SECTION 5

LANDING GEAR AND BRAKES

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5-1. LANDING GEAR.

5-2. DESCRIPTION. The aircraft is equipped with a fixed tricycle landing gear, consisting of tubular spring-steel main gear struts, and an air/oil steerable nose gear shock strut. Wheels with disc-type brakes and tube-type tires are installed on the main landing gear struts and a two-piece, die-cast aluminum wheel is mounted on the nose gear strut. The nose wheel is steerable with the rudder pedals up to a maximum pedal deflection, after which it becomes free-swiveling, up to a maximum of 30 degrees, each side of center. Nose and main wheel speed fairings are available for installation.

5-3. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
AIRCRAFT LEANS TO ONE SIDE.	Incorrect tire inflation.	Inflate to pressure specified in figure 1-1.
	Landing gear attaching parts not tight.	Tighten loose parts; replace defective parts with new parts.
	Landing gear spring excessively sprung.	Remove and install new part(s).
	Bent axles.	Install new part(s).
TIRES WEAR EXCESSIVELY.	Incorrect tire inflation.	Inflate to pressure specified in figure 1-1.
	Main wheels out of alignment.	Remove and install new part(s).
	Landing gear spring excessively sprung.	Remove and install new part(s).
	Bent axles.	Install new part(s).
	Dragging brakes.	Refer to paragraph 5-54.
	Wheel bearings excessively tight.	Adjust properly.
	Wheels out of balance.	Correct in accordance with paragraph 5-21.
	Loose torque links.	Add shims or install new parts as required.
WHEEL BOUNCE EVIDENT ON SMOOTH SURFACE.	Out of balance condition.	Refer to paragraph 5-21.

SHOP NOTES:

5-4. MAIN LANDING GEAR.

5-5. DESCRIPTION. The tubular, spring-steel main landing gear struts are attached to the aircraft at inboard and outboard forgings, located in the belly of the aircraft. A bracket is bonded to each strut for attachment of a step. Hydraulic brake lines are routed down and clamped to each main gear strut. The axles, main wheels and brake assemblies are installed at the lower end of each strut.

5-6. MAIN GEAR STRUT REMOVAL. (Refer to figure 5-1.)

NOTE

The following procedure removes the landing gear as a complete assembly. Refer to applicable paragraphs for removal of individual components.

a. Remove floorboard access covers over inboard and outboard landing gear forgings (2) and (3).
b. Hoist or jack aircraft in accordance with procedures outlined in Section 2.
c. Remove screws attaching fuselage fairing (19), and allow fairing to slide down over spring-strut fairing (18).
d. Drain hydraulic fluid from brake line (6) on strut being removed.
e. Disconnect hydraulic brake line (6) at fitting where brake line emerges from fuselage skin. Cap or plug disconnected fittings.
f. Remove nut, washer and bolt attaching inboard end of tubular strut to the inboard landing gear bulkhead fitting.
g. Pull tubular strut from fitting and bushing. Use care when removing strut to prevent damage to hydraulic brake line.

NOTE

The tubular strut is a compression fit in the bushing in the outboard landing gear forging (3).

5-7. MAIN GEAR STRUT INSTALLATION. (Refer to figure 5-1.)

NOTE

The following procedure installs the landing gear as a complete assembly. Refer to applicable paragraphs for installation of individual components.

a. Install all parts removed from strut.
b. Apply Dow Corning Compound DC7 to approximately 11 inches on upper end of tubular strut.

NOTE

Avoid use of Dow Corning DC7 on surfaces to be painted. DC7 contains silicone which is harmful to painted surfaces.

c. Slide tubular strut into place through bushing in outboard strut fitting and into inboard strut fitting.
d. Align tubular strut in inboard fitting and install bolt through fitting and strut. Install washer and nut on bolt and tighten to torque value listed in Section 1.
e. Connect hydraulic brake line to fitting. Fill and bleed brake system in accordance with applicable paragraph in this Section.
f. Install fairing.
g. Lower aircraft and install floorboard access covers.

5-8. STEP BRACKET INSTALLATION.

