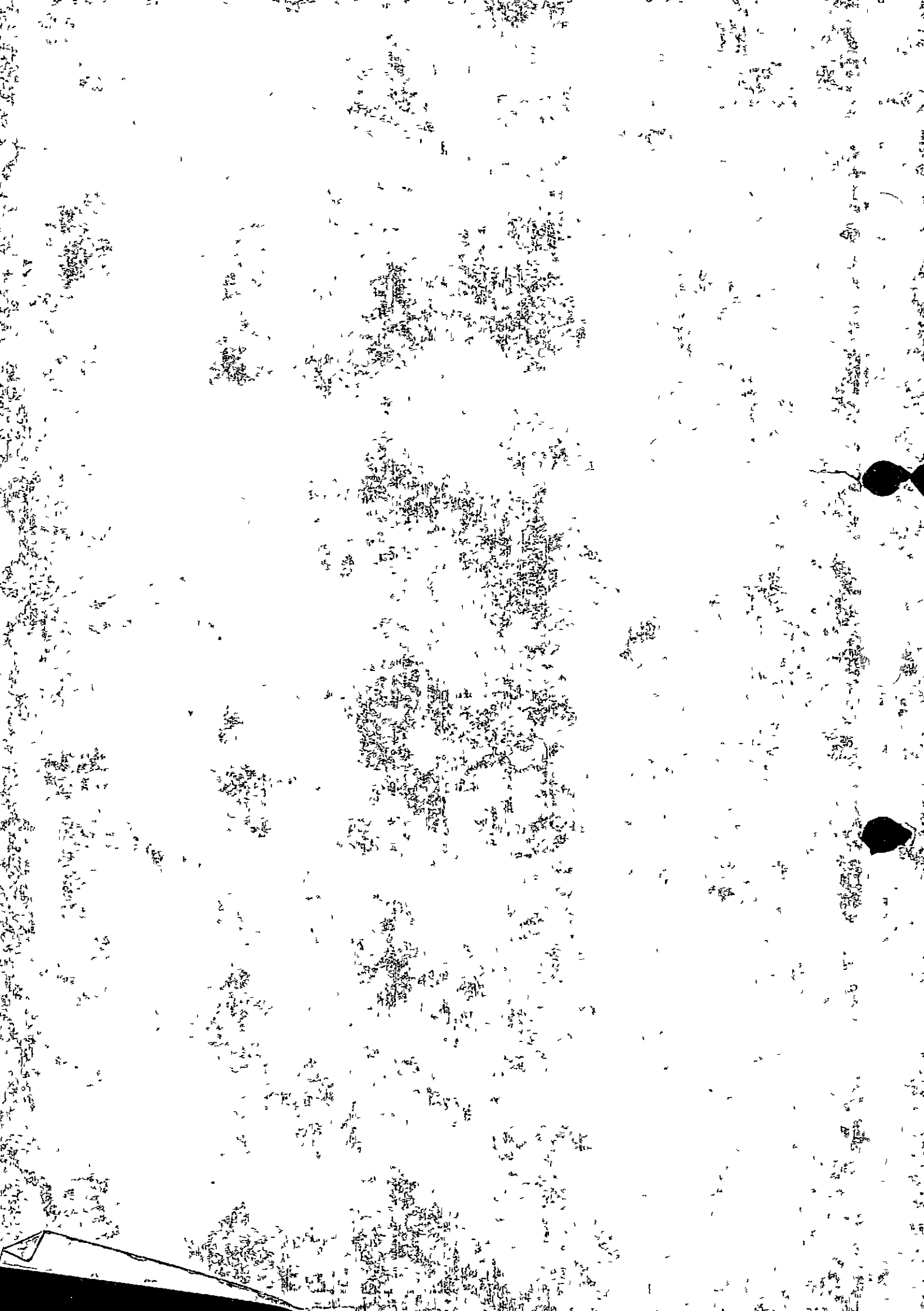


CHAPTER

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- (9) If nose wheels turn before the nose gear has reached 20 degrees from down position, adjust shutoff valve position per dimension on figure 201.
- (10) Turn wheels straight ahead, disconnect hydraulic cart, and remove protractor.
- (11) Check that nose gear is in full down position, and install external downlocks.
- (12) Lower nose and remove jacks.
- (13) Release inner-cylinder from external restraint.
- (14) Inflate nose gear shock strut per instructions on chart in wheel well.



STEERING CYLINDERS - MAINTENANCE PRACTICES

1 Removal/Installation Steering Cylinders

A. Remove Steering Cylinders

- (1) Depressurize the utility hydraulic system.
- (2) Open nose wheel well doors.
- (3) Close hydraulic interconnect valve.
- (4) Install all landing gear external down locks.
- (5) Remove nose wheel steering metering valve. See 32-8-21.
- (6) Loosen turnbuckles to release tension on steering control cables.
- (7) Remove pulleys from control crank (4, figure 202) and push cables out of way.
- (8) Remove the control crank by removing one bolt
- (9) Disconnect steering cylinder piston rod terminals (2) from steering collar (1)
- (10) Disconnect and remove crew call horn on lower support plate (3)
- (11) Disconnect steering cylinder assembly from shock strut.
 - (a) Support cylinder assembly and remove bolts attaching lower support plate
 - (b) Remove upper support attaching bolts.
- (12) Remove cover mechanism outer support bracket (7, figure 201).

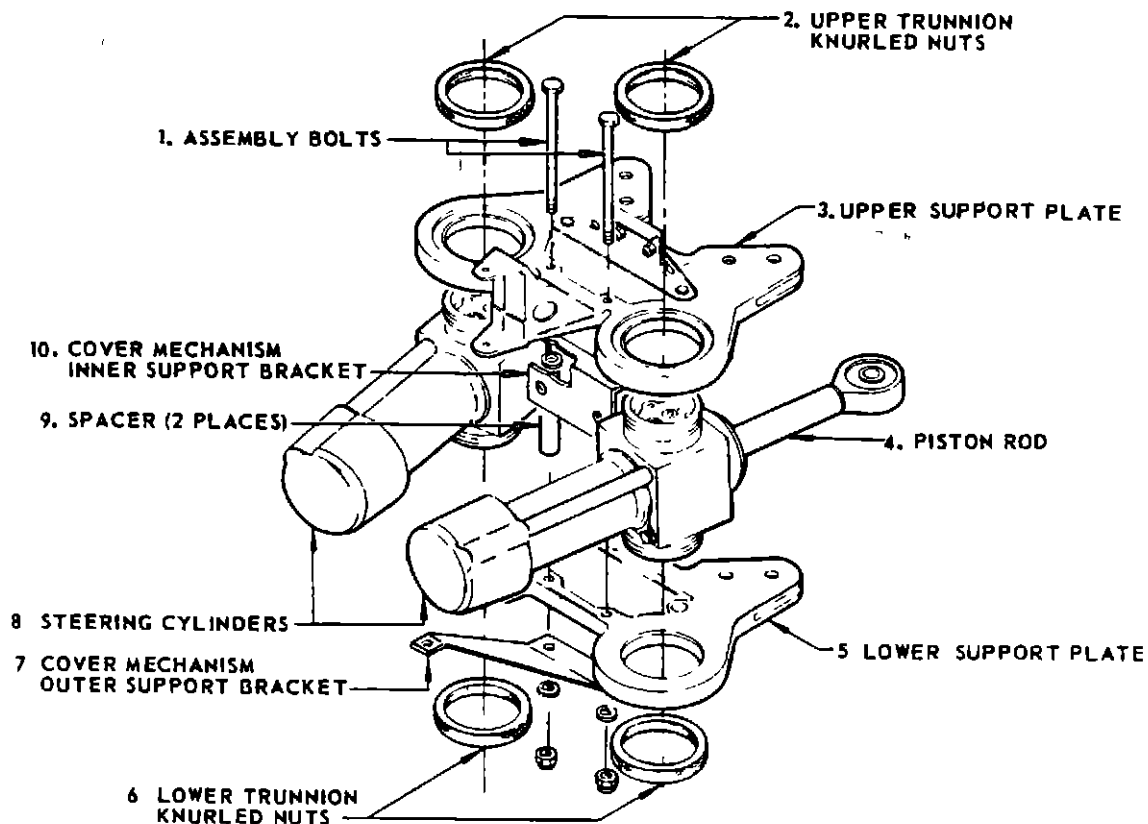
NOTE When removing the two support plate assembly bolts (1), watch for two spacers (9), two washers, and cover mechanism inner support bracket (10).
- (13) Remove two upper trunnion knurled nuts (2) by hand
- (14) Remove upper support plate.
- (15) Remove two lower knurled nuts (6)
- (16) Remove steering cylinders

B. Install Steering Cylinders

- (1) Place new or serviceable steering cylinders (filled with Skydrol 500) on cylinder lower support plate (5, figure 201) and install knurled nuts (6), but do not tighten.

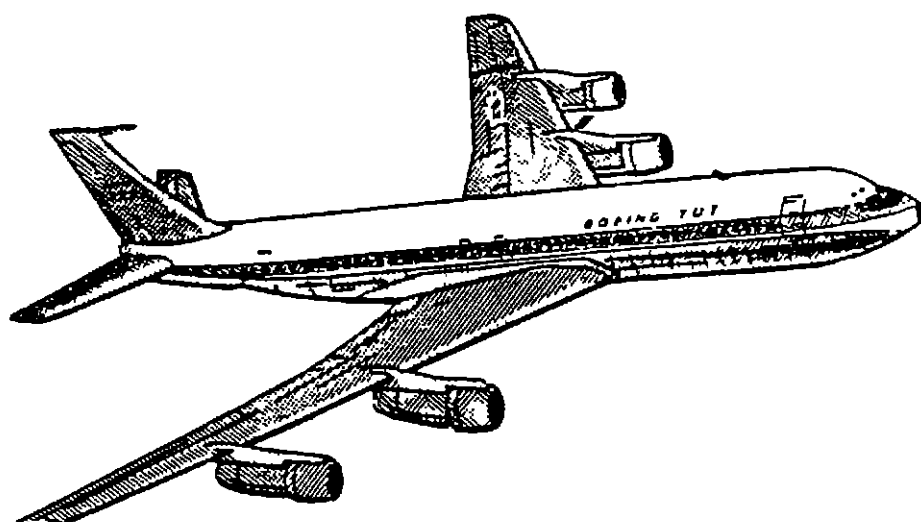
NOTE Hydraulic ports of cylinders must be covered to prevent entry of foreign matter into hydraulic system.

- (2) Place cylinder upper support plate on upper end of cylinder trunnions and install upper knurled nuts (2), but do not tighten.
- (3) Install cover mechanism inner support bracket between lower and upper support plates as shown



Nose Wheel Steering Cylinder Assembly
Figure 201

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FOR NATO TRAINER CARGO AIRCRAFT

NATO DOC.. TCA D6-6003

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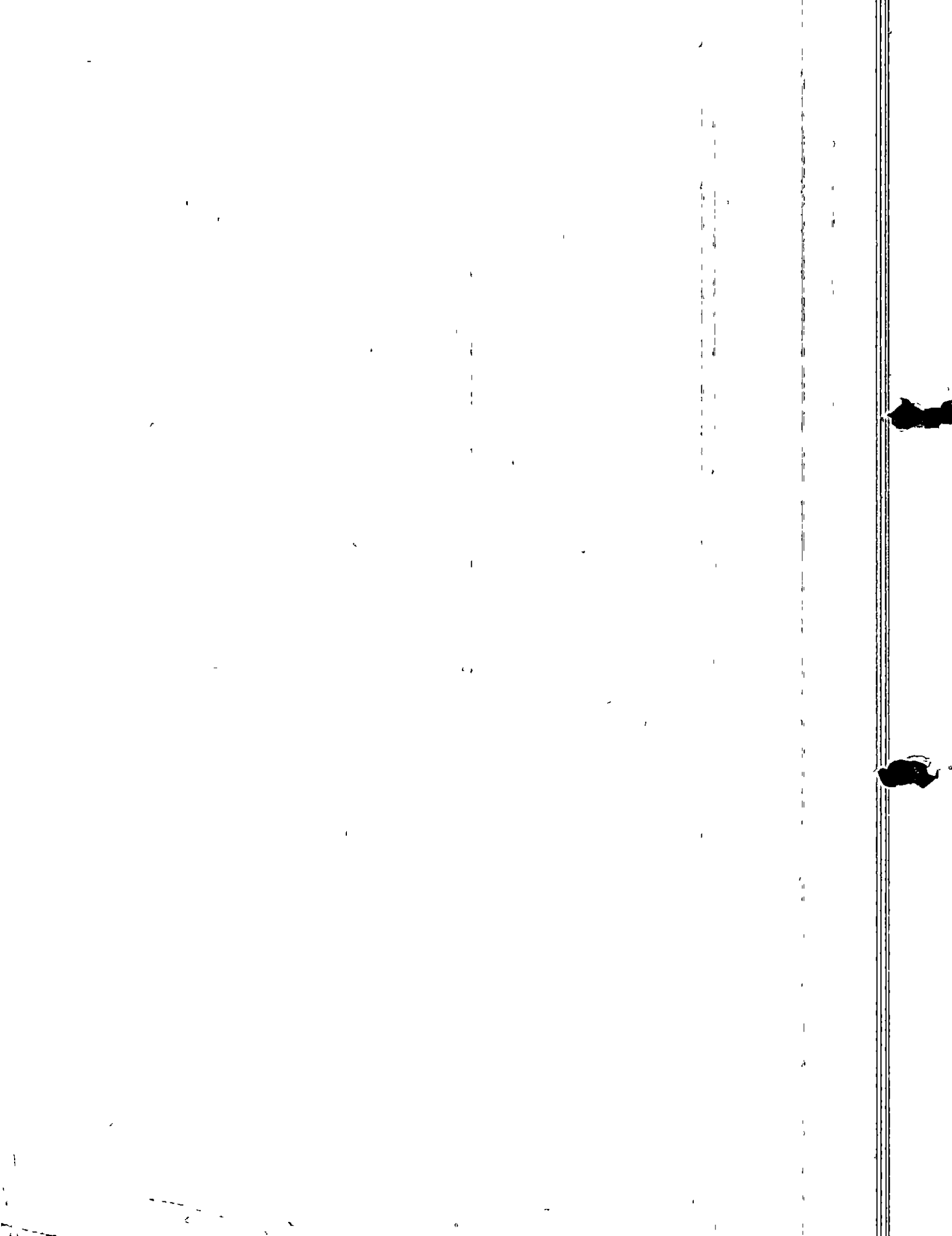
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Reason To add a troubleshooting procedure which isolates the condition where the airplane is on the ground and the red warning light for the Nose Landing Gear is illuminated.

Effectivity All 707 Airplanes

LANDING GEAR AND DOOR CONTROL SYSTEM - TROUBLESHOOTING

The following procedure is used to troubleshoot the landing gear.



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LANDING GEAR AND DOOR CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. General

- A. The landing gear and door control system controls the retraction and extension of the main and nose gear, and the main and nose gear doors. The doors are sequenced to close after each retraction or extension of the landing gear.
- B. The control system consists of a control handle, control cable system, a selector valve, door control valves, sequence valves, door safety valves, door shutoff valve, restrictors, a pressure relief and various check valves.
- C. When the landing gear control handle is positioned to actuate the gear, the wheel well doors will open first. As the doors reach open position, hydraulic pressure is directed to unlock the gear. Pressure is also directed to the landing gear actuators to retract or extend the gear, depending on the position of the control handle. As the gear reaches retracted or extended position, hydraulic pressure is directed to close the wheel well doors.

2. Landing Gear Control Handle

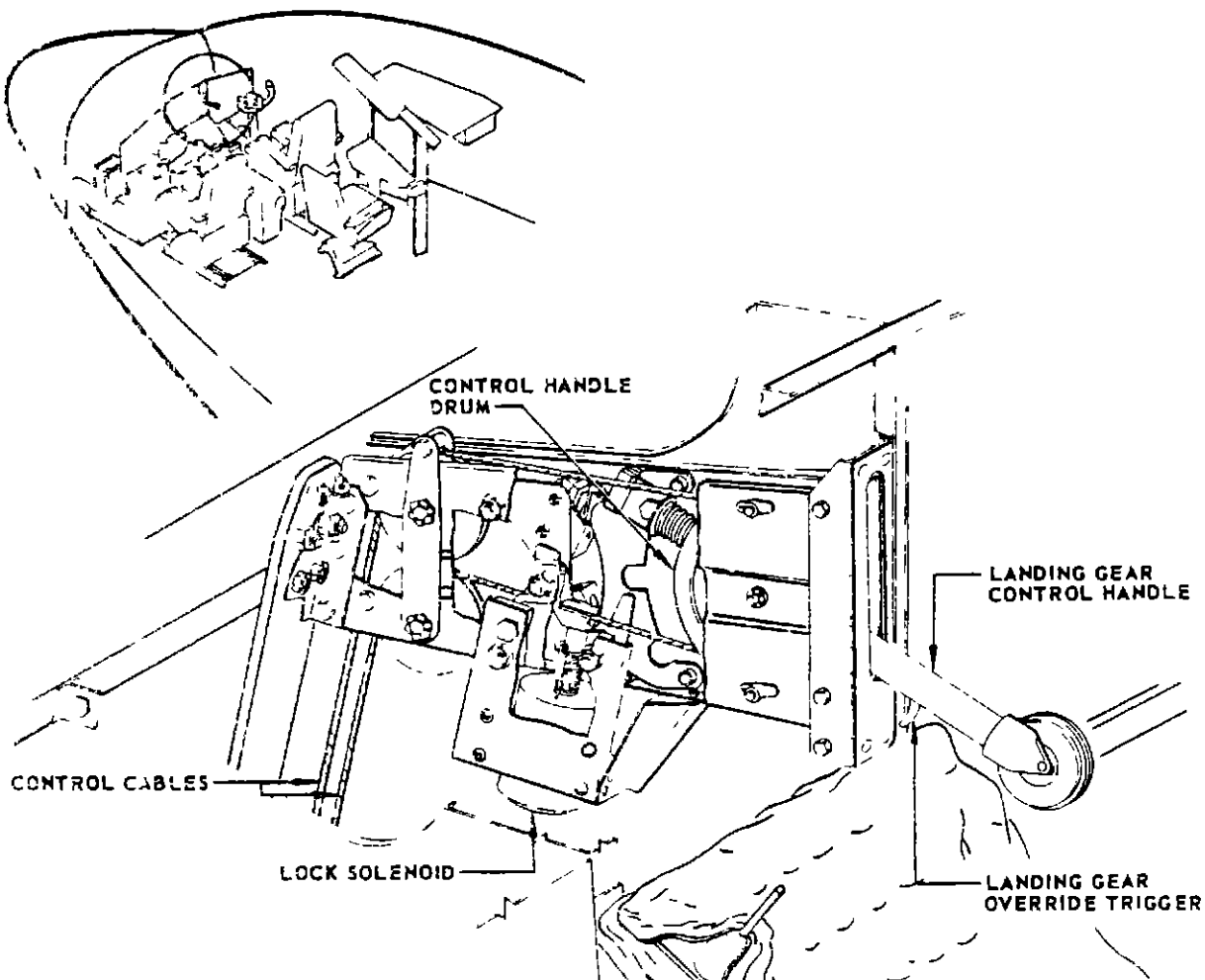
- A. The landing gear control handle (figure 1) is the pilots' control for selecting the desired position of the landing gear. The control handle and control handle drum are located on the pilot's engine instrument panel. Cables attached to the control handle drum, extend down and back to the landing gear selector valve. The control handle rides in a guide as the handle is moved up and down. The guide has three detent positions for the control handle to stop in. The three positions for the control handle are; "UP," "DOWN," and "OFF."
- B. A solenoid-operated lock mechanism prevents the control handle from being moved to the UP position if the landing gear cannot be safely retracted. An override trigger on the control handle releases the lock mechanism to allow the control handle to be moved to the UP position.
- C. Two position switches, mounted on the back side of the control handle, are actuated when the control handle is moved to UP or DOWN position. For more information on the switches and the lock solenoid, see 32-6-0.

3 Landing Gear Control Cable System

- A The landing gear control cable system (figure 2) transfers movement of the control handle to the landing gear selector valve. The control cable system consists of four cables, two short ones and two long ones. The cables are 1/8-inch diameter, 7 x 19, carbon steel. The short cables are attached to the control handle drum. The long cables are attached to the selector valve control drum and are connected to the short cables with turnbuckles.

4. Landing Gear Control Selector Valve

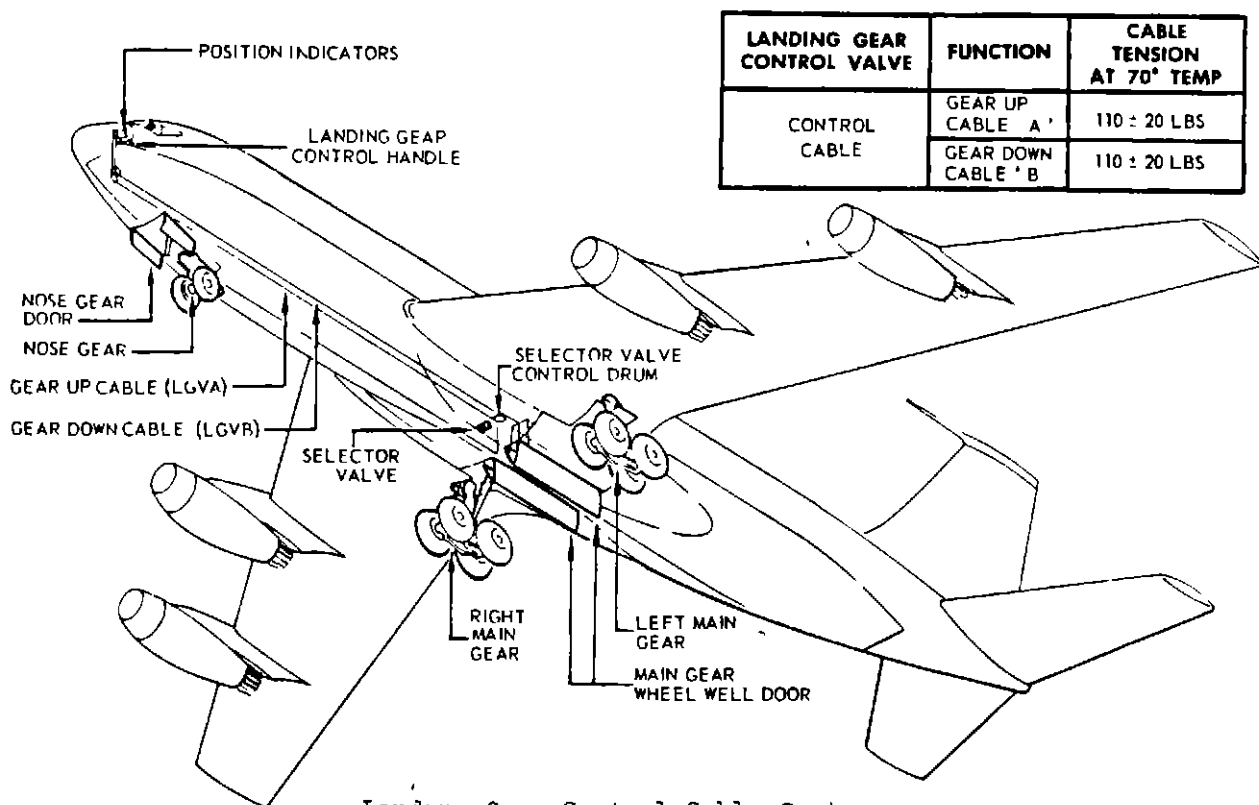
- A The landing gear control selector valve (figure 3) directs hydraulic pressure to the landing gear up and down lines. Return fluid from the landing gear system passes back through the selector valve and on to the utility return line. The selector valve is bolted to the ceiling in the forward end of the right main gear wheel well. Linkage connects the selector valve to the control cable system. When the landing gear control handle is operated, motion from the handle is transferred through the cable system and the selector valve is positioned.



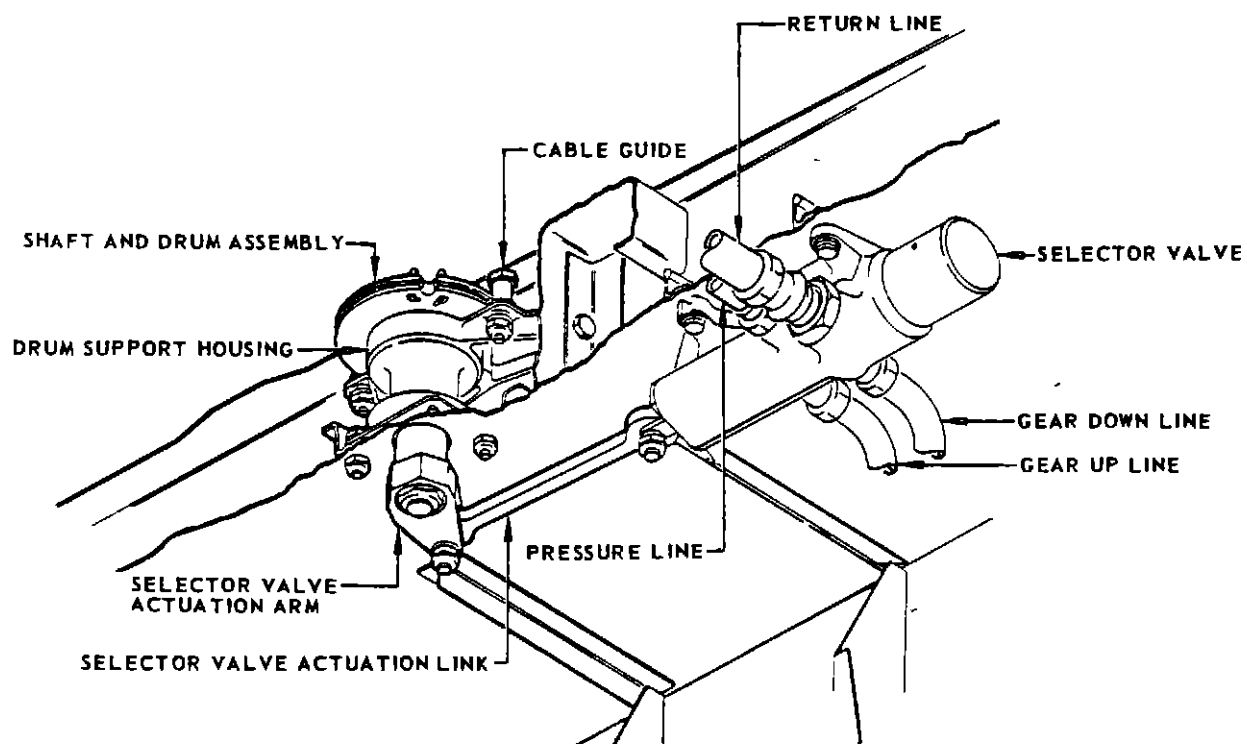
Landing Gear Control Handle
Figure 1

LANDING GEAR
Landing Gear and Door Control System
Description and Operation

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Landing Gear Control Cable System
Figure 2



Landing Gear Control Selector Valve
Figure 3

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5. Landing Gear Door Control Valves

A. Main Gear Door Control Valves

- (1) The main gear door control valves (figure 4) direct hydraulic pressure to the main gear door actuators and also to the lock port of the landing gear lock actuators. The door control valves receive hydraulic pressure from the landing gear up and down lines, depending on the position of the selector valve.
- (2) The control valves are attached to the main gear lock mechanism support bulkhead just aft of the main gear side strut. The valves are spring-loaded to neutral by a single double-acting spring bungee and are actuated by linkage from a rabbit-ear crank which is positioned by the up lock roller on the shock strut and also by down lock roller on the side strut.

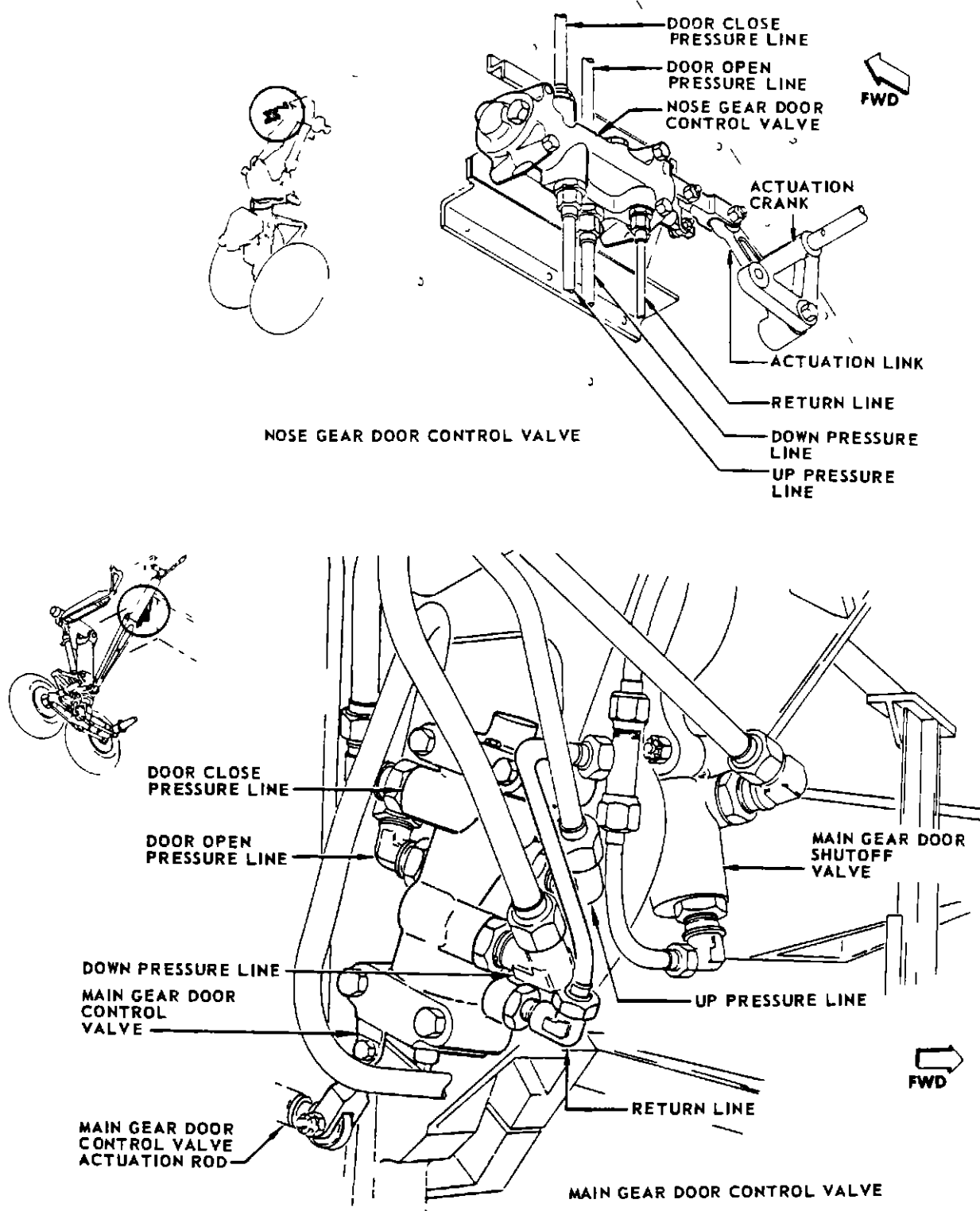
B. Nose Gear Door Control Valve

- (1) The nose gear door control valve (figure 4) directs hydraulic pressure to the nose gear doors actuator and also to the lock retention actuator. The door control valve receives hydraulic pressure from the landing gear up and down lines, depending on the position of the selector valve.
- (2) The control valve is attached to the aft right side of the nose wheel well. The valve is actuated by an actuation link and crank which are attached to the nose gear lock arm mechanism.

6. Landing Gear Sequence Valves

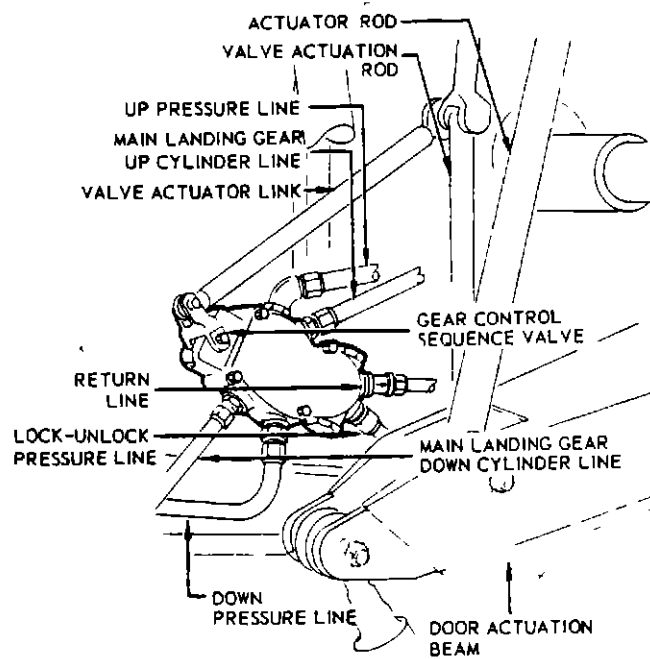
A. Main Gear Sequence Valves

- (1) The main gear sequence valves (figure 5) direct hydraulic pressure to the main gear actuators, unlock port of the lock actuators, and to the side strut actuators. The valves receive hydraulic pressure from the landing gear up and down lines, depending on the position of the selector valve.
- (2) The main gear sequence valves are bolted to structure in the lower inboard area of the wheel well forward bulkhead. The valves are actuated by linkage from the wheel well door actuating beam shaft. Actuation of the valve depends entirely on the position of the door and this prevents gear operation before the door is fully open.

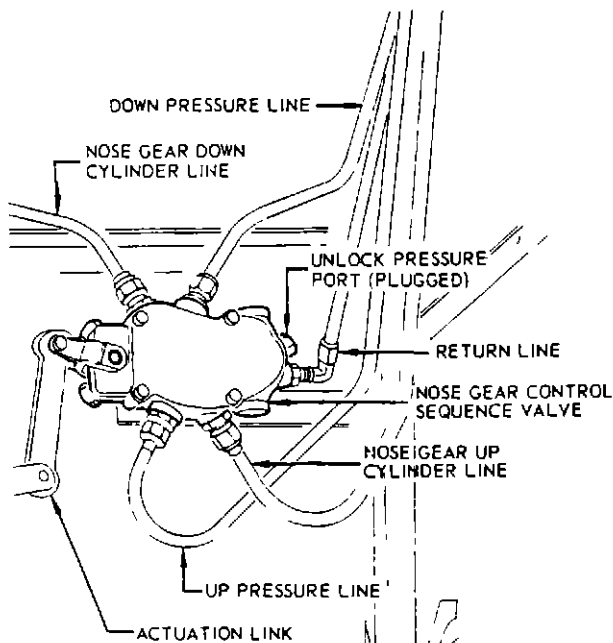


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Main and Nose Gear Door Control Valve
Figure 4



MAIN GEAR SEQUENCE VALVE



NOSE GEAR SEQUENCE VALVE

Landing Gear Sequence Valve
Figure 5

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B Nose Gear Sequence Valve

- (1) The nose gear sequence valve (figure 5) directs hydraulic pressure to the nose gear actuator and lock actuator. The valve receives hydraulic pressure from landing gear up and down lines, depending on the position of the selector valve.
- (2) The nose gear sequence valve is bolted to the nose wheel well forward bulkhead and is actuated by linkage from the door crank.

7 Landing Gear Door Safety Valves

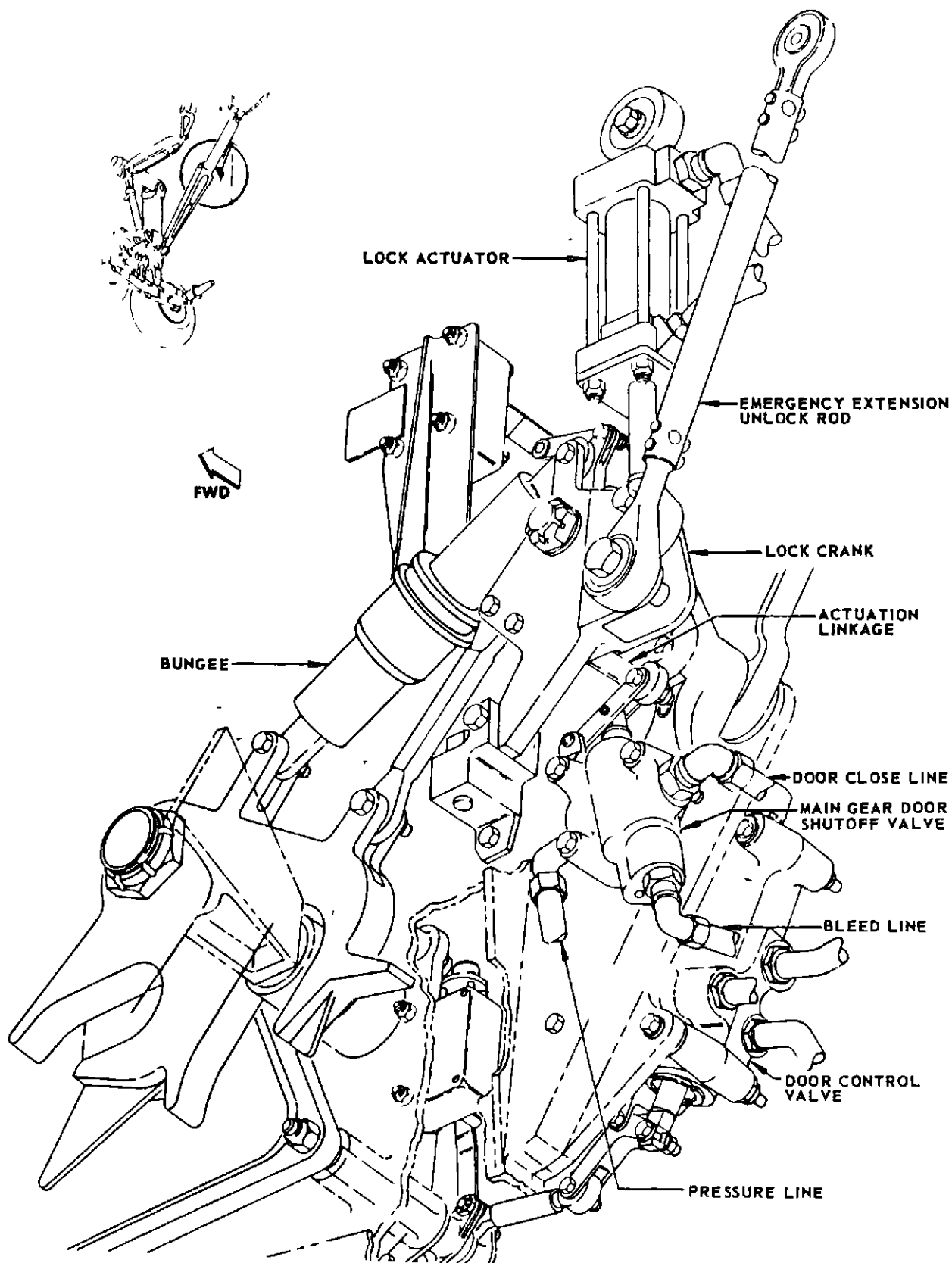
- A. The landing gear door safety valves prevent inadvertent closing of the wheel well doors during maintenance operation in the wheel well area. The nose gear door safety valve is mounted on the rear side of the forward bulkhead in the nose wheel well. The main gear door safety valve, which is similar to the nose gear valve, is mounted above the door ground release handle in each of the main gear wheel wells. When any door ground release handle is pulled down the door safety valve is operated through a linkage system. Pressure to the door closed line is blocked and the door closed line is connected to the door open line to permit free flow of hydraulic fluid from one end of the door actuator, the other, allowing the doors to free fall open. For more information on door safety valves, see 32-5-0.

8. Main Gear Door Shutoff Valves

- A The purpose of the main gear door shutoff valves (figure 6) is to block hydraulic fluid to the door actuators when the doors are open. The hydraulic block will prevent door movement while the landing gear is in transit. The valve is situated in the door down line.
- B The shutoff valve is located on the main gear lock mechanism support bulkhead. Operation of the valve is controlled through linkage from the gear lock mechanism.

9 Landing Gear Hydraulic Restrictors and Check Valves

- A The landing gear hydraulic system incorporates various check valves and restrictors for controlling rate and sequence of the actuators. One restrictor check valve is located in the main gear side strut actuator down line and one variable restrictor is located in the nose gear lock actuator extend line.
- (1) Check valves permit free flow of fluid in one direction and no flow in the other.
 - (2) Restrictors limit the flow of fluid in both directions.
 - (3) Restrictor check valves permit free flow of fluid in one direction and limited flow in the other.
 - (4) Variable restrictors permit initial free flow and then restricted flow in both directions.



Main Gear Door Shutoff Valve
Figure 6



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10 Landing Gear Pressure Relief Valves

- A. A pressure relief valve is located in each main landing gear side strut actuator retraction line. The relief valve relieves excessive pressures in this line during landing gear extension, when the weight of the gear tends to pull the actuator to down position.

11. Operation

- A. When the landing gear control handle is placed in the "UP" or "DOWN" position, hydraulic fluid passes through the selector valve and enters the landing gear actuating system. For main or nose gear operation, see paragraphs B and C.

B. Main Gear Operation

- (1) When the landing gear control handle is placed in the "UP" position, hydraulic pressure is directed through the selector valve to open the main gear doors. (See figure 7.) Hydraulic pressure is also directed to the brakes. When the doors reach full open position, the main gear sequence valve is positioned by the door linkage, and hydraulic pressure is directed to the main gear lock actuators to unlock the gear. Linkage from the lock mechanism positions the shutoff valve to block the pressure in the door open side of the door actuator. With pressure blocked in the door actuator, the door will not move while the gear is in transit. Hydraulic pressure from the sequence valve is also directed to the side strut actuator and the main gear actuator. When the main gear reaches the retracted position, a roller on the shock strut contacts the door control valve actuating linkage. As the control valve linkage is moved, the valve is positioned and pressure is directed to the lock actuator to lock the gear up, and to the door actuator to close the doors. When the lock mechanism rotates, the shutoff valve opens and allows the return fluid in the door actuator to be forced out by door closing pressure. When the control handle is placed to the "OFF" position, hydraulic pressure is blocked at the selector valve and the main gear is held in up and locked position by a lock bungee. The main gear doors are kept closed by a piston locking device inside the door actuator.

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- (2) With the landing gear control handle placed in DOWN position, when the gear is up and locked, hydraulic pressure is directed through the selector valve to open the wheel well doors. (See figure 7) When the doors open, linkage from the doors positions the sequence valves and pressure is directed to the lock actuators to unlock the gear. As the lock mechanism rotates, the door shutoff valves again block fluid in the door actuators to prevent the doors from moving while the gear is extending. Pressure from the sequence valves is also directed to the side strut and main gear actuators to extend the gear. As the gear reaches down position, a roller on the side struts actuate each door control valve linkage. When the door control valve is positioned, pressure is directed to the lock actuators to lock the gear down. As the lock mechanism rotates, the door shutoff valve is opened and the doors close.

C. Nose Gear Operation

- (1) When the landing gear control handle is placed in UP position, hydraulic pressure is directed through the selector valve to open the nose gear doors. (See figure 7) The nose gear doors are held open during gear retraction by hydraulic pressure from the nose gear up line. When the doors reach the full open position, the nose gear sequence valve is positioned by door linkage and hydraulic pressure is directed to the nose gear lock actuator to unlock the gear. The nose gear lock actuator extends to unlock the gear from the gear down and locked position. As the gear retracts, the drag brace rotates downward to attain a vertical position. Rotation of the drag brace also rotates the lock crank to which the nose gear lock actuator is attached. The lock crank arm and lock actuator attachment point rotates to an overcenter position and the continued extension action of the lock actuator locks the nose gear in the up position. Linkage from the lock crank then repositions the door control valve to direct hydraulic pressure to close the wheel well doors and to extend the lock retention actuator to keep the gear locked. As the nose gear doors close, the nose gear sequence valve is repositioned to block hydraulic pressure to the nose gear and nose gear lock actuators. When the gear is in the up and locked position, with control handle in UP position, hydraulic pressure remains on the close side of door actuator and on extend (lock) side of the lock retention actuator. When the control handle is placed to OFF position, hydraulic pressure is blocked at the selector valve and the nose gear is held in up and locked position by a lock spring within the drag brace knuckle to keep the lock roller in the lock detent. The nose gear doors are kept locked closed by a lock bungee.

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- (2) When the landing gear control handle is placed in DOWN position with the gear up and locked, hydraulic pressure is directed through the selector valve to open the wheel well doors.
- (See figure 7) The nose gear doors are held open during gear extension by hydraulic pressure from the nose gear down line. When the doors open the gear sequence valve is positioned to direct hydraulic pressure to the retract port of the lock actuator and to retract port of gear actuator. Retraction of the lock actuator, with the nose gear up and locked, unlocks the gear. Retraction pressure remains on the lock actuator throughout gear extension. As the drag brace and lock crank rotates from the gear up to the gear down position, the lock actuator and lock crank arm attachment point passes to an overcenter position so that retract pressure in the lock actuator locks the nose gear. As soon as the drag brace reaches the gear down position, the retract action of the lock actuator pushes the lock roller into the lock detent and locks the gear. Locking of the nose gear repositions the door control valve to close the nose gear doors and block pressure from the nose gear actuator and lock actuator.

SAB REV 7 MARS 1970

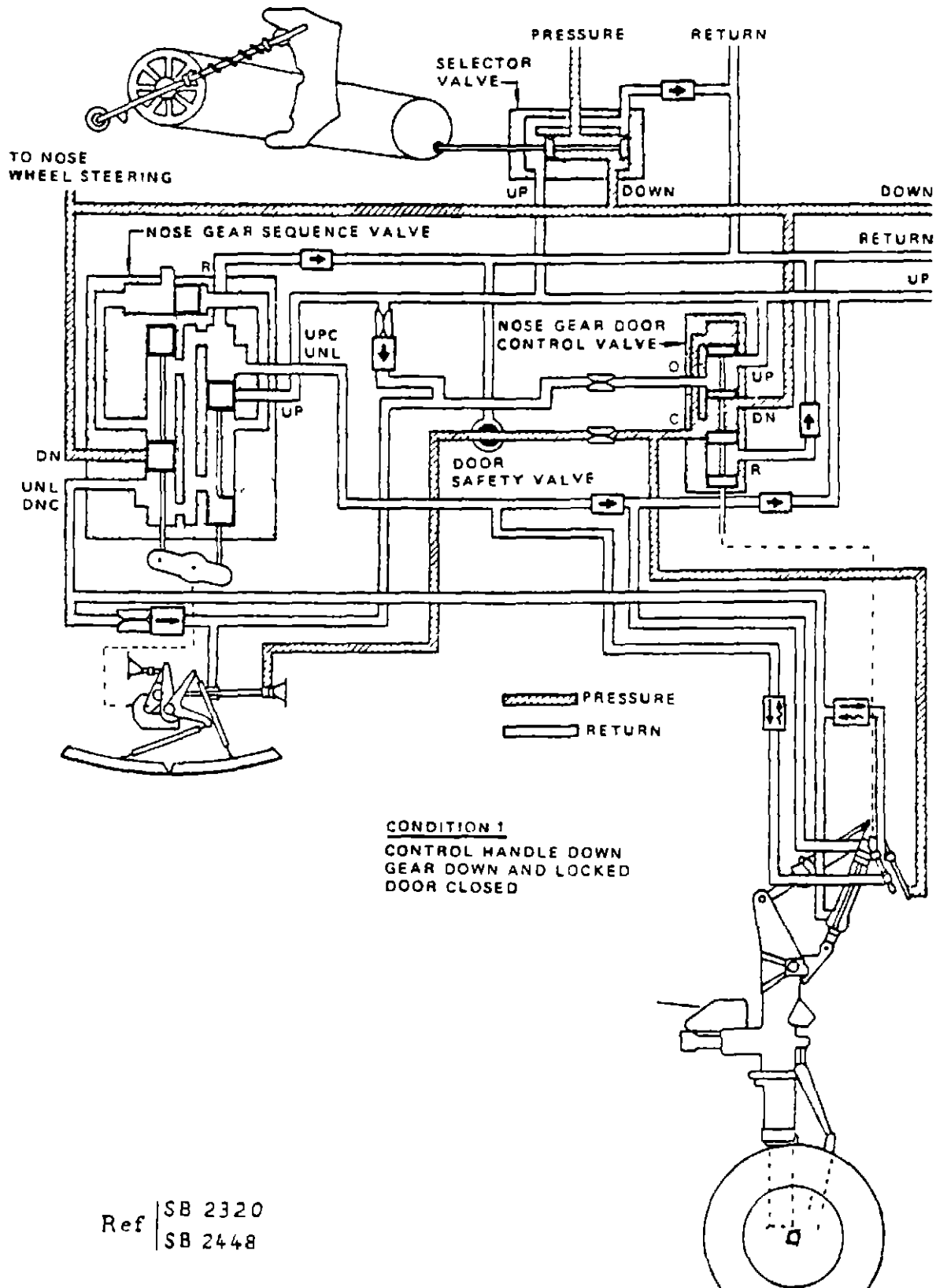
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| SB 2448

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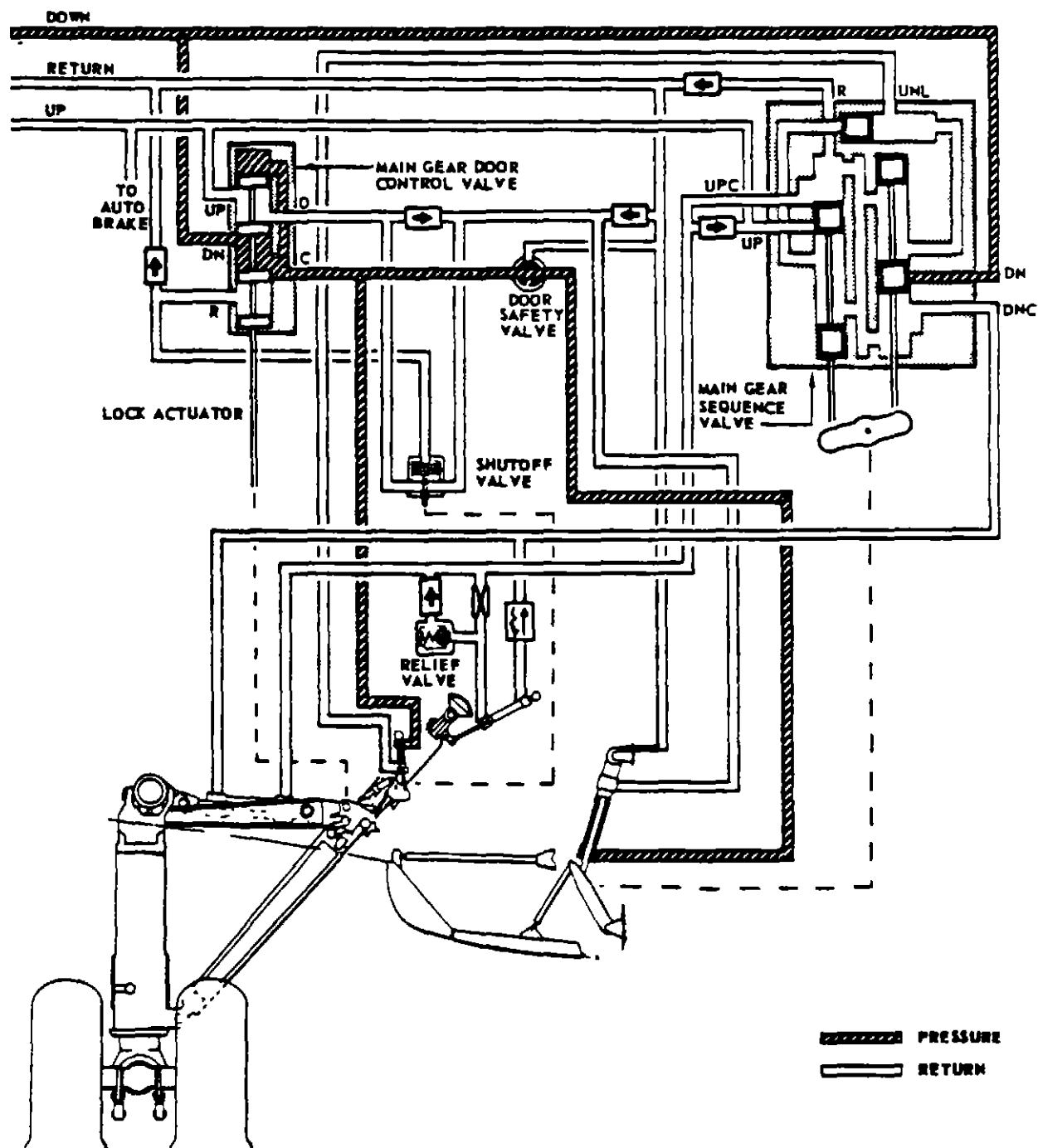
EFFECTIVITY
ALL AIRPLANES



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| SB 2448

Landing Gear Operating Sequence
Figure 7 (Sheet 1)

LANDING GEAR
Landing Gear and Door Control System
Description and Operation

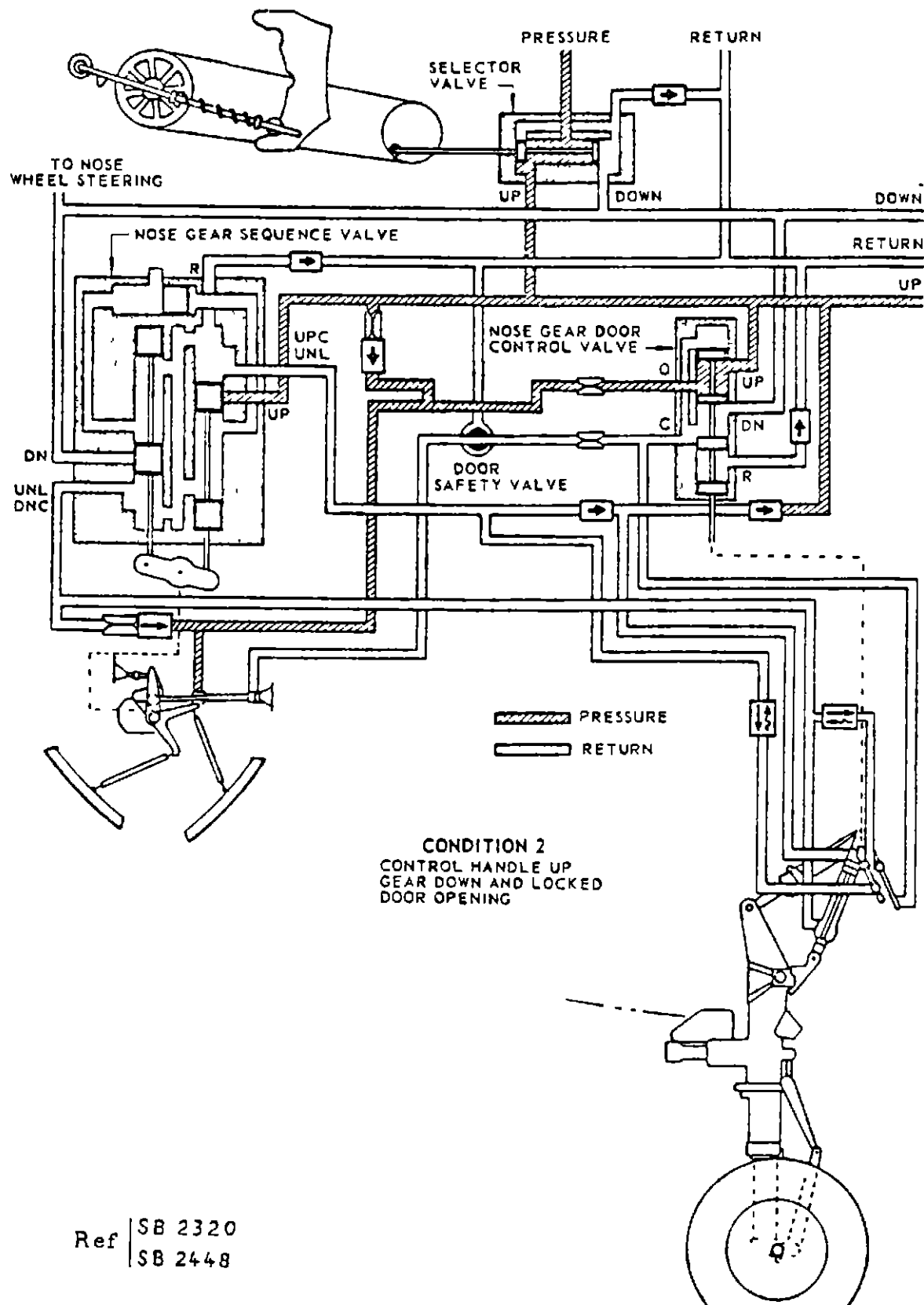


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Landing Gear Operating Sequence
Figure 7 (Sheet 2)

SAB REV 7 MARS 1970

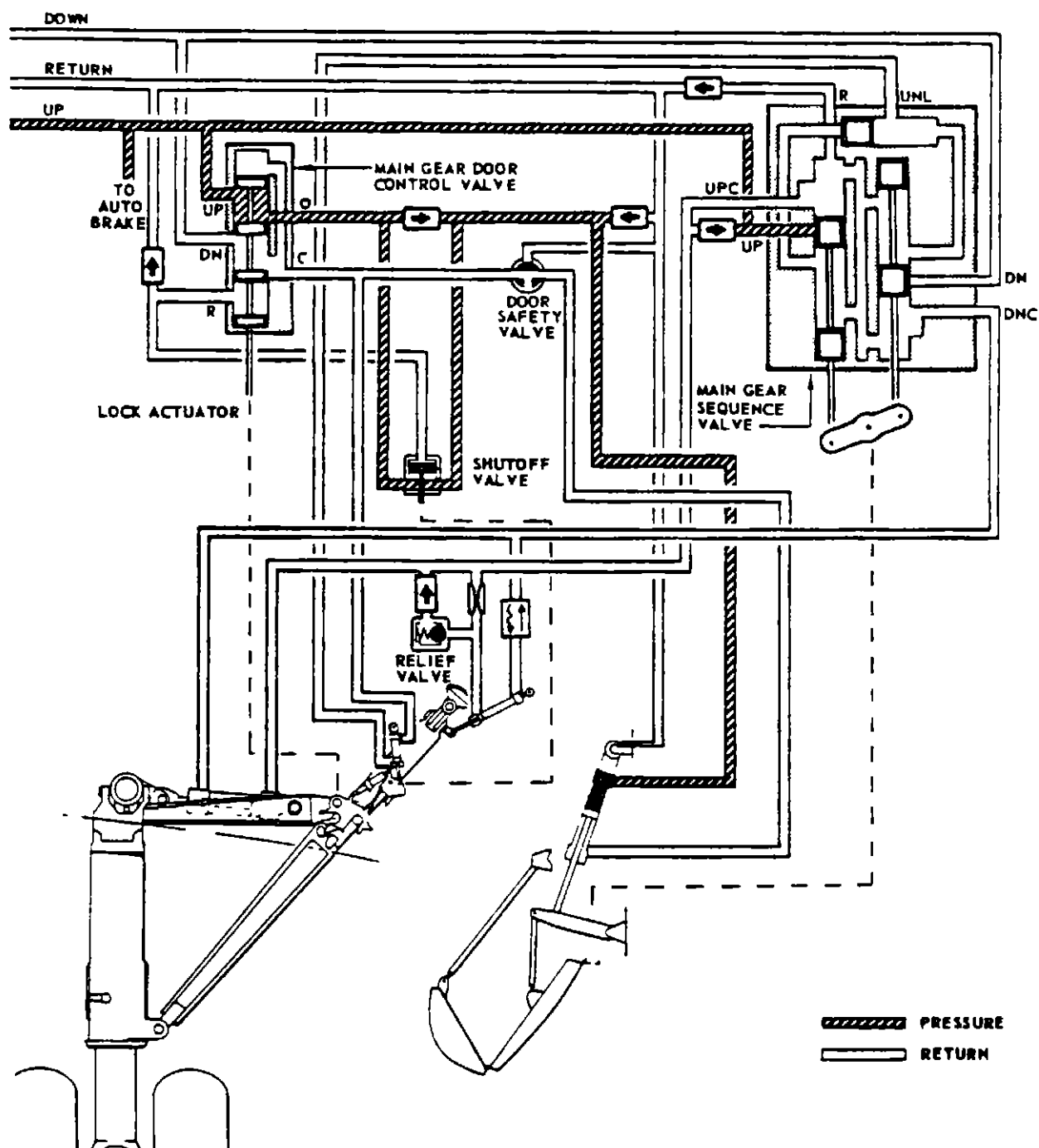
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Landing Gear Operating Sequence
 Figure 7 (Sheet 3)

LANDING GEAR
Landing Gear and Door Control System
Description and Operation

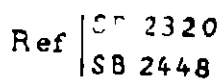


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Landing Gear Operating Sequence
Figure 7 (Sheet 4)

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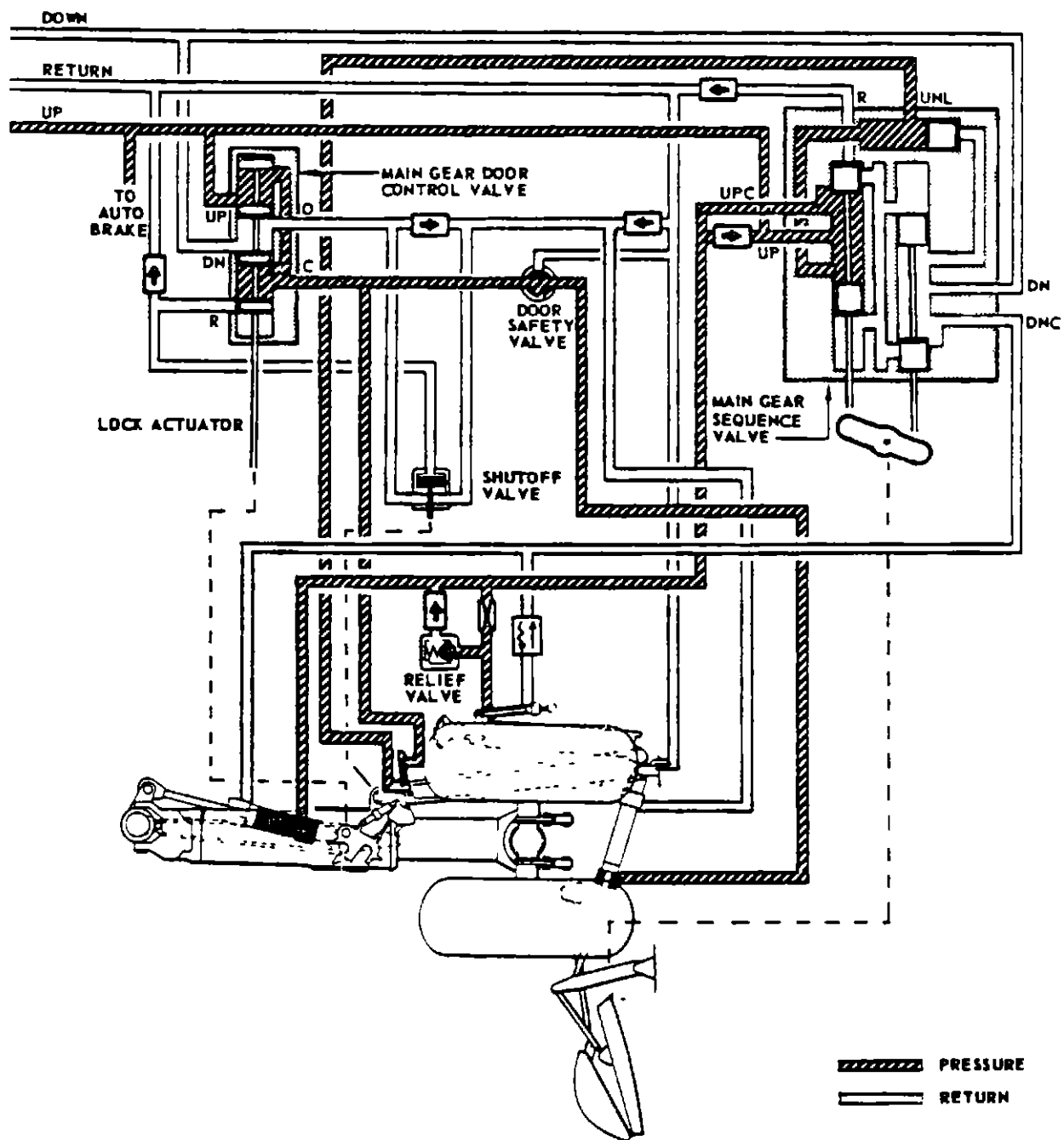


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LANDING GEAR
Landing Gear and Door Control System
Description and Operation



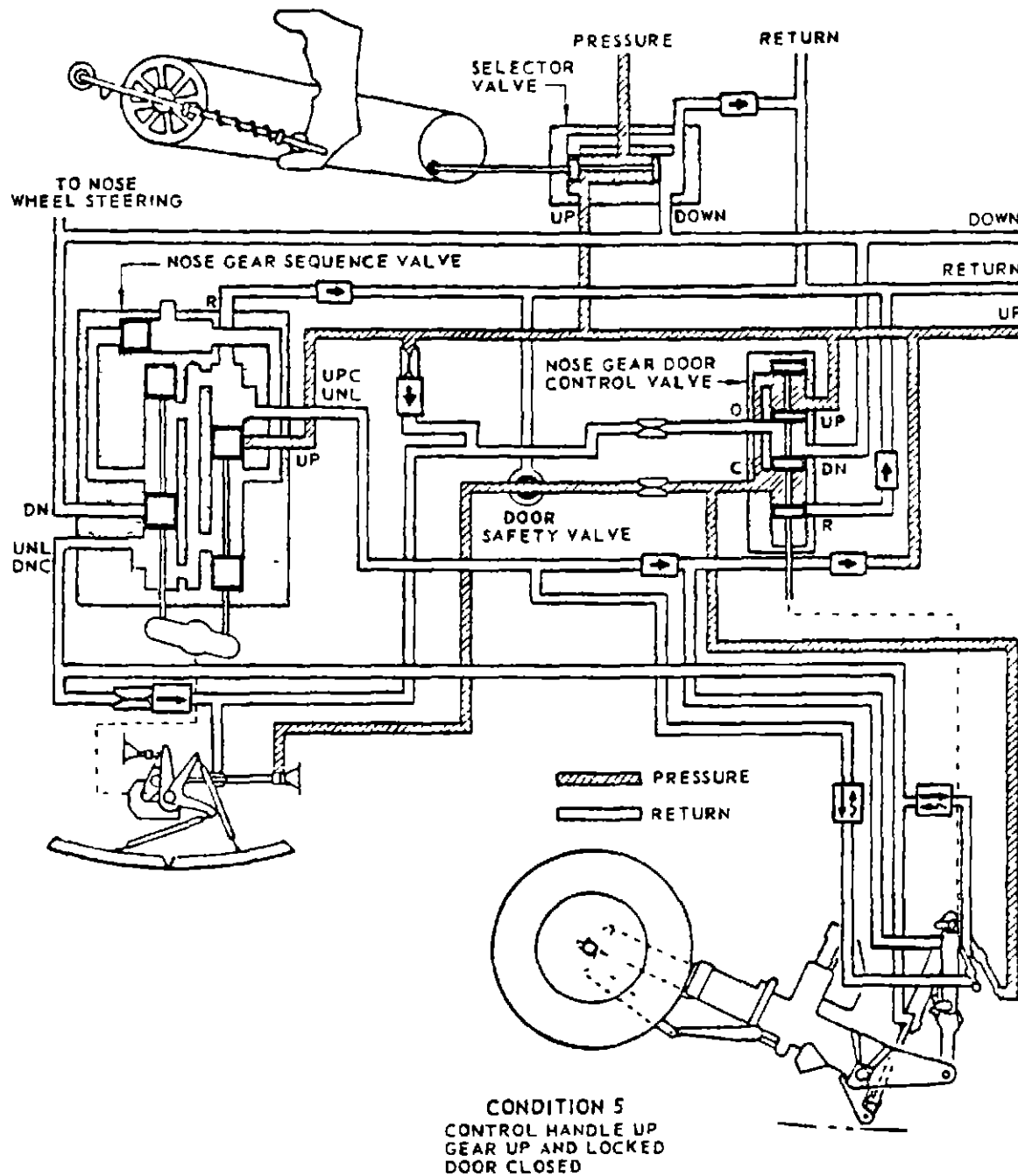
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Landing Gear Operating Sequence
Figure 7 (Sheet 8)

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EFFECTIVITY
ALL AIRPLANES

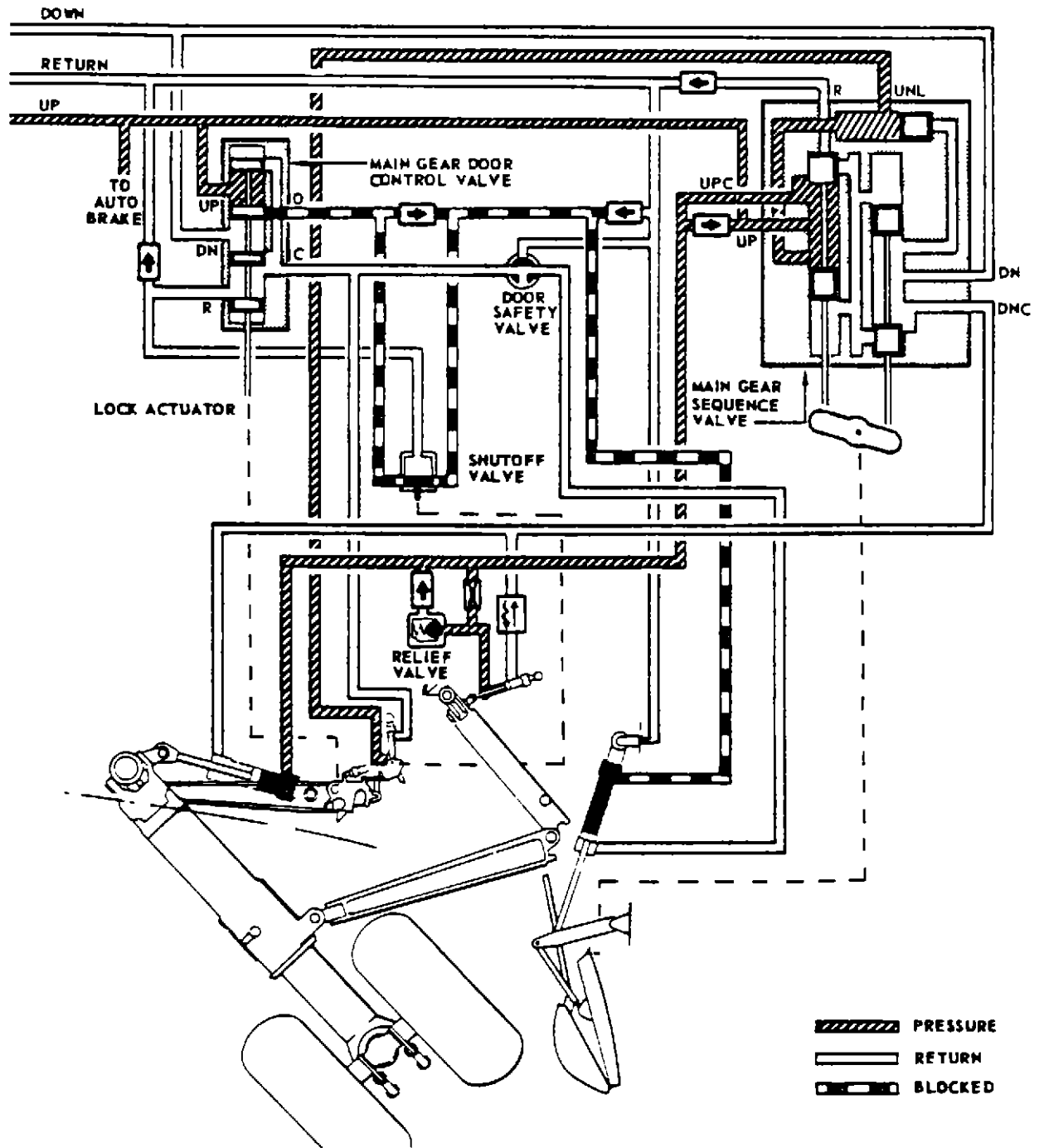


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Landing Gear Operating Sequence
Figure 7 (Sheet 9)

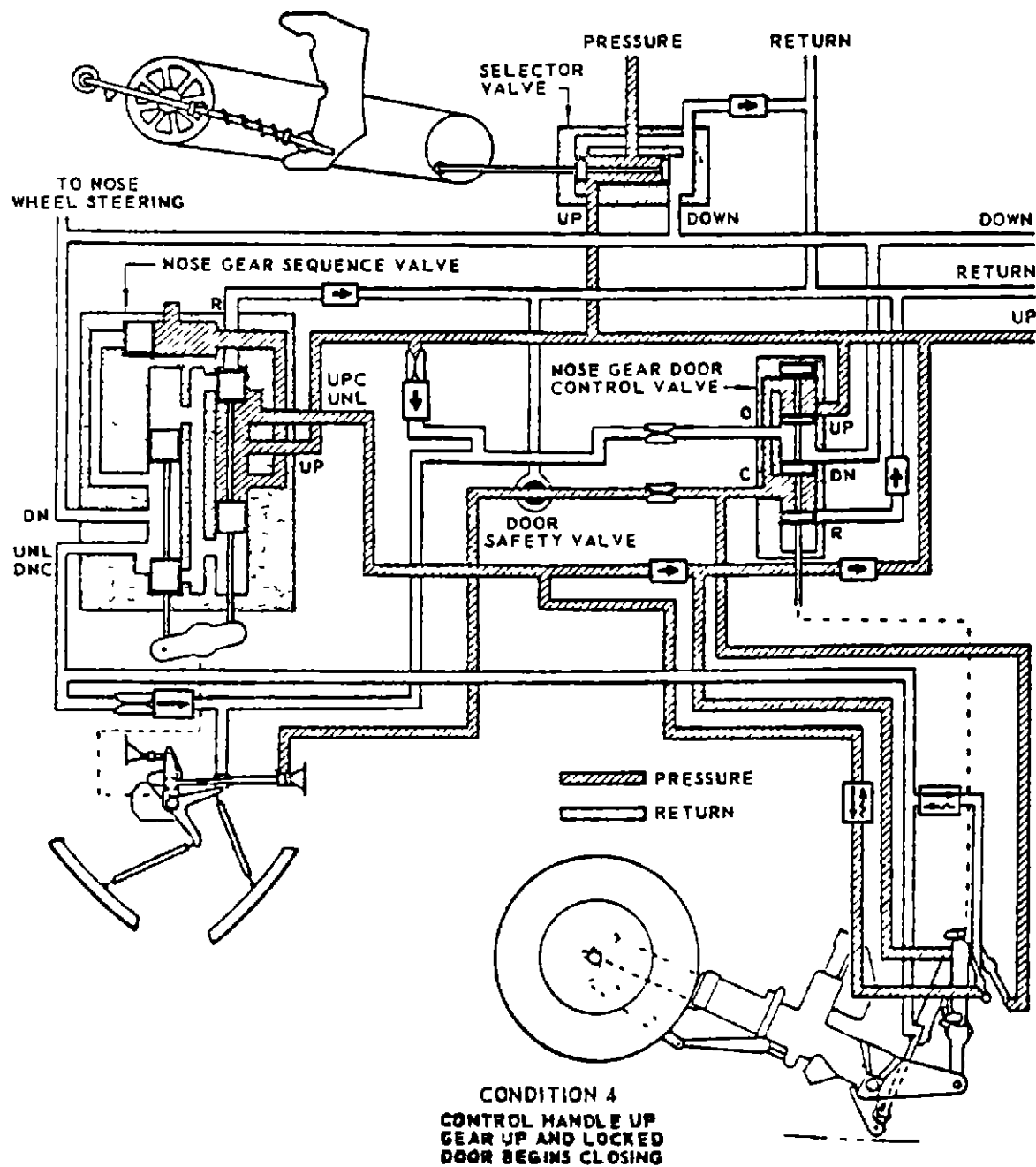
LANDING GEAR
Landing Gear and Door Control System
Description and Operation



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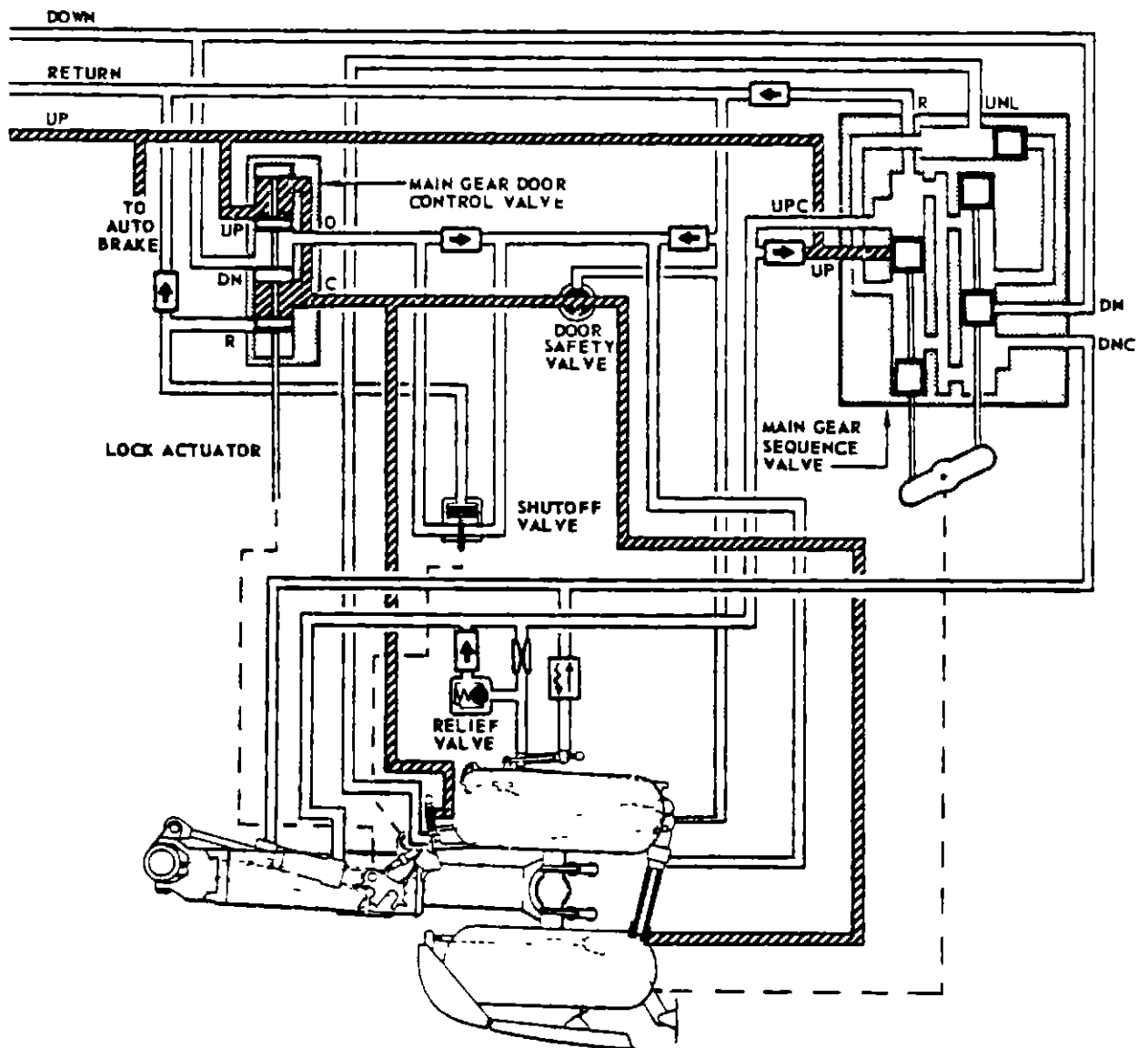
Landing Gear Operating Sequence
Figure 7 (Sheet 6)

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Landing Gear Operating Sequence
 Figure 7 (Sheet 7)



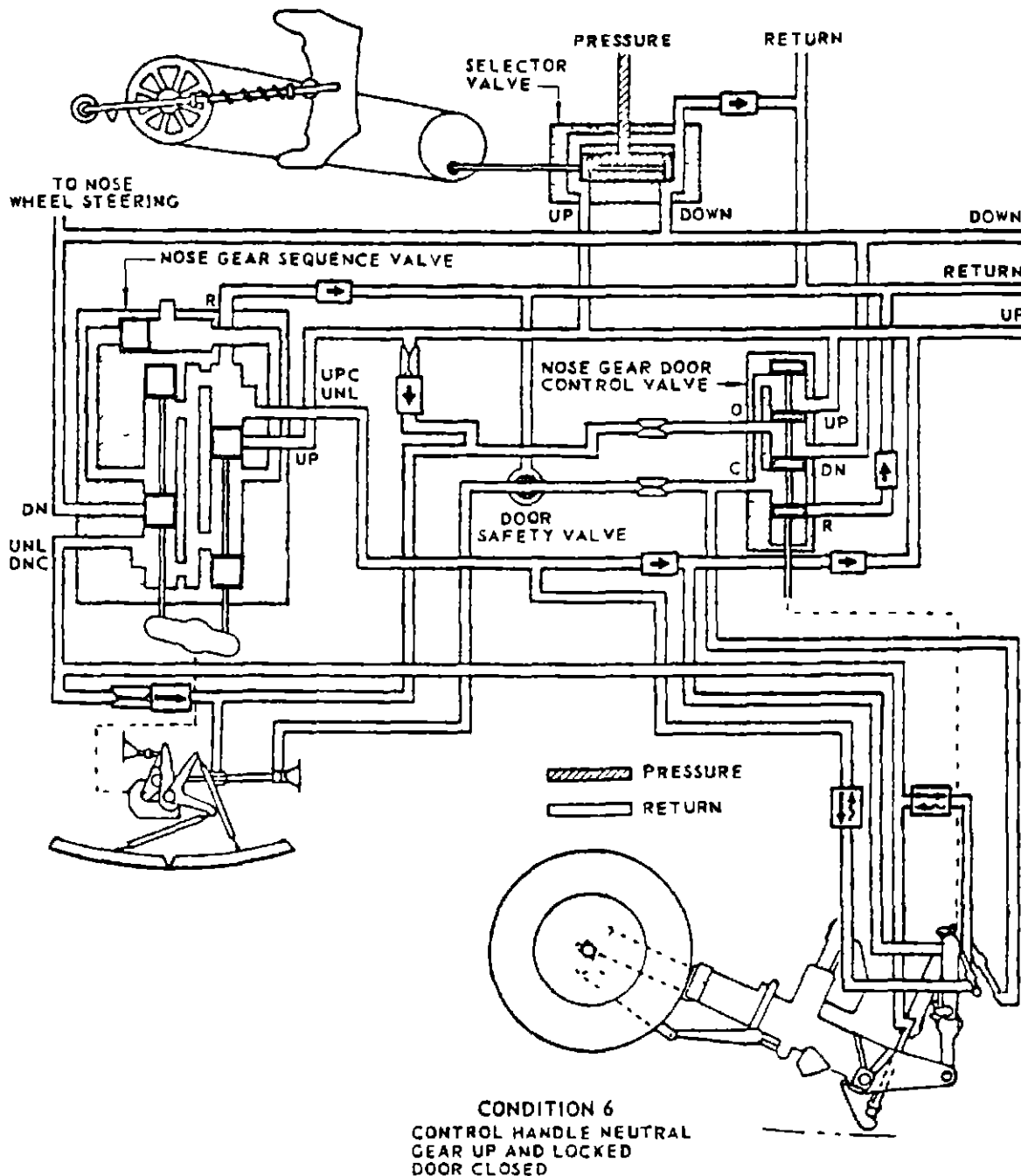
PRESSURE
 RETURN

SAB REV 7 HANS 1570

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Landing Gear Operating Sequence
Figure 7 (Sheet 10)

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Landing Gear Operating Sequence
 Figure 7 (Sheet 11)

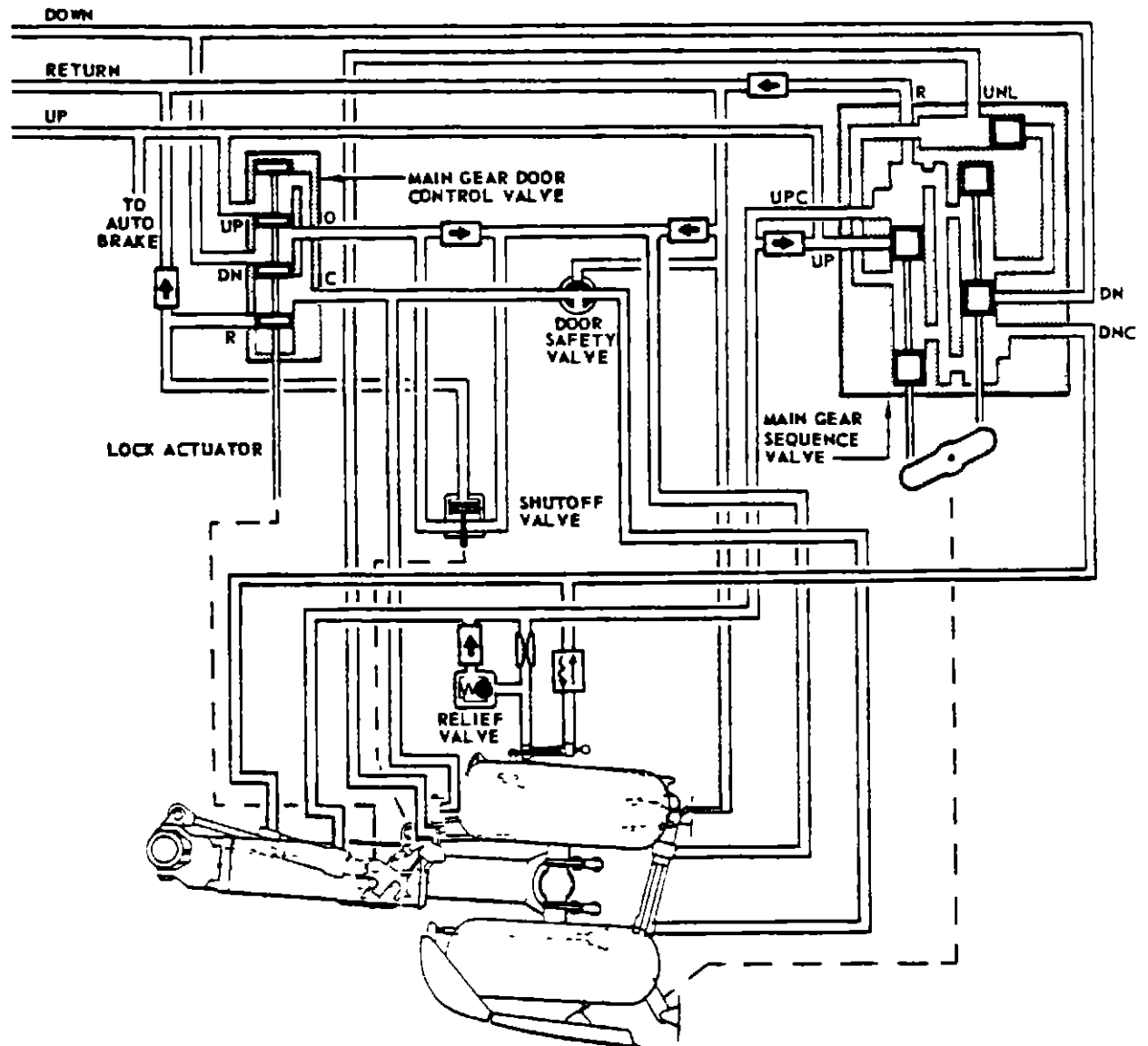
SAB REV 7 MARS 1970

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LANDING GEAR
Landing Gear and Door Control System
Description and Operation

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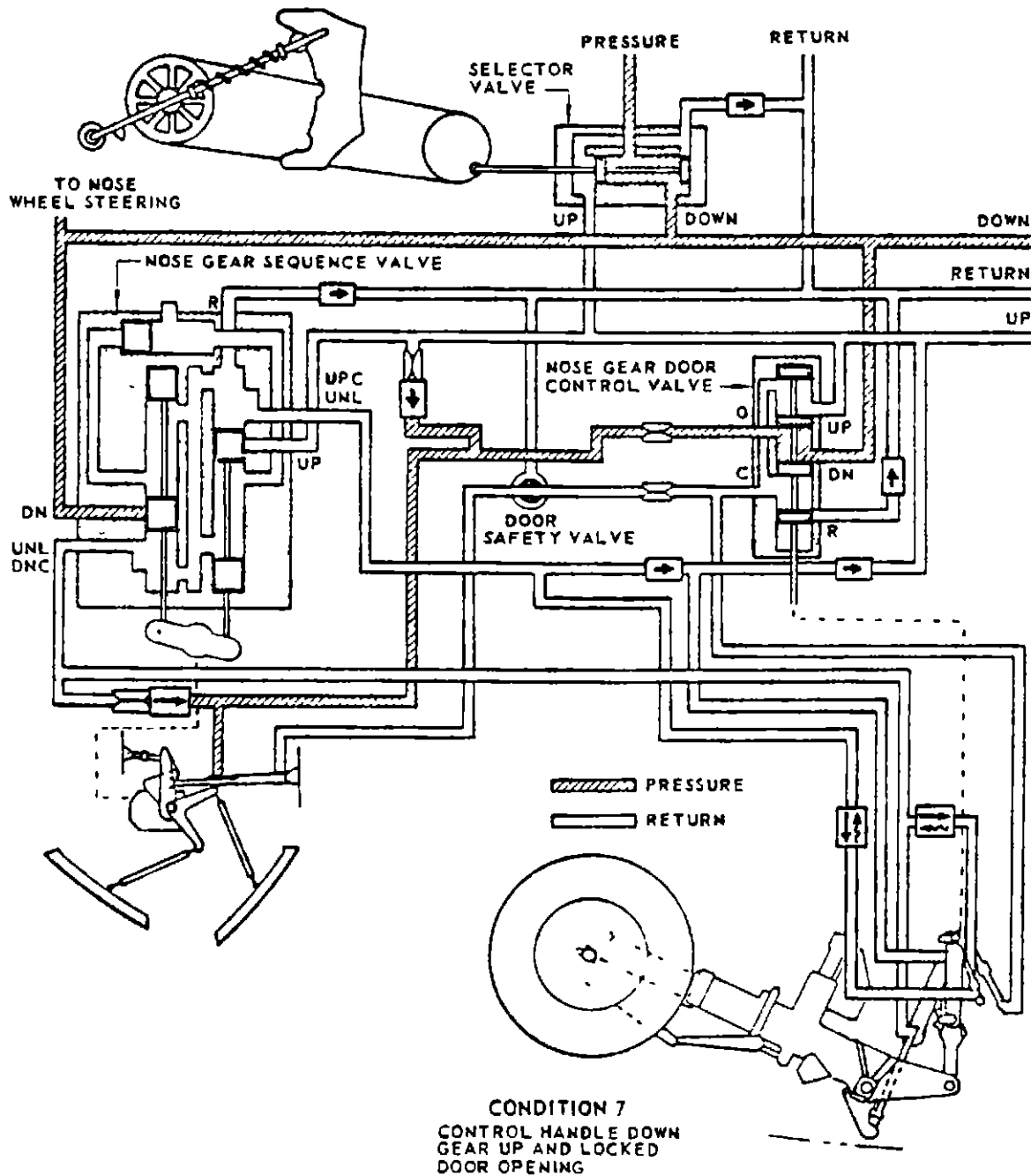
PRESSURE
 RETURN

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Landing Gear Operating Sequence
Figure 7 (Sheet 12)

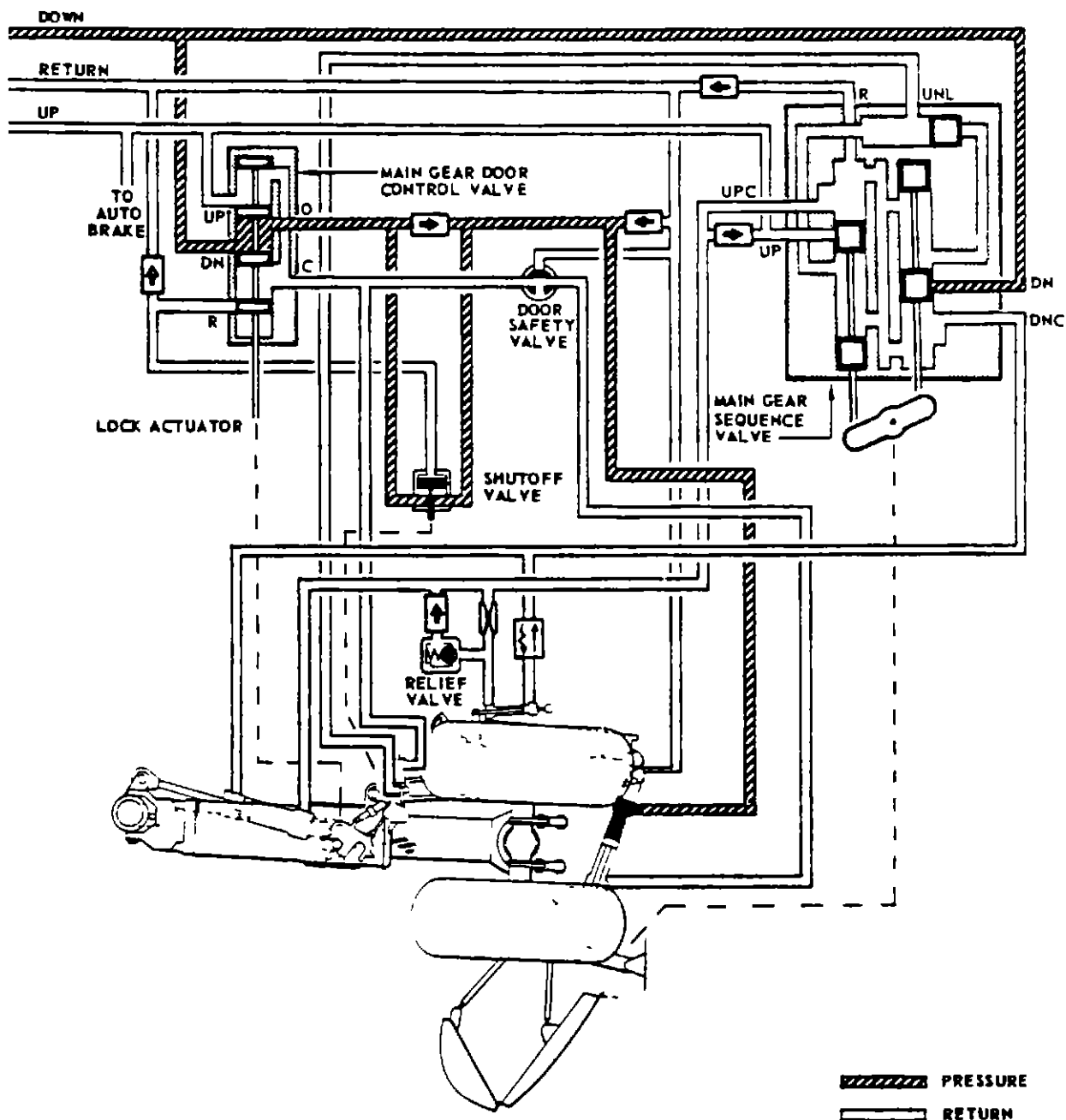
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Landing Gear Operating Sequence
Figure 7 (Sheet 13)

SAB REV 7 MARS 1970

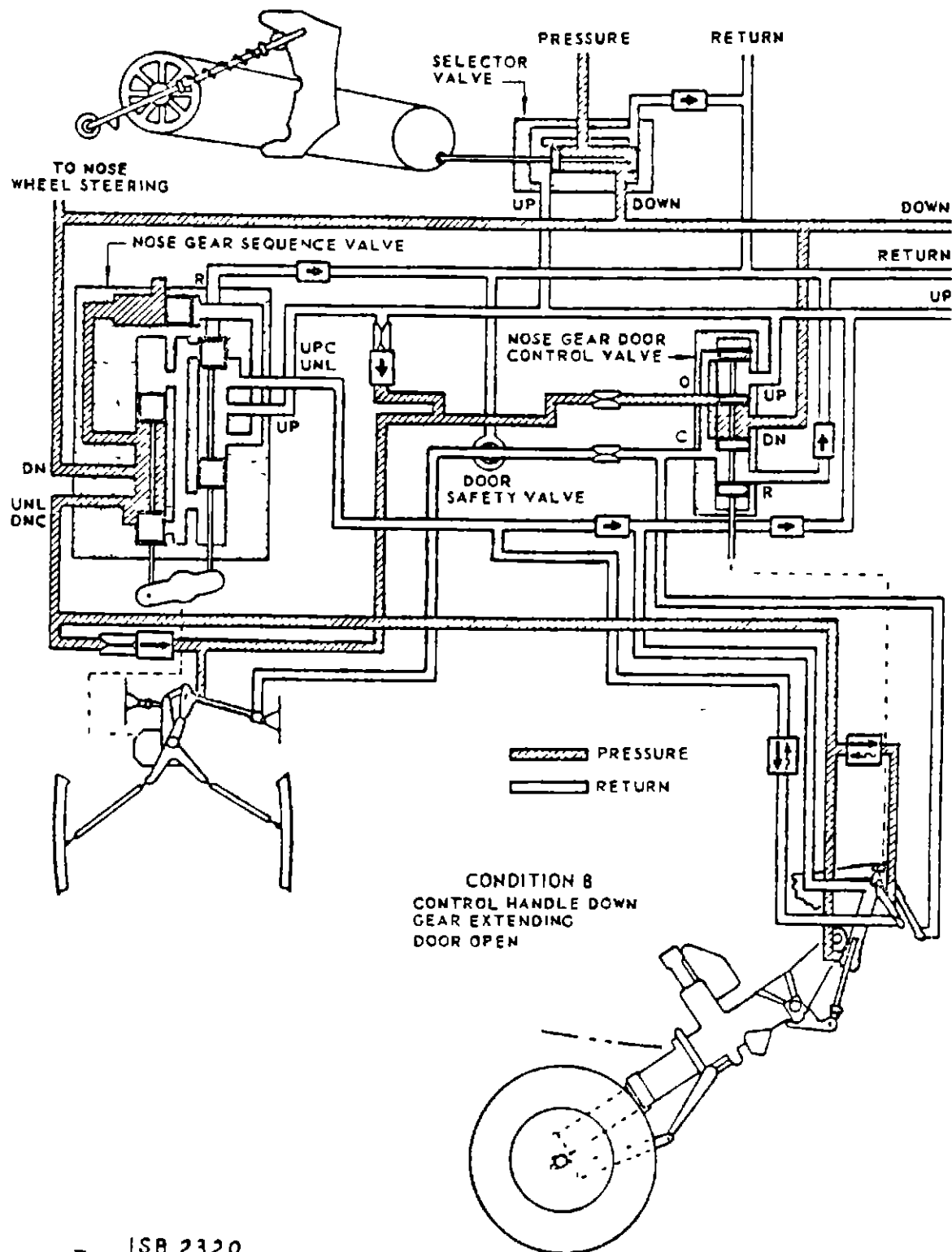


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Landing Gear Operating Sequence
Figure 7 (Sheet 14)

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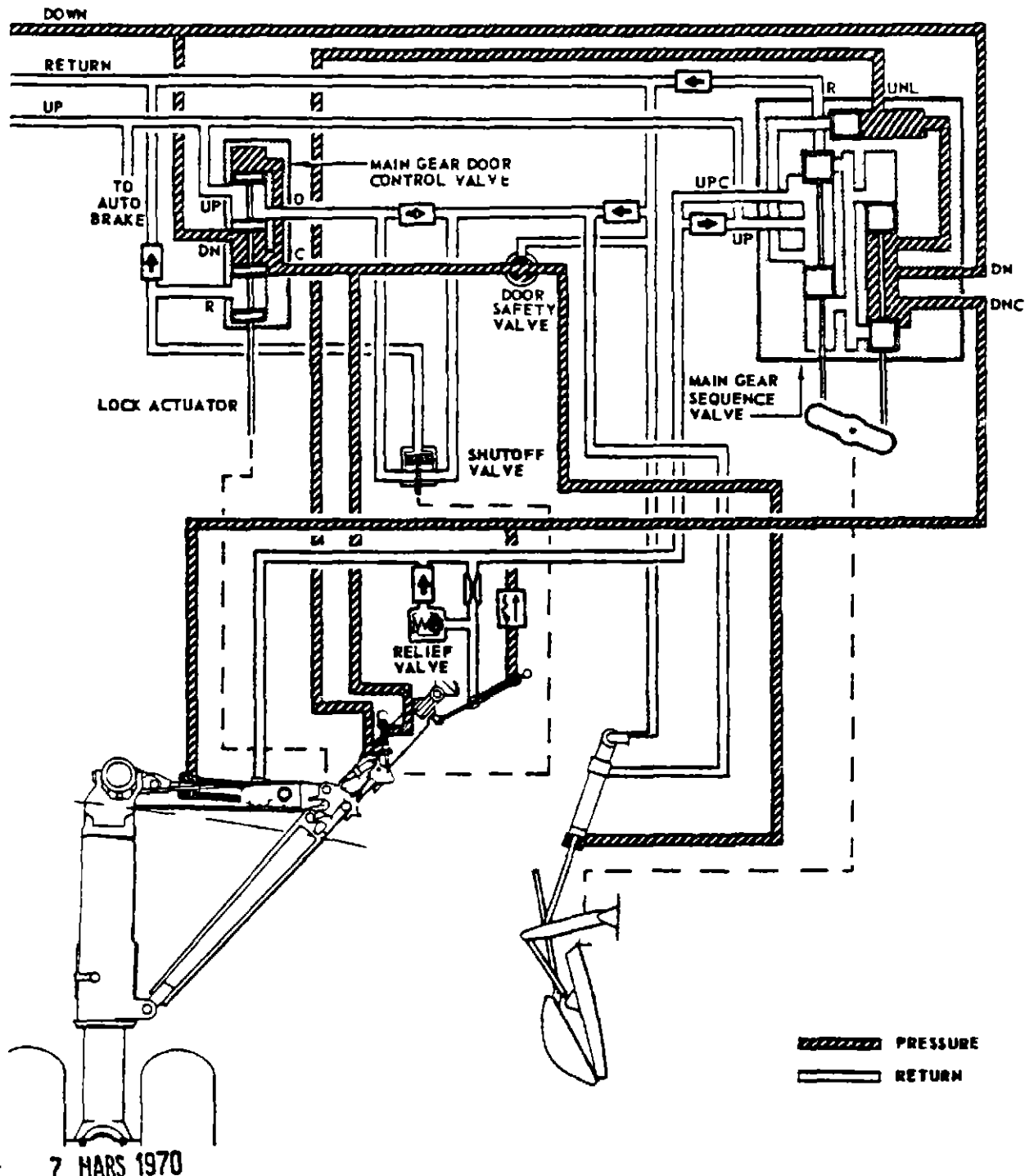
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SAB REV 7 MARS 1970

LANDING GEAR

Landing Gear and Door Control System

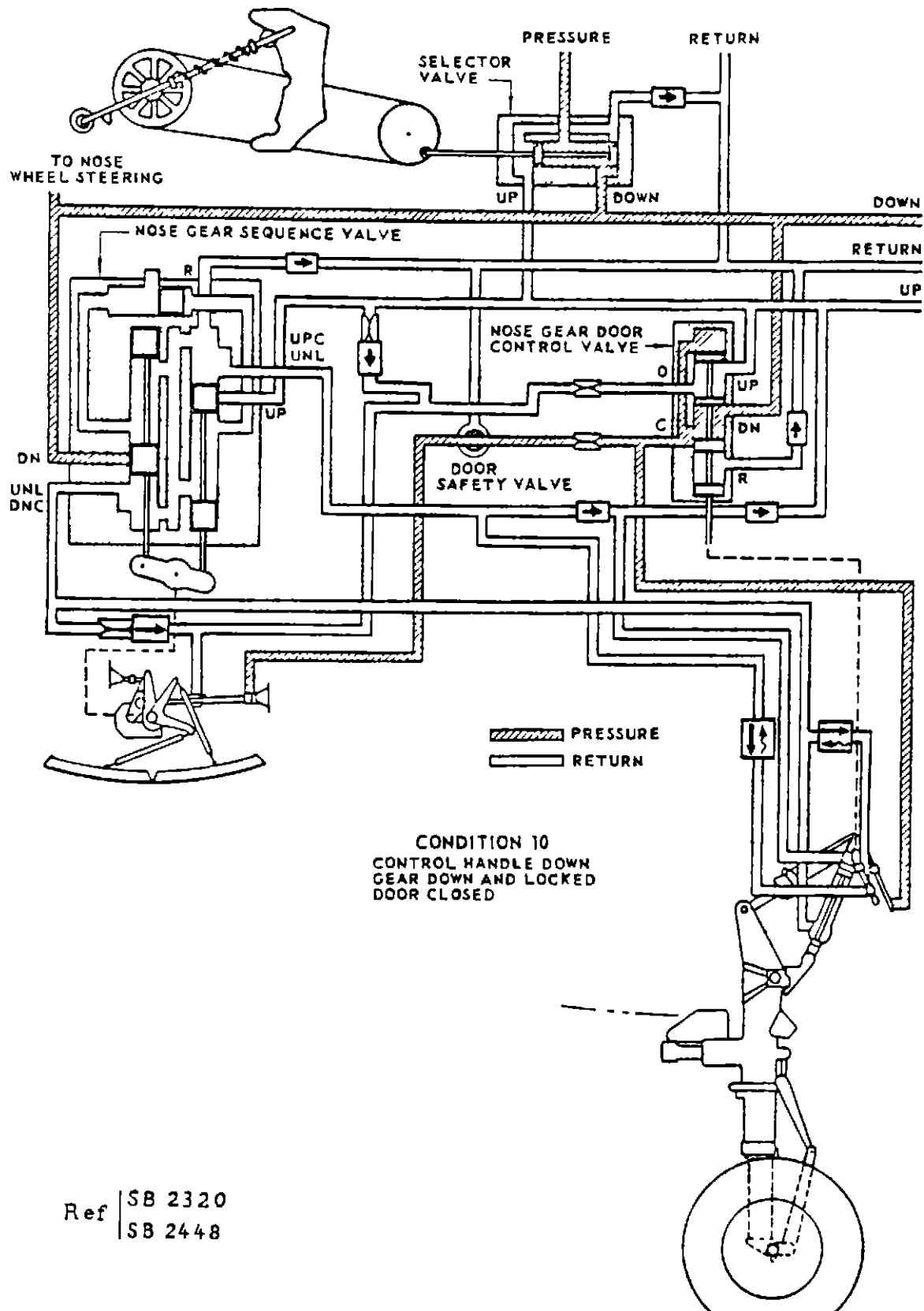
Description and Operation



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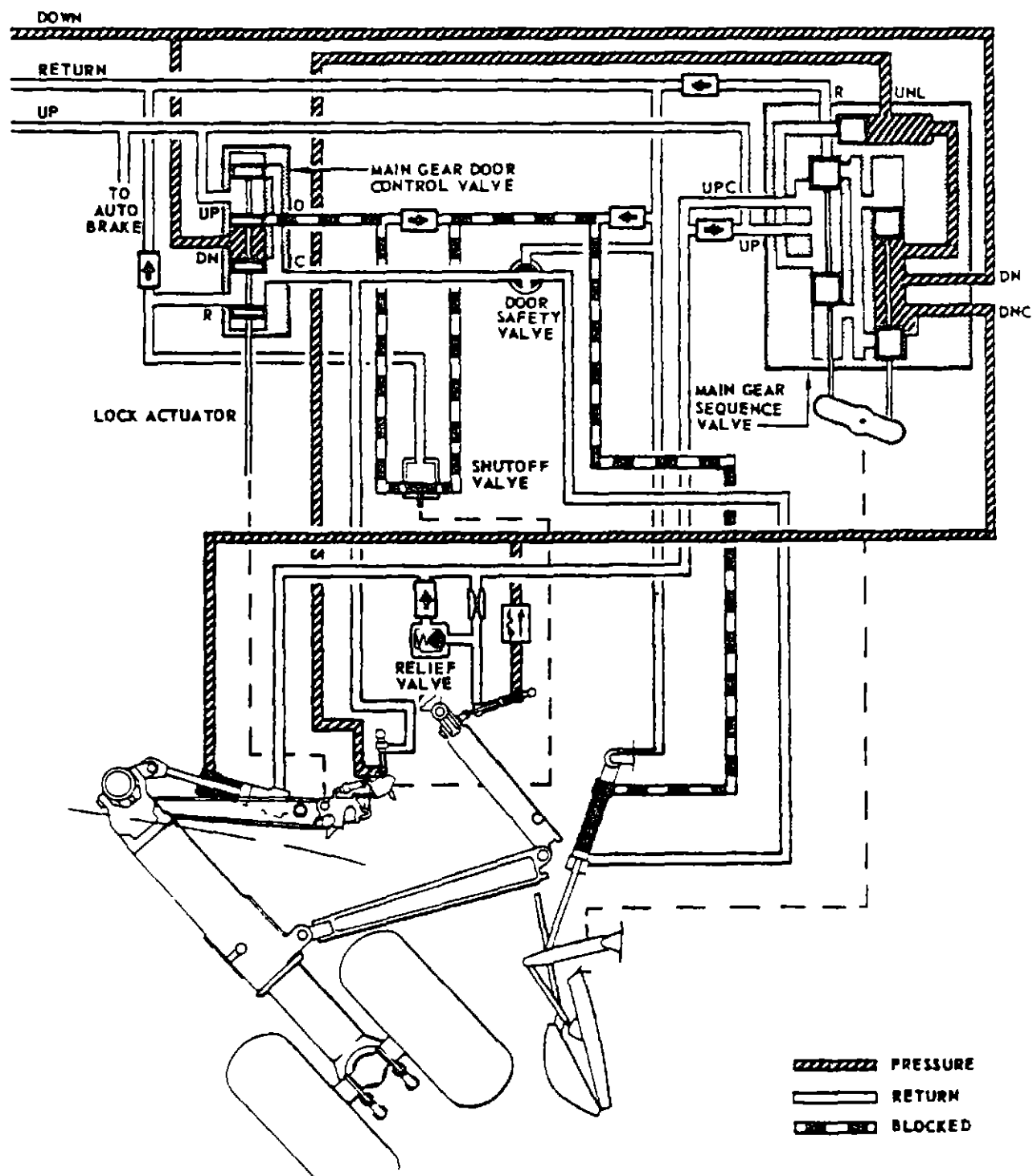
Landing Gear Operating Sequence
Figure 7 (Sheet 18)



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Landing Gear Operating Sequence
 Figure 7 (Sheet 19)

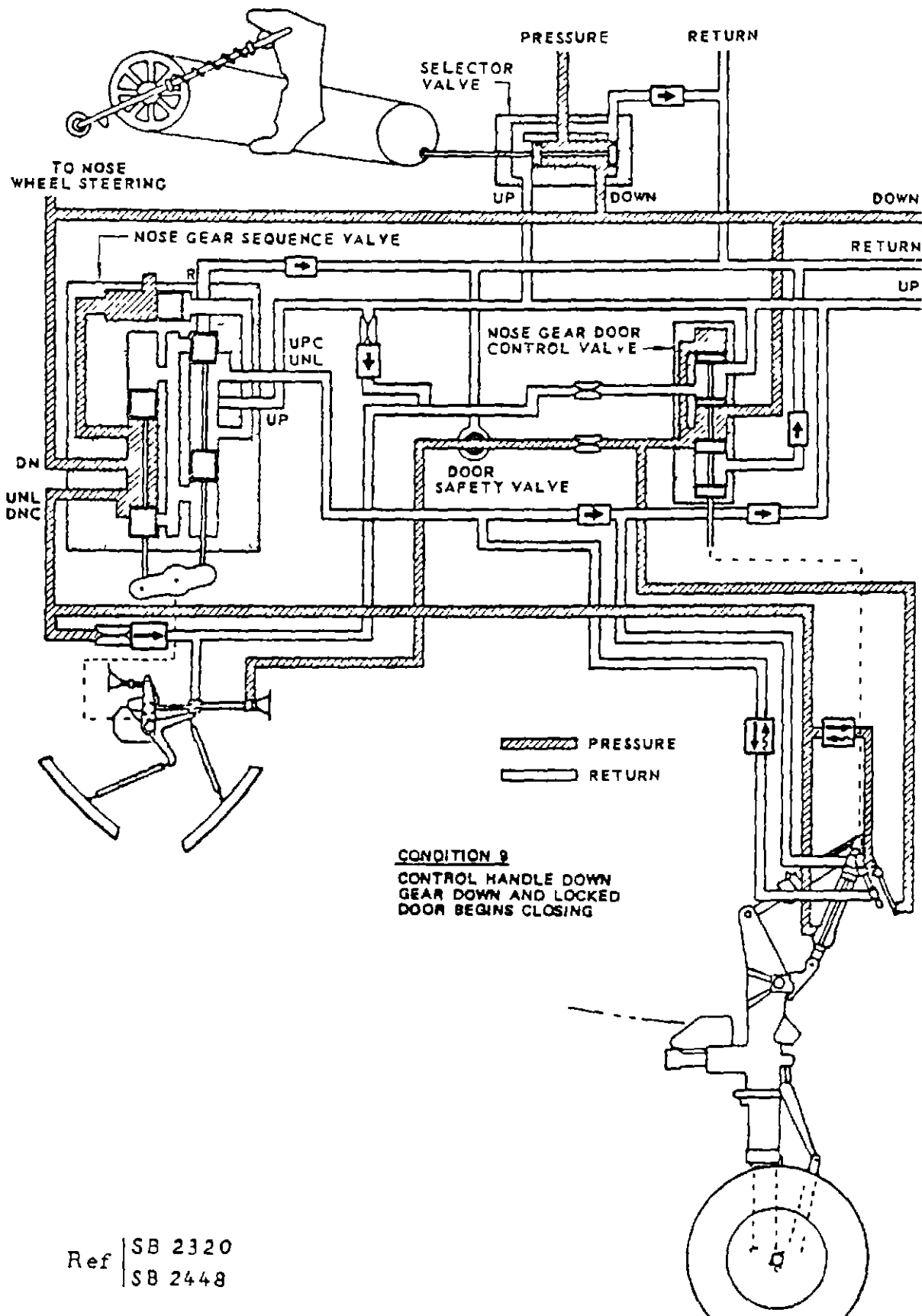
LANDING GEAR
Landing Gear and Door Control System
Description and Operation



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Landing Gear Operating Sequence
Figure 7 (Sheet 16)



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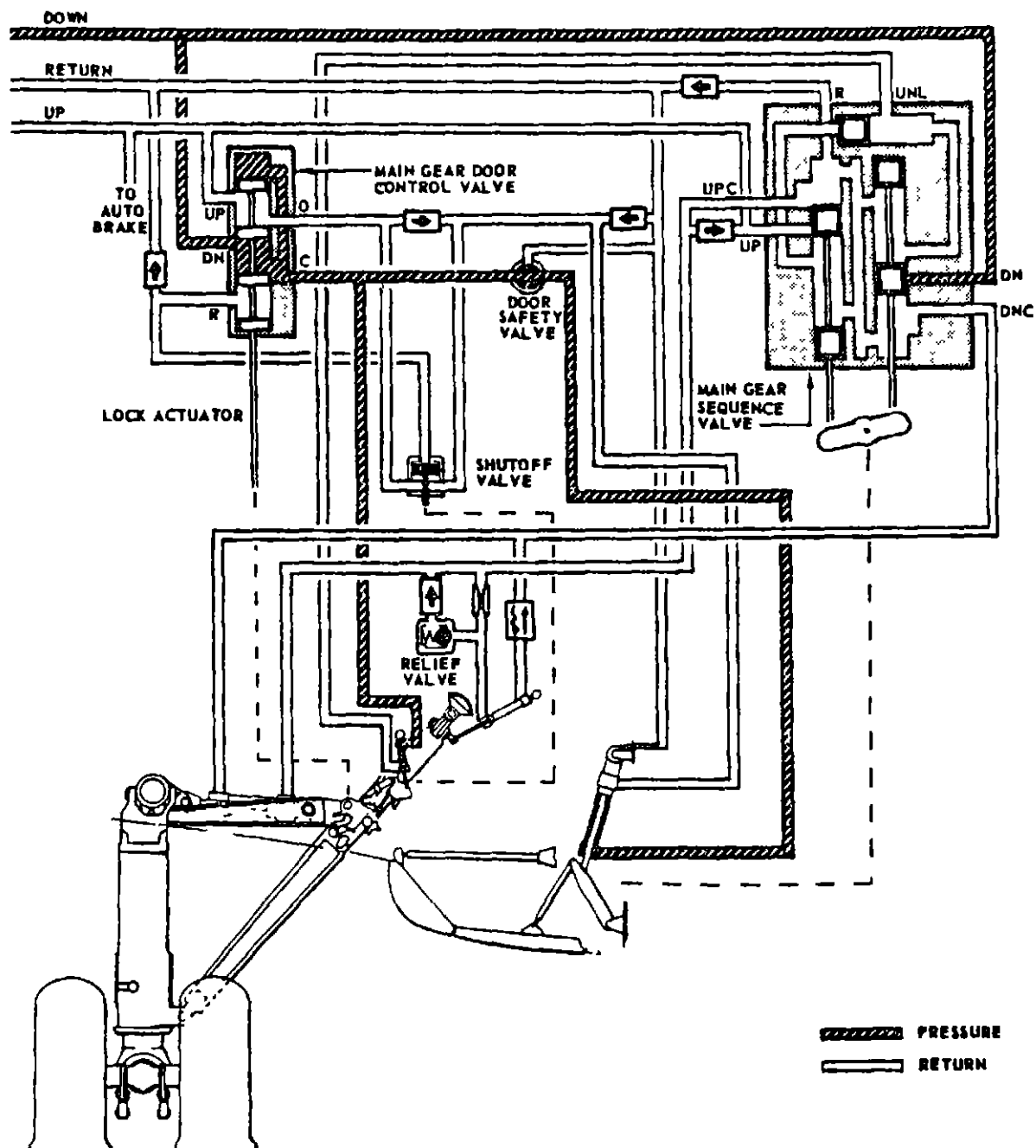
Landing Gear Operating Sequence
Figure 7 (Sheet 17)

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LANDING GEAR
Landing Gear and Door Control System
Description and Operation



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Landing Gear Operating Sequence
Figure 7 (Sheet 20)

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WARNING THIS CAN BE A VERY DANGEROUS CONDITION IF THE NOSE LANDING GEAR IS NOT LOCKED IN THE DOWN POSITION, IT CAN INADVERTENTLY RETRACT IF THE NOSE LANDING GEAR RETRACTS, INJURY OR DEATH TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR

THE AIRPLANE IS ON THE GROUND AND THE RED WARNING LIGHT FOR THE NOSE LANDING GEAR IS ILLUMINATED THE LANDING GEAR CONTROL LEVER IS IN THE DN POSITION

WARNING DO NOT LET YOURSELF OR ANOTHER PERSON BE UNDER THE AIRPLANE TO CHECK FOR THE GROUND LOCK ASSEMBLY IF THE NOSE LANDING GEAR RETRACTS, INJURY OR DEATH TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR

If you are not sure if the ground lock assembly for the nose landing gear is installed, do the steps that follow

WARNING MOVEMENT OF THE AIRPLANE CAN CAUSE THE INADVERTENT RETRACTION OF THE NOSE LANDING GEAR IF IT IS NOT IN THE LOCKED POSITION AND THE GROUND LOCK ASSEMBLY IS NOT INSTALLED IF THE NOSE LANDING GEAR RETRACTS, INJURY OR DEATH TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR

- 1 Stop all maintenance and other activities that can cause the airplane to move, shake, or bounce
- 2 Make sure that the configuration of the hydraulic system is NOT changed

NOTE If the hydraulic power is supplied, leave it on If the hydraulic power is not supplied, leave it off

- 3 Make sure the parking brake is set
- 4 Make sure that chocks are secured against the front and back of at least one set of MAIN LANDING GEAR tires

WARNING MAKE SURE THE GROUND LOCK ASSEMBLIES ARE INSTALLED ON ALL THE MAIN LANDING GEAR WITHOUT THE GROUND LOCK ASSEMBLIES, THE LANDING GEAR COULD RETRACT AND CAUSE INJURIES TO PERSONS AND DAMAGE TO EQUIPMENT

- 5 If the ground lock assemblies are not installed on all the main landing gear, install the ground lock assemblies

WARNING DO NOT LET YOURSELF OR ANOTHER PERSON BE UNDER THE AIRPLANE WHEN YOU PUT THE CHOCKS IN FRONT OF THE NOSE LANDING GEAR TIRES IF THE NOSE LANDING GEAR RETRACTS, INJURY OR DEATH TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR

- 6 Use ropes or a long pole to put a chock in FRONT of the nose landing gear tires, if chocks are not already installed

NOTE Do not put chocks behind the nose landing gear tires It will not help prevent an inadvertent retraction of the nose landing gear

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ING GEAR AND DOOR CONTROL SYSTEM - TROUBLE SHOOTING

Items

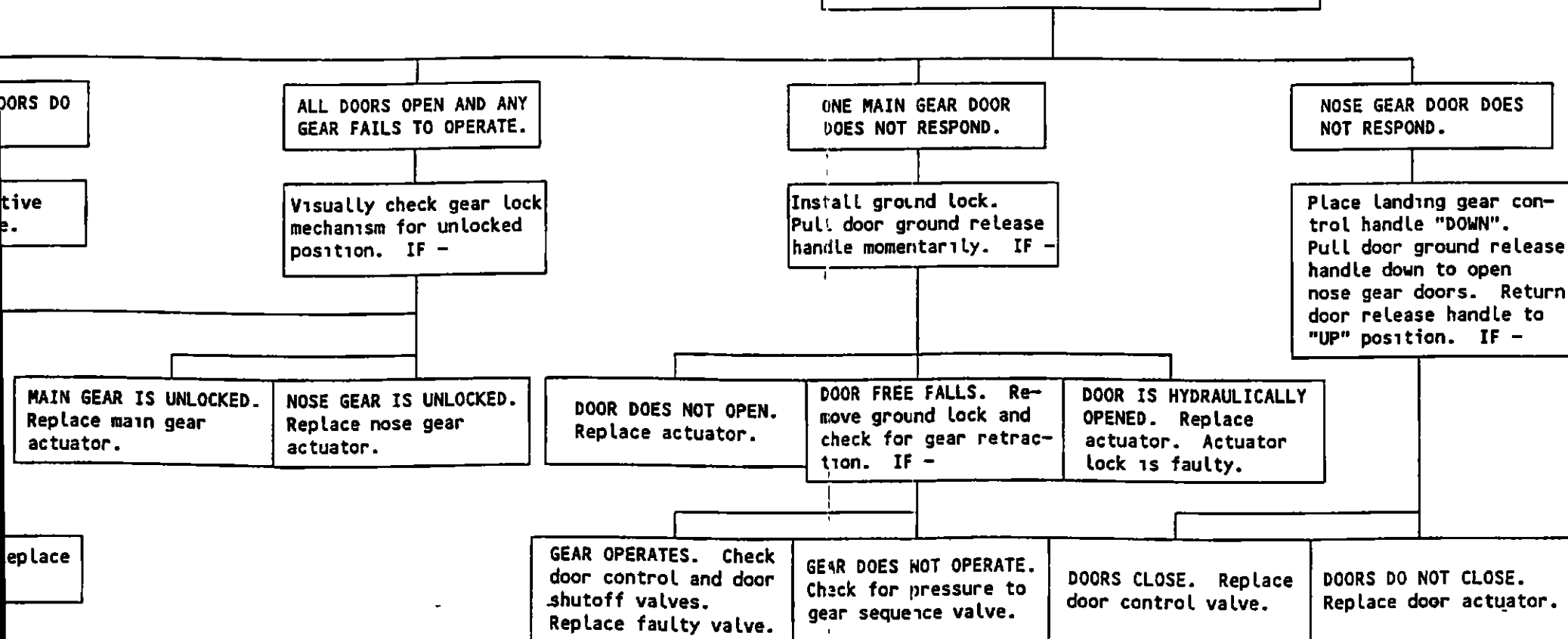
Following items must be completed before control system is operated
trouble shooting.

Check main gear snubber and leveling cylinder for required fluid
air servicing, see Servicing Chapter 12.

Check nose and both main gear shock struts for required fluid and
servicing.

Check system rigging per "Adjustment/Test Landing Gear Control Cable
System, see 32-1-11. Check that all hydraulic actuators have proper
cables attached to respective actuator ports.

See "Airplane Jacking", Chapter 7.



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CONTINUED FROM PRECEDING PAGE

- 7 Look through the nose landing gear viewing port to see if the visual lock indicator arrows on the lock mechanism shows it is locked

NOTE You can also look through the viewing port to see if the ground lock assembly for the nose landing gear is installed in the lock mechanism. If you can clearly see it and you are sure it is installed, then the lock mechanism is in the locked position.

Do the visual indicator arrows indicate that the lock mechanism is in the locked position? IF -

Do the Landing Gear Position Indicating and Warning System - Maintenance Practices Procedure (AMM 32-6-41/201) IF -

NOT OK - Do the Landing Gear Position Indicating and Warning System - Troubleshooting procedure (AMM 32-6-0/101)

NO/NOT SURE - Do the steps that follow
WARNING DO NOT LET YOURSELF OR ANOTHER PERSON BE UNDER THE AIRPLANE WHEN YOU INSTALL THE JACK PAD. IF THE NOSE LANDING GEAR RETRACTS, INJURY OR DEATH TO PERSONS AND DAMAGE TO EQUIPMENT CAN OCCUR.

- 1 Carefully install the nose jack pad
- 2 Lift the nose of the airplane with a jack such that the jack supports some of the weight of the airplane, but does not lift the nose landing gear tires off the ground (AMM 7-1-1/201)
- 3 If hydraulic power is supplied, remove the hydraulic power from the hydraulic system (AMM 29-9-21/201)
- 4 Lift the nose of the airplane until the nose landing gear tires are clear of the ground (AMM 7-1-1/201)

Do the Nose Landing Gear Extension and Retraction Test from the "Landing Gear and Door Control System - Maintenance Practices (AMM 32-1-0/201) " IF -

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FOLLOWING PAGE

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NO - If the functional test was not normal or you can not install the ground lock assembly for the nose landing gear, adjust the lock mechanism (OHM 32-04-06)

NOTE You can not adjust the lock mechanism if it is installed on the airplane. It is necessary to remove the lock mechanism to adjust it (AMM 32-4-51/201)

Can you now install the nose landing gear ground lock assembly? IF

NO - Replace the Nose Gear Lock Actuating Mechanism - Maintenance Practices (AMM 32-4-51/201)

Can you install the nose landing gear ground lock assembly? IF

NO - Do the Landing Gear and Door Control System - Trouble shooting procedure "ALL DOORS OPEN AND ANY GEAR FAILS TO OPERATE" (AMM 32-1-0/101)

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MAINTENANCE MANUAL

LANDING GEAR AND DOOR CONTROL SYSTEM - MAINTENANCE PRACTICES

1. Unit Servicing, Landing Gear and Door Control System

A. General

- (1) Control cables are lubricated in all areas which contact fairleads, air pressure seals, quadrants, pulleys and drums.
- (2) Cables in contact with magnesium drums and quadrants require lubricants free from graphite. (See figure 201.)
- (3) For cable general servicing, see Control Cable System General, Chapter 27.

B. Lubricate nose gear door control valve actuation link per figure 202.

2. Adjustment/Test Landing Gear and Door Control System

A. Test Landing Gear and Door Control System

(1) General

- (a) The landing gear and door control system is tested to determine proper operation by checking time required for retraction and extension of the gear. This test is performed by operating all landing gear, with the airplane on jacks.
- (b) Prior to conducting the test, the landing gear control cable system must be properly rigged. Refer to 32-1-11.

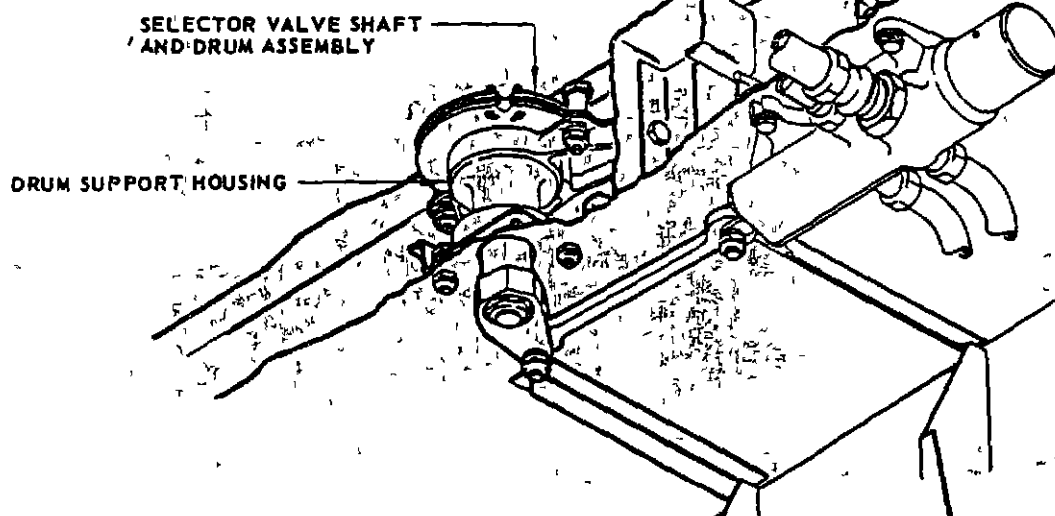
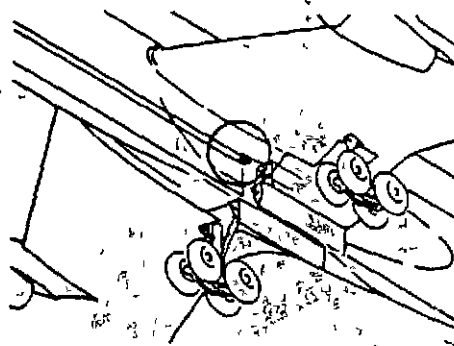
(2) Equipment and Materials

- (a) Hydraulic Source - (Skydrol 500 hydraulic fluid) Two test benches, each capable of delivering approximately 20 gpm flow at 3000 psi, or one test bench capable of delivering approximately 40 gpm flow at 3000 psi.

NOTE: Rudder - Spoiler auxiliary pump may be used to retract gear but operational time requirements cannot be met due to low flow output of auxiliary pump.

- (b) Stop watch

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Magnesium Control Drum Cable Lubrication
Figure 201

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(3) Prepare for Testing

- (a) Jack the airplane until all wheels clear the ground. See Airplane Jacking, Chapter 7.

NOTE: If the nose gear only is to be checked, install safety pins at each main gear. Jack nose until wheels clear floor, then install jack at tail jack point and snug up against jack pad. Do not exceed nose jack point load limits.

CAUTION: DO NOT TURN STEERING WHEEL WITH NOSE GEAR FULLY EXTENDED, BECAUSE OF POSSIBLE DAMAGE TO CENTERING CAMS IN THE SHOCK STRUT.

- (b) Ground airplane from grounding braids on externally mounted jack pads. For more information on grounding, see Parking and Mooring, Chapter 10.

(4) Test Operation of Landing Gear

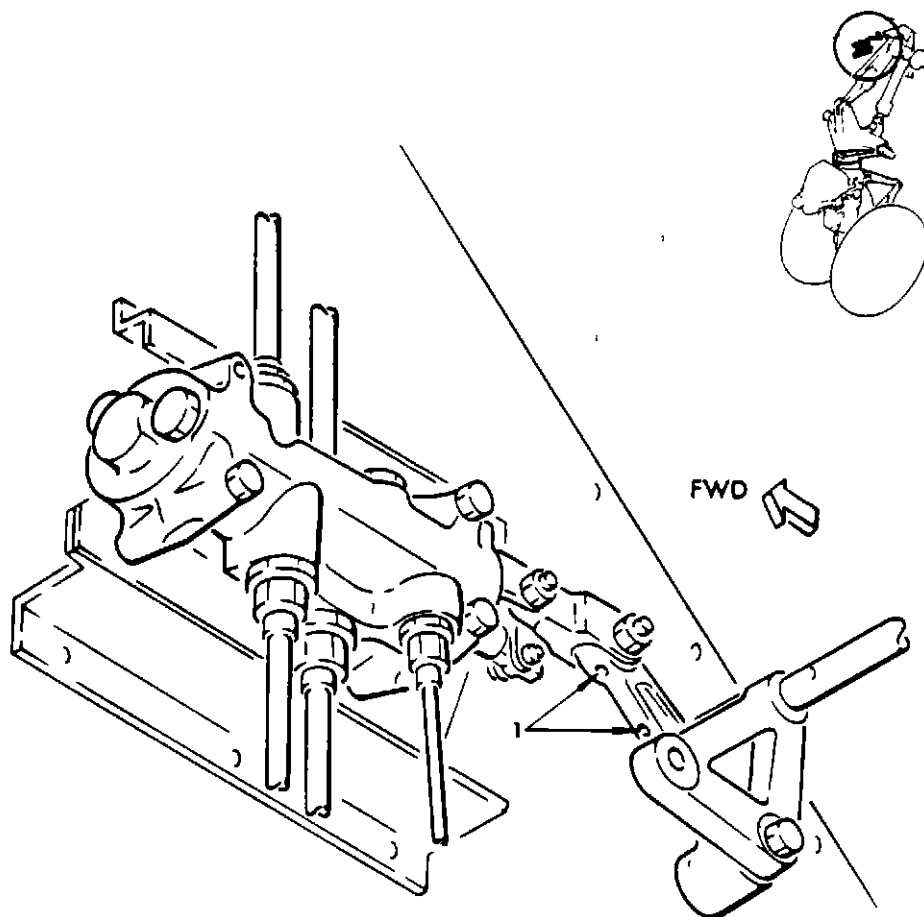
WARNING: CLEAR ALL WHEEL WELL AREAS OF EQUIPMENT AND PERSONNEL.

- (a) Place the landing gear control handle to "UP" position.
- (b) All wheel well doors shall open, landing gear retract and all doors close.

NOTE: If the nose gear has been replaced open manually nose gear wheel well doors.
Check in nose gear wheel well that the steering shutoff valve plunger is in fully extended position with the nose gear in retracted position.

- (c) Total time required for complete gear retraction should not be more than 10 seconds.
- (d) Place the landing gear control handle to "DOWN" position.
- (e) All wheel well doors shall open, landing gear extend and all doors close.
- (f) Total time required for complete gear extension should not be more than 10 seconds.

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INDEX NO	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	ACTUATION LINK	APPLY GREASE MIL-G-21164 FLUSH FITTING (2 PLACES)

Nose Gear Door Control Valve Actuation Link Lubrication
 Figure 202

LANDING GEAR CONTROL HANDLE - MAINTENANCE PRACTICES

1. Removal/Installation Landing Gear Control Handle

A. Remove Landing Gear Control Handle

- (1) Check that all external ground locks are installed
- (2) Open all wheel well doors using door ground release handles

NOTE Hydraulic system need not be depressurized if doors are kept open
- (3) Relieve tension on control cables
- (4) Unfasten and rotate engine and co-pilot's instrument panels down
- (5) Place protective blankets over panels to prevent contact of tools with electric terminals or possible damage to wiring and instruments (See figure 201)
- (6) Remove cable guide bolts from control handle drum
- (7) Remove control handle installation bolt
- (8) Remove control cables from control cable drum and push them back out of way
- (9) Remove control handle and drum upward.

B. Install Landing Gear Control Handle

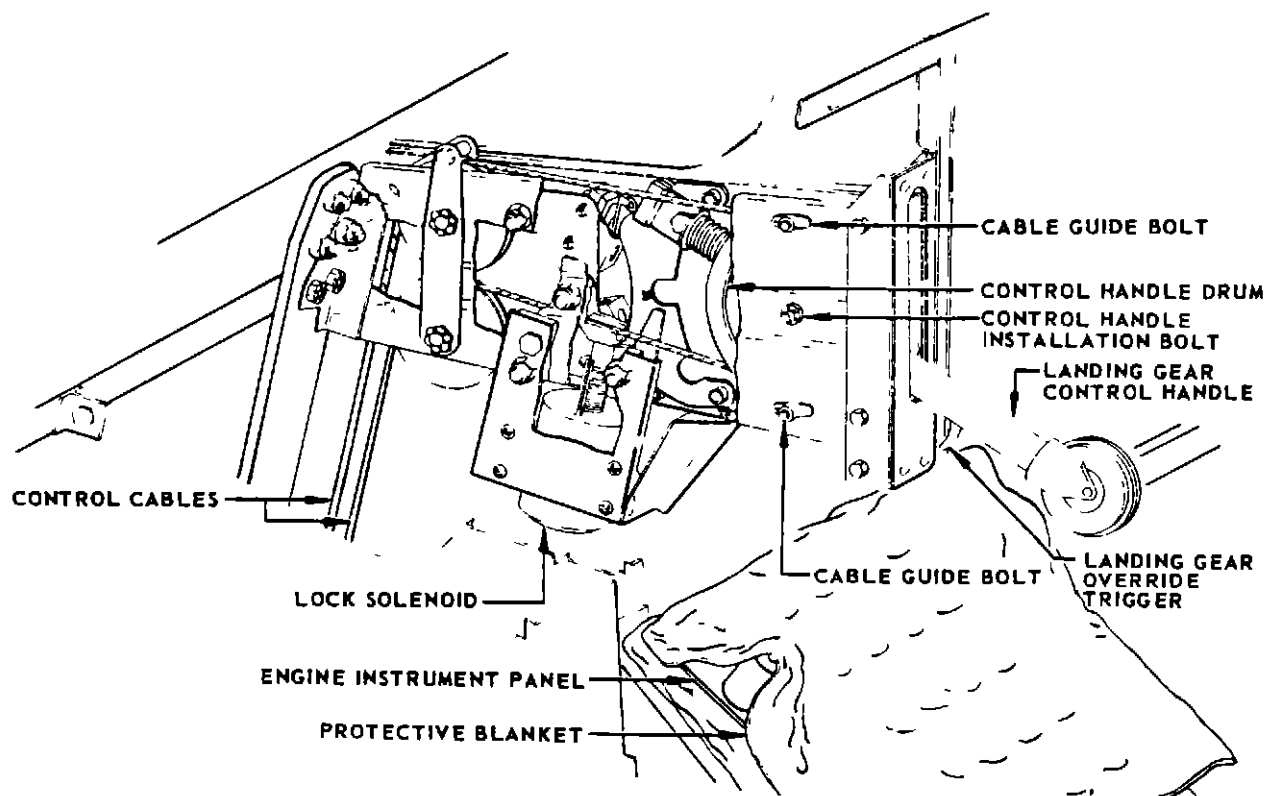
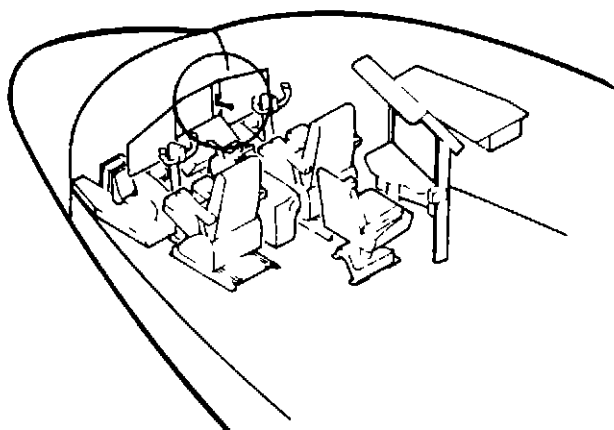
- (1) Install control handle and drum into supports from top. (See figure 201)
- (2) Attach control cables to control handle drum and install cable retaining cotter pins
- (3) Install control handle installation bolt
- (4) Install cable guide bolts.
- (5) Adjust control cables See 32-1-11
- (6) Fasten engine and co-pilot's instrument panels in place

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(7) Return all door ground release handles up.

CAUTION: DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING: STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOOR CLOSING WHEN HANDLE IS UP.



Landing Gear Control Handle Installation
Figure 201

LANDING GEAR CONTROL CABLE SYSTEM - MAINTENANCE PRACTICES

1 Removal/Installation Landing Gear Control Cable System

A Remove Landing Gear Control Cable System

- (1) Check that all external ground locks are installed
- (2) Open all wheel well doors using door ground release handles.

NOTE Hydraulic system need not be depressurized if doors are kept open.

- (3) Remove cables from landing gear control handle drum See 32-1-1.
- (4) Remove floor panels at station 833 for access to selector valve actuation drum
- (5) Remove cables from selector valve actuation drum (See figure 201.)
- (6) Remove bolts attaching drum support housing to floor structure.
- (7) Remove selector valve actuator arm from shaft
- (8) Remove bolts and nuts attaching drum support housing to upper side of wheel well ceiling
- (9) Pull cables from pulleys and floor beams.

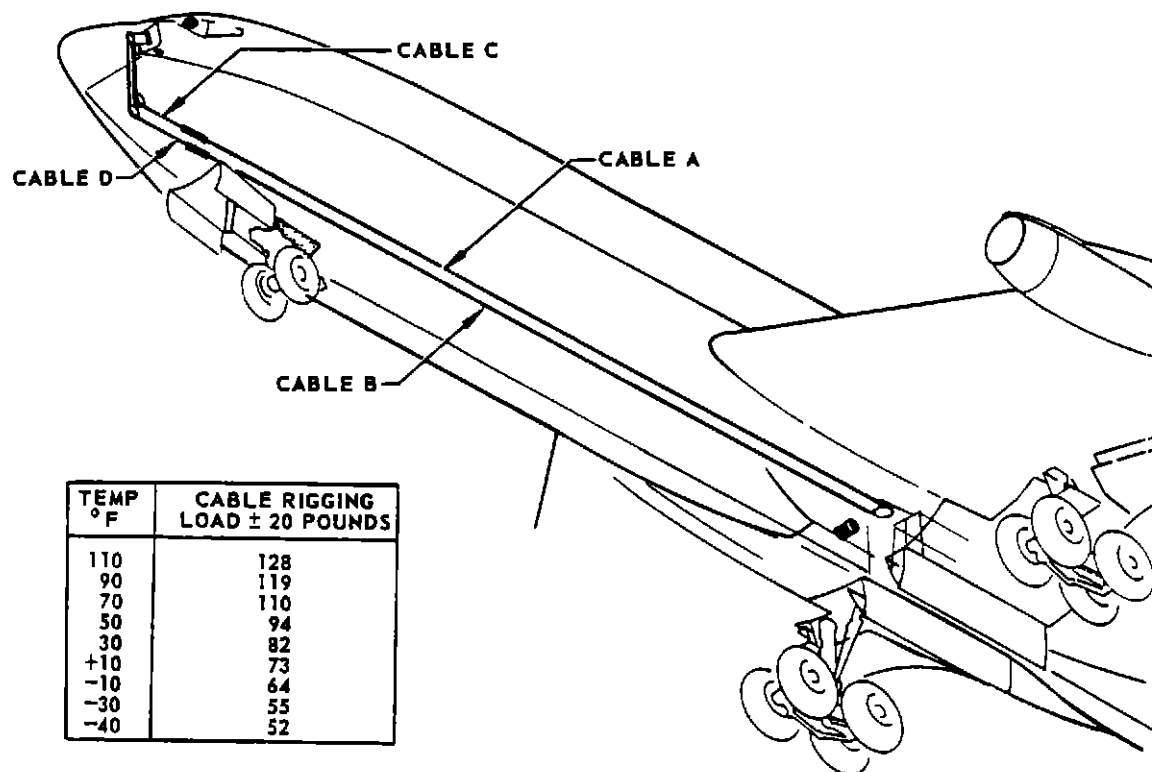
NOTE: A piece of cord or wire may be tied to the loose ends of the cables when they are removed. The cord will act as a guide for removal and installation

B. Install Landing Gear Control Cable System

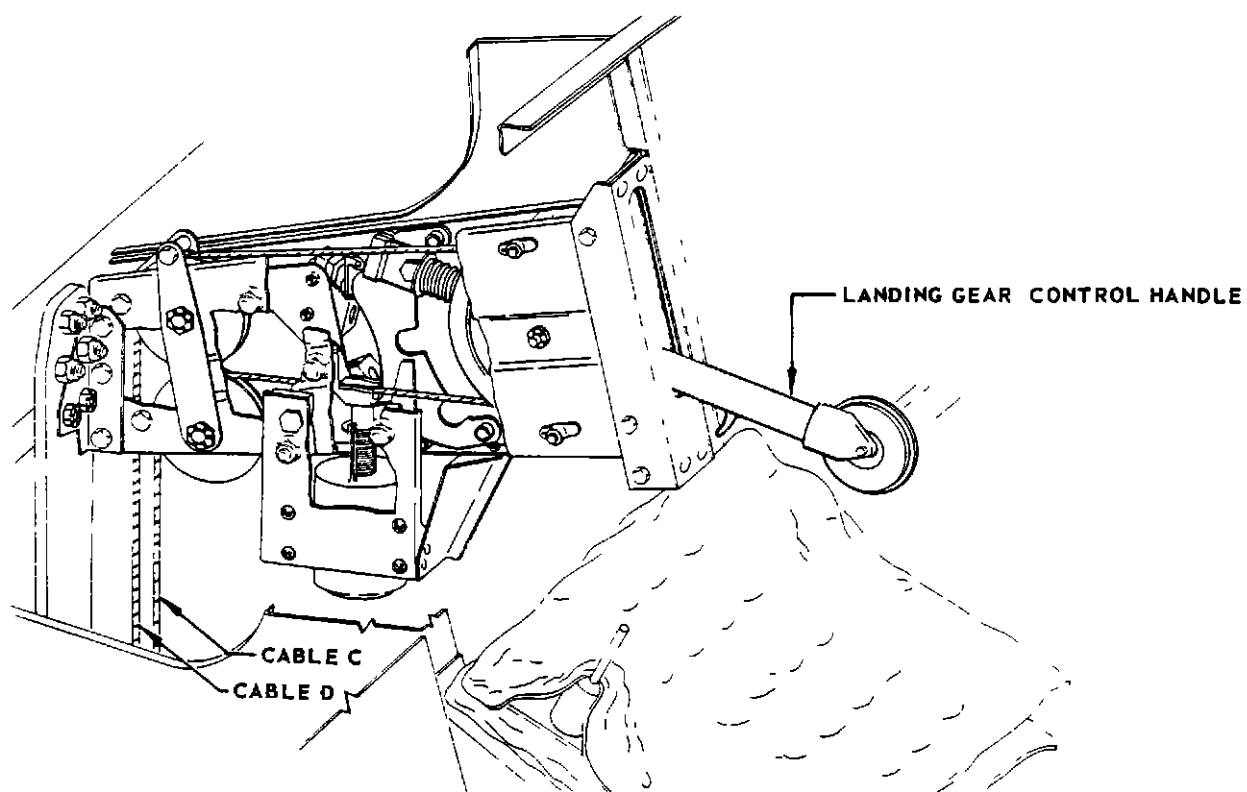
- (1) Place shaft and drum assembly in position on upper side of wheel well ceiling (See figure 201)
- (2) Install bolts with washers downward through drum support housing and wheel well ceiling.
- (3) Apply fillet seal around bottom of drum support housing. See Sealing, Chapter 51
- (4) Install selector valve actuator arm to shaft.
- (5) String the cables through floor beams and over pulleys.

NOTE. For cable length and fittings, see chart in figure 201 and for cable general installation information, see Control Cable System General, Chapter 27.

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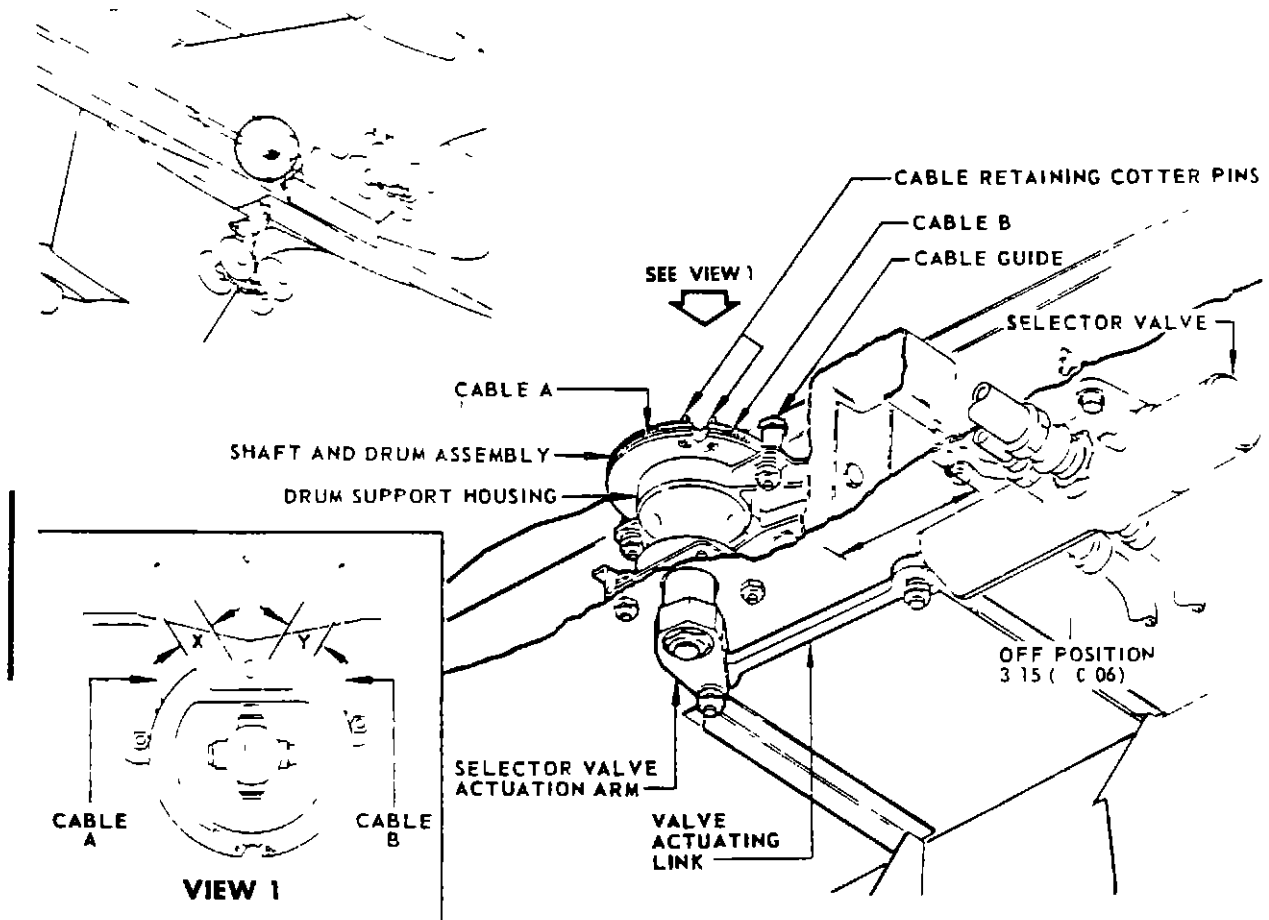


TEMP °F	CABLE RIGGING LOAD ± 20 POUNDS
110	128
90	119
70	110
50	94
30	82
+10	73
-10	64
-30	55
-40	52



Landing Gear Control Cable Installation
 Figure 201 (Sheet 1 of 2)

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CABLE REF.	DRAWING NO.	NO. REQ.	CABLE LENGTH	CABLE SIZE	FITTINGS		
					1.	2.	3.
A	BAC-C13G-468 7978	1	797 8 IN	1/8 7 x 19	AN669L4RH	BAC-T14A-4	
B	BAC-C13G-468-7888	1	788 8 IN	1/8 7 x 19	AN669L4RH	BAC-T14A-4	
C	BAC-C13G-469 816	1	816 IN	1/8 7 x 19	AN669L4LH	BAC-T14A-4	
D	BAC-C13G-469 973	1	973 IN	1/8 7 x 19	AN669L4LH	BAC-T14A-4	

A, B, C AND D



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- (6) Attach cables to selector valve control drum and control handle drum.
- (7) Install control handle. See 32-1-1.
- (8) Adjust the control cables. See paragraph 2.
- (9) Perform test of landing gear. See 32-1-0.
- (10) Replace floor panels at station 833.
- (11) Return all door ground release handles up.

WARNING STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOORS
CLOSE WHEN HANDLES ARE UP.

2. Adjustment/Test Landing Gear Control Cable System

A. Adjust Landing Gear Control Cable System

- (1) Install all landing gear downlocks.
- (2) Place landing gear control handle to "OFF "
- (3) Place the selector valve control drum so that X = Y as shown in figure 201.

NOTE Some airplanes have an adjustable valve actuation link. The nominal length of the adjustable link is 7.3 (± 0.02) inches between link end centers. If necessary after step (3) the length of link may be varies until the selector valve is in off position.

- (4) Apply tension equally on cables, by tightening turnbuckles, to 110 (± 20) pounds.

3. Inspection/Check Cables

A. Check Control Cables

- (1) Examine control cables for wear per figure 202.

CABLE	CABLE SIZE	ALLOWABLE PERCENT WEAR OF OUTER WIRES BEFORE REPLACEMENT
LANDING GEAR CONTROL (A, B, C AND D)	1/8 7 X 19	50

LANDING GEAR CONTROL SELECTOR VALVE - MAINTENANCE PRACTICES

1 Removal/Installation Landing Gear Control Selector Valve

A Remove Landing Gear Control Selector Valve

- (1) Check that all external ground locks are installed.
- (2) Depressurize the utility hydraulic system using the manual bypass valve located on the forward side of right wheel well side strut opening
- (3) Depressurize the utility hydraulic reservoir by loosening the filler cap slowly
- (4) Open the right wheel well door by pulling down on door ground release handle in shock strut opening.
- (5) Remove nut attaching actuation arm to selector valve control drum.
(See figure 201)
- (6) Disconnect all hydraulic lines from the selector valve.
- (7) Plug and cap all lines and ports
- (8) Remove bolts attaching selector valve to structure
- (9) Remove control selector valve, remove hydraulic fittings, discard O-rings and plug valve ports.

B Install Landing Gear Control Selector Valve

- (1) Install hydraulic fittings with new O-rings in control selector valve
- (2) Attach link and arm to selector valve as shown in figure 201
- (3) Place selector valve in position and install mounting bolts.
- (4) Attach actuation arm to selector valve control drum.
- (5) Fill valve and hydraulic lines with fluid and connect the hydraulic lines to fittings as shown.
- (6) Pressurize the utility hydraulic system.

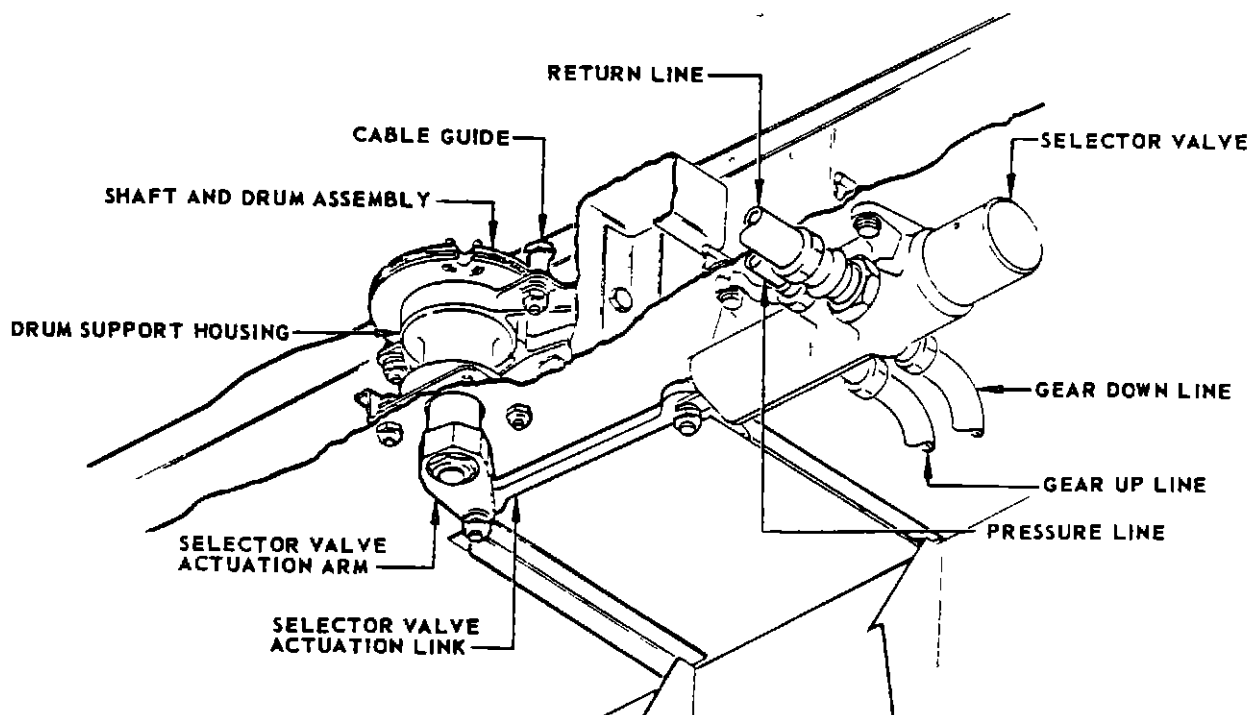
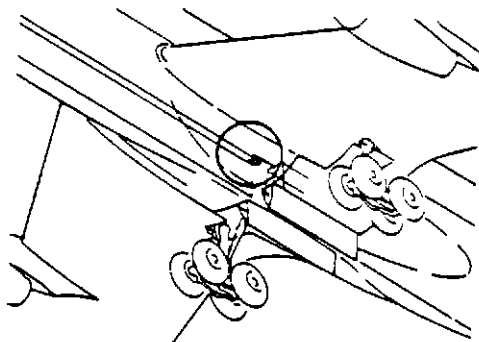
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- (7) Return door ground release handle up.

CAUTION: DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOOR CLOSES WHEN HANDLE IS UP.

- (8) Bleed air from selector valve by operating main landing gear control handle to open doors two or three times.
- (9) Perform test of landing gear See 32-1-0, "Adjustment/Test Landing Gear and Door Control System."



Landing Gear Selector Valve Installation
Figure 201

LANDING GEAR DOOR CONTROL VALVES - MAINTENANCE PRACTICES

1. Removal/Installation Main Gear Door Control Valves

A. Remove Main Gear Door Control Valves

- (1) Check that all external ground locks are installed.
- (2) Depressurize the utility hydraulic system using the manual bypass valve located on forward side of right wheel well side strut opening.
- (3) Depressurize the utility hydraulic reservoir by loosening the filler cap slowly.
- (4) Open the wheel well door by pulling down on door ground release handle in side strut opening.
- (5) Disconnect hydraulic lines from door control valve. (See figure 201.)
- (6) Plug and cap all lines and ports.
- (7) Disconnect actuation linkage from door control valve
- (8) Remove installation bolts, washers and nuts.
- (9) Remove door control valve, remove hydraulic fittings, discard O-rings and plug valve ports.

B. Install Main Gear Door Control Valves

- (1) Install hydraulic fittings with new O-rings in door control valve.
- (2) Place door control valve in position and install mounting bolts, washers and nuts. (See figure 201.)
- (3) Attach actuation linkage to door control valve.
- (4) Fill valve and hydraulic lines with fluid and connect the hydraulic lines to the fittings as shown.

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- (5) Pressurize the utility hydraulic system.
- (6) Return door ground release handle up.

CAUTION. DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP BACK INTO UP POSITION.

WARNING. STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOOR CLOSSES WHEN HANDLE IS UP.

- (7) Perform test of landing gear. See 32-1-0, "Adjustment/Test Landing Gear and Door Control System."

NOTE Cycle landing gear several times to bleed air

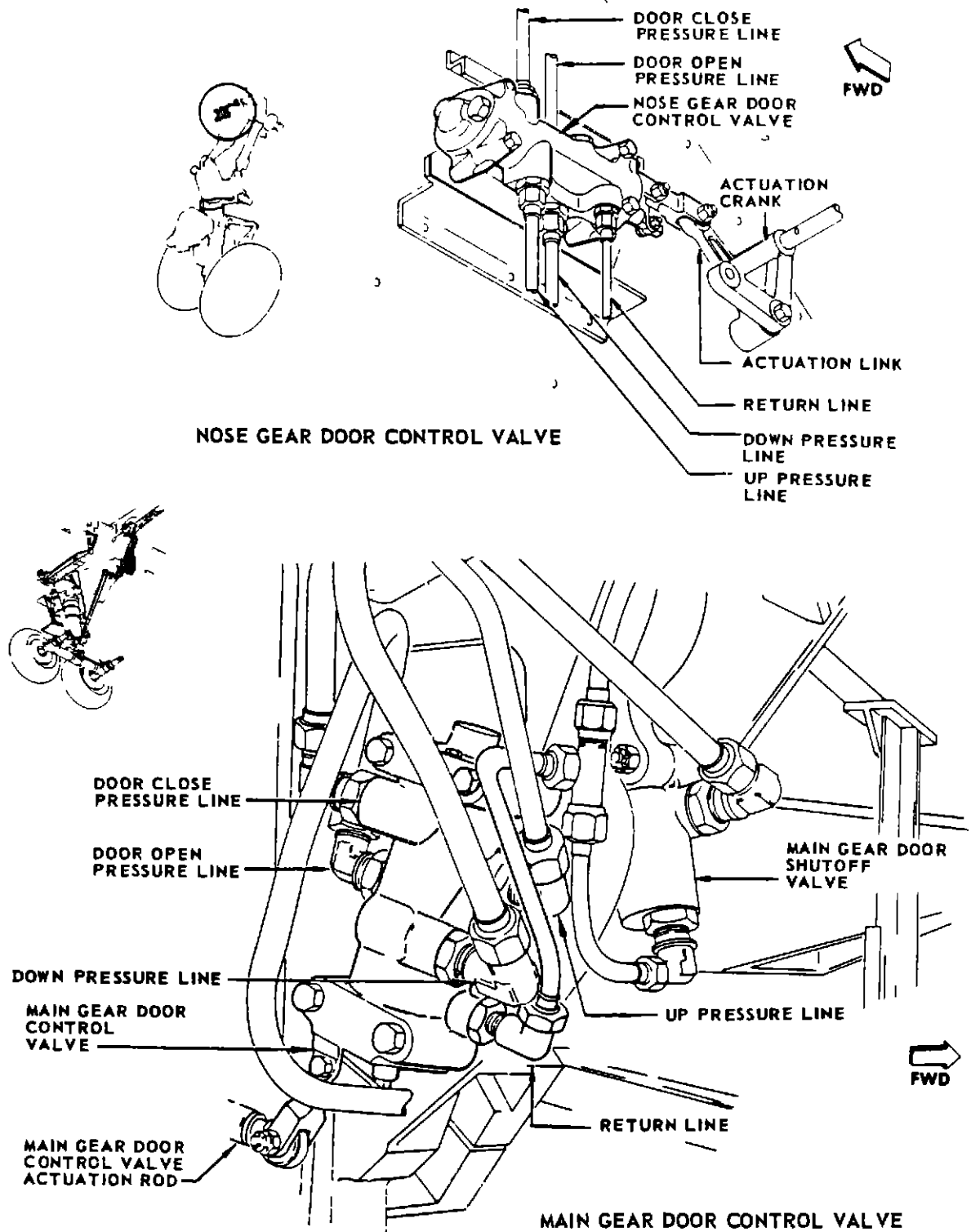
2. Removal/Installation Nose Gear Door Control Valve

A. Remove Nose Gear Door Control Valve

- (1) Check that all external ground locks are installed.
- (2) Depressurize the utility hydraulic system using the manual bypass valve located on forward side of right wheel well side strut opening.
- (3) Depressurize the utility hydraulic reservoir by loosening the filler cap slowly.
- (4) Open the nose gear doors by pulling down on door ground release handle in the external power receptacle opening.
- (5) Disconnect hydraulic lines from door control valve (See figure 201.)
- (6) Plug and cap all lines and ports.
- (7) Disconnect actuation linkage from door control valve.
- (8) Remove bolts attaching control valve to structure.
- (9) Remove control valve, remove hydraulic fittings, discard O-rings and plug valve ports.

B. Install Nose Gear Door Control Valve

- (1) Install hydraulic fittings with new O-rings in door control valve
- (2) Place door control valve in position and install mounting bolts, washers and nuts (See figure 201.)



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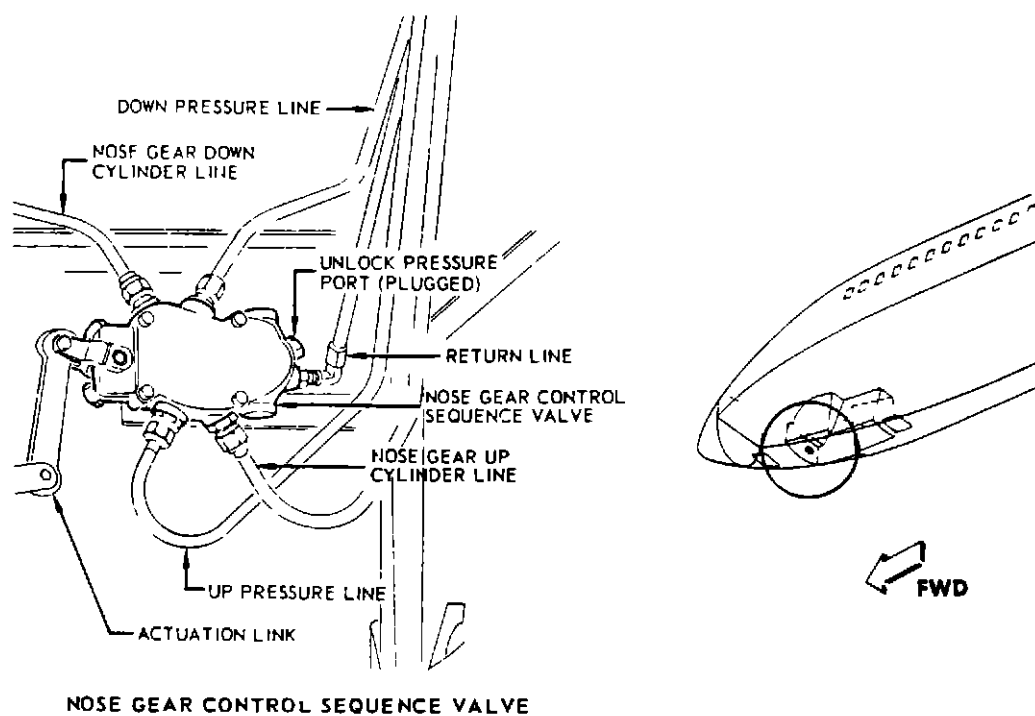
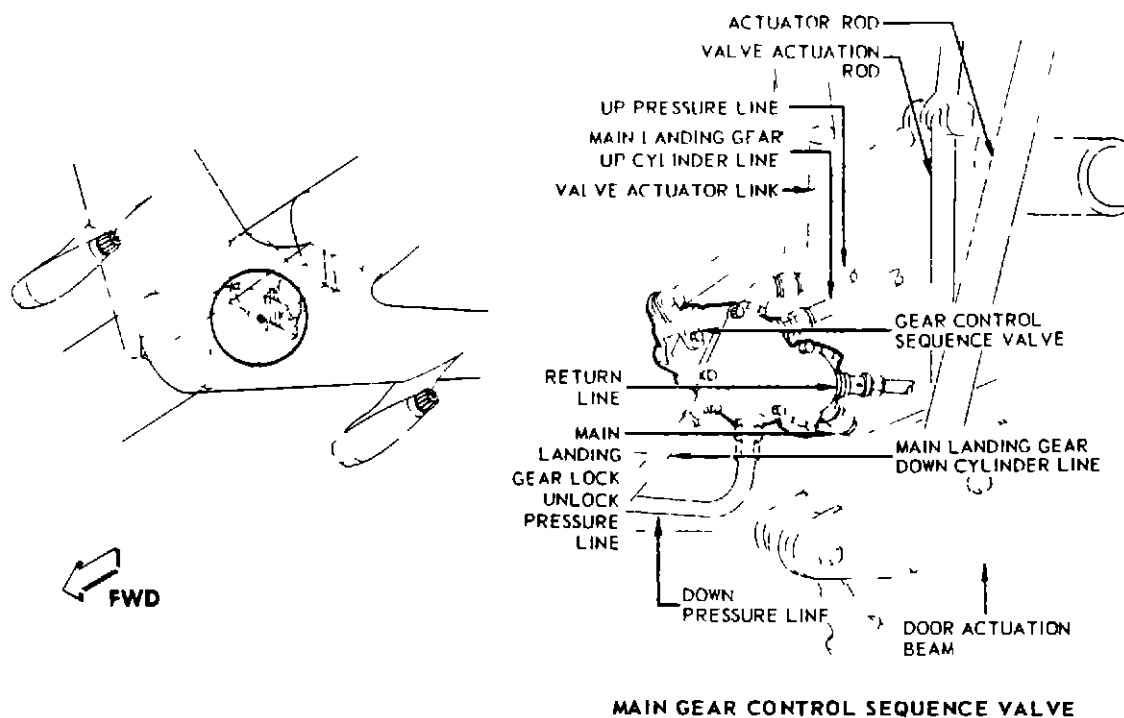
- (3) Attach actuation link to door control valve.
- (4) Fill valve and hydraulic lines with fluid and connect the hydraulic lines to fittings as shown.
- (5) Pressurize the utility hydraulic system.
- (6) Return door ground release handle up.

CAUTION DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING: STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOOR CLOSES WHEN HANDLE IS UP.

- (7) Perform test of landing gear. See 32-1-0, "Adjustment/Test Landing Gear and Door Control System."

NOTE: Cycle landing gear several times to bleed air.



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- (3) Attach valve actuation link to sequence valve
- (4) Fill valve and hydraulic lines with fluid and connect hydraulic lines to fittings as shown.
- (5) Pressurize the utility hydraulic system.
- (6) Return door ground release handle up.

CAUTION DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP BACK INTO UP POSITION.

WARNING. STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOORS CLOSE WHEN HANDLE IS UP

- (7) Bleed air from sequence valve by operating main landing gear control handle to open doors two or three times
- (8) Perform test of landing gear. See 32-1-0, "Adjustment/Test Landing Gear and Door Control System "

LANDING GEAR SEQUENCE VALVES - MAINTENANCE PRACTICES

1. Removal/Installation Main Gear Sequence Valves

A. Remove Main Gear Sequence Valves

- (1) Check that all external ground locks are installed.
- (2) Depressurize the utility hydraulic system using manual bypass valve on forward side of right wheel well side strut opening
- (3) Depressurize the utility hydraulic reservoir by loosening the filler cap slowly.
- (4) Open the wheel well doors by pulling down on door ground release handle in side strut opening
- (5) Disconnect hydraulic lines from sequence valve (See figure 201.)
- (6) Plug and cap all lines and ports.
- (7) Disconnect valve actuator link from sequence valve.
- (8) Remove bolts attaching sequence valve to structure
- (9) Remove sequence valve, remove hydraulic fittings, discard O-rings and plug valve ports.

B. Install Main Gear Sequence Valves

- (1) Install hydraulic fittings with new O-rings in sequence valve.
- (2) Place sequence valve in position and install mounting bolts (See figure 201.)
- (3) Attach valve actuator link to sequence valve.
- (4) Fill valve and hydraulic lines with fluid and connect hydraulic lines to fittings as shown.

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- (5) Pressurize the utility hydraulic system.
- (6) Return door ground release handle up.

CAUTION: DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING: STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOOR CLOSES WHEN HANDLE IS UP.

- (7) Bleed air from sequence valve by operating main landing gear control handle to open doors two or three times.
- (8) Perform test of landing gear See 32-1-0, "Adjustment/Test Landing Gear and Door Control Systems."

2. Removal/Installation Nose Gear Sequence Valve

A. Remove Nose Gear Sequence Valve

- (1) Check that all external ground locks are installed
- (2) Depressurize the utility hydraulic system using the manual bypass valve on forward side of right wheel well side strut opening.
- (3) Depressurize the utility hydraulic reservoir by loosening the filler cap slowly
- (4) Open the nose gear doors by pulling down on door ground release handle in external power receptacle opening.
- (5) Disconnect hydraulic lines from sequence valve. (See figure 201)
- (6) Plug and cap all lines and ports.
- (7) Disconnect actuation link from sequence valve.
- (8) Remove bolts attaching sequence valve to structure.
- (9) Remove sequence valve, remove hydraulic fittings, discard O-rings and plug valve ports.

B. Install Nose Gear Sequence Valve

- (1) Install hydraulic fittings with new O-rings in sequence valve.
- (2) Place sequence valve in position and install mounting bolts. (See figure 201)

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MAIN GEAR DOOR SHUTOFF VALVES - MAINTENANCE PRACTICES

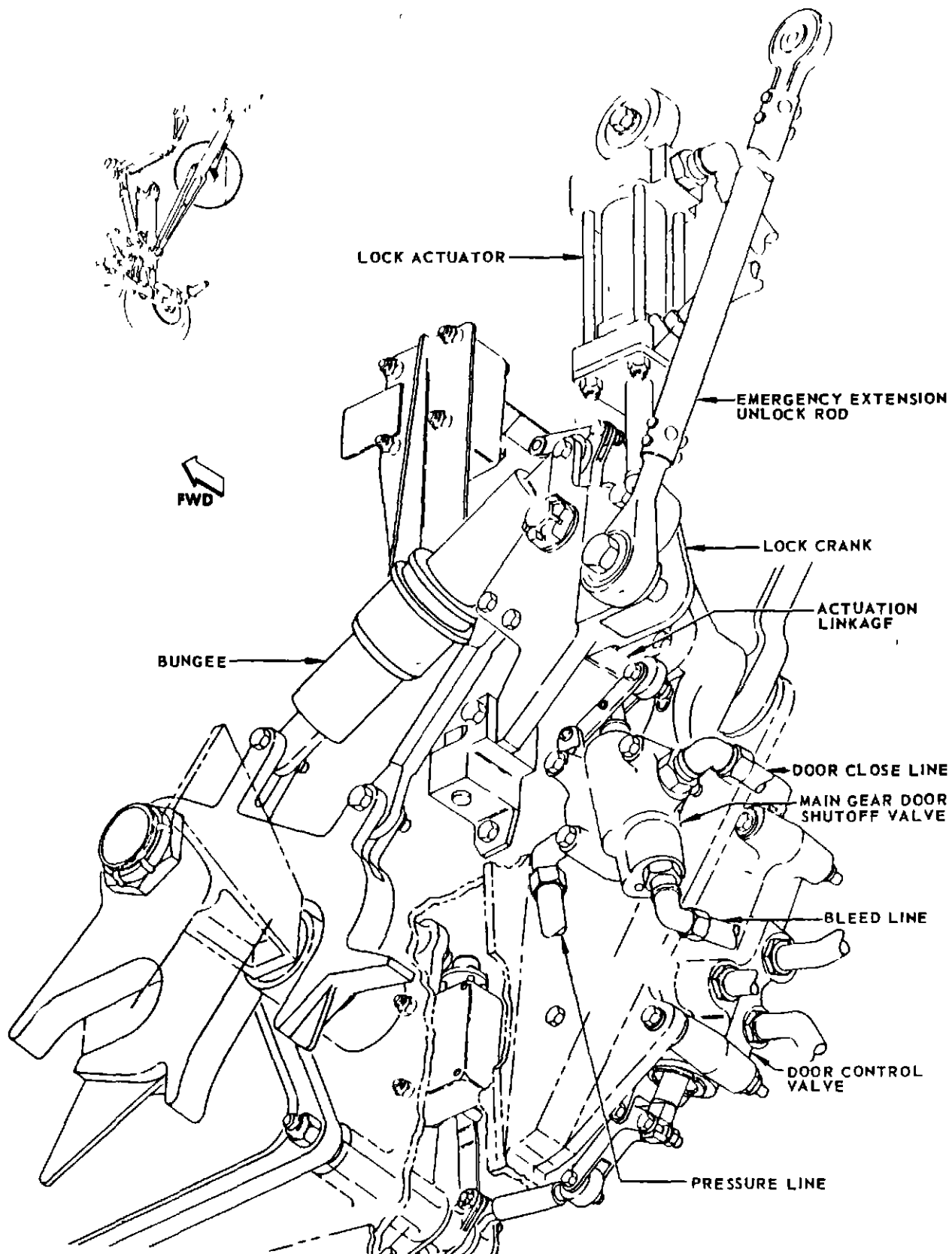
1. Removal/Installation Main Gear Door Shutoff Valves

A. Remove Main Gear Door Shutoff Valves

- (1) Check that all external ground locks are installed.
- (2) Depressurize the utility hydraulic system using manual bypass valve located on forward side of right wheel well side strut opening
- (3) Depressurize utility hydraulic reservoir by loosening filler cap slowly
- (4) Open wheel well doors by pulling down on door ground release handle in side strut opening.
- (5) Disconnect hydraulic lines from door shutoff valve (See figure 201)
- (6) Plug and cap all lines and ports
- (7) Disconnect actuation linkage from door shutoff valve.
- (8) Remove bolts attaching shutoff valve to structure
- (9) Remove shutoff valve, remove hydraulic fittings, discard O-rings and plug valve ports.

B. Install Main Gear Door Shutoff Valves

- (1) Install hydraulic fittings with new O-rings in shutoff valve.
- (2) Place door shutoff valve in position and install mounting bolts. (See figure 201)
- (3) Attach actuation linkage to door shutoff valve
- (4) Fill valve and hydraulic lines with fluid and connect the hydraulic lines to the fittings as shown.



Main Gear Door Shutoff Valve Installation
Figure 201

1

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- (5) Pressurize the utility hydraulic system.
- (6) Return door ground release handle up

CAUTION. DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING. STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOOR CLOSES WHEN HANDLE IS UP.

- (7) Perform test of landing gear. See 32-1-0, "Adjustment/Test Landing Gear and Door Control System."

NOTE. Cycle landing gear several times to bleed air.

C. Internal leakage check of Main Gear Door Shutoff Valve.(Left hand and right hand).

- (1) Open the main wheel well door with the door safety valve (handle).
- (2) Depressurize utility hydraulic system.
- (3) Disconnect shutoff valve from L.G. lock mechanism.
- (4) Move piston of shutoff valve to the retract position.
(push on the piston)
- (5) Put the door safety valve in the door closed position
(with the handle).
- (6) Move the doors to close them by pushing, closure of the doors should be impossible.
- (7) If closure is possible, replace door shutoff valve.
- (8) After test, restore airplane to normal.

NOSE GEAR DOOR SAFETY VALVE - MAINTENANCE PRACTICES

1 Removal/Installation Nose Gear Door Safety Valve

A. Equipment and Materials

- (1) Lock Assembly - Down, Main Landing Gear, F71126-500 or equivalent
- (2) Lock Assembly - Down, Nose Landing Gear, F70008-500 or equivalent.

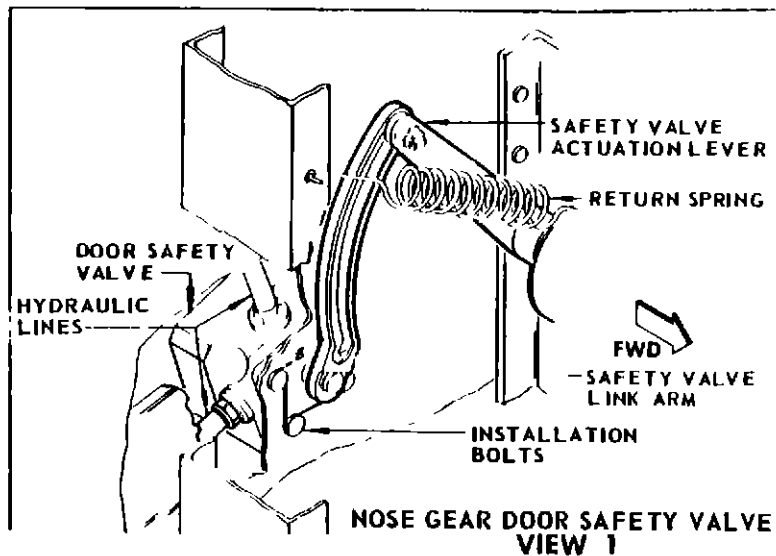
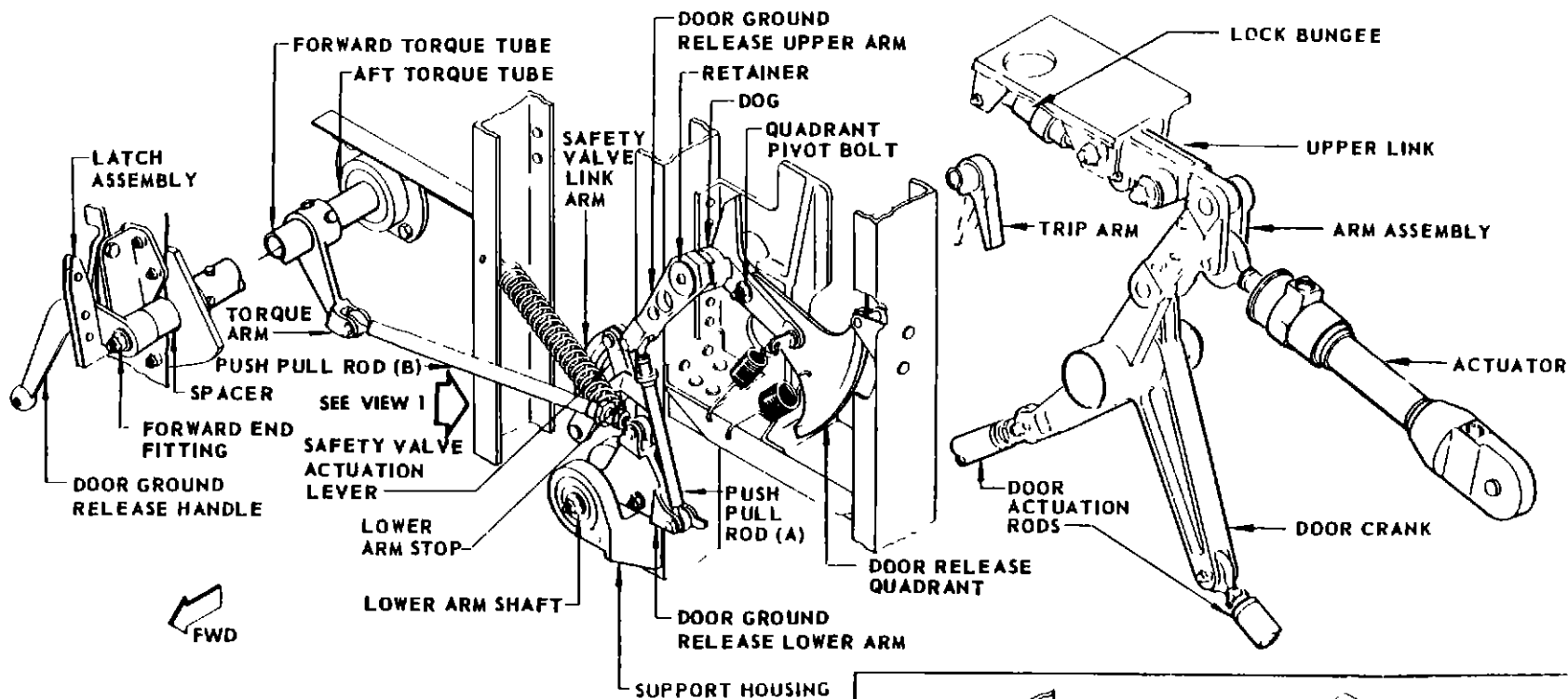
B. Remove Nose Gear Door Safety Valve

- (1) Check that landing gear external down locks are installed, and that nose gear doors are open with release handle down and latched.
- (2) Disconnect nose gear door actuation rods at doors.
- (3) Depressurize the hydraulic system and the utility reservoir
- (4) Disconnect the hydraulic lines (figure 201) from safety valve. Plug lines and cap hydraulic unions
- (5) Disconnect the safety valve link arm from safety valve and secure to safety valve actuation lever to prevent loss.
- (6) Take out installation bolts and remove valve.
- (7) Remove hydraulic unions from the safety valve and discard O-rings. Cap hydraulic ports.

