SECTION VII
LANDING GEAR AND BRAKE SYSTEM

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SECTION VII

LANDING GEAR AND BRAKE SYSTEM

7-1. INTRODUCTION. This section contains instructions for maintenance, overhaul, inspection and adjustment of the various components of the landing gear and brake system. Adjustments are also given for electrical limit and warning switches.

This section does not cover the hydraulic operation of the landing gear. For maintenance of hydraulic system, refer to Section VI.

7-2. DESCRIPTION. The tricycle landing gear system is an air-oil oleo type unit that is hydraulically operated and fully retractable with the nose gear retracting aft into the nose section and the main gear retracting forward into the engine nacelles. On PA-23-250; PA-23-235; and PA-23-250 (six place), Serial Nos. 27-2000 to 27-2504 incl., the doors operate by mechanical linkage, but do not cover the gear completely when retracted. On PA-23-250 (six place), Serial Nos. 27-2505 and up, the doors are hydraulically operated and completely cover the gear when it is retracted.

To prevent the gear from being retracted while the airplane is on the ground, an anti-retraction valve, located on the left main gear, prevents a build up of hydraulic pressure in the retraction system while the weight of the airplane is on its wheels.

The nose gear is steerable through a 30 degree arc by the use of the rudder pedals. As the gear retracts, however, the steering linkage becomes separated from the gear so that rudder pedal action with the gear retracted is not impeded by the nose gear operation.

The position of the landing gear is indicated by four lights located on the pedestal. When the three green lights are on, all three legs of the gear are down and locked; when the amber light is on, the gear is entirely up, gear doors closed and when no light is on, the gear is in an intermediate position. A red light in the landing gear control knob flashes when gear is up and power from one engine is reduced below 14 to 15 inches of manifold pressure. When power from both engines is reduced below 10 to 12 inches of manifold pressure, a warning horn in the cockpit will sound.

The brakes are hydraulically actuated by individual master cylinders mounted on the left (optional on the right) set of rudder pedals. A reservoir,

accessible through an access panel located on the left side of nose supplies fluid to each master cylinder. From these cylinders, hydraulic fluid is routed through lines and hoses to a parking brake valve, located on the aft-left side of the nose section, through wings to the brake assemblies on each main landing gear. The brakes are self-adjusting, single-disc, double housing and double piston assemblies. To operate the brakes, apply toe pressure against the top of the rudder pedal. The parking brake may be actuated by applying toe pressure and at the same time pulling out on the brake handle. To relieve parking brake pressure, apply toe pressure on the pedals and at the same time push in on the parking brake handle.

Servicing the hydraulic and brake systems is found in Section II.

7-3. TROUBLESHOOTING. Mechanical and electrical switch troubles peculiar to the landing gear system are listed in Table VII-IV at the back of this section. When troubleshooting, first eliminate hydraulic malfunctions as listed in Section VI. Then proceed to switch malfunctions and last to the mechanical operation of the gear itself, both of which are listed in this section. Always place the airplane on jacks before attempting any troubleshooting of the gear.

7-4. LANDING GEAR SYSTEM.

7-5. NOSE LANDING GEAR SYSTEM.

7-6. DISASSEMBLY OF NOSE GEAR OLEO. (Refer to Figure 7-1.) The nose gear oleo assembly may be removed and disassembled from the gear oleo housing with the gear removed from or installed on the airplane.

a. Place the airplane on jacks. (Refer to Jacking, Section II.)

b. Place a drip pan under the nose gear to catch hydraulic fluid spillage.

c. Remove air and fluid from the oleo strut. Depress the air valve core pin (21) until strut chamber pressure has diminished, remove the air valve (18) and with a small hose siphon as much hydraulic fluid from the strut as possible.

d. Remove the torque link assembly by removing the cotter pin, nut, washer and (close tolerance) bolt from the strut housing and fork assembly.

e. Release and remove the snap ring (12) from the annular slot at the bottom of the strut housing.

f. Pull the piston tube (13), with component parts, from the strut housing.

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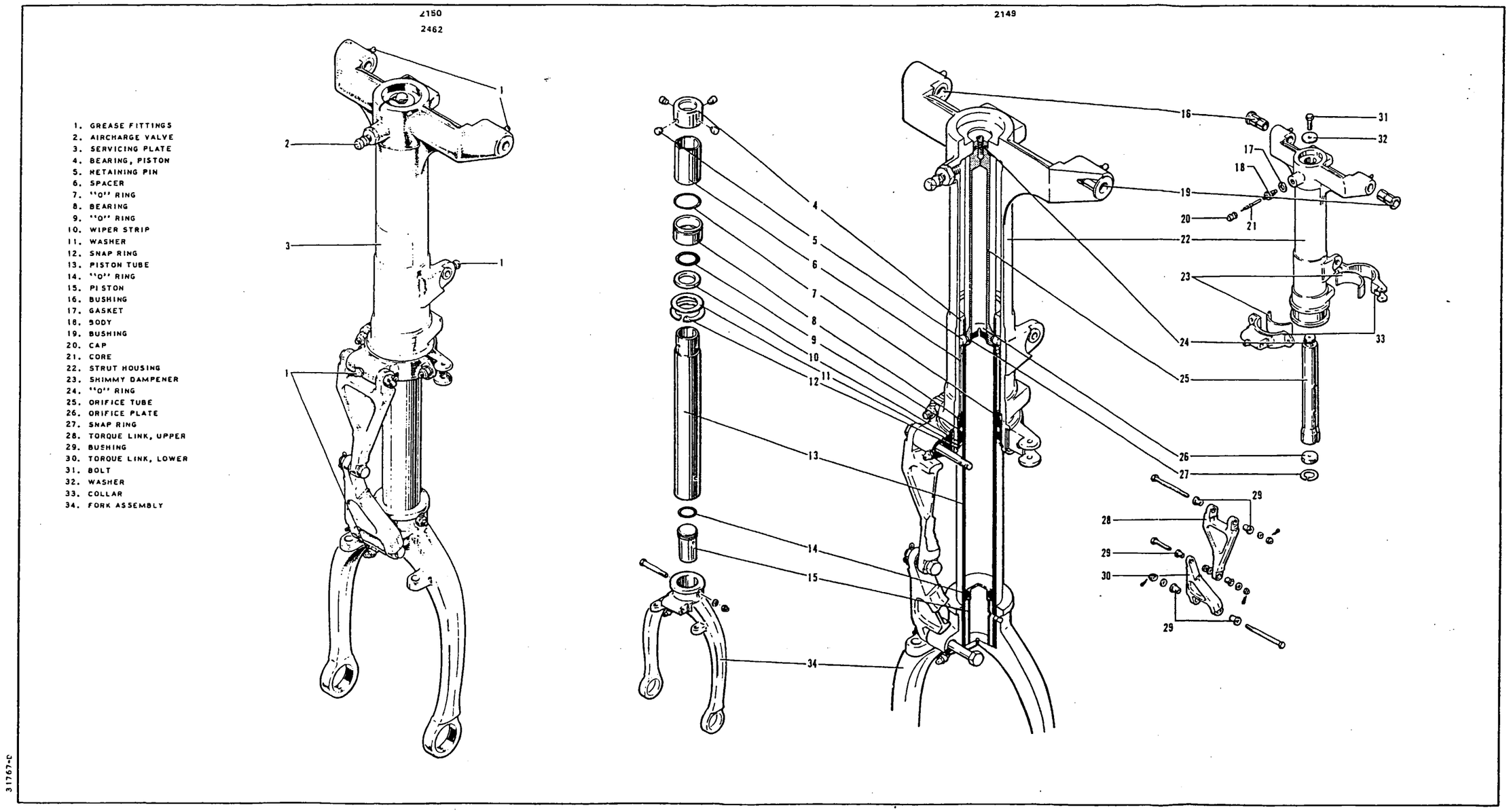

Figure 7-1. Nose Gear Oleo Strut Assembly

g. The piston tube components may be removed by reaching in the tube and pushing out the upper bearing retaining pins (5). Slide the upper bearing (4), spacer (6), lower bearing (8) with outer (7) and inner (9) "O" rings, wiper strip (10), washer (11) and snap ring (12) from the tube.

h. To remove the orifice tube (25), remove the bolt (31) and washer (32) from the top of the strut housing. Pull the tube from the housing (22).

i. The orifice plate (26) is removed from the bottom of the orifice tube by releasing the snap ring (27) that holds the plate in position.

j. To remove the piston tube plug (15) with "O" ring (14) located in the lower end of the tube, remove the bolt assembly at the top of the fork and insert a rod up through the hole in the body of the fork (34), pushing the plug out through the top of the tube.

7-7. CLEANING, INSPECTION AND REPAIR OF NOSE GEAR OLEO.

a. Clean all parts with a suitable dry type cleaning solvent.

b. Inspect the landing gear oleo assembly components for the following:

1. Bearings and bushings for excess wear, corrosion, scratches and overhaul damage.

2. Retaining pins for wear and damage.

3. Snap rings for cracks, burrs, etc.

4. Cylinder and orifice tube for corrosion, scratches, nicks and excess wear.

5. Orifice plate for hole restriction.

6. Fork tube for corrosion, scratches, nicks, dents and misalignment.

7. Air valve for general condition.

c. Repair of the oleo is limited to smoothing out minor scratches, nicks and dents and replacement of parts. Service tolerances for wear of the various components may be found in Table VII-II.

7-8. ASSEMBLY OF NOSE GEAR OLEO. (Refer to Figure 7-1.)

a. Ascertain that parts are clean and inspected.

b. To assemble the fork assembly (34), press the tube end (13) into the fork body, aligning the bolt holes.

c. If a new tube is to be installed that has not been drilled, press the tube into the fork housing until it bottoms. Using the bolt holes in the fork body as a guide, drill a pilot hole and ream to .250 +.002 -.000 through each side of the tube wall. Remove burrs from the inside of the tube and flush the tube with a suitable solvent to remove all metal particles.

d. To install the piston tube plug (15), first lubricate the tube plug and "O" ring (14) with hydraulic fluid (MIL-H-5606) and install the "O" ring on the plug. Lubricate the inside wall of the tube, insert the plug into the top of the tube and push it to the fork end. Align the bolt holes and install bolt assembly.

e. If desired, cement a cork in the hole in the bottom of the fork body to prevent dirt from entering the fork tube.

f. To assemble the orifice tube (25), insert the orifice plate (26) into the bottom of the tube. Secure the plate with the snap ring (27). Lubricate and install and "O" ring (24) on the top end of the tube.

g. Insert the tube up through the bottom of the strut housing (22). With the tube exposed through the top of the housing, install washer (32) and bolt (31). The bolt should only be installed finger tight at this time.

h. The fork tube assembly may be assembled by installing the tube components on the tube. In the following order slide onto the tube, the snap ring (12), washer (11), wiper (10), lower bearing (8) with outer (7) and inner (9) "O" rings, spacer (6) and upper bearing (4). Align lock pin holes of the upper bearing and piston tube and install pins (5).

i. Lubricate the inner wall of the cylinder. Carefully insert the piston tube assembly into the bottom of the housing, allowing the orifice tube to guide itself into the piston tube, until the retainer ring can be installed in the annular slot at the bottom of the cylinder. Slide the washer into position and secure assembly with snap ring.

j. At the top of the housing, tighten the orifice tube retaining bolt and safety.

k. Install the torque link assembly (28 and 30) using bolt (ct), washer, nut, and cotter pin.

NOTE

The bolt should be installed with one of the flat sides of the hex head against the milled stop on the drag links.

m. Lubricate the gear assembly. (Refer to Lubrication Chart, Section II.)

n. Compress and extend the strut several times to ascertain that the strut will operate freely. The weight of the gear wheel and fork should allow the strut to extend.

o. Service the oleo strut with fluid and air. (Refer to Servicing Oleo Struts, Section II.)

p. Check the nose gear for correct adjustment (Refer to Paragraph 7-12.) and for alignment (Refer to Paragraph 7-13.) and gear operation.

q. Lower the airplane and remove jacks.

7-9. REMOVAL OF NOSE LANDING GEAR. (Refer to Figure 7-2.)

a. Remove the left and right access panels from the aft portion of the nose section by releasing fasteners to gain access to the landing gear attachment fittings. (Refer to Access Plates and Panels, Section II.)

b. Place the airplane on jacks. (Refer to Jacking, Section II.)

c. Using the hand pump, retract the gear slightly to relieve the gear from its down and locked position.

d. To remove the drag link assembly, the following procedure may be used:

1. Disconnect the gear retraction rod (19) from the upper drag link (15), by removing cotter pin, nut, washers and bolt.

2. Disconnect the lower drag links (11) from the gear strut housing (4) by removing from each support, the pin, nut, washers, clevis bolt and wire support lug from the left side.

3. Lower the forward end of the drag link assembly and disconnect the down lock indicating switch (22) from its attachment fitting.

4. Remove the drag link assembly by removing the attaching cotter pin, nut, washers and bolt from the aft end of the upper drag link.

e. With the lower drag links disconnected from the gear housing, the gear may be removed by removing the attaching cotter pins, nuts, washers and bolts (close tolerance) at the fuselage frame fitting.

7-10. CLEANING, INSPECTION AND REPAIR OF NOSE LANDING GEAR.

a. Clean all parts with a suitable cleaning solvent.

b. Inspect the landing gear assembly components for the following unfavorable conditions:

1. Bolts, bearings, bushings and ball joints for excessive wear, corrosion and damage.

2. Gear housing, drag links, rods and attachments for cracks, bends or misalignment.

3. Downlock springs for wear, corrosion and not returning to complete compression.

4. General condition of limit switches.

5. Wiring for fraying, poor connections or conditions that may lead to failures.

c. Attach the upper and lower drag links and check that there is 0 to .007 of an inch clearance between the latch hook and pin. Dress upper and lower link stop surfaces to obtain minimum clearance. Also check that when the stop surfaces touch, linkage is .250 +.031 -0 inch through center. (Refer to Figure 7-3.) Should this distance exceed the required through center travel, and bolt and bushings are tight, replace one or all drag links.

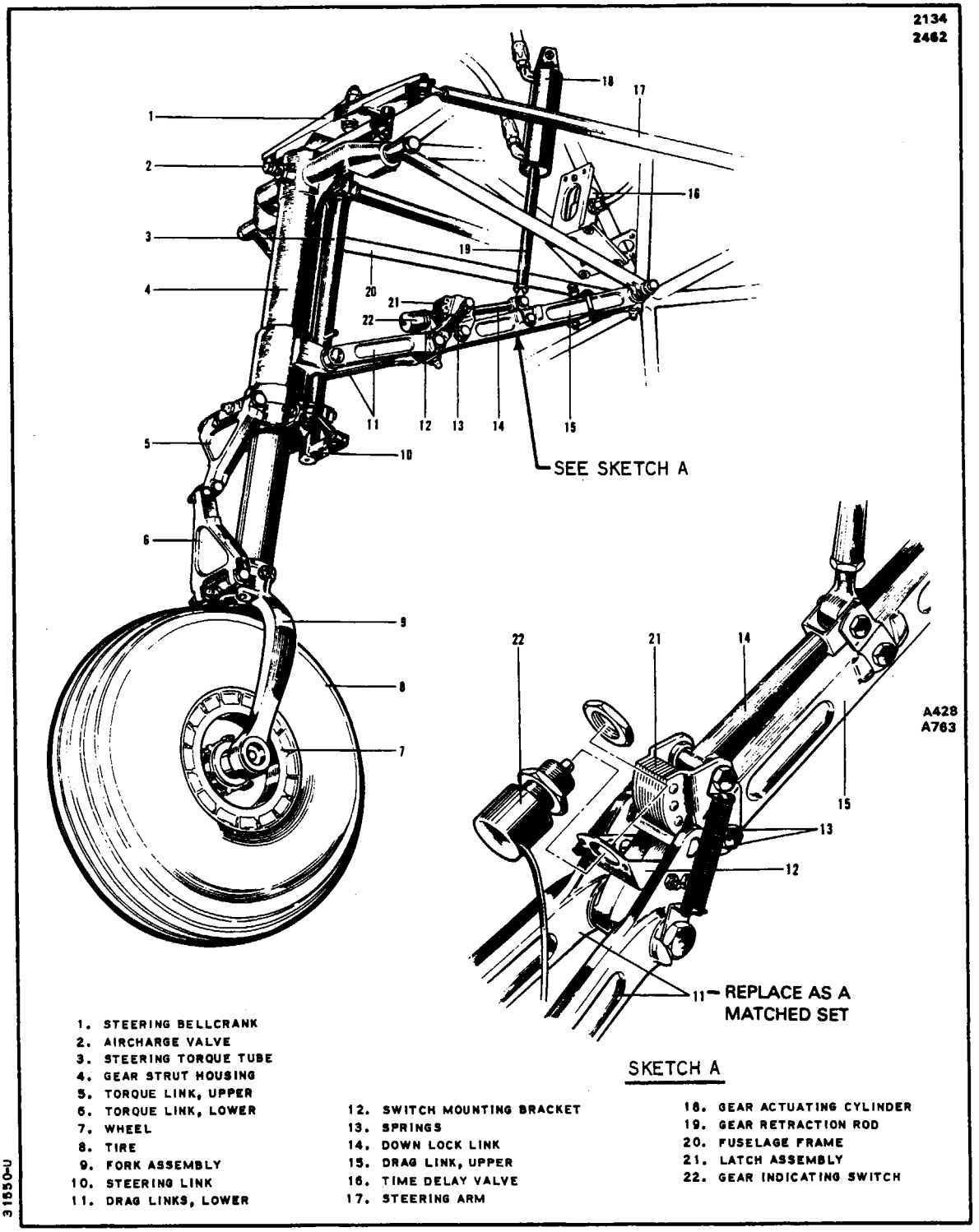

Figure 7-2. Nose Landing Gear Installation

d. Repair to the landing gear is limited to reconditioning of parts such as replacing bearings and bushings, smoothing out minor nicks and scratches, repainting of areas where paint has chipped or peeled and replacement of parts. Service tolerances for wear of the various components may be found in Table VII-II.

7-11. INSTALLATION OF NOSE LANDING GEAR. (Refer to Figure 7-2.)

NOTE

When assembling any units of the landing gear, lubricate bearings and friction surfaces with proper lubricant as described in Section II.

a. Position the landing gear portion of the steering mechanism and the gear housing attachment point bushings so they align with the attachment points at the front of the tubular structure. From each outboard side install the stop bolt plate, bolt (ct), washer, nut and cotter pin. Tighten the pivot bolts to a snug fit, allowing the gear to swing free, and safety.

b. If the drag link assembly was removed, reinstall by the following procedure:

1. Ascertain that the linkage through center travel is within tolerance. (Refer to step c, Paragraph 7-10.)

2. Position the aft end of the drag link assembly (15) and install, from left to right, the attaching bolt, washer, nut and cotter pin.

3. Temporarily install the landing gear down limit switch (22) to the attachment bracket (12) on the drag links (11 and 15).

4. Connect the forward end of the drag link assembly (11) to the strut housing. Install, from each outboard side, a clevis bolt, washer, nut and cotter pin.

NOTE

A small right angle wire support lug is installed under the head of the left bolt, with its outstanding leg aft.

5. With the drag link assembly in the down and locked position and the retraction rod (19) fully extended, adjust the rod end until the attachment bolt can be freely inserted.

c. Check adjustment and operation of nose landing gear. (Refer to Paragraph 7-12.)

d. Check adjustment of nose gear down limit switch. (Refer to Paragraph 7-44.)

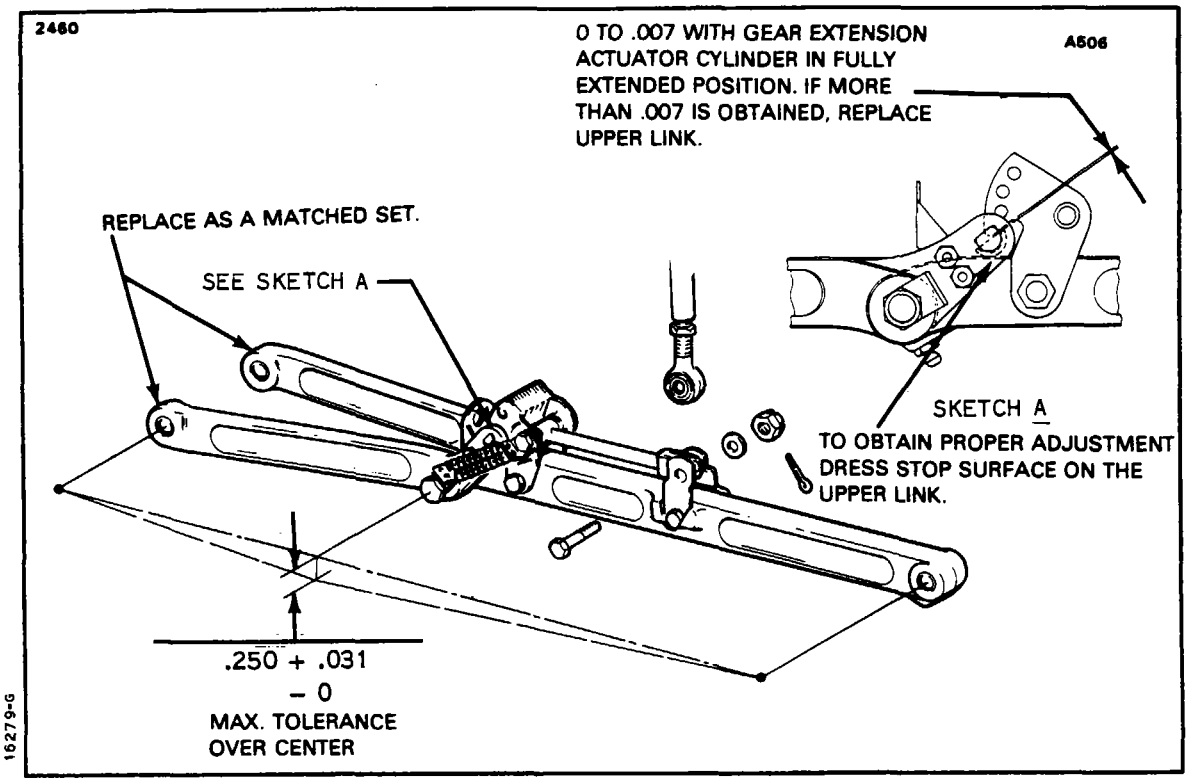

Figure 7-3. Adjustment of Nose Gear Drag Link and Latch Assembly

e. Check alignment of nose gear. (Refer to Paragraph 7-13.)

f. Lubricate the landing gear assembly. (Refer to appropriate Lubrication Chart, Section II.)

g. Lower the airplane and remove jacks.

h. Install canvas cover, if removed, around the upper side of the wheel well with screws and install access panels.

