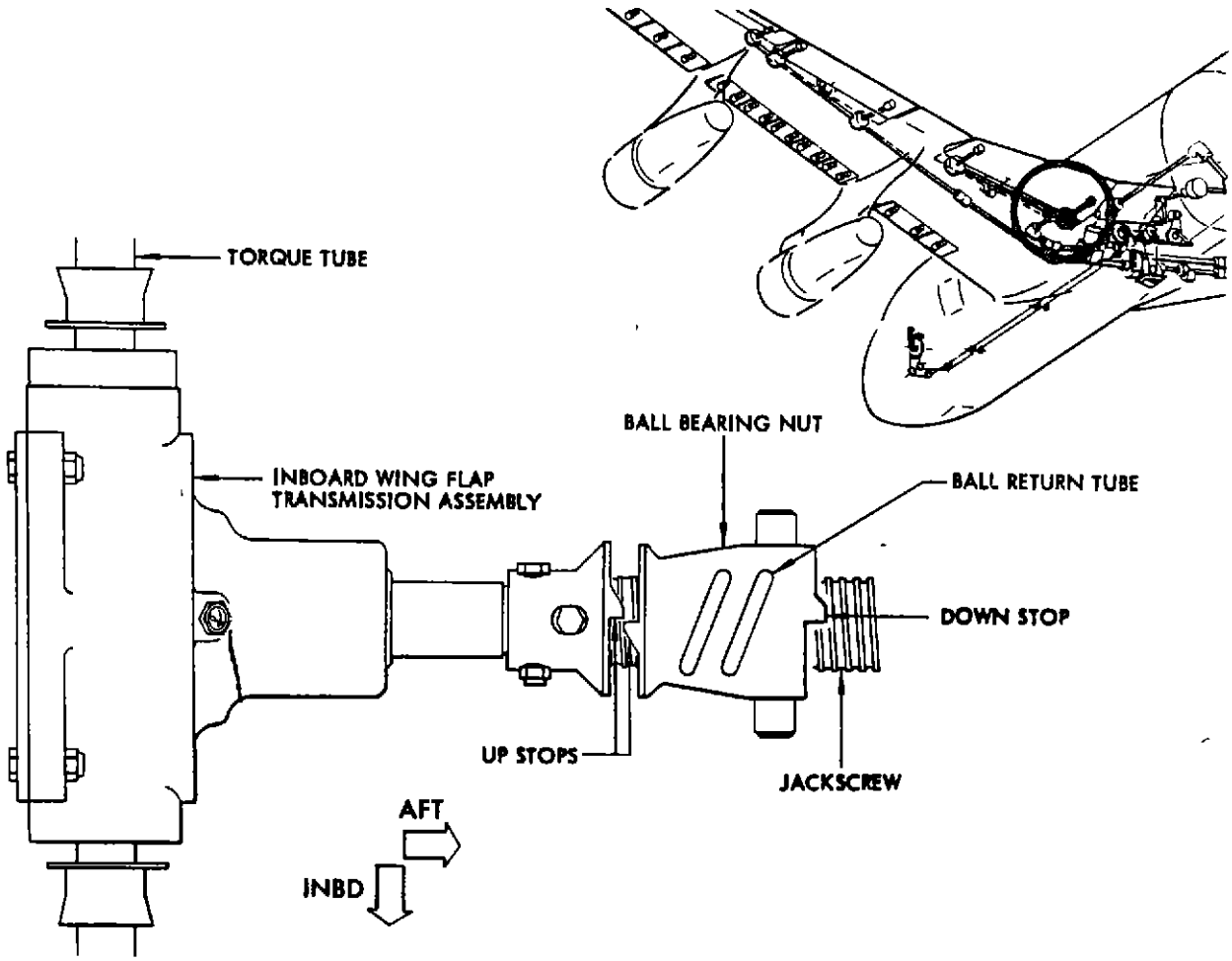
Inboard Wing Flap Adjustment
Figure 202

(16) Position flap control lever at UP.

(17) Depressurize utility hydraulic system.

(18) Check clearance between top of flap and trailing edges of spoilers. Adjust spoiler stop as necessary. Refer to 27-4-1, Spoilers.

(19) Raise and latch cove lip doors.



3. Approved Repairs Inboard Wing Flap

A. Replace Foreflap

(1) Pressurize utility hydraulic system.

(2) Position flap control lever at DOWN.

(3) Depressurize utility hydraulic system. Hang red DO NOT OPERATE tag on flap control lever.

(4) Lower cove lip doors by unlatching cove lip door latches simultaneously.

(5) Remove foreflap by removing four bolts from flap carriage at each end of foreflap.

(6) Reinstall new foreflap as follows:

(a) Align foreflap with flap carriage and slip the mounting bolts in place with washer under each bolt head.

(b) Fill gaps between foreflap end plates and flap carriages by shimming with AN960PD416L washers. Use an equal number of washers on each bolt at one end of foreflap. If more than four w shers are required to fill gaps, shim opposite end. Foreflap end plate may be sprung up to 0 015 inch away from flap carriage if necessary to completely fill gap with washers.

CAUTION: GAP BETWEEN FOREFLAP END PLATE AND FLAP CARRIAGE MUST BE COMPLETELY FILLED WITH WASHERS TO PREVENT PRESTRESSING OF FOREFLAP END PLATE. A MAXIMUM OF FOUR WASHERS, 0 064 INCH, IS ALLOWED ON EACH BOLT. WITH 2 OR LESS WASHERS, USE AN4-11A BOLTS; WITH 3 OR 4 WASHERS, USE AN4-12A BOLTS.

(7) Check that installed foreflap is within dimensions A, B and C as shown on figure 204.

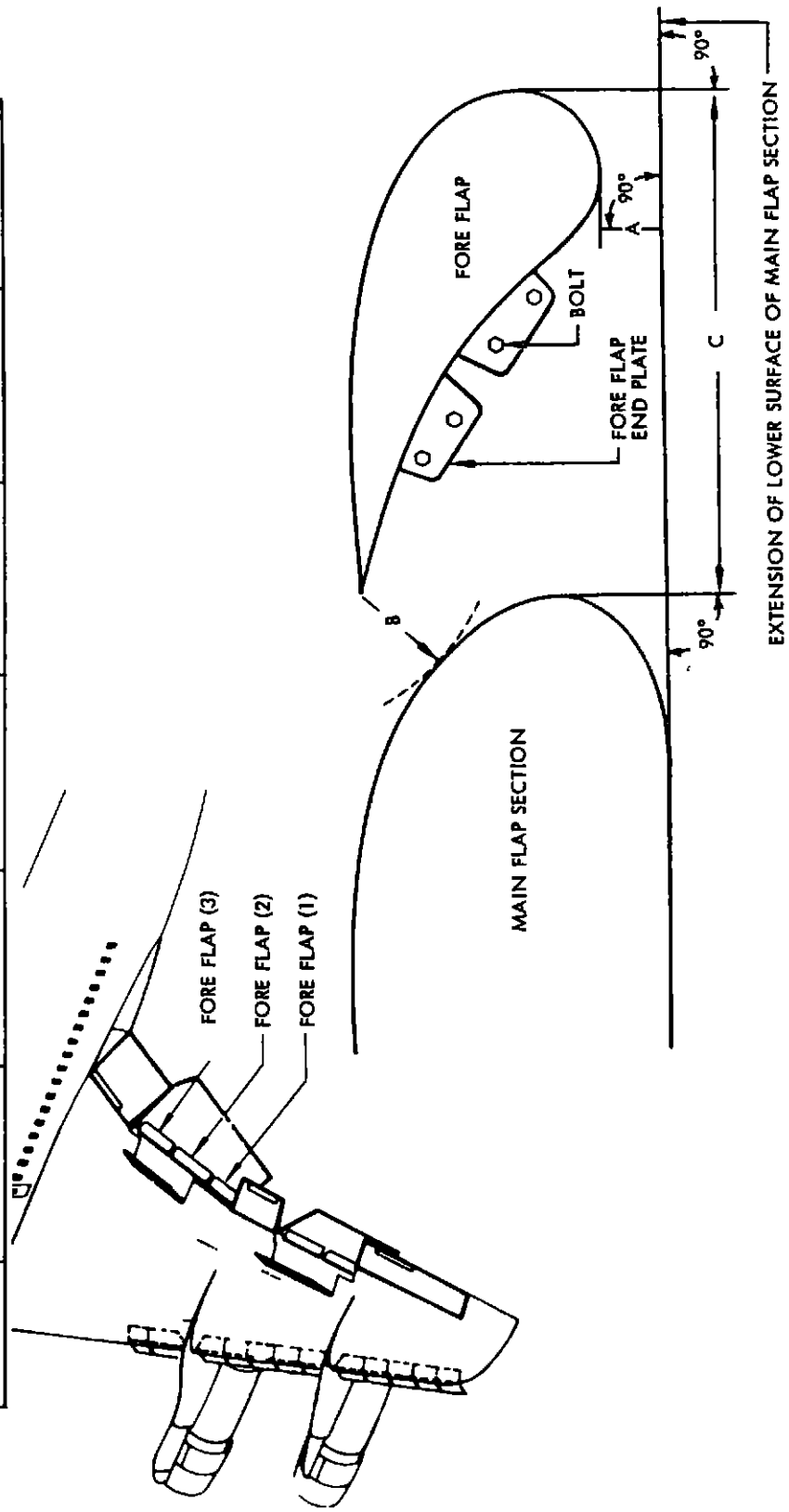
(8) Raise and latch cove lip doors.

(9) Pressurize utility hydraulic system.

(10) Position flap control lever to UP.

(11) Disconnect hydraulic pressure source.

DIMENSION	OUTBD END OF FORE FLAP (1)		INBD END OF FORE FLAP (1)		OUTBD END OF FORE FLAP (2)		INBD END OF FORE FLAP (2)		OUTBD END OF FORE FLAP (3)		INBD END OF FORE FLAP (3)	
"A"	1 75	1 85	1 61	1 71	1 61	1 71	2 07	2 17	2 07	2 17	3 30	3 40
		1 65		1 51		1 51		1 97		1 97		3 20
"B"	2 97	3 07	2 95	3 05	2 95	3 05	3 00	3 10	3 00	3 10	3 00	3 10
		2 87		2 85		2 85		2 90		2 90		2 90
"C"	14 10	14 20	14 13	14 23	14 13	14 23	14 08	14 18	14 08	14 18	13 98	14 08
		14 00		14 03		14 03		13 98		13 98		13 88



Fore Flap Replacement
Figure 204

OUTBOARD WING FLAPS - MAINTENANCE PRACTICES

1. Removal/Installation Outboard Wing Flap

A. General

(1) Removal or installation of the outboard wing flap requires removal of the extreme outboard foreflap to provide clearance of the inboard bearing from the outboard support fitting on the flap. The torque tube between the outboard transmission assembly and the outboard aileron lockout mechanism must be removed prior to removal of the flap to prevent damaging the mechanism when adjusting the flap.

B. Remove Outboard Wing Flap

(1) Pressurize utility hydraulic system.

(2) Position flap control lever to DOWN.

(3) Depressurize utility hydraulic system.

WARNING: OPERATION OF FLAPS DURING MAINTENANCE MAY RESULT IN DAMAGE TO FLAP SYSTEM AND INJURY TO PERSONNEL. HANG A RED "DO NOT OPERATE" TAG ON FLAP CONTROL LEVER AND DISCONNECT ELECTRIC POWER FROM EMERGENCY FLAP DRIVE UNITS.

(4) Unlatch and lower outboard cove lip doors.

(5) Remove torque tube (4, figure 202) between outboard aileron lockout gearbox (5) and outboard flap transmission assembly (3).

(6) Remove position transmitter retaining clip from trailing edge of foreflap. Do not release cable. Allow cable to rewind slowly.

(7) Remove outboard foreflap by removing four bolts from flap carriage at each end of foreflap. (See figure 205.)

(8) Remove flap carriage stops (8, figure 201) from inboard and outboard flap tracks (3).

(9) Remove two retaining bolts (4) from each flap support fitting (6).

WARNING: THE OUTBOARD WING FLAP WEIGHS ABOUT 365 POUNDS. MAKE SURE THAT ENOUGH MEN ARE AVAILABLE TO SUPPORT AND LIFT THE FLAP BEFORE REMOVING RETAINING BOLTS.

(10) Support flap (1) and remove two bearings (5) from each support fitting.

(11) Roll flap aft off flap tracks and remove.

C. Install Outboard Wing Flap

(1) Adjust ball bearing nut (7, figure 201) such that clearance between downstops on ball bearing nut and jackscrew is a minimum of 1/4 turn of jackscrew on each transmission assembly.

(2) Roll flap (1) forward on flap track (3).

(3) With ball return tubes up, align ball bearing nut with flap support fitting (6) and install two bearings (5) in flap support fitting.

(4) Install two retaining bolts (4) in each flap support fitting.

(5) Install flap carriage stops (8) on inboard and outboard flap tracks

(6) Install position transmitter cable retaining clip on trailing edge of foreflap.

(7) Align outboard foreflap with flap carriage and install four mounting bolts at each end of foreflap. Install washer under each bolthead.

(8) Check that installed foreflap is within tolerances of A, B, and C as shown in figure 205.

(9) Adjust wing flap per paragraph 2.B.

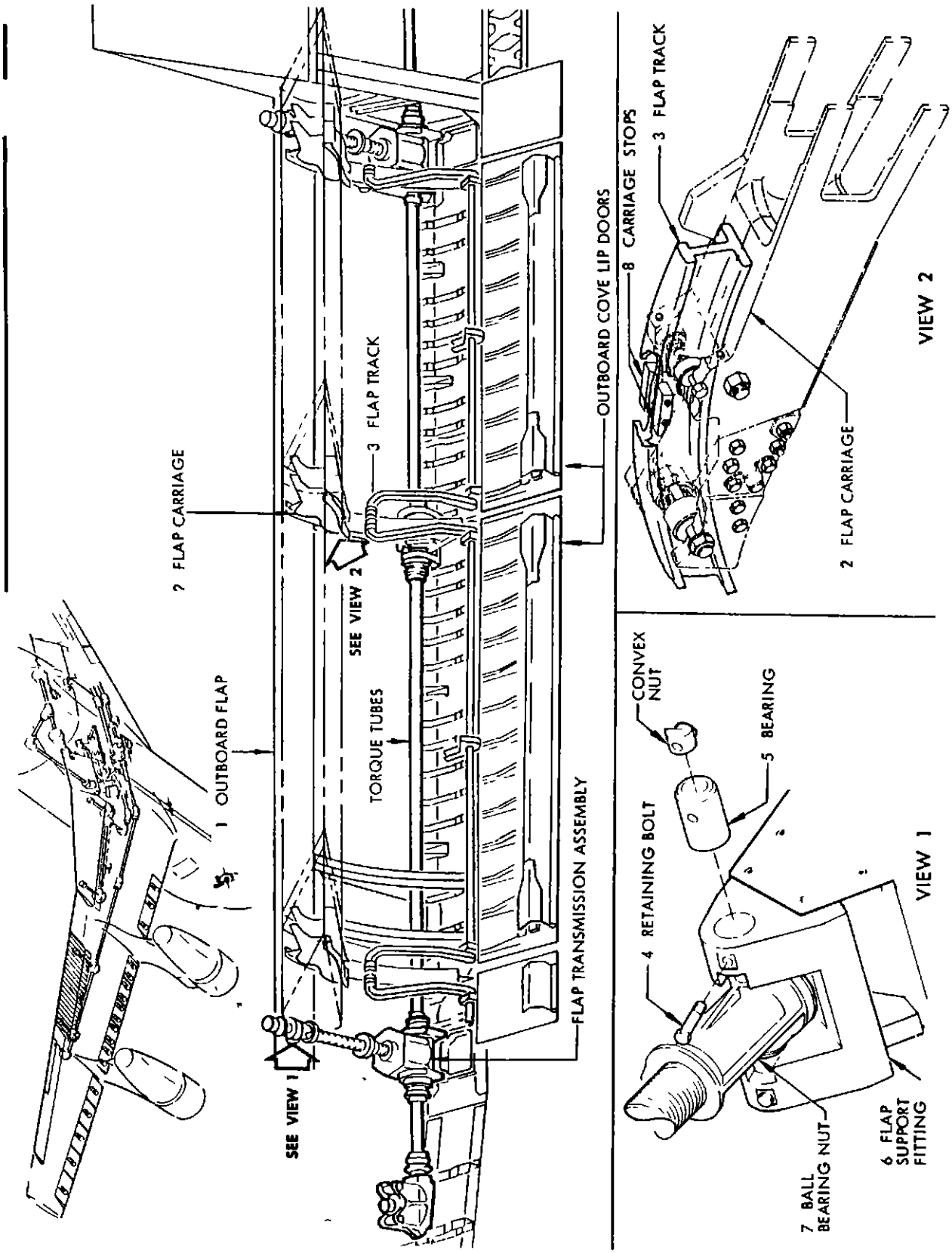
2. Adjustment/Test Outboard Wing Flap

A. Special Tools and Equipment

(1) Spline Coupling Spanner Wrench - F71228 or equivalent

B. Adjust Outboard Wing Flap

(1) Pressurize utility hydraulic system.



Outboard Wing Flap Installation
Figure 201

(2) If flaps are retracted, position flap control lever to DOWN.

(3) Unlatch and lower outboard cove lip doors.

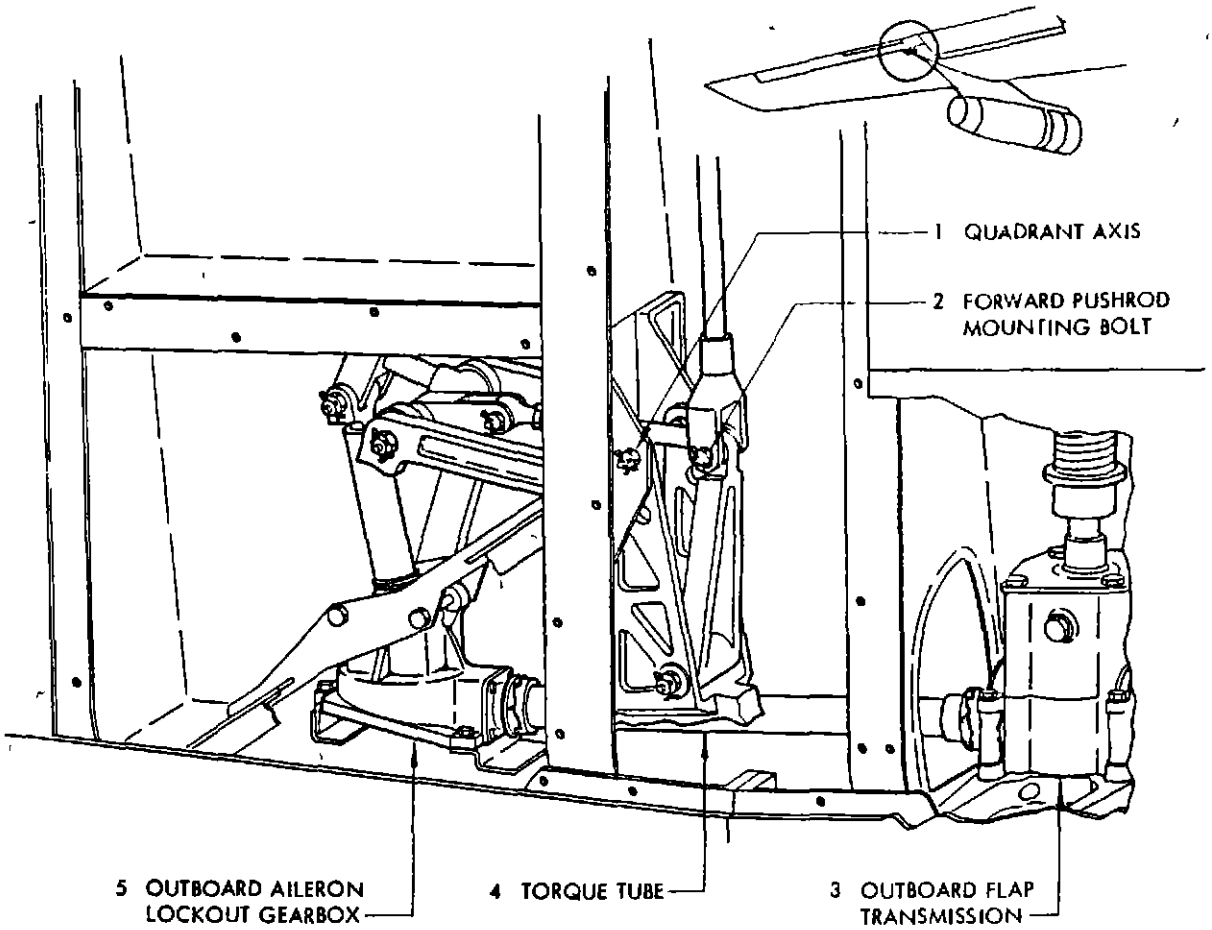
(4) Remove torque tube (4, figure 202) between outboard flap transmission assembly and outboard aileron lockout gearbox (5).

(5) Position flap control lever to UP. Hang red DO NOT OPERATE tag on flap control lever.

(6) Disconnect torque tube from inboard side of inboard transmission assembly.

(7) Position outboard flap trailing edge to contour with wing trailing edge within 1/4 inch by adjusting transmission assembly spline couplings with spline coupling spanner wrench (See figure 203)

NOTE. Faired position of outboard flap may be determined by placing an eight-foot straightedge along lower surface of wing at and parallel to centerline of inboard and outboard flap track. Forward block should be as close as possible to rear spar skin and aft block as close as possible to fastener line shown.



Adjustment of Outboard Aileron Lockout Mechanism
Figure 202

(8) Check that clearance between upstops on ball bearing nut and jackscrew is 90° (+90°/-45°) on each flap transmission assembly.

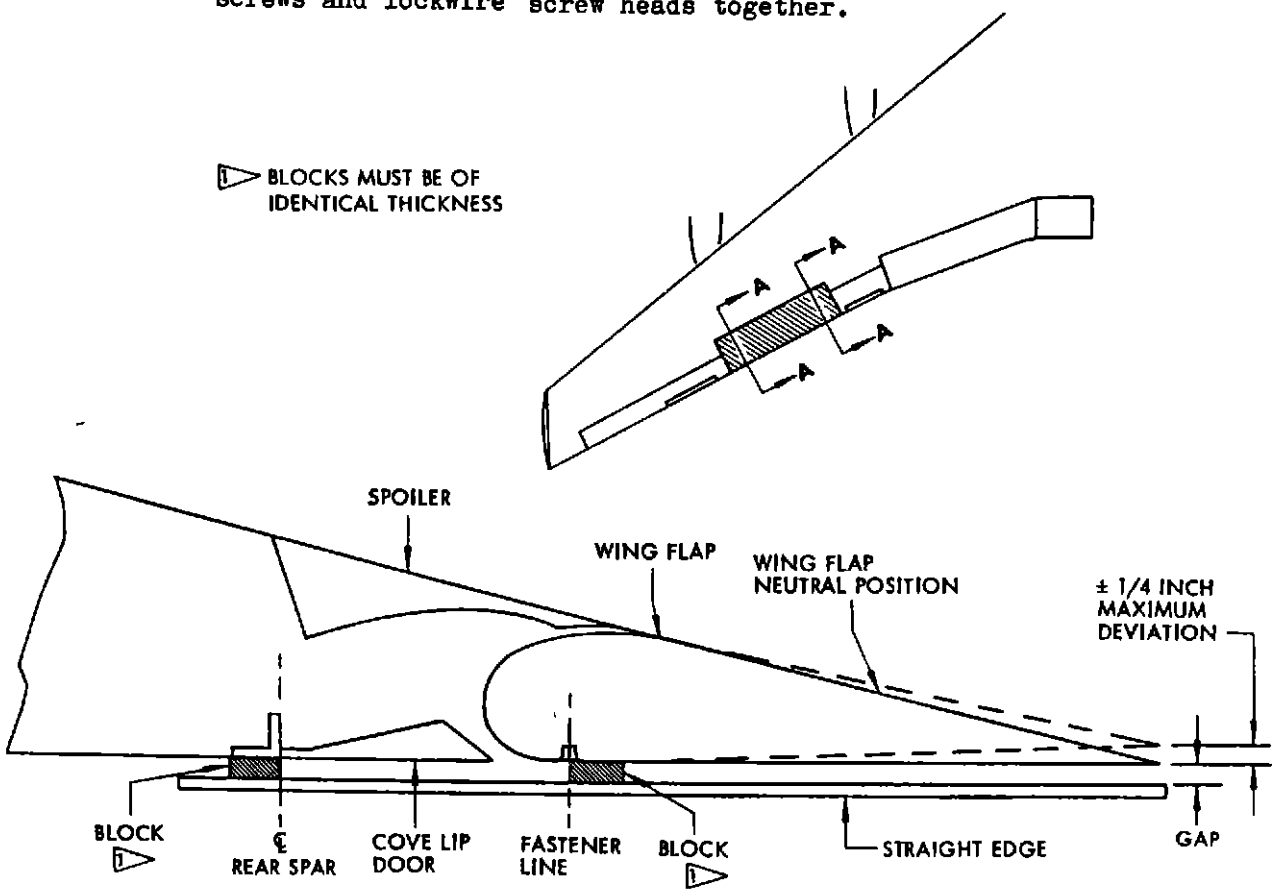
CAUTION OUTBOARD AILERON LOCKOUT MECHANISM MAY BE DAMAGED IF MAXIMUM LIMIT IS EXCEEDED.

(9) Check that mismatch between trailing edge of flap and inboard aileron does not exceed 1.25 inches. Check that mismatch between trailing edge of flap and outboard aileron does not exceed 0.61 inch Adjust flap and aileron to obtain best mismatch compromise.

(10) Connect torque tube to inboard flap transmission assembly. Install coupling retaining screws and lockwire screw heads together.

(11) Adjust outboard aileron lockout gearbox (5, figure 202) with spline coupling spanner wrench until forward pushrod mounting bolt (2) is aligned with quadrant axis (1).

(12) Install torque tube (4) between outboard aileron lockout gearbox and outboard flap transmission assembly (3). Install coupling retaining screws and lockwire screw heads together.



A-A

(6-7132-4868; 20.9.67)

Adjustment of Outboard Wing Flap
Figure 203

(13) Rotate aileron control wheel clockwise and counterclockwise and check that outboard ailerons do not respond to control wheel movement.

(14) Pressurize utility hydraulic system.

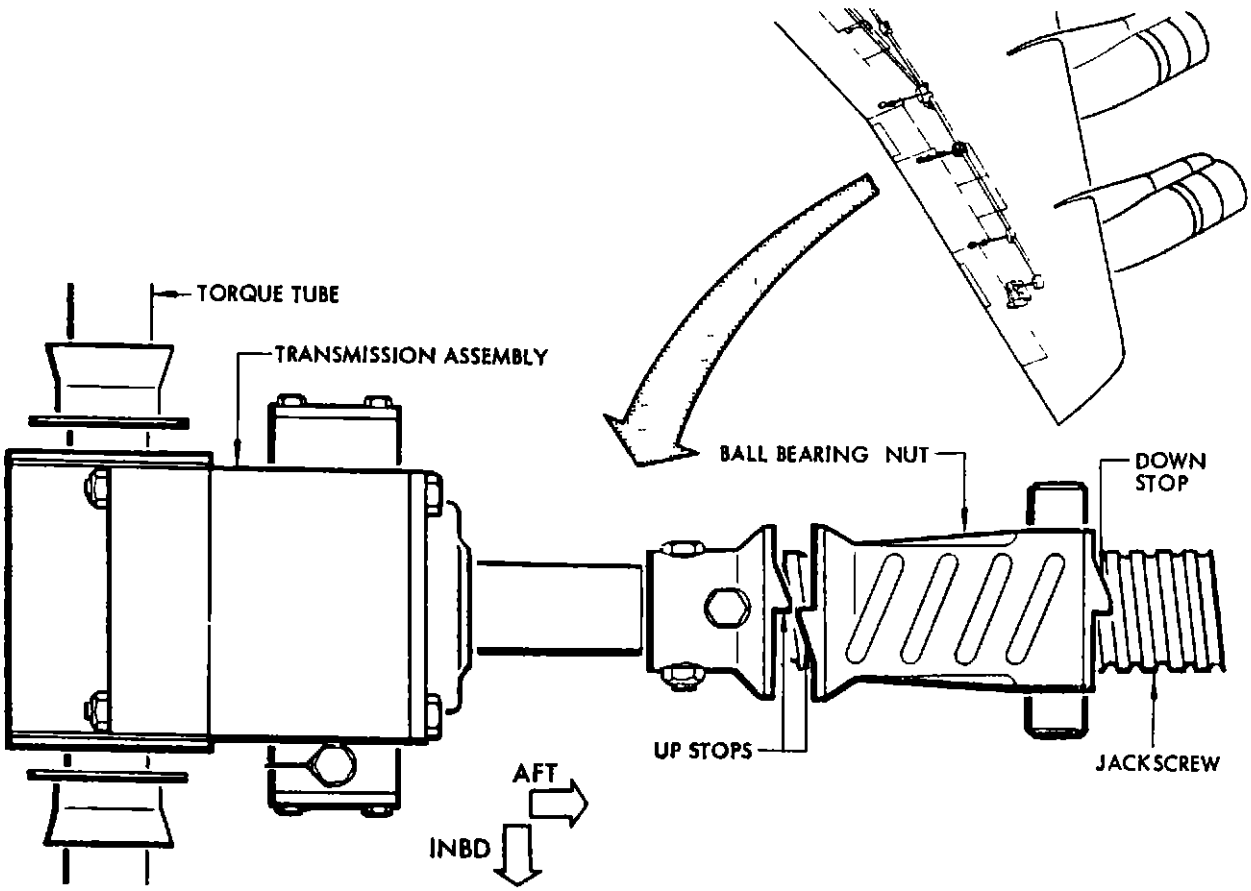
(15) Position flap control lever to DOWN.

(16) Check that clearance between downstops on ball bearing nut and jackscrew is not less than 1/4 turn of jackscrew.

(17) Raise and latch cove lip doors.

(18) Position flap lever to UP to retract flaps

(19) Disconnect hydraulic pressure source.



Adjustment of Outboard Flap Transmission Assembly
Figure 204

3. Approved Repairs Outboard Wing Flap

A. Replace Flap Carriage Bearings

(1) The flap carriage aft upper track bearings can be replaced with the wing flaps in the down position. To replace the flap carriage lower track bearings and the flap carriage cam follower bearing, the wing flap must be removed from the airplane

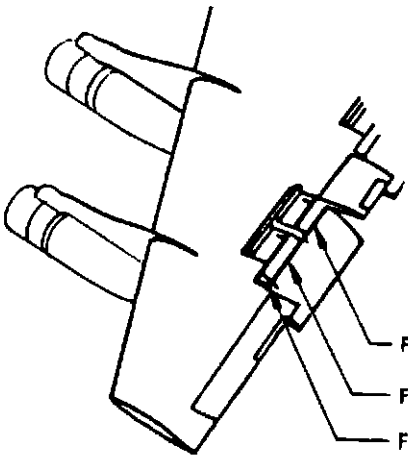
B. Replace Foreflap

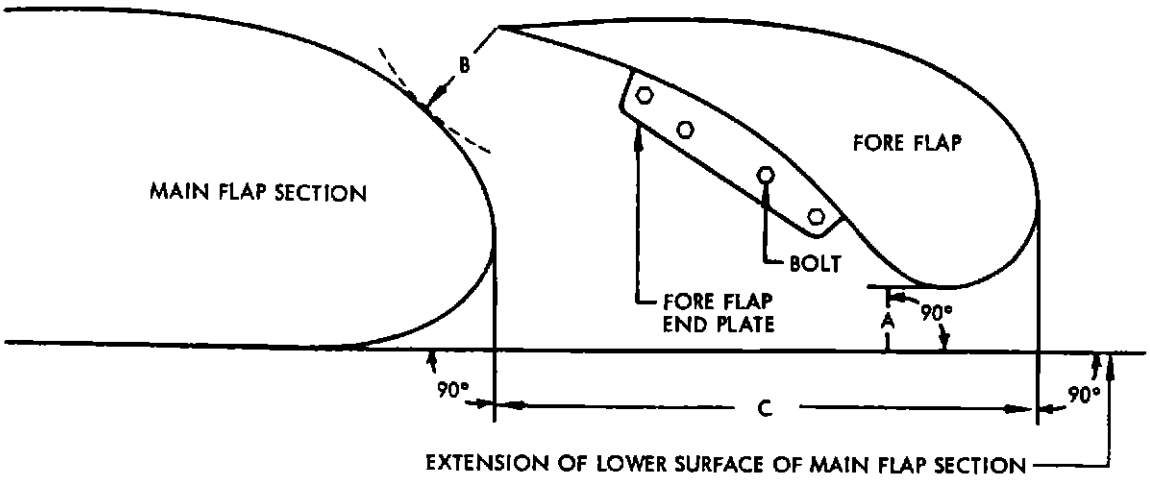
(1) Pressurize utility hydraulic system.

(2) Position flap control lever to DOWN. Hang a red DO NOT OPERATE tag on flap control lever.

(3) Depressurize utility hydraulic system; open system bypass valve.

DIMENSION	BOTH ENDS OF FORE-FLAP (1)	BOTH ENDS OF FORE-FLAP (2)	OUTBOARD END OF FORE-FLAP (3)	INBOARD END OF FORE-FLAP (3)
"A"	1 67 1 57 1 47	1.67 1 57 1 47	1 67 1 57 1 47	1 82 1 72 1 62
"B"	3 10 3 00 2 90	3 10 3 00 2 90	3 10 3 00 2.90	3 07 2 97 2 87
"C"	14 22 14 12 14 02	14 22 14 12 14 02	14 22 14 12 14 02	14 22 14 12 14 02





Foreflap Replacement
Figure 205

(4) Unlatch cove lip door latches simultaneously and lower cove lip doors.

(5) Remove foreflap by removing four bolts from flap carriage at each end of foreflap. (See figure 205.)

(6) Reinstall new foreflap as follows:

(a) Align foreflap with flap carriage and slip the four mounting bolts in place with washer under each bolthead.

(b) Fill gaps between foreflap end plates and flap carriages by shimming with AN960PD416L washers. Use an equal number of washers on each bolt at one end of foreflap. If more than four washers are required to fill gap, shim opposite end. Foreflap end plate may be sprung up to 0.015 inch away from flap carriage, if necessary, to completely fill gap with washers.

CAUTION: GAP BETWEEN FOREFLAP END PLATE AND FLAP CARRIAGE MUST BE COMPLETELY FILLED WITH WASHERS TO PREVENT PRESTRESSING OF FOREFLAP END PLATE. A MAXIMUM OF FOUR WASHERS IS ALLOWED ON EACH BOLT. WITH 2 OR LESS WASHERS USE AN4-11A BOLTS; WITH 3 OR 4 WASHERS USE AN4-12A BOLTS.

(7) Check that installed foreflap is within tolerance of dimensions A, B and C as shown on figure 205.

(8) Raise and latch cove lip doors.

(9) Pressurize utility hydraulic system.

(10) Position flap control lever to UP.

(11) Disconnect hydraulic pressure source.

FLAP TRACKS - MAINTENANCE PRACTICES

1. Removal/Installation Flap Track

A. General

(1) The flap track is attached to a support assembly of machined fittings and tubular supports. If replacement of support assembly is necessary install castellated nuts on bolts connecting support tubes to support tube sockets. If self-locking nuts were previously installed, drill bolt to accommodate cotter pin. Install castellated nuts finger tight, then tighten to first position to allow installation of cotter pin.

B. Equipment and Materials

(1) Bolt Puller Assembly - F70173, or equivalent

C. Remove Flap Track

(1) Pressurize utility hydraulic system.

(2) Place flap control lever at DOWN

(3) Depressurize utility hydraulic system.

(4) Unlatch spring-loaded cove lip door latches and lower cove lip door below flap to be removed.

(5) Remove wing flap. Refer to 27-16-11, Inboard Wing Flap - Maintenance Practices, or to 27-16-21, Outboard Wing Flaps - Maintenance Practices, whichever is applicable.

(6) Using bolt puller, remove mounting bolts (3 and 4, figure 201) as illustrated in figure 202.

NOTE: Bolt puller is intended for use in removing forward attach bolt of four inboard flap tracks or aft attach bolt of two most inboard flap tracks.

(7) Remove flap track (2).

(8) If track between inboard spoilers is being removed, remove spoiler stop from track.

D. Install Flap Track

(1) Align flap track (2, figure 201) with support bracket and install mounting bolt (4).

(2) Align flap track with upper support tube (1) and install mounting bolt (3).

(3) Tighten nuts on mounting bolts (3) and (4) to 15 to 20 pound-inches torque and install cotter pins.

NOTE: A maximum of three washers may be installed under nuts.

(4) If track between inboard spoilers is being replaced, install spoiler stop.

(5) Install wing flap. Refer to 27-16-11, Inboard Wing Flap - Maintenance Practices, or to 27-16-21, Outboard Wing Flap - Maintenance Practices, whichever is applicable.

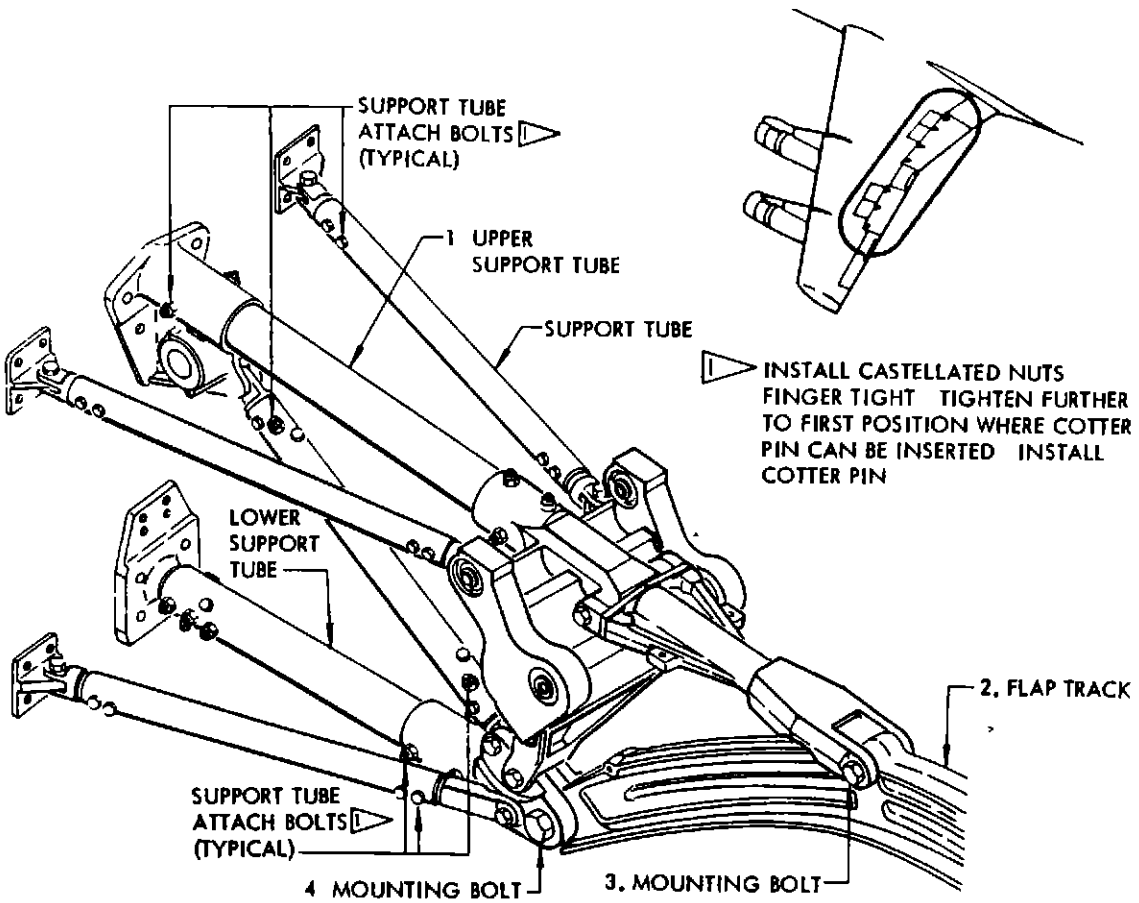
(6) Raise and latch cove lip doors.

(7) Pressurize utility hydraulic system.

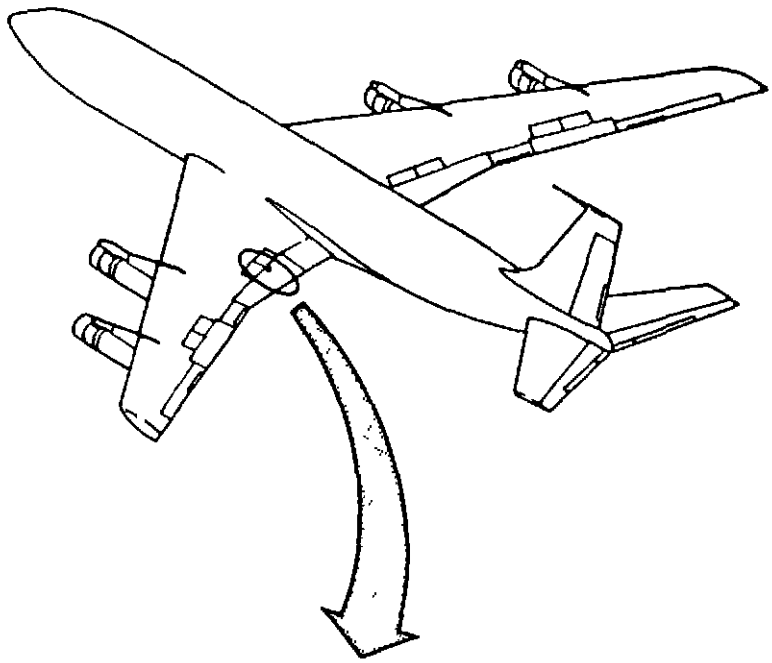
(8) Position flap control lever to UP.

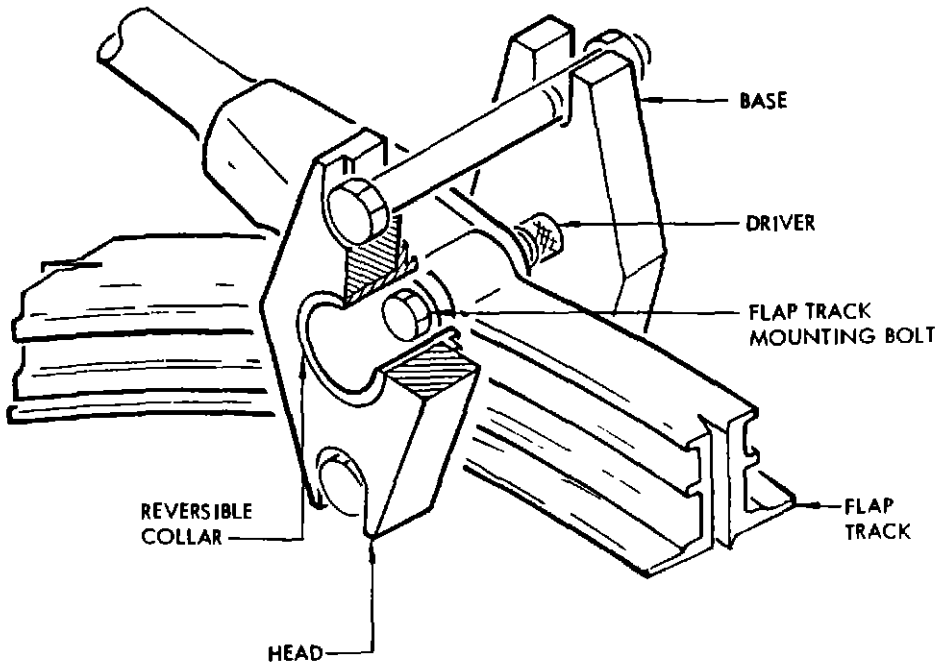
(9) Depressurize utility hydraulic system.

(10) Check clearance between flap and trailing edges of spoilers. Adjust spoiler stop as necessary. Refer to 27-4-1, Spoilers.



Flap Track Installation
Figure 201




BASE
DRIVER
FLAP TRACK
MOUNTING BOLT
REVERSIBLE
COLLAR
FLAP
TRACK
HEAD

INBOARD FLAP TRACK AND SPOILER SUPPORT FITTING - REMOVAL/INSTALLATION

1. General

   A. When replacing flap track and spoiler support fitting, or flap track support fitting, it is necessary to locate and drill mounting and attaching bolt holes. These parts are delivered undrilled and must be drilled at installation. These parts are not interchangeable after drilling; each part is fitted to a specific airplane and can not be used on any other.

   B. The relationship of bolt holes drilled in any fitting must be identical to the hole relationship in the part being replaced, within 0.005 inch. The bolt hole relationship must be closely held to prevent misalignment of flap track and resulting defective flap operation.

   C. Any flap track support, or flap track and spoiler support fitting may be removed and replaced without removing the applicable wing flap. The flap should be extended and, if necessary, the applicable flap track may be dismounted and rotated aft and into the flap to provide working space.

2. Equipment and Materials

   A. Bolt Puller Assembly - F70173, or equivalent (use to remove forward attach bolt of four inboard flap tracks or aft attach bolt of two most inboard flap tracks).

   B. Drill Jig - F70179 (for inboard flap track and spoiler support fitting only)

   C. Spoiler Actuator Locks - F71264-500, or equivalent

3. Remove Inboard Flap Track and Spoiler Support Fitting

   A. Pressurize utility hydraulic system.

   B. Extend flaps.

C. Extend speed brakes (inboard spoilers) and install spoiler actuator locks.

D. Depressurize utility hydraulic system.

E. Dismount electric power connector from inboard flap emergency drive motor.

WARNING: ACCIDENTAL OPERATION OF FLAPS WITH FLAP TRACK DISMOUNTED AND WITH PERSONNEL WORKING IN THE FLAP CAVITY COULD RESULT IN DAMAGE TO THE AIRPLANE AND INJURY TO PERSONNEL.

F. Open inboard cove lip doors.

G. Disconnect torque tube from each side of support fitting.

H. Using bolt puller assembly, remove flap track mounting bolts (5, figure 401.)

NOTE: Removal of the flap track mounting bolts may be facilitated by applying slight lifting force at the flap trailing edge and supporting the flap in this position. If flap is supported, protective cover must be installed on the trailing edge.

I. Roll flap track (6) aft into extended flap. Use care to avoid damage to flap.

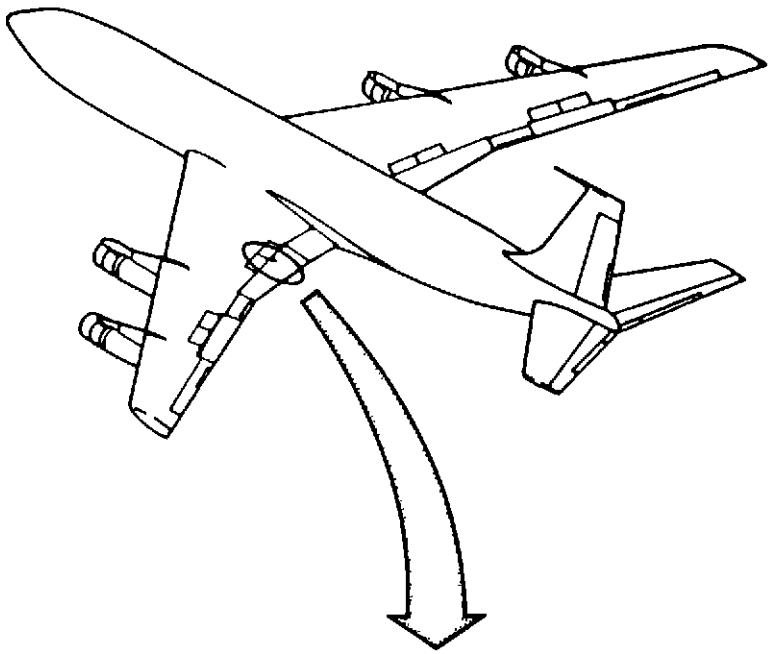
J. Remove support link (4).

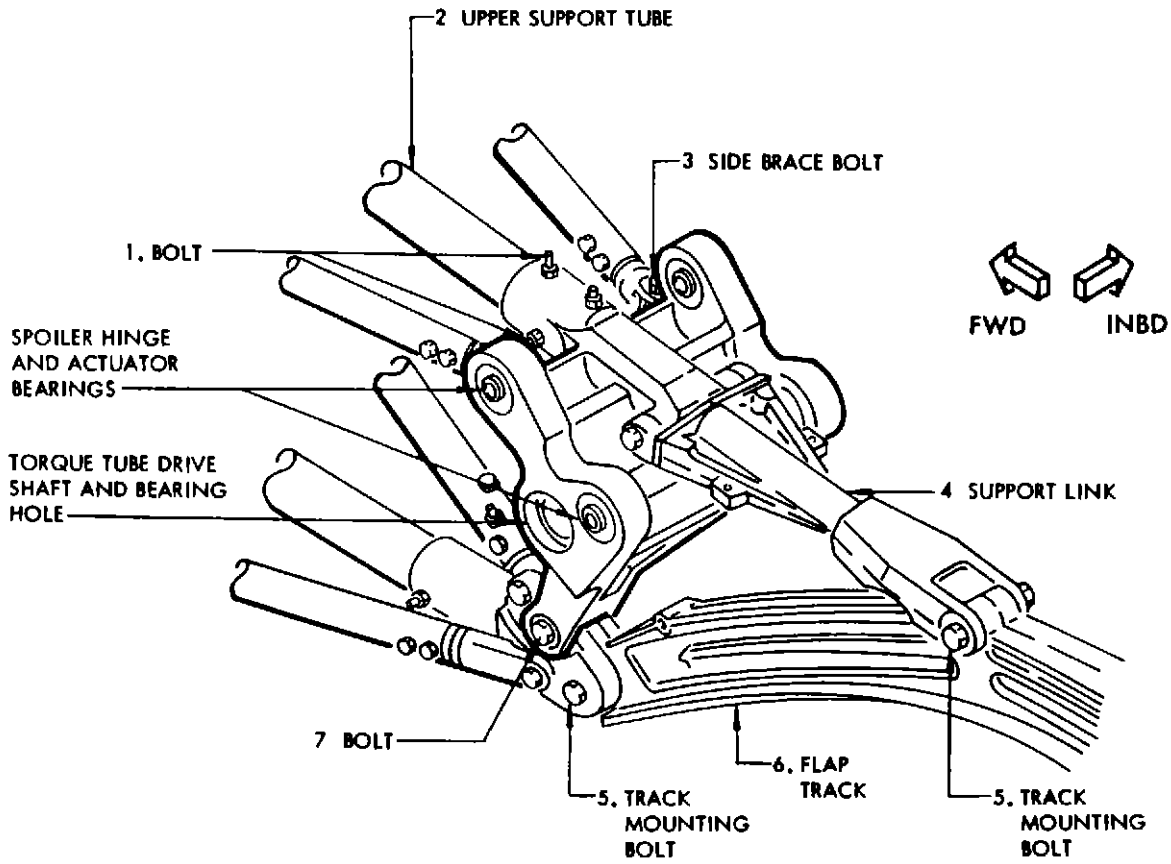
K. Remove bolts (3), connecting aft ends of side braces to support fitting.

L. Remove bolts (1) from aft end of upper support tube (6).

M. Remove bolt (7) from bottom of support fitting and remove fitting.

N. Remove flap torque tube drive shaft and bearings and spoiler hinge bearings from fitting. Refer to 27-16-101.





Inboard Flap Track and Spoiler Support Fitting Installation
Figure 401

5. Install Inboard Flap Track and Spoiler Support Fitting

A. Prepare New Flap Track and Spoiler Support Fitting

(1) Position removed defective fitting in drill jig (figure 402).

(2) Install 7/16-inch bolt through bottom of fitting and support block in end of jig.

(3) With track and spoiler support fitting positioned so that drill jig locator fits into torque tube bearing hole in fitting, install 3/8-inch bolt and clamping plate. Tighten bolt to hold fitting securely.

(4) Adjust positions of drill guide bushings as follows:

(a) Loosen cap screws to free drill guide bushings.

(b) Align drill guide bushings with applicable holes in old fitting.

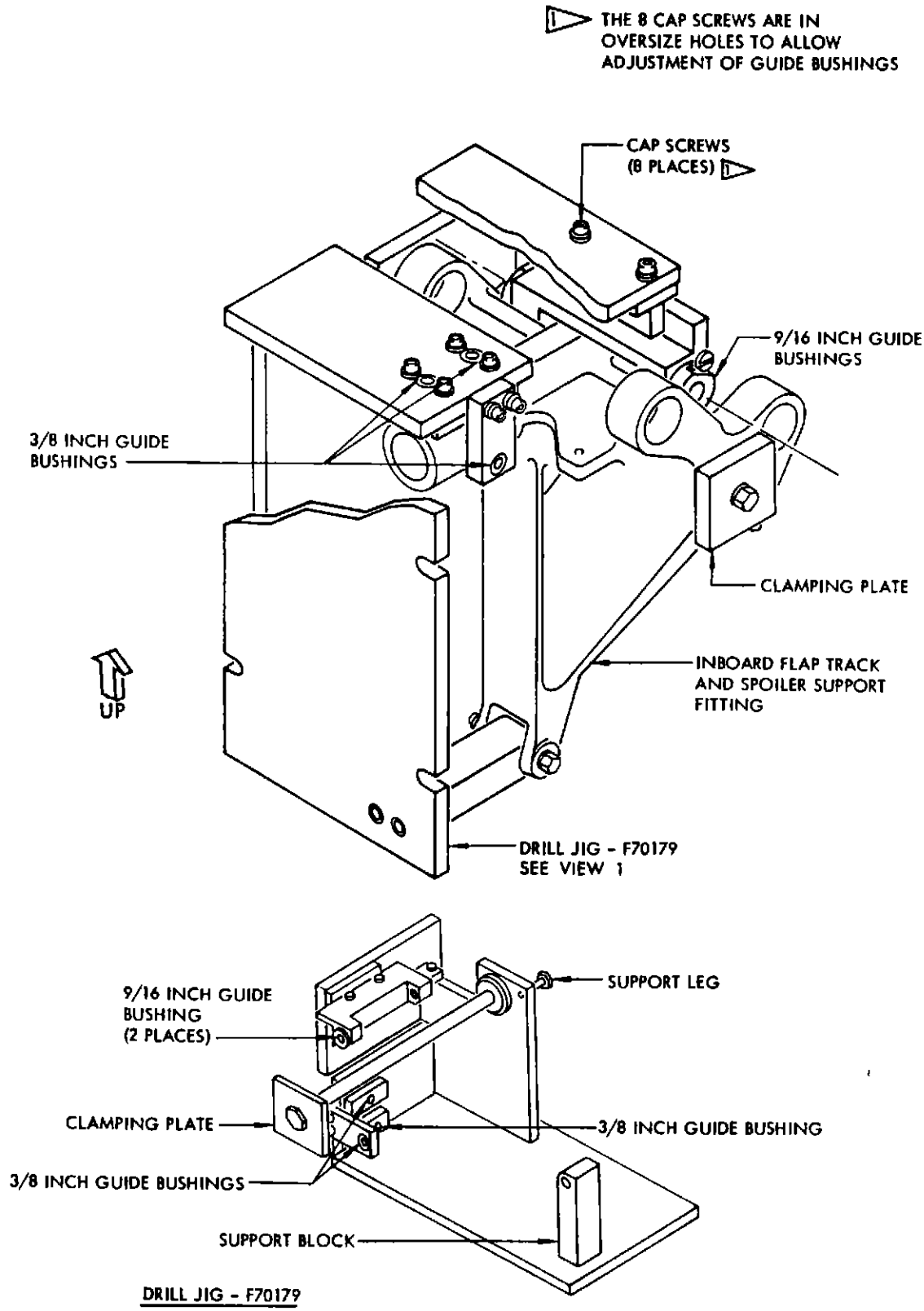
NOTE: If a bolt hole is worn, maximum wear will normally be in the direction of maximum stress, that is; maximum wear will be in the aft side of the 9/16-inch hole for support link (4, figure 401) attach bolt and in the forward sides of the three bolt holes provided for attachment of the upper support tube.

(c) Secure drill guide bushings in aligned position with rigging pins, or equivalent, of suitable size and tighten cap screws.

(d) Remove rig pins and make sure that guide bushings are secure.

(5) Remove old flap track and spoiler support fitting from drill jig.

(6) Install new flap track and spoiler support fitting in drill jig. Make sure that fitting is properly aligned and secured.



Flap Track and Spoiler Support Fitting Drilling Set-Up
Figure 402

(7) Drill bolt holes as follows.

(a) Drill through the two 9/16-inch guide bushings. The finished hole through the fitting shall be 0.5625 (± 0.0005) inch.

(b) Drill through the three 3/8-inch guide bushings. Drill only through one side of support fitting tube socket. Holes shall be 0.3745 (± 0.0010/-0.0) inch in diameter.

NOTE: Drilling three 3/8-inch holes through the other side of upper support tube socket will be completed with fitting installed in wing.

(c) Install flap track and spoiler support fitting in wing trailing edge structure as follows:

1) Position the fitting in the support structure and install bolt (7, figure 401).

2) With upper support tube seated in fitting socket, install one bolt (3) to connect one side brace. Connect the side brace opposite the hole drilled in the side of the upper support tube socket.

(d) With fitting installed, and with 3/8-inch holes through one side of fitting socket aligned with holes through upper support tube, complete drilling of 3/8-inch holes through other side of socket. Make sure that drill does not enlarge hole in either side of support tube. Holes shall not exceed 0.3755 inch diameter.

(e) Remove fitting from supporting structure and clean up drilled holes.

B. Press spoiler hinge and spoiler actuator support bearings into support fitting. Press only on outer races of bearings.

C. Press torque tube bearings into support fitting, making sure that spacer is properly positioned between inner races of bearings.

D. Install bearing retainer on outboard side of support fitting.

E. Install torque tube drive shaft, and install spacer, coupling half, washer, and retaining nut on inboard end of shaft. Tighten nut to between 300 and 400 pound-inches torque.

F. Position support fitting in supporting structure and install bolt (7, figure 401).

G. Install three bolts (1) through upper support tube (2) and socket in support fitting. Tighten castellated nuts finger-tight and then just enough more to allow installation of cotter pins.

H. Install bolts (3) to connect side braces.

I. Connect torque tube to each end of torque tube drive shaft in support fitting. Install coupling retaining screws and lockwire screw heads together.

J. Install aft end of support link (4) in support fitting.

K. Roll flap track forward and install flap track mounting bolts (5). Tighten nuts on bolts (5) to between 15 and 20 pound-inches torque.

L. Install electric power connector on inboard flap emergency drive motor.

M. Pressurize utility hydraulic system.

N. Slowly move flap control lever toward FLAPS UP 0 and carefully check flap operation. If flaps operate correctly at slow speed, extend and retract flaps at normal speed, and check operation.

O. Depressurize utility hydraulic system.

P. Close cove lip doors and remove spoilers actuator locks.

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MAIN FLAP COVE LIP DOORS - MAINTENANCE PRACTICES

1. Removal/Installation Main Flap Cove Lip Doors

A Remove Main Flap Cove Lip Door

(1) Pressurize utility hydraulic system.

(2) Extend wing flaps.

(3) Depressurize utility hydraulic system. Open system bypass valve.

(4) Pull triggers down to release cove lip door latches (4, figure 201) and lower cove lip door (5).

(5) Detach bonding jumper (3) from cove lip door.

(6) Remove hinge pin retaining clips (7) at center of door.

(7) Pull hinge pins (6) from hinge halves and remove cove lip door.

B. Install Main Flap Cove Lip Door

(1) Align cove lip door hinges halves on wing structure and install hinge pins (6, figure 201).

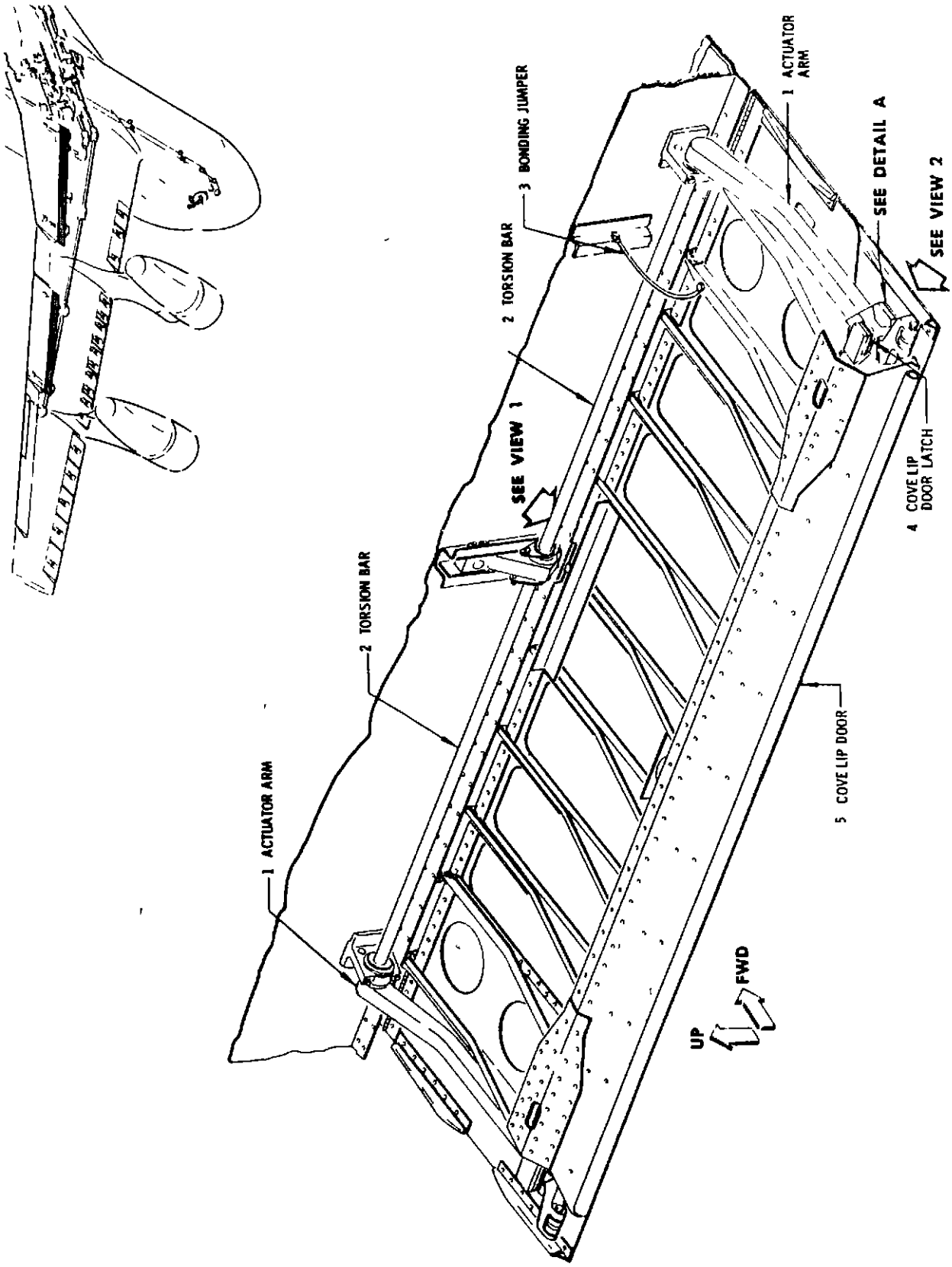
(2) Install retaining clips (7) to secure hinge pins.

(3) Connect bonding jumper (3) to cove lip door (5). Install jumper to allow full opening of cove lip door.

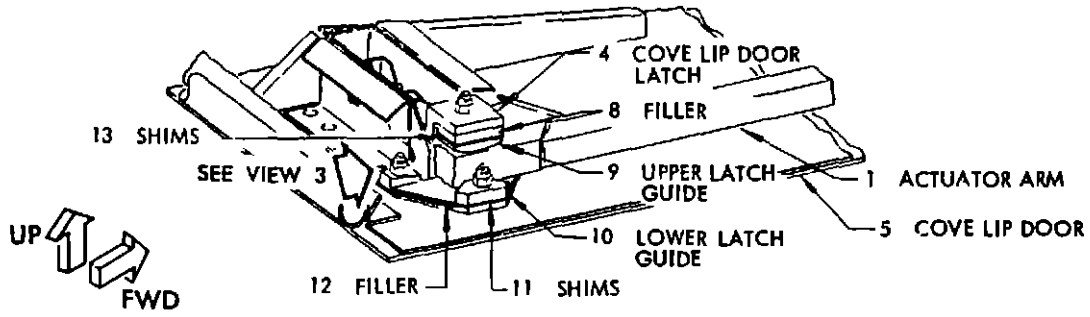
(4) With flaps in down position and actuator arm in contact with flap track, apply a download to end of actuator arm to separate arm from track. Slowly allow arm to return to track so that there is no sideways deflection. (Refer to figure 202.)

(5) Raise cove lip door so that cove lip door actuator arm fits into projections in latch guide. Loosen four bolts on lower latch guide and position guide as required to obtain 0.05 inch clearance between projections on guide and actuator arm. (See figure 201, view 3.) Tighten bolts.

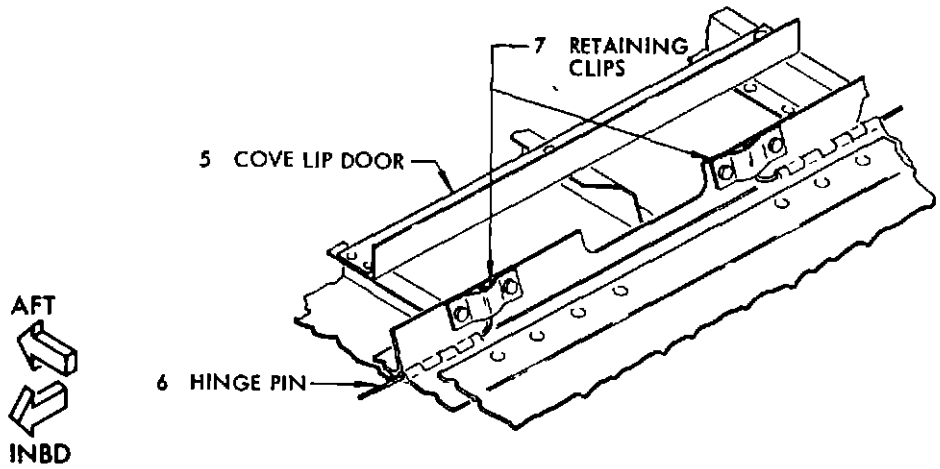
NOTE: It is not required that the 0.05 inch dimension be maintained after initial installation of cove lip door if the above procedure is followed.



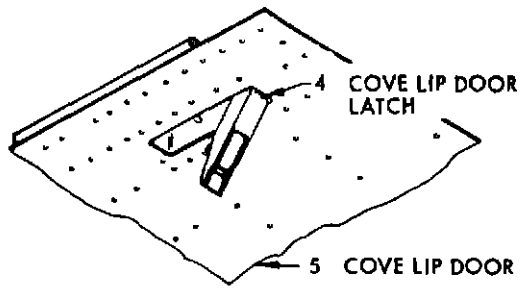
Main Flap Cove Lip Door Installation
Figure 201 (Sheet 1 of 2)



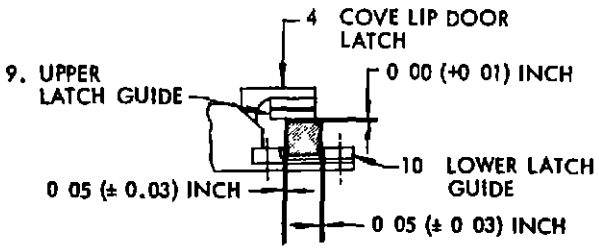
DETAIL A



VIEW 1



VIEW 2



VIEW 3

(6) Pressurize utility hydraulic system and retract flaps.

(7) Depressurize hydraulic system and check that cove lip door to flap mismatch does not exceed 0.10 inch at flap carriages by laying a straight edge against flat portion of the flap just aft of the bull nose. Position straight edge at right angle to cove lip door.

(8) Add or remove shims between upper latch guide and filler to obtain faired condition as specified in above step and to obtain 0.00 to 0.01 inch clearance between upper latch guide and cove lip door actuator arm.

(9) Check that clearance between adjacent cove lip doors or doors and adjacent wing structure is 1/4 (± 7/64) inch.

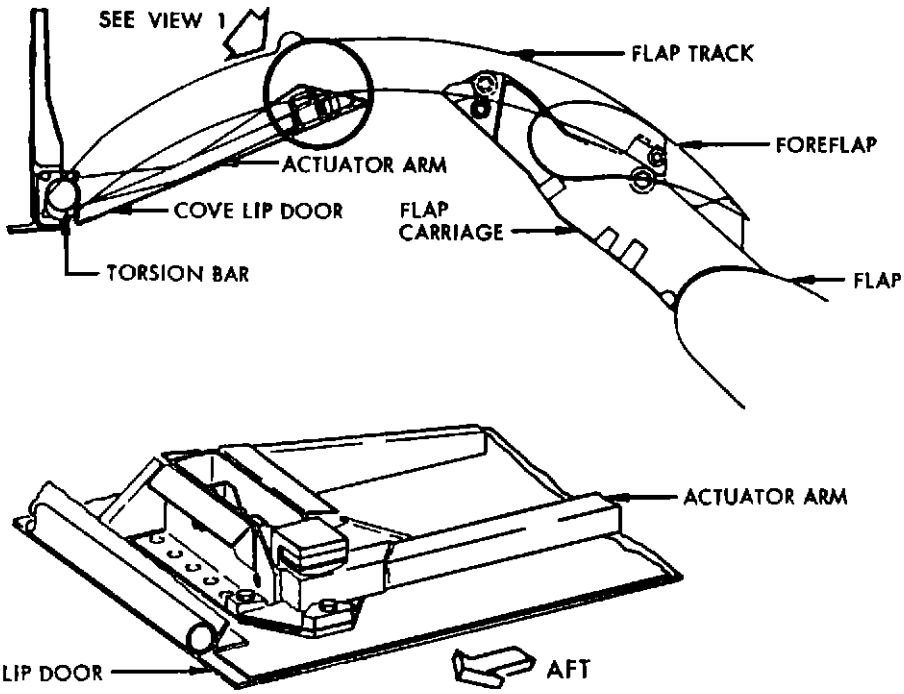
(10) Pressurize utility hydraulic system.

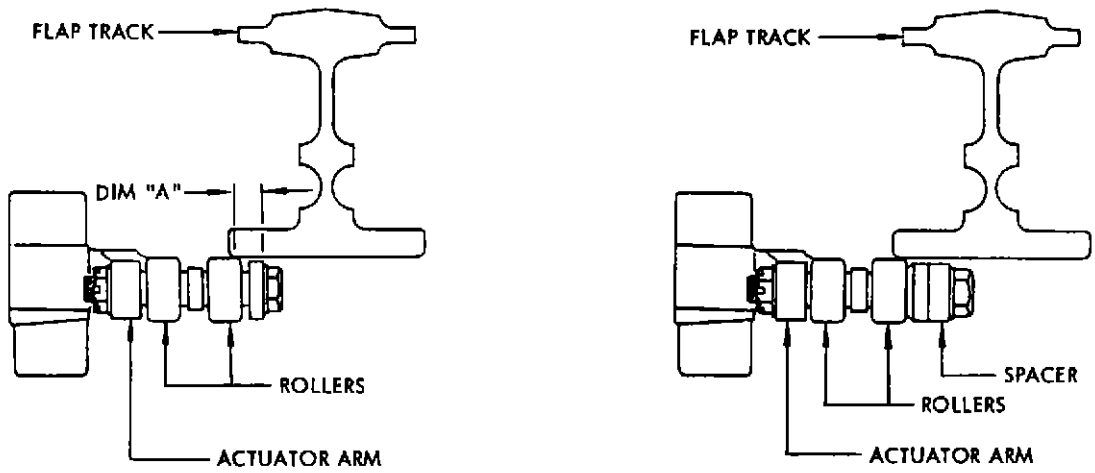
(11) Check that each inboard flap cove lip door actuator arm roller and at least one roller on each outboard flap cove lip door actuator arm has contact with flap carriage cam not less than 75 percent of roller width. Cove lip door must be latched to actuator arm while making check.

(12) Extend flaps to 50° and check that cove lip door actuator arm transfers smoothly from flap carriage cam to flap track

(13) With flaps extended and cove lip door latched to actuator arm, check that actuator arm extension makes sufficient contact with flap track to ensure a positive stop. This may be ascertained by measuring distance from end of spacer on actuator arm to chamfer on flap track on inboard cove lip door actuator arms. A dimension of 1/2 inch or more will ensure a positive stop. Failure to obtain 1/2 inch dimension indicates incorrect installation. On outboard cove lip doors, measure dimension from bottom face of bolthead through actuator arm to chamfer on flap track. (See figure 202.) A dimension of 1/2 inch or more will ensure a positive stop If dimension is less than 1/2 inch, remove bolt and install a longer bolt with spacer between bottom face of bolthead and actuator arm. Spacer width should be 0.25 inch and diameter should be 0.84 inch

(14) Lower cove lip doors.





ORIGINAL CONFIGURATION (TYP)

ALTERNATE CONFIGURATION

VIEW 1

(15) Check for gap between actuator arm and supporting bearing If no gap exists, tap edge of actuator arm on opposite side of bearing support until gap is available.

NOTE Gap must exist between actuator arm and supporting bearing to allow for wing deflection during flight

(16) Raise and latch cove lip doors.

(17) Retract flaps.

(18) Check that sliding motion between cove lip door actuator arms and latch guide is not impeded by binding.

(19) Check for smooth transferral of actuator arm from flap track to flap carriage cam as flap retracts.

(20) Disconnect hydraulic pressure sources.

2. Pemoval/Installation Main Flap Cove Lip Door Actuating Mechanism

A General

(1) Special tools are required to release the torsional preload on the cove lip door actuating mechanism torsion bars during removal of the bars or of the cove lip door actuator arms. These same tools are used to preload the bars in torsion when the actuator arms or the torsion bars are installed on the airplane. The tools are used to crank the support brackets into place so that the bolts which attach the brackets to structure may be installed. The opposite procedure is used to release the torsional load on the bars. Tools are shown on figure 203 along with wing station numbers where tools are used.

B. Equipment and Materials

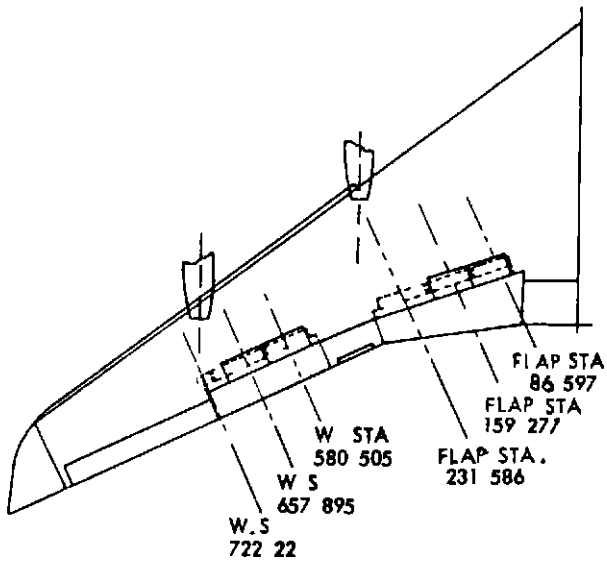
(1) MIT65-18940-1 Cove Lip Door Actuation Installation Tool

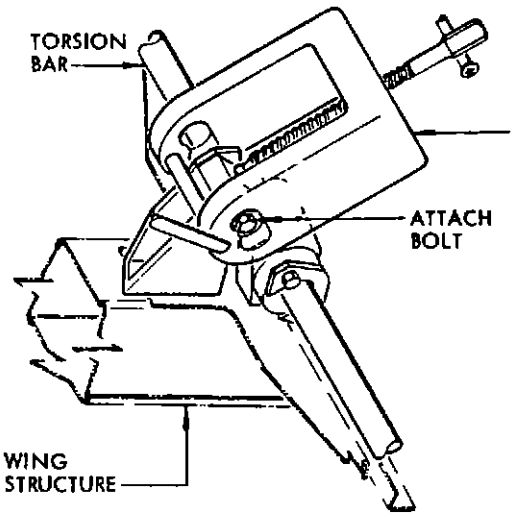
(2) 2 MIT65-18940-1 Assembly Nos. 1 and 2 Cove Lip Door Actuation Tool

C. Remove Cove Lip Door Actuating Mechanism

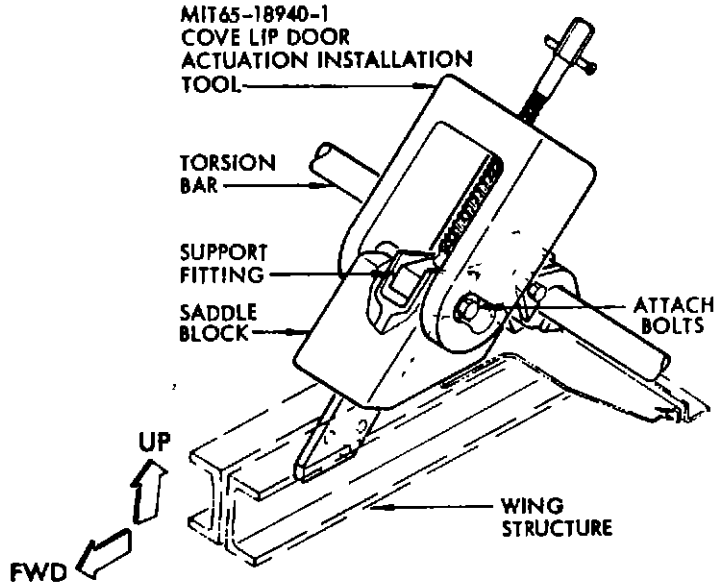
(1) Pressurize utility hydraulic system.

(2) Extend wing flaps Hang a red DO NOT OPERATE tag on flap control lever.

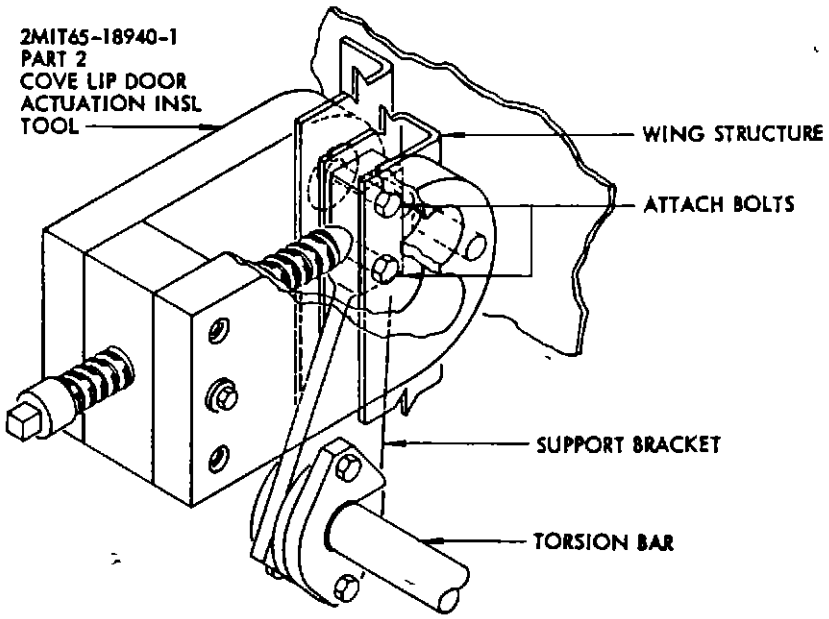




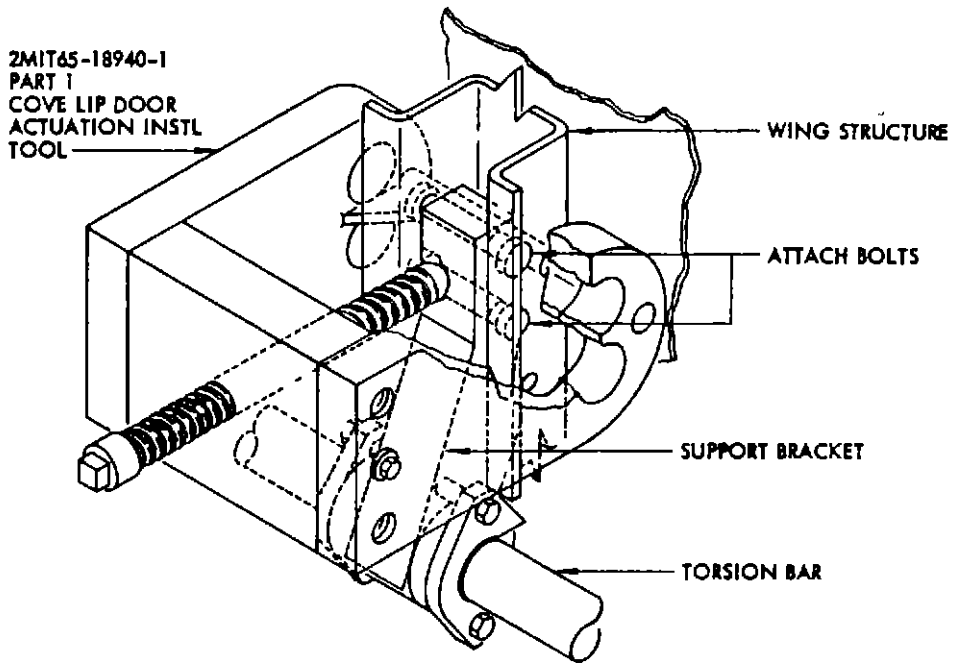
USED AT FLAP STATION 231 586



USED AT FLAP STATIONS 86 597 AND 159 277



USED AT WING STATION 722 22



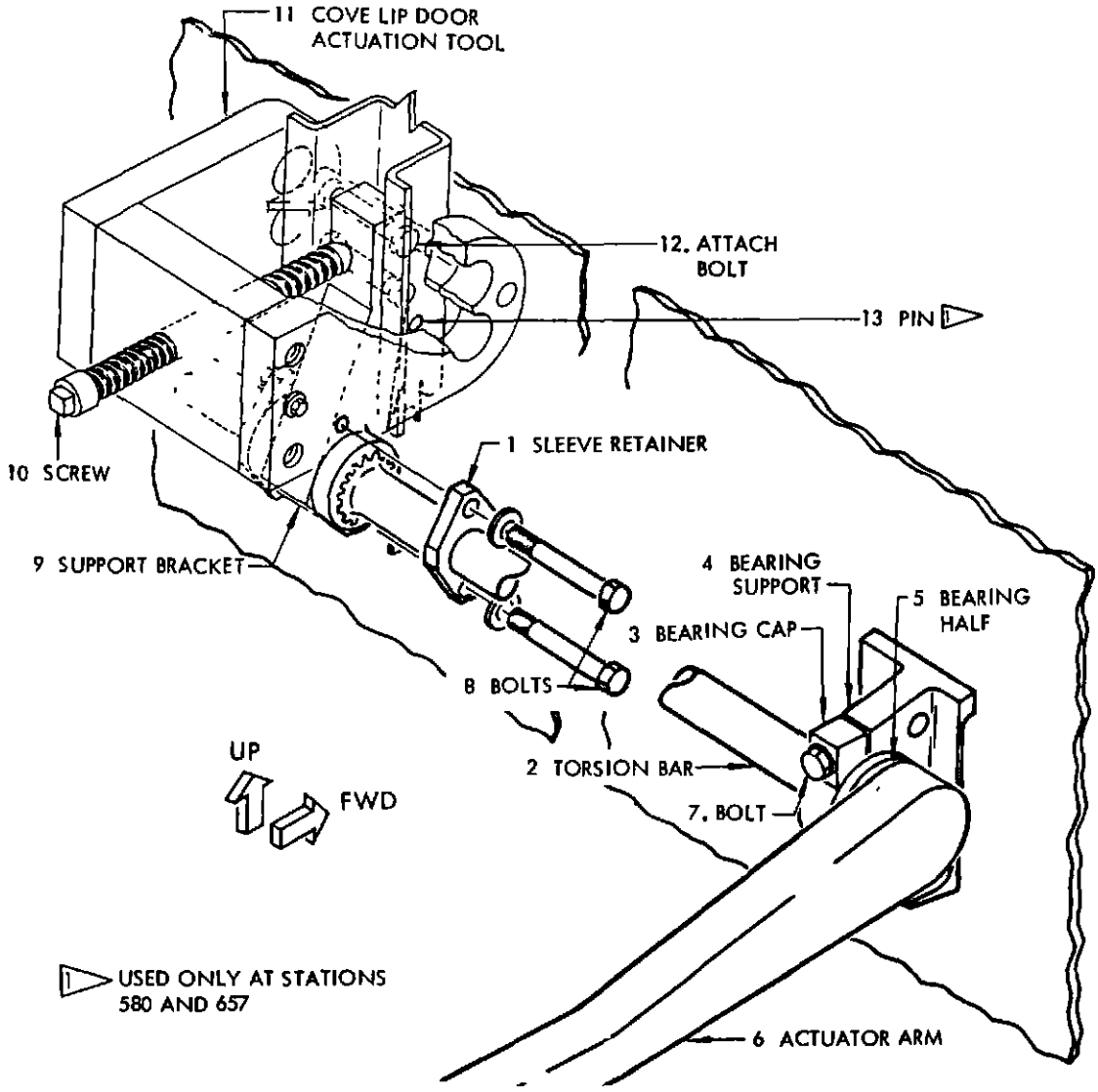
USED AT WING STATIONS 580 505 AND 657 855

(3) Depressurize utility hydraulic system; open system bypass valve.

(4) Unlatch and lower cove lip doors.

(5) Install appropriate cove lip door actuation tool over support bracket as shown in figure 203. Run screw against bracket to relieve load on attach bolts and remove bolts (12, figure 204) and pin (13), if applicable. Loosen screw (10), allowing support bracket (9) to rotate until torsional preload is relieved.

(6) Remove two bolts (7) attaching bearing cap (3) to bearing support (4)



Main Flap Cove Lip Door Actuating Mechanism Installation
Figure 204

(7) Remove one bearing half.

(8) Remove two bolts (8) attaching sleeve retainer (1) to support bracket.

(9) Move actuator arm (6) aft to clear bearing support and pull arm and torsion bar (2) toward end of cove lip door to disengage splines.

(10) Separate torsion bar from actuator arm.

D Install Main Flap Cove Lip Door Actuating Mechanism

(1) Install bearing half in bearing support (4, figure 204) such that chamfered end of bearing half bears on pin through bearing support.

(2) Install cove lip door actuator arm (6) over external spline on either end of torsion bar (2).

NOTE: One spline valley is missing from each part for indexing.

(3) Insert opposite end of spline in support bracket (9)

(4) With actuator arm properly positioned in bearing support, install bearing half. Check that edge of pin through bearing support does not protrude beyond either face of bearing half.

(5) Install bearing cap (3). Apply a torque of 100 to 125 pound-inches to bolts (7).

(6) Position sleeve retainer (1) over torsion bars and install bolts (8) attaching sleeves to support bracket.

(7) Install appropriate cove lip door actuation tool (figure 203) over support bracket and crank bracket into installed position. Install attach bolts (12, figure 204) to connect support bracket to wing structure. Install pin (13) and cotter pin, if applicable.

(8) Remove cove lip door actuation tool

(9) Pressurize utility hydraulic system and retract wing flaps.

(10) Raise and latch cove lip doors.

(11) Depressurize utility hydraulic system.

(12) Check and adjust latch guides per paragraph 1 B steps (4) through (9).

(13) Test cove lip door operation per paragraph 1 B steps (10) through (20).

4 Approved Repairs Main Flap Cove Lip Door

A. Equipment and Materials

(1) Cement (BMS5-34) kit of 3C-90A and 3C-90B, Churchill Chemical Corp. or equivalent

(2) Methyl Ethyl Ketone, TT-M-261

(3) Delchem E-Z Strip 19-A or equivalent

B. Replace Cove Lip Door Felt Seals

(1) Unlatch and lower cove lip door.

(2) Wipe excess oil and grease from seal area.

(3) Scrape fabric from area to expose adhesive surface.

(4) Apply a heavy coat of E-Z Strip 19A on adhesive surface with brush or spatula. Allow stripper to set for 1 hour.

NOTE. Temperature must be between 40° and 100°F and surface must be dry.

(5) Rinse with high pressure water to remove stripper.

(6) Dry area and apply methyl ethyl ketone to faying surface.

(7) Scrub surface with a clean fiber brush, if necessary, to loosen accumulations of dirt and grease.

(8) Wipe solvent from area before it evaporates with a clean, oil and lint-free absorbent, disposable material such as new cheese cloth. Laundered returnable rags are not satisfactory.

(9) Mix 100 parts of Churchill 3C-90A with 58 parts Churchill 3C-90B.

NOTE. Pot life of mixed adhesive is 30 minutes at 75°F

(10) Apply adhesive to both faying surfaces with brush or spatula

(11) Press parts firmly together Hold in position with clamps where necessary.

(12) Allow to cure for 48 hours at 75°F (± 5°F) or for 3 hours at 160°F (± 10°F).

(13) Remove uncured adhesive with methyl ethyl ketone.

(14) Raise and latch cove lip door

FILLET FLAP COVE LIP DOOR - MAINTENANCE PRACTICES

1. Removal/Installation Fillet Flap Cove Lip Door

   A. Equipment and Materials

      (1) Zinc Chromate Primer MIL-P-8585

      (2) Aerodynamic Filler BMS 5-28, Type 1 or Type 2

   B. Remove Fillet Flap Cove Lip Door

      (1) Pressurize utility hydraulic system.

      (2) Extend flaps to 50 degrees. Hang red DO NOT OPERATE tag on flap control lever.

      (3) Depressurize utility hydraulic system. Open system bypass valve.

      (4) Remove access panels (11, figure 201) from inboard and outboard end of fillet flap cove lip door (12).

      (5) Remove screws attaching cam attach fittings (6) to cove lip door. Philips head on screws installed through upper side of cam attach fittings are covered with aerodynamic filler. Note position and thickness of shims, if any. Retain shims for use in installation of new door.

      (6) Remove bolts attaching links (1) to fixed structure and remove door from airplane.

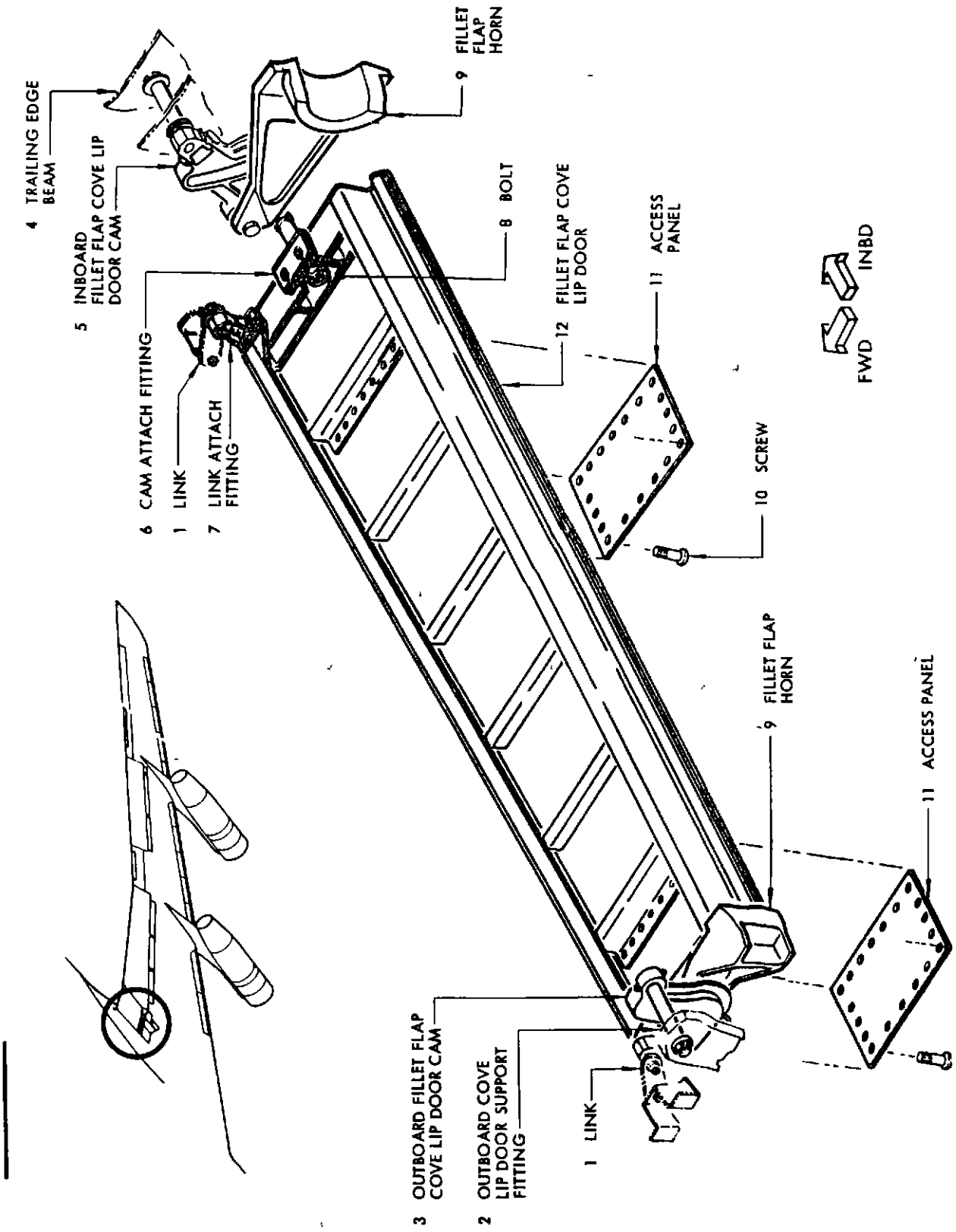
      (7) Disconnect cam attach fittings from cove lip door cams (3 and 5) and stow cam attach fittings with removed door. Note, but do not remove shims from bolts (8). Do not remove bolts (8) from cove lip door cams.

      (8) Remove link attach fittings (7) from door; use shims from under fittings in installing new door.

   C. Install Fillet Flap Cove Lip Door

      (1) Remove link attach fittings (7) from new door and install shims from old door fittings.

      (2) Remove cam attach fittings (6, figure 201) from new or serviceable cove lip door.



Fillet Flap Cove Lip Door Installation
Figure 201

(3) Install cam attach fittings (6) on bolts (8) in cove lip door cams (3 and 5). Use shims noted at removal of old fittings (step B.8).

(4) Connect links (1) to link attach fittings (7) on cove lip door.

(5) Remove access panels (11) from inboard and outboard end of cove lip door.

(6) Align cove lip door links (1) with attach fittings (7) and install bolts.

(7) Position cam attach fittings (6) on ends of cove lip door with shims retained from door removal and install screws.

(8) Check gap between cove lip door cam webs and ends of cam followers on fillet flap horns. Gap shall be not less than 0.040 inch between either cam and its follower.

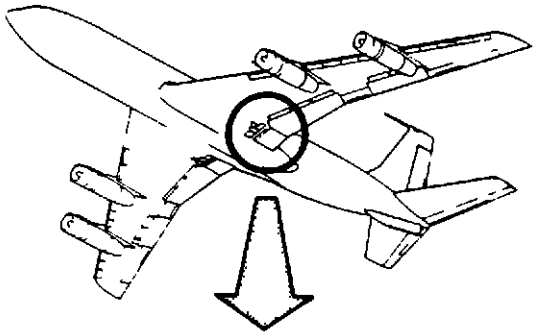
NOTE The gaps between cove lip door cams and cam followers must be adjusted simultaneously with clearances between door cams and supporting fixed structure.

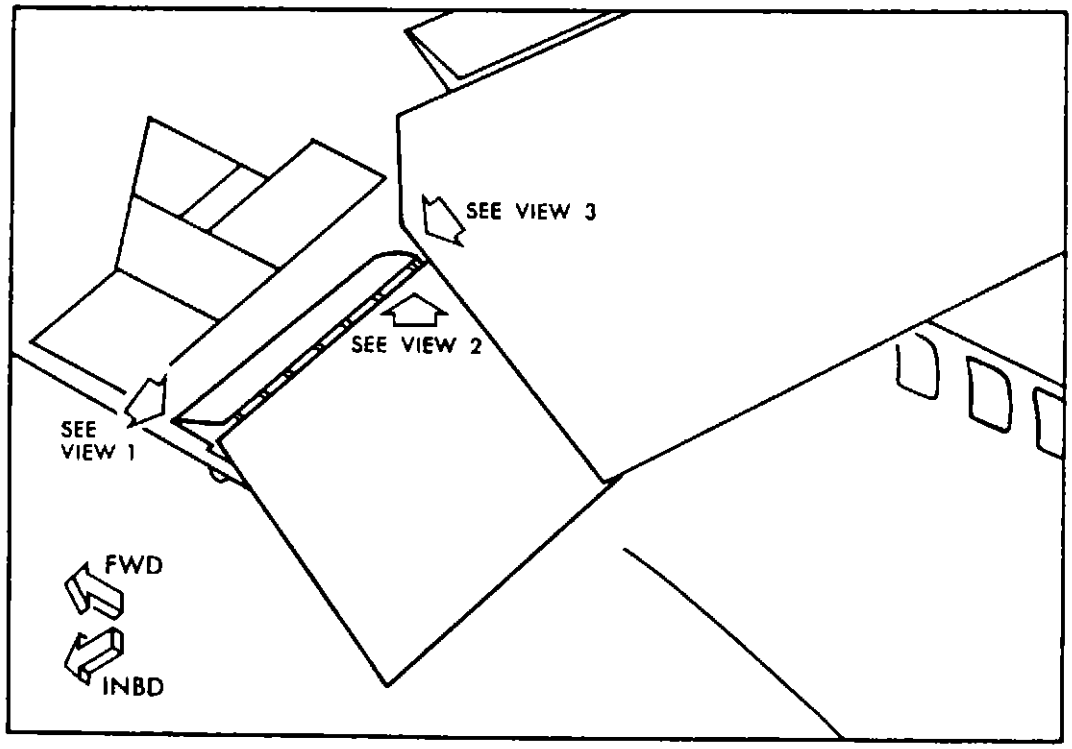
(9) Check clearance between cove lip door cams and structure, or nearest bolt heads. Clearance at outboard end of cove lip door shall be no less than 0.030 inch and at inboard end, no less than 0.100 inch. Adjust clearances as in step (12).

(10) Disconnect torque tube from input side of fillet flap transmission assembly. Manually retract fillet flap; check clearances as in steps (8) and (9) at two additional stages of flap travel. Check cove lip door to flaperette clearance as in step (14).

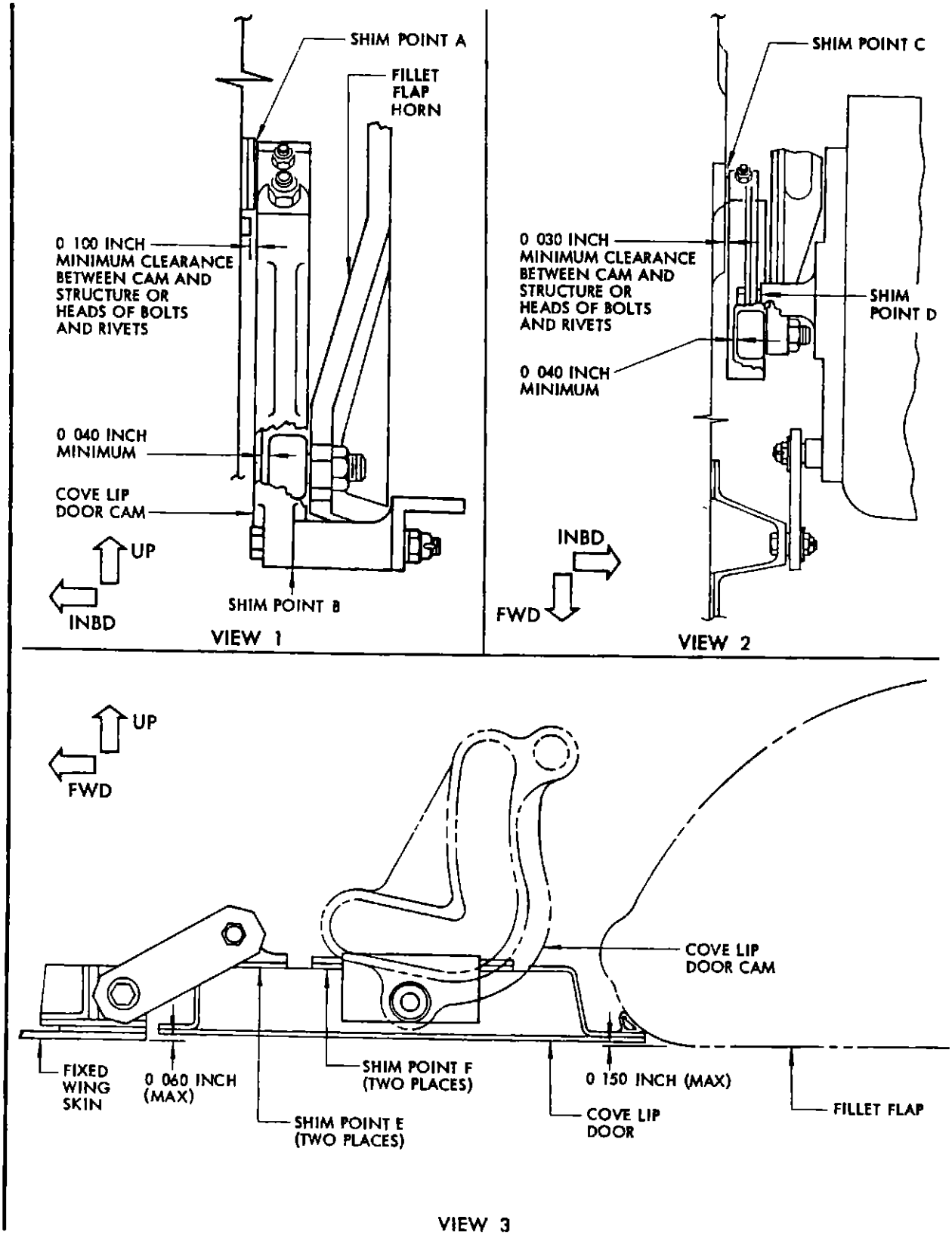
(11) With flap fully retracted, check mismatch between cove lip door and fillet flap and trailing edge structure. Leading edge of door must fair with structure within 0.060 inch; lay straight edge across inboard and outboard ends of door to check mismatch. Trailing edge of door must fair with fillet flap within 0.15 inch; lay straight edge along flat portion of fillet flap parallel to end of door at inboard and outboard ends of door. If adjustment is required, add or remove shims as outlined in step (13).

NOTE. Adjustments outlined in steps (12) and (13) should be accomplished with one removal of the cove lip door.





Fillet Flap Cove Lip Door Adjustment
Figure 202 (Sheet 1)



Fillet Flap Cove Lip Door Adjustment
Figure 202 (Sheet 2)

(12) If clearance adjustment is required, add or remove shim washers as follows:

(a) Determine total thickness of shims or washers required at each shim point shown in figure 202.

(b) Extend fillet flap and remove cove lip door.

(c) If cove lip door cams require adjustment, remove cove lip door attach fittings from cams and/or remove cam pivot bolts (kingpins) as necessary.

NOTE: To remove inboard kingpin, it will be necessary to remove bolt attaching cam to kingpin link. To remove outboard kingpin, it will be necessary to remove the cove lip door cam follower as outlined in 27-16-1, Fillet Flap Maintenance Practices.

(d) Install required thickness of shim washers. On inboard and outboard kingpins (A and C, figure 202), use AN960D1216 or AN960D1216L washers as required. On attach fitting pivot bolts (B and D), use AN960D616 or AN960D616L washers. Total thickness of shims (B and D) on either pivot bolt should be about 0.064 inch, however, this may be reduced to 0.000 or increased to 0.250 inch if necessary.

(e) Install all removed parts with required shims. Tighten kingpin nuts finger-tight, then tighten only enough to allow installation of cotter pins.

(13) If fairing adjustment is required, add or remove shims as follows:

(a) Determine total thickness of shims required at points E and F at each end of door. (See figure 202.)

(b) With fillet flap extended, remove cove lip door.

(c) Add or remove shims at each shim point as required. Cover all shims with one coat of zinc chromate primer. Shims used at points E and F shall be as follows:

		Width (in.)	Length (in.)	Maximum Thickness(in.)
Point E	Inboard	1.10	2.10	0.50
	Outboard	1.40	1.90	0.50
Point F	Inboard	1.30	6.90	0.125
	Outboard	1.50	5.30	0.125

NOTE: Shims may be tapered if necessary.

(d) Install cove lip door with shims and new attach bolts and screws.

CAUTION: MAKE SURE THAT FITTING ATTACH SCREWS ARE OF PROPER LENGTH FOR NEW SHIM THICKNESSES.

(14) Manually retract fillet flap. Carefully check clearance between cove lip door and flaperette as flap retracts Clearance shall be no less than 0.10 inch at any stage of flap retraction.

(15) Recheck clearances as in steps (8), (9), and (10).

(16) With flaps retracted, recheck mismatch as in step (11).

(17) Check gap between inboard and outboard ends of cove lip door and trailing edge structure. Gap shall be 0.125 to 0.250 inch.

(18) Check gap between leading edge of cove lip door and trailing edge structure. Gap shall be 0.120 to 0.200 inch.

(19) With all shimming completed and all gaps, clearances, and mismatches within required limits, tighten all bolts and screws.

(20) Install access panels (11, figure 201) on both ends of cove lip door.

(21) Remove torque tube disconnected from fillet flap transmission assembly and retract flaps.

(22) Make sure that fillet flap is properly faired and install torque tube. Install coupling retaining screws and lockwire screw heads together.

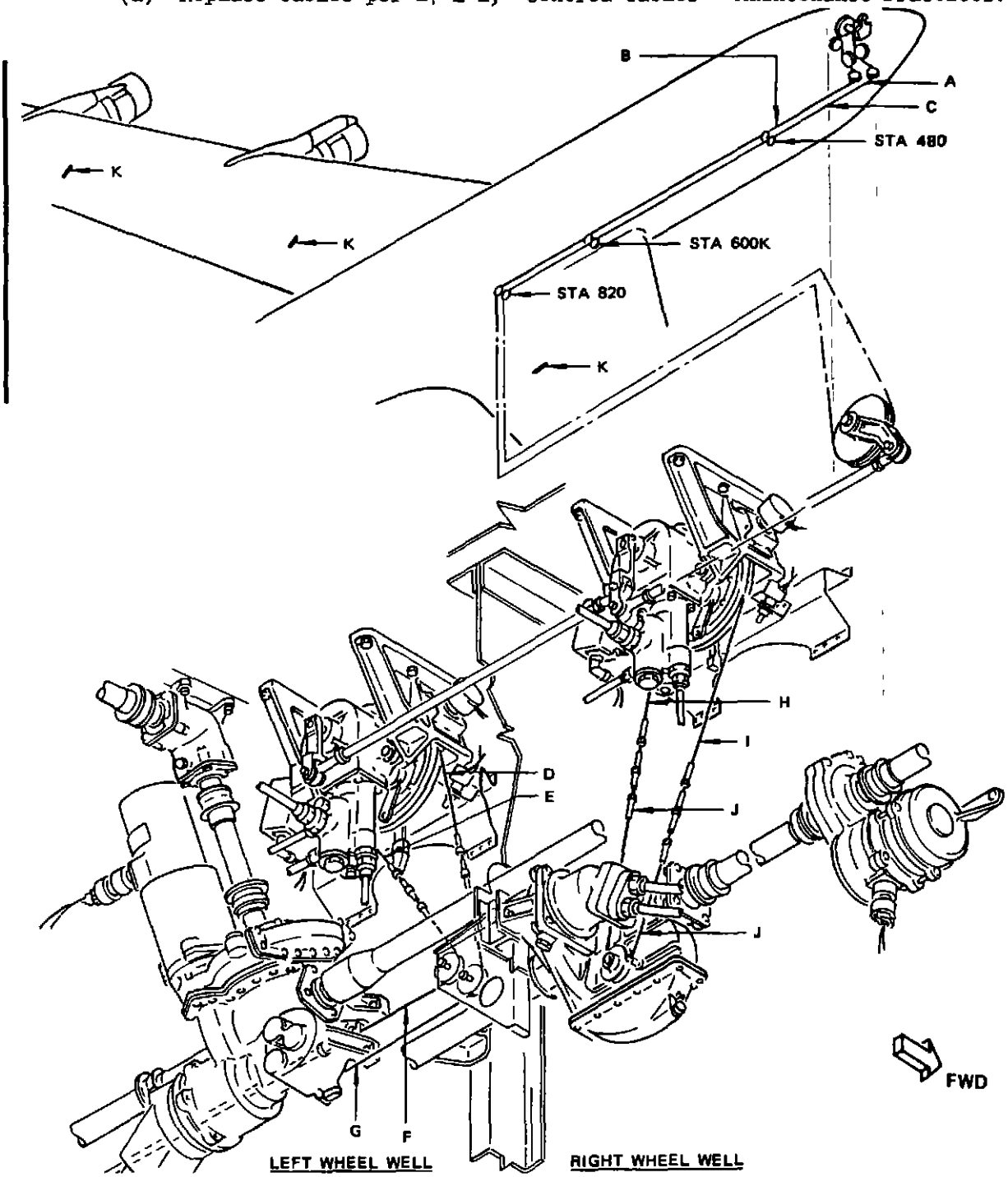
(23) Disconnect hydraulic pressure source.

FLAP CONTROL CABLES - MAINTENANCE PRACTICES

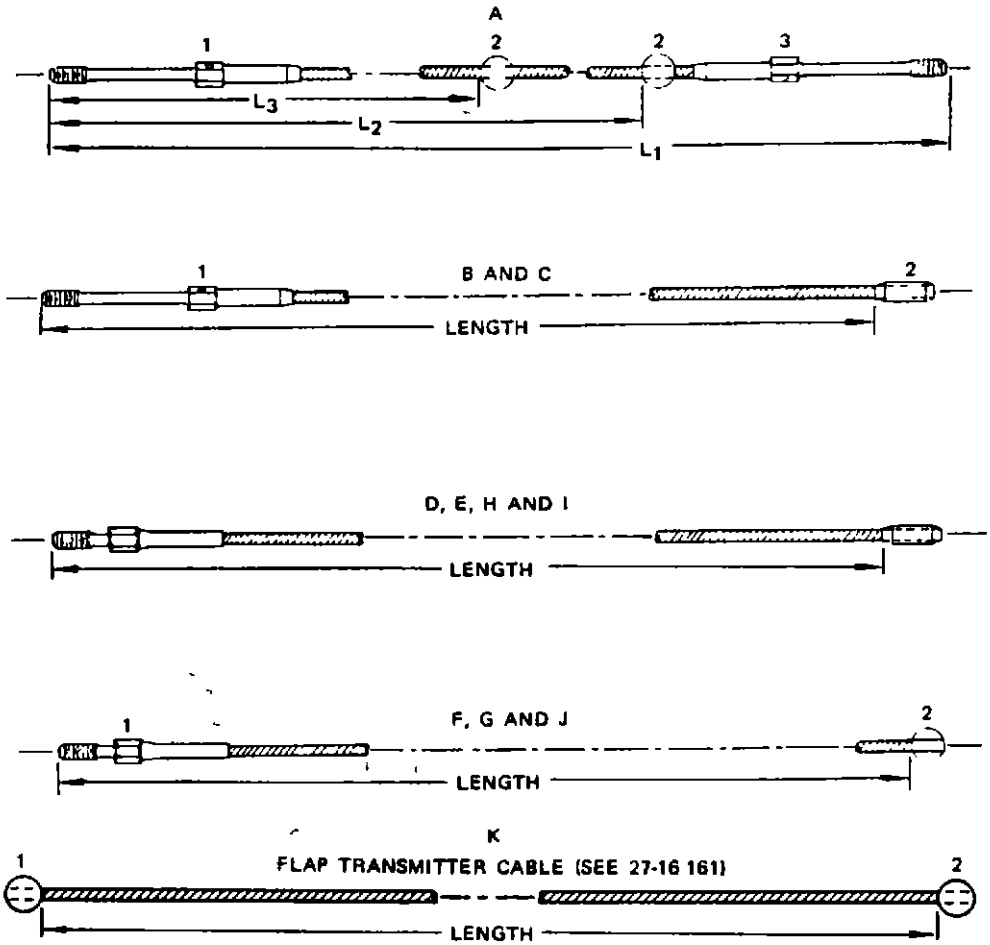
1. Flap Control Cables

A Approved Repairs Flap Control Cables

(1) Replace cables per 27-1-1, Control Cables - Maintenance Practices.



CABLE REF	DRAWING NO	NO REQ	LENGTH	CABLE SIZE	FITTINGS 1	2	3
A	66 24025	1	L_1 137 6 L_2 126 2 L_3 63 0	3/32 7 x 7	AN669L3LH	BACT14B3	AN669L3LH
B	BACC13G320 7625	1	762 5	3/32 7 x 7	AN669L3RH	BACT14A3	
C	BACC13G320 7635	1	763 5	3/32 7 x 7	AN669L3RH	BACT14A3	
D	BACC13G318 130	1	13 0	3/32 7 x 7	AN669S3RH	BACT14A3	
E	BACC13G318 144	1	14 4	3/32 7 x 7	AN669S3RH	BACT14A3	
F	BACC13G329 242	1	24 2	3/32 7 x 7	AN669S3LH	BACT14B3	
G	BACC13G329 261	1	26 1	3/32 7 x 7	AN669S3LH	BACT14B3	
H	BACC13G318 182	1	18 2	3/32 7 x 7	AN669S3RH	BACT14A3	
I	BACC13G318 177	1	17 7	3/32 7 x 7	AN669S3RH	BACT14A3	
J	BACC13G329 146	2	14 5	3/32 7 x 7	AN669S3LH	BACT14B3	
K	BACC13G333 482	2	48 2	3/32 7 x 7	BACT14B3	BACT14B3	



FLAP CONTROL VALVE - MAINTENANCE PRACTICES

1. Deleted

2. Removal/Installation Flap Control Valve

A. General

(1) When removing or installing the flap control valve it will be necessary to loosen the adjacent hydraulic tubes by loosening the support clamps and other fittings. This will be required to allow some slack in the tubing for removal from the fittings on the flap control valve. At the same time a container will be necessary to catch spilled fluid when disconnecting hydraulic lines. Should any fluid spill on the airplane, decontaminate the area. Refer to Cleaning and Washing, Chapter 12.

CAUTION: SPOILER CONTROL VALVES 50-6875-1 AND 65-7018, AND FLAP CONTROL VALVES 50-6875, 65-21890-1, 65-40449-1 AND -3 ARE IDENTICAL IN APPEARANCE BUT ARE NOT INTERCHANGEABLE. CARE MUST BE TAKEN TO ENSURE THAT THESE VALVES ARE NOT INSTALLED IN THE WRONG CONTROL SYSTEM. ON OO-SJH AND ON, USE VALVES 65-21890-1, 65-40449-1 OR -3.

B. Equipment and Materials

(1) Skydrol 500 Hydraulic fluid

(6-7132-11031, 22.10.69)

C. Remove Flap Control Valve

(1) Depressurize utility hydraulic system. Hang a red DO NOT PRESSURIZE tag on the hydraulic ground service connection.

(2) Lower main gear wheel well door.

(3) Remove or loosen hydraulic lines as necessary to provide access to control valve (3, figure 201).

(4) Disconnect hydraulic lines (12) from control valve.

(5) Disconnect pushrod (4) or pushrods, from control valve.

(6) Remove screw attaching follow-up crank to follow-up drum (11).

(7) Remove mounting bolts (6) and remove control valve.

(8) Remove input crank, follow-up crank, unions, and reducer from control valve.

D. Install Flap Control Valve

(1) Align and install input crank (2, figure 201) and follow-up crank on control valve (3) splines and install retaining bolts.

(2) Install O-ring and reducer in control valve inlet port.

(3) Install O-ring and union in all other ports on control valve.

(4) Position control valve vertically and fill with Skydrol 500A until fluid is level with the filler plug boss.

(5) Position control valve on support bracket (1) and install mounting bolts (6).

(6) Align holes in control valve follow-up cable drum (11) and follow-up crank and install screw and nut. Install AN960D416L washers as necessary to fill gap between crank and drum.

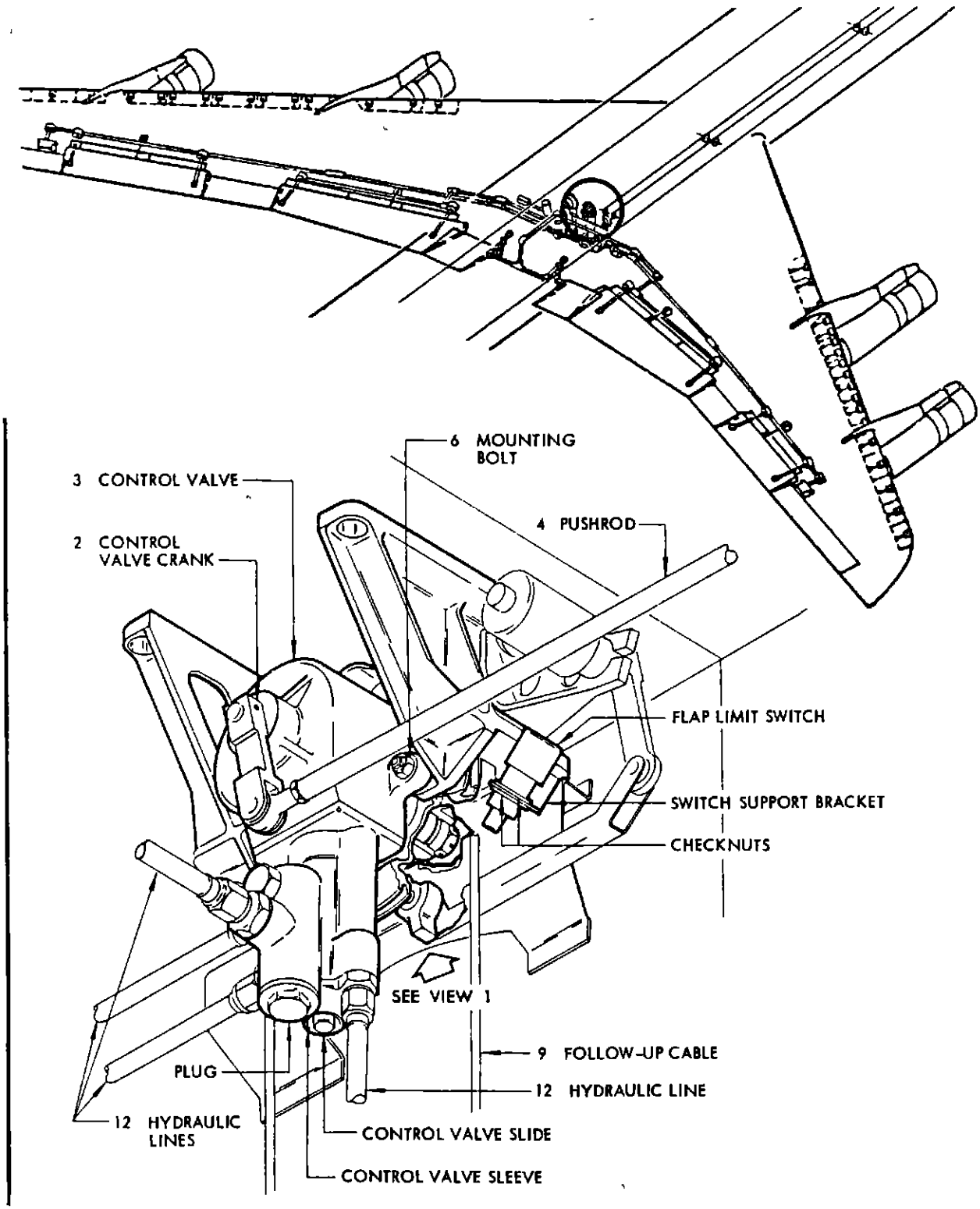
(7) Position flap control lever to UP.

(8) Install rigging pin through each control valve support bracket and follow-up cable drum.

(9) Adjust pushrod (4), or pushrods, so that valve slide and sleeve of each control valve are flush within 0.015 inch and connect to crank.

(10) Remove rigging pins.

(11) Connect hydraulic lines (12) to control valve.



Flap Control Valve Installation
Figure 201 (Sheet 1)

FLAP CONTROL VALVE - MAINTENANCE PRACTICES

1. Deleted

2. Removal/Installation Flap Control Valve

   A. General

      (1) When removing or installing the flap control valve it will be necessary to loosen the adjacent hydraulic tubes by loosening the support clamps and other fittings. This will be required to allow some slack in the tubing for removal from the fittings on the flap control valve. At the same time a container will be necessary to catch spilled fluid when disconnecting hydraulic lines. Should any fluid spill on the airplane, decontaminate the area. Refer to Cleaning and Washing, Chapter 12.

      CAUTION: SPOILER CONTROL VALVES 50-6875-1 AND 65-7018, AND FLAP CONTROL VALVES 50-6875, 65-21890-1, 65-40449-1 AND -3 ARE IDENTICAL IN APPEARANCE BUT ARE NOT INTERCHANGEABLE. CARE MUST BE TAKEN TO ENSURE THAT THESE VALVES ARE NOT INSTALLED IN THE WRONG CONTROL SYSTEM. USA VALVES 65-21890-1, 65-40449-1 or -3.

   B. Equipment and Materials

      (1) Skydrol 500 Hydraulic fluid

C. Remove Flap Control Valve

(1) Depressurize utility hydraulic system. Hang a red DO NOT PRESSURIZE tag on the hydraulic ground service connection.

(2) Lower main gear wheel well door.

(3) Remove or loosen hydraulic lines as necessary to provide access to control valve (3, figure 201).

(4) Disconnect hydraulic lines (12) from control valve.

(5) Disconnect pushrod (4) or pushrods, from control valve.

(6) Remove screw attaching follow-up crank to follow-up drum (11).

(7) Remove mounting bolts (6) and remove control valve.

(8) Remove input crank, follow-up crank, unions, and reducer from control valve.

D. Install Flap Control Valve

(1) Align and install input crank (2, figure 201) and follow-up crank on control valve (3) splines and install retaining bolts.

(2) Install O-ring and reducer in control valve inlet port.

(3) Install O-ring and union in all other ports on control valve.

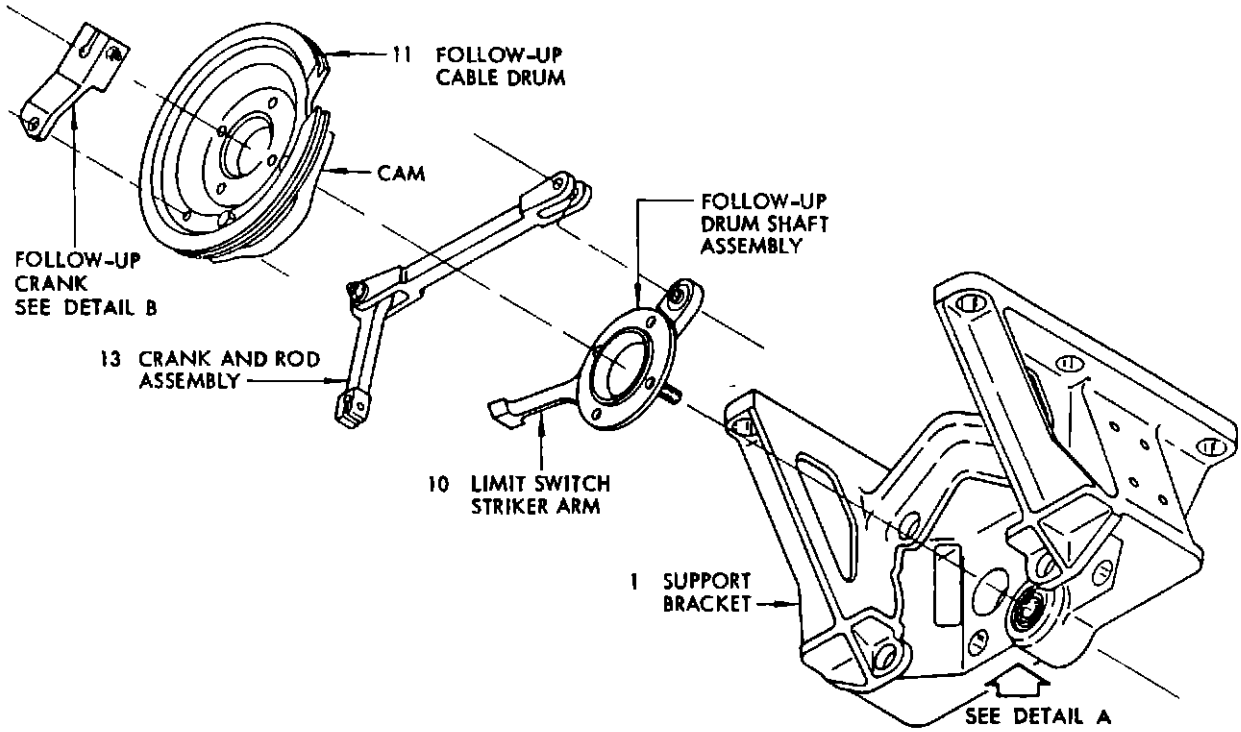
(4) Position control valve vertically and fill with Skydrol 500A until fluid is level with the filler plug boss.

(5) Position control valve on support bracket (1) and install mounting bolts (6).

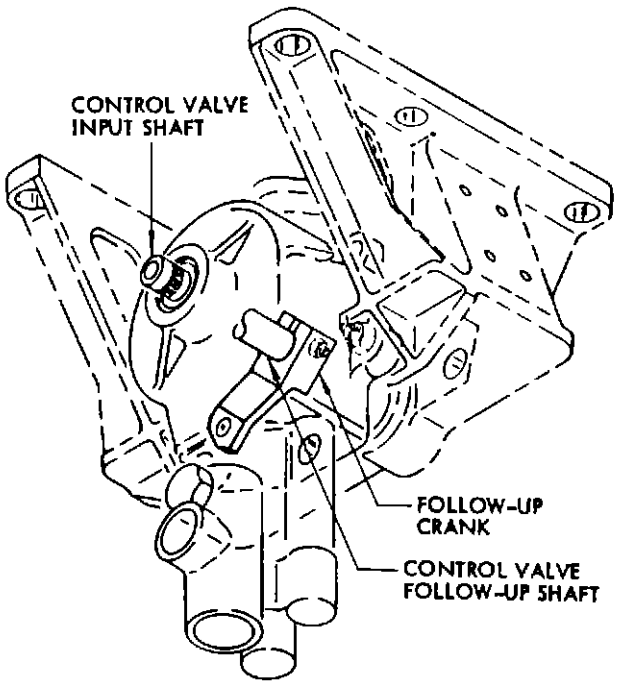
(6) Align holes in control valve follow-up cable drum (11) and follow-up crank and install screw and nut. Install AN960D416L washers as necessary to fill gap between crank and drum.

(7) Position flap control lever to UP.

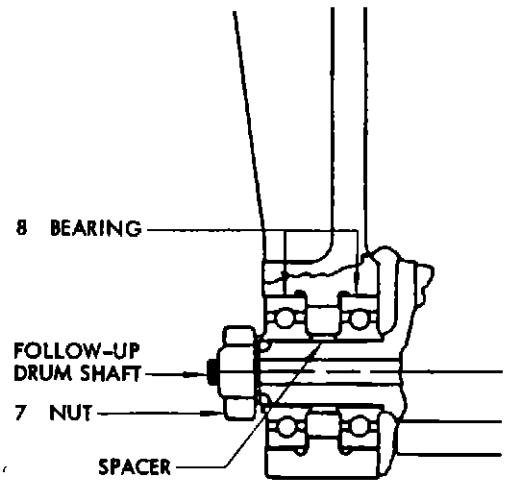
(8) Install rigging pin through each control valve support bracket and follow-up cable drum.



VIEW 1



DETAIL B



DETAIL A
ROTATED FOR CLARITY

(12) If outboard control valve is being replaced, disconnect electric connector from outboard emergency flap drive unit.

CAUTION: ELECTRIC POWER SHOULD BE DISCONNECTED TO PREVENT DAMAGE TO THE SYSTEM THAT MAY BE CAUSED BY OPERATION WITH TORQUE TUBES DISCONNECTED.

(13) Install flap trailing edge covers and suitable supports under flaps to prevent any movement of flaps when torque tubes are disconnected.

(14) Disconnect torque tube from each side of applicable flap power unit.

(15) Pressurize utility hydraulic system.

(16) Move flap control lever down a few degrees then return to 0 degree detent. Power unit shall rotate and must stop, so that rigging pin fits freely through control valve support bracket and follow-up cable drum. Readjust pushrod to flap control valve, if necessary, to allow insertion of rigging pin.

(17) Depressurize utility hydraulic system.

(18) Connect torque tubes. Install coupling retaining screws and lockwire screw heads together.

(19) Remove supports and covers from flaps.

(20) Install electric power connector on emergency flap drive unit, if applicable.

(21) Test flap control valve.

3. Adjustment/Test Flap Control Valve

A. Special Tools and Equipment

(1) Protractor Assembly - F52458-500, or equivalent

(2) Clamp Assembly - F71292-16, or equivalent

B. Test Flap Control Valve

(1) Open main gear wheel well door.

(2) Pressurize utility hydraulic system.

(3) Position flap control lever to 50 degree detent.

(4) Check that flap angle of extension is 49 to 50 degrees. Measure angle with protractor assembly.

(5) Check control valve and tubing connections for leakage.

(6) Position flap control lever to UP; flaps must retract.

(7) Check all connections and control valve for leakage.

(8) Disconnect hydraulic pressure source.

4. Inspection/Check Flap Control Valve

A Open main gear wheel well door.

B Examine control valve screens for evidence of foreign matter.

5. Approved Repairs Flap Control Valve

A. Equipment and Materials

(1) Splined Coupling Spanner Wrench - F71288 or equivalent

B. Replace Flap Control Valve Bracket Assembly Bearings

(1) Remove control valve per paragraph 1.C.

(2) Relieve tension on follow-up cables (WFFA and WFFB, figure 202) by loosening turnbuckles.

(3) Disconnect link rod (13, figure 201) from arm at top of follow-up drum (11).

(4) Remove mounting bolts from follow-up drum.

(5) Lower drum out of control valve mounting bracket.

(6) Dismount switch mounting brackets from control valve mounting bracket. Stow switch brackets clear of valve bracket.

(7) With all attached parts or brackets dismounted or removed, remove six bolts and control valve mounting bracket.

(8) Remove nut (7) from follow-up drum shaft. Press shaft out of bearings.

(9) Remove defective bearing.

(10) Press new bearing into position in valve bracket. Make sure that spacer is in proper position between bearings. Press on outer bearing race only.

(11) Install follow-up drum shaft. If shaft must be pressed in, support bearing inner race. Install shaft nut (7).

(12) Position control valve mounting bracket in wheel well and install mounting bolts. Coat threads of each bolt with pressure sealant.

(13) Remount switch brackets on valve bracket.

(14) Align follow-up drum (11) with drum shaft and install drum mounting bolts.

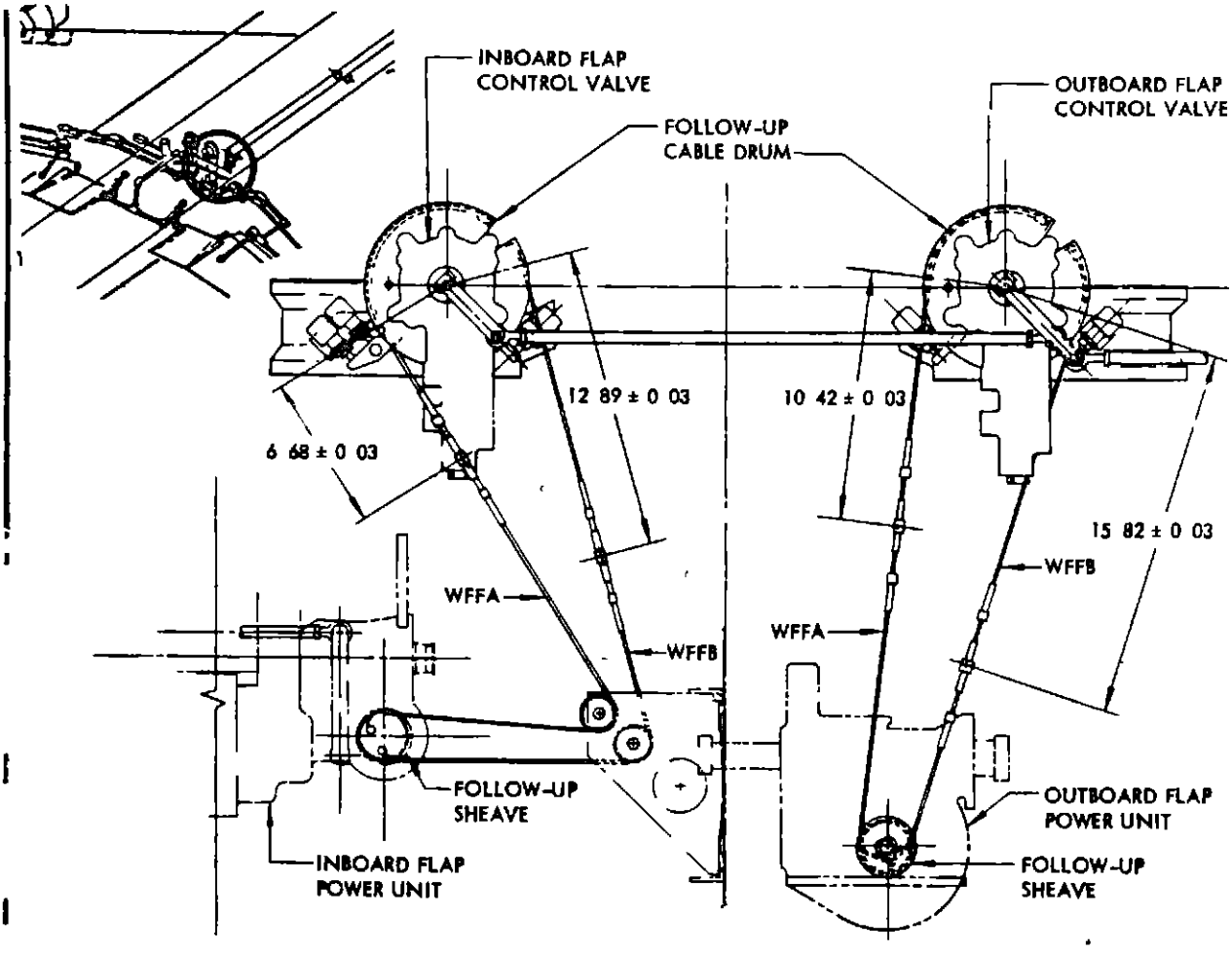
(15) Connect link rod (13) to arm at top of follow-up drum (11).

(16) Insert AN395 rigging pin or AN5 bolt through follow-up drum and control valve mounting bracket.

(17) Adjust follow-up cables to dimensions specified in figure 202 and to tension specified in 27-16-0, figure 203 for WFFA and WFFB cables.

(18) Remove rigging pin from follow-up drum.

(19) Install control valve as outlined in paragraph 1.D.



Follow-Up Control Cable Adjustment
Figure 202

FLAP ACTUATING HYDRAULIC MOTOR - REMOVAL/INSTALLATION

1. General

   A. When removing or installing the flap actuating hydraulic motor it will be necessary to loosen the support clamps and other fittings to allow some slack in the adjacent hydraulic tubing for removal from the flap actuating hydraulic motor. A container will be necessary to catch any spilled fluid when disconnecting hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to Cleaning and Washing, Chapter 12.

2. Equipment and Materials

   A. Aliphatic Naphtha, Standard 265, TT-N-95 or equivalent

   B. Zinc Chromate Primer, MIL-P-8585 or equivalent

   C. Toluene, TT-T-548, or Dupont TT-8806, or equivalent

3. Remove Flap Actuating Hydraulic Motor

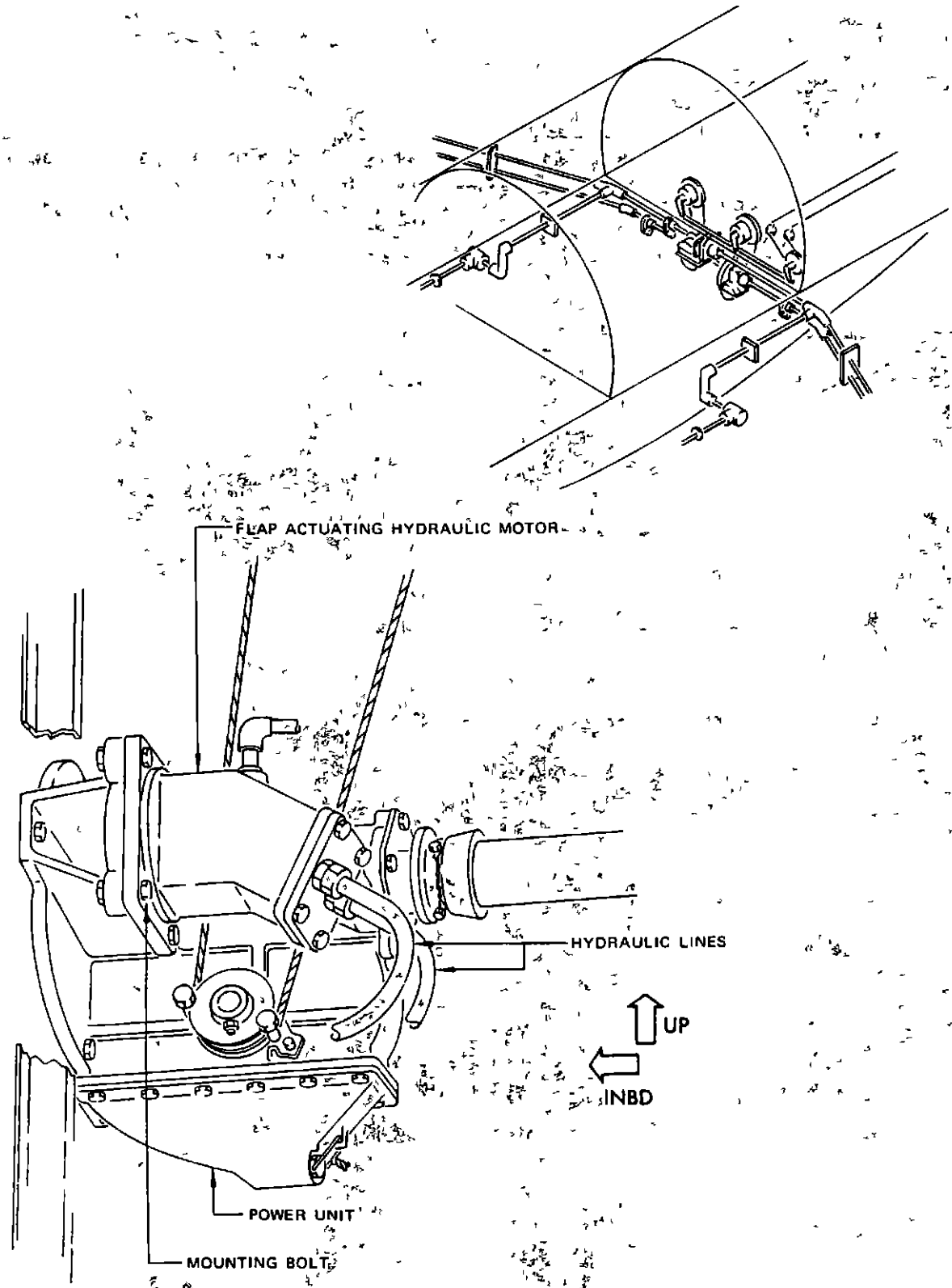
   A. Lower main gear wheel well door.

   B. Depressurize utility hydraulic system.

   C. Remove hydraulic lines from motor. (See figure 401.)

   D. Cap all ports on motor.

   E. Remove mounting bolts and remove motor.



Flap Actuating Hydraulic Motor Installation
Figure 401

4. Install Flap Actuating Hydraulic Motor

A. Install a gasket and reducer in each motor inlet port.

(1) For inboard flap hydraulic motor, install nut and tee in the drain port, ensuring that the tee is installed parallel to centerline of motor.

(2) For outboard flap hydraulic motor, install nut and elbow in the drain port ensuring that elbow is parallel with centerline of motor with fitting outboard.

B. Clean mounting bolts with Aliphatic Naphtha, TT-N-95, Standard 265 or equivalent. Dry with a clean cloth.

C. Dip mounting bolts in a mixture of zinc chromate primer, MIL-P-8585, diluted one to two parts by volume with toluene TT-T-548, or Dupont TT-8806, or equivalent.

D. Position hydraulic motor (figure 401) on power unit and install mounting bolt.

E. Connect all hydraulic lines to motor.

F. Pressurize utility hydraulic system.

G. Position flap control handle to DOWN.

H. Check hydraulic motor and fittings for fluid leakage.

I. Position flap control handle to UP.

J. Disconnect hydraulic pressure source.

FLAP TORQUE TUBES - MAINTENANCE PRACTICES

1. Removal/Installation Flap Torque Tubes

A. General

(1) Access to remove or install the flap torque tubes is provided through the following access doors and panels; the main wheel well doors, inboard cove lip doors and panel No.'s 1255, 1351, 1352, 1354, and 1355. Refer to Access Doors and Panels, Chapter 12.

B. Remove Flap Torque Tube (See figure 201.)

(1) Open main wheel well doors, as necessary.

(2) Pressurize utility hydraulic system and extend flaps.

(3) Depressurize hydraulic system.

(4) Disconnect electric power cable from flap emergency drive unit.

CAUTION: OPERATION OF THE FLAP SYSTEM DURING MAINTENANCE MAY DAMAGE THE FLAP SYSTEM OR RESULT IN LOSS OF FLAP ADJUSTMENT.

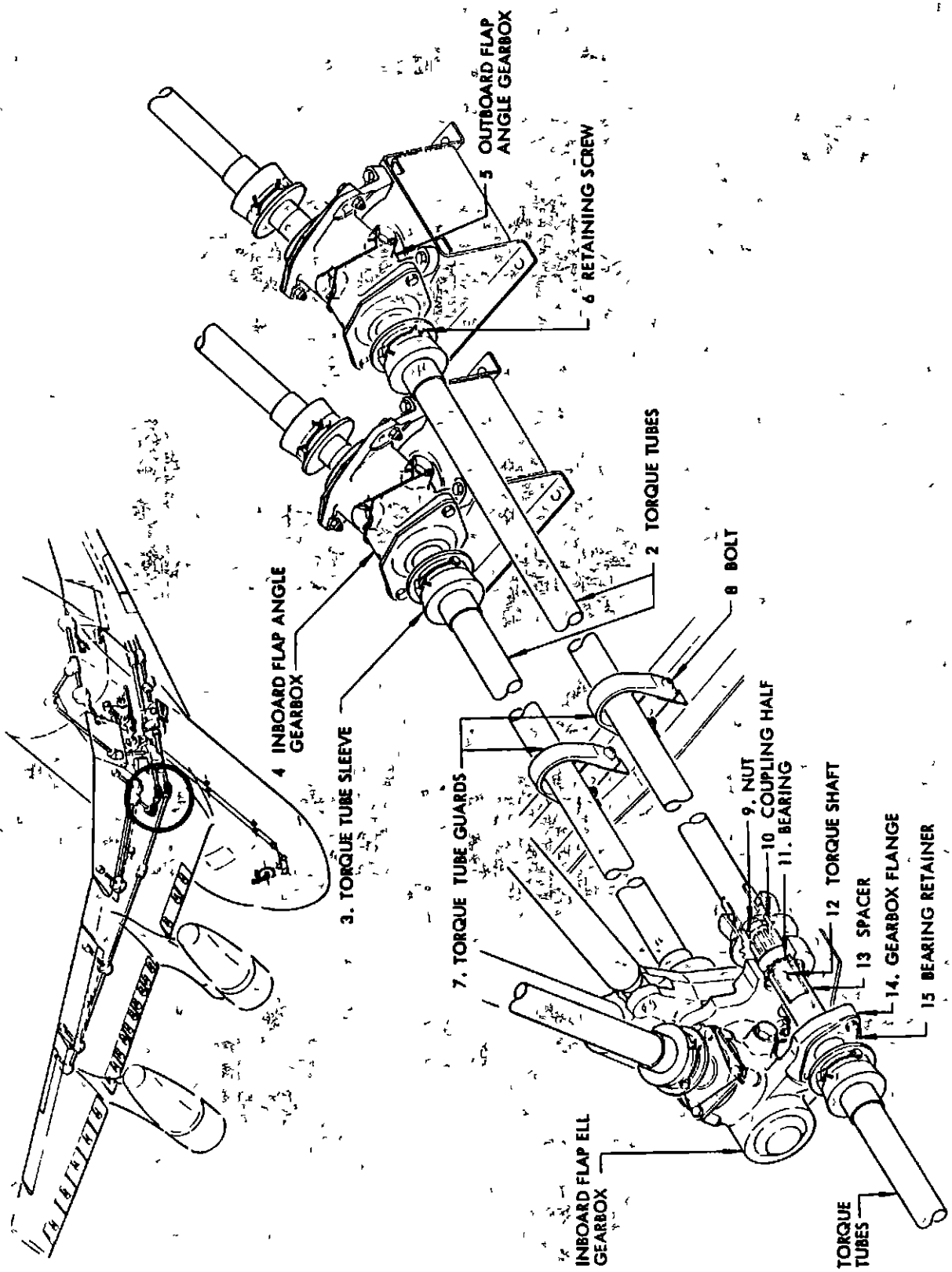
(5) Remove access panels as necessary. See Access Doors and Panels, Chapter 12.

(6) Remove torque tube guard, if applicable.

(7) Disconnect both ends of torque tube by removing sleeve retaining screws and sliding sleeves off of spline couplings.

NOTE: In some installations it will be necessary to shift the torque tube inboard or outboard to work it out of the installed position. In other installations, it will be necessary to remove installed equipment and lines in order to remove torque tubes. Other components should be removed only if necessary to permit torque tube removal.

(8) Remove torque tube.



Typical Flap Torque Tube Installation
Figure 201

C. Install Flap Torque Tube (See figure 201.)

(1) Work torque tube into position.

(2) Align holes in torque tube sleeves with holes in splined couplings and slide sleeves over couplings.

(3) Install retaining screws in splined couplings and lockwire screw heads together.

(4) Install torque tube guard, if applicable.

(5) Install parts removed to provide space for removal of torque tube.

(6) Make sure that clearance between torque tube and adjacent retaining straps, structure, tubing, or other components, is not less than 0.110 inch.

(7) Pressurize utility hydraulic system and retract flaps.

(8) Connect electric power cable to flap emergency drive unit.

(9) Close wheel well door, if applicable.

WARNING: STAND CLEAR OF WHEEL WELL DOORS.

(10) Install access doors and panels, as applicable.

2. Approved Repairs Flap Torque Tubes

A. General

(1) Torque tubes may be reworked to remove nicks or scratches incurred after installation. When smoothing out nicks or scratches in the torque tubes, 0.0135 inch reduction in wall thickness is allowable. Checking and recording torque tube diameter before and after rework to determine the amount of wall reduction is required. Any tube damaged in an area that has been previously reworked shall be rejected and replaced. For this reason, repaired areas must be identified.

B. Special Tools and Equipment

(1) Spline Coupling Spanner Wrench - F71228, or equivalent

(2) Torque Wrench

C. Replace Outboard Flap Torque Tube Support Bearings

(1) Pressurize utility hydraulic system.

(2) Position flap control lever to DOWN.

(3) Open main gear wheel well doors.

CAUTION: ACCIDENTAL OPERATION OF THE FLAPS DURING MAINTENANCE COULD DAMAGE THE SYSTEM. SUCH ACCIDENTAL OPERATION MAY BE AVOIDED BY OPENING THE HYDRAULIC SYSTEM BYPASS VALVE AND DISCONNECTING THE EMERGENCY DRIVE MOTOR.

(4) Depressurize utility hydraulic system.

(5) Disconnect electric power cable from outboard emergency flap drive unit.

(6) Unlatch and lower outboard cove lip doors.

(7) Disconnect torque tube at each side of center flap track support fitting. (See figure 202.)

(8) Remove nut from inboard end of drive shaft.

(9) With a soft mallet, tap inboard end of drive shaft out of coupling half and bearings.

(10) Remove bolts attaching bearing retainer to outboard side of track support fitting.

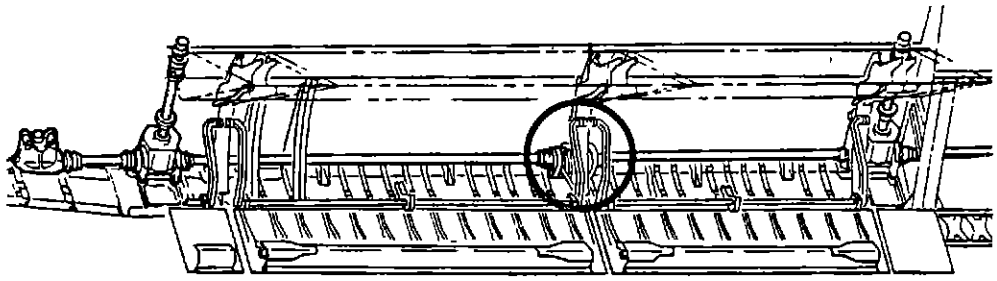
(11) Pull drive shaft outboard and out of fitting.

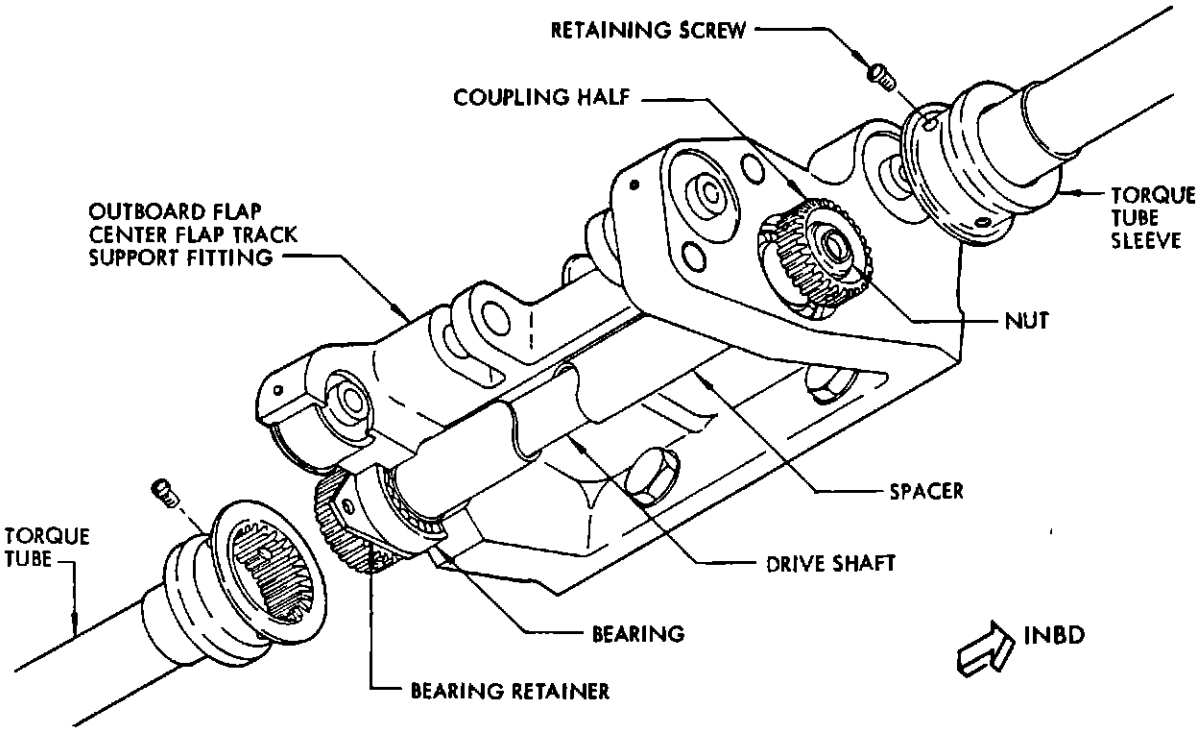
(12) With spacer in place, tap on inboard side of inboard bearing to drive both bearings out of fitting.

(13) Install new bearing and bearing retainer on outboard side of fitting.

(14) Install spacer and new bearing in inboard side of fitting.

(15) Insert drive shaft from outboard side of fitting. Tap outboard end of shaft lightly to make sure that shaft is properly seated in outboard bearing.




RETAINING SCREW
COUPLING HALF
TORQUE TUBE SLEEVE
OUTBOARD FLAP CENTER FLAP TRACK SUPPORT FITTING
NUT
SPACER
TORQUE TUBE
DRIVE SHAFT
BEARING
INBD
BEARING RETAINER

(16) Install coupling half and nut. Tighten nut to between 300 and 400 pound-inches torque. Make sure that bearing is properly positioned in fitting and against end of spacer. Secure splined end of shaft with splined coupling spanner while tightening nut.

(17) Connect torque tube on each side of track support fitting. Install coupling retaining screws and lockwire screw heads together.

(18) Pressurize utility hydraulic system.

(19) Check clearance between torque tubes and structure, tubing, and other equipment. Clearance shall be not less than 7/64 inch.

(20) Retract flaps. Recheck clearances and check for noisy or rough operation.

(21) Close and latch cove lip doors.

(22) Connect electric power cable to emergency flap drive unit.

(23) Close wheel well doors.

WARNING: STAND CLEAR OF WHEEL WELL DOORS.

(24) Depressurize utility hydraulic system and disconnect hydraulic pressure source.

D. Replace Inboard Flap Ell Gearbox Torque Tube Support Bearings

(1) Open main wheel well doors.

(2) Open utility hydraulic system bypass valve.

CAUTION: ACCIDENTAL OPERATION OF THE FLAP SYSTEM DURING MAINTENANCE MAY DAMAGE THE SYSTEM. SUCH ACCIDENTAL OPERATION MAY BE AVOIDED BY OPENING THE UTILITY SYSTEM BYPASS VALVE AND DISCONNECTING THE EMERGENCY FLAP DRIVE MOTOR.

(3) Disconnect electric power cable from inboard flap emergency drive motor.

(4) Remove access panels 1351 and 1354. (See Chapter 12, Access Doors and Panels.)

(5) Disconnect torque tubes (2, figure 201) from torque shaft (12).

(6) Hold coupling half (10) with spline coupling spanner wrench and remove nut from inboard end of torque shaft.

(7) Remove coupling half from end of torque shaft and, with a rawhide or plastic mallet, tap torque shaft out of bearings.

(8) Remove bearing retainer (15) from outboard flange of gearbox.

(9) Remove bearings (11) and spacer (13).

(10) Install new bearing in outboard flange of gearbox.

(11) Install bearing retainer (15).

(12) Install torque shaft (12) through outboard bearing; seat shaft against inner bearing race.

(13) Install spacer (13), inboard bearing, and coupling half (10). With soft mallet, tap coupling half to position bearing in inboard flange of gearbox.

(14) Install nut (9). With inboard bearing properly aligned in gearbox flange, tighten nut to a torque of 300 to 400 pound-inches.

(15) Check installation. Make sure that both bearings are properly positioned, not "cocked", and that shaft rotates easily and smoothly.

(16) Connect torque tubes to each end of torque shaft. Install coupling retaining screws and lockwire screw heads together.

(17) Close utility hydraulic system valve, pressurize system, and cycle flaps to check operation.

(18) Connect electric power cable to flap emergency drive motor.

(19) Install access panels.

(20) Close wheel well doors.

WARNING: STAND CLEAR OF WHEEL WELL DOORS.

(21) Depressurize utility hydraulic system.

E. Replace Fillet Flap Torque Tube Support Bearing

(1) Open left main wheel well door.

(2) Disconnect forward and aft ends of torque tube from gearboxes. Disconnect forward end first to prevent rotation of tube if flaps are operated.

(3) Remove bolts attaching bearing retainers to support bracket, (figure 203), and remove torque tube. Do not allow key or bearing halves to fall out.

(4) Remove bearing halves, key, and bearing retainers from torque tube.

(5) Assemble new bearing halves, key, and bearing retainers. Tighten retainer bolts so that gap between retainer edges does not exceed 0.010 inch.

(6) Ream assembled bearing to 1.562 to 1.564 inch diameter.

(7) Disassemble bearing and retainer assembly, reassemble on torque tube, position torque tube in airplane, and install bearing retainer mounting bolts. Tighten bolts as in step (5).

(8) With torque tube bearing sleeve properly positioned in bearing, rotate torque tube. Tube must rotate smoothly in bearing.

(9) Lubricate bearing through flush fitting with Aeroshell Grease 17.

(10) Connect torque tube coupling halves to angle gearboxes. Connect aft end first. Install coupling retaining screws and lockwire screw heads together.

(11) Pressurize utility hydraulic system and operate flaps through one complete cycle. Check rotation of torque tube in bearing.

(12) Close wheel well door and depressurize hydraulic system.

WARNING: STAND CLEAR OF WHEEL WELL DOORS.

3. Inspection/Check Flap Torque Tubes

A. Check torque tube couplings (figure 201).
Coupling half (10) should have no perceptible end play. Any appreciable end play of coupling half would indicate a loose or missing nut (9).

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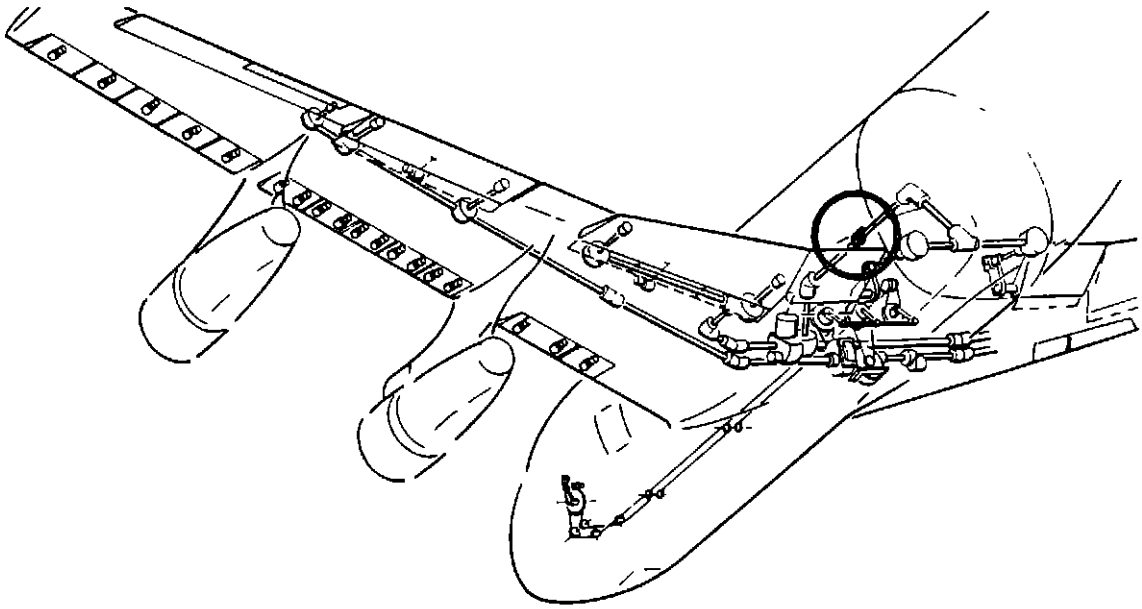
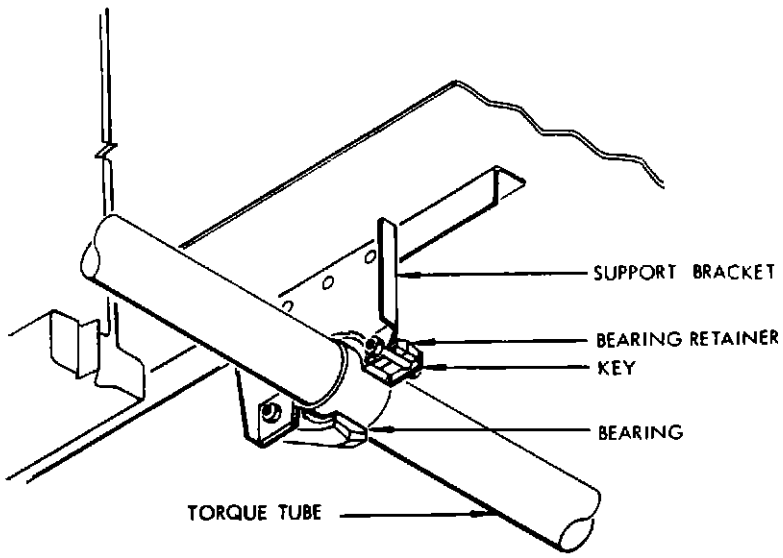
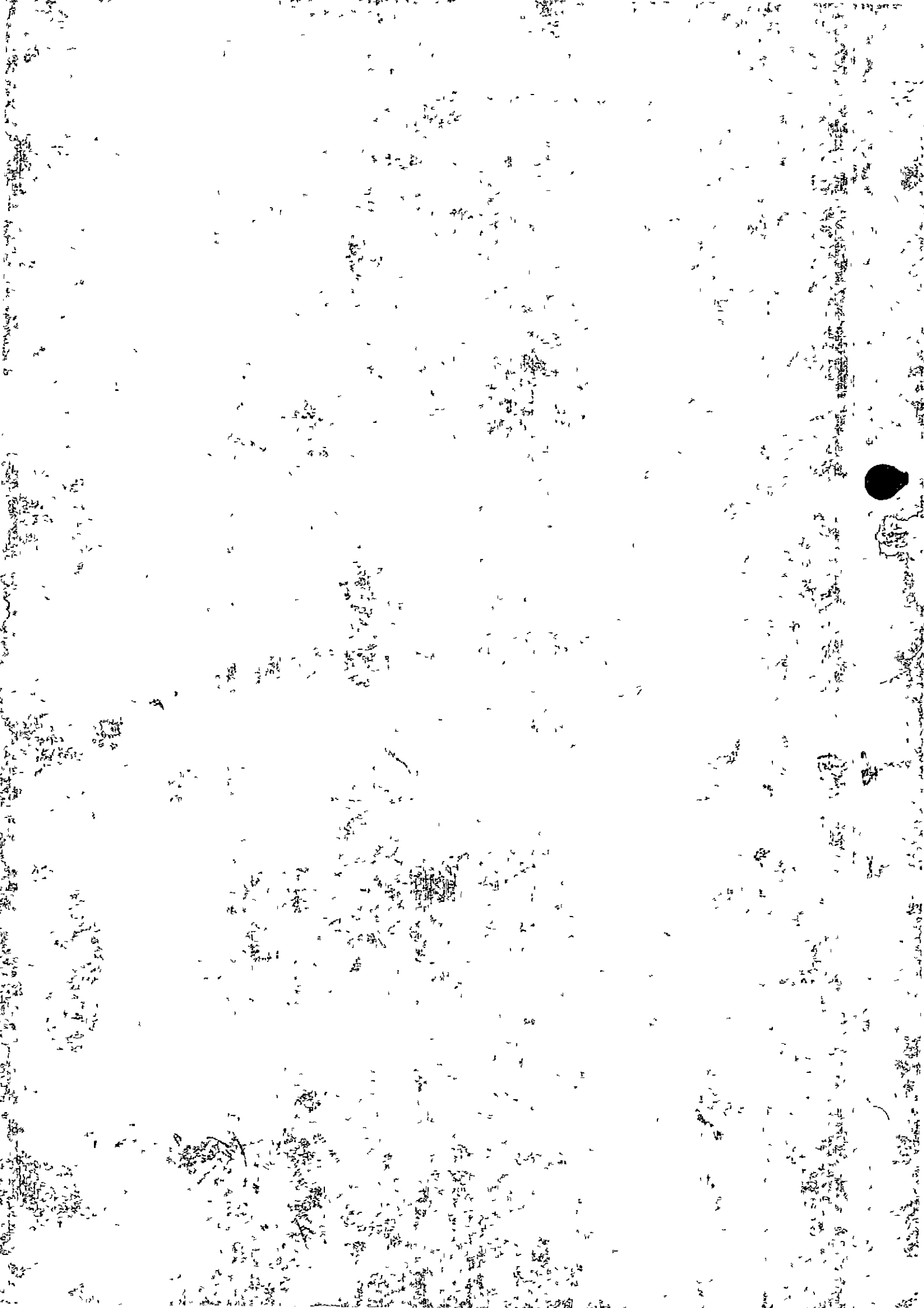




Fillet Flap Torque Tube Support Bearing Installation
Figure 203



FLAP DRIVE GEARBOXES - MAINTENANCE PRACTICES

1. Equipment and Materials

   A. Gearbox Lubricant

      (1) Not applicable to SABENA aircraft.

      (2) A mixture, by volume, of one part Aeroshell Grease 7A and four parts MIL-L-7808 lubricating oil.

2. Removal/Installation Inboard Flap Tee Gearbox

   A. Remove Inboard Flap Tee Gearbox

      (1) Pressurize utility hydraulic system.

      (2) Position flap control lever to DOWN.

      (3) Unlatch and lower cove lip door No. 1257. See Access Doors and Panels, Chapter 12.

      (4) Open main gear wheel well doors.

      (5) Disconnect electrical connector from emergency flap drive unit.

      CAUTION IF ELECTRICAL CONNECTOR IS NOT DISCONNECTED EMERGENCY FLAP DRIVE UNIT MAY BE OPERATED ACCIDENTALLY CAUSING DAMAGE TO FLAP DRIVE SYSTEM WHEN TORQUE TUBES ARE DISCONNECTED.

      (6) Disconnect torque tubes (1, figure 201) from inboard flap tee gearbox (9). Remove torque tube on outboard side of gearbox.

      (7) Remove nuts from bolts (8) securing gearbox to transmission assembly trunnion support (5).

      (8) Pull gearbox outboard to disengage from spline on inboard flap transmission assembly (6) and remove.

   B. Install Inboard Flap Tee Gearbox

      (1) With inboard flap tee gearbox (9, figure 201) held in installed position, remove filler plug (4) and fill to level of filler with lubricant.

      CAUTION: DO NOT MIX LUBRICANTS. CHECK LUBRICANT IN GEARBOX TO MAKE SURE LUBRICANT BEING USED IS THE SAME AS THAT BEING ADDED.

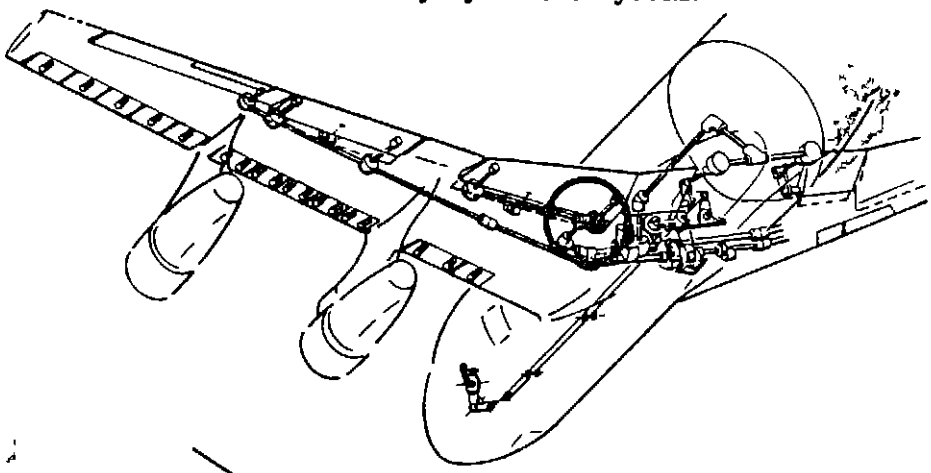
(2) Align gear box mounting flange with mounting bolts (8) and insert into transmission assembly (6) spline fitting.

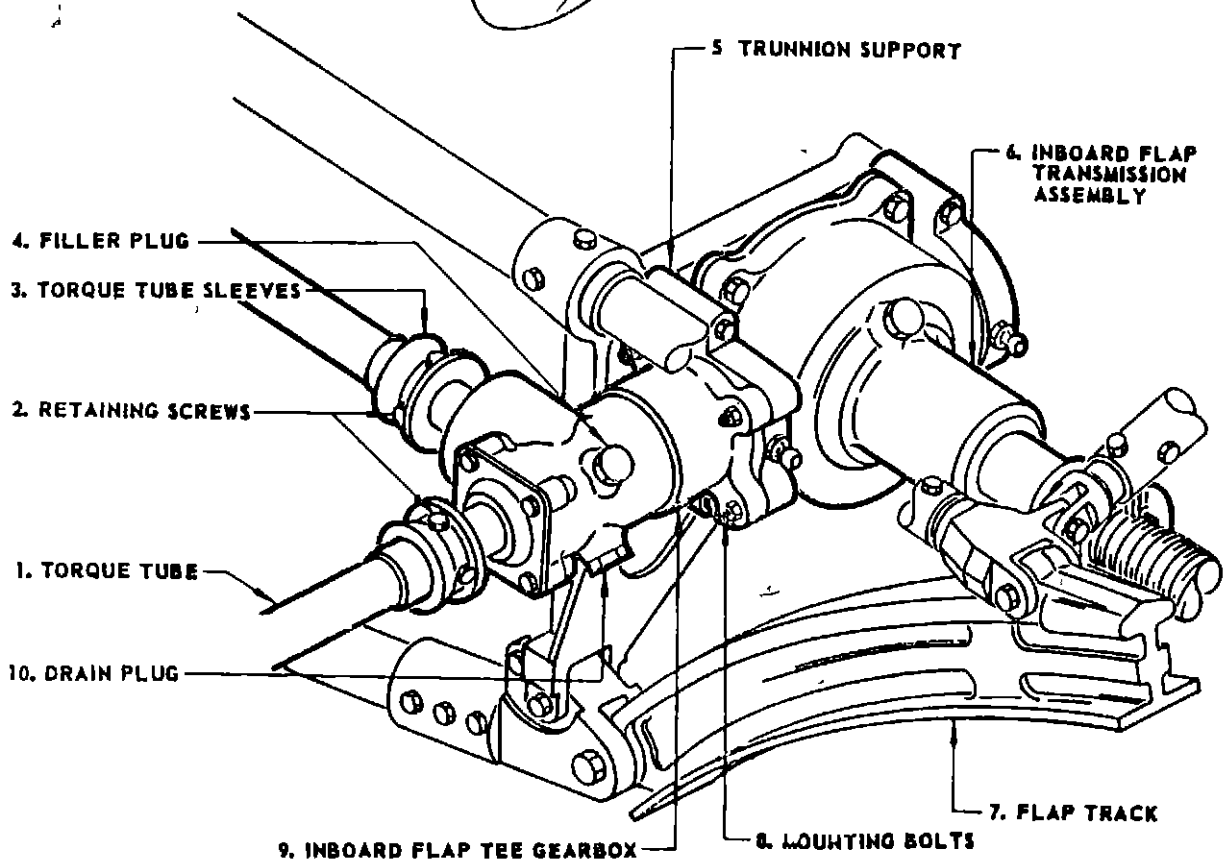
(3) Connect torque tube (1) to forward side of gear box and install torque tube on outboard side of gear box. Install coupling retaining screws and lockwire screw heads together.

(4) Raise and latch cove lip door.

(5) Connect electrical connector to emergency flap drive unit

(6) Pressurize utility hydraulic system.





Inboard Flap Tee Gear Box Installation
Figure 201

(7) Position flap control lever to "UP."

(8) Close wheel well doors.

WARNING: STAND CLEAR AS WHEEL WELL DOORS CLOSE TO AVOID INJURY.

(9) Disconnect hydraulic pressure source

3. Removal/Installation Inboard Flap Ell Gearbox

A. Equipment and Materials

(1) Torque wrench

(2) Deleted

(3) Spline Coupling Spanner Wrench - F71228 or equivalent

B. Remove Inboard Flap Ell Gear Box

(1) Remove access panels 1351 and 1354. See "Access Doors and Panels," Chapter 12.

(2) Open main wheel well door.

(3) Disconnect electrical connector from inboard and fillet flap emergency flap drive unit.

CAUTION: IF ELECTRICAL CONNECTOR IS NOT DISCONNECTED EMERGENCY FLAP DRIVE UNIT MAY BE OPERATED ACCIDENTALLY CAUSING DAMAGE TO FLAP DRIVE SYSTEM WHEN TORQUE TUBES ARE DISCONNECTED.

(4) Disconnect inboard and outboard flap torque tubes (2, figure 202) from inboard flap ell gear box (1).

(5) Remove gear box mounting bolts (8) and remove gear box.

(6) Remove nut (4) from end of torque shaft (7).

(7) Remove coupling half (5), bearing (6) and spacer (9) from torque shaft

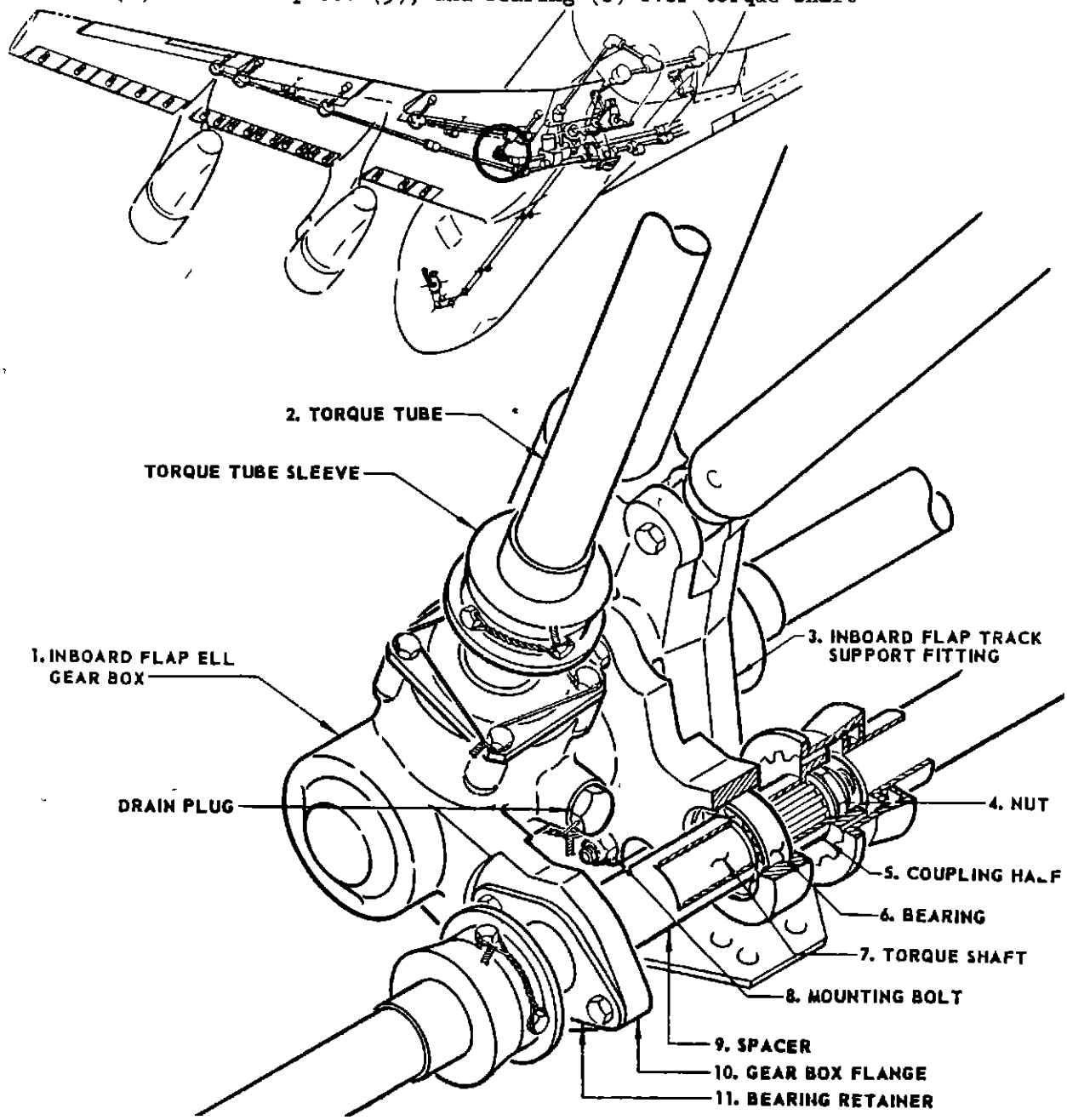
(8) Remove bolts securing bearing retainer (11) to gear box flange (10)

(9) Pull torque shaft, bearing retainer and bearing out of gear box flange.

C. Prepare for Installation Inboard Flap Ell Gear Box

(1) Position bearing retainer (11, figure 202) and bearing on torque shaft (7) and insert torque shaft through gear box flange (10)

(2) Install spacer (9), and bearing (6) over torque shaft



Inboard Flap Ell Gear Box Installation
Figure 202

(3) Install coupling half (5) on torque shaft and tighten nut (4) 300 to 400 pound-inches torque. Secure torque shaft with spline coupling spanner wrench while tightening nut to specified torque.

(4) Install bolts securing bearing retainer to gearbox flange

(5) Position gearbox in installed position and fill to level of filler with lubricant.

D. Install Inboard Flap Ell Gearbox

(1) Position inboard flap ell gearbox (1, figure 202) on outboard side of inboard flap track support fitting (3) and install mounting bolts (8).

(2) Connect inboard and outboard flap torque tubes (2) to gearbox spline couplings. Install coupling retaining screws and lockwire screw heads together.

(3) Install access panels 1351 and 1354.

(4) Connect electrical connector to emergency flap drive unit

4. Removal/Installation Outboard Flap Angle Gearbox

A Remove Outboard Flap Angle Gearbox

(1) Open main wheel well doors

(2) Disconnect electrical connector from emergency flap drive unit

CAUTION IF ELECTRICAL CONNECTOR IS NOT DISCONNECTED, EMERGENCY FLAP DRIVE UNIT MAY BE OPERATED ACCIDENTALLY CAUSING DAMAGE TO FLAP DRIVE SYSTEM WHEN TORQUE TUBES ARE DISCONNECTED.

(3) Remove access panel 1356.

(4) Disconnect torque tubes (figure 203) from each side gearbox.

(5) Remove bolts securing gearbox to flap track support fitting and remove gearbox

B Install Outboard Flap Angle Gearbox

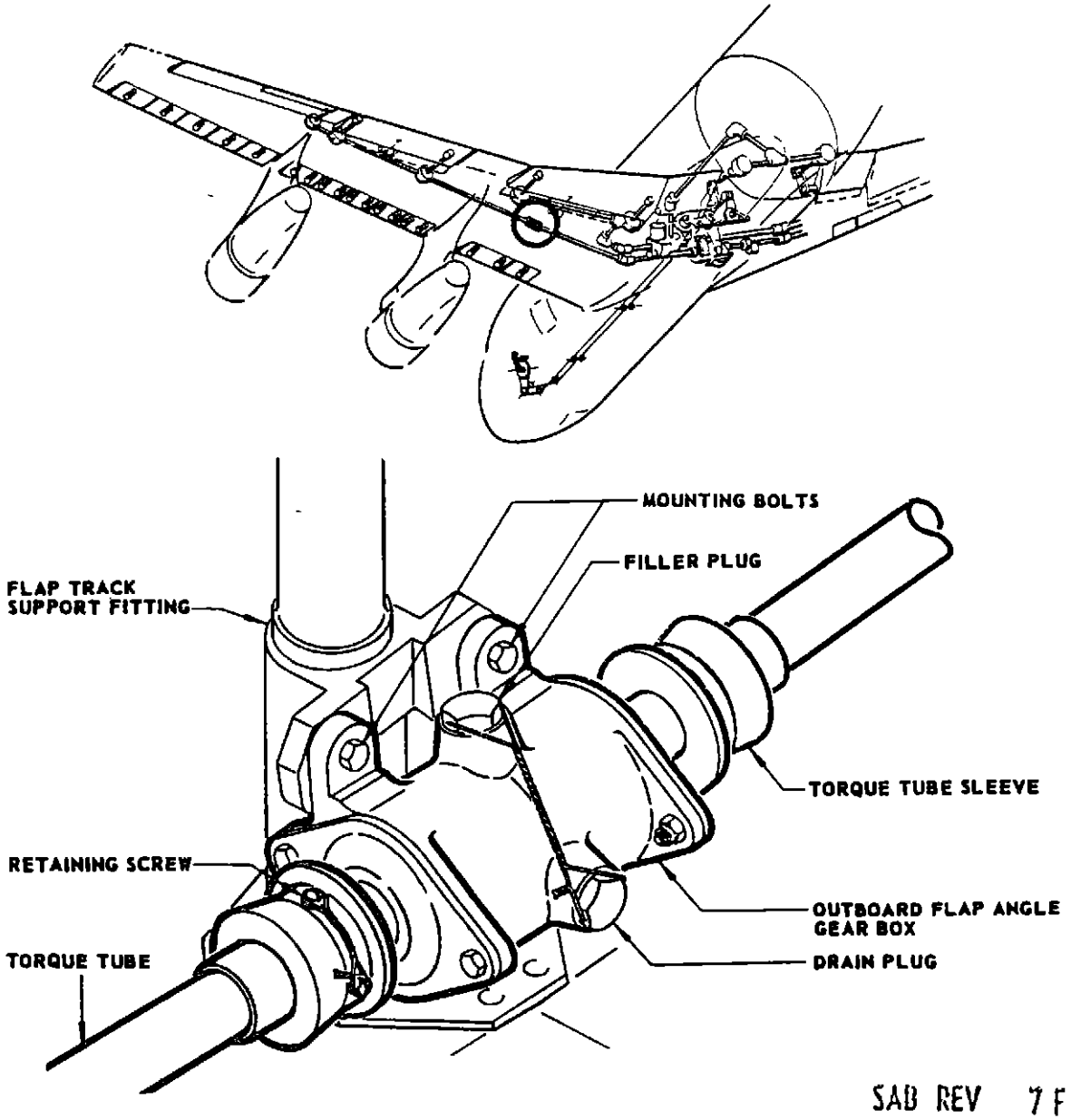
(1) Position gearbox (figure 203) in installed position and fill to level of filler with lubricant

(2) Position gearbox underneath flap track support fitting and install mounting bolts.

(3) Connect torque tubes to each side of gearbox. Install coupling retaining screws and lockwire screw heads together.

(4) Install access panel No. 1356.

(5) Connect electrical connector to emergency flap drive unit.



Outboard Flap Angle Gearbox Installation
Figure 203

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5. Removal/Installation Flap Drive Angle Gearboxes

A. Remove Flap Angle Gearboxes

(1) Disconnect electrical connector from emergency flap drive unit.

CAUTION: IF ELECTRICAL CONNECTOR IS NOT DISCONNECTED EMERGENCY FLAP DRIVE UNIT MAY BE OPERATED ACCIDENTALLY CAUSING DAMAGE TO FLAP DRIVE SYSTEM WHEN TORQUE TUBES ARE DISCONNECTED.

(2) Disconnect torque tubes from gearbox. (See figure 204.)

(3) Remove mounting bolts and remove gearbox.

B. Install Flap Angle Gearbox

(1) Position gearbox in installed position and fill to level of filler with lubricant. (See figure 204.)

(2) Position gearbox on support bracket and install mounting bolts.

(3) Connect torque tubes to gearbox. Install coupling retaining screws and lockwire screw heads together.

(4) Connect electrical connector to emergency flap drive unit.

6. Removal/Installation Fillet Flap Tee Gearbox

A. Remove Fillet Flap Tee Gearbox

(1) Open main wheel well doors.

(2) Disconnect torque tubes from fillet flap tee gearbox by removing retaining screws and separating splines. (See figure 205.)

(3) Remove four mounting bolts attaching gearbox to support bracket.

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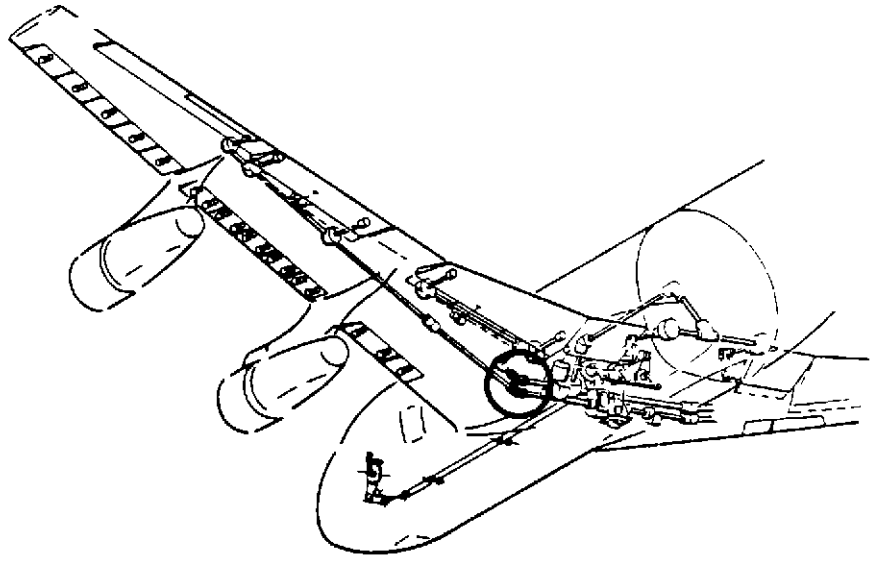

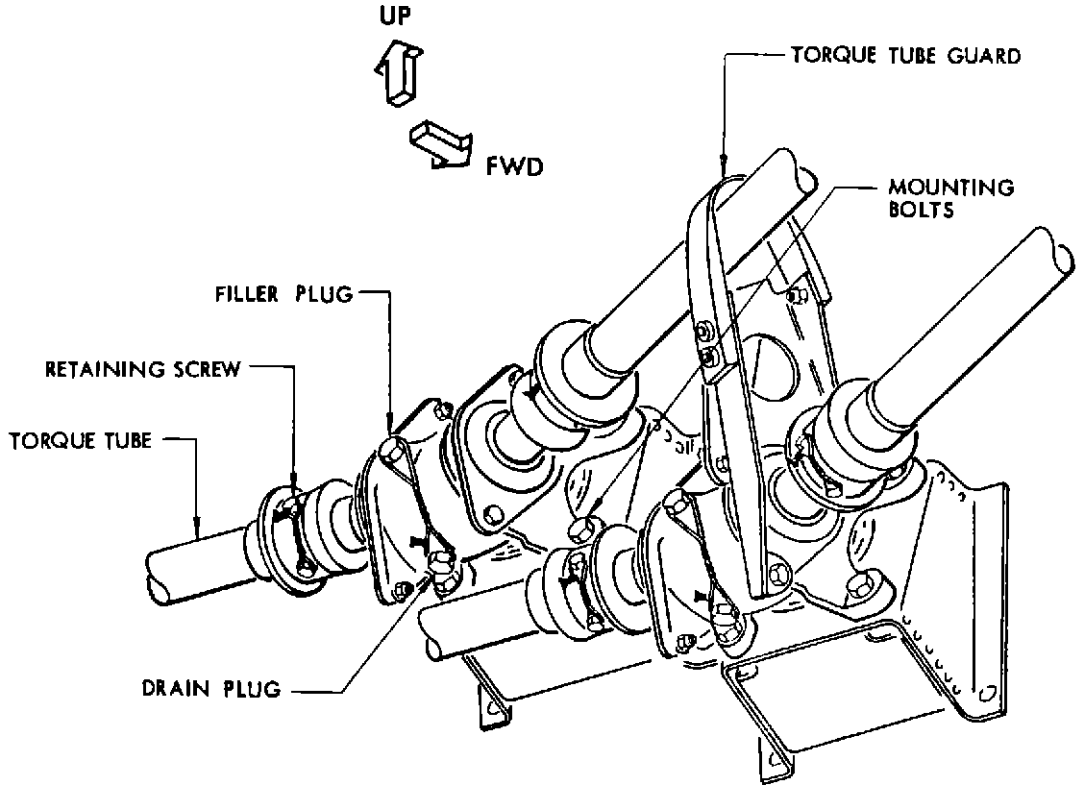

Flap Drive Angle Gear Box Installation
Figure 204

B. Install Fillet Flap Tee Gearbox

(1) Position gearbox in installed position and fill to level of filler with lubricant. (See figure 205.)

(2) Align mounting lugs with holes in support bracket and install four mounting bolts.

(3) Align torque tubes with gearbox, slide couplings over gearbox splines. Install retaining screws and lockwire screw heads together.

(4) Pressurize utility hydraulic system.

(5) Close main wheel well doors.

(6) Disconnect hydraulic pressure source.

7 Removal/Installation Fillet Flap Angle Gearboxes

A. Remove Fillet Flap Angle Gearbox

(1) Open main wheel well door.

(2) Remove torque tube retaining screws from couplings, and slide couplings off gearbox splines. (See figure 206.)

(3) Remove Mounting bolts attaching gearbox to support bracket and remove gearbox.

B Install Fillet Flap Angle Gearbox

(1) Position gearbox in installed position and fill to level of filler with lubricant. (See figure 206.)

(2) Align gearbox with support bracket and install mounting bolts

(3) Connect torque tubes to gearbox spline couplings. Install coupling retaining screws and lockwire screw heads together.

(4) Pressurize utility hydraulic system.

(5) Close main wheel well doors.

(6) Disconnect hydraulic pressure source.

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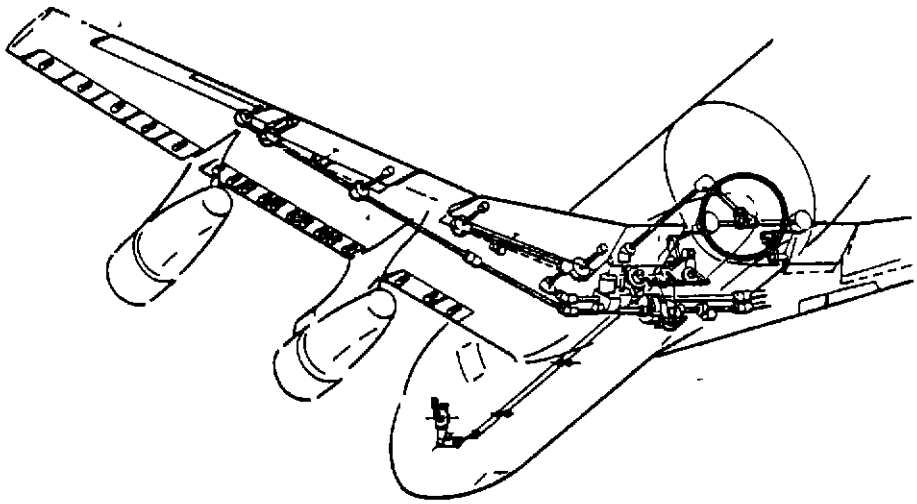
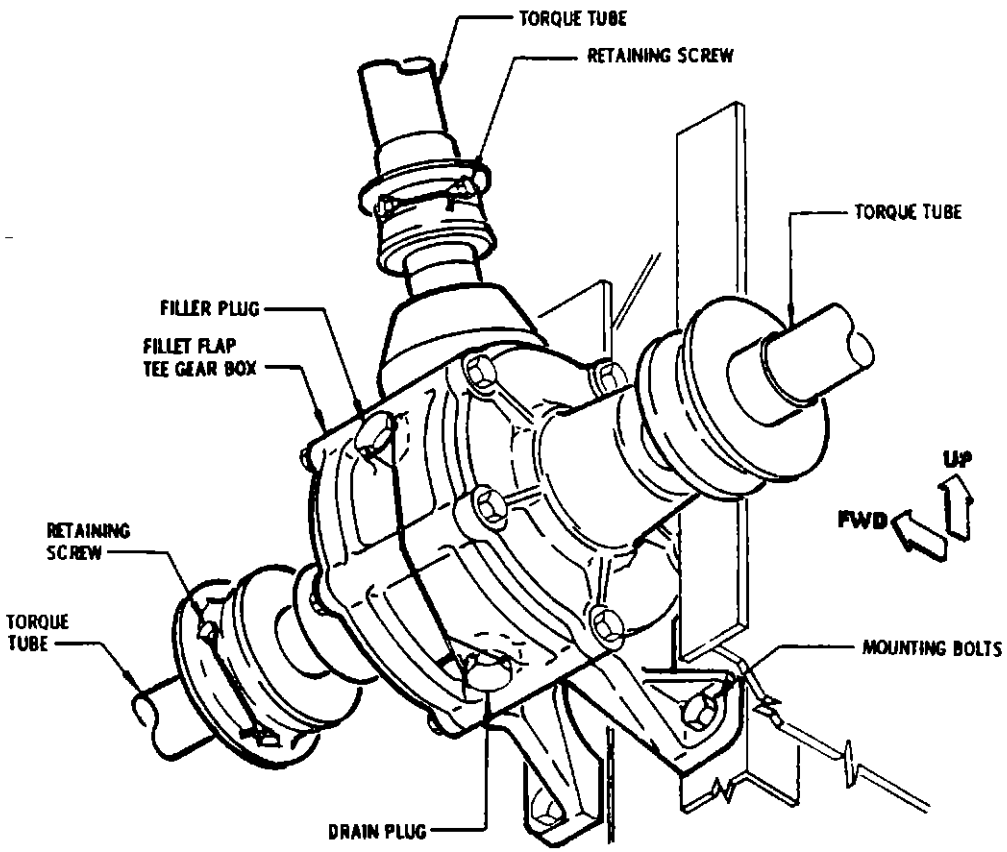
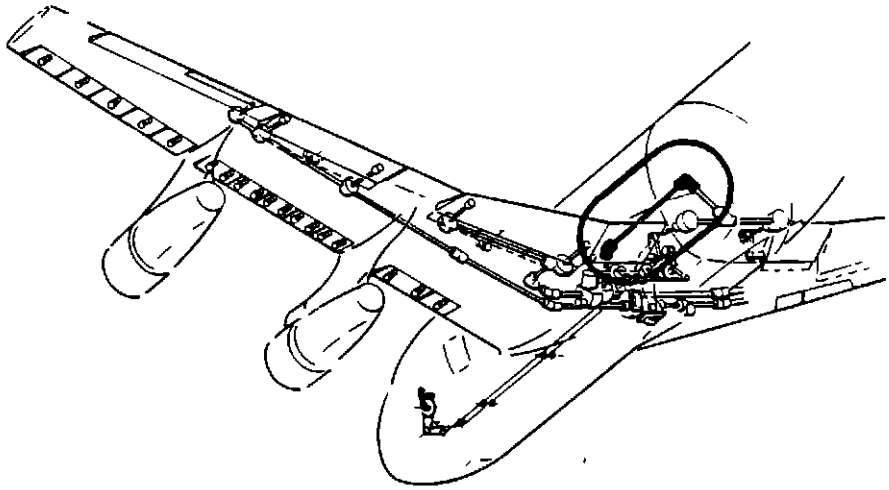
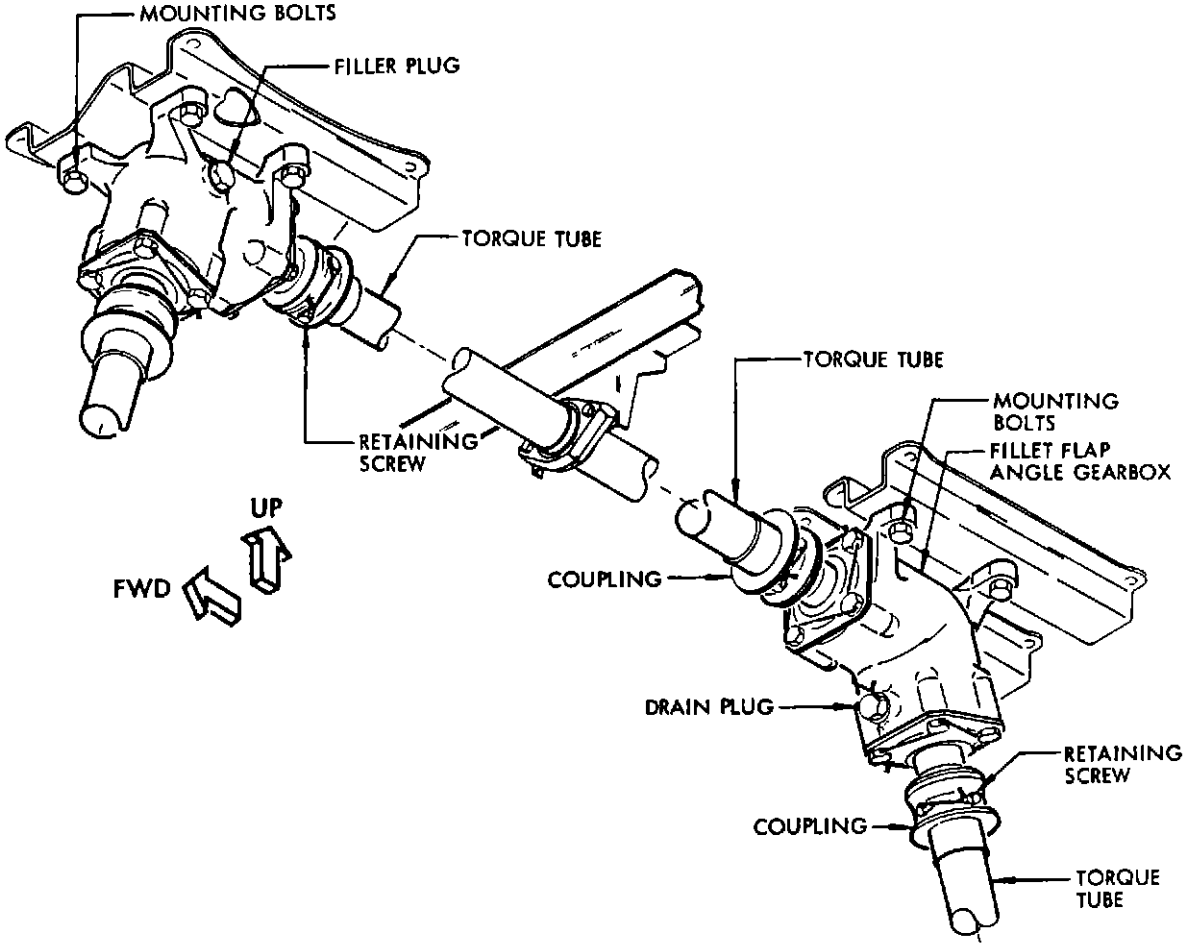




Fillet Flap Tee Gear Box
Figure 205




MOUNTING BOLTS
FILLER PLUG
TORQUE TUBE
RETAINING SCREW
UP
FWD
TORQUE TUBE
MOUNTING BOLTS
FILLET FLAP ANGLE GEARBOX
COUPLING
DRAIN PLUG
RETAINING SCREW
COUPLING
TORQUE TUBE

FILLET FLAP TRANSMISSION ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation Fillet Flap Transmission Assembly

A. Equipment and Materials

(1) Lubricant

(a) A mixture, by volume, of 1 part Aeroshell Grease 7A and 4 parts MIL-L-7808 lubricating oil.

(b) Deleted

(c) Aeroshell Grease 17.

(d) Silicone Compound Cellolac D-40 (Mastinox)

(2) Spline Coupling Spanner Wrench - F71228 or equivalent

(3) Control Surfaces Protractor Assembly - F52485-500, or equivalent

(4) Protractor Clamp Assembly - F71292-16, or equivalent

B. Remove Fillet Flap Transmission Assembly

(1) Open main gear wheel well door.

(2) Open utility hydraulic system bypass valve. Disconnect electric power cable from inboard and fillet flap emergency drive motor.

CAUTION: OPERATION OF INBOARD FLAPS WITH TORQUE TUBES DISCONNECTED, OR WITH FILLET FLAP SUPPORTED, MAY DAMAGE THE SYSTEM OR CAUSE LOSS OF ADJUSTMENT.

(3) Install protective cover on trailing edge of fillet flap, support trailing edge to prevent rotation of flap during removal of transmission assembly.

(4) Disconnect torque tube (1, figure 201) from fillet flap transmission assembly (11).

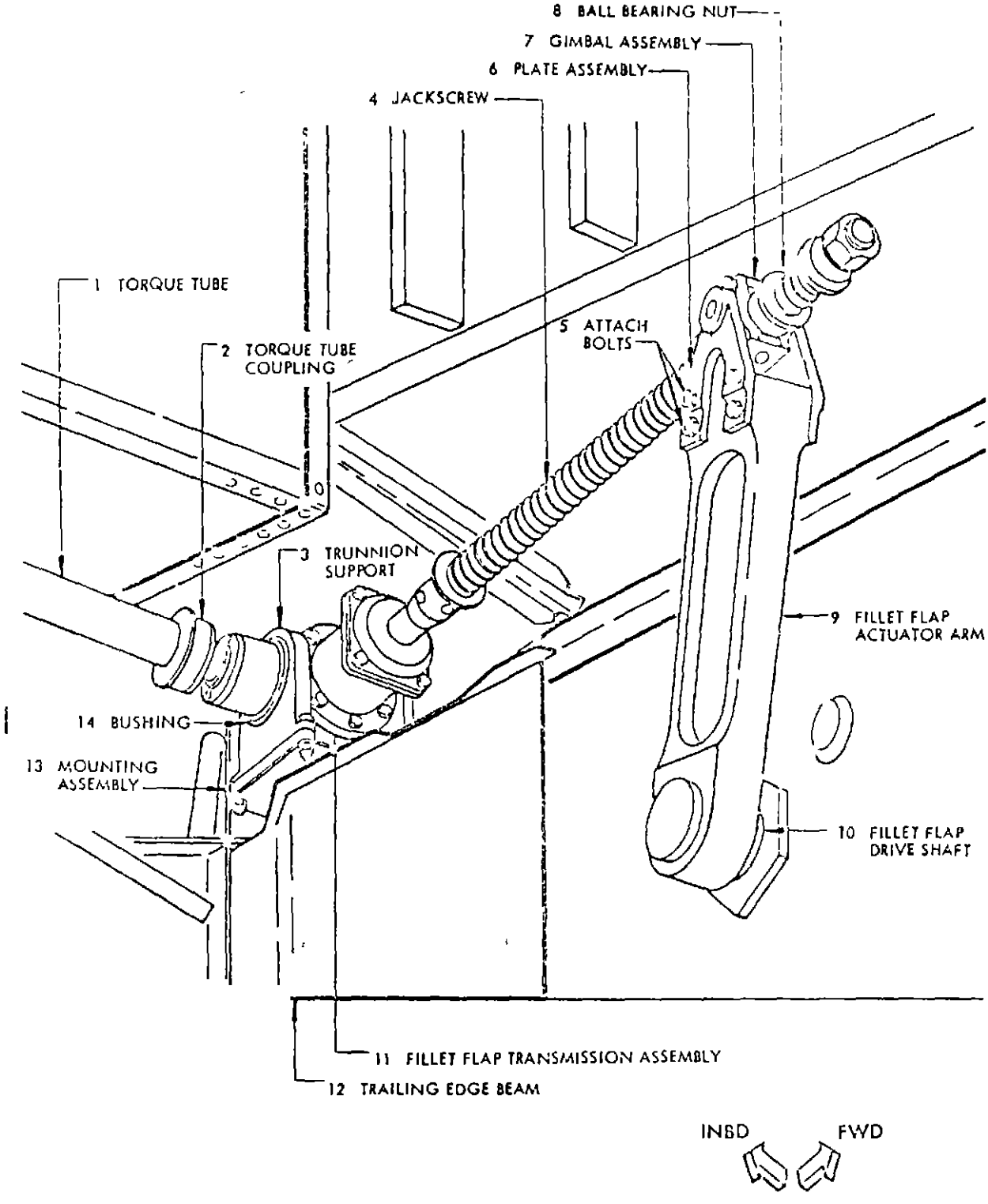
(5) Remove nuts from bolts (5) attaching plate assemblies (6) to fillet flap actuator arm (9). Remove inboard plate assembly and disengage ball nut from actuator arm. Removal of outboard plate assembly is not required.

(6) Remove bolts attaching transmission assembly trunnions support (3) to mounting assembly (13).

(7) Raise forward end of transmission assembly to clear actuator arm and remove from airplane.

(8) Remove bolts attaching gimbal assembly (7) side plate to end plates and remove gimbal assembly from ball bearing nut (8) trunnions.

NOTE: Gimbal assembly side plates and end plate constitute a matched set; do not separate.



Fillet Flap Transmission Assembly Installation
Figure 201

C. Install Fillet Flap Transmission Assembly

(1). When filling Fillet Flap Transmission Assembly with lubricant, use a mixture, by volume, of one part MIL-G-23827 grease and four parts MIL-L-7808 lubricating oil or use MIL-H-5606 hydraulic oil depending on which lubricant is presently used in particular unit being serviced.

CAUTION: DO NOT MIX GREASE/OIL MIXTURE AND HYDRAULIC OIL. DO NOT DRAIN AND REFILL WITH DIFFERENT TYPE OIL TRANSMISSION BRAKE MAY BE DAMAGED.

(1a) Position center line of fillet flap transmission assembly (11, figure 201) 15 degrees above horizontal plane and fill to level of filler plug with lubricant. After filling, remove one pint of oil to ensure proper fluid level.

CAUTION: DO NOT MIX LUBRICANTS. MAKE SURE THAT LUBRICANT BEING ADDED IS THE SAME AS THAT IN THE GEARBOX.

(2) Install gimbal assembly (7) on ball bearing nut (8) by first installing side plates over trunnions and connecting end plates. Position side plates such that 3/4 inch bolts are closest to gearbox and ball return tubes on ball bearing nut are up.

(3) Check that maximum diametrical clearance between flap drive bushings (14), and the transmission trunnion supports (3), does not exceed 0.012 inch.

(4) Position transmission assembly on mounting assembly (figure 202) and install trunnion supports (3, figure 201).

(5) Align gimbal assembly with fillet flap actuator arm (9), engage gimbal assembly trunnion with outboard plate assembly (6) and install inboard plate assembly.

(6) Install nuts on bolts (5) to attach plate assemblies to fillet flap actuator arm.

(7) Connect torque tube (1) to fillet flap transmission assembly coupling.

(8) Remove support and protective cover from trailing edge of fillet flap.

(9) Pressurize utility hydraulic system.

(10) Position flap control lever to UP.

(11) After 5 minutes disconnect torque tube coupling at fillet flap transmission assembly and adjust transmission assembly to position fillet flap lower surface to fair with lower contour of trailing edge beam within 1/4 inch. Apply lift to trailing edge of flap to remove down slack.

(12) Check that angular clearance between up stops on ball bearing nut and jackscrew is 45 to 135 degrees.

(13) Connect torque tube to fillet flap transmission assembly. Install coupling retaining screws and lockwire screw heads together.

(14) Install protractor assembly on fillet flap. Zero protractor. Extend flaps.

(15) Check that fillet flap extends 47 to 49 degrees.

(16) Check that clearance between down stops on ball bearing nut and jackscrew is not less than 1/4 turn of jackscrew.

(17) Retract flaps. Check that protractor indicates zero degrees. Remove protractor.

(18) Install electric power connector on inboard and fillet flap emergency drive motor.

(19) Close wheel well doors.

WARNING: STAND CLEAR OF WHEEL WELL DOORS.

(20) Disconnect hydraulic pressure source.

2. Removal/Installation Fillet Flap Transmission Mounting Assembly

A. Remove Fillet Flap Transmission Mounting Assembly (See figure 202.)

(1) Open left or right main gear wheel well door.

(2) Remove fillet flap transmission assembly per paragraph 1.B.

(3) Remove seal assembly from lower surface of trailing edge beam.

(4) Remove three bolts from lower end of mounting assembly and remove bearing retainer, bearing and spacer.

(5) Lift mounting assembly out of beam and remove.

NOTE: Upper bearing is roller staked in beam.

B. Install Fillet Flap Transmission Mounting Assembly (See figure 202)

(1) Apply Aeroshell Grease 17 to upper bearing (staked in beam) and lower bearing to be installed.

(2) Apply Silicone Compound Cellolac D-40 on areas of mounting assembly shaft which will be in contact with upper and lower bearing.

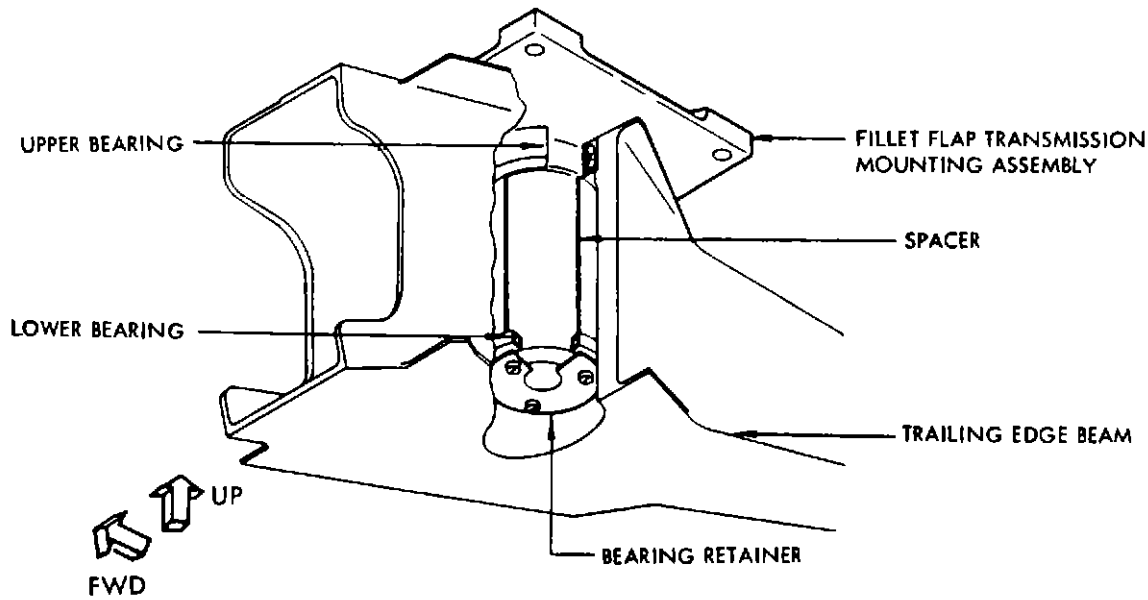
(3) Lower fillet flap mounting assembly through support fitting on trailing edge beam.

(4) Install spacer over mounting assembly shaft from lower side of beam

(5) Slide lower bearing over mounting assembly shaft Install bearing retainer

(6) Install screws attaching seal to lower surface of trailing edge beam.

(7) Install and adjust fillet flap transmission assembly per paragraph 1 C.



FLAP TRANSMISSION ASSEMBLIES - MAINTENANCE PRACTICES

1. Removal/Installation of Flap Transmission Assemblies

A. General

(1) Access to remove and install flap transmission assemblies may be obtained by opening cove lip doors 1256, 1258, 1362, and 1363 as applicable, and for the inboard flap transmission assemblies, the applicable access panels must be removed from immediately forward of the cove lip door. See Access Doors and Panels, Chapter 12.

B. Equipment and Materials

(1) Spline Coupling Spanner Wrench - F71228, or equivalent

(2) Gearbox lubricant

(a) A mixture, by volume, of one part Aeroshell Grease 7A and four parts MIL-L-7808 lubricating oil

(b) Deleted

C. Remove Flap Transmission Assembly

(1) Pressurize utility hydraulic system and extend flaps. If removing inboard flap inboard transmission assembly, extend flaps 30 to 40 degrees, remove bolt (10) and bearing (11) from inboard side of flap inboard support fitting (12), then extend flap to 50-degree position.

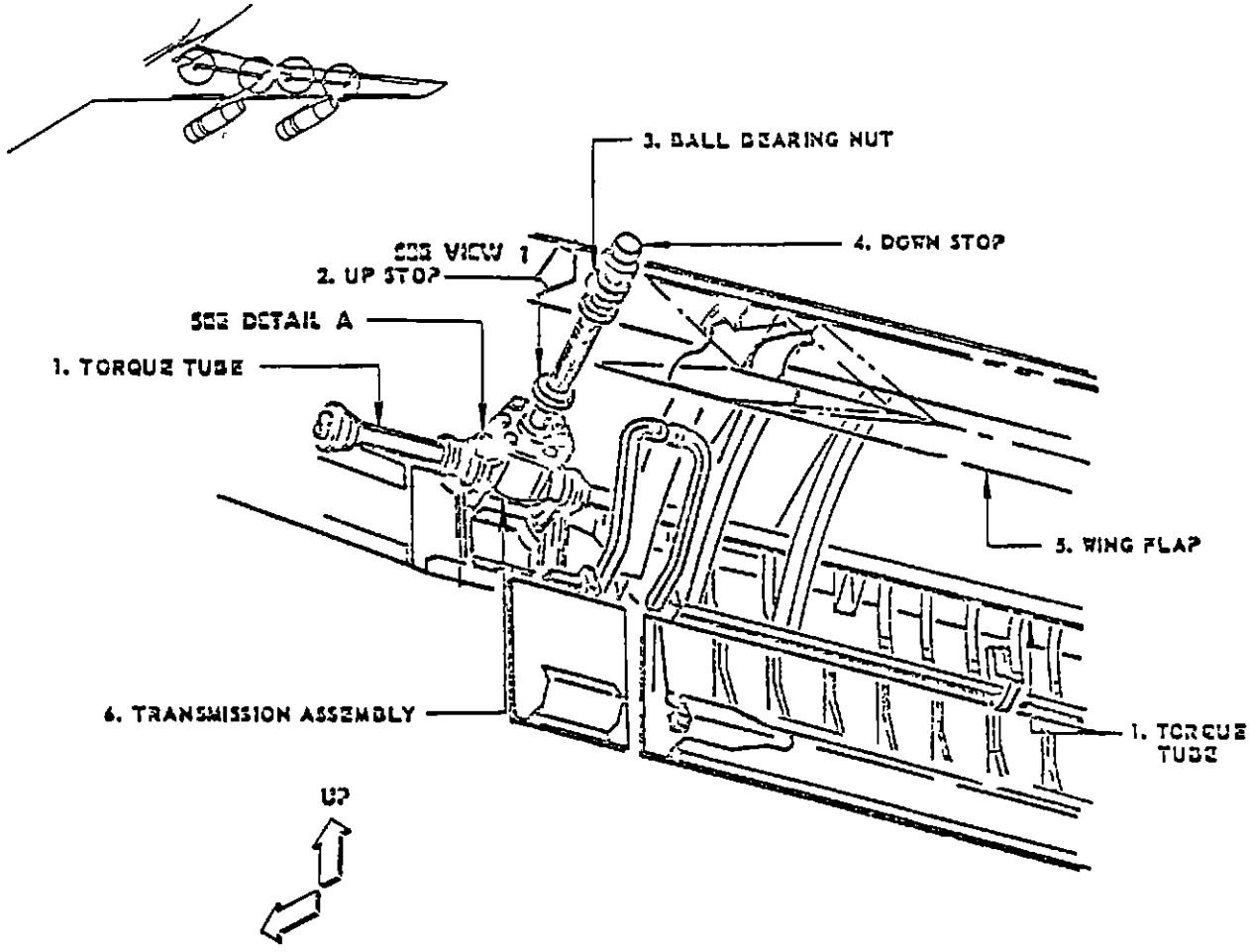
CAUTION. IF FLAPS DO NOT EXTEND, FLAP CONTROL LEVER MUST BE RETURNED TO UP POSITION.

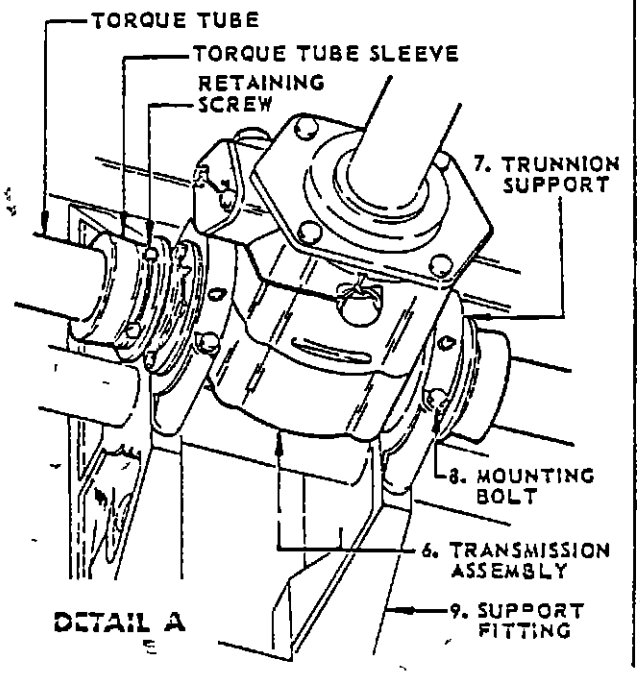
NOTE: If flaps do not extend, spoilers may be extended to provide access to transmission assemblies.

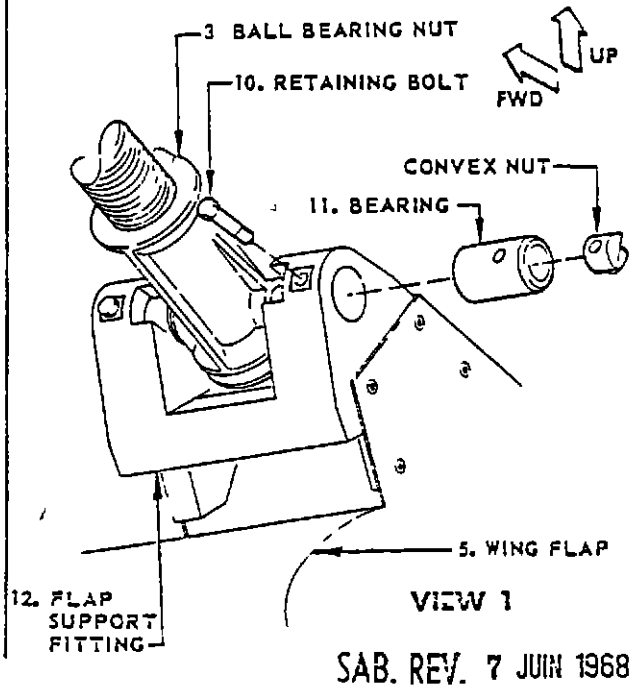
(2) Open main wheel well doors.

(3) Depressurize utility hydraulic system and open system bypass valve. Disconnect electric power cable from flap emergency drive motors.

WARNING: OPERATION OF FLAPS DURING FLAP MAINTENANCE MUST BE PREVENTED TO AVOID DAMAGE TO THE SYSTEM OR INJURY TO MAINTENANCE PERSONNEL.







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Flap Transmission Assembly Installation
Figure 201

(4) Open applicable cove lip doors and for inboard flap transmission assemblies, remove applicable access panels.

(5) Disconnect torque tubes (1, figure 201) from each side of transmission assembly. If inboard flap inboard transmission assembly is being removed, disconnect torque tubes from inboard flap tee gearbox.

(6) For removal of inboard flap inboard transmission assembly, remove inboard flap tee gearbox. Refer to 27-16-111.

(7) If flap is extended, install protective cover on trailing edge and position support under flap to hold flap in position when transmission assembly is removed. Apply enough lift at trailing edge to remove down slack when positioning support.

(8) Remove bearing retaining bolts (10) from flap support fitting (12) and remove bearings (11).

NOTE: If inboard flap inboard transmission assembly must be removed with flaps fully extended, inboard bearing (5) may be shifted inboard while transmission assembly is disconnected Bearing must then be returned to installed position if flap position is to be changed; this will prevent interference between protruding bearing and structure.

(9) Remove mounting bolts (8) from transmission assembly trunnion supports (7) and remove transmission assembly.

(10) Remove trunnion supports from transmission assembly.

D. Install Flap Transmission Assembly

(1). When filling Flap Transmission Assembly with lubricant, use a mixture, by volume, of one part MIL-G-23827 grease and four parts MIL-L-7808 lubricating oil or use MIL-H-5606 hydraulic oil depending on which lubricant is presently used in particular unit being serviced.

CAUTION. DO NOT MIX GREASE/OIL MIXTURE AND HYDRAULIC OIL. DO NOT DRAIN AND REFILL WITH DIFFERENT TYPE OIL. TRANSMISSION BRAKE MAY BE DAMAGED.

(1a) Hold transmission assembly in installed position (retracted); remove lubrication filler plug and check lubricant level. Add lubricant as necessary to raise lubricant level to filler port. Install filler plug.

CAUTION. DO NOT MIX LUBRICANTS. MAKE SURE THAT LUBRICANT BEING ADDED IS THE SAME AS THAT IN THE GEARBOX.

(2) Install trunnion supports (7, figure 201) on transmission assembly (6).

(3) Position transmission assembly on support fitting (9) and install mounting bolts (8).

(4) If installing inboard flap inboard transmission assembly, install inboard flap tee gearbox as outlined in 27-16-111.

(5) Connect torque tubes (1) to transmission assembly splined couplings. If installing outboard flap outboard transmission assembly, do not connect outboard torque tube (to aileron lockout gearbox) until transmission assembly is adjusted.

(6) If flaps are extended, adjust bearing nut (3) so that clearance between downstops on ball bearing nut and jack is not less than 1/4 turn of jackscrew. If flaps are retracted, adjust ball bearing nut to obtain angular clearance between upstops, on ball bearing nut and jackscrew, of 90° (+90°/-45°).

(7) With ball return tubes up (on ball bearing nut), align ball bearing nut with flap support fitting (12) and insert two bearings (11) into support fitting.

(8) Align bolt holes in bearings (11) and flap support fitting (12) and install bolts (10).

(9) Remove support and protective cover from trailing edge of flap.

(10) Pressurize utility hydraulic system.

(11) If flaps are extended, position flap control lever at UP to retract flaps.

(12) Disconnect torque tubes from each side of flap transmission assembly. If adjusting inboard transmission assembly at inboard flap, disconnect torque tubes on forward and outboard side of inboard flap tee gearbox.

(13) Adjust outboard flap and outboard end of inboard flap to fair trailing edge with wing chord plane within 0.25 inch (figure 202) by adjusting transmission assembly spline coupling with spline coupling spanner wrench. Lift trailing edge of flap at midpoints between tracks to remove down slack. Adjust inboard end of inboard flap to fair with fillet flap trailing edge. Inboard end of inboard flap trailing edge shall not extend above, or droop more than 0 75 inch below, fillet flap trailing edge.

NOTE: Outboard flap faired position on wing chord plane is determined by placing straightedge flush along lower surface of wing and flap at straightedge markings and measuring gap. Inboard flap faired position is determined by placing straightedge at markings near outboard end. Gap dimension should equal height of blocks on straightedge. Take measurements parallel to centerline of tracks. Wing chord plane theoretically passes through wing trailing edge.

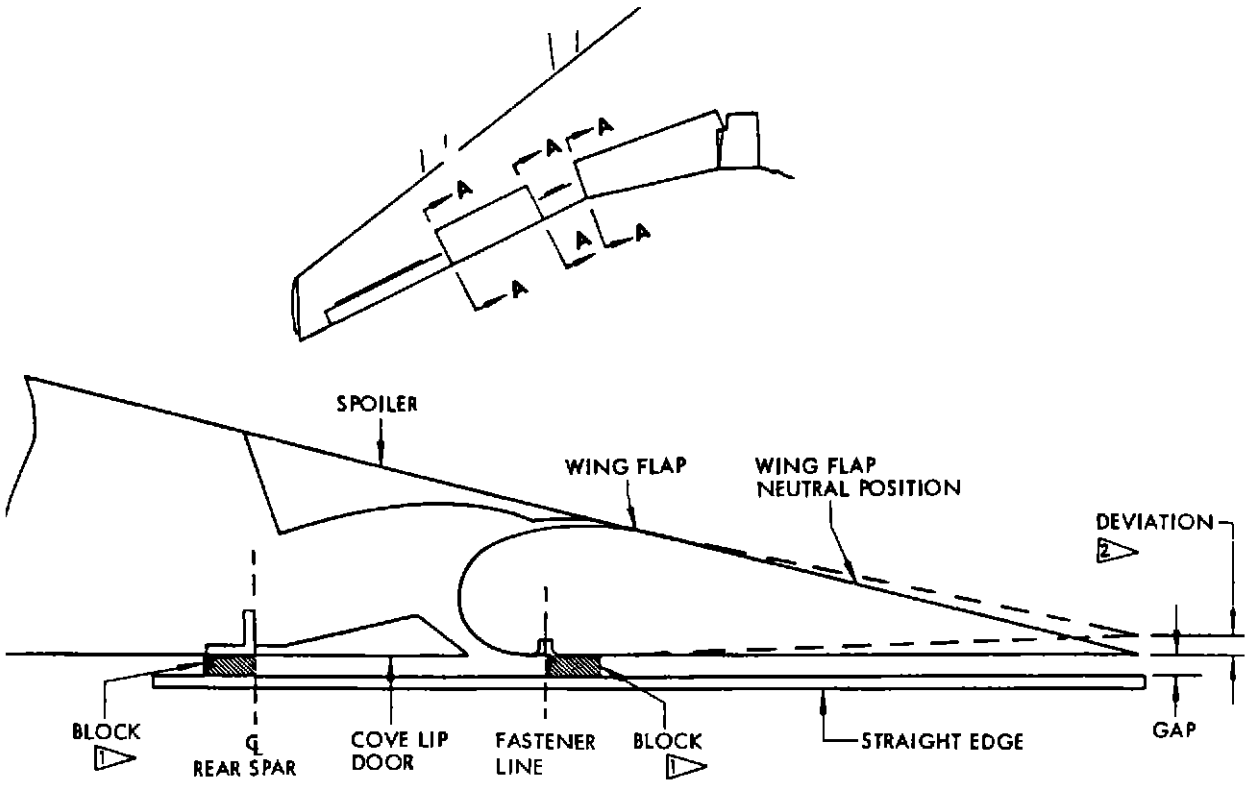
(14) Check that angular clearance between upstops on ball bearing nut and jackscrew is 90° (+90°/-45°).

NOTE: Stops are designed to absorb full motor torque but should not contact during normal operation.

(15) If adjusting outboard flap transmission assembly at outboard flap, adjust outboard aileron lockout gearbox torque tube until forward push rod mounting bolt is aligned with quadrant axis and connect torque tube to flap transmission assembly.

(16) Connect torque tubes to transmission assembly spline coupling and to inboard flap tee gearbox as required. Install coupling retaining screws and lockwire screw heads together.

(17) Connect electric power cable to emergency flap drive unit.



1 BLOCKS MUST BE SAME THICKNESS

2 DEVIATION SHALL NOT EXCEED 0 25 INCH AT OUTBOARD END OF INBOARD FLAP AVERAGE DEVIATION SHALL NOT EXCEED 0.25 INCH FOR OUTBOARD FLAP

A-A

EMERGENCY FLAP DRIVE CIRCUIT COMPONENTS - MAINTENANCE PRACTICES

1 Removal/Installation Flap Bypass Valve

A General

(1) When removing or installing the flap bypass valve it will be necessary to loosen the adjacent hydraulic tubes by loosening the support clamps and other fittings. This is required to allow some slack in the tubing for removal of the fittings from the bypass valve. At the same time, a container is necessary to catch spilled fluid when disconnecting the hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to "Cleaning and Washing", Chapter 12

B Remove Flap Bypass Valve

(1) Depressurize utility hydraulic system.

(2) Open main gear wheel well door

(3) Remove hydraulic lines as necessary to gain access to bypass valve. (See figure 201.)

(4) Disconnect electrical connector from bypass valve.

(5) Disconnect hydraulic lines from bypass valve.

(6) Remove bolts attaching bypass valve to support bracket and remove bypass valve

C Install Flap Bypass Valve

(1) Install O-ring and union in each port on bypass valve. (See figure 201)

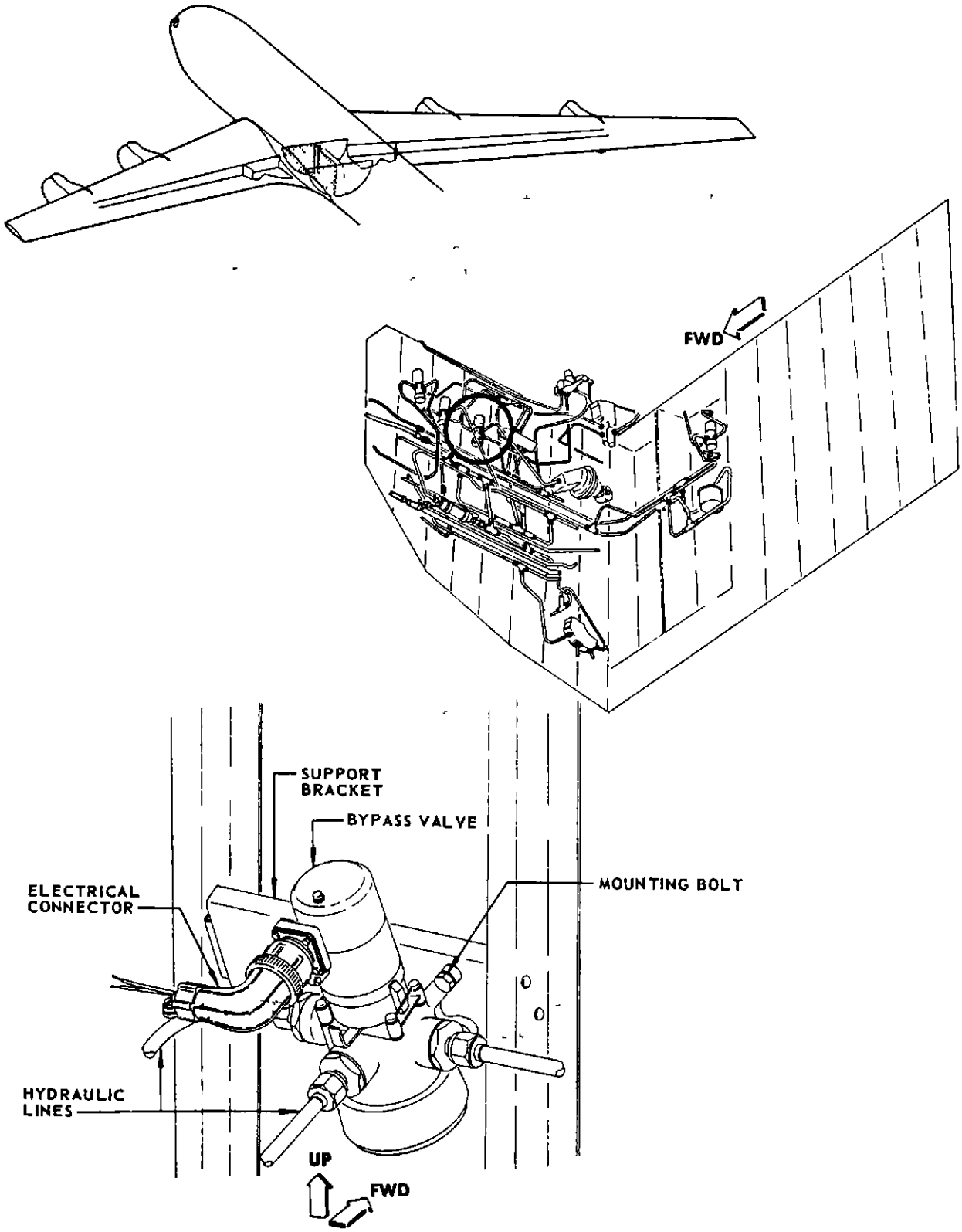
(2) Position bypass valve on support bracket and install mounting bolts.

(3) Connect hydraulic lines to valve.

(4) Connect electrical connector to bypass valve.

(5) Install hydraulic lines that were removed.

(6) Test bypass valve per paragraph 2.A.



Flap Bypass Valve Installation
Figure 201

2. Adjustment/Test Flap Bypass Valve

A. Test Flap Bypass Valve

(1) Connect electrical power to airplane.

(2) Open main gear wheel well doors.

(3) Pressurize the utility hydraulic system.

(4) Close flap motor control circuit breakers on radio and T-R circuit breaker panel (P5).

(5) Position emergency flap drive switch to "ON".

(6) Position flap control lever to "DOWN" and check that flaps do not extend.

(7) Position emergency flap drive switch to "OFF", and check that flaps extend

(8) Position flap control lever to "UP"

(9) Check bypass valve for leaks.

(10) Disconnect hydraulic pressure source and electrical power.

3. Removal/Installation Emergency Flap Limit Switch

A. Remove Emergency Flap Limit Switch

(1) Open main gear wheel well door.

(2) Disconnect electrical connector from emergency flap drive unit.

CAUTION: IF ELECTRICAL CONNECTOR IS NOT DISCONNECTED, EMERGENCY DRIVE UNIT MAY BE OPERATED ACCIDENTALLY CAUSING DAMAGE TO FLAP DRIVE SYSTEM DURING LIMIT SWITCH REMOVAL.

(3) Remove wire bundle retaining straps.

(4) Disconnect splice on emergency flap limit switch electrical leads

(5) Pull electrical leads out of wire bundles.

(6) Remove lower check nut from limit switch and remove switch from support bracket (See figure 202)

B. Install Emergency Flap Limit Switch

(1) Position limit switch in support bracket and install lower checknut. (See figure 202.)

(2) Thread electrical leads through wire bundles and install splices.

(3) Connect electrical connector to emergency flap drive unit.

(4) Adjust switch per paragraph 4.A.

4 Adjustment/Test Emergency Flap Limit Switch

A Equipment and Materials

(1) Control Surfaces Protractor Assembly - F52485-500, or equivalent

(2) Protractor Clamp Assembly - F71292-16, or equivalent

B. Adjust Emergency Flap System Limit Switches

(1) Pressurize utility hydraulic system.

(2) Install control surfaces protractor assembly. Zero protractor.

(3) Position wing flaps at 1/2° to 1°.

(4) Adjust up limit switch on inboard flap control valve down toward switch actuator arm until switch actuates.

(5) Adjust switch away from arm until it snaps second time and tighten checknut to secure switch.

(6) Position flap control lever to 0° detent.

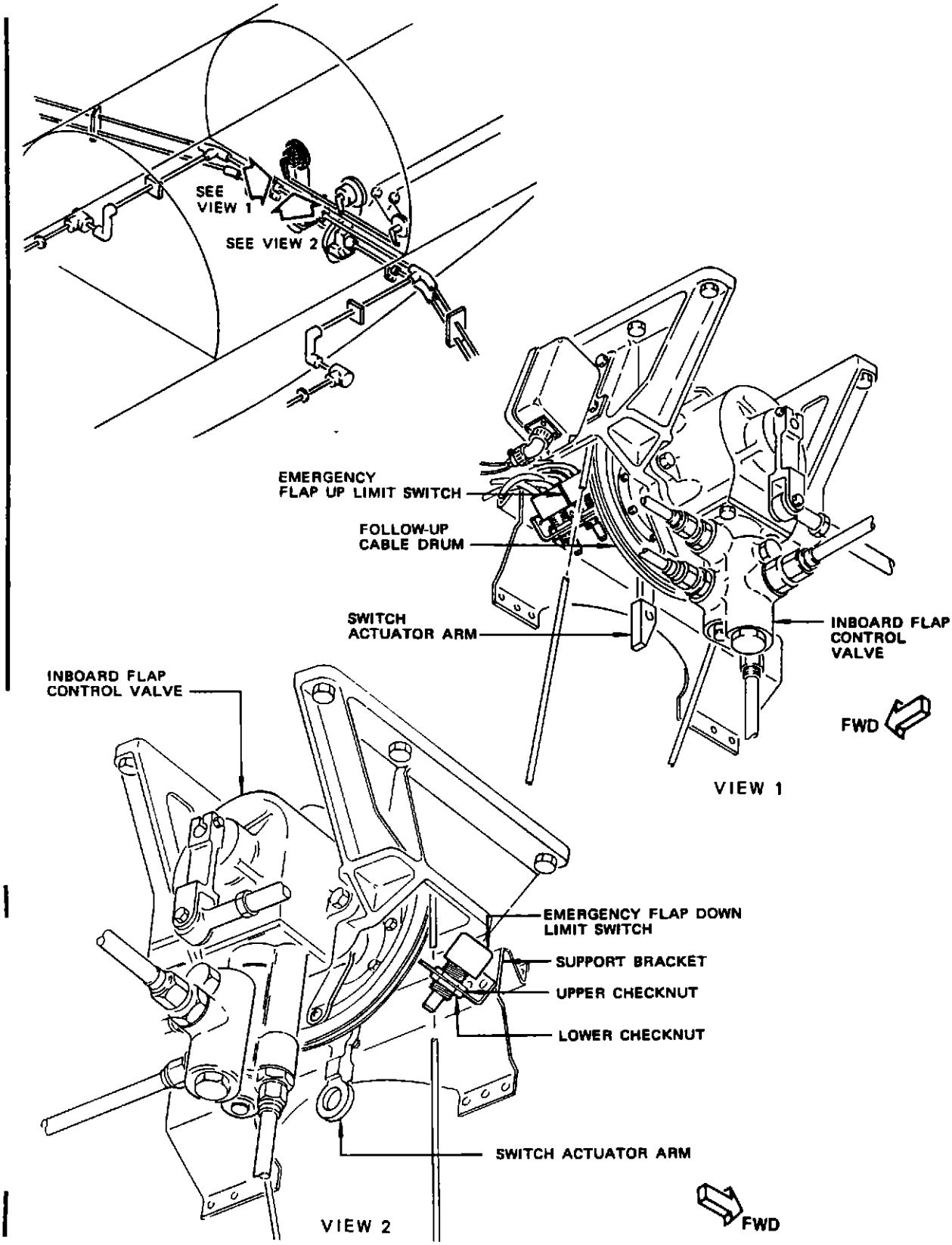
(7) Adjust up limit switch on outboard flap control valve down toward switch actuator arm until switch actuates and tighten checknuts.

(8) Extend wing flaps to 49° (+1°/-0°).

(9) Adjust down limit switches on each flap control valve to actuate and tighten checknut.

(10) Retract flaps.

(11) Test emergency flap limit switch.



Emergency Flap Limit Switch Installation
Figure 202

C. Test Emergency Flap System Limit Switches

(1) Connect electric power source to airplane.

(2) Position emergency flap control switch to ON

(3) Position flap control lever to DOWN Flaps shall not move.

(4) Position emergency inboard and outboard flap switches to DOWN.

(5) Check that trailing edge flaps extend 49° to 50°.

(6) Check that angular distance between down stop dogs on inboard and outboard flap transmission assemblies is not less than 1/4 turn of jackscrew.

(7) Position flap control lever to UP. Flaps shall not move

(8) Position inboard and outboard emergency flap switches to UP.

(9) Check that outboard flaps retract to within 1/4 inch of wing chord plane. It is not required that inboard flap retract to wing chord plane since inboard flap up limit switch is adjusted to actuate with inboard flap extended 1/2° to 1°.

CAUTION: THE EMERGENCY FLAP SYSTEM IS LIMITED TO ONE COMPLETE EXTENSION AND RETRACTION, THEN 27 MINUTES OF NONOPERATION.

(10) Position emergency flap switch to OFF.

(11) Unlatch and lower cove lip doors

(12) Check that angular clearance between up stop dogs on jackscrew and ball bearing nut is 45° to 180° on outboard flap transmission assemblies and not less than 45° on inboard flap transmission assemblies.

(13) Raise and latch cove lip doors.

(14) Disconnect electric power source.