C. Install Nose Gear Door Safety Valve

- (1) Install hydraulic unions with new O-rings in valve. Fill valve with hydraulic fluid and cap ports.
- (2) Clean mounting surface of valve and valve support channel.
- (3) Apply a removable faying surface seal between valve and support channel. Position valve on channel and insert installation bolts (figure 201).

CAUTION KEEP SEALANT FROM THREADED HOLES AND MOVING SURFACES.



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- (4) Remove caps and plugs from valve and hydraulic lines. Connect hydraulic lines to valve.

WARNING DO NOT FORCE HYDRAULIC LINES INTO POSITION ON VALVE. ANY STRAIN ON HYDRAULIC LINES CAN DISTORT VALVE SUPPORT AND SO DISPLACE VALVE THAT LINKAGES FOUL ADJACENT AIRPLANE STRUCTURE.

- (5) Tighten and lockwire valve installation bolts.

- (6) Install safety valve link arm on valve.

NOTE With handle latched down, the valve should be "OFF," and the safety valve link up, with the roller of the valve actuation lever at top of curved slot.

- (7) Connect nose gear door actuation rods.

- (8) Pressurize the hydraulic system and test operation of nose gear door ground release mechanism.

- (9) Check hydraulic connections for leaks.

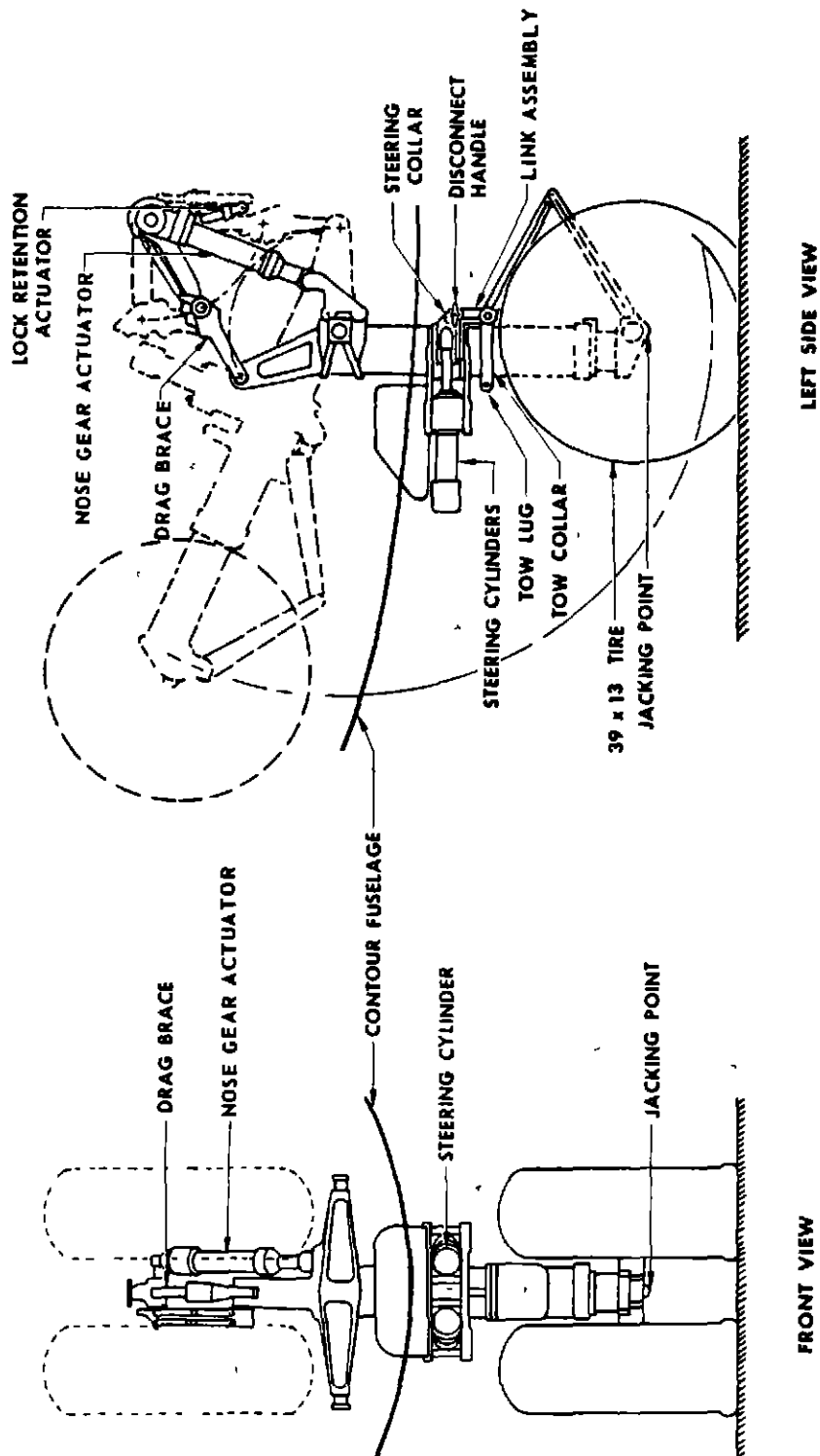
NOSE LANDING GEAR - DESCRIPTION AND OPERATION

1. General

- A The nose landing gear supports the forward end of the fuselage and provides directional control while the airplane is on the ground. The nose gear (figure 1) is a steerable dual wheel assembly which is hydraulically actuated to retract forward and up into a wheel well recessed into the lower nose compartment. The nose gear is retracted or extended simultaneously with the main gear when the landing gear control handle in control cabin is positioned to the UP or DOWN detent
- B. The nose landing gear (figure 2) consists of a drag brace, shock strut assembly, wheel and tire assembly, a nose wheel snubber, nose gear actuator, lock mechanism including lock and lock retention actuators, and a shock strut door and fairing assembly
- C When the landing gear control handle is positioned to actuate the gear, the wheel well doors open first. As the doors reach open position, hydraulic pressure is directed to unlock the gear. Pressure is also directed to the nose gear actuator to retract or extend the gear, depending on the position of the control handle. As the gear reaches full up or down position, hydraulic pressure is directed to close the wheel well doors.

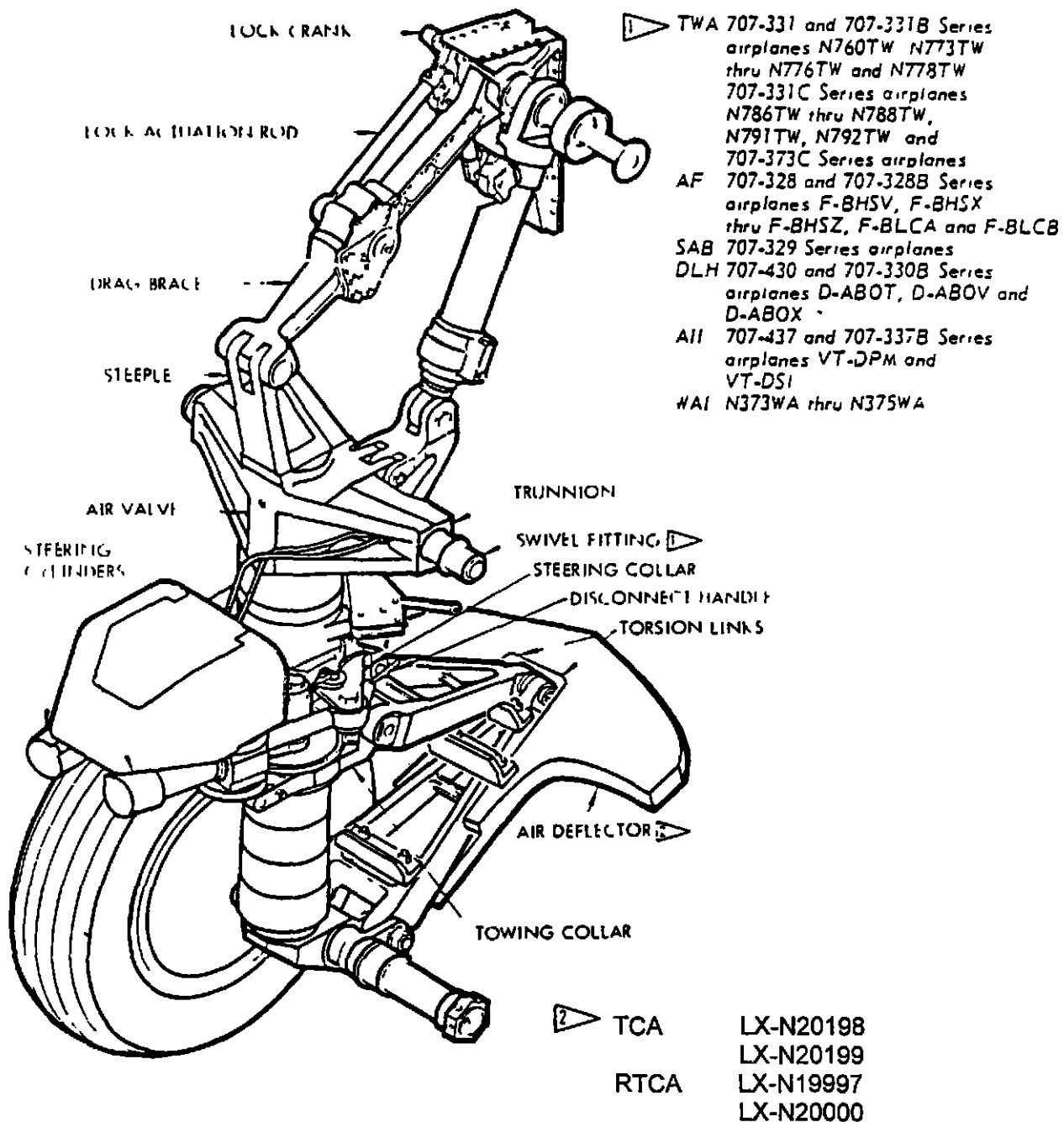
2 Nose Gear Drag Brace

- A. The purpose of the nose gear drag brace is to hold the nose gear in the up or down locked position. The drag brace (figure 3) consists of an upper link assembly and lock actuating rod, a center lockable knuckle and a lower link assembly. The upper link assembly is attached at the upper end by a shaft through a support fitting. The lower end of the upper link assembly makes up part of the drag brace lock knuckle. The upper end of the lower link assembly attaches to and is part of the drag brace lock knuckle. The lower end of the drag brace has a forked terminal which attaches to the steeple part of the shock strut. The lock actuating rod attaches to a lock actuating arm in the lock knuckle and to a lock crank on the support shaft. As the lock is applied, the lock roller enters a detent (figure 3) of the lock knuckle where the roller stops and prevents any bending movement of the drag brace until the lock actuation rod pulls the roller out of the detent by an unlocking force.
- B A lock switch attached to the drag brace is operated by action of the lock actuating rod to indicate if nose gear is in locked position (extended or retracted). A position switch attached to the support shaft fitting is actuated by linkage attached to the upper link assembly of the drag brace to indicate extended or retracted position of the nose gear

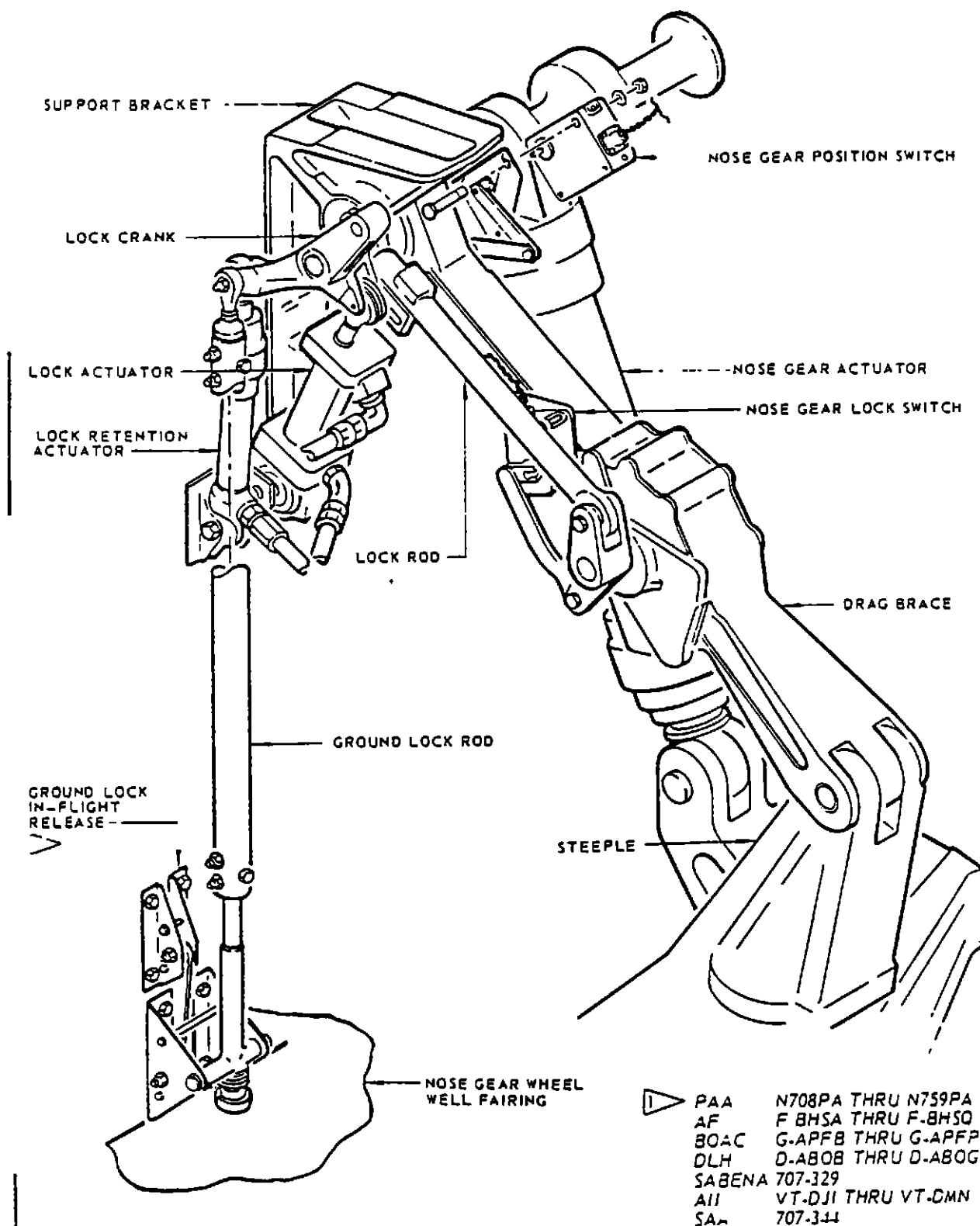


Nose Gear
Figure 1

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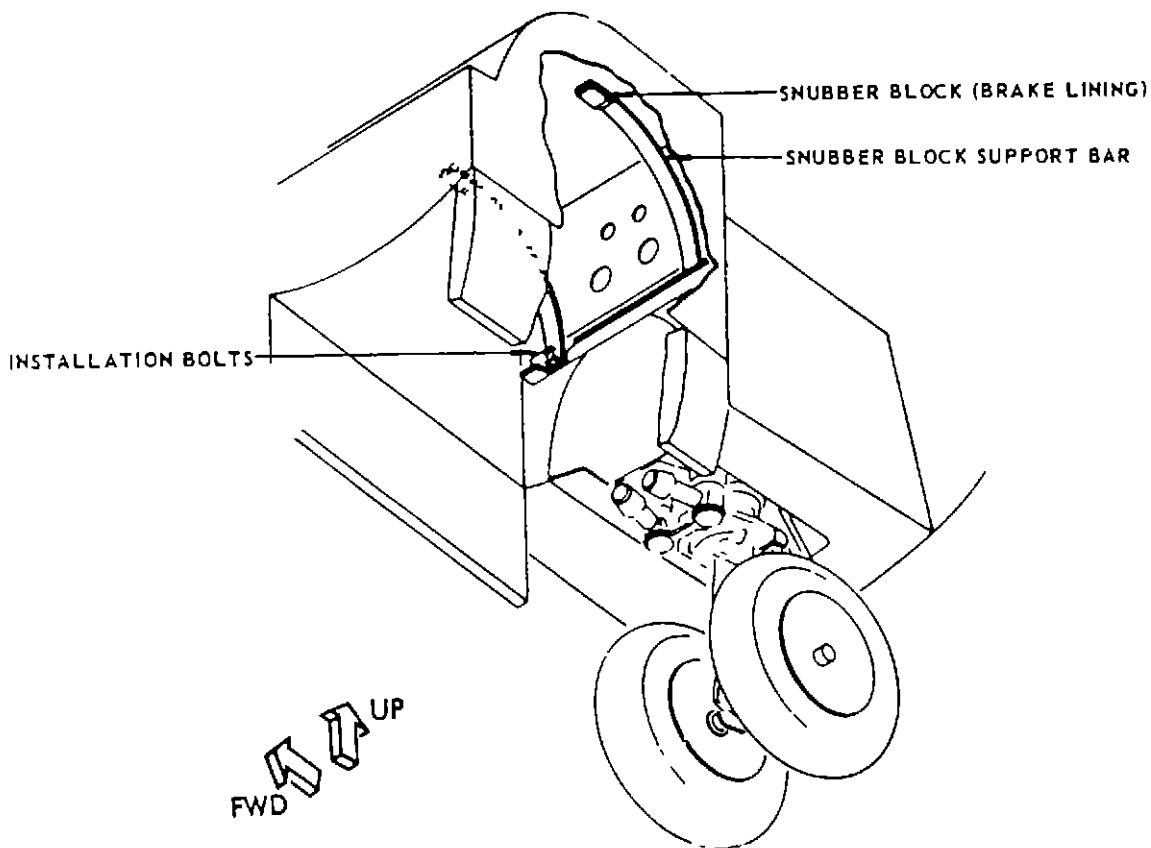
Nose Gear Component Location
Figure 2 (Sheet 2)

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gear from unlocking. A red band on the down lock shaft indicates when the lock is unsafe. No red is visible below the fairing when the lock is fully engaged.

- (1) On turbojet airplanes, a down lock handle release system is provided for the release of the nose gear down lock while in flight. A release handle on the aft side of the nose wheel well aft bulkhead is cable connected through the bulkhead to a release collar on the lower end of the ground lock assembly. When the release handle is pulled, the release collar rotates the down lock handle to a release position. The down lock handle will then drop out of the hole and fall clear of the airplane.





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- (2) A drag brace lock is supplied to ensure positive safety during maintenance work around nose gear. The lock is inserted through the drag brace (figure 3) to prevent relative movement between the upper and lower links. The drag brace lock can be used alone, but the normal ground lock must also be installed if the hydraulic system is pressurized while personnel are employed in the nose gear area.

8. Nose Gear Lock Actuator

- A. The nose gear lock actuator (figure 2) is a hydraulic piston-type actuator used to operate the lock mechanism to unlock and lock the nose gear in the up or down position. The cylinder end of the actuator is attached to the wheel well aft bulkhead. The piston rod terminal is attached to one arm of the lock crank at right end of the drag brace support shaft. When hydraulic pressure enters the lock actuator, the lock crank is rotated and the nose gear unlocked. As the gear extends, pressure remains on the lock actuator but is bypassed through built-in passages until the nose gear reaches the down position. At the down position, the passages are closed and the lock actuator rotates the lock crank to lock the gear. The lock actuator operates similarly on the retraction cycle of the gear

9. Nose Gear Lock Retention Actuator

- A. The nose gear lock retention actuator is a single-acting cylinder and piston-type hydraulic actuator used to keep a locking force applied to the lock mechanism. The actuator is attached by the cylinder end terminal to the nose wheel well aft bulkhead structure and by the piston rod terminal to an arm of the lock crank (figure 2). The actuator has only one hydraulic port which is in the cylinder end of actuator. The actuator extends when hydraulic pressure is applied, and is retracted by the action of the lock mechanism.

10. Shock Strut Door and Fairing (See figure 6 for effectivity.)

- A. Enclosing the aft wheel well area is a U-shaped fairing and shock strut door assembly. The fairing is attached to structure by clips and bolts on the inside, and by cowl fasteners from the outside. The shock strut door is hinged to the fairing and linked to the shock strut by a shock strut door rod damper. In gear retracted position, the door closes over the open area that is occupied by the shock strut when the gear is down. An extruded rubber seal around the shock strut door seals the door to keep out the weather.

11. Air Deflector (See figure 2 for effectivity.)

- A. A tee-shaped air deflector is attached to the lower torsion link, on the nose gear shock strut, to reduce airloads on the nose gear aft doors.

12. Operation

- A. For operation of nose gear, see 32-1-0 Operation.

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NOSE LANDING GEAR - MAINTENANCE PRACTICES

1. Unit Servicing Nose Landing Gear

A. Lubricate Nose Landing Gear

(1) Lubricate the fittings shown in figure 201.

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	NOSE GEAR ACTUATOR	Apply grease MIL-G-23827 to zerk fitting (2 places)
2	LOCK ACTUATOR	Apply grease MIL-G-23827 to flush fitting (2 places)
3	TRUNNION BEARING	Apply grease MIL-G-23827 to zerk fitting (2 places)
4	STEERING COLLAR	Apply grease MIL-G-23827 to zerk fitting (2 places) flush fitting (4 places)
5	LINK ASSEMBLY	Apply grease MIL-G-23827 to flush fitting (1 place)
6	TORSION LINKS	Apply grease MIL-G-23827 to zerk fitting (6 places)
7	STEERING CYLINDER	Apply grease MIL-G-23827 to flush fitting (1 place each cylinder)
8	TOWING COLLAR	Apply grease MIL-G-23827 to flush fitting (4 places) Turn nose gear approximately 45° off center when lubricating towing collar. Two metal sheets (sandwiched together with grease) will facilitate turning the nose gear. Return nose gear to straight ahead when lubrication is completed.
9	WHEEL BEARINGS	Apply grease MIL-G-3545 (Preferred), MIL-G-25760 (Alternate), hand pack. CAUTION: DO NOT MIX THE ABOVE TWO TYPES OF GREASE IN THE SAME BEARING.
10	METERING VALVE LINKAGE	Apply grease MIL-G-23827 to flush fitting (2 places)
11	NOSE GEAR STEEPLE	Apply grease MIL-G-23827 to flush fitting (2 places)
12	DRAG BRACE	Apply grease MIL-G-23827 to flush fitting installed on each side plate (2 places) Apply grease MIL-G-23827 to zerk fitting installed on plugs "X" (2 places).

2

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Nose Gear Lubrication

Figure 201 (Sheet 1)

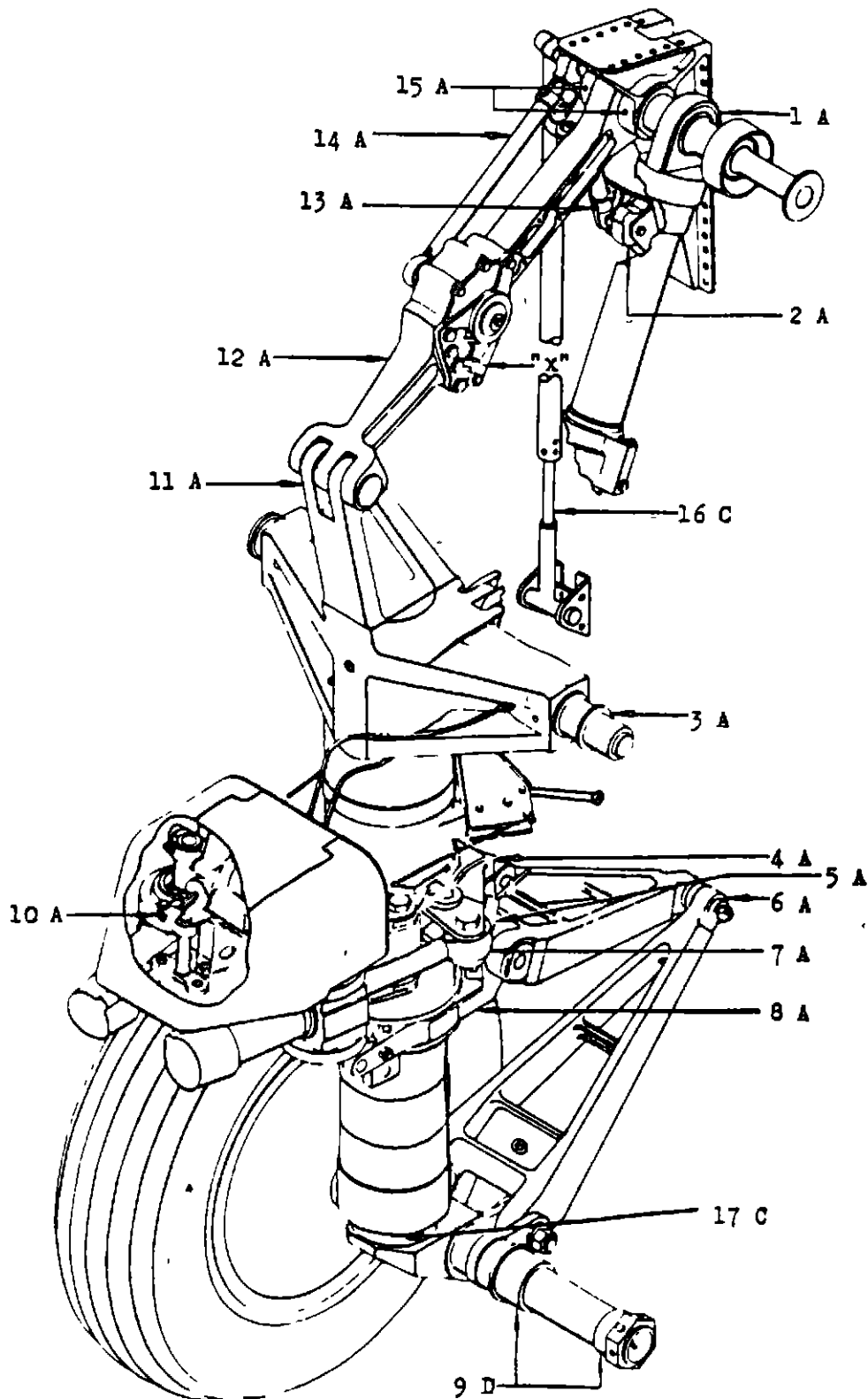
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Nose Gear Lubrication
Figure 201 (Sheet 2 of 3)



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2. Removal/Installation Nose Landing Gear

A. Equipment and Materials

- (1) Lock Assembly - F70029 or equivalent.
- (2) Down Lock Assembly, Nose Landing Gear - F70008-500 or equivalent

B. Remove Nose Landing Gear

- (1) Depressurize the utility hydraulic system using the manual bypass valve on the forward side of the right main gear side strut opening in wing.
- (2) Depressurize the utility hydraulic reservoir by loosening the filler cap slowly.
- (3) Open the nose gear doors by pulling down on door ground release handle in external power receptacle.
- (4) Install nose gear down lock, F70008.
- (5) Disconnect the door actuation rods from the nose gear doors.
- (6) Remove nose gear shock strut door and fairing. Refer to 32-5-51, Shock Strut Door and Fairings- Maintenance Practices.

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
13	LOCK RETENTION ACTUATOR	Apply grease MIL-G-23827 to flush fitting (2 places)
14	LOCK ACTUATION ROD	Apply grease MIL-G-23827 to flush fitting (2 places)
15	SUPPORT FITTING	Apply Grease MIL-G-23827 to flush fitting (2 places)
16	GROUND LOCK TRUNNION	Apply oil MIL-H-5606, six drops
17	EXPOSED INNER CYLINDER	Apply oil MIL-H-5606

SYMBOL	SPEC.	Used Product	SYMBOL	SPEC.	Used Product
A	MIL-G-23827	See Chapter 20-93-(-) SABENA Complements on green paper	C	MIL-H-5606	See Chapter 20-93-(-) SABENA Complements on green paper
			D	MIL-G-3545 MIL-L-3545	

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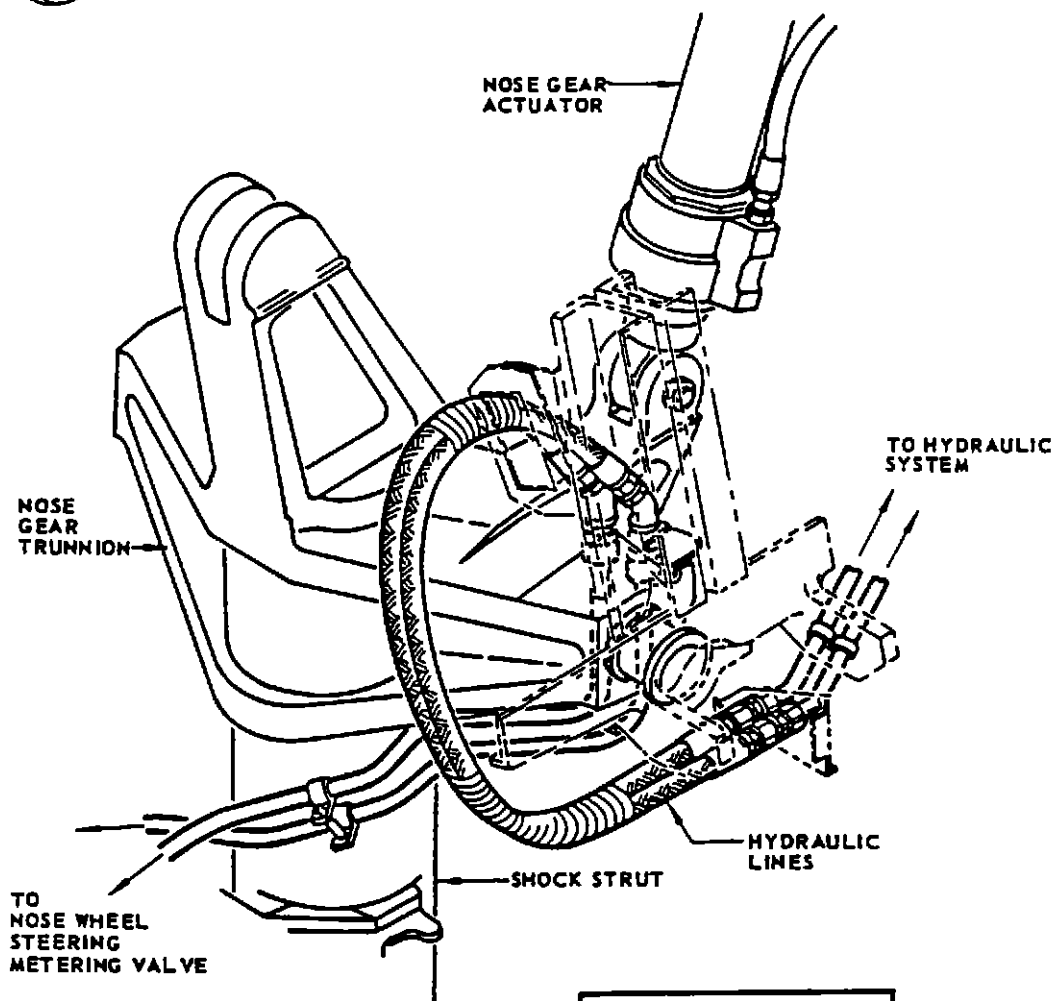
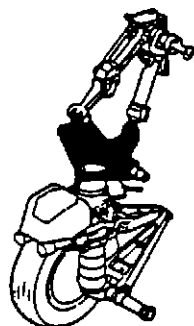
- (7) Disconnect nose wheel steering cables.
- (a) On airplanes 00-SJA through 00-SJE, reduce tension on nose wheel steering cables, remove pulley guards and unfasten cable at attachment points.
 - (b) On airplanes 00-SJF and 00-SJG, disconnect the nose wheel steering cables at the quick disconnect as follows:

NOTE: Access to disconnect fittings is through lightening holes in right side of nose wheel well structure, opposite steering valve housing on nose gear.

 - 1) Detach protection tube assembly at bulkhead and slide assembly aft on cable.
 - 2) Release tension on cables.
 - 3) Turn nose gear to move disconnect forward into an accessible position.
 - 4) Compress retention spring on disconnect assembly and remove aft cable swaged end from disconnect barrel.
 - (c) On airplanes 00-SJH and on, disconnect steering cables at turnbuckles at shock strut.
- (8) On airplanes 00-SJA through 00-SJG, disconnect hydraulic lines from swivel fitting on outboard left side of nose gear trunnion. Remove antirotation bracket attached to swivel fitting.
- (9) On airplanes 00-SJH and on, disconnect hydraulic lines as necessary. (See figure 201A.)
- (10) Deflate nose gear shock strut. See 32-4-11.
- (11) Install lock assembly, F70029, around cross members in upper and lower torsion links.

NOTE: This will prevent inner cylinder from extending when airplane is jacked.

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EFFECTIVITY

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	LX-N20199
RTCA	LX-N19997
	LX-N20000

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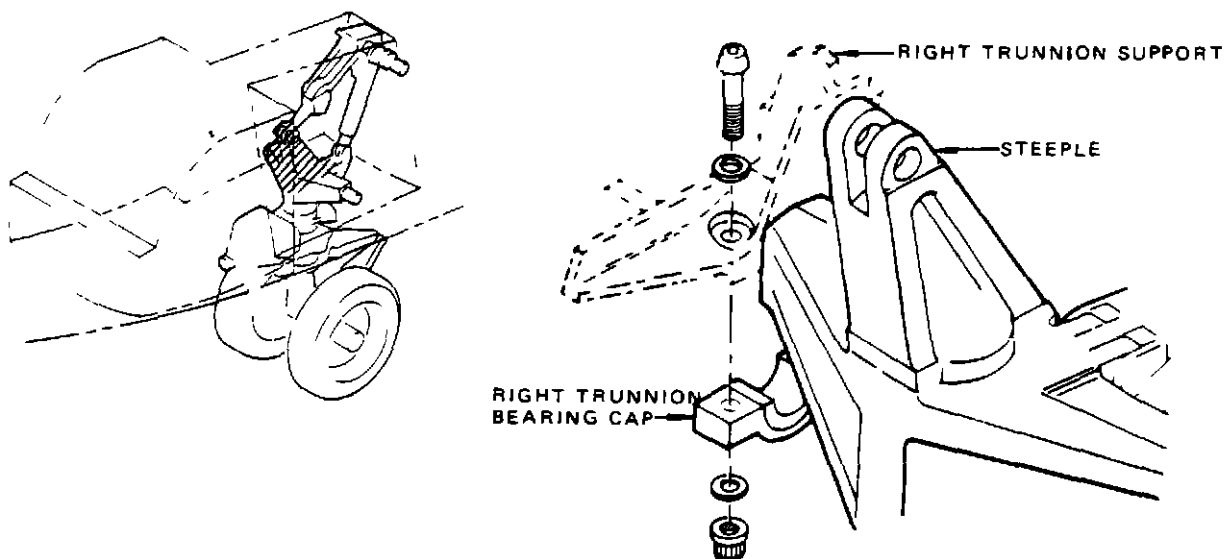
- (12) Jack airplane until nose gear clears the ground (See Airplane Jacking, Chapter 7)
- (13) Disconnect the hydraulic actuator from the nose gear and let it hang from the upper attachment shaft (See figure 204)
- (14) Disconnect the drag brace from the nose gear steeple and let it hang from the upper attachment shaft. (See figure 203)
- (15) Attach a rope to the shock strut and over the actuator support shaft to act as a guide when gear is lowered
- (16) Place jack under nose gear and raise to support weight of gear (See figure 205)
- (17) Remove the trunnion bearing caps (See figure 202)

NOTE The bearings in bearing caps and trunnion supports are matched pairs and must not be interchanged

- (18) Lower gear slowly and slacken guide rope as gear goes down

C. Install Nose Landing Gear

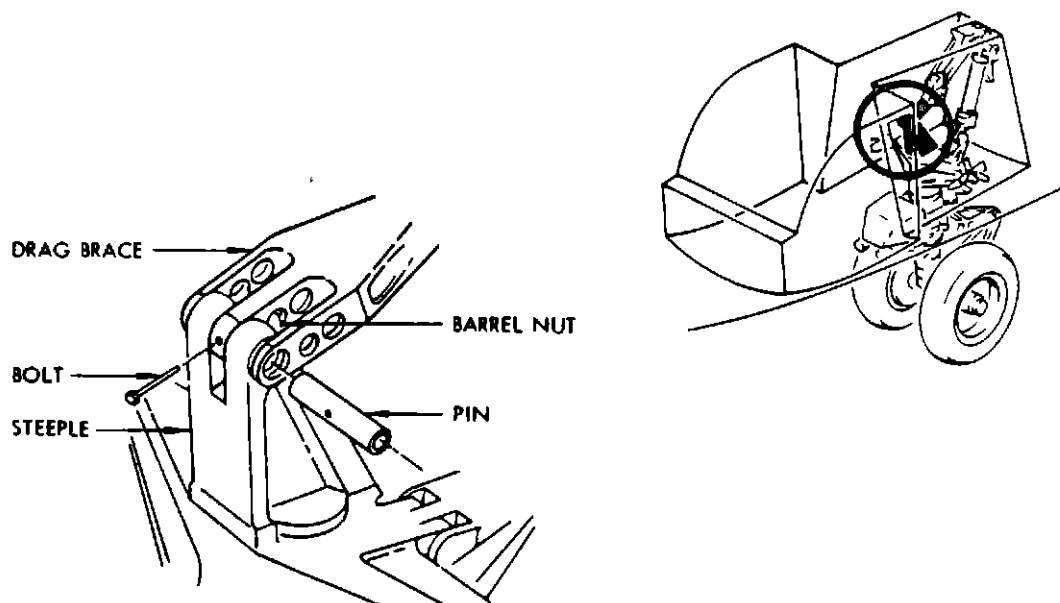
- (1) Roll a new or serviceable gear into position under wheel well
- (2) Attach a rope to the shock strut and over the actuator support shaft, to act as a guide, when the nose gear is raised
- (3) Place jack under nose gear and raise nose gear, guiding trunnions into trunnion support bearings.
- (4) Install the trunnion bearing caps and tighten the bolts to a torque range of 3700 to 4900 pound-inches (See figure 202)



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- (5) Attach drag brace to shock strut.
 - (a) Set drag brace in locked down position.
 - (b) Insert pin through drag brace and steeple, using finger pressure only. (See figure 203.)
 - (c) Rotate nose gear to up position and with no load on pin, with finger pressure only, move pin back and forth to ensure there is no binding.
 - (d) Align holes in drag brace and pin.
 - (e) Secure pin with lockbolt.
- (6) Rotate nose gear to down and locked position.
- (7) Attach nose gear actuator.
 - (a) Align actuator with actuator attachment lug. (See figure 204.)
 - (b) Insert washers and install attachment bolt.
- (8) On PAA N714PA thru N799PA and N401PA thru N407PA, TWA N760TW thru N779TW, AF 707-328 and 707-328B, ELAL 4X-ATA thru 4X-ATC, SAA ZS-CKC thru ZS-CKE, SAB OO-SJA thru OO-SJG, install swivel fitting antirotation bracket and connect hydraulic lines to swivel fitting.
- (9) On PAA N408PA thru N499PA, TWA N780TW, N793TW, N8705T, N8715T, N8725T, N18701 and on, AF 707-328C, ELAL 707-358B, SAA ZS-DYL and on, SAB OO-SJH and on, connect hydraulic lines as necessary. (See figure 201A.)

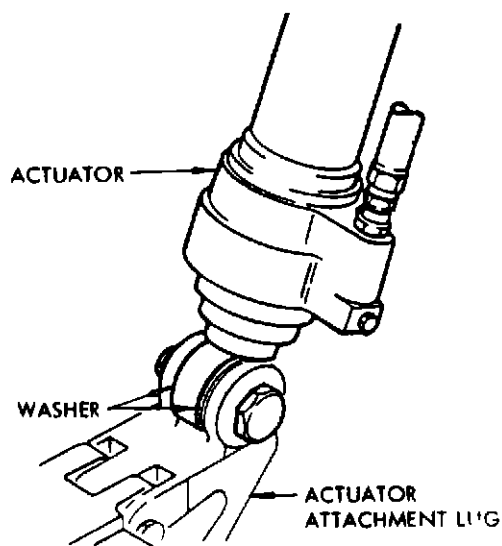
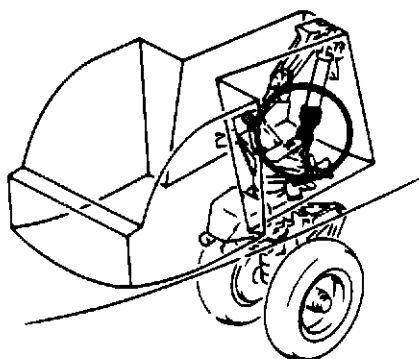


Attachment of Drag Brace
Figure 203



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- (10) Remove jack under nose gear. (See figure 205.)
- (11) Connect nose wheel steering cables.
 - (a) On PAA N701PA thru N706PA and N714PA thru N730PA, AF F-BHSA thru F-BHSQ, SABENA OO-SJA thru OO-SJE, attach and adjust steering cables and install pulley guards. See 32-8-11, Steering Cable and Linkage - Maintenance Practices.
 - (b) On PAA airplanes N757PA and on, and all 707-321B, AF airplanes F-BHSR thru F-BLCB, F-BLCD, SABENA OO-SJF and OO-SJG connect cables at quick-disconnect as follows.
 - 1) Turn nose gear until disconnect assembly is in an accessible position.
 - 2) Compress retention spring on disconnect assembly, insert swaged ball end of cable in barrel and release spring.
 - 3) Check collars on disconnect assembly and cable ends for correct seating.
 - 4) Slide protection tubes forward into position on bulkhead.
 - 5) Rotate tube mounting angle relative to clamp to match angle between bulkhead and cable.
 - 6) Secure guard to bulkhead.





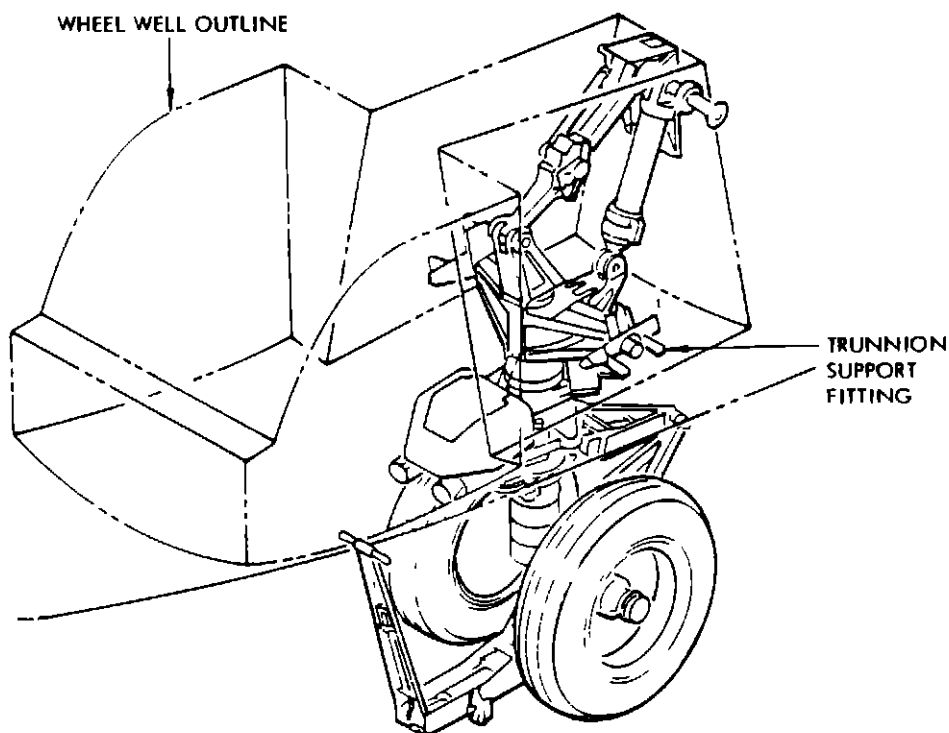
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- (c) On airplanes 00-SJH and on, connect steering cables at turnbuckles at shock strut. Refer to 32-8-13.
- (12) Adjust steering cables. See 32-8-13, Steering Cable and Linkage.
- (13) Remove jacks from under airplane.
- (14) Service nose gear shock strut. See 32-4-11.
- (15) Replace nose gear shock strut door and fairing. See 32-5-51.
- (16) Attach nose gear door actuation rods to nose gear doors.
- (17) Pressurize utility hydraulic system.
- (18) Return nose gear door ground release handle to up position.

CAUTION: DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING: STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOORS CLOSE WHEN DOOR RELEASE HANDLE IS IN DOOR CLOSED POSITION.

- (19) Perform test of nose landing gear. See 32-1-0, Adjustment/Test Landing Gear and Door Control System.



Raising of Nose Gear
Figure 205



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3 Inspection/Check Nose Landing Gear

A Equipment and Materials

- (1) Down Lock - Nose Landing Gear - F70008-500 or equivalent
- (2) Drag Brace Lock - F71125
- (3) Spring Balance - 60 pound capacity

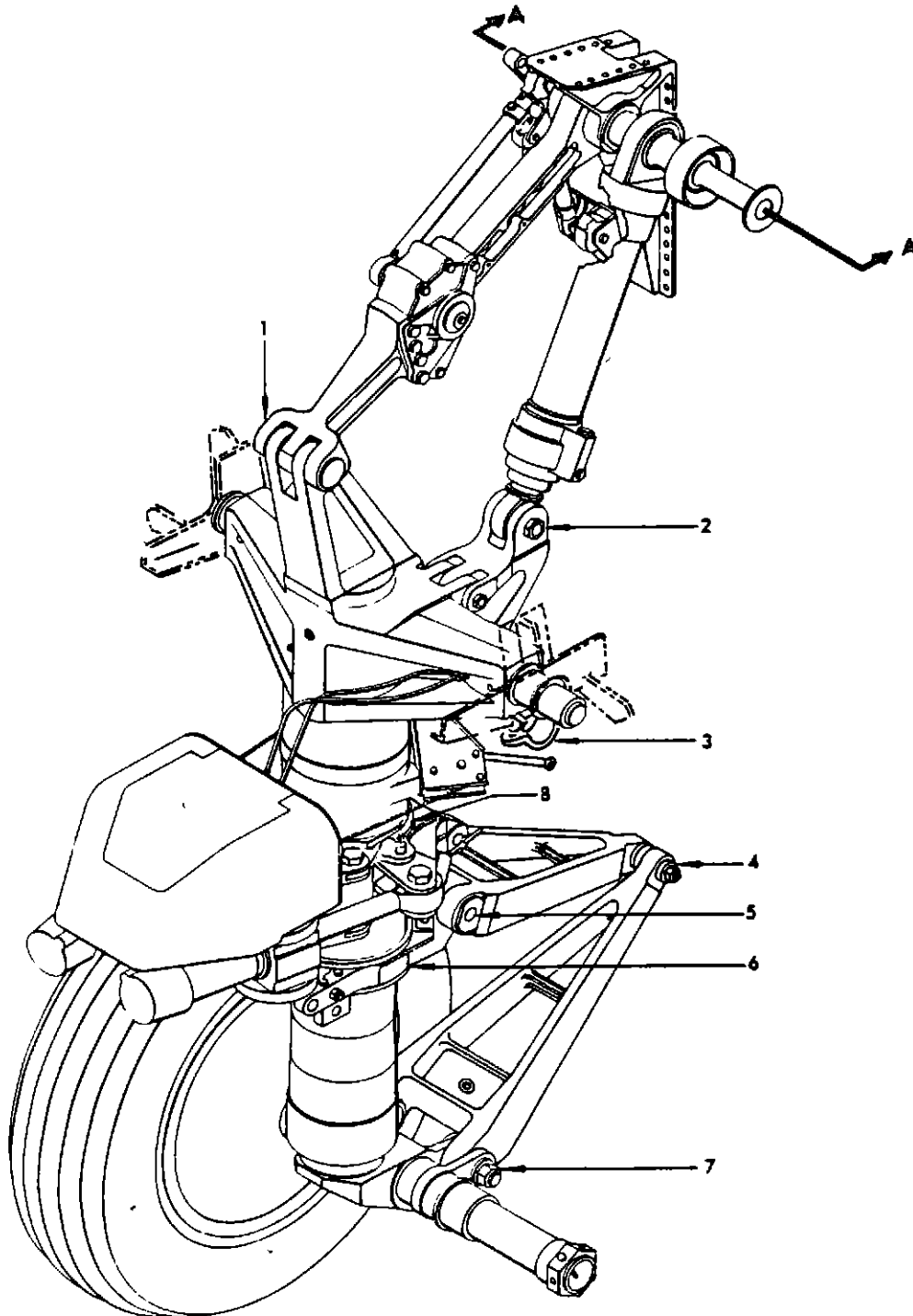
B Examine Nose Landing Gear

- (1) Open nose gear doors using door ground release handle
- (2) Check that the nose landing gear external down lock and drag brace lock are installed
- (3) Disconnect door actuation rods from nose gear doors
- (4) Examine nose gear for the following
 - (a) Strut filler valve and strut for hydraulic leaks.
 - (b) Strut outer cylinder lug welds, and seams for cracks.
 - (c) Exterior surface of strut inner cylinder for dirt, scratches, and galling.
 - (d) Strut for specified fluid and inflation pressure
 - (e) Drain plug for leaks
 - (f) Torsion links, steering collar, and steering cylinder support plate attachment lugs for cracks and loose mounting bolts.
 - (g) Steering and towing collar bearings for dirt and wear, (See figure 206.)
 - (h) Wheels for cracks, corrosion and flaked paint
 - (i) Drag brace shaft for cracks, and evidence of wear.
 - (j) Torsion link apex for loose bolt.
 - (k) Nose gear, lock, and lock retention actuators for loose mounting bolts and evidence of fluid leakage.
 - (l) Pin, through drag brace and steeple, for looseness and wear.
 - (m) Trunnions for looseness, cracks, or evidence of wear



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- (5) On airplanes having flap type nose gear shock strut doors, check shock strut door rod damper by applying a 60 (± 5) pound tangential load in both directions at extreme end of door. Rod damper assembly should extend or contract 0.10 (± 0.02) inch.
- (6) Reconnect door actuation rods to doors.



Nose Gear Allowable Wear and Rework
Figure 206 (Sheet 1)



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INDEX NO.	DIM.	DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
		DIAMETER		MAX. WEAR DIM.	MAX. DIAM. CLEAR-ANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE	
		MIN.	MAX.			YES	NO	MTL		MIN.	MAX.
1	ID	1.5000	1.5010	1.5040	.0080		X				
	OD	1.4980	1.4990	1.4960		X		▽			
2	ID	.8743	.8750		.0040			▽			
	OD	.8725	.8737	.8721		X		▽			
3	ID	2.2500	2.2520	2.2530	.0060	X		▽			
	OD	2.2480	2.2490	2.2470		X		▽			
4	ID	.7500	.7510	.7555	.0125	X		▽			
	OD	.7445	.7490	.7430			X				
5	ID	1.5000	1.5020	1.5050	.0090	X		▽			
	OD	1.4970	1.4980	1.4960		X		▽			
5	ID	1.5000	1.5010	1.5040	.0080	X		▽			
	OD	1.4970	1.4980	1.4960		X		▽			
6	ID	7.3750	7.3770	7.3800	.0100	X		▽			
	OD	7.3720	7.3750	7.3600			X				
7	ID	1.5000	1.5020	1.5050	.0090	X		▽			
	OD	1.4980	1.4990	1.4960		X		▽			

18 PAA N714PA thru N763PA 19 Bronze
 TWA N761TW thru N772TW
 AF F-BESA thru F-BHSU 20 Chromium QQ-C-320
 SAB OO-SJA thru OO-SJF
 BOAC G-APFB thru G-APRA 21 Cadmium QQ-P-416
 DLH D-ABOB thru D-ABOG
 AII VT-DJI thru VT-DNZ 22 Needle Bearing
 VARIG FF-VJA
 SAA ZS-CKC thru ZS-CKE
 ELAL 4X-ATA thru 4X-ATC

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

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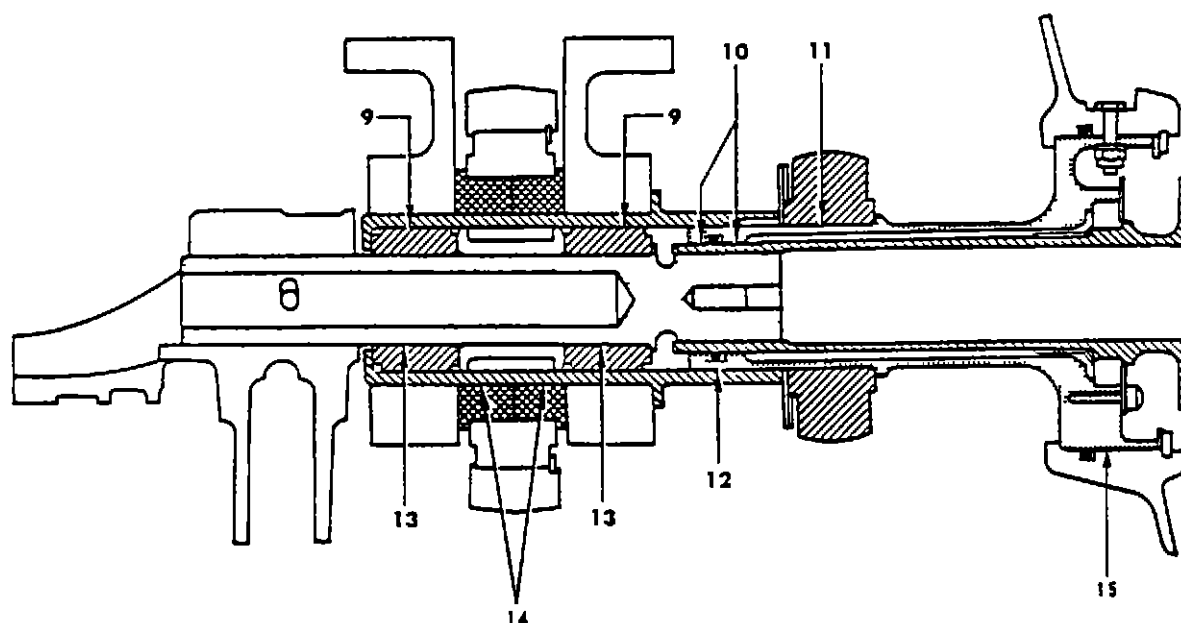
Nose Gear Allowable Wear and Rework
Figure 206 (Sheet 2)

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SECTION A-A



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INDEX NO	DIM.	DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
		DIAMETER		MAX WEAR DIM	MAX DIAM. CLEAR-ANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTERFERENCE	
		MIN	MAX			YES	NO	MTL.		MIN	MAX
7 ▶	ID	1.4990	1.5000	1.5020	.0060	X		▶			
	OD	1.4980	1.4990	1.4960		X		▶			
8	ID	7.3750	7.3770	7.3800	.0100	X		▶			
	OD	7.3720	7.3750	7.3700			X				
9	ID	1.9990	2.0000	2.0000	.0062	X		▶	.0060		
	OD	1.9994	2.0000								
10	ID	1.5000	1.5020	1.5020	.0120						
	OD	1.4950	1.4970	1.4930		X		▶	.0050		
11	ID	1.9993	2.0000		.0140						
	OD	1.9980	1.9990	1.9840		X		▶	▶.0050		
12	ID	1.9990	2.0000	2.0000	.0072						
	OD	1.9980	1.9990	1.9928		X		▶	.0050		
13	ID	1.2493	1.2500		.0040						
	OD	1.2485	1.2495	1.2450		X		▶	▶.0045		
14 ▶	ID	2.3840	2.3850	2.3880	.0080						
	OD	2.3815	2.3825	2.3800		X		▶			
15	OD	4.366	4.368	4.356	IF OD OF SHAFT IS CORRODED CLEAN UP BY SAND BLASTING. LOCAL WEAR OR CORROSION SHOULD NOT EXCEED 40% OF TOTAL SURFACE AND A DEPTH OF .010. PLATE PER ▶						

▶ Bronze
 ▶ Chromium QQ-C-320
 ▶ Cadmium QQ-P-416
 ▶ Needle Bearing

▶ PAA N701PA thru N763PA
 AF F-4C thru F-4SU
 SAB OO-3JA thru OO-3JF
 BOAC G-AFFB thru G-APRA
 DLH D-ABOB thru D-ADOG
 ATI Turbojet

▶ Nickel
 ▶ Install with Grease
 ▶ Standard Passenger Airplanes only

▶ PAA N764PA and on
 AF F-4SV and on
 SAB OO-4JG
 BOAC G-ARRB and G-ARRC
 DLH D-AJOP and on
 ATI Turbofan

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Nose Gear Allowable Wear and Rework
 Figure 206 (Cont'd)
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- (7) Return nose gear door ground release handle to up position.

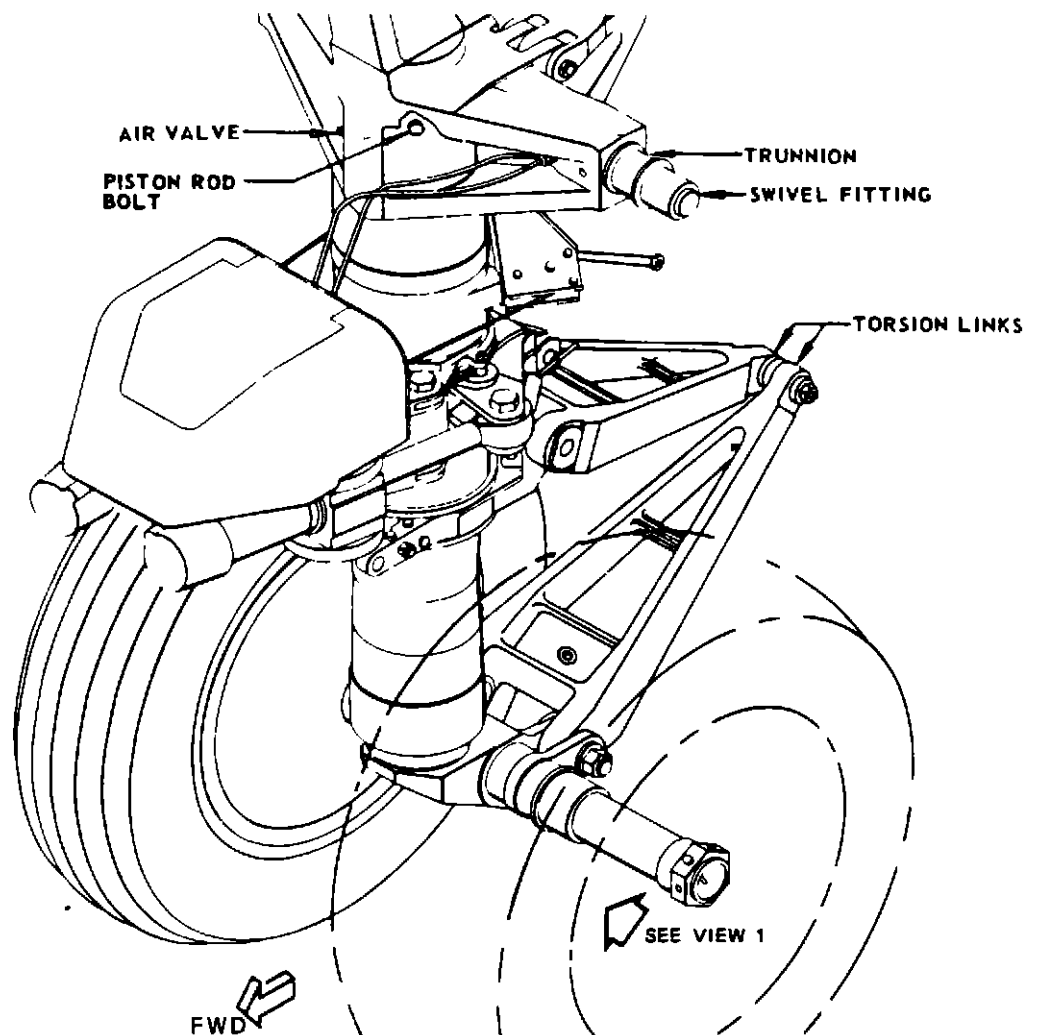
CAUTION: DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING: STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOORS CLOSE WHEN DOOR RELEASE HANDLE IS IN DOOR CLOSED POSITION.

C. Special Check on Nose Gear

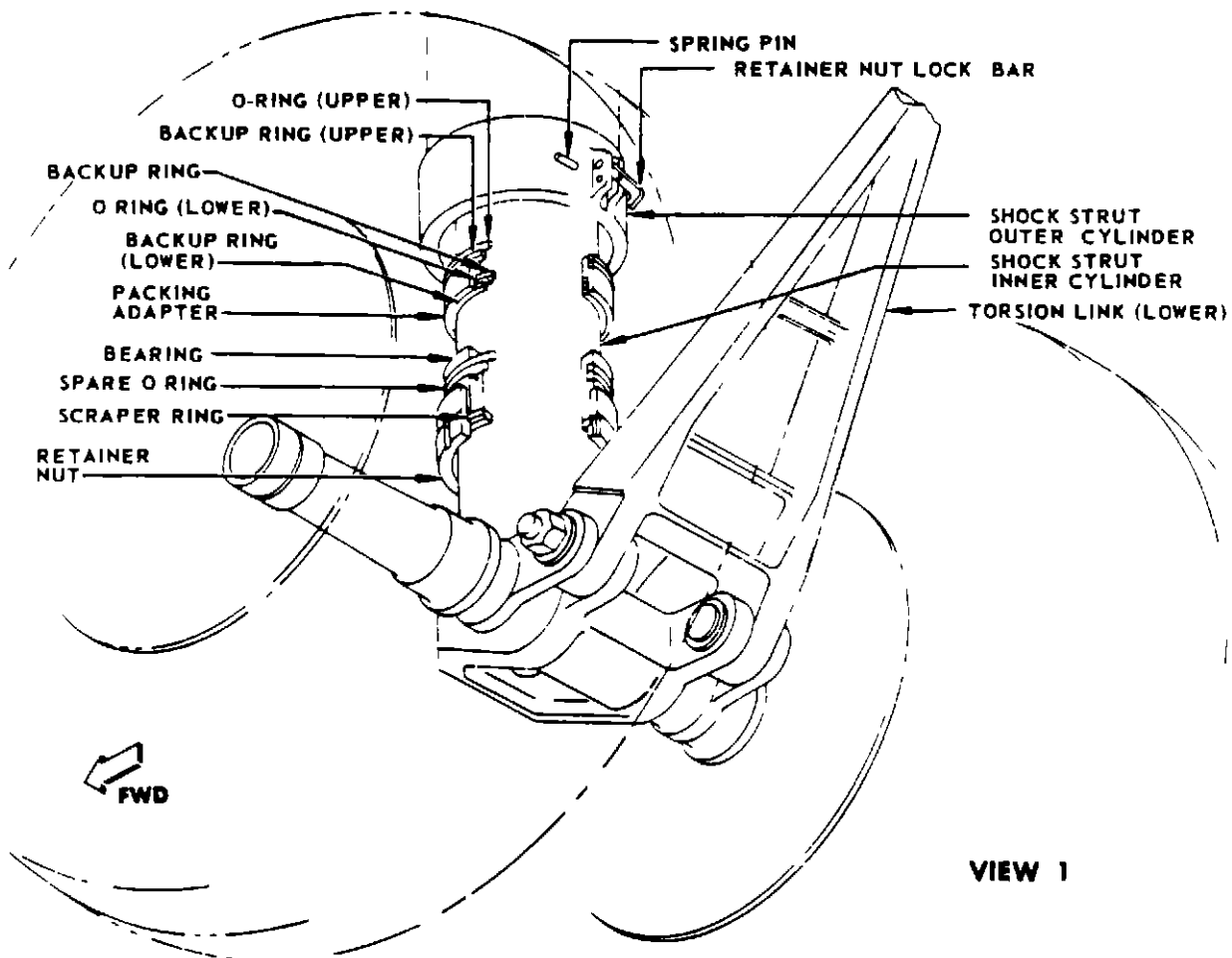
NOTE: Perform nose gear special check in accordance with instructions given in Conditional Inspection Requirements, Chapter 51.

- (1) Check nose gear axle.
 - (a) With wheels removed check axle for scoring and galling.
- (2) Check shock strut piston rod for distortion or cracks around fluid path holes.



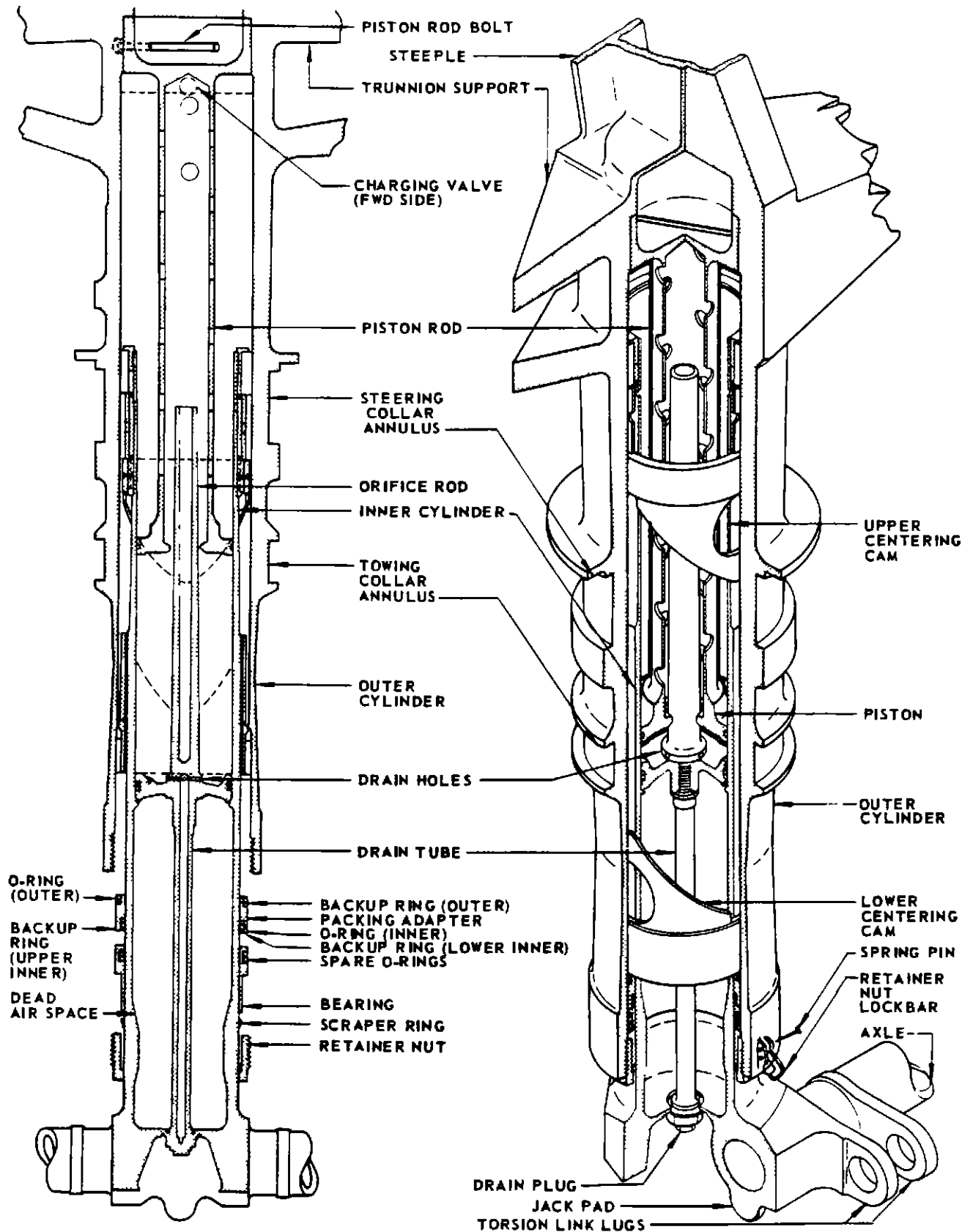
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- (a) Check that main gear external downlocks are installed, depressurize hydraulic system, shut off electrical power and position landing gear control handle to "OFF."
- (b) Raise nose of airplane until nose gear oleo is extended but wheels are still in contact with ground See Chapter 7, "Jacking."
- (c) Deflate and drain nose gear oleo See Chapter 12, "Air and Nitrogen Servicing."
- (d) Remove retainer nut lock bar (figure 207) and unscrew retainer nut from oleo outer cylinder, slipping retainer nut down to rest on axle For more information see 32-4-11 "Nose Gear Shock Strut-Maintenance Practices "
- (e) Disconnect torsion links at apex bolt and manually unlock nose gear, so that gear is free to swing forward
- (f) Roll wheels forward along ground until inner cylinder is completely withdrawn from outer cylinder



Nose Gear Piston Rod Examination
Figure 207 (Sheet 2 of 2)

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Nose Gear Piston Rod Location
 Figure 208

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- (g) Remove piston rod bolt from top of outer cylinder.

NOTE If bolt is installed with head facing aft it will be necessary to cut off bolt head to remove bolt.

- (h) Pull piston rod (figure 208) from outer cylinder and examine for distortion or cracks around lower fluid path holes. Replace piston rod if necessary.

- (i) When examination is completed install piston rod in outer cylinder, install piston rod bolt with head facing forward. Reinstall inner cylinder into outer cylinder and reconnect torsion links.

NOTE Before reassembly fit new O-rings to piston rod and inner cylinder and check that spare seals are provided in their housing on bearing.

- (j) Roll wheel along ground in aft direction until strut is in fully down attitude and install external down lock
- (k) Check that nose wheels are set straight ahead, lower airplane and remove jacks.
- (l) Service nose bear oleo per Chapter 12, "Air and Nitrogen Servicing," restore hydraulic system to normal condition and restore electrical power.

4. Approved Repairs Nose Gear Axle

A. General

- (1) Damaged nose gear axles may be repaired if rework does not reduce axle wall thickness by more than 0.020 inches, or cover an arc more than 30 degrees on any cross section of axle. Rework on bearing surface must not exceed 20 per cent of projected bearing area.

B. Equipment and Materials

- (1) Hand files
- (2) Emery cloth

C. Repair Nose Gear Axles

- (1) Hand file gouges to one inch blend radius, and polish galling in damaged area.

CAUTION IF REWORKED AREA EXCEEDS LIMITS SPECIFIED IN PARAGRAPH 4.A.(1) AXLE MUST BE REPLACED.

- (2) Dress out file marks with emery cloth.
- (3) Check reworked area for cracks by magnetic inspection

5. Approved Repairs Nose Gear Outer Cylinder Fatigue Cracks

A. General

- (1) Fatigue cracks may occur in the radius between the outer cylinder and the right hand trunnion support. (See figure 209).
- (2) Outer cylinder may be repaired if cracks are no longer than 3 inches and if they can be completely removed without reducing cylinder wall thickness by more than 0.110, while maintaining a radius of 0.75 to 0.98 inches. (See figure 209.) If any of the above limits is exceeded, the outer cylinder must be replaced.

B. Examine Outer Cylinder for Cracks.

- (1) Remove nose wheel fairing.
- (2) Inspect area where cracks may occur per ultrasonic inspection.
- (3) Remove paint and confirm presence of indicated cracks per dye penetrant inspection.

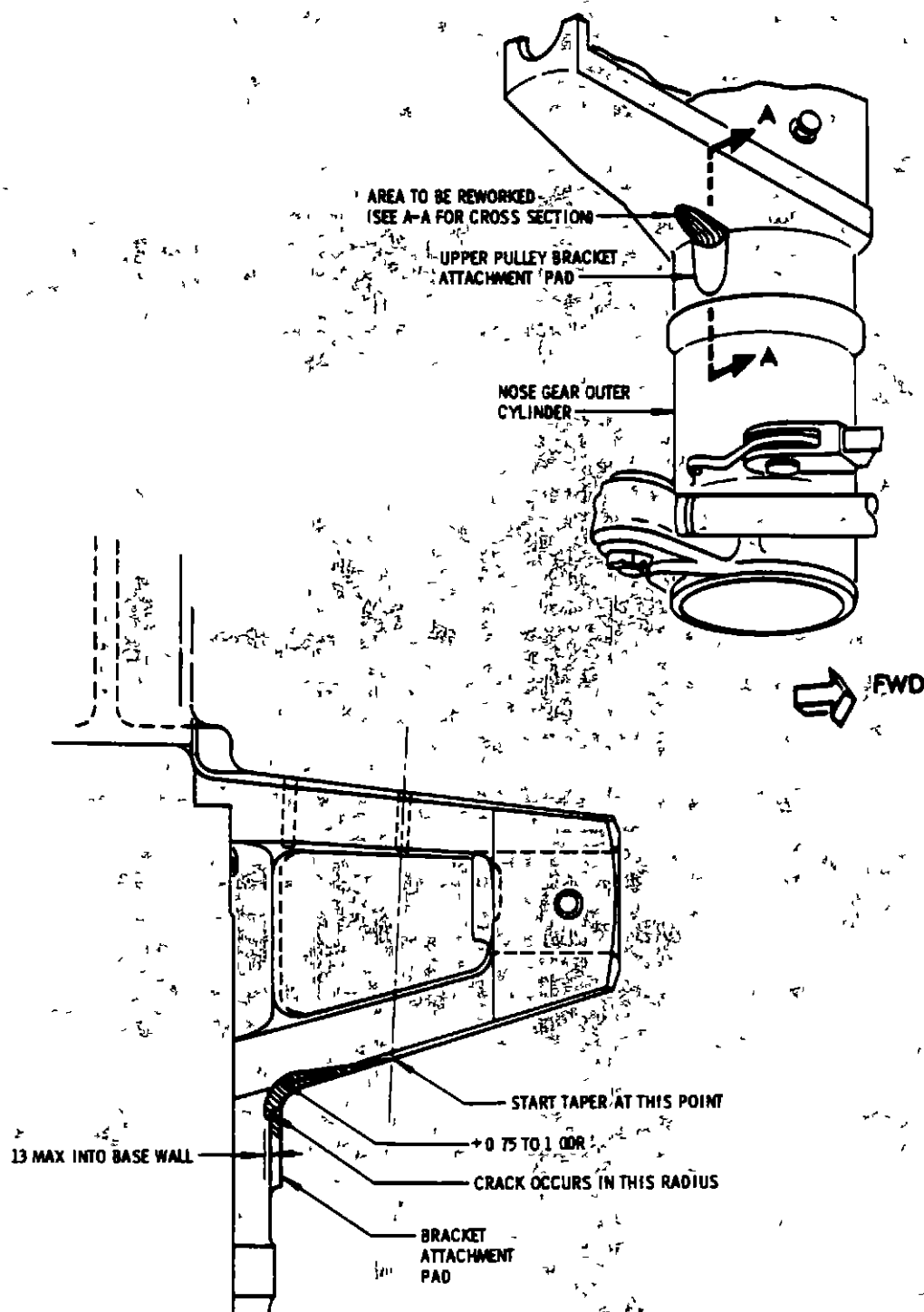
C. Repair Cracks

- (1) Rework outer cylinder per figure 209 by rotary file
- (2) Remove an extra 0.020 inches of wall thickness after all evidence of cracks has disappeared. Polish reworked area with emery cloth to obtain a 63 micro inches finish.

CAUTION: IF TOTAL DEPTH OF MATERIAL REMOVED DURING STEPS (1) AND (2) EXCEEDS 0.130 INCHES OUTER CYLINDER MUST BE REPLACED.

- (3) Check reworked area for cracks by magnetic inspection.
- (4) Repaint as necessary. See Chapter 51.
- (5) Replace nose wheel well fairing.

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Nose Gear Shock-Strut Fatigue Cracks Approved Repair
Figure 209

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NOSE GEAR DRAG BRACE - MAINTENANCE PRACTICES

1. Removal/Installation Nose Gear Drag Brace

A. General

- (1) Before the drag brace can be removed from the airplane, the complete upper support shaft has to be removed. The upper support shaft consists of four separate parts; a drag brace shaft, lock mechanism shaft, nose gear actuator shaft, and emergency extension shaft.
- (2) To remove the drag brace shaft involves the removal of the nose gear actuator, lock mechanism lock crank, and the nose gear emergency extension shaft and release drum.

B. Equipment and Materials

- (1) Down Lock, Nose Landing Gear, F70008-500 or equivalent
- (2) Down Lock, Main Landing Gear, F71126-500

C. Remove Nose Gear Drag Brace

- (1) Depressurize utility hydraulic system using manual bypass valve on forward side of right wheel well side strut opening.
- (2) Depressurize utility hydraulic reservoir by loosening filler cap slowly.
- (3) Open nose gear doors using door ground release handle in external power receptacle opening.
- (4) Check that nose gear and both main gear down locks are installed.
- (5) Disconnect door actuation rods from nose gear doors.
- (6) On turbojet airplanes remove nose gear shock strut door and fairing. See 32-5-51.
- (7) Using nose jacking point raise nose of airplane until nose wheel clears ground by no less than one-inch with shock strut fully extended. See Airplane Jacking, Chapter 7. Do not deflate shock strut.

WARNING: IF NOSE WHEEL DOES NOT CLEAR GROUND, PRESSURE IN SHOCK STRUT MAY CAUSE UNEXPECTED MOTION OF GEAR DURING DRAG BRACE REMOVAL/INSTALLATION, AND PERSONNEL MIGHT BE INJURED.

- (8) Remove nose gear lock and position switches. See 32-6-12.
- (9) Remove nose gear actuator. See 32-4-41.

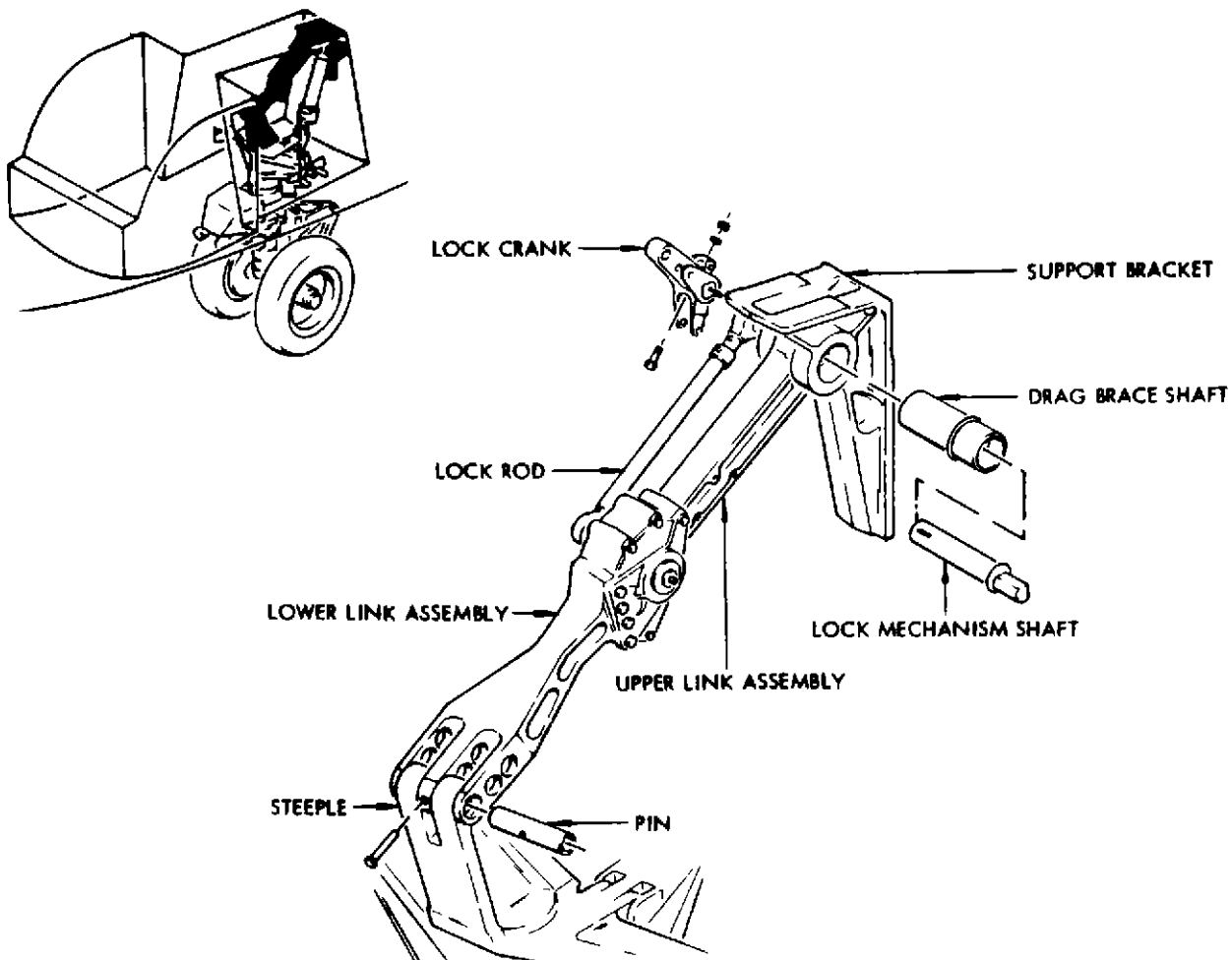
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- (10) Remove nose gear lock mechanism lock crank. See 32-4-51.
- (11) Remove bolt and pin from lower link assembly and steeple of nose gear. (See figure 201.)
- (12) Support drag brace and remove drag brace shaft from upper link assembly and support bracket.

NOTE: There are two detachable spacers in drag brace upper bearing.

C. Install Nose Gear Drag Brace

- (1) Support a new or serviceable drag brace in position and install drag brace shaft through spacers in upper link assembly and support bracket. (See figure 201.)
- (2) Install pin and bolt through lower link assembly and steeple of nose gear with drag brace in locked position, using finger pressure only.



Nose Gear Drag Brace Installation
Figure 201



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- (3) Rotate nose gear to up position and with no load on pin with finger pressure only, move pin back and forth to ensure there is no binding.
- (4) Rotate nose gear to down and locked position.
- (5) Install nose gear lock mechanism lock crank. See 32-4-51.
- (6) Install nose gear actuator. See 32-4-41.
- (7) Install nose gear lock switch and position switch. See 32-6-12
- (8) Install nose gear shock strut door and fairing. See 32-5-51
- (9) Install nose gear downlock.
- (10) Connect nose gear door actuation rods to nose gear doors.
- (11) Pressurize utility hydraulic system.
- (12) Return nose gear door ground release handle to up position.

WARNING: STAND CLEAR OF THE DOOR ACTION PATH AND BE SURE DOORS
CLOSE WHEN DOOR RELEASE HANDLE IS IN DOOR CLOSED POSITION.
- (13) Perform test of nose landing gear with hydraulic power. See 32-1-0.
- (14) Perform manual extension test of nose landing gear. Refer to 32-7-21, Adjustment/Test Nose Gear Emergency Extension Mechanism.
- (15) Lower airplane and remove jacks.

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NOSE GEAR SHOCK STRUT - MAINTENANCE PRACTICES

1 Approved Repairs Nose Gear Shock Strut

A. General

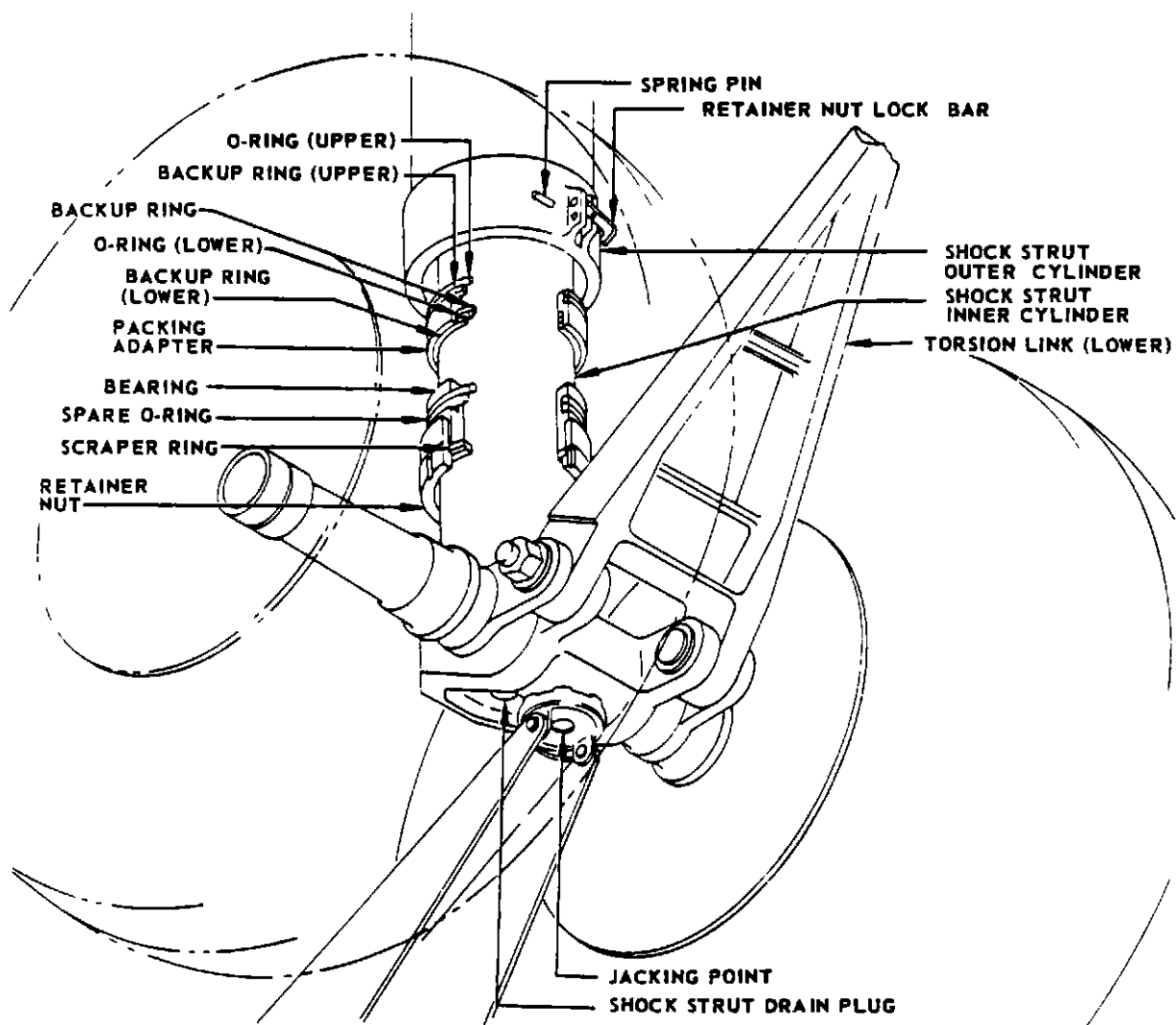
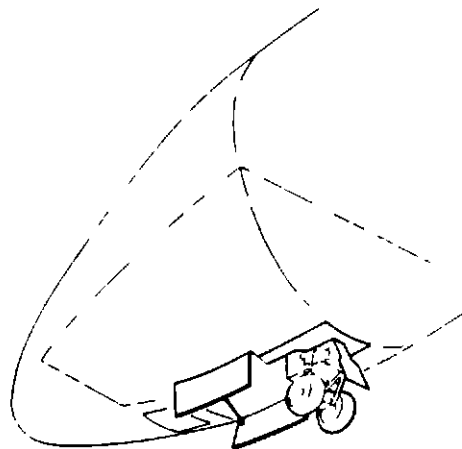
- (1) A spare set of O-rings are carried in grooves in the shock strut lower bearing so that seals may be replaced once without removing shock strut inner cylinder.
- (2) After spare O-rings have been used in replacement, next replacement of seals will require disassembly of shock strut. At this time a spare set of seals should be stowed in the bearing annuli.

B. Equipment and Materials

- (1) Hydraulic cart with MIL-H-5606 (hydraulic fluid) for servicing nose gear shock strut
- (2) An air compressor or air bottle capable of 1800 psi for servicing nose gear shock strut
- (3) Petrolatum - VV-P-236
- (4) Molybdenum Disulphide - MIL-L-7866
- (5) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (6) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent
- (7) Spanner wrench for nose gear oleo retaining nut
- (8) Container.- 2-gallon capacity

C. Prepare for Seal Replacement

- (1) Check that all landing gear downlocks are installed and that nose gear wheel well doors are open with release handle down and latched.
- (2) Depressurize hydraulic system and shut off electrical power
- (3) Jack nose of airplane until shock strut has extended about 10 inches. Refer to Airplane Jacking, Chapter 7.



Nose Gear Shock Strut O-ring Replacement
 Figure 201

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(4) Deflate shock strut

- (a) Remove valve cap from charging valve and loosen outer hex-nut.
(Maximum two turns)

WARNING. DO NOT LOOSEN VALVE BODY UNTIL SHOCK STRUT IS
COMPLETELY DEFLATED. AIR PRESSURE CAN BLOW
VALVE BODY OUT, CAUSING INJURY TO PERSONNEL.

- (b) When air ceases to escape through valve, replace valve cap

(5) Drain shock strut

- (a) Check that shock strut is deflated.
- (b) Place container below drain plug at bottom of shock strut.
(See figure 201.)
- (c) Remove plug and allow oil to drain.
- (d) Replace plug and lockwire.

D. Replace Active Inner Cylinder Seals with Spare Seals

- (1) Jack under nose gear until shock strut extension is reduced to three or four inches.
- (2) Remove lock wire from retainer nut lock bar. (See figure 201.)
- (3) Remove lower spring pin on lock bar and turn lock bar up
- (4) Loosen retainer nut and allow nut to slide down inner cylinder
- (5) Lower jack under nose gear slowly to extend inner cylinder.
- (6) Pull scraper ring, bearing, and packing adapter out of outer cylinder
- (7) Cut and remove old O-rings from packing adapter.

CAUTION DO NOT DAMAGE BACKUP RINGS ON PACKING ADAPTER

- (8) Slip spare O-rings out of groove in bearing.
- (9) Apply a film of hydraulic fluid to the O-rings.

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- (10) Place large O-ring in upper part of packing adapter.
- (11) Place smaller O-ring in lower end of packing adapter with a backup ring on both sides of O-ring
- (12) Insert packing adapter, with new O-rings, into outer cylinder.
- (13) Insert bearing, without O-rings, into outer cylinder
- (14) Insert scraper ring into outer cylinder.
- (15) Screw retainer nut into outer cylinder and tighten to 25 to 100 pounds-foot torque.
- (16) Back off retainer nut to nearest locking slot and install lock bar.
- (17) Install spring pin in lock bar and lockwire
- (18) Wipe the exposed inner cylinder with hydraulic fluid.
- (19) Remove all jacks from the airplane.
- (20) Service the shock strut. See Combined Air and Fluid Servicing, Chapter 12.

E Replace Active Inner Cylinder Seals and Install Spare Seals

- (1) Prepare shock strut for seal replacement. See paragraph C.
- (2) Raise nose of airplane until shock strut is extended but wheels are still in contact with ground.
- (3) Remove lock wire from retainer nut lock bar.
- (4) Remove lower spring pin from lock bar, and turn lock bar up.
- (5) Loosen retainer nut and allow nut to slide down inner cylinder.
- (6) Disconnect torsion links at apex bolt and manually unlock nose gear so that gear is free to swing forward.
- (7) Roll wheels forward along ground until inner cylinder is completely withdrawn from outer cylinder.



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- (8) Raise upper O-ring from groove in packing adapter. Cut and discard O-ring.
- (9) Slide packing adapter and cam up inner cylinder and squirt solvent into groove for lower O-ring.
- (10) Clean and dry inner cylinder below packing adapter. Push packing adapter down until O-ring is on dry surface.
- (11) Taking care not to damage packing adapter, or block O-ring groove, apply leverage with a quick pull to force packing adapter up and leave O-ring exposed.
- (12) Cut and discard O-ring.

CAUTION: DO NOT ATTEMPT TO CUT O-RING WHILE O-RING IS IN GROOVE IN PACKING ADAPTER. DO NOT USE ANY SHARP INSTRUMENT TO PRY O-RING FROM GROOVE.

- (13) Remove backup rings from upper and lower seal adapter grooves. Check for serviceability. Replace with new rings if damaged in any way.
- (14) Wipe shock strut inner cylinder with hydraulic fluid.
- (15) Immerse new upper O-rings in hydraulic fluid and apply a light coat of petrolatum to upper O-rings and all backup rings. Coat new lower O-rings with molybdenum disulphide powder.
- (16) Work spare O-rings over head of inner cylinder, cams and packing adapter. Insert in outer groove in bearing.
- (17) Install backup ring in lower groove of packing adapter.
- (18) Work active O-ring over head of inner cylinder as in step (6). Insert O-ring in lower groove of packing adapter. Add backup ring.
- (19) Install backup ring in upper groove of packing adapter. Work active O-ring over inner cylinder and insert above the backup ring.

NOTE: To prevent backup ring in upper groove of packing adapter from catching in outer cylinder on assembly, coat with petrolatum and work into smallest possible outside diameter.

- (20) Check shock strut for cleanliness and working surfaces for damage

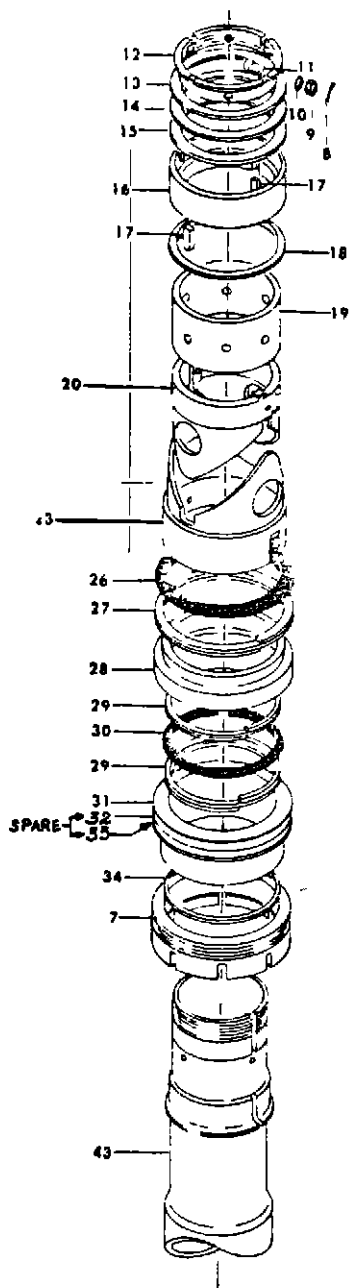
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- (21) Wipe inner surface of outer cylinder with MIL-R-5606.
- (22) Swing outer cylinder into position to permit insertion of inner cylinder.
- (23) Turn nose gear emergency extension handle $3/4$ turn clockwise and return shock strut to vertical position. Engage down lock by turning extension handle one turn counterclockwise.
- (24) Slide lower centering cam up into strut taking care to line up keyways.

NOTE: A long narrow tool may be used to position the cam. If cam slips down when released, hold in position with approved grease. If installation of cam is difficult proceed as follows:

- (a) Place a wood block and a jack under nose gear inner cylinder and jack up wheels.
 - (b) Remove both wheels.
 - (c) Lower inner cylinder until sufficient clearance is obtained to install wood block between axle and retainer nut, thus holding cams, packing adapter, bearing and retainer nut in place.
 - (d) Jack inner cylinder slowly and work cylinder round to align cam keyways and bring cam shoulder into place.
 - (e) Continue jacking until retainer nut reaches outer cylinder.
 - (f) Hold retainer nut, ease jack and remove wood block from under nut.
 - (g) Screw in retainer nut.
- (25) Tighten retainer nut to 25 to 100 pounds-foot torque.
 - (26) Back off retainer nut to nearest locking slot and install lock bar.
 - (27) Install spring pin in lockbar and lockwire.
 - (28) Connect torsion links.
 - (29) Wipe exposed inner cylinder with hydraulic fluid.
 - (30) Install external down lock in nose gear.
 - (31) Remove jacks from airplane.
 - (32) Service the shock strut. See Combined Air and Fluid Servicing, Chapter 12.

F. Replacement of Seals and Rings on Bearing Adapter
Modified per SAB 707/426.



- Prepare shock strut for seal replacement (See paragraph C). Follow instructions given in paragraph E (1) to (7).
 - Remove cotter pin (8) from nut retainer pin (11), unscrew nut (9) and remove washer (10) and pin (11).
 - Unscrew nut (12) using lug spanner wrench PN. F7113, and remove washers (13-14-15).
Note thickness and number of washers to facilitate reassembly.
 - Remove bearing (16) and key (17). Remove washer (18) and spacer (19).
 - Remove upper cam assy (20) and lower cam assy (23).
Do not remove keys from upper and lower cam unless replacement is necessary.
 - Slide bearing adapter PN. 1-73978 with seals and rings incorporated (26-27-29-32-33) from inner cylinder assy. (43).
- NOTE:** Item (28) and (31) are only given on figure for reference. They will be replaced by a one piece adapter PN. 1-73978 (See drawing 1-73979).
- Remove the affected seals and rings on bearing adapter. Replace with new seals in any way. (Check rings for serviceability).
 - Slide bearing adapter PN. 1-73978 with new seals and rings installed on inner cylinder (43).
 - Assemble in reverse sequence of disassembly.
 - Follow instructions given in paragraph E, (20) to (32).

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NOSE GEAR TIRE AND WHEEL -TROUBLESHOOTING

1 Shimmy Problems

- A. The following procedure must be accomplished when troubleshooting nose wheel shimmy problems on jet aircraft:
- B. With towing disconnect link connected and steering pressure ON, operate steering wheel a slight amount in each direction from neutral without moving nose wheel tires and check for movement. Correct as follows

- (1) Upper and lower attachment of towing disconnect link. Side play up to .004 inch permitted. If disconnect link wobbles, disassemble. Maximum allowable clearance between disconnect pin diameter and hole in steering collar is .008 inch. Maximum allowable clearance between bolt diameter and lower attachment hole in disconnect link is .005 inch.

NOTE: This information applies to spring loaded disconnect pin installation only.

- (2) Upper and lower torque arm attachment to towing collar and NLG piston. Side play up to .004 inch permitted. No play allowed in apex bolt. If movement is noted at lower attachment of torque link to NLG piston, disassemble and measure wear. Maximum allowable clearance between bolt diameter and hole in lower torque arm is .004 inch. Maximum allowable clearance between bolt diameter and attachment hole in upper torque link is .005 inch. Play at apex bolt may be removed by tightening apex bolt until thrust bearing between torque links is seated firmly, then back off nut to next castellation and install cotter pin.
- (3) Steering collar and bearings. Slight vertical movement in steering collar is allowed, however, if vertical movement and wobble is noted, disassemble collar and measure O.D. of upper and lower bearing area with bearings tight against the strut. Measure diameter in fore and aft direction and 45 degrees each side of fore and aft direction. With steering collar removed from strut, measure I.D. of upper and lower bearing area in fore and aft direction and 45 degrees each side of fore and aft direction. Maximum allowable clearance between bearing O.D. and collar I.D. must not exceed .010 inch. Replace bearings or collar if required.
- (4) Towing collar and bearings. Slight vertical movement is permitted but no wobble allowed. Disassemble towing collar and measure O.D. of towing collar bearings with bearings tight against the strut. Measure upper and lower bearing area in fore and aft direction and 45 degrees each side of fore and aft direction. With towing collar removed from strut, assemble and measure I.D. of upper and lower bearing areas. Maximum allowable clearance between bearing O.D. and collar I.D. must not exceed .010 inch. Replace bearings on collar if required.



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- (5) After parts have been installed, check that play at above locations has been eliminated or greatly reduced so that slight movement of steering wheel results in immediate nose wheel movement. If response is not immediate, check that there is no end play in steering metering valve shaft.
- (6) Whenever possible, install nose tires having equal inflated diameters within $3/8$ inch. In all cases, tire diameters must be equal within $3/4$ inch when properly inflated.

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NOSE GEAR TIRE AND WHEEL - MAINTENANCE PRACTICES

1. Removal/Installation Nose Gear Tire and Wheel

A. Equipment and Materials

- (1) Dolly Assembly, Wheel Change - F71200 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent
- (3) Drag Brace Lock - F71125 or equivalent
- (4) Grease, MIL-G-25760 (preferred), MIL-G-3545 (alternate)

CAUTION: DO NOT MIX THE ABOVE TWO TYPES OF GREASE IN THE SAME BEARING.

- (5) Nose gear jack
- (6) Wrench - axle nut
- (7) Masking tape

B. Remove Nose Gear Tire and Wheel

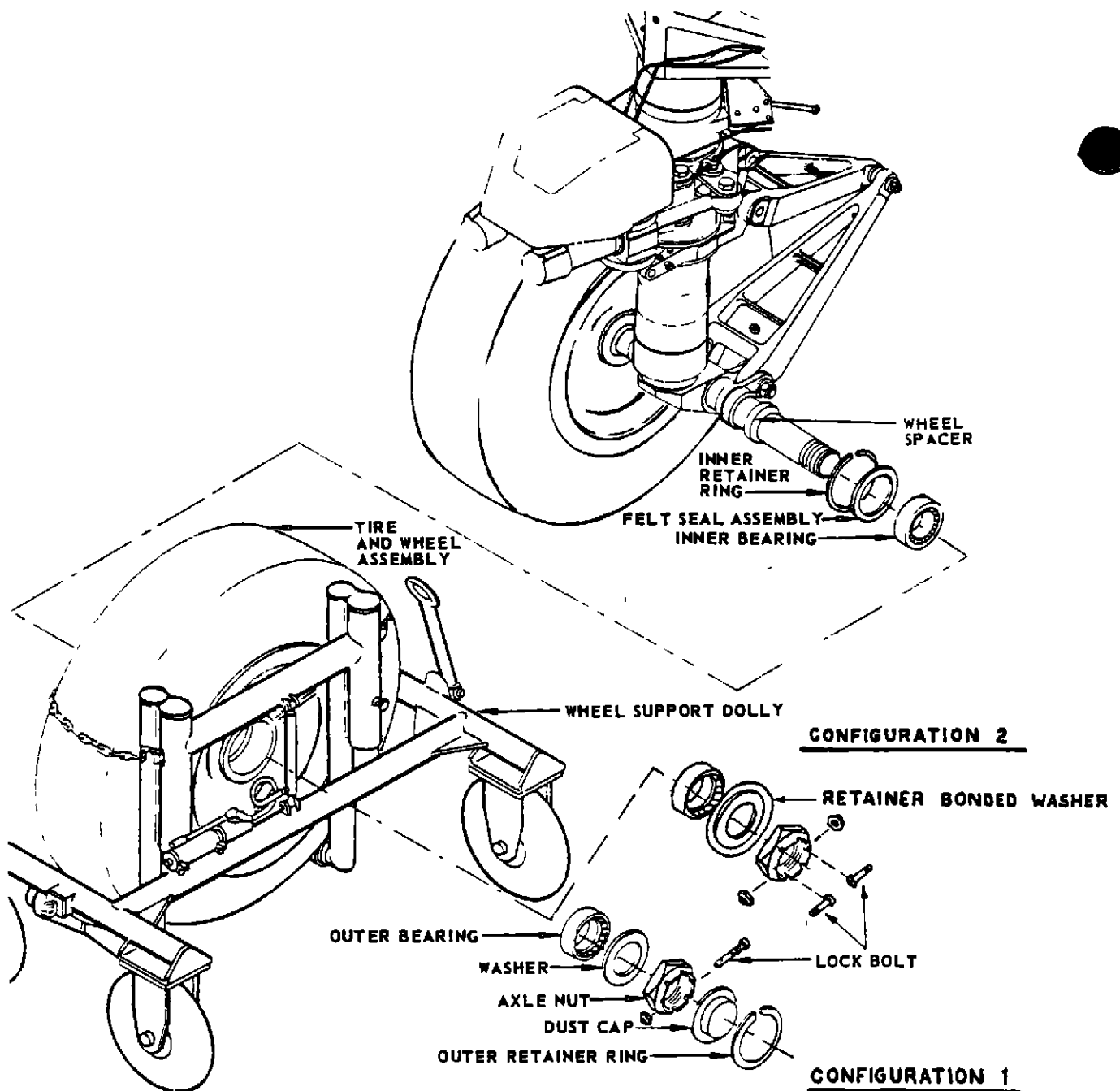
- (1) Check that the landing gear external downlock and drag brace lock are installed.
- (2) Jack nose gear. Refer to Airplane Jacking, Chapter 7.
- (3) Position wheel support dolly (figure 201) to support tire and wheel assembly.
- (4) Remove outer retainer ring, dust cap, lockbolt, axle nut, and washer.
- (5) Remove outer bearing.
- (6) Wrap masking tape around axle threads.
- (7) With weight of wheel on dolly, pull wheel from axle.
- (8) Remove inner retainer ring from inboard side of wheel.
- (9) Remove felt seal assembly and inner bearing.

C. Install Nose Gear Tire and Wheel

- (1) Check that wheel spacer is installed.

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- (2) Pack new or serviceable inner bearing (figure 201) with grease
- (3) Place inner bearing in wheel
- (4) Install felt seal assembly.
- (5) Install retainer ring to inboard side of wheel
- (6) With tire and wheel assembly on dolly, position wheel on axle



Nose Gear Tire and Wheel Installation
Figure 201

- (7) Remove masking tape from threads.
- (8) Pack new or serviceable outer bearing with grease.
- (9) Install outer bearing.
- (10) ON CONFIGURATION 1: install washer and axle nut.
- (10A) ON CONFIGURATION 2: install retainer bonded washer with the large outer dia. adjacent to bearing, install nut.
- (11) Roll wheel support dolly away.
- (12) Rotate wheel and while wheel is spinning, torque axle nut to 100 pound-feet to seat bearings.
- (13) Back off nut to zero torque. Then rotate wheel, and while wheel is spinning, retighten to 30 pound-feet minimum and continue to tighten until slot in nut and hole in axle are aligned.
- (14) ON CONFIGURATION 1: install lock bolt, dust cap and retainer ring.
- (14A) ON CONFIGURATION 2: install both lock bolts with bolt heads inside of wheel axle.
- (15) Remove nose gear jack.

2. Inspection/Check Nose Gear Tire and Wheel

A. General

- (1) The nose gear tire and wheel may be checked with wheel in place. A further examination is made when wheel is off and also when wheel is disassembled.

B. Examine Nose Gear Tire and Wheel

- (1) Check tires for abrasion, uneven wear, cuts and flat spots. Check for evidence of tire creeping on wheel.
- (2) Check for tire leakage.
 - (a) Check installed tires in storage (after repair or replacement)
 - 1) Check tire inflation pressure. Check again after 24 hours. Pressure drop must not exceed 5 per cent of specified pressure.
 - (b) Check installed tires in service.
 - 1) Check tire pressure each day.

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- 2) Tires within 5 percent of specified pressure do not require servicing.
- 3) Tires with no record of previous leakage within the last 24 hours may be re-inflated if a pressure drop from 5 to 20 per cent of specified pressure is indicated.

NOTE: Tires re-inflated as above must be entered in Flight Log with request for tire pressure check to be made at next station.

- 4) If on second check tire pressure is low and requires inflation, affected tires must be removed from service as soon as possible.
- 5) Until defective tire is removed, pressure checks must be made after every landing.
- 6) If tire leakage exceeds 20 per cent of specified pressure at any time, tire must be replaced before the next flight.

NOTE: Drop in tire pressure may be due to one or more of following reasons.

- a) Decrease in ambient temperature after filling tire.
 - b) Faulty O-ring between wheel halves.
 - c) Leaks at tirebead seat.
 - d) Leaks through vent holes in tire sidewall.
- (3) Check for tire wear - Tires worn down to following limits may be recapped.
- (a) Check rib tread tires
 - 1) Remove from service when grooves nearest center are still just visible, either locally or over full circumference of tire.
 - (b) Check dimple tread tires
 - 1) Remove from service when dimples near center are just starting to disappear. Any flat spot to full dimple depth necessitates removal from service.
- (4) Check wheel for cracks, flaked paint and corrosion. Check dust caps for security.



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- (5) Check security of tie bolts Torque to be 120 to 200 pound-inches with tire deflated
 - (6) Examine for seepage of grease around bearings.
- C. Special Checks on Nose Gear Tire and Wheel
- (1) Examine nose gear wheel when removed
 - (a) Check wheels for corrosion, cracks and flaked paint.
 - (b) Check bearings and bearing surfaces for distortion and flat spots Check that bearings have sufficient lubrication
 - (c) Check grease seals for hardness and dryness.
 - (d) Check lock ring and seal retainer for cracks, distortion or surface damage
 - (e) Check for bent or distorted wheel rims.
 - (f) Check balance weights for security.
 - (2) Examine nose gear wheel when disassembled.
 - (a) Check inner bead rim area and air seal groove for scratches or burrs.
 - (b) Check air seal for cuts, chafed spots or permanent set.
 - (c) Examine inner surface of wheel halves for cracks.
 - 1) After tire is removed from wheel, separate wheel halves by unfastening tie bolts.
 - 2) Remove paint from inside surface of wheel halves.
 - 3) Perform dye penetrant inspection of entire inside of wheel halves where the tie bolt boss radius joins the web.
 - 4) If wheel is not cracked, clean and refinish with zinc chromate or equivalent. Assemble tire and wheel and reinstall.
 - 5) If cracks are found, replace with a serviceable wheel. See vendor for disposition of cracked wheels.

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3 Cleaning/Painting Nose Gear Tire and Wheel

A Cleaning Nose Gear Tire and Wheel

- (1) When washing down aircraft, use wheel covers to prevent solution entering wheel bearings or brake assembly.
- (2) Wipe wheels dry after washing to preclude possible corrosion. Use air supply to blow out any water or solution that may have collected between wheel halves in spoke area.

B Painting Nose Gear Wheel

- (1) Coat nose gear wheel with chemical and solvent resitant paint See Chapter 51, "Interior and Exterior Finishes". See Overhaul Manual for painting procedure.



NOSE GEAR ACTUATOR - MAINTENANCE PRACTICES

1 Removal/Installation Nose Gear Actuator

A. Remove Nose Gear Actuator

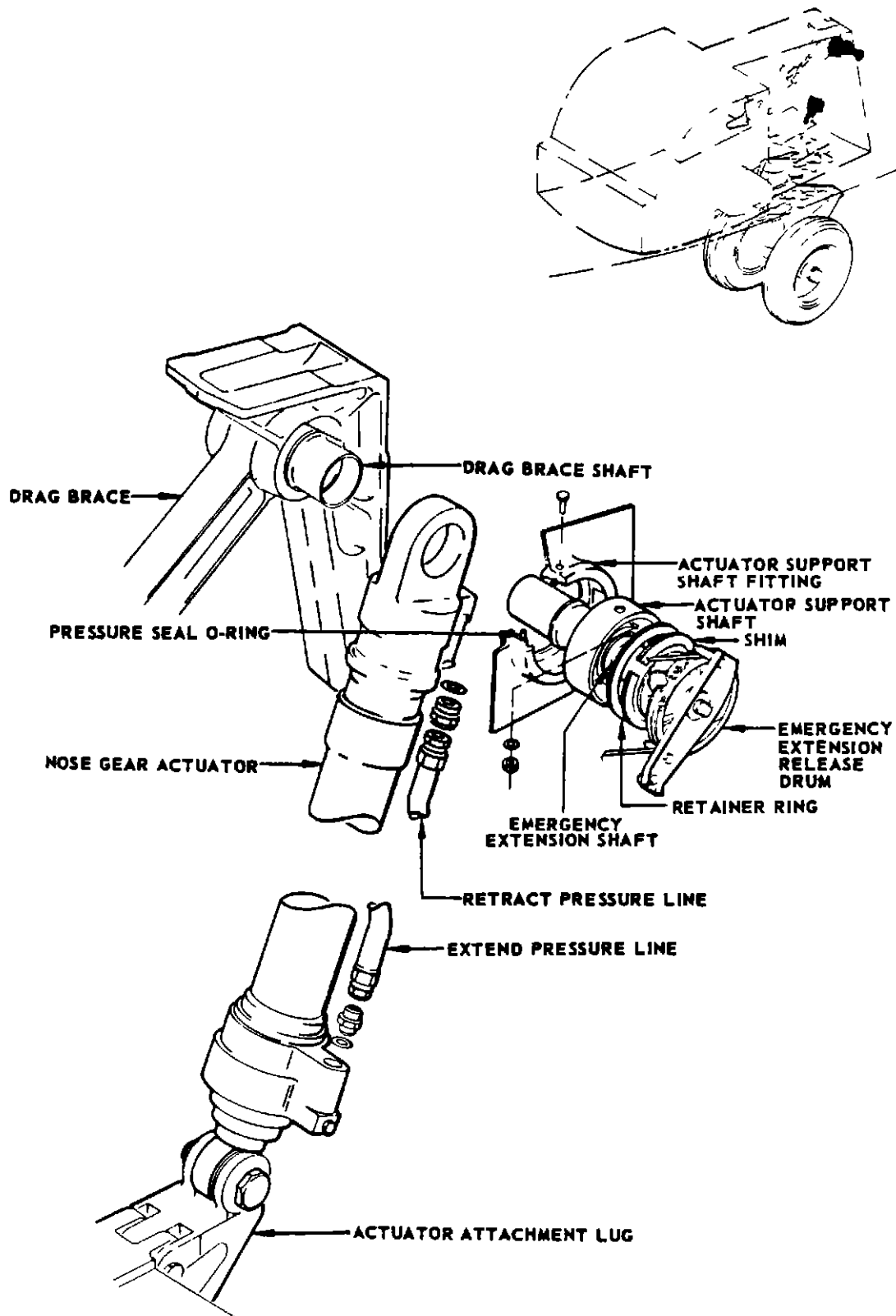
- (1) Depressurize the utility hydraulic system using the manual bypass valve on the forward side of the right wheel well side strut opening.
- (2) Depressurize the utility hydraulic reservoir by loosening filler cap slowly.
- (3) Open nose gear doors using door ground release handle in external power receptacle opening.
- (4) Check that landing gear down locks are installed.
- (5) Remove nose gear shock strut door and fairing. See 32-5-51.

WARNING NOSE GEAR DOWNLOCK MUST BE INSTALLED TO PREVENT
ACCIDENTAL RETRACTION OF NOSE GEAR WHILE WORKING IN
WHEEL WELL.

- (6) Disconnect hydraulic lines from actuator (See figure 201)
- (7) Cap and plug all lines and ports.
- (8) Remove nose gear emergency extension release drum. See 32-7-21.
- (9) Remove bolt that attaches actuator support shaft to actuator shaft support fitting.
- (10) Remove the actuator support shaft retainer ring and shim
- (11) Support the nose gear actuator and pull actuator support shaft out into lower nose compartment.
- (12) Remove O-ring seal from support fitting.
- (13) Remove bolt from actuator lower attachment and remove actuator.

B. Install Nose Gear Actuator

- (1) Support a new or serviceable nose gear actuator in position and install bolt through actuator lower attachment. (See figure 201)
- (2) Install a new O-ring, lubricated with MIL-L-4343, in actuator shaft support fitting.
- (3) Install the actuator support shaft through the support fitting, actuator, two washers, and in drag brace shaft.



Nose Gear Actuator Installation
Figure 201

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- (4) Install bolt that attaches actuator support shaft to the actuator shaft support fitting.
- (5) Install original actuator shaft shim and the retainer ring to the support fitting

NOTE If actuator support shaft is changed, check clearance between support shaft and retainer ring. If shim is required, remove the 0.002 thick laminations from shim until minimum possible clearance is obtained.

- (6) Install nose gear emergency extension release drum See 32-7-21
- (7) Connect hydraulic lines to actuator
- (8) Install nose gear shock strut door and fairing See 32-5-51.
- (9) Pressurize utility hydraulic system
- (10) Return the nose gear door ground release handle to up position

CAUTION DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING. STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOORS CLOSE WHEN DOOR RELEASE HANDLE IS IN DOOR CLOSED POSITION

- (11) Perform test of nose landing gear See 32-1-0.

NOSE GEAR LOCK ACTUATING MECHANISM - MAINTENANCE PRACTICES

1. Removal/Installation Nose Gear Lock Actuating Mechanism (PAA 707-321 and 707-321B, AF 707-328 and 707-328B, SABENA 707-329, DLH 707-430 and 707-330B, NWA 707-351B, BOAC 707-436)

A. Equipment and Materials

- (1) Down Lock Assembly, Nose Landing Gear, F70008-500 or equivalent
- (2) Down Lock Assembly, Main Landing Gear, F71126-500

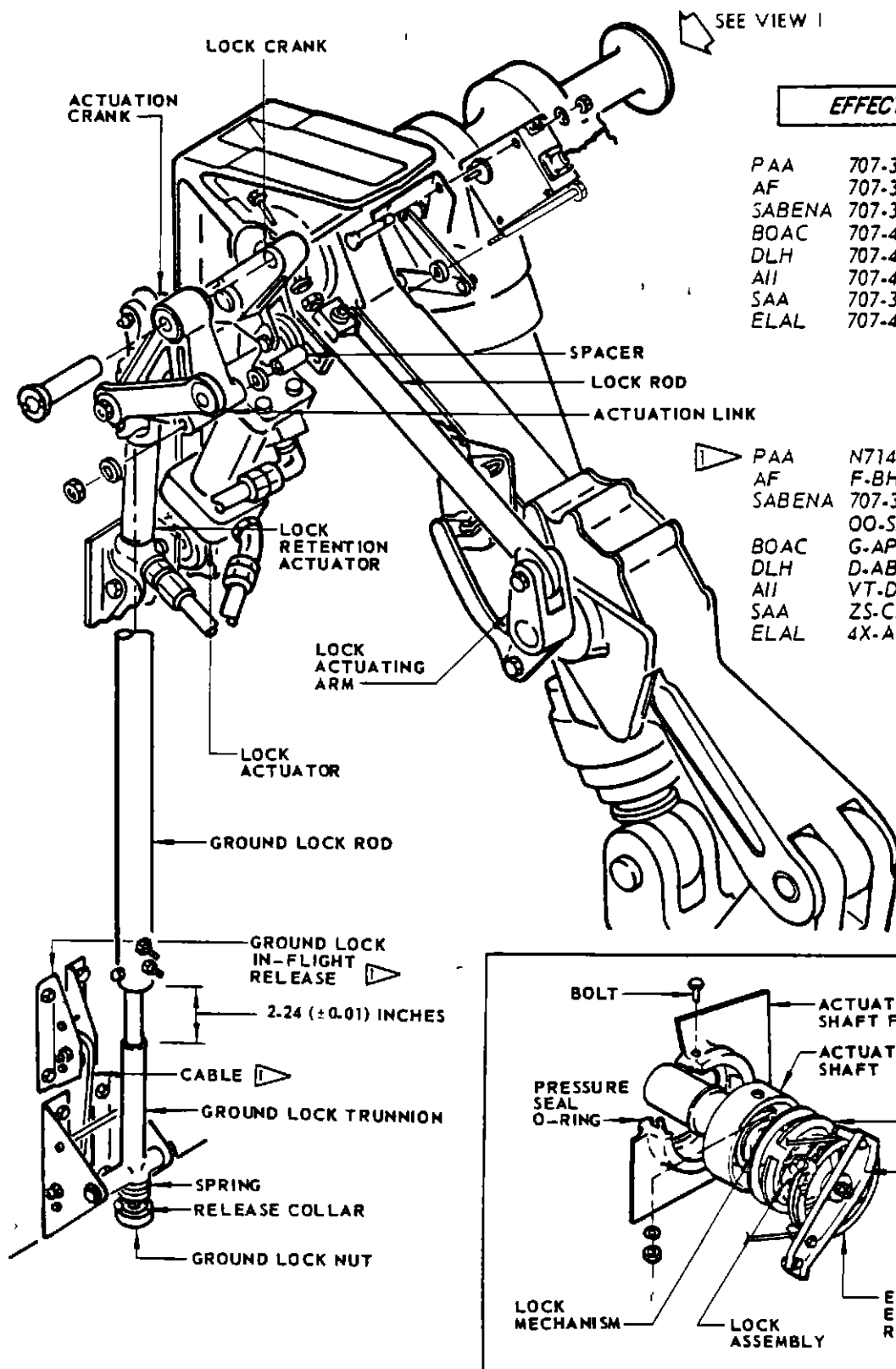
B. Remove Nose Gear Lock Actuating Mechanism

- (1) Using nose jacking point raise nose of airplane until nose wheel clears ground by no less than one-inch with shock strut fully extended. See Airplane Jacking, Chapter 7. Do not deflate shock strut.

WARNING: IF NOSE WHEEL DOES NOT CLEAR GROUND, PRESSURE IN SHOCK STRUT MAY CAUSE UNEXPECTED MOTION OF GEAR DURING LOCK MECHANISM REMOVAL/INSTALLATION, AND PERSONNEL MIGHT BE INJURED.

- (2) Open nose gear doors, using door ground release handle in external power receptacle opening.
- (3) Check that nose gear and both main gear down locks are installed.
- (4) Remove nose gear shock strut door and fairing. See 32-5-51.
- (5) Remove bolt and spacer from door control valve actuation crank and lock rod. (See figure 201.)
- (6) Disconnect door control valve actuation link from actuation crank.
- (7) Remove door control valve actuation crank from lock crank.
- (8) Disconnect lock actuator from lock crank.
- (9) Disconnect lock retention actuator and ground lock rod from lock crank.

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EFFECTIVITY

PAA	707-321 and 707-321B
AF	707-328 and 707-328B
SABENA	707-329
BOAC	707-436
DLH	707-430 and 707-330B
All	707-437 and 707-337B
SAA	707-344 and 707-344B
ELAL	707-458 and 707-358B

PAA	N714PA thru N759PA
AF	F-BHSA thru F-BH5Q
SABENA	707-329
	OO-SJA thru OO-SJE
BOAC	G-APFB thru G-APFP
DLH	D-ABOB thru D-ABOG
All	VT-DJI thru VT-DMN
SAA	ZS-CKC thru ZS-CKE
ELAL	4X-ATA and 4X-ATB

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Nose Gear Lock Actuating Mechanism Installation
Figure 201

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- (10) Pull ground lock rod out of ground lock trunnion.
- (11) Disconnect lock rod from lock crank.
- (12) Remove bolt that connects lock crank to lock mechanism shaft.
- (13) Pull lock crank from shaft and watch for key.
- (14) Remove set screw and ground lock nut from lower end of ground lock mechanism.
- (15) Remove release collar, washer, spring, and another washer.
- (16) On airplanes PAA N714PA thru N759PA, AF F-BHSA through F-BHSQ, Sabena 707-329, BOAC G-APFB through G-APFP, DLH D-ABOB through D-ABOG remove seal in nose wheel well aft bulkhead and pull cable and release handle through hole.
- (17) Remove two pins that attach ground lock trunnion to bracket.

C. Install Nose Gear Lock Actuating Mechanism

- (1) Position ground lock trunnion in place and install pins. (See figure 201.)
- (2) On airplanes PAA N708PA thru N759PA, AF F-BHSA through F-BHSQ, Sabena 707-329, BOAC G-APFB through G-APFP, DLH D-ABOB through D-ABOG put release handle and cable through hole in nose wheel well aft bulkhead and install seal.
- (3) Install washer, spring, and another washer on bottom of ground lock trunnion.
- (4) Install release collar on trunnion with lugs pointing down.
- (5) Install ground lock nut.
 - (a) Screw nut on tight with release collar lug grooves up.
 - (b) Back off nut until slots in nut and slots in ground lock trunnion are aligned.
 - (c) Install set screw.
- (6) Place key in slot on lock mechanism shaft.
- (7) Slide lock crank on shaft and install bolt through shaft and crank.
- (8) Insert ground lock rod in ground lock trunnion.



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- (9) Attach ground lock rod and lock retention actuator to lock crank.

NOTE: If a damaged ground lock rod is replaced, or the length adjustment disturbed, check for 2.24 (± 0.01) inches dimension as shown in figure 201. If necessary adjust rod length to obtain this dimension then lock rod end.

- (10) Connect lock actuator to lock crank.
(11) Connect lock rod to lock crank.
(12) Attach door control valve actuation crank to lock crank.
(13) Attach door control valve actuation link to actuation crank.
(14) Install bolt and spacer through actuation crank and lock rod.
(15) Install nose gear shock strut door and fairing. See 32-5-51.
(16) Return nose gear door ground release handle to up position.

CAUTION: DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING: STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOORS CLOSE WHEN DOOR RELEASE HANDLE IS IN DOOR CLOSED POSITION.

- (17) Perform test of nose landing gear. See 32-1-0, Adjustment/Test Landing Gear and Door Control System.

2. Removal/Installation Nose Gear Lock Actuating Mechanism

(TCA LX-N20198, TCA LX-N20199, RTCA LX-N19997, RTCA LX-N20000)

A. Equipment and Materials

- (1) Downlock Assembly, Nose Landing Gear, F70008-500 or equivalent
(2) Downlock Assembly, Main Landing Gear, F71126-500
(3) Grease, MIL-G-4343



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B. Remove Nose Gear Lock Actuating Mechanism

- (1) Using nose jacking point raise nose of airplane until nose wheel clears ground by no less than one-inch with shock strut fully extended. See Airplane Jacking, Chapter 7. Do not deflate shock strut.

WARNING. IF NOSE WHEEL DOES NOT CLEAR GROUND, PRESSURE IN SHOCK STRUT MAY CAUSE UNEXPECTED MOTION OF GEAR DURING REMOVAL/INSTALLATION, AND PERSONNEL MIGHT BE INJURED.

- (2) Open nose gear doors, using door ground release handle in external power receptacle opening.
- (3) Check that nose gear and both main gear down locks are installed.
- (4) Remove bolt and spacer from door, control valve actuation crank and lock rod. (See figure 202.)
- (5) Disconnect door control valve actuation link from actuation crank.
- (6) Remove door control valve actuation crank from lock crank.
- (7) Disconnect lock actuator from lock crank
- (8) Disconnect lock retention actuator and ground lock rod from lock crank.
- (9) Pull ground lock rod out of ground lock trunnion.
- (10) Disconnect lock rod from lock actuating arm.
- (11) Remove nose gear emergency extension release drum.
 - (a) Remove cable guard support. (See view I, figure 202.)
 - (b) Remove cables from drum.
 - (c) Remove bolts attaching extension drum to lock assembly and remove drum.
 - (d) Remove retainer ring and shim.
 - (e) Remove bolt-attaching actuator support shaft to actuator support shaft fitting.



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- (12) Remove bolt that connects lockcrank to lock mechanism shaft.
- (13) Pull lock mechanism shaft out of drag brace shaft to free lock crank. Watch for key as lock crank is released from shaft. Refer to 32-4-1, Nose Gear Drag Brace - Maintenance Practices.
- (14) Disconnect lockrod from lockcrank.
- (15) Remove setscrew and ground locknut from lower end of ground lock mechanism.
- (16) Remove release collar, washer, spring, and another washer
- (17) Remove two pins that attach ground lock trunnion to bracket.

C. Install Nose Gear Lock Actuating Mechanism

- (1) Position ground lock trunnion in place and install pins. (See figure 202.)
- (2) Install washer, spring, and another washer on bottom of ground lock trunnion.
- (3) Install release collar on trunnion with lugs pointing down
- (4) Install ground locknut
 - (a) Screw nut on tight with release collar lug grooves up.
 - (b) Back off nut until slots in nut and slots in ground lock trunnion are aligned.
 - (c) Install setscrew.
- (5) Connect lockrod to lockcrank
- (6) Place key in slot on lock mechanism shaft.
- (7) Place lockcrank in position with lockrod connection arm up.
- (8) Deleted



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- (9) Push actuator support shaft inboard until lock mechanism shaft slides through lock crank. Check that key is correctly engaged.
- (10) Install bolt through lock crank and lock mechanism shaft.
- (11) Insert ground lock rod in ground lock trunnion.
- (12) Attach ground lock rod and lock retention actuator to lock crank.

NOTE: If a damaged ground lock rod is replaced, or the length adjustment disturbed, check for 2.24 (± 0.01) inch dimension as shown in figure 201. If necessary adjust rod length to obtain this dimension then lock rod end.

- (13) Connect lock rod to lock actuating arm.
- (14) Connect lock actuator to lock crank.
- (15) Attach door control valve actuation crank to lock crank.
- (16) Attach door control valve actuation link to actuation crank.
- (17) Install bolt and spacer through actuation crank and lock rod.
- (18) Install nose gear emergency extension release drum.
 - (a) Install bolt attaching actuator support shaft to actuator support shaft fitting. (See view 1, figure 202.)
 - (b) Install shim and retainer ring.
 - (c) Install emergency extension drum on lock assembly.
 - (d) Connect cables to drum.
 - (e) Install cable guard support.
 - (f) Tension cables. Refer to 32-7-21.

- (19) Return nose gear door ground release handle to up position.

CAUTION: DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING: STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOORS CLOSE WHEN DOOR RELEASE HANDLE IS IN DOOR CLOSED POSITION.

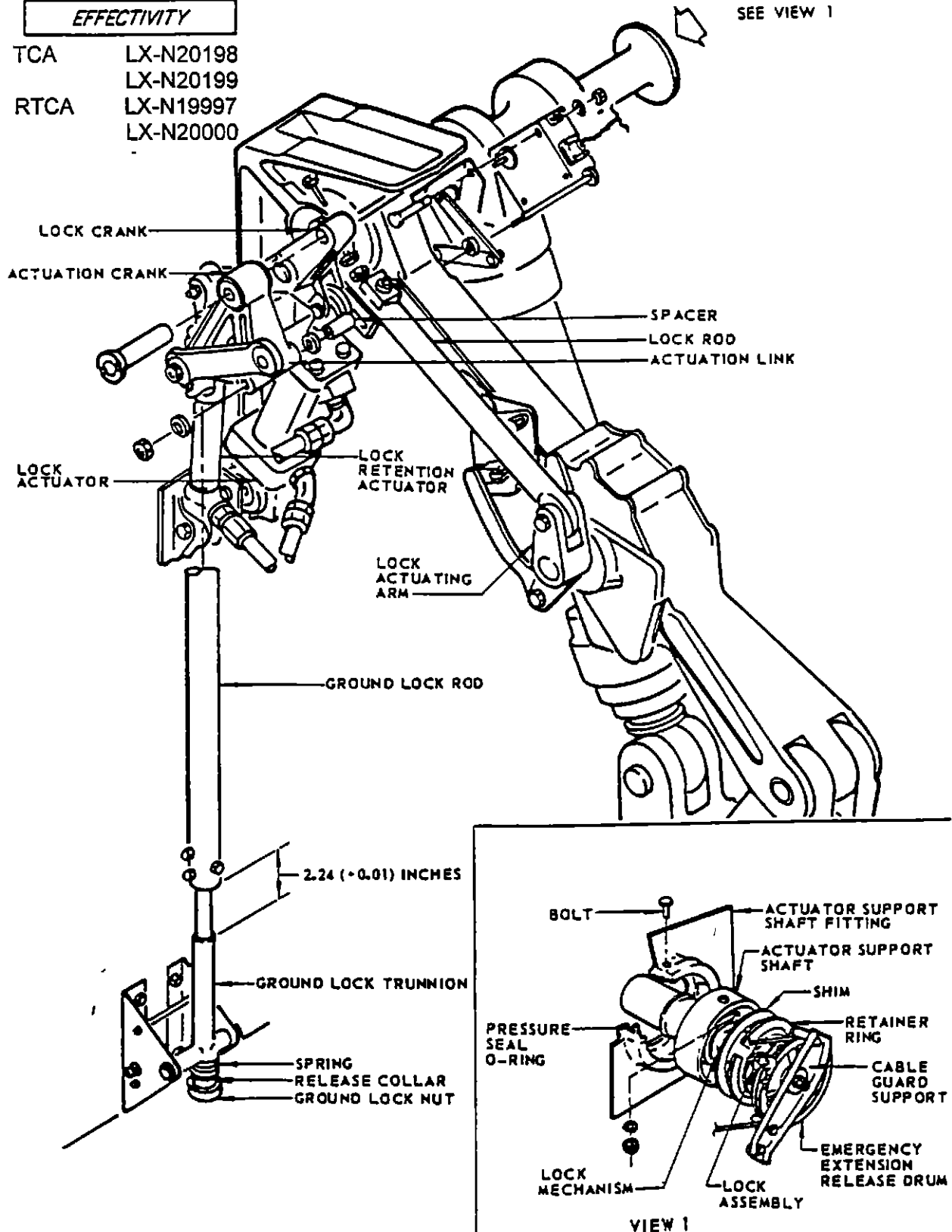
- (20) Perform test of nose landing gear. See 32-1-0, "Adjustment/Test Landing Gear and Door Control System."

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EFFECTIVITY

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

SEE VIEW 1



Nose Gear Lock Actuating Mechanism Installation
Figure 202

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NOSE GEAR LOCK ACTUATOR - MAINTENANCE PRACTICES

1. Removal/Installation Nose Gear Lock Actuator

A. Remove Nose Gear Lock Actuator

- (1) Depressurize utility hydraulic system using manual bypass valve on forward side of right wheel well side strut opening.
- (2) Depressurize utility hydraulic reservoir by loosening the filler cap slowly.
- (3) Open nose gear doors using door ground release handle in external power receptacle opening.
- (4) On airplanes without the clamshell type shock strut doors, remove nose gear shock strut door and fairing. See 32-5-51.
- (5) Install nose gear ground lock.
- (6) Disconnect hydraulic lines from lock actuator. (See figure 201.)
- (7) Plug and cap all ports and lines.
- (8) Disconnect lock actuator from lock crank and from support bracket.

B. Install Nose Gear Lock Actuator

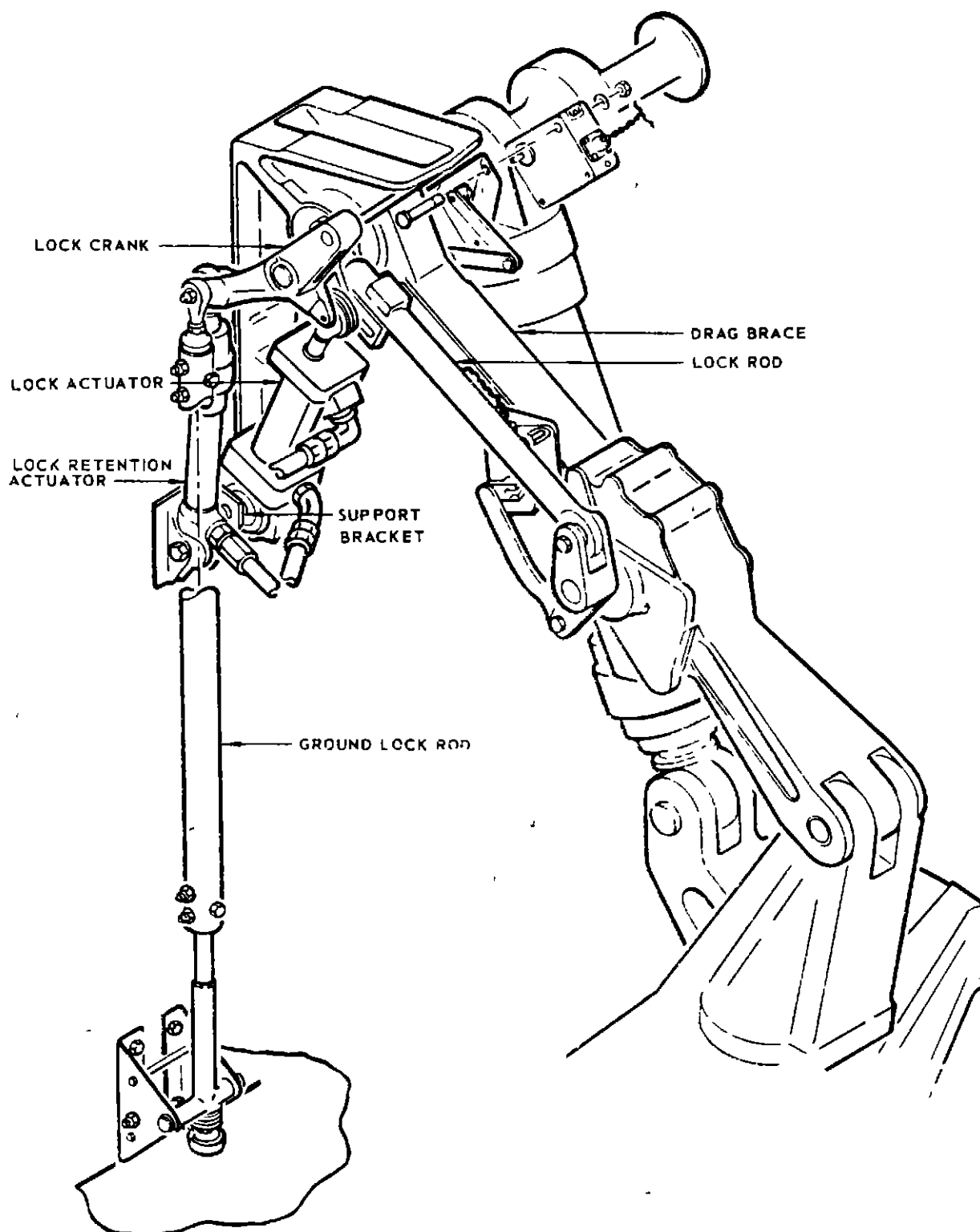
- (1) Connect piston rod of a new or serviceable lock actuator to lock crank. (See figure 201.)
- (2) Attach cylinder end to support bracket.
- (3) Connect hydraulic lines to lock actuator.
- (4) If removed in step 1.A.(4), install nose gear shock strut door and fairing. See 32-5-51.
- (5) Pressurize utility hydraulic system.
- (6) Return nose gear door ground release handle to up position.

CAUTION: DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION WHEN CLOSING DOORS.

WARNING: STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOORS CLOSE WHEN DOOR RELEASE HANDLE IS IN DOOR CLOSED POSITION.

- (7) Perform test of nose landing gear. See 32-1-0.

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Nose Gear Lock Actuator Installation
Figure 201



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NOSE GEAR LOCK RETENTION ACTUATOR - MAINTENANCE PRACTICES

1. Removal/Installation Nose Gear Lock Retention Actuator

A. Equipment and Materials

- (1) Down Lock Assembly, Nose Landing Gear, F70008-500 or equivalent
- (2) Down Lock Assembly, Main Landing Gear, F71126-500

B. Remove Nose Gear Lock Retention Actuator

- (1) Using nose jacking point raise nose of airplane until nose wheel clears ground by no less than one-inch with shock strut fully extended. See Airplane Jacking, Chapter 7. Do not deflate shock strut.

WARNING: IF NOSE WHEEL DOES NOT CLEAR GROUND, PRESSURE IN SHOCK STRUT MAY CAUSE UNEXPECTED MOTION OF GEAR DURING LOCK RETENTION ACTUATOR REMOVAL/INSTALLATION, AND PERSONNEL MIGHT BE INJURED.

- (2) Depressurize utility hydraulic system using manual bypass valve on forward side of right wheel well side strut opening.
- (3) Depressurize utility hydraulic reservoir by loosening the filler cap slowly.
- (4) Open nose gear door using door ground release handle in external power receptacle opening.
- (5) Check that nose gear and both main gear down locks are installed.
- (6) On airplanes without the clamshell type shock strut doors, remove nose gear shock strut door and fairing. See 32-5-51.
- (7) Disconnect hydraulic line from lock retention actuator. (See figure 201.)
- (8) Plug and cap port and line.
- (9) Disconnect lock retention actuator from lock crank and support bracket.

NOTE: Ground lock rod and lock retention actuator are attached to the lock crank with the same bolt. When the bolt is removed, let ground lock rod hang from lower attaching point.

C. Install Nose Gear Lock Retention Actuator

- (1) Connect piston rod of a new or serviceable lock retention actuator and ground lock rod to lock crank. (See figure 201.)
- (2) Attach cylinder end of actuator to support bracket.

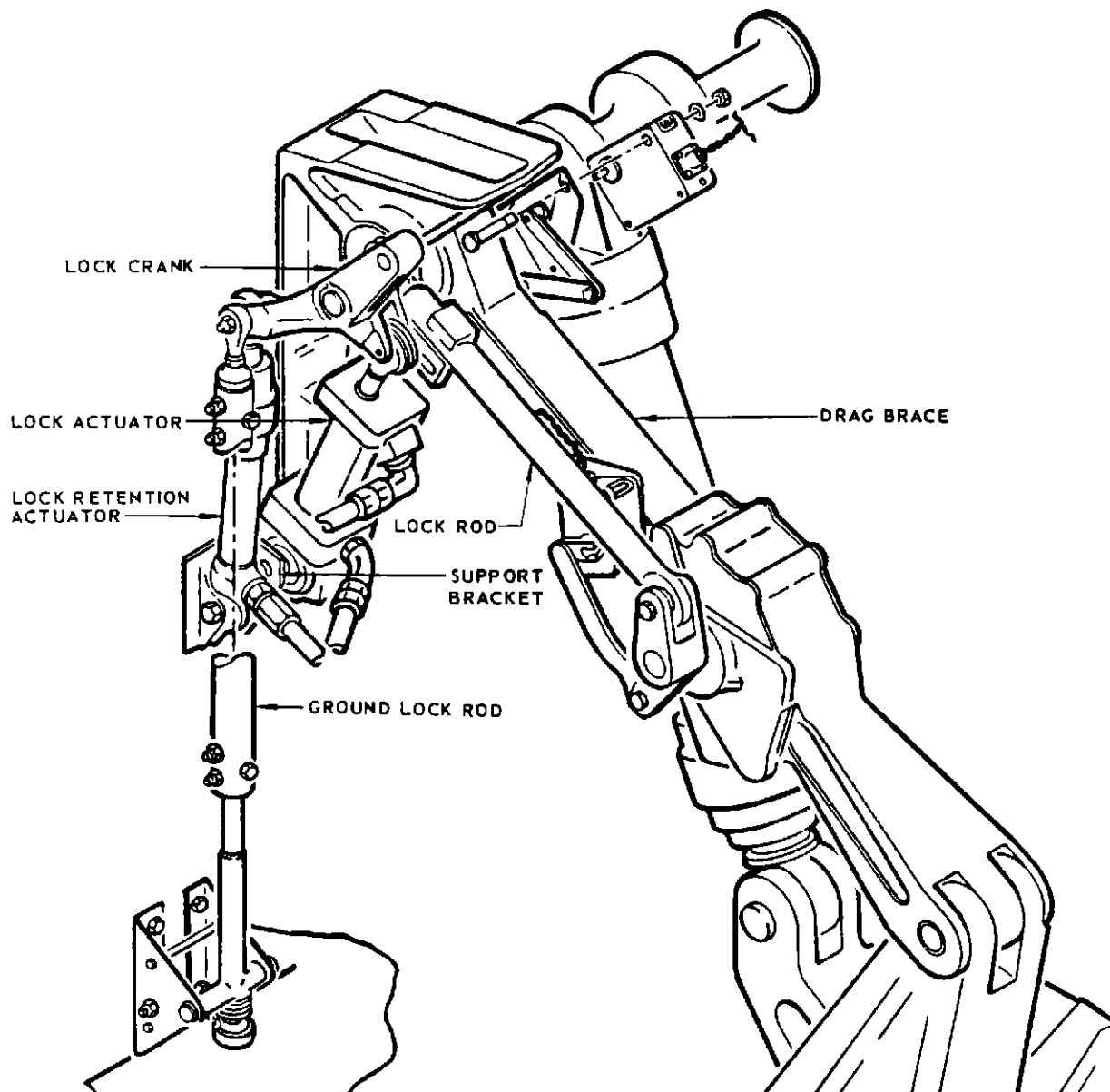


MAINTENANCE MANUAL

- (3) Install fitting to actuator and connect hydraulic line.
- (4) If removed in step 1.B.(6), install nose gear shock strut door and fairing. See 32-5-51.
- (5) Pressurize utility hydraulic system.
- (6) Return nose gear door ground release handle to up position.

WARNING. STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOORS CLOSE WHEN DOOR RELEASE HANDLE IS IN DOOR CLOSED POSITION.

- (7) Perform test of nose landing gear See 32-1-0, "Adjustment/Test Landing Gear and Door Control System."



Nose Gear Lock Retention Actuator Installation
Figure 201

NOSE GEAR WHEEL SNUBBER - MAINTENANCE PRACTICES

1. Removal/Installation Nose Gear Wheel Snubber

A. General

- (1) This procedure provides instructions for removal/installation of snubber, and an inspection for wear.

WARNING: NOSE WHEEL SNUBBER BLOCKS MAY CONTAIN ASBESTOS FIBERS OR DUST WHICH MAY BE HARMFUL IF INHALED. A PROTECTIVE TYPE RESPIRATOR SHOULD BE WORN BY PERSONNEL WHEN HANDLING BLOCKS OR WHEN EXPOSED TO ACTIVITIES CAPABLE OF GENERATING SUCH AIRBORNE FIBERS OR DUST.

B. Equipment and Materials

- (1) Down Lock Assembly - Nose Landing Gear F70008

C. Remove Nose Gear Wheel Snubber

- (1) Check that landing gear external down locks are installed, and that wheel well doors are open with release handle down and latched.
- (2) Disconnect door actuation rods from doors.
- (3) Remove bolts attaching snubber to bulkhead and remove snubbers.

NOTE: Observe the number and sequence of packing and fillers at the snubber attachment.

D. Install Nose Gear Wheel Snubber

- (1) Place snubber in position on bulkhead with packing and fillers at attachment point.
- (2) Install and tighten attachment bolts.
- (3) Check distance from top of wheel well to snubber as shown in Fig. 201.
- (4) Connect door actuation rods to doors.
- (5) Pressurize the utility hydraulic system.
- (6) Return the nose gear door ground release handle to up position.

CAUTION DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING: STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOORS CLOSE WHEN DOOR RELEASE HANDLE IS IN DOOR CLOSED POSITION.

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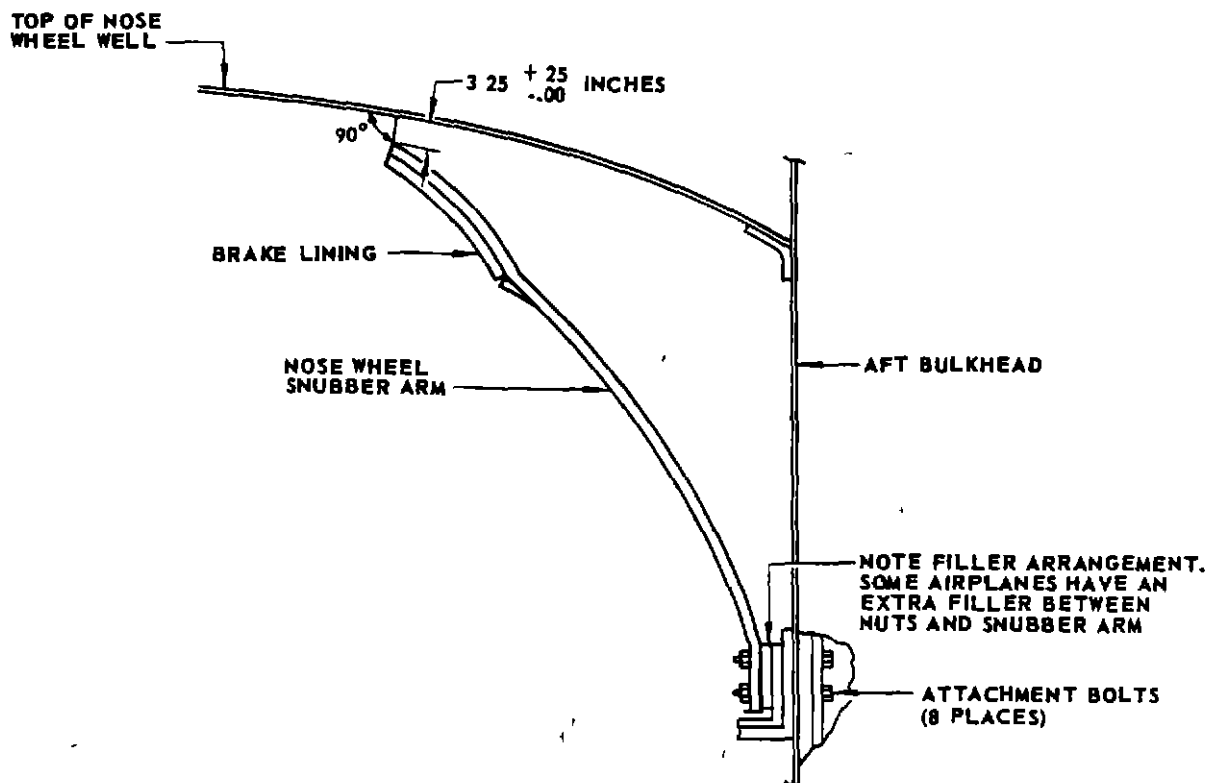
2. Inspection/Check Nose Gear Wheel Snubber

A General

- (1) If arms are cracked replace snubbers. Distorted arms exerting insufficient pressure on tire may be reformed to drawing after appropriate heat treatment. Otherwise tapered fillers may be installed between snubber arms and structure to lower brake ends to correct position.

B. Check Nose Gear Wheel Snubber

- (1) Check snubber brake lining for security and wear. Replace lining before tire rubs on rivet heads.
- (2) Check snubber attachment points for loose or missing bolts.
- (3) Examine snubber arms in vicinity of attachment to structure for distortion and cracks.
- (4) Measure distance from top of wheel well to snubber as shown on figure 201.
- (5) If airplane is on jacks retract the nose gear and test the effectiveness of snubber by attempting to rotate nose wheels by hand.



Nose Gear Wheel Snubber Installation
Figure 201

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NOSE LANDING GEAR WHEEL WELL DOORS - DESCRIPTION AND OPERATION

1. General

- A. The nose wheel well is divided into two sections for enclosure purposes. The large nose wheel well is enclosed by clamshell type doors on all airplanes. Two types of doors enclose the shock strut area of the nose wheel well. Turbojet airplanes have the shock strut door mounted on the shock strut. See 32-4-0, Nose Landing Gear. Turbofan airplanes have clamshell type doors to cover the shock strut area. The nose wheel well doors open only to permit the nose gear to retract or extend and are sequenced to close when the nose gear is up and locked or down and locked. The wheel well doors are opened manually during emergency extension by rotating the hand crank drum in the control cabin floor or opened for ground maintenance in the wheel well area by using the release handle in the external power receptacle. The nose wheel well door system consists of nose gear doors hydraulic actuator, lock bungee, door ground release mechanism and the door linkage mechanisms. (See figure 1.)
- B. When the landing gear control handle is positioned to retract the landing gear, hydraulic pressure is directed to the door actuator to open the door. As the door reaches the open position, a door actuated linkage positions the sequence valve to direct hydraulic fluid to actuate the gear. After the gear has retracted, pressure is directed back to the door actuator to close the doors. The system operates similarly when the landing control handle is positioned to extend the gear.

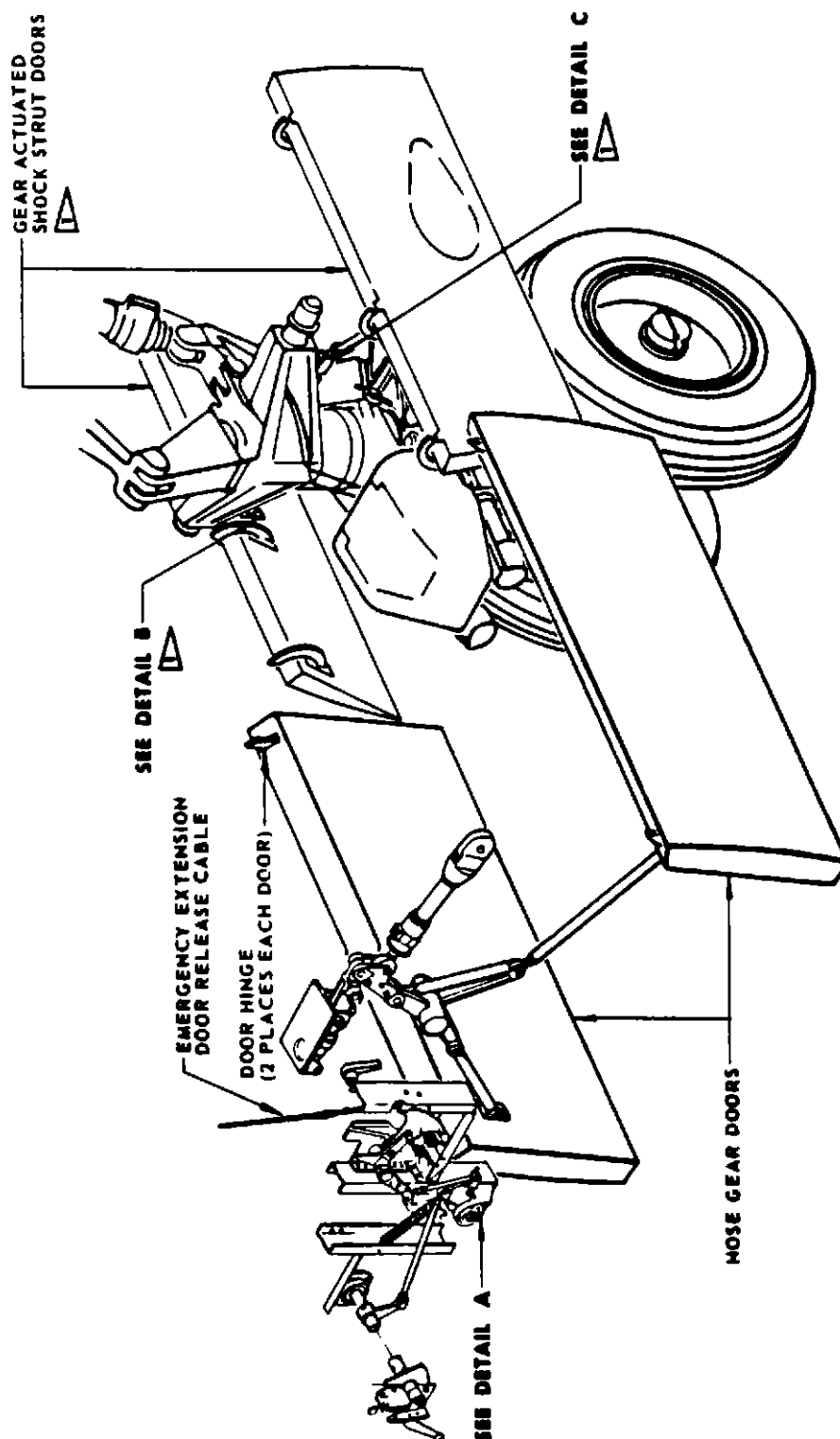
2. Nose Gear Doors

- A. The nose gear wheel well clam shell doors are attached to the wheel well structure by two hinges in each of the two doors. The doors are normally operated by a hydraulic actuator through a linkage and two door actuation rods. The actuation rods are attached to the doors by quick disconnect pins. In normal operation, the nose gear doors open to allow gear extension or retraction, and then the doors close.
- B. The nose wheel well doors have an extruded rubber seal strip along the forward edge and center line mating edge of each door. A rubber seal strip is provided along the hinge line and aft edge of the door

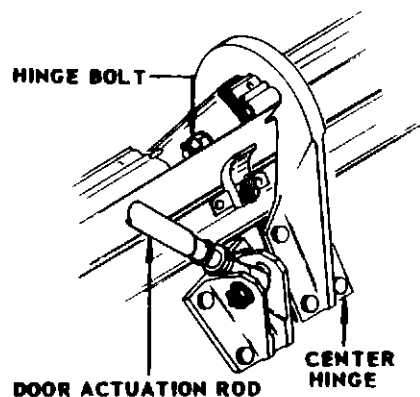
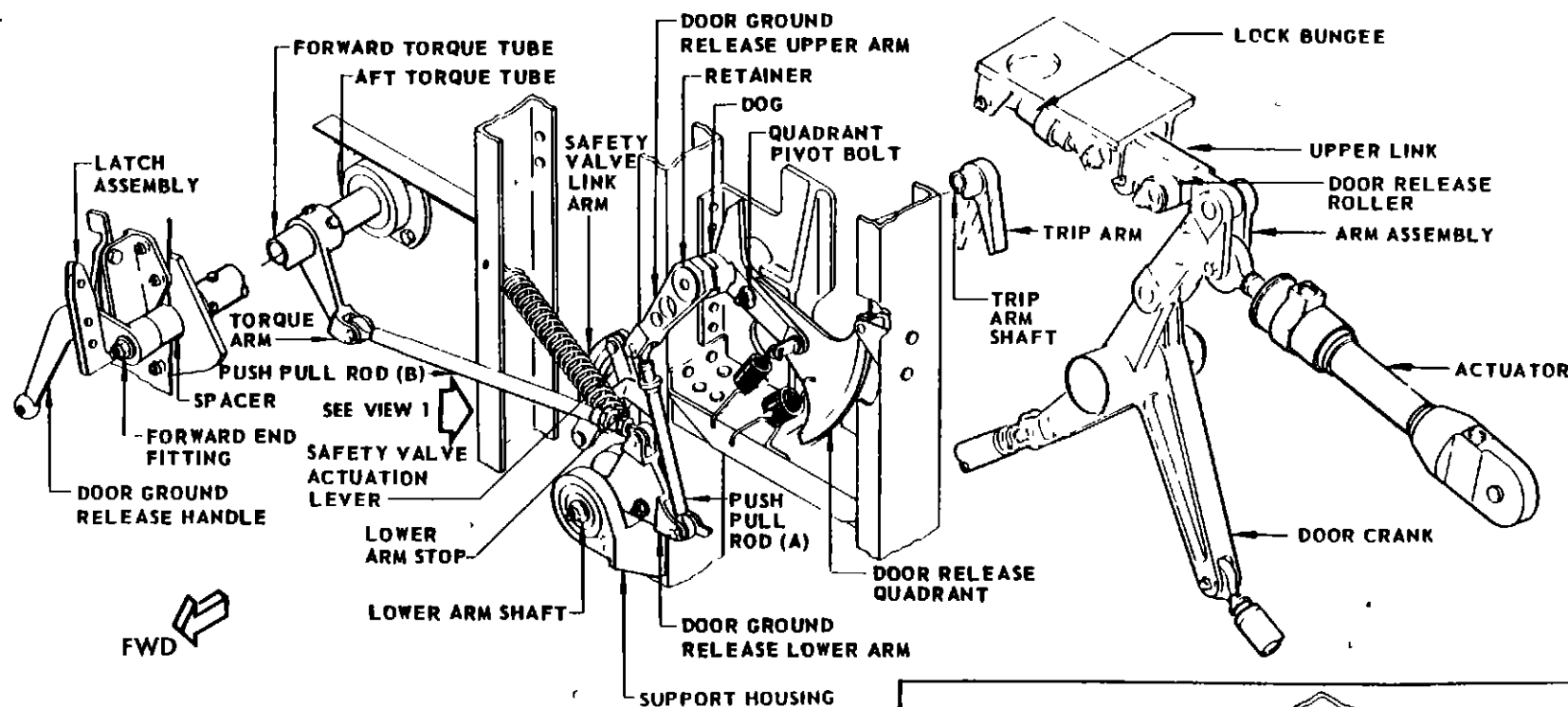
3. Shock Strut Doors and Fairings (Turbofan Airplanes)

- A. The shock strut doors and fairings are attached to wheel well structure. The doors are hinged to the fairings in three places and connected by a rod assembly to the nose gear trunnion so that extension or retraction movement of the nose gear moves the doors. The doors are closed when the nose gear is retracted and remain open when the nose gear is extended.

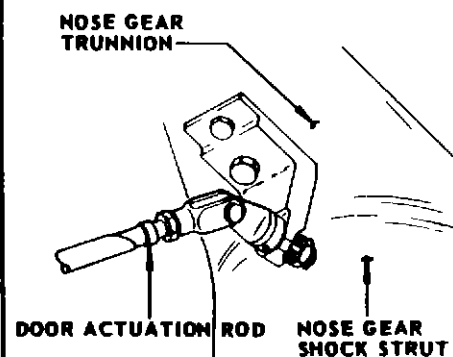
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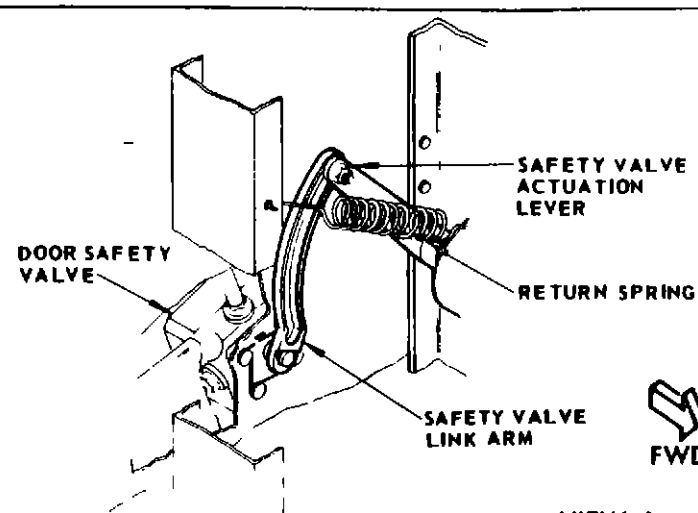
 TURBOFAN AIRPLANES



DETAIL B



DETAIL C



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Nose Gear Doors
 Figure 1 (Sheet 2 of 2)

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4. Nose Gear Door Actuator

- A. The nose wheel well door actuator is a conventional type piston and cylinder hydraulic unit which extends to close the doors and retracts to open them. The actuator is a fixed stroke unit which requires no adjustment. The actuator piston is snubbed (slowed), during the last 3/4 inch of travel in the opening cycle, by a spring loaded piston incorporated inside the piston. The actuator is mounted on the wheel well forward bulkhead. The rod end attaches to the door lock and linkage assembly. The cylinder case is mounted to wheel well structure.

5. Nose Gear Door Lock Bungee

- A. The nose wheel well door lock mechanism incorporates a spring loaded lock bungee that exerts a force of about 66 pounds to hold the door linkage mechanism in a door closed and over center locked position. In the door open position, the bungee is freely extended with no loads exerted. One end of the bungee is attached to a support bracket and the other end is attached to a door linkage arm.

6. Nose Gear Door Ground Release Mechanism

- A. For ground maintenance access to the nose gear wheel well area, the nose gear doors can be opened by pulling down on a door ground release handle located in the external power receptacle opening. The handle is attached to a torque tube which extends aft into the lower nose compartment. A door safety valve (figure 1) actuation lever mounted on the aft end of the torque tube rotates a door safety valve actuation link arm. The link arm is mounted on the door safety valve actuation shaft. The door safety valve is mounted in the wheel well on the forward bulkhead. The safety valve actuation shaft extends forward through the wheel well forward bulkhead into the lower nose compartment.

7. Nose Gear Door Linkage Mechanism

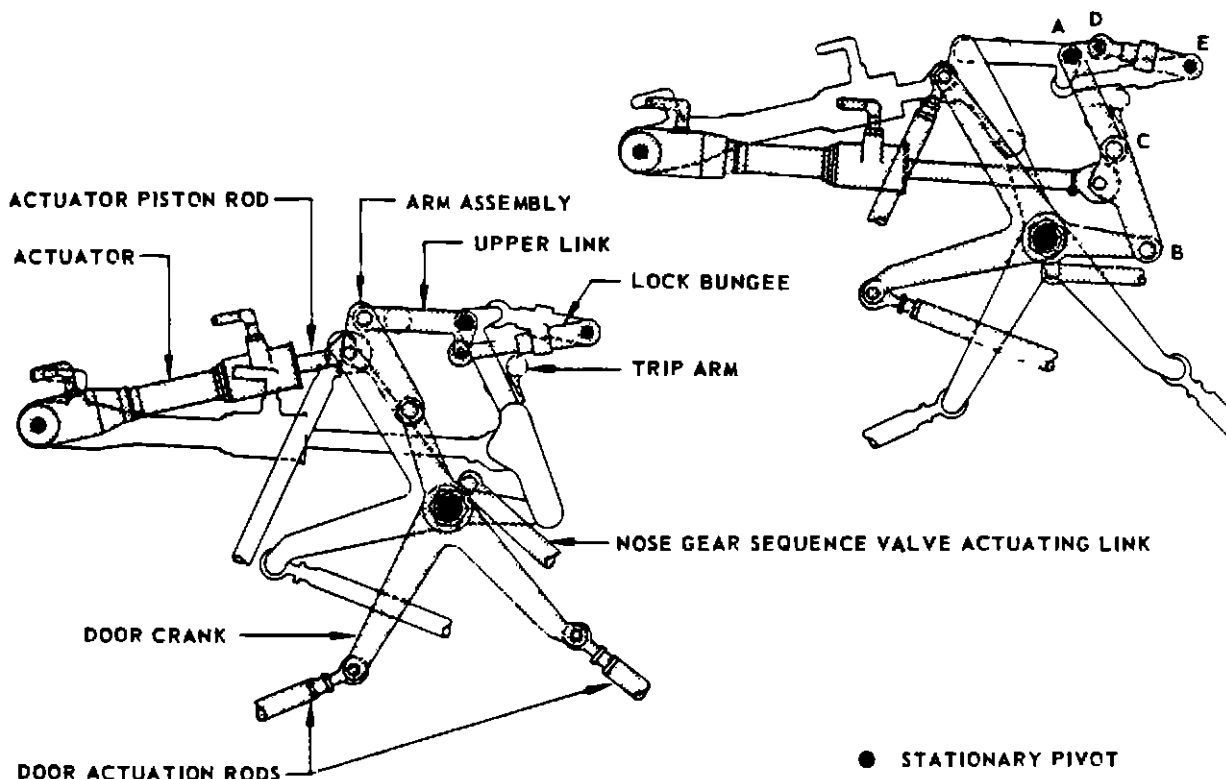
- A. The door linkage mechanism is mounted on the aft side of the nose wheel well forward bulkhead. The doors are connected to the door crank by door actuation rods. When the door crank is rotated, the doors will either open or close. The nose gear door sequence valve is actuated through linkage from the door crank. (See figure 2.) The hydraulic actuator is connected to an arm which is attached to both, the door crank and to an upper link. When the actuator extends, point C passes to an over center position, between points A and B, rotating the door crank and the upper link. Point D, on the lock bungee, passes to an overcenter position between points A and E. The bungee holds the linkages in the overcenter condition until the actuator retracts or until the trip arm is rotated.

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8. Operation

- A. When the landing gear control handle is placed in "UP", hydraulic pressure enters the door actuator and the door will open. As the door reaches open position, linkage from the door crank positions the sequence valve and hydraulic pressure is directed to retract the nose gear. When the gear is retracted, the door control valve is positioned to direct hydraulic pressure to the door actuator to close the doors. As the doors close, the actuator piston rod pushes an arm assembly, upper link, and crank arm into an overcenter position. The lock bungee, attached to the upper link holds the linkage in the overcenter position to keep the doors closed after hydraulic pressure is off. When the doors are closed, the arm assembly contacts a door locked micro-switch and opens the switch. The switch is electrically connected with other landing gear door position and lock switches to control illumination of the door open warning red light on the pilot's instrument panel. The system operates in the same manner when the landing gear control handle is placed to "DOWN."
- B. When the nose landing gear is manually extended from the control cabin, rotation of the emergency extension crank pulls a cable and rotates a shaft which extends through the nose wheel well forward bulkhead. A door release trip arm on the shaft rotates against a roller on the upper link to push the linkage in door open direction. The lock bungee will unlock and allow the nose gear doors to free fall open. The doors are then in a position for nose gear extension





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- C. When the door ground release handle is pulled down, the torque tube rotates the door ground release lower arm through the torque arm and push-pull rod (B). (See figure 1.) The lower arm is splined to the forward side of the lower arm shaft and the safety valve actuation lever is splined to the aft side. The initial movement of the lower arm and the safety valve actuation lever rotates the safety valve link arm 90 degrees, which operates the valve to block off hydraulic pressure to the door closed actuator port, and to open the port to return. The actuator is now depressurized and hydraulic fluid is free to flow from one end of the actuator to the other. Continued movement of the release handle rotates the door ground release upper arm through push-pull rod (A), but no force is applied to the trip arm until the upper arm contacts the dog bolted to the trip arm shaft. (During the further movement of the upper arm the valve actuation lever runs freely in the curved slot in the safety valve link arm. Force is then applied by the trip arm to the door release roller which partially compresses the lock bungee and moves the arm assembly linkage over center to unlock the door. The doors may free fall open, but if not, may be pulled open by hand.

CAUTION DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING: THE DOOR RELEASE HANDLE MUST BE LATCHED DOWN TO KEEP DOORS OPEN. STAND CLEAR OF DOOR ACTION PATH WHEN OPERATING RELEASE HANDLE. ALWAYS SEE THAT DOOR IS UP AFTER RETURNING RELEASE HANDLE TO NORMAL. THIS REQUIRES UTILITY HYDRAULIC SYSTEM PRESSURE.



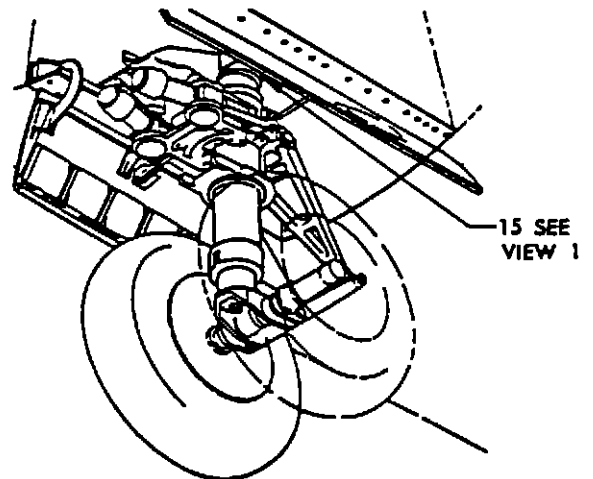
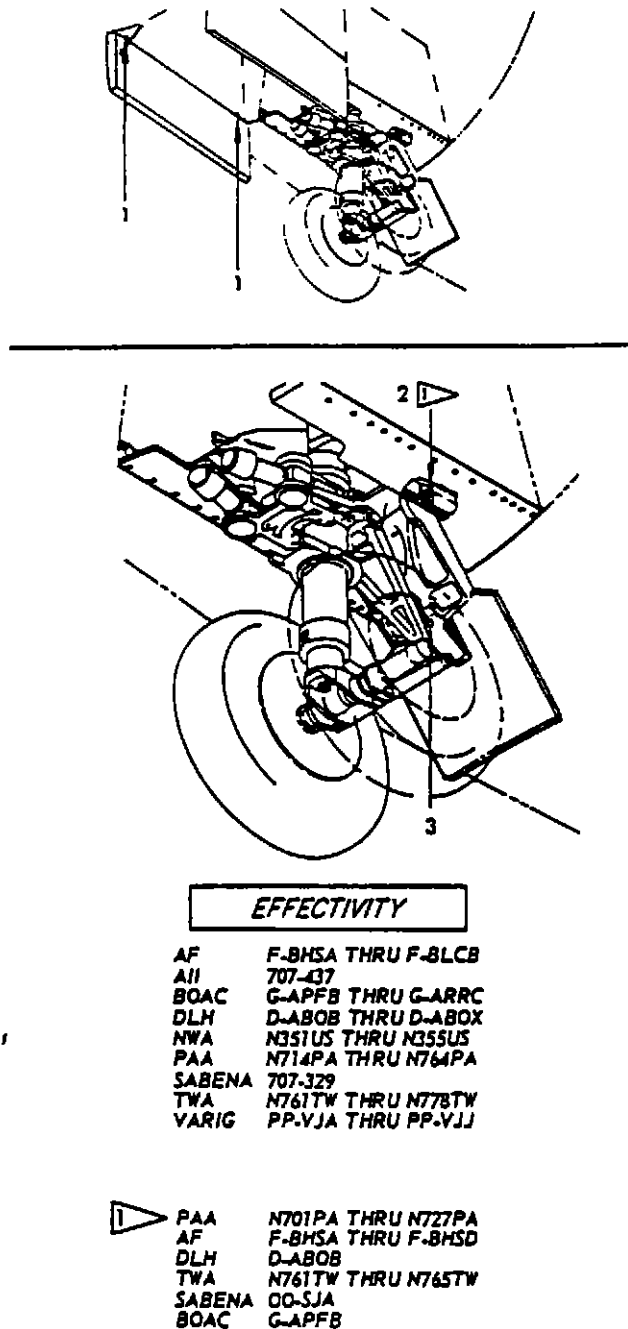
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NOSE GEAR DOORS - MAINTENANCE PRACTICES

1. Unit Servicing Nose Gear Doors

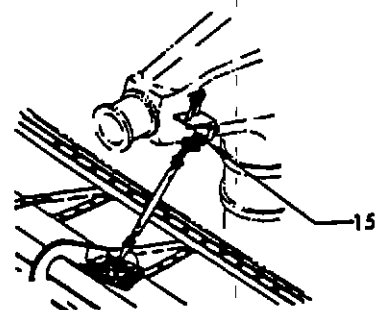
A. Lubricate Nose Gear Doors

- (1) Lubricate the fittings shown on figure 201.



EFFECTIVITY

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

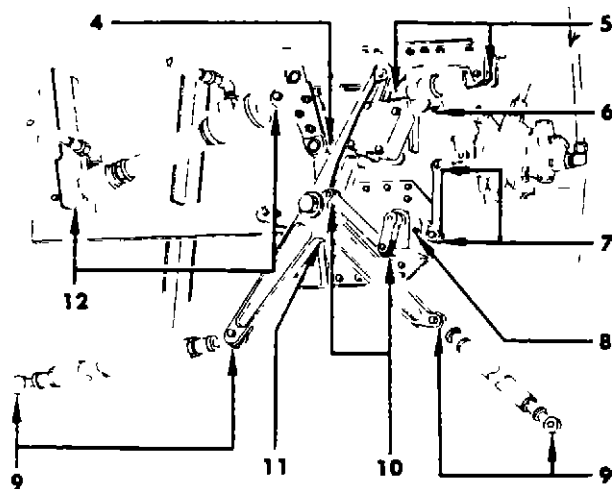


VIEW 1

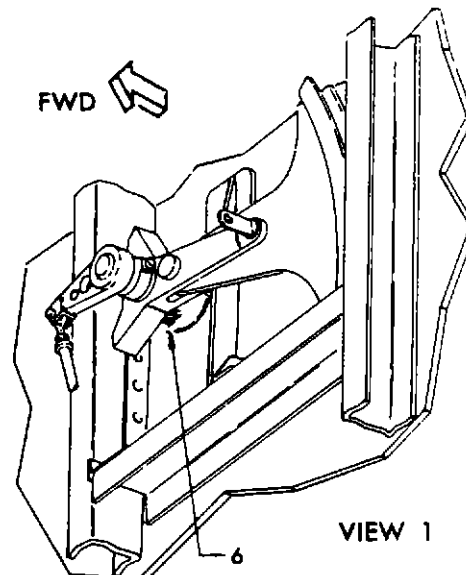


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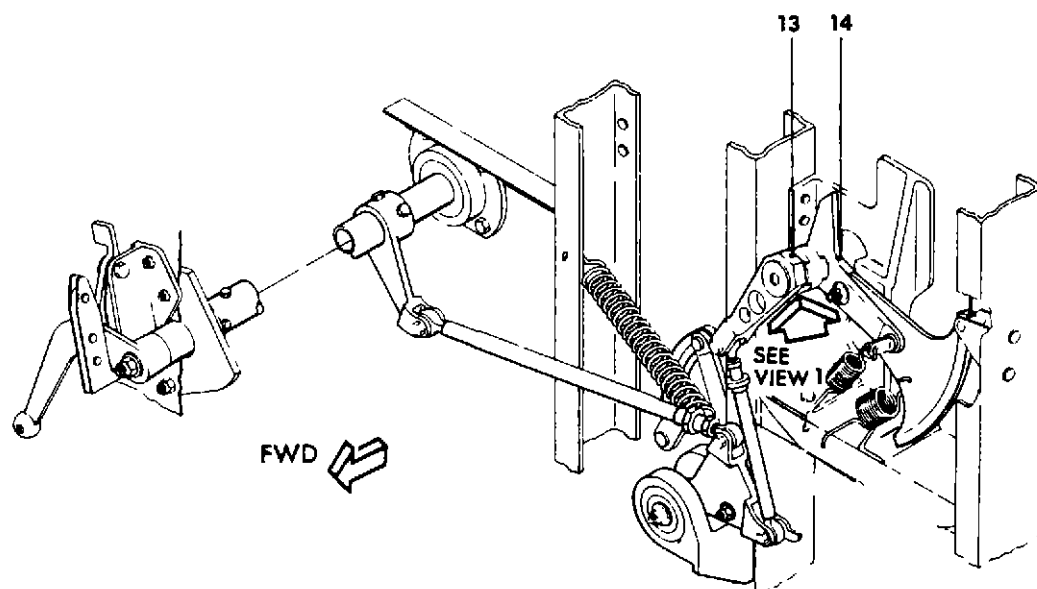
INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	DOOR HINGES	Apply grease, MIL-G-21164 flush fitting (4 places)
2	SHOCK STRUT DOOR HINGES	Apply grease, MIL-G-21164 flush fitting (2 places)
3	SHOCK STRUT DOOR ACTUATION ROD	Apply grease, MIL-G-21164 flush fitting (2 places)
4	DOOR OPERATOR ARM AND LINK	Apply grease, MIL-G-21164 flush fitting (5 places)
5	LOCK BUNGEE	Apply grease, MIL-G-21164 flush fitting (2 places)
6	DOOR RELEASE SUPPORT ASSEMBLY	Apply grease, MIL-G-21164 zerk fitting (1 in wheel well, 1 in lower nose compartment)
7	SEQUENCE VALVE LINKAGE	Apply grease, MIL-G-21164 flush fitting (2 places)
8	SEQUENCE VALVE LINKAGE HOUSING ASSEMBLY	Apply grease, MIL-G-21164 flush fitting (1 places)
9	DOOR ACTUATION RODS	Apply grease, MIL-G-21164 flush fitting (4 places)
10	LINK	Apply grease, MIL-G-21164 flush fitting (2 places)
11	DOOR OPERATOR BRACKET	Apply grease, MIL-G-21164 flush fitting (2 places)
12	DOOR ACTUATOR	Apply grease, MIL-G-21164 flush fitting (2 places)
13	DOOR GROUND RELEASE UPPER ARM	Apply grease, MIL-G-21164 flush fitting (1 place)
14	EMERGENCY DOOR RELEASE CRANK ARM	Apply grease, MIL-G-21164 flush fitting (1 place)
15	NOSE GEAR DOOR TERMINAL FITTING	Apply grease, MIL-G-21164 flush fitting (2 places)



REAR VIEW NOSE WHEEL WELL FORWARD BULKHEAD



VIEW 1



FRONT VIEW NOSE WHEEL WELL FORWARD BULKHEAD

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2. Inspection/Check Nose Gear Doors

A. Equipment and Materials

- (1) Down Lock - Nose Landing Gear - F70008-500 or equivalent.
- (2) Drag Brace Lock - F71125 or equivalent.
- (3) Spring Balance - 60 pound capacity.

B. Examine Nose Gear Doors

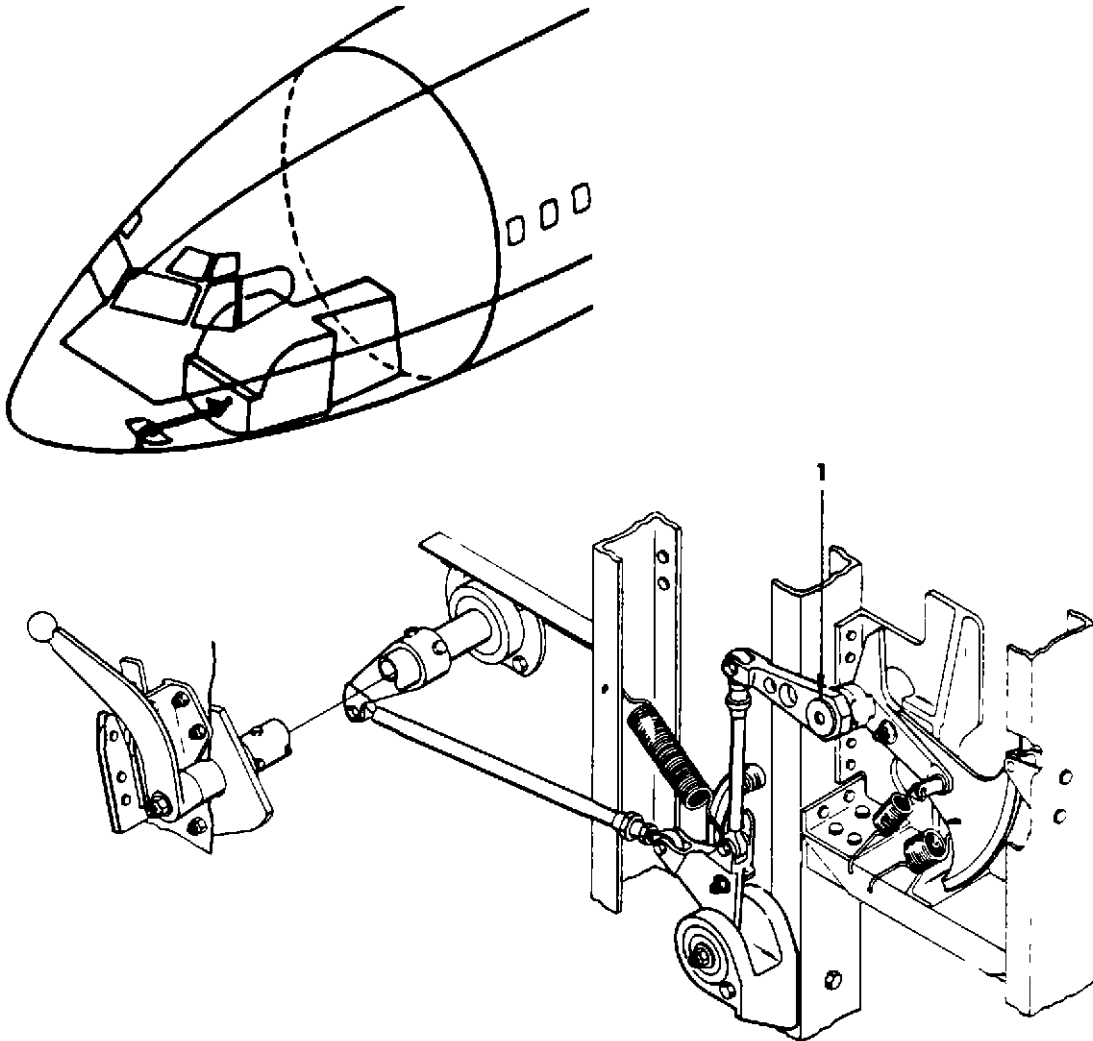
- (1) Open nose gear doors using door ground release handle.
- (2) Check that the nose landing gear down lock and the drag brace lock are installed.
- (3) Examine nose gear doors for the following:
 - (a) Wheel well doors for cracks, buckled skin and pulled rivets.
 - (b) Seals for tears, deterioration and loose mounting screws.
 - (c) Hinges for cracks, and bonding jumpers for fraying or looseness.
 - (d) Door actuation rods, pins, and lock nuts for looseness.
 - (e) Wheel well door crank and linkage for loose mounting bolts and evidence of binding.
 - (f) Shock strut door for dents, cracks and loose hinge bolts.
 - (g) Shock strut door linkage for loose bolts and check nuts.
 - (h) Shock strut door fairing for cracks, and missing or loose fasteners.
 - (i) Wheel well door actuator for loose mounting bolts and evidence of leakage.
 - (j) Door ground release mechanism for evidence of binding and wear.
(See figure 202.)
- (4) Check shock strut door rod damper by applying a 60 ($\pm$ 5) pound tangential load at extreme end of shock strut door. Rod damper assembly should extend or contract 0.10 ($\pm$ 0.02) inches.
- (5) Remove drag brace lock.