7-12. ADJUSTMENT OF NOSE LANDING GEAR.

a. Place the airplane on jacks. (Refer to Jacking, Section II.)

b. Disconnect the actuator cylinder from the upper drag link assembly, if not previously disconnected.

c. Check to determine that the gear housing is not restricted from swinging far enough forward as a result of the steering arm rollers pressing against the steering bellcrank, thus preventing the drag link assembly from dropping into the locked position. Should there be interference, remove the shims on the steering horn until after drag link adjustments are made. Readjust per Paragraph 7-13.

d. Ascertain that the piston rod of the actuating cylinder is in the fully extended position by operating the hand pump with the landing gear selector in the down position.

e. Disconnect the downlock springs, by removing cotter pin, nut and washer, and the bolt installed through the latch and link assembly. Reinstall the bolt and nut through catch and link.

NOTE

Ascertain that the actuating cylinder has one inch side play, measured at the rod end bearing with the cylinder fully extended. Adjust the actuating cylinder mounting bolt to allow sufficient clearance to permit this side play.

f. Holding the drag links in the down and locked position, adjust the rod end bearing of the actuator until the attaching bolt passes freely through the gear idler link and downlock link assembly. Secure rod end with bolt, washer, nut and cotter pin. Tighten jam nut on rod end against piston rod.

CAUTION

If the actuator is over-extended, the pressure may bend or snap the lock link.

g. Ascertain there is 0 to .007 of an inch clearance between the latch and hook. (Refer to Figure 7-3.)

NOTE

The stop surface on the upper link may be dressed to obtain the 0 to .007 of an inch clearance. If .007 is exceeded replace the upper link. The lower links are matched sets and should be replaced as sets.

h. Reassemble the downlock springs and secure with bolt, washer, nuts and cotter pins.

i. Using the hand pump or a hydraulic test stand, raise and lower the gear several times to determine proper operation of all components.

j. Adjust the gear up bumper block so that the strut housing compresses the rubber pad by approximately .062 of an inch.

NOTE

The strut housing is made to bear against the pad to eliminate up and down bouncing of the strut assembly. The bumper block provides the necessary solid resistance without damaging the gear.

k. Lower the airplane and remove jacks.

7-13. ALIGNMENT OF NOSE LANDING GEAR. Two methods of aligning the nose landing gear are as follows:

I. CHALK METHOD:

a. Remove the access panels from both sides of the nose section and relieve the rudder cable tension by loosening the turnbuckles.

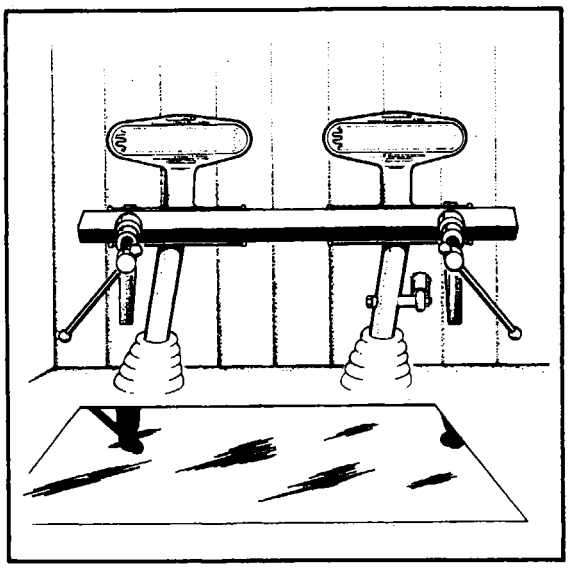

Figure 7-4. Clamping Rudder Pedals in Neutral

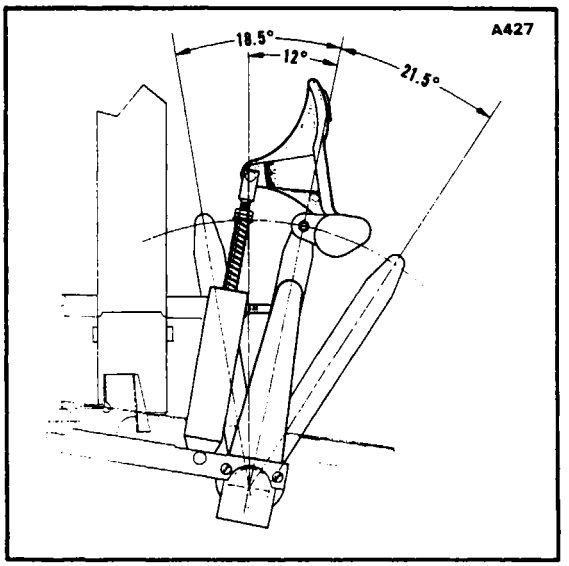

Figure 7-5. Rudder Pedals Neutral Angle

b. Place the airplane on a smooth level floor that will accommodate the striking of a chalk line.

c. Place the airplane on jacks. (Refer to Jacking, Section II.)

d. Level airplane laterally and longitudinally. (Refer to Leveling, Section II.)

e. From the center of the tail skid, extend a plumb bob and mark the contact point on the floor.

f. From the grease fitting, at the upper end of the drag link assembly, extend a plumb bob and mark the contact point on the floor.

g. Using the two plumb bob marks as a guide, snap a chalk line extending several feet beyond each mark.

h. On airplanes with an adjustable nose wheel steering link, check and, if required, adjust the link to maintain a 2.31 inch dimension between the center of the attaching end fittings.

i. Clamp rudder pedals to align in a lateral position. (Refer to Figure 7-4.)

j. To insure full travel of nose wheel, make sure no gaps exist at points where the steering arm travel bushings contact with the steering bellcrank. If gaps exist, install shims (.032, P/N 18874-00; .062, P/N 18874-02 or .125, P/N 18874-03) as required until a maximum gap of .032 of an inch exists between the steering bellcrank rollers and the steering arm.

k. Adjust the rod end bearings of each steering rod to align the nose wheel with the chalk line and to bring the rudder pedals into neutral angle fore and aft. (Refer to Figure 7-5.) The neutral angle of the pedals is 12 degrees aft of the vertical position, with the airplane level. To align the nose wheel straight forward, stand in front of the nose gear and align the center rib of the tire with the chalk line or lay a straightedge along the side of the tire and parallel the straight edge with the chalk line.

l. To check nose gear steering for its 15 degree maximum right and left travel, mark on each side of the nose wheel a 15 degree angle line from centerline and wheel pivot point. Turn wheel to maximum travel in both directions to check for allowable travel. Should travel be exceeded in one direction and not enough in the other direction, check for possible damage to the gear fork or torque links.

m. Adjust the shimmy dampener (refer to Figure 7-1, item 23) by means of its washers to give a good firm fit. If the collar is too tight, the result will be hard steering and, if too loose, nose wheel shimmy will be present. It may be necessary, at times, to try several combinations or thicknesses of washers to get the proper result.

n. Adjust rudder cable tension per Adjustment of Rudder Controls, Section V, and install the access panels.

II. JIG METHOD. (Refer to Figure 7-6.) Fabricate a jig tool conforming to specifications given in Figure 7-32.

a. Remove the access panels from both sides of the nose section and relieve the rudder cable tension by loosening the turnbuckles.

b. Place the airplane on jacks. (Refer to Jacking, Section II.)

c. Level the airplane laterally and longitudinally.

d. Attach the (fabricated) nose wheel jig to the back of the nose wheel at the axle.

e. Extend and attach a plumb bob from the grease fitting at the upper end of the drag link assembly.

f. On airplanes with an adjustable nose wheel steering link, check and if required, adjust the link to maintain a 2.31 inch dimension between the center of the attaching end fittings.

g. Clamp the rudder pedals to align in a lateral position. (Refer to Figure 7-4.)

h. To insure full travel of nose wheel, make sure no gaps exist at points where the steering arm travel bushings contact with the steering bellcrank. If gaps exist, install shims (.032, P/N 18874-00; .062, P/N 18874-02 or .125, P/N 18874-03) as required until a maximum gap of .031 of an inch exists between the steering bellcrank rollers and the steering arm.

i. Adjust the rod end bearings of each steering control rod to align the plumb bob with the centerline marked on the jig and to bring the rudder pedals into neutral angle fore and aft. The neutral angle of the pedals is 12 degrees aft of the vertical position, with the airplane level. (Refer to Figure 7-5.) Do not attempt to make the adjustment by means of one bearing, but divide the adjustment between the bearings at each end of the steering rods. Check that rod ends have sufficient gripping thread by ascertaining that a wire will not go through the check hole in the rod, and then tighten locknut.

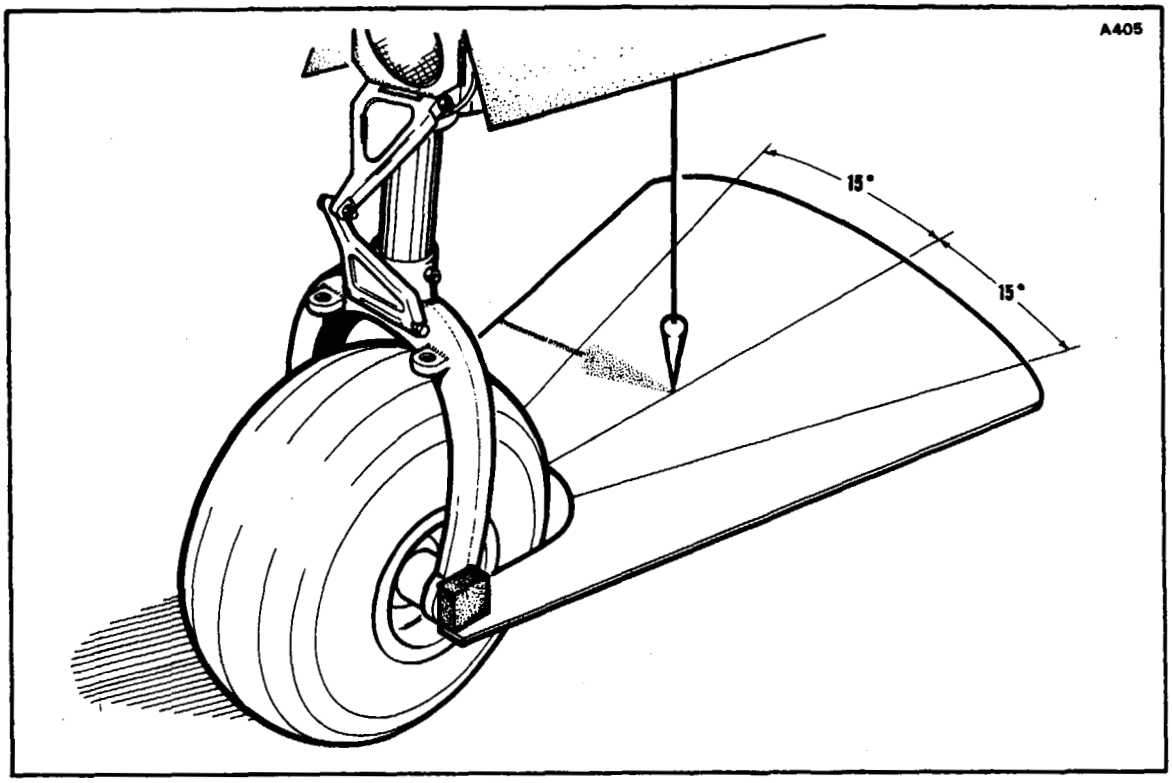

Figure 7-6. Aligning the Nose Gear

j. To check nose gear steering for its 15 degree maximum right and left travel, turn the nose wheel with jig attached in each direction to determine that the plumb bob aligns with the 15 degree marks on the jig. Should travel be exceeded in one direction and not enough in the other direction, check for possible damage to the gear fork or torque links.

k. Adjust the shimmy dampener (refer to Figure 7-1, Item 23) by means of its washers to give a good firm fit. If the collar is too tight, the result will be hard steering and, if too loose, nose wheel shimmy will be present. It may be necessary, at times, to try several combinations or thicknesses of washers to get the proper result.

l. Adjust the rudder cable tension per instructions in Section V and install the access panels.

7-14. NOSE GEAR DOOR ASSEMBLY.

7-15. REMOVAL OF NOSE GEAR DOOR ASSEMBLY. (PA-23-250; PA-23-235; and PA-23-250 (six place), Serial Nos. 27-2000 to 27-2504 incl.) (Refer to Figure 7-7.)

a. Disconnect the retraction rod assembly from the door by removing self-locking nut, washers, and bolt from each door half.

b. On PA-23-250 and PA-23-235 airplanes, the doors may be removed by removing the attaching bolt from each hinge. On PA-23-250 (six place) airplanes, the doors may be removed by removing the hinge pins from each door.

c. The operating mechanism may be removed by removing the bolts and washers from the bearing blocks on each side of the wheel well.

NOTE

The operating mechanism may be further disassembled as necessary.

7-16. CLEANING, INSPECTION AND REPAIR OF NOSE GEAR DOOR ASSEMBLY. (PA-23-250; PA-23-235; and PA-23-250 (six place), Serial Nos. 27-2000 to 27-2504 incl.)

a. Clean all parts with a suitable cleaning solvent.

b. Inspect the door for cracks or bent skin, loose hinge brackets and worn or corroded bearings.

c. Check the retracting mechanism for worn downlock spring and worn or damaged surfaces.

d. Repair to the door assembly is limited to replacing hinge bearings or rivets and mechanism parts, minor skin repairs and repainting.

7-17. INSTALLATION OF NOSE GEAR DOOR ASSEMBLY. (PA-23-250; PA-23-235; and PA-23-250 (six place), Serial Nos. 27-2000 to 27-2504 incl.) (Refer to Figure 7-7.)

a. Position the complete operating mechanism inside the wheel well and secure the bearing blocks with attaching bolts and washers.

b. On PA-23-250 and PA-23-235 airplanes, install the doors by positioning the doors and securing with attaching bolt. On PA-23-250 (six place) airplanes, install the gear doors by positioning the doors and installing a new hinge pin. The hinge pin ends should be bent to provide a safety.

c. Adjust the gear doors. (Refer to Paragraph 7-18.)

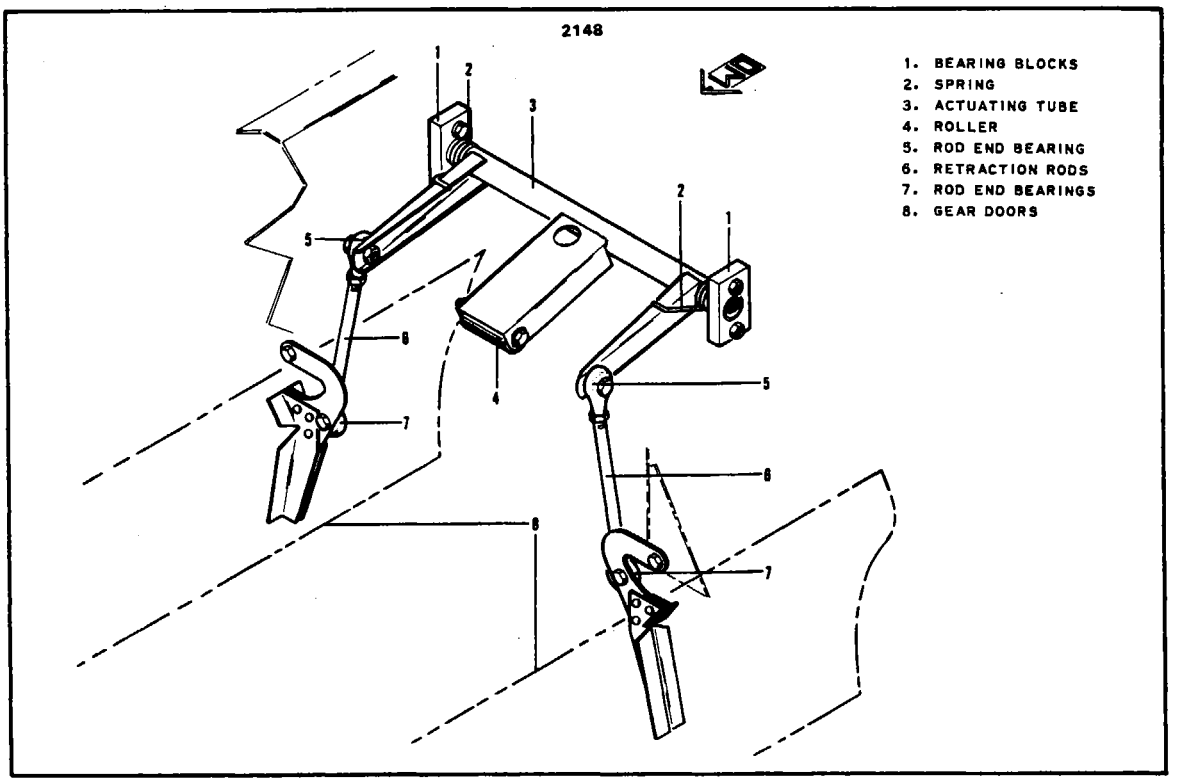

Figure 7-7. Mechanical Nose Gear Door Mechanism
PA-23-250; PA-23-235; and PA-23-250 (six place)
Serial Nos. 27-2000 to 27-2504 incl.

7-18. ADJUSTMENT OF NOSE LANDING GEAR DOORS. (PA-23-250; PA-23-235; and PA-23-250 (six place), Serial Nos. 27-2000 to 27-2504 incl.) (Refer to Figure 7-7.)

a. Place the airplane on jacks. (Refer to Jacking, Section II.)

b. Disconnect the nose gear door retraction rods, if not previously disconnected.

c. Using the hydraulic hand pump, raise the landing gear to the full up position.

d. Adjust the doors one at a time. Close the door to the stop and adjust the retraction rod so the connecting bolt passes freely through the hole in the rod and attachment bracket.

e. Disconnect the adjusted door and adjust the other door according to step d.

f. Extend the landing gear and connect both doors.

g. Retract the landing gear fully and ascertain the doors close properly and do not bind.

7-19. REMOVAL OF NOSE GEAR DOOR ASSEMBLY. (PA-23-250 (six place), Serial Nos. 27-2505 and up.) (Refer to Figure 7-8.)

a. Disconnect the rod assembly from the doors by removing the attaching self-locking nut and bolt.

b. The doors may be removed by removing the hinge pins from each door.

c. The operating mechanism may be removed by the following procedure:

1. If a downlock spring is installed, disconnect it from the left side of the wheel well by removing bolt, washer and bushing.

2. Disconnect the hydraulic actuating rod from the front door mechanism.

3. Remove the attaching bolts from the bearing blocks located on each side of the wheel well. Remove the operating mechanism.

NOTE

The operating mechanism may be further disassembled as necessary.

7-20. CLEANING, INSPECTION AND REPAIR OF NOSE GEAR DOOR ASSEMBLY. (PA-23-250 (six place), Serial Nos. 27-2505 and up.)

a. Clean all parts with a suitable cleaning solvent.

b. Inspect the outboard or inboard doors for cracks or bent skin, loose hinge brackets and worn or corroded bearings.

c. Repair to the door assemblies is limited to replacing hinge bearing, brackets or rivets, minor skin repairs and painting.

d. Refer to Section VI for repair of the actuating cylinder.

7-21. INSTALLATION OF NOSE GEAR DOOR ASSEMBLY. (PA-23-250 (six place), Serial Nos. 27-2505 and up.) (Refer to Figure 7-8.)

a. Position the complete operating mechanism inside the wheel well and secure the bearing blocks with attaching bolts.

b. Install the gear doors by positioning the doors and installing a new hinge pin. The hinge pin ends should be bent to provide a safety.

c. If previously installed, attach the downlock spring to the left side of the wheel well with bushing, washer and bolt.

d. Adjust the gear doors. (Refer to Paragraph 7-22.)