(15) Remove control surfaces protractor assembly.

EMERGENCY FLAP DRIVE UNITS - MAINTENANCE PRACTICES

1. Removal/Installation Inboard and Fillet Flap Emergency Drive Unit

A. Remove Inboard and Fillet Flap Emergency Drive Unit

(1) Open left main gear wheel well door.

(2) Disconnect electrical connector from inboard and fillet flap emergency drive unit (See figure 201.)

(3) Remove mounting bolts and remove emergency drive unit.

B Install Inboard and Fillet Flap Emergency Drive Unit

(1) Position emergency drive unit on emergency flap drive power unit and install mounting bolts. (See figure 201.)

(2) Connect electrical connector to emergency drive unit.

(3) Connect electrical power to aircraft.

(4) Close emergency flap motor inboard control circuit breaker on radio and T-R circuit breaker panel (P5).

(5) Close emergency flap motor inboard circuit breaker on 115 volt ac circuit breaker panel (P4)

(6) Position emergency flap control switch to ON.

(7) Position emergency flap inboard switch to DOWN

(8) Check that inboard flap extends in 1-1/2 to 3-1/2 minutes.

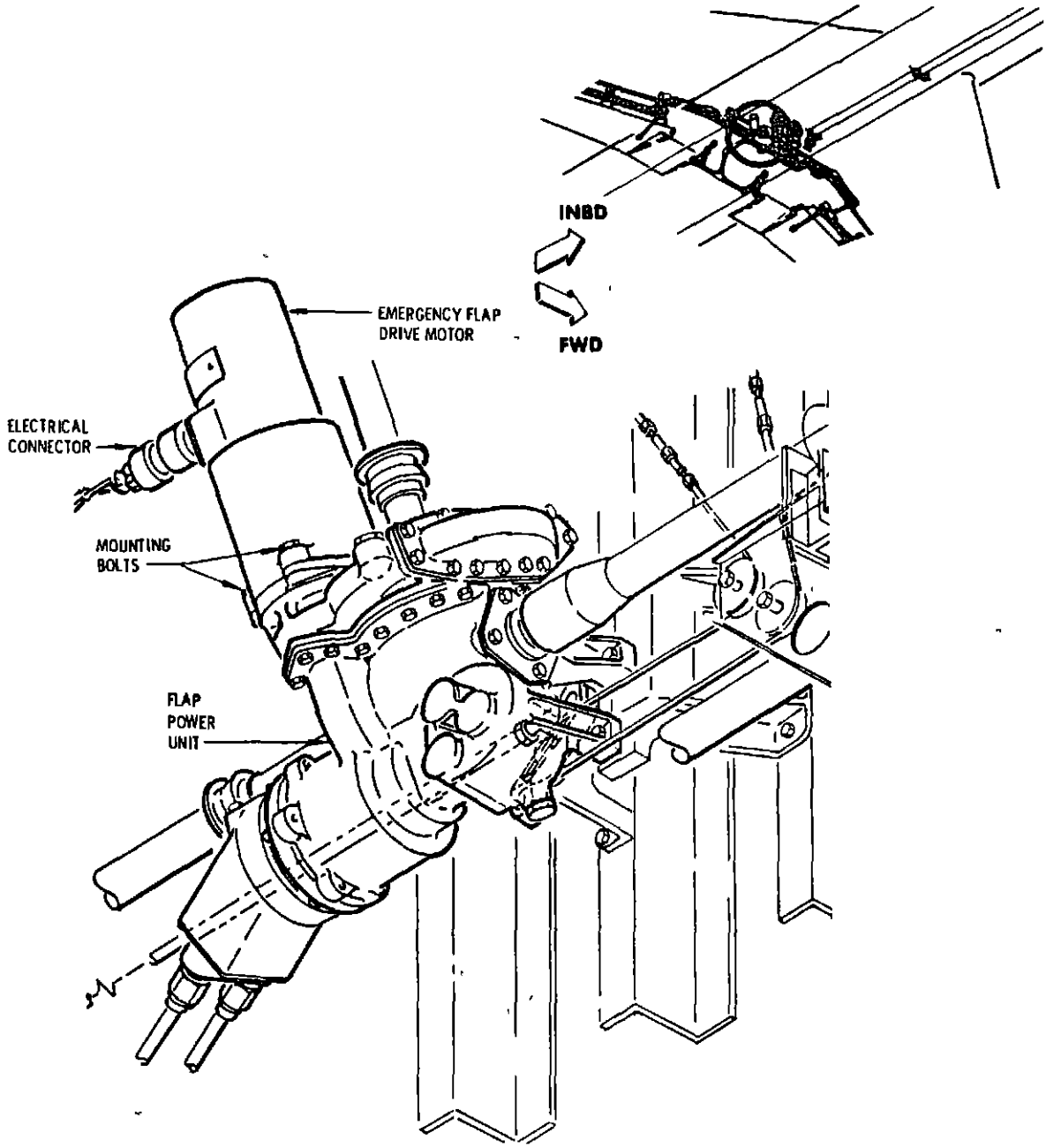
CAUTION. FOR GROUND OPERATION, THE EMERGENCY FLAP SYSTEM IS LIMITED TO A DUTY CYCLE OF ONE COMPLETE EXTENSION AND RETRACTION, THEN 27 MINUTES OF NONOPERATION.

(9) Wait 30 seconds and position emergency flap motor inboard switch to UP.

(10) Check that flap retraction time is 1-1/2 to 3-1/2 minutes.

(11) Return emergency flap control switch to OFF.

CAUTION. IF HYDRAULIC POWER IS AVAILABLE, THE EMERGENCY FLAP DRIVE SWITCH (GUARDED SWITCH) SHALL NOT BE SWITCHED TO OFF UNTIL AFTER EMERGENCY FLAP SWITCHES HAVE BEEN OFF FOR A MINIMUM OF 6 SECONDS AND FLAP CONTROL LEVER IS AT THE ACTUAL POSITION OF THE FLAP.



Inboard and Fillet Flap Emergency Drive Unit Installation
Figure 201

(12) Disconnect electrical power.

(13) Close left main gear wheel well door.

2. Removal/Installation Outboard Flap Emergency Flap Drive Unit

A. Remove Outboard Flap Emergency Flap Drive Unit

(1) Open left main gear wheel well door.

(2) Disconnect electrical connector from emergency flap drive unit. (See figure 202.)

(3) Disconnect torque tubes from each side of emergency drive unit.

(4) Remove mounting bolts and remove emergency drive unit.

B. Install Outboard Flap Emergency Flap Drive Unit

(1) Position emergency drive unit on support bracket and install mounting bolts. (See figure 202.)

(2) Remove cap from side of emergency drive unit. Secure 7/16-inch hex fitting with wrench and rotate spline coupling with torque wrench. Check that torque limiter releases when 1000 to 1300 pound-inches of torque is applied to couplings. Rotate torque tubes in opposite direction to re-engage torque limiter.

(3) Install cap on side of emergency flap drive unit.

(4) Connect torque tubes to emergency drive unit spline couplings. Install coupling retaining screws and lockwire screw heads together.

(5) Connect electrical connector to emergency drive unit.

(6) Connect electrical power to aircraft.

(7) Close flap motor outboard control circuit breaker on radio and T-R circuit breaker panel (P5).

(8) Close emergency flap motor outboard circuit breaker on 115 volt ac circuit breaker panel (P1)

(9) Position emergency flap control switch to ON.

(10) Position emergency flap outboard switch to DOWN.

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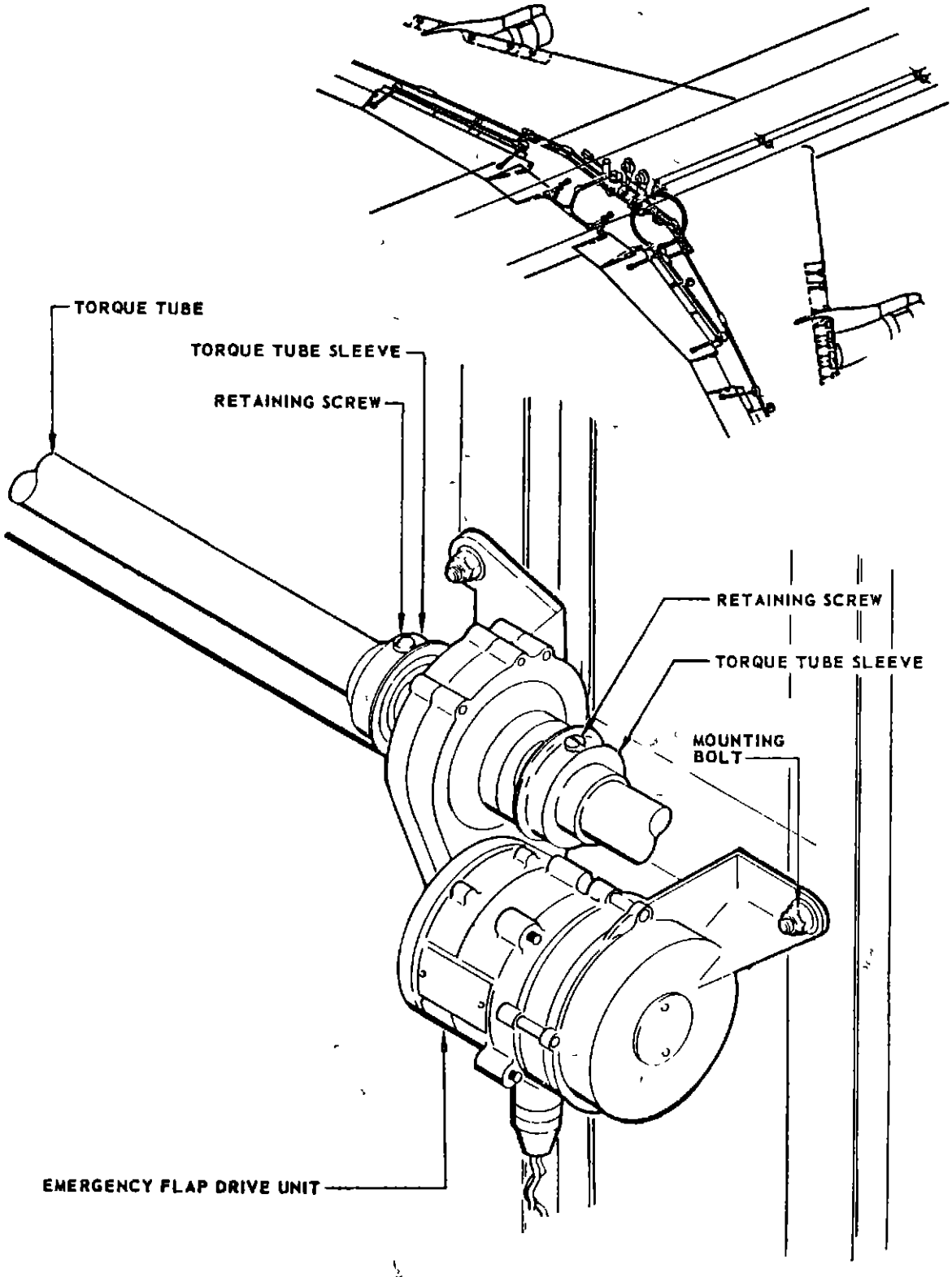


Emergency Flap Drive Unit Installation
Figure 202

(10) Hold elevator 2 (± 1/4) degrees down and adjust length of crank pushrod (8) until mounting bolt fits freely.

(11) Install crank pushrod and tighten checknut.

CAUTION: INSTALL BOLT WITH HEAD INBOARD TO PREVENT INTERFERENCE.

(12) Check that tab aligns with elevator within 1/8 inch.

(13) Remove all rigging pins.

(14) Test elevator follow-up motion per 27-7-0, Test Elevator Follow-up Motion.

(15) Replace access panels.

4. Removal/Installation Elevator Tab Control Torque Tube

A. Equipment and Materials

(1) Steel scale - 0 to 2 feet graduated in inches and sixteenths

(2) Aeroshell Grease 17.

(3) Rigging pin MS20392-4, or equivalent

B. Remove Elevator Tab Control Torque Tube

(1) Remove elevator access panels 1606, 1609, 1612, 1614 and 1629. See Chapter 12, Access Doors and Panels.

(2) Remove torque tube pushrod (9, figure 204) by removing bolts in follow-up crank (5) and inboard torque tube crank (3).

(3) Remove control tab pushrod (16) by disconnecting from torque tube outboard crank (15) and from control tab.

(4) Remove outboard torque tube crank (15) by removing crank retaining bolt (11) and thrust bolt (13) and sliding crank off torque tube.

(5) Remove torque tube outboard bearing housing (17) by removing four bolts and sliding housing and bearing off torque tube.

(6) Remove inboard support fitting (4) by removing two fitting bolts (7).

(7) Slide torque tube (1) outboard until it contacts structure.

(8) Remove torque tube inboard crank (3) by removing crank retaining bolt (2) and sliding crank off torque tube.

(9) Slide torque tube inboard support assembly (4) off torque tube and remove from airplane.

(10) Slide torque tube inboard until it contacts structure.

(11) Lower outboard end of torque tube through access opening and remove from airplane.

C. Install Elevator Control Tab Torque Tube

(1) Place torque tube assembly (11, figure 202) in elevator with correct end outboard as marked and note dash number of part number. Torque tubes for right and left elevator differ with respect to position of bolt slots on inboard spline.

(2) Slide torque tube outboard until structure is contacted.

(3) Slide inboard support fitting (4, figure 204) on end of torque tube.

(4) Install support fitting on elevator structure by means of two bolts (7).

(5) Install torque tube inboard crank (3) over spline so that mounting bolt hole is aligned with slot. Torque nut on mounting bolt not over 70 inch-pounds.

(6) Slide bearing and bearing housing (17) over outboard end of torque tube.

(7) Install bearing housing by means of four housing mounting bolts (12).

(8) Install outboard crank (15) on torque tube by aligning slot in spline with mounting bolt hole in crank.

(9) Install torque tube crank retaining bolt and nut (11) and thrust bolt with washer (14). Torque nuts on crank retaining bolts to eliminate backlash in spline joint. Do not exceed 70 pound-inches on retaining bolt nut to avoid damaging crank.

(10) Install torque tube pushrod (9) connecting to torque tube inboard crank (3) and follow-up crank (8).

CAUTION. INSTALL BOLTS WITH HEAD INBOARD TO PREVENT INTERFERENCE.

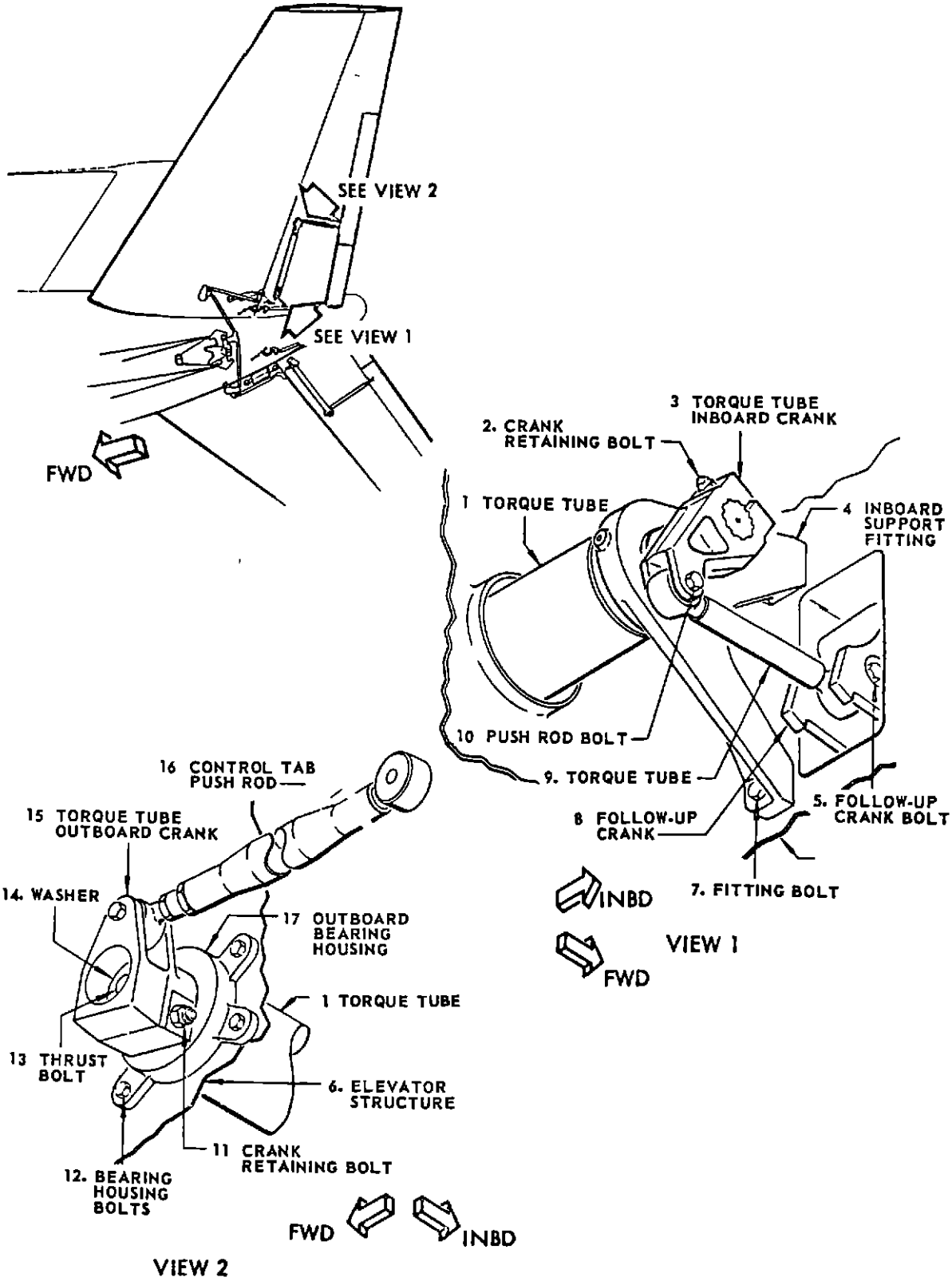
(11) Set stabilizer jackscrew dimension "A" at 26-7/16 (± 3/32) inches.

CAUTION. DO NOT OPERATE STABILIZER WITH RIGGING PINS INSTALLED.

(12) Install rigging pin in follow-up crank.

(13) Hold elevator down 2° (± 1/4°) from stabilizer while adjusting rods and tab.

(14) Install control tab pushrod (13) with adjustable end forward. Adjust length of control tab pushrod until elevator control tab (1) is in faired position within ± 1/8 inch. Use 2 foot steel scale or equivalent as straight edge to check alignment of elevator and tab.



Elevator Tab Control Torque Tube Installation
Figure 204

(15) Lubricate torque tube support bearings.

(16) Remove all rigging pins and clamps.

(17) Move control column forward and aft slowly several times and check torque tube and connecting pushrods for proper operation.

(18) Install all access panels.

5. Removal/Installation Elevator Centering Spring Linkage

A. Equipment

(1) Spring scale - 0 to 25 pounds

(2) Rigging pin MS20392-4 or AN5 bolt

B. Remove Elevator Centering Spring Linkage

(1) Remove tail cone access panels 1076 or 1188. See Chapter 12, "Access Doors and Panels."

(2) To facilitate access to centering spring turnbuckle position stabilizer leading edge down until lower jackscrew gearbox stops contact.

(3) Loosen centering spring turnbuckle (5, figure 205).

(4) Detach spring terminal (7) from centering crank (9) Rotate centering spring (6) free of turnbuckle and remove from airplane.

(5) Detach centering spring nuts (2) from quadrant crank (3).

(6) Remove cotter pin and safety pin. Remove centering crank mounting bolt (10) and slide crank free. Remove crank and cable assembly from airplane.

. Install Elevator Centering Spring Linkage

(1) Install centering crank (9, figure 205) with mounting bolt (10). Install upside down bolt protection safety pin and cotter pin.

(2) Install centering cables (1), centering spring nuts (2), check nuts and cable retainers (4).

(3) Attach spring terminal (7) to centering crank.

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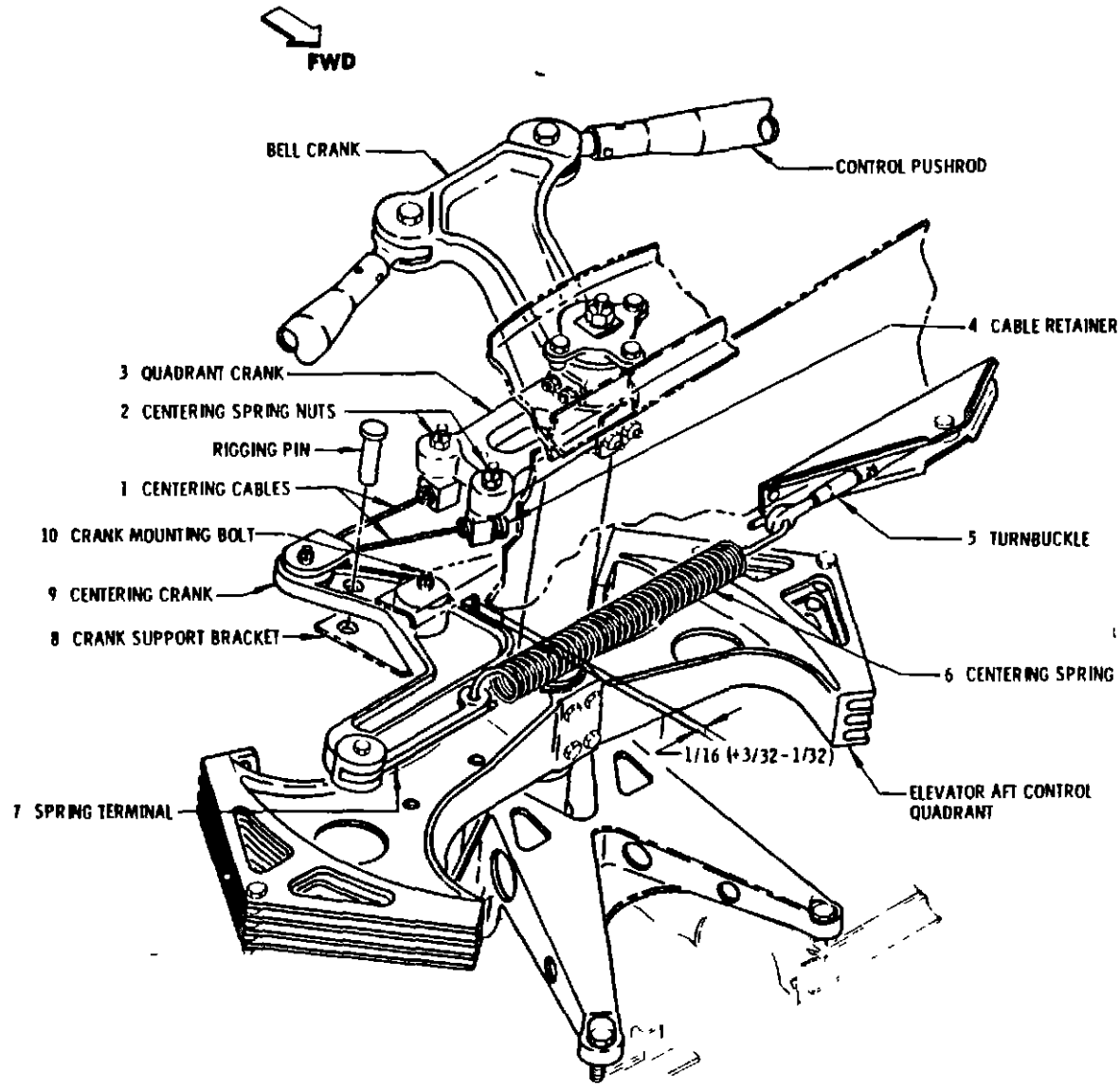

FWD
BELL CRANK
CONTROL PUSHROD
4 CABLE RETAINER
3 QUADRANT CRANK
2 CENTERING SPRING NUTS
RIGGING PIN
1 CENTERING CABLES
10 CRANK MOUNTING BOLT
5 TURNBUCKLE
9 CENTERING CRANK
8 CRANK SUPPORT BRACKET
6 CENTERING SPRING
1/16 (+3/32 - 1/32)
ELEVATOR AFT CONTROL QUADRANT
7 SPRING TERMINAL

D E L E T E D

C. Adjust Centering Spring Linkage.

(1) Remove centering spring (6, figure 205 or 205A) from airplane.

(2) Measure length of spring with a 16.0 (± 1.0) pound tension load applied to the spring. Use spring scale to apply load.

(3) Install centering spring in airplane.

(4) Install rigging pin in elevator aft control quadrant (figure 203) and through centering spring crank (9) and crank support bracket (8).

(5) Adjust turnbuckle (5) until the spring length determined in step (2) is established within 1/32 inch.

(6) Adjust one centering cable (1) by adjusting cable retainer (4) until rigging pin through crank (9) and bracket (8) can be easily removed.

(7) Lockwire turnbuckle (5).

(8) Adjust remaining cable (1) by adjusting cable retainer (4) until rigging pin in aft control quadrant can be easily removed and rigging pin can be easily reinstalled through centering spring crank (9) and crank support bracket (8).

(9) Repeat step (8) until rigging pin conditions are met.

(10) Remove rigging pins.

(11) Test elevator centering spring linkage per paragraph D

(12) Install lock wires and access panels.

D. Test Elevator Centering Spring Linkage

(1) Push elevator control column forward until stops are contacted, then release. Control column should return to neutral position (± 2°).

(2) Pull elevator control column aft until stops are contacted, then release. Control column should return to neutral position (± 2°).

ELEVATOR SNUBBER ASSEMBLY - MAINTENANCE PRACTICES

1. Unit Servicing Snubber Assembly

   A. Equipment and Materials

      (1) Bleed cup as shown on figure 201.

      (2) Two reducers for ports "A" and "B" as shown on figure 201 (Use AN919-1 reducer and drill 11/64 inch dia hole through.)

      (3) Hydraulic Fluid, MIL-H-5606 or equivalent.

   B. Replenish Snubber with Hydraulic Fluid

      NOTE: Do not apply compressed air to ports at any time. Test shall be conducted at room temperature.

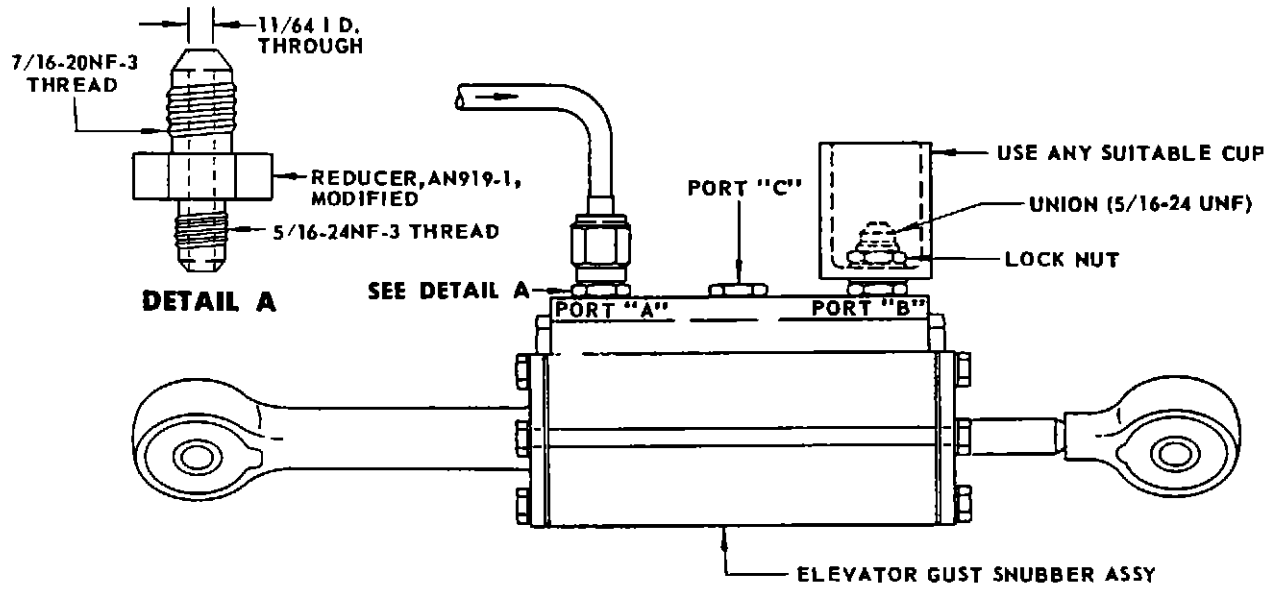
      (1) Remove snubber assembly.

      (2) Fill and bleed snubber. (See figure 201.)

         (a) Connect port "A" to hydraulic pressure source.

         (b) Replace plug "B" with bleed cup

         (c) With port "C" closed and plugs turned uppermost apply 2 psi to port "A" until bleed cup is filled.



Bleeding Operation
Figure 201

(d) Cycle unit manually through complete strokes until oil shows no visible aeration

NOTE: The end towards which the piston end is moving should be elevated during each half cycle.

(e) Remove bleed cup and plug port "B".

(3) Test reservoir level

(a) With unit in vertical position, reservoir plug up, refill reservoir by applying sufficient hydraulic pressure at port "B" to retract indicator pin.

(b) Remove hose and install plug "B".

(c) Check reservoir level by inserting a depth gage through hole in reservoir plug.

NOTE With indicator pin in its normal position the head bottomed against the plug, the dimension from face of plug to bottom of reservoir piston should be 3 99 to 4 24 inches. Bleed off excess fluid through plug "C".

(4) Cycle the unit manually through several full strokes. Unit must operate smoothly with no tendency to stick or bind. After initial breakaway, maximum force required just sufficient to maintain motion shall not exceed 14 pounds at midtravel of the snubber. No measure of force shall be taken when piston is within 1/2 inch of fully extended or fully retracted position.

NOTE: A cycle is defined as one stroke from completely extended to completely retracted and a return stroke to completely extended.

(5) Tighten all plugs. Lockwire using the double twist method.

(6) Install snubber assembly.

2 Removal/Installation Elevator Snubber Assembly

A General

(1) The elevator snubber must be replaced when the end of low fluid indicator pin has been forced out any measurable distance beyond the aft surface of snubber end cap.

B Equipment and Materials

(1) Steel scale - 0 to 2 feet graduated in inches and sixteenths

(2) Protractor Assembly - F52485-500 with Clamp Assembly F71292-16 or equivalent

(3) Corrosion Preventative Compound, MIL-C-11796A, Grade 3

(4) Grease Gun with Aeroshell Grease 17.

(5) Cleaning Solvent, P-S-661b, Type I

(6) Torque Wrench - 410 pound-inch capacity

C. Remove Elevator Snubber Assembly

(1) Remove elevator trim tab control access panel 1612 and elevator tab control access panels 1614 and 1629. See Chapter 12, Access Doors and Panels.

(2) Remove snubber assembly mounting bolts (figure 202) at each end of snubber.

(3) Remove elevator snubber assembly from airplane.

D. Install Elevator Snubber Assembly

(1) Position snubber in airplane with head end aft and with grease fitting on head end facing nearest elevator surface.

NOTE: Head end grease fitting will be up on left elevator and down on right elevator for easiest lubrication access.

(a) Install one Warlon washer on each side of snubber piston rod bearing.

(b) Install two Warlon washers on inboard side and one Warlon washer on outboard side of snubber head end bearing.

(2) Install mounting bolts and nuts with washers on each side of bearings and under nuts. Torque nuts between 290 and 410 pound-inches.

(3) Lubricate bearings at both end bearing grease fittings.

(4) Push elevator up slowly by hand until snubber stop is contacted and hold in this position.

(5) Check that the elevator is 23 degrees to 24-1/2 degrees up from faired position. Use protractor and clamp assembly.

(6) Push elevator down by hand until snubber stop is contacted and hold in this position.

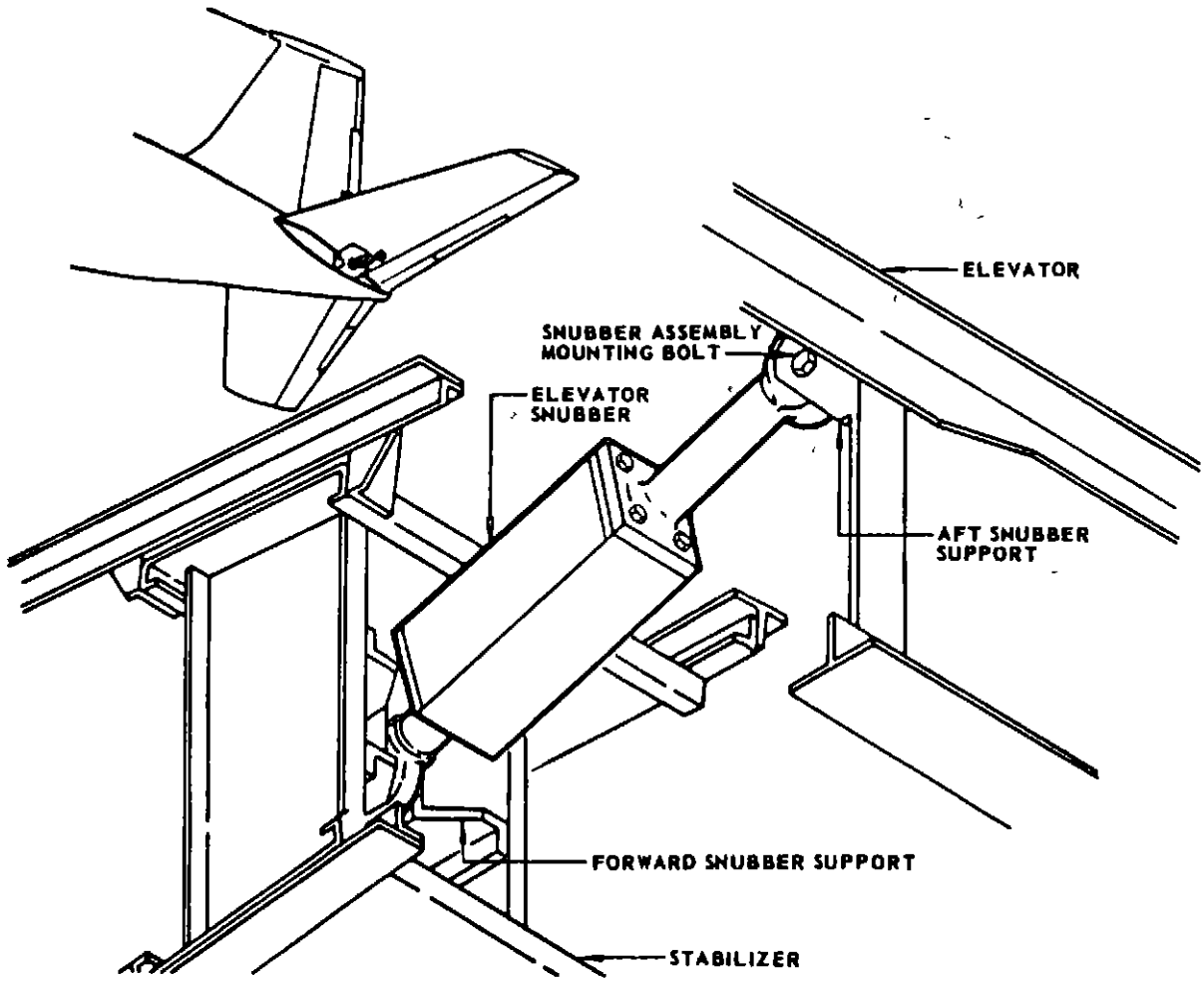
(7) Check that the elevator is 14-1/2° to 16° down from faired position.

(8) If access panels are magnesium:

(a) Remove old corrosion preventative compound from access panel faying surfaces and mounting screws removed in paragraph B. Use cleaning solvent P-S-661b Type 1 and clean cloth.

(b) Apply coat of corrosion preventative compound MIL-C-11796, Grade 3, on faying surfaces of access panels and under heads of all mounting screws removed in paragraph B.

(9) Install all access panels.



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Elevator Snubber Assembly
Figure 202

ELEVATOR FORWARD CONTROL QUADRANT - MAINTENANCE PRACTICES

1. General

A. Elevator forward control quadrants are accessible through the lower nose compartment. Both forward quadrants and the connecting torque tube are removed together as one unit. One pilot's control column must be removed prior to removing the quadrants.

B. Equipment and Materials

(1) Bubble protractor, F52485-500 or equivalent

(2) Aeroshell Grease 7A.

(3) Straightedge about 6 feet long

(4) Rigging pins, MS20392-4

2. Removal/Installation Elevator Forward Control Quadrant

A. Remove Elevator Forward Quadrant

(1) Clamp elevator and elevator control tab in faired position to centralize the control column.

(2) Install rigging pins or AN5 bolts (7, figure 201) in elevator forward and aft control quadrants.

(3) Relieve elevator cable tension by loosening turnbuckles and disconnect cables at forward control quadrant. Tag all cables.

(4) Disconnect electrical wire bundle assembly (3) and remove electrical clamps.

(5) Remove control column.

(a) Remove outboard coupling retaining bolts (9) and coupling retainer (6).

CAUTION. SUPPORT CONTROL COLUMN TO PREVENT IT FROM FALLING AND DAMAGING EQUIPMENT.

(b) Remove ring assembly (11), dust seal (10).

(c) Remove control column (1) through opening.

(6) Remove inboard coupling retaining bolt (4) and inboard coupling retainer (5).
(7) Remove connector (13).
(8) On airplanes equipped with a stabilizer trim brake, disconnect rod assembly (Fig. 202) from fork on elevator quadrant torque tube.
(9) Support quadrant and remove opposite inboard coupling retaining bolts and coupling retainer.
(10) Disconnect stabilizer control cables from forward cable drum (Ref 27-10-31, Remove Forward Mechanism).

NOTE Additional cables may be disconnected to facilitate quadrant removal.

(11) Remove rigging pin (7, Fig. 201) and remove quadrant.

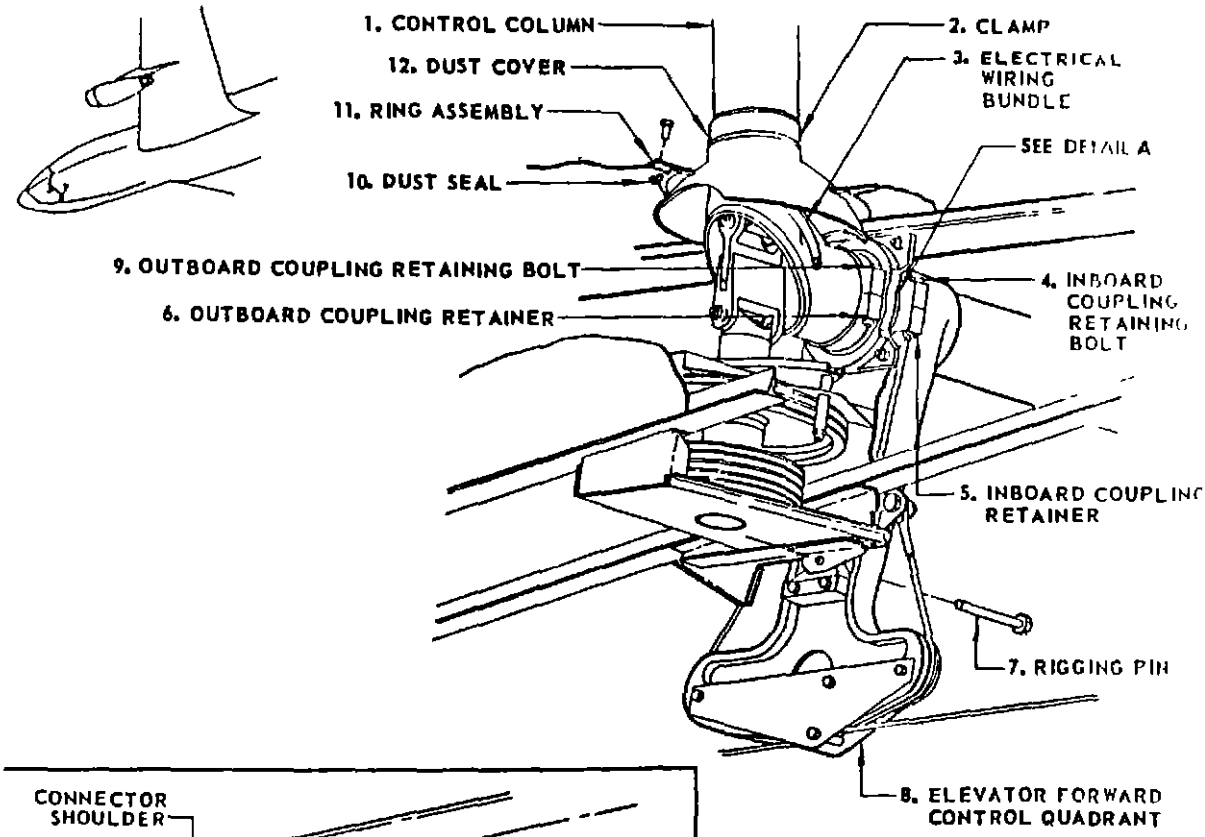
B. Install Forward Elevator Control Quadrant
(1) Apply grease to mating surface of connectors.
(2) Position quadrant and install rigging pin (7, Fig. 201).
(3) At end of quadrant shaft which mates with installed connector position inboard coupling retainer and install coupling retaining bolts. Tighten bolts until gap on each side of retainer is equal Gap should be 1/16 to 9/64 inch.

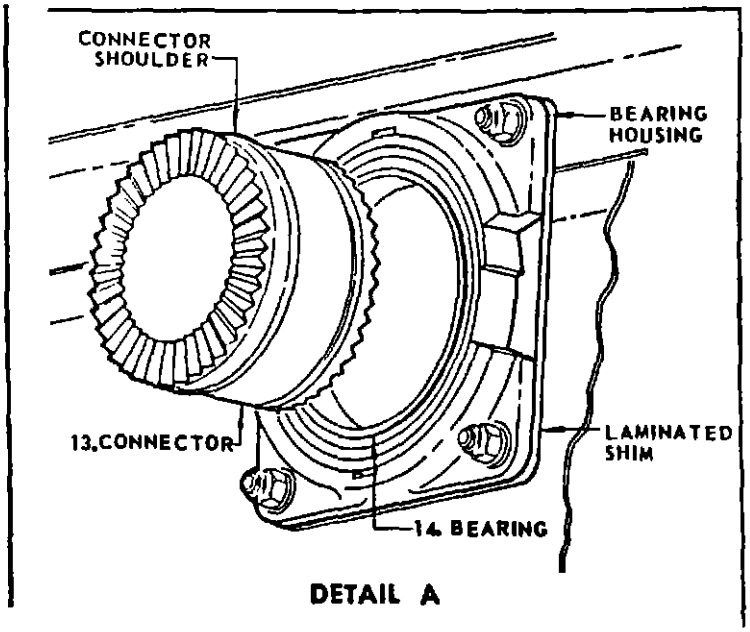
NOTE Check bolt length to ensure that the proper bolts are installed. Improper length bolts can cause interference which prevents achieving full control wheel and control column travel.

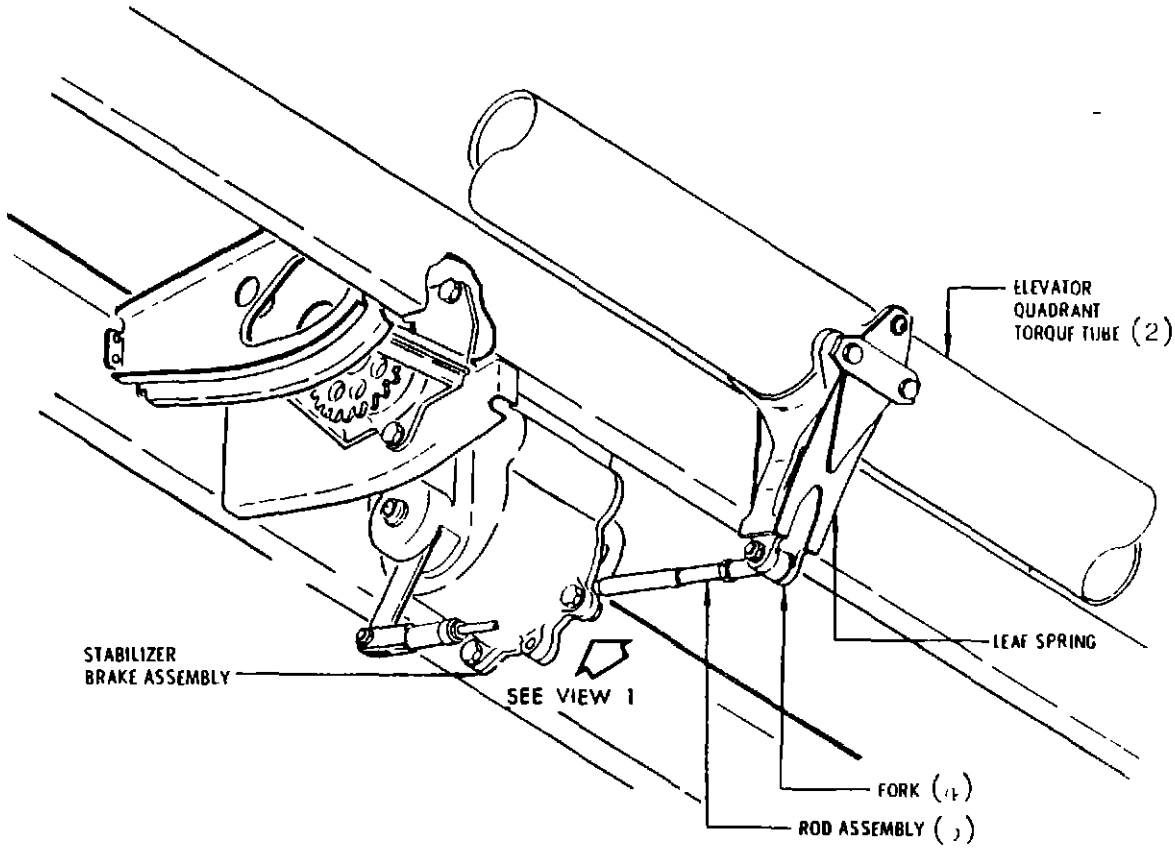
(4) At opposite end of quadrant shaft install connector (13), inboard coupling retainer (5), and coupling retaining bolts.
(5) Tighten bolts until gap on each side of the retainer is equal. Gap should be 1/16 to 9/64 inch.
(6) Check clearance between connector shoulder and bearing (14). Clearance should be 0.01 to 0.03 inch on one side with other connector shoulder against bearing.
(7) Add or remove shims as required to bring connector into desired limits without loading bearing.
(8) Connect cables to elevator control quadrants.
(9) Position control wheel near neutral then lower control column through opening and engage connector.
(10) Position control column at 7 1/2° to 9 1/2° forward of a perpendicular line taken from floor of airplane. Use bubble protractor.
(11) Engage teeth of column and connector (13, Fig. 201).

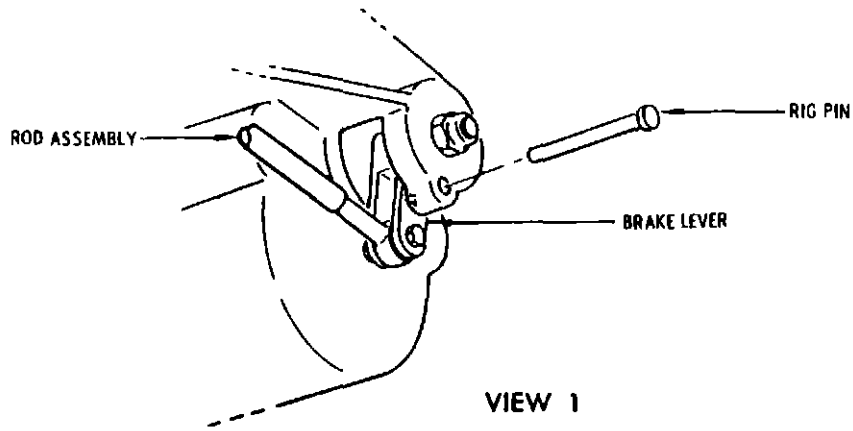
(12) Position coupling and install outboard coupling retaining bolts (9). Tighten bolts until gap on each side is equal. Gap should be 1/16 to 9/64 inch.

(13) Check that control wheels are neutral by placing a straight edge across thumb rests of both wheels.






ELEVATOR QUADRANT TORQUE TUBE (2)
LEAF SPRING
STABILIZER BRAKE ASSEMBLY
SEE VIEW 1
FORK ( )
ROD ASSEMBLY ( )


ROD ASSEMBLY
RIG PIN
BRAKE LEVER

VIEW 1

(14) On airplanes equipped with a stabilizer trim brake, proceed as follows.

(a) Install rigging pin through brake lever on stabilizer brake assembly. (See figure 202.)

WARNING: WITH RIGGING PIN INSTALLED IN BRAKE MECHANISM, DO NOT MOVE ELEVATOR CONTROL COLUMN. IF CONTROL COLUMN IS MOVED 50% OR MORE OF FULL TRAVEL, LEAF SPRINGS ON CONTROL COLUMN TORQUE TUBE WILL BE PERMANENTLY DEFORMED AND MUST BE REPLACED. DEFORMED LEAF SPRINGS MAY CAUSE STABILIZER TRIM SYSTEM JAM.

(b) Connect rod assembly to fork using screw, nut, washer, and cotter pin. If necessary, adjust rod assembly so that rigging pin slides freely without binding. Thread engagement at each rod assembly end shall be equal within 0.05 inch.

(15) Position ring assembly (11, figure 201) and dust seal (10). Install assembly with seal slightly extended upward on dust cover (12) of control column.

NOTE: Dust cover may be adjusted to obtain proper adjustment of seal.

(16) Position clamp (2) with bolt on aft side of control column.

(17) Connect applicable wire to terminals and install electrical wire clamps.

(18) Adjust elevator control cables to specified tension as shown in 27-7-0, figure 202.

(19) Remove rigging pins.

(20) Connect stabilizer control cables to forward cable drum and adjust cables. Refer to 27-10-0, Adjust Stabilizer Trim System.

(21) Remove clamps from elevator and elevator control tab.

(22) Rotate control wheel in both directions and check for about 105- to 110-degree full travel.

(23) Check for full elevator travel per 27-7-0, Test Elevator Motion and Travel.

STABILIZER ACTUATED ELEVATOR TAB MECHANISM - MAINTENANCE PRACTICES

1. Removal/Installation Support Shaft Assembly

A General

(1) The stabilizer must be set so that dimension "A" (see 27-10-0, figure 202) is 37-3/4 (± 3/32) inches. With the stabilizer in position, the elevators must be held faired (within ± 1/4°) so that rigging pins can be installed where necessary.

CAUTION: DO NOT OPERATE STABILIZER OR ELEVATORS WITH RIGGING PIN INSTALLED.

B. Equipment and Materials

(1) Protractor Assembly - F52485-500 with Clamp Assembly F71292-16 or equivalent

(2) Spring Scale 0 to 50 pounds

(3) Cleaning Solvent P-S-661b, Type I

(4) Corrosion Preventative Compound, MIL-C-11796A, Grade 3

C. Remove Support Shaft Assembly

(1) Remove tail cone access panel 1076 or 1188 and access panels 1612, 1614 and 1629. See Chapter 12, Access Doors and Panels.

(2) Install rigging pins through elevator link (16, figure 201) and cam bell crank (9).

(3) Loosen turnbuckle (2) and remove spring (1).

(4) Disconnect support rod (15) from support shaft assembly (3).

(5) Disconnect forward pushrod (8) from outboard crank (6).

(6) Remove nut from inboard end of crank shaft (5) and remove spring crank arm (4).

(7) Replace washer and nut loosely on crank shaft (5).

(8) Remove four mounting bolts (18) and remove support shaft assembly (3) from airplane. Secure two loose radius fillers at aft bolts.

D. Install Support Shaft Assembly

(1) Place support shaft assembly containing crankshaft assembly in airplane.

(2) Install four mounting bolts (18, figure 201) in support shaft asse bly. Install radius fillers under nuts on two aft mounting bolts.

(3) Install spring crank arm (4).

(a) Align arm on crank shaft with missing groove opposite missing spline tooth on shaft.

(b) Place washer under nut on inboard end of crank shaft and install cotter pin in nut.

(4) Connect spring (1) and turnbuckle (2) to spring crank arm (4).

(5) Adjust turnbuckle (2) so that a force of 39 to 49 pounds applied aft at the bolt hole through the clevis on the spring crank arm is required to move the outboard crank (6) away from stop "A" (17). Lockwire turnbuckle after adjustment.

(6) Check that surfaces are positioned as in step A.(1) and adjust forward pushrod (8) length so that rigging pin fits easily through cam bell crank. Tighten check nut after adjustment and connect pushrod to outboard crank (6).

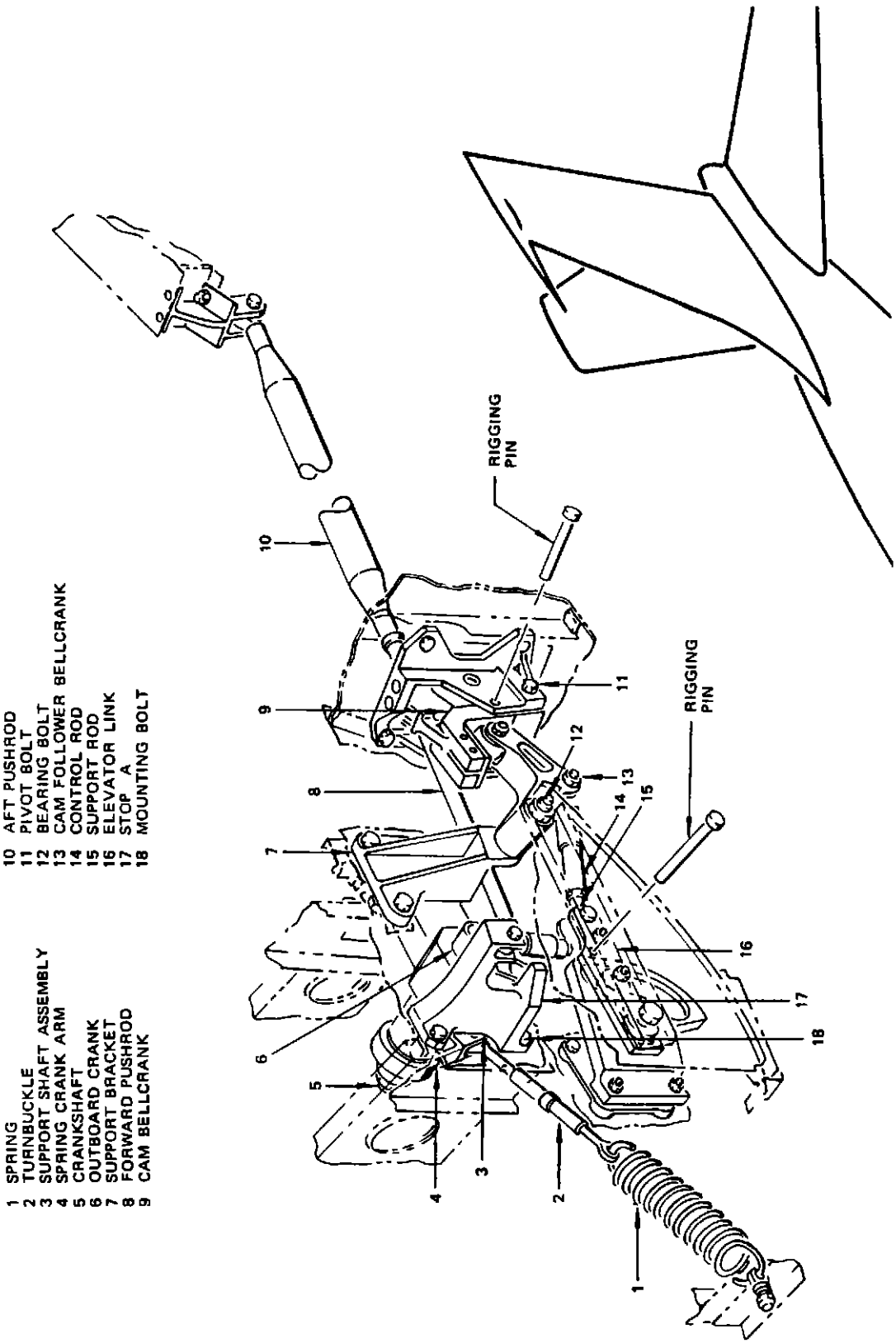
NOTE. Outboard crank (6) will remain against stop. To maintain 3° (± 30') angle of the stabilizer actuated tab and to meet test requirements a 0.010 to 0.200 inch shim may be bonded to stop "A" (17) where the outboard crank (6) contacts the stop. Use shim only if required to meet test requirements.

(7) Adjust support rod length so that rigging pin fits easily in elevator link (16). Tighten check nut after adjustment and connect support rod (15) to support shaft assembly (3).

(8) Remove rigging pins through cam bell crank (9) and elevator link (16).

(9) Test mechanism per 27-7-0, "Test Stabilizer Actuated Elevator Tab Motion."

(10) Replace all access panels.



Stabilizer Actuated Elevator Tab Mechanism Installation
Figure 201

2 Removal/Installation Cam Follower Bell Crank

A. General

(1) The stabilizer must be set so that dimension A (see 27-10-0, figure 202) is 37-3/4 (± 3/32) inches With the stabilizer in position, the elevators must be held faired (within 1/4 degree up and 1/4 degree down) so the rigging pins can be installed where required.

CAUTION. DO NOT OPERATE STABILIZER OR ELEVATORS WITH RIGGING PINS INSTALLED.

B. Special Tools and Materials

(1) Protractor Assembly - F52485-500 and Clamp Assembly F71292-16 or equivalent

(2) Cleaning Solvent P-S-661b, Type 1

(3) Corrosion Preventative Compound, MIL-C-11696A, Grade 3

(4) Aeroshell Grease 17.

C. Remove Cam Follower Bell Crank

(1) Remove access panels 1614 and 1629. See Chapter 12, Access Doors and Panels.

(2) Install rigging pin through elevator link (16, figure 201).

(3) Disconnect control rod (14) from cam follower bell crank (13).

(4) Remove nut from bearing bolt (12).

(5) Remove cam follower bell crank (13), bearing, spacer, and bearing bolt from support bracket (7).

D. Install Cam Follower Bell Crank

(1) Place bearing bolt (12, figure 201) in support bracket (7), and position cam follower bell crank (13), spacer, and bearing on bolt.

NOTE: Bearing and spacer can be aligned on short dowel if required.

(2) Install washer and nut on bearing bolt (12) and secure with cotter pin.

(3) Connect control rod (14) to cam follower bell crank (13).

(4) Remove rigging pins.

(5) Position stabilizer so that dimension "A" is 34-13/32 (± 3/32) inches. Hold elevator at 4° (± 1/2°) up.

CAUTION DO NOT OPERATE STABILIZER OR ELEVATOR WITH RIGGING PINS INSTALLED.

(6) With surfaces positioned per step (5), adjust the length of control rod (14) so that cam roller is 0.001 (0.001 to 0.020) inches from contacting the cam surface of cam bell crank (9) Tighten checknut after adjustment.

(7) Test tab mechanism per 27-7-0, Test Stabilizer Actuated Elevator Tab Motion.

(8) Replace all access panels.

3. Removal/Installation Cam Bell Crank

A. General

(1) The stabilizer must be set so that dimension "A" (see 27-10-0, figure 202) is 37-3/4 (± 3/32) inches. Hold the elevators faired (within ± 1/4°) so that rigging pins can be installed where required.

CAUTION. DO NOT OPERATE STABILIZER OR ELEVATOR WITH RIGGING PINS INSTALLED.

B Equipment and Materials

(1) Protractor Assembly - F52485-500 and Clamp Assembly F71292-16 or equivalent

(2) Cleaning Solvent P-S-661b, Type I

(3) Corrosion Preventative Compound, MIL-C-11696A, Grade 3

C Remove Cam Bell Crank

(1) Remove access panels 1612, 1614 and 1629. See Chapter 12, Access Doors and Panels.

(2) Install rigging pin through cam bell crank (9, figure 201)

(3) Disconnect forward end of forward pushrod (8) from outboard crank (6)

(4) Disconnect aft pushrod at cam bell crank (10).

(5) Remove cotter pin, nut, and washer from pivot bolt (11).

(6) Remove rigging pin and remove cam bell crank (9) by pulling pivot bolt (11).

NOTE. The forward pushrod (8) will remain attached to the cam bell crank. A bushing, a bearing, and a spacer are released when the bell crank is removed.

D. Install Cam Bell Crank

(1) Place cam bell crank in position in airplane

(a) Align spacer and bearing within bell crank by a wood dowel.

(b) Place bushing in support bracket.

(c) Install pivot bolt (11, figure 201) and drive out dowel.

(2) Attach washer, nut, and cotter pin to pivot bolt (11).

(3) Insert rigging pin in cam bell crank.

(4) Check that surfaces are positioned as in step A.(1) and adjust forward pushrod (8) so that rigging pin fits easily in cam bell crank. Tighten check nut after adjustment and connect forward pushrod to outboard crank (6).

(5) Attach aft pushrod (10) to cam bell crank.

(a) Check that surfaces are positioned as in step A.(1) and check that rigging pin is installed in cam bell crank.

(b) Adjust length of aft pushrod so that stabilizer actuated elevator tab is up 3° (± 1/2°) with respect to the elevator.

(c) Tighten check nut after adjustment and connect aft pushrod (10) to cam bell crank (9).

(6) Remove rigging pins.

(7) Test tab per 27-7-0, "Test Stabilizer Actuated Elevator Tab Motion."

(8) Replace all access panels.

ELEVATOR BALANCE PANEL LINKAGE - REMOVAL/INSTALLATION

1. General

   A. Elevator balance panel linkage is mounted inside stabilizer trailing edge ribs. Access panels both outboard and inboard of the trailing edge rib must be removed prior to removal of any balance panel linkage.

   B. The following procedure applies to balance panel linkages at all elevator balance panels.

2. Equipment and Materials

   A. Corrosion preventative compound, MIL-C-11796A, Grade 3

   B. Cleaning solvent P-S-661b

3. Remove Elevator Balance Panel Linkage

   A. Remove balance bay access panels 1624 through 1628 and 1615 as required. See Access Doors and Panels, Chapter 12.

   B. Remove balance panel attached to linkage. See Remove Elevator Balance Panel, 27-7-31.

   C. Remove web cover (figure 401) and reinforcing channel by removing all retaining screws.

   D. Remove nuts from linkage mounting bolts and withdraw bolts from inboard side of trailing edge rib.

   E. Pull balance panel linkage free of stabilizer.

4. Prepare for Installation

   A. Assemble balance panel parallelogram linkage before installing it in stabilizer.

      NOTE: Cotter pins through nuts and bolts should be bent parallel to the bolt threads, not over the ends of the nut and bolt, to prevent the cotter pin from rubbing on the rub strips.

      Maintain a 0.010 inch minimum clearance between bolt and adjacent structure on 00-SJM and on. (See figure 401, detail A)

5. Install Elevator Balance Panel Linkage

A. Slide assembled linkage into position and install two mounting bolts through cutouts in inboard web of trailing edge rib. Check that washers are in place on each side of linkage arms.

B. Reinstall web cover and reinforcing channel.

CAUTION: SCREWS WITHIN AREA BOUNDED BY RED LINES ON WEB COVER MUST BE NAS517-3-0 TO AVOID INTERFERENCE WITH BALANCE PANEL LINKAGE

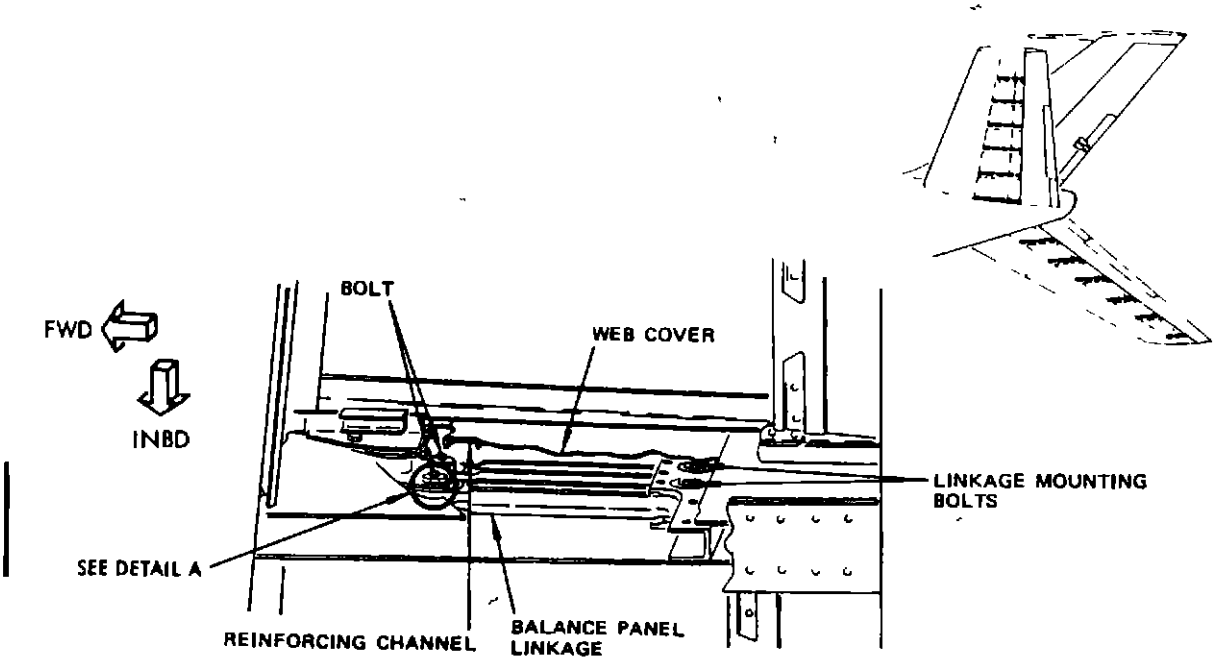
C. Install balance panel. See Install Elevator Balance Panels, 27-7-31.

D. If balance bay access panels are magnesium

(1) Clean access panel faying surfaces and mounting screws with cleaning solvent.

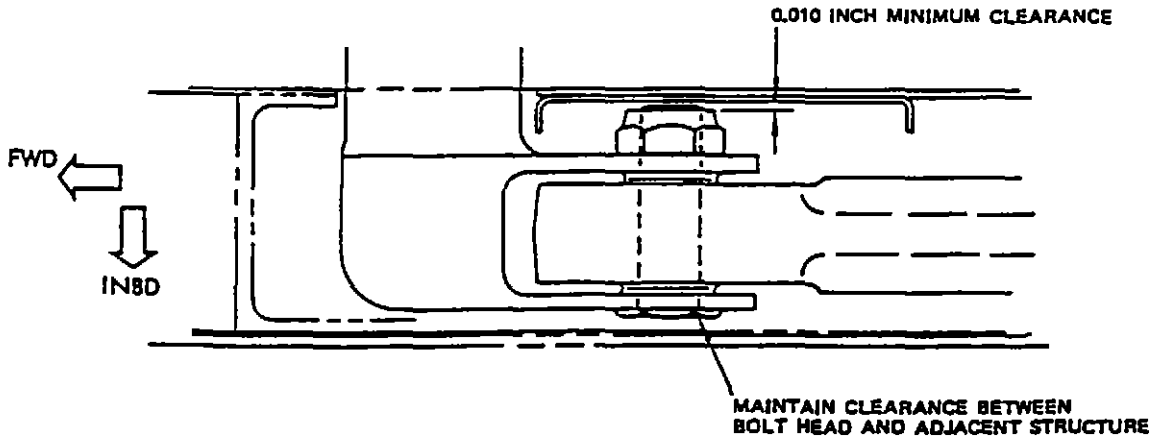
(2) Cover faying surfaces and heads of mounting screws with corrosion preventative compound.

E. Install balance bay access panels.



Elevator Balance Panel Linkage Installation
Figure 401 (Sheet 1)

EFFECTIVITY	
TCA	LX-N20198
	LX-N20199
RTCA	LX-N19997
	LX-N20000



DETAIL A

SAB. 707/390

STABILIZER TRIM SYSTEM - DESCRIPTION AND OPERATION

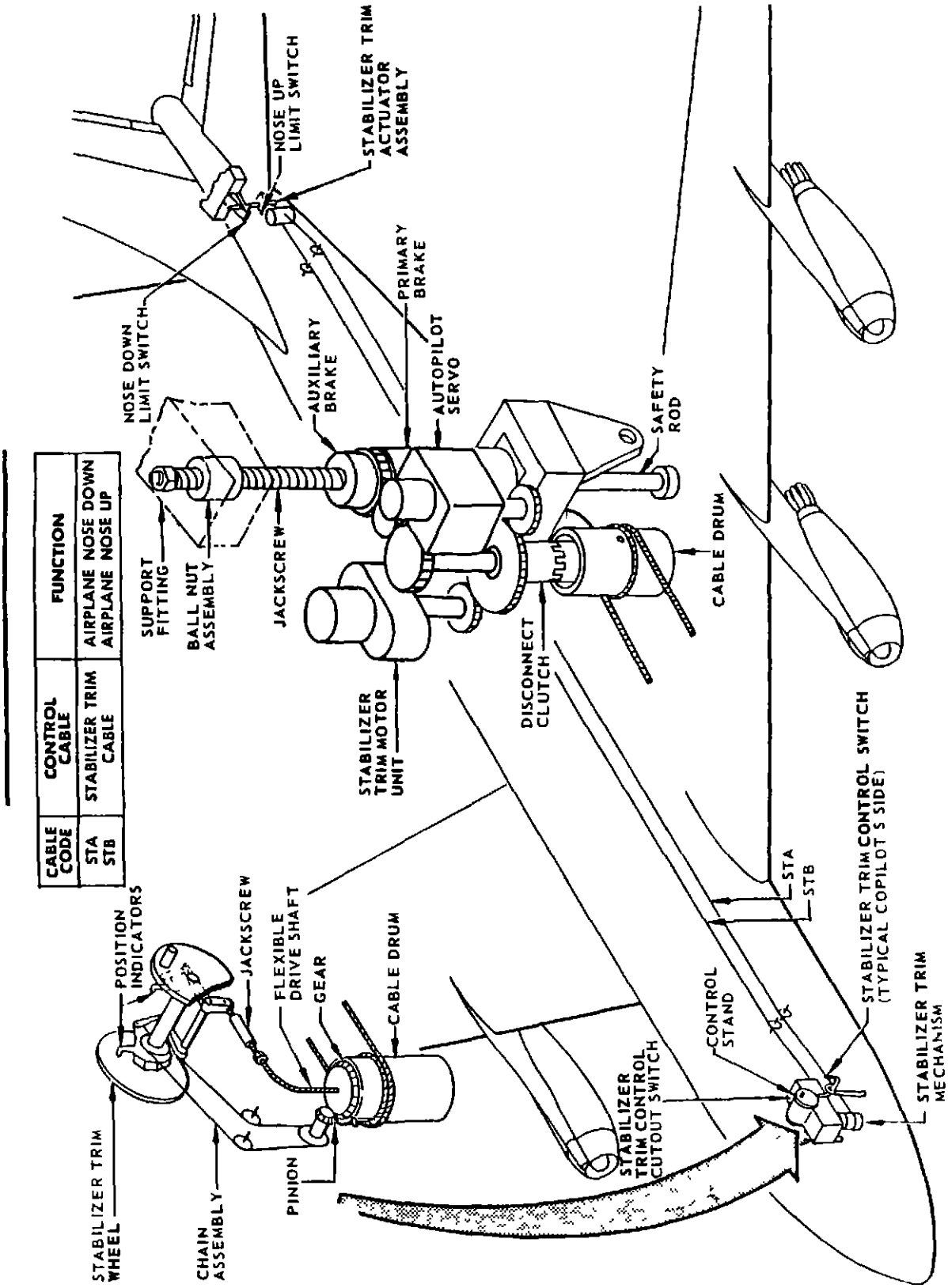
1. General

A. The stabilizer trim system is used to vary the incidence of the stabilizer to accomplish longitudinal trim of the airplane. Longitudinal trim is accomplished by actuating the entire horizontal stabilizer. The stabilizer can be operated by either a normal electrical or manual emergency control system. For major components of the system, see Fig. 1. For coverage of stabilizer takeoff warning switch, refer to 31-26-0, Description and Operation.

B. The horizontal stabilizer is also positioned by the autopilot system. Refer to Chapter 22, Autopilot.

C. The horizontal stabilizer is positioned by operation of the stabilizer trim actuator assembly. Normal electrical control of the trim actuator is by a stabilizer trim motor unit on the actuator. The trim motor operates in one direction, and the unit contains two electromagnetic clutches for reversing the direction of the drive. The motor is operated by ac power and the clutches are operated by dc power. A phase sequence relay insures proper direction of rotation of the trim motor. The trim motor unit is controlled by the stabilizer trim control switch on either pilot's control wheel and by actuator limit switches. The limit switches control the motor unit in advance of the extreme travel position of the stabilizer. A stabilizer trim control cutout switch is used whenever it is necessary to remove normal ac and dc power to the actuator. If the normal electrical system is inoperative, or has been disconnected by the stabilizer trim control cutout switch, the manual system is used to position the stabilizer by use of either trim wheel. Operation of the trim wheel actuates the forward trim mechanism which is cable connected to the trim actuator assembly, thereby positioning the stabilizer. The trim position indicator is driven from the forward mechanism. The autopilot servomotor is mounted in the left side of the actuator assembly to drive the jackscrew during autopilot operation. The autopilot control system, when energized, automatically adjusts trim in response to signals from the flight controller. The manual disconnect clutch (figure 1) disengages only if the normal electrical or autopilot systems are jammed; otherwise the clutches idle during manual operation.

D. A stabilizer trim brake is used to arrest stabilizer out-of-trim motion. The brake is actuated when elevator column movement opposes stabilizer trim movement.



Stabilizer Trim Control System
Figure 1

2. Stabilizer Control Circuit Components

A. A three position stabilizer trim switch is located on the outboard end of each control wheel. Each switch has two momentary on positions, "NOSE UP" and "NOSE DOWN", and is spring returned to the center "OFF" position. The stabilizer trim control switch consists of two self contained switches jointed into a single unit. One switch controls stabilizer trim actuator motor operation and the other switch controls clutch engagement. The two switch toggles are arranged to be thumb operated and are normally actuated and released simultaneously. However, release of the motor switch toggle will interrupt power to both the motor and the clutches to discontinue trim operation. Release of the clutch switch will interrupt power to the clutch only.

B. Stabilizer Trim Actuator/Limit Switches

(1) Two stabilizer trim actuator limit switches are used to limit the up and down travel of the stabilizer. The limit switches (figure 1) are located on airplane structure adjacent to the stabilizer support fittings. The switches are actuated by a cam mounted on the stabilizer torque box. Actuation of the switch opens the applicable electromagnetic clutch circuit preventing the ball nut assembly from being driven into stops at either end of travel. The stabilizer trim limit switches are adjusted to obtain a specified clearance between stop nuts of the actuator.

3. Stabilizer Trim Motor Unit

A. The stabilizer trim motor unit provides power to actuate the horizontal stabilizer during normal operation. The unit consists of a three-phase

induction motor, two electro-magnetic clutches and a torque limiter. (See figure 2.) The trim motor is energized by 200/115 volt three-phase a-c power and is capable of operation on two-phase supply The electro-magnetic clutches control the direction of rotation of the trim motor unit output shaft and are energized by 28v d-c power The torque limiter is a mechanical clutch which controls the output torque of the trim motor unit. The clutch will slip at a torque of 1500 pound-inches and will re-engage when the torque decreases to 1200 pound-inches. If a limit switch fails to operate, or the stabilizer jams, the torque limiter prevents any load in excess of 1500 pound-inches being imposed on the output shaft of the trim motor unit, thus protecting the actuating system from damage. The trim motor unit is mounted on the upper right side of the stabilizer actuator (See figure 3.)

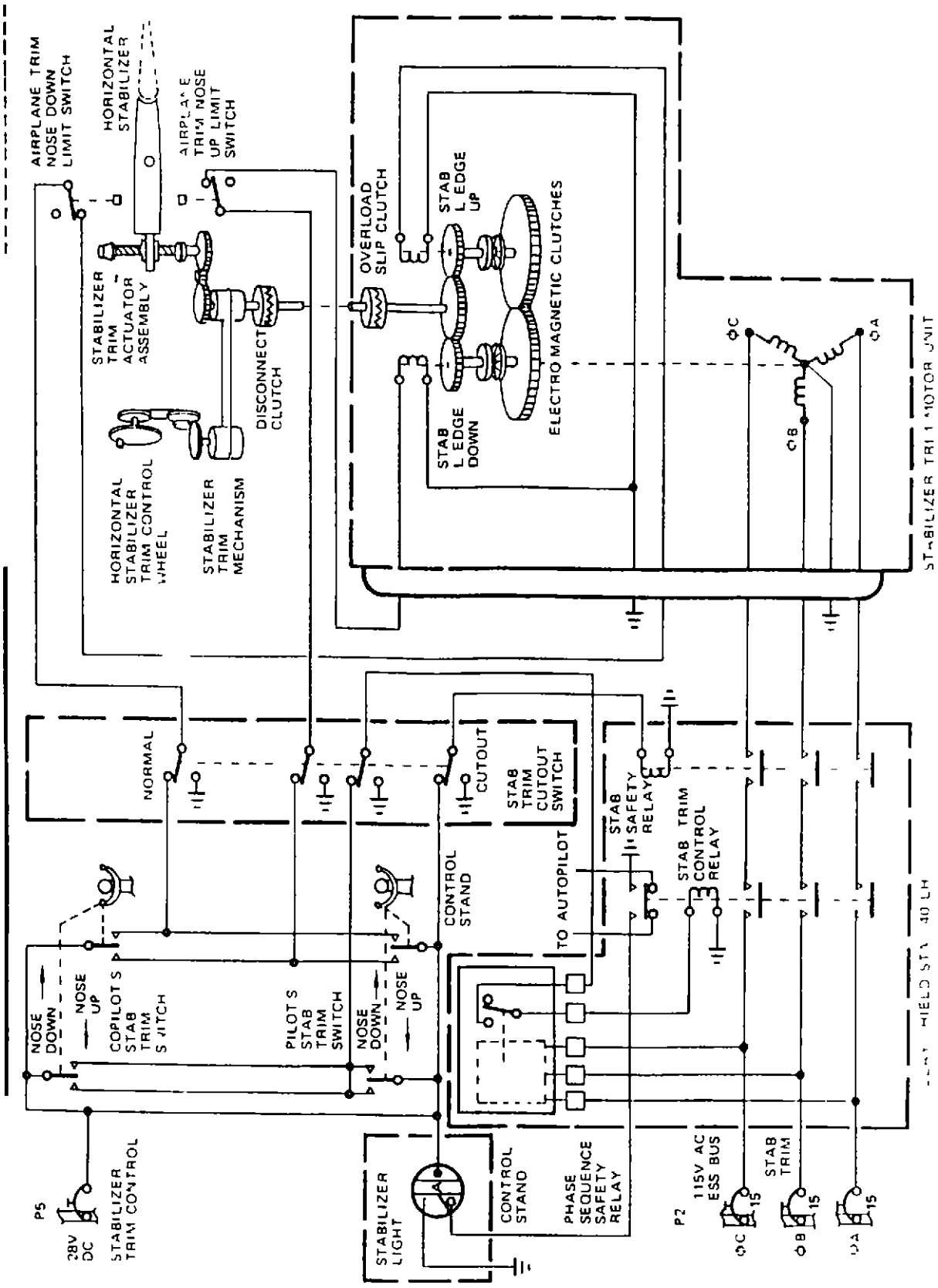
4 Stabilizer Trim Actuator Assembly

A. The stabilizer trim actuator assembly positions the stabilizer by converting trim motor unit, autopilot servo or cable drum rotary motion to linear motion. The stabilizer trim actuator consists of the jackscrew, gimbal assembly, cable drum, and the jackscrew actuator consisting of gearing and brakes. The stabilizer trim actuator is located in the tail compartment (figure 3) just forward of the stabilizer torque box. The cable drum located on the bottom of the actuator, serves a dual purpose. The drum drives the actuator for manual control of trim, and when the actuator is driven electrically, the cable drum is rotated and positions the stabilizer indicator on the control stand.

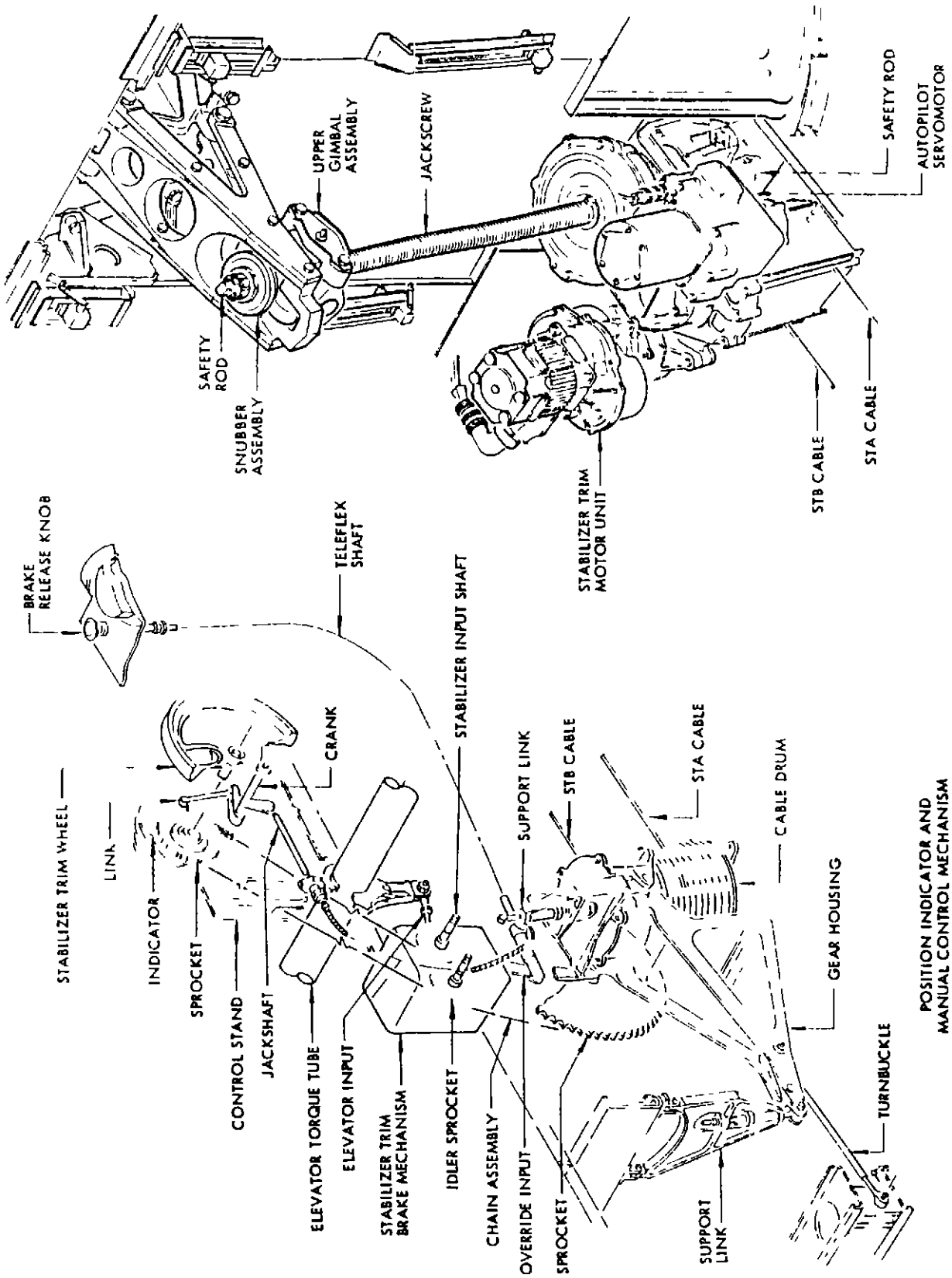
B. A primary brake assembly (figure 4) is incorporated in the stabilizer trim actuator assembly. The brake assembly prevents aerodynamic loads on the stabilizer from rotating the jackscrew shaft when the trim system is not being operated. When the jackscrew shaft is driven by the actuator in a direction which increases airloads on the stabilizer, a brake plate turns through a ratchet which produces a clicking sound in the assembly An auxiliary brake assembly is incorporated to prevent the shaft from turning if the primary brake fails When the jackscrew shaft is turned by the actuator, the auxiliary brake is released through a gear driven by the actuator. If the primary brake fails to hold, the jackscrew shaft rotation compresses a spring which applies the auxiliary brake force This braking force prevents any further shaft rotation.

NOT APPLICABLE TO
SABENA AIRCRAFT.

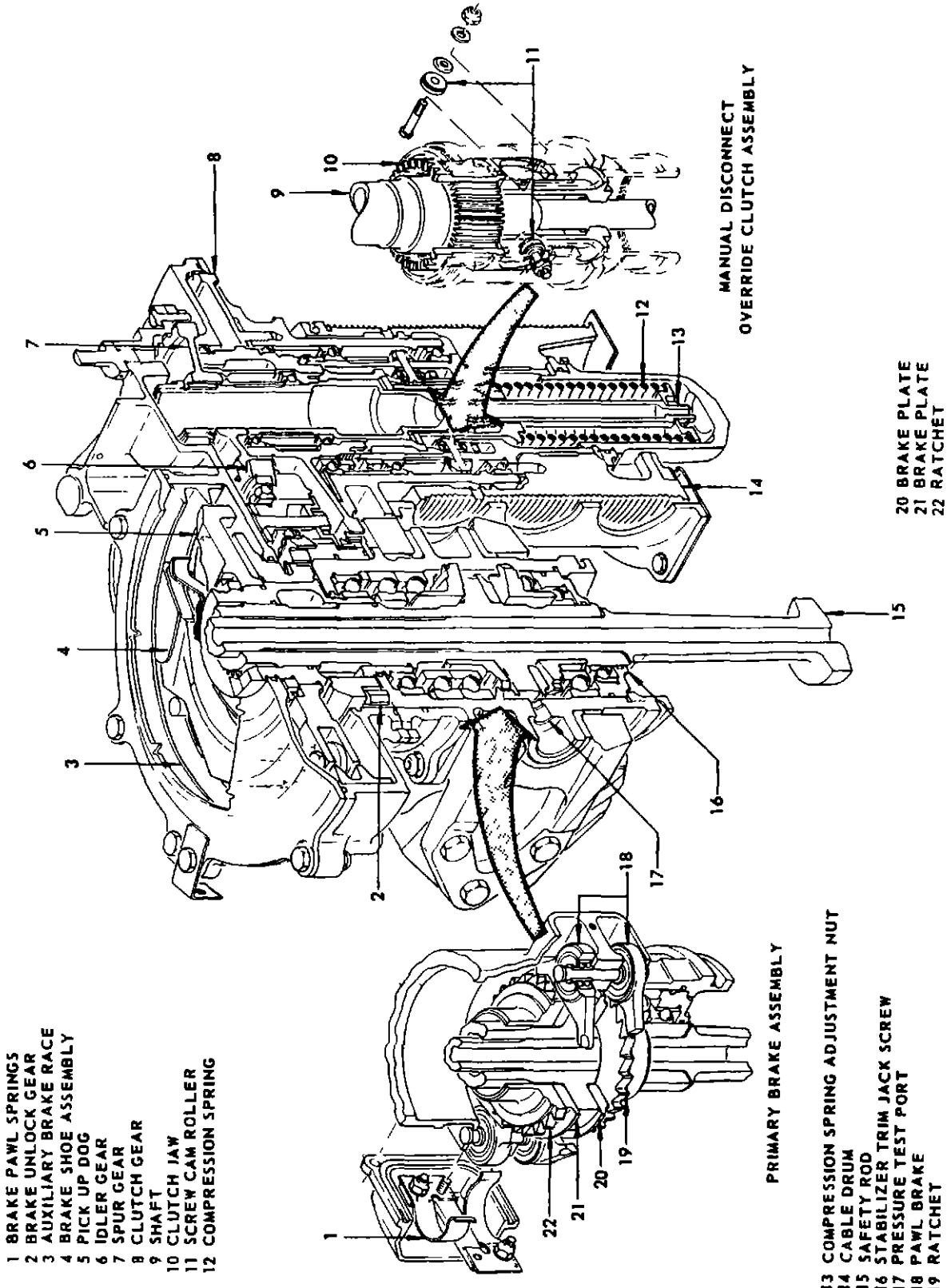
SAB REV 7 MAR 1970



Stabilizer Trim Control Circuit
Figure 2 (Sheet 2)



Stabilizer Trim Details
Figure 3



Stabilizer Trim Actuator Mechanism Details
Figure 4

C The stabilizer trim actuator assembly is connected to the body structure by means of a gimbal assembly. The gimbal assembly allows angular movement, fore and aft, of the actuator assembly as the stabilizer is positioned. A gimbal assembly also connects the ball nut to the stabilizer support fitting. This gimbal assembly prevents any binding of the screw while the ball nut positions the stabilizer. Linear travel of the ball nut on the jackscrew is limited by a stop and snubber assembly on both ends of the jackscrew shaft. During normal operation, limit switches de-energized the motor unit clutches to prevent driving the ball nut against either stop on the jackscrew shaft The snubber assembly absorbs shock loads on the actuator assembly if the ball nut is inadvertantly driven against the jackscrew stops During manual operation, the ball nut may contact the stops at either extreme end of travel. A safety rod installed in the jackscrew shaft will support the stabilizer in event of jackscrew failure.

5. Stabilizer Position Indicator and Manual Control Mechanism

A. The stabilizer position indicator and manual control mechanism provides continuous indication of stabilizer trim and a means of manual control of the stabilizer in the event of electrical malfunction.

B. The stabilizer position indicator and manual control mechanism extends from the stabilizer trim wheels on each side of the control stand to the trim mechanism in the lower nose compartment. (See figure 3.) The trim wheels and sprocket are splined to a control wheel shaft that extends through the control stand. The handles of the trim wheels are installed at least 90° apart. A chain assembly interconnects the trim wheels and the trim mechanism. The sprocket internal gearing and the cable drum are the main functional parts of the trim mechanism. The trim mechanism is attached to lower nose compartment structure by support linkages. The support linkages are adjustable for trim mechanism alignment, and to obtain proper chain and cable tension. The position indicator indicating components include the flexible drive shaft, jack shaft and linkage to the indicator. A metal-cal on the control stand is calibrated in units of trim to indicate the position of the stabilizer. The green area of the metal-cal indicates the safe take-off position for the stabilizer and is referred to as the "Green Range" (1/2 unit "AIRPLANE NOSE DOWN" to 5-1/2 units "AIRPLANE NOSE UP" on B-707-329 and 0.2 to 6.75 units "AIRPLANE NOSE UP" on B-707-329C.)

C. Turning either trim wheel rotates the sprocket in the control stand and drives the chain assembly which turns the sprocket on the trim mechanism. Rotation of the trim mechanism sprocket turns the cable drum and the flexible drive shaft. The trim mechanism is cable connected to the trim actuator assembly which positions the stabilizer. The flexible drive shaft transmits motion to the indicator linkage through the jack shaft, positioning the indicator. During normal operation, the stabilizer trim cables drive the forward mechanism drum to operate the position indicator and rotate the trim wheels.

6 Stabilizer Trim Brake System

A. The stabilizer trim brake system arrests out-of-trim stabilizer motion when the control column is moved in the direction opposing the stabilizer motion.

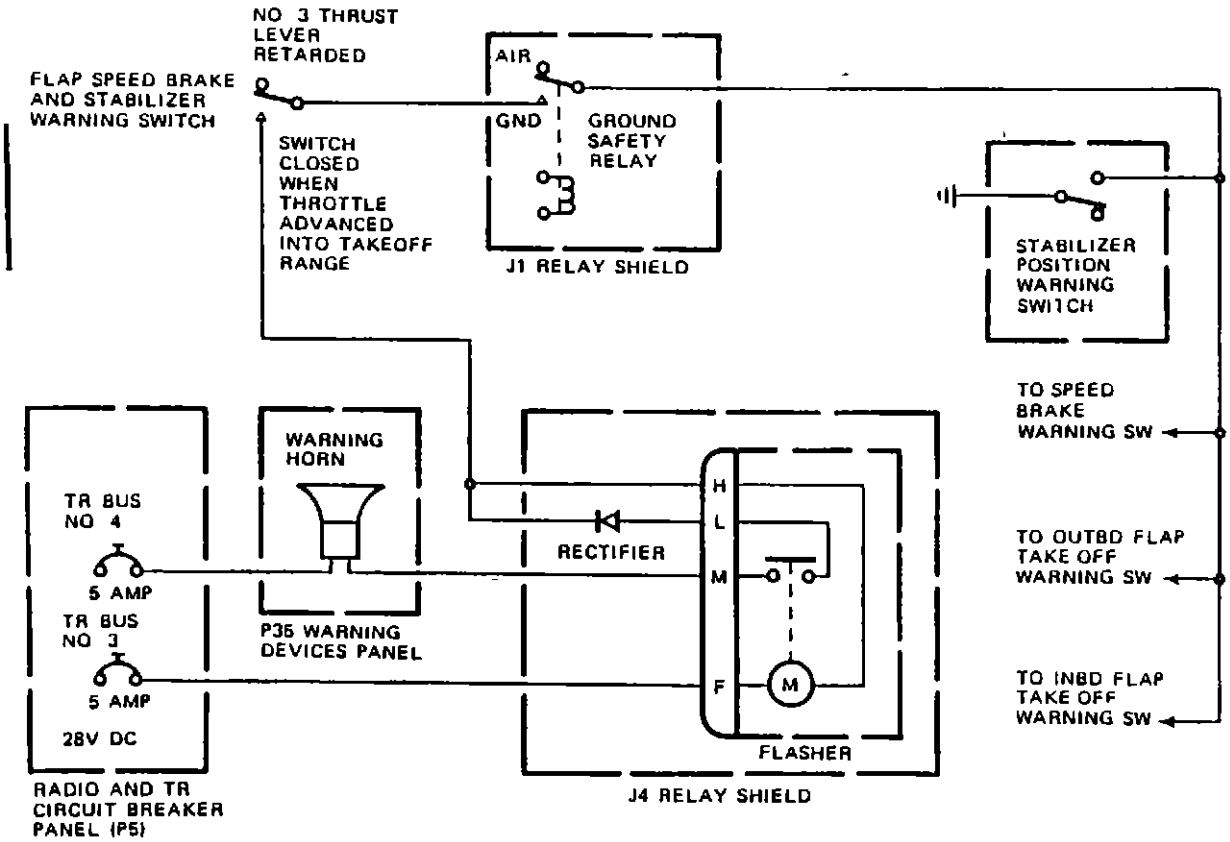
B The stabilizer trim brake system is a self-contained mechanical unit, located in the forward nose compartment of the airplane under the aisle control stand The unit is provided with mounting provisions to be attached independently and consists of the following rotating shafts· elevator input, stabilizer input, and override input. The unit operates in such a way that whenever a rotation in one direction is introduced by the elevator control, the elevator input shaft will prevent the stabilizer input shaft from rotating in same direction but will allow free rotation in opposite direction as elevator input shaft. Should a runaway stabilizer cause an AIRPLANE NOSE DOWN or AIRPLANE NOSE UP pitch, moving the elevator control column backward or forward, respectively, will stop the stabilizer from further travel in the out-of-trim direction and allow operation in the opposite direction. The override input shaft is used for releasing the brake mechanism in the unit. The shaft has 2 positions, OFF and OVERRIDE and is spring-loaded to OFF When the override shaft is turned to OVERRIDE position, the brake mechanism will be released regardless of elevator input shaft position. When released from OVERRIDE position the shaft will automatically return to OFF position and restore the brake mechanism to the position called for by the elevator input shaft.

Operation

A Normal control and operation of the stabilizer trim is accomplished with electrical power The stabilizer trim control switches control the stabilizer trim control relay (figure 2). The trim control relay allows 115/200 volt ac power to operate the trim motor and closes the trim light circuit The trim light indicates that the system is operating. The trim motor armature rotates in only one direction. The phase sequence relay prevents the trim control relay from closing if power to the relay has the wrong phase sequence. This allows normal electrical trim control only when power with the correct phase sequence, insuring correct direction of armature rotation, is available at the trim control relay. The electromagnetic clutches control the direction of the drive through the torque limiter and actuator to the jackscrew. The trim motor unit actuates the jackscrew until the applicable limit switch is actuated or the trim control switch is released. Limit switch actuation opens the circuit to the electromagnetic clutch when no further travel in this direction is possible. The system operation is the same in the reverse direction. A mechanical clutch or torque limiter prevents damage due to a malfunction that would allow the ball nut to be driven into either stop. Either pilot's or copilot's stabilizer trim control switch may operated the system, but if both the switches are actuated at the same time in opposing directions, the trim motor will stall since both electromagnetic clutches are energized Should the trim motor stall, damage might occur. The stabilizer trim control cutout switch, when in CUTOUT interrupts ac and dc power in the system. This action opens the power circuit to the trim motor and the control circuits to the clutches and trim control

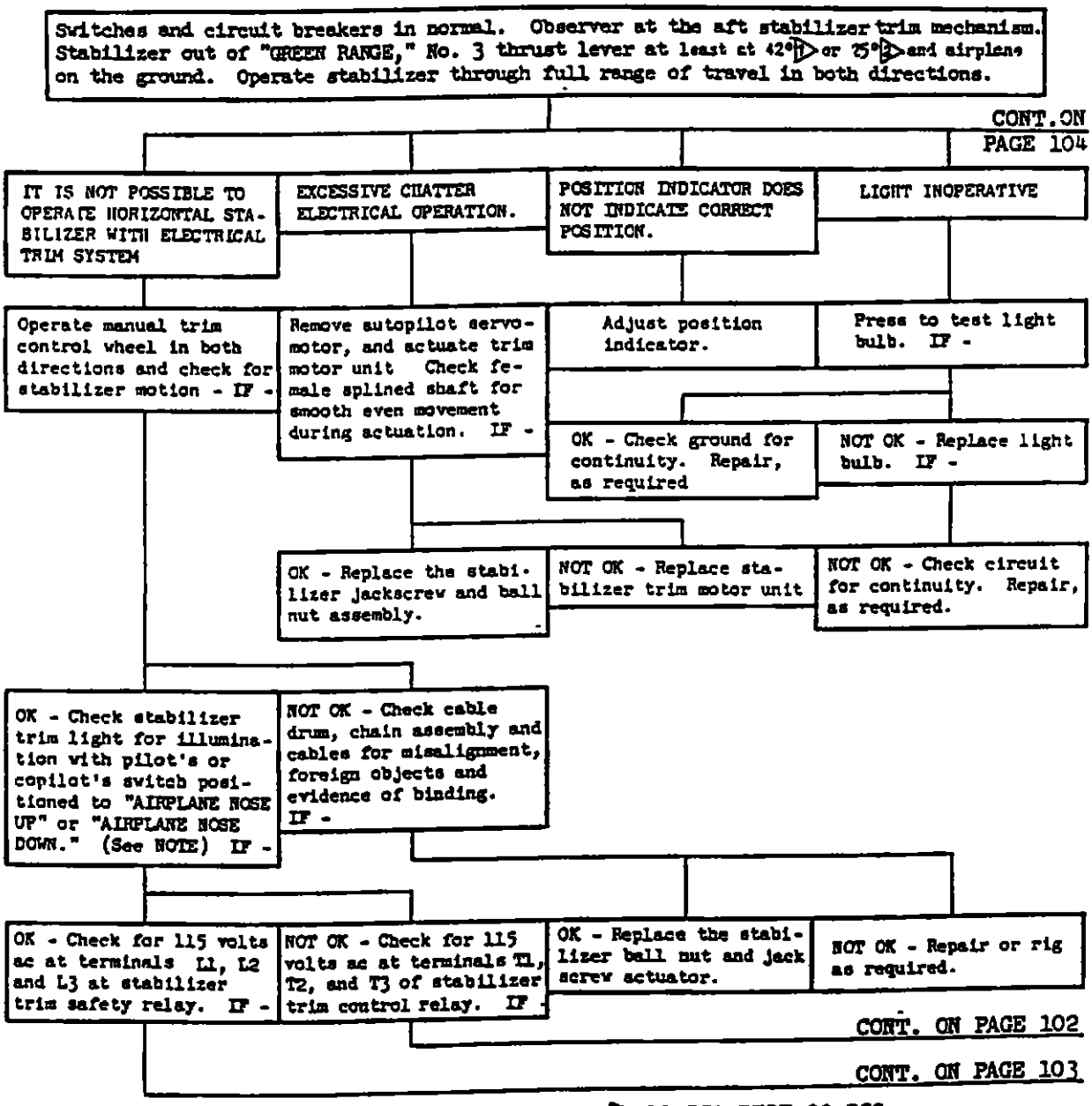
relay. Prior to take-off with the No. 3 thrust level advanced and the stabilizer not within the indicated Green Range a warning horn sounds to indicate an unsafe stabilizer position. (See figure 5.) The horn continues to sound and cannot be cut off until the stabilizer has been positioned within the Green Range.

B. Alternate control is accomplished by manually rotating either stabilizer trim wheel. The two trim wheels, one on each side of the control stand, are connected to a common shaft which has a sprocket gear attached. The sprocket gear is attached to the forward mechanism by a chain assembly. The chain assembly drives the cable drum which is housed in the trim mechanism. The mechanism cable drum is connected by control cables to the stabilizer ball nut actuator assembly cable drum. When the stabilizer is operated manually the trim wheel handle is extended by depressing the button on the handle and pulling out. Trim wheel motion is transmitted to the stabilizer trim actuator assembly by the control cables. If the system is jammed, initial movement of the trim wheel operates a clutch in the actuator which disconnects both of the motors on the actuator assembly. The manual operation is limited in up and down travel by stops on the jackscrew. As the trim mechanism is turned by either system, flexible drive shaft rotation actuates the jack shaft that positions the right and left position indicators on the control stand. The stabilizer trim brake system arrests out-of-trim stabilizer motion. The system is actuated by elevator control column deflection, which introduces the braking force.



Stabilizer Trim Position Warning System Circuit
Figure 5

STABILIZER TRIM SYSTEM - TROUBLE SHOOTING

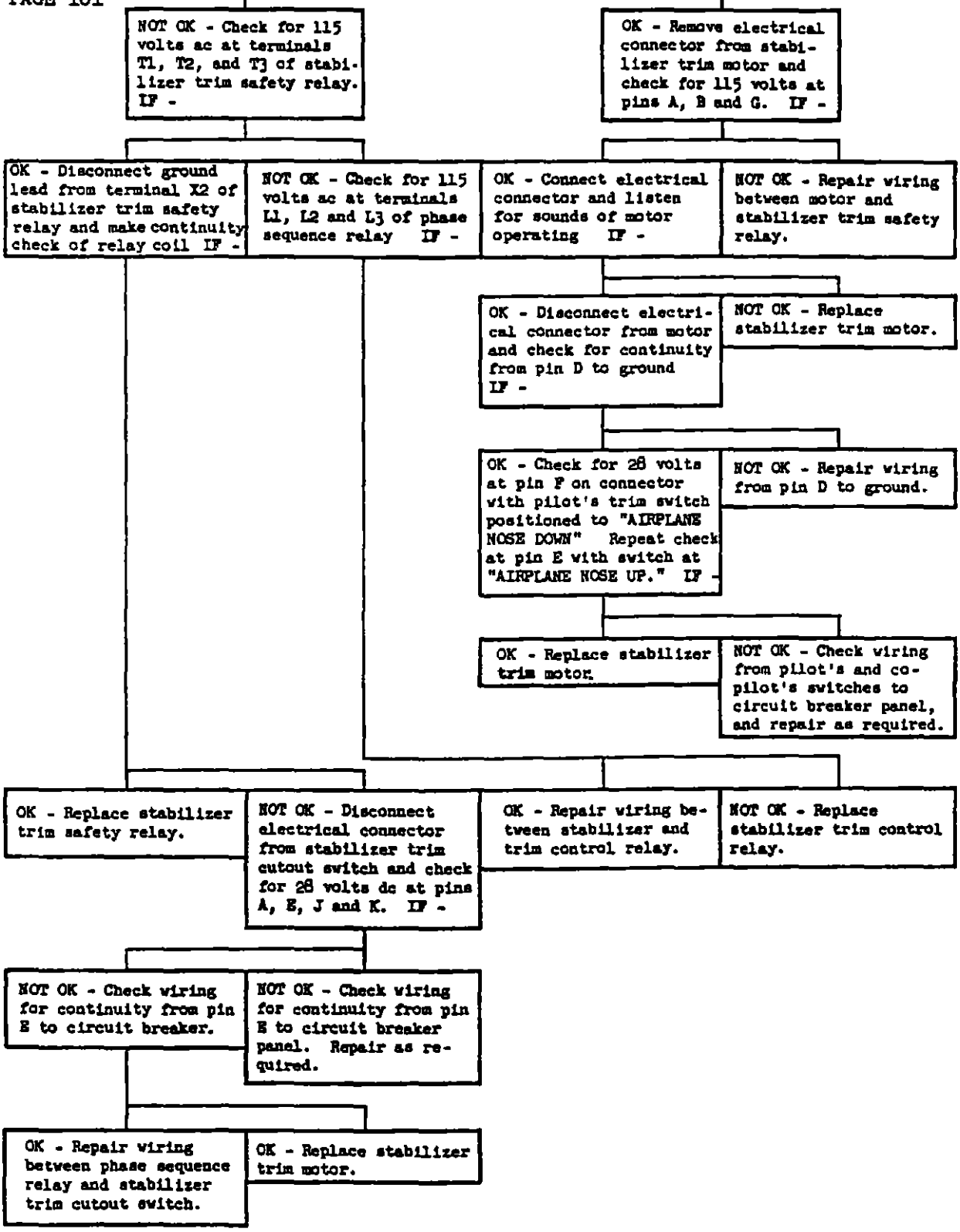


▷00-SJA THRU 00-SJG
▷ TCA LX-N20198
LX-N20199
RTCA LX-N19997
LX-N20000

NOTE: All tests should be made when operating pilot's and copilot's trim switches to both "NOSE UP" and "NOSE DOWN" positions.

SB.2384

CONT. FROM PAGE 101



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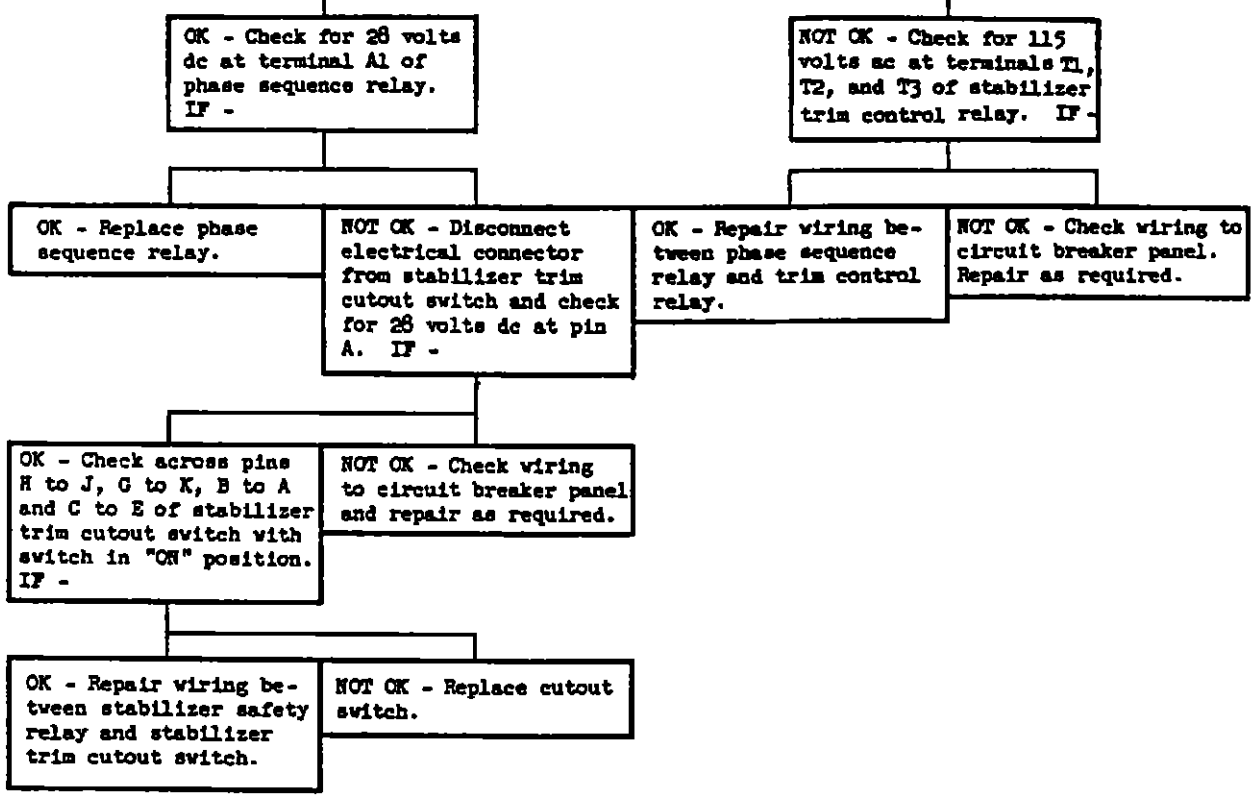
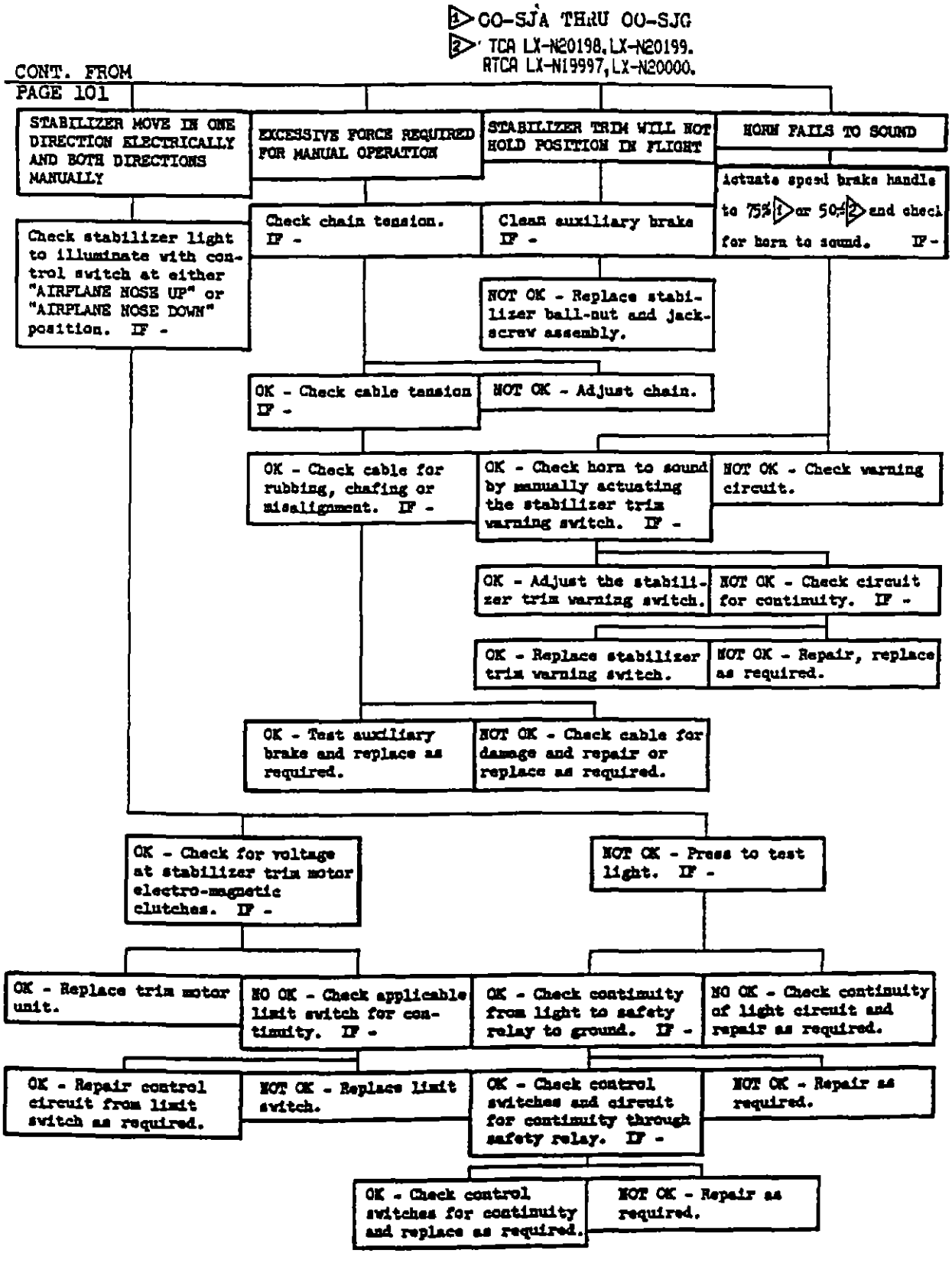



1 OO-SJA THRU OO-SJG
2 TCA LX-N20198, LX-N20199.
RTCA LX-N19997, LX-N20000.
CONT. FROM PAGE 101
STABILIZER MOVE IN ONE DIRECTION ELECTRICALLY AND BOTH DIRECTIONS MANUALLY
EXCESSIVE FORCE REQUIRED FOR MANUAL OPERATION
STABILIZER TRIM WILL NOT HOLD POSITION IN FLIGHT
HORN FAILS TO SOUND
Actuate speed brake handle to 75% 1 or 50% 2 and check for horn to sound. IF -
Check stabilizer light to illuminate with control switch at either "AIRPLANE NOSE UP" or "AIRPLANE NOSE DOWN" position. IF -
Check chain tension. IF -
Clean auxiliary brake IF -
NOT OK - Replace stabilizer ball-nut and jackscrew assembly.
OK - Check cable tension IF -
NOT OK - Adjust chain.
OK - Check cable for rubbing, chafing or misalignment. IF -
OK - Check horn to sound by manually actuating the stabilizer trim warning switch. IF -
NOT OK - Check warning circuit.
OK - Adjust the stabilizer trim warning switch.
NOT OK - Check circuit for continuity. IF -
OK - Replace stabilizer trim warning switch.
NOT OK - Repair, replace as required.
OK - Test auxiliary brake and replace as required.
NOT OK - Check cable for damage and repair or replace as required.
OK - Check for voltage at stabilizer trim motor electro-magnetic clutches. IF -
NOT OK - Press to test light. IF -
OK - Replace trim motor unit.
NO OK - Check applicable limit switch for continuity. IF -
OK - Check continuity from light to safety relay to ground. IF -
NO OK - Check continuity of light circuit and repair as required.
OK - Repair control circuit from limit switch as required.
NOT OK - Replace limit switch.
OK - Check control switches and circuit for continuity through safety relay. IF -
NOT OK - Repair as required.
OK - Check control switches for continuity and replace as required.
NOT OK - Repair as required.

STABILIZER TRIM SYSTEM - MAINTENANCE PRACTICES

1. Unit Servicing Stabilizer Trim System

   A. Lubricate stabilizer trim system. (See figure 201.)

2. Adjustment Test Stabilizer Trim System

   A. General

      (1) Adjustment and testing of the stabilizer trim system should be avoided with the stabilizer exposed to strong tail winds. Tail winds may cause loading of control surfaces that could be misinterpreted as erratic operation of one or more of the stabilizer trim control systems.

      (2) Severe chatter or jerking may be encountered when manually operating stabilizer toward AIRPLANE NOSE DOWN position on the ground. This is due to location of stabilizer center of gravity which places a tension load on jackscrew shaft and causes engagement of the upper primary brake plate and jackscrew in the actuator. The chatter will normally disappear after a few flight hours on the actuator and is not cause for replacement of the actuator.

         CAUTION: DO NOT OPERATE PILOT'S AND COPILOT'S STABILIZER TRIM SWITCHES SIMULTANEOUSLY AND IN OPPOSITE DIRECTIONS. THIS WILL IMPOSE A SEVERE LOAD ON THE SERVOMOTOR WHICH WILL RESULT IN STRIPPING OF THE MOTOR PINION TEETH OR MOTOR BURNOUT.

         NOTE: A failure in which the motor pinion teeth have been stripped may be recognized immediately, since the manual trim wheel will not rotate when a stabilizer trim switch is actuated. Manual operation of the trim wheel and autopilot operation will not be affected.

      (3) Refer to 22-7-0 when adjusting stabilizer operated elevator servo torque switching system, if installed.

   B. Equipment and Materials

      (1) Tensiometer - 0 to 200 pound capacity

(2) Scale - 0 to 4 feet in inches and sixty fourths

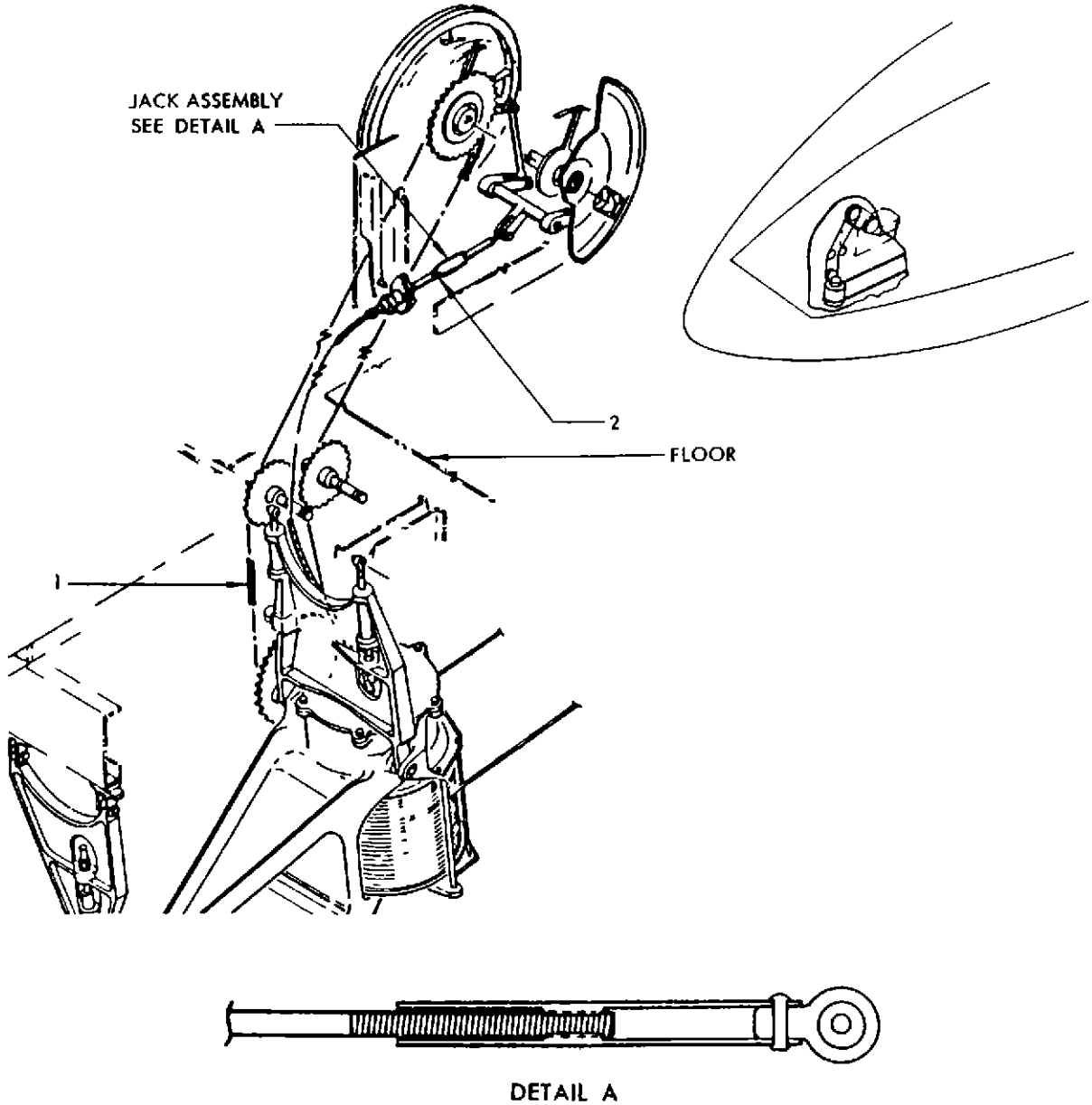
(3) Spring Scale - 0 to 60 pound capacity

(4) Adapter - F71252 or equivalent

(5) Torque Wrench Adapter - 4MIT 50-8704

C. Adjust Stabilizer Trim System

(1) Remove stabilizer jackscrew access panel 1185. See Chapter 12, Access Doors and Panels.



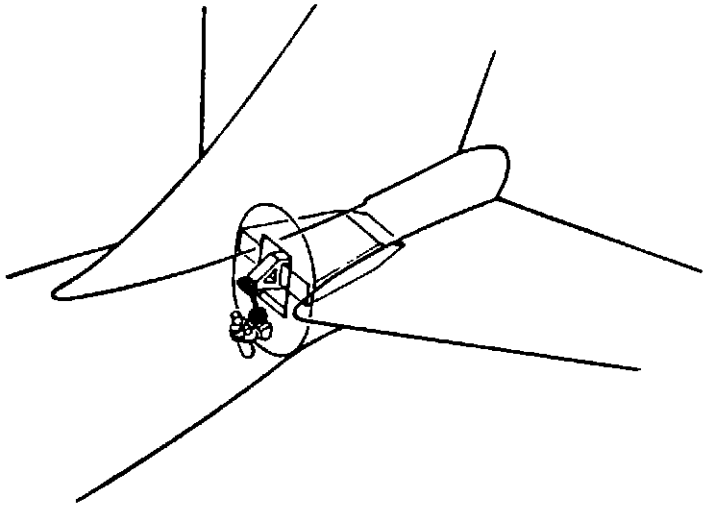
DETAIL A

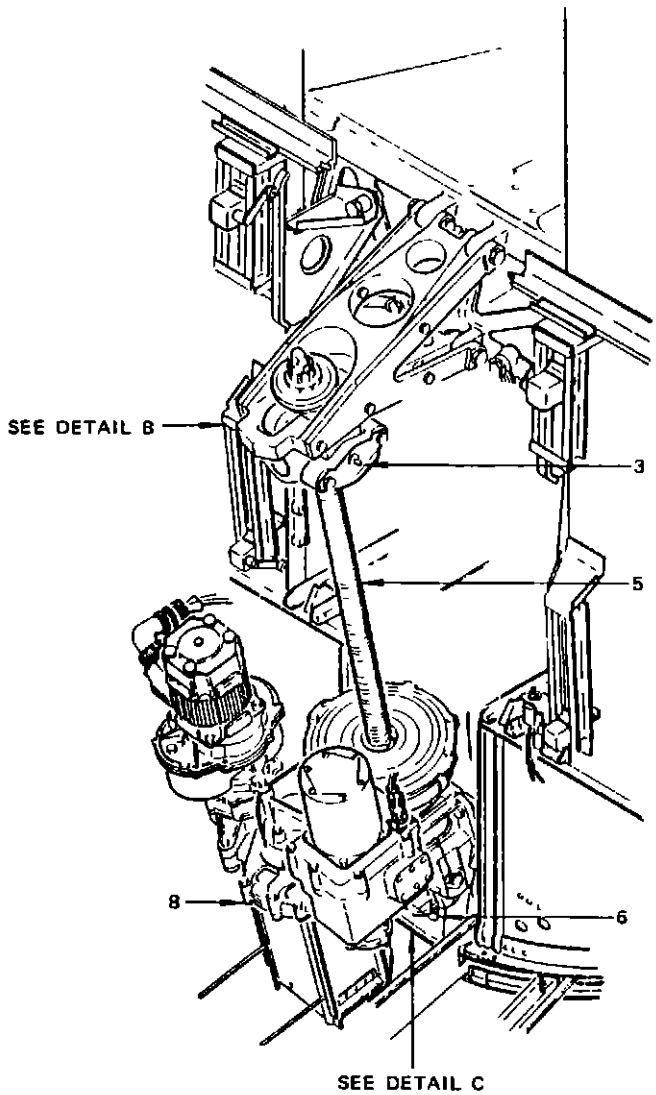
Stabilizer Trim System Lubrication
Figure 201 (Sheet 1)

INDEX NO	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	STABILIZER TRIM CHAIN ASSEMBLY AND SPROCKETS	Apply light coat of Aeroshell Grease 17 (all points). Cycle mechanism twice and wipe off excess
2	TRIM INDICATOR DRIVE SHAFT SCREW	Apply light coat of Aeroshell Grease 7A to total screw. Cycle mechanism several times and wipe off excess lubricant
3	UPPER GIMBAL	Apply Aeroshell Grease 17 through Zerk fitting (two places).
4	UPPER GIMBAL YOKE	Apply Aeroshell Grease 17 through flush fitting (two places).
5	JACKSCREW	Apply light coat of Aeroshell Grease 7A (all points). Cycle mechanism twice and wipe excess off nut and stops
6	LOWER GIMBAL	Apply Aeroshell Grease 17 through flush fitting (two places).
7	LOWER GIMBAL YOKE	Apply Aeroshell Grease 17 through flush fitting (two places).
8	O-RING SEAL	Apply light coat of MIL-L-4343 on O-rings which are reinstalled.

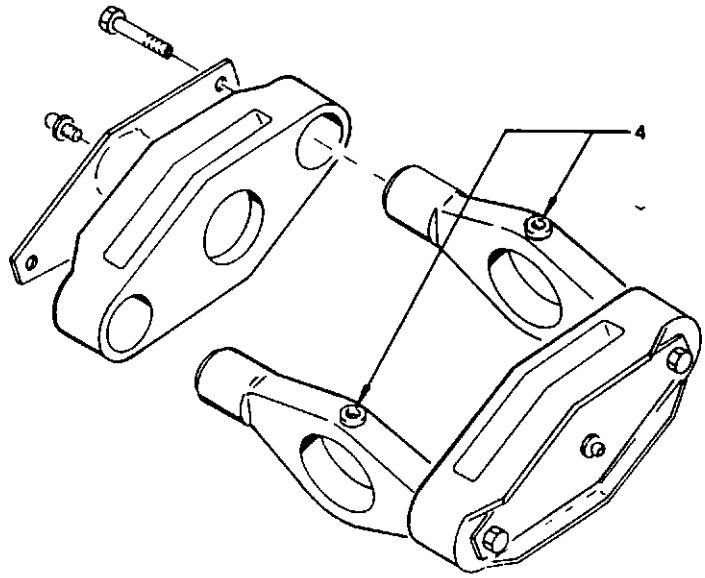
SAB 707/480, dwg 1-4882, metalcol BACM10L6N (SB 1854)

SAB REV. 17 MAR 1972

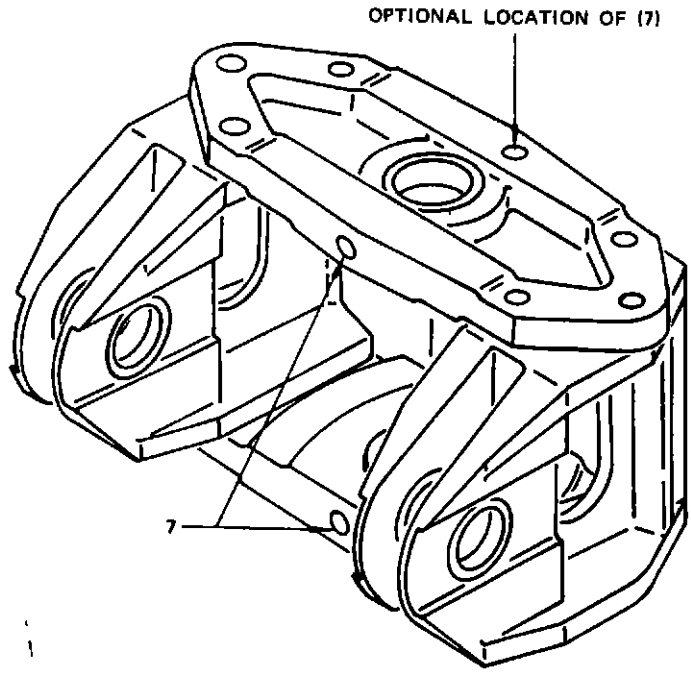




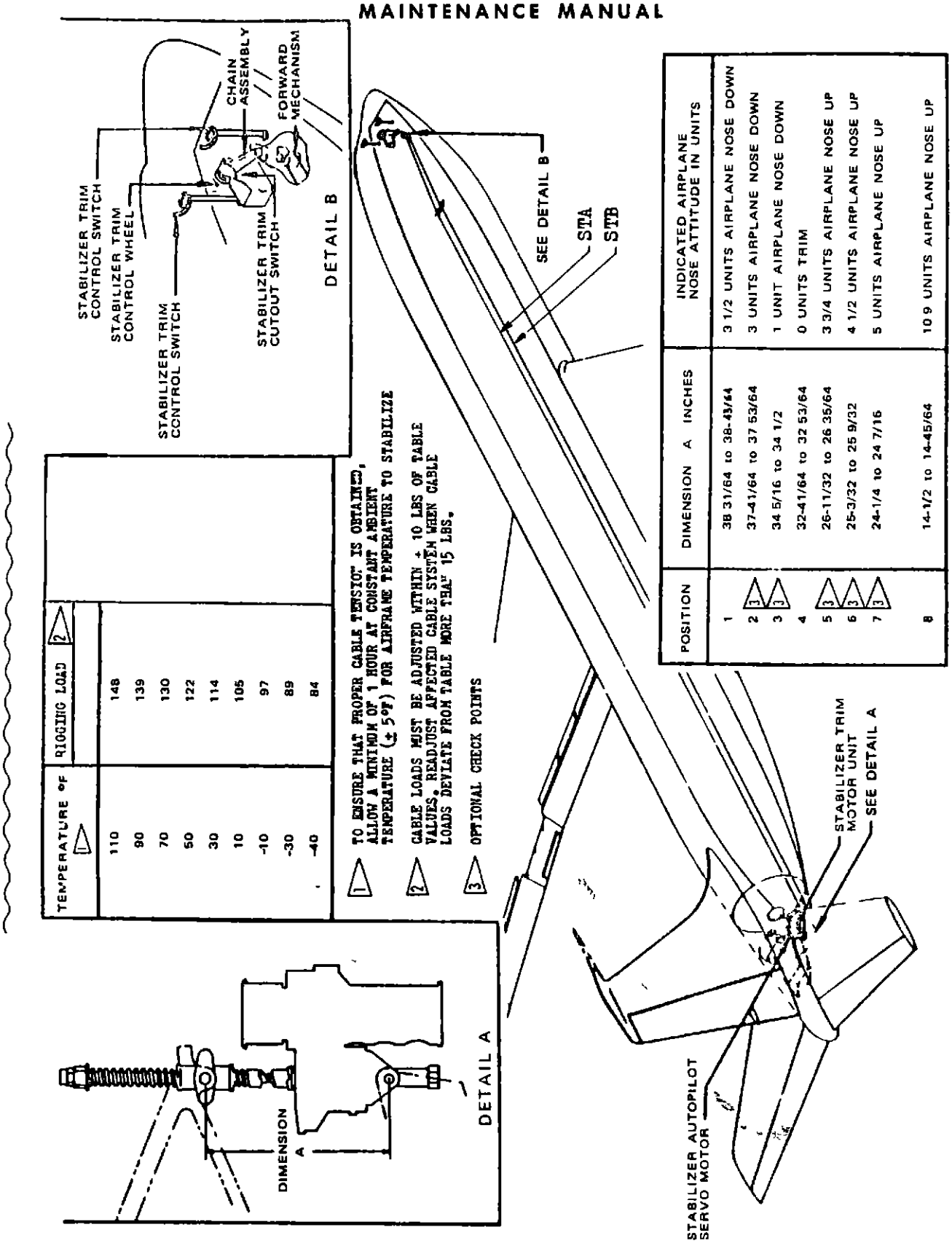
Stabilizer Trim System Lubrication
Figure 201 (Sheet 3)



DETAIL B



DETAIL C



TEMPERATURE °F (1)	RIGGING LOAD (2)
110	148
90	139
70	130
50	122
30	114
10	105
-10	97
-30	89
-40	84

(1) TO ENSURE THAT PROPER CABLE TENSION IS OBTAINED, ALLOW A MINIMUM OF 1 HOUR AT CONSTANT AMBIENT TEMPERATURE (± 5°F) FOR AIRFRAME TEMPERATURE TO STABILIZE

(2) CABLE LOADS MUST BE ADJUSTED WITHIN ± 10 LBS OF TABLE VALUES. READJUST AFFECTED CABLE SYSTEM WHEN CABLE LOADS DEVIATE FROM TABLE MORE THAN 15 LBS.

(3) OPTIONAL CHECK POINTS

POSITION	DIMENSION A INCHES	INDICATED AIRPLANE NOSE ATTITUDE IN UNITS
1	38 31/64 to 38-43/64	3 1/2 UNITS AIRPLANE NOSE DOWN
2 (3) (3)	37-41/64 to 37 53/64	3 UNITS AIRPLANE NOSE DOWN
3 (3) (3)	34 5/16 to 34 1/2	1 UNIT AIRPLANE NOSE DOWN
4	32-41/64 to 32 53/64	0 UNITS TRIM
5 (3) (3)	26-11/32 to 26 35/64	3 3/4 UNITS AIRPLANE NOSE UP
6 (3) (3)	25-3/32 to 25 9/32	4 1/2 UNITS AIRPLANE NOSE UP
7 (3) (3)	24-1/4 to 24 7/16	5 UNITS AIRPLANE NOSE UP
8	14-1/2 to 14-45/64	10 9 UNITS AIRPLANE NOSE UP

Stabilizer Trim System Adjustment
Figure 202
T.EG.SYS.SERV.

(2) Deleted

(3) Manually operate stabilizer to full "AIRPLANE NOSE UP" position. Make sure down stops are contacted.

(4) Check that STA cable has 1-3/4 turns on forward drum and that STB cable has 28-1/4 turns.

(5) Manually operate system until "STA" and "STB" cable have approximately same number of turns on forward drum.

(6) Check cable tension per temperature tension chart.

(7) If cable tension is not within limits, loosen support linkage to prevent inducing a rigging load in chain assembly. Adjust turnbuckle (2, Fig. 203) until rigging load as shown in temperature tension chart is obtained, then check that turnbuckle (2) dimension is within limits shown in Fig. 203. If turnbuckle adjustment is insufficient to re-establish the normal rigging load, the cable may be cut as follows:

(a) Measure average cable tension.

(b) Measure distance between turnbuckle bolt centers (refer to [7] Fig. 203).

(c) Determine cable length to be removed per figure 206 and cut the cable attached to the stabilizer trim forward mechanism drum.

NOTE: If cable end fitting is red painted, the cable length has already been reduced since its installation on aircraft and may not be cut a second time, it should be replaced.

(d) Install cable end fitting according to MM 27-1-1.

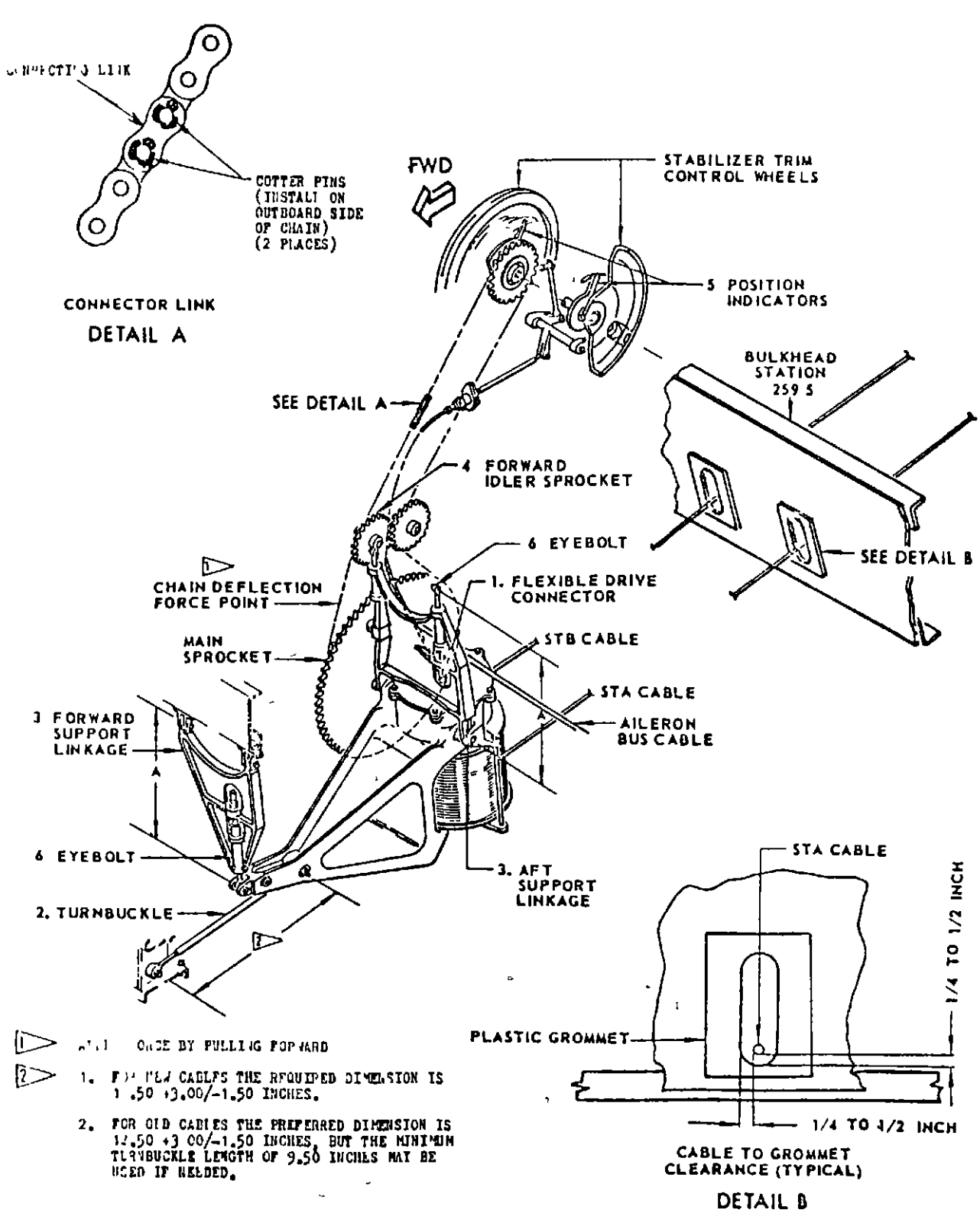
(e) Identify the cut cable by application of red colour on the cable end fitting. Carefully remove grease from the cable terminal with Chlorothène, then spray CRC URETHANE ISOLATION RED COLOUR on the fitting.

(f) Install cable end fitting that attaches to forward mechanism drum assembly.

(8) Remove lower right hand access panel from control stand.

(9) Apply a 2 pound load perpendicular to chain assembly at chain deflection force point midway between tangencies of chain on forward idler sprocket and main sprocket.

(10) Check that chain deflects 3/16 to 5/16 inch.



1. ADJUST ONCE BY PULLING FORWARD

2. 1. FOR NEW CABLES THE REQUIRED DIMENSION IS 1.50 +3.00/-1.50 INCHES.

2. FOR OLD CABLES THE PREFERRED DIMENSION IS 12.50 +3.00/-1.50 INCHES, BUT THE MINIMUM TURNBUCKLE LENGTH OF 9.50 INCHES MAY BE USED IF NEEDED.

(11) Adjust support linkage as required to bring chain deflection within limits.

(12) Check that length of fore and aft support linkages (Distance "A" Fig. 203) are equal within 1/16 inch.

NOTE: Measurement is taken at all three linkages, on a vertical line from center to center of support stud and support mounting bolts.

(13) Manually operate stabilizer through full travel in each direction. Center cables on forward drum and check cable tension. Repeat steps (7) through (13) until correct rigging load is obtained.

(14) Manually operate stabilizer to full "AIRPLANE NOSE UP" position. Make sure down stops on stabilizer are in contact.

(15) Check that clearance between cable and forward grommet is 1/4 to 1/2 inch (detail B).

NOTE: Forward grommet is located at station 259.5 in first bulkhead through which cable passes after leaving forward cable drum.

(16) If clearance between grommet and cable is not within specified limits, release tension in cable and chain assembly per step (7). Disconnect chain assembly at connector link and add or remove links from chain as necessary to obtain correct clearance. Connect chain assembly at connector link and install cotter pins per detail A.

NOTE: Adding or removing a chain link will change clearance at grommet 7/32 inch.

(17) Check that clearance between chain assembly and aileron control bus cable is a minimum of 3/4 inch.

(18) If clearance is less than 3/4 inch adjust turnbuckle (2) to obtain correct clearance.

(19) Rerig cables and chain assembly per steps (7) through (16). Disconnect flexible drive shaft (1, figure 203) from forward mechanism.

(20) Set manually stabilizer "A" dimension and stabilizer trim indicator as follows:

(a) Set stabilizer "A"dimension at 21-13/32 (±3/32) inches. Rotate flexible drive shaft until trim indicators are positioned at 6-11/16 trim units "AIRPLANE NOSE UP".

(21) Connect flexible drive shaft to forward mechanism. Check for positive engagement of flexible drive shaft with spline in forward mechanism before tightening nut.

(22) Connect electrical power to airplane.

(23) Adjust stabilizer trim limit switches. See 27-10-1.

(24) Adjust stabilizer takeoff warning switch (Ref 31-26-0, Adjustment/Test).

(25) Adjust stabilizer trim brake. See 27-10-81.

(26) Remove electrical power.

(27) Test system per paragraph 2.D.

(28) Install access panel.

D. Test Stabilizer Trim Control System

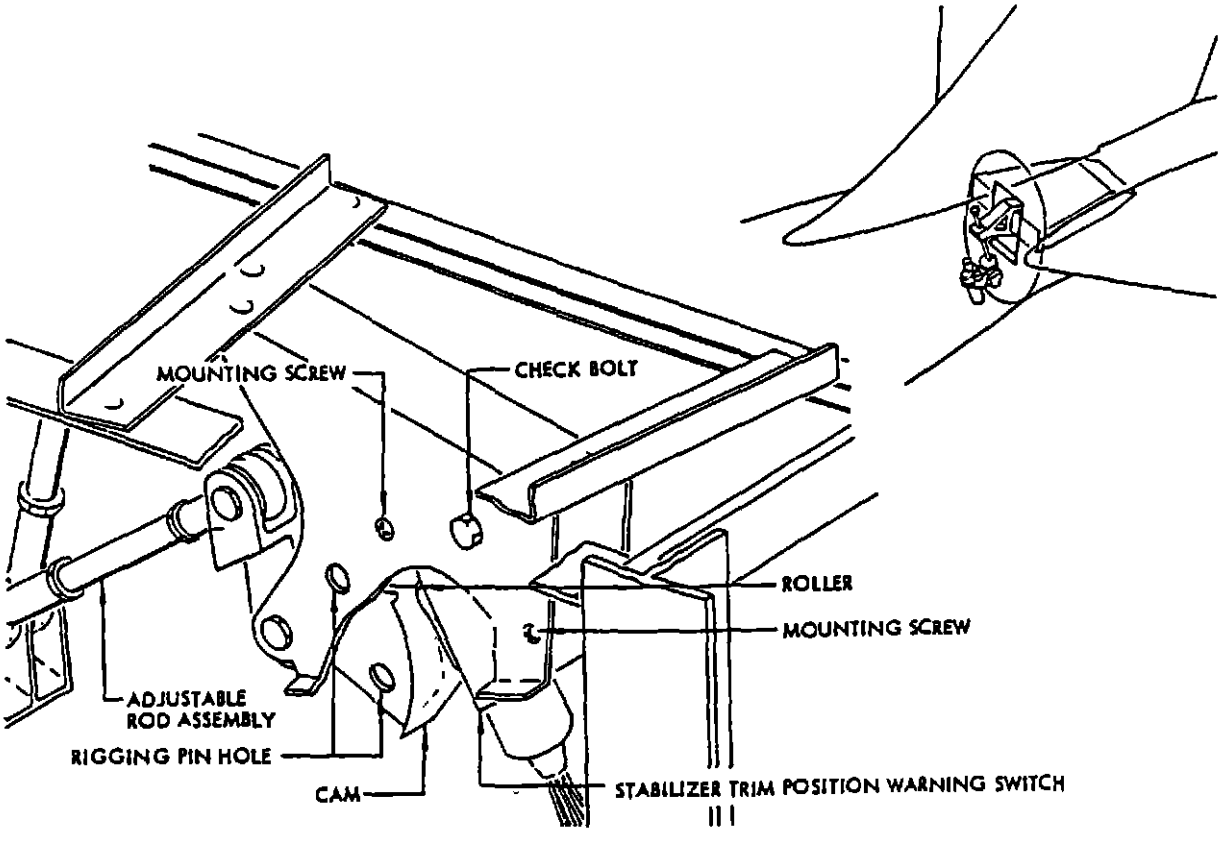
(1) Remove stabilizer jackscrew access panel 1185. See Chapter 12, Access Doors and Panels.

(2) Rotate pilot's stabilizer trim control wheel counterclockwise until stabilizer trim actuator up stop is just contacted.

(3) Check that distance from lower gimbal bolt centerline to upper gimbal pin centerline is 38-31/64 to 38-43/64 inches. (See detail A, figure 202.)

(4) Check that stabilizer trim indicator indicates 3-1/2 (± 1/2) units AIRPLANE NOSE DOWN trim.

(5) Turn pilot's stabilizer trim wheel clockwise until lower stops are just contacted



Stabilizer Trim Position Warning Switch Adjustment
Figure 204

(6) Check distance from lower gimbal bolt centerline to upper pin centerline. Distance shall be 14-1/2 to 14-45/64 inches.

(7) Check that stabilizer trim indicator indicates 10.9 (± 1/2) units "AIRPLANE NOSE UP".

(8) Operate stabilizer until "A" dimension (See detail A, fig. 202) is 32-41/64 to 32-53/64 inches. Check that position indicator indicates 0 (± 1/2) units. Check of position indication for positions 2, 3, 5, 6 and 7 as defined in table in figure 202 is optional.

(9) Check breakaway and steady rotation forces at several places from one extreme of travel to the other. Force should not exceed 24 lbs. at wheel handle (98.5 in.lbs.torque) in either direction.

NOTE: Breakaway is defined as accelerating trim handwheel from rest to 0.60 rpm. Wheel rate should not exceed 6 rpm. during steady rotation.

(10) Manually operate system through one complete cycle and check that system runs smoothly without binding.

NOTE: Severe chatter or jerking may be encountered when manually operating stabilizer toward "AIRPLANE NOSE DOWN" position on the ground. This is due to location of stabilizer center of gravity which places a tension load on jackscrew shaft and causes engagement of the upper primary brake plate and jackscrew in the actuator. This condition will normally disappear after a few flight hours on the actuator and is not cause for replacement of the actuator.

(11) Remove autopilot trim servo.

(12) Insert pinion gear adapter into female spline on actuator. Hold adapter to prevent rotation.

(13) Check that manual force required at stabilizer control wheel handle to disengage manual clutch does not exceed 45 pounds. Travel will be accomplished by ratcheting the clutch.

(14) Remove adapter and install autopilot trim servo. Shim as necessary under upper mounting lug.

(15) Deleted.

(16) through (17) deleted

(18) At circuit breakers on the P2 panel, reverse any two 115-volt power leads to the electric trim actuator servomotor.

(19) Connect external power to airplane.

(20) Position stabilizer trim cutout switch to normal position.

(21) Position pilot's trim control switch to "NOSE UP" and then to "NOSE DOWN".

(22) Check that stabilizer does not operate.

(23) Repeat steps (21) and (22) with copilot's trim switch.

(24) At circuit breakers on the P2 panel, restore power leads to normal.

(25) Position pilot's stabilizer trim switch momentarily to "AIRPLANE NOSE DOWN". Check that trim wheels rotate counterclockwise when viewed from pilot's seat and that stabilizer leading edge moves up.

(26) Position pilot's stabilizer trim switch momentarily to "AIRPLANE NOSE UP". Check that trim wheels rotate clockwise when viewed from pilot's seat and that stabilizer leading edge moves down.

(27) Repeat steps (25) and (26) with copilot's stabilizer trim control switch and check stabilizer leading edge movement.

(28) Test limit switch adjustment per 27-10-1, Adjustment / Test Stabilizer Actuator limit Switch.

(29) Operate stabilizer through one complete cycle from 2.4 units "AIRPLANE NOSE DOWN" to 8 units "AIRPLANE NOSE UP" on OO-SJA through OO-SJG, and to 10.4 units "AIRPLANE NOSE UP" on OO-SJH and on.

CAUTION: OPERATION OF SYSTEM SHALL BE CONDUCTED IN SUCH A MANNER THAT TRIM MOTOR DUTY CYCLE OF 2 MINUTES "ON" AND 13 MINUTES "OFF" IS NOT EXCEEDED.

(30) Deleted.

(31) Check that system runs smoothly with no binding or chatter. See note after (37).

(32) Repeat steps (29) and (31) except operate stabilizer to opposite direction.

(33) Perform several consecutive actuations of approximately 3 seconds duration in "STABILIZER NOSE UP" direction.

(34) Check that operation is smooth and free of chatter. See note after (37).

(35) Repeat steps (33) and (34) in "STABILIZER NOSE DOWN" direction.

(36) Actuate in STABILIZER NOSE UP direction until system comes up to full rpm then return switch to OFF for approximately 0.2 seconds and actuate switch in opposite direction.

(37) Check that reversal of direction is immediate.

NOTE: Initial surges or chatter may be experienced due to cable stretch or moment of inertia.

(38) Repeat steps (36) and (37) in opposite direction.

(39) Actuate trim control switch in NOSE UP direction until system comes up to full rpm, then position stabilizer trim cutout switch to CUTOUT position.

(40) Check that stabilizer stops immediately.

(41) Position pilot's trim control switch to NOSE UP and then to NOSE DOWN position.

(42) Check that stabilizer does not operate.

(43) Repeat steps (41) and (42) using copilot's trim switch.

(44) Return stabilizer trim cutout switch to NORMAL.

(45) Actuate trim control switch in stabilizer NOSE UP direction until system comes up to full rpm. Release switch and check that maximum coast of stabilizer trim control wheel is 3 4 revolutions.

NOTE: Stabilizer trim wheel coast on a new or overhauled actuator should not exceed 2 revolutions. 3.4 revolution is an inservice limit.

(46) Repeat step (45) in stabilizer nose down direction

(47) Test stabilizer takeoff warning switch (Ref 31-26-0, Adjustment/Test).

(48) Test the stabilizer trim brake. See 27-10-81.

3. Inspection/Check Stabilizer Trim System

A. Check stabilizer trim system for wear per figure 205.

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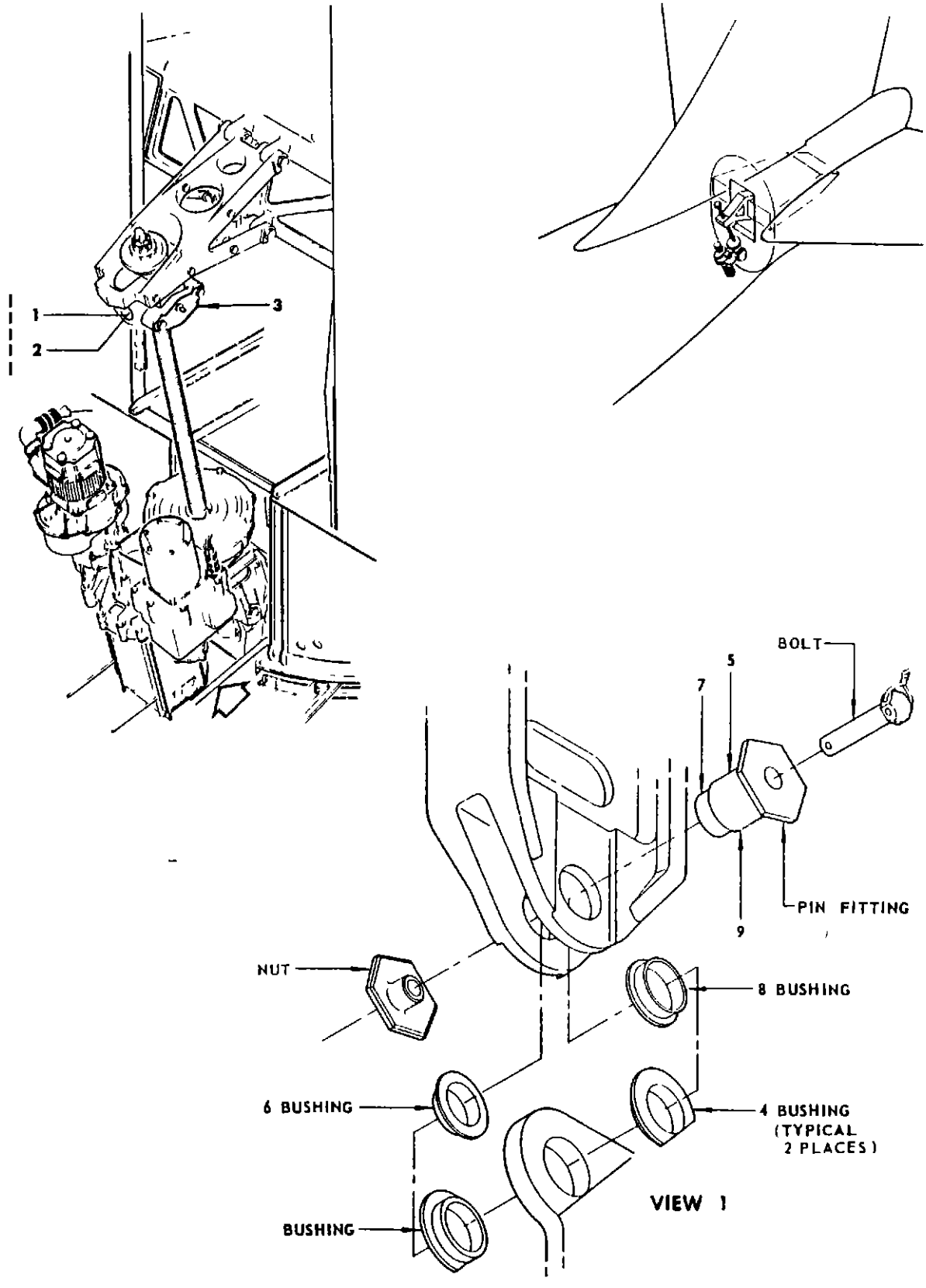

Stabilizer Trim System Wear Tolerance
Figure 205 (Sheet 1 of 2)

INDEX NO.	DIM.	DESIGN LIMITS DIAMETER MIN.	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM	WEAR LIMITS MAX. DIAM CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	NO	MTL	OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE MIN	MAX.
1	OD	1.4360	1.4370	1.4340	.0055						
2	ID	1.4375	1.4385	1.4395	.0055	A					
3	ID	1.2505	1.2510	1.2530	.0045						
	OD	1.2495	1.2500	1.2485	.0045						
4	ID	1.250	1 2510	1.2530	.0050						
5	OD	1.2490	1.2495	1.2480	.0050	B					
6	ID	1.000	1.001	1.003	.0050	C					
7	OD	0.9990	0.9995	0.9980	.0050	B					
8	ID	1.250	1.2510	1.2530	.0050	C					
9	OD	1.2490	1.2495	1.2480	.0050	B					

A. Replace Bushing
B. See drawing 1-5834
C. See drawings 1-72087 and 1-72110

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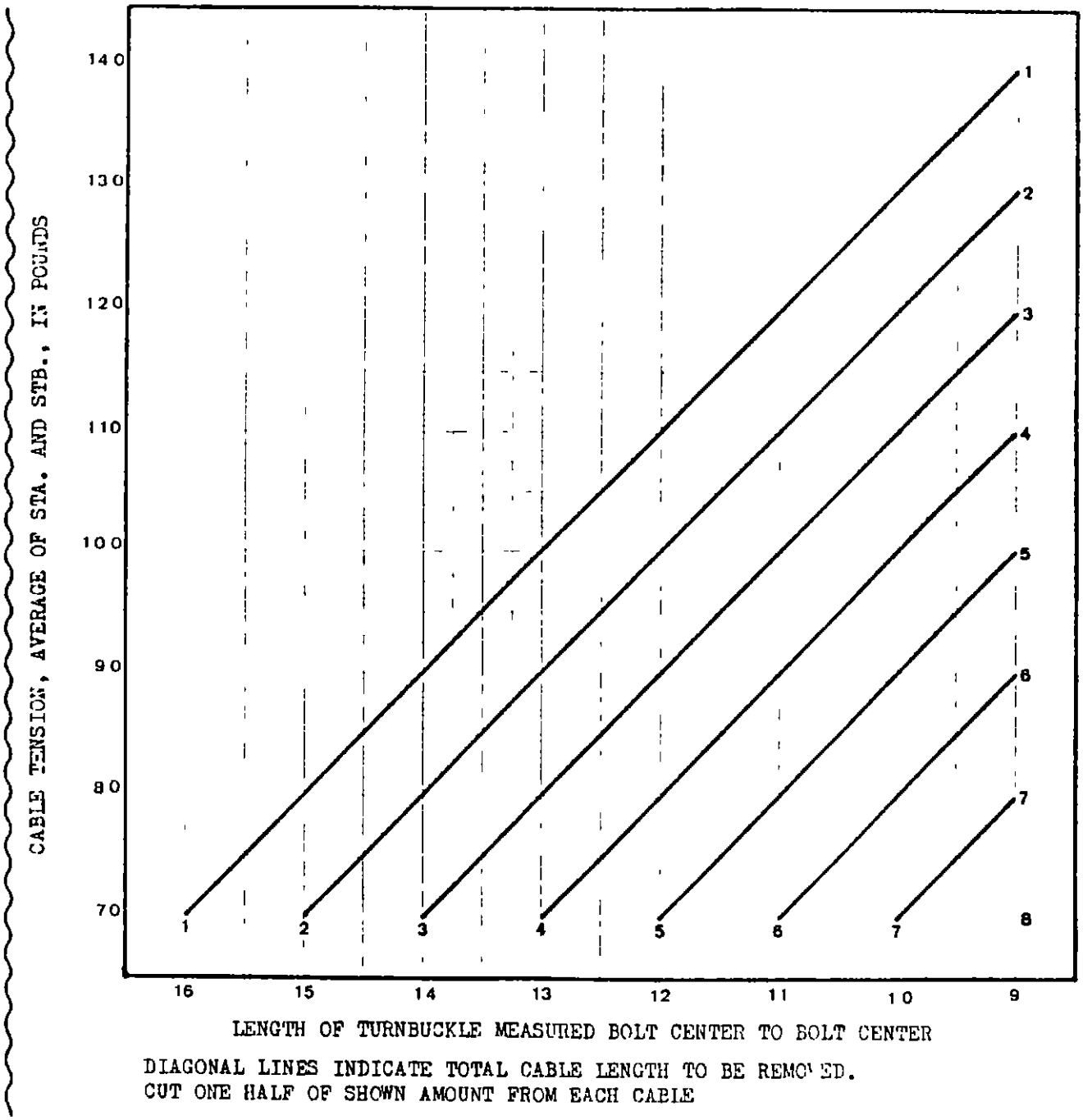

Cable Cutting Chart

Figure 206
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STABILIZER TRIM CONTROL CIRCUIT COMPONENTS - MAINTENANCE PRACTICES

1 Removal/Installation Stabilizer Trim Cutout Switch

A Remove Stabilizer Trim Cutout Switch

(1) Remove lower right access panel from control stand

(2) Remove cotter pin and locknut. (See figure 201.)

(3) Remove mounting bracket screws

(4) Remove switch mounting screws.

(5) Disconnect electrical connector and remove switch

B Install Stabilizer Trim Cutout Switch

(1) Position switch and install switch mounting screws. (See figure 201.)

(2) Connect electrical connector.

(3) Install bracket screws.

(4) Install washer and locknut

(5) Position pushrod and install cotter pin.

(6) Position cutout switch lever on control stand to "NORMAL" then "CUTOUT". Check for switch operation and adjust pushrod as required

(7) Test switch per paragraph 2A

(8) Install access panel

2 Adjustment/Test Stabilizer Trim Cutout Switch

A Test Stabilizer Trim Cutout Switch

(1) Connect external electrical power

(2) Position stabilizer control switch to "NOSE UP" then "NOSE DOWN"

(3) Check stabilizer operates and stabilizer light illuminates during operation.

(4) Position cutout switch to "CUTOUT".

(5) Position stabilizer trim control switch to "NOSE UP" and "NOSE DOWN".

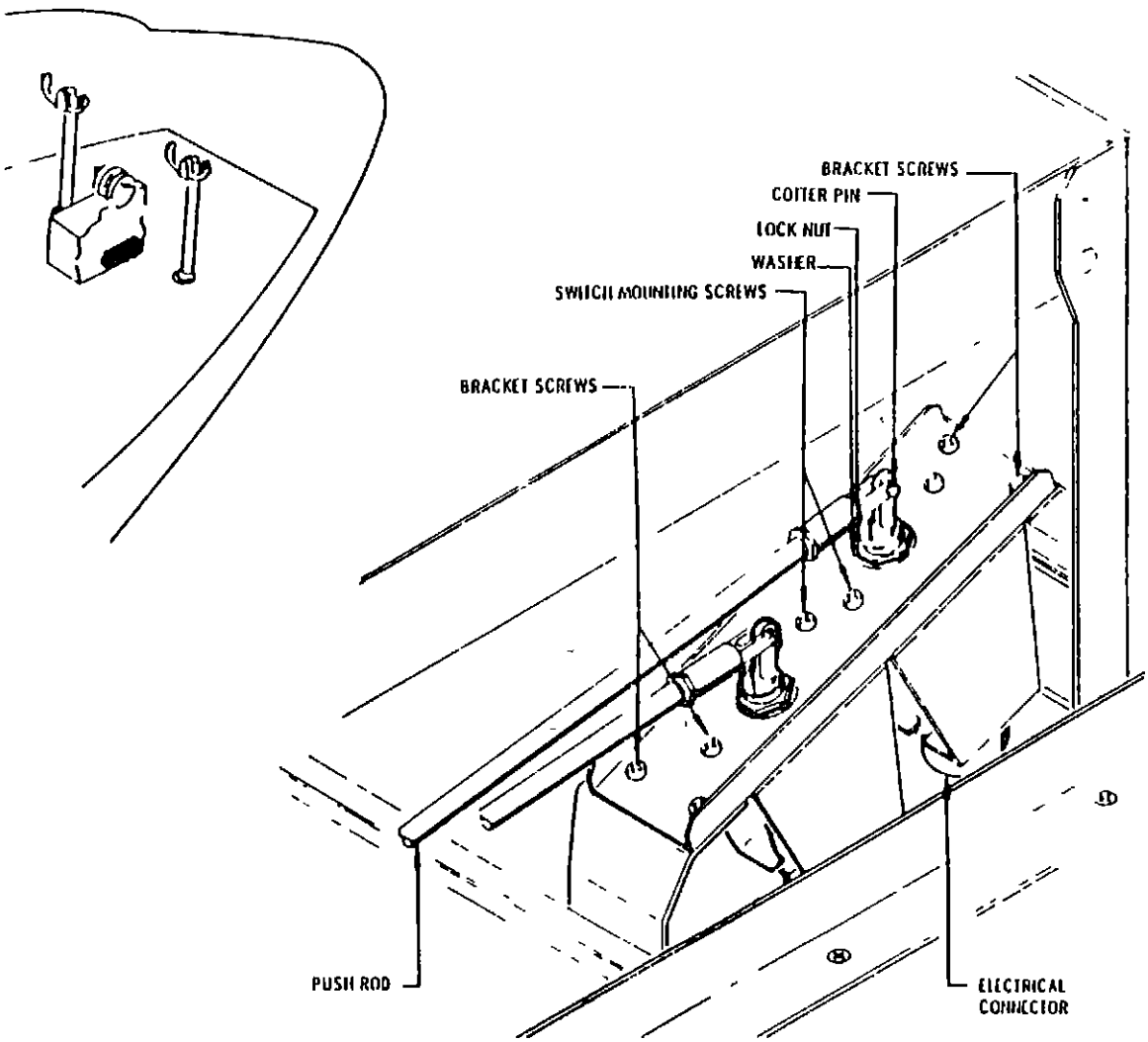
(6) Check that stabilizer trim light does not illuminate and system does not operate.

(7) Position switch to "ON" and check that system operates and stabilizer light illuminates.

(8) Remove electrical power.

(9) Check that force required to operate each trim and stabilizer trim cutout switch levers does not exceed 6 pounds in either direction.

(10) Cycle each switch lever 10 times each way and check for interference or binding.



Stabilizer Trim Cutout Switch Installation
Figure 201 (Sheet 1)

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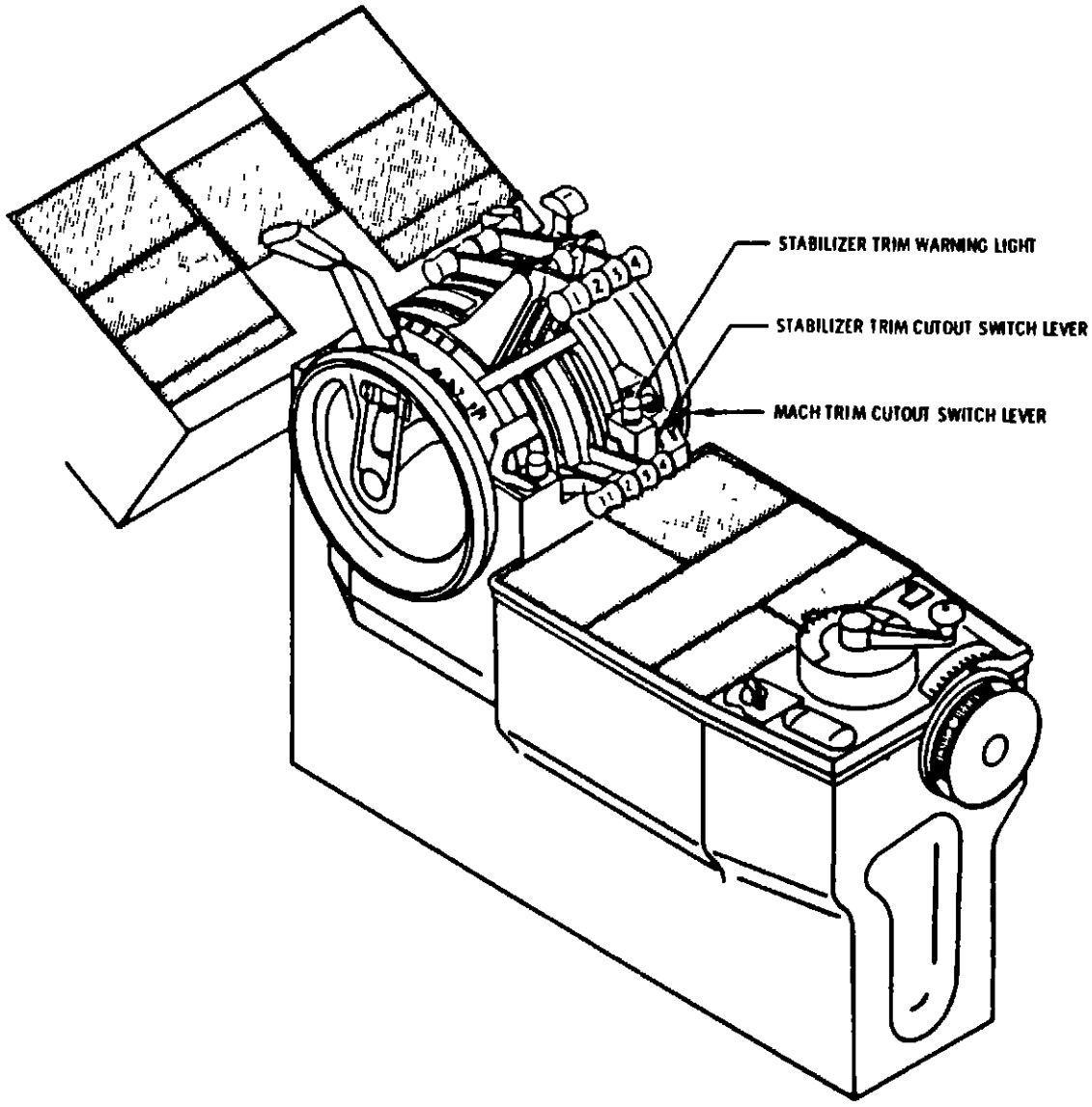

STABILIZER TRIM WARNING LIGHT
STABILIZER TRIM CUTOUT SWITCH LEVER
MACH TRIM CUTOUT SWITCH LEVER

4. Adjustment /Test Stabilizer Trim Limit Switch

A. Adjust Stabilizer Trim Limit Switch

(1) Remove stabilizer jackscrew access panel 1185. See Chapter 12, "Access Doors and Panels".

(2) Connect electrical power.

(3) Move stabilizer in "AIRPLANE NOSE UP" direction until dimension "A" is 15-3/16 (± 3/32) inches.

(4) Adjust "AIRPLANE NOSE UP" limit switch.

(5) Move stabilizer in "AIRPLANE NOSE DOWN" direction until dimension "A" is 36-3/4 (± 3/32) inches.

(6) Adjust "AIRPLANE NOSE DOWN" limit switch.

(7) Close access panel.

B. Test Stabilizer Trim Limit Switch

(1) Remove stabilizer jackscrew access panel. See Chapter 12, "Access Doors and Panels".

(2) Connect electrical power to airplane.

(3) Actuate stabilizer to "AIRPLANE NOSE UP" direction until limit switches de-energize magnetic clutches in trim motor unit.

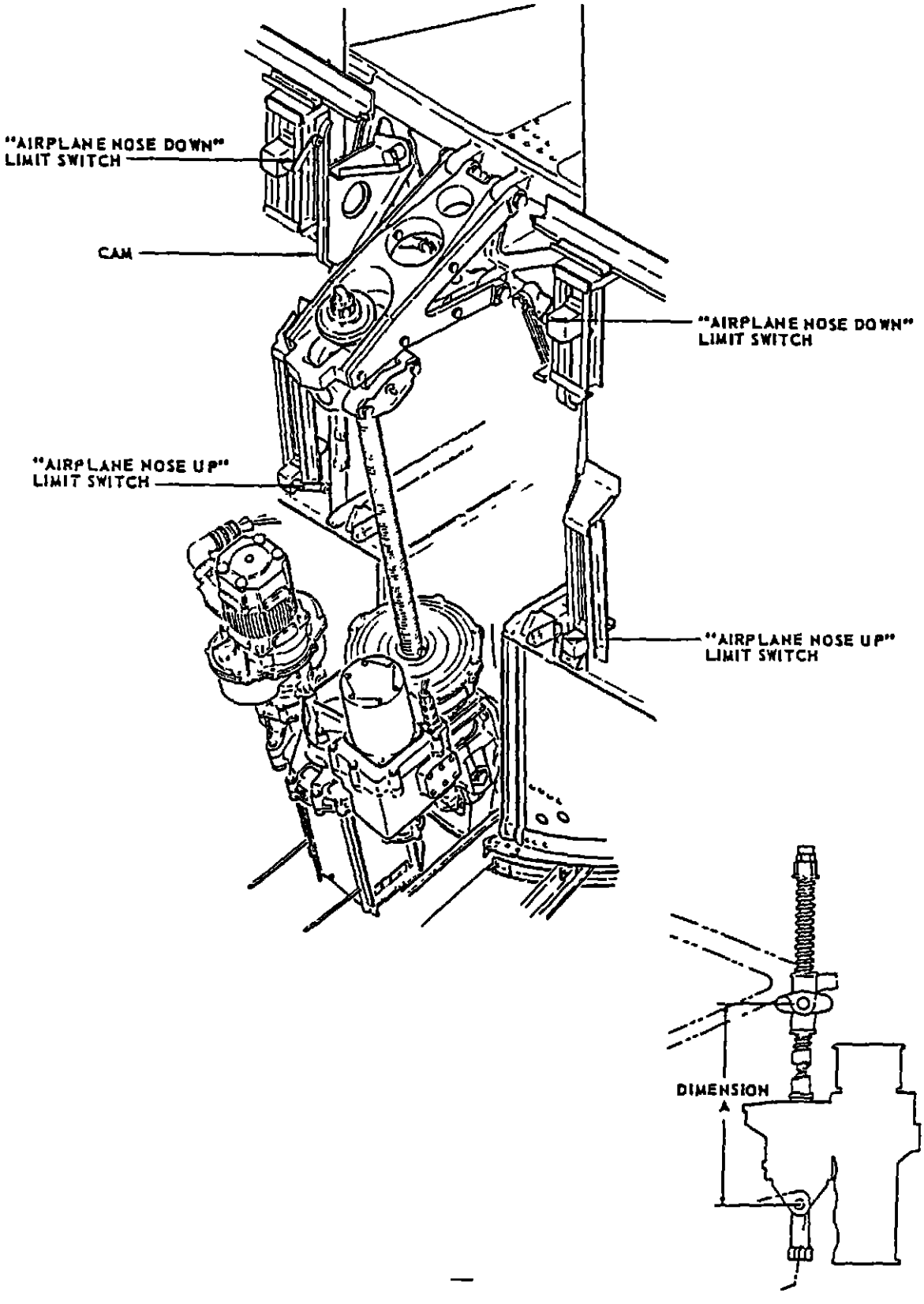
(4) Check that dimension "A" is 14-25/32 to 15-5/16 inches. If O.K., block limit switch using locating blocks.

(5) Actuate stabilizer to "AIRPLANE NOSE DOWN" direction until limit switches de-energize clutches in trim motor unit.

(6) Check that dimension "A" is 36-21/32 to 37-3/16 inches. If O.K., block limit switch using locating blocks.

(7) Determine whether there is any further need for electrical power; if not, remove external power.

(8) Close access panel.



Stabilizer Trim Limit Switch Adjustment
Figure 202A

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5. Deleted

6. Deleted

D E L E T E D

7. Removal/Installation Stabilizer Trim Control Switch Assembly

A. General

(1) The stabilizer control trim switch is attached to a wire bundle routed through the control wheel handle to a terminal strip in the control wheel. In the control wheel it is spliced to a wire bundle running through the control column. If a switch becomes defective the wire bundle and switch are replaced as an assembly.

B. Equipment and Materials

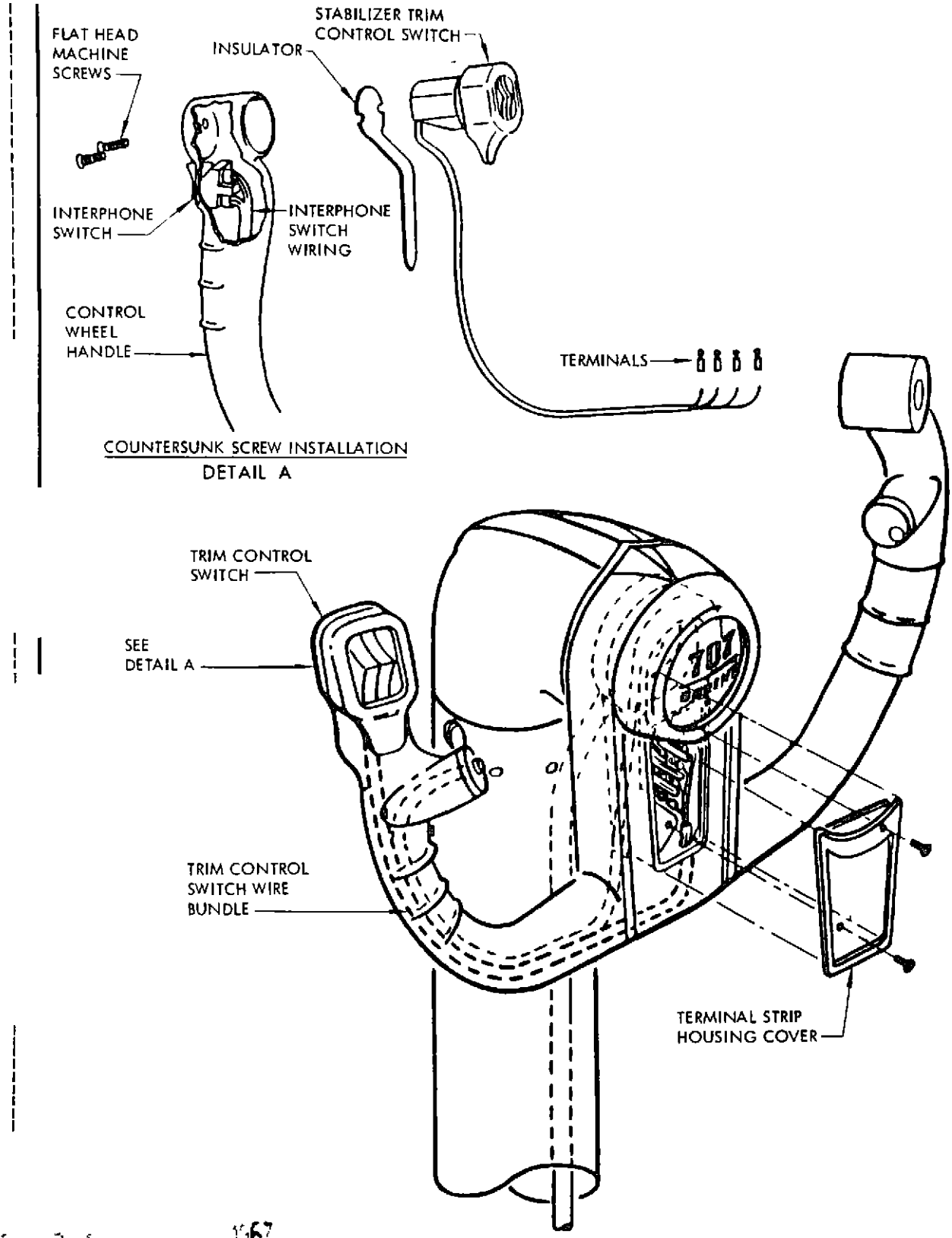
(1) Insulation tester

(2) Talc

C. Remove Stabilizer Trim Control Switch Assembly

(1) Remove terminal strip housing cover. (See figure 208.)

(2) Disconnect the stabilizer trim control switch leads from the terminal.



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Stabilizer Trim Control Switch Installation
Figure 208

(3) Disconnect stabilizer trim switch from handle.

(4) Attach wire guide to end of switch wire bundle and withdraw bundle through stabilizer trim switch hole. Disconnect wire bundle and allow guide to remain in control wheel handle

D Install Stabilizer Trim Control Switch Assembly

(1) Apply talc to exterior of wire bundle.

(2) Pull wire bundle through trim control switch hole of control wheel

(3) Insert insulator between trim switch and interphone switch wires.

(4) Install trim control switch.

(a) Pull wire bundle through control wheel until control switch is firmly seated in control wheel. Install flat head screws and tighten to 2 ($\pm$ 1/4) pound-inches torque.

CAUTION: DO NOT OVERTORQUE SCREWS.

(b) Deleted.

(5) Attach control switch wires to terminal

(6) Test wire bundle and switch for electrical insulation between each wire and ground, and between wires VIOLET to RED, VIOLET to ORANGE, VIOLET to BLACK-ORANGE, RED to BLACK-ORANGE, RED to ORANGE, and BLACK-ORANGE to ORANGE Using insulation tester, check that all wires and the switch have a resistance of 100 megohms or greater.

(7) Replace terminal strip housing.

8. Adjustment/Test Stabilizer Trim Control Switch Assembly

A. Test Stabilizer Trim Control Switch Assembly

(1) Rotate control wheel through 5 cycles of full travel, 108° each side of neutral

(2) Test all wires and switch for electrical insulation between wire and ground as in paragraph D6 Continually rotate wheel through full travel during this test.

(3) Connect external electrical power and energize A-C bus No 2 circuit breaker panel (P2) and Radio and T-R circuit breaker panel (P5)

(4) Actuate stabilizer trim control switch to "AIRPLANE NOSE UP". Check that stabilizer leading edge moves down. Actuate stabilizer trim control switch to "AIRPLANE NOSE DOWN". Check that stabilizer leading edge moves up.

(5) Determine whether there is any futher need for electrical power on airplane, if not, remove external power.

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STABILIZER TRIM MOTOR UNIT - MAINTENANCE PRACTICES

1. Removal/Installation Stabilizer Trim Motor Unit

   A. Remove Stabilizer Trim Motor Unit

      (1) Remove stabilizer jackscrew access panel 1185. (See "Access Doors and Panels, Chapter 12)

      (2) Remove electrical connector (figure 201) from stabilizer trim motor unit.

      (3) Remove trim motor unit mounting bolts.

      (4) Remove motor unit.

      (5) Remove clamps to free electrical wire bundle.

      (6) Cover mounting pad to prevent foreign matter from entering the stabilizer ball nut and jackscrew actuator assembly.

   B. Install Stabilizer Trim Motor Unit

      (1) Check for a clean mounting surface and position shaft of stabilizer trim motor (figure 201).

      (2) Position and install mounting bolts.

      (3) Install electrical connector.

      (4) Secure electrical wire bundle.

      (5) Test stabilizer trim motor per paragraph 2.A.

      (6) Install stabilizer jackscrew access panel.

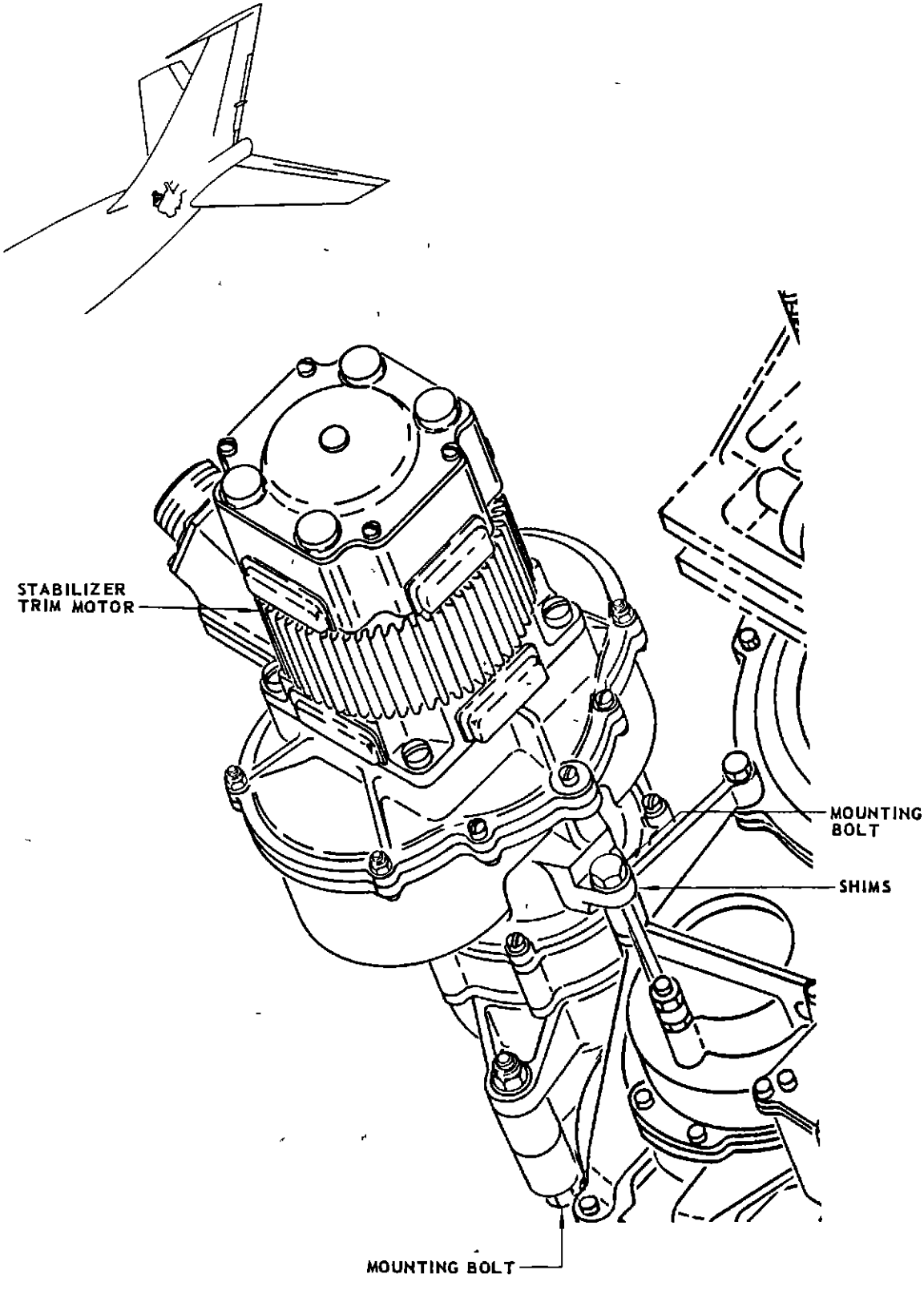
2. Adjustment/Test Stabilizer Trim Motor Unit

   A. Test Stabilizer Trim Motor Unit

      (1) Connect external electric power to airplane.

      (2) Position stabilizer trim control switch to "NOSE UP" and check position indicator for proper direction of travel.

      CAUTION. ALLOW AT LEAST 13 MINUTES FOR COOLING FOR EVERY 2 MINUTES OF OPERATION OF THE STABILIZER TRIM MOTOR UNIT.



Stabilizer Trim Motor Unit Installation
Figure 201

(3) Position stabilizer trim control switch to NOSE DOWN and check position indicator for direction of travel.

(4) Position control switch to NOSE DOWN until limit switch is actuated.

(5) Position control switch to NOSE UP until limit switch is actuated.

(6) Disconnect electrical power from airplane.

STABILIZER TRIM ACTUATOR ASSEMBLY - MAINTENANCE PRACTICES

1. Deleted.

2. Removal/Installation Stabilizer Trim Actuator Assembly

   A. General

      (1) Severe chatter of jerking may be encountered when manually operating stabilizer toward AIRPLANE NOSE DOWN position on the ground. This is due to location of stabilizer center of gravity which places a tension load on jackscrew shaft and causes engagement of the upper primary brake plate and jackscrew in the actuator. The chatter will normally disappear after a few flight hours on the actuator and is not cause for replacement of the actuator.

   B. Equipment and Materials

      (1) Stabilizer Support Jack Assembly - F70057-500 or equivalent

      (2) Spring scale, 0 to 10 pounds

      (3) BMS 5-16; Two Part Hole Filling Compound

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MAINTENANCE MANUAL

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C. Remove Stabilizer Trim Actuator

(1) Remove stabilizer jackscrew access panel 1185. See Chapter 12, "Access Doors and Panels."

(2) Remove safety rod access panels 1075 and 1199 from ventral fin. (For airplanes with ventral fin.)

(3) Remove safety rod access panel 1186 from bottom of fuselage. Access panel 1186 attaching screws are accessible through access panel 1075 on the ventral fin.

(4) Position stabilizer at 3-3/4 units of nose up trim.

(5) Remove safety bolt (14, figure 202) and safety rod nut (15), and pull safety rod (4) down through jackscrew (18) and remove.

(6) Operate stabilizer to full "AIRPLANE NOSE UP" trim. (Stabilizer nose down.)

(7) Adjust forward mechanism support linkage to relieve tension in chain assembly. (See figure 201, 27-10-31.)

NOTE Slack in chain assembly is necessary to prevent excessive loads on chain assembly when cable tension is relieved.

(8) Release tension in cables by loosening turnbuckles in forward mechanism. (See figure 202.)

(9) Remove stabilizer trim motor (11).

(a) Disconnect electrical connector (10) from stabilizer trim motor.

(b) Remove clamps to free electrical bundle.

(c) Remove mounting bolts (9) and remove stabilizer trim motor

(10) Remove autopilot servo (5)

(a) Disconnect electrical connector (1) from autopilot servo.

(b) Remove clamps to free electrical bundle.

(c) Remove mounting bolts and remove autopilot servo.

(11) Remove stabilizer actuator shroud assembly (6)

(a) Remove forward cover bolts (27), nuts (31) and forward cover (28).

(b) Remove lower support plate bolts (25) and cable guard bolts (26) with spacers.

(c) Remove support plate (24) with lower spacers (23)

(d) Remove aft cover bolts (21) and aft cover (20) with laminated shims.

(e) Remove two top bolts which secure upper plate (19). Remove upper plate and side covers (29) by sliding forward.

(12) Remove "STB" cable from cable drum.

NOTE Take necessary precautions to prevent fouling cables.

(13) Insert adapter into stabilizer trim motor internal spline. Attach hand ratchet to adapter and actuate stabilizer to full "AIRPLANE NOSE DOWN" position (Stabilizer nose up).

NOTE. As stabilizer is moved, pull cable "STB" into tail compartment and wind cable on cable reel or wire spool.

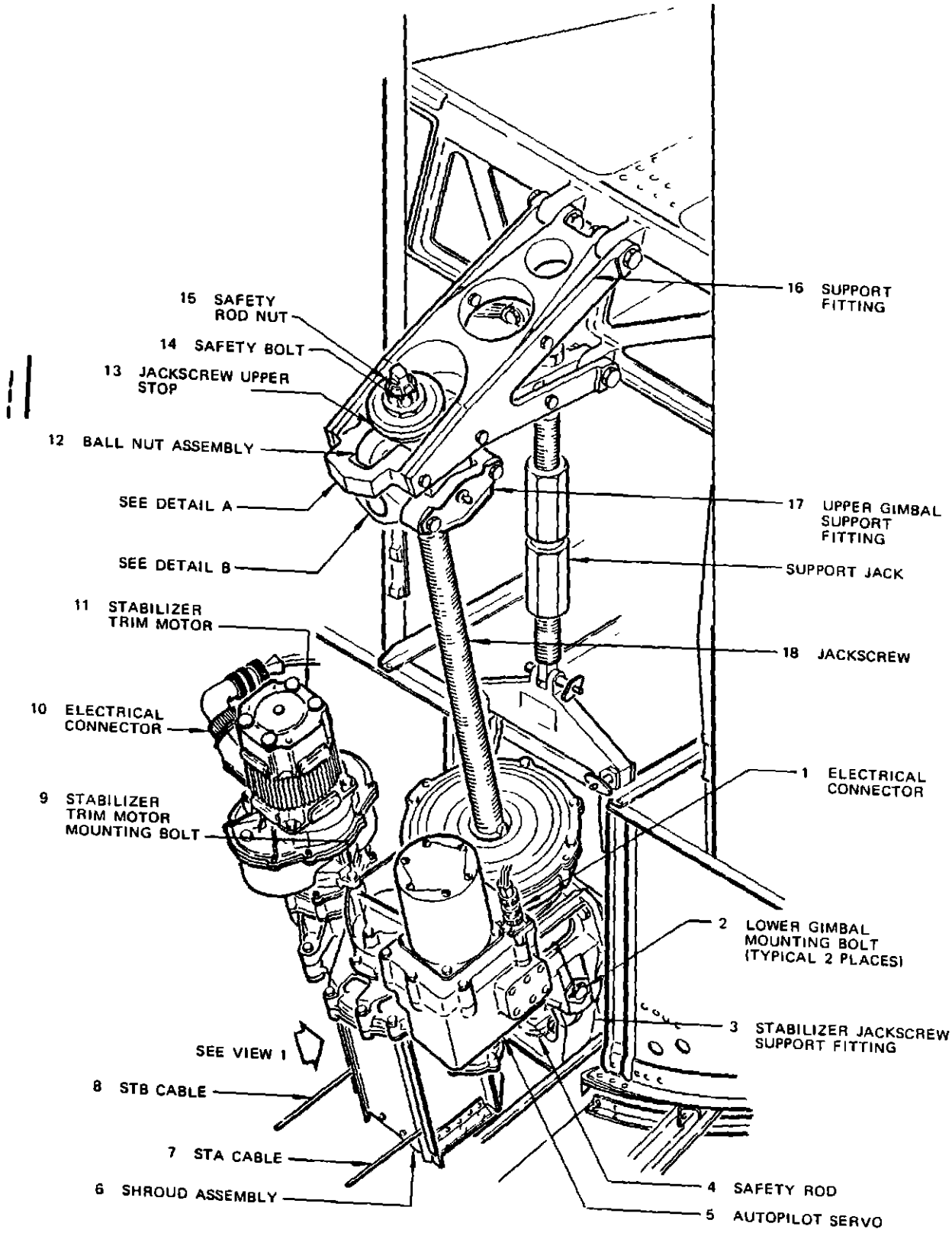
(14) Remove "STA" cable from cable drum and block cables.

NOTE. Make note of cable "STA" that is left on drum before removal. (Note number of turns and/or fractions of turns.) Tag cable terminal with this information.

(15) Install stabilizer support jack assembly.

NOTE· Before installing stabilizer support jack assembly, check for near equal threads on each side of barrel.

(16) Adjust stabilizer support jack to take weight off stabilizer trim actuator



Stabilizer Trim Actuator Installation
Figure 202 (Sheet 1)

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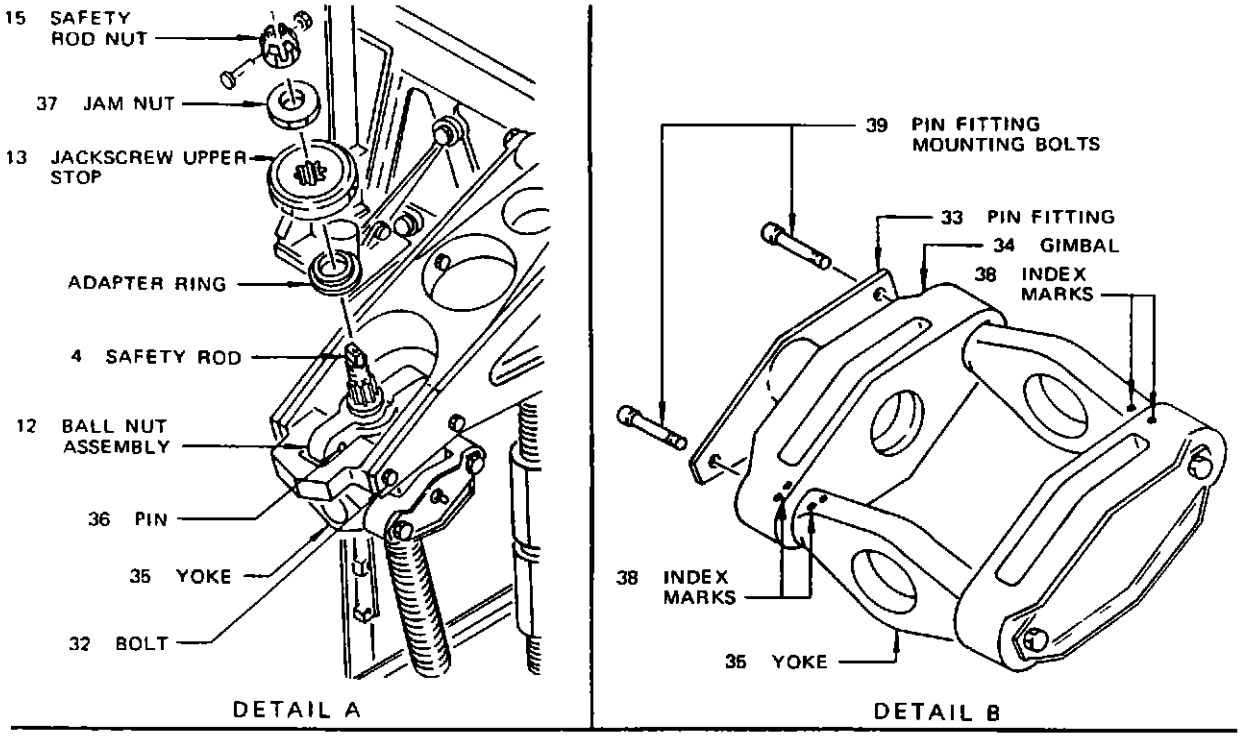
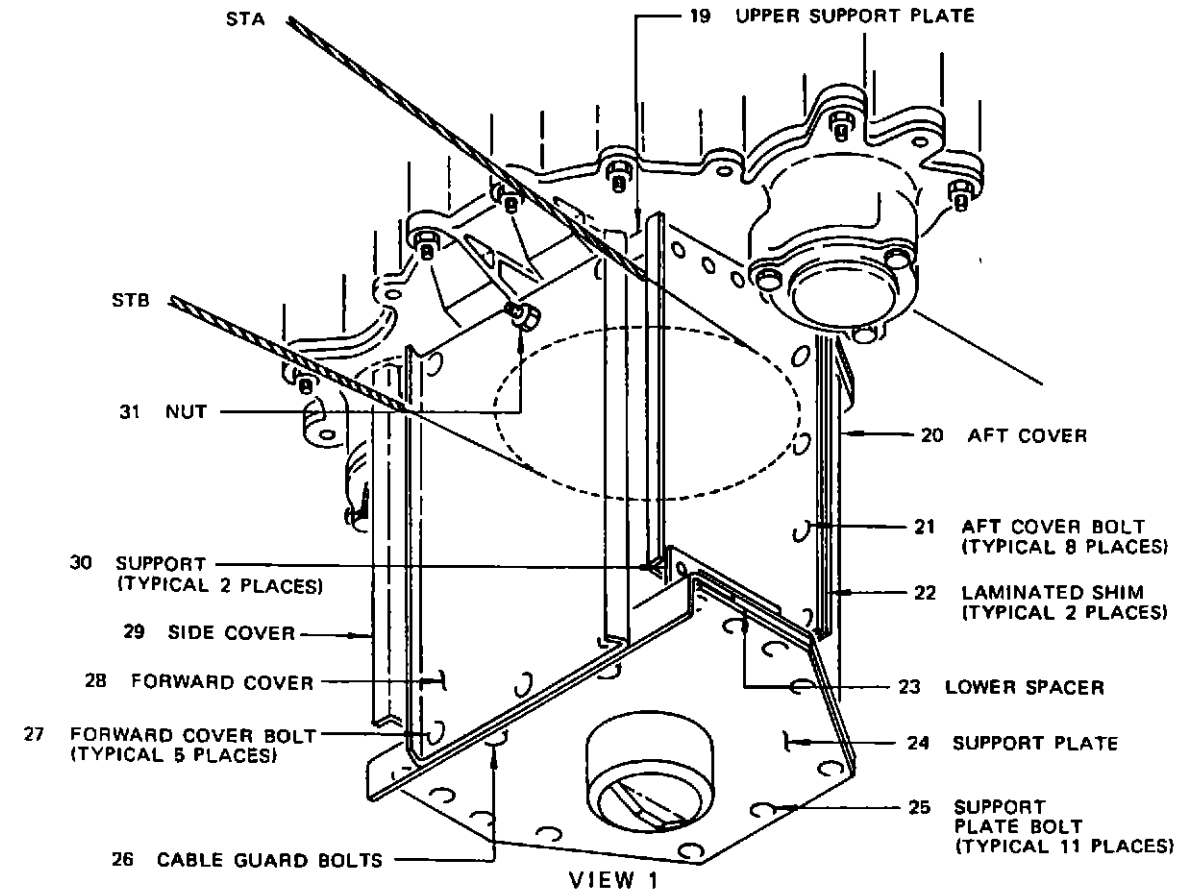

15 SAFETY ROD NUT
37 JAM NUT
13 JACKSCREW UPPER STOP
ADAPTER RING
4 SAFETY ROD
12 BALL NUT ASSEMBLY
36 PIN
35 YOKE
32 BOLT
DETAIL A
39 PIN FITTING MOUNTING BOLTS
33 PIN FITTING
34 GIMBAL
38 INDEX MARKS
38 INDEX MARKS
35 YOKE
DETAIL B


STA
19 UPPER SUPPORT PLATE
STB
31 NUT
20 AFT COVER
21 AFT COVER BOLT (TYPICAL 8 PLACES)
30 SUPPORT (TYPICAL 2 PLACES)
22 LAMINATED SHIM (TYPICAL 2 PLACES)
29 SIDE COVER
28 FORWARD COVER
23 LOWER SPACER
27 FORWARD COVER BOLT (TYPICAL 5 PLACES)
24 SUPPORT PLATE
25 SUPPORT PLATE BOLT (TYPICAL 11 PLACES)
26 CABLE GUARD BOLTS
VIEW 1

(17) Remove nut (37) securing jackscrew upper stop (13) to jackscrew and pull stop from jackscrew spline.

(18) Remove ball nut mounting bolts (32) and pins (36), remove bolts (39) attaching pin fitting (33) to upper gimbal assembly and remove pin fitting.

(19) Remove lower gimbal mounting bolts (2) and locking pins and pull bottom of actuator forward, allowing actuator assembly to pivot about support fitting and remove assembly through access opening.

(20) Remove gimbal assembly from ball nut by applying equal force at each end of gimbal fitting (34). Gimbal fitting and yoke (35) are machined to extremely close tolerances and may be difficult to separate.

D. Prepare for Installation Stabilizer Trim Actuator

(1) Remove cable guard from new or serviceable actuator.

(2) Remove safety bolt, safety rod nut and remove safety rod.

(3) Index snubber to jackscrew spline and remove snubber from spline.

(4) Lubricate trunnions with Aeroshell Grease 17. Position yokes over ball nut trunnions so that their lube fittings face the gearbox. Install gimbal fittings. Remove excess of grease.

NOTE: Gimbal fitting and yoke must be assembled so that colored index marks (38) match.

E. Install Stabilizer Trim Actuator

(1) Adjust ball nut assembly (12, figure 202) until downstop nut is contacted.

(2) Lift actuator until jackscrew (18) fits through stabilizer support fitting (16).

(3) Align actuator lower gimbal (2) assembly with stabilizer jackscrew support fitting (3) and install locking pin and mounting bolts. Lubricate locking pins with grease, MIL-G-23827. Install nuts with boss in the recess of the pin fittings, as shown in view 1 of figure 205, 27-10-0

(4) Position ball nut assembly slightly below stabilizer support fitting (16) and lower support jack until ball nut assembly fits through support fitting. Lugs on support fitting must fit into slots on upper gimbal assembly (17).

(5) Install pin fitting (33) and pin fitting mounting bolts.

(6) Install pins (36) and ball nut mounting bolts (32). Check that there is no interference between aft pin (36) and aft upper edge of aft slot in ballnut fitting (12). Just touching condition is acceptable. If interference exists, rework pin (36) or slot edge in fitting (12) per PC 707/69 to give 0.010 inch clearance.
Do not remove more material than 0.062 inch from slot edge or 0.060 inch from pin diameter.
Torque nuts on bolts (32) at 100 to 140 pound-inches.

(7) Position jackscrew upper stop (13) over jackscrew spline so that indices on stop and jackscrew match and torque jamnut at 40 to 60 pound-inches. Check that adapter ring is installed over spline either prior to or with installation of stop.

(8) Insert adapter into stabilizer trim motor spline and position actuator to full AIRPLANE NOSE DOWN (stabilizer nose up). Stops on jackscrew and ball nut must contact.

(9) Check that clearance between upper jackscrew stop and top of ball nut stop is 0.18 (± 0.01) inch as shown on figure 203. If necessary remove jamnut and rotate upper stop or snubber on spline to obtain required clearance.

(10) Not applicable to SABENA aircraft.

(11) Insert STA cable terminal into lower terminal slot on cable drum.

NOTE: Check number of turns of cable STA and STB removed from original actuator drum. (See tag attached to cable) Approximately the same amount of cable should be installed on new actuator drum, but should not be less than 3/4 turn of cable wrap with ball nut against upper and lower stops.

(12) Remove stabilizer support jack.

(13) Wind STA cable on drum by driving stabilizer trim actuator with ratchet and adapter toward AIRPLANE NOSE UP position (stabilizer nose down). Guide and restrain cable during actuation.

NOTE: As STA cable winds on drum, unwind STB cable from cable reel or spool in tail compartment. Maintain slight tension on STB cable.

(14) Install STB cable on cable drum.

(15) Operate stabilizer to 3-3/4 units nose up trim using stabilizer trim wheel on side of control stand.

(16) Install safety rod (4) through jackscrew (18) by passing rod through bottom of ventral fin and stabilizer jackscrew support fitting (3) into jackscrew (18).

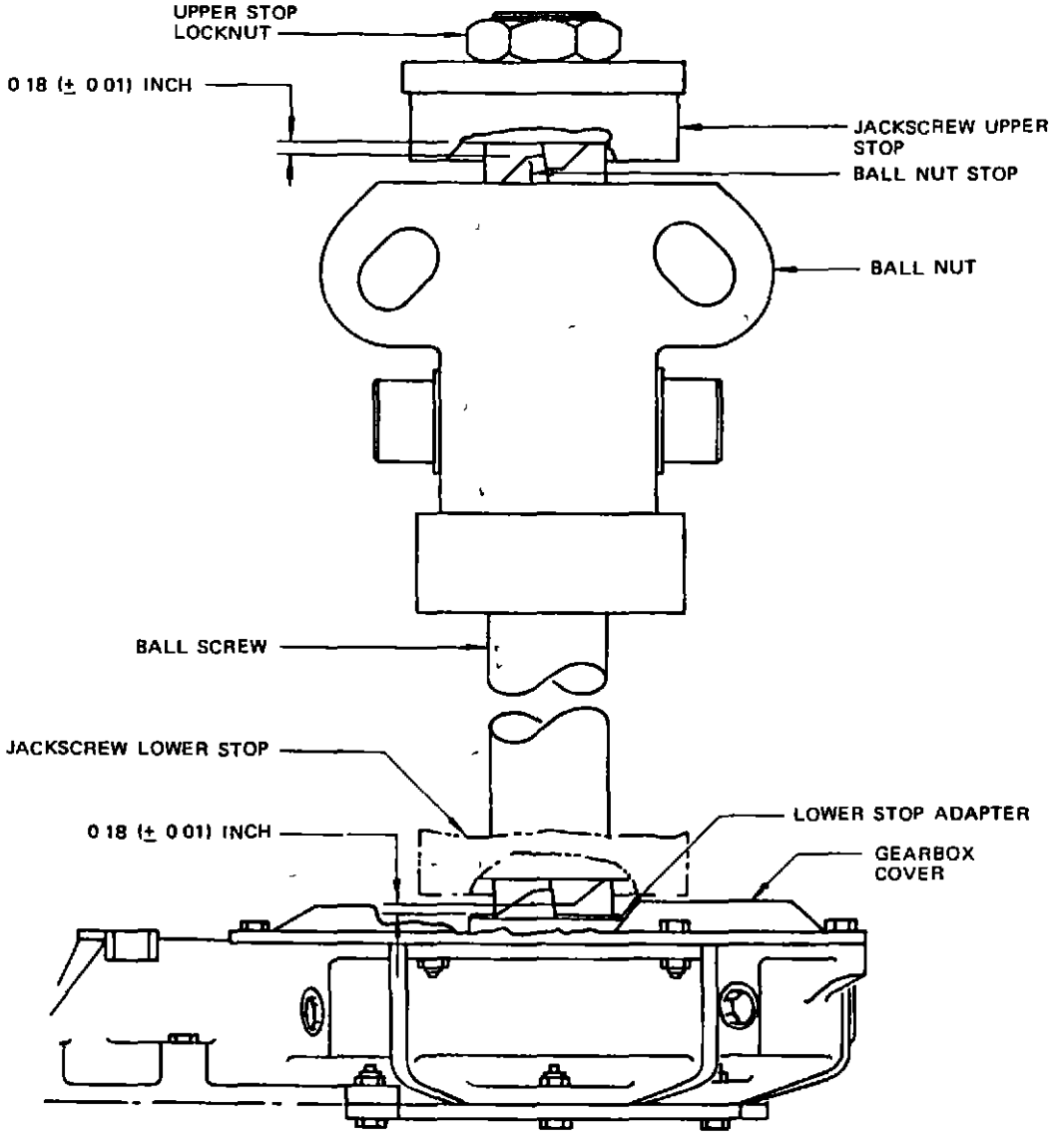
NOTE: Apply a light coat of Aeroshell Grease 17 along safety rod.

(17) Install safety rod nut (15) finger-tight and then install safety bolt (14).

(18) Position cable guard around cable drum and install mounting bolts.

(19) Install stabilizer shroud assembly (6).

(a) Position upper support plate (19) with side covers (29) and install the two mounting bolts.



Ball Nut Stop Clearance
Figure 203

SAB. RLV. 17 NOV. 1969

(b) Position lower supports (30) and lower spacers (23).

(c) Position support plate (24) and install support plate bolt (25)

(d) Position cable guard spacers and install cable guard bolts (26).

(e) Position forward cover (28) and install forward covers bolts (27) and nut (31).

(f) Position aft cover (20) and install aft cover bolts (21).

(g) Apply BMS 5-16 to seal opening between actuator and top of aft cover (21). See 51-3-0, "Sealing."

(20) Install autopilot servo (5). See PC 707/72

(a) Remove all foreign matter from mounting pad.

(b) Position autopilot trim servo on mounting pad. Determine if a gap exists between either upper or lower mounting lugs and mounting face of stabilizer trim actuator housing.

(c) If gap exists at the upper mounting lug, shim the assembly so that gap does not exceed 0.002 inch

(d) If gap exists at lower mounting lug and exceeds 0 002 inch machine material from bottom surface of upper mounting lug on trim servo as required. Repeat steps (b) and (c) and install mounting bolts.

(e) If gap does not exceed 0.002 inch install mounting bolts.

(f) Connect electrical connector to autopilot servo and install clamps securing electrical bundle.

(21) Install stabilizer trim actuator motor (11).

(a) Remove all foreign matter from motor mounting pad.

(b) Position stabilizer trim motor on mounting pad and install mounting bolts (9). Shim as necessary at upper mounting lug.

(c) Connect electrical connector (10) to motor.

(d) Secure electrical wire bundle.

(22) Adjust turnbuckle at forward mechanism to 15-1/2 inches to start cable tension adjustment. (See 27-10-31, figure 201.)

(23) Rotate trim control wheel until "STA" and "STB" have approximately equal number of turns on forward cable drum.

(24) Remove lower right access panel from control stand.

(25) Apply a two pound force perpendicular to chain at approximately 4-3/4 inches along chain from tangency of chain and idler sprocket. Check that chain deflects 3/16 to 3/8 inch. (See 27-10-31, figure 201.)

(26) Adjust support linkage as required to obtain required amount of chain deflection.

(27) Check that length of fore and aft linkage is equal within 1/16 inch. Equal length is required to prevent misalignment of forward mechanism.

(28) Readjust turnbuckle as required to obtain rigging loads as specified in temperature tension chart. (See 27-10-0, figure 202.)

(29) Install lower right access panel on control stand.

(30) Adjust stabilizer actuator limit switch. See 27-10-1, "Adjustment/ Test Stabilizer Actuator Limit Switch."

(31) Install access panels 1185, 1075, 1199 and 1186.

(32) Test stabilizer trim actuator.

3. Adjustment/Test Stabilizer Trim Actuator Assembly

A. Equipment and Materials

(1) Pinion Gear Adapter - F71252 or equivalent

(2) Spring Scale - 0 to 50 pound capacity

B. Test Stabilizer Trim Actuator Assembly

(1) Remove stabilizer jackscrew access panel 1185. See Chapter 12, "Access Doors and Panels."

(2) Rotate pilot's stabilizer trim wheel counterclockwise until stabilizer trim actuator upstop is contacted and check that distance from lower gimbal bolt centerline to upper gimbal pin centerline is 38-37/64 ($\pm$ 3/32) inches. (See detail A, figure 202, 27-10-0.)

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(3) Check that clearance between jackscrew upper stop and top of ball nut stop is 0.18 (± 0.01) inch as shown in figure 203. If necessary remove jamnut and rotate upper stop on spline to obtain required clearance.

(4) Check that stabilizer trim indicator indicates 3-1/2 (± 1/2) units airplane nose down trim.

(5) Turn pilot's stabilizer trim wheel clockwise until lower snubber stops are just contacted.

(6) Check distance from lower gimbal bolt centerline to upper gimbal bolt centerline and check stabilizer position indicator. Distance shall be 14-1/2 to 14-45/64 inches and indicator shall show 10.85 (± 1/2) units "AIRPLANE NOSE UP" trim.

(7) Check that clearance between jackscrew lower stop and top of ball nut stop is 0.18 (± 0.01) inch. (See figure 203.)

(8) Check breakaway and steady rotation forces at several places from one extreme of travel to the other. Force should not exceed 24 lbs. at wheel handle (98.5 in.lb. torque) in either direction.

NOTE: Breakaway is defined as accelerating trim handwheel from rest to 0.60 rpm. Wheel rate should not exceed 6 rpm during steady rotation.

(9) Operate system through one complete cycle and check that system runs smoothly without binding.

NOTE: Severe chatter or jerking may be encountered when manually operating stabilizer toward "AIRPLANE NOSE DOWN" position on the ground. This is due to location of stabilizer center of gravity which places a tension load on jackscrew shaft and causes engagement of the upper primary brake plate and jackscrew in the actuator. The chatter will normally disappear after a few flight hours on the actuator and is not cause for replacement of the actuator. See I.T.EG. 62/7

(10) Remove autopilot trim servo.

(11) Insert pinion gear adapter into female spline. Hold adapter to prevent rotation.

(12) Check that force required at stabilizer control wheel handle to disengage manual disconnect clutch does not exceed 45 pounds. Travel will be accomplished by ratcheting the clutch.

(13) Remove adapter and install autopilot trim servo.

(14) Rotate stabilizer trim wheel several revolutions in clockwise direction.

(15) through (16) deleted.

(17) Connect electrical power to airplane.

(18) Position stabilizer trim cutout switch to normal position.

(19) Position pilot's stabilizer control switch momentarily to "AIRPLANE NOSE DOWN". Check that trim wheels rotate counterclockwise when viewed from pilot's seat and that stabilizer leading edge moves up.

(20) Position pilot's stabilizer control switch momentarily to "AIRPLANE NOSE UP". Check that trim wheels rotate clockwise when viewed from pilot's seat and that stabilizer leading edge moves down.

(21) Repeat steps (19) and (20) with copilot's stabilizer trim control switch and check stabilizer leading edge movement.

(22) Test limit switch adjustment per 27-10-1,"Adjustment / Test Stabilizer Actuator Limit Switch."

(23) Operate stabilizer through one cycle from 2.4 units "AIRPLANE NOSE DOWN" 10.4 units "AIRPLANE NOSE UP"

NOTE: OPERATION OF SYSTEM SHALL BE CONDUCTED IN SUCH A MANNER THAT TRIM MOTOR DUTY CYCLE OF 2 MINUTES "ON" AND 13 MINUTES "OFF" IS NOT EXCEEDED.

(24) Deleted.

(25) Check that system runs smoothly with no binding or chatter. See note after (30).

(26) Repeat steps (23) to (25) except operate stabilizer to opposite direction.

(27) Perform several consecutive actuations of approximately 3 seconds duration in stabilizer nose up direction.

(28) Check that operation is smooth and free of chatter. See note after (30).

(29) Repeat steps (27) and (28) in stabilizer nose down direction.

(30) Actuate in "STABILIZER NOSE UP" direction until system comes up to full rpm, then return switch to "OFF" for approximately 0.2 seconds and actuate switch in opposite direction.

NOTE: Initial surges or chatter may be experienced due to cable stretch or moment of inertia.

(31) Check that reversal of direction is immediate

(32) Repeat steps (30) and (31) in opposite direction.

(33) Remove electrical power from airplane.

(34) Install stabilizer jackscrew access panel

4 Cleaning/Painting Stabilizer Trim Actuator Assembly

A Equipment and Materials

(1) Pneumatic System Grease, MIL-L-4343

(2) Stabilizer Auxiliary Brake Spanner Wrench - F70087, or equivalent

(3) Dry air source (Regulated to 15 psig)

B. Clean Auxiliary Brake Assembly

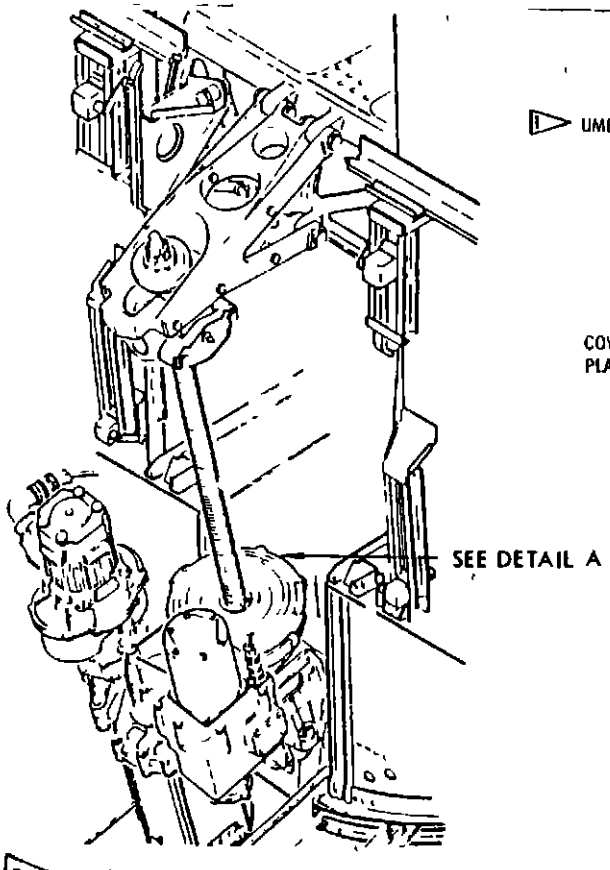
(1) Remove stabilizer jackscrew access panel 1185. See Chapter 12, "Access Doors and Panels "

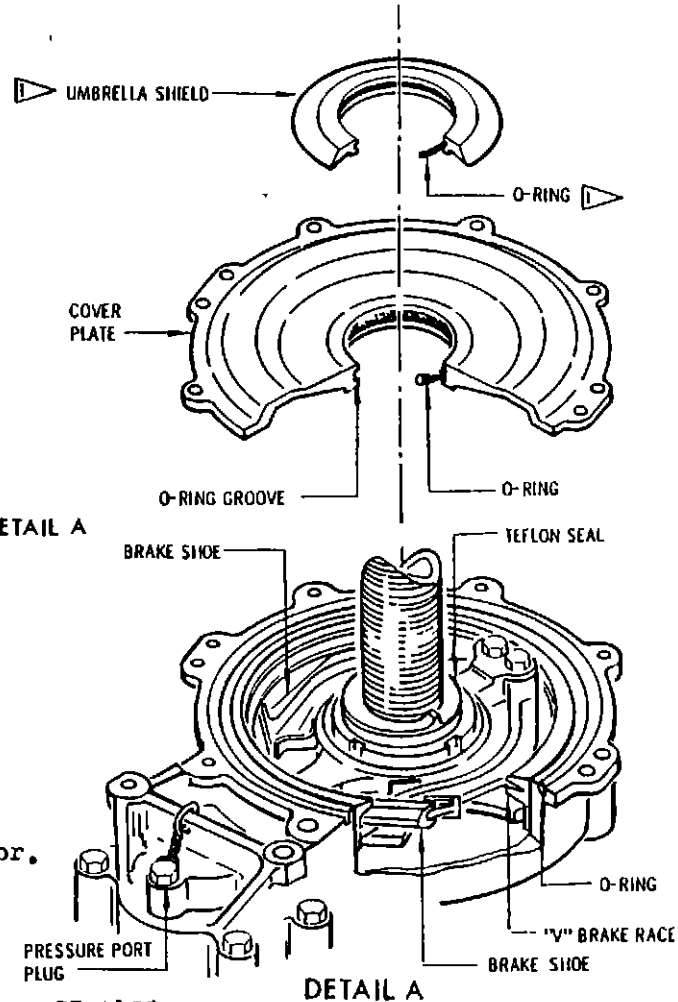
(2) Deleted

(3) Operate stabilizer to mid-travel position.

(4) Disconnect electrical power source.

(5) Raise umbrella shield.





1 Airplanes with vented actuator.

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Cleaning of the Auxiliary Brake
Figure 204

(6) Remove cover plate bolt and raise cover plate.

CAUTION: EXERCISE CARE WHEN RAISING COVER PLATE TO PREVENT DAMAGING "O" RING IN GROOVE IN CENTER HALF OF COVER PLATE AND TEFLON SEAL ON END OF LOWER STOP ADAPTER SHAFT.

(7) Carefully clean all foreign matter from brake race and brake shoes.

CAUTION: USE CLEAN RAG AND KEEP ALL GREASE FROM BRAKE AREA.

(8) Check teflon and O-ring seals for damage.

(9) Apply grease, MIL-L-4343, in O-ring groove without removing O-ring.

(10) Apply a light coat of grease to teflon seal and large O-ring. Apply grease to O-ring in umbrella shield.

(11) Position cover plate and install cover plate bolts.

(12) Reposition umbrella shield.

(13) Deleted

(14) (15) (16) Deleted.

(17) Install stabilizer jackscrew access panel.

(18) Disconnect electrical power source.

STABILIZER POSITION INDICATOR AND MANUAL CONTROL MECHANISM - MAINTENANCE PRACTICES

1. Removal/Installation Forward Mechanism

A Equipment

(1) Tensiometer, 0 to 200 pounds capacity.

(2) Spring Scale, 0 to 50 pounds capacity.

B. Remove Forward Mechanism

(1) Actuate stabilizer to full "NOSE UP."

(2) Release cable tension by loosening turnbuckle, (7, figure 201).

(3) Remove cable guards (4).

(4) Remove "STA" cable from cable drum (5).

NOTE: When removing cables take necessary precautions to prevent fouling the cables.

(5) Disconnect flexible drive shaft connector at forward mechanism.

(6) Rotate stabilizer trim control wheel until chain connector is between idler sprocket (2) and forward mechanism sprocket (9).

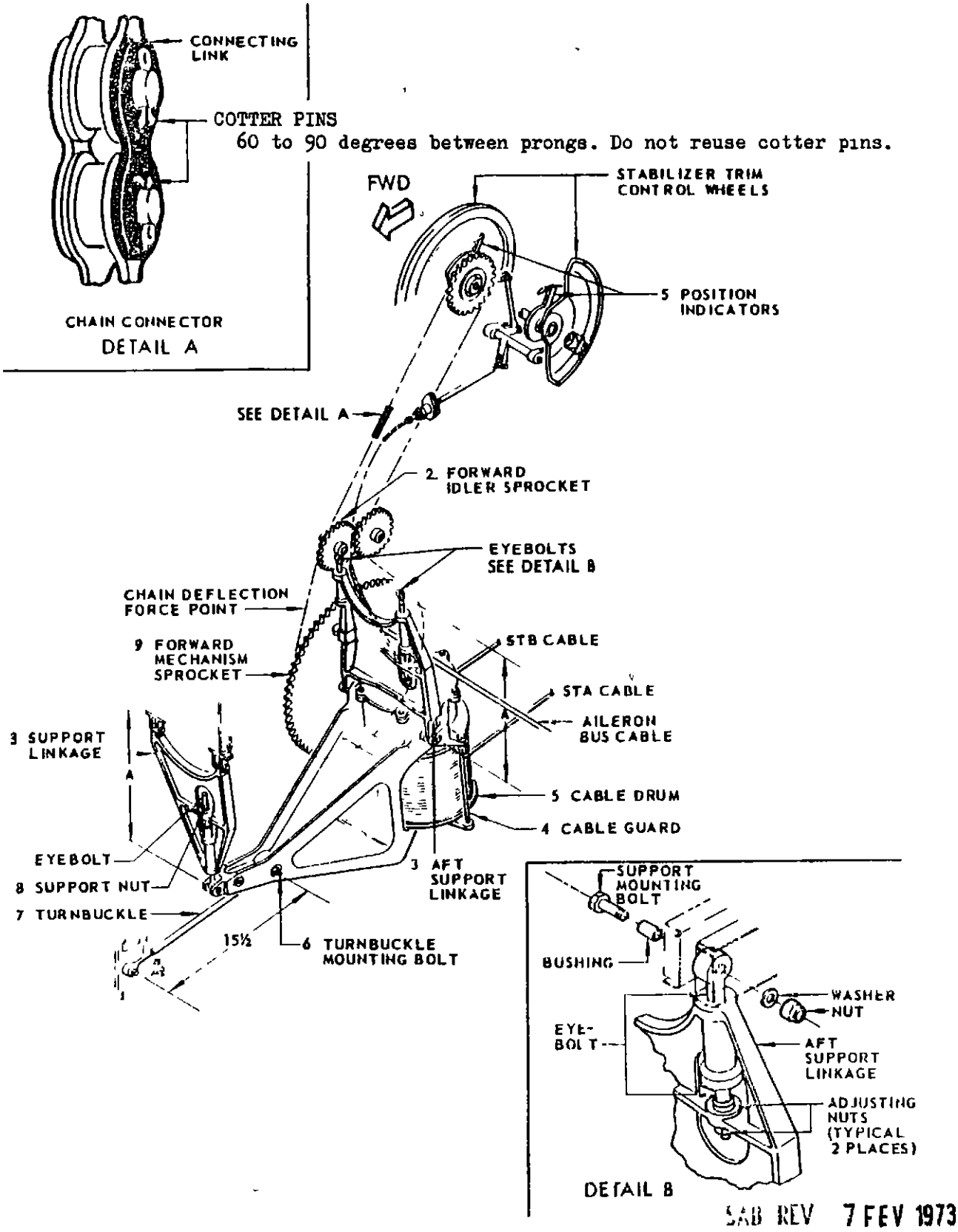
(7) Disconnect chain (1) at connector by removing pin from link.

(8) Pull "STB" cable and remove from drum.

(9) Remove aft turnbuckle mounting bolt (6), washers and nut.

(10) Support mechanism and remove support mounting bolt, nut, washers and bushings. The bushings on the aft supports are not the same size.

CAUTION. DO NOT LET FORWARD MECHANISM FALL WHEN REMOVING MOUNTING BOLTS.



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Forward Mechanism Installation, Chain Installation and Adjustment 6
Figure 201 Jun 15/65

C Install Forward Mechanism

(1) Position forward mechanism, install bushing (figure 201) washers, support mounting bolts, and nut.

NOTE: Bushings on the aft support are not the same size.

(2) Position turnbuckle (7), install bushing, washers, bolt, and nut (6). Check that both sides of turnbuckle have equal extension.

(3) Position chain on sprockets and connect chain assembly (1).

NOTE: It may be necessary to adjust support linkage so chain can be easily connected

(4) Remove cable guards (4).

(5) Install "STB" cable on cable drum (5).

(6) Rotate stabilizer trim wheel in nose up direction to wind "STB" cable on drum Apply a restraining load to cable while turning trim wheel

(7) Install "STA" cable on cable drum (5).

(8) Install cable guards (4)

(9) Adjust turnbuckle (7) to 15-1/2 inches.

NOTE Positioning of turnbuckle at 15-1/2 inches is a convenient starting point

(10) Check chain deflection to check for proper chain tension

(a) Apply a two pound force with spring scale perpendicular to chain assembly at chain deflection force point midway between tangencies of chain on forward idler sprocket and main sprocket

(b) Check that chain deflection is 3/16 to 5/16 inch

(11) If deflection is not within specified limits, adjust support linkage (3)

(12) Check that distance "A" of support linkages are equal and within 1/16 inch to insure proper alignment of forward mechanism

NOTE: Measurement is taken on a vertical line from center to center of support stud and support mounting bolts.

(13) Adjust cable to specified tension with turnbuckle (7). See 27-10-0, figure 202 for tension.

(14) Repeat steps "10" through "12".

(15) Connect external electrical power.

(16) Actuate control switch to "NOSE DOWN".

CAUTION: ALLOW 13 MINUTES FOR COOLING FOR EVERY 2 MINUTES OF OPERATION STABILIZER TRIM MOTOR.

(17) Check cable tension and adjust if necessary.

(18) Repeat steps "10" through "12" if necessary.

(19) Actuate trim to "NOSE UP" and repeat steps "18" and "19".

(20) Connect flexible drive shaft to forward mechanism.

(21) Remove electrical power.

(22) Rotate stabilize trim control wheel and check for freedom from chattering or binding.

(23) Test stabilizer trim system per 27-10-0.

2. Removal / Installation Chain Assembly

A. General

(1) A new chain assembly can be installed by using the old chain, if the old chain is still in tact. This is accomplished by joining both chain assemblies together by using a chain connector. After the chains are connected, pull the old chain so the new chain will be installed as the old chain is removed. The installation procedure given is to install a chain assembly when no chain remains installed.

B. Equipment

(1) Tensiometer, 0 to 200 pounds capacity

(2) Spring scale, 0 to 10 pounds capacity

C. Remove Chain Assembly

(1) Rotate stabilizer control wheel in either direction until chain connector is between idler (2, figure 201) and forward mechanism sprocket (9).

(2) Turn support nuts (8) which hold support linkages (3) to allow slack in chain (1).

(3) Release cable tension at turnbuckle (7).

(4) Disconnect chain connector and remove chain assembly (1).

D Install Chain Assembly

(1) Remove fore and aft cover tie straps on control stand

(2) Remove end cover.

(3) Remove first right cover assembly.

(4) Insert chain in control stand and install chain on sprocket

(a) Attach wire and put wire through the intended path of chain in front of sprocket.

(b) Pull approximately one half of the assembly through and disconnect wire.

(c) Attach wire and guide chain on back of sprocket and remove wire.

(5) Check that chain is positioned correctly on all sprockets.

(6) Position chain assembly (1, figure 201) so point of connection is between idler (2) and forward mechanism sprocket (9).

(7) Connect chain assembly by installing pins and connecting links

(8) Apply a two pound force with spring scale perpendicular to chain assembly at chain deflection force point midway between tangencies of chain on forward idler sprocket and main sprocket. Check deflection at 3/16 to 5/16 inch.

(9) Adjust support nuts (8) until chain deflection is 3/16 to 5/16 inch.

(10) Check that distance "A", of support linkages are equal within 1/16 inch to check for proper alignment.

NOTE: Measurement is taken on a vertical line from center to center of support stud and support mounting bolts.

(11) Adjust cable tension with turnbuckle (7). See 27-10-0, figure 202, for tension chart.

(12) Check clearance between cable and forward grommet. Clearance should be 1/4 to 1/2 inch. (See figure 203, 27-10-0.)

NOTE: Forward grommet is located at station 259.5 in first bulkhead through which cable passes after leaving forward cable drum.

(13) If not in specified clearance, release tension in cables, and chain assembly. Disconnect chain assembly at connector link and add or remove chain links as required. Repeat steps "8" through "13".

(14) Check that clearance between chain assembly and aileron bus cable is a minimum of 3/4 inch.

(15) If clearance is less than 3/4 inch adjust turnbuckle (2) to obtain correct clearance.

(16) Install right cover assembly.

(17) Install end cover.

(18) Install fore and aft cover tee straps.

(19) Rotate stabilizer trim control wheel and check for freedom from chattering or binding.

(20) Test stabilizer trim system per 27-10-0.

3 Removal/Installation Stabilizer Position Indicator

A. General

(1) During removal of the stabilizer position indicator, rigging pins are installed in the thrust reverser control drum, speed brake drum, and flap follow-up drum to eliminate the necessity of rerigging After installing rigging pins tension is released on the chain assembly and on the cables which extend into the upper control stand. Removal of either stabilizer position indicator is accomplished from the right side of the control stand. Removal of the left indicator requires the right indicator and thrust friction regulator to be disconnected and moved outboard on the shaft. By moving the shafts outboard the left indicator shim and indicator can be removed During removal of the left indicator care should be exercised to prevent dropping the shim and indicator. The difference in thickness of the indicator being replaced and installed is measured to determine the amount of shims to be removed or added to make up the difference in the thickness of the two indicators.

B Equipment

(1) 1-inch micrometer

(2) Spring scale 1 to 10 pounds capacity

(3) Tensiometer 0 to 200 pounds capacity

(4) Spacer - 0 092 inch

C. Remove Stabilizer Position Indicator

(1) To remove left position indicator, proceed with steps "3" through "15", "17" and on.

(2) To remove right position indicator, proceed with steps "11" through "16".

(3) Open nacelle strut panel 1742 and access panel 1708. (See Access Doors and Panels, Chapter 12.)

(4) Insert AN395 rigging pin or AN5 bolt through each thrust reverser control drum and hanger.

(5) Open right main gear door and insert AN395 rigging pin or AN5 bolt through speed brake bus drum and support.

(6) Insert AN395 rigging pin or AN5 bolt through follow-up drum and flap control cable drums located in the main wheel wells.

(7) Relieve tension on speed brake cable by loosening turnbuckle in lower nose compartment.

(8) Remove ceiling panel in forward cargo compartment.

(9) Relieve cable tension on thrust cable by loosening turnbuckle in forward cargo compartment.

(10) Relieve cable tension on flap control cables WFA and WFB by loosening turnbuckles in lower nose compartment.

(11) Remove right stabilizer trim control wheel nut, (16, figure 202).

(12) Remove right stabilizer trim control wheel (15) and right engine control shaft nut (14)

(13) Remove right audio selector panel (17) and remove screws which attach upper side panel to aft electronic panel.

(14) Remove right upper side panel (11), right access cover (13), and key (12)

(15) Disconnect right stabilizer position indicator (9), from stabilizer indicator link, (18).

(16) Remove right position indicator shim (10) and stabilizer position indicator.

NOTE: It is not necessary to remove right indicator to remove the left indicator, just disconnect linkage.

(17) Rotate control wheel until chain connector is near the control stand sprocket gear (7) so the chain may be disconnected.

(18) Adjust forward mechanism support linkage to release chain tension. (See figure 201.)

(19) Disconnect chain at connector and tie chain ends to the control stand to prevent chain from falling.

(20) Disconnect thrust friction regulator from thrust lever brake link, (figure 202).

(21) Remove left stabilizer trim control wheel (1) and tie rod shaft by pulling outboard.

(22) Remove left engine control shaft nut, (2).

(23) Remove key (3) and left access cover, (19).

(24) Disconnect left stabilizer position indicator (5) from position link.

(25) Pull stabilizer trim control wheel shaft and right control shaft outboard approximately 2 inches.

(26) Pull left control shaft (6), which the left indicator is mounted about 1 inch to allow left indicator to be removed.

(27) Remove left indicator shim (4) and indicator.

D. Install Stabilizer Position Indicator

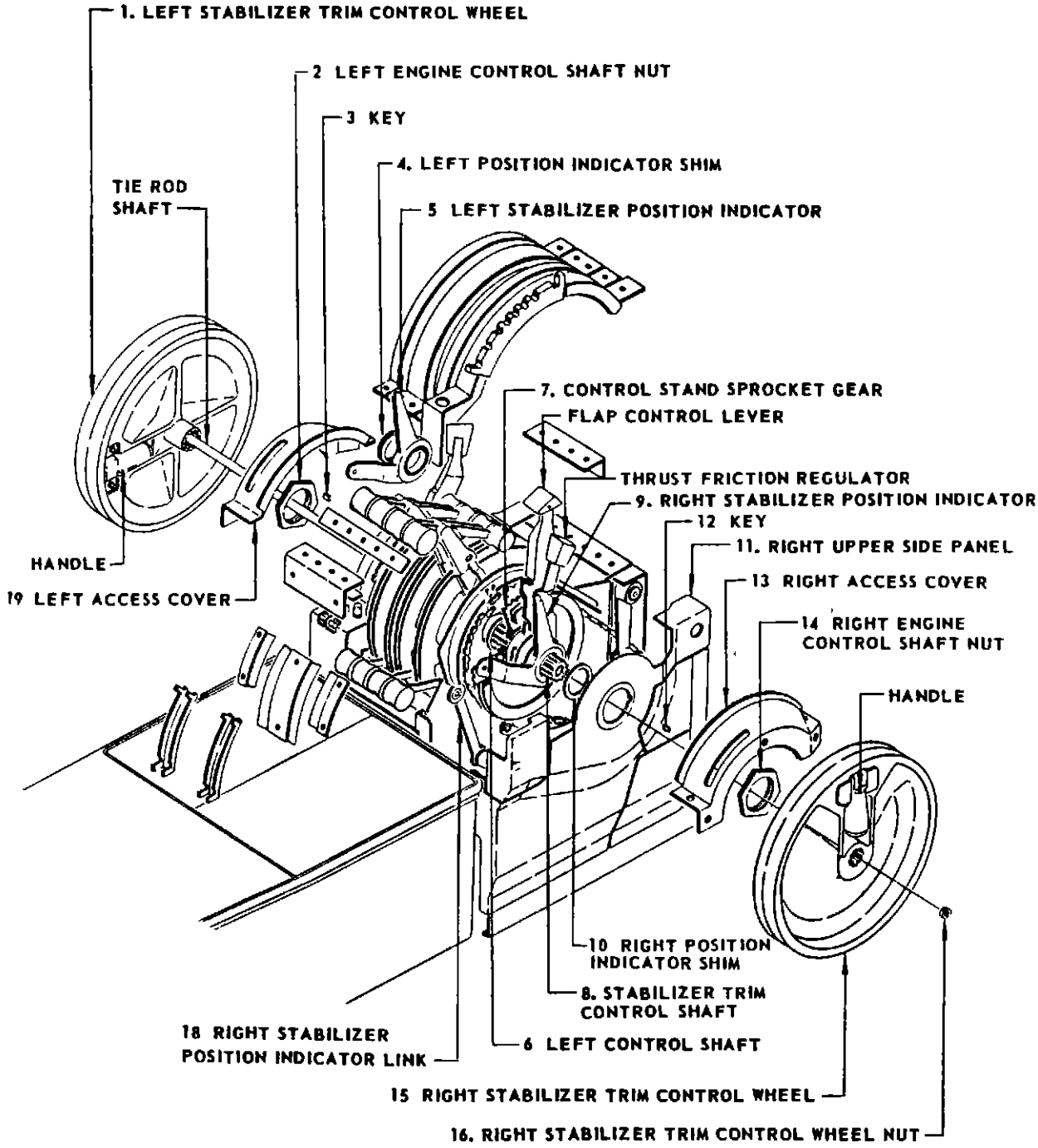
(1) For right indicator complete steps "3" through "6".

(2) For left indicator complete all steps except step "6".

(3) Measure thickness of the old indicator and new indicator near mounting hole. Add or remove .003 inch laminated stabilizer position indicator shim to adjust for difference in indicator thickness.

(4) Position stabilizer position indicator shim and indicator on control shaft (see figure 202). For left indicator (5) slide shaft into position by moving right control shaft and stabilizer trim control shaft inboard.

(5) Connect position link to indicator.



Stabilizer Position Indicator Installation
Figure 202

(6) For right stabilizer position indicator only.

(a) Install upper access panel (10) and right access cover (13).

(b) Install right audio control panel (17).

(c) Install key, (12), engine control shaft nut (14) and apply 200 to 300 pound-inches.

(d) Position right stabilizer trim control wheel handle at least 90° apart and install right stabilizer, trim control wheel nut (16).

(7) Connect chain and position on control stand sprocket gear (7).

(8) Adjust chain.

(a) Adjust support linkage to remove slack in chain. (See figure 201.)

(b) Apply a two pound force with a spring scale perpendicular to chain at a distance about 4-3/4 inches along chain from tangency of idler sprocket.

(c) Measure chain defection to be 3/16 to 3/8 inch and adjust support linkage as required

(9) Connect thrust friction regulator lever and position flap control lever.

(10) Connect right stabilizer position indicator (5).

(11) Repeat step "6".

(12) Adjust thrust cables.

(a) Install a 0.092 inch spacer against idler stop. Move thrust lever against spacer.

(b) Set friction regulators to hold thrust lever against spacer.