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- (6) Return nose gear door ground release handle to up position.

CAUTION. DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION WHEN CLOSING DOORS

WARNING: STAND CLEAR OF DOOR ACTION PATH



		DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
INDEX NO.	DIM.	DIAMETER		MAX. WEAR DIM.	MAX. DIAM. CLEAR-ANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTERFERENCE	
		MIN.	MAX.			YES	NO	MTL		MIN.	MAX.
1.	I.D	1.000	1.002	1.007	.012		X				
	O.D.	.996	.998	.995		X		CHROME			

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Revised

Allowable Wear and Rework of Nose Gear Door
Ground Release Mechanism
Figure 202

32-5-0
Page 205

NOSE GEAR DOORS - MAINTENANCE PRACTICES

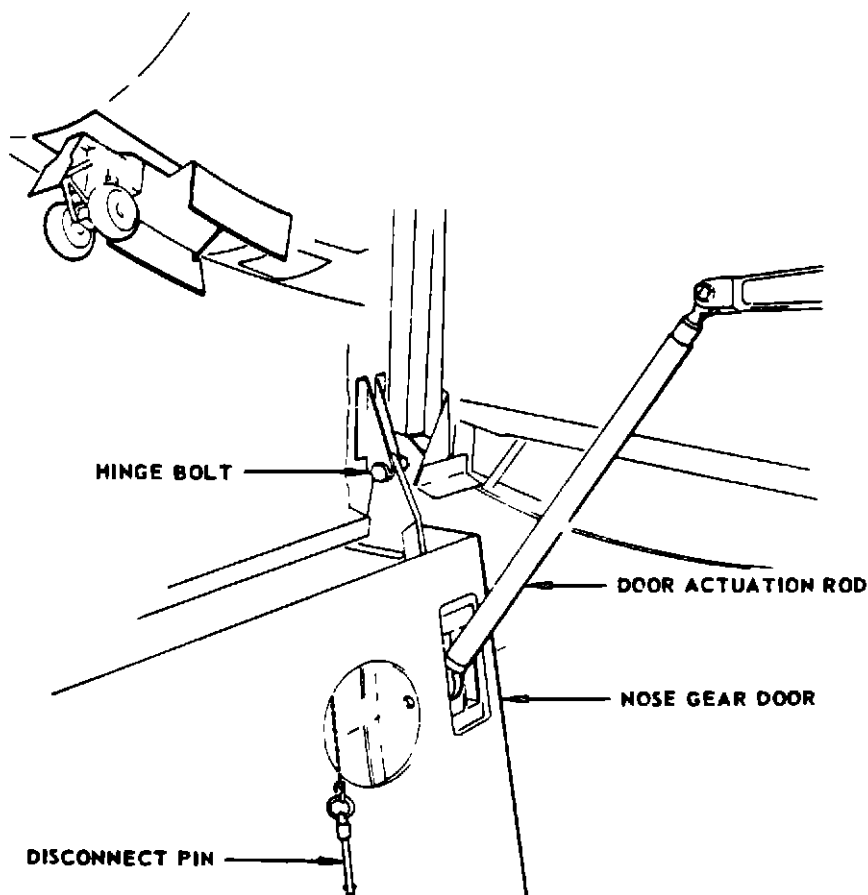
1 Removal, Installation Nose Gear Doors

A Remove Nose Gear Doors

- (1) Depressurize the utility hydraulic system using manual bypass valve on forward side of right main gear side strut opening in lower wing surface.
- (2) Open nose gear doors using door ground release handle in external power receptacle opening.
- (3) Disconnect the door actuation rods from the doors by pulling pins (See figure 201)
- (4) Support the door and remove the hinge bolts

B. Install Nose Gear Doors

- (1) Support a new or serviceable door in position. (See figure 201.)



Nose Gear Door Installation
Figure 201



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- (2) Insert and tighten the hinge bolts and connect bonding jumpers.
- (3) Adjust the door actuation rods. See Adjustment/Test Nose Gear Doors.
- (4) Attach rods to doors.
- (5) Pressurize the utility hydraulic system.
- (6) Return door ground release handle to up position.

CAUTION DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION WHEN CLOSING DOORS.

WARNING. STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOOR CLOSES.

2. Adjustment/Test Nose Gear Doors

A Adjust Nose Gear Doors

- (1) Set distance between end of actuation rod and center of rod terminal at 1.62 inches on both ends.
- (2) Adjust door actuation rod if necessary to maintain flushness within (± 0.02) with body contour along leading edge of door.

B. Test Nose Gear Doors

- (1) Check that ground locks are installed in main gear, main gear doors, and the nose gear.
- (2) With door ground release handle down and latched, pressurize hydraulic system.
- (3) Return door ground release handle to up position and close doors.

CAUTION: DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION WHEN CLOSING DOORS.

WARNING: CHECK THAT PERSONNEL, ALL TOOLS AND OBSTRUCTIONS ARE CLEAR OF DOOR ACTION PATH BEFORE OPERATING DOORS.

- (4) Open and close doors several times by operating the landing gear control handle.
- (5) Check that doors operate smoothly and for flushness within tolerance when closed.
- (6) Depressurize hydraulic system and check operating force required to pull down door ground release handle.
- (7) If a force in excess of 35 pounds is required, lengthen door actuation rods and repeat steps (3) through (6).

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NOSE GEAR DOOR ACTUATOR - MAINTENANCE PRACTICES

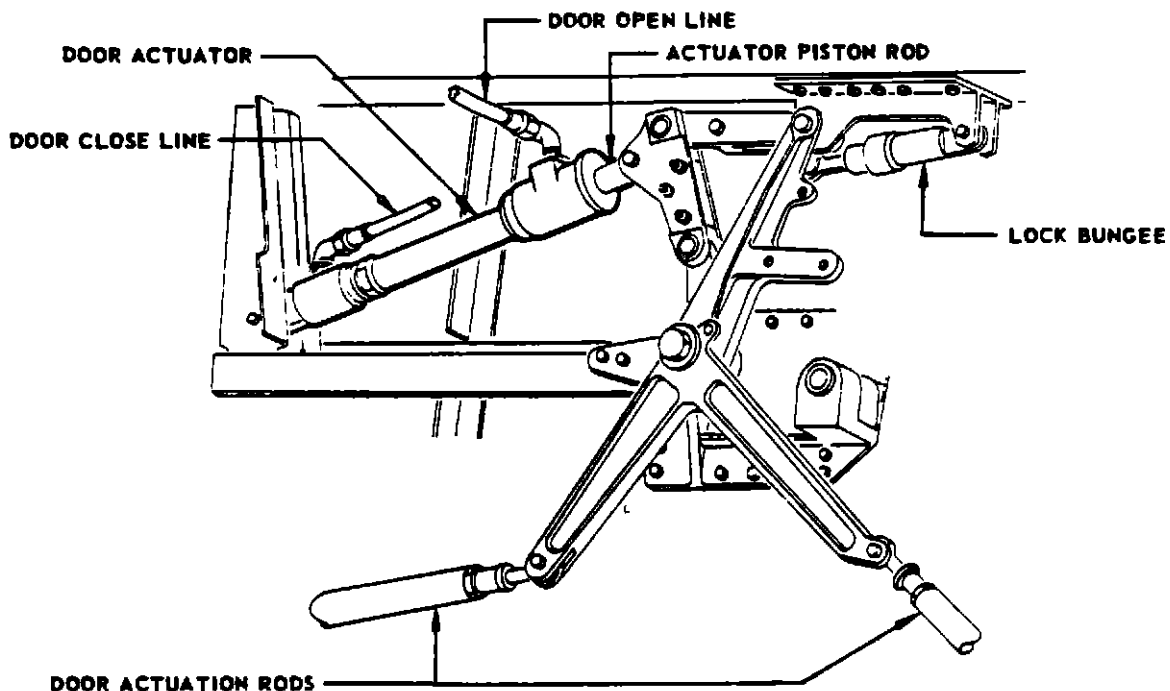
1. Removal/Installation Nose Gear Door Actuator

A. Remove Nose Gear Door Actuator

- (1) Depressurize the utility hydraulic system using manual bypass valve on forward side of right wheel well side strut opening.
- (2) Depressurize utility reservoir by loosening filler cap slowly.
- (3) Open nose gear doors using door ground release handle in external power receptacle opening.
- (4) Disconnect door actuation rods from doors.
- (5) Disconnect hydraulic lines from actuator. (See figure 201.)
- (6) Cap or plug hydraulic lines and actuator parts.
- (7) Disconnect actuator piston rod from arm assembly.
- (8) Remove bolt connecting actuator to structure and remove actuator.

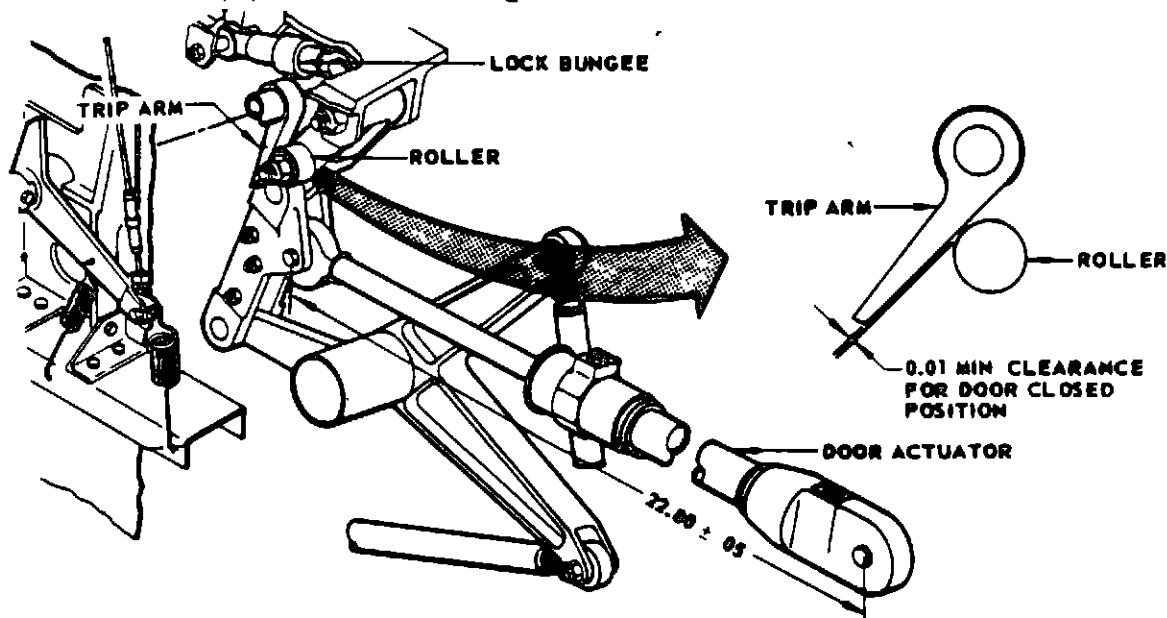
B. Install Nose Gear Door Actuator

- (1) Check extended length of actuator prior to installation. Extended length should be 22.75 to 22.85 inches.



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- (2) Place actuator, fitted with hydraulic fittings and new seals, in position and install bolt connecting actuator to structure. (See figure 201.)
- (3) Connect cylinder actuator rod to arm assembly.
- (4) Remove caps and plugs on hydraulic lines and actuator ports and connect hydraulic lines to actuator.
- (5) Bleed air from door actuator open and return lines. Maintain correct fluid level in hydraulic reservoir while bleeding lines.
 - (a) Return nose gear door ground release handle to UP position.
 - (b) Apply 40 to 50 psi air pressure to reservoir pressure regulator inlet to produce fluid flow for bleeding.
 - (c) Loosen but do not disconnect fitting at the outlet port of the check valve in the return line of the nose gear door control valve.
 - (d) Allow flow from cracked fitting until fluid shows no aeration, then tighten fitting.
 - (e) Crack fitting at "OPEN" port of door actuator and proceed as in step (d).
 - (f) Crack fitting at "OPEN" port of nose gear door control valve and proceed as in step (d).
 - (g) Remove air pressure source from reservoir.
 - (h) Position door ground release handle to OPEN.



Nose Gear Door Release Mechanism
Figure 202

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- (6) Pressurize utility hydraulic system and bleed system as required for normal operation.
- (7) Return nose wheel well door ground release handle to up position.

NOTE. With door actuation rods disconnected, doors will remain open.

- (8) Check for minimum clearance of 0.01 inch between roller and trip arm. (See figure 202.) If clearance is less than 0.01 inch, check adjustment of nose gear emergency extension mechanism. Refer to 32-7-21.
- (9) Position door ground release handle to down position and connect doors to door actuation rods.
- (10) Check nose gear door emergency and normal operation.

CAUTION: DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

WARNING. STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOOR CLOSES WHEN DOOR RELEASE HANDLE IS IN DOOR CLOSED POSITION.

NOSE GEAR DOOR LOCK BUNGEE - MAINTENANCE PRACTICES

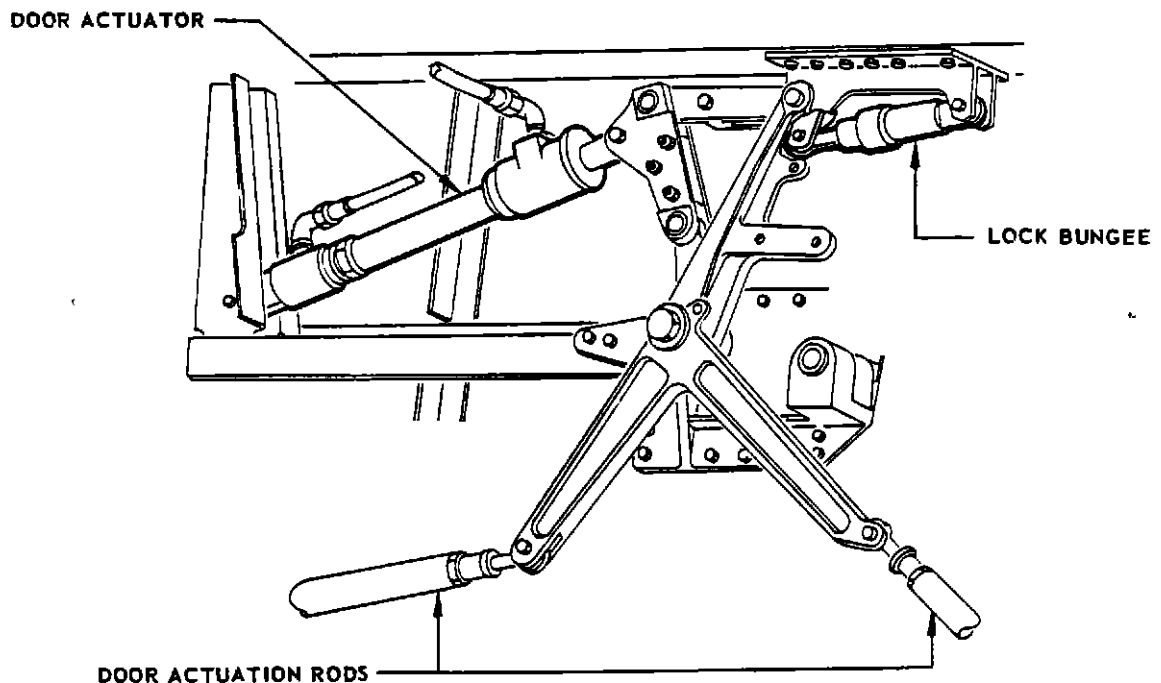
1. Removal/Installation Nose Gear Door Lock Bungee

A. Remove Nose Gear Door Lock Bungee

- (1) Depressurize utility hydraulic system using manual bypass valve on forward side of right wheel well side strut opening.
- (2) Open nose gear doors using door ground release handle in external power receptacle opening.
- (3) Disconnect the door actuation rods from the door crank. (See figure 201.)

NOTE Do not alter the adjustment on rods.

- (4) Remove the bolt, washers, switch return spring, and spacers from the stationary end of lock bungee.
- (5) Rotate door crank in door open direction until the bolt through bungee rod is accessible.
- (6) Remove bolt through bungee rod and remove bungee.



B. Install Nose Gear Door Lock Bungee

- (1) Place a new or serviceable bungee in position and install bolt through upper link and bungee rod. (See figure 201.)
- (2) Rotate door crank in door close direction.
- (3) Install bolt, spacers, switch return spring, and washers through stationary end of bungee and structure.
- (4) Connect door actuation rods to door crank.
- (5) Pressurize the utility hydraulic system.
- (6) Return door ground release handle to up position.

CAUTION DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION WHEN CLOSING DOORS.

WARNING - STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOOR CLOSES WHEN DOOR RELEASE HANDLE IS IN DOOR CLOSED POSITION.

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MAINTENANCE MANUAL

SHOCK STRUT DOORS AND FAIRINGS - MAINTENANCE PRACTICES

EFFECTIVITY

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

1. Removal/Installation Shock Strut Doors and Fairings

A. Remove Shock Strut Doors and Fairings (See figure 201.)

- (1) Disconnect door actuation rods from nose gear door terminal fittings on trunnion by removing bolts.
- (2) Support door and remove hinge bolts and bonding jumpers.
- (3) Remove screws attaching the fairing to structure.

B. Install Shock Strut Doors and Fairings (See figure 201.)

- (1) Position fairings and install screws.
- (2) Position a new or serviceable door and check alignment of hinge fittings. Center hinge pin should move in or out with no binding with forward and aft hinge pins installed.

NOTE: If door hinge fittings are misaligned, return door to shop for alignment. If necessary, shim bulkhead hinge fittings to align with door hinge fittings.
- (3) Install hinge bolts and bonding jumpers.
- (4) Adjust door actuation rods. See Adjustment/Test Shock Strut Doors.
- (5) Loosen nut on each eyebolt in door terminal fitting on trunnion. Lubricate each terminal fitting. Retighten each eyebolt nut to 50 pound-inches torque. Reduce torque to nearest castellation and install cotter pin. Check for finger pressure rotation of each eyebolt.

CAUTION: OVERTORQUEING OF EYEBOLT NUTS OR LACK OF LUBRICATION OF TERMINAL FITTINGS CAN CAUSE NOSE GEAR ACTUATION ROD FAILURE.

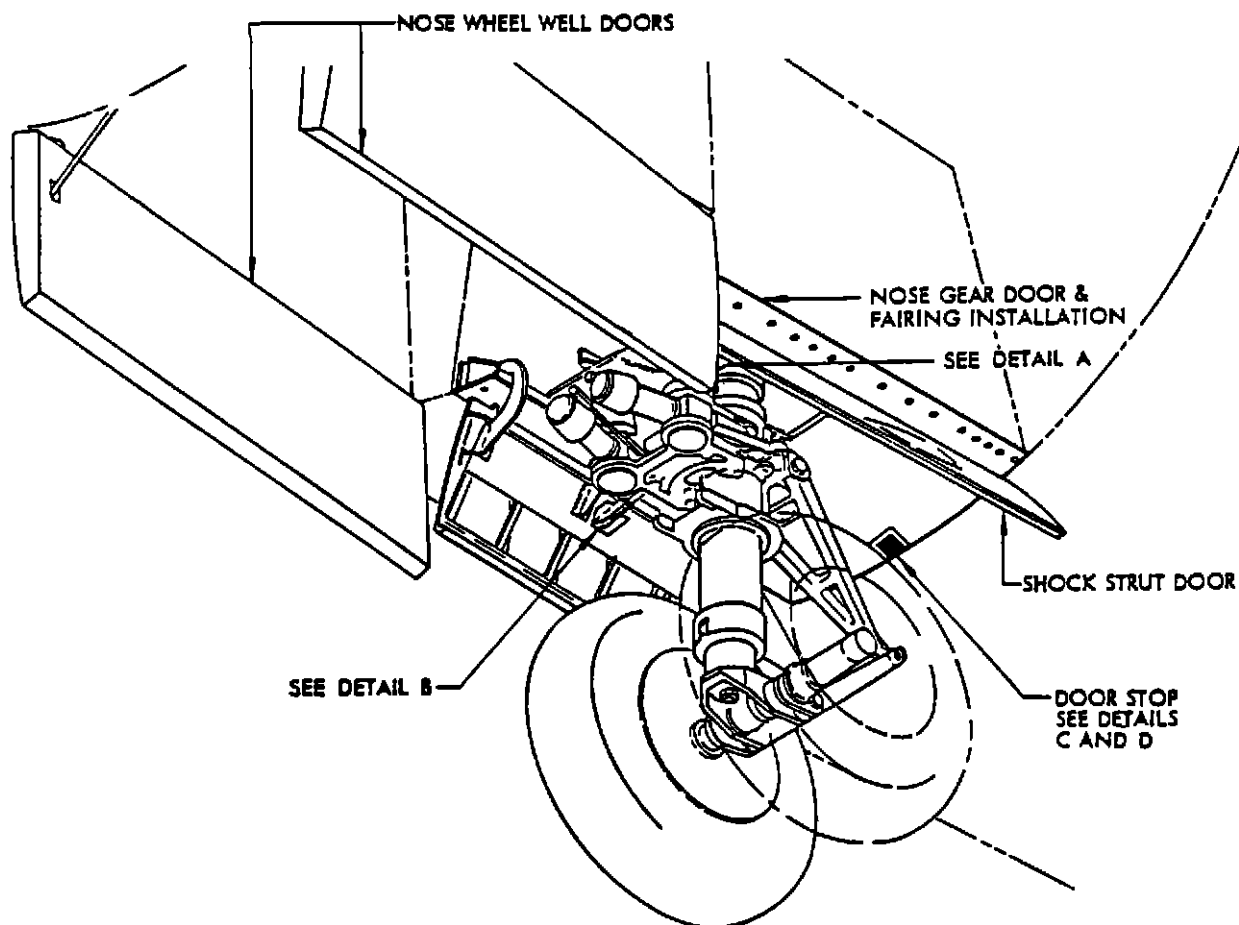
- (6) Connect actuation rods to door terminal fittings on trunnion and finger-tighten nuts.



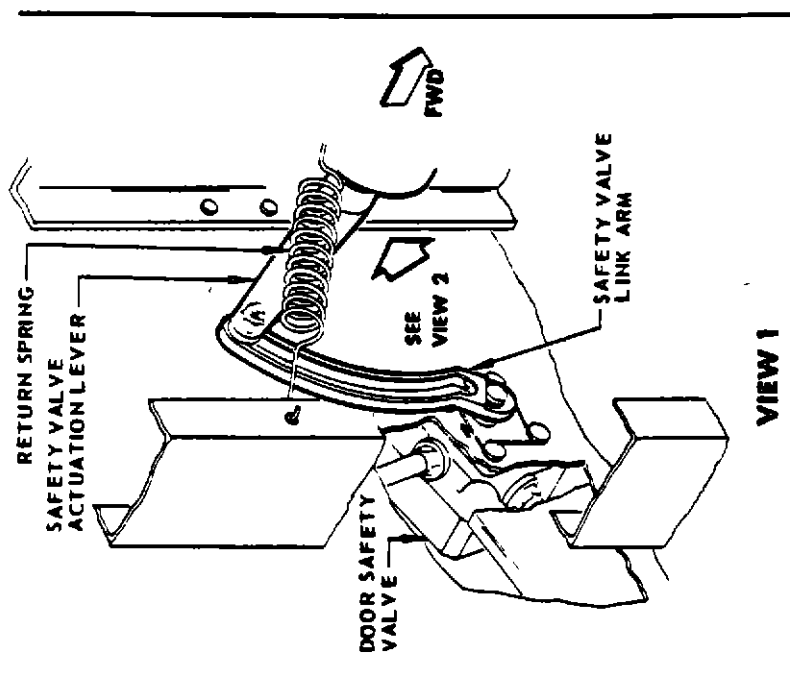
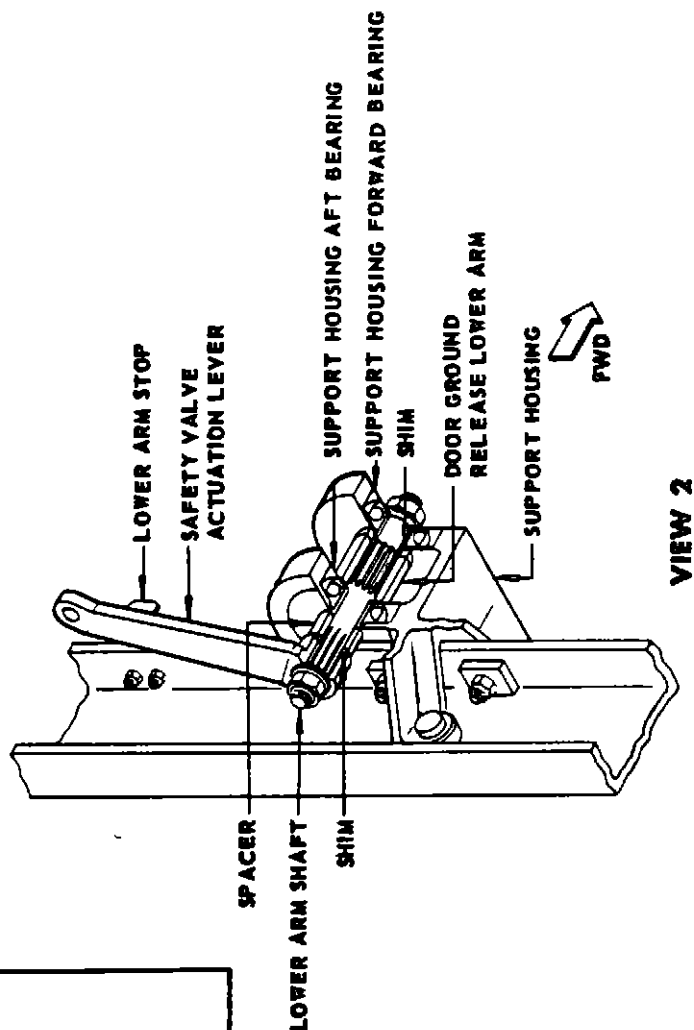
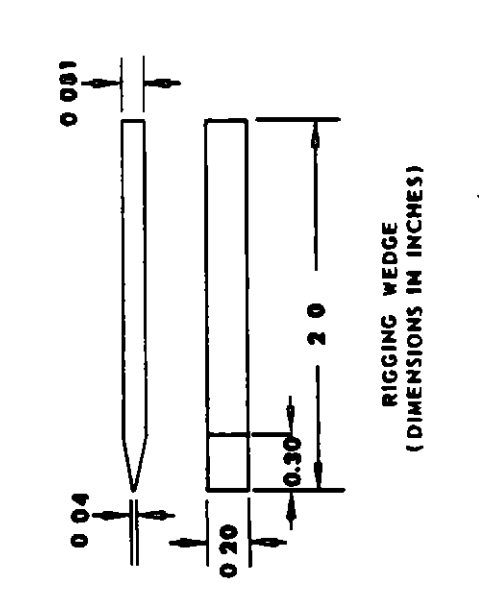
2. Adjustment/Test Shock Strut Doors

A. Adjust Nose Gear Doors

- (1) Set distance between centers of rod terminal and rod end bearing at 11.91 (± 0.03) inches as a nominal distance.
- (2) Adjust door hinges, if necessary, to maintain flushness within (± 0.04) with body contour when doors are closed.
- (3) Adjust aft stop for positive door contact with doors flush with contour to 0.03 inches outside body contour. For stop with serrated backing plate, loosen bolts and move stop as necessary, then tighten bolts. For stop with adjustable pin, remove retainer spring, adjust pin to contact door when door is flush with skin then turn pin down one turn to preload door against stop. Continue to turn pin down as necessary until retainer spring grooves align and install retainer spring. (See figure 201, details C and D.)
- (4) Adjust door actuation rod for forward edge of doors to be inside contour 0.03 to 0.06 inches.



Nose Gear Door and Fairing Installation
Figure 201 (Sheet 1)



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Revised

Nose Gear Door Ground Release Mechanism
Figure 201 (Sheet 2 of 2)

B. Install Nose Gear Door Ground Release Mechanism

- (1) With new O-ring in place, install crank shaft (figure 201) forward from wheel well area into wheel well forward bulkhead.
- (2) In doppler equipment area, on nose wheel well forward bulkhead, place emergency extension door release quadrant, dog, door ground release upper arm, and retainer on crank shaft in that order.

NOTE: Make sure that dog is installed with shortest jaws facing forward.

- (3) Install bolt through dog, crank shaft and retainer.
- (4) Connect springs and cable to quadrant.

NOTE: Quadrant pivot bolt should be finger tight only.

- (5) Place support housing aft bearing on aft end of lower arm shaft.
- (6) Install lower arm shaft through aft end of support housing, lower arm, shim, and housing forward bearing in that order.
- (7) Install washer and nut on forward side of lower arm shaft.
- (8) Install support housing and attach spring to lower arm.
- (9) Attach push-pull rod (A) to door ground release upper and lower arms.
- (10) If safety valve has been removed, locate it in place and install four installation screws and connect all hydraulic lines.
- (11) Install link arm on safety valve actuation shaft.
- (12) On aft side of lower arm shaft, install spacer, shim, safety valve actuation lever and nut.

NOTE: When installing lever, add or remove shims to maintain 0.10 (± 0.01) clearance between lever and link arm.

- (13) Install lever guide roller.
- (14) Install forward end fitting to door ground release front torque tube.
- (15) Insert forward end fitting through the forward bearing housing.
- (16) Slip torque arm on aft end of front torque tube.

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- (17) Install aft torque tube inside front torque tube and into aft bearing housing.
- (18) Install bolts through torque arm, front and aft torque tubes.
- (19) Install push pull rod (B) to torque arm and door ground release lower arm.
- (20) In the external power receptacle opening, install spacer, door ground release handle, and latch assembly.
- (21) Adjust nose gear door ground release mechanism.

2. Adjustment/Test Nose Gear Door Ground Release Mechanism

A. Equipment and Materials

- (1) Sheet metal stock, 0.081 gage.

B. Adjust Nose Gear Door Ground Release Mechanism

- (1) Check that cable (E) is correctly rigged. See 32-7-21, "Adjustment/Test Nose Gear Emergency Extension Mechanism"
- (2) With all units installed, rotate trip arm (figure 201) from wheel well area, counterclockwise until jaw on dog contacts jaw on emergency extension door release quadrant.
- (3) In doppler equipment area, shorten push-pull rod (A) until jaw on door ground release upper arm contacts jaw on dog.
- (4) Extend push-pull rod (A) until there is just enough clearance for rigging wedge to bottom in space between jaw on upper arm and jaw on dog (figure 201).

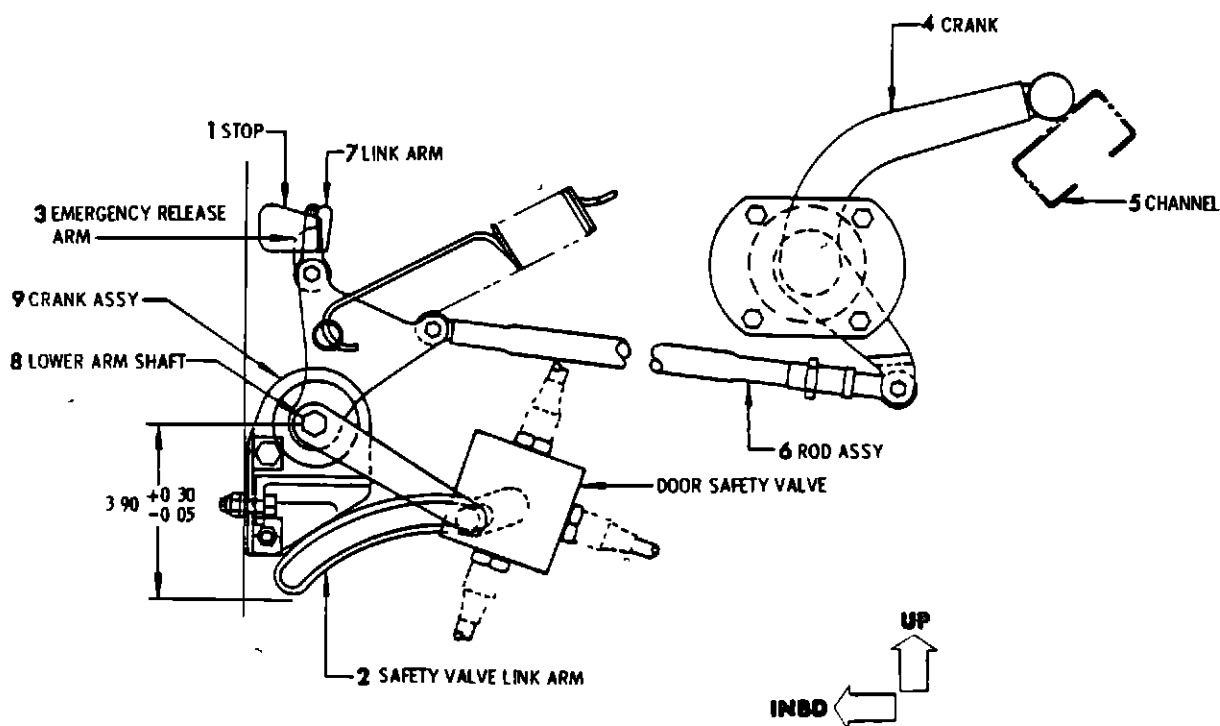
NOTE. Fabricate rigging wedge, from 0.081 sheet metal stock, using dimensions in figure 201.

- (5) Position the nose gear door release mechanism as shown on figure 202.
- (6) Check that the emergency release arm (3) is against the stop (1).
- (7) Check that the safety valve link arm (2) is positioned properly as indicated by the measurement.

NOTE: Backlash is to be removed from the safety valve link arm (2) by loading lightly in the up direction when measuring. Checking this dimension may require removal of the bracket immediately forward of the safety valve link arm (2).

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- (8) Shim the stop (1) or grind the ear of the emergency release arm (3) as required to meet the given dimension.
- (9) Close the external power access door.
- (10) Adjust the length of rod assy (6) to have the knob of crank (4) resting against channel (5) and the emergency release arm (3) against stop (1) and the safety valve link arm (2) positioned within the limits of the dimension.
- (11) Check for adequate clearance throughout travel between the ear on emergency release arm (3) and link arm (7) and between safety valve link arm (2) and the bulkhead.
- (12) In external power receptacle opening, adjust latch assembly to maintain 0.03 minimum clearance with door ground release handle.
- (13) Examine to assure for positive latching of handle.



Nose Gear Door Ground Release Linkage
Figure 202

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C Test Nose Gear Door Ground Release Mechanism

(1) General

- (a) The nose gear door ground release mechanism is first tested with the hydraulic system pressurized, then re-tested with pressure off. Any evidence of binding, end play or excessive force required on release handle during test denotes incorrect adjustment.

(2) Test door ground release mechanism (pressure on)

- (a) Check that landing gear external ground locks are installed.

WARNING · CHECK THAT PERSONNEL, ALL TOOLS AND OBSTRUCTIONS ARE CLEAR OF DOOR ACTION PATH BEFORE OPERATING DOORS

- (b) Pull down nose gear door ground release handle from external power receptacle. Check for full travel and positive latching.
- (c) Check release handle for excessive resistance to movement.
- (d) Check that doors unlock smoothly with no evidence of sticking or binding.

NOTE Doors may not free fall open under their own weight. Light hand pressure is sufficient to open them completely.

- (e) Unlatch handle, note that doors close and lock, and that release handle returns to normal position clear of external receptacle door. Check handle for end play.
- (f) Repeat operation several times.
- (g) If unable to move handle, or to unlock door, depressurize utility system and test from (2)(a) through (2)(e). If doors operate check safety valve linkage.
- (h) If handle requires excessive force to operate with system depressurized, see 32-5-1, "Test Nose Gear Doors."



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- (3) Test emergency door release mechanism (pressure off)
 - (a) With nose gear down and ground locks installed check the following.
 - 1) Nose gear doors closed and locked.
 - 2) Door ground release handle up
 - 3) Landing gear control handle in "OFF" position
 - 4) Emergency down lock pin disengage. See 32-7-21 "Adjustment/Test Nose Gear Emergency Extension System."
 - (b) Open access door to emergency crank socket in control cabin floor.
 - (c) Check that index mark on crank socket matches index mark on bearing retainer on top of drum housing.
 - (d) Insert crank in socket and turn clockwise to solid stop.
 - (e) Check doors for smooth unlocking without evidence of sticking or binding.
- (4) Return landing gear control handle to "DOWN" position.

NOTE Hydraulic pressure will be required to lock doors closed

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NOSE GEAR DOOR LINKAGE MECHANISM - MAINTENANCE PRACTICES

1. Removal/Installation Nose Gear Door Linkage Mechanism

A. Remove Nose Gear Door Linkage Mechanism

- (1) Depressurize utility hydraulic system using manual bypass valve on forward side of right wheel well side strut opening.
- (2) Open nose gear doors using door ground release handle in external power receptacle opening.
- (3) Disconnect the door actuation rods from doors and from door crank. (See figure 201.)
- (4) Remove door lock switch. (See 32-6-21.)
- (5) Disconnect the sequence valve control linkage from the door crank.
- (6) Remove the door lock bungee. (See 32-5-21.)
- (7) Disconnect the actuator piston rod from the arm assembly.
- (8) Remove the door crank.
- (9) Remove the outer support bracket.

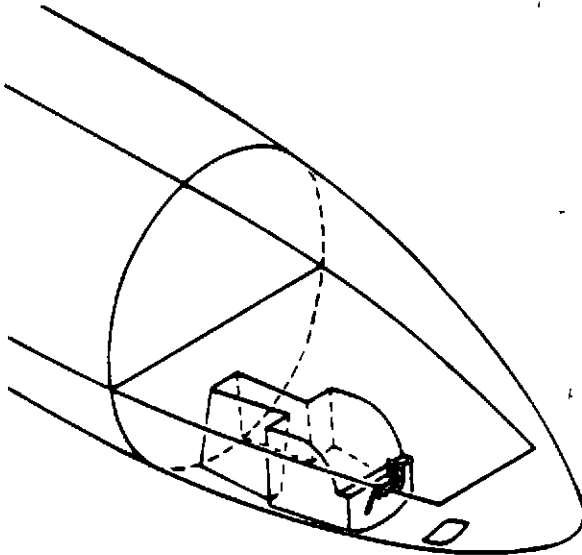
NOTE: When removing bolt through outer support bracket and top support, hold upper link assembly to keep linkage from falling.

- (10) Remove the upper link assembly, arm assembly, and splined shaft and arm.

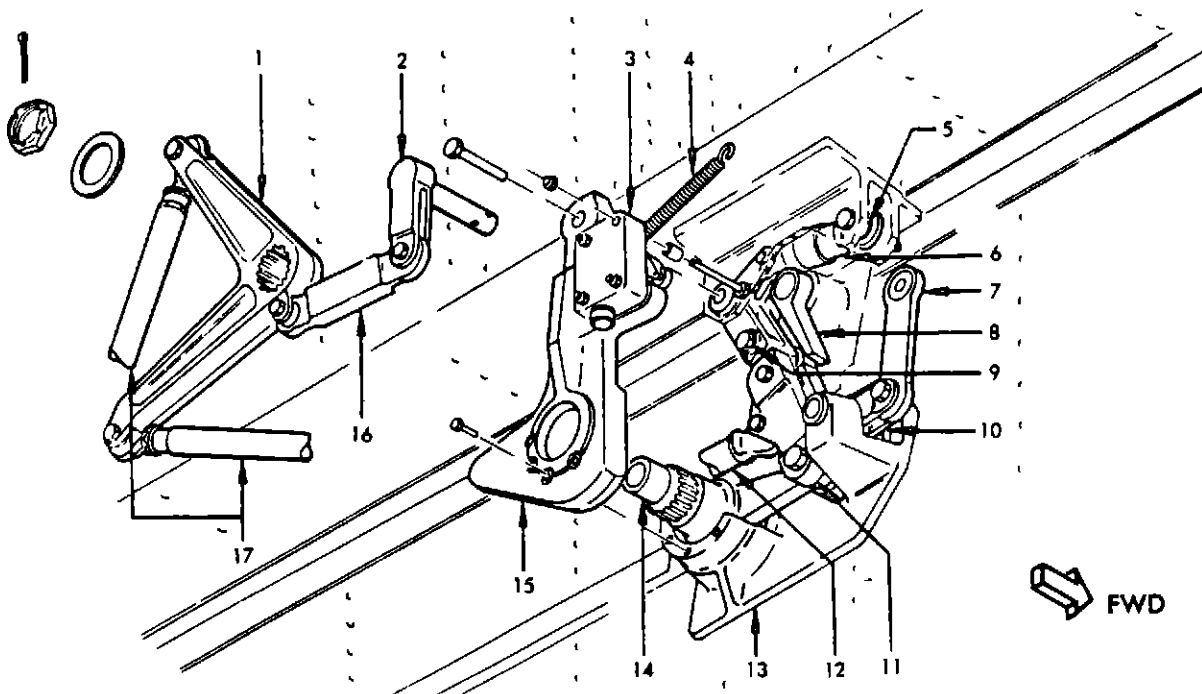
B. Install Nose Gear Door Linkage Mechanism

- (1) Position the upper link assembly, arm assembly, and splined shaft and arm in place. (See figure 201.)
- (2) Position outer support bracket in place and install bolt through outer support bracket, top support and upper link assembly.
- (3) Install remaining bolts in outer support bracket.

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- 1 DOOR CRANK
- 2 VALVE CRANK ASSEMBLY (OUTER)
- 3 DOOR LOCK SWITCH
- 4 SWITCH RETURN SPRING
- 5 SPACER
- 6 DOOR LOCK BUNGEE
- 7 VALVE ACTUATOR ROD
- 8 TRIP ARM
- 9 LINK ASSEMBLY
- 10 VALVE CRANK ASSEMBLY (INNER)
- 11 ARM ASSEMBLY
- 12 ACTUATOR PISTON ROD
- 13 HOUSING ASSEMBLY
- 14 SHAFT ASSEMBLY
- 15 OUTER SUPPORT BRACKET
- 16 VALVE CONTROL LINKAGE
- 17 DOOR ACTUATION RODS



Nose Gear Door Linkage Mechanism Assembly
Figure 201



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- (4) Install door crank and nut. Tighten nut snug, then loosen nut and retighten finger-tight. Tighten to next castellation and install cotter pin.
- (5) Connect the actuator piston rod to the arm assembly.
- (6) Install the door lock bungee. (See 32-5-21.)
- (7) Connect the sequence valve control linkage to the door crank.
- (8) Install the door lock switch. (See 32-6-21.)
- (9) Attach the door actuation rods to the door crank and to the doors.

NOTE: If adjustment of door actuation rods has been altered, refer to 32-5-1 for adjustment.

- (10) Pressurize the utility hydraulic system.
- (11) Return door ground release handle to up position.

CAUTION: DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION WHEN CLOSING DOORS.

WARNING: STAND CLEAR OF DOOR ACTION PATH AND BE SURE DOOR CLOSES WHEN DOOR RELEASE HANDLE IS IN DOOR CLOSED POSITION.

SHOCK STRUT DOORS AND FAIRINGS - MAINTENANCE PRACTICES

EFFECTIVITY

PAA N401PA THRU N499PA, N765PA AND ON
TWA N760TW, N799TW, N780TW, N793TW,
N8705T, N8715T, N8725T, N18701 AND ON
AF F-BLCC AND ON
SABENA 707-329C
BOAC G-ASZF AND ON
DLH D-ABUA AND ON
AII 707-337B AND 707-337C
VARIG PP-VJJ AND ON
NWA N356US AND ON

1. Removal/Installation Shock Strut Doors and Fairings

A. Remove Shock Strut Doors and Fairings (See figure 201.)

- (1) Disconnect door actuation rods from nose gear door terminal fittings on trunnion by removing bolts.
- (2) Support door and remove hinge bolts and bonding jumpers.
- (3) Remove screws attaching the fairing to structure.

B. Install Shock Strut Doors and Fairings (See figure 201.)

- (1) Position fairings and install screws.
- (2) Position a new or serviceable door and check alignment of hinge fittings. Center hinge pin should move in or out with no binding with forward and aft hinge pins installed.

NOTE: If door hinge fittings are misaligned, return door to shop for alignment. If necessary, shim bulkhead hinge fittings to align with door hinge fittings.

- (3) Install hinge bolts and bonding jumpers.
- (4) Adjust door actuation rods. See Adjustment/Test Shock Strut Doors.
- (5) Loosen nut on each eyebolt in door terminal fitting on trunnion. Lubricate each terminal fitting. Retighten each eyebolt nut to 50 pound-inches torque. Reduce torque to nearest castellation and install cotter pin. Check for finger pressure rotation of each eyebolt.

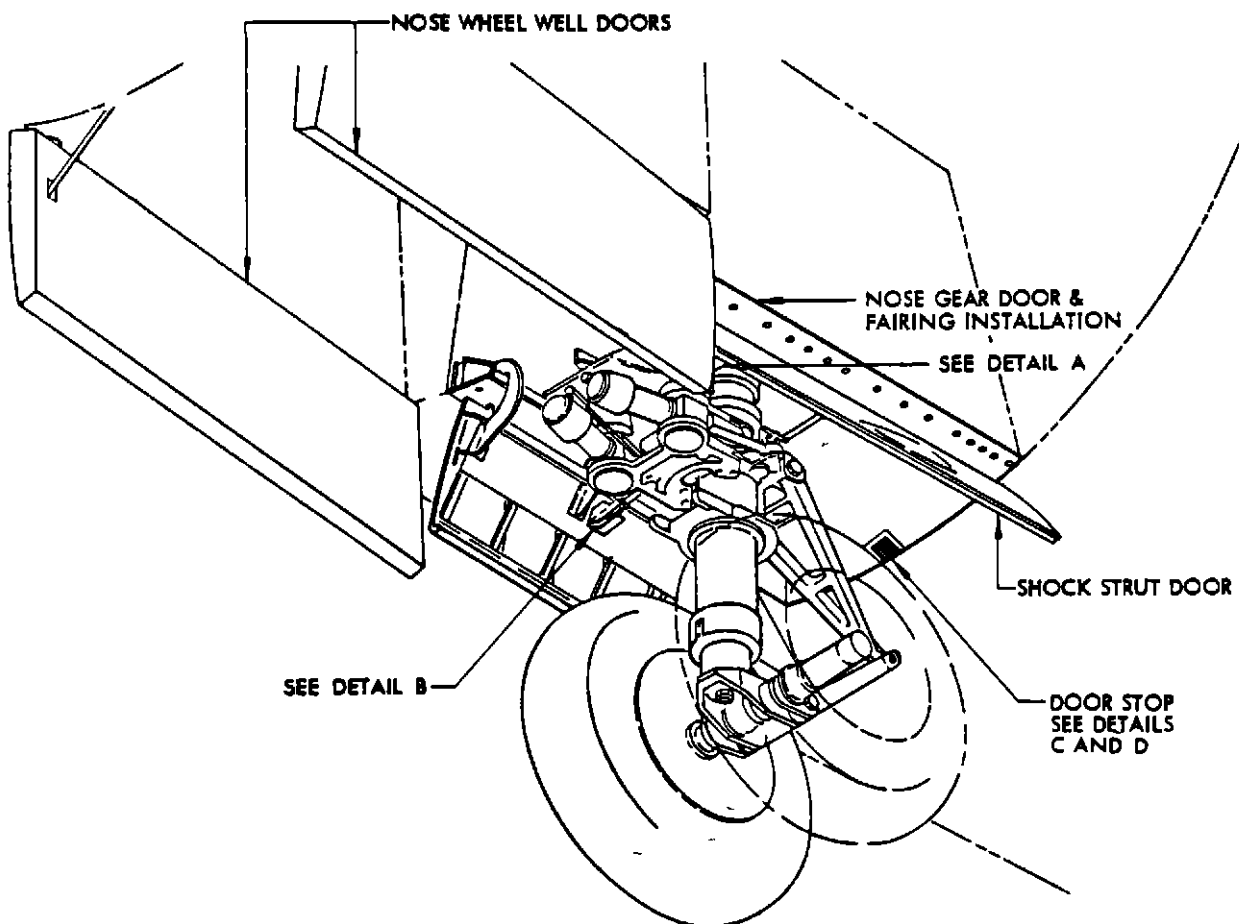
CAUTION: OVERTORQUEING OF EYEBOLT NUTS OR LACK OF LUBRICATION OF TERMINAL FITTINGS CAN CAUSE NOSE GEAR ACTUATION ROD FAILURE.

- (6) Connect actuation rods to door terminal fittings on trunnion and finger-tighten nuts.

2. Adjustment/Test Shock Strut Doors

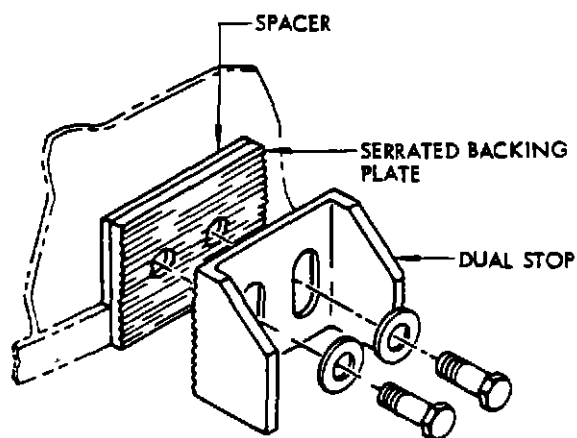
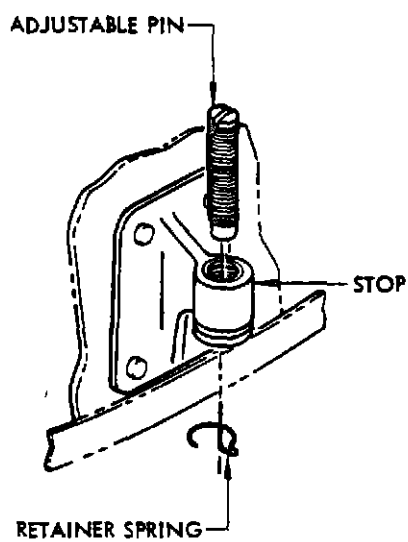
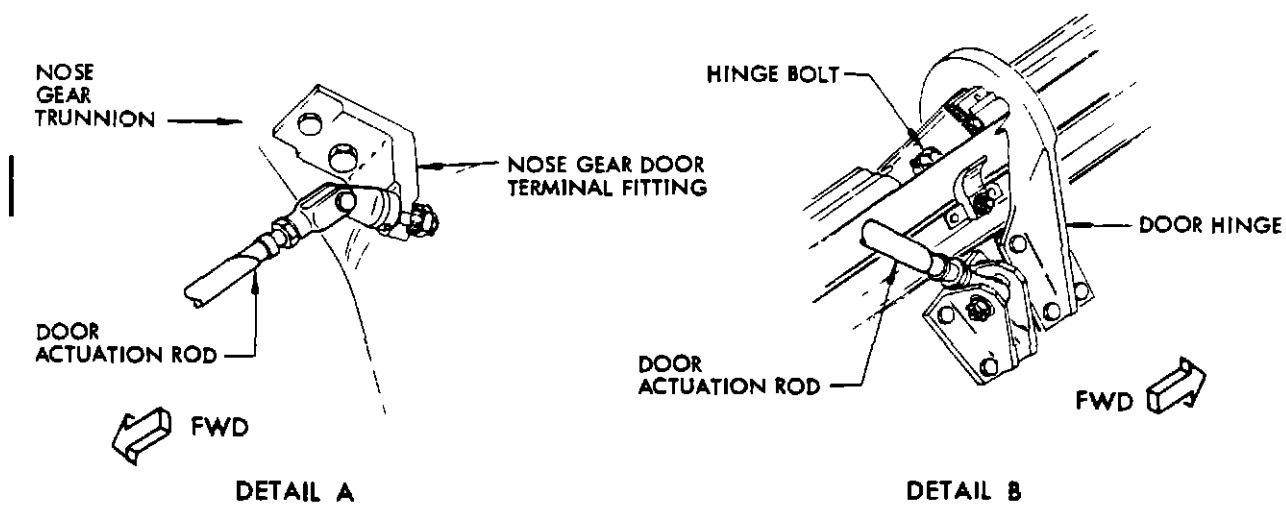
A. Adjust Nose Gear Doors

- (1) Set distance between centers of rod terminal and rod end bearing at 11.91 (± 0.03) inches as a nominal distance.
- (2) Adjust door hinges, if necessary, to maintain flushness within (± 0.04) with body contour when doors are closed.
- (3) Adjust aft stop for positive door contact with doors flush with contour to 0.03 inches outside body contour. For stop with serrated backing plate, loosen bolts and move stop as necessary, then tighten bolts. For stop with adjustable pin, remove retainer spring, adjust pin to contact door when door is flush with skin then turn pin down one turn to preload door against stop. Continue to turn pin down as necessary until retainer spring grooves align and install retainer spring. (See figure 201, details C and D.)
- (4) Adjust door actuation rod for forward edge of doors to be inside contour 0.03 to 0.06 inches.



Nose Gear Door and Fairing Installation
Figure 201 (Sheet 1)

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LANDING GEAR POSITION INDICATING AND WARNING SYSTEM - DESCRIPTION AND OPERATION

1 General

- A The landing gear position indicating and warning system may be regarded as four subsystems which are: the landing gear control handle lock system, the landing gear warning system, the warning horn cutout system and the landing gear door warning system

2 Landing Gear Control Handle Lock System

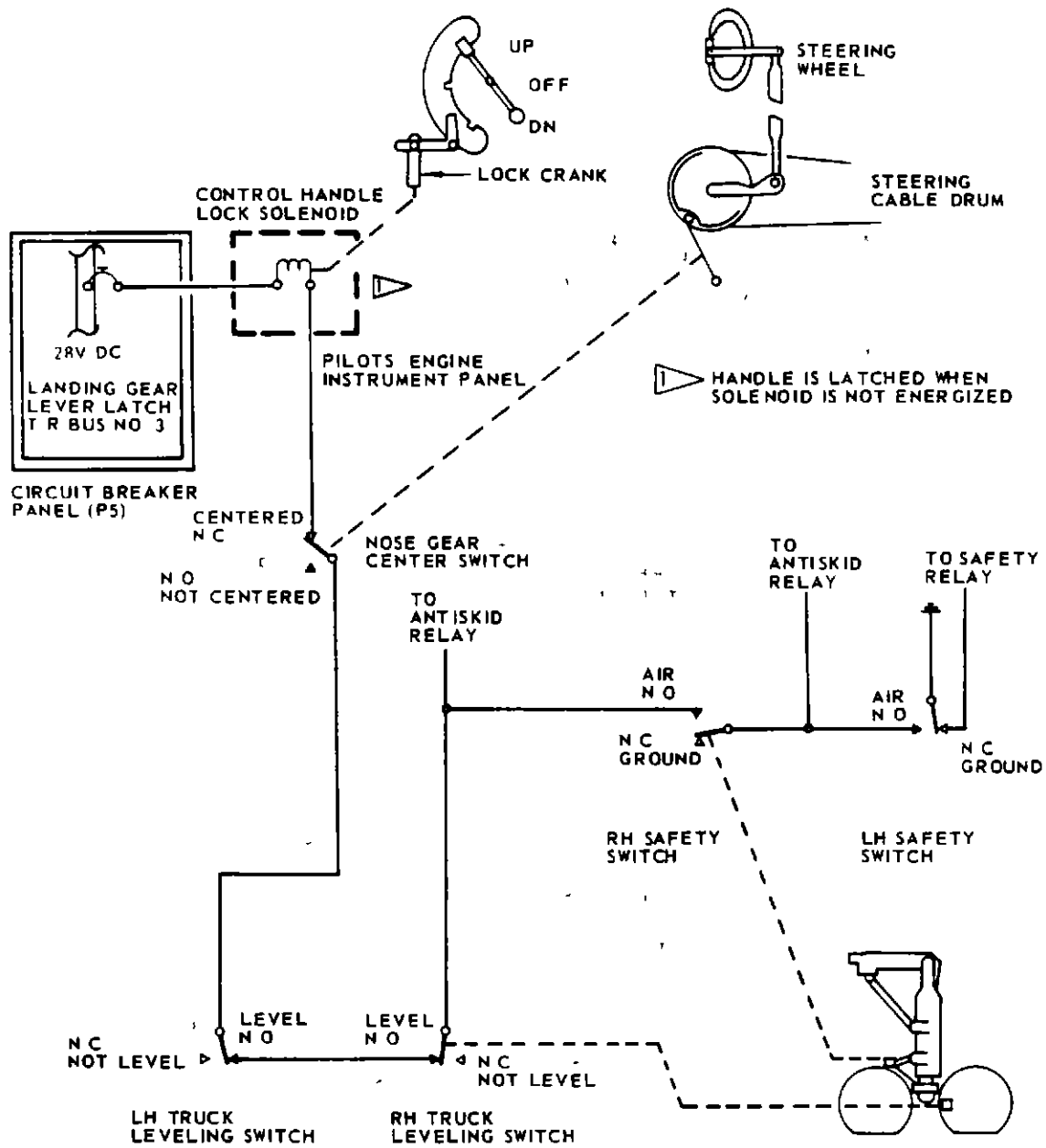
A General

- (1) The landing gear control handle lock system prevents inadvertent movement of the control handle into "UP" position when conditions are not right for landing gear retraction. The system consists of a control handle lock and the switches for sensing the conditions required for gear retraction. An oleo safety switch and a truck leveling switch on each main gear sense shock strut extension and truck level conditions respectively. On earlier airplanes (see figure 1 for effectivity) a nose wheel centering switch is provided to sense that nose wheels are straight ahead. A lock override trigger is built into the control handle so that in an emergency the handle can be moved to "UP" position with lock engaged. The system operates on 28-volt d-c power. The control handle lock is released when the lock solenoid is energized. The solenoid is energized only when both main gear oleos are extended, the main gear trucks are perpendicular to the oleos, and, on airplanes with nose wheel centering switch, the nose wheels are pointing straight ahead.

B Landing Gear Control Handle Lock

- (1) The landing gear control handle lock provides a movable stop for the inner end of the control handle. (See figure 1.) The lock assembly consists of a lock crank and a solenoid. When the crank is in the locked position the control handle can be moved between "DN" and "OFF," but not into "UP" position. The lock crank is hooked on the shaft of the lock solenoid which is spring loaded to hold the crank in the locked position. When energized, the solenoid rotates the crank to the unlocked position. The control handle can then be moved into the "UP" detent. The override trigger is connected to the spring loaded inner end of the control handle. If it is necessary to move the control handle into the "UP" position with the lock engaged, the lock override trigger can be used to pull the inner end of the control handle clear of the lock crank.

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EFFECTIVITY

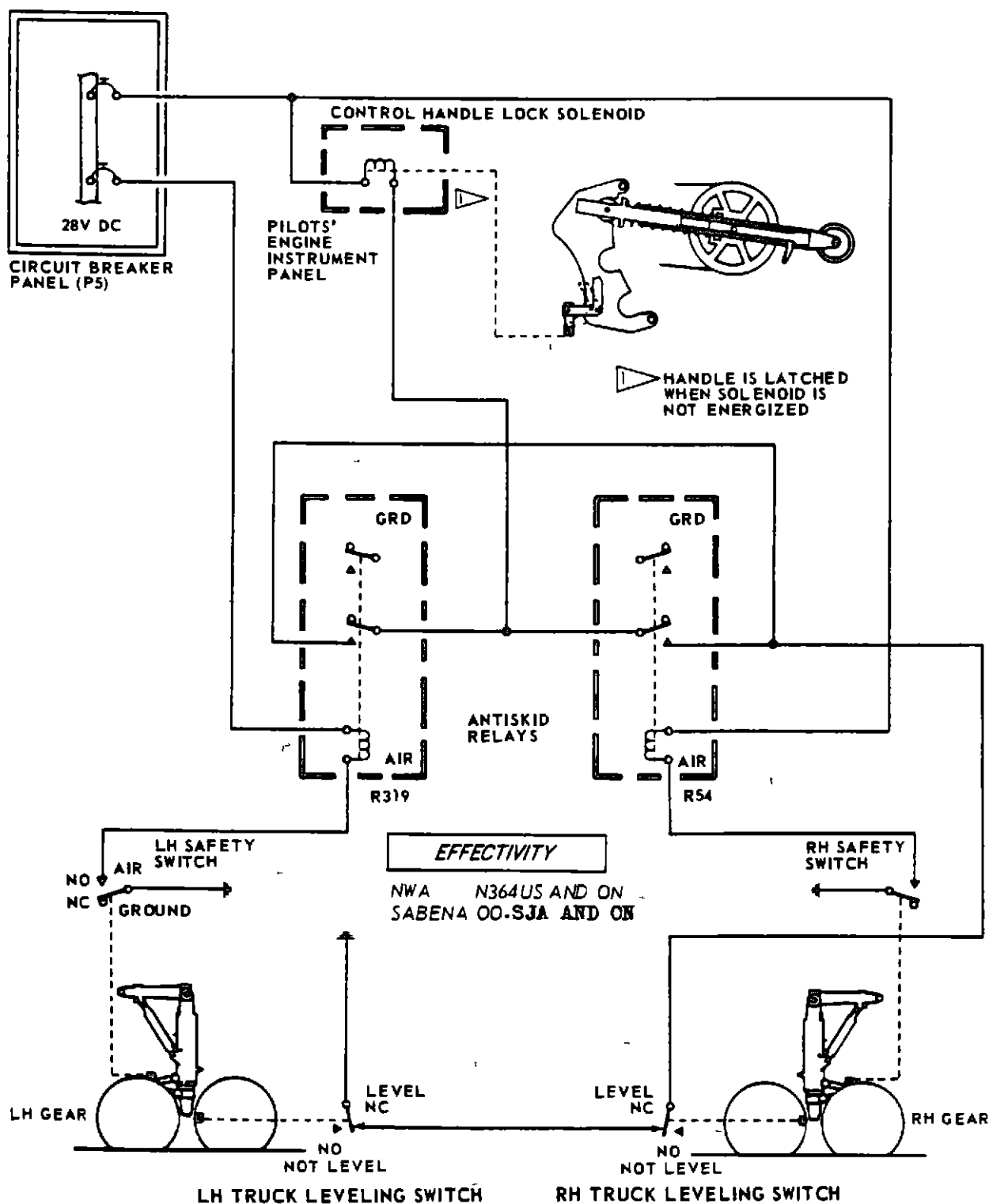
NWA N351US THRU N363US

Landing Gear Control Handle Lock System Circuit
Figure 1
T.EG.SYS.SERV.

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SN REV. August 27, 1978

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Ref. SB 32-2204

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Landing Gear Control Handle Lock System Circuit

Figure 1A

T.EG.SYS.SERV.

32-6-0
Page 2A



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C. Nose Wheel Centering Switch (See figure 2 for effectivity)

- (1) The nose wheel centering switch prevents landing gear retraction when nose wheels are not centered. The centering switch is in the lower nose compartment. The switch assembly includes a low travel hermetically sealed microswitch, a roller type switch actuator and switch support plates mounted on a bracket below the steering control cable drum. The switch actuator roller contacts an actuating rim on the side of the steering control cable drum. When the nose wheels are straight ahead the switch actuator roller drops into a detent in the actuating rim to close the switch.

D. Main Gear Oleo Safety Switch

- (1) The main gear oleo safety switch (figure 3) prevents landing gear retraction when the weight of the airplane is on the landing gear. One safety switch is mounted on a cast bracket on the upper torsion links of each main gear. The assembly consists of a low travel microswitch, a switch bracket and linkage. The switch is closed when the shock strut is extended and open when the airplane is on the ground with the shock strut compressed. Actuation of the switch is through the linkage from the lower torsion links

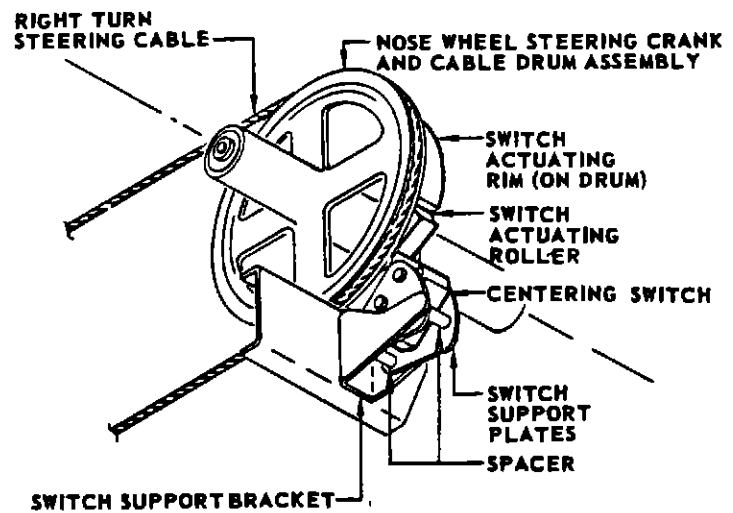
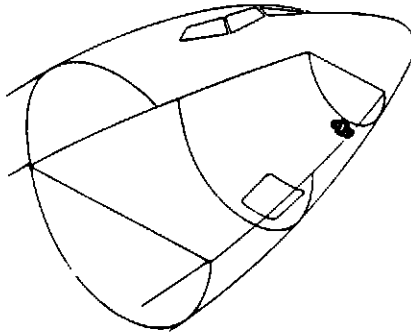
E. Main Gear Truck Leveling Switch

- (1) The main gear truck leveling switch (figure 4) prevents landing gear retraction when the truck is not perpendicular to the shock strut. One leveling switch is attached to the right side of each main gear truck beam. The assembly includes a low travel microswitch and an operating link connecting the switch actuating arm to the lower terminal of the shock strut outer cylinder. The switch opens when the trucks are tilted to an extent that is unsafe for gear retraction.

F. Operation (Airplanes with nose wheel centering switch. See figure 1.)

- (1) When the nose wheel centering switch, both main gear oleo safety switches and both truck leveling switches are all closed; the nose wheels are straight ahead, the main gear trucks are perpendicular to shock struts, and the main gear oleos are extended. With all switches closed the control handle lock circuit is energized. The energized lock solenoid rotates the lock crank in a forward direction clear of the control handle. The control handle may then be moved into "UP" position. If any one of the switches is opened by its respective linkage, the lock solenoid becomes de-energized and the lock crank rotates to prevent the control handle from entering "UP" position. When the crank is in locked position the control handle may be moved into the "UP" detent by using the lock override trigger to pull the inner end of the control handle back until it clears the lock crank

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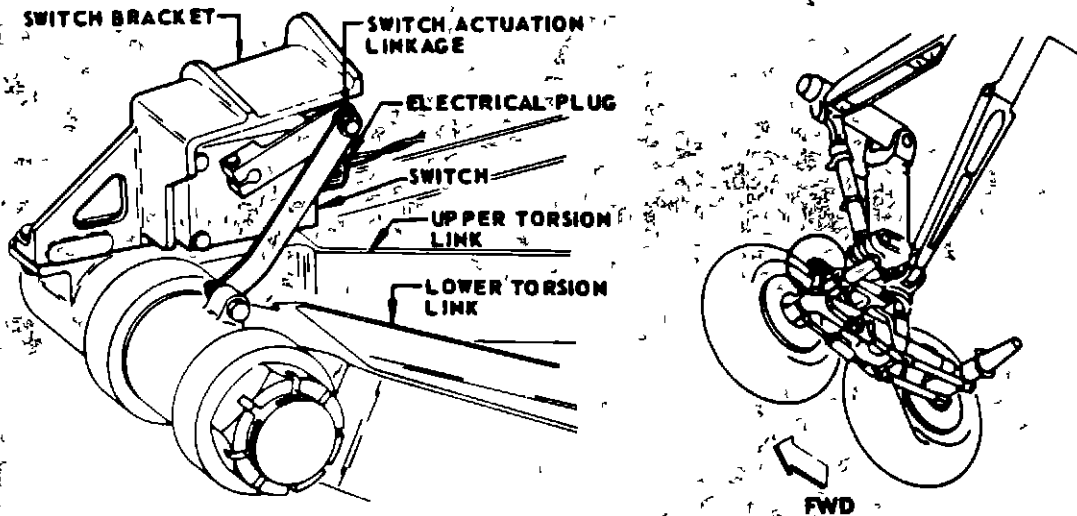


EFFECTIVITY

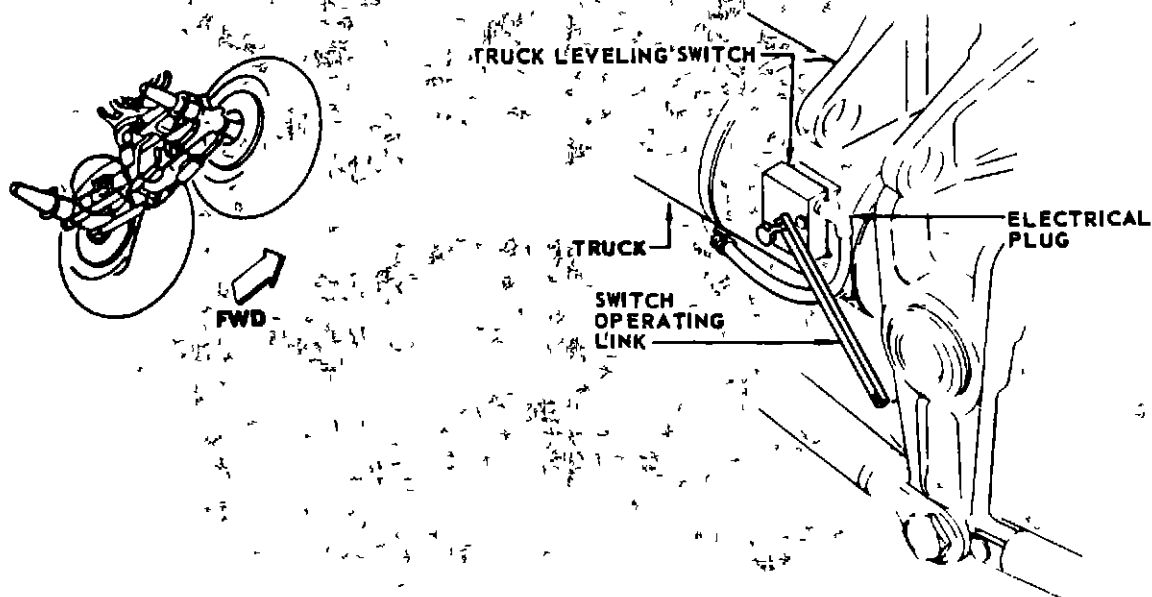
SABENA 00-SJA THRU 00-SJH
 NWA N351US THRU N363US

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Main Gear Oleo Safety Switch
Figure 3



Main Gear Truck Leveling Switch
Figure 4

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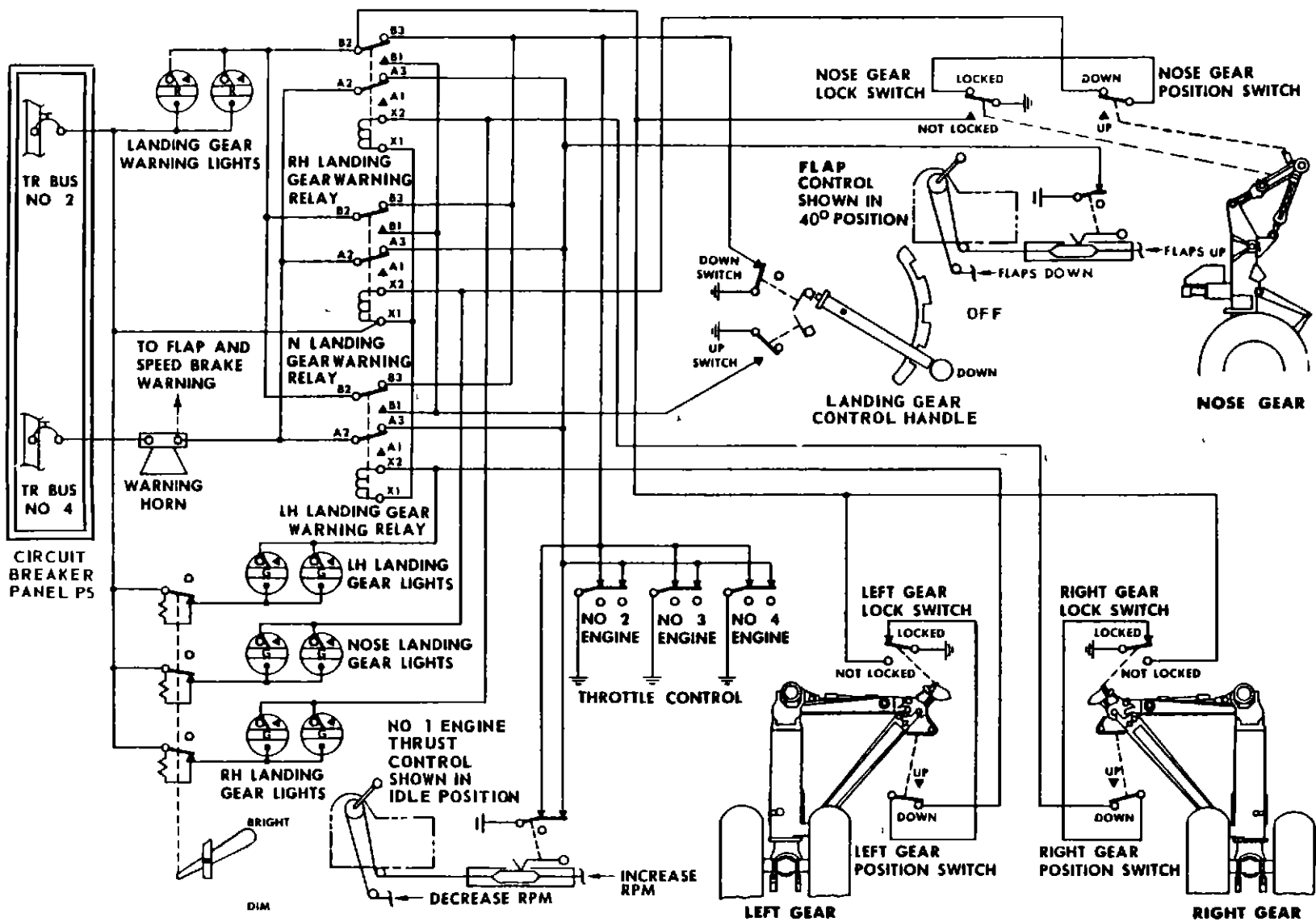
G. Operation (Airplanes without nose gear centering switch. See figure 1A)

- (1) With shock struts extended and wheel trucks perpendicular to shock struts, safety and leveling switches are closed. When either safety switch and both leveling switches are closed the control handle lock solenoid is energized. The energized lock solenoid rotates the lock crank in a forward direction, clear of the inner end of the control handle. The control handle can then be moved into UP position. If one leveling switch, or both safety switches are opened through their respective linkage, the lock solenoid is de-energized. The lock crank then rotates to prevent the control handle from entering UP position. When the lock crank is in locked position, the control handle can be moved into UP position by using the lock override trigger to pull back the inner end of the control handle until it clears the lock crank.

3 Landing Gear Warning System

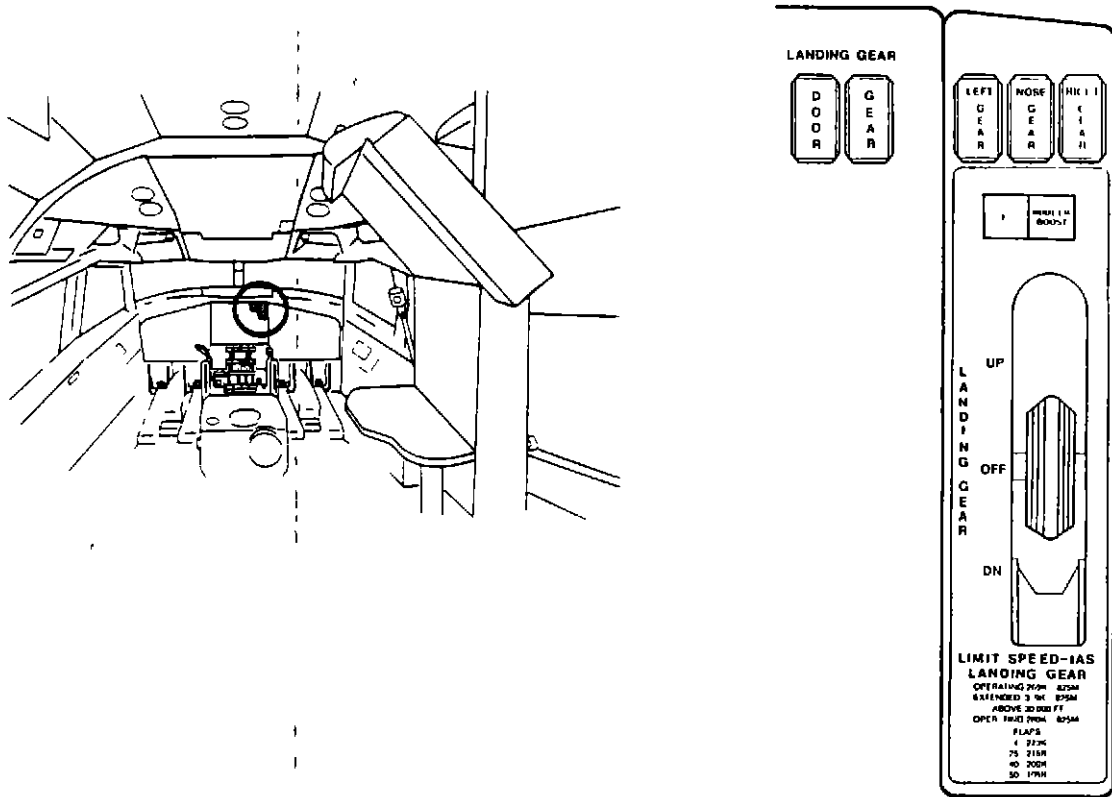
A. General

- (1) The landing gear warning system (figure 5) provides visual indication of landing gear down and locked condition, and of landing gear position not in accordance with control handle position. In addition to visual indication a warning horn sounds if engine thrust levers are retarded into idle range before the landing gear is down and locked. The warning horn will sound (without visual indication) if the flap control lever is moved to lower flaps 33 degrees or more before the landing gear is down and locked.
- (2) On cargo airplanes, a main gear mechanical position and lock indication system is provided to permit verification of landing gear position and condition of the locks when cargo stowed in the cabin obstructs access to the main gear sighting windows in the cabin floor. (See figures 7A and 7B)
- (3) Indication and Warning Circuit (See figure 5)
 - (a) Three green indicator lights, one for each main and nose gear, are controlled by the landing gear lock and position switches to illuminate when the respective landing gear is down and locked. Indicator lights are mounted on the pilots instrument panel above the landing gear control handle. (See figure 6) A dimmer switch below the left gear indicator light is provided to reduce indicator light intensity during night operations.

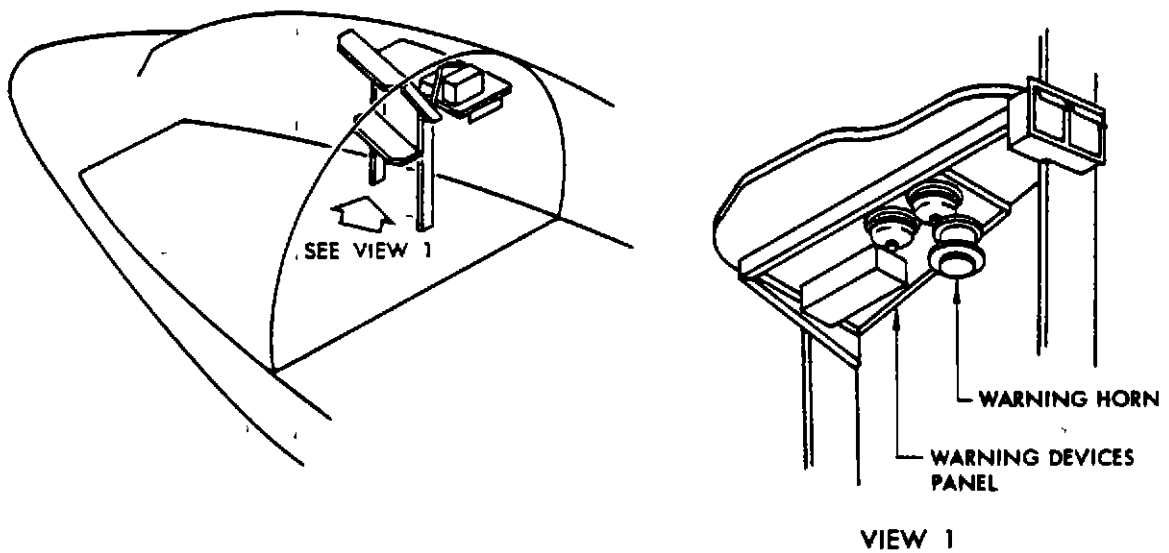


Landing Gear Position Indicating and Warning System Circuit
Figure 5

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MAINTENANCE MANUAL



Landing Gear Indicating And Warning Lights
 Figure 6

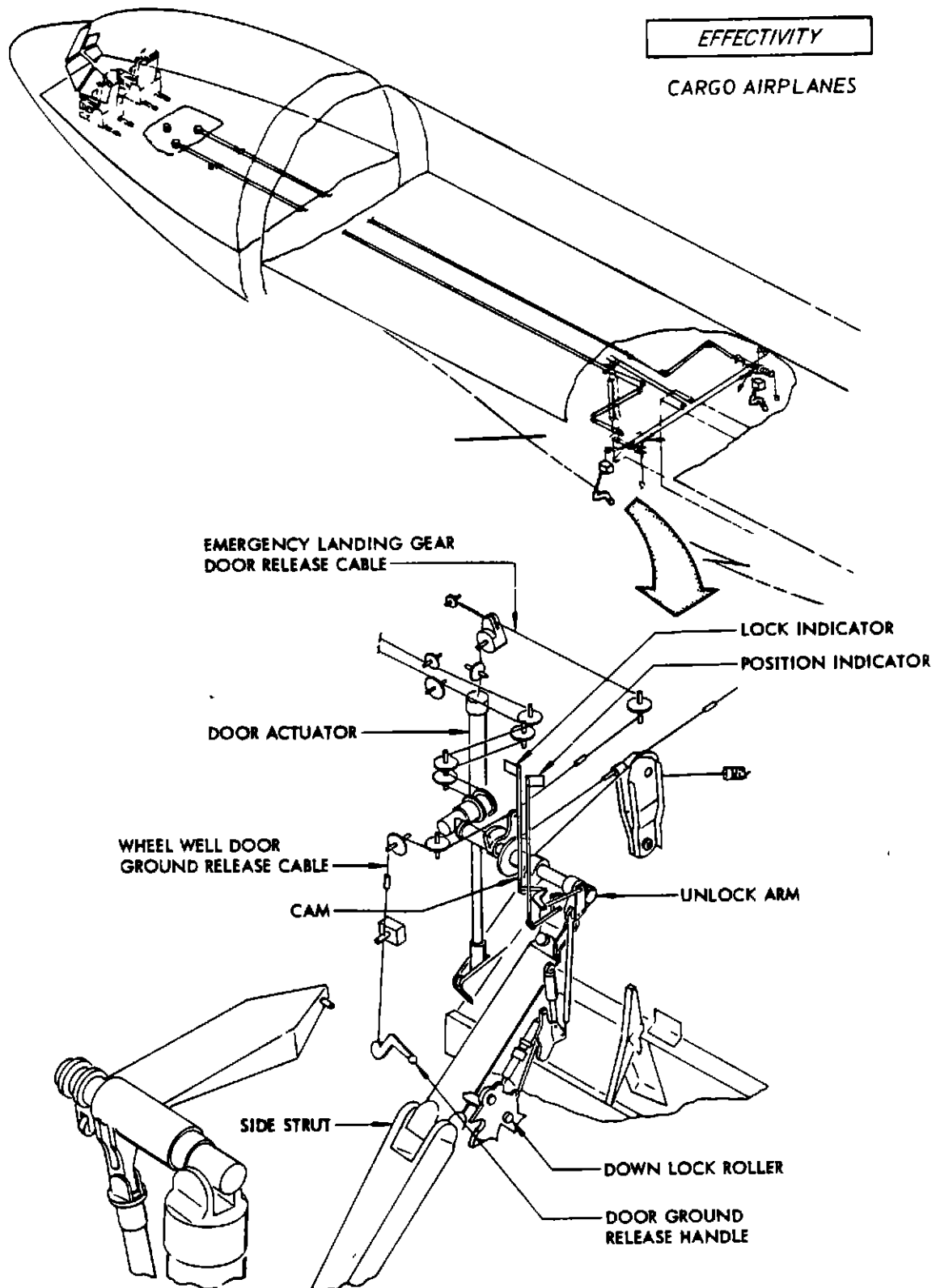




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- (b) One red warning light illuminates when landing gear and control handle positions do not coincide; when any landing gear is not up and locked, or down and locked; and when engine thrust levers are in idle range with landing gear not down and locked. The red warning light is on the pilots' instrument panel, left of the green indicator lights. Control of the warning light is by microswitches operated by the movement of the landing gear control handle, the engine thrust levers, and by the landing gear lock and position switches. Landing gear warning relays controlled by the landing gear lock switches, determine how the light will respond to each position and condition of gear when landing gear, flap, and engine controls are operated.
 - (c) A warning horn (figure 7) sounds steadily if the landing gear position is incorrect for the current operating condition. Switches operated by movement of engine thrust levers, and the flap control lever, control the warning horn. The landing gear warning relays provide the control necessary to prevent the horn sounding when engine and flap controls are operated, and the landing gear position is right for the operation performed. The warning horn is mounted on the P35 warning devices panel on coat rack above the flight engineer's table
- (4) Main Gear Mechanical Position and Lock Indication System (On Cargo Airplanes)
- (a) Main gear position and lock indication is provided by colored flags projecting from a box set into the cabin sidewall about 15 inches above the floor level at Body Station 885. (See figures 7A and 7B.) When cargo loading is such that sighting windows are not obstructed, the flags are detached from their mounting shafts and stowed in the indicator box which is then closed by a hinged cover.
 - 1) The mechanical indication mechanism consists of two pairs of shafts extending upwards into the lower sidewall on each side of the fuselage, and the associated driving linkage. The position indicator shaft is connected to the cam on the main gear side strut upper universal by a pushrod. The lock indicator shaft is connected to a fitting on the main gear emergency extension unlock arm through two pushrods and a bell crank
 - 2) To bring the mechanical indication system into action, the coverplate of the indicator system is hinged down, a metal flag installed on each shaft, and a rubber tab attached to the aft face of each indicator box. The rubber tab projects inboard to provide a background when viewing flags. Each

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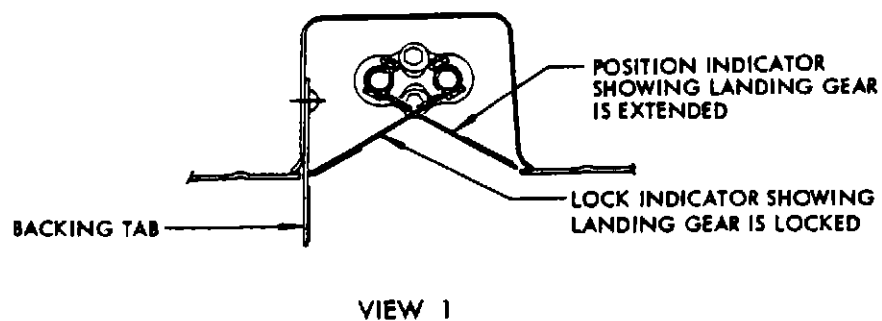
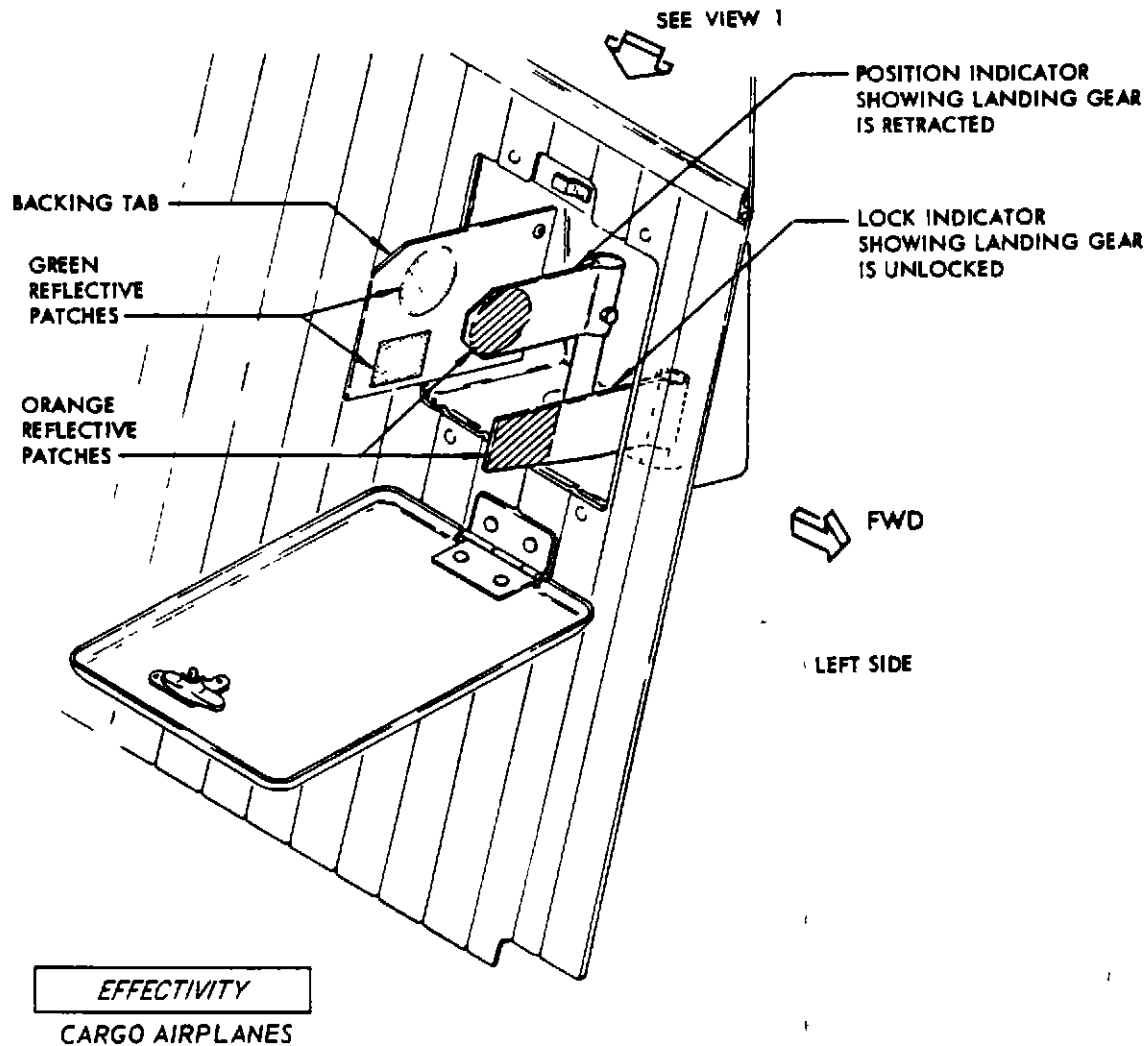
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flag is provided with a patch of orange reflective tape on the side that faces forward when the flags rotate inboard. The upper flag of each indicator shows landing gear position, and carries an orange disc, this flag rotates inboard when the main landing gear is retracted. The lower flag of each indicator shows condition of landing gear locks, and carries an orange square. The lower flag rotates inboard when the locks are disengaged. The forward face of the rubber backing tab behind each indicator is provided with two patches of green reflective tape, one round patch above a square patch. The green patches are obscured by the indicator flags when the flags are rotated inboard. The indicators are designed to be viewed from the forward end of the cabin. Inspection is made by flashing a light aft along each side of the cabin, and observing the colored signals reflected by each indicator.

- 3) When the gear is down and locked the visible signal from both indicators should be the two green patches (round above square) of the backing tab. With the gear down and locked all flags are retracted within the box.
- 4) During flight, with the landing gear retracted and locked up, the signal will show a round orange spot above a green square. With the gear up and locked, the upper position indicating flags are rotated inboard.
- 5) Prior to landing, both indicators should show a double green signal. Any orange signal at this time would indicate that the related main landing is not extended, not locked, or neither, according to the orange signals displayed.

| B Deleted

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Main Gear Mechanical Position and Lock Indicators
 Figure 7B

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C. Control Handle Limit Switches

- (1) The control handle limit switches (figure 8) are provided to illuminate the red warning light when the control handle position does not correspond with the landing gear position. Switches are mounted within the control handle support structure. Each switch assembly consists of low travel microswitch and a roller type switch actuator. The roller on the actuator contacts the inner end of the control handle and operates the switch when the handle is pulled back to clear the UP or DN detent.

D. Landing Gear Lock Switches

- (1) The landing gear lock switches illuminate the green indicator light and energize the landing gear relays when landing gear locks are closed and the position switches are in down position. The lock switch closes on a second contact when the landing gear locks open to illuminate the red warning light. Lock switches are double contact microswitches and are mechanically linked to the landing gear lock mechanism. Main gear lock switches (figure 9) are mounted on the fillet flap support structure in the wing adjacent to wheel well. The nose gear lock switch is on the nose gear drag brace. (See figure 10.) Operation of the landing gear locks controls the lock switches on both main and nose landing gear.

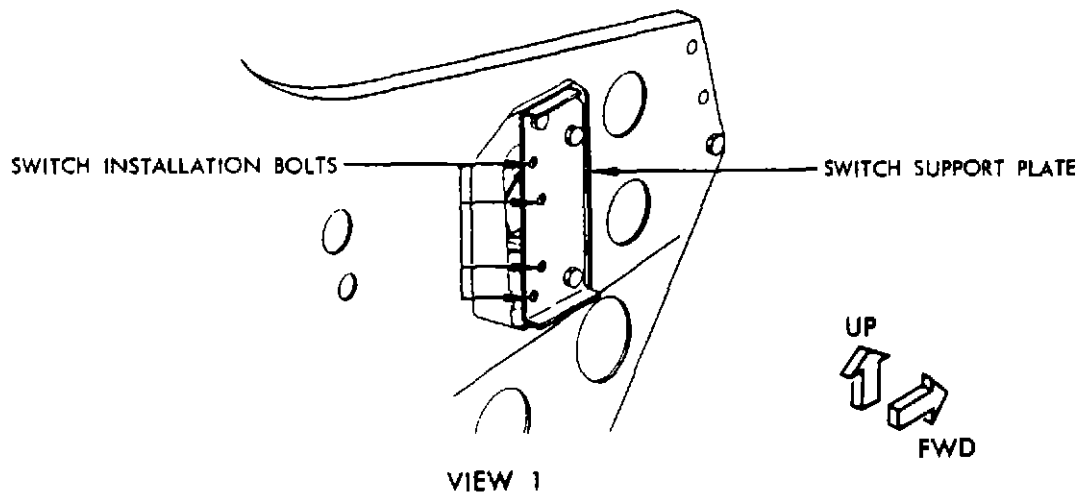
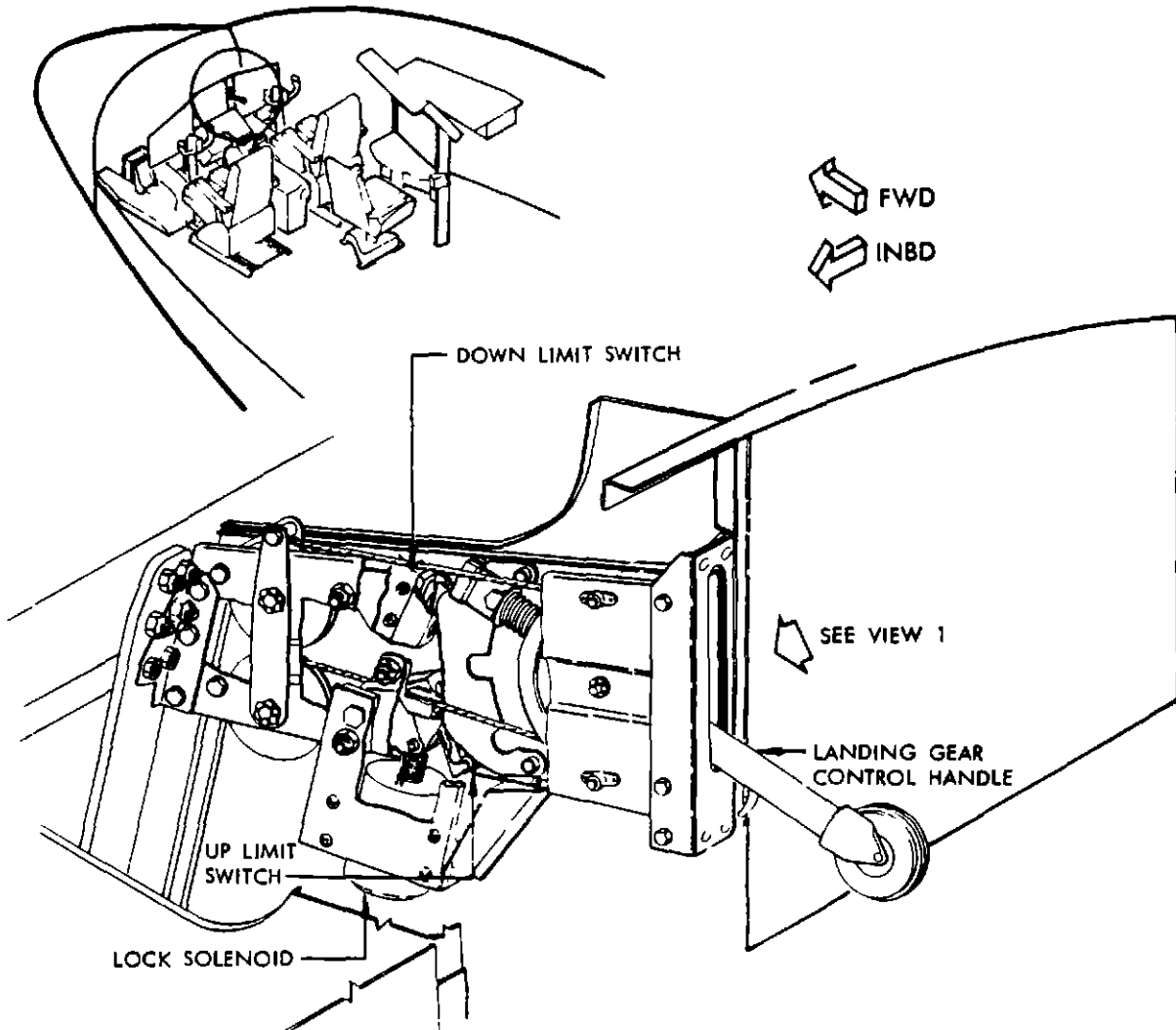
E. Landing Gear Position Switches

- (1) The landing gear position switch (in conjunction with a closed lock switch) illuminates the green indicator lights and energizes landing gear warning relays when landing gear is down. Switches are similar to the lock switches but only one contact is used. Main gear position switches (figure 11) are mounted on the fillet flap support structure below the lock switches. The nose gear position switch is mounted on a bracket near upper end of the nose gear actuator. (See figure 10.) Position switches are operated by the lock rollers contacting rabbit ears on main gear and by movement of the drag brace on nose gear.

F. Engine Thrust Lever and Flap Position Warning (Landing) Switches

- (1) Engine thrust lever and flap position warning (landing) switches (figure 12) energize the warning horn and (engine thrust lever switches only) illuminate the red warning light when landing gear position is not right for the lever setting. Switch assemblies include a low travel microswitch and a roller type switch actuator

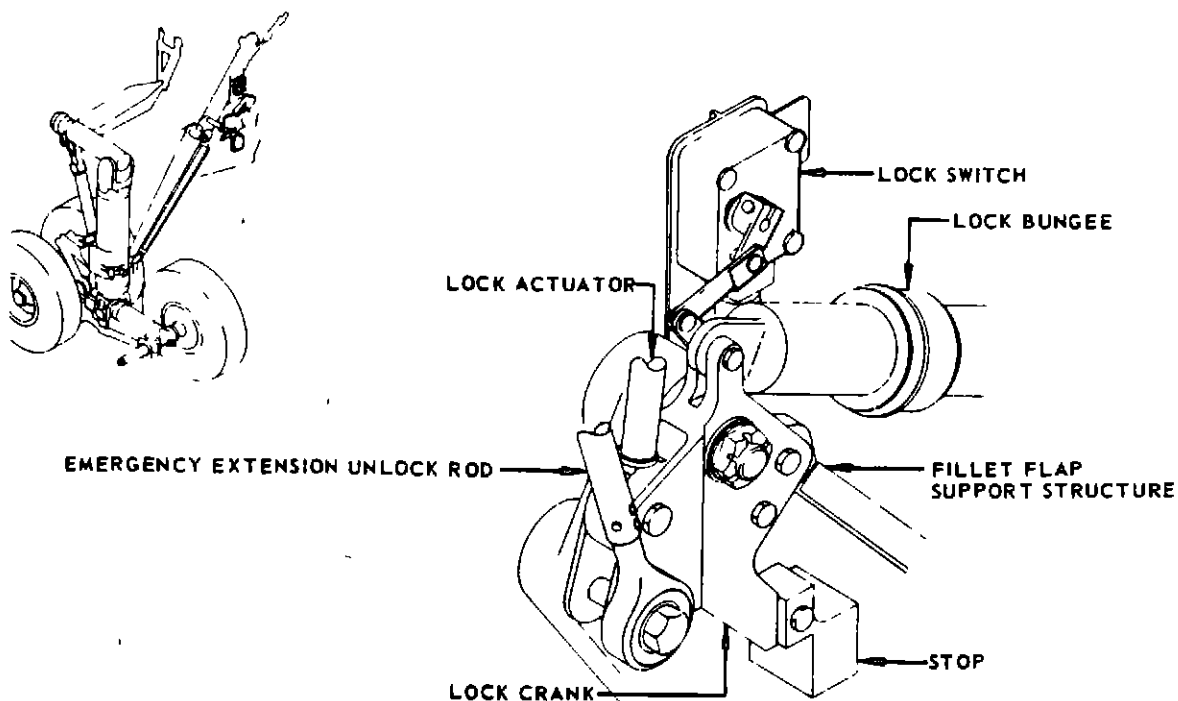
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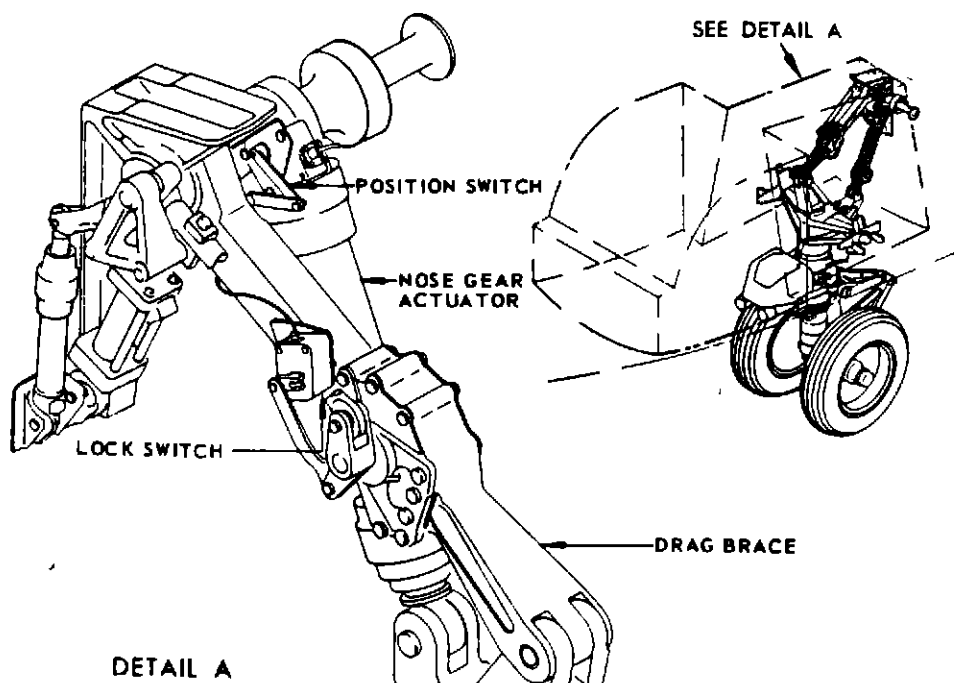
Control Handle Limit Switch
Figure 8

LANDING GEAR
Position Indicating and Warning
System
Description and Operation

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Main Gear Lock Switch
Figure 9



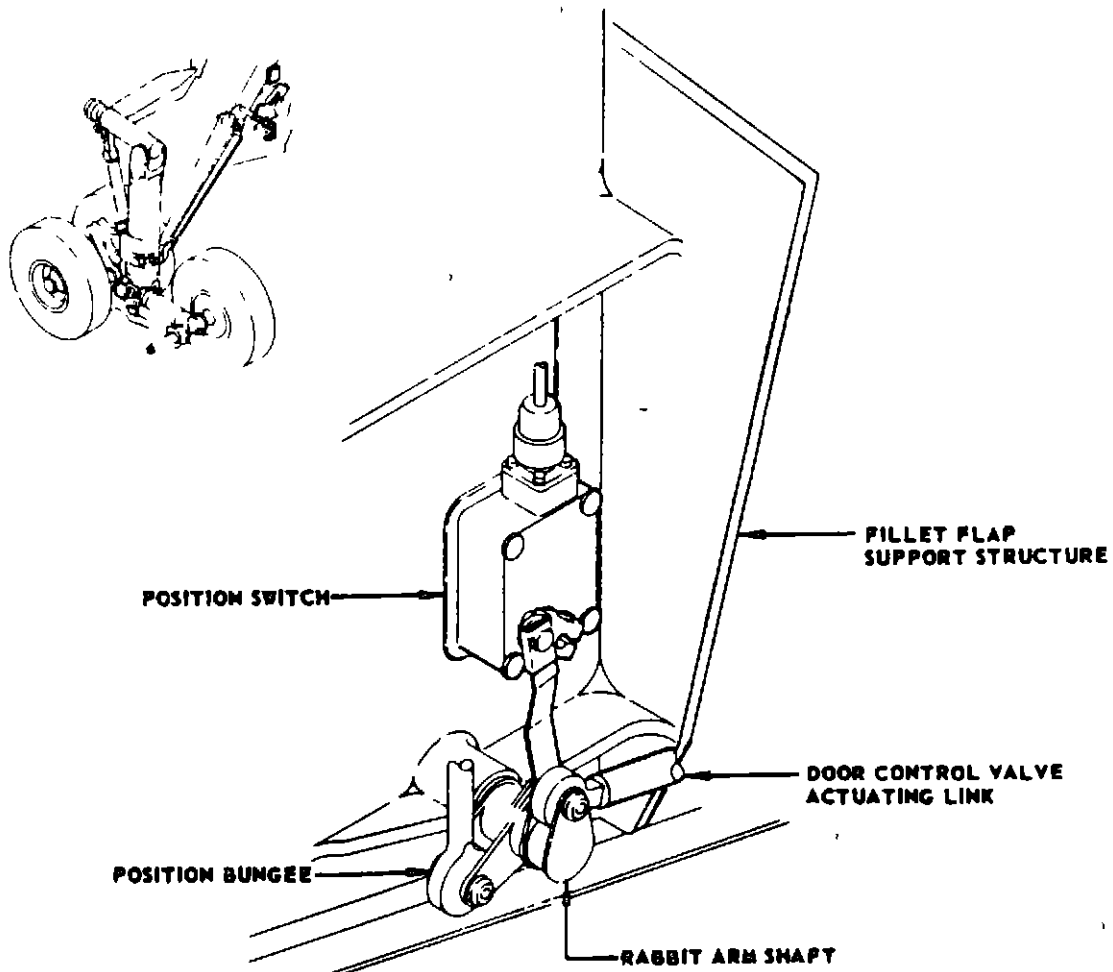
Nose Gear Position And Lock Switches
Figure 10

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- (2) All switches are in the lower nose compartment ceiling, just aft of nose wheel well. When the levers are moved to a pre-set position, cams on the control cables operate the appropriate switch. The engine thrust lever switches are supplied with two operating buttons. One button for closing and the other for opening the switch. When closed by the cams, engine thrust lever switches may be opened by depressing the second operating buttons through the warning horn cutout system. Switches opened in this manner require resetting by moving the cable cam (repositioning thrust lever) to release the first button.

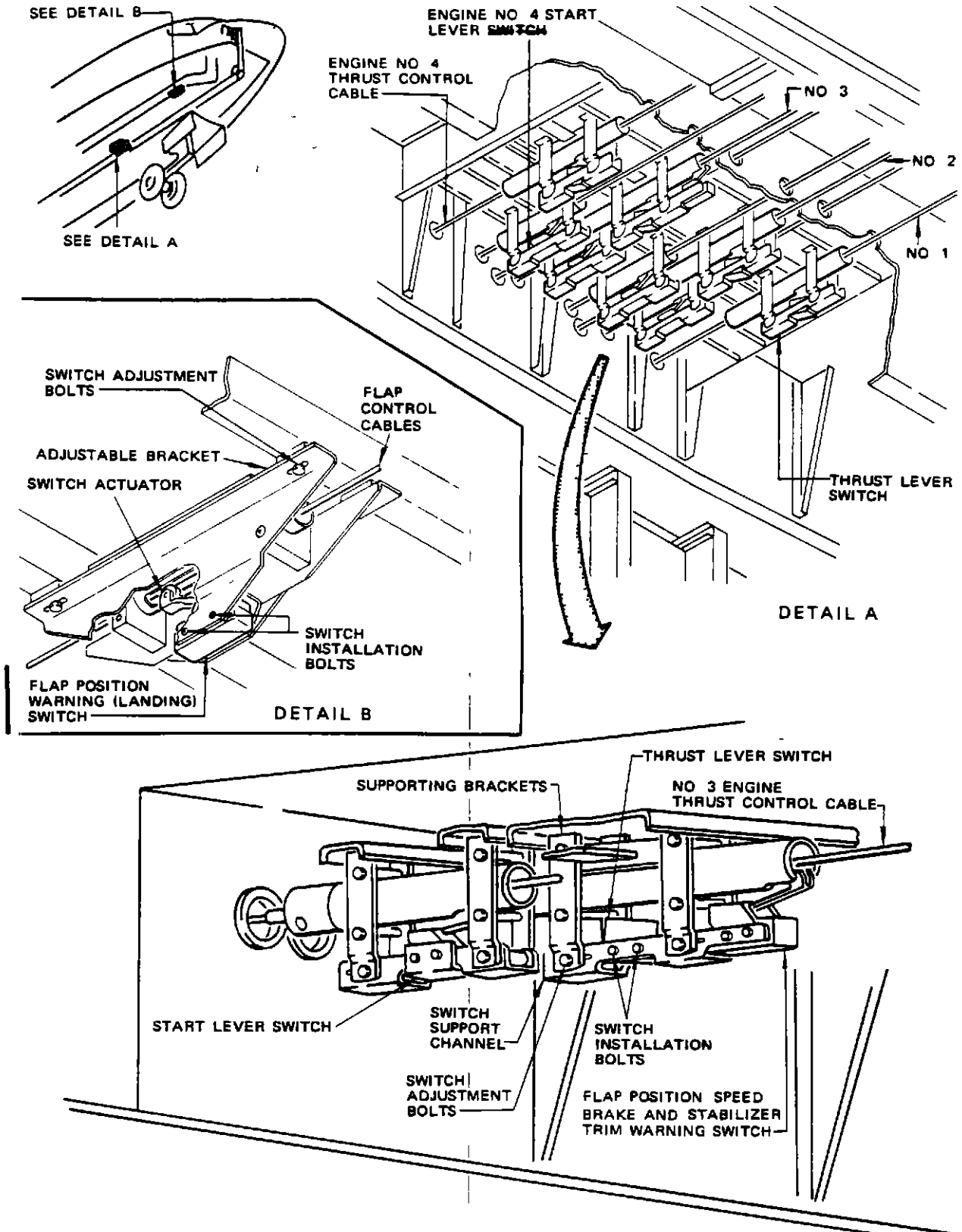
G. Landing Gear Warning Relays

- (1) The landing gear warning relays are energized by the position switches when the respective landing gears are down and locked, to open the warning horn circuit, and a part of the red warning light circuit. (See figure 13.) Each landing gear warning relay (one for each gear) is a four pole hermetically sealed unit. Landing gear relays are on J1 relay panel in lower nose compartment. Relay operation is controlled by the landing gear lock and position switches.



Main Gear Position Switch
Figure 11

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Thrust Lever and Flap Position Warning
(Landing) Switches Installation
Figure 12

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H. Operation

- (1) With all landing gear locked down, and aircraft on ground, the landing gear warning relays are energized and all green indicator lights are illuminated. The flap lever position and engine thrust lever circuits are held open by the energized landing-gear warning relays. When the airplane leaves the ground and the control handle is moved to UP position, the wheel well doors open and the landing gears unlock, this opens the lock switches to de-energize the landing gear warning relays and put out the green indicator lights. In the unlocked position the lock switches make a second contact to provide a ground to illuminate the red warning light. When the landing gear is fully retracted and locked, the lock switch returns to the first position and the warning light goes out. Re-energizing of the green indicator lights and landing gear warning relays when the lock switch returns to locked position is prevented by the position switches, which open the circuit as the landing gear retracts. Therefore, all indicator and warning lights remain out when landing gear is up and locked.
- (2) If the flap lever is moved to lower flaps 33 degrees or more before landing gear is down and locked the cable-operated flap position warning (landing) switch closes to sound the warning horn. With the landing gear locked down, the position and lock switches are closed to energize landing gear warning relays and indicator lights. Energized landing gear warning relays open contacts to cut out the flap position warning. If an engine thrust lever is moved into idle range before landing gear is locked down, a cable-operated switch will close, causing the warning horn to sound and the red warning light to illuminate. Action of the landing gear lock and position switches on the warning relays opens the circuit and cuts out the warning in the same manner as that described for flap position warning when the landing gear locks down.



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4. Warning Horn Cutout System

A. General

- (1) The warning horn cutout system (figure 14) opens the engine thrust lever operated switches. The system may be used at the aircrews discretion, to silence the warning horn and put out the warning light when landing gear is not down and locked and thrust levers are in the idle range. The cutout system includes either a horizontal pushrod or a handle, and associated switch linkage. Operating pushbuttons on either end of the pushrod or lifting the handle, transfers the motion through a cable to the actuating linkage and switches.

B. Horizontal Pushrod

AF F-BHSA thru F-BHSD
SABENA OO-SJA thru OO-SJC
BOAC G-APFB and G-APFC
DLH D-ABOB and D-ABOC
AII VT-DJI thru VT-DJK

- (1) The horizontal pushrod is mounted in the upper rear portion of the control stand. Both ends of the pushrod terminate in a pushbutton, one on each side of the control stand for pilot and copilot. A cable attachment is provided in the center of the rod to connect with the rest of the system.

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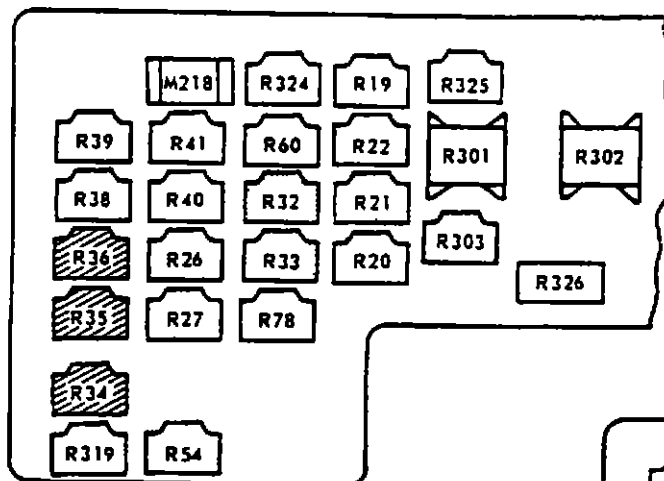
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C. Warning Horn Cutout Handle

- (1) The warning horn cutout handle is mounted in the top right corner of the control stand. The handle pivots on a cracket inside of the control stand and is connected with the rest of the system at a cable attachment near the pivot point.

D. Switch Linkage

- (1) The switch linkage operates buttons on the side of the engine thrust lever switches to open switch contacts, as required to silence the warning horn. The linkage is installed above the switches and is supported by the switch brackets. The assembly consists of two switch linkage bars, a cam and a return spring. The cable is attached to the cam which rotates on a vertical pivot. Each linkage bar is connected to an arm on either side of the cam. A lever projecting aft from the cam serves as an attachment point for the return spring. A pull on the cable rotates the cams and this draws back both horizontal bars towards the center of the cam. Each horizontal bar has two clips to contact the actuating buttons on the switches. As the bars move inward the clips press the buttons on all four switches at once.



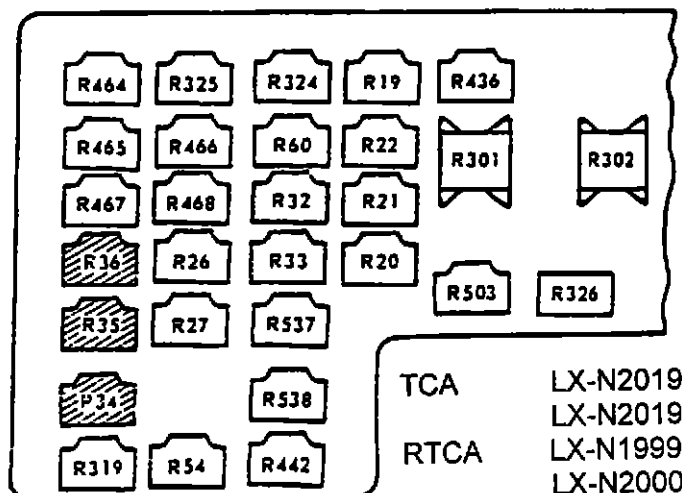
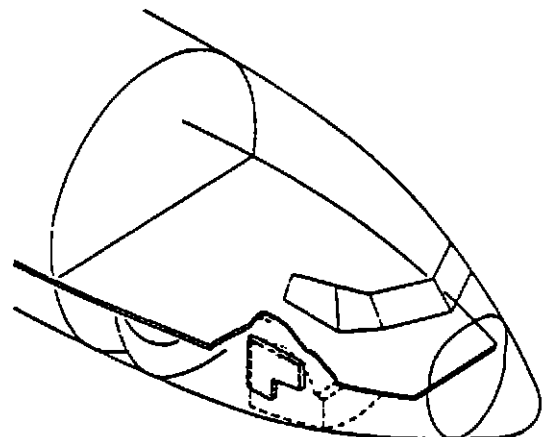
AIRPLANES 00 SJA THRU 00 SJG



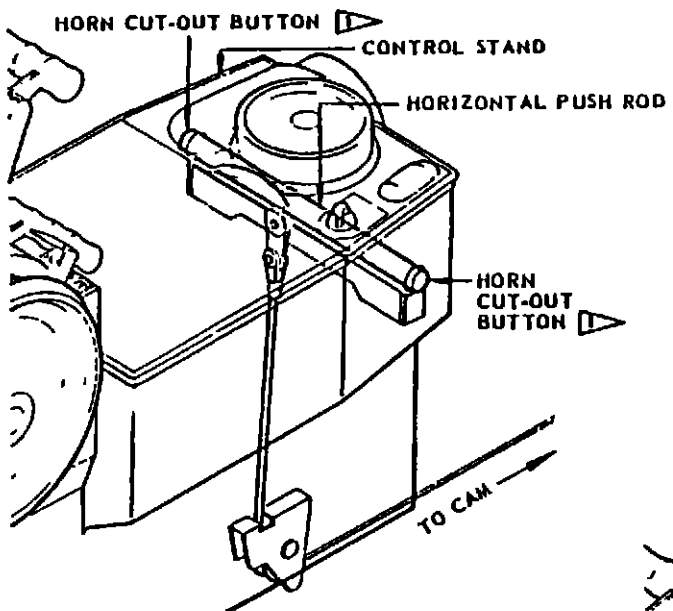
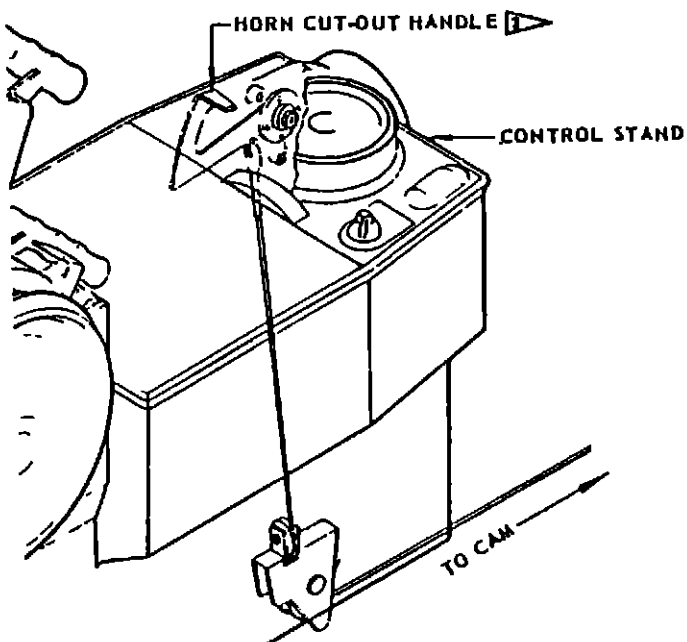
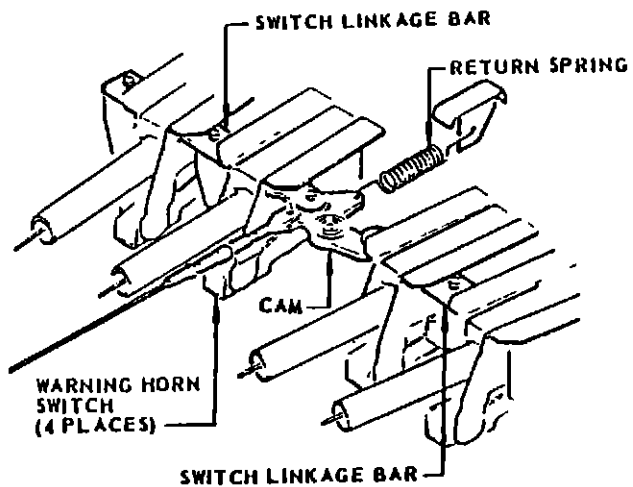
SAFETY RELAY



WARNING RELAY



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



1	PAA AF SABENA BOAC DLH	N701PA THRU N705PA AND N714PA THRU N728PA F-BHSA THRU F-BHSD OO-SJA THRU OO-SJC G-APFB AND G-APFC D-ABOB AND D-ABOC
2	TCA RTCA	LX-N20198 LX-N20199 LX-N19997 LX-N20000

E. Operation

- (1) Thumb pressure on a cut-out button or lifting the cutout handle results in pull on the cable to the switch linkage. The cam in the linkage converts the pull on the cable to an inward lateral movement on two bars running across the thrust lever switches. Clips projecting from the bars contact buttons on the switches to open the circuits. The cut-out system is returned to neutral by a tension spring. Switches are reset by advancing the thrust levers.

5. Landing Gear Door Warning System

A. General

- (1) The landing gear door warning system illuminates the door warning light whenever a wheel well door is not closed and locked. The system consists of a red warning light, three door lock switches and the associated wiring circuit (figure 15).

B. Landing Gear Door Warning Light

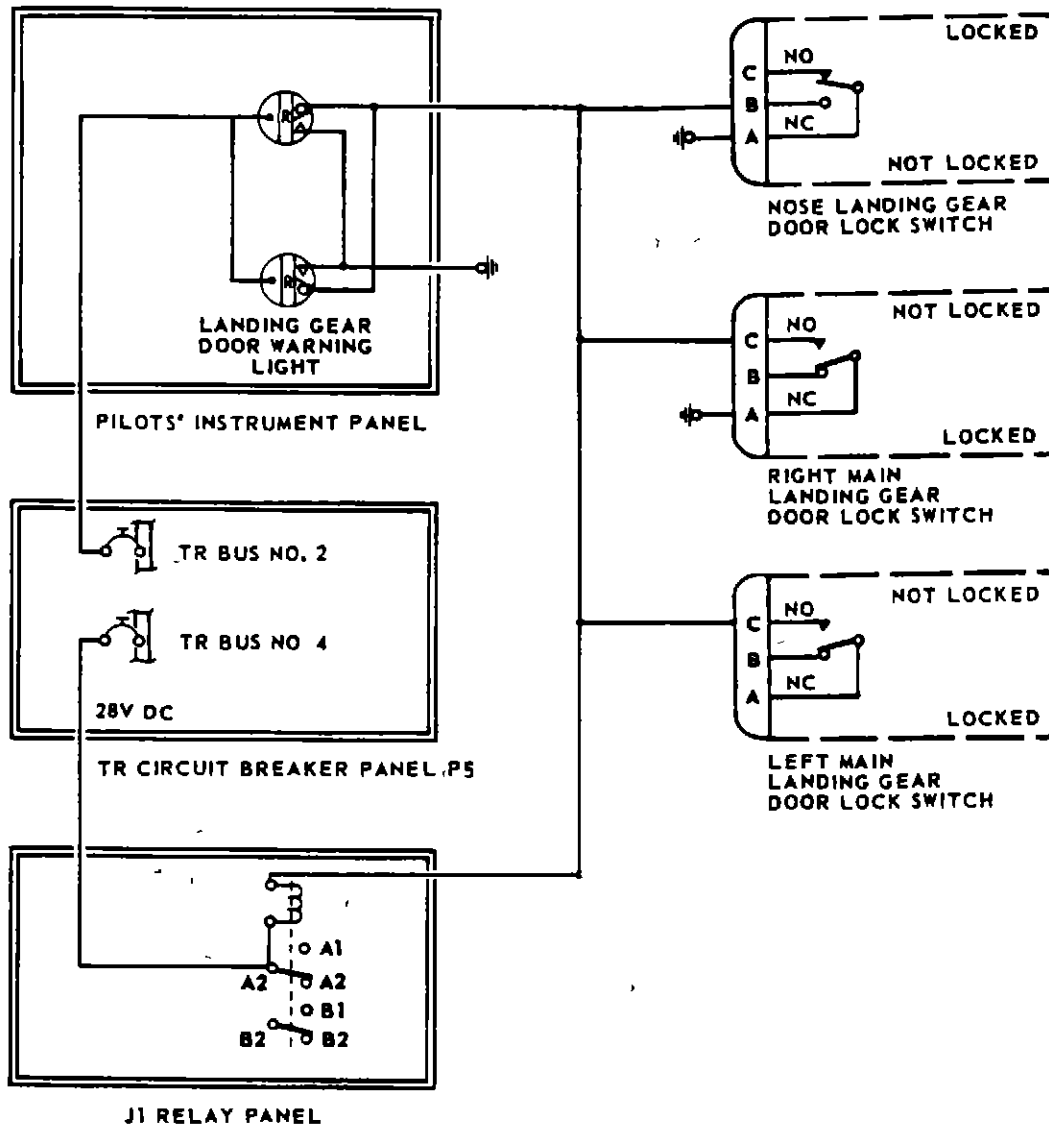
- (1) The landing gear door warning light illuminates to show that a wheel well door is unlocked. The light is a rectangular shaped socket type with twin bulbs and a red translucent plastic cover. The lamp may be pressed down to test the circuit current or the bulb filaments. The door warning light is on the pilot's instrument panel, just left of the main gear warning light. (See figure 6.)

C. Landing Gear Door Lock Switches

- (1) The landing gear door lock switches switch on the door warning light when a wheel well door unlocks. Switches are low travel hermetically sealed microswitches. The main gear door lock switches (figure 16) are mounted on the top end of the door actuators. The switch assembly includes an actuation arm and a torsion return spring. An extension of the door lock projects through the top end of the door actuator to operate the switch. The nose gear door lock switch is on the aft side of the nose wheel well forward bulkhead. The switch assembly consists of a microswitch an actuation arm with roller and a tension return spring. The switch is spring loaded in closed position and is opened by the action of its roller on the door lock linkage when the door locks.

D. Operation

- (1) All landing gear door lock switches are wired in parallel. Therefore, all switches must open before the door warning light goes out.



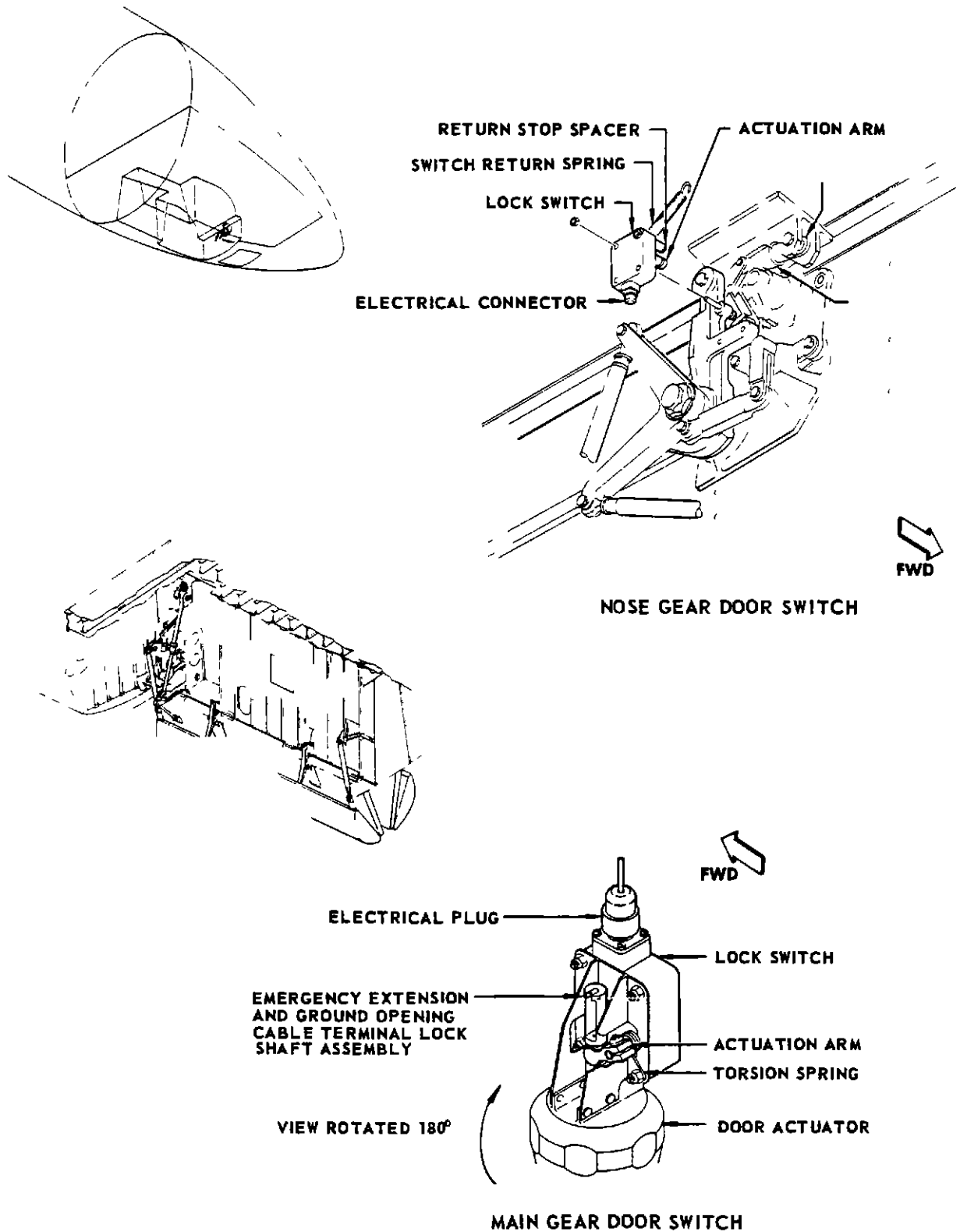
Landing Gear Door Warning Circuit
Figure 15

LANDING GEAR

Position Indicating and Warning
System

Description and Operation

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Landing Gear Door Lock Switches
Figure 16

END
32-6-0
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LANDING GEAR POSITION INDICATING AND WARNING SYSTEM -
TROUBLE SHOOTING

1. General

- A. Trouble shooting of the position indicating and warning system can be done without jacking the airplane or operating the gear. Switch actuating linkages can be disconnected and the switches positioned to simulate various sequences of gear operation. Refer to the Wiring Diagram Manual for system circuits when performing continuity checks.
- B. Except when otherwise indicated, the landing gear control handle will be left in the "OFF" position. The following precheck items should be performed to simplify trouble shooting of any of the systems.

2. Precheck Items

- A. Check that landing gear control handle is in "OFF" position.
- B. Check that landing gear ground locks are engaged and wheel well doors are opened with release handles pulled down and latched.
- C. Check all indicator and warning lights for serviceable light bulbs. Check operation of down and locked position indicating lights dimmer switches.
- D. Provide electric power to the airplane. Push in landing gear lever latch, warning, and position indicating circuit breakers.
- E. Check landing gear actuation control system rigging. Refer to "Adjustment/Test Landing Gear Control System," 32-1-0.
- F. Disconnect the actuation linkage on the main gear wheel well door lock switch, the main gear safety and truck leveling switches, the main gear position and lock switches, and the nose gear position and lock switches.

NOTE: The nose gear door lock switch, the nose gear centering switch (not on all airplanes), the landing gear control handle limit switches, the thrust lever controlled switches, and the flap lever controlled landing gear warning switches can be actuated by hand without disconnecting the actuating linkages.

- G. Depressurize the hydraulic system only while trouble shooting the control handle lock solenoid and limit switches. For all other checks, the control handle should remain in the "OFF" position and the hydraulic system need not be depressurized.



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3. Trouble Shoot Landing Gear Control Handle Lock System (Airplanes NWA N351US through N363US; SABENA OO-SJA through OO-SJH)

- A. Trouble shooting the control handle lock system entails performing an operation check of the control handle to the UP position with the nose gear centering switch and the main gear safety and truck leveling switches all closed to simulate normal condition for retraction. Then check for lock solenoid release by opening one of the above switches at a time. The five switches are in series and opening any one should release the lock solenoid. Release of the lock solenoid prevents the control handle from movement to the UP position. Cause of malfunction is easily determined by performing a continuity check of the system. Refer to the Wiring Diagram Manual for wiring diagrams.

4. Trouble Shoot Control Handle Lock System

- A. Trouble shooting the control handle lock system entails performing an operation check of the control handle to UP position with the wheel truck leveling switches, and either main gear safety switch closed, to simulate condition for retraction. Then check for solenoid release by opening a leveling switch, or both safety switches. Leveling switches are in series, and safety switches are in parallel, with antiskid relays. Therefore opening one leveling switch will release the lock solenoid. If leveling switches are closed, both safety switches must be opened. Release of the lock solenoid prevents movement of the control handle to UP position. Cause of malfunction is easily determined by performing a continuity check of the system. Refer to Wiring Diagram Manual for wiring diagrams.

5. Trouble Shoot Landing Gear Warning System

- A. Actuate the landing gear position and lock switches, the control handle limit switches, the thrust lever controlled switches, and the flap lever controlled switch to simulate various conditions of landing gear operation. Cause of malfunction can be determined by performing a continuity check of the circuit to isolate faulty wiring, switches, relays, light sockets or horn.

6. Trouble Shoot Landing Gear Door Warning System

- A. With all landing gear doors closed and locked, the warning light should be off. Cause of malfunctions can be determined by performing a continuity check of the door warning circuit. Refer to the Wiring Diagram Manual for system circuits.



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LANDING GEAR CONTROL HANDLE LOCK SYSTEM - MAINTENANCE PRACTICES

1 Removal/Installation Landing Gear Control Handle Lock System Components

A General

- (1) Maintenance of the control handle lock system consists of changing defective switches, lock solenoid, and associated electrical wiring. Attachments are conventional and mounting instructions for switches are detailed on metal-calls adjacent to switches.

B Equipment and Materials

- (1) Lock assembly - Down, Main and Nose Landing Gear F71126-500 and F70008 or equivalent.
- (2) Protective blanket or padding
- (3) Means to measure angular travel of nose gear steering cable drum for airplanes listed on figure 202

C. Preparation for Component Replacement

- (1) Check that landing gear ground down locks are engaged.
- (2) Shut off electrical power, pull lever latch circuit breaker on top center of P5 circuit breaker panel
- (3) Depressurize the utility hydraulic system using the manual bypass valve located on forward side of right wheel well side strut opening.

D. Removal/Installation Landing Gear Control Handle Lock Solenoid

- (1) Remove Landing Gear Control Handle Lock Solenoid

- (a) Release and lower engine instrument panel (figure 201).

CAUTION: TO AVOID DAMAGE TO INSTRUMENTS, LAY PROTECTIVE BLANKET OVER RADIO CONTROL PANEL, AND ALSO OVER ENGINE INSTRUMENT PANEL.

- (b) Disconnect panel hinges and move panel back as far as wiring permits
 - (c) Clip electrical leads to solenoid as close to splice as possible.

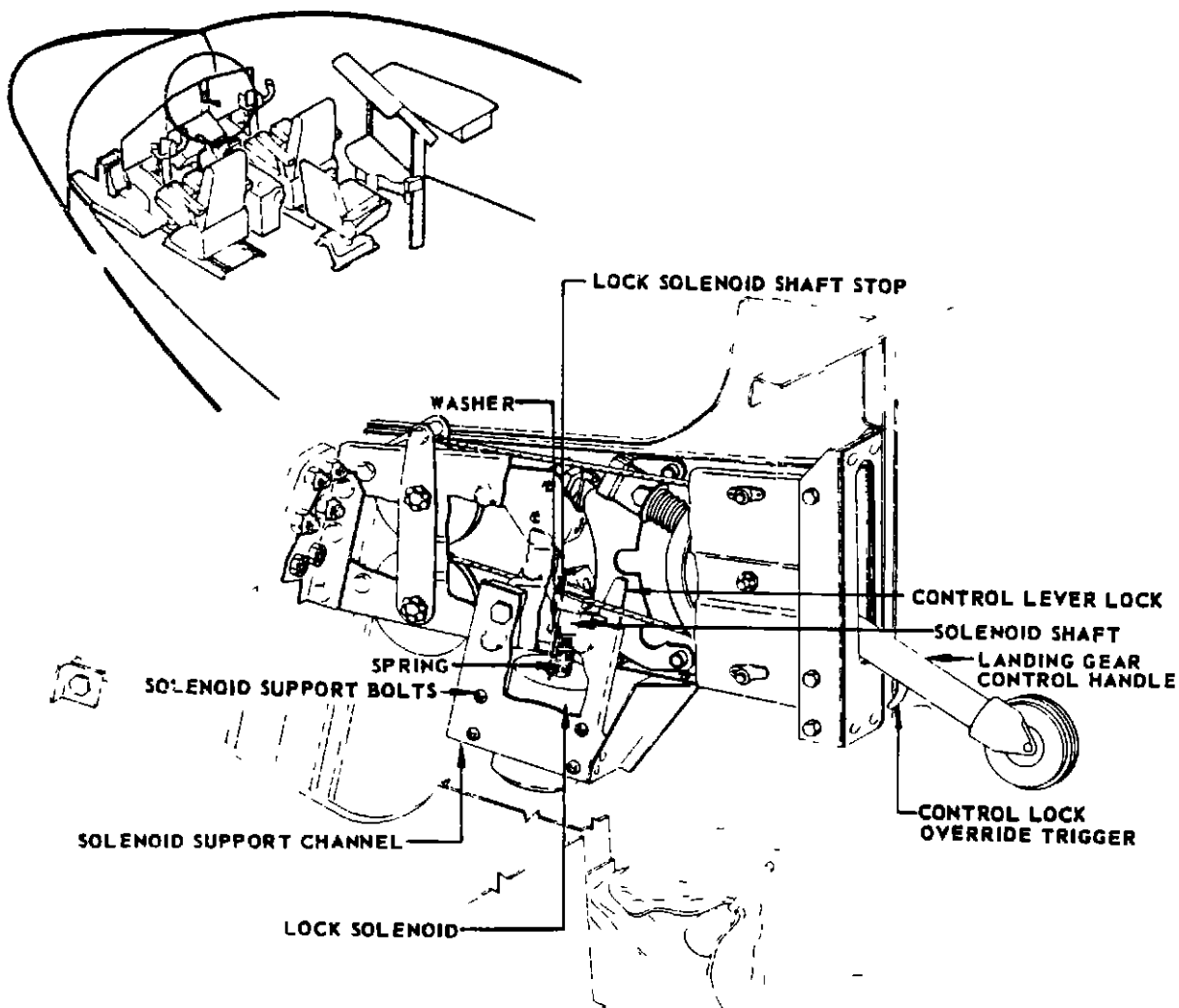


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- (d) Remove four solenoid support bolts from the solenoid support channel.

NOTE In order to align solenoid some airplanes may need washers between solenoid and mounting bracket. Watch for washers when removing solenoid. If washers are present on removal of solenoid they must be installed in the same position on assembly

- (e) Slide the solenoid, spring and washer off the shaft.
- (f) Remove the shaft by raising and moving shaft forward
- (2) Install Landing Gear Control Handle Lock Solenoid
- (a) Hang solenoid shaft, (figure 201) on hook of solenoid lock arm.



Landing Gear Control Handle Lock Solenoid Installation
Figure 201

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- (b) Slide washer and spring on shaft, followed by solenoid assembly
- (c) Insert the four solenoid support bolts and secure solenoid to solenoid support channel
- (d) Splice the electrical wiring to solenoid and insulate splice.
- (e) Connect instrument panel hinges.
- (f) Remove padding and close engine instrument panel
- (g) Check operation of landing gear control handle lock solenoid, see "Adjustment/Test Landing Gear Control Handle Lock System Components."

E. Removal/Installation Nose Gear Centering Switch (Airplanes listed on figure 202)

(1) Remove Nose Gear Centering Switch

- (a) Remove two installation bolts (figure 202) and remove switch assembly.

NOTE: Observe spacers on bolts

- (b) Disconnect electrical wiring from switch.
- (c) Remove switch from switch support plates and from switch actuator assembly.

(2) Install Nose Gear Centering Switch

- (a) Assemble switch (figure 202) and switch actuator to support plates with two screws and self-locking nuts.
- (b) Connect electrical connection to switch
- (c) Attach switch assembly to support bracket with two bolts, spacers, washers and thin aluminum alloy self-locking nuts
- (d) Adjust switch position until switch actuates at 5 (+3/-0)° rotation of drum from both sides of the rigged neutral position

NOTE: Rigged neutral position is set by inserting 5/16-inch diameter rigging pin through drum.

- (e) Tighten bolts to secure switch assembly
- (f) Remove rigging pin.
- (g) Check operation of nose gear centering switch, see "Adjustment/Test Landing Gear Control Handle Lock System Components "

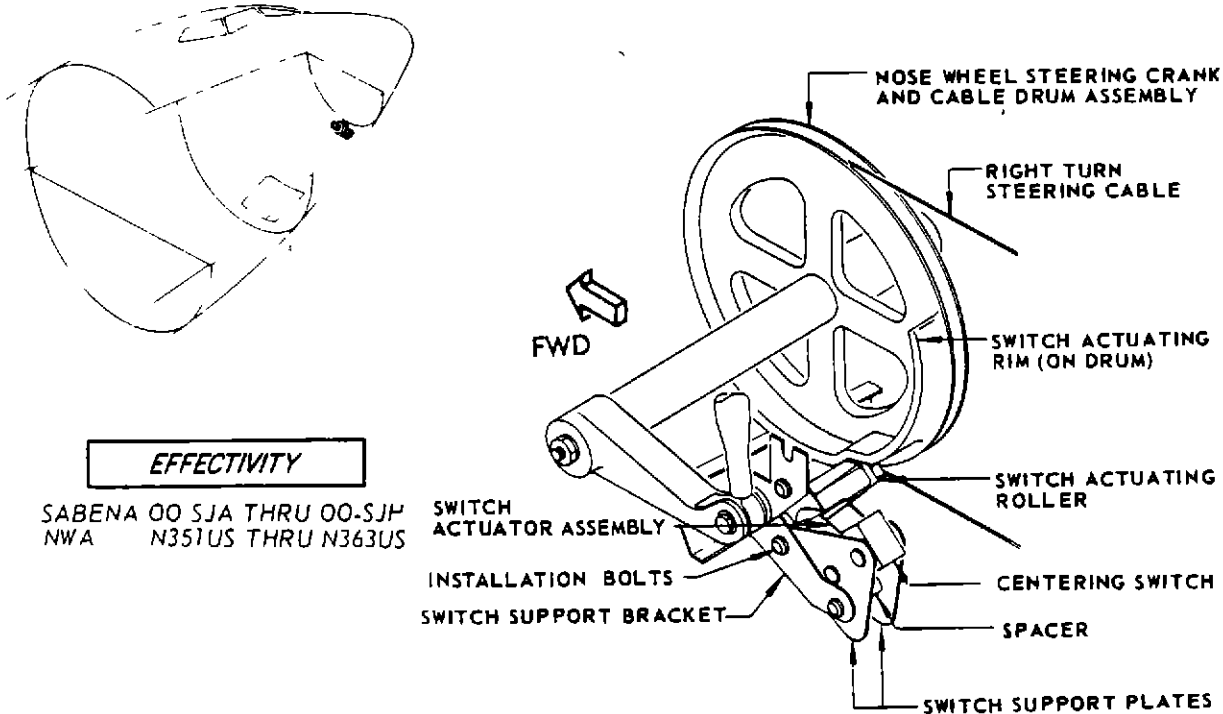


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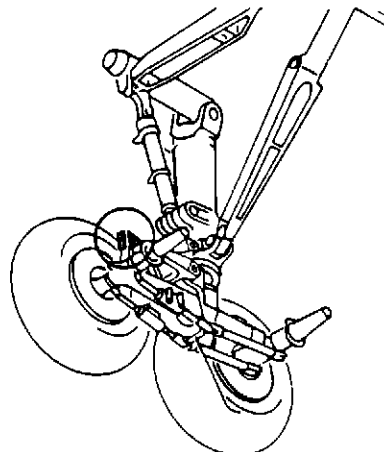
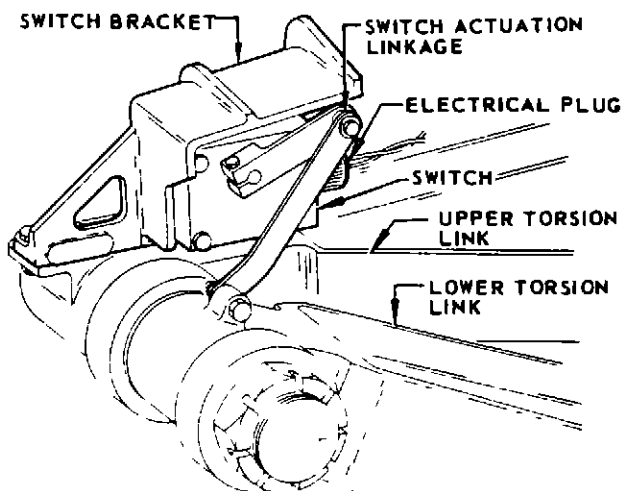
F. Removal/Installation Main Gear Oleo Safety Switch

(1) For details of attachment and linkage see figure 203.

CAUTION MAKE SURE THAT THE INDEX PIN IN SWITCH OPERATING ARM IS ENGAGED IN INNER HOLE IN SWITCH SHAFT COLLAR. DO NOT FORCE PIN IN HOLE.



Nose Gear Centering Switch Installation
Figure 202



Main Gear Oleo Safety Switch Installation
Figure 203

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C. Removal/Installation Main Gear Leveling Switch

(1) General

(a) For details of attachment and linkage, see figure 204. Before installing leveling switch, check that all three switch mounting bosses are in the same plane. If not, proceed as follows

- 1) Lightly fasten switch with one bolt to each mounting boss in turn. When switch is attached to longest boss, the greatest clearances will be obtained between switch and the remaining two bosses.
- 2) With switch attached to the longest boss, shim up gaps between switch and the other two bosses with flat washers, AN960-10 or equivalent, of appropriate thickness.

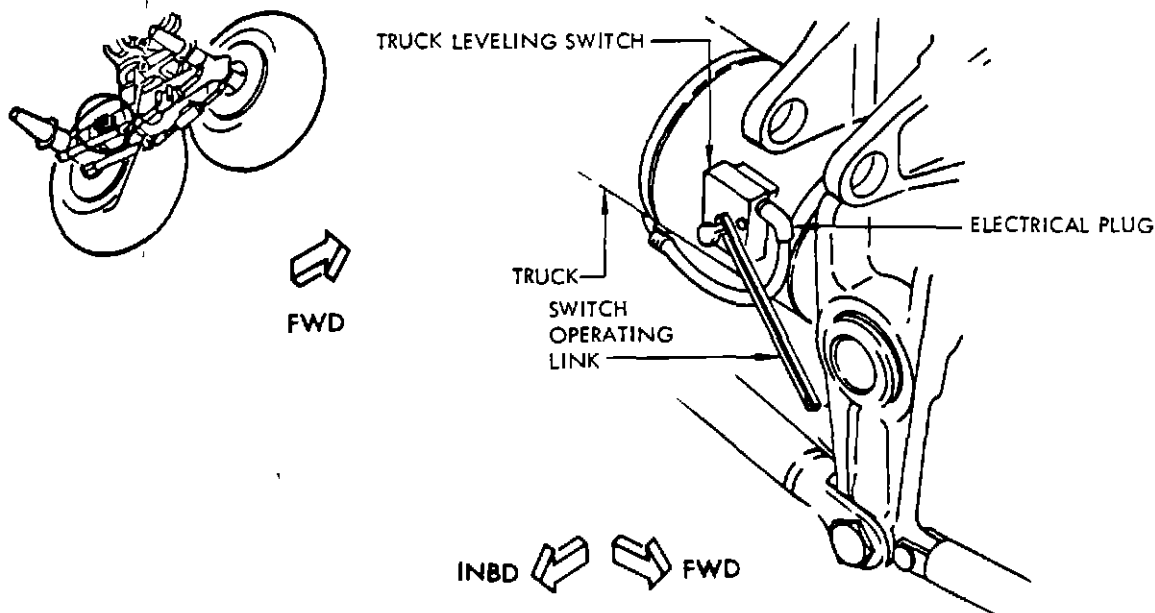
CAUTION. MAKE SURE THAT SWITCH ARM IS POSITIONED AS SHOWN ON FIGURE 204 ON INSTALLATION.

(c) On switch P/N H10-1012, check that top vent plug is installed and bottom vent plug is removed.

2. Adjustment/Test Landing Gear Control Handle Lock System Components

A. General

- (1) A functional test of the affected portion of the control handle lock system is required after repair or replacement of landing gear lock system components to assure correct functioning of system.





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- (2) These tests cover the operation of the lock solenoid latch at the control handle, the switches operated by compression and extension of the main gear shock struts, the main gear truck leveling switches, and the nose gear centering switch on airplanes listed on figure 202. Switch actuating linkage will be disconnected to permit simulating landing gear operation.

B Equipment and Materials

- (1) Lock Assembly - Down, Main and Nose Gear F71126-500 and F70008 or equivalent.
- (2) External electrical power supply.
- (3) Means of measuring angular movement of nose gear wheels.
- (4) Two metal sheets sandwiched with grease to ease nose wheel turning.
- (5) Airplane jacks.

NOTE. Items (3) and (4) are required for airplanes listed on figure 202 only.

C Prepare for Test

- (1) Check that nose and main landing gear ground downlocks are engaged
- (2) Check that all landing gear doors are open with ground door release handles pulled down and latched.
- (3) Depressurize utility hydraulic system using manual bypass valve located on forward side of right wheel well side strut opening.
- (4) Connect external electric power.
- (5) Push in lever latch circuit breaker on P5 circuit breaker panel

D Test Landing Gear Control Handle Lock System Components

- (1) Test Main Gear Truck Leveling Switches
 - (a) Disconnect oleo safety and truck leveling switches actuating linkages and close switches, simulating oleos extended and trucks perpendicular to oleo
 - (b) On airplanes listed on figure 202, check that nose wheels are centered.
 - (c) Check that landing gear control handle can be moved freely into UP and DOWN position. Return control handle to DOWN position.



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- (d) Open left main gear truck leveling switch, simulating truck tilted out of perpendicular to oleo.
 - (e) Check that control handle lock prevents control handle movement into the UP position.
 - (f) Return control handle lever to DOWN and left main gear truck leveling switch to closed position.
 - (g) Check that landing gear control handle will move freely into UP position. Return control handle to DOWN position.
 - (h) Repeat steps (d) through (g) on right main landing gear truck leveling switch.
- (2) Test Main Gear Oleo Safety Switch (All airplanes except those listed on figure 202)
- (a) With wheel trucks perpendicular to main gear shock struts, open both left and right oleo safety switches to simulate shock struts compressed.
 - (b) Check that control handle lock prevents control handle movement into UP position.
 - (c) Return control handle to DN position and close right oleo switch.
 - (d) Check that control handle will move freely into UP position. Return control handle to DN position.
 - (e) Open right oleo switch and close left oleo switch. Repeat step (d)
- (3) Test Main Gear Oleo Safety Switch (Airplanes listed on figure 202)
- (a) With nose wheel centered and wheel trucks perpendicular to main gear oleos open the left gear oleo safety switch, simulating the left oleo compressed.
 - (b) Check that control handle lock prevents control handle movement into UP position.
 - (c) Return control handle to DN position and close the oleo switch.
 - (d) Check that control handle will move freely into UP position. Return control handle to DN position.
 - (e) Repeat step (a) through (d) on the right main landing gear oleo switch.



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- (4) Test Nose Gear Centering Switch (Airplanes listed on figure 202)
- (a) Jack nose of airplane and place greased plates under nose gear wheels. Lower airplane until oleo is at least six inches from full extension.
 - (b) Close main gear oleo safety switches and check that wheel trucks are perpendicular to main gear oleos.
 - (c) Turn nose gear wheels in 5 to 7 degree left turn.
 - (d) Check that control handle is prevented from moving into UP position.
 - (e) Pull trigger on control handle and check that handle can be moved into UP position.
 - (f) Release trigger and return control handle to DN position. Check that control handle is again prevented from moving into UP position. Return handle to DN position.
 - (g) Center nose gear and check that control handle is free to move into UP position. Return handle to DN position.
 - (h) Repeat steps (c) through (g) with nose gear wheels turned 5 to 7 degrees to the right.
- (5) Disconnect external electrical power.
- (6) Inspection/Test of Main Gear Leveling Switch
- (a) Remove LH main gear leveling switch (Ref.: MM 32-6-1, Steps G.(1) and G. (2).
 - (b) Remove cover from switch.
 - (c) Check switch for cleanliness, condition of contacts, electrical wires and continuity (Contact drop Pin A to C: 0.1 to 0.125 V with 1 Amp current in a 28 VDC resistive circuit.).
 - (d) Apply light coat of Dow Corning MS4 silicone compound on all contacts.
 - (e) Install cover and install leveling switch on main gear.(Ref.: MM 32-6-1, Steps G. (1) and G. (2).
- NOTE: Do not connect operating link.
- (f) Repeat steps (a) through (e) on RH main gear leveling switch.
 - (g) Perform test of landing gear control handle lock system components. (Ref.: MM 32-6-1, Paragraph C and steps D. (1) and D. (2).
 - (h) Connect operating link on LH and RH main gear.



LANDING GEAR WARNING SYSTEM - MAINTENANCE PRACTICES

EFFECTIVITY

Turbofan

1. Removal/Installation Landing Gear Warning System Components

A. General

- (1) Maintenance on the landing gear warning system is limited to replacement of defective switches, indicating lights, relays, or warning horn. Methods of component installation are conventional for attachment of switches with instructions on adjacent markers. The landing gear control handle limit switches require adjustment and are included below.

B. Equipment and Materials

- (1) Main Landing Gear Downlock Assembly - F71126-500
- (2) Nose Landing Gear Downlock Assembly - F70008-500
- (3) Protective blanket or padding to cushion instrument panel when opened
- (4) Throttle Warning Horn Protractor Assembly - F70024

C. Removal/Installation Landing Gear Control Handle Limit Switch

- (1) Remove Control Handle Limit Switch
 - (a) Check that all landing gear downlocks are engaged and wheel well doors are opened with door release handle pulled down and latched.
 - (b) Shut off airplane electric power.
 - (c) Depressurize utility hydraulic system.
 - (d) Release and lower center instrument panel onto padding placed on control stand radio control panel.

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- (e) Open copilot's instrument panel.
- (f) Remove bolts attaching switch assembly to control handle support structure (Fig. 201).
- (g) Pull switch assembly up and disconnect switch wiring terminals. Notice terminal to which each wire is attached.
- (h) Remove defective switch from switch assembly.

(2) Install Control Handle Limit Switch

- (a) Assemble switches (Fig. 201) on support bracket.

CAUTION SWITCH INSTALLATION BOLTS MUST BE INSTALLED WITH HEADS FACING SOLENOID.

- (b) Attach wires to respective terminals (Ref step (1)(g))
- (c) Attach switch and bracket assembly on right side of control handle support structure.
- (d) Adjust control handle limit switches.
 - 1) Place gear control handle in UP position. Rotate switch support bracket until switches are actuated by end of control handle in guide detents. Tighten adjustment bolts.

D. and E. Deleted

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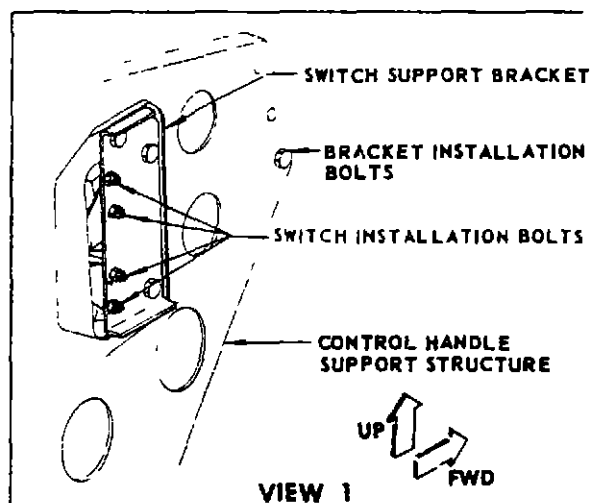
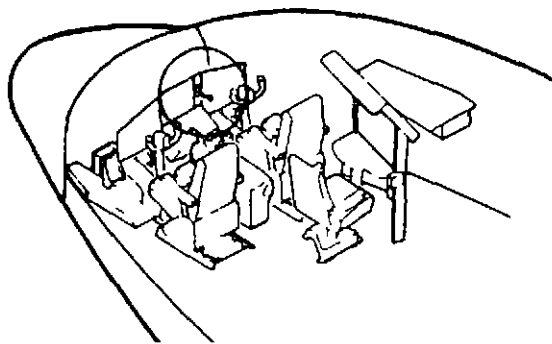
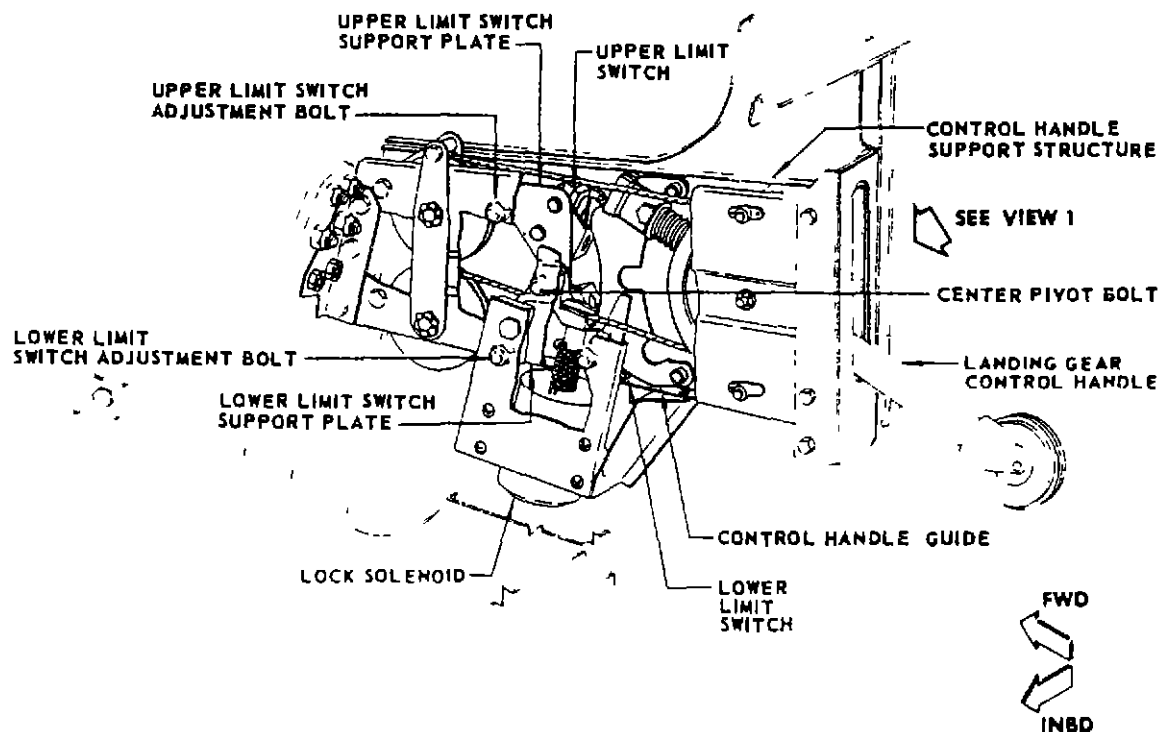
FIGURE 202 DELETED

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Control Handle Limit Switch Installation
Figure 201

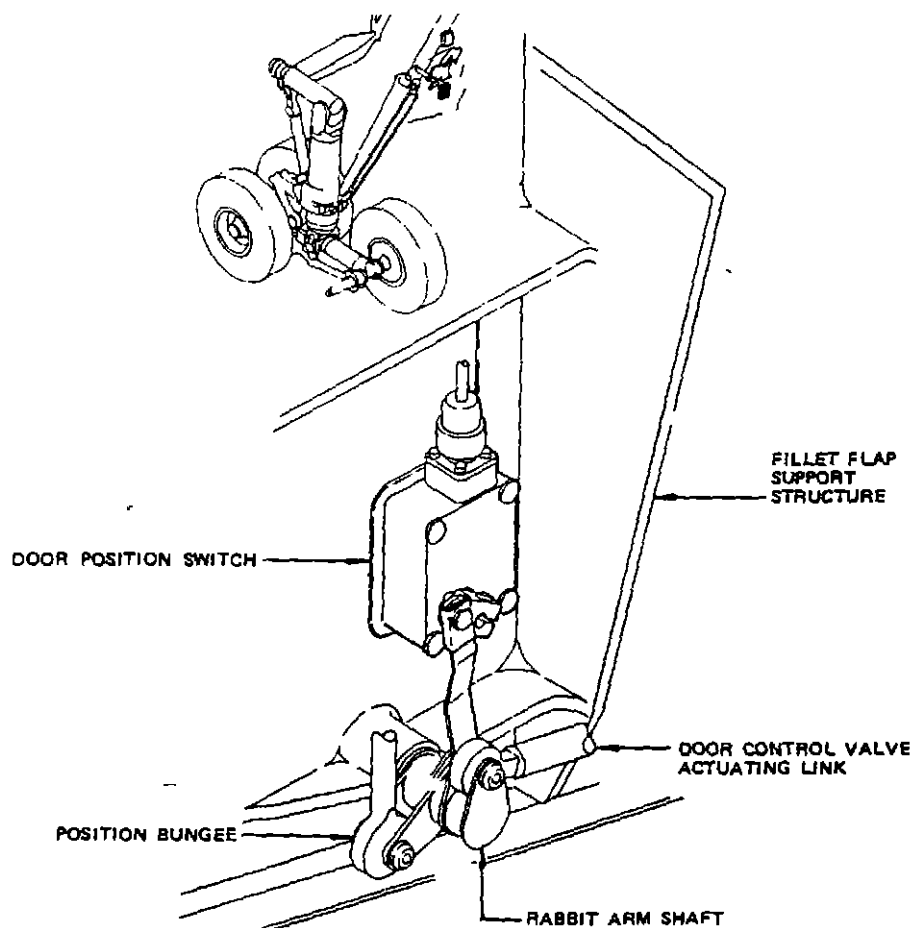
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F Removal/Installation Main Gear Position Switch

- (1) For details of attachment and linkage, Fig. 203.

CAUTION MAKE CERTAIN INDEX PIN IN MAIN GEAR POSITION SWITCH OPERATING ARM IS ENGAGED IN OUTER HOLE IN SWITCH SHAFT COLLAR. DO NOT FORCE PIN IN HOLE.



Main Gear Position Switch Installation

Figure 203

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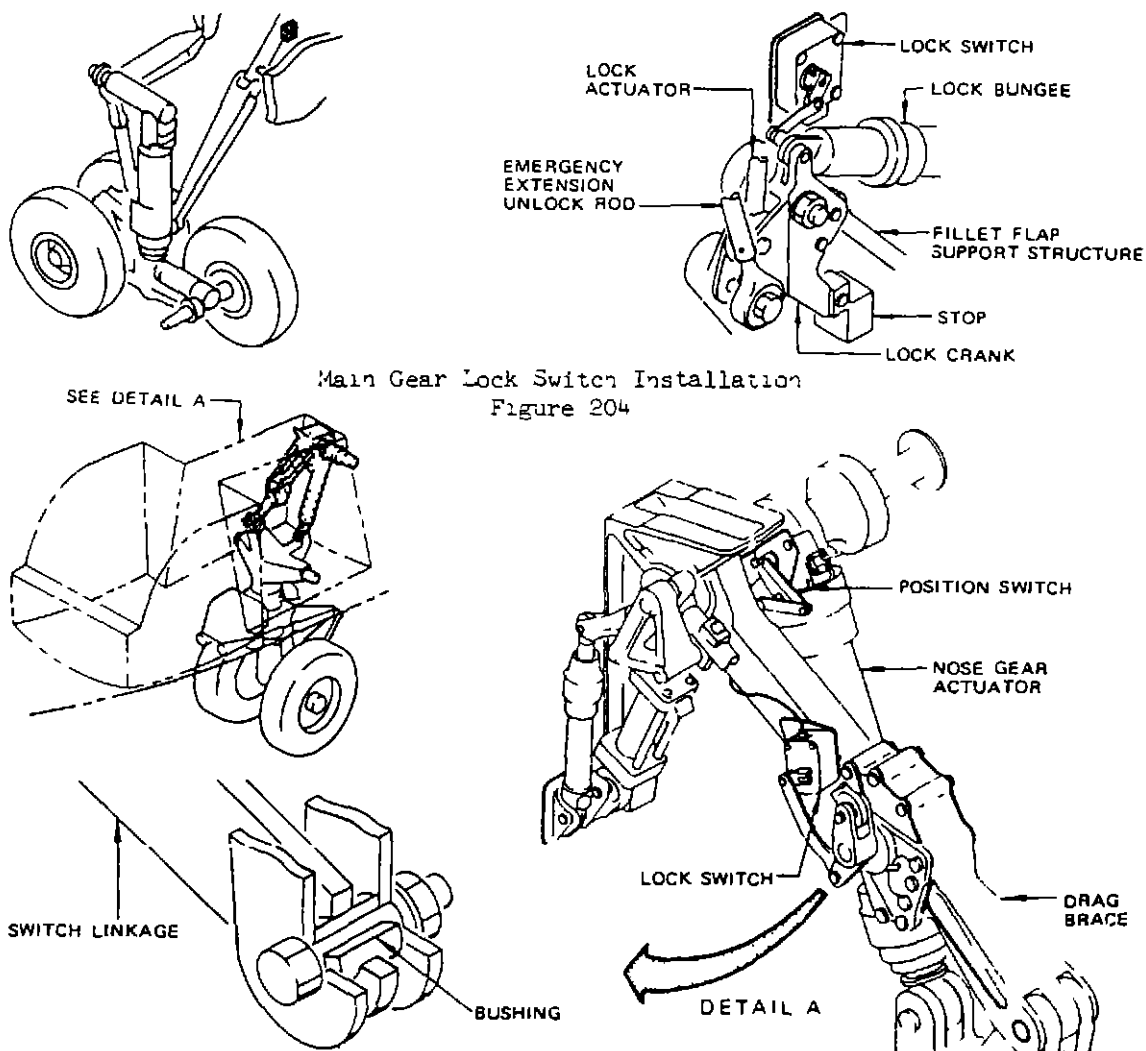
G. Removal/Installation Main Gear Lock Switch

- (1) For details of attachment and linkage, see Fig. 204.
- (2) On assembly, insert switch arm index pin in outer hole in switch shaft collar.

H Removal/Installation Nose Gear Position and Lock Switch

- (1) For details of attachment and linkage, see Fig. 205.
- (2) On assembly, insert switch arm index pin in inner hole in switch shaft collar. Check that bushing is installed in switch linkage.

CAUTION DO NOT FORCE INDEX PIN IN HOLE.



Main Gear Lock Switch Installation
 Figure 204

Nose Gear Position and Lock Switch Installation
 Figure 205

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2. Adjustment/Test Landing Gear Warning System Components

A. Adjust Landing Gear Warning System Components

(1) General

- (a) The only components in the landing gear warning system that require adjustment are the control handle limit switches, the thrust lever switches, and the flap position warning (landing) switch. All other components are factory adjusted and require no installation adjustment. For the adjustment of the control handle limit switches, see Install Control Handle Limit Switch. For adjustment landing gear warning thrust lever switches, refer to 31-26-13, Adjustment/Test. For adjustment of flap position warning (landing) switch, refer to 31-26-14, Adjustment/Test.

B. Deleted

C Test Landing Gear Warning System Components

(1) General

- (a) A test of the affected landing gear position indicating and warning sub-system should be made after changing or disturbing any electrical component in the sub-system.
- (b) Tests cover the operation of the warning lights, indicator lights, and all related switches. Switch actuation linkages can be disconnected to facilitate checking switch operation without operating the landing gear.

(2) Equipment and Materials

- (a) Main and Nose Landing Gear Downlock Assembly - F71126-500 and F70008-500
- (b) External electric power cart

(3) Prepare for Test

- (a) Push in landing gear horn circuit breaker on TR Bus No. 4 and landing gear warning light circuit breaker on TR Bus No. 2 in P5 circuit breaker panel.
- (b) Engage landing gear ground downlocks and open wheel well doors by pulling down and latching door release handles
- (c) Depressurize utility hydraulic system by positioning manual bypass valve located forward of side strut opening in right wheel well to BYPASS.
- (d) Disconnect actuating linkage on nose gear position and lock switches and main gear position and lock switches.
- (e) Move all thrust levers forward at least 20 degrees from idle stop.
- (f) Check that flap control lever is in less than 30 degrees flap down position.

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- (4) Test Landing Gear Position and Warning Indicators and Switches
- (a) Close nose gear and both main gear position and lock switches to simulate all gear down and locked.
 - (b) Check that all gear down and locked green indicator lights are on.
 - (c) Test Position Switch Operation
 - 1) Position nose gear position switch, and each main gear position switch in turn, to open position. (Simulating respective gear up position.)
 - 2) Check that respective green indicator lights go off.
 - 3) Return position switches to closed position. Green indicator lights should come on.
 - (d) Test Lock Switch Operation
 - 1) Position nose gear lock switch and each main gear lock switch to gear unlocked position. (Simulating respective gear unlocked.)
 - 2) Check that respective green indicator light goes off and that landing gear red warning light comes on.
 - 3) Return each lock switch to locked position before checking next lock switch. As each switch is returned to the locked position, check that landing gear red warning light goes off and respective green indicator light comes on.
- (5) Test Landing Gear Control Handle Limit Switches.
- (a) Place control handle in DN position and all gear position and lock switches in gear down and locked position. Landing gear warning light shall be off.
 - (b) Place control handle in UP position but leave gear position and locked switches in gear down and locked position. Landing gear warning light shall come on.
 - (c) With control handle in UP position, place nose and main gear position switches to up position. Landing gear warning light shall go off, (become de-energized).
 - (d) Place landing gear control handle to DN position and check that landing gear warning light comes on.

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LANDING GEAR DOOR WARNING SYSTEM - MAINTENANCE PRACTICES

1. Removal/Installation Main Gear Door Lock Switch.

A. Deleted

B. Equipment and Materials

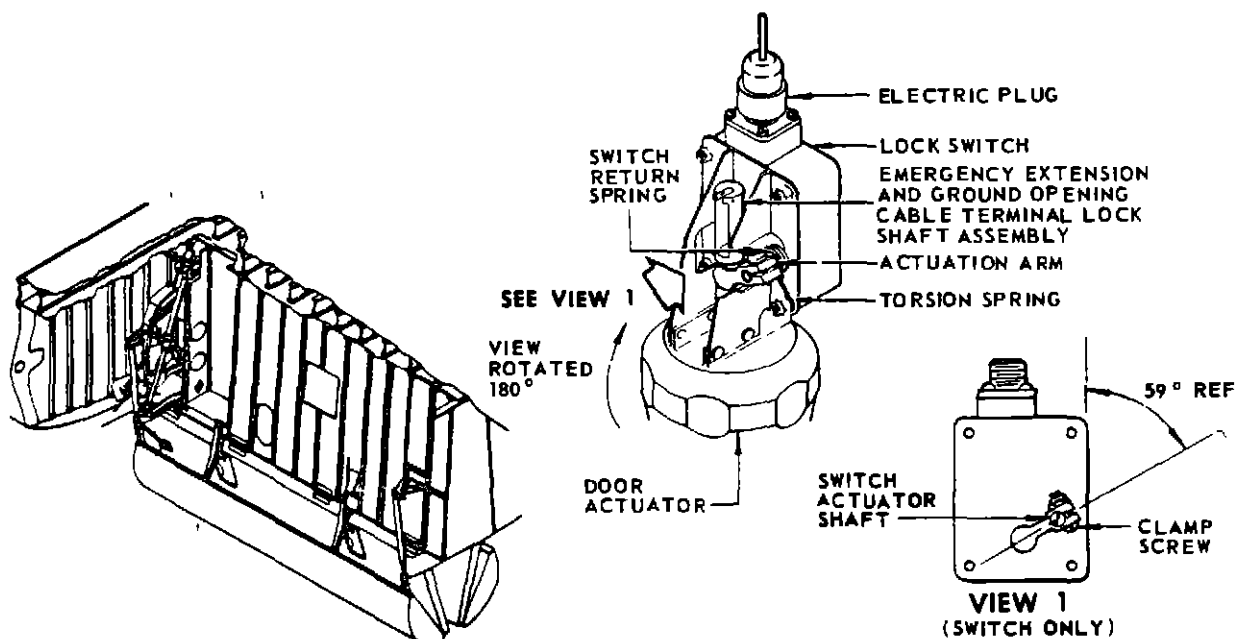
- (1) Lock Assembly - Down, Nose Landing Gear, F70008 or equivalent.
- (2) Lock Assembly - Down, Main Landing Gear, F71126-500 or equivalent.
- (3) Deleted

C. Remove Main Gear Door Lock Switch

- (1) Check that landing gear external down locks are installed; and that wheel well doors are open with the release handles down and latched.
- (2) Depressurize hydraulic system and open Indicator Lights (circuit breaker on circuit breaker panel P5, or on TWA airplanes panel P6.
- (3) Disconnect electrical plug from lock switch. Remove switch attachments and remove switch. (See figure 201.)

NOTE: Observe position of torsion spring washer and spacer on installation screw at spring attachment, for installation on replacement switch assembly.

- (4) Remove actuating arm from the switch.





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D. Install Main Gear Door Lock Switch

- (1) Install actuating arm on switch (figure 201).
- (2) Slip actuator arm into lock shaft assembly. Align switch by inserting screws through switch and bracket.

NOTE: Longest screw goes in lowest forward position.

- (3) Fit self locking nuts on three short screws. Tighten nuts. Fit spacer, washer, and nut on longest screw. Tighten nut.
- (4) Hook spring over actuator arm and over spacer on long screw.
- (5) Connect electrical plug to switch assembly receptacle.
- (6) Adjust and test lock switch installation per paragraph 3.

2. Removal/Installation Nose Gear Door Lock Switch

A. Equipment and Materials

- (1) Lock Assembly - Down, Nose Landing Gear, F70008 or equivalent
- (2) Lock Assembly - Down, Main Landing Gear, F71126-500 or equivalent

B. Remove Nose Gear Door Lock Switch

- (1) Check that landing gear external downlocks are installed.
- (2) Open nose gear doors and disconnect door operator rods at door connections.
- (3) Depressurize hydraulic system and open indicator lights circuit breaker on circuit breaker panel P5, or on TWA airplanes, panel P6.
- (4) Disconnect electrical plug from switch. (See figure 202)
- (5) Disconnect return spring from switch actuating arm.
- (6) Remove actuation arm from switch.
- (7) Remove switch from airplane.



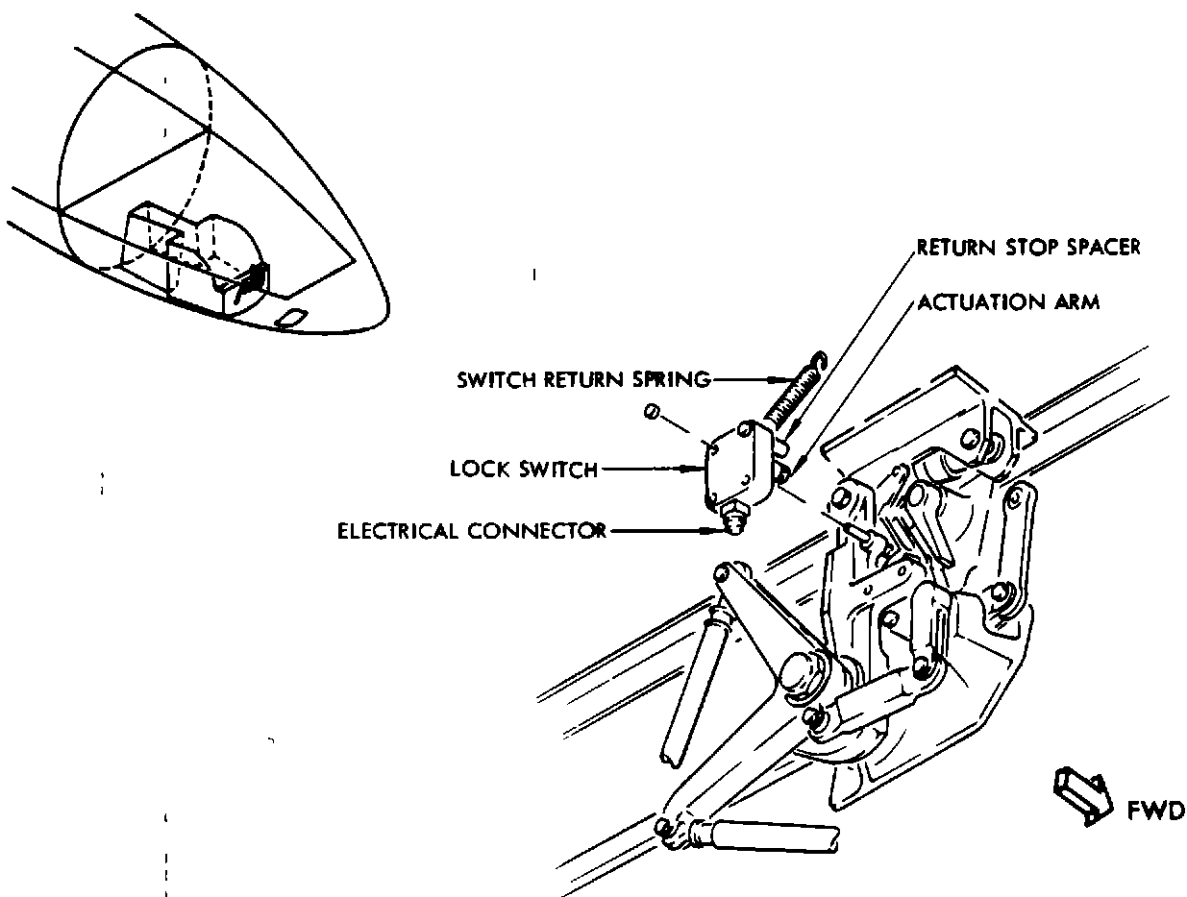
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D. Install Nose Gear Door Lock Switch

- (1) Place new or serviceable switch in position. (See figure 202.)
- (2) Secure switch attachment bolts.
- (3) Install actuation arm on switch shaft.

CAUTION: MAKE SURE THAT INDEX PIN IN SWITCH ACTUATION ARM IS ENGAGED IN OUTER HOLE IN SWITCH SHAFT COLLAR. DO NOT FORCE PIN IN HOLE.

- (4) Connect return spring to switch actuating arm.
- (5) Connect electrical plug to switch.
- (6) Connect door operator rods to doors.
- (7) Test lock switch installation per "Adjustment/Test - Landing Gear Door Warning System."



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3. Adjustment/Test Landing Gear Door Warning System

A. General

- (1) A functional test of the landing gear door warning system is required after repair or replacement of landing gear door operating mechanism. Tests of individual circuits are required if a defect develops, or after changing any electrical components in the system. Adjustment is required after replacement of a main gear door lock switch.
- (2) Adjustment of the main gear wheel well door lock switch may be accomplished by removing the switch from the door actuator and setting the switch to the required actuation point per paragraph C. The switch can be adjusted while installed on the door actuator by use of a locally fabricated tool, per paragraph D.

B. Equipment and Materials

- (1) Main Gear Wheel Well Door Lock Switch Adjusting Tool, P/N SE 32-1001 (locally fabricated). Refer to Illustrated Tool and Equipment List.

NOTE: Use of adjusting tool is optional.

C. Adjust Main Gear Wheel Well Door Lock Switch (without Adjusting Tool)

- (1) Connect external electrical power and close the landing gear door warning circuit breakers on panel P5, or, on TWA airplanes, panel P6.
- (2) Depressurize utility hydraulic system by moving hydraulic bypass valve handle to BYPASS.
- (3) Open main gear door by pulling down on door release handle.
- (4) Disconnect door actuator at door actuator beam and push actuator piston rod to door closed and locked position. Return handle to up position.

NOTE: Exert additional force on piston rod as piston rod approaches end of closing cycle and check that lock actuating mechanism locks piston rod in door closed and locked position with piston rod fully retracted.

- (5) Remove switch from actuator, connect electrical plug.