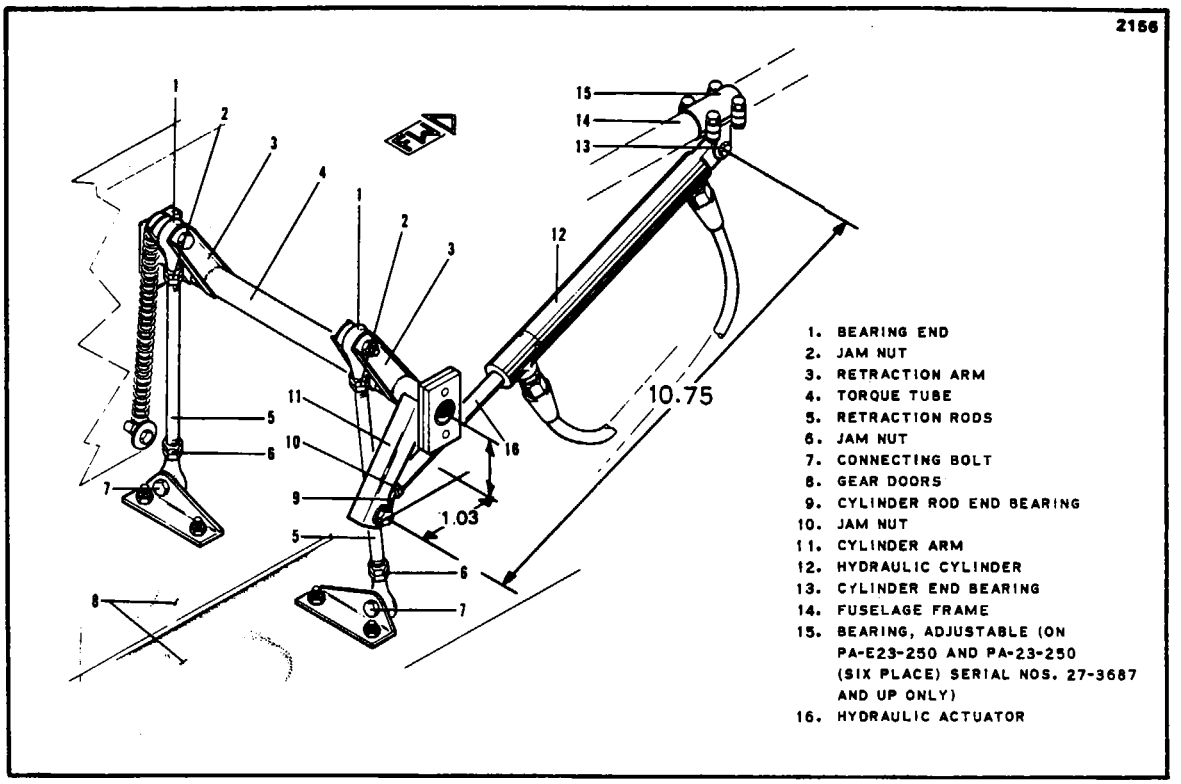

Figure 7-8. Hydraulic Nose Gear Door Mechanism
PA-23-250 (six place), Serial Nos. 27-2505 and up

7-22. ADJUSTMENT OF NOSE LANDING GEAR DOORS. (PA-23-250 (six place), Serial Nos. 27-2505 and up.) (Refer to Figure 7-8.)

a. Place the airplane on jacks. (Refer to Jacking, Section II.)

b. Disconnect the nose gear door retraction rods, if not previously disconnected.

c. Using the hydraulic hand pump, raise the landing gear to the fully retracted position.

d. Ascertain that the door actuator rod is fully extended and adjust the rod end bearing to give 10.75 inches from center of the rod end bearings to center of the cylinder end bearings.

e. Connect the actuating rod to the torque tube arm.

f. On PA-23-250 (six place), airplanes, Serial Nos. 27-3687 and up, with adjustable actuating cylinder attachment bracket, use the following procedure:

1. Loosen the attaching bolts holding the bracket in place on the fuselage frame.

2. With the actuator rod fully extended, move the bracket until a horizontal dimension of 1.03 inches is obtained between the center of the torque tube and the

actuating rod end bearing.

3. Tighten the attaching bolts securing the bracket to the fuselage frame.

g. Adjust doors one at a time. Close door to stop and with no load exerted on the cylinder, adjust retraction rods so the connecting bolts pass freely through their holes.

h. Extend the landing gear, connect both doors.

i. Retract the landing gear fully and ascertain that there is .031 of an inch between doors.

j. Take up each retraction rod two additional turns to pre-load the doors.

7-23. MAIN GEAR ASSEMBLY.

7-24. DISASSEMBLY OF MAIN GEAR OLEO. The main gear oleo assembly may be removed and disassembled from the gear oleo housing with the gear removed from or installed on the airplane. (Refer to Figure 7-9.)

a. Place the airplane on jacks. (Refer to Jacking, Section II.)

b. Place a drip pan under the main gear to catch spillage.

c. Remove air and fluid from the oleo strut. Depress the air valve core pin (27) until strut chamber pressure has diminished, remove the air charge valve (2) and, with a small hose, siphon as much hydraulic fluid from the strut as possible by compressing the strut to the top of the housing.

d. Disconnect the brake hydraulic lines just above the bracket on the main gear fork assembly (18).

e. Remove the torque link assembly (23 and 25) by removing the cotter pin, nut, washer, and bolt (close tolerance) from the strut housing (30) and fork assembly (18).

f. Release and remove the snap ring (14) from the annular slot at the bottom of the strut housing.

g. Pull the piston tube (15), with component parts, from the strut housing.

h. The piston tube components may be removed by reaching in the tube and pushing out the upper bearing retaining pins (7). Slide the upper bearing (6), spacer, lower bearing (10) with outer (9) and inner (11) "O" rings and wiper strip (12), washer (13) and snap ring (14) from the tube (15).

i. To remove the orifice tube (20), remove the bolt (1) and washer (4) from the top of the strut housing. Pull the tube from the housing.

j. The orifice plate (21) is removed from the bottom of the orifice tube by releasing the snap ring (22) that holds the plate in position.

k. To remove the piston tube plug (17) with "O" ring (16) located in the lower end of the tube, remove the bolt assembly at the top of the fork and insert a rod up through the hole in the body of the fork, pushing the plug out through the top of the tube.

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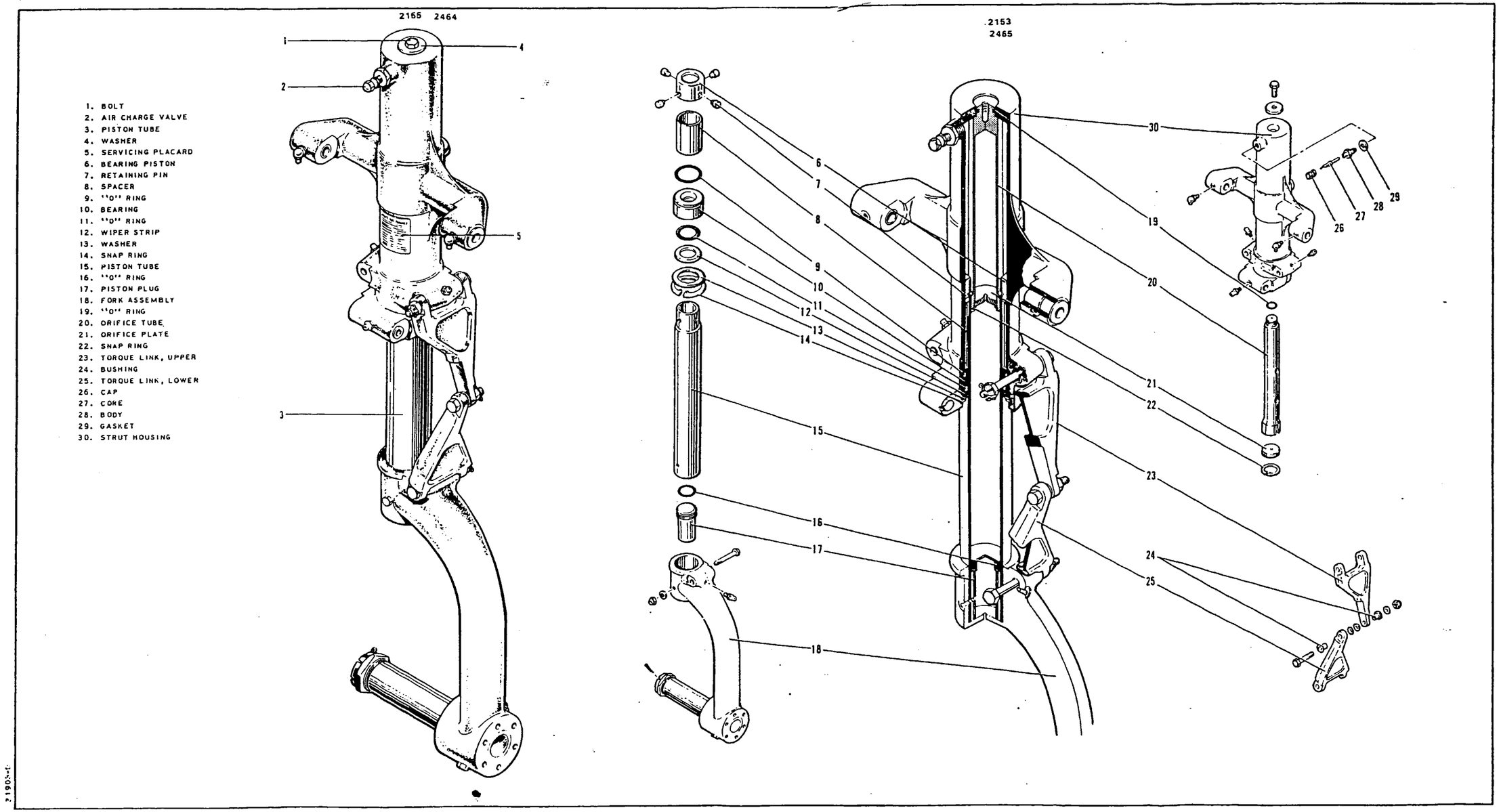

Figure 7-9. Main Gear Oleo Strut Assembly

7-25. CLEANING, INSPECTION AND REPAIR OF MAIN GEAR OLEO.

a. Clean all parts with a suitable dry type cleaning solvent.

b. Inspect the landing gear oleo assembly component for the following:

1. Bearings and bushings for excess wear, corrosion, scratches and overhaul damage.

2. Retaining pins for wear and damage.

3. Snap rings for cracks, burrs, etc.

4. Cylinder and orifice tube for corrosion, scratches, nicks and excess wear.

5. Orifice plate for hole restriction.

6. Fork tube for corrosion, scratches, nicks, dents and misalignment.

7. Air valve general condition.

c. Repair of the oleo is limited to smoothing out minor scratches, nicks and dents and replacement of parts. Service tolerance for wear of the various components may be found in Table VII-III.

7-26. ASSEMBLY OF MAIN GEAR OLEO. (Refer to Figure 7-9.)

a. Ascertain that parts are clean and inspected.

b. To assemble the fork assembly, press the tube end (15) into the fork body (18), aligning the bolt holes.

c. If a new tube is to be installed that has not been drilled, press the tube into the fork housing until it bottoms. Using the bolt holes in the fork body as a guide, drill a pilot hole and ream to .250 + .002 - .000 through each side of the tube wall. Remove burrs from the inside of the tube and flush the tube with a suitable solvent to remove all metal particles.

d. To install the piston tube plug (17), first lubricate the tube plug and "O" ring (16) with hydraulic fluid (MIL-H-5606) and install the "O" ring on the plug. Lubricate the inside wall of the tube, insert the plug into the top of the tube and push it to the fork end. Align the bolt holes and install bolt assembly.

e. If desired, cement a cork in the hole in the bottom of the fork body to prevent dirt from entering the fork tube.

f. To assemble the orifice tube (20), insert the orifice plate (21) into the bottom of the tube. Secure the plate with the snap ring (22). Lubricate and install "O" ring (19) on the upper end of the tube.

g. Insert the tube up through the bottom of the strut housing (30). With the tube exposed through the top of the housing install the packing, washer (4) and bolt (1). The bolt should only be installed finger tight at this time.

h. The fork tube assembly may be assembled by installing the tube components on the tube. In the following order slide onto the tube, the snap ring (14), washer (13), wiper (12), lower bearing (10) with outer and inner "O" rings (9 and 11), spacer (8) and upper bearing (6). Align lock pin holes of the upper bearing and

orifice tube and install pins (7).

i. Lubricate the inner wall of the cylinder. Carefully insert the piston tube assembly into the bottom of the housing, allowing the orifice tube to guide itself into the piston tube, until the snap ring can be installed in the annular slot at the end of the cylinder.

j. At the top of the housing, tighten the orifice tube retaining bolt (1) and safety.

k. Install the torque link assembly (23 and 25) using bolt (ct), washer, nut and cotter pin.

NOTE

The bolt should be installed with one of the flat sides of the hex head against the milled stop on the torque links.

l. Connect the brake line.

m. Lubricate the gear assembly. (Refer to Lubrication Chart, Section II.)

n. Compress and extend the strut several times to ascertain that the strut will operate freely. The weight of the gear wheel and fork should allow the strut to extend.

o. Service the oleo strut with fluid and air. (Refer to Servicing Oleo Struts, Section II.)

p. Bleed the brake system. (Refer to Paragraph 7-74.)

q. Align the landing gear. (Refer to Paragraph 7-31.)

r. Lower the airplane and remove jacks.

7-27. REMOVAL OF MAIN LANDING GEAR. (Refer to Figure 7-10.)

a. Place the airplane on jacks. (Refer to Jacking, Section II.)

b. Place a drip pan under the landing gear to be removed to catch spillage.

c. Disconnect the brake line fitting at the main spar.

d. At the left gear only, disconnect the hydraulic line fittings from the anti-retraction valve (3).

e. Remove the clamp around the landing gear strut housing, holding the down lock indicator switch wire.

f. Disconnect the lower drag links (17) from the landing gear strut housing (2) by removing cotter pin, nut, washer and bolt (ct).

g. Remove the cotter pin and nut from the landing gear attaching bolts.

h. Remove the landing gear attaching bolts (ct) (24) with their stop (20), by reaching through an opening in the wing ribs.

NOTE

It may be necessary to remove the fabric dust cover from the openings in the wing rib.

i. Remove the landing gear.

j. If the drag link assembly is to be removed, use the following procedure:

1. Disconnect the gear retraction rod (12) from the drag link assembly (14 and 17) by removing cotter pin, nut, washers and bolt.

2. Lower the drag link and remove the downlock indicating switch (16).

3. Remove the attaching cotter pin, nut, washer and bolt from the upper drag link assembly and remove the assembly.

7-28. CLEANING, INSPECTION AND REPAIR OF MAIN LANDING GEAR.

a. Clean all parts with a suitable cleaning solvent.

b. Inspect the landing gear assembly components for the following unfavorable conditions:

1. Bolts, bearings, bushings and ball joints for excessive wear, corrosion and damage.

2. Gear housing, drag links, rods and attachment cracks, bends or misalignment.

3. Downlock springs for wear, corrosion and not returning to complete compression.

4. General condition of limit switches.

5. Wiring for fraying, poor connections or conditions that may lead to failures.

c. Attach the upper and lower drag links and check that there is 0 to .007 of an inch clearance between the latch hook and pin. Dress upper and lower link stop surfaces to obtain minimum clearance. Also check that when the stop surfaces touch, linkage is 0 to .031 inch through center. (Refer to Figure 7-11.) Should this distance exceed the required through center travel and bolt and bushings are tight, replace one or all drag links.

d. Repair to the landing gear is limited to reconditioning of parts such as replacing bearings and bushings, smoothing out minor nicks and scratches, repainting of areas where paint has chipped or peeled and replacement of parts. Service tolerances for wear of the various components may be found in Table VII-III.

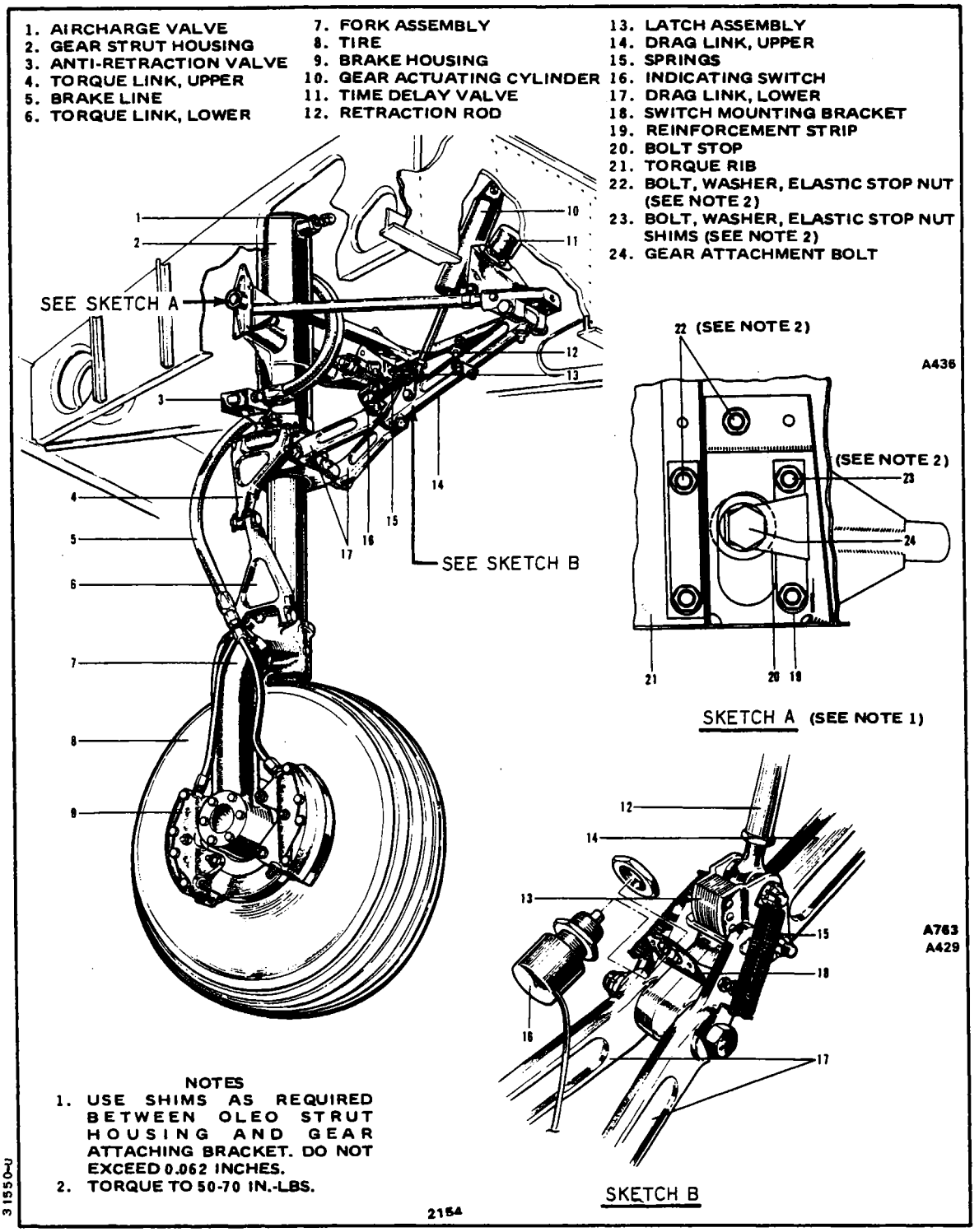

Figure 7-10. Main Landing Gear Installation (Left)

7-29. INSTALLATION OF MAIN LANDING GEAR. (Refer to Figure 7-10.)

NOTE

When assembling any units of the landing gear, lubricate bearings and friction surfaces with proper lubricant as described in Section II.

NOTE

On high time aircraft the main gear attaching brackets may become worn or bolts become loose. Access may be obtained by removing fabric dust covers from the openings in the wing rib to remove the bracket or tighten the bolts. Torque bolts to 50-70 in. lbs.

a. Position the landing gear and install, from each outboard side, the stop plate (20), bolt (ct) (24), nut and cotter pin. Torque the five outer bolts to 50-70 in. lbs.

NOTE

Install shim washers, AN960-816L, as required, between gear strut and gear attaching bracket to prevent side movement of the landing gear. Do not add washers to exceed 0.062 of an inch.

b. If the drag link was removed, reinstall by the following procedure:

1. Ascertain that linkage through center travel is within tolerance as described in paragraph 7-28.
2. Position the aft end of the drag link assembly and install from left to right, bolt (ct), washer, nut and cotter pin.
3. Temporarily install the landing gear down limit switch (16) to the drag link assembly (14 and 17).
4. Connect the forward end of the drag link assembly to the strut housing (2) by installing from right to left, bolt (ct), washer, nut and cotter pin.

NOTE

A small right angle wire support lug is installed under the head of the bolt, with its outstanding leg down.

c. Adjust the main landing gear. (Refer to Paragraph 7-30.)
d. At the left gear only, connect the hydraulic lines to the anti-retraction valve (3) and fill the Powerpak Resevoir. (Refer to Filling Powerpak Reservoir, Section II.)
e. Connect the brake line at the fitting on the main spar and fill the brake cylinder reservoir. (Refer to Filling Brake Cylinder Reservoir, Section II.)
f. Check alignment of main landing gear. (Refer to Paragraph 7-31.)
g. Lubricate the landing gear assembly. (Refer to the Lubrication Chart, Section II.)