NOTE

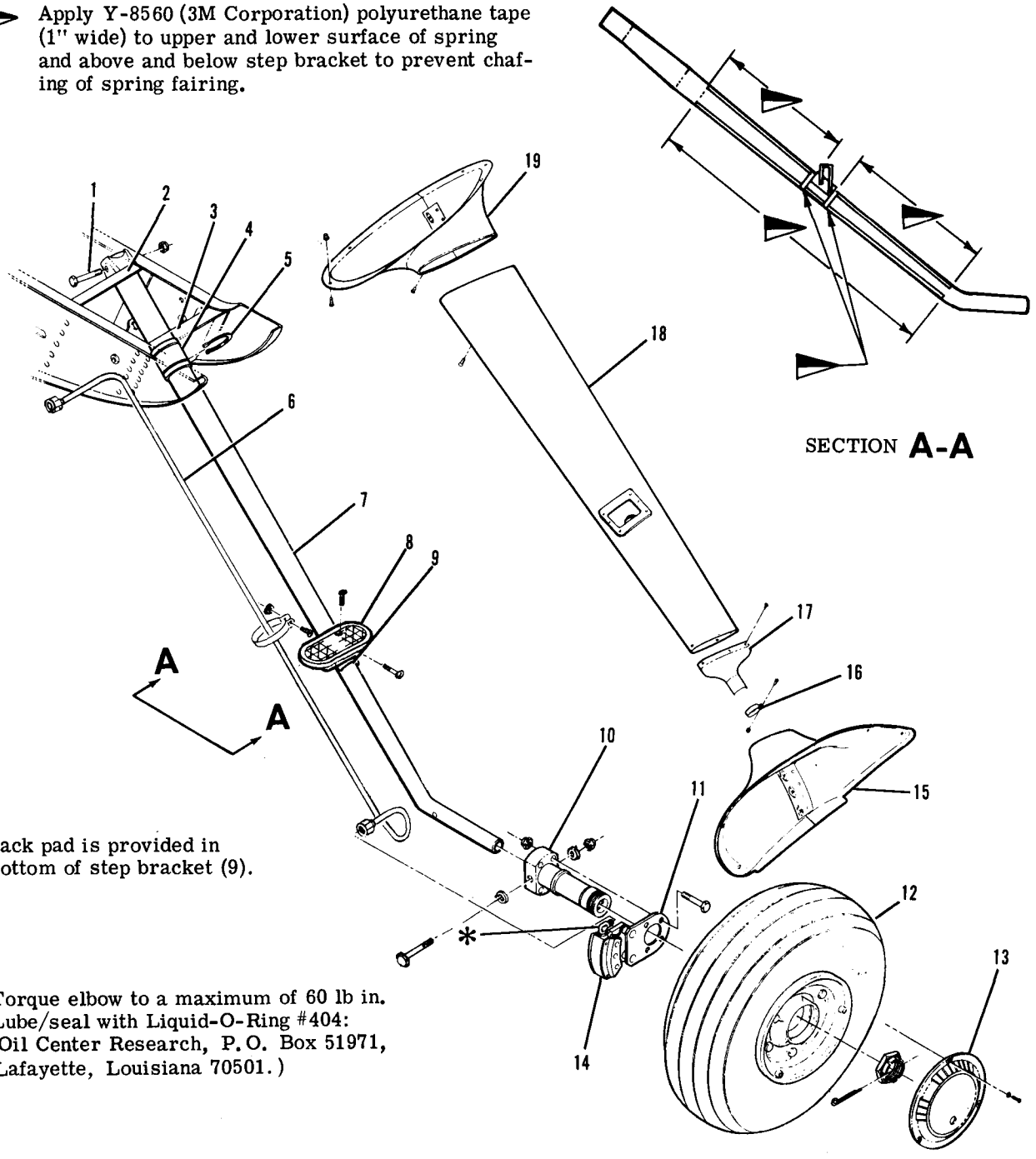
The step bracket is secured to the tubular gear strut with EA9309, EC2216, EC2214, EC3445, or a similar epoxy base adhesive.

a. Mark position of the bracket so that the new step bracket will be installed in approximately the same position on the strut.
b. Remove all traces of the original bracket and adhesive as well as any rust, paint or scale with a wire brush and coarse sandpaper.
c. Leave surfaces slightly roughened or abraded, but deep scratches or nicks should be avoided.
d. Clean surfaces to be bonded together thoroughly. If a solvent is used, remove all traces of the solvent with a clean, dry cloth. It is important that the bonding surfaces be clean and dry.
e. Check fit of step bracket on the tubular strut.
f. Mix adhesive (any of those listed in note preceding step "a") in accordance with manufacturer's directions.
g. Spread a coat of adhesive on bonding surfaces, and place step bracket in position on the tubular strut. Clamp bracket to strut to ensure a good tight fit.
h. Form a small fillet of the adhesive at all edges of the bonded surfaces. Remove excess adhesive with lacquer thinner.
i. Allow adhesive to cure thoroughly according to manufacturer's recommendations before flexing the tubular gear strut or applying loads to the strut.
j. Paint tubular strut and step bracket after curing is completed.

5-9. MAIN LANDING GEAR FAIRINGS. (Refer to figures 5-1 and 5-2.)

5-10. DESCRIPTION. Some aircraft are equipped with fuselage fairings, attached to the fuselage and the tubular strut fairings with screws. The tubular strut fairings cover the tubular landing gear struts, and attach to the fuselage fairings at the upper end and to fairing caps at the lower end. The fairing caps attach to the tubular strut fairings at the upper end and are clamped to the tubular struts at the lower end. Brake fairings are installed at the lower end of the tubular strut fairings and are attached to the wheel speed fairings by screws around their outer perimeters. The speed fairings are installed over the wheels and are attached to mounting plates, attached to the axles. The wheel fairings are equipped with

Apply Y-8560 (3M Corporation) polyurethane tape (1" wide) to upper and lower surface of spring and above and below step bracket to prevent chafing of spring fairing.