(c) Position reverse thrust lever in reverse idle position.

(d) Adjust cables to specified tension. (See 76-1-0, figure 202.)

(e) Remove spacers and rigging pins.

(13) Replace ceiling panel in forward cargo compartment.

(14) Adjust speed brake cables.

(a) Position speed brake handle at "0".

(b) Adjust cables to specified tension. (See 27-5-0, figure 202.)

(c) Remove rigging pins.

(15) Adjust flap control cables.

(a) Position flap control lever to full "FLAP UP".

(b) Adjust flap control cables per chart.

(c) Remove rigging pins.

(16) Close access openings.

(17) Test stabilizer trim system per 27-10-0.

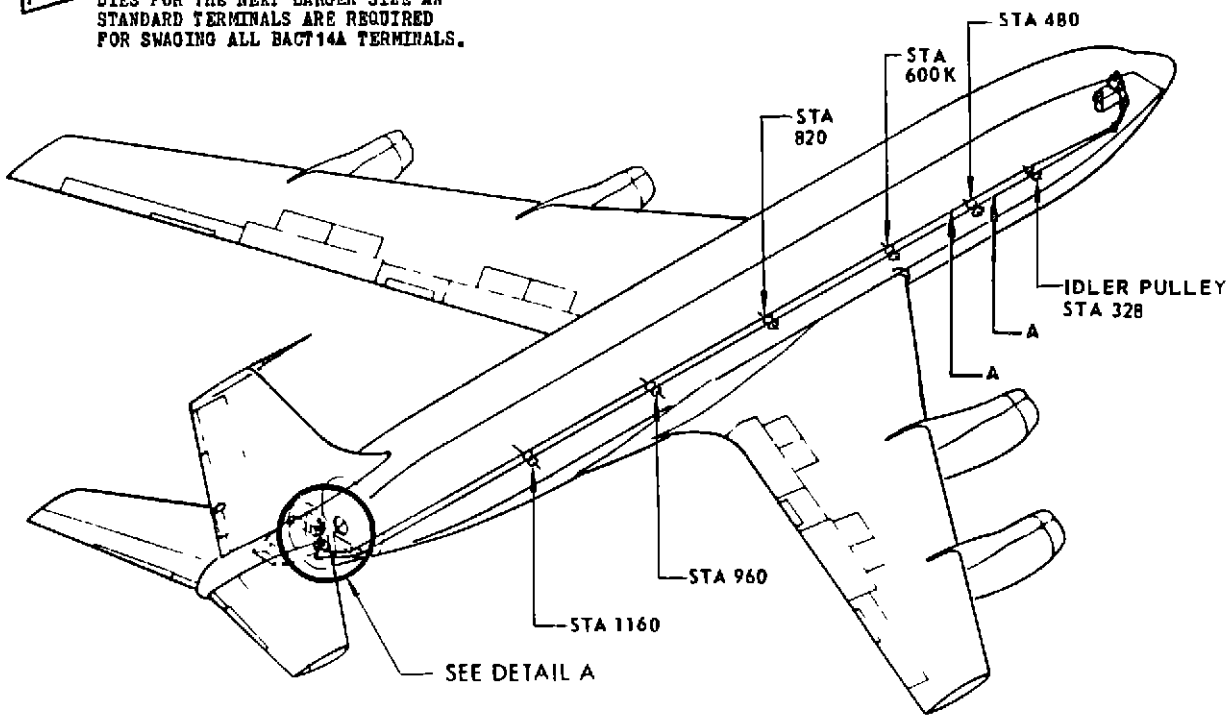
END

STABILIZER TRIM CONTROL CABLES - MAINTENANCE PRACTICES

1. Removal/Installation Stabilizer Trim Control Cable

A. General

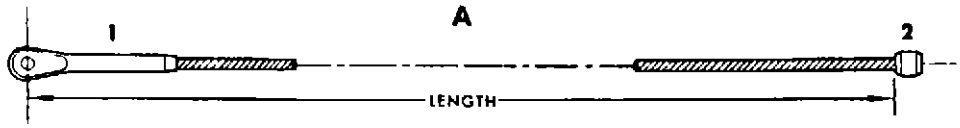
(1) To remove a stabilizer trim control cable, it is necessary to position the stabilizer ball nut and actuator assembly to one extreme end of travel to minimize the amount of cable on the actuator assembly cable drum. Cable tension is released and the cable guards are removed for access to the cable terminal. The forward end of the cable at the forward mechanism is removed by operating the stabilizer trim control wheel to position the actuator assembly to the opposite end of travel. The new cable is installed simultaneously with removal of the old cable.

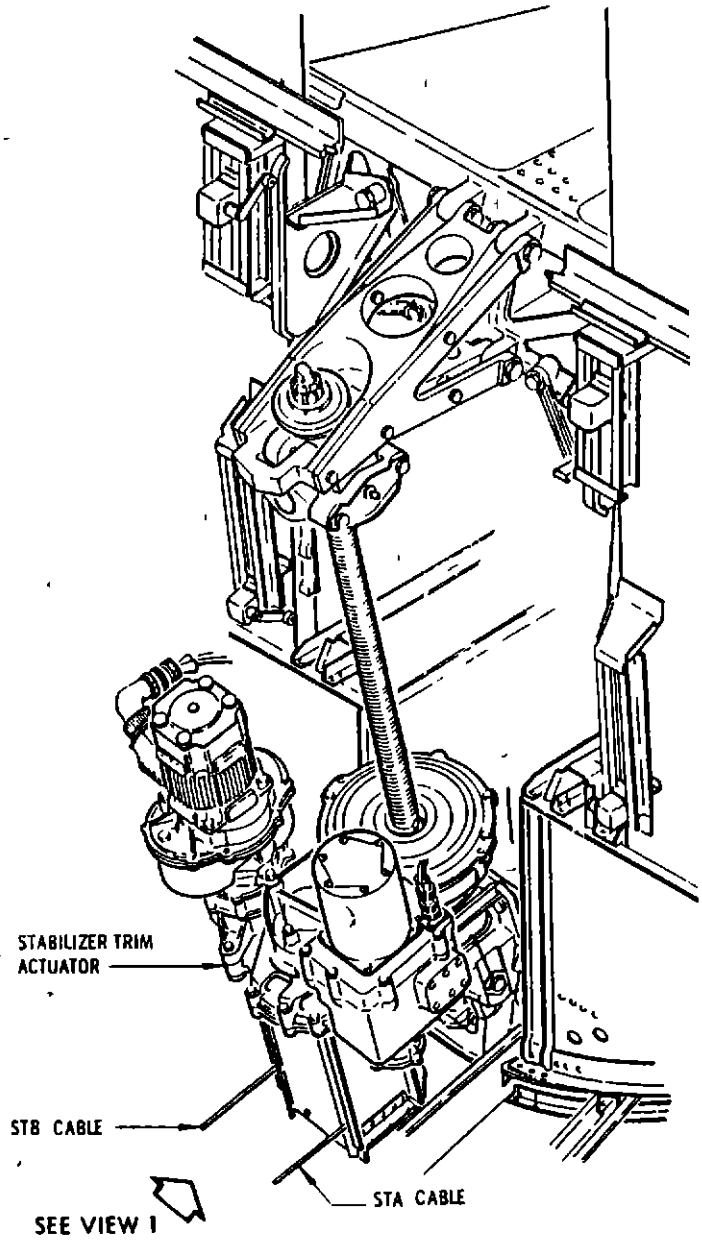


CABLE REF.	NO. REQ.	LENGTH	FITTINGS 1.	2.	3.
A	2	2221.5 IN.	MS20668-4	1 BAC-T14A-4	

CABLE MATERIAL - CARBON STEEL PER MIL-W-83420 TYPE L COMPOSITION A (PREFERRED)
- CARBON STEEL PER MIL-W-1511 (OPTIONAL)

CABLE SIZE - 1/8 X 7 X 19





DETAIL A

Stabilizer Trim Control Cable Installation
Figure 201 (Sheet 2)

B. Equipment and Materials

(1) Ball and Roller Bearing Grease, Wide Temperature Range MIL-G-25760 (Aeroshell 16).

(2) BMS 5-16; Two Part Hole Filling Compound.

(3) Portable Swaging Equipment.

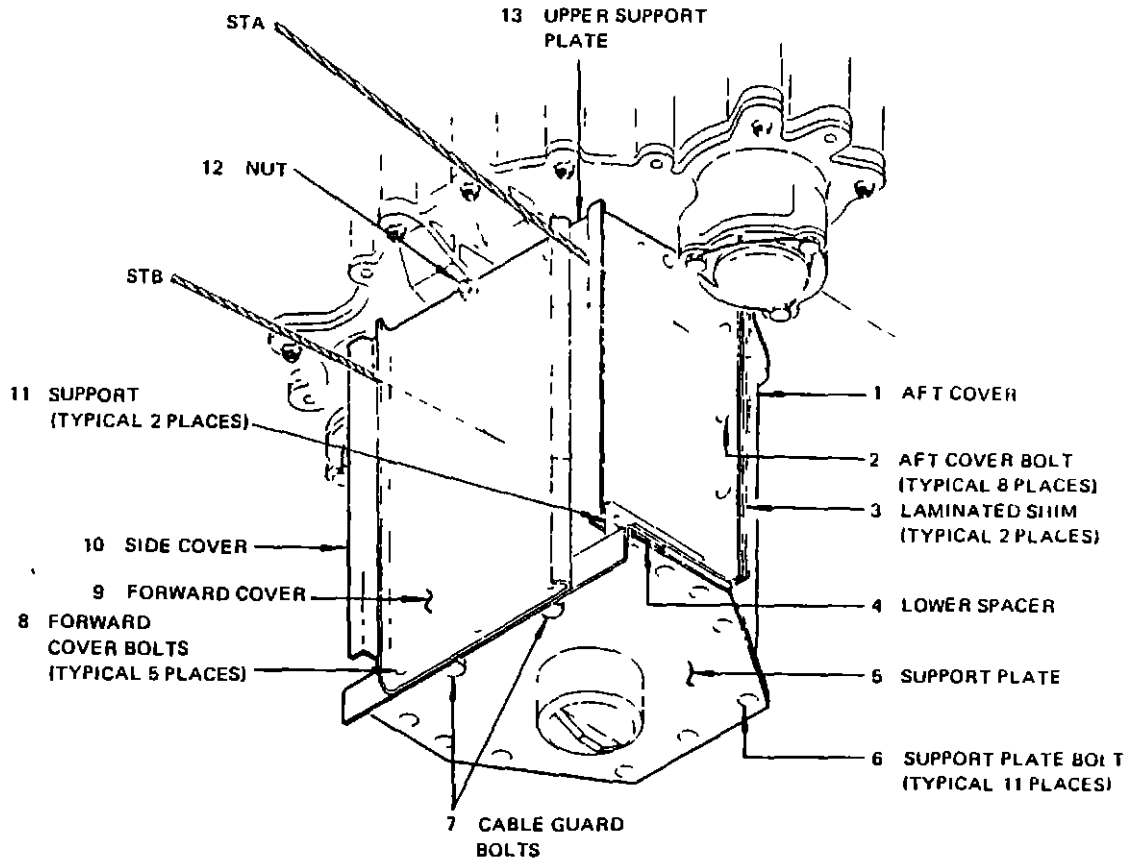
(4) Model A Cable Tester (or equivalent), Mine Safety Appliances, Pittsburgh, Pensylvania.

(5) Cleaning Solvent, Federal Specification P-D-680, Type I (Stoddard Solvent).

C. Replace Stabilizer Trim Control Cables

(1) Connect external electric power to airplane.

(2) If right stabilizer trim cable STB is to be removed position stabilizer trim control switch in AIRPLANE NOSE DOWN position. If removing STA cable (left cable) position stabilizer trim control switch in AIRPLANE NOSE UP to wind cable on cable drum at forward trim mechanism. Allow system to run until stopped by limit switches.



VIEW 1

Stabilizer Trim Control Cable Installation
Figure 201 (Sheet 5)

(3) Disconnect electrical power.

(4) Remove stabilizer jackscrew access panel 1185. See Chapter 12, "Access Doors and Panels "

(5) Remove shroud assembly from stabilizer trim actuator assembly.

(a) Remove forward cover bolts (8, figure 201), nuts and forward cover (9).

(b) Remove lower support plate bolts (6) and cable guard bolts (7) with spacers.

(c) Remove support plate (5) with lower spacers (4).

(d) Remove aft cover bolts (2) and aft cover (1) with laminated shims (3).

(e) Remove two top bolts which secure upper plate. Remove upper plate and side covers by sliding forward.

(6) At forward trim mechanism in lower 41 section, adjust forward and aft support linkage (3 and 4, figure 202) to relieve tension in chain assembly (1).

(7) Adjust turnbuckle (2) to relieve tension in stabilizer trim control cables.

(8) Disconnect cable from drum on stabilizer trim actuator Note amount of cable (number of turns and/or fraction of turns) that is left on drum before removal. Tag actuator with this information.

(9) Using stabilizer trim control wheel, operate system until cable being removed is wound off forward mechanism cable drum. Approximately 2 to 3 turns of cable will be left on forward mechanism cable drum.

NOTE: As stabilizer is moved, pull disconnected cable into tail compartment and wind cable on cable reel or wire spool.

(10) Note amount of cable (number of turns and/or fraction of turns) that is left on forward mechanism drum before disconnecting from drum. Tag drum with this information.

(11) Prepare new cable for installation:

(a) Determine new cable requirements (Fig. 201) and prestretch cable as follows:

1) Load cable smoothly so that a load of 1200 to 1260 pounds is reached in not less than 3 seconds, and hold load for a minimum of 5 seconds, then smoothly release load. To ensure full cable prestretch, repeat loading cycle three times with a minimum of 1 minute between cycles.

NOTE: Allow extra length for installation.

(b) Install cable end fitting that attaches to forward mechanism drum assembly.

(c) Apply 1200 to 1260 pound proof load to cable and end fitting to check swaging and to prestretch cable.

(d) Mark position of end fitting that attaches to aft cable drum.

(e) Wipe full length of cable with dry cloth until cable is clean.

(f) Apply a light, even coat of grease to cable for full length of travel through fairleads, air pressure seals, over pulleys, quadrants and drums. Grease must fill the grooves of the cable.

(g) Wind cable on reel or wire spool and place in lower 41 section.

(12) Use old cable to pull in new cable as follows:

(a) Wrap old cable so it will not unravel.

(b) Cut off end fitting from old cable.

(c) Splice new cable to old cable. Splice must be of minimum diameter and strong enough to pull cable through.

(d) Pull old cable into tail compartment maintaining a slight tension on new cable.

(13) Connect new cable to forward and aft drums:

(a) Cut new cable at mark referenced in step (11) (d).

(b) Using portable swaging equipment install end fitting to cable that attaches to aft drum.

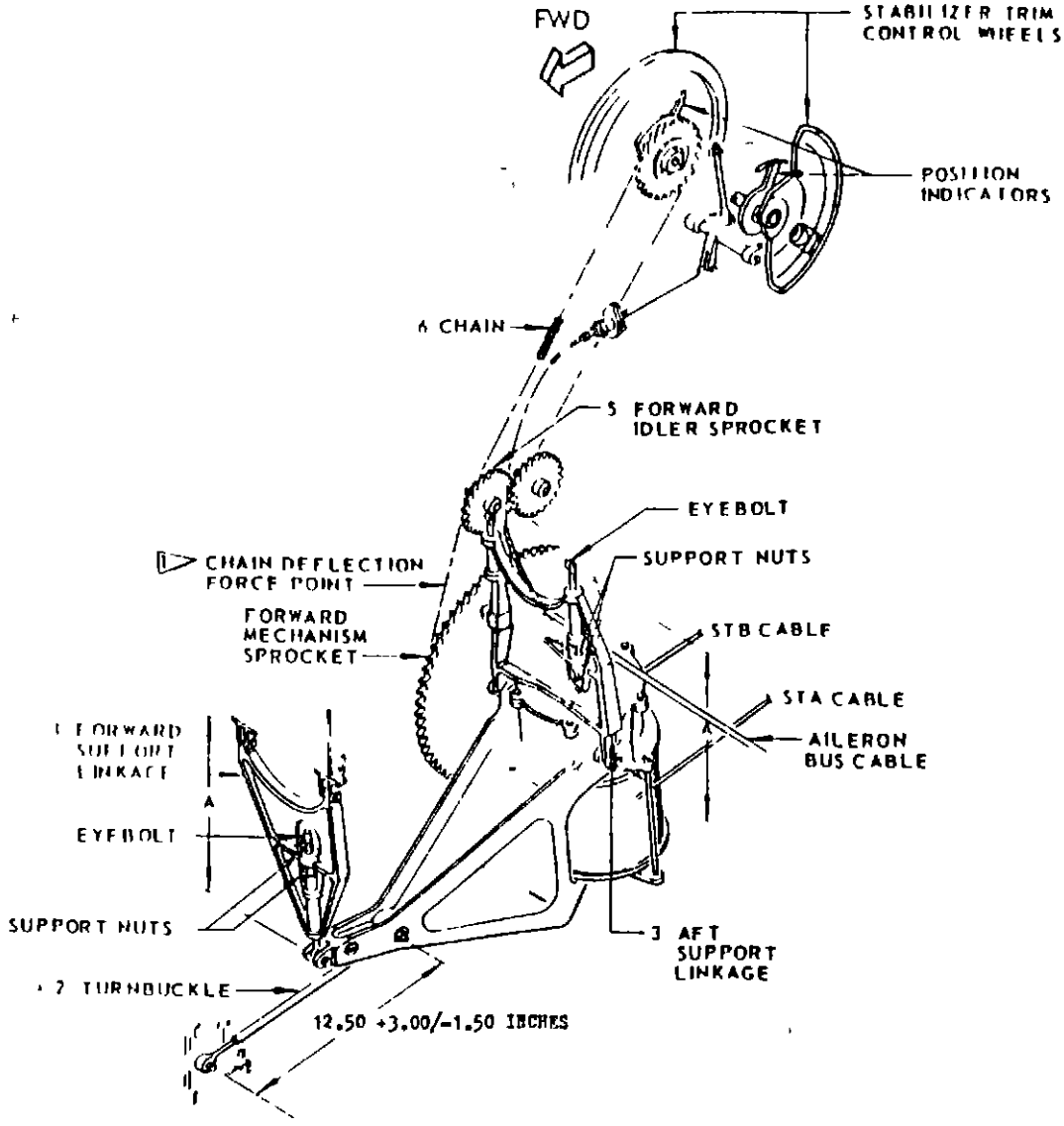
(c) Apply 1200 to 1260 pound proof load to fitting using cable tester.

(d) Attach forward fitting to cable drum on forward mechanism in lower 41 section. Cable should be wrapped on drum same number of turns as old cable. See step (10).

(e) Connect electrical power to airplane.

(f) Operate stabilizer trim control switch in direction to wrap new cable on forward drum. Switch should be intermittently positioned to ON to slowly operate actuator. Maintain tension on free end of new cable to prevent cable from jumping pulley guides.

(g) Wrap loose end of cable around actuator drum and install cable terminal in drum slot. Cable should be wound on drum same number of turns as old cable. See step (8). STB cable terminal should be installed in upper slot and STA in lower slot on drum.


FWD
STABILIZER TRIM CONTROL WHEELS
POSITION INDICATORS
6 CHAIN
5 FORWARD IDLER SPROCKET
EYEBOLT
SUPPORT NUTS
1 CHAIN DEFLECTION FORCE POINT
FORWARD MECHANISM SPROCKET
STB CABLE
STA CABLE
AILERON BUS CABLE
4 FORWARD SUPPORT LINKAGE
A
EYEBOLT
SUPPORT NUTS
3 AFT SUPPORT LINKAGE
2 TURNBUCKLE
12.50 +3.00/-1.50 INCHES
1 APPLY FORCE BY PULLING FORWARD

(h) Operate stabilizer trim control system 5 cycles.

(14) Adjust turnbuckle (2, figure 202) at forward mechanism to 15-1/2 inches to start cable tension adjustment. (See figure 202.)

(15) Rotate trim control wheel until "STA" and "STB" have approximately equal number of turns on forward cable drum.

(16) Adjust stabilizer trim chain to proper tension:

(a) Remove lower right access panel from control stand. In lower 41 section, tighten chain by adjusting fore and aft support linkages to lower forward mechanism.

(b) Adjust chain so that a 2 pound load applied perpendicular to chain assembly at chain deflection force point midway between tangencies of chain on forward idler sprocket and main sprocket will deflect chain 3/16 to 5/16 inch.

(c) Insure that dimension "A" of fore and aft linkage (3 and 4) is equal within 1/16 inch. Equal length is required to prevent misalignment of forward mechanism.

(17) Readjust turnbuckle as required to obtain rigging loads in stabilizer trim control cables as specified in temperature tension chart (Ref 27-10-0, Fig. 202), then check that turnbuckle dimension is within limits shown in Fig. 202.

(18) Install shroud assembly over stabilizer trim actuator cable drum as follows:

(a) Position upper support plate (13, figure 201) with side covers (10) and install the two mounting bolts.

(b) Position lower supports (11) and lower spacers (4).

(c) Position support plate (5) and install support plate bolt (6).

(d) Position cable guard spacers and install cable guard bolts (7).

(e) Position forward cover (9) and install forward cover bolts (8) and nut (12).

(f) Position aft cover (1) and install aft cover bolts (2).

(g) Apply BMS 5-16 to seal opening between actuator and top of aft cover (2). See 51-3-0, "Sealing".

(19) Install access panels.

(20) Disconnect external power source.

STABILIZER TRIM ACTUATOR LOWER SNUBBER - MAINTENANCE PRACTICES

On all SABENA aircraft both upper and lower snubbers are deactivated per Boeing Service Bulletin n° 1777.

STABILIZER TRIM BRAKE ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation Stabilizer Trim Brake Assembly

A. Equipment and Materials

(1) Rig pin, 0.184 to 0.186 inch dia. (MS20392-2 or equivalent)

(2) Rig pin, 0.309 to 0.311 inch dia. (MS20392-4 or equivalent)

B. Remove Stabilizer Trim Brake Assembly

(1) Remove lower nose compartment interior access door 822.

(2) Disconnect rod assembly (5, figure 201) from fork (4) on elevator quadrant torque tube (2) by removing cotter pin, nut, washers and bolt.

(3) Disconnect flexible shaft (8) from brake override lever (9) by removing cotter pin, nut, washers and bolt

(4) Remove three mounting bolts (1) attaching stabilizer brake assembly (7) to sprocket support bracket (11).

(5) Remove mounting bolt (6) attaching stabilizer brake to support bracket, and pull brake assembly outboard to disengage splined shaft from sprocket support shaft.

(6) Disconnect rod assembly (5) from brake lever (12) on right side of brake assembly.

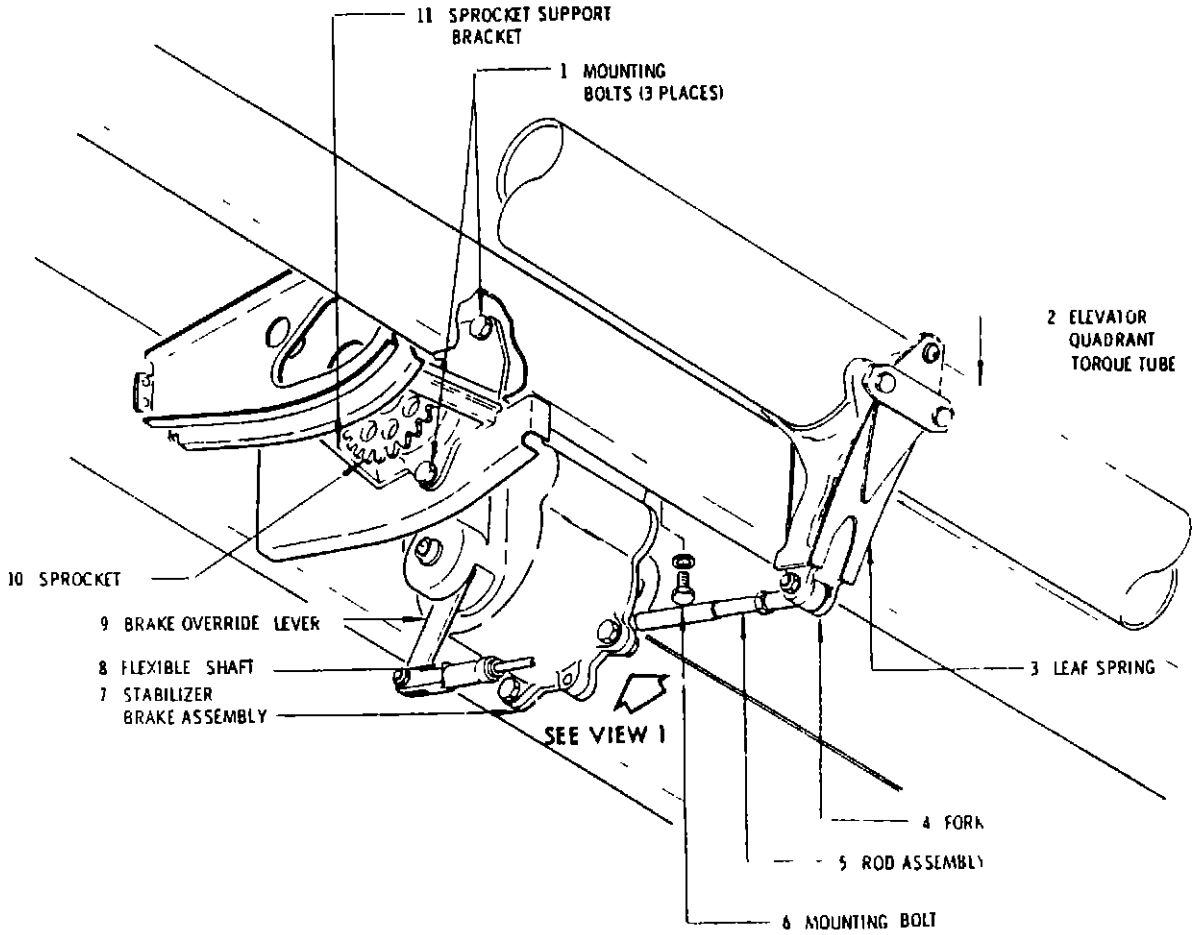
C. Install Stabilizer Trim Brake Assembly

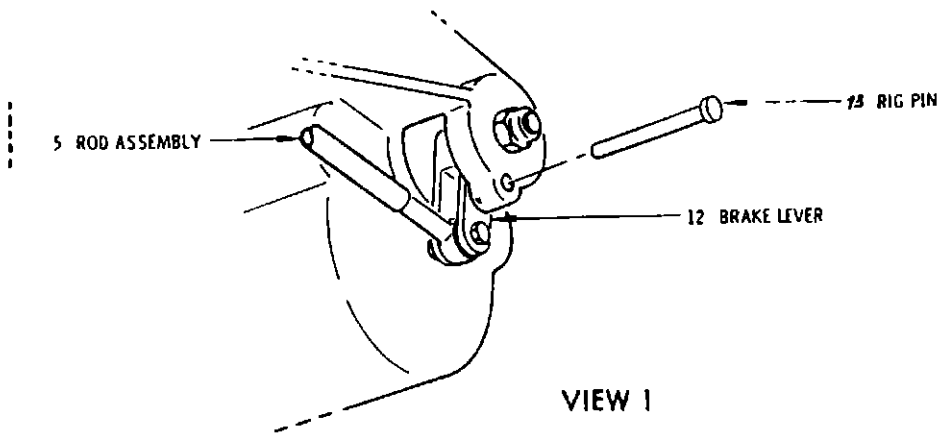
(1) Connect rod assembly (5, figure 201) to brake lever (12). Install one washer on each side of rod and one under nut. Tighten nut finger tight and install cotter pin.

(2) Engage stabilizer trim brake assembly splined shaft with internal spline on sprocket support shaft such that dowel pin on left side of brake assembly is inserted through hole in web of mounting bracket and sprocket support bracket (11)

(3) Install rig pin (13, figure 201) through brake lever on stabilizer brake assembly and rig pin (1, figure 202) through left forward elevator quadrant.

WARNING: WITH RIGGING PIN INSTALLED IN BRAKE MECHANISM, DO NOT MOVE ELEVATOR CONTROL COLUMN. IF CONTROL COLUMN IS MOVED 50% OR MORE OF FULL TRAVEL, LEAF SPRINGS ON CONTROL COLUMN TORQUE TUBE WILL PERMANENTLY DEFORMED AND MUST BE REPLACED. DEFORMED LEAF SPRINGS MAY CAUSE STABILIZER TRIM SYSTEM JAM.





VIEW 1

Stabilizer Trim Brake Assembly Installation
Figure 201

(4) Adjust rod assembly to fit between fork (4, figure 201) on elevator quadrant torque tube (2) and brake lever on stabilizer brake assembly without binding rigging pins. Connect rod to elevator torque tube fork using mounting screw, washer, nut and cotter pin and tighten jam nuts. Thread engagement for each rod end shall be equal within 0.05 inch.

(5) Push stabilizer brake release knob on control stand down and brake override lever (9) on stabilizer brake assembly full forward

(6) Adjust flexible shaft (8) to match brake override lever. Attach shaft to brake override lever using mounting screw, washer, nut and cotter pin.

(7) Remove rig pins from elevator quadrant and brake lever.

(8) Install access door.

(9) Test stabilizer trim brake assembly.

2. Adjustment/Test Stabilizer Trim Brake Assembly

A. Equipment and Materials

(1) Rig pin, 0 184 to 0.186 dia. (MS20392-2 or equivalent)

(2) Rig pin, 0 309 to 0 311 dia. (MS20392-4 or equivalent)

B. Adjust Stabilizer Trim Brake Assembly

(1) Remove lower nose compartment interior access door No 822.

(2) Install rig pin (1, figure 202) through left forward elevator control quadrant.

(3) Attempt to install rig pin (13, figure 201) through brake arm on stabilizer trim brake assembly. If rig pin cannot be installed without binding, disconnect rod assembly and adjust as required to install rig pin. Connect rod assembly to brake arm with washer on each side of brake arm and under nut. Install cotter pin and tighten jam nut.

WARNING: WITH RIGGING PIN INSTALLED IN BRAKE MECHANISM, DO NOT MOVE ELEVATOR CONTROL COLUMN. IF CONTROL COLUMN IS MOVED 50% OR MORE OF FULL TRAVEL, LEAF SPRINGS ON CONTROL COLUMN TORQUE TUBE WILL BE PERMANENTLY DEFORMED AND MUST BE REPLACED. DEFORMED LEAF SPRINGS MAY CAUSE STABILIZER TRIM SYSTEM JAM.

(4) Remove bolt attaching flexible shaft (8) to brake override lever (9).

(5) Push brake override lever full forward and stabilizer brake release knob on control stand down.

(6) Adjust flexible shaft to match override lever. Attach shaft and lever together with mounting screw, washer, nut and cotter pin.

(7) Remove rig pin from brake arm and from elevator quadrant.

(8) Install access door.

(9) Test stabilizer trim brake assembly.

C. Test Stabilizer Trim Brake Assembly.

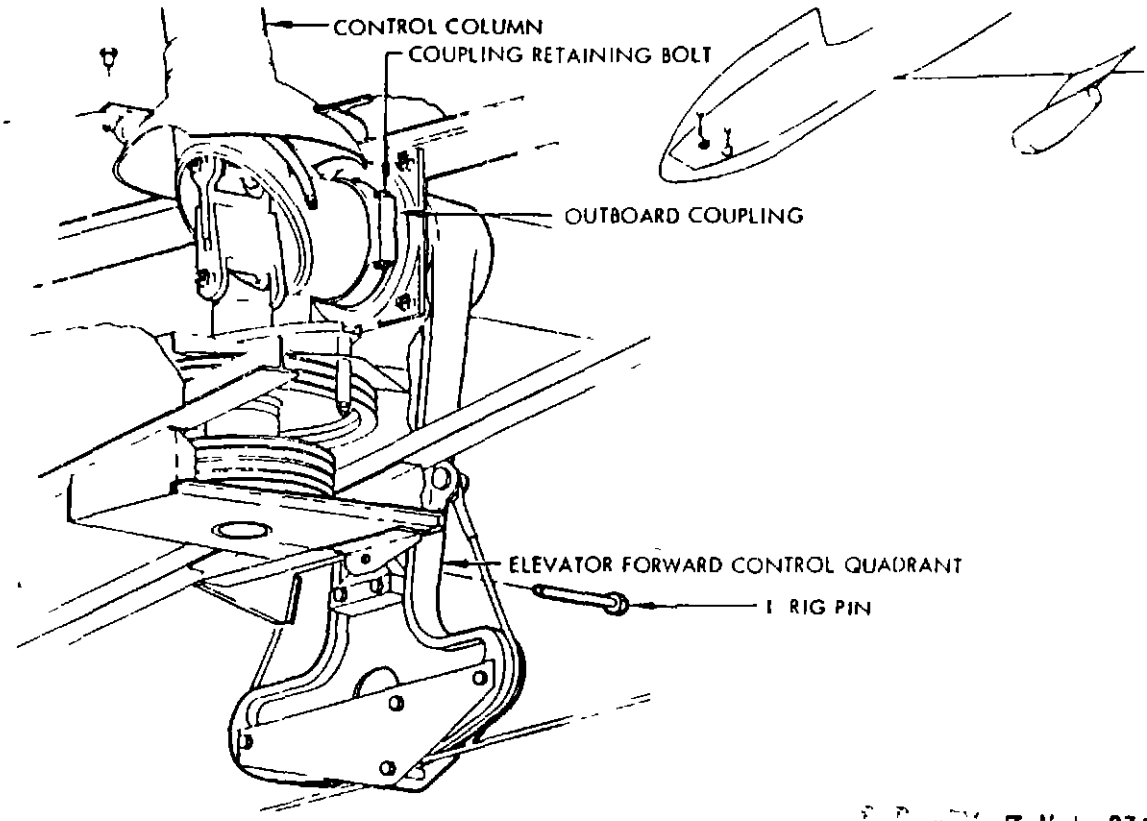
(1) Connect electrical power to airplane.

NOTE: During the following tests column angles shall be measured only while the stabilizer is passing through 3 units airplane nose up ±2 units of stabilizer trim position.

WARNING: BEFORE MOVING ELEVATOR CONTROL COLUMN, CHECK THAT RIGGING PIN IS REMOVED FROM BRAKE ARM ON STABILIZER TRIM BRAKE. IF RIGGING PIN IS LEFT IN BRAKE MECHANISM AND CONTROL COLUMN IS MOVED 50% OR MORE OF FULL TRAVEL, LEAF SPRINGS ON CONTROL COLUMN TORQUE TUBE WILL BE PERMANENTLY DEFORMED AND MUST BE REPLACED. DEFORMED LEAF SPRINGS MAY CAUSE STABILIZER TRIM SYSTEM JAM.

CAUTION: TO PREVENT EXCESSIVE LOADS ON MACH TRIM SERVO, IT SHOULD NOT BE USED TO MOVE STABILIZER DURING BRAKE TESTS.

(2) Using the captain's stabilizer trim switch operate system in AIRPLANE NOSE UP direction.



7 Mar 1974

Left Forward Control Quadrant Installation
Figure 202
T.R. 27-217

12
Jul 15/68

(3) While the system is in operation, push the control column in "AIRPLANE NOSE DOWN" direction until the brake stops the stabilizer system and then immediately return the control column to neutral.

(4) Returning the control column to neutral should cause the system to resume trimming in the "AIRPLANE NOSE UP" direction.

(5) Using the captain's stabilizer trim switch operate system in "AIRPLANE NOSE DOWN" position.

(6) While the system is in operation, pull the control column rapidly in "AIRPLANE NOSE UP" direction until the brake stops the stabilizer system and then immediately return the control column to neutral

(7) Returning the control column to neutral should cause the system to resume trimming in the "AIRPLANE NOSE DOWN" direction.

(8) Using the captain's stabilizer trim switch operate system in the "AIRPLANE NOSE UP" direction.

(9) While the system is in operation, push the control column in the "AIRPLANE NOSE DOWN" direction until the brake stops the system

(10) The control column should be between 2 0 degrees and 3.2 degrees from the neutral in the airplane "NOSE DOWN" direction.

(11) With the control column held in this position, actuate the captain's stabilizer trim switch in the "AIRPLANE NOSE DOWN" direction. The system should operate freely in the "AIRPLANE NOSE DOWN" direction.

(12) Using the captain's stabilizer trim switch, operate system in the "AIRPLANE NOSE DOWN" direction.

(13) While the system is in operation, pull the control column in the "AIRPLANE NOSE UP" direction until the brake stops the system

(14) The control column should be between 2.0 degrees and 3.2 degrees from the neutral in the airplane "NOSE UP" direction.

(15) With the control column held in this position, actuate the captain's stabilizer trim switch in the "AIRPLANE NOSE UP" direction. The system should operate freely in the "AIRPLANE NOSE UP" direction.

(16) Pull the stabilizer brake release handle and pull the control column from neutral 6-1/2° (± 1/2°) in the aft direction. The stabilizer trim system should be operable in either direction.

(17) Pull the stabilizer brake release handle and push the control column from neutral 6-1/2° (± 1/2°) in the forward direction. The stabilizer trim system should be operable in either direction.

(18) Determine if there is further need for electrical power, if not, disconnect electrical power

(19) Stabilizer Trim Brake - Test of Brake Assembly.

a) Position control column in full forward position.

b) Measure and record torque required to start rotation of stabilizer trim control wheel in nose up direction.(Minimum 330 inch-pounds or 80 pounds at stabilizer trim wheel handle).

c) Position control column in full aft position.

d) Measure and record torque required to start rotation of stabilizer trim control wheel in nose down direction.(Minimum 330 inch-pounds or 80 pounds at stabilizer trim wheel handle).

3. Inspection / Check Stabilizer Trim Brake Assembly.

A. Check Stabilizer Trim Brake Leaf Springs.

(1) Check clearance between fork (4) and leaf springs (3).

(2) If clearance exceeds 0.015 inch, replace the four leaf springs.

AILERONS, AILERON TABS AND AILERON CONTROL SYSTEM - DESCRIPTION AND OPERATION

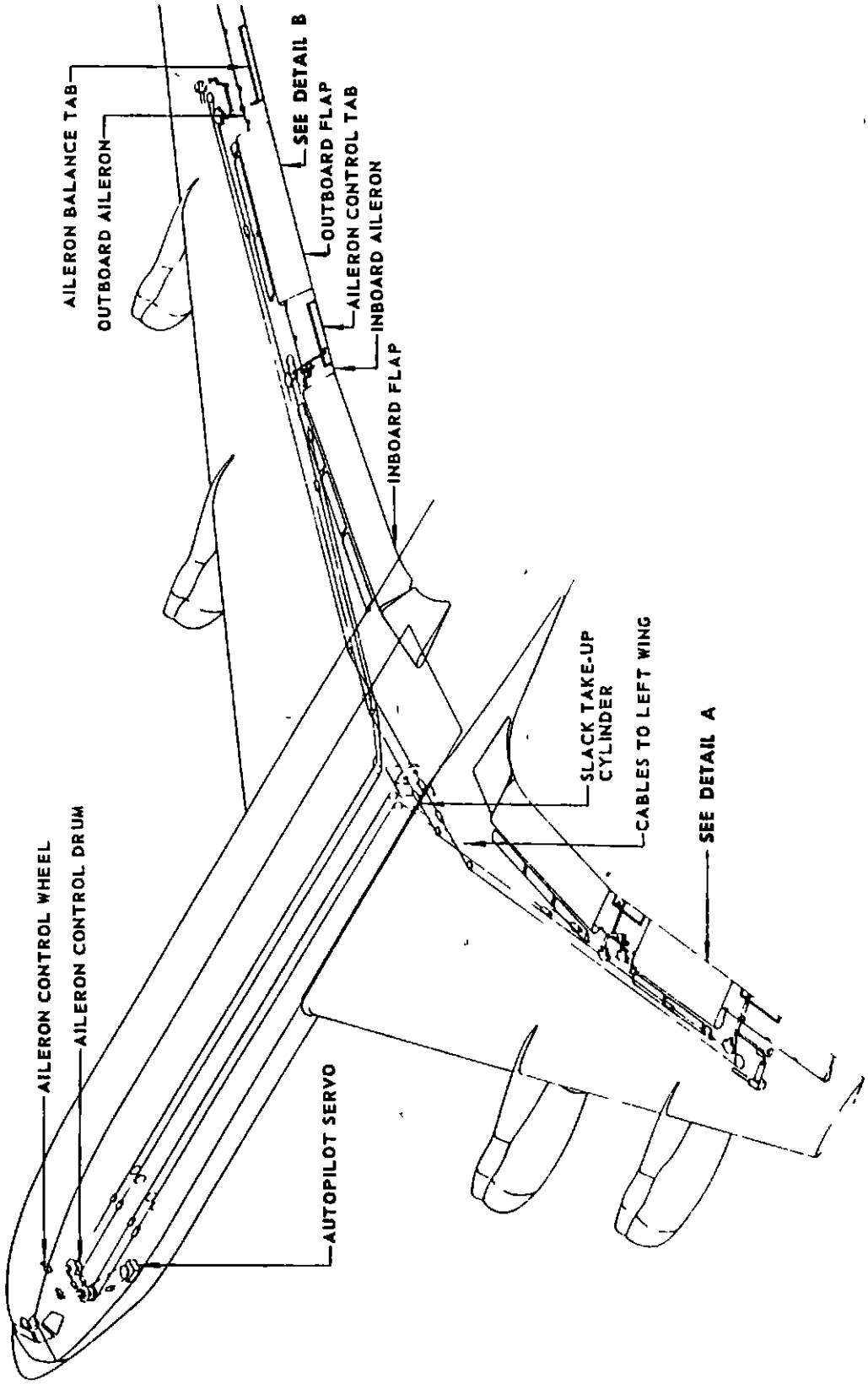
1 General

A. The aileron control system (figure 1) provides lateral control about the airplane roll axis by operating two ailerons in each wing and controlling spoiler system operation. Refer to Spoilers and Spoiler Control System, 27-4-0 During low speed flight with extended flaps all lateral control surfaces are in operation In the high speed flight attitude flaps are retracted and the outboard ailerons are locked out of the aileron control system. All ailerons are aerodynamically balanced against the external surface air loads to minimize the control force required for system operation. For this reason no hydraulic boost or electric servos are integrated into the aileron control system. A hydraulic snubber attached between each inboard aileron and wing structure provides protection against wind damage from air gusts up to 70 mph for these surfaces The use of hydraulic snubbers eliminates the need for any locks in the aileron control system

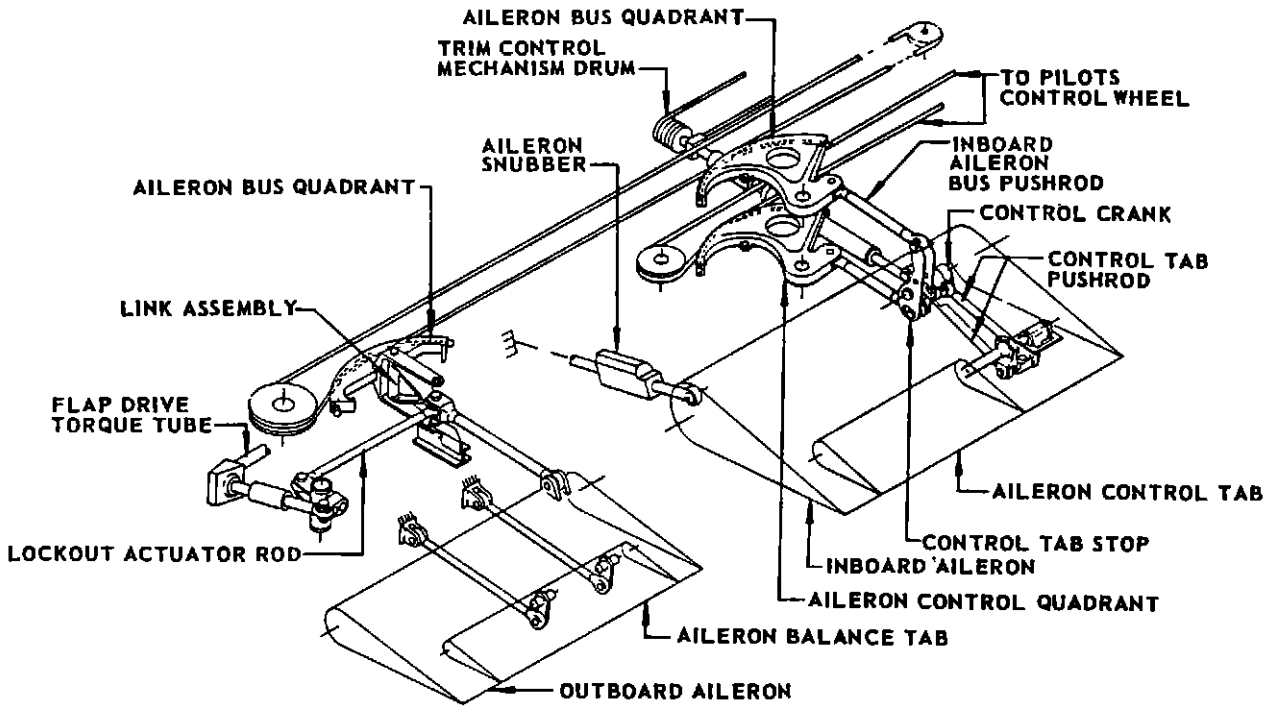
B The major components of the aileron control system and their respective positions in the system are shown in figure 1

C. The aileron control wheels are the primary controls for the aileron control system The control wheels are interconnected by cables attached to the control drum below each control column. The lateral control servo of the autopilot system is connected by cable to the pilot's control drum Two cables from the pilot's control drum attach directly to the left inboard aileron control quadrants and two cables from the copilot's control drum attach to the right inboard aileron control quadrant. Linkage connects the control quadrants with the inboard aileron control tabs in the trailing edge of each inboard aileron The position of the control tab is directly controlled by the aileron control system or the aileron trim control system. Control wheel movement rotates the tab opposite to the direction it is desired to move the aileron Air loads on the control tabs, plus differential air pressure on the balance panels (figure 2) position and hold the ailerons. A snubber assembly connects each inboard aileron with wing structure to control rotational limits of the aileron and provide protection from wind gusts.

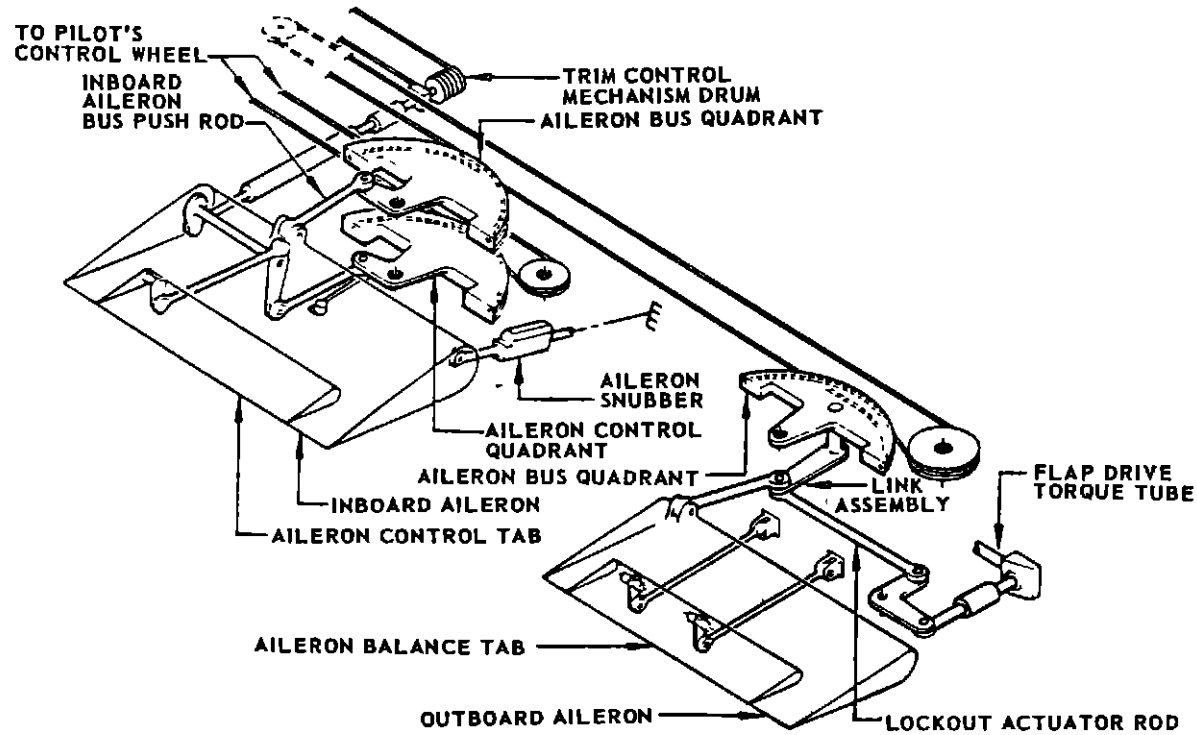
D. The bus cable system extends from the outboard aileron bus quadrant in the left wing to the right wing outboard aileron bus quadrant. Inboard



Aileron Control System
Figure 1 (Sheet 1 of 2)



DETAIL A
LEFT WING SYSTEM



DETAIL B
RIGHT WING SYSTEM

ailerons are directly connected to the bus cable system, outboard ailerons are connected through the outboard aileron control linkage When flaps are retracted, the outboard aileron control linkage locks the outboard ailerons out of the aileron control system and holds them in the faired position. Extending the flaps returns outboard aileron operation to the aileron control system. Movement of the inboard ailerons is then transferred through the bus cables and outboard aileron control linkage to rotate the outboard ailerons as required by the control signal.

2 Inboard Ailerons

A The major skin area of inboard ailerons is aluminum honeycomb panels. Honeycomb edges that would be exposed are covered with sealant and protective finish. The aileron nose tapers to a thin cross-section and extends forward of the aileron hinge line into the balance chamber. Attached to the forward edge of the aileron nose is half of a continuous hinge which is grooved to receive the hem of a transverse fabric seal for connection to balance panels. (See figure 2) Brush airseals are attached to the sides of the aileron nose.

B. Three hinge roller bearings are attached to the aileron nose spar and circular brush airseals enclose each hinge area. Access panels are provided for each of the hinge bearings. These bearings may be replaced individually without removing the aileron from the wing. Attached to the inboard side of the nose spar in the right wing is a three throw aileron control crank. A control tab push rod attaches to the upper throw of the crank to operate the aileron control tab. Attached to the bottom two crank throws are the aileron control push rod and the aileron trim control mechanism. A control crank assembly, consisting of a tab trim crank and a tab control crank, is attached to the inboard side of the nose spar in the left wing Each crank is provided with two throws. The tab trim push rod and spring cartridge are attached to tab trim crank. The aileron control push rod and tab control push rod are attached to the aileron control crank A positive engagement between the control crank and aileron nose spar is provided to manually rotate the inboard aileron when control tab motion does not produce the desired aileron displacement.

C. The inboard aileron is located between the inboard and outboard flaps at the trailing edge of the wing. Hinge supports that extend aft from ribs mounted on the rear wing spar attach to the aileron hinge bearings and support the aileron. A snubber assembly attached to the outboard side of the aileron connects the aileron with wing structure This snubber controls aileron rotational limits and provides protection from wind damage from gusts up to 70 mph.

D Control for the inboard aileron originates at the inboard aileron control tab The tab provides a turning moment to rotate the aileron relative to the direction of airflow Balance panels assist the control tab in positioning and holding the aileron. Each part of a control surface installation is independently balanced. Therefore, the inboard aileron may be replaced separately without rebalancing the entire control surface installation.

3. Inboard Aileron Control Tab

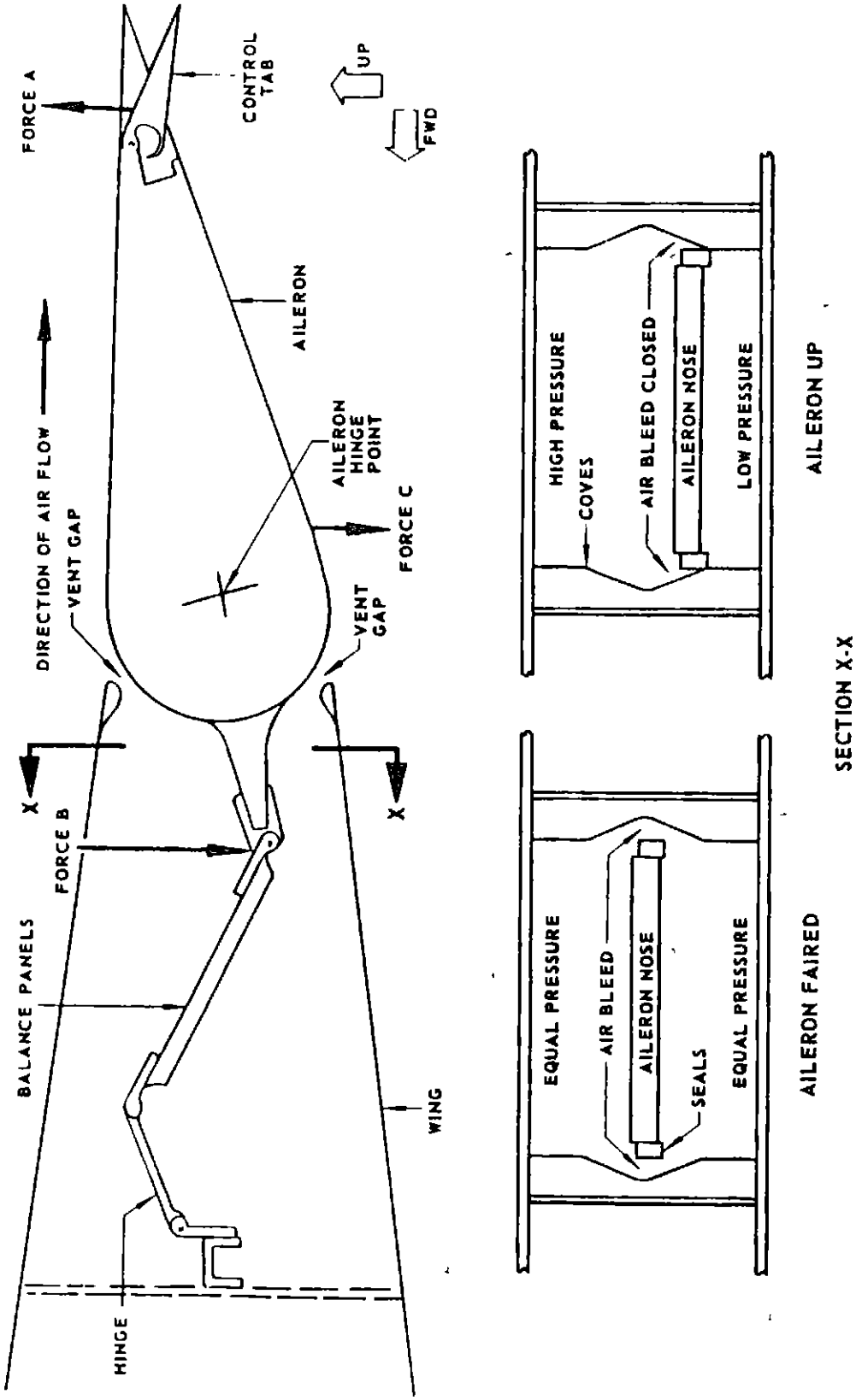
A. Inboard aileron control tabs produce the initial aerodynamic turning moment that positions the inboard ailerons. The control tab consists of an aluminum honeycomb core to which is bonded an aluminum skin. Honeycomb edges that would be exposed are covered with a sealant and a protective finish. High density steel balance weights are installed in the tab nose. An integral support shaft and crank is built into the inboard end of the tab. Hinge points at the center and outboard ends of the control tab are provided by bearing retainers. Each bearing retainer contains a concave roller bearing and lubrication fittings. These bearing retainers are secured to tab structure with two countersunk head bolts normal to the tab cord. The control tab may be replaced without rebalancing the entire control surface installation. Each control tab is furnished with adjust weights (colored international orange) that bolt to the lower aft surface of the inboard aileron balance panel. These weights number from 0 to 24 depending on the control tab weight. The weight of each tab is stamped on the side of the tab. Installed adjust weights bring the control tab into final balance about the inboard aileron hinge line.

B. The crank at the inboard end of the control tab is assembled with shear rivets. This method of construction provides a shear section in the aileron control tab actuating mechanism that will fail safe in the event the tab becomes jammed.

4. Outboard Ailerons

A. The outboard ailerons in conjunction with the inboard ailerons and spoiler control system provide lateral control about the airplane roll axis during low speed flight. The aileron consists of a nose spar and ribs covered with aluminum honeycomb skin panels. Honeycomb areas that would be exposed are covered with a sealant and a protective finish. The nose of the aileron tapers to a thin cross section and extends forward of the hinge line into the balance chamber. Brush airseals are attached to the sides of the aileron nose. A continuous hinge is attached to the forward edge of the nose and is grooved to receive the hem of a fabric seal. Attached to the aileron nose spar are 8 hinge bearings. Brush airseals inclose each hinge bearing area. Travel stops are located at each end of the spar. A cutout in the aileron trailing edge contains the outboard aileron balance tab.

B. An outboard aileron is located in the trailing edge of each outboard wing section. Eight hinge supports extend aft from the wing and attach to the aileron hinge bearings to support the aileron. Access panels are provided for each hinge bearing, and individual bearings may be replaced without removing the aileron. The nose of the aileron projects into the wing (balance chamber) and is attached to the balance panels. A pushrod attaches the outboard aileron to the link assembly of the outboard aileron bus quadrant.



1. FORCE A INDUCED BY AIR PRESSURE DIFFERENTIAL ON CONTROL TAB INITIATES ROTATION OF AILERON
2. FORCE B INDUCED BY AIR PRESSURE DIFFERENTIAL ON BALANCE PANELS, AFTER AILERON IS DISPLACED BY TAB MOVEMENT
3. FORCE C AS INDUCED BY AIR PRESSURE DIFFERENTIAL ON AILERON, OPPOSING FORCES A AND B
4. ALL FORCES ARE PROPORTIONAL TO ANGULAR DISPLACEMENT OF SURFACES FOR ANY GIVEN TAB DISPLACEMENT, AILERON ROTATES UNTIL THE MOMENT OF FORCE C IS EQUAL TO THE SUM OF THE MOMENTS OF FORCES A AND B
5. A CONTROLLED AIR BLEED IS PROVIDED AT THE ENDS OF THE AILERON TO PROPORTION FORCE B WITH DISPLACEMENT OF AILERON SEE SECTION X-X

Balance Panel Schematic
Figure 2

C. The outboard aileron may be replaced separately without rebalancing the entire control surface installation. When the flaps are extended, the outboard aileron is positioned by rotating the outboard aileron bus quadrant. The magnitude of aileron rotation is dependent upon the degree of flap extension and the position of the outboard bus quadrant. Aerodynamic loads on the outboard aileron balance tab and balance panels help position and hold the outboard aileron. Clearance between the aileron nose and wing structure provides a controlled air flow area necessary for balance panel performance.

5 Outboard Aileron Balance Tab

A. The outboard aileron balance tab reduces the force required to position and hold the outboard aileron. The tab consists of an aluminum honeycomb core to which is bonded an aluminum skin. Honeycomb edges that would be exposed are covered with a sealant and a protective finish. The upper forward edge of the tab contains a continuous hinge half.

B. The balance tab is located in a cutout in the trailing edge of the outboard aileron. The tab is attached to the aileron by a hinge pin through engaged halfs of the continuous hinge. Two balance tab push rods connect the tab with wing structure. The balance tab may be replaced separately without rebalancing the entire control surface installation. Each balance tab is furnished with adjust weights (colored international orange) that bolt to the lower aft surface of the balance panel in the outboard aileron balance panel bay No. 5. These weights bring the tab into final balance about the outboard aileron hinge line. The number of adjust weights used will vary from 0 to 12 depending on tab weight.

6. Balance Panels

A. Aileron balance panels (figure 2) reduce the force required to position and hold the ailerons. Inboard aileron balance panels consist of aluminum honeycomb skin bounded with an aluminum frame. Outboard aileron balance panels are aluminum skin covered assemblies with hat-section stiffeners bonded to the surface. Seals are attached to the panels to control air leakage. A double continuous hinge attached to the forward edge of the panels is entirely covered with a transverse fabric seal. Half of a continuous hinge is mounted to the aft edge of inboard aileron balance panels. This hinge half contains a groove to receive the hem of a transverse fabric seal. These transverse fabric seals are held in place with seal pins equal in length to the length of the seal. Sides of the balance panels, where continuous hinges terminate, utilize felt and brush seals for air leakage control.

B. Two inboard aileron balance panels are located in balance chambers within the wing forward of each inboard aileron. Access to the balance panels is obtained by removing inboard aileron balance bay access panels on the lower surface of the wing. The forward edge of each balance panel is bolted to wing structure. The aft edge of the panel is attached to the inboard aileron nose by engaging hinge halves of the continuous hinge and inserting a pin through the hinge. The inboard aileron control tab adjust weights (colored international orange) are bolted to the lower aft surface of the balance panels. The number of weights used will vary between 0 to 24 depending on the weight of the control tab. These weights are divided as evenly as possible between the two inboard balance panels on each inboard aileron. The adjust weights are part of the control tab installation and are used to bring the tab into final balance about the inboard aileron hinge line. A balance panel may be replaced separately without rebalancing the entire control surface installation.

C. Outboard aileron balance panels are located in balance chambers in the wing forward of each outboard aileron. The balance chambers are identified in sequence from bay 1, inboard, to bay 5 outboard, and aileron balance panels are located in bays 2 through 5. The forward edge of each outboard aileron balance panel is bolted to wing structure, the aft edge is bolted to a continuous hinge on the aileron nose. A balance panel may be replaced separately without rebalancing the entire control surface installation. Balance tab adjust weights (colored international orange) are bolted to the lower aft surface of the balance panel in bay No. 5. The number of adjust weights used will vary between 0 to 12 depending on balance tab weights. These adjust weights are divided as evenly as possible about the balance panel center line. The adjust weights bring the tab into final balance about the outboard aileron hinge line. Balance bay access panels on the lower surface of the wing provide access to the balance panels. A small quick access panel is incorporated into the larger access panel for inspecting the lower interior of the balance chamber.

D. Air loads on the balance panels (figure 2) are dependent upon aileron position. Movement of the aileron during flight to either side of the faired position will result in differential pressure across the balance panels. The force created by the differential pressure acts on the balance panels in a direction that assists aileron movement. Variable air bleed progressively increases balance panel load as the aileron rotates from the faired position. Air seals, attached to the balance panel sides on the outboard aileron balance panels, rotate past coves (contoured sides of balance chamber structure) and are utilized for air

bleed control. Air seals that are attached to the sides of the inboard aileron nose and rotate past coves, provide air bleed control for the inboard aileron balance panels.

E. Air bleed reduces differential air pressure on the balance panels by establishing an air flow within the balance chamber. Full balance panel force is not required for small angles of aileron displacement since the manual force required to rotate the control tab through small angles is small. Controlled air bleed (flow area) is progressively decreased as the aileron displacement angle is increased. This action increases the differential air pressure on the balance panel as the aileron rotates from the faired position. The increasing load on the balance panel counteracts increasing air loads on the ailerons.

7. Slack Take-Up Cylinder

A. The slack take-up cylinder (figure 1) eliminates bus cable drag over structure. The cylinder consists of a preloaded coil spring within a telescoping tube. The tube is drilled to receive an AN395 rigging pin in the extended position. Each end of the tube has a cable coupling.

B. The cable slack take-up cylinder is located in the left main gear wheel well near the forward bulkhead. Bus cables attach to each end of the cylinder and cable slack that would be introduced by air loads on the ailerons is eliminated by action of the cylinder. The take-up cylinder will bottom against either side at cable loads of about 58 and 20 pounds respectively.

8. Inboard Aileron Control Tab Actuating Mechanism

A. The inboard aileron control tab actuating mechanism rotates the aileron control tab. The mechanism changes cable motion from aileron control cables into linear push rod motion. The spoiler control system is regulated by the control tab actuating mechanism.

B. The control tab actuating mechanism consists of the control quadrant, support shaft, control push rod, tab control crank and tab control push rod Motion in the aileron control cables rotates the quadrant about the support shaft. Control quadrant rotation positions the aileron control tab through the control push rod, crank and tab control push rod.

C. The periphery of the quadrant is grooved for two cables and contains clips to secure these cables. The center portion of the quadrant is drilled for attaching push rods. The quadrant is located within the wing behind the rear spar on the inboard side of the inboard aileron. Access to the quadrant is through the inboard aileron control access door on the lower wing surface. Rotating the aileron control wheels

transfers motion by cable directly to the control quadrant. The inboard bus quadrant rotates about the same support shaft as the control quadrant, with no interference.

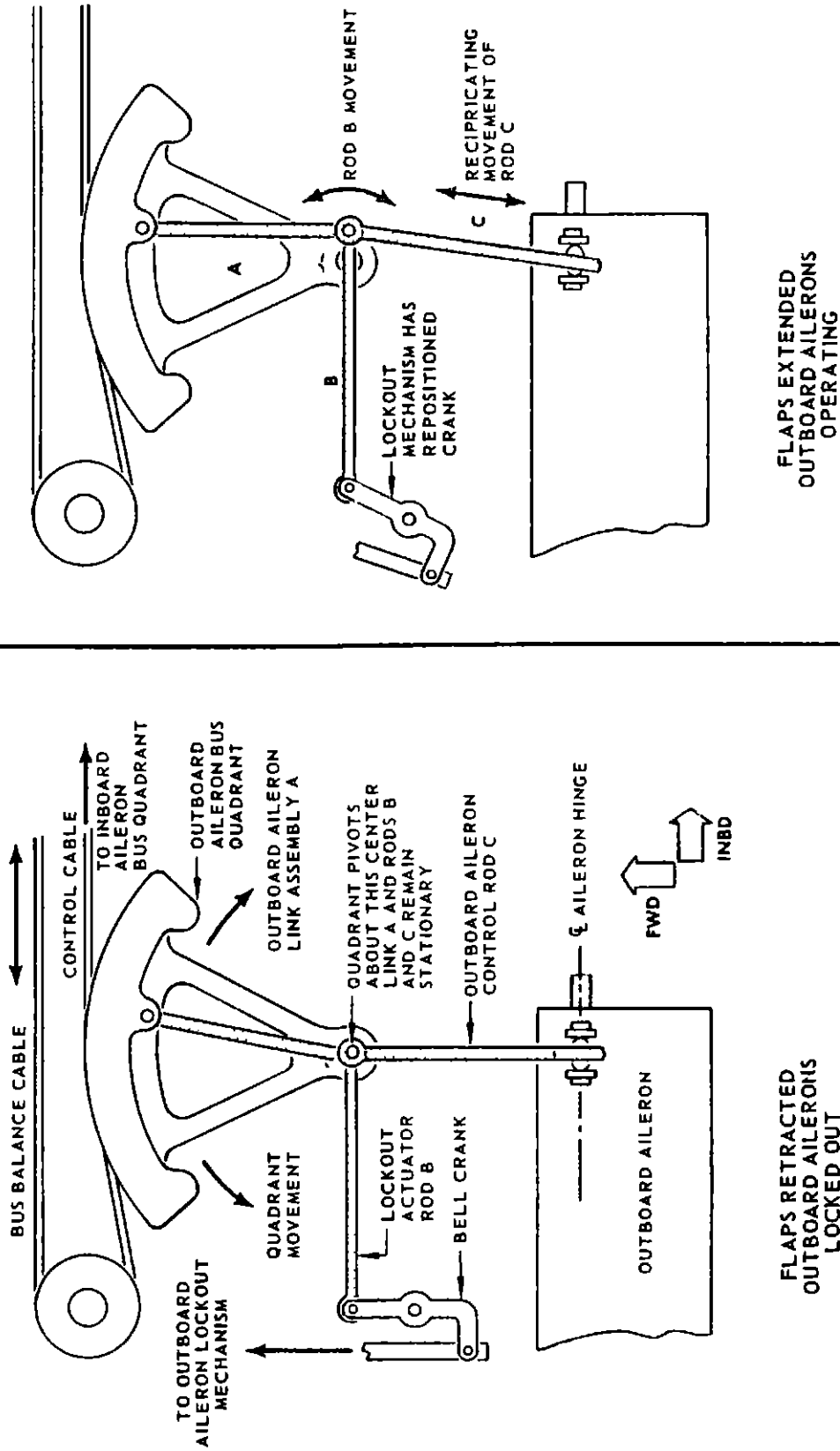
D. The control crank provides a neutral point on the inboard aileron for attaching push rods. The crank is a multiple throw assembly with two hinge bearings. The control crank is located on the inboard aileron nose spar at the inboard side. Access to the crank is through the inboard hinge access panel. Attached to the two lower arms are the aileron trim control mechanisms and aileron control push rods. The tab push rods attach to the upper arms. The crank hinge line is on the aileron hinge line, therefore, rotation of the aileron does not disturb the crank. Motion from the trim control mechanism or control push rod is transferred through the crank to the control tab.

9. Outboard Aileron Control Linkage

A. The outboard aileron control linkage rotates the outboard aileron. The control linkage is locked in or out of the aileron control system by action of the flap control system. (See figure 3.)

B. The outboard aileron control linkage consists of the outboard bus quadrant, link assembly, outboard aileron control rod, and lock out actuator rod. (See figure 4.) The outboard bus quadrant changes cable motion into linear pushrod motion. The bus quadrant is located in balance chamber No. 1 at the inboard side of the outboard aileron. Accessibility to the quadrant is through the outboard aileron control access panels on either the upper or lower wing surface. The quadrant is a forked assembly containing a link assembly mounted within the fork and hinged to the forward end. (See figure 4.) Clips secure the bus cables to the quadrant. The quadrant and link both contain two ball bearings. Connected to the aft end of the link assembly by a hinge bolt are the lockout actuator rod and the outboard aileron control rod. The lockout actuator rod attaches to the lockout crank assembly. The aft end of the outboard aileron control push rod attaches to a mast on the upper surface of the outboard aileron.

C. The position of the bus quadrant link assembly controls outboard aileron lockout. When the lockout actuator rod (figure 3) holds the aft end of the link assembly aligned with the quadrant axis, no motion is transferred to the outboard aileron control rod when the quadrant rotates. This is the lockout position. When the lockout actuator rod



Typical Outboard Aileron Control Linkage Schematic
Figure 3

positions the aft end of the link assembly away from the quadrant axis, motion introduced by rotating the bus quadrant is transferred through the link assembly and control rod to rotate the outboard aileron.

10. Outboard Aileron Lockout Mechanism

A. The outboard aileron lockout mechanism holds the outboard aileron in the faired position during high speed flight. During low speed flight with flaps extended, the lockout mechanism returns the operation of the outboard aileron to the aileron control system. On turbojet airplanes, the leading edge flap control valve is linked to the lockout mechanism so that operation of the valve is dependent upon mechanism position.

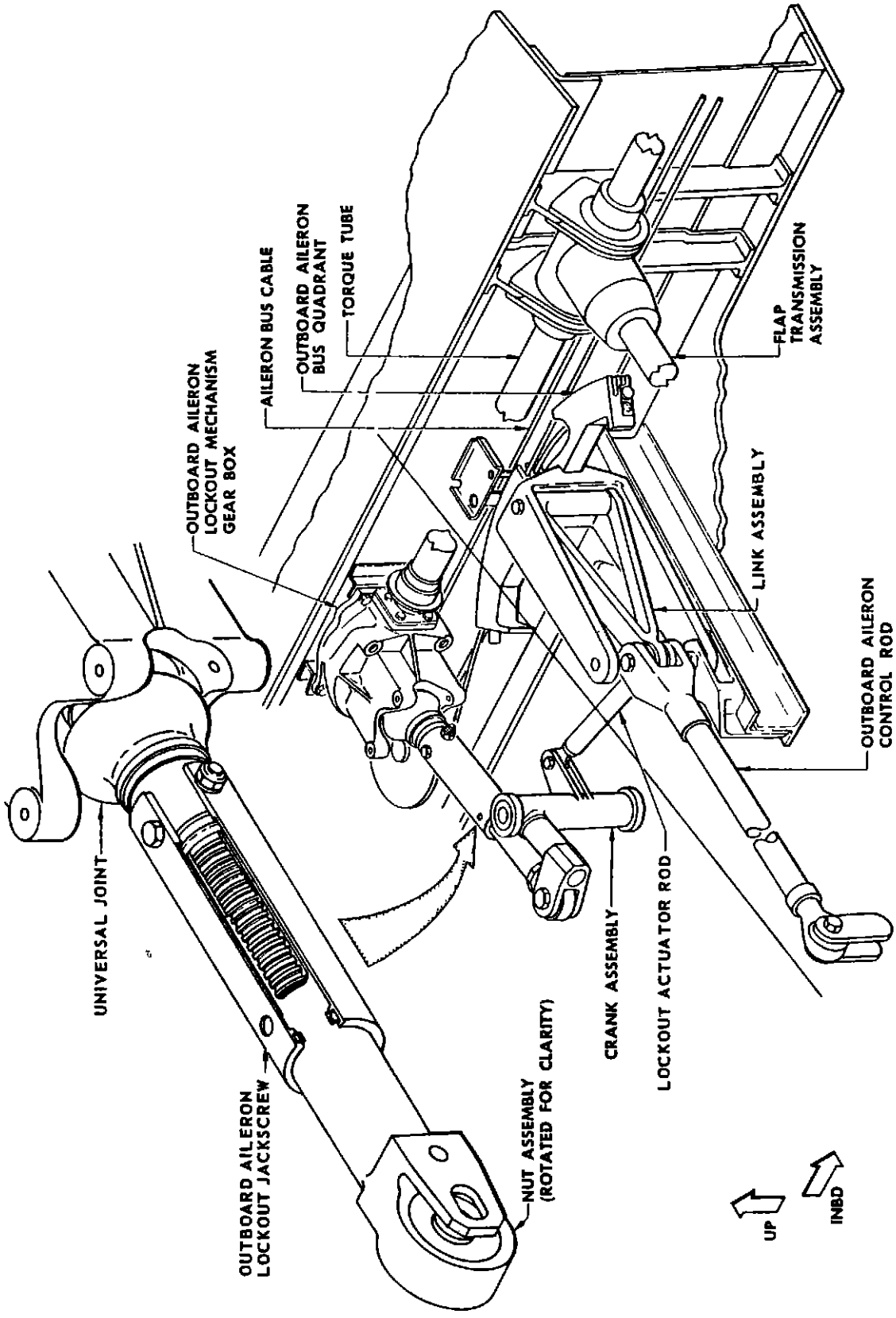
B. The outboard aileron lockout mechanism (figure 4) consists of a torque tube with couplings, angle drive gearbox and universal joint, jackscrew and crank assembly. Rotation of the torque tube through the gearbox extends the jackscrew to pivot the crank assembly about its axis.

C. The gearbox changes drive angle to drive the jackscrew. The input shaft of the gearbox is externally splined and a universal joint is mounted on the output shaft. The gear set consists of a pinion mounted on the input shaft and a ring gear on the output shaft. The gears are lubricated with a mixture of 1 part MIL-G-23827 to 4 parts MIL-L-7808.

D. The jackscrew changes rotary motion into linear motion to pivot the crank assembly. Threads of the screw are lubricated prior to assembly with the nut.

E. The outboard aileron lockout mechanism is located in the wing forward of the outboard aileron on the inboard side. Access to the mechanism is through the aileron control access panels on the upper or lower surface of the wing. The gearbox is mounted to the rear spar. The torque tube extending from the outboard flap drive system drives the input side of the gearbox. The jackscrew attaches to the universal joint on the output side of the gearbox. The aft end of the jackscrew attaches to a throw on the crank assembly. The crank is connected by the lockout actuator rod to the outboard aileron control linkage. On turbojet airplanes, the leading edge flap control valve is also connected to the crank.

F. Extending the flaps causes the flap drive system to transmit motion through the gearbox to the jackscrew. The jackscrew contracts and rotates the crank assembly which positions the aft end of outboard aileron bus quadrant link assembly away from the quadrant axis. The outboard aileron then responds to signals from the aileron control system. The universal joint allows for misalignment between the jackscrew and gearbox as the aft end of the jackscrew rotates with the crank. Retracting the flaps extends the jackscrew which positions the control linkage to the lockout position.



Typical Outboard Aileron Lockout Mechanism
Figure 4

11. Aileron Snubber Assembly

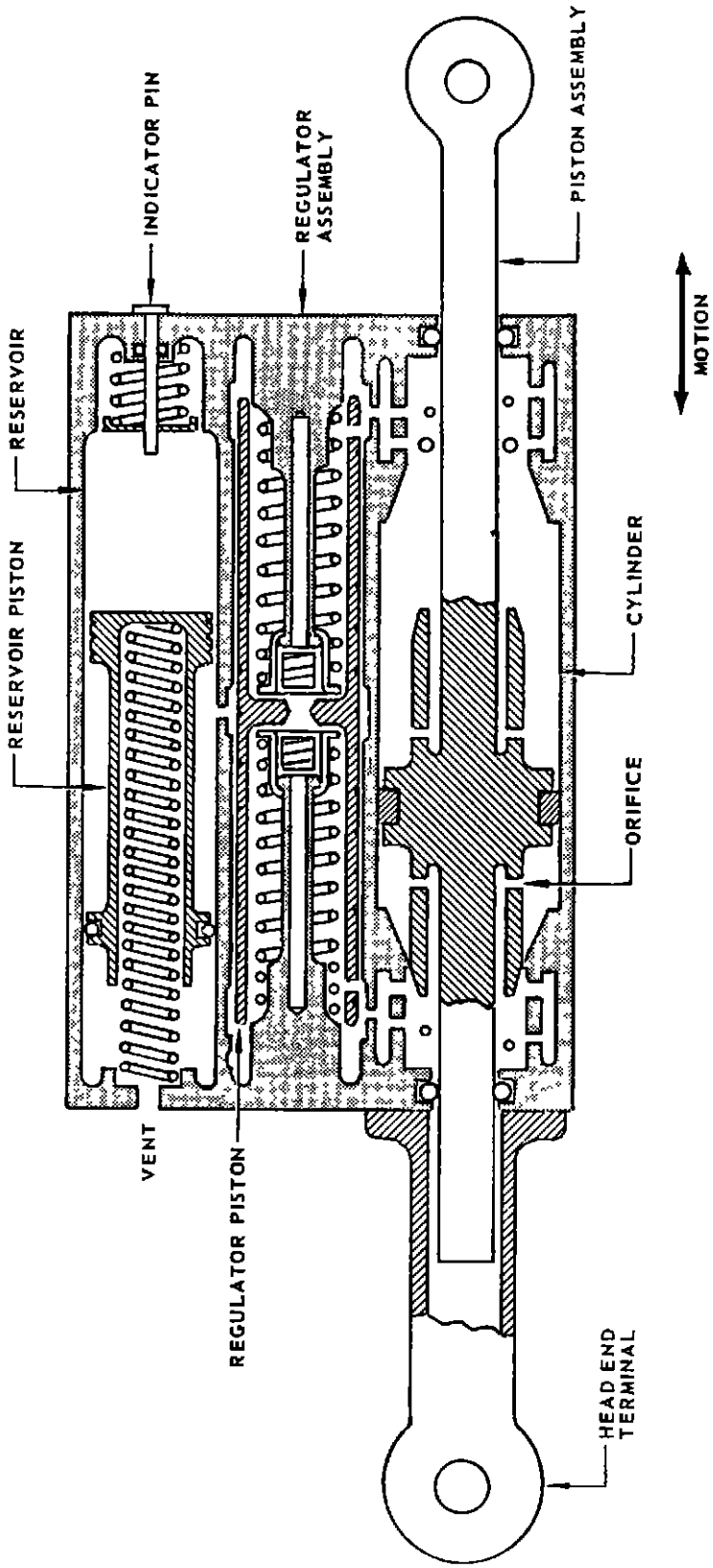
A. Aileron snubber assemblies (figure 1) dampen out rapid inboard aileron fluctuations and provide stops to limit maximum aileron rotation. Components of a snubber assembly are shown in figure 5. The snubber is filled with hydraulic fluid, MIL-H-5606. One snubber assembly is located on the outboard side of each inboard aileron. Access to the snubber is through the snubber access panel on the lower surface of the wing. The snubber is attached between the inboard aileron nose spar and wing structure.

B. The spring loaded reservoir piston maintains fluid within the cylinder and regulator assembly regardless of snubber position. When the reservoir piston has displaced most of the fluid in the reservoir it unseats an indicator pin. Any perceptible clearance under the head of the pin indicates low fluid supply, and the snubber should be replaced.

C. Rotation of the inboard aileron moves the piston assembly forcing fluid from the cylinder and through the regulator assembly. Restrictions imposed on the circulating fluid cause resistance to rapid motion of the piston assembly. The regulator limits maximum aileron velocity to 50 degrees per second. As the piston assembly approaches its travel limit, projections on the piston close off the major area of free fluid flow from the cylinder. Hydraulic fluid is then compelled to flow through small orifices in the piston assembly greatly increasing resistance to piston motion. The orifice area is further deminished as the piston assembly moves to extreme travel limits. This increases damping action and prevents damage caused by sudden bottoming. The snubber assemblies are double acting, damping motion in either direction. The inboard ailerons are protected from damage from air gusts up to 70 mph.

12. Operation

A. Control wheel rotation or action of the autopilot servo actuates the control quadrants at both inboard ailerons. Motion of the inboard aileron control quadrants is transmitted through linkage to rotate the inboard aileron control tabs in opposite directions. Aerodynamic loads on the control tabs induce a moment about the inboard aileron hinge line which initiates aileron rotation. Aileron rotation from the faired position causes air flow over the aileron surface to be disturbed. (See figure 2.) A pressure increase is created on the deflected side and a low pressure area on the contour side of the airflow. This differential pressure propagates through the aileron vent gaps into the upper and lower portions of balance chambers to load the balance panels. The force on the balance panels is applied to the aileron nose to develop a moment that aids in positioning and holding the aileron against aerodynamic forces.



Aileron Snubber Assembly Schematic
Figure 5

B. Additional lateral control is available during slow speed flight when flaps are extended. As the flaps extend, the flap drive system positions the outboard lockout mechanism (figure 4) to the active position. The outboard ailerons are then operated by the aileron control system. The motion of the inboard ailerons is transferred to the outboard aileron control linkage by the bus cables to rotate the outboard ailerons. Retracting the flaps causes the flap drive system to rotate the outboard aileron lockout mechanism. This positions the aft end of the link assembly in alignment with the quadrant axis to lockout the ailerons. In the lockout position, no motion is transferred to the outboard ailerons when the inboard ailerons rotate. Retracting the flaps returns the outboard ailerons to the faired position regardless of inboard aileron position.

C. On the ground, the outboard ailerons are locked in the faired position by having the flaps retracted. The inboard ailerons are provided damage protection from air gusts up to 70 mph by the snubber assemblies. With extended flaps, all ailerons receive a limited amount of protection from wind gusts.

END

AILERONS, AILERON TABS AND AILERON CONTROL SYSTEM - TROUBLE SHOOTING

1 General

A The troubles that may occur in the aileron control system can be readily isolated to either controls between inboard aileron control quadrants and control columns, or to outboard and inboard ailerons and aileron bus cables. When control wheels rotate freely for 54 degrees to either side of neutral then become resistive to further rotation to full travel, the trouble is in the outboard and inboard ailerons and aileron bus cables. Refer to Aileron Bus Control System Trouble Shooting Chart. When excessive force is required to rotate control wheels from the neutral position to 54 degrees, the trouble is between inboard aileron control quadrants and control columns. Refer to the Aileron Control System Trouble Shooting Chart. An energized autopilot servo may give a false indication of system malfunction. A tangential force of about 46 pounds must be applied to the pilot's control wheel to override this lateral servo

B. Excessive control wheel force required for lateral control during flight but not experienced on the ground results from unbalanced aerodynamic forces. This type of trouble originates at ailerons with components necessary for aerodynamic balance such as vent gap clearance or balance panel seal clearance Use the Aileron Control System Trouble Shooting Chart for aerodynamic trouble.

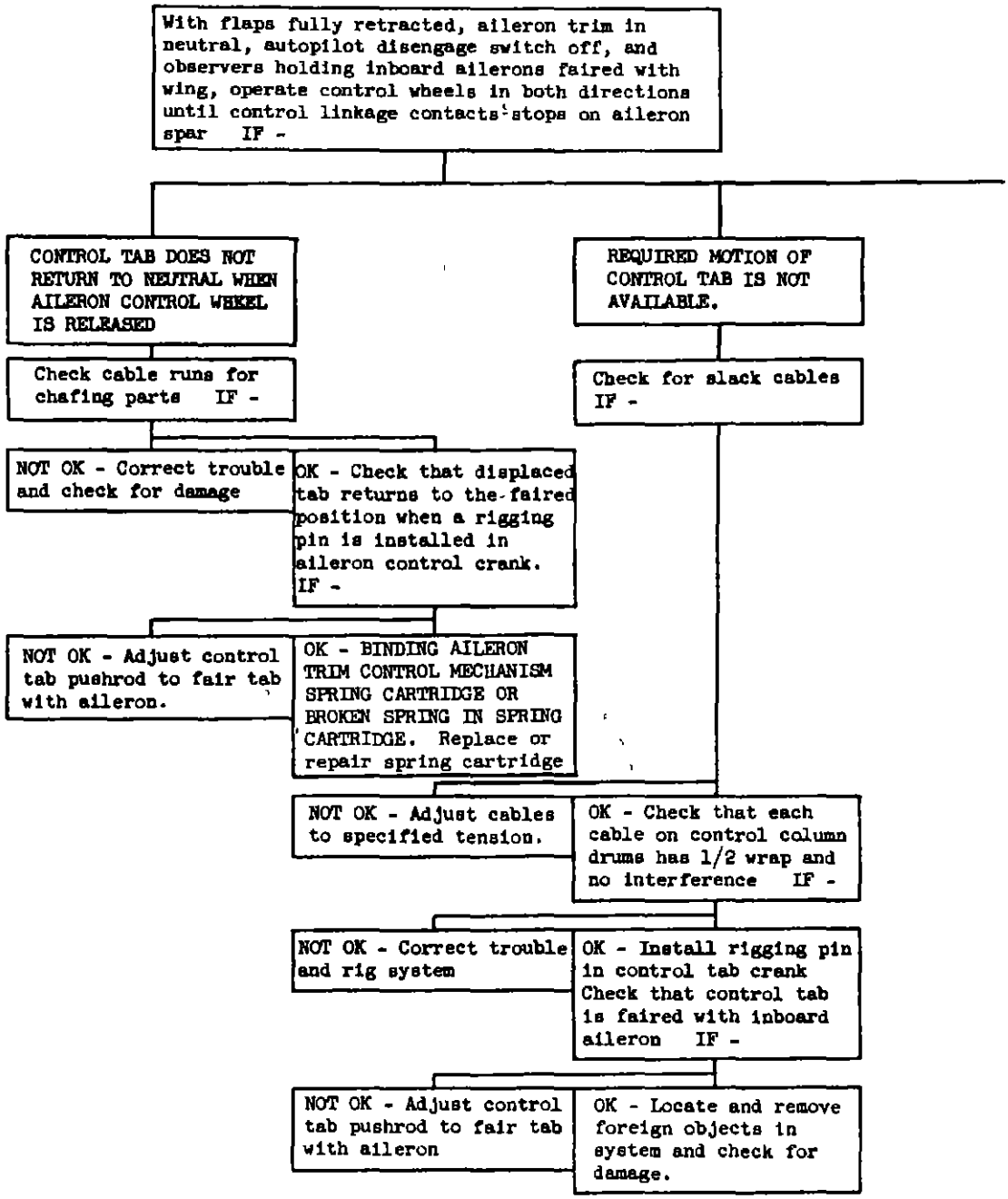
C. When the airplane is parked on the ground and a prevailing tail wind exists, ailerons and balance panels are aerodynamically loaded in such a manner that larger than normal control wheel forces are required to move these surfaces. Position the airplane into the wind if this condition should exist when trouble shooting.

D. Equipment and Materials

(1) Spring Scale, 0 to 25 pound capacity

(2) Rigging Pins - MS20392-4 (0.309 to 0.311 inch Diameter).

2. Aileron Control System Trouble Chart


With flaps fully retracted, aileron trim in neutral, autopilot disengage switch off, and observers holding inboard ailerons faired with wing, operate control wheels in both directions until control linkage contacts stops on aileron spar IF -
CONTROL TAB DOES NOT RETURN TO NEUTRAL WHEN AILERON CONTROL WHEEL IS RELEASED
REQUIRED MOTION OF CONTROL TAB IS NOT AVAILABLE.
Check cable runs for chafing parts IF -
Check for slack cables IF -
NOT OK - Correct trouble and check for damage
OK - Check that displaced tab returns to the faired position when a rigging pin is installed in aileron control crank. IF -
NOT OK - Adjust control tab pushrod to fair tab with aileron.
OK - BINDING AILERON TRIM CONTROL MECHANISM SPRING CARTRIDGE OR BROKEN SPRING IN SPRING CARTRIDGE. Replace or repair spring cartridge
NOT OK - Adjust cables to specified tension.
OK - Check that each cable on control column drums has 1/2 wrap and no interference IF -
NOT OK - Correct trouble and rig system
OK - Install rigging pin in control tab crank Check that control tab is faired with inboard aileron IF -
NOT OK - Adjust control tab pushrod to fair tab with aileron
OK - Locate and remove foreign objects in system and check for damage.

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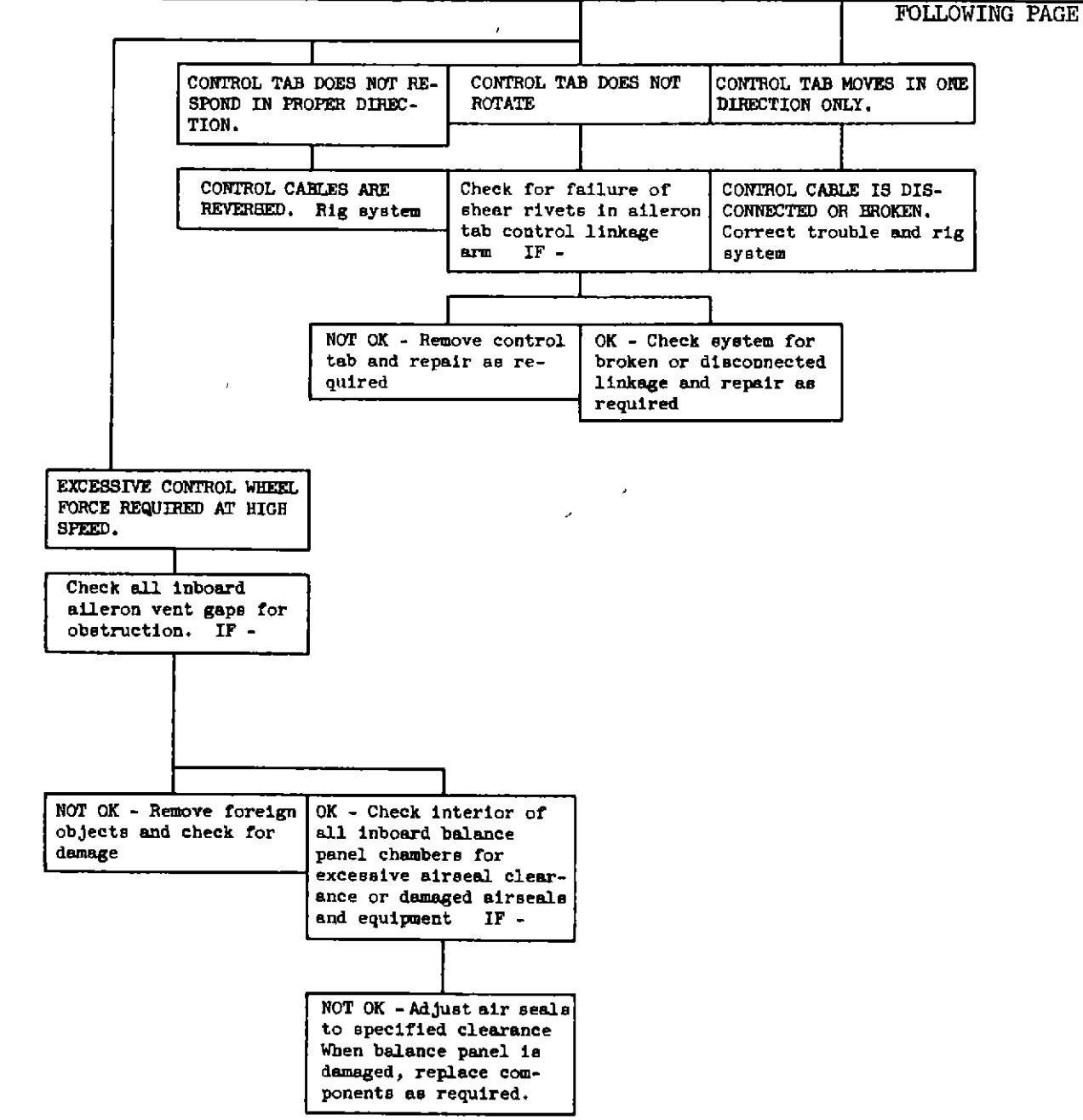

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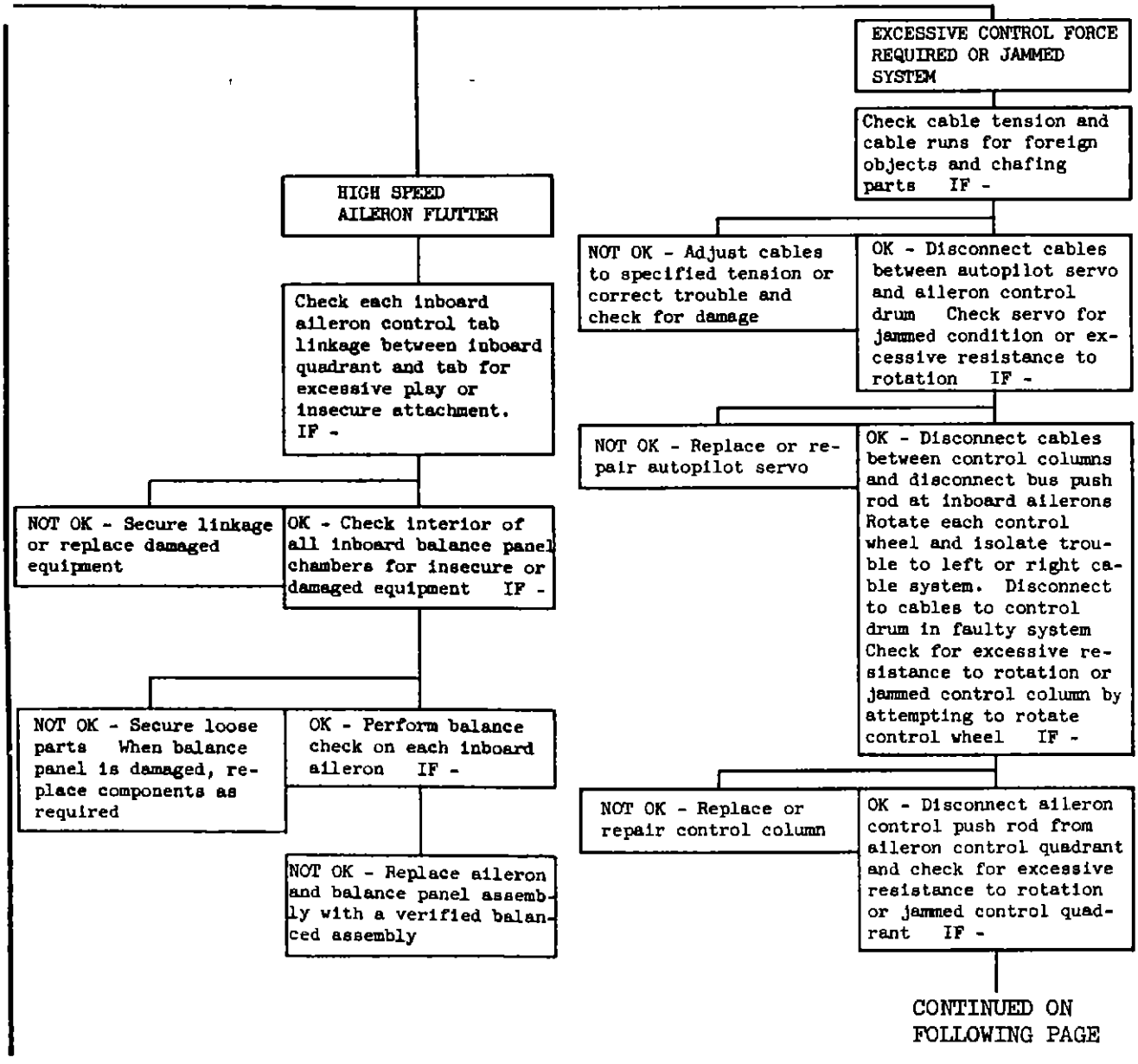

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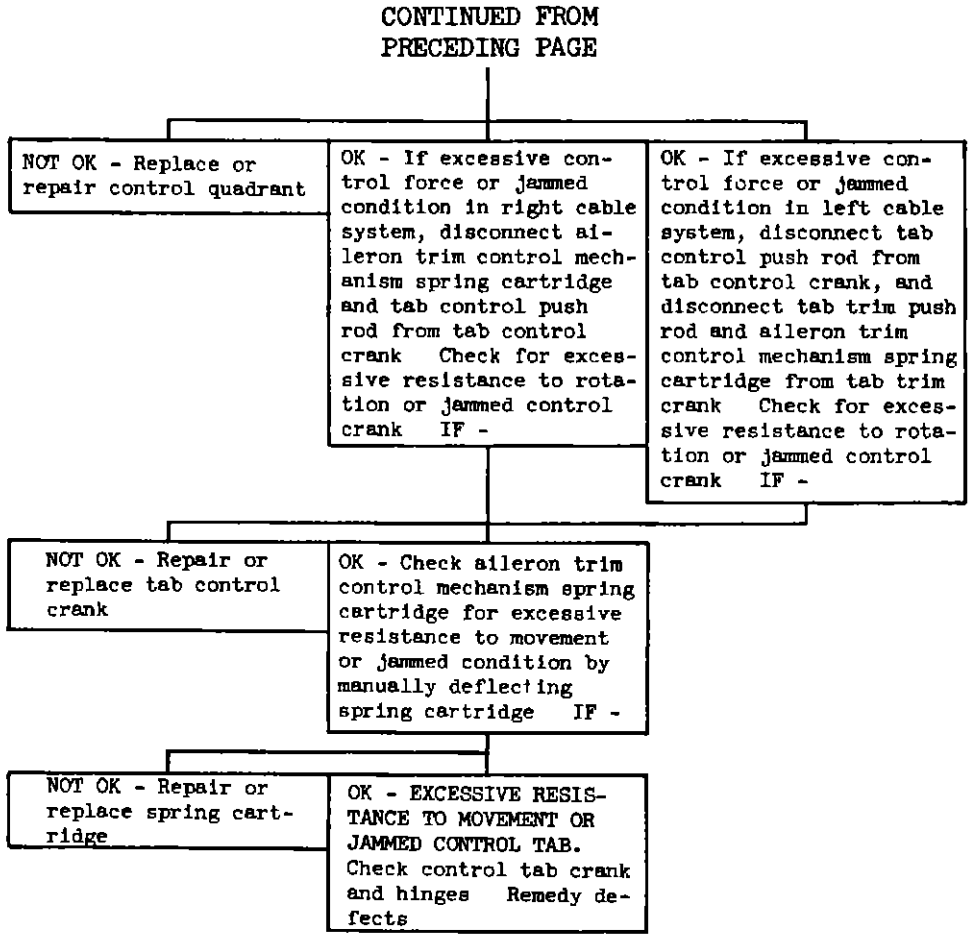
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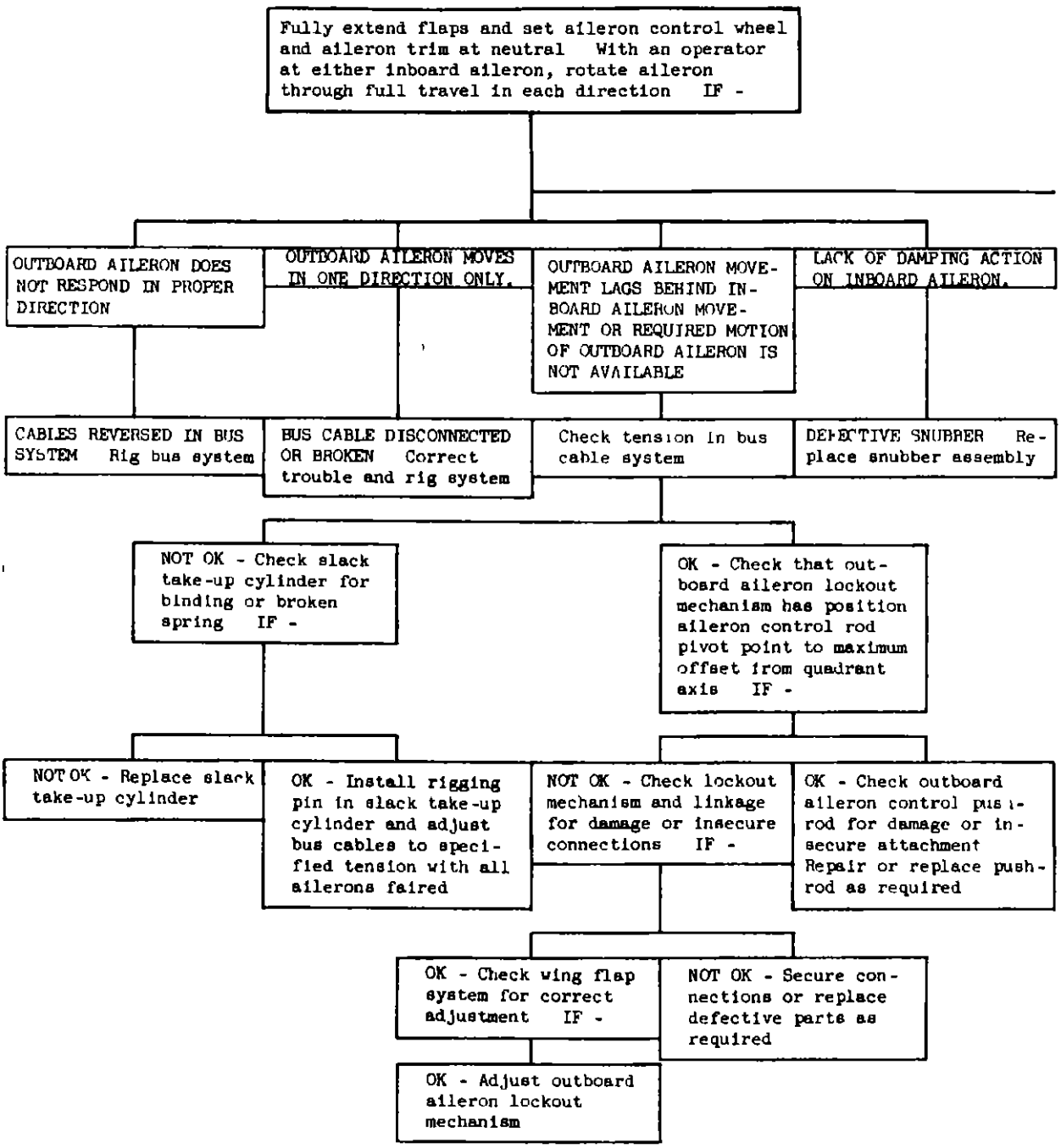
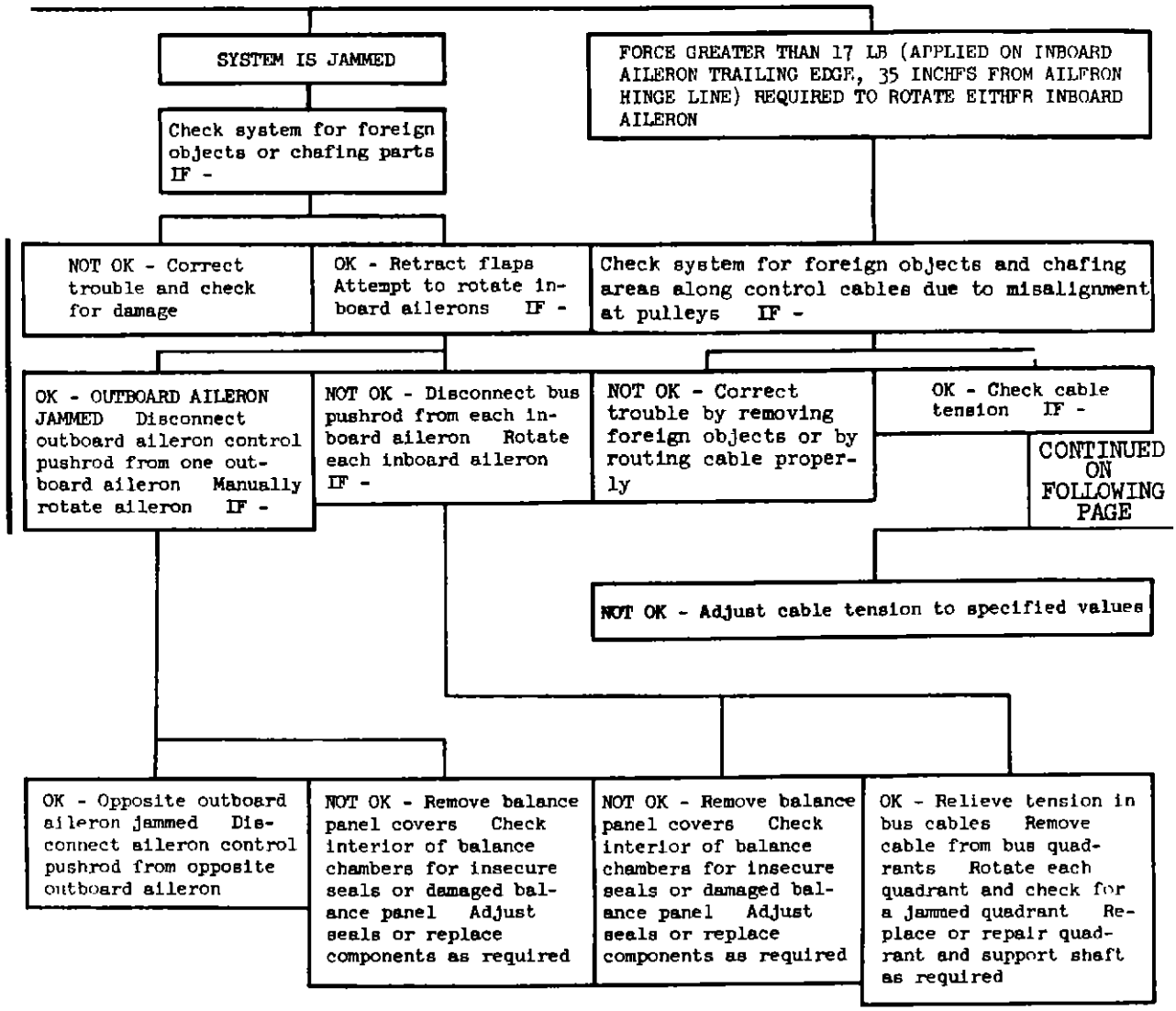
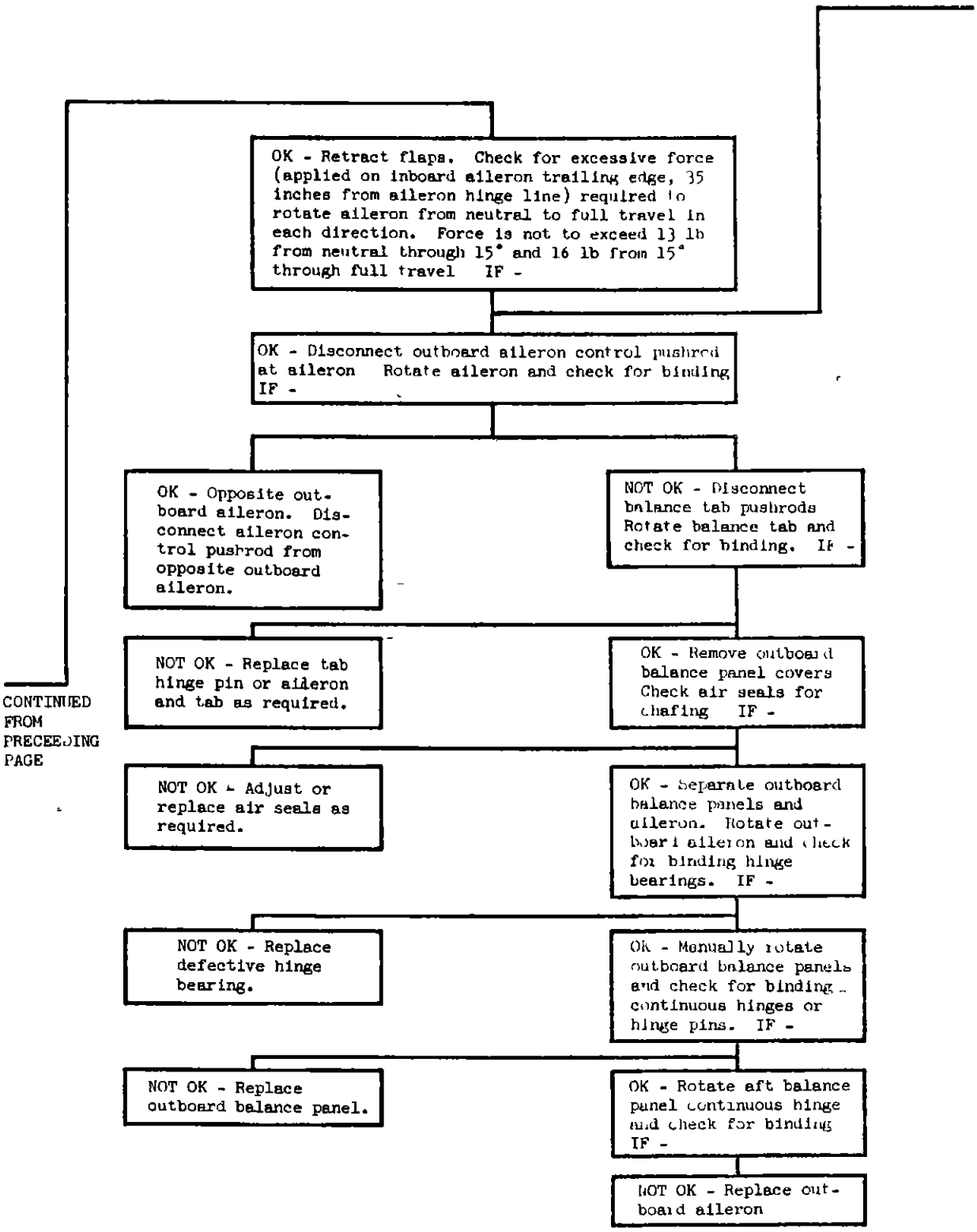
NOT OK - Replace or repair control quadrant
OK - If excessive control force or jammed condition in right cable system, disconnect aileron trim control mechanism spring cartridge and tab control push rod from tab control crank Check for excessive resistance to rotation or jammed control crank IF -
OK - If excessive control force or jammed condition in left cable system, disconnect tab control push rod from tab control crank, and disconnect tab trim push rod and aileron trim control mechanism spring cartridge from tab trim crank Check for excessive resistance to rotation or jammed control crank IF -
NOT OK - Repair or replace tab control crank
OK - Check aileron trim control mechanism spring cartridge for excessive resistance to movement or jammed condition by manually deflecting spring cartridge IF -
NOT OK - Repair or replace spring cartridge
OK - EXCESSIVE RESISTANCE TO MOVEMENT OR JAMMED CONTROL TAB. Check control tab crank and hinges Remedy defects

3. Aileron Bus Control System Trouble Chart




SYSTEM IS JAMMED
FORCE GREATER THAN 17 LB (APPLIED ON INBOARD AILERON TRAILING EDGE, 35 INCHES FROM AILERON HINGE LINE) REQUIRED TO ROTATE EITHER INBOARD AILERON
Check system for foreign objects or chafing parts IF -
NOT OK - Correct trouble and check for damage
OK - Retract flaps Attempt to rotate inboard ailerons IF -
Check system for foreign objects and chafing areas along control cables due to misalignment at pulleys IF -
OK - OUTBOARD AILERON JAMMED Disconnect outboard aileron control pushrod from one outboard aileron Manually rotate aileron IF -
NOT OK - Disconnect bus pushrod from each inboard aileron Rotate each inboard aileron IF -
NOT OK - Correct trouble by removing foreign objects or by routing cable properly
OK - Check cable tension IF -
CONTINUED ON FOLLOWING PAGE
NOT OK - Adjust cable tension to specified values
OK - Opposite outboard aileron jammed Disconnect aileron control pushrod from opposite outboard aileron
NOT OK - Remove balance panel covers Check interior of balance chambers for insecure seals or damaged balance panel Adjust seals or replace components as required
NOT OK - Remove balance panel covers Check interior of balance chambers for insecure seals or damaged balance panel Adjust seals or replace components as required
OK - Relieve tension in bus cables Remove cable from bus quadrants Rotate each quadrant and check for a jammed quadrant Replace or repair quadrant and support shaft as required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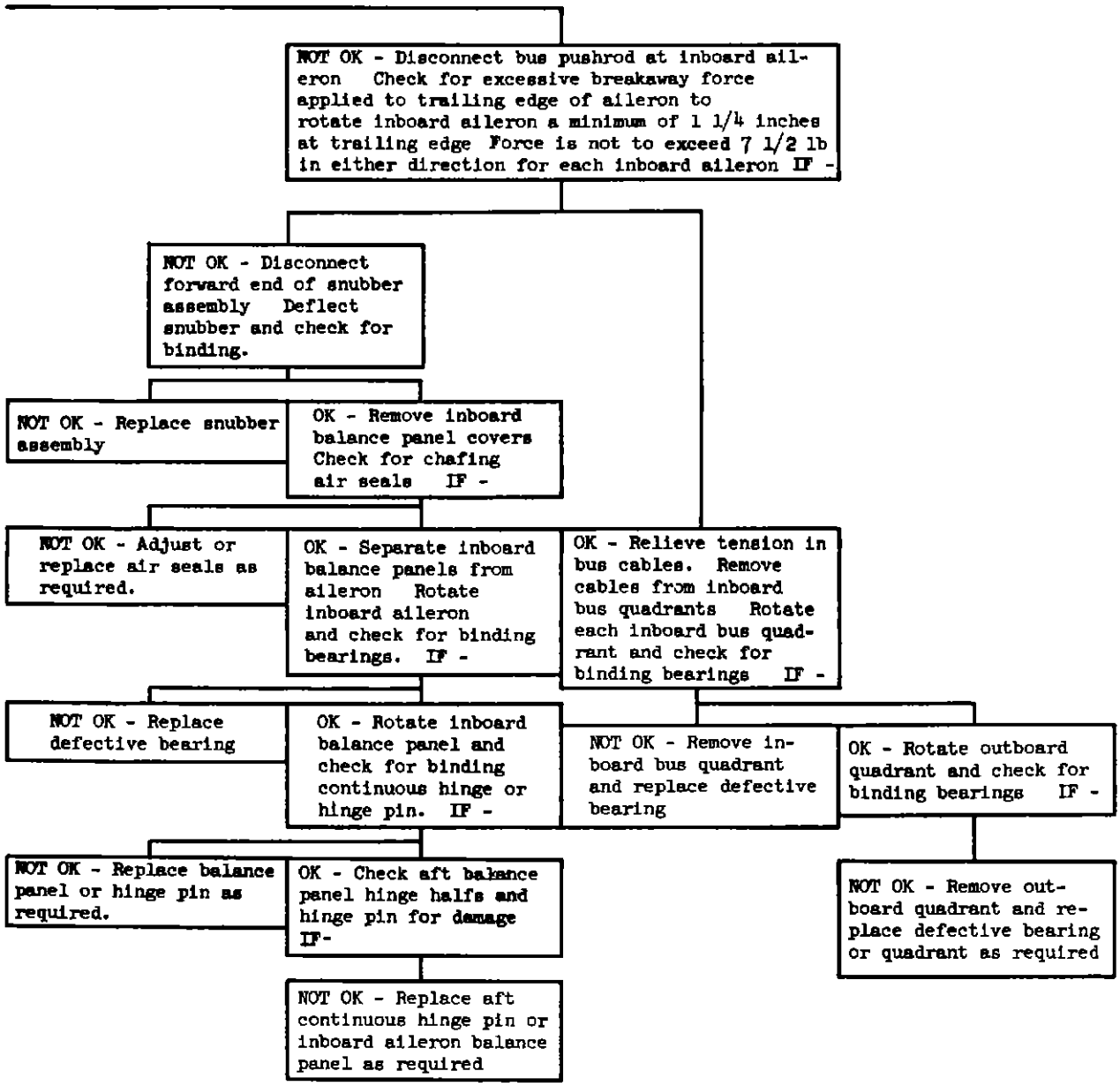
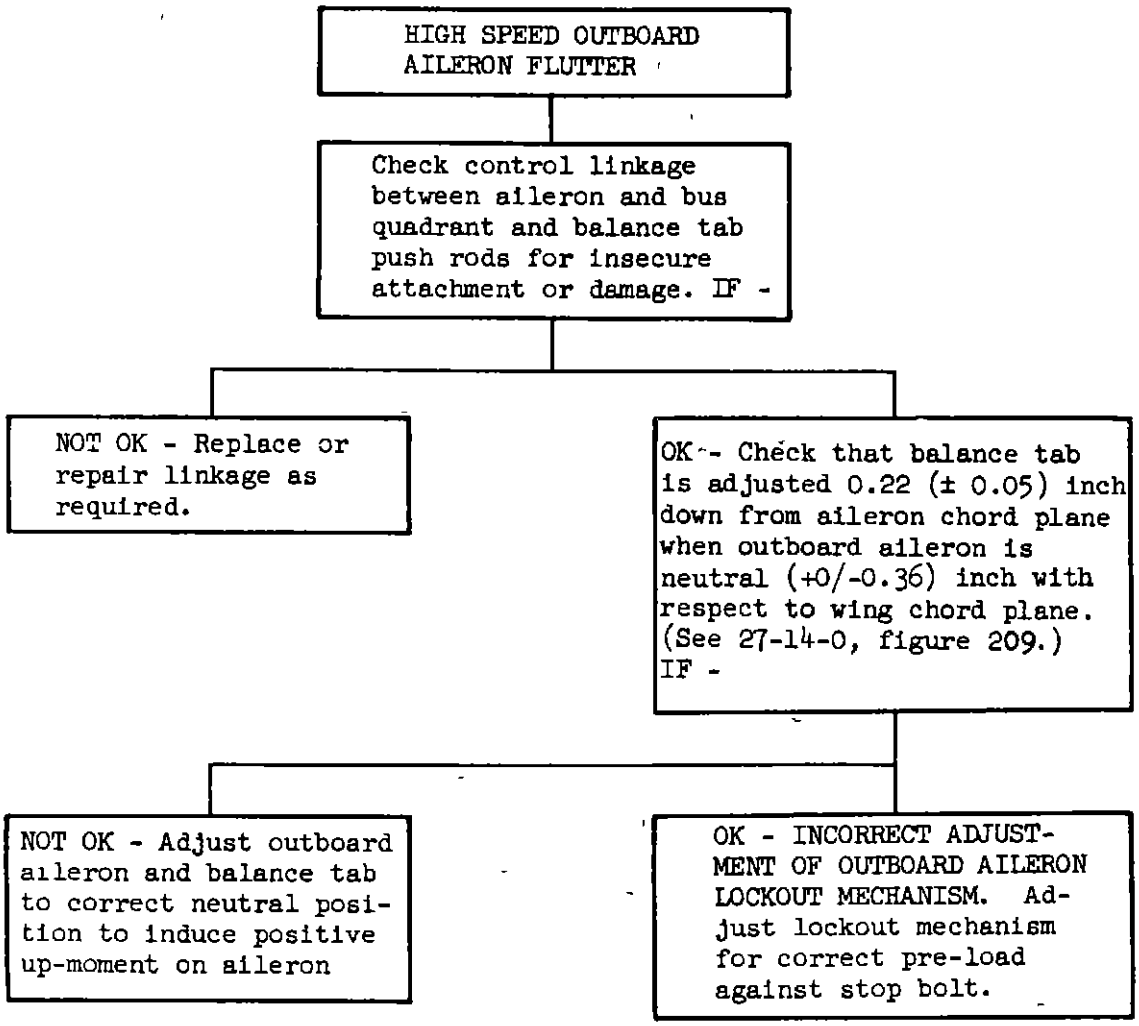
OK - Retract flaps. Check for excessive force (applied on inboard aileron trailing edge, 35 inches from aileron hinge line) required to rotate aileron from neutral to full travel in each direction. Force is not to exceed 13 lb from neutral through 15° and 16 lb from 15° through full travel IF -
OK - Disconnect outboard aileron control pushrod at aileron Rotate aileron and check for binding IF -
OK - Opposite outboard aileron. Disconnect aileron control pushrod from opposite outboard aileron.
NOT OK - Disconnect balance tab pushrods Rotate balance tab and check for binding. IF -
NOT OK - Replace tab hinge pin or aileron and tab as required.
OK - Remove outboard balance panel covers Check air seals for chafing IF -
NOT OK - Adjust or replace air seals as required.
OK - Separate outboard balance panels and aileron. Rotate outboard aileron and check for binding hinge bearings. IF -
NOT OK - Replace defective hinge bearing.
OK - Manually rotate outboard balance panels and check for binding - continuous hinges or hinge pins. IF -
NOT OK - Replace outboard balance panel.
OK - Rotate aft balance panel continuous hinge and check for binding IF -
NOT OK - Replace outboard aileron

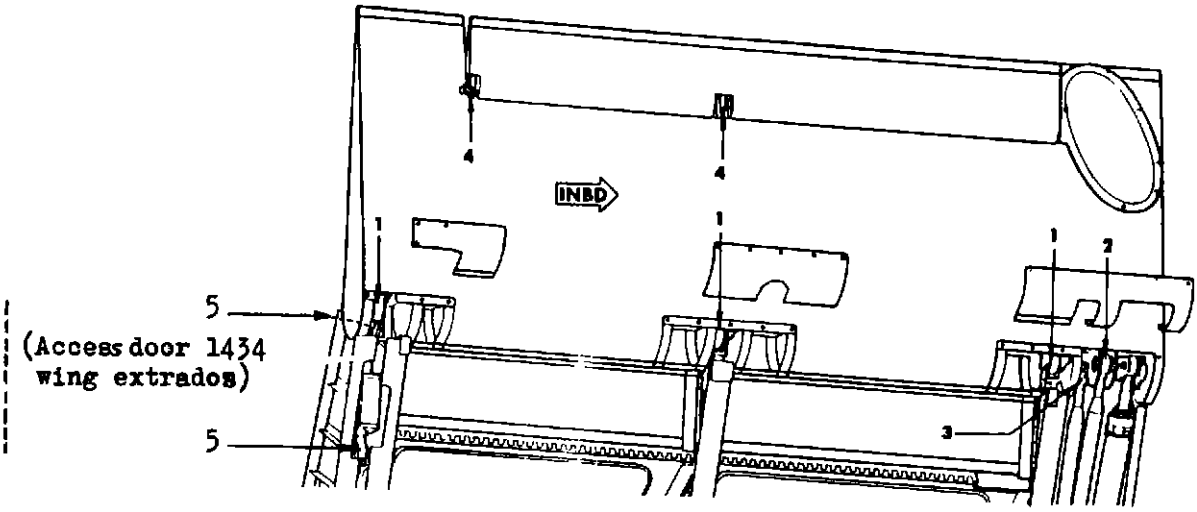

NOT OK - Disconnect bus pushrod at inboard aileron Check for excessive breakaway force applied to trailing edge of aileron to rotate inboard aileron a minimum of 1 1/4 inches at trailing edge Force is not to exceed 7 1/2 lb in either direction for each inboard aileron IF -
NOT OK - Disconnect forward end of snubber assembly Deflect snubber and check for binding.
NOT OK - Replace snubber assembly
OK - Remove inboard balance panel covers Check for chafing air seals IF -
NOT OK - Adjust or replace air seals as required.
OK - Separate inboard balance panels from aileron Rotate inboard aileron and check for binding bearings. IF -
OK - Relieve tension in bus cables. Remove cables from inboard bus quadrants Rotate each inboard bus quadrant and check for binding bearings IF -
NOT OK - Replace defective bearing
OK - Rotate inboard balance panel and check for binding continuous hinge or hinge pin. IF -
NOT OK - Remove inboard bus quadrant and replace defective bearing
OK - Rotate outboard quadrant and check for binding bearings IF -
NOT OK - Replace balance panel or hinge pin as required.
OK - Check aft balance panel hinge halfs and hinge pin for damage IF-
NOT OK - Remove outboard quadrant and replace defective bearing or quadrant as required
NOT OK - Replace aft continuous hinge pin or inboard aileron balance panel as required


HIGH SPEED OUTBOARD AILERON FLUTTER
Check control linkage between aileron and bus quadrant and balance tab push rods for insecure attachment or damage. IF -
NOT OK - Replace or repair linkage as required.
OK - Check that balance tab is adjusted 0.22 (± 0.05) inch down from aileron chord plane when outboard aileron is neutral (+0/-0.36) inch with respect to wing chord plane. (See 27-14-0, figure 209.) IF -
NOT OK - Adjust outboard aileron and balance tab to correct neutral position to induce positive up-moment on aileron
OK - INCORRECT ADJUSTMENT OF OUTBOARD AILERON LOCKOUT MECHANISM. Adjust lockout mechanism for correct pre-load against stop bolt.

AILERONS, AILERON TABS AND AILERON CONTROL SYSTEM - MAINTENANCE PRACTICES

1. Unit Servicing Ailerons, Aileron Tabs and Aileron Control System

A. Lubricate Ailerons, Aileron Tabs and Aileron Control System (See figures 201, 202 and 203.)



INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	INBOARD AILERON HINGE BEARINGS	Remove inboard aileron hinge access panels. Apply Aeroshell Grease 17, to flush fitting (3 places each aileron).
2	INBOARD AILERON CONTROL ROD	Remove inboard aileron control access panel. Apply Aeroshell Grease 17, to flush fitting (2 places each aileron).
3	INBOARD AILERON BUS ROD	Apply Aeroshell Grease 17, to flush fitting (2 places each aileron).
4	CONTROL TAB HINGE BEARING	Apply Aeroshell Grease 17, to flush fitting (2 places each aileron).
5	AILERON SNUBBER ASSEMBLY	Remove snubber access panel. Apply Aeroshell Grease 17 to flush fitting (2 places each aileron).

Typical Inboard Aileron Lubrication
Figure 201
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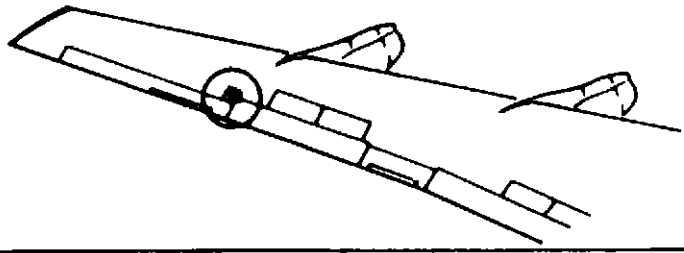
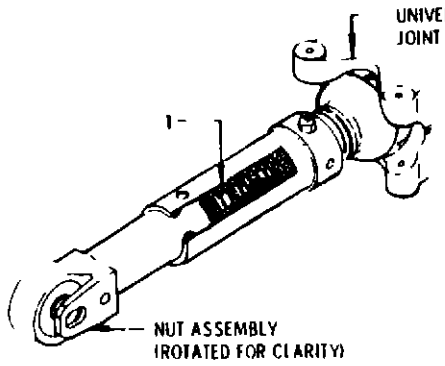
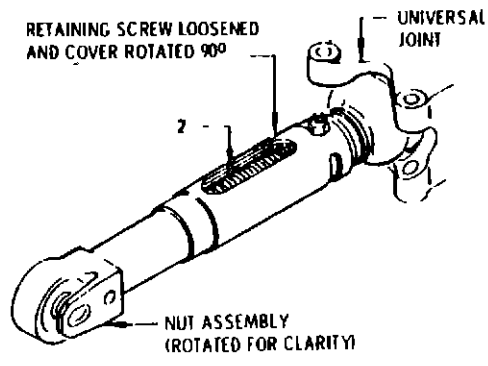




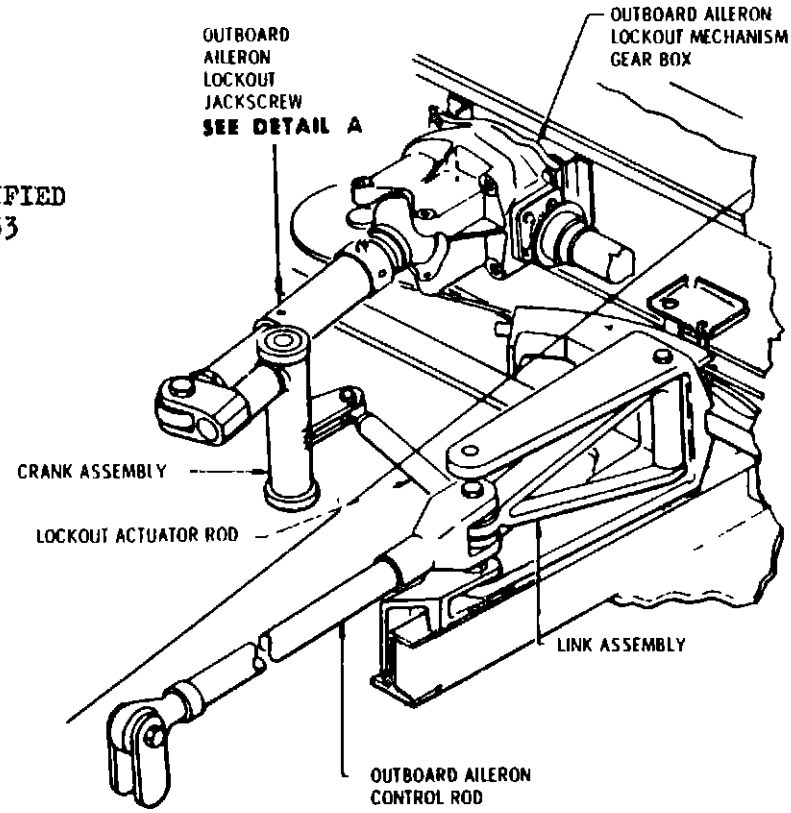
DETAIL A



DETAIL A

1 JACKSCREWS NOT MODIFIED PER SB 1253

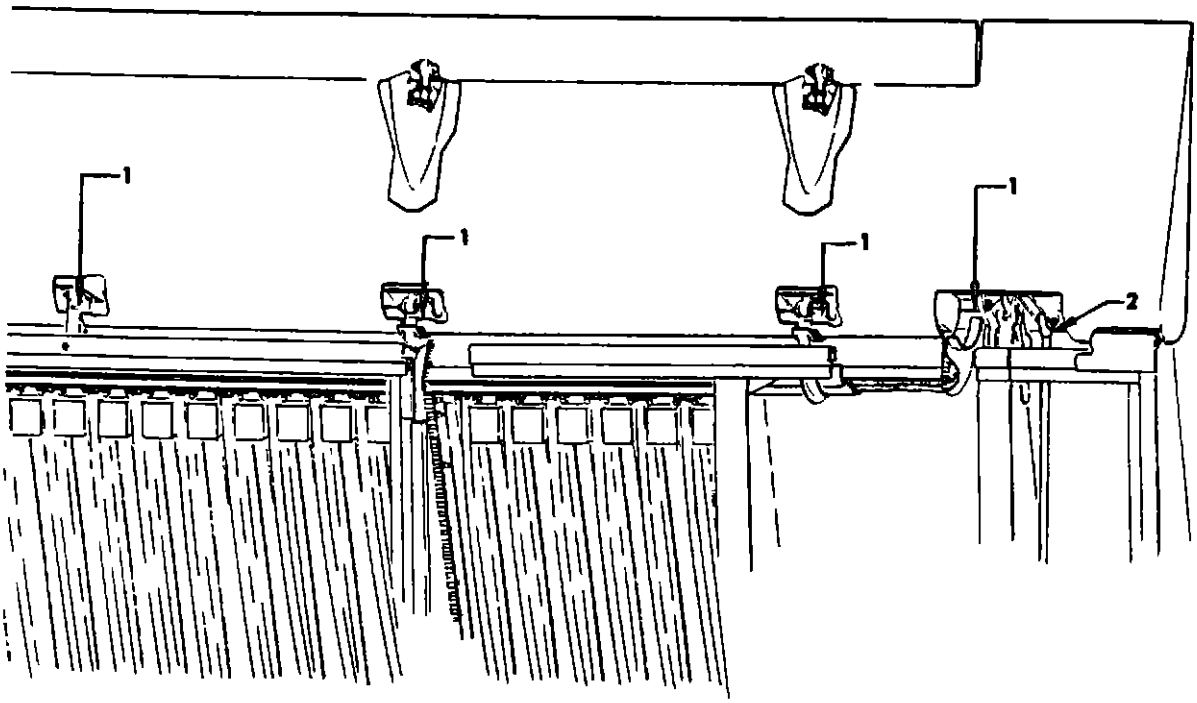
2 JACKSCREWS MODIFIED PER SB. 1253



Outboard Aileron Lockout Mechanism Lubrication
Figure 202 (Sheet 1)

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	OUTBOARD AILERON LOCKOUT MECHANISM ▷1◁	(a) Remove access panel on upper surface of wing. (b) Apply a pencil mark to nut at aft end of cover to reference length of jackscrew. (c) Remove retaining bolt, slide retaining ring back on cover and extract retaining pin from jackscrew. (d) Slide cover aft exposing screw threads. (e) Separate jackscrew from gear box universal, extend screw and wipe threads clean. (f) Apply a light even coat of grease Aeroshell 17 to threads. (g) Assemble jackscrew carefully matching original length referenced above. CAUTION: CORRECT LENGTH MUST BE MAINTAINED OR DAMAGE WILL RESULT TO CRANK AND STOP BOLT WHEN FLAPS ARE RETRACTED. (h) Operate flaps through one complete cycle observing motion of jackscrew and action of crank against stop bolt. (i) With flaps fully retracted, check that no motion transfers to outboard aileron when aileron control wheels are rotated.

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
2	OUTBOARD AILERON LOCKOUT MECHANISM [2]	(a) Remove access panel on upper surface of wing. (b) Loosen retaining bolt. (c) Rotate cover 90 degrees to expose screw threads. (d) Wipe threads clean. (e) Apply a light even coat of grease Aeroshell 17 to threads. (f) Not applicable to SABENA aircraft. (g) Rotate cover 90 degrees to shield screw threads. (h) Tighten retaining bolt. (i) Not applicable to SABENA aircraft. (j) Not applicable to SABENA aircraft.



INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1.	OUTBOARD AILERON HINGE BEARINGS	Remove outboard aileron hinge access panels. Apply Aeroshell Grease 17, to flush fitting (8 places each aileron).
2.	OUTBOARD AILERON CONTROL ROD	Remove mast fairing on upper surface of aileron if grease fitting is on top side of rod end. Apply Aeroshell Grease 17, to flush fitting (1 place each aileron).

MAINTENANCE MANUAL

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2. Adjustment/Test Aileron Control System

A. General

(1) Adjustment to neutral position for lateral control surfaces on Intercontinental airplanes is divided into three independent areas. The aileron control system between aileron control wheels and inboard aileron control tabs, outboard aileron lockout mechanisms, and the aileron bus control system which ties all ailerons together, constitute these areas. The inboard ailerons and outboard aileron control tabs are adjusted slightly down to induce a positive up-movement on ailerons during flight. This up-movement removes backlash from aileron control linkage. Because the outboard aileron lockout mechanism receives power from the outboard flap drive system, it is necessary that the flap drive system be in correct adjustment. It is permissible for aileron travel to exceed the limits given in the manual, providing structure is not contacted.

CAUTION: TO PREVENT STRUCTURAL DAMAGE TO THE OUTBOARD AILERON, NEVER EXTEND FLAPS WITH A RIGGED SYSTEM AND CLAMPED OUTBOARD AILERON.

(2) Each aileron is tested separately for friction and balance, then the complete system tested. Friction moments are assumed equal for small clockwise and counterclockwise rotations. The applied breakaway force at the trailing edge of an aileron overcomes friction and any out of balance force that exists. Adding breakaway force required to rotate the aileron up from neutral to force required to rotate aileron down will solve for the friction force. Subtracting up force from down force will solve for out of balance force. Breakaway force is the result of balance and friction; therefore, not equal to either.

(3) Loss of initial tension in cables "AA" and "AB" (figure 204) when rigging new cables is avoided as follows: Preload cables "AA" and "AB" to 200 (+10/-30) pounds tension. Operate system a minimum of 25 cycles. Then reduce tension to specified value as system is brought to neutral. (See figure 204.)

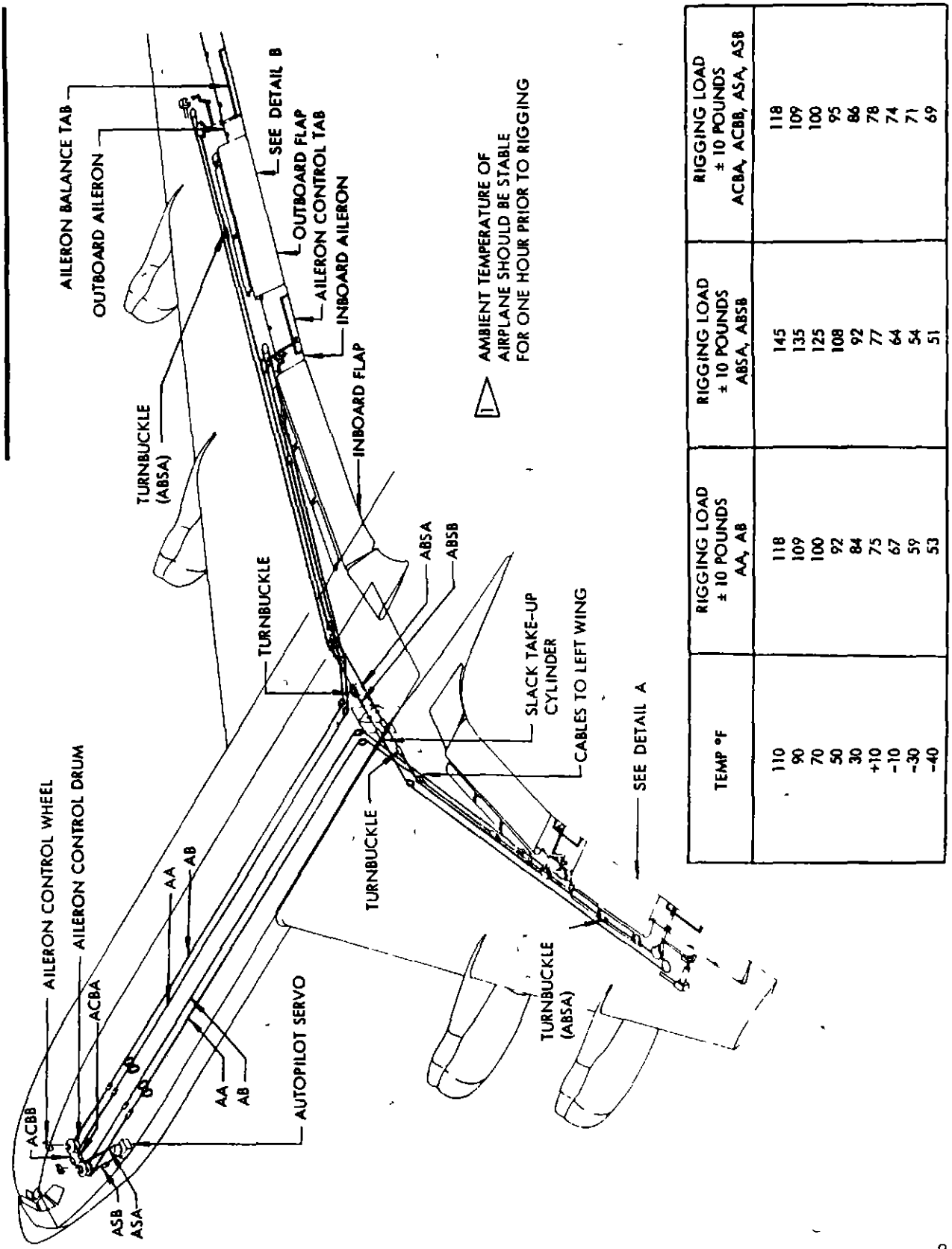
B. Equipment and Materials

(1) Tensiometer - 0 to 150 pound capacity

(2) Bubble protractor suitable for control surfaces

(3) Feeler gage graduated in hundredths of an inch

(4) Clamps suitable for control surfaces



TEMP °F	RIGGING LOAD ± 10 POUNDS AA, AB	RIGGING LOAD ± 10 POUNDS ABSA, ABSB	RIGGING LOAD ± 10 POUNDS ACBA, ACBB, ASA, ASB
110	118	145	118
90	109	135	109
70	100	125	100
50	92	108	95
30	84	92	86
+10	75	77	78
-10	67	64	74
-30	59	54	71
-40	53	51	69

Aileron Control System Adjustment
Figure 204

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(5) Straight edge - 60 inches long.

(6) Spring scale - 0 to 40 pound capacity

(7) Scale - 12 inches long graduated in sixty-fourths

(8) Main Landing Gear Door Down Lock - F71127 or equivalent

(9) Eight-Foot Straight Edge - To be fabricated locally as shown in figure 206.

(10) Rigging pins - MS20392-4 (0.309 to 0.311 inch Diameter)

C. Prepare for Adjustment

(1) Extend wing flaps

(a) Connect external hydraulic pressure to ground test disconnect located outboard of right main gear wheel well.

(b) Pressurize utility hydraulic system or increase hydraulic pressure.

(c) Position flap control valve to 50° down.

(d) Reduce external hydraulic pressure to "0."

(e) Depressurize utility hydraulic system by positioning bypass valve to "BYPASS."

(2) Open the following doors and remove access panels. See Access Doors and Panels, Chapter 12.

(a) Outboard aileron control mast fairing 1413, control access panels 1355 and 1367 and cove lip door 1363.

(b) Inboard aileron fairing access panel 1380, control access panel 1357, hinge access panel 1383 and panels 1355 and 1356.

(c) Main gear wheel well doors.

D. Adjust Aileron Control System

(1) Relieve tension in cables "AA" and "AB" (figure 204).

(2) Relieve tension in cables "ACBA" and "ACBB" in lower nose compartment.

(3) Fit locating pin into slack take-up cylinder and relieve tension in cables ABSA between inboard bus quadrants.

(4) Remove fairing and disconnect inboard aileron bus pushrod from left inboard aileron bus quadrant. (See figure 205.)

(5) Clamp left and right inboard ailerons so that mean trailing edge is faired within 1/4 inch of wing chord plane. Wing chord plane theoretically passes through wing trailing edge.

NOTE: A straight edge may be applied flush with lower wing surface and aileron to obtain a reference point for trailing edge faired position. (See figure 206.)

(6) In right wing, install rigging pin No. 1 through aileron control crank and aileron structure. In left wing, install rigging pins Nos. 1 and 2 through aileron trim crank and aileron control crank and aileron structure. (See figure 205.)

(7) Adjust control tab push rod (in right wing) and control tab and trim tab pushrods in left wing until aileron tab is faired with aileron within 0.05 inch at aileron trailing edge. Tab faired with aileron position is determined by average of readings at inboard and outboard end of tab. Symmetry between left and right tabs to be within 0.05 inch. Mismatch between trailing edge of either end of each tab and aileron trailing edge shall not exceed 0.11 inch.

NOTE: One half turn of tab pushrod end equals 0.08 inch tab trailing edge movement. Tighten checknuts within 85 to 140 pound-inch torque range.

If after first flight a flight report indicates that the control wheel is not centered with zero trim, reinspect entire aileron control and trim systems for possible misrigged condition. If system is found to be satisfactory, then increase inboard aileron tab to aileron fairing tolerance of ± 0.05 inch to ± 0.10 inch maximum. If above deviation is necessary, the inboard aileron tab symmetry requirement shall not apply.

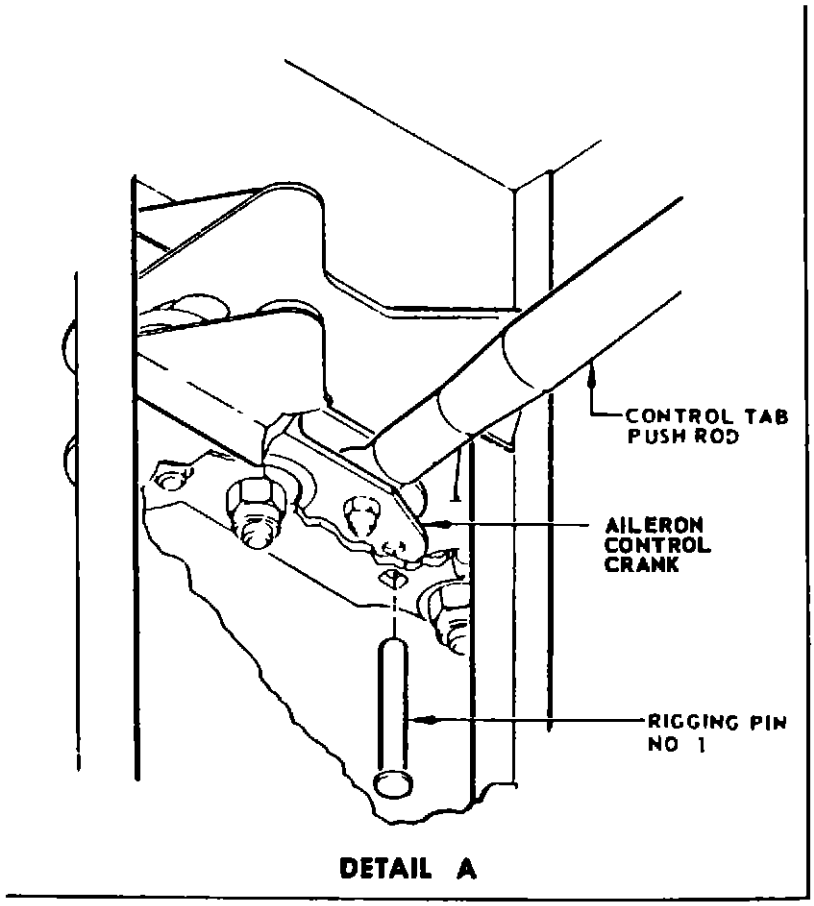
(8) Position aileron control wheels to neutral with straight edge across thumb rests. One thumb rest projection on each wheel may be out of contact with straight edge 0.05 inch maximum.

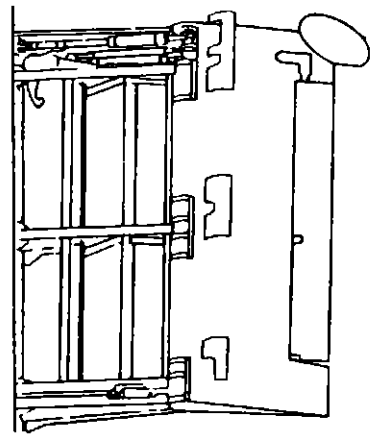
(9) Adjust aileron control cables "AA" and "AB" and aileron control cables "ACBA" and "ACBB" to specified tension per figure 204. Lockwire turnbuckles.

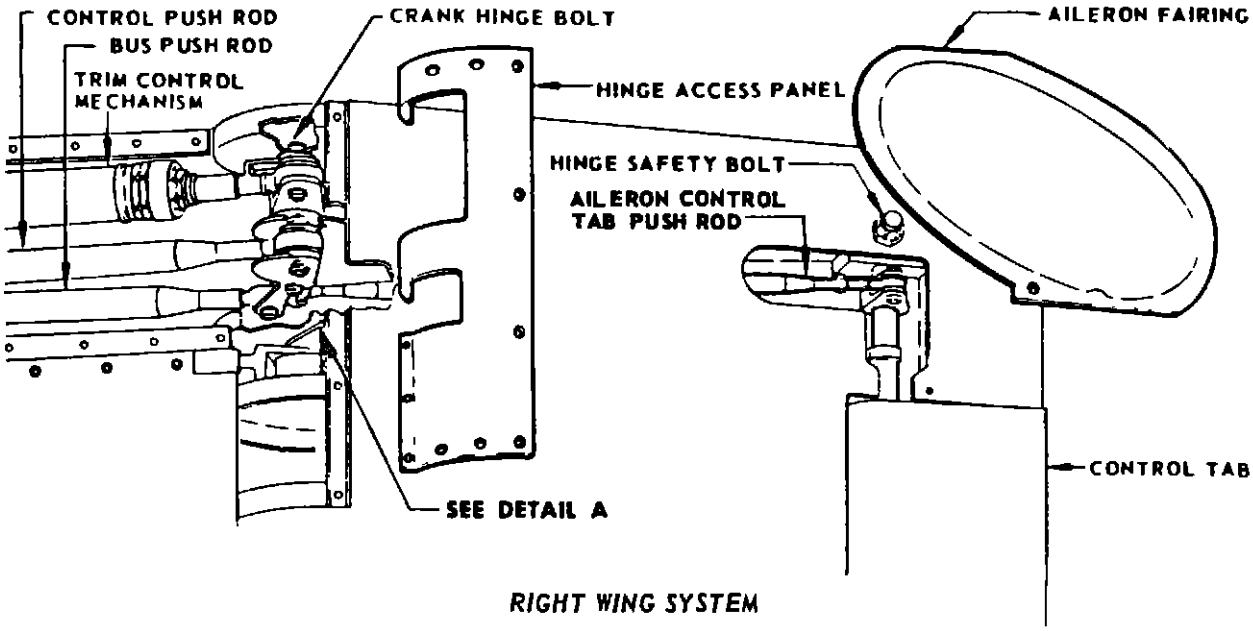
(10) With aileron control wheel still held in neutral and each aileron servo cable with one wrap on aileron trim servo drum, adjust servo cables "ASA" and "ASB" to specified tension as shown in figure 204. Lockwire turnbuckles.

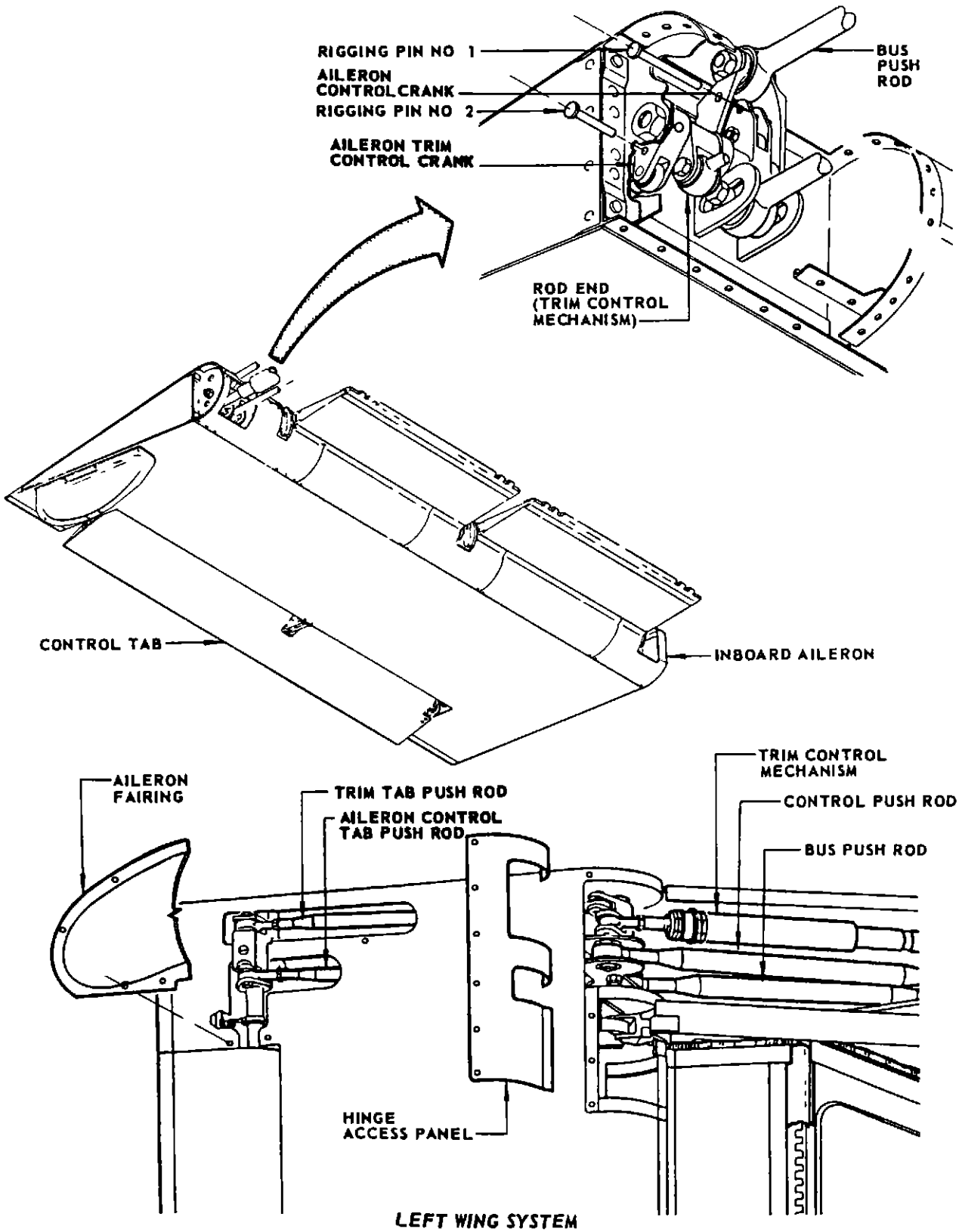
(11) Remove clamps from ailerons and rigging pins

(12) Connect left inboard aileron bus pushrod at bus quadrant.


CONTROL TAB PUSH ROD
AILERON CONTROL CRANK
RIGGING PIN NO 1
DETAIL A

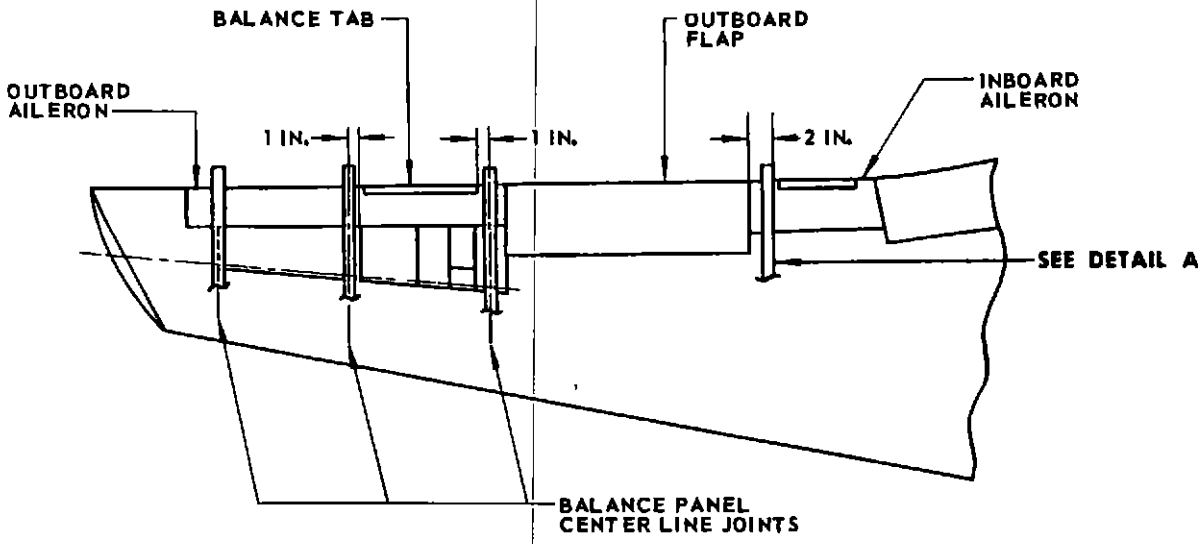



CONTROL PUSH ROD
BUS PUSH ROD
TRIM CONTROL MECHANISM
CRANK HINGE BOLT
HINGE ACCESS PANEL
HINGE SAFETY BOLT
AILERON CONTROL TAB PUSH ROD
AILERON FAIRING
CONTROL TAB
SEE DETAIL A
RIGHT WING SYSTEM

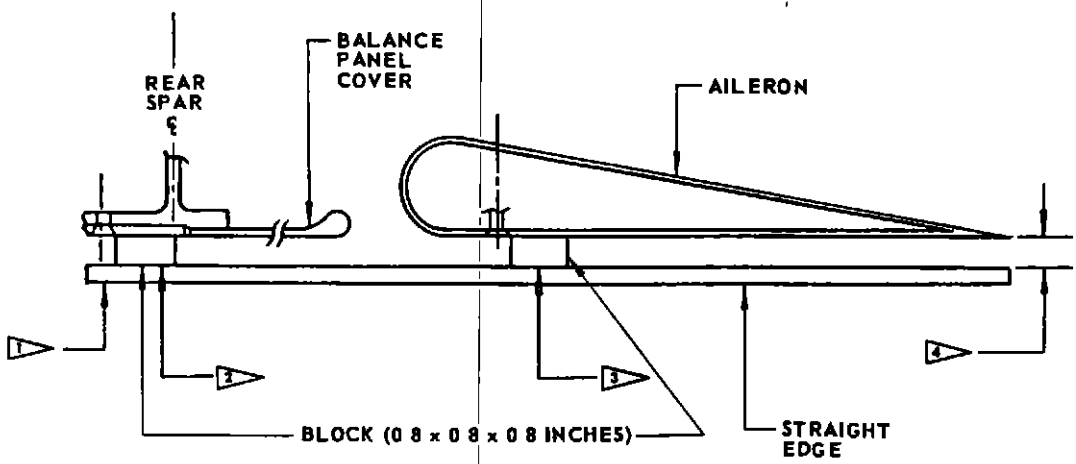


LEFT WING SYSTEM

Inboard Aileron Control Tab Adjustment
Figure 205 (Sheet 2 of 2)



WING BOTTOM VIEW



DETAIL A
(TYPICAL)

1 STRAIGHT EDGE WILL BE LOCALLY FABRICATED AS SHOWN.

2 AT ALL LOCATIONS APPLY BLOCK AS CLOSE TO AFT EDGE OF INSPAR SKIN AS POSSIBLE BUT BE SURE BLOCK DOES NOT SIT ON RIVET HEADS, SEALANT OR DOUBLERS.

3 AT ALL LOCATIONS APPLY BLOCK AS CLOSE AS POSSIBLE TO THE FASTENER LINE SHOWN.

4 AILERON IS FAIRED WHEN GAP IS EQUAL TO BLOCK THICKNESS THEORETICAL WING CHORD PLANE PASSES THROUGH WING TRAILING EDGE AILERON TRAILING EDGE INTERSECTS WING CHORD PLANE WHEN AILERON IS FAIRED FOR OUTBOARD AIL ERON FAIRED POSITION IS DETERMINED BY OBTAIN- ING THE MEAN OF MEASUREMENTS TAKEN AT 3 STATIONS AS SHOWN APPLY 8 (+ 2) POUNDS PRESSURE UPWARD ON AILERON TO REMOVE DOWN SLACK

E. Adjust Outboard Aileron

(1) and (2) Deleted

(3) Disconnect lockout mechanism torque, tube (12, figure 207) from outboard flap drive transmission (14) by removing coupling retaining screws and sliding coupling (13) back on shaft.

(4) Retract crank stop bolt (9) about 2 turns (away from crank).

NOTE The outboard flap drive system must be rigged correctly to complete adjustment of outboard aileron

(5) Rotate torque tube (12) until centerline of bolt through aft end of link assembly (5) is aligned with quadrant axis (8) Rotate quadrant full travel in both directions and check that visible motion transferred to trailing edge of outboard aileron does not exceed 0.08 inch.

NOTE: Assure that backlash is removed from outboard aileron when motion is measured.

(6) Deleted.

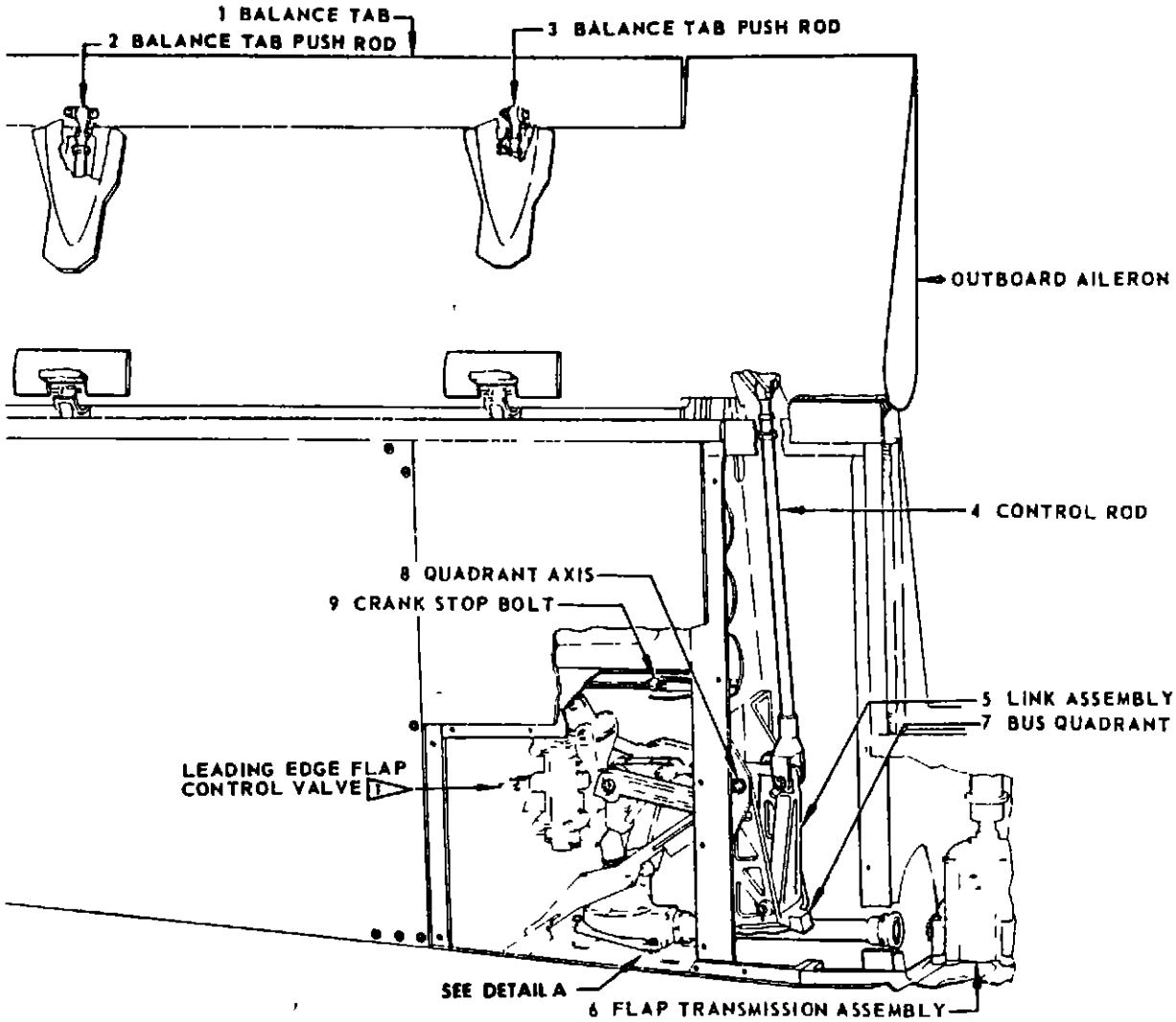
(7) With link assembly in position as noted in step "5", adjust crank stop bolt (9) until positive contact is made between bolt head and crank.

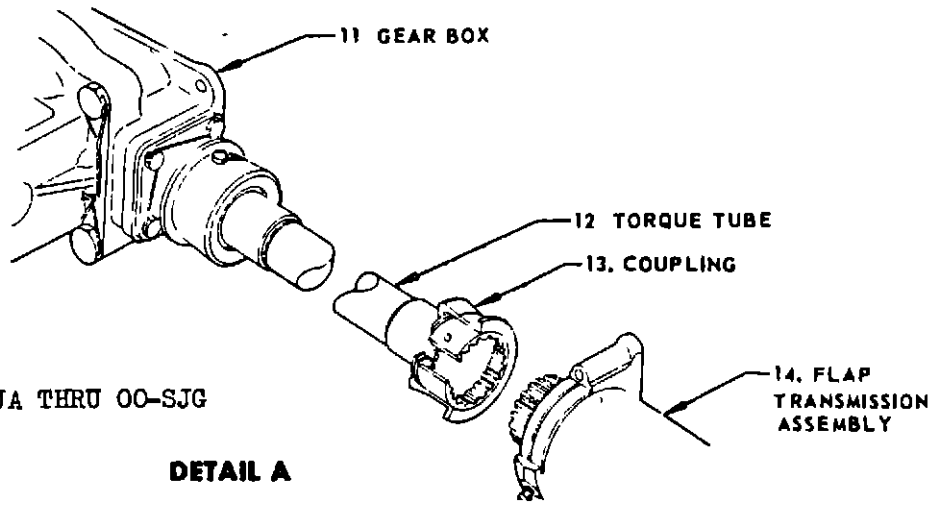
(8) After positive contact has been established, back off jackscrew by rotating the gear box input shaft several turns.

(9) Extend crank stop bolt (9) 45° (± 5°), about 1/8 turn, past the stop position (towards crank) as noted in step "7" Tighten jam nut and lockwire stop bolt

(10) With a torque wrench and adapter, determine the friction torque required to rotate the gear box and jackscrew in the screw extending direction before the stop bolt is contacted The accuracy of the measurement is to be within ± 2.0 pound-inches torque Record the friction torque value.

NOTE Working clearance may be increased by removal of the torque tube (12)





1 00-SJA THRU 00-SJG

DETAIL A

(11) Rotate the lockout gear box input shaft until the stop bolt is contacted and continue rotation until a torque preload of 15 (± 2) pound-inches plus the friction torque determined in step "9" is applied to the input shaft. This will preload the outboard aileron lockout mechanism against the stop bolt. If the required torque is exceeded, back off the input shaft retracting the jackscrew and re-apply the required torque.

CAUTION TO PREVENT DAMAGE TO LINKAGE AND STRUCTURE, DO NOT EXCEED 45 POUND-INCHES APPLIED TORQUE.

(12) Pressurize hydraulic system.

(a) Position hydraulic bypass valve to "CLOSED".

(b) Deleted

(13) Retract flaps to full up position with hydraulic power.

(14) Check that link assembly (5) has not deviated from neutral position by rotating bus quadrant (7) full travel in both directions and observing that motion transferred to inboard trailing edge of outboard aileron does not exceed 0.08 inch.

(15) Connect lockout mechanism torque tube (12) to flap drive transmission assembly (14) by replacing coupling (13). Location of torque tube inspection hole is at the inboard end of tube.

(16) Install coupling retaining screws and lockwire screw heads together.

(17) Apply 6 to 10 pounds upward force to trailing edge of aileron to remove slack from system.

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(18) Hold bus quadrant in neutral position within ± 5° as shown in figure 207A and adjust control rod (4, figure 207) until mean trailing edge of outboard aileron is positioned 0 to 0 36 inches down from wing chord plane. (See figure 206.) Symmetry between left and right outboard ailerons to be within 0.125 inch. Mismatch between trailing edge of either end of each outboard aileron and trailing edge of adjacent structure shall not exceed 0.61 inch.

NOTE: For trim correction after flight, outboard aileron may be rigged as much as 0.50 inch down from wing chord plane, symmetry requirement is waived and maximum mismatch of 0.75 inch is allowed.

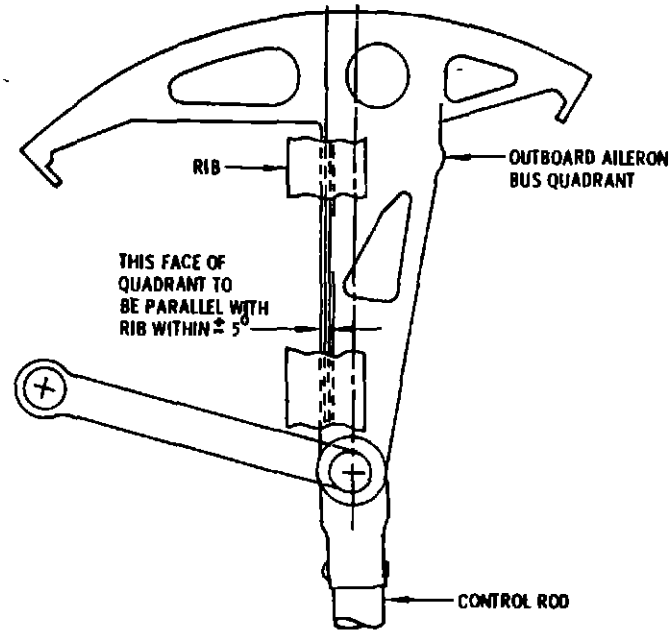
(19) Keeping upward force on aileron adjust balance tab push rods (2) and (3) until tab is located 0.22 (± 0.05) inches down with respect to aileron chord plane. This is a mean dimension found from two readings, one at each end of tab. Tab must be readjusted if aileron position is altered. Symmetry between left and right balance tabs to be within 0.05 inch. Mismatch between trailing edge of either end of each balance tab and trailing edge of outboard aileron shall be -.12 to -.32 inch.

F. Adjust Aileron Bus Control System

(1) Locate position of each outboard aileron. Mark position on a suitable reference such as sickle type protractor attached to wing.

(2) Extend flaps to 50° with hydraulic power.

(3) Depressurize utility hydraulic system.



Outboard Aileron Adjustment
Figure 207A

(4) Lock cable slack take-up cylinder in left wheel well in extended position with rigging pin (MS20392-4 or AN5 bolt).

NOTE: Normally, cable tension compresses spring in cylinder and extends slide. If slack exists, a force along cable ABSB will extend slide to clear rigging pin holes.

(5) Clamp one inboard aileron such that trailing edge is down from wing chord plane per following table.

TEMP °F	DISTANCE OF AILERON TRAILING EDGE FROM WING CHORD PLANE
110	-0.87 (± 0.05) in.
90	-0.80 (± 0.05) in.
70	-0.75 (± 0.05) in.
50	-0.70 (± 0.05) in.
30	-0.63 (± 0.05) in.
10	-0.57 (± 0.05) in.
-10	-0.50 (± 0.05) in.

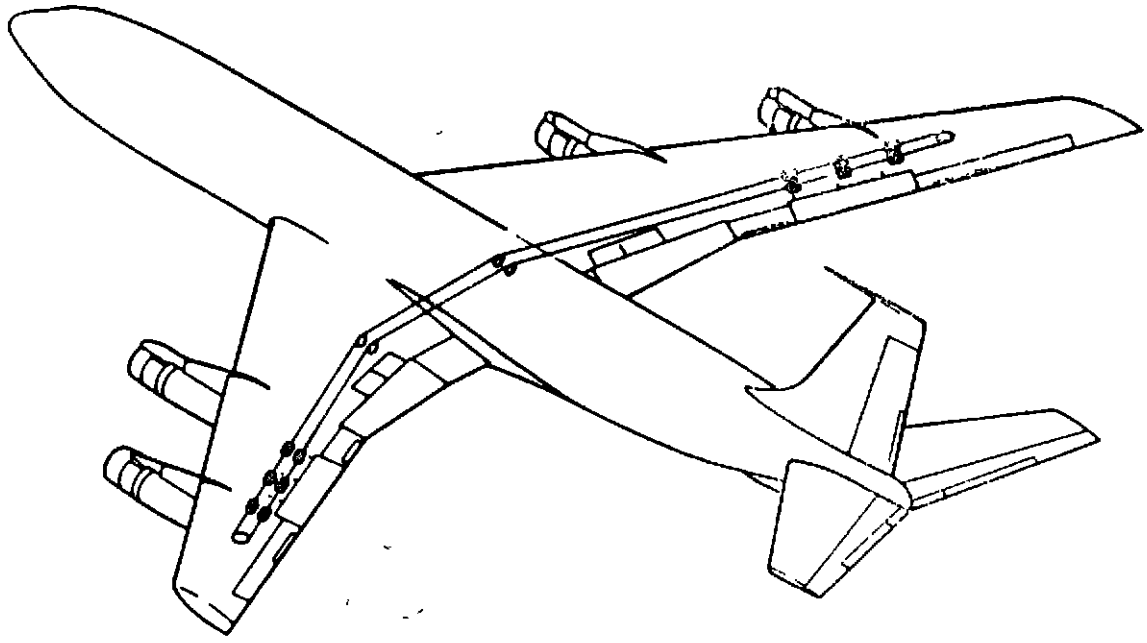
Maximum mismatch between each end of inboard ailerons and trailing edge of adjacent flaps shall not exceed 1.25 inch.

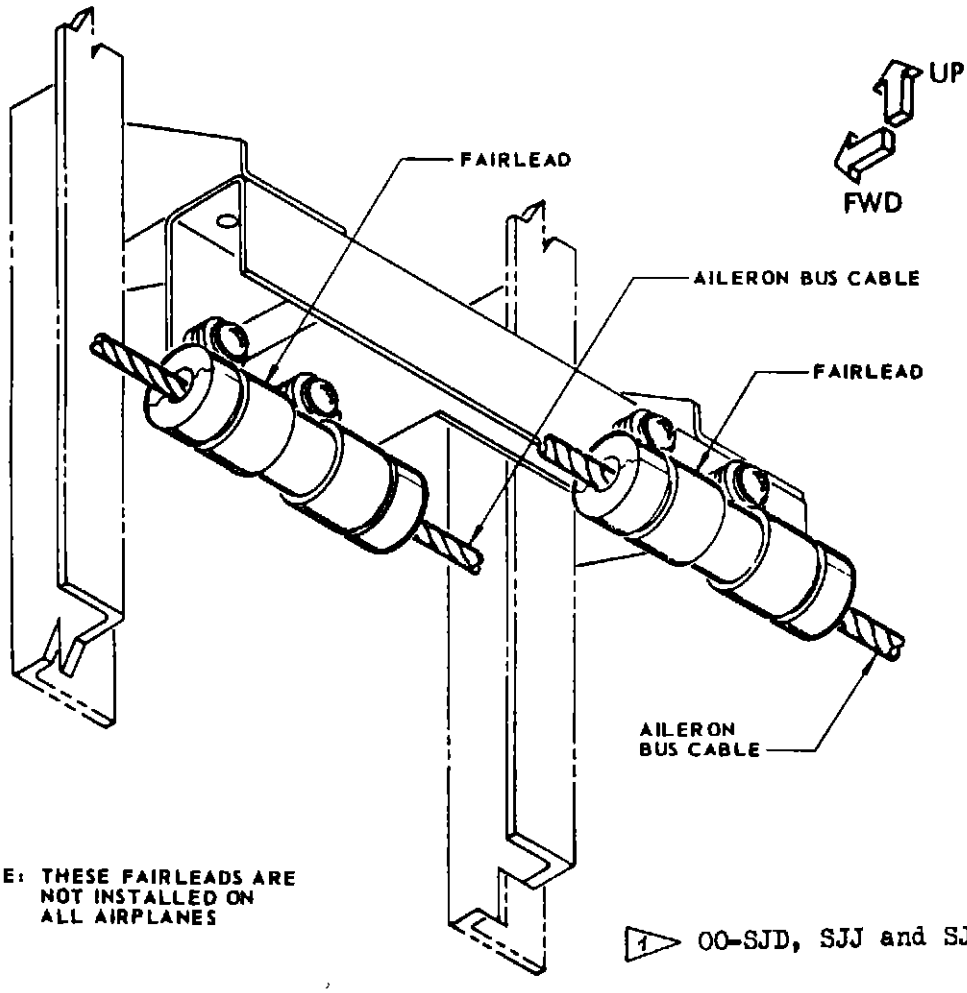
(6) Adjust bus cable loop (cables ABSA and ABSB) to tension values shown on figure 204 by tightening all four turnbuckles. Turnbuckle locations are shown on figure 204. Airplane temperature shall be stabilized for one hour prior to adjusting cables.

NOTE: If fairleads are installed on aileron bus cables, some deflection at the fairleads is allowable with cable tensioned. See figure 207B for fairlead location.

(7) Raise or lower outboard aileron on wing with clamped inboard aileron to position equivalent to lockout by adjusting turnbuckle connecting inboard and outboard bus quadrant, and turnbuckle on cable ABSB in right main gear wheel well. Position outboard aileron to proper position while maintaining specified cable tension.

(8) Raise or lower the inboard aileron for the opposite wing to proper droop position per table in step (5) by adjusting turnbuckle on cable ABSA in left main wheel well and turnbuckle connecting inboard and outboard bus quadrants for that wing. Symmetry between left and right inboard ailerons to be within 0.10 inch.





NOTE: THESE FAIRLEADS ARE NOT INSTALLED ON ALL AIRPLANES

[1] 00-SJD, SJJ and SJK only.

Aileron Bus System Fairlead Installation [1]
Figure 207B

(9) Raise or lower remaining outboard aileron to position equivalent to lockout by adjusting turnbuckle on cable "ABSB" in right main wheel well and turnbuckle connecting inboard and outboard bus quadrants for that wing while retaining proper cable tension.

NOTE: Adjusting a pair of turnbuckles, one to either side of a quadrant affects only the position of that quadrant relative to the position of the other three quadrants. With two quadrants between a pair of turnbuckles being adjusted, position of these two quadrants will be affected equally relative to the position of the other two quadrants.

(10) Lockwire turnbuckles.

(11) Remove rigging pin from slack take-up cylinder.

(12) Test aileron control system. See 1.G.

G. Test Aileron Control System

(1) Test Aileron Control System Function

(a) Provide external hydraulic power.

(b) Rotate aileron trim control wheel to "0 "

(c) Check that flaps are fully retracted.

(d) Rotate aileron control wheel to neutral and hold.

(e) Apply manual force to the left inboard aileron and rotate it down 18-1/2° (± 1/2°) from the wing chord plane.

(f) Check the left inboard aileron control tab follow-up. The tab shall move in the same direction as the aileron The angle between the tab chord plane and aileron chord plane shall be same magnitude as angle between aileron chord plane and wing chord plane within 1°. (See figure 208)

(g) Apply manual force to right inboard aileron and rotate it down 18-1/2° (± 1/2°) from the wing chord plane and check that the right inboard aileron control tab follow-up meets the same requirements as noted in the previous step.

(h) Remove fairing and disconnect one inboard aileron bus control rod.

(i) Move left inboard aileron to the wing chord plane and hold

(j) Rotate aileron control wheel counterclockwise until left control tab stop is contacted. The left control tab shall rotate to a position 20° (± 1°) down from aileron chord plane. Rotate aileron control wheel clockwise until left control tab stop is contacted. Tab shall rotate to a position 20° (± 1°) up from aileron chord plane.

(k) Release left aileron and move right inboard aileron to wing chord plane and hold.

(l) Rotate aileron control wheel clockwise until right control tab stop is contacted. The right control tab shall rotate to a position 20° (± 1°) down from aileron chord plane. Rotate aileron control wheel counterclockwise until right control tab stop is contacted. Tab shall rotate to a position 20° (± 1°) up from aileron chord plane.

(m) Release right aileron and reconnect inboard aileron bus rod.

(n) Rotate the aileron control wheel hard over counterclockwise until right inboard aileron snubber stops are contacted. The left inboard aileron shall be 16° (+2°/-1/2°) above the wing chord plane, the left inboard aileron control tab shall be 20° (± 1°) below the aileron chord plane, the right inboard aileron shall be 18-1/2° (± 1/2°) below wing chord plane and right inboard aileron control tab shall be 17-1/2° (+2°/-1°) above aileron chord plane.

(o) Rotate aileron control wheel hard over clockwise until left inboard aileron snubber stops are contacted. The right inboard aileron shall be 16° (+2/-1/2°) above wing chord plane; the right inboard aileron control tab shall be 20° (± 1°) below aileron chord plane, the left inboard aileron shall be 18-1/2° (± 1/2°) below wing chord plane and the left inboard aileron control tab shall be 17-1/2° (+2°/-1°) above aileron chord plane.

NOTE Ailerons may be rotated manually if full control wheel does not move surface to stop.

S (p) Check that outboard ailerons do not move more than 0.080 inch during the inboard aileron geometry check noted in previous two steps. Outboard aileron motion is measured at inboard end of trailing edge.

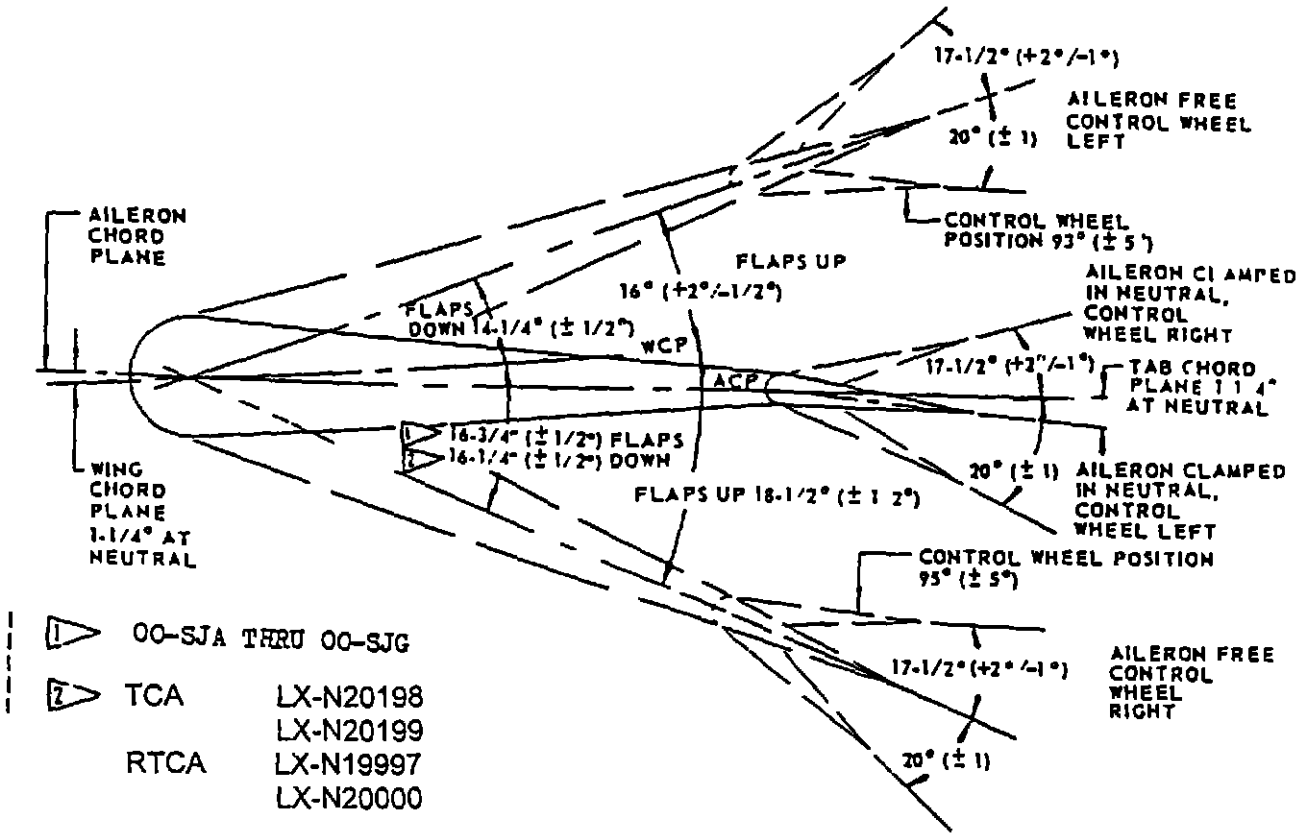
(q) Extend wing flaps down 50 degrees.

(r) Rotate control wheel clockwise until left outboard aileron contacts its down stop at 20° (± 1°) below wing chord plane. (See figure 209.)

(s) The left outboard aileron tab shall move up with respect to the aileron from its neutral position through an angle (within ± 1°) equal to the angle of motion of the left outboard aileron from its neutral position.

NOTE Neutral position is the rigged position. (See paragraph 2.E)

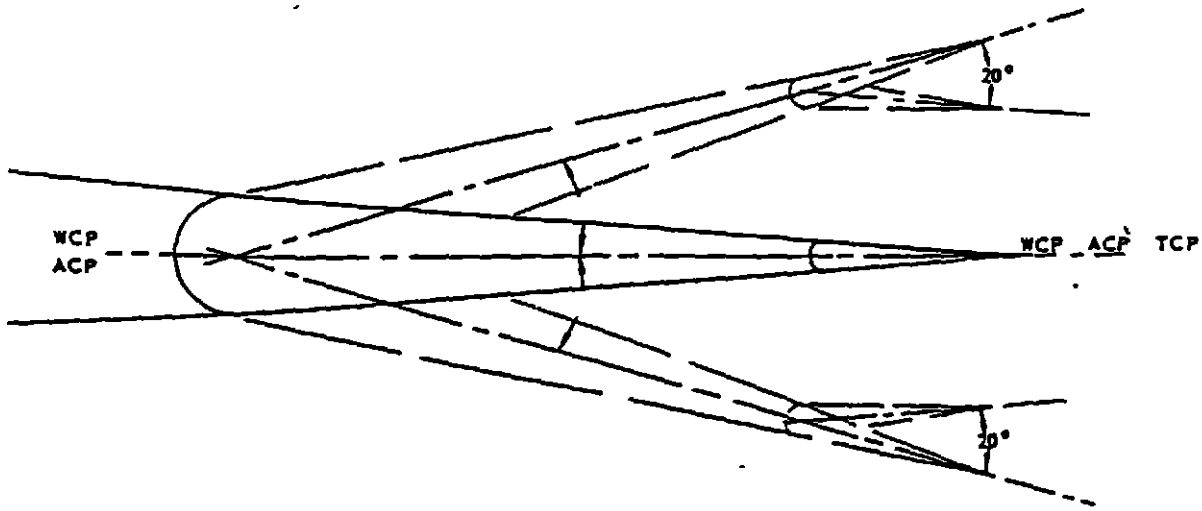
(t) The right outboard aileron shall move to a position 19-3/4° (+1-1/4°/-1°) above the wing chord plane and the right outboard aileron tab shall move down from its neutral position through an angle equal (within ± 1°) to the right outboard aileron motion from its neutral position.



1 OO-SJA THRU OO-SJG

2 TCA LX-N20198
LX-N20199
RTCA LX-N19997
LX-N20000

INBOARD AILERON GROUND OPERATION

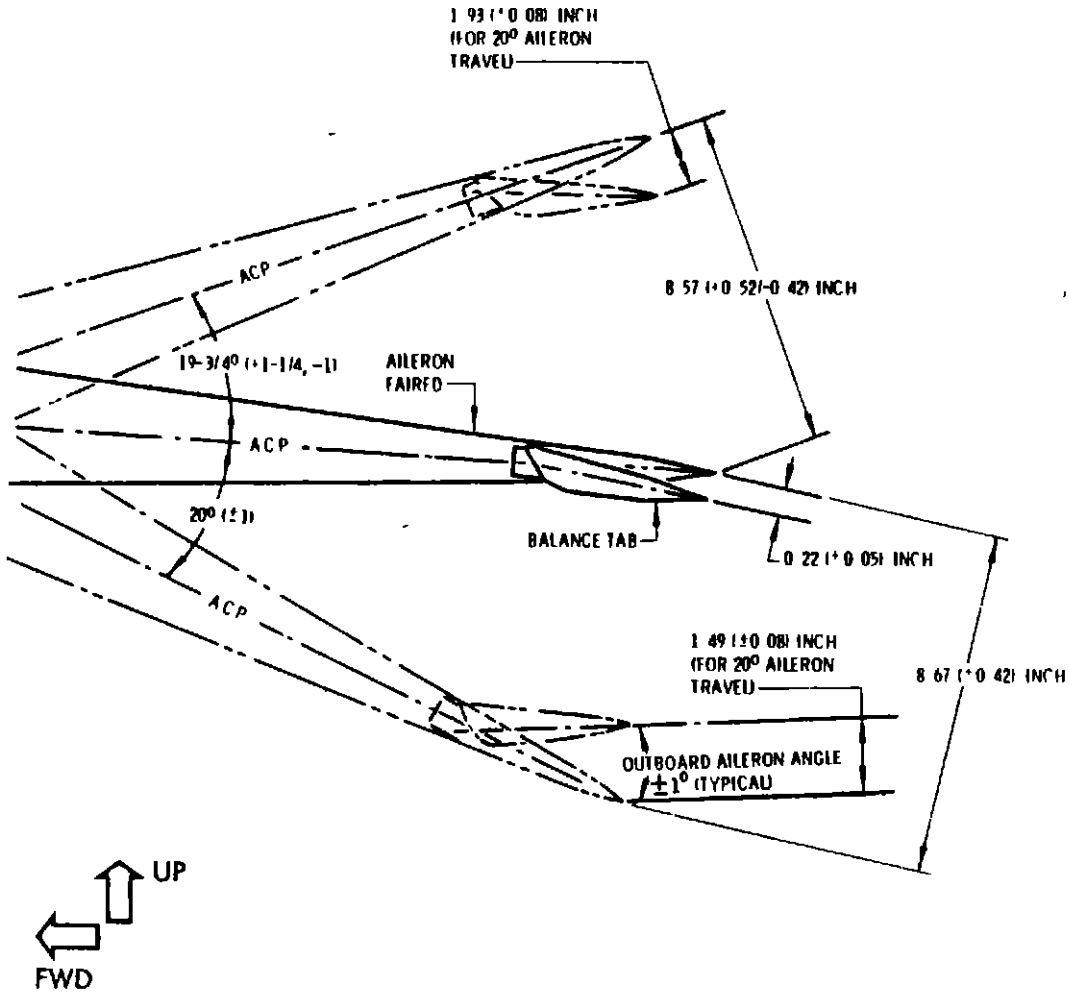


INBOARD AILERON INFLIGHT OPERATION

(u) On airplanes listed in figure 208 [1] the position of the left inboard aileron shall be 16-3/4° (± 1/2°) down from the wing chord plane and the position of the right inboard aileron shall be 14-1/4° (± 1/2°) up from wing chord plane.

(v) On airplanes listed in figure 208 [2] the position of the left inboard aileron shall be 16-1/4° (± 1/2°) down from the wing chord plane and the position of the right inboard aileron shall be 14-1/4° (± 1/2°) up from wing chord plane.

(w) Rotate control wheel counterclockwise until right outboard aileron contacts its down stop at 20° (± 1°) below wing chord plane.



Outboard Aileron and Balance Tab Motion Diagram
Figure 209

(x) Check position of outboard ailerons, outboard aileron balance tabs and inboard ailerons. The motions shall be reversed but of the same magnitudes and tolerances as noted in previous steps (s) thru (v).

(y) Retract flaps to the full up position and clamp both inboard ailerons in neutral (1-1/4° below wing chord plane). Trailing edge of ailerons must be symetrical within 7/64 inch.

(z) Extend wing flaps to 50° and check that outboard ailerons drop to a maximum of 4° and return to neutral within 1° as flaps extend. Maximum drop shall occur at about 15° of flap angle.

(aa) Retract flaps to full up position.

(ab) Remove clamps from ailerons.

(ac) Rotate aileron trim control wheel counterclockwise 3.55 turns from neutral or until stops are contacted.

(ad) Push left inboard aileron down against the snubber stops.

(ae) Rotate aileron control wheel to the full clockwise position.

(af) With the ailerons held in the position noted, the control wheels shall return to neutral or beyond (until tab stops are contacted) when released.

(ag) Repeat centering test with 3.55 turns of trim wheel clockwise, right inboard aileron held down against snubber stops, and full counterclockwise travel of control wheel. The control wheel shall again return to neutral or beyond (until tab stops are contacted) when released.

(ah) Clamp both inboard aileron in neutral (1-1/4°) down from wing chord plane) and set aileron trim wheel at neutral.

(ai) Rotate aileron control wheel counterclockwise approximately 20° and release, then rotate control wheel clockwise about same amount and release. Centering action or rate of centering should be slightly greater from left.

NOTE The centering detent will appear to be slightly to the right of center. This is caused by left-hand spring cartridge being preloaded against a reacting load from right-hand spring cartridge due to down rigging of the aileron. When the ailerons float back to wing chord plane in flight, the centering detent will move to "0." Do not adjust the right-hand spring cartridge to overcome this effect.

(aj) Release ailerons.
(ak) Retract flaps.

(2) Test Aileron Control System Friction and Balance
(a) Check for control wheel and control column binding.
1) Move column repeatedly fore and aft between stops and simultaneously move control wheel repeatedly left and right between stops.
2) Hold control wheel left against stop and move control column fore and aft between stops.
3) Hold control wheel right against stop and move control column fore and aft between stops.
4) Hold control column full forward and move control wheel left and right between stops.
5) Hold control column full aft and move control wheel left and right between stops.
(b) Pressurize utility and auxiliary hydraulic systems to full system pressure.
(c) Remove mast fairing on upper surface of each inboard aileron and disconnect aft end of bus pushrod. Temporarily reinstall fairing. Disconnect LH. inboard aileron tab trim rod.
(d) Rotate aileron trim control wheel and aileron control wheel to neutral and hold.
(e) Rotate inboard ailerons to neutral (1-1/4 degrees below wing chord plane).
(f) With a spring scale, determine magnitude of breakaway forces required to rotate each inboard aileron up and down 2 degrees (approximately 1-1/4 inches at trailing edge) from neutral. All forces are to be measured at trailing edge of aileron (35 inches aft of aileron hinge line).
(g) Record forces required to push aileron through neutral either up or down as positive and record forces required to restrain aileron from rotating through neutral as negative.
(h) Add forces with like signs and subtract forces with unlike signs. Results must not exceed 7.5 pounds and the down force shall always exceed the up force for each inboard aileron

NOTE: Center of gravity for complete inboard aileron installation is located from 0 to 0.28 inches forward of aileron hinge line. Therefore, if a force is required to restrain aileron from rotating down, aileron installation is out of balance. Check for missing balance weights and/or water in honeycomb panels and rebalance the installation per Overhaul Manual procedure.

(i) Remove mast fairing on upper surface of each outboard aileron and disconnect aileron push rod. Temporarily reinstall fairings.

(j) Rotate outboard ailerons to neutral.
(k) With a spring scale, determine magnitude of breakaway forces required to rotate each outboard aileron up and down 2 degrees (approximately 1 inch at trailing edge). All forces are to be measured at trailing edge of aileron (25 inches aft of aileron hinge line).
(l) Record forces required to push aileron either up or down through neutral as positive and record forces required to restrain aileron from rotating through neutral as negative
(m) Add forces with like signs and subtract forces with unlike signs. Results must not exceed 7.20 pounds and down forces shall always exceed the up forces for each outboard aileron.

NOTE: Center of gravity for complete outboard aileron installation is located from 0 to 0.20 inches forward of aileron hinge line. Therefore, if a force is required to restrain aileron from rotating down, aileron installation is out of balance. Check for missing balance weights and/or water in honeycomb panels and rebalance the installation per Overhaul Manual procedure.

(n) With bus pushrods still disconnected, rotate inboard ailerons through full travel up and down. Snubber stops shall be contacted at 18-1/2° ± 1/2° in either direction from the wing chord plane.
(o) Connect all rods, except LH inboard aileron tab trim control pushrod which must be disconnected.
(p) Check that flaps are fully retracted and aileron trim and control wheels are in neutral.
(q) With spring scale applied to inboard aileron trailing edge (35 inches aft of hinge center), determine maximum force to rotate aileron 15 degrees up and down from neutral position (1-1/4 degrees below wing chord plane). This force is not to exceed 13 pounds for each inboard aileron. Determine force required to rotate from 15 degrees to full travel (about 1° to 3° additional movement up and down to first contact with snubber stops as shown in Fig. 208). This force is not to exceed 16 pounds for each aileron and should be applied slowly to avoid snubber action.
(r) Extend flaps to 50 degree position.
(s) With a spring scale applied to inboard aileron trailing edge (35 inches aft of hinge line), determine maximum force to rotate each aileron 14 degrees up and down from neutral position (1-1/4 degrees below wing chord plane). The force shall not exceed 17 pounds before or 20 pounds after accomplishment of SB2842 and SB2977.
(t) Retract flaps to full up position.
(u) Disconnect one bus pushrod at aileron bus quadrant and clamp inboard ailerons on wing chord plane. Connect inboard aileron tab trim control pushrod on left inboard aileron.

(v) Set aileron trim at neutral and check tangential force at aileron control wheel required to deflect right-hand aileron control tab from 0° to a minimum of 1/2° (1/16 inch). Breakaway force is not to exceed 7.25 pounds or be less than 3 pounds in either direction.

(w) Connect bus pushrod and disconnect left inboard aileron trim tab rod.

(x) Determine tangential force required to rotate aileron control wheel from neutral to 85 degrees clockwise, then 85 degrees counterclockwise. Tangential force is not to exceed 15 pounds before or 20 pounds after accomplishment of SB2842 and SB2977. Manually rotate inboard ailerons to prevent tab stops from contacting.

(y) Determine tangential force required to rotate aileron control wheel from 90 degrees to 93 degrees clockwise and counterclockwise. Tangential force is not to exceed 30 pounds. Manually rotate inboard ailerons to prevent tab stops from contacting.

(z) Reconnect tab trim rod on left inboard aileron.

(aa) If friction forces found during test of aileron control system are greater than specified in steps (f) thru (y), one or all of the following steps may have to be accomplished to isolate the faulty component. If friction forces are satisfactory disregard this step and proceed with step (ab)

1) With flaps retracted, disconnect control pushrods from inboard aileron quadrants.
2) Determine breakaway force applied 7 inches from center of control wheel for a no-load control force condition.
3) Breakaway force determined in step 2) shall not exceed 4 lbs.
4) With AA and AB cables removed from forward control drums (Fig. 204), determine breakaway force at each control wheel per step 2). This force shall not exceed 2.5 lbs
5) With aileron control bus cables ACBA and ACBB disconnected from control drums, determine breakaway force for each control wheel per step 2). This force shall not exceed 1 lb.
6) Connect control pushrods to inboard aileron control quadrants and rerig affected system. Check that all rods have been reinstalled, attached and safetied. Replace and attach all fairings.

(ab) Position right inboard aileron full down against snubber stops and left inboard aileron tab full down against tab stops. Control wheels shall rotate 93 degrees minimum counterclockwise from neutral position.

(ac) With ailerons and aileron tabs held in position noted in previous step, rotate copilot's control wheel counterclockwise and check that pilot's control wheel will continue rotation to 105.5 degrees from neutral before striking column stops.

NOTE: An up-load on left inboard aileron and a heavy load on copilot's control wheel may be required to obtain this travel.

(ad) Repeat steps (ab) and (ac) with left inboard aileron. Motion of control wheels shall be of same magnitude but in opposite direction.

NOTE. An up-load on right inboard aileron and a heavy load on copilot's control wheel may be required to obtain this travel.

(3) Close up

(a) Replace access panels and close doors.

(b) Position hydraulic bypass valve to CLOSED position.

(c) Increase hydraulic pressure.

(d) Retract flaps.

(e) Disconnect external hydraulic power.

3. Inspection/Check Aileron Control System

A. Check Aileron Control System

(1) Remove inboard aileron balance bay access panel 1359. See Chapter 12, "Access Doors and Panels."

(2) Remove snubber access panel 1361 on lower side of wing outboard side of inboard aileron.

(3) Remove inboard aileron fairing access panel 1380 and hinge access panel 1383.

(4) Remove outboard aileron control access panel 1366.

(5) Remove outboard aileron balance panel quick access panels 1370, 1372, 1374 and 1376 on lower surface of wing.

(6) Check crank stop bolt (9, figure 207) for insecurity and shear rivets at inboard end of torque tube (12) for failure.

(7) Check interior of outboard balance panel chambers for insecure seals.

(8) Check aileron vent gap for damaged areas and foreign objects.

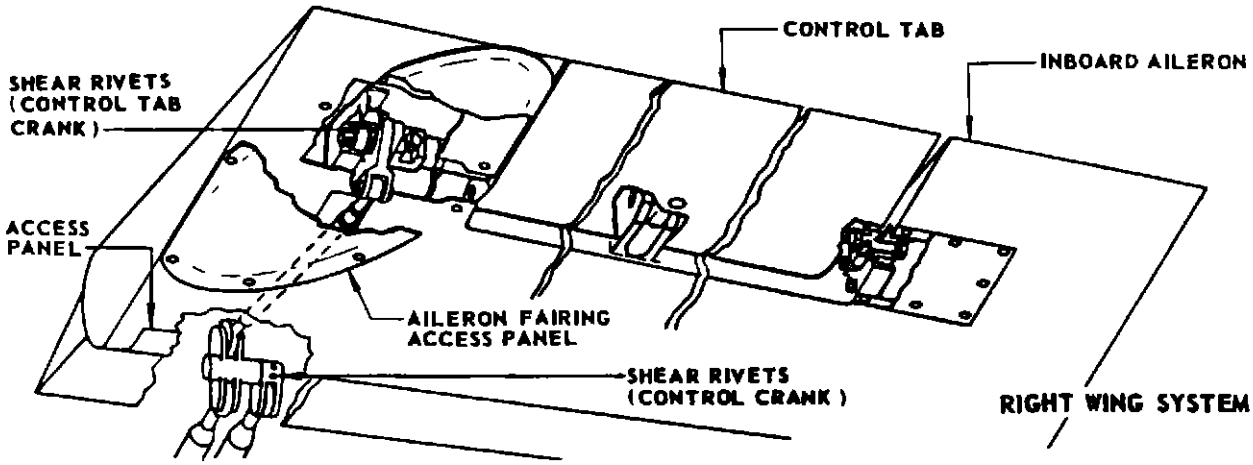
(9) Check snubber (figure 5) for low oil level indicated by clearance under indicator pin head.

(10) Check shear rivets in aileron control system for evidence of failure when mismatch is observed between mating parts. (See figure 210.)

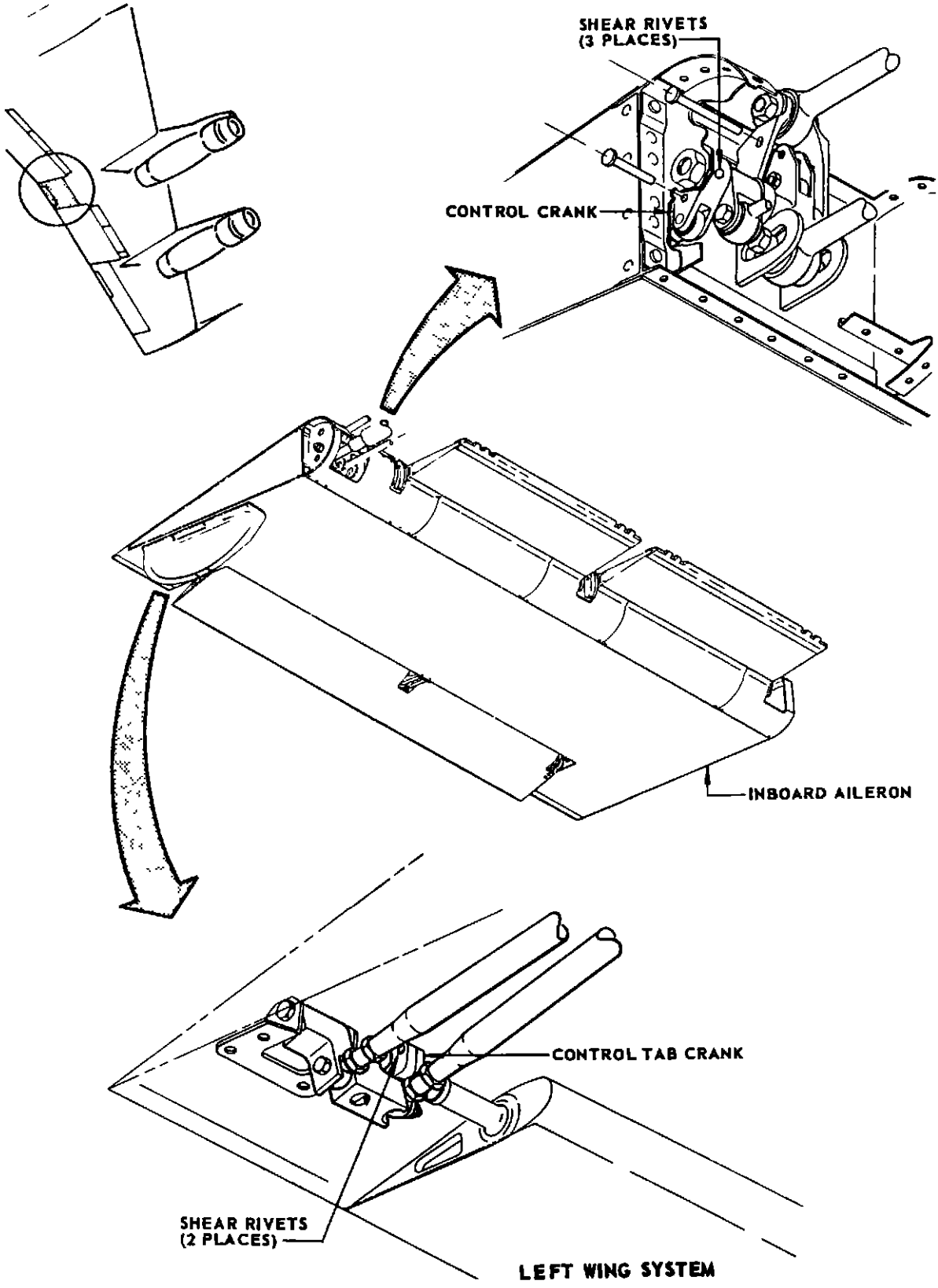
(11) Check for binding trim control mechanism by rotating control tab and observing its return.

(12) Check interior of inboard balance panel chambers for insecure seals, loose hinges and foreign objects.

(13) Replace access panels and close doors.



Aileron Control System Shear Rivet Location
Figure 210 (Sheet 1 of 2)



Aileron Control System Shear Rivet Location
Figure 210 (Sheet 2, of 2)

B. Check Aileron Control System Wear Limits

(1) Check the allowable wear limits for the inboard and outboard ailerons per figures 211, 212 and 213. These control surfaces must be removed to perform this check. Refer to "Inboard Aileron - Maintenance Practices," Aileron Control Tab - Maintenance Practices" and "Outboard Aileron - Maintenance Practices."

(2) Check inboard and outboard aileron balance panel hinges for wear For all outboard aileron and two forward inboard aileron hinges, the minimum pin diameter is 0 080 inch at ends and 0 085 inch at center. The hinge pin hole maximum diameter is 0 125 inch at ends and 0.115 inch at center. For the inboard aileron nose hinge, the minimum pin diameter is 0.170 inch at ends and 0.175 inch at center The maximum hinge pin hole diameter is 0.215 inch at ends and 0.205 inch at center.

NOTE: End is considered to be outer 1/8 of hinge. Center is remaining 3/4.

(3) Check inboard aileron quadrant shaft and bearings for wear

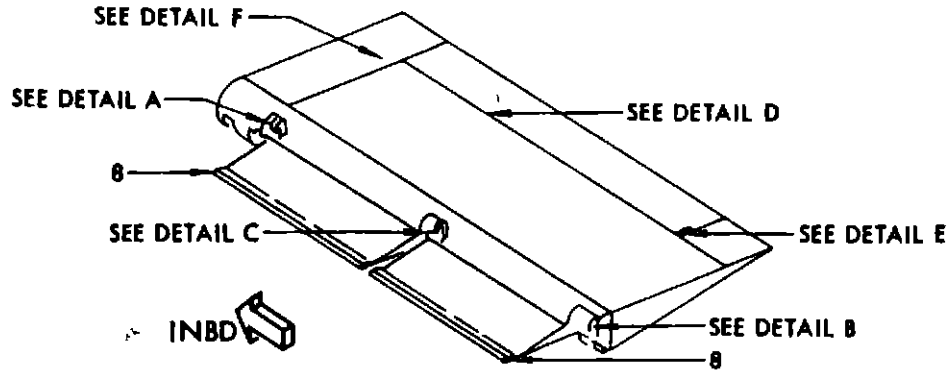
(a) Remove inboard aileron control access panel No. 1357 from lower side of wing.

(b) Check lower surface of quadrant for evidence of wear and contact with supporting structure. (See figure 214.)

(c) Manually attempt to move lower quadrant up and down on shaft Vertical movement indicates the upper bearing is not properly retained Replace bearing if damaged or reinstall in the sleeve by roller staking to a depth of .006, plus .003, minus .001 inch.

(d) Check for side play of quadrant shaft and if found remove quadrant from wing and inspect for wear (See figure 214, "Wear Limits"). Replace or rework parts as indicated.

(e) If supporting structure is worn beyond limits new bushings must be installed. Bushings may be locally fabricated to conform to design details given in figure 214.



INDEX NO	DIM	DESIGN LIMITS DIAMETER MIN.	DESIGN LIMITS DIAMETER MAX.	WEAR LIMITS MAX WEAR DIM.	WEAR LIMITS MAX DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL.	OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTERFERENCE MIN	BUSHING INTERFERENCE MAX.
1	I.D.	0.3112	0.3140	0.3144	0.0027	X		[1]	0 4340	0.0002	0.0013
	O.D.	0.3108	0.3117	0.3104							
2	I.D.	0.4986	0.5001	0.5026	0.0035	X		[1]	0 6201	0.0002	0.0018
	O.D.	0.4982	0.4991	0.4978							
3	I.D.	0.3112	0.3140	0.3144	0.0027	X		[1]	0 4340	0.0002	0.0013
	O.D.	0.3108	0.3117	0.3104							
4	I.D.	0 3112	0.3140	0.3144	0.0027	X		[1]	0.4340	0.0002	0.0013
	O.D.	0.3108	0.3117	0.3104							
5	I.D.	0.2487	0.2497	0.2517	0.0025	[2]					
	O.D.	0.2483	0.2492	0.2479							
6	I.D.	0.2487	0.2497	0.2517	0.0025	[2]					
	O.D.	0.2483	0.2492	0.2479							
7	I.D.	0.2487	0.2497	0.2517	0.0025			[1]	0 3745	0.0002	0 0013
	O.D.	0.2483	0.2492	0.2479							
[3] 8	HOLE	.183	.188	.215	.045						
	PIN	.178	.180	.170							
[4] 8	HOLE	.183	.188	.205	.030						
	PIN	.178	.180	.175							

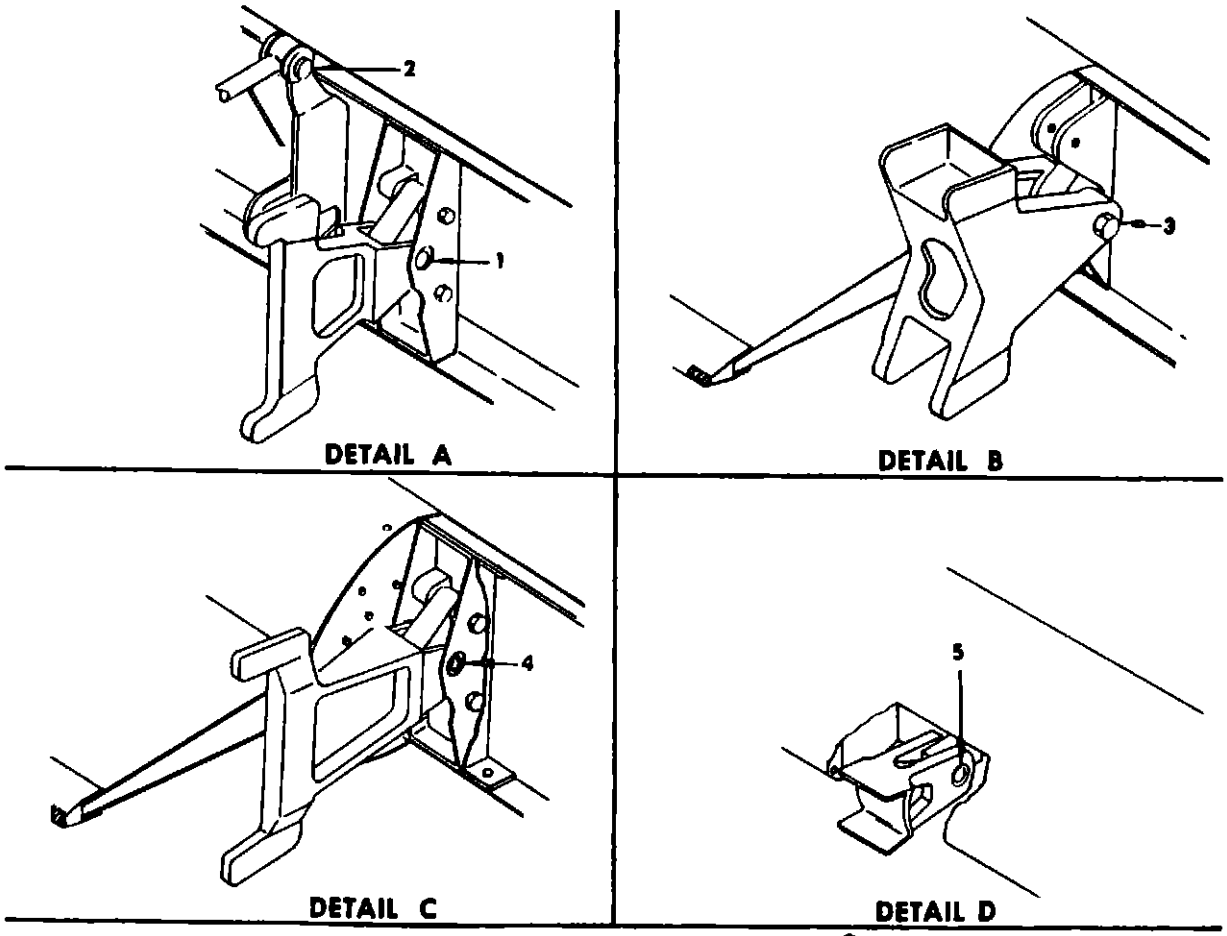
[1] 7076-T6 Bushing, ream hole to design size on installation.

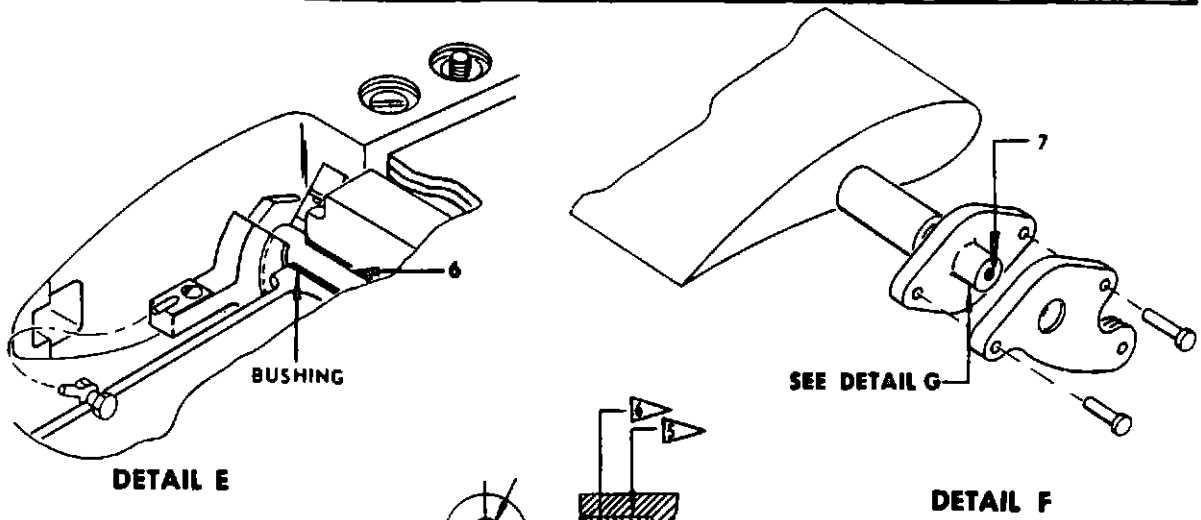
[2] Replace bushing.

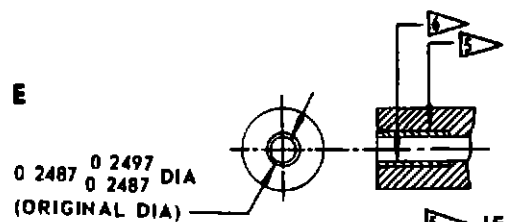
[3] Each end - 1/8 length.

[4] Center 3/4 of hinge length.

Inboard Aileron Wear Limits
Figure 211 (Sheet 1)

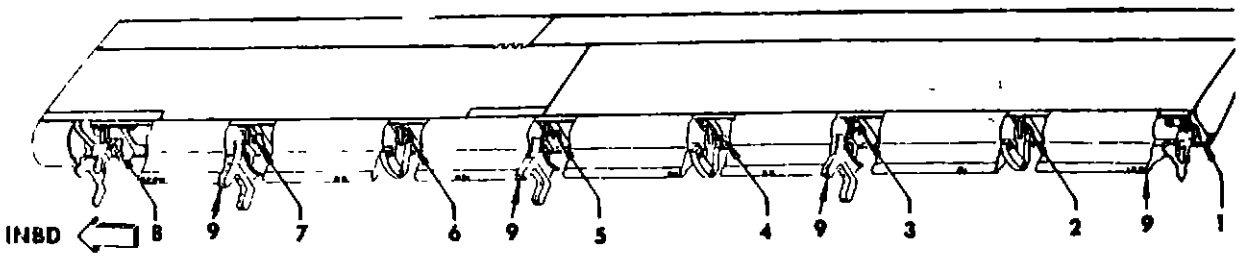






5 IF WEAR EXCEEDS MAX WEAR LIMIT OF 0 0025 COUNTER BORE AND INSTALL A 7075-T6 BUSHING UP TO MAX O D OF 0 375 WITH 0 0005 INTERFERENCE FIT

6 REAM TO NET FIT WITH BOLT



INDEX NO	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM	WEAR LIMITS MAX. DIAM CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	NO	MTL	OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE MIN	MAX.
1	I D.	0.3112	0.3122	0.3144	0.0027	X		[1]	0 4322	0.0002	0.0013
	O.D.	0.3108	0.3117	0.3104							
2	I.D.	0.3130	0.3170	0.3179	0.0062	[4]		[1]	0 4370	0.0002	0.0013
	O.D	0.3108	0.3117	0.3104							
3	I.D.	0.3112	0.3122	0.3144	0.0027	X		[1]	0.4322	0.0002	0.0013
	O.D.	0.3108	0.3117	0.3104							
4	I.D.	0.3130	0.3170	0.3179	0.0062	[4]		[1]	0 4370	0.0002	0.0013
	O.D.	0.3108	0 3117	0.3104							
5	I D.	0.3112	0.3122	0.3144	0.0027	X		[1]	0.4322	0.0002	0.0013
	O.D.	0.3108	0.3117	0.3104							
6	I.D.	0 3130	0.3170	0.3179	0.0062	[4]		[1]	0 4370	0.0002	0.0013
	O.D.	0.3108	0.3117	0.3104							
7	I.D.	0.3112	0.3122	0.3144	0.0027	X		[1]	0 4322	0.0002	0.0013
	O.D.	0.3108	0.3117	0.3104							
8	I.D.	0.3112	0.3122	0.3144	0.0027	X		[1]	0 4322	0.0002	0.0013
	O.D.	0.3108	0.3117	0.3104							
[3] 9	HOLE	.093	.098	.125	.045						
	PIN	.088	.090	.080							
[3] 9	HOLE	.093	.098	.115	.030						
	PIN	.088	.090	.085							

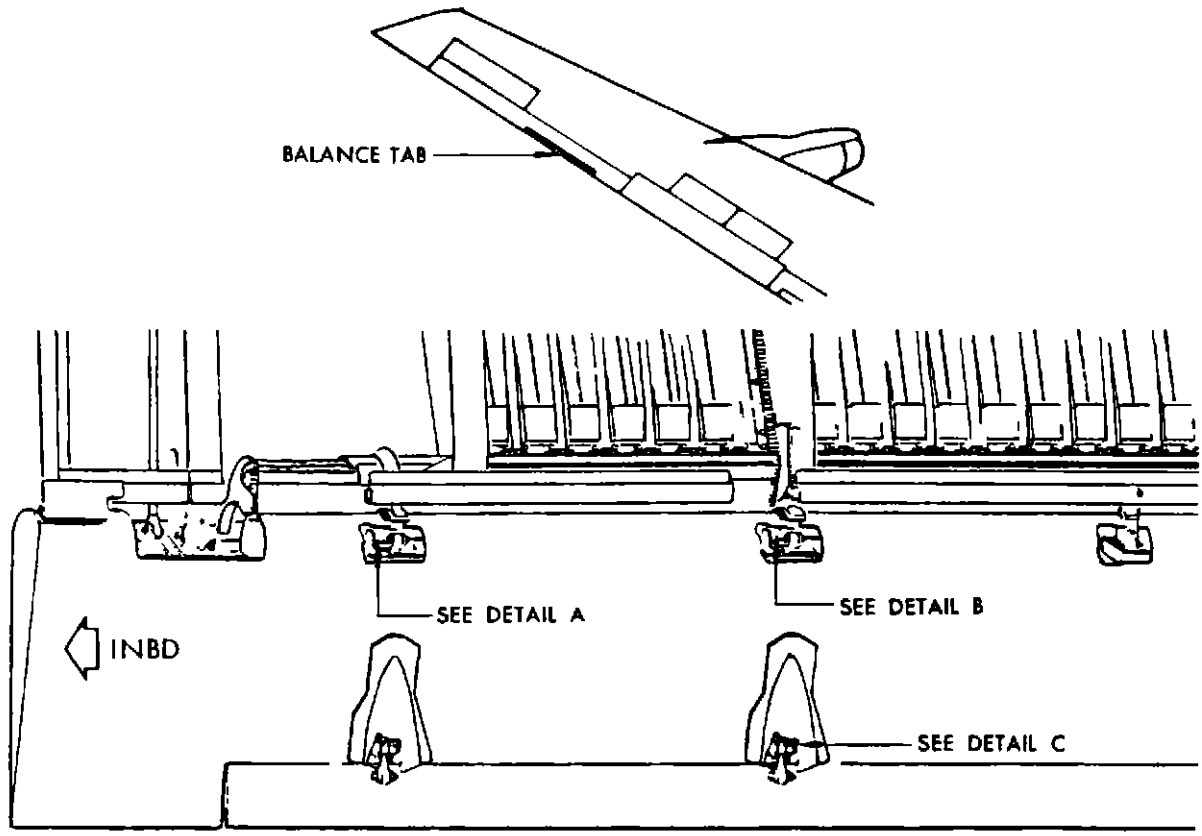
[1] 7075-T6 Bushing, ream hole to design size on installation

[3] Each end - 1/8 length.

[1] Center 3/4 of hinge length.

[4] Drawing 1-90053

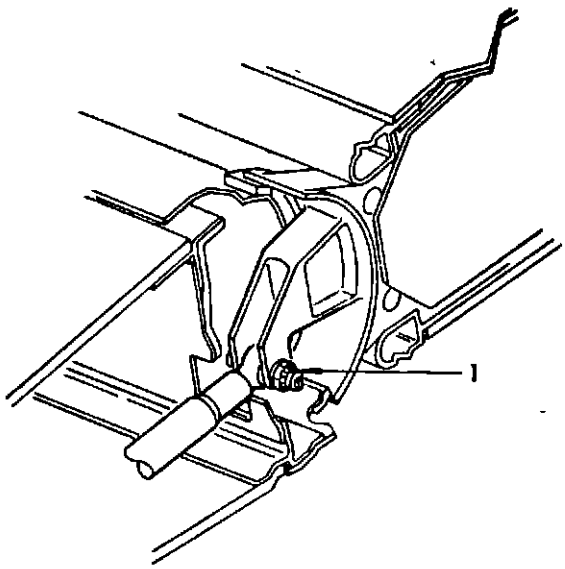
Outboard Aileron Wear Limits
Figure 212



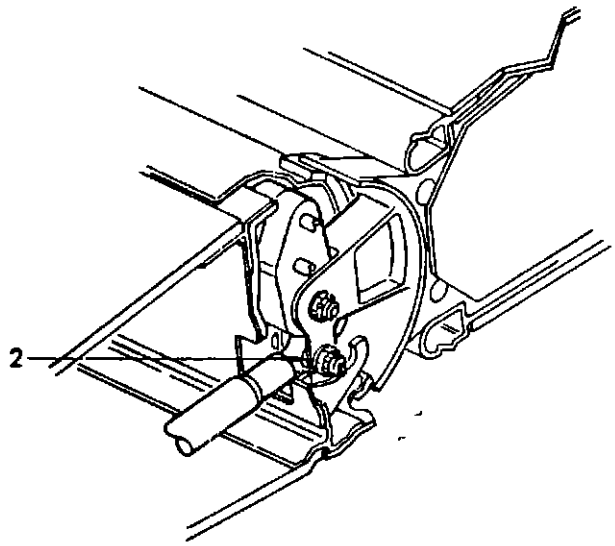
INDEX NO	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX WEAR DIM	WEAR LIMITS MAX DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL	OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE MIN	BUSHING INTERFERENCE MAX
1.	ID	0.2487	0.2497	0.2520	0.0025	X		▷		0.0002	0.0010
	OD	0.2485	0.2495	0.2481			X	REPLACE PART			
2.	ID	0.2487	0.2497	0.2520	0.0025	X		▷			
	OD	0.2485	0.2495	0.2481			X	REPLACE PART		0.0001	0.0004
3.	ID	0.2487	0.2497	0.2520	0.0025	▷2		▷			
	OD	0.2485	0.2495	0.2481			X	REPLACE PART		0.0002	0.0010

▷ Install 7075-T6 bushing or equivalent with wet primer (BMS 10-11, Type I) and ream to design dimension after installation. (Min wall thickness after reaming 0 06 inch)

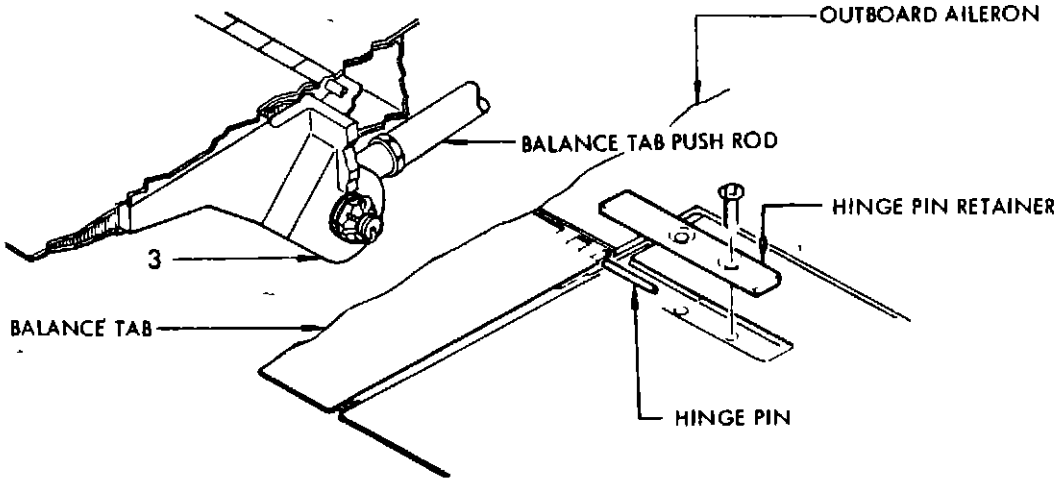
▷2 Drawing 1-5850



DETAIL A



DETAIL B



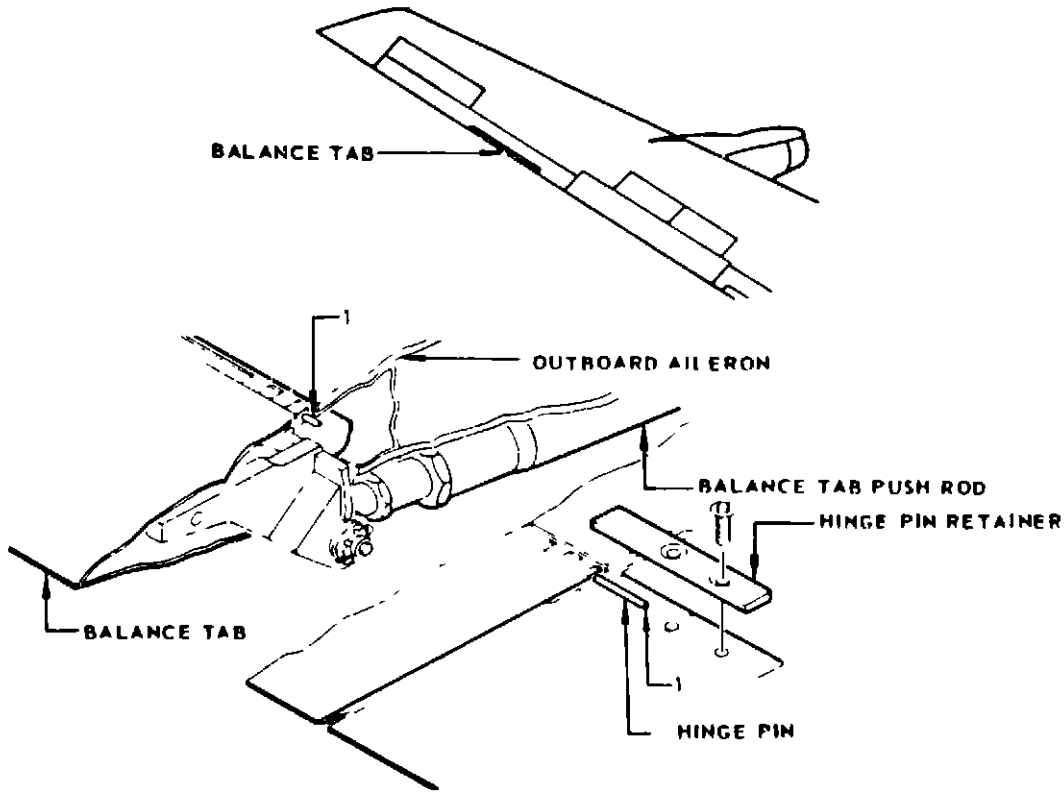
DETAIL C

Outboard Aileron Balance Tab Wear Limits
Figure 212 A (Sheet 3)

Outboard Aileron Bearing Support P/N 6-83592

Design limits:	ID min:	0.2500 in.
	ID max:	0.2520 in.
Maximum wear	ID:	0.3750 in.
Maximum diametrical clearance:		0.0050 in.

Bushing permitted. Open up ID to 0.3750 in. Make bushing from 2024-T4 or AMS 4640 and install with 0 to 0.0010 interference fit.

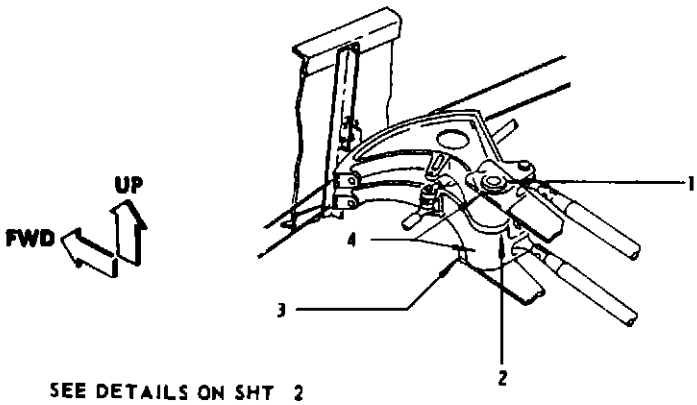


INDEX NO.	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX.	WEAR LIMITS MAX. WEAR DIM	WEAR LIMITS MAX. DIAM. CLEAR-ANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL	OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTERFERENCE MIN	BUSHING INTERFERENCE MAX.
1	ID	0.093	0.098	[1]	[3]		x				
	OD	0 088	0 090	[2]							

[1] 0.125 INCH FOR 1/8 OF HINGE LENGTH INBOARD FROM EACH END.
0.105 INCH FOR REMAINING LENGTH IN CENTER OF HINGE.

[2] 0.080 INCH FOR 1/8 OF HINGE LENGTH INBOARD FROM EACH END.
0.085 INCH FOR REMAINING LENGTH IN CENTER OF HINGE.

[3] 0.045 INCH FOR 1/8 OF HINGE LENGTH INBOARD FROM EACH END
0.020 INCH FOR REMAINING LENGTH IN CENTER OF HINGE.



SEE DETAILS ON SHT 2

INDEX NO	DIM	DESIGN LIMITS DIAMETER MIN	DESIGN LIMITS DIAMETER MAX	WEAR LIMITS MAX. WEAR DIM	WEAR LIMITS MAX DIAM. CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL	OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTERFERENCE MIN	BUSHING INTERFERENCE MAX
1	ID	1 3600	1 3610	1 375	0 015	X		[1] [2]		0008	0016
	OD	1.3593	1 3600	1 355			X	Replace Part			
2	ID	1 3125	1 3135	1 318	0 005		X	Replace Part			
	OD	1 3113	1 3120	1 307			X	Replace Part			
3	ID	1 5320	1 5330	1 548	0 015	X		[3] [2]	1.6530	[4]	0
	OD	1 5313	1.5320	1.528			X	Replace Part			
4	ID	2 0623	2 0630	2 0655	0.003	X		[5]	2 1830	0	.0013
	OD	2 0615	2 0625	2 0615			X	Replace Part			

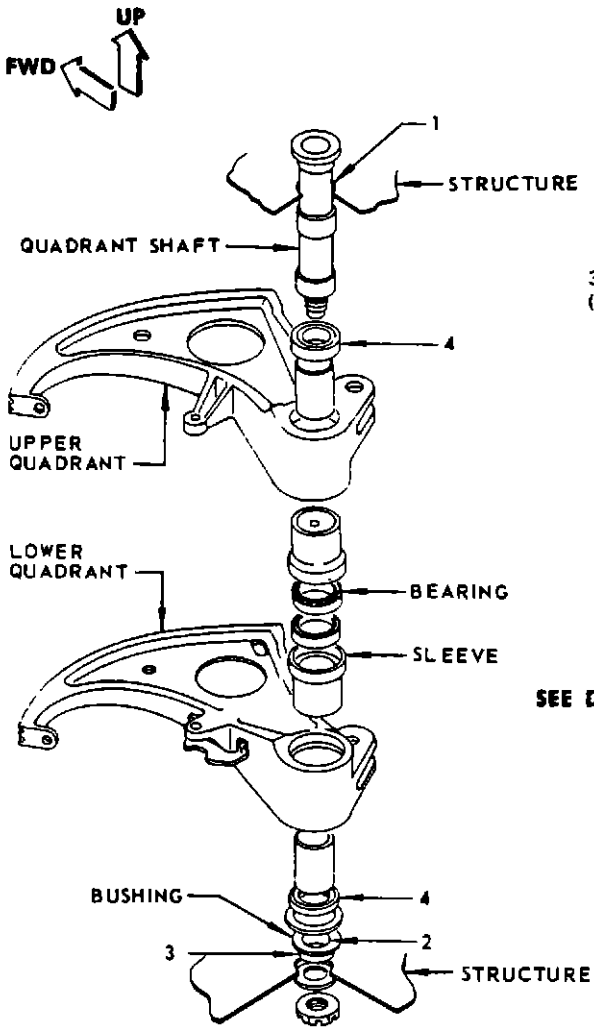
[1] Machine hole oversize 1.46 to 1 47 inches diameter Make bushing as designed on sheet 2 and install with flange down.

[2] Holes must align within ± 0 03 inches.

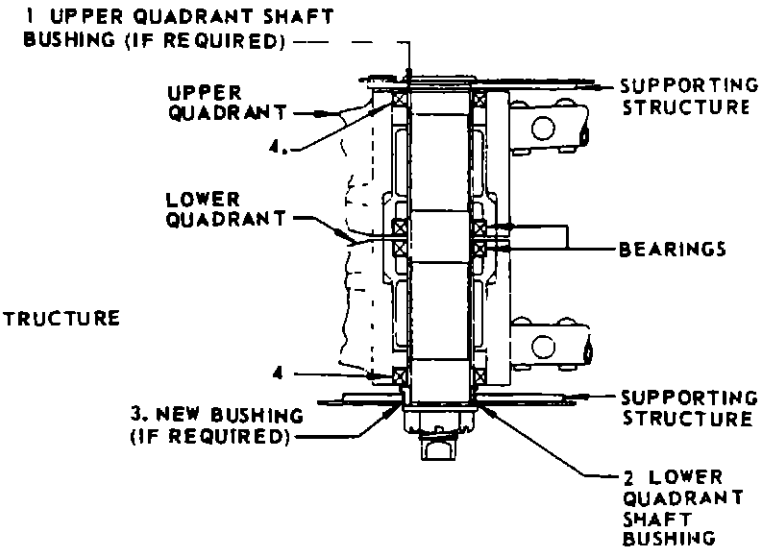
[3] Machine hole oversize and make new part similar to original bushing to fit per [4]

[4] .0017 maximum clearance.

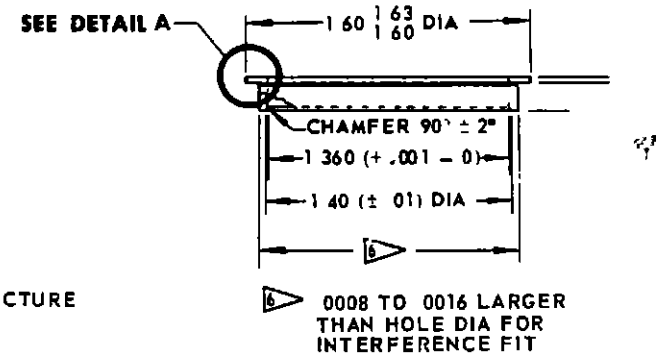
[5] Stake steel bushing in place (Drawing 1-5250)



INBOARD AILERON BUS
AND CONTROL QUADRANT INSTALLATION

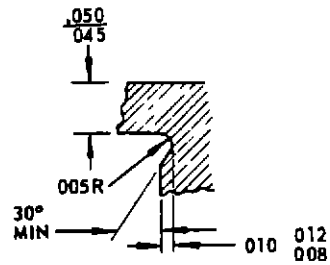


QUADRANTS, BEARINGS AND SHAFT ASSEMBLY

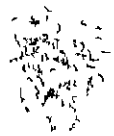


UPPER QUADRANT SHAFT BUSHING

MATERIAL 4130 MIL-S-18729
ANNEALED OR NORMALIZED
FINISH SRF 1 611
BREAK CORNERS 01



DETAIL A



INBOARD AILERON - MAINTENANCE PRACTICES

1. Removal/Installation Inboard Aileron

A. General

(1) Inboard aileron, control tab and balance panels function as a balanced assembly. Each of these parts is balanced by the component method. Therefore, an inboard aileron may be installed as a functional part without rebalancing the entire assembly. Prior to installing a new aileron with control tab it must be verified that the installation will be within balance limits by use of the correct number of control tab adjust weights.