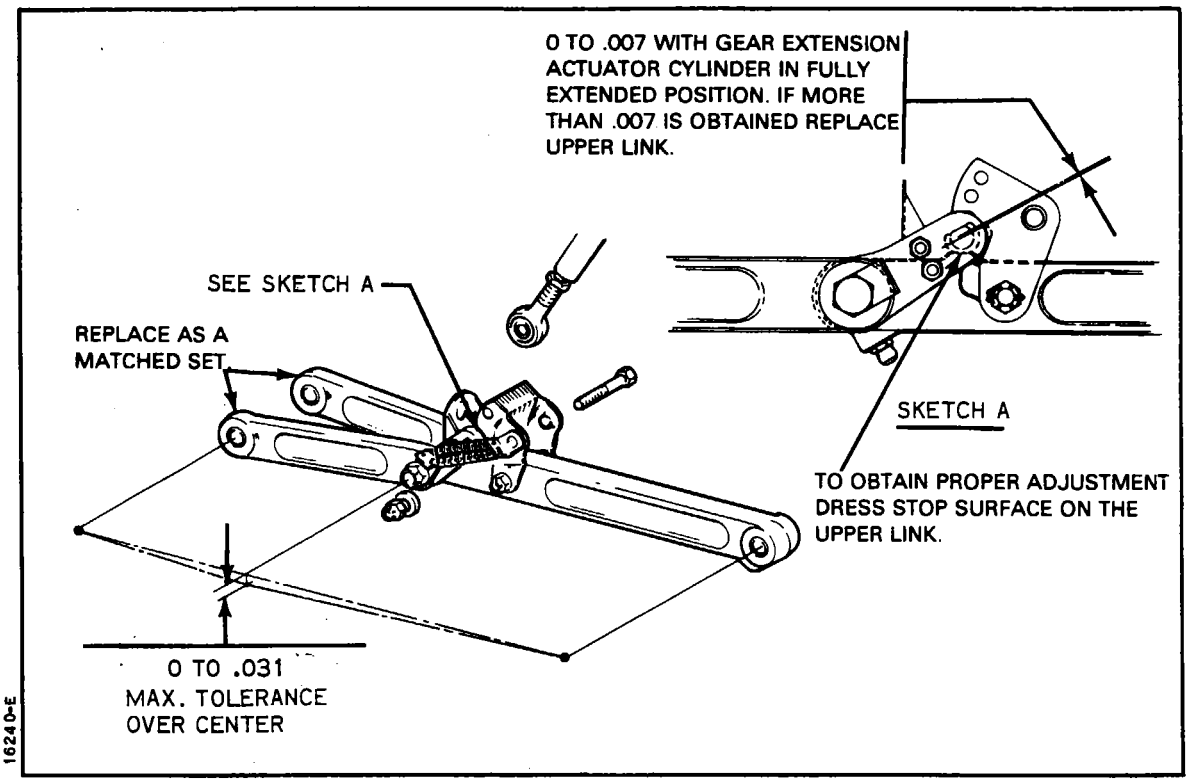

Figure 7-11. Adjustment of Main Gear Drag Link and Latch Assembly

h. Install access covers, lower airplane and remove jacks.

7-30. ADJUSTMENT OF MAIN LANDING GEAR. (Refer to Figure 7-10.)

a. Place the airplane on jacks. (Refer to Jacking, Section II.)

b. Remove the bolt connecting the actuator cylinder retraction rod (12) end bearing to the downlock latch (13).

c. Determine that the piston rod (12) of the actuating cylinder (10) is in the fully extended position by re-cycling the power pack manually.

NOTE

Ascertain that the actuating cylinder has one inch side play, measured at the rod end bearing with the cylinder fully extended. Adjust the actuating cylinder mounting bolt to allow sufficient clearance to permit this side play.

d. Loosen the rod end bearing jam nut at the end of the piston rod. Adjust the end bearing by turning it in the internally threaded end of the piston rod until the attaching bolt passes freely through the gear downlock link assembly and the bearing. This adjustment

should be made with the latch springs (15) detached and manually holding the latch (13) in the closed position. When assured that the bolt is not binding, tighten jam nut and reasembly springs.

NOTE

If the actuator is over-extended, rather than obtaining the free fit for the bolt as described above, excessive pressure may bend or snap the drag links.

e. Ascertain there is a 0 to .007 of an inch clearance between the latch and hook.

NOTE

The stop surface on the upper link may be dressed to obtain the 0 to .007 of an inch clearance. If .007 is exceeded replace the upper link. The lower links are matched sets and should be replaced as sets.

f. Raise and lower the gear by means of the hand pump and check to see if there is any interference encountered by the downlock latch and the stop. If it operates smoothly and the latch completely seats itself, the adjustment is correct.

g. Lower the airplane and remove jacks.

7-31. ALIGNMENT OF MAIN LANDING GEAR WHEEL.

a. Place a straightedge no less than twelve feet long across the front of both main landing gear wheels. Butt the straightedge against the tire at the hub level. Devise a support, or use a box, to hold the straightedge in this position.

b. Set a square against the straightedge and check to see if its outstanding leg bears on the front and rear sides of the tire. (Refer to Figure 7-12.) If it touches both outboard sides of the tire, the landing gear is correctly aligned. The toe-in for these wheels is 0 degrees.

NOTE

A carpenter's square, because of its especially long legs, is recommended for this check.

c. If the square contacts the rear side of the tire, leaving a gap between it and the front side of the tire, the wheel is toed-in. If a gap appears at the rear, the wheel is toed-out.

NOTE

At the point where the upper and lower torque links connect, the upper link is positioned forward of the lower link.

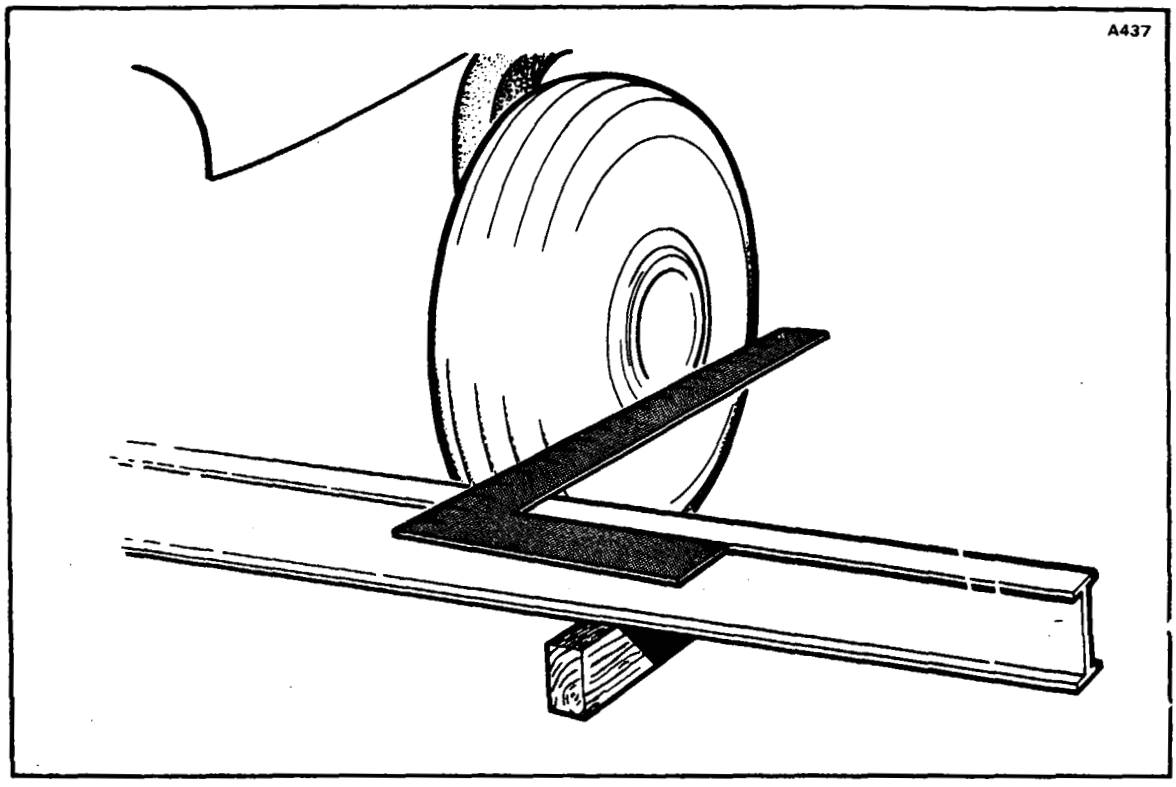

Figure 7-12. Aligning Main Gear

d. Rectify a toed-in condition by removing the cotter pin, castellated nut and bolt at the common pivotal point of the scissor and bushing assembly torque links. On the left landing gear remove a spacer between the two links. If this same condition exists on the right landing gear, it will be necessary to remove a spacer between the two links. Reassemble the torque links.

e. Recheck the wheel alignment. If corrected, safety the castellated nut with a cotter pin. If this condition still exists, add or remove washers in the same manner mentioned in the preceding step.

f. Rectify a toed-out condition on the left landing gear by disconnecting the torque links from each other and add a spacer between the links. It will be necessary to add a spacer between the links on the right landing gear. Reconnect the links and recheck the alignment.

g. If still further adjustment is required, repeat procedure mentioned in preceding step.

NOTE

When adding spacers between the torque links, limit the number installed so that the safety hole is accessible to the cotter pin.

7-32. MAIN GEAR DOOR ASSEMBLY.

7-33. REMOVAL OF MAIN GEAR DOOR AND ACTUATOR ASSEMBLY. (PA-23-250; PA-23-235; and PA-23-250 (six place), Serial Nos. 27-2000 to 27-2504 inclusive.)

a. Disconnect the retraction rods from the door hinges by removing the self-locking nut, washer and bolt from each door half.

b. Remove the doors by removing the attaching bolts from the nacelle door hinge brackets.

c. Remove the machine screws securing the bottom of the door springs to the wheel well.

d. Remove the actuating mechanism by removing the bolts, bushings and washers securing the upper end of the link assembly to the wheel well bulkhead.

NOTE

The actuating mechanism may be further disassembled as necessary.

7-34. CLEANING, INSPECTION AND REPAIR OF MAIN GEAR DOOR ASSEMBLY. (PA-23-250; PA-23-235; and PA-23-250 (six place), Serial Nos. 27-2000 to 27-2504 inclusive.)

a. Clean all parts with a suitable cleaning solvent.

b. Inspect the outboard or inboard doors for cracks or bent skin, loose hinge brackets and worn or corroded bearings.

c. Repair to the door assemblies is limited to replacing hinge bearing, brackets or rivets, minor skin repairs and painting.

7-35. INSTALLATION OF MAIN GEAR DOOR AND ACTUATOR ASSEMBLY. PA-23-250; PA-23-235; and PA-23-250 (six place), Serial Nos. 27-2000 to 27-2504 inclusive.) (Refer to Figure 7-13.)

a. Ascertain that the actuating mechanism is fully assembled.

b. Position the actuating mechanism inside the wheel well and secure with washer, bushing and bolt.

c. Attach the door springs to the sides of the wheel well with machine screws.

d. Position the doors and install the attaching bolts.

e. Adjust the main gear doors for proper operation. (Refer to Paragraph 7-36.)

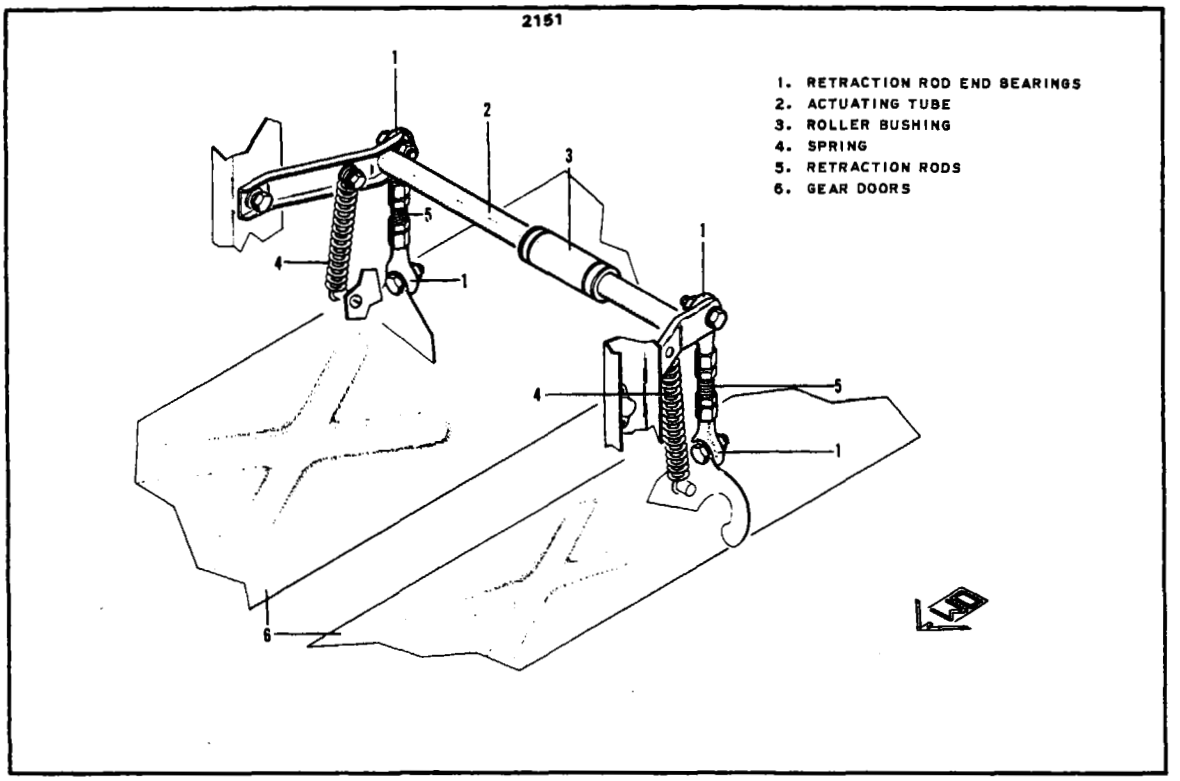

Figure 7-13. Mechanical Main Gear Door Mechanism
PA-23-250; PA-23-235; and PA-23-250 (six place),
Serial Nos. 27-2000 to 27-2504 incl.

7-36. ADJUSTMENT OF MAIN GEAR DOORS. (PA-23-250; PA-23-235; and PA-23-250 (six place), Serial Nos. 27-2000 to 27-2504 incl.) (Refer to Figure 7-13.)

a. Place the airplane on jacks. (Refer to Jacking, Section II.)

b. Disconnect the main gear door retraction rods, allowing the doors to hang free.

c. Using the hand pump, retract the landing gear to the fully retracted position.

d. Adjust the doors one at a time. Close the door and adjust the aft retraction rod to allow the aft end of door to fit snug against the nacelle. Adjust the forward retraction rod to allow the attaching bolt to be freely installed.

CAUTION

Over-shorting of the forward retraction rod will draw the door up into the wheel well, warping the door.

e. Disconnect the adjusted door and adjust the other door in a like manner.

f. Using a hand pump, extend the gear and connect all retraction rods.

g. Operate the landing gear and ascertain the doors close evenly, but do not bind. If the doors do not close evenly, readjust the retraction rod of the lower door until they fit evenly.

h. After the doors have been adjusted as previously described, the following checks should be made:

1. Do not permit the hinge edge of either door assembly to strike the nacelle skin when the gear is extended and the doors are open. If they do, adjust the main gear cover actuating tube assembly to provide no less than 0.062 of an inch clearance between the edges of the doors and the skin. On new doors, it may be necessary to trim the hinge edge to provide this clearance.

2. When the landing gear is extended, see if there is a minimum clearance of 6.875 of an inch between the interior surface of the inboard door and the confronting side of the piston portion of the fork and piston assembly.

3. It is necessary to have a minimum of from 0.187 of an inch clearance between the landing gear and the adjacent components.

7-37. REMOVAL OF MAIN GEAR DOOR AND ACTUATOR ASSEMBLY. (PA-23-250 [six place], Serial Nos. 27-2505 and up.) (Refer to Figure 7-14.)

a. The main gear doors may be removed by the following procedure:

1. Disconnect the retraction rods from the doors by removing self-locking nut and bolt from the front doors and the self-locking nut from the aft door.

2. Remove the hinge pins from each door removing each door.

b. The main gear door operating mechanism may be removed by the following procedure:

1. Disconnect the hydraulic actuator rod from the mechanism by removing self-locking nut, washers, and bolt.

2. Remove the connector rod by removing cotter pin, washers, pin, and spring, if installed.

3. Remove the four retraction rods and disconnect the spring where installed by removing self-locking nuts, washers, bolts and the spring bushing.

4. Remove the rivets securing the forward tube assemblies to the aft tube assemblies.

5. Remove the aft tube assemblies by drawing them aft through the main spar.

6. Remove the forward tube assemblies by removing the bearing blocks from the sides of the wheel well.

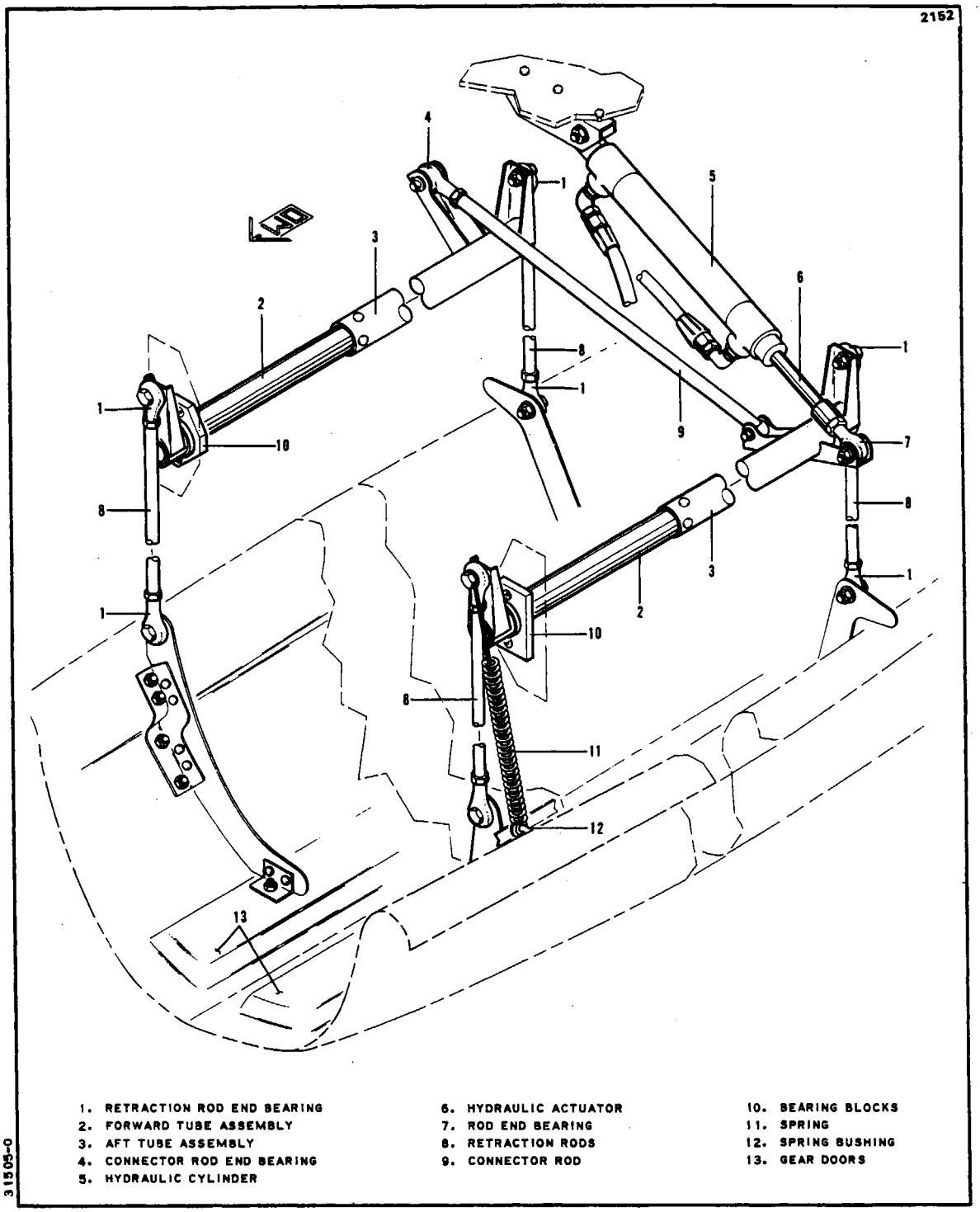

Figure 7-14. Hydraulic Main Gear Door Mechanism
PA-23-250 (six place) Serial Nos. 27-2505 and up

7-38. CLEANING, INSPECTION AND REPAIR OF MAIN GEAR DOOR ASSEMBLY. (PA-23-250 [six place], Serial Nos. 27-2505 and up.)

a. Clean all parts with a suitable cleaning solvent.

b. Inspect the outboard or inboard doors for cracks or bent skin, loose hinge brackets and worn or corroded bearings.

c. Repair to the door assemblies is limited to replacing hinge bearing, brackets or rivets, minor skin repairs and painting.

d. Refer to Section VI for Repair of the Actuating Cylinder.

7-39. INSTALLATION OF MAIN GEAR DOOR AND ACTUATOR ASSEMBLY. (PA-23-250 [six place], Serial Nos. 27-2505 and up.) (Refer to Figure 7-14.)

a. The main gear door operating mechanism may be installed by the following procedure:

1. Install the aft tube assemblies by inserting them forward through the main spar.

2. Install the forward tube assemblies with bearing blocks. Insert the forward tubes into the aft tubes and secure the bearing blocks to the wheel well wall.

3. Align the holes in the tube assemblies and secure together with CR2249-4-2 rivets.

4. Adjust the connector rod to measure 11.312 inches between center line of each attachment hole.

5. Install the adjusted rod to the tube assemblies with pin, washers and cotter pin. Install the spring if previously removed from this position.

6. Install the four retraction rods and spring, where installed, with bolts, washers, self-locking nut and spring bushing.

b. The gear doors may be installed by positioning the doors and installing a new hinge pin. Bend the ends of the hinge pin over to provide a safety.

c. Adjust the main gear doors. (Refer to Paragraph 7-40.)

7-40. ADJUSTMENT OF MAIN LANDING GEAR DOORS. (PA-23-250 [six place], Serial Nos. 27-2505 and up.) (Refer to Figure 7-14.)

a. Disconnect the main gear door retraction rods and static anti-closing spring, allow the doors to hang clear.

b. Place the airplane on jacks. (Refer to Jacking, Section II.)

c. Retract the landing gear fully.

d. Adjust the retraction rod for the rear door so the rod attaches to the door freely with the door tight against its stops.