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- (6) Loosen clamp screw on switch actuation arm (figure 201)
 - (7) Turn switch actuator shaft with a small screwdriver until door warning light comes on, then turn shaft counterclockwise until warning light goes off.
 - (8) Hold shaft in position and set switch arm at 59 degrees to long side of switch (See figure 201.)
 - (9) Tighten clamp screw and install switch on actuator
 - (10) Pull up on lock shaft assembly to actuate switch. Check that warning light comes on.
 - (11) Slowly move lock shaft assembly down until warning light goes off.
 - (12) Check that warning light goes off at less than 0.03 inch from the fully retracted position of lock shaft assembly.
 - (13) If operation is not correct, remove switch and adjust position of arm on shaft as required.
 - (14) Repeat steps (9) through (13) until conditions described in steps (10) through (12) are met.
 - (15) Pull down on door release handle. Pull door actuator rod to extended position and connect door actuator to door actuator beam.
 - (16) Check operation of main landing gear door lock switch per paragraph E
- D Adjust Main Gear Wheel Well Door Lock Switch (With Adjusting Tool)
- (1) Connect external electrical power and close landing gear door warning circuit breakers on panel P5, or, on TWA airplanes, panel P6.
 - (2) Depressurize utility hydraulic system by moving hydraulic bypass valve handle to BYPASS
 - (3) Open main gear door by pulling down on door release handle



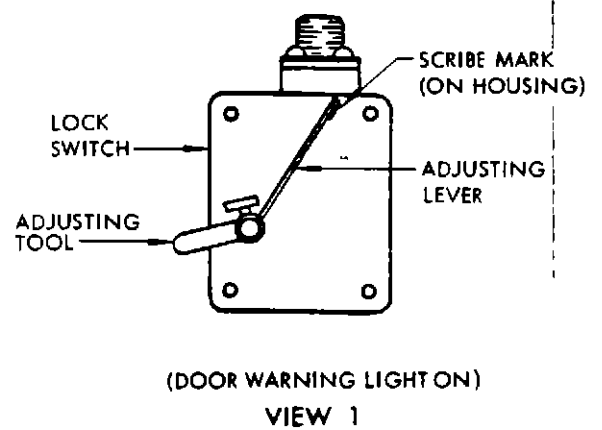
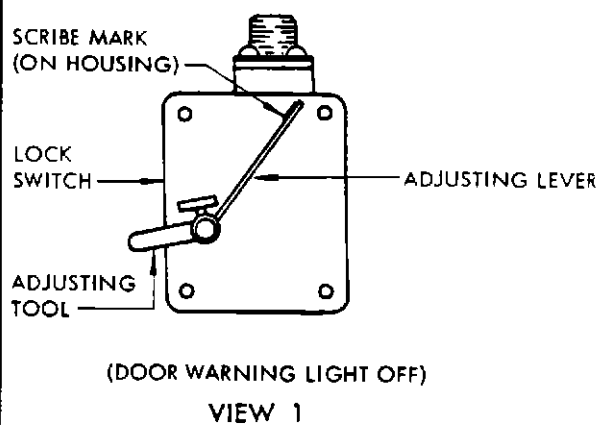
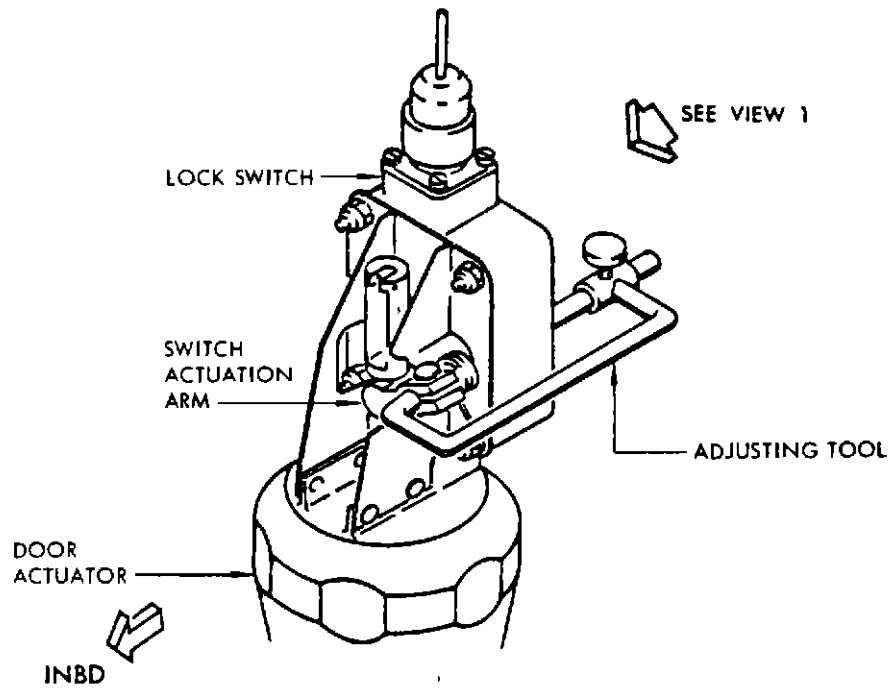
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- (4) Disconnect door actuator at door actuator beam and push actuator piston rod to door closed and locked position. Return handle to up position.

NOTE Exert additional force on piston rod as piston rod approaches end of closing cycle and check that lock actuating mechanism locks piston rod in door closed and locked position with piston rod fully retracted.

- (5) Attach adjusting tool to door lock switch as shown in figure 203. Seat screwdriver end of tool in slot on inboard side of switch actuator shaft. Loosen thumbscrew and seat adjusting lever rod extension in centering hole on outboard side of shaft. Tighten thumbscrew to hold tool in place.
- (6) Check that door warning light is off. If light is on, loosen clamp screw on switch actuation arm and turn switch actuator shaft counterclockwise until light goes off. Tighten clamp screw. (See figure 201.)
- (7) Scribe a mark on outboard side of switch housing in line with switch actuator shaft. Loosen thumbscrew and align left side of adjusting lever with scribe mark. Tighten thumbscrew.
- (8) Insert handcrank in emergency extension system handcrank drum. Rotate handcrank slowly in direction necessary to release main gear until adjusting lever of tool travels one width so that right side of lever aligns with scribe mark.
- (9) Check that door warning light comes on when adjusting lever aligns with scribe mark as in step (8). If light comes on, switch is properly adjusted. If light does not come on, perform steps (10) through (14) to adjust switch.
- (10) Loosen clamp screw on switch actuation arm (figure 201)
- (11) Turn switch actuation shaft clockwise with adjusting tool (figure 203) until door warning light comes on. Tighten clamp screw.

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- (12) Rotate emergency extension handcrank to original position and check that door actuator piston rod is fully retracted and locked.
- (13) Set tool adjusting lever as in step (7).
- (14) Rotate emergency extension handcrank in direction necessary to release main gear and check that door warning light comes on when right side of adjusting lever aligns with scribe mark.
- (15) Loosen thumbscrew and remove adjusting tool.
- (16) Rotate emergency extension handcrank to original position and remove and stow handcrank.
- (17) Pull ground door release handle down and latched.
- (18) Pull door actuator rod to extended position and connect door actuator to door actuator beam.
- (19) Check operation of main landing gear door lock switch per paragraph E

E. Test Landing Gear Door Warning System

- (1) With landing gear down and locked and wheel well doors closed, check that door warning light is off.
- (2) Pull nose gear door release handle and open nose gear doors. Check that door warning light comes on.
- (3) Disconnect electrical plug from nose gear door lock switch. Check that warning light goes off.
- (4) Manually release left main gear door. Check that door warning light comes on.
- (5) Disconnect electrical plug from left landing gear door lock switch and (on PAA and AA airplanes N7501A thru N7504A) disconnect electrical plug from door position switch. Check that door warning light goes off.
- (6) Repeat steps (4) through (5) for right main landing gear.
- (7) Connect all electrical plugs and restore system to normal.
- (8) Disconnect and remove external electrical power.

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LANDING GEAR MECHANICAL POSITION INDICATING AND WARNING SYSTEM -
MAINTENANCE PRACTICES

EFFECTIVITY

CARGO AIRPLANES

- 1 Removal/Installation Landing Gear Mechanical Position Indicating and Warning System Components
 - A. Equipment and Materials
 - (1) Lock assembly - Down, Main and Nose Landing Gear F71126-500 and F70008 or equivalent.
 - B Prepare to remove components
 - (1) Check that landing gear ground locks are engaged.
 - (2) Pull "LEVER LATCH" circuit breaker on top center of the circuit breaker panel P5.
 - (3) Depressurize the utility hydraulic system.
 - C. Removal/Installation Indicator Flags and Backing Tab
 - (1) Remove indicator flags and backing tabs.
 - (a) Remove bolts securing flags to shafts and lift off the flags. (See figure 201.)
 - (b) Undo screws attaching the rubber backing tabs Remove tabs.
 - (c) Stow flags, tabs, bolts and screws in indicator box and close cover.
 - (2) Install indicator flags and backing tabs.
 - (a) Slide flags over shafts with the colored patches facing forward

NOTE The flag with the square patch goes on the short shaft
 - (b) Turn flags inboard and rotate on shafts until the bolt holes line up.
 - (c) Insert bolts, add washers and nuts. Tighten nuts.



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- (d) Install rubber backing tab to project inboard with colored patches facing forward and with the square patch at the bottom. Tighten screws.

D. Removal/Installation Indicator Shafts

(1) Remove indicator shafts

- (a) Remove indicator flags. See paragraph C
- (b) Disconnect the pushrod from the side strut cam, at the lever on the position indicator shaft.
- (c) Remove nut from the bottom end of position shaft.
- (d) Release the intercostal from structure, and remove complete with bearing from the shaft.
- (e) Withdraw the shaft downward through the bearing in housing. (See figure 201.)
- (f) Disconnect the pushrod, between the bellcrank and the lock indicator shaft, at the lever on shaft.
- (g) Remove the bolt securing lever to shaft and tap the shaft down through the bearing.

NOTE If difficulty is experienced in sliding the shafts through the bearings, remove the bearing housing complete with shafts from the underside of the cabin floor. Observe that the housing requires sealant on installation to provide an airtight joint.

(2) Install indicator shafts

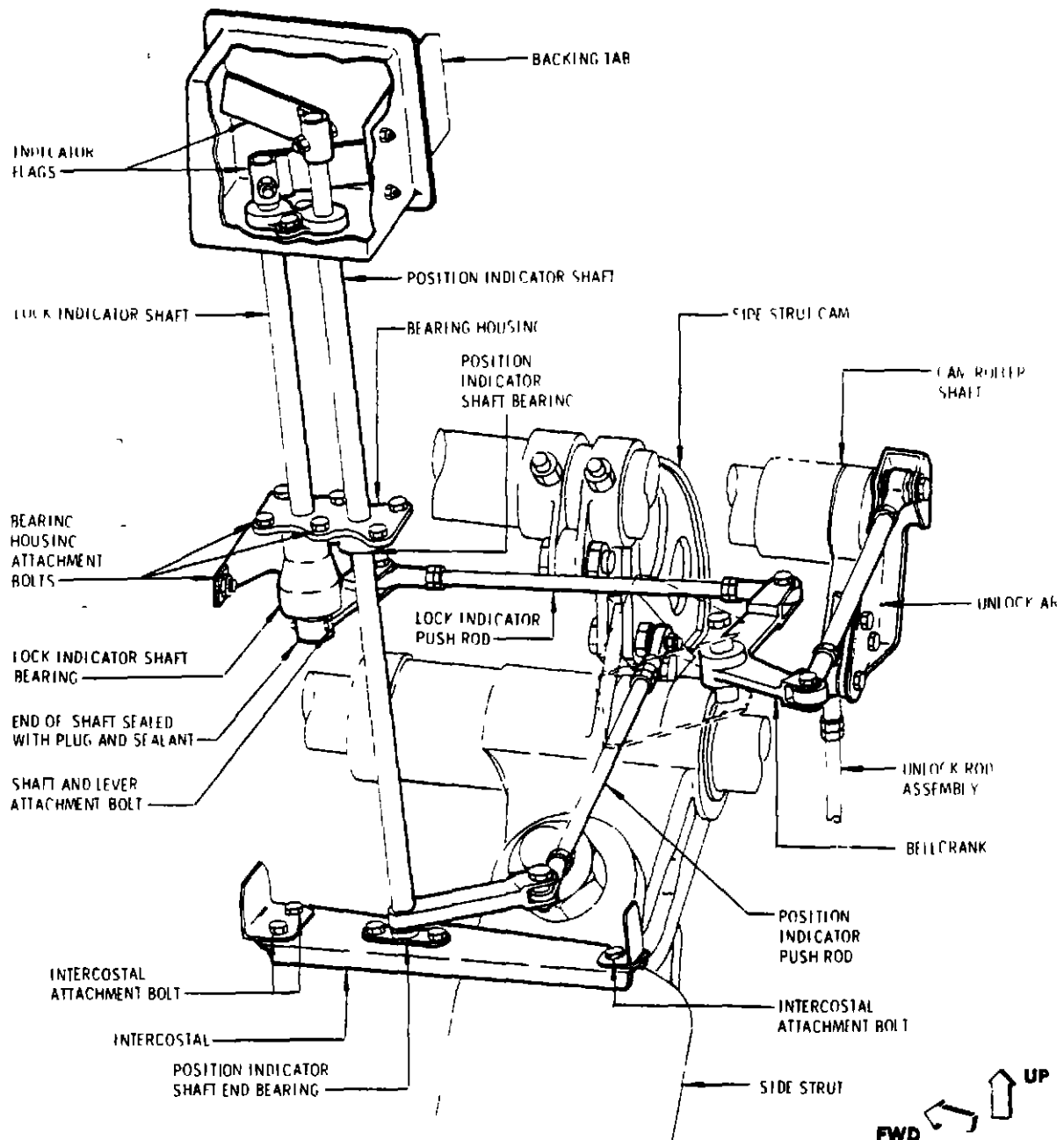
- (a) Check that the lower end of the short shaft is plugged and that the bolt holes in shaft and plug are lined up.
- (b) Insert the upper end of the short shaft from below through the sleeve in the forward bearing mounted in the housing.

NOTE It may be necessary to hold the sleeve to prevent it being pushed up out of the bearing

- (c) Install the lever on the end of the shaft and line up the holes in shaft, sleeve, and lever
- (d) Insert bolt, add washer and nut, and secure the lever.
- (e) Connect the lever to the pushrod from the bellcrank aft of the bearing housing

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- (f) Check the end of the shaft to make sure that the plug is fully sealed
- (g) Insert the long shaft from below through the aftermost bearing in the bearing housing
- (h) Place the intercostal in position, install and tighten attachment bolts



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Landing Gear Mechanical Position Indicating and
Warning System Components Installation
Figure 201

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- (i) Insert the lower end of the shaft into the bearing mounted on the intercostal. Secure with nut and cotter pin.
- (j) Connect the lever on the shaft to the pushrod from the side strut cam.
- (k) Examine all connections for security.

2 Adjustment/Test Landing Gear Mechanical Position Indicating System

A. Adjust Landing Gear Mechanical Position Indicating System

- (1) Install the flags on shafts.
- (2) With the main landing gear down and locked adjust lengths of pushrods until the ends of the flags are flush with lip of indicator box. Trim flags as required to prevent interference with decorative panel cover.
- (3) Tighten the locknuts on pushrods to a torque of 10 to 15 pound-inches.

B. Test Landing Gear Mechanical Position Indicating System

- (1) Check that landing gear ground locks are installed.
- (2) Operate the main gear downlocks manually by means of the manual lowering system.
- (3) Check that the lower flag with the square reflective patch is rotated to project inboard when the locks are disengaged.
- (4) Check the upper flag to be retracted into the box with the landing gear extended.
- (5) Disconnect the pushrod, at the end of the lever on the long shaft.
- (6) Rotate the lever inboard 60 degrees from the pushrod connection. The flag should move inboard until it is at right angles to the front face of the box.

NOTE. If the airplane is on jacks, check the movements of the mechanical indicators when retracting and extending the main landing gear.

- (7) Connect the pushrod to the lever on the landing gear position indicating shaft.
- (8) Check all connections tightness and locking.
- (9) Close LEVER LATCH circuit breaker on panel P5.



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LANDING GEAR EMERGENCY EXTENSION SYSTEM - DESCRIPTION AND OPERATION

1. General

A. The landing gear emergency system provides a means of gear extension which is independent of the normal hydraulic controls. Crank operated cable systems for each gear control the emergency extension. Any of the gear, when unlocked, will free fall to the extended position. This makes cranking necessary only to release the doors and unlock the gear from the up position, and to lock the gear in the down position. When released, the doors drop down to the open position and remain open.

B. The controls for emergency landing gear extension are in the floor of the control cabin. Three hand crank drums (one for each gear) are accessible through doors in the cabin floor. A crank, stowed in the emergency equipment rack, is used to turn the drums. The handcrank drums are rotated one way to unlock the wheel well doors and unlock the gear. Rotation in the opposite direction locks the gear down.

C. The emergency extension system should not be used to open wheel well doors for ground maintenance for the following reasons.

- (1) During nose gear emergency extension the airplane must be on jacks as the gear will retract if unlocked with airplane weight on the nose gear.

CAUTION: DO NOT OPERATE LANDING GEAR EMERGENCY EXTENSION SYSTEM WITH AIRPLANE WEIGHT ON THE NOSE GEAR AS THE NOSE GEAR WILL RETRACT IF UNLOCKED.

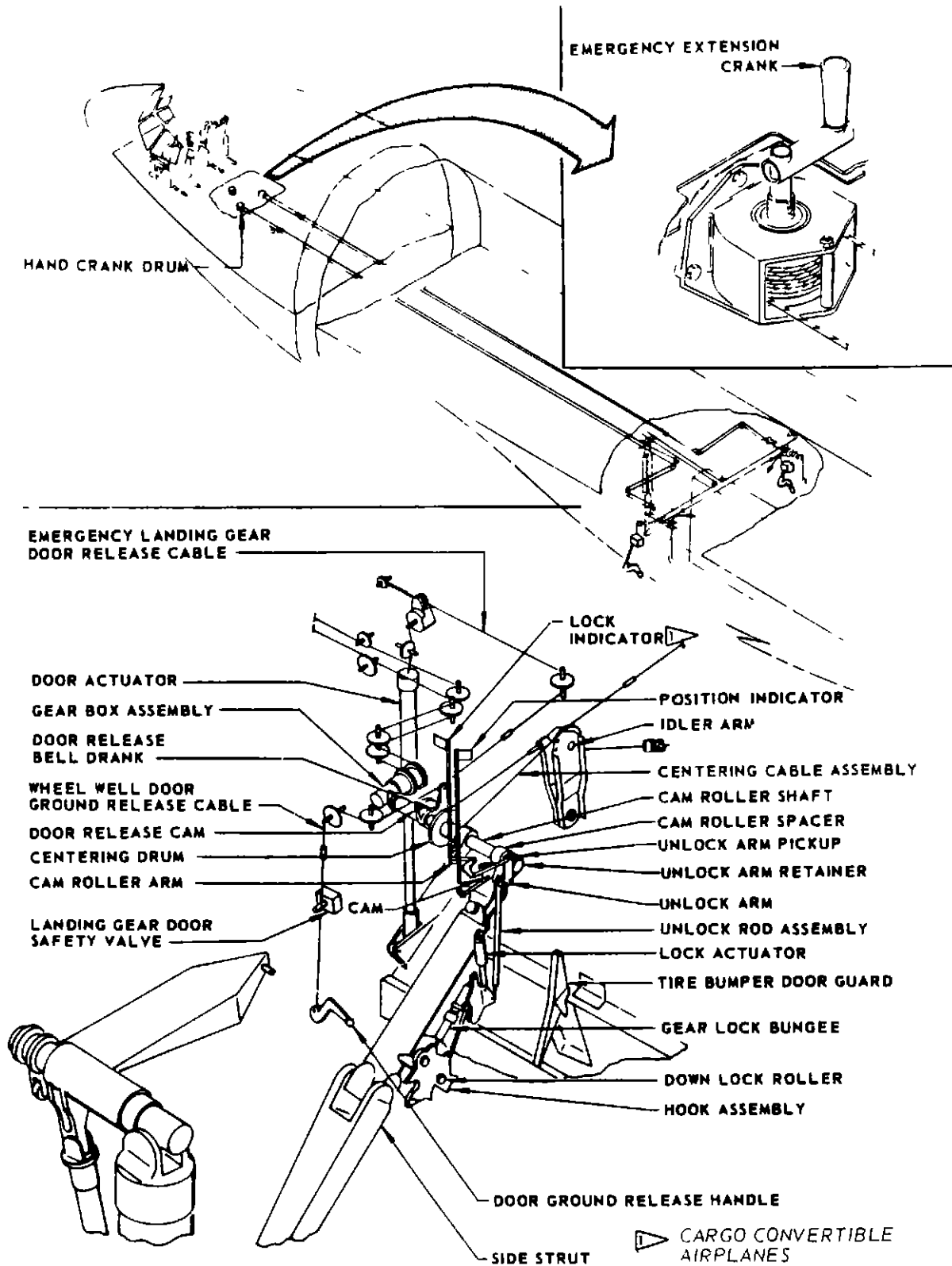
- (2) In main gear door emergency extension operation during ground maintenance the door safety valve is not actuated unless the door ground release handle is also moved to the down and latched position.

WARNING. APPLICATION OF HYDRAULIC PRESSURE TO LANDING GEAR SYSTEM WITH DOORS OPEN AND RELEASE HANDLE NOT DOWN AND LATCHED COULD CLOSE THE DOORS AND INJURE PERSONNEL.

2. Main Gear Emergency Extension Mechanism

A. Each main gear emergency extension system consists essentially of a hand crank drum, cable system, a gearbox assembly, a cam roller shaft, door release cam and bellcrank, cam roller arm, centering drum, unlock arm, and unlock rod assembly. (See figure 1.) Motion from the hand crank drum is transferred through the cable system aft to the gearbox. The cam roller shaft, splined to the gearbox, extends aft. The emergency extension door release and door ground release cables are attached to the door release bellcrank. When the shaft turns, the door release cam mounted on the cam roller shaft, contacts the door release bellcrank and rotates it to pull the door release cable and open wheel well doors. The door release bellcrank is hinged next to the cam roller shaft. When the door ground release handle is pulled down, the cam roller shaft is not affected. The unlock rod connects aft end of cam roller shaft to the gear lock mechanism.

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Main Gear Emergency Extension System
Figure 1



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- B. Motion from the handcrank drum is transferred through a cable system to rotate the cam roller shaft and pull the unlock rod up. This rotates the lock crank and the hook assembly. Rotating the hook assembly releases the gear up lock roller and gear will free fall to down position. Rotation of the lock crank loads the lock bungee as the lock mechanism reaches the unlock position. Rotation of the cam roller shaft extends the centering spring. When the handcrank is rotated in opposite direction, the cam roller arm will contact a cam on upper end of side strut. The cam roller arm rotates against the cam and pushes the side strut lock roller to contact and rotate the hook assembly into locked position. Rotation of the hook assembly rotates the lock crank until the lock bungee passes an overcenter position. The lock bungee exerts a force to keep the lock crank and hook assembly in locked position. Centering drums, mounted on each main gear cam roller shaft, are connected by centering cables and springs. The centering spring maintains the rig position and centers the mechanism when the handcrank is released.
- C. With hydraulic system depressurized the landing gear control handle may be placed in the OFF or DOWN position before using emergency extension. If the hydraulic system is pressurized, the handle must be placed in the OFF position. The following is based on the assumption that the hydraulic system is pressurized, the mode of operation being the same for system depressurized except for handle position.
- D. The main gears are extended (one at a time) by placing the emergency extension crank in the related drum and rotating the crank as follows

CAUTION: THE LANDING GEAR CONTROL HANDLE MUST BE IN "OFF" POSITION WHEN GROUND TESTING WITH HYDRAULIC SYSTEM PRESSURIZED.

(1) For right landing gear.

- (a) Check that index mark on crank socket matches mark on triangular bearing retainer on top of drum housing.

NOTE. Under normal conditions, the marks will match when there is no rotating force on the handcrank drum. Whenever the crank handle is rotated, a spring is put in tension and will return the control mechanism to neutral automatically when the crank handle is released.

- (b) Remove the stopper. Insert crank in right handcrank drum and rotate handle three turns counterclockwise to release wheel well door and landing gear up-lock. Landing gear and landing gear door red warning light on pilots' engine instrument panel should be illuminated.

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- (c) Turn crank 6-1/2 to 7 turns clockwise to lock gear down. Landing gear green down and locked light for right gear on pilots' engine instrument panel, should be illuminated.

NOTE: Landing gear door warning light remains illuminated since the doors do not close after emergency extension. With landing gear control handle in OFF position the gear warning light goes out when the right main gear is down and locked.

- (d) Turn crank 3-1/2 to 4 turns counterclockwise to neutral position.

CAUTION: IT IS NECESSARY TO RETURN CRANK TO NEUTRAL TO READY THE SYSTEM FOR NEXT EMERGENCY EXTENSION.

- (2) For left landing gear:

- (a) Check that index mark on crank handle socket matches mark on triangular bearing retainer on top of drum housing.

NOTE: Under normal conditions, the marks will match when there is no rotating force on the hand crank drum. Whenever the hand crank drum is rotated with the crank handle, a spring is put in tension. The spring will return the control mechanism to neutral automatically when the crank handle is released. Index marks will match.

- (b) Remove the stopper. Place crank in left handcrank drum and rotate handle three turns clockwise to release wheel well door and landing gear up lock. Landing gear and landing gear door red warning lights on pilots' engine instrument panel should be illuminated.



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- (c) Turn crank 6-1/2 to 7 turns counterclockwise to lock gear down. Landing gear green down and locked light for left gear on pilots' engine instrument panel should be illuminated.

NOTE: Door warning light remains illuminated since doors remain open. With landing gear control handle in OFF position the gear warning light goes out when the left main gear is down and locked.

- (d) Turn crank 3-1/2 to 4 turns clockwise to neutral position.

CAUTION: IT IS NECESSARY TO RETURN CRANK TO NEUTRAL TO READY THE SYSTEM FOR NEXT EMERGENCY EXTENSION.

E On TCA LX-N20198, LX-N20199 and RTCA LX-119997, 20000 the door ground release cables can be reached through access doors located in the cabin floor, forward of the main landing gear inspection doors. If the main gear wheel well doors fail to unlock manually, the door actuator lock may be released by opening the access doors and pulling on the ground release cables

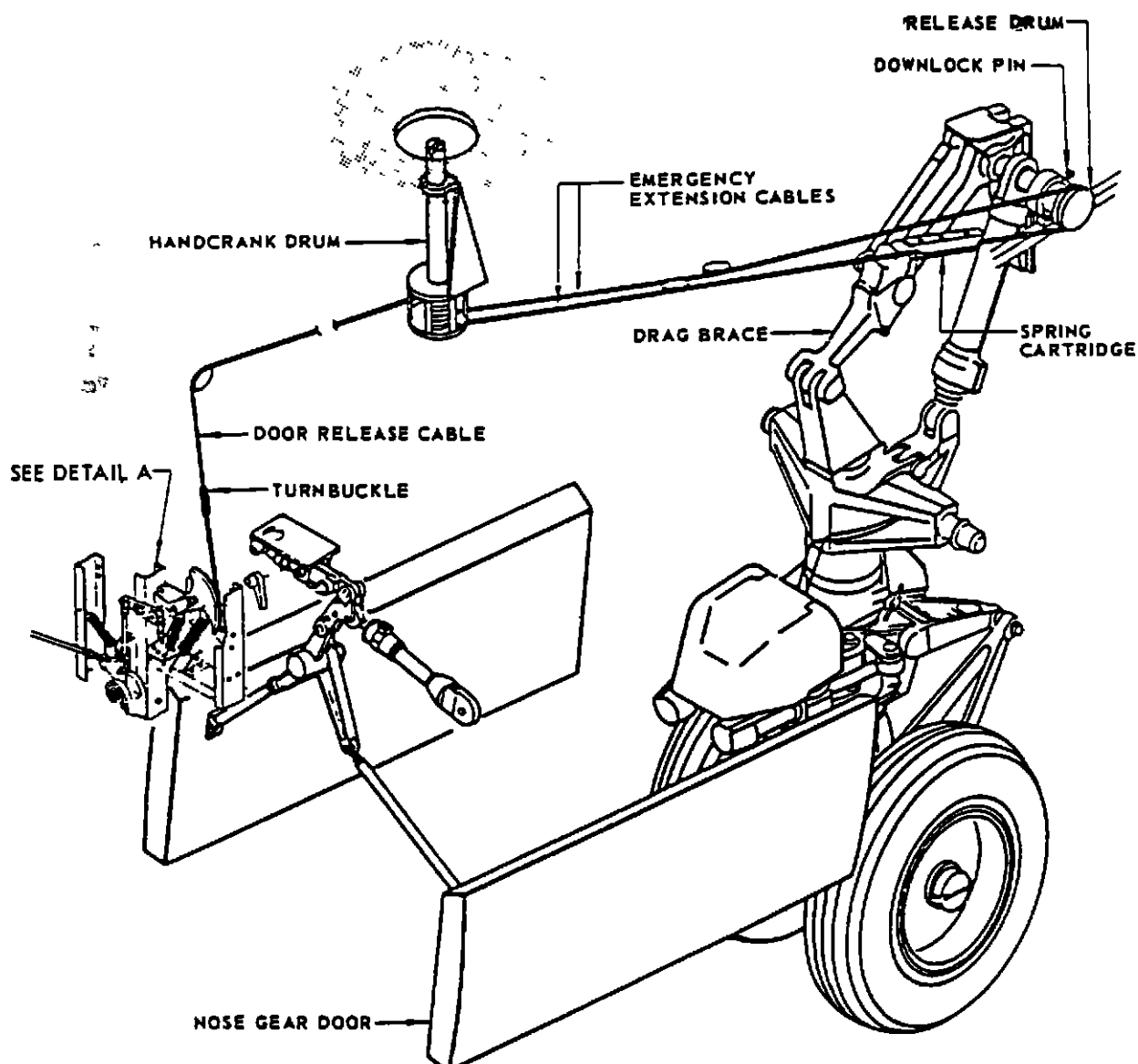
3. Nose Gear Emergency Extension Mechanism

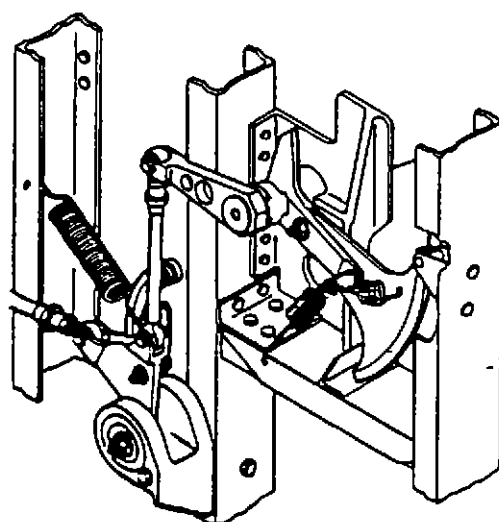
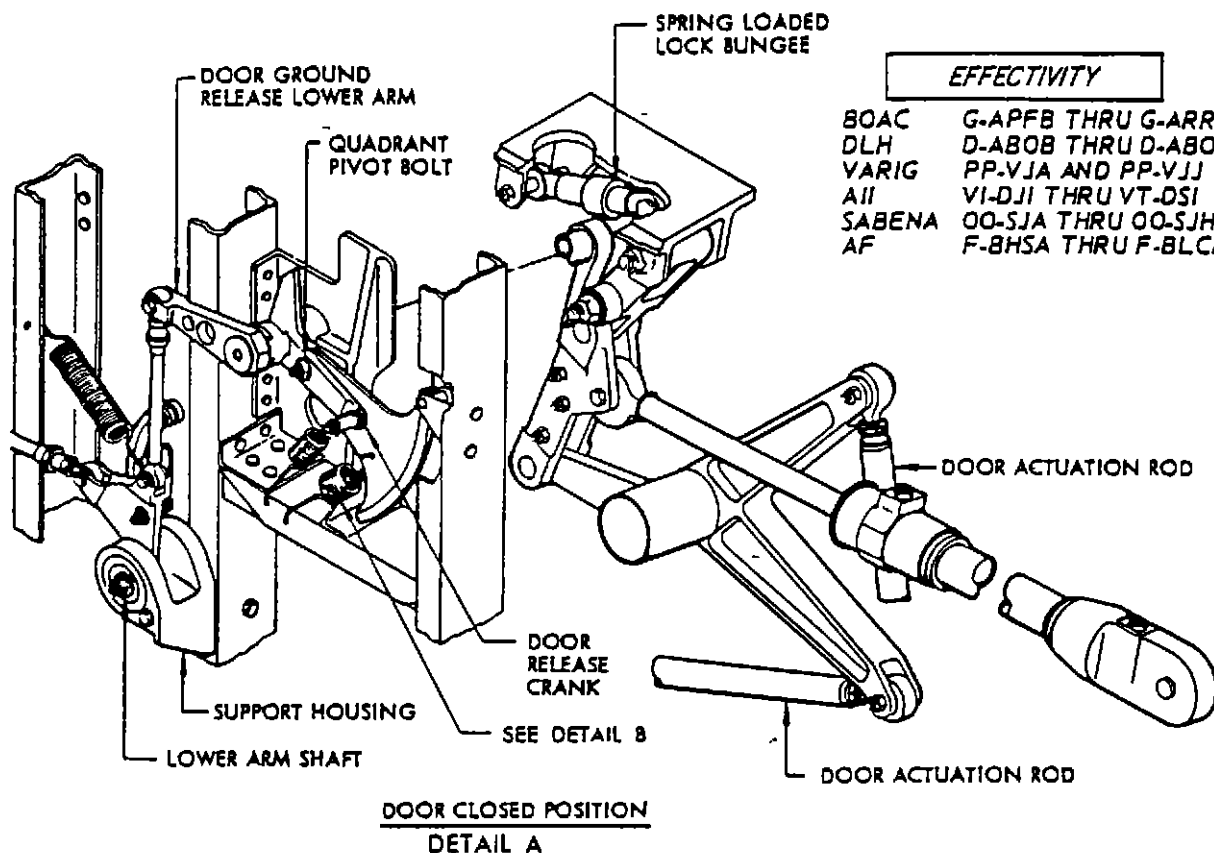
- A. The nose gear doors are opened by means of a cable running from the handcrank drum to the door actuating mechanism. (See figure 2.) The cable is connected to a quadrant on the forward side of nose wheel well forward bulkhead. The quadrant is mounted on a crank shaft which goes through the bulkhead to the door actuating mechanism. Turning the handcrank drum pulls the cable and rotates the crank shaft. In the wheel well on forward bulkhead, a trip arm contacts the door release roller and pushes the door actuating mechanism passed an overcenter position and opens the doors. A spring-loaded lock bungee which holds door in closed position is pushed to an overcenter position to aid in door opening.
- B. Motion from the handcrank drum is transferred through a cable system to a release drum. The cable system incorporates a spring cartridge located and mounted near the release drum. This spring cartridge aids in returning the system to neutral position. The release drum is mounted on a shaft which is connected to the nose gear unlock mechanism. Also mounted on this shaft is a lock pin. The lock pin will go into locked position to keep nose gear in down position when the gear is extended by the emergency system. This pin will have to be pulled (unlocked) before system can be returned to neutral. The pin is painted red and is located on upper left side of the wheel well aft bulkhead in lower nose compartment.

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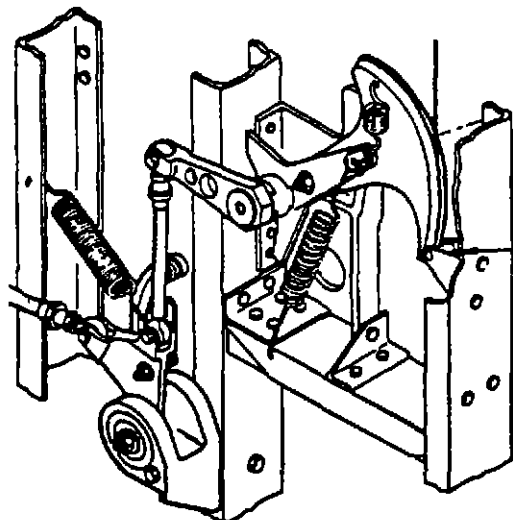
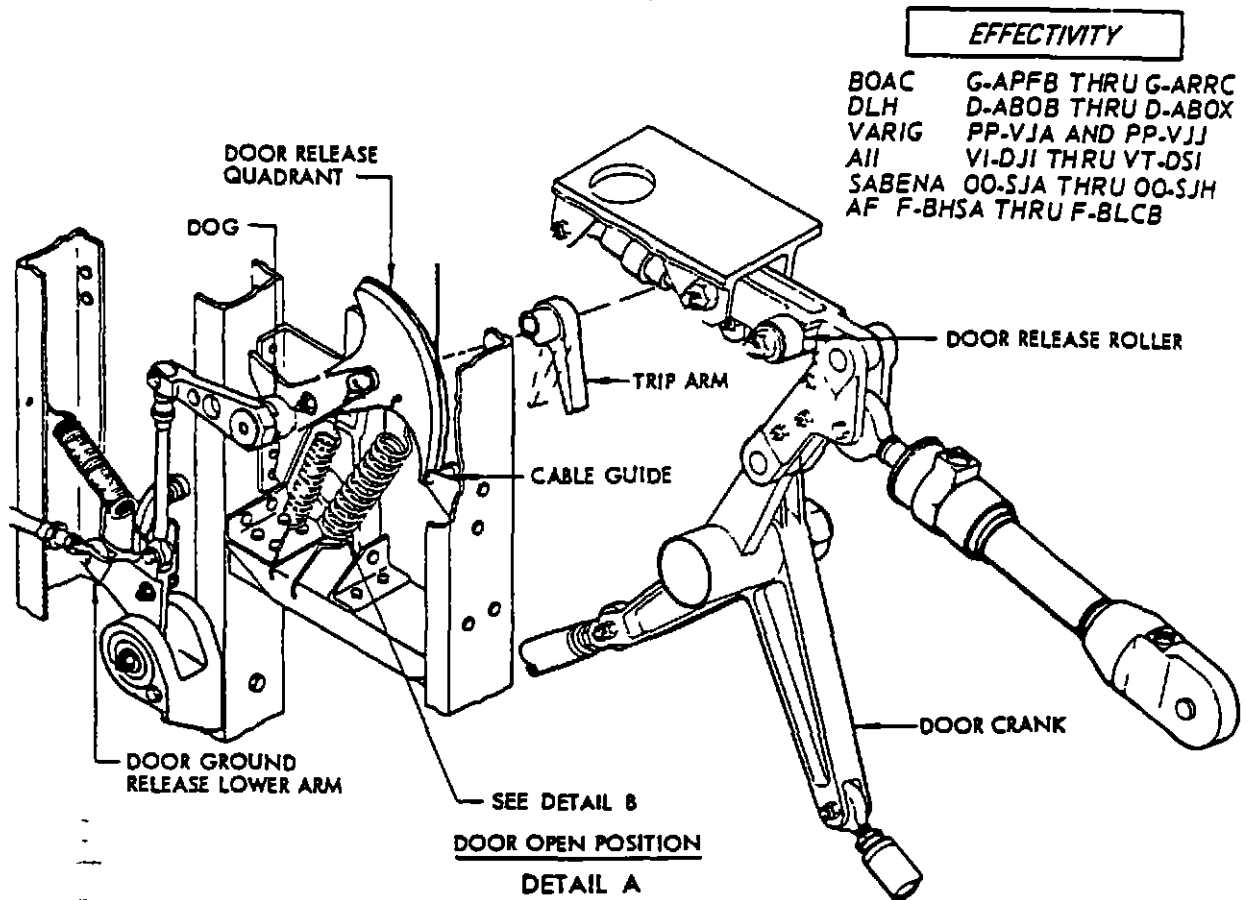
- C. When the hydraulic system is pressurized the landing gear control handle must be in the "OFF" position before operating the emergency extension system. Loads cranked into the emergency extension cable may be sufficient to cause failure of the linkage if an attempt is made to operate the manual extension mechanism while the door actuator is pressurized to close the doors. When the hydraulic system is depressurized the extension system can be operated while the landing gear control handle is in either "DN" or "OFF" position.
- D. The nose gear is extended by placing emergency extension crank in drum and rotating crank as follows:

CAUTION: THE LANDING GEAR CONTROL HANDLE MUST BE IN "OFF" POSITION WHEN GROUND TESTING WITH HYDRAULIC SYSTEM PRESSURIZED.





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



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- Remove the stopper. (SAB.707/78).
- (1) Insert crank in drum and rotate (approximately 3/4 of a turn) clockwise until stop is reached. This will open wheel well doors and unlock nose gear. Landing gear and landing gear door red warning light on pilots' engine instrument panel should be illuminated.
 - (2) Allow handcrank drum to return to neutral position.
 - (3) Turn crank (approximately 1/4 of a turn) counterclockwise until stop is reached. This will lock gear in down position. Landing gear green down and locked light for nose gear on pilots' engine instrument panel should be illuminated.

NOTE: Landing gear door warning light remains illuminated and the gear warning light goes out when the nose gear is down and locked with control handle in "OFF" position or with main gears down and locked.

CAUTION: TO RESET THE EMERGENCY EXTENSION SYSTEM, THE HANDCRANK DRUM IS RETURNED TO NEUTRAL BY THE SPRING CARTRIDGE AFTER THE LOCK PIN HAS BEEN PULLED.

E. On PAA airplanes N757FA and on, AF airplanes F-BHSR and on, SAB airplanes OO-SJF and on, DLH airplanes D-ABOT and on except D-ABOV, AII airplanes VT-DNY and on, BOAC airplanes G-ARRA and on, and TWA airplanes N773TW and on an emergency release lever is stowed in the lower nose compartment on the aft side of the nose wheel well cover. Should a malfunction cause the nose wheel extension system to jam, the release lever may be used to apply a turning force to the emergency release drum. The emergency release lever is operated in the following sequence:

- (1) Place landing gear selector lever in "OFF" position.
- (2) Insert lever in hole marked "1" in release drum.
- (3) Pull aft on lever for drum travel of approximately 138 degrees.
- (4) Return lever to initial position.
- (5) Remove lever from hole No. 1 and insert in hole No. 2.
- (6) Push forward on lever to engage down lock pin.
- (7) If pin fails to engage, move landing gear selector lever to "DN" while pushing forward on emergency lever.

F. Sequence pawls in the handcrank drum shaft assembly prevent motion of the emergency extension system that would engage the nose gear lock before releasing the doors and the gear to the down position.

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LANDING GEAR EMERGENCY EXTENSION SYSTEM - MAINTENANCE PRACTICES

1. Unit Servicing Landing Gear Emergency Extension System

A. Lubricate Landing Gear Emergency Extension System

(1) Lubricate the fittings shown on Detail B, figure 201.

B. Lubricate Cables in Contact with Magnesium Drums and Quadrants.

(1) Cables in contact with magnesium drums and quadrants require lubricant free of graphite. Magnesium drums in this system are the gear box drum in the main gear emergency extension system, and the release drum in the nose gear emergency extension system. (See figures 201 and 202.)

(2) Refer to Unit Servicing Control Cables, Chapter 27.

2. Inspection/Check Landing Gear Emergency Extension System

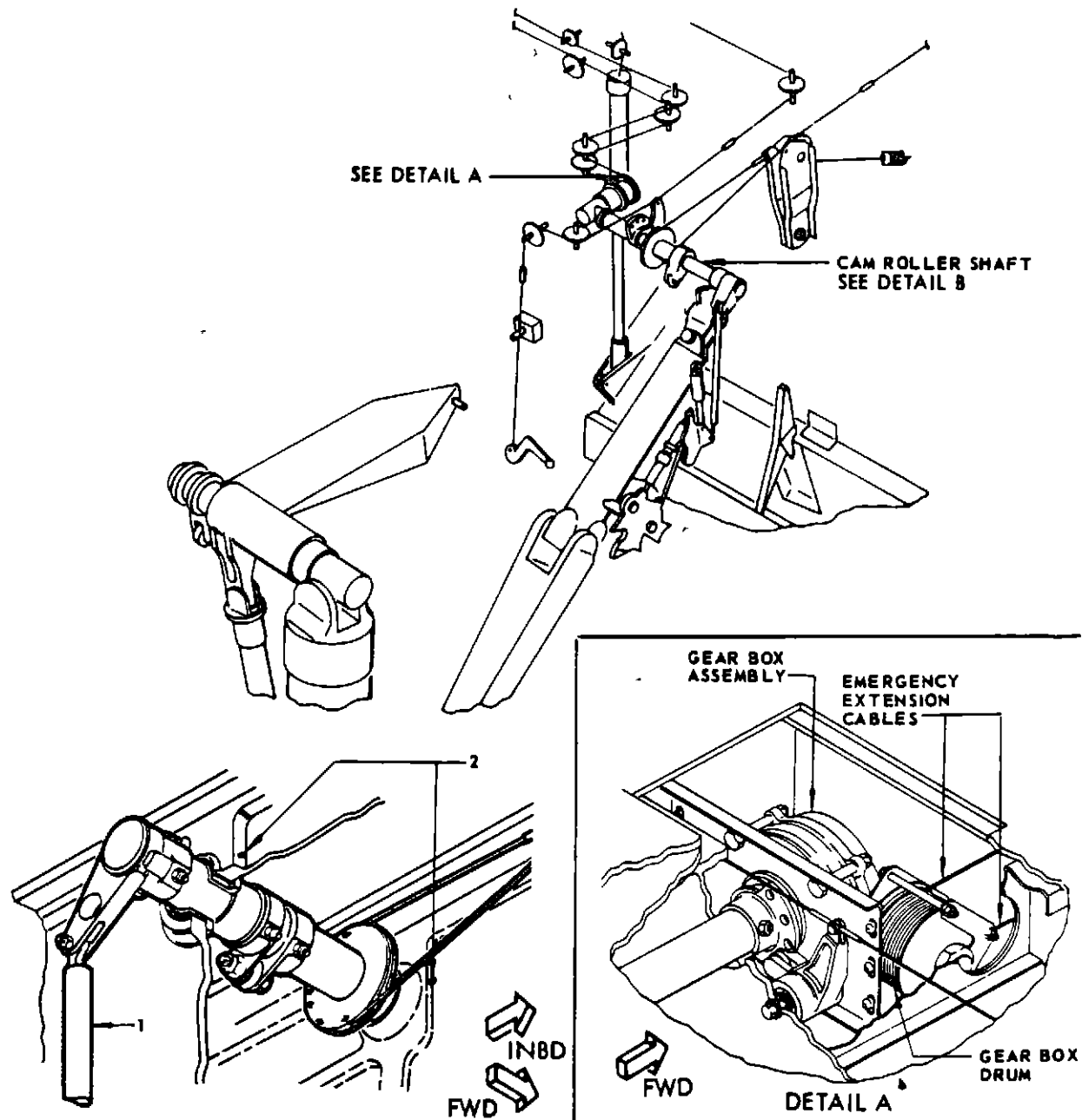
A. Examine Main Gear Emergency Extension System for the Following.

(1) Gear boxes and cable drums for loose mounting bolts.

(2) Cables for specified rigging loads, fraying and corrosion.

(3) Pulleys for misalignment and binding.

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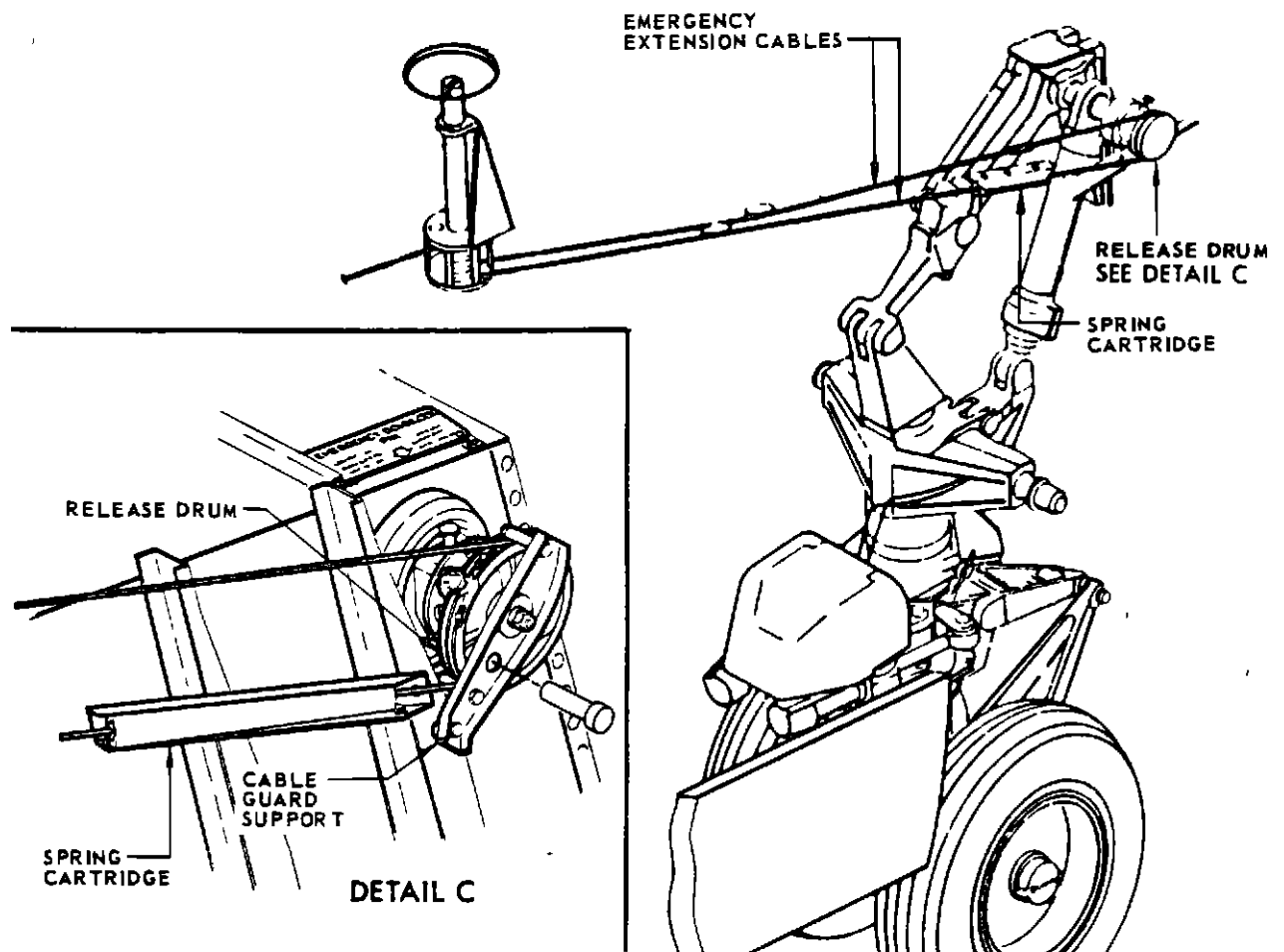
INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1.	UNLOCK ROD UPPER TERMINAL	Apply Grease, MIL-G-21164. Flush Fitting
2.	CAM ROLLER SHAFT	Apply Grease, MIL-G-21164. Zerk Fitting (2 Places)

DETAIL B

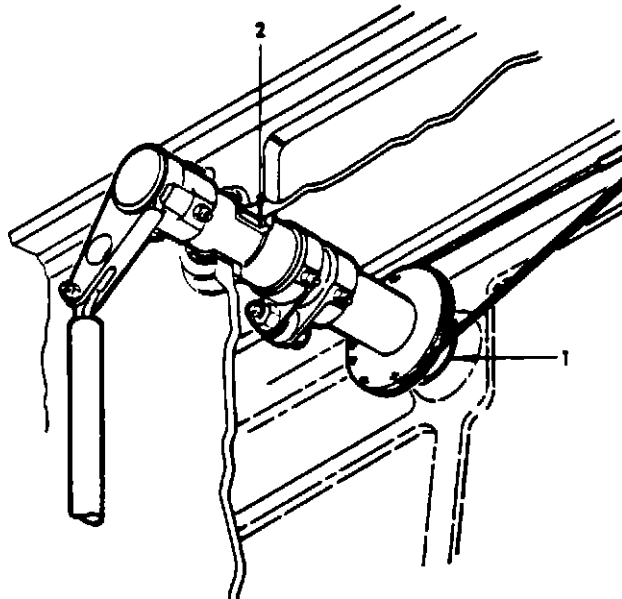


MAINTENANCE MANUAL

- (4) Hand crank drums for loose mounting bolts.
 - (5) Cam roller shaft and bushings for looseness and wear. (See figure 203)
- B. Examine Nose Gear Emergency Extension System for the Following.
- (1) Hand crank drum for loose mounting bolts.
 - (2) Pulleys for misalignment and binding.
 - (3) Cables for specified rigging loads, fraying and corrosion.
 - (4) Release drum for loose mounting bolts.
 - (5) Spring cartridge for looseness.
 - (6) Crank shaft and bearing for looseness and wear. (See figure 204.)
 - (7) Emergency door release crank arm for wear, binding, and cracks.



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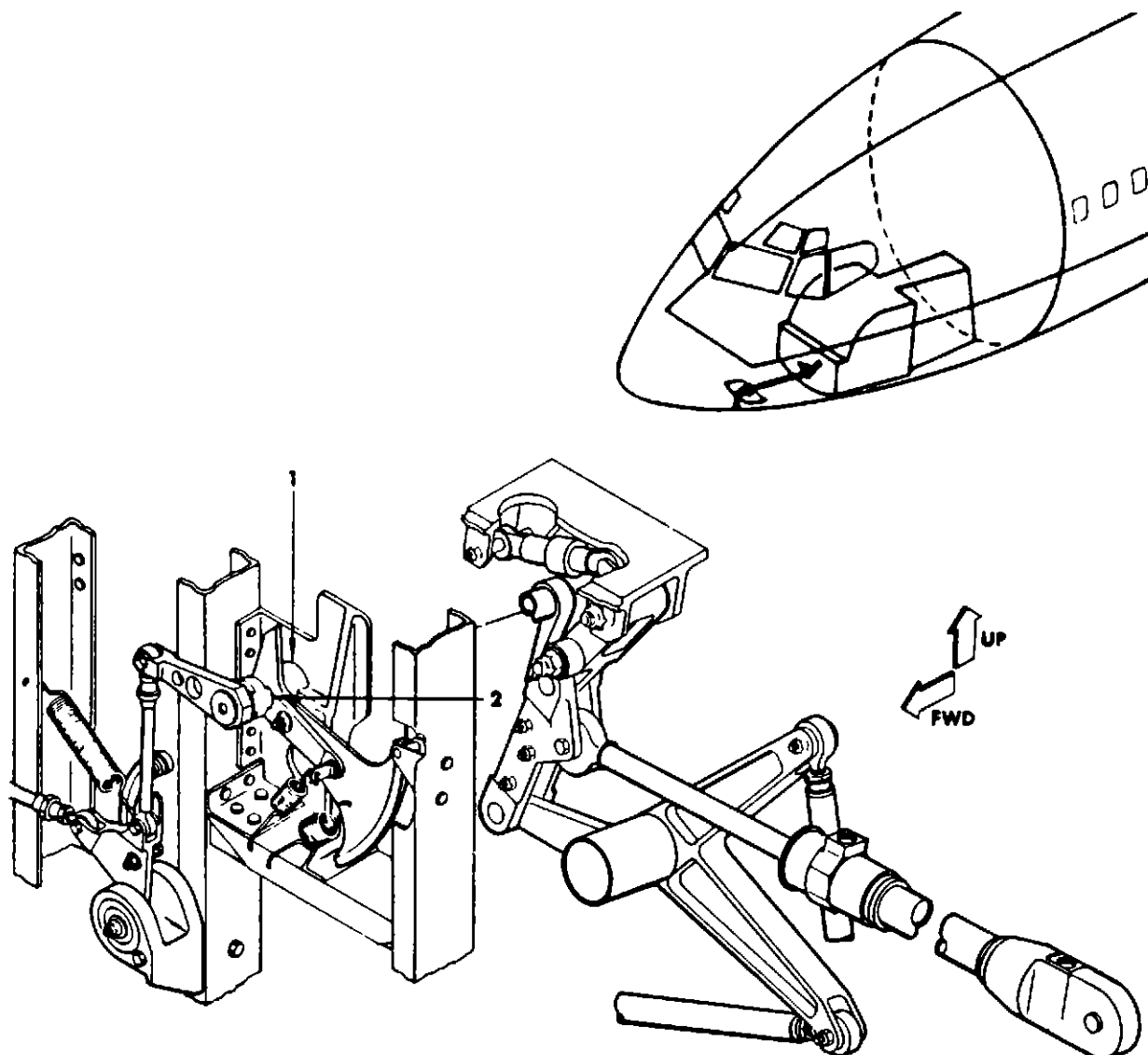


INDEX NO	DIM	DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
		DIAMETER		MAX WEAR DIM	MAX DIAM. CLEAR. ANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP	BUSHING INTERFERENCE	
		MIN.	MAX			YES	NO	MTL		MIN	MAX
1	I.D.	2.000	2.002	2.007	.010						
	O.D.	1.998	2.000	1.997		X		CHROME			
2	I.D.	2.000	2.002	2.007	.010						
	O.D.	1.998	2.000	1.997		X		CHROME			

Replace 60-6946 Bushing

Allowable Wear and Rework of Main Gear Emergency Extension
Figure 203

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		DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
INDEX NO.	DIM	DIAMETER		MAX. WEAR DIM.	MAX. DIAM. CLEAR-ANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP	BUSHING INTERFERENCE	
		MIN	MAX.			YES	NO	MTL		MAX	MIN
1	I.D.	1 000	1.002	1.005	.010						
	O.D.	.996	.998	.995		X		CHROME			
2.	I.D.	1 000	1 002	1.005	010		X				
	O.D.	.996	.998	.995		X		CHROME			

 Replace 3-93574-1 Bushing

MAIN GEAR EMERGENCY EXTENSION MECHANISM - MAINTENANCE PRACTICES

1. Removal/Installation Main Gear Emergency Extension Mechanism

A Remove Main Gear Emergency Extension Mechanism

- (1) Relieve tension on emergency extension cables (figure 202).
- (2) Remove installation bolts attaching handcrank drum under control cabin floor.
- (3) Remove emergency extension cables from handcrank drum.
- (4) Remove emergency extension cables from gear box drum under floor panel at station 875 (Figure 201).
- (5) Remove bolts attaching gear box assembly to support bracket. Pull gear box assembly free from cam roller shaft.
- (6) Remove nut and washer from door release bellcrank bolt.

NOTE The bolt and seal will be removed aft into wheel well area.

- (7) Remove gear box assembly support bracket for access to door release bellcrank and door release cam.
- (8) Remove door release cables from door release bellcrank, take out bellcrank.
- (9) Remove bolt through door release cam. Take cam from shaft.
- (10) In the wheel well area, remove nuts, washers, and bolts from aft end of cam roller shaft.
- (11) Remove unlock arm retainer, unlock arm, and unlock arm pick up cam from cam roller shaft.

NOTE Let unlock arm and unlock rod hang from rod lower attachment, unless they are to be replaced.

- (12) Remove two nuts, washers and bolts from cam roller arm.
- (13) Relieve tension on idler cable at turnbuckle.
- (14) Disconnect centering spring from idler cable and tie cable so that it is not pulled through seal in wheel well inboard bulkhead.
- (15) Remove bolt that attaches centering drum to cam roller shaft.



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- (16) With one man positioned in wheel well to receive cam roller arm, cam roller spacer, and centering drum as parts slip off, remove cam roller shaft forward

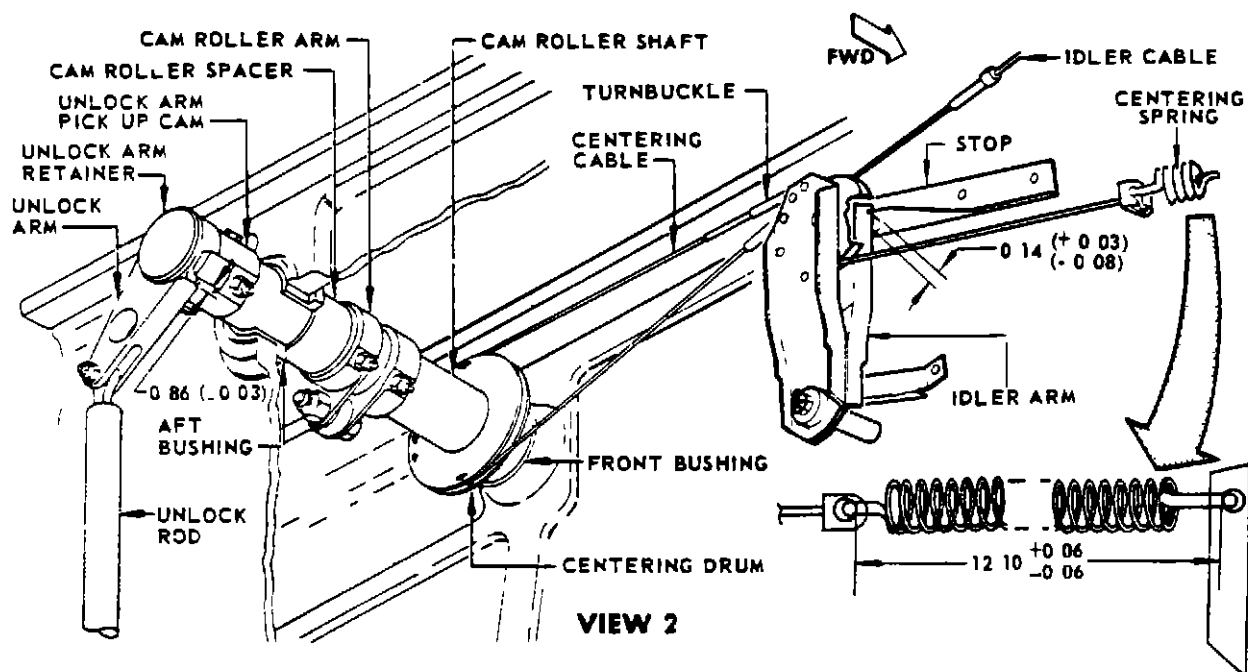
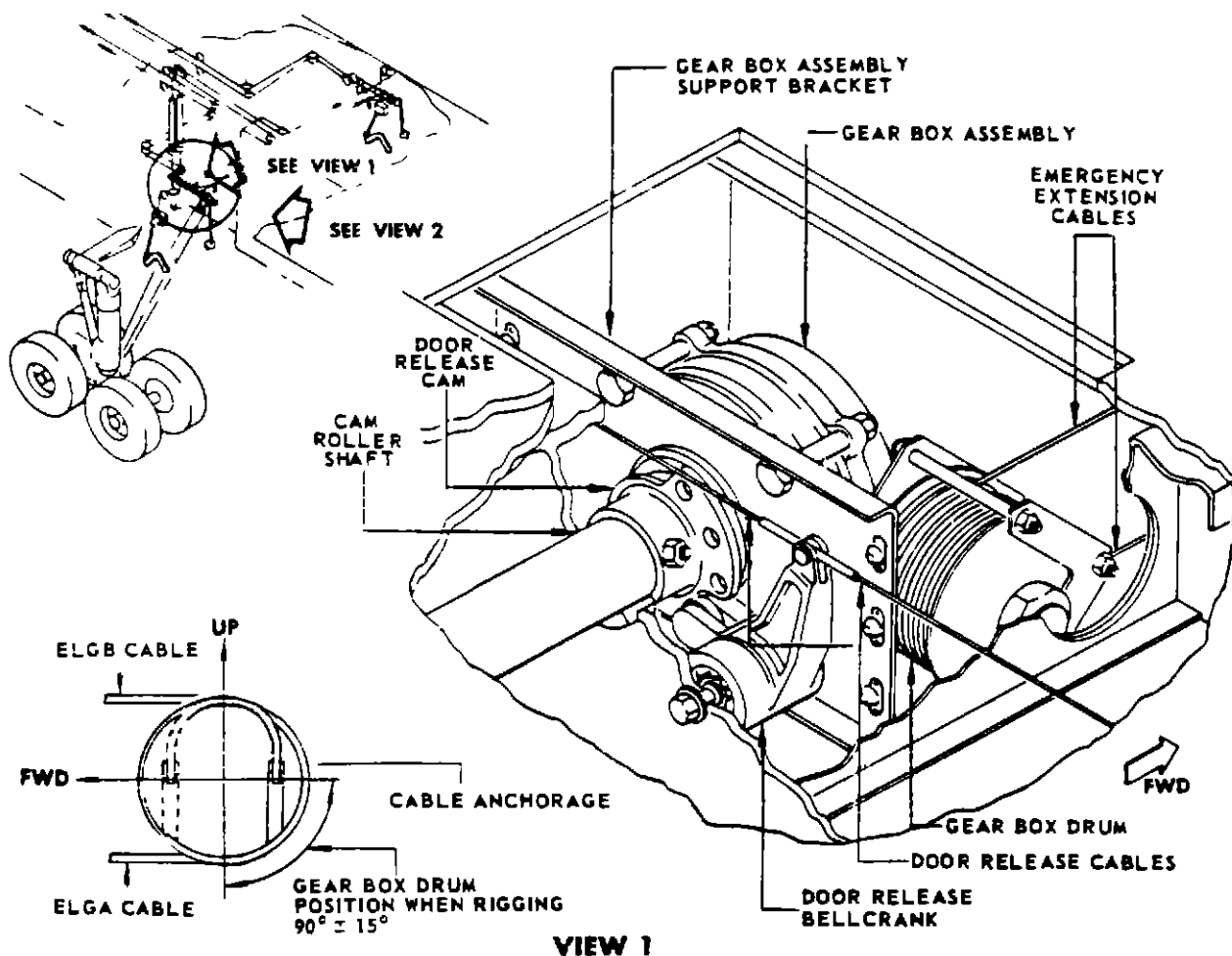
NOTE: Centering drum may be left hanging from idler arm.

B. Install Main Gear Emergency Extension Mechanism

- (1) Insert cam roller shaft (figure 201) aft through front bushing
- (2) Have man in wheel well area to install centering drum, cam roller arm, and cam roller spacer in that order.
- (3) Slide shaft through aft bushing and install unlock arm pickup cam, unlock arm, and unlock arm retainer. Insert and tighten bolts that fasten these to cam roller shaft.
- (4) Install bolts that attach cam roller arm to cam roller shaft
- (5) Install bolt that attaches centering drum to shaft.
- (6) Connect centering spring to idler cable
- (7) Place door release cam on cam roller shaft and install bolt
- (8) Attach door release cables to door release bellcrank and place bellcrank in position
- (9) Install gearbox assembly support bracket
- (10) Install door release bellcrank bolt, with serviceable seal ring on bolt, forward from wheel well.
- (11) Attach gearbox assembly to support bracket
- (12) Attach emergency extension cables to gearbox drum.

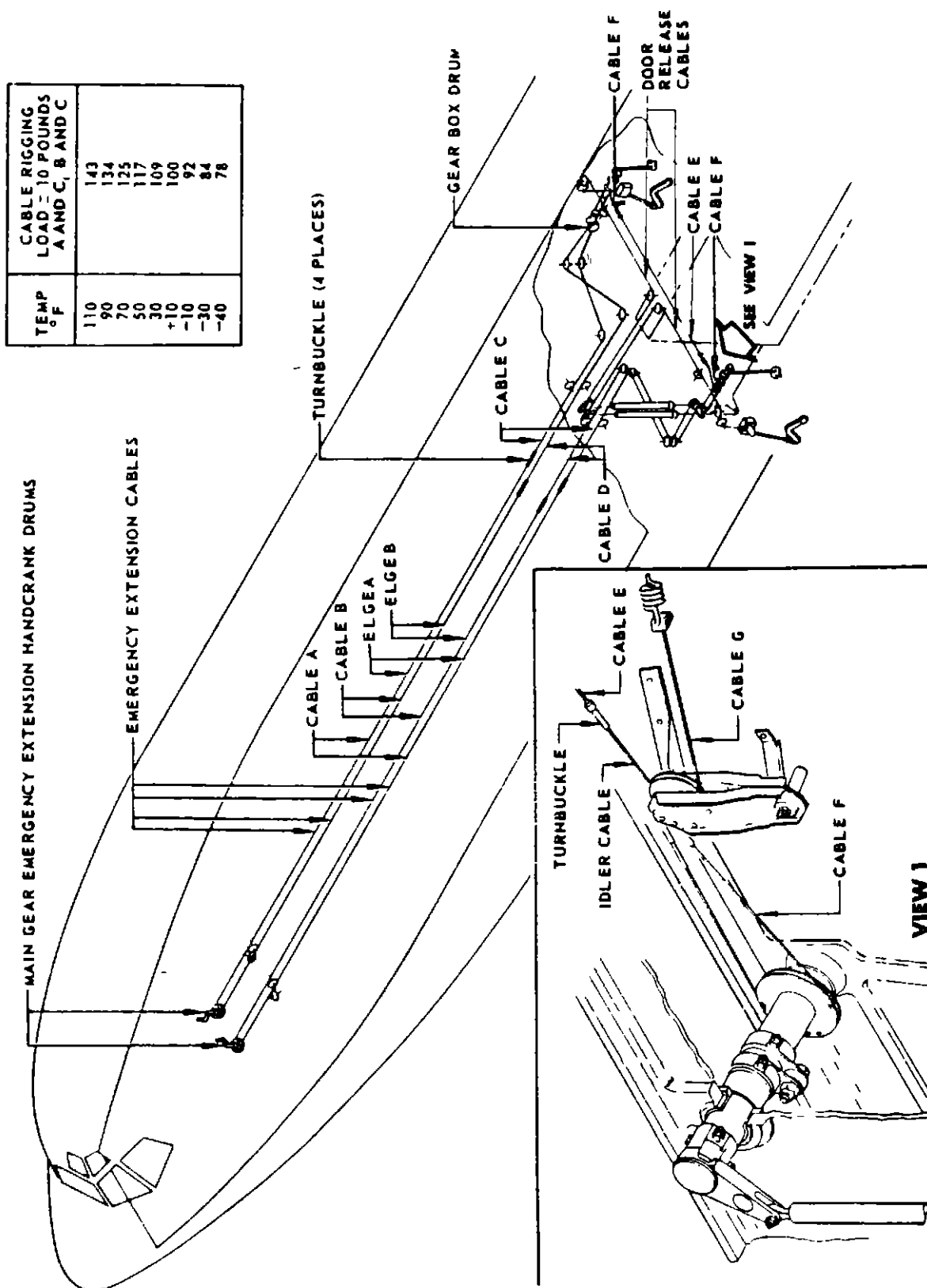
NOTE: Wrap cable C (ELGEA) 3-1/2 turns and cable D (ELGEB) 4 turns around gearbox drum (See figure 202.)

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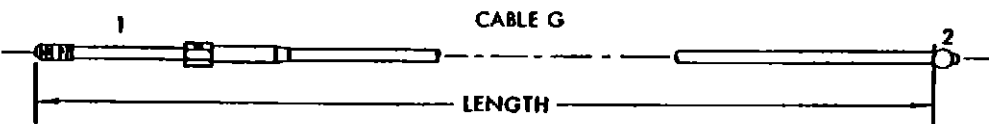
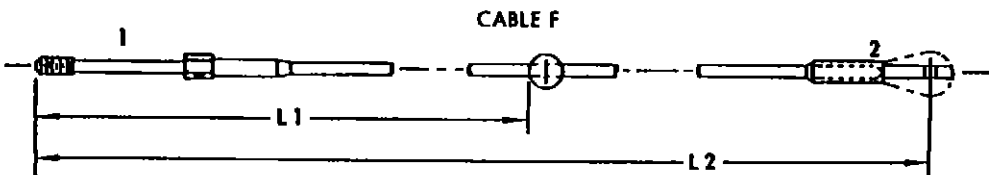
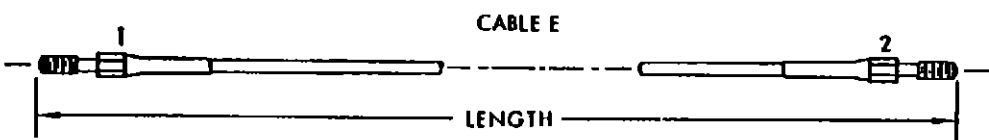
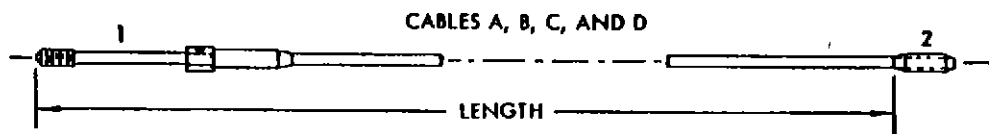
Main Gear Emergency Extension Mechanism Installation
Figure 201



TEMP ° F	CABLE RIGGING LOAD = 10 POUNDS A AND C, B AND D
110	143
90	134
70	125
50	117
30	109
+10	100
-10	92
-30	84
-40	78

Main Gear Emergency Extension Cables Installation
 Figure 202 (Sheet 1)

CABLE FUNCTION	CABLE REF.	DRAWING NO	NO REQ.	LENGTH	CABLE SIZE	FITTINGS		
						1	2	3
ELGEA	A	BAC-C13AM4D-6756	2	675.6 IN.	1/8 7 x 19	MS21260L4LH	BAC-T14A-4	
ELGEA	A	BAC-C13AM4D-6817	2	681.7 IN.	1/8 7 x 19	MS21260L4LH	BAC-T14A-4	
ELGEB	B	BAC-C13AM4D-6596	2	659.6 IN.	1/8 7 x 19	MS21260L4LH	BAC-T14A-4	
ELGEB	B	BAC-C13AM4D-6657	2	665.7 IN.	1/8 7 x 19	MS21260L4LH	BAC-T14A-4	
ELGEA	C	BAC-C13AM4E-2027	2	202.7 IN.	1/8 7 x 19	MS21260L4RH	BAC-T14A-4	
ELGEB	D	BAC-C13AM4E-2200	2	220.0 IN.	1/8 7 x 19	MS21260L4RH	BAC-T14A-4	
	E	NAS-303-00-785	1	78.825 IN.	3/32 7 x 7	MS21269S3RH	MS21269S3RH	
	F	60-318B-3005	2	L1 13.3 IN. L2 26.7 IN.	1/16 7 x 7	MS21260-2RH	RA-2487-2	AM668-2
	G	BAC-C13AM3F-136	2	13.6 IN.	3/32 7 x 7	MS21260S3LH	BAC-T14B-3	



TWA N786TW thru N792TW
WAI N373WA thru N375WA
SABENA OO-SJA thru OO SJH
All VT DJI thru VT DSI
CAL N17321 thru N17324

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



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- (13) Attach emergency extension cables to the handcrank drum under the control cabin floor.
- (a) On airplanes listed below wrap cable A (ELGEA) 3-1/2 turns and cable B (ELGEB) 3 turns around hand crank drum.
- | | |
|------------------------|------------------------|
| SAB OO-SJA thru OO-SJG | AII VT-DJI thru VT-DSI |
| TWA N760TW thru N793TW | CAL N17321 thru N17324 |
| WAI N373WA thru N375WA | |
- (b) On airplanes listed below wrap cable A (ELGEA) 4 turns and cable B (ELGEB) 3-1/2 turns around hand crank drum.
- | | |
|------|-----------|
| TCA | LX-N20198 |
| | LX-N20199 |
| RTCA | LX-N19997 |
| | LX-N20000 |
- NOTE: For cable general installation information, see Control Cable System General, Chapter 27.
- (14) Set handcrank drum in neutral position with index marks aligned within ± 5 degrees.
- (15) Fasten handcrank drum to floor beam under control cabin floor.
- (16) Connect emergency extension cables at turnbuckles. (See figure 202.)
- (17) Adjust the system per following paragraph.

2. Adjustment/Test Main Gear Emergency Extension Mechanism

A. Adjust Main Gear Emergency Extension Cables

- (1) With all components installed, locate unlock arm in left wheel well to provide a space of 0.86 (± 0.03) inches between outer edges of unlock arm and unlock arm pickup cam (figure 201).
- (2) Hold unlock arm in position as above and pull idler arm inboard to within 0.14 ($+0.03/-0.08$) inches of stop.
- (3) Adjust upper centering cable until both portions of cable are equally tight.

NOTE: It is essential that both portions of the cable be taut. Remove material from the stop as necessary to meet the above requirements. Limit material removed to one-eighth inch. If above this limit, check cables, pulleys etc., per paragraph 3.

- (4) Repeat steps (1), (2), and (3) in right wheel well.
- (5) Adjust turnbuckle on idler cable in left wheel well until centering spring is extended 12.10 ($+0.04/-0.06$) inches. (See figure 201.)



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- (6) Check that 0.86 dimension is within tolerance. If necessary repeat steps (3), (4) and (5).
- (7) With 0.86 dimension held, set gearbox drum with cable anchorages vertical within $\pm 15^\circ$ (anchor points down).
- (8) Check that upper cable in left installation is in inboard groove, and upper cable in right installation is in outboard groove.

NOTE: Upper cables in both installations have 4 turns wrap around gearbox drum. Lower cables have 3 1/2 turns wrap around drum.

- (9) Check that handcrank drums are in neutral position with index marks aligned within ± 5 degrees.

NOTE: Inboard cables in both installations (LH and RH) have 3 turns wrap around drum. Outboard cables in both installations have 3-1/2 turns wrap around drum. Slots originate outboard.

- (10) Tension cables to values given in figure 202 and lock all adjustments.
- (11) Adjust main gear door ground release cable. (Refer to 32-3-61.)

B. Test Main Gear Emergency Extension Mechanism

(1) General

- (a) The emergency extension mechanism is first tested with hydraulic system pressurized, then retested with pressure off. When pressurized, allow system to sit for 10 minutes before conducting test.

CAUTION: WHEN TESTED WITH PRESSURE ON, LANDING GEAR CONTROL MUST BE IN "OFF" POSITION.

- (b) Rigging of landing gear selector valve controls and door ground release mechanism must be correct to prevent back pressuring of the system. Any evidence of back pressure denotes incorrect rigging.

(2) Test emergency extension mechanism (pressure on)

- (a) Jack airplane until all wheels clear ground. See Chapter 7, "Jacking."
- (b) Retract landing gear, and then move control handle to "OFF" position.
- (c) Open access doors to emergency crank sockets in control cabin floor.

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- (d) Check that index mark on crank sockets matches mark on triangular bearing retainer on top of drum housings.

CAUTION: THE CONTROL MECHANISM MUST BE IN NEUTRAL POSITION WHEN BEGINNING THE EMERGENCY EXTENSION AND RETURNED TO THE NEUTRAL POSITION AFTER COMPLETION OF CRANK ROTATION IN EITHER DIRECTION. CONTROL MECHANISM NOT BEING IN NEUTRAL POSITION, BEFORE STARTING CRANK ROTATION, CAN CAUSE GEAR TO NOT EXTEND PROPERLY TO THE DOWN AND LOCKED POSITION.

- (e) Insert emergency crank in socket and rotate 3 turns, clockwise for left gear, counterclockwise for right gear.
- (f) Check that force required to break main gear loose does not exceed 50 pounds at crank handle.

NOTE: If force required to move handle exceeds 50 pounds cycle system 12 to 15 times. If force still exceeds 50 pounds, system must be investigated to find cause of excessive friction.

- (g) Check to ensure that door opening is sufficient to allow tires to be guided past doors by the safety bars.
- (h) Check for binding or jamming of tires on doors.
- (i) Check that landing gear doors have opened and that the gear has fallen to down position by the time 3 full turns of emergency crank have been made.
- (j) Check gear and door red warning lights for ON.
- (k) Push crank handle, with a maximum of 10 pounds force against stop after rotating crank to stop. Release handle and check that control mechanism returns to the neutral position.

NOTE: When crank is rotated in either direction a spring is put in tension which under normal conditions will return the control mechanism to neutral automatically when the crank handle is released. When in neutral the index mark on crank sockets will match the mark on triangular bearing retainer on top of drum housings.

- (l) With control mechanism in neutral rotate crank about 3-1/2 to 4 turns to stop; counterclockwise for left gear, clockwise for right gear.

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- (m) Check that downlock engages.
 - (n) Repeat step (k) for centering from opposite direction.
 - (o) Check that downlocks on each gear are in full engagement.
 - (p) Check main landing gear down locked green indicator lights for ON.
- (3) Test emergency extension mechanism (pressure off).
- (a) Repeat above tests for main gear extension system with pressure off. Control handle may be in OFF or DOWN position.
3. Inspection/Check Main Gear Emergency Extension Cables
- A. Examine Main Gear Emergency Extension Cables
- (1) Check main gear emergency extension cables for fraying and corrosion.
 - (2) Examine cable seals for deterioration, out of round wear, and insecurity of mounting rings.
 - (3) Check pulley brackets for cracks, distortion and loose mounting bolts.
 - (4) Check pulleys and fairleads for cracks, looseness and misalignment.
 - (5) Check cables for specified rigging.
 - (6) Examine emergency extension cables for wear per figure 203.

CABLE (SEE FIGURE 202)	CABLE SIZE	ALLOWABLE PER CENT WEAR OF OUTER WIRES BEFORE REPLACEMENT
A B C AND D	1/8 7 x 19	50
E AND G	3/32 7 x 7	50
F	1/16 7 x 7	50

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NOSE GEAR EMERGENCY EXTENSION MECHANISM - MAINTENANCE PRACTICES

1. Removal/Installation Nose Gear Emergency Extensior Mechanism

A Equipment and Materials

- (1) Rigging pins 5/16 inches diameter

B Remove Nose Gear Emergency Extension Mechanism

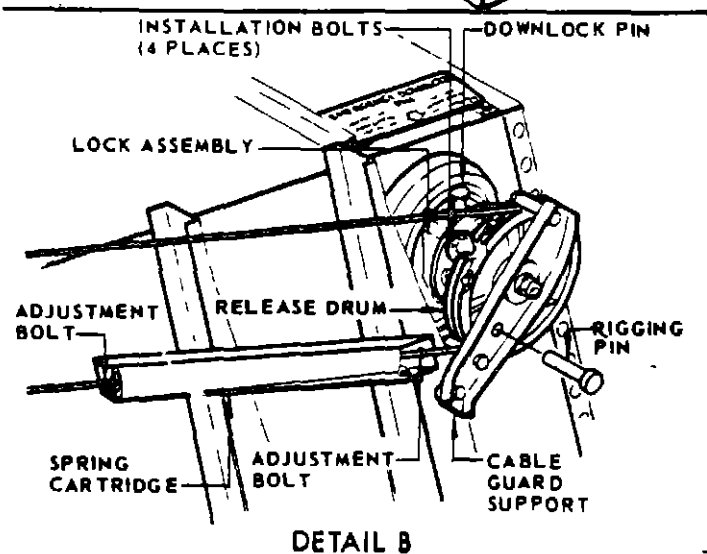
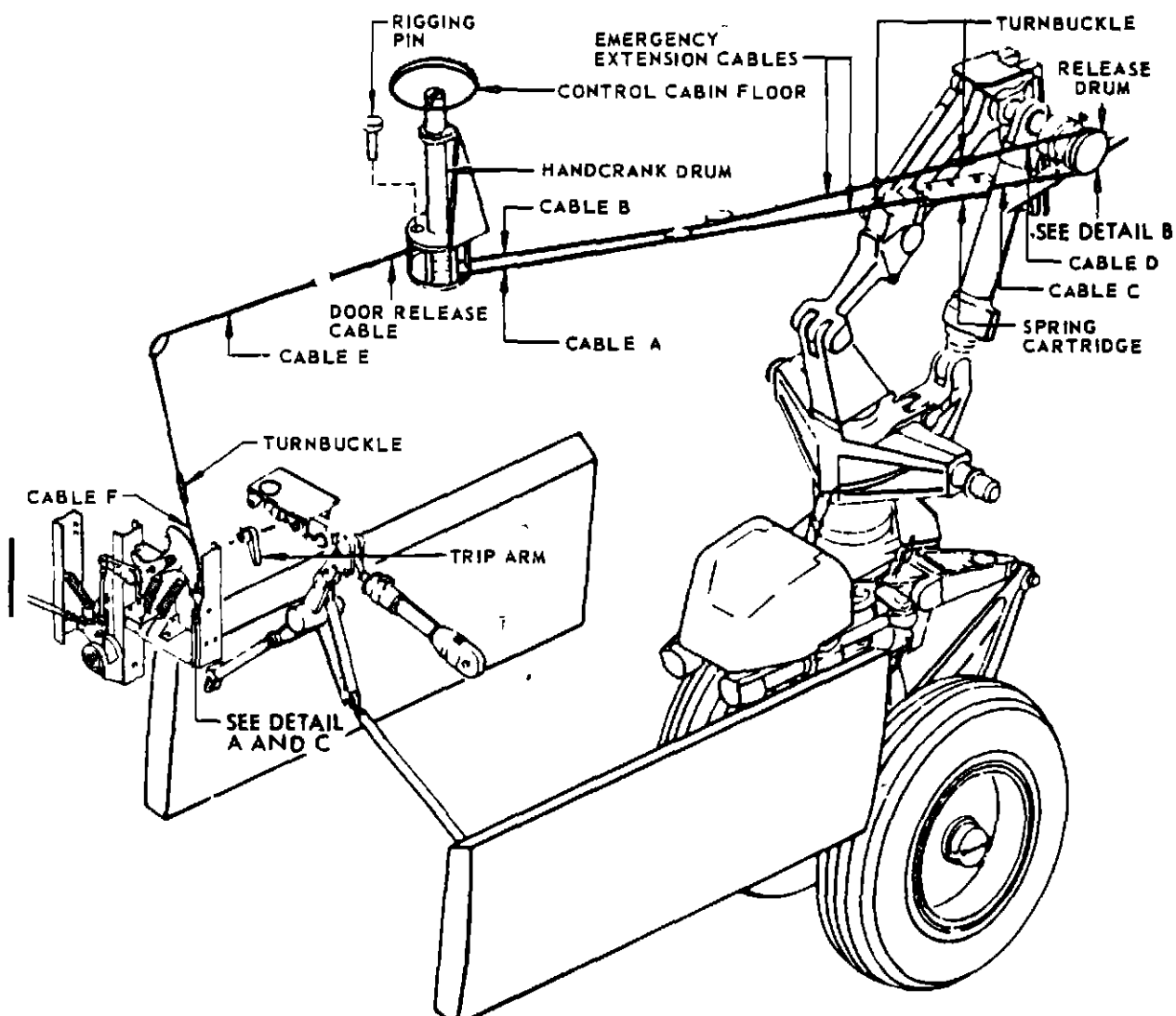
- (1) Release tension on nose gear emergency extension cables (figure 201) and nose gear door release cable
- (2) Remove bolts attaching handcrank drum under control cabin floor.
- (3) Remove the cables from handcrank drum
- (4) Remove the release drum cable guard support
- (5) Remove the spring cartridge.
- (6) Remove the cable retaining cotter pins from the release drum and remove cables from drum.
- (7) Remove four installation bolts through release drum and lock assembly Take off release drum and lock assembly
- (8) In the lower nose compartment on nose wheel well forward bulkhead, remove installation bolt through dog, crank shaft and retainer
- (9) Remove quadrant spring and cable from door release quadrant
- (10) Take off retainer, door ground release upper arm, dog, and quadrant

NOTE. Let door ground release upper arm and push-pull rod hang from rod lower attachment

C Install Nose Gear Emergency Extension Mechanism

- (1) Position lock assembly and release drum and install four installation bolts. (See detail B, figure 201)
- (2) Place the cables (C and D) or the release drum and install the cable retaining cotter pins
- (3) Install the release drum cable guard support
- (4) Install rigging pin through cable guard support and release drum.

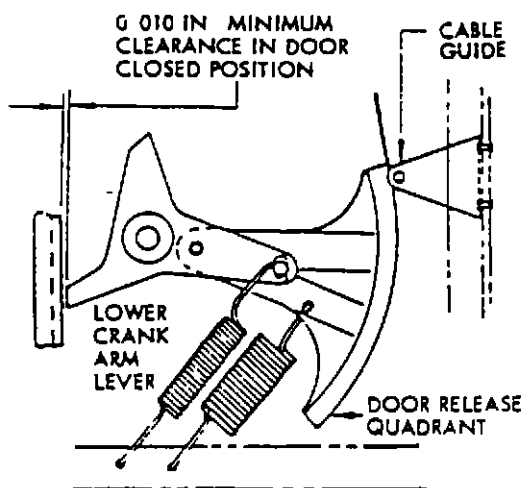
MAINTENANCE MANUAL



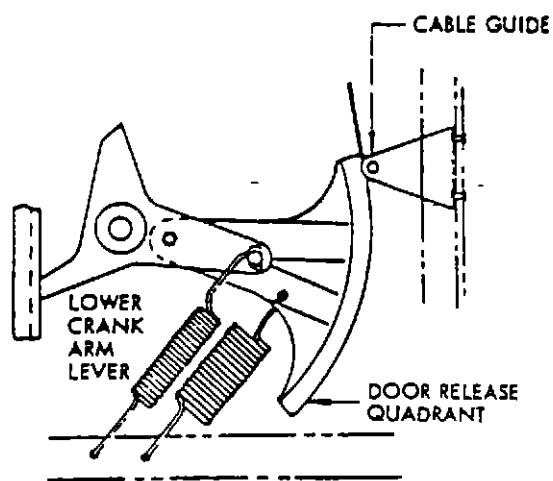
TEMP °F	CABLE RIGGING LOAD - 10 POUNDS A AND B
110	93
90	84
70	75
50	67
30	59
+ 10	50
- 10	42
30	34
- 40	28

Nose Gear Emergency Extension Mechanism Installation
Figure 201 (Sheet 1)

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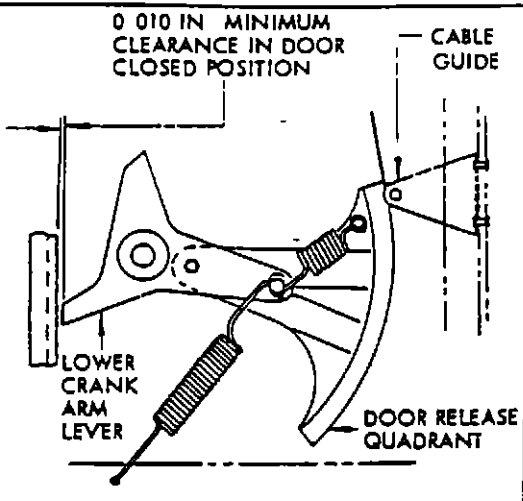
DETAIL A



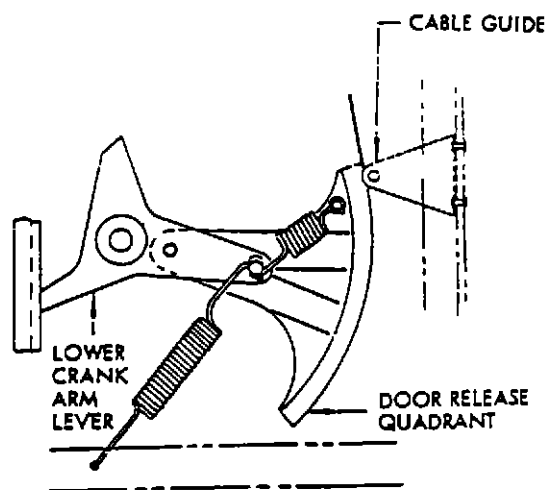
DETAIL C

EFFECTIVITY

BOAC	C-APFB THRU G-ARRC
DLH	D-ABOB THRU D-ABOX
VARIG	PP-VJA AND PP-VJJ
ALL	VI-DJI THRU VT-DSI
SABENA	OO-SJA THRU OO-SJH



DETAIL A



DETAIL C

EFFECTIVITY

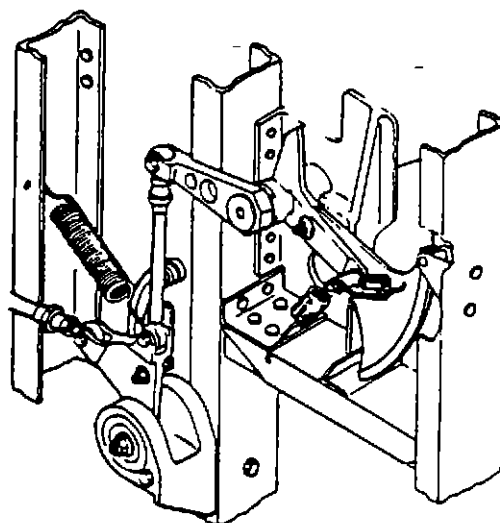
TCA	LX-N20198
	LX-N20199
RTCA	LX-N19997
	LX-N20000

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EFFECTIVITY

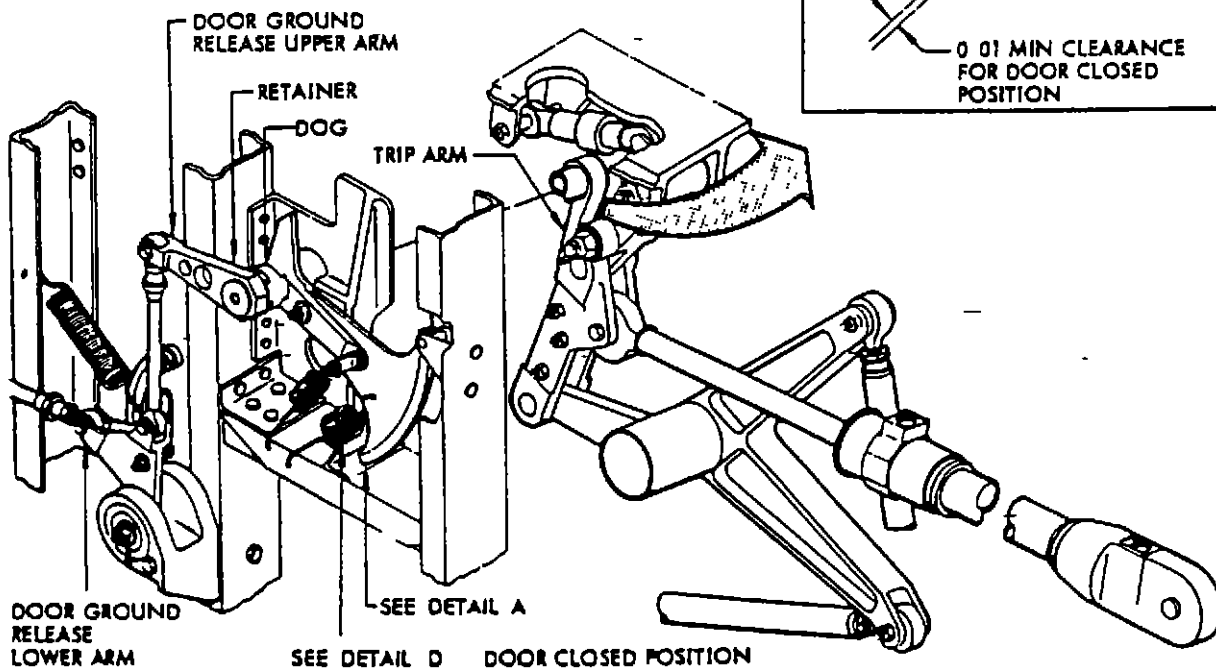
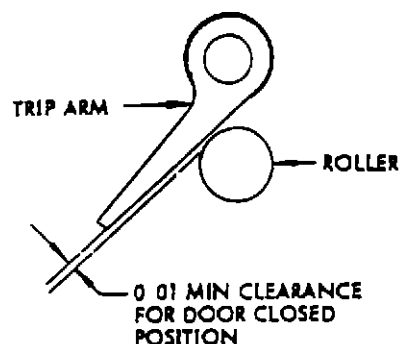
TCA	LX-N20198
	LX-N20199
RTCA	LX-N19997
	LX-N20000



DOOR CLOSED POSITION

EFFECTIVITY

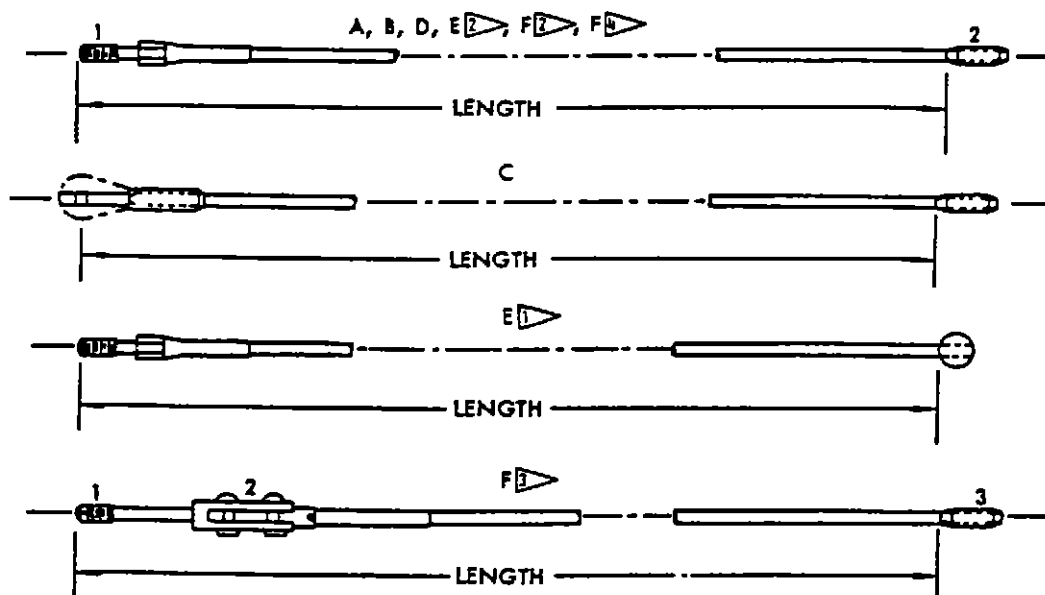
BOAC	G-APFB THRU G-ARRC
DLH	D-ABOB THRU D-ABOX
VARIG	PP-VJA AND PP-VJJ
ALL	VI-DJI THRU VT-DSI
SABENA	OO-SJA THRU OO-SJH





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CABLE REF	DRAWING NO.	NO REQ	LENGTH	CABLE SIZE	FITTINGS		
					1	2.	3.
A	BACC13G466-642	1	64.2 IN.	1/8 7 x 19	AN669S4LH	BACT14A4	BACT14A3
B	BACC13G469-796	1	79 6 IN.	1/8 7 x 19	AN669L4LH	BACT14A4	
C	BACC13G472-224	1	22 4 IN.	1/8 7 x 19	AN668-4	BACT14A4	
D	BACC13G468-238	1	23 8 IN.	1/8 7 x 19	AN669S4RH	BACT14A4	
E	BACC13G330-292	1	29.2 IN.	3/32 7 x 7	AN669S3RH	BACT1483	
F	BACC13AM4C292	1	29 2 IN.	1/8 7 x 19	MS21260S4RH	BACT14A4	
	69-5833-2	1	18 19 IN.	3/32 7 x 7	60-3276	66-5123	
	BACC13G317-182	1	18 2 IN.	3/32 7 x 7	AN669S3LH	BACT14A3	
	BACC13AM48182	1	18 2 IN.	1/8 7 x 19	MS21260S4LH	BACT14A4	



1 SABENA OO-SJA THRU OO-SJH
All VT-DJI THRU VT-DSI
VARIG PP-VJA AND PP-VJJ

3 SABENA OO-SJA THRU OO-SJF
All VT-DJI THRU VT-DNZ
VARIG PP-VJA

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

4 SABENA OO-SJG AND OO-SJH
All VT-DPM AND VT-DSI
VARIG PP-VJJ



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- (5) Install the nose gear door release cable (E) and nose gear emergency extension cables (A and B) on handcrank drum.

NOTE: Emergency extension cable (A) has a 1/2 wrap and cable (B) 1-1/8 wrap around handcrank drum. For cable general installation information, see Chapter 27, "Control Cable General."

- (6) Install the handcrank drum under control cabin floor.
- (7) Install rigging pin in handcrank drum.
- (8) Connect emergency extension cables (A and B) to cables (C and D).
- (9) Fasten spring cartridge in place, but do not tighten until adjustment of cables is made.
- (10) In lower nose compartment on nose wheel well forward bulkhead place quadrant, dog, door ground release upper arm, and retainer on crank shaft.

NOTE: Make sure that dog is installed with shortest jaws facing forward and that quadrant pivot bolt is finger tightened only.

- (11) Install the installation bolt through dog, crank shaft, and retainer.
- (12) Attach door release cable (F) to quadrant.
- (13) Attach springs to quadrant.
- (14) Rig the system per following paragraph.

2. Adjustment/Test Nose Gear Emergency Extension Mechanism

A. Equipment and Materials

- (1) Rigging pins - 5/16-inch diameter.

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B. Adjust Nose Gear Emergency Extension Mechanism

- (1) Check that main and nose gear down locks are installed.
- (2) Open doppler cavity access panel.
- (3) Open nose wheel well doors using ground door release handle.
- (4) Disconnect door operator rods from nose wheel well doors.
- (5) Pressurize hydraulic system and move ground door release handle to close position to extend door actuator. Check that extended length of actuator is between 22.75 and 22.85 inches and record length.
- (6) With actuator extended and with lower crank arm lever against stop, check that clearance between roller and trip arm is not less than 0.01 inches.
- (7) Move lower crank arm lever away from stop, against return spring force, until trip arm contacts roller.
- (8) Check that gap between lower crank arm lever and structural stop is 0.01 to 0.04 inches. (See figure 201, Detail A.)
 - (a) If minimum clearance cannot be obtained, trim crank arm.
 - (b) If actuator length is 22.85 inches and gap exceeds 0.04, add shims to stop.
 - (c) If actuator length is less than 22.85 inches, the maximum allowable gap is greater than 0.04 by the same amount.

NOTE: The gap lower limit prevents the crank from being driven into the stop by hydraulic actuation. The gap upper limit assures adequate interval between door opening and gear release during manual extension.

- (9) Release lower crank arm.
- (10) Insert rigging pin through support casting and handcrank drum. (See figure 201.)

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- (11) Check that cable (A) has one-half wrap and cable (B) has 1-1/8 wrap around handcrank drum.
- (12) With lower crank arm lever held against stop by its return spring, adjust cable (E) at turnbuckle in lower nose compartment until pin in crank is centered in slot in quadrant. Check that dimension C equals dimension D within ± 0.03 inches as shown in detail C.
- (13) Insert rigging pin through cable guard support and release drum.
(See detail B.)
- (14) Loosen adjustment bolts on spring cartridge.
- (15) Tighten cables (A) and (B) evenly to load specified on chart in figure 201.
- (16) Adjust spring cartridge.
 - (a) Adjust position of support to assure no misalignment of cable. Tighten bolts.
 - (b) Adjust cartridge to hold control system at rigged position.
- (17) Remove rigging pins from handcrank drum and release drum.
- (18) Connect door actuation rods to doors.
- (19) Close nose wheel well doors using ground door release handle.
- (20) Test nose gear emergency extension system per paragraph C.

C. Test Nose Gear Emergency Extension Mechanism

(1) General

- (a) The emergency extension mechanism is first tested with the hydraulic system pressurized, then retested with pressure off. When pressurized, allow the system to sit for 10 minutes before conducting the test.

CAUTION: WHEN TESTED WITH PRESSURE ON, LANDING GEAR CONTROL HANDLE MUST BE IN "OFF" POSITION.



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- (b) Rigging of landing gear selector valve controls and door ground release mechanism must be correct to prevent back pressurizing of the system. Any evidence of back pressure denotes incorrect rigging.
 - (c) The following test procedure assumes that the nose gear emergency system is being tested in conjunction with a main gear test with the entire airplane on jacks. However, an independent test of the nose gear emergency system can be made with only the nose of the airplane jacked. See Chapter 7, Jacking.
- (2) Test nose gear emergency extension mechanism (pressure on).
- (a) With airplane on jacks, landing gear retracted, wheel well doors closed and landing gear control handle in OFF position, open access door to nose gear emergency crank socket in control cabin floor.
 - (b) Check that index mark on crank socket matches index mark on top of bearing retainer on top of drum housing.
 - (c) Insert crank in socket and turn crank clockwise.
 - 1) Check that crank force required to open nose wheel well doors does not exceed 35 pounds.
 - 2) Check that angular movement of crank is between 224 and 252 degrees from the rigged position, and that torque required to break nose gear loose does not exceed 60 pound-feet at crank handle.
- NOTE If torque required to move handle exceeds 60 pound-feet, cycle system 12 to 15 times. If torque still exceeds 60 pound-feet, system must be investigated to find cause of excessive friction.
- (d) When handle has been turned, check that nose gear doors have opened and that gear has fallen to down position before handle reaches stop
 - (e) Check that gear and door red warning lights are on.
 - (f) Release handle and check that control system returns to rigged position.
 - (g) Rotate crank counterclockwise to stop.
 - (h) Check that angular movement of crank is between 80 to 85 degrees from the rigged position.



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- (i) Check that emergency down lock pin is in locked position, and that indicators on lock rod and lock are aligned.
- (j) Disengage emergency down lock pin and check that control system returns to rigged position and that pawl in control drum is in engaged position.

(k) Check that nose gear down locked green indicator light is on.

(3) Test nose gear emergency extension (pressure off).

(a) Repeat above tests for nose gear "extension system with pressure off." Control handle may be in "OFF" or "DOWN" position.

3. Inspection/Check Nose Gear Emergency Extension Mechanism

A. Examine Nose Gear Emergency Extension Cables

- (1) Check nose gear emergency extension cables for fraying and corrosion.
- (2) Examine cable seals for deterioration, out of round wear, and insecurity of mounting rings.
- (3) Check pulley brackets for cracks, distortion, and loose mounting bolts.
- (4) Check pulleys and fairleads for cracks, looseness and misalignment.
- (5) Check cables for specified rigging.
- (6) Examine emergency extension cables for wear per figure 202.

B. Visually check lower crank arm lever for cracks.

CABLE (SEE FIGURE 201)	CABLE SIZE	ALLOWABLE PER CENT WEAR OF OUTER WIRES BEFORE REPLACEMENT
A, B, C, AND D	1/8 7 X 19	50
E AND F	3/32 7 X 7	50

Nose Gear Emergency Extension Cable Wear Limits

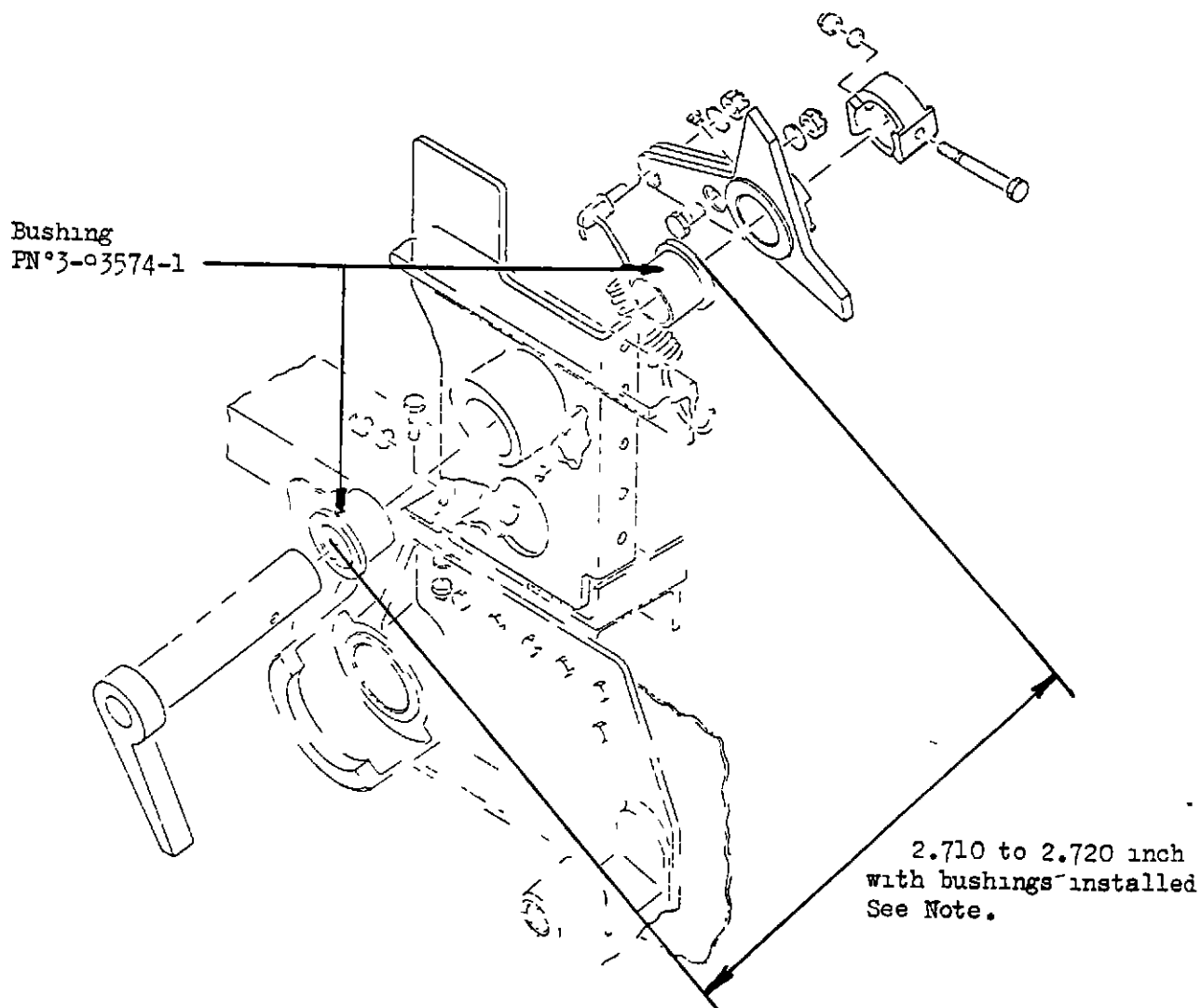
Figure 202

T.E.G.F.L.H.

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NOTE: The flange surface of the two bushings PN° 3-93574-1 may be machined to obtain a crank shaft assy fit of .004 to .008 inch. Minimum thickness of bushing flange is .100 inch.

FIGURE 203 RELEASE INSTALLATION NOSE GEAR DOOR (SB. 2108)

Sub.Rev.March 27. 1966

NOSE WHEEL STEERING SYSTEM - DESCRIPTION AND OPERATION

1. General

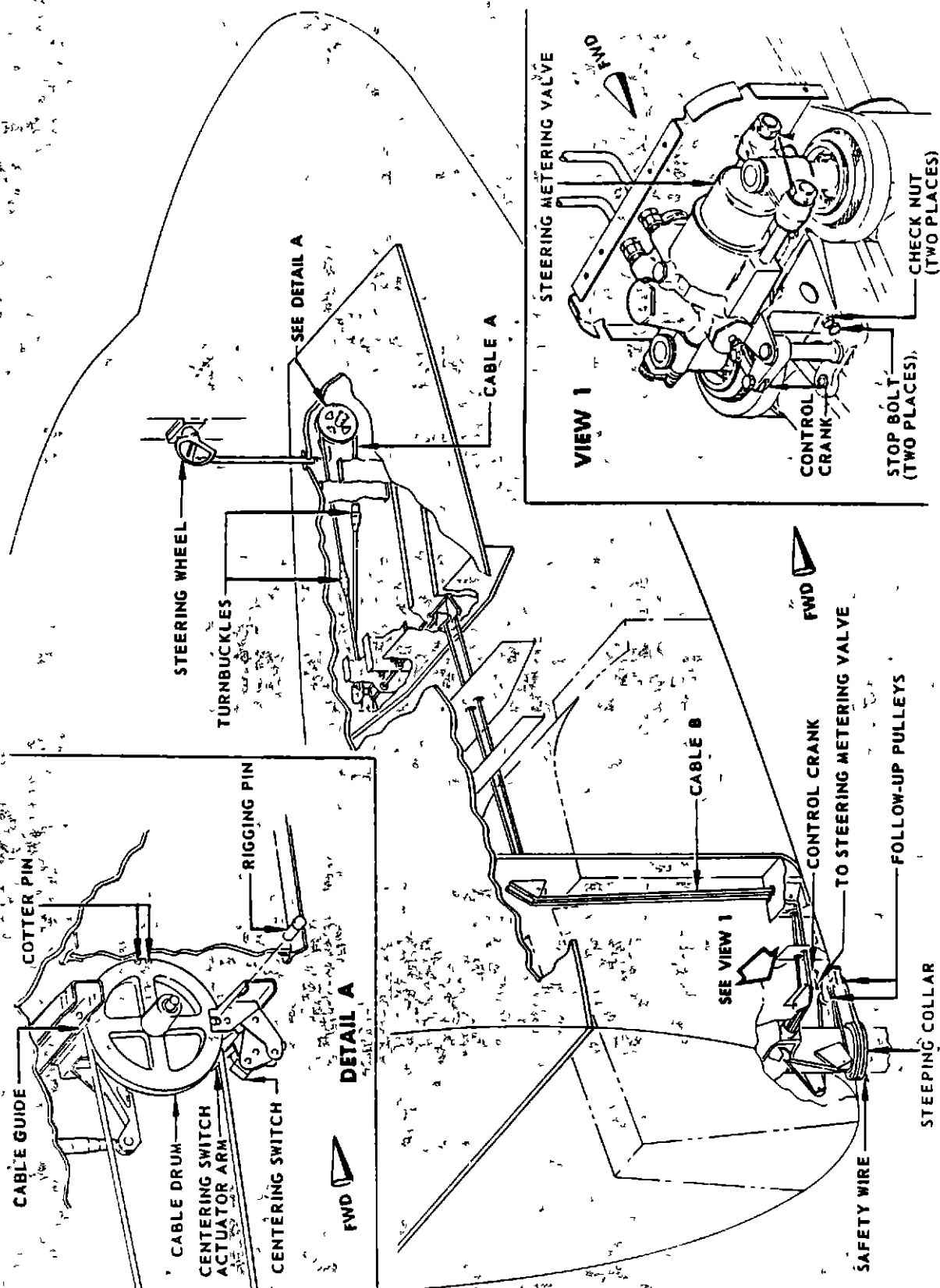
- A. Directional control of the airplane on the ground may be accomplished by steerable nose wheels. Steering wheel movement is transferred through a cable control system to a metering valve. Hydraulic fluid is directed through the metering valve to enter opposite ends of two hydraulic cylinders to turn the nose wheels.
- B. The nose wheel steering system (figure 1) consists of a steering wheel and cable drum, steering control cables, follow-up pulleys, metering valve control crank, a trunnion operated steering shutoff valve, swivel fitting, steering metering valve, and steering cylinders. The remaining linkage in the steering system consist of a steering collar, towing collar, link assembly, and torsion links. (See figure 2.)
- C. The nose wheels are steerable approximately 60 degrees either side of the straight forward position. Hydraulic pressure for steering is obtained from the landing gear hydraulic system down line through the trunnion operated steering shutoff valve. This provides hydraulic pressure to the steering system only when the landing gear control handle is down and the landing gear is extended. Nose wheels may be released from the steering system by a quick disconnect for turns up to 90 degrees when the airplane is being towed.
- D. Centering cams, inside the shock strut, center the nose wheels when the inner cylinder is fully extended. Steering should not be attempted until the shock strut has been compressed at least four inches, to prevent damage to the cams.
- E. A metering valve compensator maintains low hydraulic pressure against both sides of both steering cylinder pistons to provide snubbing and shimmy dampening.

2. Steering Wheel and Cable Drum

- A. The nose wheel steering wheel (figure 1) is located on the pilot's side wall. The steering wheel is fastened by a bracket to a structural frame. A push pull rod interconnects a crank on the steering wheel shaft and a crank on the cable drum shaft. Movement of the steering wheel is transmitted to the cable drum through the cranks and push pull rod linkage. The nose gear can be centered by aligning an arrow located on the steering wheel with an arrow on the side wall panel metal-cal.

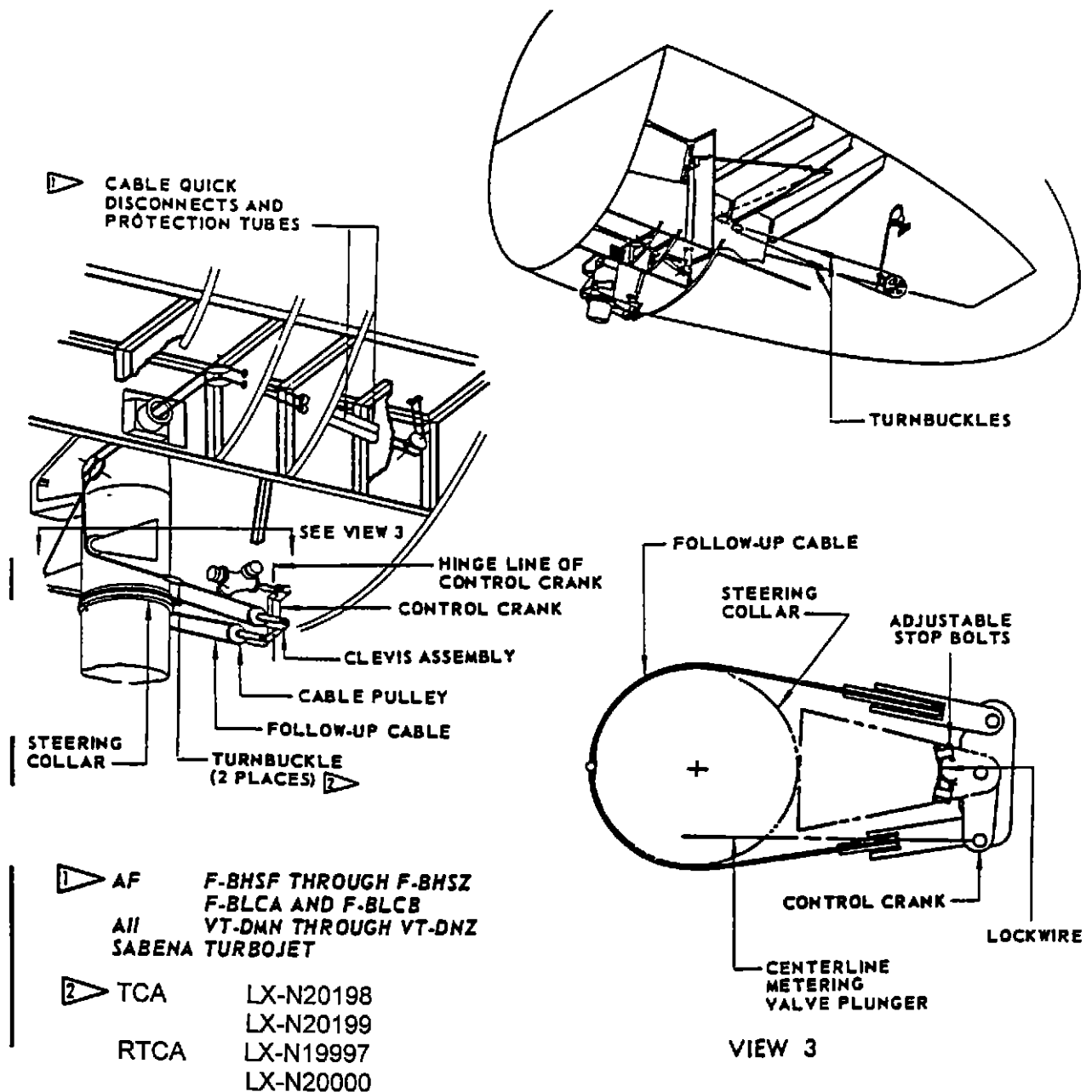
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LANDING GEAR
Nose Wheel Steering System
Description and Operation



Nose Wheel Steering Control Components
Figure 1 (Sheet 1 of 2)

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3 Steering Cable and Linkage

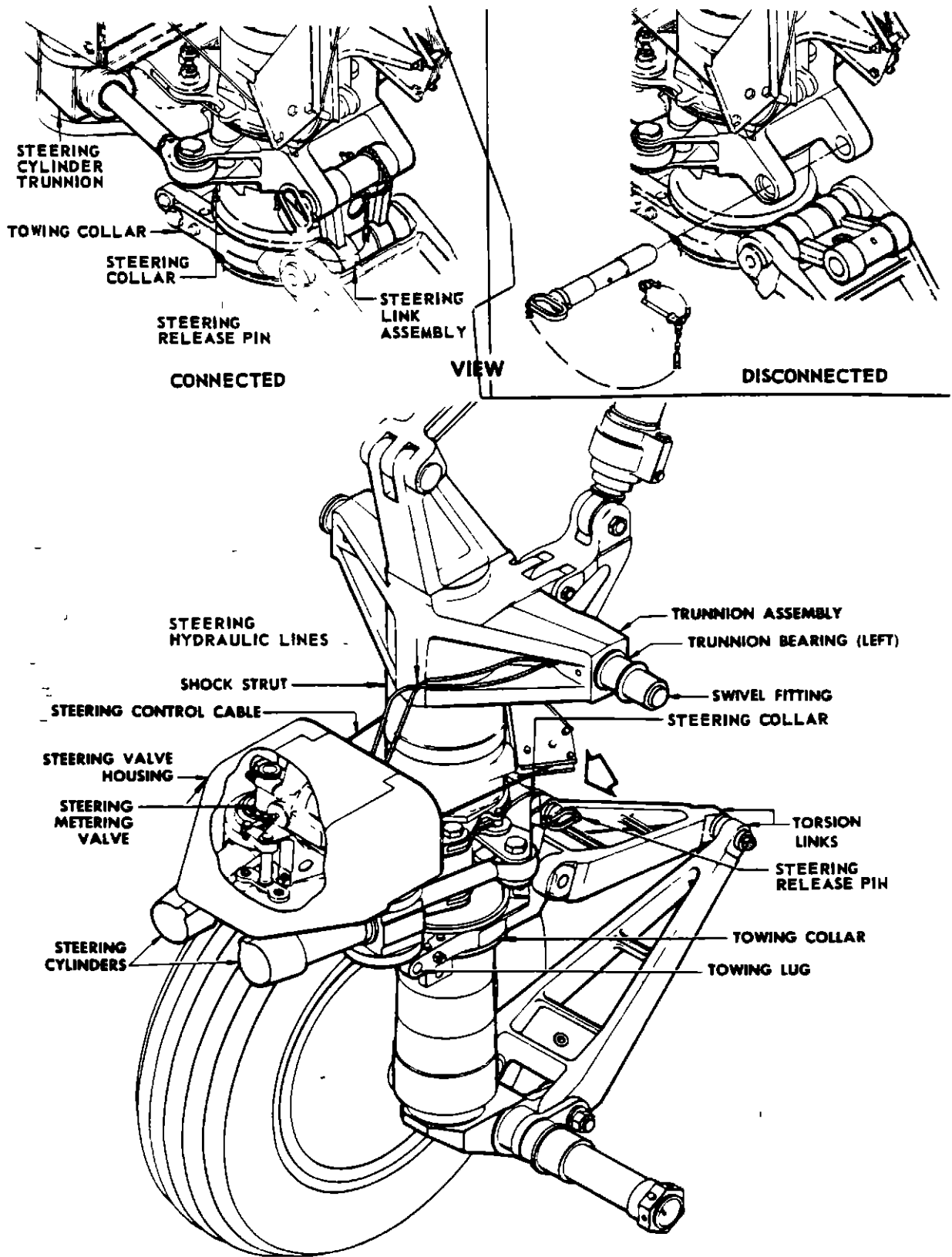
- A The nose wheel cable system (figure 1) consists of two cables of 3/32 inch diameter made of corrosive resistant carbon steel. The first cable runs from a turnbuckle to the control cable drum and back to the other turnbuckle. It is approximately 1.5 m long with a swaged ball at about 145 mm from the center of the cable. The second cable runs from a turnbuckle down to the metering valve around the shockstrut collar and back to the other turnbuckle. It is approximately 1.45 m long with a swaged ball at about 230 mm from the center of the cable. The swaged ball is safety wire locked at the aft side of the shockstrut steering collar.

The steering collar, (figure 2) installed in an annulus on the shock strut outer cylinder, transmits motion from the actuating cylinder down through a link assembly to a towing collar also installed in an annulus on the outer cylinder. From the towing collar, motion is transmitted down through the torsion links to the nose wheel axle and nose wheels. The link assembly should be disconnected from the steering collar for towing. The link assembly is disconnected by pulling out the quick-release pin and removing the steering release pin.

4 Steering Metering Valve

- A The steering metering valve (figure 2), is mounted on the steering cylinders with 10 close tolerance bolts, five on each steering cylinder trunnion. The metering valve directs the hydraulic fluid to the proper side of the two steering cylinders. Shimmy dampening is also provided by a snub compensator incorporated in the metering valve by retaining a certain amount of pressure on the steering cylinders (See figure 3).
- B The metering valve plunger is mechanically actuated by the cable system from the steering wheel, and is spring-loaded to a neutral position. Displacement of the plunger permits hydraulic fluid under pressure to enter the metering valve through a removable hydraulic filter in the pressure inlet passage of the valve. The fluid enters a metering chamber consisting of various sized holes through which the fluid is metered. Metered hydraulic fluid enters the steering cylinders through mating passages of the metering valve and steering cylinders. O-rings are used to seal the mating surfaces around each passage. Fluid from the

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cylinders returns to the airplane system by way of a snub compensator unit within the metering valve assembly. The snub compensator consists of a spring loaded cylinder and relief valve assembly set to relieve return pressure to the airplane system at 70 to 130 psi. The snub compensator is kept full of fluid at all times by a direct bleed passage from the pressure inlet port. Check valves are incorporated between each cylinder pressure and return line to allow the snub compensator pressure to enter the cylinder ports preventing cavitation tendencies during sudden turning forces.

5. Steering Shutoff Valve

- A. The purpose of the shutoff valve (figure 4) in the steering hydraulic system is to keep hydraulic pressure from entering the steering system until the landing gear is down. The valve is a sliding plunger type that is spring-loaded to the shutoff position. The valve is attached to the nose wheel well structure behind the left side of nose gear trunnion. A cam, attached to the aft left side of the nose gear trunnion, depresses (actuates) the valve plunger when the nose gear extends. When the plunger is depressed, hydraulic pressure is directed to the metering valve.

6. Steering Cylinder

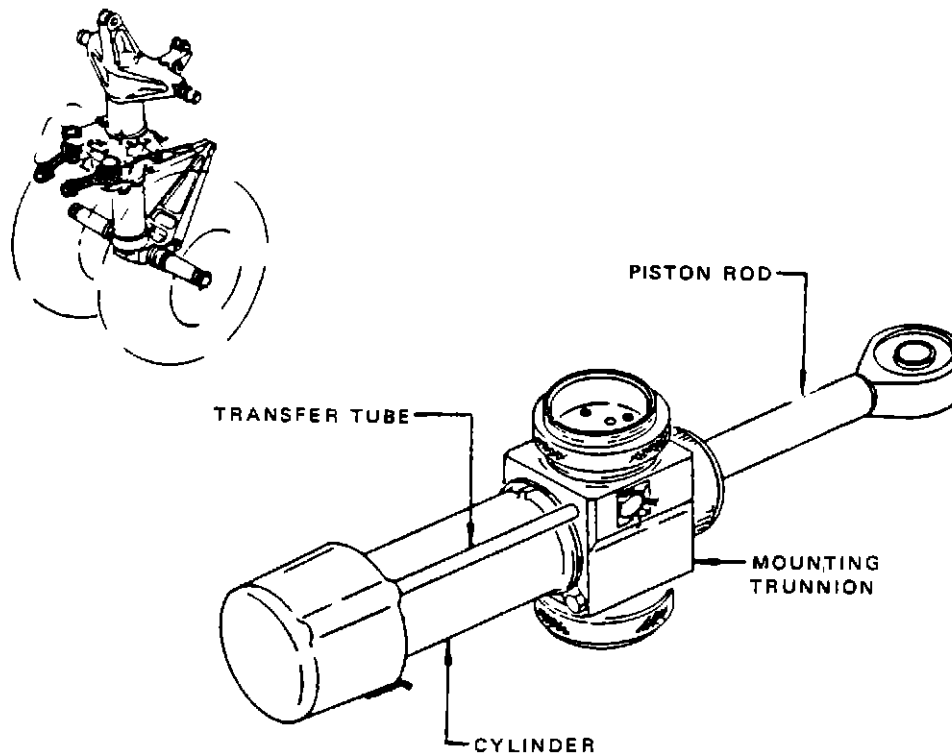
- A. The nose wheel steering cylinder (figure 3) is a double acting hydraulic piston and cylinder assembly, using external fluid transfer tubes to effect a double acting arrangement. Mounting trunnions on the steering cylinder are attached between steering plates fixed to the outer cylinder of the oleo assembly. Bearings in the steering plates allow full swiveling action of the steering cylinder. Hydraulic oil passages are provided within the trunnions, to mate with oil passages in the metering valve mounted directly above the steering cylinder. Close tolerance bolts and faying-surface packings are provided around the oil passages to provide a fluid tight connection.

7. Operation

- A. When the landing gear control handle is placed in the DOWN position, hydraulic pressure is directed through the landing gear down line to the steering shutoff valve, (figure 5). A cam on the aft left side of the nose gear trunnion depresses the shutoff valve plunger as the nose gear reaches down position. When the valve plunger is depressed, hydraulic pressure is directed to the steering metering valve. Although pressure is now available, steering must not be attempted until the shock strut has been compressed at least 4 inches. If steering is attempted, with inner cylinder extended, the centering cams within the shock strut will be damaged.

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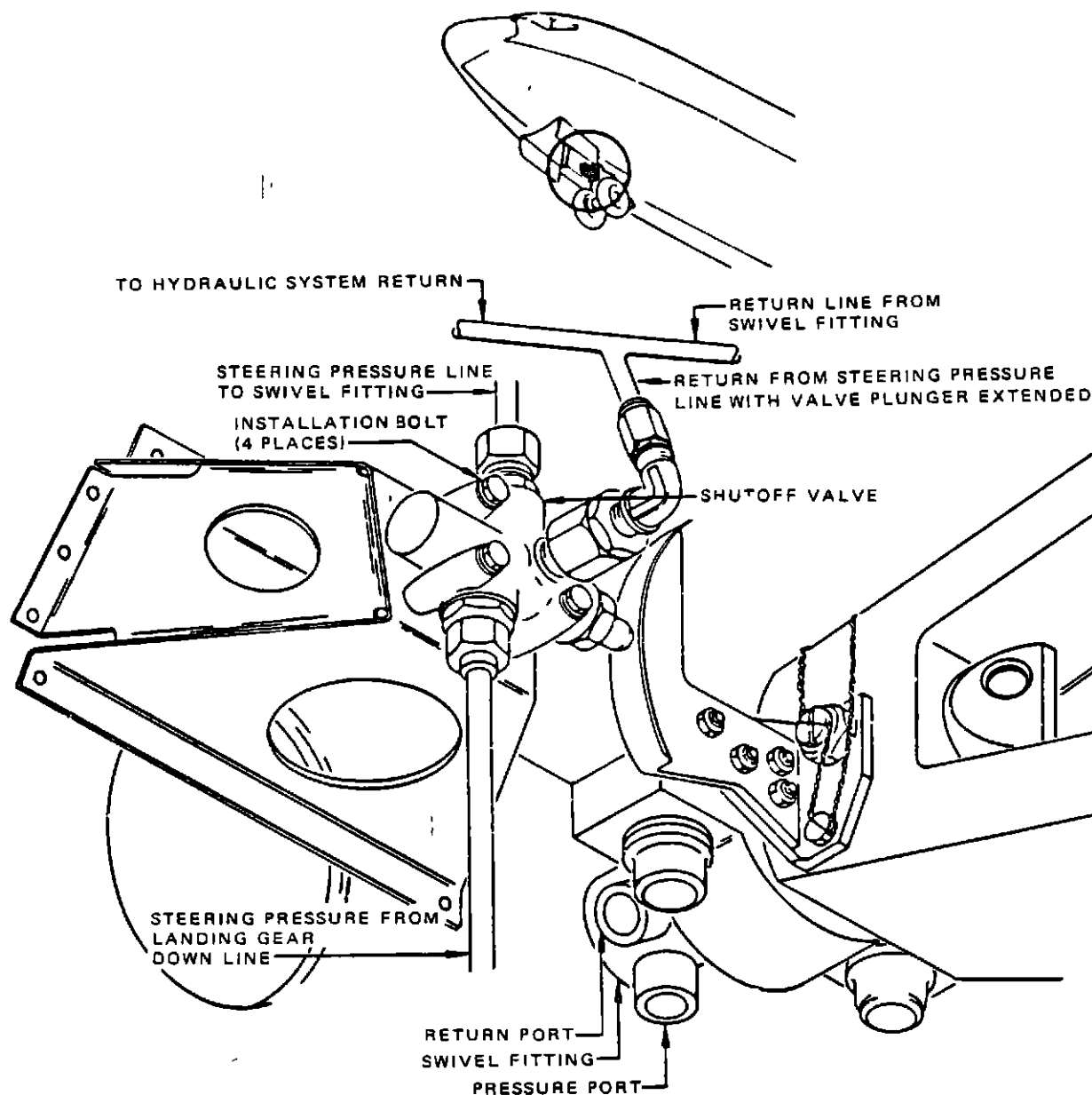
- B By turning the steering wheel, motion is transferred through the cable system to the control beam and arm. The control beam and arm will displace the metering valve plunger. This will open the valve to distribute hydraulic pressure to the steering cylinders. Hydraulic pressure will cause the steering cylinder pistons to rotate the nose gear by way of steering collar and torsion links. The motion of the steering collar also actuates the follow up cables. The follow up cables will move and reposition the control beam and arm. This will close the control valve and block the hydraulic pressure, and thus maintain the desired degree of turn. Return fluid from the steering cylinders goes back through the steering metering valve compensator, then to the hydraulic system return. The compensator maintains a small amount of pressure on the cylinders at all times to provide shimmy dampening.





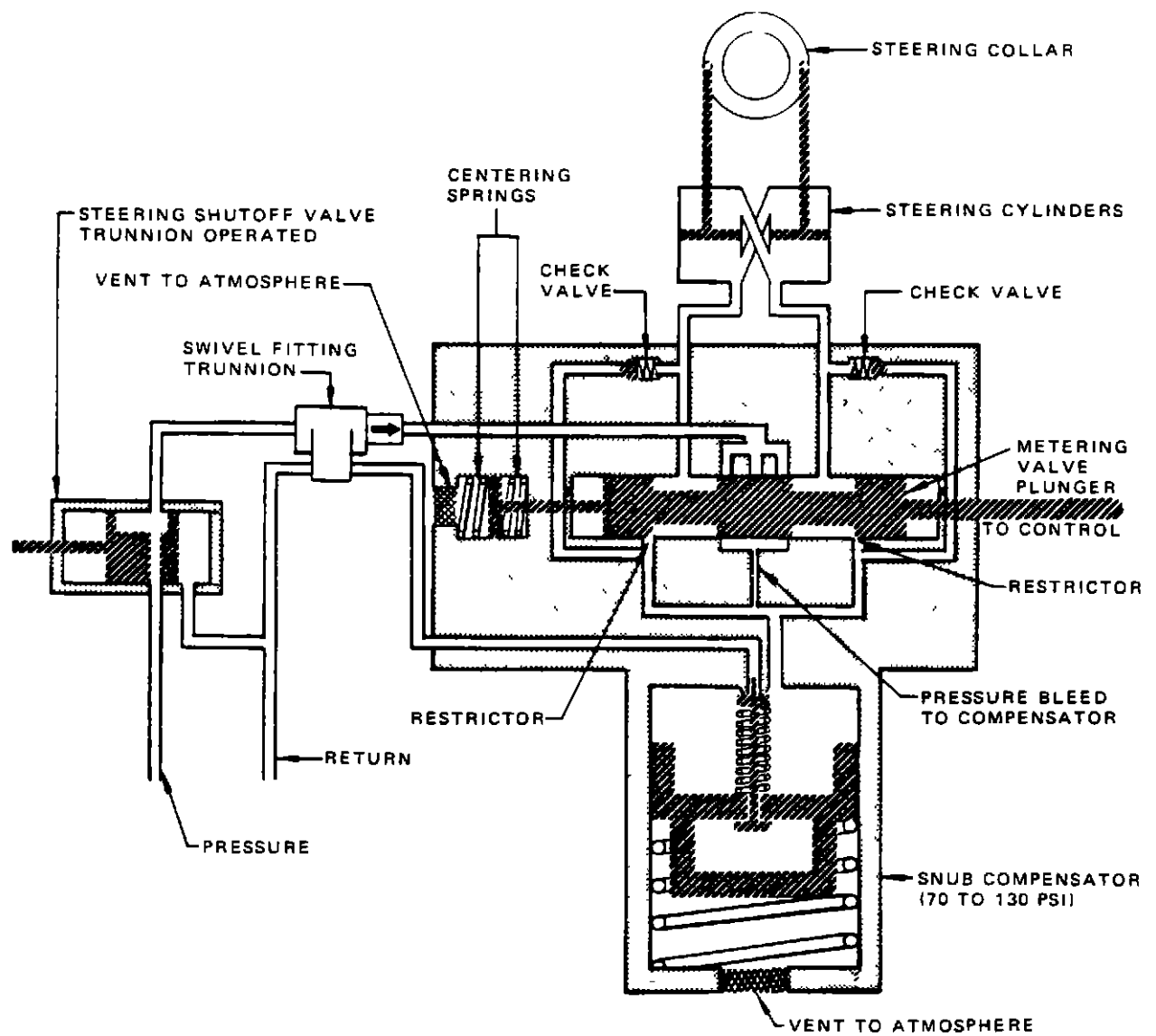
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- C. Release of the steering wheel during a taxi turn will permit the nose wheels and the steering wheel to return to center or neutral due to the cornering forces. Holding the steering wheel during a taxi turn allows just enough metering to overcome the cornering forces.



Steering Shutoff Valve
Figure 4

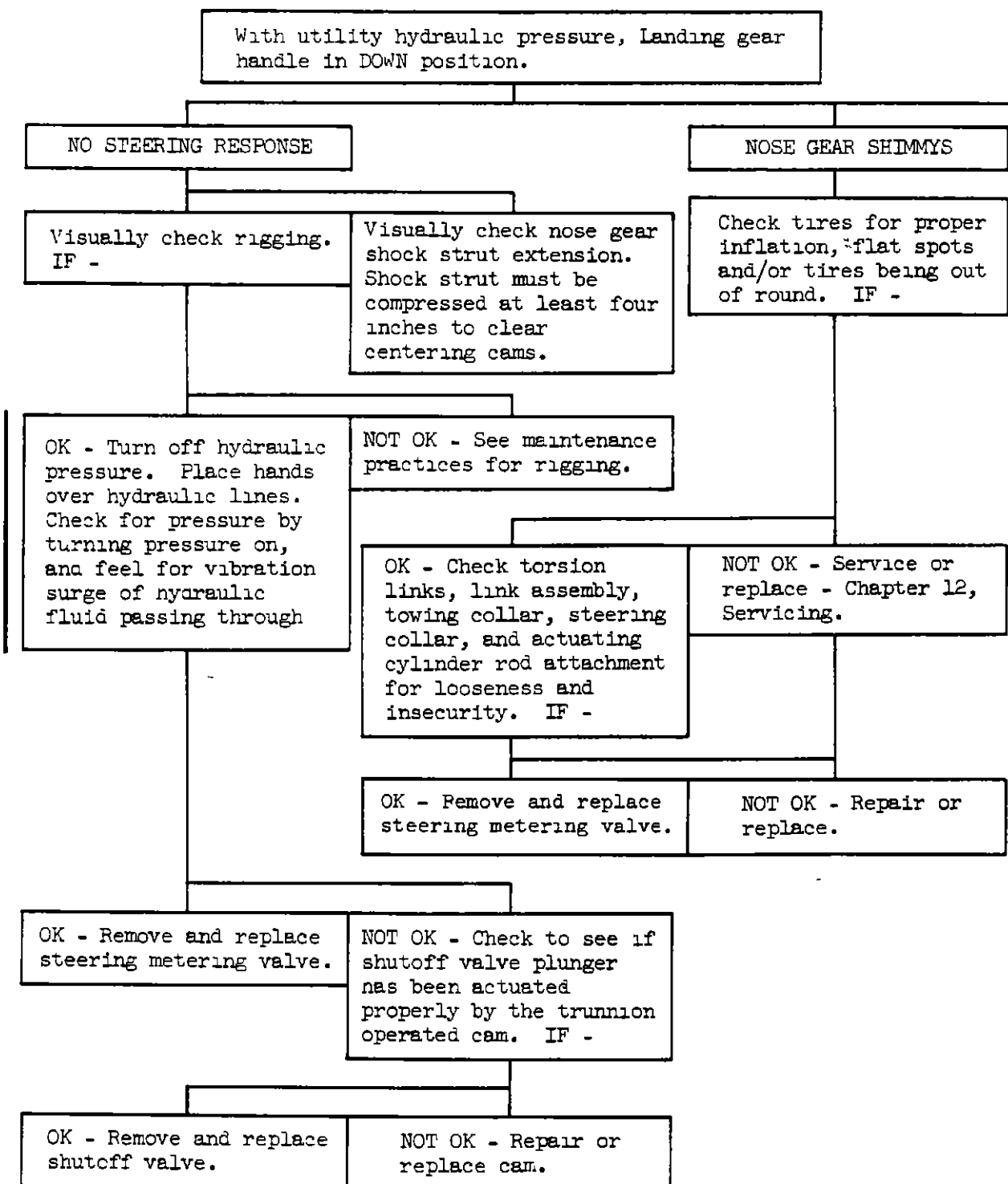
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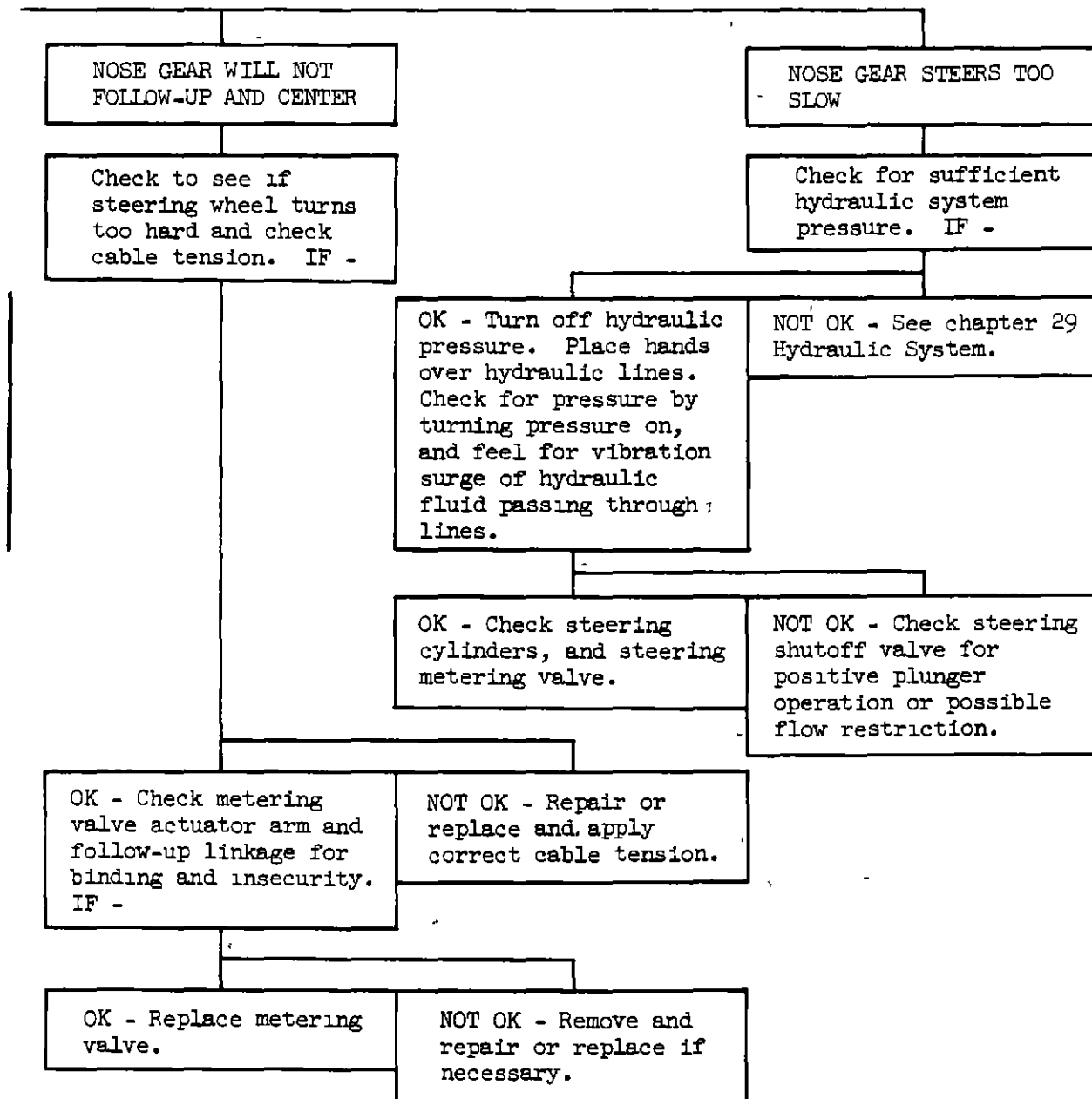


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NOSE WHEEL STEERING SYSTEM - TROUBLE SHOOTING



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NOSE WHEEL STEERING SYSTEM - MAINTENANCE PRACTICES

1. Unit Servicing Nose Wheel Steering System

A. Lubricate Cables in Contact with Magnesium Drums and Quadrants

- (1) Cables in contact with magnesium drums and quadrants require lubricant free of graphite. The magnesium drum in this system is the cable drum linked to the steering wheel. (See figure 201.)
- (2) Refer to Unit Servicing Control Cables, Chapter 27.

2. Adjustment/Test Nose Wheel Steering System

A. Test Nose Wheel Steering System

(1) General

- (a) The nose wheel steering system is tested to determine steering rate, castering and steering wheel centering, and angle of travel. These tests are performed to ensure that the system is free of malfunctions and leaks.
- (b) Prior to conducting the tests the hydraulic system shall have been flushed and the nose wheel steering system properly rigged. Refer to Chapter 29, Flushing Hydraulic System.

(2) Equipment and Materials

- (a) Hydraulic source, for Skydrol 500 hydraulic fluid, capable of delivering approximately 20 gpm flow at 3000 psi.
- (b) Protractor for measuring angular displacement of nose gear.
- (c) Stop watch.
- (d) Pressure gage 0 to 5000 psi.
- (e) Two metal sheets (sandwiched together with grease) that are large enough for nose wheels to rest on.
- (f) Spring scale, at least 30 pound capacity.

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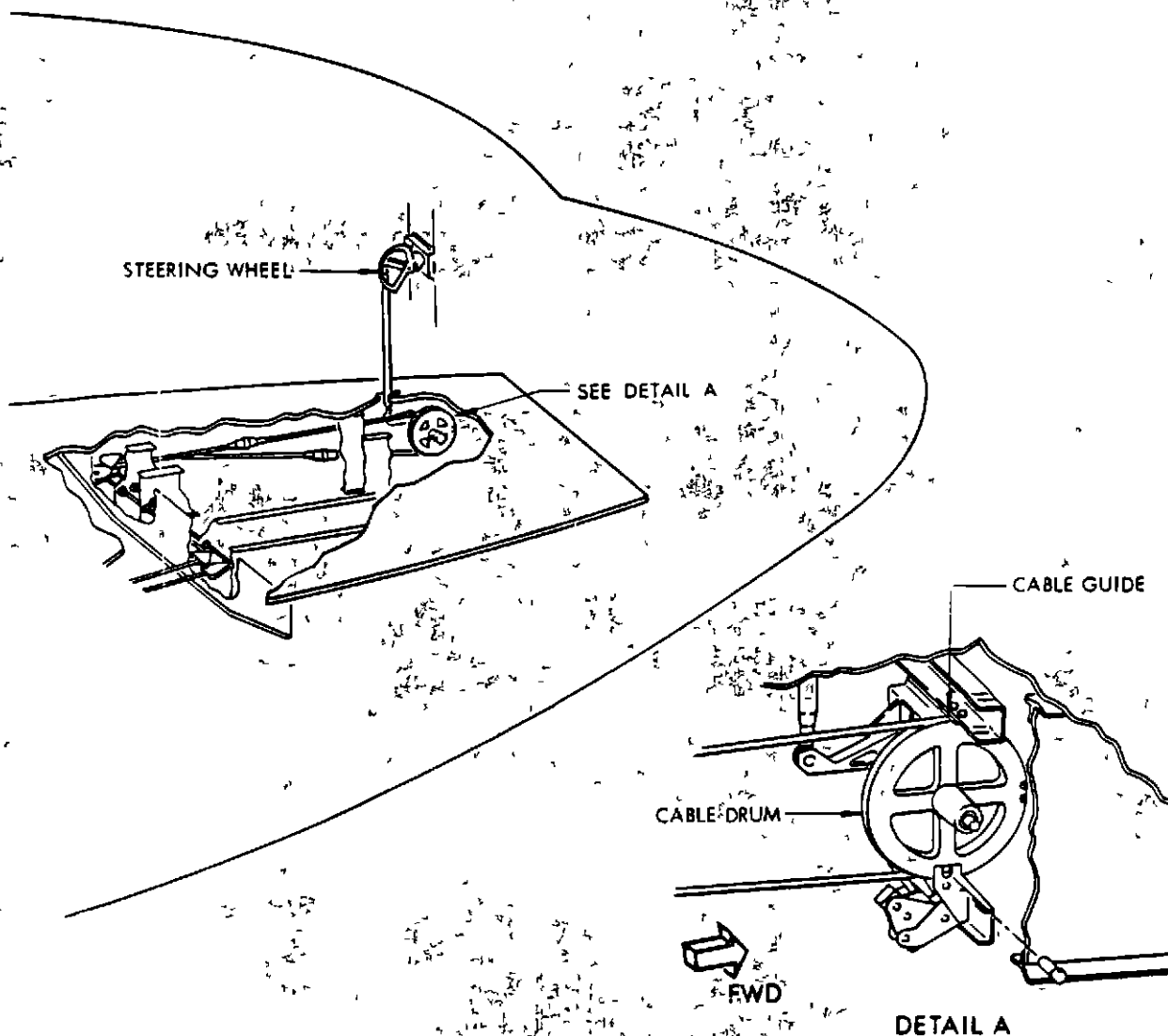
(3) Prepare for Testing.

- (a) Jack nose of airplane until wheels clear ground. The nose wheels will be centered by centering cams inside the shock strut.

CAUTION: DO NOT TURN STEERING WHEEL WITH NOSE GEAR FULLY EXTENDED, BECAUSE OF POSSIBLE DAMAGE TO CENTERING CAMS IN THE SHOCK STRUT.

- (b) Place metal sheet sandwiched with grease, under nose wheels and lower airplane until shock strut has been compressed at least four inches.

- (c) Disconnect door actuator rods from nose gear doors, by removing actuator rod-pull pin.



Nose Wheel Steering Magnesium Drum Lubrication
Figure 201

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- (4) Test Steering Rate
 - (a) With the external hydraulic power source connected, regulate the pressure to 3000 psi and the flow to 5 gpm minimum.
 - (b) With steering wheel centered and nose wheel centered, turn steering wheel as rapidly as possible to one extreme of travel. Total time required for complete (right or left) angular travel of the nose wheel shall be 4 (± 2) seconds.
- (5) Test Steering Linkage Play
 - (a) With steering wheel and nose gear centered, turn steering wheel left and right. Check that play in either direction does not exceed 1-1/2 degrees from center, and total play through center does not exceed 3 degrees before nose gear begins to turn.
- (6) Test Castering and Steering Wheel Centering
 - (a) With external hydraulic power source connected, regulate pressure to 3000 psi and the flow to 5 gpm minimum.
 - (b) With the steering wheel unrestrained, simulate castering by manually turning nose wheel throughout its travel range. The steering wheel movement shall closely follow the movement of the nose wheel.
 - (c) Restrain the steering wheel in any position. Nose wheel movement shall be restrained.
 - (d) With nose wheel centered, hydraulic power off, and system depressurized, turn steering wheel through approximately 10° (right or left) and release. The steering wheel shall return to neutral smoothly without binding or sticking.
- (7) Test Angle of Travel
 - (a) With hydraulic system pressurized or depressurized, manually turn nose wheel (right or left) until the stop is reached.
 - (b) The angle of travel from centered position shall be 60° ($\pm 2^\circ$).
- (8) Test Steering Wheel Loads
 - (a) Pressurize the hydraulic system.
 - (b) Check that the load on the rim of the steering wheel required to move the steering wheel throughout complete travel either way shall be 15 pounds maximum.

NOTE: If load exceeds 15 pounds, check system for cables binding, tight bearing, etc., and repair or replace as necessary.



MAINTENANCE MANUAL

3. Inspection/Check Nose Wheel Steering System

A. Equipment and Materials

- (1) Downlock, Nose Landing Gear - F70008-500 or equivalent

B. Examine Nose Wheel Steering System

- (1) Open nose gear doors using door ground release handle in external power receptacle opening.
- (2) Install nose landing gear downlock.
- (3) Disconnect door actuation rods from nose gear doors.
- (4) Examine nose wheel steering system for the following:
 - (a) Steering wheel and cable drum for binding and specified travel.
 - (b) Steering adjustable rod for loose terminal bolts and locknuts.
 - (c) Centering switch for proper mounting and actuation.
 - (d) Cables for specified rigging load, fraying and corrosion.
 - (e) Pulleys for misalignment and binding.
 - (f) Cable seals for deterioration, out of round wear and insecurity of restraining rings.
 - (g) Pulley brackets for cracks, distortion and loose mounting bolts.
 - (h) Metering valve for leakage at trunnions.
 - (i) Loose mounting bolts, and mounting brackets for cracks.
 - (j) Actuating linkage for loose terminal bolts.
 - (k) Shut off valve port fittings, line connections, and valve plunger for evidence of leakage.
 - (l) Shut off valve plunger for binding and mounting bracket for cracks and loose mounting bolts.
 - (m) Swivel fitting for leakage, cracked or loose mounting clamp.

STEERING WHEEL AND CABLE DRUM - MAINTENANCE PRACTICES

1 Removal/Installation Steering Wheel and Cable Drum

A Special Tools and Equipment

- (1) Tensiometer

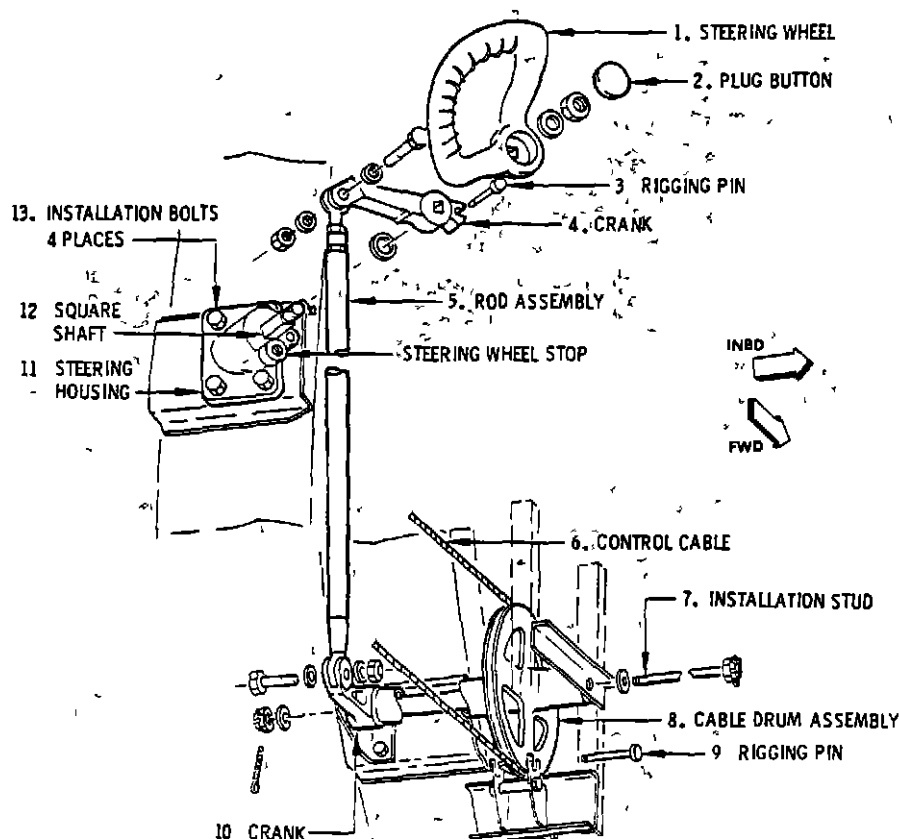
B Remove Steering Wheel and Cable Drum

- (1) Depressurize the utility hydraulic system
- (2) Remove steering wheel.
 - (a) Remove plug button (2, figure 201) from steering wheel (1)
 - (b) Remove nut and washer and pull steering wheel from square shaft (12).
- (3) Remove side panel
- (4) Remove crank (4) by disconnecting rod assembly (5) from crank, then removing crank from square shaft.
- (5) Remove steering wheel support housing (11) by removing four installation bolts (13)
- (6) Remove square shaft by removing nut and washer in back of housing.
- (7) Remove rod assembly by disconnecting rod from crank on cable drum assembly (8)
- (8) Remove cable drum assembly
 - (a) Remove lockwire and loosen turnbuckles to release tension on the control cable (6)
 - (b) Remove cotter pin, nut and washer from outboard end of cable drum installation stud (7) and extract stud in inboard direction
 - (c) Remove cable terminal retaining cotter pins

C. Install Steering Wheel and Cable Drum

- (1) Install cable drum assembly.
 - (a) Fit control cable into groove on cable drum assembly (8, figure 201), and install cable terminal retaining cotter pins
 - (b) Place cable drum assembly into position and install the installation stud (7), washer, nut and cotter pin

- (c) Insert rigging pin (9).
- (d) Adjust cable tension to 20 (± 5) pounds using tensiometer.
- (2) Insert rod assembly (5) through hole in floor above crank.
- (3) Attach the rod assembly to the crank (10) on drum assembly.
- (4) Install the square shaft (12) through steering housing (11) and add washer and nut.
- (5) Place the steering housing (11) in position and install the four installation bolts (13)
- (6) Place crank (4) on square shaft and install rigging pin (3)
- (7) Attach rod assembly to the crank on steering wheel assembly and adjust rod so rigging pins do not bind
- (8) Remove rigging pins (3 and 9).
- (9) Install side panel.
- (10) Place steering wheel (1) on square shaft and add washer, nut and plug button (2).



Installation of Nose Wheel Steering Wheel and Cable Drum
Figure 201



MAINTENANCE MANUAL

STEERING CABLE AND LINKAGE - MAINTENANCE PRACTICES

LX-N19997 & LX-N20000

1 Removal/Installation Steering Cable and Linkages

A Special Tools and Equipment

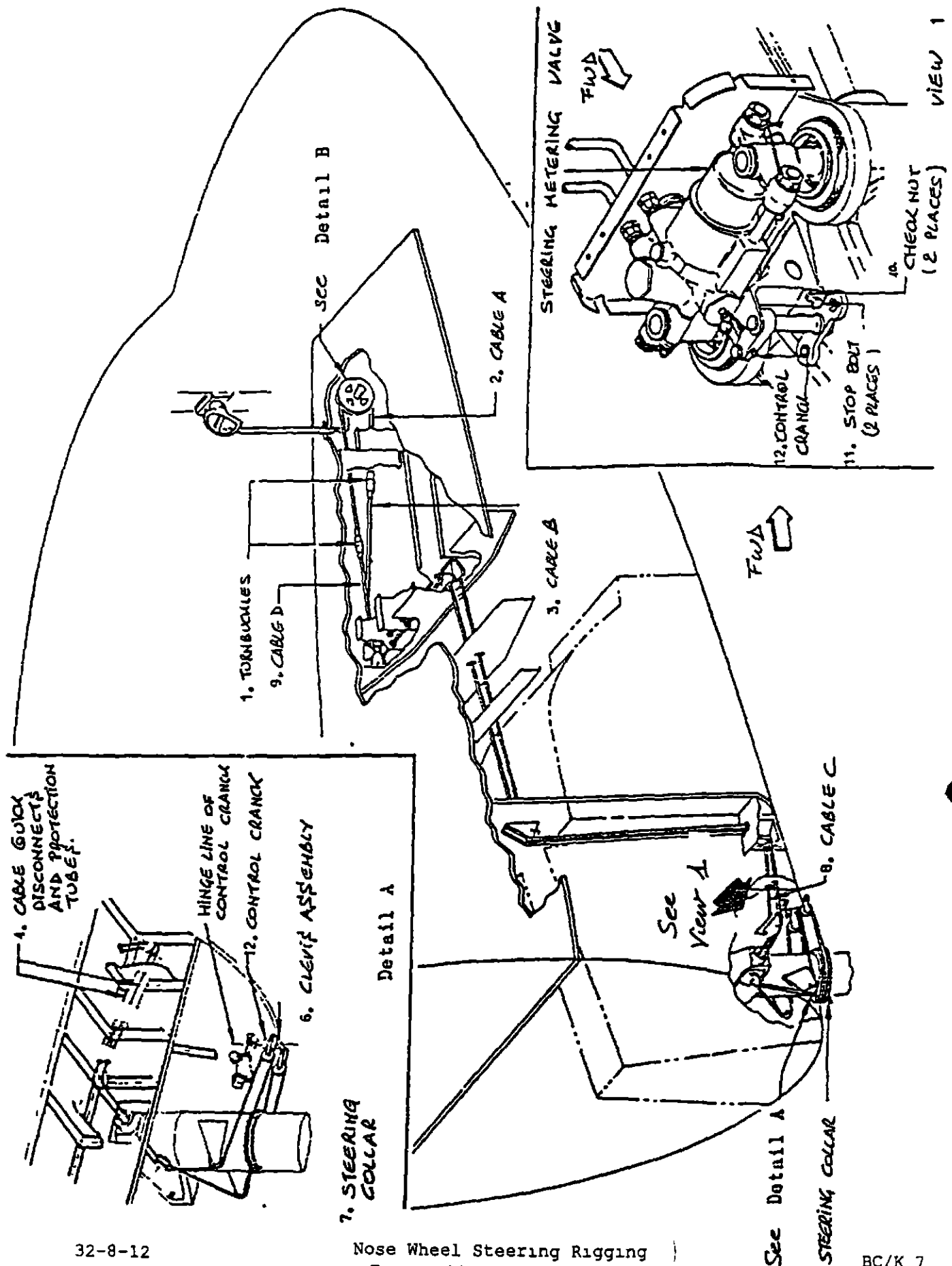
- (1) Grounding equipment

B Remove Steering Cable and Linkage

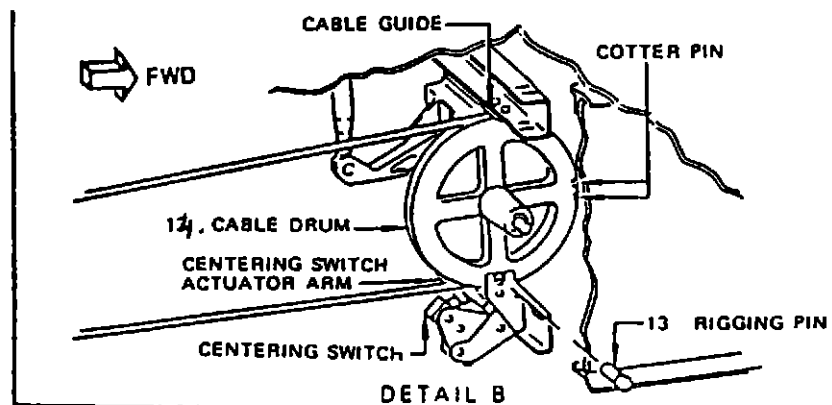
- (1) Check if aircraft is grounded
- (2) Check that utility hydraulic system is depressurized, and nose gear doors are opened with door release handle down and latched.
- (3) Remove nose gear fairing with shock strut door and remove steering mechanism cover
- (4) Disconnect cables at turnbuckles
- (5) Remove cable guides at cable drums
- (6) Remove cable retaining cotter pins from forward side of cable drum (18) and remove cable (2)
- (7) Move protection tubes at FWD bulkhead and move cable aftward
- (8) Push quick disconnect spring together and remove guiding tube from cable
- (9) Remove cables (3) and (9) by pulling slowly over pulleys
- (10) Remove cable retaining safety wire from the aft side of the steering collar (7)
- (11) Remove cable (8) by pulling slowly over pulleys

NOTE A piece of cord or wire may be tied to the loose ends of cables (3), (8) and (9) when they are removed. This will act as guide for installation

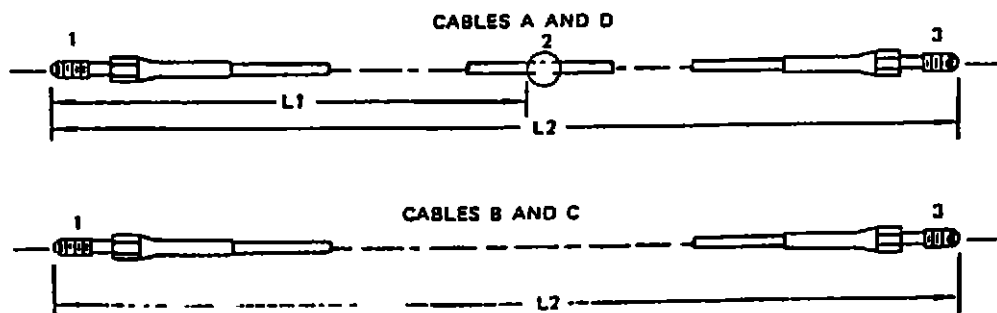
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FL2G	SECT	DRAWING N°	N° REQ	LENGTH		CABLE SIZE	FITTINGS		
				L1	L2		1	2	3
707	A	BAC C13C H235-586	1	23 5IN	58 6IN	3 32 7x7	AN669 L3LH	BAC T14B 3	AN669 L3LH
707	B	66-11478	1		198 5IN	3 32 7x7	AN669-L-TRH		AN663C3
707	D	66-11478-1	1		184 0IN	3 32 7x7	AN669-L3RH		AN663C3
707A/B	C	66-11486	1	89 75IN	183.5IN	3 32 7x7	AN663C3	BAC-T14B-3	AN663C3
707C	C	69-17422-5 DLH	1		189 5IN	3/32 7x7	AN663C3	BAC-T14B-3	AN663C3



Nose Wheel Steering Rigging
Figure 201 (Page 2 of 2)

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C Install steering cable and linkage

- (1) String cable (2, figure 201) over cable drum and fit swaged ball into cable drum. Short end of cable should be strung around the bottom of the cable drum.

NOTE For cable length and fittings, see chart in figure 201 and for cable general installation information, see Control Cable System General, Chapter 27

- (2) Install cotterpins at both ends of swaged ball
- (3) Install cable guide on both sides of the cable drum
- (4) String cable (8) in steering collar groove with swaged ball placed in detent and safety wired
- (5) String cable (8) through follow-up pulleys (6), and forward to the turnbuckles
- (6) String cables (3) and (9) from turnbuckles (7) over pulleys to turnbuckles (1)
- (7) Push quick disconnect spring together, put cable ends in quick disconnect bushing, release spring
- (8) Check collars on disconnect assembly and cable ends for correct seating
- (9) Move protection tubes in the bulkhead
- (10) Turn tuber attachment angle and adjust tube with angle between bulkhead and cable
- (11) Secure protection tube at bulkhead
- (12) Adjust steering cable and linkage as per following paragraph 2

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2 Adjustment/Test Steering Cable and Linkage

A Adjust (Rig) Steering Cable and Linkage

- (1) Install rigging pin (13) through cable drum (12) (See figure 201)
- (2) Center nose wheel and check that metering valve plunger is centered
- (3) Apply tension equally on all cables by tightening turnbuckles to a tension of 20 (+/- 5) pounds

NOTE With this accomplished, rigging pin should be free to turn

- (4) Not applicable

- (5) Adjust right turn position stop

(a) Loosen checknut (10) and turn the stop bolt (11) into control crank support bracket

(b) Turn steering wheel to the extreme right turn position and adjust the stop bolt to contact the control crank (8)

(c) Center the steering system and back out stop bolt one-half turn or (180° +/- 20°) Tighten checknut

- (6) Repeat the above procedure for the left turn position stop

3 Inspection/Check Nose Wheel Steering Cables

A Examine Nose Wheel Steering Cables

- (1) Check nose wheel steering cables for fraying and corrosion
- (2) Examine seals for deterioration, out of round wear, and insecurity of retaining rings
- (3) Check pulley brackets for cracks, distortion and loose mounting bolts

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- (4) Check pulleys and fairleads for cracks, looseness and misalignment
- (5) Check cables for specified rigging
- (6) Examine steering cables for wear per figure 202

CABLE (SEE FIGURE 201)	CABLE SIZE	ALLOWABLE PER CENT WEAR OF OUTER WIRES BEFORE REPLACEMENT
A, B, C, AND D	3/32 7 x 7	50

Nose Wheel Steering Cable Wear Limits

Figure 202

STEERING CABLE AND LINKAGE - MAINTENANCE PRACTICES

EFFECTIVITY

AF	707-328C
SABENA	Turbofan
BOAC	G-ASZF and on
AII	VT-DPM and on
CAL	All airplanes except N70773 thru N70775 N70785, N74612, N17321 thru N17329 and N47330

1. Removal/Installation Steering Cable and Linkage

A. Remove Steering Cable and Linkage

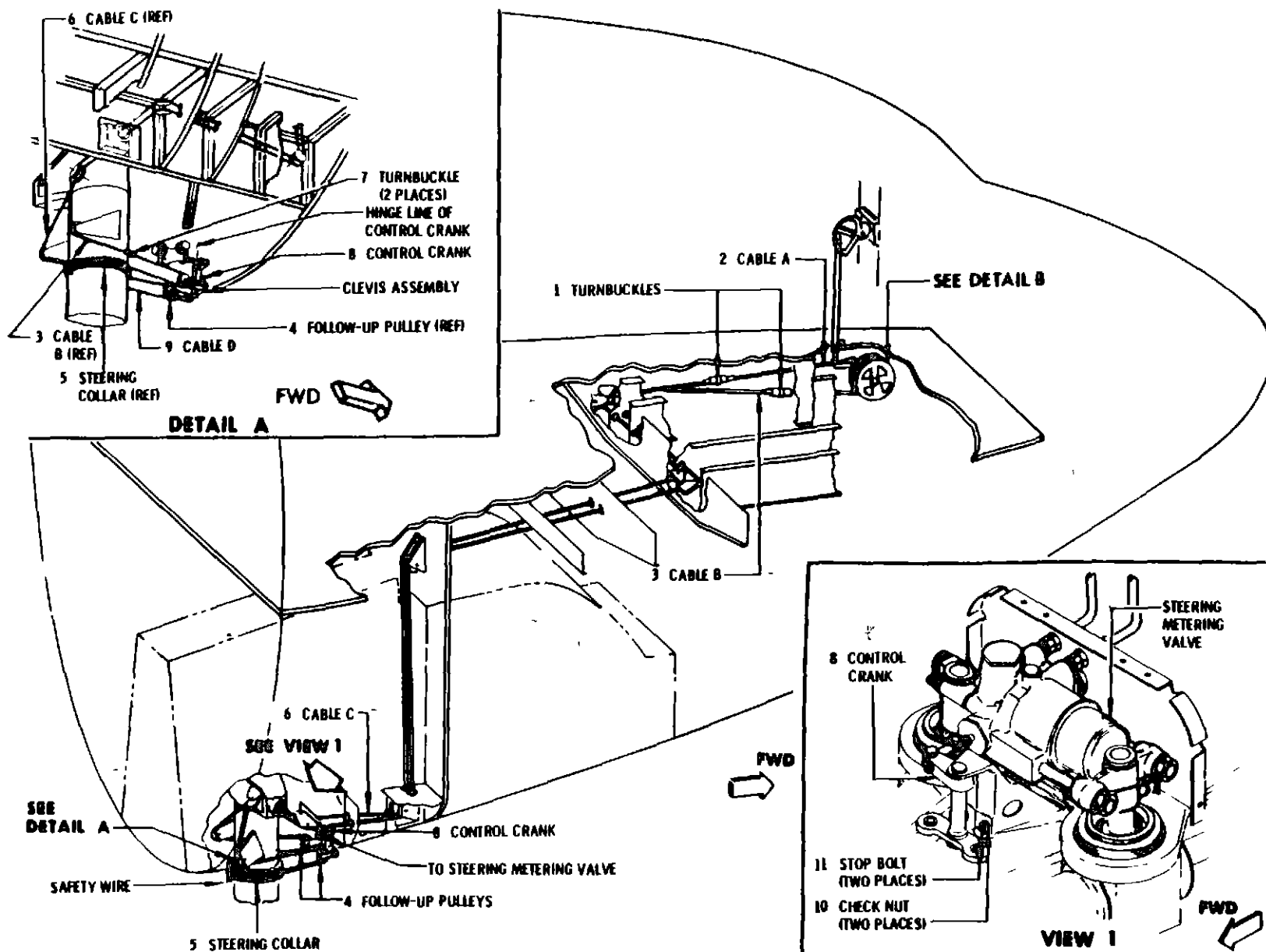
- (1) Check that utility hydraulic system is depressurized, and nose gear doors are opened with door ground release handle down and latched.
- (2) Remove nose gear fairing with shock strut door and remove steering mechanism cover.
- (3) Disconnect cables at turnbuckles (1 and 7, figure 201).
- (4) Remove cable guides at cable drums.
- (5) Remove cable retaining cotter pins from forward side of cable drum (12).
- (6) Remove all pulley guards, if installed.
- (7) Remove cables (3), (6), and (9) by pulling slowly over pulleys.
- (8) Remove cable retaining safety wire from the aft side of the steering collar (5).

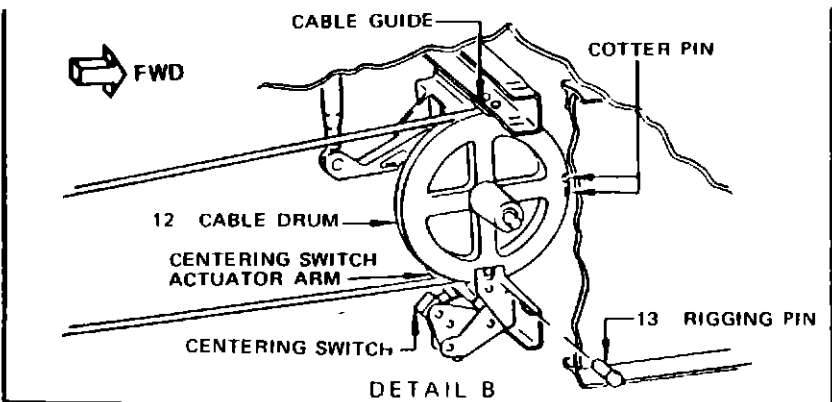
NOTE· A piece of cord or wire may be tied to the loose ends of cables (3), (6), and (9) when they are removed. This will act as a guide for installation.

B. Install Steering Cable and Linkage

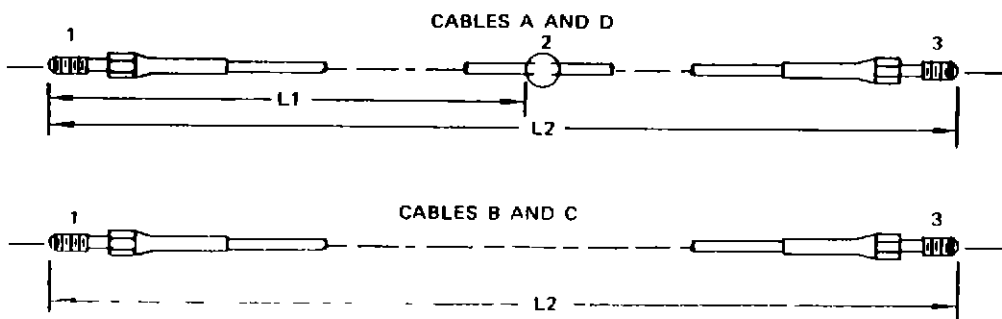
- (1) String cable (2, figure 201) over cable drum and fit swaged ball into cable drum. Short end of cable should be strung around the bottom of the cable drum.

NOTE· For cable length and fittings, see chart in figure 201 and for cable general installation information, see Control Cable System General, Chapter 27.





CABLE REF	DRAWING NO	NO REQ	LENGTH		CABLE SIZE	FITTINGS		
			L1	L2		1	2	3
A	BACC13CH235 586	1	23 5 IN	58 6 IN	3/32 7 x 7	AN669 L3LH	BACT14B 3	AN669L3LH
B	69 17422 7	1		260 6 IN	3/32 7 x 7	69 17396 1		AN669L3RH
C	69 17422 9	1		242 4 IN	3/32 7 x 7	69 17396 1		AN669L3RH
D	69 17422 11	1	33 15 IN	66 5 IN	3/32 7 x 7	69 17396 2	BACT14B 3	69 17396 2



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Nose Wheel Steering Rigging
Figure 201 (Sheet 2)

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- (2) String cable (9) in steering collar groove with swaged ball placed in detent and safety wired.
- (3) String cable (9) through follow-up pulleys (4), and forward to the turnbuckles (7).
- (4) String cables (3) and (6) from turnbuckles (7) over pulleys to turnbuckles (1).
- (5) Connect cables (3) and (6) to cable (9) at turnbuckles (7).
- (6) Connect cables (3) and (6) to cable (2) at turnbuckles (1).
- (7) Check collars on disconnect assembly and cable ends for correct seating.
- (8) Install pulley guards.
- (9) Adjust steering cable and linkage per following paragraph.

2. Adjustment/Test Steering Cable and Linkage

A. Adjust (Rig) Steering Cable and Linkage

- (1) Install rigging pin (13) through cable drum (12). (See figure 201.)
- (2) Center nose wheel and check that metering valve plunger is centered.
- (3) Apply tension equally on all cables by tightening turnbuckles to a tension of 20 (± 5) pounds.

NOTE: With this accomplished, rigging pin should be free to turn.



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- (4) On airplanes SAB 00-SJH only FTL N322F and N323F
 DLH D-ABUA only NWA N356US thru N363UC
 AII VT-DPM thru VT-DSI IIA EI-AMW and EI-ANO
 EL AL 4X-MTR only TAP CS-TBA only,
 adjust centering switch so that switch actuator bottoms in cam track
 detent. Remove rigging pins.
- (5) Adjust right turn position stop.
- (a) Loosen checknut (10) and turn the stop bolt (11) into control
 crank support bracket.
- (b) Turn steering wheel to the extreme right turn position and
 adjust the stop bolt to contact the control crank (8).
- (c) Center the steering system and back out stop bolt one-half
 turn or $(180^\circ \pm 20^\circ)$ Tighten checknut.
- (6) Repeat the above procedure for the left turn position stop.

3 Inspection/Check Nose Wheel Steering Cables

A Examine Nose Wheel Steering Cables

- (1) Check nose wheel steering cables for fraying and corrosion.
- (2) Examine seals for deterioration, out of round wear, and insecurity
 of retaining rings.
- (3) Check pulley brackets for cracks, distortion and loose mounting
 bolts.
- (4) Check pulleys and fairleads for cracks, looseness and misalignment.
- (5) Check cables for specified rigging.
- (6) Examine steering cables for wear per figure 202.

CABLE (SEE FIGURE 201)	CABLE SIZE	ALLOWABLE PER CENT WEAR OF OUTER WIRES BEFORE REPLACEMENT
A B C AND D	3/32 x 7	50

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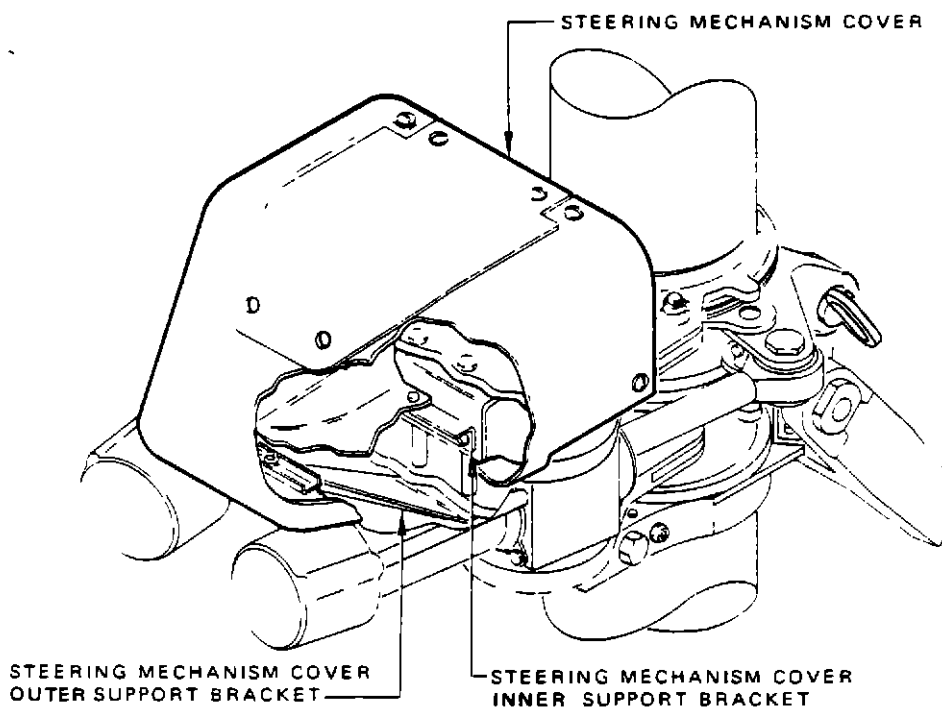
STEERING METERING VALVE - REMOVAL/INSTALLATION

1. Prepare for Removal

- A. Place hydraulic interconnect valve in closed position to prevent depressurization of auxiliary hydraulic system.
- B. Depressurize utility hydraulic system.
- C. Open and latch nose wheel well doors.
- D. Install all landing gear external downlocks.

2. Remove Steering Metering Valve

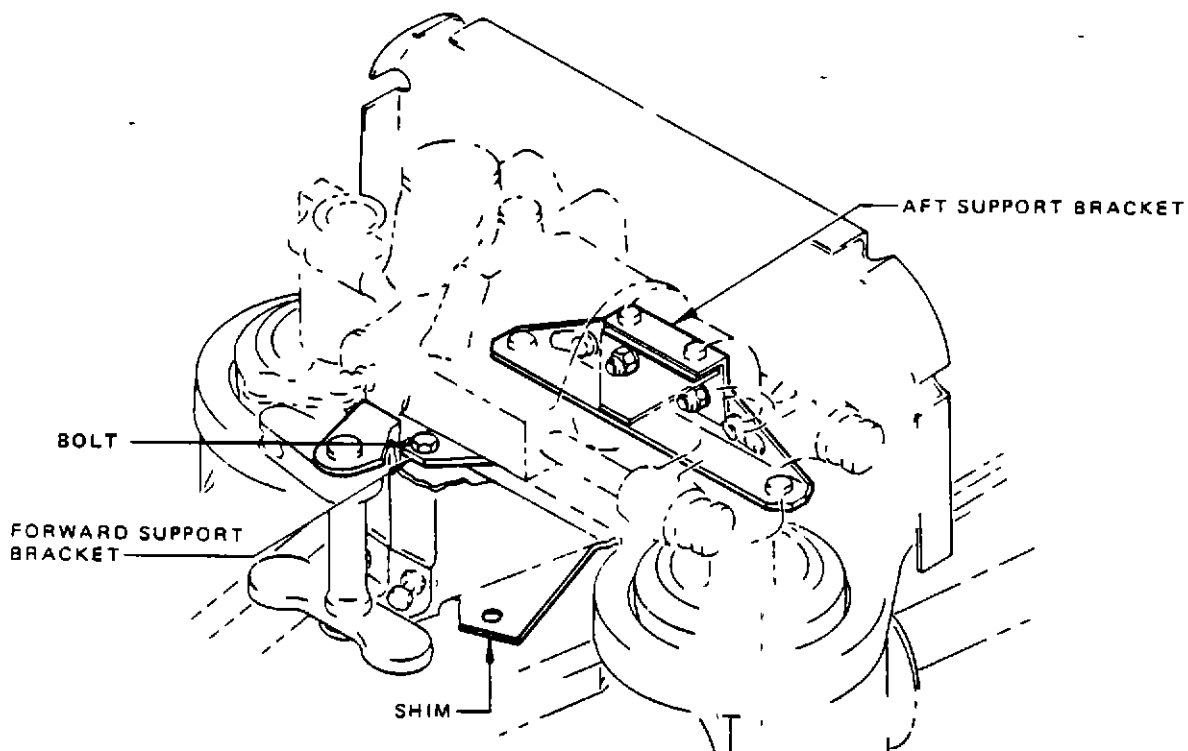
- A. Remove steering mechanism cover (figure 401).
- B. Remove bolt attaching metering valve plunger actuation linkage (figure 403) to control crank.
- C. Disconnect hydraulic lines and fittings from metering valve and cap or plug lines and ports.