(2) Each control tab is furnished with international orange colored adjust weights to counter balance the tab weight about the aileron hinge line. The tab adjust weights must match the installed control tab for correct inboard aileron balance. When the inboard aileron is removed and the control tab will not be replaced, the tab adjust weights are removed from the lower aft surface of the inboard aileron balance panels and retained with the control tab. If adjust weight data is available for the new tab that will be installed, only surplus weights need be removed. See 27-14-11, figure 201, for number of adjust weights required for any inboard aileron control tab.

B. Equipment and Materials

(1) Scale - 0 to 12 inches graduated in sixty-fourths

(2) Clamps suitable for control surfaces

(3) Straight edge - 60 inches long

(4) Rigging pins - MS20392-4 (0.309 to 0.311 inch diameter)

(5) Sling assembly - ME5-73133-1, or equivalent

C. Remove Inboard Aileron

(1) Remove inboard aileron hinge access panels; see figure 201.

(2) Remove inboard aileron snubber attach bolt access panel 1434 on upper nose of aileron. See Chapter 12, "Access Doors and Panels."

(3) Remove inboard aileron mast fairing 1411.

(4) Remove inboard aileron control access panel 1357.

(5) Remove inboard aileron balance cover access panel 1359.

(6) Disconnect bonding jumper (1, figure 201) from each end of aileron nose.

NOTE: Bonding jumpers are also accessible by lowering flaps.

(7) Disconnect trim control mechanism (8) and control push rod (9) at aileron crank.

(8) Disconnect aft end of bus (upper) push rod (6).

(9) Disconnect aft end of aileron snubber assembly (2).

NOTE: Maximum working clearance is avilable with aileron rotated to its lower limit.

(10) Remove nose seals (4) from ends of aileron.

(11) Remove hinge pin retainers and aft balance panel seals (10) from aft sides of balance panels.

(12) Rotate aileron to extreme up position.

(13) On each balance panel, remove forward seal pin (11) from hinge seal by extracting loop then pulling pin free.

(14) Pull hinge seal (5) from free hinge.

(15) Extract hinge pin (7) from aft balance panel hinge.

(16) Separate balance panel from aileron.

(17) Install sling assembly.

(18) Support aileron then remove hinge bolts (15) from aileron hinge bearings.

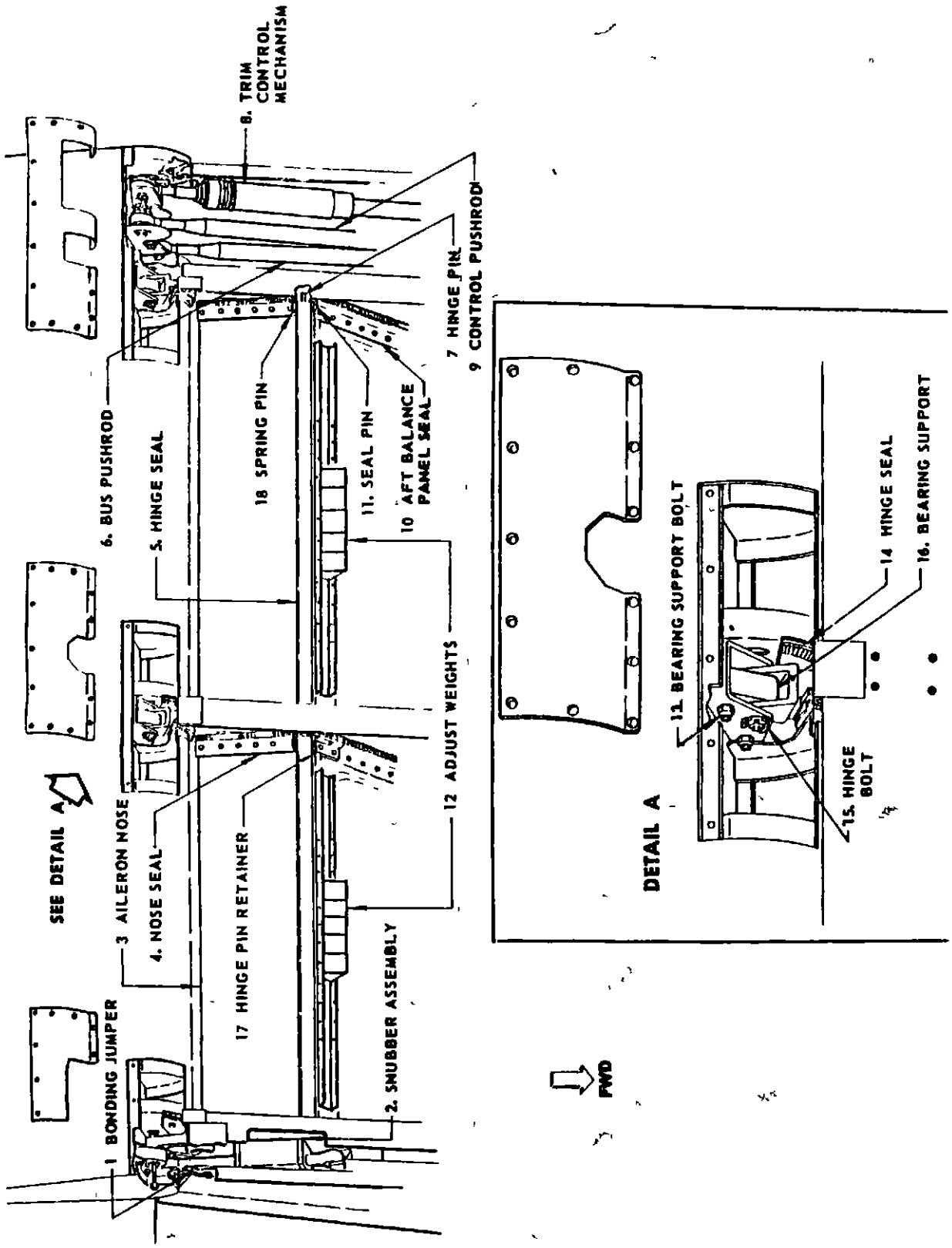
NOTE: The inboard aileron plus control tab and balance panels weighs about 200 pounds.

(19) Remove aileron from wing being careful that aileron nose does not damage interior of balance panel chamber.

(20) Remove control tab adjust weights from lower aft surface of the balance panels if the control tab will not be replaced. Retain these weights with their tab.

D. Install Inboard Aileron

(1) Place aileron in mounting position being careful that aileron nose does not damage interior of balance panel chamber.



Inboard Aileron Installation
Figure 201

(2) Replace hinge bolts (15, figure 201), and remove sling assembly.

(3) Rotate aileron to extreme up position.

(4) Engage aft balance panel hinge halves.

(5) Install hinge pin (7) through continuous hinge.

(6) Install hinge seal (5) in seal retaining groove.

(7) Insert seal pins (11) through seals and secure by inserting end of loop in retaining hole.

(8) Install aft balance panel seal (10) and hinge pin retainer. Adjust seal for 0.00 (+0.03/-0.00) inch clearance between rib and seal. Torque seal retaining bolts at 20 to 25 pound-inches.

NOTE: A 0.020 inch shim may be used for this adjustment.

(9) Install aileron nose seal (4). Adjust seal for 0.00 (+0.03/-0.00) inch clearance between structure and seal when aileron is rotated for minimum seal structure clearance. Torque seal retaining bolts at 20 to 25 pound-inches.

(10) Adjust aileron hinge seals (14) for 0.00 (+0.03/-0.00) inch clearance.

(11) Connect aileron snubber (2) to aileron.

(12) Connect bus push rod (6) to aileron.

(13) Connect bonding jumpers (1) to ends of aileron nose.

(14) Attach trim control mechanism (8) and control push rod (9) to aileron control crank.

(15) Manually rotate aileron through several cycles; check for binding and chafing.

(16) Check adjustment of inboard aileron. If both inboard ailerons and their control tabs can be placed in the neutral position together then the system is in rig. Neutral position is aileron drooped 1-1/4° with respect to wing chord plane and tab drooped to aileron 1-1/4°. If adjustment is required, continue with step (17). When no adjustment is required, continue with step (34).

NOTE: A straight edge may be placed flush with wing surface and aileron to establish a reference point for trailing edge faired position. (See 27-14-0, figure 206.)

(17) Disconnect bus pushrod (6) from aileron.

(18) Clamp aileron so that mean trailing edge is faired within 1/4 inch of wing chord plane.

(19) Install rigging pins in control crank and crank support. (See 27-14-0, figure 205.)

(20) Remove inboard aileron fairing access panel 1380. See Chapter 12, "Access Doors and Panels."

(21) Adjust control tab pushrod (right inboard aileron) and control and trim pushrods (left inboard aileron) until mean trailing edge of each tab is faired with aileron within $\pm$ 0.05 inch.

NOTE: This is a mean dimension to be established by taking average of readings at each end of tab.

(22) Locate position of each outboard aileron. Mark position on a suitable reference such as a sickle type protractor attached to wing.

(23) Pressurize utility hydraulic system.

(24) Extend flaps to 50° with hydraulic power.

(25) **Deleted**

(26) Depressurize utility hydraulic system.

(27) Lock cable slack take-up cylinder in left wheel in extended position with rigging pin (MS20392-4 or AN 5 bolt).

NOTE: Normally, cable tension compresses spring in cylinder and slide. If slack exists, a force along cable "ABSB" will extend slide to clear rigging pin holes.

(28) Clamp *one* inboard aileron such that trailing edge is down from wing chord plane per following table:

TEMP °F	DISTANCE OF AILERON TRAILING EDGE FROM WING CHORD PLANE
110	-0.87 (± 0.05) in.
90	-0.80 (± 0.05) in.
70	-0.75 (± 0.05) in.
50	-0.70 (± 0.05) in.
30	-0.63 (± 0.05) in.
10	-0.57 (± 0.05) in.
-10	-0.50 (± 0.05) in.

Symmetry between both inboard ailerons is to be within 0.10 inch. Maximum mismatch allowed between each end of inboard ailerons and trailing edge of adjacent flaps shall not exceed 1.25 inch.

(29) Adjust bus cable loop (cables ABSA and ABSB) to tension values shown on 27-14-0, figure 204 by tightening all four turnbuckles. Turnbuckles are located in 27-14-0, figure 204. Airplane temperature shall be stabilized for one hour prior to adjusting cables.

(30) Raise or lower outboard aileron on wing with clamped inboard aileron to position equivalent to lockout by adjusting turnbuckle connecting inboard and outboard bus quadrants and turnbuckle on cable ABSB in right main wheel well. Position outboard aileron to proper position while maintaining specified cable tension.

(31) Raise or lower the inboard aileron for the opposite wing to proper droop position per table in step (28) by adjusting turnbuckle on cable ABSA in left main wheel well and turnbuckles connecting inboard and outboard bus quadrant for that wing.

(32) Raise or lower remaining outboard aileron to position equivalent to lockout by adjusting turnbuckle on cable ABSB and turnbuckles connecting inboard and outboard bus quadrants for that wing while retaining proper cable tension.

NOTE: Adjusting a pair of turnbuckles, one to either side of a quadrant affects only the position of that quadrant relative to the position of the other three quadrants. With two quadrants between a pair of turnbuckles being adjusted, position of these two quadrants will be affected equally relative to the position of the other two quadrants.

(33) Remove rigging pin from slack take-up cylinder.

(34) Rotate aileron manually; check for binding and chafing.

(35) Check inboard aileron friction and balance as outlined in 27-14-0, Test Aileron Control System Friction and Balance.

(36) Replace access panels and close doors.

(37) Retract flaps.

(38) Remove external power.

2 Inspection/Check Inboard Aileron

A. General

(1) Equipment and parts subject to normal usage wear require checking for deterioration and insecurity at regular intervals. It is not necessary to check mismatch and vent gap configurations after the installation of a new aileron or the same aileron because of functional interchangeability of parts. Only after a structural repair or damage that might influence hinge alignment or surface contour would it be necessary to check vent gap and mismatch tolerances after aileron installation.

B. Equipment and Materials

(1) Scale - 0 to 12 inches graduated in sixty-fourths.

(2) Internal calipers - 0 to 2 inch capacity.

(3) Feeler gauge set.

(4) Straight edge 24 inches long.

C Check Inboard Aileron

(1) Remove inboard aileron balance cover access panel 1359.

(2) Check aileron nose seals for insecure attachment and deteriorating seals.

(3) Check hinge seals for insecure attachment and deteriorating seals.

(4) Check lower surface drain holes for obstruction.

(5) Check vent gap clearance between inboard aileron and wing trailing edge. (See figure 202.)

(a) Rotate inboard aileron to the full up position and hold.

(b) On the upper surface of the aileron, measure the vent gap at about 5 inches from each hinge and the center of each balance panel (total of 6 measurements across aileron). Small deviations in the vent gap that contribute slightly to the total vent gap area may be neglected if they influence a measurement. In this case, an alternate measurement should be taken at an adjacent station.

(c) Record each measurement for the upper surface vent gap.

(d) On the lower surface of the aileron, measure the vent gap with the same procedure as step (b).

(e) Record each measurement for the lower surface vent gap.

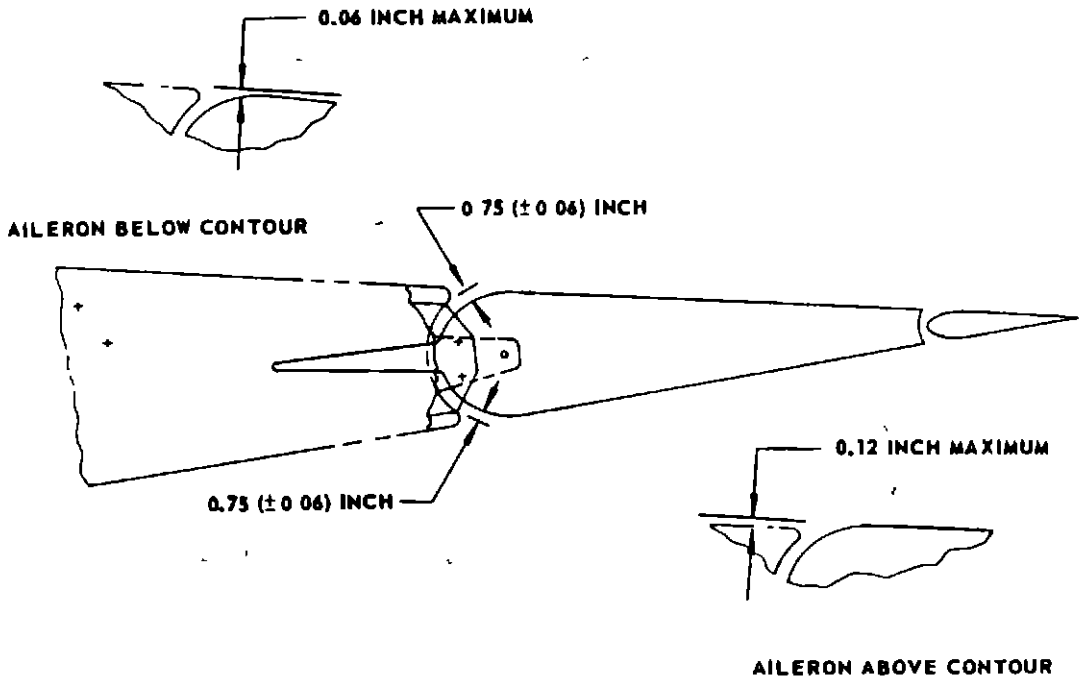
(f) Calculate the average vent gap by adding the measurements for the upper and lower aileron surfaces (12 measurements) and dividing the sum by 12.

(g) The correct average vent gap for the inboard aileron is 0.75 (± 0.04) inch. Measurements at individual stations may be 0.75 (± 0.06) inch.

(h) Complete the inboard aileron vent gap check with the aileron in the faired position, then in the full down position. The procedure and requirements are the same as given in steps (a) through (g).

(6) Check the inboard aileron to wing mismatch. (See figure 202.)

(a) Clamp inboard aileron in faired position (flaps retracted).



Inboard Aileron Vent Gap and Mismatch Measurements
Figure 202

(b) Place a 2 foot long straight edge against upper surface of inboard aileron and wing, so that straight edge is flush with either wing surface or aileron surface (depending on whether aileron is above or below contour at any station) Measure and record mismatch at about 5 inches from each hinge and at the center of each balance panel. (6 measurements across aileron) Small deviations in mismatch that are confined to local areas and will not greatly effect overall mismatch may be neglected In this case an alternate measurement should be taken at an adjacent station.

NOTE If aileron is below contour (straight edge flush with wing surface) record mismatch gap as a (+) measurement If aileron is above contour (straight edge flush with aileron surface) record mismatch gap as a (-) measurement

(c) Calculate average aileron to wing mismatch as follows

1) Add all (+) measurements (if any).

2) Add all (-) measurements (if any)

3) Subtract sum of the (-) measurements from sum of the (+) measurements.

4) Divide remainder from step (3) by 6. Maximum average aileron to wing mismatch is +0 06 inch for an aileron below contour and -0.12 for an aileron above contour. Maximum mismatch at any one point shall not exceed 1.10 inches.

(d) Repeat steps (b) and (c) for lower surface of inboard aileron

3 Approved Repairs Inboard Aileron

A Replace Hinge Bearing

(1) Remove inboard aileron hinge access panel (figure 201)

(2) Remove 2 bearing support bolts (13) and aileron hinge bolt (15)

(3) Slide bearing support (16) from aileron.

(4) Install new bearing support and replace hinge bolt

(5) Rotate aileron and check for binding and chafing

(6) Replace access panels

B. Replace Aileron Nose Seal

(1) Remove inboard aileron balance cover access panel 1359.

(2) Remove aileron nose seal (4, figure 201), by removing seal retaining bolts.

(3) Install new seal. Adjust for 0.00 (+ 0.03/-0.00) inch clearance between seal and structure when aileron is rotated for minimum structure seal clearance. Torque seal retaining bolts at 20 to 25 pound-inches.

NOTE. A 0.02 inch shim may be used to regulate adjustment.

(4) Rotate aileron and check for binding and chafing areas.

(5) Replace access panels.

C. Replace Aileron Hinge Seals

(1) Remove inboard aileron per paragraph 1.C

(2) Remove aileron hinge seals (14, figure 201) from aileron structure.

(3) Install new seals on aileron but do not secure in place until final adjustment.

(4) Install inboard aileron per paragraph 1.D.

(5) Adjust seals for 0.00 (+ 0.03/-0.00) inch clearance between seal and structure.

NOTE: A 0.02 inch shim may be used to regulate adjustment.

(6) Rotate aileron and check for binding and chafing.

(7) Replace access panels.

AILERON CONTROL TABS - MAINTENANCE PRACTICES

1 Removal/Installation Aileron Control Tabs

A General

(1) For correct inboard aileron balance, the number of international orange colored adjust weights (0 to 24) bolted to the lower aft surface of the balance panels must match the required number of weights called out in figure 201 The control tab is functionally replaceable when the required number of international orange adjust weights are installed on the balance panels. The tab weight is stamped on the end of the tab

B Equipment and Materials

(1) Cleaning fluid, Aliphatic Naphtha (TT-N-95) or Methyl Ethyl Ketone (TT-M-261)

(2) Aerodynamic filler, Pro-Seal 715 A-1, Coast Pro-Seal & Manufacturing Company, Los Angeles, California or EC 1328 A-1, Minnesota Mining & Manufacturing Company, St. Paul, Minnesota or Presstite 108.1, Prestite-Keystone Products Engineering Company, St. Louis, Missouri

C. Remove Right Inboard Aileron Control Tab

(1) Remove inboard aileron fairing access panel (8, figure 201).

(2) Disconnect aft end of control tab push rod (9)

(3) Disconnect bonding jumpers (10) and (11).

(4) Remove hinge safety bolt (5).

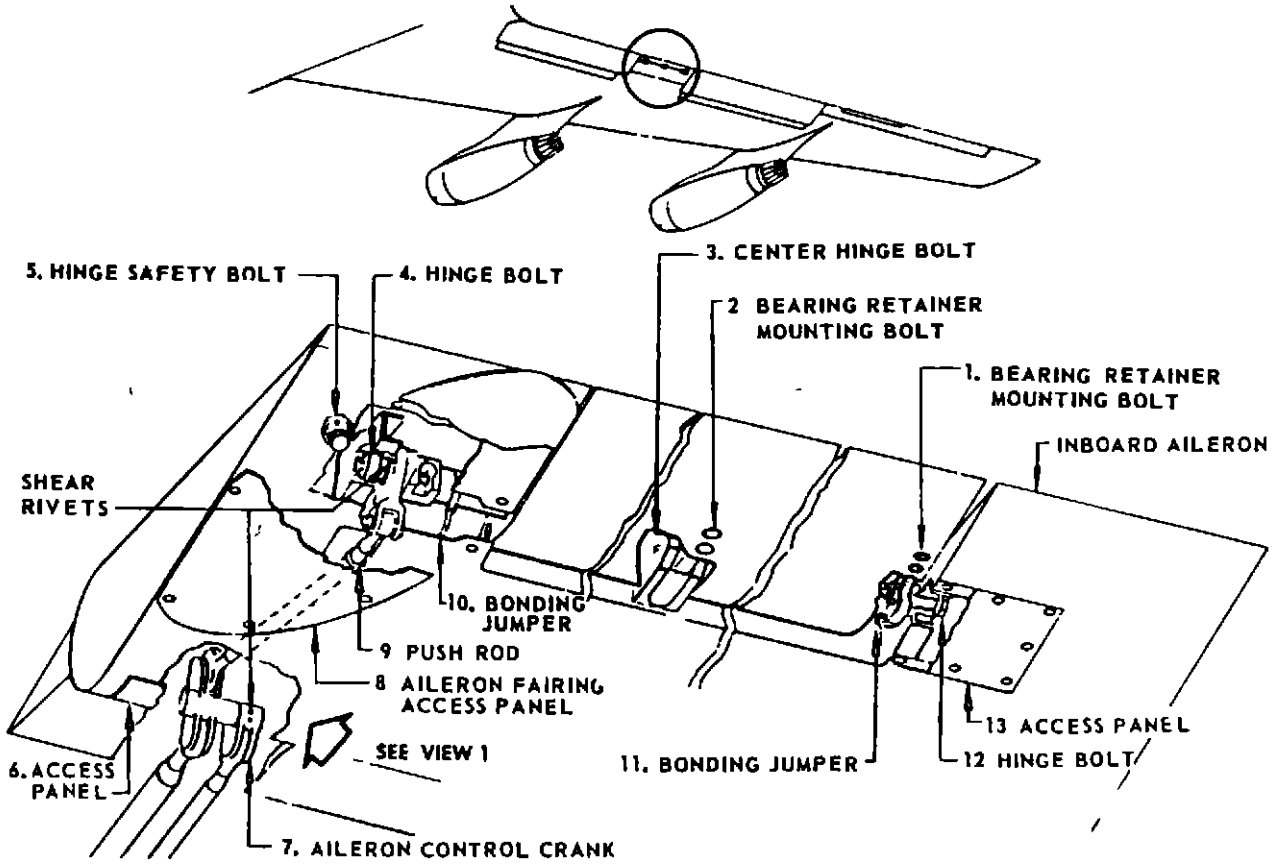
(5) Remove inboard hinge bolt (4) and washers.

NOTE Bolt head is accessible from hole in side of aileron

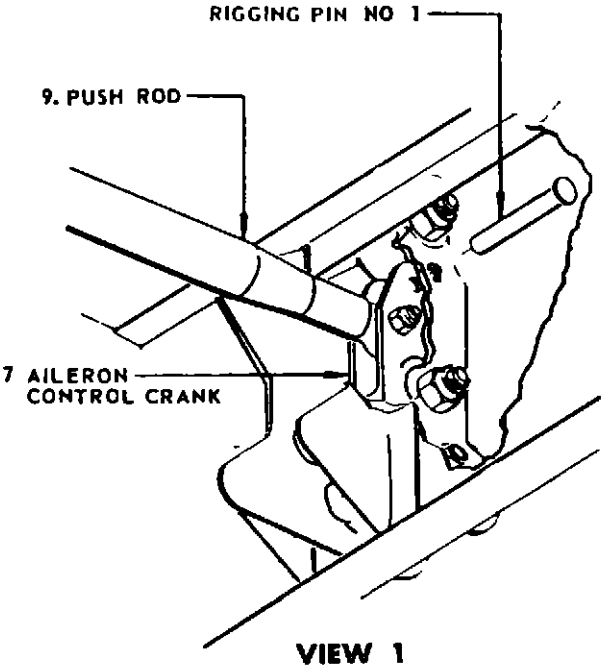
(6) Remove aerodynamic filler from upper and lower surfaces of control tab to expose bearing retainer mounting bolts at center and outboard hinge points.

NOTE: Aliphatic Naphtha (TT-N-95) or Methyl Ethyl Ketone (TT-M-261) may be used as a cleaner

(7) Support tab and remove bearing retainer mounting bolts at center and outboard hinge points



TAB WEIGHT (pounds)	REQUIRED NUMBER OF ADJUST WEIGHTS
0-11	0
11.01-11.25	1
11.26-11 50	2
11.51-11 75	3
11.76-12 00	4
12.01-12.25	5
12.26-12.50	6
12.51-12.75	7
12.76-13.00	8
13.01-13.25	9
13.26-13.50	10
13.51-13.75	11
13 76-14.00	12
14.01-14.25	13
14.26-14.50	14
14.51-14.75	15
14.76-15.00	16
15.01-15 25	17
15.26-15.50	18
15.51-15.75	19
15.76-16.00	20
16.01-16.25	21
16.26-16.50	22
16.51-16.75	23
16.76-17.00	24



VIEW 1

Right Aileron Control Tab Installation
Figure 201

(8) Carefully move tab down and aft, extracting bearing retainers from tab.

(9) Remove tab from aileron. If tab will not be reinstalled, continue with step (10).

(10) Remove inboard aileron balance cover access panel 1359. See Chapter 12, Access Doors and Panels.

(11) Check new tab weight and determine from table of figure 201 if new tab will require a larger or smaller number (0 to 24) of adjust weights.

(12) Remove surplus adjust weights from both balance panels. If only one weight is surplus, remove it from the outboard balance panel. Retain surplus weights with old control tab.

D. Remove Left Inboard Aileron Control Tab

(1) Remove inboard aileron fairing access panel (5, figure 202).

(2) Disconnect bonding jumpers (6) and (15).

(3) Remove nut, bolt and clamp plate (27).

(4) Disconnect aft end of pushrod No. 2 (21) from crank.

(5) Remove crank support mounting screws (20).

(6) Separate crank at engagement point and shift crank support forward in skin cutout.

(7) Disconnect pushrod No. 1 (22) from control tab.

(8) Remove inboard hinge bolt (9) and washers.

(9) Remove aerodynamic filler from upper and lower surfaces of control tab to expose bearing retainer mounting bolts (8) and (10) at center and outboard hinge points.

NOTE: Aliphatic Naphtha (TT-N-95) or Methyl Ethyl Ketone (TT-M-261) may be used as a cleaner.

(10) Support tab and remove bearing retainer mounting bolts (8) and (10) at center and outboard hinge points.

(11) Carefully move tab down and aft, extracting bearing retainers from tab.

(12) Remove tab (4) from aileron. If tab will not be reinstalled, continue with step (13).

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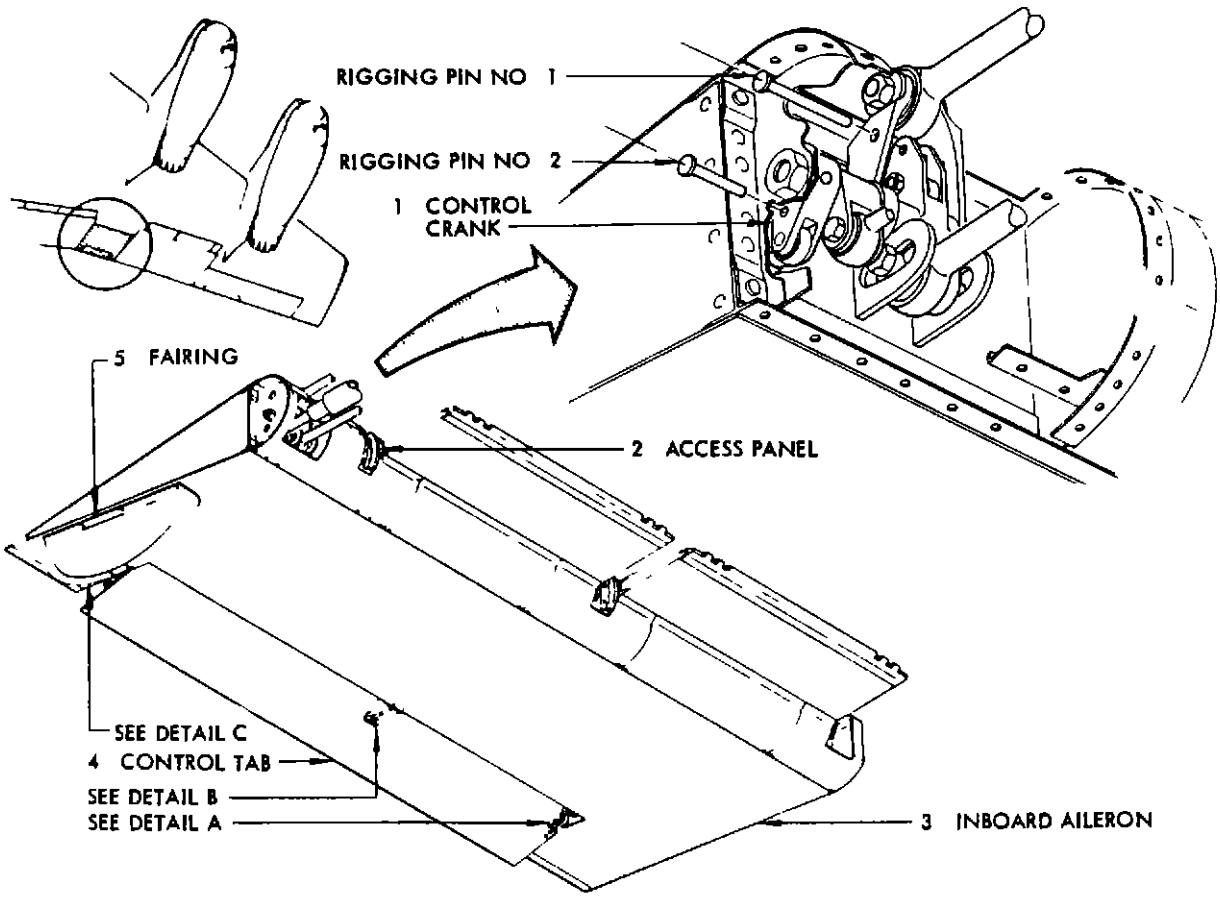
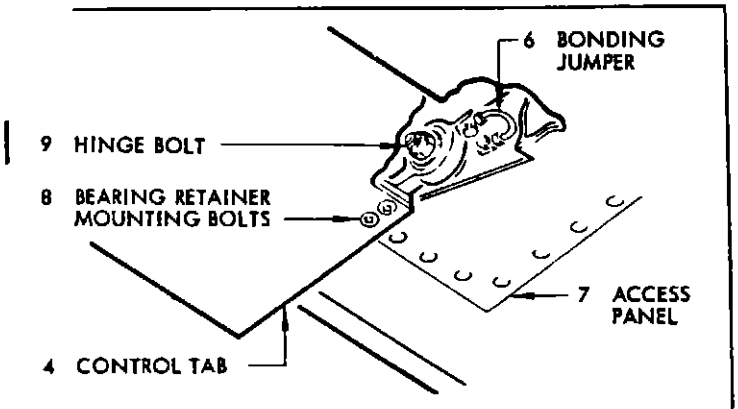
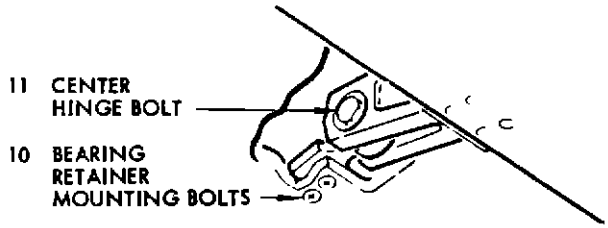




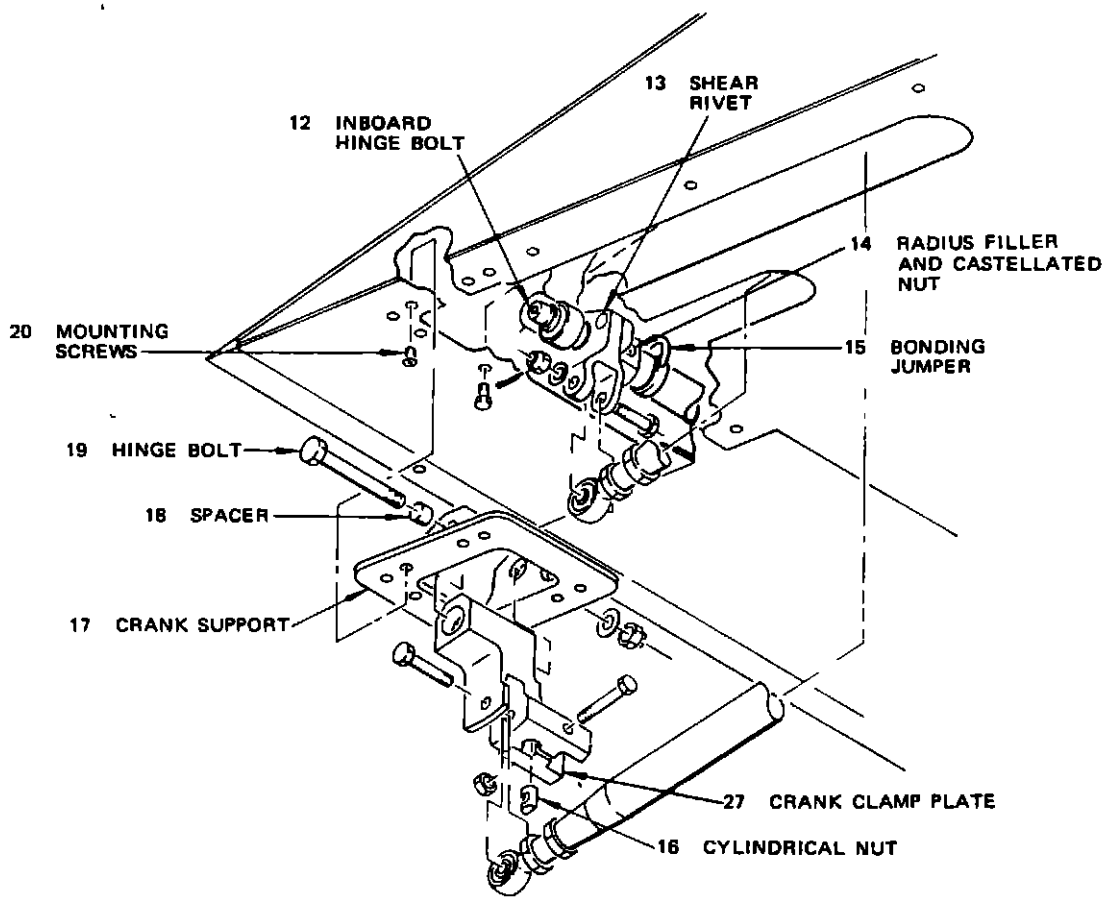
DETAIL A

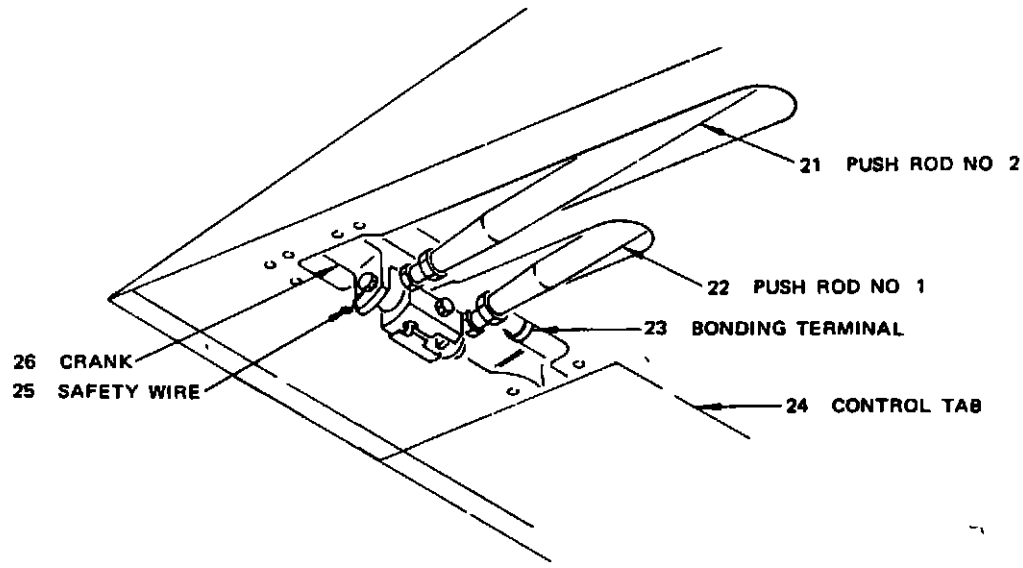


DETAIL B

TAB WEIGHT (pounds)	REQUIRED NUMBER OF ADJUST WEIGHTS
0-11	0
11 01-11 25	1
11 26-11 50	2
11 51-11 75	3
11 76-12 00	4
12 01-12 25	5
12 26-12 50	6
12.51-12 75	7
12 76-13 00	8
13 01-13 25	9
13 26-13 50	10
13 51-13 75	11
13 76-14 00	12
14 01-14.25	13
14 26-14 50	14
14 51-14 75	15
14 76-15 00	16
15 01-15 25	17
15 26-15 50	18
15 51-15 75	19
15 76-16 00	20
16 01-16 25	21
16 26-16 50	22
16 51-16 75	23
16 76-17 00	24

Left Aileron Control Tab Installation
Figure 202 (Sheet 1)





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DETAIL C

(13) Remove inboard aileron balance cover access panel 1359 See Chapter 12, Access Doors and Panels.

(14) Check new tab weight and determine from table of figure 202 if new tab will require a larger or smaller number (0 to 24) of adjust weights.

(15) Remove surplus adjust weights from both balance panels. If only one weight is surplus, remove it from the outboard balance panel. Retain surplus weights with old control tab.

E. Install Right Inboard Aileron Control Tab

(1) Carefully place control tab in mounting position, inserting center and outboard bearing retainers into tab as final position is reached.

(2) Install bearing retainer mounting bolts (1 and 2, figure 201) so that countersunk bolt head surfaces properly mate with tab structure. If required, install aluminum shims between tab slot and bearing retainer tongue for press fit.

NOTE: Each bearing retainer has a 3/16-inch and a 1/4-inch bolt rotated 180 degrees apart.

(3) Install self-locking nuts on bearing retainer mounting bolts.

CAUTION: TO PREVENT SIDE LOADING DO NOT TIGHTEN NUTS UNTIL STEP (6).

(4) Partially install inboard hinge bolt (4) with concave washer engaging bolt head and flat washer on each side of bearing support.

(5) Place radius filler and nut into mounting position in inboard end of tab shaft. Torque inboard hinge bolt (4) at 30 to 40 pound-inches and install hinge safety bolt (5).

(6) Torque 3/16-inch bearing retainer mounting bolts at 30 to 40 pound-inches and 1/4-inch bolts at 125 to 140 pound-inches.

(7) Apply aerodynamic smoother to bearing retainer bolt. See Chapter 51, Sealing.

(8) Connect inboard bonding jumper (10).

(9) Remove inboard hinge access panel (6).

(10) Install rigging pin in aileron control crank (7) and crank support.

(11) Adjust aft end of tab control push rod (9) until tab is faired within 3/64-inch with trailing edge of aileron when connecting bolt is installed.

(12) Remove rigging pin from crank.

(13) Bolt international orange control tab adjust weights on lower aft surface of balance panels if a new tab is being installed. See figure 201 and 27-14-1, figure 201. Divide adjust weights equally between the two balance panels. If an odd number of weights are required, bolt the extra weight to the inboard balance panel.

NOTE: The quantity of weights retained with the old tab will be equal to the number of weights used when the tab was installed on the aileron.

(14) Rotate control tab several cycles and check for binding.

(15) Install access panels and covers.

(16) Test aileron control tab.

F. Install Left Inboard Aileron Control Tab

(1) Carefully place control tab (4) in mounting position, inserting center and outboard bearing retainers into tab as final position is reached.

(2) Install bearing retainer mounting bolts (8 and 10, figure 202) so that countersunk bolt head surfaces properly mate with tab structure. If required, install aluminum shims between tab slot and bearing retainer tongue for press fit.

NOTE Each bearing retainer has a 3/16-inch and 1/4-inch bolt rotated 180 degrees apart.

(3) Install self-locking nuts on bearing retainer mounting bolts.

CAUTION: TO PREVENT SIDE LOADING DO NOT TIGHTEN NUTS UNTIL STEP (6).

(4) Partially install inboard hinge bolt with concave washer engaging bolt head and flat washer on each side of bearing support.

(5) Place radius filler and nut into mounting position in inboard end of tab shaft. Torque inboard hinge bolt at 30 to 40 pound-inches.

(6) Torque 3/16-inch bearing retainer mounting bolts at 30 to 40 pound-inches and 1/4-inch bolts at 125 to 140 pound-inches.

(7) Remove aileron inboard hinge access panel.

(8) Install rigging pins No. 1 and 2 (MS20392-4 or AN5 bolt) through structure and control crank.

(9) Adjust aft end of pushrod No. 1 until control tab trailing edge is faired within 3/64 inch with ailerons trailing edge and secure pushrod to crank with bolt head outboard.

(10) Move crank support into mounting position, engage mating parts and secure with retaining screws.

(11) Adjust aft end of pushrod No. 2 until control tab trailing edge is faired within 3/64 inch with aileron trailing edge and secure rod to crank. Safety wire bolt.

(12) **Install crank clamp plate on crank using bolt and self-locking nut. Tighten nut within torque range of 30 to 50 pound-inches.**

(13) Remove both rigging pins from control crank.

(14) Apply aerodynamic smoother to bearing retainer bolt. See Chapter 51, Sealing.

(15) Connect inboard bonding jumper (6).

(16) Bolt international orange control tab adjust weights on lower aft surface of balance panels if a new tab is being installed. (See figure 202 and 27-14-1, figure 201.) Divide adjust weights equally between the two balance panels. If an odd number of weights are required, bolt the extra weight to the inboard balance panel.

NOTE: The quantity of weights retained with the old tab will be equal to the number of weights used when the tab was installed on the aileron.

(17) Rotate control tab several cycles and check for binding.

(18) Install access panels and covers.

(19) Test aileron control tab.

2. Adjustment/Test Aileron Control Tab

A. Equipment

(1) Scale - 0 to 12 inches graduated in sixty-fourths

B. Test Aileron Control Tab

(1) Manually rotate inboard aileron to extreme up position and hold.

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(2) Rotate control tab down until stop is contacted.

(3) Check that control tab displacement relative to aileron is 2-5/16 to 2-9/16 inches measured at trailing edge.

(4) Rotate aileron to extreme down position and hold.

(5) Rotate control tab up until stop is contacted.

(6) Check that control tab displacement relative to aileron is 2-5/16 to 2-9/16 inches measured at trailing edge.

(7) Return aileron to faired position.

3. Inspection/Check Aileron Control Tab

A. Remove aileron fairing access panel.

B. Check control tab crank for evidence of shear rivet failure when control linkage arm and tab drive support fitting exhibit mismatches mating surfaces.

C. Replace access panel

4. Approved Repairs/Aileron Control Tab

A. Replace Inboard Hinge Bearing Support Fitting

(1) Remove inboard aileron control tab from aileron.

(2) Remove inboard hinge bearing support fitting from aileron by removing mounting bolts.

(3) Install new inboard hinge bearing support fitting and secure with mounting bolts.

(4) Replace inboard aileron control tab.

(5) Replace access panels

(6) Test aileron control tab.

B. Replace Center or Outboard Hinge Bearing Retainer

(1) Remove control tab from inboard aileron.

(2) If replacing outboard bearing, remove access panel adjacent to bearing.

(3) Remove bearing retainer by removing hinge bolt.

(4) Install new bearing retainer and insert hinge bolt with washer on each side of bearing. Clearance before tightening bolt shall be 0.005 to 0.016 inch.

(5) Tighten hinge bolt at 30 to 40 pound-inches. Inner race of outboard bearing will be tight against aileron structure.

(6) Replace aileron control tab.

(7) Test aileron control tab.

C. Replace Outboard Hinge Support Fitting

(1) Remove inboard aileron control tab from aileron.

(2) Remove access panel adjacent to outboard bearing.

(3) Remove outboard bearing retainer by removing hinge bolt.

(4) Remove outboard hinge support fitting by removing mounting bolts.

(5) Install new outboard hinge support fitting and secure in place with mounting bolts.

(6) Install outboard bearing retainer and insert hinge bolt with washer on each side of bearing. Clearance before tightening bolt shall be 0.005 to 0.016 inch.

(7) Tighten hinge bolt at 30 to 40 pound-inches. Inner race of outboard bearing will be tight against aileron structure.

(8) Replace aileron control tab.

(9) Test inboard aileron control tab.

D. Replace Control Tab Crank Shear Rivets

(1) Equipment and Materials

(a) Shear rivets - 1/4 inch diameter, 100 degrees countersunk head, 2017-T3, MS20426D8.

(2) Remove control tab from aileron.

(3) Replace shear rivets in crank as required. (See figure 203.)

CAUTION: THE PRESENCE OF THE CORRECT RIVETS IN THE CONTROL TAB CRANK PROVIDES A SHEAR FUSE IN THE AILERON CONTROL SYSTEM THAT WILL FAIL SAFE IN THE EVENT OF TAB MALFUNCTION. REPLACE RIVETS ONLY WITH THOSE CALLED OUT IN THE MATERIAL LIST OR AN EQUIVALENT RIVET.

(4) Replace control tab.

(5) Test Control tab.

E. Replace Left Inboard Aileron Crank Support Hinge Bearing

(1) Remove inboard aileron fairing access panel (figure 202).

(2) Remove nut, bolt and crank clamp plate.

(3) Disconnect aft end of pushrod No. 2 from crank.

(4) Remove crank support mounting screws.

(5) Separate crank at engagement point and shift crank support forward in skin cutouts then remove from aileron.

(6) Remove crank support hinge bolt separating crank and support.

(7) Remove free bearing from crank and install new bearing. Opposite bearing is roller swaged.

NOTE Spacer is installed between bearings.

(8) Check mounting position of crank support in aileron, then install crank in support with crank arm pointing outboard.

(9) Install hinge bolt through support and crank with bolt head inboard and secure with washer and self-locking nut.

(10) Place crank support in mounting position in skin cutout and engage mating parts with control tab.

(11) Secure crank support to aileron with mounting screws

(12) Remove aileron inboard hinge access panel.

(13) Install rigging pin No. 2 (MS20392-4 or AN5 bolt) through structure and crank.

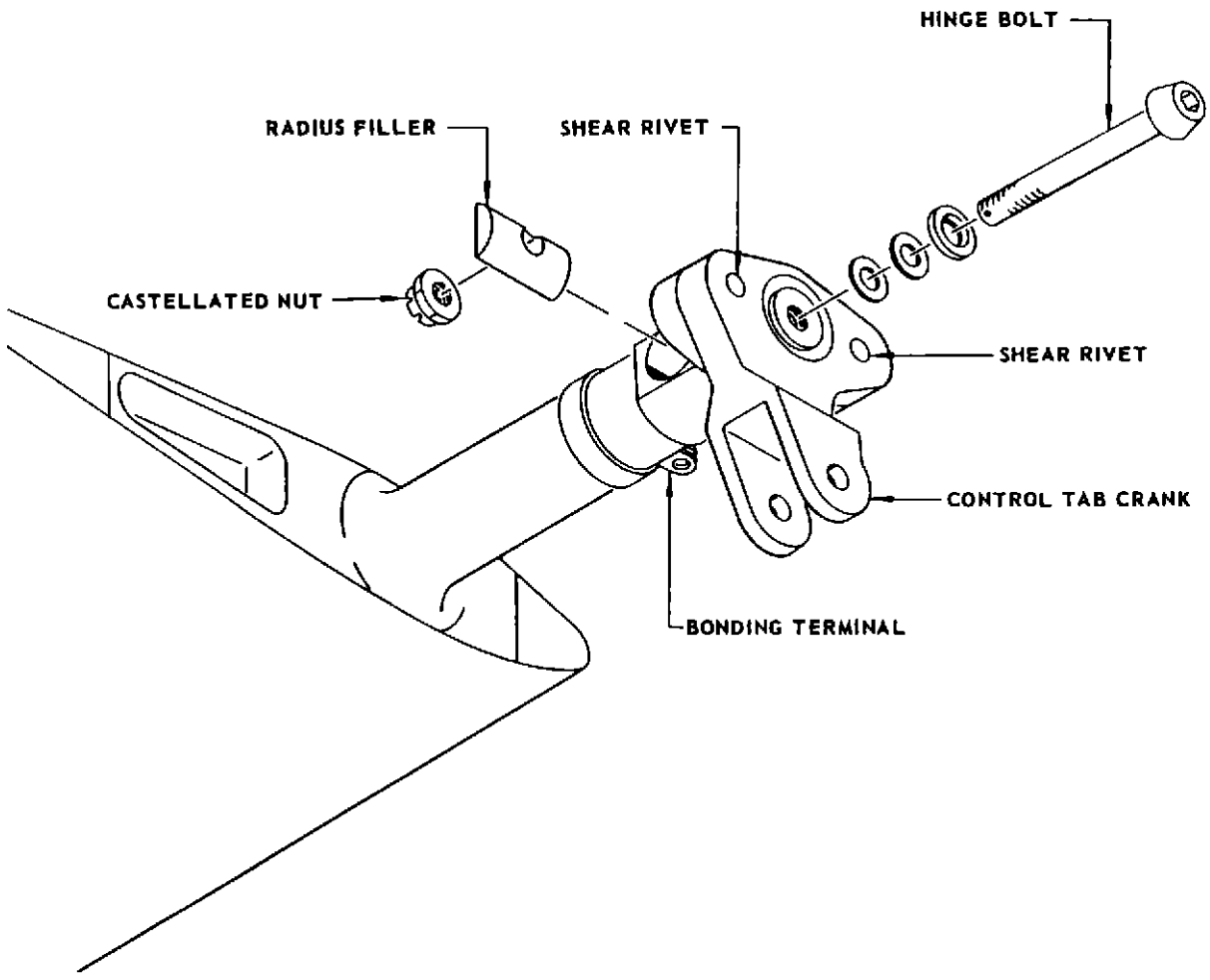
(14) Adjust tab control pushrod No. 2 until control tab trailing edge is faired within 3/64 inch with aileron trailing edge and secure pushrod to crank. Safety wire bolt.

(15) Install crank clamp plate on crank using bolt and self-locking nut. Tighten nut within torque range of 30 to 50 pound-inches.

(16) Remove rigging pin from control crank.

(17) Operate aileron trim control system and aileron control system through several complete cycles and check for binding.

(18) Replace access panels.



Control Tab Crank Shear Rivet Installation
Figure 203

OUTBOARD AILERON - MAINTENANCE PRACTICES

1 Removal/Installation Outboard Aileron

A General

(1) The outboard aileron, balance panels and balance tab function together as a balanced assembly. Outboard ailerons (without tabs) are independently balanced as a single component and may be installed without rebalancing the entire assembly. Prior to installing a new aileron with balance tab, it must be verified that the installation will be within balance limits

(2) Each balance tab is furnished with international orange colored adjust weights that bolt to the lower aft surface of the balance panel in Bay No. 5 When the outboard aileron is removed and the balance tab will not be replaced, the adjust weights are also removed and retained with the tab. The installation of a new aileron and balance tab requires that the new tab adjust weights are also installed If adjust weight data is available for a new tab that will be installed later, only surplus weights need be removed from the balance panel See 27-14-31, figure 201 for quantity of adjust weights required for any outboard aileron balance tab

B Equipment and Materials

(1) Scale - 0 to 12 inches graduated in sixty-fourths

C. Remove Outboard Aileron

(1) Remove outboard aileron hinge access panels (5, figure 201).

(2) Remove balance panel covers 1369, 1371, 1373 and 1375. See Chapter 12, "Access Doors and Panels "

(3) Remove outboard aileron control mast fairing 1414 on upper surface of aileron

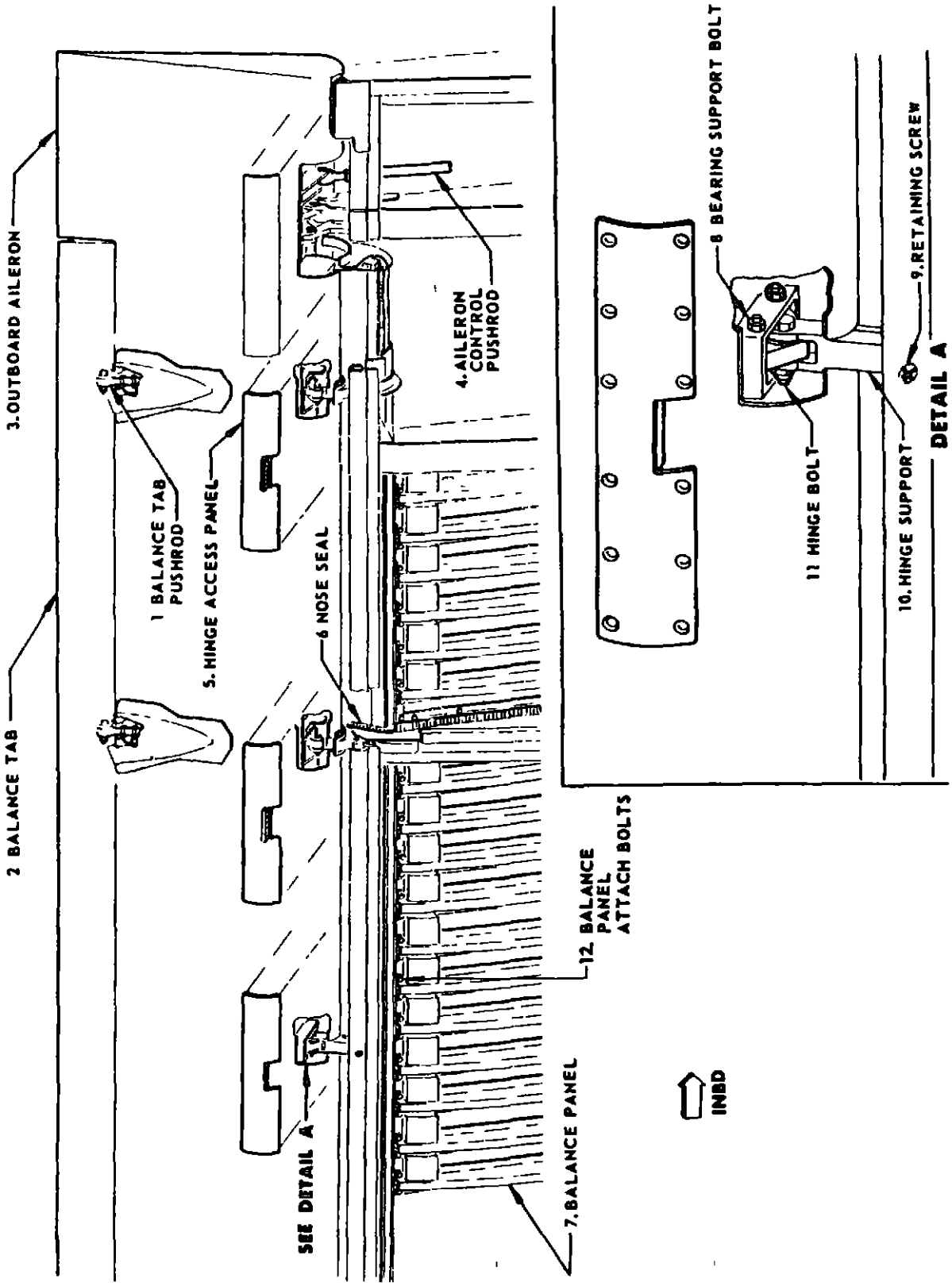
(4) Disconnect outboard aileron control push rod (4) at aileron.

(5) Detach hinge supports (10) centered in balance chambers 3, 4, and 5, by removing retaining screws (9) on top and bottom surface of wing

NOTE: Each screw is secured with a cylindrical self locking nut and a cylindrical nut retainer.

(6) Disconnect balance panels (7) from aileron nose by removing attaching bolts (12) at aft balance panel hinge

(7) Loosen aileron nose seals (6).



Outboard Aileron Installation
Figure 201

(8) Disconnect forward end of balance tab pushrods (1).

NOTE: If new aileron will be installed, detach pushrods at tab and retain for reuse.

(9) Support outboard ailerons and remove hinge bolts from the 5 rib mounted hinge supports.

(10) Remove aileron from wing being careful that nose does not damage interior of balance chamber or vent gap contour.

NOTE: Hinge supports (10) are removed with the aileron.

(11) Remove hinge supports (10) from aileron by removing access panels and hinge bolts (11).

(12) Remove balance tab adjust weights (international orange color) from the balance panel in bay No. 5 if balance tab will not be reinstalled. Retain these adjust weights with removed tab. See 27-14-31, figure 202.

D. Install Outboard Aileron

NOTE: Prior to install aileron, replace the two bearing support bolts (8) by new ones. Torque to 20-30 inch-pounds.

(1) Place the three hinge supports (10, figure 201) through cutouts in aileron nose so that they project through from the under side.

(2) Install hinge bolts (11) through hinge supports.

(3) Replace access panels for these three hinge supports.

(4) Place aileron in mounting position.

NOTE: The three hinge supports in the aileron nose may require individual attention to hold them in mounting positions.

(5) Install retaining screws (9).

NOTE: Each screw is secured with a cylindrical self-locking nut and a cylindrical nut retainer.

(6) Attach balance panels (7) to aileron nose. Torque 10-32 bolts at 20 to 25 pound-inches.

(7) Adjust aileron hinge seals (figure 203) for 0.00 (+0.03/-0.00) inch clearance.

NOTE: A 0.02 inch shim may be used to regulate adjustment.

(8) Adjust aileron nose seals (6, figure 201) and wing seal for 0.00 (+0.03/-0.00) inch clearance.

(9) Rotate aileron manually between stops and check for binding or chafing areas.

(10) With flaps retracted and aileron bus quadrant held in neutral position within ± 5° as shown in 27-14-0, figure 207A, adjust aileron control pushrod (4) until mean trailing edge of aileron is zero to 0.36 inch down from wing chord plane. Apply an upward force of 6 to 10 pounds to aileron to remove down slack while making adjustment

NOTE: A straight edge may be placed flush with wing surface and aileron parallel to balance panel joints to establish a reference point for trailing edge faired position. (See 27-14-0, figure 205.)

(11) With outboard aileron still uploaded and held in rigged position per step (10), adjust balance tab pushrods (1, figure 201) until trailing edge of tab is located 0.22 (± 0.05) inch down with respect to aileron chord plane.

NOTE: This is a mean dimension found from two readings, one at each end of tab. Tab must be readjusted if aileron position is altered.

(12) If original balance tab is replaced, install international orange colored adjust weights from new tab on lower aft surface of the balance panel in bay No. 5. Number of weights installed will vary between 0 to 12 depending on tab weight. Mount adjust weights symmetrically about center line of balance panel. When an odd number of weights are used, mount remaining weight on inboard side of balance panel. See 27-14-33, figure 202.

(13) Replace all access panels.

(14) Test outboard aileron.

2. Adjustment/Test Outboard Aileron

A. Equipment and Materials

(1) Scale - 0 to 12 inches graduated in sixty fourths

B. Adjust Outboard Aileron

(1) Remove outboard aileron control mast fairing (1414) on upper surface of aileron. See Chapter 12, "Access Doors and Panels."

(2) Remove balance panel covers 1369, 1371, 1373 and 1375.

(3) Remove aileron hinge access panels (5, figure 201).

(4) Adjust aileron hinge seals (figure 203) for 0.00 (+0.03/-0.00) inch clearance.

NOTE: A 0 02 inch shim may be used to regulate adjustment.

(5) Adjust wing seal and aileron nose seal (6, figure 201) for 0.00 (0.03/-0.00) inch clearance

(6) Adjust mean trailing edge of aileron neutral to 0.36 inch down relative to wing chord plane.

(7) Adjust tab trailing edge down 0.22 (± 0.05) inches relative to aileron chord plane.

NOTE: This is average of readings taken at inboard and outboard edge of aileron.

(8) Check that left and right ailerons are rigged symmetrically within 1/8 inch.

(9) Check that left and right aileron balance tabs are rigged symmetrically within 0.05 inches.

(10) Check that maximum mismatch between each end of aileron trailing edge and wing is 0.61 inch.

(11) Check that mismatch between each end of aileron balance tab trailing edge and aileron trailing edge is between 0.12 and 0.32 inches down.

(12) If after flight additional outboard aileron adjustment is required for trim correction the following changes are allowable.

(a) Aileron rigging from wing chord plane is neutral to 1/2 inch down.

(b) Left to right aileron symmetry does not apply.

(c) Aileron to wing mismatch is allowed to be 3/4 inch.

NOTE: Tab must still be rigged as given in steps (7), (9) and (11).

NOTE: A straight edge may be placed flush with wing surface and aileron to establish a reference point for trailing edge faired position. (See 27-14-0, figure 206.)

(13) Replace access panels and covers.

(14) Test outboard aileron.

C. Test Outboard Aileron

(1) Provide external hydraulic power.

(2) Lower flaps.

(3) Manually rotate outboard aileron for full travel.

(4) Check that outboard aileron will rotate between stops with no binding or chafing.

(5) Check that 8-1/4 to 9-3/32 inches of aileron travel is available in either direction from the faired position.

(6) Retract flaps.

(7) Check that the outboard aileron will return to the faired position regardless of inboard aileron position.

(8) Remove external power.

3. Inspection/Check Outboard Aileron

A. General

(1) Equipment and parts subject to normal usage wear require checking for deterioration and insecurity at regular intervals. It is not necessary to check mismatch and vent gap configurations after the installation of a new aileron or the same aileron because of functional interchangeability of parts. Only after a structural repair or damage that might influence hinge alignment or surface contour would it be necessary to check vent gap and mismatch tolerance after aileron installation.

B. Equipment and Materials

(1) Internal calipers - one inch capacity

(2) Scale - 0 to 12 inches graduated in sixty-fourths

(3) Feeler gauge set

C. Check Outboard Aileron

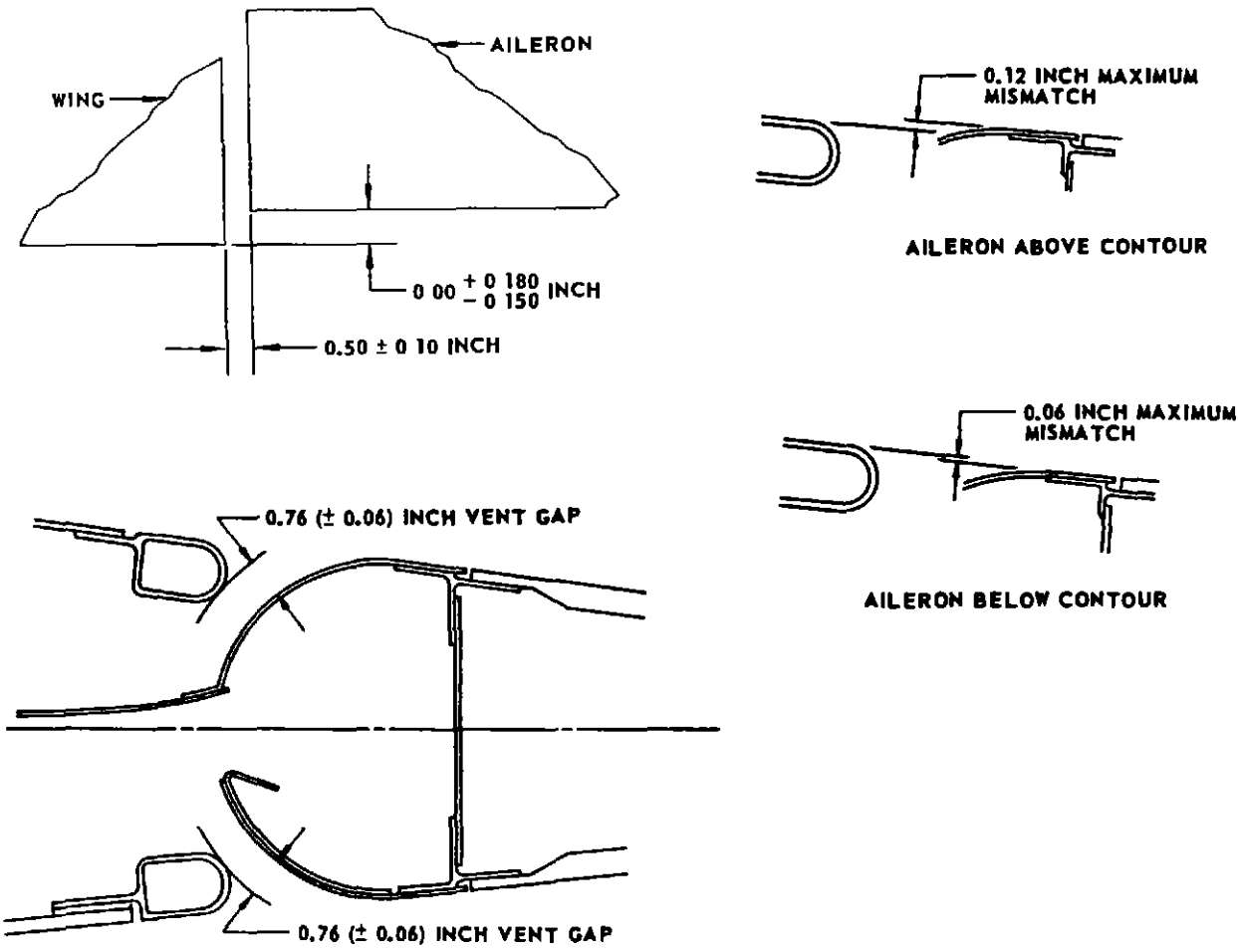
(1) Check hinge seals and wing seal for deterioration.

(2) Check lower surface drain holes for obstruction.

(3) Check vent gap clearance between outboard aileron and wing trailing edge. See figure 202.

(a) Rotate outboard aileron to "UP" position and hold.

(b) On the upper surface of the aileron, measure the vent gap at the center of bay No. 1 and about 9 inches from each hinge or support fitting on balance panel bays No. 2 through No. 5 (total of 15 measurements across aileron). Small deviations in the vent gap that contribute slightly to the total vent gap area may be neglected if they influence a measurement. In this case an alternate measurement should be taken at an adjacent station.



(c) Record each measurement for the upper surface vent gap.

(d) On the lower surface of the aileron measure the vent gap with the same procedure as step (b).

(e) Record each measurement for the lower surface vent gap.

(f) Calculate the average vent gap by adding the measurements for the upper and lower aileron surfaces (30 measurements) and dividing the sum by 30.

(g) The correct average vent gap for the outboard aileron is 0.76 (± 0.04) inch. Measurements at individual stations may be 0.76 (± 0.06) inch

(h) Complete the outboard aileron vent gap check with the aileron in the faired position, then in the full down position. The procedure and requirements are the same as given in steps (a) through (g).

(4) Check outboard aileron to wing mismatch. (See figure 202.)

(a) Clamp outboard aileron in faired position (flaps retracted)

(b) Place a 2 foot long straight edge against upper surface of outboard aileron and wing so that straight edge is flush with either wing surface or aileron surface (depending on whether aileron is above or below contour at any given station). Measure and record mismatch at center of Bay 1 (inboard bay) and about 9 inches from each hinge or support fitting on Bays 2 through 5 (total of 15 measurements across aileron). Small deviations in mismatch that are confined to local areas and will not greatly affect overall mismatch may be neglected In this case, an alternate measurement should be taken at an adjacent station.

NOTE If aileron is below contour (straight edge flush with wing surface) record mismatch gap as a (+) positive measurement. If aileron is above contour (straight edge flush with aileron surface) record mismatch gap as a (-) minus measurement.

(c) Calculate average aileron to wing mismatch. Maximum allowable average aileron to wing mismatch is +0.06 inch for an aileron below contour and -0.12 inch for an aileron above contour.

1) Add all (+) measurements (if any).

2) Add all (-) measurements (if any).

3) Subtract sum of the (-) measurements from the sum of the (+) measurements.

4) Divide remainder from step 3) by 15.

5) Maximum mismatch at any one point shall not exceed 0.61 inch

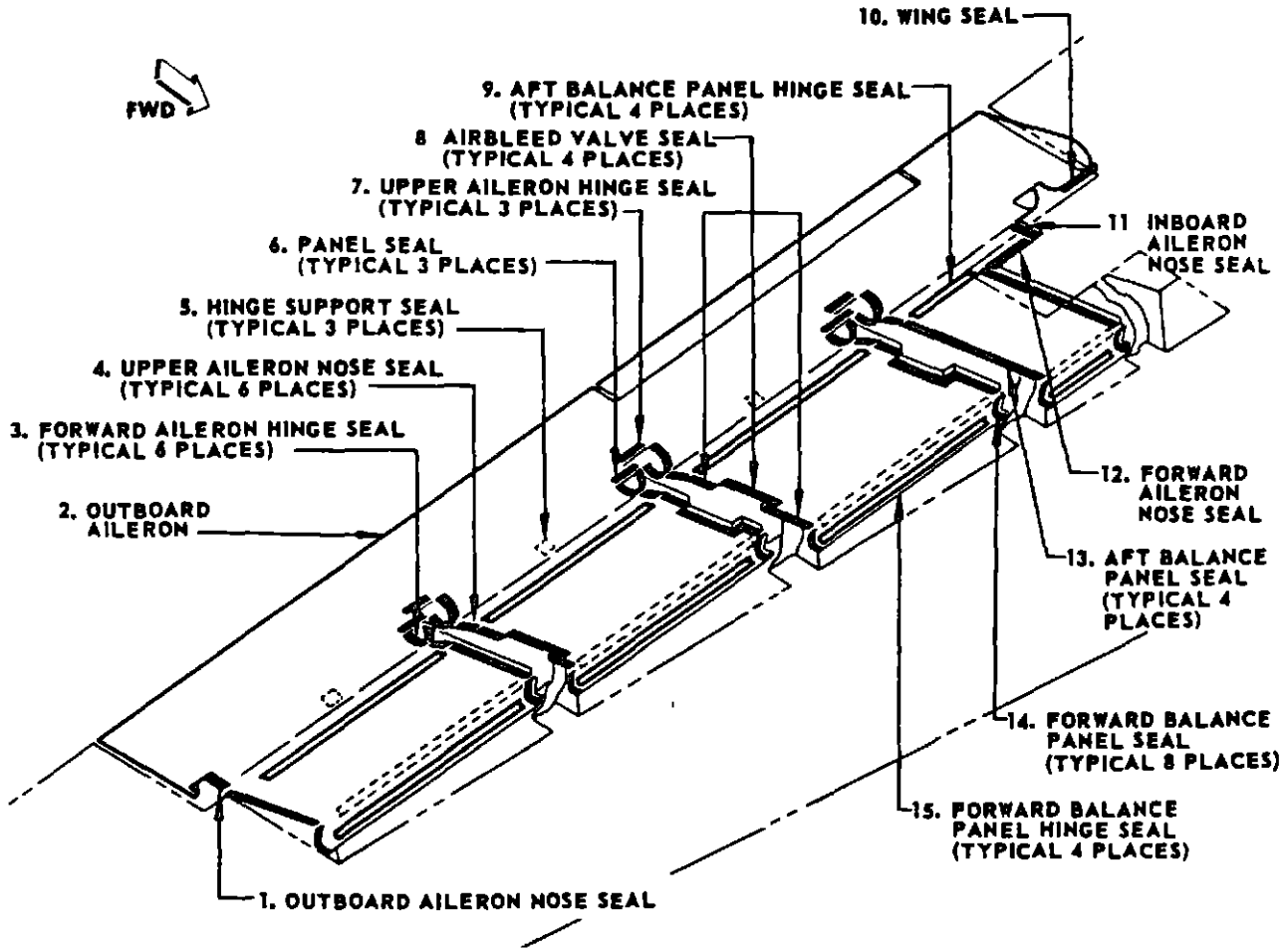
(d) Repeat steps (b) and (c) for lower surface of outboard aileron.

4 Approved Repairs Outboard Aileron

A Equipment and Materials

(1) Adhesive - Pro-Seal 590M by Coast Pro-Seal and Manufacturing Co., Los Angeles, California; M6249 by U.S. Rubber Co., Fort Wayne, Indiana, or equivalent.

(2) Liquid cleaner - Methyl ethyl Ketone (TT-M-261) or equivalent.



Outboard Aileron Seals Installation
Figure 203

B. Replace Outboard Aileron Hinge Bearing

(1) Remove outboard aileron hinge access panel (figure 201).

(2) Remove hinge bolt (11) and 2 bearing support bolts (8).

(3) Remove bearing support from aileron

NOTE By removing and replacing one bearing support at a time, all 8 bearing supports may be replaced without removing outboard aileron

(4) Install new bearing support and secure with 1/4 inch diameter support bolts (8) torqued at 20 to 30 pound-inches

(5) Install hinge bolt

(6) Replace access panel.

C Replace Outboard Aileron Seals

(1) Replace outboard aileron nose seal (1, figure 203)

(a) Provide external hydraulic power.

(b) Remove outboard balance panel cover.

(c) Remove seal by removing retaining bolts

(d) Install new seal and adjust for 0.00 (+ 0 03/-0.00) inch clearance between seal and structure

NOTE. A 0.02 inch shim may be used to regulate adjustmert

(e) Lower flaps.

(f) Manually rotate aileron and check for binding.

(g) Retract flaps.

(h) Replace covers.

(i) Remove external power

(2) Replace upper aileron nose seal (4).

(a) Provide external hydraulic power.

(b) Lower flaps.

(c) Remove balance panel cover

(d) Detach balance panel from aileron nose by removing retaining bolts at aft balance panel hinge.

(e) Rotate aileron up

(f) Remove seal by removing seal retaining bolts.

(g) Install new seal and adjust for 0 00 (+ 0.03/-0 00) inch clearance between seal and structure.

(h) Attach balance panel to aileron nose. Torque 10-32 bolts at 20 to 25 pound-inches

(i) Manually rotate aileron and check for binding and chafing

(j) Retract flaps.

(k) Replace covers.

(l) Remove external hydraulic power.

(3) Replace forward aileron hinge seal (3)

(a) Provide external hydraulic power.

(b) Remove outboard aileron from wing (see paragraph 1.C.).

NOTE It is not necessary to remove hinge supports (10, figure 201) from aileron nose

(c) Remove seal from aileron nose by removing seal retaining bolts

(d) Install new seal but do not tighten bolts until final adjustment

(e) Install outboard aileron (see paragraph 1 D)

(f) Adjust seals for 0 00 (+ 0 03/-0.00) inch clearance between seal and structure

NOTE: A 0 02 inch shim may be used to regulate adjustment

(g) Lower flaps

(h) Manually rotate aileron and check for binding and chafing.

(i) Replace access panels

(j) Remove external hydraulic power.

(4) Replace inboard aileron nose seal (11, figure 203).

(a) Provide external hydraulic power.

(b) Remove outboard aileron from wing (see paragraph 1.C.).

NOTE It is not necessary to remove hinge supports from aileron nose.

(c) Remove seal by removing seal retaining bolts.

(d) Install new seal but do not tighten bolts until final adjustment.

(e) Install outboard aileron (see paragraph 1.D.).

(f) Adjust seal for 0.00 (+0 03/-0.00) inch clearance between seal and structure

NOTE A 0.02 inch shim may be used to regulate adjustment.

(g) Lower flaps.

(h) Manually rotate aileron and check for binding and chafing

(i) Retract flaps

(j) Replace access panels.

(k) Remove external hydraulic power.

(5) Replace forward aileron nose seal (12, figure 203)

(a) Provide external hydraulic power.

(b) Remove outboard aileron from wing. (See paragraph 1.C)

NOTE It is not necessary to remove hinge supports from aileron nose.

(c) Remove seal by removing seal retaining bolts.

(d) Install new seal but do not tighten bolts until final adjustment

(e) Install outboard aileron (see paragraph 1 D.).

(f) Adjust seal for 0 00 (+ 0 03/-0.00) inch clearance between seal and structure

NOTE: A 0 02 inch shim may be used to regulate adjustment

(g) Lower flaps

(h) Manually rotate aileron and check for binding or chafing

(i) Retract flaps

(j) Replace access panels.

(k) Remove external hydraulic power.

(6) Replace hinge support seals (5, figure 203).

(a) Provide external hydraulic power.

(b) Remove outboard aileron from wing (see paragraph 1.C.).

(c) Remove hinge support access panel.

(d) Remove hinge support by removing hinge bolt.

(e) Remove hinge support seal assembly by removing retaining bolts

(f) Remove old seal from retainer with aluminum or plastic scraper

(g) Remove residual material from seal area with liquid cleaner Wipe dry with clean cloth

(h) Apply adhesive to mating surface of seal and retainer Allow to dry until very tacky but will show no transfer to knuckle when touched

(i) Join seal and retainer when adhesive is still tacky with sufficient pressure for a good bond

NOTE: It is not necessary to wait until adhesive cures to continue work with aileron

(j) Install hinge support seal assembly on aileron.

(k) Saturate felt with general purpose oil, MIL-L-7870, after installation

(l) Install hinge support.

(m) Install outboard aileron (see paragraph 1 D).

(n) Lower flaps.

(o) Manually rotate aileron and check for binding and chafing

(p) Replace access panels

(q) Retract flaps.

(r) Remove external hydraulic power.

(7) Replace upper aileron hinge seal (7, figure 203).

(a) Provide external hydraulic power.

(b) Remove outboard aileron from wing (see paragraph 1.C.).

(c) Remove old seal with aluminum or plastic scraper.

(d) Remove residual material from seal area with liquid cleaner.

(e) Apply adhesive to mating surface of aileron and seal. Allow to dry until very tacky but will show no transfer to knuckle when touched

(f) Join seal and aileron when adhesive is still tacky with sufficient pressure for good bond

NOTE. It is not necessary to wait until adhesive cures to continue work with aileron.

(g) Install outboard aileron (see paragraph 1 D)

(h) Lower flaps.

(i) Manually rotate aileron and check for binding and chafing

(j) Retract flaps.

(k) Remove external hydraulic power.

(8) Replace aft balance panel hinge seal (9, figure 203).

(a) Provide external hydraulic power.

(b) Remove outboard aileron from wing. (See paragraph 1.C.)

(c) Spread ends of seal pin retaining grooves.

NOTE This step is not necessary when seal pin is retained with a spring pin. In this case, extract spring pin from locking hole.

(d) Drive seal pins from groove.

(e) Extract hinge seal from groove.

(f) Slide new seal into retaining grooves.

(g) Install seal pins in retaining grooves

(h) Crimp ends of retaining groove with a light hammer blow or install spring pins.

(i) Install outboard aileron. (See paragraph 1.C)

(j) Lower flaps.

(k) Manually rotate aileron and check for binding and chafing.

(l) Retract flaps.

(m) Replace access panels and covers.

(n) Remove external hydraulic power.

D. Replace Outboard Aileron Travel Stop

(1) Remove outboard aileron from wing. (See paragraph 1 C.)

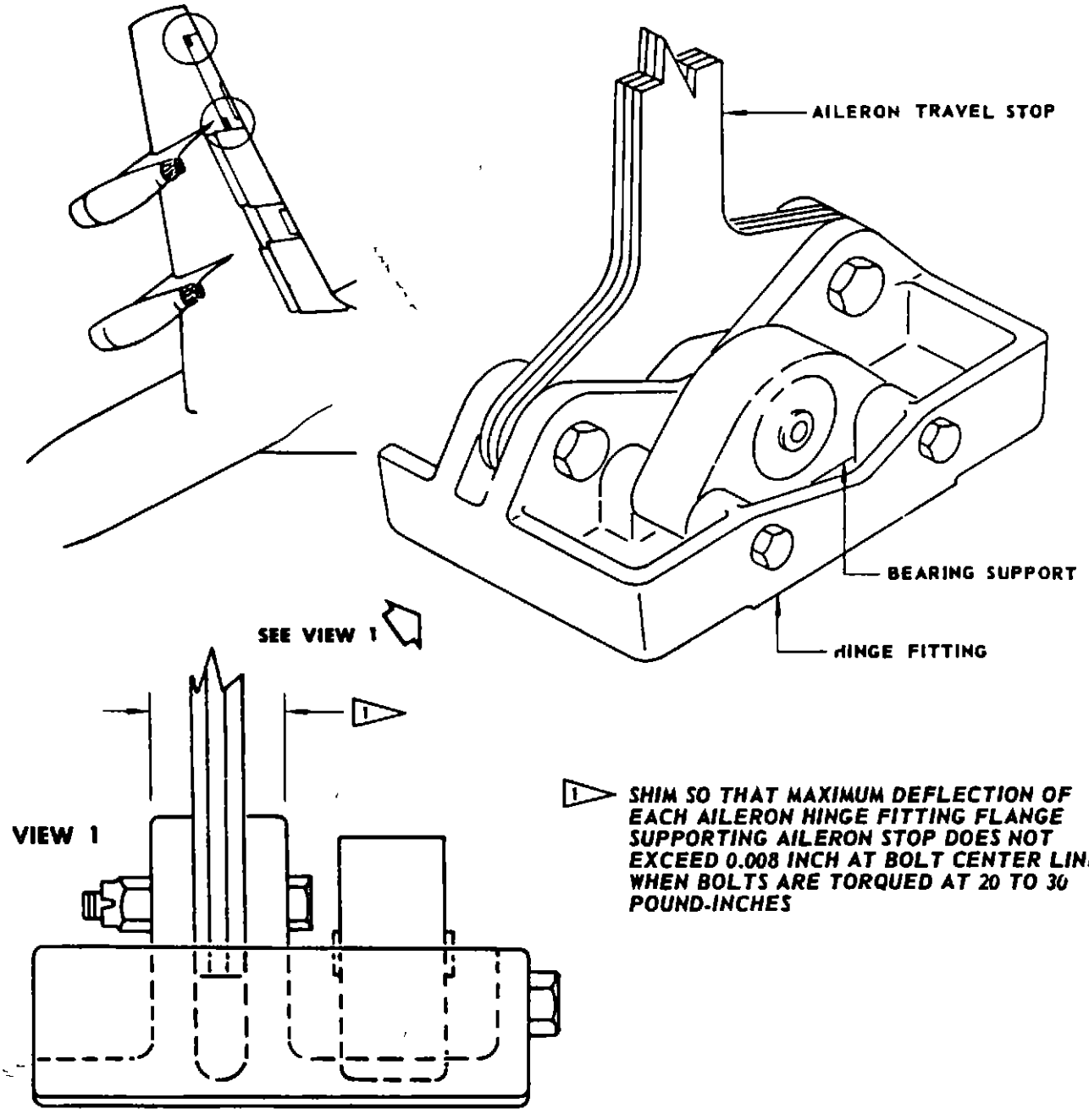
(2) Remove stop (figure 204) from hinge fitting at end of spar.

(3) Clean mating surfaces of hinge fitting and new stop.

(4) Position travel stop in hinge fitting and check that clearance between stop and hinge fitting does not exceed 0.008 inch at retaining bolt centerline.

(5) When clearance is greater than 0.008 inch, install shim stock so that maximum deflection of hinge fitting flange due to torquing retaining bolts does not exceed 0.008 inch at bolt centerline. Torque retaining bolts at 20 to 30 pound-inches

(6) Install outboard aileron. (See paragraph 1.D.)



Outboard Aileron Travel Stop Installation
Figure 204

AILERON BALANCE TAB - MAINTENANCE PRACTICES

1. Removal/Installation Aileron Balance Tab

A General

(1) For correct outboard aileron balance, the number of international orange colored adjust weights (0 to 12) bolted to the lower aft surface of the balance panel in Bay 5 must match the required number of weights called out in figure 201. The balance tab is functionally replaceable when the required number of adjust weights are installed on the balance panel in Bay 5.

B. Equipment and Materials

(1) Scale - 0 to 12 inches graduated in sixty-fourths

C. Remove Aileron Balance Tab

(1) Remove outboard aileron control mast fairing 1414 on upper surface of aileron. See Chapter 12, "Access Doors and Panels."

(2) Disconnect outboard aileron control rod at aileron.

(3) Rotate aileron to its lower limit.

(4) Disconnect aft end of balance tab push rods (2, figure 201).

(5) Disconnect bonding jumpers.

(6) Remove hinge pin retainer (3) at endboard end of aileron by removing attaching screws.

(7) Support tab and pull hinge pin (4) free.

(8) Remove tab (5) from aileron.

(9) Check new tab weight and determine from table of figure 201 if new tab will require a larger or smaller number of adjust weights.

NOTE: Spares should have tab weight and required number of adjust weights stamped on plate beneath tab hinge.

(10) Remove surplus adjust weights from the balance panel in Bay 5 (outboard). If only one weight is surplus, remove it from the outboard side of the balance panel centerline. Retain surplus weights with the old balance tab. (See figure 202.)

D. Install Aileron Balance Tab

(1) Place balance tab (5) in mounting position.

(2) Install tab hinge pin (4, figure 201).

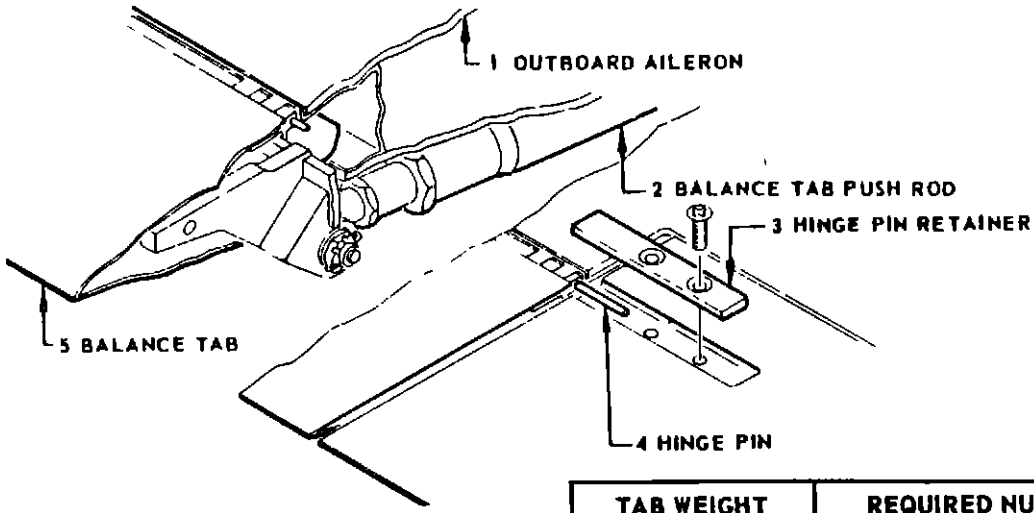
(3) Replace hinge pin retainer (3).

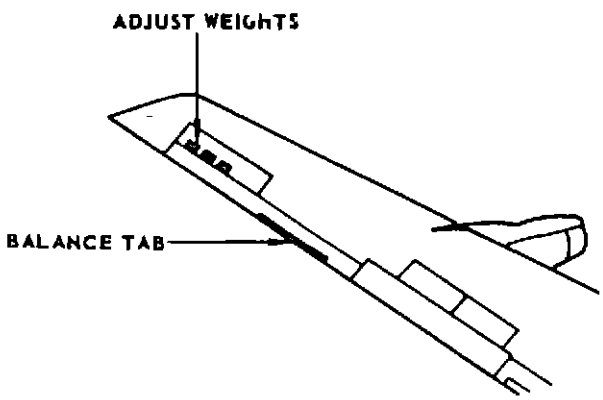
(4) Connect bonding jumpers.

(5) Rotate aileron and check for binding and chafing areas.

(6) When installing a new balance tab, bolt the balance tab adjust weights (symmetrically about the center line) to the lower aft surface of the balance panel in Bay 5. The number of weights installed will vary from 0 to 12. When an odd number of weights is installed, bolt the remaining weight to the inboard side of the balance panel. (See figure 202.)

NOTE The quantity of weights retained with the old tab will be equal to the number of weights used when the tab was installed on the aileron.





TAB WEIGHT (pounds)	REQUIRED NUMBER OF ADJUST WEIGHTS
2.50-2.69	0
2.70-2.88	1
2.89-3.08	2
3.09-3.27	3
3.28-3.46	4
3.47-3.65	5
3.66-3.85	6
3.86-4.04	7
4.05-4.23	8
4.24-4.42	9
4.43-4.62	10
4.63-4.81	11
4.82-5.00	12

Outboard Aileron Balance Tab Installation
Figure 201

(7) Plug unused holes with a bolt similar to those used to retain the adjust weights to prevent air leakage through balance panel.

(8) With flaps fully retracted and aileron bus quadrant held in neutral position within ± 5° adjust aileron control pushrod until mean trailing edge of aileron is zero to 0.36 inch down from wing chord plane and connect to aileron Apply an upward force of 6 to 8 pounds to aileron to remove down slack while making adjustment

NOTE: A straight edge may be placed flush with wing surface and aileron parallel to balance panel joints to locate wing chord plane. (See 27-14-0, figure 205)

(9) With aileron in rigged position and upload still applied, adjust balance tab pushrods (2, figure 201) until trailing edge of tab is located 0.22 (± 0.05) inch down with respect to aileron chord plane Offset at each end of tab shall not exceed 0 32 inch down nor be less than 0 12 inch down
NOTE This is a mean dimension found from two readings one at each end of tab. Tab must be readjusted if aileron position is altered.

(10) Replace fairing.

(11) Replace balance panel cover

2. Adjustment/Test Balance Tab

A Equipment and Materials

(1) Scale - 0 to 12 inch graduated in sixty-fourths

B. Test Aileron Balance Tab

(1) Provide external hydraulic power.

(2) Lower flaps.

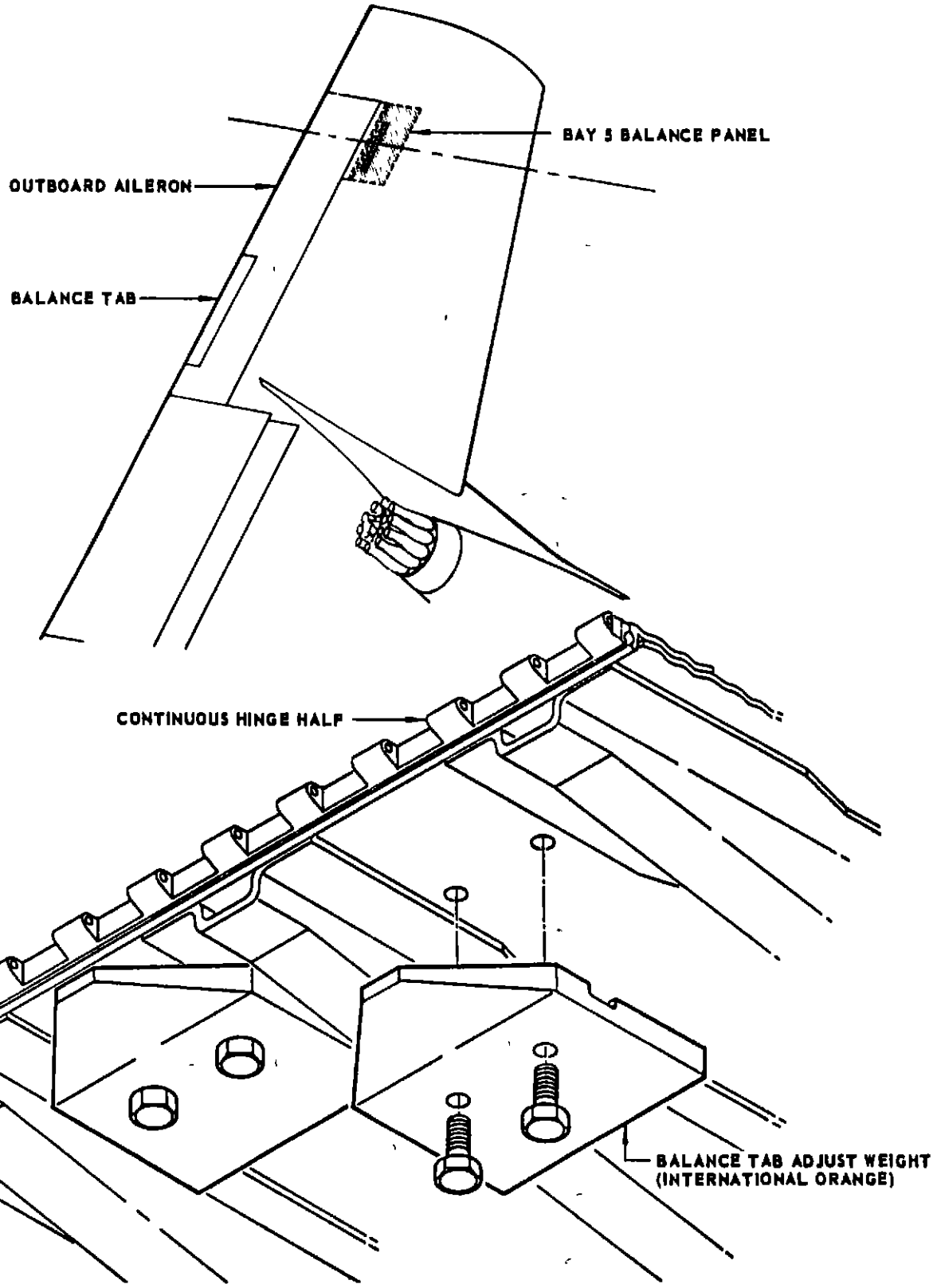
(3) Rotate outboard aileron up until stop is contacted

(4) Check that dimension from trailing edge of aileron to tab trailing edge is 1.93 (± 0.05) inches Tab shall be down with respect to aileron chord plane. 1.93 inch dimension includes 0.22 inch droop plus tab rotation of 1.71 inch (See 27-14-0, figure 209.)

(5) Rotate aileron down until stop is contacted. Dimension from aileron trailing edge to tab trailing edge shall be 1.49 (± 0.08) inches Tab shall be up with respect to aileron chord plane. Dimension of 1.49 inches includes 1.71 inch tab rotation minus 0.22 inch tab droop.

(6) Retract flaps.

(7) Remove external hydraulic power.



Balance Tab Adjust Weight Installation
Figure 202

INBOARD AILERON BALANCE PANELS AND WEIGHTS - MAINTENANCE PRACTICES

1 Removal/Installation Inboard Aileron Balance Panel and Weights

A. General

(1) The international orange colored adjust weights bolted to the lower aft surface of each balance panel are part of the control tab installation These adjust weights are always retained with their designated tab. When a balance panel is replaced, the adjust weights are removed from the old balance panel and installed on the new balance panel. The adjust weights bring the control tab into final balance about the inboard aileron hinge line. See 27-14-11, figure 201, for number of weights required for any inboard aileron control tab.

B. Remove Inboard Aileron Balance Panel and Weights

(1) Remove inboard aileron hinge access panel 1383; See Chapter 12, "Access Doors and Panels."

(2) Remove aileron snubber access panel 1361 on lower surface of wing.

(3) Remove inboard aileron balance cover access panel 1359.

(4) Remove inboard aileron mast fairing 1411 on upper surface of aileron.

(5) Disconnect bus push rod from aileron

(6) Disconnect snubber from wing

(7) Disconnect trim control mechanism and control push rod from tab control crank. See 27-14-1, figure 201.

(8) Remove aileron nose seals (3, figure 201).

(9) Remove hinge pin retainer (7) and aft balance panel seals (8)

(10) Rotate aileron to upper limit.

(11) On aft balance panel hinge, remove seal pin (6) by extracting loop and pulling pin free of hinge.

(12) Pull free side of aft balance panel hinge seal (2) from hinge.

(13) Pull aft balance panel hinge pin (5) free

(14) Separate balance panel (16) and aileron (1)

CAUTION: THE AILERON WILL NOW ROTATE FREELY AND MAY BE DAMAGED BY WIND. ATTACH SNUBBER OR CLAMP AILERON IF NECESSARY

(15) Remove forward balance panel retaining bolts (13).

(16) Move balance panel aft until forward seal retaining bolts are accessible.

(17) Remove forward seal by removing retaining bolts.

(18) Remove balance panel from balance chamber

(19) Remove tab adjust weights (14) from panel if balance panel will not be reinstalled.

C Install Inboard Aileron Balance Panel and Weight

(1) Place balance panel in balance chamber with double hinge forward

(2) Install forward balance panel seals (10, figure 201) but do not tighten retaining bolts until clearance adjustment.

(3) Install and torque double hinge retaining bolts (13) at 20 to 25 pound-inches.

(4) Rotate aileron up until nose clears structure

NOTE Snubber must be disconnected

(5) Engage balance panel hinge half with aileron nose hinge half (4)

(6) Install aft hinge pin (5) through hinge halves.

(7) Insert edge of aft hinge seal (2) in hinge retaining groove

(8) Slide seal pin (6) through hinge seal and secure by inserting end of loop in retaining hole

(9) Install aileron nose seal (3) Do not tighten bolts until seal clearance adjustment

(10) Install aft balance panel seal (8) and hinge pin retainer (7) Do not tighten bolts until seal clearance adjustment.

(11) Rotate aileron until clearance between nose seal (3) and structure is minimum and hold

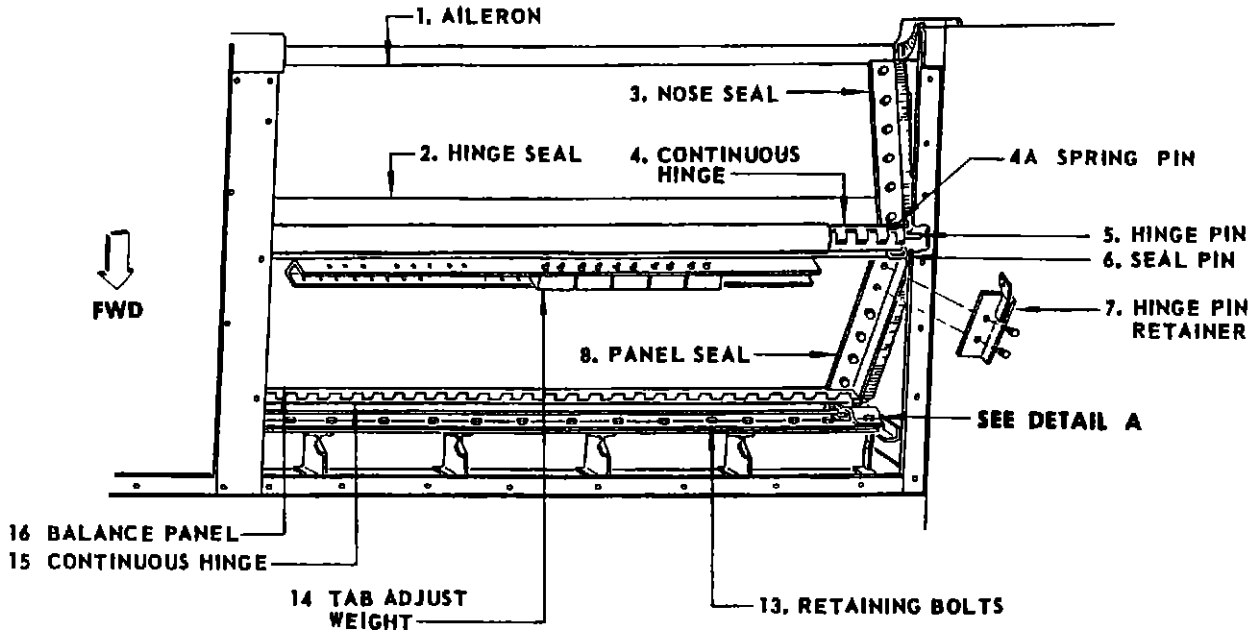
(12) Adjust all seals for 0.00 (+ 0 03/-0.00) inches clearance between structure and seals

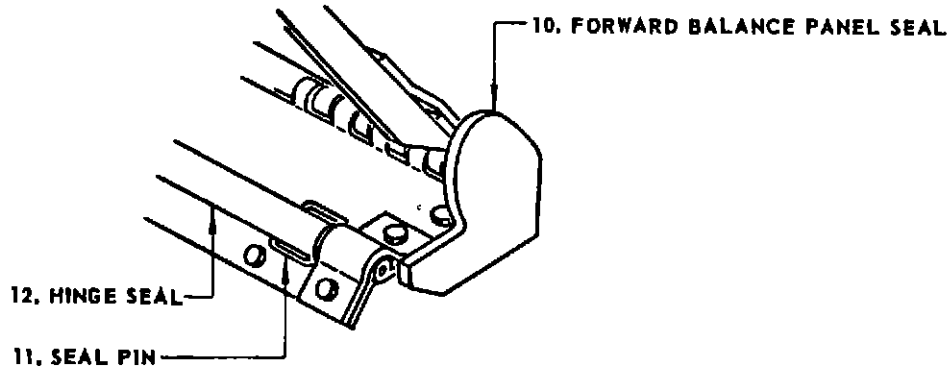
NOTE: A 0.02 inch shim may be used to regulate adjustment.

(13) Install tab adjust weights (14) if balance panel has been replaced.

(14) Connect bus push rod to aileron

(15) Attach snubber to wing.





DETAIL A

(16) Connect trim control mechanism and tab control push rods to tab control crank. (See 27-14-1, figure 201.)

(17) Rotate aileron through several cycles and check for binding and chafing.

(18) Check that full aileron travel is available between snubber stops.

(19) Replace access panels and covers.

2. Adjustment/Test Inboard Aileron Balance Panel and Weight

A. Adjust Inboard Aileron Balance Panel and Weight

(1) Remove balance panel cover 1359. See Chapter 12, "Access Doors and Panels."

(2) Loosen retaining bolts on forward balance panel seals (10, figure 201) and aft balance panel seals (8).

(3) Adjust seals for 0.00 (+0.03/-0.00) inches clearance between structure and seal.

NOTE: A 0.02 inch shim may be used to regulate adjustment.

(4) Rotate aileron through several cycles and check for binding and chafing.

(5) Check that full aileron travel is available between snubber stops.

(6) Replace cover.

3. Inspection/Check Inboard Aileron Balance Panel and Weights

A. Check Inboard Aileron Balance Panel and Weights

(1) Remove balance panel cover 1359 on lower surface of wing. See Chapter 12, "Access Panels and Doors."

(2) Check all seals for insecurity and deterioration.

(3) Install balance panel cover.

4. Approved Repairs Inboard Aileron Balance Panel and Weights

A. Replace Aft Balance Panel Seals

(1) Remove inboard aileron balance cover access panel 1359. See Chapter 12, "Access Doors and Panels."

(2) Remove aft balance panel hinge pin retainer (7, figure 201) and aft balance panel seal (8) by removing retaining bolts.

(3) Install new seal and hinge pin retainer but do not tighten bolts until final adjustment

(4) Adjust seal for 0 00 (+ 0.03/-0 00) inch clearance between seal and structure.

NOTE A 0.02 inch shim may be used to regulate adjustment.

(5) Manually rotate aileron for full travel and check for binding and chafing

(6) Replace access panel

B Replace Aft Balance Panel Hinge Seal

(1) Remove inboard aileron hinge access panel 1383. See Chapter 12, "Access Doors and Panels."

(2) Remove aileron snubber access panel 1361.

(3) Remove inboard aileron balance cover access panel 1359.

(4) Remove inboard aileron mast fairing 1411 on upper surface of aileron.

(5) Disconnect bus (upper) push rod from aileron.

(6) Disconnect snubber from wing.

(7) Disconnect trim control mechanism and control push rod from aileron control crank. See 27-14-1, figure 201.

(8) Remove aileron nose seals (3, figure 201).

(9) Remove hinge pin retainer (7) and aft balance panel seals (8)

(10) Rotate aileron to upper limit and hold

(11) On aft balance panel hinge, remove forward seal pin (6) by extracting loop end and pulling pin free from hinge.

(12) Extract spring pins (4A) from each end of aileron nose and drive aft seal pin from hinge.

(13) Remove aft balance panel hinge seal (2) by sliding seal free from hinge.

(14) Install new aft hinge seal in retaining grooves.

(15) Install spring pin (4A) in one end of aileron nose.

(16) Install aft seal pin through retaining groove and secure with second spring pin.

(17) Install forward seal pin (6) through retaining groove and secure by inserting end of loop in retaining hole.

(18) Rotate aileron down slightly.

(19) Install aileron nose seal (3) but do not tighten bolts until seal clearance adjustment.

(20) Install aft balance panel seal (8) and hinge pin retainer (7) but do not tighten bolts until seal clearance adjustment

(21) Rotate aileron until clearance between aileron nose seal and structure is minimum.

(22) Adjust seals for 0.00 (+ 0 03/-0.00) inch clearance between seal and structure

NOTE A 0.02 inch shim may be used to regulate adjustment

(23) Attach bus push rod to aileron

(24) Attach snubber to wing.

(25) Attach trim control mechanism and tab control push rod to tab control crank, see 27-14-1, figure 201

(26) Rotate aileron through several cycles and check for binding and chafing.

(27) Replace access panels and covers

C. Replace Forward Balance Panel Hinge Seal

(1) Remove inboard aileron balance panel, see paragraph 1 B

(2) Remove seal pins (11, figure 201) from forward hinge by extracting bent end from hinge and pulling pin free.

(3) Remove fabric hinge seal (12)

(4) Install new hinge seal in retaining grooves

(5) Install seal pins through retaining grooves and secure by inserting end of pins in retaining holes

(6) Install inboard aileron balance panel, see paragraph 1.C.

D Replace Forward Balance Panel Seal

(1) Remove inboard aileron balance panel, see paragraph 1 B

(2) Remove seal (10, figure 201) by removing seal retaining bolts in double continuous hinge

(3) Install new seal but do not tighten bolts until seal clearance adjustment

(4) Saturate felt with general purpose oil, MIL-L-7870, after installation

(5) Install inboard aileron balance panel, see paragraph 1 C.

(6) Adjust seal for 0 00 (+ 0 03/-0.00) inch clearance between seal and structure

NOTE A 0 02 inch shim may be used to regulate adjustment

(7) Rotate aileron for full travel and check for binding and chafing

(8) Replace panel

OUTBOARD AILERON BALANCE PANELS AND WEIGHTS - MAINTENANCE PRACTICES

1 Removal/Installation Outboard Aileron Balance Panels and Weights

A General

(1) The international orange colored adjust weights bolted to the lower aft surface of the balance panel in bay No. 5 (outboard) are part of the balance tab installation These adjust weights are always retained with their designated tab When No 5 balance panel is removed, and will not be reinstalled, the adjust weights are removed from the panel and installed on the new balance panel These adjust weights correct for balance tab weight only See 27-14-31, figure 201, for number of adjust weights required for any outboard aileron balance tab. Balance panels in bays 2 through 4 may be replaced without changing any weights After installation of a new balance panel, friction and balance is checked as outlined in 27-14-0, "Test Aileron Control System."

B Remove Outboard Aileron Balance Panel and Weights

(1) Remove required outboard aileron balance panel cover. See Chapter 12, "Access Doors and Panels"

(2) Remove aft balance panel seals (6, figure 201) or air bleed seals (7) on each side of aileron

(3) Loosen forward balance panel seals (8 and 9) at each side of balance panel

(4) Remove bonding jumper (3) from balance panel.

(5) Disconnect balance panel from aileron nose by removing attaching bolts (1).

(6) Disconnect forward edge of balance panel from structure by removing forward attaching bolts (5).

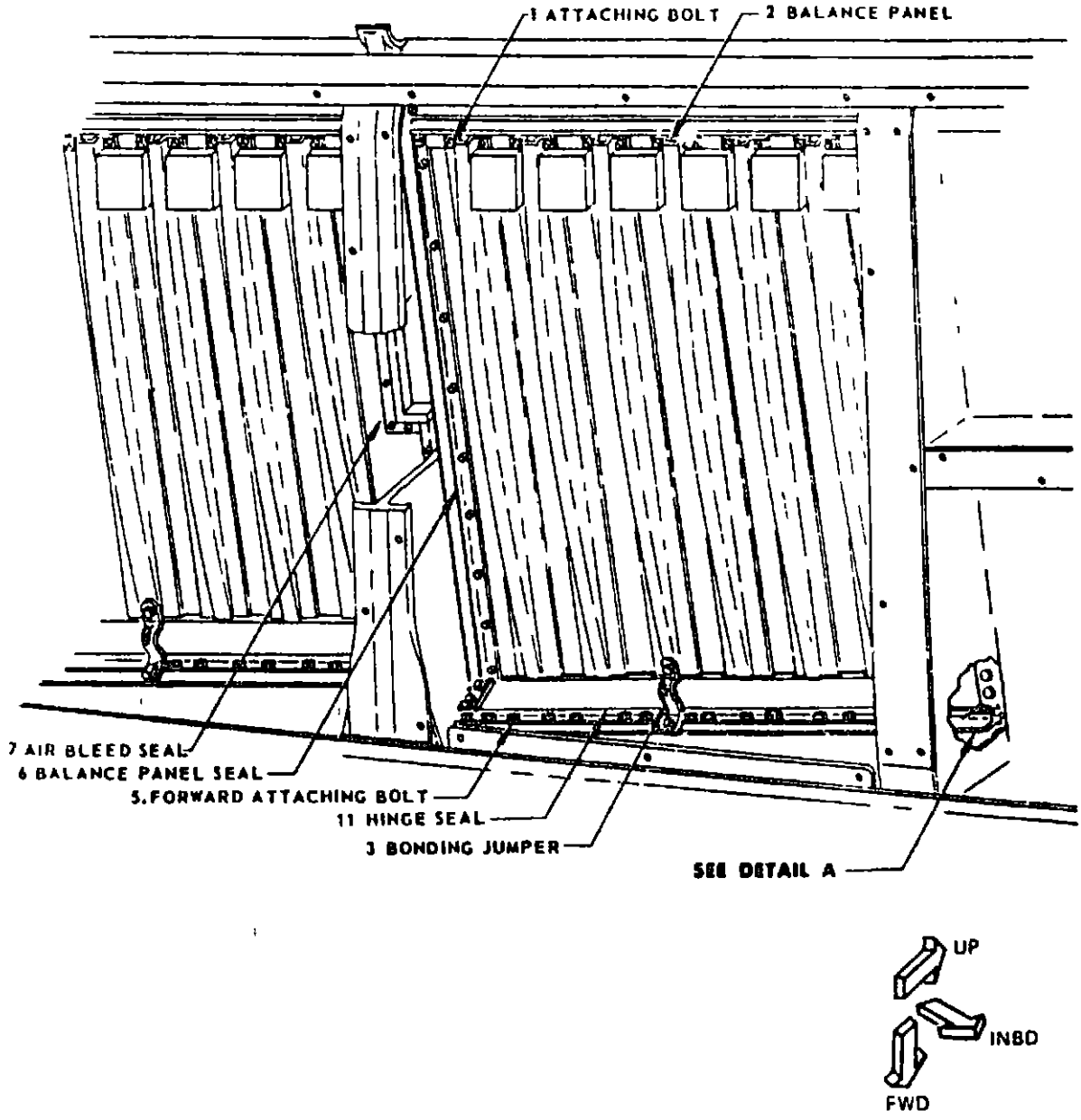
(7) Remove balance panel from wing

(8) If the balance panel in bay No. 5 (outboard) will not be reinstalled, remove the adjust weights from the panel

C. Install Outboard Aileron Balance Panel and Weights

(1) Supply external hydraulic power.

(2) If a new balance panel in bay No. 5 is being installed, bolt international orange colored balance tab adjust weights symmetrically about the center line of the balance panel and to the lower aft surface of the panel When an odd number of weights are to be installed, bolt the remaining weight to the inboard side of the balance panel. The adjust weights will number from 0 to 12, depending on tab weight. Plug unused holes with a bolt similar to those used to retain the adjust weights to prevent air leakage through balance panel (See 27-14-31, figure 202.)



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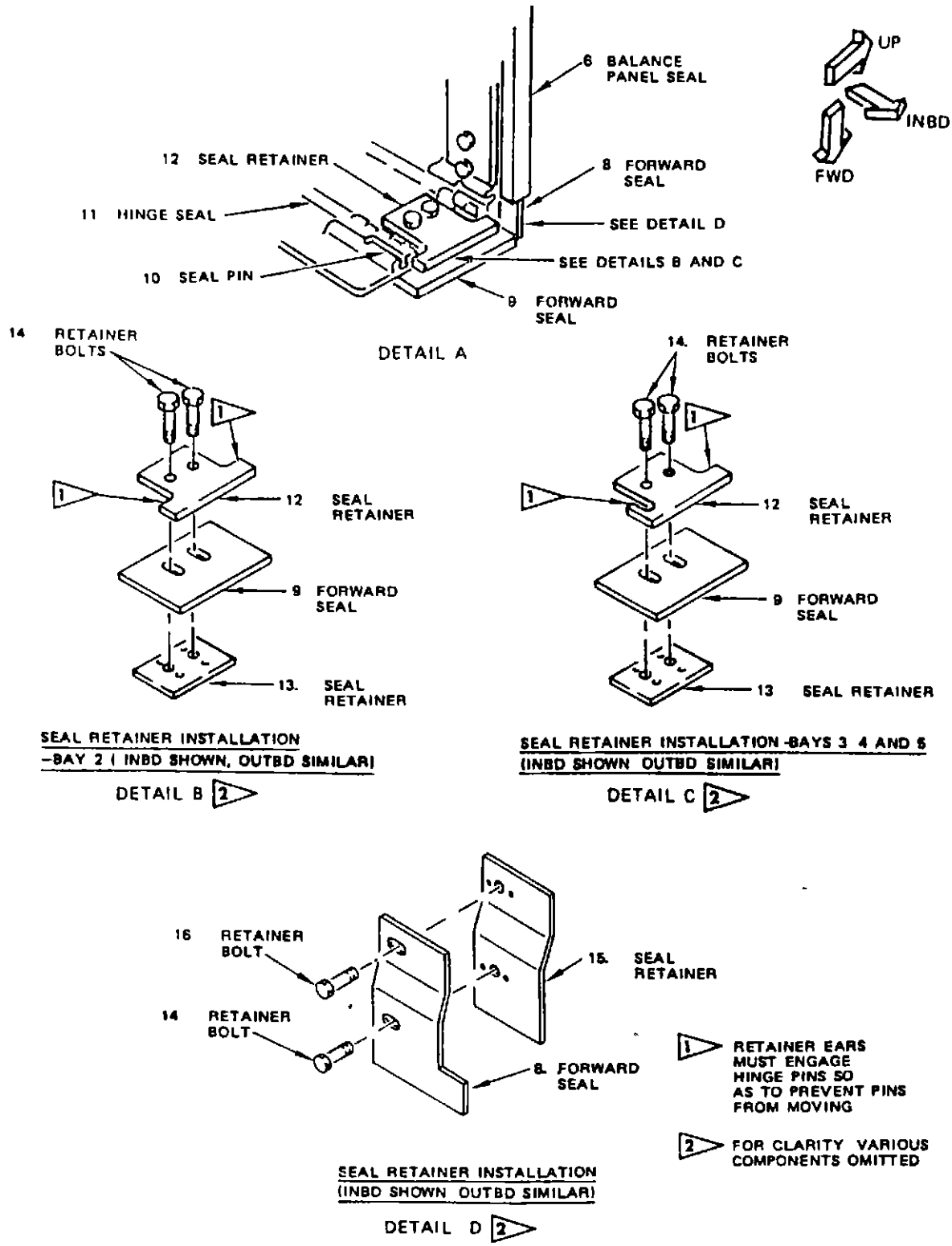
Outboard Balance Panel and Weights Installation
Figure 201 (Sheet 1)


6 BALANCE PANEL SEAL
UP
INBD
FWD
12 SEAL RETAINER
8 FORWARD SEAL
11 HINGE SEAL
SEE DETAIL D
SEE DETAILS B AND C
10 SEAL PIN
9 FORWARD SEAL
DETAIL A
14 RETAINER BOLTS
1
12 SEAL RETAINER
9 FORWARD SEAL
13. SEAL RETAINER
SEAL RETAINER INSTALLATION -BAY 2 (INBD SHOWN, OUTBD SIMILAR)
DETAIL B 2
14. RETAINER BOLTS
12 SEAL RETAINER
9 FORWARD SEAL
13 SEAL RETAINER
SEAL RETAINER INSTALLATION -BAYS 3 4 AND 5 (INBD SHOWN OUTBD SIMILAR)
DETAIL C 2
16 RETAINER BOLT
14 RETAINER BOLT
15. SEAL RETAINER
8. FORWARD SEAL
1 RETAINER EARS MUST ENGAGE HINGE PINS SO AS TO PREVENT PINS FROM MOVING
2 FOR CLARITY VARIOUS COMPONENTS OMITTED
SEAL RETAINER INSTALLATION (INBD SHOWN OUTBD SIMILAR)
DETAIL D 2

T.R. 27-389

(3) Place balance panel in mounting position (double hinge forward) with forward seals (8 and 9, figure 201) installed but retaining bolts not tightened.

(4) Attach forward end of balance panel to structure by replacing forward retaining bolts (5). Torque 10-32 bolts at 20 to 25 pound-inches.

(5) Attach bonding jumper (3) to balance panel.

(6) Attach aft end of balance panel to aileron nose by installing retaining bolts (1) Torque 10-32 bolts at 20 to 25 pound-inches.

(7) Install aft balance panel seals (6, figure 201) or air bleed seals (7) at each side of balance panel. Do not tighten retaining bolts until clearance adjustment.

(8) Adjust forward seals and aft balance panel seals for 0.00 (+0.03/ -0 00) inch clearance between seal and structure.

NOTE A 0.02 inch shim may be used to regulate adjustment

(9) Extend flaps

(10) Manually rotate aileron until clearance between air bleed seal and structure is minimum and hold.

(11) Adjust air bleed seal (7) for 0.00 (+0.03/-0 00) inch clearance between seal and structure

NOTE A 0 02 inch shim may be used to regulate adjustment.

(12) Manually rotate aileron through several cycles and check for chafing and binding.

(13) Check that full travel is available between outboard aileron stops.

(14) Check outboard aileron friction and balance as outlined in 27-14-0, "Test Aileron Control System Friction and Balance"

(15) Replace cover

(16) Retract flaps.

(17) Remove external power

2 Adjustment/Test Outboard Aileron Balance Panel and Weights

A. Adjust Outboard Aileron Balance Panel and Weights

(1) Supply external hydraulic power.

(2) Remove required outboard aileron balance panel cover. See Chapter 12, "Access Doors and Panels".

(3) Adjust forward balance panel seals (8 and 9, figure 201) for 0 00 (+0 03/-0 00) inch clearance between seal and structure.

NOTE. A 0 02 inch shim may be used to regulate adjustment.

(5) To adjust air bleed seals (7, figure 201) extend flaps to 50° position

(6) Manually rotate aileron until clearance between air bleed seal and structure is minimum.

(7) Adjust air bleed seal for 0 00 (+0 03/-0 00) inch clearance between seal and structure

NOTE A 0 02 inch shim may be used to regulate adjustment

(8) Rotate aileron through several cycles and check for chafing and binding.

(9) Check that full travel is available between outboard aileron stops

(10) Replace cover.

(11) Retract flaps

(12) Remove external power.

3 Inspection/Check Outboard Aileron Balance Panels and Weights

A. Check Outboard Aileron Balance Panels and Weights

(1) Remove outboard aileron balance panel covers See Chapter 12, "Access Doors and Panels".

(2) Check all seals for deterioration and insecurity.

(3) Replace covers

4 Approved Repairs Outboard Aileron Balance Panel and Weights (Fig 201)

A. Replace Aft Balance Panel Seals or Air Bleed Seals

(1) Supply external hydraulic power
(2) Remove required outboard aileron balance panel cover (Ref Chapter 12, "Access Doors and Panels").
(3) Remove seal (6 or 7), by removing retaining bolts
(4) Install new seal but do not tighten retaining bolts until seal clearance adjustment.
(5) Extend flaps to 50° position, if adjusting air bleed seals
(6) To adjust air bleed seals (7), manually rotate outboard aileron until clearance between seal and structure is minimum and hold.
(7) Adjust seals for 0.00 +0 03/-0 00 inch clearance between seal and structure

NOTE: A 0 02 inch shim may be used to regulate adjustment

(8) Manually rotate outboard aileron through several cycles and check for chafing and binding

NOTE: Flaps must be extended.

(9) Check that full travel is available between outboard aileron stops
(10) Replace cover.
(11) Retract flaps
(12) Remove external power

B. Replace Forward Balance Panel Seals

(1) Supply external hydraulic power
(2) Remove outboard aileron balance panel
(3) Remove forward seals (8 and 9, Detail A) by removing seal retainers (12, 13 and 15, Details B, C and D).

NOTE: It may be necessary to separate seal from retainer.

(4) Install new seals, but do not tighten retainer bolts (14 and 16, Details B, C and D) until seal clearance has been adjusted.

CAUTION: EARS ON SEAL RETAINER (12) MUST ENGAGE HINGE PINS SO AS TO PREVENT LATERAL MOVEMENT (DETAILS B AND C). INCORRECT ASSEMBLY MAY ALLOW MIGRATION OF HINGE PINS, WITH RESULTING DAMAGE.

(5) Saturate felt with general purpose oil, MIL-L-7870, after installation.

(6) Install outboard aileron balance panel.

(7) Adjust seals for 0.00 (+0.03/-0.00) inch clearance between seal and structure.

(8) Lower flaps.

(9) Manually rotate aileron and check for chafing and binding.

(10) Replace cover.

(11) Retract flaps.

(12) Remove external power.

C. Replace Forward Balance Panel Hinge Seal

(1) Supply external hydraulic power.

(2) Remove outboard aileron blance panel.

(3) Remove seal pins (10, figure 201) from retaining holes and pull pins free of hinge.

(4) Remove hinge seal (11) by sliding seal from hinge retaining grooves.

(5) Slide new seal into hinge seal retaining grooves.

(6) Install seal pins through hinge seal retaining grooves and secure by clipping end of pins in retaining holes.

(7) Install outboard aileron balance panel.

(8) Extend flaps.

(9) Rotate aileron and check for cnafing or binding.

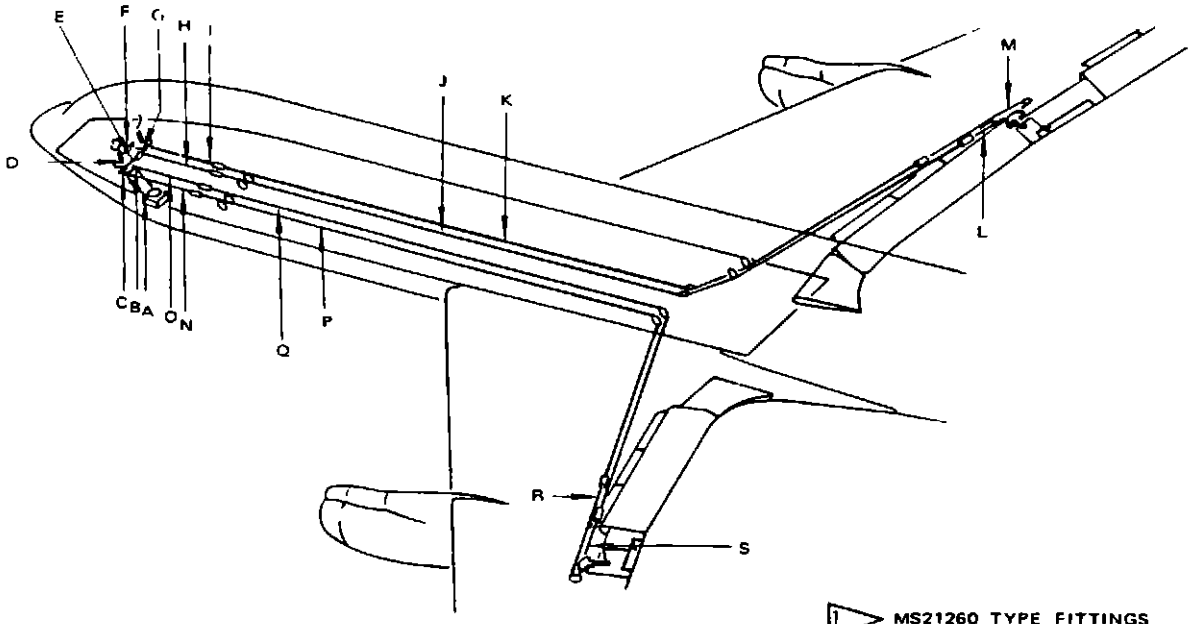
(10) Check that full travel is available between outboard aileron stops.

(11) Replace cover.

(12) Retract flaps.

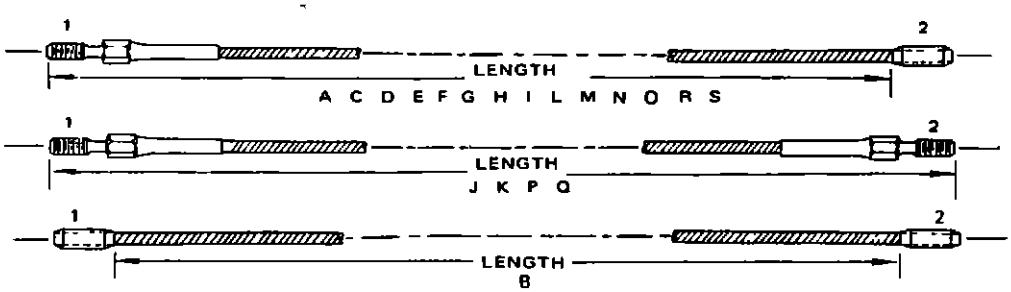
(13) Remove external power.

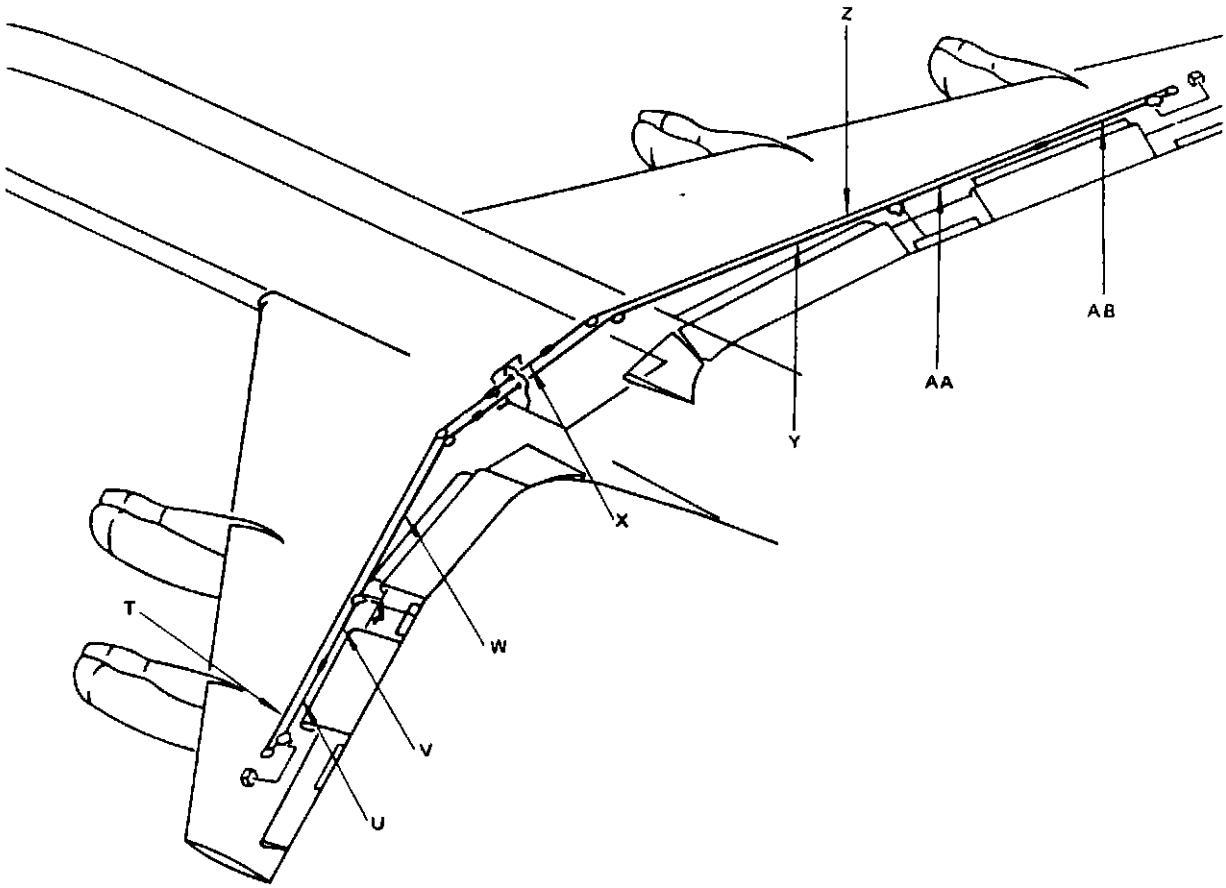
AILERON CONTROL CABLES - MAINTENANCE PRACTICES



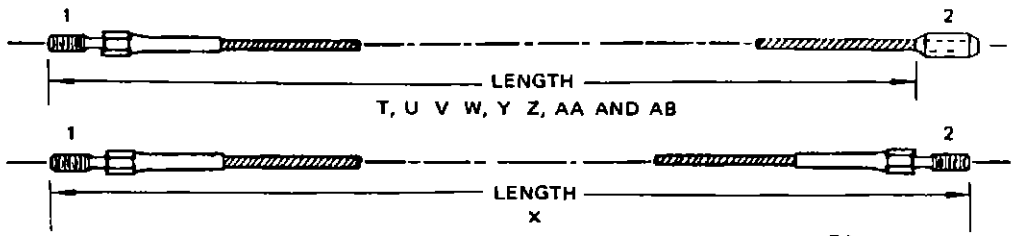
1 MS21260 TYPE FITTINGS MAY BE SUBSTITUTED FOR TYPE AN669 FITTINGS

CABLE REF	DRAWING NUMBER	NO REQ	LENGTH	CABLE SIZE	FITTINGS 1	
					1	2
A	BACC13G468 235	1	23 5 IN	1/8 7 x 19	AN669L4RH	BACT14A4
B	BACC13G470 460	1	46 0 IN	1/8 7 x 19	BACT14A4	BACT14A4
C	BACC13G469 215	1	21 5 IN	1/8 7 x 19	AN669L4LH	BACT14A4
D	BACC13G466 320	1	32 0 IN	1/8 7 x 19	AN669S4LH	BACT14A4
E	BACC13G466 320	1	32 0 IN	1/8 7 x 19	AN669S4LH	BACT14A4
F	BACC13G465 320	1	32 0 IN	1/8 7 x 19	AN669S4RH	BACT14A4
G	BACC13G465 320	1	32 0 IN	1/8 7 x 19	AN669S4RH	BACT14A4
H	BACC13G469 385	1	38 5 IN	1/8 7 x 19	AN669L4LH	BACT14A4
I	BACC13G469 285	1	28 5 IN	1/8 7 x 19	AN669L4LH	BACT14A4
J	NAS304 45 10141	1	1014 13 IN	1/8 7 x 19	AN669L4LH	AN669L4RH
K	NAS304 44 10523	1	1052 38 IN	1/8 7 x 19	AN669L4RH	AN669L4RH
L	BACC13G468 1352	1	135 2 IN	1/8 7 x 19	AN669L4RH	BACT14A4
M	BACC13G469 1735	1	173 5 IN	1/8 7 x 19	AN669L4LH	BACT14A4
N	BACC13G469 400	1	40 0 IN	1/8 7 x 19	AN669L4LH	BACT14A4
O	BACC13G469 235	1	23 5 IN	1/8 7 x 19	AN669L4LH	BACC14A4
P	NAS304 45 10407	1	1040 88 IN	1/8 7 x 19	AN669L4LH	AN669L4RH
Q	NAS304 44 10284	1	1028 4 IN	1/8 7 x 19	AN660L4RH	AN669L4RH
R	BACC13G468 1735	1	173 5 IN	1/8 7 x 19	AN669L4RH	BACT14A4
S	BACC13G469 1352	1	135 2 IN	1/8 7 x 19	AN669L4LH	BACT14A4





CABLE REF	DRAWING NUMBER	NO REQ	LENGTH	CABLE SIZE	FITTINGS	
					1	2
T	BACC13G469 7146	1	714 6 IN	1/8 7 x 19	AN669L4LH	BACT14A4
U	BACC13G626 650	1	65 0 IN	3/16 7 x 19	AN669L6LH	BACT14A6
V	BACC13G625 2173	1	217 3 IN	3/16 7 x 19	AN669L6RH	BACT14A6
W	BACC13G626 3654	1	365 4 IN	3/16 7 x 19	AN669L6LH	BACT14A6
X	NAS304 46 734	1	73 5 IN	1/8 7 x 19	AN669L4LH	AN669L4RH
Y	BACC13G625 4838	1	483 8 IN	3/16 7 x 19	AN669L6RH	BACT14A6
Z	BACC13G468 6764	1	676 4 IN	1/8 7 x 19	AN669L4RH	BACT14A4
AA	BACC13G626 2173	1	217 3 IN	3/16 7 x 19	AN669L6LH	BACT14A6
AB	BACC13G625 650	1	65 0 IN	3/16 7 x 19	AN669L6RH	BACT14A6



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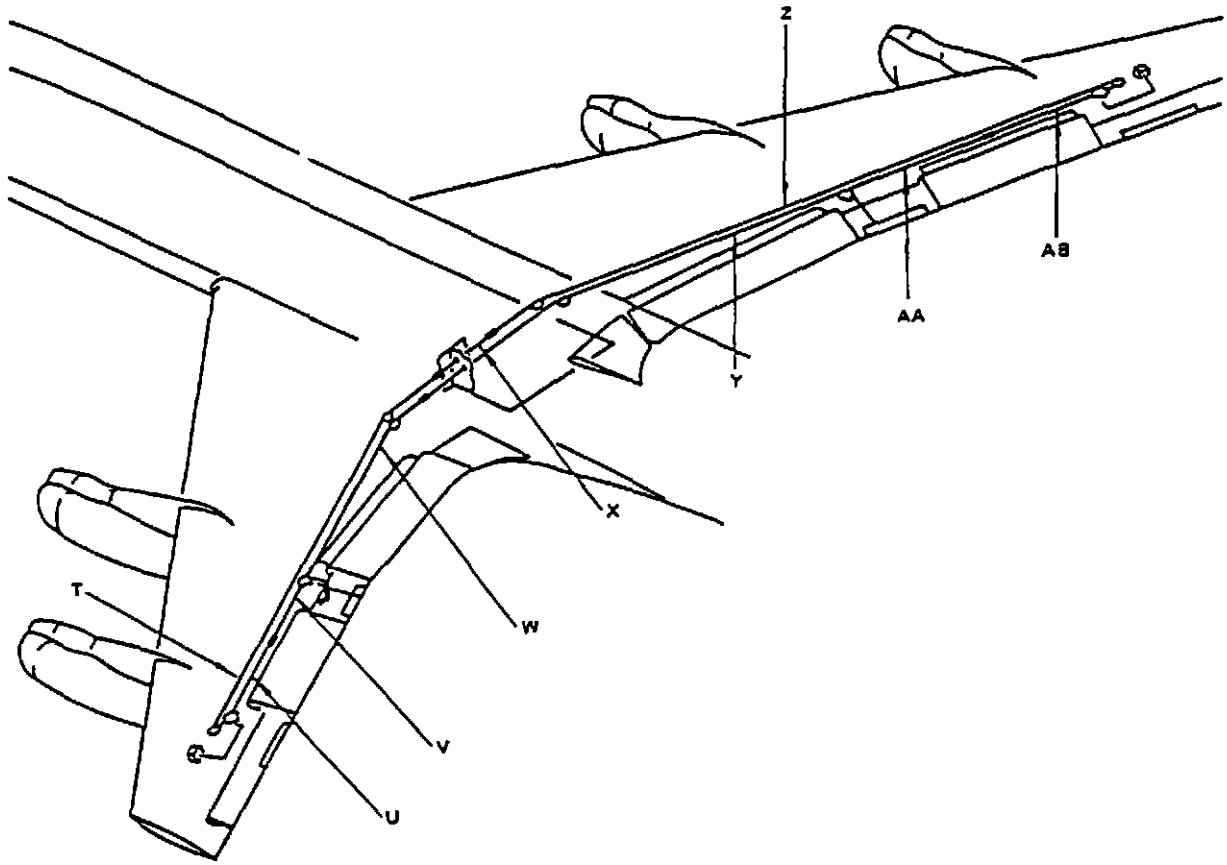
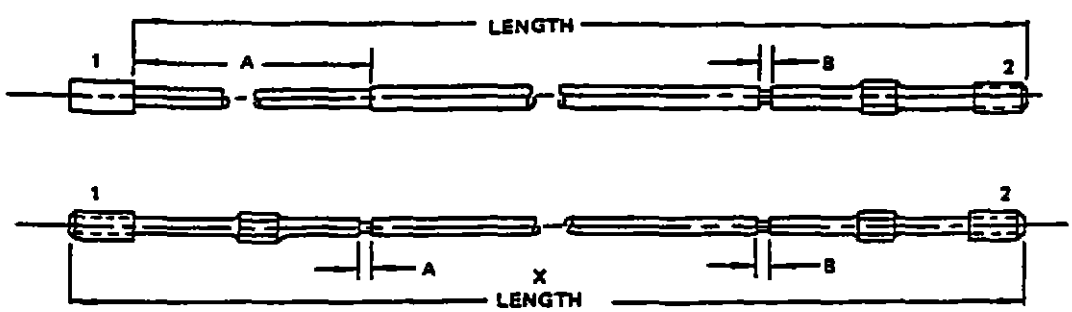
Aileron Control Cables
Figure 201 (Sheet 2)



CABLE REF	CABLE ASSY NO	NO REQ.	LENGTH (INCHES)	CABLE SIZE	DIM. A	DIM B	FITTINGS 1	FITTINGS 2
T	65 75195-43	1	714.60 ± .25	1/8	2.0	.50	BACT14A4	MS21260L4LH
U	65-75195-25	1	65 00 ± 12	3/16	20 0	.50	BACT14A6	MS21260L6LH
V	65-75195 26	1	217 30 ± .12	3/16	16 0	.50	BACT14A6	MS21260L6RH
W	65-75195-27	1	385.40 ± .20	3/16	16.0	50	BACT14A6	MS21260L6LH
X	65-75195-44	1	73 50 ± 12	1/8	50	50	MS21260L4LH	MS21260L4RH
Y	65 75195 28	1	483.80 ± 25	3/16	16 0	50	BACT14A6	MS21260L6RH
Z	65-75195-45	1	676.40 ± .25	1/8	2.0	.50	BACT14A4	MS21260L4RH
AA	65 75195-29	1	217.30 ± 12	3/16	16 0	.50	BACT14A6	MS21260L6LH
AB	65-75195-30	1	65.00 ± 12	3/16	20.0	50	BACT14A6	MS21260L6RH

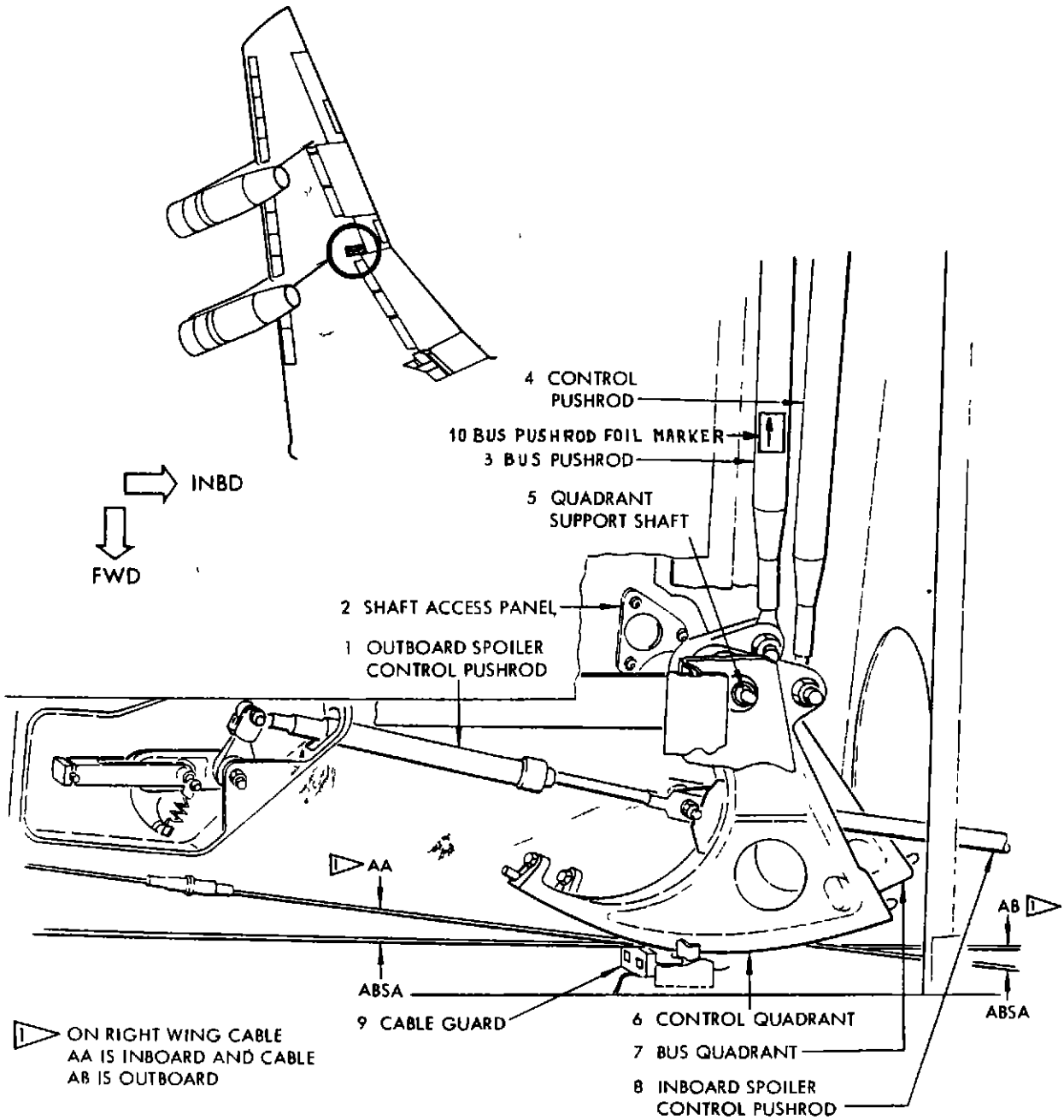
T,U,V,W,Y,Z,AA, AND AB



(11) Install outboard spoiler control push rod (1) between spoiler control valve and control quadrant

(12) Install inboard quadrant support shaft access panel (2) on upper surface of wing.

(13) Install hydraulic tubing.



(14) Remove inboard aileron hinge access panel (figure 203).

(15) Install MS 20392-4 or AN 5 rigging pin in tab control crank and crank support.

(16) Clamp inboard aileron with mean aileron trailing edge faired within 1/4 inch with wing chord plane. The wing chord plane theoretically passes through the wing trailing edge.

NOTE: A straight edge may be placed flush with wing surface and aileron to establish a reference point for trailing edge faired position (See 27-14-0, figure 206.)

(17) Place control wheels at neutral with straight edge across thumb rests.

NOTE: All thumb rests must contact straight edge.

(18) Adjust tension in cables "AA" and "AB" to specified values. (See 27-14-0, figure 204.)

(19) Remove clamps and rigging pin from inboard aileron.

(20) Locate position of each outboard aileron Mark position on a suitable reference such as a sickle type protractor attached to wing

(21) Extend flaps to 50° with hydraulic power.

(22) Lock cable slack take-up cylinder in left wheel well in extended position with rigging pin (MS20392-4 or AN 5 bolt).

NOTE: Normally, cable tension compresses spring in cylinder and extends slide. If slack exists, a force along cable "ABSB" will extend slide to clear rigging pin holes.

(23) Clamp one inboard aileron such that trailing edge is down from wing chord plane per following table.

TEMP °F	DISTANCE OF AILERON TRAILING EDGE FROM WING CHORD PLANE
110	-0.87 (± 0.05) in.
90	-0.80 (± 0.05) in
70	-0 75 (± 0.05) in.
50	-0 70 (± 0.05) in
30	-0 63 (± 0.05) in.
10	-0.57 (± 0.05) in.
-10	-0.50 (± 0.05) in.

(24) Adjust bus cable loop (cables ABSA and ABSB) to tension values shown on figure 204 by tightening all four turnbuckles. Turnbuckles are located in 27-14-0, figure 204. Airplane temperature shall be stabilized for 1 hour prior to adjusting cables.

(25) Raise or lower outboard aileron on wing with clamped inboard aileron to position equivalent to lockout by adjusting turnbuckle connecting inboard and outboard bus quadrants and turnbuckle on cable ABSB in right main gear wheel well. Position outboard aileron to proper position while maintaining specified cable tension.

(26) Raise or lower the inboard aileron for the opposite wing to proper droop position per table in step (23) by adjusting turnbuckle on cable ABSA in left main gear wheel well and turnbuckle connecting inboard and outboard bus quadrants for that wing.

(27) Raise or lower remaining outboard aileron to position equivalent to lockout by adjusting turnbuckle on cable ABSB in right main wheel well and turnbuckle connecting inboard and outboard bus quadrants for that wing while retaining specified cable tension.

NOTE: Adjusting a pair of turnbuckles, one to either side of a quadrant, affects only the position of that quadrant relative to the position of the other three quadrants. With two quadrants between a pair of turnbuckles being adjusted, position of these two quadrants will be affected equally relative to the position of the other two quadrants.

(28) Remove rigging pin from slack take-up cylinder.

(29) Manually rotate inboard aileron and control tab and check for binding or chafing.

CAUTION: INTERFERENCE MAY OCCUR BETWEEN INBOARD AILERON BUS CONTROL QUADRANT AND SPOILER HYDRAULIC TUBE ASSEMBLY AT AILERON EXTREME TRAVEL. INTERFERENCE MAY BE ELIMINATED BY REPLACING THE EXISTING TUBE ASSEMBLY WITH A REDESIGNED TUBE ASSEMBLY OR BY REPLACING THE EXISTING SPACER WITH A LARGER SPACER BETWEEN TUBING CLAMPS AT APPROXIMATE WING STATION 475. ADJUST CLAMP LOCATION AS NECESSARY TO OBTAIN THE MAXIMUM CLEARANCE BETWEEN THE AILERON QUADRANT AND THE TUBING.

(30) Test aileron control system. See 27-14-0, Test Aileron Control System.

(31) Operate all hydraulic equipment that had lines disconnected. Check for leaking fluid and equipment response.

(32) Replace access panels.

(33) Retract flaps.

(34) Remove external power.

2. Approved Repairs Inboard Aileron Control Quadrant and Bus Quadrant

A. Equipment and Materials

(1) Scale - 0 to 12 inch graduated in sixty-fourths.

(2) Aeroshell Grease 7A.

B. Replace Quadrant Bearings

(1) Remove quadrant from wing.

(2) Remove sleeve retaining bolt from quadrant (figure 202).

(3) Pull sleeve with roller staked bearing free of quadrant.

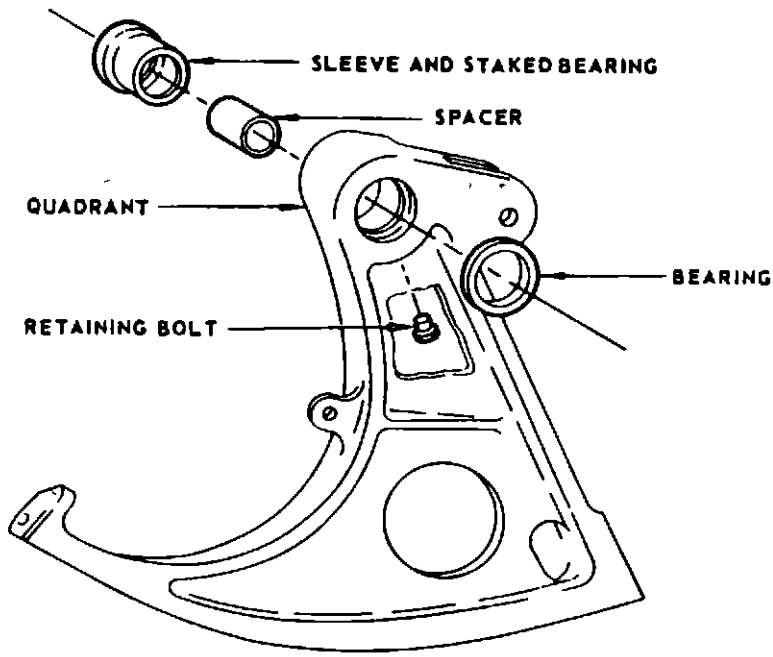
(4) Remove bearing from opposite side of quadrant.

NOTE: A spacer is installed between the two bearings of each quadrant.

(5) Install new sleeve with roller staked bearing in quadrant.

(6) Secure sleeve with retaining bolt.

(7) Lubricate bore of quadrant and circumference of new bearing with a light film of grease.



Inboard Aileron Quadrant Bearings Installation
Figure 202

(8) Install new bearing in quadrant with spacer between staked bearing and installed bearing.

(9) Install inboard quadrant in wing.

3. Removal/Installation Inboard Aileron Control Tab Linkage

A. Equipment and Materials

(1) Scale 0 to 12 inches graduated sixty-fourths

B. Remove Inboard Aileron Control Tab Linkage

(1) Supply external hydraulic power.

(2) Extend flaps.

(3) Remove inboard aileron control access panel 1357. See Chapter 12, "Access Doors and Panels."

(4) Remove inboard aileron hinge access panel. (See figures 203 and 204.)

(5) Remove inboard aileron fairing access panel.

(6) Disconnect control pushrod from control quadrant.

(7) Disconnect control pushrod and trim control mechanism from lower end of control crank.

CAUTION: TRIM CONTROL MECHANISM WILL PIVOT ABOUT FORWARD MOUNTING TIE OR BLOCK MECHANISM TO PREVENT DAMAGE.

(8) Remove control pushrod from wing.

(9) Disconnect both ends of tab pushrods and remove from aileron.

(10) Remove control crank from aileron by removing crank hinge bolt.

C. Install Inboard Aileron Control Tab Linkage

(1) Place control crank (2 cranks for left aileron) in mounting position so that rigging pin holes in crank and structure are aligned. (See figures 203 and 204.)

NOTE: Crank with large radius throws occupies outboard position.

(2) Install control crank hinge bolt and secure with retaining nut and cotter pin at outboard end.

NOTE: For left aileron, use washers on hinge bolt at inboard end of trim control crank to center tab control crank between control tab linkage stops. Tighten crank hinge bolt retaining nut 200 to 300 pound-inches torque.

(3) Install control push rod between control quadrant and lower end of crank Travel stops must be installed on each side of crank to push rod connecting bolt.

NOTE: Control rod (lower rod) is made of aluminum tubing with a nominal length of 25 95 (± 0.01) inches Bus push rod (upper rod) is made of steel tubing with a nominal length of 25 77 (± 0.01) inches.

(4) Attach trim control mechanism to crank.

(5) Clamp inboard aileron with mean trailing edge faired within 1/4 inch of wing chord plane Wing chord plane theoritically passes through wing trailing edge.

NOTE. A straight edge may be applied flush with lower wing and aileron surface to locate wing chord plane.

(6) Install rigging pins (MS20392-4 or AN 5 bolt) through structure and control crank. See figure 203 for right wing installation and 204 for left wing installation

S (7) Install control tab push rods with rod ends adjusted to fair tab trailing edge with aileron trailing edge within ± 0.05 inch. Tab
S faired with aileron is determined by average of readings at inboard and outboard end of tab.

(8) Remove rigging pin from crank.

(9) Manually rotate aileron and control tab and check for binding or chafing.

(10) Retract flaps.

(11) Remove external power.

(12) Replace access panels.

4. Inspection/Check Inboard Aileron Control Tab Linkage

A. Check Control Crank

(1) Remove hinge access panel. (See figures 203 and 204.)

(2) Check crank for evidence of shear rivet failure when misalignment is observed between the two bottom crank throws. (See figures 205 and 206.)

(3) Replace access panel.

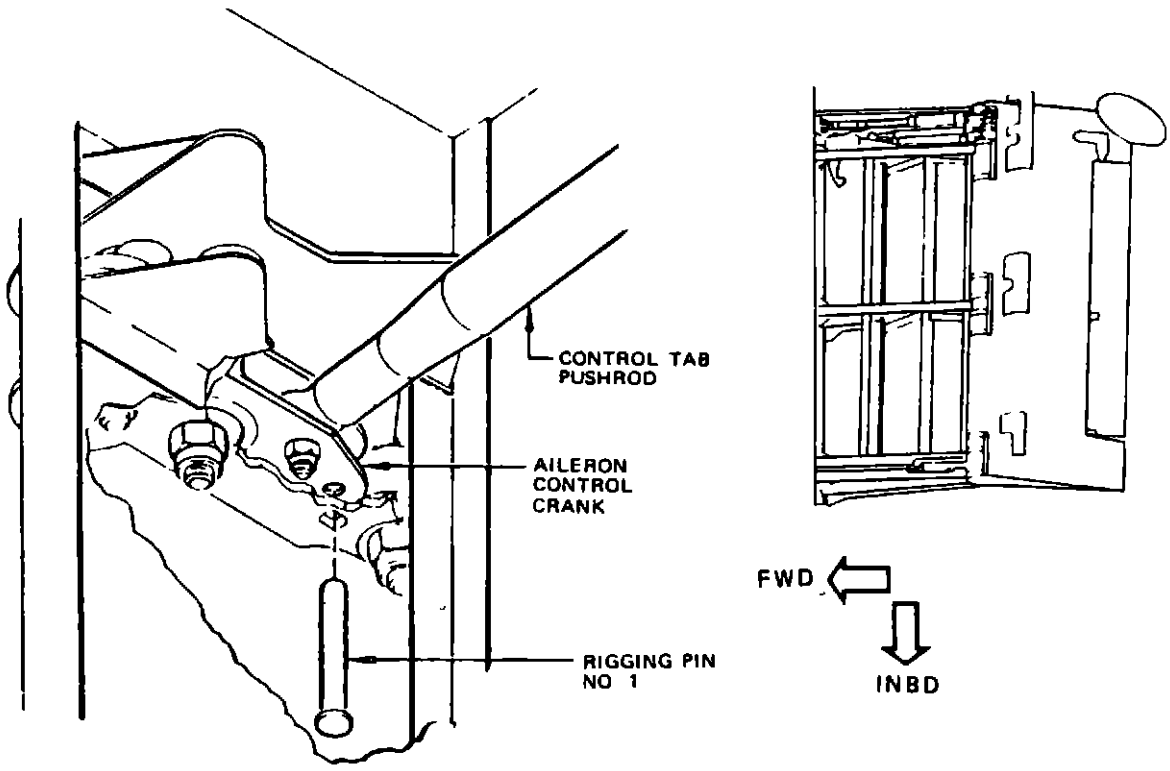
5. Approve Repairs Inboard Aileron Control Tab Linkage

A. Equipment and Materials

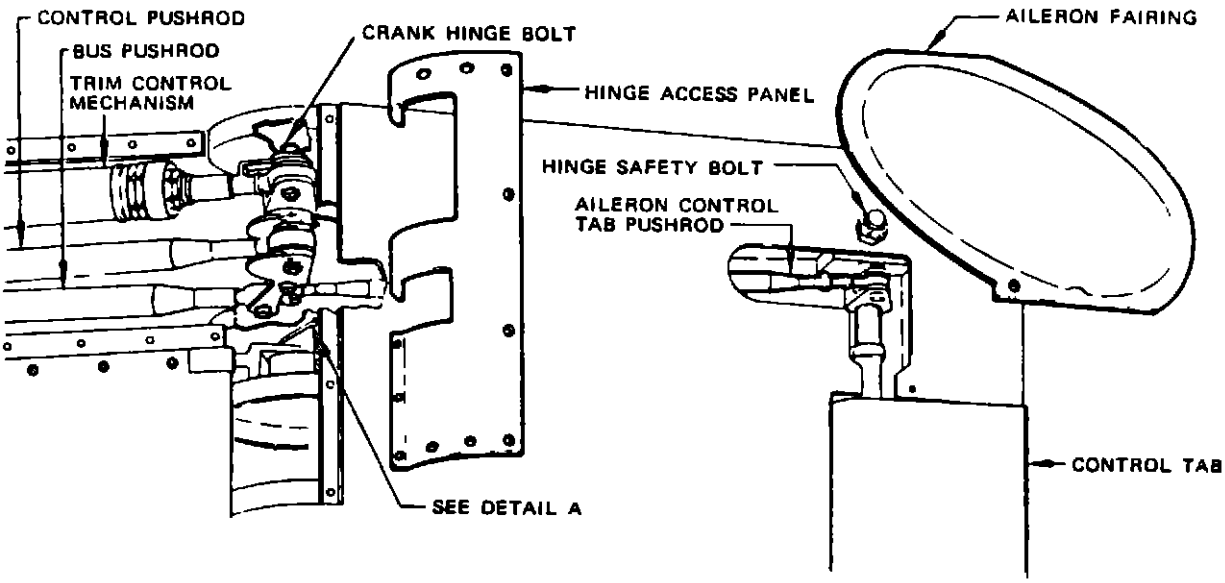
(1) Scale - 0 to 12 inches graduated in sixty-fourths

(2) Aeroshell Grease 17.

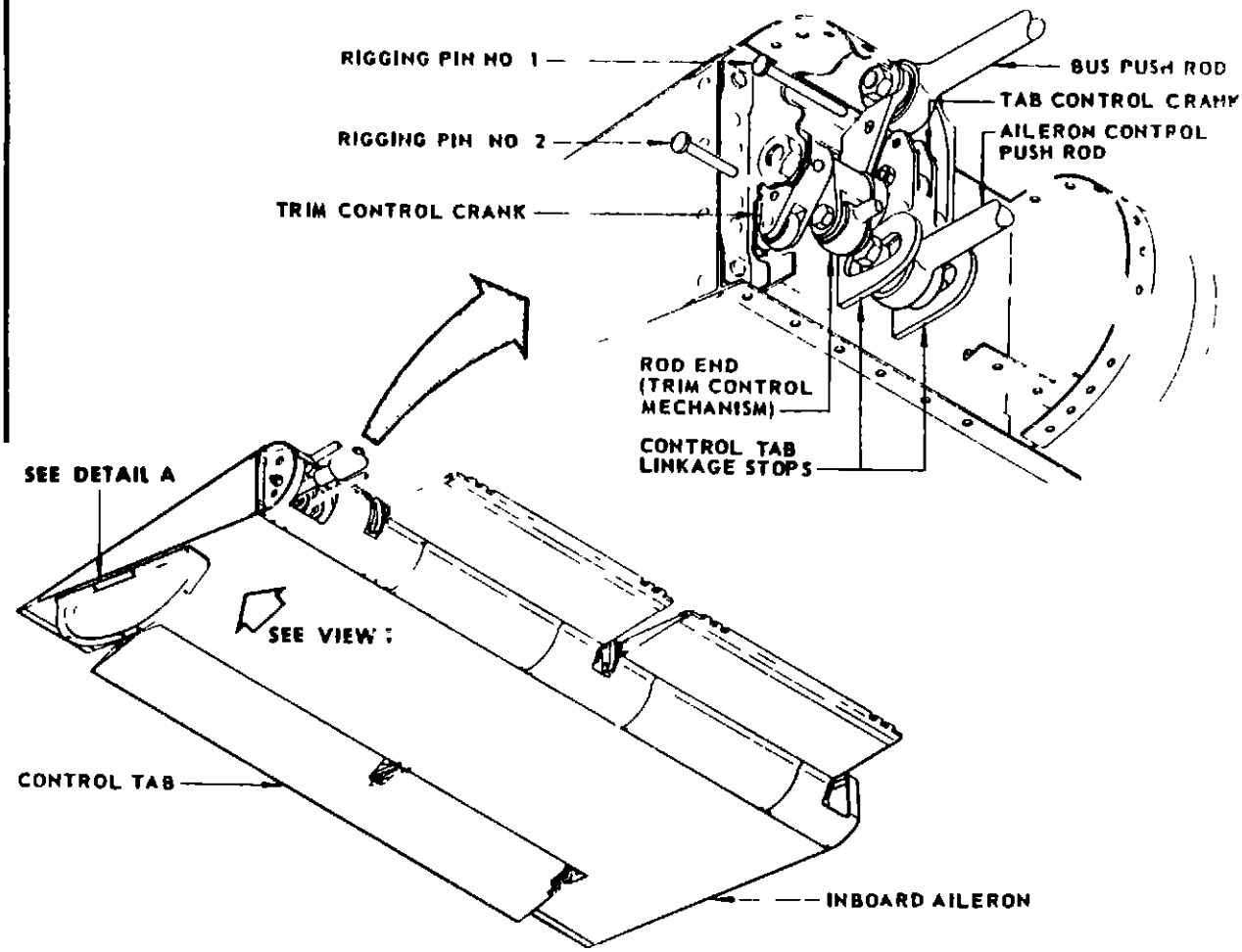
(3) Shear rivets - 5/32 DIA. Universal head, 2017-T3, MS20470D5

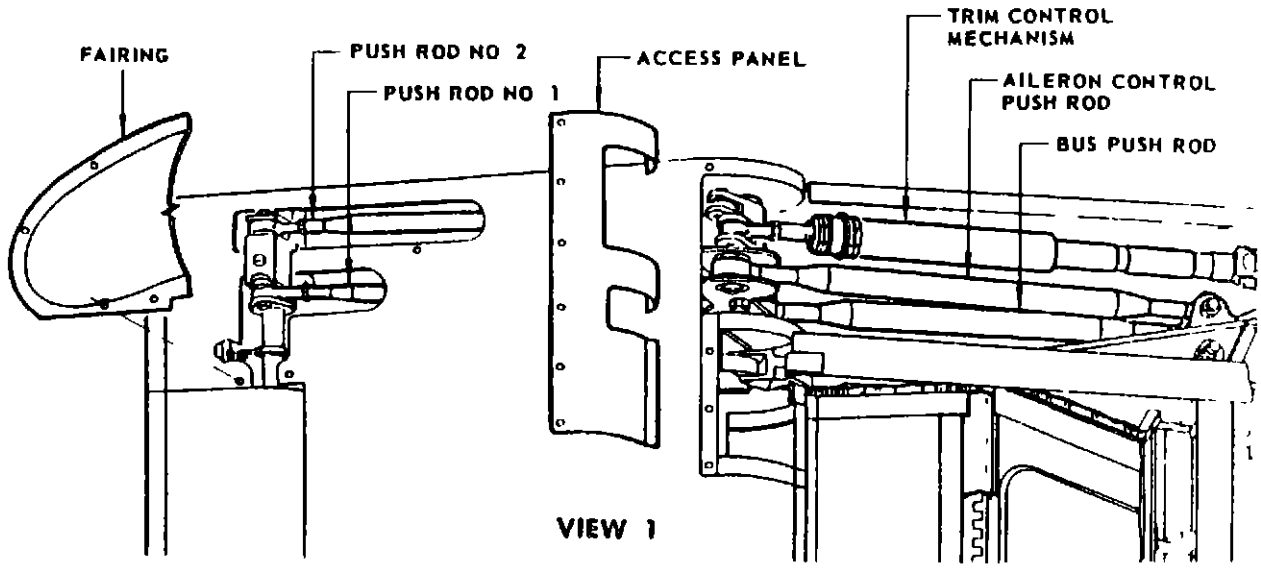


DETAIL A

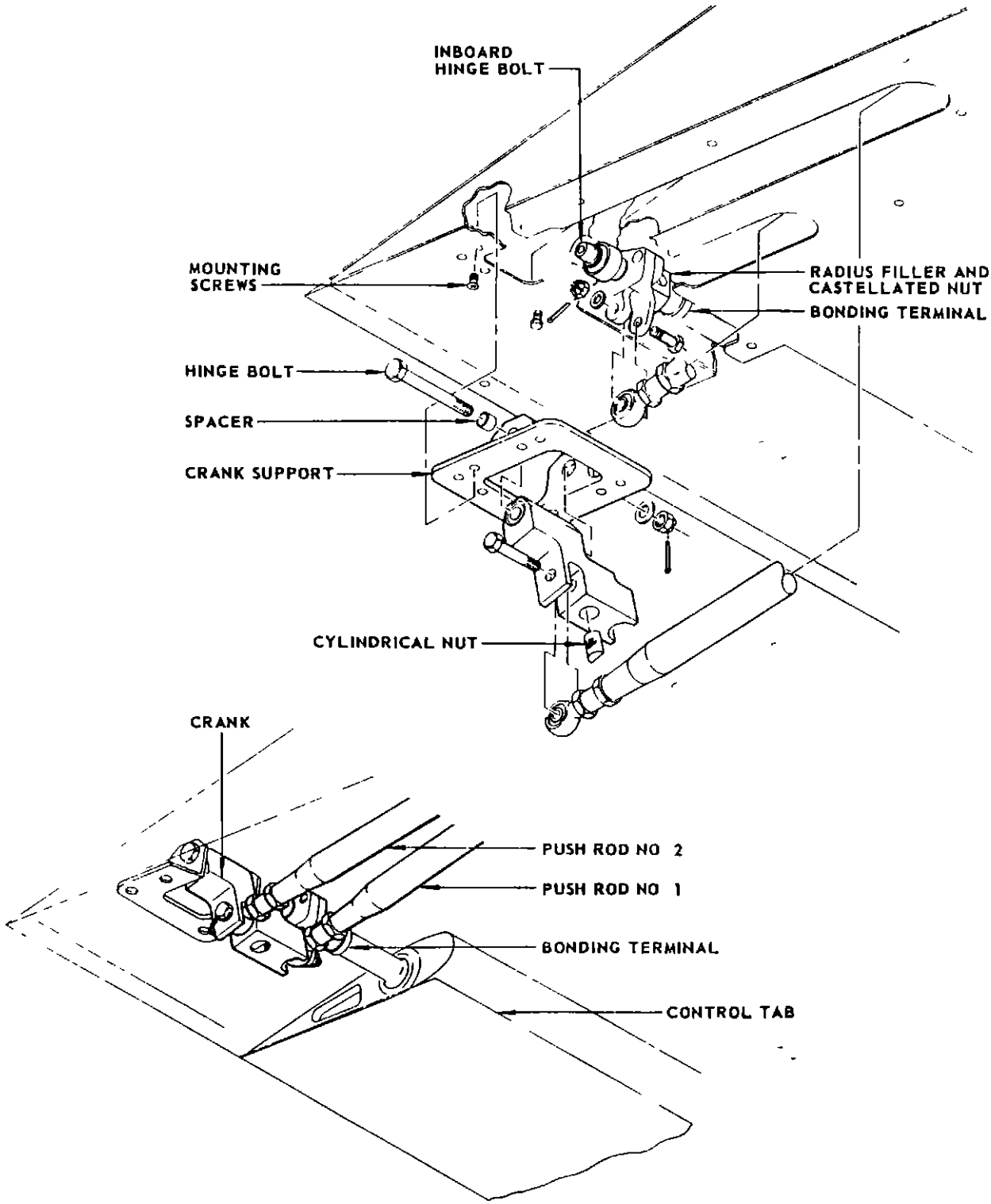


Right Inboard Control Tab Linkage Installation
Figure 203



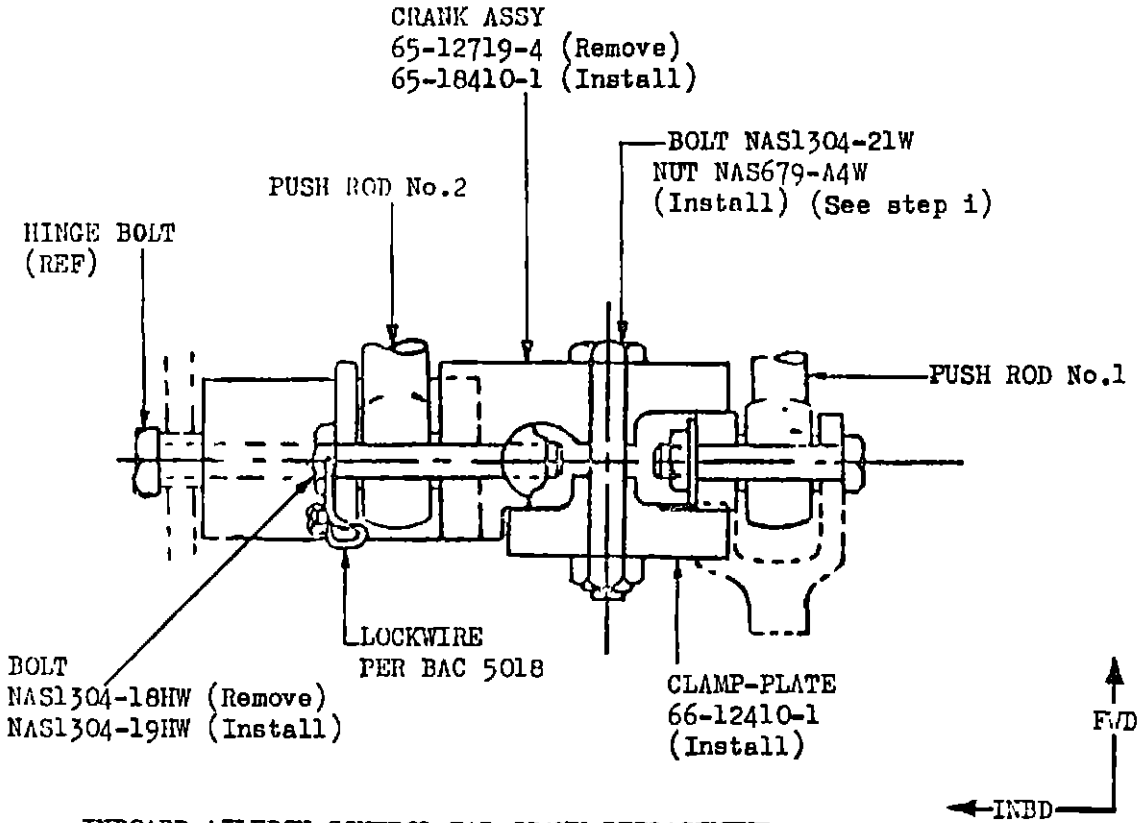


Left Inboard Aileron Control Linkage Installation
Figure 204 (Sheet 1)



DETAIL A

Left Inboard Aileron Control Tab Linkage Installation
Figure 204 (Sheet 2 of 2)



INBOARD AILERON CONTROL TAB CRANK REPLACEMENT

Figure 204 a

a) Extend flaps in accordance with Maintenance Manual procedure.

b) Remove LH side inboard aileron hinge access panel and remove aileron fairing access panel. (See figure 204a)

c) Disconnect push rod number 2 at both ends and remove for access, and remove crank hinge bolt safety screw.

d) Remove bolts securing crank support to aileron and slide crank support inboard to gain access to crank hinge bolt nut.

e) Remove crank hinge bolt and remove crank assembly 65-12719-4.

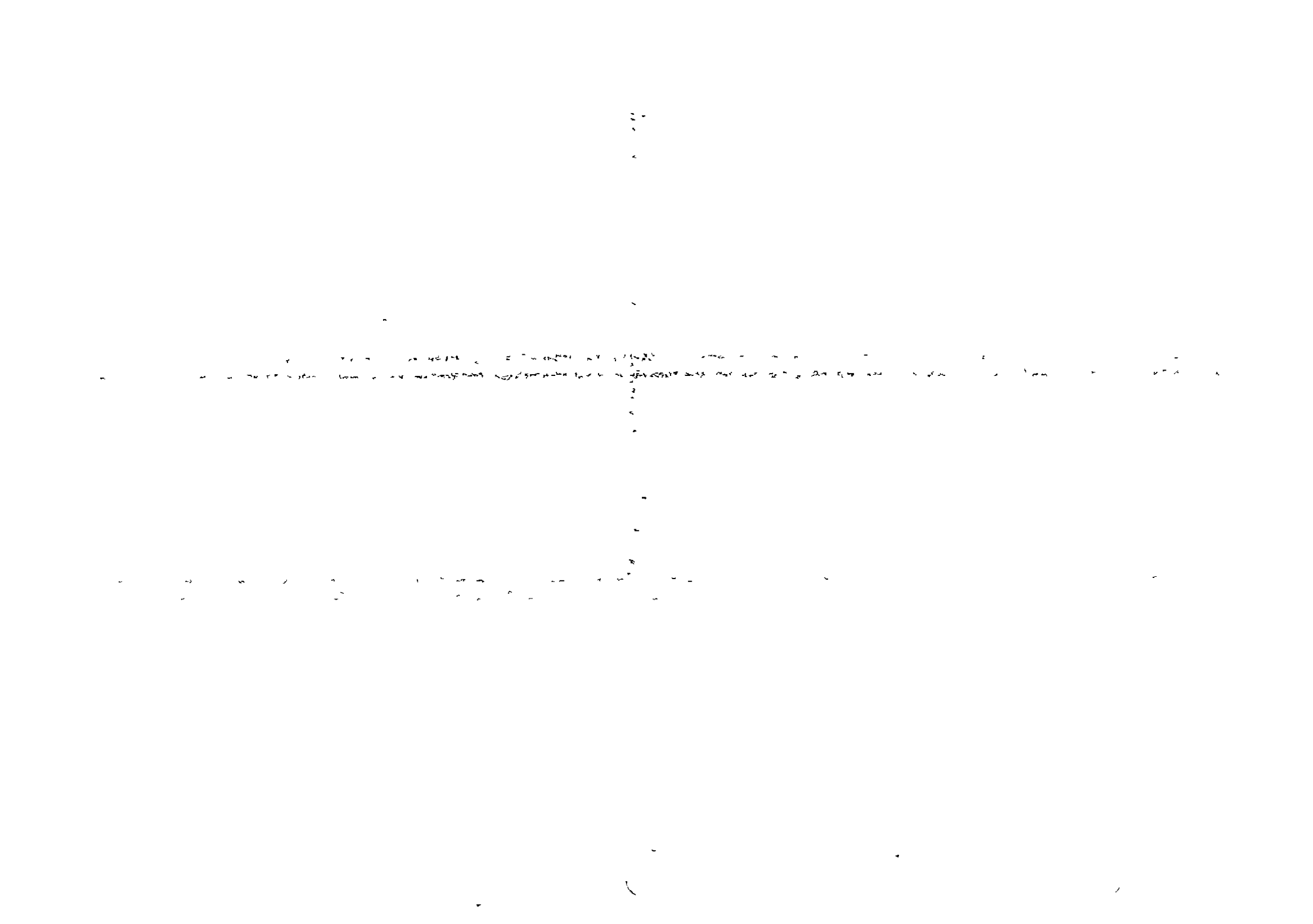
f) Install new crank assembly 65-18410-1.

g) Reinstall crank support using existing bolts. Be sure that tab of crank assembly is aft of the fitting at the aft end of the push rod No.2.

h) Reinstall crank hinge bolt safety screw.

i) Install clamp plate 66-12410-1 using bolt NAS1304-21W and nut NAS679-A4W, torque bolt to 30 to 50 inch-pounds.

j) Reinstall push rod No.2 using new bolt NAS1304-19HW and rerig aileron control tab in accordance with Maintenance Manual procedure.



B. Replace Control Crank Bearing

(1) Supply external hydraulic power.

(2) Extend flaps.

(3) Remove inboard aileron hinge access panel. (See figures 203 and 204.)

(4) Disconnect push rods and trim control mechanism from crank.

CAUTION: TRIM CONTROL MECHANISM WILL PIVOT ABOUT FORWARD MOUNTING TIE OR BLOCK MECHANISM TO PREVENT DAMAGE.

(5) Remove control crank from aileron by removing crank hinge bolt.

(6) Remove bearing from crank by pulling bearing free. (See figures 205 and 206.)

NOTE There is one roller swaged bearing for each crank throw.

(7) Lubricate bearing circumference and crank bore with a light film of grease.

(8) Install bearing in crank bore.

(9) Install crank in aileron so that rigging pin holes align with structure and secure with hinge bolt. (See figures 203 and 204.) Hinge bolt is held with nut and cotter pin at outboard end.

(10) Attach trim control mechanism and push rods to crank.

(11) Manually rotate aileron control tab and check for binding or chafing.

(12) Retract flaps.

(13) Remove external power.

(14) Replace access panel.

C. Replace Shear Rivets

(1) Supply external hydraulic power.

(2) Extend flaps.

(3) Remove inboard aileron hinge access panel (figure 203).

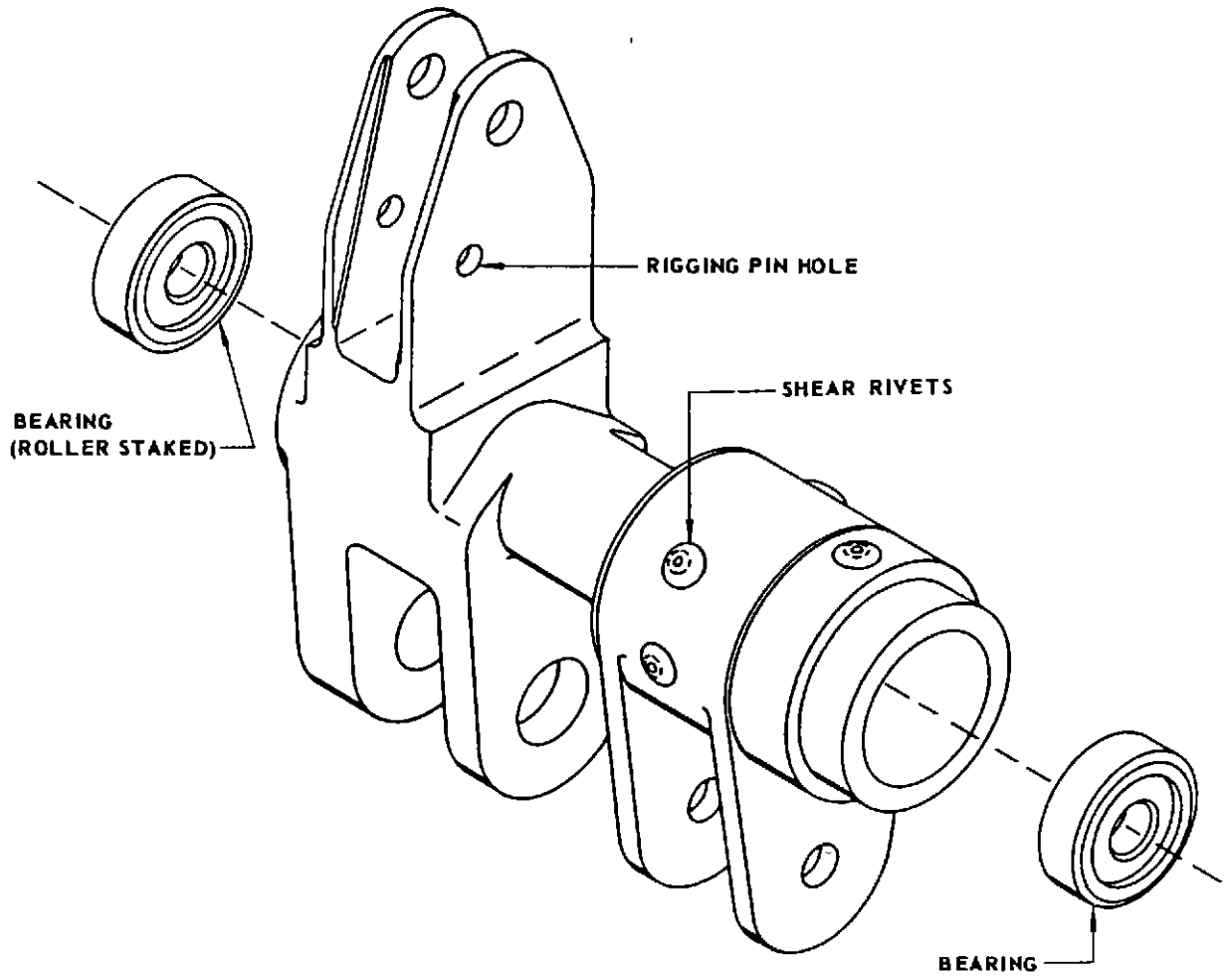
(4) Disconnect pusn rods and trim control mechanism from control crank.

CAUTION: TRIM CONTROL MECHANISM WILL PIVOT ABOUT FORWARD MOUNTING TIE OR BLOCK MECHANISM TO PREVENT DAMAGE.

(5) Remove control crank from aileron by removing hinge bolt.

(6) Replace shear rivets as required. (See figure 206.)

CAUTION THIS CRANK PROVIDES A SHEAR FUSE IN THE AILERON CONTRCL SYSTEM. SHEARED RIVETS MUST BE REPLACED WITH THE RIVETS CALLED OUT IN PARAGRAPH 5A OR AN EQUIVALENT RIVET.



Right Control Crank Bearing Installation
Figure 205

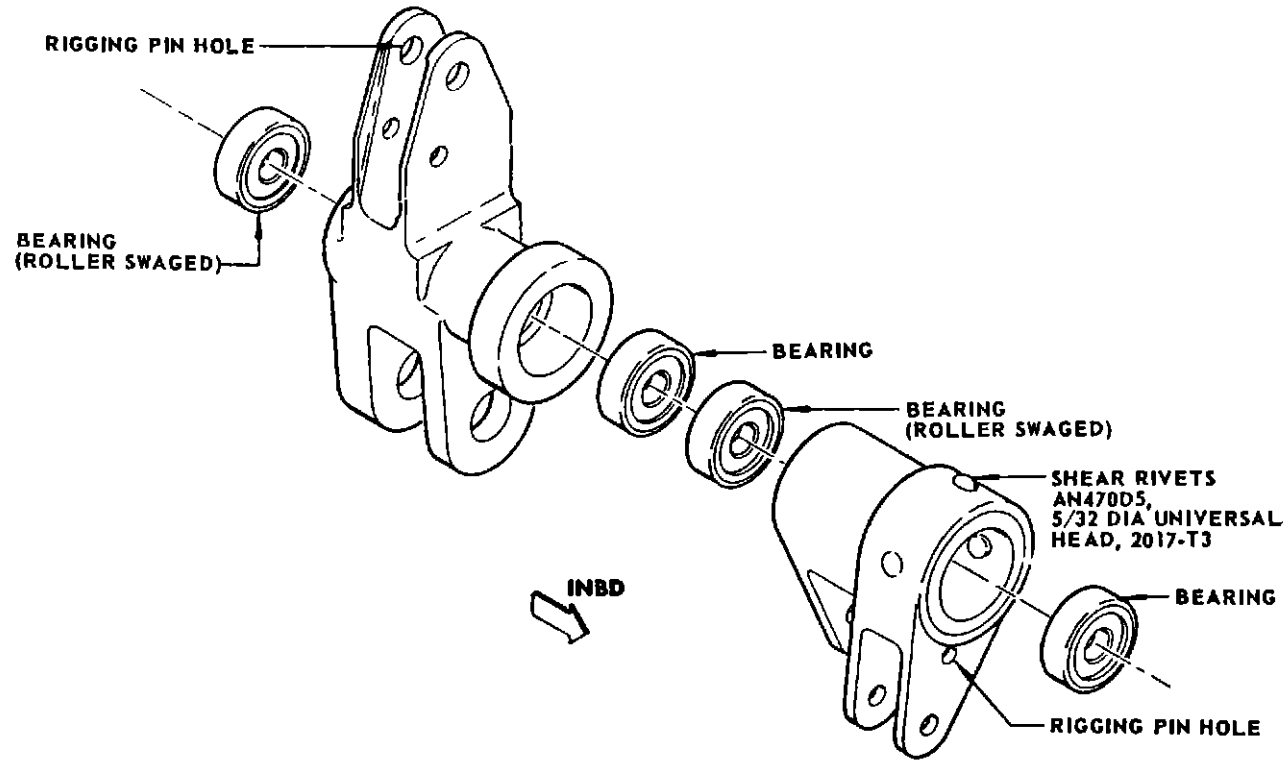
(7) Install crank in aileron with rigging pin holes aligned with structure and secure with hinge bolt. (See figures 203 and 204.) Hinge bolt is held with nut and cotter pin at outboard end.

(8) Attach trim control mechanism and push rods to control crank.

(9) Manually rotate aileron control tab and check for binding or chafing.

(10) Replace access panel.

(11) Remove external power.



Left Control Crank Bearing Installation
Figure 206

OUTBOARD AILERON CONTROL LINKAGE - MAINTENANCE PRACTICES

1. Removal/Installation Outboard Aileron Bus Quadrant

A. Equipment and Material

(1) Scale - 0 to 12 inches graduated in sixty fourths

(2) Tensiometer - 0 to 150 lb capacity

B. Remove Outboard Aileron Quadrant

(1) Open main gear wheel well doors.

(2) Remove outboard aileron control access panel 1412, 1415. See Chapter 12, "Access Doors and Panels."

(3) Remove outboard aileron control mast fairing.

(4) Remove outboard aileron control access panels 1366 and 1367.

(5) Relieve tension in bus cables ABSA and ABSB. See 27-14-0, figure 204.

(6) Disconnect lockout actuator rod (4, figure 201) from crank assembly (1).

NOTE: On turbojet airplanes, a spacer is installed between crank and leading edge flap control valve push rod.

(7) Disconnect outboard aileron control push rod (7) from quadrant link assembly (8) by removing clevis bolt.

NOTE: It may be necessary to hold the aileron in an elevated position to rotate link assembly off center for working clearance.

(8) Disconnect aft end of control push rod (7) and remove push rod from wing.

CAUTION: OUTBOARD AILERON WILL NOW ROTATE FREELY AND MAY BE DAMAGED BY WIND. CLAMP AILERON IF NECESSARY.

(9) Remove bus cables from quadrant by removing cable retaining clips.

NOTE: Removal of cable guards will facilitate cable removal.

(10) Remove quadrant hinge bolts (5 and 6, figure 201).

(11) Remove quadrant (9) from wing.

C. Install Outboard Aileron Bus Quadrant

(1) Provide external hydraulic power.

(2) Place quadrant (9) with link assembly (8, figure 201) installed in mounting position.

(3) Install upper quadrant hinge bolt (6) with shank pointing up. Attach bolt retainer.

(4) Install lower quadrant hinge bolt (5) with shank pointing down

(5) Attach bus cables to quadrant . Install cable guards, if removed Insure 0.03 (± 0.01) inch gap exists between quadrant and cable guards.

(6) Connect pushrod (7) and lockout actuator rod (4) to link assembly (8).

NOTE: It may be necessary to hold the aileron in an elevated position to rotate link assembly off center for working clearance.

(7) Adjust length of lockout actuator rod (4) until aft end of link assembly (8) is aligned with quadrant axis when rod is connected to crank assembly (1). Check that motion transferred to inboard trailing edge of outboard aileron does not exceed 0.08 inch when quadrant is rotated full travel in both directions. Flaps must be retracted.

(8) Adjust aileron control pushrod (7) to position outboard aileron trailing edge 0 to 0.36 inch down from wing chord plane when pushrod is connected to aileron.

NOTE: A straight edge may be placed flush with wing surface and aileron to establish a reference point for trailing edge faired position (See 27-14-0, figure 206.)

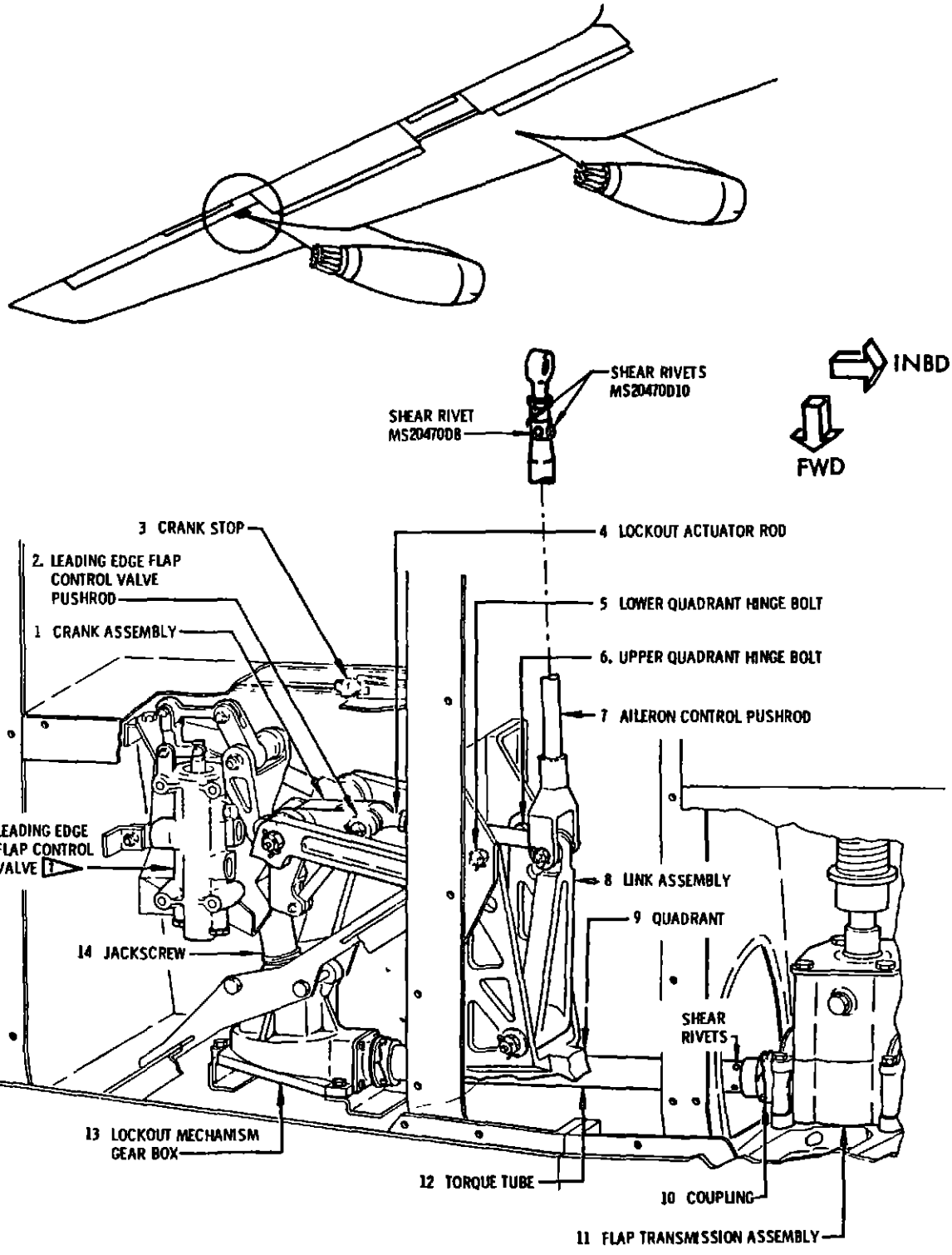
(9) Locate position of each outboard aileron Mark position on a suitable reference such as a sickle type protractor attached to wing

(10) Extend flaps to 50°.

(11) Lock cable slack take-up cylinder in extended position with rigging pin (MS20392-4 or AN5 bolt)

NOTE: Normally, cable tension compresses spring in cylinder and extends slide If slack exists, a force along cable "ABSB" will extend slide to clear rigging pin holes

1 OO-SJA THRU OO-SJG



Outboard Aileron Bus Quadrant Installation
Figure 201

(12) Clamp one inboard aileron such that trailing edge is down from wing chord plane per following table.

TEMP °F	DISTANCE OF AILERON TRAILING EDGE FROM WING CHORD PLANE
110	-0.87 (± 0.05) in.
90	-0.80 (± 0.05) in.
70	-0.75 (± 0.05) in.
50	-0.70 (± 0.05) in.
30	-0.63 (± 0.05) in.
10	-0.57 (± 0.05) in.
-10	-0.50 (± 0.05) in.

(13) Adjust bus cable loop (cables "ABSA" and "ABSB") to tension values shown on 27-14-0, figure 204, by tightening all four turnbuckles. Turnbuckles are located on 27-14-0, figure 204. Airplane temperature shall be stabilized for one hour prior to rigging cables.

(14) Raise or lower outboard aileron on wing with clamped inboard aileron to position equivalent to lockout by adjusting turnbuckle connecting inboard and outboard bus quadrants and turnbuckle on cable "ABSB" in right main gear wheel well. Position outboard aileron to proper position while maintaining specified cable tension.

(15) Raise or lower the inboard aileron for the opposite wing to proper droop position per table in step (12) by adjusting turnbuckle on cable "ABSB" in left main gear wheel well and turnbuckle connecting inboard and outboard bus quadrants for that wing.

(16) Raise or lower remaining outboard aileron to position equivalent to lockout by adjusting turnbuckle on cable "ABSB" in right main wheel and turnbuckle connecting inboard and outboard quadrants for that wing while retaining specified cable tension.

NOTE: Adjusting a pair of turnbuckles one to either side of quadrant affects only the position of that quadrant relative to the position of the other three quadrants. With two quadrants between a pair of turnbuckles being adjusted, position of these two quadrants will be affected equally relative to the position of the other two quadrants.

(17) Remove rigging pin from slack take-up cylinder and remove clamp from inboard aileron.

(18) Manually rotate outboard aileron through several cycles and check for binding or chafing.

(19) Check that outboard aileron will rotate 8-1/4 to 9-3/32 inches (19° to 21°) from faired position in either direction.

(20) Retract flaps.

(21) Replace access panels and close doors.

(22) Remove external power.

2. Approved Repairs Outboard Aileron Bus Quadrant

A. Equipment and Materials

(1) Scale - 0 to 12 inches graduated in sixty-fourths

(2) Tensiometer - 0 to 150 lb capacity

B. Replace Bus Quadrant Bearing

(1) Remove outboard aileron quadrant.

(2) Remove quadrant bearing.

(3) Install new bearing.

(4) Install outboard aileron quadrant.

(5) Replace access panels.

C. Replace Outboard Aileron Push Rod Bearing

(1) Provide external hydraulic power.

(2) Remove outboard aileron control mast fairing (1414) on upper surface of aileron. See Chapter 12, "Access Doors and Panels."

(3) Remove outboard aileron control access panel 1366.

(4) Lower flaps.

(5) Disconnect push rod (7, figure 201) from quadrant link assembly by removing clevis bolt.

(6) Disconnect aft end of push rod and remove rod from wing.

(7) Remove push rod bearing.

(8) Install new bearing.

(9) Install push rod (7) between aileron and quadrant link assembly (8).

CAUTION: THE CONTROL PUSHROD (7) PROVIDES A STRUCTURAL FUSE JOINT. THEREFORE, WHEN REPLACING THE SHEAR RIVETS DO NOT CHANGE RIVET MATERIAL OR DIAMETER. (SEE FIGURE 201.)

NOTE: Clevis bolt also retains lockout actuator rod that actuates quadrant link assembly.

(10) Manually rotate outboard aileron and check for binding and chafing.

(11) Replace access panels.

(12) Retract flaps.

(13) Remove external power.

OUTBOARD AILERON LOCKOUT MECHANISM - MAINTENANCE PRACTICES

1. Removal/Installation Gearbox Assembly

A. Equipment and Materials

(1) Gearbox lubricant.

(a) Deleted

(b) A mixture, by volume, of 1 part Aeroshell Grease 7A and 4 parts MIL-L-7808 lubricating oil.

(2) Scale - 0 to 12 inch graduated in sixty-fourths

B. Remove Gearbox Assembly

(1) Provide external hydraulic power.

(2) Remove outboard aileron control access panel 1415. See Chapter 12, "Access Doors and Panels."

(3) Remove outboard aileron control access panels 1366 and 1367.

(4) Remove lockout mechanism torque tube (12, figure 201) by removing coupling (10) retaining screws and sliding coupling back.

NOTE: Extending flaps slightly will rotate torque tube exposing coupling retaining screws that are difficult to reach.

(5) Separate jackscrew (14) from gearbox (13) by removing retaining bolt, sliding retaining ring back on jackscrew and extracting coupling pin

(6) Support gearbox and remove mounting bolts.

(7) Remove gearbox from wing.

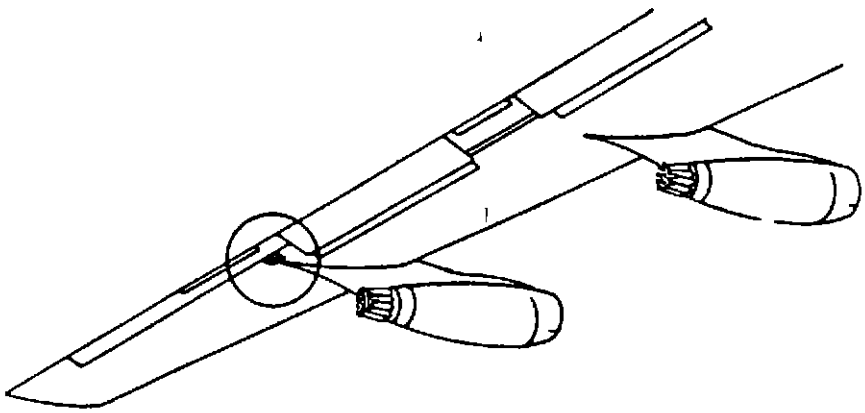
C. Install Gearbox Assembly

(1) Provide external hydraulic power.

(2) Elevate gearbox so that upper filling plug is 1/4 inch above horizontal position. Remove filling plug and check that fluid is at the overflow point. Replenish with gearbox lubricant if level is low.

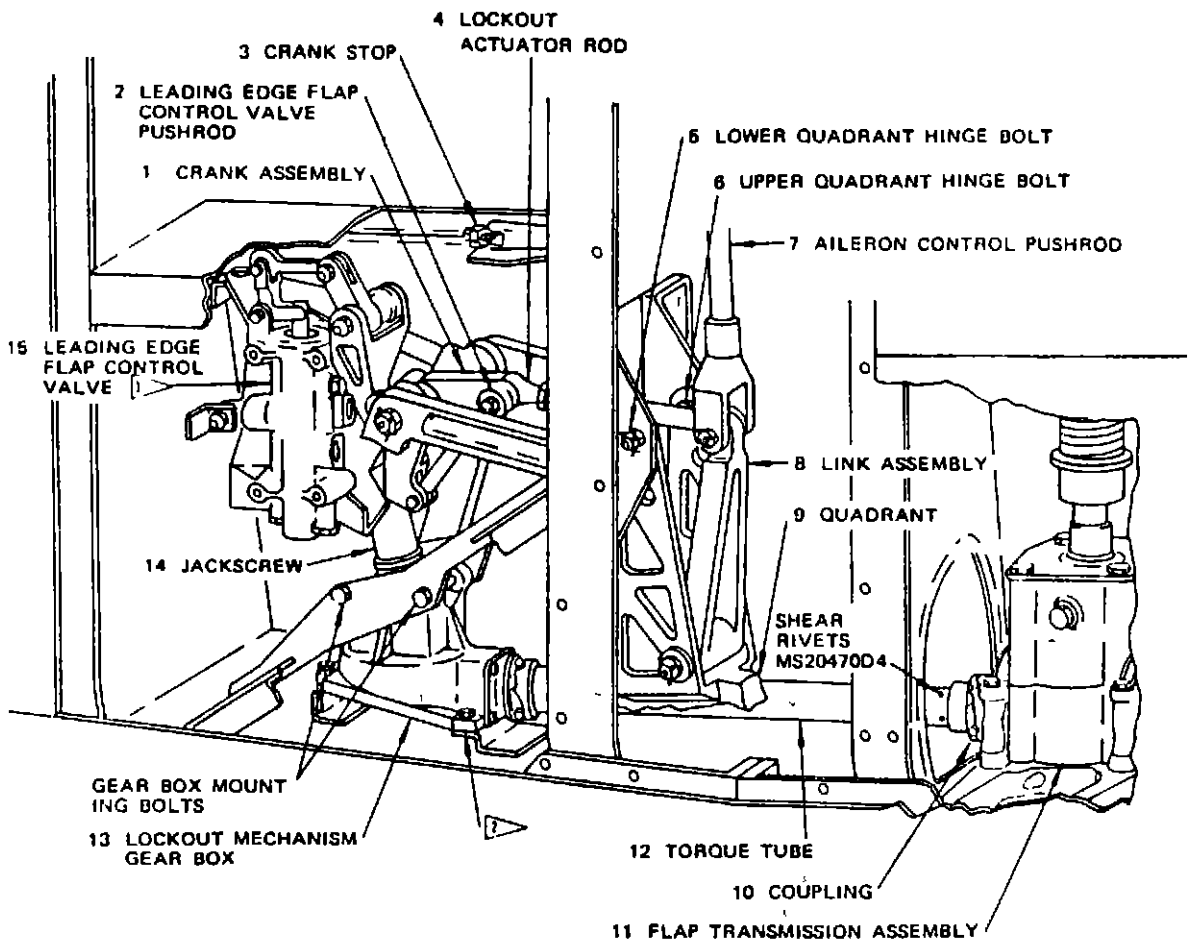
(3) Place gearbox in mounting position and secure with retaining bolts.

CAUTION: AN IMPROPERLY RIGGED OUTBOARD AILERON AND INSUFFICIENT SHIMMING TO ALIGN MOUNTING BOLTS WITH GEARBOX LUGS AND STRUCTURE MAY RESULT IN FAILURE OF LUGS DUE TO OVERLOADING.



⌈1⌋ > 00-SJA THRU 00-SJG.

⌈2⌋ > *Shim as required to align mounting bolts with gear box lugs and structure*



Outboard Aileron Lockout Mechanism Installation
Figure 201

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(4) Attach jackscrew (14, figure 201) to gearbox by installing coupling pin through jackscrew and gearbox output shaft, sliding retaining ring over pin and installing retaining bolt through ring and shaft.

(5) Retract crank stop bolt (3) about 2 turns away from crank.

(6) Rotate gearbox until jackscrew has positioned quadrant link assembly at neutral or lock out position. Outboard aileron control push rod (7) pivot point is aligned with quadrant axis (5 and 6). Rotate quadrant full travel in both directions and check that motion transferred to inboard trailing edge of aileron does not exceed 0.08 inch Assure that backlash is removed from outboard aileron when motion is measured.

(7) With link assembly in position as noted in step (6), adjust crank stop bolt (3) until positive contact is made between bolt head and crank

(8) After positive contact has been established, back off jackscrew by rotating the gear box input shaft several turns.

(9) Extend crank stop bolt (3) 45° (± 5°), about 1/8 turn, past the stop position (towards crank) as noted in step (7). Tighten jam nut and lockwire stop bolt.

(10) With torque wrench and adapter, determine the friction torque required to rotate the gear box and jackscrew in the screw extending direction before the stop bolt is contacted. The accuracy of the measurement is to be within ± 2.0 pound-inches torque. Record the friction torque value.

(11) Rotate the lockout gear box input shaft until the stop bolt is contacted and continue rotation until a torque preload of 15 (± 2) pound-inches plus the friction torque determined in step (10) is applied to the input shaft This will preload the outboard aileron lockout mechanism against the stop bolt If the required torque is exceeded, back off the input shaft retracting the jackscrew and reapply the required torque.

CAUTION: TO PREVENT DAMAGE TO LINKAGE AND STRUCTURE, DO NOT EXCEED 45 POUND-INCHES APPLIED TORQUE.

(12) Retract flaps with hydraulic power.

(13) Install torque tube (12) between gear box assembly and outboard flap transmission assembly (11) with inspection hole and shear rivets at inboard end of tube.

(14) Check that link assembly (8) has not deviated from the neutral position by rotating bus quadrant (9) full travel and observing that motion transferred to inboard trailing edge of outboard aileron does not exceed 0.08 inch.

(15) Install coupling (10) retaining screws and lockwire screw heads together.

(16) Extend flaps

(17) Manually rotate outboard aileron through several cycles.

(18) Check for binding and chafing

(19) Check that the outboard aileron will rotate 8-1/4 to 9-3/32 inches (19° to 21°) between stops in either direction from the faired position. Displacement measured at trailing edges of aileron and wing

(20) Replace access panels.

(21) Retract flaps.

(22) Check that outboard aileron returns to faired position regardless of inboard aileron position.

(23) Remove external power

2 Removal/Installation Jackscrew Assembly

A Equipment and Materials

(1) Scale - 0 to 12 inches graduated in sixty-fourths

B. Remove Jackscrew Assembly

(1) Provide external hydraulic power.

(2) Remove outboard aileron control access panels 1366 and 1367. See Chapter 12, Access Doors and Panels.

(3) Remove outboard aileron control access panel 1415.

(4) Lower flaps.

(5) Separate jackscrew (14, figure 201) and gearbox (13) by removing retaining bolt, sliding retaining ring back on jackscrew and extracting coupling pin

(6) Disconnect jackscrew from crank.

(7) Remove jackscrew from wing

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C. Install Jackscrew Assembly

(1) Provide external hydraulic power.

(2) Place jackscrew (14, figure 201) in mounting position with clevis lip under crank arm.

(3) Connect jackscrew to crank with clevis bolt.

(4) Attach jackscrew to gearbox (13) assembly by installing coupling pin through jackscrew and gearbox output shaft, sliding retaining ring over pin and installing retaining bolt.

NOTE: It may be necessary to rotate jackscrew to obtain an overall length that will permit attachment.

(5) Remove torque tube (12) from outboard flap transmission assembly by removing coupling (10) retaining screws and sliding coupling back on torque tube.

(6) Adjust outboard aileron lockout mechanism per paragraph 1.C., steps (5) through (23).

3. Removal/Installation Crank Assembly

A. Equipment and Materials

(1) Scale - 0 to 12 inches graduated in sixty-fourths

B. Remove crank assembly

(1) Provide external hydraulic power.

(2) Remove outboard aileron control access panel 1415. See Chapter 12, Access Doors and Panels.

(3) Remove outboard aileron control access panel 1367.

(4) Extend flaps

(5) Disconnect jackscrew (14, figure 201) from crank assembly.

(6) Disconnect lockout actuator rod (4) and, on 00-SJA through 00-SJG, leading edge flap control valve pushrod (2) from crank assembly (1).

(7) Remove crank assembly (1) shaft by removing nut at lower end of shaft.

(8) Remove shaft from wing.

(9) Remove crank assembly (1) from wing.

CAUTION: THE OUTBOARD AILERON WILL NOW ROTATE FREELY AND MAY BE DAMAGED BY WIND. CLAMP OUTBOARD AILERON IF NECESSARY.

C. Install Crank Assembly

(1) Provide external hydraulic power.

(2) Place crank assembly (1, figure 201) in mounting position with jackscrew arm up.

CAUTION: THERE ARE TWO OUTBOARD AILERON LOCKOUT CONFIGURATIONS IN WHICH THE LOCKOUT CRANK AND QUADRANT LINK FORM A SET. THE IMPROPER COMBINATION OF CRANK AND ROD WILL PHYSICALLY MATE BUT WILL NOT FUNCTION PROPERLY. CHECK PARTS CATALOG TO ENSURE COMPATIBILITY OF PARTS.

(3) Install crank assembly shaft from upper side of crank.

(4) Secure shaft with retaining nut torqued at 320 to 440 pound-inches.

(5) Attach lockout actuator rod (4) and, on OO-SJA through OO-SJG, leading edge flap control valve pushrod (2) to crank assembly (1)

(6) Attach jackscrew (14) to crank assembly with clevis lip on lower side of crank arm.

(7) Remove torque tube (12) from outboard flap drive transmission assembly by removing coupling (10) retaining screws and sliding coupling back.

NOTE: Extending flaps slightly will rotate torque tube exposing coupling retaining screws that are difficult to reach.

(8) Adjust outboard aileron lockout mechanism per paragraph 1.C., steps (5) through (23).

(9) Remove external power.

4. Inspection/Check Outboard Aileron Lockout Mechanism

A. Check Crank Stop and Torque Tube

(1) Remove outboard aileron control access panels 1366 and 1367. See Chapter 12, Access Doors and Panels.

(2) Check crank stop bolt (3, figure 201) for insecurity.

(3) Check torque tube (12) shear rivets at inboard end of tube for evidence of failure when mismatched tube and sleeve is noted through inspection hole in the torque tube.

(4) Replace access panels.

5. Approved Repairs Outboard Aileron Lockout Mechanism

A. Replace Crank Assembly Bearing

(1) Equipment and Materials

(a) Scale - 0 to 12 inch graduated in sixty-fourths.

(2) Provide external hydraulic power.

(3) Remove crank assembly (1, figure 201) from wing.

(4) Remove bearing from lower end of crank.

NOTE: Opposite bearing is roller staked and replaced at overhaul.

(5) Install new bearing in lower end of crank.

(6) Install crank assembly in wing.

(7) Install access panels.

(8) Remove external power.

B Replace Torque Tube Shear Rivets

(1) Equipment and Materials

(a) Shear Rivets - 1/8 inch diameter, universal head, 2017-T3, MS20470D4.

(2) Provide external hydraulic power.

(3) Remove access panels 1366 and 1367. See Chapter 12, Access Doors and Panels.

(4) Disengage couplings (10, figure 201) by removing retaining screws and sliding coupling back on torque tube.

NOTE: It may be necessary to extend the flaps slightly to rotate the screws to a more accessible working position.

(5) Remove torque tube from wing.

(6) Replace rivets as required with the torque tube and sleeve positioned to open the inspection hole.

CAUTION. THE PRESENCE OF CORRECT RIVETS IN THE TORQUE TUBE PROVIDES A SHEAR FUSE BETWEEN THE AILERON CONTROL SYSTEM AND OUTBOARD FLAP DRIVE SYSTEM. REPLACE RIVETS ONLY WITH THOSE CALLED OUT IN THE MATERIAL LIST.

(7) Check that link assembly (8) is in the neutral position by rotating bus quadrant (9) and observing that motion transferred to inboard trailing edge of aileron does not exceed 0.08 inch. If motion exceeds specified limits, rotate the input side of the gear box (13) until the neutral position is obtained. Assure that backlash is removed from outboard aileron when motion is measured.

(8) Check that flaps are fully retracted.

(9) Position torque tube (12) in mounting position with inspection hole on the inboard end.

(10) Engage the inboard internal splined coupling (10) and secure with retaining screws.

(11) Check that clearance between the outboard external splined coupling and the mating coupling on the lockout mechanism gear box (13) is 5/16 (± 1/32) inch.

(12) Install outboard internal splined coupling and secure with retaining screws

(13) Secure all retaining screws by lockwiring screw heads together.

NOTE: It may be necessary to extend the flaps slightly rotating the screws to a more accessible working position. This is permissible after the couplings have been engaged with retracted flaps and outboard aileron lockout mechanism in neutral or locked out position.

(14) Operate flaps through several complete cycles and check for binding or erratic operation.

(15) Check that outboard ailerons return to the faired position regardless of inboard aileron position when flaps are retracted.

(16) Remove external power.

(17) Install excess panels.

AILERON SNUBBER ASSEMBLY - MAINTENANCE PRACTICES

1 Removal/Installation Aileron Snubber Assembly

A. Equipment and Materials

(1) Scale - 0 to 12 inches graduated in sixty-fourths

B. Remove Aileron Snubber Assembly

(1) Remove inboard aileron snubber access panel 1361 and the snubber attach bolt access panel 1434. See Chapter 12, "Access Doors and Panels "

(2) Remove inboard aileron hinge access panel 1383

(3) Disconnect aileron control push rod from control tab crank (figure 201)

(4) Disconnect forward end of snubber assembly from structure by removing mounting bolt

(5) Carefully rotate aileron to its lower limit

(6) Working from the upper surface of the aileron remove aft snubber assembly mounting bolt

(7) Remove snubber assembly through access panel opening

C Install Aileron Snubber Assembly

(1) Check snubber assembly for low fluid supply prior to installing A low fluid supply is indicated by any perceptible clearance between fluid level indicator head and reservoir plug When a low fluid supply is evident, replace snubber

(2) Place snubber assembly in mounting position with fluid level indicator forward (figure 201)

(3) Carefully rotate aileron to its lower limit

(4) Install aft snubber assembly mounting bolt

(5) Install forward snubber assembly mounting bolt.

(6) Connect control push rod to control tab crank

(7) Manually rotate inboard aileron rapidly through several complete cycles and check for binding.

(8) Check that damping action progressively increases in magnitude as aileron approaches extreme limits of travel.

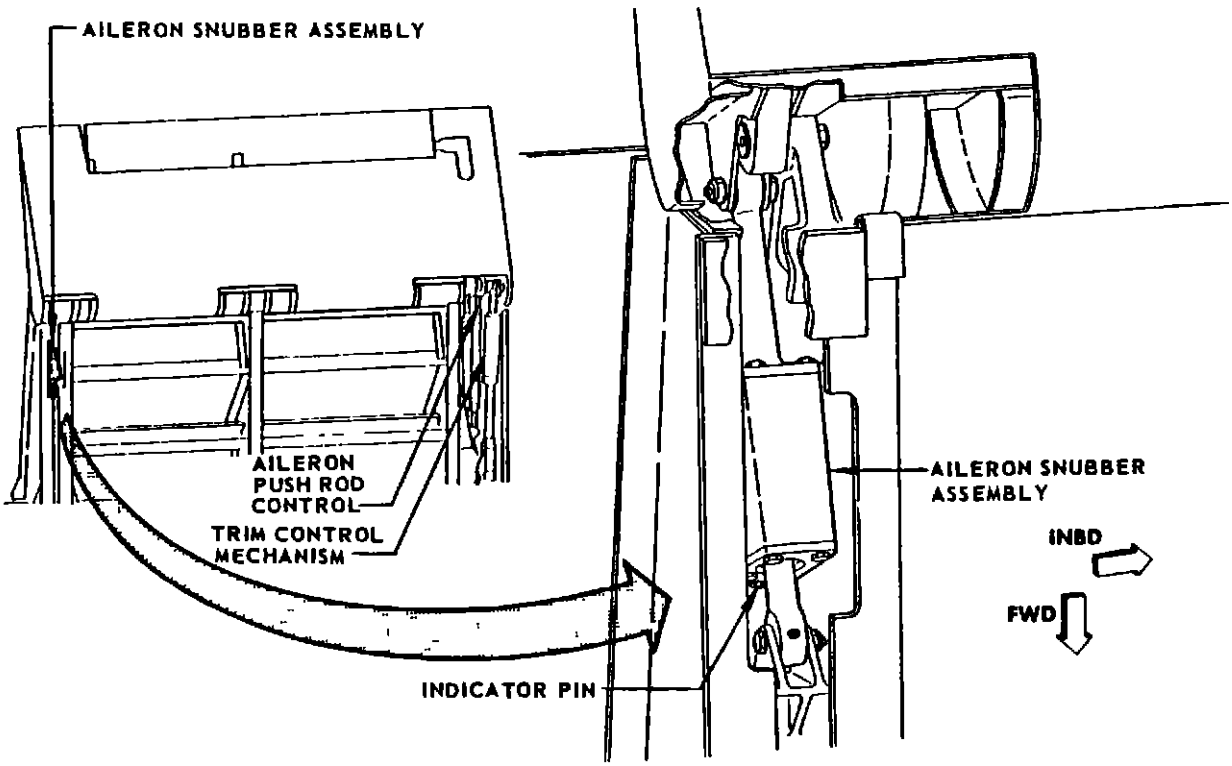
(9) Remove inboard aileron mast fairing (1411) from upper surface of aileron. See Chapter 12, Access Doors and Panels.

(10) Detach bus pushrod from aileron mast.

(11) Check that inboard aileron will rotate 10-15/16 to 11-9/16 inches (18 to 19°) in either direction from the faired position. Displacement should be measured between trailing edges of aileron and wing.

(12) Attach bus pushrod to aileron mast.

(13) Replace access panels and mast fairing.



Aileron Snubber Assembly Installation
Figure 201
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CABLE SLACK TAKE-UP CYLINDER - MAINTENANCE PRACTICES

1. Removal/Installation Slack Take-Up Cylinder

A. Equipment and Materials

(1) Cable Clamps

(2) Rigging Pin

B. Remove Slack Take-Up Cylinder

(1) Loosen turnbuckle on cable "ABSB" in right main gear wheel well to relieve tension in aileron bus cables.

(2) Loosen U-bolts and slide shield laterally to expose rigging pin holes. (See figure 201.) Install rigging pin in slack take-up cylinder. Extend cylinder slide by applying tension to cable ABSB if necessary to allow insertion of rigging pin.

(3) Remove lock wiring from cable terminals to cylinder and unscrew terminals from cylinder threads.

C. Install Slack Take-Up Cylinder

(1) Place cable slack take-up cylinder in position with rigging pin holes outboard and screw cable terminals fully into cylinder (no more than three threads exposed). (See figure 201.)

CAUTION: LOCKWIRE CABLE TERMINALS TO CYLINDER PER FIGURE 201.

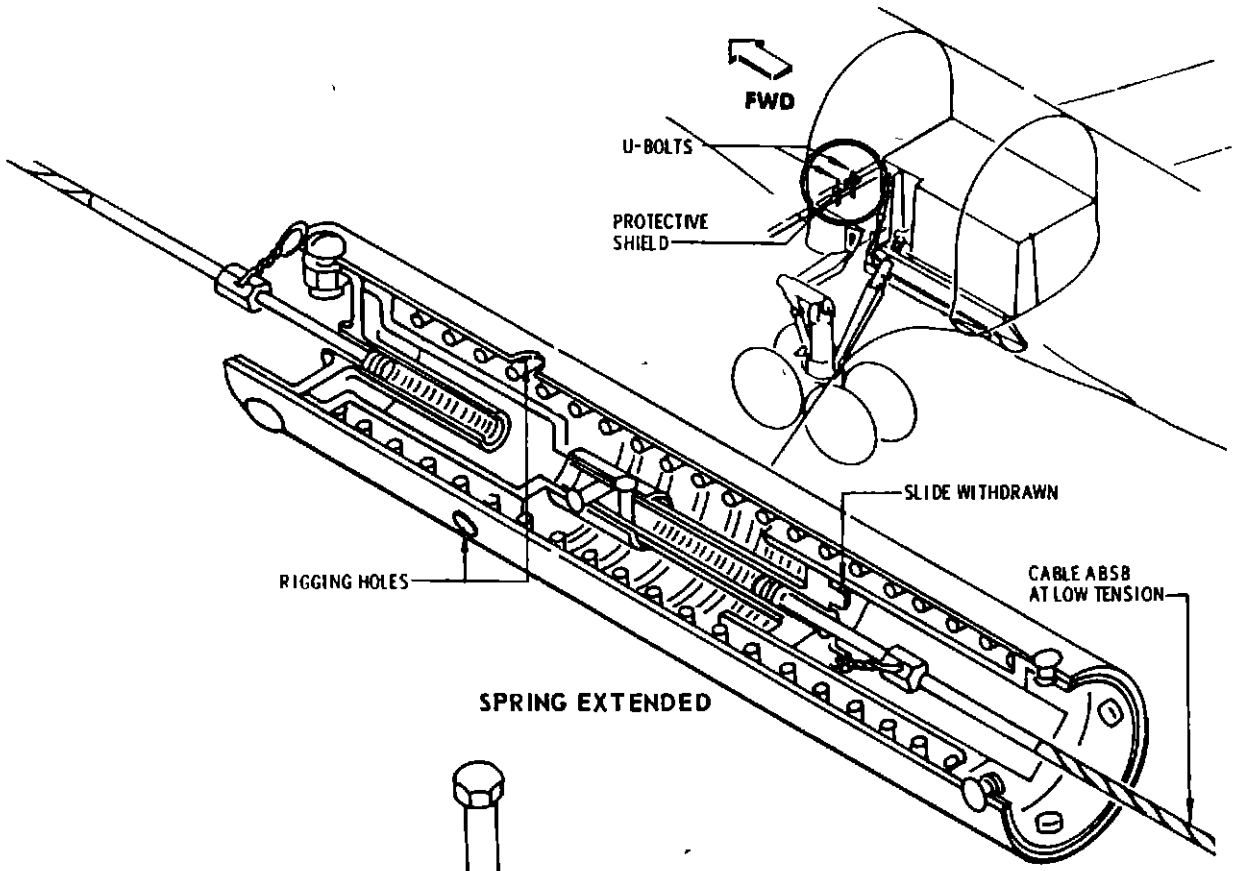
(2) Locate position of each outboard aileron. Mark position on a suitable reference such as a sickle type protractor attached to wing.

(3) Pressurize utility hydraulic system.

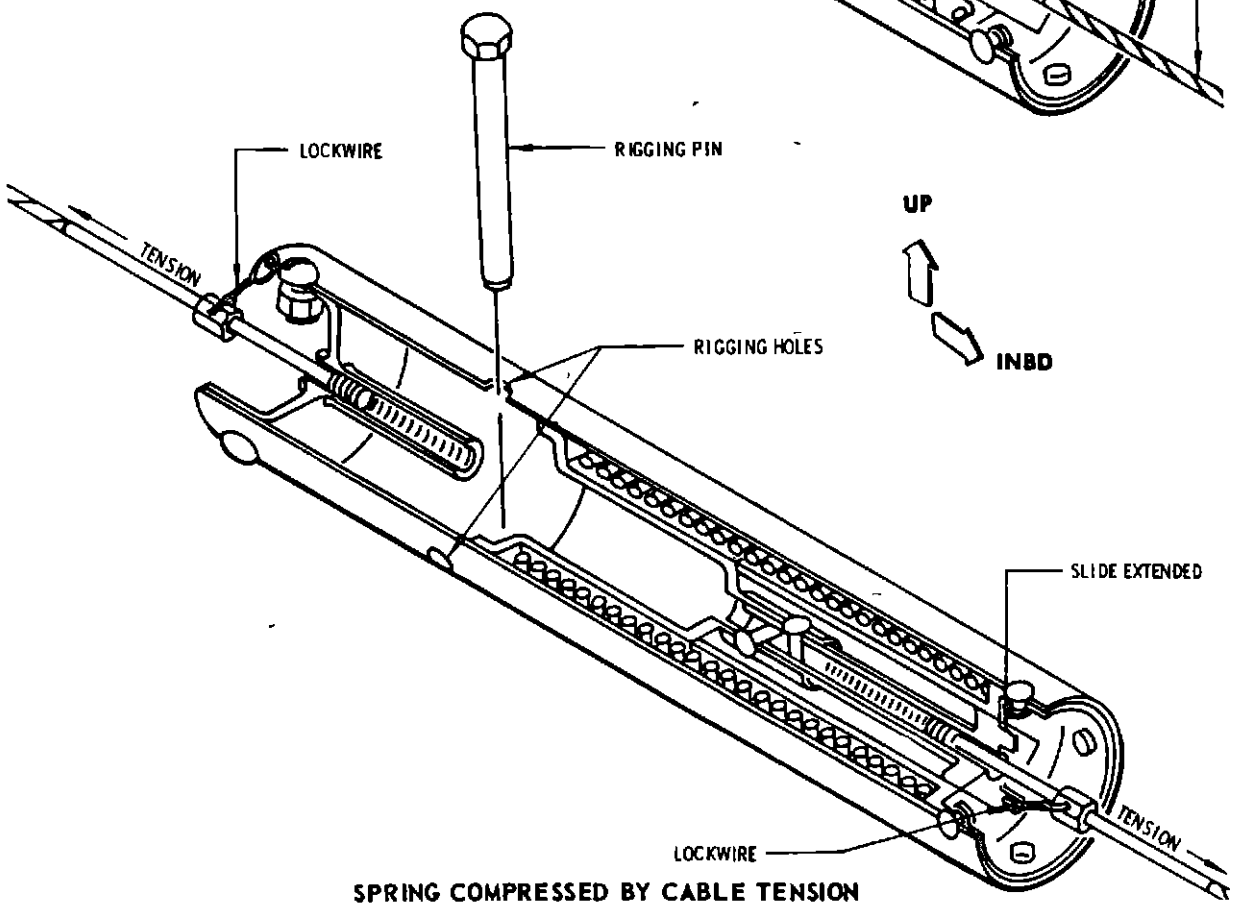
(4) Extend flaps to 50°.

(5) Lock cable slack take-up cylinder in left wheel well in extended position with rigging pin (MS20302-4 or AN5 bolt).

NOTE: Normally, cable tension compresses spring in cylinder and extends slide. If slack exists, a force along cable ABSB will extend slide to clear rigging pin holes.



SPRING EXTENDED



SPRING COMPRESSED BY CABLE TENSION

Slack Take-Up Cylinder Installation
Figure 201

(6) Clamp one inboard aileron such that trailing edge is down from wing chord plane per following table.

TEMP °F	DISTANCE OF AILERON TRAILING EDGE FROM WING CHORD PLANE
110	-0.87 (± 0.05) in.
90	-0.80 (± 0.05) in.
70	-0.75 (± 0.05) in.
50	-0.70 (± 0.05) in.
30	-0.63 (± 0.05) in.
10	-0.57 (± 0.05) in.
-10	-0.50 (± 0.05) in.

Maximum mismatch allowed between each end of inboard ailerons and trailing edge of adjacent flaps shall not exceed 1.25 inch. Symmetry between inboard ailerons is to be 0.10 inch.

(7) Adjust bus cable loop (cables "ABSA" and "ABSB") to tension values shown on figure 204 by tightening all four turnbuckles. Turnbuckles are located in 27-14-0, figure 204. Airplane temperature shall be stabilized for one hour prior to adjusting cables.

(8) Raise or lower outboard aileron on wing with clamped inboard aileron to position equivalent to lockout by adjusting turnbuckle connecting inboard and outboard bus quadrants and turnbuckle on cable "ABSB" in right main gear wheel well. Position outboard aileron to proper position while maintaining specified cable tension.

(9) Raise or lower the inboard aileron for the opposite wing to proper droop position per table in step (23) by adjusting turnbuckle on cable "ABSA" in left main gear wheel well and turnbuckle connecting inboard and outboard bus quadrants for that wing.

(10) Raise or lower remaining outboard aileron to position equivalent to lockout by adjusting turnbuckle on cable "ABSB" in right main wheel well and turnbuckle connecting inboard and outboard bus quadrants for that wing while retaining specified cable tension.

NOTE: Adjusting a pair of turnbuckles one to either side of a quadrant affects only the position of that quadrant relative to the position of the other three quadrants. With two quadrants between a pair of turnbuckles being adjusted, position of these two quadrants will be affected equally relative to the position of the other two quadrants.

(11) Remove rigging pin from slack take-up cylinder and install protective shield.

(12) Conduct check of aileron bus system as follows:

(a) Rotate aileron control wheel clockwise until left outboard aileron contacts its down stop at 19° to 21° below wing chord plane and that dimension from trailing edge of aileron to tab trailing edge is 1.49 (± 0 08) inches. Dimension of 1 49 inches consists of 1.71 inch tab rotation minus 0.22 inch tab droop.

(b) Check that right outboard aileron moves to a position 18-3/4° to 21° above wing chord plane and that distance from aileron trailing edge to tab trailing edge is 1.93 (± 0.05) inches. Dimension of 1.93 inches consists of 1 71 inches tab travel plus 0.22 inch tab droop.

(c) Rotate aileron control wheel counterclockwise and check aileron and tab travels per steps (a) and (b) Aileron and tab motions shall be opposite in direction but of same travel and tolerances as noted above

(13) Raise flaps to the full up position.

Figure 202 and Figure 203 Deleted

AILERON TRIM CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General

A. The aileron trim control system provides lateral stability about the roll axis of the airplane. This is accomplished by positioning the aileron control system. A different linkage and mechanism is used in the left wing than in the right wing to ensure positive trimming action and to provide maximum trim capabilities at all flight attitudes

B Spring forces from the trim mechanism in the right wing are returned through the aileron control system to provide pilot feel as the pilot rotates the aileron control wheel. These same forces center the control wheel after an aileron signal has been introduced into the aileron control system Aerodynamic loads on the inboard aileron control tabs are isolated from the trim control system by a brake in the trim mechanism, thus preventing a change in trim setting

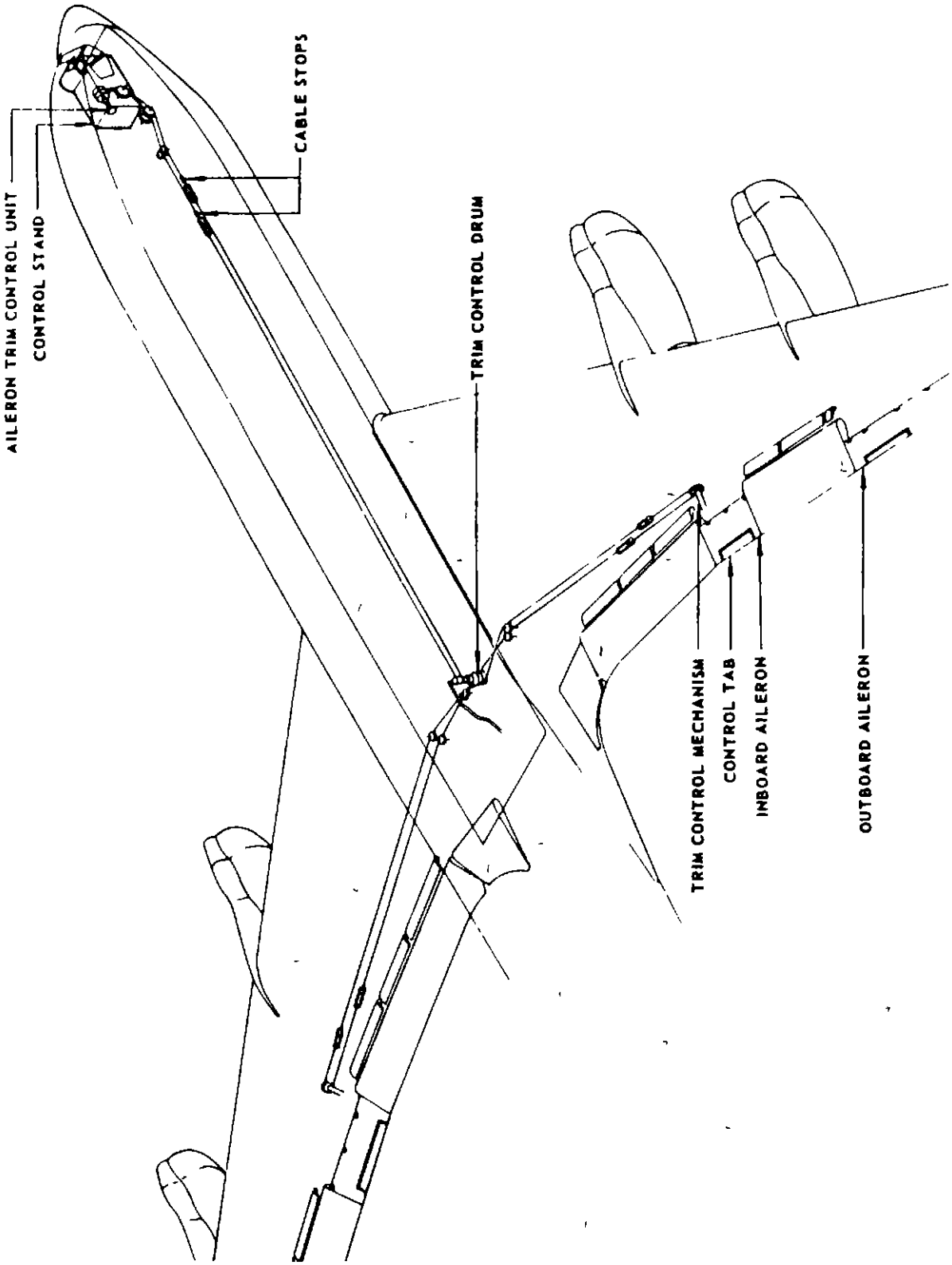
C The major components and their position in the aileron trim control system are shown in figure 1.

D. Manual control of the system originates at the aileron trim control wheel which is part of the aileron trim control unit Control motion is transferred by cable to the inboard aileron trim control mechanism in each wing. These mechanisms extend or contract (depending on the control action) to rotate inboard aileron control tabs for lateral trim

2. Pilot's Aileron Trim Control Unit

A. The pilot's aileron trim control unit (figure 2) is used to initiate motion in the aileron trim control system. The unit consists of a cable drum attached to a split shaft, an indicator with dial, indicator actuator, and a control wheel. The cable drum is located within the control stand and is rotated by the control wheel on the aft side of the control stand Access to the drum is available by removing the control stand cover plate

B. The control wheel can be manually rotated about 3.55 turns in either direction from "0" or neutral Cable stops regulate the amount of cable that may be wound on or off the drum. The aileron trim indicator is directly forward of the control wheel. The indicator pivots on a clevis bolt attached to the aft side of the control stand and is driven

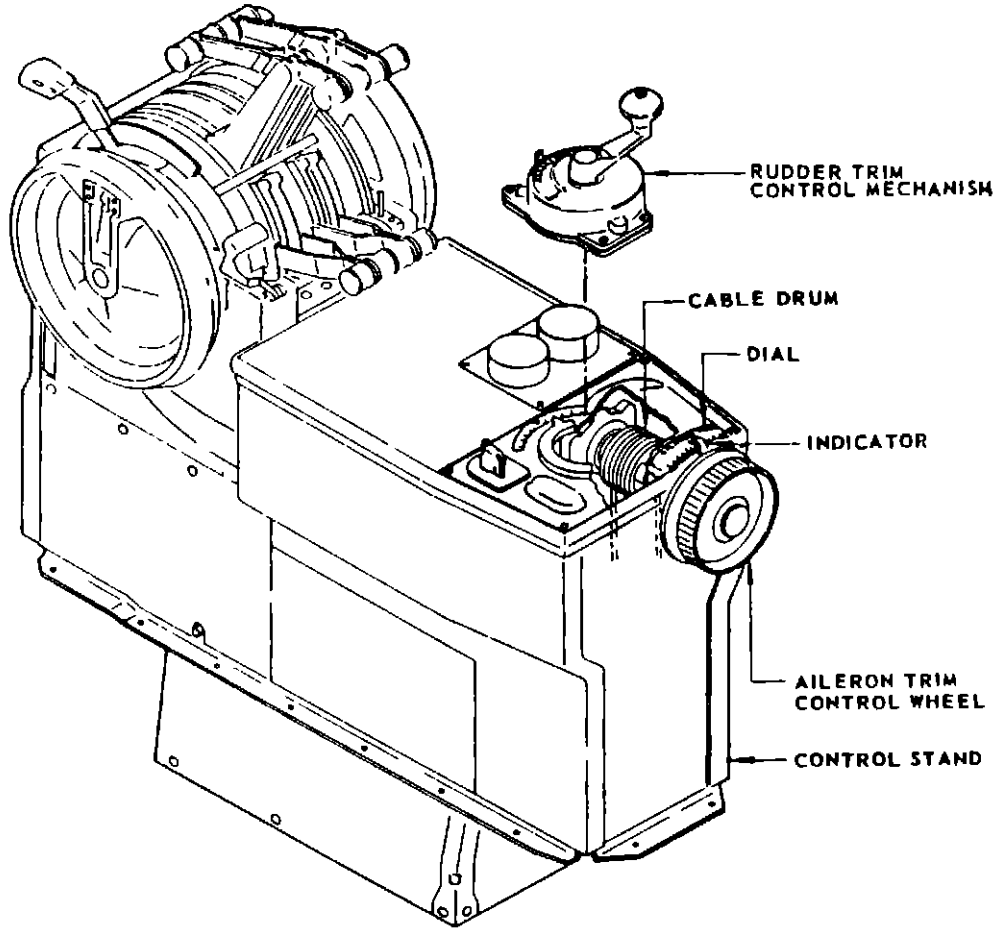


Aileron Trim Control System
Figure 1

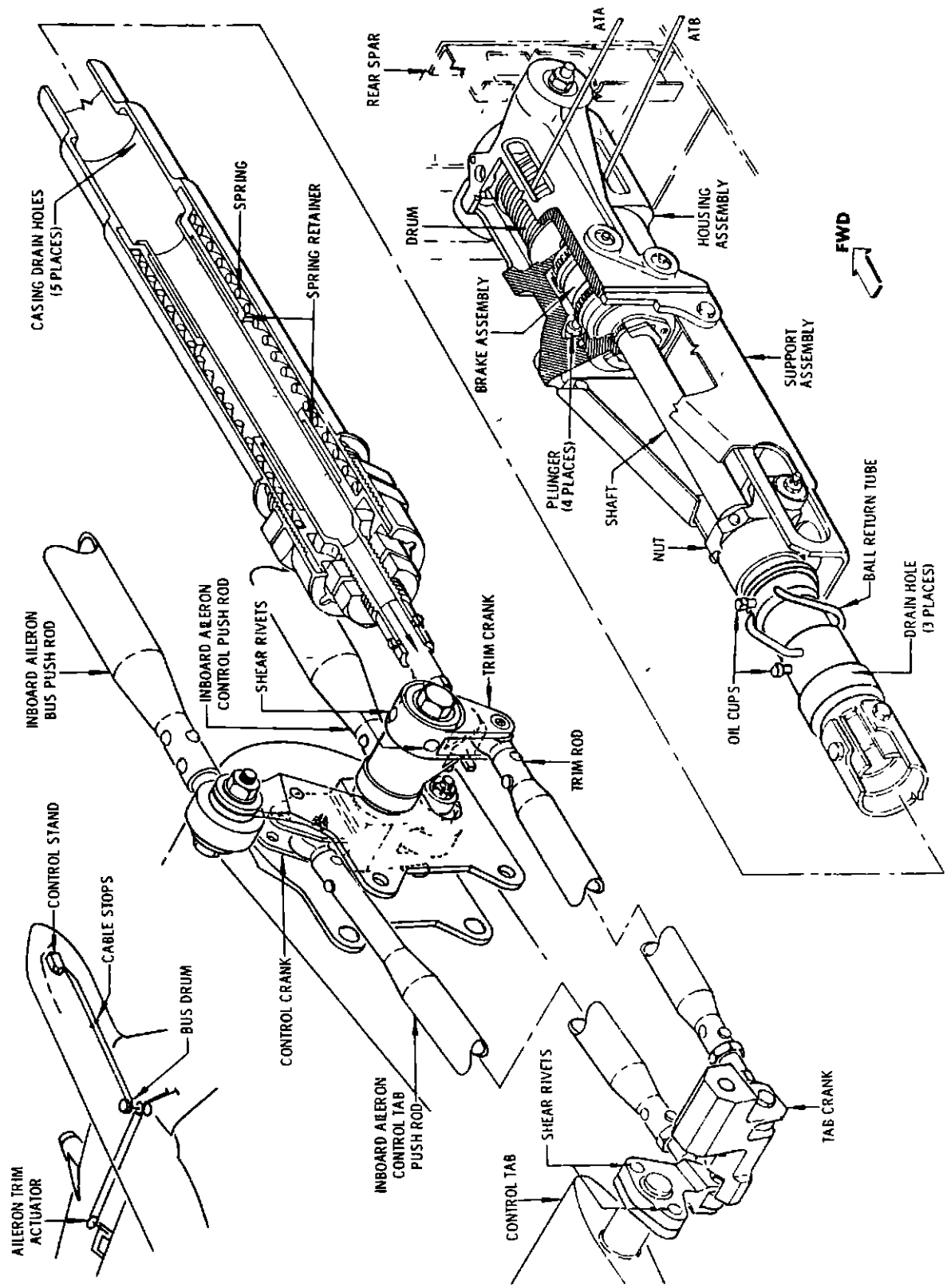
by an actuator splined to the drive shaft. The top of the indicator consists of a pointer that traverses a dial on the control stand cover plate. The dial is marked in units of trim on either side of neutral, "0." The action produced by rotating the control wheel (trimming the airplane) is identified on the dial with the inscriptions "Lower Left Wing" and "Lower Right Wing." Turning the aileron trim control wheel to the right lowers the right wing, turning the control wheel to the left lowers the left wing

3. Inboard Aileron Trim Control Mechanism

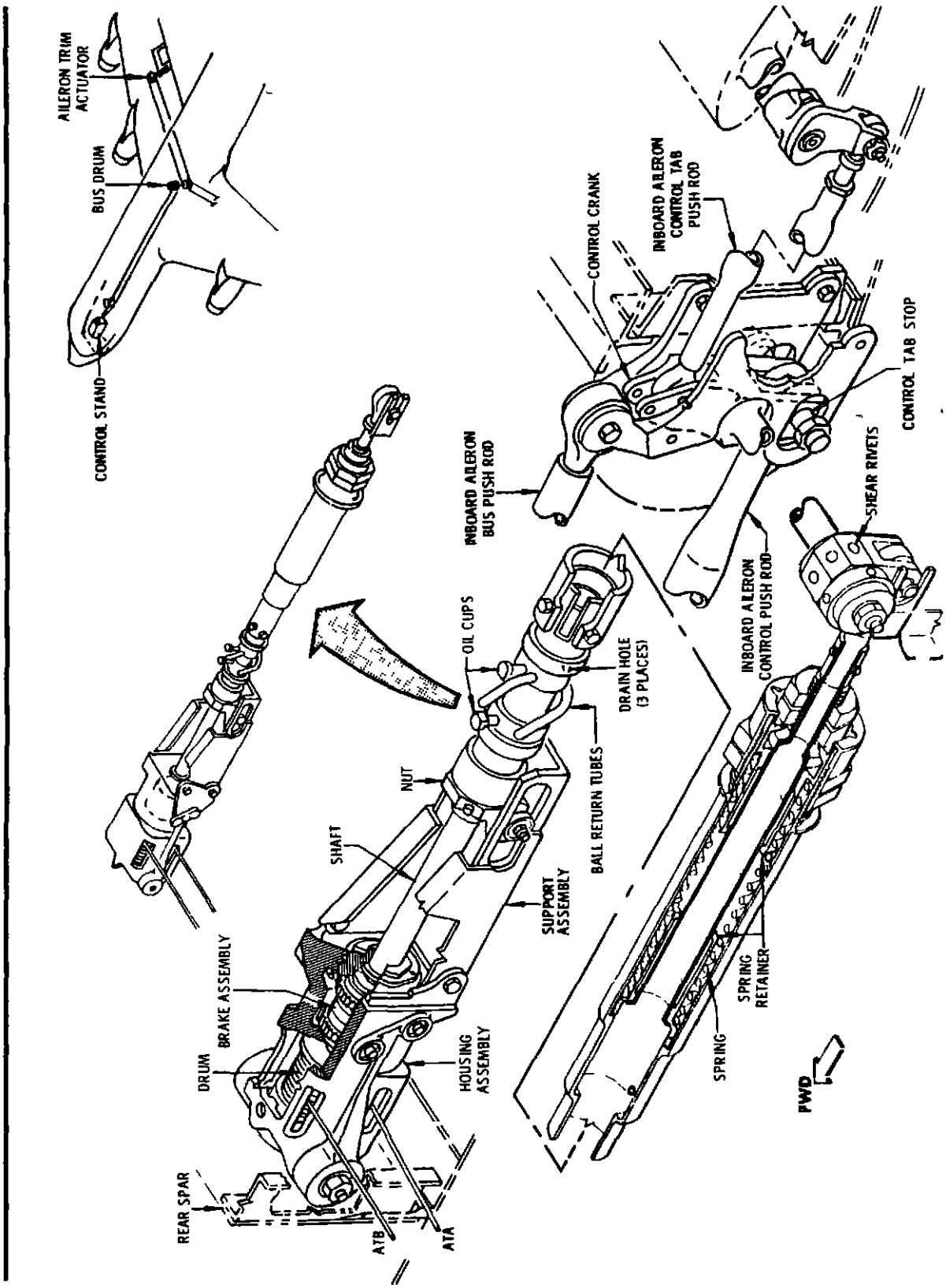
A. The trim control mechanism (figure 3) consists of a cable drum, double acting brake, jackscrew, frame and a spring cartridge assembly. The jackscrew is of low friction design using recirculating steel balls to transfer motion between the screw and traveling nut. The double acting brake is contained within an inclosed housing behind the cable drum The jackscrew is supported by two rollers that traverse cut-outs in the frame Drain holes are provided in the underside of the trim control mechanism to eliminate internal moisture.