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e. With the door actuator rod fully extended from the gear door cylinder, adjust the rod end to give 10.88 inches from center of rod end bearing to center of cylinder end bearing. If the door cylinder is removed to obtain this measurement, reinstall at this time.

f. Ascertain that the connector rod is 11.312 inches in length between the center of each attaching point.

g. Adjust doors one at a time. Close door to stop and with load exerted on the cylinder, adjust retraction rods so the connecting bolts pass freely through their holes.

h. Disconnect the adjusted door and adjust the other door in a like manner.

i. Using the hand pump, extend the landing gear, connect both doors.

j. Retract the landing gear fully and ascertain that there is .031 inch between doors.

k. Take up all four retraction rods two turns.

l. Using the hand pump, operate the landing gear and ascertain the doors close tight, but do not bind.

7-41. ADJUSTMENT OF LANDING GEAR LIMIT SWITCHES.

7-42. ADJUSTMENT OF NOSE GEAR UP LIMIT SWITCH. (Refer to Figure 7-17.) The nose gear up limit switch, located just above the upper drag link assembly and aft of the timer check valve on PA-23-250 (six place), Serial Nos. 27-2505 and up, may be adjusted by the following procedure:

a. Place the airplane on jacks. (Refer to Jacking, Section II.)

b. Remove the access panel from the left side of the nose section by releasing fasteners. (Refer to Access Plates and Panels, Section II.)

c. Unsnap the canvas cover over the nose wheel well.

d. Using the hand pump, retract the landing gear to the fully retracted position.

e. On models with the early switches, adjust the switch by loosening the locknut and the switch mounting nut. Then rotate the nuts in whichever direction provides the necessary clearance. The switch actuator should be depressed just far enough to actuate and close the circuit. Tighten the mounting and locknut. On the later switches, rest the spacing tool on switch actuator button between the upper drag link and the switch actuator and adjust by rotating nut so that the tool fits snugly.

f. Extend the landing gear, resnap the canvas cover, connect the gear doors, replace the access panel and remove the jacks.

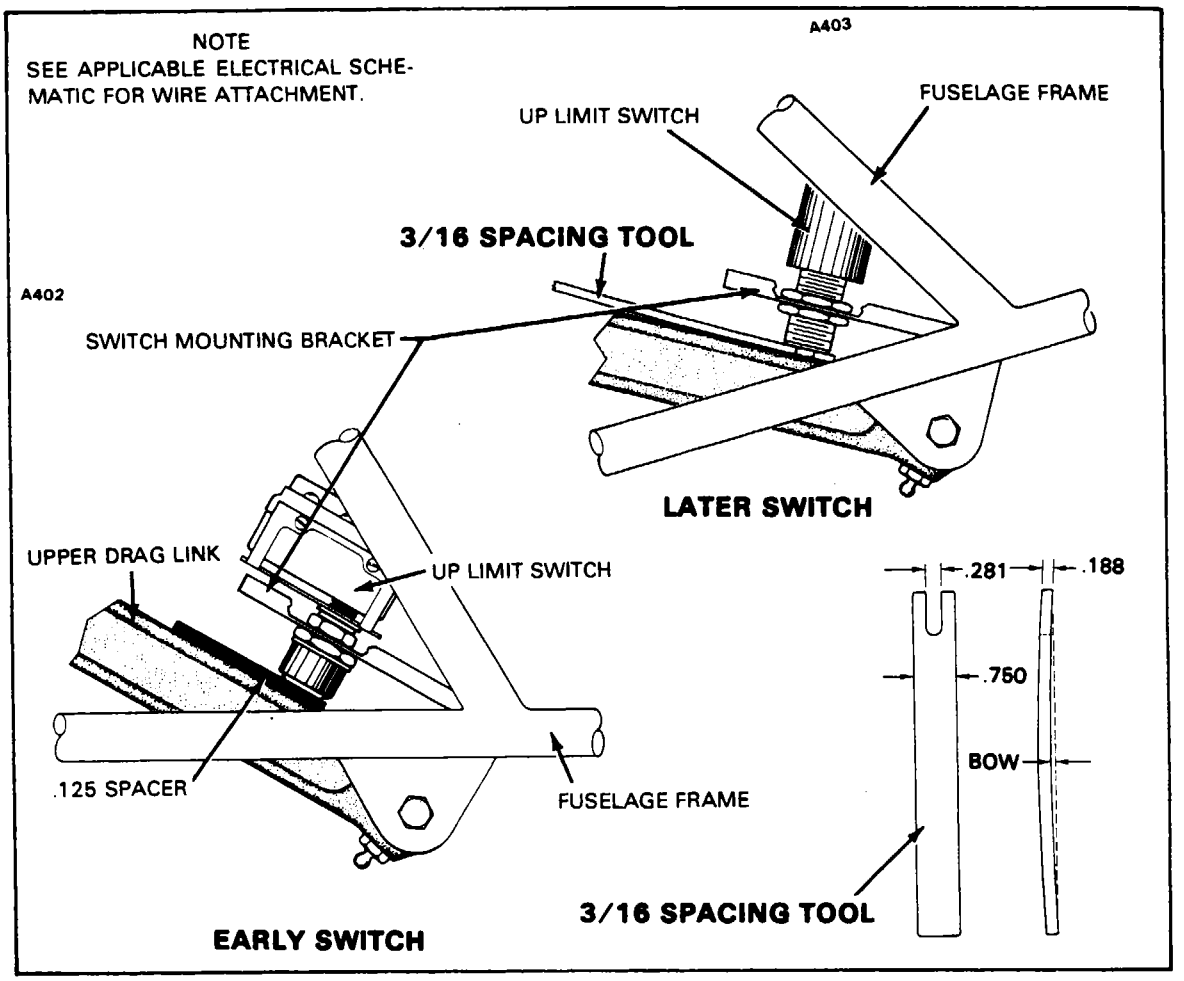

Figure 7-17. Adjustment of Nose Gear Up Limit Switch

7-43. ADJUSTMENT OF MAIN GEAR UP LIMIT SWITCH. (Refer to Figure 7-18.) The main gear up limit switch, located just above the aft drag assembly on PA-23-250; PA-23-235; and PA-23-250 (six place), Serial Nos. 27-2000 to 27-2504 inclusive and on the forward side of the main spar adjacent to the gear door mechanism on the PA-23-250 (six place), Serial Nos. 27-2505 and up, may be adjusted by the following procedure:

a. Place the airplane on jacks. (Refer to Jacking, Section II.)
b. Disconnect the door retraction rods and allow the doors to hang free.
c. Using the hand pump, retract the landing gear to the fully retracted position.
d. On the models with the early switches, adjust the switch by loosening the locknut and the switch mounting nut. Then rotate the nuts in whichever direction provides the necessary clearance when a .125 inch spacer is placed between the upper drag link and the switch actuator. On models with the later switches, rest tool on switch actuator button between the upper drag link and the switch actuator. Adjust in same manner as above. For configuration of tool, refer to Figure 7-17.

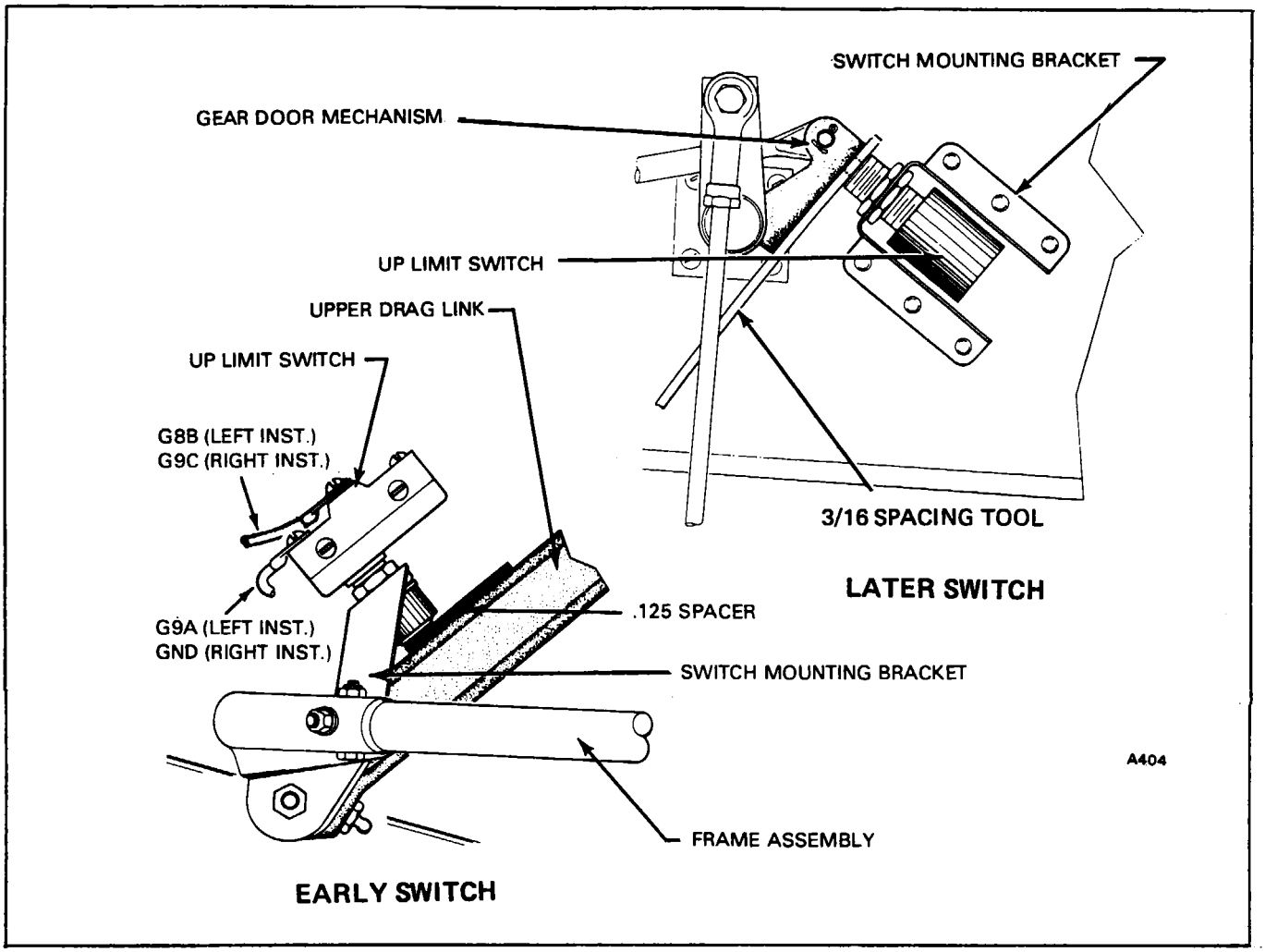

Figure 7-18. Adjustment of Main Gear Up Limit Switch

e. Adjust the switch so that the actuator is completely depressed with the .125 inch spacer or 3/16 inch spacing tool (depending on type of switch) inserted. Tighten the mounting nut until it bears against the bracket and tighten the locknut to secure the switch.

f. Extend the gear, connect the door retraction rods and remove the jacks.

7-44. ADJUSTMENT OF LANDING GEAR DOWN LIMIT SWITCHES. (Refer to Figure 7-19.) The adjustment of the landing gear down limit switches is common to all three landing gears and may be accomplished by the following procedure:

a. Ascertain that the downlocks are properly adjusted. (Refer to Paragraphs 7-12 and 7-30.)

b. Rest tool on switch actuator button between the latch and the switch actuator. Adjust the switch by loosening the locknut and the switch mounting nut. Then rotate the nuts in whichever direction provides the necessary clearance for snug fitting of tool. For configuration of tool, refer to Figure 7-17.

c. Adjust the switch so that the actuator is completely depressed with the 3/16 inch spacing tool inserted. Tighten the mounting nut until it bears against the bracket and tighten the locknut to secure the switch.

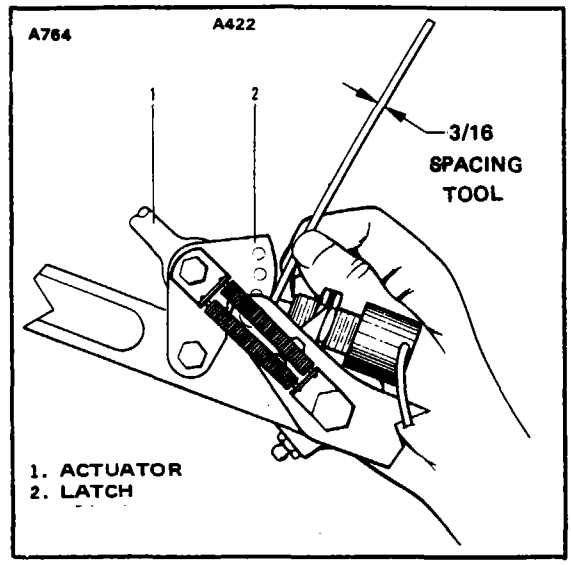

Figure 7-19. Adjustment of Landing Gear Down Limit Switches

7-45. LANDING GEAR WARNING SYSTEM.

7-46. REMOVAL OF GEAR WARNING SWITCHES.

a. Remove the access plate on the left side of the control pedestal.

b. Disconnect the cannon plug inside the access opening.

c. Remove the knobs from the throttle mixture and propeller control levers.

d. Remove the flap and landing gear selector knobs, by removing the Allen screw from the flap knob and the nut and bolt from the landing gear knob.

e. Disconnect the carburetor heat or alternate air knobs on the pedestal control placard. Extend the control knob approximately one inch. Unscrew the outside knob and remove the spring. Unscrew the inside knob and the outside nut that secures the cable to the placard. (The removed cables should be marked for identification.)

f. Remove the attaching screws from around the upper pedestal control cover and remove the cover with placard attached.

g. Disconnect the wiring from the micro switches and mark them for identification.

h. Remove the warning switches and striker plate by removing the two round headed machine screws, nuts and washers securing them in place.

7-47. INSTALLATION OF GEAR WARNING SWITCHES.

a. Position the warning switches and striker plate in the bracket and secure with round headed machine screws, washers and self-locking nuts.

b. Connect the wiring to the warning switches. (Refer to Wiring Schematic, Section XI.)

c. Install the upper pedestal cover with placard attached.

d. Connect the carburetor heat or alternate air knobs. Screw on the nut that secures the cable to the placard. Screw on the inside nut. Install the spring and screw on the outside nut.
e. Install the flap and landing gear selector knobs to their respective handles.
f. Connect the cannon plug inside the left access opening.
g. Install the access plate to the left side of the pedestal.
h. Install the knobs to the control levers.

7-48. ADJUSTING GEAR WARNING SWITCHES. (Refer to Figure 7-20.) The following is a procedure for adjusting the gear up warning light and warning horn micro-switches which are located in the control pedestal at the base of the throttle levers. On serial nos. 27-4426, 27-4574 thru 27-7405476, the two outer switches actuate the warning horn and the center switch actuates the warning light. On serial nos. 27-7554001 and up, all switches actuate the warning horn and the warning light.

The ground adjustment procedure, as outlined in this paragraph, should allow the landing gear warning light to flash and the warning horn to operate when the power is reduced below approximately 12 inches of manifold pressure with the aircraft in normal descent and the landing gear retracted.

a. Start and run up the engine with the propeller set for high RPM.
b. For adjustment of the warning horn and warning light activation, advance the throttles and then retard them until approximately 5 inches of manifold pressure is indicated above the desired in-flight pressure previously stated. Mark the throttles in some manner as a reference for adjusting the gear up warning light and horn switches.
c. Shut the engines down.
d. Retard the throttles to the location, as marked above, which gave the proper manifold pressure indication for the operation of the warning horn and light. Adjust the center switch up or down through the control travel slots until a clicking sound is heard when the switch activates. To check, retard the throttle controls until it is ascertained that the switches actuate at the proper location.
e. Retard the throttles again to the same mark and adjust and check the outer switches in a like manner.
f. To check the horn and light operation, jack the airplane and retract the landing gear. For airplanes with serial nos. 27-4426, 27-4574 thru 27-7405476, with the master switch on, retard one throttle first and then the other until the gear up indicator light comes on. Check the location of the throttle to the adjusting mark. Retard both throttles together and check the warning horn adjustment. The warning horn should not operate when only one throttle is retarded. For airplanes with serial nos. 27-7554001 and up, with the master switch on, retarding either throttle or both to the adjusting mark should actuate both the indicator light and horn.

h. With the warning horn operating, lower the gear to insure that the horn and light cease to operate when the gear is down and locked.

i. Remove the aircraft from the jacks.

j. Flight test the aircraft to insure operation of the warning system when the gear is up and power is reduced to the desired manifold pressure. Also, reduce power on one engine and insure the light operation.

k. If the light and horn fail to operate at the desired settings, mark the throttles at the proper manifold pressure and repeat the preceding adjust-

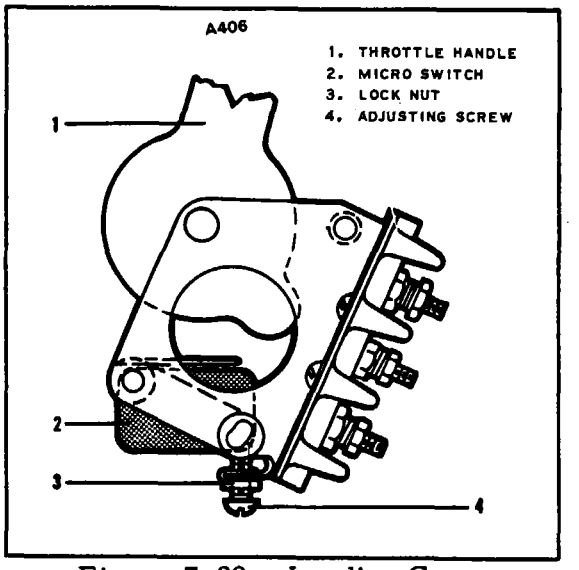

Figure 7-20. Landing Gear Warning Switches

7-49. WHEELS.

7-50. REMOVAL AND DISASSEMBLY OF NOSE WHEEL. (Refer to Figure 7-21.)

a. Place the airplane on jacks. (Refer to Jacking, Section II.)

b. To remove the nose wheel, remove the axle tie rod nut, tie rod and axle plugs. Insert a 1-7/16 inch diameter tube into the fork and tap out the axle from the wheel assembly.

c. Flex the fork enough to remove the wheel spacers and to allow the wheel to clear the fork assembly.

d. The wheel halves (1 and 2) may be separated by first deflating the tire. With the tire sufficiently deflated, remove the wheel through bolts (3). Pull the wheel halves from the tire by removing the wheel half (2) opposite the valve stem first and then the other half.

e. The wheel bearing assemblies may be removed from each wheel half by first removing the screws that secure the grease seal, and then the retainers (8), grease seals (9) and bearing cones (7). The bearing cups (6) should be removed only for replacement and may be removed by tapping out evenly from the inside.

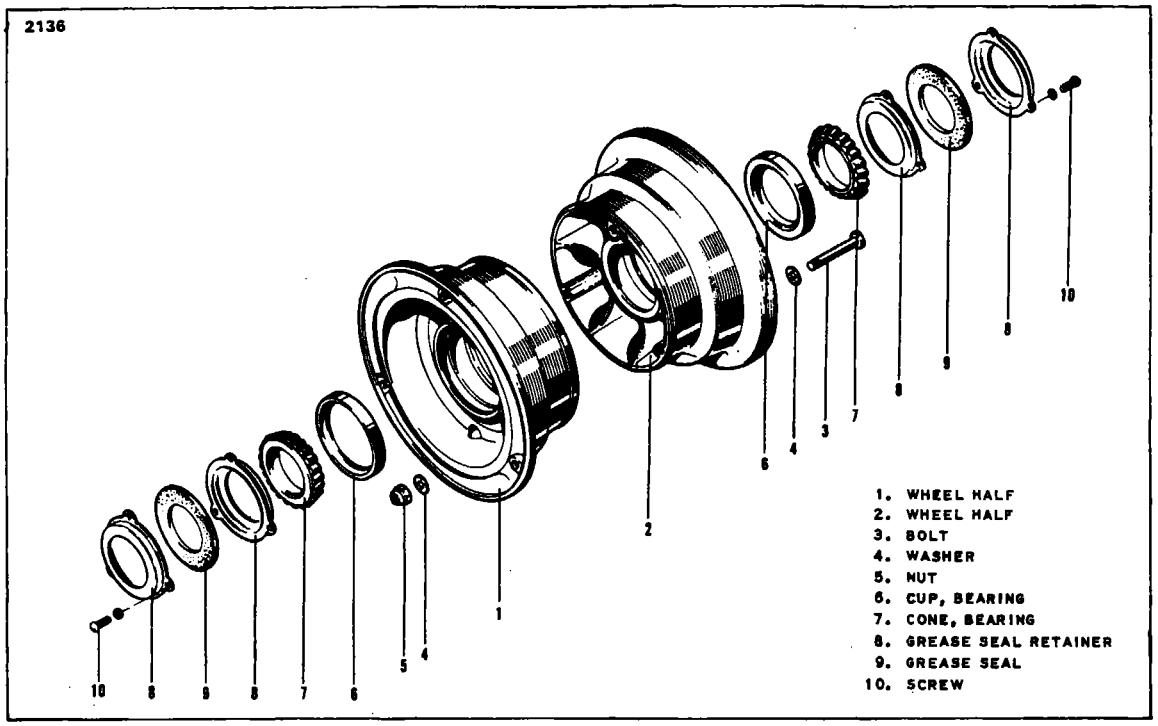

Figure 7-21. Nose Wheel Assembly

7-51. INSPECTION OF NOSE WHEEL ASSEMBLY.

a. Visually check all parts for cracks, distortion, defects and excess wear.

b. Check tie bolts for looseness or failure.

c. Check internal diameter of felt grease seals. Replace the felt grease seal if surface is hard or gritty.

d. Check tire for cuts, internal bruises and deterioration.

e. Check bearing cones and cups for wear and pitting and relubricate.

f. Replace any wheel casting having visible cracks.