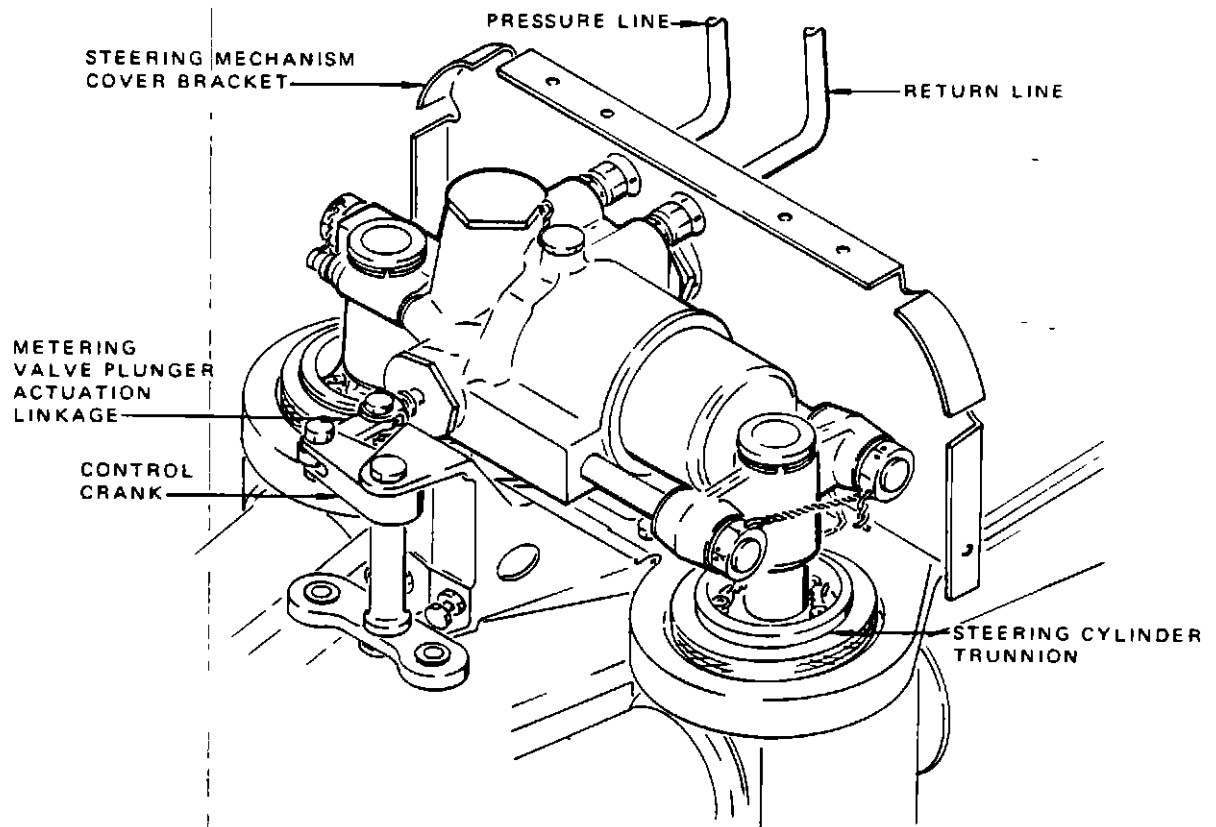
MAINTENANCE MANUAL

- D. Remove bolt attaching metering valve to forward support bracket on forward side (figure 402).
- E. Remove two bolts attaching metering valve to adjustable aft support bracket on aft side of valve.
- F. Remove internal wrenching bolts (figure 405) attaching valve trunnions to steering cylinder trunnions.
- G. Remove metering valve and discard used O-rings (figure 404).
- H. Cover open cylinder trunnions to prevent foreign matter from entering hydraulic system.



Steering Metering Valve Support Bracket Attachment
Figure 402

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Steering Metering Valve Installation
Figure 403

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3. Install Steering Metering Valve

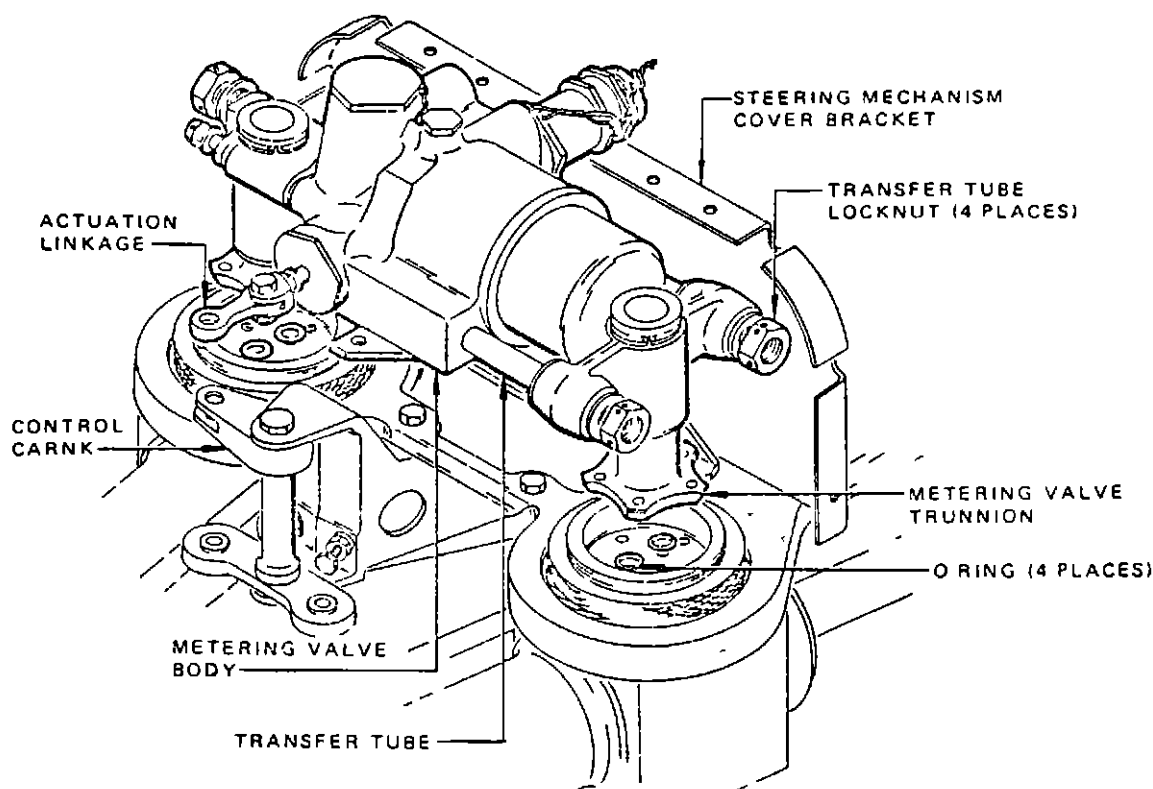
- A Check that landing gear external downlocks are installed.
- B. Loosen locknuts (figure 404) on transfer tubes of steering metering valve and screw transfer tubes into metering valve body.
- C. Position metering valve on trunnions of steering cylinders taking care in placing new O-rings around mating oil channels.
- D. Insert and tighten internal wrenching bolts (figure 405) 50 to 70 pound-inches. Lockwire bolts.

NOTE: There are five bolts in each trunnion.

- E. Install two bolts attaching metering valve to aft support bracket (figure 402).
- F. Install bolt attaching metering valve to forward support bracket. Add or remove shim under actuation crank support bracket as required.

CAUTION DO NOT BIND SWIVEL JOINT SLEEVE ON METERING VALVE TRUNNION.

- G. Screw transfer tubes out of metering valve body until shoulders make positive contact with swivel joints. Tighten transfer tube locknuts 50 to 70 pound-inches and lockwire.



Steering Metering Valve Trunnion O-Ring Attachment
Figure 404



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- E. Install fittings (with new O-rings) to metering valve and connect hydraulic lines (figure 403).
- I. Attach metering valve plunger actuation linkage to control crank.
- J. Replace steering mechanism cover (figure 401).

NOTE: To avoid face chafing of lower support plate, check for a minima of .125 inch between cover and lower plate.

- K. Open hydraulic interconnect valve.
- L. Connect nose wheel doors.
- M. Test steering system per 32-8-0.

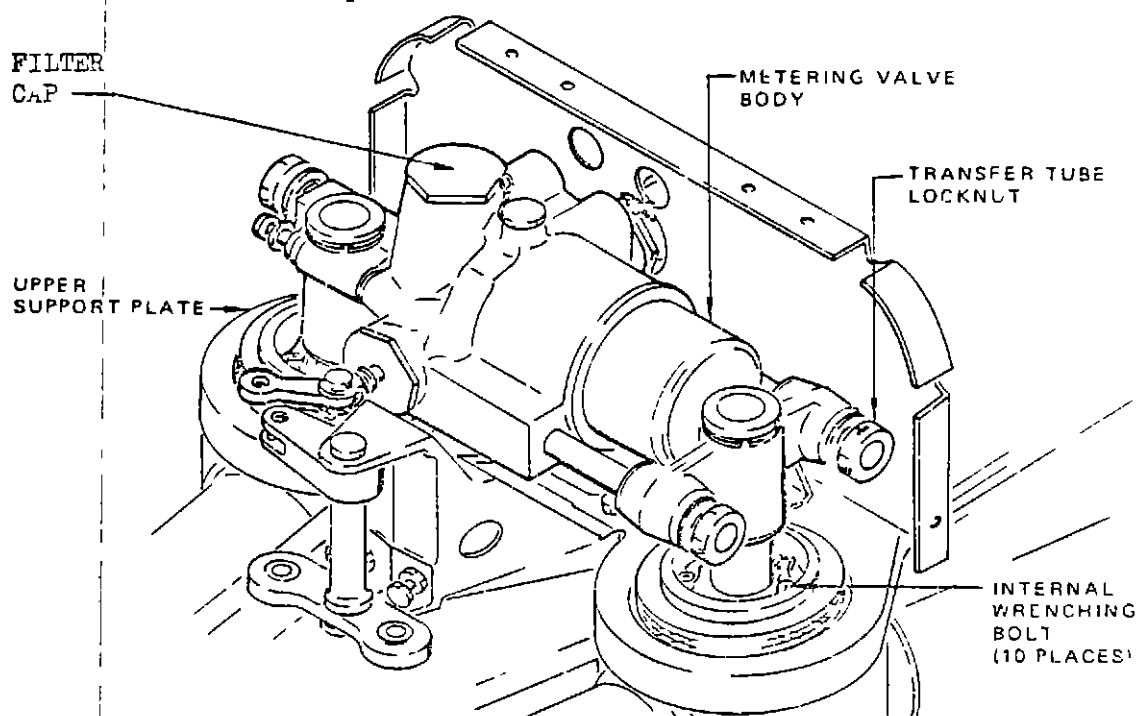
4. Filter Cap - Removal/Installation

A. Removal

- (1) Remove lockwire and loosen cap.

B. Installation

- (1) Install cap. Torque the cap to a value of 50 (+0/-5) ft-LB.
- (2) Lockwire the cap.



Steering Metering Valve Trunnion Attachment
Figure 405

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STEERING SHUTOFF VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Steering Shutoff Valve

A. Remove Steering Shutoff Valve

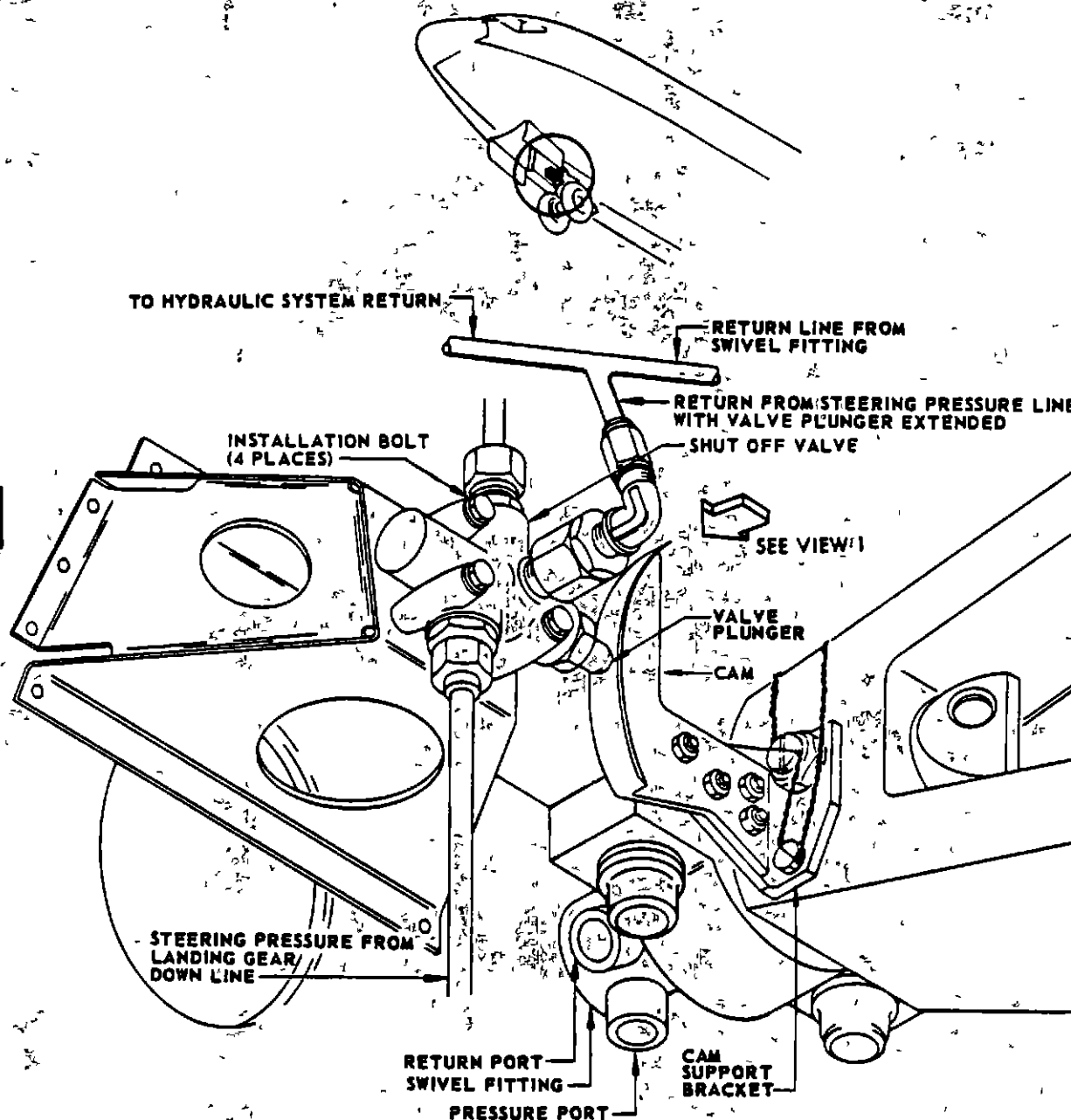
- (1) Depressurize utility hydraulic system and open nose wheel well doors by placing door release handle down and latched.
- (2) Remove shock strut fairing and place hydraulic interconnect valve switch in "closed" position.
- (3) Engage all landing gear external down locks.
- (4) Disconnect hydraulic lines from shutoff valve. (See figure 201.)
- (5) Plug all lines.
- (6) Remove installation bolts.
- (7) Remove steering shutoff valve, remove hydraulic fittings, discard O-rings and plug ports.

B. Install Steering Shutoff Valve

- (1) Install hydraulic fittings with new O-rings in steering shutoff valve.
- (2) Place shutoff valve in position. The dimension between the forward attachment bolts on the valve and the aft face of the nose gear trunnion must be maintained per figure 201. On airplanes using outer cylinder assemblies 65-33509 or 65-33510, rework the valve support bracket by slotting valve attachment holes.
- (3) Install four attachment bolts.
- (4) Remove plugs and caps, fill valve and hydraulic lines with fluid.

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- (5) Connect all lines and pressurize utility hydraulic system.
- (6) Operate nose wheel steering system several times to bleed air.
- (7) Check shutoff valve connections for leaks.
- (8) Replace shock strut fairing and close nose wheel well doors.



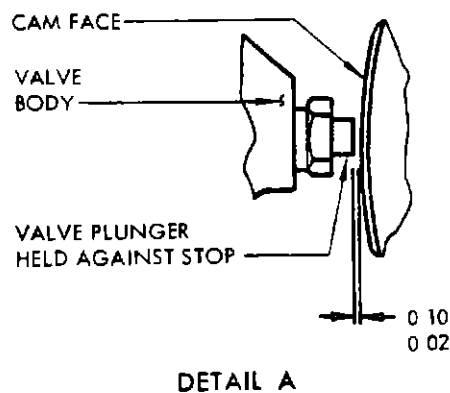
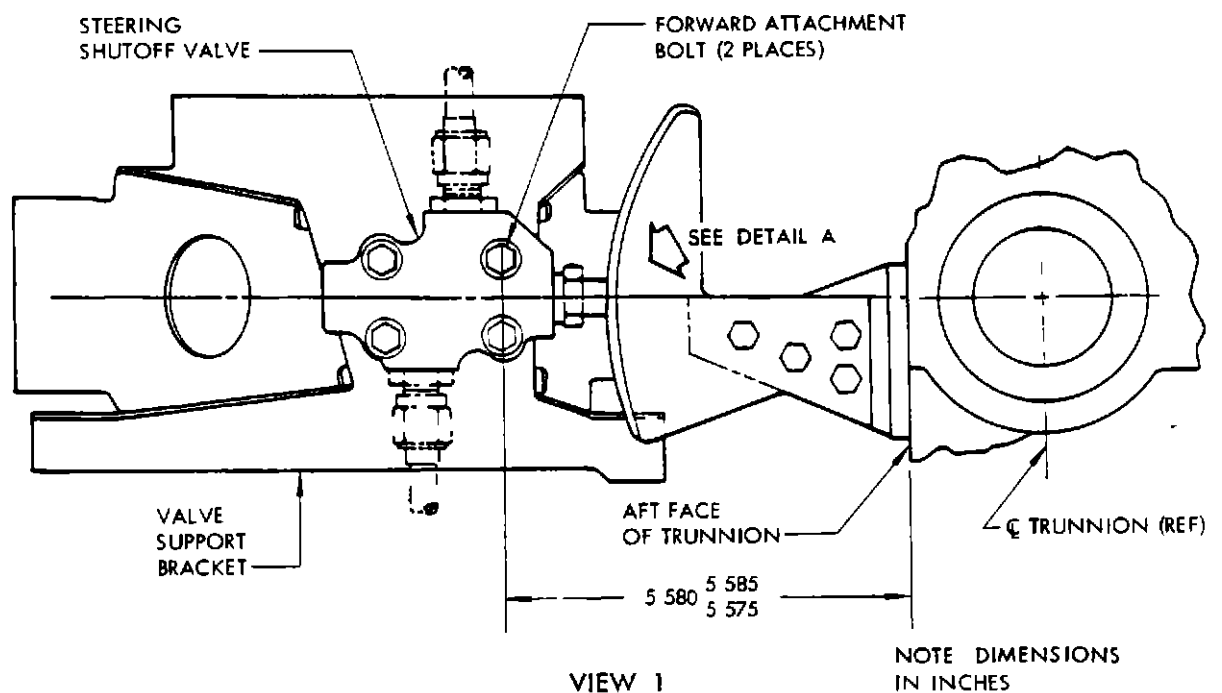
Steering Shutoff Valve Installation
Figure 201 (Sheet 1)

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2. Adjustment/Test Steering Shutoff Valve

A. General

- (1) To preclude the possibility of internal damage in the valve which could cause the loss of nose wheel steering, a quick check can be performed for correct location of the steering shutoff valve.
 - (a) With nose gear in down and locked position, move valve plunger away from operator cam attached to the nose gear trunnion.



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- (b) Check dimension per figure 201, detail A, between valve plunger and operator cam.
- (c) If valve plunger travels less than the specified limits, remove and reinstall valve per paragraph 1.
- (2) For a full functional test of valve operation in the steering hydraulic system, refer to Test Steering Shutoff Valve, 2.C.

B. Equipment and Materials

- (1) Hydraulic source, for Skydrol 500 hydraulic fluid, capable of delivering approximately 20 gpm flow at 3000 psi.
- (2) Protractor to measure first 25 degrees of nose gear retraction.
- (3) Airplane Jacks

C. Test Steering Shutoff Valve

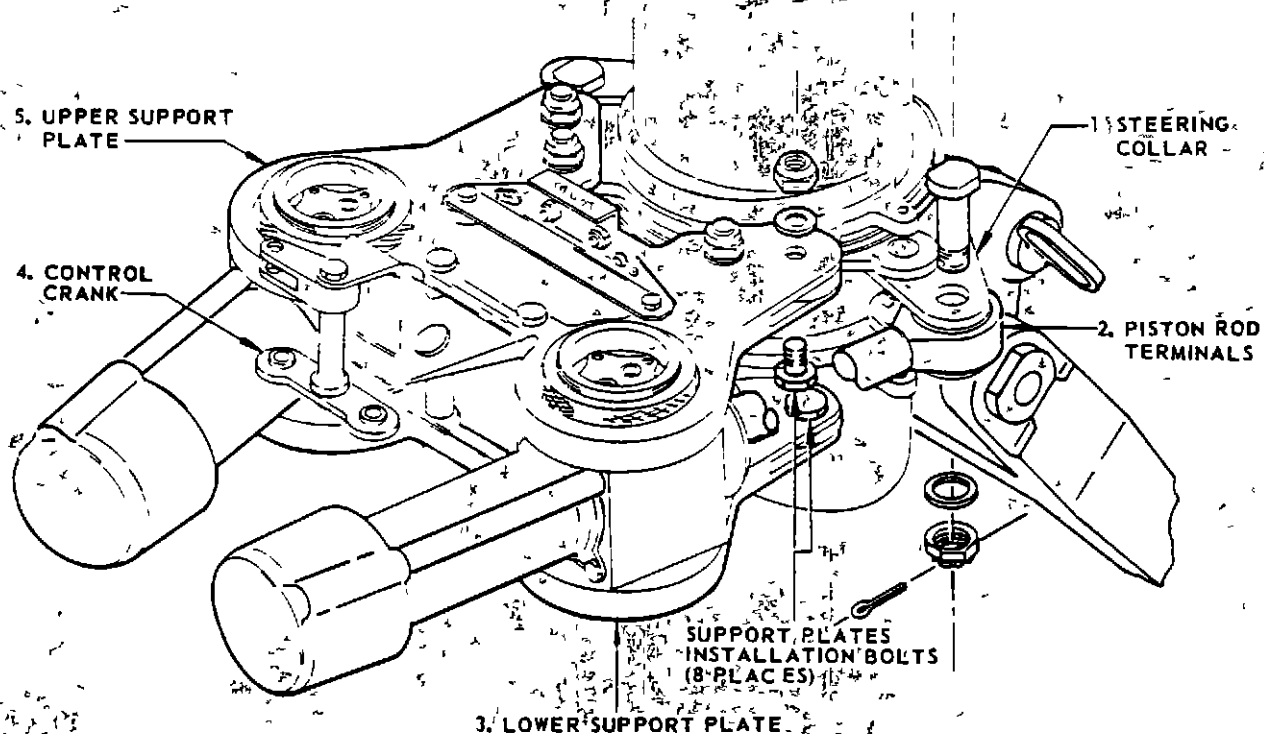
- (1) Jack nose of airplane. See Jacking, Chapter 7.
- (2) Install protractor and connect hydraulic cart.
- (3) Deflate nose gear and contract shock strut a minimum of 4 inches from full extension. Secure inner cylinder in this position.
- (4) Retract and hold nose gear a minimum of 25 degrees from full down position.
- (5) Reduce hydraulic pressure to 300 psi.
- (6) Turn nose gear steering wheel to right with a light steady pressure.

CAUTION: TO AVOID DAMAGE TO CAMS DO NOT TURN STEERING WHEEL BEFORE STEP (3) IS COMPLETED.

- (7) Place landing gear control handle in DN position.
- (8) Check that nose wheels turn to the right when the nose gear has extended to within 20 degrees or less from the full down position.



- (4) Insert two support plate assembly bolts (1) down through upper support plate, cover mechanism inner support bracket, washers, spacers, and lower support plate.
- (5) Install cover mechanism outer support bracket, washers, and turn nuts on tight.
- (6) Position steering cylinder assembly so upper and lower support plates mate with shock strut support lugs, figure 202.
- (7) Insert upper support plate installation bolts upward. Insert lower support plate installation bolts downward. Add washers and locknuts and tighten nuts.
- (8) Attach piston rod to steering collar.
 - (a) Swing piston rod (2) to align with steering collar attachment lug.
 - (b) Loosen and/or tighten upper and lower knurled nuts to raise or lower cylinder assembly until piston rod end passes into lug.
 - (c) Tighten knurled nuts by hand and lock wire.
 - (d) Insert bolt through each lug and piston rod terminal. Add washers and nuts Tighten nuts.
- (9) Install metering valve control crank (4).
- (10) Remove pulleys temporarily and string control cables. Re-install pulleys.
- (11) Install nose wheel steering metering valve. See 32-8-21.
- (12) Adjust (rig) nose wheel steering cable and linkage.
- (13) Test nose wheel steering system. See 32-8-0.



Nose Wheel Steering Cylinder Installation
Figure 202

END

STEERING AND TOWING COLLARS - MAINTENANCE PRACTICES

1 Removal/Installation Steering and Towing Collars

A. Equipment and Materials

- (1) Grease, MIL-G-21164

B. Remove Steering and Towing Collars

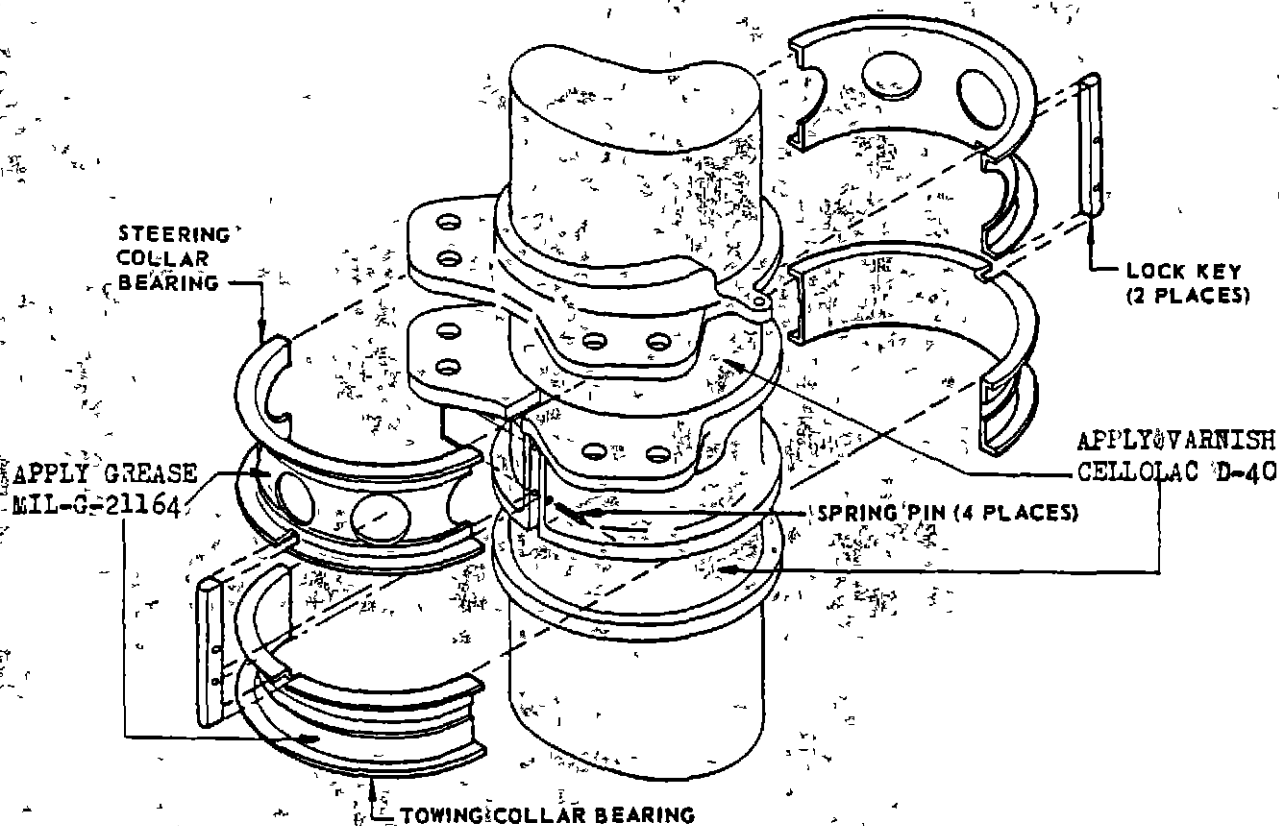
- (1) Engage landing gear external downlocks.
(2) Open nose wheel well doors and remove shock strut fairing.

NOTE: It will not be necessary to remove the nose wheel steering metering valve nor the steering cylinders.

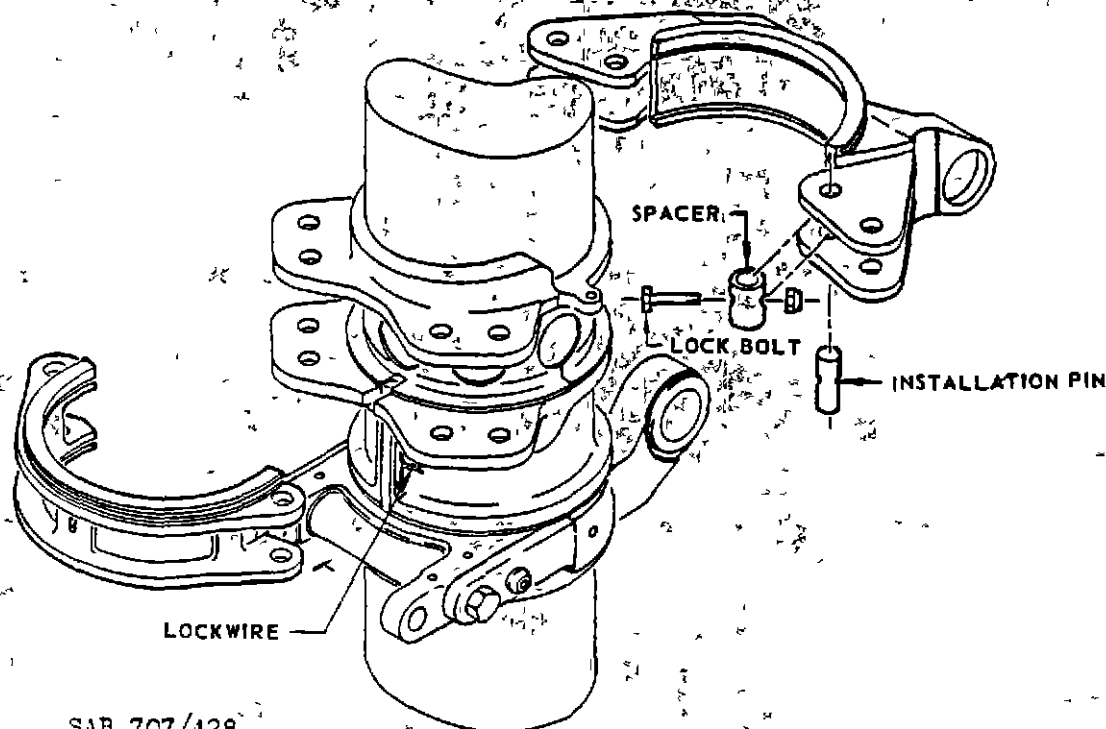
- (3) Loosen steering control cable and disconnect nose wheel steering cylinder actuator rods from steering collar (figure 204).
(4) Disconnect link assembly from steering collar.
(5) Disconnect upper torsion link taking care not to drop the link assembly.
(6) Remove two short bolts and one long bolt that install towing collar (figure 203). Remove towing collar.
(7) Disconnect control cable from steering collar.
(8) Remove two lock bolts through two spacers and pins (figure 202) and remove pins holding the two halves of steering collar together. Remove front and rear steering collar halves.
(9) Remove lockwire through spring pins in bearing lock keys (figure 201) and remove four spring pins.
(10) Remove lock keys, steering collar bearing and towing collar bearing.

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LANDING GEAR
Steering and Towing Collars
Maintenance Practices



Steering and Towing Collar Bearings Installation
Figure 201



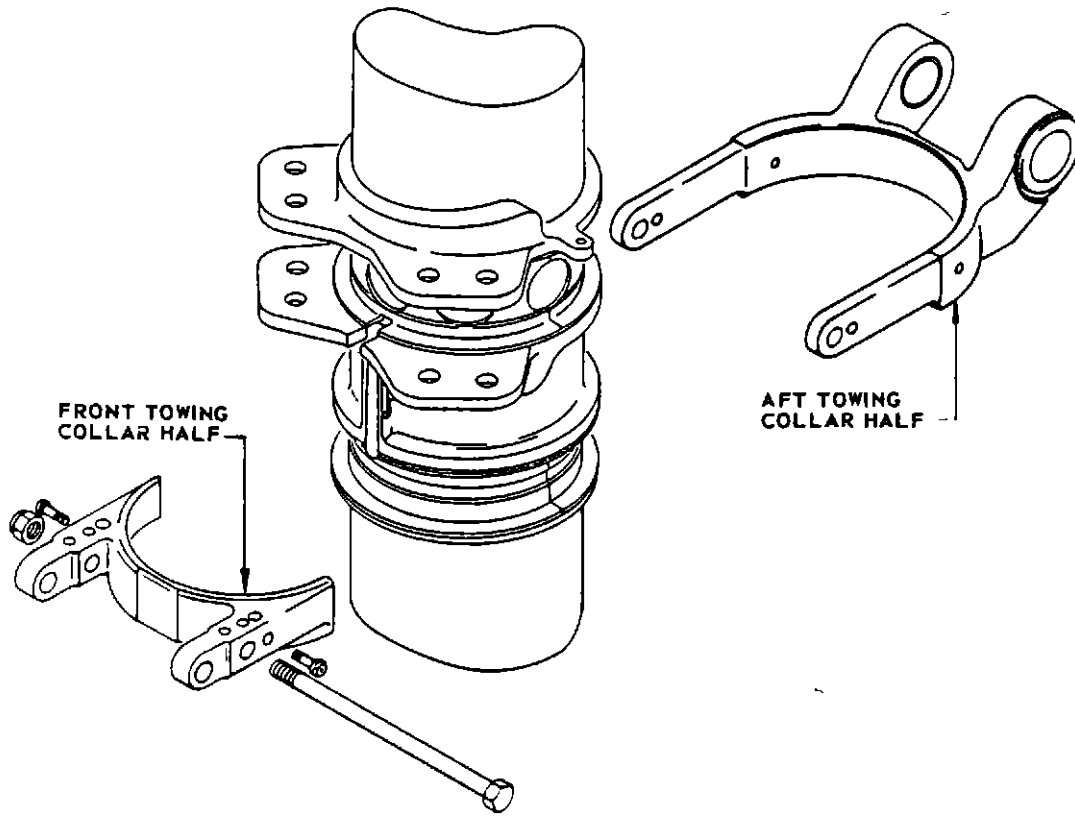
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Steering Collar Installation
Figure 202

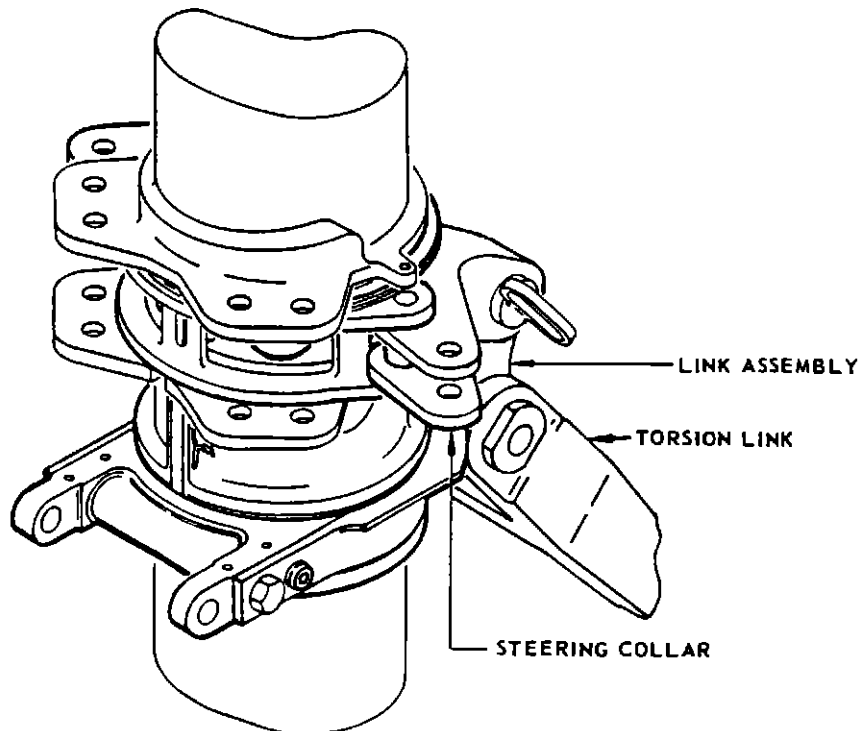


B. Install Steering and Towing Collars

- (1) Apply Mastinox D-40 on outer cylinder knuckle and towing collar area.
- (1a) Apply a light coat of grease, MIL-G-21164, to steering and towing collar bearings (figures 201 and 202).
- (2) Place bearings in position on shock strut outer cylinder and insert bearing lock keys.
- (3) Install spring pins and lockwire.
- (4) Install steering collar.
 - (a) Place steering collar halves together so installation pin holes are aligned.
 - (b) Place two spacers (figure 202) in position between lugs.
 - (c) Insert installation pins.
 - (d) Install two lock bolts through spacers and pins.
- (5) Place towing collar (figure 203) in position on shock strut and install two short bolts and one long bolt on forward side of towing collar. Torque nut on long bolt to 600 to 1000 pound-inches.
- (6) Connect upper torsion link (figure 204) and link assembly to aft side of towing collar.
- (7) Connect link assembly to the steering collar.
- (8) Connect steering cylinder actuator rods to the steering collar.
- (9) Lockwire control cable to steering collar and tighten cable to a tension of 20 pounds.



Towing Collar Installation
Figure 203



Steering and Towing Collar Installation
Figure 204

HYDRAULIC BRAKE SYSTEM - DESCRIPTION AND OPERATION

1 General

- A The hydraulic braking system aids airplane control during ground operations. Brakes hold the airplane when parked, and also throughout engine runs. The brakes also stop spinning wheels after take off, shorten the landing run, and assist in turning when the airplane is taxied.
- B. The hydraulic brake control system includes linkage and cables running from the rudder pedals (brake pedals) in the control cabin to metering valves located in the main wheel wells. A parking brake handle on the pilot's control stand, operates linkage to hold brakes on when brake pedals are released. Pressure for brake operation is provided by one hydraulic accumulator. Metering valves, one for each main landing gear, control the pressure applied to the brakes. Lockout-deboost valves limit the pressure entering the brakes and limit fluid loss if leakage occurs between the lockout-deboost valves and the brakes. Automatic brake actuation is provided to apply brakes when the main landing gear is retracted. An anti-skid system prevents locked or skidding wheels when brakes are applied on any landing surface.
- C. Brakes are multiple disc type, with full circle sintered lining. Eight brakes are provided, one on each main landing gear wheel. Brakes have automatic adjustment for lining wear.

2. Brake Pedal

- A The four rudder pedals (brake pedals) turn on two bearings, carried on a horizontal shaft at the top of each rudder pedal arm. On the inner end of each brake pedal, an integral arm projects forward from the pivot center. This arm is connected by a push rod assembly to a bell crank turning on the same center as the rudder pedal arm. The integral arm, rudder pedal arm, push rod, and bell crank form a parallelogram. This arrangement holds the brake pedal within $\pm 5^\circ$ of normal position when rudder pedals move over full range of travel. Corresponding pilot and copilot brake pedals are interconnected through linkage below the control cabin floor. Therefore, simultaneous and identical brake operation is available at both pilot's and copilot's positions.

3 Brake Control Linkage

- A The brake pedals operate bell cranks below the cabin floor (figure 1). Forward of each pair of pedal arms, a horizontal quadrant and bell crank rotate on a common vertical axis. A push rod from the bell crank connected to the pilot's right brake pedal operates the horizontal bell crank. A tie rod runs across the airplane from this bell crank to the right horizontal quadrant. The copilot's left brake pedal operates the left horizontal quadrant in a similar manner through a push rod across the airplane. The pilot's left brake pedal operates the left horizontal quadrant. The copilot's right brake pedal operates the right horizontal quadrant. By this arrangement of linkage, if either pilot (or both) operate the left brake pedal, left brakes are applied. Operating the right pedal (or pedals) applies right brake. If either pair or all brake pedals are depressed, all brakes are applied simultaneously.

4 Brake Metering Valve

- A Two brake metering valve assemblies (figure 2) are used, one for each main landing gear. The metering valves are located near the top inboard forward corners of each main wheel well. Four hydraulic lines are attached to each valve, pressure, return, brakes, and automatic braking. Valve ports are opened or closed by operating a circular grooved sliding rod. The linkage end of the valve rod projects beyond the valve body, the opposite end is supported in a sealed compensating chamber.
- B. When the brake pedals are depressed, movement is imparted to the valve rod through mechanical linkage and cables. Hydraulic pressure is directed to the brakes and also to the compensating chamber. This creates a return force on end of the valve rod to close the valve. As valve is held open by position of brake operating mechanism, the return force can be felt at the brake pedals. Cable stretch and adjustment of pedal position controls the braking force as required.
- C Automatic braking is provided by a small diameter piston operating in a cylinder attached to the metering valve. The cylinder is connected to the landing gear retract hydraulic line. When the landing gear control handle is placed to "UP", hydraulic pressure is directed to the automatic brake cylinder and the piston extends. One end of the piston rod rests on the valve rod, therefore, extension of the piston opens the metering valve and applies brakes. This stops spinning wheels before landing gear retracts.

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LANDING GEAR BRAKE UNIT - INSPECTION/CHECK

1. Landing Gear Brake Unit Inspection

A. General

- (1) The normal landing gear brake unit inspection should be performed when normal conditions exist. The special landing gear brake unit inspection should be performed after high energy stops.

B. Normal Landing Gear Brake Unit Inspection

(1) Examine Landing Gear Brake Unit.

- (a) With power off, check wheel brake unit for leakage at brake pistons, hydraulic lines, flexible hoses, and connections.
- (b) With power on, pressurize hydraulic system, apply brakes and repeat step (a).
- (c) Check brake pressure plate for tendency to hang or stick during brake application.
- (d) Check upper and lower wear indicator (figure 601) with brake applied. The brake should be removed for wear when the bottom of either wear indicator nut is flush with the brake housing

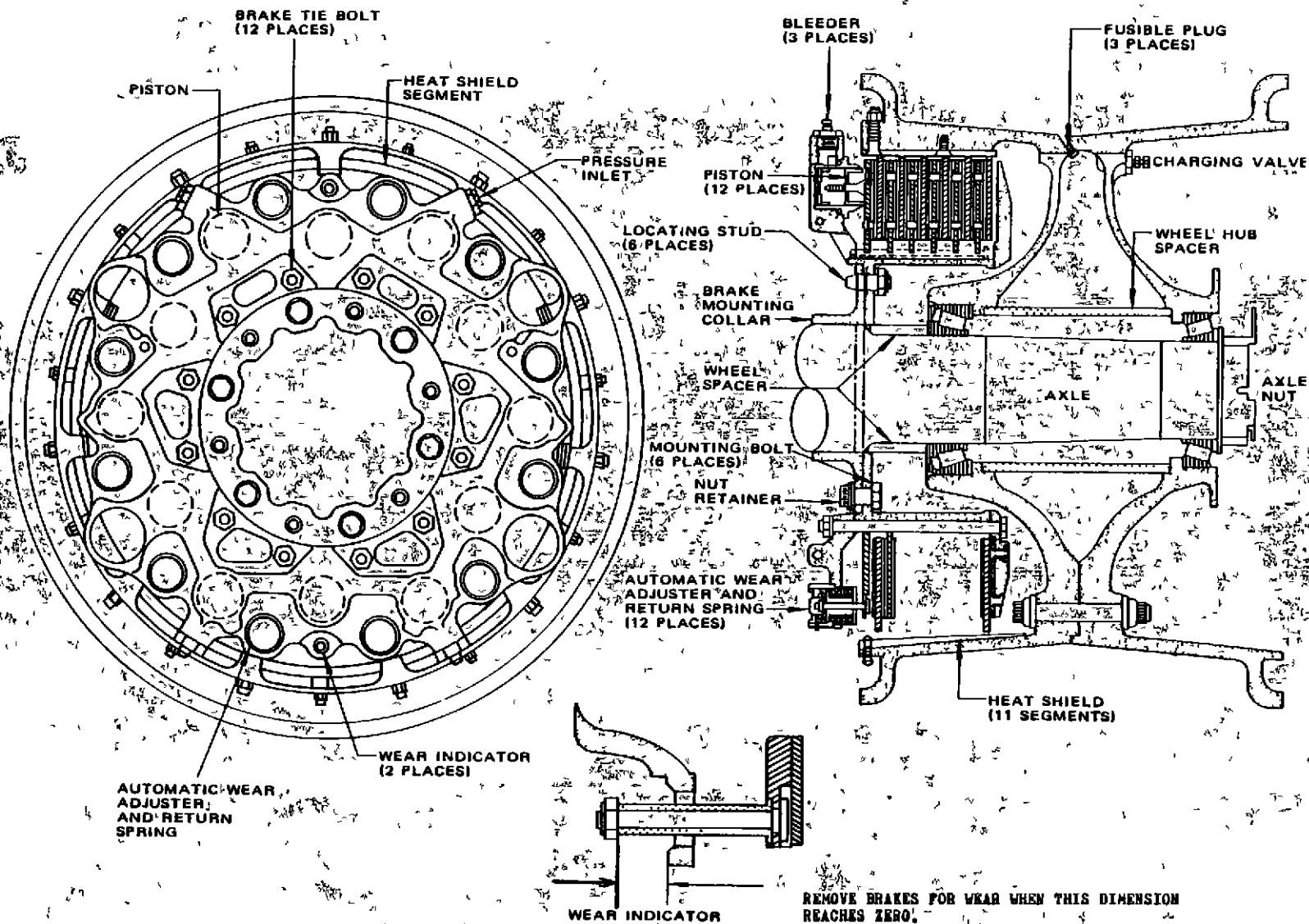
C. Special Landing Gear Brake Unit Inspection

(1) General

- (a) A high energy stop may be defined as a refused takeoff or any stop other than normal. Due to the high temperatures reached by brake units and wheels after stops of over 24 million foot-pounds energy, special precautions and checks are required. See Brake Limitation Chart in Operations Manual for computation of energy absorbed by brakes in any particular stop.

(2) Prepare for Examination

- (a) Stops of 10 to 24 million foot-pounds energy
 - 1) Allow 7 minutes cooling period for each million foot-pounds over 10 million, or until equipment has cooled to touch.
- (b) Stops of 24 to 28 million foot-pounds energy
 - 1) Move airplane clear of active runway. Use brakes sparingly when moving airplane. Do not set parking brake.
 - 2) Do not approach landing gear for 30 minutes.





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(c) Stops of over 28 million foot-pounds energy

- 1) Clear runway immediately after stop as tires will deflate.

CAUTION · WHEN THERMAL PLUGS MELT, BOTH WHEEL AND TIRE HAVE BEEN OVERHEATED AND MUST NOT BE USED AGAIN UNLESS SUCH REUSE HAS BEEN APPROVED BY WHEEL AND/OR TIRE MANUFACTURER.

- 2) Do not set parking brakes.
- 3) Alert fire extinguishing equipment for hydraulic fluid, grease, or tire fire. A dry chemical extinguisher is preferred, fog or foam may be used.
- 4) If any tires remain inflated, approach landing gear cautiously from front or rear only. Avoid spraying extinguisher or coolant directly on inflated tire or wheel.
- 5) Use fog or foam for cooling or wait two or three hours for brakes to cool sufficiently to be handled.

(3) Examine Landing Gear Brake Unit

(a) Stops of 24 to 28 million foot-pounds energy

- 1) When brake has cooled to touch, make a complete visual examination (with brake pressure on) at brake units tires and wheels. Check brake for seal leakage. Refer to 32-22-41, Main Gear Tire and Wheel - Inspection/Check.
- 2) Apply brakes fully five or six times. Check for leaks during final application.
- 3) Check for brake lining wear. See step 1.B.(1)(d).

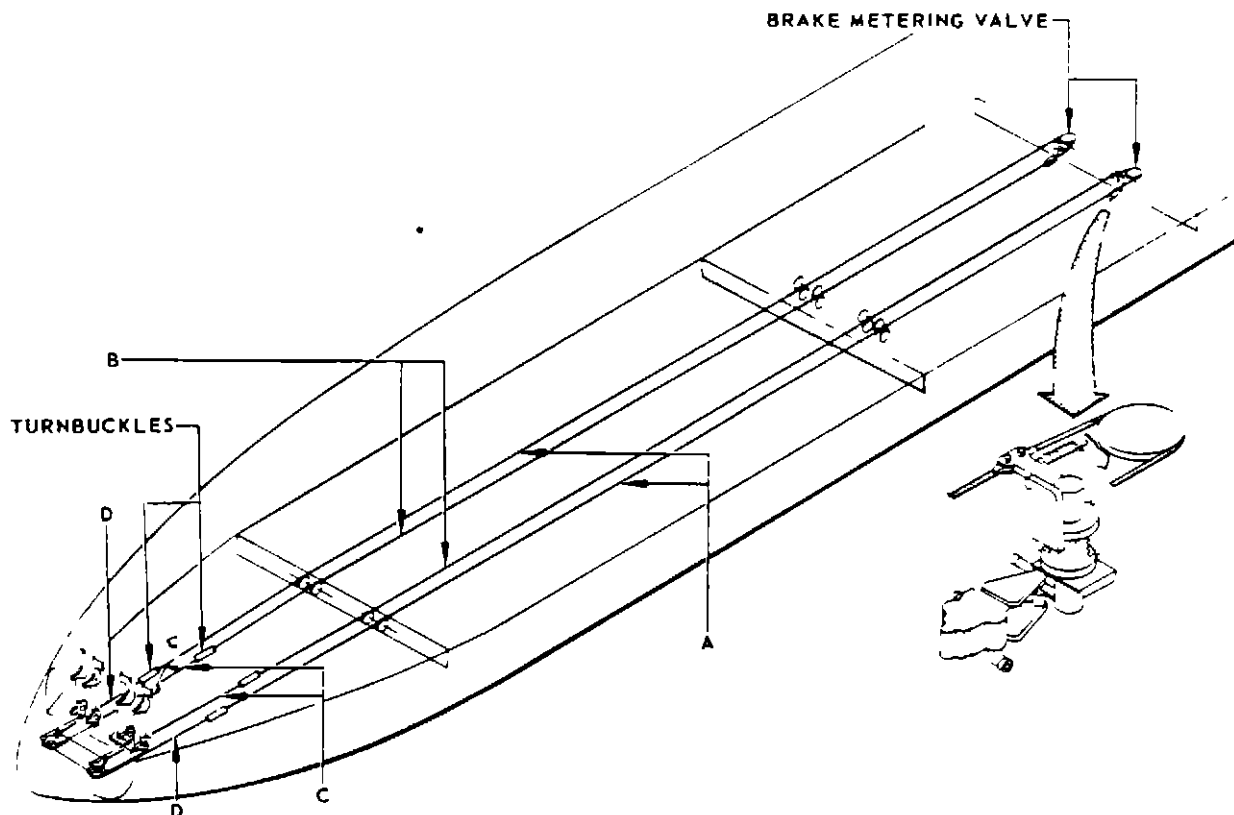
(b) Stops over 28 million foot-pounds energy

- 1) When landing gear is cool and safe to approach, replace all tires, wheels and brakes.

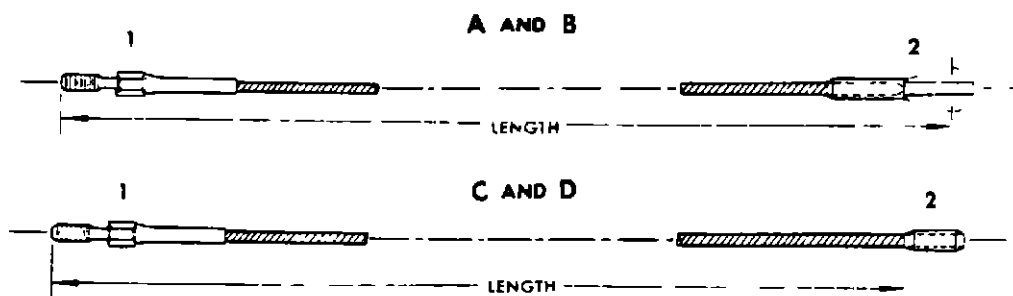
HYDRAULIC BRAKE CONTROL CABLES - MAINTENANCE PRACTICES

1. General

- A The hydraulic brake control cable system consists of eight cables. Four with R.H. thread and four with L.H. thread fittings (figure 201). Cables with R.H. thread fittings have eye terminals at the opposite end. Cables with L.H. thread fittings have cylindrical swaged terminals at opposite end. Replacement cables may be made up to dimensions given on figure 201



CABLE REF.	DRAWING NO.	NO. REQ	LENGTH	CABLE SIZE	FITTINGS		
					1.	2.	3.
A	NAS-304-34-8122	2	812.3 IN.	1/8 x 7 x 19	AN669L4RH	AN668	
B	NAS-304-34-7712	2	771.3 IN.	1/8 x 7 x 19	AN669L4RH	AN668	
C	BAC-13G-469-337	2	33.7 IN.	1/8 x 7 x 19	AN669L4LH	BAC-T14A-4	
D	BAC-13G-469-213	2	21.3 IN.	1/8 x 7 x 19	AN669L4LH	BAC-T14A-4	



HYDRAULIC BRAKE ACCUMULATOR - MAINTENANCE PRACTICES

1 Removal/Installation Hydraulic Brake Accumulator

A Remove Hydraulic Brake Accumulator

- (1) Check that landing gear ground down locks are engaged and landing gear doors are opened with release handle pulled down and latched
- (2) Depressurize hydraulic system including utility reservoir, and depressurize brake accumulator by applying brakes eight to ten times. Depressurize utility reservoir
- (3) Remove dust cap from brake accumulator charging valve, (figure 201)
- (4) Discharge nitrogen pressure from accumulator by loosening swivel hexagon nut on charging valve a maximum of one turn.

CAUTION DO NOT LOOSEN VALVE BODY OR VALVE MAY BLOW OFF, RESULTING IN INJURY TO PERSONNEL.

- (5) Disconnect hydraulic line on outboard end of accumulator Cap line, and hydraulic accumulator port.
- (6) Disconnect pressure gage line on inboard end of accumulator
- (7) Loosen T-bolts and release clamps. Remove accumulator from airplane
- (8) Remove charging valve, charging valve tee, hydraulic union and O-rings.

B. Install Hydraulic Brake Accumulator

- (1) Install a tee fitting (figure 201) with new O-rings onto end of accumulator.
- (2) Install serviceable charging valve.
- | (3) Tighten installation nut to 125 ($\pm$ 5) pound-inches. Hold installation nut and back off swivel hexagon nut.
- | (4) Deleted.
- (5) Install serviceable hydraulic union with new O-ring Torque to 120-130 pound-inches
- (6) Apply enough nitrogen pressure through charging valve to bottom piston in accumulator.
- | (7) Tighten swivel hexagon nut 50 to 70 pound-inches.
- (8) Fill hydraulic side with "Skydrol 500" and cap connection

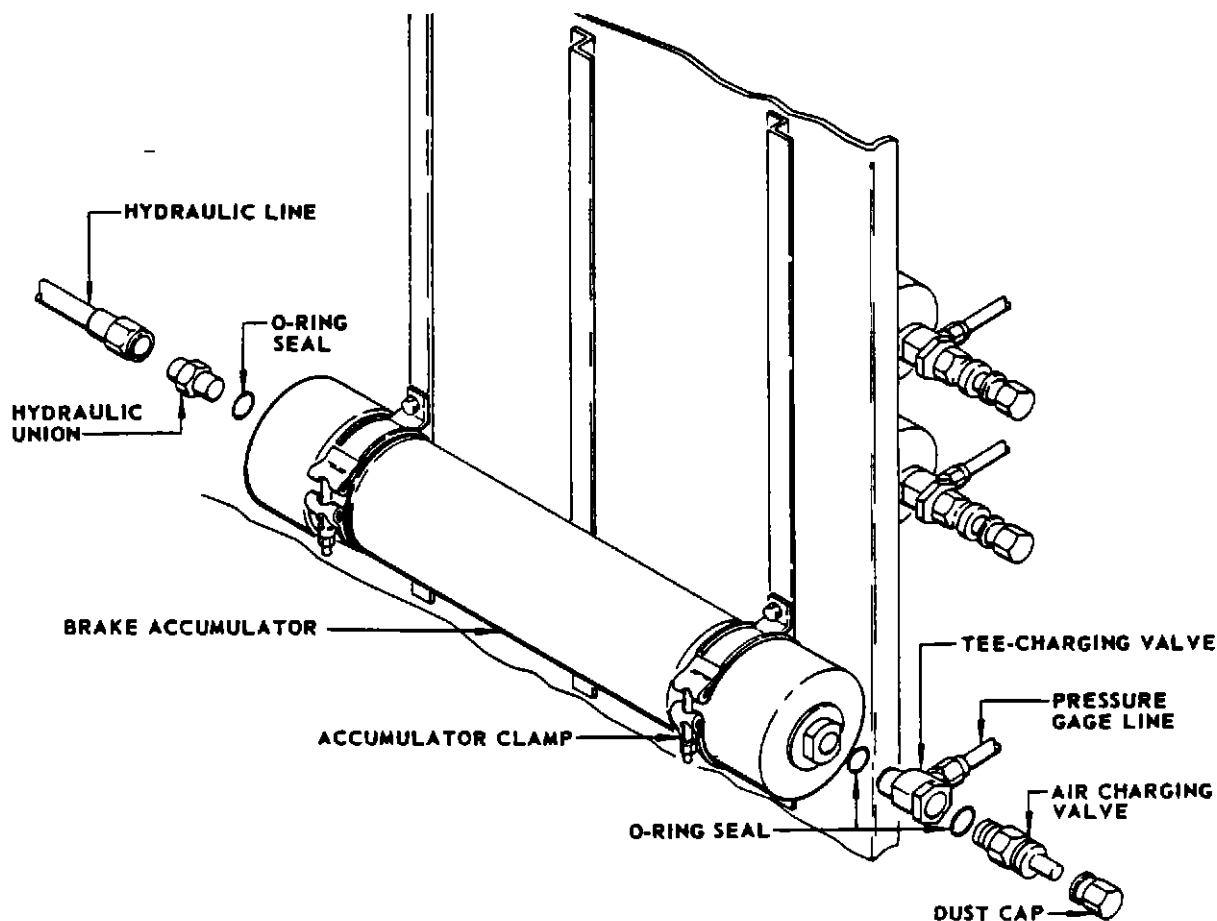
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- (9) Place accumulator inside clamps with charging valve inboard, align gage line and fitting, and secure T-bolts.
- (10) Remove caps and connect hydraulic and gage lines.
- (11) Pre-charge hydraulic accumulator according to instructions on metal-
cal near pressure gages. Replace cap on charging valve.
- (12) Pressurize hydraulic system. Gage should read approximately 3000
psi
- (13) Check hydraulic and gage line connections at accumulator for leaks
- (14) Bleed system. See "Servicing Hydraulic Brake System", 32-9-0.

2. Inspection/Check Hydraulic Brake Accumulator

A. Periodic Check

- (1) Check accumulator for leaks, loose mounting bolts and correct
precharge. See attached placard.



Brake Accumulator Installation
Figure 201

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PARKING BRAKE SYSTEM - DESCRIPTION AND OPERATION

1 General

- A. The airplane is equipped with a parking brake system to permit setting the brakes for prolonged periods. The parking brake system consists of a mechanical linkage, from a parking brake handle on pilots' control stand, to actuate a pawl in lower nose compartment which locks brake linkage in the brakes applied position. The parking brake linkage positions pawl to lock brake linkage in less than full brake applied position (not less than 925 psi hydraulic pressure through lockout deboost valve). To release parking brakes, the pilot's or copilot's brakes need only be fully applied and then released. A light is provided to indicate when the parking brake is on.

CAUTION PARKING BRAKES SHOULD NOT BE SET FOLLOWING A HIGH ENERGY STOP. HIGH ENERGY STOPS ARE DEFINED AS A "REFUSED TAKE OFF", OR ANY STOP OTHER THAN NORMAL. UNDER STATIC PRESSURE, HOT BRAKE SURFACES TEND TO FUSE TOGETHER. THEREFORE, AFTER A HIGH ENERGY STOP, OR FOLLOWING SUCCESSIVE TOUCH AND GO STOPS, A COOLING PERIOD OF 15-20 MINUTES FOR BRAKE UNITS SHOULD BE ALLOWED BEFORE THE PARKING BRAKE IS SET. SEE "OPERATIONS MANUAL".

2. Parking Brake Linkage

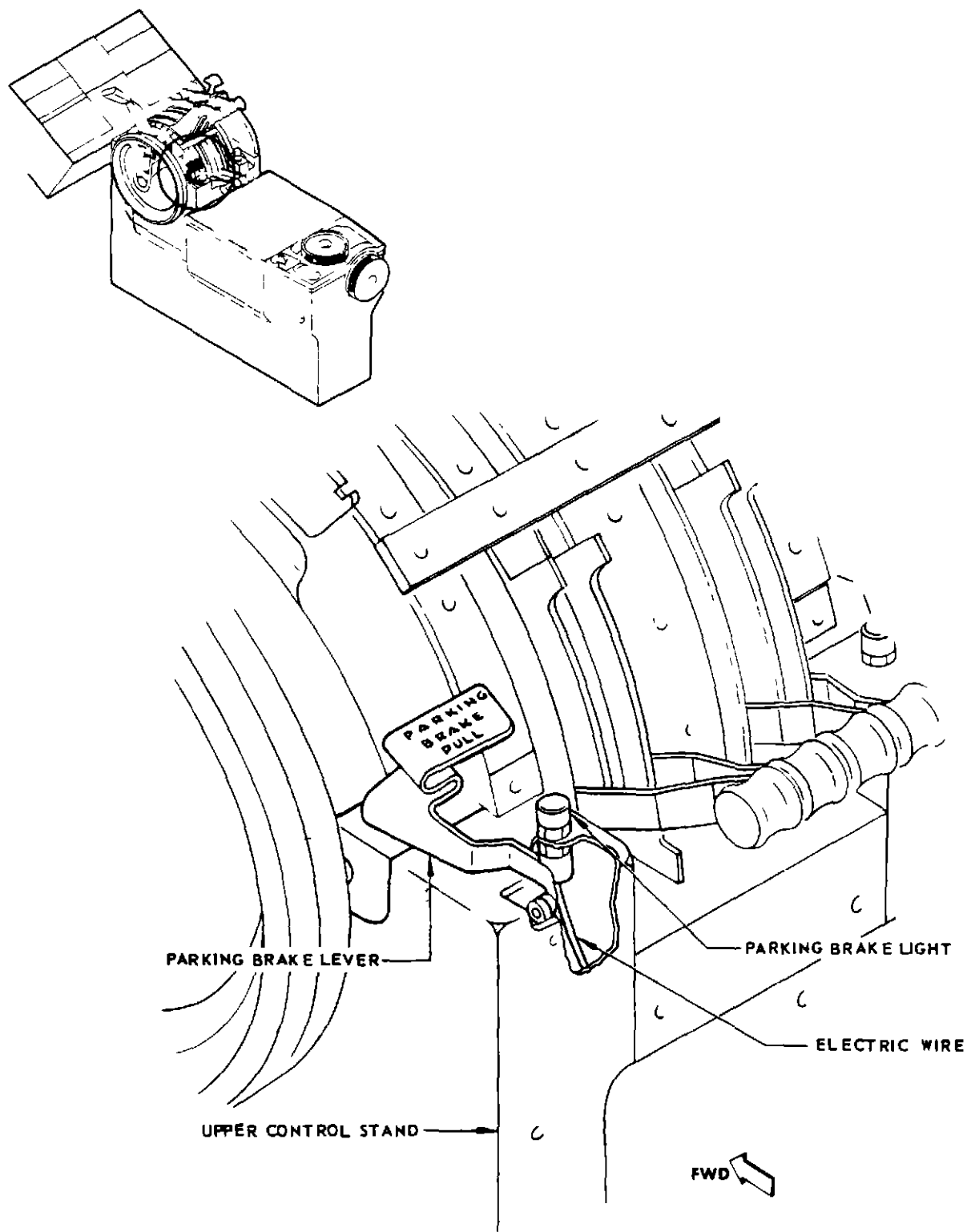
- A. The parking brake is controlled by a C-shaped lever, hinged in the top of pilot's control stand (figure 1). For parking brake linkage location see figure 2. When parking brake is operated, pawls swing toward rudder pedals to engage with forward ends of bell cranks in pilot's brakes linkage. Both brake pedals must be depressed before engaging or releasing parking brake.

CAUTION CENTER RUDDER BEFORE APPLYING PARKING BRAKE AND CHECK THAT BOTH PEDALS REMAIN DOWN WHEN RELEASED.

NOTE. The rudder may be offset after parking brake is applied.

3. Parking Brake Light

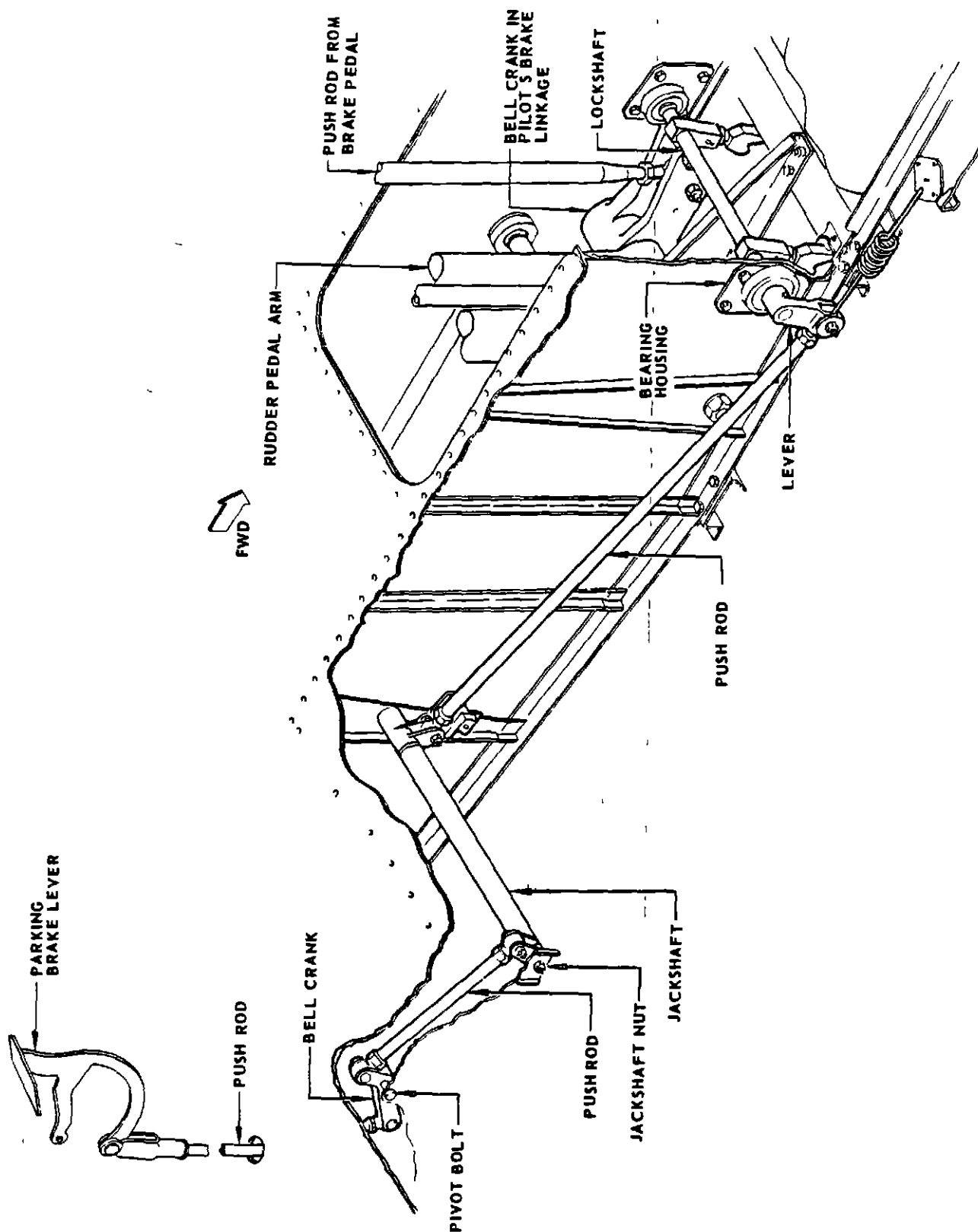
- A. The parking brake light is a socket type with a red plastic translucent cover. The light is located on the pilots control stand. When the parking brake is on, the outboard lever on the jackshaft operates a micro-switch to illuminate the light (figure 1). Power for the light is taken from a 28-volt d-c battery bus.



Parking Brake Lever and Light
 Figure 1

LANDING GEAR
Parking Brake System
Description and Operation

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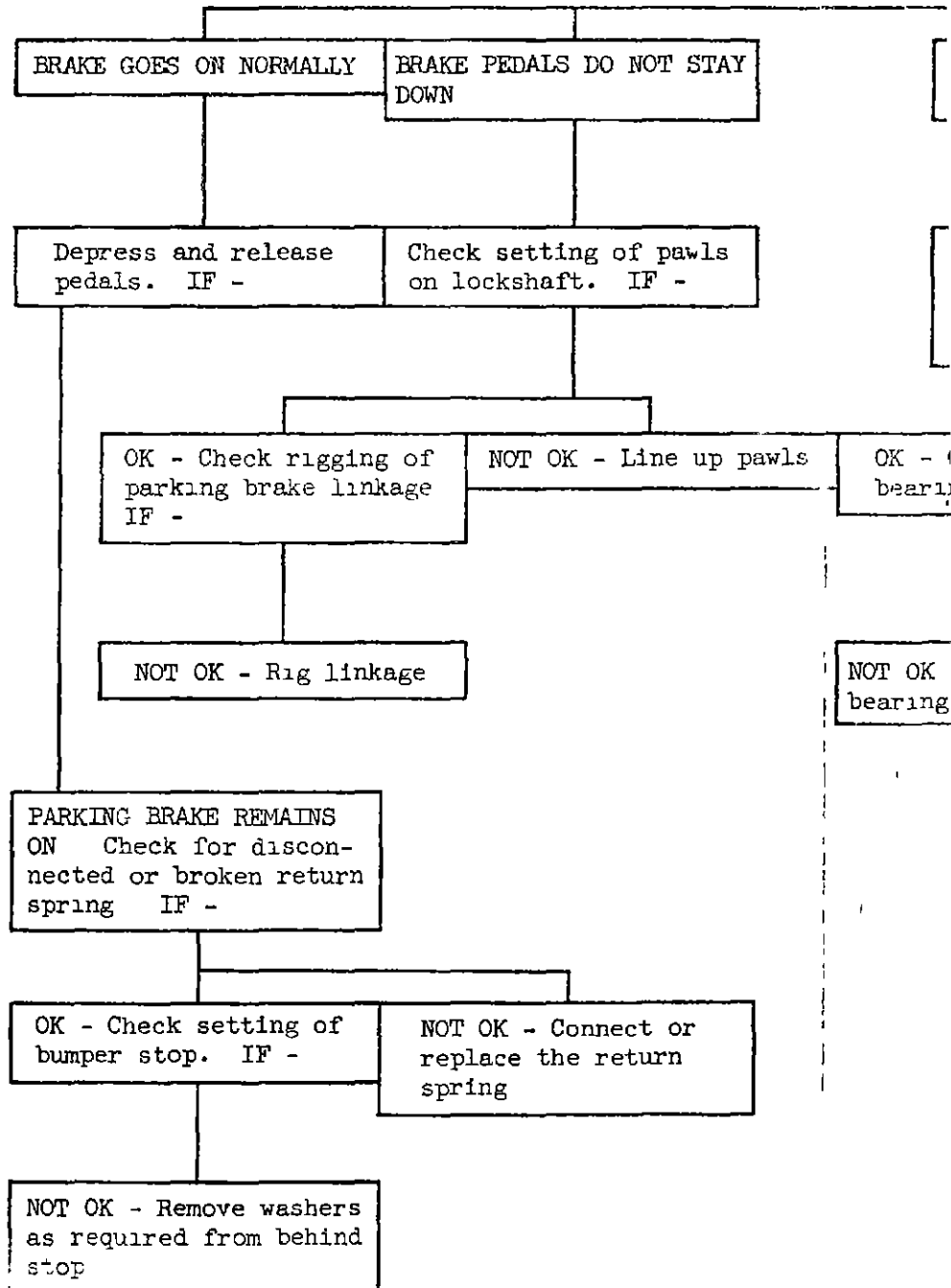


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Parking Brake Linkage
Figure 2

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PARKING BRAKE SYSTEM - TROUBLE SHOOTING



Operator in control
depresses brake
applies parking
brake and releases
IF -

PARKING BRAKE LEVER IS
JAMMED

EXCESSIVE FORCE REQUIRED
TO MOVE PARKING BRAKE
LEVER

PARKING BRAKE LIGHT DOES
NOT ILLUMINATE WHEN
BRAKE IS ON

Check through parking
brake linkage for loose
objects or displaced
bolts. IF -

Check for dry bearings
in linkage IF -

Check for faulty light
bulb IF -

Check for seized
parts. IF -

NOT OK - Remove
obstruction and repair
any damage or replace
displaced bolts

NOT OK - Lubricate or
renew defective bearings
as required

Renew defective

OK - Check operation of
micro switch. IF -

OK - Check wiring at
light circuit for
continuity. IF -

NOT OK - Renew faulty
micro switch

NOT OK - Repair or
replace defective
wiring

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PARKING BRAKE SYSTEM - MAINTENANCE PRACTICES

1. Adjustment/Test Parking Brake System

A. General

- (1) The parking brake system is adjusted to hold brakes on at a specified pressure with a set control handle position. (See figure 201.) Adjustment may be necessary after pedal linkage is reset, or after replacements in parking brake linkage. Pressure setting is controlled by adjusting two pawls. The handle is adjusted by adjusting push rods, and by the setting of a bumper stop.

B. Equipment and Materials

- (1) Pressure gages (4 required) -0 to 1500 psi, suitable for Skydrol 500

C. Adjust Parking Brake System

- (1) Adjust pawls on lockshaft to 2.19 inches long. (See detail A, figure 201.) Square up to straight edge laid across both pawls. (See view 1.) Lock adjustment.
- (2) Set bumper stop for pawls by adding or removing washers. With parking brake off, pick-up-bolt on brake control bell crank should clear pawl by 5/32 inch when brake pedals are operated. (See detail A, figure 201.)
- (3) Check that control handle just rests on top of control stand when parking brake is off. If necessary, adjust length of push rod directly attached to parking brake control handle.

D. Test Parking Brake System

- (1) Install a 1,500 psi gage downstream of each lockout-deboost valve.
- (2) Check brake accumulator pressure to be 3,000 psi. Depress brake pedals, lift parking brake handle and release pedals
- (3) Depressurize hydraulic system Gages downstream of lockout-deboost valves shall read not less than 925 psi. If pressure is low, increase length of both pawls

NOTE. Parking brake must release when brake pedals are fully depressed and then released, and pawls must clear lockwire on brake cable turnbuckles.

- (4) Check brake pressure or brake accu. pressure at the end of one hour. Brake pressure must not be less than 600 psi, the brake accu. pressure must not be less than 1900 psi.

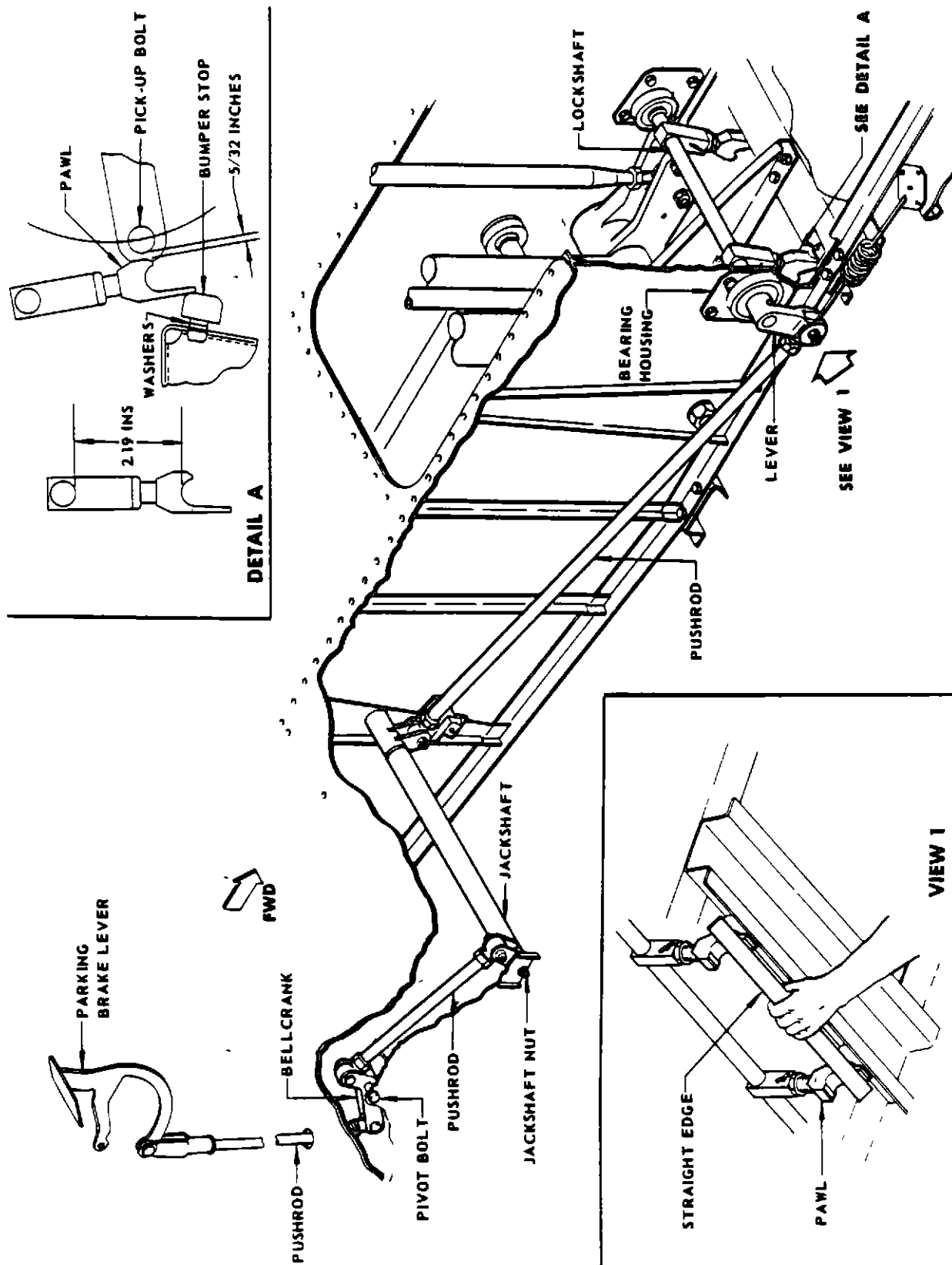
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Parking Brake System Adjustment
Figure 201

PARKING BRAKE LINKAGE - MAINTENANCE PRACTICES

1 Removal/Installation Parking Brake Linkage

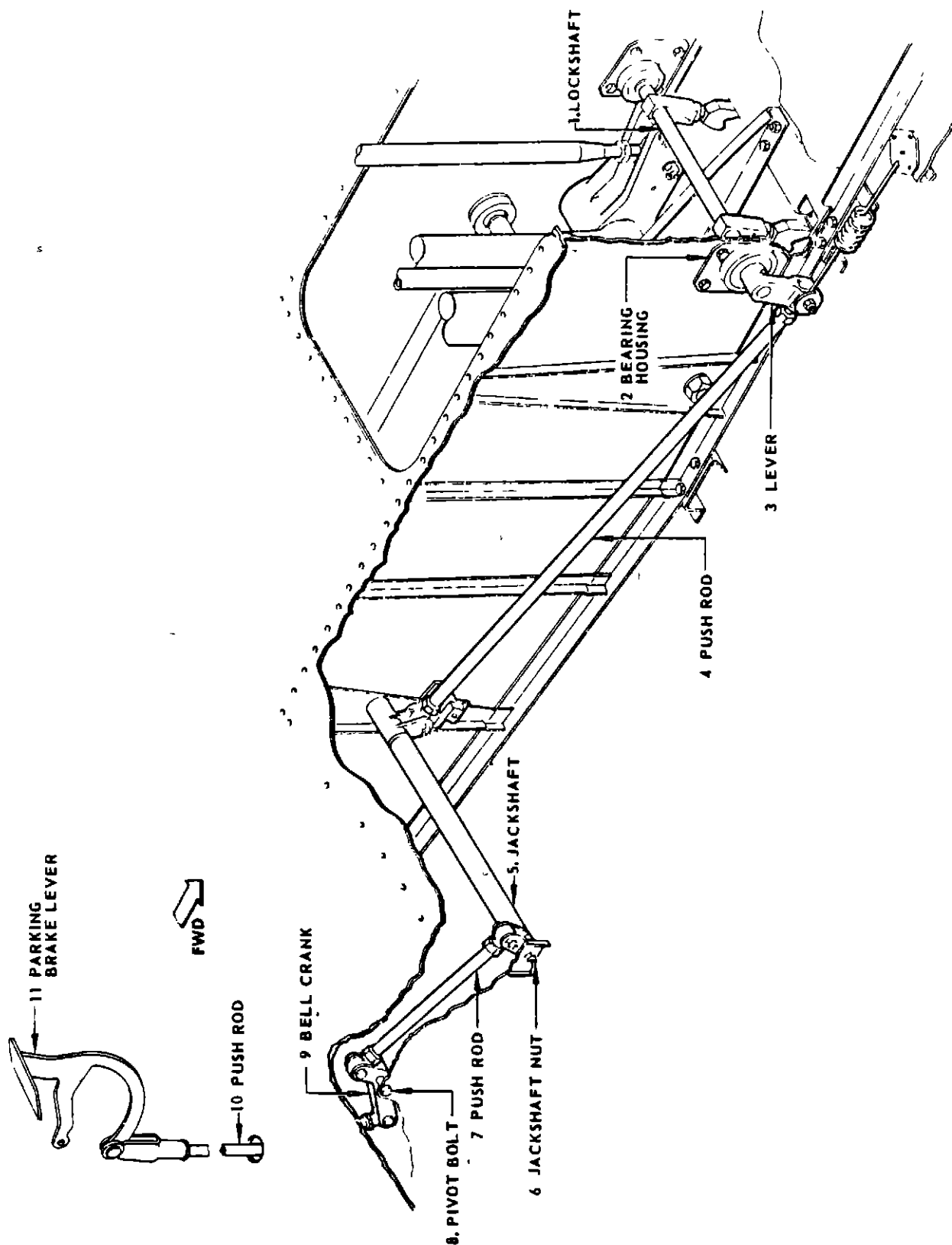
A. Remove Parking Brake Linkage

- (1) Detach pushrod (4, figure 201) from lever (3) on lockshaft (1)
- (2) Remove securing bolt and take lever off lockshaft.
- (3) Remove three bolts securing bearing housing (2) at inboard end of lockshaft

NOTE. Observe red anti-galvanic washers under bolt head and spacer at lever, step (1) Also under bolt head and nut, at lever securing bolt, step (2), and also a washer under heads of bolts securing bearing housing, step (3)

- (4) Tap lockshaft inboard until outboard end leaves bearing.
- (5) Remove bearing and housing from inboard end of shaft
- (6) Take out shaft in an aft and outboard direction
- (7) Detach aft end of push rod (4) from jackshaft (5). Remove push rod.
- (8) Detach push rod (7) at lever on inboard end of jackshaft.
- (9) Remove nut (6) on end of stud through jackshaft. Tap out stud and remove jackshaft.
- (10) Remove both access panels below thrust levers on left side of control stand.
- (11) Detach pushrod at short lever on bell crank (9) in control stand.
- (12) Withdraw push rod below cabin floor.
- (13) Detach push rod (10) at long lever on bell crank
- (14) Remove bolt (8) through pivot of bell crank and take out bell crank
- (15) Detach and remove push rod from parking brake lever (11)

NOTE. Bearings for lockshaft and jackshaft can be changed when parking brake linkage is disassembled.



Parking Brake Linkage Installation
Figure 201



B. Install Parking Brake Linkage

- (1) Fit bell crank (9, figure 201) in lower portion of control stand with short lever up and long lever aft. Fit bolt and secure bell crank.
- (2) Connect push rod (10) between long lever of bell crank and parking brake lever.
- (3) Insert push rod (7) from below cabin floor and connect to bell crank.
- (4) Place jackshaft (5) in position and tap in stud. Fit nuts and secure jackshaft.
- (5) Attach push rods (7 and 4) on jackshaft levers.
- (6) Manipulate lockshaft (1) in position. Line up with bearings and insert inboard end of shaft in bearing.
- (7) Set lockshaft in position, fit outboard bearing and housing (2) over shaft. Insert three bolts with red anti-galvanic washers under heads, and secure bearing housing.
- (8) Fit lever (3) on outboard end of jackshaft. Insert and tighten securing bolt with red anti-galvanic washers under head and nut.
- (9) Attach push rod to lever. Insert anti-galvanic washer under head and under spacer below washer and nut.
- (10) Adjust and test control operation, see "Adjustment/Test Parking Brake System", 32-10-0

END

PARKING BRAKE LIGHT - MAINTENANCE PRACTICES

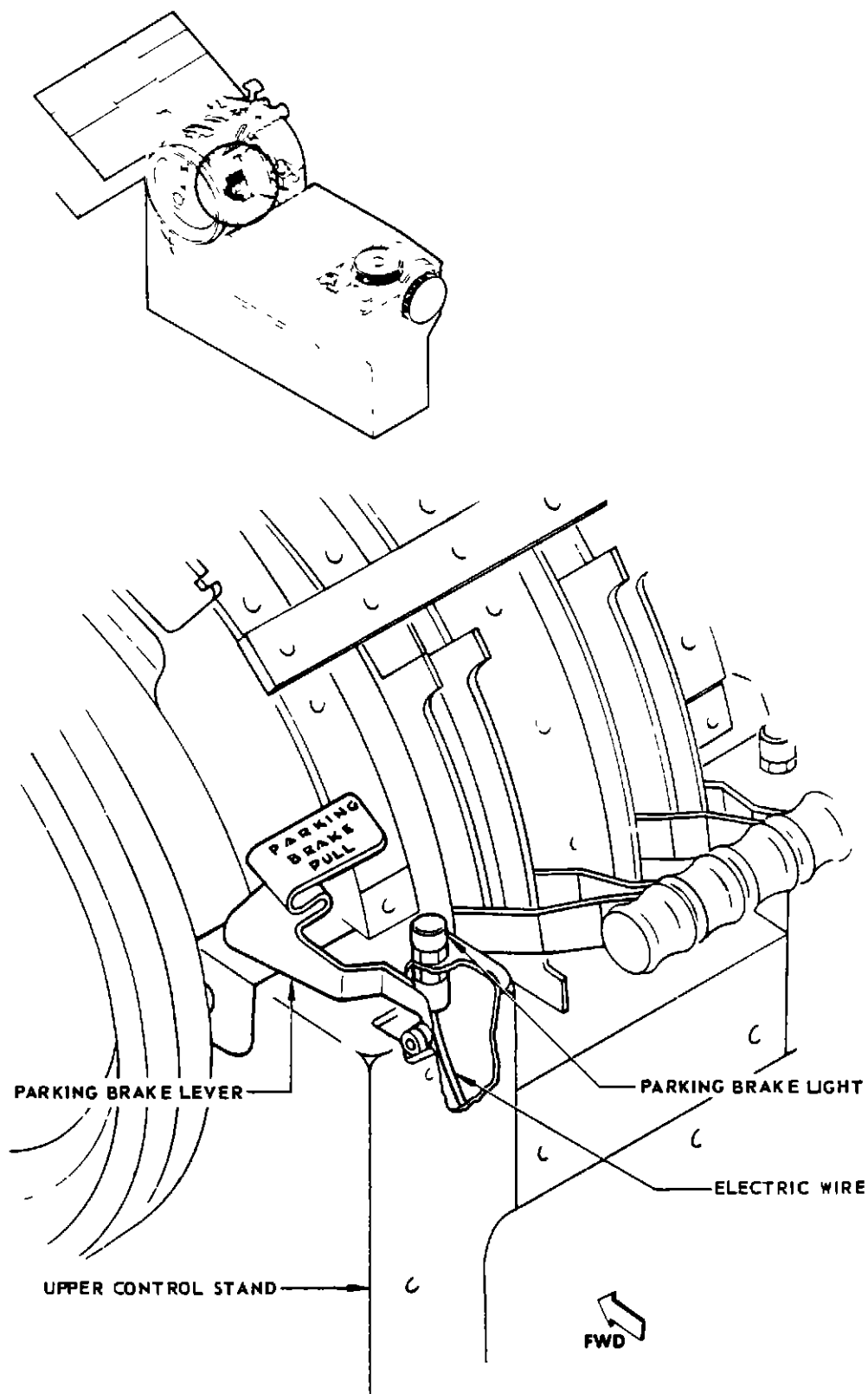
1. Removal/Installation Parking Brake Light

A. Remove Parking Brake Light

- (1) Pull out circuit breaker for parking brake light in upper right corner of P6 circuit breaker panel.
- (2) Remove left stabilizer trim control wheel, and left upper side panel assembly from control stand.
- (3) Unscrew lower mounting nut from light assembly (figure 201) Lift light assembly sufficiently to give access to wire connection on underside
- (4) Unsolder wire connections and remove light assembly from airplane.

B Install Parking Brake Light

- (1) Thread mounting nut and washer over wires, below hole in control stand for light.
- (2) Pull off cover and remove bulb from light.
- (3) Draw wires through hole and solder to connections on light Use a good commercial radio type rosin core solder
- (4) Draw wires back and insert light.
- (5) Fit nut on underside of light. Adjust upper and lower nuts to leave no thread showing on top. Tighten lower nut.
- (6) Insert bulb and replace lamp cover.
- (7) Replace left stabilizer trim control wheel, and left upper side panel assembly on control stand.
- (8) Push in circuit breakers and test operation of light. Press light to test and also operate parking brake.





PNEUMATIC BRAKE SYSTEM - DESCRIPTION AND OPERATION

1. General

- A. The pneumatic brake system is an alternate method of applying the main gear wheel brakes. This pneumatic brake system bypasses the normal hydraulic brake system and has no antiskid control, and no directional control braking.
- B. The pneumatic brake system is a combined system using dry air or nitrogen and hydraulic fluid. A pneumatic bottle with pressure gages and a charging valve stores high pressure air or nitrogen for system usage. (See figures 1 and 2.) A pneumatic brake control valve operated by a handle on the captain's instrument panel regulates the pressure for braking. Compressed gas from a pneumatic bottle is directed to the emergency brake line containing hydraulic fluid for applying the brakes.
- C. A pneumatic brake system charging quick-disconnect and a check valve are located on the keel beam in left wheel well for filling the emergency brake line with hydraulic fluid.

2. Pneumatic Brake Control Valve

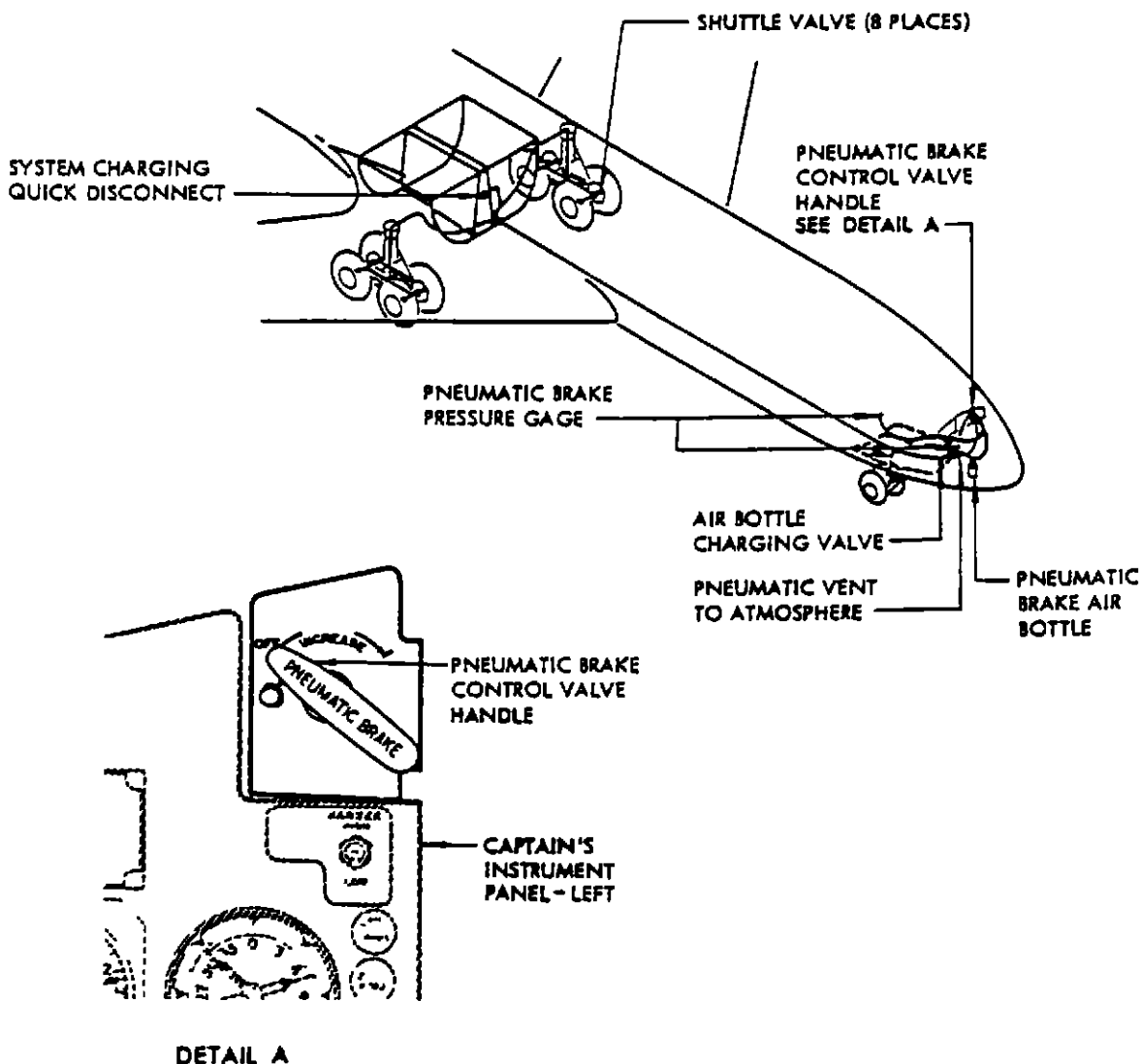
- A. A pneumatic brake control valve directs high pressure air or nitrogen to actuate the brake units. The valve is located behind the pilot's instrument panel and is controlled by a control handle on the panel. The valve is set to the full open position when the control handle is turned clockwise through an angle of 90 degrees from the closed position. The valve has three ports: an inlet port for pressure from the bottle, an outlet to the brakes and an exhaust. (See figure 3.)



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3. Pneumatic Brake Air Bottle

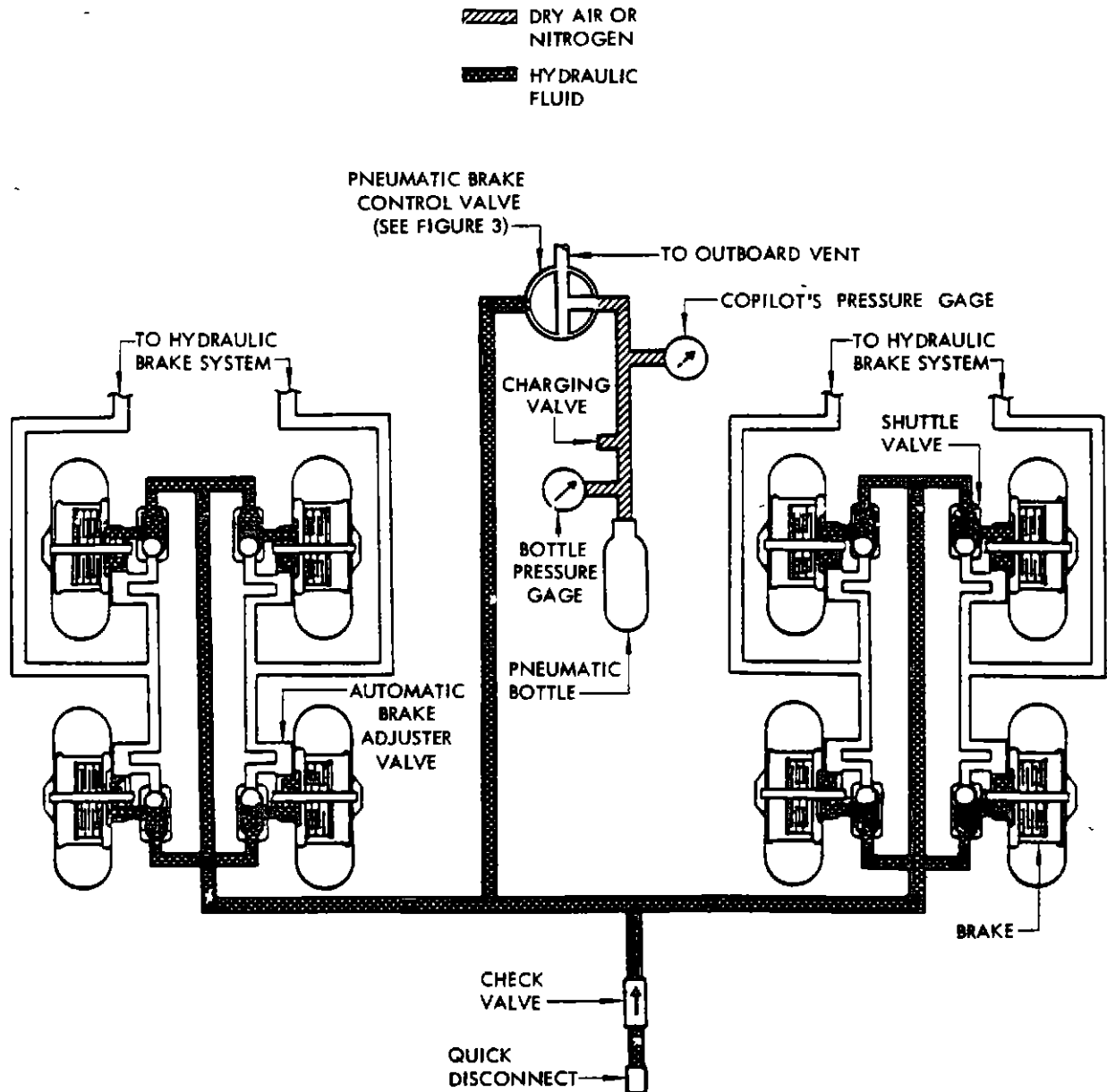
- A. The pneumatic brake air bottle is used to store high pressure air for emergency application of wheel brakes. The bottle has an internal volume of 200 cubic inches and a nominal working pressure of 1400 psi. The working medium may be clean dry air or nitrogen. A moisture drain plug is located in the head (port) end of bottle. The bottle has two air line ports. One port is line connected to a charging valve and a pressure gage, both located in the nose wheel well. The other port is line connected to the control valve on pilot's instrument panel, and a pressure gage mounted on copilot's side wall panel.
- B. The bottle is located in the lower nose compartment attached to structure below the rudder control linkage.



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Pneumatic Brake System Equipment Location
Figure 1

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SYSTEM SHOWN WITH PNEUMATIC BRAKE APPLIED

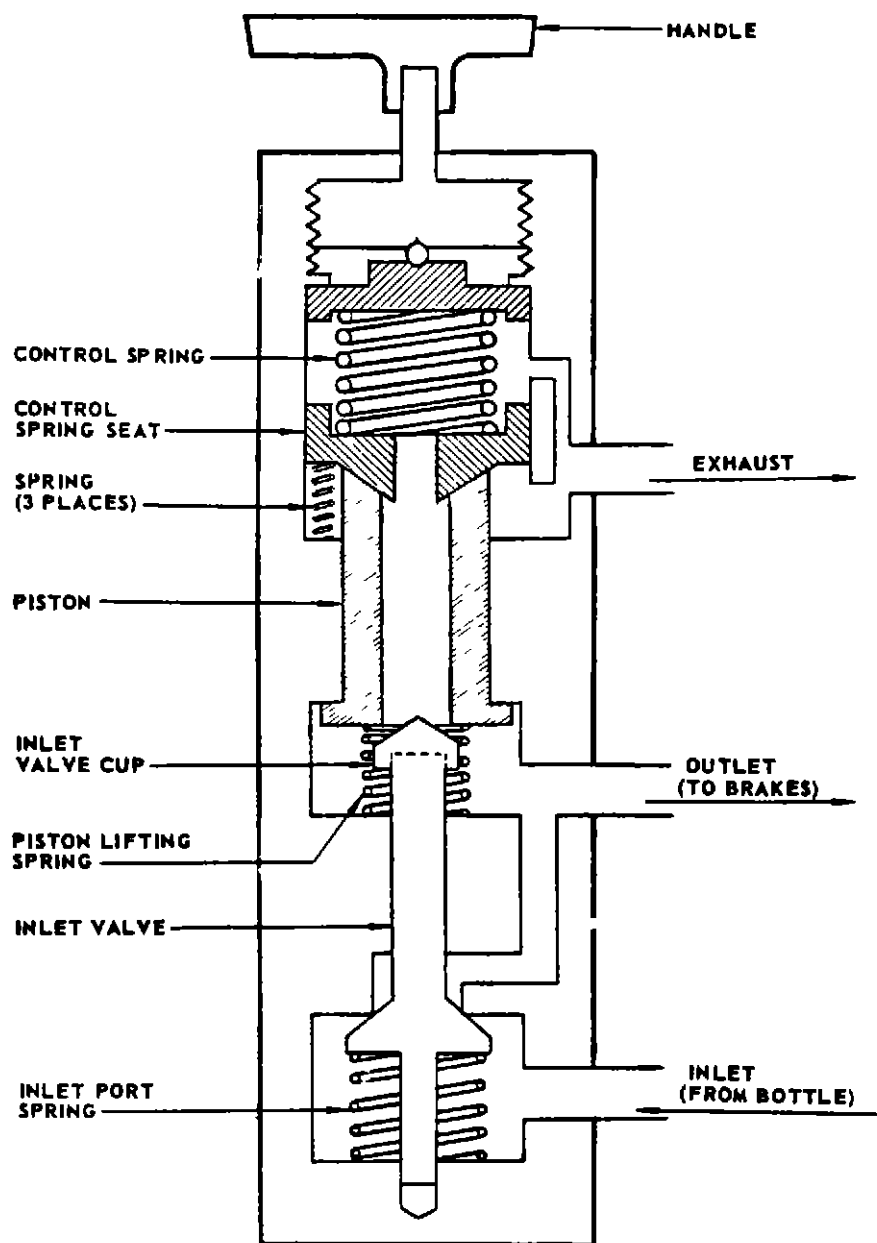


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4. Operation

- A. Pneumatic braking is applied by rotating the pneumatic brake control handle to obtain the desired braking effect. Rotation of the handle permits selecting braking pressure from 0 to a maximum of approximately 850 psi.
- B. As the control valve handle is rotated clockwise from the closed position, the control spring is compressed. (See figure 3.) This causes the control spring seat and piston to move so that the piston contacts the inlet valve cup, thus closing the vent passage between the exhaust port and outlet to the emergency brake line. Additional motion of the piston forces the inlet valve to open, allowing gas from the pneumatic bottle to flow from the control valve outlet to the emergency brake line. When gas pressure against the piston is equal to control spring opening pressure against the piston, the piston moves to allow the inlet valve to close, thus maintaining gas pressure on the emergency brake line at a constant value. This pressure is maintained at a constant value until it is increased by further rotation of the control valve handle, or until released by rotating the control valve handle to the closed position which permits the inlet valve to close and opens the passage between the outlet port and the exhaust port, thus relieving all pressure from the emergency brake line.
- C. Pressure applied to the emergency brake line is transmitted by hydraulic fluid shuttle valves at each main gear wheel brake. (See figure 2.) The shuttles of the shuttle valves move to prevent fluid flow into the main brake lines, and pneumatic braking pressure is applied to the brake cylinders. This pressure is maintained until increased or released by actuating the pneumatic brake control valve.

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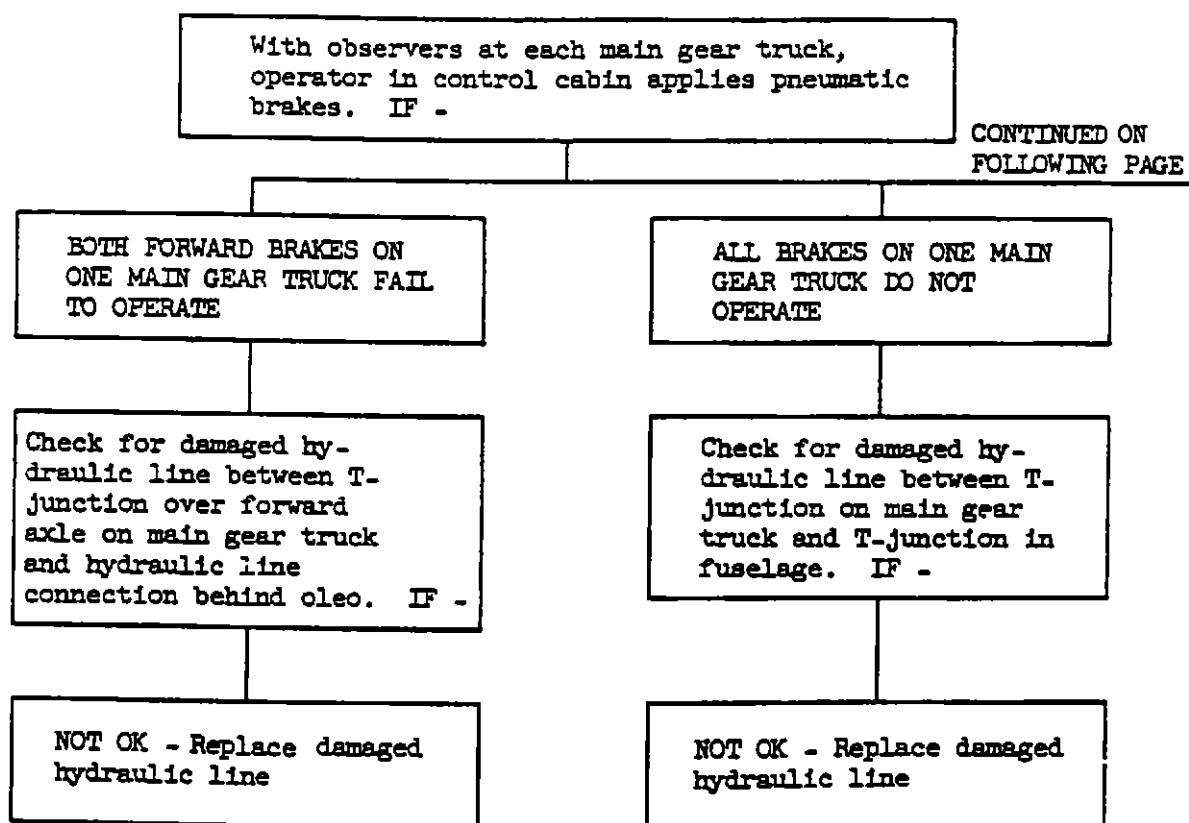
NOTE: VALVE SHOWN IN
CLOSED POSITION

PNEUMATIC BRAKE SYSTEM - TROUBLE SHOOTING

1. General

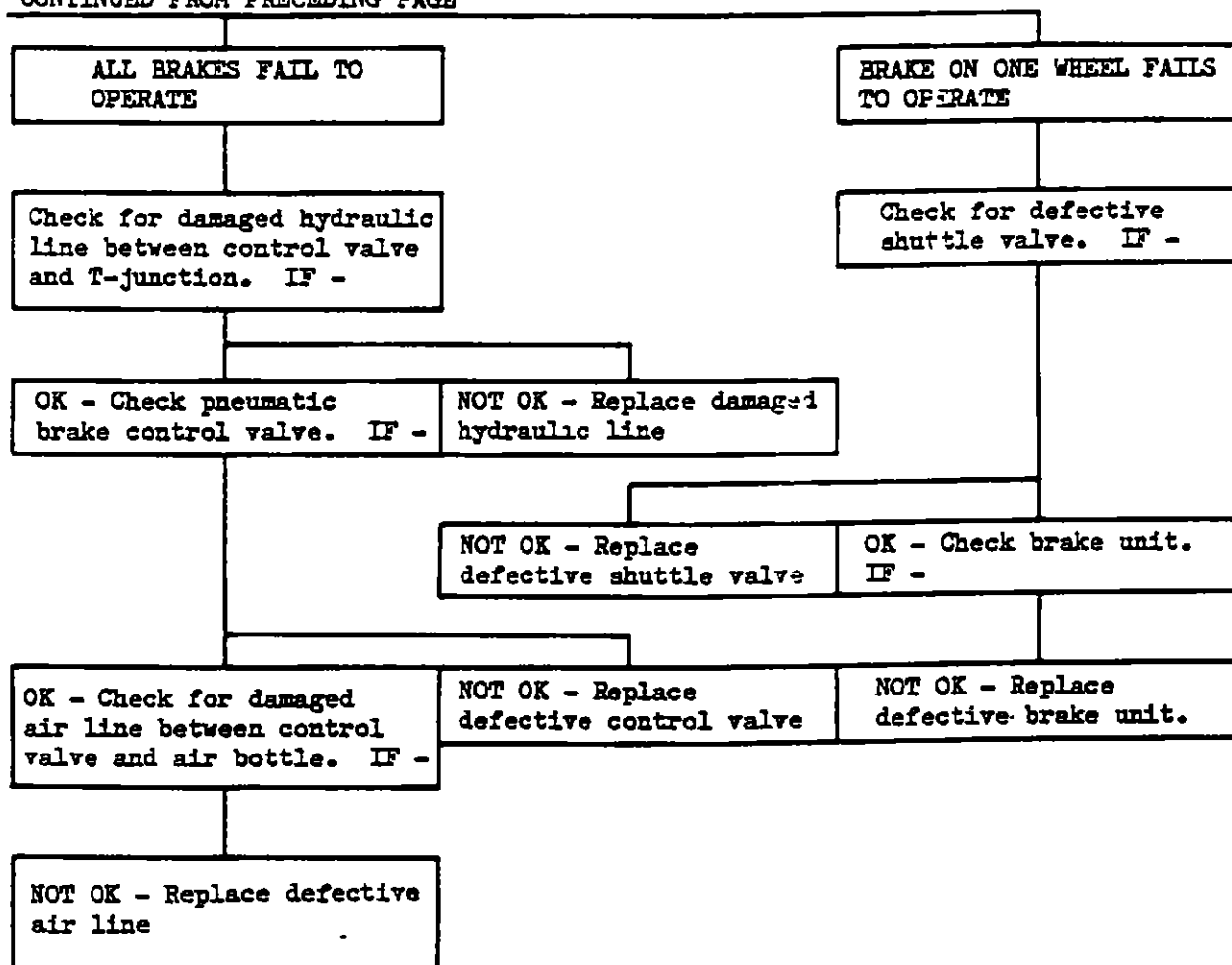
- A. Test pneumatic brake system. See Adjustment Test, Pneumatic Brake System.
- B. If system malfunctions, recharge air bottle and see following chart.

2. Pneumatic Brake System Trouble Shooting Chart



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 MAINTENANCE MANUAL

CONTINUED FROM PRECEDING PAGE





PNEUMATIC BRAKE SYSTEM - MAINTENANCE PRACTICES

1. General

- A. The maintenance practices included in this section (201-299 page block) are general maintenance instructions that do not fall within a specific category. Any maintenance practices that fall within a specific category will be provided in the applicable page blocks.
- B. The pneumatic brake system must be bled whenever the brakes and brake shuttle valve are replaced.

2. Equipment and Materials

- A. Hydraulic Cart - 0 to 150 psi, or equivalent
- B. No. 6 MS Drain Hose
- C. 150 psi shutoff valve
- D. 0 to 1500 psi pressure gage

3. Prepare Pneumatic Brake System for Bleeding

- A. Precharge the pneumatic bottle per placard with dry air or nitrogen.
- B. Check that parking brakes are off.

4. Bleed Pneumatic Brake System

- A. Disconnect vent line at bulkhead fitting in nose wheel well. Install drain hose with shutoff valve. Close shutoff valve and place pilot's pneumatic brake control valve in OFF position.
- B. Connect hydraulic cart to system quick-disconnect, in left wheel well.
- C. Bleed each brake through bleed fittings on top of brake assembly until fluid is clear, indicating no air inclusion.



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- D. Open drain shutoff valve.
- E. Pressure fill remaining portion of system until hydraulic fluid flows from vent line in nose wheel well. Do not exceed 75 psi filling pressure.
- F. Charge pneumatic brake system bottle per placard in nose wheel well.
- G. Install pressure gage in emergency brake lines on each main gear.
- H. Slowly turn control valve handle on pilot's main instrument panel to full increase position. Pressure at each brake should be 800 (+100/-75) psi.
- I. Depressurize brake system and remove pressure gages.
- J. Repeat steps E. and F. to service brake system.
- K. Disconnect drain hose and connect vent line in nose wheel well.
- L. Pressurize utility system to 200 psi using hydraulic cart.
- M. Apply parking brakes and check that all main gear brakes have operated thus indicating that shuttle valves have shifted properly.
- N. Depressurize brake system and disconnect hydraulic cart.



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PNEUMATIC BRAKE SYSTEM - ADJUSTMENT/TEST

EFFECTIVITY

All except 00-SJA thru 00-SJK

1. Equipment and Materials
 - A. 0 to 1500 PSI Hydraulic Gauges (two required)
 - B. Hydraulic Cart
2. Prepare to Test Pneumatic Brake System
 - A. Install a 0 to 1500 psi gauge suitable for Skydrol 500 in the pneumatic brake line at each wheel truck.
 - B. Precharge the pneumatic bottle per placard with dry air or nitrogen.
 - C. Check that parking brakes are Off.
3. Test Pneumatic Brake System
 - A. Rotate the pneumatic control valve to ON position and hold for three minutes.
 - B. Check that the pressure at each wheel truck is 800 (+100/-75) psi and there is no leakage in the system, either gas or hydraulic fluid.
 - C. Rotate the pneumatic control valve to OFF position.
 - D. Check that pressure at the brakes returns to 0 psi and all brakes release.
4. Restore Airplane to Normal Configuration
 - A. Remove gauges from pneumatic brake lines.
 - B. Connect hydraulic cart (150 psi max) to system charging quick-disconnect.
 - C. Replenish hydraulic fluid supply until fluid flows from the vent line in the nose wheel well.
 - D. Shift all brake shuttle valves by applying hydraulic brakes by brake pedals.
 - E. Set parking brakes and check that all main brakes are applied and no leaks are evident in system.
 - F. Recharge pneumatic bottle per placard.

PNEUMATIC BRAKE CONTROL VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Pneumatic Brake Control Valve

A. Remove Pneumatic Brake Control Valve

- (1) Release pressure from air bottle by removing cap from charging valve in nose wheel well and loosening large thin nut, a maximum of one turn.
- (2) Remove nut and withdraw pneumatic brake control handle from control valve on pilot's instrument panel.
- (3) Release catches and hinge back pilot's instrument panels.
- (4) Detach air lines at valve. Cap or plug lines.
- (5) Take out two bolts securing control valve and remove valve from panel.

B. Install Pneumatic Brake Control Valve

- (1) Place serviceable valve in installed position with two air line connections toward back side of panel.
- (2) Insert attachment bolts and secure valve to panel.
- (3) Connect air lines to valve.
- (4) Set point of triangular stub on valve spindle facing outboard.
- (5) Place control handle on spindle with open end facing inboard. Secure handle with nut.
- (6) Charge air bottle according to instruction on metal-cal near charging valve in nose wheel well.
- (7) Check that full hydraulic brake pressure is available and apply parking brake.
- (8) Check air line connections at valve for leaks. See "Adjustment/Test Pneumatic Brake System," 32-12-0.
- (9) Lockwire handle in "OFF" position.

CAUTION: USE ONLY 0.020 INCH DIAMETER ALUMINUM ALLOY WIRE, INSTALL DOUBLE TWIST METHOD.

- (10) Reuse and fasten instrument panel.

END

PNEUMATIC BRAKE AIR BOTTLE - MAINTENANCE PRACTICES

1. Removal/Installation Pneumatic Brake Air Bottle

A General

- (1) The bottle fitting has two ports marked "IN" and "OUT". The "IN" or charging port opens directly into the bottle. The "OUT" or discharge port draws air from the central portion of the bottle through a tube. This tends to prevent the discharge of water, dirt, or foreign matter which may have accumulated on the dome of the bottle. The outlet passage is also fitted with a 40-mesh screen.
- (2) The emergency brake will operate with the bottle reversed, but in order to obtain full benefit from the design, the "IN" and "OUT" ports should be properly oriented during bottle installation.

B Remove Pneumatic Brake Air Bottle

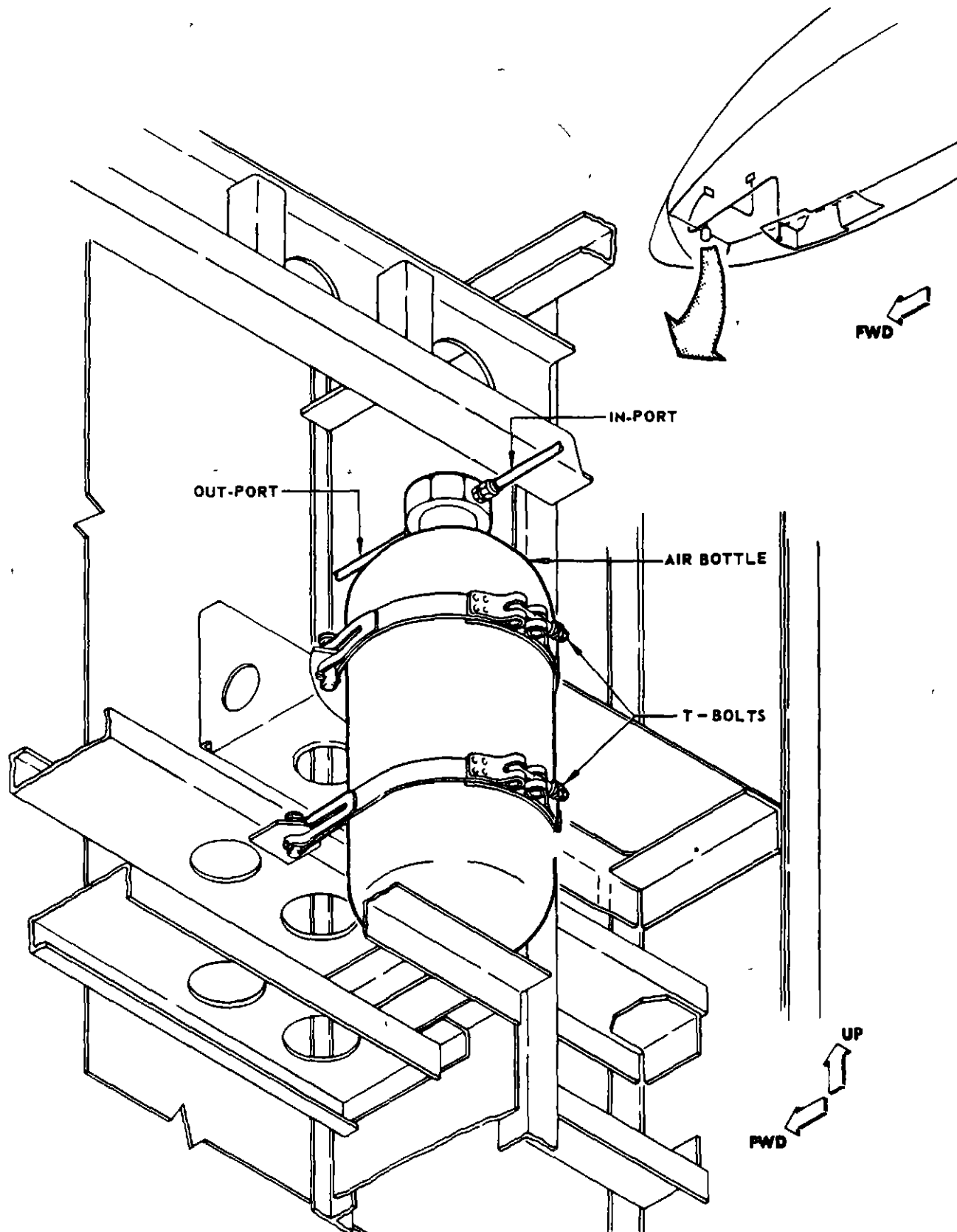
- (1) Remove cap from charging valve (nose wheel well) and discharge air bottle (lower nose compartment) by loosening large thin nut a maximum of one turn.
- (2) Disconnect air lines at bottle neck, (figure 201). Cap lines and plug ports in air bottle.
- (3) Release T-bolts, open clamps and remove air bottle.

C. Install Pneumatic Brake Air Bottle

- (1) Place air bottle in position, neck up.
- (2) Adjust position of bottle to bring connection on bottle neck in line with air lines.

NOTE - The "OUT" port line points approximately to the left and forward of the bottle. The "IN" port line points approximately to the right and aft of the bottle

- (3) Secure bottle in position with clamps
- (4) Remove caps and plugs and connect air lines, to air bottle.
- (5) Charge air bottle with nitrogen to pressure indicated on placard through charging valve in nose wheel well
- (6) Close valve by tightening large thin nut and then check system for leaks.



Pneumatic Brake Air Bottle
Figure 201

MAIN LANDING GEAR - DESCRIPTION AND OPERATION1. General

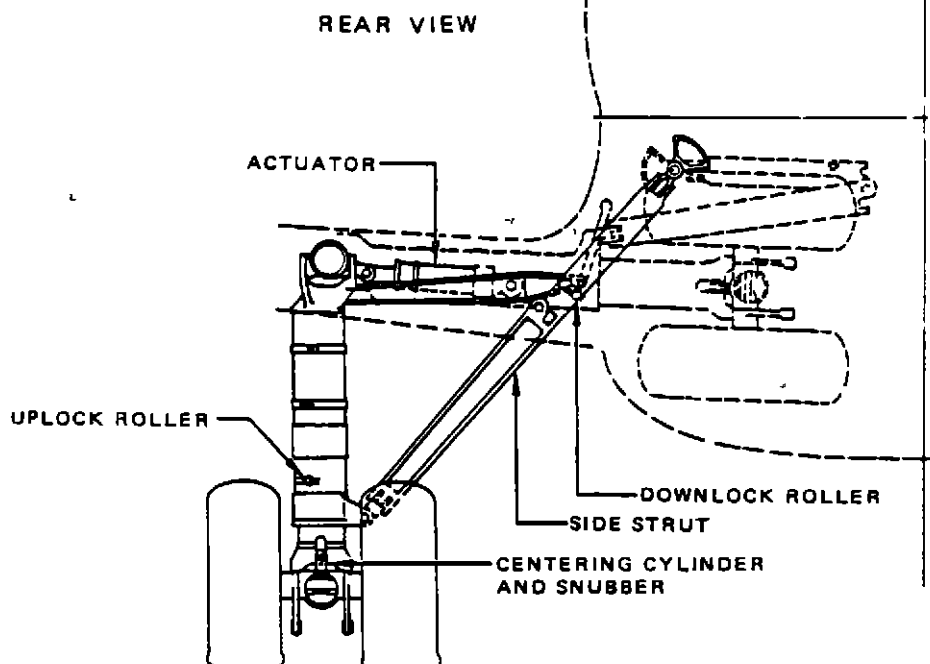
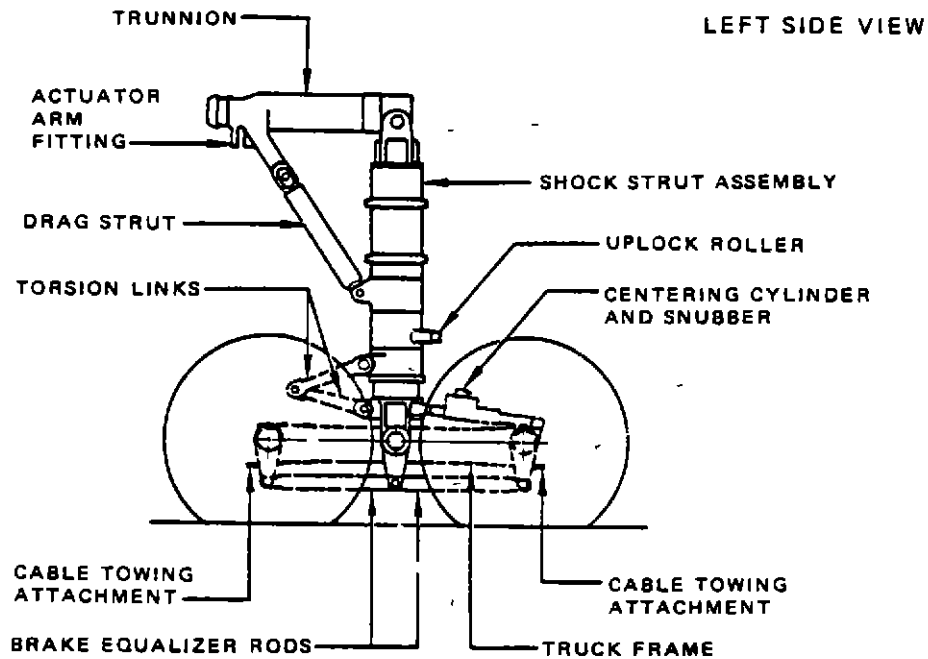
- A. The main landing gear in conjunction with the nose landing gear, supports the airplane during ground operation. The landing gear oleo cushions impact on landing, dampens vibrations and absorbs shock when the airplane is towed or taxied.
- B. Each main gear (figure 1) retracts inboard into wheel wells in the fuselage. Gear actuation for retraction or extension is by hydraulic power. Multiple wheels are used to economize space required for retraction. Four wheels on each main gear truck carry the load with a minimum size of wheel. An emergency extension system is provided for extending the gear. A trunnion, pivoting on an axis parallel to the airplane center line, provides the main attachment for each main landing gear. Trunnion support bearings are carried in a torsion box attached to the wing rear spar. Secondary loads (drag and side) are transmitted from the oleo to structure through struts. For main gear components, see figure 2.
- C. Moving the landing gear control handle to "UP" or "DOWN" directs hydraulic pressure for landing gear actuation. To retract an extended landing gear, the control handle is moved to "UP." Wheel well doors open, down locks release and the landing gear retracts. Up locks engage and the wheel well doors close. To extend the gear, the control handle is placed in the "DOWN" position, the wheel well doors open, the gear extends and the doors close.

2 Main Gear Trunnion

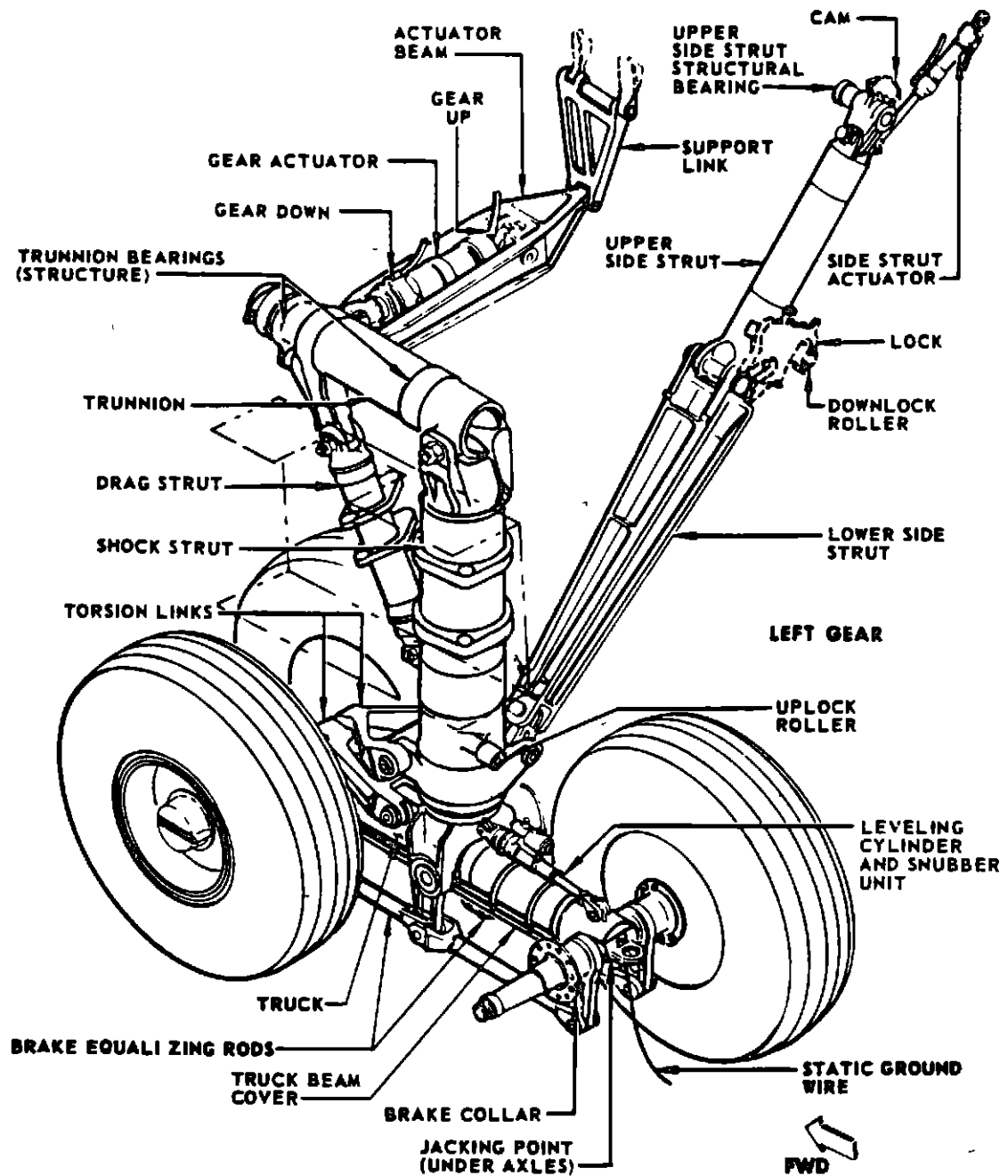
- A. The main gear trunnion (figure 3) transmits landing gear loads to the airplane structure and is the hinge for main gear retraction. The trunnion is pivoted on bearings. The bearings are supported on a torsion box projecting aft from the rear wing spar. An attachment is provided at the aft end of the trunnion for the shock strut. An arm attached to the aft end of the trunnion serves to close one of the shock strut doors as the gear retracts. The forward end of the trunnion is provided with lugs for the attachment of the outboard ends of the main gear actuator and the actuator beam. The shock strut and the drag strut are attached to the trunnion each by one shear bolt.

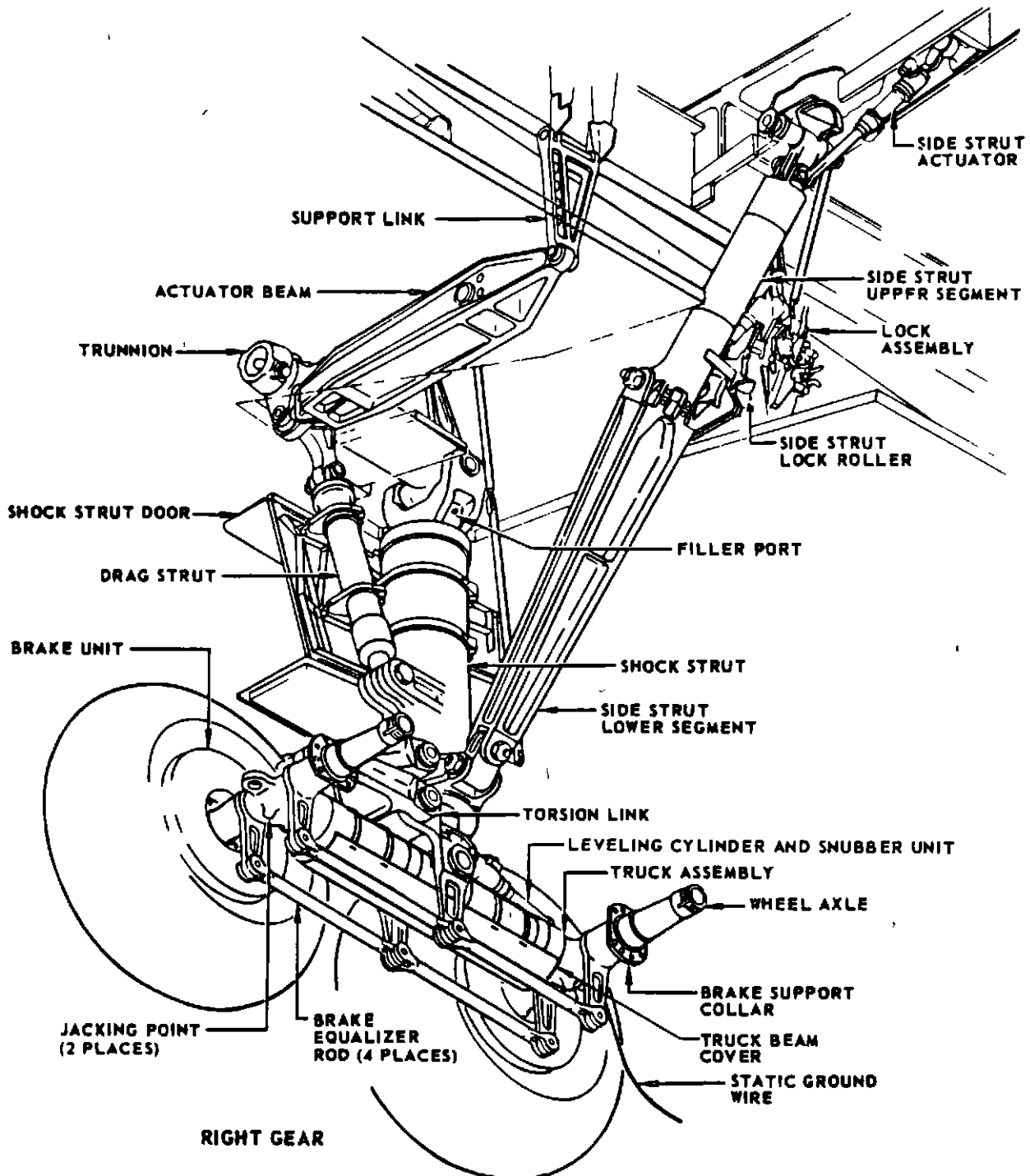
3 Main Gear Shock Strut (Oleo)

- A. The main gear shock strut (figure 1), transmits fuselage and wing loads to the main gear wheels when the airplane is on the ground. The shock strut is made of steel and consists of an outer and inner cylinder, a piston attached to the upper inner side of the outer cylinder, and an orifice rod attached to the inner cylinder (figure 4). The shock strut is filled with hydraulic fluid and charged with compressed air to absorb landing and taxi shock loads. Shock absorption is accomplished by flow of hydraulic fluid through a variable orifice formed by the tapered orifice rod through an opening in the piston, and by flow of hydraulic



Main Landing Gear Schematic
Figure 1





Main Gear Components
Figure 2 (Sheet 2 of 2)

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fluid through openings in the piston rod. As the shock strut is compressed, the tapered orifice rod permits a diminishing rate of hydraulic fluid passage from the inner cylinder chamber to the upper side of the piston. Landing and taxi shocks are also cushioned by the increasing volume of hydraulic fluid above the piston further compressing a volume of air in the upper end of the outer cylinder. The shock strut is serviced with hydraulic fluid through an air valve in the upper inboard side of outer cylinder. The shock strut is serviced with clean dry air through air valve to shock strut extension as specified on a servicing chart on the keel beam in the left wheel well.

- B. Upper and lower bearings provide sliding surfaces and an air-oil seal between inner and outer cylinders. Between the lower bearing and the spacer, a seal adapter with annular grooves is installed. A D-ring and an O-ring with back-up rings are inserted in the grooves to provide an air-oil seal between cylinders. See figure 4, Detail A. Shock struts have annular grooves in the lower bearing for storage of spare D and O-rings. The spare seals can be used to replace the working seals without complete disassembly of shock strut.
- C. Lugs are provided on the forward side of outer and inner cylinders for attachment of torsion links to keep the inner cylinder (which is attached to main gear wheel truck) from turning within the outer cylinder. Another lug on the forward side of the outer cylinder, just above the torsion link lug, is provided for drag strut attachment. A lug on the lower inboard side of the outer cylinder is provided for attachment of the lower side strut segment universal fitting. Shock strut doors are attached to the outer cylinder.
- D. A lock roller on the lower aft side of the shock strut outer cylinder contacts a "rabbit ear crank" on main gear retraction. Movement of the crank actuates the main gear position switch and the door control valve. The lock roller simultaneously engages a power operated lock hook. This holds landing gear securely in the up and locked position. Rotation of lock crank to gear locked position also actuates a lock switch in circuit with the position switch to illuminate green down and locked indicating lights or a gear unlocked red warning light. (Refer to 32-6-0.)

4. Main Gear Wheel Truck

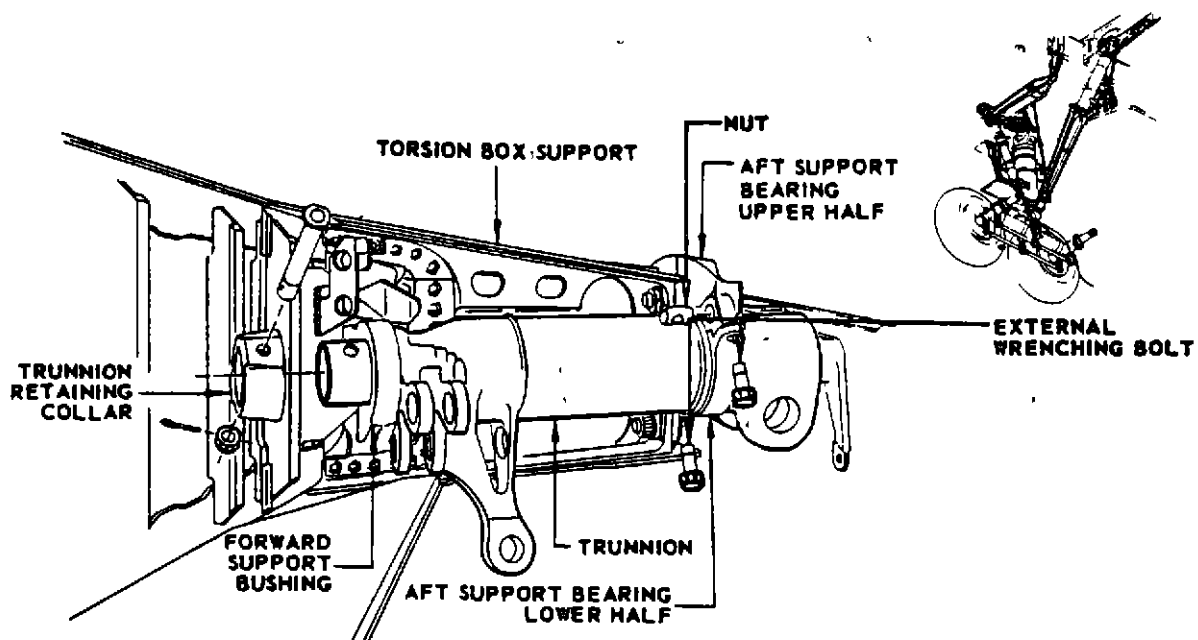
- A. The majority of fuselage and wing loads (with airplane on ground) are transmitted through the main gear support trunnion, drag strut and side strut, into the main gear shock strut. Loads in the main gear shock strut are transmitted through the main gear trucks (figure 1) into the four wheels of each main gear. The main gear truck is a T-shaped tubular steel beam to which the forward and aft axles are attached. A jacking pad and a towing eye are formed on front and aft ends of the truck beam.

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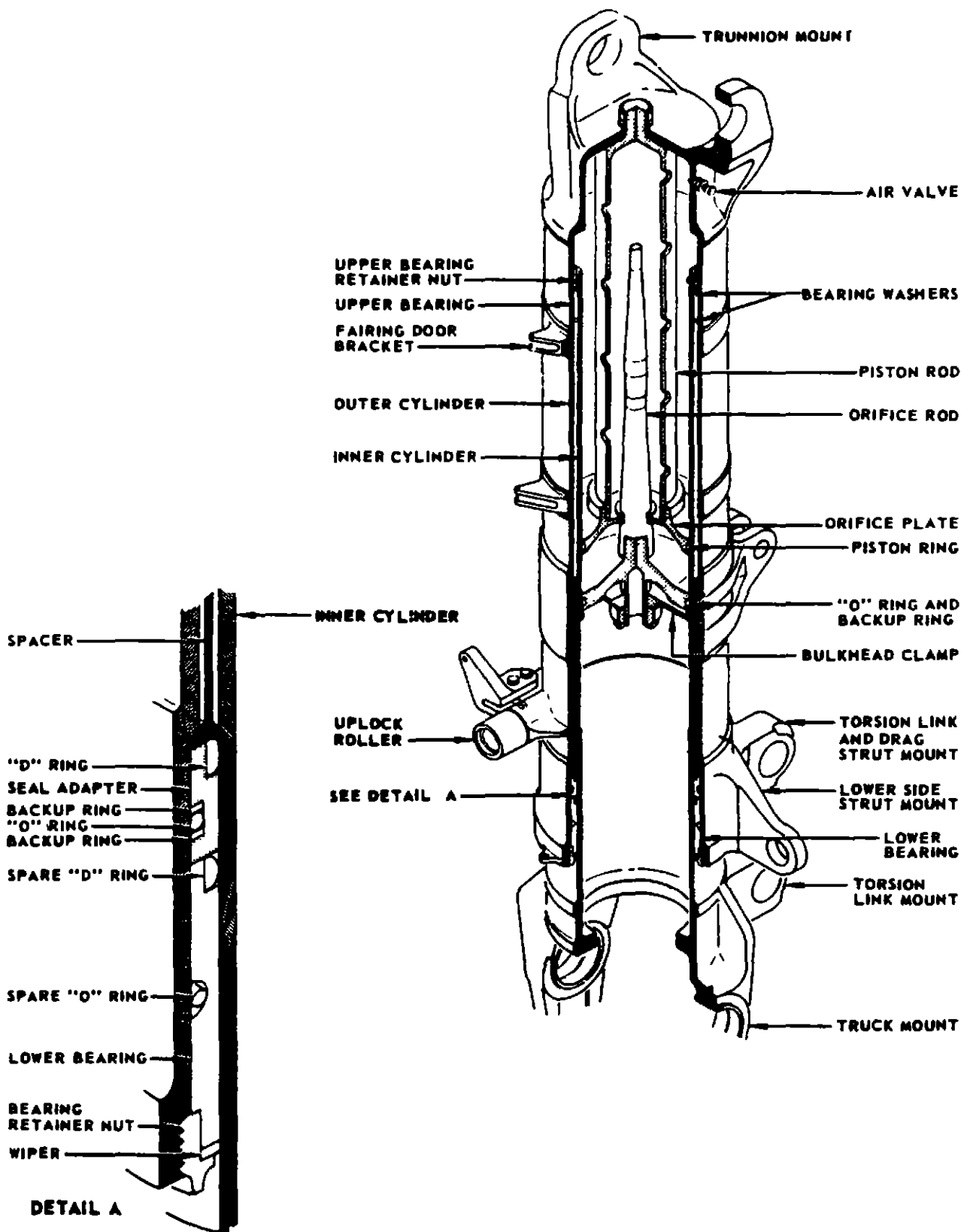
The forward horizontal arms of the truck beam carry the two piece forward axle. One axle stub is secured in each horizontal arm by a single bolt. The one piece aft axle is installed through the aft end of the truck beam and locked in position by two retaining plates. Both retaining plates are bolted to the center of the axle inside the truck beam. Axles are machined on each side of the truck beam to support movable collars. Each movable collar carries a brake assembly and provides an attachment lug for a brake equalizer rod. Brake equalizer rods link the movable collars with the lower terminal of the shock strut inner cylinder. This arrangement prevents porpoising (raising of rear wheels) as brakes are applied on landing or taxi-roll. The center portion of the truck beam is machined and drilled to mate with the yoke at the lower end of the shock strut inner cylinder. One large bolt attaches the truck to the shock strut. Hydraulic and pneumatic tubing, electric wiring and a truck leveling switch are attached or bracketed to the truck. The static ground wire is attached to the aft end of truck beam. A cover is installed under the truck beam to protect truck from damage.

5. Main Gear Brakes

- A. The main gear brakes (figure 1) are multi-disc type. Six lined carrier discs are keyed into and turn with the wheel. Five brake discs are keyed to the torque plate and do not rotate. Each brake assembly is bolted to a flange on the axle. Flanges for the brakes are on support collars that are free to turn on the axles. This is for brake equalizing. (See paragraph 7.) Normal braking uses hydraulic pressure and emergency braking uses pneumatic pressure. For more information on brakes, see 32-9-0.



Main Gear Trunnion
Figure 3



6. Main Gear Tire and Wheel

A. The main gear tires and wheels (figure 1), in conjunction with the nose wheels, support the airplane on the ground. Each main gear is equipped with four tire and wheel assemblies designed to withstand landing and taxi shock loads. Each tire and wheel assembly consists of a tubeless tire mounted on a split wheel assembly. Wheel and tire assemblies are designated Nos. 1, 2, 3 and 4 front, and Nos. 1, 2, 3 and 4 rear, counting from left to right looking forward.

B. Main Gear Tire

- (1) The main gear tire is a 46 x 16, 28 ply rating type VII tubeless tire.

C. Main Gear Wheel

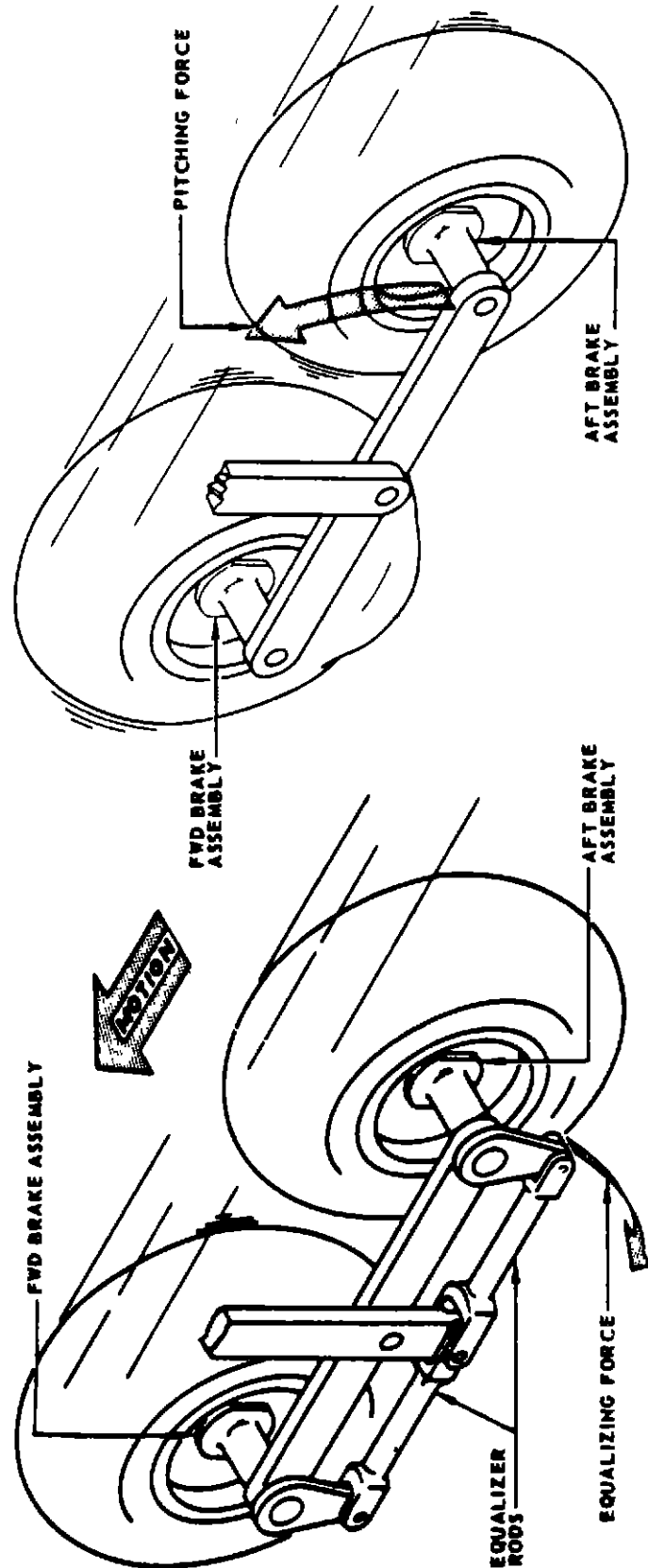
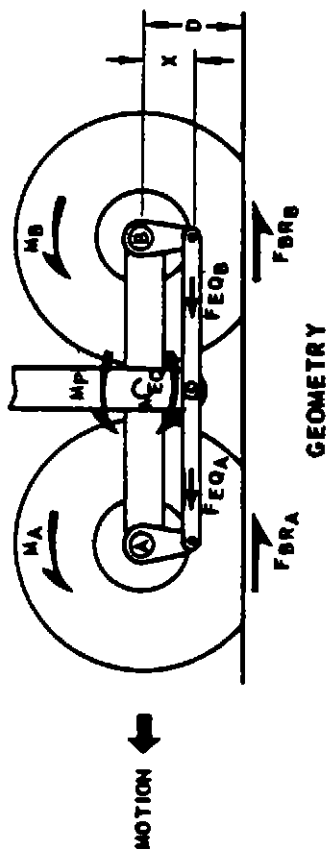
- (1) The main gear wheel is a forged aluminum split wheel assembly for ease in mounting tires. The inner surface of the rim of each wheel half is the sealing surface against which the tire bead rests and must be kept free of scratches, burrs, or foreign matter which may affect the air seal. An air valve is sealed in outer wheel half to permit inflation of mounted tires. A wheel dust cap is attached to the outer wheel half hub. The inner and outer wheel halves are mated and must be bolted together with index marks in line, and the joint sealed with a rubber packing. Grooves for the rubber packing are located near the outer mating half of each wheel half. The wheel halves are fastened together by bolts, with two washers and a lock nut on each. Keyway inserts installed in the inboard wheel half, rotate the brake lining carriers as the wheel turns. Each wheel half is independently balanced before assembly. The wheel rotates on tapered roller bearings. A felt seal is installed outside the bearing nearest the axle flange. The outer bearing is sealed with a rubber seal and a dust cap.

7. Main Gear Brake Equalizer Rods

- A. The main gear brake equalizer rods (figure 1) are fixed length rigid units arranged to cause braking torque to depress aft end of wheel truck (figure 5). This keeps weight on the rear wheels for more efficient and balanced braking. Each rod is mounted between a lug on the brake support collar and the shock strut inner cylinder lower terminal.

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MP - PITCHING MOMENT
MEQ - EQUALIZING MOMENT
FBR - FORCE OF RUNWAY
ON TIRES DURING
BRAKING
FEQ - FORCE ABSORBED BY
EQUALIZER RODS



Revised
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Main Landing Gear Brake Equalizer Rods Schematic
Figure 5

CONDITION 1 GEAR WITHOUT EQUALIZER
BOTH BRAKE ASSEMBLIES SECURED TO TRUCK

CONDITION 2 GEAR WITH EQUALIZER
BRAKE ASSEMBLY IS BEARING MOUNTED



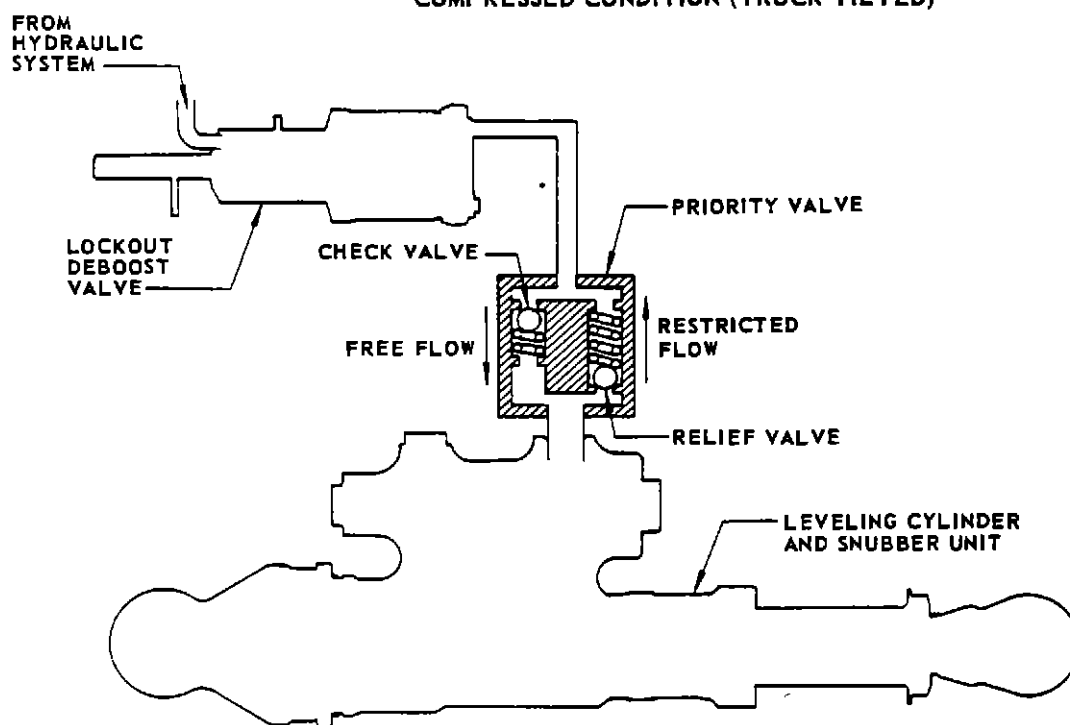
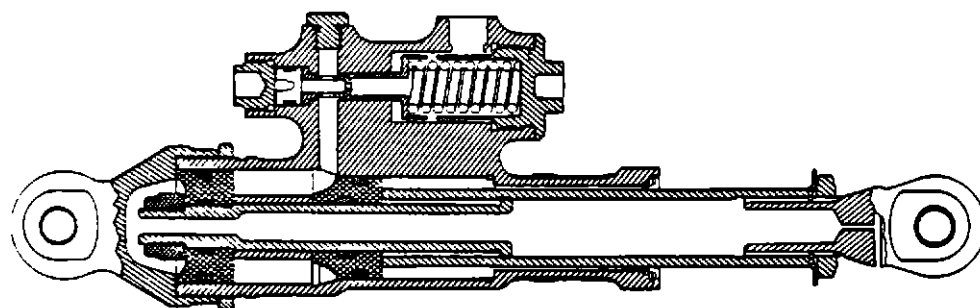
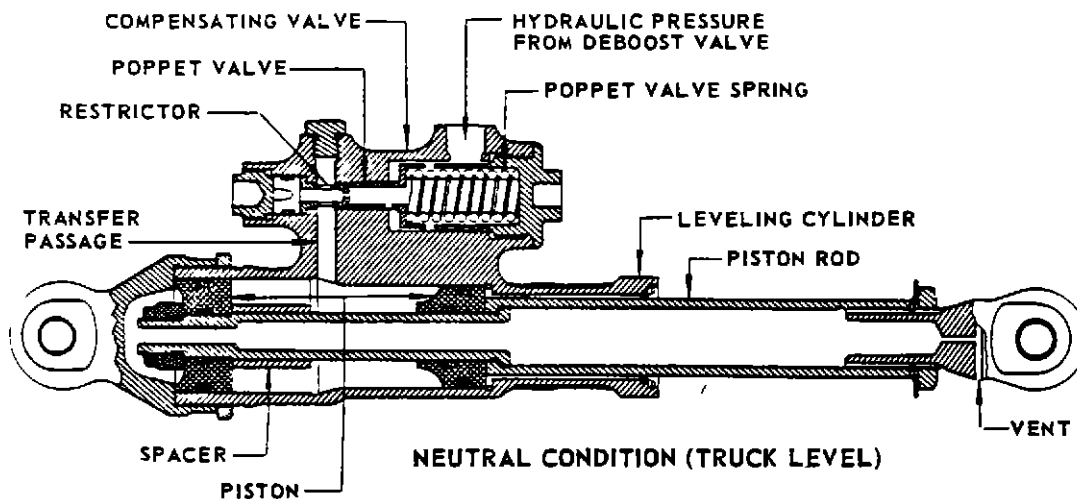
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8. Main Gear Leveling Cylinder and Snubber Unit

- A. The main gear truck leveling cylinder and snubber unit is installed between a lug on the upper aft end of the truck beam and a lug on the shock strut inner cylinder. (See figure 2.) The leveling cylinder and snubber unit serves to return a tilted wheel truck to the perpendicular with shock strut after the tilting force is removed; this assures landing gear alignment for retraction. The unit also dampens wheel truck pitching. Force for leveling is supplied by hydraulic pressure from the utility hydraulic system acting on twin opposing pistons. (See figure 6.) Pressure from the system is directed to a lockout deboost valve which reduces system pressure to approximately one third of its original value for leveling and snubbing operation. To prevent pressure drop in the leveling cylinder and snubber unit when the landing gear is retracting or extending, a priority valve is installed between the lockout - deboost valve and the leveling cylinder. The priority valve contains a check valve providing free flow from the lockout deboost valve to the leveling cylinder, and a pressure relief valve to hold the correct pressure in the leveling cylinder at all times. The unit is therefore self servicing, any slight loss of hydraulic fluid is replaced and correct pressure maintained by the hydraulic system. When the aft end of the truck moves down, the unit is extended, when the aft end moves up the unit is compressed. Either movement drives one piston towards the other forcing hydraulic fluid from the unit back into the hydraulic system where the expelled fluid is absorbed by the hydraulic accumulator. When the tilting force is removed the hydraulic pressure acting on the pistons will push the displaced piston back to its stop and return the truck to the perpendicular with shock strut. The snubbing action acts to prevent rapid truck pitching. Snubbing is provided by a compensating valve consisting of a poppet valve and restrictor. (See figure 6.) The poppet valve is normally closed and remains closed when the truck is returning to level position, at which time the hydraulic flow is from the hydraulic utility system to the leveling cylinder. With the poppet valve closed all hydraulic fluid must pass through the restrictor. The resulting resistance to hydraulic flow slows the leveling movement of the main gear truck which may be returning under an external force in addition to the action of the leveling cylinder. When the truck is moving away from its level position, the hydraulic flow through the compensator valve is reversed and must overcome the utility system pressure. The reversed hydraulic flow opens the poppet valve to allow fluid to bypass the restrictor. By this means resistance to hydraulic flow is reduced to compensate for the force required to overcome utility system pressure. Movement in either direction meets increased resistance when the truck is rapidly tilted. The increased resistance is provided by a hydraulic pressure build up behind either end of the transfer passage when the rate of truck tilt is too high for normal hydraulic flow through the compensating valve.





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9. Main Gear Drag Strut

- A. The main gear drag strut (figure 1) is a fixed length strut which gives fore and aft support to the shock strut. The drag strut is attached at the upper end to a lug on the forward end of the main gear trunnion. The lower end of the drag strut is attached to a triple lug on the forward side of the shock strut outer cylinder. The upper attachment to trunnion is made by a special shear bolt designed to shear at excessive loads (such as caused by main gear hitting a solid object) to prevent damage to wing rear spar and fuel cells. Two clamps attached to drag strut are used to help support shock strut doors.

10. Main Gear Torsion Links

- A. The main gear torsion links (figure 1) prevent rotation between inner and outer shock strut cylinders. The upper link is attached to lugs on the outer cylinder and the lower link is attached to the inner cylinder. The other end of links (apex) are linked together by one bolt. This locks the landing gear truck parallel to airplane centerline without effecting shock strut action. Action of the torsion links operates a safety switch for the electrical circuits of the antiskid system and the landing gear control handle lock system.

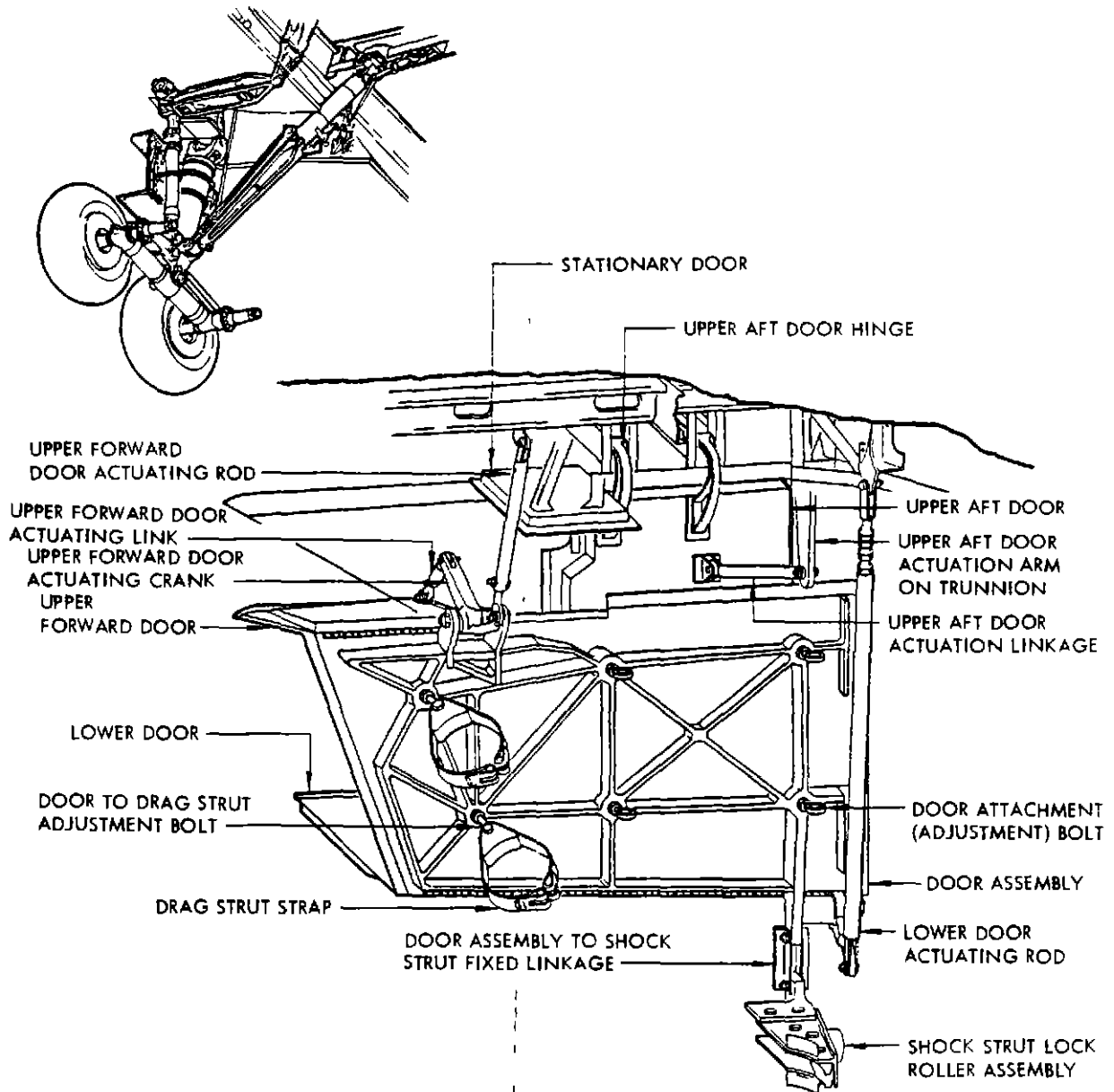
11. Main Gear Side Strut

- A. The main gear side strut (figure 1) gives lateral support to the shock strut. The side strut is hinged to fold for retraction. It is attached at the upper end, by a universal fitting, to floor beams in the wheel well. The upper attachment bolt also connects to the piston rod end of a side strut actuator. A cam secured to the upper attachment universal fitting provides a contact for the emergency extension roller. The extension roller serves to push the main gear to down and locked position when emergency extension is used. The lower aft side of the side strut upper segment carries the main gear downlock roller. The roller locks in a hook assembly when the gear is fully extended. It also operates the "rabbit ear" crank which actuates the door control valve and the landing gear position switch. Holes near the center hinge of the upper and lower side strut segments take a special ground downlock. This lock is used to prevent the side strut from unlocking and thus preventing main gear retraction when not intended. The lower segment is covered by a fairing to eliminate air noises in flight with gear down. The lower segment is attached by a universal fitting to a lug on the shock strut outer cylinder.

Figure 7 Deleted

12. Main Gear Shock Strut Doors

- A. The main gear shock strut doors (figure 8) fair over the opening in wing for the shock strut and the drag strut retraction paths. The assembly consists of four doors (with linkage) attached to the shock and the drag struts. The doors are linked to the shock strut lock roller support fitting, the trunnion aft end, and to overhead wing structure. Two of the doors are hinged to the main door which is attached to the shock strut and the drag strut. The fourth door is hinged to overhead structure and is actuated by linkage from the trunnion aft arm. Doors are actuated by direct attachment or by linkage from main gear or structure. Shock strut doors are closed only on gear retraction.





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13 Main Gear Actuator Walking Beam

- A. The main gear actuator walking beam (figure 1) works in conjunction with the main gear actuator, to retract and extend the main gear assembly. The walking beam serves to reduce the reaction force going into the airplane structure from the main landing gear actuator. This is accomplished by taking the reaction force of the main gear actuator back to the trunnion through the walking beam. The beam is attached to the lower of two lugs at the forward end of the trunnion. The inboard end is attached to a beam support, hinged to the airplane structure. One end of the main gear actuator pivots in the beam, the piston-rod end is attached to an upper lug on the trunnion. With the main gear down and locked, the walking beam trunnion attachment lug is below and slightly outboard of the trunnion centerline. The actuator attachment to trunnion is just slightly below a point directly inboard of the trunnion centerline. When hydraulic pressure first enters the actuator to retract the landing gear, the piston rod-trunnion lug is in an overcenter position. This results in the piston rod force tending to rotate the trunnion in the direction for gear extension. The opposite reaction of the extending actuator exerts an inboard acting force on the walking beam. As the beam is attached to the lower lug on the trunnion the inboard force has a longer moment arm than the slightly overcenter piston rod and arm combination. This results in a greater force tending to rotate the trunnion in the direction for gear retraction. After a small retraction movement, the piston rod trunnion arm passes over center and the piston rod force then acts with the inboard force from the walking beam to retract the landing gear. The total reaction then tends to rotate the actuator-walking beam combination about the trunnion. The force required to resist an unbalance to this reaction, acts through the beam support. With the walking beam length as a lever arm, a much reduced force will resist the reaction. The piston rod moment arm increases in length as the gear moves up. The actuator-beam-trunnion-lug moment arm decreases, as the gear moves up, but does not reach the in line point.

14. Main Gear Actuator

- A. The main gear actuator (figure 1) provides the power required to retract and extend the main landing gear. The actuator is a hydraulic piston type, with snubbing action to slow its movement when limits of travel are approached. The cylinder end of the actuator is attached to the walking beam, and the piston rod end is attached to a trunnion arm. One end of the walking beam is attached to structure and the opposite end pivots on a second trunnion arm. The actuator and walking beam are located in the wing trailing edge just inboard of the trunnion, and forward of the main gear side strut.

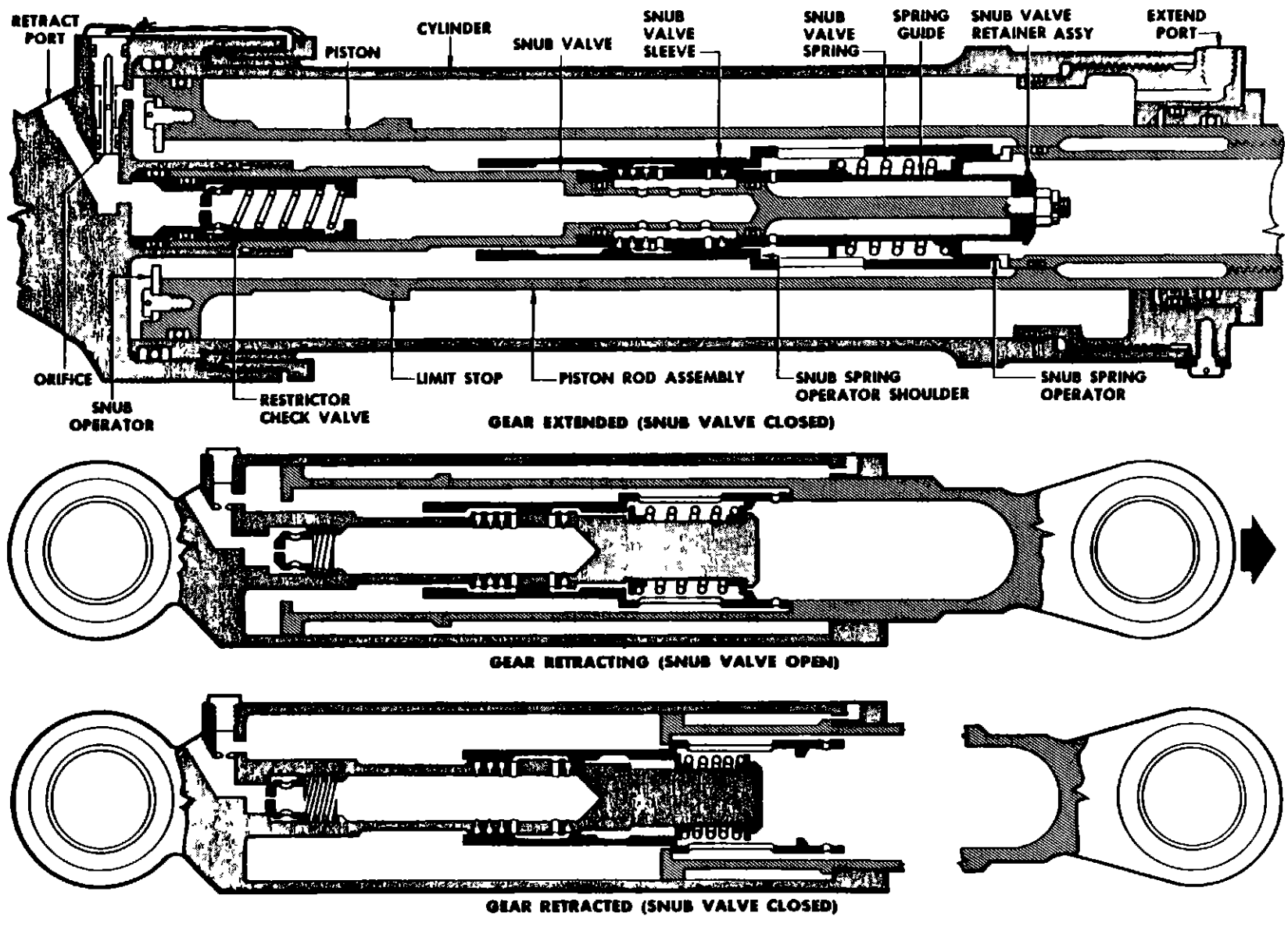
B. Operation

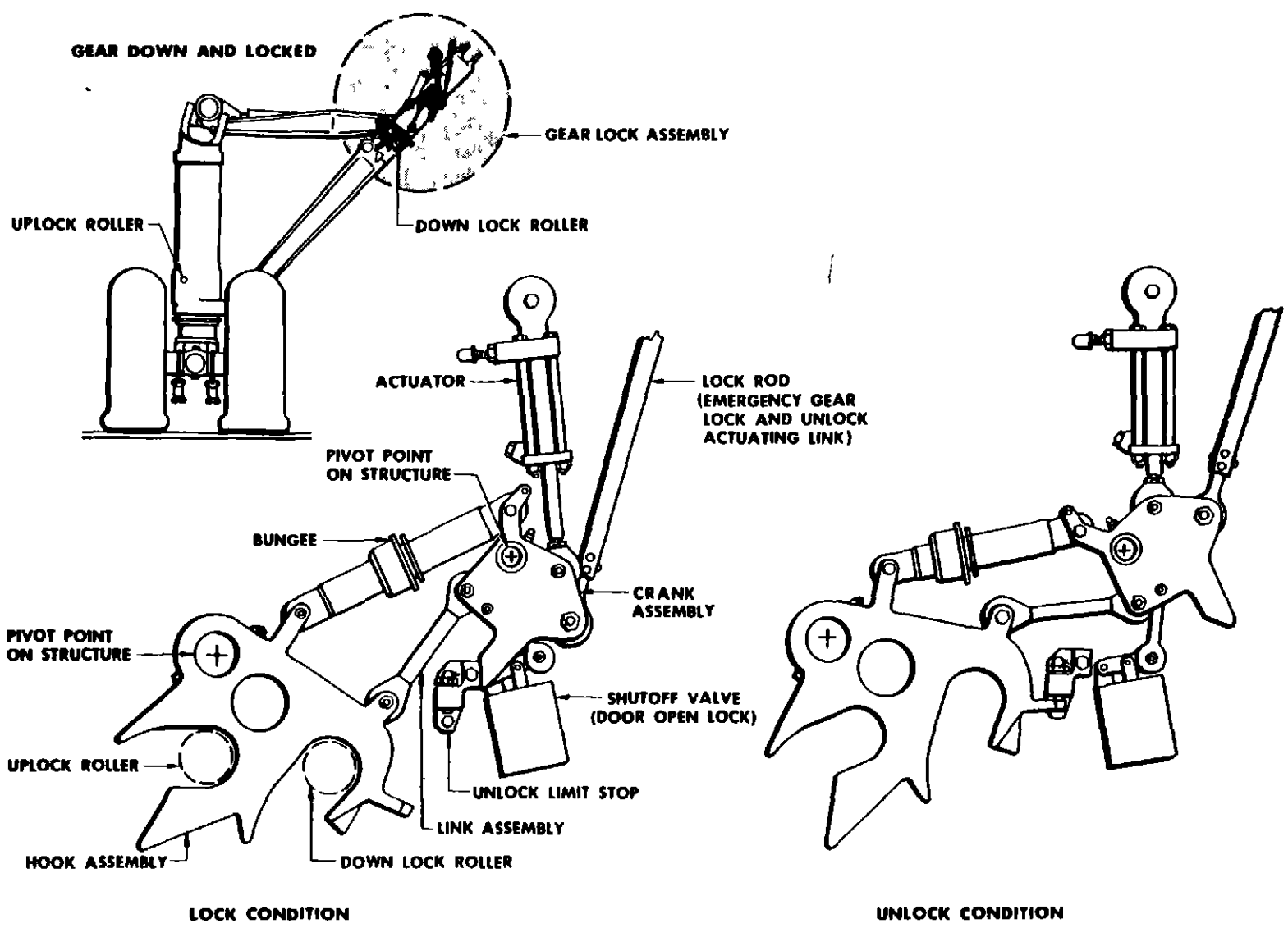
- (1) When the main gear actuator is pressurized to extend, forces acting on the two trunnion arms become additive to rotate the trunnion. The trunnion rotates counterclockwise (viewed from aft end) to swing main gear inward and up into the wheel well. When the actuator is retracted the forces rotate the trunnion in the opposite (clockwise) direction to extend the gear.

- (2) The actuator (figure 9) restricts the rate of extension or retraction of the gear, just as it approaches the down and locked or up and locked position. The snubbing effect is achieved by means of a spring loaded sliding valve snubbing assembly. On gear retraction, with the actuator extending, hydraulic pressure applied at the head end port of the actuator, passes through the snubbing valve assembly. The hydraulic pressure must also pass through an orifice to reach the head end of the actuator for piston rod extension. When the limit stop on the piston reaches within 0.79 inches from the end of travel, the piston head contacts the snubber valve assembly. Further movement of the piston pulls the outer sliding portion of the snubber valve assembly against a compression spring to close off pressure ports. For the remainder of piston travel the hydraulic flow must pass through the orifice. The restriction of hydraulic flow then slows down the rate of actuator movement until the piston contacts its stop.
- (3) On gear extension the actuator starts to retract slowly at first, due to the restricted flow of displaced fluid out through the orifice. As the actuator retracts, the compression spring acts to return the outer sliding portion of the snubber valve and open the ports. During free fall, the piston retracts rapidly with snubbing valve ports open. When the piston reaches within 1.16 inches of the fully retracted position, stops in the actuator piston contact the opposite end of the outer sliding portion of the snubber. Further retraction compresses the valve spring and moves the outer sliding piston of the valve toward the actuator cylinder head, and again shuts off the ports. For the remainder of actuator retraction, fluid flow must pass through the orifice. The restriction to flow then slows actuator movement until the piston is fully retracted.

15. Main Gear Side Strut Actuator

- A. The main gear side strut actuator (figure 1) extends to push the side strut overcenter into locked position as the main gear fully extends. On initial retraction the actuator pulls the side strut back from overcenter and out of locked position. The actuator is a hydraulic piston type and is located between the side strut upper universal and structure.
- B. Operation
- (1) After the landing gear control handle has been moved to up or down position, the wheel well doors open. Movement of the doors positions the sequence valve to direct hydraulic pressure to the landing gear actuator components. The pressure lines to the main and side strut actuators receive pressure simultaneously. Synchronized movement of the two actuators is obtained by providing a restrictor in the side strut actuator retraction line. By this means, the side strut actuator is able to start the side strut folding just as the main gear begins to retract. A relief valve bypassing the restrictor permits rapid fluid flow from the side strut actuator during free fall of the landing gear.







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overcenter position and then the lock bungee force (diminishing from approximately 165 pounds to a maximum of approximately 65 pounds) rotates the hook assembly into locked position. The lock actuator receives locking pressure to maintain the gear locked whenever the door control valve is positioned to direct pressure to the door close line.

17. Main Gear Lock Actuator

A. The main gear lock actuator (figure 10) unlocks the main gear lock mechanism (hook assembly) to permit retraction or normal extension of the landing gear. The lock actuator also assures that the down lock roller remains locked for ground operation. The actuator is a hydraulic piston type, and is located on the main gear lock mechanism support bulkhead just aft of the side strut. The cylinder end of the lock actuator is attached to structure; the piston rod end is attached to the lock crank which is linked to the hook assembly.

B. Operation

- (1) When the main gear retracts or extends, the up lock or down lock rollers engage and move, the "rabbit ear" crank and the hook assembly. Movement of the rabbit ear crank repositions the door control valve. The valve then directs hydraulic pressure to close the wheel well doors, and also to the cylinder side of the lock actuator. Movement of the lock actuator rotates the lock crank assembly to further engage and hold the lock roller in the locked position. A spring loaded lock bungee attached to the lock crank and hook assembly exerts a holding force in the overcenter position. The overcenter position keeps the lock mechanism in the locked or neutral position, depending on the position of the gear. When the gear is locked and the landing gear control handle is positioned for gear operation, the wheel well doors open. As the doors open the landing gear sequence valve is repositioned to first direct hydraulic pressure to the piston rod end of the lock actuator. The resulting movement of the lock actuator rotates the crank and hook assembly to free the lock roller for gear operation. When the up (or down) lock roller moves out of the hook assembly, down (or up) lock roller engages and operates the rabbit's ear crank. Movement of the rabbit ear crank repositions the door control valve, to again direct hydraulic pressure for wheel well door closing, and to the lock actuator for up or down lock engagement.

18. Operation - Main Landing Gear

- A. For operation of main landing gear, see 32-1-0.