Pilot's Aileron Trim Control Unit
Figure 2



Aileron Trim Control Mechanism
Figure 3 (Sheet 1)



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Aileron Trim Control Mechanism
Figure 3 (Sheet 2 of 2)

B. The spring cartridge assembly is attached to the aft end of the jackscrew. (See figure 3) The cartridge consists of a telescoping tube and a compression spring. Extension or compression of the cartridges places the spring under compression. The spring in the left wing is preloaded S to about 1.5 pounds and will produce a force of approximately 66.5 pounds when the spring cartridge is deflected 1/2 inch. This spring is utilized as a trim spring only. The spring in the right wing is preloaded to S about 36 pounds, and will produce a force of approximately 46 pounds at 1/2 inch spring cartridge deflection. The spring in the right wing acts as a centering spring and a trim spring. When a trim signal is introduced into the system both springs are compressed further to increase the force exerted by the trim system. When an aileron signal is introduced the right spring is compressed further, while the left spring is only momentarily compressed. The left spring unloads as the aileron responds to the signal but the right spring remains compressed as long as the aileron remains deflected.

C The forward end of each trim control mechanism is attached to the aft spar by a hinge bolt. The aft end of the left trim control mechanism is connected to one arm of the trim control crank while the aft end of the right trim control mechanism is connected to one arm of the aileron control crank. The aileron trim control crank is assembled with shear rivets. The arm to which the right control mechanism attaches is also assembled with shear rivets. This provides a shear joint in each wing that will fail safe in the event of spring cartridge malfunction.

D. Cable motion in the aileron trim control system is converted to rotary motion at the cable drum. A shaft transfers this motion through the double acting brake to the jackscrew which produces linear motion that extends or retracts the mechanism.

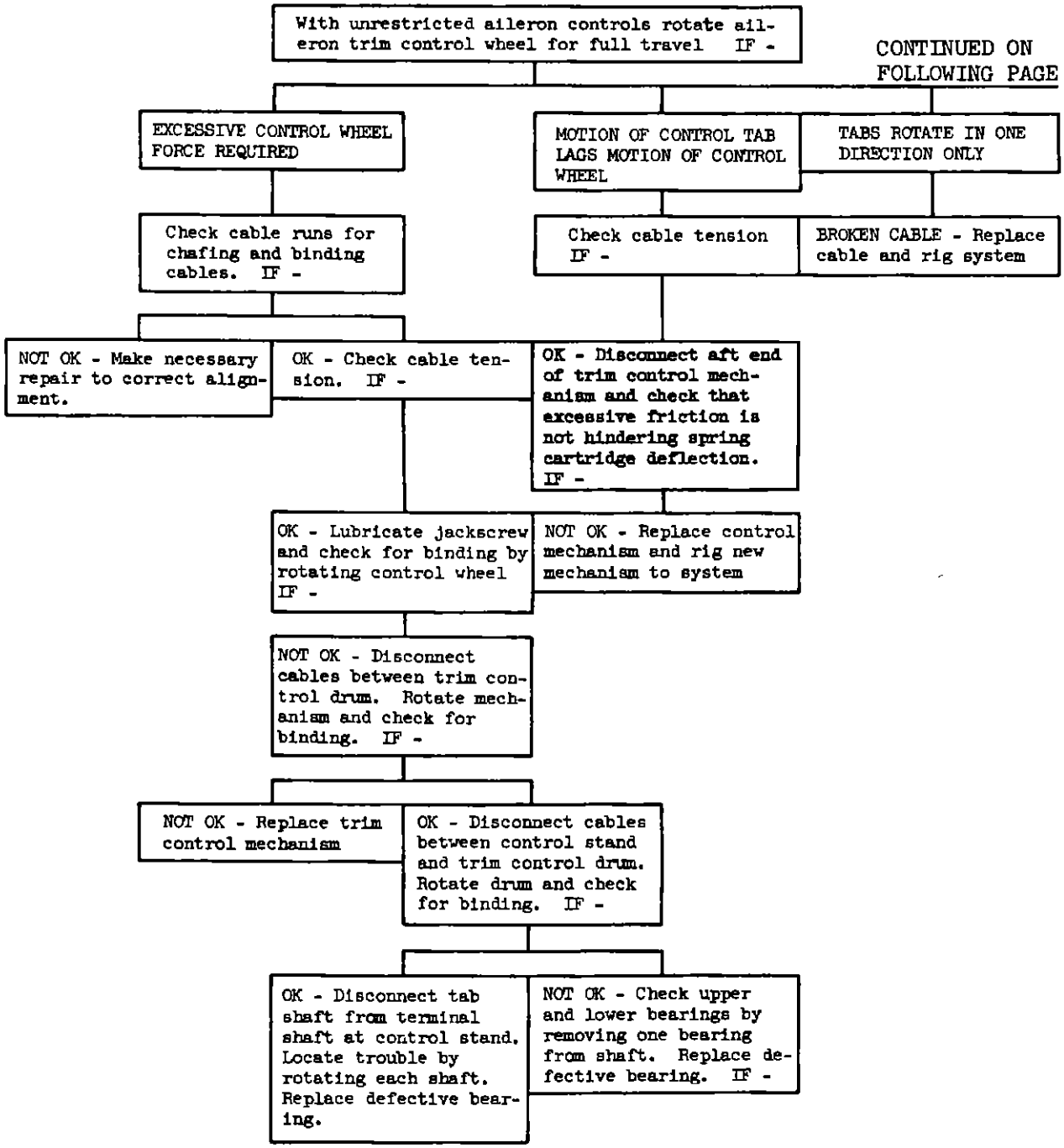
E. The double acting brake prevents tension or compression loads on the spring cartridge from rotating the jackscrew. A forward brake plate assembly is activated by compression loads and rear brake plate by tension loads. Each brake plate utilizes friction and ratchet locks to prevent feed back forces from rotating the jackscrew. Rotating the aileron trim control wheel overrides the friction brake and extends or contracts the jackscrew to change the trim setting.

4. Operation

A. Rotating the aileron trim control wheel at the control stand introduces motion into the control cables. These cables cross directly behind the control stand and the direction of cable motion is reversed. Two cables carry motion aft to the aileron trim control drum under the floor at Station 820. This drum is connected, by a shaft, to a bus drum in the right wheel well. A pair of cables behind the rear spar transfers bus drum motion to operate the aileron trim control mechanisms. The pair of cables extending from the bus drum to the trim mechanism in the right wing are crossed outboard of the bus drum, again reversing direction of cable motion This action causes both trim mechanisms to extend or contract simultaneously Rotary motion is changed to linear motion, by the trim control mechanism, to position the aileron control tabs. The control wheel is adjusted as required until the airplane assumes a level flight attitude.

B. The trim control mechanism holds the desired trim setting against forces (air loads) originating at the control tab and forces in the aileron control system. When control tabs are positioned by the autopilot servo, or by rotating the aileron control wheels, the spring cartridges deflect. The left spring cartridge begins to relieve when aileron motion is obtained. The right spring cartridge remains deflected. The pilot feels the effect of right spring cartridge deflection as if the returning force was an aerodynamic load on the aileron. The feel is progressively increased with increased spring cartridge deflection.

AILERON TRIM CONTROL SYSTEM - TROUBLE SHOOTING



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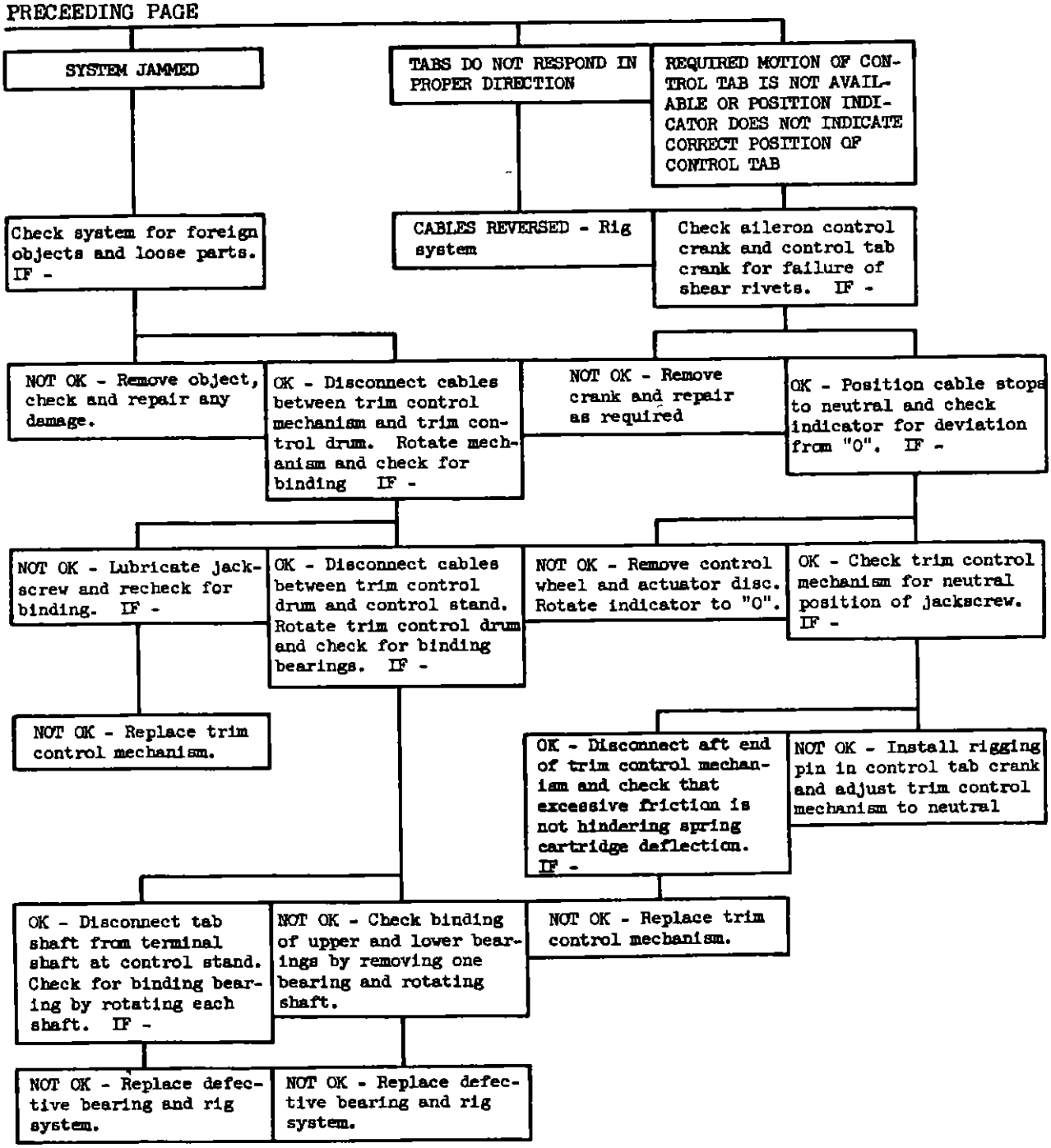


With airplane configuration adjusted for symmetrical wing fuel loading and symmetrical power, flight control trim systems are adjusted for straight and level flight

CONTINUED ON FOLLOWING PAGE

Control wheels cocked No aileron trim required and no rudder trim required

Check inboard aileron control tab positions with inboard aileron faired to wing chord plane Corresponding tab should be up 0.05 inch, down 0 00 inch with bus cable tension equal IF

NOT OK - Adjust control tab position as required If tab appears warped, position should be compromised such that tab area favors up direction (air load to aileron down)

OK - Adjust control tab away from faired position as required, but not to exceed ± 0.10 inch, to bring control wheels to neutral position Tab symmetry requirement is waived for this condition.

Aileron trim required up to 1 unit maximum. No rudder trim required.

Place aileron trim control mechanism and aileron trim control cable stops at neutral position. Check that aileron trim indicator reads "0." IF

NOT OK - Adjust aileron trim indicator to "0" position

OK- Adjust appropriate inboard flap down. Do not exceed 0.25 inch below wing chord plane. Flap down 0.20 inches corrects about 1 unit of aileron trim.

OK - AILERON CONTROL SYSTEM OUT OF ADJUSTMENT Adjust aileron control system as required IF

CONTINUED FROM PRECEDING PAGE

Aileron trim required and rudder trim required [3]

Place rudder trim control system and aileron trim control system in neutral position and check that each trim indicator reads "0." IF

NOT OK - Adjust applicable trim control system to neutral position

OK - Set rudder control system at neutral and check that rudder control tabs are faired within 1/8 inch with rudder IF

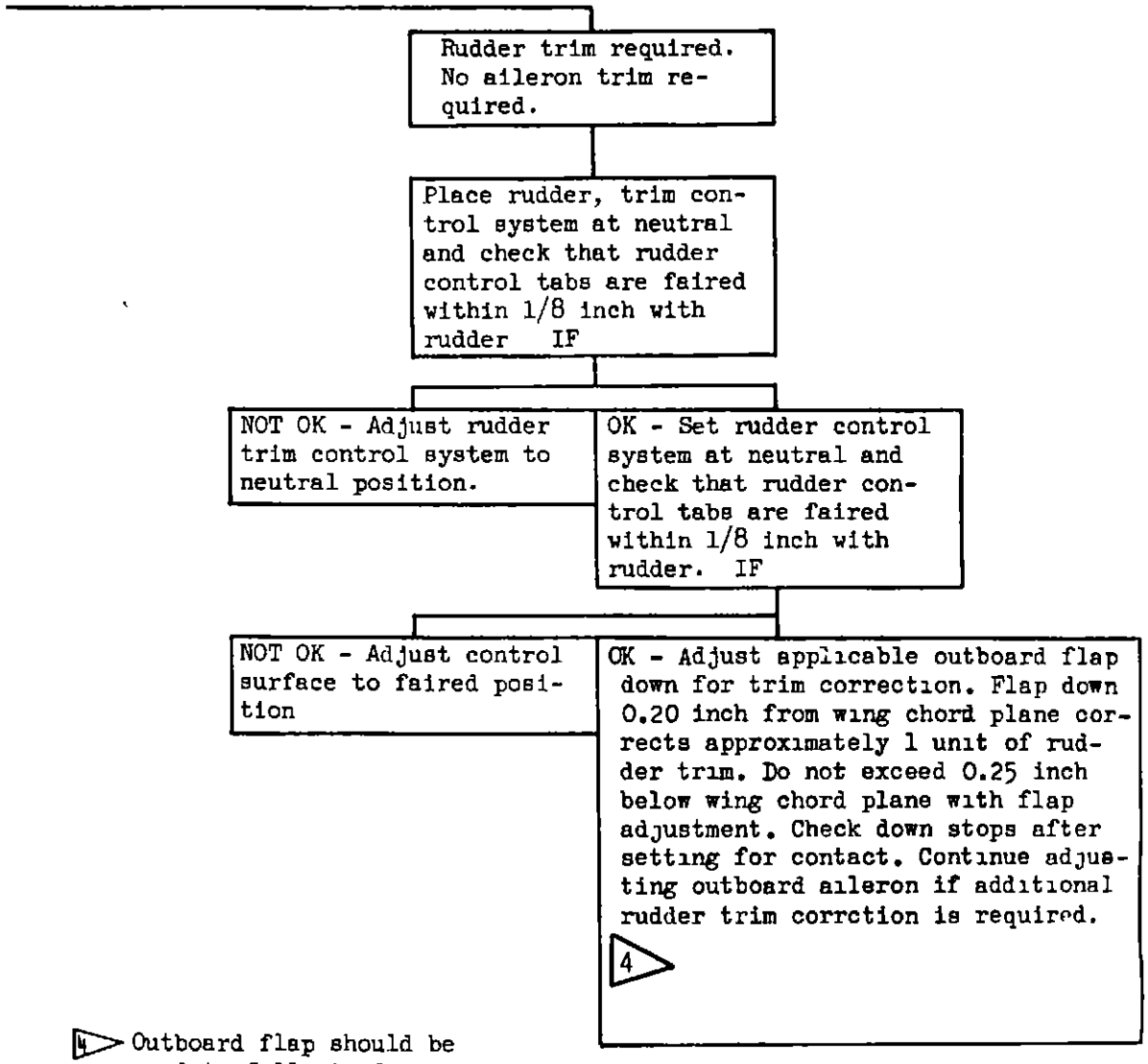
NOT OK - RUDDER CONTROL SYSTEM OUT OF ADJUSTMENT. Adjust rudder control system to neutral

OK - Adjust rudder control tabs toward direction of correction required. Check all outboard flap and aileron position for deviation from faired position with wing chord plane IF

NOT OK - Adjust control surface to faired position with wing chord plane

OK - Adjust applicable outboard flap down for trim correction. Flap down 0.20 inch from wing chord plane corrects approximately 1 unit of rudder trim and approximately 1-1/2 units of aileron trim.

[3] Any rudder trim required over 2 units, in the majority of cases, may be considered as partially lateral even though pilot did not use aileron trim and reported only rudder trim.



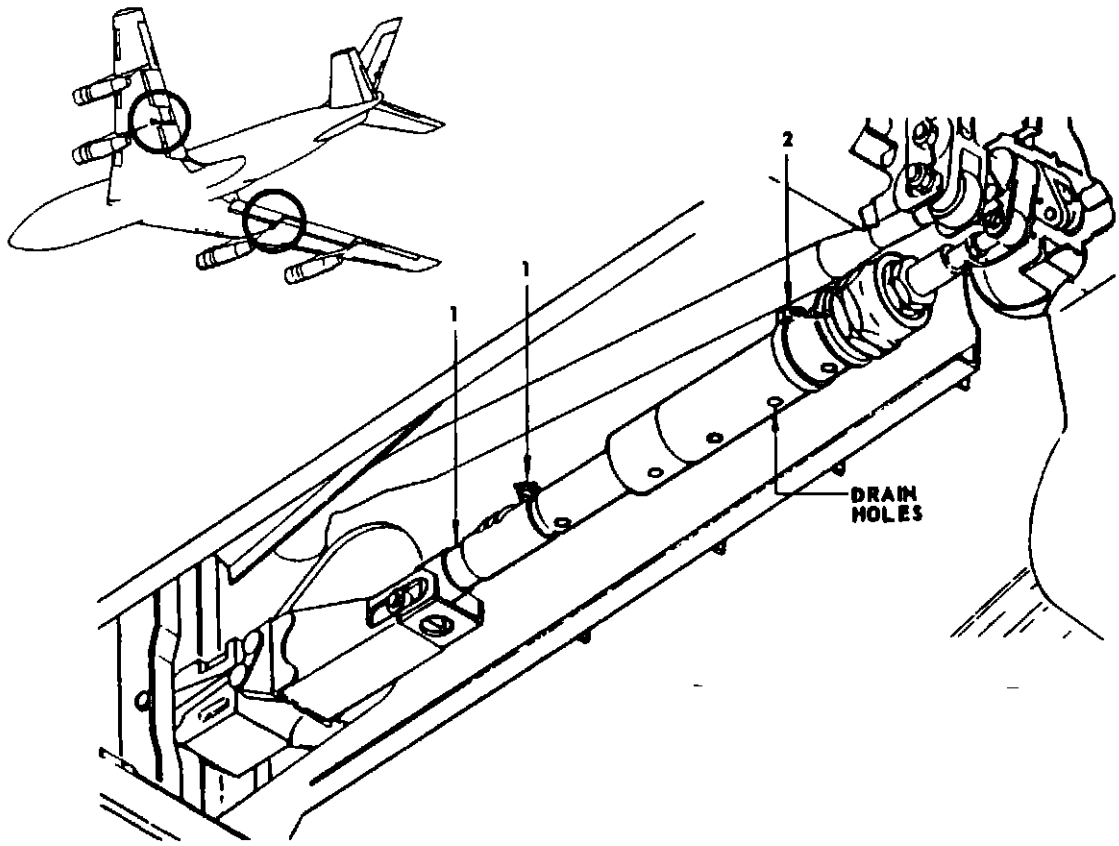
4 Outboard flap should be used to fullest advantage in correcting any trim problem and outboard aileron left faired except when absolutely required (A 0.20 inch change in outboard aileron position from wing chord plane corrects approximately 1 unit of rudder trim).

AILERON TRIM CONTROL SYSTEM - MAINTENANCE PRACTICES

1. Unit Servicing Aileron Trim Control System

A. Lubricate Aileron Trim Control System (See figure 201.)

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	INBOARD AILERON TRIM CONTROL MECHANISM	Remove inboard aileron control access panel 1357. Apply general purpose oil, (MIL-L-7870), to oil cups (2 places each mechanism). Operate mechanism through one complete cycle.
2	INBOARD AILERON TRIM CONTROL MECHANISM SPRING CARTRIDGE	Remove inboard aileron control access panel 1357. Remove filler plug, cover drain holes with tape. Fill cartridge with oil (MIL-L-7870) and exercise cartridge by moving the tab. Remove tape and allow oil to drain out. Reinstall filler plug and lockwire.



Inboard Aileron Trim Control Mechanism Lubrication
Figure 201

2. Adjustment/Test Aileron Trim Control System

A. General

(1) To adjust the aileron trim control system it is necessary to neutralize all system components. No locks or rigging pins are used to rig from the control stand to the aileron trim control mechanism. Proper care must be exercised in maintaining component alignment during rigging.

(2) To maintain straight and level flight with symetrical power zero aileron trim and zero rudder trim, inboard and outboard flaps and ailerons may be positioned away from neutral but within rigging tolerances for applicable control surface faired position. See "Aileron Trim Control System Trouble Shooting."

B. Equipment and Materials

(1) Tensiometer - 0 to 100 lb capacity

(2) Scale - 0 to 36 inches graduated in sixty-fourths

(3) Clamps suitable for control surfaces

(4) Spring Scale - 0 to 20 lb capacity

(5) Rigging Pin - MS20392 or AN5 bolt.

C Adjust Aileron Trim Control System

(1) Remove access panels 1355, 1356, inboard aileron control access panel 1357 and inboard aileron hinge access panel 1383. See Access Panels and Doors, Chapter 12

(2) Open wing lower access door 1358.

(3) Provide external power (hydraulic).

(4) Open right main gear wheel well door.

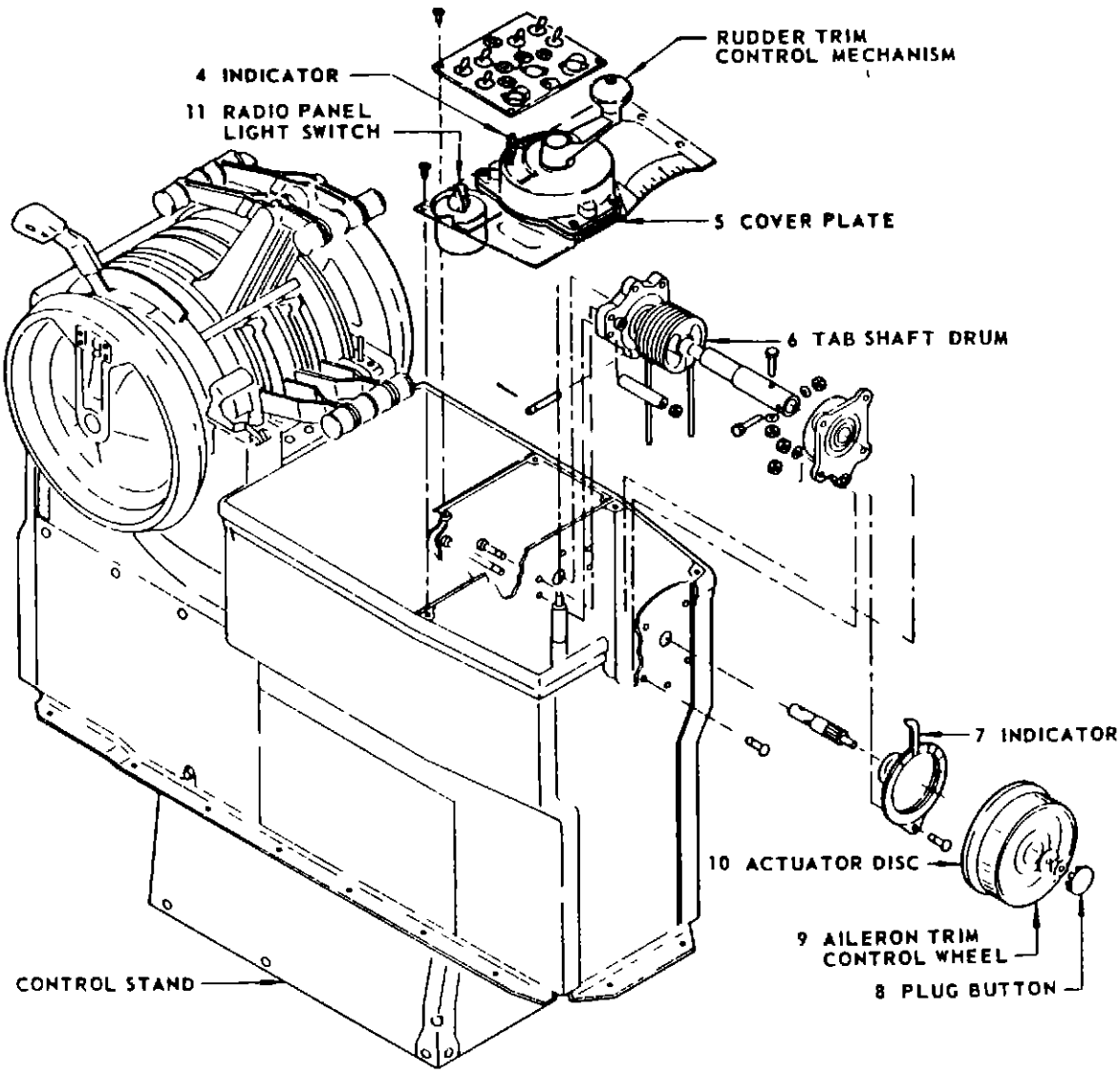
(5) Relieve tension in aileron trim cables.

(6) Remove necessary interior equipment and floor panel for access to upper aileron trim control drum at station 820.

(7) Remove control stand cover plate.

(a) Rotate rudder trim indicator to "0" prior to removal to avoid rigging rudder trim system at assembly.

(b) Remove cover plate retaining screws.



Pilot's Aileron Trim Control Unit Adjustment
Figure 202

(c) Carefully lift cover plate from control stand separating rudder trim gear box assembly and splined rudder trim control shaft.

NOTE: Wires to radio panel light switch may be disconnected to aid in removing cover plate.

(8) Block or tie upper end of rudder trim control shaft to reduce bending load or sprocket mounting bracket.

(9) Rotate aileron trim control wheel (9) until each cable has 4-1/2 turns on tab shaft drum (6)

(10) Rotate aileron trim control drum (figure 203) until cables on upper drum have 4-1/4 turns each. Maintain this position for tension adjustment.

(11) Adjust aileron trim cables until stops are 23-5/16 (± 1/2) inches from fairleads when cables are rigged to specified tension. (See figures 204 and 205.)

NOTE: Phenolic cable clamps may be applied to each aileron trim cable in lower nose compartment adjacent to a fairlead to maintain this neutral position.

(12) Lockwire turnbuckles and cable stops (figure 204)

(13) Remove aileron trim control wheel (9, figure 202) being careful not to change cable stop setting.

(a) Pry out plug button (8).

(b) Remove retaining nut and washer.

(c) Slide wheel (9) and actuator disc (10) from shaft.

(14) Replace control stand cover plate.

(15) Set aileron trim indicator (7) to "0."

NOTE: Cable stops must be 23-5/16 (± 1/2) inches from fairleads

(16) Replace actuator disc (10) with indicator (7) drive pin riding in actuator cam groove.

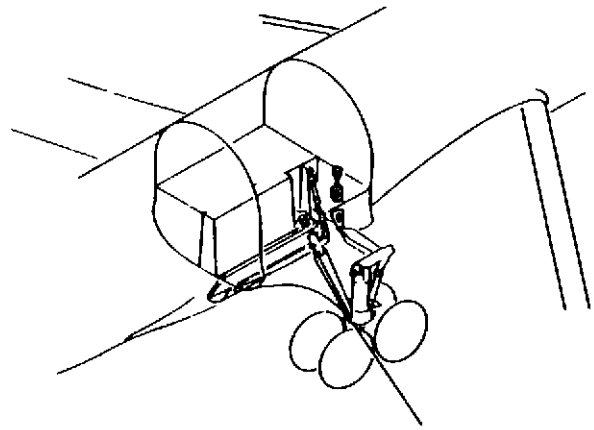
* (17) Install aileron trim control wheel. Paint white marking on wheel (9) per SAB 707/96. Remove old markings.

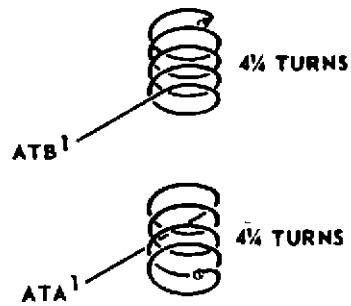
(18) Set rudder trim indicator (4) to "0."

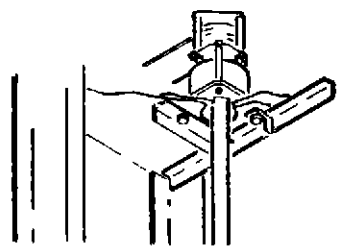
NOTE: Rudder and rudder trim tab must be aligned within 1/16 inch with "0" index point on body centerline.

(19) Replace rudder trim control actuator disc (3) with indicator (4) drive pin riding in actuator cam groove.

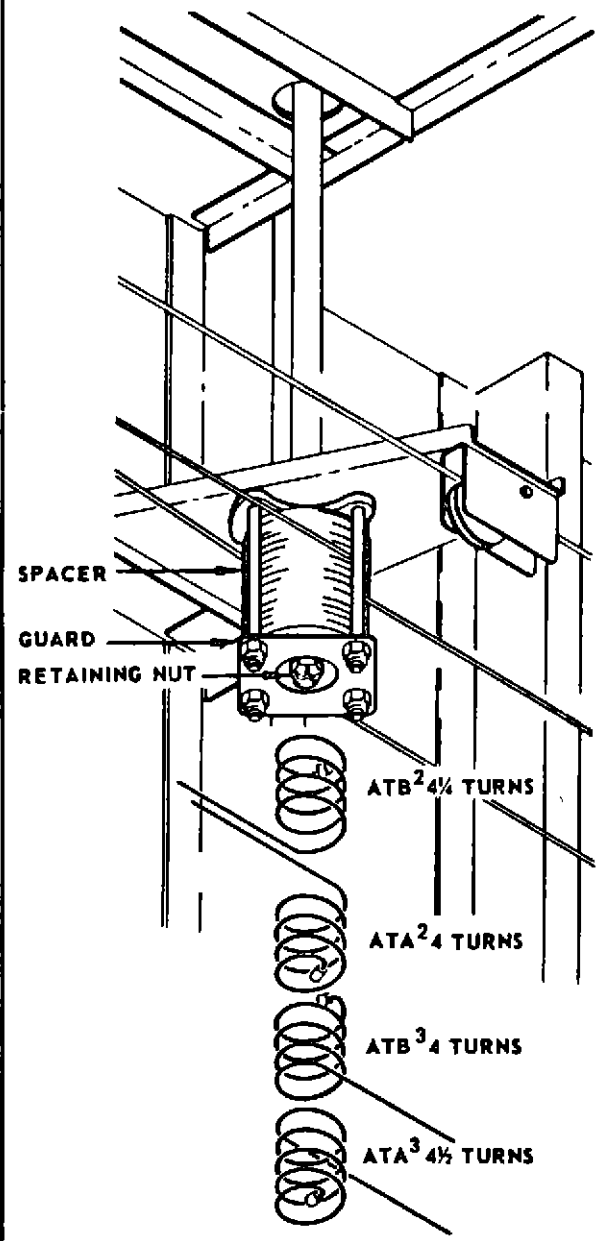
* SAB 707/96



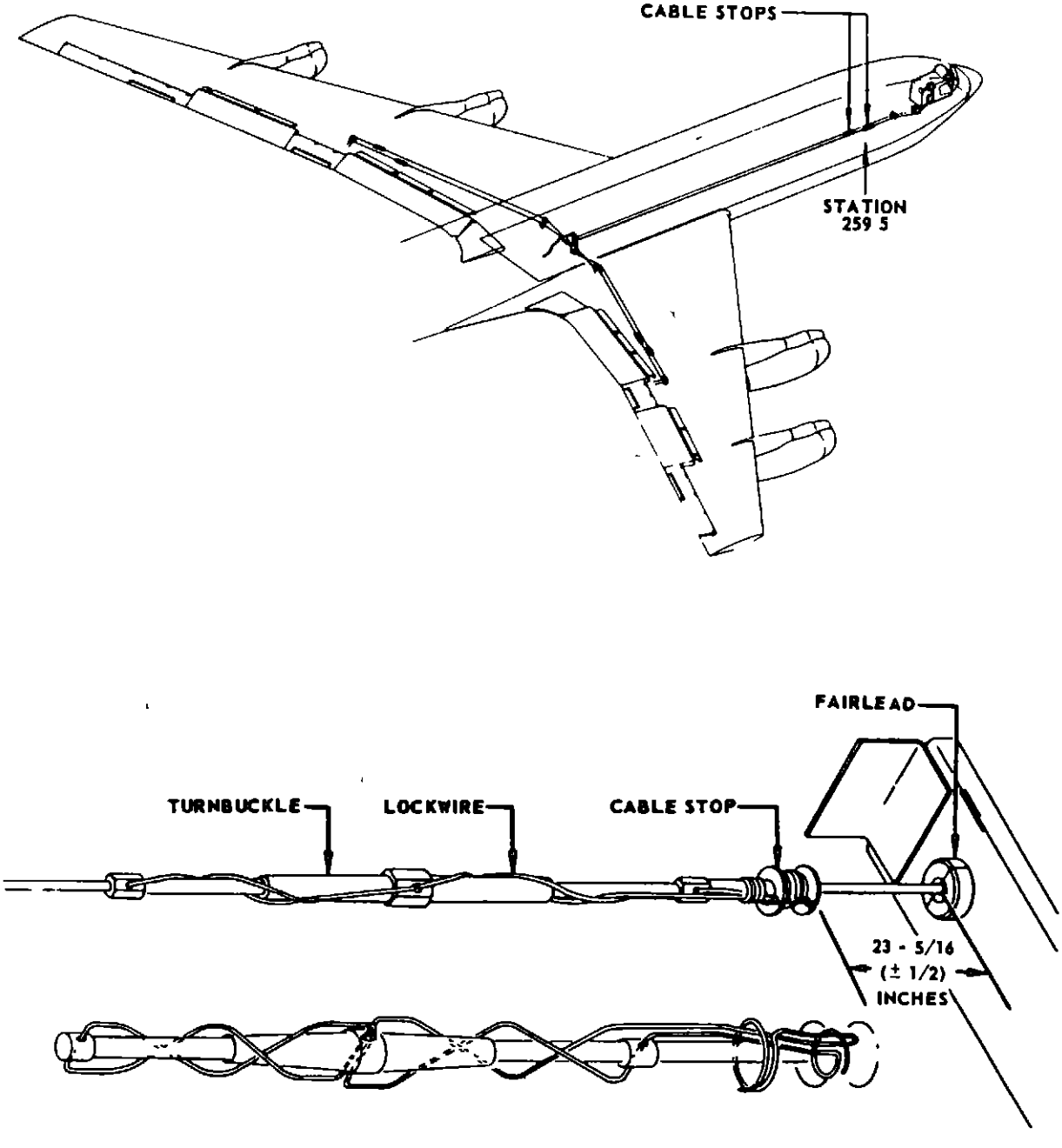




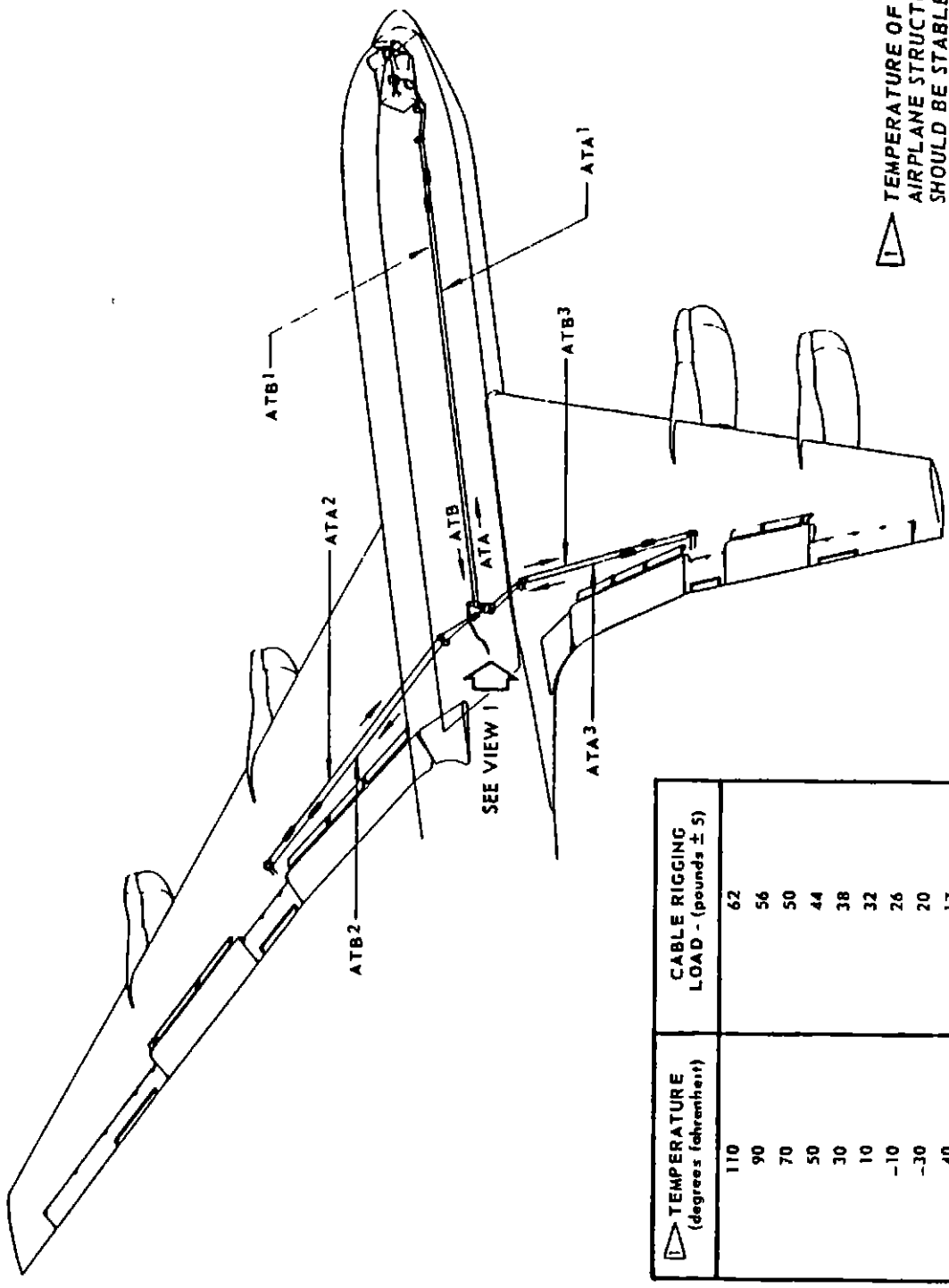
UPPER DRUM



LOWER (BUS) DRUM



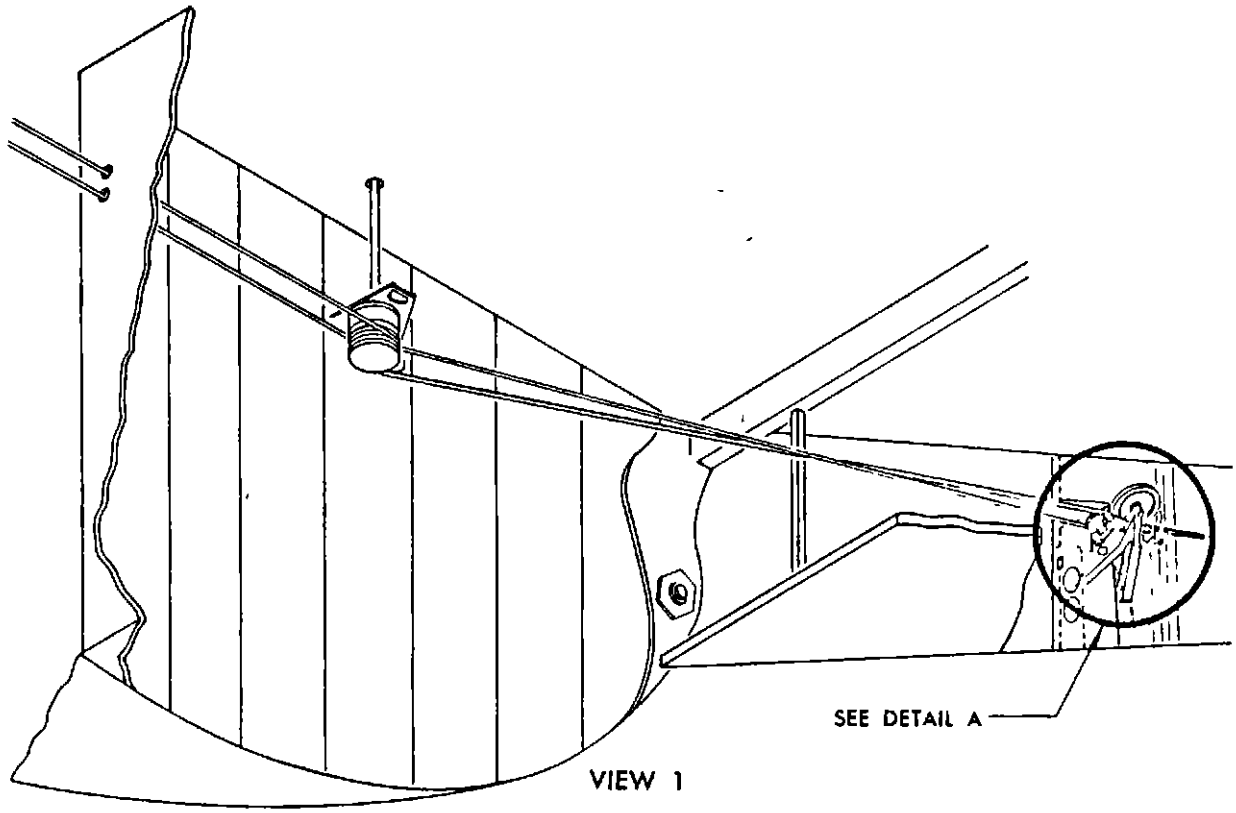
Aileron Trim Control Cable Stop Adjustment
Figure 204



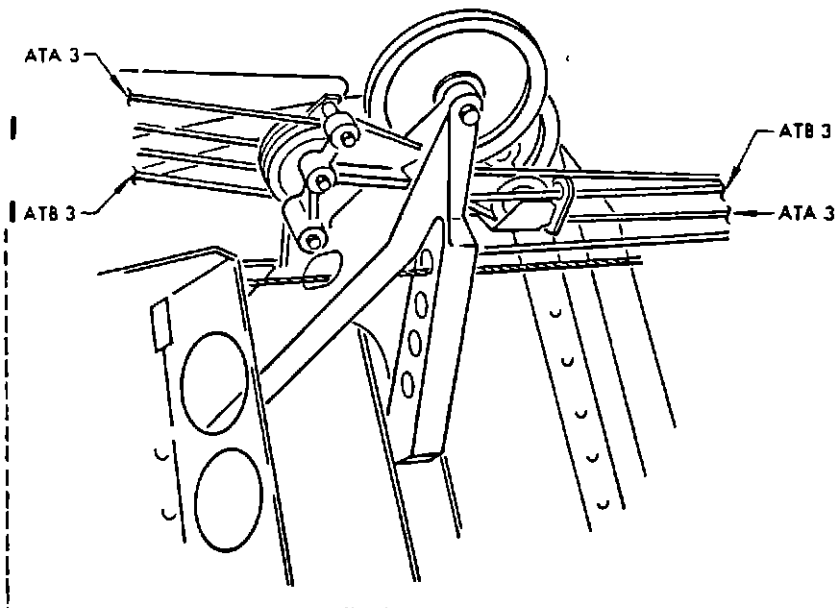
△1 TEMPERATURE OF PRIMARY AIRPLANE STRUCTURE WHICH SHOULD BE STABLE ABOUT ONE HOUR PRIOR TO RIGGING

△1 TEMPERATURE (degrees fahrenheit)	CABLE RIGGING LOAD - (pounds ± 5)
110	62
90	56
70	50
50	44
30	38
10	32
-10	26
-30	20
-40	17

Aileron Trim Control Cables Adjustment
Figure 205 (Sheet 1)



VIEW 1



DETAIL A

Aileron Trim Control Cables Adjustment
Figure 205 (Sheet 2)

S.B. REV 17 JAN 1967

(20) Install rudder trim control wheel.

(21) Remove bus drum guard and spacers (figure 203).

(22) Remove bus drum from shaft by removing retainer nut and sliding drum from shaft

(23) View bus drum from the top and rotate drum as indicated below until each cable has the required number of wraps. Apply a pencil reference mark to cable drum and housing to indicate neutral position

CABLE	DIRECTION OF DRUM ROTATION	CABLE WRAPS REQUIRED
ATB2	Clockwise	4 1/4 wraps
ATA2	Counterclockwise	4 wraps
ATB3	Clockwise	4 wraps
ATA3	Counterclockwise	4 1/2 wraps

(24) Install bus drum on shaft and secure with retaining nut Then replace spacers and guard Hold this position until drum control mechanism is adjusted.

(25) Disconnect aft end of each trim control mechanism

(26) Rotate jackscrew until end of nut is 1/8 (± 3/64) inches from end of screw (figure 206) Apply a pencil reference mark to cable drum and drum housing to indicate neutral position.

NOTE: Jackscrew may be rotated by turning drum on forward end of mechanism

(27) Disconnect one inboard aileron bus push rod

(28) Clamp each aileron in faired position within 1/4-inch of wing chord plane (See 27-14-0, figure 205)

(29) Install rigging pin No. 2 through structure and trim control crank (figure 206) in left wing and through structure and control crank on right wing

NOTE Aileron tab should be faired if aileron control system has been rigged.

(30) Adjust rod end of each trim control mechanism until connecting bolt can be installed through crank and rod end without binding and secure mechanism to control crank.

CAUTION: ANTI-ROTATIONAL FORK ON LEFT AILERON MECHANISM MUST BE ON OUTBOARD SIDE OF CRANK ASSEMBLY AND ON RIGHT AILERON MECHANISM THE FORK MUST BE ON INBOARD SIDE OF CRANK ASEMBLY.

NOTE: Check that aft end of mechanism freely aligns with crank fork within 0.10 inch. (Shim at fwd end if required)

(31) Adjust cables to specified tension (figure 205), being careful to maintain neutral position. Check reference marks applied in steps (23) and (26).

(32) Remove rigging pin from crank.

(33) Test aileron trim control system. (See paragraph 1.D.)

(34) Replace access panels.

(35) Close main gear wheel well doors.

CAUTION: STAND CLEAR OF MAIN GEAR DOOR ACTION PATH TO AVOID INJURY TO PERSONNEL AS DOORS CLOSE.

(36) Remove external power.

D. Test Aileron Trim Control System.

(1) Remove inboard aileron control access panel 3271. See Chapter 12, "Access Doors and Panels."

(2) Clamp both inboard ailerons so that aileron mean trailing edge is faired with 1/4-inch of wing chord plane.

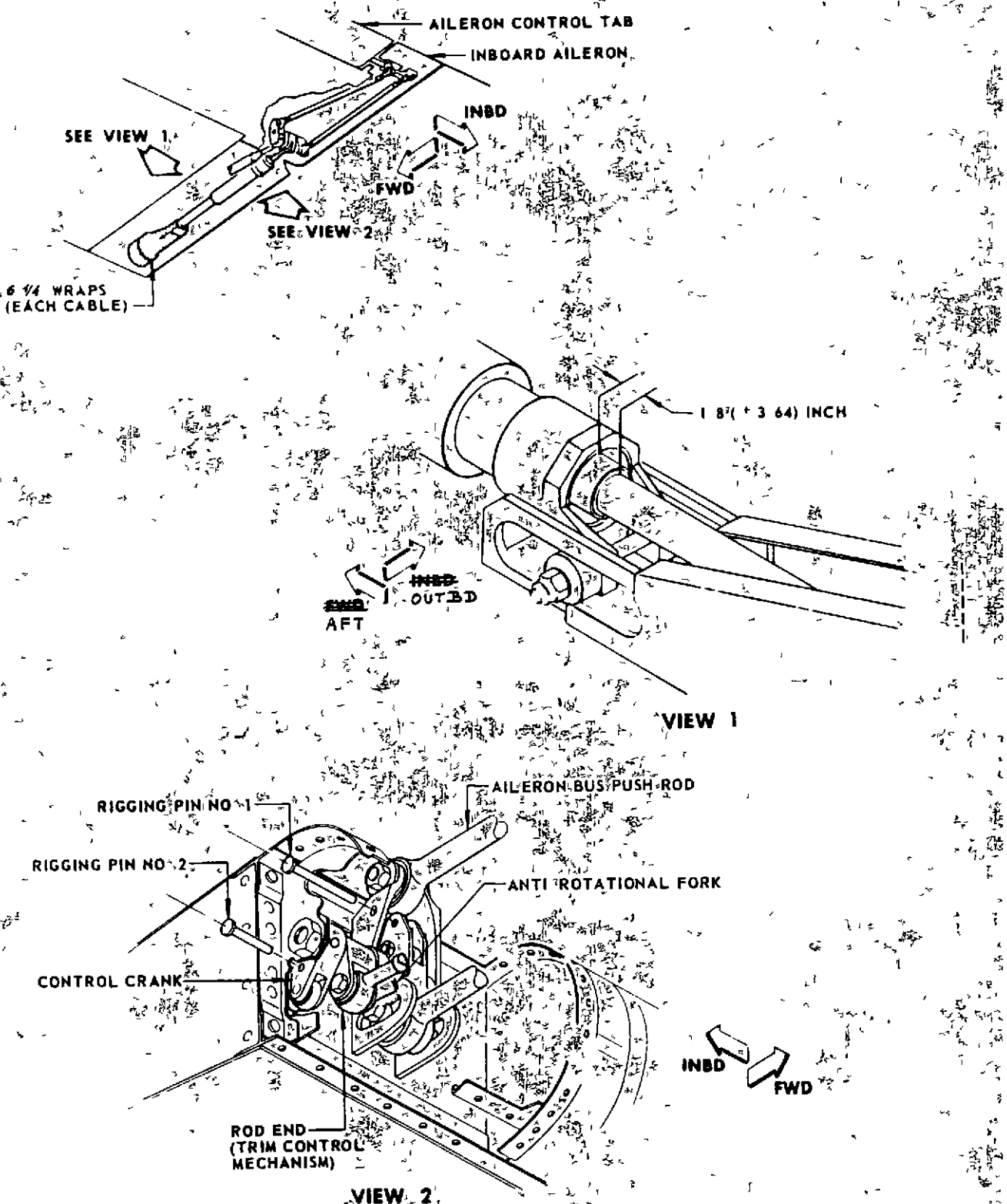
NOTE: In order to put both inboard ailerons on wing chord plane simultaneously and to prevent a preload in tab linkage, disconnect one aileron bus control rod at the aileron bus quadrant. Aileron faired position on wing chord plane is determined by placing a straight edge flush with lower surface of wing and aileron near outboard end of aileron. Wing chord plane theoretically passes through wing trailing edge.

(3) Rotate aileron trim control wheel counterclockwise from zero until cable stops are contacted.

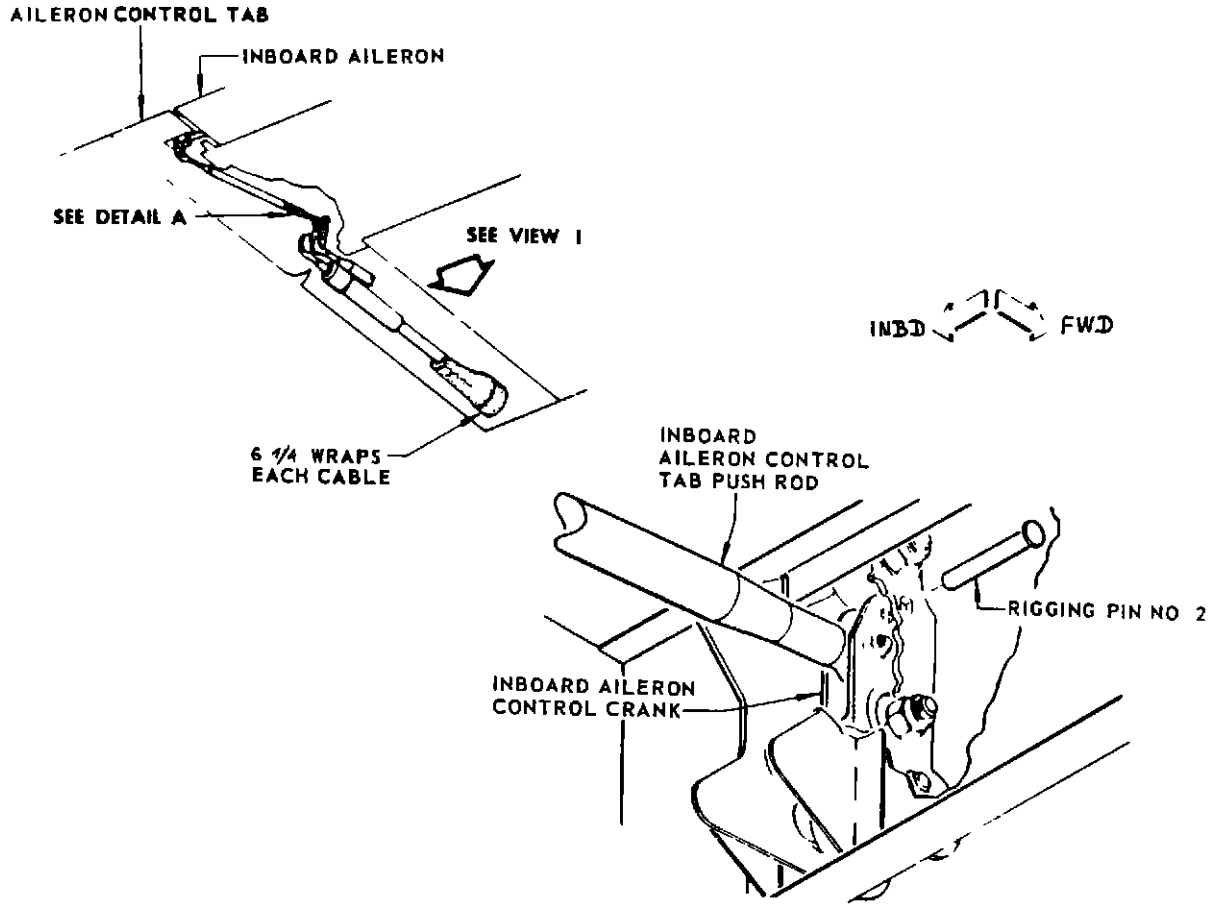
(4) Check that trim control wheel rotates 3.30 to 3.80 revolutions from zero to cable stops.

(5) Check that indicator rotates with control wheel for full travel.

(6) Check that RH inboard aileron tab rotates up against tab stops and that LH inboard aileron tab rotates down against tab stops.



LH Inboard Aileron Trim Control Mechanism Adjustment
Figure 206 (Sheet 1 of 2)



RH Inboard Aileron Trim Control Mechanism Adjustment
Figure 206 (Sheet 2 of 2)

(7) Check trim control mechanism spring cartridge assembly deflection with trim control wheel at counterclockwise stop. RH assembly shall extend 0.67 (± 0.05) inches and LH assembly shall extend 0.75 (± 0.05) inches at full tab travel.

(8) Check that jackscrew support rollers are not binding in guides.

(9) Rotate trim control wheel clockwise from zero until cable stops are contacted.

(10) Check that trim control wheel rotates 3.30 to 3 80 revolutions and that indicator rotates with control wheel for full travel.

(11) Check that RH tab will rotate down against tab stops and LH tab rotates up against tab stops.

(12) Check trim control mechanism spring cartridge assembly deflection RH assembly shall compress 0.67 (± 0.05) inches and LH assembly shall compress 0.55 (± 0.05) inches at full tab travel.

(13) Check that jackscrew support rollers are not binding in guides.

NOTE: Any ratcheting of the trim mechanism during the above mentioned tests is to be disregarded.

(14) Remove clamps from aileron and connect inboard aileron bus control rod.

(15) Hold inboard ailerons in neutral position (1-1/4 degrees below wing chord plane) and check tangential force required to rotate trim control wheel. With unrestricted aileron tabs, control wheel tangential force is not to exceed 19 pounds in either direction.

(16) Replace access panels.

(17) Return aileron trim control wheel to "0."

PILOTS' AILERON TRIM CONTROL UNIT - MAINTENANCE PRACTICES

1. Removal/Installation Pilots' Aileron Trim Control Unit

A. Equipment

(1) Tensiometer - 0 to 100 pound capacity

(2) Scale - 0 to 36 inches graduated in sixty-fourths

B. Remove Pilots' Aileron Trim Control Unit

(1) Rotate aileron trim control wheel to 0 (neutral).

(2) In lower nose compartment, install phenolic faced clamp on each aileron trim control cable aft of turnbuckle and adjacent to forward side of a fairlead.

NOTE This procedure will maintain cable position on the aileron trim control drum under the floor at station 820.

(3) Disconnect aileron trim cable turnbuckles.

(4) Remove control stand coverplate (figure 201).

(a) Rotate rudder trim indicator to 0 prior to removal to avoid rigging rudder trim system at assembly.

(b) On coverplate with stabilizer brake release knob, remove spring pin from knob and remove knob from slider assembly. Remove nut from stabilizer brake release slider assembly.

(c) Remove coverplate retaining screws.

(d) Carefully lift coverplate from control stand separating rudder trim gearbox assembly and splined rudder trim control shaft.

NOTE Wires to radio panel light switch may be disconnected to aid in removing coverplate.

(5) Block or tie upper end of rudder trim control shaft to reduce bending load on sprocket mounting bracket.

(6) Remove radio autopilot panel (21).

(7) Remove aileron trim control wheel (14).

(a) Pry out plug button (15).

(b) Remove retaining nut and washer.

(c) Pull wheel and actuator (13) from shaft.

(8) Remove aileron trim control indicator (12).

(9) Disconnect terminal shaft (11) from tab shaft (8) by extracting shaft connecting bolts (9).

(10) Pull terminal shaft from bearing.

(11) Remove aft bearing housing (10) mounting screws and slide housing from control stand.

(12) Remove forward bearing housing (6) mounting screws and lift drum, tab shaft and bearing housing from control stand.

(13) Remove cable guides (17) from bearing housing.

(14) Pull bearing housing (6) from tab shaft (8).

(15) Remove cables from drum if drum is to be removed.

NOTE Tag cables for assembly reference.

(16) Remove retaining pin (18) and slide drum off tab shaft.

C. Install Pilots' Aileron Trim Control Unit

(1) Place drum (7, figure 201) on tab shaft (8) and align retaining pin (18) holes.

(2) Install retaining pin in drum and shaft with cotter pin (19) hole between hub and small pilot hole in drum wall.

(3) Viewing drum from the rear, secure cables by rotating drum counterclockwise to wrap ATB and clockwise to wrap ATA until each has 4 1/2 wraps.

NOTE. Aileron trim control cables cross directly behind control stand.

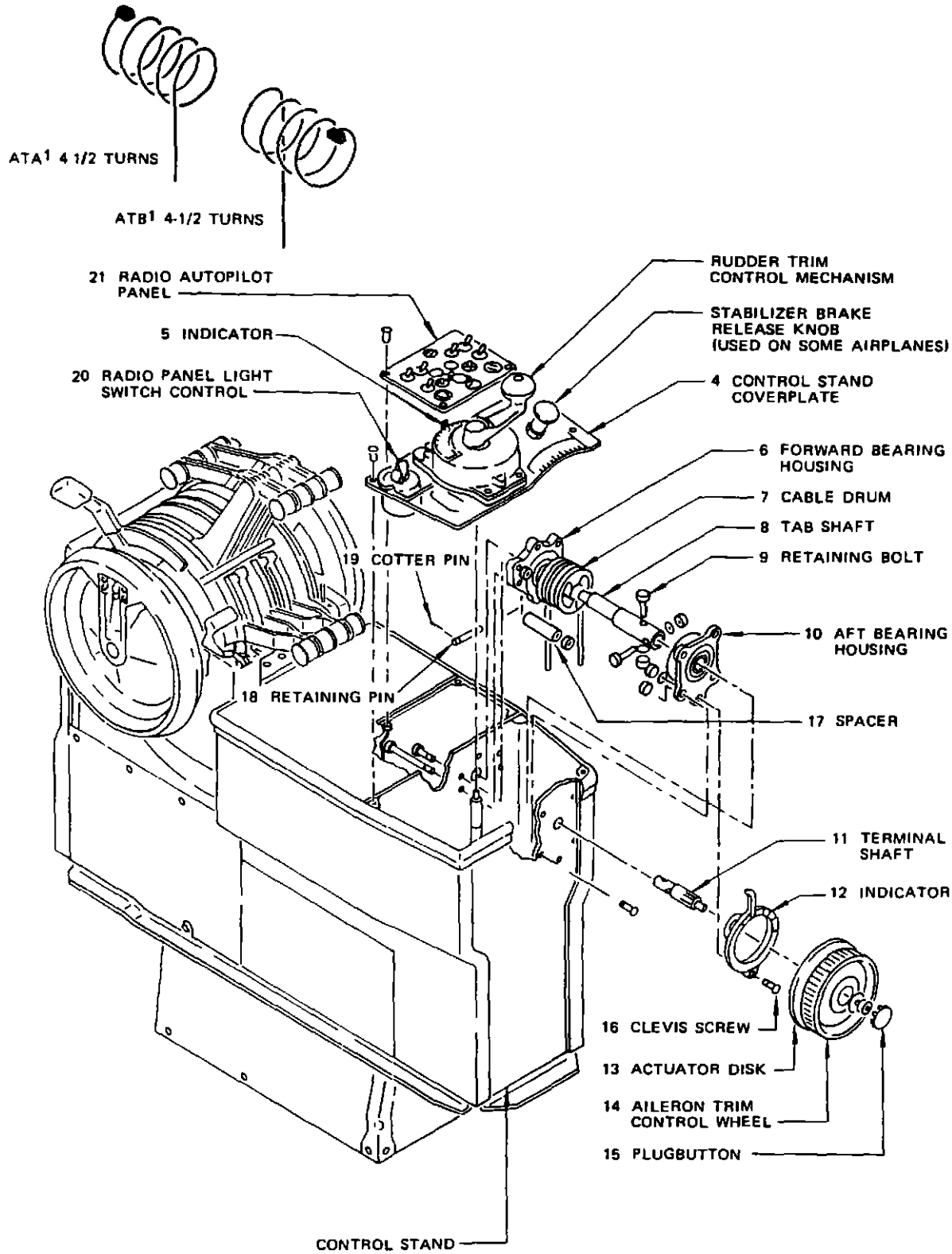
(4) Place forward bearing housing (6) with bearing on tab shaft (8) with flush or mating side forward.

(5) Install cable guides (17) on housing.

(6) Lower drum and shaft assembly into control stand and secure with mounting screws.

(7) Install aft bearing housing (10) with flush side against control stand.

(8) Insert terminal shaft (11) through aft bearing and connect to tab shaft (8).



Pilots' Aileron Trim Control Unit Installation
Figure 201

(9) Install aileron trim indicator (12) with clevis screw (16) head to rear

(10) Replace radio autopilot panel (21).

(11) Rotate drum until each cable has 4-1/2 turns and hold lower end of cables to prevent drum rotation

(12) Position rudder trim indicator (5) to 0 with handle pointing right

(13) Push stabilizer brake release slider assembly through mounting hole in coverplate and install nut to keep assembly from sliding through coverplate.

(14) Carefully replace control stand coverplate engaging splined rudder trim control shaft with gearbox assembly Secure cover with retaining screws

NOTE Rudder and rudder trim tab must be aligned within 1/16 inch with 0 index point on body centerline

(15) Place aileron trim indicator (12) at 0

(16) Install aileron trim actuator (13) with drive pin on indicator (12) riding in actuator cam groove

(17) Install aileron trim control wheel (14) and secure to shaft Remove old markings on wheel (14) and paint new white mark per SAB.707/96.

(18) Tighten stabilizer brake release assembly nut to 50-70 pound-inches torque.

(19) Locate stabilizer brake release knob on slider assembly and drive in spring pin

(20) Connect cable turnbuckles and take up tension

(21) Remove cable clamps.

(22) Adjust aileron trim cables until stops are 23-5/16 (± 1/2) inches from fairleads when cables are rigged to specified tension. (See 27-15-0, figure 205)

NOTE: Aileron trim indicator must be positioned at 0

(23) Lockwire turnbuckles and cable stops (See 27-15-0, figure 204.)

(24) Rotate aileron trim control wheel for full travel in each direction

(25) Check for erratic operation, rubbing wheel and binding bearings.

(26) Observe indicator to see that it follows as the control wheel is rotated.

(27) Test pilots aileron trim control unit.

(28) Rotate aileron trim control wheel to 0.

2. Adjustment/Test Pilots' Aileron Trim Control Unit

A. Equipment and Materials

(1) Scale - 0 to 36 inches graduated in sixty-fourths

B Adjust Pilots' Aileron Trim Control Unit

(1) Rotate aileron trim control wheel until cable stops are 23-5/16 (± 1/2) inches from fairleads. (See 27-15-0, figure 204.)

(2) Remove aileron trim control wheel (14, figure 201) being careful not to rotate cable drum

(a) Pry out plug button (15).

(b) Remove retaining nut and washer

(c) Slide control wheel and actuator disk (13) from shaft.

(3) Position aileron trim indicator (12) to 0 Cable stops must be 23-5/16 (± 1/2) inches from fairleads.

(4) Replace actuator disk (13) with indicator (12) drive pin riding in actuator cam groove

(5) Install trim control wheel (14) and secure to shaft. Remove old markings on wheel (14) and paint new white mark per SAB.707/96.

(6) Test pilot's aileron trim control unit.

C. Test Pilots' Aileron Trim Control Unit

(1) Rotate aileron trim control wheel counterclockwise 3 55 turns from neutral or until stops are contacted.

(2) Check indicator for full travel with operation of control wheel

(3) Check that control wheel, indicator and bearings do not bind.

(4) Check that tangential force required to rotate aileron trim control wheel during full travel does not exceed 19 pounds with unrestricted aileron controls and inboard ailerons held at neutral

3 Approved Repairs Pilots' Aileron Trim Control Unit

A Equipment and Materials

(1) Scale - 0 to 36 inches graduated in sixty-fourths

(2) Tensiometer - 0 to 100 pound capacity

B Replace Terminal (Aft) Shaft Bearing

(1) Rotate aileron trim control wheel to 0 (neutral)

(2) In lower nose compartment, install a phenolic faced clamp on each aileron trim control cable aft of turnbuckle and adjacent to the forward side of a fairlead.

NOTE This procedure will maintain cable position on the aileron trim control drum under the floor at station 820

(3) Relieve tension in aileron trim control cables between control stand and trim control drum at station 820.

(4) Remove control stand coverplate (figure 201).

(a) Rotate rudder trim indicator to 0 prior to removal to avoid rigging rudder trim system at assembly

(b) On coverplate with stabilizer brake release knob, remove spring pin from knob and remove knob from slider assembly Remove nut from stabilizer brake release slider assembly

(c) Remove coverplate retaining screws

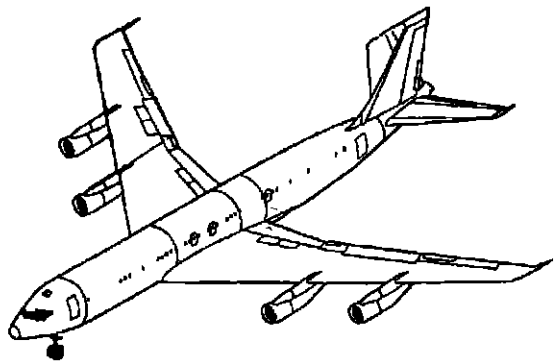
(d) Carefully lift coverplate from control stand separating rudder trim gearbox assembly and splined rudder trim control shaft

NOTE Wires to radio panel light switch may be disconnected to aid in removing coverplate.

EADS Military Air Systems

EADS DEFENCE & SECURITY

Accompanying Document for Documentation Amendments



NATO Trainer / Cargo Aircraft

NATO DOC.: D6-6003
AIRCRAFT MAINTENANCE MANUAL

EADS REV: **TR-No. 27-3** **Sept 15, 2010**

Reason for change DCN/R ESEC-DO-08-0159

	Dept	Name	Date	Signature
Preparation	MOCE2	J Leyrer	15 09	
Engineering	MOCE5	R Guenther	04/10/10	
Quality	MQD1	E Narvaez	05 OCT 2010	
IAMCO	BRANCH 2	A MONGERA	12th Nov '10	
Approved	HQ NAEW&C FC	M. WEBER	16 Dec-10	

BOEING Intercontinental 707

MAINTENANCE MANUAL

TEMPORARY REVISION NR. DFW 27-3

INSERT COVER PAGE OF THIS TR IN FRONT OF CHAPTER 27

REASON FOR CHANGE: DCN/R ESEC-DO-08-0159

INSTRUCTION: Insert page 3 of this TR in front of page 201 of the original chapter 27-18-0.

NOTE: The insertion of this TR has to be listed in the Record of Temporary Revisions at the beginning of Volume 1.

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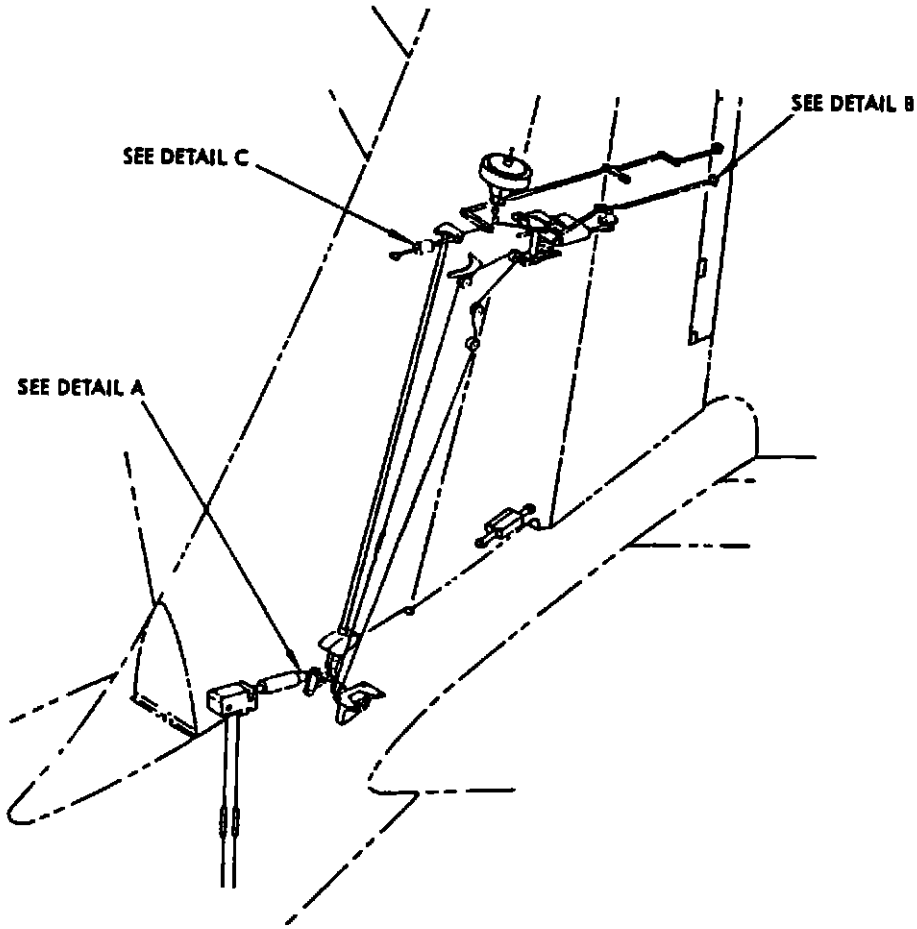
RUDDER TRIM CONTROL SYSTEM - MAINTENANCE PRACTICES

1. Unit Servicing

A. Lubricate Rudder Trim Control System (See figure 201.)



INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
		CAUTION Lubricants (grease, oil, cleaning compound) are not to be applied to thrust washers, brake surfaces or other components inside the rudder trim actuator assembly housing Lubricants on these surfaces causes excessive loads, particularly at cold temperatures
1	Actuator Jackscrew (Rudder Trim Actuator Assy)	(a)Add a few drops of oil,MIL-L-7870,to oil cups. (b)Actuate through one complete cycle
2	Rod End Bearing	Apply Aeroshell Grease 17 through flush fitting.
3	Control Tab Push Rod	Apply Aeroshell Grease 17 through flush fitting.
4	Control Tab Damper	Apply Aeroshell Grease 17 through flush fittings 2 places.

Rudder Trim Control System Lubrication
Figure 202 (Sheet 1)

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(5) Block or tie upper end of rudder trim control shaft to reduce bending load on sprocket mounting bracket.

(6) Remove aileron trim control wheel (14).

(a) Pry out plug button (15).

(b) Remove retaining nut and washer

(c) Pull wheel and actuator disk (13) from shaft

(7) Remove aileron trim control indicator (12)

(8) Disconnect terminal shaft (11) from tab shaft (8) by extracting shaft connecting bolts (9).

(9) Pull terminal shaft from bearing.

(10) Remove bearing housing mounting (10) screws and slide housing from control stand.

(11) Press defective bearing from housing and install new bearing in housing.

(12) Slide bearing housing (10) into control stand and secure.

(13) Install aileron trim indicator (12) with clevis screw (16) head aft.

(14) Insert terminal shaft (11) into bearing and connect to tab shaft (8).

(15) Position rudder trim indicator (5) to 0 with handle pointing right.

(16) Push stabilizer brake release slider assembly through mounting hole in coverplate and install nut to keep assembly from sliding through coverplate.

(17) Carefully replace control stand coverplate engaging splined rudder trim control shaft with gearbox assembly. Secure cover with retaining screws.

NOTE Rudder and rudder trim tab must be aligned within 1/16 inch with 0 index point on body centerline.

(18) Tighten stabilizer brake release assembly nut to 50-70 pound-inches torque.

(19) Locate stabilizer brake release knob on slider assembly and drive in spring pin.

(20) Connect aileron trim cable turnbuckles and take up tension.

(21) Remove cable clamps.

(22) Adjust aileron trim cables until stops are 23-5/16 (± 1/2) inches from fairleads when cables are rigged to specified tension. (See 27-15-0,figures 204 and 205.) Hold this neutral position until aileron trim control wheel is installed

(23) Lockwire turnbuckles and cable stops

(24) Position aileron trim indicator (12, figure 201) at 0

(25) Install actuator disk (13) with indicator drive pin riding in actuator cam groove.

(26) Install aileron trim control wheel (14) and secure to shaft Remove old markings on wheel (14) and paint new white mark per SAB.707/96.

(27) Rotate aileron trim control wheel for full travel and check for erratic operation, rubbing wheel and binding bearings

(28) Test pilots' aileron trim control unit.

C. Replace Tab (Forward) Shaft Bearing

(1) Rotate aileron trim control wheel to 0 (neutral)

(2) In lower nose compartment, install a phenolic faced clamp on each aileron trim control cable aft of turnbuckle and adjacent to the forward side of a fairlead.

(3) Disconnect aileron trim cable turnbuckles.

(4) Remove control stand coverplate (figure 201).

(a) Rotate rudder trim indicator to 0 prior to removal to avoid rigging rudder trim system at assembly

(b) On coverplate with stabilizer brake release knob, remove spring pin from knob and remove knob from slider assembly Remove nut from stabilizer brake release slider assembly

(c) Remove coverplate retaining screws.

(d) Carefully lift coverplate from control stand separating rudder trim gearbox assembly and splined rudder trim control shaft.

NOTE. Wires to radio panel light switch may be disconnected to aid in removing coverplate.

(5) Block or tie upper end of rudder trim control shaft to reduce bending load on sprocket mounting bracket.

(6) Remove radio autopilot panel (21).

(7) Disconnect terminal shaft (11) from tab shaft (8) by extracting shaft connecting bolts (9)

(8) Pull terminal shaft (11) with actuator disk, and control wheel from bearing

(9) Remove aileron trim control wheel (14) from shaft.

(a) Pry out plug button (15).

(b) Remove retaining nut and washer.

(c) Slide control wheel from shaft.

(10) Remove tab shaft bearing housing (6) mounting screws and lift drum, tab shaft, and housing from control stand.

(11) Separate bearing housing (6) and tab shaft (8).

(12) Press defective bearing from housing and install new bearing.

(13) Place bearing housing (6) on tab shaft (8) with flush side forward.

(14) Install drum, tab shaft and bearing housing in control stand.

(15) Insert terminal shaft (11) through bearing and connect to tab shaft (8).

(16) Connect cables and take up tension

(17) Remove cable clamps.

(18) Adjust aileron trim cables until stops are 23-5/16 (± 1/2) from fairleads when cables are rigged to specified tension. (See 27-15-0, figures 204 and 205.) Hold this neutral position until aileron trim control wheel is installed.

(19) Lockwire turnbuckles and stops.

(20) Install radio autopilot panel (21, figure 201).

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(21) Position rudder trim indicator to 0 with handle pointing right.

(22) Push stabilizer brake release slider assembly through mounting hole in coverplate and install nut to keep assembly from sliding through coverplate

(23) Carefully replace control stand coverplate engaging splined rudder trim control shaft with gearbox assembly Secure cover with retaining screws

NOTE Rudder and rudder trim tab must be aligned within 1/16 inch with 0 index point on body centerline

(24) With aileron trim indicator (12) positioned at 0 install actuator disk (13) so that indicator drive pin is riding in actuator cam groove

(25) Install aileron trim control wheel (14) and secure to shaft Remove old markings on wheel (14) and paint new white mark per SAB.707/96.

(26) Tighten stabilizer brake release assembly nut to 50-70 pound-inches torque

(27) Locate stabilizer brake release knob on slider assembly and drive in spring pin.

(28) Rotate aileron control wheel for full travel in each direction

(29) Check for erratic operation, rubbing wheel and binding bearings.

(30) Observe the indicator to see that it is following as the wheel is rotated.

(31) Test pilots' aileron trim control unit.

AILERON TRIM CONTROL CABLES - MAINTENANCE PRACTICES

1. Removal/Installation Aileron Trim Control Cables

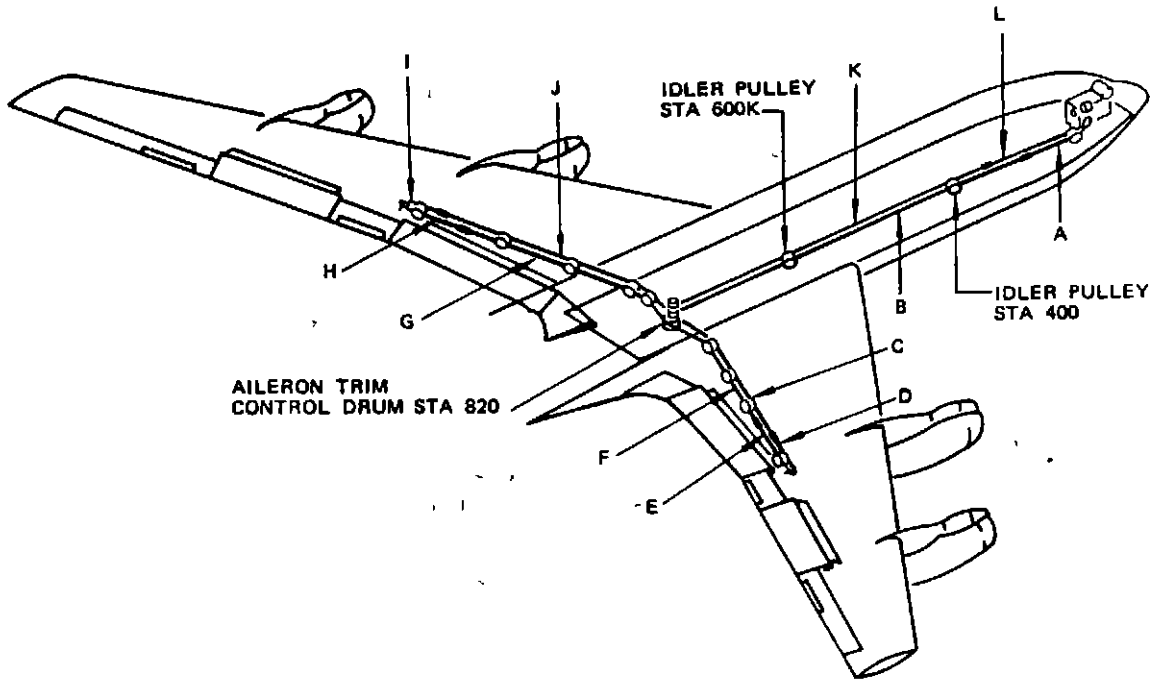
A. General

(1) To remove the forward body run cables it is necessary to remove the control stand cover plate and right aft radio autopilot panel. With these removed the cable guides around the trim control drum can be removed and the cable terminals extracted. The cables can be pulled from the aft end.

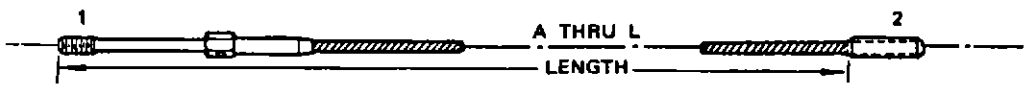
(2) The control cables terminating at the aileron trim control mechanism are removed and installed with the mechanism. See 27-15-21, Removal/Installation Aileron Trim Control Mechanism.

2. Approved Repairs/Aileron Trim Control Cables (See figure 201.)

A. Replace cables per 27-1-1, "Control Cables - Maintenance Practices."



CABLE REF	DRAWING NUMBER	NO REQ	LENGTH	CABLE SIZE	FITTINGS	
					1	2
A	BACC13G319 1154	1	115 4 IN	3/32 x 7 x 7	AN669L3LH	BACT14A3
B	BACC13G320 7230	1	723 0 IN	3/32 x 7 x 7	AN669L3RH	BACT14A3
C	BACC13G319 3063	1	306 3 IN	3/32 x 7 x 7	AN669L3LH	BACT14A3
D	BACC13G320 1487	1	148 7 IN	3/32 x 7 x 7	AN669L3RH	BACT14A3
E	BACC13G319 1467	1	146 7 IN	3/32 x 7 x 7	AN669L3LH	BACT14A3
F	BACC13G320 3135	1	313.5 IN	3/32 x 7 x 7	AN669L3RH	BACT14A3
G	BACC13G319 3760	1	376 0 IN	3/32 x 7 x 7	AN669L3LH	BACT14A3
H	BACC13G319 1467	1	146 7 IN	3/32 x 7 x 7	AN669L3RH	BACT14A3
I	BACC13G320 1487	1	148 7 IN	3/32 x 7 x 7	AN669L3RH	BACT14A3
J	BACC13G320-3803	1	380 3 IN	3/32 x 7 x 7	AN669L3LH	BACT14A3
K	BACC13G319 7230	1	723 0 IN	3/32 x 7 x 7	AN669L3LH	BACT14A3
L	BACC13G320 1142	1	114 2 IN	3/32 x 7 x 7	AN669L3RH	BACT14A3



Aileron Trim Control Cables
Figure 201

INBOARD AILERON TRIM CONTROL MECHANISM - MAINTENANCE PRACTICES

1. Removal/Installation Inboard Aileron Trim Control Mechanism

A. Equipment and Materials

(1) Scale - 0 to 6 inches graduated in sixty-fourths

(2) Tensiometer - 100 lb capacity

(3) Clamps suitable for flight control surfaces

B. Remove Inboard Aileron Trim Control Mechanism

(1) Remove access panels 1355, 1356, inboard aileron control access panel 1357 and inboard aileron hinge access panel 1383. See Access Panels and Doors, Chapter 12.

(2) Open wing lower access door 1358.

(3) Disconnect aileron trim cable turnbuckles in wing (figure 201).

NOTE Tag cables for assembly reference.

(4) Disconnect aft end of mechanism. Hold mechanism from pivoting about forward mounting bolt and damaging equipment.

(5) Disconnect mechanism from drain tubing by loosening the hose clamp.

(6) Disconnect forward end of mechanism.

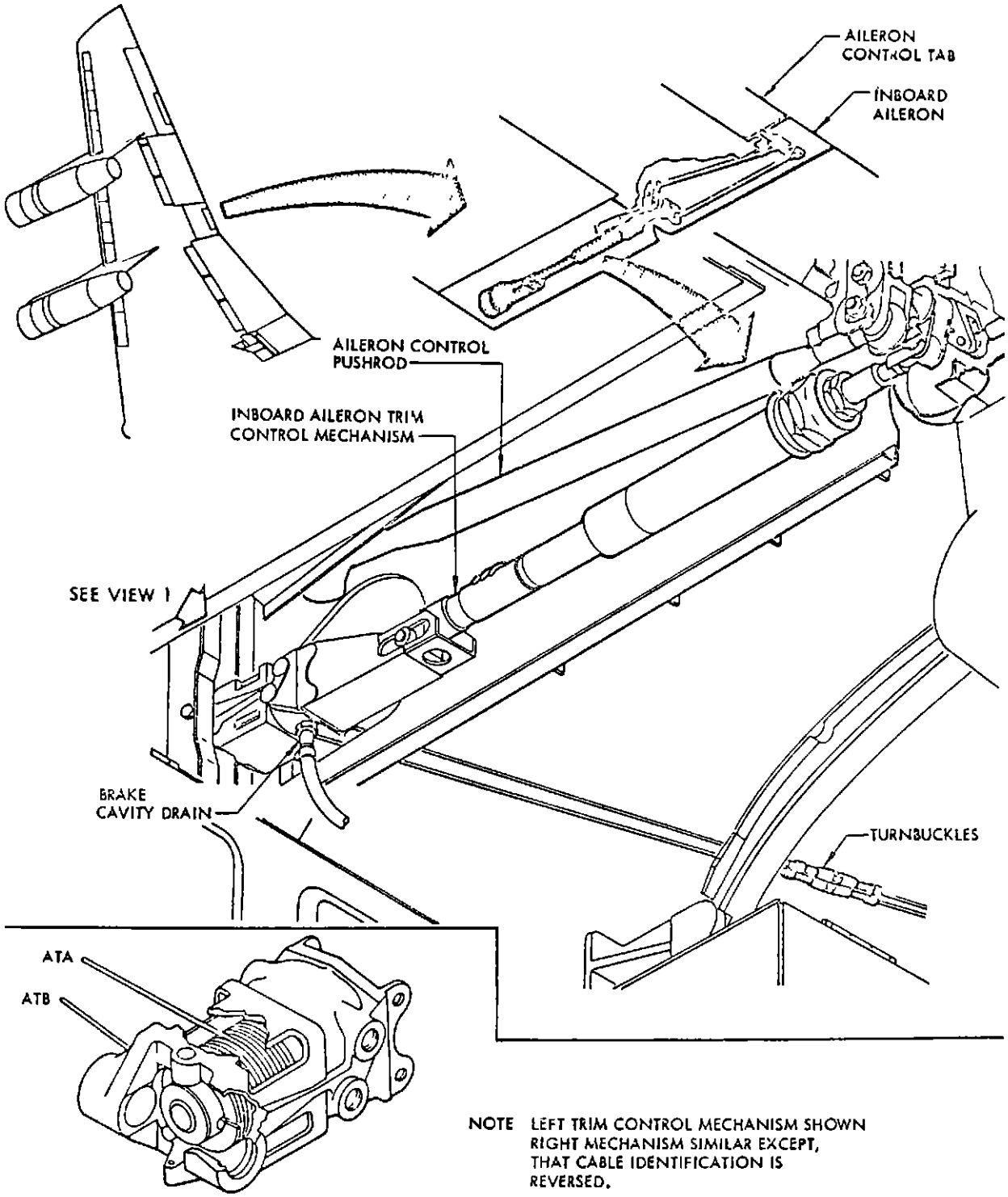
(7) Lift mechanism from forward mounting; working control cables out as mechanism is removed.

C. Installation Inboard Aileron Trim Control Mechanism

(1) Deflect spring cartridge and check that excessive friction is not hindering spring cartridge motion.

(2) Rotate jackscrew until linear clearance between end of nut and screw is 1/8 (± 3/64) inch (figure 202).

(3) Apply a reference mark to the trim control mechanism cable drum and housing so that this neutral position may be checked when cable tension is adjusted.



NOTE LEFT TRIM CONTROL MECHANISM SHOWN RIGHT MECHANISM SIMILAR EXCEPT, THAT CABLE IDENTIFICATION IS REVERSED.

VIEW 1

SB. 2298

Inboard Aileron Trim Control Mechanism Installation 2
Figure 201 Aug 15/66

SAB.REV 17 OCT 1967

(4) Place mechanism (figure 201) in mounting position with ball return tubes on top

NOTE Control cables are installed with mechanism and may be clamped to prevent unwinding during installation

(5) Position cables in their respective runs.

(6) Secure forward end of mechanism to structure with hinge bolt, castellated nut and cotter pin.

(7) Clamp aileron in faired position within 1/4 inch of wing trailing edge

NOTE A straight edge may be placed flush with wing surface and aileron to establish a reference point for trailing edge faired position (See 27-14-0, figure 206.)

(8) Install rigging pin or AN5 bolt in control crank and crank support (figure 202)

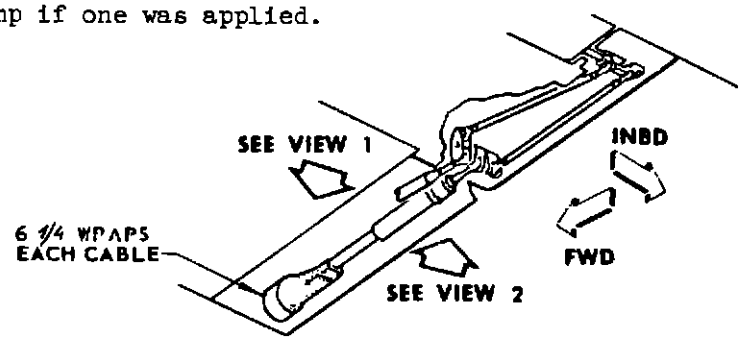
(9) Adjust rod end of mechanism until connecting bolt can be inserted freely through control crank and rod end.

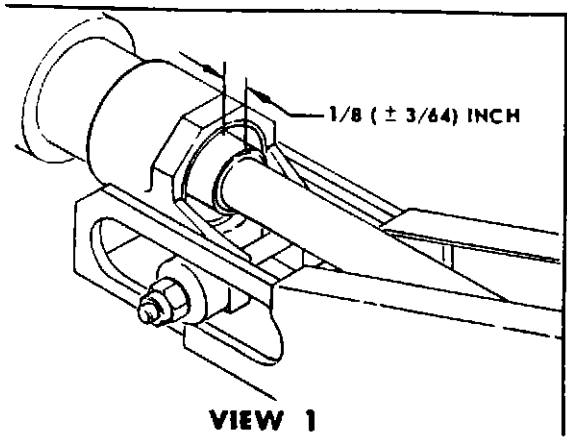
(10) Secure aft end of mechanism to crank.

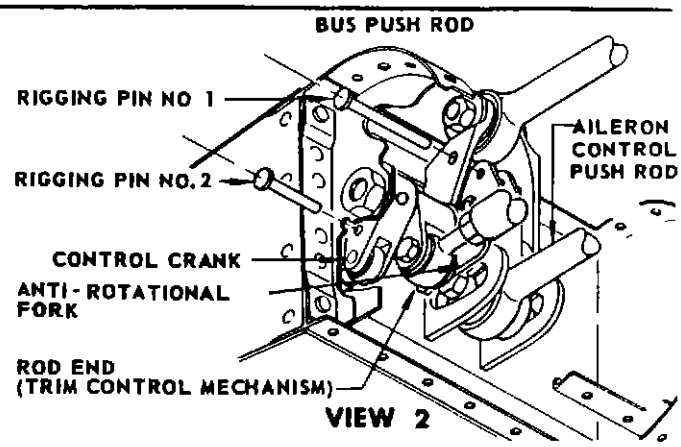
CAUTION ANTI-ROTATIONAL FORK ON LEFT AILERON MECHANISM MUST BE ON OUTBOARD SIDE OF CRANK ASSEMBLY AND ON RIGHT AILERON MECHANISM THE FORK MUST BE ON INBOARD SIDE OF CRANK ASSEMBLY.

(11) Rotate aileron trim control wheel to "0" and hold this position.

(12) Remove cable clamp if one was applied.







Inboard Aileron Trim Control Mechanism Adjustment
Figure 202

(13) Connect cables.

(14) Adjust cables to specified tension being careful not to rotate trim control mechanism. See 27-15-0, figure 205, for temperature-rigging load chart.

(15) **Connect mechanism to drain tubing, and tighten hose clamp.**

(16) Remove surface clamps and rigging pin.

(17) Test aileron trim control mechanism. (See 2.C.)

2. Adjustment/Test Inboard Aileron Trim Control Mechanism

A. Equipment and Materials

(1) Scale - 0 to 6 inches graduated in sixty-fourths

(2) Clamps suitable for flight control surfaces

B. Test Inboard Aileron Trim Control Mechanism

(1) Remove inboard aileron control access panel 1357. See Chapter 12, Access Doors and Panels.

(2) Clamp both inboard ailerons so that aileron mean trailing edge is faired withint 1/4-inch of wing chord plane.

NOTE In order to put both inboard ailerons on wing chord plane simultaneously and to prevent a preload in tab linkage, disconnect one aileron bus control rod at the aileron bus quadrant. Aileron faired position on wing chord plane is determined by placing a straight edge flush with lower surface of wing and aileron near outboard end of aileron. Wing chord plane theoretically passes through wing trailing edge.

(3) Rotate aileron trim control wheel counterclockwise from zero until cable stops are contacted.

(4) Check that trim control wheel rotates 3.30 to 3.80 revolutions from zero to cable stops.

(5) Check that indicator rotates with control wheel for full travel.

(6) Check that RH inboard aileron tab rotates up against tab stops and that LH inboard aileron tab rotates down against tab stops.

(7) Check trim control mechanism spring cartridge assembly deflection with trim control wheel at counterclockwise stop. RH assembly shall extend 0.67 (± 0.05) inches and LH assembly shall extend 0.75 (± 0.05) inches at full tab travel.

(8) Check that jackscrew support rollers are not binding in guides.

(9) Rotate trim control wheel clockwise from zero until cable stops are contacted.

(10) Check that trim control wheel rotates 3.30 to 3.80 revolutions and that indicator rotates with control wheel for full travel.

(11) Check that RH tab will rotate down against tab stops and LH tab rotates up against tab stops.

(12) Check trim control mechanism spring cartridge assembly deflection. RH assembly shall compress 0.67 (± 0.05) inches and LH assembly shall compress 0.55 (± 0.05) inches at full tab travel.

(13) Check that jackscrew support rollers are not binding in guides.

NOTE Any ratcheting of the trim mechanism during the above mentioned tests is to be disregarded.

(14) Remove clamps from aileron and connect inboard aileron bus control rod.

(15) Hold inboard ailerons in neutral position (1-1/4 degrees below wing chord plane) and check tangential force required to rotate trim control wheel. With unrestricted aileron tabs, control wheel tangential force is not to exceed 19 pounds in either direction.

(16) Replace access panels.

(17) Return aileron trim control wheel to "0."

3. Inspection/Check Inboard Aileron Trim Control Mechanism

A. Check Inboard Aileron Trim Control Mechanism

(1) Remove inboard aileron control access panel 1357. See "Access Doors and Panels," Chapter 12.

(2) Check drain holes in mechanism for obstruction.

(3) Replace access panels.

4. Approved Repairs/Inboard Aileron Trim Control Mechanism

A. Equipment and Materials

(1) Scale - 0 to 6 inches graduated in sixty-fourths

(2) Clamps suitable for control surfaces

B. Replace Rod End

(1) Remove inboard aileron control access panel 1357 and inboard aileron hinge access panel 1383. See "Access Panels and Doors," Chapter 12.

(2) Disconnect aft end of mechanism (figure 201).

(3) Remove rod end from spring cartridge assembly.

(4) Install new rod end but do not tighten check nut.

(5) Rotate jackscrew until linear clearance between end of nut and jackscrew is 1/8 (± 3/64) inch (figure 202) when ball return tubes are on top.

(6) Clamp aileron in a faired position within 1/4-inch of the wing trailing edge.

NOTE A straight edge may be placed flush with wing surface and aileron to establish a reference point for trailing edge faired position. (See 27-14-0, figure 206.)

(7) Install MS20392-4 rigging pin or AN5 bolt in control crank and crank support (figure 202).

(8) Adjust rod end until connecting bolt can be inserted freely through control crank and rod end.

(9) Secure aft end of mechanism to crank.

(10) Remove rigging pin and clamps.

(11) Replace access panel.

AILERON TRIM CONTROL DRUM - MAINTENANCE PRACTICES

1. Removal/Installation Aileron Trim Control Drum

A. Equipment and Materials

(1) Cleaner - Methyl ethyl ketone, TT-M-261, or equivalent

(2) Aeroshell Grease 17.

(3) Scale 0 to 36 inches graduated in sixty-fourths

(4) Tensiometer 0 to 100 lb capacity

(5) Pressure sealant - PR1221 Products Research Co , or EC1239 Minnesota Mining and Manufacturing Co.

(6) Primer-Zinc Chromate, MIL-P-8585A, or equivalent

B. Remove Aileron Trim Control Drum

(1) Provide external power (hydraulic or electric).

(2) Remove access panels 1355 and 1356. See "Access Doors and Panels," Chapter 12

(3) Rotate aileron trim control wheel to "0".

(4) Relieve tension in all aileron trim cables. (See 27-15-0, figure 205.)

(5) Remove necessary interior equipment and floor panel for access to upper trim control drum at station 820

(6) Open right main gear wheel well door.

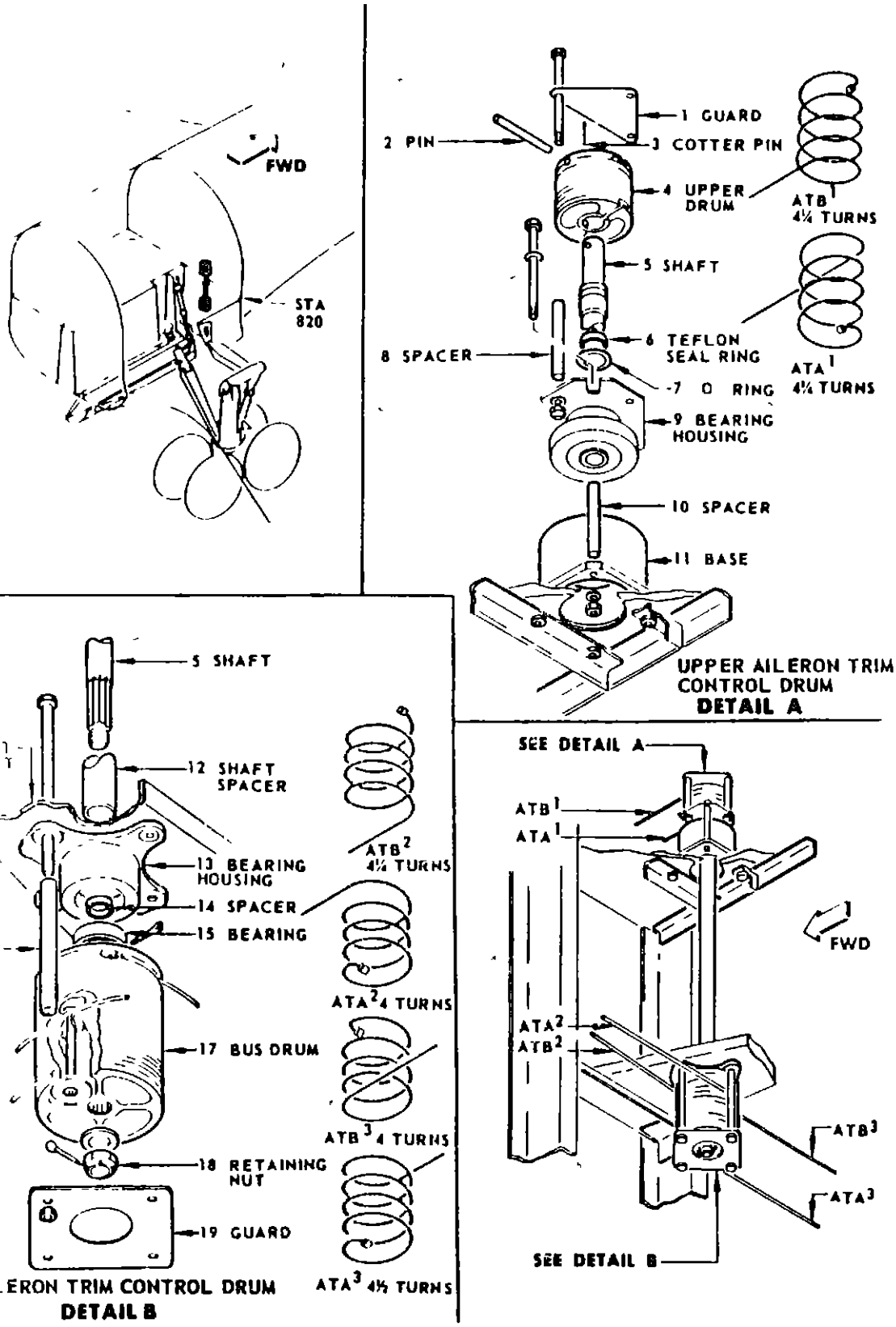
(7) Remove bus drum guard (19, figure 201) and spacers (16).

(8) Remove drum retaining nut (18).

(9) Pull bus drum (17), bearing housing (13) and shaft spacer (12) from shaft

(10) Remove cables from drum.

NOTE: Tag cables for assembly reference.



Aileron Trim Control Drum
Figure 201

(11) Remove upper drum guard (1) and spacers (8).

(12) Remove pin (2) from drum and shaft.

(13) Pull drum (4) from shaft.

(14) Remove cables from drum.

NOTE: Tag cables for assembly reference

(15) Lift shaft (5) from upper bearing housing (9).

(16) Remove upper bearing housing base mounting bolts.

NOTE: Retaining nuts are accessible from the right main gear wheel well.

(17) Lift base (11) and bearing housing (9) from mounting area.

C. Install Aileron Trim Control Drum

(1) Clean upper base mounting area to remove old pressure sealant. Use aluminum scraper and methyl ethyl ketone cleaner.

(2) Lubricate spherical mating surfaces of base (11, figure 201) and bearing housing (9) with grease.

(3) Assemble upper base and bearing housing.

(4) Place base and bearing housing assembly in mounting position with alignment spacer (10) at 4 o'clock as viewed from top.

(5) Apply pressure sealant to bolt shanks and surfaces of bolt holes before installing mounting bolts.

(6) After base has been secured to structure apply continuous fillet pressure seal to flange.

(7) Apply a light coat of pneumatic system grease to O-ring (7) and teflon seal (6) and place shaft (5) in upper bearing housing (9) with splined end down.

(8) Viewing upper drum from the top, secure cables by rotating drum counterclockwise to wrap ATB1 and clockwise to wrap ATA1 until each has 4-1/4 wraps.

(9) Install drum (4) on shaft

(10) Install pin (2) through drum (4) and shaft (5) with cotter pin (3) hole between hub and pilot hole in drum wall.

(11) Install drum guard (1).

(12) View bus drum from the top. Secure cables by rotating drum as indicated below until each cable has the required number of wraps.

CABLE	DIRECTION OF DRUM ROTATION	CABLE WRAPS REQUIRED
ATB2	Clockwise	4-1/4 wraps
ATA2	Counterclockwise	4 wraps
ATB3	Clockwise	4 wraps
ATA3	Counterclockwise	4-1/2 wraps

(13) Place fore and aft guard mounting bolts in lower bearing housing with heads up.

(14) Rotate upper drum until each cable has 4-1/4 turns when viewed from the top. Hold this position until lower drum is installed.

(15) Install shaft spacer (12) on shaft with guarded end down.

(16) Install lower bearing housing (13) on shaft with bearing spacer (14) between the two ball bearings.

NOTE: If lower bearing (15) is removed from bearing housing, reinstall with wet primer.

(17) Install bus drum (17) and secure to shaft. Apply pencil reference mark to cable drum and housing to indicate neutral position.

(18) Install four spacers (16) and bus drum guard (19). Secure with four guard mounting bolts.

(19) If required, eliminate vertical preload of support bracket (20). Install washers on mounting bolts between support bracket and structure to allow bracket to be installed with no preload.

(20) Rotate aileron trim control wheel to "0" (neutral).

(21) Adjust aileron trim cables in fuselage until cable stops are 23-5/16 (± 1/2) inches from fairleads when cables are rigged to specified tension See 27-15-0, figure 204 and 205, for cable stop adjustment and temperature-rigging load chart Check that aileron trim indicator remains at "0" and cable drum reference marks applied in step (17) are at neutral position.

(22) Rotate aileron trim control mechanism until clearance between screw and end of nut is 1/8 (± 3/64) inch. (See 27-15-0, figure 206.) Apply pencil reference mark to trim control mechanism cable drum and housing to indicate neutral position.

(23) Adjust wing run aileron trim cables to specified tension being careful not to rotate the trim control mechanism or bus drum. Check reference marks applied in steps (17) and (22) to assure drums have not rotated

(24) Lockwire turnbuckles and cable stops. (See 27-15-0, figure 204)

(25) Rotate drum and check for binding bearings and chafing cables.

(26) Replace panels.

(27) Close main gear wheel well doors.

CAUTION: STAND CLEAR OF MAIN GEAR DOOR ACTION PATH TO AVOID INJURY TO PERSONNEL AS DOOR CLOSES.

(28) Remove external power.

2 Inspection/Check Aileron Trim Control Drum

A. Check Aileron Trim Control Drum

(1) Remove necessary interior equipment and floor panel for access to upper aileron trim control drum.

(2) Provide external power (hydraulic or electric).

(3) Open right main gear wheel well door.

(4) Check fillet pressure sealant for deterioration.

(5) Check shaft spacer for damage.

(6) Replace floor panel and equipment.

(7) Close main gear wheel well doors.

CAUTION: STAND CLEAR OF MAIN GEAR DOOR ACTION PATH TO AVOID INJURY TO PERSONNEL AS DOOR CLOSES.

(8) Remove external power

3. Approved Repairs Aileron Trim Control Drum

A Equipment and Materials

(1) Scale 0 to 36 inches graduated in sixty-fourths

(2) Tensiometer 0 to 100 lb capacity

(3) Grease - Pneumatic System, MIL-L-4343A or equivalent

(4) Aeroshell Grease 17.

(5) Primer-Zinc Chromate, MIL-P-8585A, or equivalent

B. Replace shaft seals.

(1) Provide external power (hydraulic or electric).

(2) Remove access panels 1355, 1356, and inboard aileron control access panel 1357 See "Access Doors and Panels," Chapter 12.

(3) Rotate aileron trim control wheel to "0".

(4) Open right main gear wheel well doors.

(5) Relieve tension in all aileron trim control cables (See 27-15-0, figure 205.)

(6) Remove bus drum retaining nut (18, figure 201) and washer.

(7) Remove necessary interior equipment and floor panel for access to upper aileron trim control drum at station 820.

(8) Remove upper drum guard (1).

(9) Remove pin (2) from drum (4) and shaft (5).

(10) Lift drum from shaft

(11) Lift shaft (5) from upper bearing housing (9).

NOTE It is not necessary to completely remove shaft.

(12) Extract O-ring (7) from seal retainer.

(13) Slide teflon seal ring (6) over retaining collar and off shaft

(14) Install new O-ring and teflon seal. Lubricate these seals with a light coat of pneumatic system grease.

(15) Align shaft spacer (12) and bearing housing (13)

(16) Install shaft through upper bearing housing but prevent splines from engaging bus drum (17) serrations until step (23).

(17) Install upper drum (4) on shaft (5)

(18) Insert pin (2) through drum (4) and shaft (5) with cotter pin (3) hole between hub and small pilot hole in drum wall

(19) Rotate upper drum until each cable has 4-1/4 turns when viewed from the top

(20) View bus drum from the top and rotate drum as indicated below until each cable has the required number of wraps.

CABLE	DIRECTION OF DRUM ROTATION	CABLE WRAPS REQUIRED
ATB2	Clockwise	4-1/4 wraps
ATA2	Counterclockwise	4 wraps
ATB3	Clockwise	4 wraps
ATA3	Counterclockwise	4-1/2 wraps

(21) Secure bus drum (17) to shaft (5) with retaining nut. Apply a pencil mark to cable drum and drum housing to indicate neutral position.

(22) Install upper drum guard (1).

(23) Adjust aileron trim cables in fuselage until cable stops are 23-5/16 (± 1/2) inches from fairleads when cables are rigged to specified tension. See 27-15-0, figures 204 and 205, for cable stop adjustment and temperature-rigging load chart. Check that aileron trim indicator remains at "0" and reference mark applied in step (21) is at neutral position.

(24) Rotate aileron trim control mechanism until clearance between screw and nut is 1/8 (± 3/64) inch. Apply a pencil reference mark to trim control mechanism cable drum and housing to indicate neutral position. (See 27-15-0, figure 206.)

(25) Adjust wing run aileron trim cables to specified tension, being careful not to rotate the trim control mechanism or bus drum. Check reference marks applied in steps (21) and (24) to assure drums have not rotated.

(26) Rotate aileron trim control wheel for full travel in each direction and check for binding and chafing surfaces.

(27) Replace access panels.

(28) Close main gear wheel well doors.

CAUTION STAND CLEAR OF MAIN GEAR DOOR ACTION PATH TO AVOID INJURY TO PERSONNEL AS DOOR CLOSES.

(29) Remove external power.

C Replace Bus Drum Bearings

(1) Provide external power (hydraulic or electric).

(2) Rotate aileron trim control wheel to "0".

(3) Remove access panels 1355, 1356, and inboard aileron control access panel 1357. See Chapter 12, "Access Doors and Panels."

(4) Open right main gear wheel well doors.

(5) Relieve tension in the wing run aileron trim cables. (See 27-15-0, figure 205.)

(6) Remove bus drum guard (19, figure 201) and spacers (16).

(7) Remove bus drum retaining nut (18) and washer.

(8) Slide bus drum (17), bearing housing (13), and shaft spacer (12) from shaft.

(9) Separate bus drum and bearing housing.

(10) Remove bearings (15) from housing (13).

(11) Press new upper bearing into housing. Coat faying surfaces of bearing and housing with grease.

(12) Install fore and aft guard mounting bolts in bearing housing with heads up

(13) Rotate aileron trim control wheel to "0," and hold until bus drum is installed.

(14) View bus drum from the top and rotate drum as indicated below until each cable has the required number of wraps.

CABLE	DIRECTION OF DRUM ROTATION	CABLE WRAPS REQUIRED
ATB2	Clockwise	4-1/4 wraps
ATA2	Counterclockwise	4 wraps
ATB3	Clockwise	4 wraps
ATA3	Counterclockwise	4-1/2 wraps

(15) Install shaft spacer (12), bearing housing (13), bearing spacer (14) and lower bearing (15) on shaft (5). Install lower bearing with wet primer.

NOTE: Bearing spacer must be installed between the two ball bearings and properly aligned

(16) Secure bus drum (17) to shaft Apply a pencil reference mark to cable drum and drum housing to indicate neutral position

(17) Install drum guard (19) Secure with four guard mounting bolts with spacers (16)

(18) If required, eliminate vertical preload of support bracket (20). Install washers on mounting bolts between support bracket and structure to allow bracket to be installed with no preload

(19) Rotate aileron trim control mechanism until clearance between screw and nut is 1/8 (± 3/64) inch (See 27-14-0, figure 206.) Apply a pencil mark to trim control mechanism cable drum and drum housing to indicate neutral position.

(20) Adjust cables to specified tension, being careful not to rotate bus drum See 27-15-0, figure 205, for temperature-rigging load chart. Check reference marks applied in steps (16) and (19) to assure drums have not rotated

(21) Rotate drum for full travel and check for binding bearings and chafing surfaces

(22) Replace access panels.

(23) Close main gear wheel well doors.

CAUTION: STAND CLEAR OF MAIN GEAR DOOR ACTION PATH TO AVOID INJURY TO PERSONNEL AS DOOR CLOSES.

(24) Remove external power

D Replace Upper Bearing Housing

(1) Repeat steps (1) through (11) of 3.B.

(2) Remove alignment bolt from bearing housing.

NOTE: Retaining nut is accessible from right main gear wheel well

(3) Separate bearing housing (9, figure 201) from base (11).

(4) Coat spherical surface of new bearing housing with grease.

(5) Apply light coat of pneumatic system grease to O-ring (7) and teflon seal (6) ring on shaft (5).

(6) Install bearing housing (9) in base (11).

(7) Repeat steps (15) through (29) of paragraph 3.B.

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WING FLAPS AND FLAP CONTROL SYSTEM - DESCRIPTION AND OPERATION

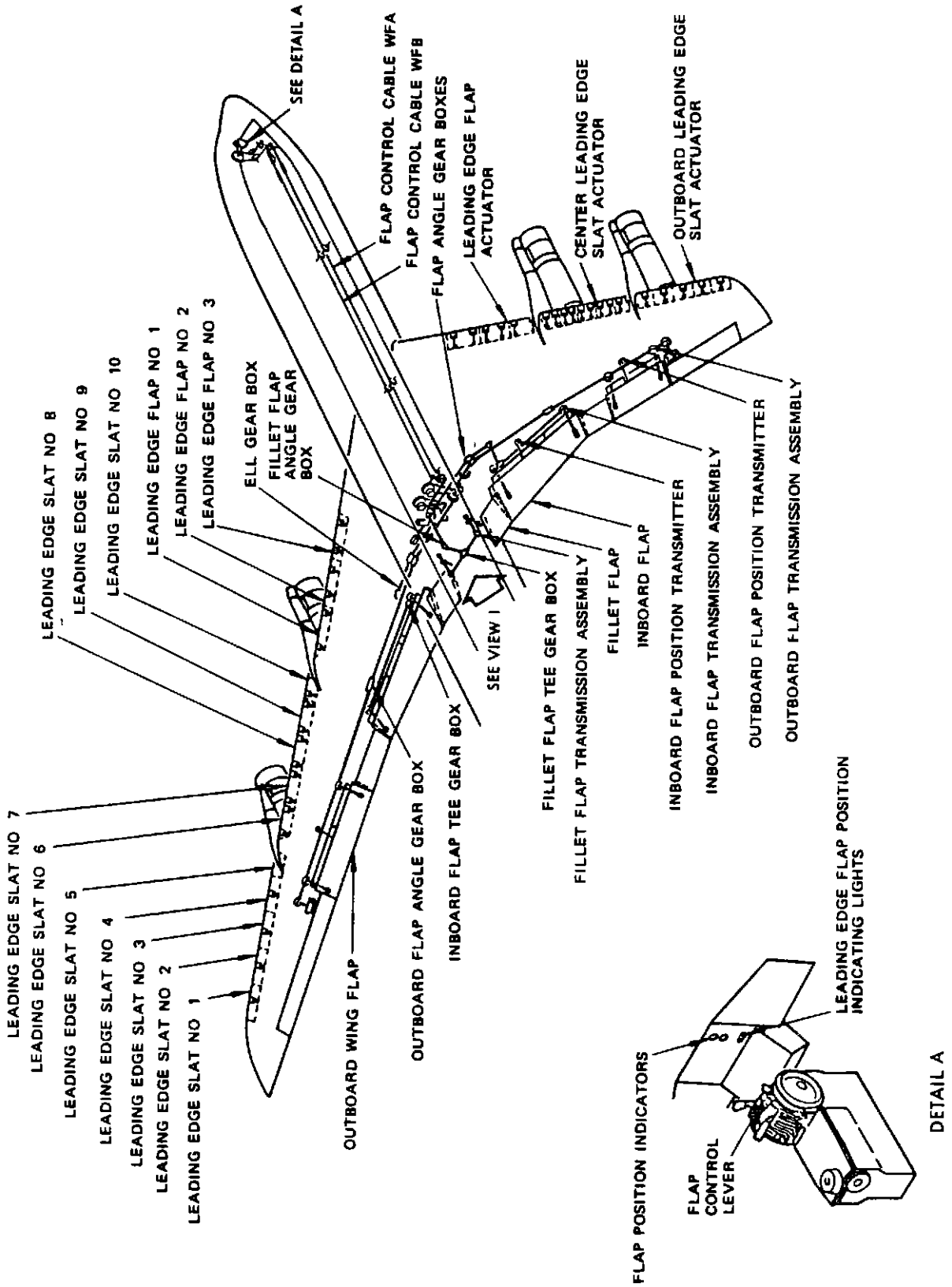
1. General

A. The flap system provides high lift and low drag on take-off and maximum lift and high drag on approach and let-down. This is accomplished with movable control surfaces on both the leading and trailing edge of each wing. Leading edge control surfaces consist of 10 leading edge slats and 3 leading edge flaps in each wing. Trailing edge control surfaces consist of two double-slotted main wing flaps and a single-slotted fillet flap on each wing. Trailing edge flaps are separated into two completely independent systems. (See figure 1.) The outboard flaps on both wings are interconnected by a torque tube system and are driven by a hydraulic motor. Another torque tube system interconnects the trailing edge inboard and fillet flaps and is driven by a separate hydraulic motor. An emergency electrically operated drive system is provided for each set of flaps and drives the torque tubes to operate the flaps. Both leading edge flaps and slats are hydraulically actuated and are controlled from a single control valve. The valve is controlled by the inboard and fillet flap drive system. This arrangement permits symmetrical operation of wing flaps when operated either hydraulically or electrically and prevents lateral unbalance. Lift characteristics of the trailing edge and fillet flaps are improved by the addition of cove lip doors on the wing trailing edge. These doors operate in unison with the flaps to maintain maximum efficiency in laminar air flow throughout the operating range of the flaps. A warning system is also provided to prevent take-off with improperly positioned wing flaps.

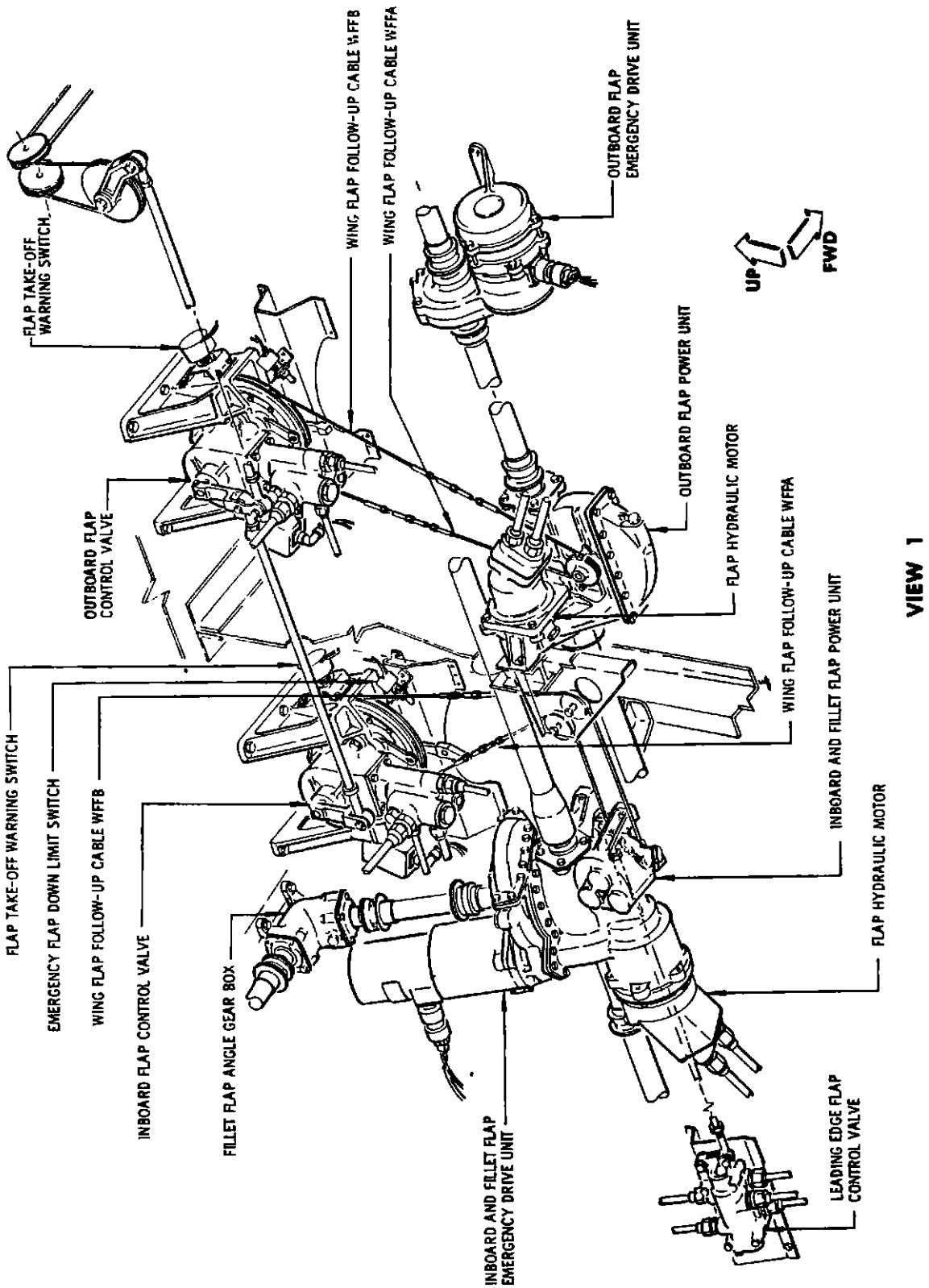
2. Trailing Edge Flaps and Control System

A. General

(1) The trailing edge flap system consists of two double-slotted main wing flaps and a single-slotted fillet flap. (See figure 1.) The main wing and fillet flaps are actuated by flap transmission assemblies. The transmission assemblies are driven by hydraulic motors through gear boxes and transverse torque tubes. The inboard and fillet flaps, interconnected by torque tubes and gear boxes, are driven by a hydraulic motor. The outboard flaps are interconnected and driven from a second hydraulic motor. Each hydraulic motor drives a power unit to operate the torque tubes and is individually controlled by a flap control valve connected by a common cable system to a flap control lever on the control stand. Mechanical feedback of flap position is incorporated into the control valve mechanism so that flap operation is proportional to flap control lever movement. A leading edge flap control valve, which is positioned by the inboard and fillet flap power unit, controls operation of leading edge slats. Cove lip doors attached to the lower trailing edge of the wing are positioned by torsion bars to provide maximum efficiency in laminar airflow.



Wing Flap and Flap Control System Equipment Location
Figure 1 (Sheet 1 of 2)



Wing Flap and Flap Control System Equipment Location
Figure 1 (Sheet 2)

B. Main Wing Flaps

(1) Main wing flaps are movable control surfaces consisting of a fore flap, main flap section and flap carriages. The main flap consists of a front spar joined to a box beam trailing edge by ribs. The front spar and ribs are built up sections with a laminated web. The box beam trailing edge is made of a machine tapered honeycomb section covered by bonded skin and is attached to the rib ends. The entire assembly of spars, ribs and trailing edge forms a torsionally rigid structure. The fore flap is a monocoque structure consisting of ribs and skin. The flap carriage consists of two aluminum forged carriage halves and bearings. The fore flap and main flap sections are fastened to four flap carriages to form the inboard flap and to three flap carriages to form the outboard flap. Each flap carriage rides along a curved steel track and is actuated by a transmission assembly attached to the inboard and outboard end of each flap. Each flap can be extended to an angle of about 50 degrees. When the flap is retracted its trailing edge fairs with wing chord plane.

C. Fillet Flap

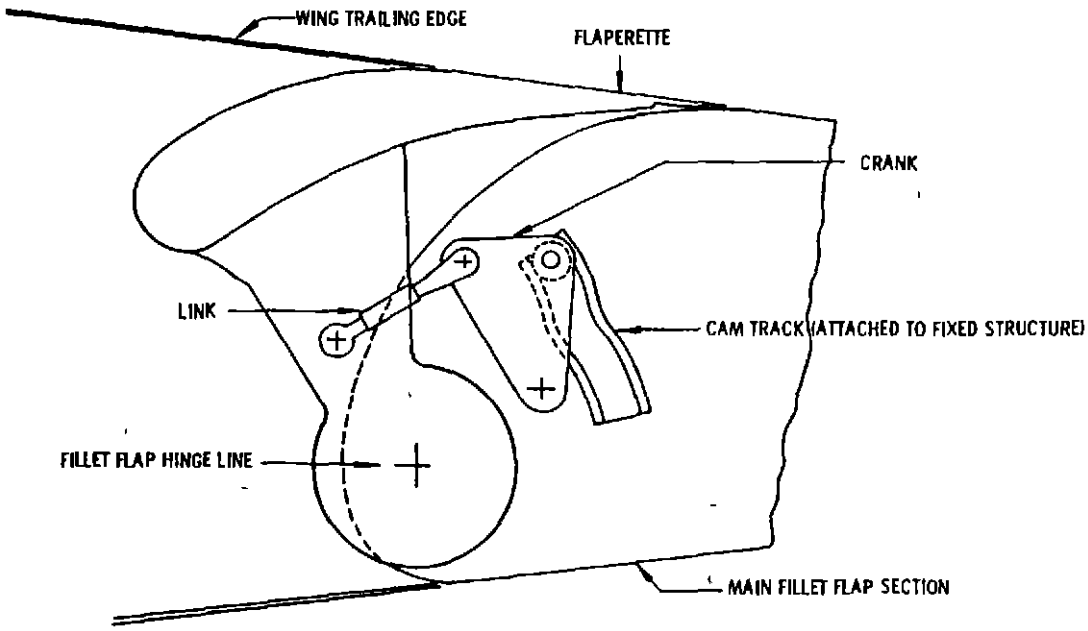
(1) The fillet flap is a single-slotted plain flap which consists of a main flap section and flaperette. The flap is located in the wing fillet area. (See figure 1.) The main flap section is a built up aluminum structure consisting of a front spar joined to a box beam trailing edge by ribs. The box beam trailing edge is a machine tapered honeycomb section covered by bonded skin and is attached to the rib ends. The entire assembly of spars, ribs and trailing edge forms a torsionally rigid structure. A seal assembly, attached by a piano hinge to the outboard side of the main flap section, overlaps the inboard end of the main inboard trailing edge flap Tension springs attached to the main flap section apply a downward load on the seal to maintain contact with the inboard flap. The flaperette is a magnesium alloy casting which is used to direct high energy air over the main fillet flap section when the flaps are extended. The flaperette is attached to the fillet flap by four support fittings which rotate about the flap hinge line. An adjustable rod extends from the support fittings at each end of the flap to a crank assembly which rotates along a cam track installed on fillet flap torque box support structure and is also fastened to the main fillet flap section. (See figure 2.) During flap extension, cam action on the crank operates the rod to the flaperette support fittings, positioning the flaperette to form a slot or gap between the flaperette trailing edge and the main

flap section. A shaft extending through the fillet flap inboard end rib and the trailing edge beam supports the fillet flap at the inboard end. The flap is supported at the outboard end by a bolt which extends through the outboard end rib and a support fitting attached to the outboard end of the fillet flap torque box. The shaft at the inboard end of the flap is externally splined at each end and mates with splines in the inboard end rib and the fillet flap actuator arm in the wheel well. The actuator arm is attached to the fillet flap transmission assembly ball bearing nut, and travels with the nut to rotate the flap. A sail-shaped fence assembly attached to the inboard upper surface of the fillet flap prevents spilling of high velocity air over the inboard end of the fillet flap in the extended position. The fence is a built up aluminum assembly consisting of inboard and outboard skin panels joined together by ribs. Hinge fittings are installed at the fore and aft ends of the assembly and are accessible through access doors in the outboard skin panel. These fittings mate with fittings on the fillet flap Another support fitting at the forward upper end of the fence is attached to a roller assembly. The roller assembly consists of a bracket and two roller bearings which are guided by a channel-shaped track installed on the fence recess panel. This panel is a built up aluminum section which is attached to body structure at the wing root. It encloses and supports the top of the fence. The recess panel is attached to the upper side of the trailing edge beam and to body structure. Access panels are provided for access to the hinges which are attached to body structure.

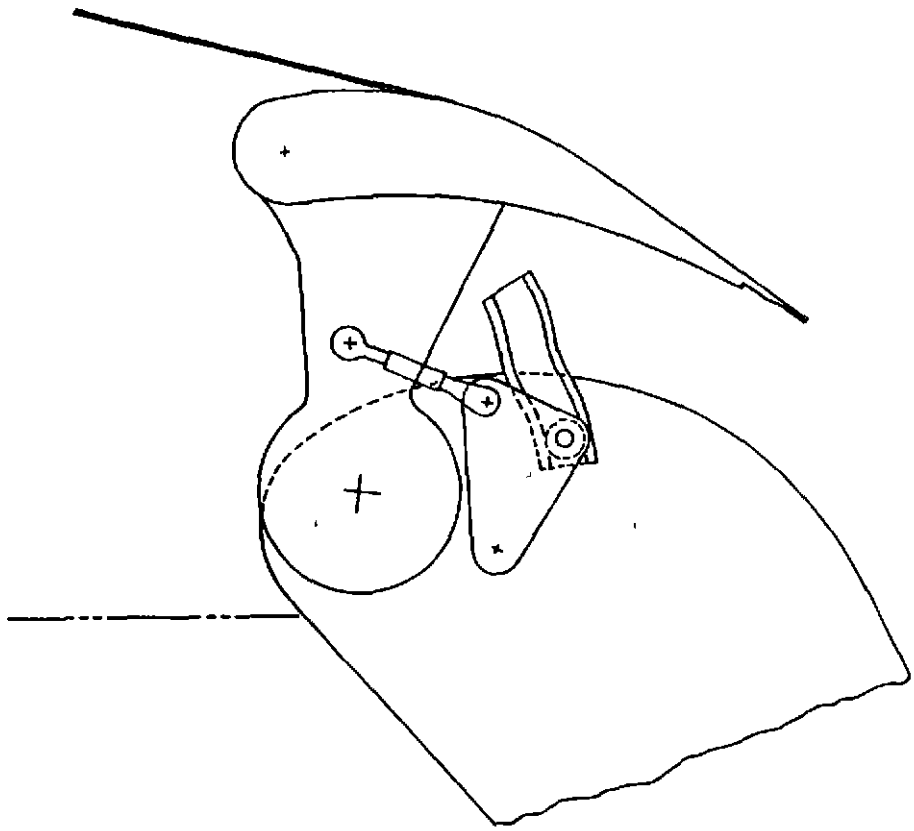
D. Cove Lip Doors and Actuating Mechanisms

(1) Main Cove Lip Doors and Actuating Mechanism

(a) Cove lip doors provide maximum efficiency in laminar air flow throughout the operating range of the wing flaps. (See figure 3.) Each door consists of a rear spar joined to ribs and covered by alclad skin on the lower side. The door is attached to lower trailing edge of the wing by a piano hinge.

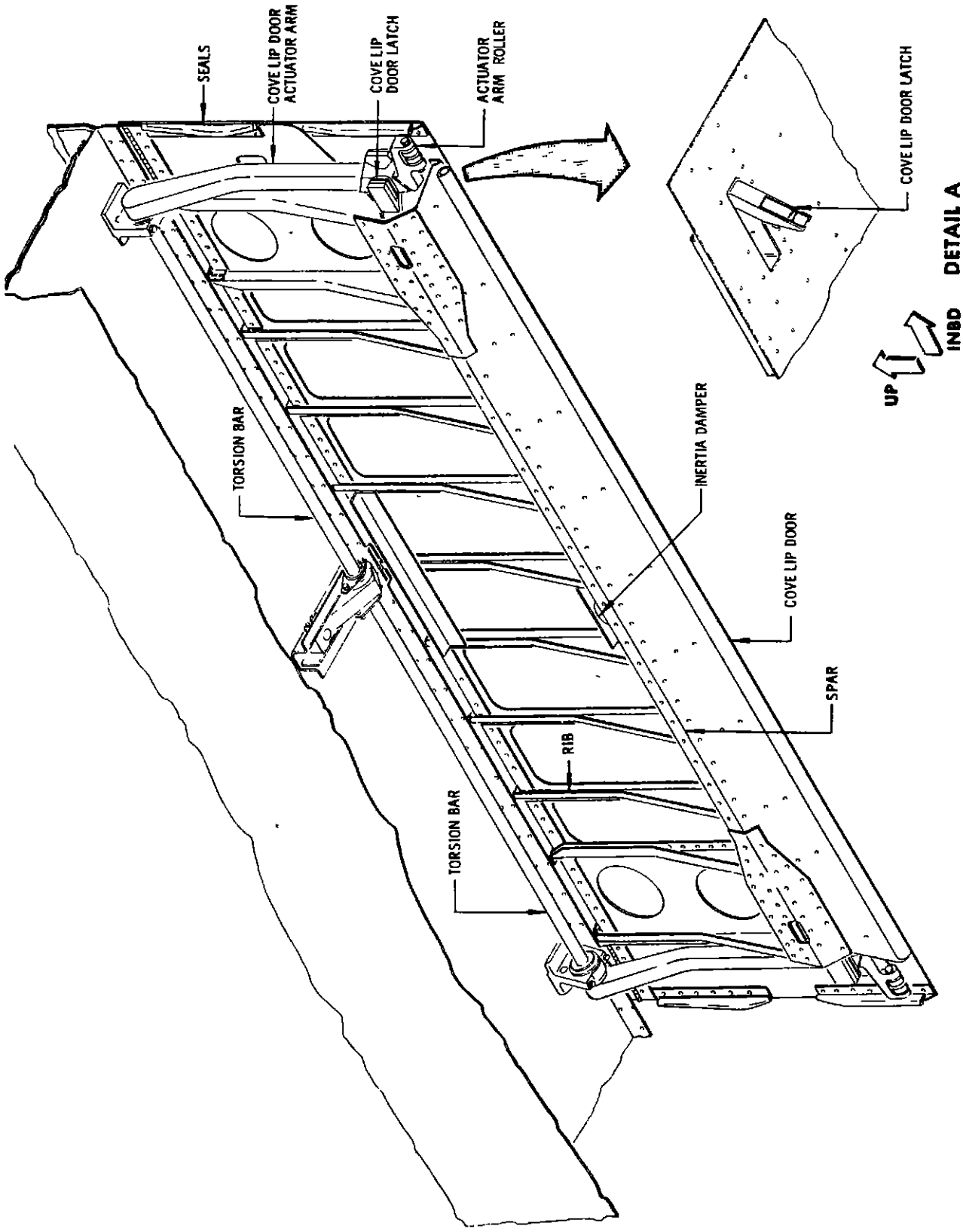


STEP 1. FILLET FLAP FAIRED



STEP 2. FILLET FLAP AT 50°

Fillet Flap Diagram
Figure 2

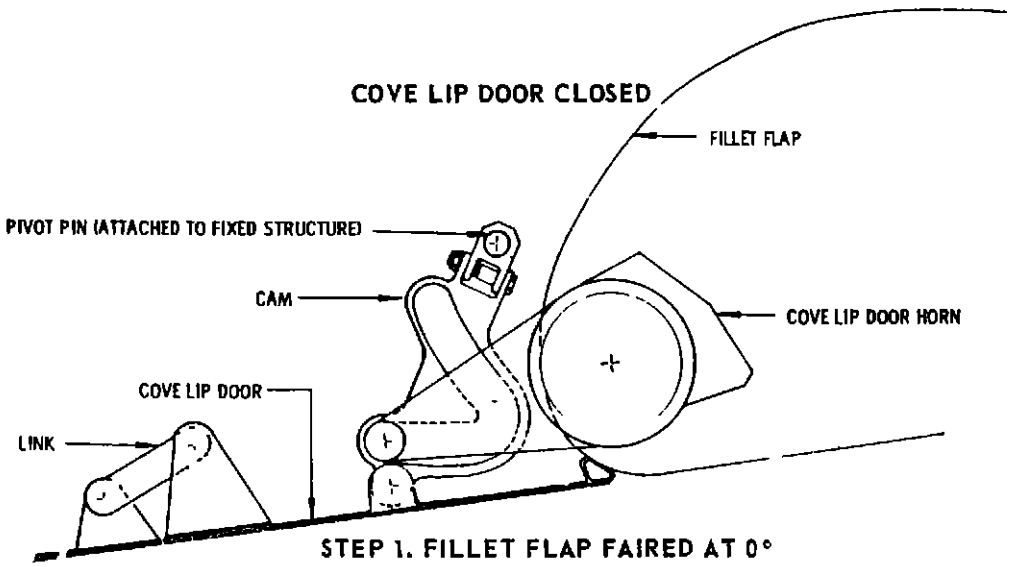

SEALS
COVE LIP DOOR ACTUATOR ARM
COVE LIP DOOR LATCH
ACTUATOR ARM ROLLER
COVE LIP DOOR LATCH
DETAIL A
INBD
UP
TORSION BAR
INERTIA DAMPER
COVE LIP DOOR
SPAR
RIB
TORSION BAR

Aerodynamic efficiency is improved by seals along the trailing edge of the door and over the hinge halves. Brush seals are installed at each end of the door and mate with seals on the adjacent door or wing structure. An inertia damper installed on each door reduces flutter by varying the natural frequency of the door. The dampers consist of copper shot installed in a sealed moisture proof housing.

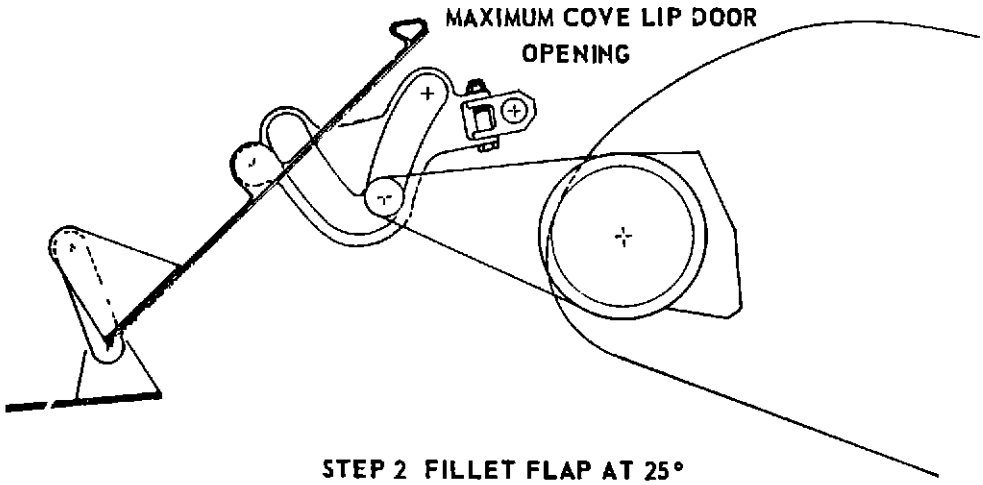
(b) The actuating mechanism consists of two torsion bars and two actuating arms for each door. (See figure 3.) The torsion bars are machined from titanium alloy stock with male splines cut in each end. One end mates with a female spline in a support bracket which is installed on trailing edge wing structure and the opposite end mates with a female spline in the actuating arm. Splines, male and female, are indexed to preload the bar in torsion upon installation. Latches installed on each side of the door connects to the aft end of the actuating arm. Two rollers installed in the aft end of each actuating arm are guided by the cam-shaped under surface of the flap carriages during flap extension to raise the cove lip door. When the flaps are retracted the doors are lowered by the flap carriages. In the retracted position the door fairs with the flap The latches provide a means of disconnecting the doors from the actuating arms for access to the rear spar area.

(2) Fillet Flap Cove Lip Door and Actuating Mechanism

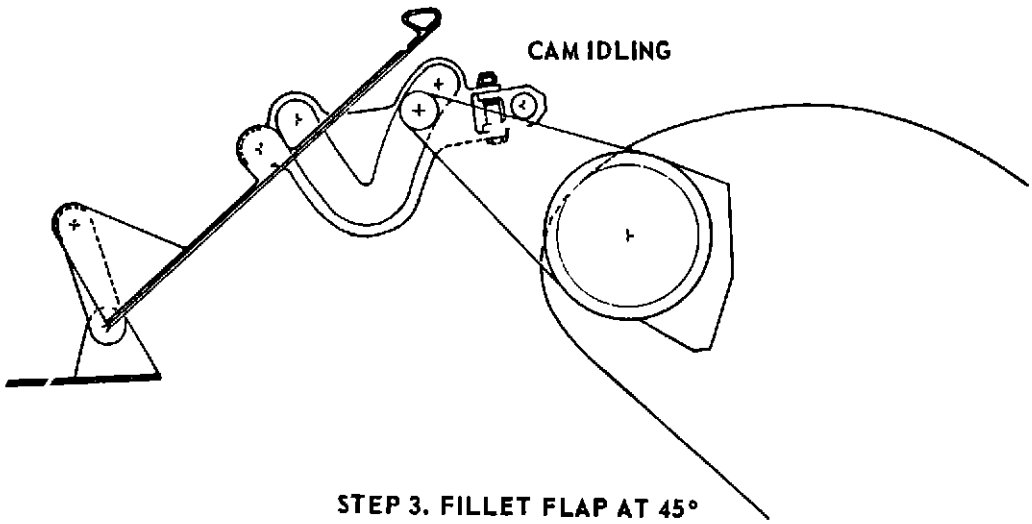
(a) The fillet flap cove lip door is a built up structure consisting of fore and aft zee-shaped beams connected by ribs and end fittings and covered on the lower side with clad aluminum skin. Link and cam attach fittings are bolted to end fittings on each side of the door. Access panels are provided at the forward and aft end of the door to facilitate removal and installation. A link at each end of the door attaches to fittings on the fillet flap torque box to support the forward end of the door. The door is supported at the aft end by a cam on each side. The cams are attached to the cam attach fittings on the door and to fillet flap torque box structure by means of pivot pins. Two horns, one a part of fillet flap structure and the other installed over the fillet flap support shaft and bolted to the flap inboard end rib, contain rollers which travel in tracks on the cams. Rotation of the fillet flap forces the cam rollers around the track to raise the forward end of the cove lip door. (See figure 4) Action of the cam continues to raise the door until the fillet flap reaches an angle of about 25 degrees At this point a transition occurs in the path of the cam track which allows the rollers to idle as fillet flap angle of rotation increases. Structural stops are provided to relieve aerodynamic loads on the cam in the door up position. The stops are attached to the fillet flap torque box structure at each end of the door.



STEP 1. FILLET FLAP FAIRED AT 0°



STEP 2 FILLET FLAP AT 25°



STEP 3. FILLET FLAP AT 45°

Fillet Flap Cove Lip Door Motion Diagram
Figure 4

E. Flap Control Lever

(1) The flap control lever introduces mechanical motion into the wing flap control system. (See figure 1.) The lever consists of an upper spring-loaded telescoping handle, lower handle, and cable drum. The cable drum rotates about the control shaft in the control stand and is attached to the flap control cables. The lever rotates about a quadrant that is detented in the "FLAP UP 0," "14," "25," "40" and "50 FLAP DOWN" positions. Each detent corresponds to angles of flap extension. The lever will lock in any detent desired. The lever is rotated manually to operate the flaps. Lifting the lever about 1/4 inch will permit rotation to any position desired. The lever, when rotated, positions the flap control cables to open two wing flap control valves.

F. Wing Flap Control Valve

(1) A manually-operated slide valve is used to control directional movement of the trailing edge flaps. (See figure 1.) The valve consists of two main sections, the gear housing and valve body. (See figure 5.) The housing contains two bevel gears and two pinion gears which, together, constitute a differential gear assembly. The bevel gears rotate with the input and follow-up shafts. The pinion gears are connected, via a crank and link to the metering piston in the valve body. One of the pinion gears is mounted on a spring-loaded swinging arm to eliminate backlash in the gear train, thus ensuring rapid response. The axes of the pinion gears converge upon, and rotate about, the axis of the bevel gears. The gear housing is filled with Skydrol 500 hydraulic oil for lubrication.

(2) The valve body contains a metering piston and a sleeve Ports are provided in the valve body for passage of fluid to and from the flap hydraulic motors. The metering piston has three basic positions, extreme in, extreme out, and neutral. When the input shaft is rotated the bevel gear rotates the pinion gear assembly because the follow-up bevel gear is held stationary by the flap follow-up cables. (See figure 5.) This shifts the metering piston away from the neutral position. As soon as the input is terminated, the input bevel gear becomes the stationary member of the differential, leaving the flap controlled follow-up bevel gear free to rotate the pinion gear assembly in the opposite direction. This pinion gear assembly rotation moves the metering piston an equal but opposite distance to its original travel. The metering piston is then returned to the neutral position to prevent fluid flow through the control valve.

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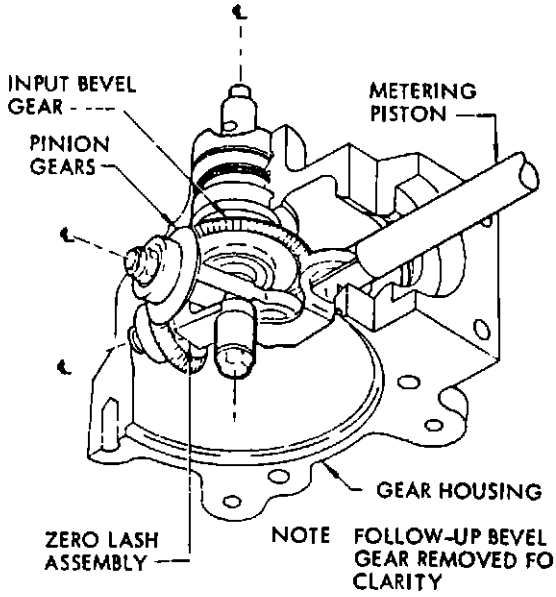
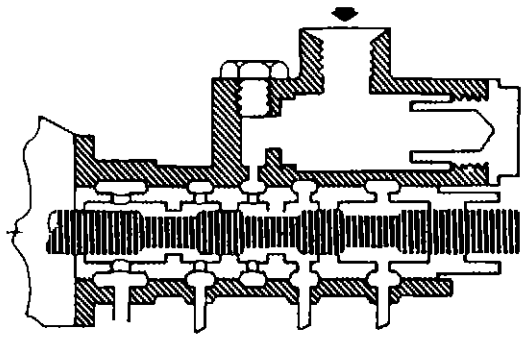
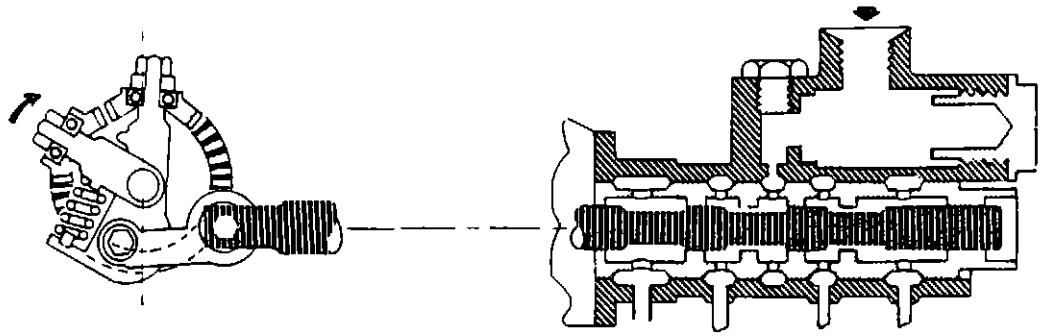


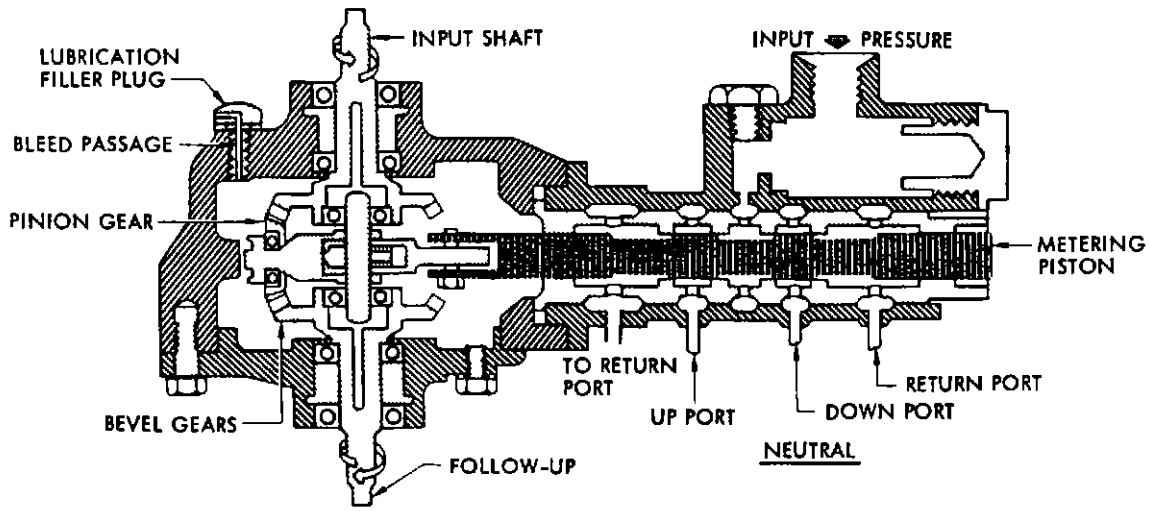
DIFFERENTIAL GEAR ASSEMBLY



FLAPS GOING DOWN



FLAPS GOING UP



Flap Control Valve Schematic
Figure 5

(3) A control valve is located in each main wheel well on the forward bulkhead near the keel beam. (See figure 1.) Input is transferred through cables from the manually operated flap lever on the control stand to a control drum in the right wheel well. The signal is then transmitted through push-pull rods to a crank attached to the input shaft on each valve. Follow-up signals are transmitted from the flap power unit to a follow-up drum attached to the valve follow-up shaft. The valve in the left main wheel well controls main inboard trailing edge flap and fillet flap operation. The valve in the right wheel well controls main outboard trailing edge flaps.

G. Flap Actuating Hydraulic Motor

(1) Two flap actuating hydraulic motors operate the flaps by converting hydraulic pressure into mechanical energy. (See figure 1.) Each unit is a nine-cylinder, piston-type reversible motor. The motor drive shaft is coupled to the power unit reduction gear through a splined shaft. Two hydraulic lines from the flap control valve are connected to the inlet ports on the motor. An additional line extending from the motor to the supply system return lines provides lubrication during motor operation. Pressurized fluid flow through the motor actuates the pistons that rotate the output shaft.

H. Flow Limiting Valve

(1) Operational speed of the trailing edge flaps is controlled by two flow limiting valves. A valve is located in the inlet line to each flap control valve. At 80°F and at pressures of 200 to 3000 psi, fluid flow to the inboard and fillet flap hydraulic motor is regulated at 16.25 to 19.5 gpm. Flow to the outboard flap motor is regulated at 5.1 to 6 gpm.

I. Priority Valve

(1) Priority valves are installed in the inlet line to each flap control valve to maintain hydraulic pressure to the landing gear down and nose gear steering system during trailing edge flap operation. The priority valve, that contains a relief valve and a check valve, is located immediately upstream of the flow limiting valve. (See figure 18.) The relief valve blocks the flow of pressurized fluid to the flap control valve when system pressure drops below 1500 psi. The check valve allows fluid to flow from the control valve back to supply system in the event pressure at the control valve exceeds supply pressure. The valve ports are labeled IN and OUT with the out port connected to the flow limiting valves.

J Flap Power Units

(1) The inboard and fillet flap power unit connects the inboard hydraulic motor or emergency flap system electrical drive unit to the inboard and fillet flap torque tubes. The power unit also actuates control linkages to operate the leading edge flaps and slats in synchronization with the trailing edge flaps and a follow-up mechanism for the trailing edge flap and control valves.

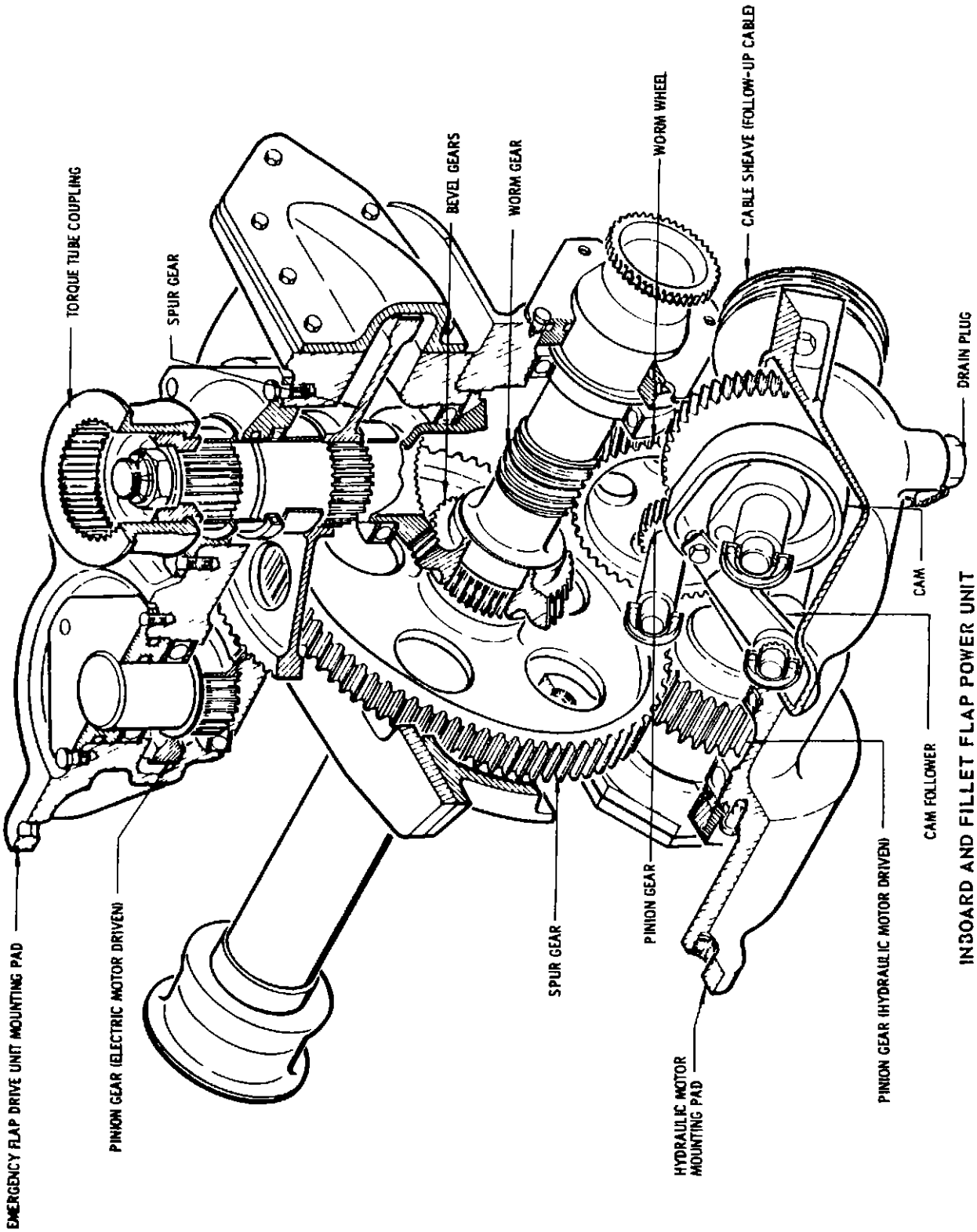
(2) The inboard and fillet flap power unit is mounted on the forward bulkhead in the left main wheel well. (See figure 1.)

(3) The unit consists of a train of reduction gears, a cam and cam follower enclosed in a sealed housing filled with lubricant. (See figure 6.) The housing incorporates mounting pads for the inboard flap hydraulic motor and the inboard and fillet flap emergency drive unit. The gear train is coupled through two drive shafts to the inboard flaps and fillet flap torque tubes. A follow-up signal from the inboard flap output shaft is transmitted through a worm gear arrangement to a follow-up drive shaft. A sheave attached to the follow-up drive shaft transmits the signal through follow-up cables to the flap control valve differential gear assembly. The follow-up signal is proportional to flap travel and returns the control valve to neutral when the flaps reach the preselected position. A cam driven by the follow-up drive shaft actuates linkages which position the leading edge flap control valve. The linkage consists of a cam follower arm drive shaft and a control valve arm. The linkage positions the control valve from retract to extend when trailing edge flap angle is about 6 degrees. A shear section incorporated in the drive shaft is designed to fail at a 200-pound control valve arm load (1100 pound-inches shaft load). This feature protects the power unit gear train in the event of a binding or frozen leading edge flap control valve.

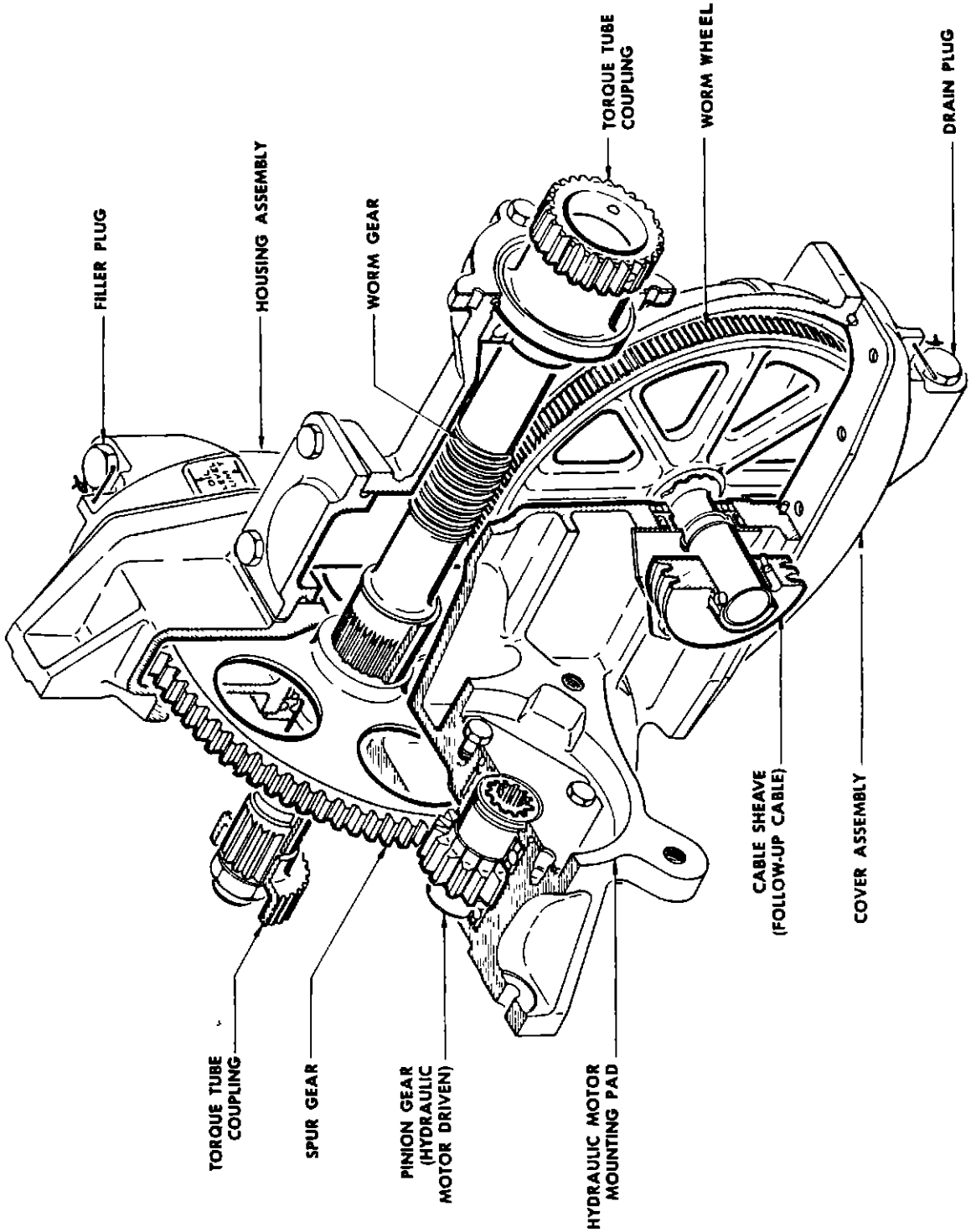
(4) The outboard flap power unit is mounted on the forward bulkhead in the right main wheel well and connects the outboard flap hydraulic motor to the outboard flap torque tubes. The outboard flap power unit consists of a pinion gear, spur gear, output shaft, and worm gear enclosed in a sealed oil filled casting. (See figure 7.) The pinion gear meshes with the spur reduction gear which is splined to the output shaft. A worm cut on the output shaft meshes with a worm gear to drive a follow-up sheave. The sheave is cable connected to the outboard flap control valve and returns the control valve to neutral when the desired flap setting is reached. The housing is filled with lubricant.

K. Flap Torque Tubes

(1) Torque tubes transfer motion from the power unit to the flap transmission assemblies and correct for slight misalignment in the flap drive system. (See figure 1.) Each torque tube is connected to bearing supports, gearboxes and transmission assemblies by sleeves and spline couplings.



Inboard and Fillet Flap Power Unit
Figure 6


TORQUE TUBE COUPLING
WORM WHEEL
DRAIN PLUG
FILLER PLUG
HOUSING ASSEMBLY
WORM GEAR
CABLE SHEAVE (FOLLOW-UP CABLE)
COVER ASSEMBLY
TORQUE TUBE COUPLING
SPUR GEAR
PINION GEAR (HYDRAULIC MOTOR DRIVEN)
HYDRAULIC MOTOR MOUNTING PAD

L Flap Drive Gearboxes

(1) General

(a) Gearboxes provide a means of changing torque tube direction The gearboxes are two fillet flap angle gearboxes, fillet flap tee gearbox, inboard flap angle gearbox, inboard flap ell gearbox, inboard flap tee gearbox and two outboard flap angle gearboxes. (See figure 1.) Basically, each gearbox consists of bearing mounted bevel gears enclosed in a sealed housing filled with lubricant.

(2) Fillet Flap Angle Gearbox

(a) The fillet flap angle gearbox provides angular change for the fillet flap torque tubes and contains two bevel gears, arranged to form an angle inside the housing The gearboxes are attached to support brackets attached to the left main wheel well pressure web (wheel well ceiling) The gearboxes connect the torque tubes from the inboard and fillet flap power unit to the fillet flap tee gearbox. (See figure 1)

(3) Fillet Flap Tee Gearbox

(a) The fillet flap tee gearbox is provided to transmit fillet flap torque tube motion through a right angle to drive the fillet flap transmission assemblies. The gearbox contains bevel gears, with one connected to the input shaft and two to driving output shafts. The gearbox is attached to the aft bulkhead in the left main wheel well and connects the torque tube extending from the aft fillet flap angle gearbox to the fillet flap transmission assemblies in the left and right main wheel wells. (See figure 1)

(4) Inboard and Outboard Flap Angle Gearboxes

(a) The inboard and outboard flap angle gearboxes accommodate an angular change of the torque tubes for the inboard and outboard trailing edge flaps. Each box contains two bevel gears, bearing mounted, and positioned to form an angle inside the housing. The inboard flap angle gearbox and one outboard flap angle gearbox are attached to support brackets on the rear spar at the outboard side of each main wheel well. The other outboard flap angle gearbox is attached to the lower side of the No 2 flap track support fitting and is accessible through access panel No 1356 on the bottom of the wing. (See figure 1.)

(5) Inboard Flap Ell Gear Box

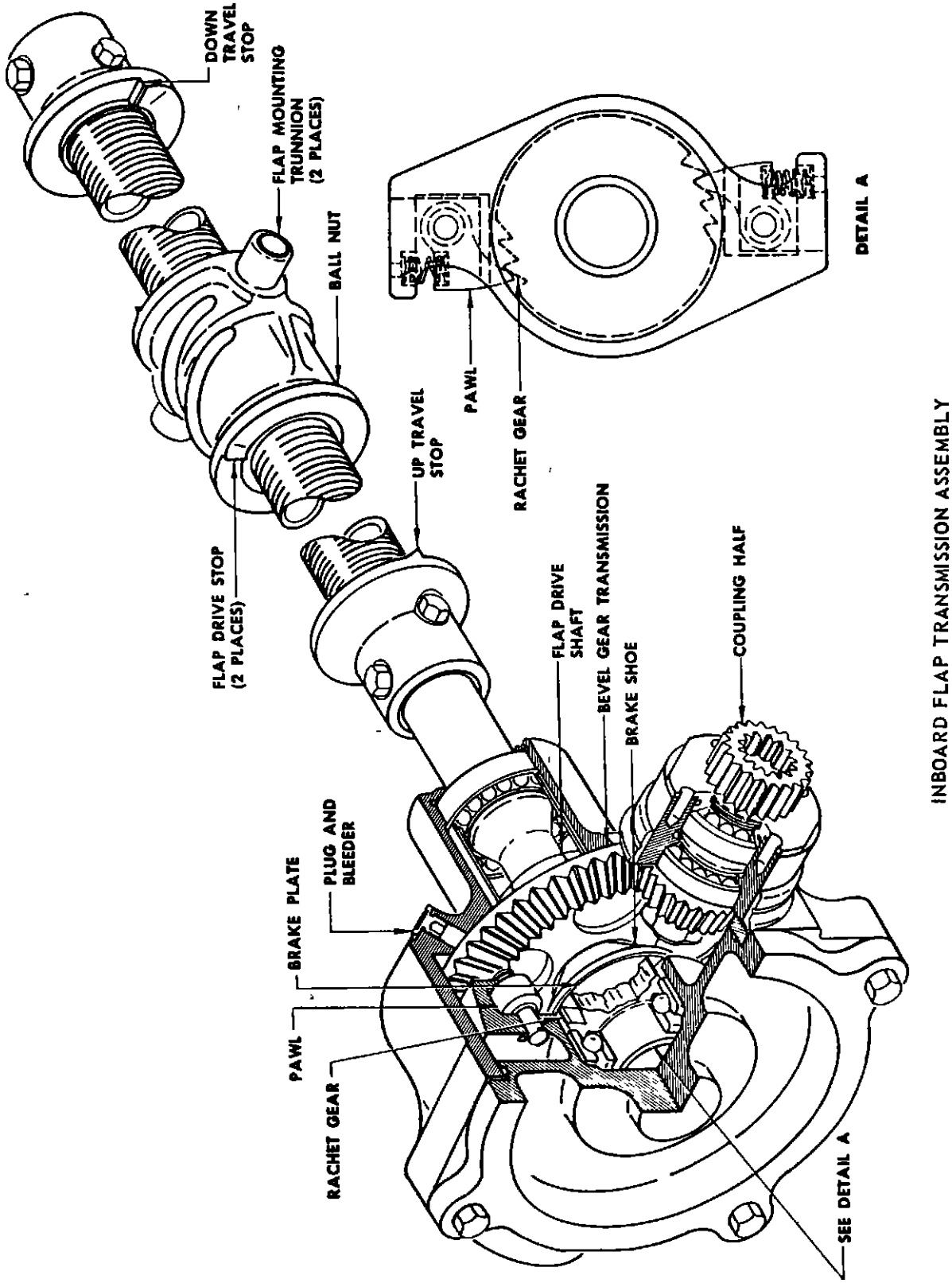
(a) The inboard flap ell gear box provides a right angle change of the inboard flap torque tubes. The gear box contains a pair of bevel gears arranged so that a right angle is formed within the housing. Flanges on the housing support the outboard flap torque tube bearings. The gear box connects the torque tubes from the inboard flap angle gear box to the inboard flap tee gear box. The gear box is mounted to the outboard side of the extreme inboard flap track support fitting immediately aft of the rear spar. (See figure 1.) The gear box is accessible through access panel No 1354

(6) Inboard Flap Tee Gear Box

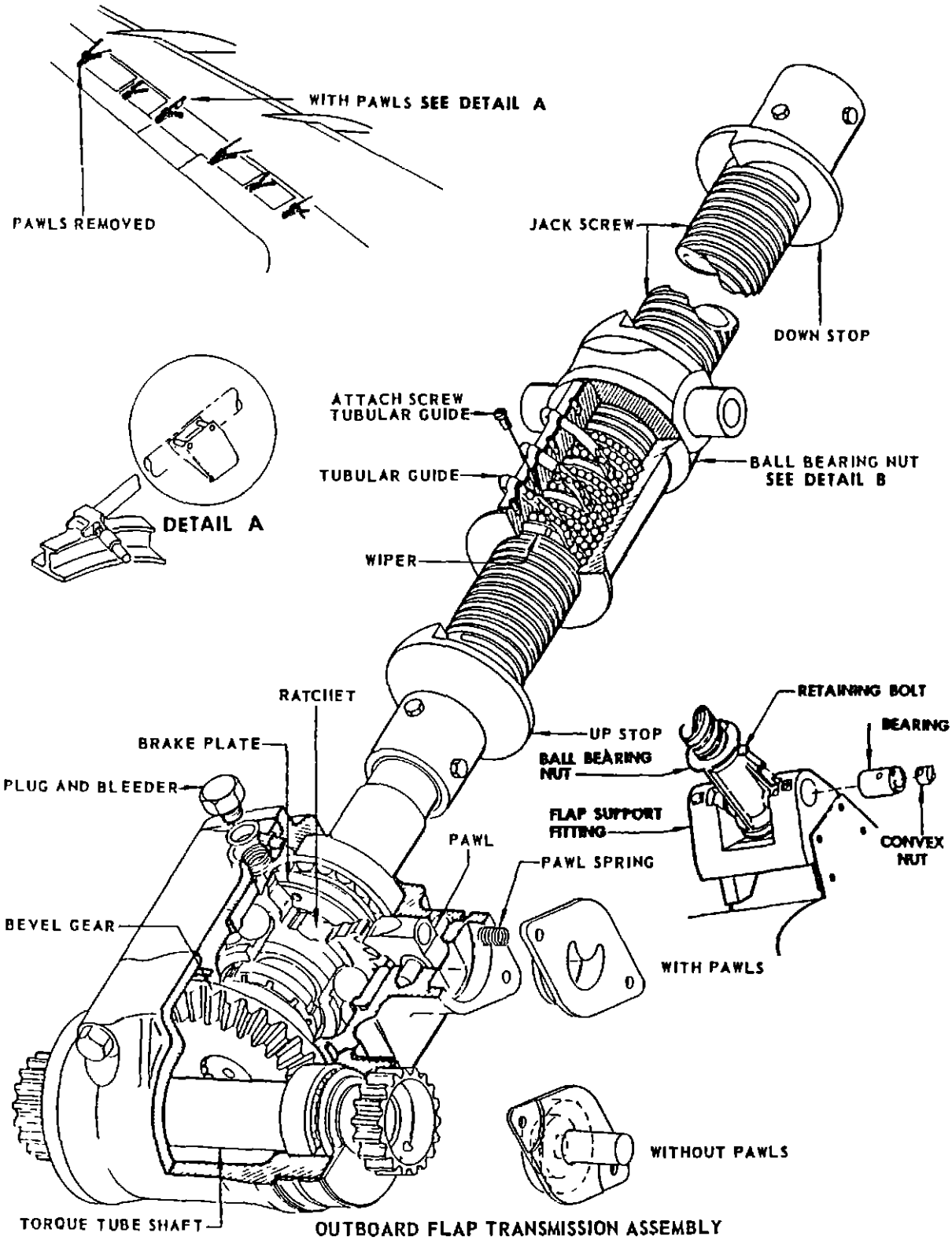
(a) The inboard flap tee gear box is used to transmit inboard flap torque tube motion through a right angle to drive the inboard flap transmission assemblies. The gear box contains bevel gears arranged so that input power is transmitted through two 90 degree angles to two counter rotating shafts. The gear box is attached to the outboard side of the inboard flap inboard transmission assembly trunnion support fitting The output shaft on the inboard side is splined to the inboard transmission assembly The output shaft on the outboard side is coupled to the torque tubes that extend to the inboard flap outboard transmission assembly. The input shaft is connected to a torque tube extending from the inboard flap ell gear box. (See figure 1.) The gear box is accessible through the inboard cove lip door No 1256.

M Flap Transmission Assembly

(1) The flap transmission assembly changes rotary motion of the torque tubes to linear motion to extend and retract the flaps. Each unit consists of a gear box and ball-nut and screw actuator. (See figure 8.) Each gear box contains an input shaft and two bevel gears A bevel gear splined to the input shaft meshes with another right angle bevel gear that is splined to the output shaft. A no-back friction brake is incorporated in the inboard flap transmission assemblies, fillet flap transmission assembly and the transmission assembly at the inboard end of the outboard flap to prevent the airloads from blowing the flaps up once they have been lowered. The brake consists of brake plate ratchet and ratchet pawl. The input shaft on the outboard flap transmission assembly extend through the housing allowing power to be transmitted through the unit.



Flap Transmission Assemblies
Figure 8 (Sheet 1 of 2)



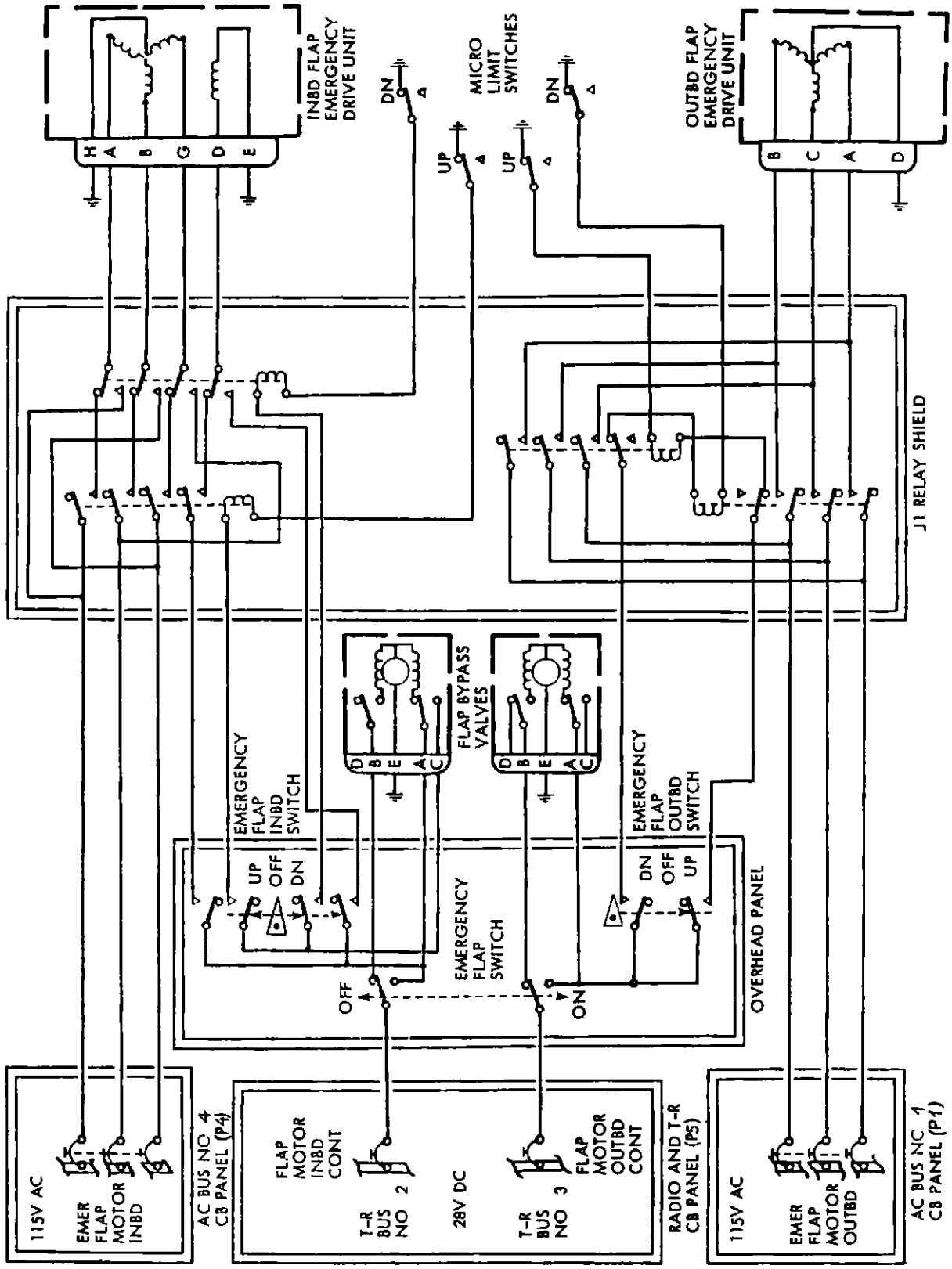
OUTBOARD FLAP TRANSMISSION ASSEMBLY

(2) The ball nut and screw actuator consists of a jackscrew, two fixed stop nuts and a recirculating ball bearing nut The jackscrew is attached to the gear box output shaft to form the transmission assembly. A transmission assembly is trunnion mounted on a support fitting forward and at the inboard and outboard end of each main flap. The ball bearing nut is connected to a support fitting on the flap The fillet flap transmission assembly is trunnion mounted to the upper side of the inboard wing trailing edge beam. The ball bearing nut is attached to the fillet flap actuator arm. The input shaft on each gear box is splined coupled to flap torque tubes. Motion from the torque tubes drives the input shaft rotating the bevel gears to drive the jackscrew The ball bearing nut is restrained from turning and travels on the rotating screw to operate the flaps During flap operation the flap airloads exert a compressive force (main inboard and outboard flap) and a tensile force (fillet flap) on the jackscrew putting pressure on the brake plate. The friction generated between the brake plate and ratchet wheel prevents the airloads from blowing the flap up. The pawl allows the ratchet wheel to turn in the direction of flap extension, thus preventing the braking action from opposing flap extension. When the flaps are retracted the torque produced by the drive system slips the brake to retract the flaps since the brake can ratchet in one direction only. The outboard transmission assembly is connected through a torque tube to the outboard aileron lockout mechanism When the outboard flap is in the retracted position the outboard aileron is locked in the faired position. Partial or complete extension of the outboard flaps unlocks the mechanism and returns control of the outboard aileron to the aileron control system

3. Trailing Edge Flap Emergency Drive System

A. General

(1) An electrical drive system is provided as an emergency backup for the normal flap hydraulic drive system. (See figure 9.) Two emergency flap drive units are provided, one to drive the torque tube system for the outboard flaps and the other to drive the torque tube system for the inboard and fillet flaps. The system is controlled from three emergency flap switches on the overhead panel. Bypass valves in the wing flap hydraulic lines are opened by the flap emergency system to prevent a hydraulic lock during emergency flap operation.



Trailing Edge Flap Emergency Control Circuit
Figure 9

B. Inboard and Fillet Flap Emergency Drive Unit

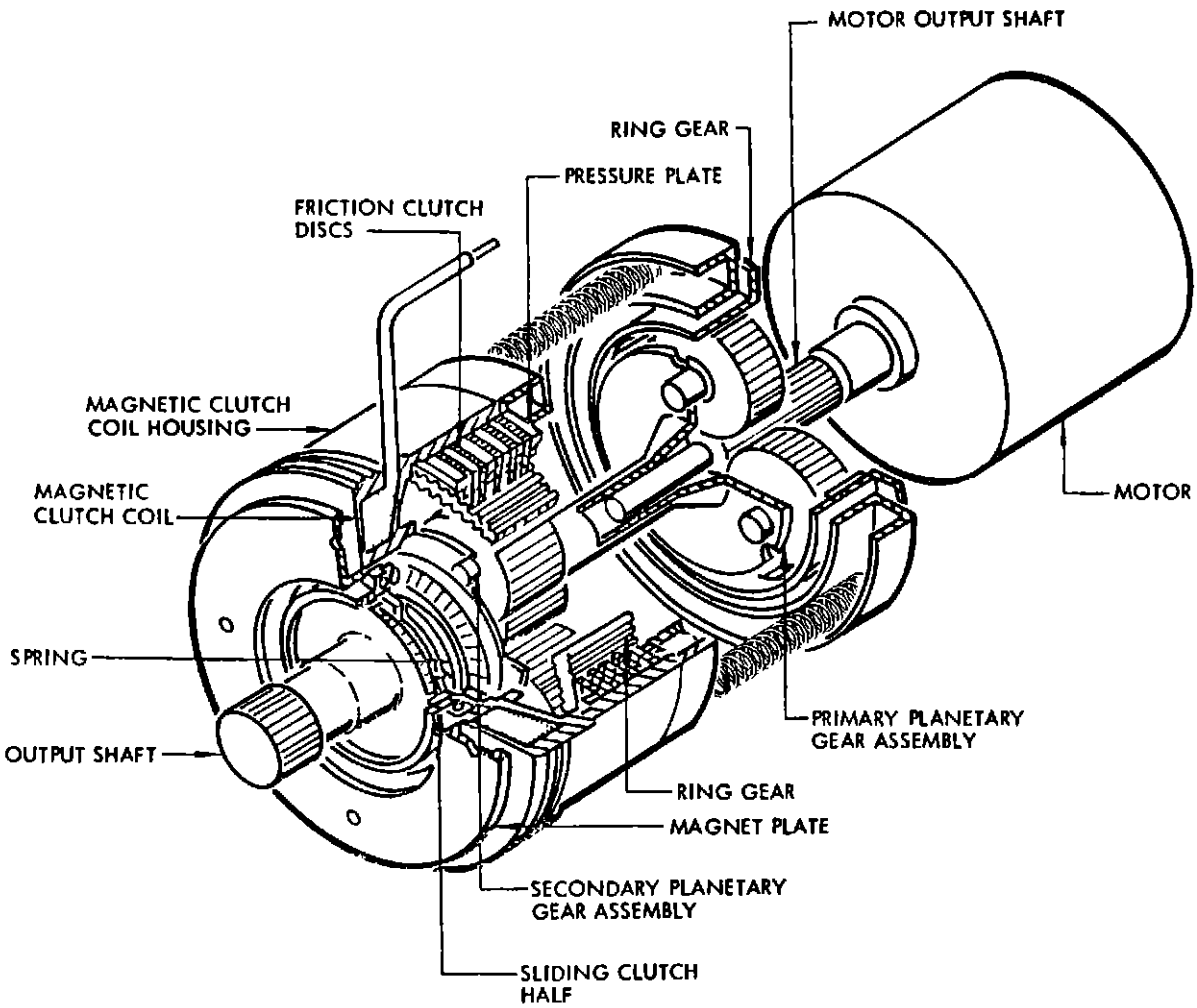
(1) The inboard and fillet flap emergency drive unit is installed on and drives the normal flap drive power unit gearbox. It is an electromechanical rotary actuator consisting of a motor, a primary planetary gear assembly, a secondary planetary gear assembly, a friction clutch assembly, a magnetic clutch assembly, and an output shaft. All components are enclosed within a housing. (See figure 10.) The motor is a reversible, 115/200 volt, 400-cps, three-phase ac, fractional-horsepower type, with a splined output shaft that engages the planetary gears of the primary planetary gear assembly. The primary planetary gear assembly consists of a fixed, internally toothed ring gear, a gear carrier with three planetary gears, and a splined shaft that engages the secondary planetary gear assembly. The secondary planetary gear assembly consists of an internally toothed ring gear and a gear carrier with three planetary gears. The friction clutch assembly is composed of one set of six externally-splined disks and one set of five internally-splined disks. The clutch disks are alternately stacked on the ring gear of the secondary planetary gear assembly. The five internally-splined disks are mated to the ring gear, and the six externally-splined disks engage an internally-splined magnetic clutch coil housing. Pressure is applied to the clutch disks by a pressure plate against the magnetic clutch coil housing on one side and a spring-loaded pressure plate on the other side Tension adjustment is provided by three adjustment screws on the housing The magnetic clutch assembly consists of a housing, coil, magnetic plate, clutch half, spring, and spring retainer The output shaft is geared on the internal end where it engages with the clutch half of the magnetic clutch assembly.

(2) The magnetic clutch must be energized with 28 volts dc to engage the output shaft with the gear carrier through the magnetic clutch half before three-phase ac voltage is applied to the motor. When a 115 volt, three-phase ac voltage is applied to the motor, the output shaft begins to rotate. Rotary motion of the motor output shaft is transmitted to the primary planetary gear assembly causing the planetary gear assembly to rotate within the fixed ring gear. The splined shaft of the primary planetary gear assembly engages the planetary gears of the secondary planetary gear assembly causing it to rotate within its ring gear which is held stationary by the friction clutch assembly. When the secondary planetary gear assembly rotates, teeth on the face of the gear carrier engage gear teeth of the magnetic clutch half, and the output shaft rotates.

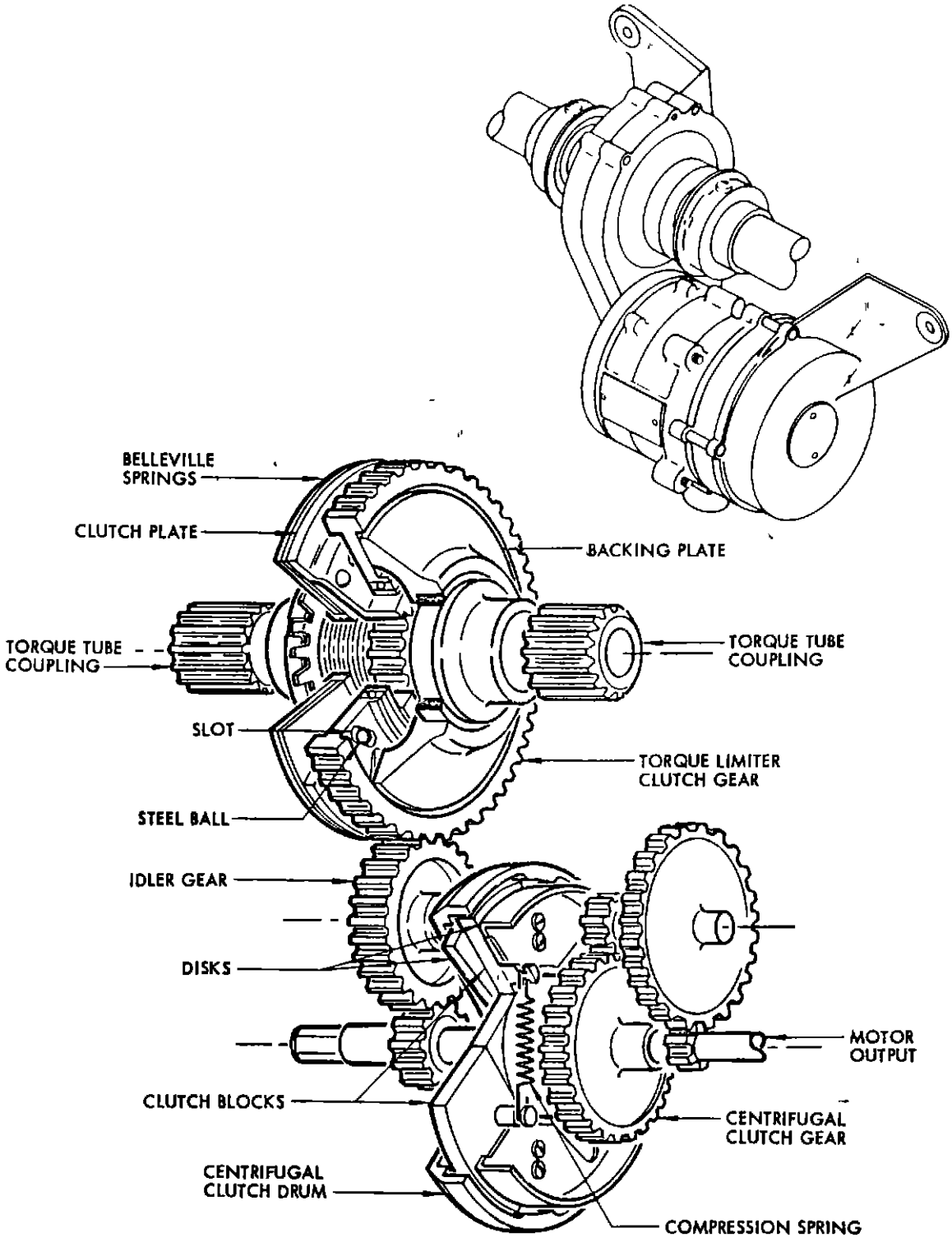
(3) When the output shaft is stopped, or when shaft speed is reduced by an overload, the clutch disks slip to allow the secondary ring gear to rotate The motor continues to drive the gears of the secondary planetary assembly, but as the overload prevents proper rotation of the output shaft, greater force is applied at the ring gear to overcome the friction clutch. If the overload is not enough to stop the output shaft, the planetary assembly will rotate, driving the ring gear as well as the output shaft. This will result in reduced speed at the output shaft. If the output shaft is stopped, motor output torque will be absorbed in rotation of the ring gear in the friction clutch.

C Outboard Flap Emergency Drive Unit

(1) The outboard flap emergency drive unit is used to drive the outboard flap torque tubes in event the normal drive system fails The unit consists of a 115/200 volt ac motor, centrifugal clutch, torque limiter, and reduction gear train and is controlled from the emergency flap system master switch and the emergency outboard flap switch on the overhead panel The unit is attached to the forward wall of the right main wheel well.



Inboard and Fillet Flap Emergency Drive Unit
Figure 10



Outboard Flap Emergency Drive Unit
Figure 11

(2) The centrifugal clutch is incorporated to prevent rotation of the motor when the flaps are driven by the normal drive system. (See figure 11.) The clutch consists of a clutch gear, two discs, four blocks, and clutch drum. One end of the gear is rectangular in shape and mates with the blocks. The blocks are secured in the axial direction by the discs and are permitted radial motion only. The discs, blocks and gear are enclosed by the clutch drum. Rotation of the gear forces the blocks outward to mesh with offsets in the rim of the clutch drum to drive the clutch. When the motor is de-energized, springs pull the blocks away from the clutch drum, disconnecting the gear train from the output shaft.

(3) The torque limiter consists of belleville springs, clutch plate, backing plate, clutch gear, and output shaft. The clutch plate is splined on the output shaft and contains a series of holes which form a circle. The gear contains a series of tangential slots which mate with the holes in the clutch plate. Twelve steel balls are carried in the slots and are held in the holes by the backing plate and belleville springs. When loads on the output shaft exceed 900 to 1200 inch-pounds, the balls are forced into the ends of the slots, disengaging the torque limiter. This causes friction to drop off rapidly, reducing driving torque requirement to about 200 pound-inches. Rotation of the output shaft in the opposite direction automatically re-engages the torque limiter.

D. Flap Bypass Valve

(1) The flap bypass valve is a three way, two position, motor-operated rotary type valve used to interconnect hydraulic motor ports during emergency flap operation. A valve is bolted to the forward bulkhead in each main wheel well. Hydraulic lines extend from the valves to the flap control valves and to the hydraulic motors that drive the flaps. Placing the emergency flap system master switch at ON supplies 28 volt dc power to open the valve to the bypass position. (See figure 9.) In this position the down line from the flap control valve is blocked and the two motor ports are connected to allow fluid circulation within the motor. Placing the switch at OFF supplies 28 volt dc power to close the valve, thus returning control of wing flaps to the flap lever on the control stand. The bypass valve is equipped with a manual override and manual override lever. Two valve positions are indicated on the valve housing. When the manual override lever is at position 1, the valve is in the normal position, in position 2, the valve is in bypass.

E. Limit Switches

(1) Emergency flap limit switches are used to open the circuit to the emergency flap drive units at either end of flap travel. A limit switch is attached to a support bracket on each side of each flap control valve. (See figure 1.) The switches are actuated by a striker arm attached to the control valve follow-up arm.

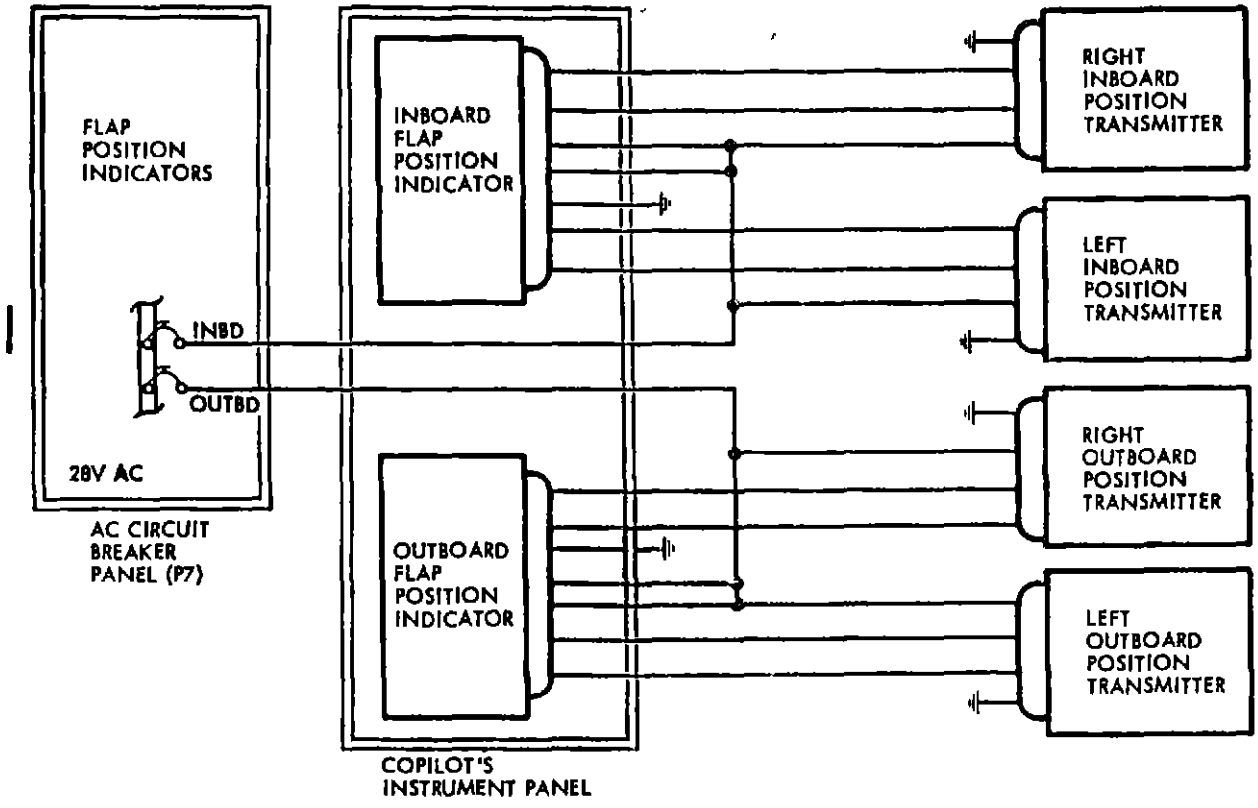
4. Trailing Edge Flap Position Indicating System

A. General

(1) The trailing edge flap position indicating system indicates angular position of the main trailing edge flaps. It is an electro-mechanical system consisting of two dual position indicators and four cable actuated position transmitter assemblies.

B Flap Position Indicators

(1) The flap position indicators are dual synchro type indicators and register the flap position in degrees. One dual indicator shows the position of each main inboard flap while the other indicator shows the position of each main outboard flap The indicators are clamp mounted on the copilot's instrument panel Each indicator receives a flap position signal from two flap position transmitters and positions dual concentric pointers to indicate flap position. (See figure 12.)



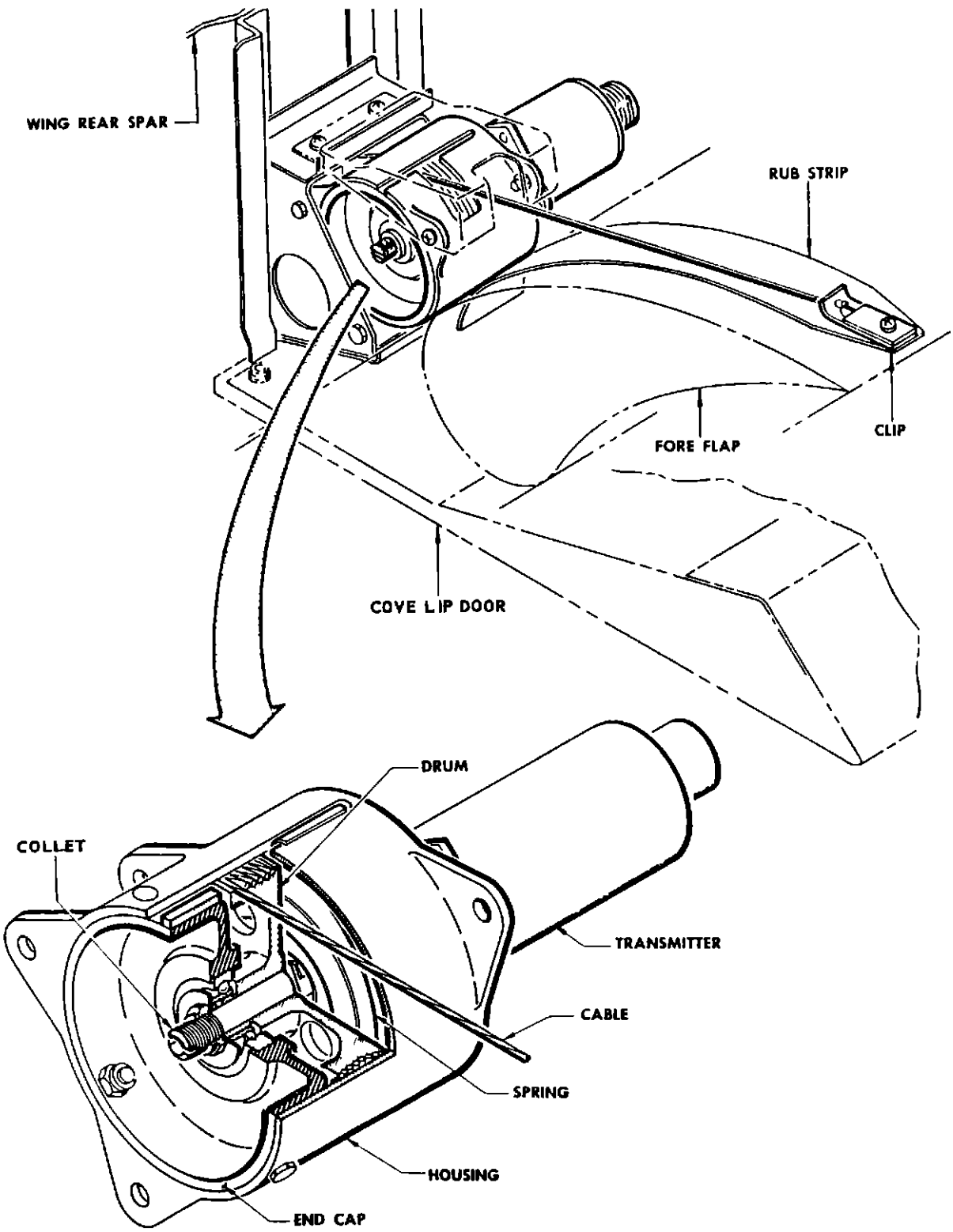
Flap Position Indicator Schematic
Figure 12

C. Flap Position Transmitter Assembly

(1) A flap position transmitter assembly transmits the angular position of each main flap to a position indicator. Each assembly is a combination of a spring-loaded drum assembly (figure 13) and synchro type transmitter. The drum assembly consists of a cable drum, cable spring, and collet enclosed in a drum housing. The collet extends through the housing and is keyed to the drum. One end of the spring is attached to the housing while the other is wrapped around the drum shaft. The synchro type transmitter is bolted to the drum housing with the drive shaft keyed to the collet. The transmitter assembly is attached to a support bracket on the upper side of the wing trailing edge just forward of each main flap. One end of the cable is attached to the flap and is pulled out against spring tension as the flap is extended. This repositions the rotor, generating an electric signal which is sent to the indicator in the cockpit. When the flaps are retracted, the spring rotates the drum in the opposite direction to rewind the cable.

5. Trailing Edge Flap Takeoff Warning System

A. A flap takeoff (position) warning switch closes to sound a warning horn in the control cabin when thrust lever No. 3 is advanced to takeoff power, the airplane is on the ground and the trailing edge flaps are not in takeoff range. Refer to 31-26-0, Aural Warning Systems - Description and Operation, for information on the takeoff warning system.



Flap Transmitter Assembly
Figure 13

6. Leading Edge Flaps, Slats and Control System

A. General

(1) Leading edge flaps and slats prevent high negative pressure rise on the forward upper surface of the wing at high angles of attack by shaping the airfoil to fit the airflow pattern. This is accomplished with 10 leading edge slats and 3 leading edge flaps in each wing. Five slats are located outboard of the outboard nacelle, five between the nacelles and the three flaps are located inboard of the inboard nacelle. (See figure 1) Slats and flaps are actuated hydraulically and are controlled from a control valve in the left wheel well. Other components provided in the system are hydraulic lock valves, restrictor check valves, thermal relief valves, and leading edge flap bypass valves.

B. Leading Edge Flaps and Slats

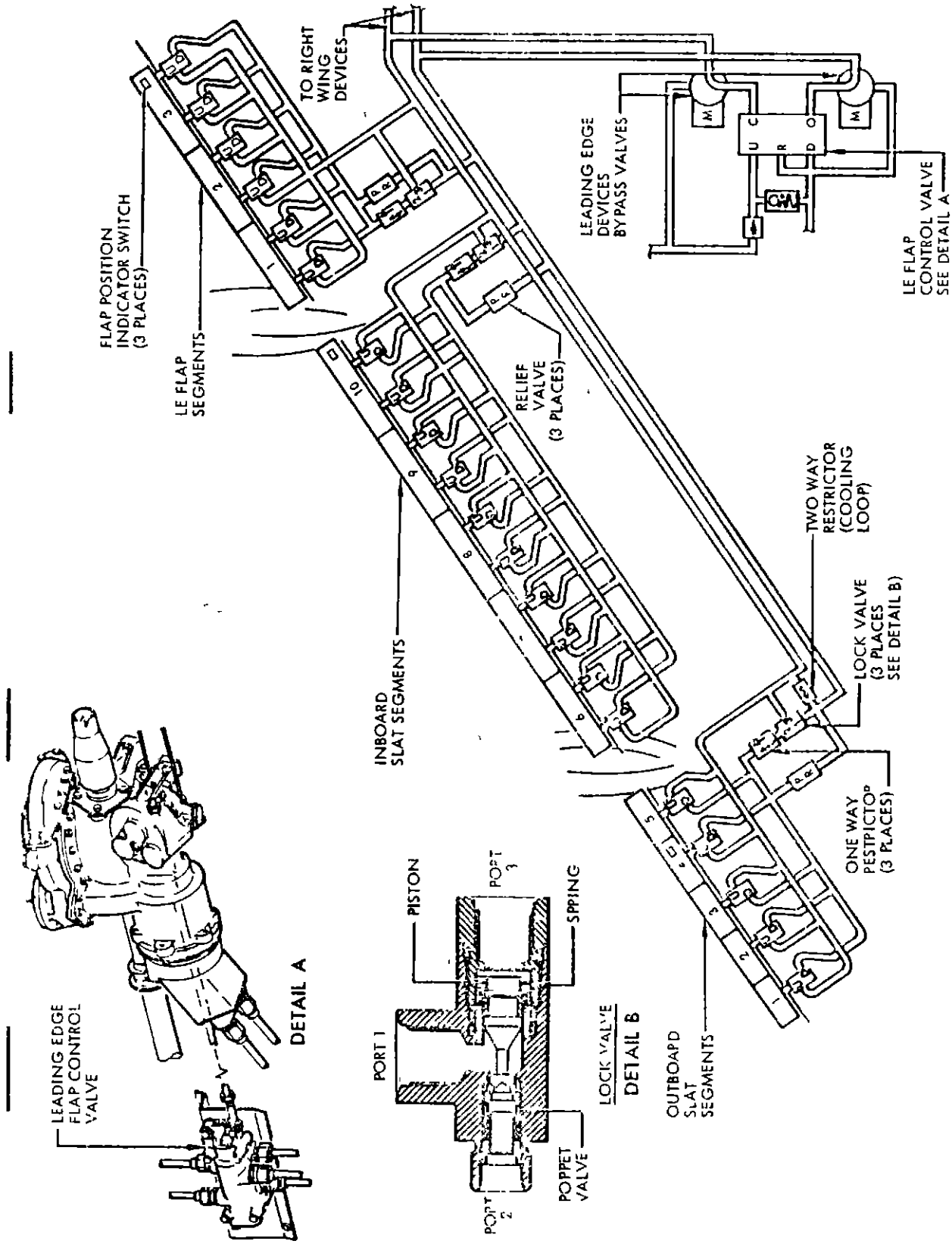
(1) Leading edge flaps and slats are located on the forward lower surface of each wing. The slats are magnesium alloy castings with integral ribs and stiffeners while the flaps are a combination of magnesium castings and sheet aluminum parts. Chord length varies from 24 inches on the outboard leading edge flap to 18 inches on the inboard leading edge flap The flaps are hinged to the wing leading edge and are retracted and extended by hydraulic actuators. Outboard leading edge slats Nos 1 through 5 are located outboard of nacelle strut. Inboard leading edge slats Nos. 6 through 10 are located between the nacelle struts. Inboard flaps Nos. 1, 2 and 3 are located inboard of the inboard nacelle strut The outboard slats are attached to slat carriages and to two gooseneck hinges. The carriages roll along cam shaped tracks fastened to wing structure. The forward end of the carriages are attached to the hinges. The slat is actuated by a single hydraulic actuator attached to the wing front spar and to a clevis fitting on the slat midway between the carriages. In the extended position, the angle between the slat and wing chord plane is about 60 degrees. The inboard slats are supported by two gooseneck hinges and are raised and lowered by a hydraulic actuator at each end. Doors attached to the wing leading edge are opened by the gooseneck hinges on the inboard leading edge slats when the slats are fully extended. A compression spring attached to each door through a spring retainer returns the door to the faired position when the slat retracts. Leading edge flaps Nos. 1, 2 and 3 are supported by gooseneck hinges attached to wing leading edge structure. Two actuators are used to raise and lower each flap. A hinged fairing (bull nose) is attached to the trailing edge of each flap and slat. The fairing changes the aerodynamic profile of the surface to permit smooth airflow in the extended position. The fairing is actuated by linkage attached to the hinges on the outboard leading edge slats and by linkage attached to fixed structure on the inboard slats and the flaps. In the retracted position the fairing is carried in a folded position to allow efficient sealing between the surface and lower wing structure.

C. Leading Edge Flap Control Valve

(1) The leading edge flap control valve is a three position, piston-type control valve which controls operation of the leading edge flaps and slats The valve consists of a sliding piston and sleeve assembly enclosed in the valve housing. Drilled passages in the piston sleeve are connected to five external ports on the housing. The five external ports are up, down, return, open and close The supply system pressure line is connected to the valve up port (See figure 15.) The supply system return lines are connected to both the down port and return port. Hydraulic lines extend from the open and close ports to the leading edge flap and slat actuators. The valve is located on the forward wall on the left main wheel well as shown in figure 1 and is actuated by a link which is positioned by the inboard and fillet flap power unit. With the trailing edge flaps retracted, the valve directs hydraulic pressure to the up side of the actuators. Extension of the main wing flaps to about 6 degrees positions the valve to extend the leading edge surfaces The valve is the same as the landing gear door control valve.

D Leading Edge Flap Bypass Valves

(1) The leading edge flap bypass valves are identical to the flap bypass valve One is connected in the pressure line to the leading edge flap control valve and another is in the return line (See figure 15.) The valves route pressurized fluid around the leading edge flap control valve when the No 2 reverse thrust lever is in the reverse thrust position. This action prevents foreign matter from being blown by the engines into the front spar cavity. During normal operation with the thrust levers in the forward thrust position hydraulic fluid is routed through the leading edge flap control valve to the flap and slat actuators. The valves are controlled from a switch which is actuated by the No. 2 thrust lever control cable. (See Figure 16)



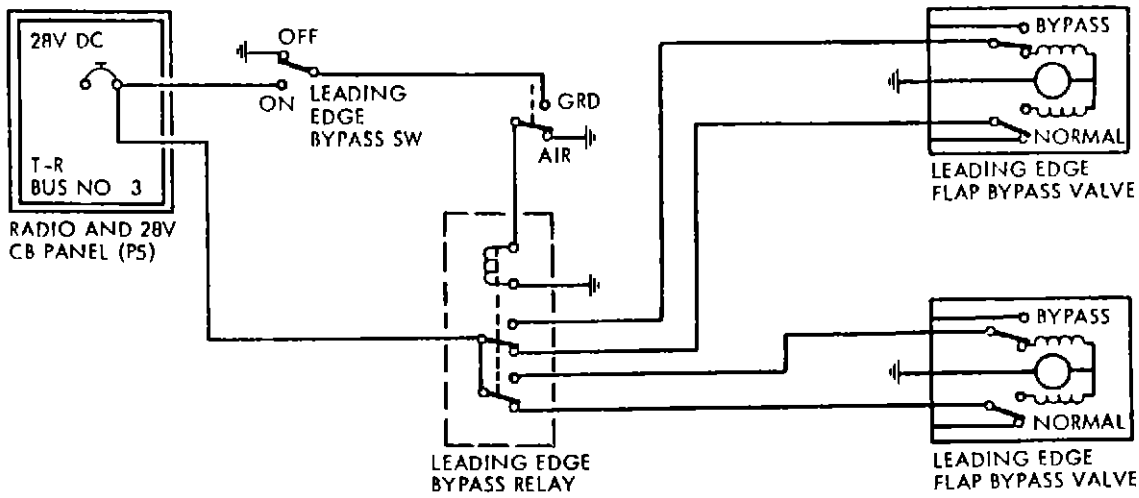
Leading Edge Flap Hydraulic System Schematic
Figure 15

E Leading Edge Flap Bypass Switch

(1) The leading edge flap bypass switch is located under the cabin floor in the lower 41 section The switch is attached to a support bracket below a guide tube The switch actuator extends up through a cutout in the tube and is actuated by a cam attached to the No 2 thrust lever cables when the thrust lever is positioned to Reverse Thrust The switch completes a segment of a circuit to the leading edge flap bypass valve relay The remainder of the circuit is completed through contacts on the ground safety relay when the airplane is on the ground This results in 28 volt dc being supplied to the bypass valve motors and actuating the valves to the bypass position. (See figure 16)

F Leading Edge Flap Hydraulic Lock Valve

(1) Six hydraulic lock valves are installed in the lines between the leading edge flap control valves and the actuators The valves are used to prevent aerodynamic blowback of the leading edge surfaces during takeoff and let down in the even of loss of hydraulic pressure. A valve is provided for each set of leading edge flaps or slats The inboard leading edge flap lock valve is located on the front spar immediately inboard of the inboard nacelle strut The inboard leading edge slat valve is located on the front spar immediately inboard of the outboard nacelle strut The outboard leading edge lock valve is located on the front spar immediately outboard of the intersection of wing and outboard nacelle strut The valve consists of a check valve and piston assembly enclosed in a tee-shaped housing (See figure 15) The housing contains three external ports numbered 1, 2 and 3 Port 1 is connected to the down port on the control valve; port 2 is connected to the extend port on the leading edge flap actuator Port 3 is connected through a tee to the up port on the control valve and to the retract port on the actuator



Leading Edge Flap Closure Schematic
Figure 16

(2) During flap extension, pressurized fluid from the down side of the control valve is routed through port 1 where it cracks the check valve and is directed through port 2 to the extend side of the actuators. Return fluid flows from the retract side of the actuator through the tee and back to the control valve. If loss of hydraulic pressure occurs at port 1 the check valve is forced closed by fluid pressure resulting from air loads on the flap. This action traps a column of fluid between the lock valve and the actuator, holding the flap in the extended position. To retract the flaps or slats, fluid from the control valve is directed to port 3 and to the retract (up) side of the actuator simultaneously. Fluid at port 3 actuates the piston, opening the check valve, and thus allowing return fluid to flow back to the control valve.

G. Leading Edge Flap or Slat Actuators

(1) The leading edge flap or slat actuator is a hydraulic cylinder. (See figure 1.) Each actuator is trunnion mounted on the wing front spar with the rod end attached to a clevis fitting on the flap. One actuator is used to actuate each outboard wing slat, two to actuate each slat between the nacelle struts, and two to actuate each leading edge flap. The actuators are controlled by the leading edge flap control valve.

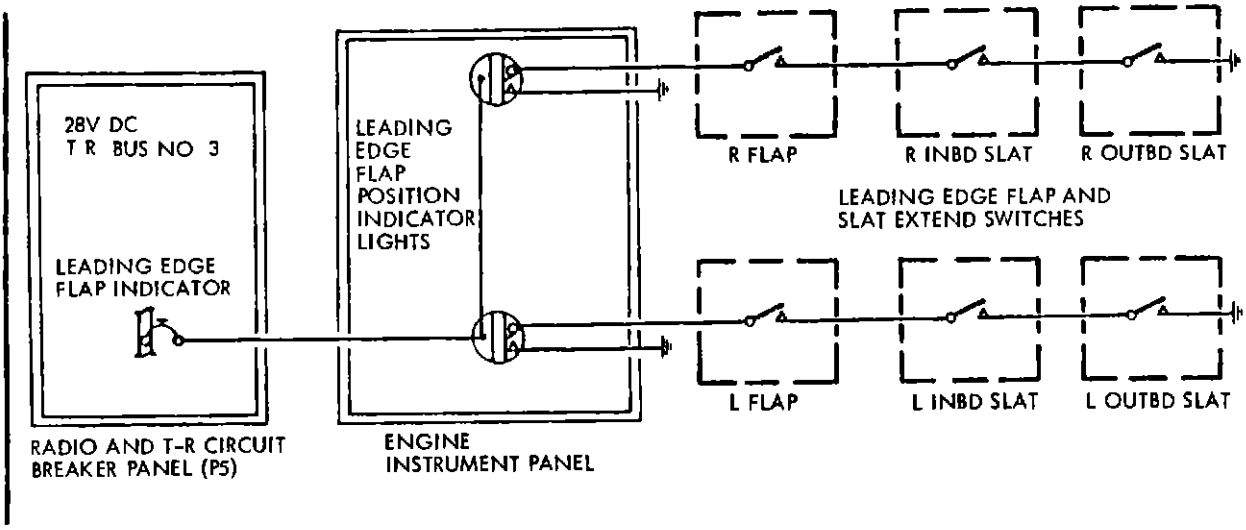
H. Leading Edge Flap and Slat Operation

(1) Leading edge flap and slats are extended and retracted by the hydraulic actuators. The actuators are hinged to the wing front spar and are attached to the flap or slat aft of the hinge line. Leading edge flaps and slats are operated automatically in unison with the trailing edge flaps. When the inboard trailing edge flaps are extended to about 6 degrees, the leading edge flap control

valve is positioned to open by the inboard and fillet flap power unit. Hydraulic fluid is then ported to the down side of all leading edge surface actuators. (See figure 15.) Hydraulic lock valves prevent aerodynamic blowback of the leading edge surfaces, if hydraulic failure occurs, by trapping a column of fluid between the valve and actuators. Thermal protection is provided in the extend position by three relief valves in each wing. A relief valve is connected across the up and down lines to each set of leading edge slats and flaps and opens at a pressure of 3500 psig and reseats when pressure drops to 3150 psig. The leading edge surfaces normally remain open until the trailing edge flaps are retracted to about 6 degrees, however, two bypass valves are provided to bypass hydraulic fluid around the leading edge flap control valves and retract the leading edge surfaces when the No. 2 reverse thrust lever is positioned to "Reverse Thrust." This protects the front spar cavity from debris emitted or blown up by the thrust reversers. The valves are controlled by a switch located in the lower 41 section and actuated by a cam on the No. 2 reverse thrust lever cable. (See figure 16.) Normally, retraction of the inboard trailing edge flaps to 6 degrees repositions the leading edge flap control valve to retract the leading edge surfaces.

7. Leading Edge Flap and Slat Position Indicating System

A Two position indicating lights illuminate when the leading edge flaps and slats are actuated to the full extended position. Each light is controlled by a set of three surface operated microswitches. (See figure 17.) A switch is provided for each set of leading edge flaps and slats and is closed when the set of flaps or slats is fully extended. The switches are wired in series so that failure of any set of flaps or slats to fully extend will not complete the light circuit and the light will be inoperative



Leading Edge Flap Position Indicating System Circuit
Figure 17

8. Operation

A. The wing flaps are normally controlled by a manually operated flap control lever on the right side of the control stand. The lever opens both flap control valves, in the main gear wheel wells, by means of cables and pushrods. The lever rotates about a quadrant detented in the "FLAP UP 0," "14," "25," "40," and "50 FLAP DOWN" positions. The marking of each detent position corresponds to the angle of flap extension obtained when the flap control lever is positioned at that detent. Rotation of the flap control lever to any down position will open both flap control valves simultaneously. This permits pressurized fluid from the utility hydraulic system to flow through the control valves to the proper sides of the hydraulic motors. (See figure 18.) The hydraulic motors drive the power unit input shafts to rotate the flap torque tubes. This motion is transmitted through gearboxes to the flap transmission assemblies where it is changed to linear motion to drive the wing flaps. The outboard flap drive system is connected through torque tubes to the outboard aileron lockout mechanism. The outboard aileron lockout mechanism prevents operation of the outboard aileron when the flaps are retracted. Extension of the flaps positions the mechanism so that control of the outboard aileron is returned to the aileron system. As the flaps are lowered to the position determined by flap lever position, the control valve is returned to the neutral (shutoff) position by follow-up cables driven by a follow-up sheave on the flap power unit.

B. Leading edge flaps and slats are operated automatically in unison with trailing edge flaps. When the trailing edge flaps are extended to about 6 degrees, the leading edge flap metering valve is positioned by the inboard and fillet flap power unit to fully extend (open) the leading edge flaps and slats. The surfaces remain open until the trailing edge flaps retract to about 6 degrees. At this point, the valve is positioned to close, retracting the surfaces flush with the lower wing surface. Positioning the No. 2 reverse thrust lever to "Reverse Thrust" actuates a switch supplying 28 volts dc to two bypass valves in the left wheel well. The bypass valves opens to bypass hydraulic fluid around the leading edge flap control valve to the retract (up) sides of the leading edge flap and slat actuators. This retracts the surfaces and they remain retracted until the flap control lever is positioned to idle or some forward thrust position.

INBOARD SLATS - MAINTENANCE PRACTICES

EFFECTIVITY

Airplanes Incorporating Single Link Slat Fairing Mechanism

TCA	LX-N20198
	LX-N20199
RTCA	LX-N19997
	LX-N20000

1. General

A. The airplane is equipped with ten slats in each wing. The inboard slats are located in the wing leading edge, between the engine nacelle struts. These slats are numbered 6 through 10; slat No. 6 is immediately inboard from the outboard engine nacelle strut and slat No. 10 is outboard of and adjacent to the inboard engine nacelle strut.

B. The inboard slats are hinge mounted and hydraulically actuated by means of hydraulic cylinders. Each slat is equipped with two hydraulic actuators.

2. Removal/Installation - Inboard Slats

A. Equipment and Materials

(1) Leading Edge Flap Actuator Lock Assembly - F70144, or equivalent

(2) Control Surface Protractor Assembly - F52485-500, or equivalent

(3) Protractor Stand Assembly - F71292-17, or equivalent

(4) Zinc Chromate Primer, MIL-P-8585, or equivalent

(5) Paint, A423 Epoxy Enamel, Semigloss Gray (Andrew Brown Co.)

(6) Silicone Compound, MIL-L-8660

(7) Alodine 1200

(8) Aerodynamic Smoother and Environmental Sealant

(9) General Purpose Cleaning Solvent

B. Remove Inboard Slats

(1) Pressurize utility hydraulic system.

(2) Extend wing flaps.

NOTE: Leading edge devices will extend when main flaps are extended about 6 degrees. It is not necessary to completely extend main flaps.

(3) Install leading edge flap lock assembly.

WARNING: MAKE SURE THAT LOCK ASSEMBLY IS PROPERLY INSTALLED TO PREVENT OPERATION OF LEADING EDGE FLAPS AND SLATS. OPERATION OF SLATS DURING MAINTENANCE COULD RESULT IN DAMAGE TO THE AIRPLANE OR SERIOUS INJURY TO MAINTENANCE PERSONNEL.

(4) Depressurize hydraulic system.

(5) Disconnect bonding jumpers (3, figure 201) from slat hinge fittings (6).

(6) Disconnect link assembly (4) from slat leading edge.

(7) Remove bolts attaching leading edge slat actuators (2) to slat (7).

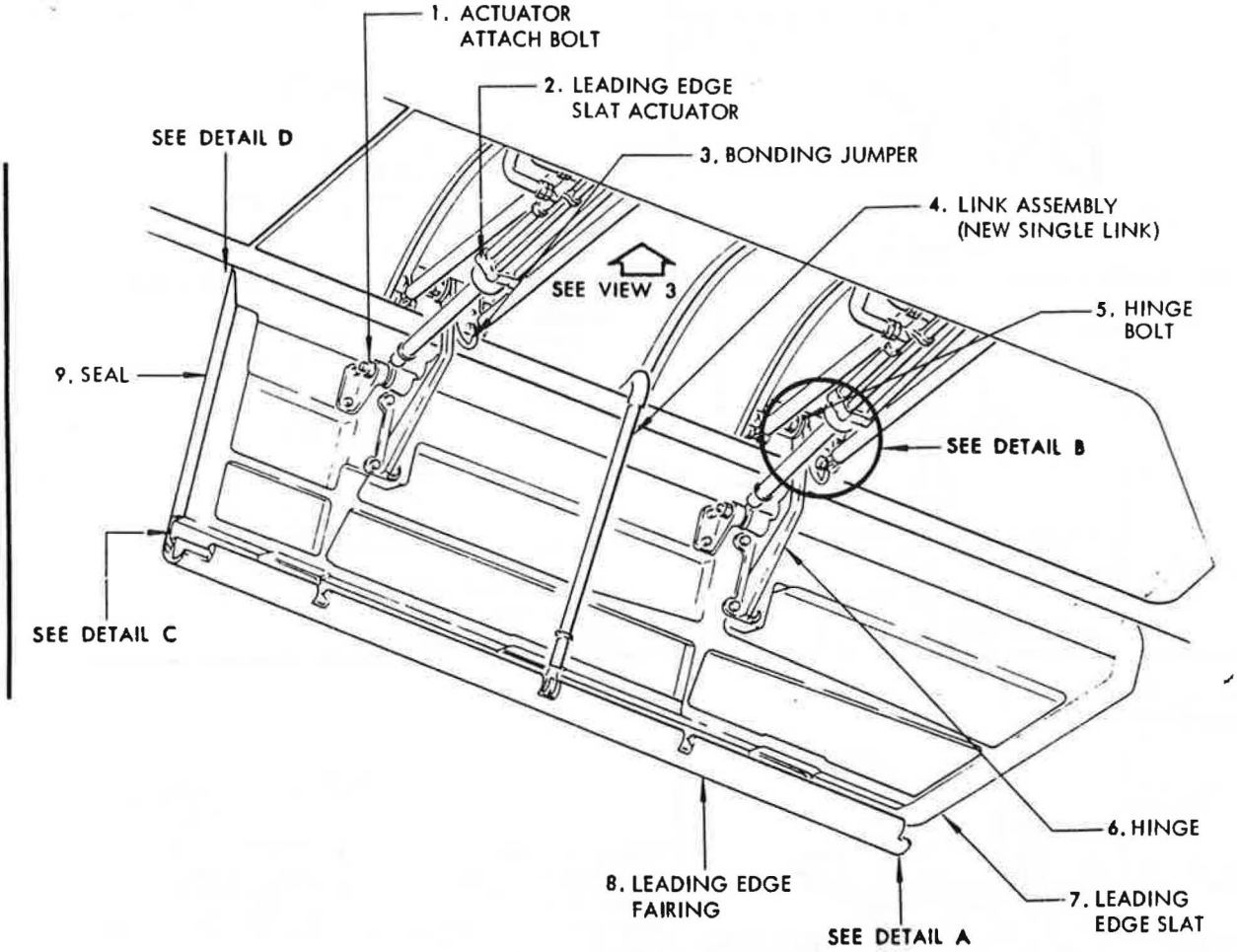
(8) Remove hinge bolts (5) and remove slat from airplane.

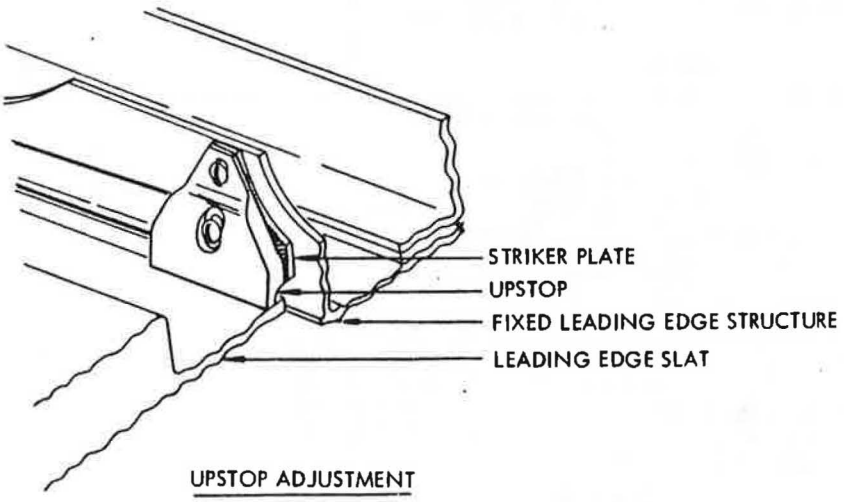
C. Install Inboard Slat

(1) Dip hinge bolt bushings in zinc chromate primer and install washer

(2) Position slat hinge fittings in leading edge hinge support fittings and install hinge bolts (detail B, figure 201). Check gap between inboard side of bearing and outboard face of bushing through hinge support fitting. If gap is greater than 0.010 inch, add AN960PD616L washers, as required, to reduce gap to less than 0.010 inch and maintain 0.12 (+0.13/-0.03)-inch dimension shown in detail C, figure 201. Locate shim washers on inboard side of bearing as shown in detail B.

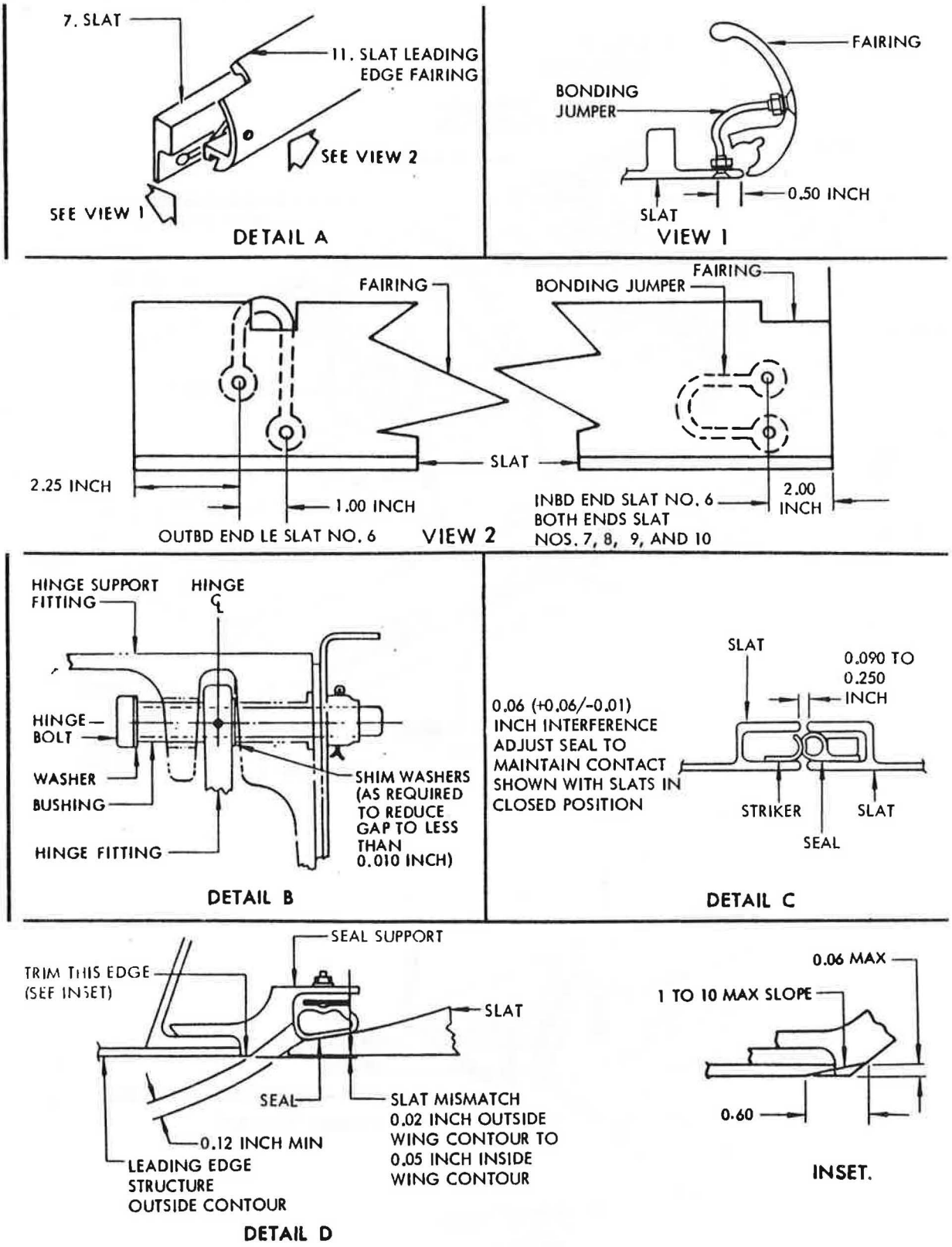
(3) Tighten hinge bolt nuts to torque of 95 to 110 pound-inches. Align nearest cotter key holes and install cotter keys. Make sure that bushings are seated against outboard sides of bearing races and that bolt head does not contact hinge support fitting.





UPSTOP ADJUSTMENT

VIEW 3



Inboard Slat Installation
Figure 201 (Sheet 2)

(4) Manually extend slat and check that clearance between leading edge of slat and leading edge skin is not less than 0.12 inch at any slat position. If clearance is less than 0.12 inch, trim and shave as shown on figure 201, detail D. Brush alodize reworked edge area with alodine solution and apply two coats of primer and one coat of paint.

(5) Dip actuator attach bolt bushings in primer and install in clevis fittings on slat. Install bolts (1) connecting slat actuators (2) to slats and tighten bolts to between 95 and 110 pound-inches torque. Rotate nut as required to align cotter keyholes and install cotter key. Bolt must not seat on fitting and bushing must seat on inner race of bearing.

(6) Connect bonding jumpers (3) to slat hinge fittings (6). Install one washer on each side of bonding jumper terminal and one under nut.

(7) Adjust slat leading edge fairing linkage as follows:

(a) Adjust link assembly (4, figure 201) to nominal length shown in figure 202.

(b) Connect link assemblies (4, figure 201) between wing leading edge fitting and slat edge fairing. Do not tighten connecting bolts.

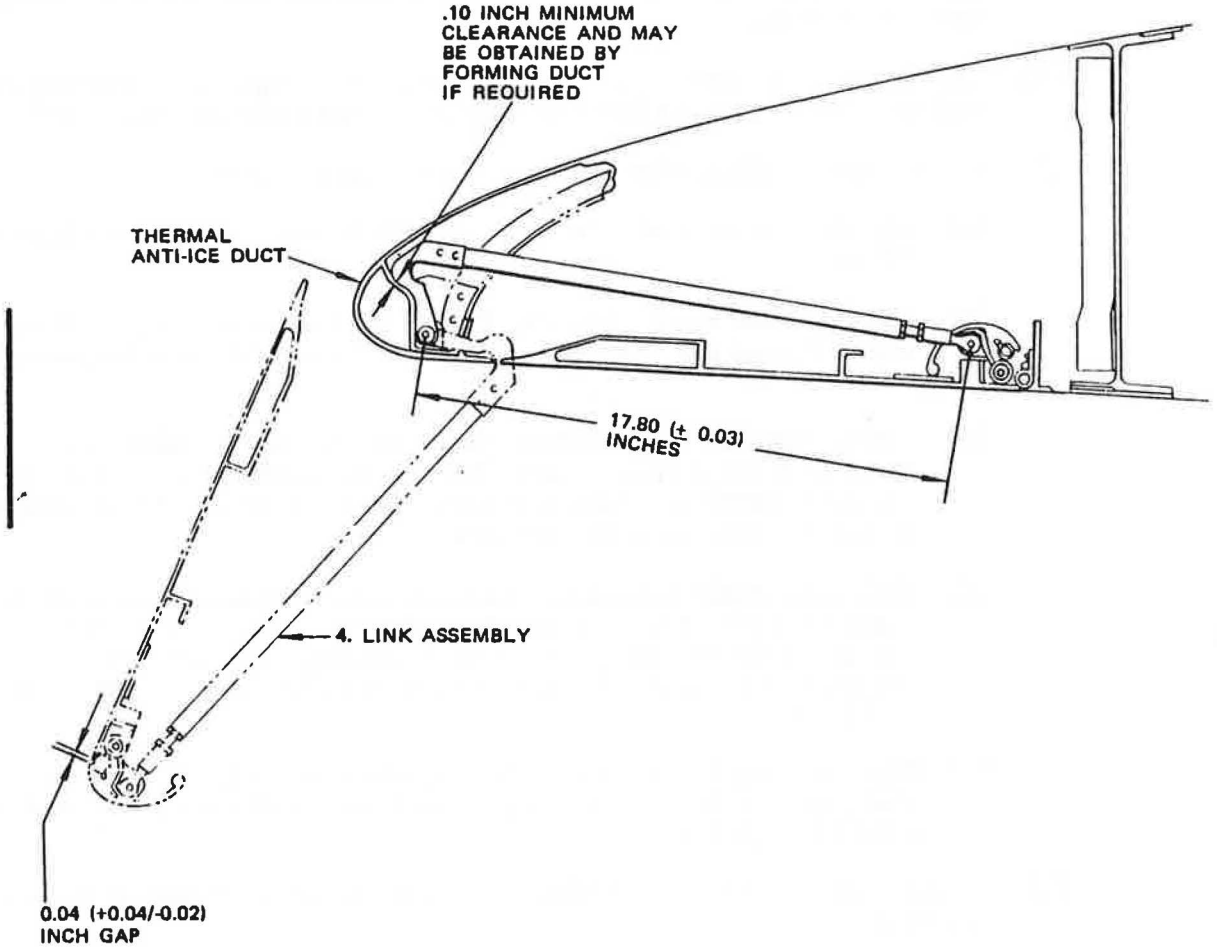
(c) Rotate slat to the extended position and install bolt and bushing through slat clevis fitting and slat actuator rod end. Use protractor to check for slat extension of 111 (± 1) degrees. Do not install nuts and washers.