7-52. ASSEMBLY AND INSTALLATION OF NOSE WHEEL. (Refer to Figure 7-21.)

a. Ascertain that the bearing cup (6) in each wheel half (1 and 2) is properly installed. Install the tire and join the two wheel halves. Install the through bolts with the nuts to the wheel stem side; torque to the specification given on the wheel and inflate the tire. (Refer to paragraph 7-76 for balancing.) Lubricate the bearing cones (7) and install the cones, grease seals (9) and seal retainer (8). Secure with screws (10).

b. Flex the fork enough to allow for the installation of the wheel and spacer tubes. Insert the axle tube, fork caps and tie bolt. Adjust the tie bolt nut to allow the wheel to turn free, yet not fit loose on the axle.

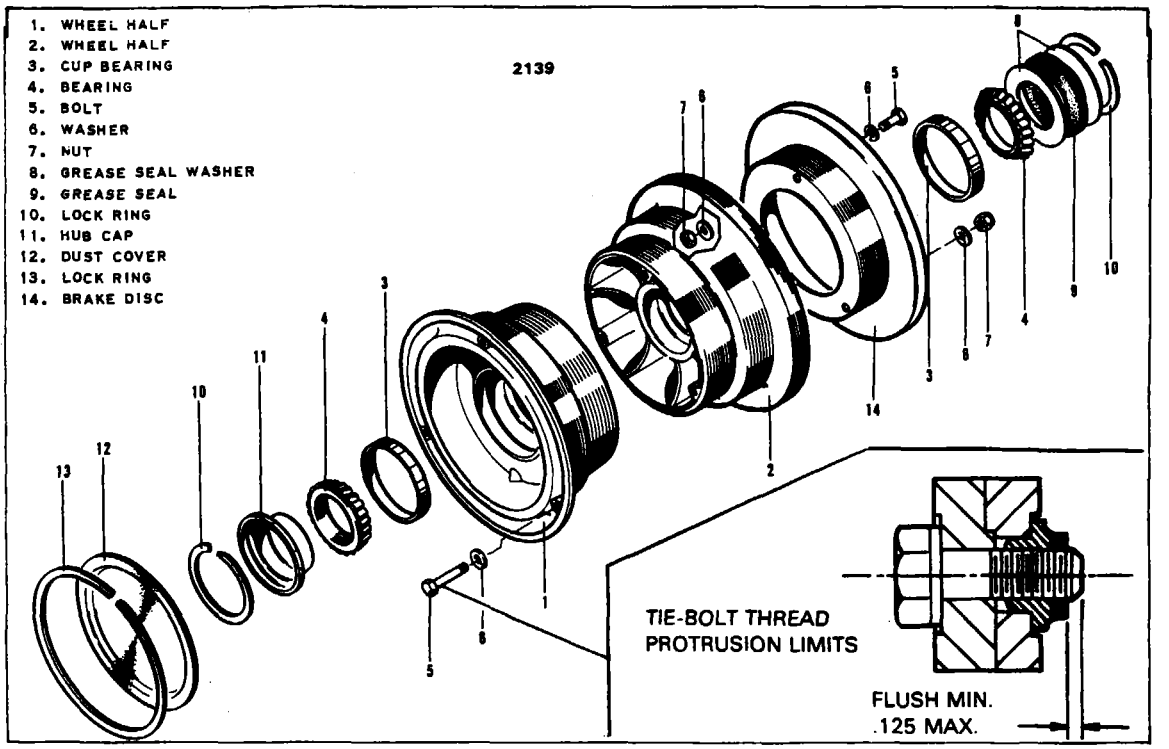

Figure 7-22. Main Wheel Assembly

7-53. REMOVAL AND DISASSEMBLY OF MAIN WHEEL. (Refer to Figure 7-22.)

a. Place the airplane on jacks. (Refer to Jacking, Section II.)

b. To remove the main wheels, remove the four bolts that join brake cylinder and lining back plate assemblies.

c. Remove the brake assembly.

d. Remove the lock ring (13) that secures the dust cover (12) and the lock ring (10) securing the hub cap (11). Remove the cotter pin and axle nut. Slide the wheel off the axle.

e. The wheel may be disassembled by deflating the tire and removing the lock ring (10) securing the grease seal (9) and seal washers (8) from the inner wheel half (2). Remove the bearing cones (4) and loosen and remove the bolts securing the wheel halves. The bearing cups (3) should be removed only for replacement and may be removed by tapping evenly from the inside.

7-54. INSPECTION OF MAIN WHEEL ASSEMBLY. (Refer to Figure 7-22.) It is advisable to clean the assembly thoroughly before inspection. Degrease all parts and dry thoroughly. A soft bristle brush may be used to remove hardened grease, dust or dirt.

WARNING

Quick drying cleaning solvents are toxic and volatile. Use in well ventilated areas only. Avoid contact with skin or clothing and do not inhale vapors.

a. Visually inspect the bearing cones for nicks, scratches, water staining, spalling, heat discoloration, roller wear, cage damage, cracks or distortion. Replace cones if defective or worn.

b. Inspect wheel bearing grease for contamination and solidification at each periodic maintenance inspection. Repack wheel bearings in accordance with lubrication charts in Section II of this manual.

c. Inspect wheel halves for cracks, corrosion, and other damage. Cracked or badly corroded castings should be replaced. Small nicks, scratches, or pits can be blended out using fine (400 grit) sandpaper.

d. Inspect snap rings and grease seals for distortion or wear. Replace any item damaged or deformed. Saturate the grease seal felts with SAE 10 oil (do not soak).

e. Inspect bearing cups for looseness, scratches, pitting, corrosion, or evidence of overheating. If evidence of any defect exists, replace the bearing cup. Refer to paragraph 7-55 for replacement procedures. Coat cups with clean bearing grease.

f. Inspect the brake disc assembly for cracks, excessive wear or scoring, rust and corrosion. Remove rust and blend out small nicks, using fine (400 grit) sandpaper. Refer to Table VII-I for wear limits.

g. Inspect wheel bolts for cracks, corrosion or any other damage. Replace cracked bolts.

h. Inspect self-locking nut for the self-locking feature. Replace any nuts with damaged or destroyed self-locking feature.

TABLE VII-I. WHEEL AND BRAKE WEAR LIMITS

WHEEL ASSY. NO.	BRAKE ASSY. NO.	DISC MIN.	LINING MIN. PRESS. PLATE	LINING MIN. BACK PLATE
3080 B	37-200-2	.657	.097 (1) /.103 (2)	.097 (1) /.103 (2)
3080 D	37-200A	.657	.097 (1) /.103 (2)	.097 (1) /.103 (2)
40-131	30-96	.525	.100	.100

Footnotes:
1. Refers to Riveted Lining only.
2. Refers to Bonded Linings including back plate.

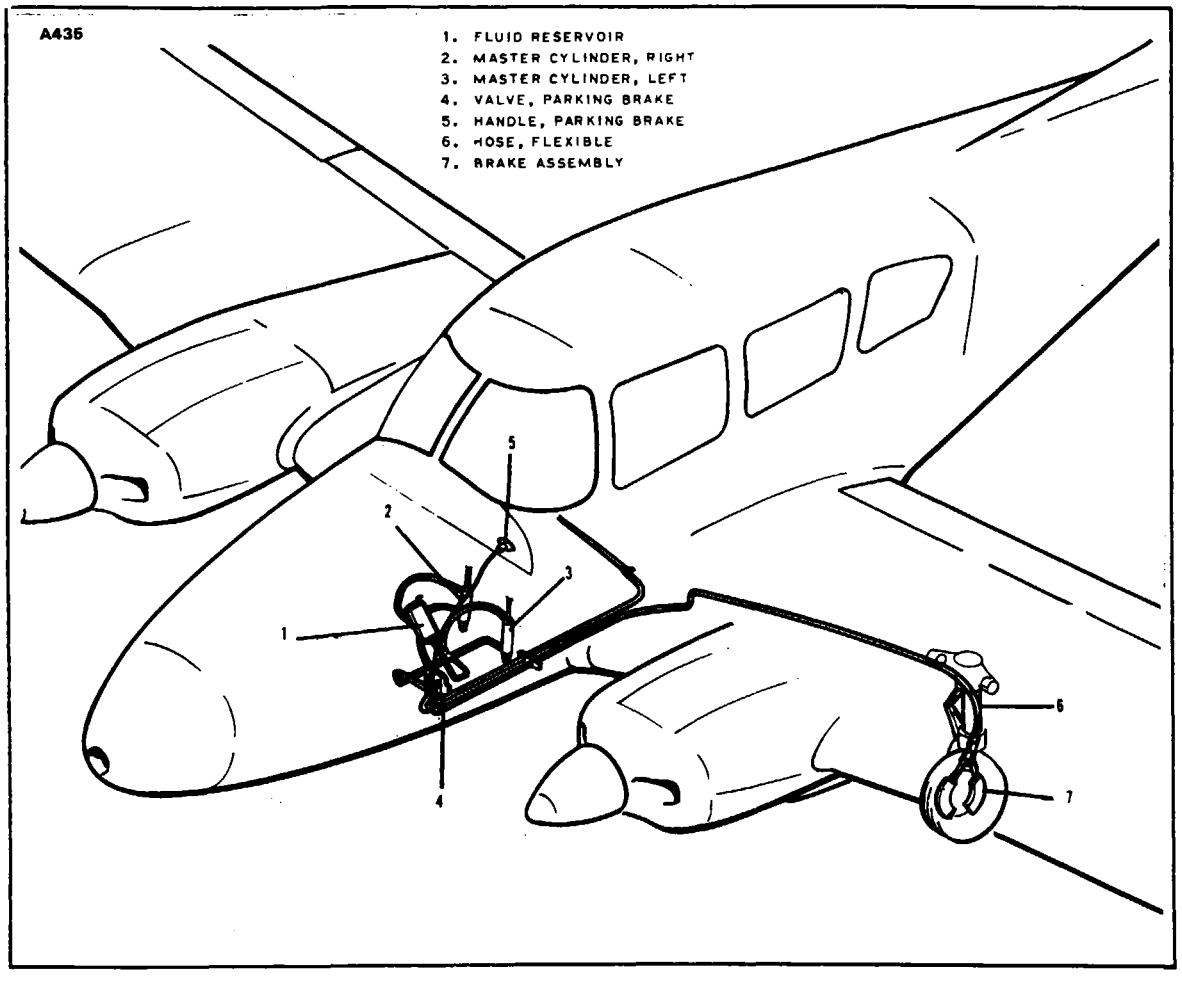

Figure 7-23. Brake Installation

7-55. REPAIR OF MAIN WHEEL ASSEMBLY. (Refer to Figure 7-22.) Repairs to the main wheel assembly are limited to blending out small nicks, scratches, gauges and areas of slight corrosion, plus the replacement of parts which are cracked or badly worn or corroded.

NOTE

Corrosion originates at points where the protective wheel coating is ruptured. All traces of corrosion and residue must be removed before wheel halves are treated and repainted. (Corrosion residue accelerates the corrosion process.)

a. Bearing Cup Replacement:

1. Heat wheel half in boiling water for one hour, or in an oven not exceeding 250°F (121°C) for 30 minutes.

2. Remove wheel half from source of heat. Bearing cup should be loose enough to fall out of the bearing bore when wheel half is inverted. If the cup does not drop out, tap evenly from bore with a fiber drift pin.

3. To install new bearing cup, repeat step 1, and chill the bearing cup in dry ice.

4. Remove wheel half from source of heat and bearing cup from dry ice.

5. Dry chilled bearing cup and coat contacting surface with zinc chromate primer.

6. Install the chilled bearing cup in the heated wheel half. Tap gently and evenly into place, using a fiber drift pin or suitable arbor press.

b. Repainting of of Main Wheel Repaired Surfaces:

1. Thoroughly clean any repaired surfaces and areas of the wheel from which paint has been removed.

2. Paint the exposed areas with one coat of primer and one coat of aluminum lacquer.

CAUTION

Never paint the working surfaces of the bearing cups.

7-56. ASSEMBLY AND INSTALLATION OF MAIN WHEEL. (Refer to Figure 7-22.)

a. Ascertain that the bearing cup (3) in each wheel half (1 and 2) is fully seated in the wheel housing. Install the through bolts with the bolt heads opposite the brake disc side and torque to 90 inch-pounds. Inflate the tire. (Refer to paragraph 7-76 for Tire Balancing.)

NOTE

Visually inspect thread protrusion on assembled and torqued wheel assembly. Thread protrusion should be flush to .125 maximum. Bolts that are below flush or beyond maximum should be replaced with P/N AN4-7A tie bolt (Refer to figure 7-22).

b. Lubricate the bearing cones (4). Install cone, grease seal (9) and seal washers (8) in inner wheel half (2) and secure with lock ring (10).

c. Place the wheel on the axle and install axle nut. Tighten to allow the wheel to run free yet not fit loose on the axle. Safety nut and install the hub cap (11) and dust cover (12) securing with lock rings (10 and 13).

d. Install the brake assembly by installing the brake cylinder on the torque plate, positioning the spacer, lining back plate, and installing the six bolts securing assembly. If the brake line was disconnected, reconnect and bleed brakes.

7-57. BRAKE SYSTEM.

7-58. WHEEL BRAKE ASSEMBLY.

7-59. BRAKE ADJUSTMENT AND LINING TOLERANCES. No adjustment of the brake clearance is necessary as they are self-adjusting. Inspection of the lining is necessary, and it may be inspected visually while installed on the airplane. The linings are of the riveted type and the bonded type. The riveted type need not be replaced until the thickness of any one segment becomes worn to limits given in Table VII-I. The bonded type need not be replaced until the thickness of any one segment, including back plate, becomes worn to limits given in Table VII-I. The linings should be replaced any time they become worn unevenly. Refer to Table VII-I for wear limits for the particular assemblies in question.

7-60. REMOVAL AND DISASSEMBLY OF WHEEL BRAKE ASSEMBLY. (Refer to Figure 7-24.)

a. Place a drip pan around the landing gear and disconnect the brake lines from the cylinder housing.

b. Cut the safety wire and remove the self-locking cap bolts (18) that secure the backing plates (1) to the brake cylinder housing (12). Remove the backing plate, shim spacer block (5). On 37-200A brake assemblies, remove the pressed fiber shim (2) between the backing plate and the shim spacer block.

c. Slide the brake cylinder housing from the torque plate (21) by removing the self-locking nuts (19) and washers (20) from the anchor bolts (13).

d. Remove the pressure plate (7) by removing the nut (17), washer (16), retraction spring (15) and the sleeve (14) from the outside center of the brake cylinder housing (12).

e. The pistons may be removed (9) by injecting low air pressure in the cylinder fluid inlet and forcing the pistons from the housing.

f. Check anchor bolt for wear.

g. Remove anchor bolt by the following procedure:

1. Position cylinder assembly on a holding fixture. (Refer to Figure 7-26.)
2. Use a suitable arbor press to remove the anchor bolt from the cylinder body.

h. Install anchor bolt by the following procedure:

1. Support anchor bolt in a holding fixture. (Refer to Figure 7-26, Step A.)
2. Align cylinder body over anchor bolt. (Refer to Figure 7-26, Step B.)
3. Use a suitable arbor press and apply pressure on the spot face directly over the anchor bolt hole. (Refer to Figure 7-26, Step C.)

7-61. CLEANING, INSPECTION AND REPAIR OF WHEEL BRAKE ASSEMBLY. (Refer to Figures 7-24 and 7-25.)

a. Clean all metal parts, insulators, and O-rings with denatured alcohol, (gasoline and dry cleaning fluids will damage O-rings). If O-rings are damaged or worn excessively, they should be replaced.

b. Inspect the brake cylinder for cracks, nicks, corrosion, damaged threads, etc. Inspect both inlet and outlet hydraulic ports for foreign contaminates. Examine cylinder walls for scoring or excessive wear. Blend and polish light scratches in piston cavities with fine emery cloth (600 grit). Castings that are cracked or have damaged threads should be replaced.

c. Inspect anchor bolts for cracks, corrosion, permanent set, and excessive wear. Replace bolts that are bent, cracked or severly corroded.

d. Inspect pistons for cracks, nicks, burrs or excessive wear. Remove burrs and blend out nicks, using fine emery cloth (600 grit) and clean thoroughly.

e. Inspect pressure plate assembly for cracks, damaged rivets and excessive warpage. Replace if found cracked or severly deformed. Replace cracked or deformed rivets.

f. Inspect brake cylinder bolts for cracks, thread damage, and self-locking feature. Replace bolts that are cracked, bent or have damaged threads.

g. Inspect brake linings for excessive edge chipping and surface deterioration. Refer to Table VII-1 for wear limits. Worn lining may be easily removed by prying loose with a screwdriver or a thin, flat wedge. Install new linings in place. Insure that they snap into position.

h. Inspect the torque plate for cracks, nicks, burrs, rust, excessive wear and brinelling in the bolt holes. Replace if cracked or severly deformed.

i. If not previously accomplished inspect the brake disc for grooves, scratches, pits and heat checks. A single groove or isolated grooves up to .031 of an inch deep would not necessitate replacement, but a grooving of the entire surface would reduce lining life and should be replaced. Heat checks are considered to be superficial surface cracks and are not detrimental to the integrity or performance of the breaking system.

j. Replace brake disc if crack length and depth exceeds limits given. Disc P/N 164-32F = length .800, depth .340. Disc P/N 164-57. = length .800, depth .280. If crack depth is not measurable, replace brake disc if crack length exceeds .400 of an inch.

CAUTION

When changing parts or replacing brake lining, use only those specified for that model brake assembly. Refer to Parts Catalog for specific part numbers.

NOTE

If only the brake linings are being replaced, it is not necessary to remove the complete brake assembly.

k. On brake assemblies which have riveted lining, remove worn lining by drilling and punching out the old rivets. Install the new brake linings with rivets and rivet setting Kit (P N 754 165) which is available through your nearest Piper Dealer or Distributor. (Rivet setting tools should be used as rolling of the rivet is very important to get a tight fit between the rivet and rivet hole.) Bonded linings may be removed and replaced as stated in Step g.

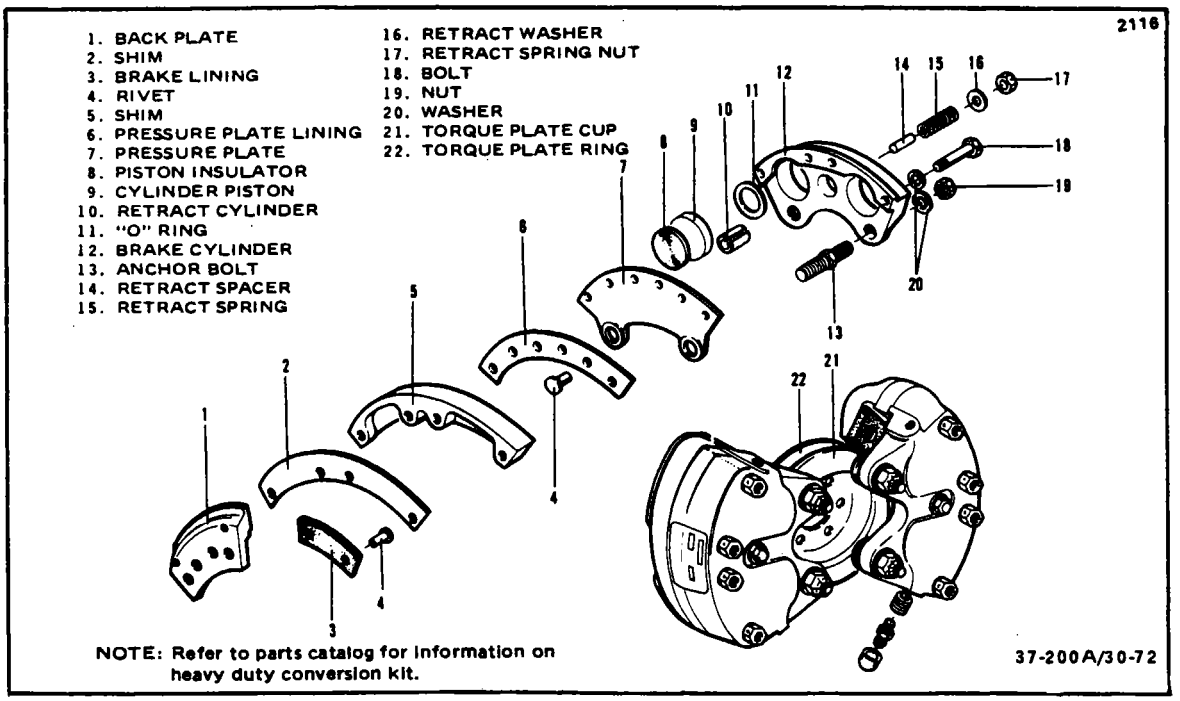

Figure 7-24. Wheel Brake Assembly
PA-23-250 (six place) Serial Nos. 27-3738 to 27-7554137 incl., 27-7554139 and 27-7554141 to 27-7554149 incl.