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MAIN LANDING GEAR - MAINTENANCE PRACTICES1. Unit Servicing Main Landing Gear

A. Lubricate Main Landing Gear per Figures 201, 202, and 203

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1.	UPPER SIDE STRUT UNIVERSAL ASSEMBLY	Apply grease MIL-G-23827 zerk fitting (2 places)
2.	SIDE STRUT ACTUATOR	Apply grease MIL-G-23827 flush fitting (2 places) Spray MIL-C-23411 on lug surfaces
3.	SIDE STRUT DOWN LOCK ROLLER	Apply grease MIL-G-23827 zerk fitting (1 place)
4.	UPPER SIDE STRUT ASSEMBLY	Apply grease MIL-G-23827 zerk fitting (2 places) Spray MIL-C-23411 on lug surfaces
5.	LOWER SIDE STRUT UNIVERSAL ASSEMBLY	Apply grease MIL-G-23827 zerk fitting (1 place) Spray MIL-C-23411 on lug surfaces
6.	UP LOCK ROLLER	Apply grease MIL-G-23827 zerk fitting (1 place)
7.	EXPOSED SHOCK	Apply oil MIL-H-5606 exposed inner cylinder surface
8.	LEVELING CYLINDER AND SNUBBER UNIT	Apply grease MIL-G-23827 zerk fitting (3 places)
9.	BRAKE COLLAR ASSEMBLY	Apply grease MIL-G-23827 zerk fitting each collar (4 places)
10.	WHEEL BEARINGS	Hand pack grease MIL-G-3545 (MIL-G-25760 alternate) CAUTION: DO NOT MIX THE ABOVE GREASES IN THE SAME BEARING.
11.	TORSION LINKS	Apply grease MIL-G-23827 zerk fitting each link (3 places)
12.	ACTUATOR BEAM	Apply grease MIL-G-23827 zerk fitting (2 places) Spray MIL-C-23411 on lug surfaces
13.	TRUNNION SUPPORT ASSEMBLY	Apply grease MIL-G-23827 zerk fitting (3 places)
14.	OPERATOR CRANK ASSEMBLY	Apply grease MIL-G-23827 flush fitting (1 place)
15.	MAIN GEAR ACTUATOR	Apply grease MIL-G-23827 flush fitting (2 places)
16.	BEAM SUPPORT LINK	Apply grease MIL-G-23827 zerk fitting (3 places)

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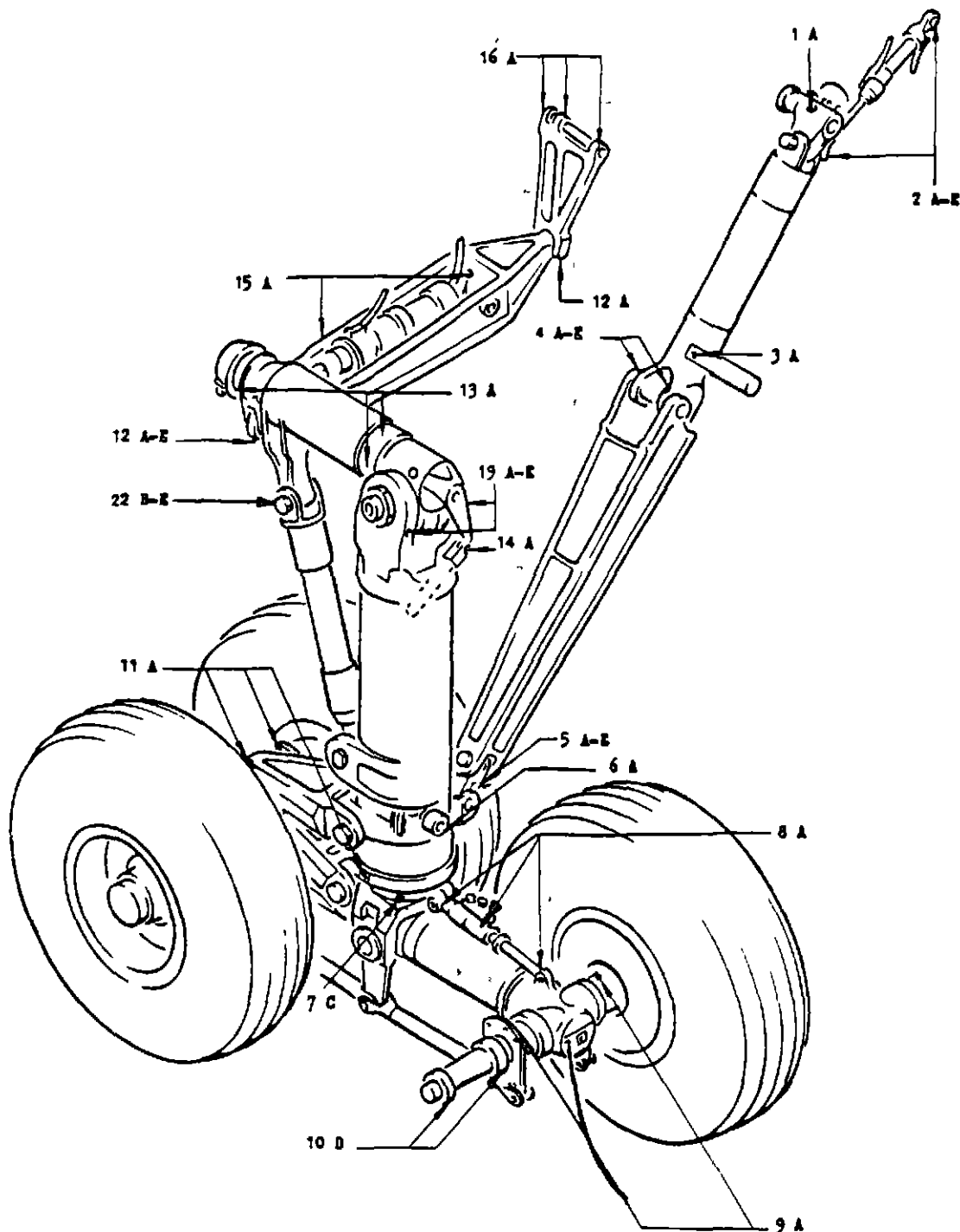
Main Gear Lubrication
Figure 201 (Sheet 1)
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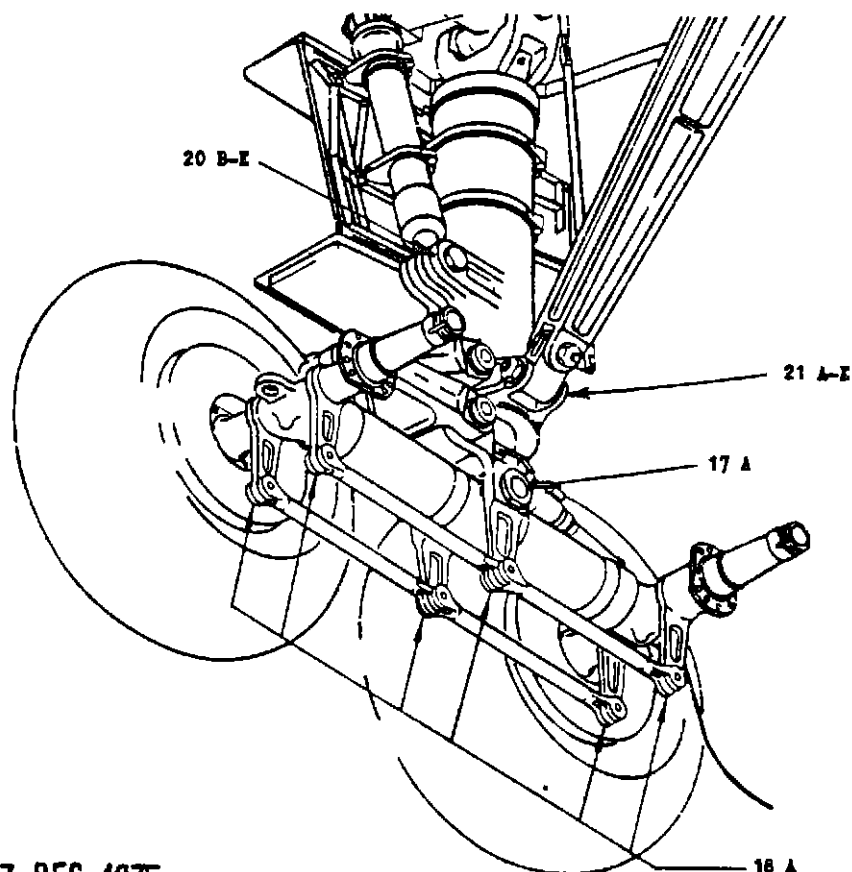
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SYMBOL	SPECIFICATION	USED PRODUCT	SYMBOL	SPECIFICATION	USED PRODUCT
A	MIL-G-23827	See Chapter 20-93-(-)	D	MIL-G-3545 MIL-G-3545	See Chapter 20-93-(-)
B	MIL-G-16173 Type 2	SABENA Complements on green paper	E	MIL-G-23411	SABENA Complements on green paper
C	MIL-H-5606				

INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
17.	TRUCK PIVOT	Apply grease MIL-G-23827 zerk fitting (4 places)
18.	BRAKE EQUALIZER RODS	Apply grease MIL-G-23827 zerk fitting (6 places)
19.	SHOCK STRUT ATTACHMENT	Apply grease MIL-G-23827 flush fitting (2 places) Spray MIL-C-23411 on lug surfaces
20.	DRAG STRUT OUTER CYLINDER	Apply grease MIL-G-16173 Type 2 Spray MIL-C-23411 on lug surfaces
21.	SIDE STRUT OUTER CYLINDER	Apply grease MIL-G-23827 Spray MIL-C-23411 on lug surfaces
22.	TRUNNION DRAG	Apply grease MIL-G-16173 Type 2 Spray MIL-C-23411 on lug surfaces



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 Main Gear Lubrication
 Figure 201 (Sheet 3)

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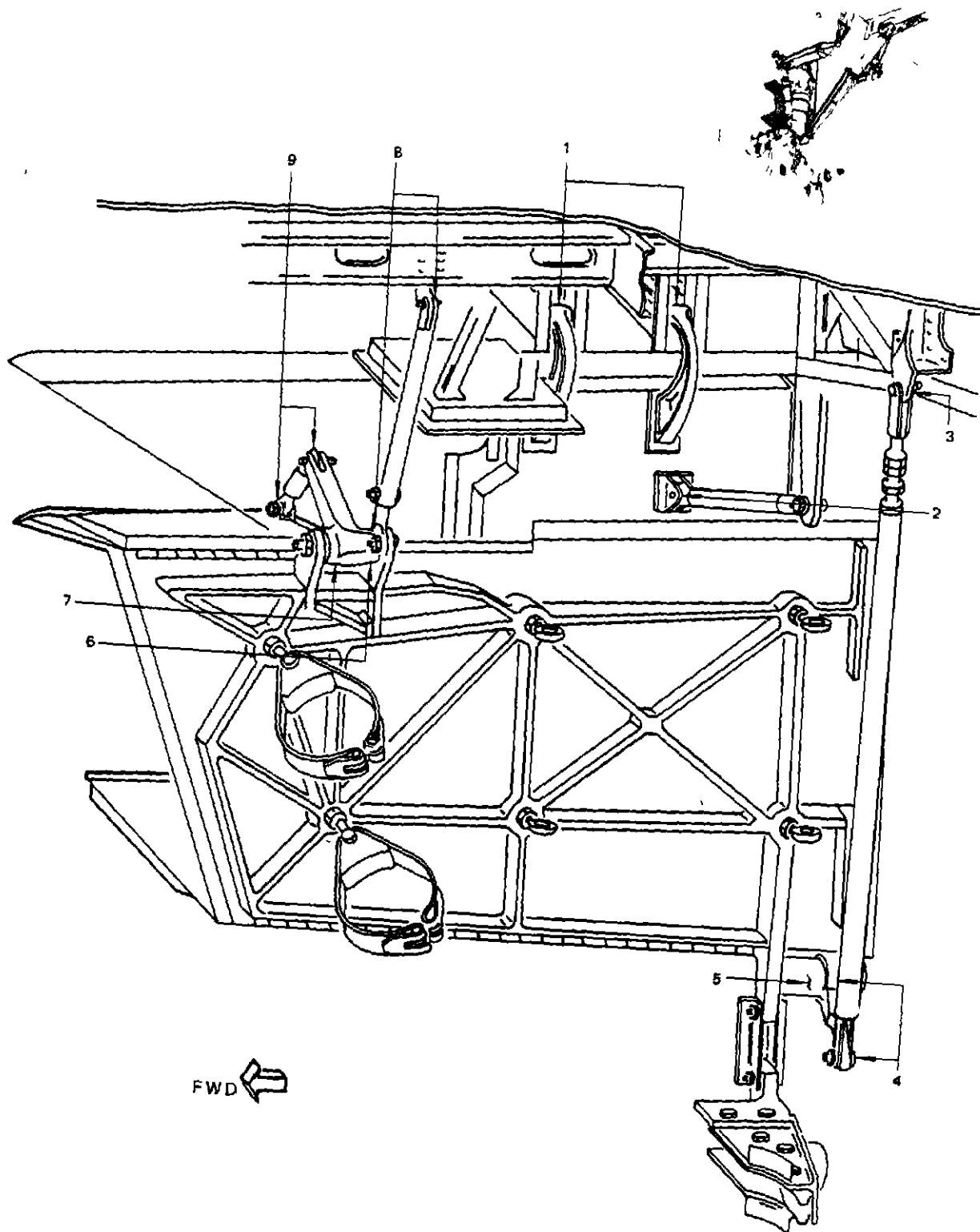
 32-22-0
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INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1.	DOOR HINGE REAR OUTBOARD	Apply oil MIL-L-7870 flush fitting (2 places)
2.	UPPER AFT ACTUATOR ROD	Apply grease MIL-G-23827 flush fitting (1 place)
3.	LINK ROD AFT LOWER DOOR TO CRANK	Apply grease MIL-G-23827 flush fitting (2 places)
4.	CRANK LOWER AFT	Apply grease MIL-G-23827 flush fitting (2 places)
5.	AFT CRANK BEARING	Apply oil MIL-L-7870 flush fitting (1 place)
6.	FORWARD CRANK BEARING 1	Apply grease MIL-G-23827 flush fitting (1 place)
7.	FORWARD CRANK BEARING 2	Apply oil MIL-L-7870 flush fitting (1 place)
8.	UPPER FORWARD ACTUATOR ROD	Apply grease MIL-G-23827 flush fitting (2 places)
9.	LINK ROD FORWARD UPPER DOOR TO CRANK	Apply grease MIL-G-23827 flush fitting (2 places)
		1 Crank assemblies P/N 69-2280-5, -6, -3003, -3004, -3005, -3006
		2 All crank assemblies except 1

EFFECTIVITY

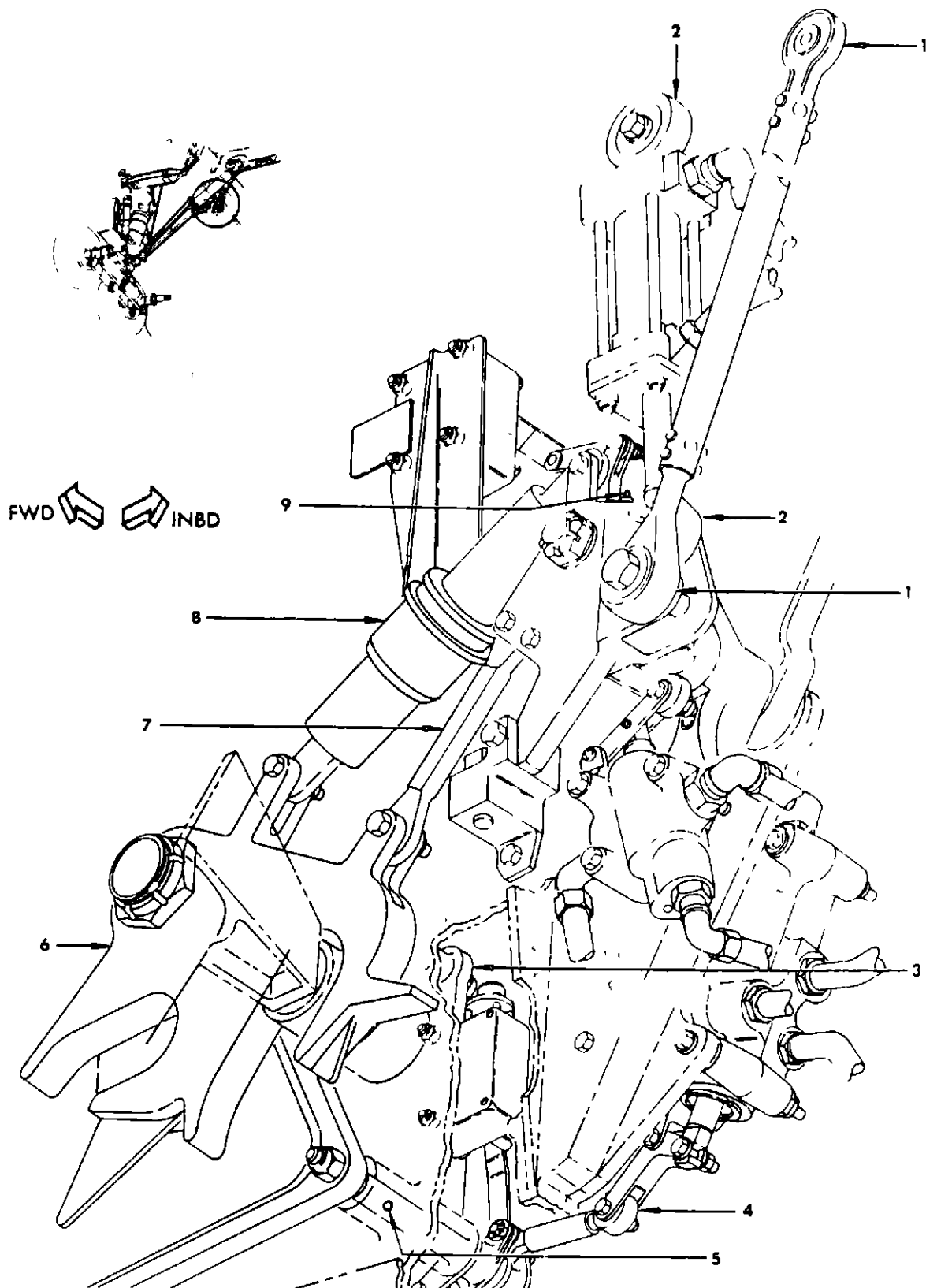
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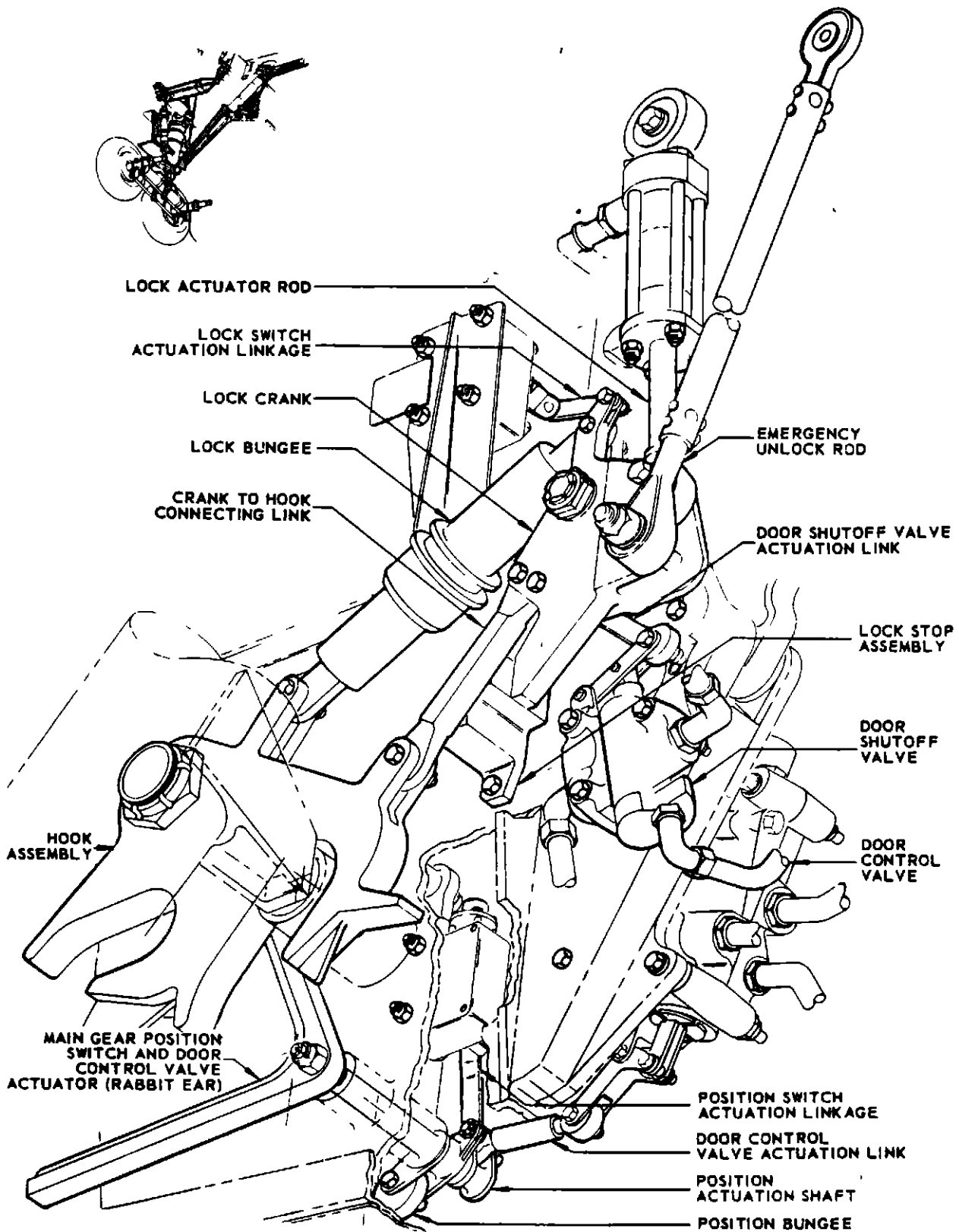
Main Gear Shock Strut Doors Lubrication
Figure 202 (Sheet 2)



Main Gear Lock Mechanism Lubrication
 Figure 203 (Sheet 1)

16. Main Gear Lock Mechanism

- A. The main gear lock mechanism, (figure 10) locks the main gear in the retracted or extended positions. This is achieved by arrangement of a hook assembly to engage lock rollers on the main landing gear. An up lock roller is attached to the shock strut, and a down lock roller to the side strut. The hook assembly is spring loaded by a bungee and crank assembly, and firmly secures either lock roller in locked position. Normal operation of the lock is by hydraulic pressure to a lock actuator. Provision is made for manual operation of the lock by the emergency main gear extension. For further information on emergency extension, see 32-7-0. A rabbit-ear crank located below the hook assembly, is linked to a gear position switch, a door control valve, and a centering bungee. The bungee returns the rabbit-ear crank to neutral when gear is in transit so that the lock roller properly contacts the rabbit-ear arms.
- B. Extension of the lock actuator rotates the hook assembly to engage the lock roller. A stop is provided for the hook assembly when it reaches the gear unlocked position. A lock crank linked to the hook assembly contacts the stop in gear locked position. A spring loaded lock bungee is attached to an arm of the hook assembly and to an arm of the lock crank to exert a holding force on the hook assembly in the locked or unlocked position. A lock switch linked to an arm of the lock crank is electrically in series with the main gear position switch to indicate (illuminate landing gear warning light on pilot's center instrument panel) when landing gear is not in up and locked, or down and locked position.
- C. Main Gear Lock Bungee
- (1) A spring loaded lock bungee (figure 10) is connected between the lock crank and hook assembly to exert a holding force on the hook assembly. When the main gear is up and locked or down and locked, the shock strut lock roller or side strut lock roller has engaged and rotated the hook assembly clockwise (looking aft) which has placed the lock bungee centerline below the hook assembly pivot point. When the landing gear control handle is placed in the "UP" or "DOWN" position, and the doors have opened to reposition the gear sequence valve, and hydraulic pressure through the gear sequence valve has been directed to the "unlock" port of the lock actuator, the actuator retracts to unlock the gear. In locked position, the lock bungee exerts a force of approximately 65 pounds to keep the hook assembly rotated about the lock roller. To unlock the gear, the lock actuator must overcome the bungee load of approximately 65 pounds, plus frictional drag in the system. The lock actuator rotates the lock crank and the hook assembly in unlock direction to clear the lock roller at which point the connecting link between lock crank and hook assembly passes into an overcenter position and the lock bungee assumes a spring holding force of approximately 165 pounds to keep the lock mechanism in unlocked position. When either the shock strut lock roller or side strut lock rollers enters the respective cam track in the hook assembly, action of the retract-extend actuators force the lock roller to rotate the hook assembly. This moves the hook assembly-lock crank connecting link back from



Main Gear Lock Mechanism
Figure 10 (Sheet 1 of 2)

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INDEX NO.	ITEM TO BE LUBRICATED	INSTRUCTIONS
1.	EMERGENCY UNLOCK ROD	Apply grease MIL-G-23827 flush fitting (2 places)
2.	LOCK ACTUATOR	Apply grease MIL-G-23827 flush fitting (2 places)
3.	POSITION BUNGEE	Apply grease MIL-G-23827 flush fitting (2 places)
4.	DOOR CONTROL VALVE ACTUATION LINK	Apply grease MIL-G-23827 flush fitting (2 places) at installation
5.	POSITION ACTUATION SHAFT	Apply grease MIL-G-23827 zerk fitting (1 place)
6.	HOOK ASSEMBLY	Apply grease MIL-G-23827 zerk fitting (2 places) ▷)
7.	CRANK TO HOOK CONNECTING LINK	Apply grease MIL-G-23827 flush fitting (2 places)
8.	LOCK BUNGEE	Apply grease MIL-G-23827 flush fitting (2 places) or (on optional lock bungee) apply oil MIL-L-6085 or MIL-L-7808 (oil cup 2 places)
9.	LOCK CRANK	Apply grease MIL-G-23827 flush fitting (1 place) ▷ Gain access to zerk fitting on aft end of hook assembly shaft through access door assembly located immediately inboard and aft of visible portion of hook assembly.

2. Removal/Installation Main Landing Gear

A. General

- (1) The main landing gear is removed after damage, defect, excessive wear, or when changing a trunnion or shock strut. Lifting equipment capable of handling components in limited space is required. The leveling cylinder and snubber unit must be full of hydraulic fluid, free of air, and the hydraulic connection capped to provide a hydraulic lock to hold the shock strut perpendicular to the wheel truck during removal operations.

B. Equipment and Materials

- (1) Main Landing Gear Downlock Assembly - F71126-500
- (2) Nose Landing Gear Downlock Assembly - F70008-500
- (3) Main Landing Gear Door Downlock - F71127
- (4) Heavy duty garage jack
- (5) Oleo-to-Trunnion Bolt Puller - MK-7161-2-75
- (6) Two-gallon container, suitable for hydraulic fluid in which to drain brake lines
- (7) Grease - MIL-G-21164

C. Prepare for Replacement

- (1) Check that landing gear external downlocks are installed and that wheel well doors are open with release handle down and latched.
- (2) Install main gear door external downlock on door actuator in effected wheel well.
- (3) Depressurize hydraulic system and reservoir.
- (4) Depressurize brake accumulator and shut off electrical power.

D. Remove Main Landing Gear

- (1) Jack airplane until main gear wheels are clear of the ground (Ref 7-1-1, Airplane Jacking). Check that wheel truck remains perpendicular to shock strut.
- (2) Deflate shock strut completely (Ref Chapter 12, Air and Nitrogen Servicing).
- (3) Disconnect lower side strut universal (Fig. 207) from shock strut lower.

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- (4) Unlock side strut lock roller manually (Fig. 204) and allow strut to hang vertically from upper fitting.
- (5) Disconnect and plug all hydraulic and pneumatic lines at base of drag strut and at trunnion (Fig. 208). Remove brake lines from drag strut and trunnion.

NOTE Use container to collect hydraulic fluid when disconnecting brake lines.

- (6) Disconnect electrical plug for landing gear wiring on fillet flap bulkhead.
- (7) Disconnect all shock strut door actuation linkages from structure.
- (8) Disconnect and remove door from shock strut (Ref 32-22-111, Remove Shock Strut Doors).

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- (9) Disconnect drag strut from lugs or shock strut (Fig. 206) and allow drag strut to hang from upper attachment to trunnion.

WARNING BE CERTAIN SHOCK STRUT IS COMPLETELY DEFLATED BEFORE DISCONNECTING DRAG STRUT. PRESSURE IN SHOCK STRUT MAY CAUSE TRUCK ASSEMBLY TO MOVE SUDDENLY FORWARD OR AFT CAUSING INJURY TO PERSONNEL OR DAMAGE TO AIRPLANE.

- (10) Lower jacks until main gear shock struts are about 4 inches from fully compressed position.
- (11) Remove locknut, bolt and installation nut from shock strut trunnion bolt (Fig. 205).
- (12) Remove truck beam cover and place a heavy duty garage jack with a wood block on the jack under center of shock strut.

CAUTION. JACK MUST NOT MAKE DIRECT CONTACT WITH TRUCK BEAM ANYWHERE OTHER THAN UNDER JACKING PADS. IF WOOD BLOCK IS NOT USED, TWO JACKS MUST BE USED, ONE UNDER EACH JACK PAD.

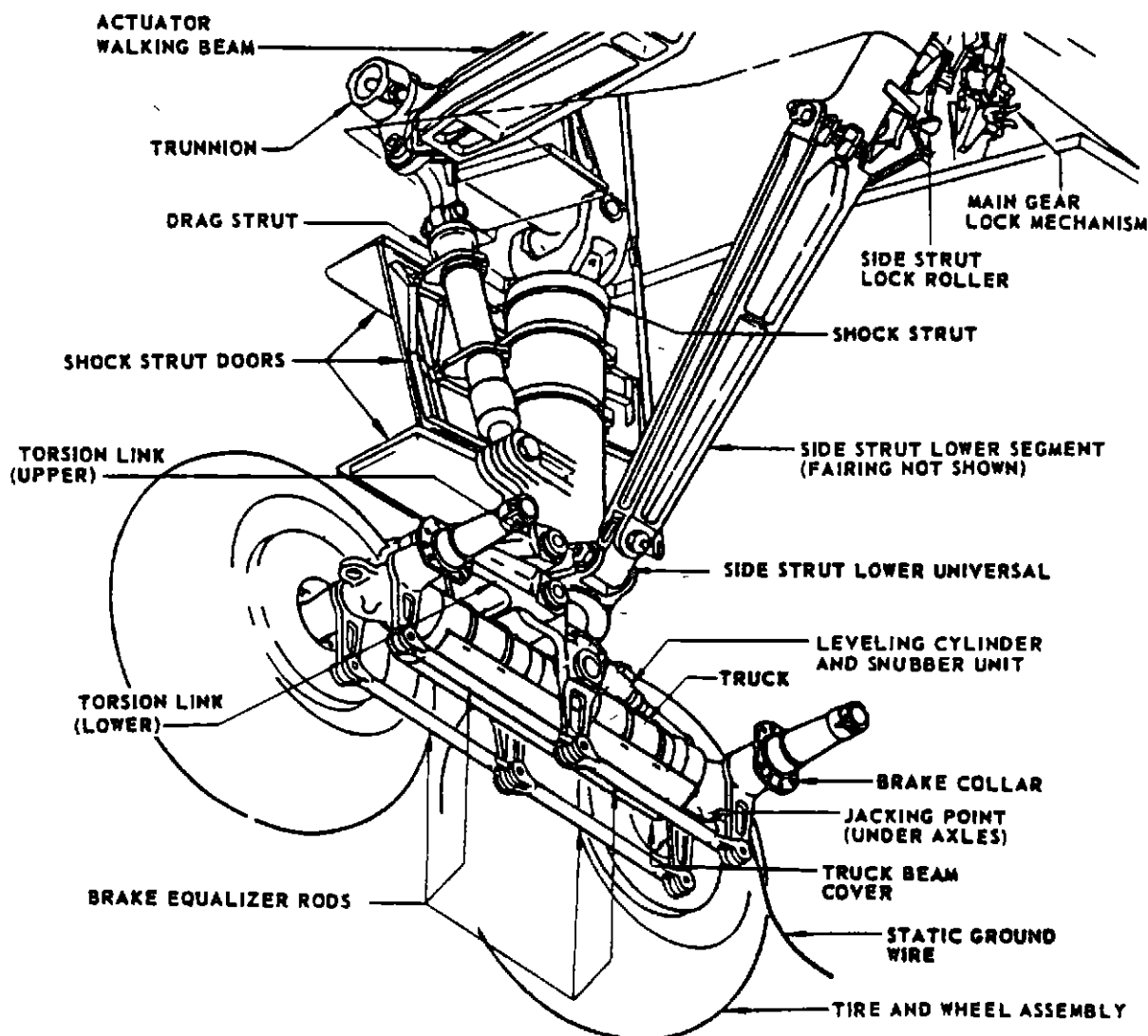
NOTE Contour block to fit truck beam. If necessary, use additional wood blocks between contoured block and jack to prevent jack from damaging brake equalizer rod attachments.

- (13) Apply puller and gradually raise shock strut until trunnion bolt is free. Remove bolt.

CAUTION CARE MUST BE TAKEN THAT SHOCK STRUT DOES NOT MOVE DURING BOLT REMOVAL. ANY MISALIGNMENT WILL JAM BOLT IN SHOCK STRUT AND TRUNNION LUGS.

NOTE After a long period in service, trunnion bolts may be difficult to remove. If normal methods fail to move bolt, the following procedure may be used.

- (a) Pack bore of trunnion bolt with dry ice and allow to cool for at least two hours.
 - (b) Apply a hydraulic puller with pressure gage to trunnion bolt.
 - (c) Apply a steady pressure on hydraulic puller and slowly adjust height of jack under shock strut until a pressure drop indicates that trunnion bolt has moved.
 - (d) Hold jack position and remove trunnion bolt.
- (14) With bolt removed, lower shock strut.
 - (15) Roll landing gear assembly out from under wing.
 - (16) Serviceable parts from removed landing gear assembly can be installed on new assembly.



Main Gear Installation
Figure 204

E. Install Main Landing Gear

- (1) Roll a serviceable main landing gear assembly into place under the wing, with the torsion links forward and the wheel truck parallel to the airplane centerline.

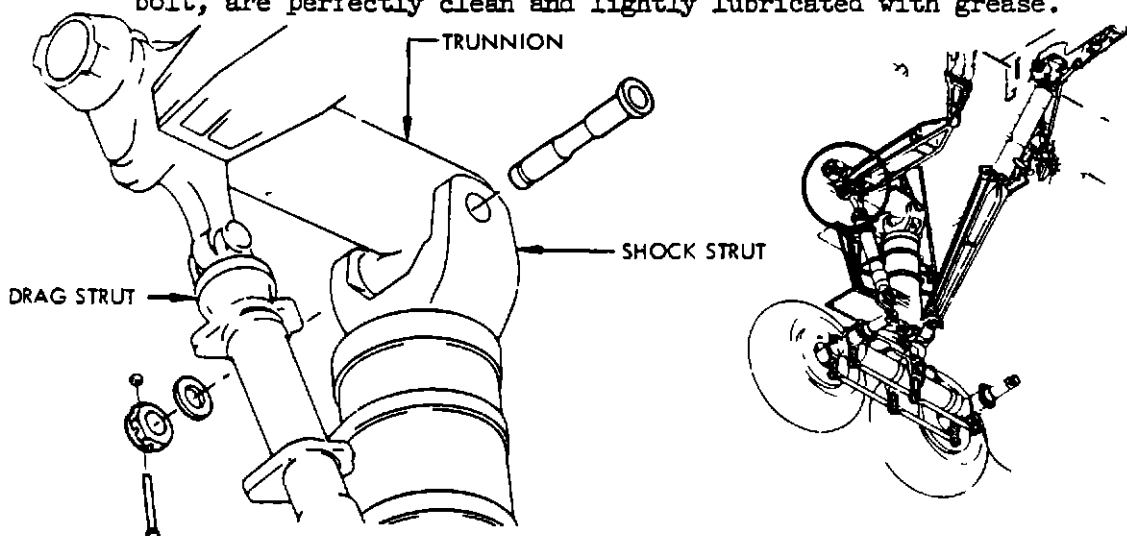
NOTE: A landing gear assembly (figure 204) consists of a shock strut, four brake units, four tire and wheel assemblies, four brake equalizer rods, one leveling cylinder and snubber unit, upper and lower torsion links, truck leveling and shock strut safety switches, static discharge assembly, hydraulic lines, pneumatic lines, electric wiring and clamps.

Check that the electrical "T" junction is flat on its supporting channel. (See figure 208.)

- (2) Check that the shock strut has been serviced, and that the leveling cylinder and snubber unit has been filled and bled. The hydraulic connection on unit capped, bleeder plug tight and lockwired. For information on filling and bleeding see, Replace Main Gear Leveling Cylinder and Snubber Unit, 32-22-61.
- (3) Remove truck beam cover and place a heavy duty garage jack, with a wood block on jack, under the center of truck. If wood block not used, place one jack under each jack pad.

CAUTION: JACK MUST NOT MAKE DIRECT CONTACT WITH TRUCK BEAM ANYWHERE OTHER THAN UNDER THE JACKING PADS

- (4) Raise the gear assembly until shock strut lugs align with trunnion lugs, (figure 205). If actuator and actuator walking beam are installed, push inboard on the walking beam to help align trunnion with shock strut.
- (5) Check that shock strut-to-trunnion bolt, and bearing surfaces for bolt, are perfectly clean and lightly lubricated with grease.



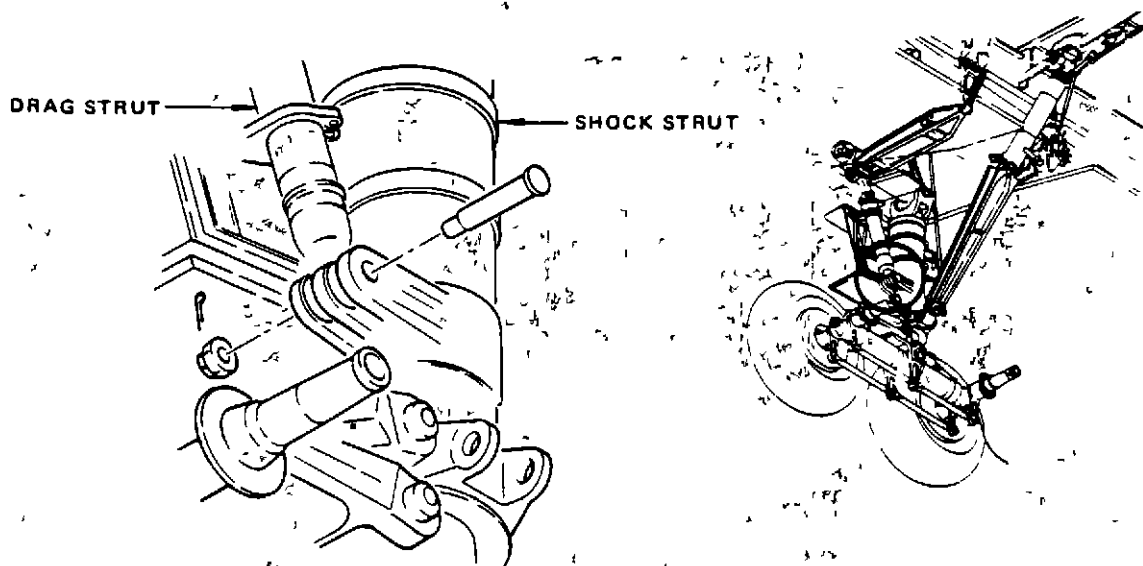
Upper Attachment Main Gear Shock Strut
 Figure 205

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- (6) Insert bolt from inboard side through shock strut and trunnion.
- (7) Add washer and nut.
- (8) Tighten nut to 300 pound-inches, then loosen nut and retighten finger-tight. Tighten to next castellation and install locking bolt.
- (9) Swing drag strut (figure 206) back into position with the shock strut forward lugs. Lightly lubricate the attachment bolt with grease. Install the bolt and nut.
- (10) Tighten nut as in step (8). Install cotter pin.
- (11) Swing side strut, (figure 207) complete with side strut lower universal, into place between the lugs on the shock strut.
- (12) Lubricate attachment bolt as in step (10). Install bolt, washer and nut.

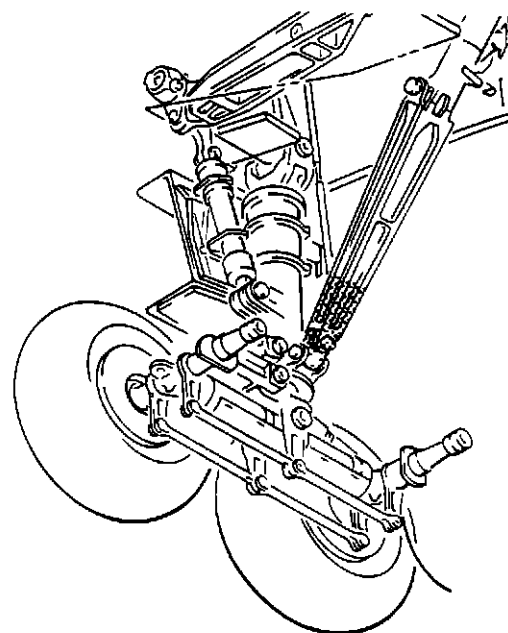
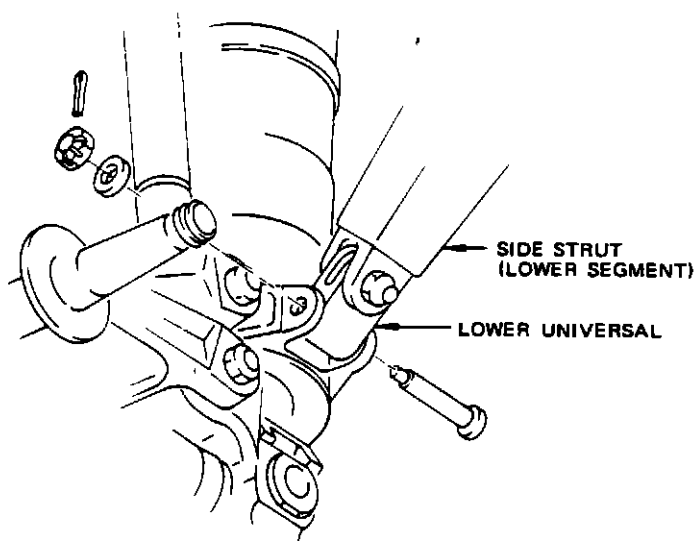
NOTE: It may be necessary to move landing gear inboard or outboard to align the lower side strut universal with the shock strut lugs.

- (13) Tighten nut as in step (8). Install cotter pin.
- (14) Install hydraulic and pneumatic lines on the drag strut (figure 208). Remove plugs and connect lines for brakes.
- (15) Remove plug and check that hydraulic line to leveling cylinder and snubber unit is full of fluid. If necessary operate reset handle on deboost valve to bleed air from line.



Lower Attachment Main Gear Drag Strut
Figure 206

- (16) Remove cap from hydraulic connection on unit and attach hydraulic line.
- (17) Pressurize hydraulic system, operate reset handle to charge leveling cylinder and snubber unit side of deboost valve.
- (18) Check hydraulic connection on unit for leakage.
- (19) Connect electrical cables at fillet flap bulkhead receptacle.
- (20) Attach shock strut doors. Refer to 32-22-111 Main Gear Shock Strut Doors - Maintenance Practices.
- (21) Service shock strut. Refer to Servicing, Chapter 12.
- (22) Check pneumatic brake line connections for leaks. Refer to 32-12-01, Pneumatic Brake System - Adjustment/Test.
- (23) Bleed brakes. Refer to 32-9-0, Bleeding Hydraulic Brake System.
- (24) Check operation of skid detectors. Refer to 32-31-0 Antiskid System - Maintenance Practices.
- (25) Remove external ground locks and perform operation test of landing gear. Refer to 32-1-0, Landing Gear and Door Control System - Adjustment/Test.
- (26) Install ground downlocks.
- (27) Lower airplane and remove jacks.
- (28) Install truck beam cover (figure 204).



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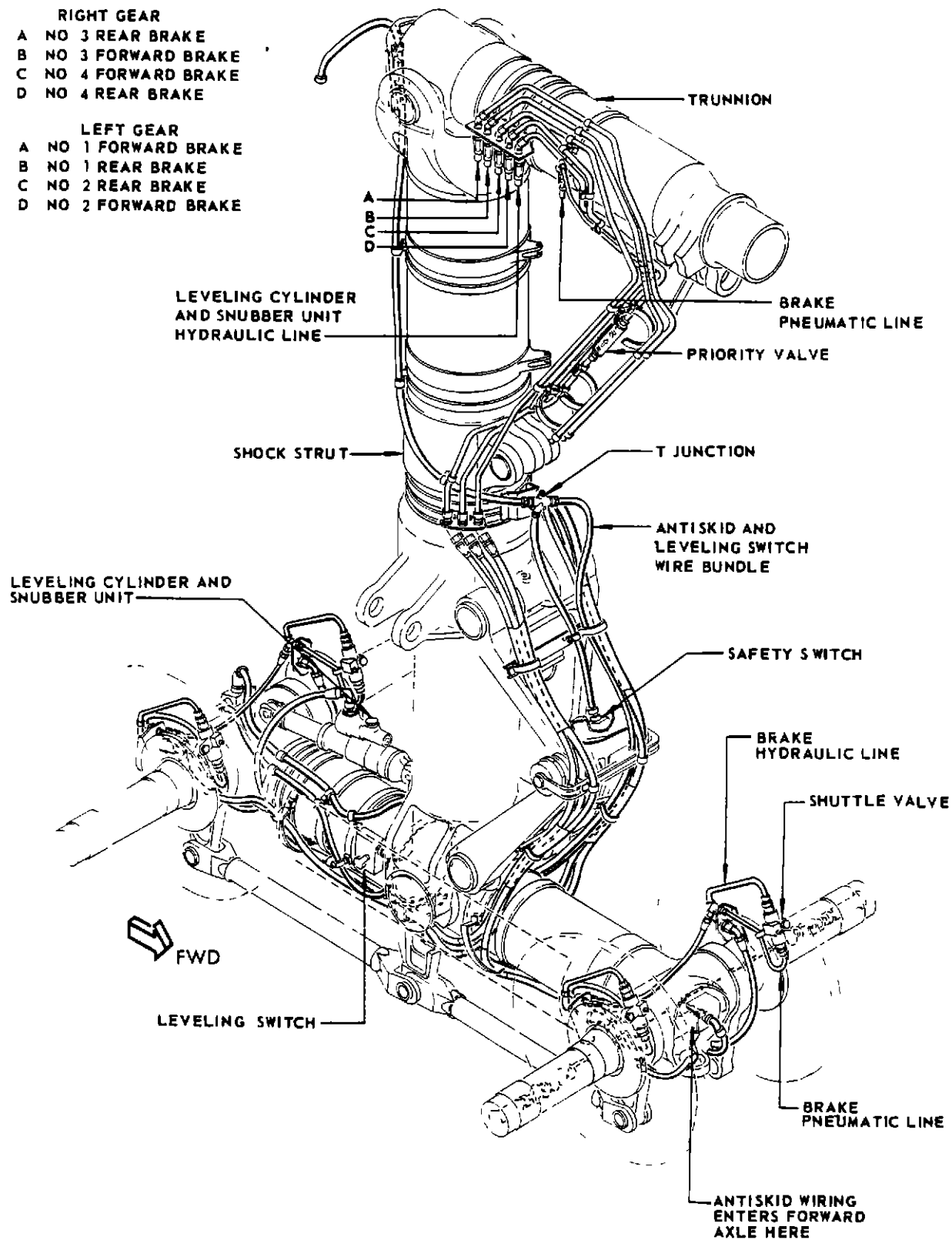
HYDRAULIC BRAKE LINES

RIGHT GEAR

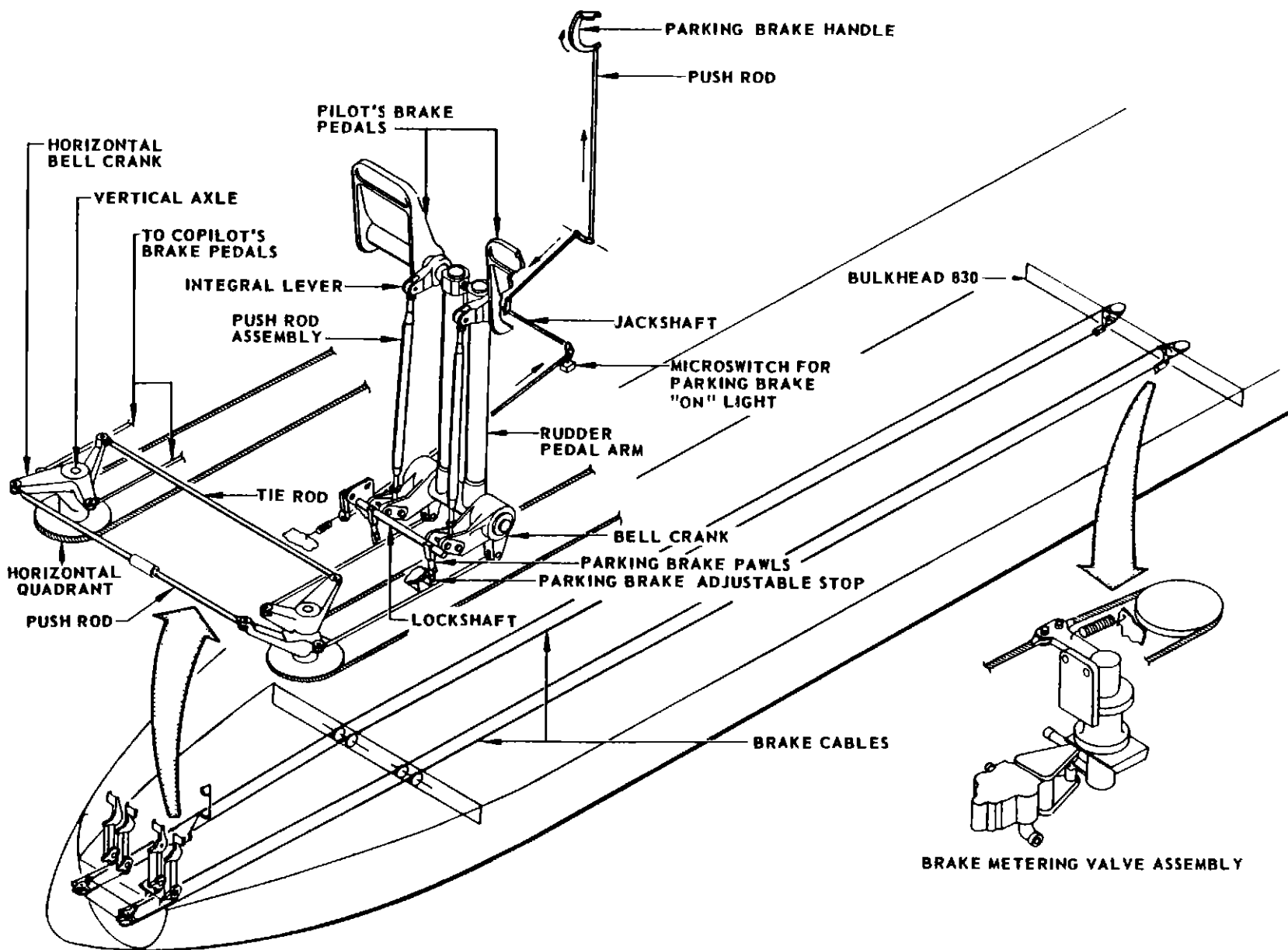
- A NO 3 REAR BRAKE
- B NO 3 FORWARD BRAKE
- C NO 4 FORWARD BRAKE
- D NO 4 REAR BRAKE

LEFT GEAR

- A NO 1 FORWARD BRAKE
- B NO 1 REAR BRAKE
- C NO 2 REAR BRAKE
- D NO 2 FORWARD BRAKE

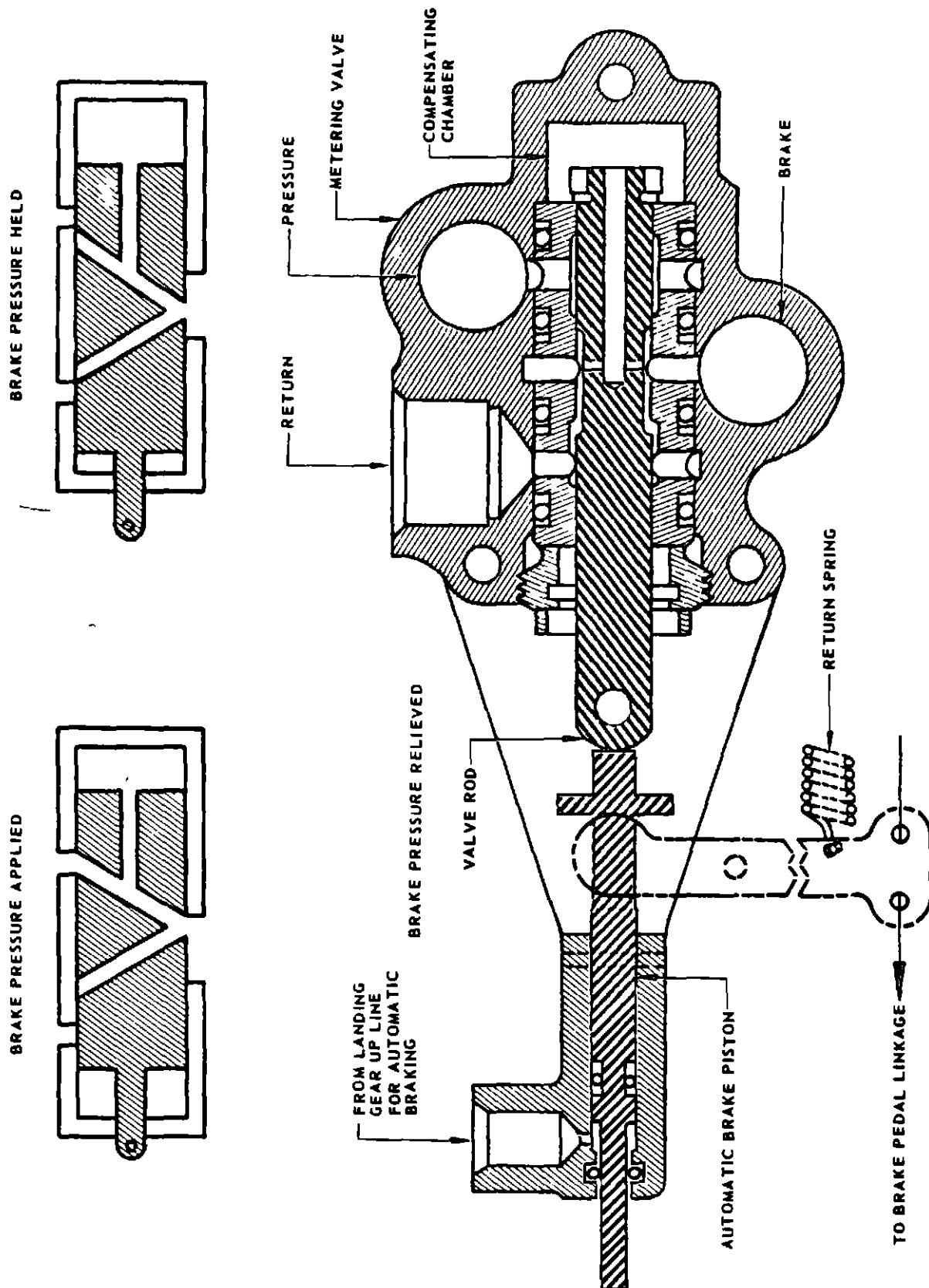


Attachment of Main Gear Hydraulic, Pneumatic and Electric Lines
Figure 208 (Sheet 1 of 2)



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Brake Control Linkage
Figure 1



Brake Metering Valve Schematic
Figure 2



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5. Brake Lockout-Deboost Valve

- A. The brake lockout-deboost valves are located immediately outside the main wheel wells. Two are mounted in each wing fillet area, and the other two are located in the aft part of the main wheel well (figure 3). The lockout-deboost valve consists of a stepped cylinder, housing a double diameter piston. The piston separates fluid in the brakes from the rest of the hydraulic system. This prevents complete loss of fluid should a leak occur on the brake side of the lockout-deboost valve. When the brake pedals are depressed, pressure released through the metering valves acts on the small diameter of the piston, the resulting force causing a pressure buildup in the fluid between large diameter of piston and brake. A reduction in fluid pressure downstream of the valve is proportional to the diameter ratios of the piston. This ratio is 2.9 to 1. The lockout-deboost valve is inoperative when the piston bottoms on the large diameter (lockout position). A manually-operated bypass valve permits fluid to pass through piston when it is required to charge the brake side and raise the piston of the deboost valve. A color plate on the indicator over the valve operating lever shows piston position at any time.

6. Brake Shuttle Valve

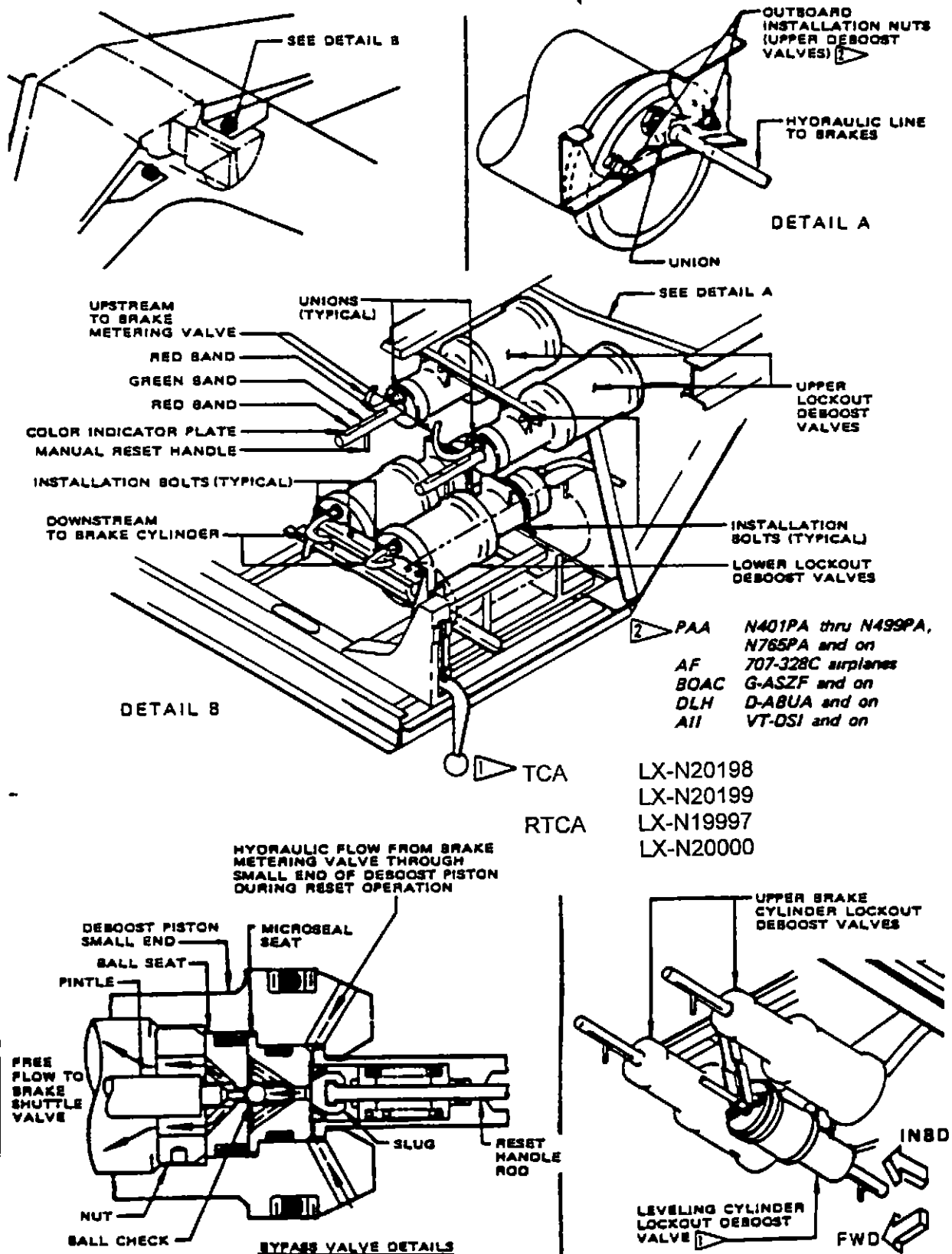
- A. One brake shuttle valve is mounted on each brake unit (figure 5). The brake hydraulic line, and the emergency brake air line are both connected to the shuttle valve. During normal brake operation, the shuttle valve seals off the emergency brake line. During emergency braking, the valve operates to seal off the hydraulic line and open the emergency brake line to the brakes.

7. Landing Gear Brakes

- A. The landing gear brakes are multidisc type (figure 4). Each brake assembly is bolted to a flange on the axle. Carrier discs with full circle sintered bronze linings on both sides are keyed into and turn with the wheel. Brake discs are keyed to the torque plate and do not rotate. A replaceable wear plate provides a friction surface on the inner face of the torque plate. When brakes are applied 12 pistons act on a pressure plate to press all discs together and against the wear plate. Friction between the rotating carrier and lining discs, and the stationary brake discs, provides the required braking. When brakes are released the pressure plate is moved back by 12 return springs equally spaced around the periphery of the piston housing. As the pressure plate moves back the carrier and lining discs separate from the brake discs and run free.

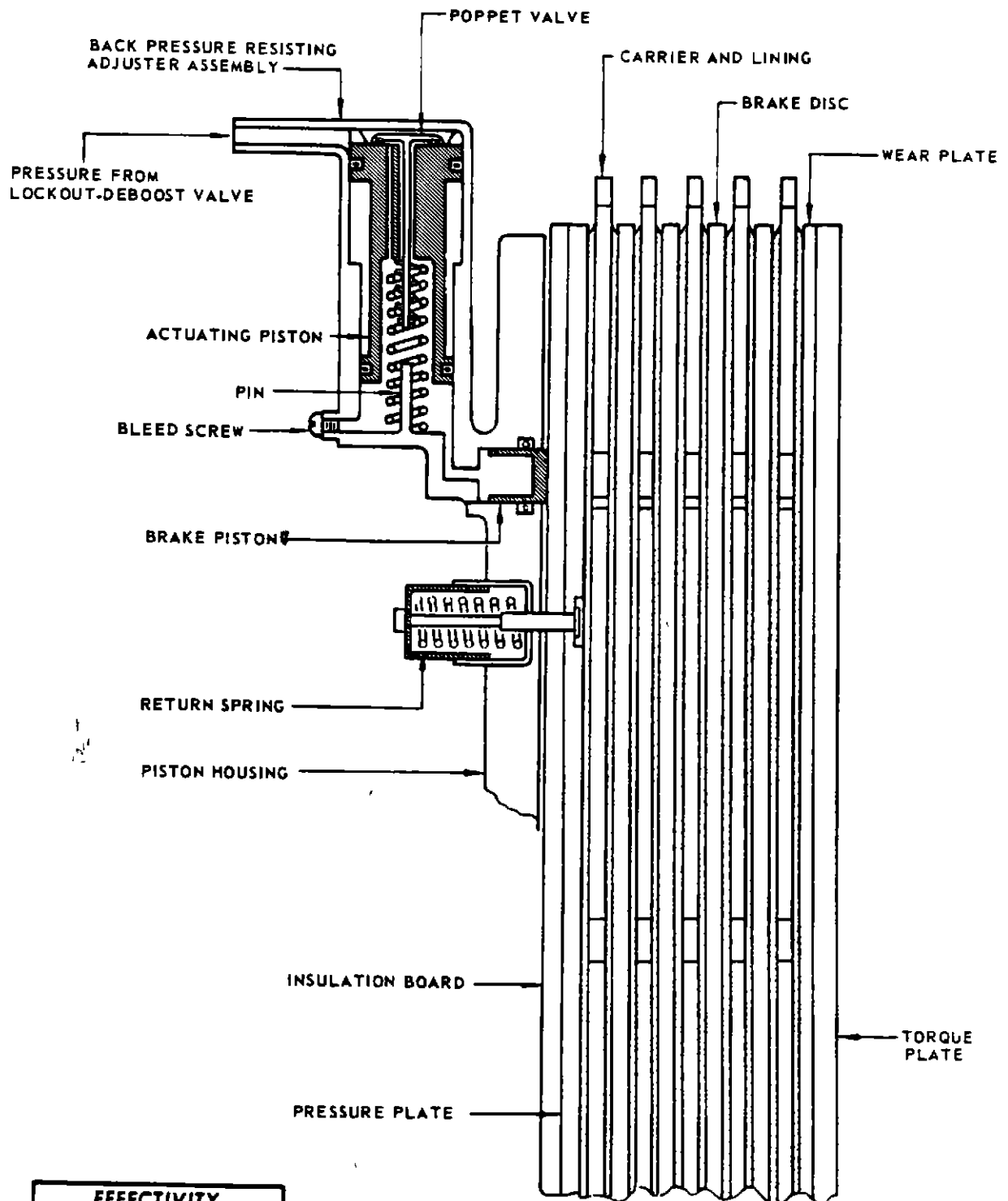
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Lockout Deboost Valve
Figure 3

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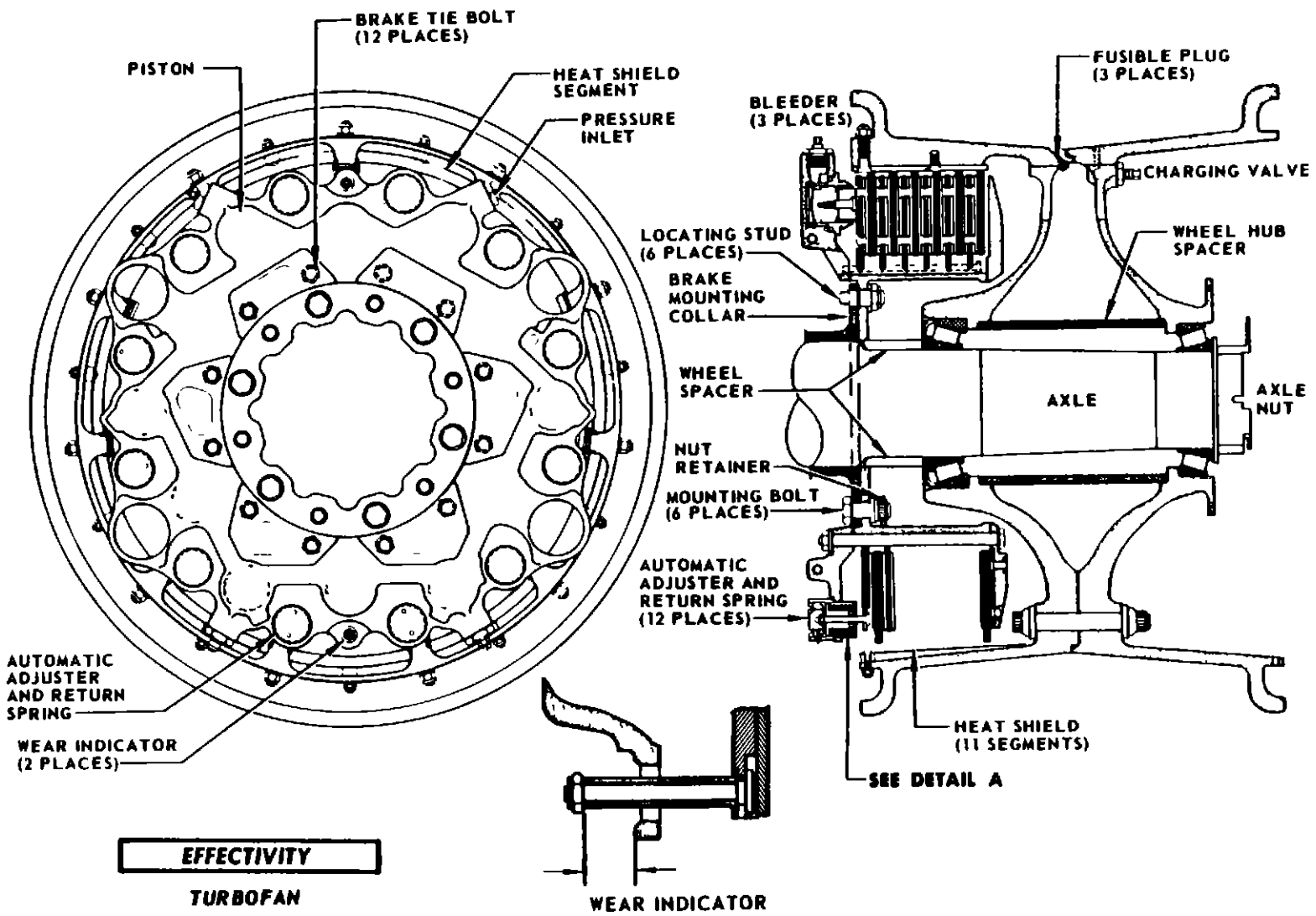
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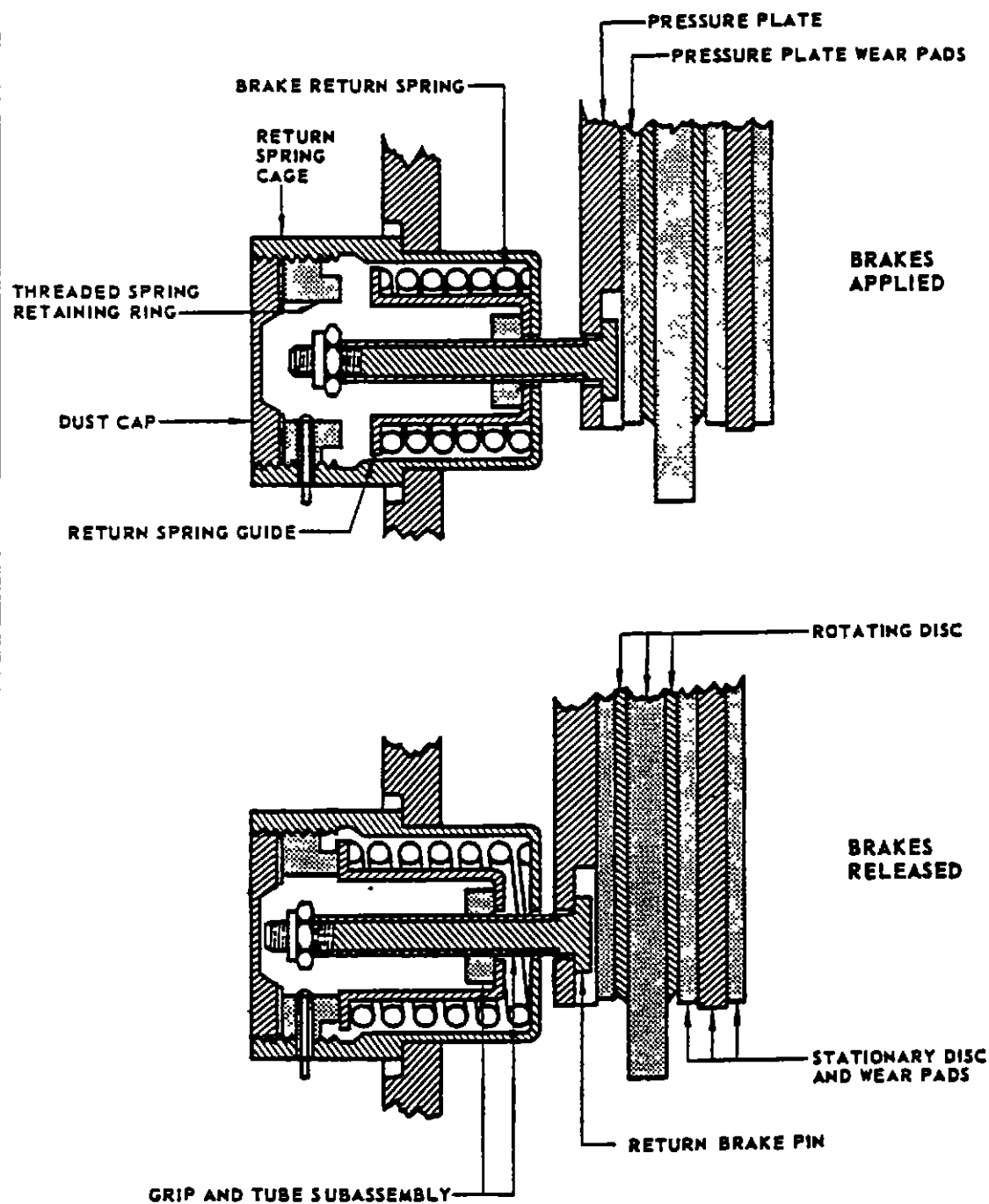
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Brake and Wheel Assembly
Figure 4 (Sheet 1)

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- B. On turbojet airplanes the automatic brake adjuster separates fluid in the brake assembly from the rest of the hydraulic system. When brakes are applied hydraulic fluid exerts a force to depress the adjuster piston. Fluid under the adjuster piston is forced into the brake cylinders through drilled passages in the brake carrier. This operates the brake. The piston in the brake adjuster incorporates a poppet valve in the head. If wear on linings necessitates increased travel of the pistons in the brake cylinders, then the piston in the automatic brake adjuster must travel further and expel extra fluid. When lining wear reaches a predetermined amount, the extra travel of the adjuster piston will bring its poppet valve in contact with a pin projecting from the bottom of the cylinder. This opens the poppet valve and fluid from the brake system passes through the adjuster piston into the brake carrier. When brakes are released, the adjuster piston returning, closes the poppet valve. The additional fluid is trapped in the brake carrier and cylinders. This reduces return travel of the brake pistons sufficiently to compensate for lining wear. Under heavy braking, the brake unit may reach high temperatures. Expansion of hot brake components will reduce the clearance between rotors and stators and brakes may drag when released. The automatic brake adjuster will act to restore clearances to normal if brakes are applied and then quickly released.
- C. On turbofan airplanes a mechanical friction type mechanism in each return spring housing provides automatic adjustment to compensate for lining wear. When the brakes are applied the pressure plate subassembly forces the return brake pins, grip and tube subassemblies, and return springs against the fixed housings. If wear on the linings has exceeded a predetermined amount, the tube around the brake return pin is forced through the grip collar which is held by the housings. As the tightness of the collar on the tube cannot be overcome by the return spring, the clearance between the linings is reduced to compensate for lining wear. (See figure 4.)

8. Hydraulic Brake Accumulator

- A. The brake accumulator (figure 5) stores energy for brake operation, dampens pressure fluctuations and assures instantaneous flow of fluid to the brakes. When fully charged, the accumulator holds a reserve of fluid under pressure sufficient for approximately five full brake applications.
- B. The brake accumulator is mounted in the wing fillet area right of the right main wheel well, below the utility and auxiliary hydraulic system accumulators. The charging valve is on the end of the accumulator, accessible from the wheel well. A pressure gage is mounted in the wing, directly above the accumulators. A pressure transmitter near the accumulator, operates a similar gage mounted on the copilot's instrument panel. A check valve prevents fluid from returning to hydraulic system when the actuator is charged. The air precharge is 750 +/- 50 psi

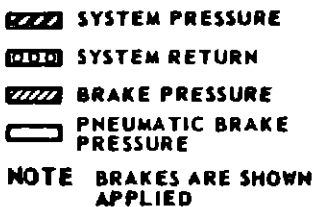
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9. Hydraulic Brake Control Cables

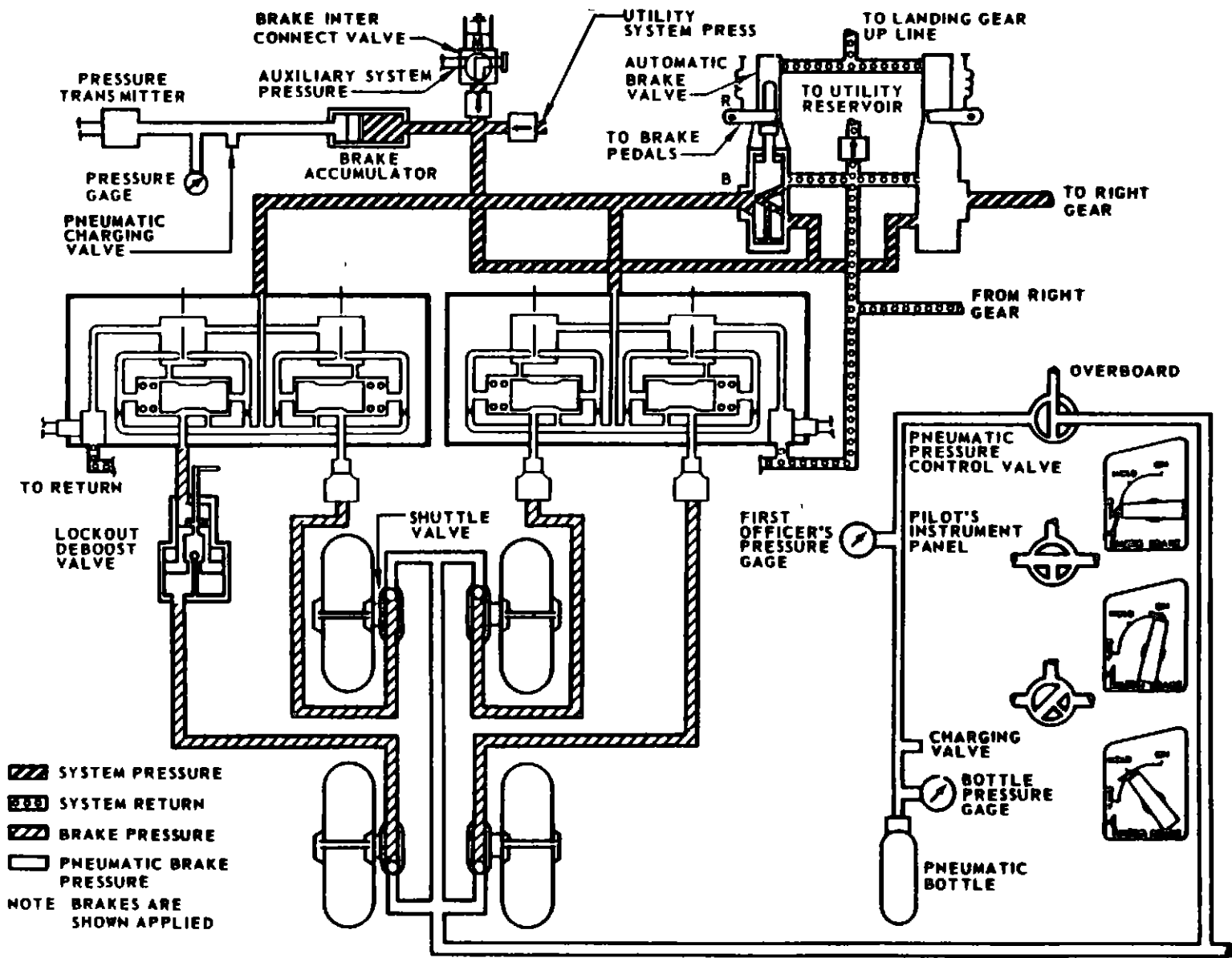
- A Pilot and copilot brake pedal linkages are interconnected to two control quadrants (figure 1). One control quadrant is for the left main gear brakes and the other quadrant is for the right main gear brakes. Braking effort by either pilot is cable directed from the quadrants (in lower nose compartment) to a metering valve (one in each main gear wheel well). Two cables are attached to each quadrant. The cables extend aft to turnbuckles located in the lower nose compartment, between floor beams. Two other cables extend aft from the turnbuckles to the brake metering valve assembly. One passes around a pulley and both cables attach to a control arm over the main gear wheel wells. A shaft from the control arm extends down through the pressure web to an arm which engages the brake metering valve plunger.

10 Operation

- A Energy for brake operation is stored in the brake accumulator. The accumulator is precharged with compressed air and uses fluid under pressure from either the utility or auxiliary hydraulic systems, figure 5. When the pilot depresses the brake pedals, the brake metering valve is opened and fluid under pressure is metered to the brakes. The intensity of pressure reaching the brakes varies with the degree of metering valve opening, thereby giving progressive brake control. Depressing left or right brake pedals gives independent left or right brake operation on left or right main landing gear. This permits differential control for taxi turning. Lockout-deboost valves serve to reduce the pressure leaving the metering valve before it reaches the brakes. When the metering valves close, fluid in the brakes is released to the hydraulic return system.



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Hydraulic Brake System Flow Diagram
Figure 5 (Sheet 2)

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2. Inspection/Check Brake Lockout - Deboost Valve

A. Examine Brake Lockout - Deboost Valve

- (1) Check brake lockout - deboost valve and hydraulic line connections for leaks
- (2) Check for insecure mounting bolts.
- (3) Check that manual reset handle is in the normal color band.



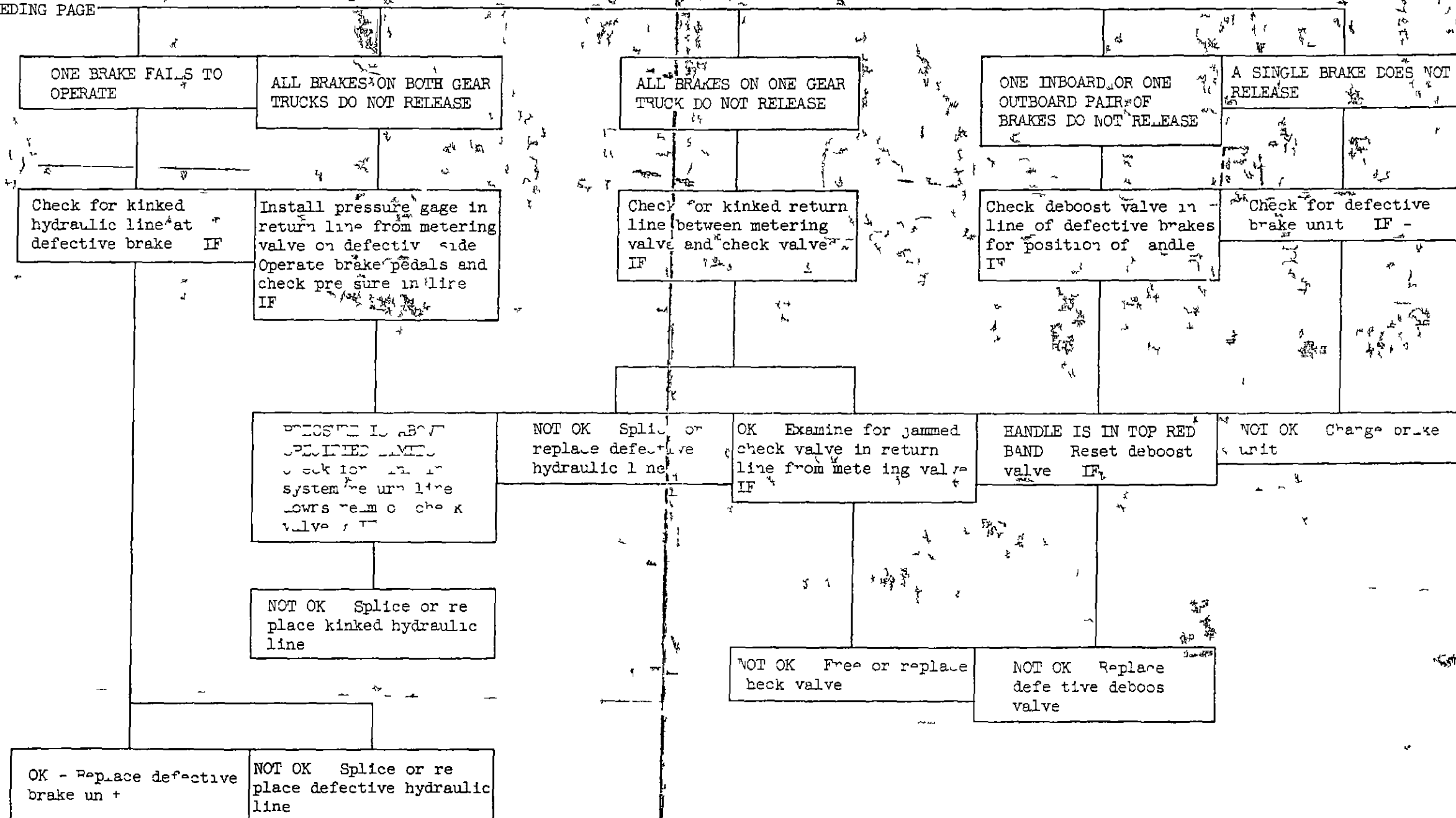
HYDRAULIC BRAKE SYSTEM - TROUBLE SHOOTING

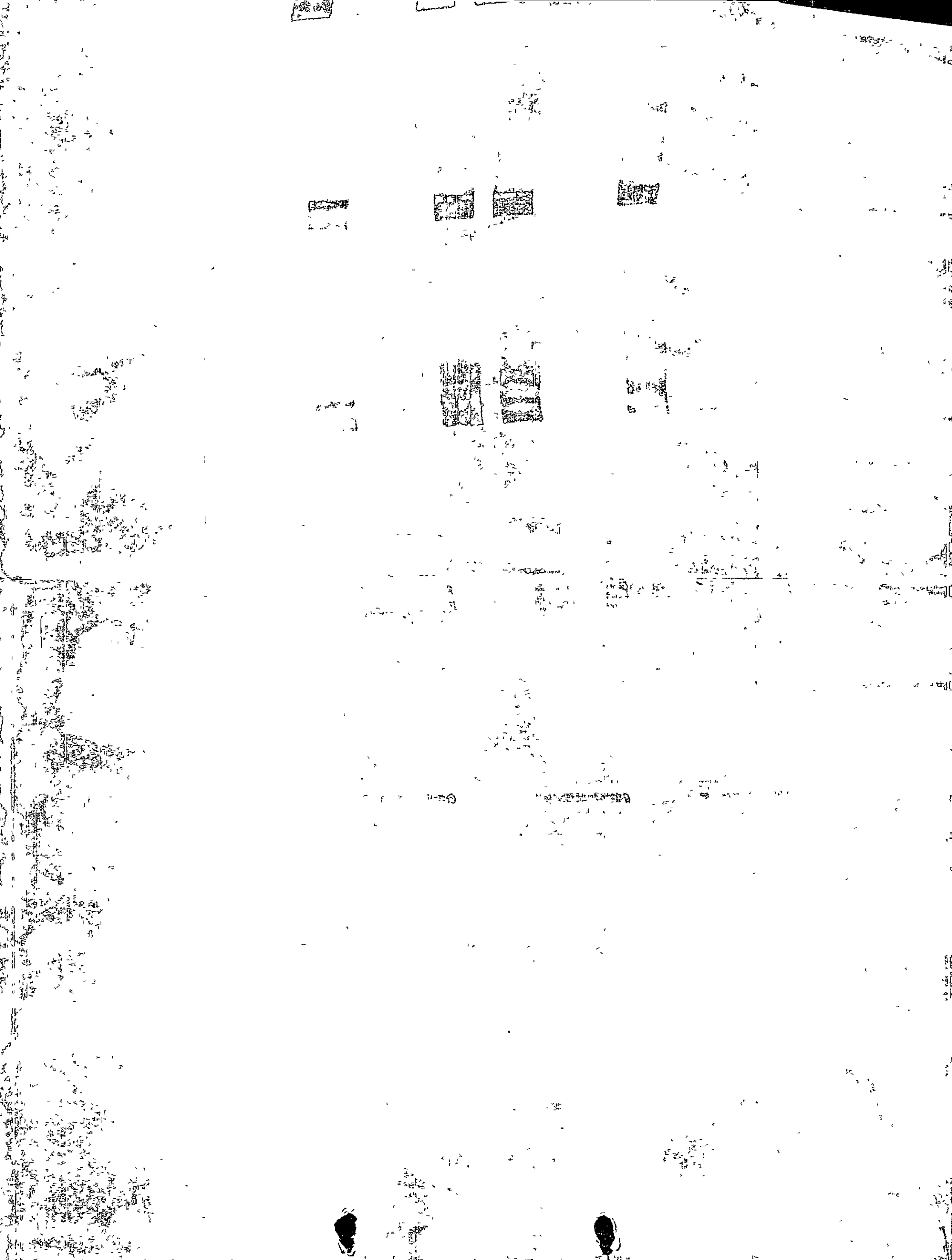
1 General

A The following precheck items should be performed before trouble shooting the hydraulic brake system.

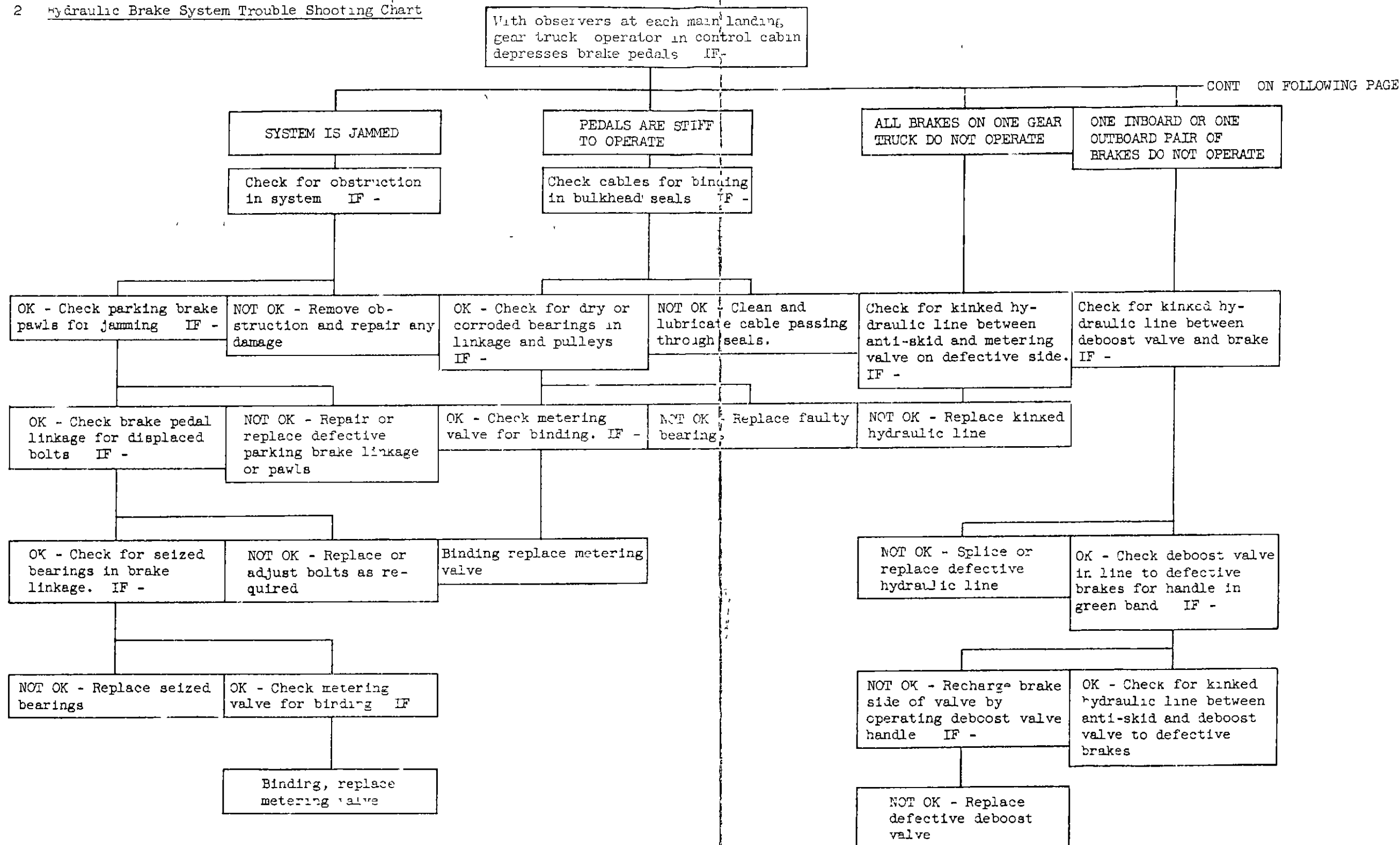
- (1) Check Anti-skid system. See 32-31-0 Adjustment/Test Anti-skid System Leave switch in the "OFF" position
- (2) Perform system operation test See "Adjustment/Test Hydraulic Brake System" If system malfunctions, see chart below.
- (3) Pressurize utility hydraulic system, see Chapter 29

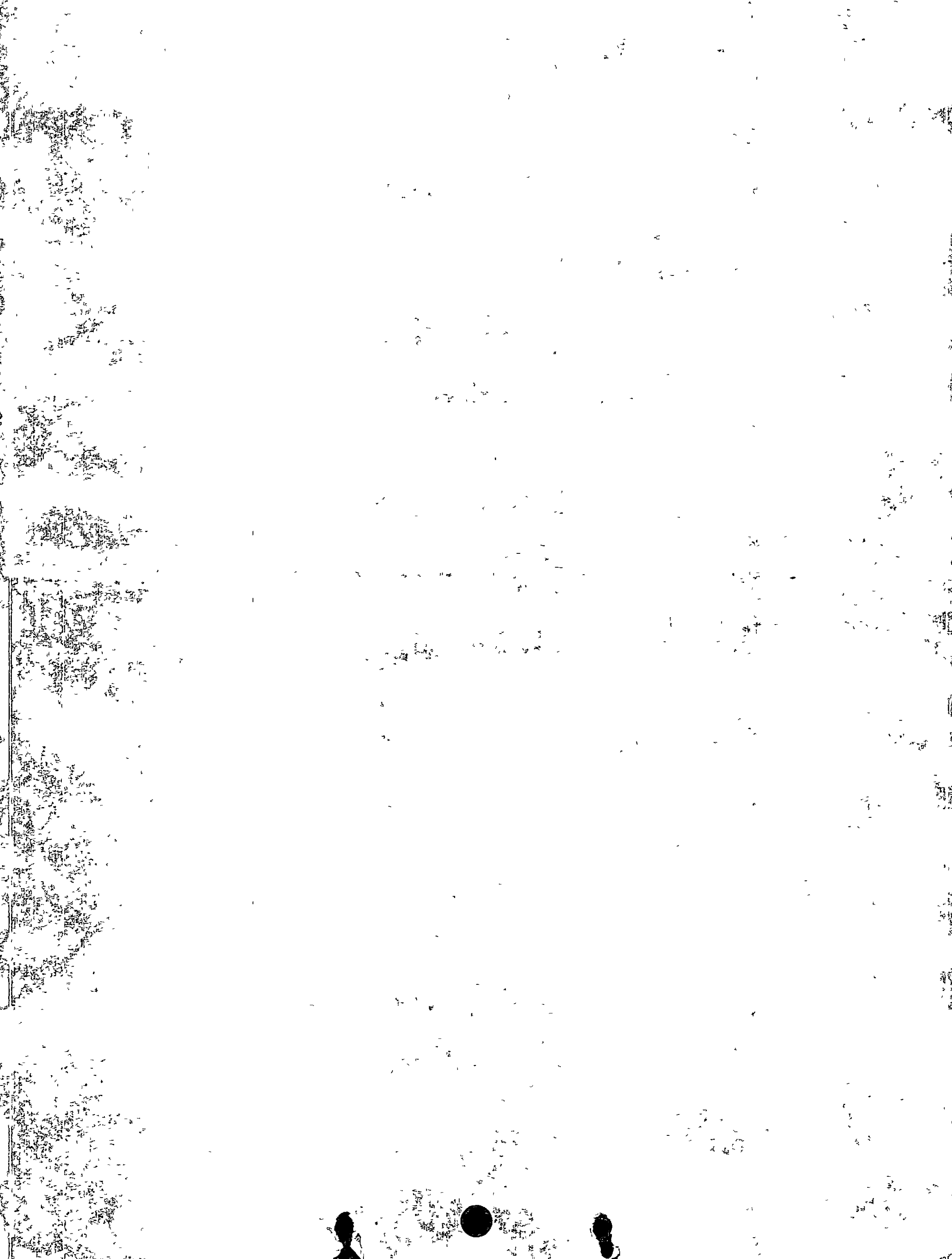
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2 Hydraulic Brake System Trouble Shooting Chart





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HYDRAULIC BRAKE SYSTEM - MAINTENANCE PRACTICES

1. Unit Servicing Hydraulic Brake System

A. General

- (1) Unit servicing of hydraulic brake system includes flushing and bleeding of system.

B. Equipment and Materials

- (1) Hydraulic Cart for Hydraulic Fluid - BMS 3-11 or equivalent, capable of delivering 20-gpm flow at 3000 psi
- (2) Hydraulic fittings and high pressure flexible hose for attaching hydraulic cart to airplane and making connections as required
- (3) Receptacles to collect hydraulic fluid ejected when servicing
- (4) Main Gear Brake Bleed Clamp Assembly - F70171-12 or equivalent

NOTE: Use of main gear brake bleed clamp assembly is optional.

C. Flush Hydraulic Brake System

(1) General

- (a) A hydraulic brake system must be flushed when contamination of hydraulic fluid exceeds limits specified by fluid vendor. The contaminated system must be flushed without delay. Any component damaged or inoperative due to fluid contamination, or being the cause of contamination, must be removed or replaced prior to flushing the system.
- (b) The system is flushed with filtered, clean hydraulic fluid, supplied by an external source of hydraulic power. Fluid flow during flushing should be as high as possible, but flushing pressure should never exceed 900 psi. Flushing time is between 1 and 4 minutes.
- (c) It is necessary to bypass some units when the system is flushed. Hydraulic lines are disconnected from these units and interconnected. The units must be drained, flushed and refilled before being reconnected into the system.

(2) Prepare for flushing.

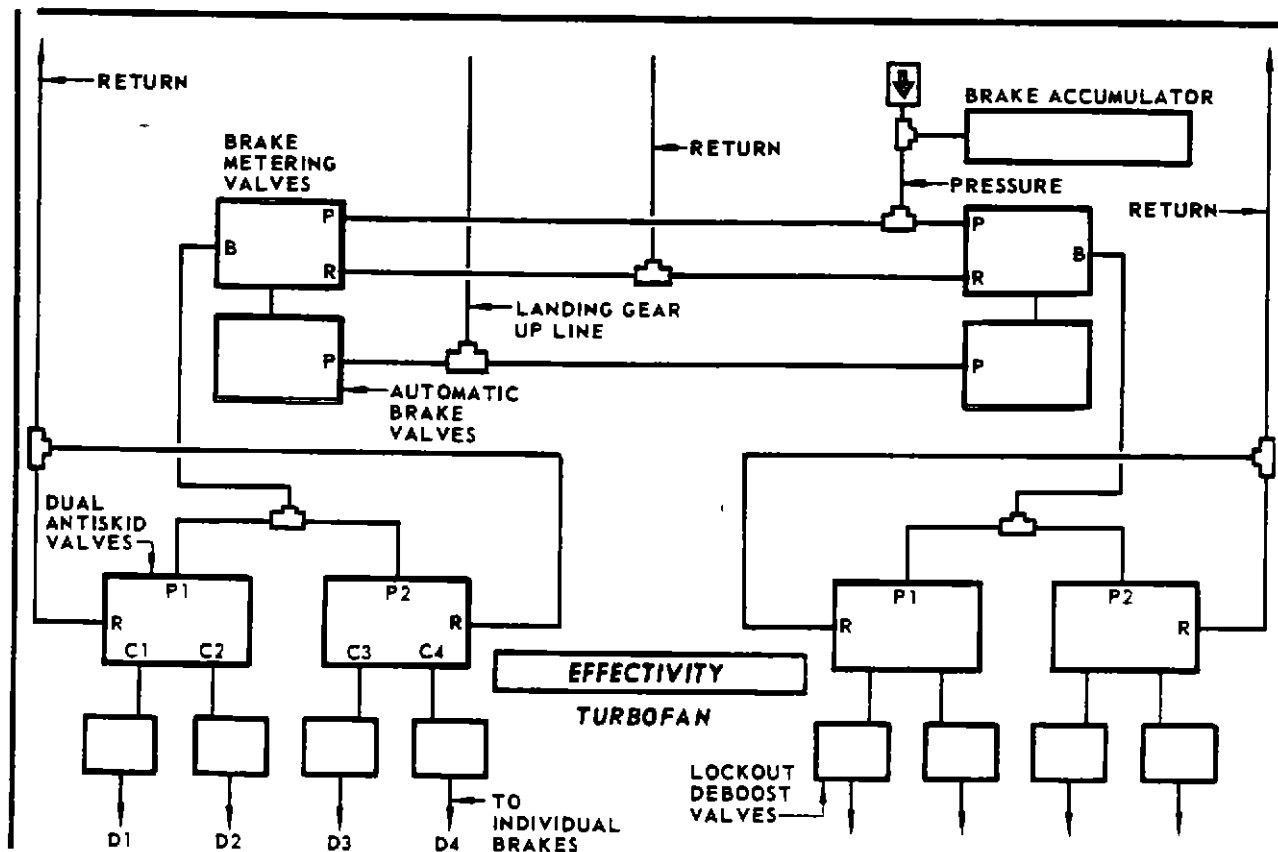
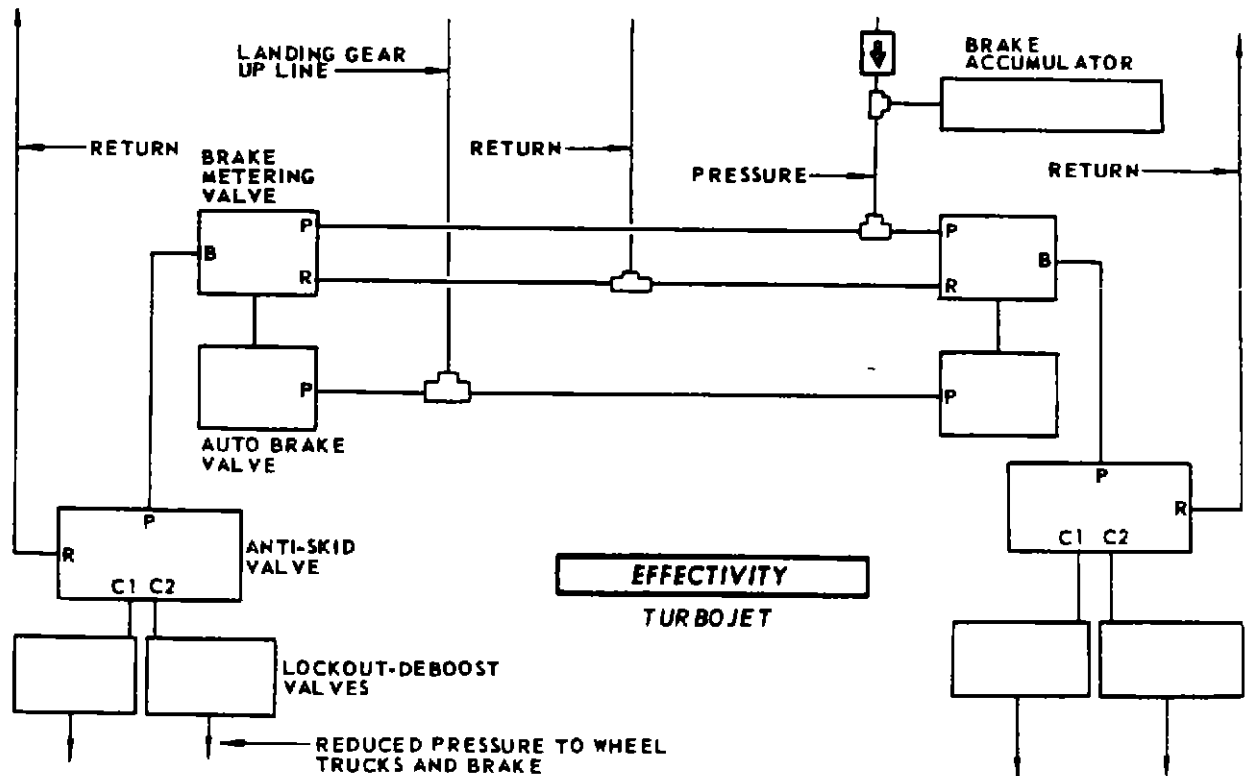
- (a) Connect external hydraulic power to ground test connections in right wing fillet.



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- (b) Depressurize utility hydraulic system.
- (c) Depressurize brake system by fully depressing brake pedals eight to ten times.
- (3) Flush brake lines upstream of brake metering valves.
 - (a) Disconnect from each brake metering valve, return line "R," landing gear up line and brake pressure line "P." Interconnect all lines at each metering valve using a tee connection and short hoses. (See figure 201.)
 - (b) Open external hydraulic shutoff valve for maximum flow keeping fluid pressure below 900 psi.
 - (c) After four minutes close external shutoff valve.
 - (d) Remove tees and hoses; reconnect landing gear up lines and return lines to metering valves.
 - (e) Plug the disconnected brake pressure line "P" at right metering valve. Leave brake pressure line disconnected from left metering valve.
- (4) On turbojet airplanes flush left side landing gear brake system downstream of brake metering valve.
 - (a) Disconnect brake line from port "B" of left metering valve and connect to brake pressure line from port "P."
 - (b) Disconnect all four lines from left antiskid valve and connect either of the two lines from the lockout-deboost valve with the line from the brake metering valve. Interconnect remaining two lines.
 - (c) Disconnect hoses from tees on each side of left main gear truck; interconnect hoses.
 - (d) Open external hydraulic shutoff valve for maximum flow, keeping fluid pressure below 900 psi.
 - (e) After four minutes close external shutoff valve.
 - (f) Reconnect hoses to tees on left main gear truck.
 - (g) Reconnect lines to left antiskid valve.
 - (h) Remove interconnecting hose at left brake metering valve and connect appropriate line to port "B." Plug line for port "P."

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- (5) On turbojet airplanes, flush right side landing gear brake system downstream of metering valve.
 - (a) Remove plug from brake pressure line "P," right metering valve and repeat steps (4) (a) through (4) (g) with right side brake system.
 - (b) Remove interconnect hose at right brake metering valve and reconnect both lines to valve.
 - (c) Remove plug and connect brake pressure line "P" to left metering valve.
- (6) On turbofan airplanes flush left side landing gear brake system downstream of brake metering valve.
 - (a) Disconnect brake line from port "B" of left metering valve and connect to brake pressure line from port "P;"
 - (b) Disconnect all four lines from the dual antiskid valve controlling one pair of brakes, and connect either of the lines with the line from the brake metering valve. Interconnect remaining two lines.
 - (c) Disconnect hoses at appropriate brakes and interconnect. Cap brake ports.
 - (d) Open external hydraulic shutoff valve for maximum flow, keeping fluid pressure below 900 psi.
 - (e) After four minutes close external shutoff valve.
 - (f) Reconnect hoses to brakes.
 - (g) Reconnect lines to dual antiskid valve.
 - (h) Repeat steps (b) through (g) substituting the antiskid valve controlling the other pair of wheels of the left truck.
 - (i) Remove interconnecting hose at left brake metering valve and connect appropriate line to port "B." Plug line and cap port "P."
- (7) On turbofan airplanes, flush right side landing gear brake system downstream of metering valve.
 - (a) Remove plug from brake pressure line "P," right metering valve and repeat steps (6) (a) through (6)(h).
 - (b) Remove interconnect hose at right brake metering valve and reconnect both lines to valve.
 - (c) Remove plug and interconnect brake pressure line "P" to left metering valve.



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D. Bleed Hydraulic Brake System

AF 707-328 and 707-328B
AI VT-DJI thru VT-DPM
BA G-APFB thru G-ARRC
LH D-ABOB thru D-ABOX
NW N351US thru N355US
SN Turbojet airplanes

(1) General

- (a) A brake hydraulic system must be bled whenever a metering valve or a unit downstream of a metering valve is replaced.
- (b) There are four bleed fittings on each brake: One on the automatic brake adjuster opposite the outlet connection; two on the brake carrier, opposite each other on both sides of the brake adjuster; and one on the brake carrier diametrically opposite the shuttle valve.
- (c) Every tandem pair of brakes (No. 1 front and No. 1 rear, No. 2 front and No. 2 rear, etc.) is connected to the same lockout deboost valve. When one brake of a tandem pair is replaced, both brakes must be bled. Bleed fittings must be closed before releasing the brake pedal or air may be drawn into the system. This method of bleeding uses high fluid flow with low pressure.

(2) Pressurize utility hydraulic system.

(3) Bleed brake lines and adjusters.

- (a) Remove screws and attach flexible tubes to automatic brake adjuster bleed fitting on No. 1 front brake. Provide clean receptacles to receive hydraulic fluid ejected when bleeding brakes.
- (b) Station man in wheel well to hold out corresponding lockout-deboost valve reset lever.
- (c) Open bleed fitting with flexible tube attached.
- (d) Depress brake pedals or use main gear brake bleed clamp assembly to actuate brake metering valve in wheel well just enough to force fluid through adjusters to bleed brake lines and adjusters.

NOTE: Use of main gear brake bleed clamp assembly is optional.



MAINTENANCE MANUAL

- (e) Allow continuous flow until fluid runs clear and free from air bubbles.

NOTE: During entire bleeding operation, replenish hydraulic reservoir with hydraulic fluid as required. Do not allow reservoir to empty. Complete brake bleeding can drain approximately two gallons of fluid from hydraulic system.

- (f) Close bleed fittings and release brake pedals or loosen thumb screw of main gear brake bleed clamp assembly.

NOTE: Be certain to close bleed fittings before releasing brake pressure or air may be drawn into the system.

- (g) Repeat steps (a) thru (f) on No. 1 rear wheel brake adjuster.
- (h) Repeat steps (a) thru (g) for remaining tandem sets as required.
- (i) Apply brakes or actuate brake metering valve by tightening thumb screw of main gear brake bleed clamp assembly several times.

NOTE: Apply just enough brake pedal effort or actuate brake metering valve to force brake pressure plate against brake stack. Between applications of brake pressure, release pedals completely or loosen thumb screw and allow 10 to 20 seconds for air bubbles to move to top of brake assembly.

- (4) Bleed each brake assembly:

- (a) Apply just enough brake pedal effort or actuate brake metering valve to force brake pressure plate against brake stack.
- (b) Open bleed fitting at top of brake assembly, close bleed fitting, reopen bleed fittings, repeat several times, each time allowing a small amount of fluid to escape until fluid runs clear when bleed fitting is first opened.
- (c) Repeat steps (a) and (b) for the other bleed fittings near top of brake assembly.

- (5) Repeat steps (4)(a), (b) and (c) for remaining brakes as required.

- (6) Release lockout-deboost valve reset lever.

- (7) Exercise pilot's or copilot's brake pedal or tighten thumb screw of main gear brake bleed clamp assembly.



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- (8) Check indicator position on deboost valves with brakes both on and off. Service deboost valves, per instructions on placard near valve.

NOTE: The indicator on the manual reset handle should be within the green band with the brakes applied when the brake system is properly serviced. When the brakes are released, the handle will move into the outer red band. If the handle moves all the way to the end of the outer red band, additional bleeding is required. If the handle moves into the inner red band, indicating that the manual bypass valve is leaking, then the deboost valve should be replaced.

- (9) Fill hydraulic reservoir with hydraulic fluid according to requirements on reservoir Metal-Cal.
- (10) Depress pilot's or copilot's brake pedal fully and hold or use main gear brake bleed clamp assembly to actuate brake metering valve, for 5 minutes.
- (11) Check for leaks at hydraulic line connections.
- (12) Remove main gear brake bleed clamp assembly, if installed.

E. Bleed Hydraulic Brake Systems

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

(1) General

- (a) Brake hydraulic system must be bled whenever a metering valve or a unit downstream from a metering valve is replaced.
- (b) There are three bleed screws on each brake carrier: one is almost diametrically opposite the shuttle valve, and the other two are on the remaining corners of an imaginary rectangle.
- (c) Every wheel brake is connected to a different lockout-deboost valve. For location and connections, see figure 201A. Adjacent brakes may be bled simultaneously for convenience.

(2) Pressurize utility hydraulic brake system.

NOTE: During entire bleeding operation, replenish hydraulic reservoir with hydraulic fluid as required. Do not allow reservoir to empty. Complete brake bleeding drains approximately 2 gallons of fluid from hydraulic system.

(3) Bleed brakes.

- (a) Remove screw and attach flexible tube to top bleed fitting of forward wheel of left truck.



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- (b) Provide clean receptacles to receive hydraulic fluid ejected when bleeding brakes.
- (c) Station man in wheel well to hold out corresponding lockout-deboost valve reset lever. (See figure 201A.)
- (d) Open bleed fitting.
- (e) Depress brake pedals or use main gear brake bleed clamp assembly to actuate brake metering valve in the wheel well just enough to force fluid through bleed ports and allow a continuous flow until fluid is clear.

NOTE: Use of main gear brake bleed clamp assembly is optional.

- (f) Close bleed fitting, pause, repeat two or three times. When fluid runs clear and free from air bubbles, close bleed fitting.
- (g) Close bleed fitting and release brake pedals or loosen thumb screw of main gear brake bleed clamp assembly.

NOTE: Be certain to close bleed fitting before releasing brake pressure or air may be drawn into the system.

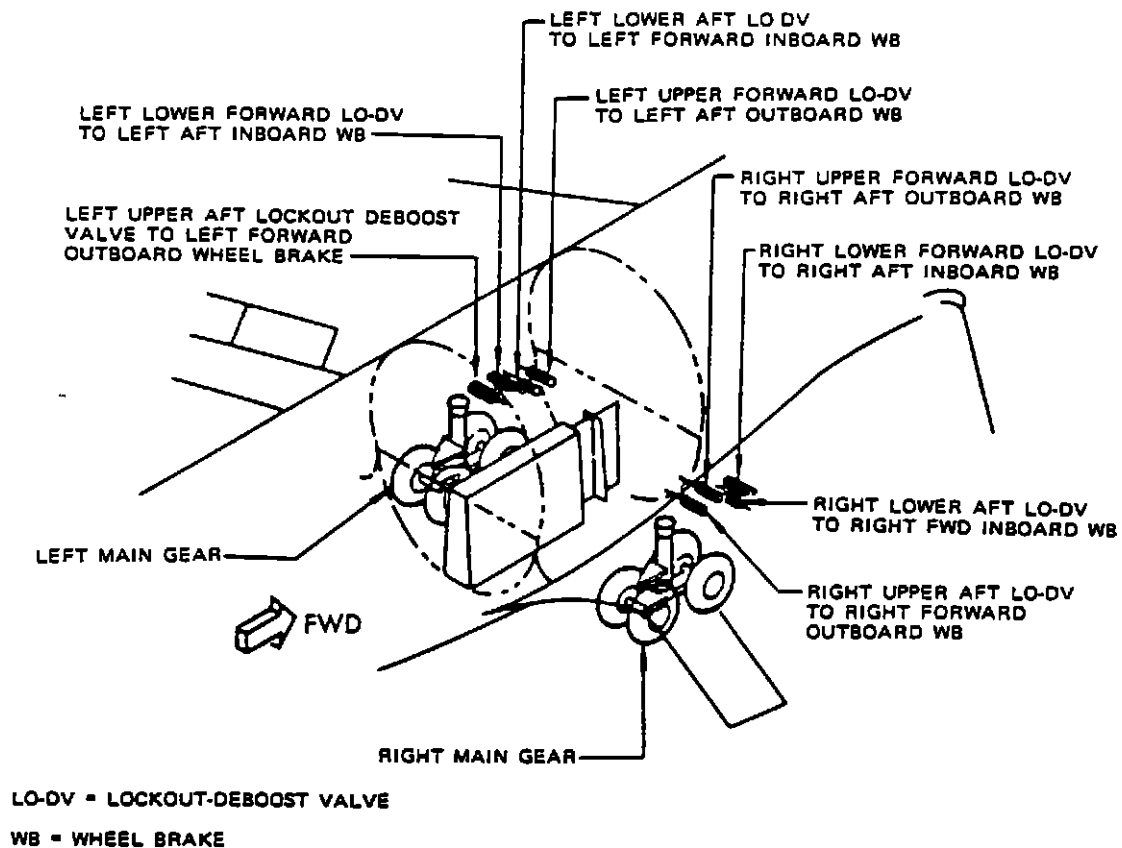
- (h) Repeat steps (a) through (g) on lower aft bleed fitting and on upper aft bleed fitting in turn.
 - (i) Remove bleed lines.
 - (j) Repeat steps (a) through (i) on other wheels of left truck and on right truck as required.
- (4) Exercise pilot's or copilot's brake pedal or tighten thumb screw of main gear brake bleed clamp assembly.
 - (5) Check indicator position on deboost valves with brakes both on and off. Service deboost valves per instructions on placard near valve.

NOTE: The indicator on the manual reset handle should be within the green band with the brakes applied when the brake system is properly serviced. When the brakes are released, the handle will move into the outer red band. If the handle moves all the way to the end of the outer red band, additional bleeding is required. If the handle moves into the inner red band, indicating that the manual bypass valve is leaking, then the deboost valve should be replaced.



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- (6) Fill hydraulic reservoir with hydraulic fluid according to requirements on reservoir Metal-Cal.
- (7) Depress pilot's or copilot's brake pedal fully and hold or use main gear brake bleed clamp assembly to actuate brake metering valve, for 5 minutes.
- (8) Check for leaks at hydraulic line connections.
- (9) Remove main gear brake bleed clamp assembly, if installed.



EFFECTIVITY

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

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2. Adjustment/Test Hydraulic Brake System

A. General

- (1) After repair or replacement of linkage or cables, the mechanical portion of the brake control system must be rigged. Adjustments are made until brake pedals reach correct angle of slope. Linkage and cables are then adjusted until metering valves are closed.
- (2) The hydraulic brake system is tested to check the function of the entire system. Tests are made on periodic inspection, after using pneumatic braking, or on brake malfunction report. Pressure is checked at accumulator and brake lines. Brakes checked at wheels for correct operation and automatic braking response.

B. Equipment and Materials

- (1) Airplane jacks. (See Airplane Jacking, Chapter 7.)
- (2) Pressure Gages (4 required) - 0 to 1500 psi for Skydrol 500.
- (3) Hydraulic Cart - 0 to 3500 psi, for Skydrol 500. Capacity 20 gpm at 3000 psi.
- (4) Cable Tensiometer - 0 to 150 pounds.

C. Adjust Hydraulic Brake Control System

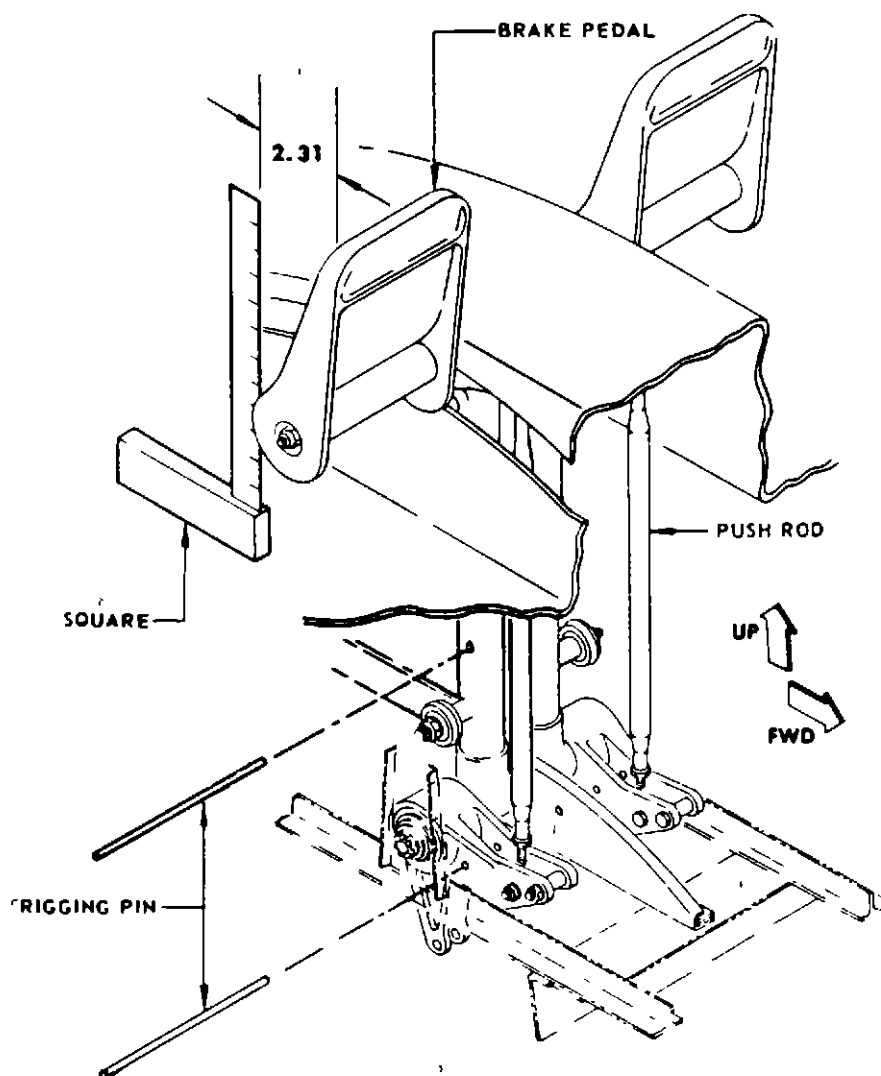
- (1) Insert two 5/16-inch diameter rigging pins, one through the floor beam and bellcranks below rudder pedals, and one through all four rudder pedal arms (figure 202).



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- (2) Place a square against each brake pedal in turn and adjust pushrod until pedal tips are 2.31 inches from square
- (3) Set the brake metering valve arm against stop and the valve rod to the fully extended position. (See figure 203.)
- (4) Check that a clearance not exceeding 0.01 inch exists between the valve arm and flange on automatic brake piston when the automatic brake piston is just in contact with the fully extended valve rod
- (5) If adjustment is required to set clearance, loosen the adjustment bolt and move the crank stop away from metering valve to reduce the clearance and towards the valve to increase clearance.

CAUTION: THE CRANK STOP MUST BE HARD DOWN IN ITS SERRATIONS WHEN CHECKING CLEARANCE.



Hydraulic Brake Pedal Adjustment
Figure 202

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- (6) When adjustment is complete tighten the adjustment bolt.
- (7) Adjust cables until metering valve arm is in contact with stop.
- (8) Tension cables to load specified on chart of figure 202. Lockwire turnbuckles.
- (9) Remove rigging pins.
- (10) Operate brake pedals and check movement of metering valves and coordination of all four brakes.

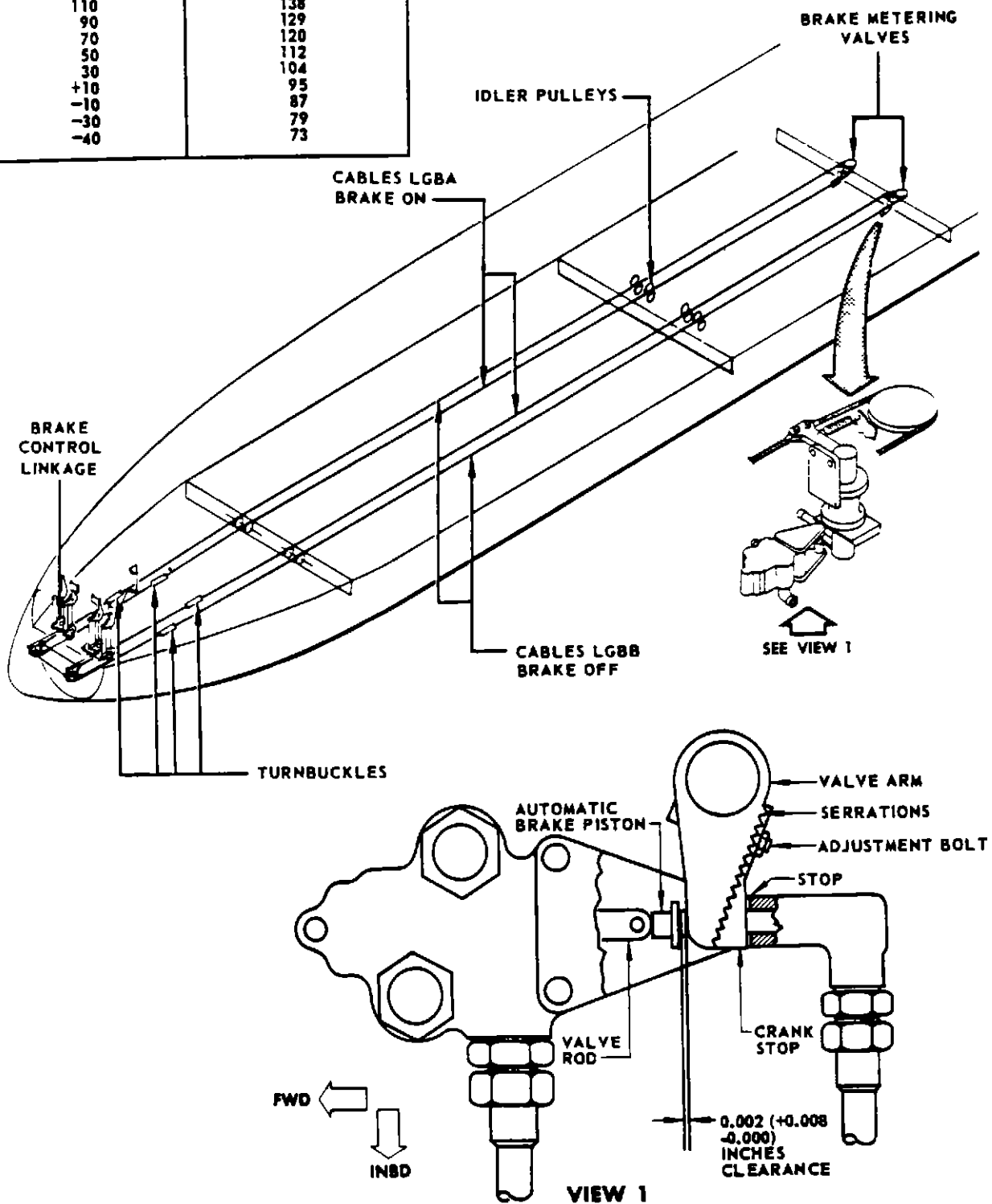
D. Test Hydraulic Brake Control System

NOTE Flush and bleed system prior to test. See "Unit Servicing Hydraulic Brake System."

- (1) Check that nose and main landing gear ground down locks are installed.
- (2) Check that main landing gear doors are open with release handle pulled down and latched.
- (3) Jack airplane until all wheels are clear of ground. Refer to Airplane Jacking, Chapter 7.
- (4) Install a 0 to 1500 psi gage downstream of each lockout-deboost valve.
- (5) Disconnect engine air bleed line to hydraulic reservoir.
- (6) Connect bleed line to a 100 psi air pressure source and slowly build up pressure. Pressure regulator will maintain 45 psi pressure in return system.
- (7) Discharge brake accumulator by operating brakes fully ten times.
- (8) Check accumulator pressure gage to agree with placard. Adjust precharge pressure if required.
- (9) Pressurize system to 3000 psi.
- (10) Depress brake pedals gradually. Pressure on gages shall build up steadily. At full pedal travel, gages shall read 1035 ($\pm$ 20) psi.

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TEMP °F	CABLE RIGGING LOAD $\pm$ 10 POUNDS
110	138
90	129
70	120
50	112
30	104
+10	95
-10	87
-30	79
-40	73



Hydraulic Brake System Cable and Metering Valve Adjustment
Figure 203



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- (11) Release pedals and turn each wheel to check for freedom of rotation.
 - (12) Check pressure on gages to read 35 psi maximum.
 - (13) Check accumulator charge to be 3000 psi and depressurize system.
 - (14) Apply brakes fully, five times. Accumulator pressure shall not drop to 800 (± 50) psi until after the fifth application.
 - (15) Pressurize hydraulic system to 3000 psi.
 - (16) Spin one main landing wheel and place main landing gear control handle in "UP" position.
 - (17) Braking action shall stop wheel when control handle reaches up position. Note progress of braking on gages installed downstream of lockout-deboost valves. Gages shall read 175 (± 25) psi.
 - (18) Place gear control handle in "DOWN" position. Gage pressure downstream of lockout-deboost valves shall fall to 35 psi or less.
 - (19) Depressurize hydraulic system.
 - (20) Remove pressure gages and reconnect hydraulic lines.
- E. Brake System - Check valve check.
- (1) Between utility and brake system.
 - (a) Connect external electrical power.
 - (b) Put parking brake lever in OFF position.
 - (c) Open brake interconnect valve with switch.
 - (d) Start auxiliary pumps by moving auxiliary pump switch to "ON" and pressurize brake system to 3000 psi.
 - (e) When 3000 psi are reached, close brake interconnect valve with switch and stop auxiliary pumps.
 - (f) There should be no pressure drop in the brake system after 5 minutes.

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- (2) Between auxiliary and brake system.
 - (a) Connect external electrical power.
 - (b) Put parking brake lever in OFF position.
 - (c) Open brake interconnect valve with switch.
 - (d) Start auxiliary pumps by moving auxiliary pump switch to "ON" and pressurize brake system to 3000 psi.
 - (e) When 3000 psi are reached, stop auxiliary pumps.
 - (f) There should be no pressure drop in the brake system after 5 minutes.

F. Brake Interconnect Valve.

- (1) Internal leak check.
 - (a) Open hydraulic access door R1348.
 - (b) Connect external electrical power.
 - (c) Depressurize brake system with brake pedals.
 - (d) Pressurize hydraulic reservoirs with compressed air applied at ground pressurization valve.
 - (e) Put parking brake lever in OFF position.
 - (f) Brake interconnect valve switch remains in OFF position.
 - (g) Operate auxiliary hydraulic pump by moving pump switch to "ON". Pressure rises to 3000 psi.
 - (h) Check that no pressure rise is visible on brake indicator after 5 minutes of operation.
 - (i) If pressure rise is visible, replace brake interconnect valve.
 - (j) Restore airplane to normal.

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(2) Operational Check.

- (a) Move brake interconnect valve switch to "BRAKE".
- (b) Check that brake interconnect valve position indicator shows "OPEN".
- (c) Move brake interconnect valve switch to "OFF".
- (d) Check that brake interconnect valve position indicator shows "CLOSED".

3. Inspection/Check Hydraulic Brake System

A. Examine Hydraulic Brake System

- (1) Check brake cables for fraying, corrosion and kinks.
- (2) Check cables for specified tension. See paragraph 2
- (3) Examine pulley brackets for cracks, distortion and loose mounting bolts.
- (4) Check pulleys and fairleads for cracks, looseness, and misalignment.
- (5) Check brake pedals and linkage for binding, corrosion, loose bolts, and missing cotter pins.

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BRAKE CONTROL LINKAGE - MAINTENANCE PRACTICES

1. Unit Servicing Brake Control Linkage

A. Lubricate Cables in Contact with Magnesium Drums and Quadrants

- (1) Cables in contact with magnesium drums and quadrants require lubricant free of graphite. The magnesium quadrants in this system are the right and left horizontal quadrants (5 and 8, figure 201.).
- (2) Refer to Unit Servicing Control Cables, Chapter 27.

2. Removal/Installation Brake Control Linkage

A. Remove Brake Control Linkage

- (1) Loosen turnbuckles to release tension and detach control cables (9 and 12, figure 201) from quadrants (5 and 8).
- (2) Release pushrods (3) at bell cranks (4 and 7) and quadrant levers (5 and 8) below control cabin floor.
- (3) Remove aft rod assembly (11).
- (4) Remove two screws from center coupling of forward rod assembly (6). Detach ends and remove rod in two parts.

NOTE: Bolts attaching rods to all levers on bell cranks and quadrants have one antigalvanic washer under bolt head and one under nut.

- (5) Remove nut and tap out shaft through bell crank and quadrant.
- (6) Lift out quadrants and bell cranks.
- (7) Disconnect and remove pushrods (3) at bell cranks (2).
- (8) Remove rudder pedal rod access panel.
- (9) Disconnect and remove pushrods (1 and 10).

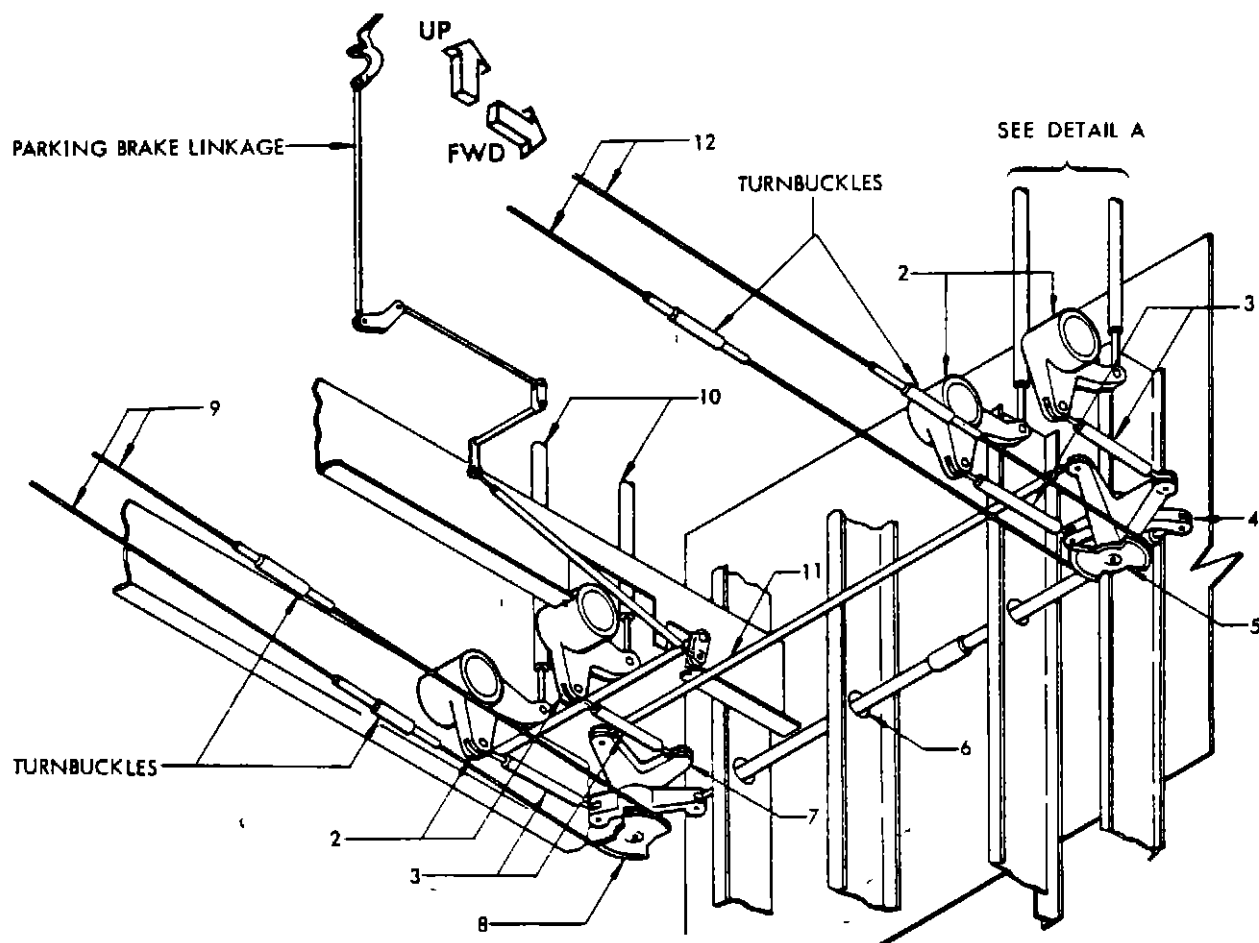
B. Install Brake Control Linkage

- (1) Insert and connect pushrods (1 and 10, figure 201) at brake pedals.

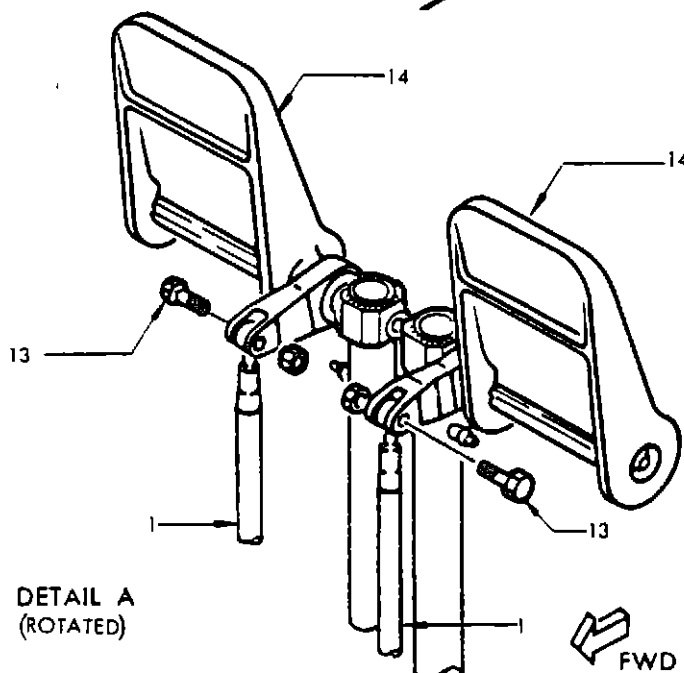
NOTE: Bolts at top of pushrods should be installed with bolt heads closest to brake pedals. (See figure 201, detail A.)

- (2) Replace rudder pedal rod access panel.

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- 1 PUSHRODS TO BRAKE PEDALS - RIGHT
- 2 BELLCRANK
- 3 PUSHROD
- 4 RIGHT BELLCRANK
- 5 RIGHT QUADRANT
- 6 FORWARD ROD ASSEMBLY
- 7 LEFT BELLCRANK
- 8 LEFT QUADRANT
- 9 CONTROL CABLES - LEFT
- 10 PUSHRODS TO BRAKE PEDALS - LEFT
- 11 AFT ROD ASSEMBLY
- 12 CONTROL CABLES - RIGHT
- 13 BOLT
- 14 BRAKE PEDAL



Brake Control Linkage Installation
Figure 201



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- (3) Insert and connect pushrods (3) at bell cranks (2).
 - (4) Place bell crank and quadrant in position on left bracket. Bell crank on top with long lever facing aft, and short lever facing inboard. Long lever on quadrant to face forward.
 - (5) Tap shaft through from top, with washer under head.
 - (6) Fit washer and nut on shaft. Secure quadrant and bell crank.
 - (7) Repeat step (1) in right bracket with long lever of bell crank facing forward, and short lever facing inboard. Long lever on quadrant to face aft.
 - (8) Repeat steps (5) and (6).
 - (9) Connect pushrods from brake pedal bell cranks to short levers on bell cranks and quadrants, (4, 5, 7, and 8), with bolt heads up.
 - (10) Check that aft rod assembly is set at 40-inch centers. Connect to bell crank and quadrant (7 and 5), with bolt heads up.
 - (11) Check that forward rod assembly is set at 40-inch centers. Connect one-half to left quadrant with bolt head up.
 - (12) Insert second half of rod assembly, fit and join coupling in center. Connect end to right bell crank with bolt head up.
- NOTE:** If forward rod assembly will not line up with attachment holes in bell crank, adjust length of both forward and aft rod assemblies. Adjust rods in opposite directions. Each rod in equal amount until attachment holes are in line.
- (13) Connect and apply tension to cables. See Adjust Hydraulic Brake Control System, 32-9-0.

BRAKE METERING VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Brake Metering Valve

A. Remove Brake Metering Valve (See figure 201.)

- (1) Check that landing gear ground downlocks are engaged. Landing gear doors are opened with release handle pulled down and latched.
- (2) Depressurize hydraulic system including utility reservoir, and discharge brake accumulator by operating brakes fully, eight to ten times.
- (3) Disconnect hydraulic lines from metering valve. Cap valve ports and hydraulic lines.
- (4) Remove aft outboard and forward attach bolts; in that order.
- (5) Remove aft inboard bolt by rotating aft end of automatic brake cylinder assembly inboard until it clears the valve arm.
- (6) Remove valve assembly.
- (7) Remove hydraulic fittings from valve and discard used O-rings.

B. Install Brake Metering Valve (See figure 201.)

- (1) Install hydraulic fittings, with new O-rings in valve ports.
- (2) Connect two halves of valve by passing the aft inboard attach bolt through applicable holes.
- (3) Remove lockwire from automatic brake piston.

CAUTION: THE PISTON RETAINING WIRE MAY PREVENT AUTOMATIC BRAKE APPLICATION UNLESS REMOVED.
- (4) Attach the assembly to structure finger-tight.
- (5) Rotate forward half of valve into alignment and install forward attach bolt, with spacer between valve and structure, finger-tight.
- (6) Simultaneously rotate valve arm (using a suitable wrench) and automatic brake cylinder into position and install aft outboard bolt finger-tight.
- (7) Tighten attach bolts.
- (8) Connect all hydraulic lines.
- (9) Check metering valve adjustment. See 32-9-0, Adjust Hydraulic Brake Control System.



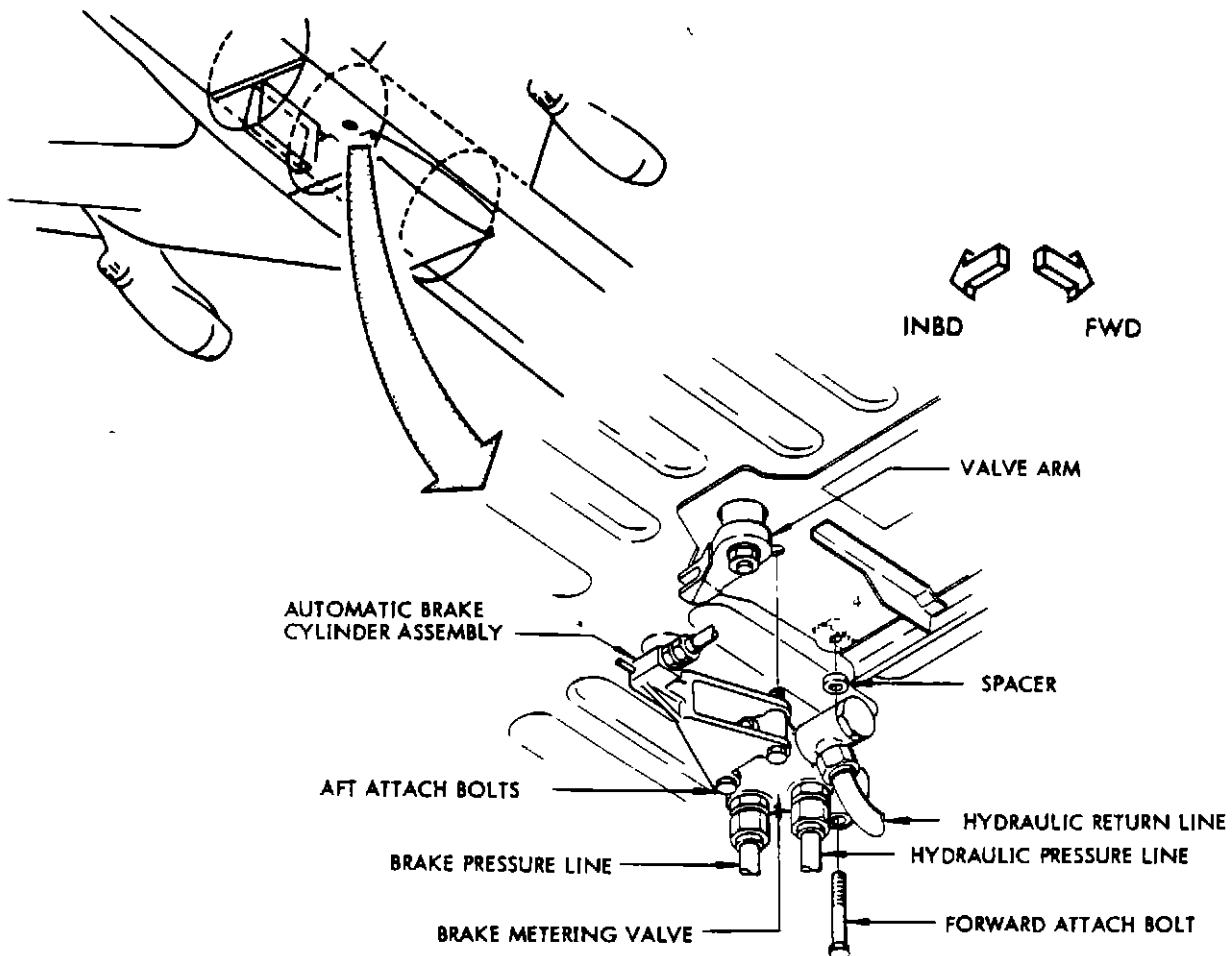
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- (10) Pressurize system and exercise brake pedals. Check metering valves for freedom of action.
- (11) Set parking brake ON. After 5 or 10 minutes, check hydraulic line connections for leaks.
- (12) Bleed system. See Servicing Hydraulic Brake System, 32-9-0.

2. Inspection/Check Brake Metering Valve

A. Examine Brake Metering Valve

- (1) Check brake metering valve and line connections for leaks.
- (2) Check brake metering valve installation bolts for looseness and insecurity of locking devices.
- (3) Check cable connections and valve mounting sealing for corrosion or deterioration.



Brake Metering Valve Installation
Figure 201

BRAKE LOCKOUT-DEBOOST VALVE - MAINTENANCE PRACTICES

1 Removal/Installation Lockout-Deboost Valve

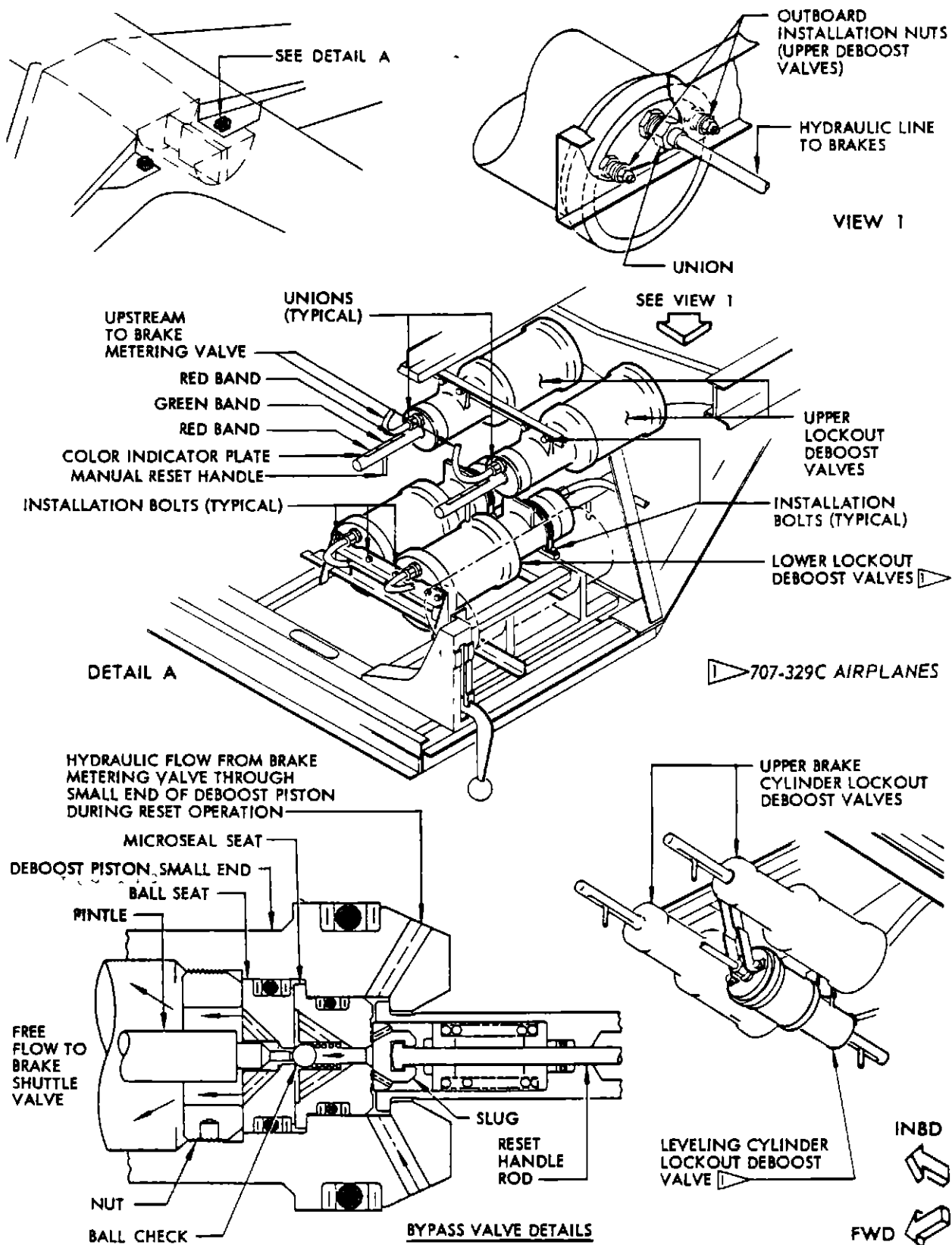
A Remove Lockout-Deboost Valve

- (1) Check that landing gear ground down locks are engaged. Landing gear doors are opened with release handles pulled down and latched.
- (2) Depressurize hydraulic system including utility, reservoir, and discharge brake accumulator by operating brakes fully eight to ten times.
- (3) Disconnect and cap hydraulic lines at each end of lockout-deboost valves (figure 201).
- (4) Remove two self-locking nuts and washers from outboard attachment. Also two bolts and washers from inboard attachment.
- (5) Lower lockout-deboost valve and remove from airplane.
- (6) Remove hydraulic unions and O-rings.

B Install Lockout-Deboost Valve

- (1) Install serviceable hydraulic unions with new O-rings in valve ports of lockout-deboost valve (figure 201).
- (2) Fill lockout-deboost valve with Skydrol 500. Cap unions.
- (3) Set valve in position with large diameter outboard and with hydraulic port up. Reset handle should be down.
- (4) Pass studs on outboard end of valve through holes in support channel. Secure with self-locking nuts over a washer.
- (5) Continue to support valve until bolts and washers on inboard attachment are installed.
- (6) Remove caps and connect hydraulic lines to valve.
- (7) Pressurize hydraulic system.
- (8) Bleed system, see "Servicing-Hydraulic Brake System" 32-9-0.

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Lockout-Deboost Valve Installation
Figure 201



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BRAKE SHUTTLE VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Brake Shuttle Valve

A. General

- (1) The brake shuttle valve is attached to the brake carrier with one large bolt. The bolt goes into a steel bushing screwed into the brake carrier. One preformed rubber packing provides a seal for the bushing.

B. Remove Brake Shuttle Valve

- (1) Check landing gear ground down locks engaged, landing gear doors open, release handle pulled down and latched.
- (2) Depressurize hydraulic system and discharge brake accumulator by operating brakes fully eight to ten times.
- (3) Check that emergency brake control valve is "OFF" and lockwired
- (4) Clean external surface of shuttle valve, air and hydraulic line connections, and surrounding area. (See figure 201.)
- (5) Disconnect and cap, hydraulic and air lines from valve.
- (6) Hold steel bushing with wrench and take out large attachment bolt. Remove shuttle valve.

NOTE: Observe position of two O-rings from ends of valve.

C Install Brake Shuttle Valve.

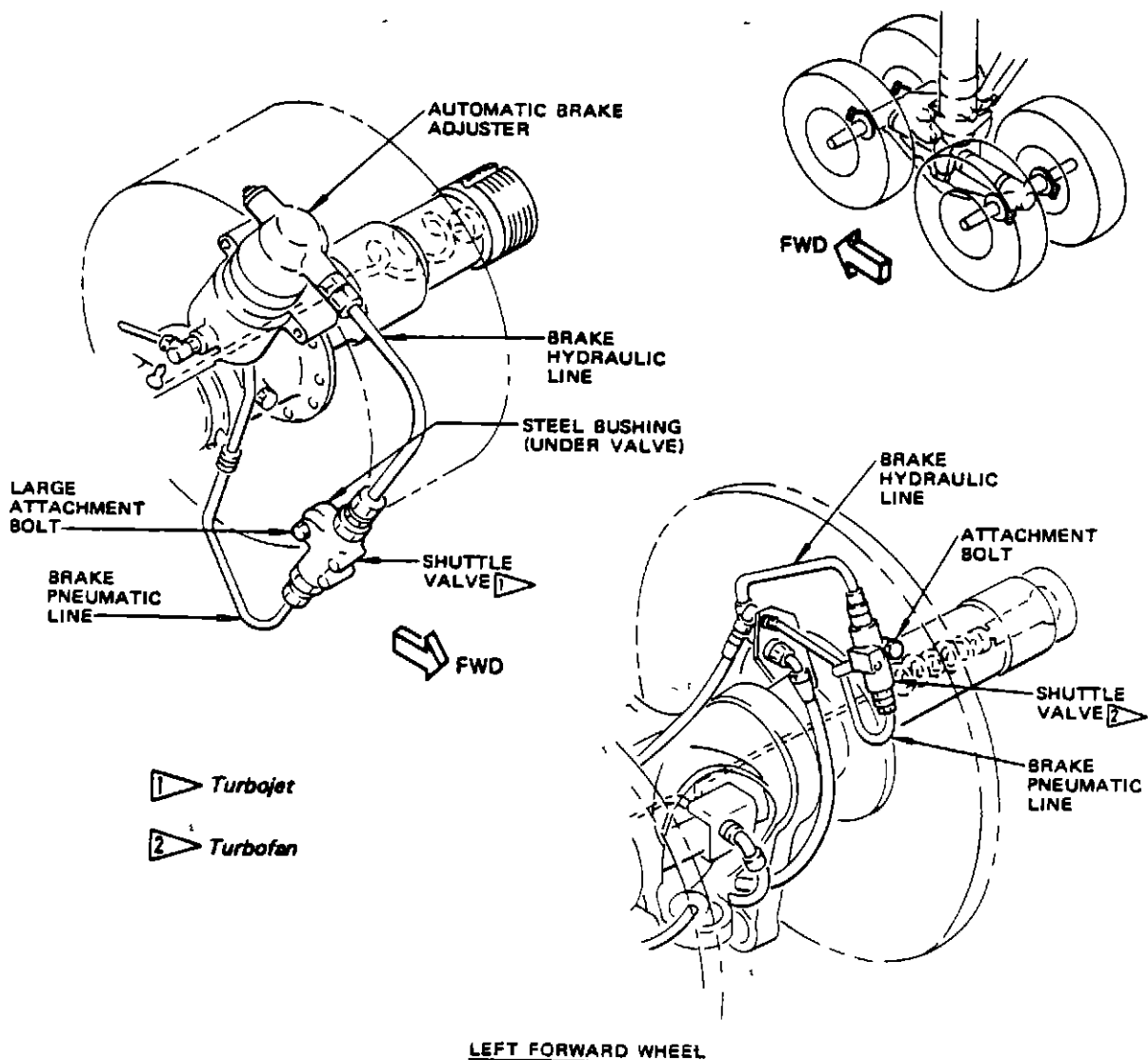
- (1) Fit flareless tube union and new O-ring in ends of serviceable valve.
- (2) Fill shuttle valve with Skydrol 500 and cap unions.
- (3) Check that steel bushing is tightened to 500 to 600 inch-pounds torque. (See figure 201.)
- (4) Place valve in position and insert large attachment bolt with two new O-rings.



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- (5) Align valve with air and hydraulic lines. Tighten attachment bolt.
- (6) Remove caps and connect hydraulic and emergency brake lines.
- (7) Bleed brake system. Refer to 32-9-0, Hydraulic Brake System - Maintenance Practices.
- (8) On airplanes listed in 32-12-01, bleed pneumatic brake system.
- (9) Check emergency brake line for leaks. Refer to Pneumatic Brake System.

NOTE: If leaks develop around steel bushing, remove the bushing and install new rubber packing. Tighten bushing as in step (3).



Brake Shuttle Valve Installation
Figure 201



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LANDING GEAR BRAKE UNIT - REMOVAL/INSTALLATION

EFFECTIVITY

Turbofan airplanes

1. Equipment and Materials

- A. Wheel Change Dolly - F71200 or equivalent
- B. Down Lock Assembly, Main Landing Gear - F71126-500 or equivalent
- C. Down Lock Assembly, Nose Landing Gear - F70008-500 or equivalent
- D. Axle Jacks
- E. Axle Protector, Main Landing Gear - F71355 or equivalent
- F. Spanner Wrench for Axle Nut

2 Remove Landing Gear Brake Unit

- A. Check that landing gear down and ground locks are engaged and landing gear doors are opened with release handle pulled down and latched.
- B. Depressurize hydraulic system including utility reservoir and discharge brake accumulator by operating brakes fully eight to ten times.
- C. Shut off electrical power and check that emergency brake control handle is lockwired in OFF position.
- D. Jack affected wheels. Refer to Airplane Jacking, Chapter 7.
- E. Remove main gear tire and wheel assembly. Refer to 32-22-41, Main Gear Tire and Wheel - Maintenance Practices.
- F. Disconnect and cover shuttle valve to hold installation bolt and keep out foreign matter. (See figure 401.)

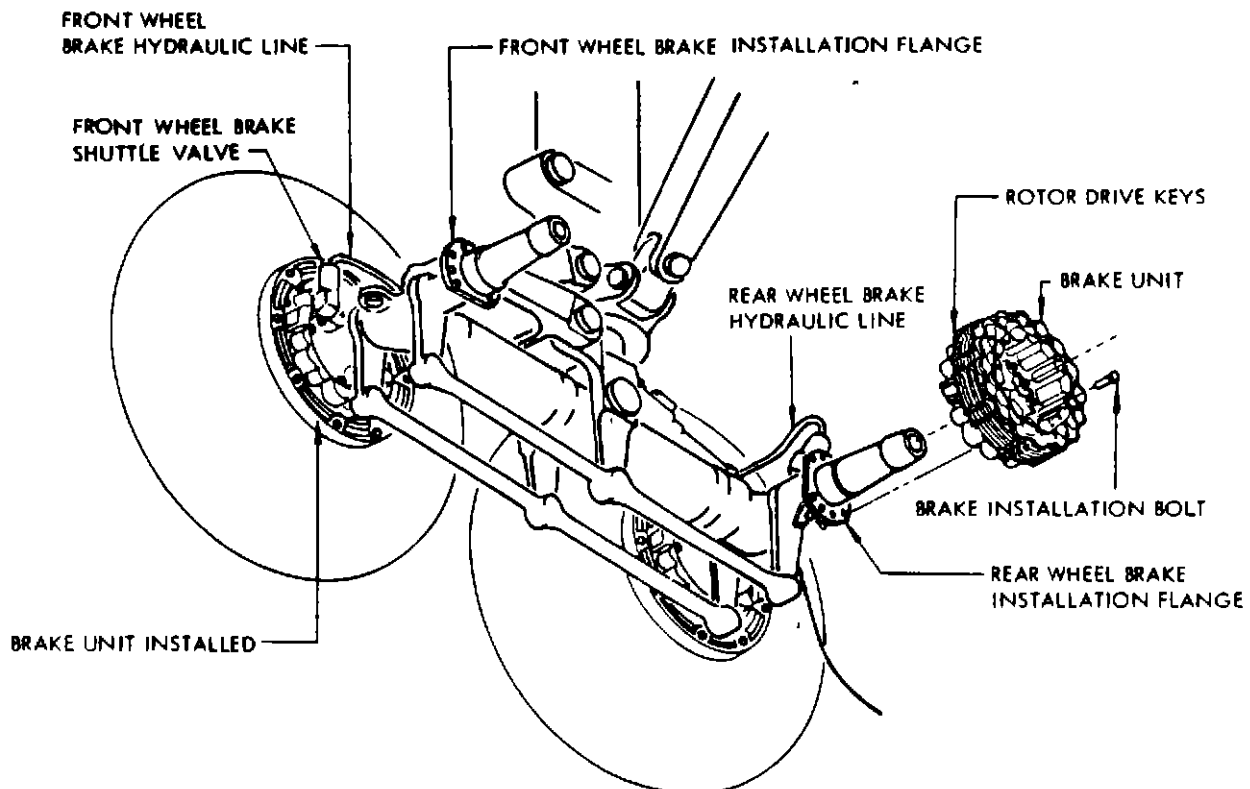
NOTE: It is not necessary to disconnect lines at shuttle valve.
Exercise care so lines are not bent.

- G. Install axle protector on axle.
- H. Remove bolts securing brake to brake installation flange and remove brake unit.

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3. Install Landing Gear Brake Unit

- A. Position brake unit on brake installation flange with shuttle valve on upper side and approximately 30 degrees forward. (See figure 401.)
- B. Install and tighten brake installation bolts to torque value given on brake identification plate.
- C. Connect shuttle valve to brake unit.
- D. Remove axle protector from axle.
- E. Line up drive keys on rotors and install main gear tire and wheel assembly. Refer to 32-22-41, Main Gear Tire and Wheel - Maintenance Practices.
- F. Lower and remove jacks.
- G. Pressurize hydraulic system.
- H. Bleed brake system. Refer to 32-9-0, Hydraulic Brake System - Maintenance Practices.
- I. Deleted.



Landing Gear Brake Unit Installation
Figure 401

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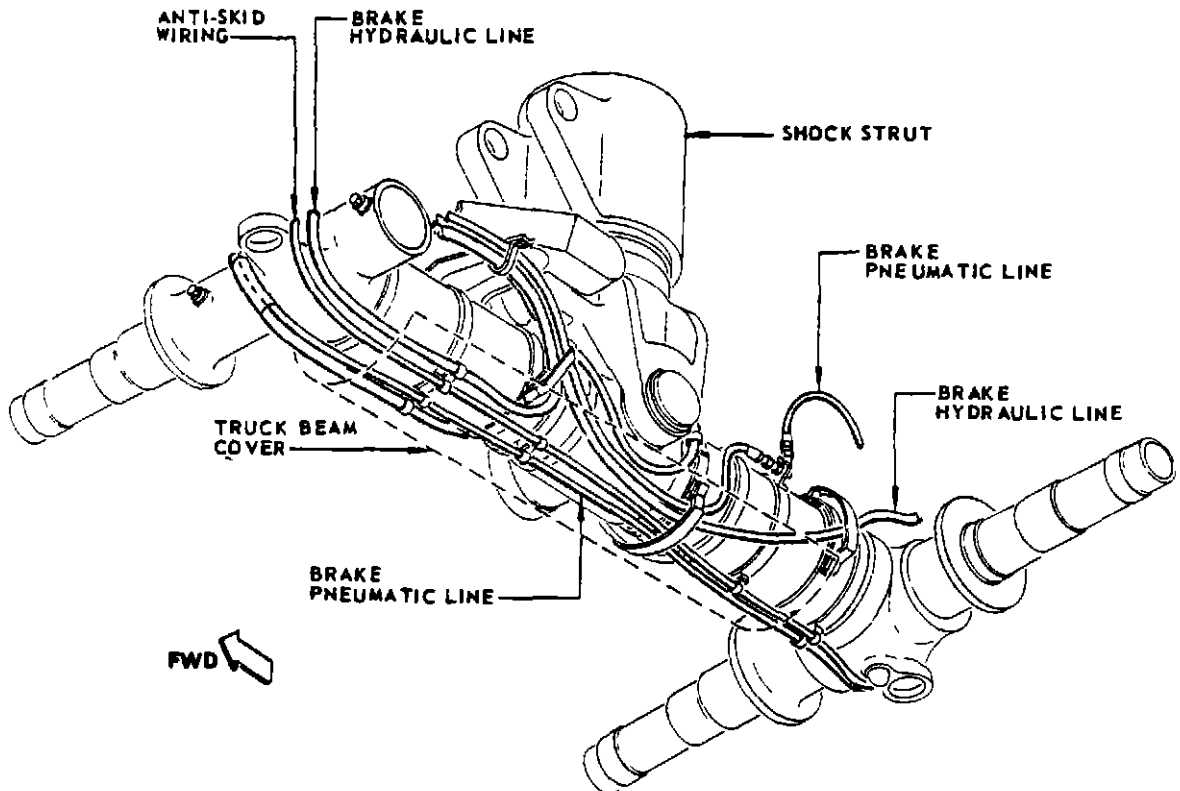
3. Inspection/Check Main Landing Gear

A. General

- (1) A special examination of the landing gear is necessary after a hard landing, after a brake seizure when the airplane is being towed or is moving at high speed on the ground, and after a high energy stop. Normal checks are made as required

B. Examine Main Landing Gear

- (1) With power off, check main gear actuator in wheel well for leaks.
- (2) Check shock strut for leaks and for specified extension. Examine extension surface of the shock strut inner cylinder for dirt, scratches or galling. Check outer cylinder lugs for cracks.
- (3) Examine main gear tires and wheels. See "Inspection/Check Main Gear Tire and Wheel," 32-22-41.
- (4) Examine main gear leveling cylinder and snubber unit for leaks and correct servicing.
- (5) Check safety and leveling switches for loose mounting bolts, and electrical connections for broken or missing lockwire.



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- (6) Examine the torsion links, drag struts, actuator walking beams, walking beam hangers and side strut segments for cracks at pivot areas. Check all attachment bolts for missing cotter pins and lock bolts.
 - (7) Check hydraulic lines for chafing on the actuator walking beam and hanger.
 - (8) Check for end play in actuator-to-beam and to-trunnion bolts.
 - (9) Examine brake equalizer rod terminals and attachment bolts for broken or missing cotter pins.
 - (10) Check the static discharge strap for loose attachment and failure to contact the ground.
 - (11) Check main gear lock mechanism. See "Inspection/Check, Main Gear Lock Mechanism," 32-22-151.
 - (12) Check landing gear brake unit. See "Inspection/Check Landing Gear Lock Mechanism," 32-9-72.
 - (13) With power on, check landing gear warning light and position indicators for correct indication.
- C. Examine Main Landing Gear After a Hard Landing
- (1) Refer to Conditional Inspections, Chapter 51.
- D. Examine Main Landing Gear After Brake Seizure
- (1) Check axles, wheel truck beam and shock strut inner cylinder forks for cracks.
 - (2) Check brake equalizer rods for distortion or attachment failure.
 - (3) Check axles for heat damage.
- E. Examine Main Landing Gear After High Energy Stop.
- (1) General
 - (a) A high energy stop may be defined as a "Refused Takeoff" or any stop other than normal. See "Brake Usage Chart" in "Operations Manual."

CAUTION DO NOT APPROACH LANDING GEAR UNTIL BRAKES AND WHEELS HAVE COOLED OFF.



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(2) Examine Main Landing Gear.

- (a) Check cadmium plate on brake collars and brake equalizer rods for evidence of blistering and melting.
- (b) Check Skydrol resistant paint on rear axle and truck beam for a brown shade due to overheating
- (c) If check (a) shows that cadmium has blistered and check (b) shows that parts have been overheated, they must be removed for hardness test.
- (d) If check (a) shows that cadmium has melted, parts must be replaced.
- (e) Check axles for heat damage

F. Examine Main Landing Gear Axle For Heat Damage

(1) General

- (a) The purpose of these inspections is to check whether any metal structure, which has been subjected to excessive heat, has suffered a detrimental change to its temper or heat treat properties.
- (b) Inspection for high strength steel is provided in par. 2. The components for which this inspection is most likely to be required are the landing gear axles. The presence of discolored or blistered paint or plating is proof that a general intense heat has impaired the temper of the axle. If, however, the axle has been damaged by defective, misaligned or galled bearings, local loss of temper due to excessive heat at the points of damage, may not be apparent. In such cases the nital etch process should be applied to the damaged portions of the bearings, after these have been reworked in accordance with the relevant sections of Chapter 32, Landing Gear.

(2) Inspect for Heat Damage (High Strength Steel)

(a) Equipment and materials

- 1) Nital etch solution - four parts (by volume) of nitric acid (specific gravity 1.42) dissolved in one hundred parts of 95% methyl alcohol
- 2) Hydrochloric acid etch solution - five parts (by volume) of hydrochloric acid (specific gravity 1.16) dissolved in one hundred parts of 95% methyl alcohol
- 3) Neutralizing solution - 7 ounces of alkali cleaner (washing soda) dissolved in 1 gallon of water
- 4) Source of clean, dry compressed air



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(b) Apply Nital Etch Solutions

- 1) Thoroughly clean steel surface to be tested to ensure complete absence of dirt and grease.
- 2) Dry surface with clean dry compressed air.
- 3) Apply nital etch solution to surface being tested, allowing solution to remain in contact with surface for between 1 and 2 minutes.
- 4) Not more than 2 minutes after applying nital etch solution, wash etched area with clean warm water.
- 5) Dry surface with clean dry compressed air
- 6) Apply hydrochloric acid etch solution, allowing solution to remain in contact with surface for between 2 and 3 minutes.
- 7) Not more than 3 minutes after applying hydrochloric acid etch solution, wash etched area with clean warm water.
- 8) Dry surface with clean dry compressed air.
- 9) Rinse surface with neutralizing solution.
- 10) Wash with clean warm water.
- 11) Dry with clean dry compressed air

(c) Examine etched area.

- 1) If the etched area is a uniform shade of grey, no detrimental change to the temper of the steel has occurred.
- 2) Any area that has been overheated will be light in color, and will appear in the center of a darker area.
- 3) If the etched area appears mottled, the condition of the heat treat is doubtful and the axle should either be replaced or subjected to a more thorough and refined metallurgical test.

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MAIN GEAR TRUNNION - MAINTENANCE PRACTICES

1. Removal/Installation Main Gear Trunnion

A General

- (1) The main landing gear must be removed for access to the trunnion.

B. Equipment and Materials

- (1) Downlock Assembly, Main and Nose Landing Gear - F71126-500 and F70008-500 or equivalent
- (2) Downlock, Main Landing Gear Door - F71127 or equivalent
- (3) Collar-to-Trunnion Bolt Puller - SK6-7161-2-75 or equivalent
- (4) Corrosion Preventive Compound, MIL-C-16173, Grade 3
- (5) Expander Tool capable of expanding to 8-1/2 inches and applying 500 to 1000 psi - 2MIT65-1055-17, -18; Cleveland Pneumatic Tool Co. T-56216 or F70186-1 or equivalent
- (6) Compression Shim Set. Refer to Illustrated Parts Catalog
- (7) Dow-Corning RTV 1200 Primer, Dow-Corning Corp., Midland, Michigan or equivalent
- (8) Dow-Corning Q3-0121 Silicone Sealant, Dow-Corning Corp., Midland, Michigan or equivalent
- (9) Pre-Sealing Cleaning Solvent, Type BMS 11-7 or equivalent

C Remove Main Gear Trunnion

- (1) Remove main landing gear. See Remove Main Landing Gear 32-22-0.
- (2) Disconnect flexible pneumatic and hydraulic brake lead in lines attached to clamp on trunnion.
- (3) Remove attaching bolt at upper end of drag strut and remove drag strut.
- (4) Disconnect trunnion aft arm from linkage attached to aft outboard (individual) shock strut door.
- (5) Remove attaching pin securing main gear actuator beam to trunnion arm.

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- (6) Disconnect main gear actuator at the trunnion arm.
- (7) Move actuator and beam inboard out of the way.
- (8) Remove cotter pin and installation nut from bolt through trunnion forward retaining collar (figure 201).
- (9) Apply puller, draw bolt, and remove collar.
- (10) Support trunnion, and remove two bolts that fasten lower half of trunnion aft support bearing.
- (11) Lower trunnion aft end slightly to clear bearing upper half and move trunnion aft to clear forward support bushing.

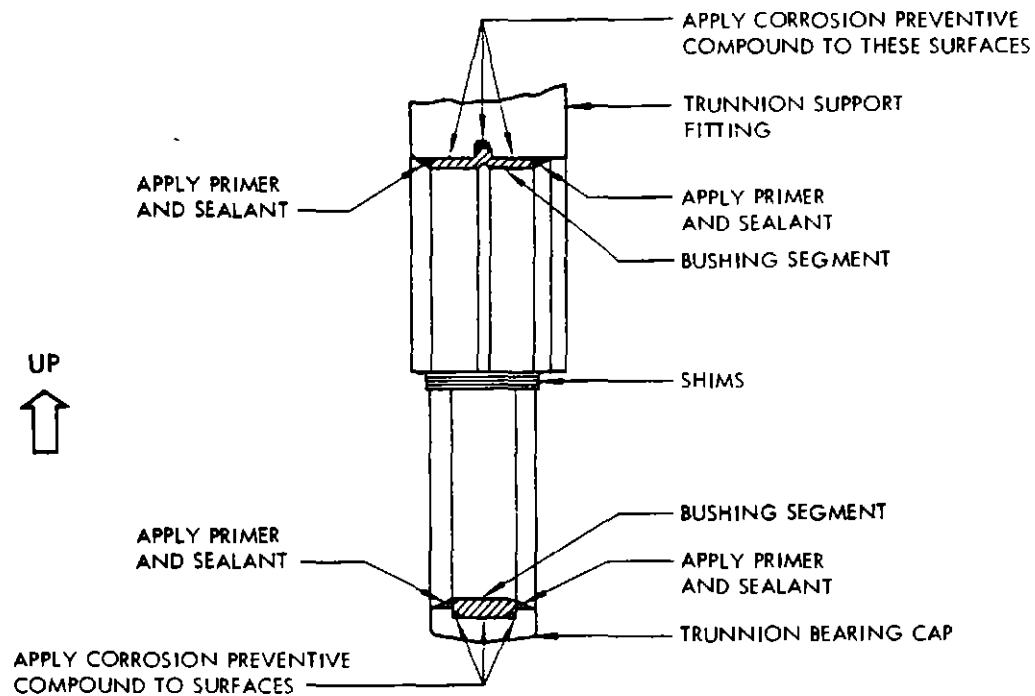
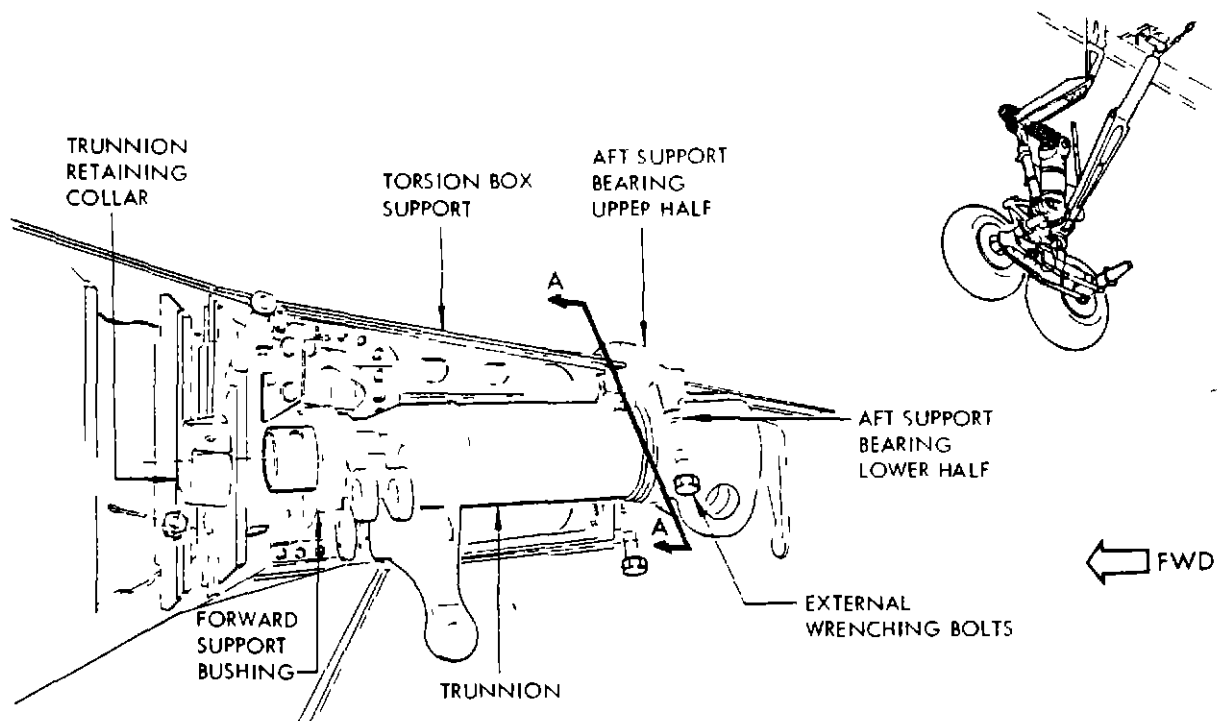
NOTE: For wear and rework limits of main landing gear trunnion aft support fitting, refer to 57-0.

- (12) Check trunnion bearing journals and bushings for wear.
 - (a) Minimum outside diameter of trunnion bearing journal at forward end, 5.827 inches.
 - (b) Maximum inside diameter of trunnion forward support bushing, 5.863 inches.
 - (c) Minimum outside diameter of trunnion bearing journal at aft end, 8.237 inches
 - (d) Maximum inside diameter of bushing in trunnion aft support bearing, 8.290 inches.

D Install Main Gear Trunnion

- (1) Apply a coat of corrosion preventive compound to faying surfaces of aft trunnion bushing segments, trunnion support fitting, and bearing cap. Keep lubrication holes and bearing surfaces free of corrosion preventive compound. (See Section A-A, figure 201.)
- (2) Position bushing segments approximately centered in support fitting and bearing cap.
- (3) Install bearing cap on support fitting. Torque bearing cap bolts 4000 to 5000 pound-inches.

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SECTION A-A
(TRUNNION REMOVED FOR CLARITY)

Main Landing Gear Trunnion Installation

Figure 201

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- (4) Position expander tool centered on bushing segments and expand tool jaws to produce a nearly uniform pressure of 500 to 1000 psi against bushing segments.
- (5) Measure gaps between bushing segments (two places)
- (6) Select two shims from compression shim set so that difference between individual shim thickness does not exceed 0.010 inch and combined thicknesses equal 0.016 inch plus gap measured in step (5) within 0.000 (+0.005/-0.000) inch
- (7) Remove expander tool.
- (8) Remove bearing cap bolts and remove bearing cap.
- (9) With bushing segments in place in support fitting and bearing cap, clean segments, support fitting, and bearing cap with solvent.
- (10) Apply primer to outside edge periphery (two places) of support fitting, bearing cap, and bushing segments. Allow primer to cure for 30 minutes. (See Section A-A.)

NOTE: Primer must be thoroughly cured before applying sealant or proper results may not be obtained.

- (11) Apply sealant to outside edge periphery (two places) of support fitting, bearing cap, and bushing segments. Allow sealant to cure. (See Section A-A.)

NOTE: Cure time of sealant depends on sealant thickness, relative humidity, and temperature. Sealant 1/8 inch thick will cure in approximately 24 hours at 75°F and 50 percent relative humidity. Lower temperatures and humidity will slow rate of cure. Cure may be accelerated by circulating warm humidified air (140°F maximum) over sealant.

- (12) Remove any excess sealant from inside of diameter of bushing segments and cut sealant four places at bushing segment joints for subsequent removal of bearing cap and lower bushing segment.
- (13) Place a serviceable main gear trunnion (figure 201) into position with forward end carefully inserted into forward support bushing.



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TEMPORARY REVISION NR. DFW 32-01

INSERT FACING TO SUBCHAPTER 32-22-1, PAGE 205

REASON FOR CHANGE: Incorporation of ASB 3509 requires an update to RTCA/TCA.

INSTRUCTION: Insert updated page.

NOTE: The insertion of this TR has to be listed in the Record of Temporary Revisions at the beginning of Volume 1.

TCA: LX-N20199

RTCA: LX-N19997, LX-N20000

32-22-1

TR-Nr. 32-01

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- (14) Raise aft end of trunnion into aft support bearing upper half and install aft support bearing lower half. Do not tighten bearing cap bolts.
- (15) Insert shims as selected in step (6) between bushing segments.

CAUTION THERE MUST BE NO SHIM PROTRUSION INSIDE BUSHING INSIDE DIAMETER SURFACE AND SHIMS MUST NOT BE TRAPPED BETWEEN SUPPORT FITTING AND BEARING CAP AFTER INSTALLATION

- (16) Torque bearing cap bolts to 6300 to 7700 pound-inches and remove excess corrosion preventive compound.
- (17) Slip retaining collar on forward end of trunnion and align with bolt holes through trunnion.
- (18) Install nut and cotter pin.
- (19) Connect actuator and actuator beam to the arms on the trunnion.
- (20) Attach hydraulic and pneumatic lead in lines to bracket on trunnion.
- (21) Install landing gear. See Install Landing Gear 32-22-0.



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- (14) Raise aft end of trunnion into aft support bearing upper half and install aft support bearing lower half. Do not tighten bearing cap bolts.
- (15) Insert shims as selected in step (6) between bushing segments.

CAUTION• THERE MUST BE NO SHIM PROTRUSION INSIDE BUSHING INSIDE DIAMETER SURFACE AND SHIMS MUST NOT BE TRAPPED BETWEEN SUPPORT FITTING AND BEARING CAP AFTER INSTALLATION
- (16) Torque bearing cap bolts to 8000 to 10,000 pound-inches and remove excess corrosion preventive compound.
- (17) Slip retaining collar on forward end of trunnion and align with bolt holes through trunnion.
- (18) Install nut and cotter pin.
- (19) Connect actuator and actuator beam to the arms on the trunnion.
- (20) Attach hydraulic and pneumatic lead in lines to bracket on trunnion.
- (21) Install landing gear. See Install Landing Gear 32-22-0.

MAIN GEAR SHOCK STRUT - MAINTENANCE PRACTICES1. Removal/Installation Main Gear Shock Strut

A. General

- (1) The main gear shock strut is removed after damage, defect, excessive wear, or on second replacement of inner cylinder seals. Removal of the main gear shock strut follows the same procedure as main landing gear removal except for loosening the clamps on the hydraulic and electric lines. Disconnecting the electrical and hydraulic lines from support clamps allows gear assembly to roll aftward until the shock strut clears the wing trailing edge. Thus permitting a hoist to lift the shock strut off the truck assembly without disconnecting hydraulic lines.

B. Equipment and Materials

- (1) An air compressor cart or air bottle with capacity of 1800 psi
- (2) Oleo Lock, Main Landing Gear - F70147 or equivalent
- (3) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (4) Downlock Assembly, Nose Landing Gear - F70003-500 or equivalent
- (5) Grease - MIL-G-21164

C. Prepare for Removal

- (1) Check that landing gear external downlocks are installed and that wheel well doors are open with door release handle down and latched.
- (2) Depressurize hydraulic system and shut off electrical power.

D. Remove Main Landing Gear Shock Strut

- (1) Perform landing gear removal. See Remove Main Landing Gear, 32-22-0.
- (2) Loosen hydraulic, pneumatic and electric lines but it is not necessary to disconnect the lines at wheel truck.
- (3) With the landing gear rolled back so that shock strut clears wing trailing edge, install the oleo lock.
- (4) Attach a sling to the shock strut, and hoist strut sufficiently to take the weight of the shock strut assembly off the pivot bolt.

CAUTION: WHEN ATTACHING HOIST TO SHOCK STRUT, EXERCISE CARE TO AVOID DAMAGE TO AIR VALVE.

- (5) Disconnect hydraulic line at leveling cylinder and snubber unit. Plug line and cap connection on unit.
- (6) Disconnect ends of brake equalizer rods (figure 201) from attachments at shock strut inner cylinder.
- (7) Disconnect forward end of leveling cylinder and snubber unit from lug on aft side of shock strut inner cylinder.
- (8) Remove pivot bolt and hoist shock strut from the wheel truck.

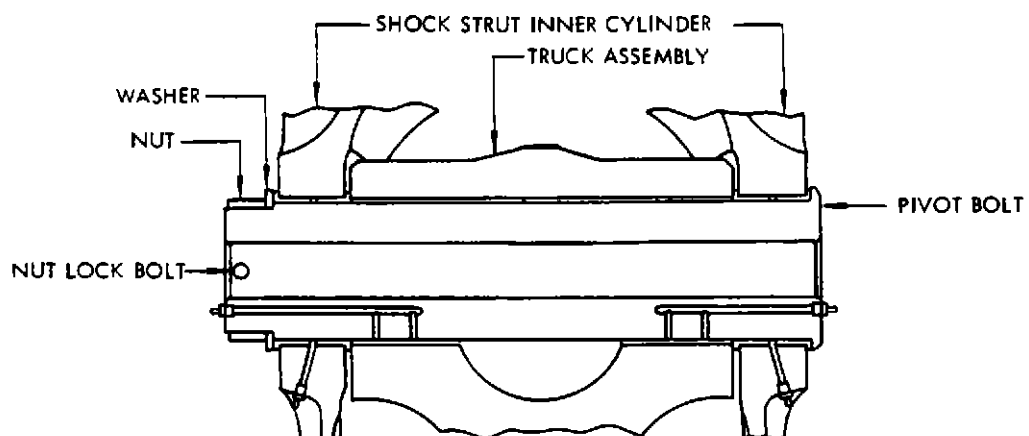
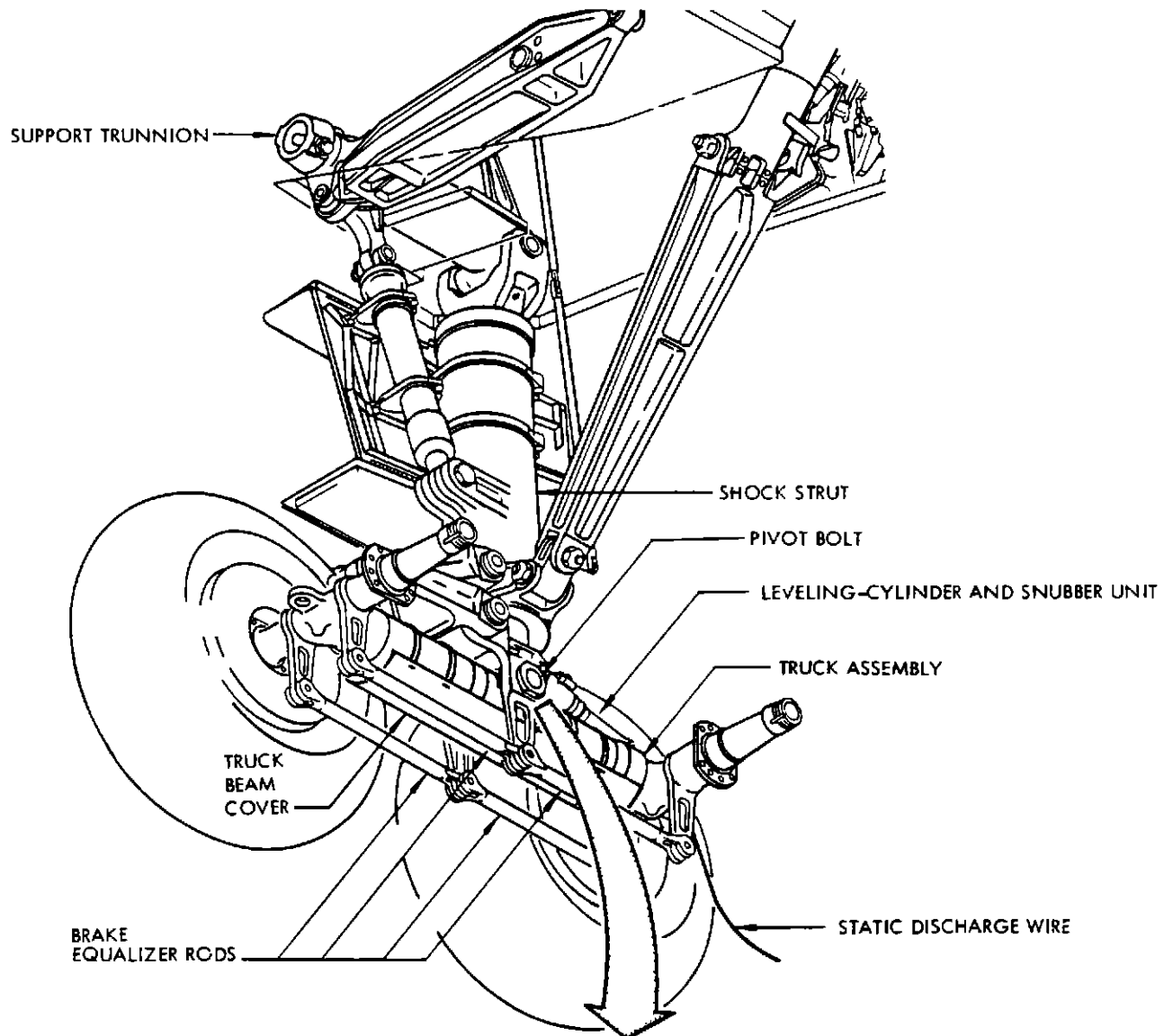
E. Install Main Gear Shock Strut

- (1) Prepare a serviceable or new shock strut (figure 201) for installation.
 - (a) Install torsion links on shock strut.
 - (b) Attach oleo lock to hold shock strut in compressed condition.
- (2) Hoist shock strut and position over the wheel truck so that the pivot bolt can be installed.