(d) With slat fully extended, readjust link assemblies to provide a gap of 0.04 (+0.04/-0.02) inch between fairing and slat (shown in figure 202) and so that linkage will clear all structure and tubing by not less than 0.120 inch in any slat position.

(e) Check clearance between link assembly and duct. Clearance shall not be less than .10 inch and may be obtained by forming duct if required.

(8) Locate holes in slat and fairing at each end of slat per detail A, figure 201.

(9) Drill 0.218 (+0.010/-0) inch hole through fairing and slat. Countersink hole in slat 100 degrees on lower side and countersink hole in fairing 100 degrees on upper side of fairing. Cover countersink area with one coat of zinc chromate.



Inboard Slat Fairing Adjustment
Figure 202

(10) Install bolts, washers and nuts connecting bonding jumper from slat to fairing at each end of slat. Install washer on each side of bonding jumper terminal.

(11) If installing slat adjacent to outboard nacelle strut, check that gap between slat and strut is 1.20 (+0.30/-0.05) inches. Measure dimension normal to nacelle surface.

(12) Pressurize utility hydraulic system and retract flaps.

(13) Check adjustment of seal (9) and striker (refer to detail C, figure 201). If adjustment is necessary, proceed as follows:

(a) Extend flaps and slats.

(b) Adjust seals by loosening seal retaining screws and shifting seal as necessary to obtain required seal compression, specified in detail C.

(c) Retract flaps. Recheck seal adjustment. Readjust as necessary.

(14) Make sure that openings at forward ends of seal and striker are filled with aerodynamic smoother. (See figure 203.) If necessary to fill openings with smoother, apply clear, chemical-and-solvent-resistant finish to slat end after smoother is cured. Apply smoother and clear finish as described in Chapter 51, Sealing, and Interior and Exterior Finishes.

CAUTION: MAKE SURE THAT OPENINGS AT FORWARD ENDS OF SEAL AND STRIKER ARE COMPLETELY FILLED WITH AERODYNAMIC SMOOTHER. THIS IS NECESSARY TO PREVENT THE ENTRY OF AIR INTO SPACE BEHIND SEAL OR STRIKER AND INTO LEADING EDGE.

(15) Lubricate slat end seal with Dow Corning Silicone Compound No. 4 (MIL-L-8660).

(16) Check that gap is 0.10 (+0.08/-0.06) inch between aft edge of slat and adjacent structure.

(17) Check that clearance between slats is within the limits shown in figure 201, detail C.

(18) Check mismatch at slat trailing edge. At stop locations, within 2.0 inches of slat stops, mismatch shall not exceed 0.02 inch. Between stop locations, trailing edge of slat shall be no more than 0.02 inch inside leading edge contour or not more than 0.05 inch outside contour. Adjust stops to reduce mismatch to required limits.

(19) Check mismatch at slat leading edge. At hinge rib locations, within 2.0 inches of hinge ribs, mismatch shall not exceed 0.02 inch. Between hinge rib locations, slats shall extend no more than 0.02

inch outside wing contour and shall be no more than 0.05 inch inside wing contour. (See detail D.) Adjust leading edge of slat to contour by either or both of the following methods:

(a) Add or remove shims from between slat and slat hinge fittings and between slat and actuator support fittings.

(b) Shave leading edge skin and structure as shown in figure 201, detail D. Maintain 1 to 10 slope when shaving leading edge skin and do not reduce total thickness of skin and structure by more than 0.06 inch.

(20) If shaving is required, brush alodize reworked surface with alodine solution. Paint treated surface with one coat of zinc chromate primer and one coat of epoxy enamel. (Refer to Chapter 51, Cleaning and Painting.)

(21) Check that gap between leading edge of slat and leading edge structure is not less than 0.12 inch and that seal is compressed as shown in figure 201, detail D.

(22) Extend flaps.

(23) Deleted.

(24) If installing leading edge slat No. 10, adjust leading edge flap position indicating switch per 27-16-251, Leading Edge Flap Position Indicating Switches - Maintenance Practices.

(25) Retract flaps.

(26) Disconnect hydraulic pressure source.

3. Removal/Installation Inboard Slat Hinge Door

A. Remove Inboard Slat Hinge Door (See figure 204.)

(1) Pressurize utility hydraulic system.

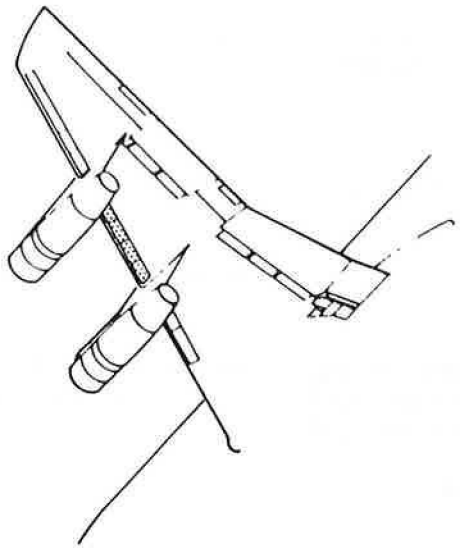
(2) Extend flaps.

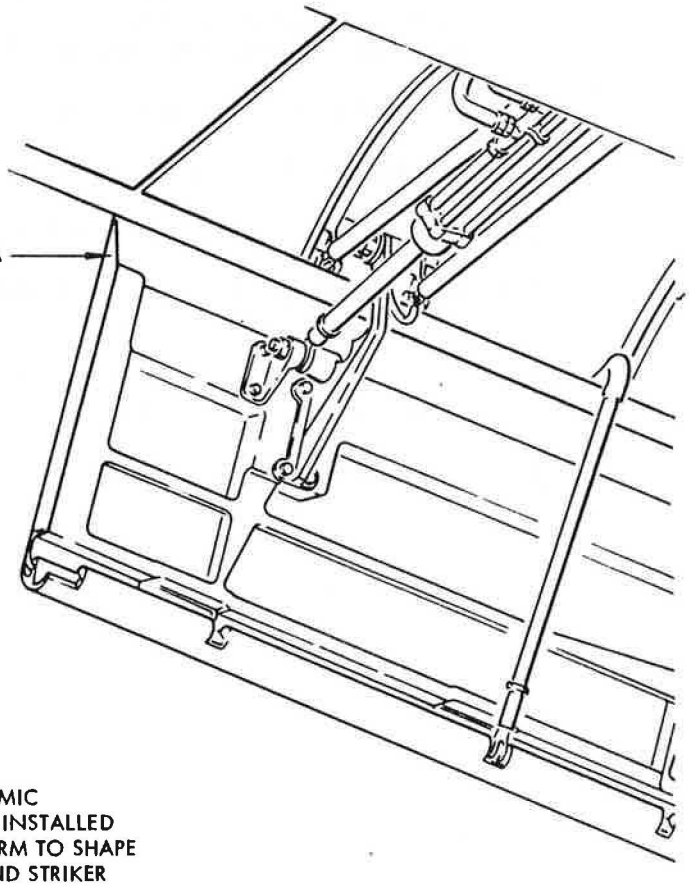
(3) Depressurize utility hydraulic system.

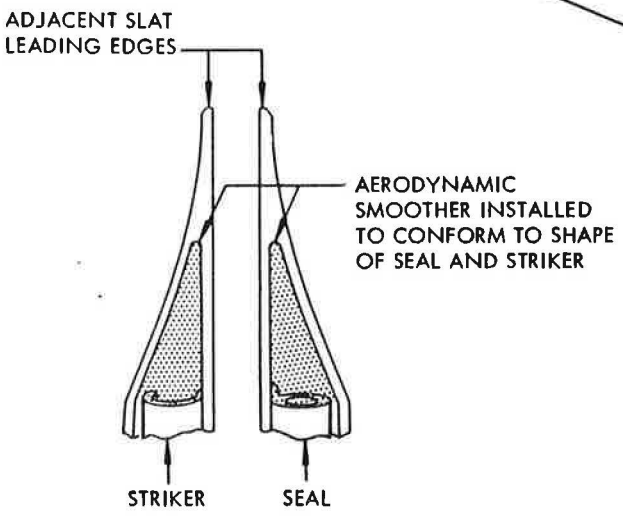
(4) Remove cotter pin from hinge pin attaching spring retainer to door.

(5) Hold spring in compressed position and remove hinge pin, spring and spring retainer.

(6) Remove hinge pin attaching door to hinge fitting and remove door.




SEE DETAIL A


ADJACENT SLAT
LEADING EDGES
AERODYNAMIC
SMOOTHER INSTALLED
TO CONFORM TO SHAPE
OF SEAL AND STRIKER
STRIKER
SEAL

DETAIL A

B. Install Inboard Slat Hinge Door (See figure 204.)

(1) Align door with hinge fittings on wing structure and install hinge pin. Direction of head on pin is optional.

(2) Install cotter pin.

(3) Insert spring retainer through compression spring and support bracket.

(4) Compress spring and install hinge pin at attaching spring retainer to door.

(5) With slat fully extended, check that clearance between edge of door and wing structure is no less than 0.02 inch, and between hinge and edge of door opening, not less than 0.03 inch.

(6) Pressurize utility hydraulic system.

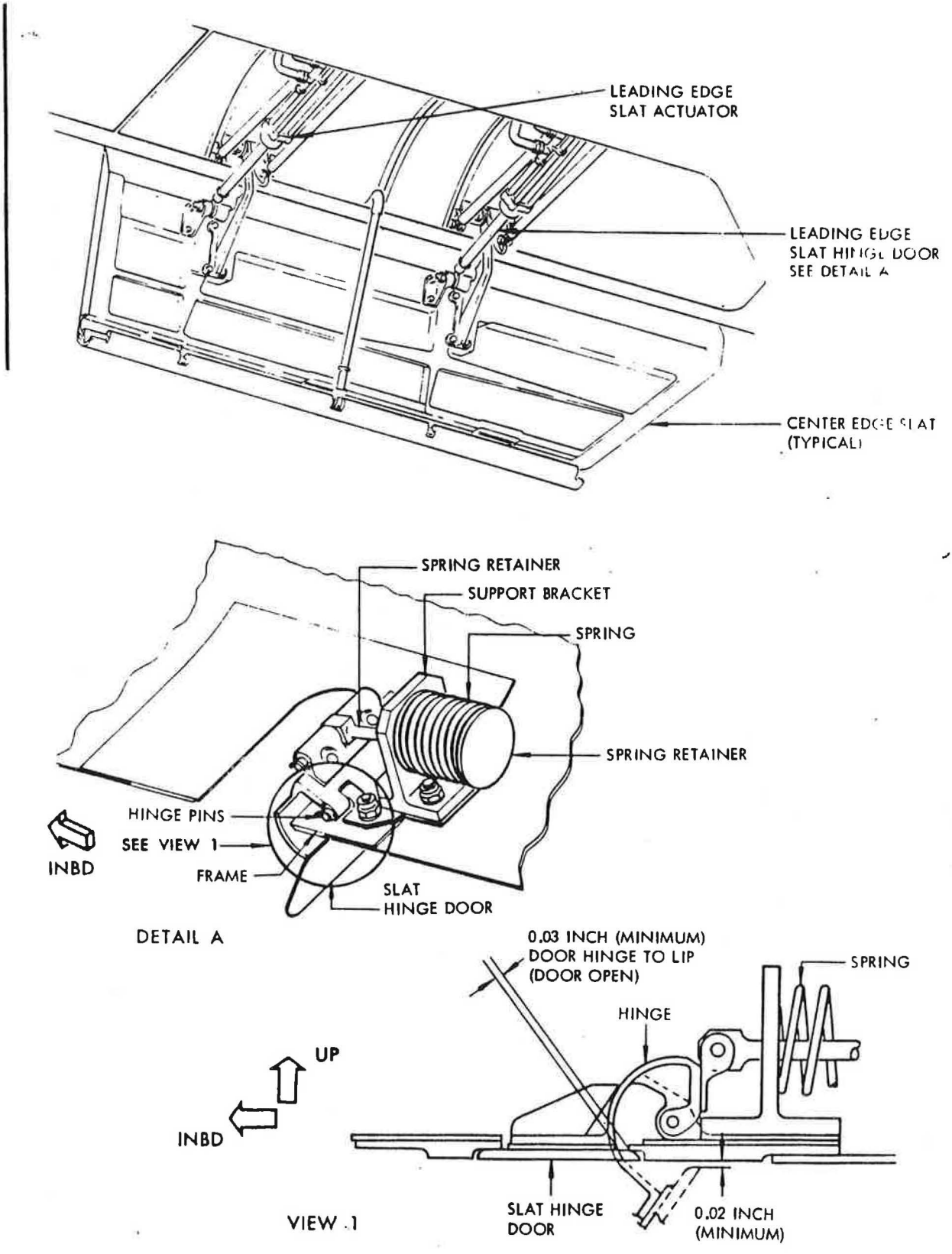
(7) Retract wing flaps.

(8) Depressurize utility hydraulic system.

(9) Check that mismatch between door and frame does not exceed 0.005 inch outside wing contour or 0.020 inside contour.

(10) Check that gap between edge of door and frame does not exceed 0.05 inch. Trim edge of door as required to obtain required clearance.

(11) Disconnect hydraulic pressure source.



Inboard Slat Hinge Door Installation
Figure 204

OUTBOARD SLATS - MAINTENANCE PRACTICES

EFFECTIVITY

Airplanes Incorporating Slat Fairing Linkage Attached to Wing Structure

TCA	LX-N20198
	LX-N20199
RTCA	LX-N19997
	LX-N20000

1. General

A. The airplane is equipped with 10 slats in each wing. The outboard slats are located in the wing leading edge, between the outboard engine nacelle strut and the wing tip. These slats are numbered 1 through 5; No. 1 is the most outboard.

B. The outboard slats are mounted on combinations of hinges, carriages and tracks and are hydraulically-actuated by means of hydraulic cylinders. Each outboard slat is driven by one hydraulic cylinder.

2. Removal/Installation - Outboard Slats

A. Equipment and Materials

(1) Leading Edge Flap Lock Assembly - F70144, or equivalent

(2) Control Surface Protractor Assembly - F52485-500, or equivalent

(3) Protractor Stand Assembly - F71292-17, or equivalent

(4) Zinc Chromate Primer, MIL-P-8585, or equivalent

(5) Paint, A423 Epoxy Enamel, Semigloss Gray (Andrew Brown Company)

(6) Silicone Compound, MIL-L-8660

(7) Alodine 1200

(8) Aerodynamic Smoother and Environmental Sealant

(9) General Purpose Cleaning Solvent

B. Remove Outboard Slats

(1) Pressurize utility hydraulic system.

(2) Extend wing flaps.

NOTE: Since leading edge flaps and slats will be fully extended when the main flaps are extended about 6 degrees, it is not necessary to fully extend the main flaps.

(3) Install leading edge flap lock assembly.

WARNING: THE LEADING EDGE FLAP LOCK ASSEMBLY, WHEN PROPERLY INSTALLED, WILL PREVENT OPERATION OF SLATS. MAKE SURE THAT LOCK ASSEMBLY IS INSTALLED DURING MAINTENANCE TO PREVENT DAMAGE TO THE AIRPLANE OR INJURY TO PERSONNEL.

(4) Depressurize utility hydraulic system.

(5) Disconnect bonding jumpers (5, figure 201) extending from outboard slat (8) to hinge links (6) on carriage tracks.

(6) Remove bolt attaching slat actuator to slat.

(7) Remove bolts attaching slat carriage assemblies (3) to leading edge slats.

(8) Disconnect pushrods (4) extending from bellcranks (9) to structure.

(9) Remove bolts (7) attaching slat to slat hinge links and remove outboard slat.

C. Prepare for Installation of Outboard Slat

(1) Install leading edge fairing (bullnose) on slat as follows:

(a) Attach outboard slat hinge halves to leading edge fairing (11) at attach points.

(b) Locate fairing hinges fore or aft as necessary to obtain dimension of 0.50 (± 0.01) inch between centerlines of hinge pins and edge of slat skin as shown in section B-B, figure 201.

(c) Insert shims (12) between hinge halves and slat to obtain 0.58 (± 0.01) inch dimension between hinge pin centerline (axis) and lower surface of slat skin.

(d) Clamp each hinge half and shims in place on slat and drill two 0.190 (+0.004/-0.000) inch holes through shims and slat. Countersink holes 100 degrees on lower (external) side of slat.

(e) Install bolts to attach hinge halves and fairing to slat. Connect bonding jumper between fairing and slat at each end of fairing.

(f) If ends of fairings extend beyond ends of slat, trim fairings flush with slat.

(2) Install bellcranks (9) on support brackets on slat.

(3) Install pushrods (10) between leading edge fairing and bellcranks (9). Adjust pushrods (10) so that the nose fairing is tangent to the surface of the slat maintaining the shortest possible length of pushrod.

D. Install Outboard Slats

(1) Position slat (8, figure 201) in leading edge and attach links (6) to slat with bolts (7). Install bolts with heads toward track centerline.

(2) Attach forward ends of carriages to slat fittings. Dip bushing in zinc chromate primer and install wet before installing attach bolt. Install 0.016 inch thick washers (section A-A, figure 202) on each side of slat fitting as necessary to maintain clearance between slat fitting and carriage.

(3) With slat and slat fairing in fully extended position, install pushrods (4) between bellcranks (9) and structure.

(4) Close slat manually. Check for interference between slat and leading edge structure and between leading edge structure and slat leading edge fairing. Gap at leading edge of closed slat should be about 0.24 inch, at trailing edge of slat gap should be about 0.12 inch, and gap at each end of slat should be about 0.12 inch.

NOTE: Final clearance (gap) checks are made with the slat retracted hydraulically.

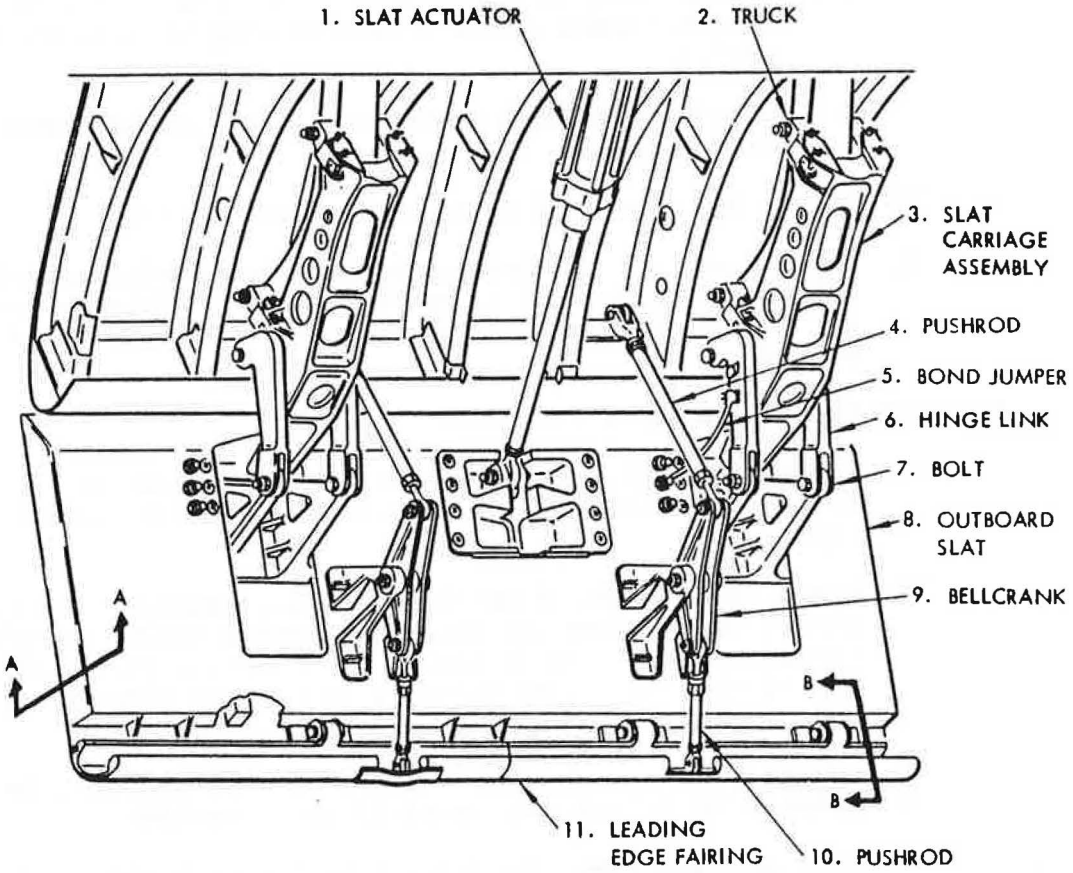
(5) Connect bonding jumper (5, figure 201) between slat and leading edge and install clamps to secure jumper to hinge links (6).

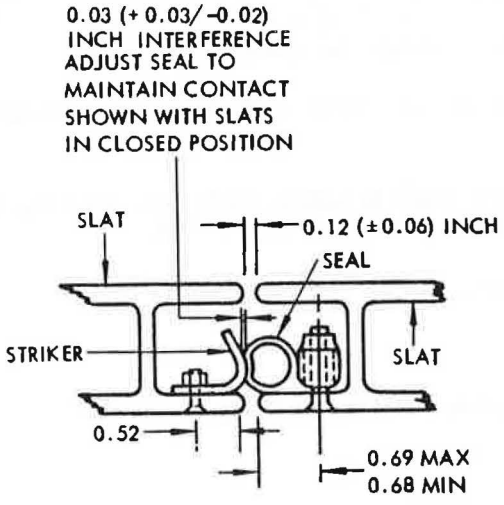
(6) Connect slat actuator (1) to slat.

(7) Extend slat manually.

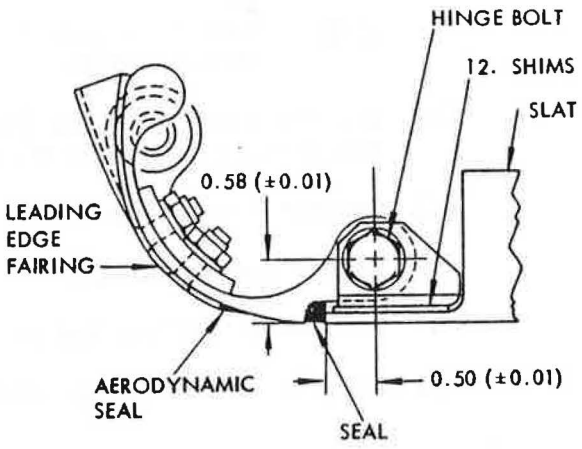
(8) Pressurize utility hydraulic system. Recheck flap extension.

(9) Retract wing flaps and slats.

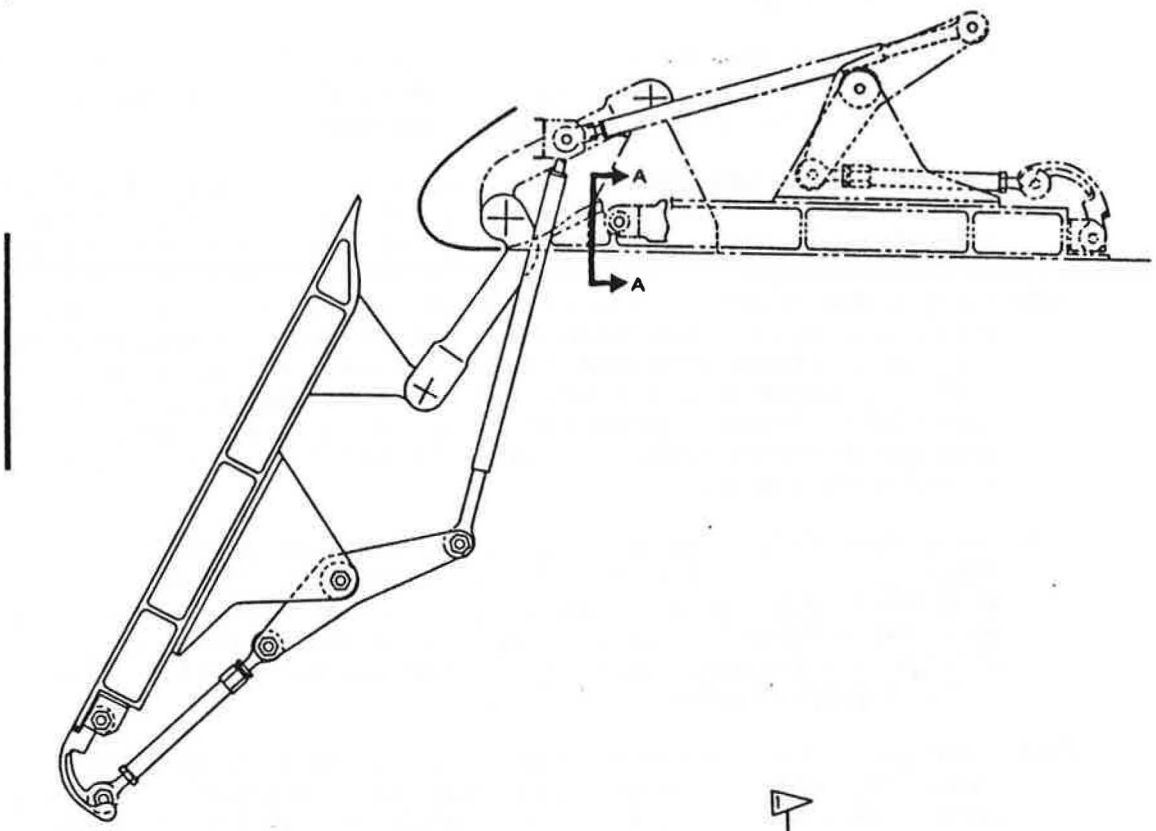


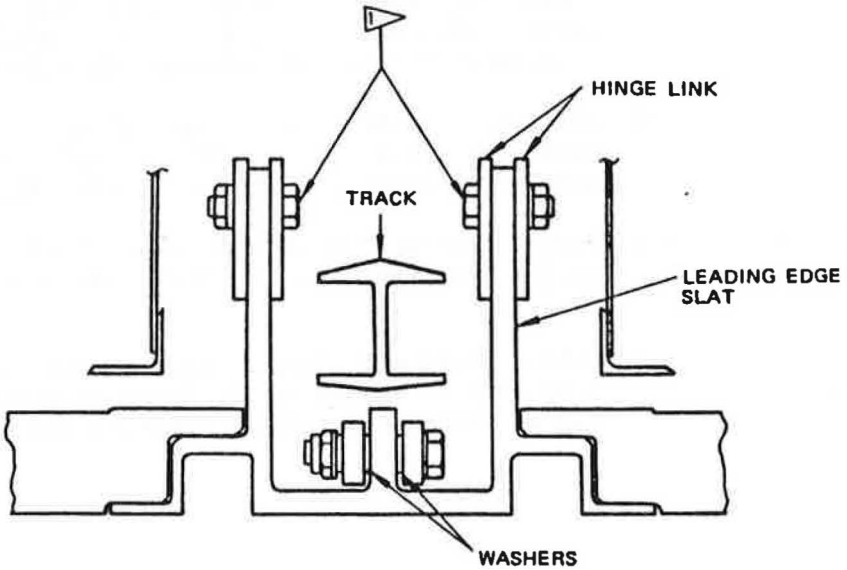


SECTION A-A



SECTION B-B





INBD

SECTION A-A

1 BOLT HEAD MUST BE TOWARD TRACK CENTERLINE.

(10) Check gap at leading edge of slat. Cap shall be 0.20 to 0.28 inch; if gap is less than 0.20 inch, trim fixed leading edge skin to obtain required gap.

NOTE: Gap and mismatch should be checked with hydraulic pressure in the actuators. Hydraulic system should be depressurized during trimming and shimming operations.

(11) Check gap along aft edge of slat. Gap between aft edge of slat and fixed leading edge structure shall be 0.04 to 0.18 inch. If gap is less than 0.04 inch, trim leading edge skin to obtain required gap.

(12) Check mismatch between forward edge of slat and lower wing skin. Within 2 inches of slat actuator or either slat carriage, slat shall not extend outside wing skin contour and shall retract no more than 0.02 inch inside skin contour. Add shims, or remove, as required to fair slat with wing leading edge skin. If necessary, leading edge skin may be shaved 0.040 inch (maximum) in 0.88 inch to obtain required surface match.

(13) Check mismatch between trailing edge of slat and lower wing skin. Within 2 inches of slat upstops, slat shall fair with lower wing skin within 0.020 inch. Between upstops, slat shall fair with wing skin within 0.020 inch inside wing contour and within 0.050 inch outside wing contour. Adjust upstops as necessary to fair slat within required limits. (See figure 201.)

(14) Check gap between adjacent slats or between slat and adjacent structure. Gap between adjacent slats shall be 0.12 (±0.06) inch. Gap between slat and adjacent structure shall be 0.13 (±0.05) inch. Trim ends of slats as necessary to obtain proper gap.

(15) Refinish all shaved or trimmed areas. Brush alodize each reworked area, apply one coat of zinc chromate primer, and apply one coat of gray epoxy enamel. Refer to Chapter 51, Cleaning and Painting.

(16) Remove leading edge flap lock assembly, install electric connectors on leading edge flap bypass valves, and pressurize utility hydraulic system.

(17) Extend flaps and slats. Leading edge fairing shall be tangent to slat when slats are in the fully extended position. Adjust pushrods (4) as required to obtain complete opening and closing of fairing.

(18) Retract flaps. Check adjustment of slat end seals with slats fully retracted (Section A-A, Fig. 201).

(19) If adjustment of slat end seals is required, extend flaps and loosen seal retaining screws and shift seal as necessary to obtain required seal compression.

(a) Retract flaps. Recheck seal adjustment. Lubricate seals with Dow Corning Silicone Compound No. 4 (MIL-S-8660).

(20) Retract flaps and slats.

(21) Depressurize utility hydraulic system.

3. Removal/Installation Outboard Slat Carriage (One-Piece Carriage)

NOTE: Carriages may be either a one-piece forging or a two-piece forging. Refer to par. 4, for removal/installation of two-piece carriages.

A. Remove Outboard Slat Carriage

(1) Pressurize utility hydraulic system.

(2) Extend wing flaps and slats.

(3) Depressurize hydraulic system.

(4) Disconnect slat carriage assembly (3, Fig. 201) from outboard slat (8).

(5) Remove cotter pins and pull pins (16) from carriage assembly to remove forward trucks (15).

(6) Roll carriage aft to roll aft rollers off cam track (2) and remove carriage assembly.

B. Install Outboard Slat Carriage Assembly

(1) Remove forward trucks (15, Fig. 201) from carriage assembly (3).

(2) Roll aft truck onto carriage track.

(3) Align forward truck (15) with cam tracks (2) and carriage assembly (3) and install pins (16). Secure with cotter pins.

(4) Install bolt attaching carriage assembly to outboard slat (8).

(5) Pressurize utility hydraulic system.

(6) Retract slats.

(7) Disconnect hydraulic pressure source.

4. Removal/Installation Outboard Slat Carriage (Two-Piece Carriage)

NOTE: Carriages may be either a one-piece forging or a two-piece forging.

A. Remove Outboard Slat Carriage

(1) Pressurize utility hydraulic system.

(2) Extend wing flaps and slats.

(3) Depressurize hydraulic system.

(4) Disconnect slat carriage assembly (3, Fig. 201) from outboard slat (8).

(5) Remove bolts (17) attaching carriage halves and remove carriage.

B. Install Outboard Slat Carriage

(1) Align carriage halves on cam track (2) and temporarily secure. If carriage has a switch striker, install spacer between carriage and striker. Do not tighten bolts.

(2) Install bolt attaching carriage assembly (3) to outboard slat (8). Install cotter pin.

(3) Tighten bolts (17) on carriage and install cotter pins.

(4) Pressurize utility hydraulic system.

(5) Retract slats.

(6) Disconnect hydraulic pressure source.

LEADING EDGE FLAP BYPASS SWITCH - MAINTENANCE PRACTICES

1. General

   A. In airplanes equipped with the cam and guide tube installation (figure 201), the leading edge flap bypass switch and the landing gear warning switch are both installed in the same adjustable bracket and are actuated by the same cable-mounted cam. As either switch is adjusted by repositioning the bracket in relation to the actuating cam, both switches are adjusted simultaneously.

2. Removal/Installation - Leading Edge Flap Bypass Switch

   A. Remove Leading Edge Flap Bypass Switch (See figure 201.)

      (1) Disconnect switch wiring.

      (2) Remove switch mounting screws from support bracket and remove switch.

      (3) Remove switch actuator from switch.

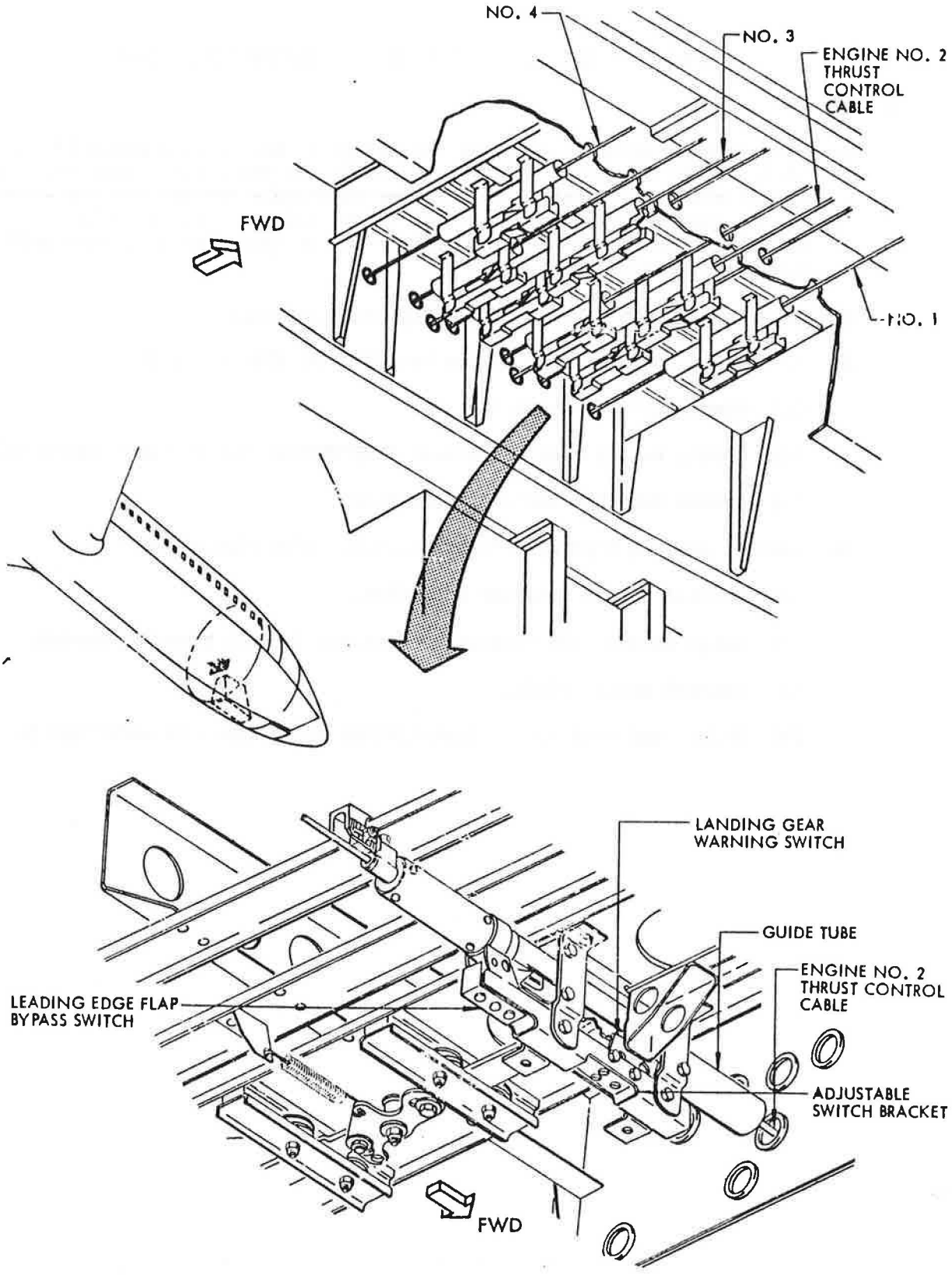
   B. Install Leading Edge Flap Bypass Switch. (See figure 201.)

      (1) Install switch actuator on switch.

      (2) Align switch with support bracket and install mounting screws.

      (3) Connect switch wiring.

      (4) Adjust and test switch installation as outlined in paragraph 3.



Leading Edge Flap Bypass Switch Installation
Figure 201

3. Adjustment/Test Leading Edge Flap Bypass Switch

A. Equipment and Materials

(1) Ohmmeter

(2) Throttle Warning Horn Protractor Assembly - F70024, or equivalent

B. Adjust Leading Edge Flap Bypass Switch and Landing Gear Warning Switch (See figure 201.)

(1) Position No. 2 thrust lever 9.5° (± 2°) from no-load IDLE position. Measure angle with throttle warning horn protractor assembly.

(2) Loosen support bracket mounting screws and adjust support bracket until landing gear warning switch is actuated by cam in guide tube. Check with ohmmeter.

(3) Tighten support bracket mounting screws.

(4) Position No. 2 thrust lever to idle position.

C. Test Leading Edge Flap Bypass Switch

(1) Remove access panels L3708, R3708, forward and aft side panels from No. 2 engine.

(2) Disengage upper and lower aft thrust reverser sleeve locks.

(3) With No. 2 thrust lever in IDLE, manually position fan reverser and aft thrust reverser sleeves to reverse thrust positions.

(4) With throttle warning horn protractor in place, slowly move No. 2 reverse thrust lever away from IDLE position and check that switch actuates before lever is 67° away from IDLE. Measure continuity with ohmmeter.

NOTE: Slight adjustment of switch actuation may be made by bending tab on switch actuator arm. (Do not bend actuator arm.) Excessive bending of tab may be avoided by bending the tabs on both switch actuator arms; that is, by averaging the adjustment between the leading edge flap bypass switch and the landing gear warning switch, and readjusting the position of the switch actuating cam.

(5) Return No. 2 reverse thrust lever to IDLE. Check that switch deactivates while reverse thrust lever is more than 40 degrees from IDLE position.

(6) With No. 2 thrust reverse lever at IDLE, move fan reverser sleeves to forward thrust positions and engage aft thrust reverser sleeve locks.

(7) Install access panels.

LEADING EDGE FLAP CONTROL VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Leading Edge Flap Control Valve

A. General

(1) When removing or installing the leading edge flap control valve, it is necessary to loosen the adjacent hydraulic lines by loosening support clamps and other fittings. This is required to allow some slack in the lines for removal from the fittings on the valve. At the same time a container will be required to catch spilled hydraulic fluid as the lines are disconnected. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, "Cleaning and Washing."

(2) Rigging of the leading edge flap control valve shall be accomplished with the trailing edge flaps in the retracted position.

B. Remove Leading Edge Flap Control Valve

(1) Depressurize utility hydraulic system.

(2) Open left main wheel well door.

(3) Disconnect push rod from valve arm. (See figure 201.)

(4) Disconnect hydraulic lines from valve.

(5) Remove mounting bolts and remove leading edge flap control valve.

C. Install Leading Edge Flap Control Valve

(1) Install O-ring gasket and union in leading edge flap control valve return port.

(2) Install O-ring and reducer in all other ports on valve.

(3) Align valve with leading edge flap control bracket and install mounting bolts. (See figure 201.)

(4) Connect hydraulic lines to valve.

(5) Adjust pushrod such that dimension between centerline of bolts on leading edge flap control valve arm and valve mounting bolts is 1.30 (± 0.03) inches, and connect pushrod to valve arm. (See figure 202.) Flap should be in retracted position and control valve actuator arm on power unit should be in vertical position.

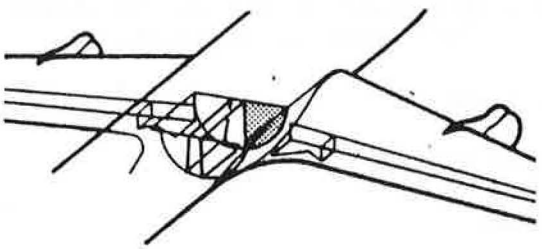
(6) Connect electrical power to airplane.

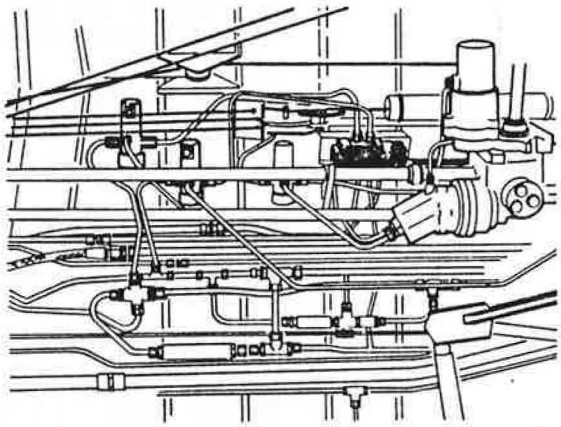
(7) Pressurize utility hydraulic system.

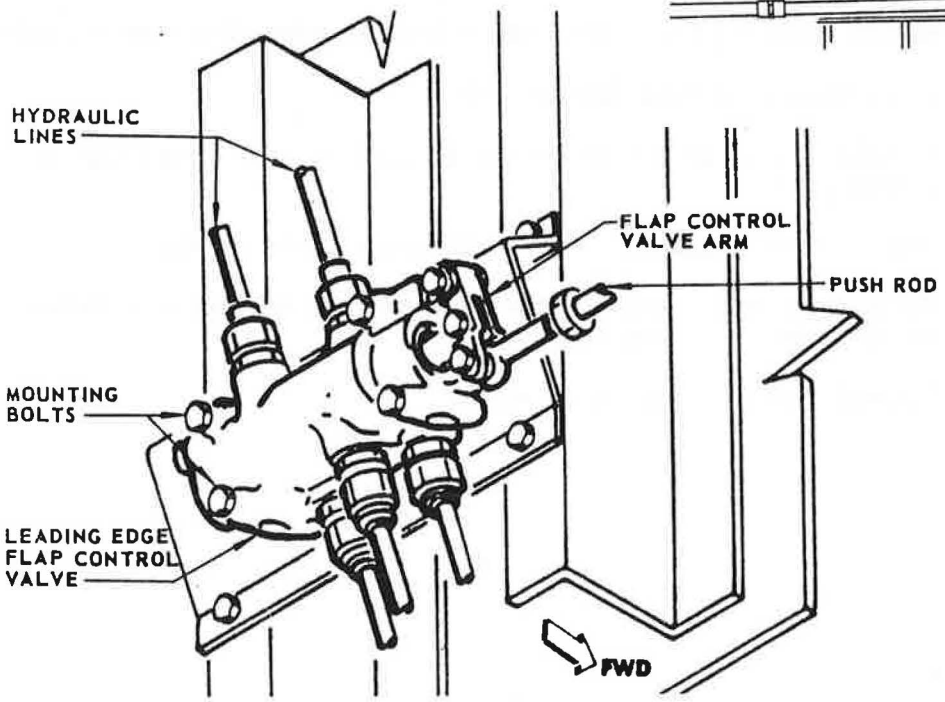
(8) Move flap control lever slowly toward "DOWN" position until leading edge flap position indicating light is illuminated.

(9) Check that trailing edge flap angle of extension is 5° to 9°.

(10) Position flap control lever to "DOWN."







Leading Edge Flap Control Valve Installation
Figure 201

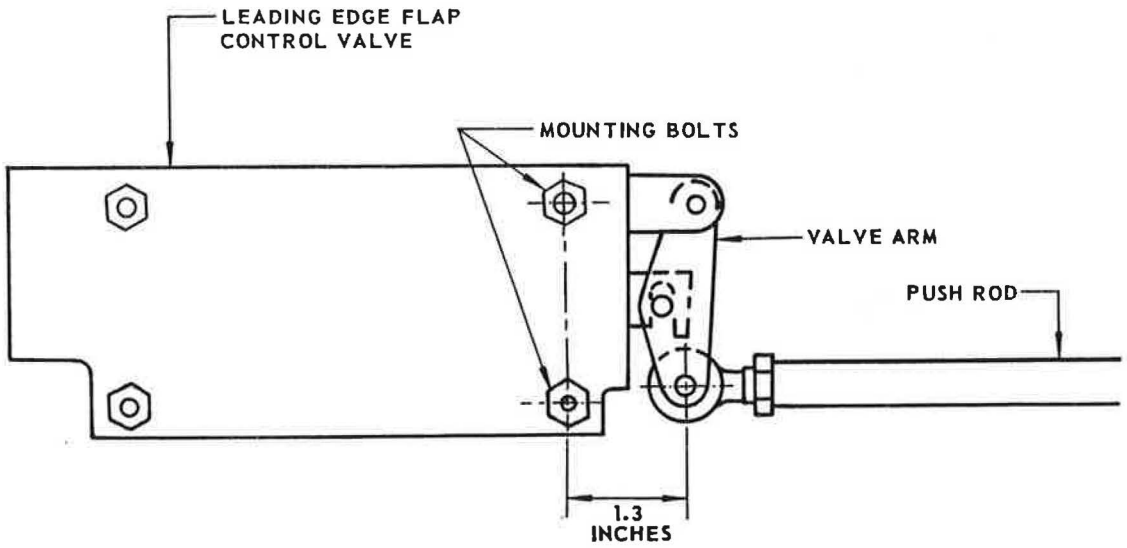
(11) Move flap control lever slowly toward "UP" position until leading edge flap position indicating light is extinguished. Check that trailing edge flaps are within 4° to 8° of the faired position.

(12) Examine hydraulic fittings on leading edge flap control valve for evidence of leakage.

(13) Disconnect electrical power source.

(14) Disconnect hydraulic pressure source.

(15) Close main wheel well door.



SLAT ACTUATORS - MAINTENANCE PRACTICES

1. Removal/Installation - Slat Actuator

A. Equipment and Materials

(1) Skydrol 500 hydraulic fluid

(2) Corrosion preventive compound, MIL-C-11796, Class 3

(3) Control Surface Protractor Assembly - F-52485-500, or equivalent

(4) Protractor Stand Assembly - F-71292-17, or equivalent

(5) Leading Edge Flap Actuator Lock Assembly - F-70144, or equivalent

B. Remove Slat Actuator

(1) Pressurize utility hydraulic system.

(2) Extend flaps.

(3) Depressurize utility hydraulic system. Install leading edge flap actuator lock assembly.

(4) Disconnect hydraulic lines from fittings on actuator. (See figures 201 and 202.)

(5) Remove bolts attaching actuator to clevis fitting on leading edge slat and to support fitting on front spar. Remove actuator.

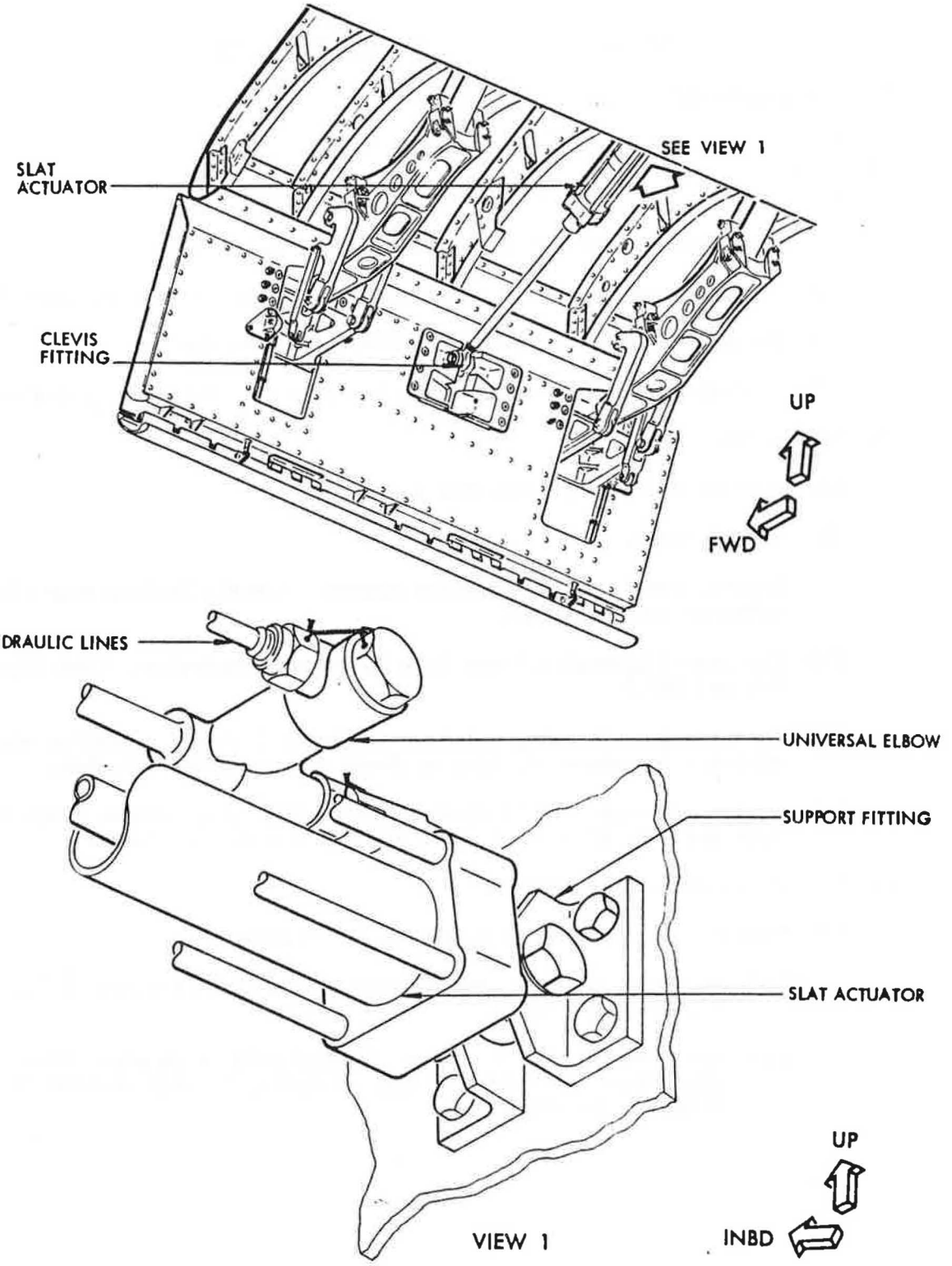
(6) Remove bushings used to clamp actuator bearings. Remove flanged bushings only if damaged or if excessive wear is evident.

C. Install Outboard Slat Actuator

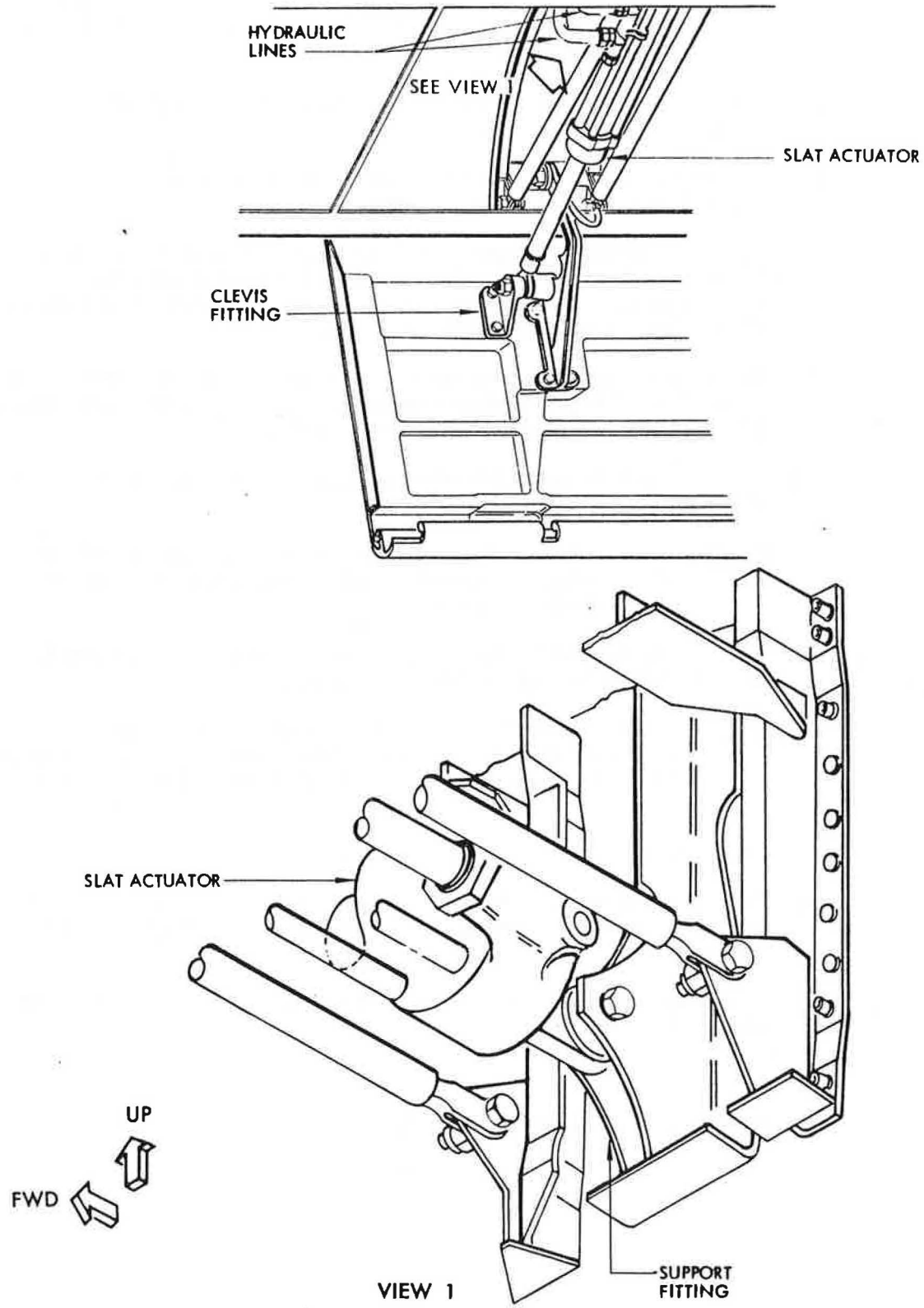
(1) Prepare actuator for installation as follows:

(a) Lubricate packings and gaskets with a light coating of Skydrol 500 hydraulic fluid.

(b) For outboard slat actuator, install packing on each universal elbow bolt. For inboard slat actuator, install packing in each actuator hydraulic port.



Outboard Slat Actuator Installation
Figure 201



Inboard Slat Actuator Installation
Figure 202

(c) Loosely install bolt and universal elbow on each port of outboard actuator. For inboard actuators, install a union in each actuator port.

(2) Extend actuator to maximum length and fill through down port with Skydrol hydraulic fluid.

(3) Dip attach bolt bushings in corrosion preventive compound and install one bushing on each bolt.

(4) Position actuator between leading edge and slat fittings and install bolts. Bolts should be installed with heads outboard. Do not install nuts. On inboard slats, install a nylon washer on each side of bearing in actuator cylinder end.

(5) Manually extend the slat as far as possible and measure angle of extension with protractor assembly. Outboard slats must extend 117° (± 1°); inboard slats must extend 112° (± 1°).

(6) Install nuts on actuator attach bolts. Tighten nuts to between 95 and 110 pound-inches torque.

NOTE: After nuts are torqued, bushings shall be seated against inner races of actuator end bearings and bolt heads shall not contact attach fittings.

(7) Connect hydraulic lines to actuator fittings. On outboard actuators, tighten bolts through universal elbows.

NOTE: Align actuator fittings to permit smooth single bends in hydraulic hoses. Double and/or sharp bends in attached hoses could prestress the actuator fitting and cause fitting failure.

(8) Pressurize utility hydraulic system.

(9) Operate flap system through three complete cycles to bleed all air from the hydraulic system; check actuator lines and fittings for leaks.

(10) Check slat extension. Slats must extend to limits specified in step (5).

(11) Retract flaps.

(12) Depressurize utility hydraulic system.

LEADING EDGE FLAP ACTUATORS - MAINTENANCE PRACTICES

1. General

   A. The airplane is equipped with three leading edge flaps located in the lower side of the wing leading edge immediately inboard of the inboard engine nacelle strut. These flaps are numbered 1, 2, and 3; leading edge flap No. 1 is adjacent to the inboard engine nacelle strut, flaps No. 2 and No. 3 are inboard of No. 1.

   B. The leading edge flaps are hydraulically actuated. Two actuating cylinders are used to drive each flap.

2. Removal/Installation - Leading Edge Flap Actuator

   A. Equipment and Materials

      (1) Skydrol 500 hydraulic fluid

      (2) Control Surface Protractor Assembly - F-52485-500, or equivalent

      (3) Protractor Stand Assembly - F-71292-17, or equivalent

      (4) Corrosion Preventive Compound - MIL-C-11796, Class 3, or equivalent

      (5) Leading Edge Flap Actuator Lock Assembly - F-70144, or equivalent

   B. Remove Leading Edge Flap Actuator

      (1) Pressurize utility hydraulic system.

      (2) Extend flaps.

      (3) Depressurize utility hydraulic system and install leading edge flap actuator lock assembly.

(4) Disconnect hydraulic lines (5, figure 201) from leading edge flap actuator (1). Cap actuator ports and hydraulic lines.

(5) Remove bolt (11) attaching leading edge flap actuator to leading edge flap hinge (6).

(6) Remove bolt (3) attaching actuator to support fitting (4) and remove actuator.

C. Install Inboard Leading Edge Flap Actuator

(1) Install union and O-ring gasket in each port on leading edge flap actuator (1, figure 201). Lubricate gaskets with a light coat of Skydrol 500.

(2) Fully extend actuator and fill through extend port with Skydrol 500 hydraulic fluid.

(3) Dip bushing (10) in corrosion preventive compound. Install bushing on actuator aft attach bolt (3).

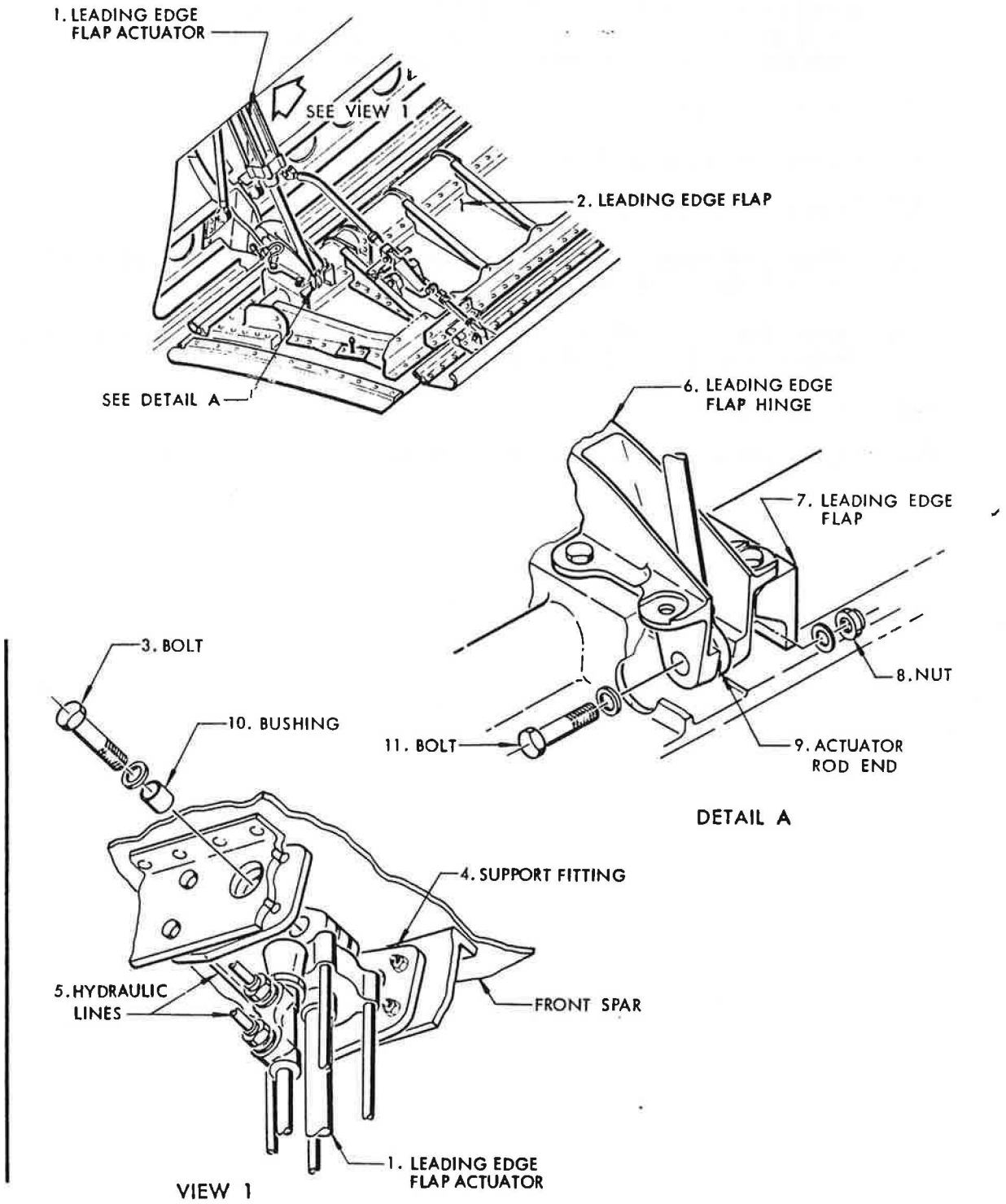
(4) Position actuator cylinder head bearing in front spar fitting and install bolt and bushing. Install nylon washers on bolt (3), between actuator bearing and support fitting, as follows:

(a) For flap No. 3 actuators, install a 0.094 inch thick nylon washer on each side of actuator bearing.

(b) For flaps No. 1 and No. 2 actuators, install a 0.094 inch thick nylon washer between the outboard side of the actuator bearing and support fitting; install a 0.0625 inch nylon washer between inboard side of bearing and fitting.

(5) Install washers and nut on attach bolt. Tighten nut to between 95 and 110 pound-inches torque for flap No. 3 and to between 270 and 300 pound-inches torque for flaps No. 1 or No. 2. Tighten or loosen nut as necessary to install cotter pin through nearest slot.

(6) Position actuator rod end (9) in flap hinge (6) and install bolt (11) with washer under bolt head and under nut; on leading edge flap No. 3 actuators, use one 0.016-inch thick washer between sides of hinge and each side of rod end bearing. Install nut (8) finger-tight.


1. LEADING EDGE FLAP ACTUATOR
SEE VIEW 1
2. LEADING EDGE FLAP
SEE DETAIL A
6. LEADING EDGE FLAP HINGE
7. LEADING EDGE FLAP
8. NUT
9. ACTUATOR ROD END
11. BOLT
3. BOLT
10. BUSHING
DETAIL A
4. SUPPORT FITTING
5. HYDRAULIC LINES
FRONT SPAR
1. LEADING EDGE FLAP ACTUATOR
VIEW 1

(7) Manually extend flap until actuator bottoms. With protractor check for flap extension of 102° 30' (± 1°). Torque nut (8) 95 to 110 pound-inches for flap No. 3 and 270 to 300 pound-inches for flaps No. 1 and No. 2. Tighten or loosen nut (8) as necessary to permit installation of cotter pin through nearest slot.

(8) Connect hydraulic lines (5) to actuator.

(9) Remove leading edge flap actuator lock.

(10) Pressurize utility hydraulic system.

(11) Retract and extend flaps through three complete cycles to bleed air from hydraulic system.

(12) Extend flaps. Check leading edge flap extension. Leading edge flaps shall extend 102° 30' (± 1°).

(13) Retract flaps.

(14) Depressurize utility hydraulic system.

LEADING EDGE FLAP AND SLAT HYDRAULIC SYSTEM COMPONENTS - MAINTENANCE PRACTICES

1. General

A. When removing or installing hydraulic system components, it will be necessary to loosen adjacent hydraulic tube support clamps and other fittings to allow some slack in the tubing for removal of the bypass valve. A container is necessary to catch spilled fluid when disconnecting the hydraulic lines. Should any fluid spill on the airplane, decontaminate. Refer to Chapter 12, Cleaning and Washing.

2. Removal/Installation Leading Edge Flap Bypass Valves

A. Equipment and Materials

(1) Reverse Thrust Lever Protractor Assembly - F70044, or equivalent

B. Remove Leading Edge Flap Bypass Valve

(1) Open left main gear wheel well door.

(2) Disconnect wiring harness from bypass valve. (See figure 201.)

(3) Depressurize utility hydraulic system.

(4) Disconnect hydraulic lines from bypass valve.

(5) Remove bolts attaching bypass valve to support bracket and remove valve.

(6) Remove unions from valve ports.

C. Install Leading Edge Flap Bypass Valve

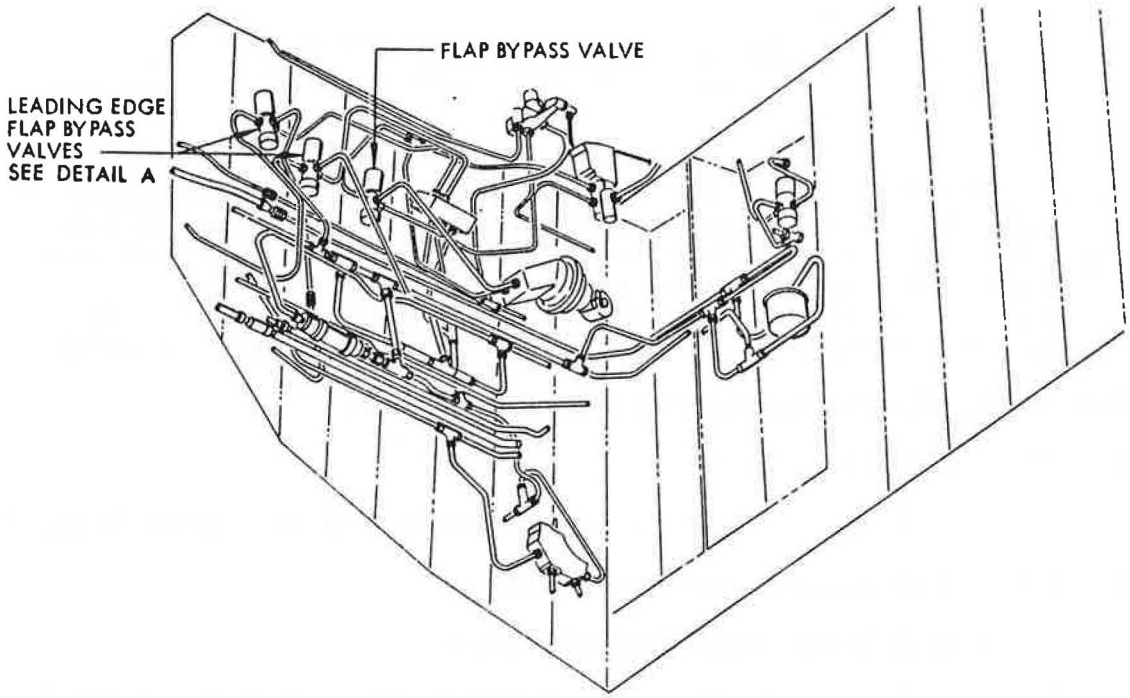
(1) Install union and new O-ring in each port of bypass valve. (See figure 201.) Lubricate O-rings with a light coat of Skydrol 500 hydraulic fluid.

(2) Position bypass valve on support bracket and install mounting bolts.

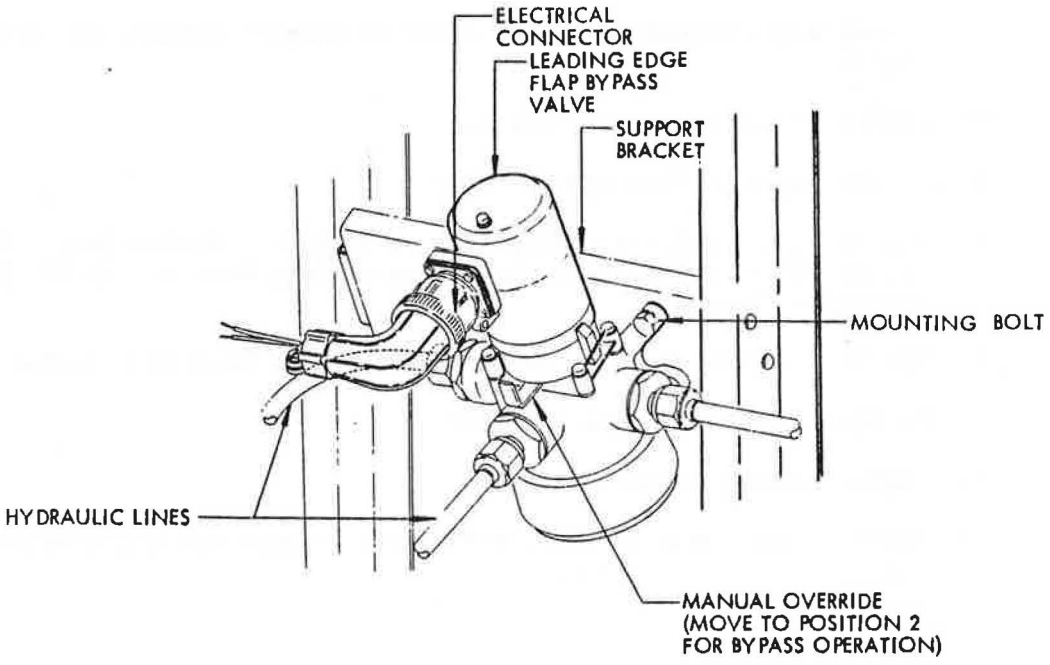
(3) Connect hydraulic lines to valve.

(4) Connect wiring harness to valve.

(5) Remove access panels L3708, R3708, and forward and aft side cowl panels from No. 2 engine.



LEFT MAIN WHEEL WELL



DETAIL A

Leading Edge Flap Bypass Valve Installation
Figure 201

(6) Disengage upper and lower aft thrust reverser sleeve locks.

(7) With No. 2 thrust lever in "IDLE," manually position fan reverser and aft thrust reverser sleeves to reverse thrust positions.

(8) Connect electrical power to airplane.

(9) Pressurize utility hydraulic system.

(10) Move flap control lever to "DOWN" to extend leading edge flaps.

(11) Move No. 2 reverse thrust lever away from "IDLE" and check that leading edge flaps retract before lever is 67° from "IDLE." Use reverse thrust lever protractor assembly to measure angle.

(12) Position No. 2 reverse thrust lever toward "IDLE" and check that leading edge flaps extend before lever is 40° from "IDLE."

(13) Move No. 2 reverse thrust lever to "IDLE."

(14) Move fan reverser sleeves to forward thrust positions and engage aft thrust reverser sleeve locks.

(15) Install access panels.

(16) Disconnect hydraulic and electric power sources.

3. Removal/Installation Leading Edge Flap Relief Valves

A. General

(1) Seven relief valves are used in the leading edge flap hydraulic system. Three are located on the front spar of each wing and one in the left main wheel. The following instructions are applicable to all the valves.

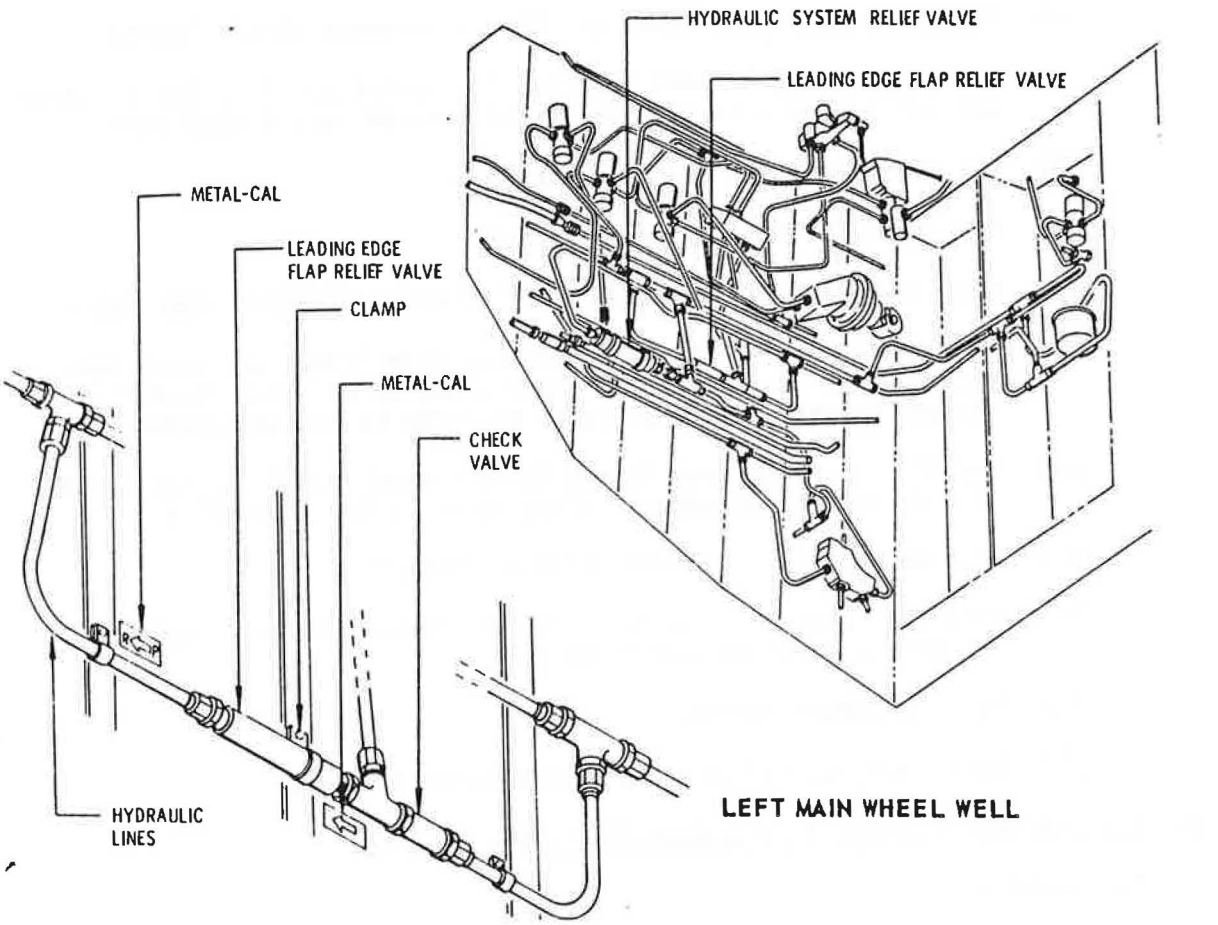
B. Remove Leading Edge Flap Relief Valve.

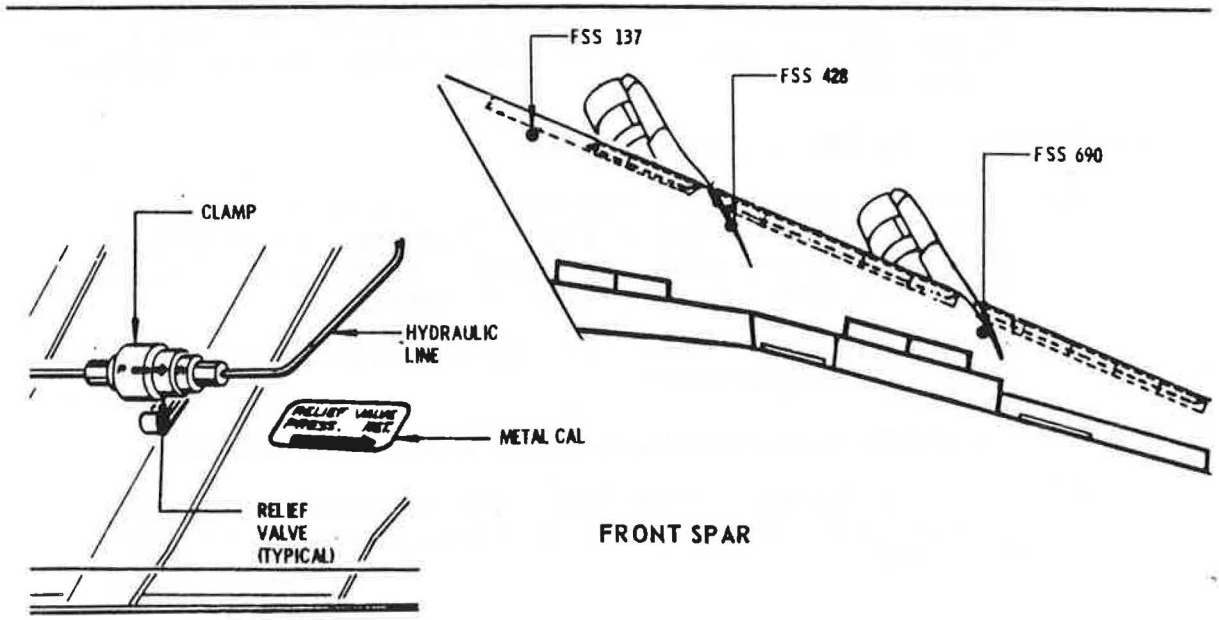
(1) If removing relief valve from front spar, pressurize utility hydraulic system and extend flaps. Depressurize hydraulic system after flaps are extended. If removing relief valve from left wheel well, open left main wheel well door.

(2) Remove hydraulic lines as necessary to gain access to relief valve. (See figure 202.)

(3) Disconnect clamps securing valve to structure if necessary.

(4) Disconnect hydraulic lines from relief valve and remove valve from airplane. Tee and check valve must be removed with valve in wheel well.





Leading Edge Flap Relief Valve Installation
Figure 202

C. Install Leading Edge Flap Relief Valve.

(1) Install O-ring and union in each port on relief valve. (See figure 202.) Connect tee and check valve to valve in left main wheel.

(2) Connect hydraulic lines to relief valve. Flow direction must agree with flow arrow on metal-cal attached to structure.

(3) Install clamp securing relief valve to structure.

(4) Pressurize utility hydraulic system.

(5) Check fittings on relief valve for leakage.

(6) Retract wing flap is necessary.

(7) Disconnect hydraulic pressure source.

4. Removal/Installation Leading Edge Flap Hydraulic Lock Valve and Restrictor Check Valve

A. Remove Leading Edge Flap Hydraulic Lock Valve and Restrictor Check Valve.

(1) Pressurize utility hydraulic system.

(2) Extend wing flaps.

(3) Depressurize utility hydraulic system.

(4) Disconnect hydraulic lines from ports on hydraulic lock valve and restrictor check valve and remove valves from support bracket. (See figure 203.)

B. Install Leading Edge Flap Hydraulic Lock Valve and Restrictor Check Valve.

(1) Connect restrictor check valve to port No. 2 on leading edge flap hydraulic lock valve. Free flow arrow should be directed away from valve port. (See figure 203.)

(2) Install O-ring and bulkhead in union in port No. 3 on hydraulic lock valve and O-ring and union in all other ports on valve.

(3) Position valve in support bracket and connect hydraulic lines to valve. Flow must agree with flow arrow on metal-cal.

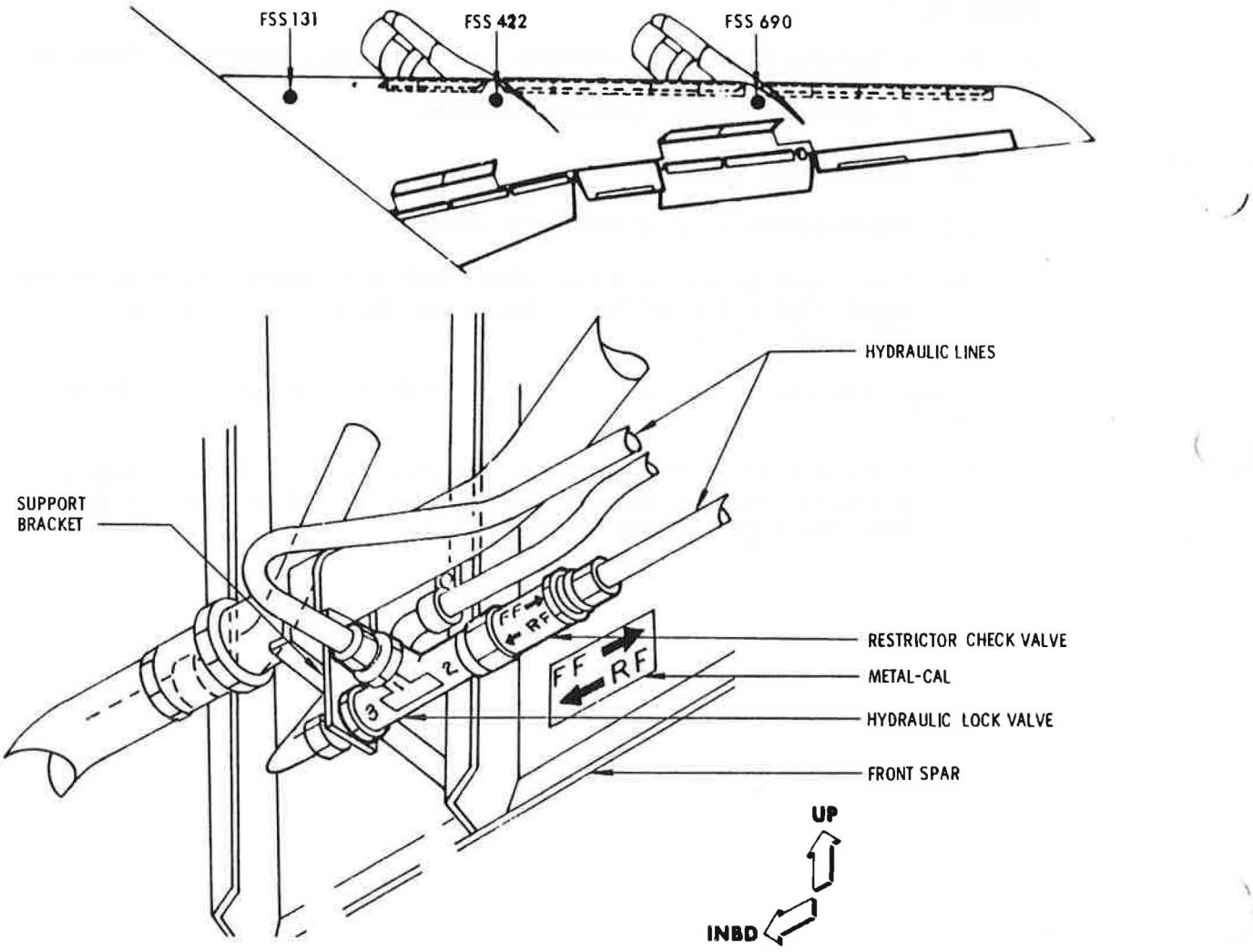
(4) Pressurize utility hydraulic system.

(5) Examine fittings on valve for leakage.

(6) Reduce hydraulic pressure to "0" psig and check that leading edge flaps do not retract when manual pressure is applied to flap in flap up direction.

(7) Place hydraulic power to rated pressure and retract the leading edge flaps.

(8) Disconnect hydraulic source.



Leading Edge Flap Hydraulic Lock Valve and Restrictor Check Valve Installation
Figure 203

RUDDER HYDRAULIC PRESSURE CONTROL AIRSPEED SWITCH - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Hydraulic Pressure Control Airspeed Switch

   A. Remove Rudder Hydraulic Pressure Control Airspeed Switch

      (1) Disconnect pitot and static lines from airspeed switch. (See figure 201.)

      (2) Cap pitot and static lines to prevent entry of foreign material.

      (3) Disconnect electrical connector from switch.

      (4) Remove mounting screws and remove switch.

   B. Install Rudder Hydraulic Pressure Control Airspeed Switch

      (1) Position airspeed switch in mounting position and install mounting screws. (See figure 201.)

      (2) Connect electrical connector to switch.

      (3) Remove caps from pitot and static lines and install lines or switch ports.

      CAUTION: CHECK CAREFULLY TO INSURE THAT LINES ARE CONNECTED TO CORRECT PORT.

      (4) Test pitot and static systems for leaks as outlined in Chapter 34-2-0, "Pitot-Static Systems."

2. Adjustment/Test Rudder Hydraulic Pressure Control Airspeed Switch

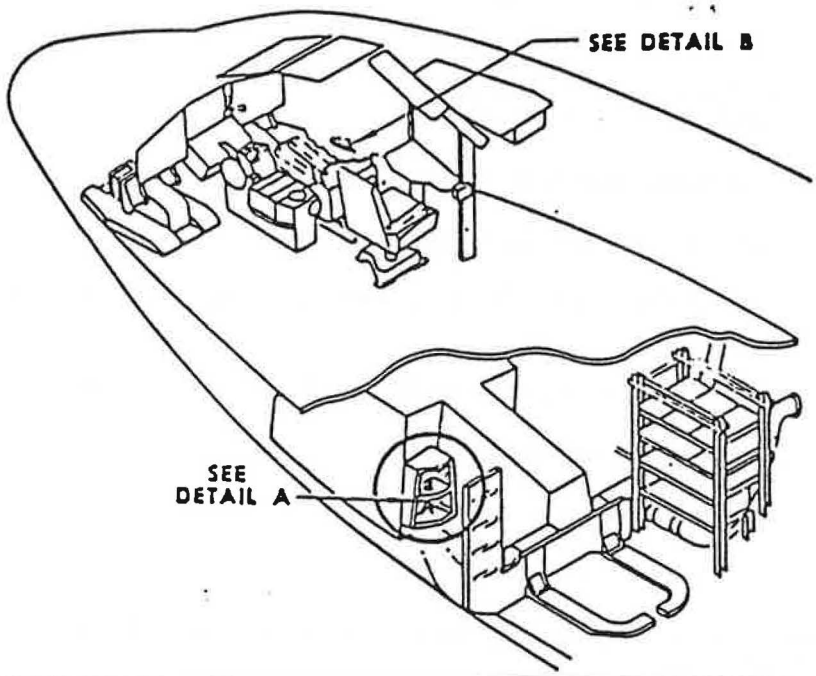
   A. Test Rudder Hydraulic Pressure Control Airspeed Switch

      (1) Connect the airspeed test equipment to the copilot's pitot system in accordance with procedures in Chapter 34-2-0, "Pitot-Static Systems."

      (2) Connect external electrical power to airplane.

      (3) Run flap to full up position.

      (4) Position No. 2 auxiliary hydraulic pump switch "ON," and check that rudder hydraulic system pressure is approximately 3000 psi.



DETAIL A

EFFECTIVITY	
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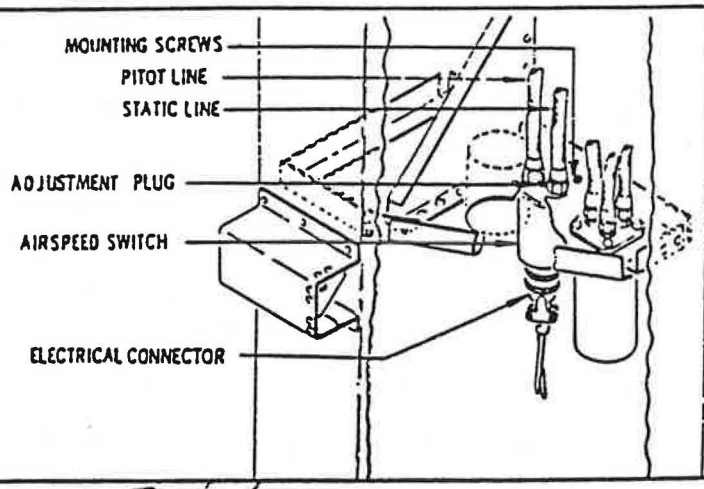
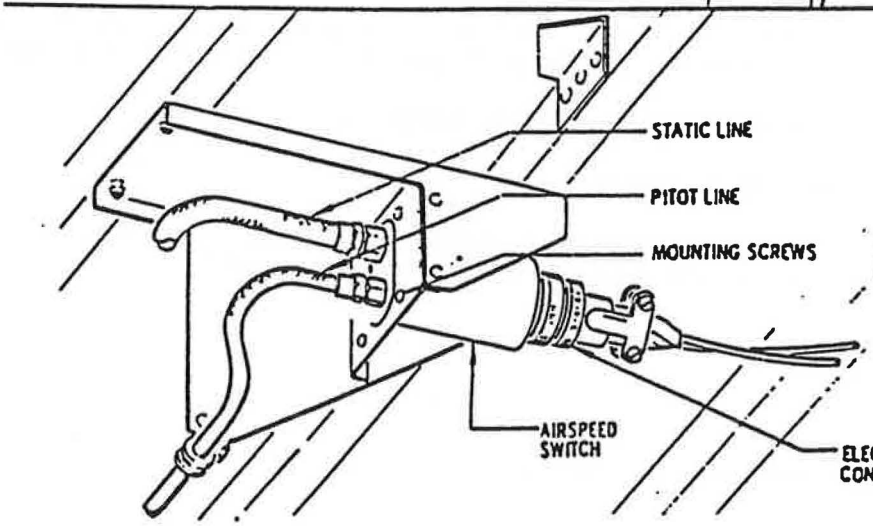
	LX-N20199
RTCA	LX-N19997
	LX-N20000





DETAIL B

EFFECTIVITY
OO-SJA THRU OO-SJG

Rudder Hydraulic Pressure Control Airspeed Switch Installation
Figure 201

(8) Manually run flaps thru one cycle and check for actuation of switch within specified limits.

(9) Connect switch leads at splice.

(10) Pressurize utility hydraulic system.

(11) Position flap control lever to UP.

(12) Disconnect utility hydraulic system.

2. Adjustment/Test Leading Edge Flap and Slat Position Indicating Switches

A. Equipment

(1) Control Surface Protractor Assembly - F-52485-500, or equivalent

(2) Protractor Stand Assembly - F-71292-17, or equivalent

(3) Ohmmeter

B. Adjust Leading Edge Flap and Slat Position Indicating Switches

(1) Pressurize utility hydraulic system.

(2) Position flap control lever to DOWN to extend flaps and slats.

(3) Depressurize utility hydraulic system.

(4) Remove bolt connecting leading edge flap actuator to flap.

(5) Manually retract flap 5° to 8° from fully extended position. Measure angle with control surface protractor assembly.

(6) Adjust flap position indicating switch so that there is continuity across contacts of switch when leading edge flap is 5° to 8° from fully extended position. Check with ohmmeter.

(7) Manually run flaps thru one cycle and check for actuation of switch when flap or slat is 5° to 8° from fully extended position.

(8) Install bolt connecting leading edge flap actuator to leading edge flap per 27-16-231, Leading Edge Flap and Slat Actuators - Maintenance Practices.

(9) Pressurize utility hydraulic system.

(10) Position flap control lever to UP.

(11) Disconnect utility hydraulic system.

C. Test Leading Edge Flaps and Slat Position Indicating Switches

(1) Pressurize utility hydraulic system.

(2) Position flap control lever to DOWN to extend flaps and slats.

(3) Depressurize utility hydraulic system.

(4) On left and right side:

(a) Remove bolt connecting leading edge flap and slat actuator to panel (3 places). See Fig. 201.

(b) Manually retract partially one by one each leading edge flap and slat. At each flap or slat retraction, check that there is no continuity across contacts of switch. Check with ohmmeter.

(5) Install bolt connecting leading edge flap and slat actuator to leading edge flap and slat per 27-16-231 and 27-16-236 - Leading Edge Flap and Slat Actuators - Maintenance Practices.

RUDDER, RUDDER CONTROL TAB AND RUDDER CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General

A. Directional control of the airplane is provided by the rudder, rudder control tab and rudder control system. Rudder positioning is accomplished by a combination of hydraulic and mechanical systems. Under normal conditions the rudder is hydraulically positioned through full travel. This force is supplemented by operation of the mechanical system which positions a rudder control tab. Aerodynamic forces acting on the tab and rudder balance panels provide additional force for positioning the rudder. In the event of hydraulic failure, the mechanical system alone is capable of providing directional control of the airplane.

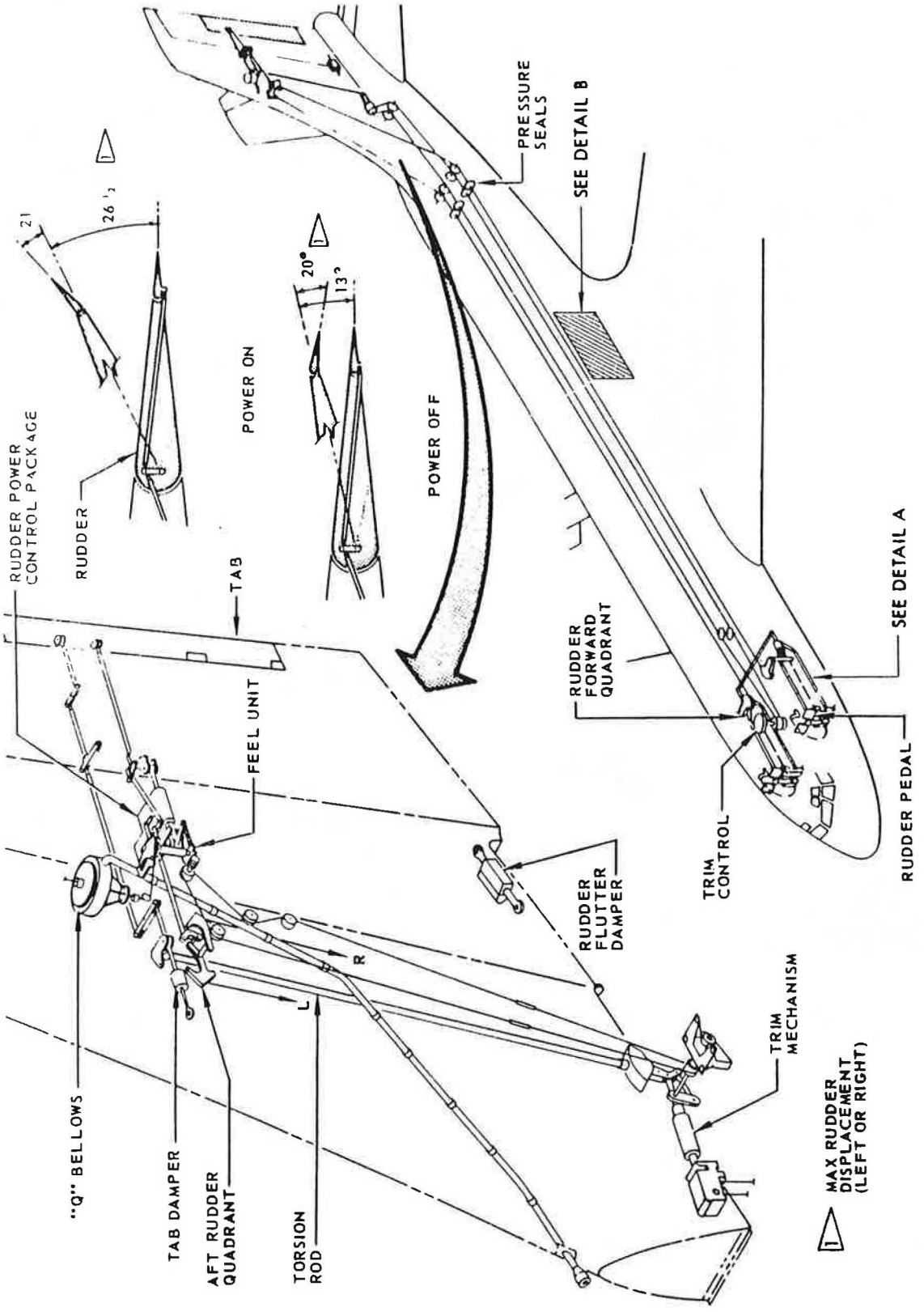
B. The rudder control system (figure 1) is operated by two sets of pedals which can be adjusted for pilot's comfort. Rudder pedal movement is transmitted to forward quadrants and jackshafts by push rods. The forward quadrants are interconnected by a bus rod. Cables in turn transmit forward quadrant motion to the aft control quadrant which is located in the vertical fin. Rotation of the aft control quadrant is transmitted by the rudder control linkage assembly to the power control unit actuating valve. The movement of the actuating valve causes the power control unit to operate and move the rudder.

C. Hydraulic power is supplied from the auxiliary hydraulic system to the rudder control system at a pressure of 3000 psi. Hydraulic fluid flow to the rudder system is controlled by a motor operated rudder hydraulic control valve and controlled by a rudder switch on the pilots' overhead panel. The rudder hydraulic control valve permits shutting off the flow of hydraulic fluid to the rudder system in the event of malfunction. Pressure to the power control unit is regulated by a hydraulic pressure reducer and a rudder hydraulic pressure control valve. The motor operated pressure control valve is controlled by an airspeed switch and a rudder hydraulic pressure control switch. For airspeeds below 250 knots, full hydraulic system pressure of 3000 psi is required to operate the rudder. For this condition, the rudder hydraulic pressure control valve is positioned to allow the hydraulic pressure to bypass the pressure reducer and enter the power control unit at full pressure. To prevent over control of the rudder at speeds in excess of 250 knots, the rudder hydraulic pressure control valve is positioned to port hydraulic fluid through the pressure reducer thus reducing the operating

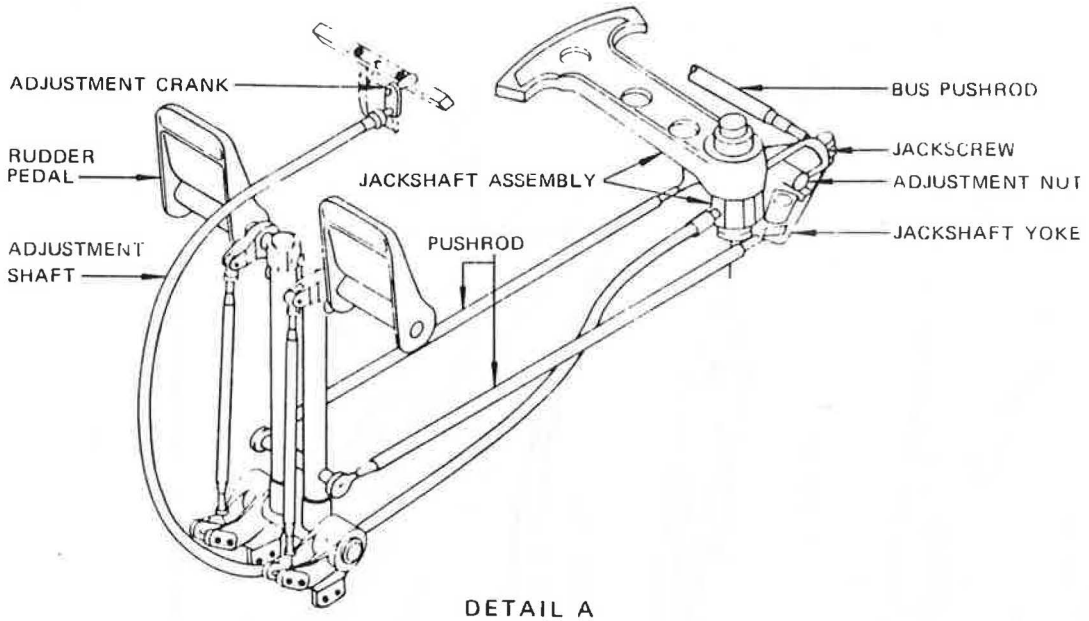
pressure to 2250 psi. The pressures supplied to the power control unit will then position the rudder as directed by the position of the rudder pedals. Operating pressure at the power control unit is shown by a pressure indicator located on the copilot's instrument panel. Additional pressure indication is provided by a low pressure warning light located on the copilot's panel which will illuminate at airplane speeds of less than 250 knots when system pressure drops below 2500 psi. A compensator is provided in the hydraulic lines to allow for thermal expansion of the hydraulic fluid. A manually operated shutoff valve is installed between the rudder hydraulic control valve and rudder hydraulic pressure reducer. This is located in the right wheel well. The valve prevents the flow of hydraulic fluid to the rudder power control unit after depressurization to eliminate the possibility of inadvertant operation of the rudder during maintenance operation. Provisions are made for the lockwiring of the valve in the open position after maintenance operation. This insures that the valve remains in the open position in flight.

D. "Q" bellows force plus a detent spring on the feel unit provide the pilot with a sense of feel in the power on condition. The "Q" force is only felt above 130 knots. With power off the feel unit spring force and "Q" force are not transmitted to the pilot. The pilot then feels aerodynamic tab hinge moments and system friction only.

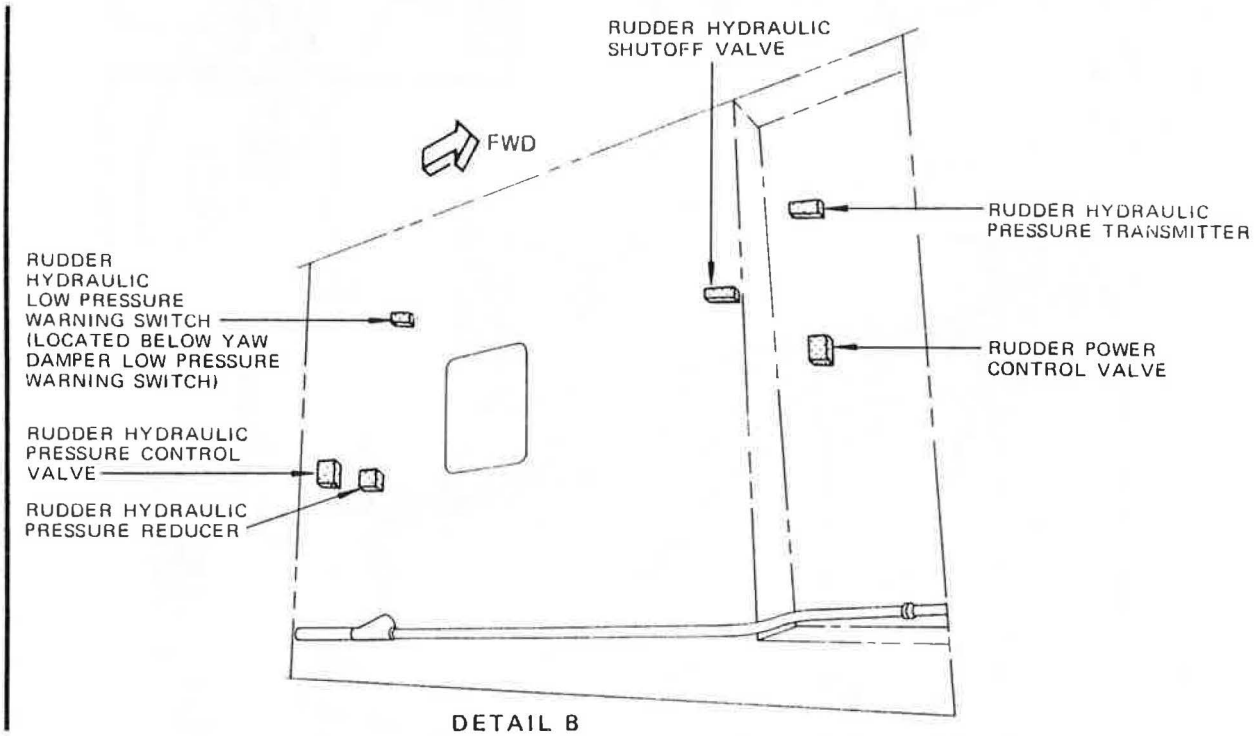
E. The rudder control system incorporates two rudder control tab dampers and two rudder dampers. The control tab dampers prevent control tab flutter while the rudder dampers prevent rudder flutter. One of the control tab dampers is connected to the manual trim linkage and the vertical fin structure while the other is integrated with the tab lock within the power unit. One rudder damper is located below the fin and is connected to the vertical fin and rudder. The power unit piston serves as the other rudder damper in the manual mode.



Rudder Control System
Figure 1 (Sheet 1)



DETAIL A



DETAIL B

2. Rudder

A. The rudder (figure 2) impresses yawing moment on the airplane. It is a beam type frame structure consisting mainly of the leading and trailing edge spars and ribs, fabricated from aluminum alloy. The skin which is of clad aluminum is flush riveted to the structure. A rectangular cutout is provided on the rudder trailing edge where the control tab is installed.

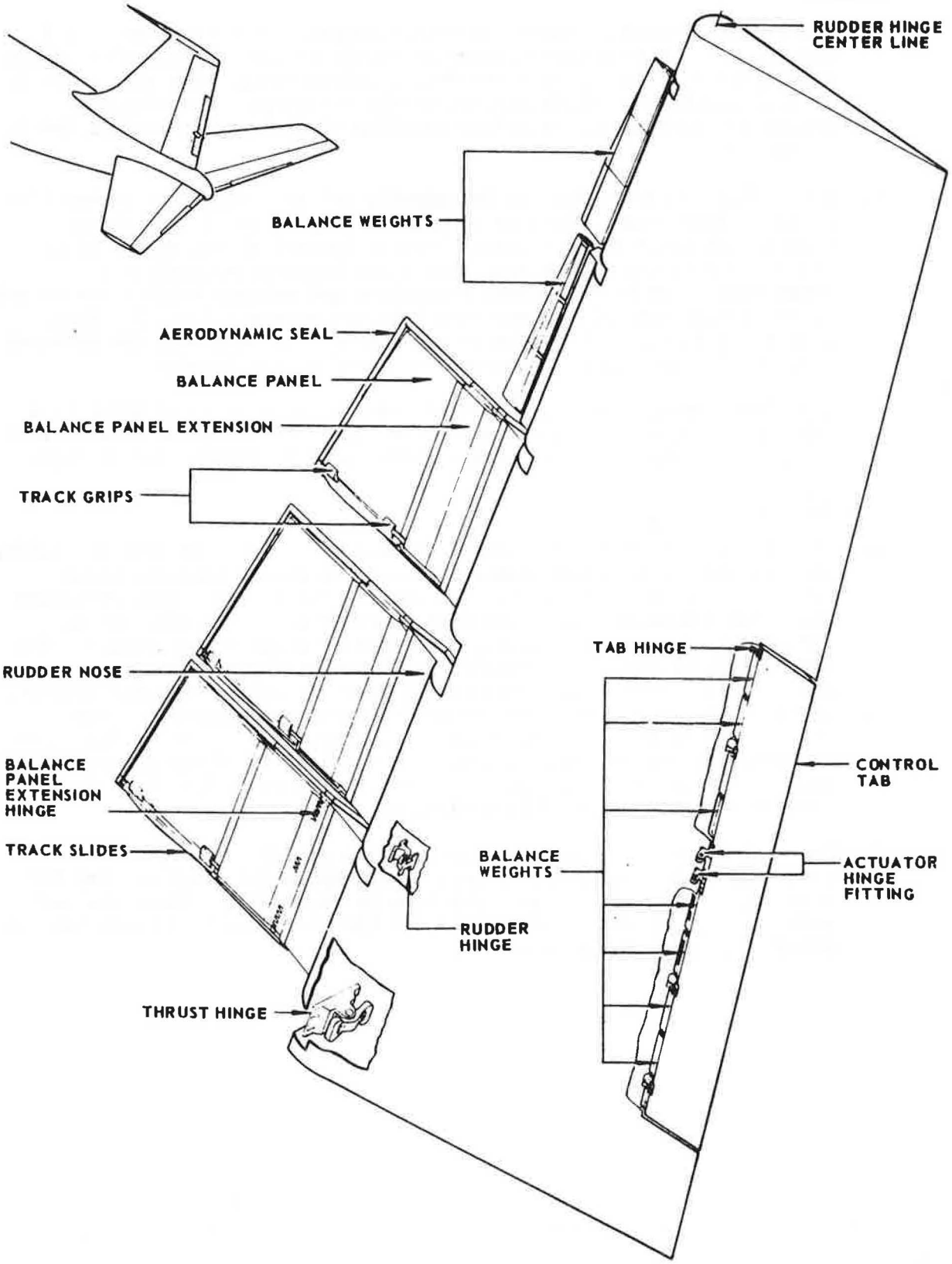
B. The rudder is statically and dynamically balanced about the center line of the rudder hinge. This is accomplished by means of two balance weights and three balance panels located forward of the rudder hinge point. The rudder and balance panels are balanced separately as components. The balance panel extensions and balance weights are hinged to the rudder nose which protrudes into the vertical fin. The three panels are bolted to the balance panel extensions and they are numbered from one to three with the number one panel to the lowest.

C. A silicon rubber cloth is installed over the balance panel hinge as an air seal. Aerodynamic seals made from impregnated silicon rubber cloth are placed along the sides of the rudder nose to control air leakage.

3. Rudder Control Tab

A. The rudder control tab (figure 2) is used to control and trim the rudder. It controls air pressure distribution on the rudder surface, which causes the rudder to deflect. The control tab is a monospar structure with bonded honeycomb core and clad aluminum alloy surface. It is attached to the rudder trailing edge spar by means of six hinges. The control tab is statically balanced as a component about its hinge center line. This is accomplished by means of balance weights retained on the nose. The control tab is replaceable as a component. Two actuator hinge fittings are securely attached to the spar of the control tab where the control tab rods are connected. One of the control tab rods is connected to the rudder control system while the other is connected to the rudder trim control system.

B. The control tab is normally deflected by a control tab rod which is connected to the rudder power unit. With hydraulic power on, the tab moves in a fixed antibalance direction by means of hydraulic tab lock within the power unit. With power off the tab moves in a fixed balance direction during manual operation.



Rudder, Rudder Control Tab and Balance Panels
Figure 2

4. Rudder Balance Panels and Seals

A. The three balance panels (figure 2) assist rudder movement. They are of rigid box construction made from corrosion resistant steel alloy and are firmly, but pivotably attached to the balance panel extensions. The balance panels are located in the three lower balance chambers of the fin and are accessible through the rudder balance bay access panels. The three panels are numbered from one to three with the number one panel the lowest. Aerodynamic seals are placed on the edges of the balance panels and their extensions to prevent air leakage from one side of the chamber to the other. This is made possible by the use of seal retainers which are installed on their lower edges. The seals are made from impregnated silicon rubber fabric. Each of the balance panels rides on track slides by means of track grips which are attached on their lower edges. Each track incorporates an arm and a parallelogram linkage. The parallelogram linkages allow parallel movement of the balance panels.

B. Differential air pressure in the balance chambers causes balance panels and balance panel extensions to move. The balance panels and panel extensions move in the direction of lesser air pressure.

5. Fin Mounted and Rudder Mounted Rudder Hinge Fittings

A. Seven hinge fittings are used to support and attach the rudder to the fin. (See figure 2.) The female halves of the six upper hinge fittings are located on the fin while the male halves are bolted to the leading edge spar of the rudder. The lowest hinge fitting is of split type and houses a thrust bearing to carry the weight of the rudder. The hinge fittings are aluminum alloy forgings and each incorporates low friction bearings.

6. Rudder Pedals

A. The pilot and copilot are each provided with a pair of rudder pedals, which are used, for controlling the airplane about its vertical axis. (See figure 1.) Each pair of pedals consists of right and left pedals mounted on a shaft. The pedal shaft is attached to the upper end of the pedal arm assembly. The lower end of the pedal arm assembly is mounted on a support shaft which is attached to the structure below the floor. The rudder pedals are located below the pilot's and copilot's instrument panel, forward of the respective pilot's stations. Rudder pedal support and quadrant assemblies are accessible through the lower nose compartment.

B. Fore and aft movement of the pedals is transmitted by the two pushrods to the jackshaft yoke. The rotary motion of the jackshaft yoke is passed to the forward quadrant by means of the jackshaft. The two sets of rudder pedals are bussed together by means of a bus pushrod connecting the two jackshaft assemblies. Toe pressure on the rudder pedals causes pedals to rotate about their shafts and initiate braking action.

7. Rudder Pedal Adjust Shaft Assembly

A. The two pairs of rudder pedals can be adjusted independently to suit the pilot and copilot. This is accomplished by means of the rudder pedal adjust shaft assembly. (See figure 1.) The rudder pedal adjust shaft assembly consists of an adjustment crank, adjustment shaft, a jackscrew, and pedal adjustment nut attached to the jackshaft assembly.

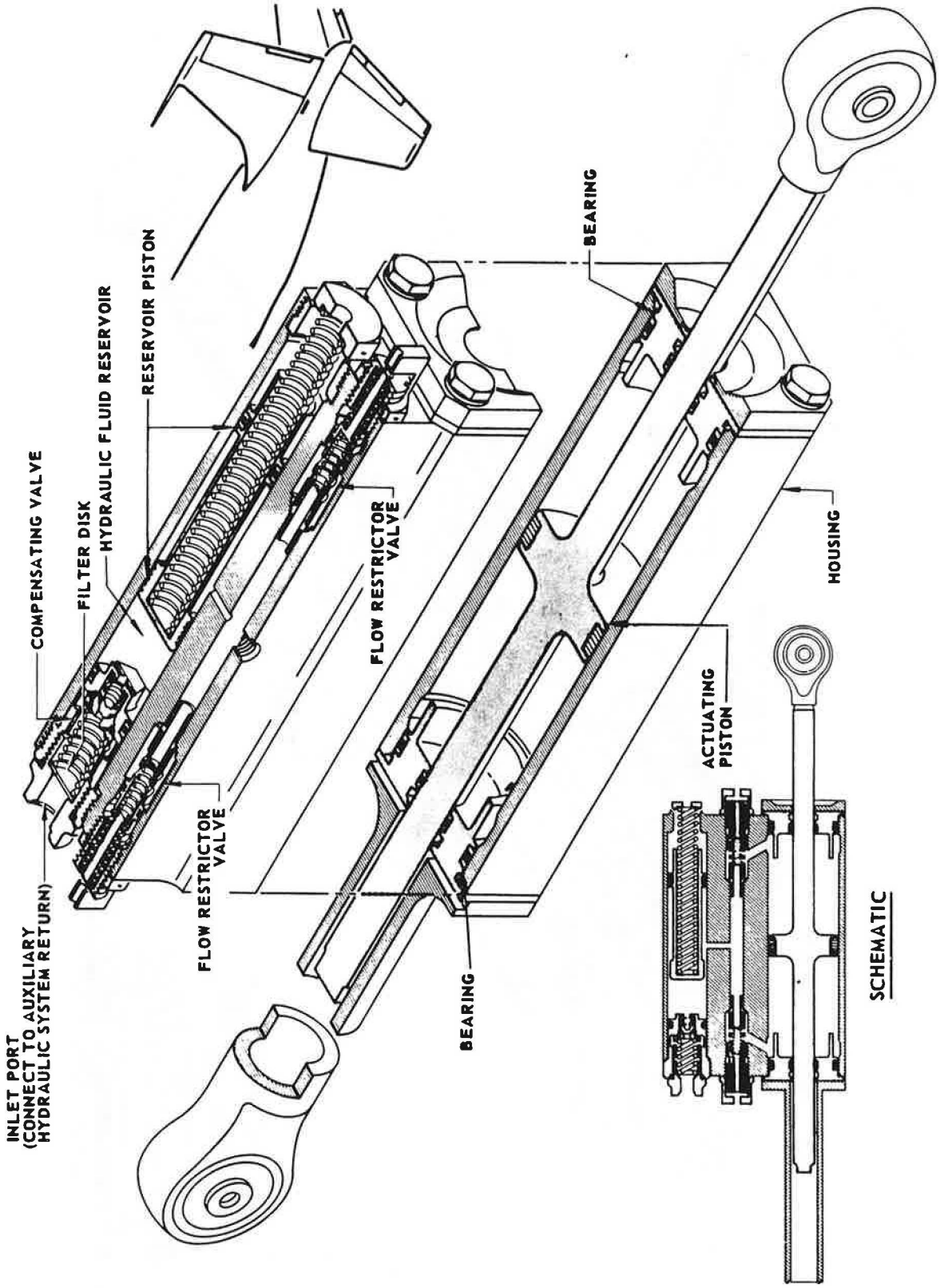
B. The crank is located on the instrument panel forward of the control wheel, and it is connected to a flex shaft routed forward under the instrument panel, then down under the floor, and aft to the universal joint in the rudder control jackshaft assembly. Rotation of the rudder pedal adjustment crank actuates the jackscrew which causes the yoke, containing the pedal adjustment nut, to move fore and aft.

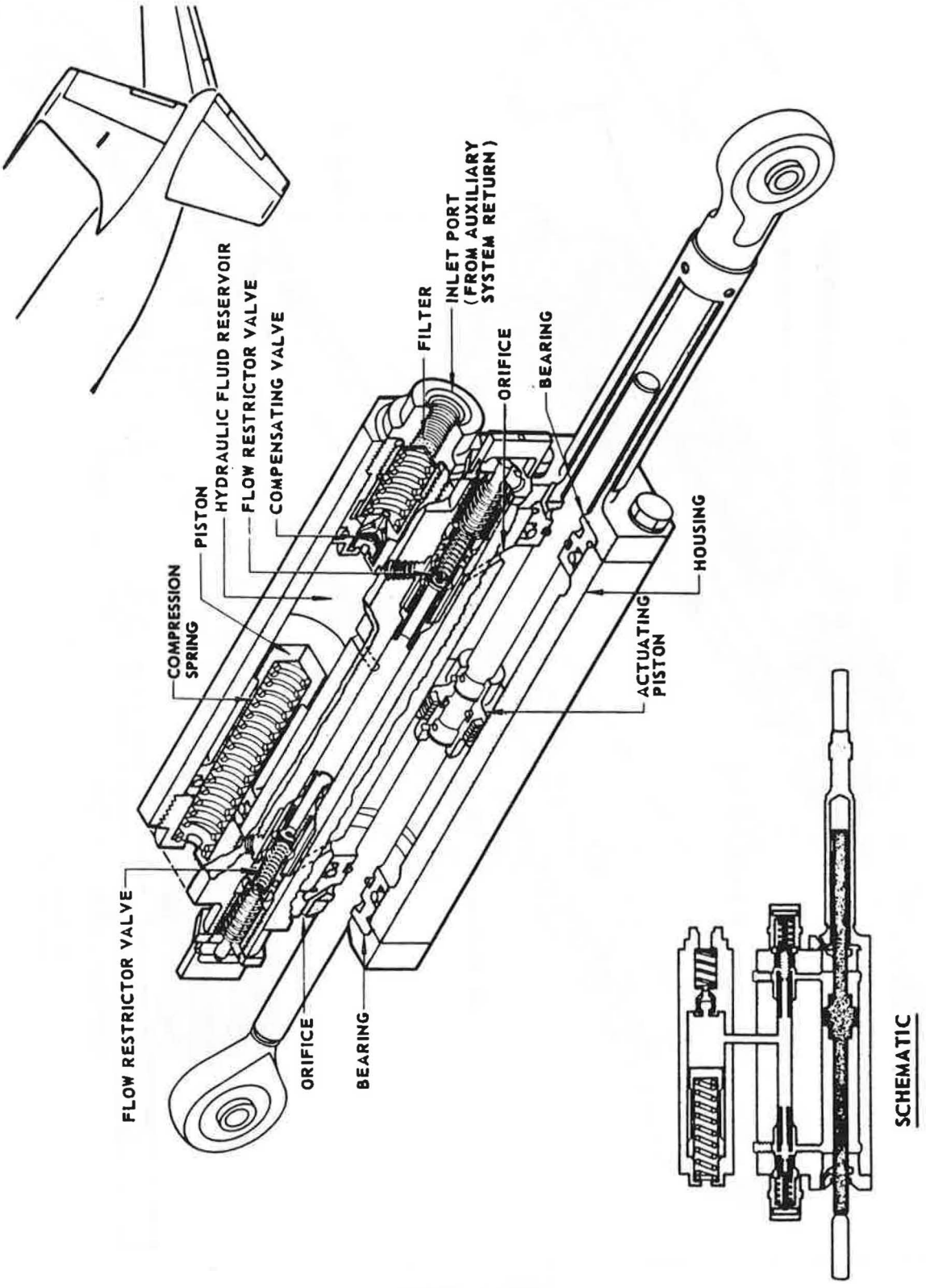
C. On SABENA airplanes, an improved rudder pedal adjustment crank and crank handle stops are installed to prevent the rudder pedal adjustment screw from being backdriven by heavy foot pressure simultaneously applied to both rudder pedals. The new crank incorporates a spring-loaded pin within the knob. The stops are spacers installed beneath the upper two bolts on the crank bearing housing. Rotation of the crank handle is prevented in either direction beyond the stop blocks, by contact of the spring-loaded pin that protrudes from the crank handle. To permit crank rotation for rudder pedal adjustment, the knob must be pulled aft so the pin clears the stops.

8. Rudder and Rudder Tab Dampers

A. Two rudder dampers prevent rudder flutter. One is located below the vertical fin (figure 3) and is attached to the fin and rudder. The other rudder damper is provided by the power unit piston and associated restrictors during the manual mode. Two rudder tab dampers prevent vibration and flutter of the control tab. One of the control tab dampers is connected to the manual trim linkage and the vertical structure (figure 4) while the other is integrated with the tab lock within the power unit. Each independent damper consists essentially of an actuating piston, housing, flow restrictor valves, hydraulic fluid reservoir and reservoir piston. These dampers are connected to the return line of the auxiliary hydraulic system to keep them filled with fluid. (See figure 10.) The inlet port contains a compensating valve which admits replenishing fluid and maintains constant pressure in the unit. The two ends of the housing each incorporate a bearing. Above each bearing is a flow restrictor valve. The independent dampers are accessible by removing the tab control quadrant access panel and the fin to fuselage aft fairing.

B. The independent dampers operate by the piston moving through the housing and transferring fluid from one side of the piston to the other through orifices and flow restrictor valves. The orifices and flow restrictor valves retard motion of the piston. In the power off mode the power unit piston acts in a similar manner to provide wind gust snubbing for the rudder. With power off the tab lock reverts to a double-acting tab flutter damper. The restrictor check valves impede flow produced by moving tab damper pistons which are alternately driven against fluid restriction by rotation of the tab lock shaft.


BEARING
RESERVOIR PISTON
HYDRAULIC FLUID RESERVOIR
FILTER DISK
COMPENSATING VALVE
FLOW RESTRICTOR VALVE
HOUSING
ACTUATING PISTON
FLOW RESTRICTOR VALVE
INLET PORT (CONNECT TO AUXILIARY HYDRAULIC SYSTEM RETURN)
BEARING
SCHEMATIC



Rudder Control Tab Damper
Figure 4

9. Rudder Aft Control Quadrant

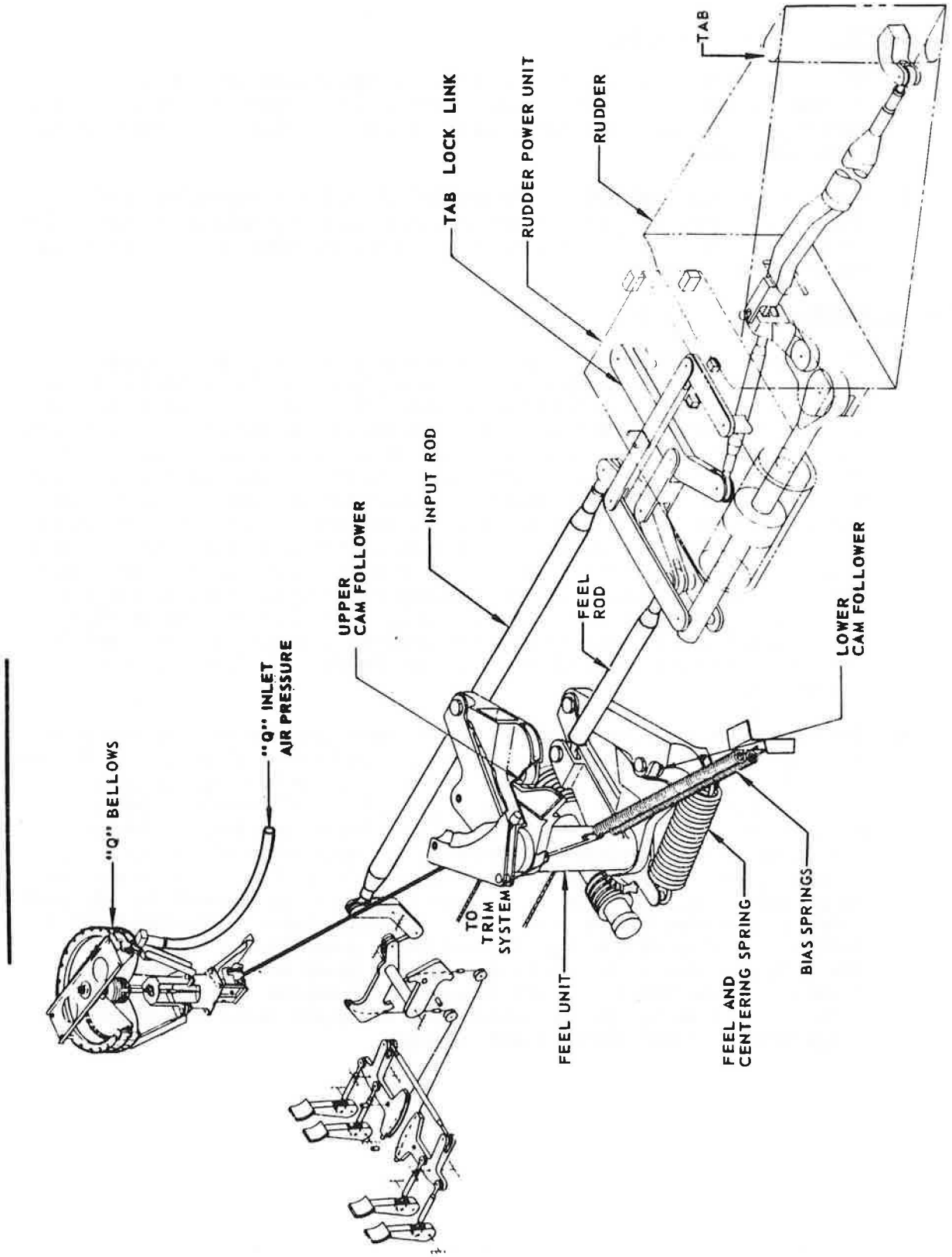
A. The rudder aft control quadrant transmits the motion of the rudder control cables to the power control unit. (See figure 9.) The assembly consists of the left and right quadrants, a reversing crank and a power unit input rod.

B. Rotation of the quadrant is transmitted through the reversing crank input rod. The input rod pushes or pulls the power unit input arm. The feel unit positions the quadrant back to neutral when there is no pressure on the rudder pedals.

10. Rudder Feel Unit

A. The rudder feel unit provides pedal pressure proportional to rudder deflection and airplane speed. The unit (figure 5) is located forward of the power control unit in the vertical fin. It is connected to the power unit linkage by a rod. The rod drives a camshaft on the feel unit which is loaded on one cam by a detent spring and on the other cam by "Q" bellows force. The camshaft rotates about an inner concentric shaft at either end of which the linkage forming the cam follower rollers are fixed. The position of the inner shaft is fixed by a sector gear which is referenced to trim position. Operation of trim repositions the inner shaft and because of the detent spring results in movement of the input arm to a trim position. The "Q" bellows force is provided by ram air pressure sensed at the "Q" inlet which is located in the fin leading edge. The inlet is connected to the bellows by a plastic tube, and is provided with an electrical heater. See Chapter 30, "Ice and Rain Protection."

B. The upper cam follower is spring loaded away from the cam surface by a bias spring such that at speeds below 130 knots the roller is off the cam. Above 130 knots the "Q" bellows force exceeds the bias spring force to cause loading of the cam shaft proportional to "Q" force and pedal deflection from neutral. The "Q" bellows force continues to increase as the speed of the airplane increases. The lower cam follower is always spring loaded to provide a reaction detent for yaw damper operation and to provide centering force to the input system. With power on, all pedal input is resisted by the feel unit. The pedal force is proportional to pedal deflection with a superimposed force proportional to "Q" force. The feel unit reacts on pedals only in the power mode because in the manual mode the tab lock shaft rotates and provides no pivot to react into the feel unit. In the manual mode the pilot feels aerodynamic tab hinge movements and system friction only.



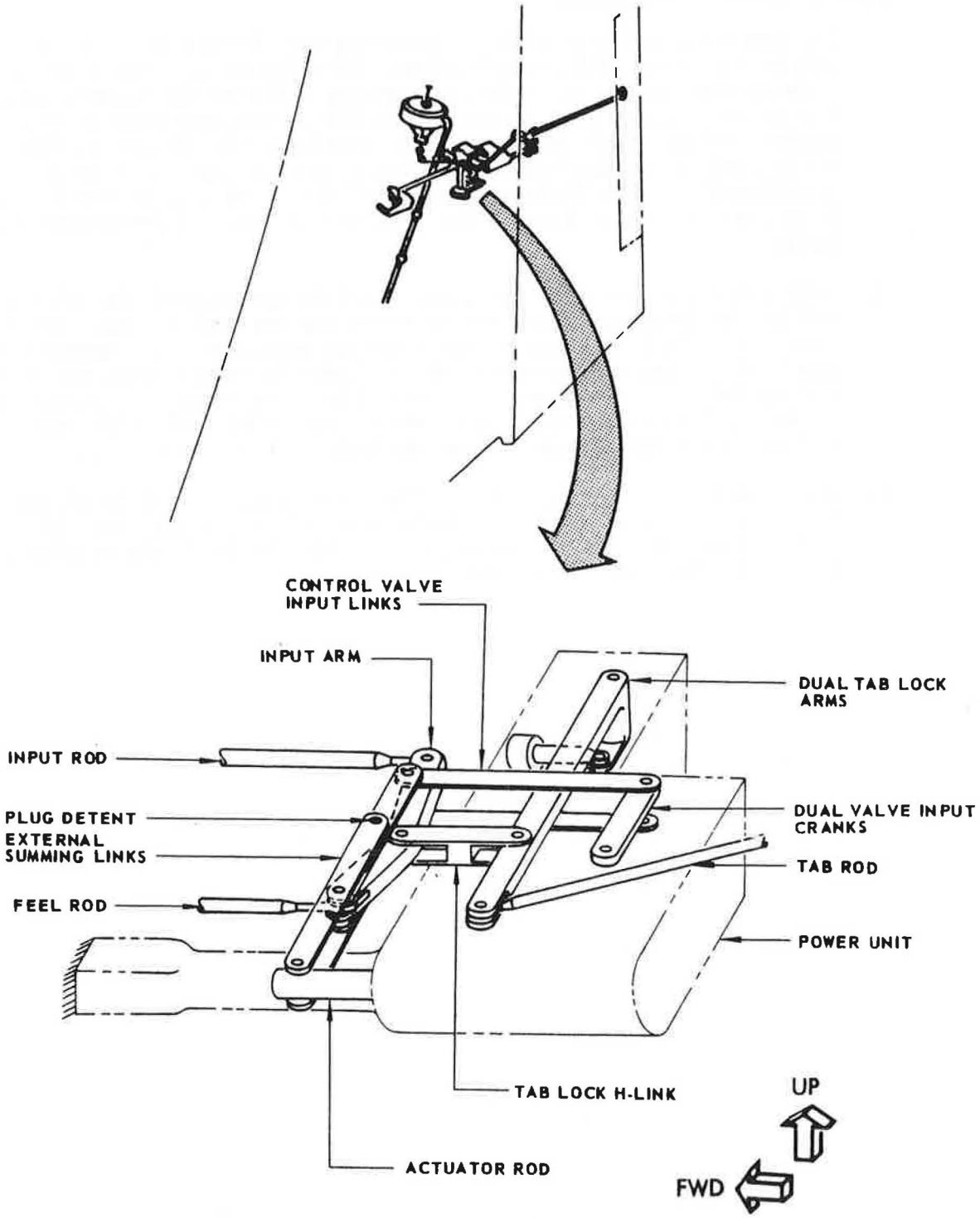
Rudder Feel Unit
Figure 5

11. Power Control Unit Linkage

A. The power control unit linkage transmits the linear motion of the input rod to the power unit control valve. (See figure 6.) The linkage driving the control valve is dual; one-half drives the primary spool of the control valve, and the other half drives the secondary sleeve of the control valve. Each follow-up path contains a plug detent so that controlled separation between the two paths can exist if needed to correct a malfunction. The linkage consists of the input arm, external summing links, control valve input links, tab lock links, and interconnecting links.

B. With hydraulic power on, the pilot input is transmitted through the input rod to the input arm which pivots about the tab lock H-link. The tab lock H-link is held fixed in the power on condition. The movement of the input arm causes the external summing links to rotate about the actuator rod connection. The external summing links are connected to dual control valve input links, which in turn are connected to dual valve input cranks. Movement of those cranks rotates the main control valve shaft.

C. With hydraulic power off the tab lock is no longer fixed in place. Pilot input causes the input arm assembly to rotate about the feel rod connection. The tab lock H-link moves with the input arm assembly, and in turn moves the tab rod and the rudder tab.

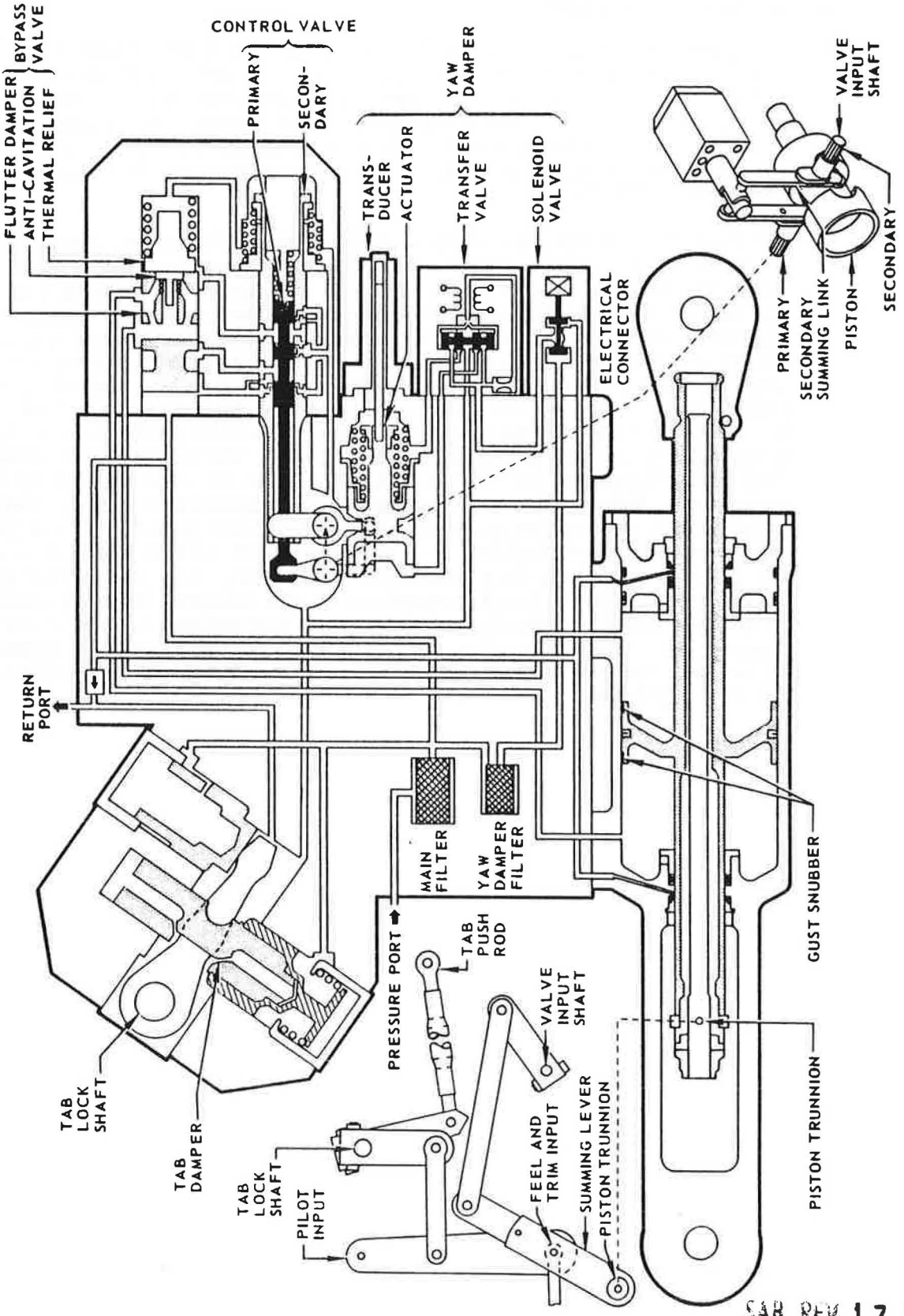


Power Control Unit Linkage Assembly
Figure 6

12. Rudder Power Control Unit

A. The rudder power control unit (figure 7) provides for normal rudder movement. It also acts as a rudder flutter damper. The unit also provides a mechanical stop for the rudder and protects the rudder from wind gust up to 70 mph when the airplane is parked. The power control unit consists of the hydraulic actuator, control valve, bypass valve, yaw damper actuator, tab lock, filters and protective devices, and associated linkage.

B. The control unit operates from auxiliary hydraulic system pressure. Movement of the control valve input crank rotates the input shaft. This **moves the internal valve arms, which in turn move the summing links. One end of the summing links is attached to the yaw damper piston and the other end is attached to the primary and secondary valve slide and** sleeve respectively. The yaw damper end acts as a pivot point for the summing links, therefore a valve displacement is made. The valve ports hydraulic pressure to the actuator piston and it moves the rudder. When the input is held constant and the rudder actuator piston moves, the rod terminal rotates the external summing levers, which now pivot about the feel unit attachment in the opposite direction as that imposed by the input arm. This motion removes the valve displacement and the rudder stops moving at a point proportional to input arm position. The yaw damper piston is controlled by a transfer valve in the power unit and the position feedback is electrical. When a separate yaw damper input is made, the pilot's input connection to the internal summing links acts as a pivot point, producing a valve input independent of the pilot's input. The external summing arms rotate about the feel unit connection **to satisfy the yaw damper's control valve input without disturbing the pilot's input arm.**



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Rudder Power Control Unit
Figure 7
SAB 707/624

13. Rudder Hydraulic Compensator

A. The rudder hydraulic compensator allows for volumetric changes of hydraulic fluid within the rudder power control unit caused by temperature changes when hydraulic power is shut off. (See figure 10.) The compensator also compensates for loss of fluid during power off conditions. The compensator consists of a two-port housing, spring-loaded piston, spring-loaded valve, and packing O-ring. One port is connected to the power control unit return line while the other port is connected to the auxiliary hydraulic system return line. The rudder hydraulic compensator is accessible through the rudder tab control access panel.

B. Thermal expansion of hydraulic fluid or operation of the rudder power control unit causes pressure to be exerted on the spring-loaded piston and valve. This increase in pressure overcomes the spring forces and moves the piston and valve so that hydraulic fluid can escape to the return line.

14. Rudder Hydraulic Power Control Valve

A. The rudder hydraulic power control valve is used to shut off hydraulic pressure to the power control unit when the operation of the unit is not required. (See figure 10.) The valve consists of a motor, rotor-type valve and three-port housing. The hydraulic power control valve is located and accessible through the right wheel well near the inboard bulkhead.

B. The valve is positioned by the motor. The electrical power which operates the motor is 28 volt dc from T-R bus No. 4. Positioning the rudder switch on the pilot's overhead panel to ON positions the valve so that auxiliary hydraulic fluid will flow through the valve to the pressure reducer and the rudder hydraulic pressure control valve. Positioning the switch OFF positions the valve to block off hydraulic pressure to the rudder control system.

15. Rudder Hydraulic Pressure Indicating System

A. The rudder hydraulic pressure indicating system shows the pilots the hydraulic pressure being supplied the rudder power control unit. The system consists of an indicator on the right side of the copilot's instrument panel and a pressure transmitter in the right wheel well, on the inboard side. The pressure transmitter is an electromechanical unit which converts hydraulic pressure to an electrical signal which is transmitted through wiring to the pressure indicator. The electrical signals impressed on the indicator result in needle deflection to indicate the hydraulic pressure. The system operates on 28 volt ac power from the ac circuit breaker panel (P7).

B. Two different types of pressure indicating systems are presently being used for hydraulic pressure indication. The first type of system utilizes an electrical circuit of wound inductances in the transmitter and indicator and is called a "synchro" type system. The second type of system employs a variable capacitance circuit for the electrical signal and is called a "capacitance" type system. Either system can be installed in the airplanes without any change required in the airplane wiring, however, the components of the two different systems cannot be mixed. If a synchro type transmitter is being installed, the indicator must be the synchro type; or if a capacitance type transmitter is installed, the indicator must be the capacitance type.

16. Rudder Hydraulic System Low Pressure Warning System

A. The rudder hydraulic system low pressure warning system provides a red light warning signal when the rudder hydraulic pressure is low. The warning system operates only when the rudder system is operating in the 3000 psi range. The warning system consists of a red low pressure warning light, low pressure warning switch, two-second time delay unit , and a flow restrictor installed between the pressure line and switch. (See figure 10)

B. The warning system light illuminates when electrical power is on and the rudder system pressure (3000 psi range) drops below the preset pressure of the low pressure warning switch. The switch operates in the range of 2500-2700 psi. During increasing pressure the light will go off at a pressure below 2700 psi. During decreasing pressure the light will come on at a pressure above 2500 psi. The warning system is powered by 28 volts dc from the radio and T-R circuit breaker panel (P5). The low pressure warning switch is installed in the right main wheel well. The warning light is on the copilot's instrument panel.

17. Rudder Hydraulic Pressure Control Valve

A. The rudder hydraulic pressure control valve is used to regulate hydraulic pressure flow into the rudder control system. (See figure 10.) The valve consists of a motor, rotor-type valve, and three-port housing (one port plugged). It is installed on the pressure side of the rudder power control unit. The rudder hydraulic pressure control valve is accessible through the right main gear wheel well.

B. The valve is controlled by the airspeed switch and the rudder hydraulic pressure control switch. (See figure 10.) The airspeed switch actuates at speeds above approximately 250 knots positioning the rudder hydraulic pressure control valve, porting rudder hydraulic fluid through a pressure reducer which reduces rudder pressure from 3000 psi to 2250 psi. Actuation of the airspeed switch above 250 knots also removes electrical power from the low pressure warning light. The rudder hydraulic pressure control switch (wired in series with the airspeed switch,), is provided to return the rudder system to the 3000 psi range in case the airspeed switch remains in the 2250 psi range. The rudder pressure control switch is installed near the inboard flap control valve and is

actuated by a cam on the control valve when the flaps are extended approximately one degree. The airspeed switch is installed in the lower nose compartment.

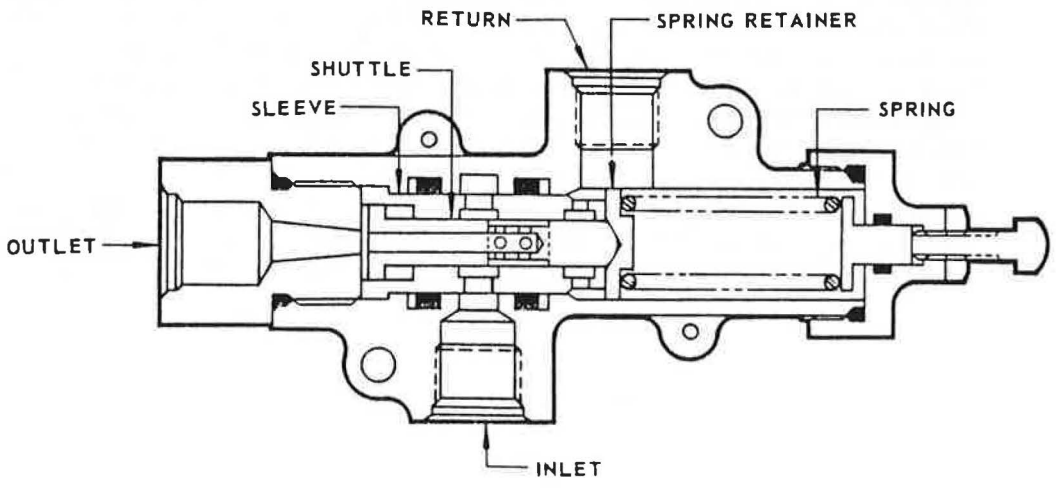
18. Rudder Hydraulic Pressure Reducer

A. The rudder power pressure reducer (figure 8) is used to reduce the rudder control system hydraulic pressure from 3000 to 2250 psi which is needed at an airplane velocity of more than 250 knots. It is a three port hydraulic component consisting mainly of a cylinder, coil spring, spring retainer, sleeve and shuttle assembly. The rudder hydraulic pressure reducer is located at the right main gear wheel well. One of its ports is connected to the rudder power control valve, and the other port is connected to the power control unit line. The third port is connected to the return side of the auxiliary hydraulic system.

B. The shuttle and sleeve assembly which is spring loaded reduces the hydraulic fluid pressure flowing out of the reducer. When the rudder system hydraulic pressure builds up to more than the reduced pressure of about 2250 psi, the difference in pressure is impressed on the shuttle of the reducer. The shuttle will be positioned such that hydraulic fluid will flow back to the return side of the system until the allowable reduced hydraulic pressure is maintained in the rudder control system.

19. Operation

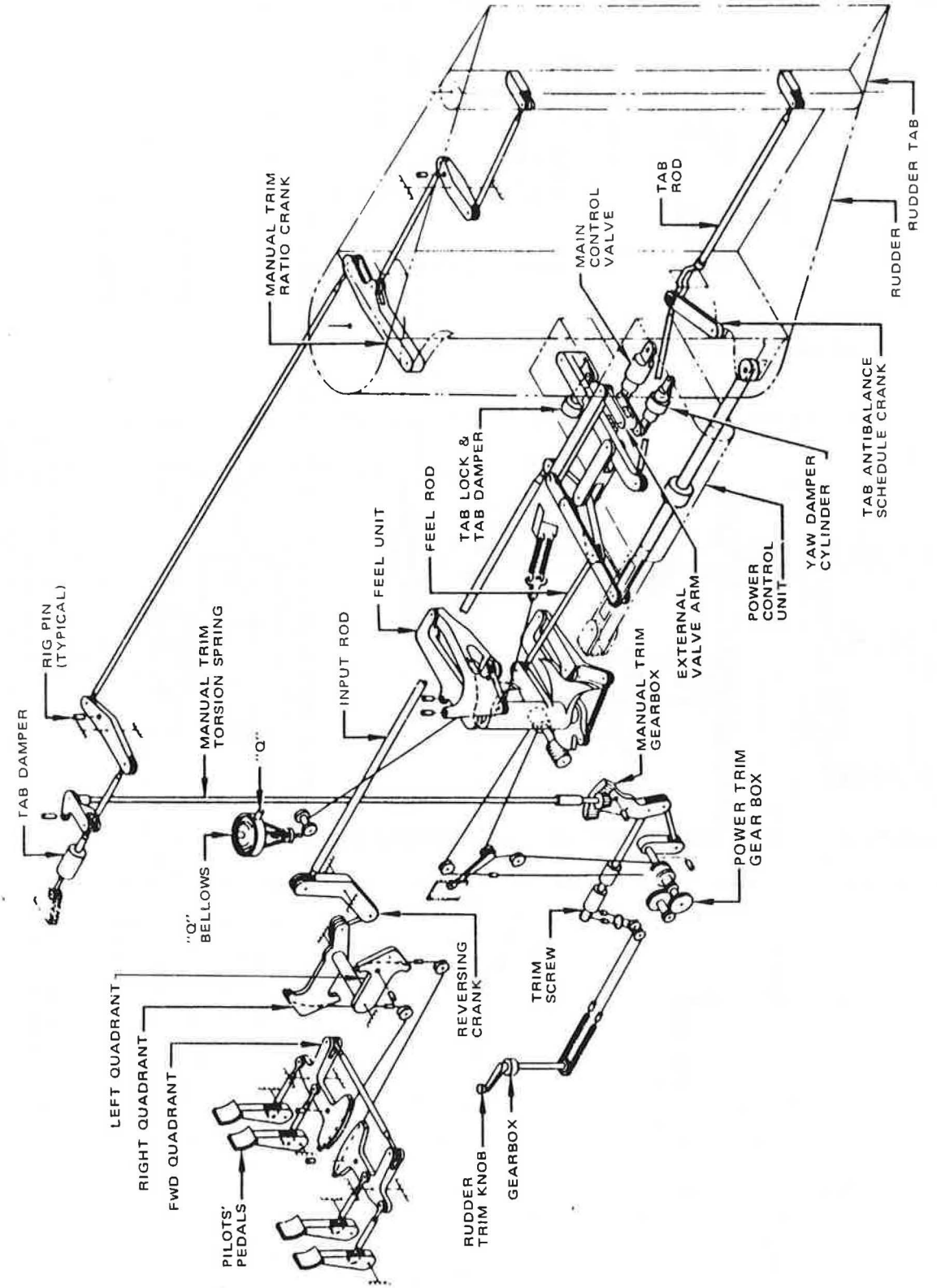
A. The rudder control system (figure 9) is operated by two sets of pedals. Rudder pedal movement is transmitted to forward quadrants and jackshafts by push rods. The forward quadrants are interconnected by a bus rod. Cables in turn transmit forward quadrant motion to the aft control quadrant which is located in the vertical fin. Rotation of the aft control quadrant is transmitted to the rudder control linkage assembly.



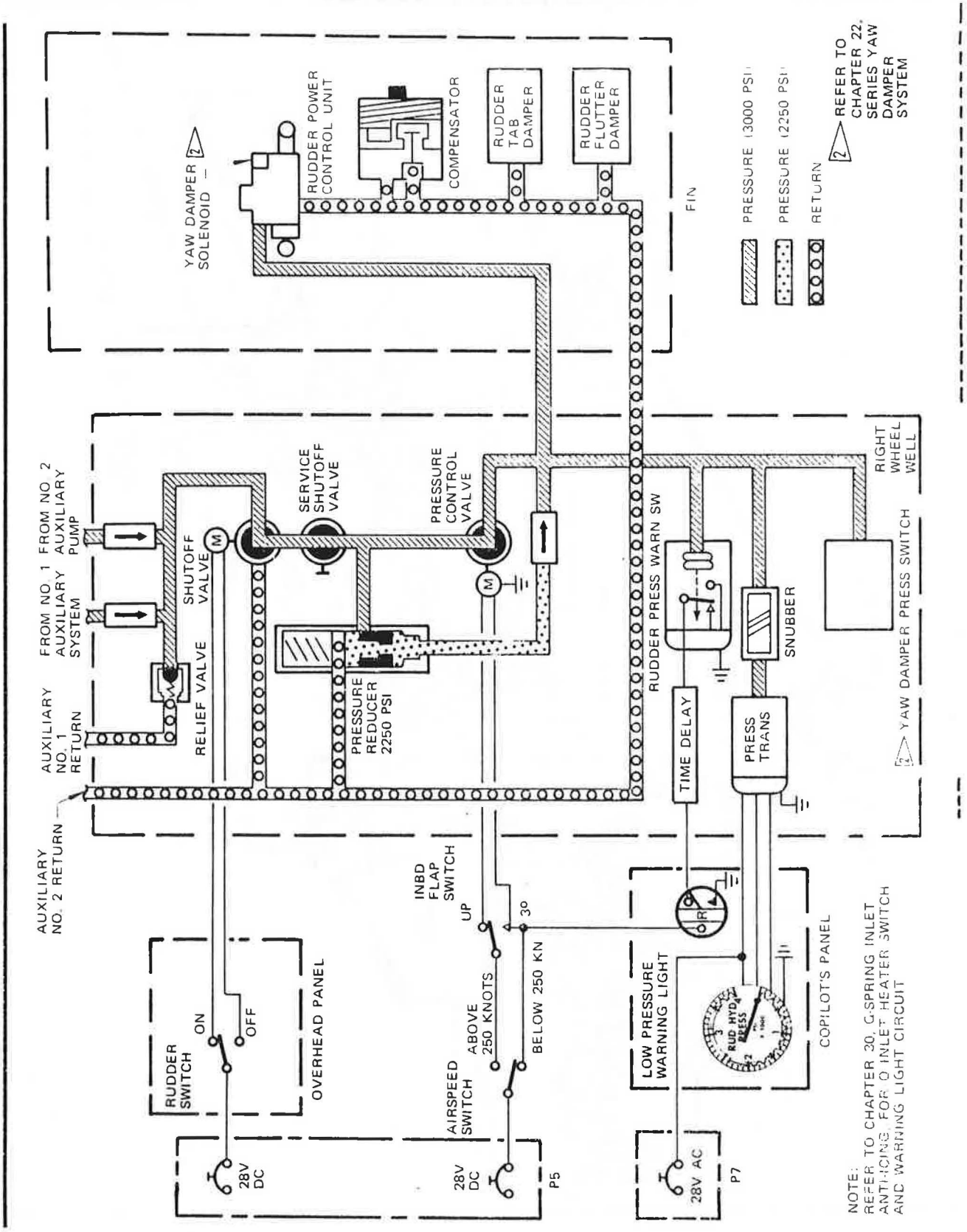
Rudder Hydraulic Pressure Reducer
Figure 8

B. The rudder control linkage assembly converts the rotary motion of the aft control quadrant into linear motion. Rotation of the aft quadrant is transmitted by the input rod to the control unit input arm. As the pilot depresses the left rudder pedal the aft quadrant rotates, and through a reversing link, causes the input rod to move linearly aft. With power on, the input rod causes the input arm to pivot about a dual link from the tab lock. The tab lock link is held fixed by the tab lock in the power on mode. The rotation of the input arm results in rotation of the main control valve shaft through the valve input cranks. The input arm motion is resisted, while it is displaced from zero rudder position, by the feel unit. As the rudder moves to the left the tab also moves left, or in the anti-balance direction. The rudder maximum power on travel is 26-1/2° in either direction. The maximum tab travel is 21° anti-balance in either direction. With hydraulic power off the tab lock shaft is free to rotate, the bypass valve causes the main actuator cylinder ports to be bypassed through orifices to return, and the control valve becomes isolated from the actuator cylinder. When a pedal input is made, the pilot input arm rotates about the feel unit attach point and the tab is then driven and the rudder is made to rotate. Rudder maximum power off travel is 13° in either direction. The maximum tab travel with power off is 20° in either direction. The tab moves in the balance direction with power off.

C. Hydraulic pressure in the system is supplied by two A-C pumps which draw hydraulic fluid from the auxiliary hydraulic reservoir. A motor operated control valve directs hydraulic fluid flow into the system. It is electrically operated by a switch located on the overhead panel. A rudder hydraulic pressure control valve, air pressure switch and hydraulic pressure reducer are also incorporated in the system. These hydraulic components are connected to the pressure side of the rudder power control unit while a hydraulic compensator is connected to the return side of the unit. At an airplane velocity of more than 250 knots the airspeed switch actuates and positions the rudder hydraulic pressure control valve allowing hydraulic fluid flow into the system from the hydraulic pressure reducer. The rudder system hydraulic pressure is then reduced from 3000 psi to 2250 psi. Hydraulic pressure in the system is indicated by an indicator located at the copilot's panel. When the airplane velocity is below 250 knots a red warning light serves to indicate that rudder system hydraulic pressure is below 2500 psi. In case the airspeed switch remains closed at an airplane velocity of less than 250 knots, the rudder hydraulic control valve will remain in the 2250 psi position. The control valve will be positioned to the 3000 psi position when the rudder hydraulic pressure control switch is actuated by the flap system when the flaps are extended approximately one degree. This will allow hydraulic fluid pressure of 3000 psi to flow into the system even though the airspeed switch fails to operate.



Rudder Control System Schematic
Figure 9



Rudder Hydraulic System
Figure 10

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RUDDER, RUDDER CONTROL TAB AND RUDDER CONTROL SYSTEM - TROUBLE SHOOTING

With rudder power on and a rudder observer, operate rudder pedals through full range of travel in both directions. IF -

CONTINUED ON FOLLOWING PAGE

EXCESSIVE CONTROL FORCE REQUIRED TO DEFLECT RUDDER

Check rudder control feel unit for excessive resistance to rotation. IF -

OK - Check cable tension. IF -	NOT OK - Repair or replace defective parts as required.
OK - Check for rubbing cables, misaligned and/or defective pulleys and fairleads and foreign objects on control mechanism. IF -	NOT OK - Adjust cable tension.
OK - Disconnect cables at rudder forward quadrant and check for excessive force to push rudder pedals. IF -	NOT OK - Repair or replace defective parts as required.
OK - Disconnect cables at rudder aft control quadrant and detach input rod from quadrant crank. Rotate quadrant and check for binding. IF -	NOT OK - Disconnect push rods from jackshafts and rotate quadrant manually. Check for binding. Repair or replace quadrant as required.
OK - Check rudder control linkage for binding. Remedy defect.	NOT OK - Repair or replace quadrant as required.

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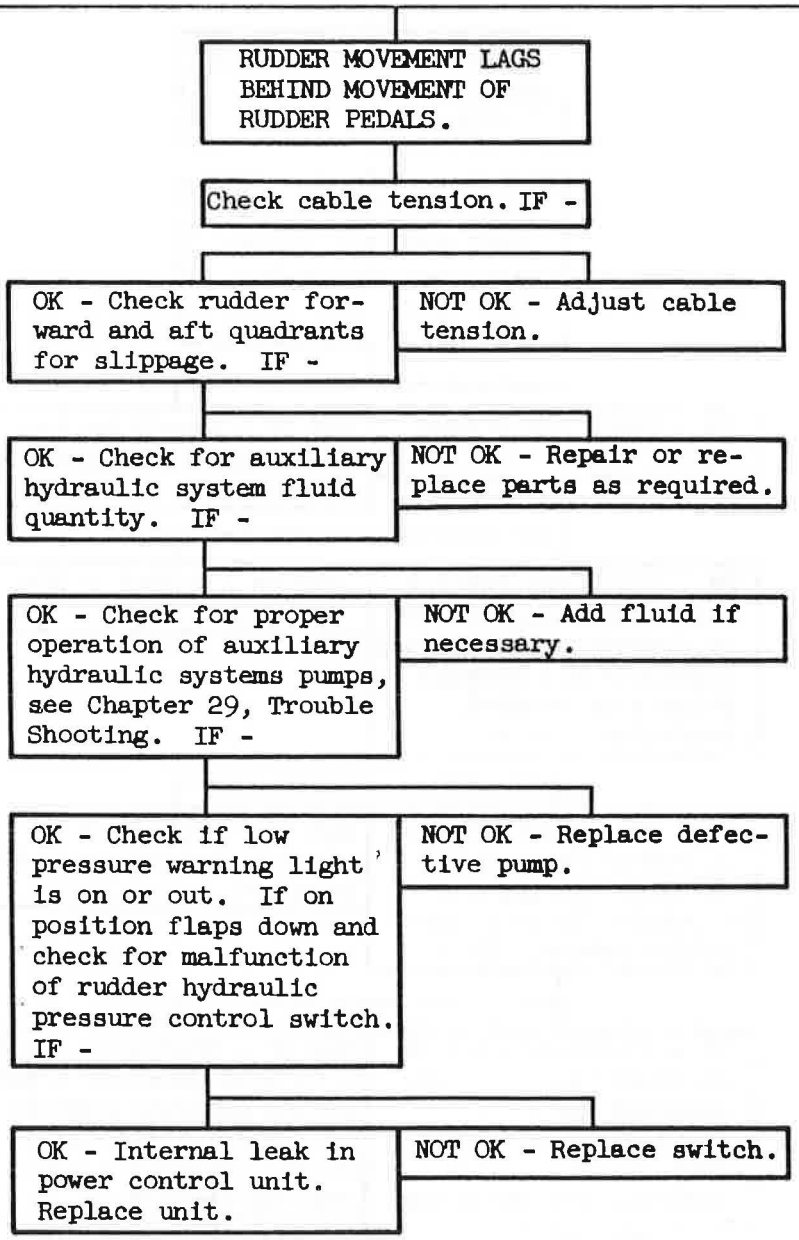

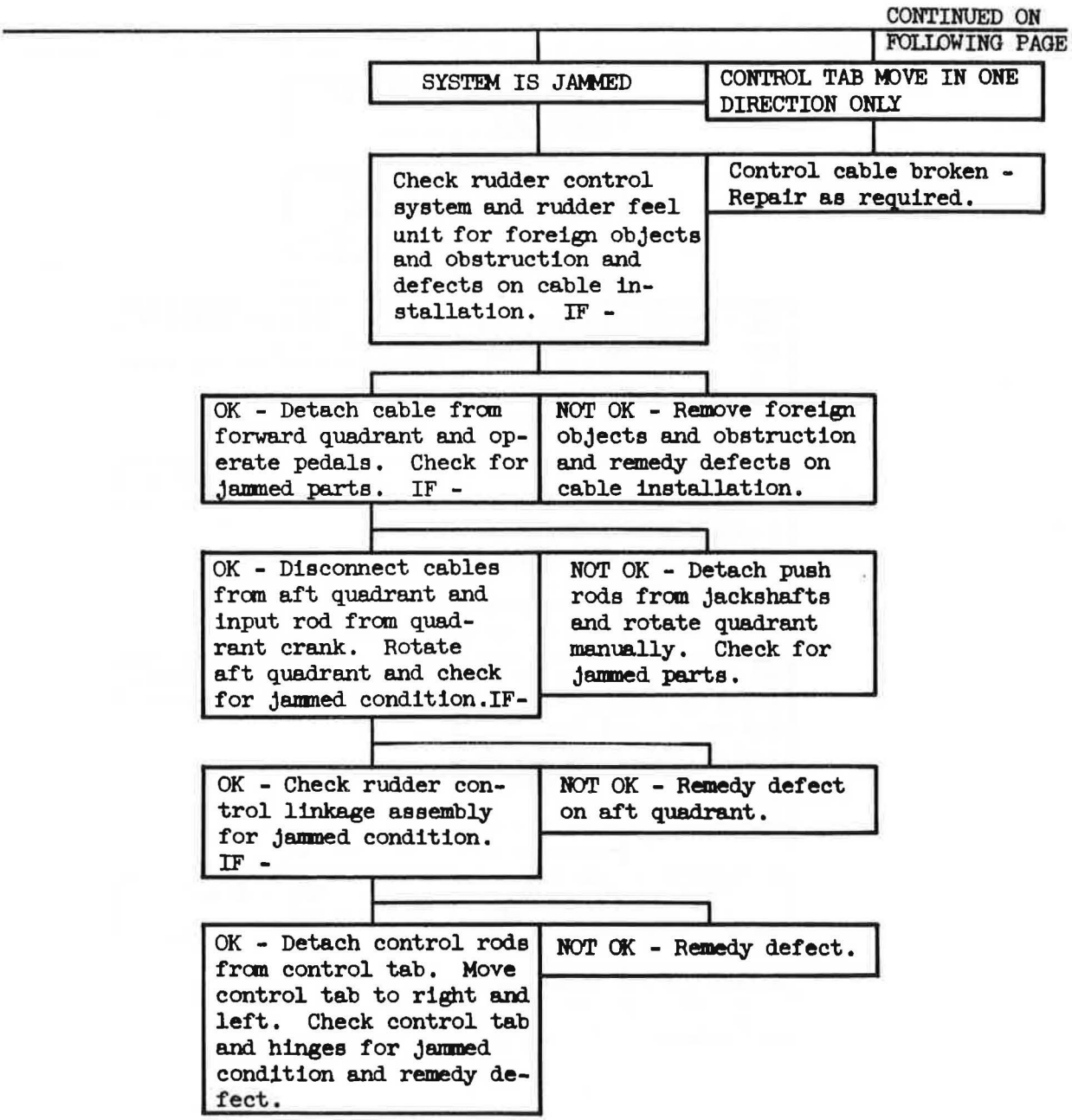
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SYSTEM IS JAMMED
CONTROL TAB MOVE IN ONE DIRECTION ONLY
Check rudder control system and rudder feel unit for foreign objects and obstruction and defects on cable installation. IF -
Control cable broken - Repair as required.
OK - Detach cable from forward quadrant and operate pedals. Check for jammed parts. IF -
NOT OK - Remove foreign objects and obstruction and remedy defects on cable installation.
OK - Disconnect cables from aft quadrant and input rod from quadrant crank. Rotate aft quadrant and check for jammed condition. IF-
NOT OK - Detach push rods from jackshafts and rotate quadrant manually. Check for jammed parts.
OK - Check rudder control linkage assembly for jammed condition. IF -
NOT OK - Remedy defect on aft quadrant.
OK - Detach control rods from control tab. Move control tab to right and left. Check control tab and hinges for jammed condition and remedy defect.
NOT OK - Remedy defect.

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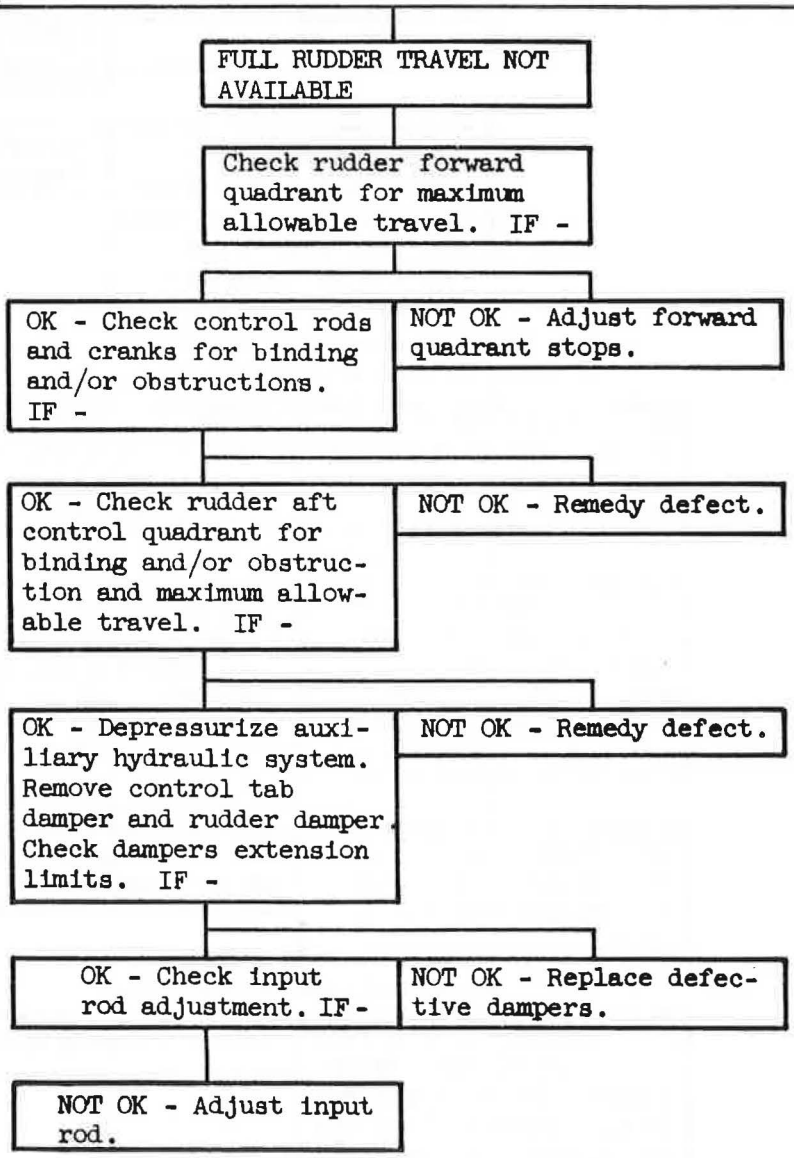

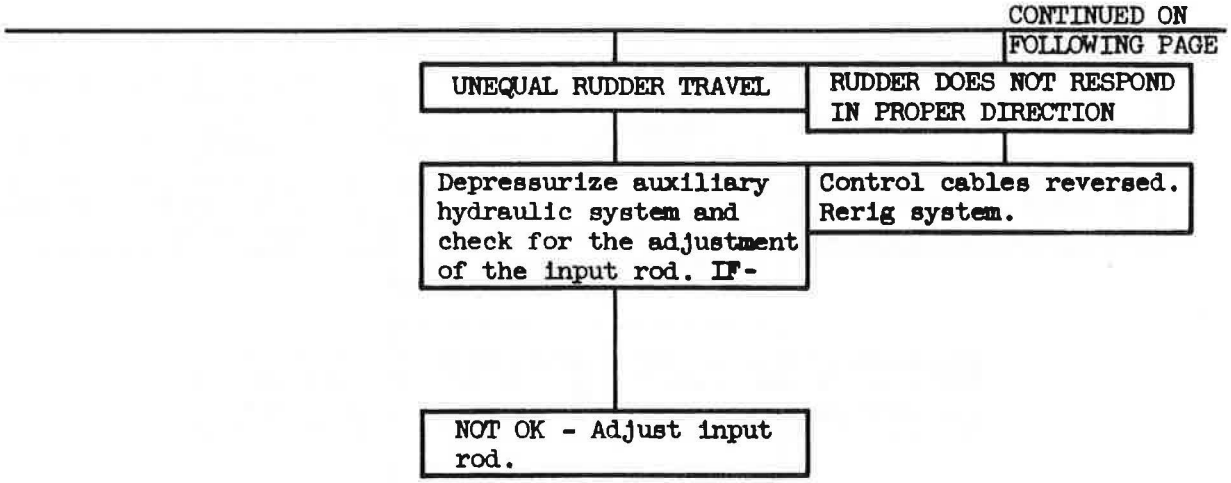
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UNEQUAL RUDDER TRAVEL
RUDDER DOES NOT RESPOND IN PROPER DIRECTION
Depressurize auxiliary hydraulic system and check for the adjustment of the input rod. IF-
Control cables reversed. Rerig system.
NOT OK - Adjust input rod.

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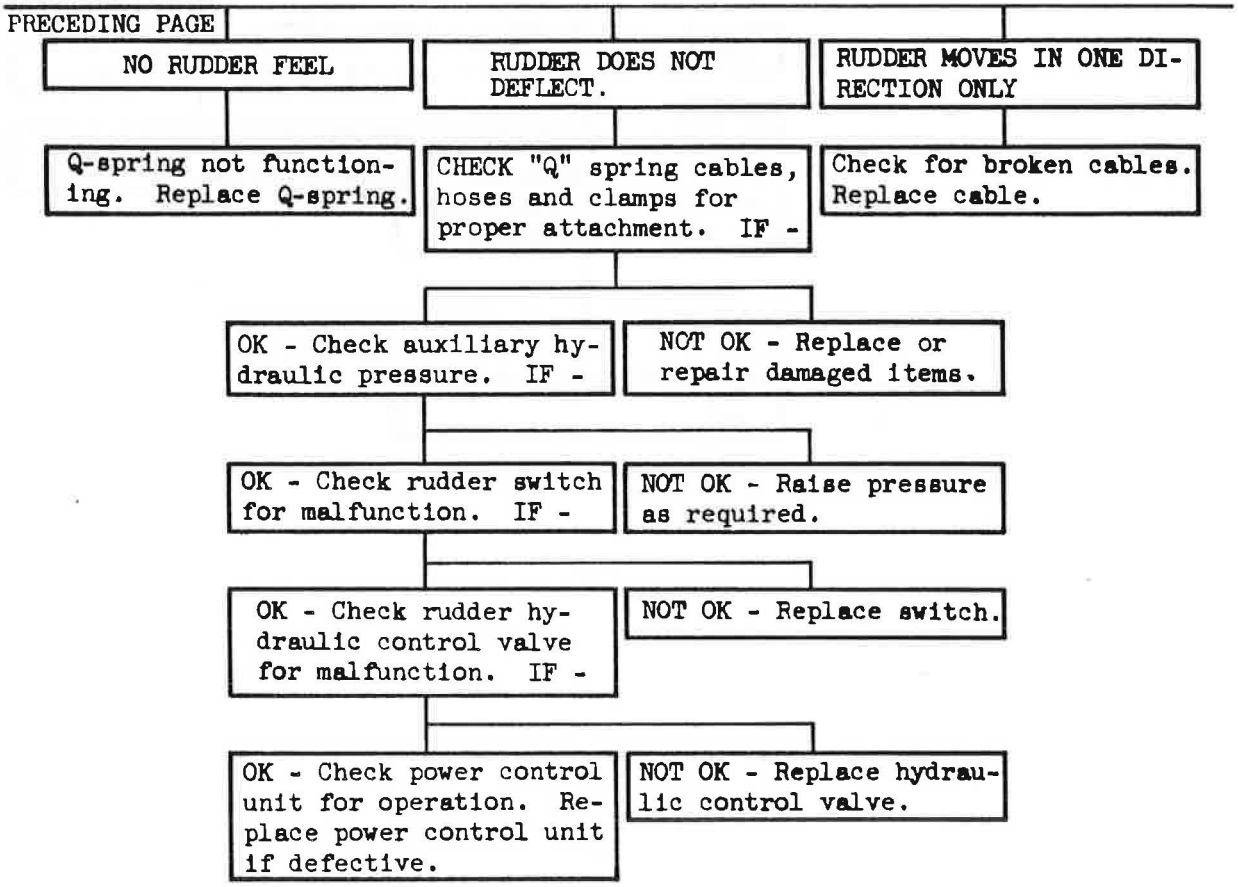

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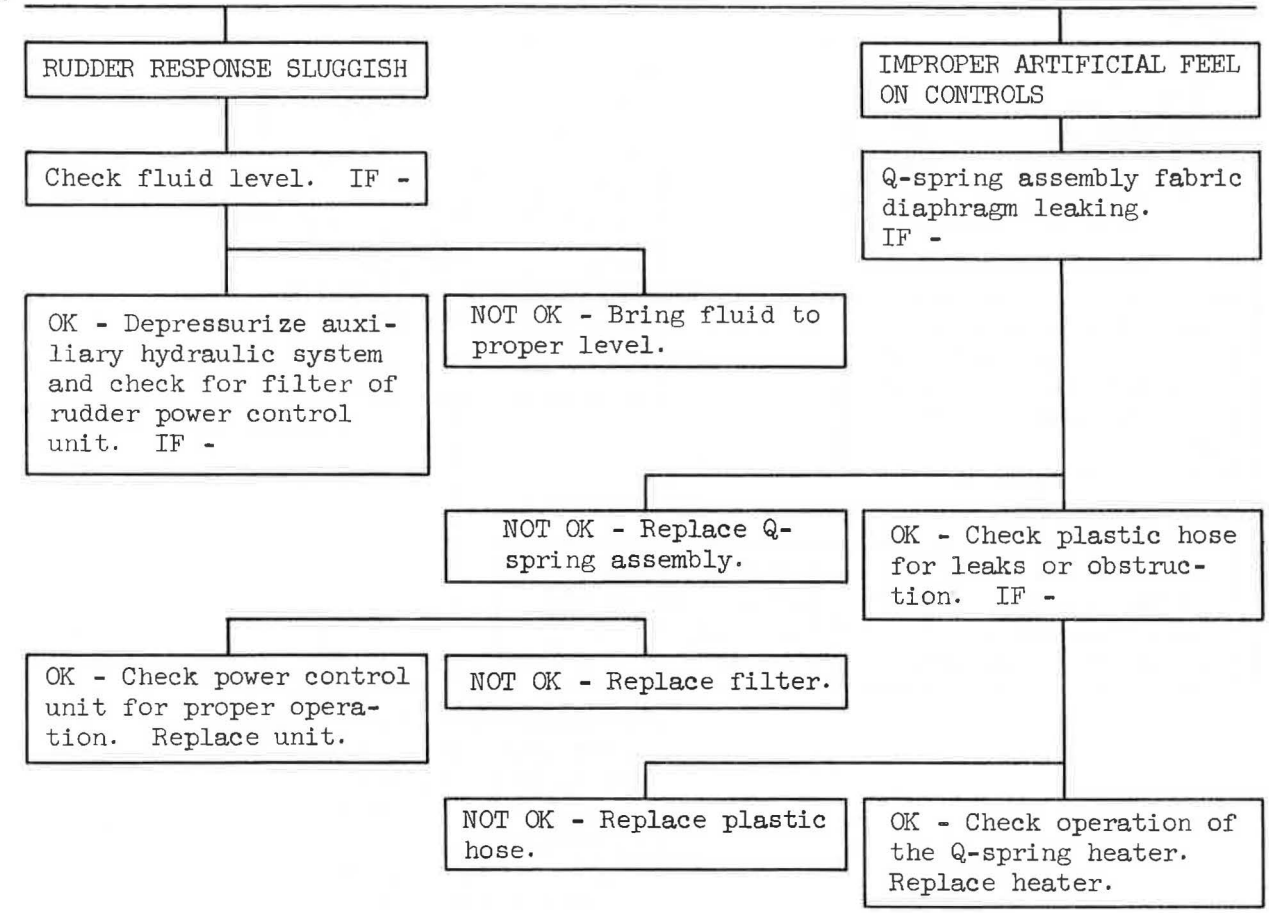
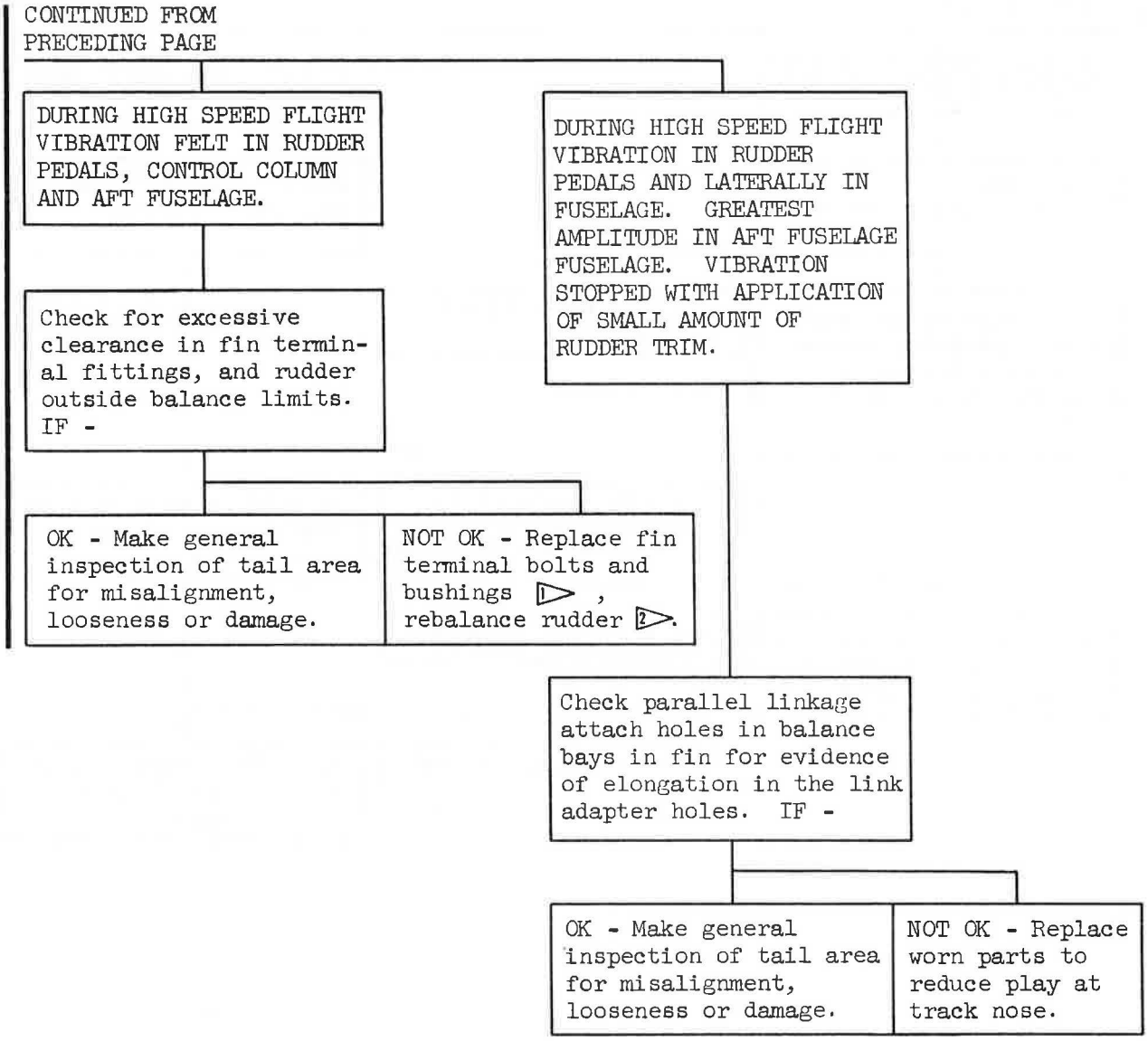




[1] Refer to Chapter 55, Vertical Fin- Maintenance Practices

[2] Refer to Structural Repair Manual

RUDDER, RUDDER CONTROL TAB AND RUDDER CONTROL SYSTEM - MAINTENANCE PRACTICES

1. General

A. The rudder control system must be depressurized to prevent injury to personnel working on rudder and vertical fin. Work stands and equipment must be placed at a distance to allow full rudder deflection when power on tests are conducted on the rudder control system.

WARNING: THE RUDDER CONTROL IS A FULLY POWERED HYDRAULIC SYSTEM WHEN OPERATED IN THE POWER MODE. THE RUDDER SHOULD BE IN NEUTRAL, ALL OBSTRUCTIONS REMOVED FROM THE SYSTEM AND ALL RIG PINS REMOVED FROM THE RUDDER AND RUDDER TRIM SYSTEMS BEFORE HYDRAULIC POWER IS APPLIED. KEEP ALL PERSONNEL AWAY FROM MOVING COMPONENTS OF THE RUDDER AND RUDDER CONTROL SYSTEM WHEN RUDDER POWER IS ON.

2. Depressurizing Auxiliary Hydraulic System for Rudder Maintenance

A. Position interconnect valve switch to closed.

B. Position auxiliary pump switches OFF.

C. Open interconnect valve circuit breaker on external power shield (J9).

D. Open auxiliary hydraulic motor circuit breakers.

E. Turn rudder switch ON.

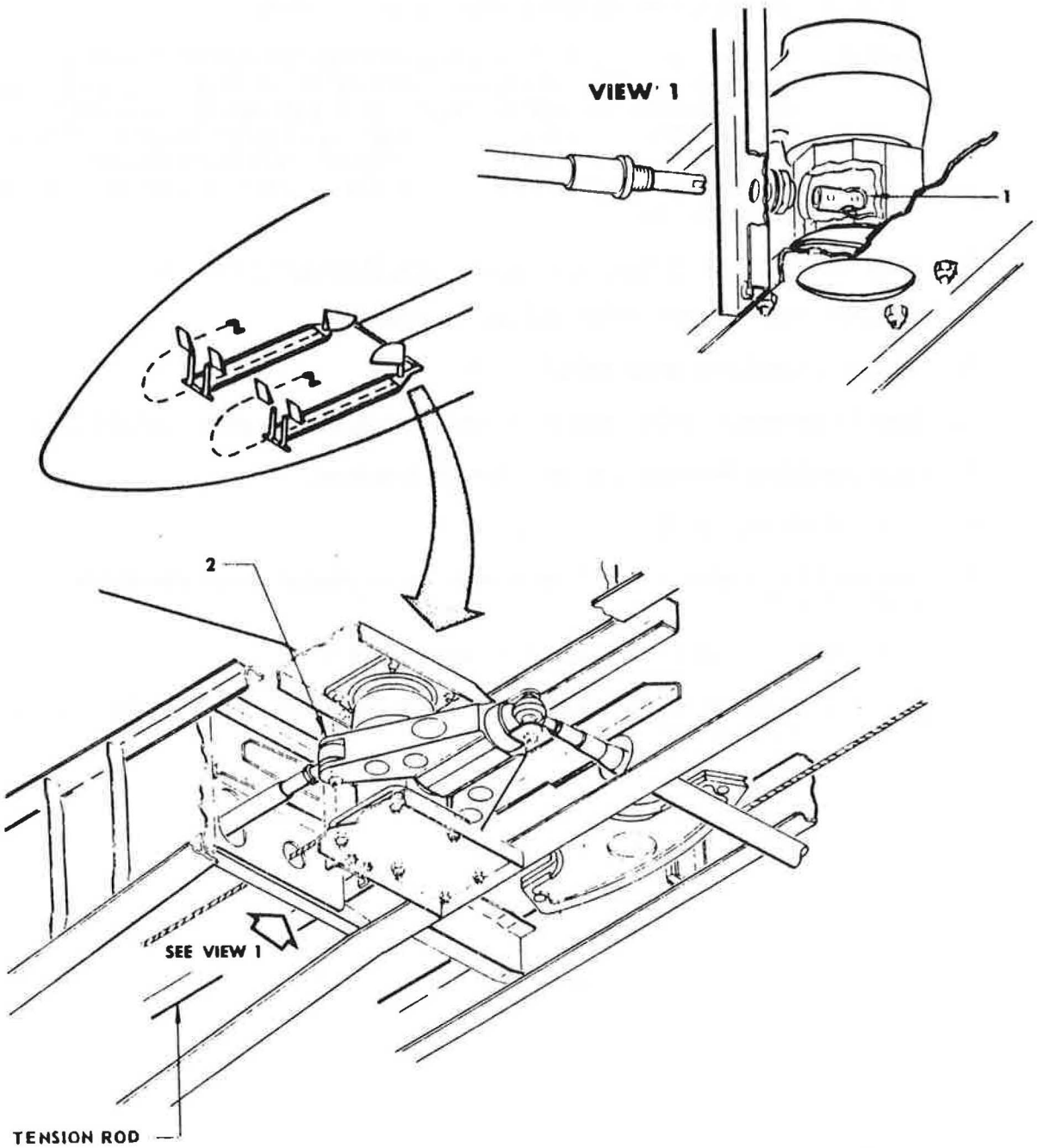
F. Depressurize system by cycling rudder until rudder stops operating hydraulically.

G. Position rudder hydraulic shutoff valve to OFF.

CAUTION: AFTER RUDDER SYSTEM MAINTENANCE LOCKWIRE SHUTOFF VALVE TO THE ON POSITION.

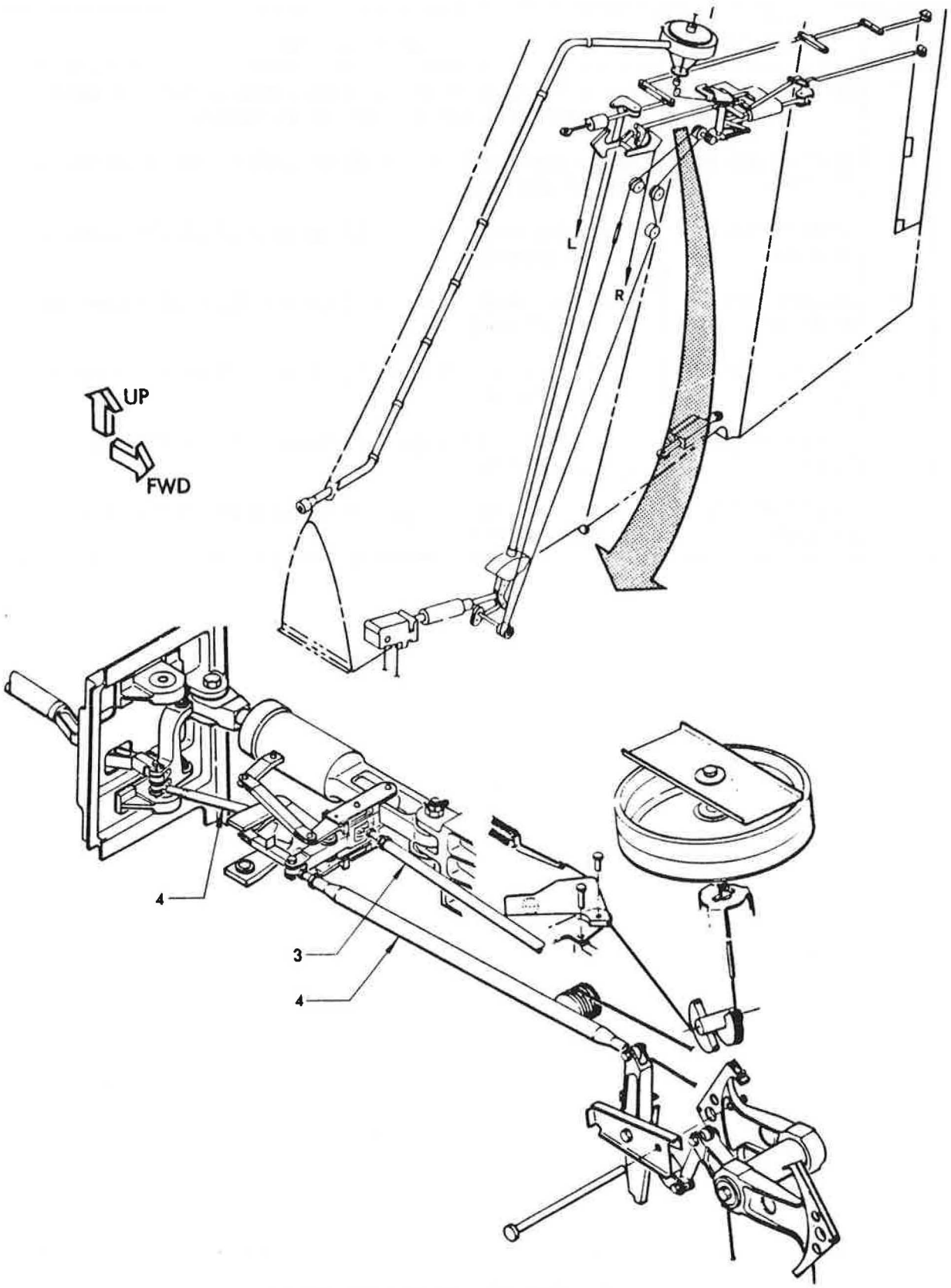
3. Unit Servicing Rudder Control System

A. Lubricate Rudder Control System (See figure 201.)

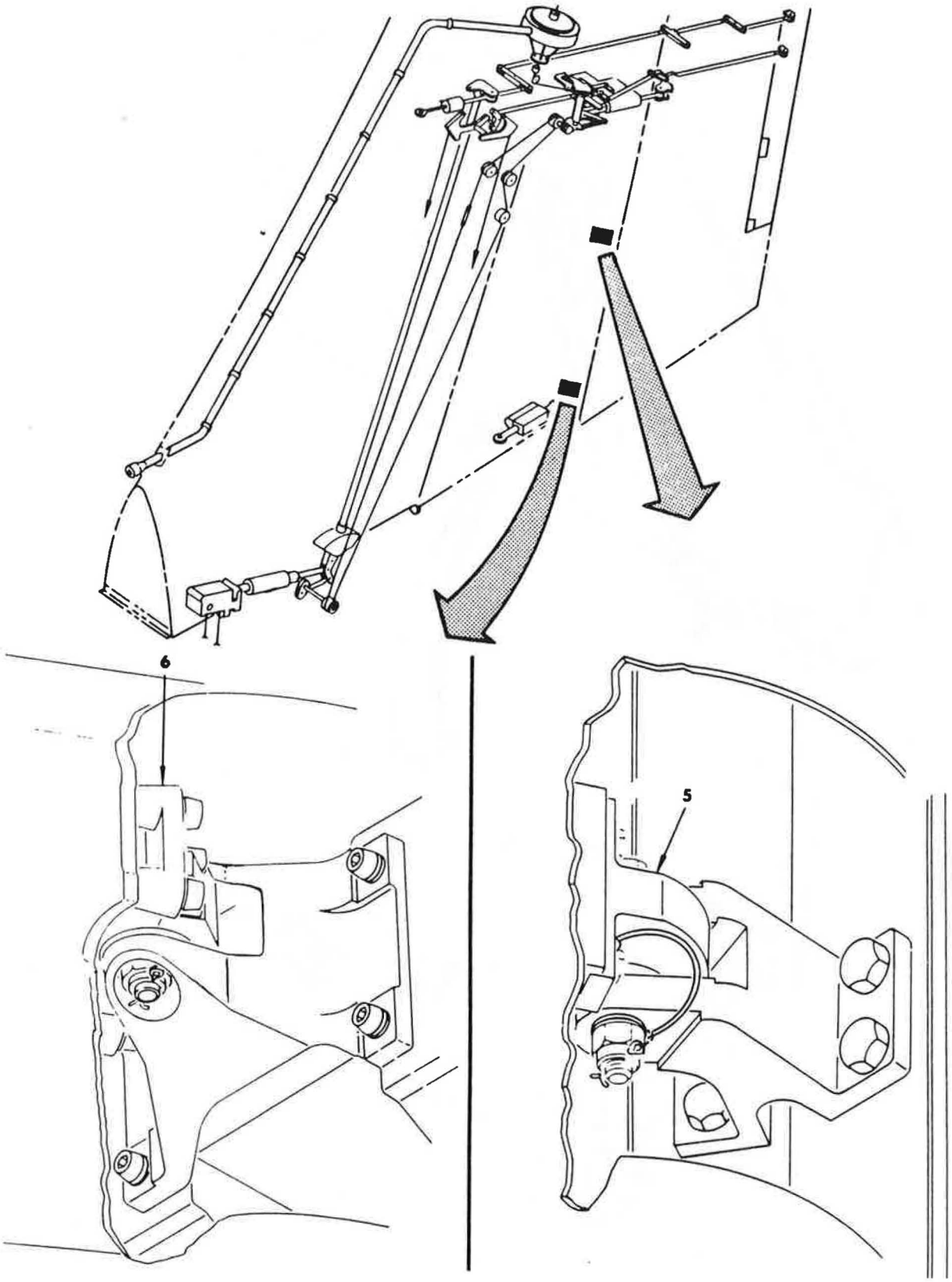


Rudder Control System Lubrication
Figure 201 (Sheet 1)

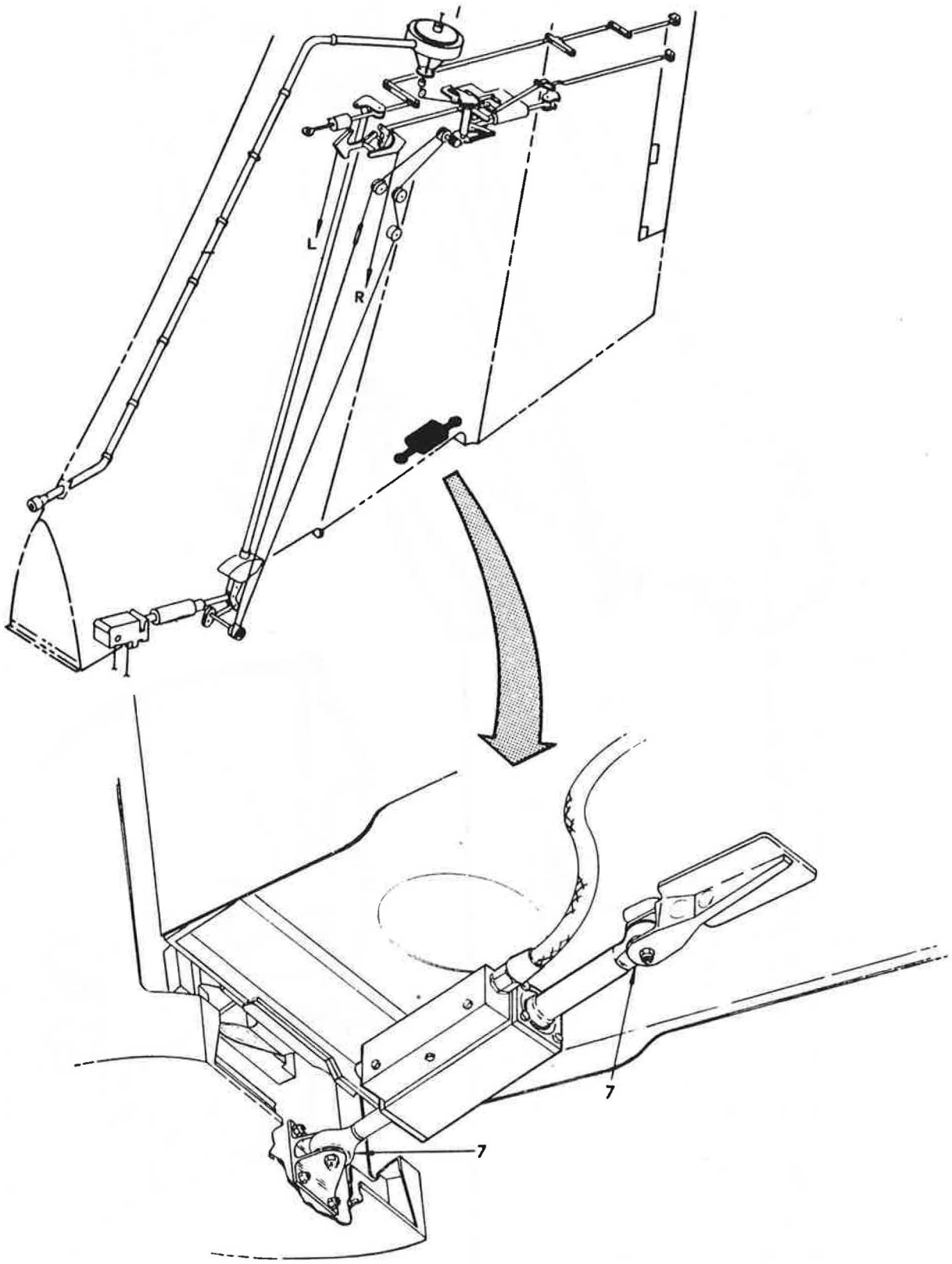
INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	UNIVERSAL JOINT	Apply light coat of lubricant, MIL-L-7870, by hand (1 place left and 1 place right hand).
2	TENSION ROD END BEARINGS	Apply Aeroshell Grease 7A through flush fittings, by gun (4 places).
3	CONTROL ROD BEARINGS	Apply Aeroshell Grease 17 through flush fittings, by gun (1 place).
4	CONTROL ROD BEARINGS	Apply Aeroshell Grease 17through flush fittings, by gun (2 places).
5	TYPICAL RUDDER HINGES	Apply Aeroshell Grease 17 through flush fittings, by gun (6 places).
6	RUDDER THRUST HINGE	Apply Aeroshell Grease 17 through flush fittings, by gun (1 place).
7	RUDDER DAMPER ASSEMBLY	Apply Aeroshell Grease 17 through flush fittings, by gun (2 places).



Rudder Control System Lubrication
Figure 201 (Sheet 3)



Rudder Control System Lubrication
Figure 201 (Sheet 4)



Rudder Control System Lubrication
Figure 201 (Sheet 5)

4. Adjustment/Test Rudder Control System

A. General

(1) The rudder control system is rigged by first positioning the rudder and control tab to neutral. A rivet and chevron on the tail cone below the lower aft corner of the rudder index the rudder neutral position. The rivet indexes the designed neutral position and the chevron indexes the rigged neutral position. During rudder adjustment and test procedures the rudder is positioned to the rigged neutral (chevron) position. The rudder travel measurements are taken between the designed neutral (rivet) position and the lower aft corner of the rudder. The rudder control system is rigged from forward to aft of the airplane. Clamps are used to keep the control surfaces in the faired position while rigging pins hold the components in the neutral position. Before testing the system special precaution should be taken that all rigging pins and clamps are removed.

CAUTION: DURING RUDDER SYSTEM RIGGING IT IS POSSIBLE THAT RUDDER MOVEMENT FROM WIND LOADS OR OTHER CAUSES COULD DAMAGE THE RUDDER CONTROL LINKAGE. WITH THE AFT QUADRANT RIG PIN IN PLACE THE RUDDER MOVEMENT FORCES WOULD BE TAKEN BY THE LINKAGES LOCATED BETWEEN THE RIG PIN AND THE RUDDER. RUDDER MOVEMENT SHOULD BE CAREFULLY CONTROLLED OR RESTRAINED WHENEVER THE RIGGING PIN IS INSTALLED IN RUDDER AFT CONTROL QUADRANT TO AVOID PLACING EXCESSIVE LOADS ON THE RUDDER CONTROL LINKAGE.

(2) When new cables are installed, provision must be made for the initial yield which takes place when the cable is first placed in tension. Rig new RA and RB cables to 30 (+10/-30) pounds and cycle system 25 times without lockwiring the turnbuckles. After cycling reduce tension to the values shown in figure 202 and lockwire the turnbuckles. After cable installation pulleys must rotate freely with no interference with guards.

(3) If an out-of-trim condition exists refer to 27-1-21, Flight Controls Trim Correction - Adjustment/Test.

B. Equipment and Materials

(1) Rigging Pin No. 1 - 0.311 (+0/-0.002) Diameter (MS20392-4)

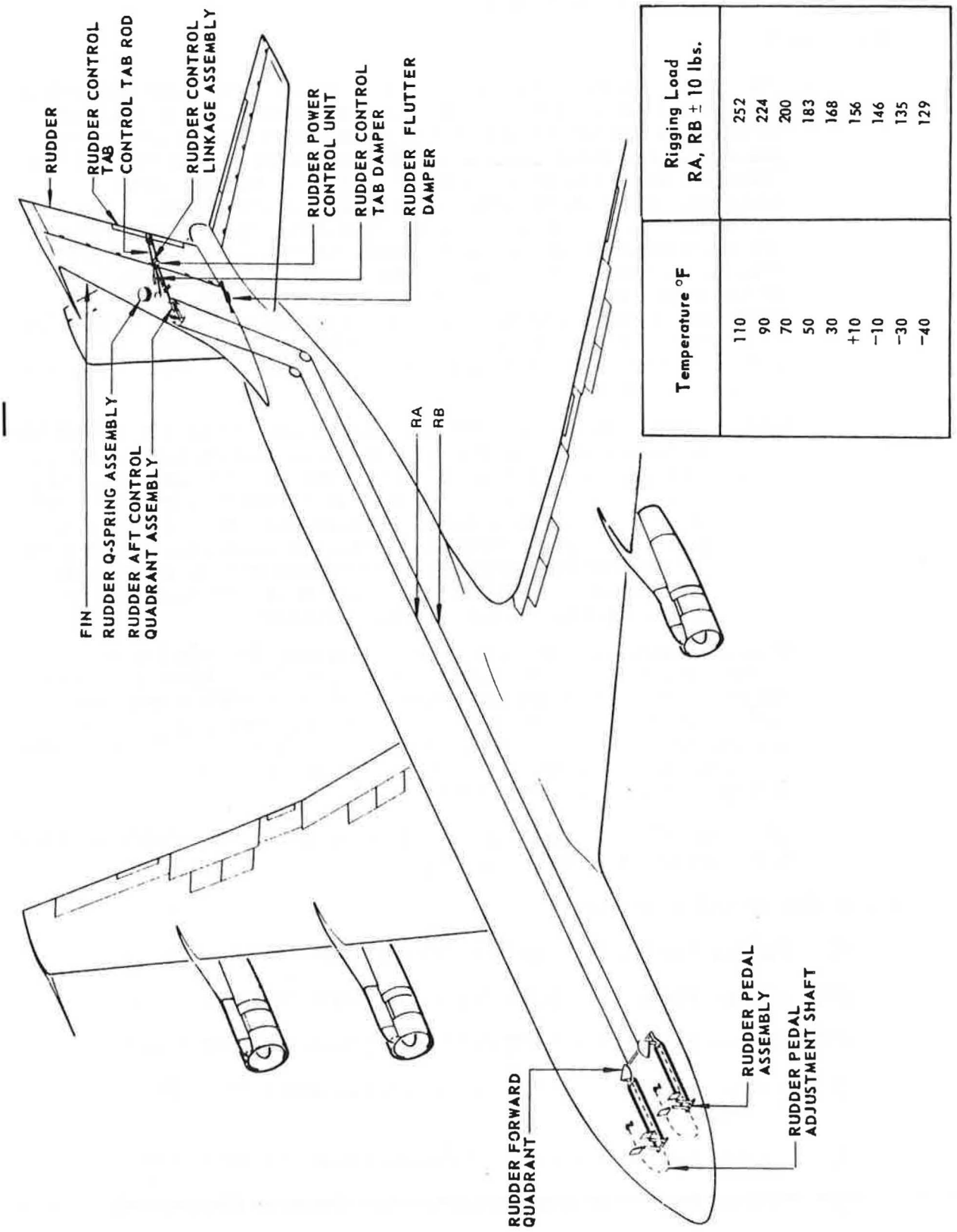
(2) Rigging Pin No. 2 - 0.311 (+0/-0.002) Diameter (MS20392-4)

(3) Rigging Pin No. 3 - 0.497 (+0/-0.002) Diameter (MS20392-7)

(4) Rigging Pin No. 7 - 0.311 (+0/-0.002) Diameter (MS20392-4) (2 required)

(5) Rigging Pin No. 9 - 0.311 (+0/-0.002) Diameter (MS20392-4)

(6) Rigging Pin No. 10 - 0.311 (+0/-0.002) Diameter (MS20392-4)



Temperature °F	Rigging Load RA, RB ± 10 lbs.
110	252
90	224
70	200
50	183
30	168
+10	156
−10	146
−30	135
−40	129

Rudder Control System Adjustment
Figure 202

(7) Spring scale - 0 to 50 pounds

(8) Cable tensiometer - 0 to 300 pounds

(9) Scale - 0 to 2 feet graduated in inches and sixty-fourths

(10) Mechanics hand level

(11) Rudder protractor - MIT-50-8703 and rudder tab protractor MIT-50-8706.

(12) Push and pull scale - 0 to 300 pounds capacity.

(13) Air pressure source, variable to 3.0 psig.

(14) Gage and Adapter Assembly, Q-Spring Ram Air Intake - F71429 or equivalent.

(15) Hydraulic cart for Skydrol "500," capacity 20 GPM at 3000 psi

(16) Main landing gear door down locks - F71127 or equivalent

C. Adjust Rudder Control System

(1) Depressurize auxiliary hydraulic system.

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(2) Adjust rudder pedal assembly and jackshaft assembly.

(a) Position jackshaft yoke to mid travel by operating rudder pedal adjustment crank. (See figure 203.)

NOTE: Midpoint of yoke travel is determined by counting equal turns of shaft from full forward and full aft adjustment.

(b) Using rudder trim mechanism position forward quadrants so that both rig pins No. 7 fit through forward rig pin hole in each quadrant. (See figure 204.) If rig pins will not fit adjust forward quadrants.

1) Adjust Rudder Forward Quadrant.

a) Loosen RA and RB cables.

CAUTION: TO AVOID DAMAGE TO ROD ENDS OR TO FASTENERS, CABLE TENSION MUST BE RELIEVED BEFORE DISCONNECTING BUSROD.

b) Remove busrod from jackshaft yoke.

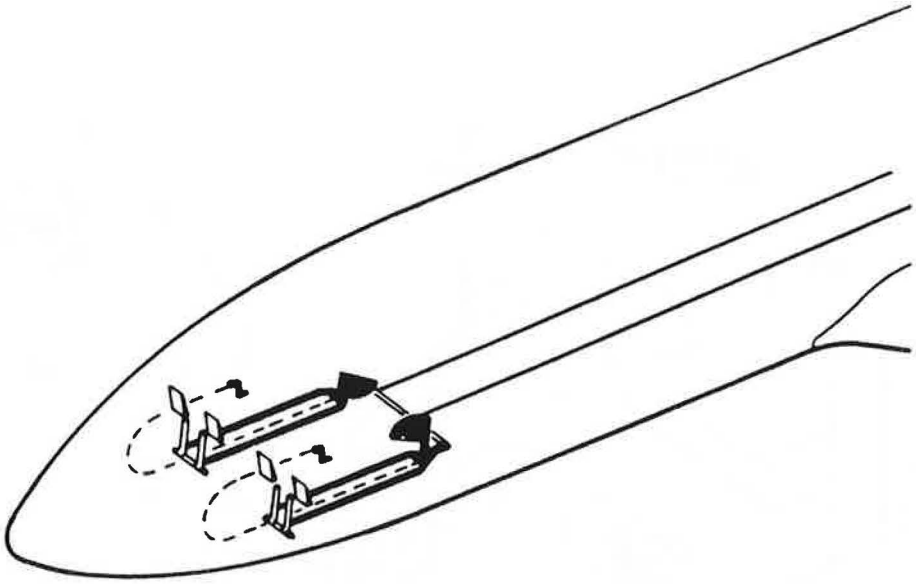
c) Install No. 7 rig pin in forward rig pin holes on each quadrant.

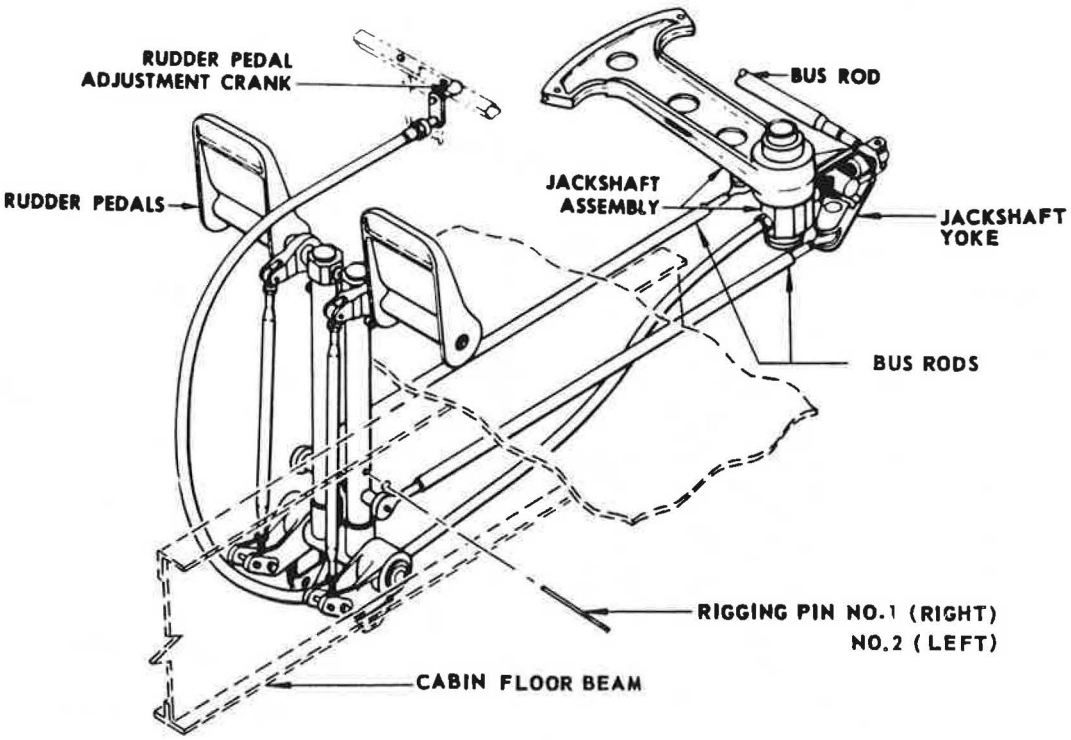
d) Adjust and reinstall busrod.

(c) With both No. 7 rig pins in forward rig pin holes check that rig pins No. 1 and No. 2 fit through rig pin holes on pedal arm assemblies. (See figure 203.) If not adjust lengths of pushrods so that rig pins No. 1 and No. 2 may be freely inserted.

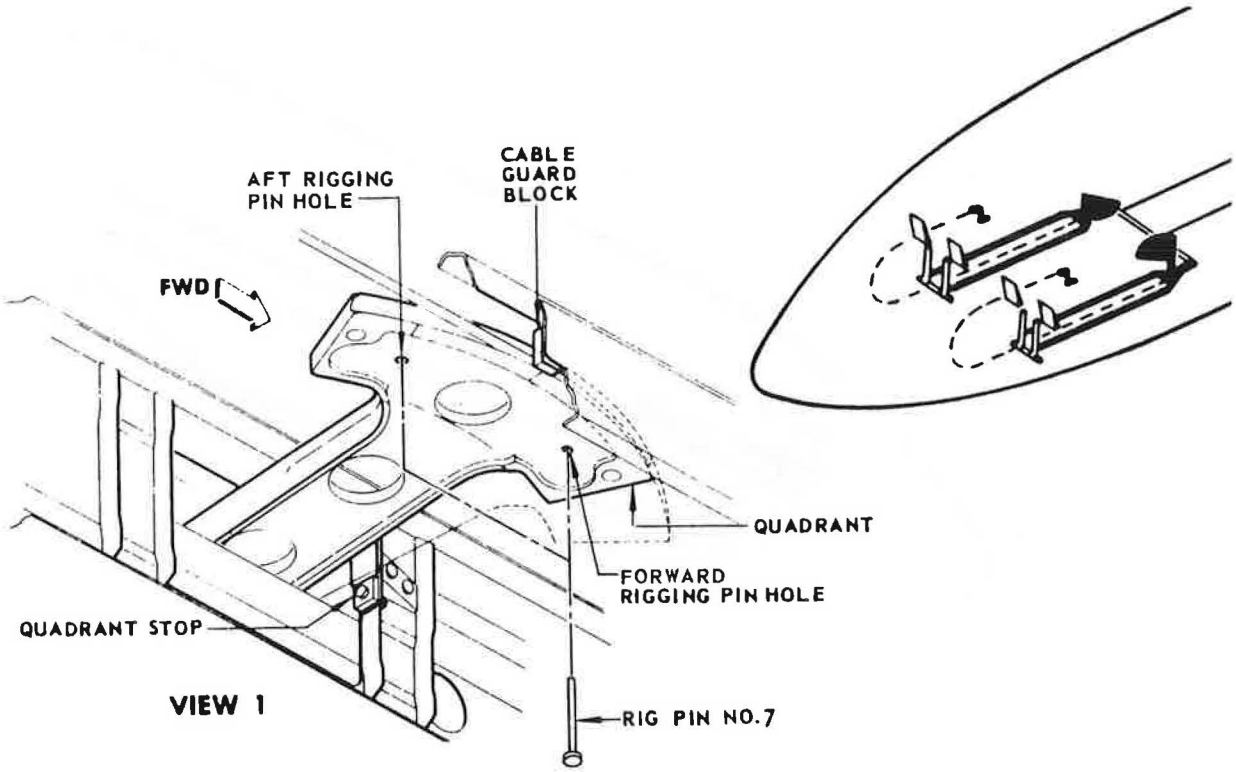
(d) Remove rig pins No. 1, No. 2 and both No. 7 pins.

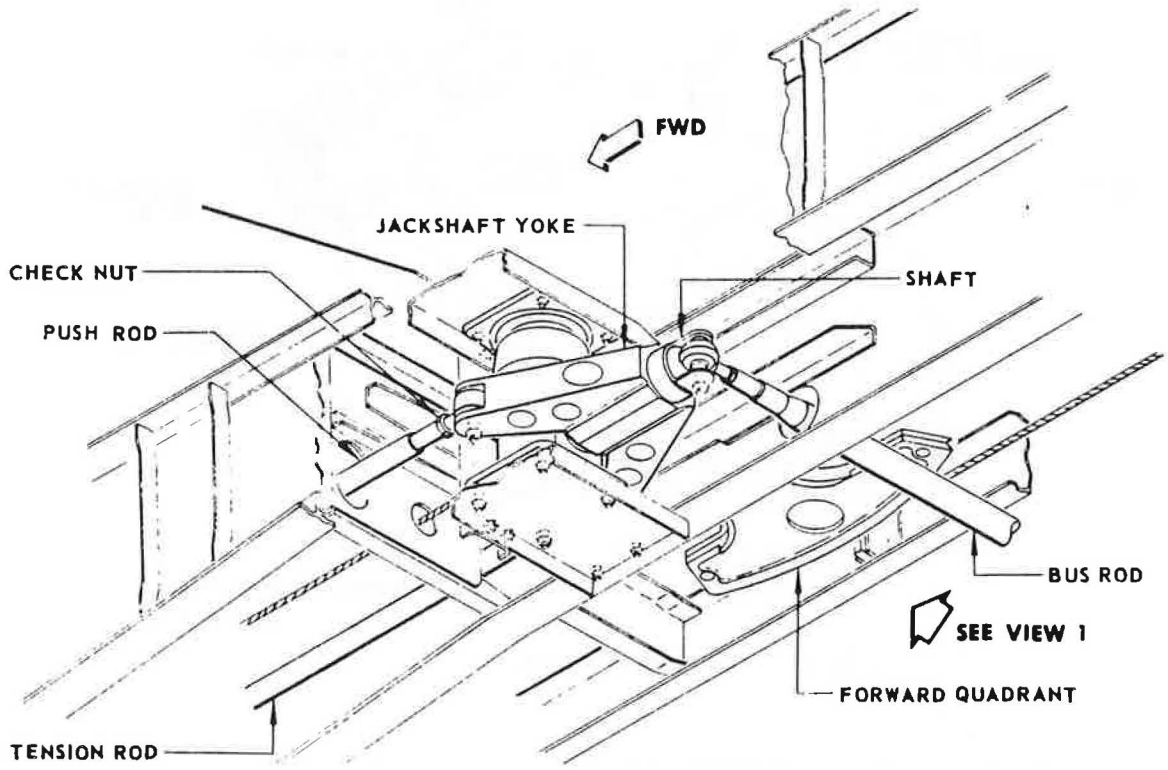
(e) Position left forward quadrant so that rig pin No. 7 can be installed through aft rigging pin hole of quadrant and floor.





Rudder Pedal Rigging Pin Installation
Figure 203





Rudder Pedal Adjustment
Figure 204

(f) Check that maximum gap between the quadrant and quadrant stop is 1/16 inch. Adjust gap if necessary.

NOTE: The maximum gap between quadrant and quadrant stop may be adjusted by adding or removing shims on quadrant stop.

(g) Remove rig pin No. 7 from left forward quadrant.

(h) Repeat (e) through (g) for right forward quadrant.

(3) Adjust RA and RB cables.

(a) Remove access panels 1510, 1514, and 1525. See Chapter 12, Access Doors and Panels.

(b) Remove stabilizer jackscrew access panel. See Chapter 12, Access Doors and Panels.

(c) Install both No. 7 rig pins through forward rig pin holes in forward control quadrants. (See figure 204.)

(d) Attempt to install rig pin No. 3 through rudder aft control quadrant. (See figure 205.) If required adjust turnbuckles until rig pin No. 3 and both rig pins No. 7 fit freely.

(e) Using tensiometer check that tension of RA and RB cables is within limits specified in figure 202. If required adjust turnbuckles to obtain proper cable tension. Check that rig pin No. 3 and both rig pins No. 7 fit freely.

(f) Lockwire turnbuckles and remove No. 7 rig pins.

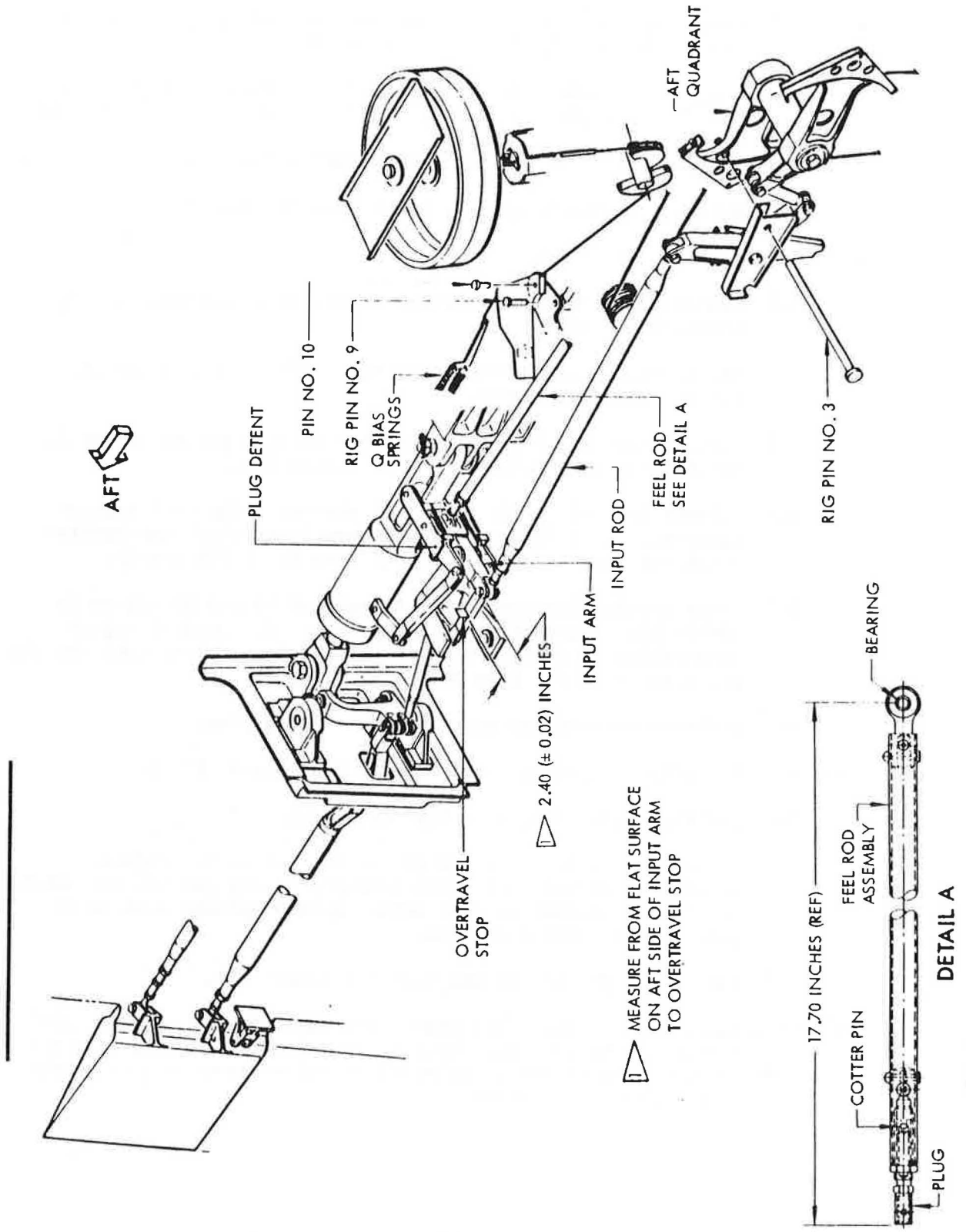
(4) Adjust rudder Q-spring and feel unit. (See figure 205.)

(a) Install rig pin No. 9 in feel unit arm.

(b) Attempt to install rig pin No. 10 in feel unit. Adjust turnbuckle on Q-spring cable assembly if rig pin No. 10 cannot be freely inserted in feel unit. Q-bias springs must be in place during this operation.

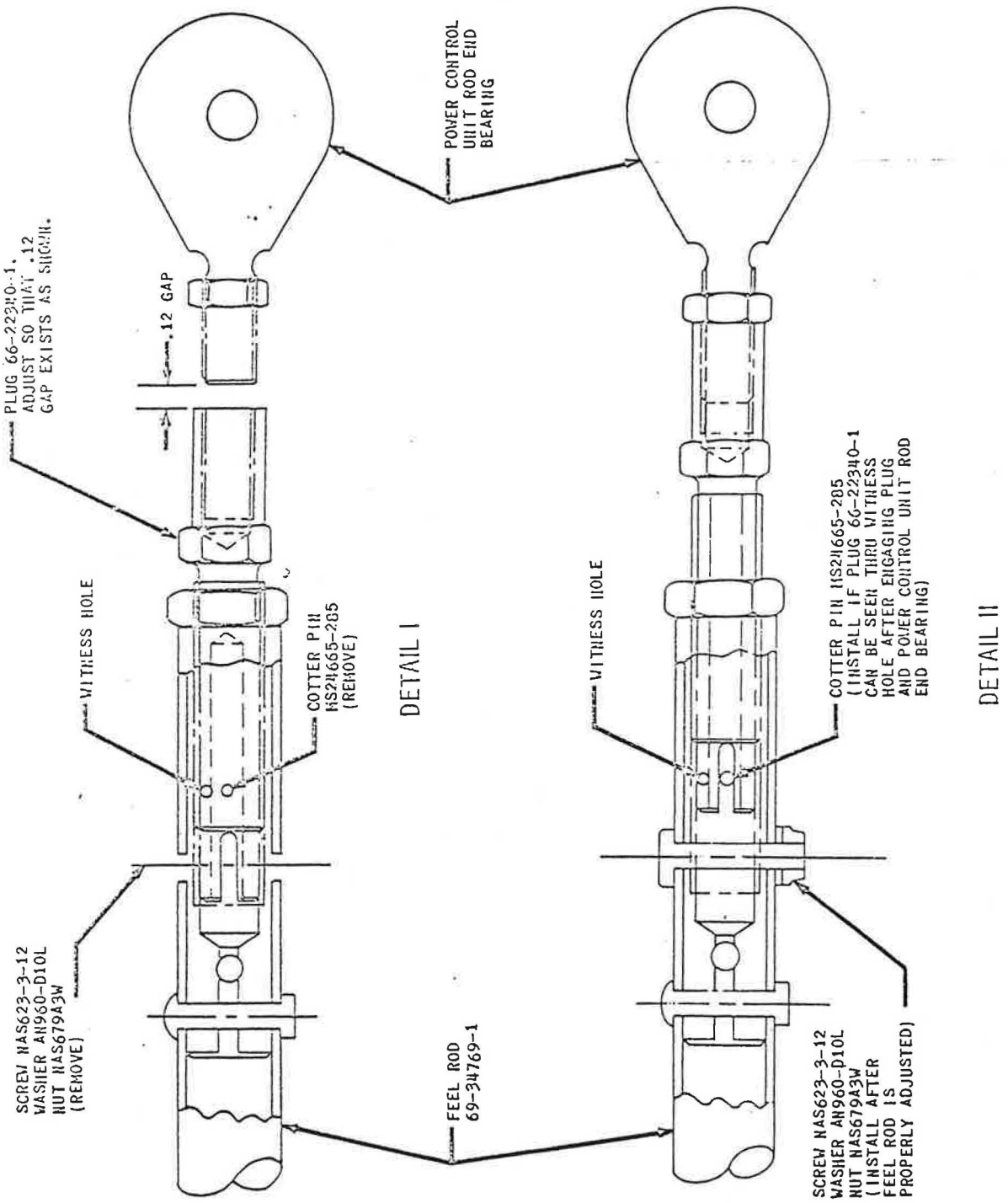
(c) Remove rig pin No. 10 and lockwire turnbuckle.

(5) With rig pin No. 3 installed check that input arm is 2.40 (± 0.02) inches from overtravel stop, by measuring from flat surface on aft side of input arm to stop. If required adjust input rod to obtain dimension. Tighten checknut.



Rudder Aft Control System Adjustment
Figure 205

S



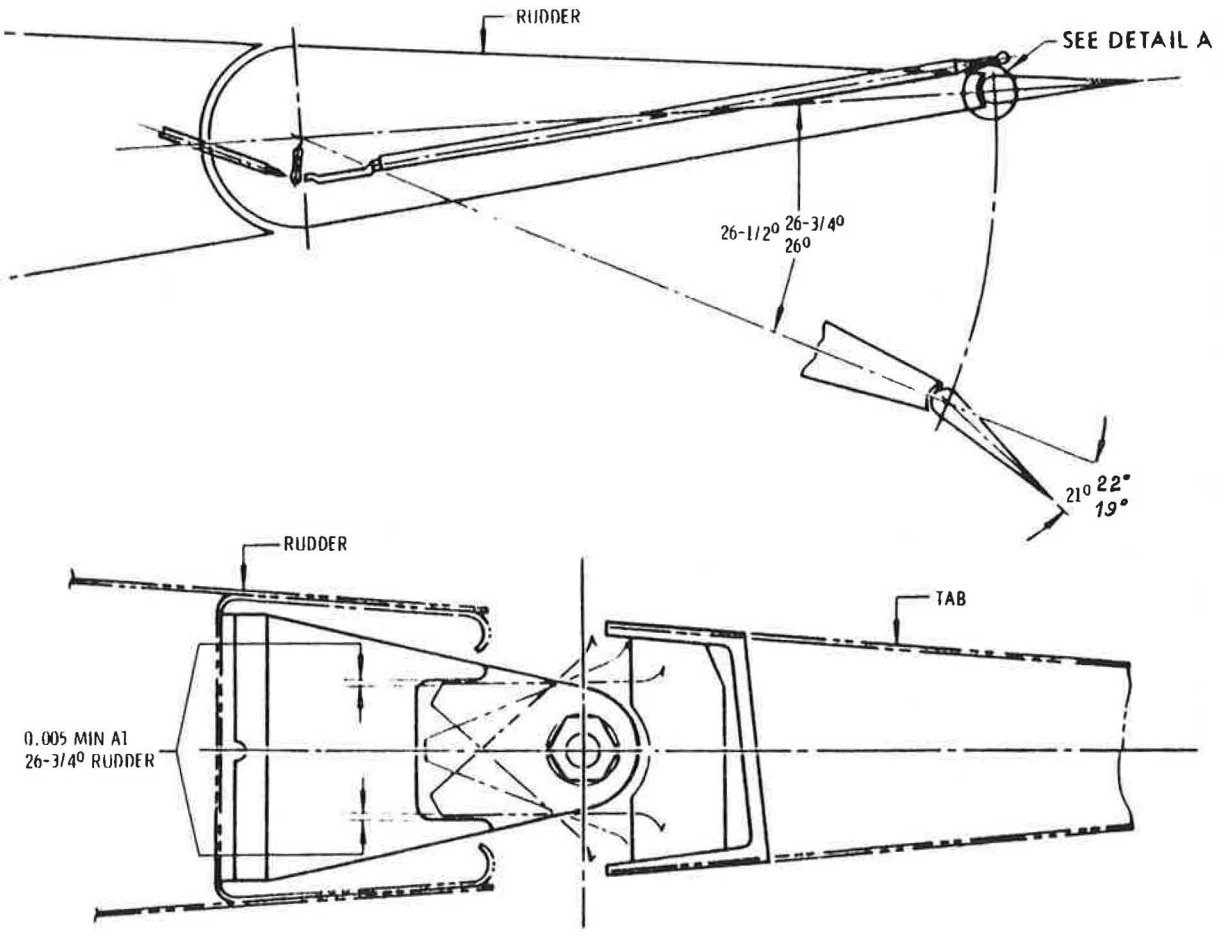
FEEL ROD LENGTH ADJUSTMENT

Figure 205A

S

(6) Deleted

SB. 2102



SB. 2102 DETAIL A (6-7161-4-1519, 17.6.66)

(7) **If a replacement feel rod is being installed:**

(a) Check that feel unit is in detent position.

(b) Install rig pins No. 3 and No. 9. (See figure 205.)

(c) Place rudder and tab in neutral.

(d) Attach feel rod to feel unit, but do not connect feel rod to power unit.

(e) Adjust plug in end of feel rod until gap of approximately 0.12 inch exists between end of plug and rod end bearing on the power control unit linkage.

(f) Move rudder tab until plug and rod end can be engaged. Engage 15 turns.

(g) Check feel rod adjustment.

(8) Check feel rod adjustment.

(a) Check that rig pins No. 3 and No. 9 are installed.

(b) Pressurize auxiliary hydraulic system and turn on rudder power.

WARNING: THE RUDDER CONTROL IS A FULLY POWERED HYDRAULIC SYSTEM WHEN OPERATED IN THE POWER MODE. KEEP ALL PERSONNEL AWAY FROM MOVING COMPONENTS OF THE RUDDER AND RUDDER CONTROL SYSTEM WHEN RUDDER POWER IS ON.

(c) Allow rudder to come to rest and check that rudder is faired within ± 0.06 inch.

1) If rudder alignment is satisfactory and feel rod has not been replaced:

a) Remove rig pin No. 9.

b) Check rudder tab alignment per paragraph (10).

2) If rudder alignment is satisfactory and feel rod has been replaced:

a) Install cotter pin.

NOTE: Plug must cover witness hole, and not be turned more than ± 1/8 turn to admit cotter pin, otherwise feel rod must be readjusted per steps (9)(c) through (9)(h).

b) Tighten check nuts on feel rod.

c) Remove rig pin No. 9.

d) With power on readjust and connect input rod until rig pin No. 3 can easily be removed. Leave rig pin No. 3 in place.

e) Tighten input rod locknut, and safety all bolts.

f) Check rudder tab alignment per paragraph (10).

3) If rudder alignment is not satisfactory, adjust feel rod per paragraph (9).

(9) Adjust feel rod.

(a) Remove cotter pin from feel rod if installed. Disconnect input rod from power unit. Adjust plug until rudder is faired within ± 0.06 inch.

(b) Install cotter pin if plug covers witness hole in feel rod, and was not turned more than ± 1/8 turn to admit the pin.

(c) If plug does not cover witness hole turn off power and back plug out of rod end until 0.12 inch gap exists between end of plug and rod end. Increase gap sufficiently to make plug cover witness hole when plug is reconnected and adjusted to fair rudder.

(d) If plug must be turned more than ± 1/8 turn to admit cotter pin turn off power and decrease the 0.12 inch gap between end of plug and rod end.

(e) Move tab until plug and rod end can be engaged. Engage 15 turns.

(f) Turn on rudder power and allow rudder to come to rest.

(g) Adjust feel rod plug until rudder is faired within ± 0.06 inch.

(h) If plug covers witness hole, install cotter pin. If not repeat steps (c) through (g).

(i) Tighten check nuts on feel rod.

(j) Remove rig pin No. 9.

(k) With power on readjust and connect input rod until rig pin No. 3 can easily be removed. Leave rig pin No. 3 in place.

(l) Tighten the input rod locknut and safety all bolts.

(m) Check the rudder tab alignment per paragraph (10).

(10) Install rig pin No. 6 in power trim drum. (See 27-18-0, figure 203.)

(11) With power on and rig pin No. 3 installed, check that rudder tab is aligned with rudder within 0.125 inch. If not:

(a) Note amount of adjustment required, and perform the following:

1) Turn hydraulic power off.

WARNING: TURN HYDRAULIC POWER OFF WHILE ADJUSTING TAB ROD ASSEMBLY.

2) Disconnect tab rod at tab horn and adjust rod end as required.

3) Connect tab rod and tighten check nut.

4) Turn rudder system hydraulic power on and check tab to rudder alignment.

(12) Check tab clearance.

(a) Remove rig pin No. 3 and turn rudder power on. The rudder shall align within 0.06 inch of the neutral position. If alignment is not within 0.06 inch, readjust feel rod per 4.C. (8).

WARNING: CHECK THAT ALL CONTROL RODS ARE PROPERLY INSTALLED AND REMOVE ALL RIGGING PINS AND CLAMPS BEFORE TESTING THE RUDDER CONTROL SYSTEM.

(b) Turn rudder power on and check that tab is aligned with rudder trailing edge within 0.125 inch. If tab is not aligned within 0.125 inch turn rudder power off and readjust tab rod per 4.C. (10).

(c) With rudder power on slowly push on left rudder pedal until the aft rudder stops are reached. The rudder shall be 26-1/2° (+1/4°/-1/2°) left and the tab shall be 21° (+1°,-2°) left. (See figure 206.) Check for 0.005 minimum clearance shown on detail A. Repeat with right rudder.

(d) Turn rudder power off.

(13) Remove rig pin number 6.

(14) Test rudder control system per paragraph D.

(15) Replace all access panels and doors.

D. Test Rudder Control System

(1) Depressurize Auxiliary Hydraulic System

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN. WHEN POWER ON TESTS ARE REQUIRED, PERSONNEL AND EQUIPMENT MUST BE KEPT CLEAR OF RUDDER.

(2) Test Rudder Pedal Adjustment Mechanism.

(a) Simultaneously apply a 2.5 pound maximum load to each of the captain's rudder pedals.

(b) Rotate rudder pedal adjustment crank to full travel, both fore and aft.

(c) Check that rudder pedals move 2.97 (± 0.13) inches forward of neutral and 2.97 (± 0.13) inches aft of neutral with no chatter or binding.

(d) Rotate crank to position pedals to neutral.

(e) Push right pedal to maximum obtainable travel.

(f) Check that right pedal moves 4.20 (± 0.13) inches forward of neutral.

(g) Check that left pedal moves 4.20 (± 0.13) inches aft of neutral.

(h) Repeat steps (e), (f) and (g) for left pedal.

(i) Repeat steps (a) through (h) for the first officer's rudder pedals.

(3) Test Rudder Travel with Power Off

CAUTION: DUE TO HAZARDS TO PERSONNEL PRECAUTIONS SHOULD BE TAKEN TO PREVENT INADVERTENT APPLICATION OF HYDRAULIC POWER DURING OPERATION IN THE MANUAL MODE. LEAVE RUDDER POWER OFF.

NOTE: All power off tests shall be conducted with the rudder trim knob at neutral, the Q system depressurized, the hydraulic pressure off but normally pressurized portions of the system lubricated with Skydrol films and all rig pins removed. All trailing edge rudder loads to be measured at lower aft corner.

NOTE: The rudder power control unit linkage plug detent (figure 205) may separate if heavy, sudden pedal application is made. This is normal; therefore the power control unit should not be suspected as defective unless separation occurs with slow, steady pedal application also.

(a) Hold rudder trailing edge at neutral. Push right rudder pedal slowly forward until the rudder tab stops are contacted. The tab shall be at 21-1/2° (+1°/-0°) to the left.

(b) Repeat (a) for the left rudder pedal. The tab shall be right and the measurement shall be of equal magnitude as in (a) above.

(c) Slowly push the right rudder pedal forward until the tab stops are contacted and the rudder begins to move to the right. Continue to push slowly on right rudder pedals and manually assist at the rudder trailing edge until the rudder reaches 13 degrees right. The forward quadrant stops shall not be contacted and the tab shall be 19 degrees or more to the left.

(d) Push to the right on the trailing edge of the rudder until the power unit stops are contacted. The rudder shall be right 26-1/2° (+1/4°, -3/4°).

CAUTION: DO NOT LOAD THE TRAILING EDGE OF THE RUDDER WITH MORE THAN 45 LB FORCE.

NOTE: The rudder balance panels may be deflected against the internal balance bay structure as required to meet the stop position. Cycle system several times to be sure fluid in rudder power unit is not limiting travel.

(e) Repeat (c) and (d) for left trailing edge motion. The rudder shall be left, the tab shall be right, and the measurements shall be of equal magnitude as in (c) and (d) above.

(4) Test Rudder Travel with Power On.

NOTE: All power on tests shall be conducted with normal system pressure (3000 psi). Return pressures shall be as held by the airplane system reservoirs. However, it is not necessary to pressurize the utility reservoir. Q dynamic air pressures when used shall be limited to 3.00 psig maximum under all conditions. The rudder trim knob shall be at neutral. The yaw damper shall be off. The system shall have been cycled a minimum of 200 times after installation, before conducting the power mode checks.

(a) Turn rudder power on.

(b) With no Q pressure, push right rudder pedal to maximum available travel and abruptly release. Record position of rudder trailing edge. Push left rudder pedal to maximum available travel and abruptly release. Record the position of the rudder trailing edge. The total distance between the recorded positions shall not exceed 0.25 inches. The midpoint between the recorded positions shall not be more than 0.25 inches from the rigged rudder neutral for manual mode.

(c) Plug drain hole in ram air tube. Apply 2.90 (± 0.10) psig to the ram air pressure port on the leading edge of the fin. Remove the pressure source. After 30 seconds, the trapped air pressure shall be 1 psig minimum. Remove drain hole plug.

IAD [illegible] 17 OCT. 1967

(d) Apply 0.47 (± 0.02) psig to the Q intake port.

(e) Push on the right rudder pedal until the rudder stops moving. The rudder shall be 26-1/2 (+1/4/-1/2) degrees to the right. The rudder tab shall be 21 (+1/-2) degrees to the right. The pedal force required to hold this position shall be 72 (+8/-12) pounds.

(f) Repeat (d) and (e) for the left rudder pedal. The rudder shall be left, the tab shall be left and the measurements shall be of equal magnitude as in (d) and (e) above.

(g) Apply 0.83 (± 0.04) psig to the Q intake port.