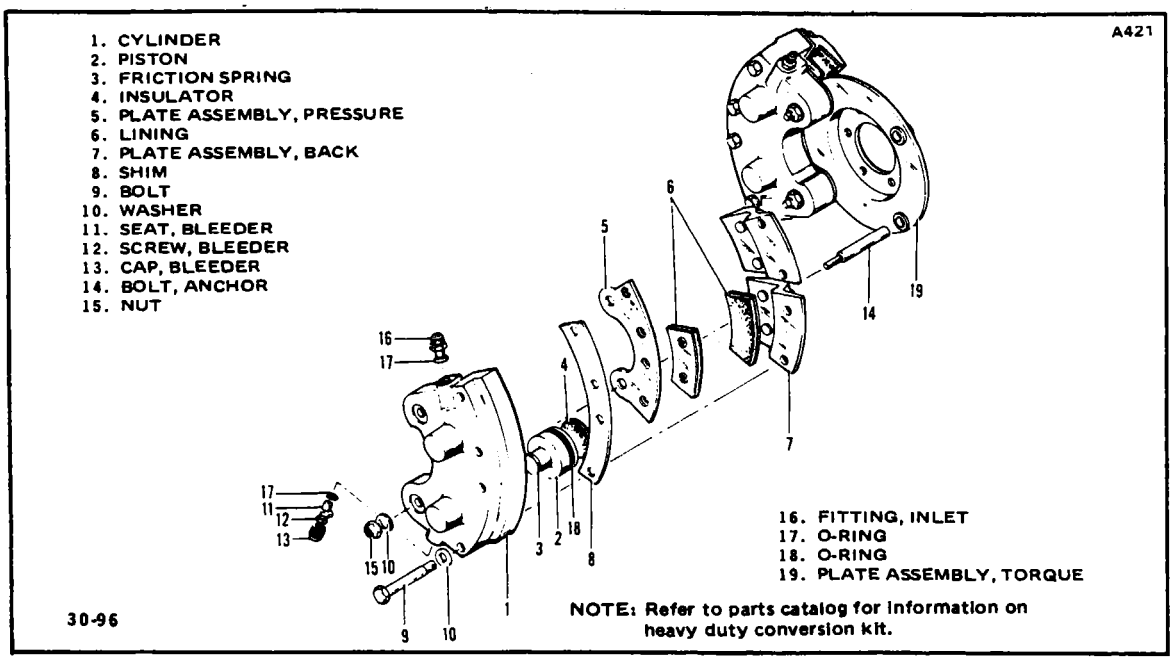

Figure 7-25. Wheel Brake Assembly
PA-23-250 (six place) Serial Nos. 27-7554138, 27-7554140, 27-7554150 and up

1. Thoroughly clean repaired surfaces and areas of the brake assembly from which paint has been removed. Paint exposed areas with one coat of primer and one coat of aluminum lacquer.

CAUTION

Do not paint pistons or the piston bores in the brake cylinder assembly.

NOTE

Replacement linings should be conditioned as follows:

For Cleveland Brake No. 30-8, perform a minimum of six light pedal effort braking applications from 25 to 40 MPH, allowing the brake discs to partially cool between stops.

For Cleveland Brake Nos. 30-72 and 30-96, perform three consecutive hard braking applications from 45 to 50 MPH without allowing the brake discs to cool substantially between stops.

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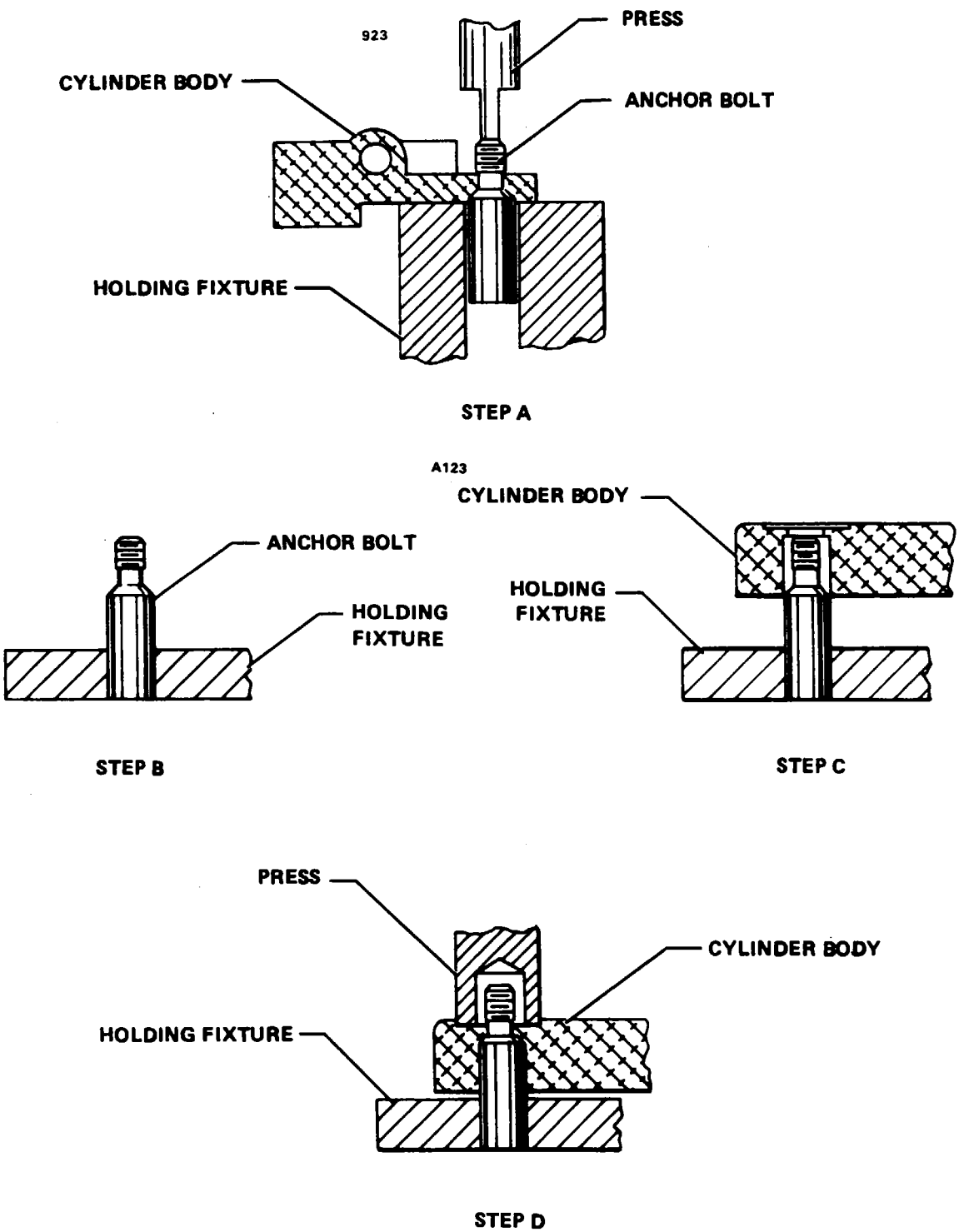

Figure 7-26. Removal and Installation of Anchor Bolts

7-62. ASSEMBLY AND INSTALLATION OF WHEEL BRAKE ASSEMBLY. (Refer to Figure 7-24.)

a. Lubricate piston "O" rings (11) with fluid MIL-H-5606 and install on pistons (9). Slide the pistons in cylinder housing (12) until flush with surface of the housing. On 37-200A brake assembly, ascertain that the insulators (8) are cemented to the pistons.

b. Position the pressure plate (7) to the cylinder housing and install the retract cylinder (14), retraction spring (15), washer (16) and self-locking nut (17) securing it in place. Turn the nut only to the point of contact with the sleeve. Do not apply torque in excess of that required to overcome the self-locking friction of the nut.

NOTE

The retract cylinder will move proportional to the pressure plate assembly and should be reset flush to the cylinder face when the lining is replaced.

c. Install the brake cylinder housing to the torque plate (21).

d. Position the shim spacer block (5) and backing plate (1) to the brake cylinder. On 37-200A brake assemblies, position a pressed fiber (2) shim between the backing plate and the shim spacer block. Install the self-locking cap bolts (18) and safety with MS20995-C41 safety wire.

e. Connect the brake lines to the cylinder housing.

f. Bleed the brakes. (Refer to paragraph 7-74.)

7-63. BRAKE MASTER CYLINDER.

7-64. REMOVAL OF BRAKE MASTER CYLINDER. The following removal procedure applies to all master brake cylinders, but is only described for removal of one on the left side.

a. Remove the small access plate from the bottom left of the fuselage forward section.

b. Reach up through the access opening and remove the cotter pin, washer and pin securing the bottom of the master cylinder to the fuselage frame.

c. Pull the carpet back from around the rudder pedals.

d. Remove the tape from around the bottom of the brake cylinder boot.

e. Raise the bottom of the boot and disconnect the hydraulic lines from the top and bottom.

NOTE

It is recommended that a lint-free rag be placed around the master cylinder being removed to absorb hydraulic fluid spillage.

f. Place a cap or some similar item over the end of the hydraulic lines removed to prevent dust or dirt from entering the system.

g. Remove the cotter pin, washer and pin attaching the top of the master cylinder to the brake pedal.

h. Remove the master cylinder.

7-65. DISASSEMBLY OF BRAKE MASTER CYLINDER. (Refer to Figure 7-27.)

a. Remove the snap ring (5) from the top of the cylinder (17).

b. Pull the clevis end (1) of the assembly removing all internal parts.

c. The piston and plunger may be further disassembled by unscrewing the clevis from the top of the piston and plunger assembly (10 thru 15).

d. As necessary, the dyna seal (12) located between the piston and plunger may be removed by driving the steel pin (11) from the plunger rod (10).

CAUTION

It is recommended that the plunger and piston assembly be placed on a wooden block to prevent damage to the assembly when removing the pin.

NOTE

If the piston and plunger assembly has an "O" ring between the piston (13) and plunger rod (10), and a roll pin attaching the plunger and piston pin together, it is recommended that the part be replaced with plunger assembly, P/N 31155-02, with dyna seal (12) and solid pin.

7-66. CLEANING, INSPECTION AND REPAIR OF BRAKE MASTER CYLINDER.

a. Clean the cylinder parts with a suitable solvent and dry thoroughly.

b. Inspect the interior walls of the cylinder for scratches, burrs, corrosion, etc.

c. Inspect the general condition of the fitting threads of the cylinder.

d. Check the piston and valve for scratches, burrs, corrosion, etc.

e. Repairs to the cylinder are limited to polishing out small scratches, burrs, etc. and replacing valve, washer, seal and "O" rings.

7-67. ASSEMBLY OF BRAKE MASTER CYLINDER. (Refer to Figure 7-27.)

a. If the piston rod (10) was removed from the plunger and piston assembly (10 thru 15), reassemble by the following procedure:

1. Install new "O" ring (14) to the piston and slide it on to the piston rod.
2. Install a new dyna seal to the piston rod (12).
3. Insert the piston assembly (12 thru 15) into the plunger (10) and secure by installing a solid pin (11), P/N 86092-27. Peen over both ends of the new pin to provide a tight seal between the pin and the plunger.

b. Install the bushing (9) to the plunger with the slots down.

c. Install new "O" rings (6 and 8) to the brake cylinder cap (7) and slide it onto the plunger.

d. Install the spring (16), with its ends closed and ground square, to the piston rod (15).

e. Insert the assembled parts into the cylinder housing (17) and install a snap ring (5) on top of the cylinder cap securing the parts inside the cylinder.

f. Install the spring, with its ends closed (4), to the exposed plunger rod.

g. Install the clevis (1) with jam nuts (2) and washer (3). Adjust the clevis until the extended cylinder length is 8.312 inches $\pm$ .250 as measured from center of a cylinder housing attaching hole to center of clevis attaching hole.

7-68. INSTALLATION OF BRAKE MASTER CYLINDER.

a. Attach the clevis end of the cylinder to the brake pedal using a pin, washer and cotter pin.

b. If the brake cylinder rubber trim boot was removed, reinstall at this time.

c. Connect the hydraulic lines to the top and bottom of the brake cylinder.

d. Tape the rubber boot to the floor and replace the carpet around the rudder pedals.

e. Through the access plate in the bottom of the fuselage, secure the bottom of the brake cylinder to the fuselage frame with a pin, washer and cotter pin.

f. Install the access plate to the bottom of the fuselage.

g. Bleed the brake system. (Refer to paragraph 7-75.)

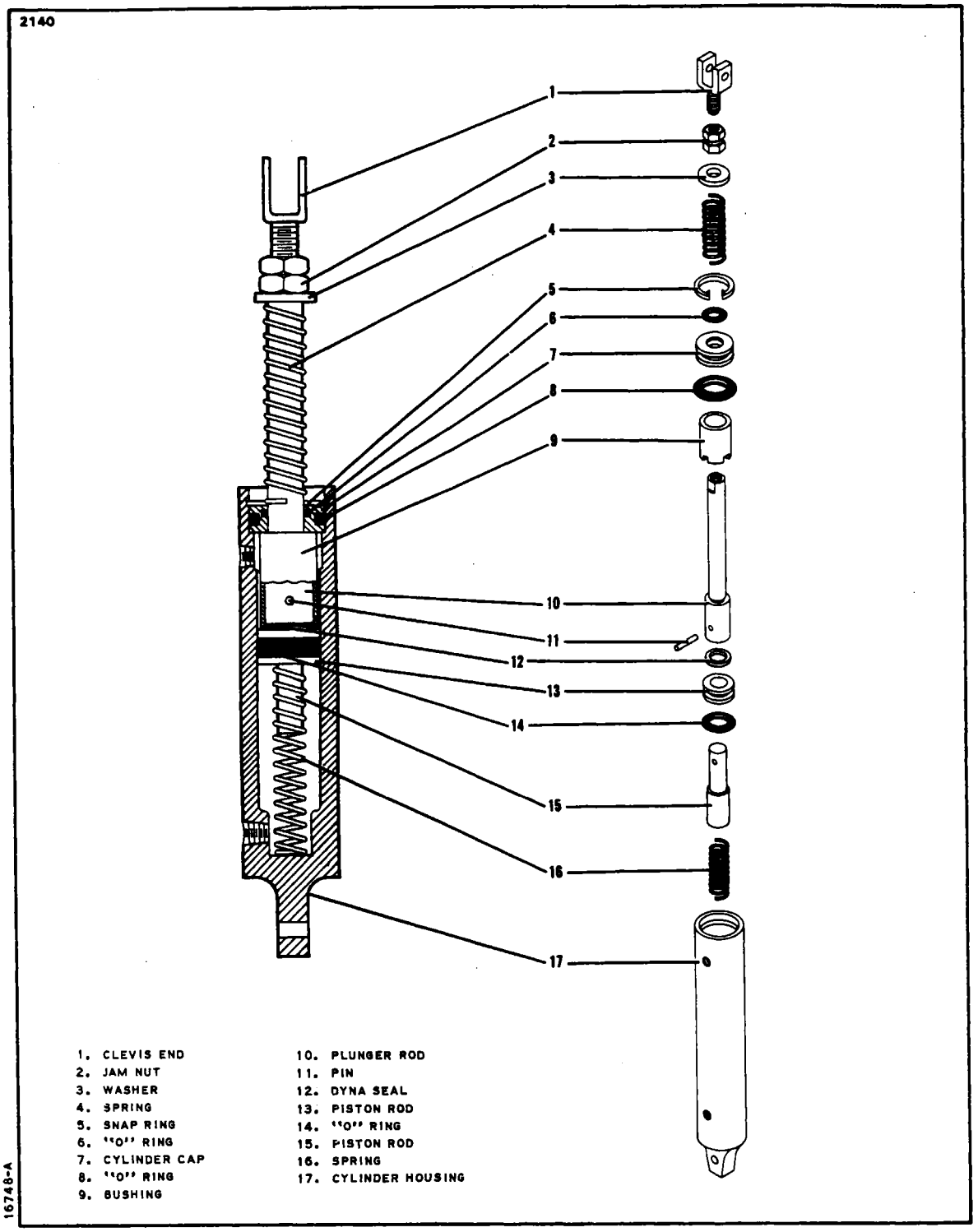

Figure 7-27. Brake Master Cylinder Assembly

7-69. PARKING BRAKE VALVE.

7-70. REMOVAL OF PARKING BRAKE VALVE. The parking brake valve is located just forward of the cabin area in the lower left side of the nose.

a. Remove the access panel from the left side of the nose by releasing fasteners. (Refer to Access Plates and Panels, Section II.)

b. Disconnect the control wire from the parking brake valve by loosening the set screws.

c. Disconnect all hydraulic lines from the valve and place a protective covering over the line openings to prevent contamination.

NOTE

It is recommended that a lint free rag be placed around the master cylinder being removed to absorb hydraulic fluid spillage.

d. Remove the thru bolts, washers and self-locking nuts securing the valve to the fuselage frame and remove the valve.

7-71. DISASSEMBLY OF PARKING BRAKE VALVE. (Refer to Figure 7-28.)

a. Disconnect the piston assembly (6) from the lever by removing speed nut, washers and pin.

b. Remove the end fitting (1) from the valve body (5).

c. Push the piston (6) out through the body. Ascertain that the end of the piston that connects to the lever is free from damage or burrs that could cause the body piston wall to become scratched or galled as the piston is pushed through.

d. Remove "O" ring packings from the end fitting and piston.

7-72. CLEANING, INSPECTION AND REPAIR OF PARKING BRAKE VALVE.

a. Clean the valve components in a suitable dry type cleaning solvent.

b. Inspect the valve for the following:

1. Check that the friction surfaces of the valve body and stem are free from nicks, dents and burrs.

2. Check that the stop on the piston is secure and undamaged.

3. Check that the threaded surfaces of the body and end fitting are not stripped or cross-threaded.

c. Repair to the valve is limited to reconditioning of parts, such as smoothing out minor nicks and scratches, and the replacement of "O" ring packings.

7-73. ASSEMBLY OF PARKING BRAKE VALVE.

a. Install "O" ring packings (3) on the piston (6) and install piston in the valve body (5). Lubricate "O" rings with hydraulic fluid before installing piston.

b. Install "O" ring packing (2) on end fitting (1) and install end fitting in the valve body.

c. Connect the piston assembly to the lever with rivet pin, washers and speed nut.

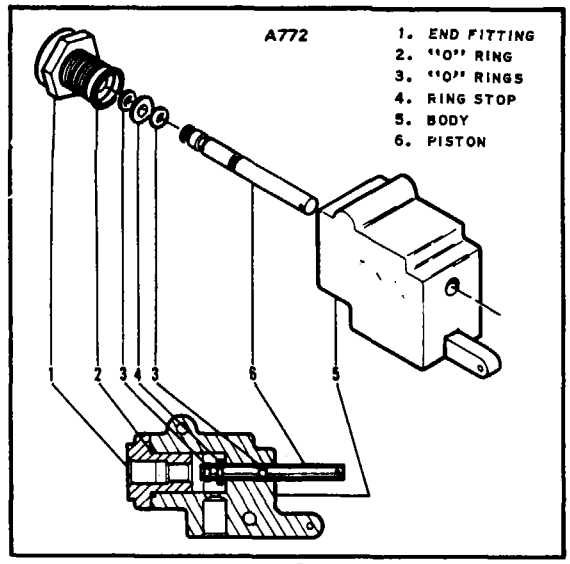

Figure 7-28. Parking Brake Valve Assembly

7-74. INSTALLATION OF PARKING BRAKE VALVE.

a. Position the parking brake valve to the fuselage frame fitting and install the two thru bolts, washers and self-locking nuts.

b. Connect the hydraulic lines to the valve.

c. Connect the control cable to valve lever and determine that when valve lever fits in the closed detent, parking brake handle is .062 to .125 of an inch of being full in against stop.

d. Bleed the brake system. (Refer to paragraph 7-75.)

7-75. BLEEDING PROCEDURE. If the brake line has been disconnected for any reason, it will be necessary to bleed the brake system as described below:

a. Place a suitable container at the brake reservoir to collect fluid overflow.

b. Remove the rubber bleeder fitting cap located on the bottom of the brake unit housing on the landing gear.

c. Slide a hose over the bleeder fitting, loosen the fitting one turn and pressure fill the brake system with MIL-H-5606 fluid. (Refer to Figure 7-29.)

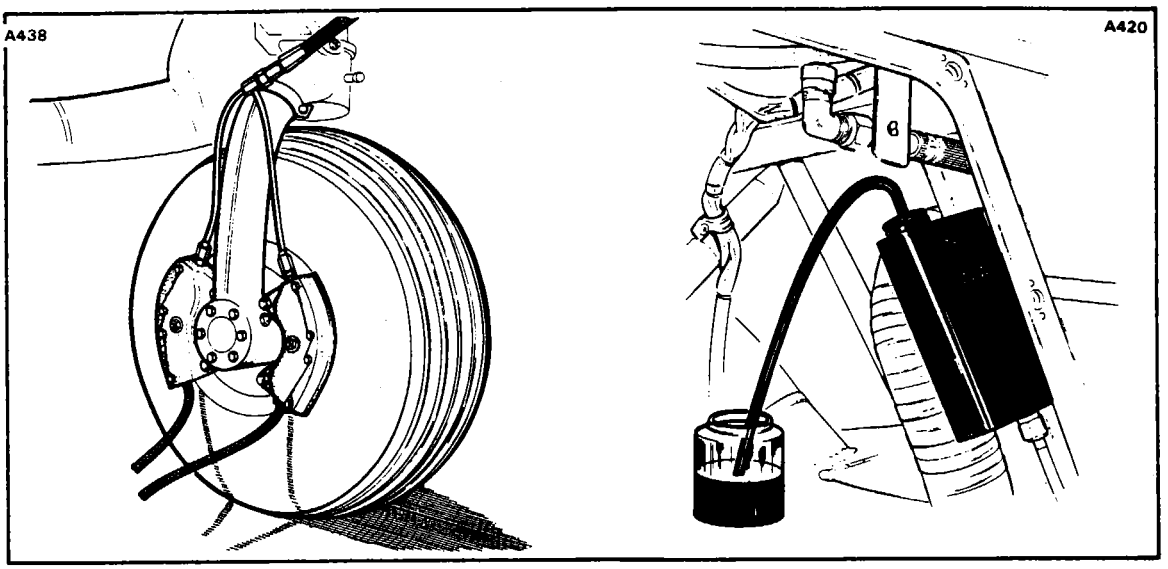

Figure 7-29. Bleeding Brakes

NOTE

By watching the fluid pass through the plastic hose at the top of the brake reservoir, it can be determined whether any air has entered the system. If air bubbles are evident, filling of the system shall be continued until all of the air is out of the system and a steady flow of fluid is obtained.

d. Tighten bleeder fitting, remove hose and check brakes for proper pedal pressure.

e. Repeat this procedure in the other unit.