NOTE: The torsion links on the shock strut must be forward in relation to the truck assembly.

- (3) Check that the pivot bolt and internal bearing surfaces for bolt are clean and lightly lubricated with grease.
- (4) Insert pivot bolt, and line up holes for lock bolts. (See cross section, figure 201.)
- (5) Install antirotation bolt through the truck assembly and pivot bolt into captive barrel lock nut. Install washer and nut on pivot bolt.
- (6) Tighten nut to solid height with a wrench, back off and retighten by hand to the nearest castellation approaching solid height. Install lock bolt and nut.
- (7) Connect forward end of leveling cylinder and snubber unit to lug on aft side of shock strut inner cylinder.

NOTE: The leveling cylinder and snubber unit must be full of Skydrol 500 hydraulic fluid, completely free from air, and have ports sealed. The unit is then hydraulically locked to support shock strut vertically.



CROSS SECTION VIEW OF PIVOT BOLT INSTALLATION



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TURBOFAN

- (8) Attach brake equalizer rods to shock strut lower terminals.
- (9) Remove hoist and sling from shock strut and remove lock assembly from torsion links.
- (10) Roll landing gear forward to position shock strut under aft end of trunnion with torsion links facing forward.
- (11) Complete landing gear installation per "Install Main Landing Gear," 32-22-0.

2. Inspection/Check Main Gear Shock Strut

A. Check Main Gear Shock Strut

- (1) Check main gear shock strut for oil quantity. See "Combined Air and Fluid Servicing," Chapter 12.

3. Approved Repairs Main Gear Shock Strut

A. General

- (1) Approved repairs to the main gear shock strut are limited to replacement of inner cylinder seals. (See figure 202.) Spare seals carried in the bearing annuli may be used for the first replacement. A second replacement of seals necessitates disassembly of the shock strut. At this time another spare set of seals should be stowed in the bearing annuli.

B. Equipment and Materials

- (1) A hydraulic cart with MIL-H-5606 for servicing shock strut.
- (2) An air compressor or air bottle capable of 1800 psi for servicing the shock strut.

- (3) Petrolatum VV-P-236
- (4) Molybdenum Disulphide, MIL-L-7866
- (5) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (6) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent
- (7) Spanner Wrench - F71283 or equivalent, for oleo retaining nut
- (8) Guide Assembly - O-Ring, Main Landing Gear - F71312 or equivalent

C Prepare for Seal Replacement

- (1) Check that landing gear external downlocks are installed and that wheel well doors are open with the release handle down and latched
- (2) Depressurize the hydraulic system and shut off electrical power
- (3) Deflate shock strut
 - (a) Remove valve cap from charging valve and loosen the outer hexagon nut a maximum of two turns

WARNING DO NOT UNSCREW VALVE BODY VALVE CAN BE BLOWN OUT,
CAUSING INJURY TO PERSONNEL.

- (b) When air ceases to escape from valve, replace valve cap

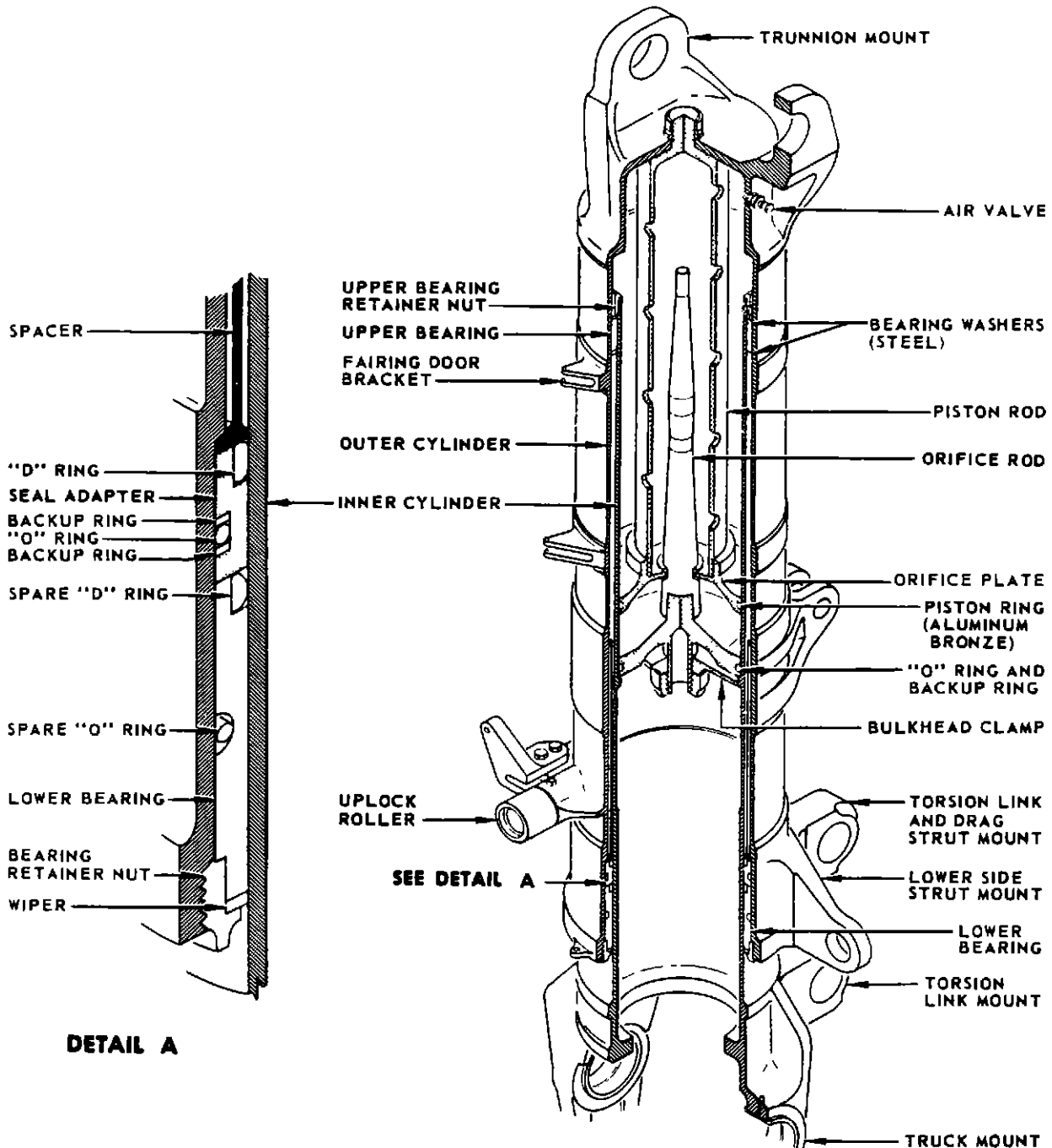
D Replace Active Inner Cylinder Seals with Spare Seals

- (1) Place jacks in position for airplane jacking. See Chapter 7, Jacking.
- (2) Measure distance retainer nut (12, figure 202) protrudes below outer cylinder.
- (3) Remove lockplate and retainer nut. Slip retainer nut down to rest on inner cylinder yoke.
- (4) Slip wiper ring (11) down to retainer nut.

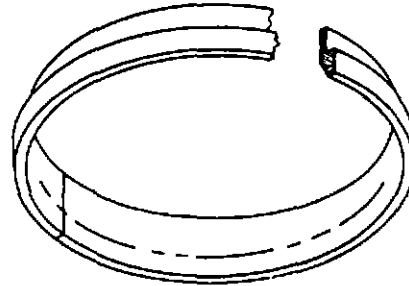
CAUTION IF WIPER RING IS REMOVED, MAKE SURE RING IS REINSTALLED
WITH STEPPED SIDE DOWN

- (5) By jacking airplane, work bearing (10) seal adapter (4) and spacer (2) out of outer cylinder

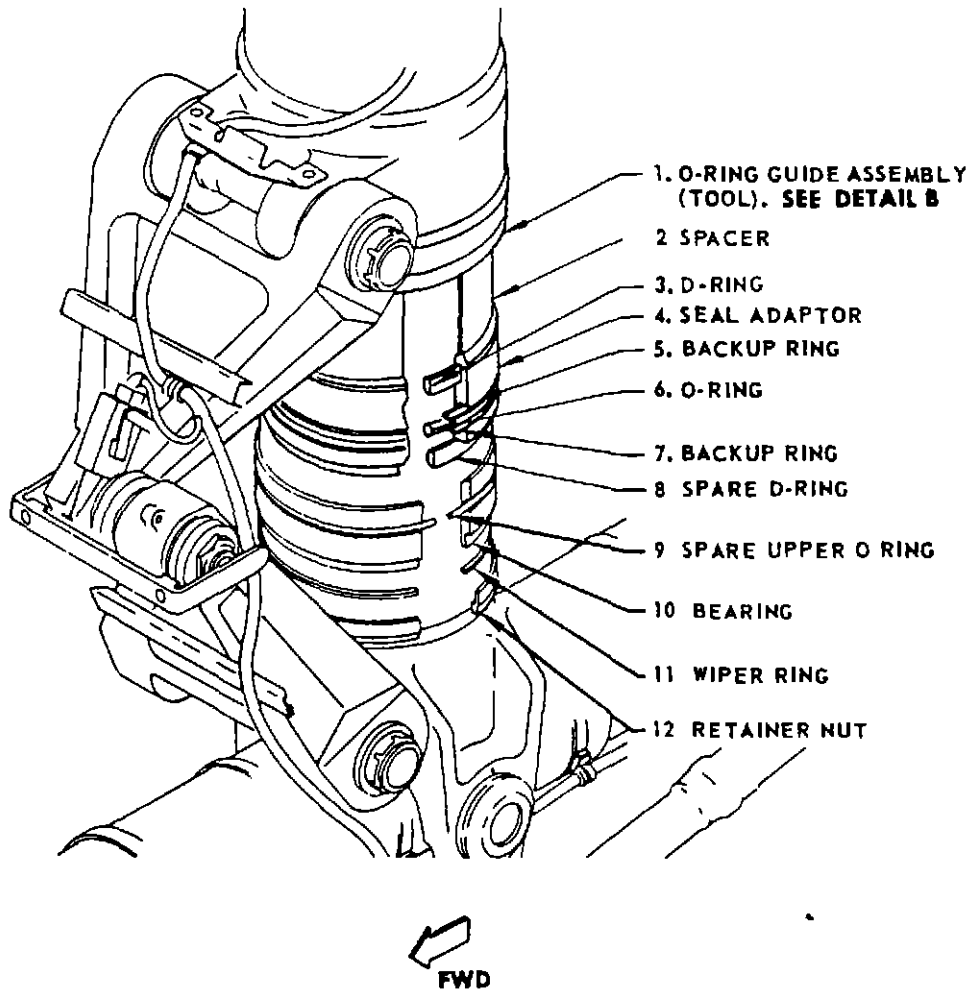
NOTE: If difficulty is experienced in disassembly during step (5), pressurize shock strut to about 100 psi to force out inner cylinder. Be prepared for considerable spillage of hydraulic fluid if this method is used



Main Gear Shock Strut Inner Cylinder Seal Replacement
Figure 202 (Sheet 1 of 2)



DETAIL B





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- (6) Side seal adapter (4) about half way down inner cylinder and squirt solvent into groove for D-ring (3).
- (7) Clean and dry inner cylinder above seal adapter Push seal adapter up until D-ring is on dry surface.
- (8) Taking care not to damage seal adapter, or block D-ring groove, apply leverage with a quick pull to force seal adapter down and leave D-ring exposed.
- (9) Cut and discard D-ring.

CAUTION· DO NOT ATTEMPT TO CUT D-RING WHILE IT IS IN ITS GROOVE IN SEAL ADAPTER, OR USE ANY SHARP INSTRUMENT TO PRY D-RING FROM GROOVE.

- (10) Wipe inner and outer cylinder with MIL-H-5606 before installing new seals.
- (11) Lift spare D-ring (8) from stowage annulus in bearing. Check for serviceability.
- (12) Wet D-ring with hydraulic oil MIL-H-5606, gently work ring over seal adapter and insert in upper groove. Check that there is no twist in D-ring.
- (13) Remove back-up rings (5) and (7). Raise O-ring (6) from groove, cut and remove O-ring.
- (14) Check back-up rings for serviceability. Replace with new rings if damaged in any way. Install back-up rings.
- (15) Wet spare O-ring (9) with MIL-H-5606 and insert in seal adapter (4) between back-up rings.
- (16) Install O-ring guide assembly (1) over inner cylinder and next to lower end of outer cylinder.
- (17) Push spacer (2) and bearing (10) up into outer cylinder.
- (18) Remove O-ring guide assembly.
- (19) Install retainer nut and tighten nut to 170 to 200 pound-feet torque to seat parts in lower cavity. Back off nut 1/6 to 1/3 turn until locking slots align.

CAUTION· DO NOT TIGHTEN RETAINING NUT TO OR BEYOND TORQUE LIMITS TO LINE UP LOCKING SLOTS. EXCESSIVE TORQUE DOES NOT IMPROVE SEALING AND PARTS MAY BE DAMAGED.

CAUTION: GLAND NUT AND OUTER CYLINDER THREADS MAY HAVE BEEN REWORKED (OVERSIZE). IF SO, GLAND NUT AND OUTER CYLINDER SHOULD BE IDENTIFIED ACCORDINGLY AND KEPT AS A SET.



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- (20) Check distance retainer nut protrudes below bottom of outer cylinder. Dimension must equal measurement obtained in step (2) within 0.01 inches.

NOTE. The above dimension may be slightly less, but never greater than original measurement. If dimension after assembly is greater than the original measurement, loosen and retorque retainer nut. If dimension is still too great, disassemble shock strut and check for gaps between mating parts or pinched seals.

- (21) With retainer nut correctly torqued and slots aligned, install lock plate.
- (22) Lower airplane until on ground.
- (23) Service shock strut. (See chapter 12.)
- (24) Remove jacks and label shock strut with tag identifying it as "SPARE SEALS USED."

E. Replace Active Inner Cylinder Seals and Install Spare Seals

- (1) Prepare shock strut for seal replacement. See paragraph C.
- (2) Place jacks in position for airplane jacking, and jacks under wheel truck. See Chapter 7, "Jacking."
- (3) Remove main landing gear wheels. See 32-22-41 "Main Gear Tire and Wheel."
- (4) Remove torsion links. See 32-22-91 "Main Gear Torsion Links."
- (5) Disconnect and plug pneumatic and hydraulic lines below fitting at drag strut, and disconnect electrical wiring.

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- (6) Measure distance retainer nut (12, figure 202) protrudes below outer cylinder
- (7) Remove lock plate and retainer nut. Slip retainer nut down to rest on inner cylinder yoke.
- (8) Slip wiper ring (11) down to retainer nut.

CAUTION: IF WIPER RING IS REMOVED MAKE SURE IT IS REINSTALLED WITH STEPPED SIDE DOWN.

- (9) By jacking shock strut, work bearing (10) seal adapter (4) and spacer (2) out of outer cylinder.

NOTE. If difficulty is experienced in disassembly during step (5), remove jacks below main gear truck and pressurize shock strut to about 100 psi to force out inner cylinder. Be prepared for considerable spillage of hydraulic fluid if this method is used.

- (10) Remove external down lock from the subject gear and release down lock by turning the emergency extension handle three turns counterclockwise. Hold handle in this position.
- (11) Lower the wheel truck on to a suitable transportation dolly and secure to prevent slipping.
- (12) Slowly push the main landing gear inboard until the inner cylinder can be removed. Return emergency extension handle to neutral.

CAUTION HAVE EQUIPMENT READY TO SUPPORT THE WEIGHT OF THE INNER CYLINDER AS IT COMES OUT.

- (13) Empty fluid from inner cylinder into a clean container and store for reuse.
- (14) Support inner cylinder on a suitable stand.
- (15) Slide seal adapter (4) about half way down inner cylinder and squirt solvent into groove for D-ring (3).
- (16) Clean and dry inner cylinder above seal adapter. Push seal adapter up until D-ring is on dry surface.



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- (17) Taking care not to damage seal adapter, or block D-ring groove, apply leverage with a quick pull to force seal adapter down and leave D-ring exposed.
- (18) Proceed to remove D-ring (3), backup and D-rings (5) (6) and (7). Cut D-ring and O-ring to facilitate removal.

CAUTION: DO NOT ATTEMPT TO CUT D-RING WHILE IT IS IN ITS GROOVE IN SEAL ADAPTER, OR USE ANY SHARP INSTRUMENT TO PRY D-RING FROM GROOVE
- (19) Wipe inner cylinder surface with hydraulic fluid.
- (20) Immerse O-rings in hydraulic fluid and apply a light coat of petrolatum. Coat D-rings with molybdenum disulphide powder.
- (21) Work spare O-ring over head of inner cylinder, spacer, and seal adapter. Insert in outer groove of lower bearing.
- (22) Install spare D-ring as in step (21) and insert in the inner groove of lower bearing.
- (23) Insert backup rings in outer groove of seal adapter.
- (24) Install active O-ring and insert between backup rings.
- (25) Install active D-ring and insert in inner groove of seal adapter. Check that there is no twist in D-ring.
- (26) Check shock strut for cleanliness and working surfaces for damage.
- (27) Wipe inner surface of outer cylinder with hydraulic fluid.
- (28) Swing outer cylinder into position to permit insertion of outer cylinder.
- (29) Turn emergency extension handle three turns counterclockwise and return shock strut vertical position. Engage downlock by turning extension handle six turns clockwise. Return emergency extension handle to neutral and install external ground lock.
- (30) Install O-ring guide assembly (1) over inner cylinder and next to lower end of outer cylinder.



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- (31) Push spacer and bearing up into outer cylinder.
- (32) Remove O-ring guide assembly.
- (33) Install retainer nut and tighten nut to 170-200 pound feet to seat parts in lower cavity. Back off nut $1/6$ to $1/3$ turn until locking slots align.

CAUTION: DO NOT TIGHTEN RETAINING NUT TO OR BEYOND TORQUE LIMITS TO LINE UP LOCKING SLOTS. EXCESSIVE TORQUING DOES NOT IMPROVE SEALING AND PARTS MAY BE DAMAGED.

CAUTION: GLAND NUT AND OUTER CYLINDER THREADS MAY HAVE BEEN REWORKED (OVERSIZE). IF SO, GLAND NUT AND OUTER CYLINDER SHOULD BE IDENTIFIED ACCORDINGLY AND KEPT AS A SET.

- (34) Check distance retainer nut protrudes below bottom of outer cylinder. Dimension must equal measurement obtained in step (6) within 0.01 inches.

NOTE: The above dimension may be slightly less, but never greater than the original measurement. If dimension after assembly is greater than the original measurement, loosen and retighten retainer nut. If dimension is still too great, disassemble shock strut (do not remove inner cylinder) and check for gaps between mating parts or pinched seals

- (35) With retainer nut correctly tightened and slots aligned, install lock plate.
- (36) Install torsion links. See 32-22-91 "Main Gear Torsion Links "
- (37) Remove plugs and connect pneumatic and hydraulic lines. Connect electrical wiring.
- (38) Install main gear wheels. See 32-22-41 "Main Gear Tire and Wheel."
- (39) Lower airplane and remove jacks.
- (40) Service shock strut. See Chapter 12
- (41) Remove tag identifying "SPARE SEALS USED."



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MAIN GEAR WHEEL TRUCK - MAINTENANCE PRACTICES

1. Removal/Installation Main Gear wheel Truck

A General

- (1) The main gear wheel truck is removed for replacement of the shock strut when there is excessive wear on the shock strut pivot bearings, if defective or if damaged.

B Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent
- (3) Two heavy duty garage jacks
- (4) A transport dolly
- (5) Grease, MIL-G-21164

C. Prepare for Replacement

- (1) Check that landing gear external downlocks are installed, and that wheel well doors are open with door release handles down and latched.
- (2) Depressurize the hydraulic systems and reservoir.
- (3) Depressurize the brake accumulator and shut off electrical power.

D Remove Main Gear Wheel Truck

- (1) Jack airplane until wheels are clear of ground. See Airplane Jacking, 7-1-1.
- (2) Remove all four tire and wheel assemblies. See Remove Main Gear Tire and Wheel, 32-22-41
- (3) Disconnect and remove the four brake assemblies. See Remove Landing Gear Brake Unit, 32-9-72.

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- (4) Disconnect and plug pneumatic and hydraulic lines below fitting at the drag strut.
- (5) Release hose clamps on torsion link. Tie hose to wheel truck.
- (6) Disconnect electric wiring at ends of wheel truck and at leveling switch.
- (7) Release electrical wiring from clamps on wheel truck, coil and tie to torsion links.
- (8) Remove leveling switch, support bracket and actuation linkage.
- (9) Position a garage jack under each truck jack pad to support wheel truck.
- (10) Remove brake equalizer rods. See Remove Main Gear Brake Equalizer Rods, 32-22-51.
- (11) Disconnect hydraulic line at leveling cylinder and snubber unit. Plug line and cap connection on unit.
- (12) Disconnect aft end of leveling cylinder and snubber unit from lug on aft end of truck.
- (13) Support truck to prevent truck from slipping off jacks. Remove pivot nut lock bolt, pivot bolt nut and washer. (See figure 201.)
- (14) Insert a rod through lock bolt holes in pivot bolt.
- (15) Adjust height at one jack while applying a rotative force to pivot bolt with rod to test when bolt is free.

NOTE It may be necessary to twist truck to one side or the other to free pivot bolt.

- (16) When pivot bolt rotates freely, slide out and remove.
- (17) Lower truck assembly onto transport dolly and move from airplane.
- (18) Remove brake hydraulic tubing and all clamps for installation on replacement wheel truck.

E. Install Main Gear Wheel Truck

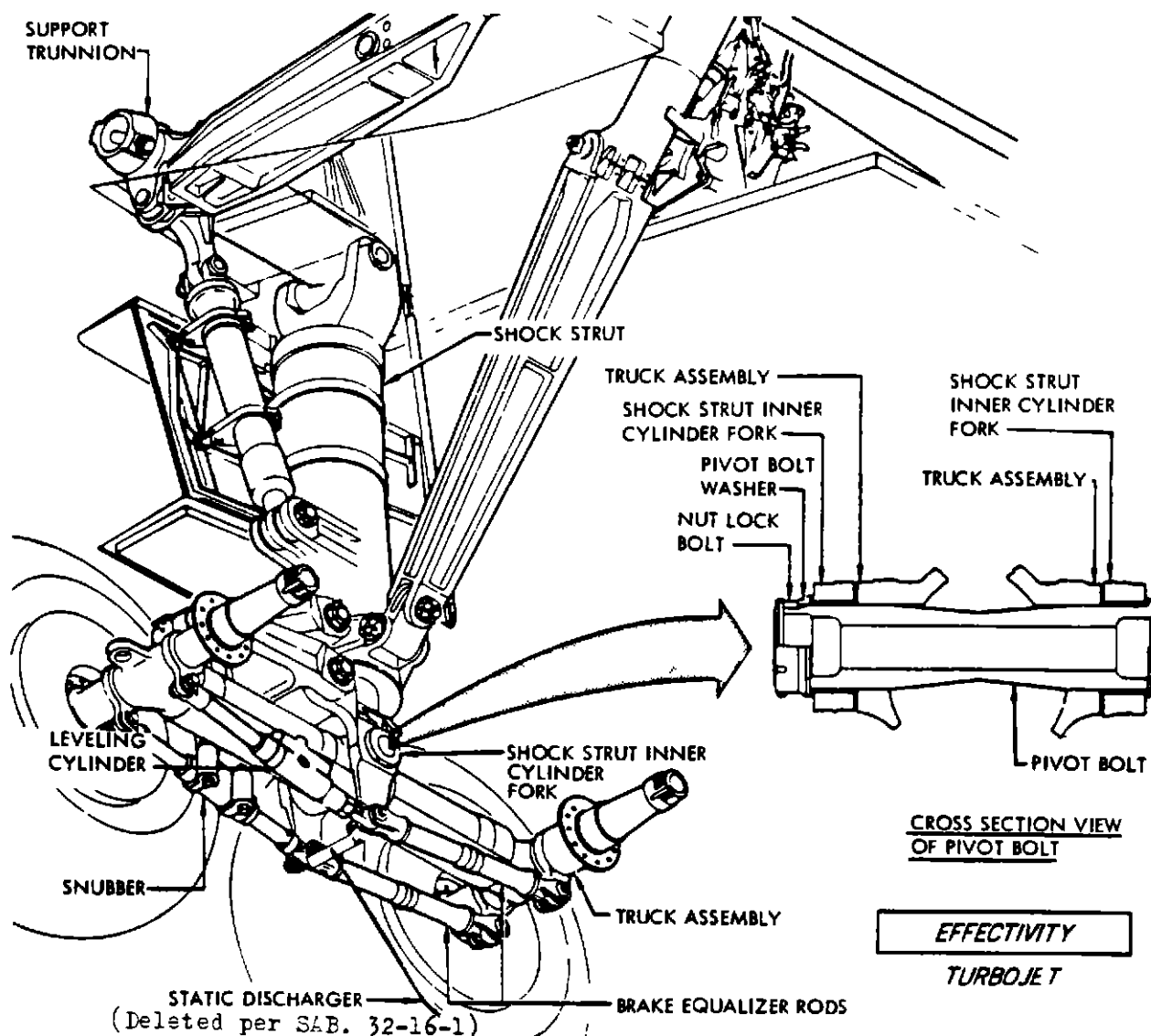


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- (1) Position a serviceable wheel truck (figure 201) assembly under the main gear shock strut with a garage jack under each jack pad.

NOTE On Turbojet airplanes the movable brake support flanges must be to the rear of the shock strut. On Turbofan airplanes the lug on top of truck for snubber unit must be to the rear of shock strut.

- (2) Steady truck on the jacks and adjust jacks to align truck pivot bolt hole with bushings in shock strut.
- (3) Check that pivot bolt and internal bearing surfaces for bolt are clean and lightly lubricated with grease.



REF SAB. 32-16-1

Main Gear Wheel Truck Installation
Figure 201 (Sheet 1)

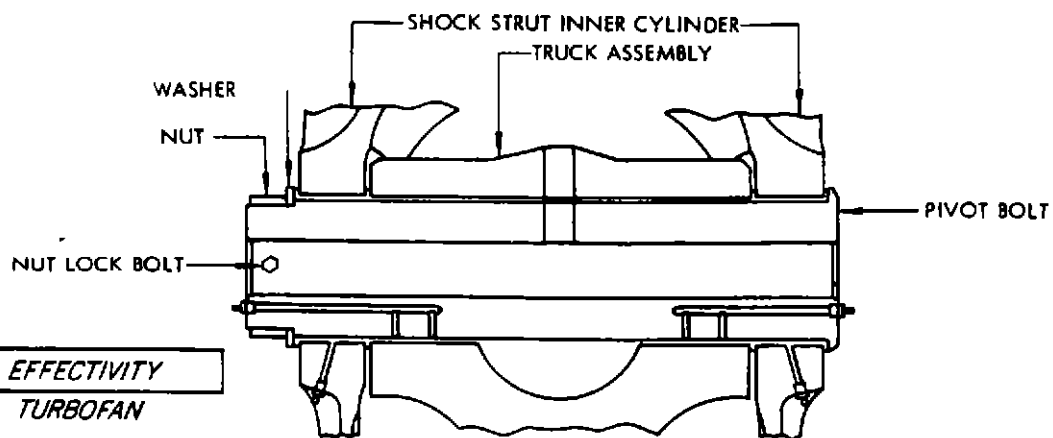
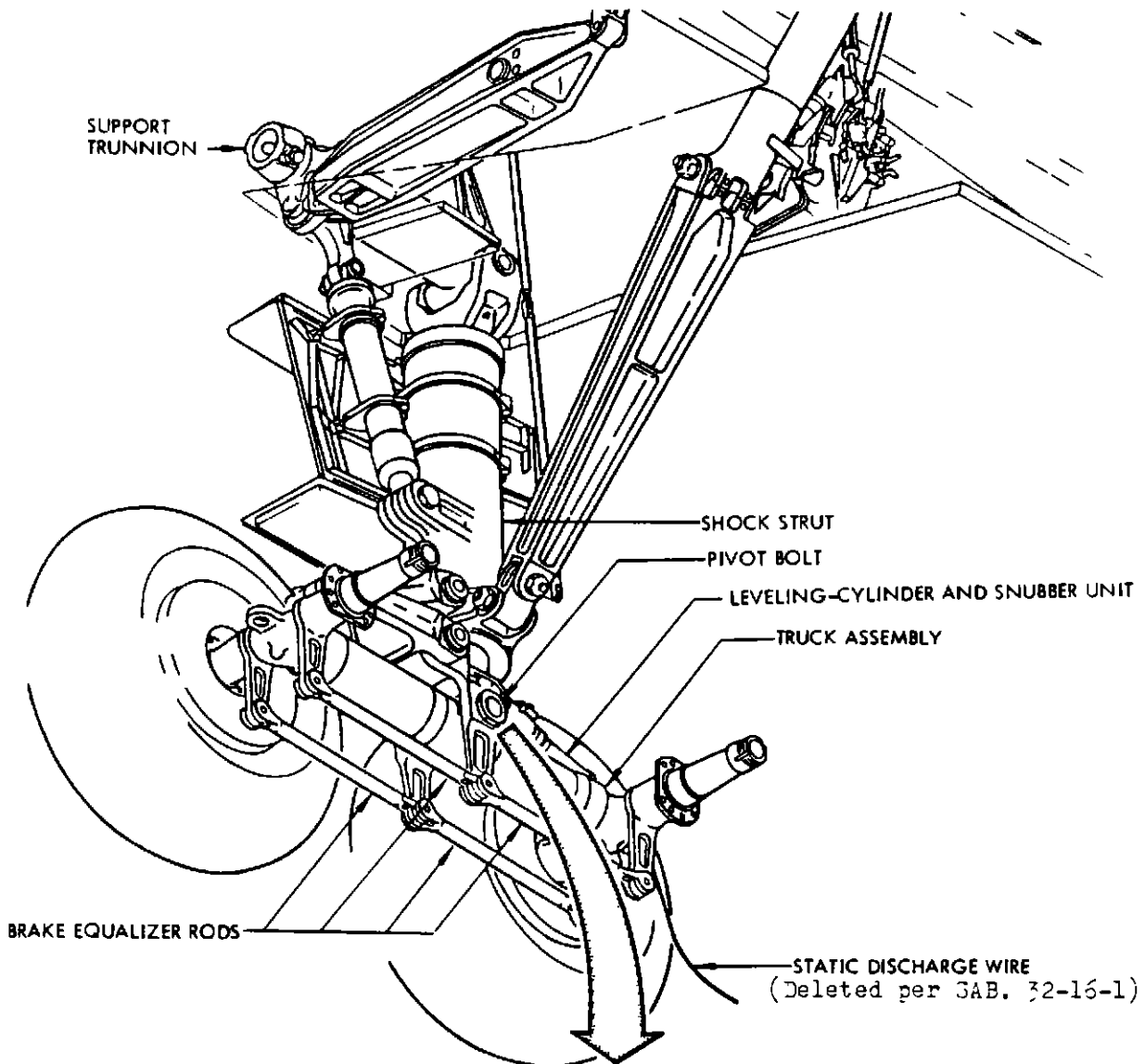
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CROSS SECTION VIEW OF PIVOT BOLT INSTALLATION

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- (4) Insert pivot bolt and line up holes for lockbolts.
- (5) Install lockbolts through truck assembly and pivot bolt, secure with washer and nut. (Deleted for SABENA).
- (6) Add pivot bolt, washer and nut.
- (7) Tighten nut to solid height with a wrench, back off and retighten by hand to nearest castellation approaching solid height. Install pivot nut, lockbolt and nut.
- (8) Install brake equalizer rods. For Turbojet airplanes, see 32-2-51. For Turbofan airplanes, see 32-22-51.
- (9) On Turbojet airplanes:
 - (a) Install and service main gear leveling cylinders. See 32-2-71.
 - (b) Service and install main gear snubber. See 32-2-61.
- (10) On Turbofan airplanes, install the leveling cylinder and snubber unit. See 32-22-61.
- (11) Lower truck and remove jacks.
- (12) Attach brake hydraulic and pneumatic lines to truck assembly.
- (13) Remove plugs and connect brake hydraulic and pneumatic lines at fitting below drag strut.
- (14) Clamp hose in position on torsion links.
- (15) Install truck leveling switch bracket, switch electrical plug, and switch actuation linkage.
- (16) Connect antiskid detector wiring. Clamp wiring to wheel truck.
- (17) Install a brake assembly on each brake support flange. See Install Landing Gear Brake Unit, 32-9-72.
- (18) Install a tire and wheel assembly to each axle. See Install Main Gear Tire and Wheel, 32-22-41.
- (19) Tilt truck and check operation of truck leveling switch.
- (20) Bleed brakes. See Bleeding Hydraulic Brake System, 32-9-0.
- (21) Check operation of skid detectors. See Test Antiskid System, 32-31-0.



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- (22) Check pneumatic brake line connections for leaks.
- (23) Lower airplane and remove jacks.
- (24) Lubricate main gear truck pivot bearings per "Unit Servicing Main Landing Gear," 32-2-0, (Turbojet) or 32-22-0 (Turbofan)

2. Adjustment/Test Main Gear Wheel Truck (See also O.M. 32-2-20 and 32-22-20)

A. Test Main Gear Wheel Truck

- (1) Jack aircraft until wheels are at least 8 inches clear of ground. See "Airplane Jacking," 7-1-1.
- (2) Check that hydraulic power is off and that landing gear external down locks are installed.
- (3) Slowly tilt the aft end of left truck upwards from the level position. Truck shall tilt through 15 degrees without interference or binding from linkage.
- (4) Tilt aft end of truck downward 10 degrees from the level position. There shall be no interference or binding.

NOTE On turbofan airplanes it may be necessary to use a jack to tilt the truck.

- (5) Repeat steps (3) and (4) on right main gear truck

3. Inspection/Check Main Gear Wheel Truck

A. General

- (1) Surface damage to the main gear wheel truck provides points of stress concentration and may result in destructive corrosion. A visual examination of the truck beam cover, or the entire wheel truck on airplanes without a beam cover, should be made after each truck jacking operation, after any snubber failure, and after the truck has contacted an obstacle.

B. Examine Main Gear Wheel Truck

- (1) If damage to the truck beam cover indicates that the truck has been damaged, or on airplanes without a truck beam cover, proceed as follows. Clean the truck beam, remove the straps around the beam and check for scratches, gouges, corrosion, dents and deformation, particularly on the underside and the area in and around the jacking points. Check for dents in the forward area of the beam below the torsion links. After a snubber failure examine also the aft area of the beam for damage below the shock strut inner cylinder. If brackets attached to the truck beam are damaged, check beam when brackets are removed. Ascertain that Skydrol resistant tape is installed under all straps removed for this examination.

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- (2) Check the wheel truck for cracks or distortion at the shock strut attachment, the axle attachment points, and at the lugs for leveling cylinder, snubber and brake equalizer rods. Check pivot bolt and pivot bolt holes in truck beam for fretting and galling. If fretting or galling has damaged more than 45 per cent of pivot bearing area, the truck beam must be repaired. For more information on repair see Chapter 32, Overhaul Manual.
- (3) With wheels off, check axles for scoring and galling.
- (4) When brakes are off, check brake mounting flanges for cracks radiating from the bolt holes

4. Cleaning/Painting Main Gear Wheel Truck

A. General

- (1) The work area must be free of dust and severe temperature changes, and well ventilated to avoid the toxic effects of solvents and resins used in painting materials. Equipment which has been used to apply other finishing materials must be thoroughly cleaned with the enamel thinner, and dried before use. Mixed primer and mixed enamel must be scrapped if not used within 8 hours of mixing. All primer, enamel and components must be stored indoors at a temperature between 50° and 80°F.

B. Equipment and Materials

- (1) Primer Base Component - *BMS10-11F Type 1
- (2) Enamel Base Component - *BMS10-11F Type 2
- (3) Enamel Thinner - *BMS10-11F Type 2
- (4) Enamel Catalyst - *BMS10-11F Type 1
- (5) Primer Converter - *BMS10-11F Type 1
- (6) Methyl iso-butyl ketone
- (7) Fine grain sandpaper
- (8) Clean lint-free cloth
- (9) Paint spray equipment or suitable brushes

*May be obtained from The Finch Paint and Chemical Co
1536 West 228 Street, Torrance, California.



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C. Paint Main Gear Wheel Truck

- (1) Remove all loosened paint.
- (2) Sand bare metal and adjacent painted areas.
- (3) Reactivate the area to be painted by swabbing with a clean cloth saturated with methyl iso-butyl ketone.

NOTE: This step is important to obtain good paint/adhesion.

- (4) Apply one coat of mixed primer (preferably by spray) over the prepared area, and overlapping onto the adjacent painted area, to give a dry primer coating from 0.0003 to 0.0005 inches thick.
- (5) Allow the applied primer to cure one-half hour minimum at a temperature of at least 75°F before applying enamel.
- (6) Apply the mixed enamel (preferably by spray) over the primed area to give a dry enamel film of 0.0012 to 0.0018 inches thick.
- (7) Cure enamel by one of the following methods:
 - (a) Allow the enamel film to cure for 8 hours at a temperature of at least 75°F before handling wheel truck, and for a minimum of 48 hours at the same temperature before returning airplane to service.
 - (b) Allow enamel film to cure for a minimum of one-half hour at room temperature followed by baking at 150° to 200°F for a minimum of two hours or until the enamel becomes hard to the touch.

5. Main Gear Truck Beam - Approved Repairs

A. Dent Damage

- (1) Dents or contour deformation anywhere on the outer surface of the truck beam may be left without rework if the depth of damage does not exceed 0.005 inches, and no scratches are present.
- (2) If dents or deformation within the above limits have surface scratches not exceeding limits specified on figure 202, the scratches may be cleaned out to a mirror finish with a minimum of 2 inch radius.
- (3) Inspect the reworked area for cracks by the particle inspection method.
- (4) If damage exceeds the above limits, or cracks are found, the truck beam must be replaced.



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D. Scratch, Gouge, or Surface Corrosion Damage

- (1) Scratches, gouges or surface corrosion may be repaired if the damage is within the limits shown on figure 202.

C. Equipment and Materials

- (1) Hand files
- (2) Emery cloth

D. Repair Main Gear Wheel Truck Beam

- (1) Hand file scratches or gouges in damaged area, using care not to remove more than 0.03 inch depth of material.

CAUTION DO NOT GRIND. POWER TOOLS ARE LIKELY TO REMOVE TOO MUCH MATERIAL

- (2) Dress out file marks with emery cloth.
- (3) Check reworked area for cracks by magnetic inspection.
- (4) Paint reworked area. See Cleaning/Painting Main Gear Wheel Truck.

6. Main Gear Axles - Approved Repairs

A. Damage Between Bearing Surfaces

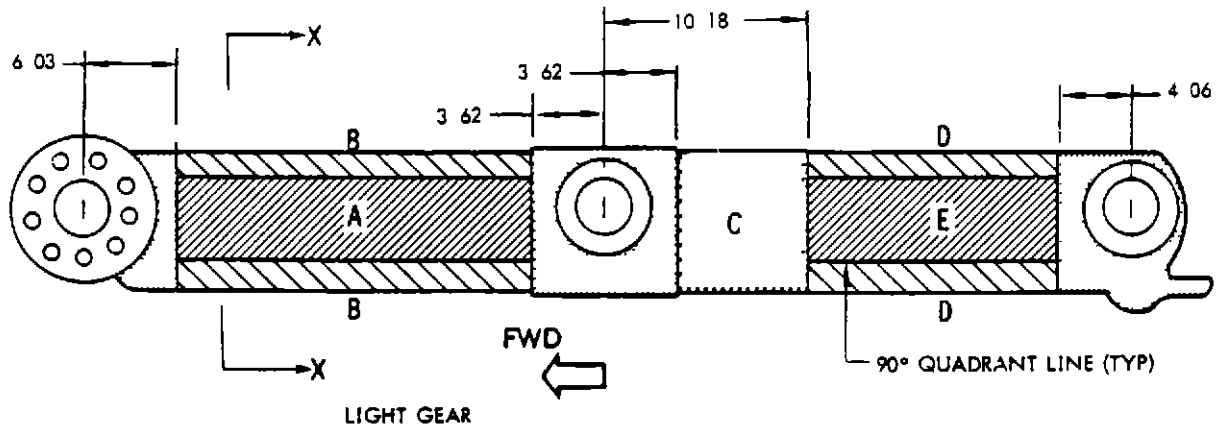
- (1) Main gear axles damaged between the bearing surfaces may be repaired if the rework does not reduce the axle wall thickness by more than 0.020 inch or cover an arc more than 30 degrees on any cross section of the axle. The reworked area must be given an anticorrosive treatment such as Skydrol resistant paint. Axles may be returned to service after rework.

NOTE Only one rework should be permitted per axle. Identify reworked axle area.

B. Damage to Bearing Surfaces

NOTE The depth of damage listed below refers to the parent metal. If damaged areas have original chrome plate, add 0.001 inch to the maximum depth given to allow for plating thickness.

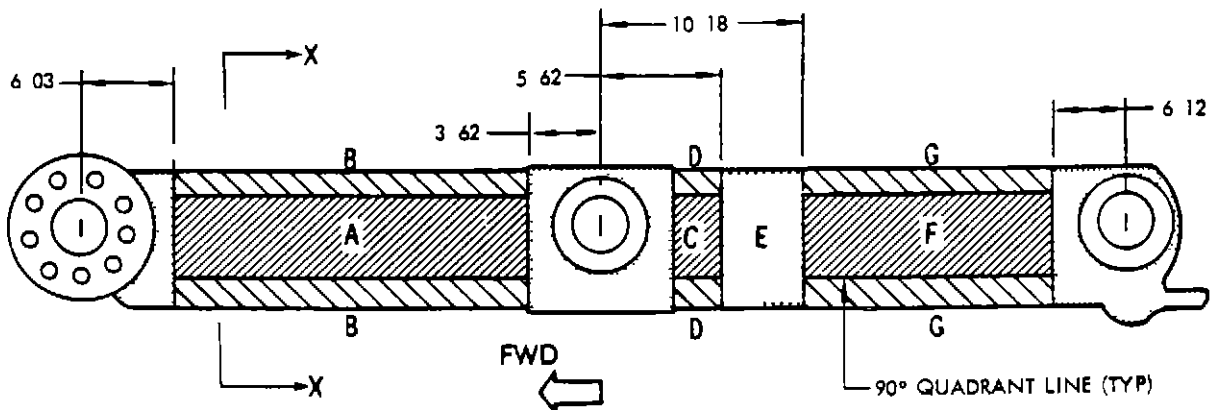
- (1) Local damage to the axle bearing surface covering an arc not greater than 30 degrees may be repaired if the rework does not exceed 20 per cent of the projected area (diameter x width) of the bearing surface, or exceed a depth of 0.020 inch. The reworked area must be treated with anticorrosive compound. Axles may be returned to service after rework.



AREA	MIN OD	MAX ID	MIN ALLOWABLE WALL THICKNESS ²		¹
			FWD END	AFT END	
A	8 000	7 420	290	345	000
B	8 000	7 420	270	345	020
C	8 150	7 420	345	345	020
D	8 030	7 420	309	285	000
E	8 030	7 420	309	305	020

¹ MAX ALLOWABLE OD REWORK DEPTH WITHOUT MEASUREMENT OF WALL THICKNESS PROVIDED THAT ID HAS NOT BEEN REWORKED

² IF MIN ALLOWABLE WALL THICKNESS VARIES FROM FWD END TO AFT END OF DESIGNATED AREA, USE STRAIGHT LINE INTERPOLATION TO DETERMINE VALUES BETWEEN EXTREMES



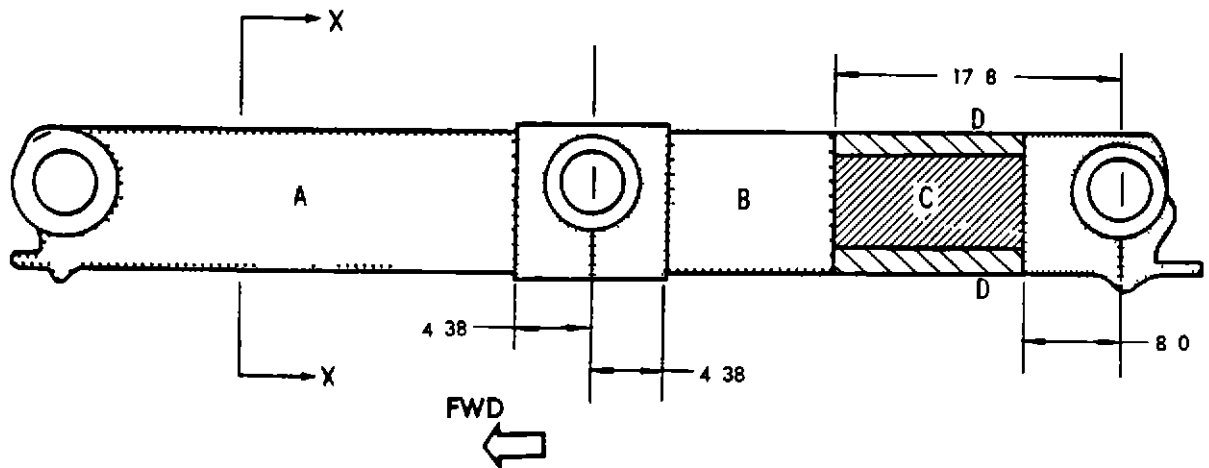
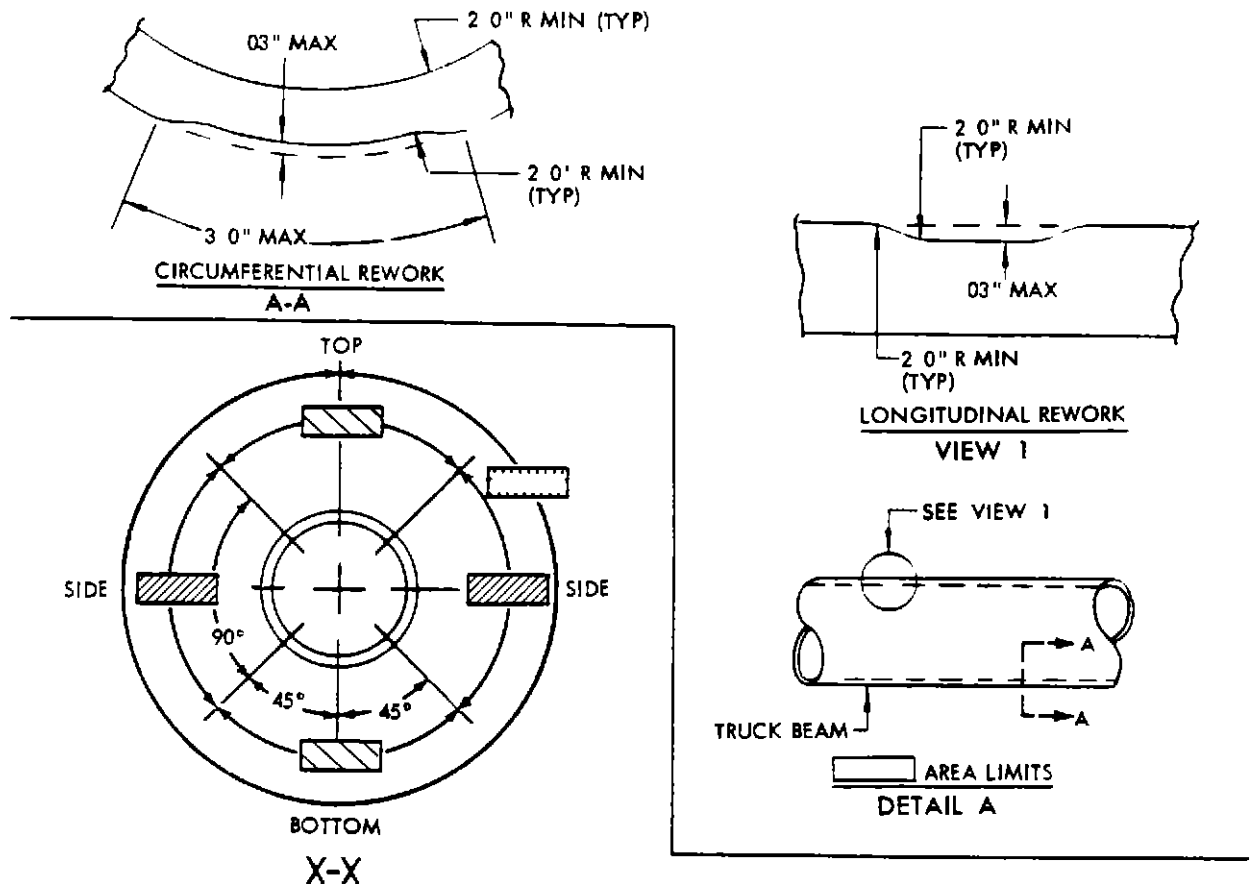
AREA	MIN OD	MAX ID	MIN ALLOWABLE WALL THICKNESS ²		¹
			FWD END	AFT END	
A	8 060	7 420	305	324	015
B	8 060	7 420	300	339	020
C	8 120	7 420	350	350	000
D	8 120	7 420	335	335	015
E	8 190	7 420	355	355	030
F	8 080	7 420	325	325	005
G	8 080	7 420	319	310	020

NOTE

WHERE WALL THICKNESS IS NOT SPECIFIED, REWORK OD TO DEPTH OF 0 030 IN ACCORDANCE WITH DETAIL A ALL DIMENSIONS ARE IN INCHES

Main Landing Gear Truck Beam Rework Limitations
Figure 202 (Sheet 1)

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AREA	MIN OD	MAX ID	MIN ALLOW WALL T	
A	8.140	7.380	360	020
B	8.190	7.380	385	020
C	8.097	7.380	350	008
D	8.097	7.380	335	024



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- (2) Damage exceeding 30 degrees are in the bearing areas before rework, falls into three categories: minor, secondary and major. In each category the axle should show no evidence of untempered martensite after testing with nital etch. See Chapter 13, "Heat Damage Inspection." After checking for category, the damage must be hand reworked to remove sharp edges and burrs from scratches and scores. The reworked area must be treated with anticorrosive compound. Categories and disposition of damaged axles is as follows:
- (a) Minor damage consists of scoring and galling not exceeding 10 per cent of the total bearing area under the inboard or outboard bearing race of front or rear axles. Depth of damage must not exceed 0.002 inches on inboard bearing surface of front axle, 0.005 inches on inboard bearing surface of rear axle, or 0.010 inches on outboard bearing surface of either front or rear axles. After cleaning up axle bearing surfaces, and applying corrosion protection, airplanes with minor axle damage may be returned to service until axle can be changed, either at next major overhaul or some convenient earlier time
 - (b) Secondary damage consists of scoring and galling not exceeding 20 per cent of the total bearing area under the inboard or outboard bearing race of front or rear axles. Depth of damage must not exceed 0.004 inches on inboard bearing surface of front axle, 0.009 inches on inboard bearing surface of rear axle, or 0.015 inches on outboard bearing surface of either front or rear axles. After cleaning up axle bearing surface and applying corrosion protection, airplane with secondary axle damage may be returned to service for not more than 65 hours flight time. Axle must be replaced within the given period.
 - (c) Major damage consists of scoring and galling not exceeding 30 per cent of the total bearing area under inboard or outboard bearing race of front or rear axles. Depth of damage must not exceed 0.020 inches on inboard bearing surfaces of either front or rear axles, 0.055 inches on outboard bearing surfaces of front axle, or 0.036 inches on outboard bearing surface of rear axle. After cleaning up axle bearing surfaces, airplanes with major axle damage may be flown to a base with facilities for immediate axle change.



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- (3) All axle damage exceeding the above limits necessitates an axle change before the next flight
- (4) Axles removed after damage to bearing areas may be reworked for future use according to directions in Overhaul Manual

C. Equipment and Materials

- (1) Hand files
- (2) Emery Cloth
- (3) Corrosion Preventive, MIL-C-16173, Grade 3

D. Repair Main Gear Axles

- (1) Hand file local gouges to one inch blend radius, and polish galling in the damaged area.
- (2) Hand file damage exceeding 30 degrees arc on bearing surfaces to a blend radius not less than 1.00 inch, and polish galling.
- (3) Dress out file marks with emery cloth.
- (4) Check reworked area for cracks by magnetic inspection.
- (5) Apply corrosion preventative over reworked areas.

7. Brake Flanges - Approved Repairs (Turbojet)

A. Crack Damage

- (1) Forward brake flanges with cracks radiating from the bolt holes may continue in service if the holes are plugged to render them inoperative, subject to the following conditions
 - (a) A maximum of two holes may be plugged in one flange, providing the two holes are not adjacent.
 - (b) Cracks radiating from the bolt hole to the outside diameter of the flange need not be stop-drilled.
 - (c) Flanges with more than one crack radiating toward the inboard diameter of the flange must be replaced.
 - (d) Any single crack radiating from the bolt hole toward the inside diameter of the flange must be stop-drilled. Stop-drilling must not damage the truck socket wall
- (2) Holes may be plugged with plastic filler or with a monel rivet flush on both sides of the flange.
- (3) If the aft brake flange is cracked, the brake collar must be replaced.



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B Equipment and Materials

- (1) Resin - Epocast 31-D*
- (2) Hardener - 9216*
- (3) Temperature sensing device - Simpson 388 Servo-meter or equivalent
- (4) Portable Heater

* May be obtained from Surane Plastics, Inc 4516 Brazil St , Los Angeles 39, California.

C Repair Brake Flanges

- (1) Stop-drill any crack radiating from a bolt hole towards the inside diameter of the flange, with an 0.25 inches diameter hole, provided the crack has not reached the truck socket wall

CAUTION NO DAMAGE TO TRUCK SOCKET WALL IS ALLOWABLE.

- (2) Make all cracked bolt holes permanently inoperative by removing bolt and plugging hole with monel rivet, or with plastic filler as follows
 - (a) Mix resin and hardener in proportions specified on label.
 - (b) Cure mixture at 75°F-85°F for 24 hours.
 - (c) Plug hole
 - (d) Attach thermocouple unit of temperature sensing device to flange near plugged hole Use plastic tape.
 - (e) Connect portable heater and temperature reading device as required
 - (f) Set control to limit temperature, as sensed by the thermocouple, to 200°F
 - (g) Turn on power and bake the plastic plug for two hours
- (3) Check reworked area of brake flange for remaining cracks, by liquid penetrant or magnetic inspection.

8 Brake Flanges - Approved Repairs (Turbofan)

- A Replace brake collars when brake flanges are cracked



MAINTENANCE MANUAL

MAIN GEAR DRAG STRUT - MAINTENANCE PRACTICES

1 Removal/Installation Main Gear Drag Strut

A. General

- (1) The main gear drag strut must be removed when the trunnion is taken out. Otherwise the drag strut is removed only if damaged, defective or during major overhauls

B Equipment and Materials

- (1) Downlock Assembly, Main and Nose Landing Gear - F71126-500 and F70008-500 or equivalent
- (2) Grease, MIL-G-21164

C. Remove Main Gear Drag Strut

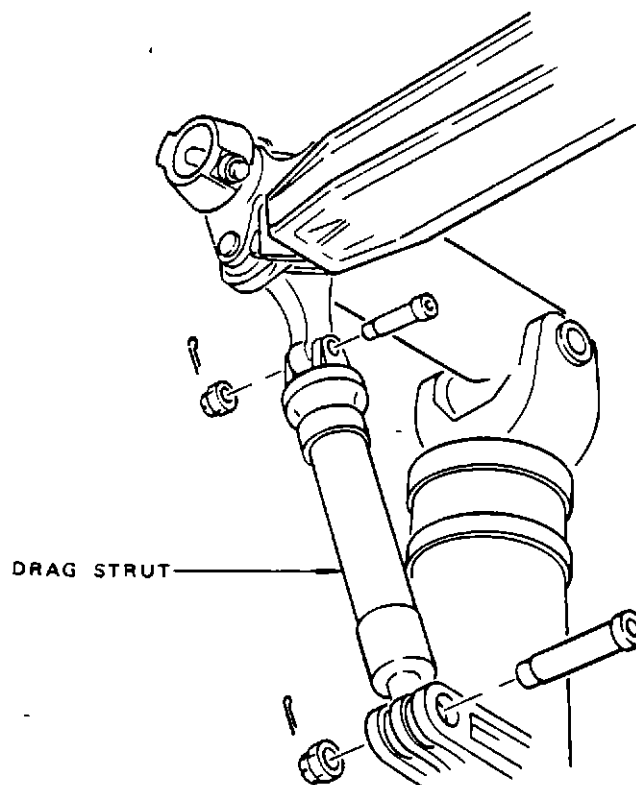
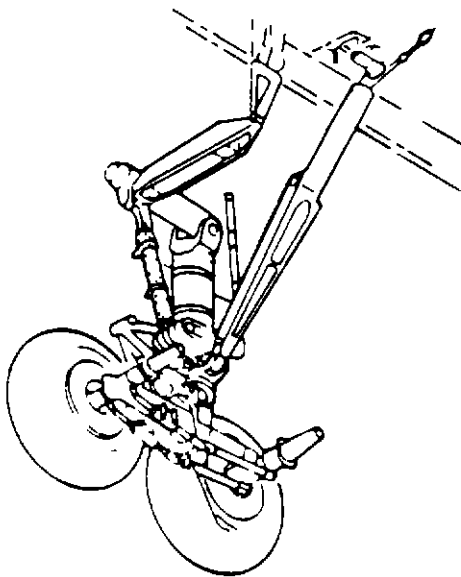
- (1) Check that landing gear external downlocks are installed, and that wheel well doors are open with release handle down and latched.
- (2) Jack airplane until wheels just clear the ground. See Airplane Jacking, Chapter 7.
- (3) Release clamps to free tubing attached to the drag strut.
- (4) Disconnect shock strut doors from the drag strut.
- (5) Remove drag strut upper attachment bolt (figure 201) and swing the drag strut down clear of hydraulic and pneumatic brake lines.
- (6) Support drag strut and disconnect lower attachment. Remove drag strut from the landing gear.

D Install Main Gear Drag Strut

- (1) Place eye end of drag strut between lugs on the forward side of the shock strut. Insert bolt, cleaned and lightly lubricated with grease. Add nut.
- (2) Move drag strut upward and line fork end up with arm on trunnion. Insert bolt as in step (1). Add nut.
- (3) Tighten nuts on upper and lower attachment bolts to 300 pound-inches, then loosen nut and retighten finger-tight. Tighten to next castellation and install cotter pins

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- (4) Connect shock strut door straps to drag strut. Torque strap bolts 185 to 200 pound-inches.
- (5) Attach brake lines to drag strut.
- (6) Lower airplane and remove jacks.



Main Gear Drag Strut Installation
Figure 201



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- 6) If tire leakage exceeds 20 percent of specified pressure at any time, tire must be replaced before next flight. Drop in tire pressure may be due to one or more of the following reasons:

- a) Decrease in ambient temperature after filling tire
- b) Dry or faulty O-ring seal between wheel halves
- c) Leaks through defective thermal plug seals

NOTE Seals may be lubricated with Dow-Corning No. 4 lubricant

- d) Leaks at the tirebead seat.
- e) Leaks through vent holes in tire sidewall

- (3) Check for tire wear (Ref. 32-45-00)

- (4) Check wheels. (Ref. 32-45-00)

- (5) Check security of tie bolt nuts with tire deflated. (Refer to applicable Overhaul Manual for required torque)

- (6) Examine for seepage of grease around bearings

C Special Checks on Main Gear Tire and Wheel

- (1) Examine main gear wheel when removed.
 - (a) Check wheels for corrosion, cracks, and flaked paint.
 - (b) Check bearings and bearing surfaces for distortion and flat spots. Check that bearings have sufficient lubrication.
 - (c) Check grease seals for hardness and dryness.

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- (d) Check lockring and seal retainer for cracks, distortion, or surface damage
 - (e) Check for bent or distorted wheel rims
 - (f) Check balance weights for security
 - (g) Check brake keyway inserts for battering and wear.
 - (h) Check thermal pressure relief plugs in wheel Torque should be 3-1/2 to 4 pound-inches
- (2) Examine main gear wheel when disassembled
- (a) Check inner bead rim area and air seal groove for scratches or burrs
 - (b) Check air seal for cuts, chafed spots or permanent set
 - (c) Examine inner surface of wheel halves for cracks
 - 1) After tire is removed from wheel, separate wheel halves by unfastening tie bolts.
 - 2) Remove paint from inside surface of wheel halves
 - 3) Perform dye penetrant inspection of entire inside of wheel halves where the tie bolt boss radius joins the web
 - 4) If wheel is not cracked, clean and refinish with zinc chromate or equivalent Assemble tire and wheel and reinstall
 - 5) If cracks are found, replace with a serviceable wheel See vendor for disposition of cracked wheels

3. Cleaning/Painting Main Gear Tire and Wheel

A. Cleaning Main Gear Tire and Wheel

- (1) When washing down the aircraft, use wheel covers to prevent solution entering the wheel bearings or the brake assembly
- (2) Wipe wheels dry after washing to preclude possible corrosion Use an air supply to blow out any water or solution that may have collected between wheel halves in the spoke area

B. Painting Main Gear Wheel

- (1) Coat the main gear wheel with chemical and solvent resistant paint See Chapter 51, Interior and Exterior Finishes See Overhaul Manual for painting procedure



MAINTENANCE MANUAL

MAIN GEAR TIRE AND WHEEL - MAINTENANCE PRACTICES

1 Removal/Installation - Main Gear Tire and Wheel

A. General

- (1) The main gear tire and wheel assembly is removed when changing a tire, a brake unit, or a wheel truck. Wheel removal is also necessary for inspection and lubrication

B Equipment and Materials

- (1) Wheel Change Dolly - F71200 or equivalent
- (2) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (3) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent
- (4) Axle jacks
- (5) Inclined blocks Refer to Airplane Jacking, Chapter 7
- (6) Spanner wrench for axle nut
- (7) Air Drill Motor - 50 to 1500 rpm range equipped with Jiffy Air Regulator, J109R or equivalent for rpm regulation
- (8) Grease - MIL-G-25760 (preferred), MIL-G-3545 (alternate)

CAUTION DO NOT MIX TWO TYPES OF GREASE IN THE SAME BEARING.

C Prepare for Replacement

- (1) Check that landing gear ground downlocks are installed
- (2) Raise airplane by any of the following methods for removing a wheel assembly
 - (a) Raise one end of main gear truck using an appropriate axle jack Refer to Airplane Jacking, Chapter 7

NOTE Airplane can be towed onto an appropriate inclined block to give required clearance for axle jack.

- (b) Tow airplane onto an inclined block of sufficient height to raise adjacent wheel to permit wheel removal For dimensions of inclined block, see Chapter 7.

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D Remove Main Gear Tire and Wheel

- (1) Place wheel change dolly (figure 201) in position and support wheel assembly to be removed. Deflate tire.
- (2) Remove attaching bolts and washers from dust cover (figure 202). Remove cover.
- (3) Remove skid detector nuts, cotter pins, and screws. Pull skid detector out of axle.
- (4) Disconnect electrical plug from skid detector and remove detector.
- (5) Remove lockbolts and wheel axle nut.
- (6) Remove retaining washer and pull dolly with wheel assembly away from axle.

NOTE: Remove outer bearing as bearing is loosened from axle so that bearing does not drop out.

- (7) Remove retaining snapring from inboard side of wheel.
- (8) Remove felt retainer assembly from wheel.
- (9) Remove inner bearing from wheel.
- (10) Cover openings in wheel to keep foreign particles from entering bearing areas.
- (11) Clean axle and bearings of old grease.

E Install Main Gear Tire and Wheel

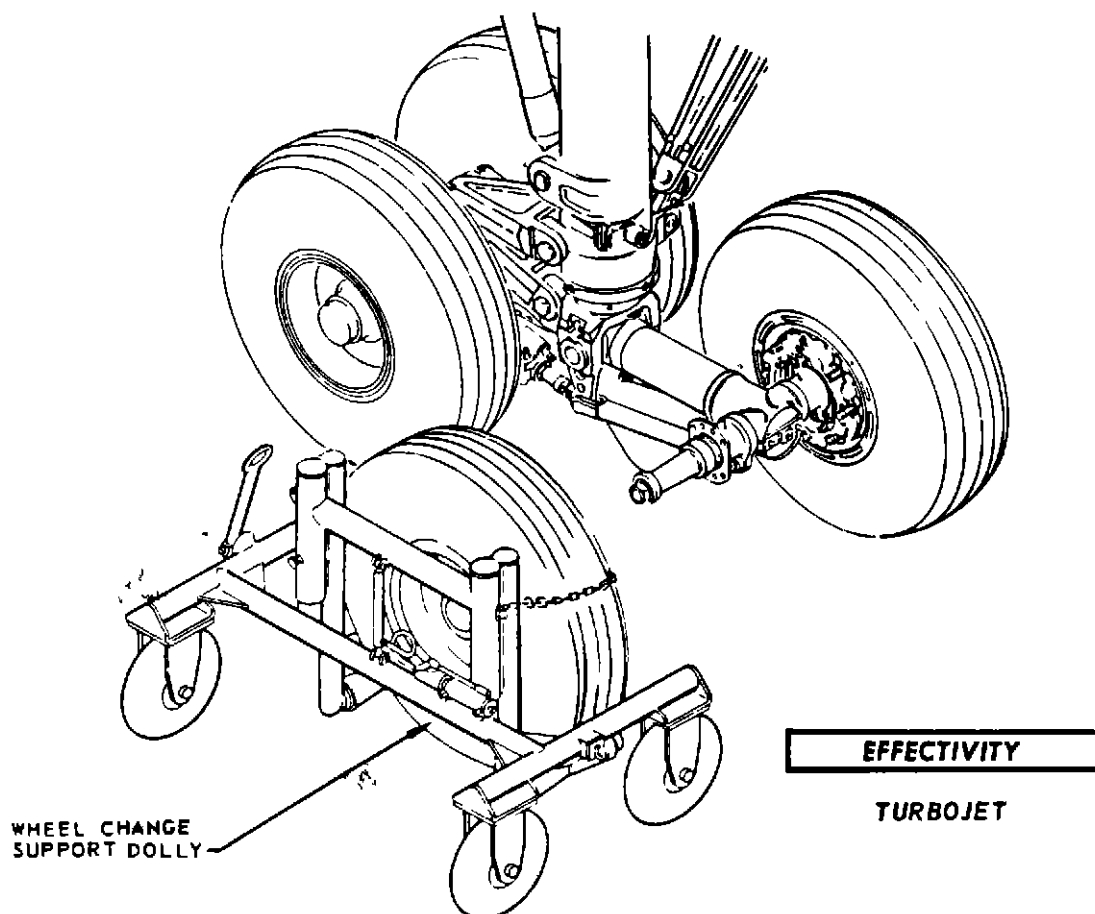
- (1) Pickup a wheel and tire assembly in wheel change dolly (figure 201).
- (2) Pack an inner bearing (figure 202) with grease.
- (3) Apply grease to housing for wheel inner bearing. Insert inner bearing in inboard side of wheel.

CAUTION: TO AVOID LEAKAGE OF EXCESS GREASE, DO NOT OVERPACK WHEEL BEARINGS.

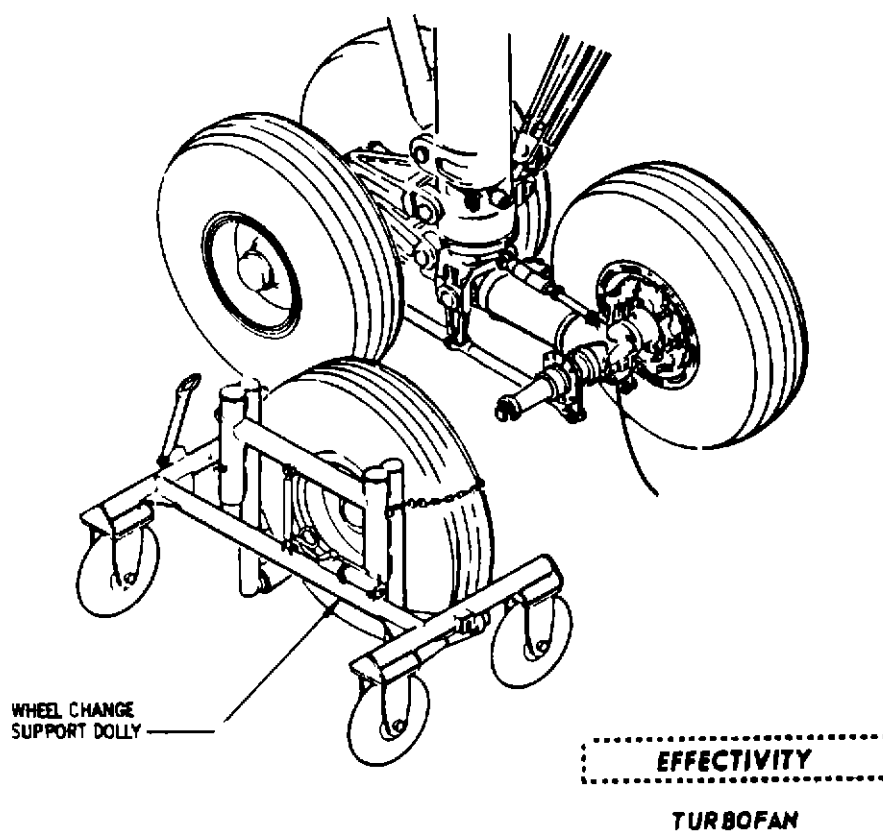
- (4) Place felt retainer assembly in wheel with flat side against inner bearing.
- (5) Install retaining snapring in wheel inboard side.

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- (6) Check that a brake unit is installed and that a wheel spacer is next to the brake support flange. Apply a light coating of grease to axle.
 - (7) Check that brake rotor drive keys are aligned.
 - (8) With the wheel assembly supported on a dolly bring wheel to the axle.
 - (9) Rotate wheel on dolly until the key slots in the wheel line up with the brake rotor keys.
 - (10) Position wheel onto axle and against the wheel spacer.
 - (11) Check that outer bearing is packed and that bearing housing is coated with grease.
 - (12) Insert outer bearing over axle into wheel.
- NOTE** If wheel bearings are replaced, check that the outer bearing is a snug fit on axle.
- (13) Insert retaining washer next to bearing.



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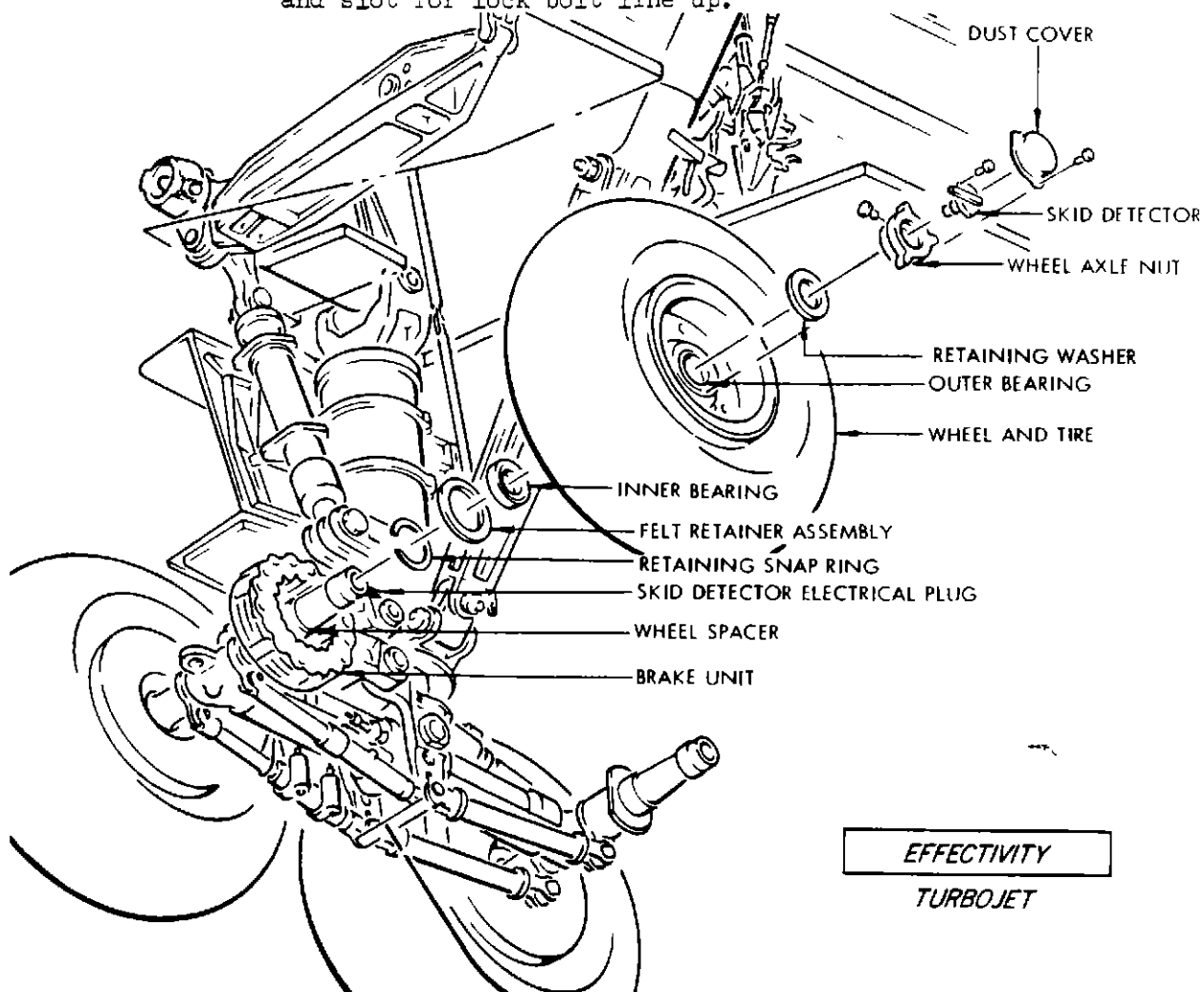
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(14) Install axle nut and rotate wheel

NOTE Prior to installation of axle nut on airplanes with Goodyear wheels, apply motor oil or bearing grease to all threads and bearing surfaces of axle nut and washer

(15) Torque axle nut.

- (a) On airplanes with Goodrich wheels, while wheel is spinning, pretighten the axle nut to 250 pound-feet torque. Back off nut to zero torque. Tighten axle nut to 100 pound-feet torque, then check for alignment of locking hole and slot.
- (b) On airplanes with Goodyear wheels pretighten axle nut, while rotating wheel, to 100 pound-feet torque. Back off nut to zero torque, then tighten to 50 pound-feet torque and check for alignment of locking hole and slot.
- (c) If locking holes are not aligned continue to tighten until hole and slot for lock bolt line up.

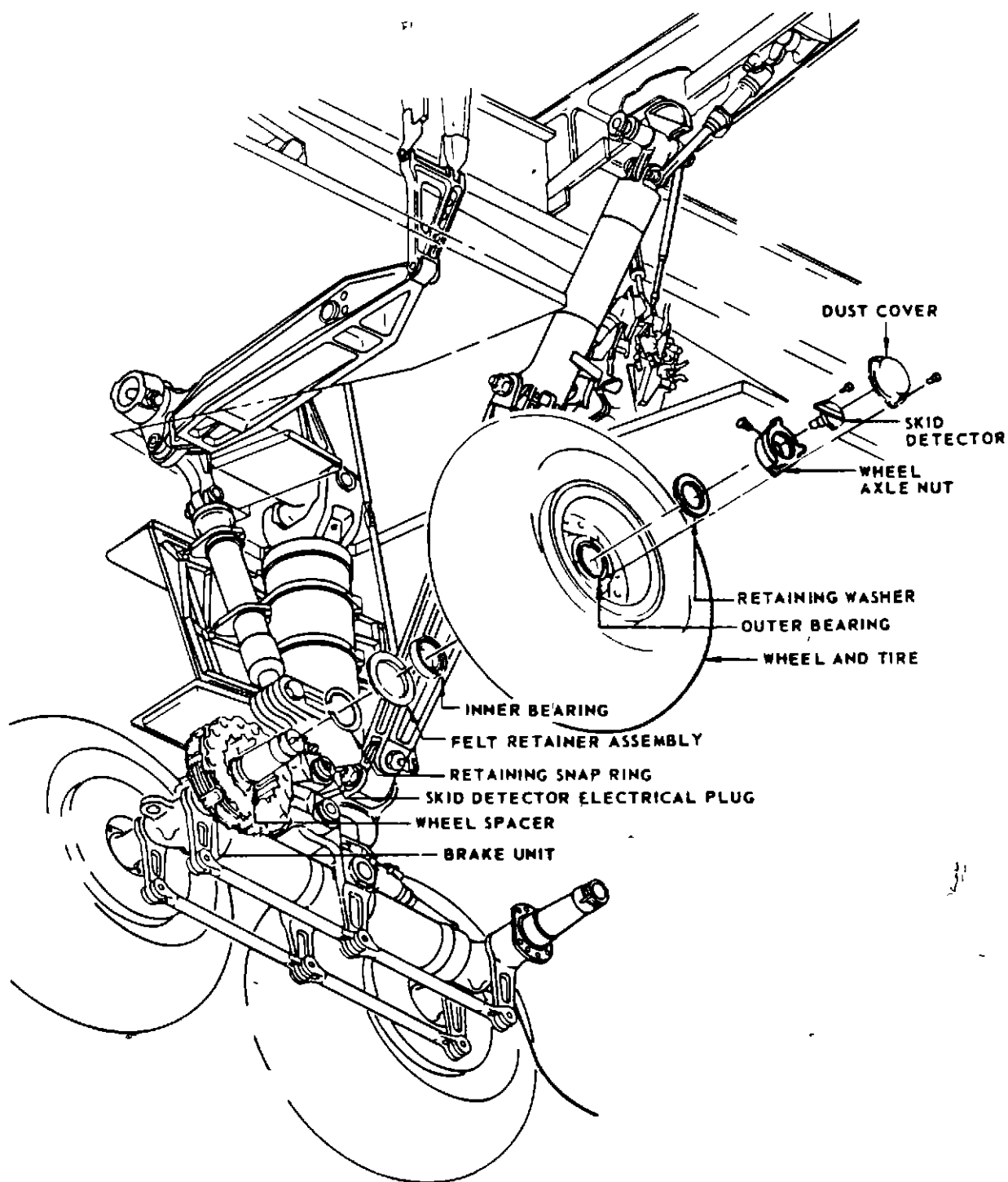


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Main Gear Wheel Installation

Figure 202 (Sheet 1)



Main Gear Wheel Installation
 Figure 202 (Sheet 2 of 2)

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- (16) Install axle nut lockbolts
- (17) Pull skid detector electrical plug out of axle. Connect plug to skid detector.
- (18) Place skid detector, plug first, into end of axle and align installation tabs with wheel nut tabs
- (19) Insert screws, cotter pins, and nuts. Secure skid detector
- (20) **Check condition of Brake Adjuster.**
 - (a) Operate brake pedals in cockpit.
 - (b) Release brake pedals in cockpit.
 - (c) Rotate wheel by hands and check wheel for dragging brake.
 - (d) If dragging brake is noticed, replace brake adjuster.

STEPS (21) - (22) DELETED.

- (23) On airplanes with Mark I antiskid system, test antiskid system on replaced wheel : (See 32-11-0, Antiskid System - Maintenance Practices).
- (24) On airplanes with Mark II antiskid system, test antiskid system on replaced wheel : (See 32-31-0, Antiskid System - Maintenance Practices par. 1.D.(1)(2)(3)(4)).

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- (25) Remove dust cover attachment bolts. Place dust cover over skid detector with detector arm located in dust cover keyway. Rotate cover until installation holes in cover and wheel are aligned. Insert attaching bolts and washers and secure cover.
- (26) Inflate tire and lower airplane

2 Inspection/Check Main Gear Tire and Wheel

A General

- (1) The main gear tire and wheel can be checked with the wheel in place. A further examination is made when the wheel is off and also when wheel is disassembled.

B. Examine Main Gear Tire and Wheel

- (1) Check tires for abrasion, uneven wear, cuts, and flat spots. Check for evidence of tire creeping on wheel.

- (2) Check for tire leakage

- (a) Check installed tires in storage (after repair or replacement)

- 1) Check tire inflation pressure, check again after 24 hours. Pressure drop must not exceed 5 percent of specified pressure

- (b) Check installed tires in service

- 1) Check tire pressure each day.
 - 2) Tires within 5 percent of specified pressure do not require servicing
 - 3) Tires with no record of previous leakage within the last 24 hours may be reinflated if a pressure drop from 5 to 20 percent of specified pressure is indicated.

NOTE. Tires reinflated as above must be entered in the Flight Log with a request for a tire pressure check to be made at the next station

- 4) If on second check tire pressure is low and requires inflation, affected tires must be removed from service as soon as possible
 - 5) Until defective tire is removed, pressure checks must be made after every landing

MAIN GEAR BRAKE EQUALIZER RODS - MAINTENANCE PRACTICES1. Removal/Installation Main Gear Brake Equalizer Rods

A. General

- (1) Brake equalizer rods are removed during general disassembly of the main landing gear wheel truck, or if damaged or defective. The ends of the brake equalizer rods pivot on hollow pins secured by nut, bolt and washer. Pins at each brake collar are inserted with the shoulder on the inside (side nearest the truck).

B. Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent
- (3) Grease - MIL-G-21164

C. Prepare for Replacement

- (1) Check that landing gear external downlocks are installed and that wheel well doors are open with release handle down and latched.
- (2) Install main gear door external downlock on the door actuator in the affected wheel well.
- (3) Chock the wheels and release the parking brake.

D. Remove Main Gear Brake Equalizer Rods

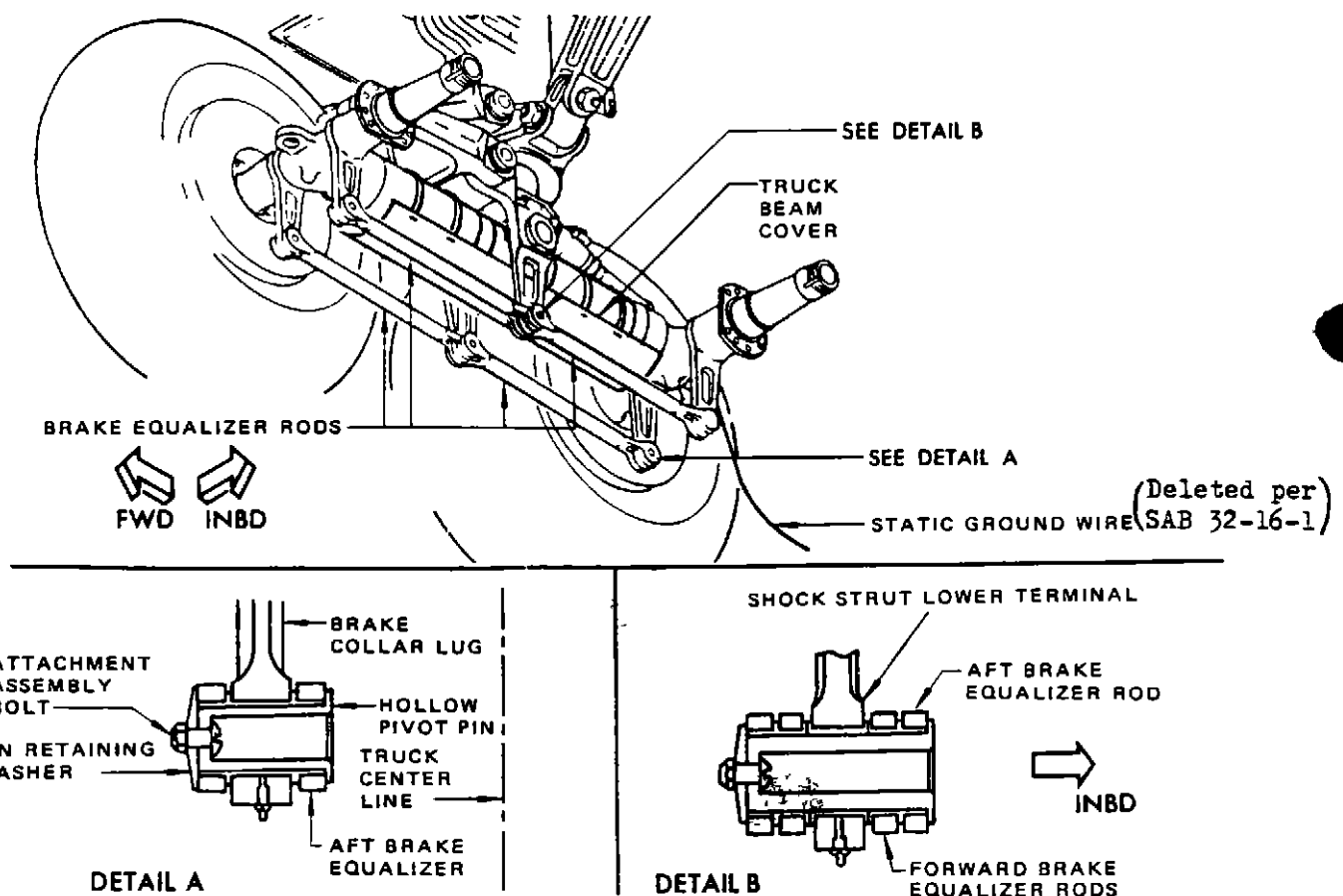
- (1) Hold the securing bolt (figure 201) with a screwdriver through the hollow pin. Remove the nut and washer and retrieve the bolt from the inside of pin.
- (2) Tap out pins in direction of the truck at each gear brake collar.
- (3) Remove the installation bolts at the shock strut end of brake equalizer rods. Remove brake equalizer rods.

E Install Main Gear Brake Equalizer Rods

- (1) Check that pivot pins, installation bolts, and the pivot bushings are clean and lightly lubricated with grease.
- (2) Install equalizer rods on shock strut inner cylinder lower terminal and insert pivot pins, (figure 201)

NOTE The narrow fork end on the forward brake equalizer rod is placed directly on the lower terminal. The wide fork end on the aft brake equalizer rod is installed over the narrow end of the forward rod. One pivot pin secures both fork ends to the lower terminal.

- (3) Raise each equalizer rod to align with attachment lug on brake collar and tap in the pivot pins. Insert pins from truck side of rods.
- (4) Insert the securing bolt through inside of pivot pin. Install washer and nut. Lock with cotter pin.
- (5) Lubricate the equalizer rod bushings. Refer to Unit Servicing Main Landing Gear, 32-22-0.



Main Gear Truck Brake Equalizing Rods Installation
Figure 201

MAIN GEAR LEVELING CYLINDER AND SNUBBER UNIT - MAINTENANCE PRACTICES1. Unit Servicing Main Gear Leveling Cylinder and Snubber Unit

A. General

- (1) The unit is connected to the utility hydraulic system through a deboost valve which reduces system pressure for the leveling and snubbing operation. Therefore, this unit does not require servicing with oil or air.

2. Removal/Installation Main Gear Leveling Cylinder and Snubber Unit

A. Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent
- (3) Grease - MIL-G-23827

B. Remove Main Gear Leveling Cylinder and Snubber Unit

31-41-21

CAUTION: AFTER ANY LEVELING CYLINDER AND SNUBBER UNIT FAILURE A PROPER VISUAL EXAMINATION OF MAIN LANDING GEAR TRUCK BEAM SHALL BE MADE. REFER TO 32-22-21.

- (1) Depressurize the hydraulic system.
- (2) Check that landing gear external downlocks are installed and that wheel well doors are open with release handle down and latched.
- (3) Disconnect hydraulic line at unit. Plug line and cap connection on unit.
- (4) Remove nuts and pivot bolts at each end of unit, and remove unit. (See figure 201.)

NOTE: Reinstall nuts, washers and pivot bolts at each end of removed leveling cylinder and snubber unit.

CAUTION: CARE MUST BE TAKEN TO AVOID SPILLING FLUID FROM UNIT. SHOULD THIS OCCUR IT WILL BE NECESSARY TO REFILL AND BLEED UNIT.

C. Prepare to Install Leveling Cylinder and Snubber Unit

- (1) Check replacement leveling cylinder and snubber unit to ensure that unit is completely filled with hydraulic fluid and that no air is trapped in the unit. If necessary, fill and bleed unit as follows:
 - (a) Remove bleeder plug and see that hydraulic connection on unit is not capped. (See figure 201.)

NOTE: Some leveling cylinder and snubber units have brake type bleeder plugs installed. On these units open bleeder plug.

- (b) Fill entire unit with Skydrol 500 hydraulic fluid.

- (c) Proceed to extend and retract unit until it is full of fluid and free from air.
- (d) When air or oil containing bubbles, ceases to issue from ports, install and tighten bleed plug.
- (e) Cap hydraulic connection on unit and lockwire bleed plug using double twist method.

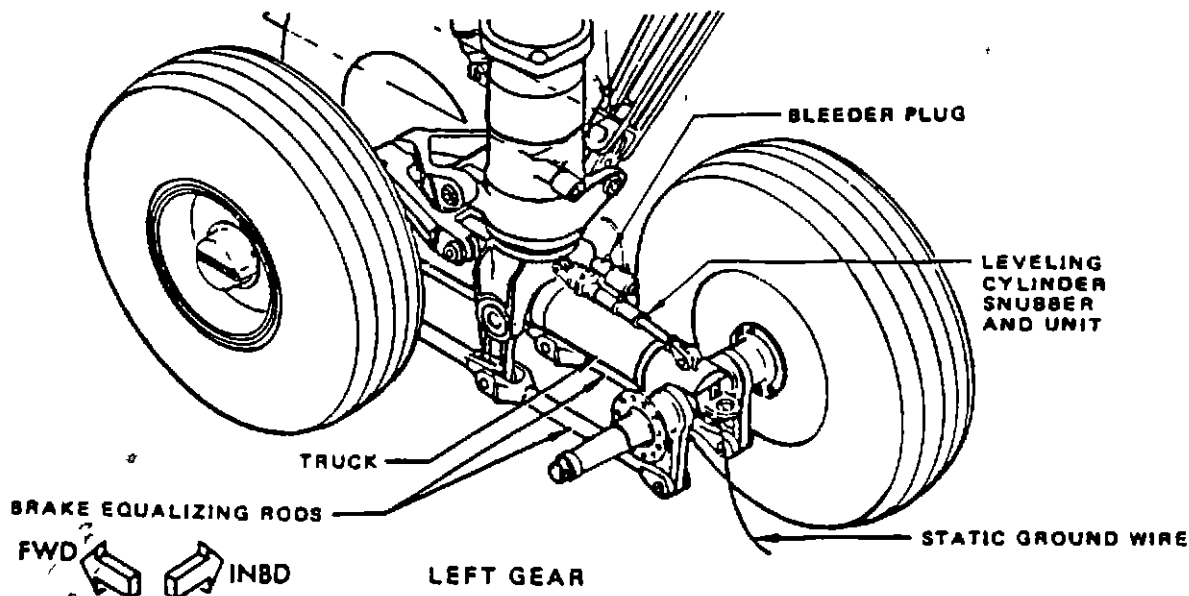
D. Install Leveling Cylinder and Snubber Unit.

- (1) Install unit between lugs on aft end of truck and aft side of shock strut inner cylinder.
- (2) Insert attachment bolts with heads retained by locking lands. Add washers and self-locking nuts.

CAUTION: DETERMINE RUN-ON TORQUE OF NUTS ON BOLTS. IF RUN-ON TORQUE IS LESS THAN 70 INCH-POUND DISCARD AND REPLACE NUT. AFTERWARDS TIGHTEN NUTS TO TORQUE OF 200 INCH-POUND. EXTREME CARE MUST BE TAKEN TO ENSURE THIS TORQUE TO PREVENT CRACKING OF LUGS.

NOTE: Insert long bolt in forward attachment.

- (3) Remove plug and check that hydraulic line to unit is full of fluid. If necessary, operate reset handle on deboost valve to bleed air from line.
- (4) Remove cap from hydraulic connection on unit and attach hydraulic line.
- (5) Pressurize hydraulic system, operate reset handle to charge leveling cylinder and snubber unit side of deboost valve.
- (6) Check hydraulic connection and bleed plug joint on unit for leakage.
- (7) Lubricate snubber per Unit Servicing Main Landing Gear, 32-22-0.



Ref. SAB 707/695

Main Gear Leveling Cylinder and Snubber Unit Installation
Figure 201

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LEVELING CYLINDER LOCKOUT-DEBOOST VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Leveling Cylinder Lockout-Deboost Valve

A. Remove Leveling Cylinder Lockout-Deboost Valve

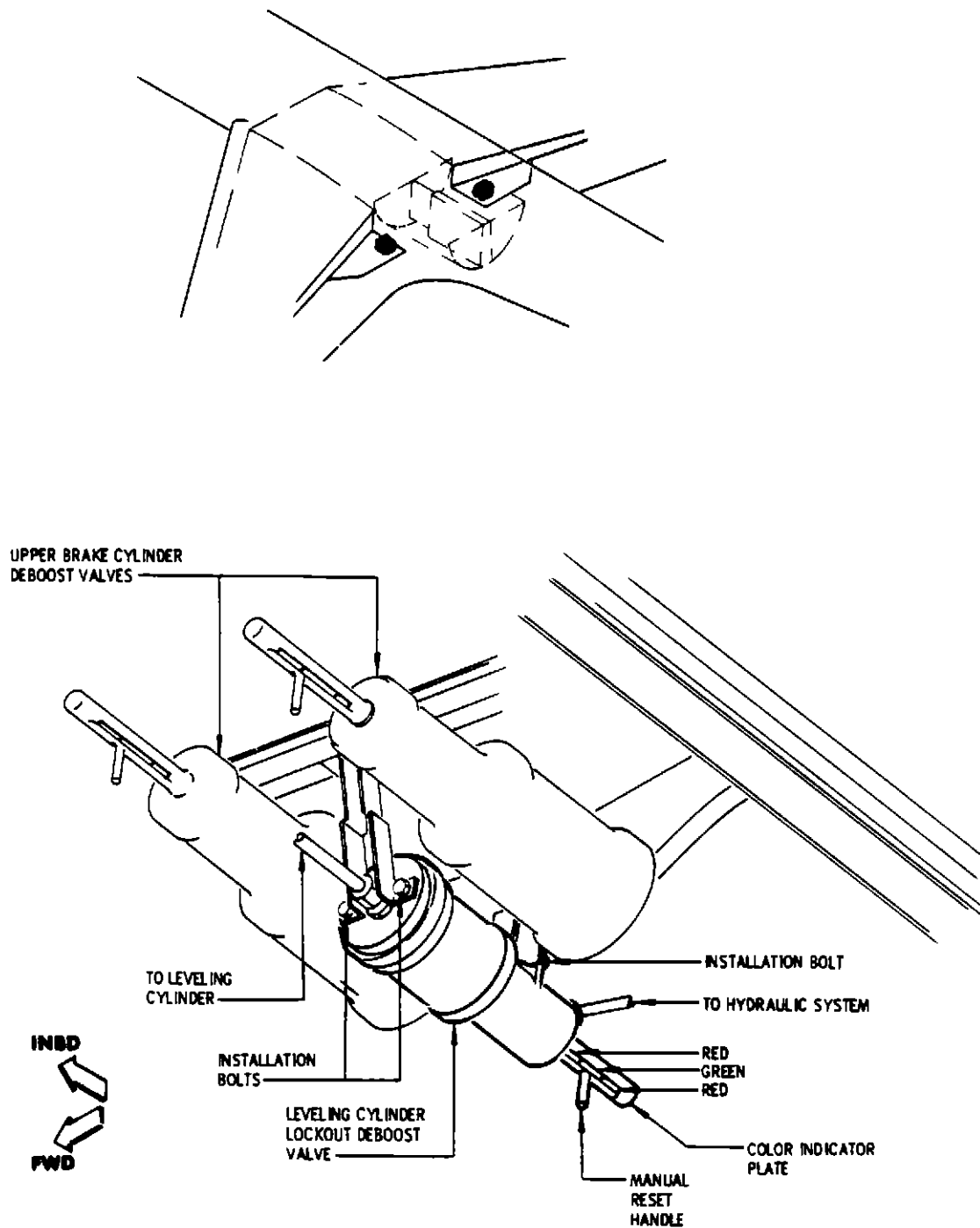
- (1) Check that landing gear external down locks are installed and that landing gear doors are open with release handle down and latched.
- (2) Depressurize hydraulic system.
- (3) Disconnect and plug hydraulic lines at each end of lockout-deboost valve. (See figure 201.)
- (4) Remove attachment bolts from inboard and outboard end of valve
- (5) Lower lockout-deboost valve and remove from airplane.
- (6) Remove hydraulic unions and O-ring.

B. Install Leveling Cylinder Lockout-Deboost Valve

- (1) Install hydraulic unions with new O-rings in valve ports of lockout-deboost valve.
- (2) Fill lockout-deboost valve with Skydrol 500 and cap unions.
- (3) Set valve in position with large diameter outboard. Reset handle should be down.
- (4) Install inboard and outboard attachment bolts.
- (5) Remove plugs and connect hydraulic lines to valve.
- (6) Pressurize hydraulic system.
- (7) Operate reset handle to charge downstream side of valve.

NOTE If the reset handle moves out of green zone after servicing, air may be trapped between valve and leveling cylinder. Open the bleed screw on leveling cylinder and operate reset handle to bleed about 1-1/2 gallons of fluid through cylinder. Close bleed screw and recharge deboost valve. If reset handle still moves out of green zone, change deboost valve.

- (8) Check hydraulic connections for leaks.



Lockout-Deboost Valve Installation
 Figure 201

PRIORITY VALVE - MAINTENANCE PRACTICES

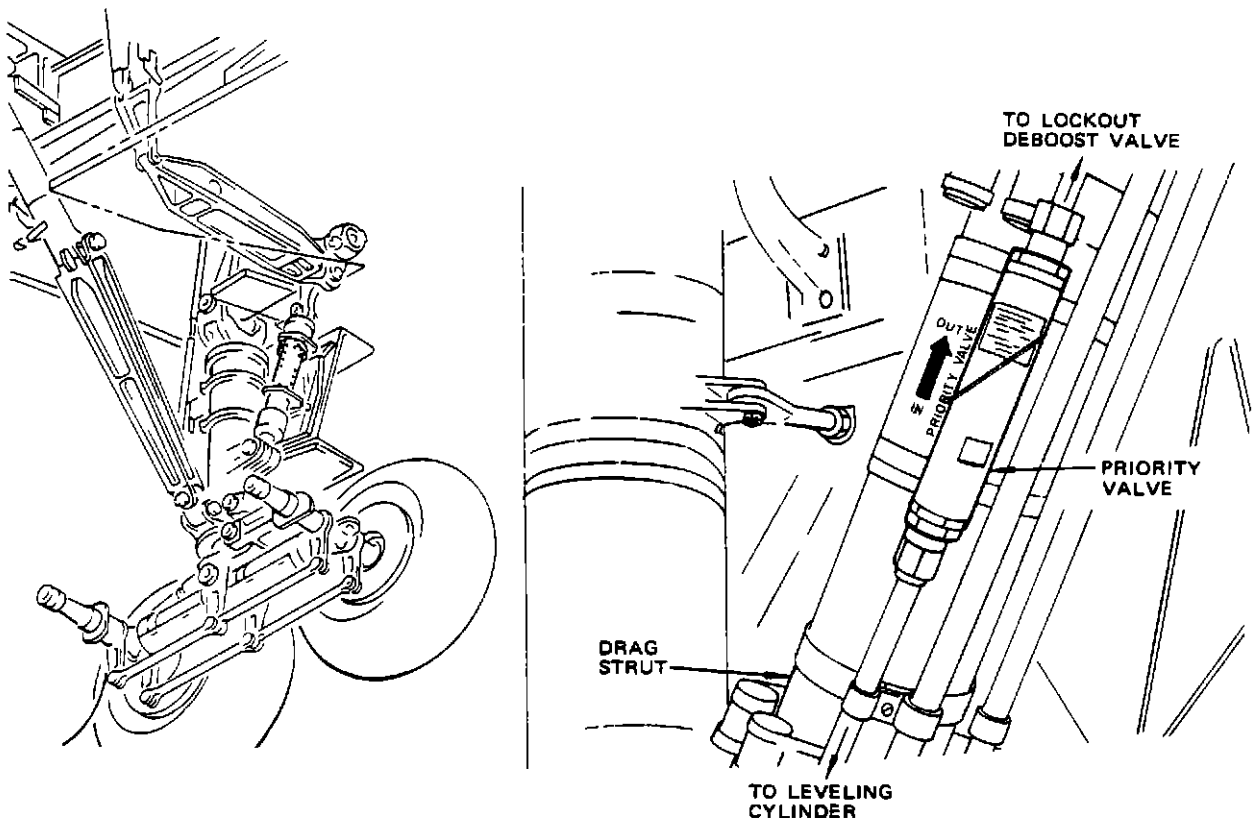
1. Removal/Installation Priority Valve

A. Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent

B. Remove Priority Valve

- (1) Depressurize hydraulic system.
- (2) Check that landing gear downlocks are installed and that wheel well doors are open with release handle down and latched.
- (3) Remove lockwire and place wrench over flats on body of priority valve. (See figure 201.)
- (4) Hold valve from turning while disconnecting hydraulic lines from both ends of valve. Remove valve.
- (5) Plug lines and cap connections on unit.



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C. Install Priority Valve

- (1) Fill unit with hydraulic fluid, check that hydraulic line from lockout deboost valve is full of fluid. If necessary operate reset handle on deboost valve to bleed air from line.
- (2) Connect upper line to priority valve as shown on adjacent instruction plate.

CAUTION: MAKE SURE THE PRIORITY VALVE IS INSTALLED WITH THE ARROW POINTING TOWARDS THE DEBOOST VALVE. THE UPPER CONNECTION IS MARKED "OUT."

- (3) Remove cap from lower connection on valve and connect hydraulic line from leveling cylinder.
- (4) Hold valve body with wrench on flats and tighten both connections.

CAUTION: DO NOT OVERTIGHTEN CONNECTIONS AS DAMAGE MAY RESULT TO VALVE BODY.

- (5) Pressurize hydraulic system.
- (6) Operate reset handle to charge system downstream of deboost valve.

NOTE: If the reset handle moves out of green zone after servicing air may be trapped between deboost valve and leveling cylinder. Open the bleed screw on leveling cylinder and operate the reset handle to bleed about 1 to 1-1/2 gallons of fluid through cylinder. Close bleed screw and recharge deboost valve.

- (7) Lockwire connections on priority valve and check hydraulic connections for leaks.

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MAIN GEAR TORSION LINKS - MAINTENANCE PRACTICES

EFFECTIVITY

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1. Removal/Installation Main Gear Torsion Links

A. Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent
- (3) Grease - MIL-G-21164

B. Remove Main Gear Torsion Links

- (1) Check that landing gear external downlocks are installed and that wheel well doors are open with release handle down and latched.
- (2) Disconnect electrical wiring and brake lines from support clamps on the torsion links. Remove wire and tubing support clamps.
- (3) Tape safety switch (9, figure 201) in the open (oleo compressed) position.

NOTE: It will not be necessary to disconnect electric plug from switch.

- (4) Disconnect safety switch actuation linkage (7) from lower torsion link (3).
- (5) Remove bolts attaching safety switch bracket (8) to upper torsion link (2). Tape bracket to the drag strut for reinstallation.
- (6) Support ends of torsion links and remove torsion links apex connecting bolt (5), torsion link spacer (6) and apex washer (10).
- (7) Remove antirotation bolt (1) through upper torsion link attaching bolt (11).
- (8) Support upper torsion link and remove attaching bolt. Remove upper torsion link.

- (9) Remove antirotation bolt through lower torsion link attaching bolt (4).

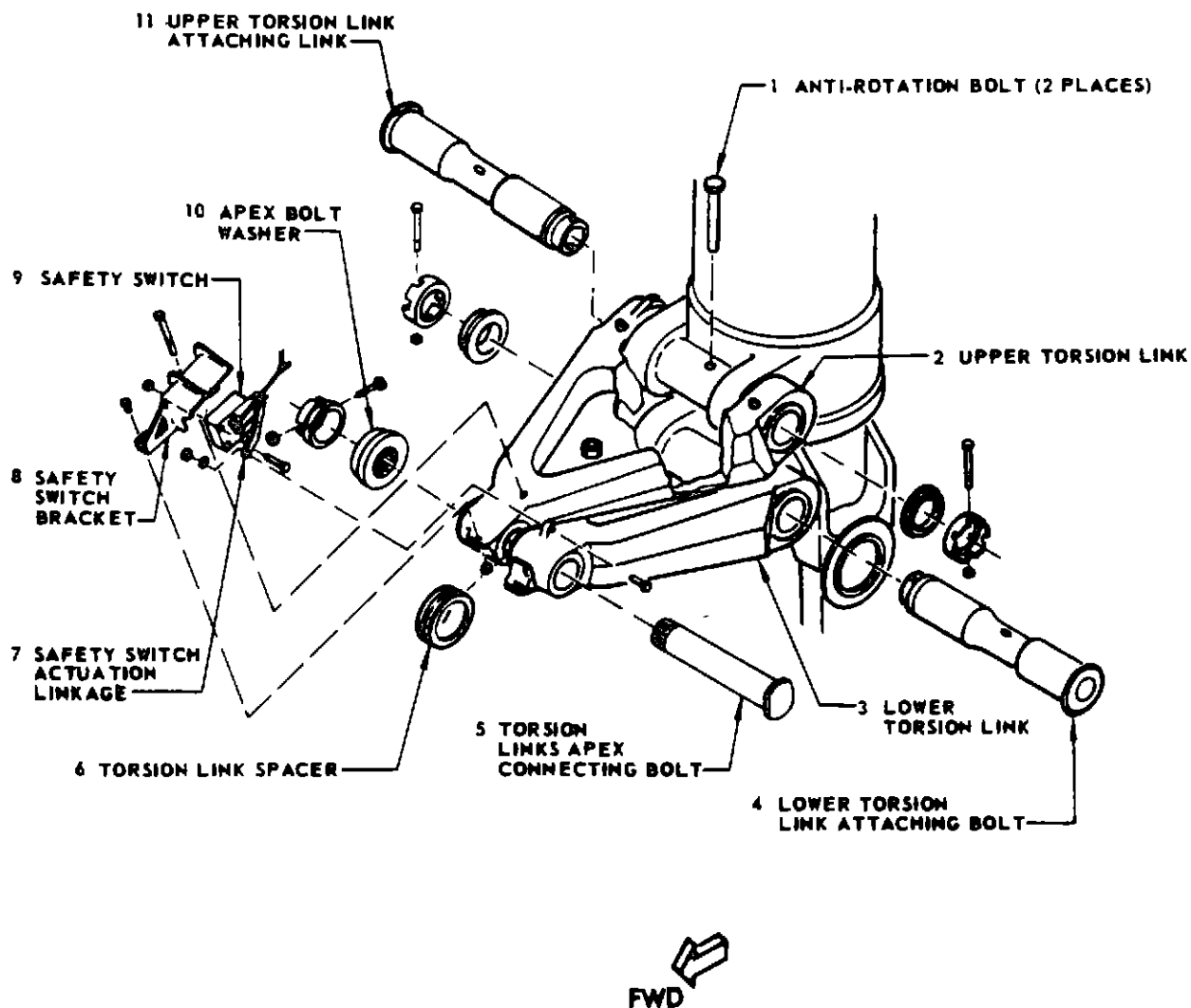
- (10) Support lower torsion link and remove lower torsion link.

C. Install Main Gear Torsion Links

- (1) Position a lower torsion link (3, figure 201) to align with lower torsion link oleo lug.
- (2) Insert lower attachment bolt (4) with head facing left and install antirotation bolt. Add serrated washer and nut to attachment bolt.

NOTE All attachment bolts and pins must be cleaned and lightly lubricated with grease before installation.

- (3) Tighten nut with a wrench to solid height, loosen, and then tighten by hand to the nearest castellation approaching solid height.
- (4) Install lockbolt and nut.
- (5) Add nut to the antirotation bolt and torque to 40 to 50 pound-inches.
- (6) Position an upper torsion link (2) to align with upper torsion link oleo lug.
- (7) Insert upper attachment bolt (11) with head facing right and install antirotation bolt (1) Add serrated washer and nut to attachment bolt.
- (8) Repeat steps (3), (4), and (5).
- (9) Insert apex connecting bolt (5) from left side through upper torsion link (2), torsion link spacer (6), lower torsion link (3), and apex bolt washer (10). Add nut and repeat steps (3) and (4).
- (10) Install safety switch bracket (8) and safety switch (9) on upper torsion link.
- (11) Connect switch actuation linkage (7) to lower torsion link.
- (12) Install wire and tubing supports clamps to torsion links. Connect brake lines and electric wiring to support clamps.
- (13) Lubricate the torsion link per Unit Servicing Main Landing Gear, 32-22-0





MAINTENANCE MANUAL

MAIN GEAR SIDE STRUT - MAINTENANCE PRACTICES

1. Removal/Installation Main Gear Side Strut

A. Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent
- (3) Grease MIL-G-21164
- (4) Transportation Dolly

B. Prepare for Replacement

- (1) Check that landing gear external downlocks are installed, and the wheel well doors are open, with release handle down and latched.
- (2) Depressurize the hydraulic system.
- (3) Jack airplane until wheels are clear of the ground. See Airplane Jacking, 7-1-1.

C. Remove Main Gear Side Strut

- (1) Remove external downlock assembly.
- (2) Remove cotter pin, nut, and washer at junction of side strut upper and lower segments, (detail B, figure 201).
- (3) Support lower segment and remove attachment bolt joining side strut segments.
- (4) Lower top end of lower segment onto a transportation dolly.
- (5) Remove cotter pin, nut washer and bolt attaching side strut lower universal, (detail C) to chock strut inboard attachment lug. Remove side strut lower segment with universal fitting attached.
- (6) Remove cotter pin, nut, washer and bolt attaching side strut lower universal to the side strut lower segment. Remove universal.



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- (7) Support side strut upper segment and release the lock roller manually. The upper segment will swing down to hang vertically when released from the lock assembly.
- (8) Support the side strut upper segment (detail A) and remove installation cotter pin, nut, and eyebolt.

NOTE: The side strut actuator is attached to the installation bolt. When the installation bolt is removed to release the side strut upper segment, leave installation bolt hanging from the actuator piston rod.

- (9) Lower the side strut upper segment onto transportation dolly and remove from under the airplane.
- (10) Remove the side strut upper universal if replacement is to be made.

D. Install Main Gear Side Strut

- (1) Clean and lightly lubricate all attachment bolts with grease, before installation.
- (2) Position side strut upper universal between floor beams (detail A, figure 201). Insert bolt, add washer and nut.

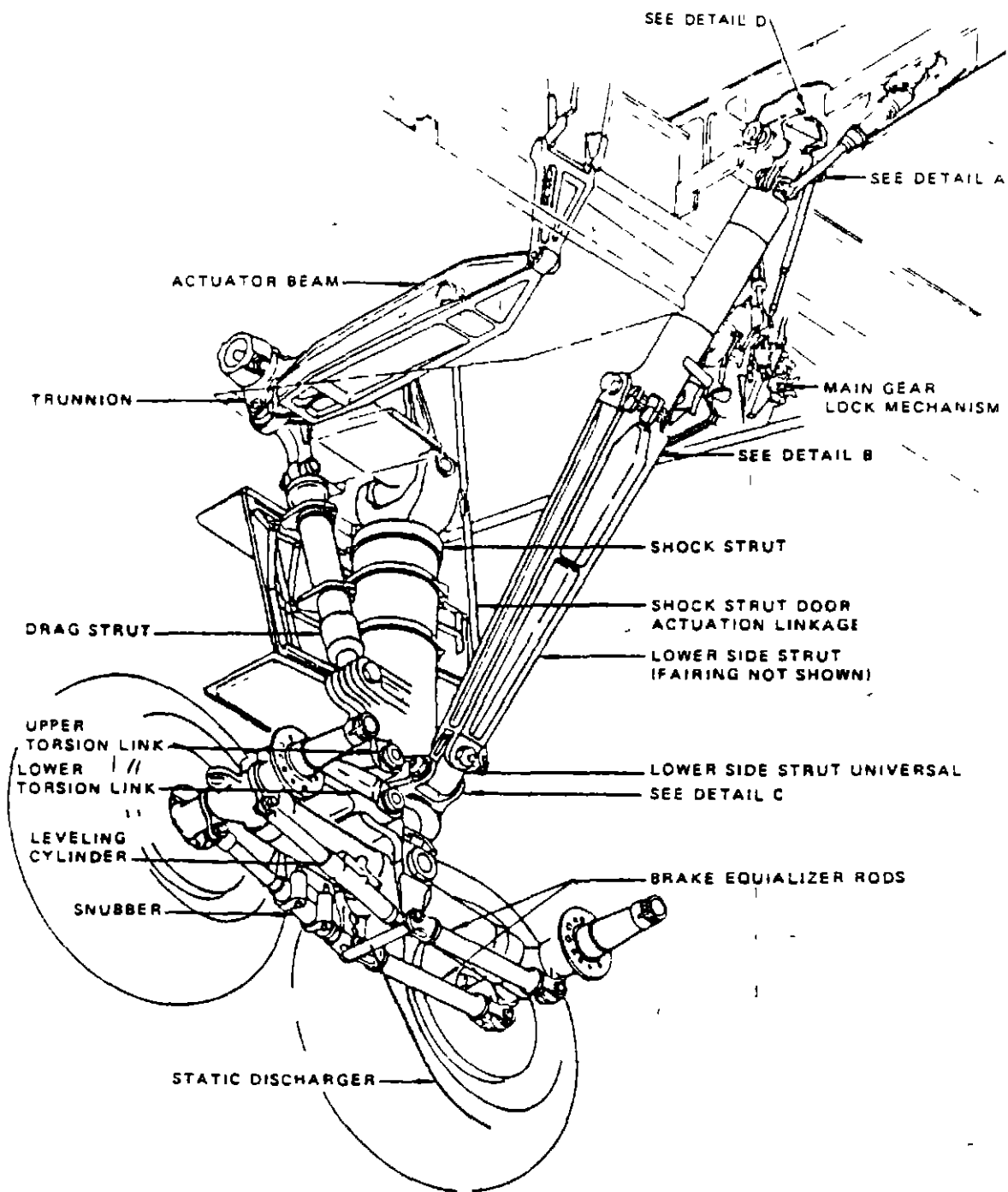
NOTE: Check that cam on universal is installed with smallest diameter lightening hole inboard.

- (3) Check that cam roller arm is positioned as shown in detail D.

CAUTION INCORRECT CAM ROLLER ARM POSITION MAY RESULT DAMAGE TO EQUIPMENT.

- (4) Tighten nut 300 pound-inches, then loosen nut and retighten finger-tight. Tighten to next castellation and install cotter pin.
- (5) Support and place side strut upper segment to align with side strut upper universal (detail A). Lock roller must be on aft side of strut.
- (6) Check that eyebolt is attached to side strut actuator rod as in step C.(8). Insert bolt, add nut and torque 300 to 800 pound-inches. Lock nut with cotter pin.
- (7) Position side strut lower segment to align with upper segment and insert assembly bolt (detail B). Check that flat of bolt head contacts the surface of antirotation lug. Add washer and nut.
- (8) Tighten nut as in step (4). Install cotter pin.

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Main Gear Side Strut Installation

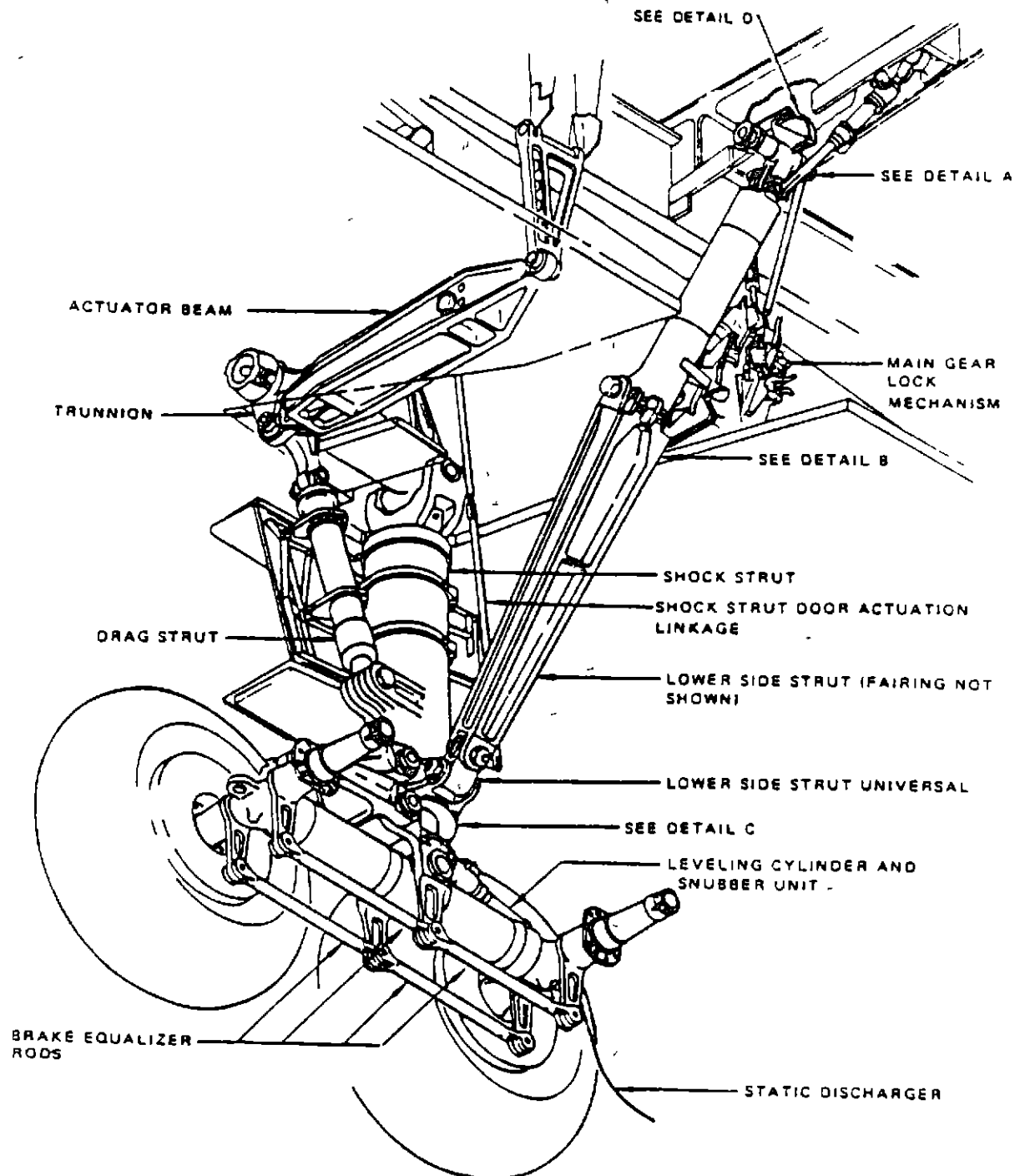
Figure 201 (Sheet 1)

TP 32-215

SN REV Mar 1/89

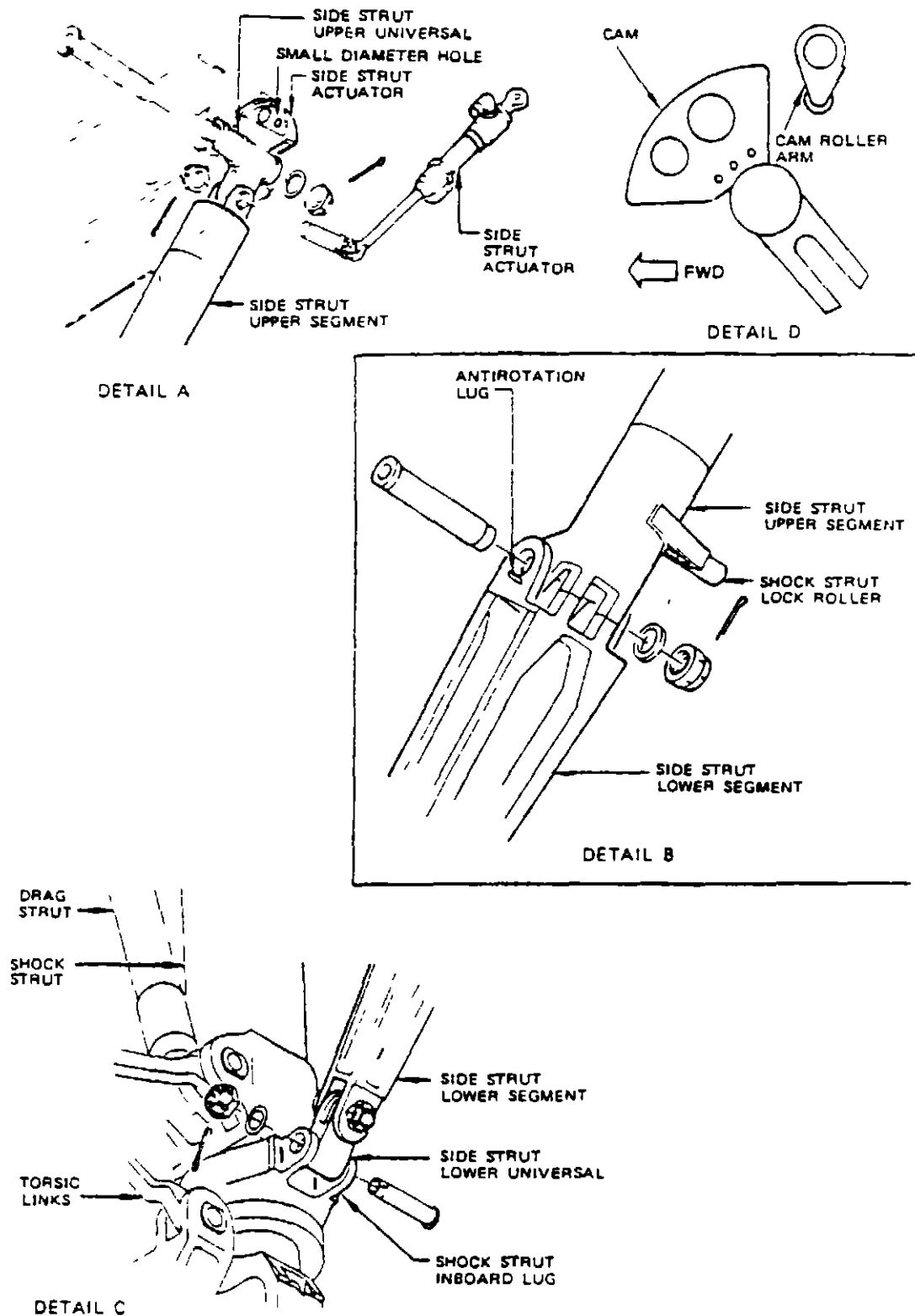
Ref. B.707 - M.M. 32- 2-101 p.203 - Nov 20/80

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Main Gear Side Strut Installation
Figure 201 (Sheet 2)
TR 32-215

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Main Gear Side Strut Installation
Figure 201 (Sheet 3)

TP 32-215



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- (9) Place side strut lower universal in position at lower end of side strut lower segment. Position universal so grease fitting is on down side. Insert bolt and add washer and nut.

WARNING: ON SOME AIRPLANES, SIDE STRUT LOWER UNIVERSALS ARE NOT SYMMETRICAL. IF UNIVERSAL IS INVERTED ON INSTALLATION, MAIN GEAR MAY NOT LOCK IN DOWN POSITION USING EMERGENCY EXTENSION SYSTEM.

NOTE: Universal has the marking DN and an arrow on each side on some airplanes. If markings are blotted out or removed, position universal with grease fitting down.

- (10) Tighten nut as in step (4). Install cotter pin.
- (11) Engage lock roller with hook assembly.
- (12) Place side strut lower universal (detail C) in alignment with the inboard lug on shock strut. Insert bolt and add washer and nut. Add cotter pin.
- (13) Tighten nut as in step (4). Install cotter pin.
- (14) Lubricate side strut (Ref 32-22-0, Unit Servicing Main Landing Gear).
- (15) Perform operation test of main landing gear (Ref 32-1-0, Maintenance Practices).
- (16) Test main gear emergency extension system (Ref 32-7-1, Maintenance Practices).

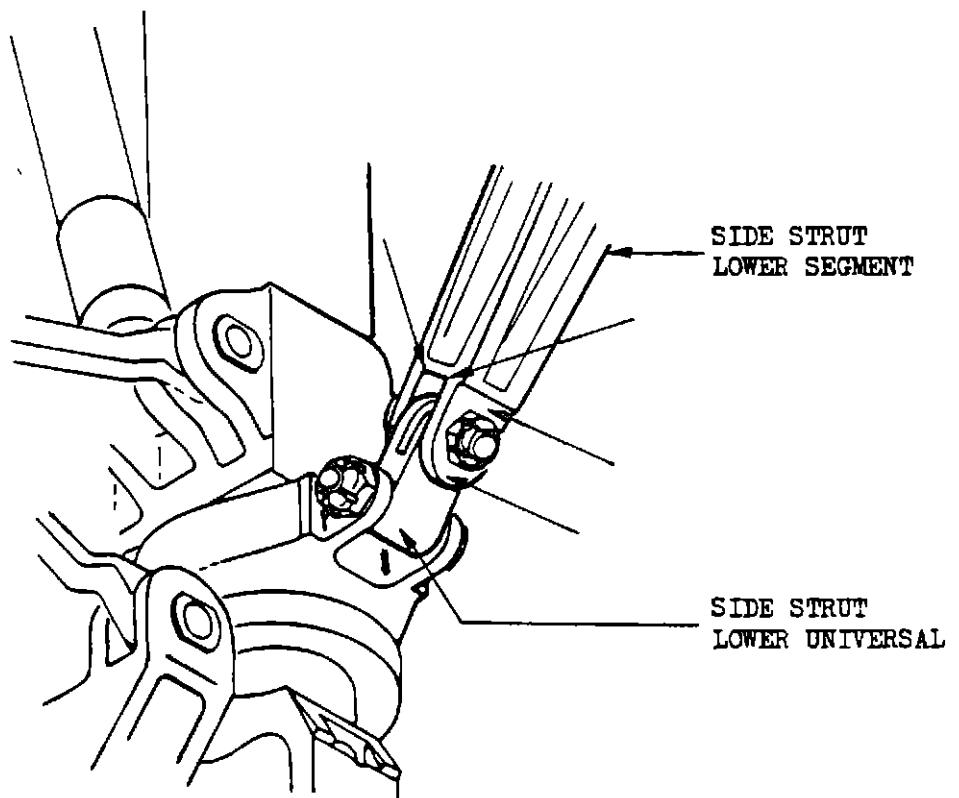
2. Inspection

A. Eddy Current Inspection of Lower Segment Lower Lugs.

- (1) Clean and degrease lower segment lower lug.

NOTE: Do not remove attaching bolt lower side strut to lower universal.

- (2) Inspect for cracks the area as indicated around bolt head, nut and radius which joins flat portion to lateral faces.



SAB 707/762

Main Gear Side Strut Lower Segment Inspection
Fig. 202

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MAINTENANCE MANUAL

MAIN GEAR SHOCK STRUT DOORS - MAINTENANCE PRACTICES

1. Removal/Installation Main Gear Shock Strut Doors

A. General

- (1) Main gear shock strut doors are removed after damage or defect, or when the main landing gear is removed. This instruction covers the complete removal and installation of the shock strut doors. When only part removal is required, find and follow the directions of the appropriate steps.

B. Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70006-500 or equivalent

C. Remove Main Gear Shock Strut Doors

- (1) Check that landing gear downlocks are engaged.
- (2) Remove lower door
 - (a) Support lower door (figure 204) and disconnect and remove door actuating rod.
 - (b) Disconnect door actuating link. Disconnect lower door at hinge and remove door.
- (3) Remove upper forward door
 - (a) Support upper forward door (figure 203) and disconnect and remove actuating rod.
 - (b) Disconnect upper forward door actuating link and door hinge. Remove door.
- (4) Remove door assembly

NOTE Door assembly (figure 202) may be removed with or without the lower door or the upper forward door attached.

- (a) Disconnect rods and link from door
- (b) Support door assembly, release door to drag strut attaching straps, and remove door to shock strut attachment bolts. Remove door assembly.
- (5) Remove upper aft door
 - (a) Disconnect actuating rod (figure 201)

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- (b) Remove bolts attaching hinges to door. Remove door.

NOTE: Keep shims (if any) with the related hinges.

- (c) After door removal, hinge pins may be removed from above the wing through the access panel, and each hinge unit taken out separately.

D. Install Main Gear Shock Strut Doors

- (1) Install upper aft door.

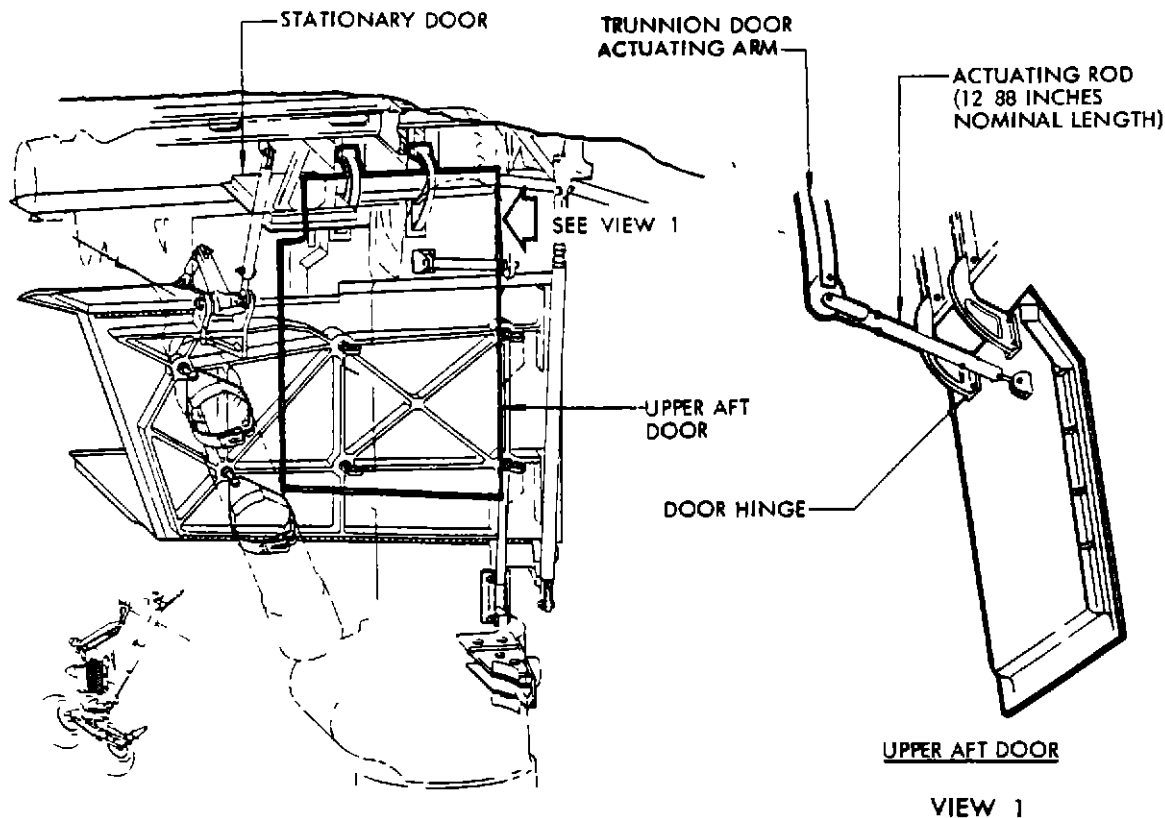
- (a) Place upper aft door hinges (figure 201) into position and install hinge bolts.
- (b) From under the wing, hold the upper aft door for attachment to hinges.

NOTE: Any shims taken out should be added under the hinges.

- (c) Adjust length of actuating rod to 12.88 inches (nominal length) between bearing centers. Connect actuating rod between door and trunnion door actuator arm.

- (2) Install door assembly.

- (a) Raise door assembly (figure 202) into position so that attaching lugs align with shock strut and drag strut support points.



Upper Aft Door Installation
Figure 201

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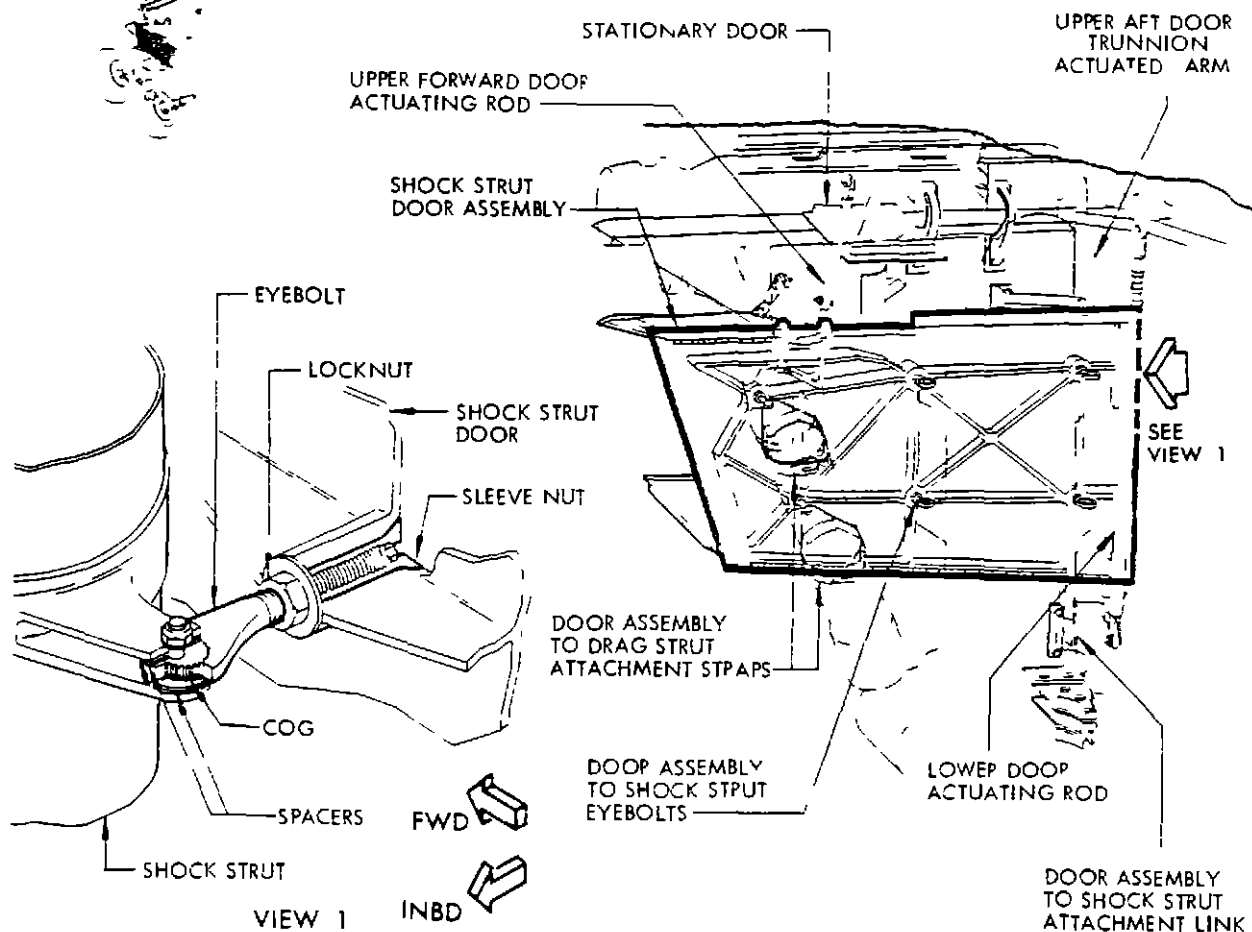
- (b) Insert attaching bolts and add washers and nuts. Tighten nuts on drag strut attachments finger-tight and add cotter pins. Torque nuts on shock strut attachments 30 to 40 pound-inches and add cotter pins.
- (c) Fasten drag strut attaching straps. Torque strap bolts to 195 to 200 pound-inches.
- (d) Connect actuating rods and links. For lower door actuating crank installation on shock strut door, check length of bolt 40 (See figure 205, sheet 1 of 5, detail A).

1 - If it is found that the bolt is too long, install a AN260PD616 washer between the original washer and nut.

2-- If it is found that the bolt is too short, spotface the lug under the washer as required. Use the smallest practical spotface diameter with .06 minimum fillet radius.

CAUTION : The lug thickness after spotfacing may not be less than .65 inch.

3 - Apply chrome pickle treatment following SABENA Norme 4721 on spotfaced areas and prime per BMS 10-11, type I.

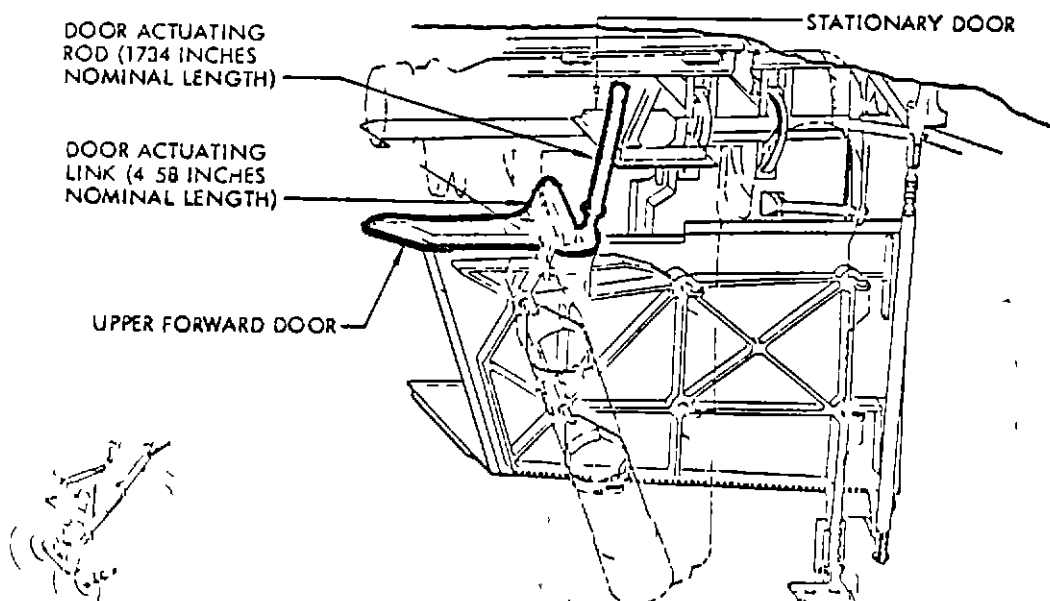




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- (e) If upper forward and lower inboard doors have been disconnected from main shock strut door, install and attach each door and respective actuating link. See paragraphs (3) and (4) following.
- (3) Install upper forward door.
 - (a) Support the upper forward door (figure 203) and connect door at hinge.
 - (b) Adjust length of door actuating link to 4.58 inches (nominal length) between bearing centers. Connect link to door and actuating crank.
 - (c) Adjust length of door actuating rod to 17.34 inches (nominal length) between bearing centers. Connect rod to actuating crank and structure.
- (4) Install lower door.
 - (a) Support the lower door (figure 204) and connect door at hinge.
 - (b) Adjust length of door actuating link to 3.70 inches (nominal length) between bearing centers. Connect actuating link between the lower door and actuating crank. Tighten link to door attaching bolt finger-tight and link to actuating crank attaching bolt to 60 to 85 pound-inches torque.
 - (c) Adjust length of door actuating rod to 36.24 inches (nominal length) between bearing centers. Install actuator rod. Torque rod-to-structure attachment bolt to 160 to 190 pound-inches.

CAUTION: IF A NEW DOOR IS INSTALLED OR IF ADJUSTMENT OF A DOOR HAS BEEN ALTERED, DOORS MUST BE ADJUSTED PER FOLLOWING PARAGRAPHS.



Main Gear Shock Strut Upper Forward Door Installation
Figure 203

2. Adjustment/Test Main Gear Shock Strut Doors

A General

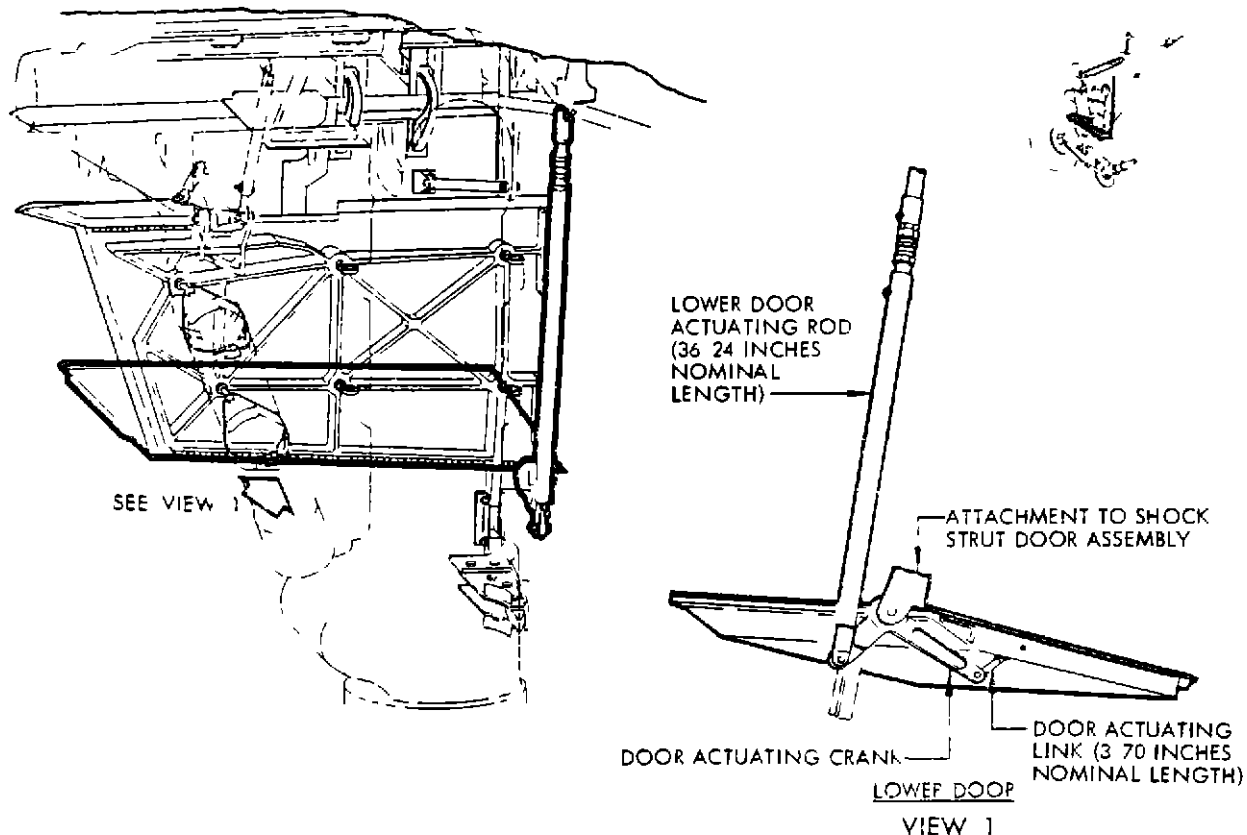
- (1) Adjustment of main gear shock strut doors is required after any doors or adjustable operating linkage has been replaced.

B. Equipment and Materials

- (1) Hydraulic Cart, 0 to 3500 psi for Skydrol 500

C. Prepare for Adjustment

- (1) Jack airplane until wheels clear ground by at least six inches.
(See Airplane Jacking, 7-1-1.)
- (2) Connect hydraulic cart. Regulate hydraulic pressure so that gear may be raised slowly.
- (3) Remove external locks from the landing gear and main gear door actuator. Return door release handle to UP position.
- (4) Check that auxiliary hydraulic pump is not operating and start hydraulic cart.





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D. Adjust Main Gear Shock Strut Doors.

- (1) Check that center door is loose on its attachments.
- (2) Remove main gear actuator access panel 1346 and main gear walking beam access panel 1347 to provide access to door attachment points.
- (3) With hydraulic cart producing no pressure and flow, place landing gear control lever in UP position.
- (4) Slowly retract landing gear by regulating pressure and flow from hydraulic cart and observe alignment of shock strut center door with wing lower panel. Note any discrepancies in alignment.
- (5) Loosen attaching straps securing shock strut door to drag strut. Adjust doors for horizontal alignment (forward, aft, inboard, or outboard) by disconnecting eyebolts securing door to shock strut and positioning cog in each eyebolt as required. (See figure 202.) Use two 0.063-inch washers each side of eyebolt or a combination of three 0.063-inch washers and two 0.032-inch washers to fill space between shock strut attachment lugs. Install bolts, washers, and nuts but do not tighten.
- (6) Adjust shock strut door for vertical alignment by loosening locknuts on eyebolts securing door to shock strut and drag strut and turning sleeve nut as required. Tighten locknuts and install lockwire.
- (7) When alignment is attained secure door attachments. Tighten center row of bolts, aft row, and finally the drag strut attachment.
- (8) Tighten fittings out not to final torque.
- (9) Set length of lower door actuating rod to 36.24 inches.
- (10) Adjust actuating rod of the lower inboard door to bring door into contour.



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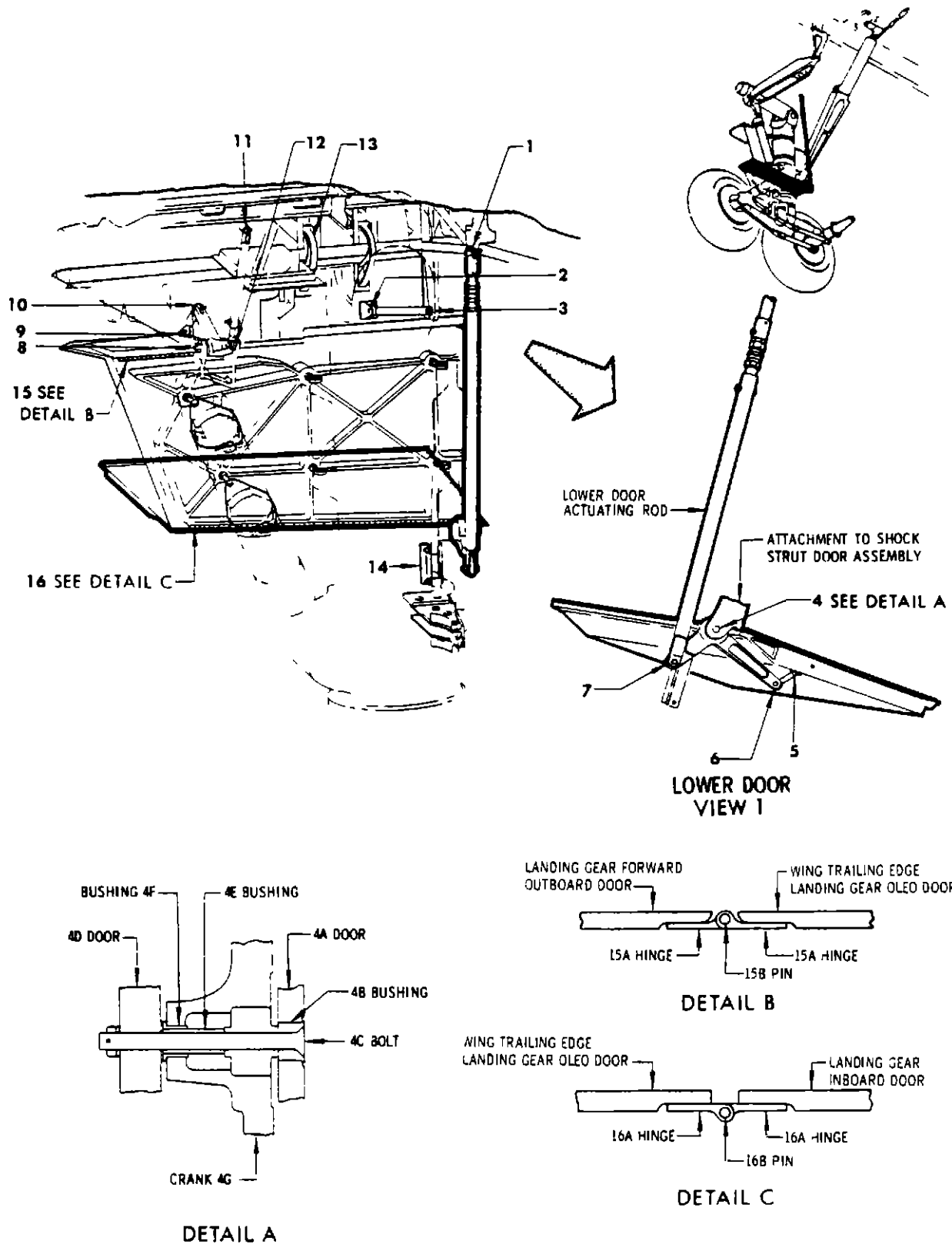
- (11) Adjust upper forward door as required by adjusting length of actuating rod until door fairs with wing when gear is retracted (up and locked).
- (12) Cycle gear slowly and adjust upper aft door strut to fair door with wing contour when gear is up and locked. Add shims if required.
- (13) Tighten all installation nuts on shock strut doors and linkages.
- (14) Cycle landing gear and check action of the doors.
- (15) Shut down hydraulic cart, install external downlocks, lower airplane and remove jacks.

3. Inspection/Check Main Gear Shock Strut Doors

A. Examine Main Gear Shock Strut Doors

- (1) Check shock strut doors for cracks, dents, and loose attaching bolts.
- (2) Examine door seals for looseness and deterioration.
- (3) Check door actuation linkage for binding, loose bolts, and missing locking devices.
- (4) Check pivot points and attachments of shock strut doors for wear per figure 205.

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Intercontinental
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DETAIL A

DETAIL B

DETAIL C

Main Gear Shock Strut Door Allowable Wear and Rework
 Figure 205 (Sheet 1)

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Intercontinental
MAINTENANCE MANUAL

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	ID	3745	3765	3775	0042		X				
5	OD	3735	3745	3733			X				
6	ID	3737	3752	3762	0029	X		▷	5200	0004	0015
5	OD	3735	3745	3733			X				
2	ID	3120	3140	3145	0037		X				
5	OD	3110	3120	3108			X				
6	ID	3112	3122	3132	0024	X		▷	4400	0004	0015
5	OD	3110	3120	3108			X				
6	ID	3112	3122	3132	0025	X		▷	4400	0004	0015
5	OD	3110	3120	3108			X				
3	ID	3118	3125	3135	0027		X				
5	OD	3110	3120	3108			X				
(A)	ID	8125	8130	8140	0015	X		▷	9400	0006	0020
(B)	OD	8127	8137	8117			X				
(B)	ID	3737	3752	3760	0029	▷		CAD	0008		
(C)	OD	3733	3742	3731			X				

▷ AL BRONZE CADMIUM PLATED
 ▷ REPLACE WITH OVERSIZE BUSHING
 ▷ CAD PLATE INSIDE DIAMETER OR REPLACE BUSHING
 ▷ OVERSIZE BOLT PER BAC 5009

▷ BOLT
 ▷ BRACKET
 ▷ CRANK
 ▷ ROD END
 ▷ BUSHING

▷ DOOR
 ▷ SPHERICAL BEARING



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INDEX NO	DIM.	DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
		DIAMETER		MAX WEAR DIM	MAX DIAM. CLEAR-ANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTERFERENCE	
		MIN	MAX			YES	NO	MTL		MIN	MAX
(D)	ID	.3737	.3752	.3760	.0029	X		▷	5100	.0004	0016
(C)	OD	.3733	.3742	.3731			X				
(E)	ID	.3745	.3760	.3770	0039		X				
(C)	OD	.3733	.3742	.3731			X				
(F)	ID	.5615	.5625	.5630	.0050		X				
(E)	OD	.5585	.5605	.5580			X				
(G)	ID	.6875	.6880	.6890	.0015	▷		sintered bronze	8200	.0005	0023
(F)	OD	.6885	.6895	.6875							
4	ID	.3112	.3122	.3132	0024	X		▷	.4400	.0004	0015
5	OD	.3110	.3120	.3108			X				
6	ID	.3120	.3140	.3150	0042		X				
7	OD	.3110	.3120	.3108			X				
8	ID	.3120	.3125	.3135	0027		X				
9	OD	.3110	.3120	.3108			X				
10	ID	.3112	.3122	.3132	.0024	X		▷	.4400	.0004	0015
11	OD	.3110	.3120	.3108			X				
12	ID	.3745	.3765	.3770	.0037		X				
13	OD	.3735	.3745	.3733			X				
14	ID	.3737	.3752	.3762	.0029	X		▷	.5200	0004	.0015
15	OD	.3735	.3745	.3733			X				
16	ID	.3112	.3122	.3132	.0024	X		▷	.4400	.0004	0015
17	OD	.3110	.3120	.3108			X				

Main Gear Shock Strut Door Allowance Wear and Rework

Figure 205 (Sheet 3)

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INDEX NO	DIM	DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
		DIAMETER		MAX WEAR DIM	MAX DIAM. CLEAR-ANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE	
		MIN	MAX			YES	NO	MTL		MIN	MAX
8	ID	3120	3135	3145	0037		X				
	OD	3110	.3120	3108			X				
	ID	5010	5020	5030	0080		X				
	OD	.4960	4980	4950			X				
	ID	.6871	6877	.6887	0007	▷		sintered bronze	.8200	0006	0021
	OD	.6890	6900	6880			X				
9	ID	3112	3122	3132	0024	X		▷	.4400	.0004	0015
	OD	3110	3120	3108			X				
	ID	3120	3140	.3145	0037		X				
	OD	3110	3120	.3108			X				
	ID	3120	.3130	3140	0032	X		▷			
	OD	.3110	3120	3108			X				
10	ID	3120	3140	3145	.0037		X				
	OD	.3110	.3120	3108			X				
	ID	.3120	3130	.3140	0032	X		▷	.4400	.0004	0015
	OD	3110	.3120	3108			X				
	ID	3120	3140	.3145	.0037		X				
	OD	3110	3120	3108			X				
11	ID	6870	.6875	.6880	0015		X				
	OD	6870	6875	6865			X				

Main Gear Shock Strut Door Allowable Wear and Rework
Figure 205 (Sheet 4)

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		DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
INDEX NO.	DIM.	DIAMETER		MAX. WEAR DIM.	MAX. DIAM. CLEAR-ANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE	
		MIN.	MAX.			YES	NO	MTL.		MIN	MAX.
12	ID	.4373	.4379	.4389	.0018	2		1	5200	.0004	.0016
	OD	.4381	.4386	.4371			X				
	ID	.3125	.3140	.3150	.0042		X				
	OD	.3110	.3120	.3108			X				
	ID	.3120	.3140	.3145	.0037		X				
	OD	.3110	.3120	.3108			X				
13	ID	.750	.751	.7530	.0020	2		sintered bronze	.8130	.0006	.0023
	OD	.752	.753	.7510			X				
	ID	.6265	.6275	.6280	.0075		X				
	OD	.6210	.6230	.6205			X				
	ID	.4370	.4385	.4395	.0037		X				
	OD	.4360	.4370	.4358			X				
	ID	.3737	.3752	.3762	.0029	X		1	.5200	.0004	.0016
	OD	.3735	.3745	.3733		2		2			
	ID	.3737	.3752	.3762	.0029	X		1	5200	.0004	.0016
	OD	.3735	.3745	.3733		2		2			
14	ID	.3737	.3752	.3762	.0032	X		1	5200	.0004	.0016
	OD	.3735	.3745	.3730		2		2			

- 1 AL BRONZE CADMIUM PLATED
- 2 REPLACE WITH OVERSIZE BUSHING
- 3 CAD PLATE INSIDE DIAMETER OR REPLACE BUSHING
- 4 OVERSIZE BOLT PER BAC 5009

- 5 BOLT
- 6 BRACKET
- 7 CRANK
- 8 ROD END
- 9 BUSHING
- 10 DOOR
- 11 SPHERICAL BEARING

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		DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
INDEX NO	DIM	DIAMETER		MAX WEAR DIM	MAX DIAM. CLEAR-ANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP MAX	BUSHING INTERFERENCE	
		MIN	MAX			YES	NO	MTL.		MIN	MAX
15(A)	ID	.181	.185	.195	.020				.213		
(B)	OD	.178	.180	.175		X					
16(A)	ID	.133	.138			X				.0003	.0012
(B)	OD	.128	.130								

 .165 FOR ONE-EIGHTH OF HINGE LENGTH FROM EACH END;
.155 FOR CENTER THREE-FOURTH OF HINGE LENGTH.

 .120 FOR ONE-EIGHTH OF HINGE LENGTH FROM EACH END,
.125 FOR CENTER THREE-FOURTH OF HINGE LENGTH.

 .045 FOR ONE-EIGHTH OF HINGE LENGTH FROM EACH END,
.030 FOR CENTER THREE-FOURTH OF HINGE LENGTH.

 BUSHING WALL THICKNESS NOT TO EXCEED .05. MATERIAL: AL-NI-BRONZE
(CADMIUM PLATE OD) OR 7075-T6.

 FS302CRS .2070 DIAMETER WIRE PER QQ-W-423, FORM I, COND. B.

MAIN GEAR ACTUATOR WALKING BEAM - MAINTENANCE PRACTICES

1 Removal/Installation Main Gear Actuator Walking Beam

A Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent
- (3) Grease - MIL-G-21164

B. Prepare for Replacement

- (1) Check that landing gear ground downlocks are installed and that wheel well doors are open with release handle down and latched
- (2) Depressurize the hydraulic system.

C. Remove Main Gear Actuator Walking Beam

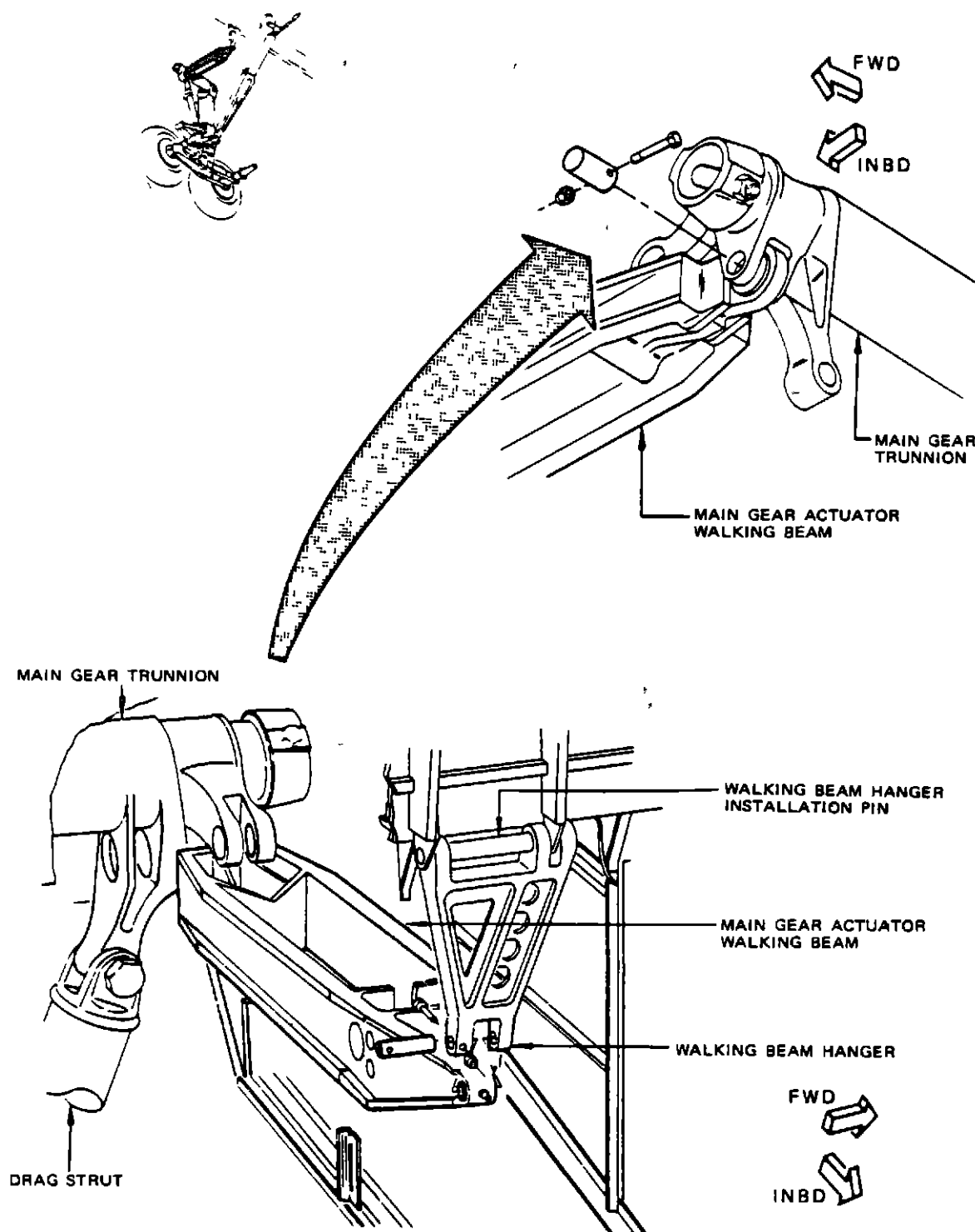
- (1) Remove lockbolt and pin attaching inboard end of walking beam (figure 201) to beam hanger.
- (2) Lower the beam to rest on the wing panel.
- (3) The beam hanger may be removed by removing lockbolt and installation pin
- (4) Remove the main gear actuator, see Remove Main Gear Actuator, 32-2-131, but do not disconnect the hydraulic lines. Place the actuator on the structure forward of the walking beam
- (5) Remove lockbolt and pin attaching outboard end of the actuator beam to the trunnion.
- (6) Raise and remove the walking beam.

D. Install Main Gear Actuating Walking Beam

- (1) Place a walking beam (figure 201) in position so that the outboard end of the walking beam aligns with the lower arm on the trunnion
- (2) Insert attaching pin and lockbolt.

NOTE All attaching pins or bolts must be cleaned and lightly lubricated with grease before installation

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- (3) Align the inboard end of the actuator with the attachment point on the walking beam. Install attaching bolt, nut and lock bolt.
- (4) Align the outboard end of the actuator with the upper arm on the trunnion. Insert the attachment bolt, nut and lock bolt.
- (5) Place the walking beam hanger into position and insert attaching pin and lock bolt.

CAUTION: INSTALL A WALKING BEAM HANGER MODIFIED PER SAB 707/656 IF A MAIN ACTUATOR WALKING BEAM IS EQUIPPED WITH A REINFORCEMENT STRAP.

- (6) Raise inboard end of the actuator walking beam to align with the hanger, install attaching pin and lock bolt.
- (7) Lubricate the actuator and walking beam pivots. See " Unit Servicing Main Landing Gear," 32-22-0.

2. Inspection/Check Main Gear Actuator Walking Beam

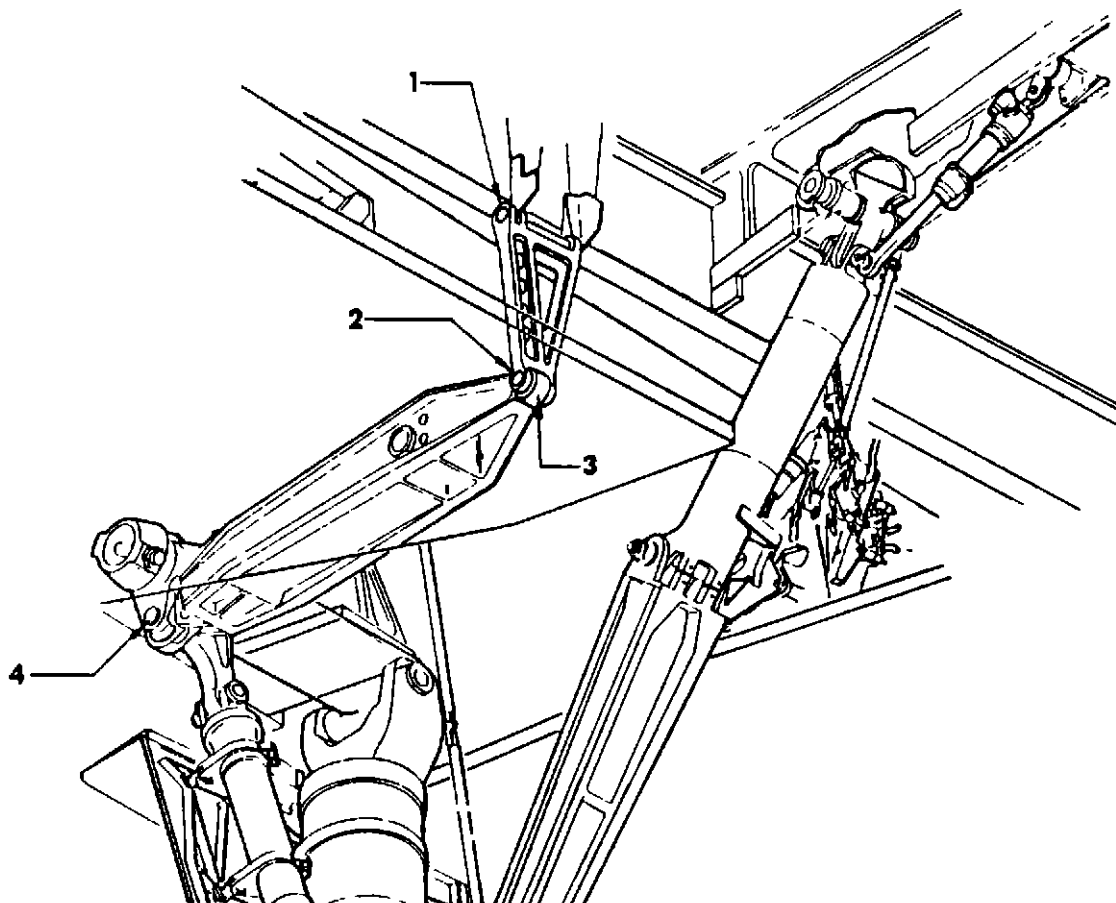
A. Equipment and Materials

- (1) Down Lock Assembly, Main Landing Gear - F71126-500 or equivalent.

B. Examine Main Gear Actuator Walking Beam

- (1) Check that landing gear external down locks are installed, and that wheel well doors are open, with release handle down and latched.
- (2) Check attachments of main gear actuator walking beam and hanger for security, locking devices, and for wear beyond specified limits as set out in figure 202.
- (3) Check beam for damage and corrosion.

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		DESIGN LIMITS		WEAR LIMITS		REWORK LIMITS					
INDEX NO.	DIM	DIAMETER		MAX. WEAR DIM.	MAX. DIAM. CLEAR-ANCE	BUSHING OR PLATING PERMITTED			OVERSIZE HOLE OR PLATING BUILD-UP MAX.	BUSHING INTERFERENCE	
		MIN.	MAX.			YES	NO	MTL		MIN	MAX.
1	ID	1.000	1.002	1.005	0.012	X					
	OD	0.996	0.998	0.993		X		CHROME			
2	ID	1.000	1.002	1.005	0.012	X		BRONZE	1.182		
	OD	0.996	0.998	0.993		X		CHROME			
3	ID	1.000	1.002	1.005	0.012	X					
	OD	0.996	0.998	0.993		X		CHROME			
4	ID	2.3616	2.3622	2.3652	0.0092		X				
	OD	2.3590	2.3605	2.3560		X		CHROME			

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MAIN GEAR ACTUATOR - MAINTANANCE PRACTICES

1 Removal/Installation Main Gear Actuator

A General

- (1) The main gear actuator is removed only if damaged or defective. For removal clearance the walking beam inboard end must be disconnected and lowered.

B. Equipment and Materials

- (1) Lock Assembly - Down, Main Landing Gear, F71126-500 or equivalent
- (2) Lock Assembly - Down, Nose Landing Gear, F70008-500 or equivalent
- (3) Grease, see chapter 32-22-0.

C Prepare for Replacement

- (1) Check that landing gear ground downlocks are installed, and that wheel well doors are open, with release handle down and latched.
- (2) Depressurize the hydraulic system and the utility system reservoir

D Remove Main Gear Actuator

- (1) Disconnect hydraulic lines (1 and 6, figure 201) that are attached to upper side of actuator. Plug or cap hydraulic lines and actuator ports.
- (2) Remove lock bolts and pin attaching the inboard end of walking beam (2) to hanger (4). Lower beam to rest on lower wing panel
- (3) Remove the lock bolt and nut and bolt (7) attaching inboard end of actuator (3) to walking beam.
- (4) Remove lock bolt and nut and bolt (8) attaching the outboard end of the actuator to upper arm on trunnion (9).

CAUTION WHEN THE OUTBOARD END OF ACTUATOR IS DETACHED THE CENTER BALL OF THE ACTUATOR BEARING CAN TWIST UNTIL BEARING ROLLERS DROP OUT. TO PREVENT LOSS OF ROLLERS, INSERT THE ATTACHMENT BOLT THROUGH THE CENTER BALL AND SECURE WITH NUT WHENEVER THE ACTUATOR IS RELEASED FROM TRUNNION.

- (5) Remove the actuator, remove elbow fittings and discard O-rings. Plug actuator ports.

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E. Install Main Gear Actuator

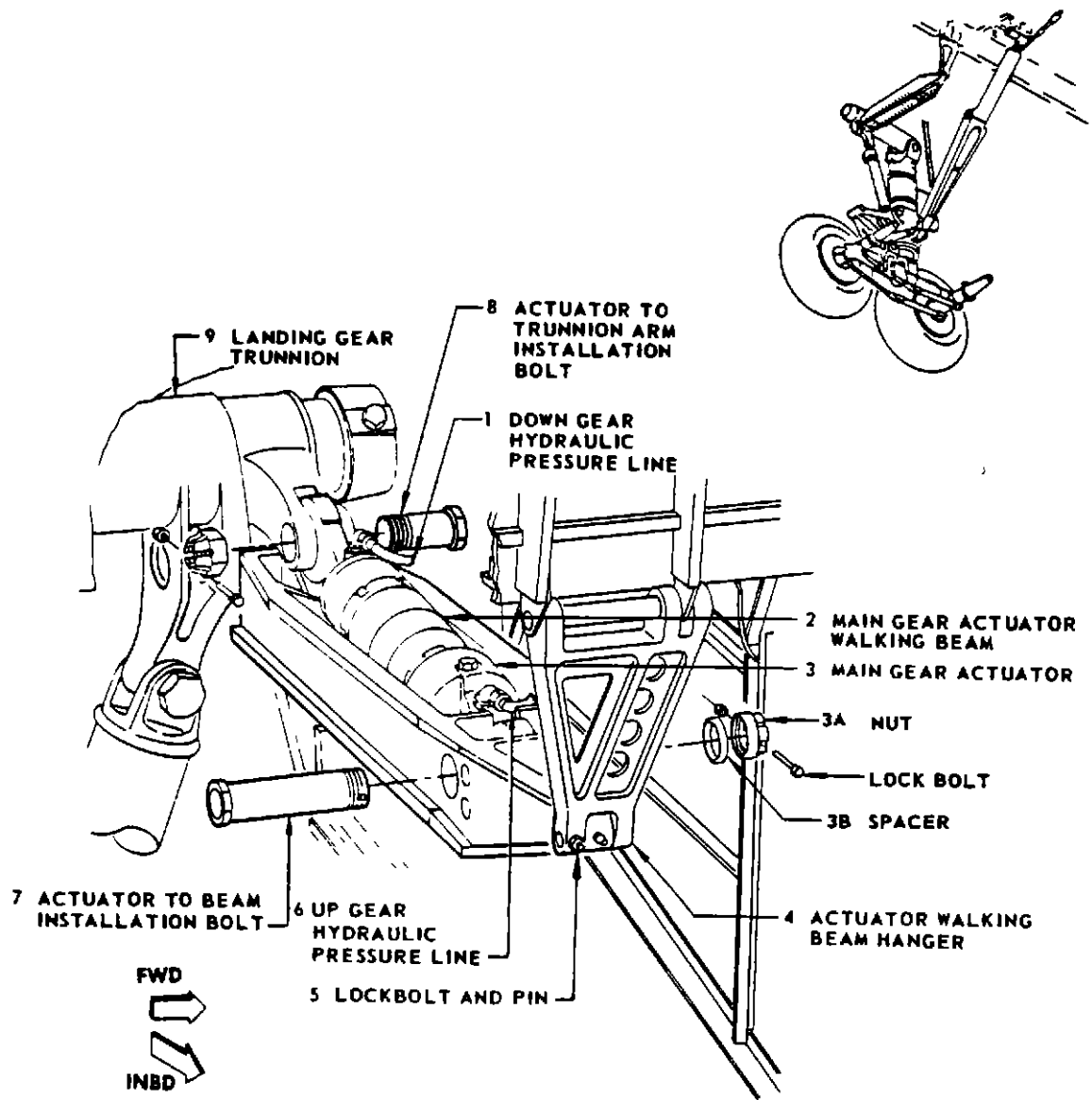
- (1) Install elbow fittings with new O-rings in an actuator (3, figure 201).
- (2) Place actuator with piston rod outboard to align with upper arm on trunnion (9). Insert attaching bolt (8) and add washer and nut. Tighten nut to 300 pound-inches torque. Loosen nut then retighten finger tight to align first slot in nut with lock bolt hole. Add lockbolt.

CAUTION: CARE MUST BE TAKEN TO AVOID EXCESSIVE TWISTING OF THE BEARING CENTER BALL WHEN CONNECTING THE OUTBOARD END OF ACTUATOR. EXCESSIVE TWISTING MAY RESULT IN LOSS OF BEARING ROLLERS.

NOTE. All attachment bolts and pins must be cleaned and lightly lubricated with grease before installation.

- (3) Align actuator inboard end with attaching point on walking beam (2). Insert the attaching bolt (7) and grease following 32-2-0 and add spacer (3B) and nut (3A). Torque nut and add lockbolt as in step (2).
- (4) Connect down gear hydraulic pressure line (1) to the actuator outboard elbow, and the up gear hydraulic pressure line (6) to the actuator inboard elbow.
- (5) Raise the inboard end of the walking beam to align with the hanger (4). Install attaching pin and lockbolt (5).
- (6) Lubricate the pivot points of the main gear actuator and walking beam. See "Unit Servicing Main Landing Gear" 32-22-0
- (7) Perform operation test of the landing gear. See "Adjustment Test Landing Gear" 32-1-0.

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Main Gear Actuator Installation
 Figure 201

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MAIN GEAR SIDE STRUT ACTUATOR - REMOVAL/INSTALLATION

1. Equipment and Materials

- A. Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- B. Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent

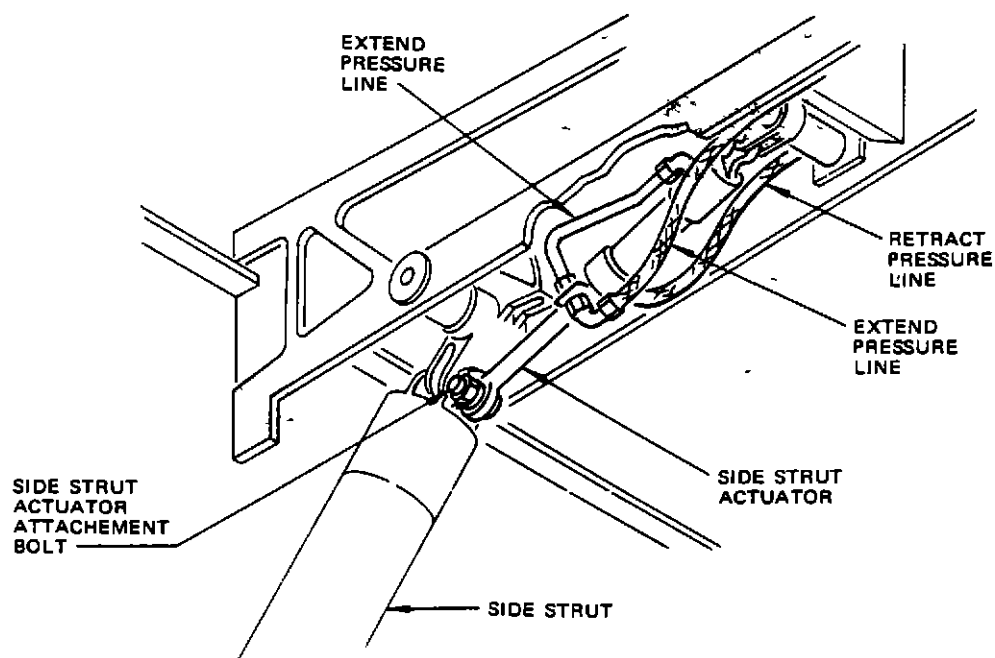
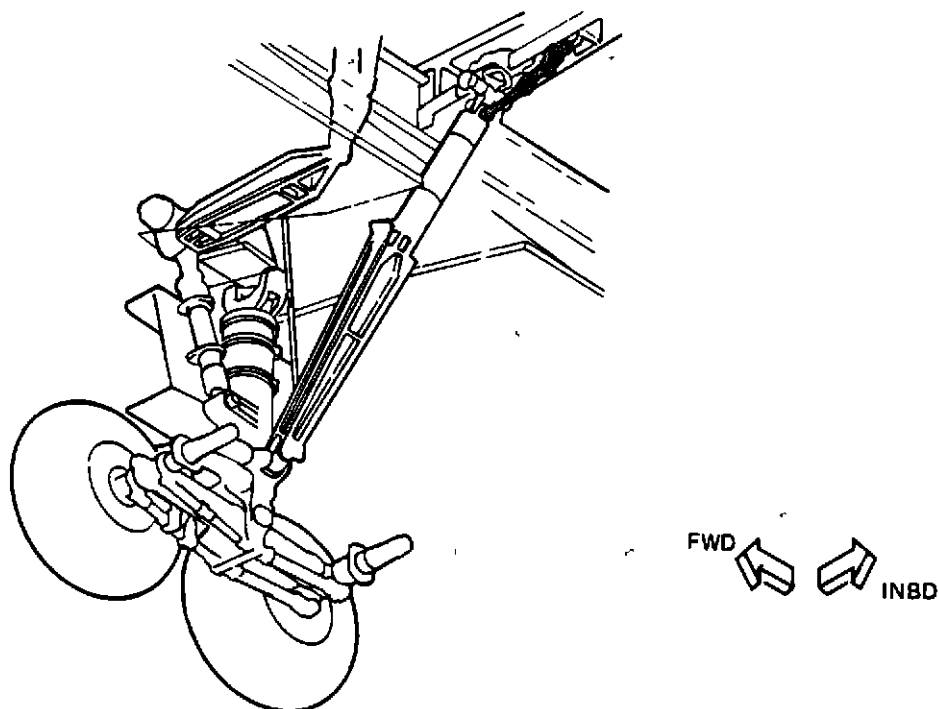
2. Remove Main Gear Side Strut Actuator

- A. Check that landing gear ground downlocks are installed and that wheel well doors are open with release handle down and latched.
- B. Depressurize hydraulic system.
- C. Disconnect hydraulic lines (figure 401) from side strut actuator. Plug or cap lines and actuator elbows
- D. Remove attachment bolt at actuator cylinder end.
- E. Support actuator and detach rod end from side strut attachment bolt
- F. Remove actuator, remove elbow fittings, discard O-rings, and plug actuator ports.

3. Install Main Gear Side Strut Actuator

- A. Install elbow fittings with new O-rings in a side strut actuator (figure 401).
- B. Attach piston rod end of actuator to the bolt attaching side strut to upper universal.
- C. Turn cylinder ~~portion~~ of actuator until elbow at piston rod end is facing aft.
- D. Connect extend pressure lines
- E. Connect retract pressure line to piston rod end of actuator.
- F. Raise actuator and align cylinder end with support fittings between floor beams. Install attachment bolt.
- G. Perform an operation test of the landing gear. Refer to 32-1-0, Landing Gear and Door Control System - Adjustment/Test.

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Main Gear Side Strut Actuator Installation

Figure 401

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MAIN GEAR LOCK MECHANISM - MAINTENANCE PRACTICES

1 Removal/Installation - Main Gear Lock Mechanism

A General

- (1) Complete removal of the main gear lock mechanism is extremely unlikely. This instruction describes the complete removal and installation of the lock mechanism. When only part removal is required, find and follow the directions for the appropriate steps.

B. Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent

C. Prepare for Replacement

- (1) Check that landing gear ground downlocks are installed, and that wheel well doors are open with release handle down and latched.
- (2) Extend flaps to full down position
- (3) Depressurize hydraulic system and shut off electrical power
- (4) Jack airplane until weight is supported on jacks. Refer to Airplane Jacking, Chapter 7

NOTE During all maintenance on main gear lock mechanism, note installation of washers for correct replacement.

D. Remove Main Gear Lock Mechanism

- (1) Disconnect link (12, figure 201) from hook assembly (11) and lock crank (14).
- (2) Disconnect and remove lock bungee (13) from hook assembly and lock crank.
- (3) Remove external downlock from side strut of gear from which the hook assembly is to be removed.
- (4) Pull side strut over center until hook clears lock roller. Disconnect side strut lower universal and allow side strut to hang vertically from upper attachment.



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- (5) Remove hook assembly by removing cotter pin, nut and washer from aft end of shaft and pulling assembly forward.