(h) Push on the right pedal until the rudder reaches 17 degrees right. The tab shall be to the right. The pedal force required to hold this position shall be 100 (+10/-20) pounds.

(i) Repeat (g) and (h) for left pedal. The rudder shall be left, the tab shall be left and the measurements shall be of equal magnitude as in (g) and (h) above.

(j) Test Q Inlet Heater.

1) Energize the applicable Essential Bus Panel and the Q inlet heater circuit breaker.

2) Check that the Q inlet heat indicator light is off.

3) Position Q inlet heat heater switch at pilot's overhead panel to ON.

4) Check that heater heats.

5) Check that indicator light is off.

6) Open "Q" inlet heater circuit breaker on panel P1.

7) Check that warning light at pilot's overhead panel is on.

8) Turn heater switch off.

9) Check that warning light is off.

10) Close "Q" inlet heater circuit breaker on Panel P1.

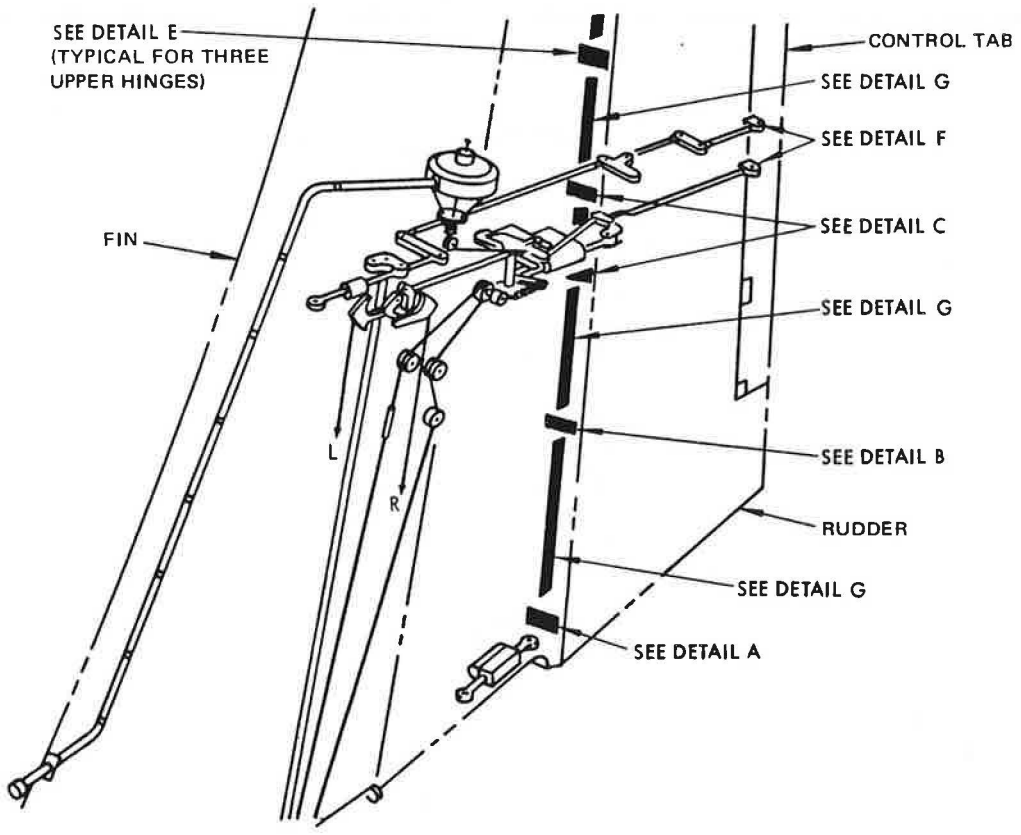
(5) De-energize the Essential Bus Panel after test.

(6) Close all access doors and panels. See Chapter 12, "Access Doors and Panels."

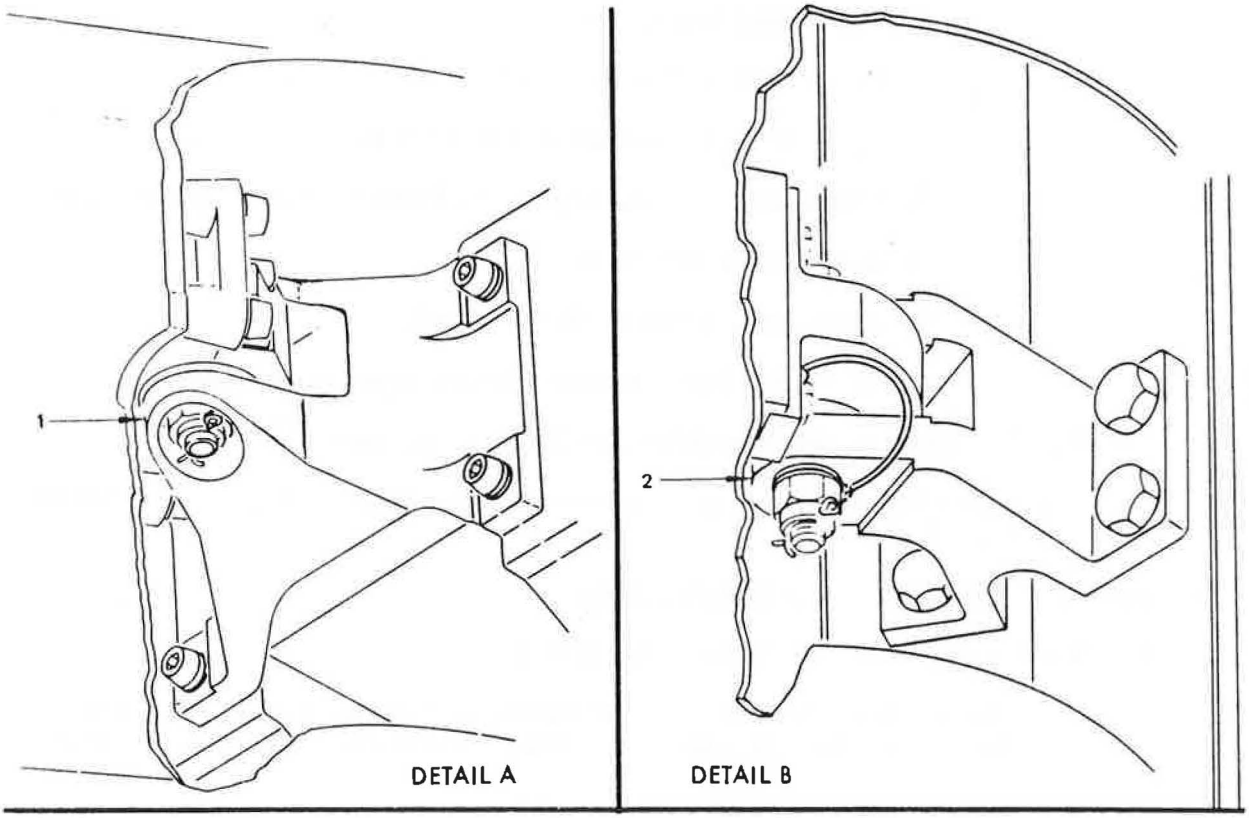
5. Inspection/Check Rudder Control System

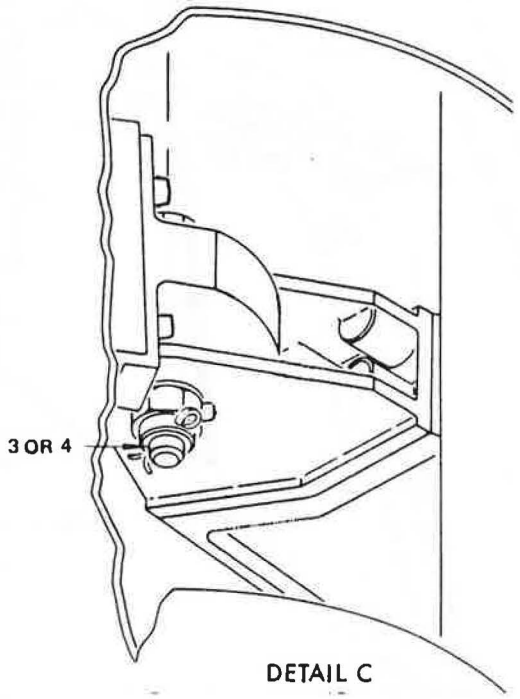
A. Check Rudder Control System Wear Limits

(1) Check allowable service wear limits for mating parts which are subject to wear in the rudder control system. (See figure 207.)

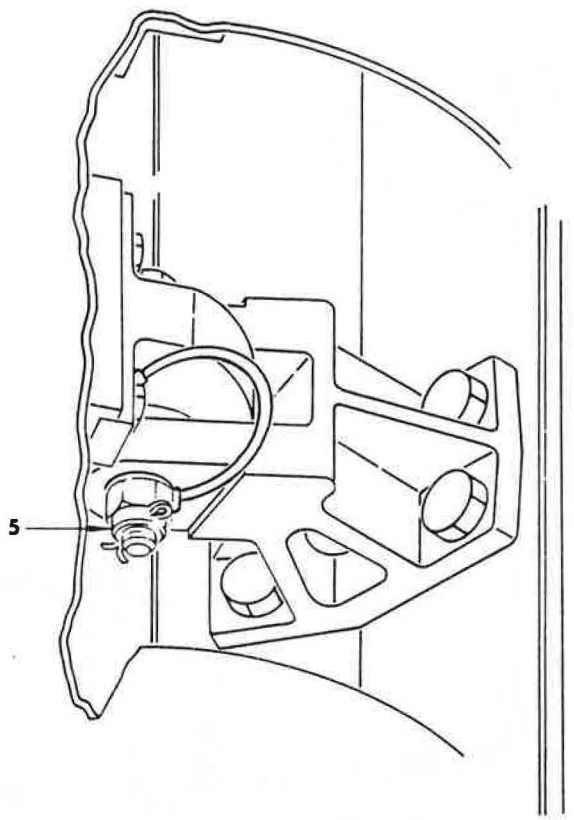


Rudder Control System Wear Limits
Figure 207 (Sheet 1)

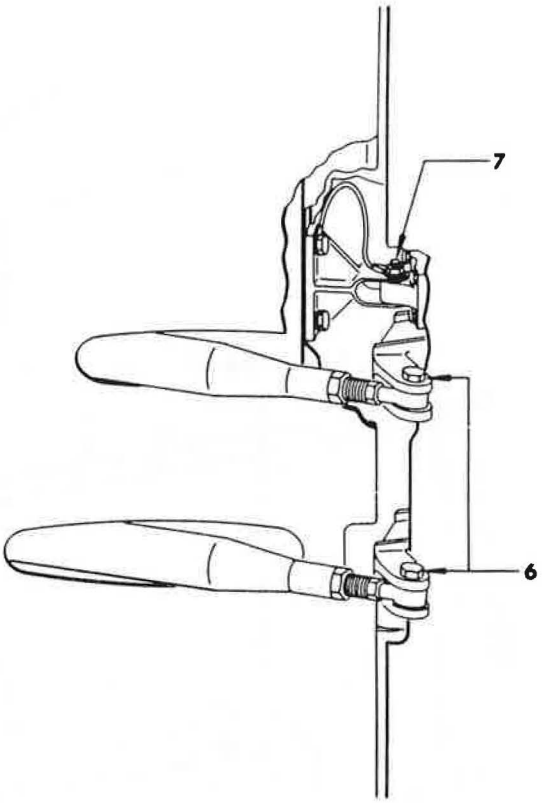




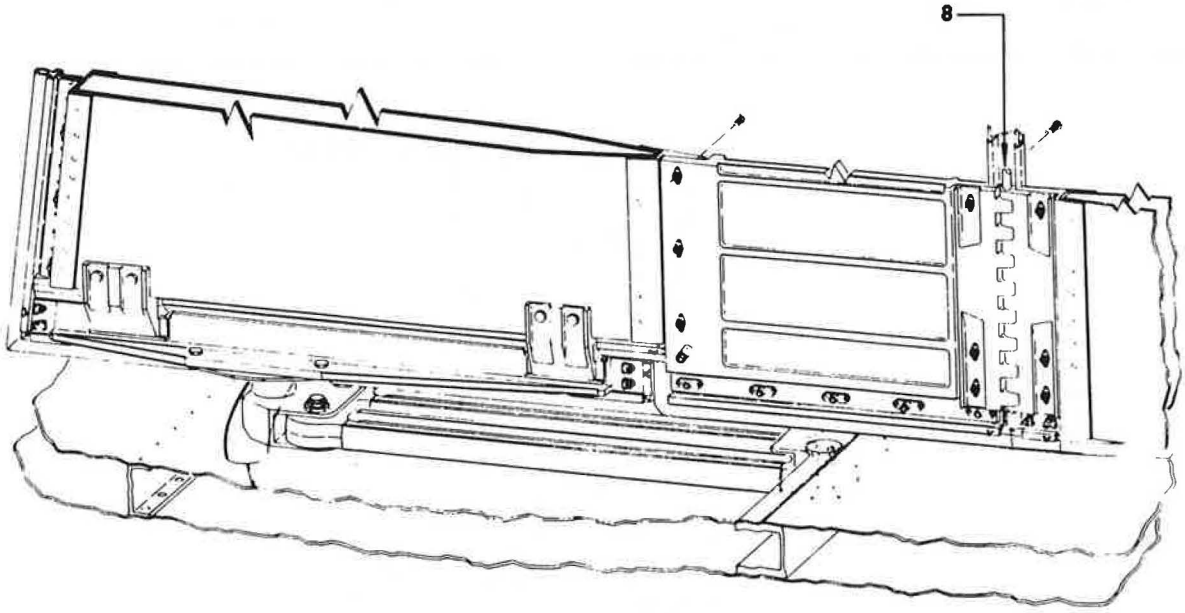
Rudder Control System Wear Limits
Figure 207 (Sheet 2)



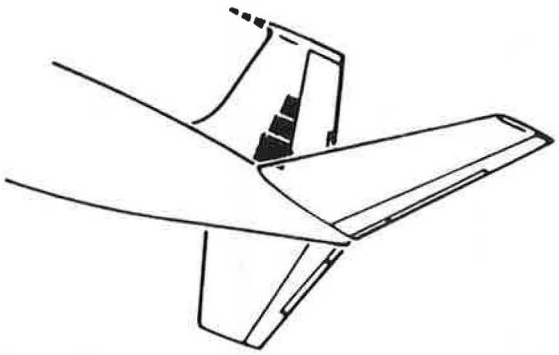
DETAIL E

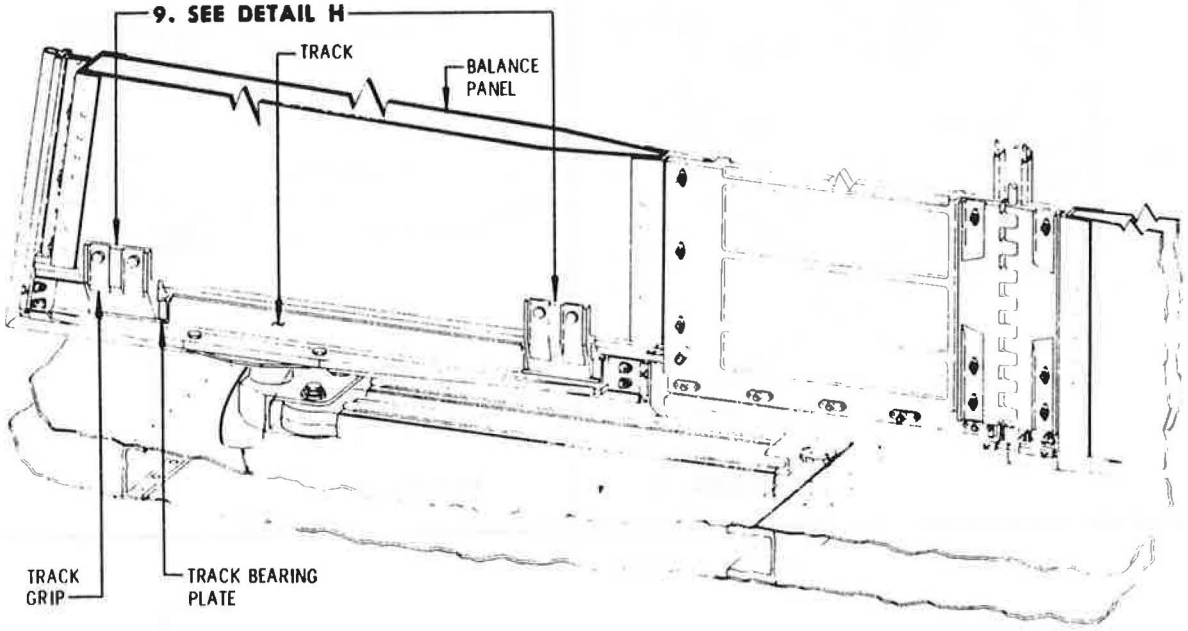


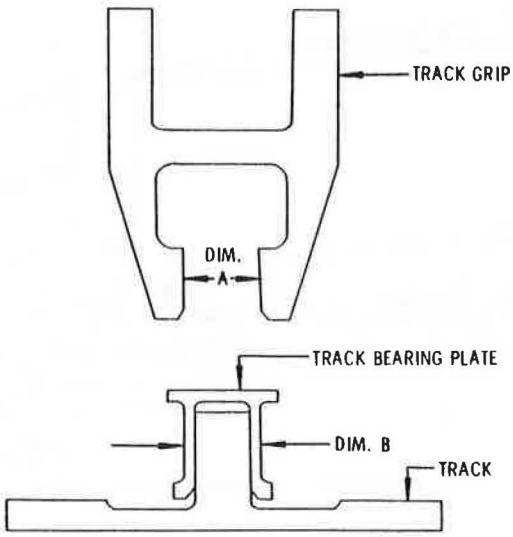
DETAIL F



DETAIL G







DETAIL H

Rudder Control System Wear Limits
Figure 207 (Sheet 4)

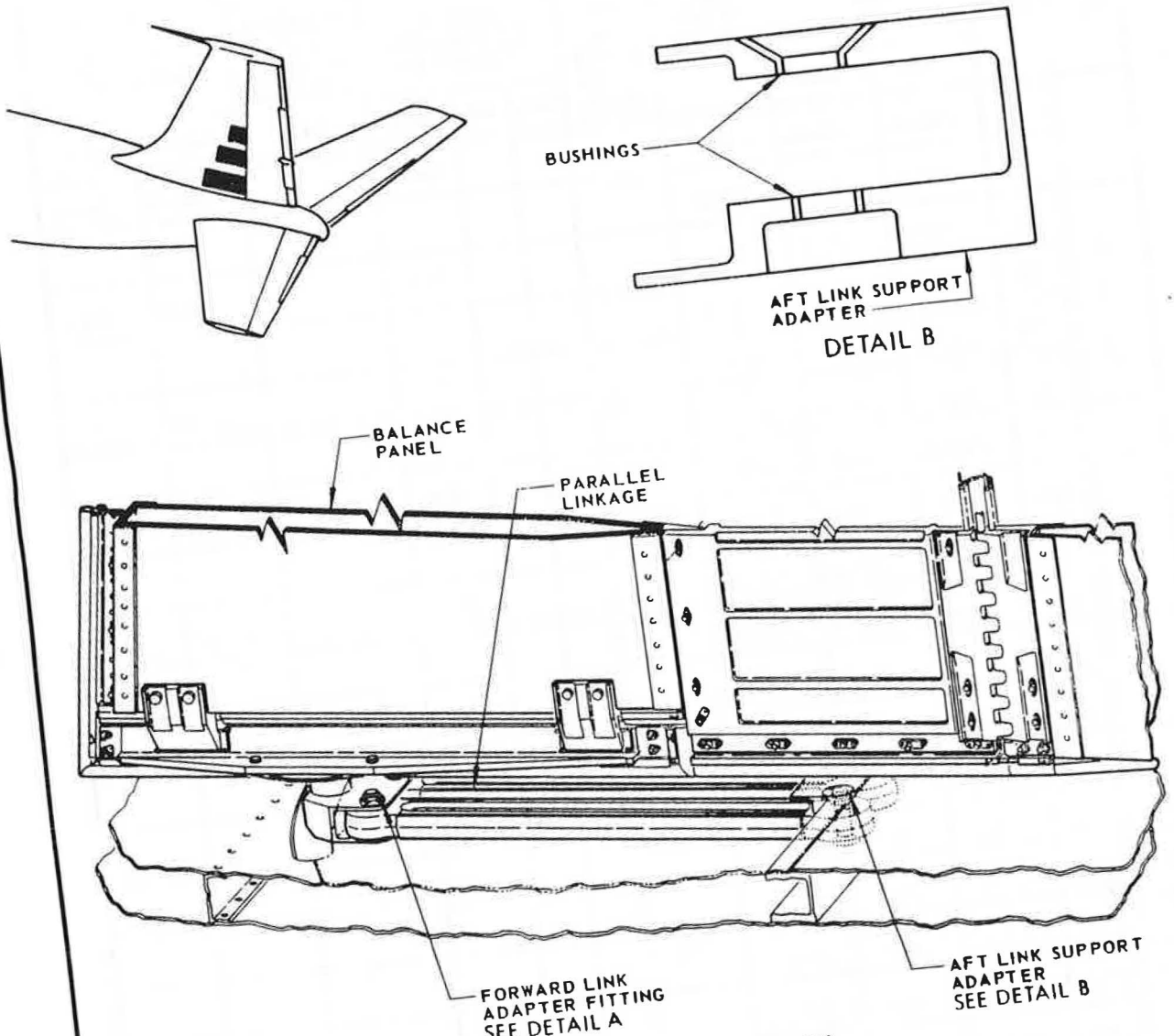
INDEX NO.	DIM.	DESIGN LIMITS DIAMETER OR WIDTH MIN.	DESIGN LIMITS DIAMETER OR WIDTH MAX.	WEAR LIMITS MAX. WEAR DIM.	WEAR LIMITS MAX. DIAM. OR WIDTH CLEARANCE	REWORK LIMITS BUSHING OR PLATING PERMITTED YES	BUSHING OR PLATING PERMITTED NO	BUSHING OR PLATING PERMITTED MTL.	OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE MIN.	BUSHING INTERFERENCE MAX.
1	ID	.5611	.5626	.5653	.0037			[1]		.0003	.0020
	OD	.5596	.5616	.5592							
2	ID	.3112	.3122	.3144	.0027			[1]		.0002	.0013
	OD	.3108	.3117	.3104							
3	ID	.4986	.5001	.5026	.0035			[1]		.0002	.0017
	OD	.4985	.4995	.4978							
4	ID	.6238	.6258	.6280	.0040			[1]		.0002	.0020
	OD	.6230	.6240	.6226							
5	ID	.3112	.3122	.3144	.0027			[3]		.0002	.0013
	OD	.3108	.3117	.3104							
6	ID	.2487	.2497	.2513	.0018			[3]		.0002	.0013
	OD	.2485	.2495	.2486							
7	ID	.2487	.2497	.2517	.0025			[3]		.0002	.0013
	OD	.2483	.2492	.2479							
[3] 8	HOLE	.183	.188	.215	.045						
	PIN	.178	.180	.170							
[4] 8	HOLE	.183	.188	.205	.030						
	PIN	.178	.180	.175							
9	A	.697	.700	.735	.078						
	B	.692	.695	.657							

[1] NAS 537 CAD PLATE STEEL BUSHING REAM HOLE TO SIZE ON INSTL.

[3] NAS 537 CAD PLATE BRONZE BUSHING REAM HOLE TO SIZE ON INSTL.

[3] EACH END - 1/8 HINGE LENGTH

[4] CENTER 3/4 OF HINGE LENGTH



Balance Bay Parallel Linkage Repair
Figure 208

B. Examine balance bay parallel linkage.

(1) Check linkage attach holes for elongation.

(a) If excessive wear of the parallel linkage attach holes (figure 208) is suspected make the following check: With rudder held firmly in place, measure the lateral play at the forward edge of the balance panel track assembly. If this is 3/8 inch or more total travel, the parallel linkage attach holes have elongated. The fittings should then be bushed or replaced.

(2) Bush forward linkage attach holes. (See drawing 1-6389)

NOTE: Bushing of the forward link adapter fitting holes is not advised because of the thinness of the webs. If the holes are elongated replacement of the link adapter fitting is recommended. However, if bushing of the link adapter fitting holes is essential, this may be done as follows:

(a) Ream holes to 0.600 inch diameter maximum.

(b) Fabricate bushings as shown in detail A of figure 208 from 17-4PH stainless steel. Heat-treat to 180-200 KSI. Cadmium plate outside diameter 0.0003 - 0.0005 inch thick.

(c) Install bushings with 0.0010 - 0.0015 inch interference fit.

(d) Ream bushings to 0.500 - 0.501 inch diameter.

(e) Check that installed bolt fits flush to -0.010 inch below bushing.

(3) Bush aft linkage attach holes.

(a) Ream holes to 0.660 inch diameter maximum.

(b) Fabricate bushings as shown in detail B of figure 208 from 2024-T3 aluminum with 0.060 minimum wall thickness.

(c) Install bushings with 0.0010 - 0.0015 inch interference fit and wet primer, BMS 10-11.

(d) Ream bushings to 0.500 - 0.501 inch diameter.

(e) Countersink one bushing so that bolt fits flush to 0.01 inch below surrounding skin surface.

RUDDER - MAINTENANCE PRACTICES

1. Removal/Installation Rudder

A. General

(1) The rudder may be removed from the fin by first lowering the fin to horizontal position or by removing the fin and rudder from the airplane as a unit. The rudder should always be removed with the fin in the horizontal position. If the fin and rudder are removed from the airplane as a unit, it should be supported at a convenient work level. If new rudder is to be installed on fin, rebalancing is not required. When repairs are made on the rudder, the rudder should be balanced independently by component balancing.

B. Special Tools and Equipment

(1) Rudder Hoisting Sling Assembly - F70021 or equivalent

(2) Torque wrench - 0 to 200 pound-inches

(3) Deleted

(4) Methyl Ethyl Ketone, TT-M-261

(5) Sealant BMS 5-16

(6) Corrosion Preventive Compound, MIL-C-11796, Grade 3

(7) Cleaning Solvent, PS 661

C. Remove Rudder

(1) Remove all balance bay access panels 1512, 1513, 1514, 1515 and 1525. See Chapter 12, Access Doors and Panels.

(2) Remove fin and rudder from fuselage. See Chapter 55, Removal/Installation Vertical Fin.

(3) Disconnect tab pushrod from tab antibalance crank. (See figure 204.)

(4) Disconnect power control unit from rudder structure.

NOTE: Support all hydraulic components while detached from rudder.

(5) Disconnect the trim control rod from manual trim ratio crank.

(6) Detach rudder flutter damper from rudder. (See figure 203.)

(7) Remove forward piano hinge mounting bolts to detach rudder from balance panel extensions. (See figure 202.)

(8) Remove seal retainer screw and one end of hinge seal.

(9) Remove rudder hinge access door 1547 to 1554, 1537 and 1565. See Access Doors and Panels, Chapter 12.

(10) Detach rudder hinges and rudder thrust hinge from fin by removing forward mounting bolts. (See figure 201.)

(11) Remove rudder by moving rudder aft until all rudder structure clears fin.

NOTE: If fin is folded use sling.

D. Install Rudder

(1) With the fin removed from airplane and supported on ground, place rudder in position aft of fin and push rudder forward into balance bay.

CAUTION: ALIGN MATING PARTS AS RUDDER IS POSITIONED TO AVOID DAMAGE TO COMPONENTS.

(2) Attach rudder to fin by installing forward rudder hinge mounting bolts. (See figure 201.) Torque bolts per 27-17-41, Rudder Hinge Fittings - Maintenance Practices.

(3) Position rudder to faired position with top of fin trailing edge.

(4) Attach rudder to balance panel extension by installing forward piano hinge mounting bolts. (See figure 202.)

NOTE: Edge of hinge seal must be completely contained in groove as bolts are tightened.

(5) Slide end of hinge seal under seal retainer and align holes in seal with holes in retainers and secure seal retainer with attaching screws. (See figure 202.)

(6) Remove old sealant with methyl ethyl ketone, TT-M-261. Scrape off sealant if necessary.

(7) Fill gaps between retainer and rudder nose sections with sealant BMS 5-16.

(8) Clean bolt heads with cleaning solvent.

(9) Check horizontal rudder friction. See Adjustment/Test Rudder.

(10) If balance bay access panels are magnesium:

(a) Remove old corrosion preventive compound from access panels and mounting screws with cleaning solvent and clean cloth.

(b) Apply corrosion preventive compound to access panel faying surfaces and under access panels mounting screws.

(11) Install balance bay access panels.

(12) Install rudder flutter damper. (See figure 203.)

(13) Install power control unit attachment bolt. (See figure 204.)

(14) Attach tab push rod to tab antibalance crank.

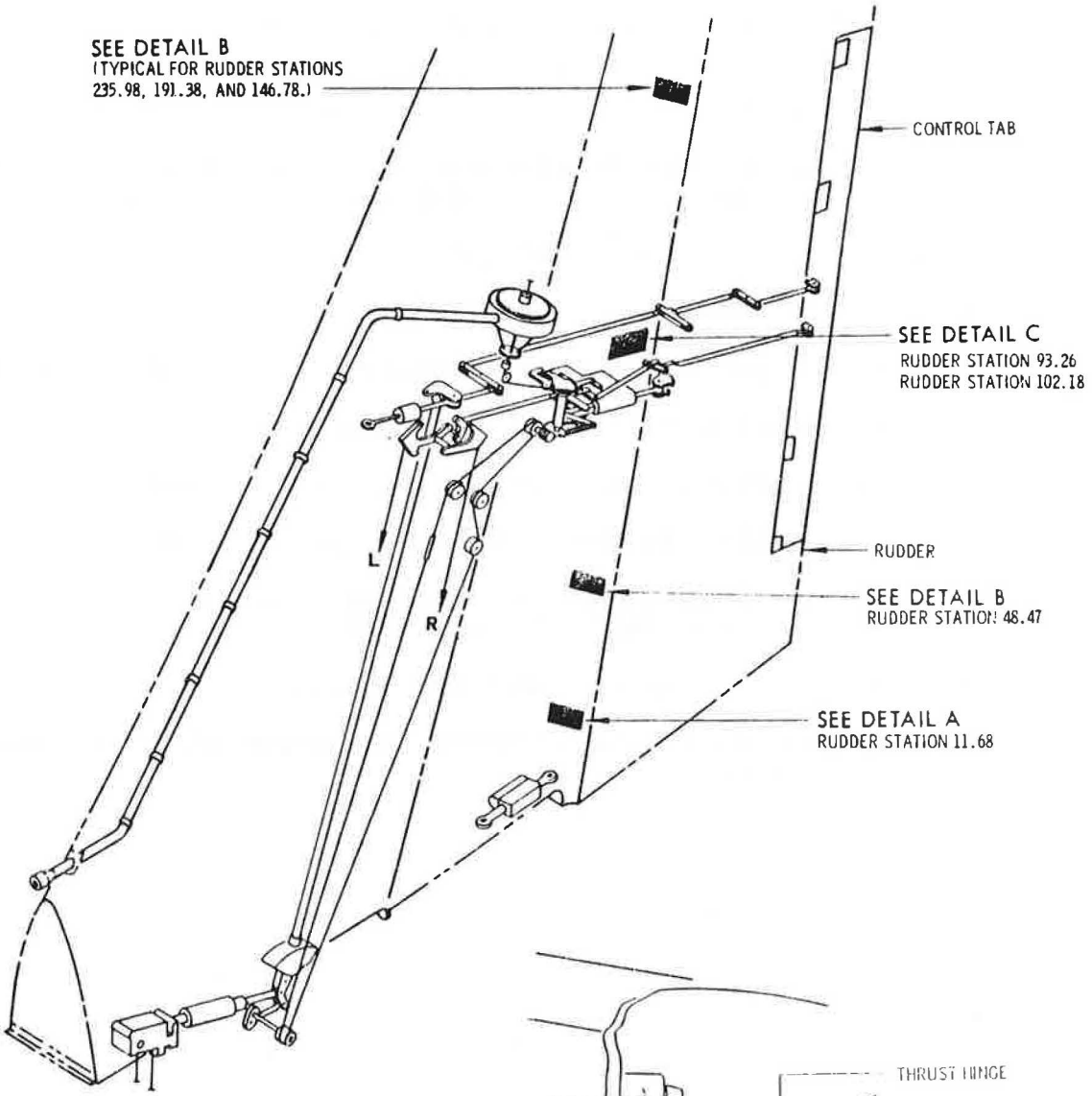
(15) Install rudder trim control rod to manual trim ratio crank.

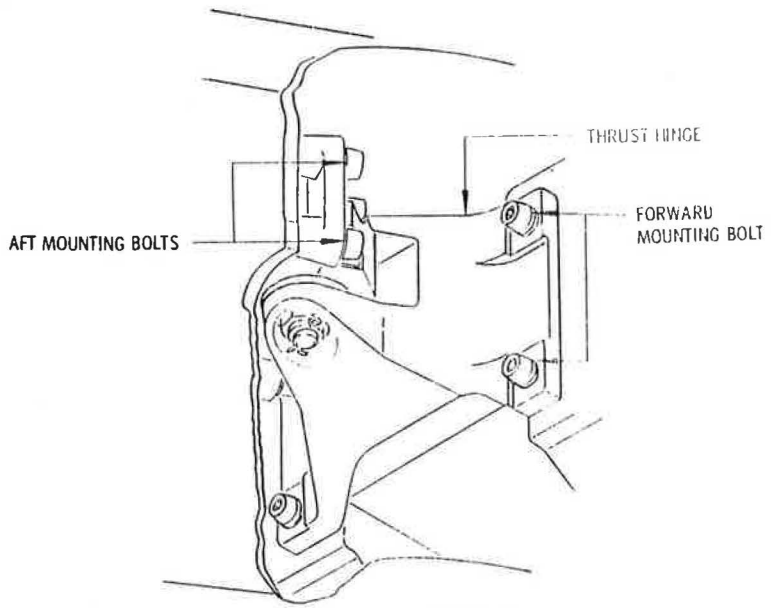
(16) Install fin. See Chapter 55, Removal/Installation Vertical Fin.

(17) Adjust and test rudder control system. See 27-17-0, Adjustment/Test Rudder Control System.

(18) Test rudder. See Adjustment/Test Rudder.

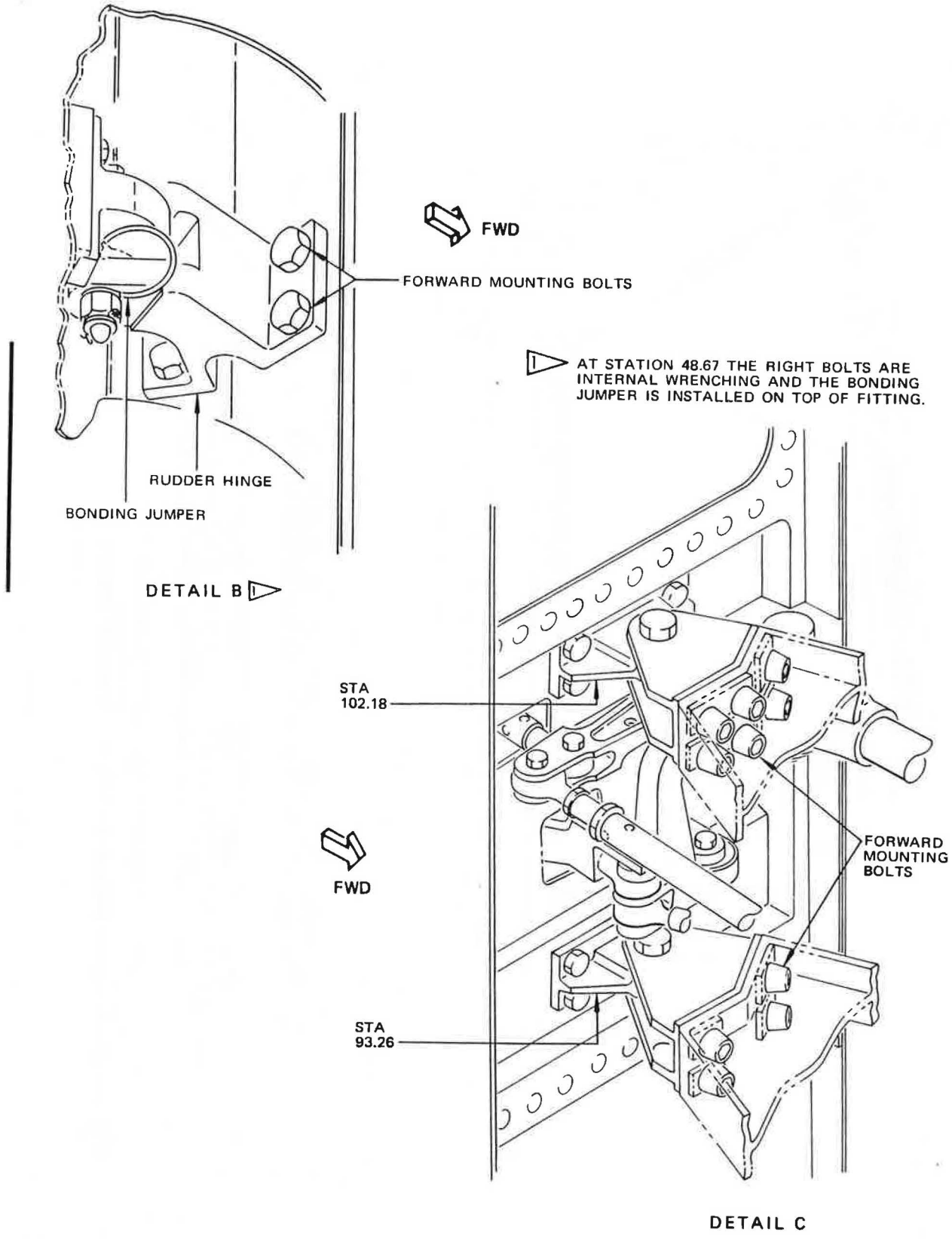
(19) Install Access Doors and Panels. See Chapter 12, Access Doors and Panels.

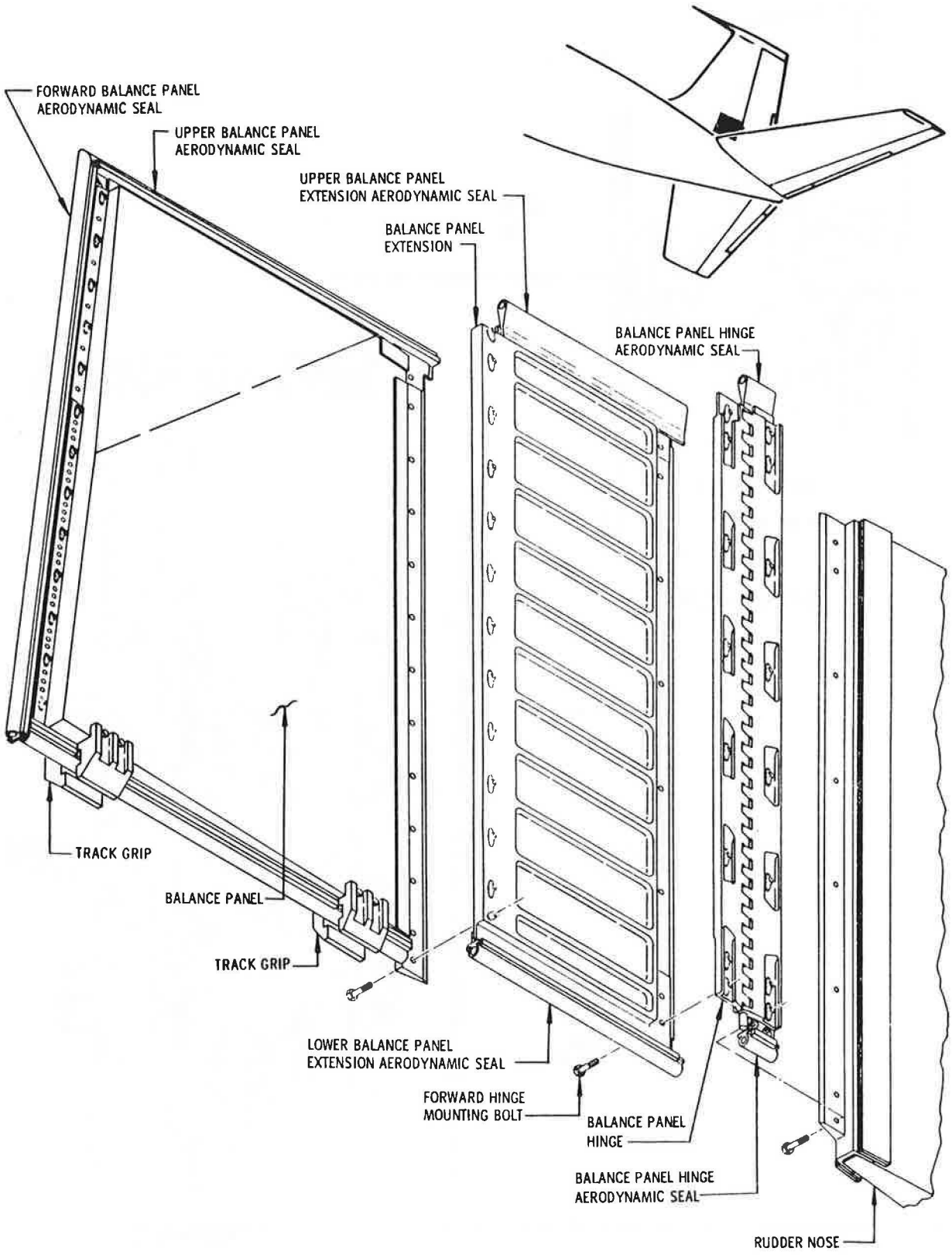




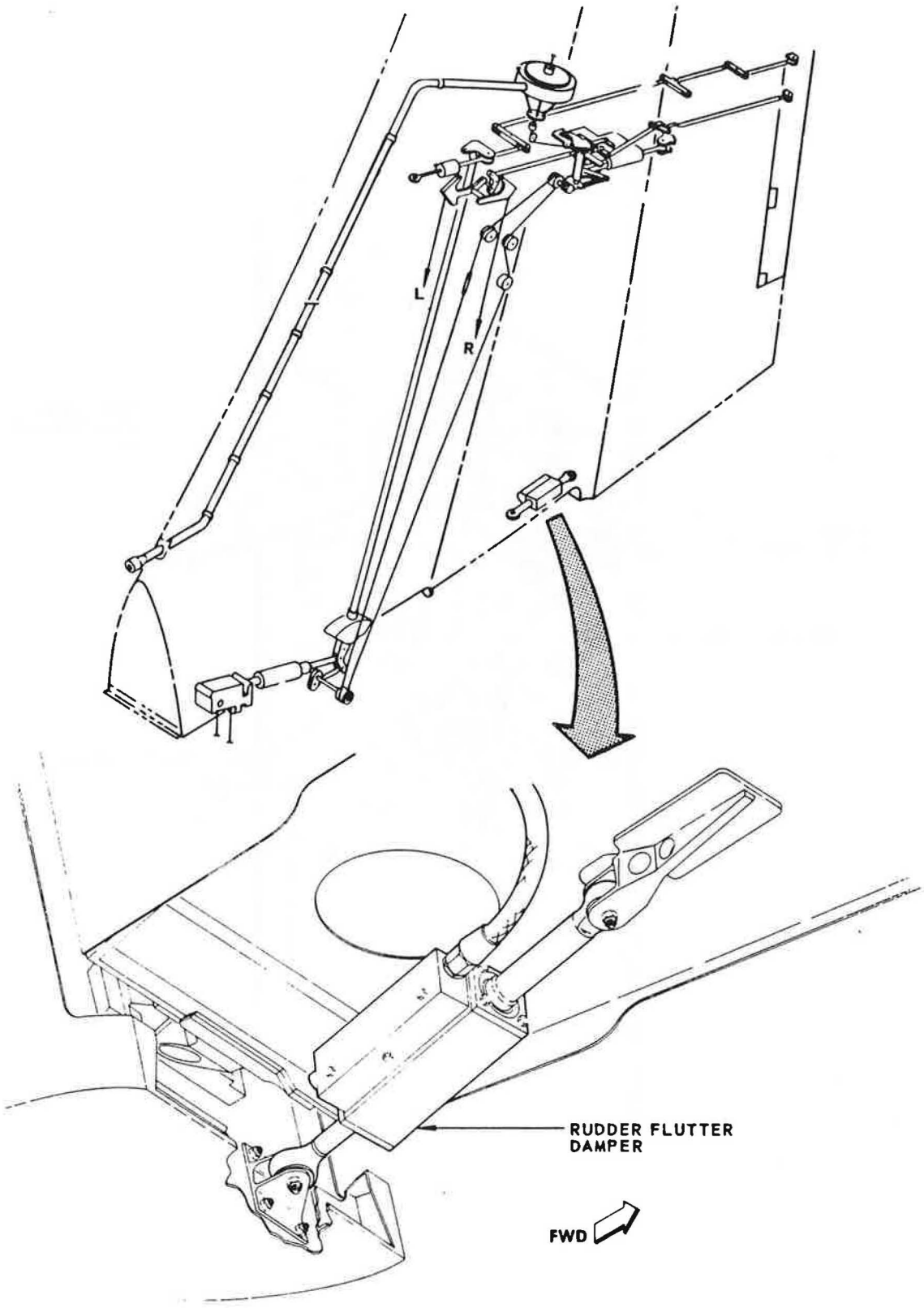
DETAIL A

Rudder Installation
Figure 201 (Sheet 1)

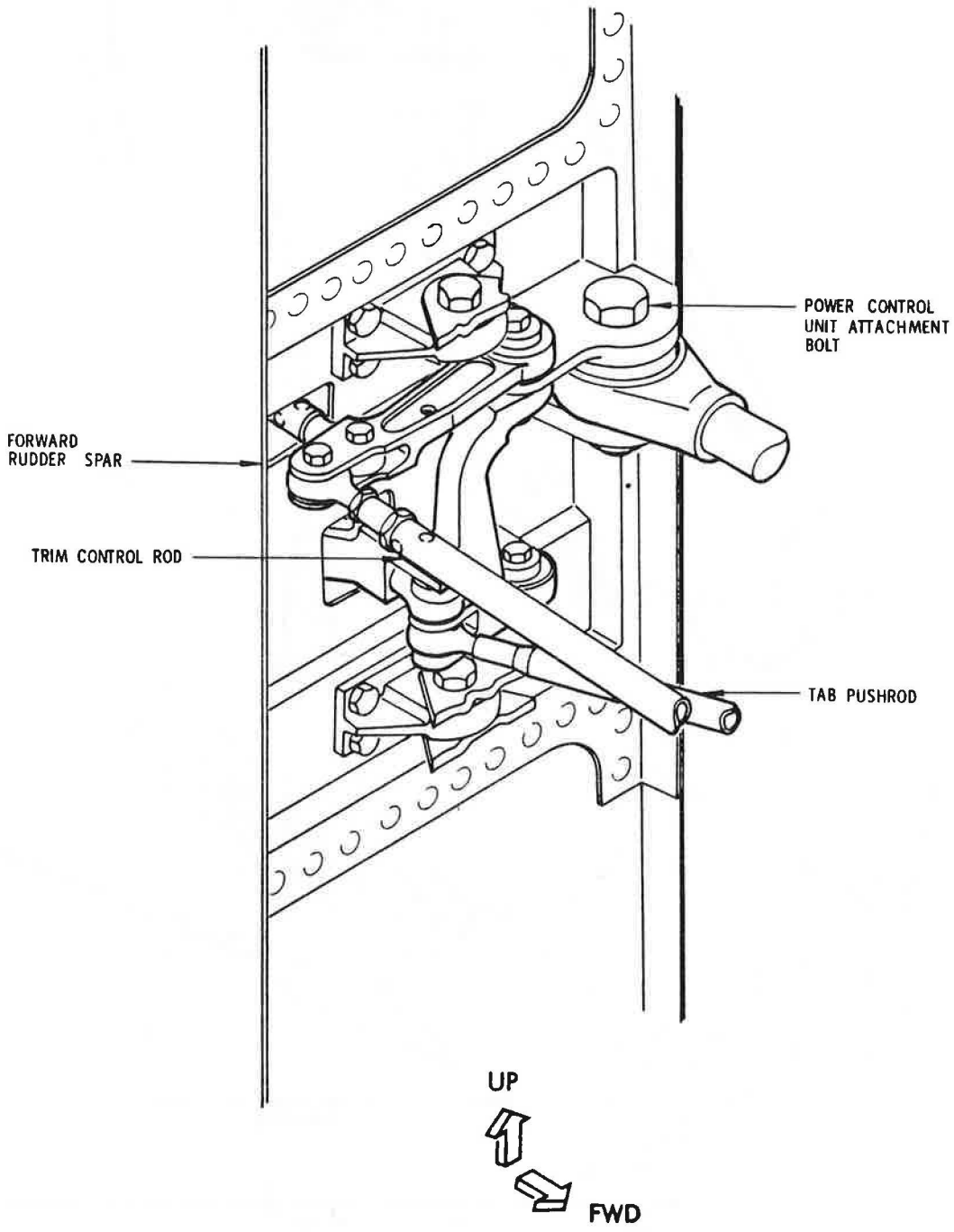

FWD
FORWARD MOUNTING BOLTS
1 AT STATION 48.67 THE RIGHT BOLTS ARE INTERNAL WRENCHING AND THE BONDING JUMPER IS INSTALLED ON TOP OF FITTING.
RUDDER HINGE
BONDING JUMPER
DETAIL B 1
STA 102.18
FWD
FORWARD MOUNTING BOLTS
STA 93.26
DETAIL C



Rudder and Balance Panel Extension Assembly
Figure 202



Rudder Flutter Damper and Power Control Unit Installation
Figure 203



Rudder Control Linkage
Figure 204

2. Adjustment/Test Rudder

A. General

(1) Friction test for rudder vertical and rudder horizontal is required when rudder is removed and installed. Vent gap and fin to rudder mismatch tests are not necessary when an interchangeable rudder is installed. Such tests are only required when misalignment is suspected as the source of troublesome operation of rudder.

B. Materials

(1) Aerodynamic Filler BMS 5-19, Type A

(2) Spring Scale - 0 to 25 pounds

C. Friction Test (Rudder Vertical)

(1) With the rudder balance seals properly adjusted, move rudder and control tab to neutral position.

(2) Check that the breakway force required to move the rudder from neutral position in either direction shall not exceed 6.0 pounds.

D. Friction Test (Rudder Horizontal)

(1) Fold fin to horizontal position. See Chapter 12, "Fold Fin."

(2) Remove access panel 1525. See Chapter 12, "Access Doors and Panels."

(3) Disconnect manual trim rod from manual trim ratio crank. (See figure 204.)

(4) Disconnect tab rod from tab antibalance schedule crank.

(5) Disconnect power control unit from rudder.

(6) Disconnect rudder flutter damper below fin. (See figure 203.)

(7) Move the rudder trailing edge down through neutral and up through neutral at a uniform rate. Minimum movement must be at least 3 degrees.

(a) Record forces required to push the rudder through neutral as positive (+). Record forces required to restrain the rudder from moving through neutral on its own as negative (-).

(b) Check friction, enter forces from (a) in the following table, and compute results:

Rudder Travel Direction	Force (lbs)	Mathematical Operation
Down Rudder	- - - - - - -	Add forces with like signs. Subtract forces with un-like signs.
Up Rudder	- - - - - - -	
Result	- - - - - - -	

Result shall be greater than 0 lbs but shall not exceed 10 lbs.

(8) Connect manual trim rod to manual trim ratio crank. (See figure 204.)

(9) Connect tab rod to tab antibalance schedule crank.

(10) Attach power control unit to rudder.

(11) Attach flutter damper to rudder. (See figure 203.)

(12) Raise fin. See Chapter 55, "Hoisting Fin."

(13) Install access doors and panels. See Chapter 12, "Access Doors and Panels."

E. Test Rudder Vent Gap

(1) Depressurize Auxiliary Hydraulic System

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(2) Position rudder to neutral.

(3) Measure actual vent gap "An" at three points per bay on each side of rudder at stations shown in figures 205 and 206.

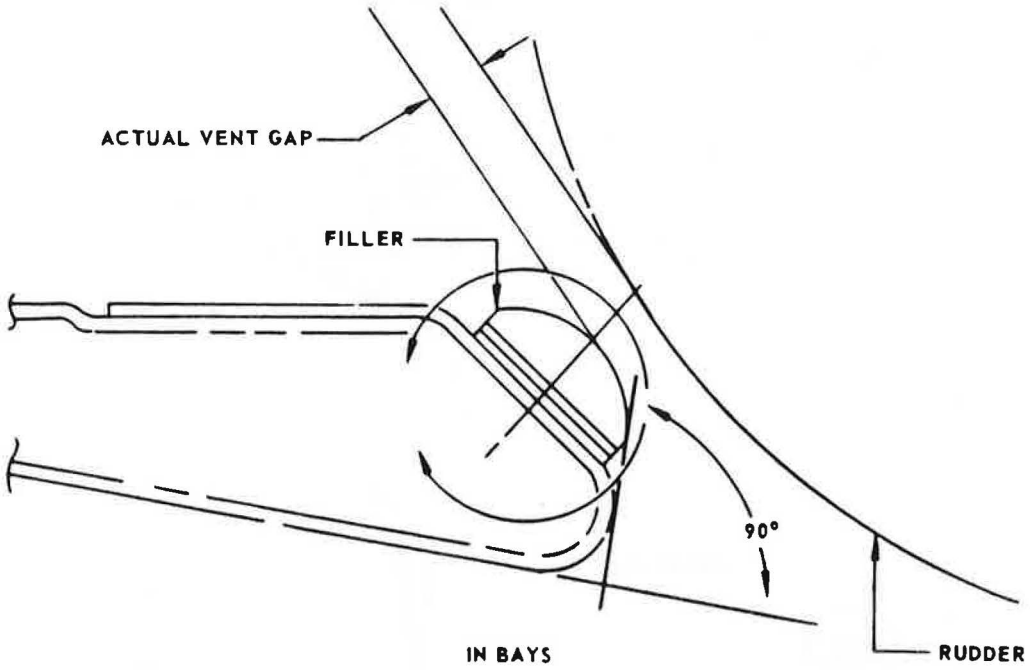
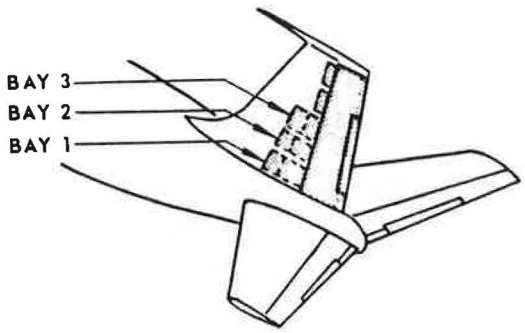
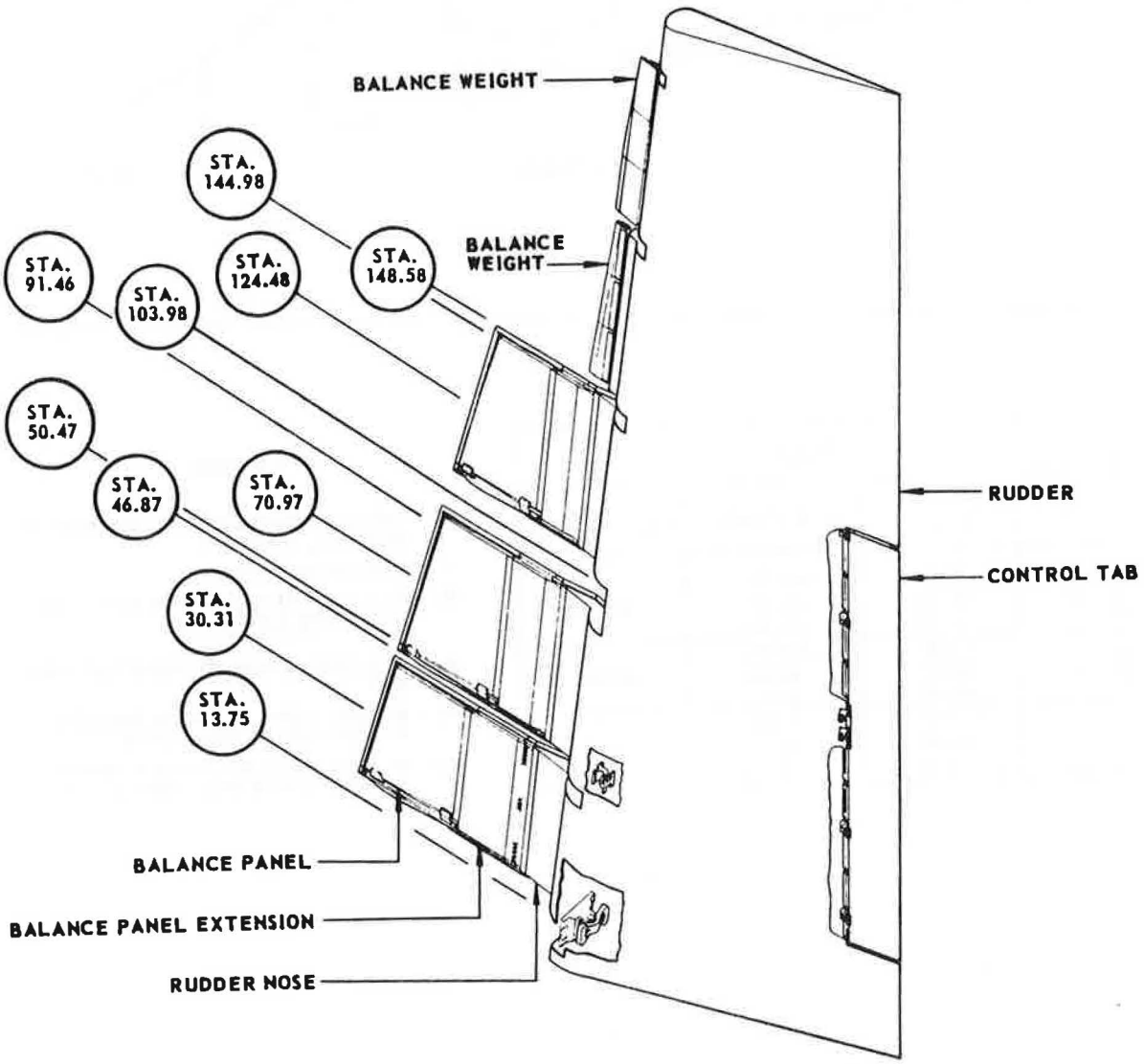


TABLE I			
BAY	RUDDER STATION	A(±0.10 Inch)	B_2(±0.03 Inch)
1	13.75 30.31 46.87	.465 IN. .45 IN. .43 IN.	.45 IN.
2	50.47 70.97 91.46	.425 IN. .41 IN. .39 IN.	.41 IN.
3	103.98 124.48 144.98	.37 IN. .36 IN. .34 IN.	.36 IN.

LEGEND

- A_N - ACTUAL VENT GAP WITH RUDDER AT NEUTRAL POSITION
- A - REQUIRED VENT GAP
- B_1 - ACTUAL AVERAGE VENT GAP PER BAY = $\frac{\text{THE SUM OF } A_N}{6}$
- B_2 - REQUIRED AVERAGE VENT GAP PER BAY
- A_L - ACTUAL VENT GAP WITH RUDDER POSITIONED AT FULL LEFT
- A_R - ACTUAL VENT GAP WITH RUDDER POSITIONED AT FULL RIGHT





Rudder Stations for Vent Gap Adjustment
Figure 206

(4) Actual vent gap "An" should be equal to required vent gap "A" as shown in figure 206, Table I.

(5) Calculate average vent gap "B1" per bay by adding actual vent gaps "An" and dividing the sum by 6.

$$B1 = \frac{\text{"An1"} + \text{"An2"} + \text{"An3"} + \text{"An4"} + \text{"An5"} + \text{"An6"}}{6}$$

NOTE: "An1" through "An3" are the actual vent gaps on one side of rudder and "An4" thru "An6" are the actual vent gaps on the opposite side for the same bay.

(6) Check that average vent gap per bay is equal to average required vent gap "B2."

NOTE: The values of required average vent gaps "B2" are given on Figure 205, Table I.

(7) Move rudder to full left position until stop is contacted.

(8) Measure actual vent gap "A1" on each side of rudder at stations specified on Figure 205, Table I.

(9) Check that actual vent gap for full left rudder "A1" is equal to "A."

(10) Repeat steps (7) through (8) for full right rudder. Actual vent gap "Ar" should be equal to "A."

(11) If vent gap does not meet above requirements, determine amount of correction necessary at each check point and adjust vent gap as follows:

(a) Remove rudder per paragraph 1.C.

(b) Remove aerodynamic filler. (See figure 207, Detail A.)

(c) Remove rivet and filler.

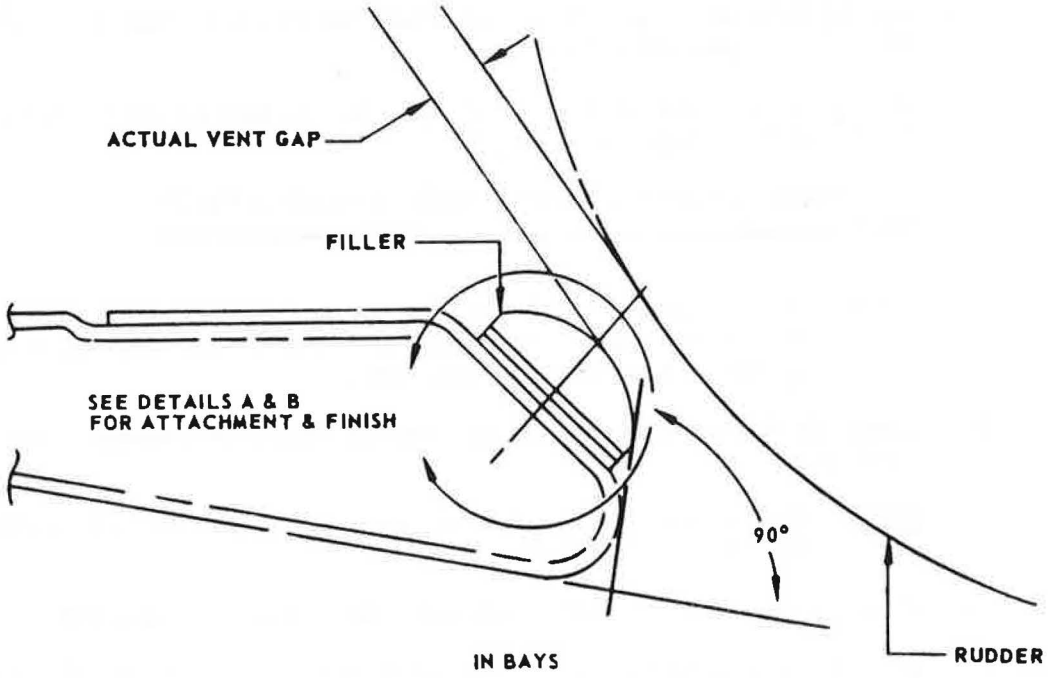
(d) Adjust filler to correct vent gap by removing or installing shims.

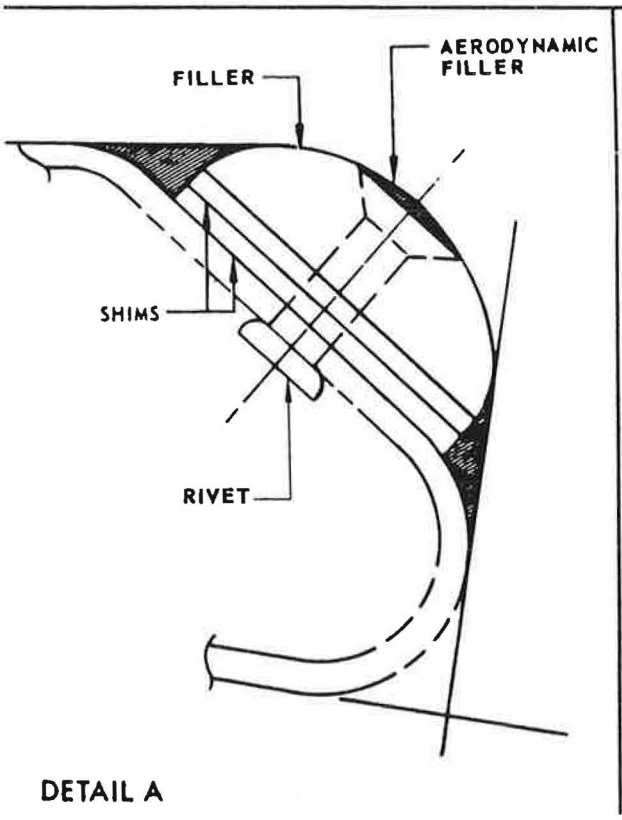
(e) Install filler and rivet.

(f) Apply aerodynamic filler over rivet, edges of filler and shims. See Chapter 51 for aerodynamic filling.

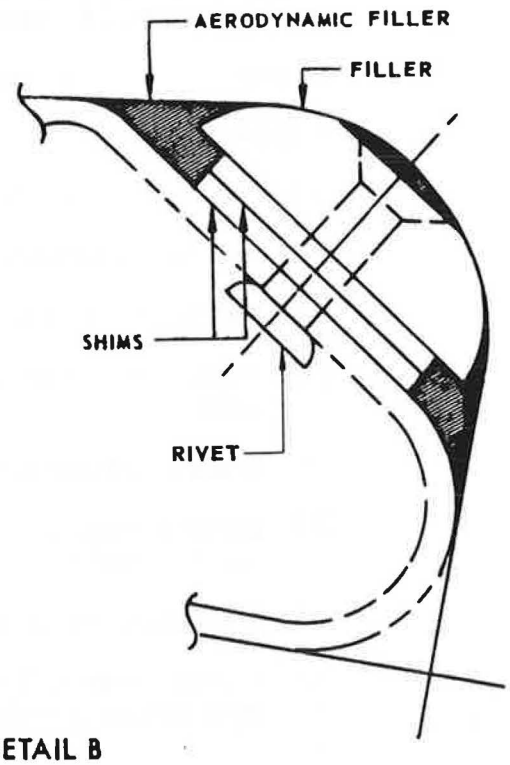
(g) Reinstall rudder per paragraph 1.D.

(h) Repeat steps (1) through (9) to determine that vent gaps have been properly adjusted.





DETAIL A



DETAIL B

Filler Adjustment
Figure 207

F. Test Fin to Rudder Mismatch

(1) General

(a) Fin to rudder mismatch tests are not necessary when an interchangeable rudder is installed. Such tests are required only when misalignment is suspected as the source of troublesome rudder operation. If mismatch tests are made and misalignment is found to be beyond limits, the rudder should be replaced or the fin removed and repaired as necessary to fulfill mismatch tolerances.

(2) Depressurize Auxiliary Hydraulic System

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(3) Position rudder to neutral.

(4) Determine reference points "A" and "B" on fin trailing edge beam. (See figure 208.) Locate point "A" at 0.50 (± 0.10) inches from aft edge of fin trailing edge beam contour and point "B" at 0.70 (± 0.10) of fin contour.

(5) Determine reference point "C" approximately at plane of center line of rudder spar, but not forward of tangent point of nose radius.

(6) If rudder is inside of contour, determine contour mismatch by placing a straight edge through points "A" and "B" and measuring perpendicular distance "D" from straight edge to point "C."

(7) If rudder is outside of contour, determine contour mismatch by placing a straight edge against side of rudder and measuring perpendicular distance "D" from straight edge to a point on fin between points "A" and "B."

NOTE: If rudder is inside of contour, contour mismatch dimension "D" is positive (+).

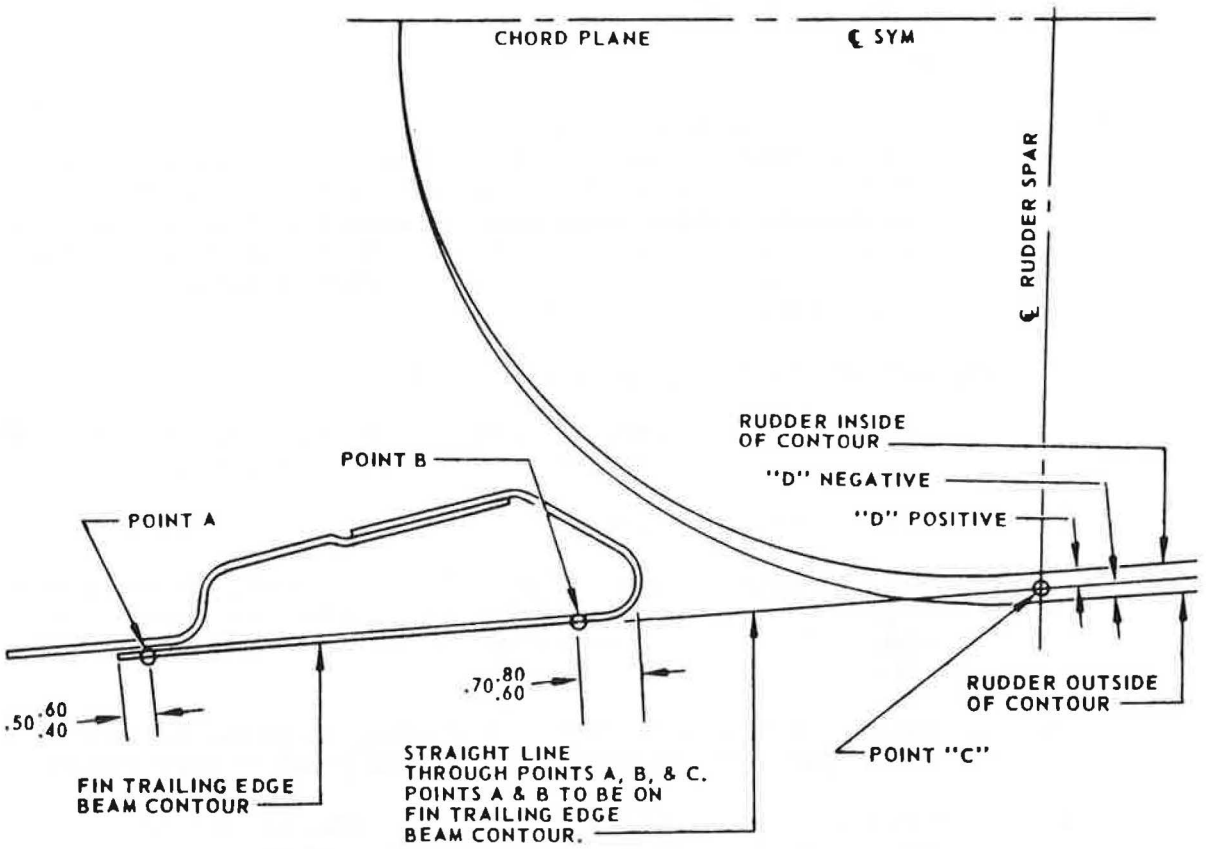
If rudder is outside of contour, contour mismatch dimension "D" is negative (-).

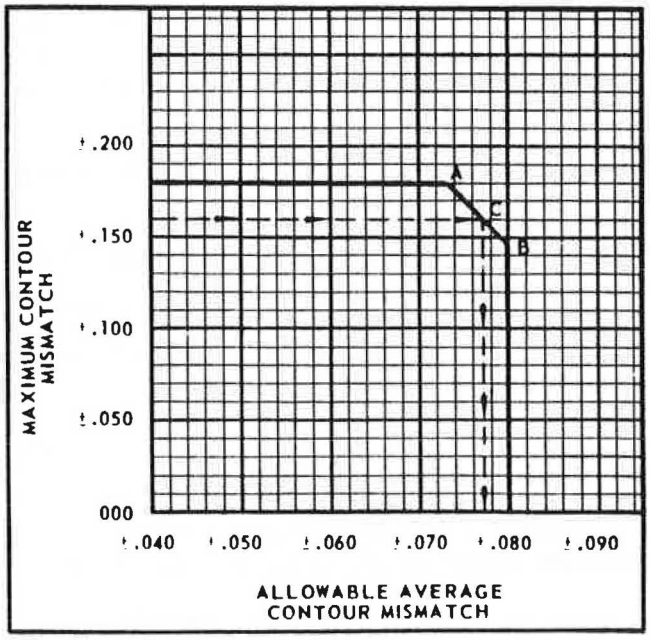
(8) Take measurements on both sides of rudder at stations indicated on Table II. (See figure 209.)

(9) Check that maximum contour mismatch at any station does not exceed ± 0.180 inch.

(10) Determine average contour mismatch on each side of rudder by adding the measurements taken at stations and dividing the sum by 8.

(11) Check that maximum average contour mismatch computed on step (8) shall not exceed limits given in graph on figure 208.





EXAMPLE THE MAXIMUM MISMATCH AT GIVEN POINT IS -0.16 THE INTERSECTION OF THIS ORDINATE WITH LINE A, B IS FOUND TO BE C. THIS REPRESENTS AN ALLOWABLE AVERAGE MISMATCH OF ±.077

Rudder-Fin Contour Mismatch Measuring Procedure
Figure 208

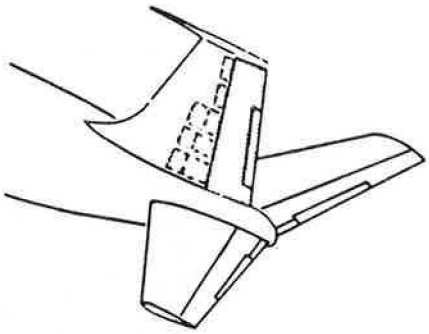
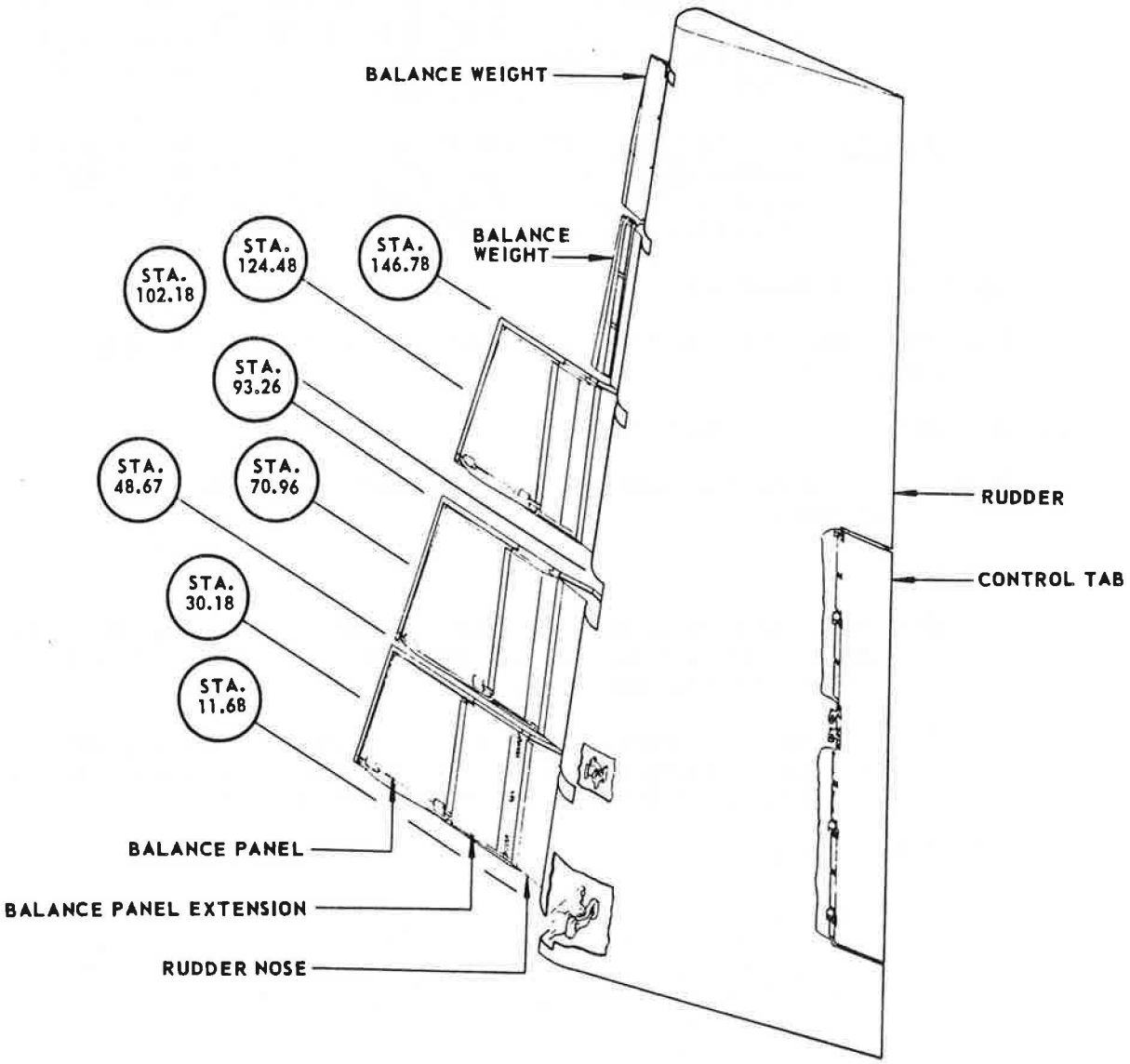


TABLE II RUDDER STATIONS		
11.68	70.96	124.48
30.18	93.26	146.78
48.67	102.18	



Rudder-Fin Contour Mismatch Measuring Locations
Figure 209

3. Cleaning/Painting Rudder

A. General

(1) A certain amount of repainting may be carried out without the necessity for rebalancing that surface. The degree of external preparation of the surface and subsequent paint applications are specifically defined and should be carefully adhered to. The permissible, nonbalanced amount of paint refurbished is then specified in terms of these definitions. Uncontrolled painting of airplane control surfaces could lead to a potentially hazardous airplane flight condition.

WARNING: THE ADDITION OF INCREASED MOMENT ALLOWED BY THE MAXIMUM REPAINT CAPABILITY PER TABLE I MUST NOT BE USED TO OFFSET STRUCTURAL REPAIRS. THIS IS A REPAINT CAPABILITY ONLY. STRUCTURAL REPAIRS MUST BE CARRIED OUT ACCORDING TO THE STRUCTURAL REPAIR MANUAL, CHAPTER 51-15-0.

CAUTION: ALL PERSONNEL CONCERNED IN THE MAINTENANCE AND EXTERIOR REFURBISHMENT OF THE AIRPLANE CONTROL SURFACES SHOULD BE AWARE OF THE NECESSITY FOR EXTREMELY HIGH QUALITY WORKMANSHIP IN THESE AREAS.

B. Equipment and Materials

(1) See Chapter 51-2-0, "Cleaning/Painting Interior and Exterior Finishes."

C. Definitions - Paint Removal

NOTE: The following definitions are to be used when stating job requirements.

(1) Light Sanding

(a) New paint: Sanding sufficient to remove completely the surface gloss leaving a surface suitable for the application of decals or another finished coat.

(b) Old paint: Sanding sufficient to remove all chalking and any patches of gloss remaining leaving a surface suitable for the application of decals or another finishing coat.

(2) Medium Sanding

(a) Sanding sufficient to remove all of the decorative paint without disturbing the primer. Satisfactory condition evidenced by patches of primer showing through the decorative paint over more than 50% of the treated area.

(3) Heavy Sanding

(a) New paint: Sanding sufficient to remove all the decorative paint and a large proportion of the primer. Satisfactory condition evidenced by bare metal being visible over more than 50% of the treated area.

(b) Old paint: As for new paint. This degree of sanding would be necessary for the preparation of a chipped or blistered area requiring feather edging and the application of primer to the exposed bare metal.

(4) Stripping

(a) Complete removal of all paint and primer leaving a completely clean metal surface, can be achieved by means of abrasive compounds, solvents or paint strippers.

NOTE: Paint solvents or strippers should not be used on bonded structures.

D. Definitions - Paint Application

NOTE: The following definitions are to be used when stating job requirements.

(1) Class I: The redecoration of a damaged area involving the removal of chipped, blistered or otherwise unsatisfactory paint from a limited area (less than 10 sq ft) and subsequent local paint application to match the surrounding paint.

(2) Class II: The redecoration of a complete control surface involving light sanding of that area followed by the application of one coat of paint (enamel, acrylic lacquer or epoxy resin).

(3) Class III: The redecoration of a complete control surface involving medium sanding of that area followed by the application of one coat of paint (enamel, acrylic lacquer or epoxy resin).

(4) Class IV: The redecoration of a complete control surface involving medium sanding of that area followed by the application of two coats of paint (enamel, acrylic lacquer or epoxy resin).

(5) Class V: The redecoration of a complete control surface involving heavy sanding or stripping of that area followed by the application of one coat of primer and one coat of paint (enamel, acrylic lacquer or epoxy resin).

(6) Class VI: The redecoration of a complete control surface involving heavy sanding or stripping of that area followed by the application of one coat of primer and two coats of paint (enamel, acrylic lacquer or epoxy resin).

NOTE: The description "complete control surface" does not include tabs or balance panels.

E. General Requirements

(1) Maximum Paint Quantities

(a) The maximum paint quantities to be used per rudder when redecorating per the Class V or Class VI definitions shall be in accordance with either of the two paint systems as specified below.

(b) When redecorating per the Class III or Class IV definitions the enamel shall be applied according to the section titled "Enamel" of the relevant paint system.

(c) When redecorating per the Class II definitions the quantity of enamel applied shall not exceed one-half of the quantity specified in the section titled "Enamel" of the relevant paint system.

(2) Epoxy Paint System

(a) Primer: The total quantity used per rudder shall not exceed 1 (one) U.S. pint (0.5 Litre).

(b) Enamel: The total quantity used per rudder shall not exceed 3 (three) U.S. pints (1.5 Litres).

(3) Alkyd or Acrylic Paint System

(a) Washer Primer: The total quantity used per rudder shall not exceed 1 (one) U.S. pint (0.5 Litre).

(b) Primer: The total quantity used per rudder shall not exceed 1 (one) U.S. pint (0.5 Litre).

(c) Enamel: The total quantity used per rudder shall not exceed 4 (four) U.S. pints (2 Litres).

NOTE: The quantities specified in these paint system definitions are applicable to finishes in the "as manufactured" or undiluted condition. These paint or primer quantities may be diluted by the addition of thinner and/or catalyst prior to application.

The quantities specified in these paint system definitions are more than adequate for a superior finish.

(4) Paint Film Thickness

(a) Total paint film thickness of the background or base paint, i.e. not including decals, shall be uniform over the whole control surface. Particular care shall be paid to this requirement in the rudder bay area above bay number 3.

NOTE: In areas redecorated per the Class I definition, the total paint film thickness at the overlay shall be kept to a practical minimum.

(5) Decals

(a) Scotchcal or painted decals may be masked or removed completely, and reapplied for the redecoration of the background paint.

CAUTION: DECALS MUST NOT BE PAINTED OUT AND SUPERIMPOSED WITH NEW DECALS.

(6) Limitations

(a) The rudder may be repainted per any one of the operations in Table I. Any subsequent repainting requires removal and rebalancing per the Overhaul Manual, Chapter 27-15, "Rudder Assembly Balancing."

a	Ten (10) Class I applications plus three (3) Class V or three (3) Class VI
b	Three (3) Class II applications plus three (3) Class V or three (3) Class VI
c	Three (3) Class III applications plus three (3) Class V or three (3) Class VI
d	Three (3) Class IV applications plus three (3) Class V or three (3) Class VI
e	Five (5) Class V applications
f	Three (3) Class VI applications

TABLE I

RUDDER CONTROL TAB - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Control Tab

A. General

(1) The rudder control tab is balanced into each rudder with selected adjust weights which are to be attached to balance panel No. 2. New adjust weights are supplied with each new replacement tab. When a new tab is installed, the new adjust weights must be installed in place of the old. Check new tab for quantity and part number (or numbers) of separate balance weights.

B. Special Tools and Equipment

(1) Rudder protractor - MIT 50-8703

(2) Rudder Tab protractor - MIT 50-8706

C. Remove Control Tab

(1) Depressurize Auxiliary Hydraulic System.

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(2) Move rudder to neutral position and hold in place.

(3) Deflect control tab (figure 201) to full travel right by rotating the rudder trim control wheel.

(4) Disconnect manual trim pushrod and tab pushrod from control tab horns.

(5) Remove control tab hinge mounting bolts and disconnect bonding jumpers.

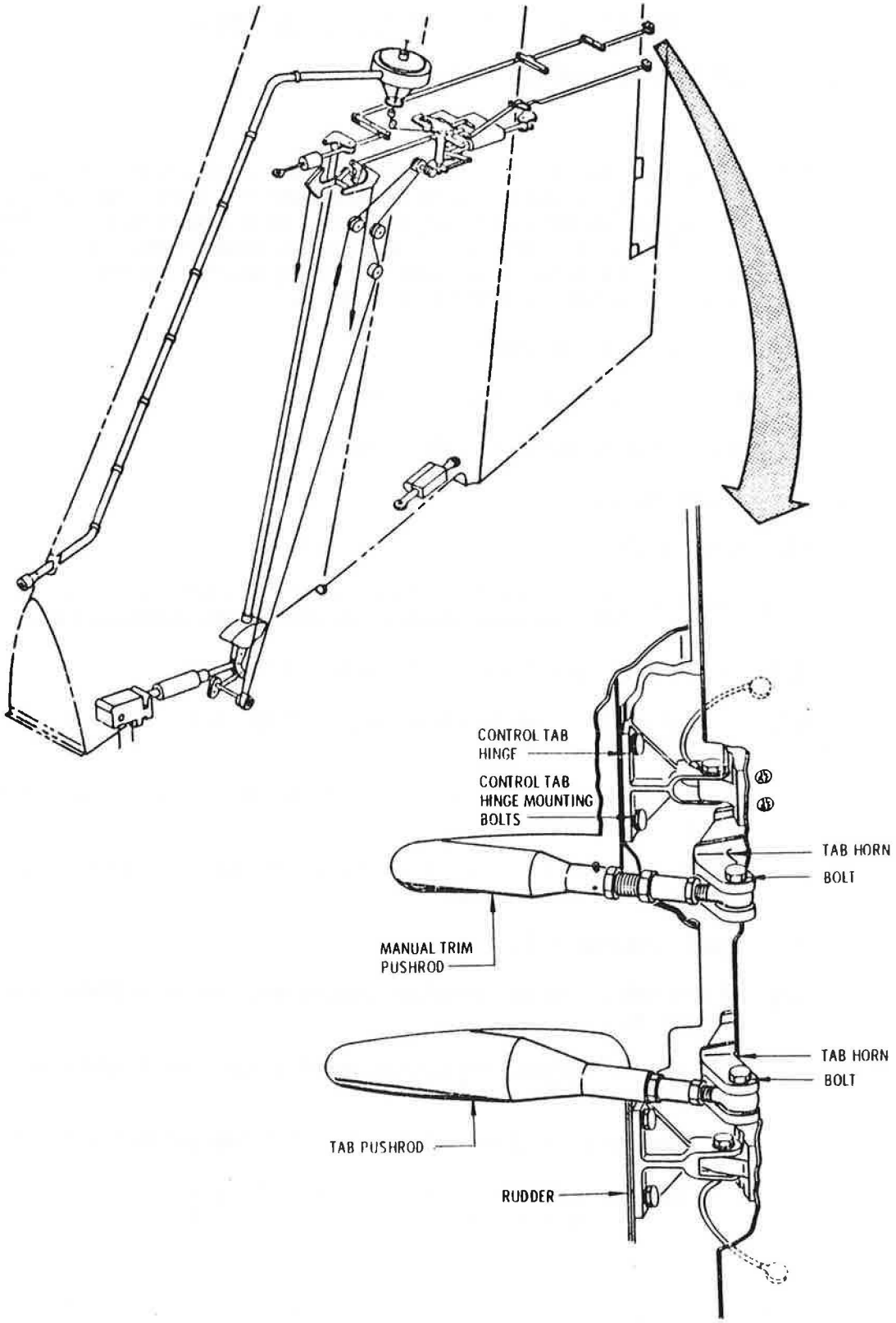
(6) Remove control tab.

(7) If new tab is to be installed remove tab adjust weights from rudder balance panel.

(a) Remove balance bay access panel 1513. See Chapter 12, "Access Doors and Panels."

(b) Remove tab adjust weights from balance panel No. 2.

NOTE: Remove weights as identified by steel stamped information on old tab.



Rudder Control Tab Installation
Figure 201

D. Install Control Tab

(1) Position control tab (figure 201) in place and install hinge mounting bolts and bonding jumpers.

(2) Free rudder.

(3) If a new control tab has been installed, install new control tab adjust weights on rudder balance panel.

(a) Install tab adjust weights supplied with new tab on rudder balance panel No. 2. See steel stamped information on tab for part numbers and quantities of balance weights.

(b) Install No. 1513 rudder balance bay access panel.

(4) Check free travel of control tab by rotating tab in both directions until tab structure contacts tab stops with spring scale at tab trailing edge. Maximum force required to rotate tab shall not exceed 5 pounds.

(5) Connect tab pushrod and manual trim tab pushrod to horns on control tab.

(6) Install rudder and rudder control tab protractors.

(7) Rotate rudder trim control handle until trim indicator indicates zero.

(8) Hold rudder trailing edge neutral.

S (9) **Push right rudder pedal slowly forward until rudder tab stops are contacted.**

(10) Check that control tab is positioned 21-1/2° to 22-1/2° to the left.

(11) Repeat steps (8) through (11) for left rudder pedal. Control tab shall move to the right with measurements of the same magnitude.

(12) Slowly push right rudder pedal forward until tab stops are contacted and the rudder begins to move to the right. Continue to push slowly on rudder pedal and manually assist at rudder trailing edge until rudder is at 13° right.

(13) Check that forward quadrant stops are not contacted and that tab is 19° or more to left.

(14) Repeat steps (12) and (13) for left rudder pedal. Rudder shall move to the left, tab to the right and measurement shall be of same magnitude.

(15) Remove protractors.

RUDDER BALANCE PANELS AND SEALS - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Balance Panel and Balance Panel Extensions

A. Materials and Equipment

(1) Corrosive preventive compound MIL-C-11796A, Grade 3 (Cosmoline 1062 or Texaco 2627)

(2) Solvent P-S-661b

B. Remove Balance Panel and Balance Panel Extensions

(1) Depressurize Auxiliary Hydraulic System.

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(2) Remove access panels 1512, 1513, and 1515 on right side of fin. See Chapter 12, "Access Doors and Panels."

NOTE: For ease of handling remove balance panels and balance panel extensions separately.

(3) Remove seal and seal retainer on aft end of track slides. (See figure 201.)

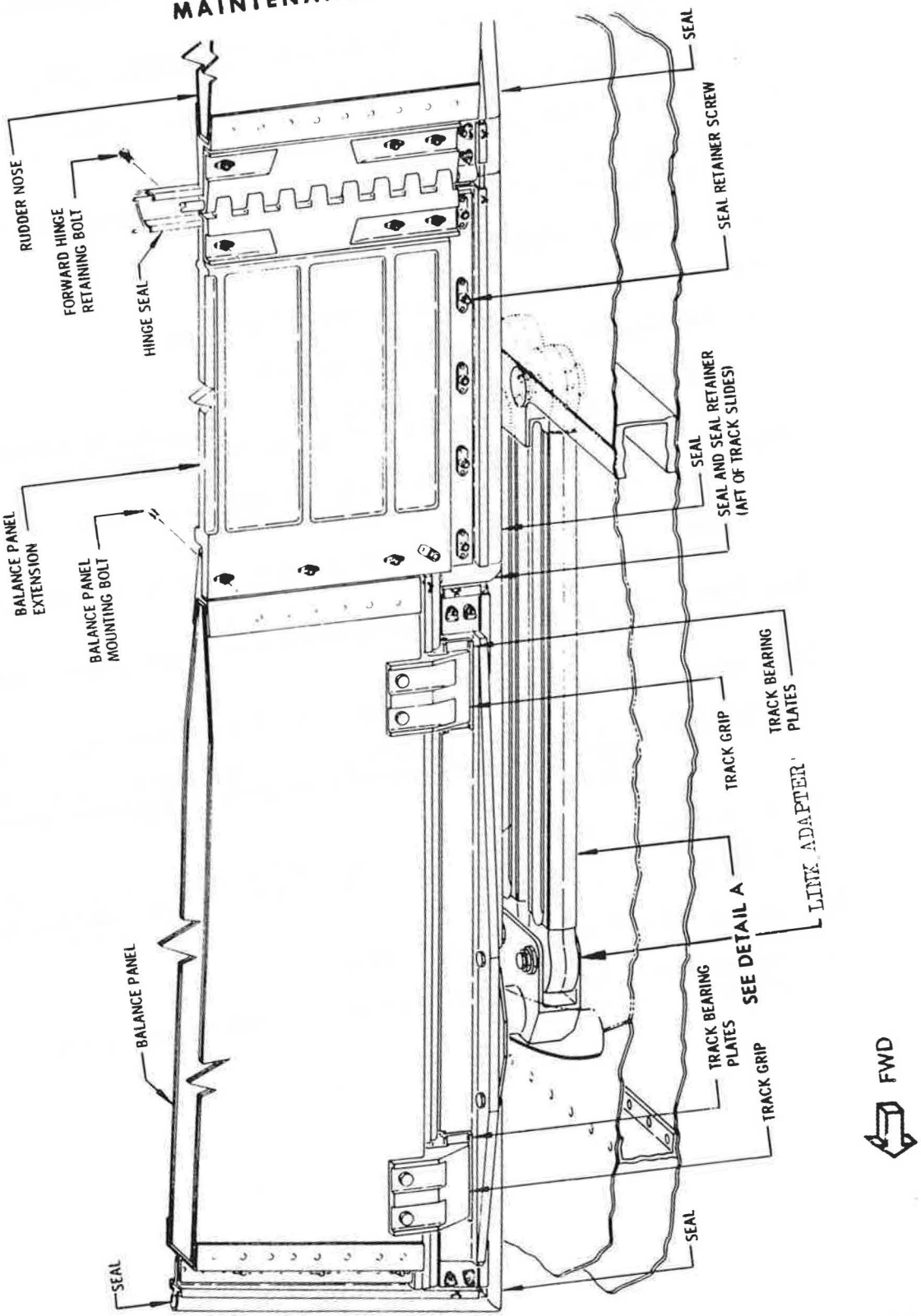
(4) Remove bolts which attaches balance panel to balance panel extension.

CAUTION: THE BALANCE PANEL MUST BE SUPPORTED DURING REMOVAL OF THE BOLTS TO PREVENT EXCESSIVE LOADING ON REMAINING BOLTS AND TRACK SLIDES.

(5) With balance panel bolts completely removed, move rudder to extreme right and slide balance panel aft until track grips clear track bearing plates.

(6) Lift panel off track and remove panel.

(7) Remove forward hinge retaining bolts to detach balance panel extension from rudder nose.



Rudder Balance Panel and Extension Installation
Figure 201 (Sheet 1)

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(8) Free hinge seal.

(9) Remove balance panel extension.

C. Install Rudder Balance Panel and Balance Panel Extension

(1) Attach balance panel extension to rudder nose by installing forward retaining bolts. (See figure 201.)

(2) Slide end of hinge seal under seal retainer at each end of hinge. Align holes in hinge seal with holes in seal retainer and install seal retainer attaching screws.

(3) Move rudder to extreme right to provide maximum space for installing balance panels.

(4) Install balance panel.

(a) Clean existing rust preventive compound from track grips and track bearing plates using methyl-ethyl ketone and clean cloth.

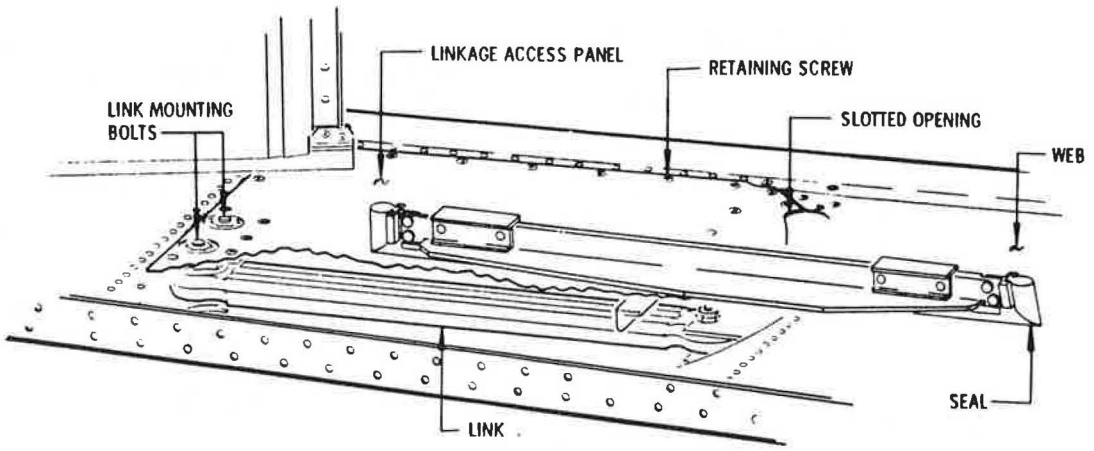
(b) Continue cleaning track grips and track bearing plates as necessary using crocus cloth.

(c) Apply rust preventive compound (MIL-C-11796A) to track grips and track bearing plates.

(d) Position balance panel in bay by tilting panel and placing it in parallel position inside the balance bay.

(e) Hold balance panel parallel to rudder surface and slide panel aft until track grips engage track bearing plates.

(f) Attach balance panel to balance panel extension by installing balance panel mounting bolts.



DETAIL A

Rudder Balance Panel and Extension Installation
Figure 201 (Sheet 2)

(g) Install seal and seal retainer on the aft end of track slides.

(h) Check that balance panel seal gap with adjacent wall of bay is ± 0.02 inches for a minimum of 0.75 percent of any given seal length. The remaining length of any seal shall not exceed ± 0.06 inch gap with adjacent wall of balance bay.

(5) Replace access panels. See Chapter 12, "Access Doors and Panels."

NOTE: Balance panel and balance panel extensions are balanced together independent of the rudder. This is accomplished by component balancing.

(6) Check rudder friction (vertical). See 27-17-1, "Friction Test (Rudder Vertical.")

D. Removal/Installation Rudder Balance Panel Linkage

(1) Remove Balance Panel Linkage

(a) Remove balance bay access panels 1512, 1513 and 1515. See Chapter 12, "Access Doors and Panels."

(b) Remove balance panels and balance panel extensions. See paragraph 1.B.

(c) Remove web cover and reinforcing channel by removing all retaining screws. (See figure 201.)

(d) Remove two linkage mounting bolts and pull linkage free.

(2) Install Balance Panel Linkage

(a) Slide rudder balance panel linkage into position and install two linkage mounting bolts. (See figure 201.)

NOTE: Head of bolts shall be placed on lower side of linkage. The linkage should be completely assembled before it is installed in the fin rib.

S (b) Replace reinforcing channel and web cover. Check that a minimum of 1/16 inch clearance exists between link adapter fitting and slot and that fitting does not contact structure. Trim flange of stiffener if required to obtain adquate clearance. S

(c) Install balance panel and balance panel extension. See paragraph 1.C.

(d) Check rudder friction (vertical). See 27-17-1, "Friction Test (Rudder Vertical)."

(e) Replace balance bay access panels 1512, 1513, and 1515.

2. Adjustment/Test Rudder Balance Panels and Seals

A. General

(1) Seals along the forward and upper end of the rudder balance panels, upper and lower end of the balance panel extensions and balance panel hinges and the forward part of rudder nose ribs are adjusted by loosening ring seal retainer screws and shifting seal to proper clearance. Seals should be adjusted with rudder at faired position. Before adjusting seals special precaution should be taken that the auxiliary hydraulic system is depressurized. After adjusting rudder balance panel and seals, rudder friction test (vertical) is necessary. See 27-17-1, "Friction Test, (Rudder Vertical)."

B. Equipment and Materials

(1) Corrosion preventive compound MIL-C-11796A, Grade 3

(2) Cleaning Solvent-P-S-661b

(3) Hole filling compound-BMS 5-16

(4) Cement-Minnesota Mining and Manufacturing Co. EC1128 or equivalent

(5) Methyl ethyl ketone - TT-M-261

(6) Spring scale - 0 to 10 pounds capacity

(7) Aerodynamic filler - BMS 5 - 19, Type A

C. Adjust Rudder Balance Panel and Balance Panel Extension Seals

(1) Depressurize Auxiliary Hydraulic System

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(2) Move rudder to neutral position.

(3) Remove access panels 1512, 1513, and 1515. See Chapter 12, "Access Doors and Panels."

(4) Loosen seal retainer screws.

(5) Shift seal until gap between seal and adjacent wall of bay is ± 0.02 inches fro a minimum of 75 percent of any given seal length.

NOTE: Adjust seals which are adjacent to walls of bays.

(6) Check that remaining gap of seal with adjacent wall does not exceed ± 0.06 inches.

(7) Retighten seal retainer screw.

(8) Repeat steps (3), (4) and (5) for the remaining end of balance panels and balance panel extension.

NOTE: The seals between balance panel and track, at each end of the track and on the aft part of the rudder nose ribs does not require adjustment.

(9) If balance bay access panels are magnesium:

(a) Remove old corrosion preventive compound from access panels and mounting screws with cleaning solvent and clean cloth.

(b) Apply corrosion preventive compound to access panel faying surfaces and under access panel mounting screws.

(10) Install balance bay access panels.

D. Adjust Balance Panel Support Link Seal

(1) Remove access panels 1512, 1513, and 1515. See Chapter 12, "Access Doors and Panels."

(2) Remove balance panels per paragraph 1.B.

(3) Measure clearance between seal on lower face of support link mechanism and web to determine shim thickness required.

(4) Remove balance panel support mechanism link by removing four bolts holding link to adapter fitting.

(5) Remove support link seal retainer screw and support link seal.

(6) Remove or add fiberglass laminated shims to obtain proper clearance between web and seals as determined in step (3).

(7) Replace seal retainer and seal on link support mechanism.

(8) Install balance panel support mechanism link.

(9) Check link seal clearance with web.

NOTE: Seals at lower edge of balance panel and at forward and aft ends of supporting links requires no adjustment.

(10) Fill gap openings between seal retainers and structure with BMS 5-16 hole filling compound after seals have been properly adjusted and lockwired.

CAUTION: BMS 5-16, CANNOT BE APPLIED WHEN DRY. DO NOT ALLOW SEALANT TO CONTACT BULB SECTION OF FABRIC COVERED SEALS WHICH MUST REMAIN FLEXIBLE TO FUNCTION PROPERLY.

(11) If balance bay access panels are magnesium:

(a) Remove old corrosion preventive compound from access panels and mounting screws with cleaning solvent and clean cloth.

(b) Apply corrosion preventive compound to access panel faying surfaces and under heads of all access panels mounting bolts.

(12) Install balance bay access panels.

E. Adjust Seals on Lower Edge of Track

(1) Gage seal to determine the necessary shim adjustment.

(2) Remove seal retainer and seal by removing attaching seal retainer screw.

(3) Peel or add required fiberglass shims under the seal retainer.

(4) Reinstall seal and seal retainer back to balance panel and tighten seal retainer screw.

NOTE: After seals have been adjusted fill gaps and openings with BMS 5-16 hole filling compound per BAC 5000. Except seals and gap between the balance panel link adapter fitting and seals on the lower edge of the track.

F. Test Rudder Balance Panel and Balance Panel Extension Seals

(1) Friction Test (Rudder Vertical)

(a) With the rudder balance seals properly adjusted move rudder and control tab to neutral position.

(b) Check that the breakaway force required to move the rudder from neutral position in either direction shall not exceed 6.0 pounds.

(2) Friction Test (Rudder Horizontal)

NOTE: Replacement of balance panels and/or balance panel extensions and seals does not require performing a horizontal rudder friction test. This test is only required if a balance panel is installed when the fin is in a horizontal position.

(a) Fold fin to horizontal position. See Chapter 55, "Fold Fin."

(b) Remove access panel 1525. See Chapter 12, "Access Doors and Panels."

(c) Disconnect tab pushrod from anti-balance crank.

(d) Disconnect power control unit head from rudder.

(e) Disconnect rudder damper from rudder.

(f) Disconnect trim control rod from trim crank.

(g) Move the rudder trailing edge down through neutral and up through neutral at a uniform rate. Minimum movement must be at least 3 degrees.

1) Record forces required to push the rudder through neutral as positive (+). Record forces required to restrain the rudder from moving through neutral on its own as negative (-).

2) Friction check

Enter forces from (a) in the following table and compute results:

Rudder Travel Direction	Force (lbs)	Mathematical Operation
Down Rudder	_____	Add forces with like signs. Subtract forces with unlike signs.
Up Rudder	_____	
Result	_____	

Result shall be greater than 0 lbs but shall not exceed 10 lbs.

(h) Connect tab pushrod to anti-balance crank.

(i) Attach power control unit head to rudder.

(j) Attach rudder damper to rudder.

(k) Attach trim control rod to trim crank.

(l) Raise fin. See Chapter 55, "Hoisting Fin."

(m) Install access doors and panels. See Chapter 12, "Access Doors and Panels."

3. Inspection/Check Rudder Balance Panels and Seals

A. Examine Rudder Balance Panels and Seals

(1) Remove balance bay access panels 1512, 1513 and 1515. See Chapter 12, "Access Doors and Panels."

(2) Examine rubbing strip on side below slotted opening for interference or rubbing of balance panel support mechanism on inside walls of fin double trailing edge ribs.

(3) Examine balance panel extension hinge and pin retainers for wear and hinge seal for holes or leaks.

(4) Examine rudder balance panel seals for wear or damaged edges.

(5) Remove rudder inspection panels 1555, 1556, 1558, 1559 and 1560 on left side of rudder.

(6) Examine each balance panel bay for loose seals or loose seal retainers and worn or torn seals.

(7) Examine track grips for evidence of sticking to tracks.

(8) If balance bay access panels are magnesium:

(a) Remove old corrosion preventive compound from access panels and mounting screws with cleaning solvent and clean cloth.

(b) Apply corrosion preventive compound to access panel faying surfaces and under head of all access panel mounting screws.

(9) Install balance bay access panels and inspection panels.

4. Cleaning/Painting Rudder Balance Panels

A. See Chapter 51-2-0, "Cleaning/Painting Interior and Exterior finishes." These items require weighing after painting to ensure that their respective weights are within limits as specified in the Overhaul Manual, see Chapter 27-15, "Rudder Assembly Balancing."

5. Approved Repairs Rudder Balance Panels

A. Equipment and Materials

(1) Corrosive Preventive Compound MIL-C-11796A, Grade 3

(2) Cleaning Solvent P-S-661b

B. Replace Balance Panel Seals

(1) Depressurize Auxiliary Hydraulic System

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(2) Move rudder to neutral position.

(3) Remove access panels 1512, 1513, and 1515. See Chapter 12, "Access Doors and Panels."

(4) Remove seal retainer screw and seal retainer.

(5) Remove lockwire at end of seal. Slide seal out of retainer.

(6) Assemble new seal in retainer and install lockwire.

(7) Attach seal retainer on panels and install seal retainer screw.

(8) Adjust seals by loosening seal retainer screw and shifting the seal to proper position.

(9) Check that gap between seal and adjacent wall of balance bay is ± 0.02 inches for a minimum of 75 percent of any given seal length. The remaining length of any given seal length shall not exceed ± 0.06 inch gap with adjacent wall of balance bay.

(10) Retighten seal retainer screw.

NOTE: Above procedure applies to seals along the forward and upper end of the balance panels, the upper and lower end of the balance panel extensions and balance panel hinges and the forward part of rudder nose ribs. The seals between balance panel and track, at each end of the track and on the aft part of the rudder nose ribs are not to be adjusted.

(11) Check rudder friction (vertical). See 27-17-1, "Friction Test (Rudder Vertical)."

C. Replace Rudder Balance Panel Continuous Hinge Seal

(1) Remove balance bay access panels 1512, 1513, and 1515. See Chapter 12, "Access Doors and Panels."

(2) Loosen the two seal retainers by removing two bolts aft of hinge center line at each end.

(3) Remove first two seal retainers attaching screw forward of continuous hinge.

(4) Pull both ends of hinge seal from under seal retainers.

(5) Loosen both fore and aft rows of hinge retaining bolts and free pin holding seal.

(6) Remove hinge seal by pulling ends containing pins clamped by end of hinge.

(7) Install new seal by placing ends of seal containing pins in spaces lengthwise of hinge.

(8) Pry out seal retainers and slide ends of seal under retainers.

(9) Align holes in ends of seal with holes in retainers and install seal retaining bolts at each end. Allow about 1/16 inch of slack in seal along inner edges of each retainer.

(10) Tighten bolt rows of hinge bolts.

(11) If balance bay access panels are magnesium:

(a) Remove old corrosion preventive compound from balance bay access panels and mounting screws with cleaning solvent and clean cloth.

(b) Apply corrosion preventive compound to access panel faying surfaces and under heads of all access panel mounting screws.

(12) Install rudder balance bay access panels.

6. Approved Repairs Rudder Balance Panel Hinge Assembly

A. Replace Balance Panel Hinge Assembly

(1) Depressurize auxiliary hydraulic system.

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(2) Remove access panel 1512, 1513, and 1515 on right side of fin. See Chapter 12, "Access Doors and Panels."

(3) Remove forward hinge mounting bolts and free one end of hinge seal. (See figure 202.)

CAUTION: BALANCE PANEL MUST BE SUPPORTED DURING REMOVAL OF BOLTS TO PREVENT EXCESSIVE LOADING ON REMAINING BOLTS AND TRACK SLIDES.

(4) Remove aft hinge mounting bolts aerodynamic seal and hinge seal.

(5) Remove lower hinge pin retainer and aerodynamic seal. (See Detail A.)

CAUTION: SPECIAL PRECAUTION SHOULD BE TAKEN TO KEEP HINGE PIN IN PLACE TO PREVENT UPPER HINGE PIN RETAINER FROM FALLING OFF.

(6) Remove balance panel hinge.

(7) Slide hinge pin out and remove upper hinge pin retainer.

(8) Check wear limits of pin and hinge hole. Replace parts if necessary.

NOTE: Maximum wear dimension of hinge hole is 0.215 inch and for pin is 0.170 inch.

(9) Install upper hinge pin retainer.

(10) Align mating parts of balance panel hinge and install balance panel hinge pin.

(11) Hold hinge pin in place. Position balance panel hinge, aerodynamic seal and hinge seal and install mounting bolts.

(12) Position lower hinge pin retainer and aerodynamic seal and install mounting bolts.

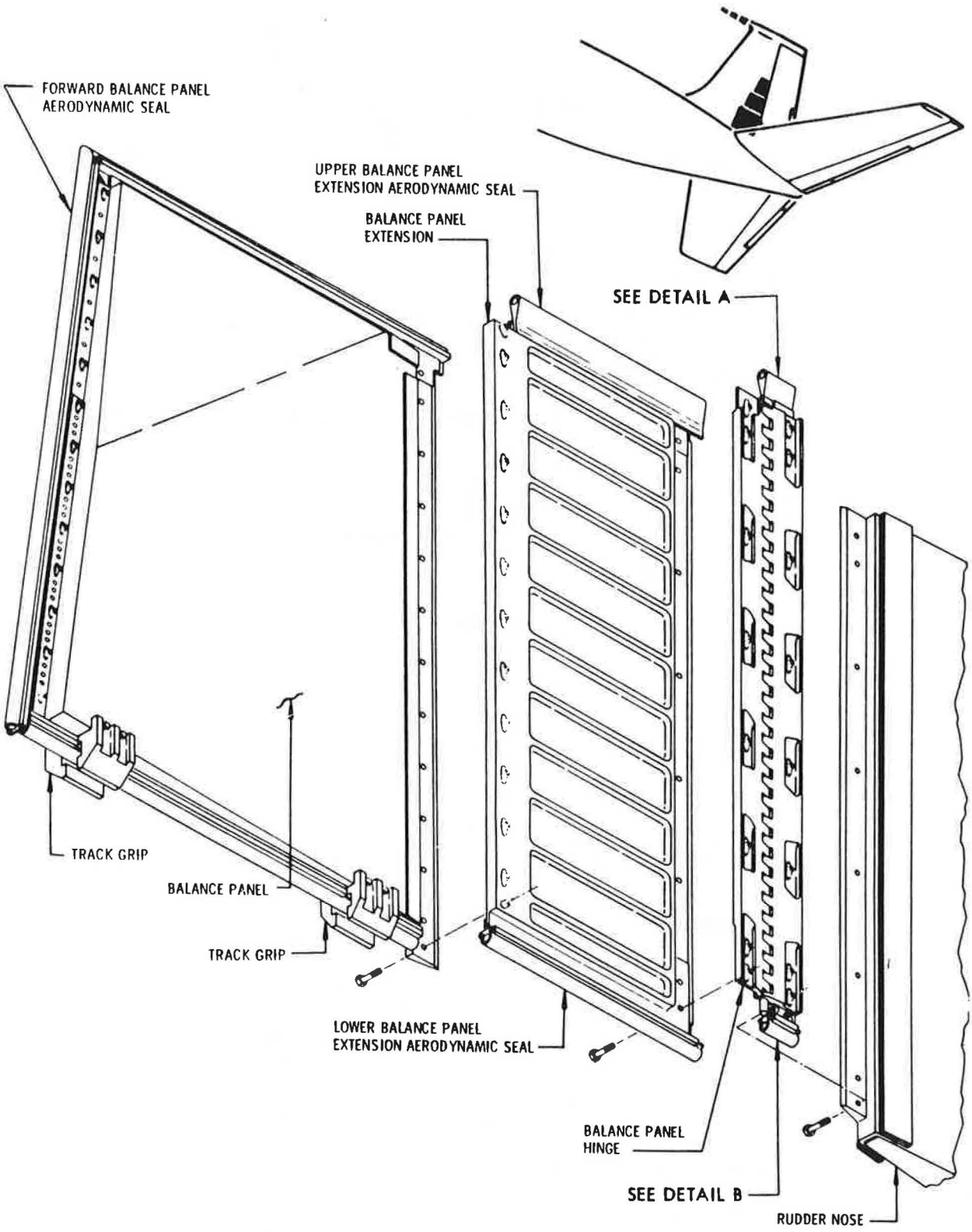
CAUTION: HINGE PIN SHOULD BE CONTAINED IN THE LOWER HINGE PIN RETAINER. CHECK THAT UPPER HINGE PIN RETAINER IS IN PLACE.

(13) If balance bay access panels are magnesium:

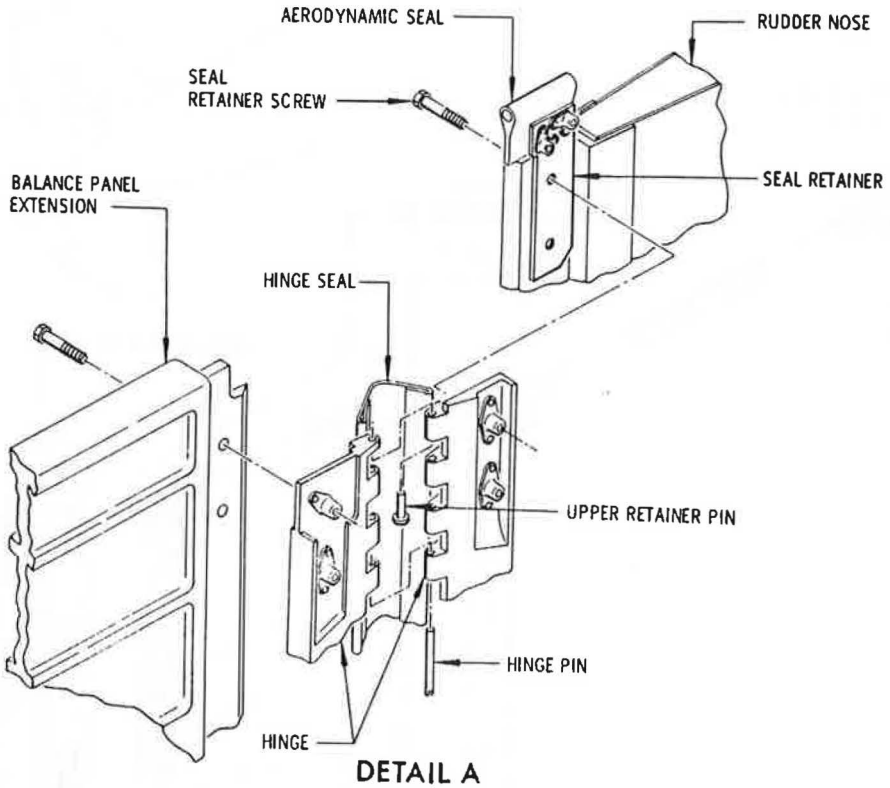
(a) Remove old corrosion preventive compound from balance bay access panels and mounting screws with cleaning solvent and clean cloth.

(b) Apply corrosion preventive compound to access panel faying surfaces and under heads of all access panel mounting screws.

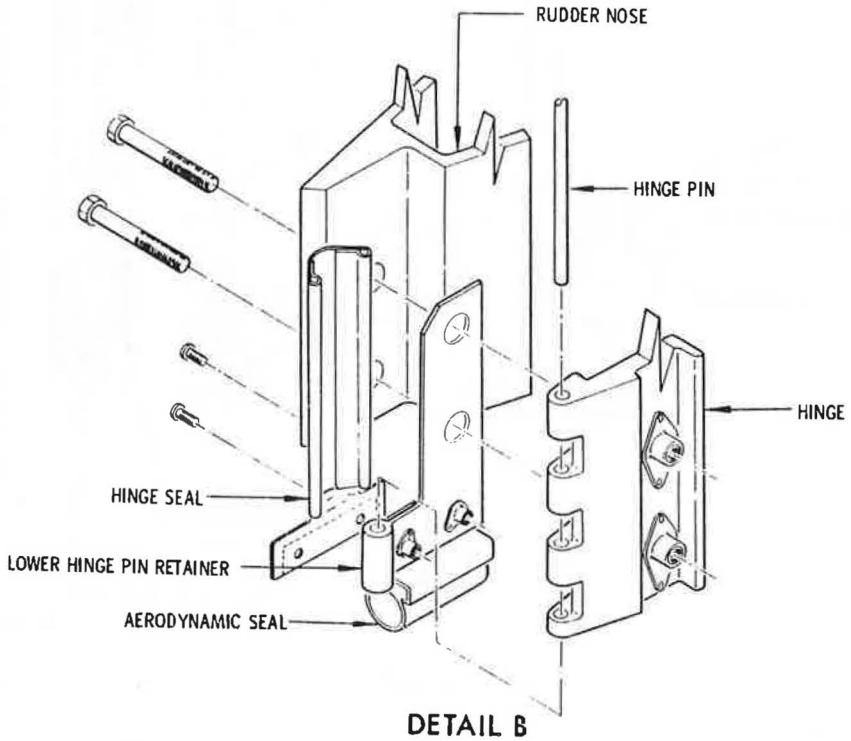
(14) Install access panels.



Rudder Balance Panel Hinge Assembly Installation
Figure 202 (Sheet 1)



DETAIL A



DETAIL B

Rudder Balance Panel Hinge Assembly Installation
Figure 202 (Sheet 2)

RUDDER HINGE FITTINGS - MAINTENANCE PRACTICES

1. General

   A. The rudder hinge fittings can be replaced individually. The rudder must be supported by a sling when hinges are being removed. The three upper hinges are typical and are installed with bonding jumper. The second bottom hinge fitting is also installed with bonding jumper. Mounting bolts should be tightened to proper torque values.

2. Equipment

   A. Torque wrench - 0 to 1000 pound-inches

   B. Grease - Aeroshell 7A.

3. Removal/Installation Rudder Thrust Hinge Assembly - Rudder Station 11.68

   A. Remove Rudder Thrust Hinge Assembly

      (1) Depressurize auxiliary hydraulic system.

      WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

      (2) Remove rudder thrust hinge access panel.

      (3) Remove forward and aft hinge mounting bolts. (See figure 201.)

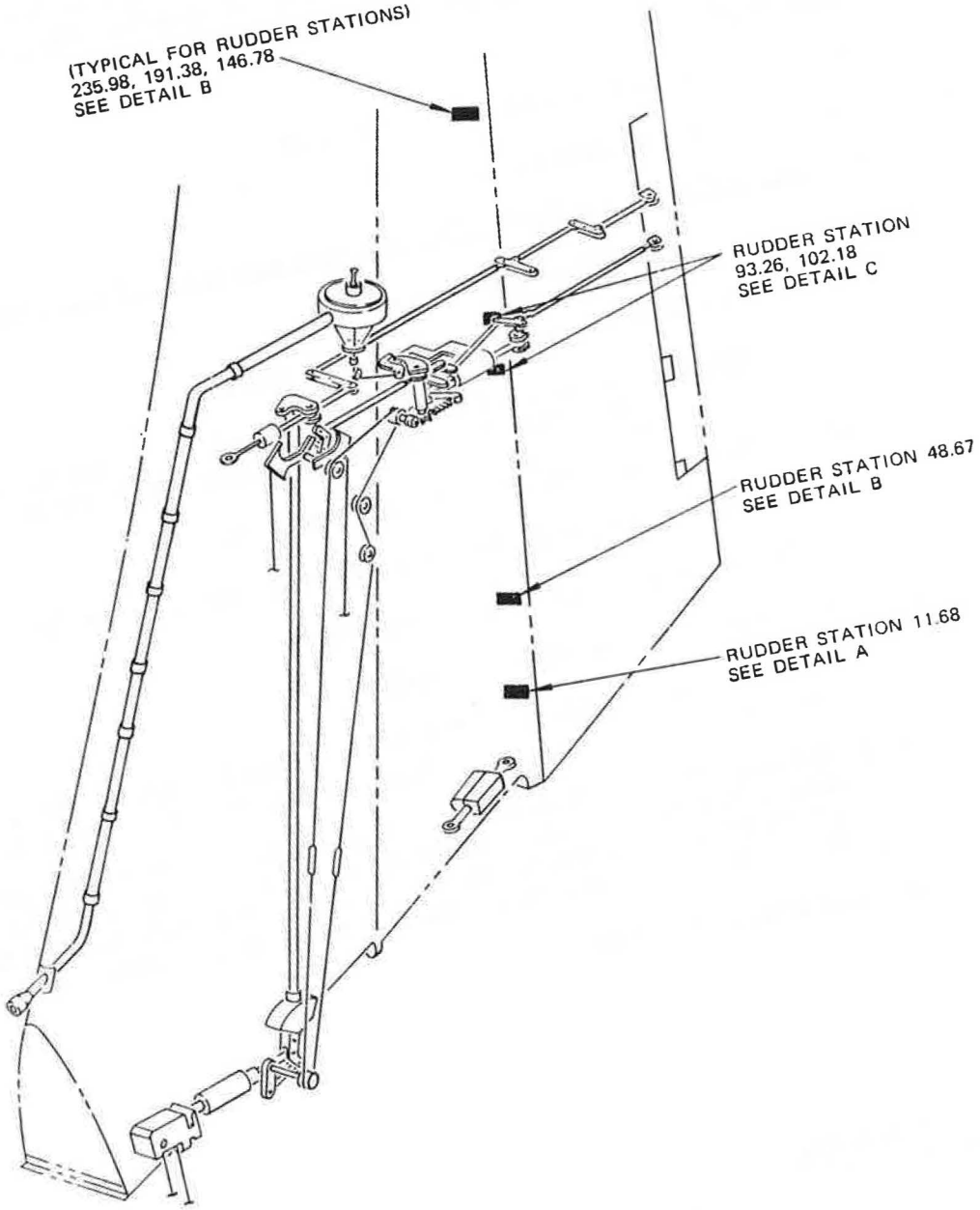
      (4) Remove rudder thrust hinge assembly.

   B. Install Rudder Thrust Hinge Assembly

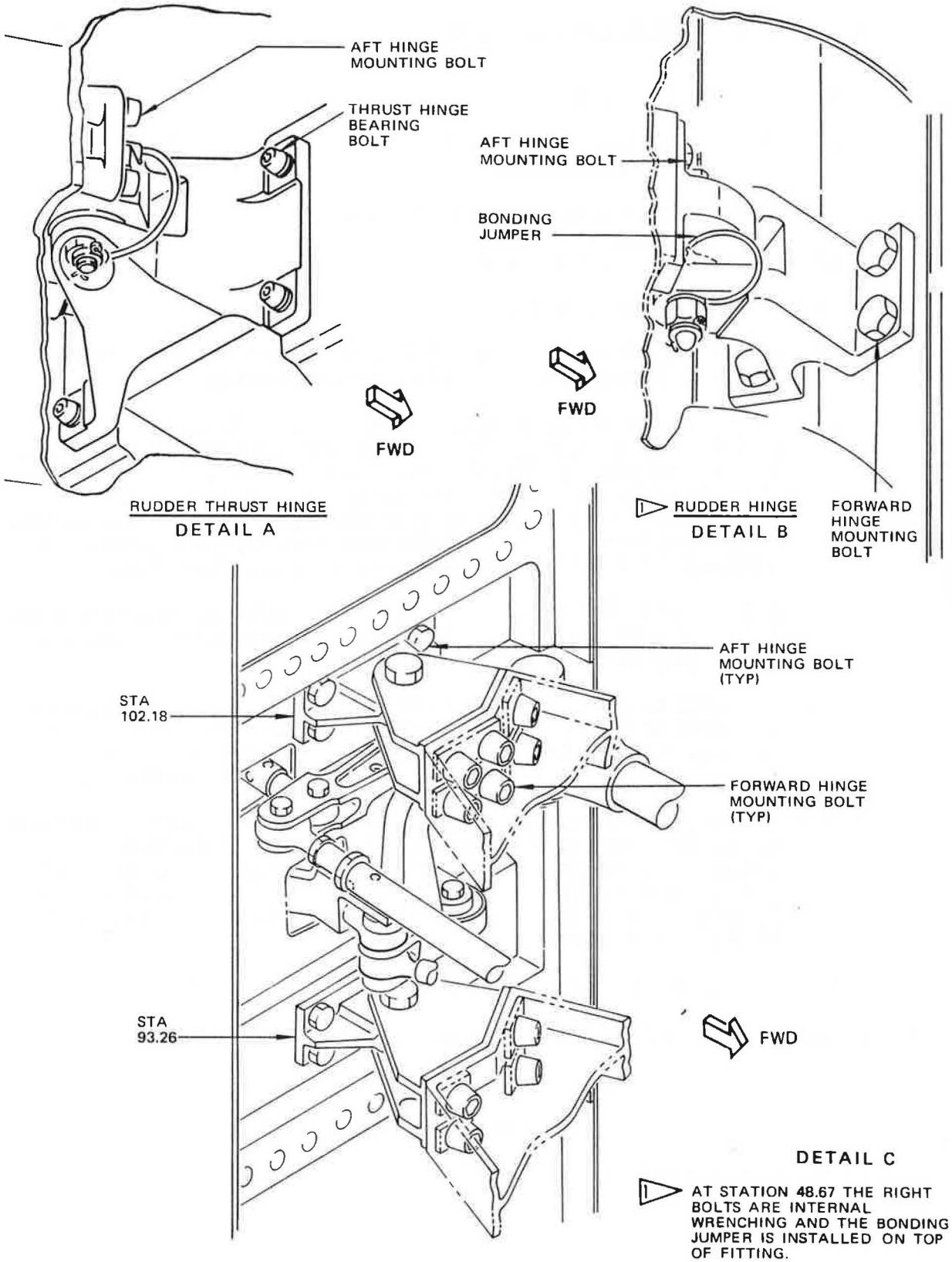
      (1) Position hinge assembly with lubrication fitting at the right and install forward and aft hinge mounting bolts.(See figure 201)

      (2) Tighten aft hinge mounting bolts to torque of 220 to 360 pound-inches and forward hinge mounting bolts to torque of 370 to 610 pound-inches. If hinge pin bolt has been removed, tighten to torque of 800 to 1000 pound-inches on installation and insert cotter pin.

      (3) Reinstall access panels.



Fin-Mounted Rudder Hinge Fitting Installation
Figure 201 (Sheet 1)



Fin-Mounted Rudder Hinge Fitting Installation
Figure 201 (Sheet 2)

4. Removal/Installation Rudder Hinge Assembly (All except rudder thrust hinge assembly)

A. Remove Rudder Hinge Assembly

(1) Remove applicable rudder hinge access panels. See Chapter 12, Access Doors and Panels.

(2) Remove forward and aft hinge mounting bolts.

(3) Remove rudder hinge assembly.

B. Install Rudder Hinge Assembly

(1) Position hinge assembly with lubrication fitting at the right and install forward and aft hinge mounting bolts.

(2) For hinges on rudder stations 48.67, 146.78, 191.38 and 235.98, install bonding jumper. Tighten aft mounting bolts to 50-70 pound-inches. At stations 146.78, 191.38 and 235.98, tighten forward mounting bolts to 100-140 pound-inches, and at station 48.67, tighten left bolts to 160-190 pound-inches and right bolts to 130-180 pound-inches. If hinge bolts have been removed, tighten to torque of 60 to 85 pound-inches, and install cotter pins.

NOTE: Check that bonding jumpers are installed so that rudder can be fully deflected without impressing tension on bonding jumpers.

(3) For hinge at rudder station 93.26, tighten forward mounting bolts to torque of 220 to 360 pound-inches and lockwire. Tighten aft mounting bolts to 130-180 pound-inches. If hinge bolt has been removed, tighten to 290-410 pound-inches and insert cotter pin.

(4) For hinge at rudder station 102.18, tighten hinge bolt to torque of 660 to 780 pound-inches. Insert cotter pin. Position hinge assembly and install forward and aft hinge mounting bolts. Tighten forward mounting bolts to torque of 220 to 360 pound-inches and lockwire bolt heads. Tighten aft mounting bolts to torque of 370 to 610 pound-inches.

(5) Install access doors and panels.

5. Approved Repairs Rudder Thrust Hinge Assembly

A. Replace Rudder Thrust Hinge Bearing

(1) Remove thrust hinge assembly per paragraph 3.A.

(2) Remove hinge bolt.

(3) Remove bearing by removing four bearing cap mounting bolts and remove thrust bearing cap and bearing.

NOTE: Bearing cap and bearing fitting are a matched set. Index or record the relative position of these parts to ensure reinstalling correctly.

(4) Install new bearing with grease, and attach bearing cap with cap mounting bolts.

(5) Tighten cap mounting bolts to torque of 130 to 180 pound-inches.

(6) Assemble hinge and install hinge bolt.

(7) Tighten hinge bolt to torque of 800 to 1000 pound-inches. Install cotter pin.

(8) Install thrust hinge assembly per paragraph 3.B.

RUDDER PEDALS - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Pedals

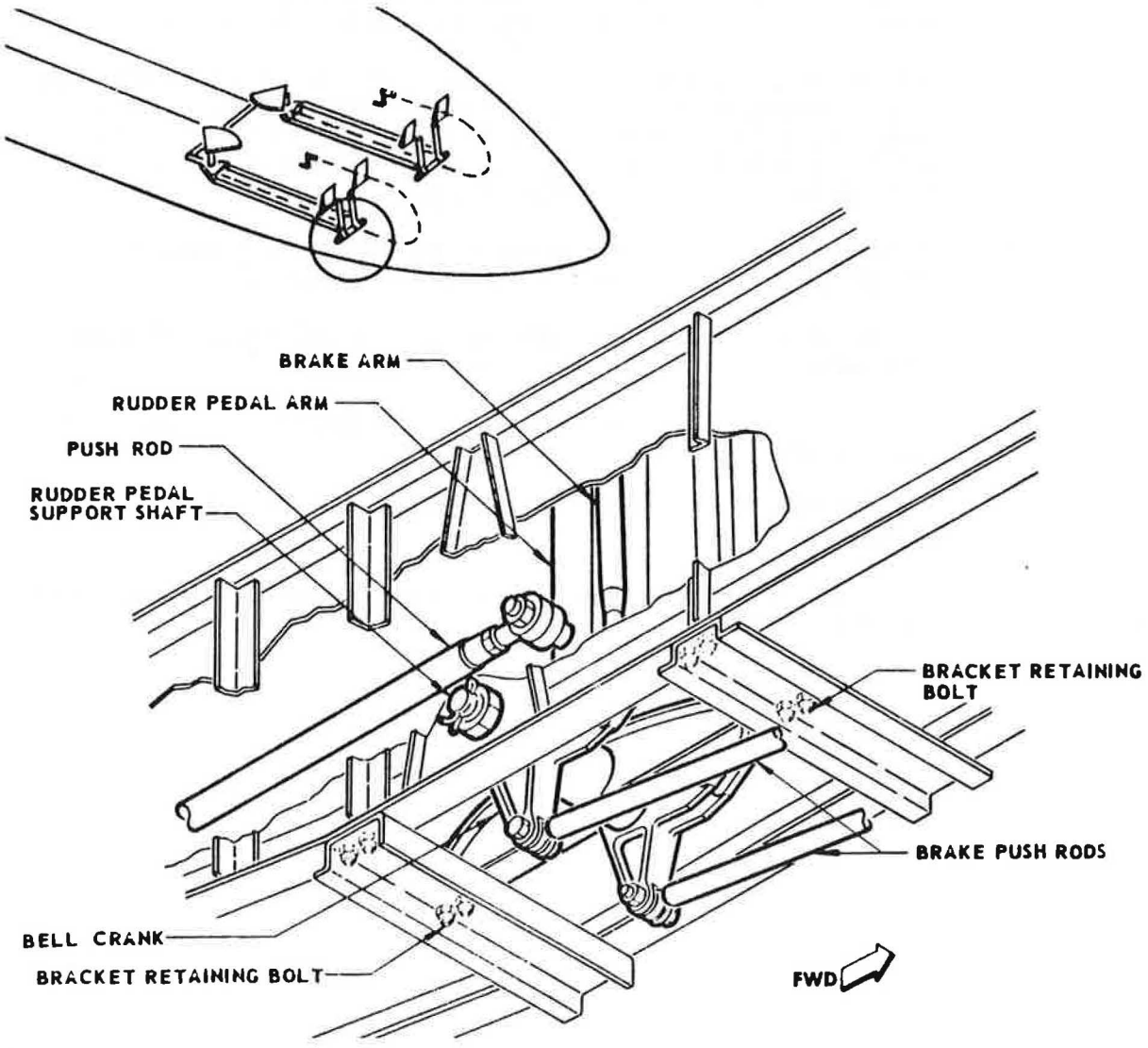
   A. Equipment and Materials

      (1) Rig pins Nos. 1, 2 and 7, 0.311 (+0/-0.002) inch dia (MS20392-4)

   B. Remove Rudder Pedals

      (1) Remove rudder pedal access panels 1801, 1802, 1803 and the lower nose compartment interior access door 1822. See Chapter 12, "Access Doors and Panels."

      (2) Disconnect brake push rods from bell crank. (See figure 201.)



Rudder Pedal Installation
Figure 201

(3) Disconnect push rods from pedal arms.

(4) Support rudder pedal and remove rudder pedal support shaft.

(5) Remove rudder pedals.

B. Install Rudder Pedals

(1) Position rudder pedals and install rudder pedal support shaft. (See figure 201.)

NOTE: Use one or more washers on both ends of rudder pedal support shaft to keep the bearings from the thread of the support shaft.

(2) Install one rig pin No. 2 through pilot and one rig pin No. 1 through copilot rudder pedal arm assembly and cabin floor.

(3) With rudder pedal arm at neutral position, adjust jackshaft yoke to its mid-travel position by operating rudder pedal adjustment crank. Position jackshaft yoke to its maximum aft and forward travel and mark these points. Then set jackshaft yoke at middle of these two points. (See figure 202.)

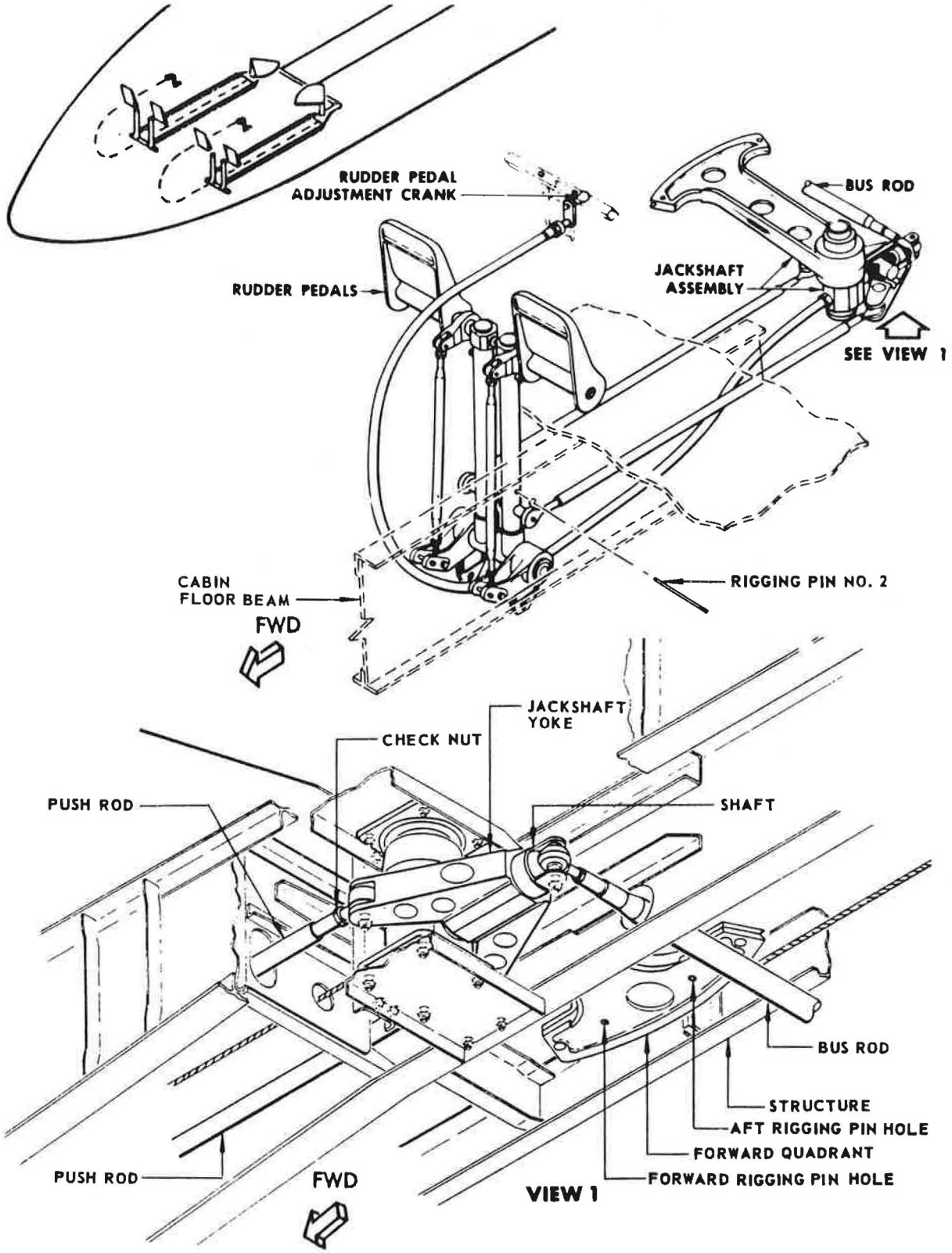
(4) Position forward control quadrants and install rig pins No. 7 through quadrants' forward rigging pin hole and floor.

(5) Adjust length of push rods and attach to pedal arms. Tighten check nuts after adjustment. (See figure 201.)

(6) Install and adjust brake push rods. See Chapter 32, "Hydraulic Brake System."

(7) Test rudder pedals. See 27-17-0, "Adjustment/Test Rudder Control System."

(8) Close all access doors and panels. See Chapter 12, "Access Doors and Panels."



Rudder Pedal and Jackshaft Installation
Figure 202

RUDDER FORWARD QUADRANT AND JACKSHAFT - REMOVAL/INSTALLATION

1. General

   A. Removal and installation procedure is similar for left and right forward quadrant jackshafts. For simplification, only one jackshaft is herein removed, with steps provided to cover either left or right jackshafts.

2. Equipment and Materials

   A. Rigging Pin No. 3 -- 0.497 (+0/-0.002) inch diameter (MS20392-7)

   B. Rigging Pin No. 7 -- 0.311 (+0/0.002) inch diameter (MS20392-4), 2 required

   C. Cable Tensiometer -- to 300 pounds

3. Prepare for Removal

   A. Remove vertical stabilizer access panels 1510 and 1562. Refer to Access Doors and Panels, Chapter 12.

   B. Open lower nose compartment interior access door in control cabin.

4. Remove Forward Quadrant and Jackshaft

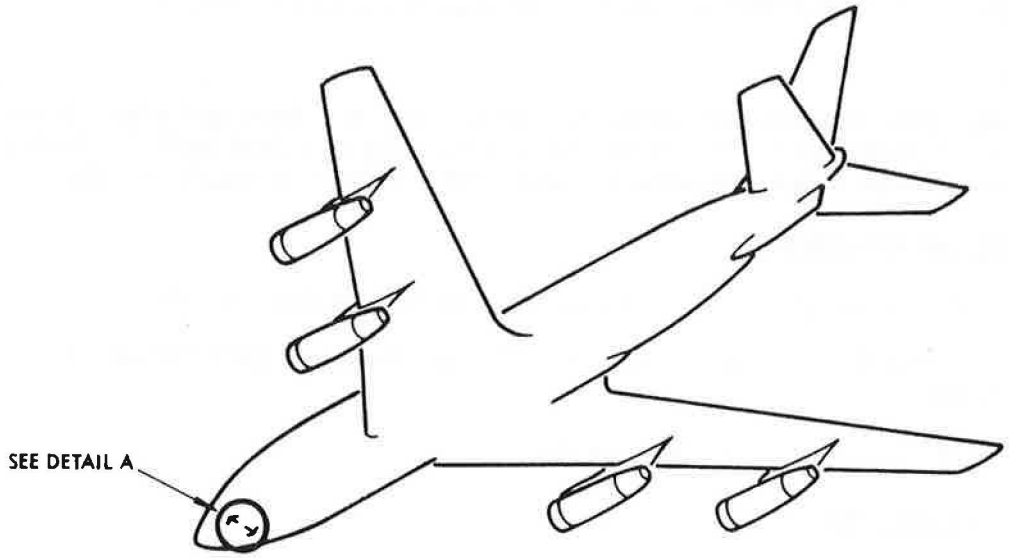
   A. Loosen turnbuckle on cable RB (4) (for left forward quadrant) or cable RA (for right forward quadrant). Turnbuckles are located in vertical stabilizer.

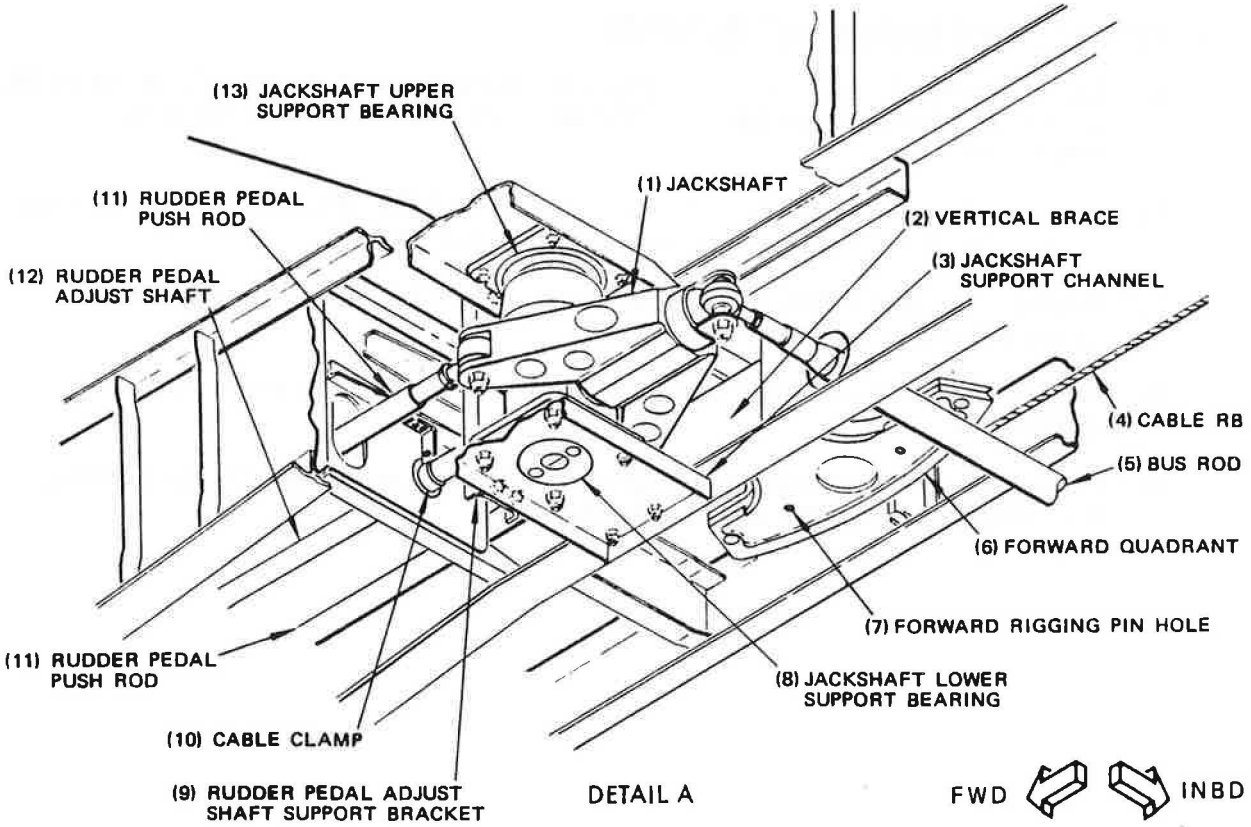
   B. Remove cable RA or RB from forward quadrant (6). Secure cable to prevent it running aft through fairlead. (See figure 401.)

   C. Remove four bolts from upper and lower ends of rudder pedal adjust shaft support bracket (9).

   D. Remove cable clamps (10) securing rudder pedal adjust shaft (12) to structure.

   E. Disengage rudder pedal adjust shaft (12) from jackshaft (1) by pulling the shaft and support bracket forward.





Forward Quadrant and Jackshaft Installation
Figure 401

F. Remove four bolts securing jackshaft support channel (3) to jackshaft lower support bearing (8).

CAUTION: SUPPORT FORWARD QUADRANT AND JACKSHAFT BEFORE PROCEEDING.

G. Remove six bolts securing jackshaft support channel (3) to structure and remove channel.

H. Disconnect bus-rod (5) from jackshaft (1).

I. Disconnect rudder pedal pushrods (11) from jackshaft (1).

J. Remove twenty bolts securing vertical brace (2) to structure. Vertical brace forms lower portion of cut-out for forward quadrant, in structure.

K. Slide jackshaft downward to clear upper support bearing (13) and remove forward quadrant and jackshaft assembly from airplane.

5. Install Forward Quadrant and Jackshaft

A. Install forward quadrant and jackshaft assembly in airplane. Provide suitable support for assembly until jackshaft support channel (3) is secured to structure. (See figure 401.)

B. Attach bus-rod (5) and rudder pedal pushrods (11) to jackshaft (1). Align castellated nut with hole in bolt-shank at all three locations and install cotter pins.

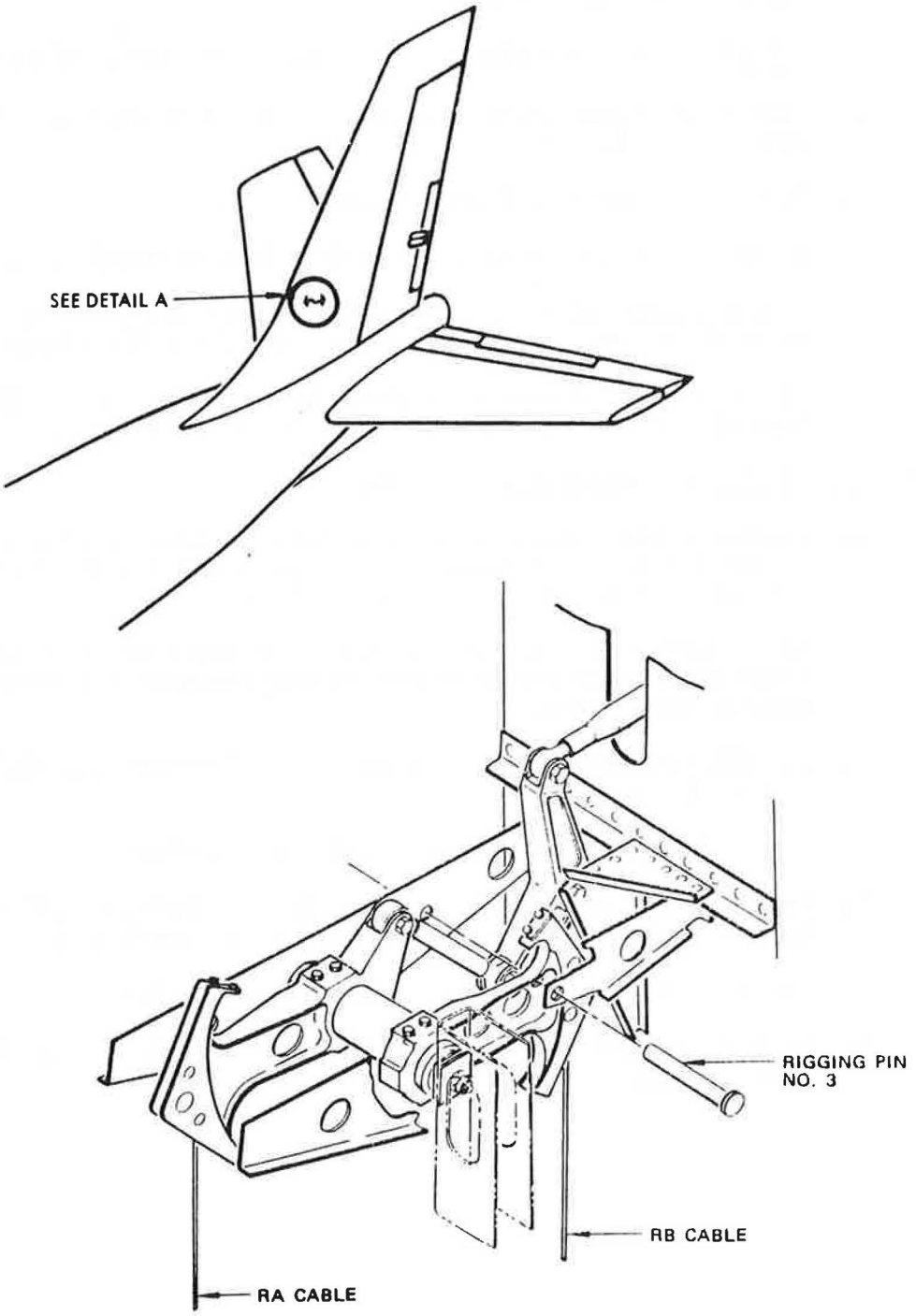
C. Install jackshaft support channel (3) and secure to jackshaft lower support bearing (8).

D. Attach jackshaft support channel (3) to structure.

E. Engage rudder pedal adjust shaft (12) with jackshaft (1) and secure upper and lower ends of rudder pedal adjust shaft support bracket (9).

F. Secure rudder pedal adjust shaft (12) to structure with cable clamps (10).

G. Install vertical brace (2) and attach to structure beneath forward quadrant (6).



DETAIL A

Rigging Pin No. 3 Location
Figure 402

H. Attach cable RA or cable RB (4) to forward quadrant (6) and adjust as follows:

(1) Install rigging pins No. 7 through forward rigging pin holes (7) of both forward quadrants.

(2) Install rigging pin No. 3 through aft control quadrant. (See figure 402.)

(3) Adjust cable tension to that specified in 27-17-0, figure 202. Balance loads in cables so that rigging pins in forward and aft quadrants fit freely.

(4) Lockwire turnbuckles after cable adjustment.

I. Test rudder control system. See 27-17-0, Adjustment-Test Rudder Control System.

6. Restore Airplane to Normal

A. Remove rigging pins from forward and aft quadrants.

B. Replace all access doors and panels.

RUDDER PEDAL ADJUST SHAFT ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Pedal Adjust Shaft Assembly

A. Remove Rudder Pedal Adjust Shaft

(1) Loosen shaft retaining nut. (See figure 201.)

(2) Remove all clamps which attach shaft to structure.

(3) Pull shaft forward until end of shaft clears rudder control jackshaft.

(4) Remove shaft retaining nut and washer and from end of shaft and pull free of support structure.

NOTE: The above component is accessible from lower nose compartment.

(5) Remove four retaining bolts from bearing housing and lower rudder pedal adjustment crank to clear crank support bracket.

(6) Pull crank and adjustment shaft free of structure and remove unit.

B. Install Rudder Pedal Adjust Shaft

(1) Run adjustment shaft (figure 201) through openings provided in airplane structure from crank support bracket to rudder control jackshaft.

(2) Attach bearing housing to crank mounting bracket by installing the four retaining bolts with heads of bolts aft. Install nylon stops under two upper bolts.

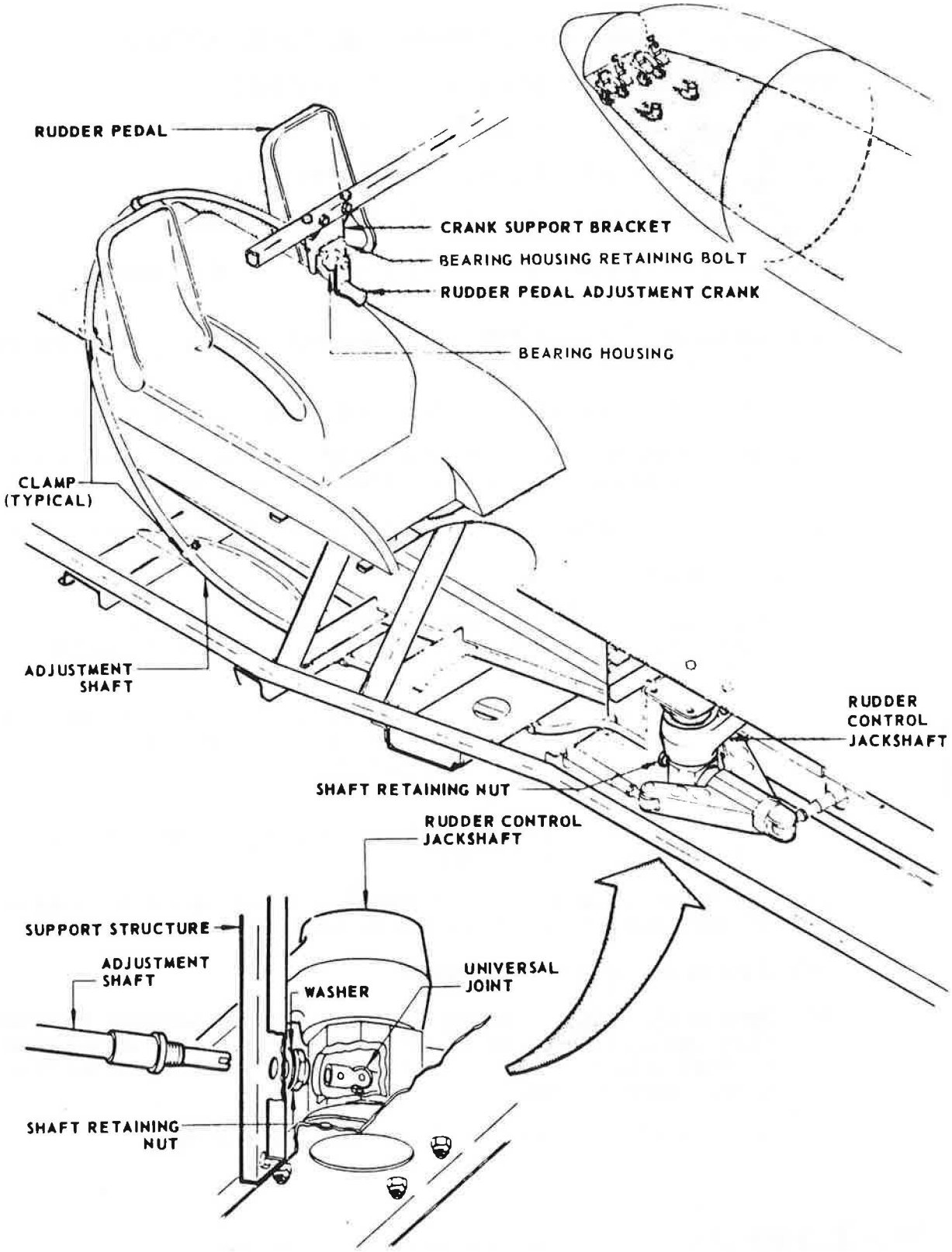
(3) Push adjustment shaft through hole in support channel and slip nut and washer over end of shaft.

(4) Insert end of shaft in rudder control jackshaft and rotate fork end of shaft until it slips over pin in jackshaft.

(5) Tighten nut on adjustment shaft.

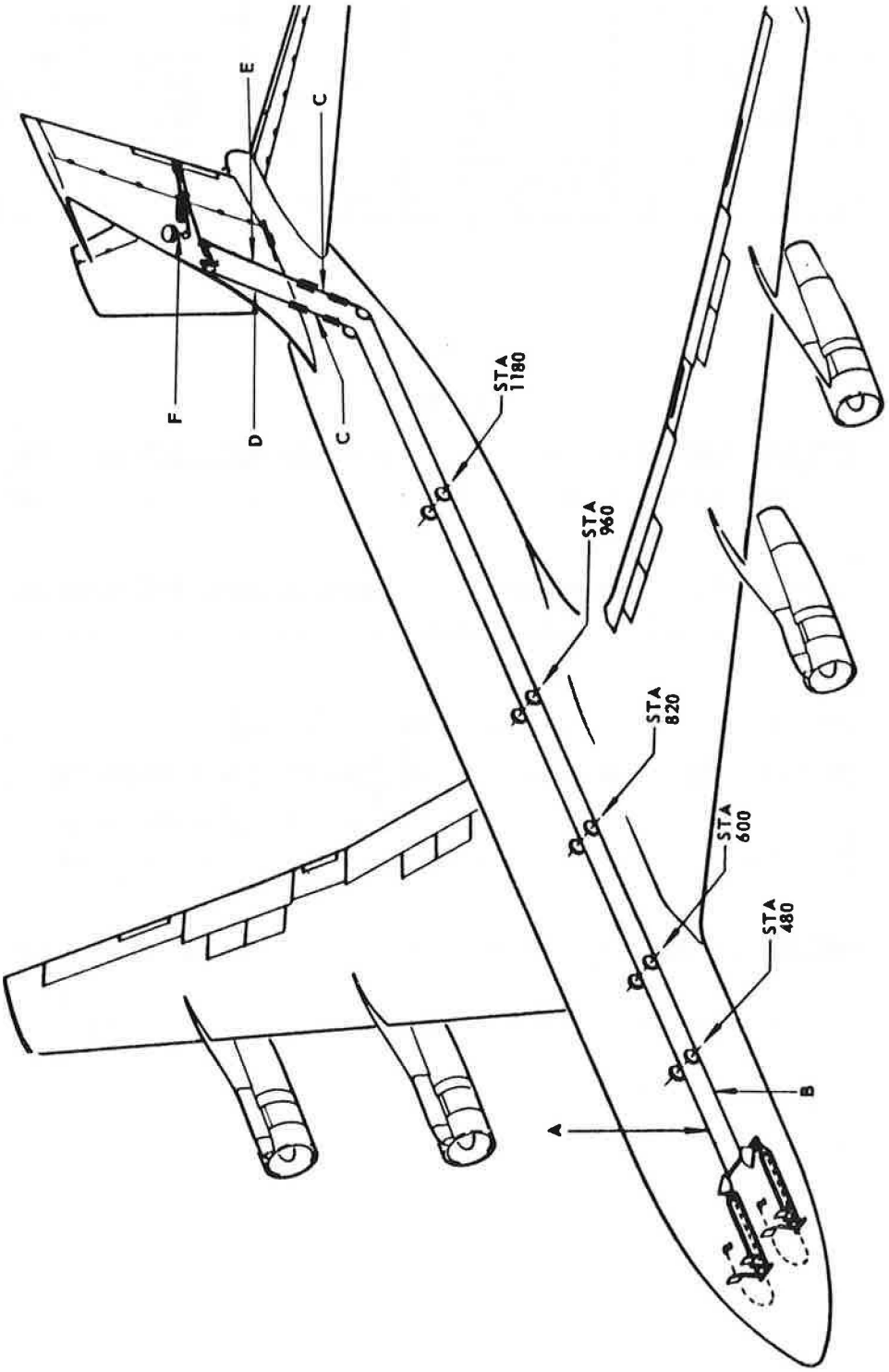
(6) Install all clamps attaching adjustment shaft to airplane structure. Clamp shaft in such a manner that radius of curvature at any point on shaft will not be less than 5.0 inches. A smaller radius will cause binding of shaft.

(7) Rotate crank through one cycle to check for binding.

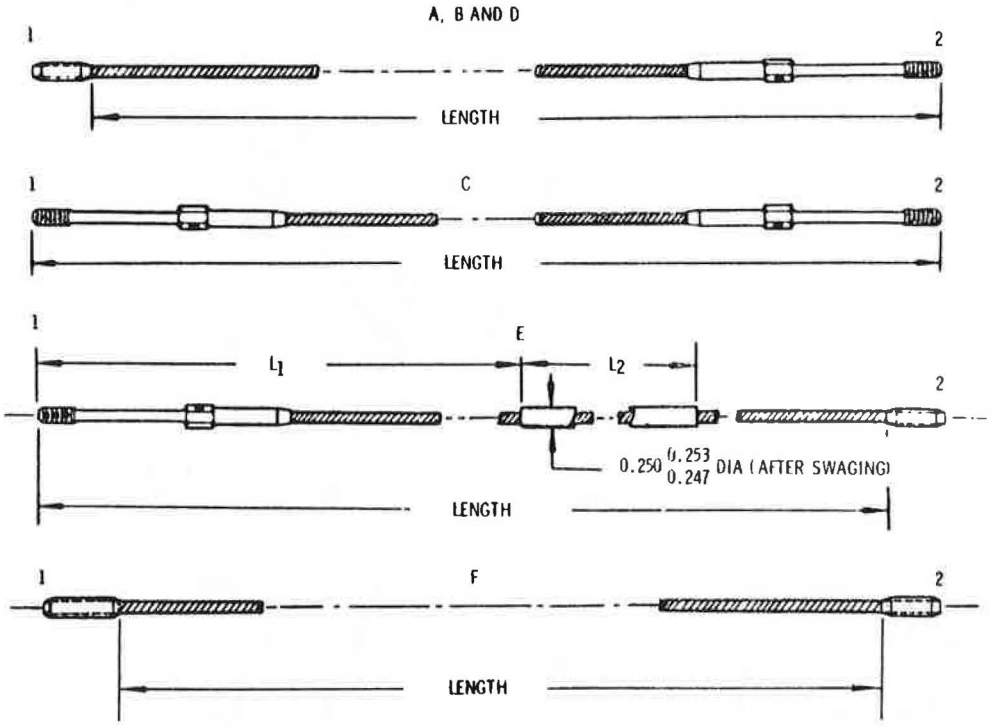


Rudder Pedal Adjust Shaft Installation
Figure 201

RUDDER CONTROL CABLES-MAINTENANCE PRACTICES



CABLE REF.	DRAWING NO.	NO. REQ.	LENGTH	CABLE SIZE	FITTINGS 1.	FITTINGS 2.
A	BAC-C13G-469-14728	1	1472.8 IN.	1/8 7 x 19	AN669L4LH	BAC-T14A-4
B	BAC-C13G-469-14486	1	1448.6 IN.	1/8 7 x 19	AN669L4LH	BAC-T14A-4
C	NAS304-45-183	2	18.4 IN.	1/8 7 x 19	MS21260L4LH	MS21260L4RH
D	BAC-C13G-468-1432	1	143.2 IN.	1/8 7 x 19	AN669L4RH	BAC-T14A-4
E	66-29068-1	1	166.9 IN. L_1 6.27(±.06) IN. L_2 42.0(±0.5) IN.	1/8 7 x 19	AN669L4RH	BAC-T-14A-4
F	66-21740-2	1	21.50 IN.	1/8 7 x 19	BAC-T-14A-4	BAC-T-14A-4



RUDDER DAMPER - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Damper

A. Equipment and Materials

(1) External hydraulic power, 20 gpm at 3000 psi.

(2) High pressure hose, 3/4 and 1/2 inch diameter.

(3) Fittings for connecting hoses to 1-1/4, 3/4, 5/8 and 3/8 inch diameter hydraulic lines.

(4) External compressed air source, 50 to 200 psi pressure.

(5) Hydraulic fluid, Skydrol "500A."

(6) Main landing gear door down lock.

(7) Pressure gage, 0 to 200 psi capacity.

B. Remove Rudder Damper

(1) Open AC auxiliary pump circuit breaker on radio and T-R bus (P5).

(2) Open left main gear wheel well door and hydraulic access panel L1348. See Chapter 12, "Access Doors and Panels."

(3) Depressurize auxiliary hydraulic system by turning rudder switch on and deflecting the rudder with the use of the power control unit until rudder stops operating hydraulically. Turn rudder switch "OFF."

(4) Depressurize utility reservoir by slowly unscrewing filler cap 3 full turns.

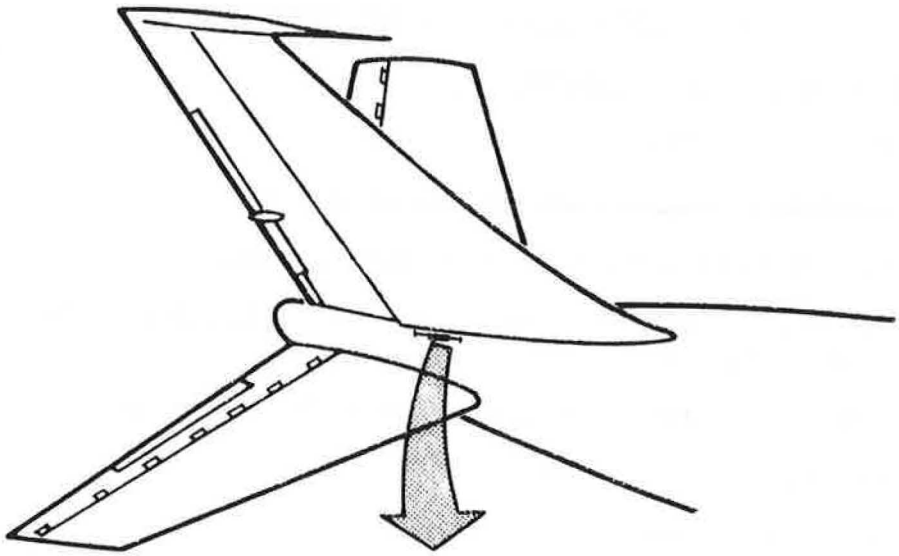
CAUTION: DO NOT REMOVE CAP UNTIL RESERVOIR IS COMPLETELY DEPRESSURIZED, OTHERWISE FLUID WILL ESCAPE.

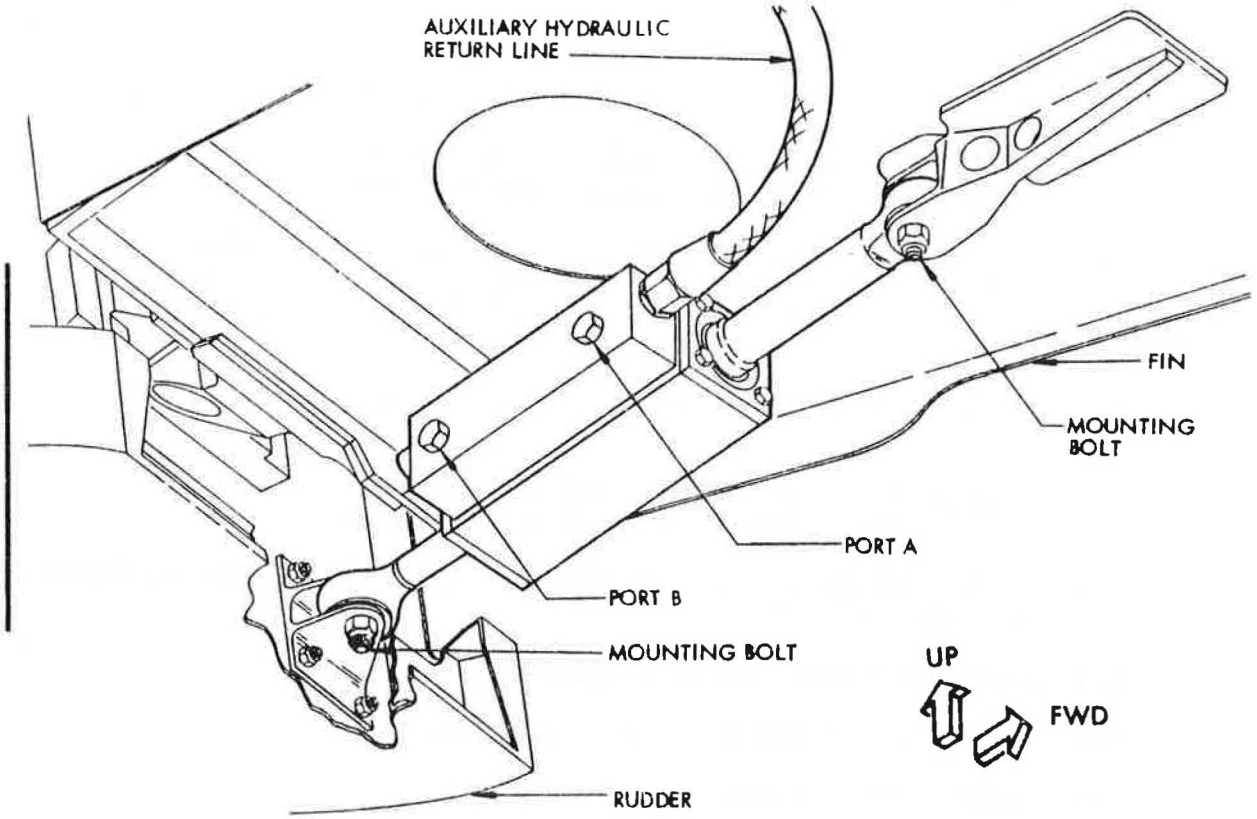
(5) Remove fuselage aft fairings 1538 and 1539. See Chapter 12, "Access Doors and Panels."

(6) Disconnect hydraulic line (figure 201) from damper.

(7) Cap damper port and plug end of hydraulic line.

(8) Remove mounting bolts and damper.





Rudder Damper Installation
Figure 201

C. Install Rudder Damper

(1) Check hydraulic fluid quantity and add fluid if necessary. See Chapter 29-0, Replenish Hydraulic System.

(2) Bleed rudder damper as follows:

(a) Connect fluid inlet port on damper to hydraulic pressure source.

(b) Position damper so that ports A and B are up. (See figure 201.)

(c) Loosen bleed plug A or B.

(d) Apply 20 psi hydraulic pressure to damper.

(e) Cycle damper through complete strokes until bleed fluid shows no visible aeration.

(f) Tighten bleed plug.

(g) Disconnect hydraulic pressure service and cap inlet port on damper.

(3) Position head end of damper to rudder rear spar and rod end to fin structure and install mounting bolt. (See figure 201.)

(4) Check that rudder switch is OFF.

(5) Bleed system hydraulic supply line to damper:

(a) Connect external electrical power to airplane.

(b) Remove cap from damper and plug from hydraulic line.

(c) Apply sufficient air pressure to inlet of hydraulic reservoir ground pressurizing valve to cause hydraulic fluid flow.

(d) Allow hydraulic fluid flow to continue until fluid shows no visible aeration.

(e) With hydraulic fluid continuing to flow from line, connect line to damper port and tighten fitting.

(6) Switch auxiliary pump ON and check connections for hydraulic leaks.

(7) Check position of reservoir piston by inserting drill rod through hole in the spring cap.

NOTE: Piston should be not more than 5.30 inches from external surface of spring cap, otherwise replace damper.

(8) Switch auxiliary pump OFF.

(9) Check hydraulic fluid quantity and add fluid if necessary. See Chapter 29-0, Replenish Hydraulic System.

(10) Charge utility hydraulic reservoir with 40 to 45 psig of air.

NOTE: Charging of utility reservoir is recommended to avoid cavitation in pumps when pumps are operated.

(11) Remove external compressed air.

(12) Remove external electrical power source.

(13) Close access doors, panels and left main gear wheel well door.

RUDDER FEEL UNIT - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Feel Unit

A. Remove Rudder Feel Unit

(1) Depressurize auxiliary hydraulic system.

WARNING: AUXILIARY HYDRAULIC SYSTEM MUST BE DEPRESSURIZED TO AVOID INJURING PERSONNEL OR DAMAGING EQUIPMENT WHEN WORKING ON RUDDER FEEL UNIT.

(2) Remove rudder Q-spring access panel 1562, rudder control quadrant access panel 1510, left and right rudder tab control access panels 1514. See Chapter 12, "Access Doors and Panels."

(3) Disconnect forward end of rudder input rod from rudder aft quadrant reversing crank. (See figure 203.)

(4) Remove bolt connecting aft end of input rod to input arm on rudder power control unit and remove rod from airplane.

(5) Remove bolt connecting feel rod (2, figure 201) to carriage assembly on feel unit (7).

(6) Loosen check nut securing rod end to feel rod at power control unit and disconnect rod from rod end. Remove feel rod from airplane.

(7) Relieve tension in Q-spring cable (12) by loosening turnbuckle at Q-bellows.

(8) Disconnect detent springs (4) from connector (5). Remove hook (6), connector and detent springs from airplane.

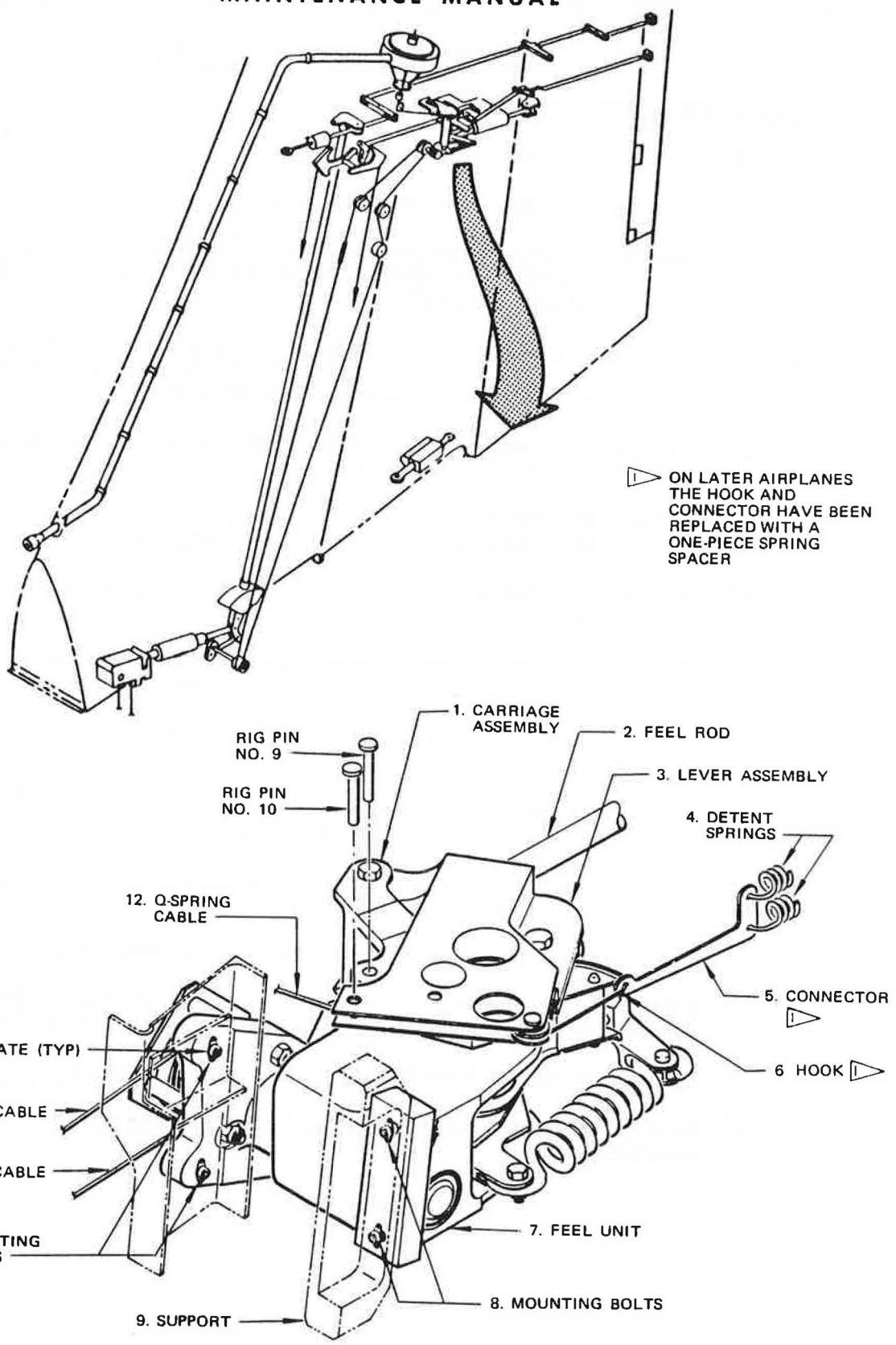
NOTE: On later airplanes, the hook and connector have been replaced with a one-piece spring spacer.

(9) Disconnect Q-spring cable from lever (3) on feel unit.

(10) Relieve tension in rudder power trim cables (10 and 11) by loosening adjustable pulley bracket on RTPA and loosening turnbuckles on RTPB.

(11) Disconnect RTPA and RTPB cables from cable drum on feel unit.

(12) Remove four mounting bolts (8) and remove rudder feel unit from airplanes.



Rudder System Feel Unit Installation
Figure 201

B. Install Rudder Feel Unit

(1) Align rudder feel unit (7, figure 201) with supports (9) in fin structure and install four mounting bolts with washer under each bolt head.

(2) Connect cables RTPB (11) and RTPA (10) to feel unit cable drum.

(3) Connect Q-spring cable (12) to feel unit lever assembly (3).

(4) Install bolt attaching hook (6) to lever assembly on feel unit. Attach connector (5) to hook.

NOTE: On later airplanes the hook and connector have been replaced with a one-piece spring spacer.

(5) Attach detent springs (4) to bracket on support structure and to connector.

(6) **Not applicable to SABENA aircraft.**

(7) Install feel rod (2) as follows:

(a) Check that feel unit is in detent position.

(b) Install rig pins No. 3 and No. 9. (See figure 203.)

(c) Place rudder and tab in neutral.

(d) Attach feel rod to feel unit, but do not connect feel rod to power unit.

(e) Remove safety bolt and cotter pin from feel rod. Adjust plug in end of feel rod until gap of approximately 0.12 inch exists between end of plug and rod end bearing on the power control unit linkage.

(f) Move rudder tab until plug and rod end can be engaged. Engage 15 turns.

(g) Align input pushrod with rudder aft quadrant reversing crank and input arm on power unit, with adjustable end of rod aft. Install bolts attaching rod to reversing crank and input arm with bolt head at input arm up.

(h) Check feel rod adjustment per paragraph 8.

(8) Check feel rod adjustment.

(a) Check that rig pins No. 3 and No. 9 are installed.

(b) Pressurize auxiliary hydraulic system and turn on rudder power.

WARNING: THE RUDDER CONTROL IS A FULLY POWERED HYDRAULIC SYSTEM WHEN OPERATED IN THE POWER MODE. KEEP ALL PERSONNEL AWAY FROM MOVING COMPONENTS OF THE RUDDER AND RUDDER CONTROL SYSTEM WHEN RUDDER POWER IS ON.

(c) Allow rudder to come to rest and check that rudder is faired within ± 0.06 inch.

1) If rudder alignment is satisfactory and feel rod has not been replaced:

a) Remove rig pin No. 9.

b) Adjust feel unit.

2) If rudder alignment is satisfactory and feel rod has been replaced:

a) Install cotter pin and safety bolt.

NOTE: Plug must cover witness hole, and not be turned more than ± 1/8 turn to admit cotter pin, otherwise feel rod must be readjusted per steps (9)(c) through (9)(h).

b) Tighten check nuts on feel rod.

c) Remove rig pin No. 9.

d) With power on readjust and connect input rod until rig pin No. 3 can easily be removed. Leave rig pin No. 3 in place.

e) Tighten input rod locknut, and safety all bolts.

f) Adjust feel unit.

3) If rudder alignment is not satisfactory, adjust feel rod per paragraph (9).

(9) Adjust feel rod.

(a) Remove cotter pin from feel rod if installed. Disconnect input rod from power unit. Adjust plug until rudder is faired within ± 0.06 inch.

(b) Install cotter pin if plug covers witness hole in feel rod, and was not turned more than ± 1/8 turn to admit the pin.

(c) If plug does not cover witness hole turn off power, remove safety bolt, and back plug out of rod end until 0.12 inch gap exists between end of plug and rod end. Increase gap sufficiently to make plug cover witness hole when plug is reconnected and adjusted to fair rudder.

(d) If plug must be turned more than ± 1/8 turn to admit cotter pin turn off power and decrease the 0.12 inch gap between end of plug and rod end.

(e) Move tab until plug and rod end can be engaged. Engage 15 turns.

(f) Turn on rudder power and allow rudder to come to rest.

(g) Adjust feel rod plug until rudder is faired within ± 0.06 inch.

(h) If plug covers witness hole, install safety bolt and cotter pin. If not repeat steps (c) through (g).

(i) Tighten check nuts on feel rod.

(j) Remove rig pin No. 9.

(k) With power on readjust and connect input rod until rig pin No. 3 can easily be removed. Remove rig pin No. 3.

(l) Tighten the input rod locknut and safety all bolts.

(m) Adjust feel unit.

2. Adjustment/Test Rudder Feel Unit

A. Equipment and Materials

(1) Rudder Trim System Rig Pin No. 6 and Rudder Rig Pin No. 9, 0.311 (+0/-0.002) inch dia (MS20392-4)

(2) Rig Pin No. 3, 0.497 (+0/-0.002) inch dia MS20392-7

(3) Air Pressure Source variable to 3.0 psig

(4) Cable Tensiometer

(5) Rudder Protractor MIT50-8703

(6) Rudder Tab Protractor MIT50-8706

(7) Push and Pull Scale - 0 to 300 pound capacity

B. Adjust Rudder Feel Unit

(1) Rotate rudder trim handle until trim indicator indicates 0.

(2) Remove stabilizer jackscrew access panel 1108.

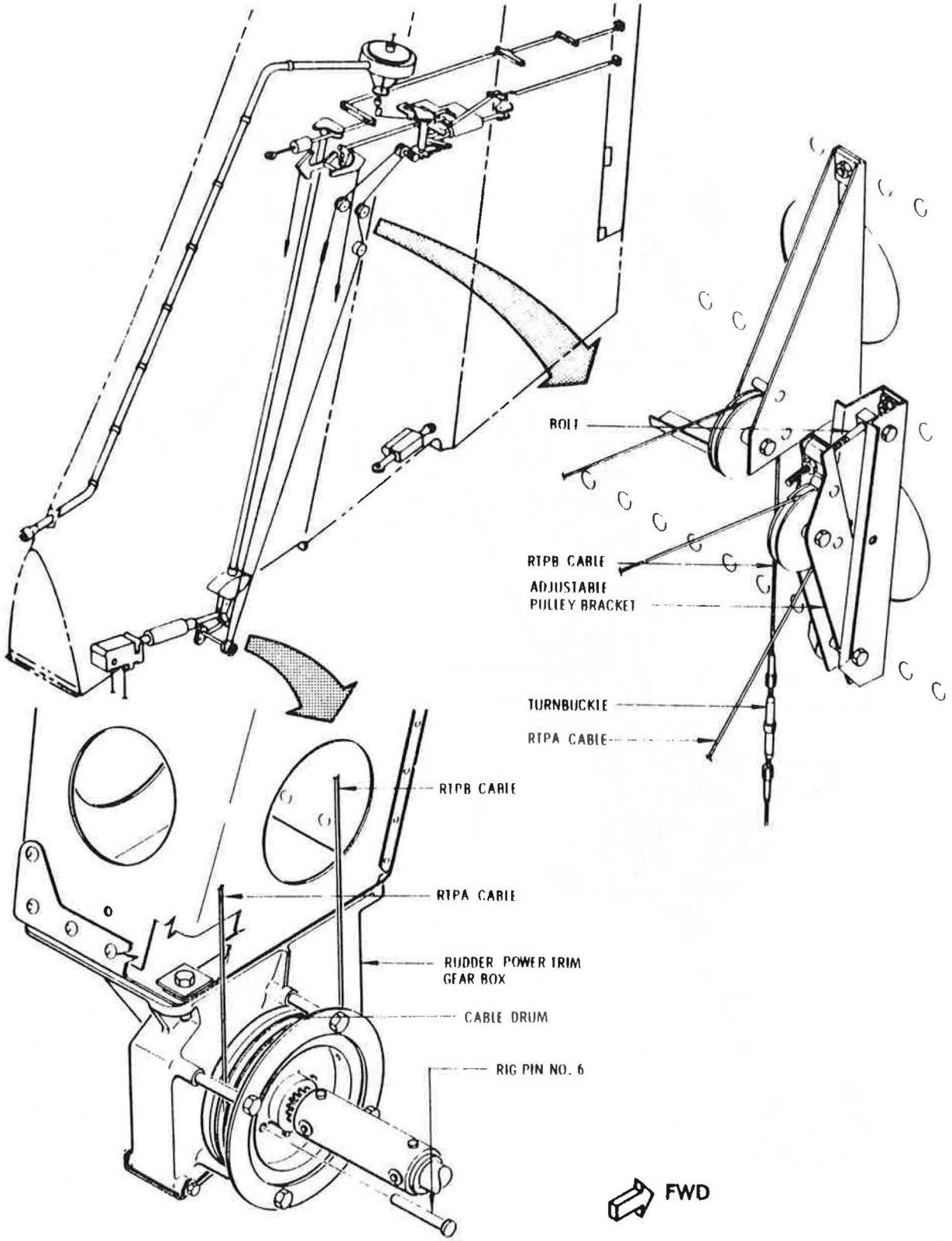
(3) Install rig pin No. 6 through cable drum and housing on rudder power trim gearbox. (See figure 202.)

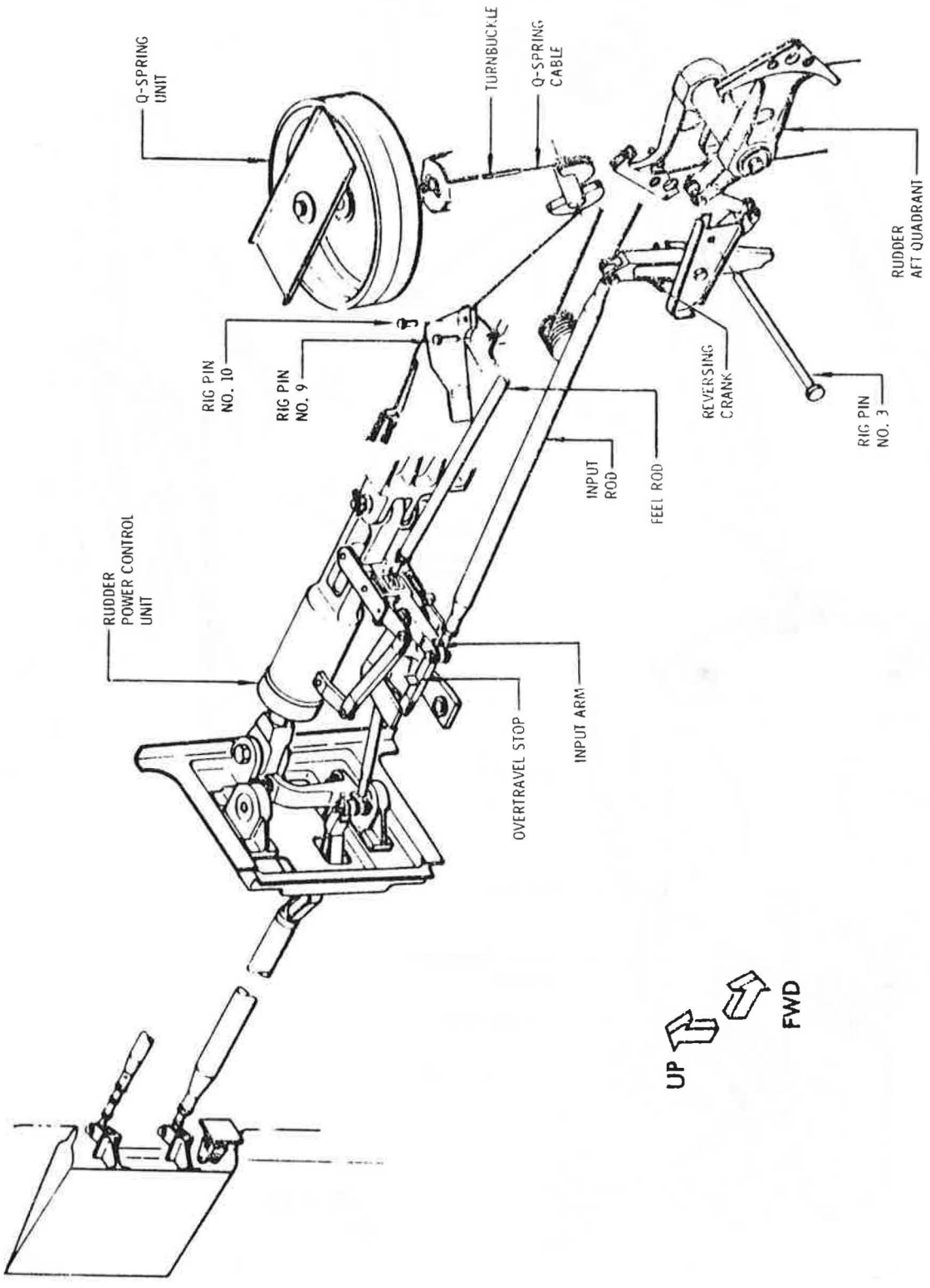
(4) Rotate cable drum on feel unit until cables RTPB (11, figure 201) and RTPA (10) are each wrapped 2-1/2 turns on cable drum.

(5) Install rig pin No. 9 through carriage assembly (1) and cable drum housing on feel unit.

(6) Adjust bolt on adjustable pulley bracket and turnbuckle to provide specified tension in power trim cables RTPA and RTPB. (See figure 202.) Balance tension loads so that rig pins 6 and 9 fit freely. See 27-18-0, figure 202, for temperature tension chart.

(7) Remove rig pin No. 6 from power unit drum and lockwire turnbuckle on cable RTPA.


BOLT
RTPB CABLE
ADJUSTABLE PULLEY BRACKET
TURNBUCKLE
RTPA CABLE
RTPB CABLE
RTPA CABLE
RUDDER POWER TRIM GEAR BOX
CABLE DRUM
RIG PIN NO. 6
FWD



Rudder Feel Unit Adjustment
Figure 203

(8) Adjust turnbuckle on Q-spring cable assembly unit so that rig pin No. 10 can be freely inserted through lever and carriage assembly on feel unit. (See figure 203.)

(9) Remove rigging pin No. 10 and lockwire turnbuckle.

(10) Position rudder and rudder control tab in neutral.

(11) Install rig pin No. 3 through rudder aft quadrant and quadrant support bracket.

(12) With rudder control tab held in neutral, check that flat surface on aft edge of input arm is 2.40 (± 0.02) inches from overtravel stop. If required adjust input arm to obtain dimension. Tighten checknut.

(13) With rudder and tab held in neutral check that feel unit is in detent position. If required adjust feel pushrod to place feel unit in detent position by removing cotter pin, loosening checknuts and turning vernier adjustment in 1/4 turn increments.

(14) Pressurize auxiliary hydraulic system and turn on rudder power.

WARNING: THE RUDDER CONTROL IS A FULLY POWERED HYDRAULIC SYSTEM WHEN OPERATED IN THE POWER MODE. THE RUDDER SHOULD BE IN NEUTRAL, AND ALL OBSTRUCTIONS REMOVED FROM THE SYSTEM BEFORE HYDRAULIC POWER IS APPLIED. KEEP ALL PERSONNEL AWAY FROM MOVING COMPONENTS OF THE RUDDER AND RUDDER CONTROL SYSTEM WHEN RUDDER POWER IS ON.

(15) Check that rudder trailing edge is within 0.06 inch of neutral position. If not, disconnect input rod from power unit, and remove cotter pin and loosen checknut on feel rod. Turn vernier in 1/4 turn increments to obtain desired results.

(a) Not applicable to SABENA.

(b) Adjust feel rod as follows:

1) Install cotter pin if plug covers witness hole in feel rod, and was not turned more than ± 1/8 turn to admit the pin.

2) If plug does not cover witness hole turn off power, remove safety bolt, and back plug out of rod end until 0.12 inch gap exists between end of plug and rod end. Increase gap sufficiently to make plug cover witness hole when plug is reconnected and adjusted to fair rudder.

3) If plug must be turned more than ± 1/8 turn to admit cotter pin turn off power, remove safety bolt, and decrease the 0.12 inch gap between end of plug and rod end.

4) Move tab until plug and rod end can be engaged. Engage 15 turns.

5) Turn on rudder power and allow rudder to come to rest.

6) Adjust feel rod plug until rudder is faired within ± 0.06 inch.

7) If plug covers witness hole, install safety bolt and cotter pin. If not repeat steps 2) through 6).

8) Tighten check nuts on feel rod.

9) Remove rig pin No. 9.

10) With power on readjust and connect input rod until rig pin No. 3 can easily be removed. Remove pin No. 3.

11) Tighten the input rod locknut and safety all bolts.

12) Test feel unit.

(16) Test rudder feel unit.

C. Test Rudder Feel Unit

(1) Install rudder and rudder trim protractors.

(2) Pressurize auxiliary hydraulic system and turn rudder power on.

WARNING: THE RUDDER CONTROL SYSTEM IS A FULLY POWERED HYDRAULIC SYSTEM WHEN OPERATED IN THE POWER MODE. THE RUDDER SHOULD BE IN NEUTRAL, AND ALL OBSTRUCTIONS REMOVED FROM THE SYSTEM BEFORE HYDRAULIC PRESSURE IS APPLIED. KEEP ALL PERSONNEL AWAY FROM MOVING COMPONENTS OF THE RUDDER AND RUDDER CONTROL SYSTEM WHEN RUDDER POWER IS ON.

(3) Check rudder centering as follows:

(a) Push right rudder pedal forward until pedal stop is contacted and abruptly release pedal.

(b) Record final position of rudder trailing edge.

(c) Push left rudder pedal forward until pedal stop is contacted and abruptly release pedal.

(d) Record final position of rudder trailing edge.

(e) Check that total distance between the two recorded positions does not exceed 1/4 inch.

(f) Check that midpoint between the two recorded positions is not more than 1/4 inch from rigged rudder neutral for manual mode.

(4) Check rudder pedal force with no "Q" pressure:

(a) Push on right rudder pedal until rudder stops moving.

S (b) Check that rudder is positioned 26° to 26-3/4° to the right and that rudder tab is positioned 19° to 22° to the right.

(c) Check that pedal force required to hold rudder and tab in this position is 56 to 65 pounds.

(d) Repeat steps (a) through (c) for left rudder pedal. Rudder shall be left, tab shall be left and measurements shall be of equal magnitude.

(6-7161-4-1519, 17.6.66)

(5) Check rudder pedal force with "Q" pressure:

(a) Apply 0.47 (± 0.02) psig air pressure to the "Q" intake port.

(b) Push on right rudder pedal until pedal stop is contacted.

S (c) Check that rudder is positioned 26° to 26-3/4° to the right and tab is positioned 19° to 22° to right.

(d) Check that pedal force required to hold rudder and tab in this position shall be 60 to 80 pounds.

(e) Repeat steps (a) through (d) for left rudder pedal. Rudder shall be left, tab shall be left and measurements shall be of equal magnitude.

(f) Apply 0.83 (± 0.04) psig to Q intake port.

(g) Push on right rudder pedal until rudder reaches 17° right. Tab shall be right.

(h) Check that pedal force required to hold this position is 80 to 110 pounds.

(i) Repeat steps (f) through (h) for left rudder pedal. Rudder and tab shall be left and measurements shall be of equal magnitude.

(6) Depressurize auxiliary hydraulic system and cycle rudder by means of pedals until rudder hydraulic pressure is zero.

(7) Disconnect air pressure source from "Q" intake port.

(8) Remove rudder and rudder control tab protractors.

(9) Install all access panels.

(6-7161-4-1519, 17.6.66)

RUDDER POWER CONTROL UNIT - MAINTENANCE PRACTICES

1. Unit Servicing

A. The rudder power control unit incorporates two built-in hydraulic fluid filters equipped with cleanable metallic filter elements. The filters are located on figure 201. Replacement or cleaning of the filter element is not recommended with the power unit installed in the airplane. Removal of the element from the power control unit should be accomplished with the power unit inverted so that drainage of fluid and debris from the element will be away from the power unit.

2. Removal/Installation Rudder Power Control Unit

NOTE: The rudder power control unit linkage plug detent (figure 201) may separate if heavy, sudden pedal application is made. This is normal; therefore, the power control unit should not be replaced for this reason unless separation occurs with slow, steady pedal application also.

A. Remove Rudder Power Control Unit

(1) Connect electrical power to airplane.

(2) Depressurize auxiliary hydraulic system by turning rudder switch ON and deflecting rudder with rudder pedals until rudder stops operating hydraulically.

(3) Turn rudder switch OFF.

(4) Open left main gear wheel well door and remove hydraulic access panel. See Chapter 12, Access Doors and Panels.

(5) Depressurize utility hydraulic reservoir by slowly unscrewing filler cap three full turns. Tighten cap after compressed air has escaped.

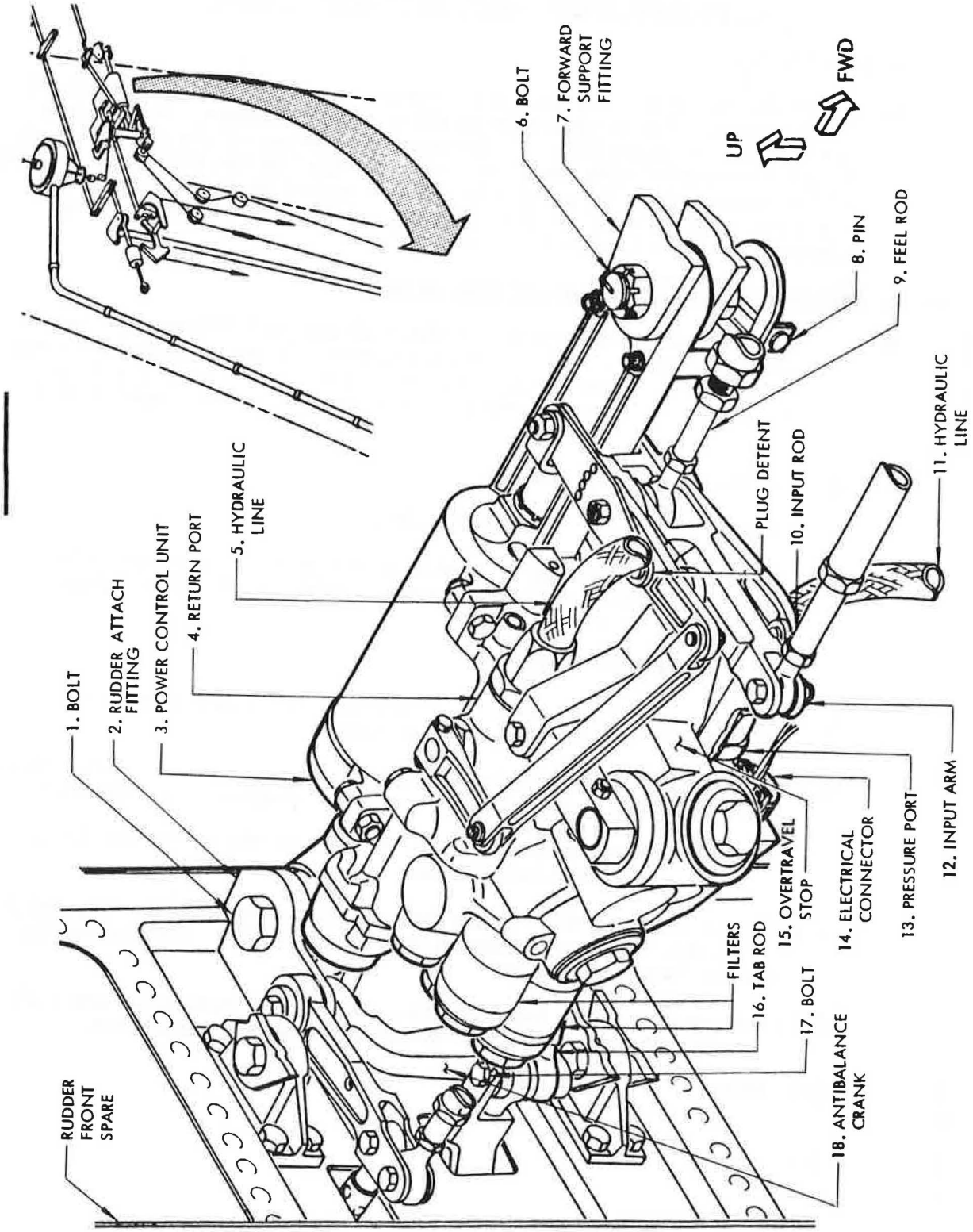
CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS COMPLETELY DEPRESSURIZED, OTHERWISE FLUID WILL ESCAPE.

(6) Remove left and right rudder tab control access panels 1514, panel 1510, and rudder nose fairing access panel 1572. See Chapter 12, Access Doors and Panels.

(7) Disconnect pilot's input rod (10, figure 201) from input arm (12) on power control unit (3). Retain adjustment of input rod.

(8) Deleted

(9) Deleted



Rudder Power Control Unit Installation
Figure 201

(10) Disconnect feel rod from power unit input arm by loosening checknut and screwing rod off rod end.

(11) Manually rotate rudder to the right.

(12) Disconnect tab rod (16) from control tab antibalance crank (18).

(13) Disconnect electrical connector (14) from power control unit.

(14) Disconnect hydraulic lines (5 and 11) from power control unit. Plug hydraulic lines and cap ports on power unit.

(15) Remove bolt (1) attaching power unit actuator rod end to attach fitting (2) on rudder front spar.

(16) Pull cotter pin and remove flat head pin (8) below power unit forward support fitting (7).

(17) Remove forward mounting bolt (6) and remove power unit from airplane.

B. Install Rudder Power Control Unit

(1) Install O-ring and union in power control unit pressure port (13, figure 201) and O-ring and reducer in return port (4).

(2) Position power control unit (3) in fin structure with head of power unit aligned with power unit forward support fitting (7) and rod end aligned with attach fitting (2) on rudder front spar.

(3) Install forward mounting bolt (6) with head down and washer under bolt head and under nut. Install cotter pin through bolt and nut.

(4) Insert flat head pin (8) through lugs on actuator head to secure forward mounting bolt. Secure flat head pin with cotter pin.

(5) Install aft bolt (1) through attach fitting (2) and rod end of power unit with bolt head up. Install washer under bolt head and under nut and install cotter pin. Check that lower rub block is adjusted to relieve the angular load on the head of bolt (6) against the antirotation bracket, minimum clearance between bolt head and bracket shall be 0.001 inch. Adjust clearance at upper rub block to .020 (± .010) inch.

(6) Remove plugs from hydraulic lines (5 and 10) and connect lines to hydraulic ports on power unit.

(7) Connect electrical connector (14) to power unit.

(8) Install bolt (17) connecting tab rod (16) to antibalance crank (18) on rudder front spar. Install bolt with head up and secure with cotter pin.

(9) Position rudder and rudder control tab in neutral.

(10) **Deleted**

(11) **Install feel rod (9) as follows:**

(a) Check that feel unit is in detent position.

(b) Install rig pins No. 3 and No. 9. (See figures 202 and 203.)

(c) Place rudder and tab in neutral.

(d) Attach feel rod to feel unit, but do not connect feel rod to power unit.

(e) Remove safety bolt and adjust plug in end of feel rod until gap of approximately 0.12 inch exists between end of plug and rod end bearing on the power control unit linkage.

(f) Move rudder tab until plug and rod end can be engaged. Engage 15 turns.

(g) Install bolt attaching forward end of input rod (10, figure 201) to rudder aft quadrant reversing crank.

(h) Install bolt attaching adjustable end of input rod to input arm (12) on power control unit.

(i) Check feel rod adjustment per paragraph (12).

(12) Check feel rod adjustment.

(a) Check that rig pins No. 3 and No. 9 are installed.

(b) Pressurize auxiliary hydraulic system and turn on rudder power.

WARNING: THE RUDDER CONTROL IS A FULLY POWERED HYDRAULIC SYSTEM WHEN OPERATED IN THE POWER MODE. KEEP ALL PERSONNEL AWAY FROM MOVING COMPONENTS OF THE RUDDER AND RUDDER CONTROL SYSTEM WHEN RUDDER POWER IS ON.

(c) Allow rudder to come to rest and check that rudder is faired within ± 0.06 inch.

1) If rudder alignment is satisfactory and feel rod has not been replaced:

a) Remove rig pin No. 9.

b) Adjust power control unit.

2) If rudder alignment is satisfactory and feel rod has been replaced:

a) Install safety bolt and cotter pin.

NOTE: Plug must cover witness hole, and not be turned more than ± 1/8 turn to admit cotter pin, otherwise feel rod must be readjusted per steps (13)(c) through (13)(h).

b) Tighten check nuts on feel rod.

c) Remove rig pin No. 9.

d) With power on readjust and connect input rod until rig pin No. 3 can easily be removed. Leave rig pin No. 3 in place.

e) Tighten input rod locknut, and safety all bolts.

f) Adjust power control unit.

3) If rudder alignment is not satisfactory, adjust feel rod per paragraph (13).

(13) Adjust feel rod.

(a) Remove safety bolt and cotter pin from feel rod if installed. Disconnect input rod from power unit. Adjust plug until rudder is faired within ± 0.06 inch.

(b) Install safety bolt and cotter pin if plug covers witness hole in feel rod, and was not turned more than ± 1/8 turn to admit the pin.

(c) If plug does not cover witness hole turn off power and back plug out of rod end until 0.12 inch gap exists between end of plug and rod end. Increase gap sufficiently to make plug cover witness hole when plug is reconnected and adjusted to fair rudder.

(d) If plug must be turned more than ± 1/8 turn to admit cotter pin turn off power and decrease the 0.12 inch gap between end of plug and rod end.

(e) Move tab until plug and rod end can be engaged. Engage 15 turns.

(f) Turn on rudder power and allow rudder to come to rest.

(g) Adjust feel rod plug until rudder is faired within ± 0.06 inch.

(h) If plug covers witness hole, install safety bolt and cotter pin. If not repeat steps (c) through (g).

(i) Tighten check nuts on feel rod.

(j) Remove rig pin No. 9.

(k) With power on readjust and connect input rod until rig pin No. 3 can easily be removed. Leave rig pin No. 3 in place.

(l) Tighten the input rod locknut and safety all bolts.

(m) Adjust power control unit.

3. Adjustment/Test Rudder Power Control Unit

A. Equipment and Materials

(1) Rig pin No. 9, 0.311 (+0/-0.002) inch diameter (MS20392-4)

(2) Rig Pin No. 3, 0.497 (+0/-0.002) inch diameter (MS20392-7)

(3) Rudder Protractor, MIT50-8703

(4) Rudder Tab Protractor, MIT50-8706

B. Adjust Rudder Power Control Unit

(1) Install rig pin No. 9 through rudder feel unit carriage and cable drum housing. (See figure 202.)

(2) Install rig pin No. 3 through rudder aft quadrant and fin structure. (See figure 203.)

(3) Position rudder and rudder control tab in neutral and hold.

(4) Adjust pilots' input pushrod to obtain a dimension of 2.40 (± 0.02) inches between flat surface on aft face of input arm (12, figure 201) and overtravel stop (15) on power unit (3).

(5) With rudder and tab still held in neutral check that feel unit is in detent position. If required, adjust feel rod to place feel unit in detent by removing cotter pin, loosening checknuts and turning vernier adjustment in 1/4 turn increments.

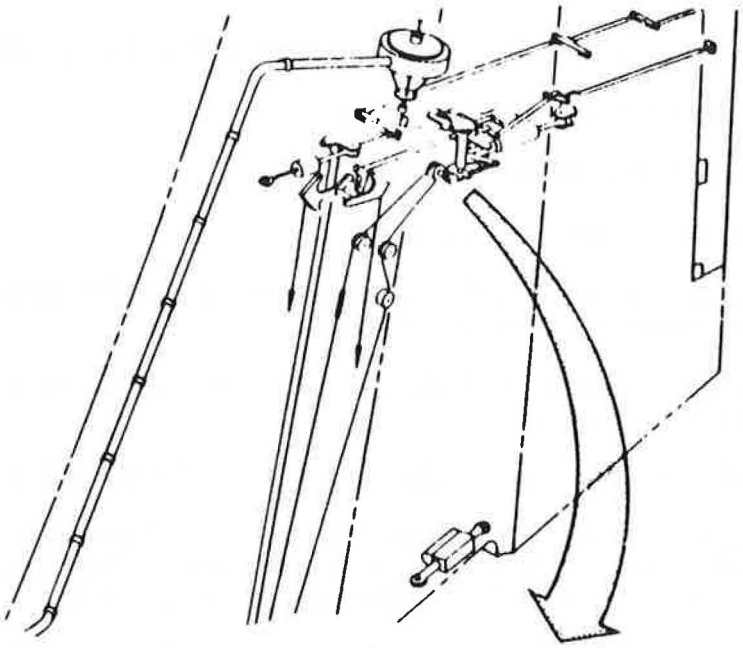
(6) Pressurize auxiliary hydraulic system and turn on rudder power.

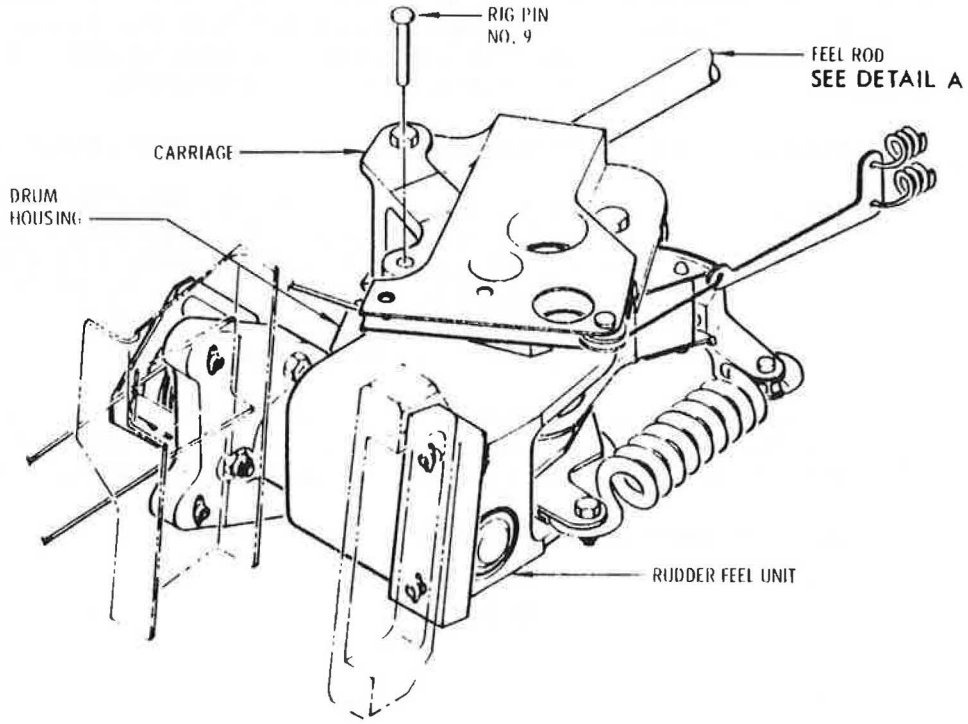
WARNING: THE RUDDER CONTROL IS A FULLY POWERED HYDRAULIC SYSTEM WHEN OPERATED IN THE POWER MODE. THE RUDDER SHOULD BE IN NEUTRAL, AND ALL OBSTRUCTIONS REMOVED FROM THE SYSTEM, BEFORE HYDRAULIC POWER IS APPLIED. KEEP ALL PERSONNEL AWAY FROM MOVING COMPONENTS OF THE RUDDER AND RUDDER CONTROL SYSTEM WHEN RUDDER POWER IS ON.

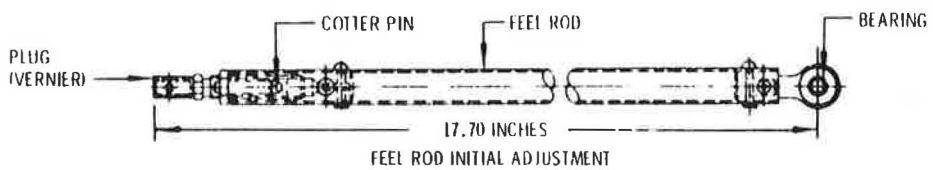
(7) Check that rudder trailing edge is within 0.06 inch of neutral position. If not, remove cotter pin and loosen checknuts on feel rod. Turn vernier in 1/4 turn increments to obtain desired results.

(a) Not applicable to SABENA.

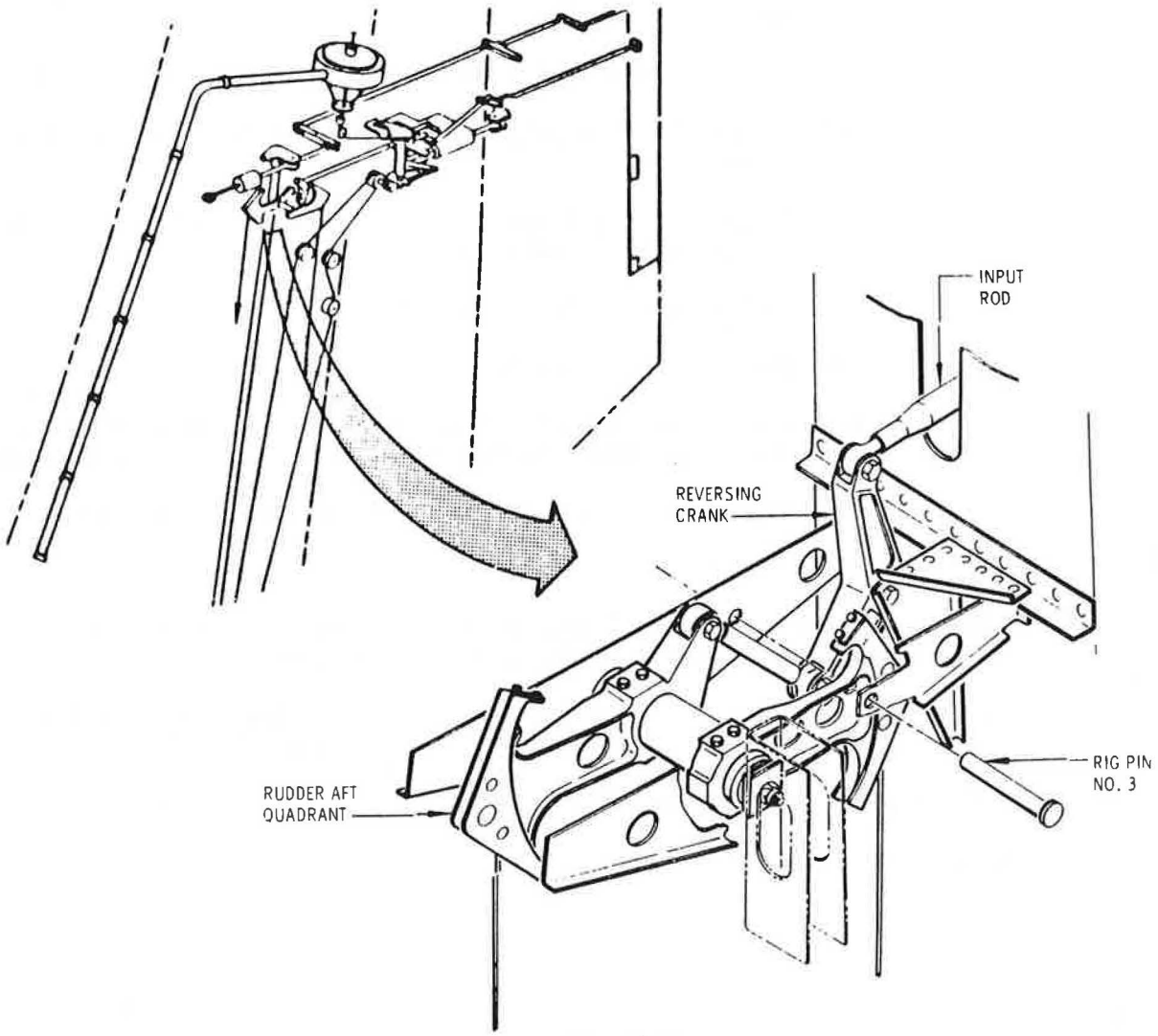
SB.2102.




RIG PIN
NO. 9
FEEL ROD
SEE DETAIL A
CARRIAGE
DRUM
HOUSING
RUDDER FEEL UNIT


COTTER PIN
FEEL ROD
BEARING
PLUG
(VERNIER)
17.70 INCHES
FEEL ROD INITIAL ADJUSTMENT

DETAIL A



SB. 21.02

Rudder Input Pushrod Adjustment
Figure 203

(b) Adjust feel rod as follows:

1) Install cotter pin if plug covers witness hole in feel rod, and was not turned more than ± 1/8 turn to admit the pin.

2) If plug does not cover witness hole turn off power and back plug out of rod end until 0.12 inch gap exists between end of plug and rod end. Increase gap sufficiently to make plug cover witness hole when plug is reconnected and adjusted to fair rudder.

3) If plug must be turned more than ± 1/8 turn to admit cotter pin turn off power and decrease the 0.12 inch gap between end of plug and rod end.

4) Move tab until plug and rod end can be engaged. Engage 15 turns.

5) Turn on rudder power and allow rudder to come to rest.

6) Adjust feel rod plug until rudder is faired within ± 0.06 inch.

7) If plug covers witness hole, install cotter pin. If not repeat steps 2) through 6).

8) Tighten checknuts on feel rod.

9) Remove rig pin No. 9.

10) With power on readjust and connect input rod until rig pin No. 3 can easily be removed. Leave rig pin No. 3 in place.

11) Tighten the input rod locknut and safety all bolts.

12) Deleted

(8) Depressurize auxiliary hydraulic system and with rudder switch on, operate pedals until rudder stops moving hydraulically.

(9) Adjust rudder tab rod at rudder control tab until tab trailing edge aligns with rudder trailing edge within 1/8 inch.

(10) Tighten checknut on tab rod and connect to control tab horn.

(11) Test rudder power control unit.

C. Test Rudder Control Unit

(1) Connect electrical power to airplane.

(2) Depressurize auxiliary hydraulic system.

(3) Actuate rudder hydraulically by using rudder pedals until rudder stops moving.

(4) Turn rudder switch "OFF."

WARNING: BECAUSE OF DANGER OF INJURING PERSONNEL, PRECAUTIONS SHOULD BE TAKEN TO PREVENT INADVERTENT APPLICATION OF HYDRAULIC POWER DURING OPERATION IN THE MANUAL MODE. LEAVE RUDDER POWER OFF.

(5) Operate rudder trim control handle to position trim indicator at zero.

(6) Install rudder and rudder control tab protractors.

(7) Hold rudder trailing edge at neutral.

(8) Push right rudder pedal slowly forward until rudder tab stops are contacted.

(9) Check that rudder control tab is positioned 21-1/2° to 22-1/2° to the left.

(10) Repeat steps (7) through (9) for left rudder pedal. The tab shall move right with measurements of the same magnitude.

(11) Slowly push right rudder pedal forward until tab stops are contacted and rudder begins to move to the right. Continue to push on pedal and manually assist at rudder trailing edge until rudder is positioned at 13° to the right.

(12) Check that forward quadrant stops are not contacted and that control tab is 19° or more to the left.

(13) Push to the right on rudder trailing edge until power unit stops are contacted.

5 CAUTION: DO NOT LOAD THE TRAILING EDGE OF RUDDER WITH MORE THAN 45 POUND FORCE. HOWEVER, RUDDER BALANCE PANELS MAY BE DEFLECTED AGAINST INTERNAL BALANCE BAY STRUCTURE AS REQUIRED TO MEET THE STOP POSITION.

(14) Check that rudder is positioned 26° to 26-3/4° to the right.

(15) Repeat steps (11) through (14) for left rudder pedal. Rudder travel shall be in opposite direction but of same magnitudes.

(16) Pressurize auxiliary hydraulic system and turn rudder switch "ON."

WARNING: THE RUDDER CONTROL IS A FULLY POWERED HYDRAULIC SYSTEM WHEN OPERATED IN THE POWER MODE. THE RUDDER SHOULD BE IN NEUTRAL, ALL OBSTRUCTIONS REMOVED FROM THE SYSTEM AND PERSONNEL CLEAR OF ALL MOVING COMPONENTS OF RUDDER AND RUDDER CONTROL SYSTEM WHEN RUDDER POWER IS ON.

(17) Cycle rudder by means of rudder pedals until rudder movement is smooth.

(18) Push right rudder pedal to maximum available travel and abruptly release.

(19) Record final position of rudder trailing edge.

(20) Push left rudder pedal to maximum available travel and abruptly release.

(21) Record position of rudder trailing edge.

(22) Check that total distance between recorded positions does not exceed 1/4 inch.

(23) Check that distance from rigged rudder position for manual mode to midpoint between two recorded positions does not exceed 1/4 inch.

(24) Push on the right rudder pedal until rudder stops moving.

(25) Check that rudder is positioned 26° to 26-3/4° to the right and that rudder tab is positioned 19° to 22° to the right.

(26) Repeat steps (24) and (25) for left rudder pedal. Rudder and tab shall be left, and measurements shall be of equal magnitude as in step (25).

(27) Depressurize auxiliary hydraulic system.

(28) Remove rudder and control tab protractors.

(29) Disconnect electrical power.

(30) Install access panels.

(6-7161-4-1519, 17.6.66)

RUDDER HYDRAULIC COMPENSATOR - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Hydraulic Compensator

A. Equipment and Materials

(1) External hydraulic power, 20 gpm at 3000 psi

(2) Hydraulic fluid Skydrol 500A

(3) Skydrol Assembly Lube MCS 352

(4) Main landing gear door down lock

B. Remove Rudder Hydraulic Compensator

(1) Open AC auxiliary pump circuit breaker on radio and T-R circuit breaker panel (P5).

(2) Depressurize auxiliary hydraulic system by turning rudder switch on and deflecting rudder with the use of the power control unit until rudder stops operating hydraulically. Turn rudder switch "OFF."

(3) Open left main gear wheel well door and install main gear door down lock. Remove hydraulic access door L1348. See Chapter 12, "Access Doors and Panels."

(4) Depressurize utility hydraulic reservoir by slowly unscrewing filler cap three full turns. Tighten cap after compressed air has escaped.

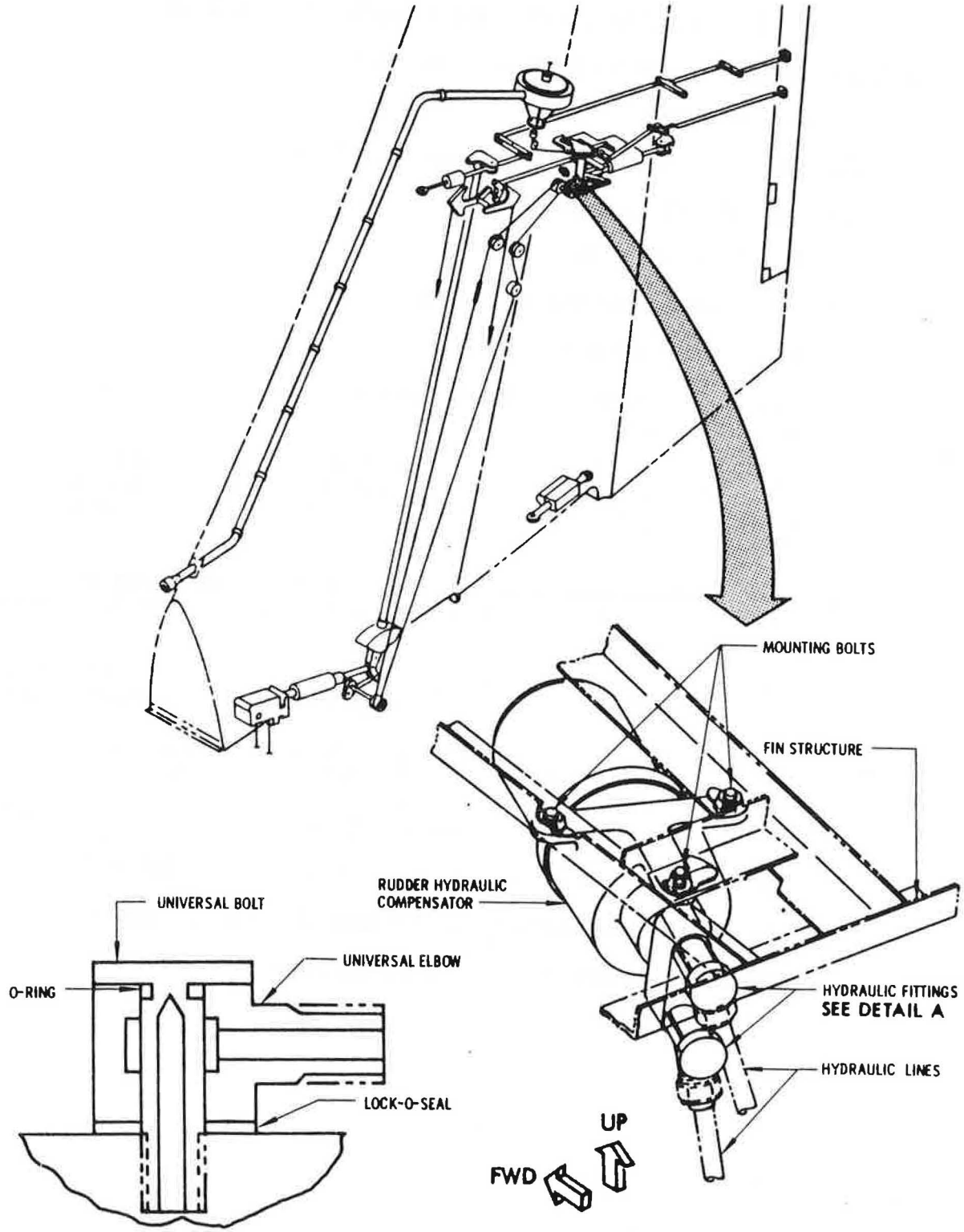
CAUTION: DO NOT REMOVE CAP UNTIL RESERVOIR IS COMPLETELY DEPRESSURIZED OTHERWISE FLUID WILL ESCAPE.

(5) Remove access panel 1514. See Chapter 12, "Access Doors and Panels."

(6) Disconnect hydraulic lines from compensator. (See figure 201.)

(7) Cap ports of compensator and plug ends of hydraulic lines.

(8) Remove compensator mounting bolts and compensator.



Rudder Hydraulic Compensator Installation
Figure 201

C. Install Rudder Hydraulic Compensator

(1) Install O-ring packing on universal bolt. Insert bolt through 90-degree elbow and install lock-o-seal over bolt. Install assembly in upper port on compensator. (See detail A, figure 201.) Lockwire bolt.

NOTE: Lubricate O-rings with Skydrol Assembly Lube MCS 352 or Skydrol 500 hydraulic fluid prior to installation.

(2) Install O-ring packing on universal bolt. Insert bolt through 45-degree universal elbow and install lock-o-seal over bolt. Install assembly in lower port on compensator. Lockwire bolt.

(3) Align compensator with support structure and install three mounting bolts.

(4) Connect hydraulic lines to fittings.

(5) Connect electrical power to airplanes.

(6) Pressurize auxiliary hydraulic system.

(7) Position rudder switch ON.

(8) Cycle rudder hydraulically by means of rudder pedals until rudder operation is free and smooth.

(9) Turn rudder switch OFF.

(10) Depressurize auxiliary hydraulic system.

(11) Disconnect electrical power.

(12) Service utility hydraulic reservoir. See Chapter 29-0, Replenish Hydraulic System.

(13) Close access doors and install access panels.

RUDDER POWER HYDRAULIC CONTROL VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Power Control Valve

   A. Equipment and Materials

      (1) External hydraulic power, 20 gpm at 3000 psi.

      (2) Hydraulic fluid Skydrol "500A."

      (3) Skydrol Assembly Lube MCS 352

      (4) Main landing gear down lock.

   B. Remove Rudder Power Control Valve

      (1) Open AC auxiliary pump circuit breaker on radio and T-R circuit breaker panel (P5).

      (2) Depressurize auxiliary hydraulic system by turning rudder switch ON and deflecting the rudder with the use of the power control unit until rudder stops operating hydraulically. Turn rudder switch "OFF."

      (3) Open left main gear wheel well door and install main gear door down lock. Remove hydraulic access panel L1348. See Chapter 12, "Access Doors and Panels."

      (4) Depressurize utility hydraulic reservoir by slowly unscrewing filler cap three full turns. Tighten cap after compressed air has escaped.

      CAUTION: DO NOT REMOVE CAP UNTIL RESERVOIR IS DEPRESSURIZED, OTHERWISE FLUID WILL ESCAPE.

      (5) Open right main gear wheel well door and install main gear door down lock.

      (6) Disconnect hydraulic lines from control valve. (See figure 201.)

(7) Cap hydraulic ports of control valve and plug end of hydraulic lines.

(8) Disconnect electrical plug from control valve.

(9) Remove power control valve mounting bolts and valve.

C. Prepare Valve for Installation

(1) Install O-ring and reducer in ports 2 and 3, and O-ring and 90° elbow in port 1. Lockwire 90° elbow.

(2) Fill valve with Skydrol 500 hydraulic fluid.

NOTE: Lightly lubricate O-rings at installation with Skydrol 500 hydraulic fluid or Skydrol Assembly Lube MCS 352

D. Install Power Control Valve

(1) Check hydraulic fluid quantity and add fluid if necessary. See Chapter 29-0, "Replenish Hydraulic System."

(2) Position control valve and install mounting bolts. (See figure 201.)

(3) Remove caps from hydraulic ports of control valve and plugs from hydraulic lines.

(4) Connect hydraulic lines to ports of rudder power hydraulic control valve.

(5) Connect electrical plug to control valve.

(6) Bleed System

(a) Connect external electrical power to airplane.

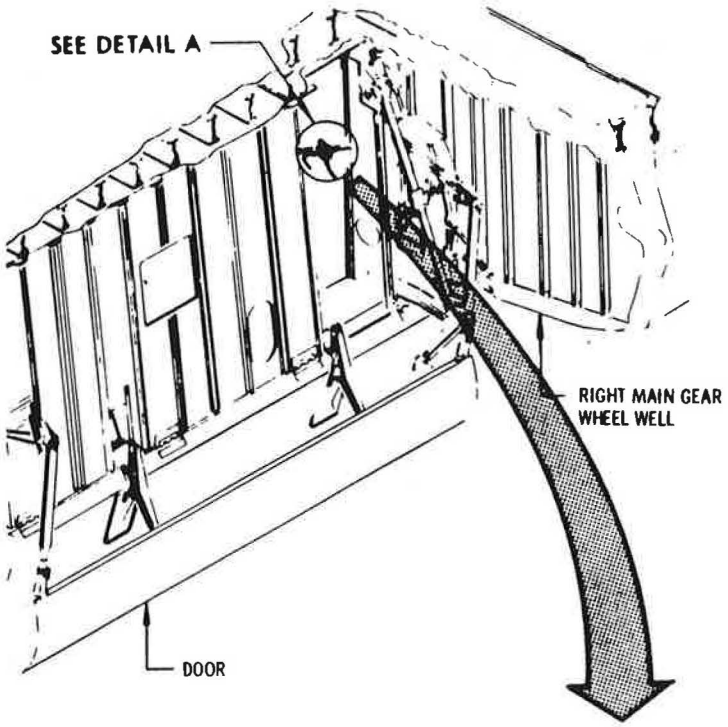
(b) Pressurize auxiliary hydraulic system by turning auxiliary pump switch to "ON."

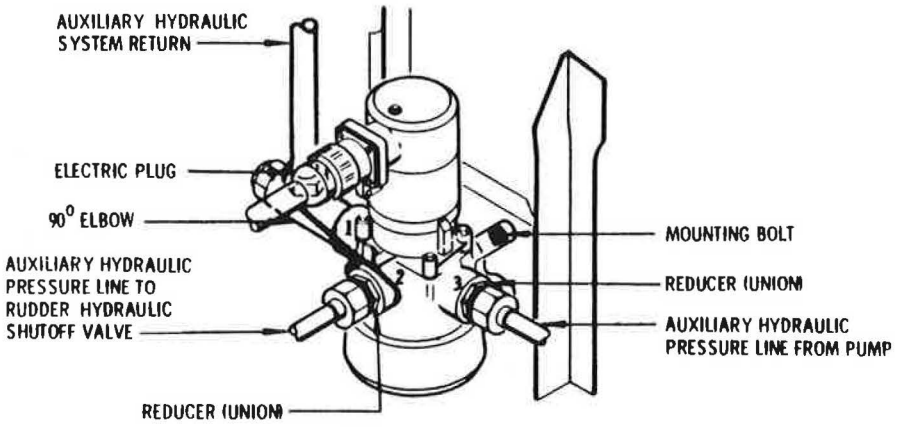
(c) Turn rudder switch "ON."

(d) Operate rudder through full travel by using rudder power control unit to expel all air in the system until rudder movement is smooth and continuous.

(7) Switch auxiliary pump "OFF" and check connections for hydraulic leaks.

(8) Turn rudder switch "OFF."


SEE DETAIL A
RIGHT MAIN GEAR WHEEL WELL
DOOR


AUXILIARY HYDRAULIC SYSTEM RETURN
ELECTRIC PLUG
90° ELBOW
AUXILIARY HYDRAULIC PRESSURE LINE TO RUDDER HYDRAULIC SHUTOFF VALVE
REDUCER (UNION)
MOUNTING BOLT
REDUCER (UNION)
AUXILIARY HYDRAULIC PRESSURE LINE FROM PUMP

DETAIL A

(9) Check hydraulic fluid quantity and add fluid if necessary. See Chapter 29-0, "Replenish Hydraulic System."

(10) Remove external electrical power.

(11) Close all access doors and panels.

(12) Close left and right main gear wheel well door.

RUDDER HYDRAULIC PRESSURE INDICATING SYSTEM - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Power Control Pressure Transmitter

A. Special Tools and Equipment

(1) External hydraulic power, 20 gpm at 3000 psi.

(2) High pressure hose, 3/4 and 1/2 inch diameter.

(3) Fittings for connecting hoses to 1-1/4, 3/4, 5/8 and 3/8 inch hydraulic lines.

(4) External compressed air source, 50 to 200 psi pressure.

(5) Hydraulic fluid Skydrol "500A."

(6) Main landing gear door down lock.

(7) Pressure gage, 0 to 200 psi capacity.

B. Remove Rudder Power Control Pressure Transmitter

(1) Open AC auxiliary pump circuit breaker on radio and T-R circuit breaker panel (P5).

(2) Depressurize auxiliary hydraulic system by turning the rudder switch on and deflecting rudder with the use of the power control unit until rudder stops operating hydraulically. Turn rudder switch "OFF."

(3) Open left main gear wheel well door and install main gear door down lock. Remove hydraulic access panel L1348. See Chapter 12, "Access Doors and Panels."

(4) Depressurize utility reservoir by slowly unscrewing filler cap three full turns. Tighten cap after compressed air has escaped.

CAUTION: DO NOT REMOVE CAP UNTIL RESERVOIR IS COMPLETELY DEPRESSURIZED, OTHERWISE FLUID WILL ESCAPE.

(5) Open right main gear wheel well door and install main gear door down lock.

(6) Disconnect hydraulic line from transmitter. (See figure 201.)

(7) Cap transmitter port and plug end of hydraulic line.

(8) Disconnect electrical connector.

(9) Remove transmitter mounting bolts and transmitter.

C. Install Rudder Power Control Pressure Transmitter

(1) Install O-ring and hydraulic fitting on transmitter. (See figure 201.)

(2) Position transmitter in place and install mounting bolts.

NOTE: Fill transmitter with hydraulic fluid before installing.

(3) Connect electrical connector to transmitter.

(4) Connect external electrical power to airplane.

(5) Remove plugs from hydraulic lines and caps from transmitter ports.

(6) Bleed supply line to pressure transmitter.

(a) Apply sufficient air to the inlet of hydraulic reservoir ground pressurizing valve to produce fluid flow.

(b) Allow hydraulic fluid flow to continue until there is no visible aeration.

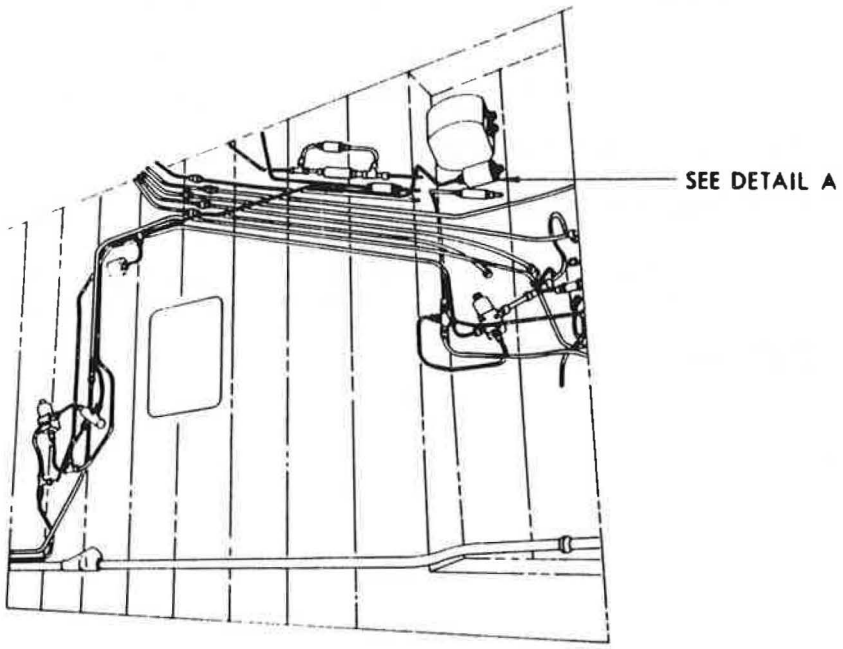
(c) With continued flow from end of hydraulic line connect line to inlet port of transmitter and tighten fitting.