NOTE

There are two units on each gear and also two bleeder fittings, therefore, it will be necessary to bleed both units to be sure the system is completely free of air.

7-76. TIRE BALANCING. Proper balancing is critical for the life of the aircraft tires. If a new tire is balanced upon installation it will usually remain balanced for the life of the tire without having any shimmy or flat spots, and an inexpensive balancer can be made that will balance almost any tire for light aircraft. (Refer to paragraph 7-77 for fabrication instructions.) Balance the tire as follows:

a. Mount the tire and tube on the wheel, but do not install the securing bolts. Install the wheel bearings in the wheel; then, using the -7 bushings, -6 spacers, and -5 nuts, install the wheel-tire assembly on the -8 pipe. Secure the -5 nuts finger-tight so that the wheel halves touch each other. Be sure the bolt holes are aligned! Insert the -4 axle through the -8 pipe and place the wheel in the center of the balancer. Make sure the axle is only on the chamfered edges of the balancer and that it is at 90° to the sides of the balancer.

b. Release the tire. If it is out of balance it will rotate, coming to rest with the heaviest point on the bottom. Tape a 1/2 ounce patch across top center of the tire. Rotate the tire 45° and release it again. If the tire returns to the same position, add a 1 ounce patch and again rotate the tire and release it. Continue this procedure until the tire is balanced.

c. When balance is attained, put a chalk mark on the sidewall directly below the patch. Use one mark for each half ounce of weight needed. Mark the valve stem location on the tire and the opposite wheel half to assure reassembly in the same position. Remove the wheel from the balance stand, break it down, and clean the tire with toluol. Apply a coat of patch cement to both the patch and the inside center of the tire in line with the chalk marks. When the cement has dried, install the patches making certain they are on the center line of the tire and aligned with the chalk marks on the sidewall. Burnish the patches to remove trapped air, etc.

d. When reassembling the wheel, powder the inside of the tire. Mount the tire on the valve side of the wheel in the same position it was in when it was balanced. Install the other wheel half, aligning the chalk marks. Install the bolts and tighten to required torque, (refer to paragraph 7-56) then air the tire and recheck the balance. The wheel should not be more than 1/2 ounce out of balance.

7-77. CONSTRUCTION OF TIRE BALANCER. (Refer to Figure 7-33.)

a. The following instructions will help in building the balancer: chamfer top edges of -3 sides, leaving 1/16 inch flat on top inboard edge. Rivet -2 tee's to -3 sides using AN 470-AD5 rivets 2" spacing. Use AN 426-AD5 rivets 2" center to center to secure -2 tee's to -1 base. If tee extrusion is unavailable, heavy angle extrusion could be used. -3 sides must be paralleled and vertical.

b. The -4 axle must slide through the -8 pipe. The -5 nuts were made by reaming the existing threads in the AN 365-624 nuts with an R drill, then tapping with a 1/8-27 pipe tap.

c. The -6 spacers were made from ½ inch aluminum tubing. The two lengths of spacers are suitable for balancing most any aircraft wheel.

d. The -7 bushings may be benchmade from one inch phenolic or aluminum using a 1½ inch hole saw to cut out the smaller bushing and a 1¾ hole saw to cut out the larger. By inserting a ¼ inch long threaded bolt through the pilot hole and securing with a washer and nut, a drill press and file may be used to make the off-set on the bushing. The turned-down part should just slide inside the bearing race. Ream the pilot hole to slide over the -8 pipe threads.

e. The -8 pipe was made from a piece of ⅛ inch black ipe and threaded with a 1/8-27 pipe die. Thread 3 inches from each end of the pipe.

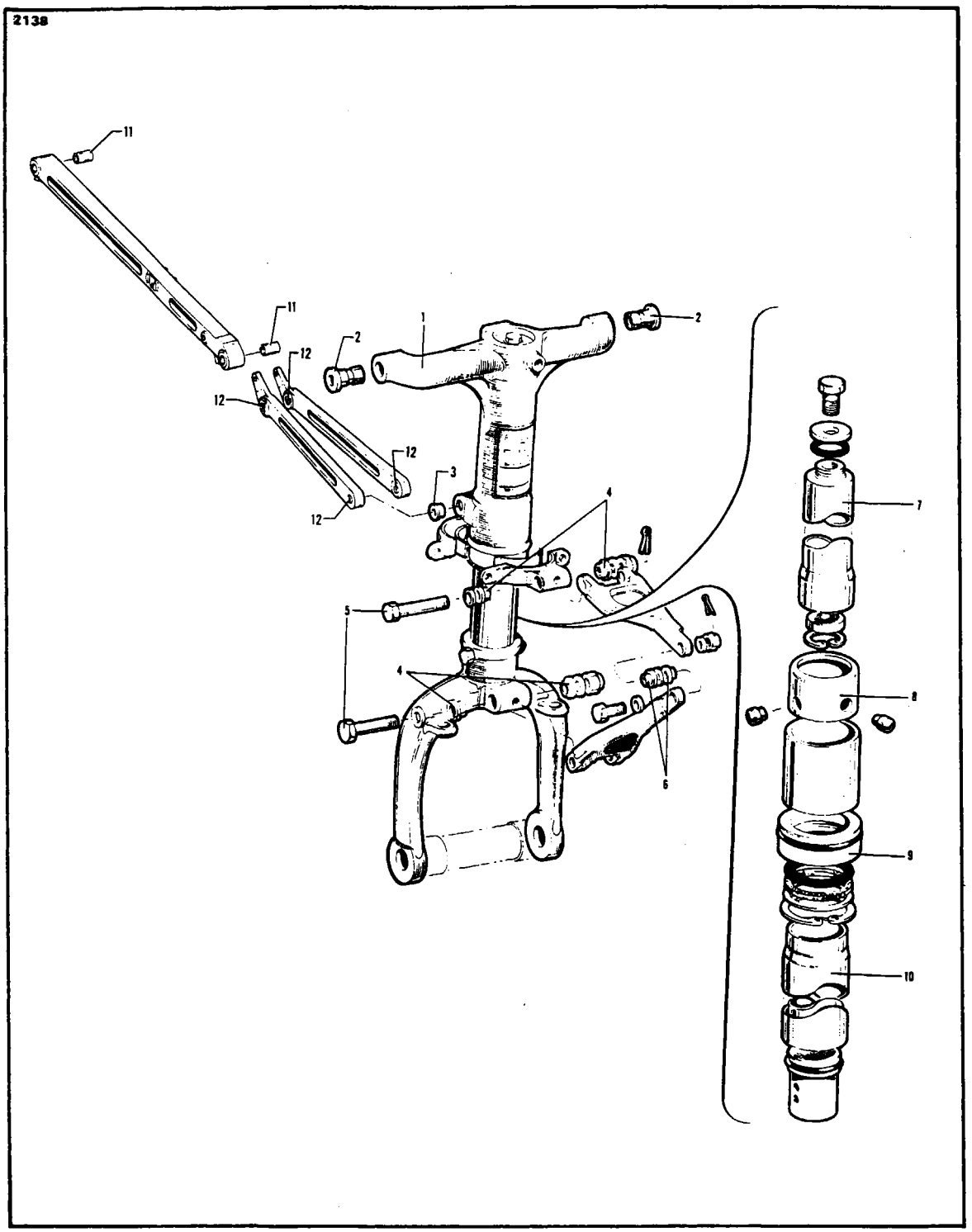

Figure 7-30. Nose Gear Oleo Service Tolerances

TABLE VII-II. LANDING GEAR OLEO SERVICE TOLERANCES
19273-02 NOSE GEAR

Figure 7-29 Index	Part No.	Item	Manufact. Dim.	Manufact. Toler.	Min. Service Limit	Max. Service Limit
8	751 363 (31779-00)	Upper Bearing, Strut Housing	2.373	OD +.000 -.002	2.3708	2.3730
1	751 930 (31768-00)	Body, Strut Housing	2.375	ID +.003 -.000	2.3750	2.3795
9	751 418 (31780-00)	Lower Bearing, Strut Housing	1.9375	ID +.002 -.000	1.9375	1.9405
10	752 770 (31790-00)	Piston Rod, Strut	1.9370	OD +.000 -.001	1.9359	1.9370
7	753 000 (31775-00)	Tube, Orifice	1.623	OD +.000 -.002	1.6208	1.623
10	752 770 (31790-00)	Piston Rod, Strut	1.625	ID +.003 -.000	1.6250	1.6283
3	751 417 (453 722)	Bushing, Drag Link	.375	ID +.0015	.3750	.3773
6	751 369 (31796-00)	Bushing, Torque Link	.251	ID +.001 -.000	.251	.253

TABLE VII-II. LANDING GEAR OLEO SERVICE TOLERANCES
19273-02 NOSE GEAR (cont.)

Figure 7-29 Index	Part No.	Item	Manufact Dim.	Manufact. Toler.	Min. Service Limit	Max. Service Limit
4	751 367 (31785-00)	Bushing, Torque Link	.313	ID +.002 -.000	.3130	.3160
5	402 344 (AN175-32)	Bolt, Torque Link Attachment	.3117	OD +.0000 -.0005	.3112	.3117
2	751 368 (31766-00)	Bushing, Mounting	.5000	ID +.0015 -.0000	.5000	.5023
11	14843-11	Bushing, Upper Drag Link		ID +.3755 -.3745		
12	16198-00 16198-03	Drag Link Assembly (Upper) (No Bushings)		ID +.3755 -.3745		

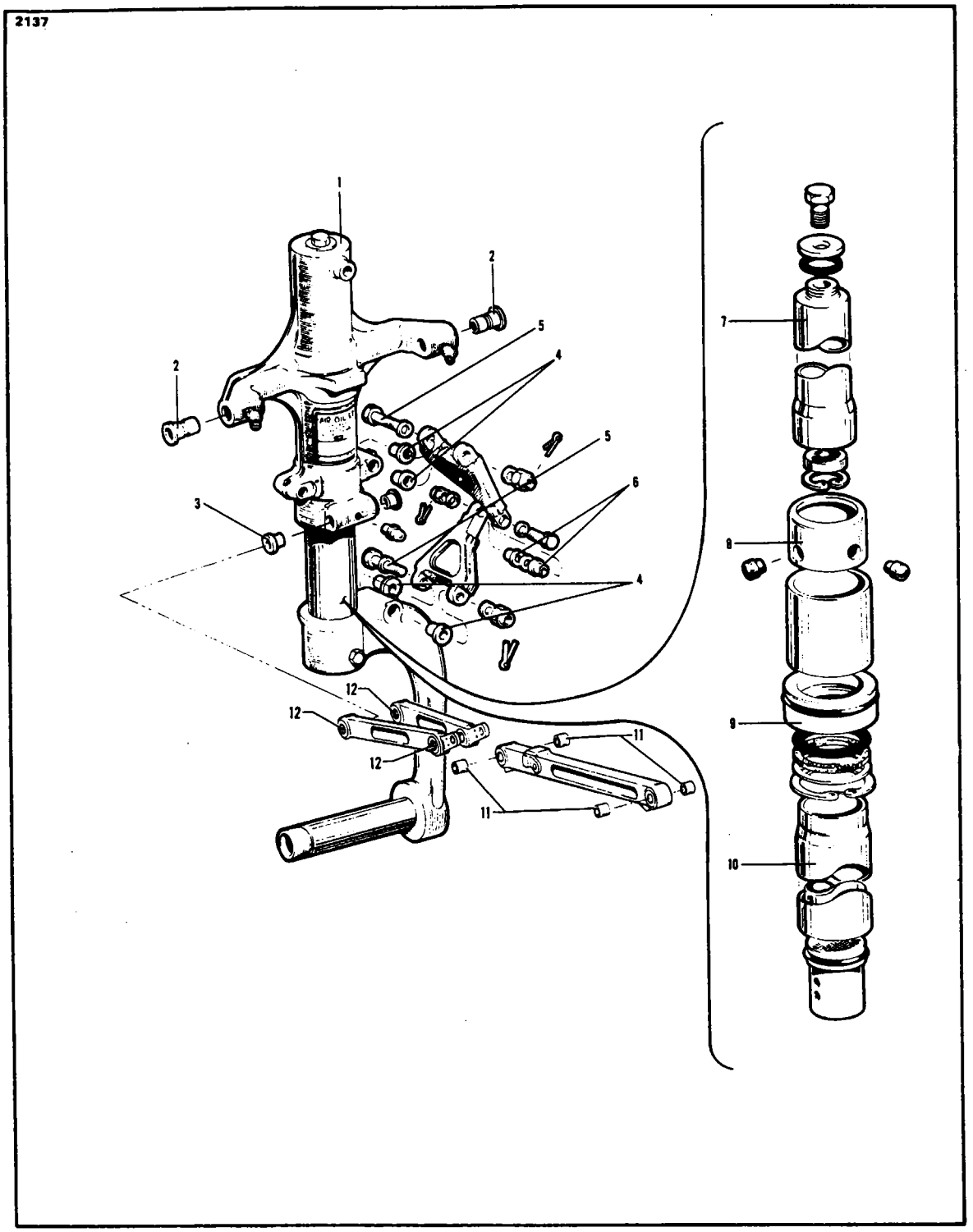

Figure 7-31. Main Gear Oleo Service Tolerances

TABLE VII-III. LANDING GEAR OLEO SERVICE TOLERANCES
19272-02 MAIN GEAR

Figure 7-30 Index	Part No.	Item	Manufact. Dim.	Manufact. Toler.	Min. Service Limit	Max. Service Limit
8	751 363 (31779-00)	Upper Bearing, Strut Housing	2.373	OD +.000 -.002	2.3708	2.3730
1	751 929 (31835-00)	Body, Strut Housing	2.375	ID +.003 -.000	2.3750	2.3795
9	751 418 (31780-00)	Lower Bearing, Strut Housing	1.9375	ID +.002 -.000	1.9375	1.9405
10	752 770 (31790-00)	Piston Rod, Strut	1.9370	OD +.000 -.001	1.9359	1.9370
7	753 000 (31775-00)	Tube, Orifice	1.623	OD +.000 -.002	1.6208	1.6230
10	752 770 (31790-00)	Piston Rod, Strut	1.625	ID +.003 -.000	1.6250	1.6283
3	751 416 (453 723)	Bushing, Drag Link	.4375	ID +.0015 -.0000	.4375	.4398
6	751 369 (31796-00)	Bushing, Torque Link	.251	ID +.001 -.000	.251	.253

TABLE VII-III. LANDING GEAR OLEO SERVICE TOLERANCES
19272-02 MAIN GEAR (cont.)

Figure 7-30 Index	Part No.	Item	Manufact. Dim.	Manufact. Toler.	Min. Service Limit	Max. Service Limit
4	751 367 (31785-00)	Bushing, Torque Link	.313	ID +.002 -.000	.3130	.3160
5	402 344 (AN175-32)	Bolt, Torque Link	.3117	OD +.0000 -.0005	.3112	.3117
2	751 368	Bushing, Mounting	.5000	ID +.0015 -.0000	.5000	.5023
11	14976-33	Bushing, Upper Drag Link		ID +.438 -.436		
12	16191-00 16191-01	Link Assembly - Lower Drag		ID +.438 -.436		

TABLE VII-IV. LANDING GEAR AND BRAKE SYSTEM TROUBLESHOOTING

Trouble	Cause	Remedy
Nose gear shimmies during fast taxi, take-off and landing.	Tire out of balance.	Check balance and replace tire if necessary.
	Worn or loose wheel bearings.	Replace and/or adjust wheel bearings.
	Worn drag link bolts and/or bushings.	Replace bolts and/or bushings.
Main landing gear shimmies during fast taxi, take-off and landing.	Tire out of balance.	Check balance and replace tire if necessary.
	Worn or loose wheel bearings.	Replace and/or adjust wheel bearings.
	Worn drag link bolts and/or bushings	Replace bolts and/or bushings.
Nose gear fails to steer properly	Oleo cylinder binding in strut housing.	Lubricate strut housing.
	One brake dragging.	Determine cause and correct.
	Steering arm roller sheared at top of strut.	Replace defective roller.
Excessive or uneven wear on main tires.	Incorrect operating pressure.	Inflate tire to correct pressure.
	Wheel out of alignment (toe-in or toe-out).	Check wheel alignment.

TABLE VII-IV. LANDING GEAR AND BRAKE SYSTEM TROUBLESHOOTING (cont.)

Trouble	Cause	Remedy
Strut bottoms on normal landing or when taxiing over rough ground.	Insufficient air and/or fluid in strut.	Service strut with air and/or fluid.
	Defective internal parts in strut.	Replace defective parts.
Green gear down light out.	Lamp burned out.	Replace lamp.
	Gear down limit switch out of adjustment.	Adjust limit switch.
	Landing gear down limit fails to operate.	Replace switch.
	Gear down indicator light circuit breaker open.	Reset circuit breaker.
Flashing red light and warning horn fail to operate when power from both engines is reduced below 14 or 15 inches manifold pressure.	Throttle switches out of adjustment.	Adjust throttle switches.
	Throttle switches are defective.	Replace switch.
	Horn or light defective.	Replace defective part.
	Defective wiring.	Check wiring.

TABLE VII-IV. LANDING GEAR AND BRAKE SYSTEM TROUBLESHOOTING (cont.)

Trouble	Cause	Remedy
Landing gear and/or doors not fully extended.	Possible jamming from foreign objects.	Inspect for any obstruction.
	Down lock not operating.	Lubricate and check for malfunction.
	Excessive friction in gear and door mechanism.	Lubricate. (Refer to Lubrication Chart.)
Warning horn fails to operate when throttles are closed and landing gear is retracting or fails to stop when throttles are closed and landing gear is extended.	Micro switches on the throttles out of adjustment.	Adjust micro switches.
	Micro switches on the throttles inoperative.	Check wiring, replace switch if necessary.
	Landing gear down limit switch out of adjustment.	Adjust limit switches.
	Landing gear down limit switch inoperative.	Check wiring, replace switch if necessary.
	Warning horn assembly.	Check wires, adjust or replace.

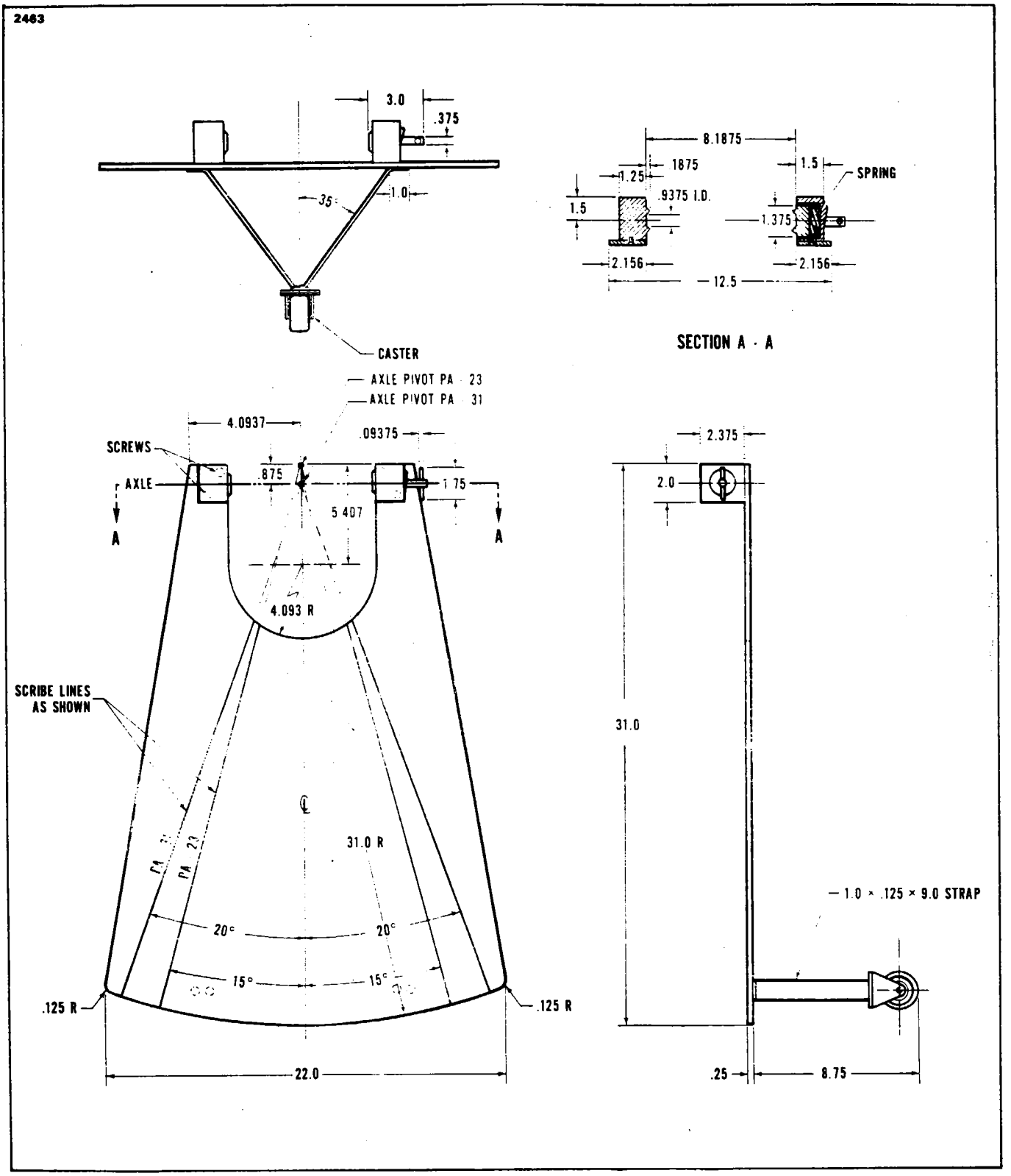

Figure 7-32. Fabricated Tool, Checking Nose Wheel Alignment