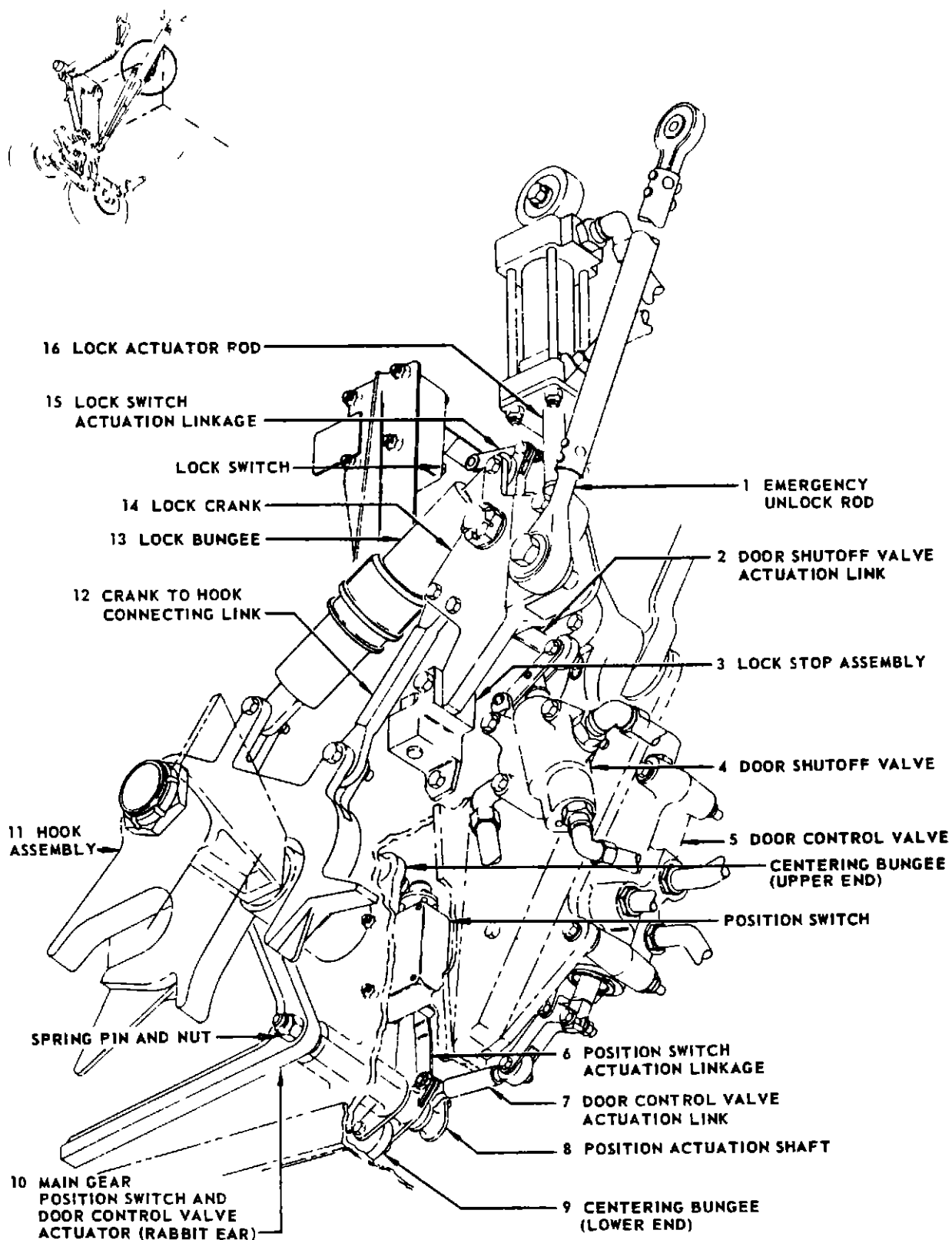
NOTE: The hook plate alone may be removed by removing cotter pin and nut at hook shaft forward end, and removing the nut and lock bolt which attaches the hook plate to the shaft

- (6) Disconnect the emergency unlock rod (1) from the lock crank. Allow the rod to hang from the upper hinge point, or disconnect upper point and remove the rod
 - (7) Disconnect lock actuator rod (16) from lock crank (14).
 - (8) Disconnect door shutoff valve actuation link (2) from door shutoff valve (4).
 - (9) Detach door control valve actuation link (7) from position actuation shaft (8).
 - (10) Disconnect main landing gear position switch actuation linkage (6) from actuation shaft.
 - (11) Disconnect centering bungee (9) from actuation shaft and structure. Remove bungee.
 - (12) Remove nut and indexing spring pin from end of actuation shaft. Remove the shaft aftward.
- NOTE:** Support the "Rabbit-ear" crank (10) which will drop free when actuation shaft is removed.
- (13) Disconnect lock switch actuation linkage (15) from lock crank (14) and remove lock switch.
 - (14) Remove cotter pin, washer and nut from forward side of lock crank. Pull off lock crank.
 - (15) The lock stop assembly (3) may be removed by removing two installation bolts.

E. Install Main Gear Lock Mechanism

- (1) Install a lock stop assembly (3, figure 201).
- (2) Place lock crank (14) in place, add washer and nut. Torque nut with a wrench to solid height, loosen, then tighten finger tight and install a cotter pin.

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Main Gear Lock Mechanism Installation
 Figure 201
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- (3) With hook assembly (11) in place, add washer nut and cotter pin on installation bolt on aft side of the fillet flap bulkhead.

NOTE If hook plate alone was removed, place hook plate in place and align the hole in hook plate, with the hole in the installation bolt. Install internal-wrenching lock bolt, washer and nut, installation nut and cotter pin.

- (4) Install lock switch and attach linkage (15) to lock crank.
- (5) Attach lock bungee (13) between lock crank and hook assembly. The piston end of bungee attaches to the hook assembly.
- (6) Install link (12) between lock crank and hook assembly.
- (7) Insert actuation shaft (8) from aft side of bulkhead. Rotate shaft until door control valve actuation arm reaches a vertical position. Hold this position and place rabbit-ear crank on splined end of shaft. The rabbit-ear crank longer arm must be horizontal and pointing outboard. Install the spring pin and nut.
- (8) Install centering bungee (9) and attach bungee to the outboard arm of position actuation shaft (8).
- (9) Attach position switch linkage (6) to actuation shaft.
- (10) Lubricate door control valve actuation link (7) with grease, two places and attach link to actuation shaft.
- (11) Attach door shutoff valve actuation link (2) to lock crank (14).
- (12) Attach lock actuator rod (16) to the lock crank.
- (13) Attach emergency unlock rod (1) to the unlock arm on the aft end of the emergency extension control shaft in floor beams above.
- (14) Perform an operation test of the landing gear. See Adjustment/Test Main Landing Gear, 32-1-0.

2 Inspection/Check Main Gear Lock Mechanism

A. Examine Main Gear Lock Mechanism

- (1) Check emergency lock rod for loose terminal bolts.
- (2) Check lock actuating cylinder for loose mounting bolts, and port fittings and connections for leaks.
- (3) Check door shutoff valve and control valve for loose mounting bolts. Check port fittings and connections for leaks. Examine valve linkage for loose bolts and corrosion.

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- (4) Check position bungee for loose attaching bolts
- (5) Check rabbit ear actuator arm and crank-to-hook connecting link, for loose bolts and corrosion.
- (6) Check the lock bungee for loose mounting bolts, and the cylinder for dirt, grease, and clogged drain holes
- (7) Check the lock switch and position switch for loose mounting bolts. Check electrical connections for broken or missing lock wire. Examine actuation linkages for free movement and loose attaching bolts.
- (8) Check that main gear down and locked markings for clarity and the inspection windows for dirt, cracks, crazing and discoloration



MAINTENANCE MANUAL

MAIN GEAR LOCK ACTUATOR - MAINTENANCE PRACTICES

1 Removal/Installation Main Gear Lock Actuator

A Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent

B. Prepare to Replace

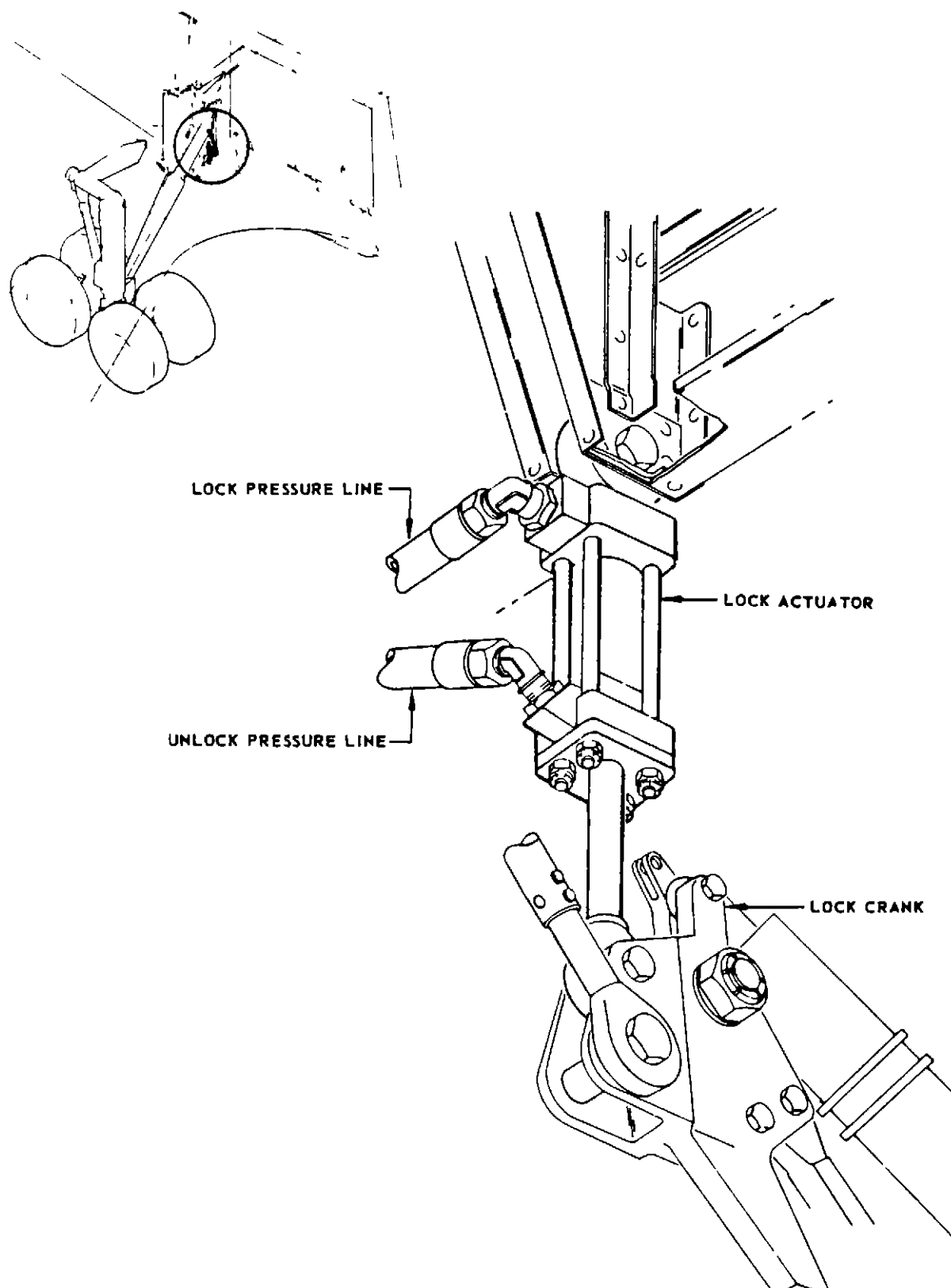
- (1) Check that landing gear ground downlocks are installed, and that wheel well doors are open with release handle down and latched
- (2) Depressurize hydraulic system and shut off electrical power

C. Remove Main Gear Lock Actuator

- (1) Disconnect two hydraulic lines (figure 201) from lock actuator
Plug or cap lines and ports
- (2) Disconnect actuator at upper and lower attachment points and remove actuator
- (3) Remove elbow fittings from actuator and discard O-rings

D Install Main Gear Lock Actuator

- (1) Install elbow fittings with new O-rings in a main gear lock actuator
- (2) Place actuator in position with cylinder end terminal in alignment with attaching point in overhead structure. Install attaching bolt.
- (3) With piston rod terminal in alignment with attaching point in lock crank, install attachment bolt
- (4) Tighten nuts on attaching bolts with a wrench, loosen, then tighten finger-tight and install cotter pins
- (5) Remove caps and plugs and connect unlock pressure line to piston end of actuator.
- (6) Connect lock pressure line to cylinder end of actuator.
- (7) Perform an operation test of the landing gear Refer to 32-1-0, Landing Gear and Door Control System - Adjustment/Test



Main Gear Lock Actuator Installation

Figure 201

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MAIN LANDING GEAR WHEEL WELL DOORS - DESCRIPTION AND OPERATION

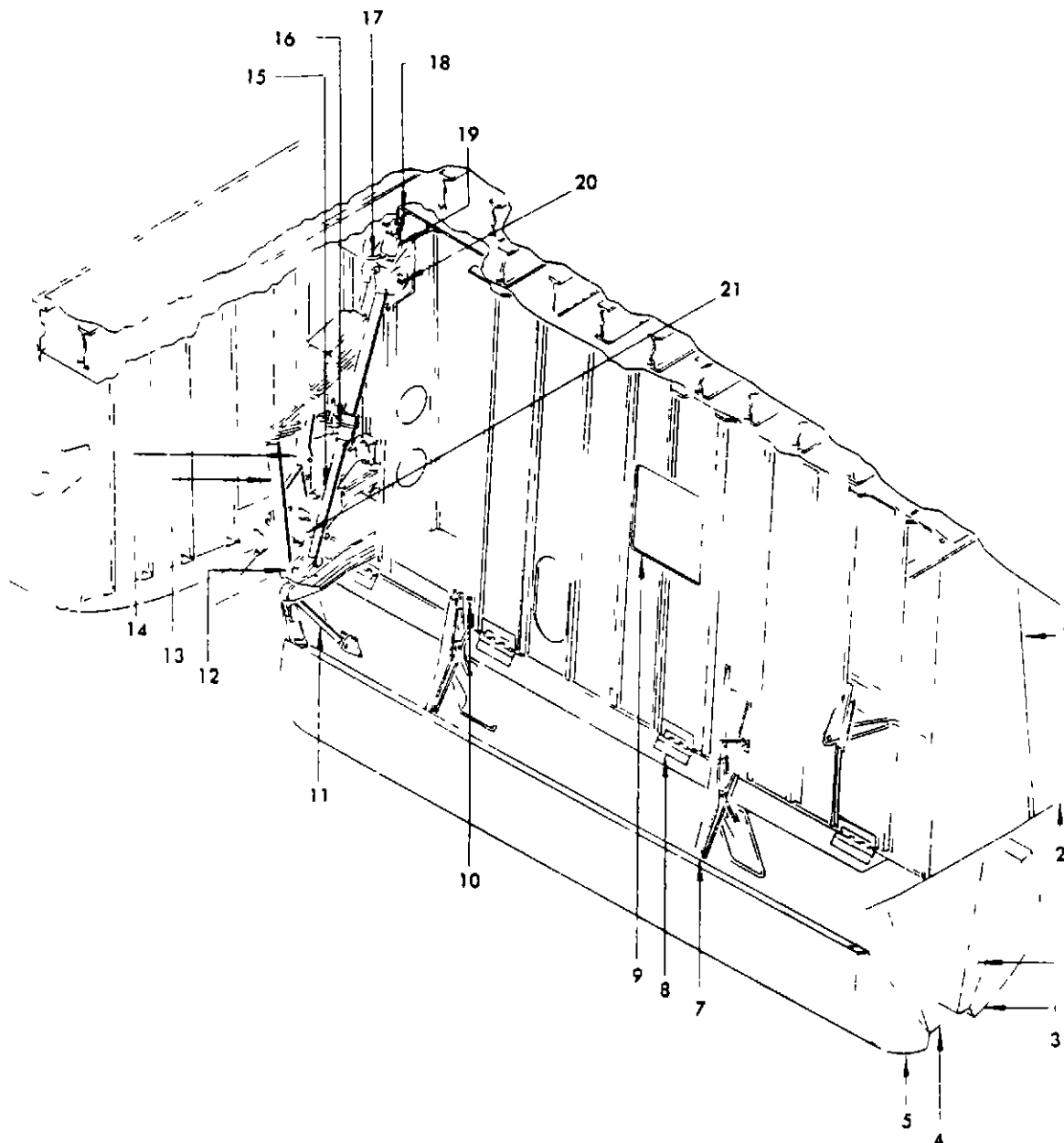
1. General

- A. The main landing gear wheel well doors fair over the fuselage wheel well opening when the landing gear is locked up or down. Doors are normally operated by a hydraulic actuator. The actuator receives hydraulic pressure from a door control valve, which is controlled by landing gear position. A mechanical lock in the hydraulic actuator locks the doors when closed. A shutoff valve positioned by the main gear lock mechanism provides a hydraulic block to prevent doors from closing during landing gear transit. The doors may be opened manually for ground maintenance in wheel well area, or for emergency landing gear extension. Doors are closed by hydraulic actuator only.
- B. When the landing gear control handle is moved to "UP" for landing gear retraction, wheel well doors open. This operates the landing gear control sequence valve to direct hydraulic pressure to retract main landing gear. When main gear are retracted, a door control valve directs pressure to close the wheel well doors. On landing gear "DOWN" selection, the same sequence operates to extend landing gear and close doors

2. Main Gear Wheel Well Doors

- A. The main gear door (figure 1) consists of two units, an inboard and an outboard door half. The inboard half is attached to the lower edge of the keel beam by four hinges. The outboard half is hinged on the outer edge of the inboard half by three hinges. Each door consists of a frame with skin paneling on inner and outer sides. The forward end of the inboard door half has a fitting to which a rod from an actuator beam is attached to operate the doors. On all SABENA airplanes, only the forward end of the outboard door is connected to structure by a radius rod. The radius rods support the outer door half and guide the door to fair with fuselage structure on closure. Two door guards are attached to the inside of the inboard door half in line with main gear wheels to prevent tires from hanging up on a door not fully opened. Rubber seal strips around door and along hinge lines seal the wheel well when doors are closed.

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1 KEEL BEAM	11 DOOR LINKAGE ROD
2 RIGHT WHEEL WELL	12 DOOR ACTUATION BEAM
3 RIGHT GEAR WHEEL WELL DOOR	13 OUTBOARD DOOR FORWARD RADIUS SUPPORT ROD
4 LEFT GEAR WHEEL WELL INBOARD DOOR	14 LEFT MAIN GEAR SEQUENCE VALVE LINKAGE
5 LEFT GEAR WHEEL WELL OUTBOARD DOOR	15 DOOR ACTUATOR
6 DOOR HINGE	16 DOOR CLOSE HYDRAULIC PRESSURE LINE
7 DOOR HINGE (4 PLACES)	17 HYDRAULIC RETURN LINE
8 DOOR HINGE (4 PLACES)	18 DOOR RELEASE CABLE
9 METALCAL SHOCK STRUT INFLATION CHART	19 DOOR ACTUATOR LOCK SWITCH
10 DOOR GUARD LINKAGE	20 SUPPORT BUSHING DOOR ACTUATOR TRUNNION
	21 LEFT MAIN GEAR SEQUENCE VALVE

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Main Gear Wheel Well Doors
Figure 1



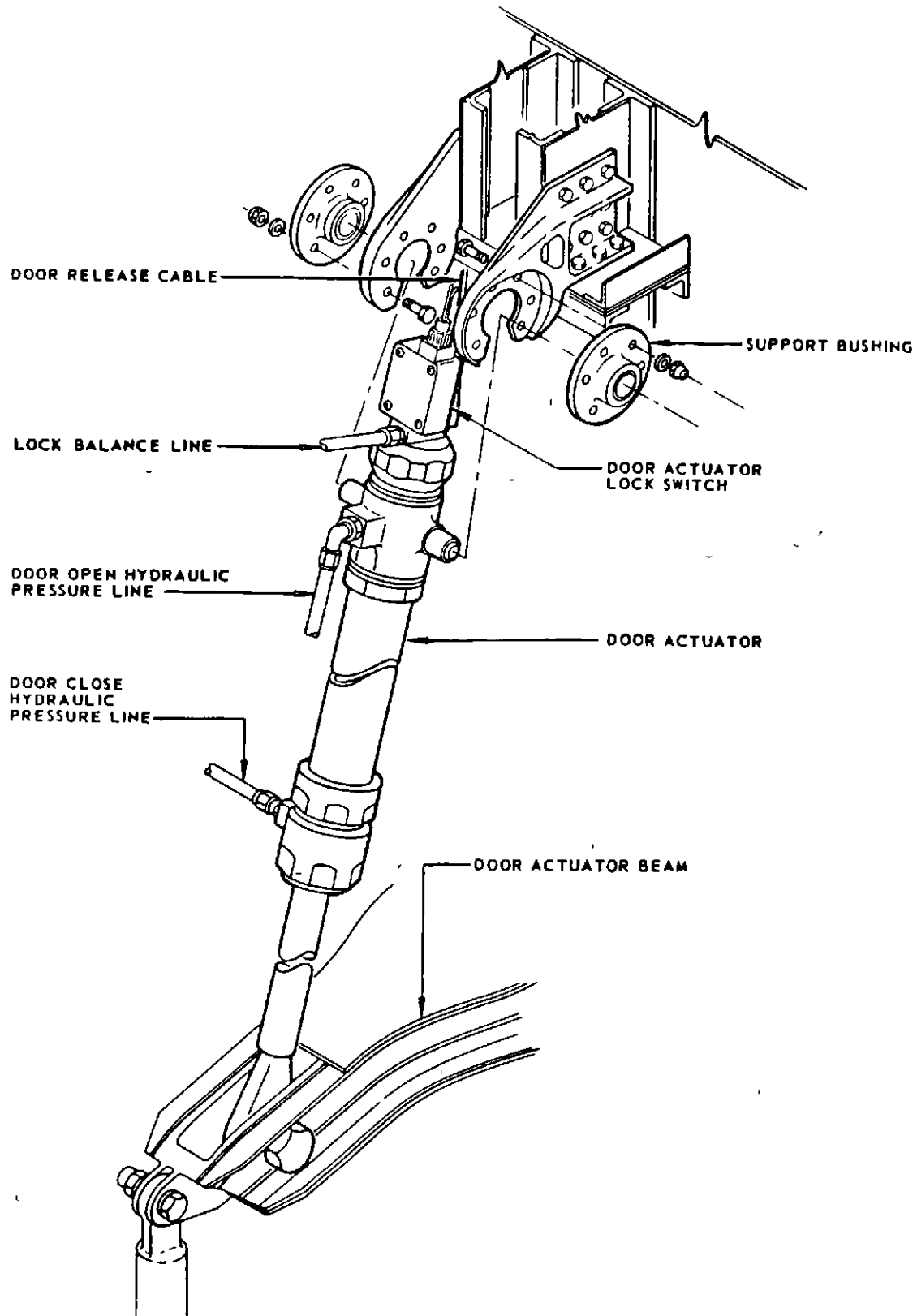
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3. Main Gear Wheel Well Doors Actuator Beam

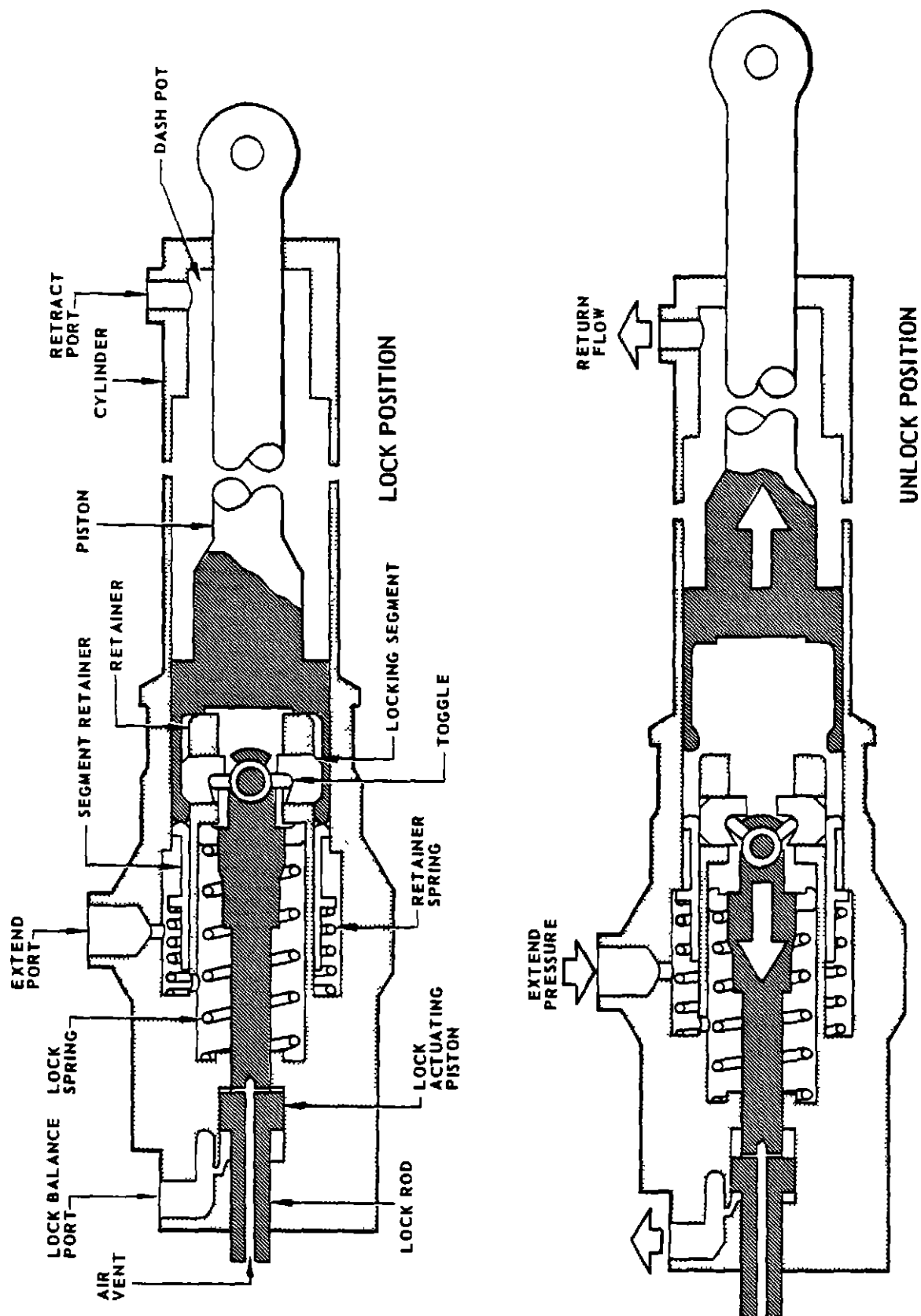
- A The main gear wheel well doors actuator beam (figure 1) is incorporated to transmit door actuator movement to operate the doors. The inboard end of the actuator beam is hinged to the keel beam. The actuator piston rod is attached near the outboard end of the beam. A rod is attached from the outboard end of the beam to a fitting on the inboard door half. As the door actuator retracts to close the doors, the beam is rotated upward about the hinge point and the door linkage rod pulls inboard half of door up to fair with body contour. The outboard door half being hinged to the inboard door and connected to structure by radius rod, is also raised to fair with body contour to completely close wheel well proper.
- B The beam hinge shaft extends forward and is rotated by the beam to actuate linkage attached to main gear sequence valve to reposition the valve. When doors are opened (beam down) the sequence valve is positioned to direct hydraulic pressure to unlock and extend or retract the main gear. When doors are closed, the sequence valve is repositioned to block hydraulic pressure to gear actuators and connect all gear actuator ports to hydraulic return.

4. Main Gear Wheel Well Doors Actuator

- A. The main gear wheel well doors are operated by a hydraulic piston type actuator (figure 2) located at the forward inboard end of each main wheel well. The cylinder end of the actuator is trunnion mounted to the upper side of keel beam web. The actuator rod end is attached to a jig located nonadjustable actuator beam pivoted on the keel beam. A mechanical lock at the cylinder end of the actuator locks doors in the closed position. The open or close cycle is completed in approximately 1 second with actuator bottoming at each end of actuation.
- B. The actuator lock mechanism (figure 3) consists of a lock rod extending out through the cylinder end of the actuator. The lock rod incorporates a pair of folding toggles on the inner end. The toggles actuate two diametrically opposed bronze lock segment blocks. The blocks are supported in broached holes in a steel retainer cylinder, and seat behind a flange on the end of the actuator piston rod. This locks the piston rod in the retracted position (doors closed). The lock rod is loaded towards locked position by a compression spring and a spring seat that is secured to the lock rod by a lockring. System pressure applied at the cylinder end of the actuator to open doors, forces the lock rod upward against the spring pressure. As the lock rod moves up, the toggles fold inward allowing the piston to push lock segment blocks inward to free actuator piston. As the actuator extends to open the doors, a spring-loaded retainer segment follows the piston. The retainer segment slides over the lock segment blocks. This keeps the blocks



LANDING GEAR
Main Landing Gear Wheel Well Doors
Description and Operation



Main Landing Gear Door Actuator Lock Mechanism

Figure 3

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pushed in for return of the piston on actuator retraction. As the actuator extends, displaced fluid returns to the hydraulic system through a restricted passage in the piston rod bearing. The restriction of displaced fluid provides a snubbing action to slow piston movement near the end of the stroke. With hydraulic pressure applied at the rod end of the actuator, the piston is retracted to close the doors. As the piston retracts it pushes the retainer segment back over the lock segment blocks. With the piston bottomed and the door closed, the spring loaded lock rod is pushed down. This causes toggles to expand, pushing lock segment blocks out to lock the actuator in the retracted position. A lock balance port at the cylinder end of the actuator prevents surge pressures in the hydraulic return line, to the cylinder end of the actuator from releasing the lock. The lock rod extension protruding through the cylinder end of the actuator is attached to the door release cable from the emergency extension system. The lock rod extension also operates a micro-switch for the door unlocked warning light.

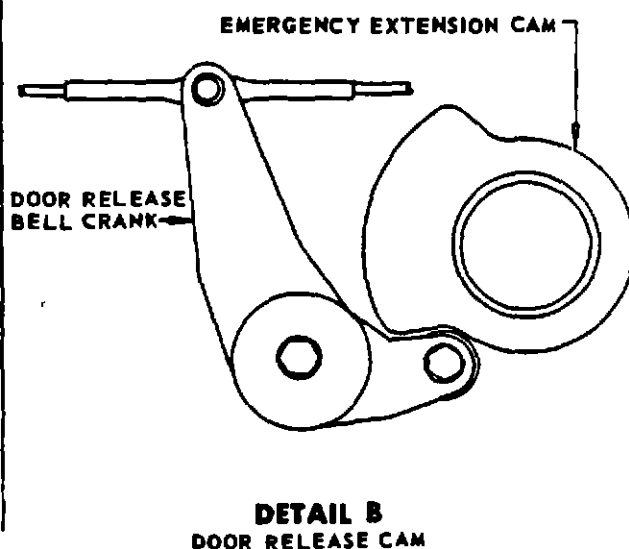
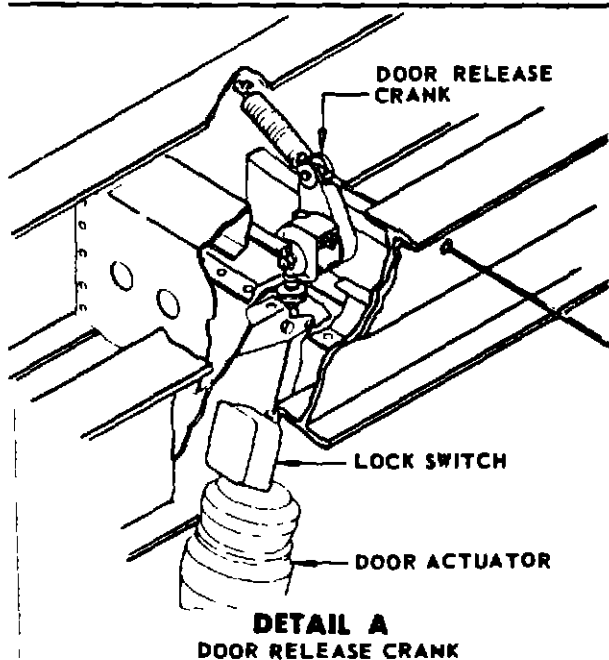
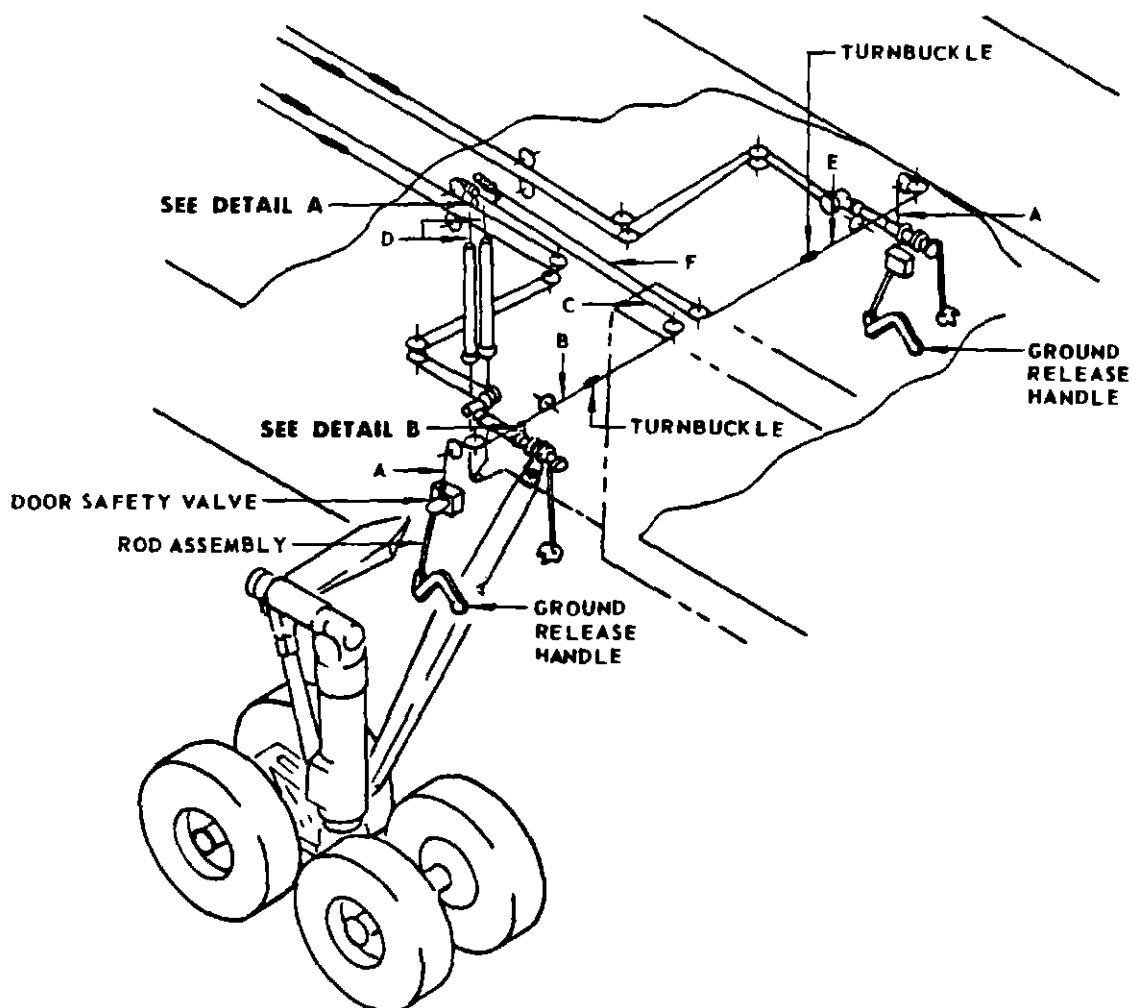
5 Main Gear Wheel Well Door Ground Release Mechanism

- A For ground maintenance access to the main gear wheel well area, main gear doors are opened by means of a rod and cable system (figure 4). The system mechanically releases a lock located in the upper end of the door actuator. The door release handle is located in the lower wing area just forward of the main gear side strut. Pulling down on the door release handle also positions a door safety valve to shut off hydraulic pressure to the door closed actuator port. The valve movement opens the same actuator port to return. As the door open actuator port is open to return through the main landing gear control valve, the actuator piston may be moved freely in the cylinder. With the door actuator lines connected to return through separate valves, operation of other hydraulic components is not effected.

WARNING THE HANDLE MUST BE LATCHED IN DOWN POSITION TO KEEP DOOR OPEN. STAND CLEAR OF DOOR ACTION PATH WHEN OPERATING RELEASE HANDLE. ALWAYS SEE THAT DOOR IS CLOSED AFTER RETURNING RELEASE HANDLE TO NORMAL. THIS REQUIRES UTILITY HYDRAULIC SYSTEM PRESSURE AND LANDING GEAR CONTROL HANDLE IN "DOWN" POSITION.

LANDING GEAR
Main Landing Gear Wheel Well Doors
Description And Operation

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Main Gear Wheel Well Door Release Mechanism
Figure 4
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- B A latch plate is secured to the release handle latch by two shear rivets (See figure 5.) If the gear is retracted with release handle down and latched, the shock strut doors will strike the handle and shear the rivets. When the rivets shear the release handle moves to up position so allowing the wheel well doors to close.
- C Downward motion of the door ground release handle is transferred through a cable system to the door release bellcrank and a crank assembly between main cabin floor and wheel well ceiling. A spring is fastened to the crank assembly to maintain tension on the door release cable. The crank assembly is connected to the door actuator lock rod by a short cable. From the crank assembly, motion through the cable pulls up on the door actuator lock rod to release a toggle lock inside door actuator. When toggle lock is released, the actuator piston rod is free to fall, permitting door to open.

6. Main Gear Wheel Well Door Ground Release Cable

- A. The main gear wheel well door ground release cable (figure 4) runs from the door safety valve to the mechanical lock in the door actuator. The cable is in four parts. The first part is attached to the door safety valve, goes up through the pressure seal, passes over two pulleys and is attached to the door release bell crank assembly. The second part runs inboard from the bell crank to a turnbuckle. The third part runs from the turnbuckle forward to the door release bell crank located over the door actuator. A short cable runs through a pressure seal between the bell crank and the actuator.

7. Main Gear Wheel Well Door Safety Valve

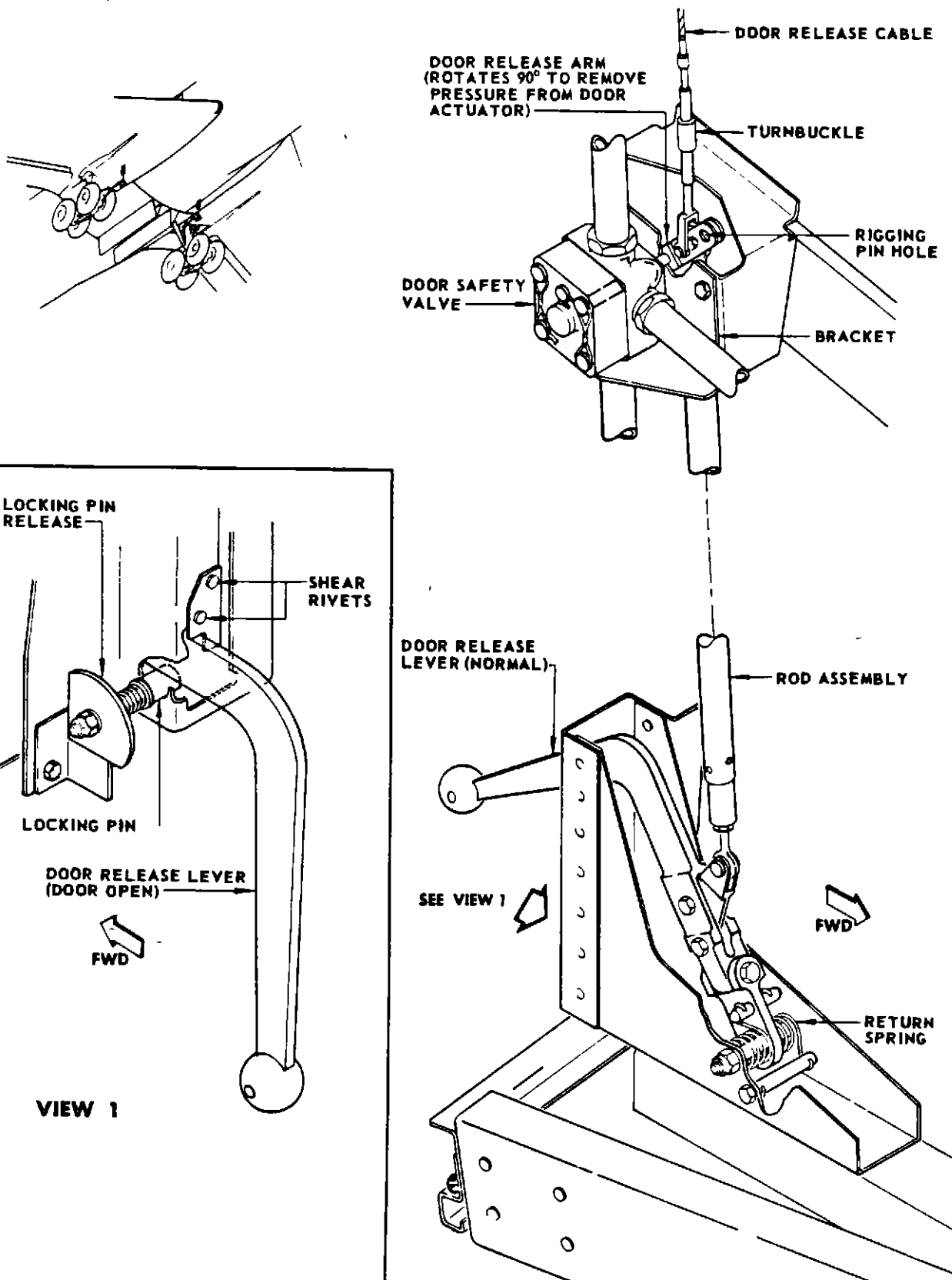
- A The main gear wheel well door safety valve, (figure 5) prevents inadvertant closing of doors during maintenance operations in the wheel well. The safety valve is operated through a linkage from the door ground release handle. When the handle is pulled down the valve is positioned to cut off door closed hydraulic pressure, and to open the door closed actuator port to return. If hydraulic pressure is directed to the door actuator by moving the landing gear control handle, pressure loss is prevented by the door safety valve and the piston in the fully extended actuator. Prevention of pressure loss permits full hydraulic operation of all other hydraulic components with the door control handle down and latched.

8. Operation - Main Gear Wheel Well Doors

- A. For operation of main gear wheel well doors see 32-1-0

LANDING GEAR
Main Landing Gear Wheel Well Doors
Description And Operation

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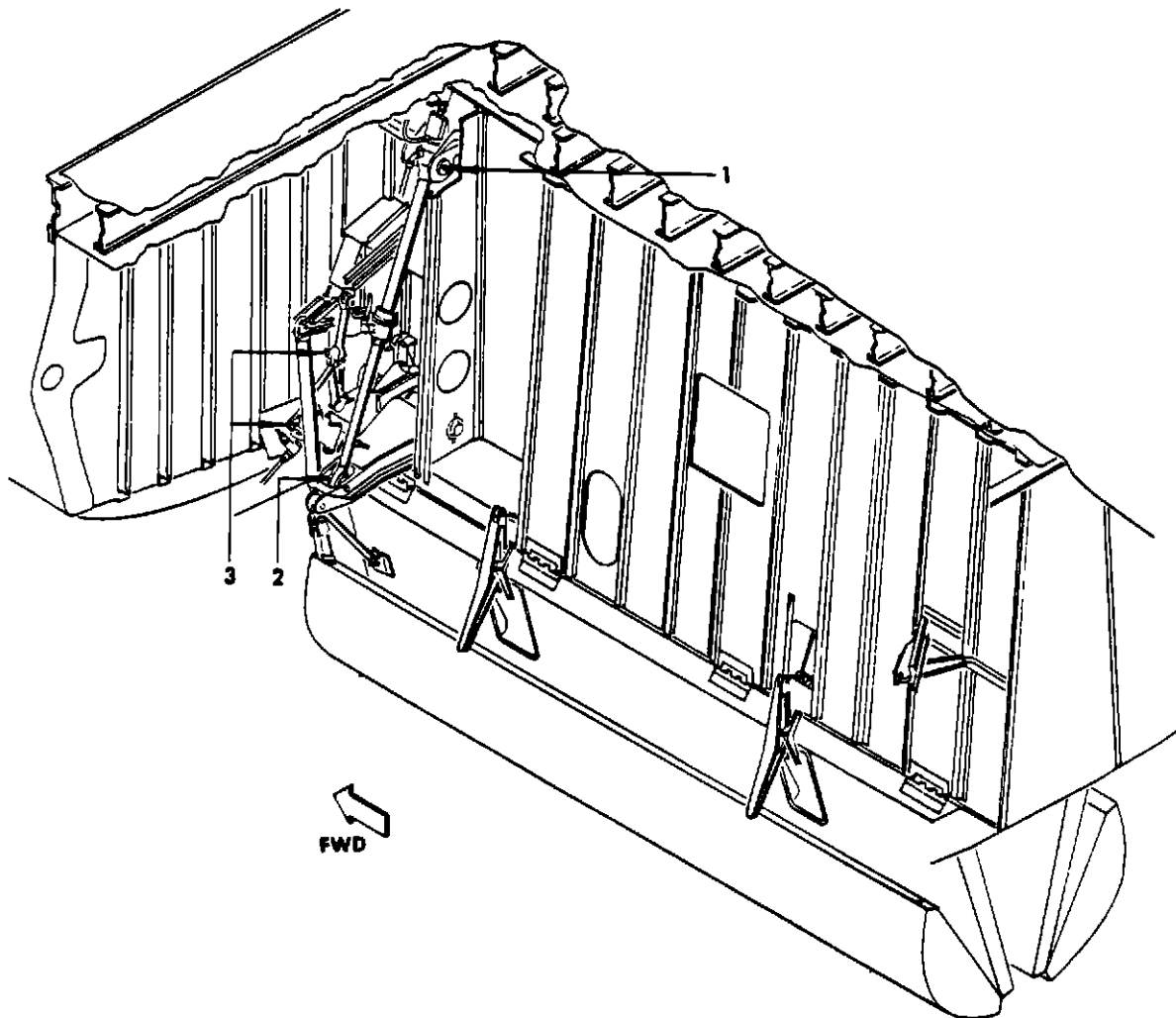
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MAIN GEAR WHEEL WELL DOORS - MAINTENANCE PRACTICES

1. Unit Servicing Main Gear Wheel Well Doors

A. Lubricate Main Gear Wheel Well Doors Per Figure 201

INDEX NO	ITEM TO BE LUBRICATED	INSTRUCTIONS
1	ACTUATOR SUPPORT	Apply Grease MIL-G-21164 Flush Fitting (2 places)
2.	ACTUATOR ASSEMBLY MAIN GEAR DOOR	Apply Grease MIL-G-21164 Flush Fitting (1 place)
3	SEQUENCE VALVE CONTROL ROD	Apply Grease MIL-G-21164 Flush Fitting (2 places)



SAB. 707/556

Main Gear Wheel Well Doors Lubrication

Figure 201

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MAIN GEAR WHEEL WELL DOORS - REMOVAL/INSTALLATION

1 Equipment and Materials

- A. Downlock Assembly - Main Landing Gear, F71126-500 or equivalent
- B. Downlock Assembly - Nose Landing Gear, F70008-500 or equivalent
- C. A low, padded, flat bed transportation dolly

2 Remove Main Gear Wheel Well Doors

- A. Check that landing gear ground downlocks are installed, and that wheel well doors are open with door release handle down and latched.
- E. Depressurize hydraulic system and shut off electrical power.
- C. Place a transportation dolly under wheel well doors (figure 401).
- D. Support outboard door (2) and disconnect outboard door radius support rods (3) at door attachment.
- E. Carefully lower outboard door to rest on transportation dolly.

NOTE Two men are required to lower the door

- F. If only outboard door is to be removed, disconnect hinges and bonding cable between inboard and outboard door and remove outboard door.
- G. Disconnect upper attachment and remove both radius rods.
- H. Disconnect door guard linkage (6) from the door guard (4) in two places.
- I. Remove attachment bolt and remove door guards.
- J. Disconnect door linkage rod (7) from inboard door (1).
- K. Support inboard door, disconnect static bonding cable and remove hinge pin from piano hinges at keel beam.
- L. Allow door to fold over and lay on outboard door. Remove wheel well doors from airplane

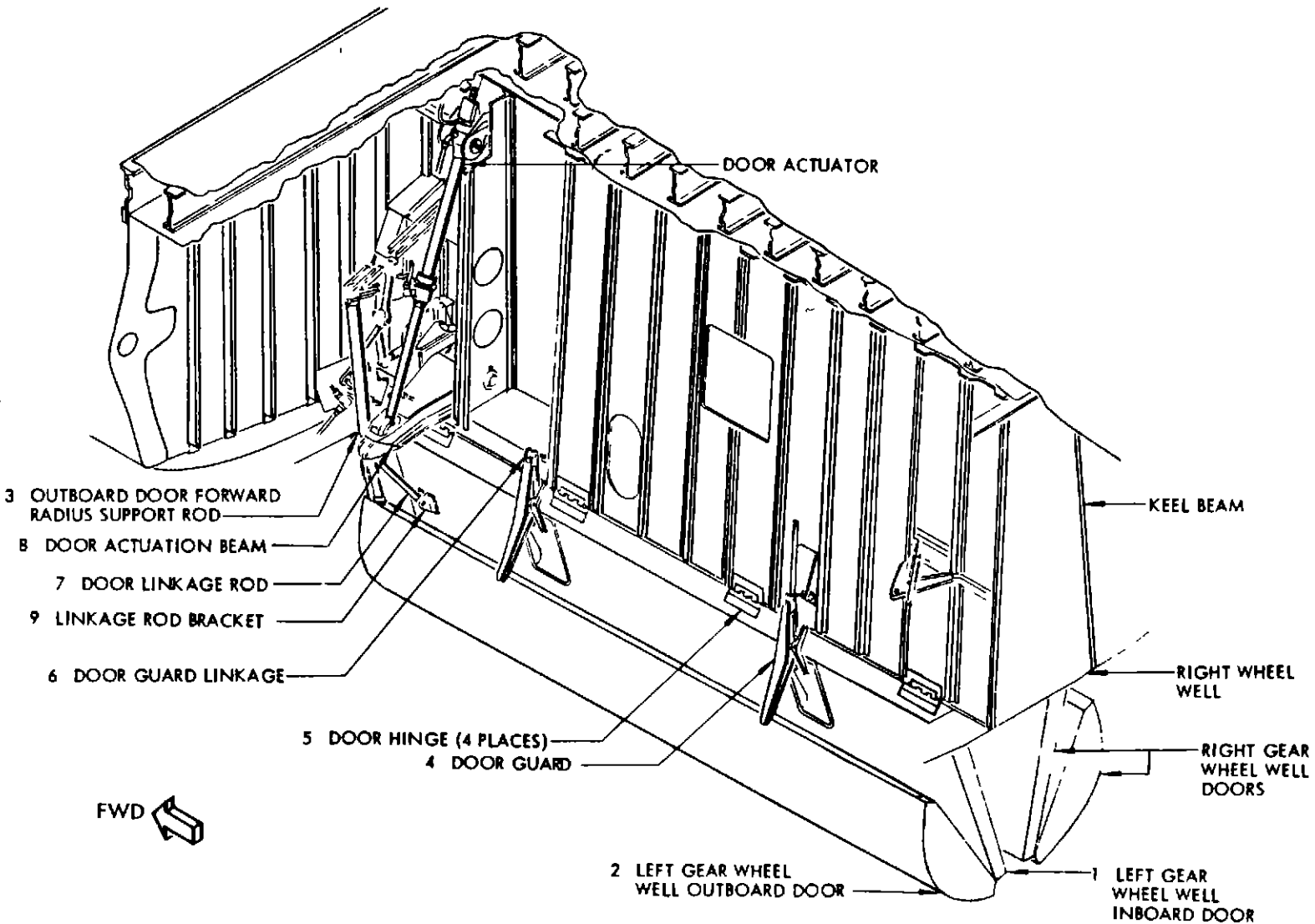
NOTE To facilitate handling, inboard and outboard doors may be separated by removing hinge pins from the three piano hinges joining doors together.



MAINTENANCE MANUAL

3. Install Main Gear Wheel Well Doors

- A Place an inboard door (1, figure 401) in position to align with hinge halves (5) on the keel beam structure. Insert four hinge pins, add cotter pins and attach static bonding cables.
- B Install door guards (4) on inboard door and connect door guard linkage (6) to keel beam structure
- C. Connect door linkage rod (7) between door actuation beam (8) and inboard door.
- D Adjust inboard door. See Adjustment/Test Main Gear Wheel Well Doors.
- E. Attach radius support rods to structure.
- F Support outboard door (2) so that hinge halves on inboard and outboard doors are aligned. Insert three hinge pins, and cotter pins
- G. Raise outboard door so that attaching fittings are in alignment with radius support rods (3). Connect rods to door fittings.



SN REV Mar 1/89

SAB. 707/556
Main Gear Wheel Well Door Installation
Figure 401
Ref. B.707 - M.M. 32-3-1 p.403 - Jul 15/68

MAIN GEAR WHEEL WELL DOORS - ADJUSTMENT/TEST

1 Main Gear Wheel Well Doors Adjustment

A. General

- (1) The doors when closed, must be flush with body contour within the following limits
 - (a) The forward end may project a maximum of 0.04 inch outside of body contour, or be depressed a maximum of 0.12 inch inside of body contour.
 - (b) The aft end of door may project a maximum of 0.12 inch outside of body contour, or be depressed a maximum of 0.04 inch inside of body contour.
- (2) Total travel of the door is determined by the length of the actuating cylinder. Door open and closed positions may be set by adjusting the lengths of the door linkage rod, and the actuation rod bracket. The aft outboard corner of the inboard door is warped up to contact stops before the forward outboard corner as the doors close. The warp keeps the aft end of door closed and free of vibration.
- (3) Due to possible warping of the lower body fairing, the doors should be faired to the lower wing body fairing contour. The lower body fairing is immediately forward of the main landing gear doors. The lower wing body fairing is forward of the lower body fairing. A tool should be used for this purpose. (See figure 501.)

B. Equipment and Materials

- (1) Hydraulic Pressure Cart, 0 to 3000 psi capacity, for Skydrol 500
- (2) Fairing Tool (See figure 501.)
- (3) Downlock Assembly - Main Landing Gear, F71126-500 or equivalent
- (4) Downlock Assembly - Nose Landing Gear, F70008-500 or equivalent
- (5) Downlock Assembly - Main Landing Gear Door, F71127 or equivalent



MAINTENANCE MANUAL

C. Adjust Main Gear Wheel Well Door

- (1) Check that landing gear external downlocks are installed, and that wheel well doors are open with release handle down and latched.
- (2) Ensure that wheel well doors are fully open by checking for a 4.24 (+0.25/-0.46)-inch dimension between centerline of airplane and centerline of hinge between inner and outer doors measured at front end of doors. (See figure 501.)
- (3) Disconnect door linkage rod from the door and apply a manual door closing force as near as possible to aft outboard corner of inboard door
- (4) Continue moving doors towards closed position until aft edge of door contacts stops on structure
- (5) Check that aft outboard corner of door is flush when door is in contact with stop.
- (6) If necessary, add or remove shims to stops until aft outboard corner of door is flush.

NOTE Clay can be used between door and stop to determine thickness of shims required to fair door.

- (7) Check that forward outboard corner of inboard door is 0.75 ($\pm$ 0.20) inch out of contour when aft outboard corner is in fair with fixed body contour.
- (8) Adjust length of radius support rods to 43.17 inches between bearing centers. Connect radius rod and pull rod manually towards door closed position to check for overcenter lock.

CAUTION IF RADIUS RODS ARE TOO SHORT AFTER ADJUSTMENT, THEY MAY LOCK IN AN OVERCENTER POSITION WHEN THE DOORS ARE FULLY OPEN, ESPECIALLY ON AIRPLANES WITH A SINGLE RADIUS ROD IN EACH WHEEL WELL. TO AVOID DAMAGE TO HINGES, PULL RADIUS ROD OUT MANUALLY TOWARDS THE DOOR CLOSED POSITION, AND CHECK FOR OVERCENTER LOCK BEFORE OPERATING DOORS HYDRAULICALLY.

- (9) Adjust length of door linkage rod to 26.57 inches (nominal length) between bearing centers. Connect door linkage rod to door and close door by normal actuation of hydraulic system

WARNING CHECK THAT PERSONNEL, ALL TOOLS AND OBSTRUCTIONS ARE CLEAR OF DOOR ACTION PATH BEFORE OPERATING DOORS



MAINTENANCE MANUAL

- (10) Measure deviation from contour at forward outboard corner of inboard door.
- (11) Adjust length of door linkage rod until inboard doors are flush with body contour in door closed position as defined in paragraph A (1).
- (12) Adjust radius support rods as required to fair outboard door.

CAUTION MINIMUM ALLOWABLE LENGTH BETWEEN BEARING CENTERS OF FORWARD RADIUS SUPPORT ROD IS 43.17 INCHES.

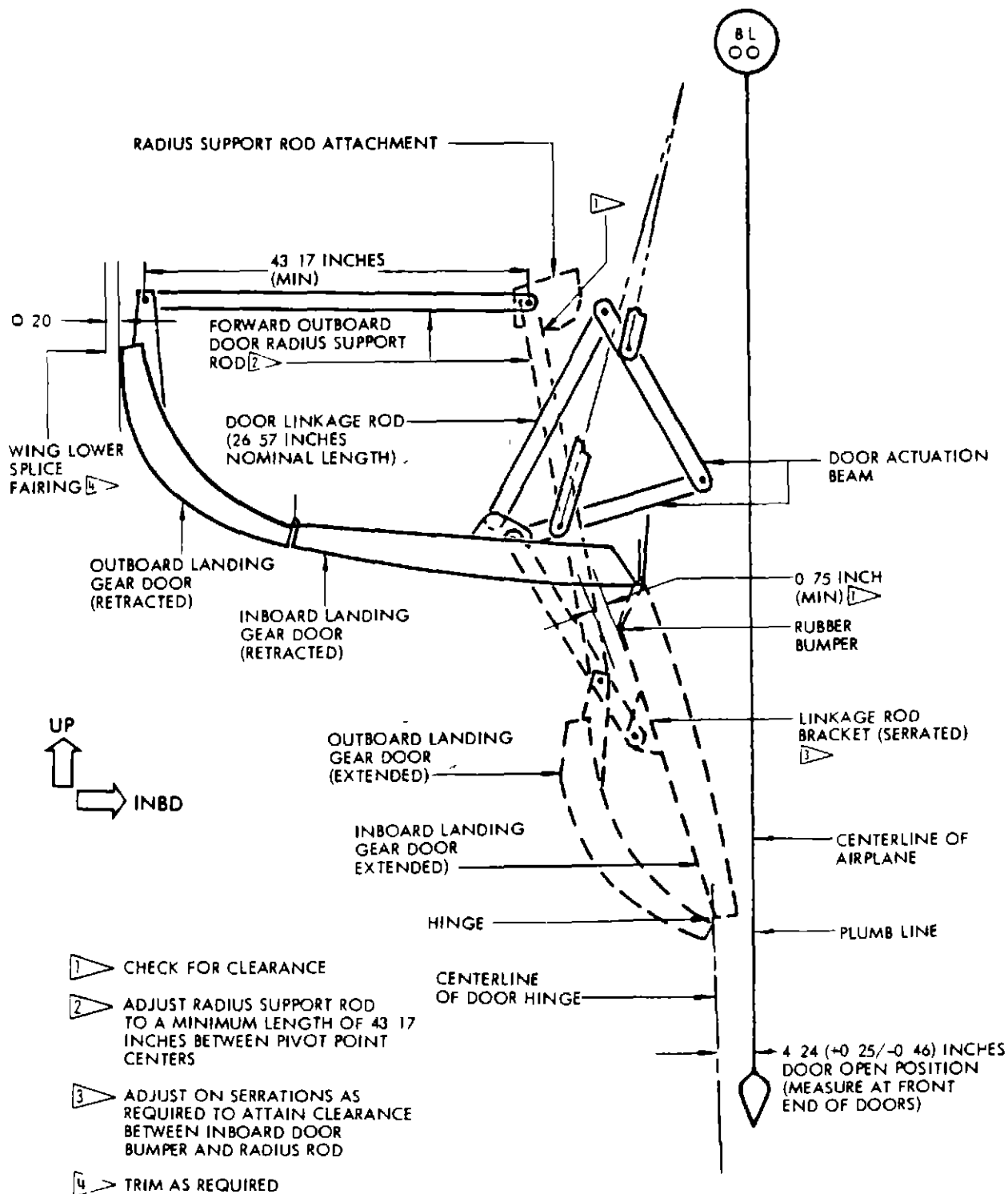
- (13) Check dimension for door open position per step (2)
- (14) If necessary, trim wing door lower splice fairing to clear outboard door by 0.20 inch.
- (15) Check radius support rods for overcenter lock and open doors hydraulically until actuator is fully extended.
 - (a) Check that nose landing gear and main landing gear external downlocks are installed
 - (b) Open nose landing gear doors using ground release handle, and disconnect door actuation rods from doors.
 - (c) Check that main landing gear door ground release handle is in up position.
 - (d) Pressurize hydraulic system.

WARNING CLEAR ALL WHEEL WELL AREAS OF EQUIPMENT AND PERSONNEL MAIN LANDING GEAR DOORS WILL CLOSE IF DOORS ARE OPEN.

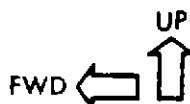
- (e) Place landing gear control in UP position using override trigger.
 - (f) Place a streamer on landing gear control handle to warn personnel not to reposition control handle.
 - (g) Install main landing gear door downlock assemblies on right and left main landing gear door actuators
- (16) Check for clearance between upper ends of radius support rods and radius rod attachments.

NOTE. Trim attachment channels if there is any interference.

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REAR VIEW OF LEFT-HAND INSTALLATION
(RH OPPOSITE)



6 THICKNESS OPTIONAL



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- (17) Check for a minimum clearance of 0.75 inch between radius rod and rubber bumper on inboard door edge beam.
- (18) If clearance is less than 0.75 inch, adjust actuation rod bracket by changing position on serrations.
- (19) Should an adjustment of more than four serrations be required, check that doors when closed are flush with body contour as defined in paragraph A.(1) and again check for 0.75-inch clearance.
- (20) Check door open position between centerline of airplane, and centerline of hinge between inboard and outboard doors at front end of doors.

NOTE Adjusting length of door linkage rod will primarily effect both door open and door closed positions. Changing location of actuation rod bracket on serrations will primarily effect door open position.

- (21) If necessary, repeat adjustment procedure until all dimension limits are reached

D. Restore Airplane to Normal

- (1) Remove main landing gear door downlock assemblies from right and left main landing gear door actuators.
- (2) Place landing gear control handle in DOWN position

WARNING CLEAR WHEEL WELL AREAS OF EQUIPMENT AND PERSONNEL. MAIN LANDING GEAR DOORS WILL CLOSE.

- (3) Depressurize hydraulic system.
- (+) Reconnect nose landing gear door actuation rods.

MAIN GEAR WHEEL WELL DOORS - INSPECTION/CHECK

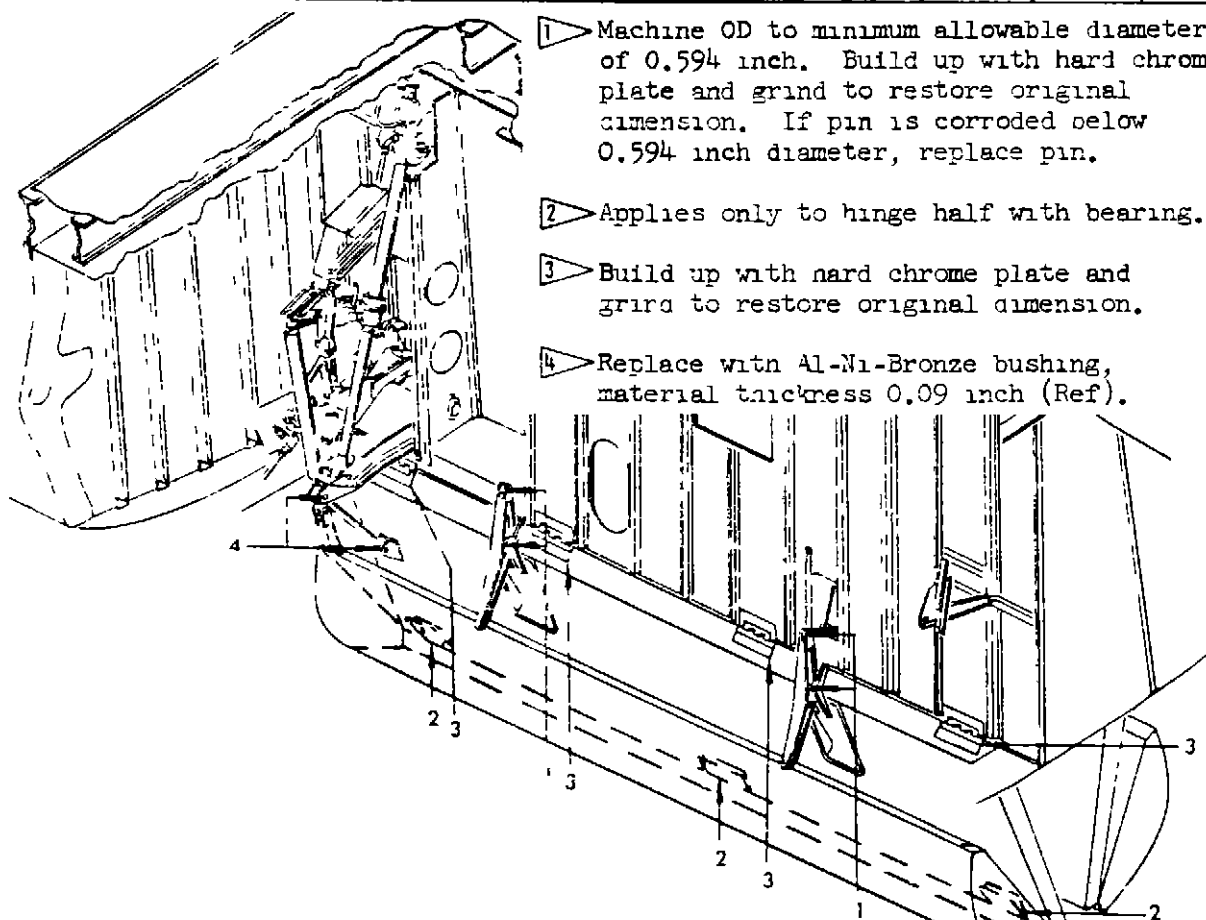
1. Main Gear Wheel Well Doors Inspection

A. Examine Main Gear Wheel Well Doors

- (1) Check door actuator, unions, and connections for leaks.
- (2) Check for hinge, door linkage, and pin wear. (See figure 601.)
- (3) Check door hinges for cracks and bonding jumpers for fraying and looseness.
- (4) Examine doors for cracks at outer edge. Check skin surfaces for buckling or pulled rivets.
- (5) Check sealing strips for deterioration, tears, and looseness.
- (6) Examine radius supported rods, door actuator rods, and door guard linkage for loose attachment bolts and checknuts.
- (7) Check door lock switch, and (if installed) door position switch for loose mounting bolts. Check electrical connections for broken or missing lockwire.

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INDEX NO	PART NAME	DIM	DESIGN LIMITS		WEAR LIMITS		REPLACE WORN PART	REPAIR WORN PART	REPAIR INSTR
			DIAMETER		MAX WEAR DIM	MAX DIAM CLEAR-ANCE			
			MIN	MAX					
1.	Bushing	ID	0.3750	0.3765	0.3800	0.0090	X		
	Pin	OD	0.3710	0.3730	0.3660		X		
2.	Bearing	ID	0.2495	0.2505	0.2540	0.0100	X		
	Pin	OD	0.2454	0.2480	0.2440			X	
 3.	Bearing	ID	0.3755	0.3765	0.3800	0.0090	X		
	Pin	OD	0.3704	0.3730	0.3660			X	
4.	Bearing	ID	0.6250	0.6300	0.6360	0.0120	X		
	Pin	OD	0.6230	0.6240	0.6130			X	



▶ Machine OD to minimum allowable diameter of 0.594 inch. Build up with hard chrome plate and grind to restore original dimension. If pin is corroded below 0.594 inch diameter, replace pin.

▶ Applies only to hinge half with bearing.

▶ Build up with hard chrome plate and grind to restore original dimension.

▶ Replace with Al-Ni-Bronze bushing, material thickness 0.09 inch (Ref).

SAB 707,556
Main Gear Wheel Well Door Allowable Wear and Rework
Figure 601



MAINTENANCE MANUAL

MAIN GEAR WHEEL WELL DOORS ACTUATOR BEAM - REMOVAL/INSTALLATION

1. Equipment and Materials

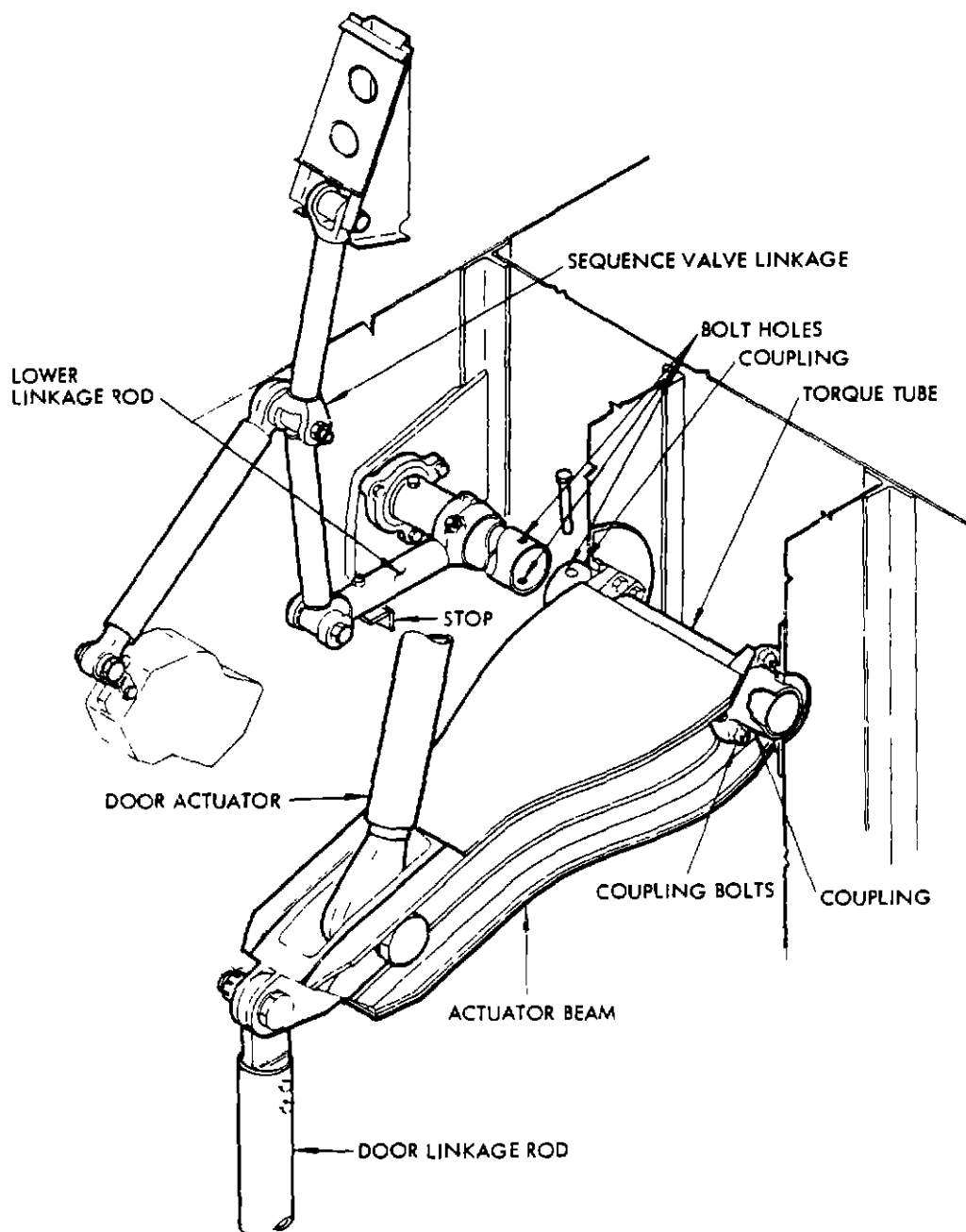
- A Downlock Assembly - Main Landing Gear, F71126-500 or equivalent
- B. Downlock Assembly - Nose Landing Gear, F70008-500 or equivalent

2. Remove Main Gear Wheel Well Doors Actuator Beam

- A. Check that landing gear ground downlocks are installed, and that wheel well doors are open with release handle down and latched
- B. Depressurize hydraulic system and shut off electrical power.
- C Check clearance between lower linkage rod and stop with door actuator beam manually held in a slightly retracted position.

NOTE : If clearance between lower linkage rod and stop exceeds 0.080 inch, replace components in the mechanism which have bolt elongation when installing main gear wheel well doors actuator beam.

- D. Disconnect door linkage rod at outboard end of actuator beam. (See figure 401.)
- E. Remove bolt attaching piston rod end of door actuator to actuator beam.
- F. Push and fasten actuator piston rod to retracted position.
- G. Remove bolts through couplings at each end of actuator beam pivot and remove torque tube.
- H. Support actuator beam and take out coupling bolts attaching each coupling to beam.
- I Withdraw actuator beam from couplings in an outboard direction.
- J. Insert torque tube through couplings install bolts and secure nuts finger-tight.





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3. Install Main Gear Wheel Well Doors Actuator Beam

- A. Remove torque tube from couplings. (See figure 401.)
- B. Place actuator beam in position between couplings and align holes in actuator beam and couplings. Install coupling bolts, washers and nuts, finger-tight.
- C. Insert torque tube and align holes in tube and coupling
- D. Insert bolts through couplings and torque tube. Tighten nuts finger-tight and wrench to next cotter hole. Install cotter pin.
- E. Torque coupling bolts, see step B.
- F. Release and pull down actuator piston rod and align terminal end with actuator attachment holes in beam. Insert bolt; add and torque nut.
- G. Connect door linkage rod to outboard end of actuator beam.
- H. Perform operation test of wheel well doors. See Adjustment/Test Main Gear Wheel Well Doors, 32-23-1.



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MAIN GEAR WHEEL WELL DOORS ACTUATOR - MAINTENANCE PRACTICES

1 Removal/Installation Main Gear Wheel Well Doors Actuator

A. Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent

B. Remove Main Gear Wheel Well Door Actuator

- (1) Check that landing gear ground downlocks are installed and that wheel well doors are open with release handles down and latched.
- (2) Depressurize hydraulic system and shut off electrical power.
- (3) Disconnect door actuator piston rod end from actuator beam (figure 201).
- (4) Push and support piston rod up to actuator retracted position. Fasten piston rod in this position to actuator cylinder.
- (5) Disconnect door close hydraulic pressure line from lower end of actuator cylinder. Plug or cap line and actuator port.
- (6) Disconnect door open hydraulic pressure line from upper end of actuator cylinder. Plug or cap line and actuator port.
- (7) Disconnect door lock balance hydraulic return line from top end of actuator cylinder. Plug or cap line and actuator port.
- (8) Disconnect electrical connection from lock switch.
- (9) Disconnect door release cable terminal from lock shaft at upper end of actuator.
- (10) Support actuator and remove installation bolts from support bushings on each side of actuator trunnion and remove support bushing. Lower and remove actuator.
- (11) Remove hydraulic fittings and lock switch from actuator for use on replacement actuator. Discard O-rings.

C. Install Main Gear Wheel Well Door Actuator

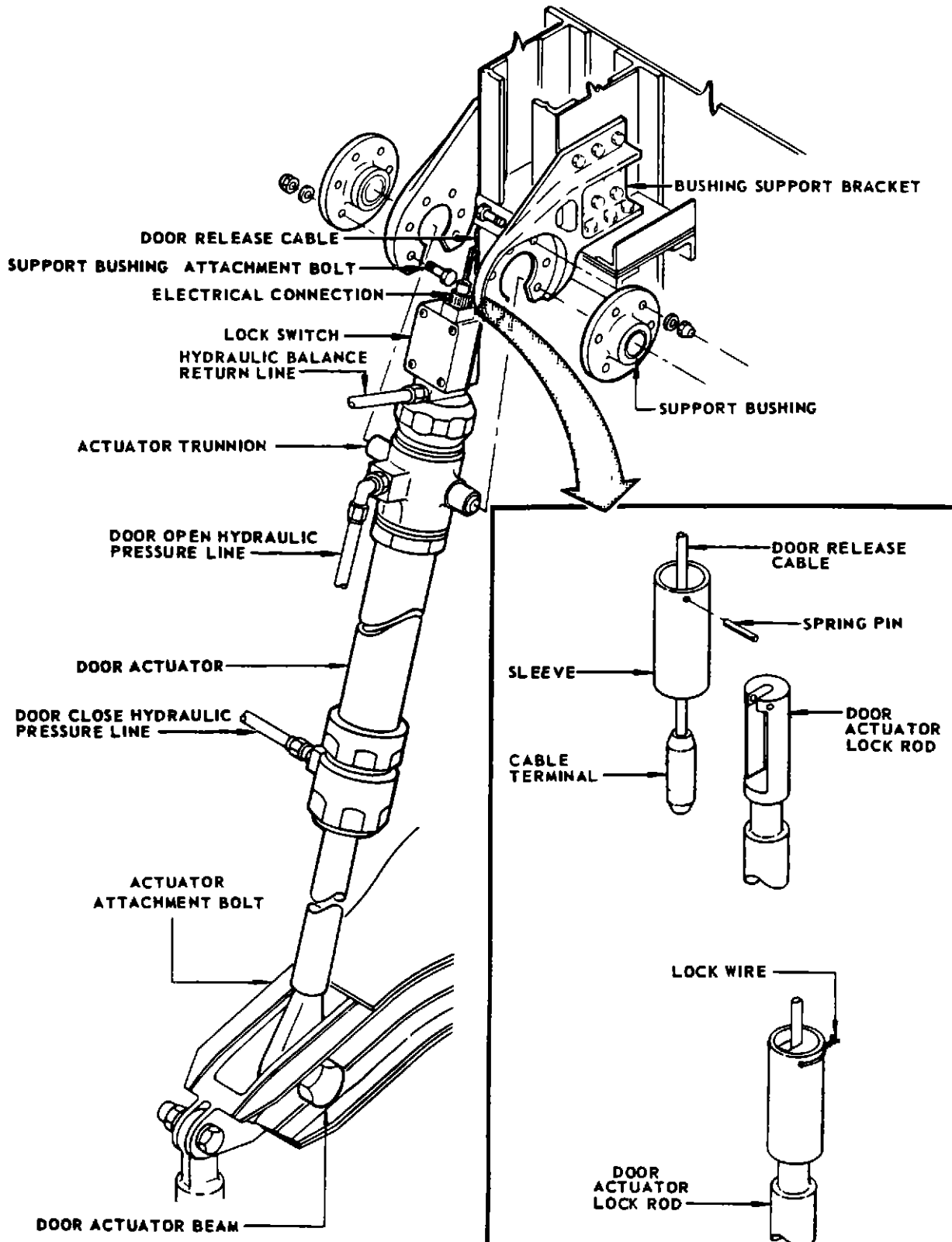
- (1) Install union and elbow fitting with O-rings in a door actuator (figure 201).
- (2) Fully extend piston rod of actuator. Fill with hydraulic fluid through elbow fittings. Cap all hydraulic fittings.



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- (3) Support a door actuator with upper hydraulic ports outboard. Place actuator trunnion in bushing support brackets. Insert and attach a bushing on each side of actuator.
- (4) Attach hydraulic balance return line, door open hydraulic line, and door close hydraulic line to actuator ports in that sequence.
- (5) Place piston rod terminal in alignment with attachment point on actuator beam. Insert and tighten attachment bolt.
- (6) Place sleeve over cable with cotter pin hole up, and insert terminal of cable into lock rod at upper end of actuator.
- (7) Drop sleeve over lock rod, insert spring pin, lockwire pin (see figure 201).
- (8) Install the lock switch. See "Landing Gear Door Warning System" 32-6-21.
- (9) Perform operation test of door actuator. See "Adjustment/Test Landing Gear Wheel Well Doors," 32-23-1.

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Main Gear Wheel Well Doors Actuator

Figure 201

SN REV Mar 1/89

Ref. B.707 - M.M. 32-3-21 p.203 - Jan 15/65

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MAIN GEAR WHEEL WELL DOOR GROUND RELEASE CABLES - MAINTENANCE PRACTICES

1. Removal/Installation Main Gear Wheel Well Door Ground Release Cables

A. General

- (1) Cables are replaced, if rendered unsafe by wear, corrosion or damage. Cable connections are accessible from the wheel wells, and under the cabin floor after removing the floor panel between stations 818 and 900. A cord attached to the end of a cable being removed will facilitate rerouting a replacement cable through seals, fairleads, and over the pulleys.

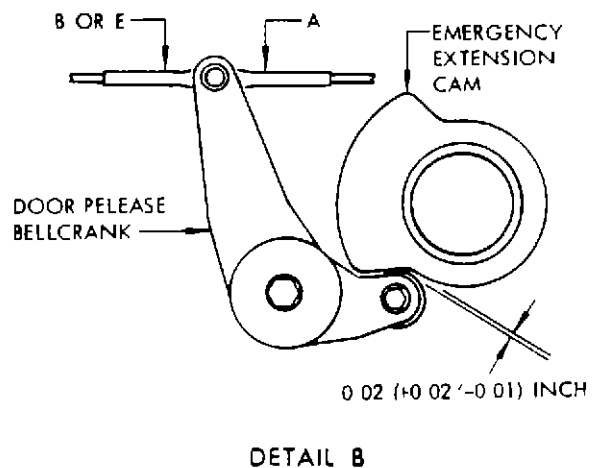
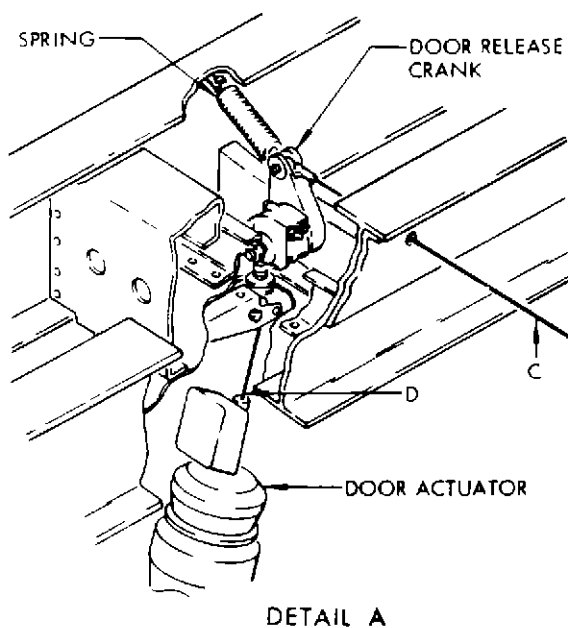
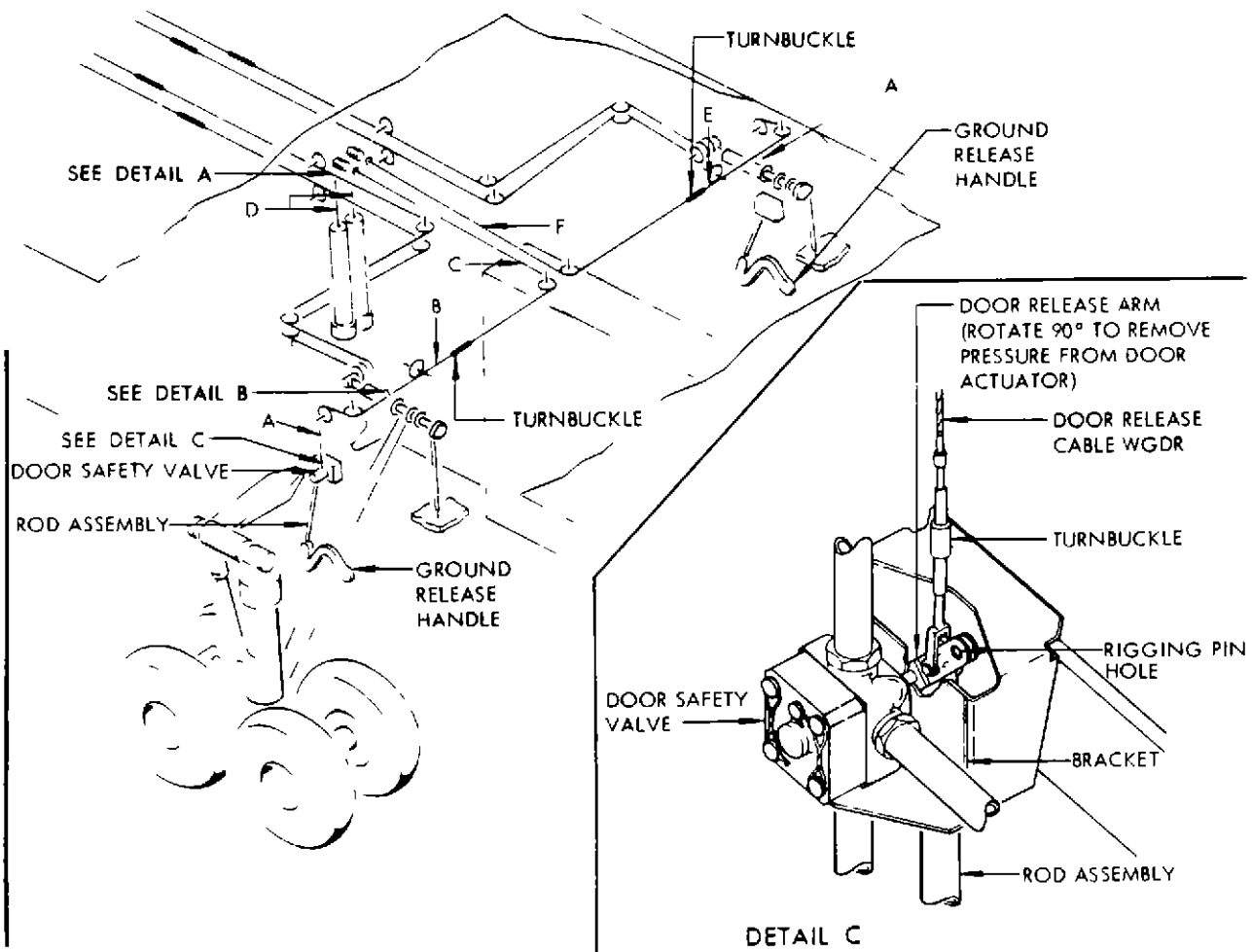
B. Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent

C. Remove Main Gear Wheel Well Door Ground Release Cables

- (1) Check that landing gear external downlocks are installed and that wheel well doors are open with release handle down and latched.
- (2) Remove floor panel between station 818 and 900 above cables to be removed.
- (3) Unscrew turnbuckle (figure 201) attached to safety valve.
- (4) Attach a cord to screw terminal on cable (A)
- (5) Detach cable at door release bellcrank (detail B) below floor panel and withdraw cable.
- (6) Detach and secure end of cord to be used for cable rerouting.
- (7) Unscrew turnbuckle below floor, detach and remove cable (B or E) from bellcrank.
- (8) Detach cable (C or F) and return spring at crank assembly. Withdraw cable.
- (9) Remove short length of cable (D) between crank assembly and main gear door actuator.

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MAINTENANCE MANUAL



Main Gear Door Ground Release Cables

Figure 201 (Sheet 1)



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D. Install Main Gear Wheel Well Door Ground Release Cables

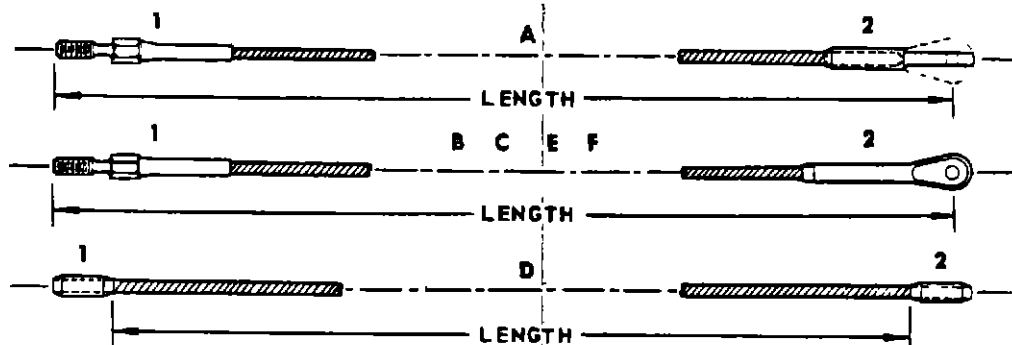
- (1) Install short length of cable between crank assembly and door actuator.
- (2) String replacement cable (A) running between door release handle and bell crank.
- (3) Attach end of cables (A and B or E) to bell crank.
- (4) Install cable (C or F) between door release crank and turnbuckle. String cable (B or E) through pulley and attach to cable (C or F) by turnbuckle barrel.
- (5) Rig and test the cables per paragraph 2.

2. Adjustment/Test Main Gear Wheel Well Door Ground Release Cables

A. General

- (1) Prior to adjusting (rigging) cables in main gear door ground release mechanism, the main gear emergency extension cables must be rigged. See 32-7-1.

CABLE REF NO	DRAWING NO.	NO REQ	LENGTH	CABLE SIZE	FITTINGS		
					1	2.	3.
A	NAS-303-37-366	2	36.6 IN	3/32 7 x 7	AN669S3LH	AN668-3	
B	NAS-303-27-306	1	30.8 IN	3/32 7 x 7	AN669S3LH	AN667-3	
C	NAS-303-26-617	1	61.9 IN	3/32 7 x 7	AN669S3RH	AN667-3	
D	BAC-C13G-470-94	2	9.5 IN	1/8 7 x 19	BAC-T14A-4	BAC-T14A-4	
E	NAS-303-26-306	1	30.8 IN.	3/32 7 x 7	AN669S3RH	AN667-3	
F	NAS-303-27-617	1	61.9 IN.	3/32 7 x 7	AN669S3LH	AN667-3	



Main Gear Door Ground Release Cables

Figure 201 (Sheet 2)



MAINTENANCE MANUAL

B. Adjust (Rig) Main Gear Door Ground Release Cables

- (1) Pressurize hydraulic system and place landing gear control handle in DN position.
 - (2) Check that door actuator is in door closed and locked position.
 - (3) Loosen cables (A, figure 201) at safety valve turnbuckle.
 - (4) Remove rod assembly.
 - (5) Insert a 5/16-inch diameter rigging pin through door release arm and valve bracket.
 - (6) Set door release handle in full up position.
 - (7) Adjust and install rod assembly.
 - (8) Remove spring (detail A) from crank assembly.
 - (9) In place of above spring, attach a spring scale to bell crank and apply 5 to 10 pounds tension to cable B by pulling forward on scale. Fix scale to structure.
 - (10) Install 0.020 (+0.020/-0.010)-inch feeler gage between extension cam and door release bell crank roller. (See detail B.) Fix gage in place with tape to prevent gage falling out.
- NOTE: Door release cam must be in neutral position. (See Main Gear Emergency Extension, 32-7-1.)
- (11) Adjust turnbuckle between cables B and C until door release crank is drawn snugly and securely against terminal end of cable D attached to door actuator.
 - (12) Release spring scale tension on door release crank and remove feeler gage from cam and roller.
 - (13) Install spring on crank assembly. B and C cable assembly should now have light tension so as not to sag between pulleys and terminals. Door release crank should be held snugly against cable D terminal end, (detail A) and door release bell crank roller should be in contact with release cam (detail B).
 - (14) Hold rigging pin in horizontal position to align with rigging pin holes.
 - (15) Adjust cable A tension to approximately 5 to 10 pounds or until snug.

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- (16) Remove rigging pin. Cable tension should be sufficient to prevent sag between pulleys and terminal ends.
- (17) With hydraulic power OFF. Operate door handle to downstop position in guide slot. Hold handle down and mark spots on edge of guide slot 0.30 and 0.50 inch up from bottom of travel.

CAUTION: STAND CLEAR OF DOOR WHEN OPERATING HANDLE.

- (18) Turn hydraulic power ON. Operate door release handle and check operation of doors. Adjust cable A turnbuckle until door actuator lock will release in range between 0.30 and 0.50 inch from lower end of handle travel in guide slot. Use marks per step (17).

NOTE: When cable A is adjusted for proper handle position and lock release, cable A then may be very loose with handle in UP position. This is normal and not cause for rejection.

- (19) Adjust and check right gear door release system in a similar manner. Substitute cables E and F for B and C.

3. Inspection/Check Main Gear Wheel Well Door Ground Release Cables

A. Examine Main Gear Wheel Well Door Ground Release Cables

- (1) Check door release cables for fraying and corrosion. Cable seals for deterioration, out of round wear, and insecurity of retaining rings.
- (2) Check pulley brackets for cracks distortion, and loose mounting bolts.
- (3) Check pulleys and fairleads for cracks, looseness and misalignment.
- (4) Check cables for specified rigging.
- (5) Examine ground release cables for wear per figure 202.

CABLE (SEE FIGURE 201)	CABLE SIZE	ALLOWABLE PER CENT WEAR OF OUTER WIRES BEFORE REPLACEMENT
A, B, C, E AND F	3/32 7 x 7	50
D	1/8 7 x 19	50

Wheel Well Door Ground Release Cables Wear Limits
Figure 202

SN REV Mar 1/89

Ref. B.707 - M.M. 32-3-61 p.205 - Jan 15/68

32-23-61
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MAIN GEAR WHEEL WELL DOOR SAFETY VALVE - MAINTENANCE PRACTICES

1. Removal/Installation Main Gear Wheel Well Door Safety Valve

A. Equipment and Materials

- (1) Downlock Assembly, Main Landing Gear - F71126-500 or equivalent
- (2) Downlock Assembly, Nose Landing Gear - F70008-500 or equivalent

B. Remove Main Gear Wheel Well Door Safety Valve

- (1) Check that landing gear external downlocks are installed, and that wheel well doors are open with release handle down and latched.
- (2) Depressurize the hydraulic system and the utility reservoir.
- (3) Disconnect hydraulic lines (figure 201) from safety valve. Plug lines and cap valve ports.
- (4) Disconnect screw and door release arm from valve actuation shaft.
- (5) Take out installation bolts and remove valve.
- (6) Remove three hydraulic unions from the safety valve and discard O-rings. Cap hydraulic ports.

C. Install Main Gear Wheel Well Door Safety Valve

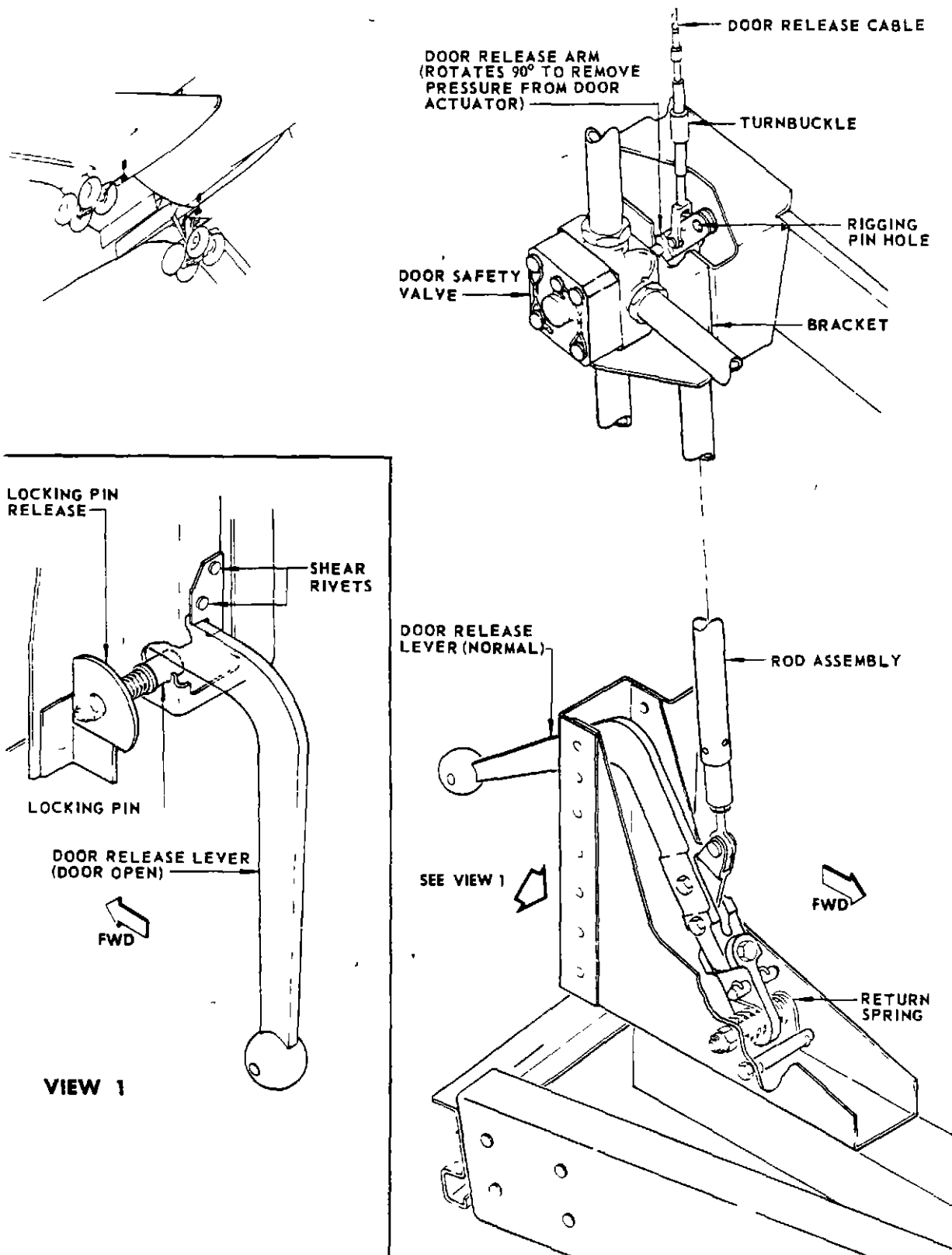
- (1) Install hydraulic unions with new O-rings in valve. Fill valve with hydraulic fluid and cap ports.
- (2) Install valve (figure 201) in position on mounting bracket.
- (3) Remove caps and plugs and connect hydraulic lines to valve.
- (4) Install and secure door release arm.
- (5) Pressurize hydraulic system.

CAUTION: ENSURE ALL EQUIPMENT AND PERSONNEL CLEAR OF DOORS.

- (6) Return door release handle to door closed position. Doors should close. Pull release handle down and doors should open.

CAUTION: DO NOT ALLOW DOOR GROUND RELEASE HANDLE TO SNAP INTO UP POSITION.

- (7) Latch release handle, and check hydraulic connections on safety valve for leaks.
- (8) Depressurize hydraulic system.



MAIN GEAR WHEEL WELL DOOR GROUND RELEASE LINKAGE -
MAINTENANCE PRACTICES

1 Approved Repairs Main Gear Wheel Well Door Ground Release Linkage

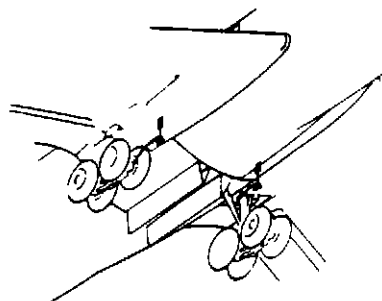
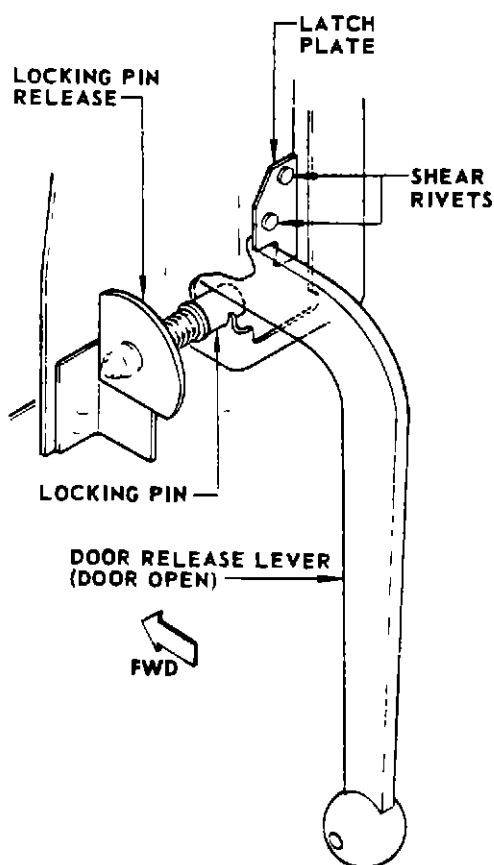
A Equipment and Materials

- (1) Shear Rivets - 3/32 inches diameter, universal head, 2017 MS20470D 3

B Replace Shear Rivets - Door Ground Release Handle Latch

- (1) Set plate in position as shown in figure 201
(2) Clamp plate securely and install rivets.

CAUTION SHEAR RIVETS IN DOOR GROUND RELEASE HANDLE LATCH PERMIT WHEEL WELL DOORS TO CLOSE IF GEAR IS RETRACTED WITH RELEASE HANDLE DOWN AND LATCHED. REPLACE RIVETS ONLY WITH THOSE CALLED OUT IN THE MATERIAL LIST.



Main Gear Door Ground Release Handle Installation

Figure 201

1

2

3

4

MAIN GEAR WHEEL WELL DOOR GROUND RELEASE LINKAGE - INSPECTION/CHECK

1. Main Gear Wheel Well Door Ground Release Linkage Inspection

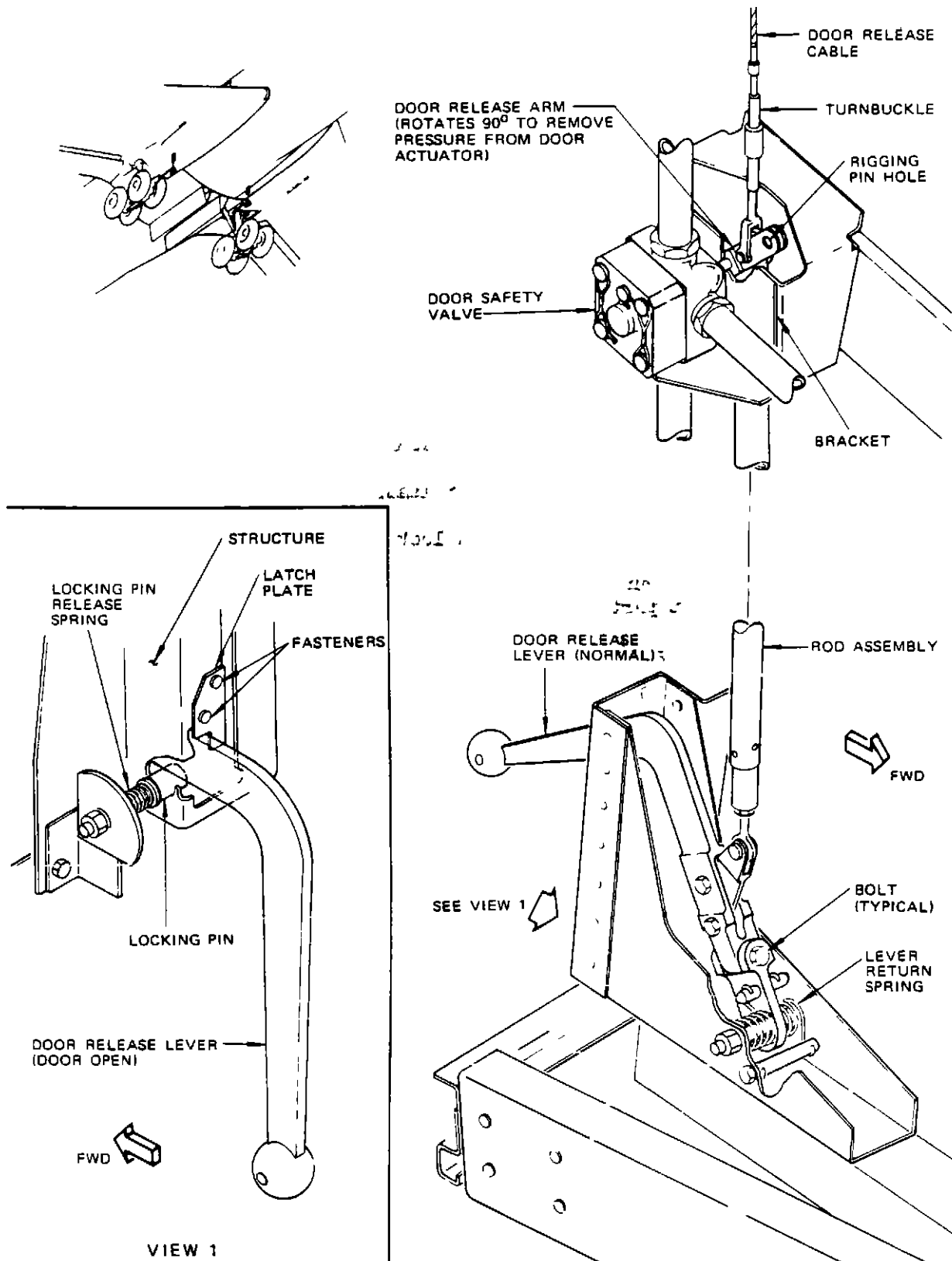
A. Examine Main Gear Wheel Well Door Ground Release Linkage

- (1) Check for security of fasteners attaching latch plate to structure.
(See figure 601.)

WARNING: LOOSE OR MISSING FASTENERS ATTACHING LATCH PLATE TO STRUCTURE MAY RESULT IN INADVERTANT CLOSING OF THE MAIN LANDING GEAR DOOR WHEN DOOR RELEASE LEVER IS IN DOOR OPEN POSITION AND NORMAL HYDRAULIC SYSTEM PRESSURE IS CHANGED.

- (2) Check for distortion of door release lever and latch plate.
- (3) Check lever return spring and locking pin release spring for damage.
- (4) Check for security of bolts connecting each portion of the linkage to adjacent part and/or structure.
- (5) Check linkage and locking pin for binding.

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Main Gear Wheel Well Door Ground Release Linkage
 Figure 601

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ANTISKID SYSTEM - DESCRIPTION AND OPERATION

EFFECTIVITY

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1. General

- A. The antiskid system provides maximum braking efficiency by continuously modulating applied brake pressure to prevent other than moderate skidding from any wheel, or by relieving brake pressure from locked wheels. The system is electronically controlled, and provides a means of continuously varying braking pressure according to tire adhesion on a runway after braking pressure is applied.
- B. The complete antiskid system consists of separate wheel speed sensing devices (skid detectors) for each wheel, a single antiskid control shield containing control and comparison circuits, and four electrohydraulic, dual antiskid control valves for individual wheel control. The system also incorporates a test circuit and indicators which enable the system to be checked for proper operation either in flight or on the ground.

2. Skid Detector

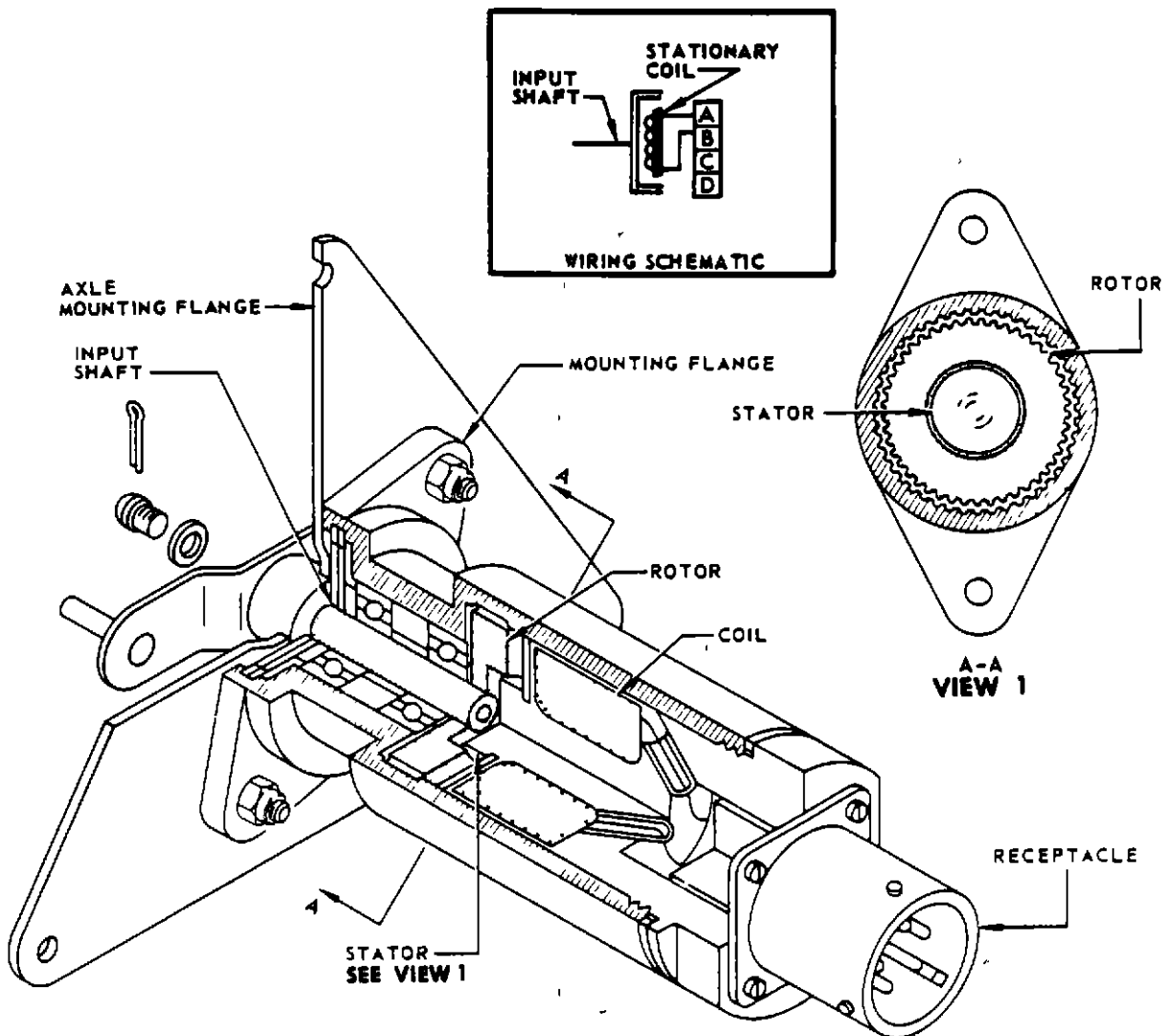
- A. The skid detector is a speed sensing device. It contains only one moving part, a rotor which rotates inside a fixed stator. (See figure 1.) The stator is firmly attached to the axle of each main gear wheel. The rotor is attached to the wheel. The rotor has 50 salient poles, or lobes, extending outward from its outer circumference. The stator has an equal number of salient poles extending inward. The stator also has a coil around it, which is connected to a controlled source of d-c power. When the stator coil is energized, the stator becomes an electromagnet. When the wheel, and thus the rotor, is turning the lobes on the rotor first approach and then recede from the lobes on the stator, thus changing the distance between them. The change in distance causes a change in the magnetic field of the stator because of the variation in magnetic coupling (magnetic reluctance) between the stator and rotor. This change in magnetic field generates in the stator coil an a-c voltage which is superimposed on the controlled d-c energizing voltage. The frequency of the generated voltage is directly proportional to the rotational speed of the wheel. This a-c signal is fed to the antiskid control shield.

3. Antiskid Control Shield

- A. The antiskid control shield contains all of the necessary circuits for control of the antiskid system. The component circuits are: one control circuit, a voltage regulator circuit, and a valve drive circuit for each wheel, and two memory circuits, each common to four wheels. (See figures 2 and 3.)

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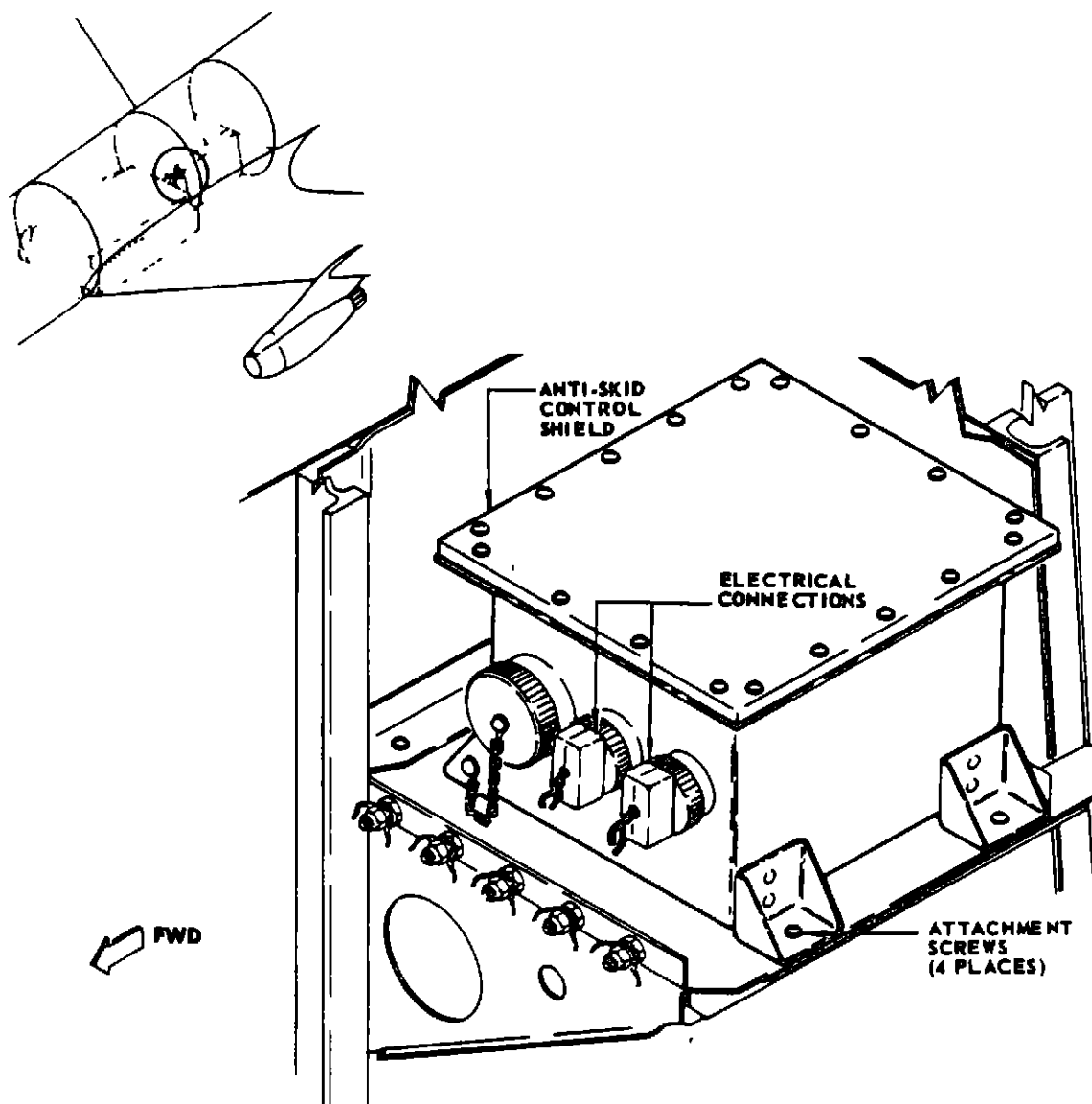
- B The voltage regulator circuit provides stable reference and biasing voltages for the control circuits and speed sensors, thus ensuring consistent operation of the system. The valve drive circuit provides power amplification of the control signals to operate the antiskid control valves, and ensures that any skid correction signal applied is from the most severely skidding wheel of a given tandem pair.
- C The control circuit contains both rate and locked wheel sensing components. When wheel deceleration is within certain predetermined limits, the rate sensing components do nothing. When wheel deceleration is greater than a predetermined maximum, the control circuit causes a maximum correction signal to be sent to the antiskid control valve, which reduces brake pressure to a low value, until the skidding wheel attains a normal rotational speed. If any wheel stops completely while others are turning, pressure is released completely until it resumes rotation.

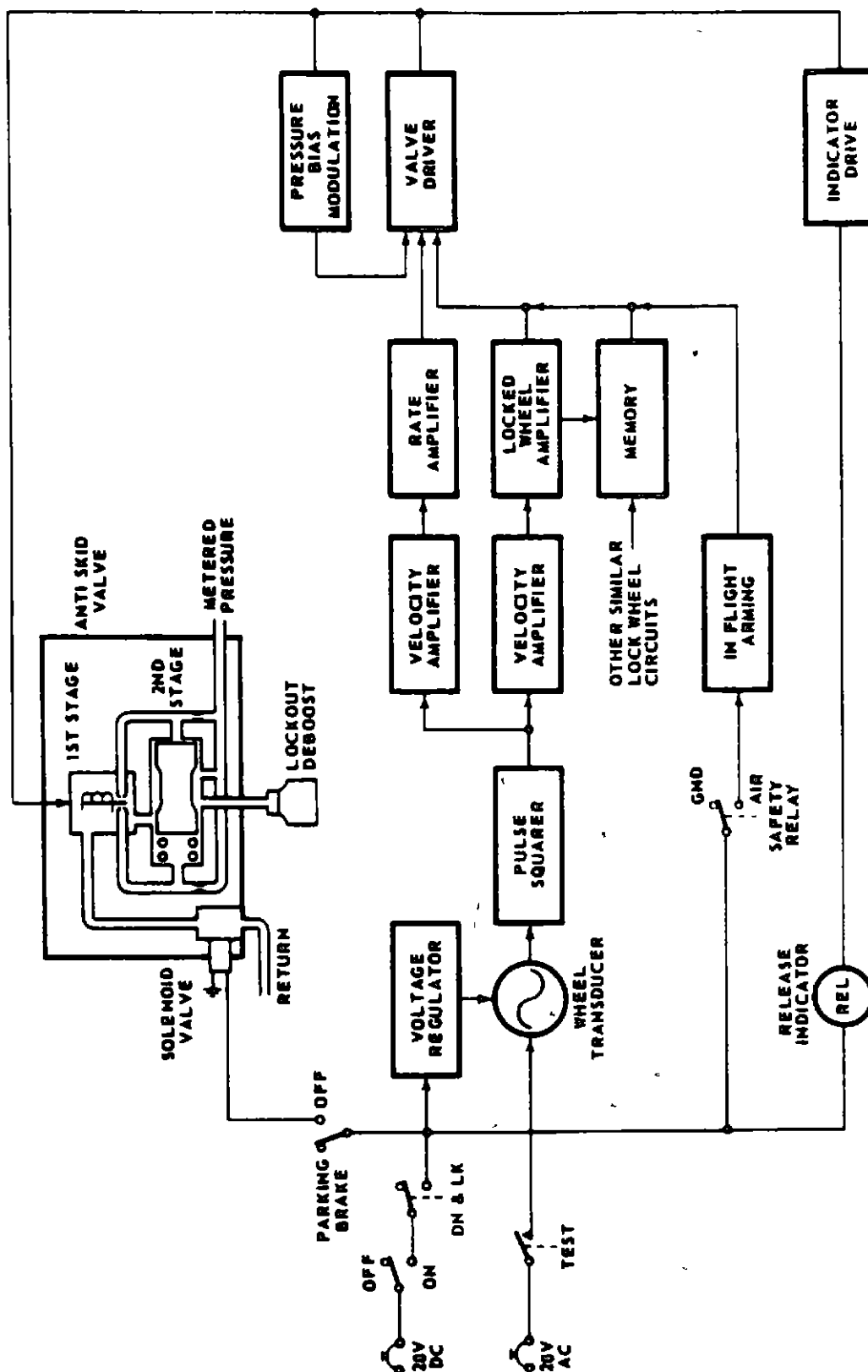


Skid Detector
Figure 1

4. Antiskid Control Valve

- A. The antiskid control valve is an electrically controlled hydraulic valve which modulates hydraulic pressure applied to the brake lockout deboost valves in accordance with signals received from the antiskid control shield. Each valve assembly consists of two complete modulating valves in a common housing. Each of the modulating valves, in turn, consists of an electrically controlled first stage or servo valve, and a hydraulically controlled second stage valve (See figure 4.) Each of the modulating valves in the dual assembly operates independently of the other.





' MARK II' INDIVIDUAL CONTROL -
SINGLE WHEEL BLOCK DIAGRAM

Antiskid Control Shield Block Diagram
Figure 3

- B Since the design of the antiskid control valve is such that there is a continuous bypass of fluid, a solenoid operated shutoff valve is incorporated in the return port of the antiskid control valve. The purpose of the shutoff valve is to close the return line when parking brakes are applied, and thus prevent bleeding off pressure through the ports of the antiskid control valve while the airplane is parked

5 Antiskid Brake Indicators

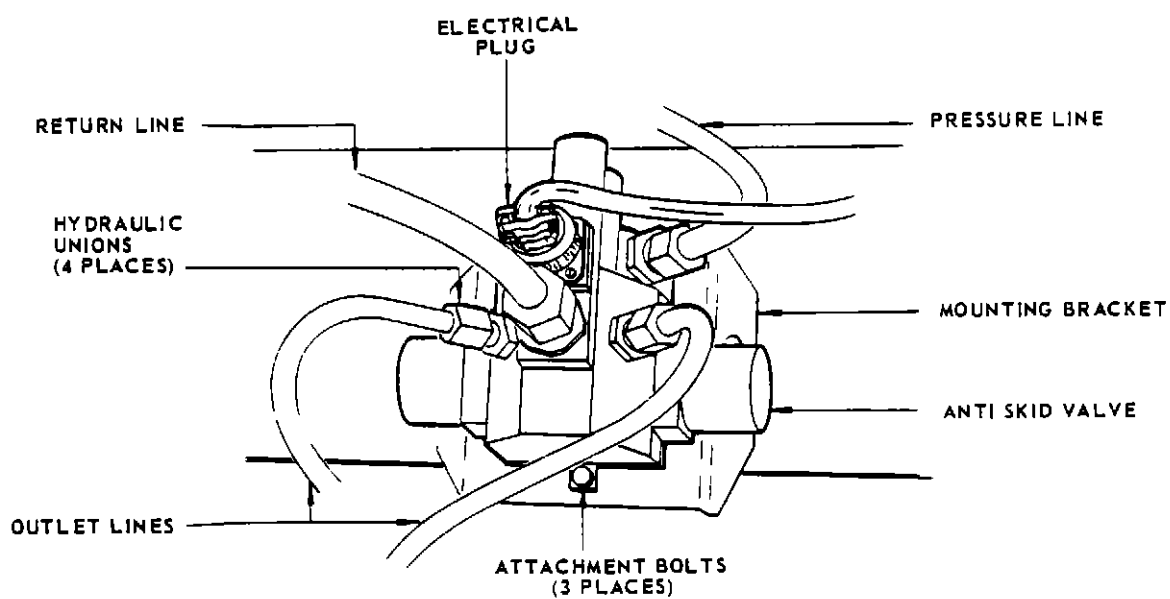
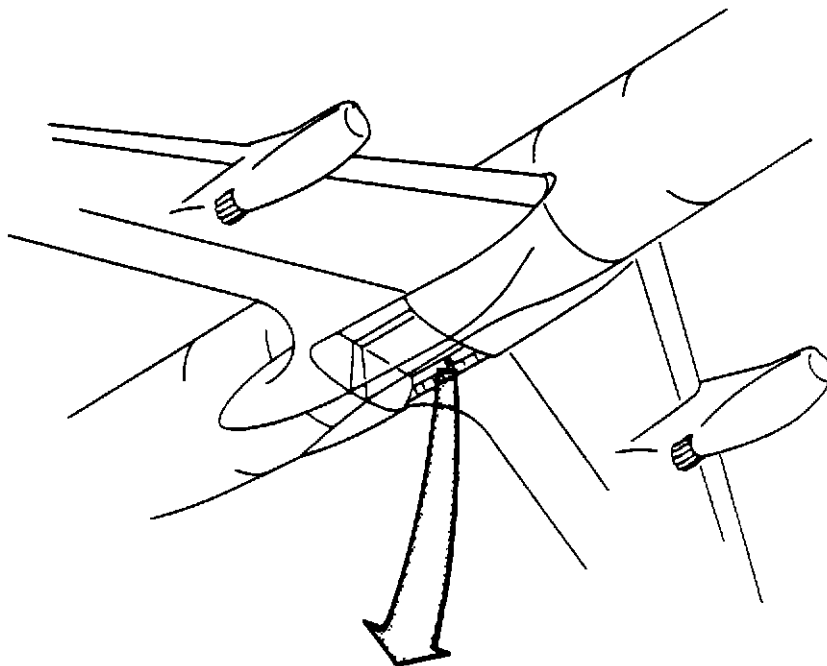
- A. Four antiskid indicators are mounted on the pilot's overhead panel (P13). The primary purpose of the indicators is to provide a visible indication of the operating condition of the antiskid system when the test switch is operated. The indicators also operate when the antiskid system is operating normally.
- B. Whenever a brake release signal is sent to an antiskid control valve, the corresponding indicator is energized. When the indicator is energized it exposes the word "REL." When the indicator is not energized the face is blank.

6 Antiskid Test Circuit

- A The antiskid test circuit provides a means of checking the condition of the antiskid system when the airplane is on the ground or in flight. A test switch is on the pilot's overhead panel (P13), adjacent to the antiskid indicators. The switch is normally off, and has momentary "OUTED" and "INED" positions. Movement of the switch to the test positions causes the indicators to operate if the system is operating normally.

7. System Operation

- A. In order for the antiskid system to operate, an "ON-OFF" switch on the pilot's overhead panel (P13) must be on, the landing gear lock switches must be in the down-and-locked position. Prior to touchdown, both landing gear safety switches are closed, thereby energizing antiskid relays, which in turn supply power to the control shield and hold all brakes off. Wheel rotational speeds at touchdown produce a signal sufficient to overcome the input from the antiskid relays in the event that the landing gear safety switches fail to operate, however, normal safety switch operation will remove the brake release signal from the control shield.
- B Skid Detector Operations
- (1) As described previously, the skid detector produces an a-c signal with a frequency proportional to the rotational speed of the wheel. This a-c signal is fed to the input of the control circuit in the antiskid control shield.



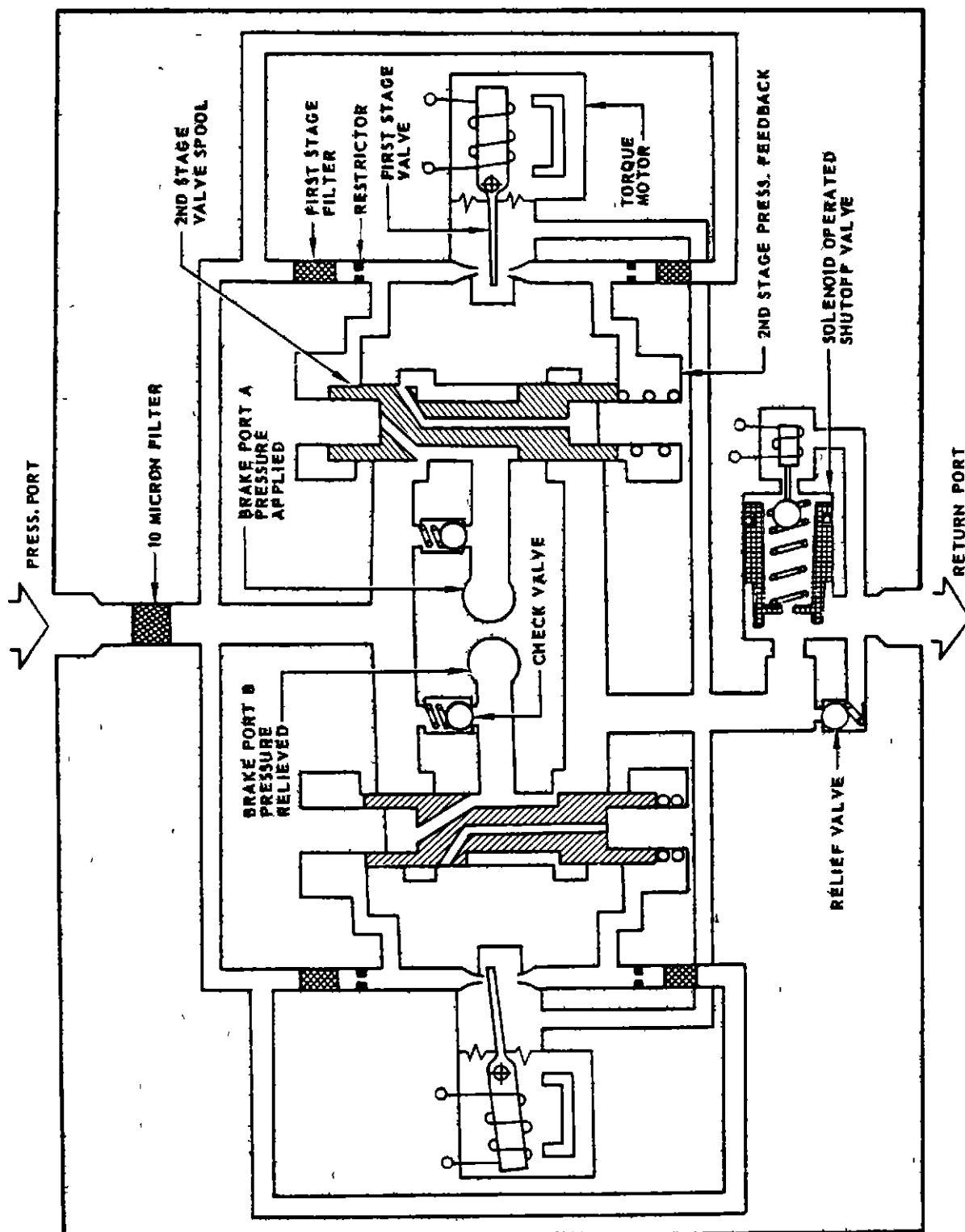
Antiskid Valve
Figure 4 (Sheet 1 of 2)

EFFECTIVITY

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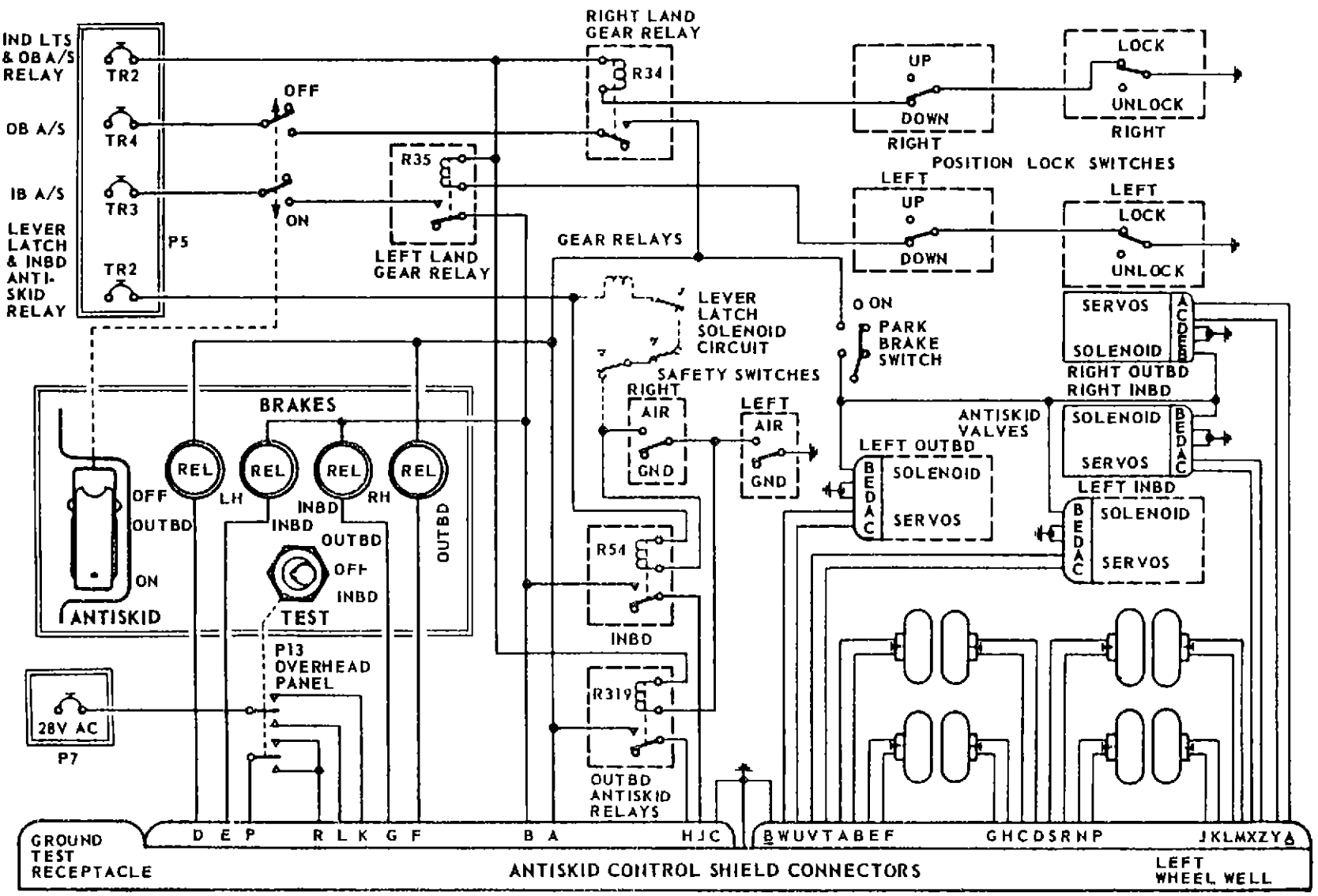




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C. Control Shield Operation

- (1) The first stage of the control circuit in the control shield is common to both a rate circuit and locked wheel circuit. In the first and second stages of the control circuit, the ac signal from the skid detector is converted into a dc voltage which is very nearly proportional to wheel speed. With correct braking, this dc voltage will be reduced within certain normal rates which are determined to be within the airplane deceleration capability. If the voltage does not drop at a rate greater than a minimum predetermined rate (approximately 11 radians/sec/sec or slightly less than two wheel revolutions/sec/sec), no correction signal is sent to the antiskid control valve, and full metered brake pressure is applied to the brake lockout-deboost valves. If any one or more wheels decelerates at a rate greater than the maximum rate, a correction signal is sent to the antiskid control valve, which reduces brake pressure applied to the wheels having the greatest deceleration. When brake pressure is reduced to the point where those wheels are no longer decelerating, the correction signal is reduced to a value which depends upon how long the correction has been applied. The rise rate of the initial correction signal depends upon the deceleration rate of the affected wheels, and reaches a maximum value beyond which no increase in correction is applied. (This maximum correction occurs at approximately 80 radians/sec/sec, or slightly less than 13 wheel revolutions/sec/sec.) When the maximum correction signal is applied the brake pressure is reduced very nearly to zero.
- (2) A locked wheel sensing circuit is included as a precaution against failure of the rate circuit to properly regulate wheel speed. For this purpose, the memory circuit is supplied a dc voltage from the second stage of the locked wheel circuit from each wheel. If one or more wheels lock, a full strength correction signal is sent to the antiskid control valve, and is maintained until the wheels spin up. One rolling wheel is sufficient to maintain the memory but in the unlikely event that all wheels in one memory circuit lock simultaneously, locked wheel protection will be lost until at least one wheel resumes rotation.



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Antiskid System Electrical Connections
 Figure 5

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D. Antiskid Control Valve Operation

- (1) When the pilot's brake metering valves are depressed, hydraulic fluid under pressure is metered to the antiskid control valves. Fluid flows into the pressure port, past the ends of the second stage valve spools, and then to brake pressure ports A and B. Fluid also flows through restrictors and ports on each side of the first stage valves, and then to the return port. When the first stage valve is in a neutral position (antiskid off or no skid signal) the pressure drops, caused by flow through the restrictors, on each side of the valve are equal. The reduced pressures on each side of the first stage valve are applied to the ends of the second stage valve spool. As long as the pressures sensed at each end of the second stage valve spool are equal, spring pressure holds the spool in the "open" position, allowing free flow of pressure to the brake port. When a skid signal is received from the control shield, it is applied to the first stage valve which moves to restrict the flow of fluid through the control port. Since this imposes an additional restriction to fluid flow, the pressure at this port increases. This increased pressure is sensed at the end of the second stage valve spool, which moves from the "open" position. Displacement of the second stage valve spool from the open position reduces the pressure available at the brake port. Differences in control pressures are balanced by differences between supply and brake pressures. Since the movement of the first stage valve and hence that of the second stage valve is proportional to the strength of the correction signal received, the antiskid control valve can modulate brake pressure from essentially zero to the full pressure available from the brake metering valves, thus permitting skidding of modest frequency and severity and thereby attaining optimum braking efficiency.

E. Test Circuit Operation

- (1) The test circuit is operated by the test switch on the pilot's overhead panel. When the airplane is on the ground, and all circuits energized, all four antiskid indicators will be blank. Movement of the test switch to the "OUTED" position electrically simulates rotation of the outboard wheels. The antiskid control shield will interpret this as locked inboard wheels, and thus show a "REL" indication on the inboard indicators. Movement of the test switch to the "INBD" position will have the opposite effect.
- (2) While the airplane is in flight, and the gear is down and locked, all indicators will show "REL." Movement of the test switch to the "OUTED" position will cause the outboard indicators to be blank. Movement of the switch to the "INBD" position will cause the inboard indicators to be blank.

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ANTISKID SYSTEM - TROUBLE SHOOTING

EFFECTIVITY

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1. General

- A. In trouble shooting the antiskid system, the trouble symptoms are best identified by performing a test of the antiskid system. See "Adjustment/Test, Antiskid System."
- B. If system malfunctions, leave hydraulic cart and external electrical power connected. Leave dust covers off, and safety switches disconnected. Proceed to isolate cause of malfunction by means of the following chart.
- C. During operation of the antiskid system, the trouble symptoms reported may not identify or isolate the malfunctioning component. This trouble shooting is set up to determine if the trouble is within the electronic control shield or located in the system components and/or wiring circuits. The test switch and brake release indicators assist in determining that a malfunction exists. The system test should be followed until the fault is noted then proceed with the trouble shooting steps to isolate the trouble.
- D. The trouble shooting charts include test plug pin callouts to allow use of the voltmeter and voltage values called out in the Adjustment/Test section 32-31-0.

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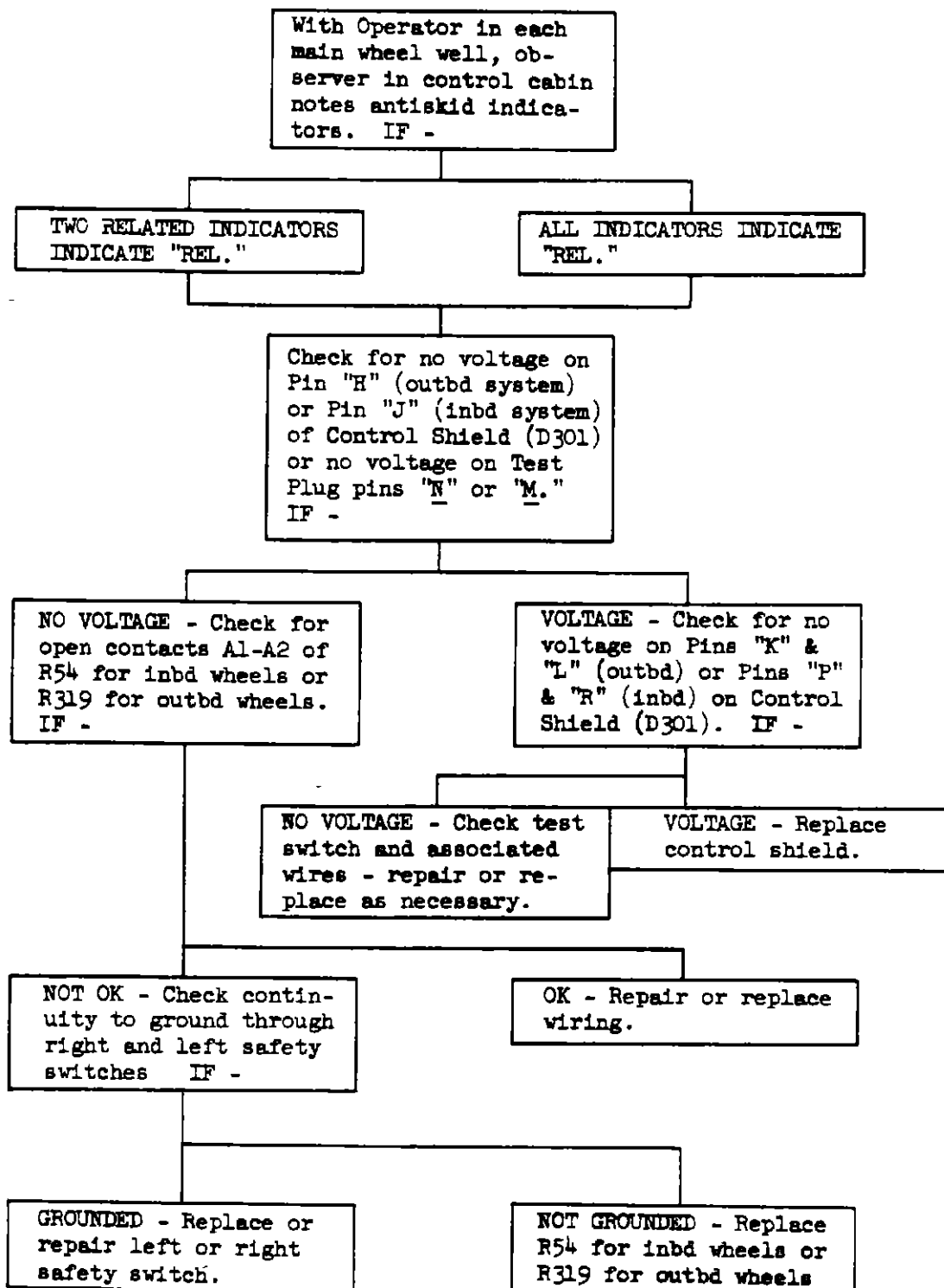
With operator in each main wheel well, observer in control cabin, notes antiskid indicators

Depress brake pedals while holding test switch momentarily in Test positions and observe brake reaction. Brakes shall remain on or shall be released according to indicator readings. If not ok, check for 28 Volt power on Pin "B" of control valve plug related to malfunctioning brakes.
IF -

OK - Replace control valve

NOT OK - Check parking brake switch and associated wiring. Repair or replace as necessary

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With operator in each main wheel well, observer in control cabin notes antiskid indicators IF -

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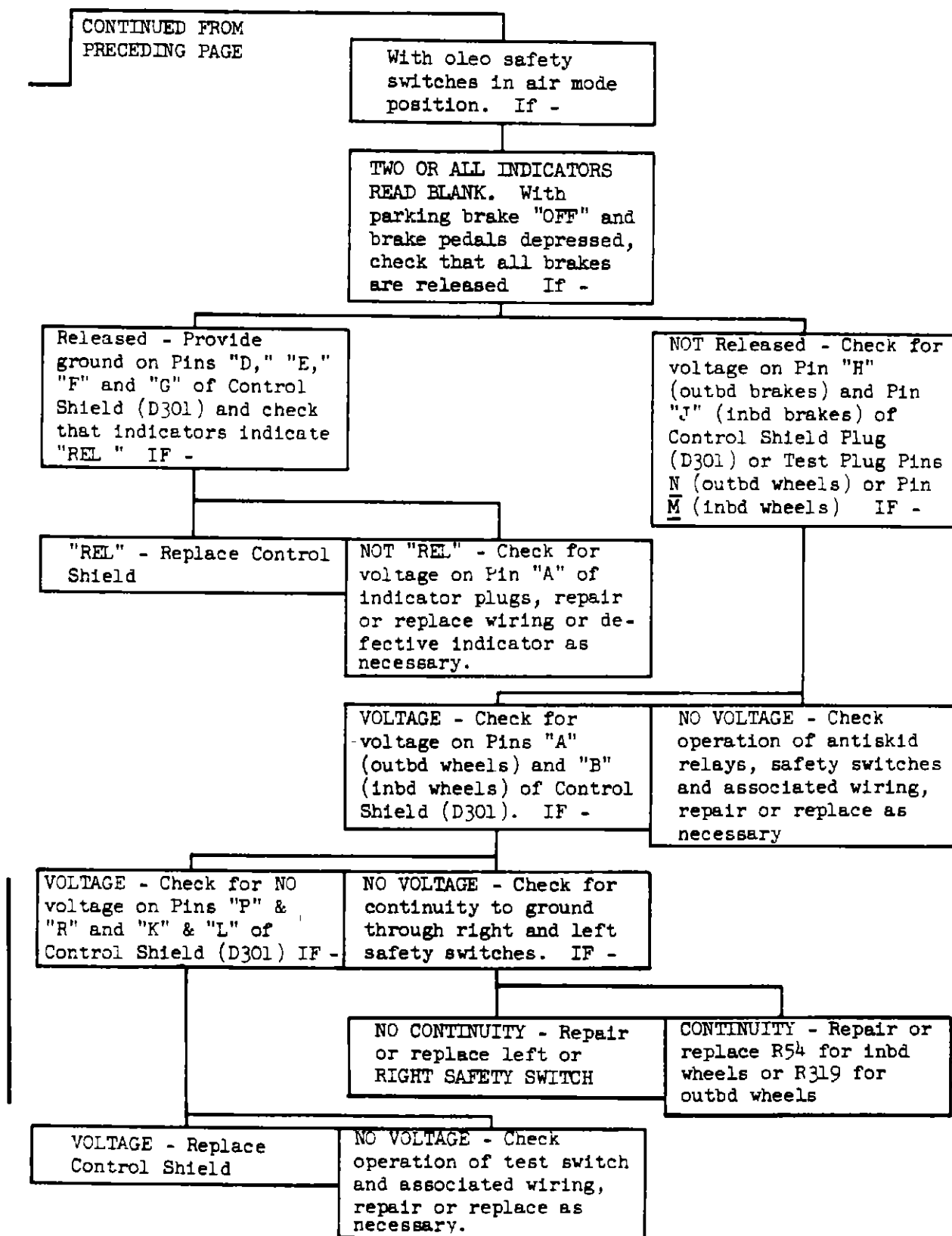
With parking brake "OFF" and brake pedals depressed. ALL INDICATORS INDICATE BLANK BUT ONE OR MORE BRAKES ARE RELEASED.

Check for not more than 0.5 volts on Pin "A" (inbd brake) or Pin "C" (outbd brake) of control valve plug or Test Plug Pins "L", "M", "S", "R", (inbd brakes) or Pins "K", "J", "P", "N", (outbd brakes) as related to released brakes. IF -

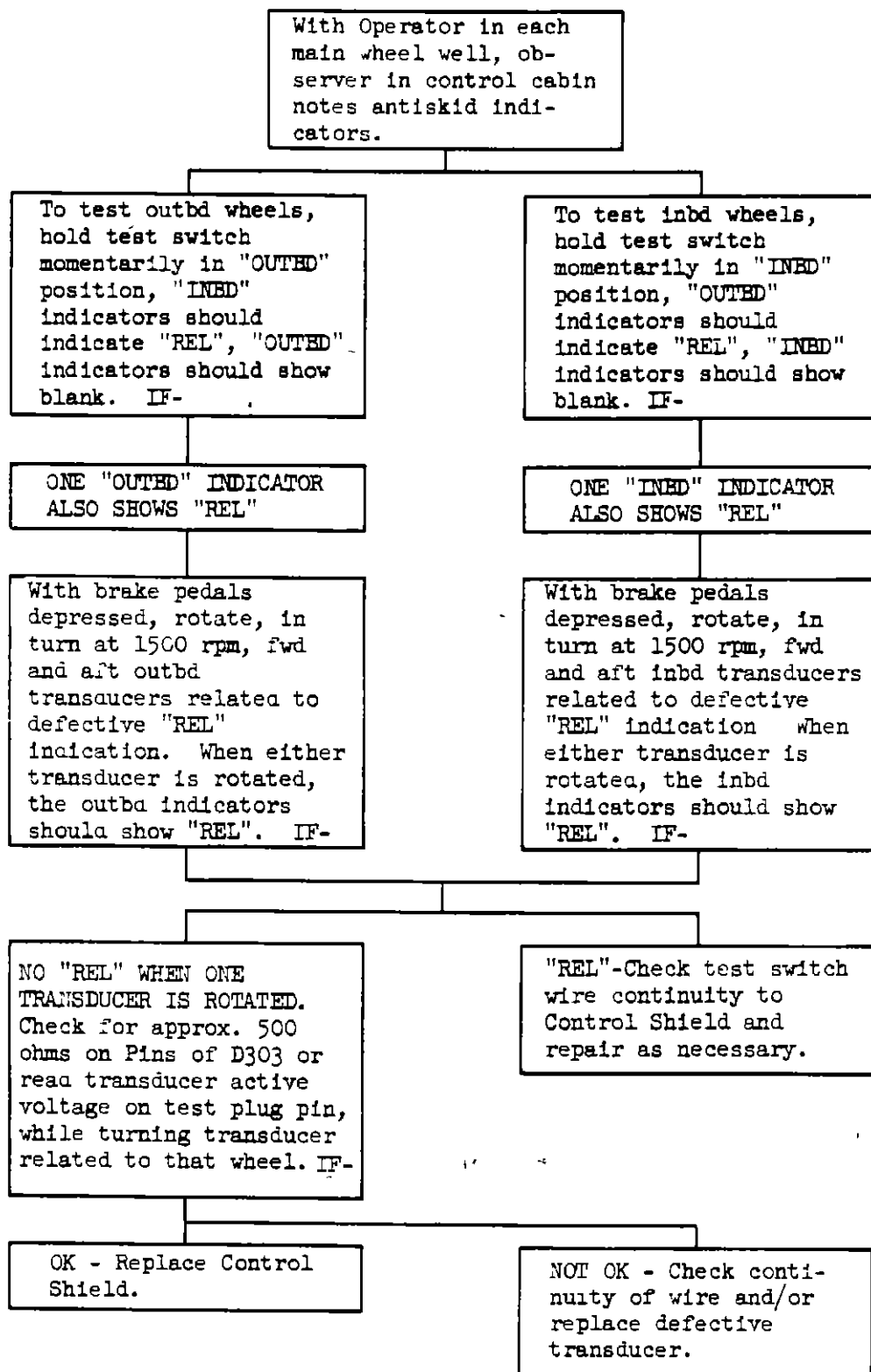
Voltage - Replace defective control valve

No voltage - Replace Control Shield.

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ANTISKID SYSTEM - MAINTENANCE PRACTICES

EFFECTIVITY

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1. Adjustment/Test Antiskid System

A. General

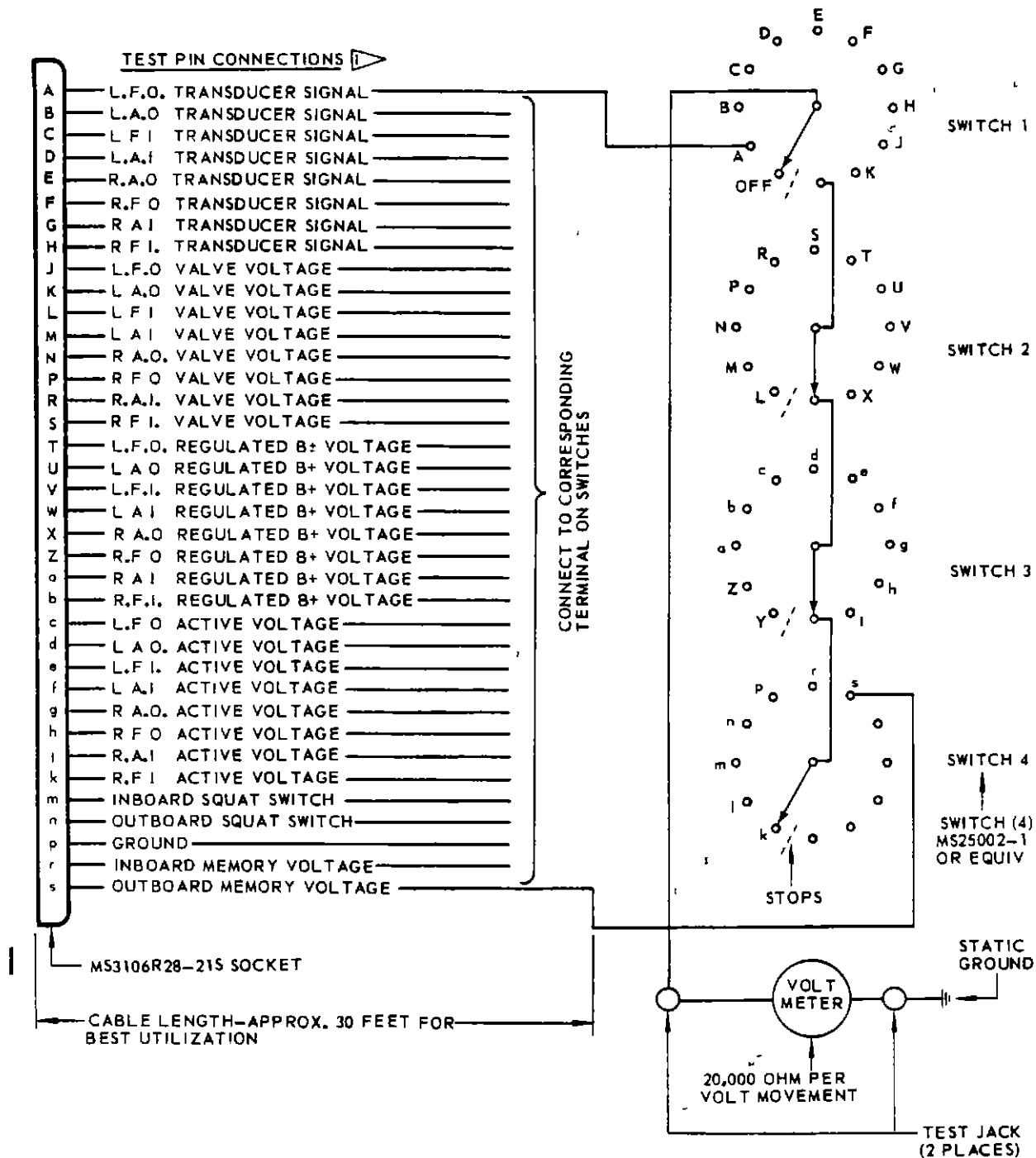
- (1) This test checks the operation of the antiskid system by the manipulation of transducer shafts. By rotating transducer shafts at various speeds and in various wheel combinations, the effect of locked or skidding wheels is obtained. A Field Tester or voltmeter, if used in conjunction with the functional test, will give a more comprehensive picture of the inner workings of the antiskid system by measuring control voltages produced.
- (2) The antiskid system functional test may be performed using the Hydro-Aire 42-041 Field Tester and functional test procedure if available. The 42-041 Field Tester checks operation of the transducers, antiskid control valves, the rate control, memory and locked wheel sections of the control shield by monitoring voltage values.
- (3) The antiskid system may be functionally tested using a voltmeter wired per enclosed diagram and table of voltage levels. (See figure 201.) The voltmeter is connected to the test outlets on the control shield, and by setting the switches each function can be checked for proper voltage during the normal functional test.

B. Equipment and Materials

- (1) Hydraulic cart - 0 to 3500 psi, capacity 20 gpm at 3,000 psi.
- (2) External source of electric power.

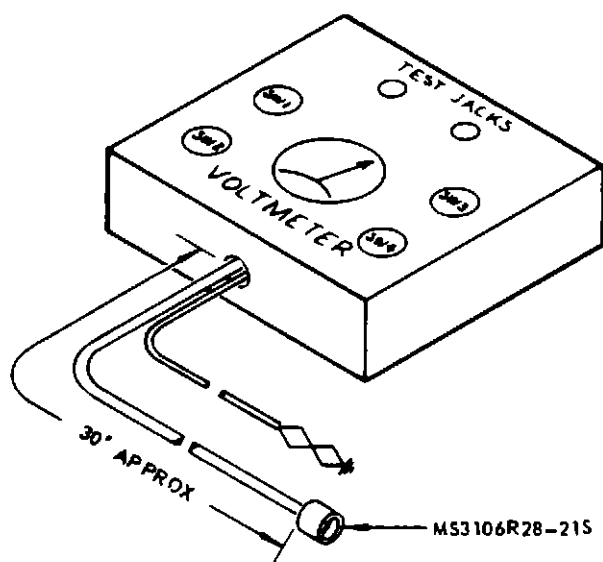
C. Prepare to Test Anti-Skid System

- (1) Connect hydraulic cart, pressurize hydraulic system and apply brakes.
- (2) Remove dust covers over anti-skid detectors on each wheel.
- (3) Check that all landing gear ground down locks are engaged and wheel well doors are opened with door release handles down and latched.



Voltmeter Wiring Diagram
 Figure 201 (Sheet 1)

- (4) Disconnect operating linkage on oleo safety switches. Close switches (oleo extended position)
- (5) Connect electrical power source.
- (6) Close landing gear "down" relay and the warning light and landing gear antiskid circuit breakers on T-R circuit breaker panel P5.
- (7) Place antiskid switch to "ON" on pilot's overhead panel.
- (8) Check that antiskid brake indicators on pilot's overhead panel read "REL."
- (9) Open oleo safety switches (oleo compressed position).
- (10) Check that all brake indicators show a black tab (antiskid valve de-energized).



SUGGESTED LAYOUT

- A PEAK TO PEAK (USE SCOPE)
- B THE 400 TEST INPUT SIMULATES A SPEED OF 52 KNOTS (APPROX)

VOLTAGE LEVELS								
A/P	VALVE VOLTAGE		TRANS-DUCER VOLT DC	TRANS-DUCER VOLT. AC	B+ VOLTAGE	ACTIVE VOLT		MEMORY VOLTAGE
	SKID	LOCKED WHEEL				ZERO SPEED	400 TEST INPUT	
▶	7.0-8.0	10.0-11.0	6.7-7.7	0.5-0.8 A	18.5-20.5	0	2.5-3.5 A	5.0-7.0

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D. Test Antiskid System

- (1) Rotate detector shaft in left gear forward outboard wheel in direction of forward wheel rotation by hand to at least 190 rpm or with an air motor to a steady speed of approximately 1500 rpm.

CAUTION: FALSE INDICATIONS MAY RESULT IF THE SPEED EXCEEDS 2000 RPM.

- (2) Check that brake pressure to outboard wheels, except the rotating wheel, is released and that outboard brake indicators read REL.

NOTE: Observers in each wheel well can determine by observing brake blocks or hydraulic flex lines, which brakes are released.

- (3) Stop the rotating transducer.
- (4) Check that brake pressure is restored to the released wheels and that respective indicators shall be off.
- (5) Repeat steps (1) through (4) for each remaining outboard wheel. Results shall be same with respect to wheel being tested.
- (6) Repeat steps (1) through (5) for each inboard wheel. Results shall be same except inboard wheel brakes will be released and reapplied.
- (7) Repeat step (1) using an air motor.
- (8) Abruptly reduce speed of skid detector to between 600 and 1000 rpm and then allow skid detector to return to speed.

NOTE: Speed reduction can be accomplished by grasping the air motor chuck by hand. This checks the deceleration rate control section of the control system. The rpm reduction must be sharp and fast and sufficient to signal a skid to the control shield.

- (9) Check that brake pressure to the wheel is reduced immediately and reapplied as skid detector returns to speed.
- (10) Repeat steps (7) and (8) on each wheel.
- (11) Results shall be same as step (9).
- (12) Disconnect and remove hydraulic cart and external source of electric power. Replace dust covers over detectors. Connect oleo safety switches.

SKID DETECTOR - MAINTENANCE PRACTICES

1. Removal/Installation Skid Detector

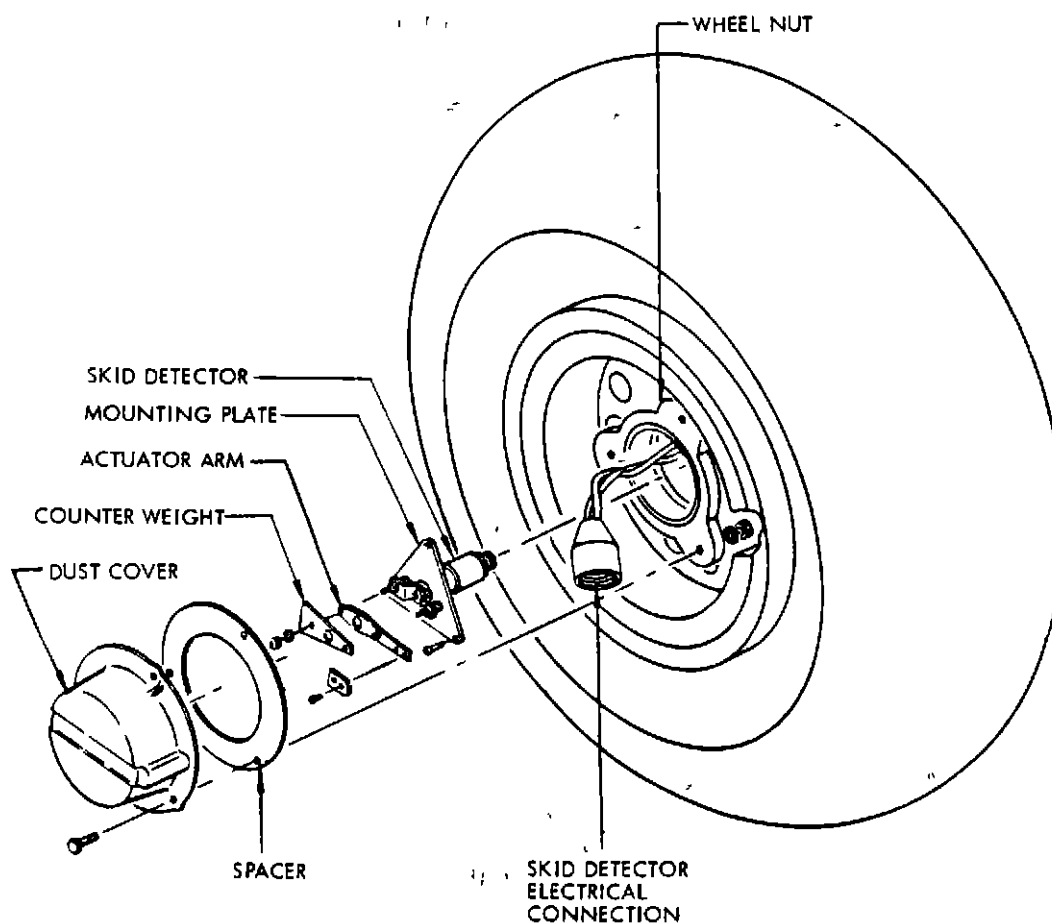
A. Remove Skid Detector

- (1) Check that all landing gear ground locks are installed, wheel well doors open with release handle down and latched.
- (2) Check that antiskid system switch is OFF. Pull out antiskid circuit breakers on circuit breaker panels P5, P6, and P7.
- (3) Remove three bolts and detach dust cover (figure 201) from wheel hub.
- (4) Remove three screws and nuts securing antiskid detector to wheel nut.
- (5) Pull detector unit out far enough to expose electrical connection.
- (6) Detach electrical connector and remove detector unit from airplane.

B. Install Antiskid Detector

- (1) Connect electrical plug to skid detector (figure 201).
- (2) Insert detector into axle and adjust to align mounting holes.
- (3) Secure detector with three screws and nuts.
- (4) Install actuator arm and counterweight per figure 201.

NOTE: The actuator arm, from existing detector, may be used on replacement detector. The counterweight is installed to extend bearing life.
- (5) Test operation of antiskid system. See Adjustment/Test Antiskid System, 32-31-0.
- (6) Mount dust cover on wheel hub. Ensure that actuator arm is keyed in cover.
- (7) Rotate dust cover until bolt holes are in line.
- (8) Secure cover with three bolts and lockwire.



Skid Detector Installation
 Figure 201

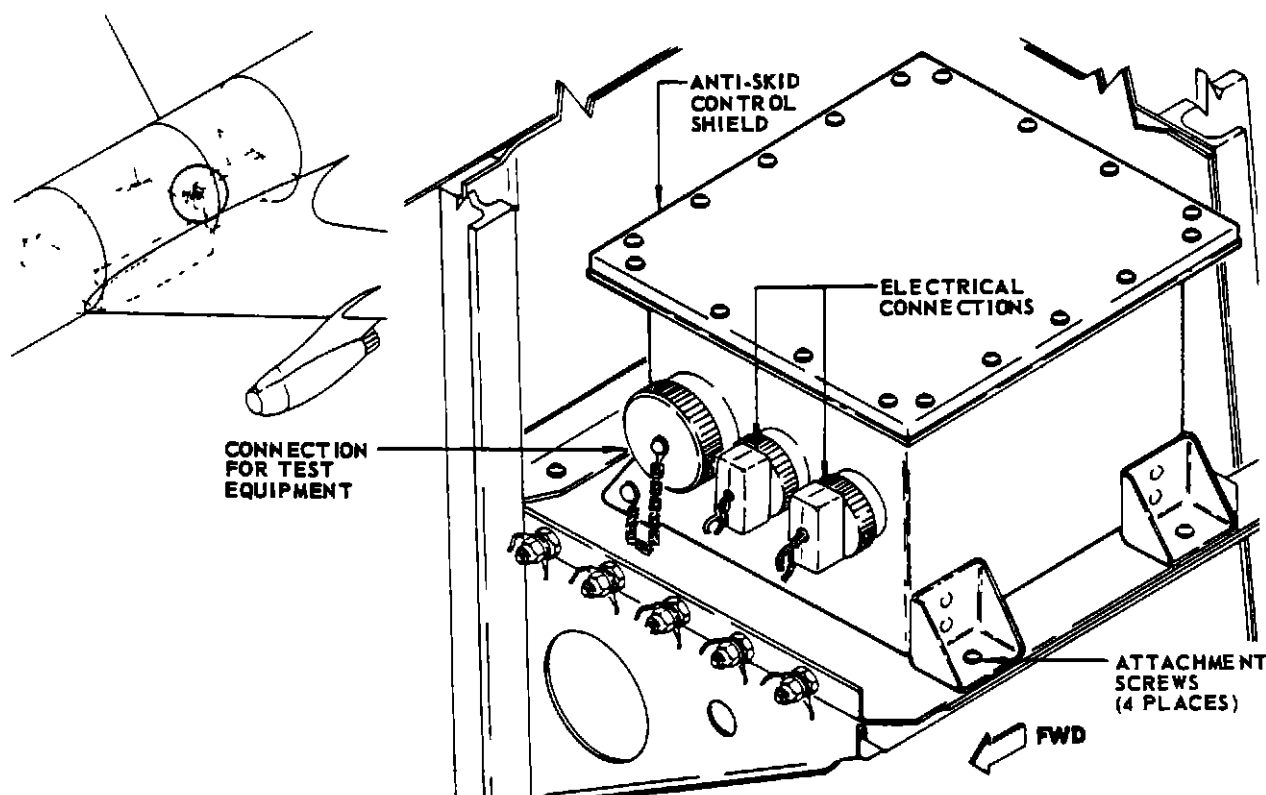
ANTI-SKID CONTROL SHIELD - MAINTENANCE PRACTICES1 Removal/Installation Anti-Skid Control Shield

A Remove Anti-Skid Control Shield (figure 201)

- (1) Check that landing gear down and ground locks are engaged, main landing gear doors are opened and door release handle pulled down and latched.
- (2) Detach control shield electrical connections
- (3) Remove four screws and two nuts attaching control shield to support.
- (4) Remove control shield from airplane

B Install Anti-Skid Control Shield

- (1) Place serviceable anti-skid control shield (figure 201) on support bracket with electrical connections facing forward.
- (2) Secure in position with four screws and two nuts
- (3) Attach electrical connections



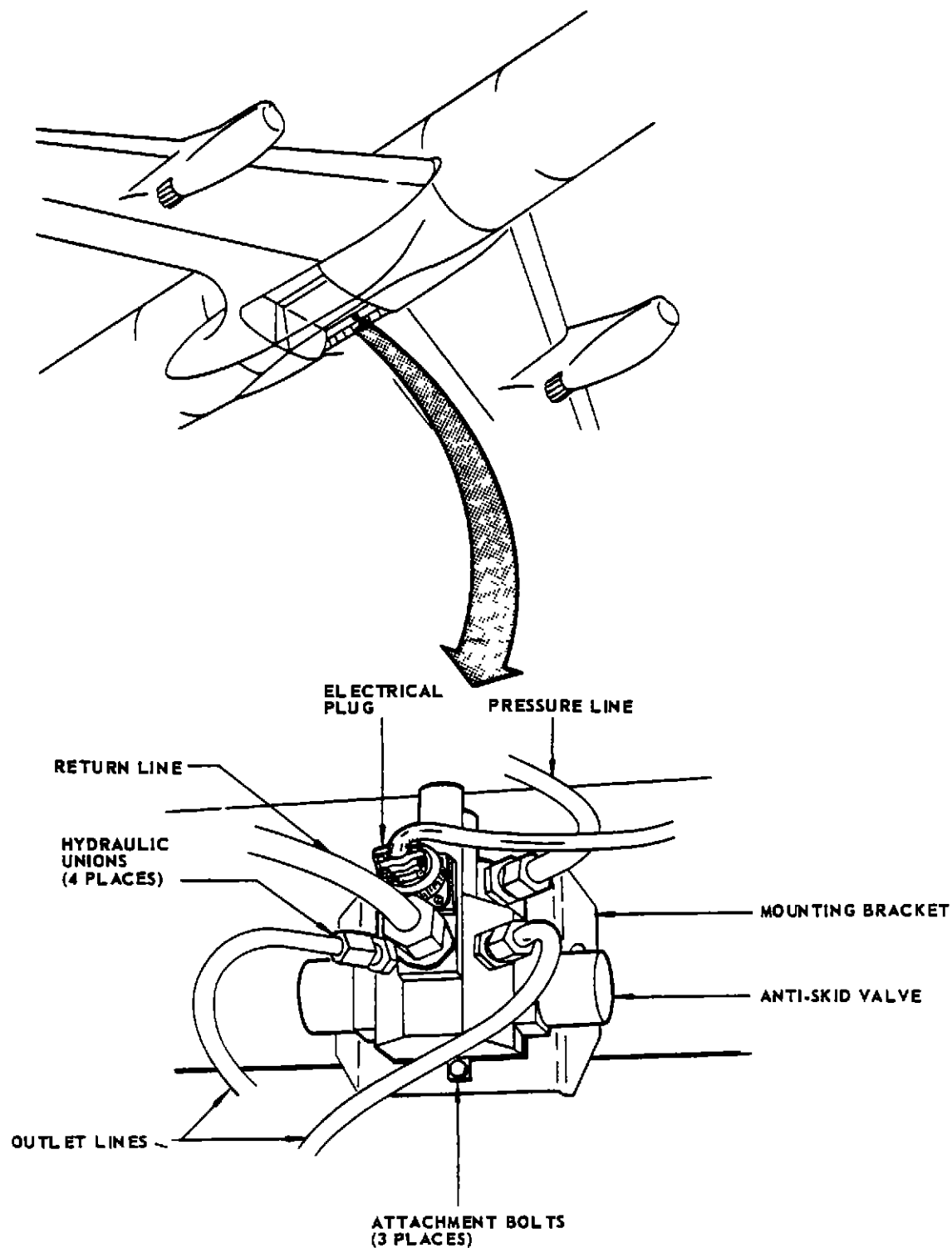
ANTISKID VALVE - MAINTENANCE PRACTICES1. Removal/Installation Antiskid Valve

A Remove Antiskid Valve

- (1) Check that landing gear ground down locks are engaged and landing gear doors are opened with release handle pulled down and latched
- (2) Depressurize hydraulic system and discharge brake accumulator by operating brakes fully, eight to ten times Depressurize hydraulic reservoir by loosening cap three turns
- (3) Position antiskid switch to "OFF" and pull out antiskid circuit breaker in circuit breaker panels (P5), (P6) and (P7).
- (4) Disconnect electrical plug from valve (figure 201) Cap plug and receptacle.
- (5) Disconnect four hydraulic lines to valve. Cap hydraulic lines
- (6) Remove three attaching bolts and washers Remove valve from airplane
- (7) Remove hydraulic unions from valve ports. Plug ports

B. Check of Check Valve (Installed in Dual Antiskid Valve Return line) for internal leak.

- (1) Remove caps from hydraulic lines between brake metering valve and dual antiskid valve and plug the lines.
- (2) Remove caps from the dual antiskid valve return lines.
- (3) Put the parking brake ON.
- (4) Pressurize hydraulic reservoir.
- (5) Check that no fluid is leaking from dual antiskid valve return lines.
- (6) If a leak is noticed, replace check valve.
- (7) If no leak is noticed, check valve is in good condition.
- (8) Depressurize hydraulic reservoir.
- (9) Release parking brake.
- (10) Remove plugs from lines and proceed as in par. C.



Antiskid Valve Installation
Figure 201

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C. Install Antiskid Valve

- (1) Install hydraulic unions (figure 201) with new O-rings, into a serviceable antiskid valve
- (2) With valve in position install three bolts, with washers, through mounting holes in valve. Tighten bolts.
- (3) Uncap valve fittings and hydraulic lines. Connect hydraulic lines.
- (4) Connect electrical plug to valve.
- (5) Bleed brake system, see 32-9-0 "Unit Servicing Hydraulic brake System."
- (6) Tighten reservoir cap and pressurize system. Apply brakes fully for five minutes and check for leaks.
- (7) Test operation of antiskid valve from the main landing gear detector serving that valve. See 32-31-0, "Adjustment/Test Antiskid System."

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ANTISKID BRAKE INDICATORS - MAINTENANCE PRACTICES

1 Removal/Installation Antiskid Indicators

A Remove Antiskid Indicator.

- (1) Check that antiskid system switch is "OFF." Pull antiskid circuit breakers in circuit breaker panels, P5, P6 and P7
- (2) Release and hinge down pilots' overhead panel
- (3) Disconnect electrical plug from indicator.
- (4) Remove two screws and lift indicator from back of panel

B. Install Antiskid Indicator

- (1) With pilots' overhead panel hinged down, place indicator in position and secure with two screws of same length as screws removed in removal of indicator

CAUTION. INSURE THAT SCREWS ARE IDENTICAL IN LENGTH TO THOSE REMOVED. EXCESSIVE LENGTH WILL BREAK INDICATOR SEALING AND DAMAGE INSTRUMENT.

- (2) Connect electrical plug to indicator and close panel.

CAUTION: IF ELECTRICAL CONNECTIONS HAVE BEEN DISTURBED, MAKE SURE THE POSITIVE LEAD IS CONNECTED TO TERMINAL "A" TO AVOID DAMAGE TO DIODE IN UNIT.

- (3) Check operation of indicator by manipulating skid detector in appropriate wheel, see "Adjustment/Test Antiskid System," 32-31-0

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TIRES AND WHEELS - INSPECTION/CHECK

1. General

- A. This section provides procedures for inspection and check of landing gear tires and wheels while installed on the airplane. Inspection procedures with wheel removed are provided in applicable wheel vendor manual.

2. Equipment and Materials

- A. Depth gauge to measure injuries. Use a depth gauge specially designed to avoid secondary damage. When gauge is not available, the injury may be evaluated with any blunt tip metal blade.
- B. Blunt awl to pry imbedded objects.

3. Tire Pressure Check

- A. Check that tire pressure is within specified limit (Ref. 12-1-1).

4. Examine main and nose landing gear wheels

- A. Examine wheels for cracks, flaked paint and evidence of overheating. Check dust caps for loose attach bolts.
- B. Check wheels for missing tie bolts. If tie bolt is missing remove wheel. Inspect wheel assembly and replace tie bolt using procedures in applicable wheel vendor manual.
- C. Examine thermal fuse on main gear wheels
 - (1) If inspection shows that a pressure loss was due to the melting of the wheel thermal fuse, the tire and wheel should be removed from service. Also, all other main gear tire/wheel assemblies should be checked for evidence of melted thermal fuses, especially at the tire/wheel positions with hot brakes.
 - (2) If a tire has been rolled flat, or if the tire-wheel has been removed due to a melted thermal fuse, the removal reason should be tagged to the wheel and the wheel should be inspected in accordance with the wheel vendor's service instructions.

5. Tire wear limit

- A. Remove from service when grooves nearest the center (tire with center rib) or center groove (tire with center groove) reach 1 mm.
The wear criteria can be relaxed at out-stations and during short transit at main base.

NOTE • Uneven wear at shoulder (step-off type wear) is typical for main tires, tires may remain in service.

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6. Cuts into tread

- A. Remove imbedded objects such as small stones, flint, etc... if present, with a blunt awl.
Take adequate protection to prevent body injury. Tires with imbedded objects such as bolt, rivet, screw or with objects which cannot be removed, shall be removed from aircraft.
- B. The evaluation criteria for cuts are depth and length.
 - (1) Cuts no deeper than bottom level of grooves (detail A. Fig. 601). No limitations.
 - (2) If cut is deeper than bottom of the nearest groove up to 8 mm for MLG and 6 mm for NLG below bottom of groove (detail B. Fig. 601), see for length limit per Fig. 602
 - (a) If cut progresses into groove, the tire will be removed if the cut length is more than 20 % of the rib width "L" (detail B1).
 - (b) If cut does not progress into groove, the tire will be removed if the cut length is more than 40 % of the rib width "L" for cut direction between the roll center line and 45° (detail B2) and more than 30% of rib width "L" for cut direction between 45 and 90° (detail B3).
 - (3) If cut extends in carcass plies, remove the tire (detail C. Fig. 601).

NOTE • The cut criteria in paragraph 6.B.(1) and (2) may be increased 10 % more, in paragraph 6.B.(3) to 4 carcass plies, at out-station and during short transit at main base. Enter the discrepancy into the appropriate document for removal of tire at main base.

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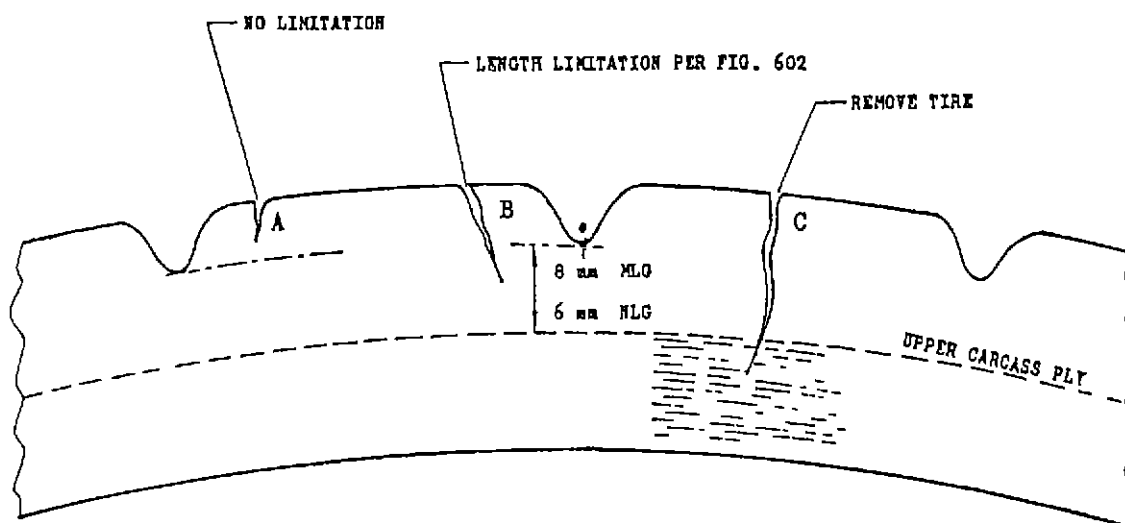


Figure 601
Cut Depth Criteria

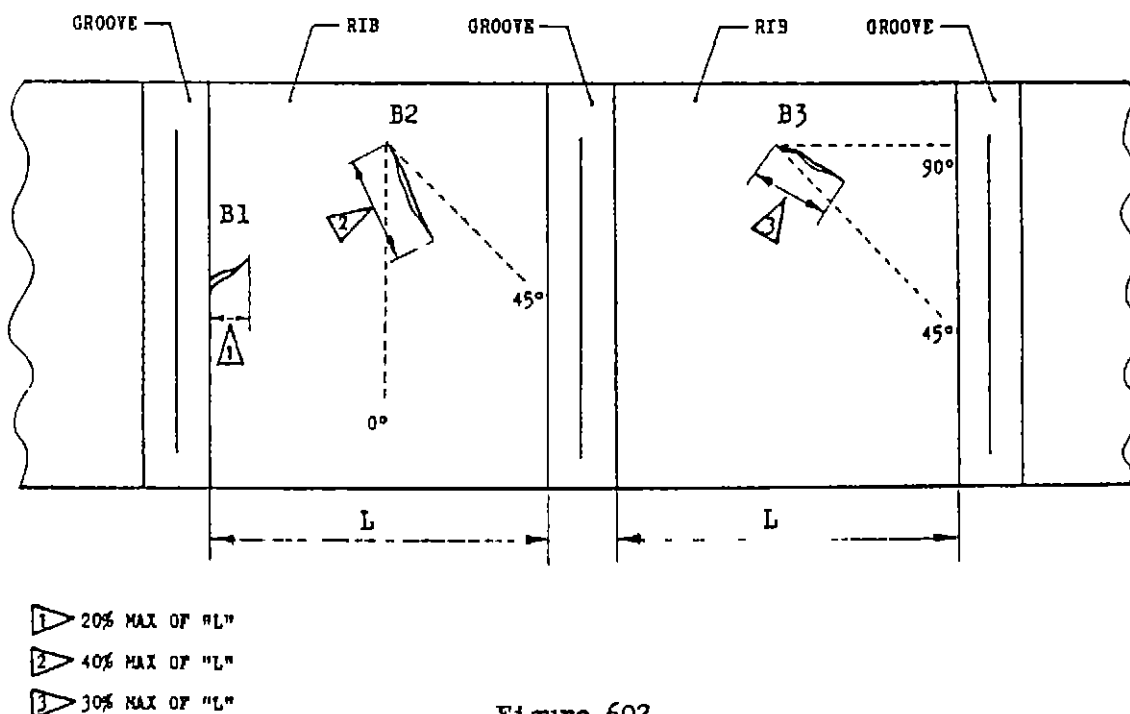


Figure 602
Cut Length Criteria

7 CUTS IN SIDE WALL

Remove tire if any cords are cut or broken. At out-station, tire may continue in service to return to main base if no more than 2 plies are cut or broken.

8 OTHER DAMAGES

	Damage description	Action required	
		Out-Station or short transit at main base	Main Base
1	<u>Chevron cuts</u> These cuts are caused by operation on grooved runway	Cuts will be evaluated according normal cut criteria per para 5	
2	<u>Flat spot</u>	Continue in service if no plies are exposed or if no excessive unbalance result	Remove from service
3	<u>Groove cracking</u> Cracks at bottom of grooves	Continue to main base	Remove from service
4	<u>Open tread splice</u> Opening in the tread splice across one or more tread ribs.	Continue to main base	Remove from service
5	<u>Blister or bulge</u>	Remove from service	
6	<u>Tread rubber reversion</u> Oval shaped area in tread similar to a skid but where rubber shows burning due to hydroplaning	Continue in service if no plies are exposed or if no excessive unbalance result	Remove from service
7	<u>Weather checks</u> Multiple small cracks on side wall	Tire can remain in service until weather checking exposes casing plies.	

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9. IN SERVICE TROUBLES

A. Burst - Melted Fuse - Thrown Tread

	Action required	
Burst 	Replace wheel/tire assy and adjacent one on same dual axle (overload condition)	 
Melted fuse	Replace wheel/tire assy and adjacent one on same dual axle (overload condition)	 
Thrown tread 	Replace wheel/tire assy and adjacent one on same dual axle if pressure of defective tire is less than 80% of normal oper pressure (see 12-15-51)	 

-  Enter aircraft, position, mention "Burst" into the removal tag
-  Enter aircraft, position, mention "overload" into the removal tag
Mark letter "D" on tire (adjacent to inflation valve)
-  Enter aircraft, position, mention "Melted fuse" into the removal tag. Mark letter "F" on tire (adjacent to inflation valve)
-  Notify the responsible engineering department by cable
State in cable date, station, aircraft, flight stage (take-off, landing, etc), position and serial number of wheel, condition of incident Action to be taken for tire parts recovering.

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10. Special checks on tire and wheel

- A. Examine main gear and nose gear wheels when removed.
- (1) Examine wheels for corrosion, cracks and flaked paint.
 - (2) Examine bearings and bearing surfaces for distortion and flat spots.
Check that bearings have sufficient lubrication.
 - (3) Examine grease seals for hardness and dryness.
 - (4) Examine for bent or distorted wheel rims.
 - (5) Test balance weights for security.
 - (6) Examine brake keyway inserts for battering and wear.
 - (7) Examine thermal pressure relief plugs in each of the main landing wheels. Dry torque to be finger tight.
 - (8) Examine lockring and seal retainer for cracks, distortion or surface damage.