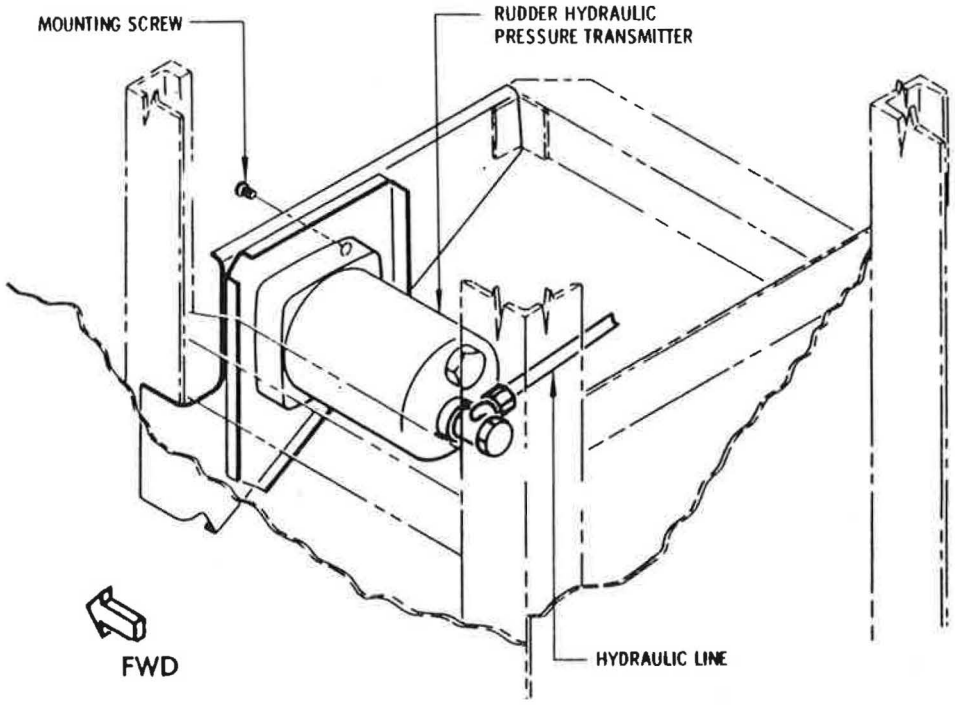
(7) Turn auxiliary hydraulic pump switch "ON."

(8) Check for hydraulic fluid leak.

(9) Turn auxiliary hydraulic pump switch "OFF."

(10) Check hydraulic fluid quantity and add fluid if necessary. See Chapter 29-0, "Replenish Hydraulic System."


SEE DETAIL A


MOUNTING SCREW
RUDDER HYDRAULIC
PRESSURE TRANSMITTER
FWD
HYDRAULIC LINE

DETAIL A

(11) Charge utility hydraulic reservoir with 40 to 45 psig of air.

NOTE: Charging of utility reservoir is recommended to avoid cavitation in pumps when pumps are operated.

(12) Remove external compressed air source.

(13) Remove external electrical power.

(14) Close hydraulic panel L1348, left and right main gear wheel well door. See Chapter 12, "Access Doors and Panels."

(15) Deleted

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RUDDER AFT CONTROL QUADRANT - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Aft Control Quadrant

A. Remove Rudder Aft Control Quadrant

(1) Depressurize auxiliary hydraulic system.

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(2) Remove access panels 1510, 1185, 1514 and 1562. See Chapter 12, "Access Doors and Panels."

(3) Release tension in cables RA (7, figure 201) and RB (5) by loosening turnbuckles in tail compartment.

(4) Detach cables RA and RB from rudder aft control quadrant.

(5) Remove bolt connecting control rod (10) to right quadrant (8).

(6) Remove bolts (3) from the left quadrant (11) and quadrant shaft (6).

(7) Remove bolts (9) from the right quadrant (8) and quadrant support shaft (6).

(8) Remove nuts from both ends of support shaft (4) and remove support shaft.

(9) Move rudder aft control quadrant until quadrant shaft (6) clears structure.

(10) Remove left and right quadrants from support shaft.

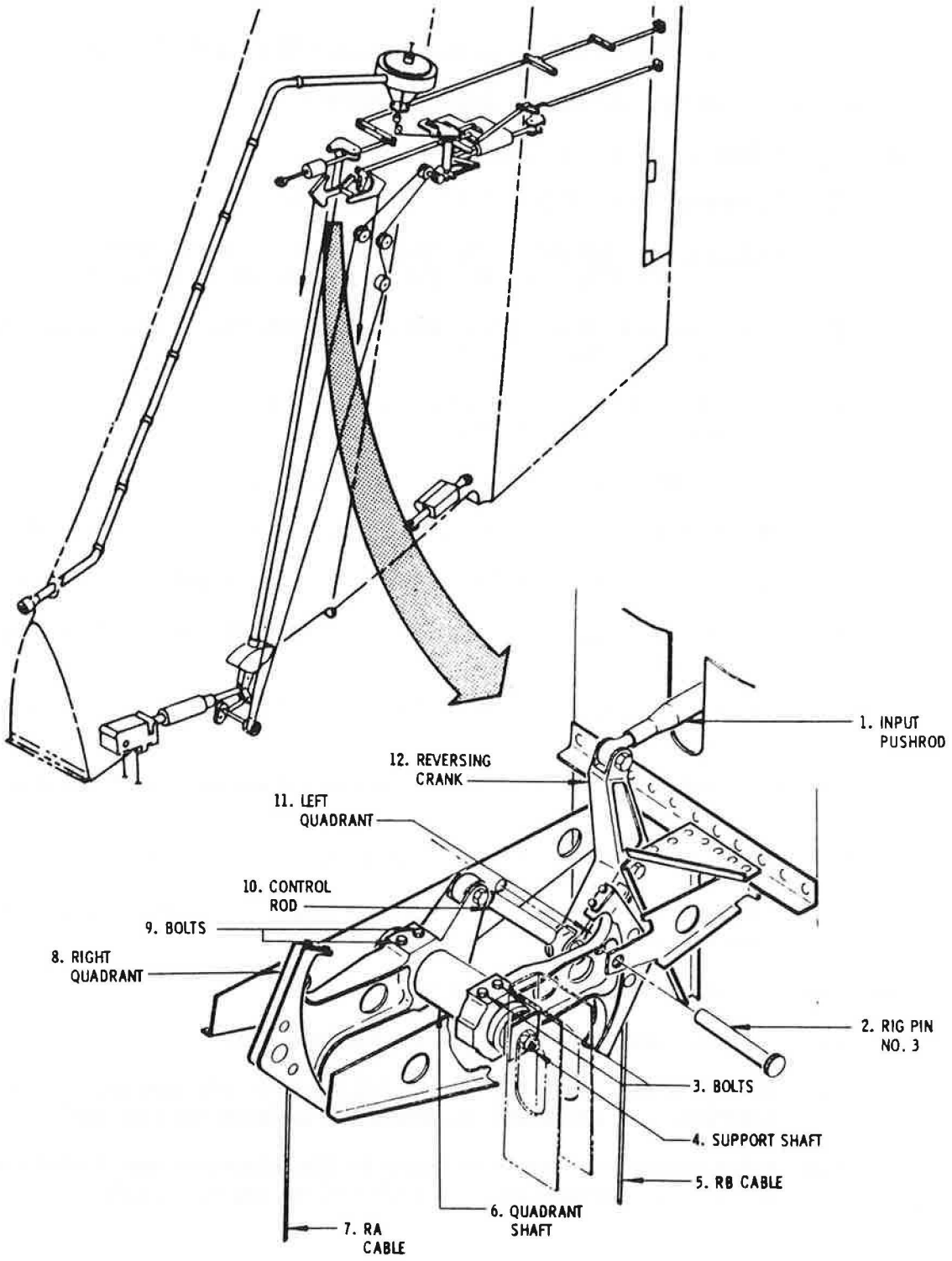
(11) Remove parts from vertical fin. Bearing and spacer are free to fall from quadrant shaft.

B. Install Rudder Aft Control Quadrant

(1) Position spacer and bearing in quadrant shaft.

(2) With quadrant shaft (6, figure 201) inside fin structure slide left quadrant (11) and right quadrant (8) on both ends of shaft.

(3) Align quadrant shaft with holes in fin structure and install support shaft (4). Install nuts on each end of support shaft.



Rudder Aft Quadrant Installation
Figure 201

(4) Install bolts (9) through right quadrant (8) and quadrant shaft (6).

(5) Position left quadrant (11) and install bolts (3).

(6) Connect control rod (10) to right quadrant (6).

(7) Attach RA and RB cables (7 and 5) to left and right quadrants. Adjust RA and RB cables as follows:

(a) Install rigging pins No. 7 through forward rigging pin holes of both forward quadrants. (See figure 202.)

NOTE: Forward quadrants are accessible through the lower interior nose compartment door. See Chapter 12, Access Doors and Panels.

(b) Install rigging pin No. 3 through aft control quadrant (figure 201) and structure.

(c) Adjust cable tension to that specified in 27-17-0, figure 202. Lockwire turnbuckles after adjustment. Balance loads in cables so that rig pins in forward and aft quadrants fit freely.

NOTE: Turnbuckles are located in tail compartment.

(d) Position rudder and rudder control tab in neutral.

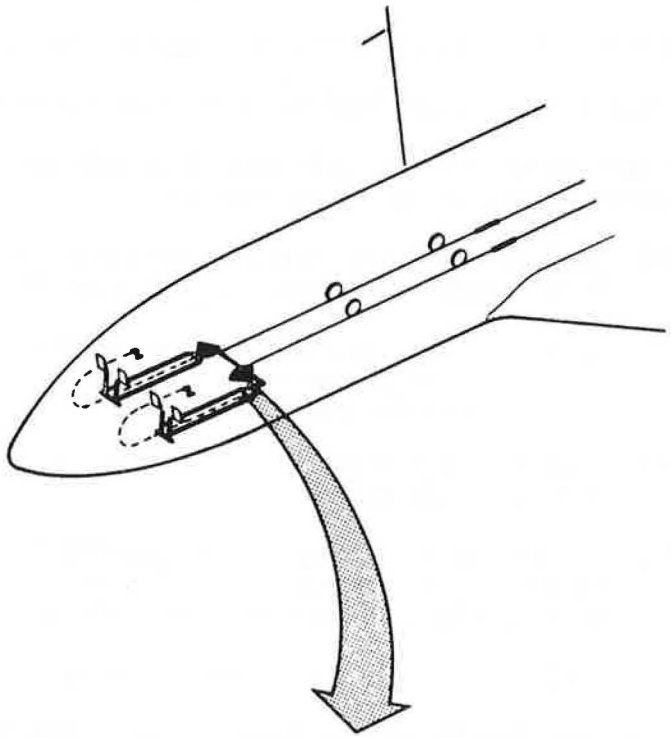
(e) Check that dimension between flat surface on aft face of pilot's input arm and overtravel stop on power control unit is 2.40 (± 0.02) inches. If required, disconnect input pushrod and adjust rod as required to obtain required dimension. Tighten checknut on pushrod.

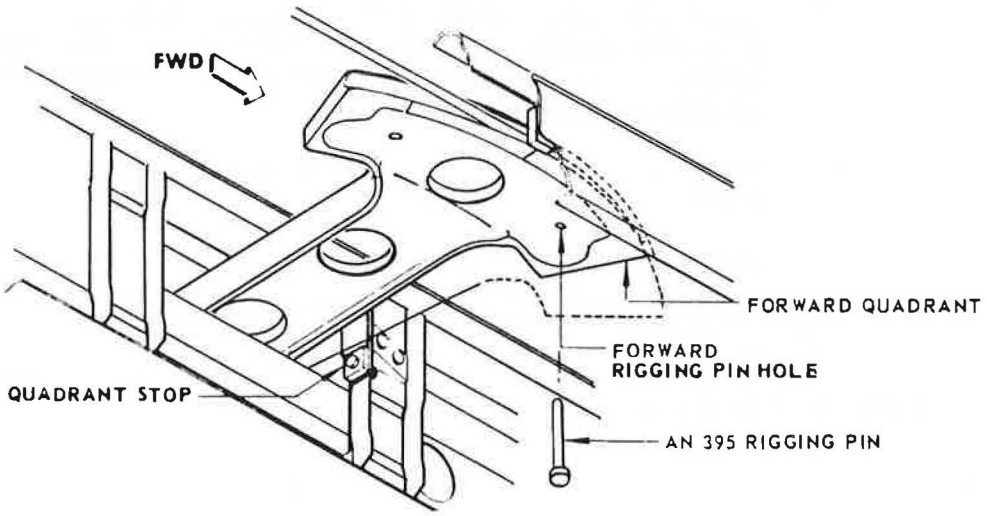
(f) Remove rig pin from aft quadrant and pins No. 7 from left and right forward quadrants.

(g) Install all access panels.

(9) Test rudder control system. See 27-17-0, Test Rudder Control System.

(10) Replace access doors and panels.





Rudder Forward Quadrant Rigging Pin Installation
Figure 202

RUDDER Q-SPRING ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation Q-spring Assembly

A. Equipment and Materials

(1) Rig pins Nos. 9 and 10 0.311 (+0, -0.002) inch dia (MS20392-4)

B. Remove Rudder Q-spring Assembly

(1) Depressurize Auxiliary Hydraulic System

WARNING: DEPRESSURIZE AUXILIARY HYDRAULIC SYSTEM TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(2) Remove access panel 1562 on right side of fin. See Chapter 12, "Access Doors and Panels."

(3) Disconnect hose from elbow of Q-spring assembly. (See figure 201.) Cap elbow and hose to prevent contamination of Q-spring by foreign matter.

(4) Loosen turnbuckle to relieve tension in cable and disconnect shaft from cable terminal.

(5) Remove upper mounting bolts.

(6) Remove one of the three lower support brackets to allow space for removal of Q-spring.

(7) Remove lower mounting bolts and Q-spring assembly.

C. Install Q-spring Assembly

(1) Position Q-spring and install upper mounting bolts. (See figure 201.)

(2) Attach shaft to cable terminal.

CAUTION: DO NOT APPLY A TORSION MOVEMENT ON CABLE TERMINAL WHEN INSTALLING ON BELLOW SHAFT.

(3) Attach hose to elbow.

(4) Position and install lower support bracket.

(5) Install lower mounting bolts.

(6) Install rig pin No. 9 through carriage assembly on rudder feel unit.

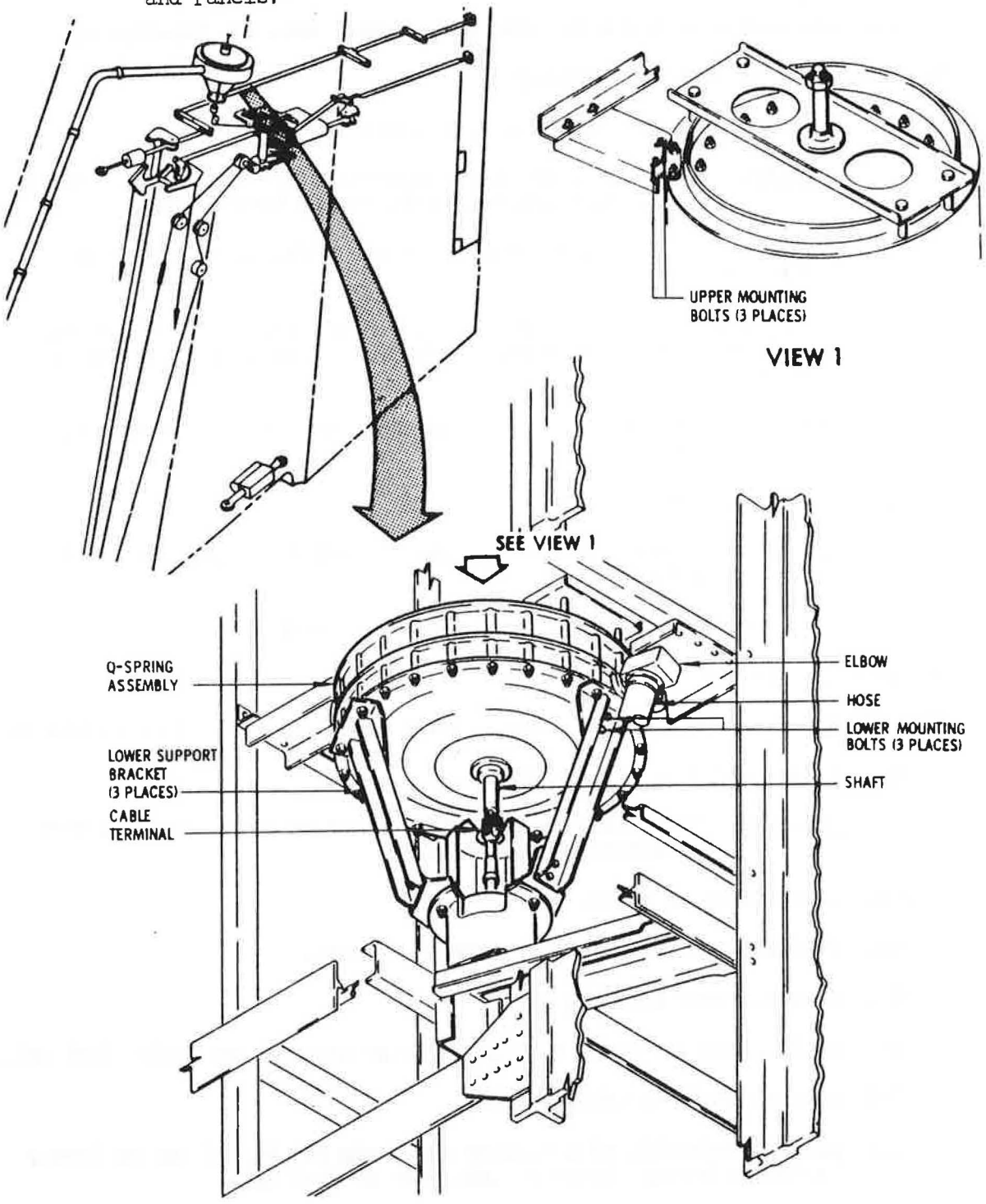
(7) Connect shaft to cable terminal.

(8) Adjust turnbuckle at Q-bellows until rig pin No. 10 can be freely installed through lever and carriage on feel unit.

(9) Safety turnbuckle.

(10) Remove rig pins Nos 9 and 10 from feel unit.

(11) Close all access doors and panels. See Chapter 12, "Access Doors and Panels."



Rudder Q-Spring Installation
Figure 201

RUDDER HYDRAULIC PRESSURE CONTROL VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Hydraulic Pressure Control Valve

A. Special Tools and Equipment

(1) External hydraulic power, 20 gpm at 3000 psi.

(2) High pressure hose, 3/4 and 1/2 inch diameter.

(3) Fittings for connecting hoses to 1-1/4, 3/4, 5/8 and 3/8 inch diameter hydraulic lines.

(4) External compressed air source, 0 to 200 psi pressure.

(5) Hydraulic fluid Skydrol "500B".

(6) Main landing gear down lock.

(7) Pressure gage, 0 to 200 psi capacity.

B. Remove Rudder Hydraulic Pressure Control Valve

(1) Open AC auxiliary pump circuit breaker on radio and T-R circuit breaker panel (P5).

(2) Depressurize auxiliary hydraulic system by turning rudder switch ON and deflecting rudder with the use of the power control unit until rudder stops operating hydraulically. Turn rudder switch "OFF."

(3) Open left main gear wheel well door and install main gear door down lock. Remove hydraulic access panel L1348. See Chapter 12, "Access Doors and Panels."

(4) Depressurize utility hydraulic reservoir by slowly unscrewing filler cap three full turns. Tighten cap after compressed air has escaped.

CAUTION: DO NOT REMOVE CAP UNTIL RESERVOIR IS DEPRESSURIZED, OTHERWISE FLUID WILL ESCAPE.

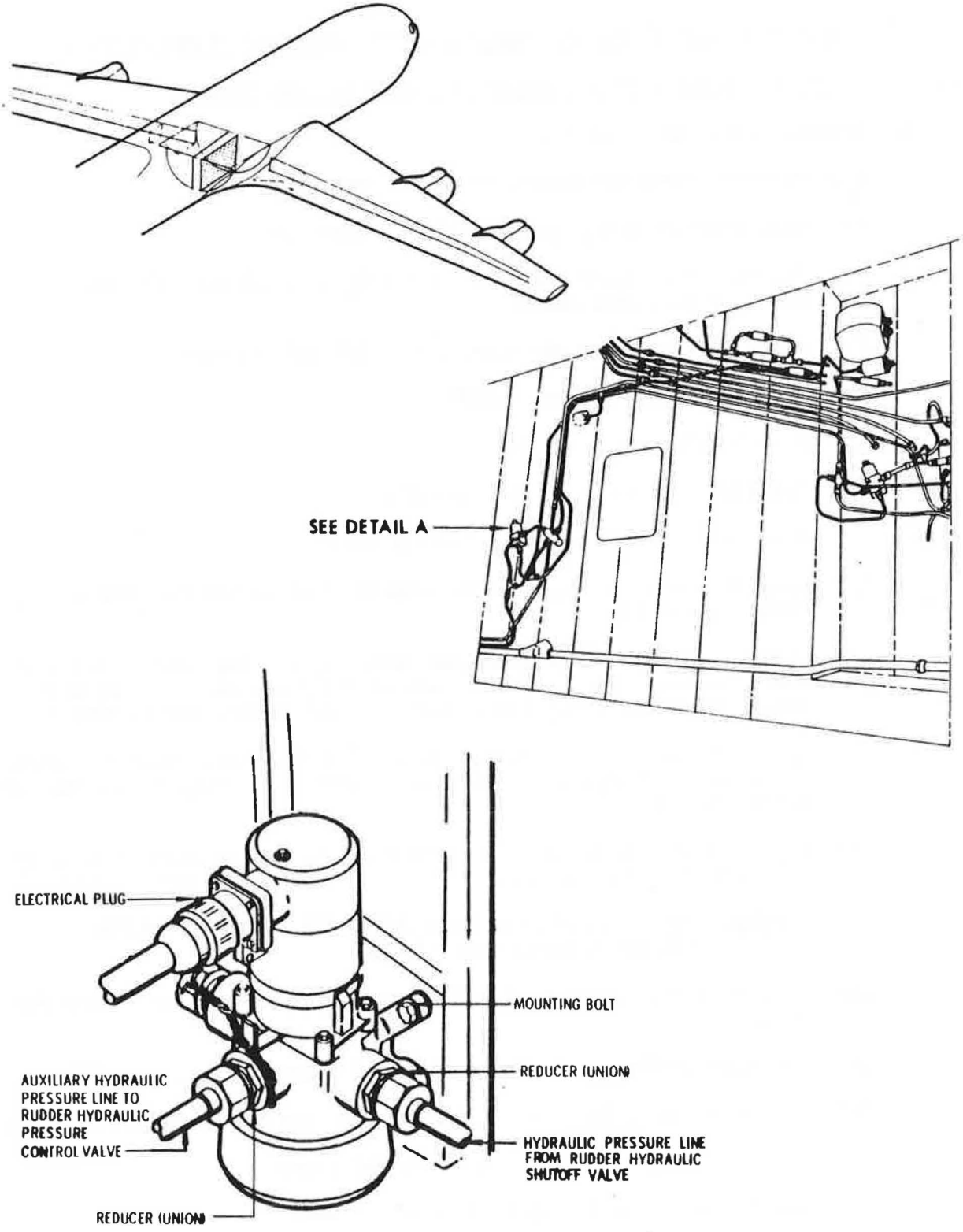
(5) Open right main gear wheel well door and install main gear door down lock.

(6) Disconnect hydraulic lines from control valve. (See figure 201.)

(7) Cap hydraulic ports of control valve and plug end of hydraulic lines.

(8) Disconnect electrical plug from control valve.

(9) Remove control valve mounting bolts and valve.



DETAIL A

Rudder Hydraulic Pressure Control Valve Installation
Figure 202

C. Prepare Valve for Installation

(1) Install O-rings and reducers (unions) in ports 2 and 3.

(2) Fill valve with Skydrol 500 hydraulic fluid.

NOTE: Lightly lubricate O-rings at installation with Skydrol 500 hydraulic fluid or Skydrol Assembly Lube MCS 352.

D. Install Rudder Hydraulic Pressure Control Valve

(1) Position control valve and install mounting bolts. (See figure 201.)

(2) Remove caps from hydraulic ports of control valve and plugs from hydraulic lines.

(3) Connect auxiliary hydraulic pressure lines to ports of power control valve and tighten fittings.

(4) Connect electrical plug to control valve.

(5) Bleed System

(a) Connect external electrical power to airplane.

(b) Pressurize auxiliary hydraulic system by turning auxiliary hydraulic pump switch "ON."

(c) Turn rudder switch "ON."

(d) Operate the rudder through full travel by using the rudder power control unit to expel all air in the system, until rudder movement is smooth and continuous.

(6) Switch auxiliary pump off.

(7) Turn rudder switch "OFF."

(8) Check hydraulic fluid quantity and add fluid if necessary. See Chapter 29-0, "Replenish Hydraulic System."

(9) Remove external electrical power.

(10) Close all access doors and panels.

(11) Close left and right main gear wheel well doors.

RUDDER HYDRAULIC PRESSURE REDUCER - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Hydraulic Pressure Reducer

A. Special Tools and Equipment

(1) External hydraulic power, 20 gpm at 3000 psi.

(2) Skydrol Assembly Lube MCS 352

(3) Hydraulic fluid Skydrol "500B".

(4) Main landing gear door down lock, F71127.

B. Remove Rudder Hydraulic Pressure Reducer

(1) Open AC auxiliary hydraulic pump circuit breaker on radio and T-R circuit breaker panel (P5).

(2) Depressurize auxiliary hydraulic system by deflecting the rudder with the use of the power control unit until rudder stops operating hydraulically. Turn rudder switch "OFF."

(3) Open left main gear, wheel well door and install main gear door down lock. Remove hydraulic access panel L1348. See Chapter 12, "Access Doors and Panels."

(4) Depressurize utility reservoir by slowly unscrewing filler cap three full turns. Tighten cap after compressed air has escaped.

CAUTION: DO NOT REMOVE FILLER CAP UNTIL RESERVOIR IS COMPLETELY DEPRESSURIZED, OTHERWISE FLUID WILL ESCAPE.

(5) Open right main gear, wheel well door and install main gear door down lock.

(6) Disconnect hydraulic lines from rudder hydraulic pressure reducer. (See figure 201.)

(7) Cap hydraulic ports and plug hydraulic lines to prevent contamination from foreign matter.

(8) Remove mounting bolts and rudder hydraulic pressure reducer.

C. Prepare Valve for Installation

(1) Install O-ring and check valve in port 1.

(2) Install O-ring and union on check valve.

(3) Install O-ring and union in port 2 and O-ring and reducer in port 3.

NOTE: Lightly lubricate O-ring at installation with Skydrol 500B hydraulic fluid or Skydrol Assembly Lube MCS 352.

(4) Fill valve with Skydrol 500B hydraulic fluid.

D. Install Rudder Hydraulic Pressure Reducer

(1) Check hydraulic fluid quantity and add fluid if necessary. See Chapter 29-0, "Replenish Hydraulic System."

(2) Position hydraulic pressure reducer and install mounting bolts. (See figure 201.)

(3) Remove caps from hydraulic ports of hydraulic pressure reducer and plugs from hydraulic lines.

(4) Connect hydraulic lines to hydraulic pressure reducer.

(5) Bleed System

(a) Connect external electrical power to airplane.

(b) Pressurize auxiliary hydraulic system by turning auxiliary pump switch "ON."

(c) Turn rudder switch "ON."

(d) Operate the rudder through full travel by using the rudder power control unit to expel all air in the system, until rudder movement is smooth and continuous.

(6) Switch auxiliary pump "OFF."

(7) Turn rudder switch "OFF."

(8) Check hydraulic fluid quantity and add fluid if necessary. See Chapter 29-0, "Replenish Hydraulic System."

(9) Remove external electrical power.

(10) Close all access doors and panels.

(11) Close left and right main gear, wheel well doors.

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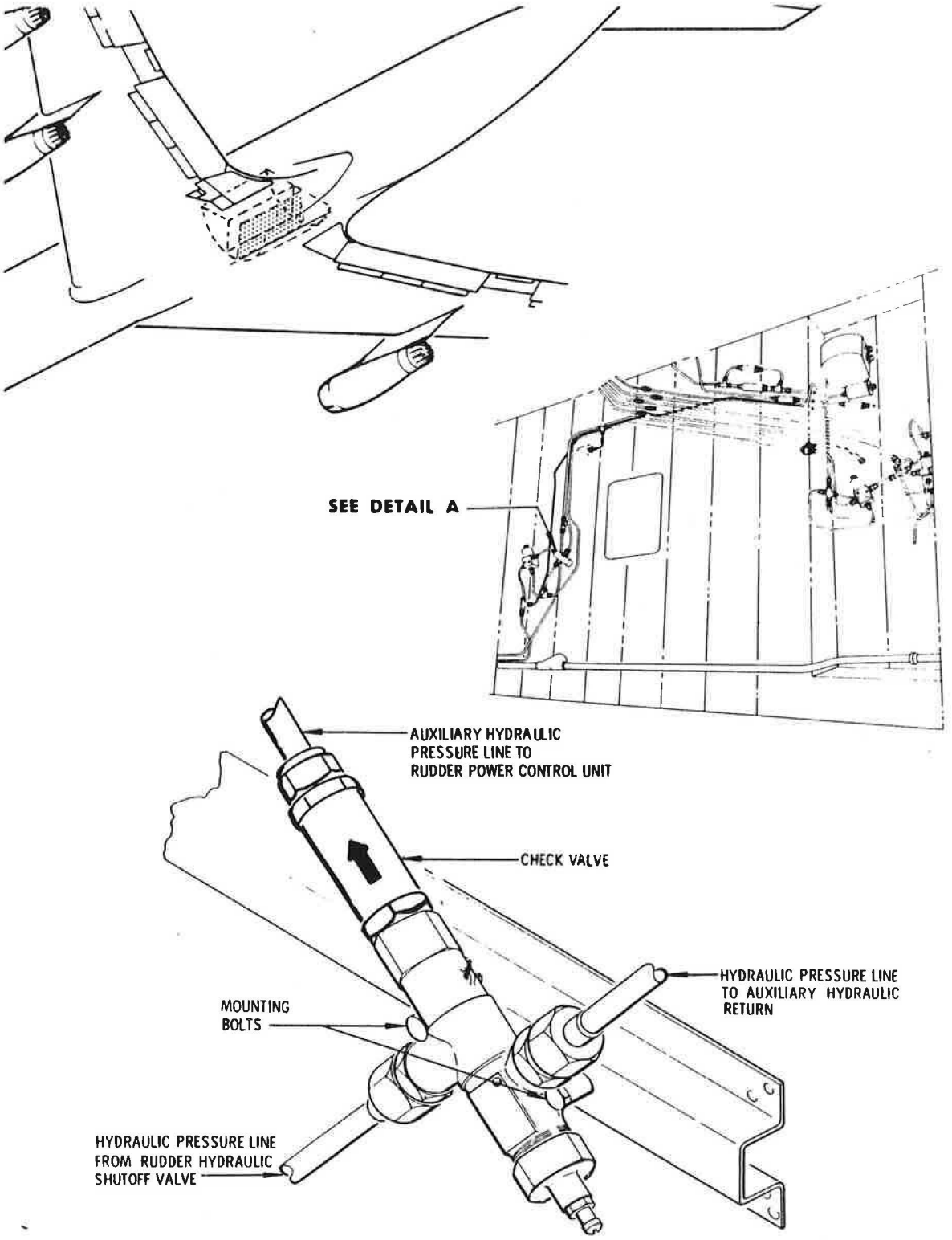

SEE DETAIL A
AUXILIARY HYDRAULIC PRESSURE LINE TO RUDDER POWER CONTROL UNIT
CHECK VALVE
HYDRAULIC PRESSURE LINE TO AUXILIARY HYDRAULIC RETURN
MOUNTING BOLTS
HYDRAULIC PRESSURE LINE FROM RUDDER HYDRAULIC SHUTOFF VALVE

DETAIL A

RUDDER HYDRAULIC PRESSURE CONTROL SWITCH - MAINTENANCE PRACTICES

1. Adjustment/Test Rudder Hydraulic Pressure Control Switch

A. Equipment and Materials

(1) Hydraulic Service Cart, Skydrol 500, 0-3000 psi.

(2) Main Wheel Well Door Down Lock, F71127 or equivalent.

(3) Protractor Assembly, F52428-500 or equivalent.

B. Adjust Rudder Hydraulic Pressure Control Switch

(1) Connect external hydraulic power and pressurize utility hydraulic system.

(2) Open left main wheel door by pulling left ground door release handle down, and install main landing gear door down lock.

WARNING: PERSONNEL STAND CLEAR OF WHEEL WELL DOOR PATH.

(3) Extend flaps 1° (+0,-1/2°).

(4) Adjust pressure control switch down against switch actuator arm until click is heard. Adjust switch back from actuator arm until click is heard again. Tighten switch locknuts and lockwire. (See figure 201.)

(5) Test rudder pressure control switch.

(6) Disconnect external hydraulic power.

(7) Remove left main gear door down lock and close wheel well by moving ground door release handle up.

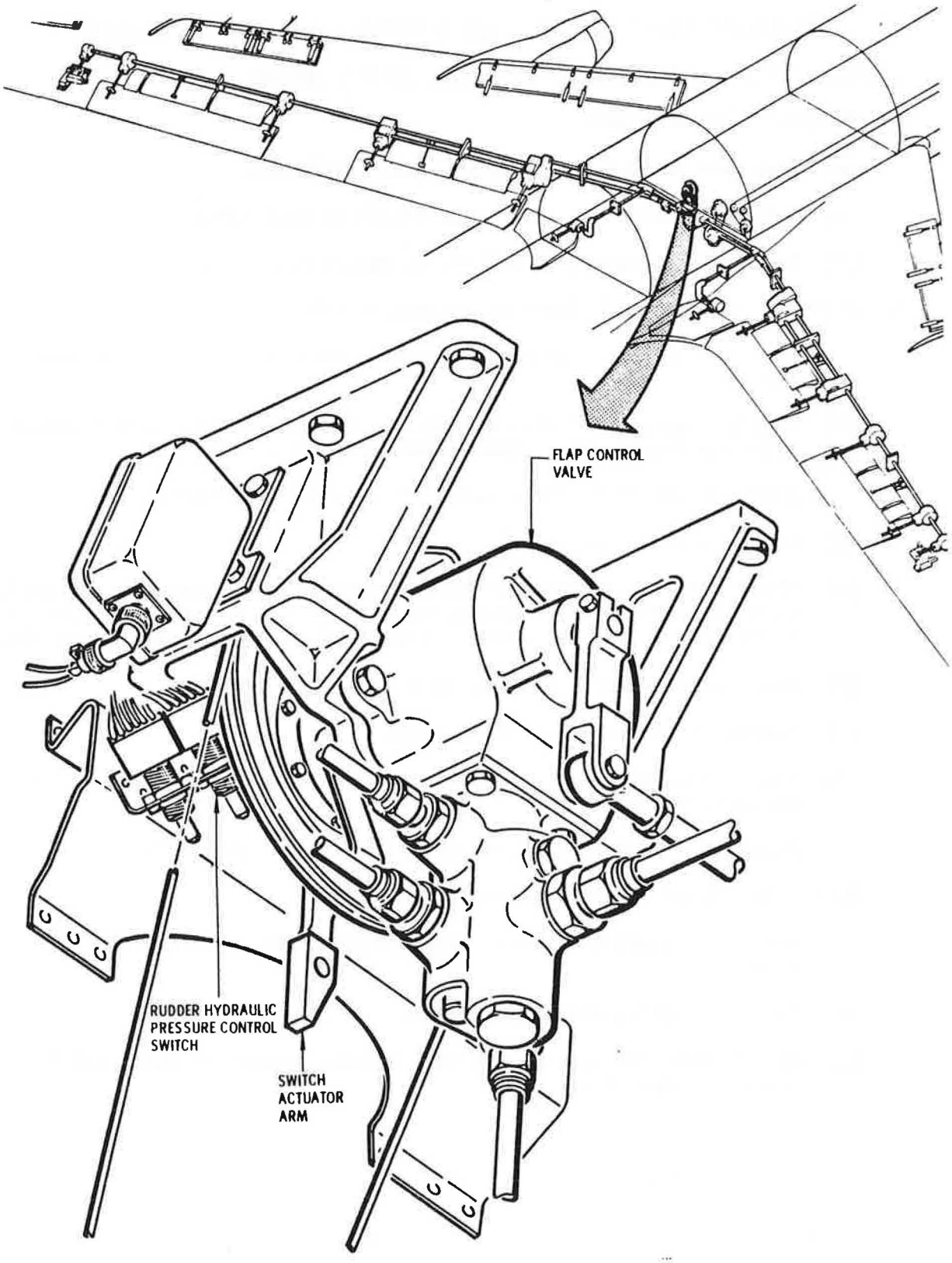
WARNING: PERSONNEL STAND CLEAR OF WHEEL WELL DOOR PATH.

C. Test Rudder Hydraulic Pressure Control Switch

(1) Connect external hydraulic power and pressurize utility hydraulic system.

(2) Connect external electrical power.

(3) Open "RUDDER SEL AND OIL QTY IND" circuit breaker on radio and T-R circuit breaker panel (P5).



Rudder Hydraulic Pressure Control Switch Adjustment
Figure 201

(4) Remove electrical connector plug from airspeed switch and attach jumper to pins "D" and "E" of airspeed switch connector plug. Close "RUDDER SEL AND OIL QTY IND" circuit breaker.

NOTE: The airspeed switch is installed on the air data sensor rack in the pitot-static compartment.

(5) Pressurize auxiliary hydraulic system by positioning systems interconnect valve switch to "OPEN." Position rudder switch to "ON." With flaps in up position, note that rudder pressure on rudder pressure indicator reads 2250 psi.

(6) Lower flaps 1° (+0/-1/2°) and check that rudder pressure rises from 2250 psi to 3000 psi on rudder pressure indicator.

(7) Disconnect external electrical and hydraulic power.

(8) Position systems interconnect valve switch to "CLOSE."

(9) Remove jumper from airspeed switch connector plug and install connector plug on airspeed switch.

RUDDER HYDRAULIC LOW PRESSURE WARNING SYSTEM - MAINTENANCE PRACTICES

1. General

   A. A container will be necessary to catch fluid from disconnected hydraulic lines. Should any fluid spill on the airplane, decontaminate the area. See Chapter 12, Cleaning and Washing.

2. Removal/Installation Rudder Hydraulic System Low Pressure Warning Switch

   A. Equipment and Materials

      (1) Main Gear Door Downlock, F71127 or equivalent

   B. Remove Rudder Hydraulic System Low Pressure Warning Switch

      (1) Open RUDDER SEL AND OIL QTY IND circuit breaker on radio and T-R circuit breaker panel (P5).

      (2) Depressurize rudder hydraulic system by turning rudder switch ON and deflecting the rudder with the power control unit until the rudder stops operating hydraulically. Turn rudder switch OFF.

      (3) Open left and right main gear wheel well doors and install main gear door downlocks.

      WARNING: PERSONNEL STAND CLEAR OF WHEEL WELL DOOR PATH.

      (4) Depressurize utility hydraulic reservoir by slowly unscrewing filler cap three full turns. Tighten cap after compressed air has escaped.

      CAUTION: DO NOT REMOVE CAP UNTIL RESERVOIR IS DEPRESSURIZED, OTHERWISE FLUID WILL ESCAPE.

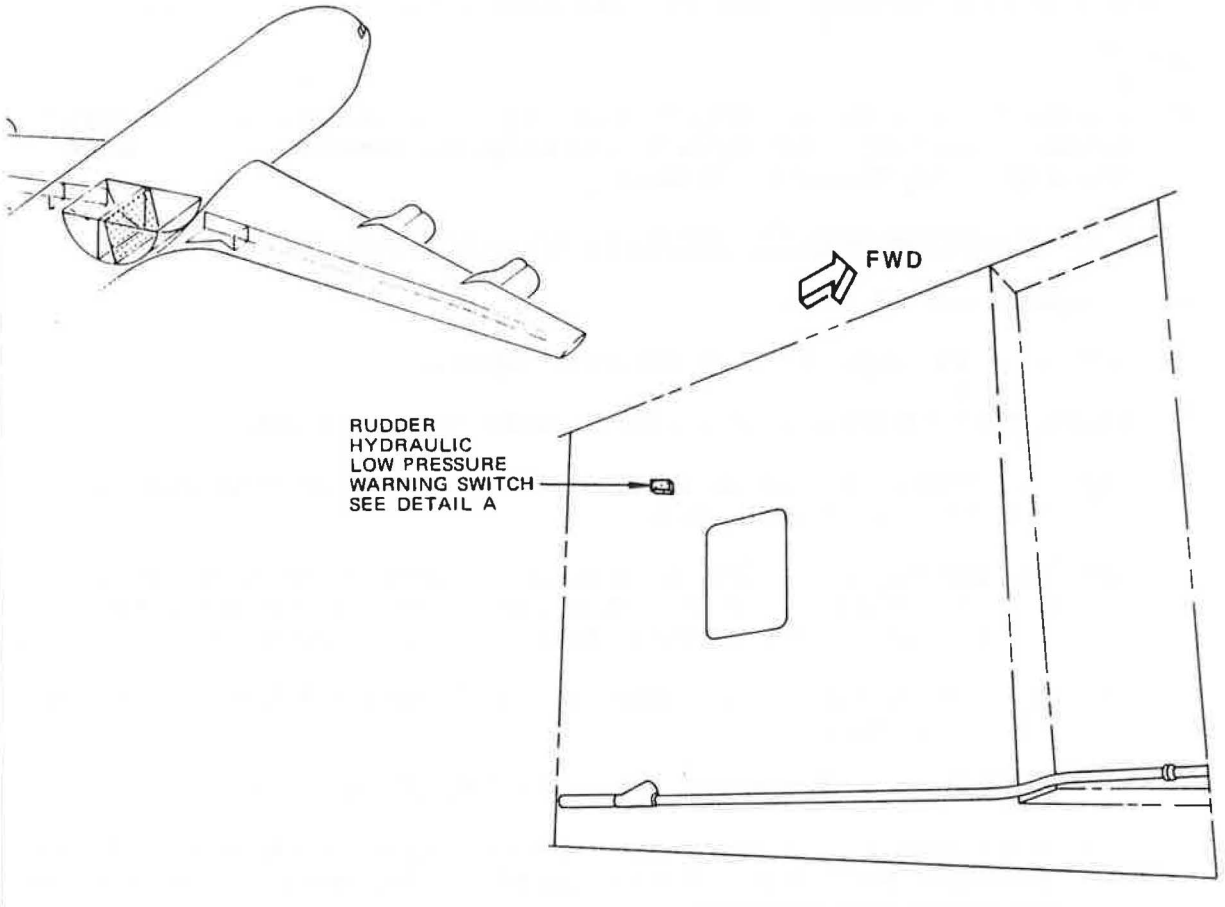
      (5) Remove electrical connector plug from switch. (See figure 201.)

      (6) Disconnect hydraulic line from restrictor and cap end of line.

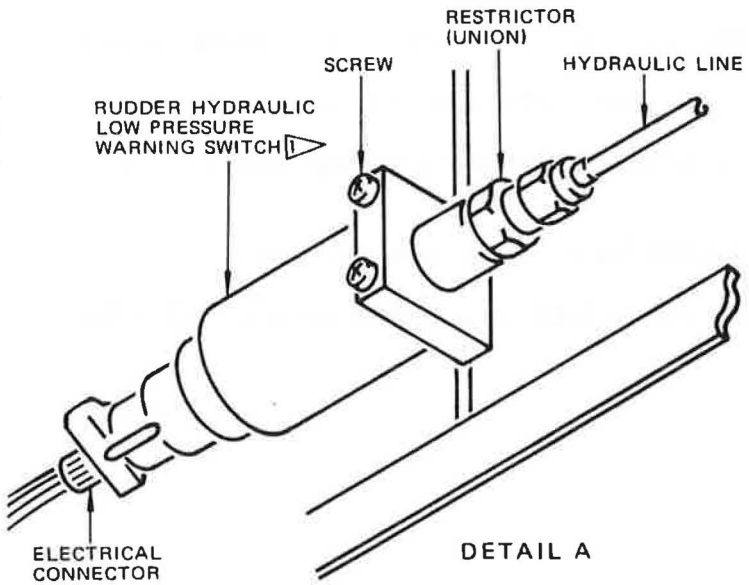
      (7) Remove switch mounting screws and remove pressure switch with restrictor.

   C. Install Rudder Hydraulic System Low Pressure Warning Switch

      (1) Install O-ring, restrictor (union) on pressure switch. (See figure 201.)



RIGHT WHEEL WELL INBOARD WALL



DETAIL A

1 THE RUDDER LOW PRESSURE WARNING SWITCH IS INSTALLED BELOW THE YAW DAMPER HYDRAULIC LOW PRESSURE WARNING SWITCH

Rudder Hydraulic Low Pressure Warning Switch Installation 6
Figure 201

(2) Position switch in mounting position and install mounting screws.

(3) Connect hydraulic line to restrictor (union).

(4) Install electrical connector to switch.

(5) Pressurize low pressure warning switch.

(a) Close RUDDER SEL AND OIL QTY IND circuit breaker on radio and T-R circuit breaker panel (P5).

(b) Connect external electrical power and position auxiliary pump switch ON.

(6) Check switch and restrictor (union) for leakage.

(7) Test rudder hydraulic system low pressure warning system.

(8) Remove main gear door downlocks and close left and right main gear wheel well doors.

WARNING: PERSONNEL STAND CLEAR OF WHEEL WELL DOOR PATH.

3. Adjustment/Test Rudder Hydraulic System Low Pressure Warning System

A. Test Rudder Hydraulic System Low Pressure Warning System

(1) Connect external electrical power.

(2) Position auxiliary pump switch ON and check that low pressure warning light extinguishes below 2700 psi.

(3) Increase pressure to 3000 psi and check low pressure warning switch for leaks.

(4) Position auxiliary pump switch OFF and decrease pressure by cycling rudder system. Check that low pressure warning light illuminates above 2500 psi.

(5) Disconnect external electrical power.

RUDDER HYDRAULIC PRESSURE CONTROL AIRSPEED SWITCH - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Hydraulic Pressure Control Airspeed Switch

   A. Remove Rudder Hydraulic Pressure Control Airspeed Switch

      (1) Disconnect pitot and static lines from airspeed switch. (See figure 201.)

      (2) Cap pitot and static lines to prevent entry of foreign material.

      (3) Disconnect electrical connector from switch.

      (4) Remove mounting screws and remove switch.

   B. Install Rudder Hydraulic Pressure Control Airspeed Switch

      (1) Position airspeed switch in mounting position and install mounting screws. (See figure 201.)

      (2) Connect electrical connector to switch.

      (3) Remove caps from pitot and static lines and install lines or switch ports.

      CAUTION: CHECK CAREFULLY TO INSURE THAT LINES ARE CONNECTED TO CORRECT PORT.

      (4) Test pitot and static systems for leaks as outlined in Chapter 34-2-0, "Pitot-Static Systems."

2. Adjustment/Test Rudder Hydraulic Pressure Control Airspeed Switch

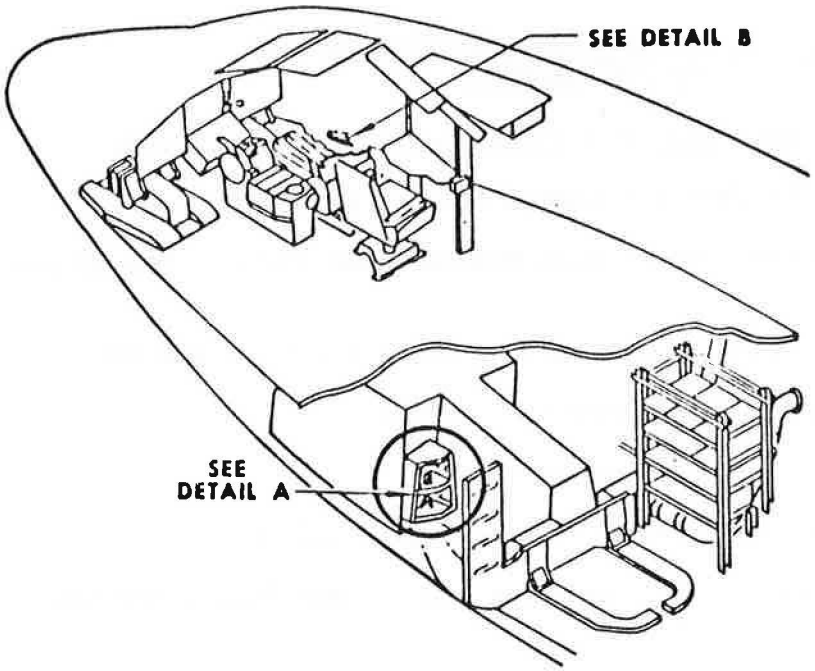
   A. Test Rudder Hydraulic Pressure Control Airspeed Switch

      (1) Connect the airspeed test equipment to the copilot's pitot system in accordance with procedures in Chapter 34-2-0, "Pitot-Static Systems."

      (2) Connect external electrical power to airplane.

      (3) Run flap to full up position.

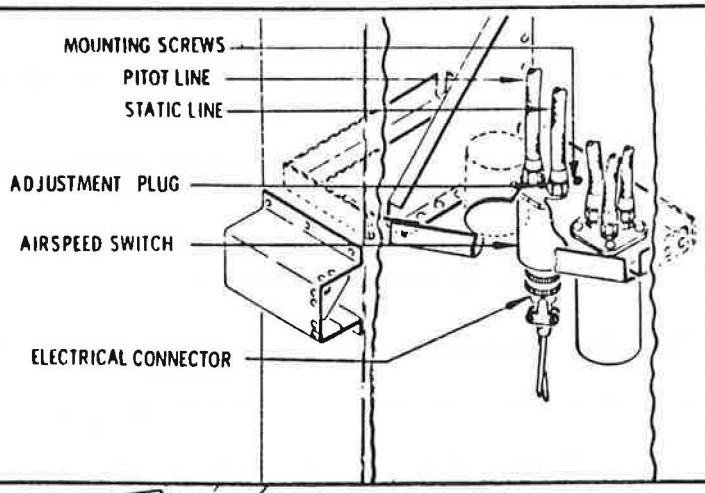
      (4) Position No. 2 auxiliary hydraulic pump switch "ON," and check that rudder hydraulic system pressure is approximately 3000 psi.

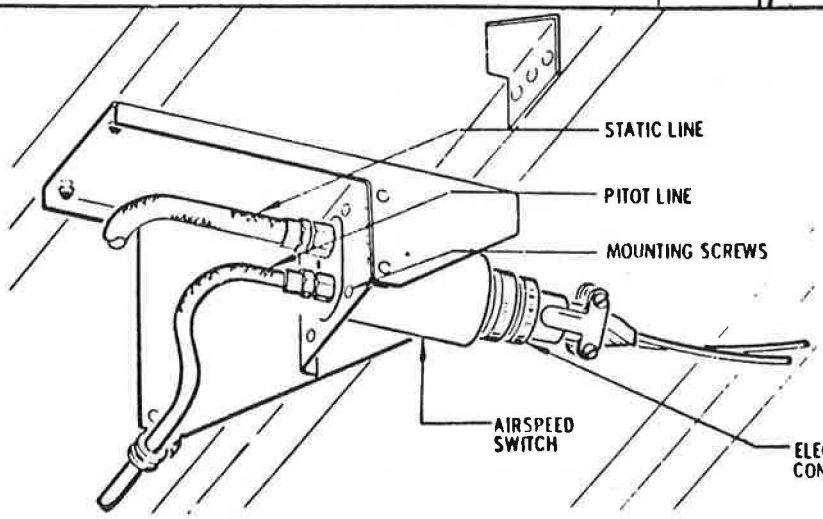


DETAIL A

EFFECTIVITY

00-SJH AND ON





DETAIL B

EFFECTIVITY

00-SJA THRU 00-SJG

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Rudder Hydraulic Pressure Control Airspeed Switch Installation 6
Figure 201 Nov 15/64

(5) Gradually supply pressure on the copilot's pitot system until the pressure reading on rudder hydraulic system gauge drops from 3000 psi to 2250 psi. Hydraulic pressure must drop at airspeed indication of 250 (± 10) knots.

(6) Remove air pressure from copilot's pitot system and check that pressure reading on rudder hydraulic system gage increases from 2250 psi to 3000 psi. Hydraulic pressure must increase at airspeed indication of 250 (± 10) knots.

NOTE: If unit is out of tolerance it may be adjusted by removing the plug between the pressure ports and rotating the adjustment screw.

(7) Return pitot system to normal.

(8) Position No. 2 auxiliary hydraulic pump switch "OFF," and remove external electrical power.

RAM AIR TUBE - "Q" BELLOWS - MAINTENANCE PRACTICES

1. General

   A. The ram air tube is removed by loosening the tube clamps and sliding it out through the "Q" air intake hole. The leading edge of the fin must be removed to provide access to tubing clamps.

2. Removal/Installation Ram Air Tube

   A. Remove Ram Air Tube

      (1) Depressurize auxiliary hydraulic system.

      (2) Open "Q-SPRING HEATER" circuit breaker on circuit breaker panel P2.

      (3) Open empennage deicing circuit breakers on main a-c power shield in control cabin.

      (4) Remove access panels 1505, 1522, 1523, 1514, 1562, 1524 and 1511. See Chapter 12, "Access Doors and Panels."

      (5) Remove fin leading edge. See Chapter 51, "Stabilizers."

      (6) Remove lower two access hole covers from fin leading edge spar.

      (7) Remove "Q" inlet and "Q" inlet fitting.

         (a) Remove electrical connection from "Q" inlet heating element. (See figure 201, detail B.)

         (b) Remove screws from "Q" inlet facing plate and remove inlet by pulling forward.

            NOTE: Aft end of inlet slides into air inlet fitting and is sealed with a heat resistant O-ring.

         (c) Loosen clamp and remove tube from "Q" inlet fitting.

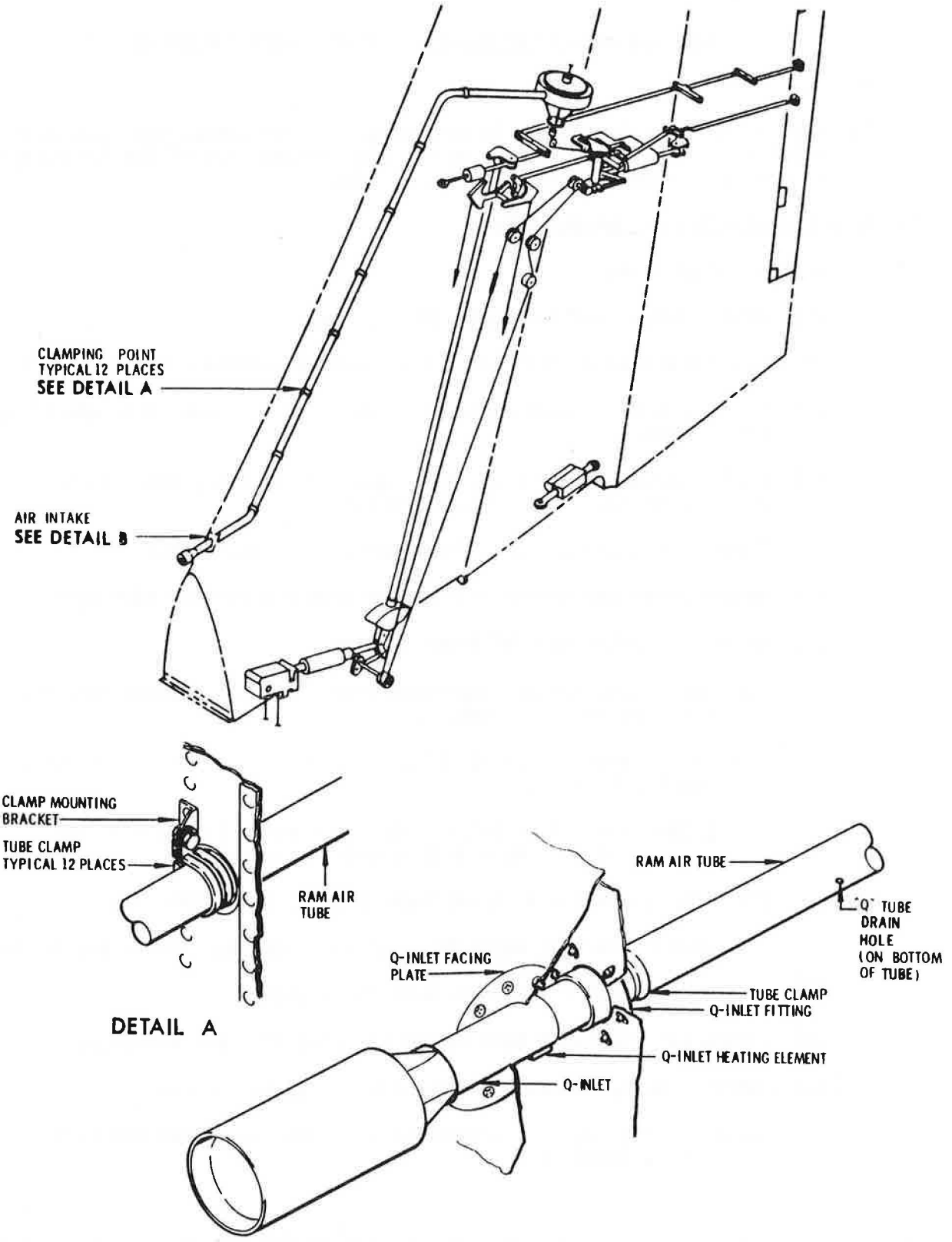
         (d) Remove mounting bolts from "Q" inlet fitting and remove fitting.

      (8) Loosen clamp and remove tube from "Q" bellows.

      (9) Loosen all remaining tube clamps (12 places). See detail A.

      (10) Remove hose by sliding forward through "Q" inlet hole.

         NOTE: In cold weather tubing may be heated with warm air to make it more flexible.



"Q" Bellows Ram Air Tube Installation
Figure 201

B. Install Ram Air Tube

(1) Thread tube in inlet hole, through clamps, up to "Q" bellows.

CAUTION: INSTALL TUBE WITH DRAIN HOLE DOWN AND AT FORWARD END OF TUBE.

(2) Connect tube to "Q" bellows and install tube clamp.

(3) Position "Q" inlet fitting and install bolts.

(4) Connect tube to inlet fitting and install tube clamp.

(5) Tighten remaining tube clamps (12 places).

(6) Slide aft end of "Q" inlet into inlet fitting and install screws.

NOTE: Examine O-ring on inlet for signs of wear. Replace if necessary.

(7) Attach electrical connections to "Q" inlet heater.

(8) Install leading edge spar access hole covers.

(9) Install fin leading edge. See Chapter 51, "Stabilizers."

S (10) Close "Q-SPRING HEATER" circuit breaker on circuit breaker panel P1.

(11) Close empennage deicing circuit breakers on main a-c power shield in control cabin.

(12) Test "Q" spring heater. See 27-17-0, "Test Q-Spring Heater."

(13) Temporarily seal drain hole in "Q" air intake and apply 3 psig of air to air intake.

(14) Remove air pressure source.

(15) Check after 30 seconds that trapped air has a pressure of not less than 1 psig.

(16) Unseal drain hole.

(17) Replace all access doors and covers.

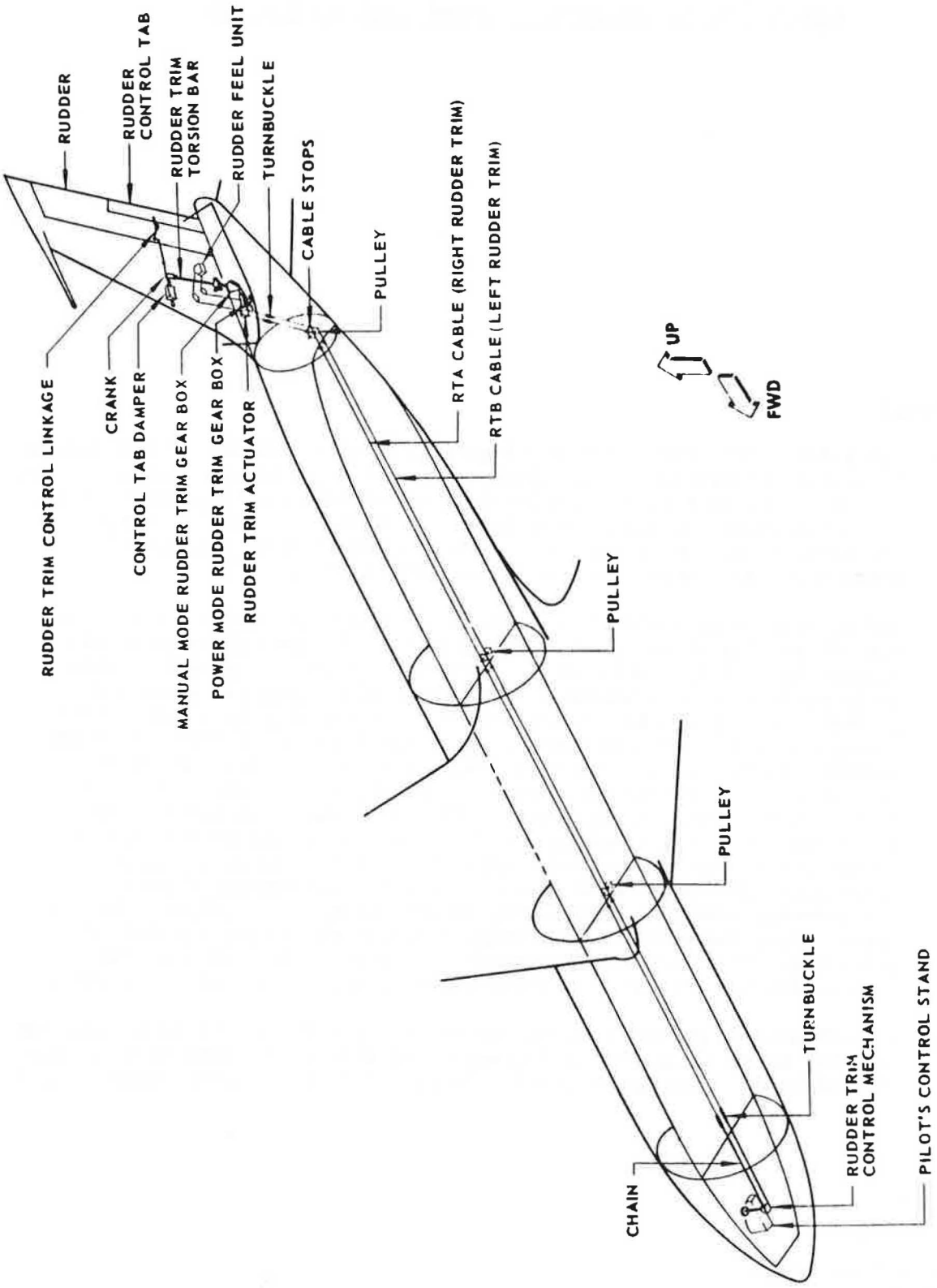
RUDDER TRIM CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General

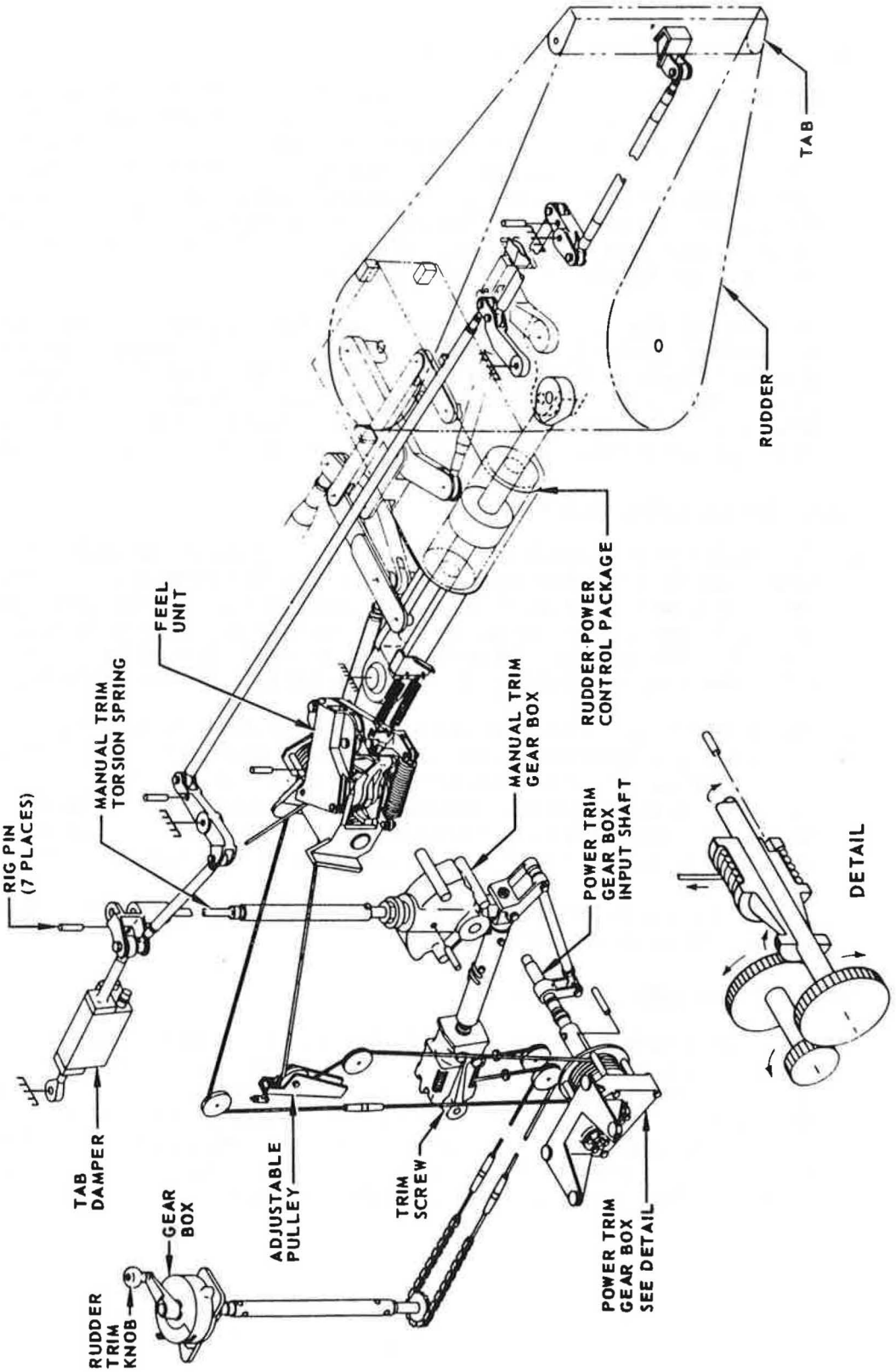
A. The rudder trim control system (figure 1) provides a means of maintaining a directional heading of the airplane without applying continuous pressure on the rudder pedals. The rudder trim system is a cable operated linkage which functions through a power trim gearbox during rudder operation in the power mode. The rudder trim system functions through a manual trim gearbox during rudder operation in the manual mode.

B. Rudder trim is initiated by rotating the rudder trim control handle on the aft portion of the pilots control stand. Rudder trim signals are transmitted aft by the rudder trim control cables in the form of linear cable motion. Linear movement is transmitted to both the power mode gearbox assembly and the manual mode gearbox assembly by a rudder trim actuator. The power mode gearbox transfers the control forces from the actuator to the rudder feel unit. Motion is transferred through the feel unit to the rudder power control unit by a feel rod. The rudder power control unit, in conjunction with the rudder trim system, deflects the rudder and rudder control tab for directional trim of the airplane. In the power mode, the rudder control tab moves in an antibalance direction. The manual mode gearbox transfers the control forces from the actuator through a torsion rod to the manual trim linkage. In the manual mode, the manual trim linkage deflects the rudder control tab in the balance direction to aerodynamically position the rudder. See Chapter 27-17-0 for detailed description of the rudder control system.

C. An indicator is provided on the rudder trim control mechanism to give the operator an approximation of the amount of rudder trim that is being used. The indicator plate shows 10 units "nose left" and 10 units "nose right."



Rudder Trim Control System
Figure 1 (Sheet 1)



Rudder Trim Control System
Figure 1 (Sheet 2)

2. Pilots' Rudder Trim Control Mechanism

A. The pilots' rudder trim control mechanism (figure 2) provides a means for controlling the directional trim of the airplane and indicates the units of rudder trim. The control mechanism consists of a trim control handle, a trim control gear box assembly, shaft, and a chain sprocket. The control handle is attached to the gearbox assembly which is mounted on the pilots control stand. The shaft connects the gear box to the sprocket in the lower nose compartment. The sprocket is attached to a chain which is connected to the trim control cables.

B. Movement of the trim control handle rotates a planetary gear system in the control mechanism gear box. A mechanical advantage is gained in the gear box which permits smooth operation of the rudder trim system by the pilot. The gear box drives the shaft which rotates the sprocket. Rotation of the sprocket drives the rollerless, single strand chain and controls the forward and aft movement of the trim control cables.

3. Rudder Trim Control Cables

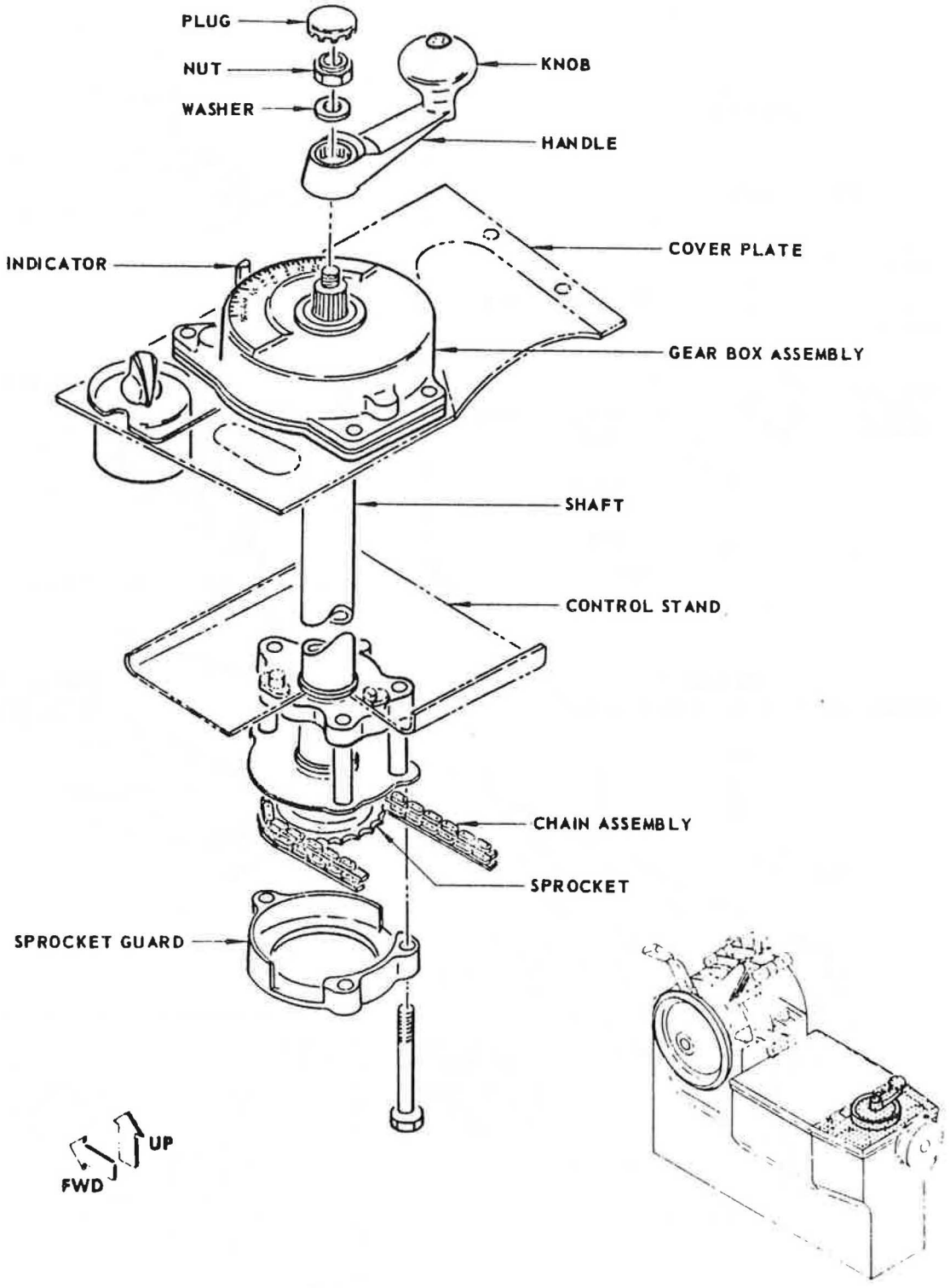
A. The rudder trim control cables (figure 1) transmit the pilot's rudder trim control mechanism motion aft to the trim actuator. The control cables are made of stranded, carbon steel wire. In the areas where the cables do not contact pulleys, aluminum tubing has been installed. This type of cable is commonly referred to as lock clad cable. The lock clad cable prevents sag between pulleys and helps maintain cable adjustment.

B. The rudder trim control cables are attached forward to a chain which is operated by a sprocket on the trim control mechanism. The cables are located under the floor and are rigged over idler pulleys. The aft end of the control cables are attached to the cable drum on the trim actuator. The cables are assembled and rigged with turnbuckles which are located in the lower nose compartment and in the tail compartment.

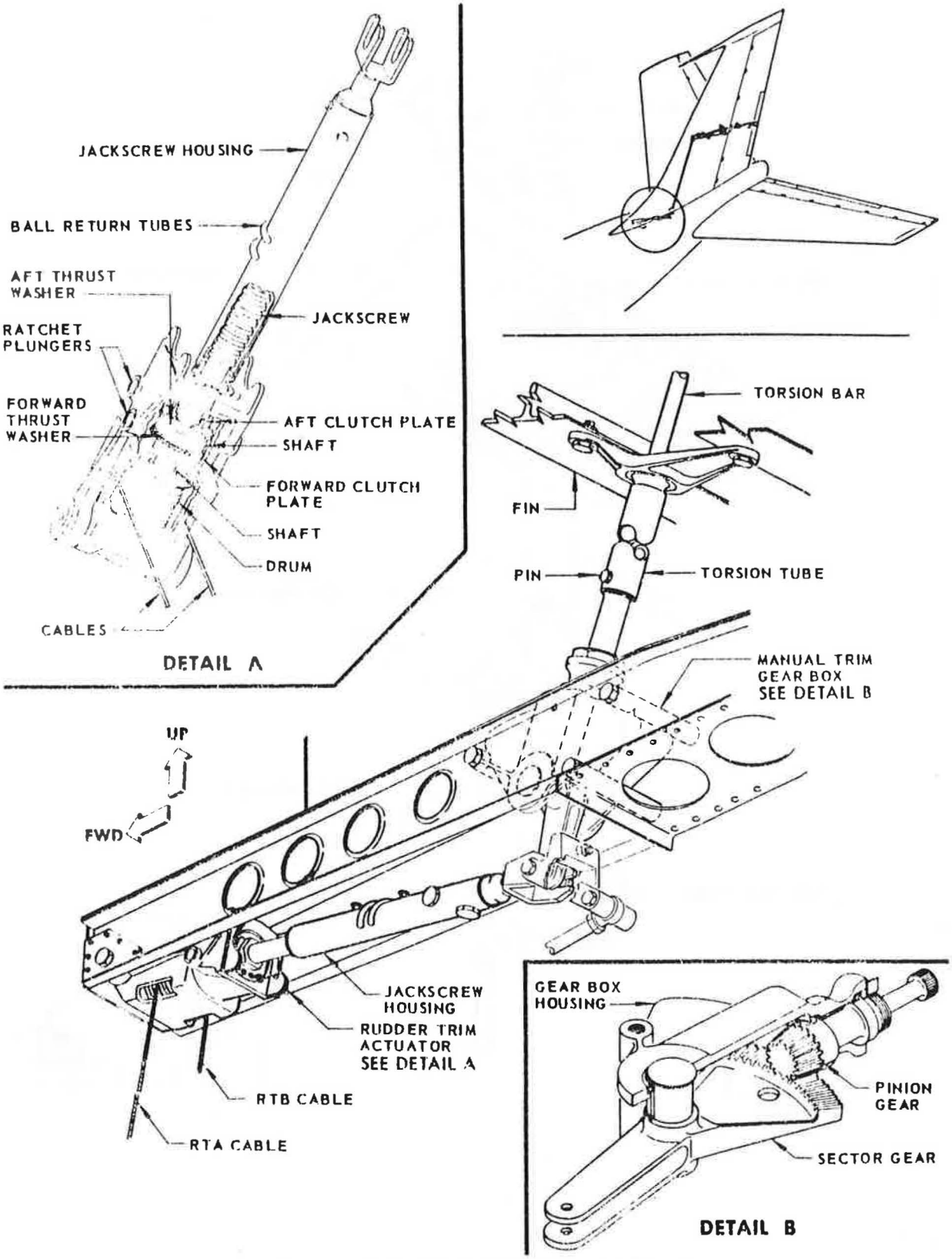
C. Rudder trim cable stops are located in the tail compartment slightly behind the pressure bulkhead.

4. Rudder Trim Actuator Assembly

A. The rudder trim actuator assembly (detail A, figure 3) converts control cable motion into a linear force which is applied to the rudder manual trim gear box assembly. The rudder trim actuator motion is also transmitted to the rudder power mode trim gear box assembly. The actuator assembly prevents any motion from feeding back into the control system. The assembly consists of control cables, a cable drum, shaft, thrust washers, clutch plates, ratchet plungers and a jackscrew assembly.



Pilot's Rudder Trim Control Mechanism
Figure 2



Rudder Trim Actuator and Gear Box Assembly
Figure 3

B. Movement of the control cables rotates the cable drum, shaft, and jackscrew. The jackscrew shaft drives the jackscrew housing aft or pulls it forward against control surface loads. When the jackscrew is driving the housing aft, the forward axial control surface loads on the jackscrew and shaft compresses the forward thrust washer which engages the forward clutch plate. The ratchet allows the control cables to rotate the jackscrew and drive the housing aft. As soon as the control cable forces are released, the ratchet engages the outer rim of the forward clutch plate and prevents any control surface force from feeding back into the control cables. Reversing the control cable movement causes the thrust washers to slip, and allows the retraction of the jackscrew housing in the direction of control surface loads.

C. When the control surface loads are pulling aft on the actuator assembly, the aft thrust washer is compressed and the aft clutch plate is engaged. Another set of ratchets on the aft clutch plate allows the control cables to rotate the jackscrew and pull the housing forward against the control surface loads. Release of the control cable loads causes the aft ratchets to engage the rim of the aft clutch plate and prevents control surface forces from driving the control cables in the opposite direction.

5. Rudder Power Trim Gear Box Assembly

A. The rudder power trim gear box assembly (figure 1) converts linear motion from the rudder trim actuator assembly into linear cable motion. The gear box consists of a cable drum, spur gears, pinion gears, an input shaft and a gear box housing. The power trim gear box output is transmitted through cables to the rudder feel unit.

B. Rotation of the power trim input shaft is transferred through two pinion gears and two spur gears to the cable drum. Power trim gear box output is seven times greater than the input.

C. Power trim gear box signals are transmitted to the feel unit during both the power and manual modes of rudder operation. However, during manual mode operation, power trim gear box signals to the feel unit do not affect rudder position.

6. Rudder Manual Trim Gear Box Assembly

A. The rudder manual trim gear box assembly (figure 3) converts the linear motion of the rudder trim actuator assembly into rotational motion. It consists of a pinion gear, sector gear, and gear box housing. The arm of the sector gear is attached to the rudder trim actuator assembly while the shaft of the pinion gear is connected to the torsion bar by means of a splined torque tube. Removing the pin and sliding the splined tube down allows the rudder and fin to be folded without removing the trim torsion bar.

B. The sector gear transmits the fore and aft movement of the rudder trim actuator assembly to the pinion gear. This causes the rotation of the pinion gear and the torsion bar. (See Detail B, figure 3.)

7. Rudder Trim Control Linkage

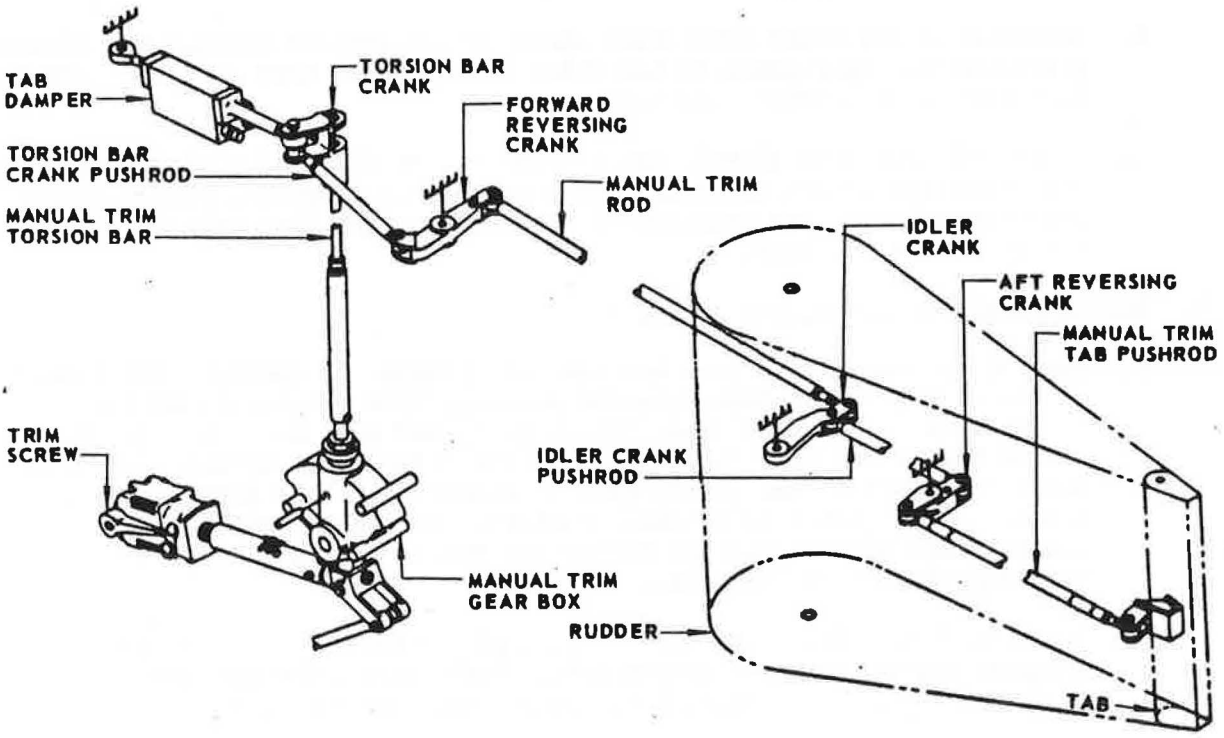
A. The rudder trim control linkage (figure 5) carries the control forces from the manual trim gear box assembly through the fin and rudder to the control tab. The linkage consists of a torsion bar assembly, idler and reversing cranks, and trim control push rods.

B. Movement of the manual trim gear box assembly rotates the torsion bar in the fin. A crank on the top of the torsion bar converts the rotary motion back into linear movement and a series of push rods and cranks transmits the control forces to the control tab crank fitting.

C. Manual trim gear box signals are transmitted to the rudder trim linkage in both the power and manual modes of rudder operation. However, in the power mode, signals from the power trim gear box override signals from the manual trim gear box by twisting the torsion bar.

8. Rudder Control Tab Damper

A. The rudder control tab damper prevents any vibration or flutter of the control tab. The damper is located in the vertical fin and is connected to the torsion bar crank. The damper consists essentially of an actuating piston, housing, flow restrictor valves, hydraulic fluid reservoir and reservoir piston. The damper is connected to the return line of the auxiliary hydraulic system which maintains the damper with fluid.



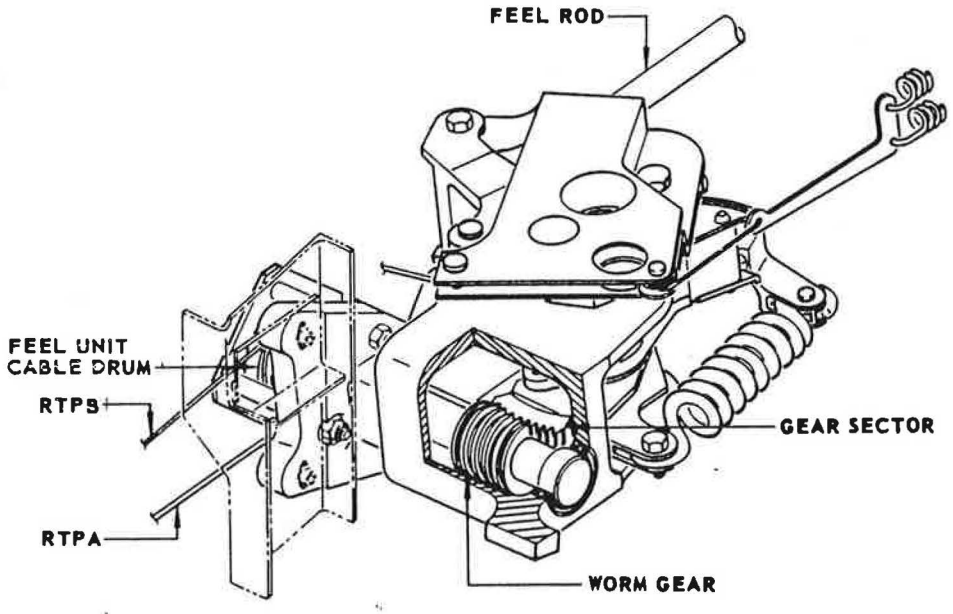
Rudder Manual Trim Linkage
Figure 4

9. Operation

A. Trimming the directional heading of the airplane is accomplished by adjusting the setting of the rudder control tab. Adjustment of the rudder control tab is initiated at the pilots control stand. When the pilot turns the handle on the trim control mechanism, a gear driven sprocket is rotated and a chain attached to the sprocket is set in motion. Forward and aft movement of the chain creates a similar movement in the control cables. The rudder trim actuator in the tail compartment transfers the cable input into a linear motion that is transmitted to the power trim gear box and to the manual trim gear box. Cable motion is transmitted from the power trim gear box to a cable drum geared to the rudder feel unit. (See figure 5.) Rotation of the cable drum displaces the feel mechanism cams and establishes a new feel unit neutral position. A signal is transmitted from the feel unit to the rudder power control unit by a feel rod. The signal from the feel unit actuates the power control unit which moves the rudder to the desired position. In the power mode, maximum rudder trim input will deflect the rudder 17° in either direction from neutral.

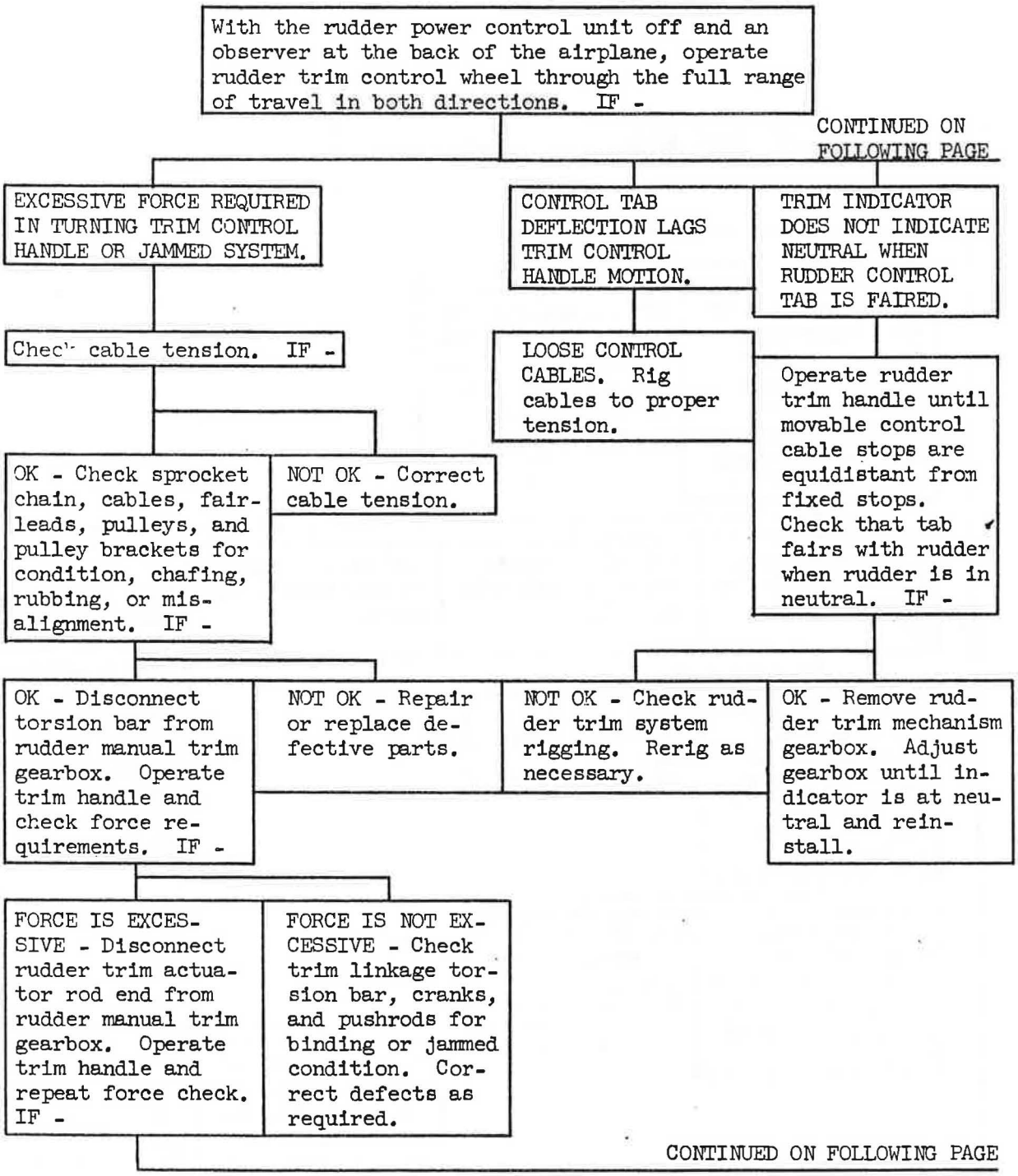
B. If the power mode becomes inoperative, rudder trim is initated by the manual trim gear box. Rotary motion is transmitted through the torsion bar to the torsion bar crank. Linear motion from the torsion bar crank is transmitted to the rudder control tab through a series of rods and cranks. In the manual mode, maximum rudder trim input will deflect the control tab 20° and the rudder 13° in either direction from neutral.

C. With any movement of the rudder in the power mode, the manual trim linkage is made to move in a direction opposite to that of manual trim, and the windup is absorbed by the manual trim torsion bar. This provides the same direction of trim on the pilots trim wheel for manual or power mode.



Rudder System Feel Unit
Figure 5

RUDDER TRIM CONTROL SYSTEM - TROUBLE SHOOTING



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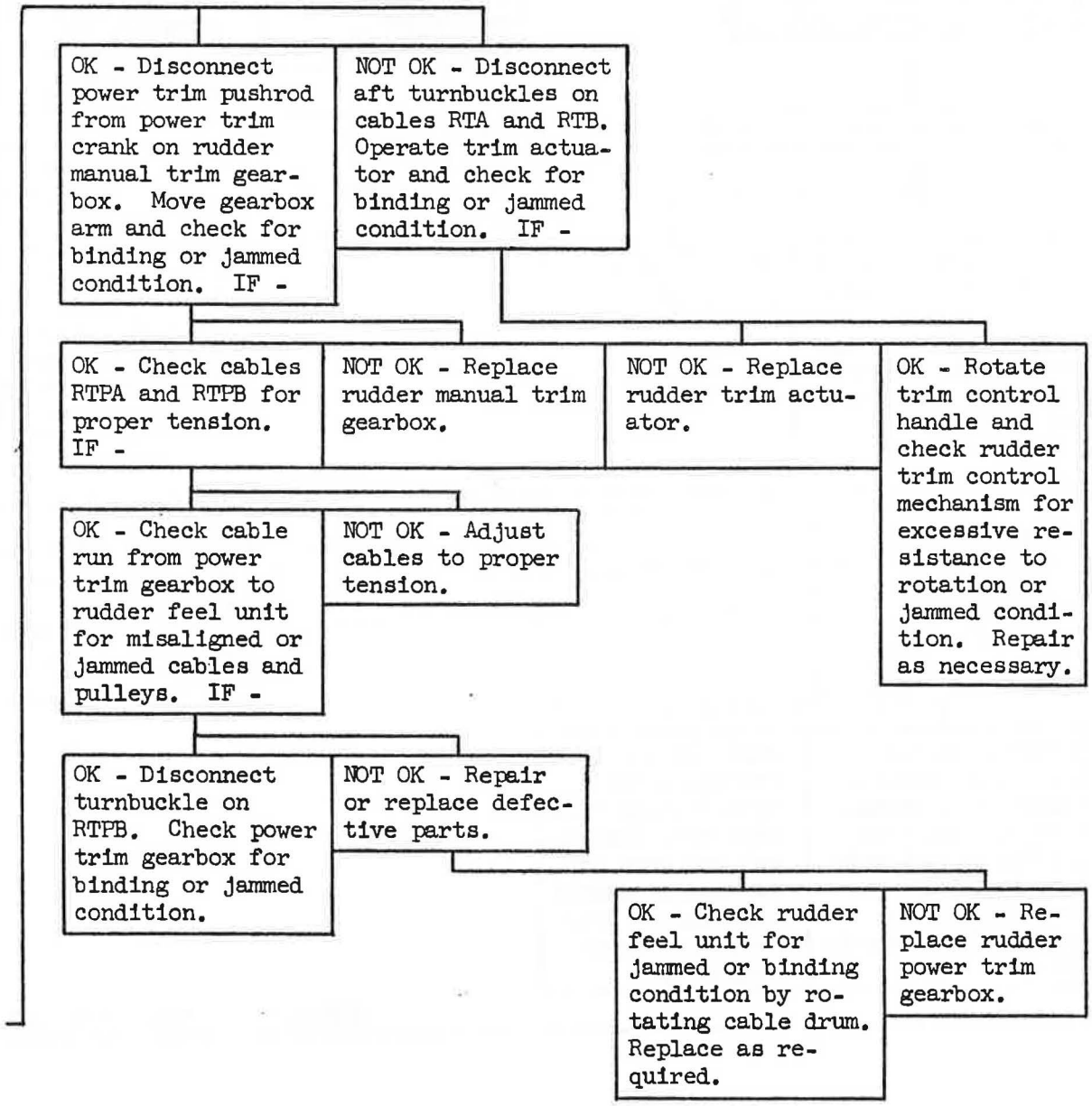

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CONTROL TAB WILL NOT REMAIN SET IN POSITION DURING FLIGHT.

REQUIRED TRAVEL OF CONTROL TAB IS NOT AVAILABLE.

Defective brake or ratchet in trim actuator assembly. Replace actuator.

Check neutral position of rudder trim control mechanism indicator in relation to neutral position of control tab. IF -

NOT OK - Adjust rudder trim mechanism to neutral.

OK - Check that aft turnbuckles are 33-1/2 inches from cable pulley bracket stop. IF -

NOT OK - Adjust rudder trim actuator.

OK - Check that RTA and RTB cables are wrapped the correct number of turns on drum when distance from end of jackscrew housing to end of shaft is 1/8 (+1/8/-3/64) inch. IF - ▷1

NOT OK - Adjust rudder trim actuator.

OK - Check that RTPA and RTPB cables are wrapped 1-1/2 turns on rudder power trim gearbox cable drum and 2-1/2 turns on rudder feel unit cable drum. IF -

NOT OK - Adjust rudder power trim cables.

OK - Check trim linkage cranks for proper installation and pushrods for proper adjustment. Correct as required.

NOT OK - Attach turnbuckle or replace cable.

NOT OK - Attach actuator rod end to gearbox arm.

NOT OK - Attach torque tube to torsion bar and install pin.

CONTINUED ON FOLLOWING PAGE

CONTROL TAB DOES NOT RESPOND.

Check trim cables for breaks or disconnected turnbuckles. IF -

OK - Check that actuator rod end is connected to gearbox arm. IF -

OK - Check that torque tube is attached to torsion bar. IF -

OK - Check control linkage for disconnected pushrod. Attach any loose pushrods.

▷1 Cable RTA is wrapped 5-3/8 turns on drum and cable RTB is wrapped 5-7/8 turns on drum.

CONTINUED FROM PRECEDING PAGE

EXCESSIVE RUDDER TRIM ▷1 REQUIRED IN FLIGHT WITH RUDDER POWER ON, ENGINE POWER SETTINGS AND WING FUEL LOADING SYMMETRICAL

Check indicator reading with tab in neutral. IF -

OK - Check that rudder control tabs are faired within ± 1/8 inch of rudder when rudder and rudder control pedals are in neutral position. IF -

NOT OK - Rig the rudder trim system

OK - Check that outboard ailerons are faired to 0.36 inch down from wing trailing edge when flaps are fully retracted or aileron control wheel is in neutral position. IF -

NOT OK - Rig the rudder control system

OK - Check that outboard flaps are faired within ± 1/4 inch of wing trailing edge when flaps are in fully retracted position. IF -

NOT OK - Rig the aileron control system

OK - Check that fillet flap fully retracts with simulated airload applied to flap. See 27-16-0 as applicable, Flap System - Trouble Shooting. If -

NOT OK - Correct per 27-16-0 as applicable, Flap System Trouble Shooting

▷1

If inservice trim limits as established by the airline are exceeded, use the following procedure for ground trouble shooting. To aid in establishing rudder trim limits, Boeing uses the following maximum allowable trim units for straight and level flight on new airplanes at airspeeds of 280 to 320 knots: Power-on rudder trim ±1 unit.

CONTINUED ON FOLLOWING PAGE

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PRECEDING PAGE

OK - On airplanes with 10 units on rudder trim indicator, adjust outboard flap down from faired position on the appropriate wing. Do not exceed 1/4 inch limit. Adjustment of 0.20 inch corrects approximately 1 unit of rudder trim. IF -

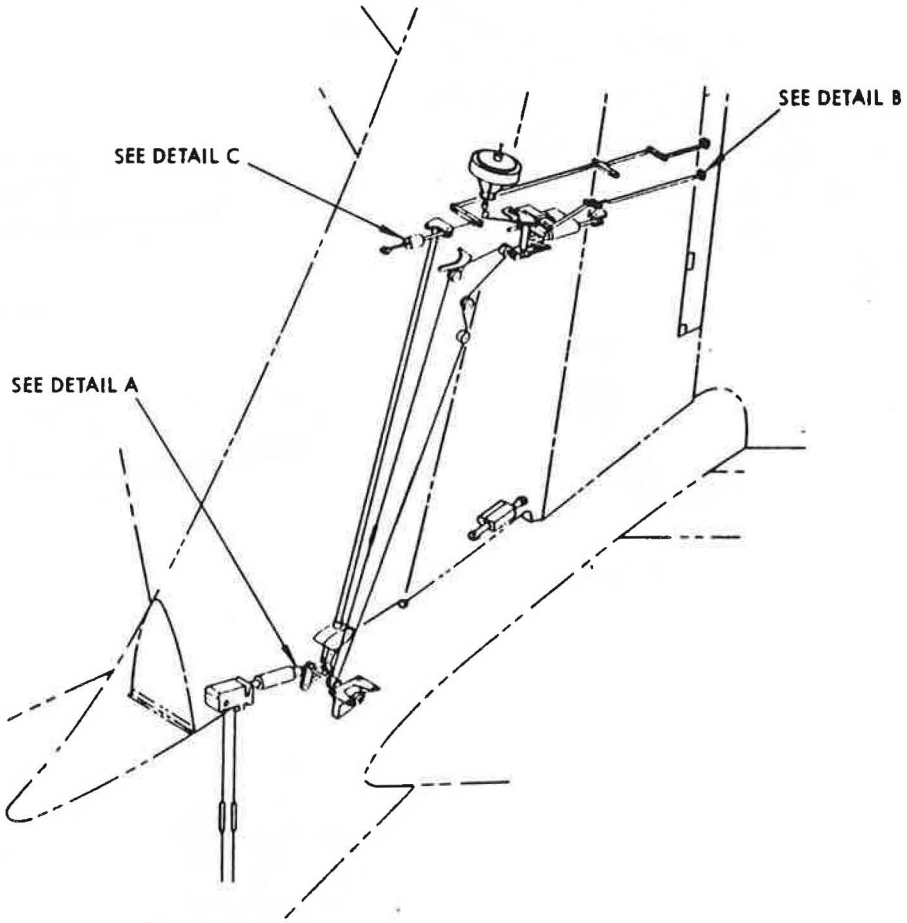
NOT OK - Adjust outboard aileron down from faired position on the appropriate wing. Do not exceed 1/2 inch limit. Adjustment of 0.20 inch corrects approximately 1 unit of rudder trim. [2]

[2] If after rigging or adjusting the appropriate flight control systems, the amount of trim required to maintain straight and level flight is excessive, refer to 27-1-21, Flight Controls Trim Correction - Adjustment/Test.

RUDDER TRIM CONTROL SYSTEM - MAINTENANCE PRACTICES

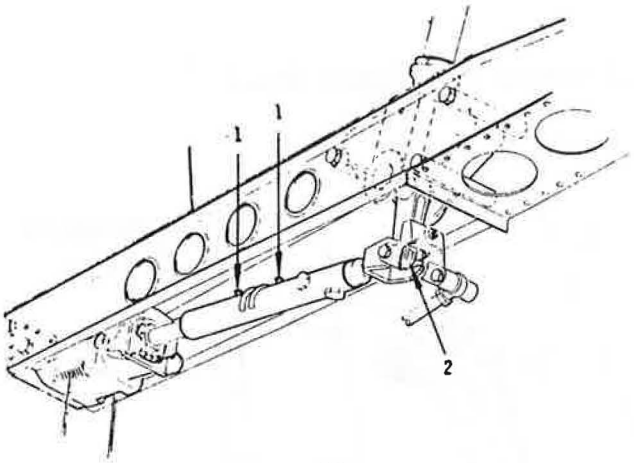
1. Unit Servicing

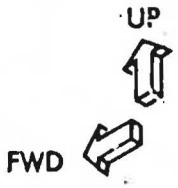
A. Lubricate Rudder Trim Control System (See figure 201.)



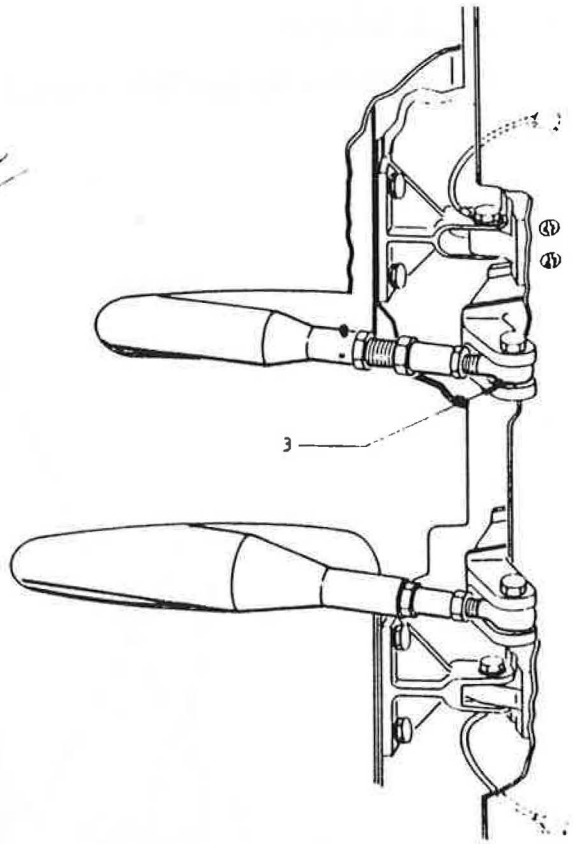
INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	Actuator Jackscrew (Rudder Trim Actuator Assy)	(a) Add a few drops of oil, MIL-L-7870, to oil cups. (b) Actuate through one complete cycle.
2	Rod End Bearing	Apply Aeroshell Grease 17 through flush fitting.
3	Control Tab Push Rod	Apply Aeroshell Grease 17 through flush fitting.
4	Control Tab Damper	Apply Aeroshell Grease 17 through flush fittings 2 places.

Rudder Trim Control System Lubrication
Figure 201 (Sheet 1)

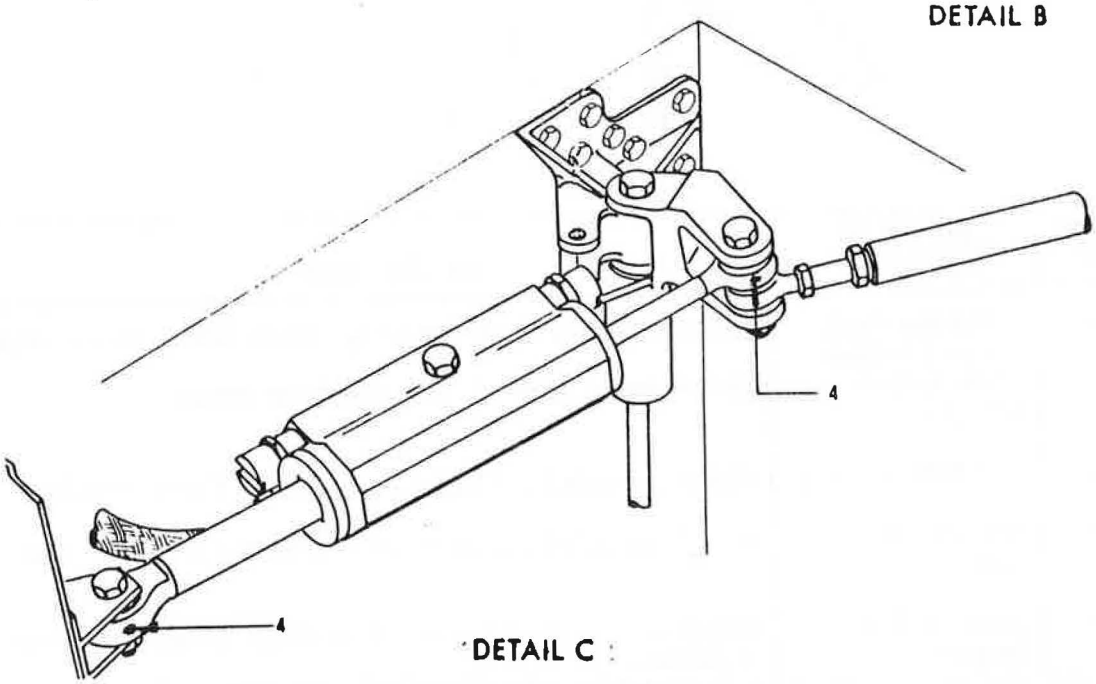




DETAIL A



DETAIL B



DETAIL C

2. Adjustment/Test Rudder Trim Control System

A. General

(1) The rudder control system must be properly rigged before adjusting the rudder trim control system.

(2) The objective of this procedure is to ensure satisfactory operation and control of the rudder trim system. Adjustment of the rudder trim system is accomplished by the use of rigging pins. Location of rig pins are shown on figure 203. Rigging of the system consists of adjusting the trim control indicator to neutral, the rudder trim actuator to neutral and adjusting the trim cables and trim linkages to neutral with the rudder and rudder tab in the faired position. After rigging the system, precautions should be taken to ensure that all rigging pins are removed.

(3) If an out-of-trim condition exists, refer to 27-1-21, Flight Controls Trim Correction - Adjustment/Test.

B. Equipment and Materials

(1) Tensiometer - 0 to 300 lb capacity

(2) Rudder Trim Tab Protractor - MIT50-8706

(3) Rudder Protractor - MIT50-8703

(4) Rig pins Nos. 1 through 6 and Rudder Rig Pin No. 9 - 0.311 (+0/-0.002) inch diameter (MS20392-4)

C. Adjust Rudder Trim Control System.

(1) Depressurize auxiliary hydraulic system.

CAUTION: ALL RUDDER TRIM SYSTEM RIGGING MUST BE ACCOMPLISHED WITH RUDDER HYDRAULIC POWER OFF.

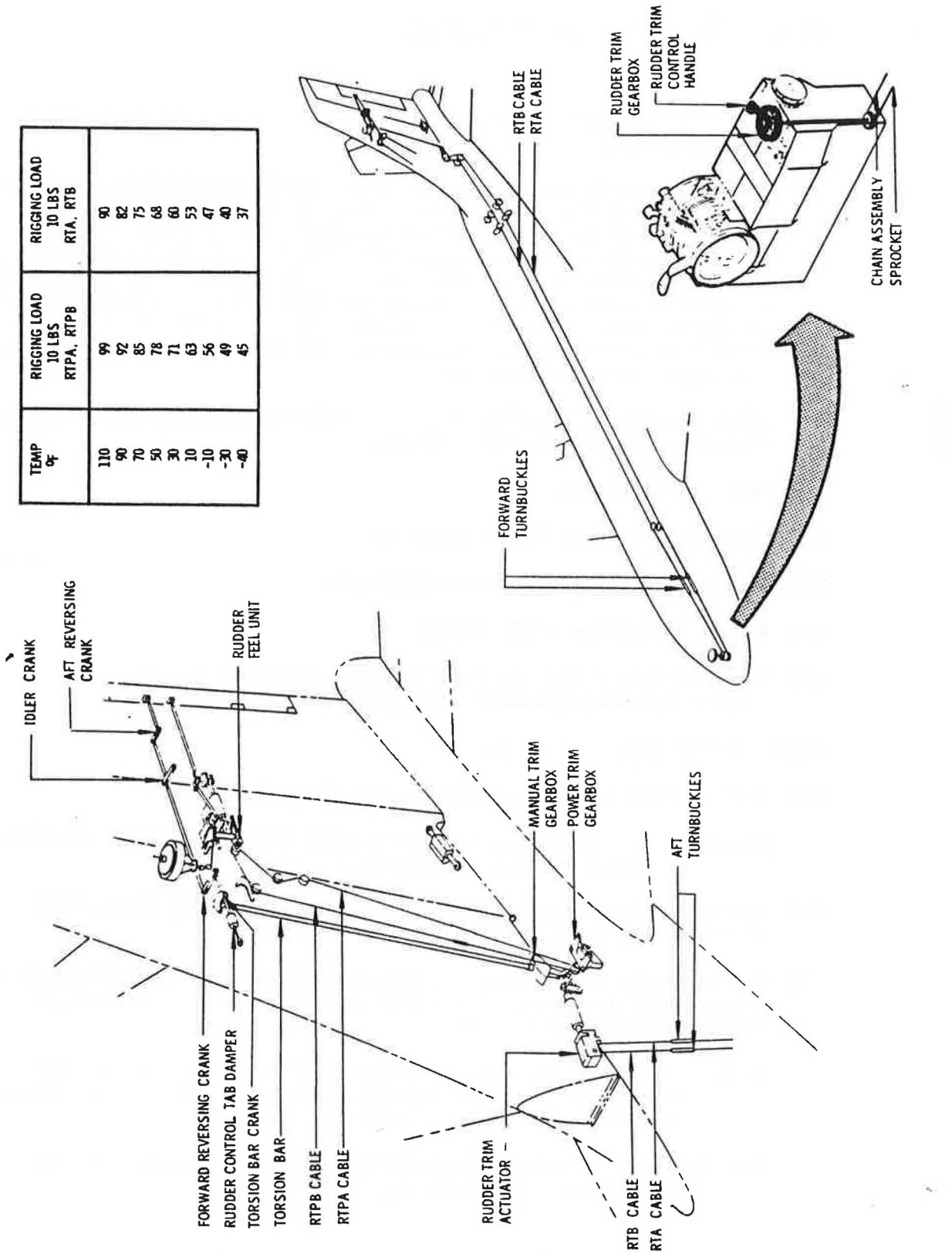
(2) Remove the following access panels 1185, 1503, 1509, 1510, 1514, 1572 and skin panel from right side of rudder.

(3) Rotate rudder trim handle (7, figure 204) until forward turnbuckles (figure 202) are even. Check that trim indicator is at zero, if not, adjust indicator as follows:

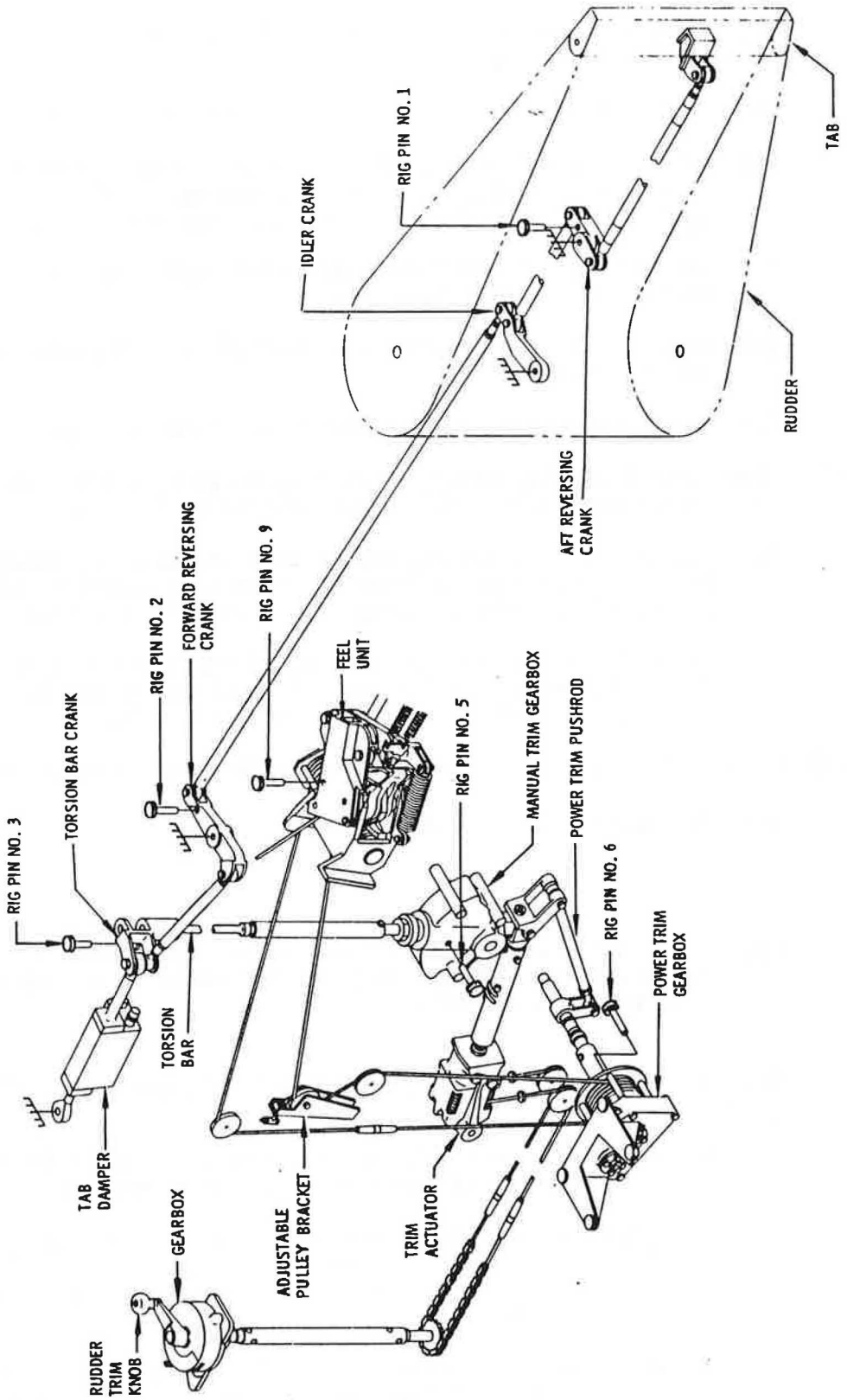
NOTE: Forward turnbuckles are located in lower 41 section just forward of the forward cargo compartment. Even turnbuckles indicate that chain assembly is at mid travel.

(a) Remove four bolts (9) attaching rudder trim gearbox (8) to control stand coverplate (1).

TEMP °F	RIGGING LOAD 10 LBS RTPA, RTPB	RIGGING LOAD 10 LBS RTA, RTB
110	99	90
90	92	82
70	85	75
50	78	68
30	71	60
10	63	53
-10	56	47
-30	49	40
-40	45	37



Rudder Trim Control System Equipment Location
Figure 202



Rudder Trim Control Rig Pin Location
Figure 203

(b) Separate gearbox from splined shaft (10) by lifting gearbox from control stand.

(c) Rotate trim handle until indicator indicates neutral.

(d) Hold trim indicator (2) at neutral and lower gearbox onto control stand engaging splined gearbox output shaft with splined trim control shaft. Install four mounting bolts.

(e) Remove plug (5) from handle and remove nut (4), washer (3) and handle from gearbox assembly.

(f) Install handle on gearbox with knob (6) toward right side of control stand.

(g) Install washer and nut on gearbox and replace plug.

(4) Check that dimension from turnbuckle stops on cables RTA and RTB to cable stops is 33-1/2 (± 3/32) inch (figure 205), if not:

(a) With rudder trim control handle held in neutral, adjust forward turnbuckles in lower 41 section to obtain 33-1/2 (± 3/32) inch between turnbuckle stops and cable stops.

NOTE: Maximum allowable twisting of chain assembly is 180 degrees at turnbuckles. Control cables may be pretwisted to prevent rotation of chain.

(5) Check number of cable turns on rudder trim actuator cable drum:

(a) Not applicable to SABENA aircraft.

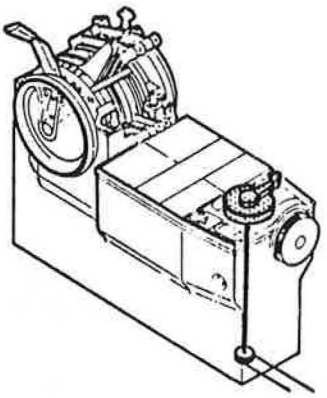
(b) Check that rudder trim control cable RTA is wrapped 5-3/8 turns and that RTB is wrapped 5-7/8 turns on actuator cable drum (12, figure 206).

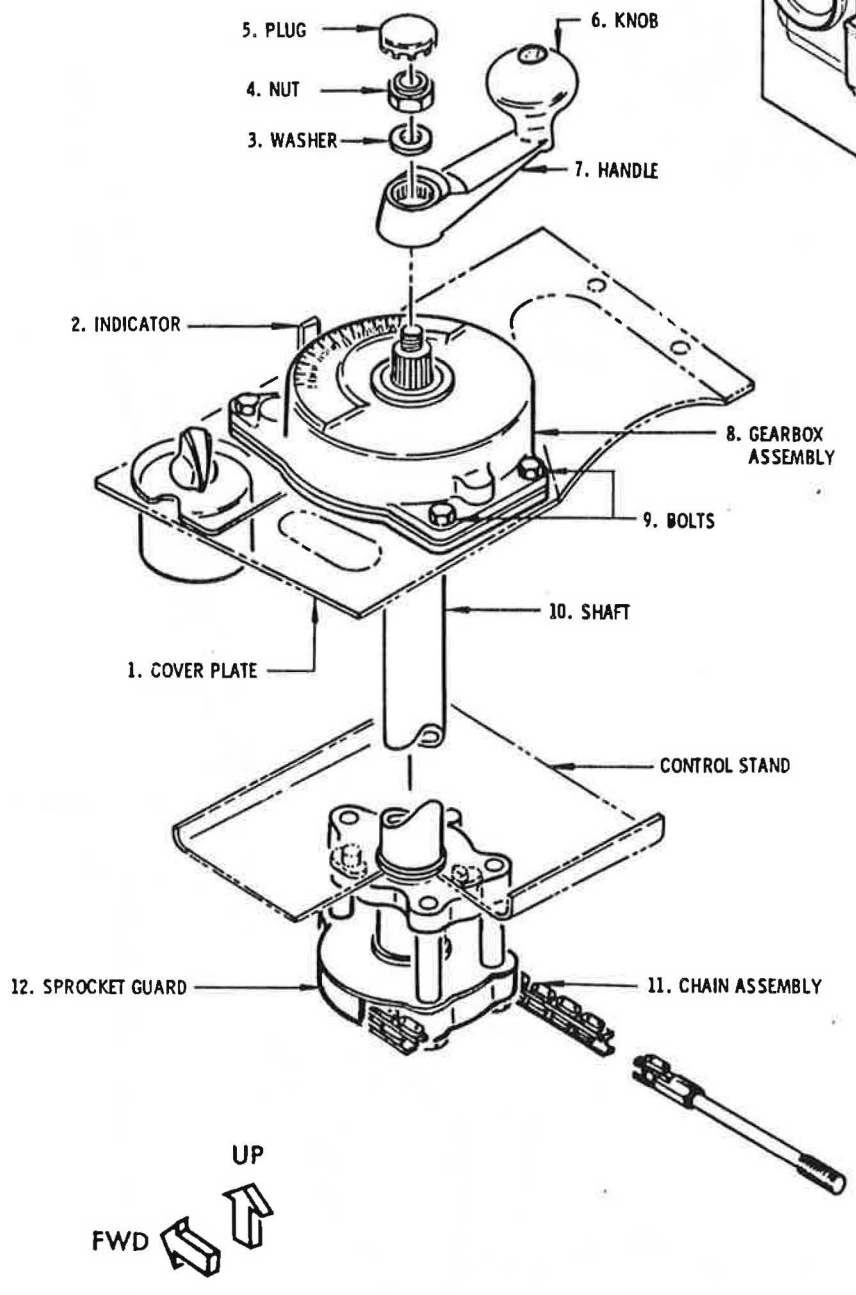
(c) If requirements in step(b) are not met, proceed as follows:

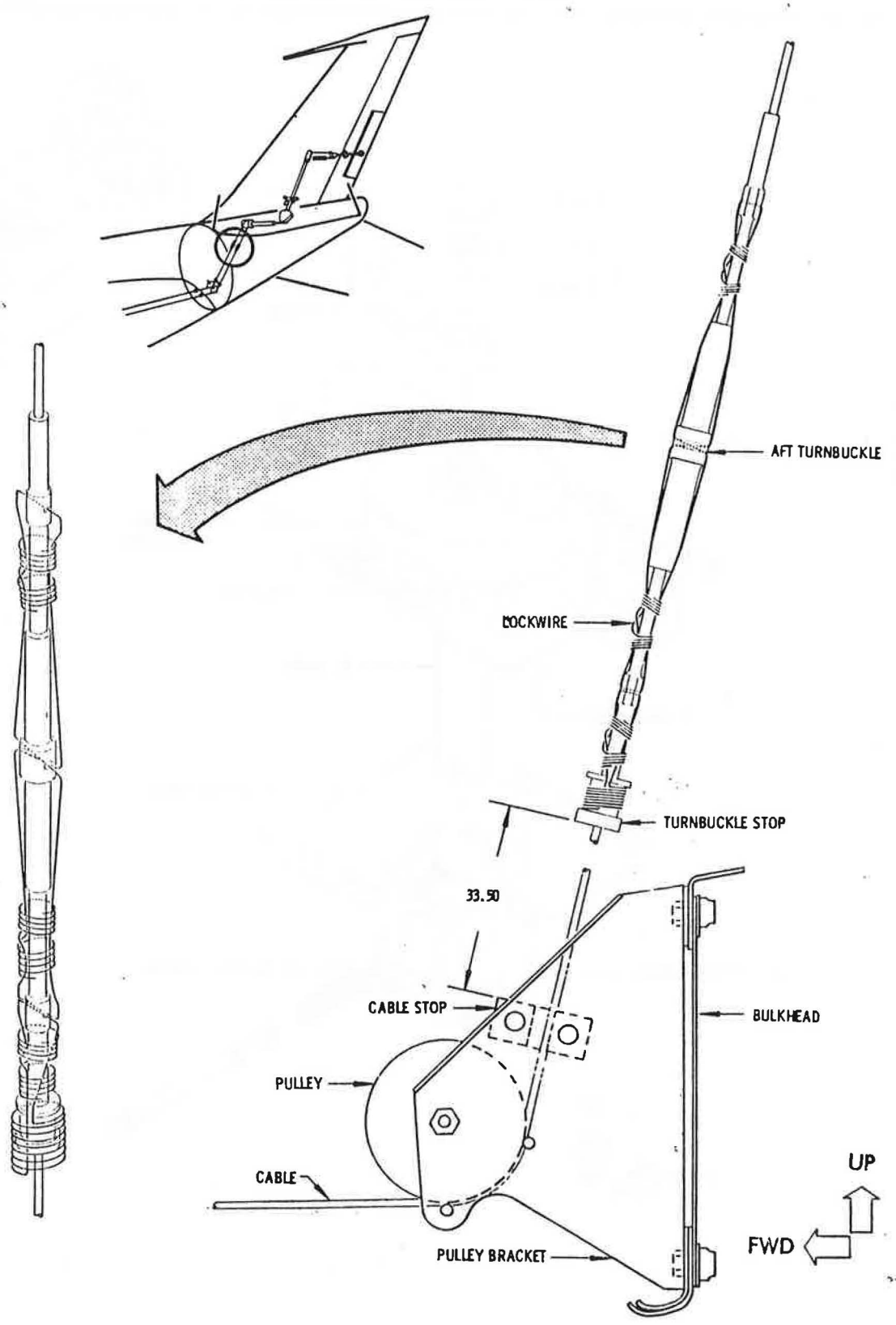
1) Adjust aft turnbuckle on RTA cable until cable is wrapped correct number of turns on rudder trim actuator cable drum.

NOTE: Rudder trim indicator must be held at zero. RTA and RTB turnbuckles must be the same distance within 0.10 inch from drum center when drum is in neutral position.

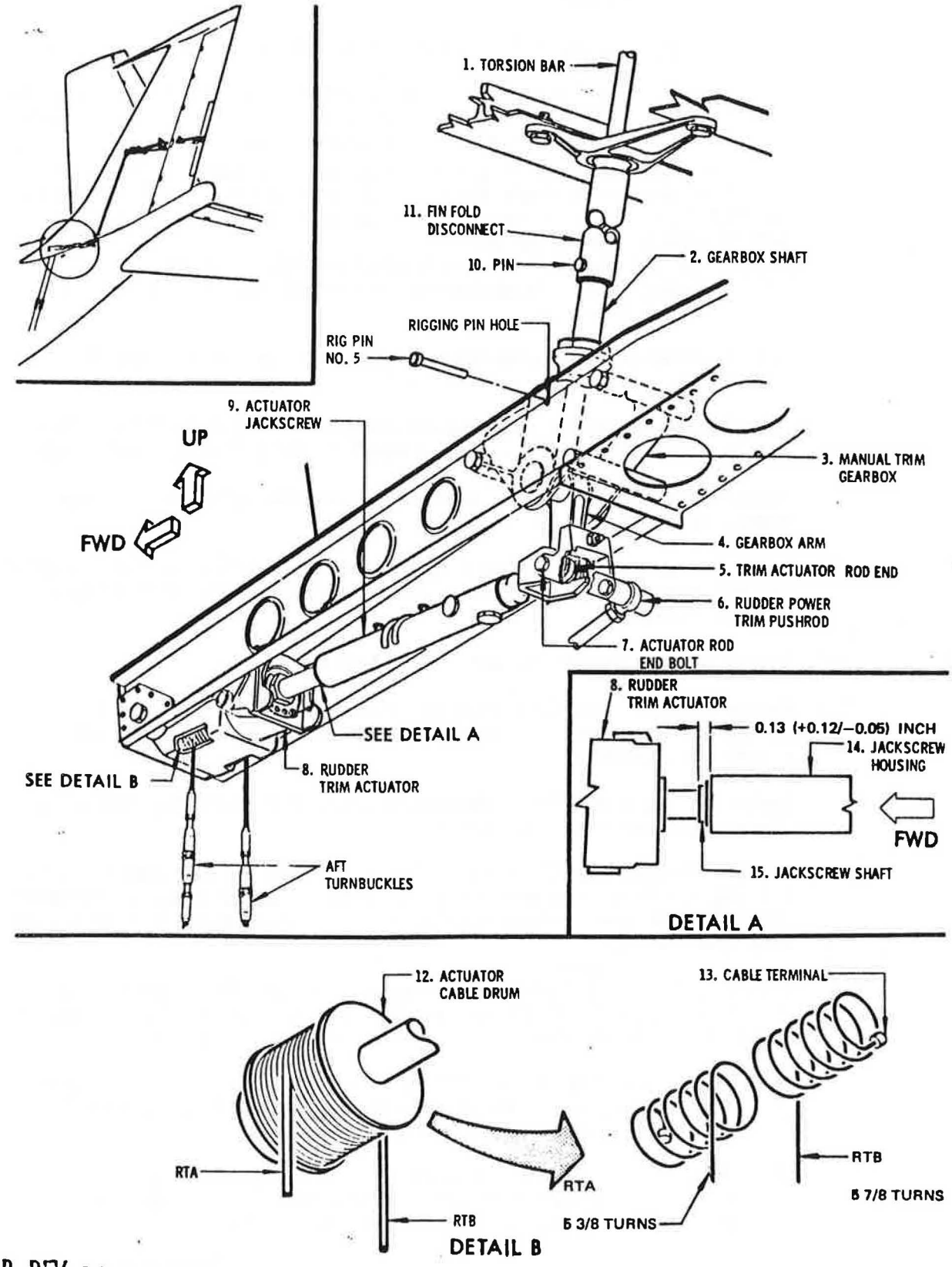
2) Adjust aft turnbuckle on RTB cable until cable is wrapped correct number of turns on trim actuator cable drum.




5. PLUG
6. KNOB
4. NUT
3. WASHER
7. HANDLE
2. INDICATOR
8. GEARBOX ASSEMBLY
9. BOLTS
10. SHAFT
1. COVER PLATE
CONTROL STAND
12. SPROCKET GUARD
11. CHAIN ASSEMBLY
UP
FWD



Aft Turnbuckle Adjustment
Figure 205



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Rudder Trim Actuator Adjustment
Figure 206

d) Adjust tension in RTA and RTB cables to specified value for ambient temperature. See figure 202 for temperature tension chart.

NOTE: When checking cable tension, place tensiometer on bare portion of cable.
Maximum allowable twisting of chain assembly is 180 degrees at turnbuckles. Control cables may be pretwisted to prevent rotation of chain.

(6) Check that dimension from end of jackscrew housing (14, figure 206) to end of jackscrew shaft (15) on rudder trim actuator (8) is 0.13 (+0.12/-0.05) inch. If not, proceed with steps (a) and (b). If satisfactory, omit step (b).

NOTE: The 0.13 inch dimension indicates that the ball nut and jackscrew are in midtravel or neutral position with ball return tubes up.

(a) Disconnect trim actuator rod end (5) from gearbox arm (4) and crank.

(b) Rotate jackscrew shaft until dimension from end of jackscrew housing to end of jackscrew shaft is 0.13 (+0.12/-0.05) inch.

(7) Rotate gearbox arm until rig pin No. 5 can be installed through manual trim gearbox (3).

(8) Hold trim actuator in neutral and adjust trim actuator rod end until rod end bore and gearbox arm bolt hole aligns within 0.010 inch. Tighten checknut.

(9) Attach trim actuator rod end to gearbox arm.

(10) Remove retainer pin (10) from fin fold disconnect (11) and lower disconnect onto gearbox shaft (2) to separate torsion bar from manual trim gearbox.

(11) Install rigging pin No. 3 through torsion bar crank (1, detail A, figure 210) and crank support (5).

(12) Connect torsion bar (1, figure 206) to gearbox output shaft (2) by sliding fin fold disconnect (11) into place and installing retainer pin (10). Do not preload torsion bar when connecting bar to manual trim gearbox (3).

(13) With rig pin No. 5 installed in manual trim gearbox, attempt to install rig pin No. 6 through cable drum (5, figure 207) on rudder power trim gearbox (6). If rig pin cannot be installed:

(a) Check that pushrod (6) (figure 206) makes an 89 (± 2) degree angle with power trim gearbox input crank. If not, adjust pushrod to obtain angle. Tighten checknut.

(b) Attempt to insert rig pin No. 6. (See figure 207.) If rig pin cannot be inserted remove bolts from splined tube (3) and slide tube inboard to free gearbox splined shaft.

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(c) Rotate gearbox splined shaft so that rig pin hole in cable drum and gearbox casting are aligned, and install rig pin No. 6.

(d) Slide splined tube onto gearbox spline and install bolts.

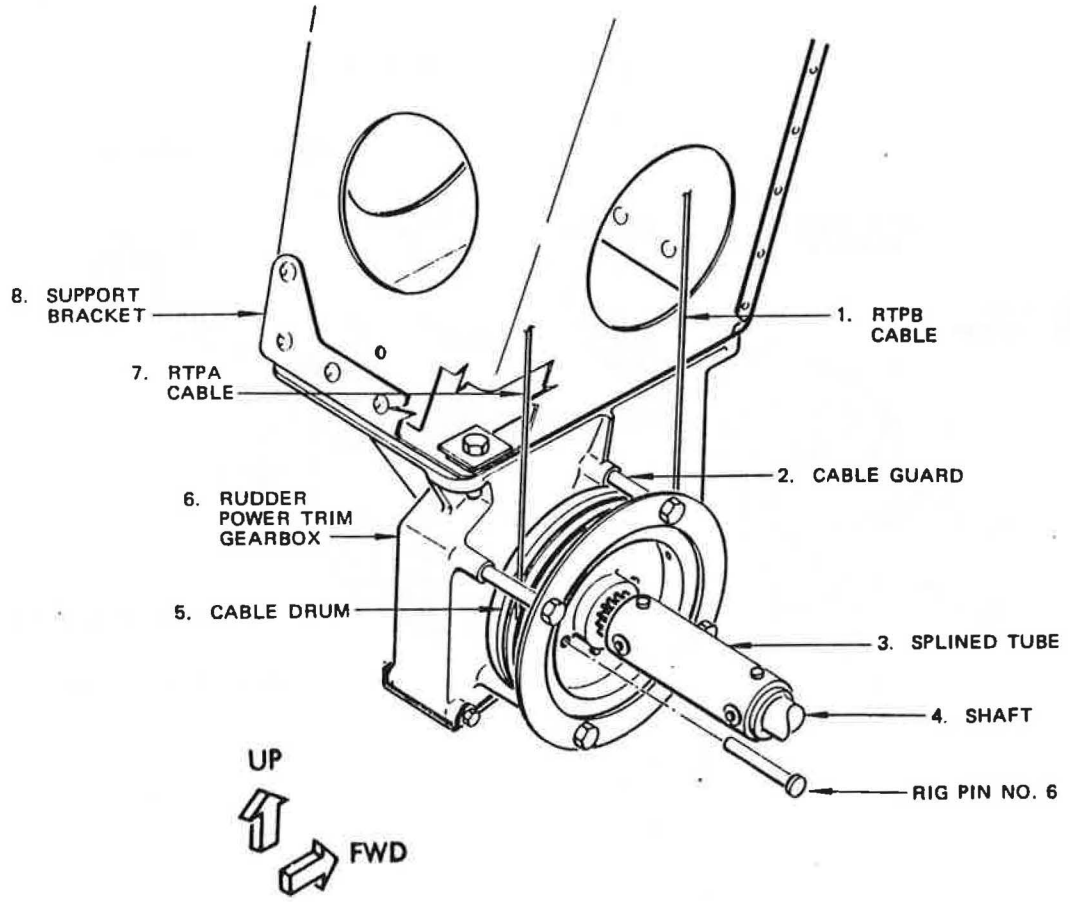
(14) Check that cables RTPB (1) and RTPA (7) are each wrapped 1-1/2 turns on power trim gearbox cable drum.

(15) Check that cables RTPA and RTPB are each wrapped 2-1/2 turns on rudder feel unit cable drum. (See figure 208.)

(16) Install rig pin No. 9 through feel unit housing and rudder feel unit carriage.

(17) Using tensiometer, check that cable tension on cables RTPA and RTPB is within limits specified on temperature tension chart, if not:

(a) Adjust turnbuckle on RTPB cable and adjustable pulley bracket on RTPA cable to obtain required tension for ambient temperature. (See figure 209.) Balance tension in cables to avoid binding rig pins. See figure 202 for temperature tension chart.



Rudder Power Trim Gearbox Adjustment
Figure 207

(18) With rig pin No. 3 still installed through torsion bar crank, attempt to install rig pin No. 2 (detail B, figure 210) through forward reversing crank (8). If rig pin cannot be installed:

(a) Disconnect forward pushrod (2) from torsion bar crank (1, detail A, figure 210).

(b) Install rig pin No. 2 through forward reversing crank.

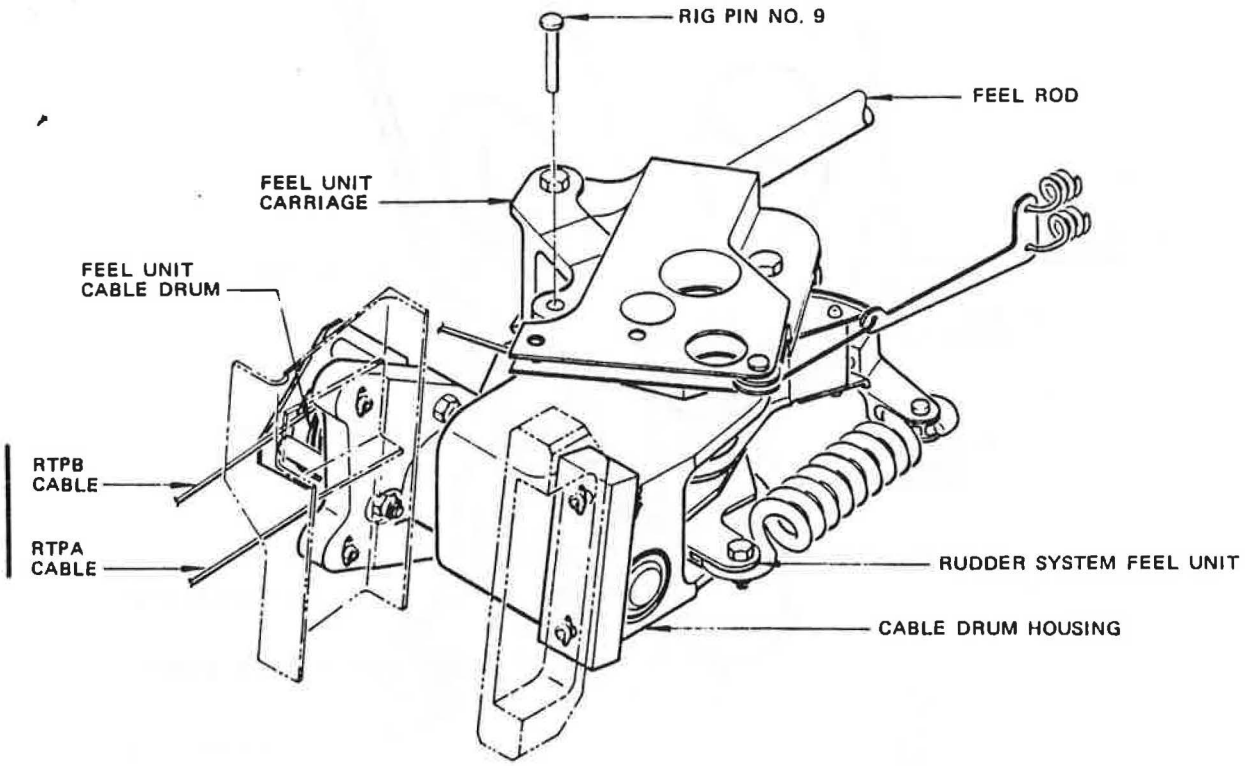
(c) Adjust forward pushrod as required to attach pushrod to torsion bar crank without binding rig pins. Tighten check nut.

(19) Attempt to install rig pin No. 1 through aft reversing crank. If rig pin cannot be installed:

(a) Disconnect forward idler crank pushrod from idler crank just forward of rudder front spar (7, detail B, figure 210).

(b) Install rig pin No. 1 through aft reversing crank.

NOTE: Aft idler crank pushrod connecting idler crank and aft reversing crank is fixed length rod.



Rudder Feel Unit Adjustment
Figure 208

(c) Adjust pushrod as required to attach pushrod to idler crank without binding rigging pins Nos. 1 and 2.

(20) Hold rudder trailing edge in neutral position at lower corner within 1°.

(21) Check that rudder control tab (14, detail D, figure 210) can be faired with rudder (14) within 1/8 inch, if not:

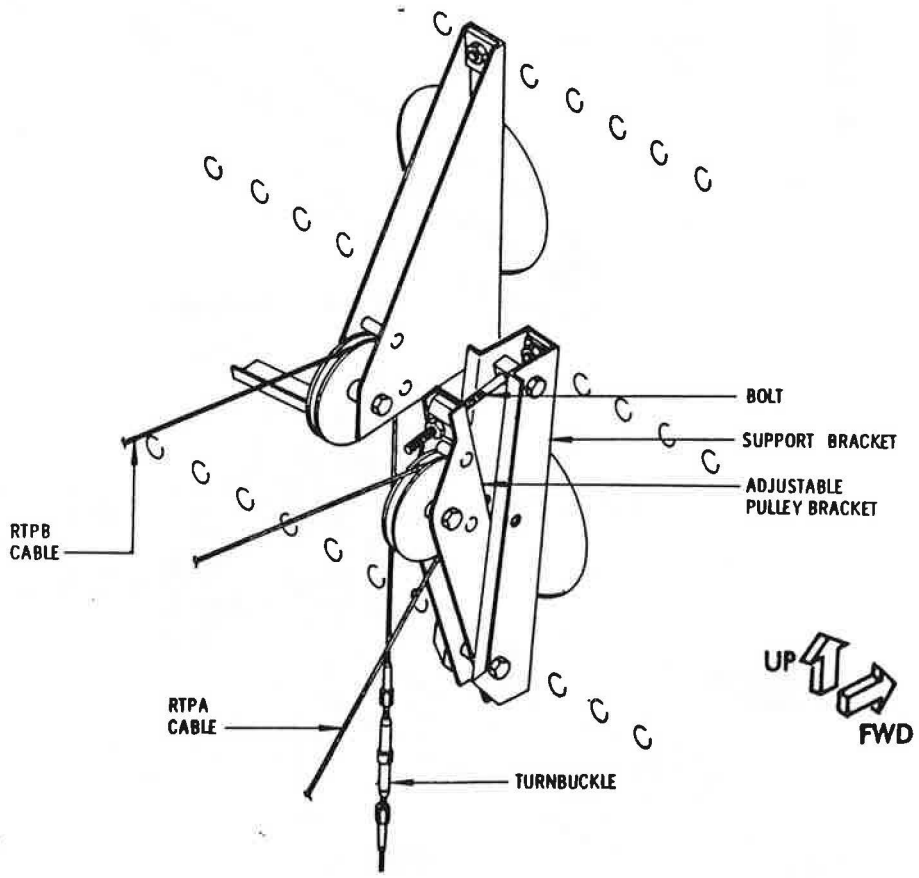
(a) Disconnect manual trim tab pushrod (12) from tab crank (15).

(b) Adjust manual trim tab pushrod so that pushrod can be attached to tab crank without binding rig pin No. 1 when rudder control tab is faired with rudder within 1/8 inch.

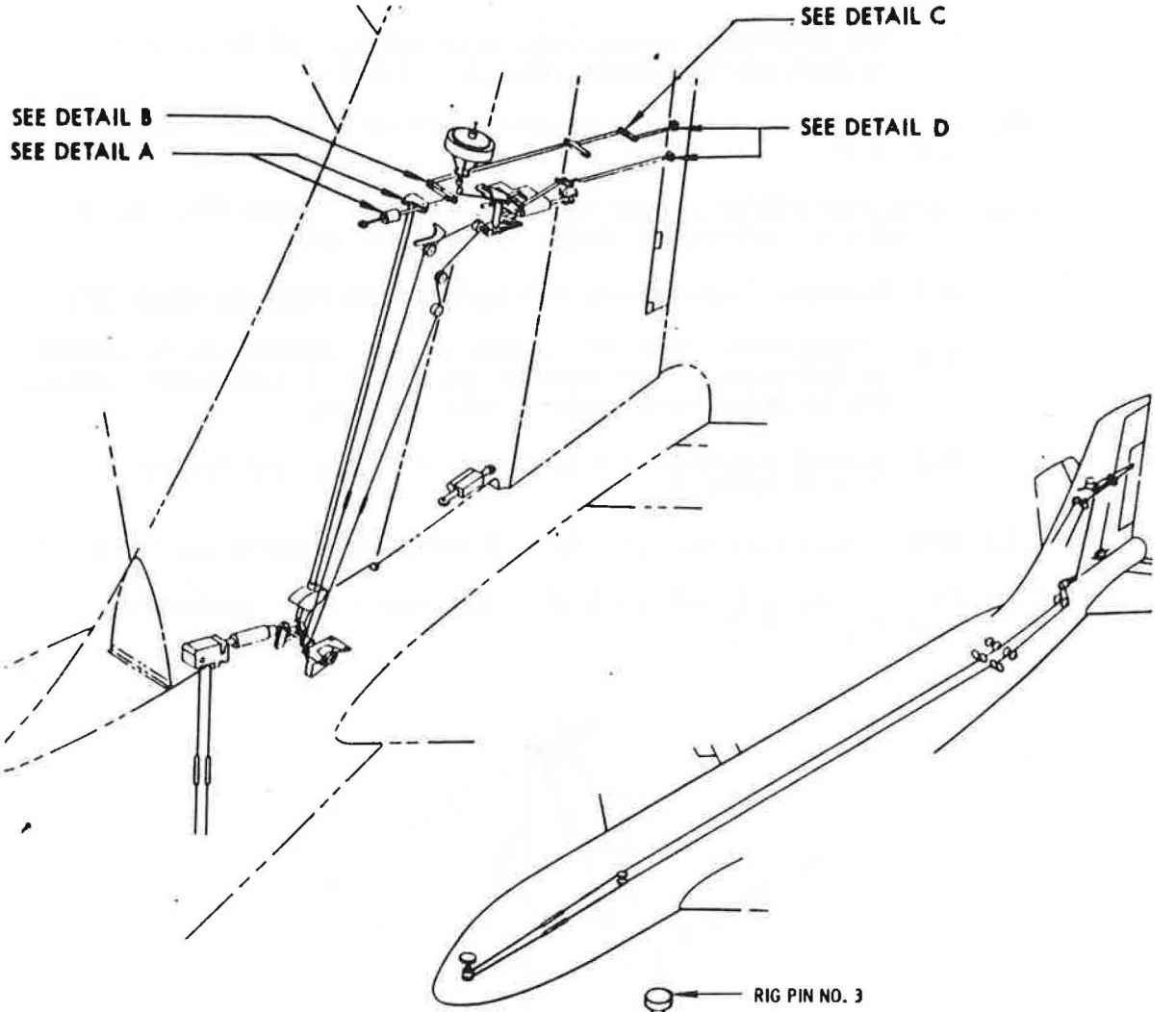
(c) Install mounting bolt in control tab crank and pushrod. Tighten check nut.

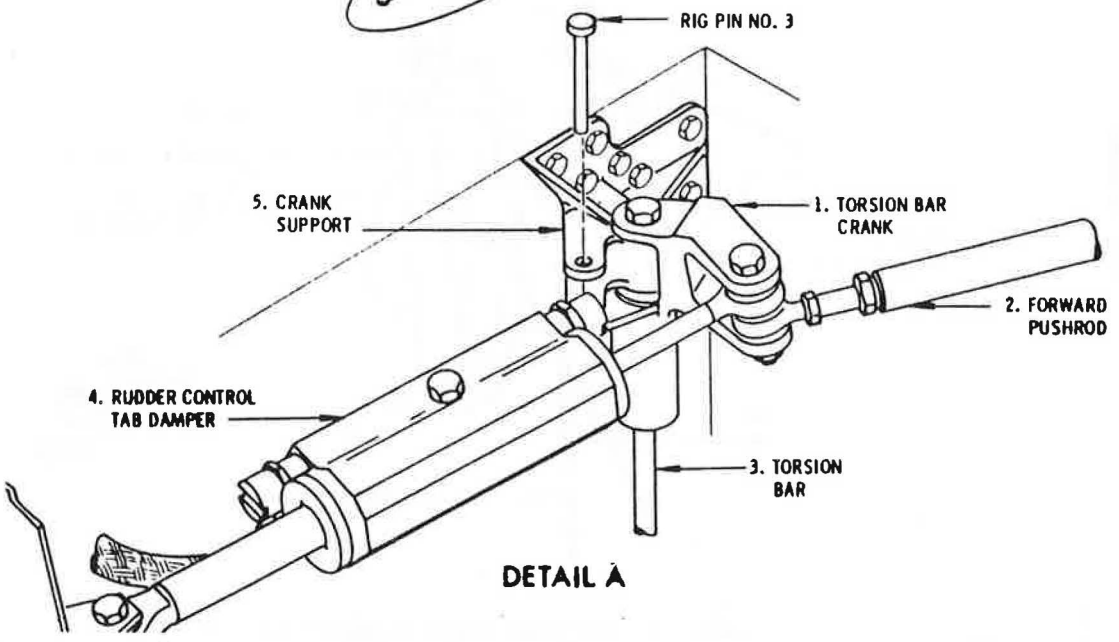
(22) Remove rig pins Nos. 1, 2, 3, 5, 6 and rudder system rig pin No. 9.

(23) Lockwire forward, aft and rudder trim power cable turnbuckles. (See figure 205.)



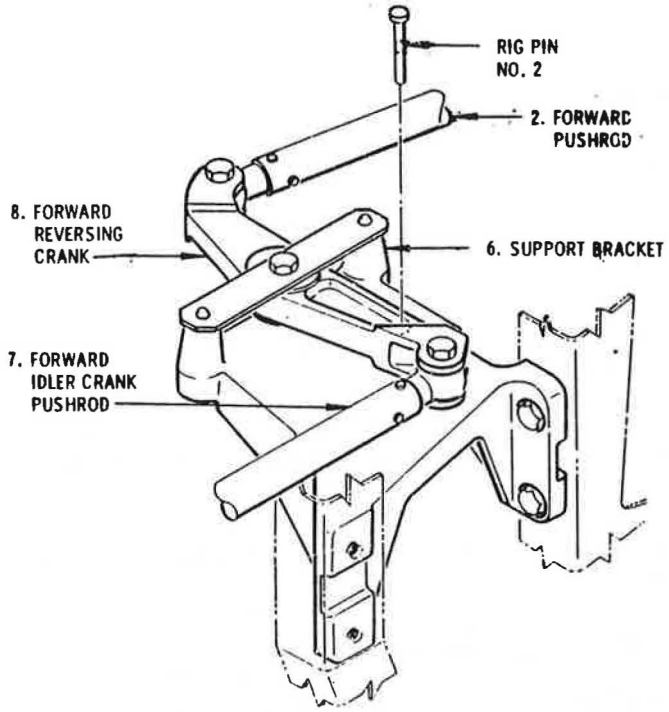
Rudder Power Trim Cable Adjustment
Figure 209



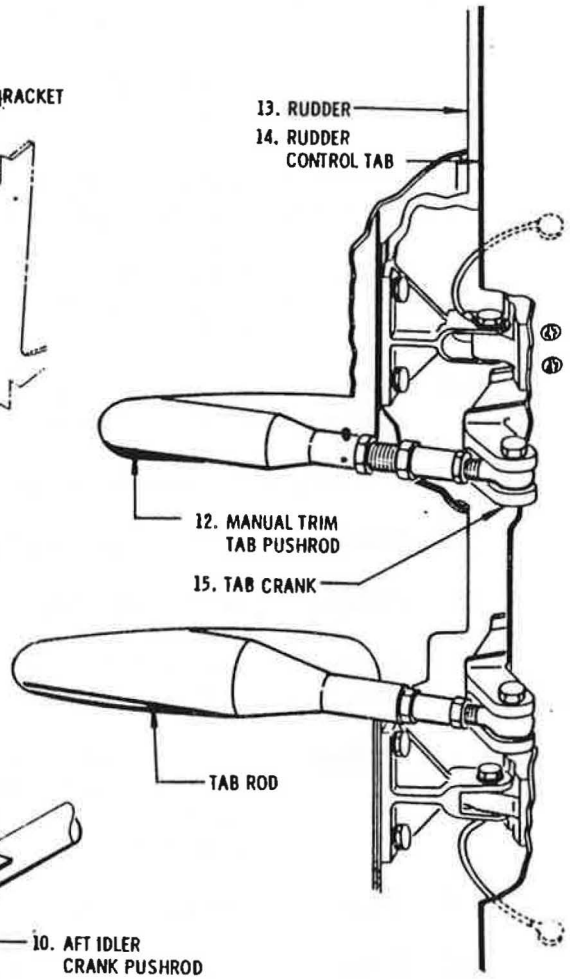


DETAIL A

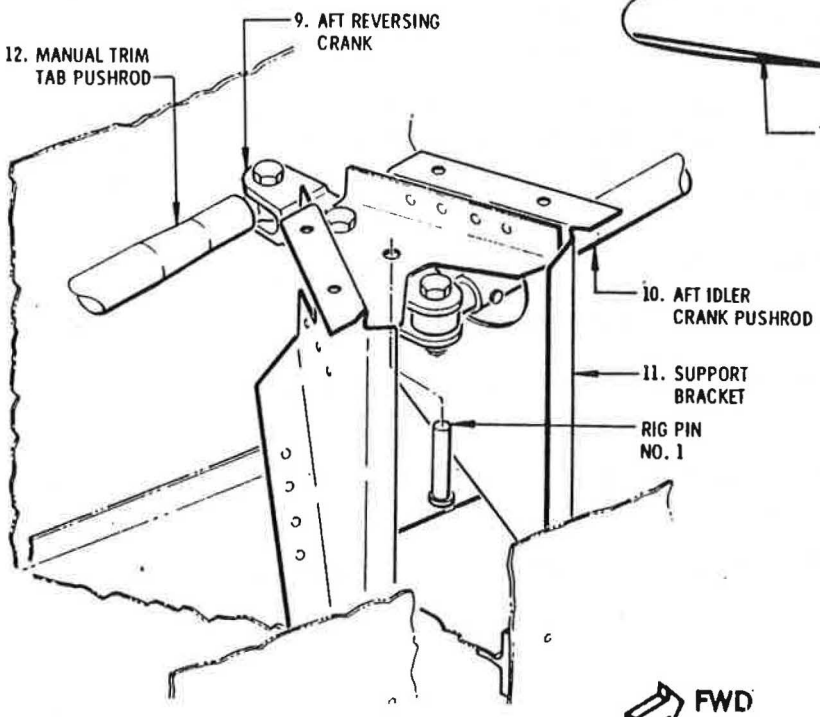
Manual Rudder Trim Linkage Adjustment
Figure 210 (Sheet 1)



DETAIL B



DETAIL D



DETAIL C

D. Test Rudder Trim System

(1) Connect electrical power to airplane.

(2) Depressurize auxiliary hydraulic system.

WARNING: THE AUXILIARY HYDRAULIC SYSTEM MUST BE DEPRESSURIZED TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(3) Position rudder in neutral position within 1° and fair control tab with rudder within 1/8 inch.

NOTE: Neutral position of rudder may be obtained by aligning trailing edge of rudder with zero index point of fuselage centerline.

(4) With control tab free to move, rotate rudder trim wheel clockwise from neutral full travel.

(5) Manually push rudder trailing edge 13° to right.

(6) Check that rudder control tab is positioned 19° or more to left.

(7) Pressurize auxiliary hydraulic system.

(8) Position rudder switch on pilot's overhead panel to ON to pressurize rudder hydraulic system.

CAUTION: DO NOT TRANSFER FROM THE MANUAL MODE RUDDER OPERATION TO POWER MODE RUDDER OPERATION WITHOUT CLEARING RUDDER AND ALL MOVING PARTS OF RUDDER SYSTEM OF ALL OBSTRUCTIONS AND PERSONNEL.

(9) Check that rudder moves 15-1/2° minimum to the right.

(10) Check that rudder control tab moves to the right.

(11) Position rudder switch to OFF to depressurize rudder hydraulic system.

(12) Position rudder to neutral within 1° and fair rudder trim control tab with rudder within 1/8 inch.

(13) Rotate rudder trim wheel counterclockwise from neutral full travel.

(14) Manually push rudder to left 13°.

(15) Check that rudder control tab is positioned 19° or more to right.

(16) Check that left rudder pedal moves forward.

(17) Position rudder switch to ON to pressurize rudder hydraulic system.

(18) Check that rudder moves 15-1/2° minimum to left and that rudder control tab moves to left.

(19) Position rudder switch to OFF to depressurize rudder hydraulic system.

(20) Place rudder in neutral position within 1° and fair control tab with rudder within 1/8 inch. Restrain rudder, but not rudder pedals.

(21) Rotate rudder trim control handle 10-1/2 to 11-1/2 turns clockwise and counterclockwise from neutral until cable stops are contacted.

(22) Remove plug from rudder trim control handle and attach torque wrench to nut. Check that torque required to move rudder trim handle through full travel both in and out of trim does not exceed 60 pound-inches.

(23) Disconnect electrical power source.

(24 Replace all access panels.

PILOTS' RUDDER TRIM CONTROL MECHANISM - MAINTENANCE PRACTICES

1. Removal/Installation Pilots' Rudder Trim Control Mechanism

   A. Equipment and Materials

      (1) Tensiometer - 0 to 100 pounds capacity

   B. Remove Pilots' Rudder Trim Control Mechanism

      (1) Remove guard retaining bolts (16, figure 201) from lower bearing housing (11, detail B) and remove sprocket guard (19).

      (2) Disconnect control mechanism chain from forward turnbuckles. See 27-18-0, figure 204.

      (3) Remove chain assembly (15, figure 201) from sprocket (20, detail B).

      (4) Remove sprocket retainer nut (17) and washer (18) from shaft (10) and remove sprocket (20), sprocket shield (14) and spacers (13) and (21).

      (5) Remove mounting screws (12) from lower bearing housing (11) and remove housing and shaft from control stand.

      (6) Remove mounting screws (4, detail A) from cover plate and remove gear box assembly (9).

   C. Install Pilots' Rudder Trim Control Mechansim

      (1) Remove stabilizer jackscrew access panel 1185. See Chapter 12, "Access Doors and Panels."

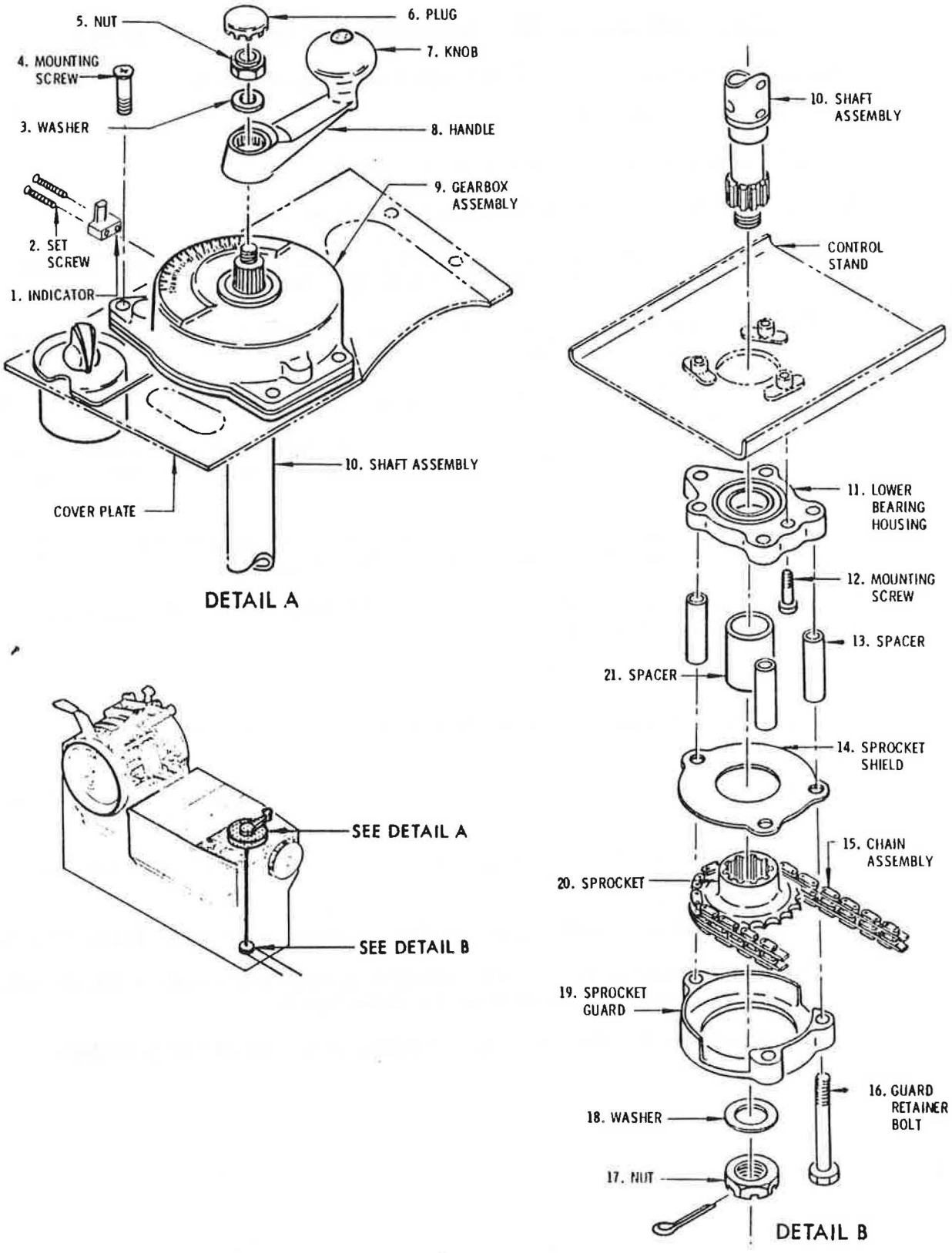
      (2) Install lower bearing housing (11, figure 201) with mounting screws (12, detail B.)

      (3) Install shaft (10) through opening in cover plate and insert in lower bearing housing.

      NOTE: Cover plate may be removed to facilitate shaft installation.

      (4) Install rudder trim control mechanism gear box assembly (9, detail A) on cover plate with mounting screws (4).

      (5) Rotate handle (8) until trim indicator (1) is at "0" position.



Pilot's Rudder Trim Control Mechanism Installation
Figure 201

(6) Remove plug (6) from handle and remove nut (5), washer (3) and handle from gear box assembly.

(7) Install handle on gear box assembly with knob (6) toward right side of control stand.

(8) Replace washer and nut on gear box and install plug.

(9) Install spacer (21, detail B), sprocket shield (14), sprocket (20), washer (18), and nut (17) on shaft assembly (10).

(10) Install chain assembly (15, figure 201) on sprocket (20, detail A) with midpoint of chain forward.

NOTE: The midpoint of chain assembly may be marked for ease of installation.

(11) Attach chain assembly to forward turnbuckles.

(12) Align spacers (13, figure 201) between shield (14) and lower bearing housing (11) and install sprocket guard (19) and bolts (6).

(13) Hold rudder trim control wheel in neutral and adjust forward turnbuckles in lower 41 section to obtain 33-1/2 (± 3/32) inch between turnbuckle stops and cable stops in tail compartment. (See figure 202.)

NOTE: Maximum allowable twisting of chain assembly is 180 degrees at turnbuckles. Control cables may be pretwisted to prevent rotation of chain.

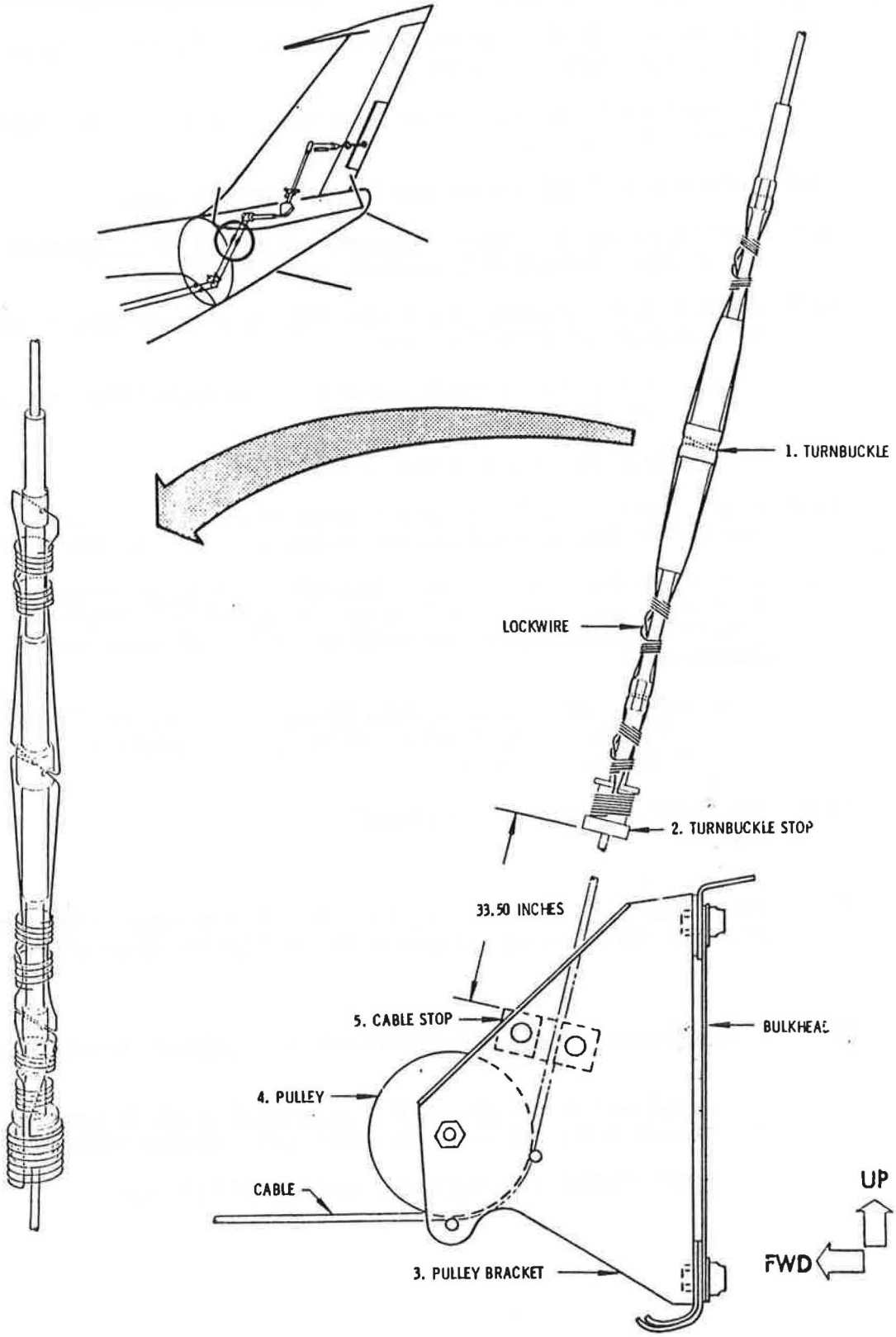
(14) Not applicable to SABENA aircraft.

(15) Check that rudder trim control cable RTA is wrapped 5-3/8 turns and that RTB is wrapped 5-7/8 turns on actuator cable drum.

(16) If requirements in step (15) are not met, proceed as follows:

(a) Adjust aft turnbuckle on RTA cable until cable is wrapped correct number of turns on rudder trim actuator cable drum.

NOTE: Rudder trim indicator must be held at zero.



Aft Turnbuckle Adjustment
Figure 202

(b) Adjust aft turnbuckle on RTB cable until cable is wrapped correct number of turns on trim actuator cable drum.

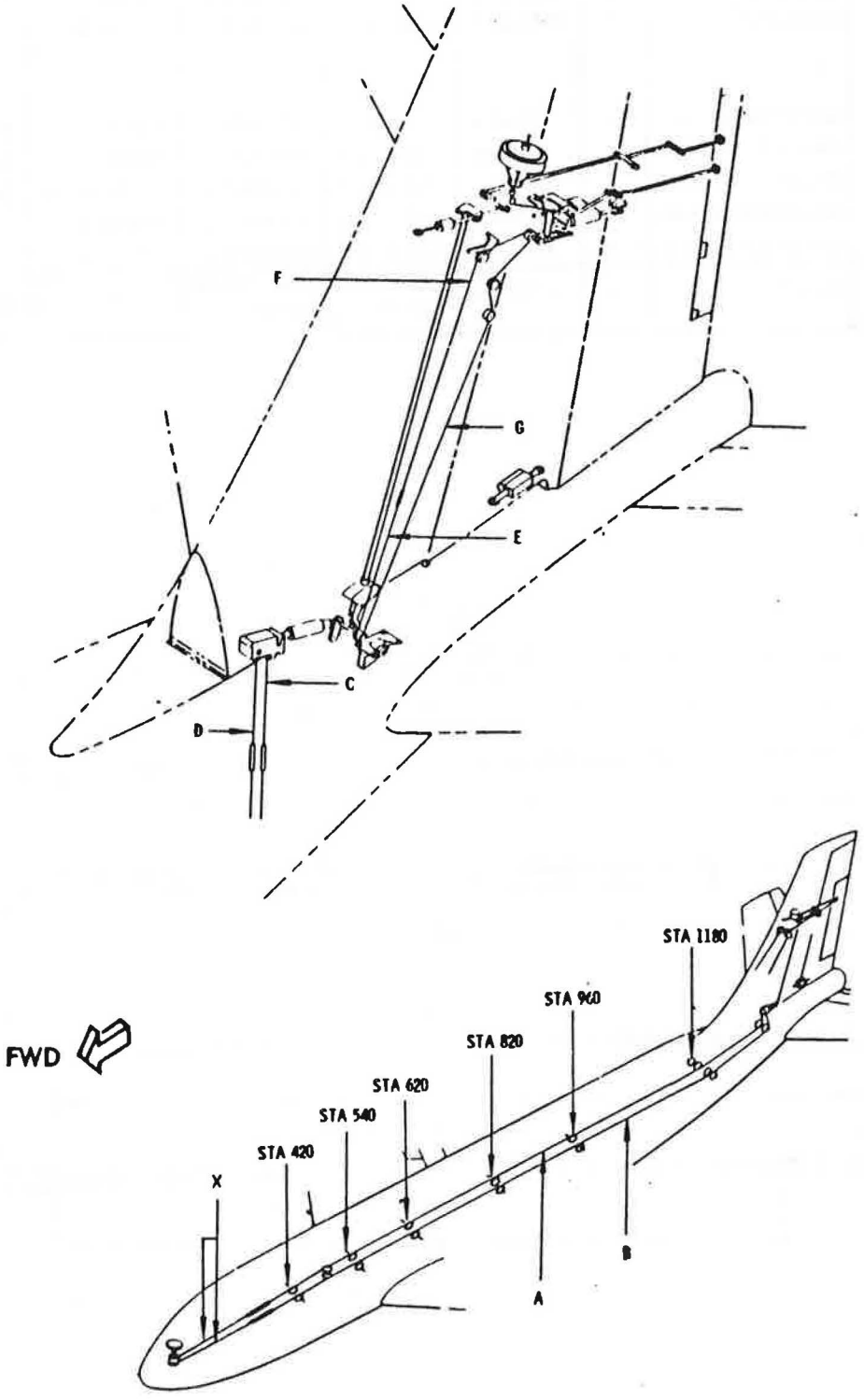
(17) Adjust tension in RTA and RTB to specified value for ambient temperature by adjusting forward and aft turnbuckles. See 27-18-0, figure 202 for temperature tension chart.

NOTE: When checking cable tension place tensiometer on bare portion of cable.

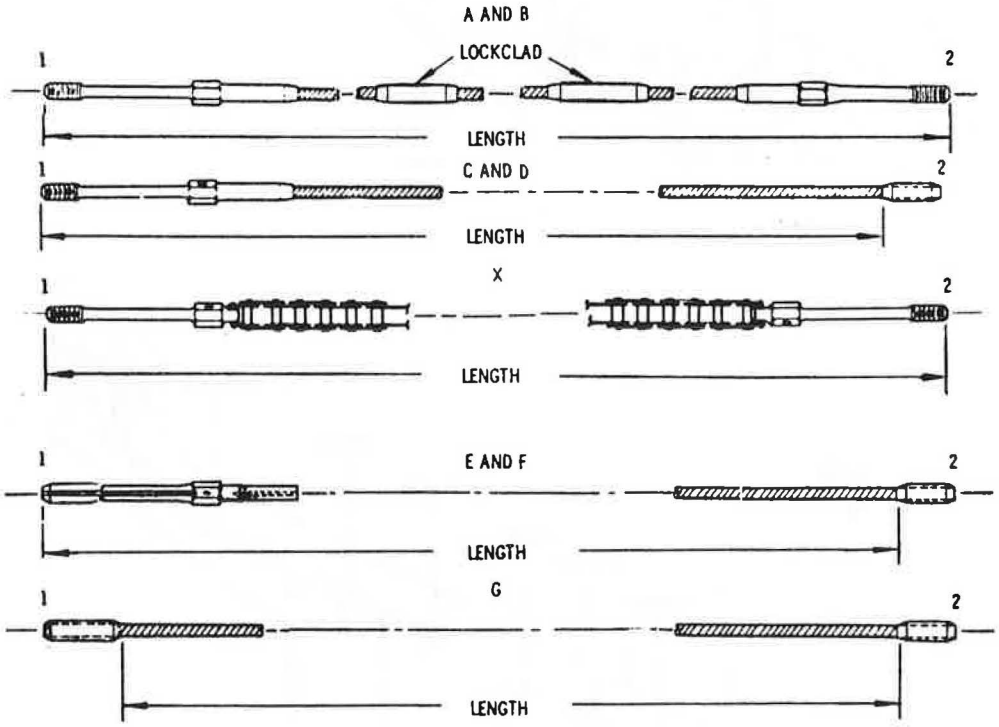
(18) Test rudder trim control system. See 27-18-0, Rudder Trim Control System Adjustment/Test.

(19) Install access panels.

RUDDER TRIM CONTROL CABLES-MAINTENANCE PRACTICES



REF NO.	PART NO.	NO. REQ	LENGTH	CABLE SIZE	CABLE TYPE	FITTINGS 1.	FITTINGS 2.
A	65-12235-6	1	1362.30 IN.	3/32 x 7 x 7	LOCKCLAD	AN669L3LH	AN669L3RH
B	65-12235-7	1	1362.30 IN.	3/32 x 7 x 7	LOCKCLAD	AN669L3LH	AN669L3RH
C	BAC-C13G-319-774	1	77.40 IN.	3/32 x 7 x 7	STRANDED	AN669L3LH	BAC-T14A-3
D	BAC-C13G-320-806	1	80.60 IN.	3/32 x 7 x 7	STRANDED	AN669L3RH	BAC-T14A-3
E	BAC-C13AM-3D-1273	1	127.30 IN.	3/32 x 7 x 7	STRANDED	NAS650-S3LH	BAC-T14A-3
F	BAC-C13AM-3E-0610	1	61.00 IN.	3/32 x 7 x 7	STRANDED	NAS650-S3LH	BAC-T14A-3
G	BAC-C13G-321-1917	1	191.70 IN.	3/32 x 7 x 7	STRANDED	BAC-T14A-3	BAC-T14A-3
X	69-10931	1	197.17 IN.	1/4" PITCH CHAIN	ROLLERLESS CHAIN	69-10931-1	69-10931-2



Rudder Trim Control Cables
Figure 201 (Sheet 2)

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RUDDER TRIM ACTUATOR - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Trim Actuator

A. Equipment and Materials

(1) Rig pins No. 5 and 6, 0.311 (+0/-0.002) inch diameter (MS20392-4).

B. Remove Rudder Trim Actuator

(1) Remove stabilizer jackscrew access panel 1185. See Chapter 12, "Access Doors and Panels."

(2) Depressurize auxiliary hydraulic system.

WARNING: THE AUXILIARY HYDRAULIC SYSTEM MUST BE DEPRESSURIZED TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(3) Rotate rudder trim control handle until trim indicator indicates neutral.

(4) Place rudder and rudder control tab in neutral position.

(5) Install rig pin N° 5 through rudder manual trim gear box (3, figure 201).

(5A) Install rig pin N° 3 through crank support bracket (18) and torsion bar crank (19) (See 27-18-31, figure 201.)

(6) Install rig pin N° 6 through cable drum on rudder power trim gearbox.

(7) Disconnect aft turnbuckles (9).

NOTE: A cable clamp may be installed on cables to prevent uncoiling of cables from drum when actuator assembly is removed.

(8) Disconnect actuator rod end (5) from gear box arm (4) by removing actuator rod end bolt (7) and spacers (6).

(9) Remove trim actuator mounting bolt (1).

(10) Remove rudder trim actuator from mounting bracket (2).

NOTE: A bearing and spacer are free to fall from actuator assembly when actuator is removed from mounting bracket.

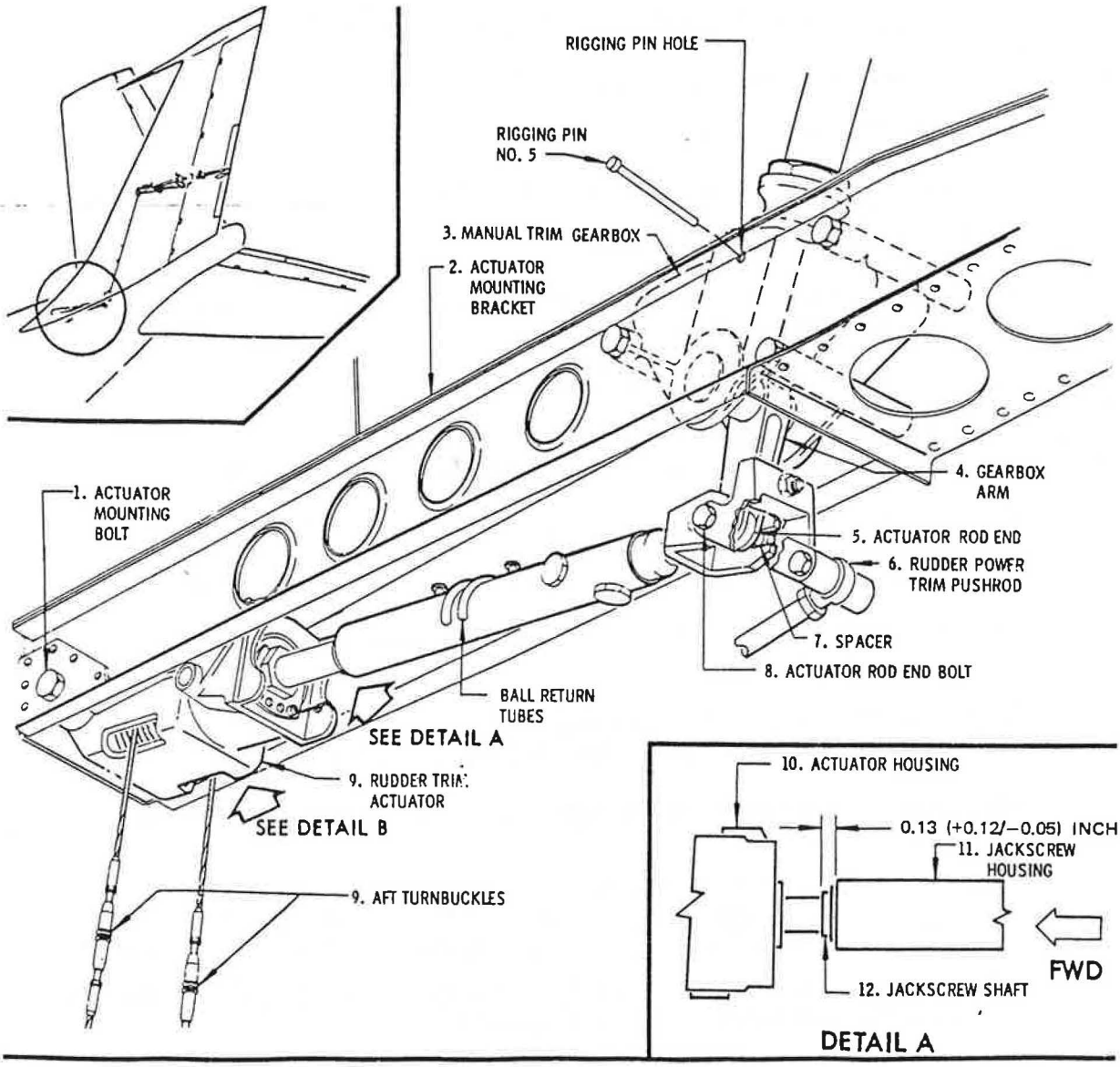
C. Install Rudder Trim Actuator

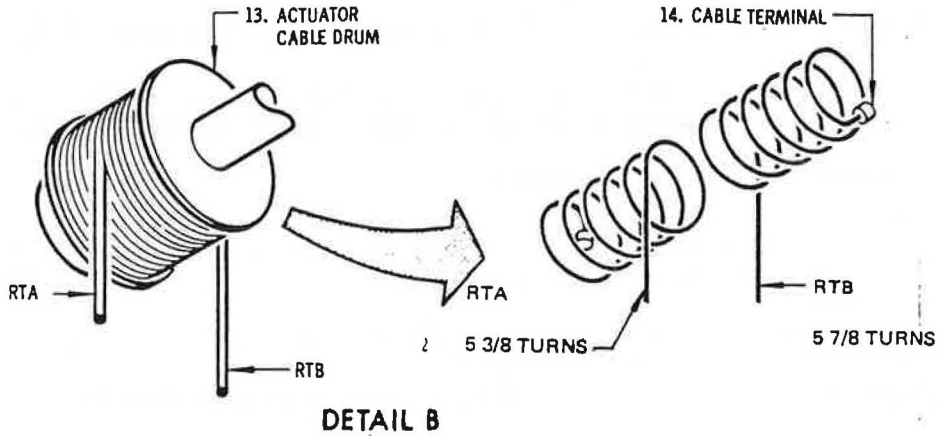
(1) Assemble removable bearing and spacer in rudder trim actuator housing (8, figure 201.)

NOTE: Removable bearing may be replaced at this time if required.

(2) Place actuator in position on mounting bracket (3).

(3) Install actuator mounting bolt (1).





Rudder Trim Actuator Installation
Figure 201

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(4) Not applicable to SABENA aircraft.

(5) Rotate actuator cable drum (13, detail B) until cable terminals (14) are on lower side of drum with cable RTA having 5-3/8 turns and RTB 5-7/8 turns on drum.

NOTE: Remove clamps from cables if installed.

(6) With rudder trim actuator drum (13, figure 201) held in neutral, adjust actuator jackscrew until dimension from end of jackscrew housing (11) and jackscrew shaft (12) is 0.13 (+0.12/-0.05) inch and ball return tubes are up.

(7) Adjust actuator rod end (5) until rod end bore and gear box arm bolt hole aligns within 0.010 inch. Tighten check nut.

(8) Attach actuator rod end to gear box arm with bolt (7) and spacers (6).

NOTE: Do not preload trim torion bar to install actuator rod end bolt.

(9) Connect aft turnbuckles (9) and tighten cables.

(10) With trim control actuator drum held in neutral, adjust forward and aft turnbuckles until turnbuckle stop is 33-1/2 (± 3/32) inches from cable stop on pulley bracket. See 27-18-0, figure 205.

(11) Adjust tension in cables to values shown on 27-18-0, figure 202 by adjusting aft turnbuckles.

CAUTION: USE TENSIOMETER ON BARE WIRE PORTION OF LOCK CLAD CABLE.

(12) Lockwire forward and aft turnbuckles.

(13) Remove rigging pins from manual trim gearbox and rudder power trim gearbox and torsion bar crank.

(14) Install access panels.

(15) Test rudder trim control system.

RUDDER MANUAL TRIM GEAR BOX - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Manual Trim Gear Box

A. Equipment and Materials

(1) Rig pins No. 3 and 5, 0.311 (+0/-0.002) inch diameter (MS20392-4).

B. Remove Rudder Manual Trim Gear Box Assembly

(1) Remove rudder tab control quadrant access panel 1510, fin to fuselage mid fairing 1503, and stabilizer jackscrew access panel 1185. See Chapter 12, "Access Doors and Panels."

(2) Depressurize auxiliary hydraulic system.

WARNING: THE AUXILIARY HYDRAULIC SYSTEM MUST BE DEPRESSURIZED TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(3) Place rudder and rudder control tab in neutral position.

(4) Install rigging pin No. 3 through crank support bracket (18, figure 201) and torsion bar crank (19).

(5) Remove flat head pin (4) and lower fin fold disconnect (5) onto gear box shaft (3).

(6) Disconnect rudder trim actuator rod end (9) from gear box arm (7) by removing actuator rod end bolt (13) and spacers (11).

(7) Disconnect power trim pushrod (12) from power trim crank (10).

(8) Remove gear box mounting bolts (1).

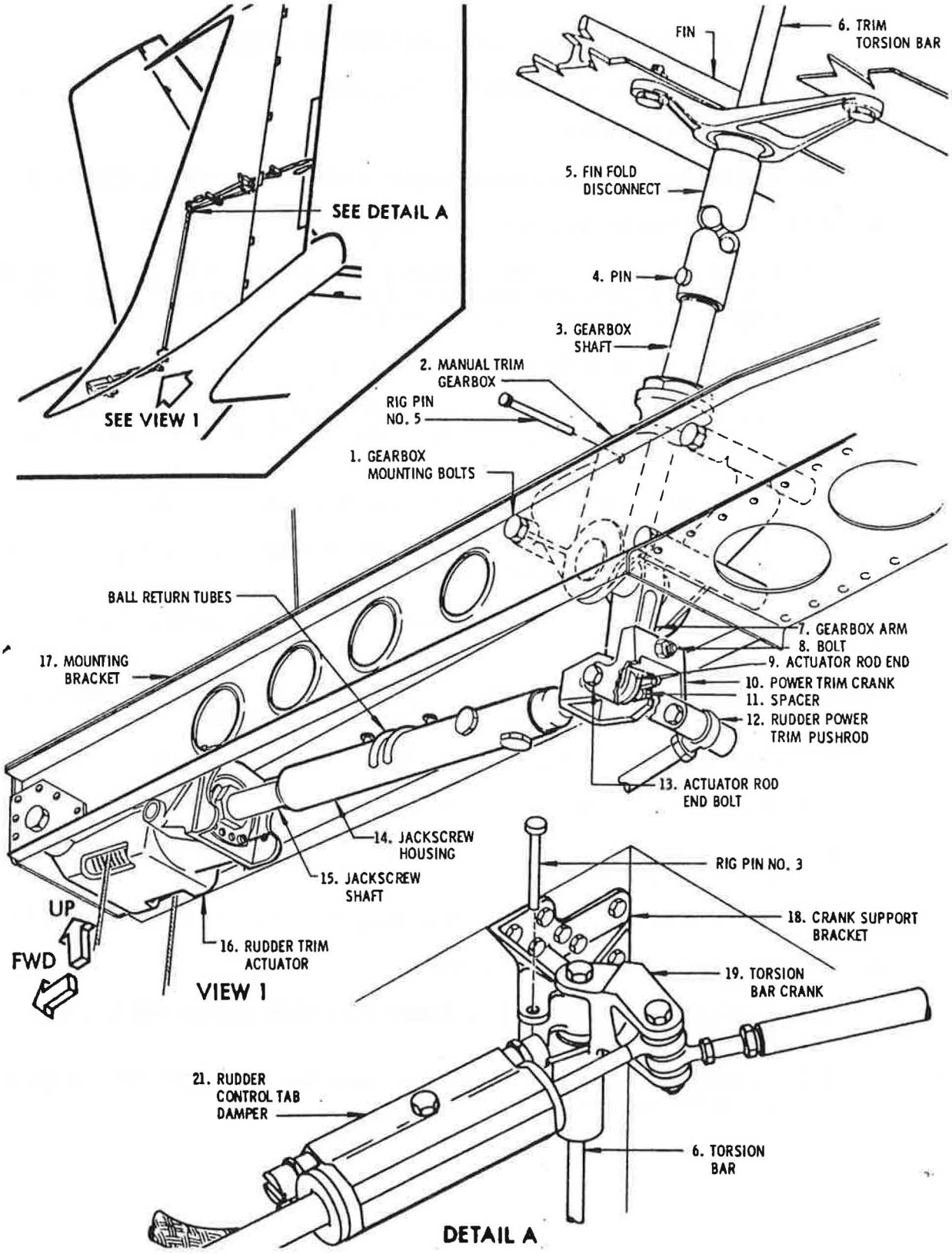
(9) Remove manual trim gear box (2) and fin fold disconnect (5) from mounting bracket (17).

(10) Remove bolt (8) attaching power trim crank (10) to gearbox arm (7).

C. Install Rudder Manual Trim Gear Box

(1) Align power trim crank (10, figure 201) with gearbox arm (7) and install bolt (8).

(2) Install fin fold disconnect (5) on gear box shaft (3) with retainer pin holes aligned.



Rudder Trim Gear Box Installation
Figure 201

(3) Position manual trim gearbox (2) in mounting bracket (17) and install mounting bolts (1).

(4) Install rigging pin No. 5 through mounting bracket and manual trim gearbox.

(5) Slide fin fold disconnect (5) onto trim torsion bar (6).

(6) Install flat head pin (4) through fin fold disconnect and gearbox drive shaft (3).

(7) Rotate ruddr trim control mechanism until trim indicator is at "0" position. (See 27-18-0, figure 204.)

(8) With drum on rudder trim actuator (16) in neutral position, adjust actuator jackscrew until dimension from end of jackscrew housing (14) to end of jackscrew shaft (15) is 0.13 (+0.12/-0.05) inch and ball return tubes are up.

NOTE: Rudder trim actuator cable drum is in neutral when RTA cable is wrapped 5-3/8 turns on drum and RTB cable is wrapped 5-7/8 turns on drum.

(9) Adjust actuator rod end (9) until rod end bore and gearbox arm bolt hole aligns within 0.010 inch. Tighten checknut.

(10) Attach rudder trim actuator (11) and power trim crank (10) to gearbox arm (7) by installing actuator rod end bolt (13).

NOTE: Do not preload torsion bar to install actuator rod end bolt.

(11) Install bolt attaching power trim pushrod (12) to power trim crank.

(12) Remove rigging pins.

(13) Manually operate rudder trim control handle through one complete cycle in each direction and that motion is transmitted smoothly through gearbox with no evidence of binding.

(14) Install access panels.

RUDDER TRIM CONTROL LINKAGE - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Trim Torsion Bar

A. Equipment and Materials

(1) Aeroshell Grease 17.

B. Remove Rudder Trim Torsion Bar

(1) Remove stabilizer jackscrew access 1185, fin to fuselage and fairing 1503, rudder trim screw inspection panel 1561, and fin interspar access panels 1521 and 1523. See Chapter 12, Access Doors and Panels.

(2) Depressurize the auxiliary hydraulic system.

WARNING: THE AUXILIARY HYDRAULIC SYSTEM MUST BE DEPRESSURIZED TO PREVENT INJURY TO PERSONNEL WORKING ON RUDDER AND VERTICAL FIN.

(3) Remove rudder manual trim gearbox assembly from airplane. See 27-18-31, Removal/Installation Rudder Manual Trim Gearbox Assembly.

(4) Remove cotter pins (8, figure 201) from upper support bracket.

NOTE: There are three upper support brackets installed on torsion bar. The brackets are located at fin stations 83.90, 111.65 and 138.65.

(5) Slide split bushing (6, figure 201) up on torsion bar (1) and separate bushing halves. Remove bushings.

(6) Remove retainer ring (4) and spacer (5) from lower support bracket (3).

(7) Remove mounting bolts (2) from lower rib of fin and remove support bracket.

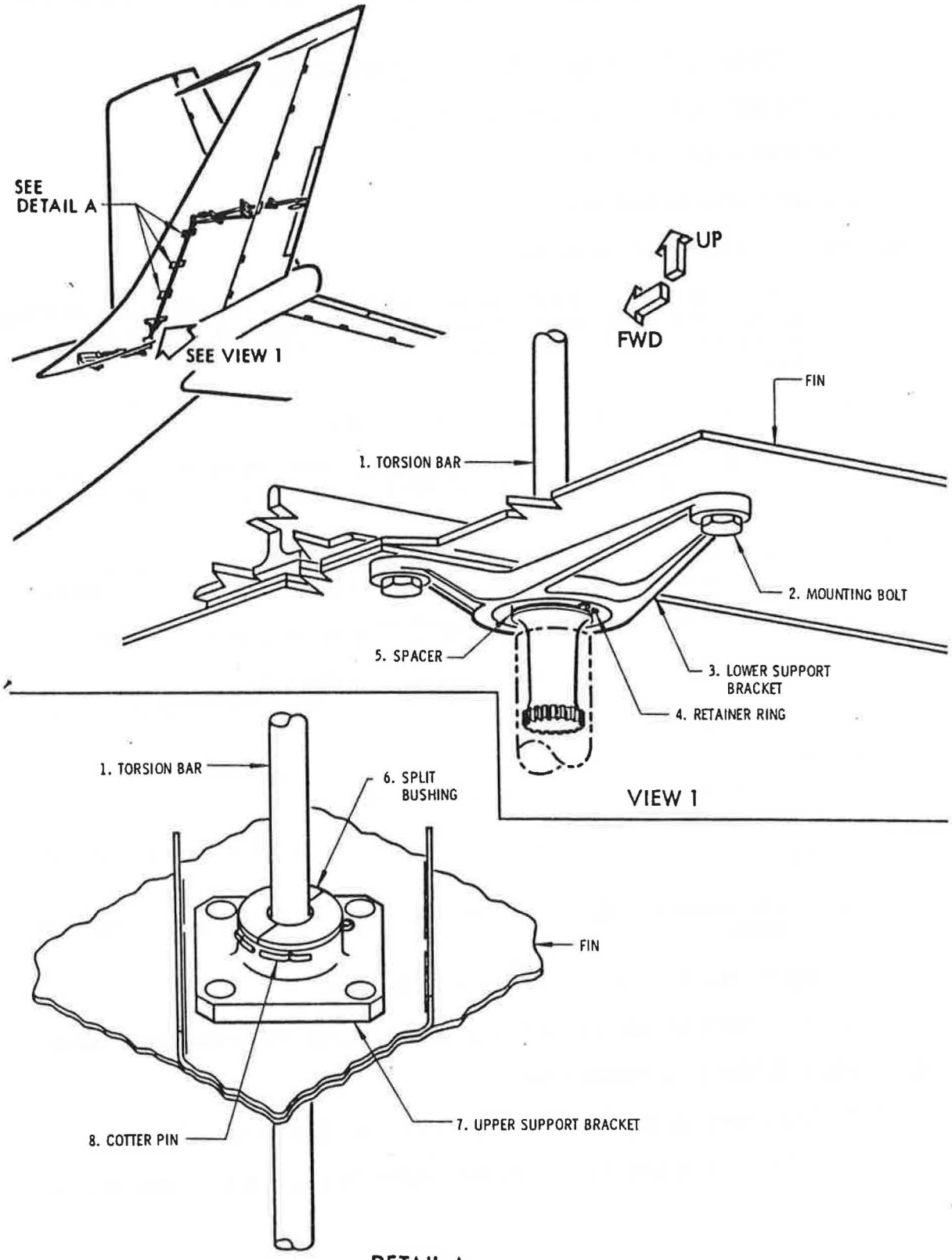
NOTE: The torsion bar is now free to fall.

(8) Lower torsion bar out of fin into stabilizer jackscrew compartment.

C. Install Rudder Trim Torsion Bar

(1) Place torsion bar (1, figure 201) in position in vertical fin.

NOTE: Insert bar in fin through stabilizer jackscrew compartment.



DETAIL A

Rudder Trim Torsion Bar Installation
Figure 201

(2) Lightly coat outer surface of lower support bushing with Aeroshell Grease 17 and install in lower support bracket (3).

NOTE: Support bushing may be replaced at this time, if required.

(3) Attach lower support bracket to lower rib of fin with mounting bolts (2).

(4) Install spacer (5) in lower support bracket and replace retainer ring (4).

(5) Place split bushings (6) on torsion bar and slide into upper support bracket (7). Replace cotter pins.

(6) Replace torque tube and gear box assembly. See 27-18-31, Removal/Installation Rudder Manual Trim Gearbox.

2. Removal/Installation Rudder Trim Torsion Bar Crank

A. Equipment and Materials

(1) Rig pins No. 2 and 3, 0.311 (+0/-0.002) inch dia. MS20342-4

B. Remove Rudder Trim Torsion Bar Crank

(1) Remove rudder control quadrant access panel 1510. See Chapter 12, "Access Doors and Panels."

(2) Remove rudder trim torsion bar.

(3) Remove bolt (4, figure 202) connecting tab damper (7) and forward pushrod (5) to torsion bar crank (3).

(4) Remove bolts (1) attaching crank support bracket (2) to rib and remove crank support bracket.

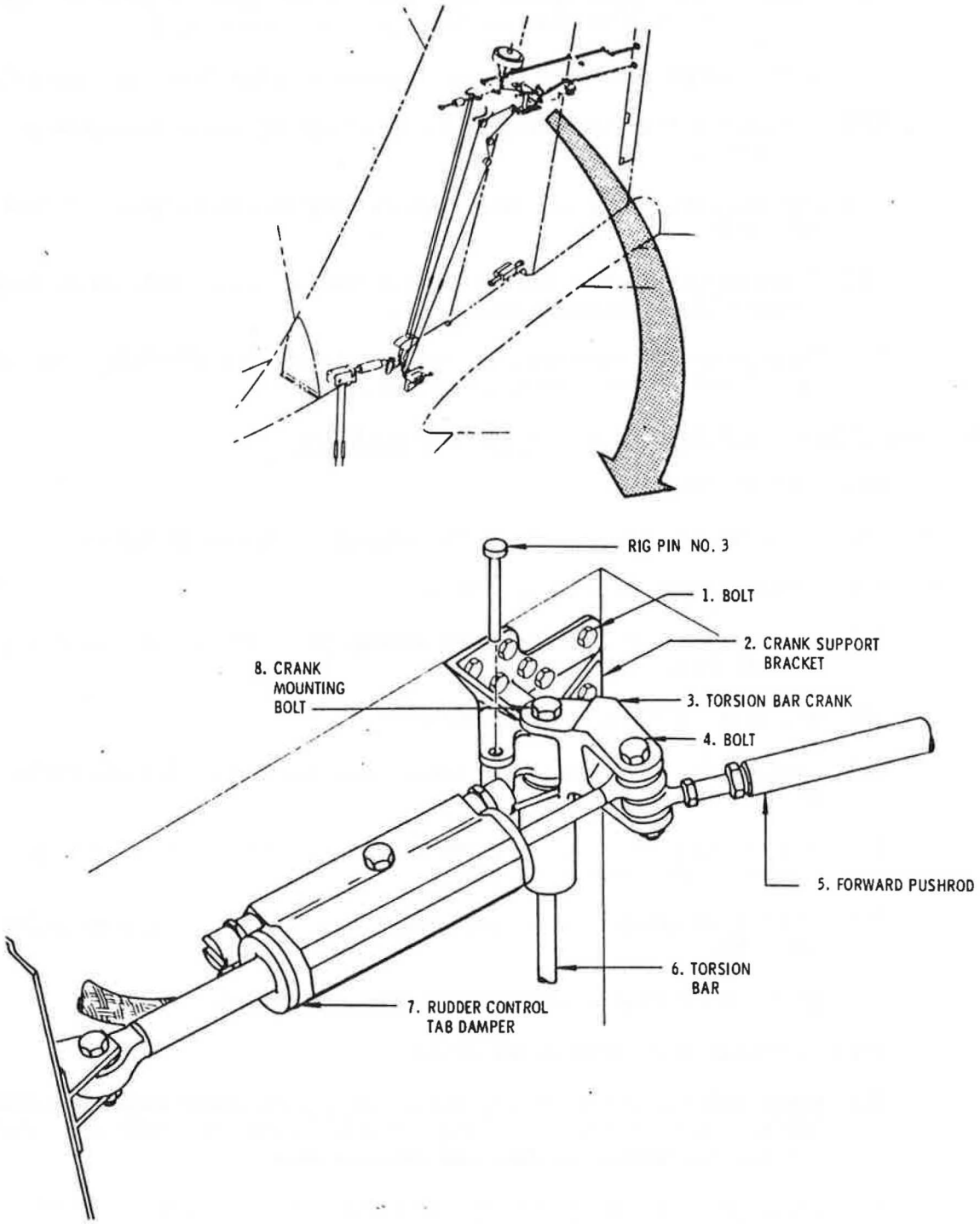
(5) Disconnect crank from support bracket by removing crank mounting bolt (8).

NOTE: A bearing is now free to fall from crank.

C. Install Rudder Trim Torsion Bar Crank

(1) Align torsion bar crank (3, figure 202) with crank support bracket (2) and install crank mounting bolts (8) with bolt head up. Install bearing and washer on bolt and install nut.

(2) Position crank and crank support bracket in fin structure and install mounting bolts (1).



Rudder Trim Torsion Bar Crank
Figure 202

(3) Align rig pin hole in crank and support bracket and install rig pin No. 3.

(4) Align rig pin holes in forward reversing crank and crank support bracket and install rig pin No. 2. (See figure 203.)

(5) Adjust forward pushrod (5, figure 202), if required so that pushrod can be connected to torsion bar crank (3) without binding rig pins. Tighten check nut on pushrod.

(6) Install bolt (4) connecting rudder control tab damper (7) and pushrod to torsion bar crank. Tab damper rod end shall be above pushrod and bolt shall be installed with head up.

(7) Install rudder trim torsion bar.

(8) Remove rig pins No. 2 and 3.

(9) Install access panels.

3. Removal Installation Rudder Trim Forward Reversing Crank

A. Equipment and Materials

(1) Rig pins No. 1 through 3, 0.311 (+0/-0.002) inch dia. (MS20392-4).

B. Remove Rudder Trim Forward Reversing Crank

(1) Depressurize auxiliary hydraulic system.

(2) Remove access panels 1514 from both sides of vertical fin. See Chapter 12, "Access Doors and Panels."

(3) Disconnect rudder system input pushrod from rudder aft reversing crank and power control unit. Retain adjustment of rod.

(4) Disconnect forward idler crank pushrod from idler crank on rudder front spar.

(5) Remove support bracket mounting bolts and lower support bracket.

(6) Disconnect forward pushrod and forward idler crank pushrod from reversing crank and remove reversing crank and support bracket from fin.

(7) Remove crank mounting bolt and separate crank from support bracket.

C. Install Rudder Trim Forward Reversing Crank

(1) Align forward reversing crank with support bracket and install mounting bolt. Bolt shall be installed with head up. (See figure 203.)

(2) Position reversing crank and support bracket in vertical fin such that forward pushrod and forward idler crank pushrod can be attached to reversing crank.

(3) Attach pushrods to reversing crank. Install bolts with head up.

(4) Align support bracket with mounting structure and install mounting bolts.

(5) Install rig pin No. 3 through rudder trim torsion bar crank. (See figure 202.)

(6) Adjust forward pushrod so that rig pin No. 2 can be installed through forward reversing crank without binding.

(7) Remove skin panel from right side of rudder.

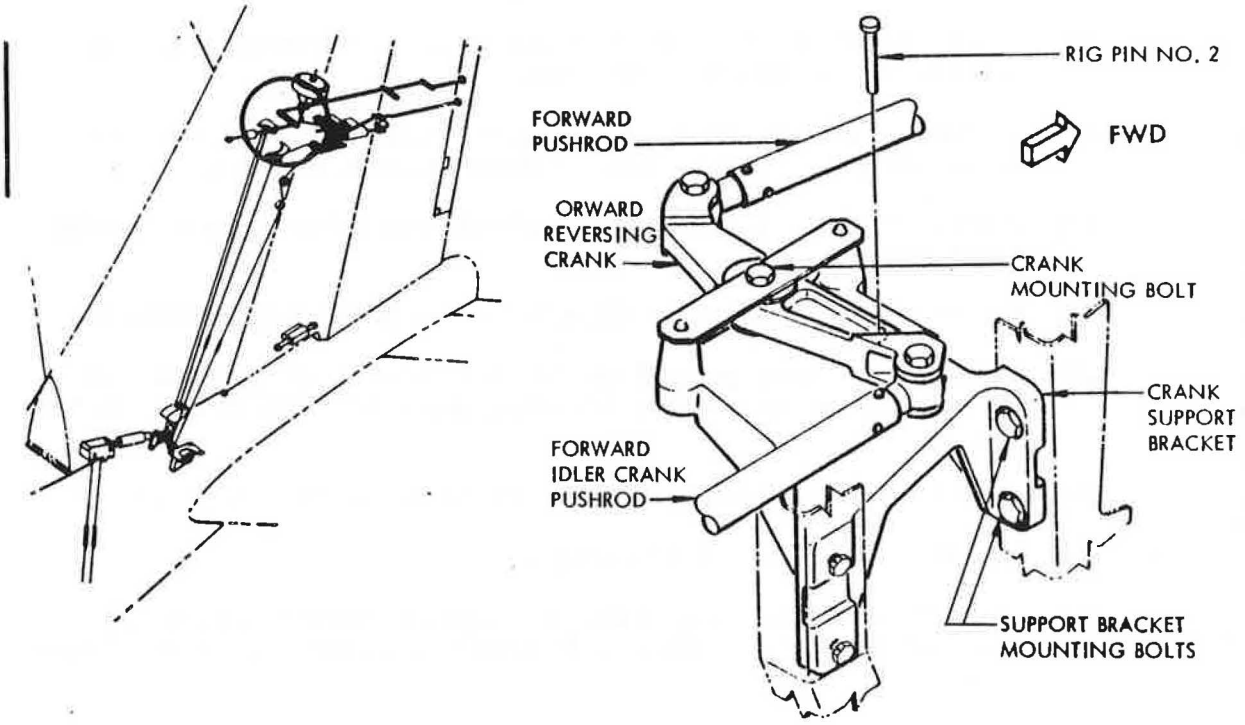
(8) Install rig pin No. 1 through aft reversing crank. (See figure 205.)

(9) Adjust aft end of forward idler crank pushrod so that pushrod can be attached to outboard hole in idler crank without binding rig pins. Tighten checknuts on pushrod. (See figure 204.)

(10) Remove rig pins.

(11) Attach rudder input pushrod to power control unit and to rudder aft quadrant reversing crank.

(12) Install access panels.



Rudder Trim Forward Reversing Crank Installation
Figure 203

4. Removal/Installation Rudder Trim Idler Crank

A. Equipment and Materials

(1) Rig pins No. 1 and 2, 0.311 (+0/-0.002) inch dia. (MS20392-4).

B. Remove Rudder Trim Idler Crank

(1) Depressurize auxiliary hydraulic system.

(2) Remove rudder hinge access panels 1563 and 1564.

(3) Disconnect forward idler crank and aft idler crank pushrods from rudder trim idler crank. (See figure 204.)

(4) Remove bolt attaching idler crank to crank support fitting and remove idler crank. Top of rudder antibalance crank will be loose when bolt is removed.

C. Install Rudder Trim Idler Crank

(1) Align rudder trim idler crank and rudder antibalance crank with crank support fitting and install mounting bolt. (See figure 204.) Install bolt with head up.

(2) Connect aft pushrod to idler crank.

(3) Remove skin panel from right side of rudder.

(4) Install rig pin No. 1 through aft reversing crank.

(5) Remove access panel 1514 from right side of vertical fin.

(6) Install rig pin No. 2 through rudder trim bellcrank.

(7) Adjust forward pushrod such that pushrod can be connected to idler crank without binding rig pins. Tighten check nut on pushrod. Install forward pushrod with threaded rod end aft and connect at outboard hole of idler crank, as shown on figure 204.

CAUTION: INTERCHANGED INSTALLATION OF THE FORWARD AND AFT PUSHRODS IN THE IDLER CRANK MAY LEAD TO THE RUPTURE OF THE FORWARD PUSHROD AFT END.

(8) Connect pushrod to aft idler crank. Bolt shall be installed with head up.

(9) Remove rig pins No. 1 and 2.

(10) Install all access panels.

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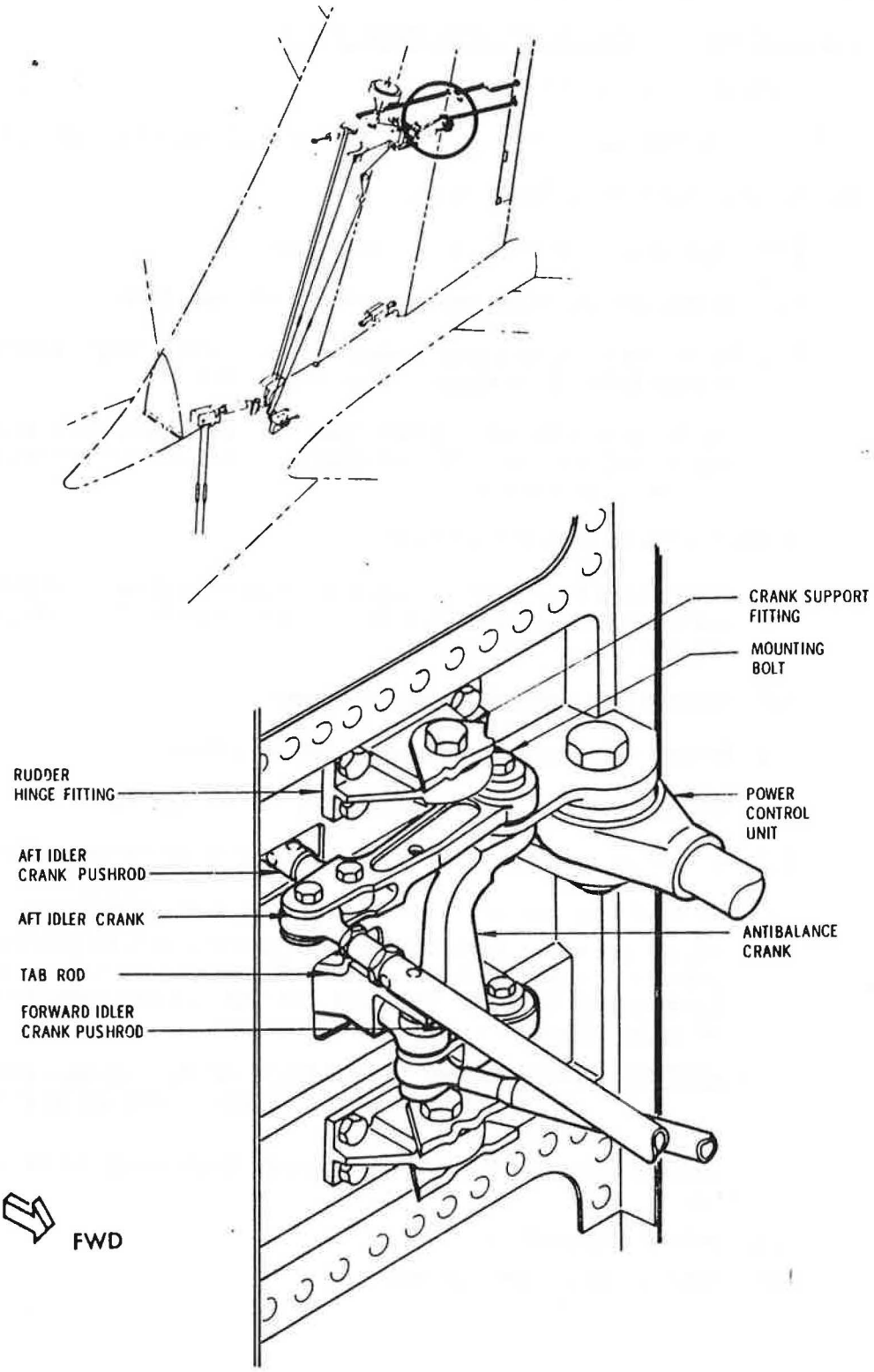


Aft Idler Crank Installation
Figure 204

5. Removal/Installation Aft Reversing Crank

A. Equipment and Materials

(1) Rig pin No. 1, 0.311 (+0/-0.002) inch dia. (MS20392-4).

B. Remove Aft Reversing Crank

(1) Depressurize auxiliary hydraulic system.

WARNING: AUXILIARY HYDRAULIC SYSTEM MUST BE DEPRESSURIZED TO PREVENT INJURING PERSONNEL WORKING ON OR IN VICINITY OF RUDDER.

(2) Remove skin panel from right side of rudder.

(3) Disconnect control tab pushrod and aft idler crank pushrod from reversing crank. (See figure 205.)

(4) Remove crank mounting bolt and remove idler crank.

C. Install Aft Reversing Crank

(1) Align crank with support bracket and install mounting bolt. Install bolt with head up. (See figure 205.)

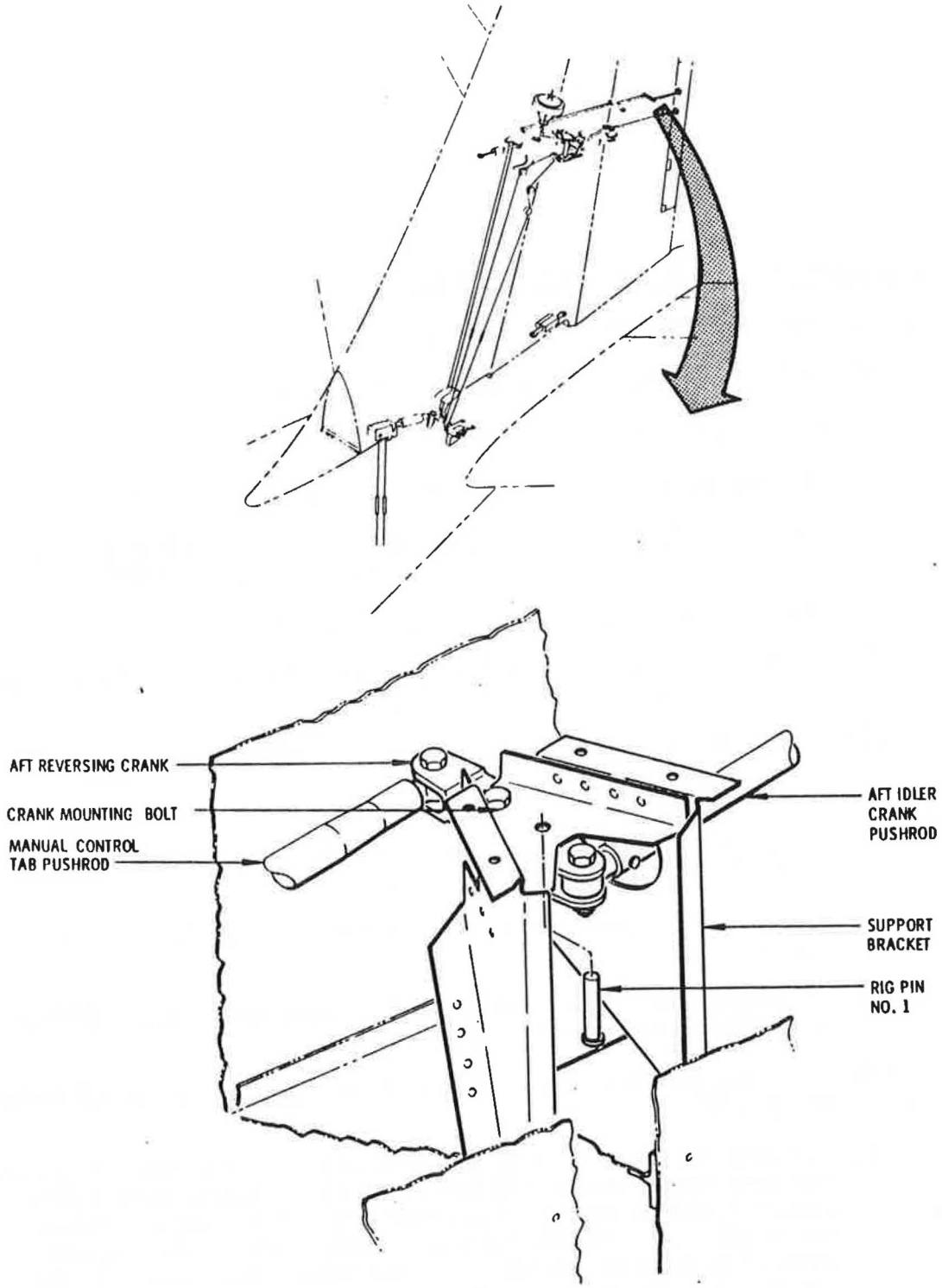
(2) Connect idler crank pushrod to reversing crank. Bolt shall be installed with head up.

(3) Connect manual control tab pushrod to reversing crank. Bolt shall be installed with head up.

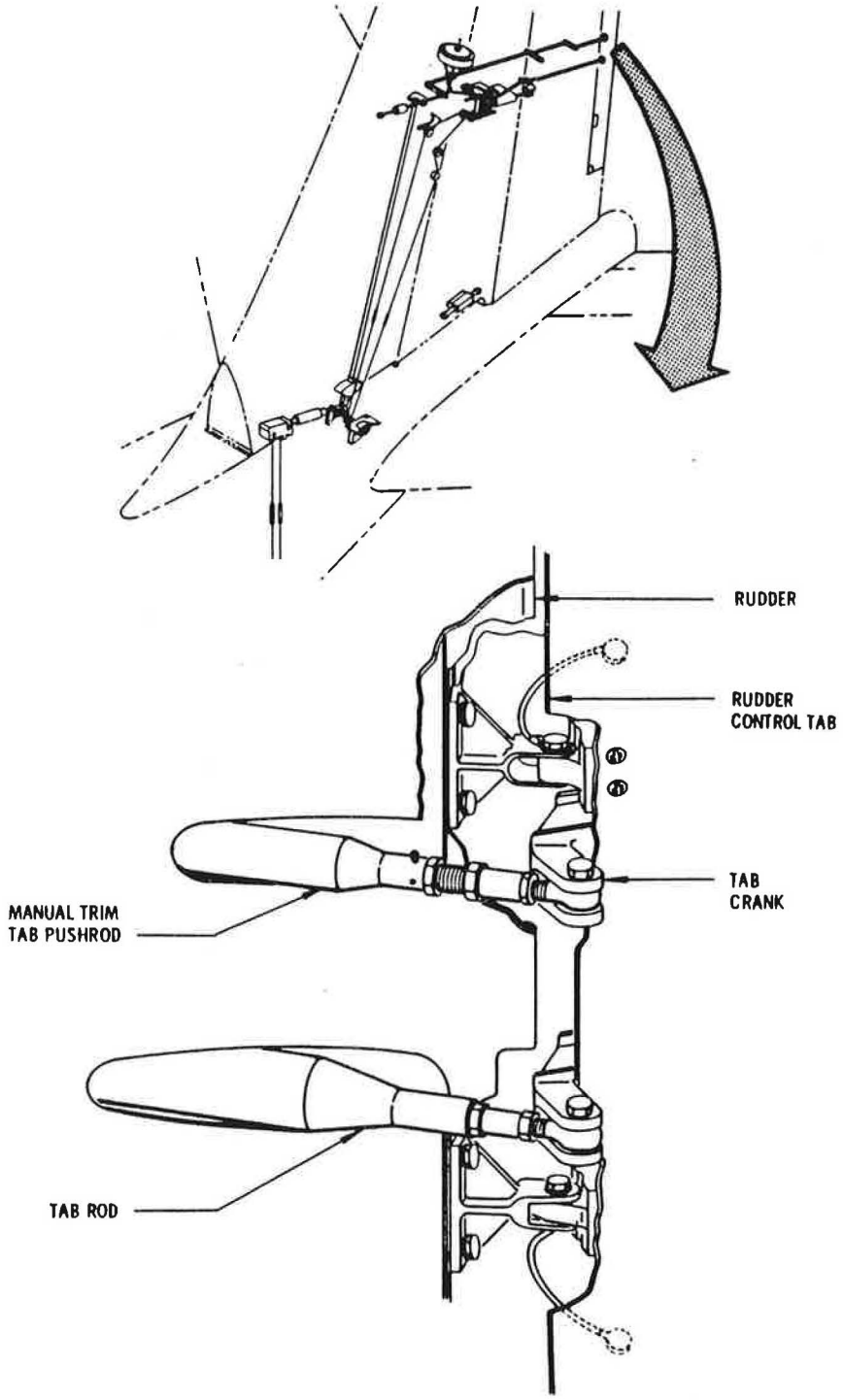
(4) Align rig pin holes in crank and crank support fitting and install rig pin No. 1.

(5) Position rudder in neutral position within 1° and fair rudder control tab with rudder within 1/8 inch. If tab cannot be faired with rudder within specified limits, remove fairing and disconnect manual trim tab pushrod from rudder tab crank. (See figure 206.) Adjust pushrod as required to fair tab with rudder and connect to tab crank. Tighten check nuts and install cotter pin through pushrod.

(6) Install access panels.



Rudder Trim Aft Reversing Crank Installation
Figure 205



Rudder Control Tab Adjustment
Figure 206

RUDDER POWER TRIM GEARBOX - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Power Trim Gearbox

A. General

(1) Prior to removing the rudder power trim gearbox, rig pins should be installed through the carriage and cable drum housing on the rudder feel unit and through the rudder manual trim gearbox for isolation purposes. This action will allow the power trim gearbox to be installed with a minimum of rigging. Rigging to be accomplished after installation consists of adjusting the rudder power trim cables extending from the power trim gearbox to the trim cable drum on the rudder feel unit.

B. Equipment and Materials

(1) Rig pins No. 5 and 6, and rudder rig pin No. 9, 0.311 (+0/-0.002) inch dia. (MS20392-4)

(2) Tensiometer - 0 to 300 pound capacity

(3) Rudder protractor - MIT 50-8703

(4) Rudder trim tab protractor - MIT 50-8706

C. Remove Rudder Power Trim Gearbox

(1) Remove the following access panels.

(a) Stabilizer jackscrew access panel 1185 for access to rudder power trim gearbox and rudder trim gearbox. See Chapter 12, "Access Doors and Panels."

(b) Remove rudder tab control quadrant access panel 1510 for access to turnbuckle on cable RTPB and adjustable pulley bracket.

(c) Remove access panel 1514 for access to rudder feel unit.

(2) Rotate rudder trim control so that trim indicator is at zero.

(3) Position rudder at neutral within ± 1°.

(4) Install rig pin No. 5 through rudder manual trim gearbox. (See figure 202.)

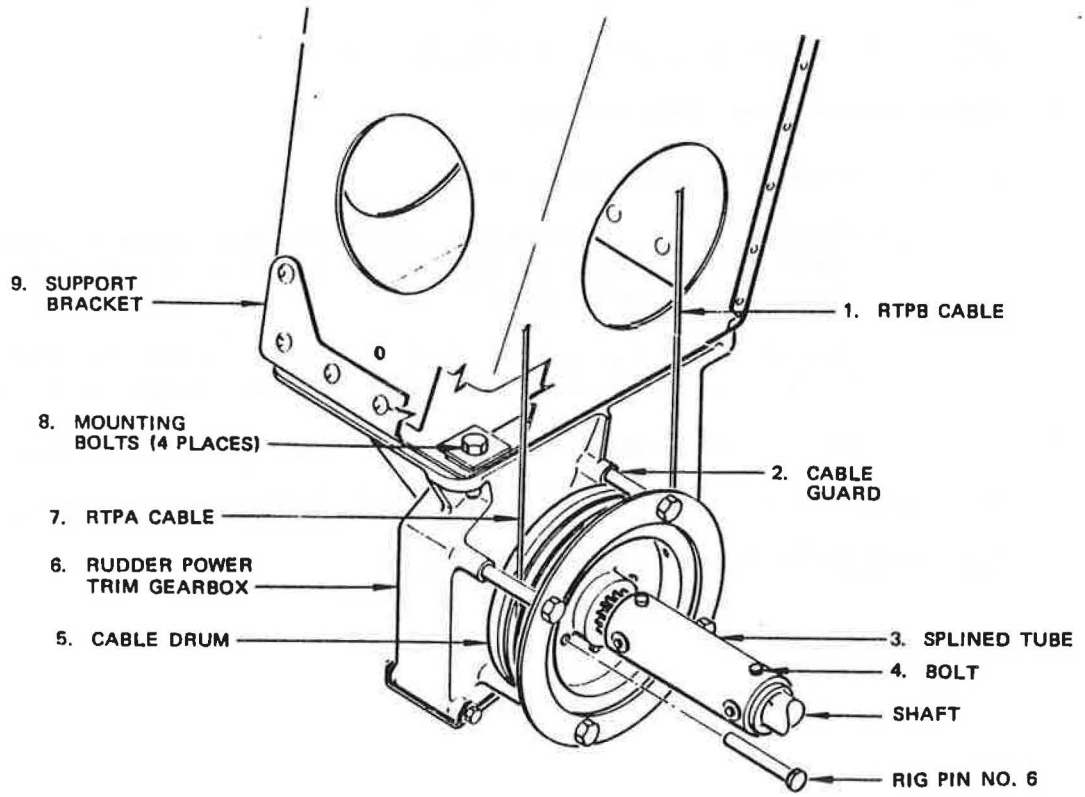
NOTE: Rudder manual trim gearbox is located in airplane tail compartment aft and above rudder power trim gearbox.

(5) Install rig pin No. 9 through rudder feel unit carriage and cable drum housing.

(6) Loosen bolt on adjustable pulley to relieve tension in rudder power trim cable RTPA.

(7) Loosen turnbuckle on rudder power trim cable RTPB to relieve tension in cable.

(8) Remove bolts (4 figure 201) from splined tube (3) and slide splined tube inboard to free gearbox splined fitting.



Rudder Power Trim Gearbox Installation
Figure 201

(9) Disconnect and unwind cables RTPB (1) and RTPA (7) from cable drum (5) on rudder power trim gearbox (6). Remove cable guards (2) as required to disconnect cables.

(10) Remove four mounting bolts (8) and remove rudder power trim gearbox.

D. Install Rudder Power Trim Gearbox

(1) Align rudder power trim gearbox (6, figure 201) with gearbox support bracket (9) and install mounting bolts (8). Install bolts with head up and radius filler under each bolt head.

(2) Remove four cable guards (2).

(3) Wrap cables RTPB (1) and RTPA (7) 1-1/2 turns on power trim gearbox drum with RTPB forward and insert cable terminals into terminal slots on drum.

(4) Install four cable guards (2).

(5) Rotate gearbox output shaft so that rig pin hole in cable drum and gearbox casting are aligned and install rig pin No. 6. RTPA and RTPB cables should be each wrapped 1-1/2 turns on drum.

(6) Check that pushrod makes an 89 (± 2) degree angle with power trim gearbox input crank. If not, adjust pushrod to obtain angle. Tighten checknut. Slide splined tube (3) onto gearbox spline and install bolts (4).

(7) With rig pin No. 6 (figure 202) installed through drum on power trim gearbox and rig pin No. 9 installed through trim drum housing and carrier assembly on feel unit, adjust turnbuckle on RTPB cable and adjustable pulley bracket on RTPA cable until tension in cables is at specified values. See 27-18-0, figure 202, for temperature tension chart.

(8) Remove rig pins Nos. 5, 6 and 9.

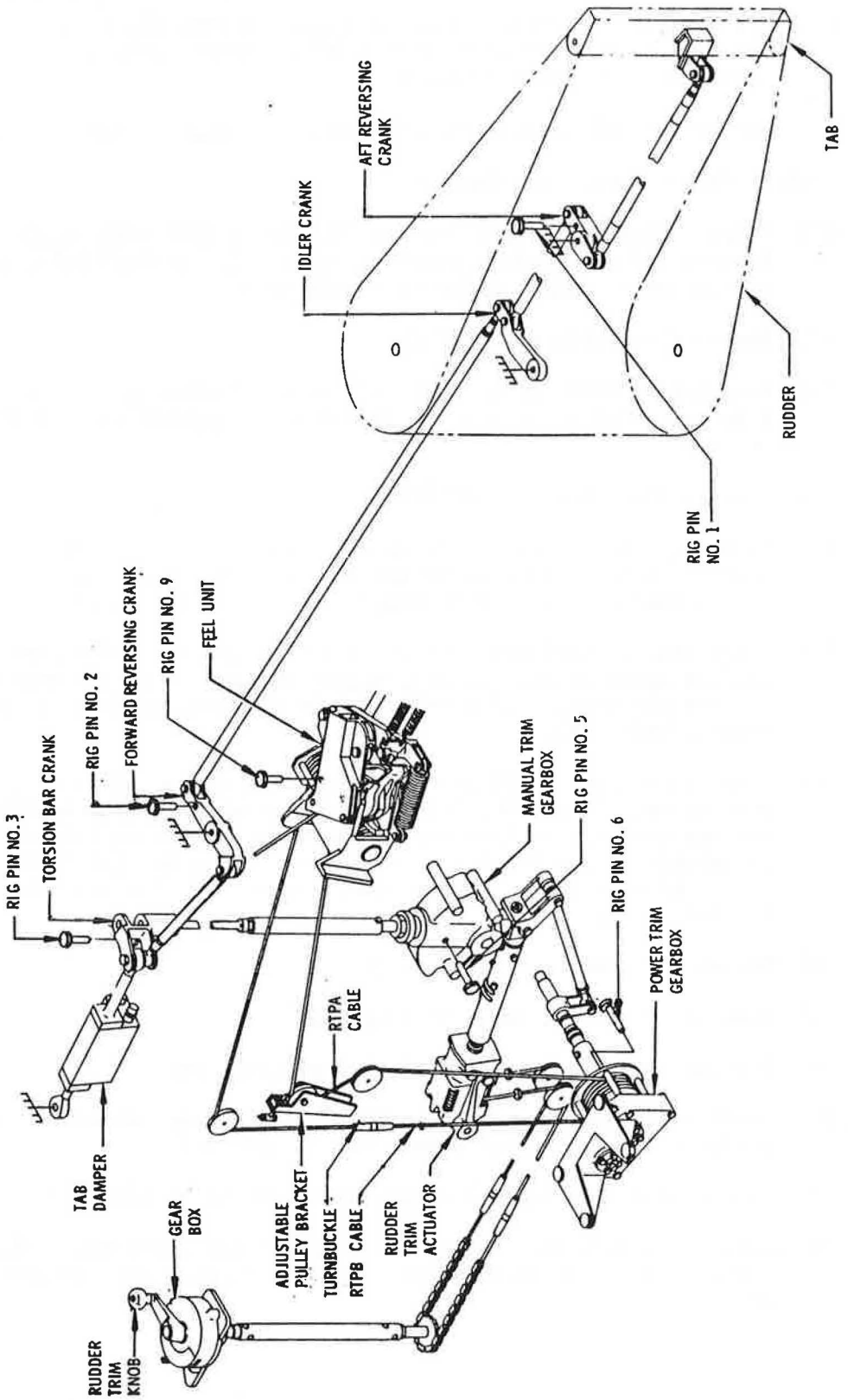
(9) Connect electrical power to airplane.

(10) Install rudder and rudder trim tab protractors.

(11) Position rudder in neutral position within 1 degree and hold. Fair rudder control tab with rudder within 1/8 inch.

(12) Turn rudder trim control handle clockwise to 10-1/2 to 11-1/2 turns.

(13) Manually push rudder 13 degrees to right and check that rudder control tab angle is 19 degrees or more to left with respect to rudder.



Rudder Power Trim Gearbox Adjustment
Figure 202

(14) Clear personnel and equipment from rudder and pressurize auxiliary hydraulic system.

(15) Turn rudder switch to "ON" to pressurize rudder hydraulic system.

(16) **Check that rudder moves 15-1/2° minimum to right and that rudder control tab moves to right.**

(17) Position auxiliary pump switch to "OFF" and cycle rudder to depressurize system.

(18) Repeat steps (12) through (17) for rudder trim handle counterclockwise motion. Rudder position and tab motion will be opposite but of same magnitude.

(19) Disconnect electrical power source.

(20) Install all access panels that were removed.

(21) Remove rudder and rudder control tab protractors.

RUDDER CONTROL TAB DAMPER - MAINTENANCE PRACTICES

1. Removal/Installation Rudder Control Tab Damper

A. Equipment and Materials

(1) Main landing gear door downlock.

(2) External compressed air source, 50 to 200 psi.

B. Remove Rudder Control Tab Damper

(1) Connect electrical power to airplane.

(2) Open AC auxiliary pump circuit breaker on Radio and TR circuit breaker panel (P5).

(3) Depressurize auxiliary hydraulic system by turning rudder switch "ON" and deflecting rudder by actuating rudder pedals until rudder stops operating hydraulically. Turn rudder switch "OFF."

(4) Open left main gear wheel well and install main gear door downlock.

(5) Remove hydraulic access panel L1348 see Chapter 12, "Access Doors and Panels."

(6) Depressurize utility reservoir by slowly unscrewing filler cap three full turns. Tighten cap after compressed air has escaped.

CAUTION: DO NOT REMOVE CAP UNTIL RESERVOIR IS COMPLETELY DEPRESSURIZED OTHERWISE FLUID WILL ESCAPE.

(7) Remove access panel 1514. See Chapter 12, "Access Doors and Panels."

(8) Disconnect hydraulic line from damper. (See figure 201.) Cap hydraulic port of damper and plug end of hydraulic line.

(9) Remove damper mounting bolts and remove damper.

C. Install Rudder Control Tab Damper

(1) Install union and O-ring in fluid inlet port on tab damper.

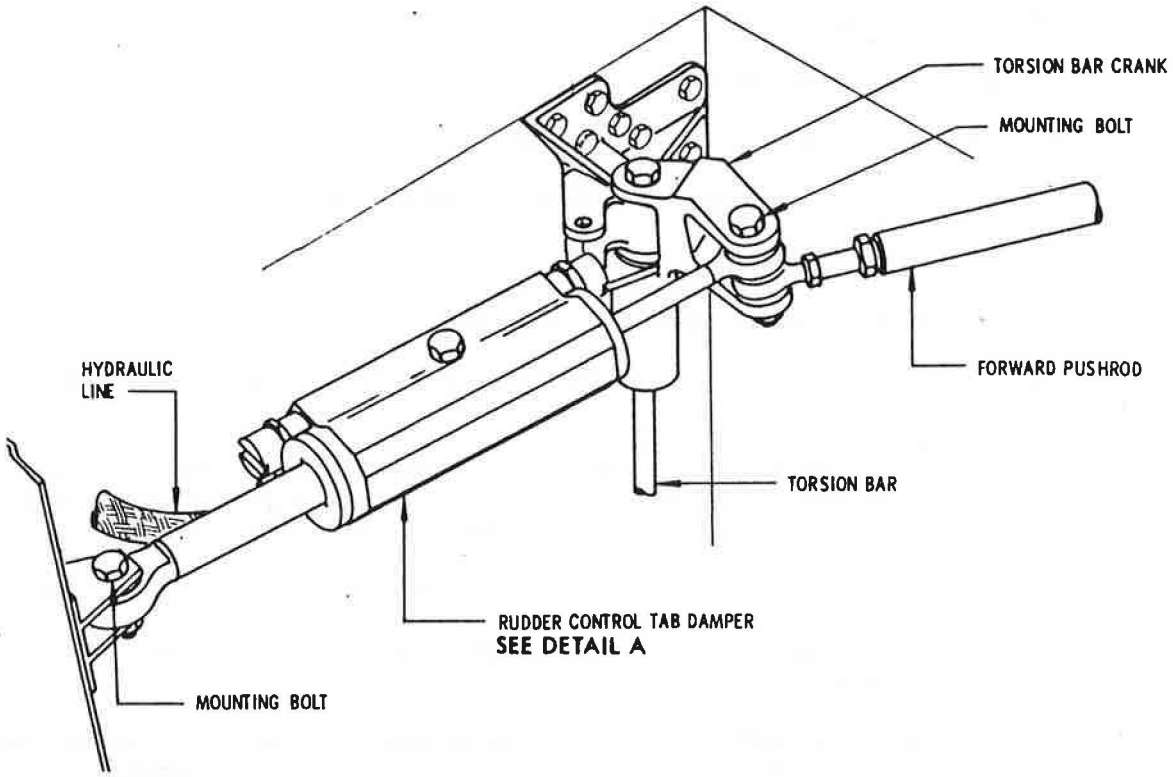
(2) Bleed rudder control tab damper as follows:

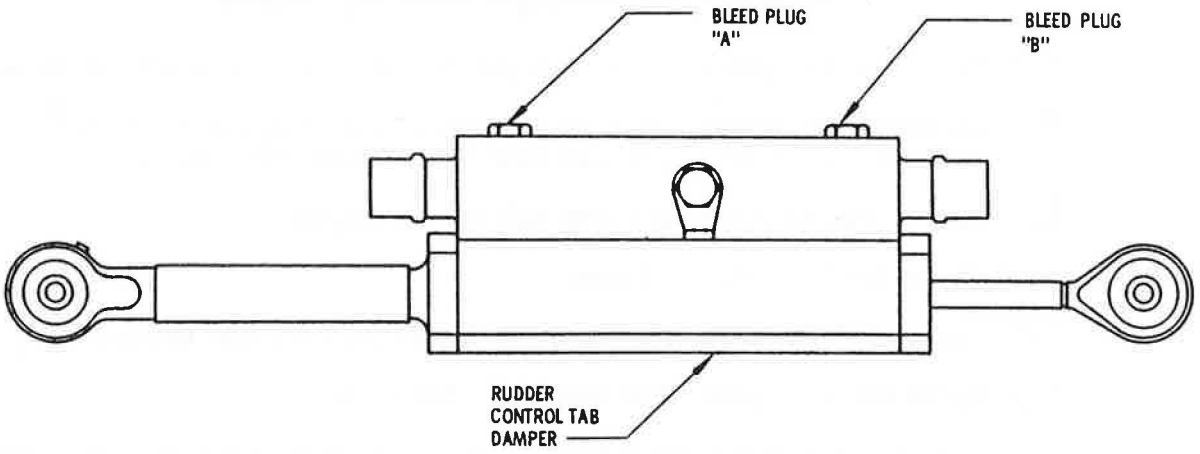
(a) Connect fluid inlet port on damper to hydraulic pressure source.

(b) Position damper so that ports A and B are up. (See detail A, figure 201.)

(c) Loosen bleed plug "A" or "B."

(d) Apply 20 psi hydraulic pressure to damper.





DETAIL A

Rudder Control Tab Damper Installation
Figure 201

(e) Cycle damper through complete strokes until bleed fluid shows no visible aeration.

(f) Tighten bleed plug.

(g) Disconnect hydraulic pressure service and cap inlet port on damper.

(3) Position head of damper to fin and rod end to torsion bar crank along with pushrod and install mounting bolts with head up.

(4) Check that rudder switch is OFF.

(5) Bleed hydraulic supply line to damper as follows:

(a) Connect external electrical power to airplane.

(b) Remove cap from fluid inlet port on damper and plug from end of hydraulic supply line.

(c) Pressurize utility hydraulic reservoir. See Chapter 29-0, Unit Servicing.

NOTE: Pressurizing utility hydraulic reservoir will cause hydraulic fluid to flow from hydraulic supply line. A container must be available to catch excess fluid from hydraulic supply line.

(d) When hydraulic fluid begins to flow from hydraulic line, connect hydraulic line to port on damper and tighten hydraulic fittings.

(6) Pressurize auxiliary hydraulic system and check connection for hydraulic leaks.

(7) Check that reservoir piston is not more than 4.00 inches from external surface of spring cap by inserting a drill rod through hole in spring cap.

NOTE: Spring cap is located directly opposite of hydraulic inlet port.

(8) Depressurize auxiliary hydraulic system.

(9) Service hydraulic system as required. See Chapter 29-0, Replenish Hydraulic System.

(10) Pressurize utility hydraulic reservoir to prevent cavitation in pumps when engines are started.

(11) Remove external compressed air.

(12) Remove external electrical power.

(13) Close access doors, install panels and close left main gear wheel well door.