1. Bolt
2. Inboard Forging
3. Outboard Forging
4. Bushing
5. Bushing Retainer
6. Brake Line
7. Tubular Strut
8. Step
9. Step Bracket
10. Axle
11. Brake Torque Plate
12. Wheel Assembly
13. Hub Cap
14. Brake Assembly
15. Brake Fairing
16. Clamp
17. Fairing Cap
18. Tubular Strut Fairing
19. Fuselage Fairing

Figure 5-1. Main Landing Gear Installation

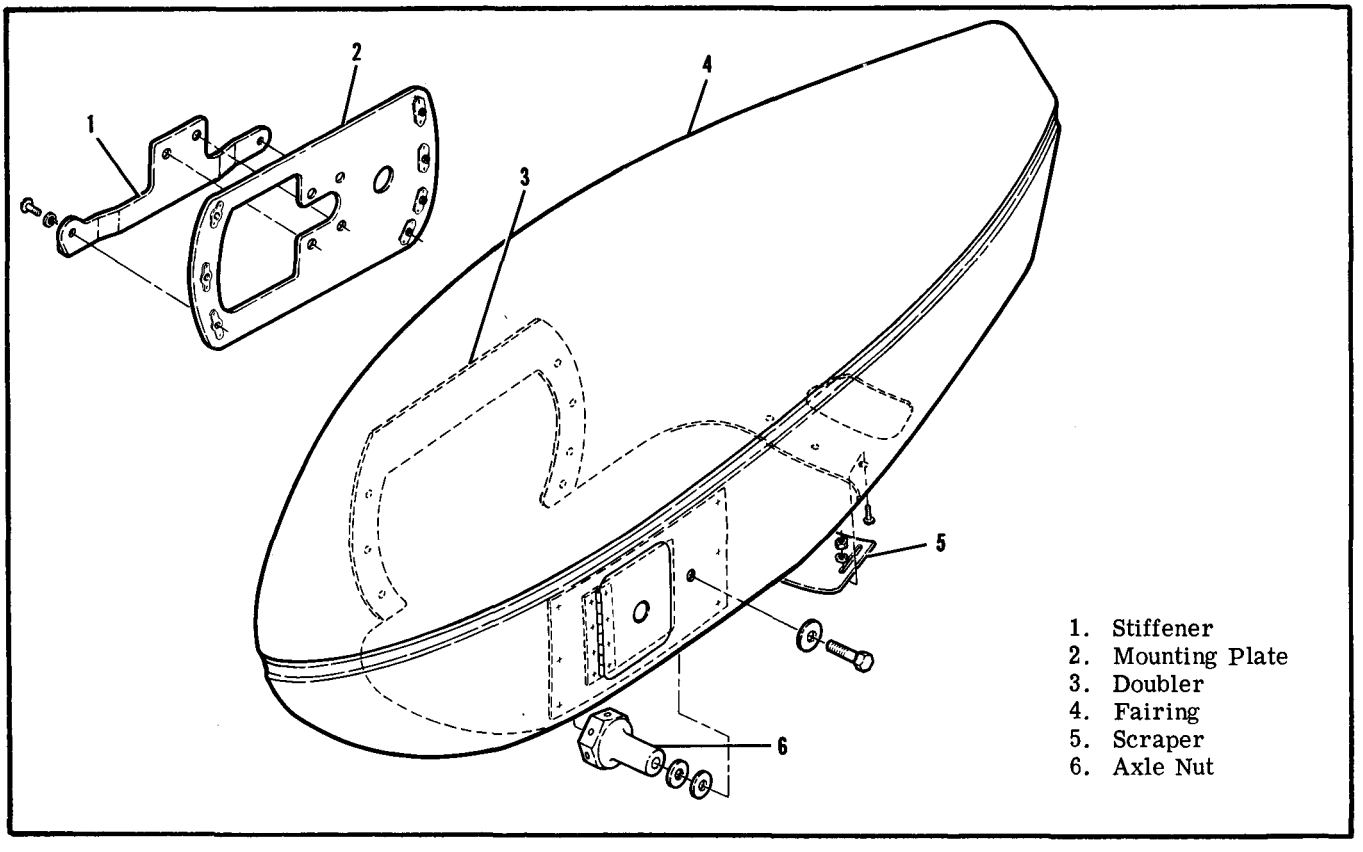


Figure 5-2. Main Wheel Speed Fairing

adjustable scrapers, installed in the lower aft part of the fairings, directly behind the wheels.

5-11. REMOVAL AND INSTALLATION OF MAIN LANDING GEAR FAIRINGS, (Refer to figure 5-1.)

a. To remove brake fairings (15), proceed as follows:

1. Remove screws from perimeter of fairings.
2. Remove screws from nutplates holding fairings together.
3. Spring fairings open to slide over spring strut fairings.
4. Remove brake fairings.
5. Reverse preceding steps to install brake fairings.

b. To remove fairing caps (17), proceed as follows:

1. Remove brake fairings (15), as outlined in step "a".
2. Remove screws attaching fairing caps to spring strut fairings (18).
3. Remove bolt and nut attaching clamps (16) to spring struts (7).
4. Slide clamps (16) down tubular struts (7); remove fairing caps (17).

NOTE

Clamps may be sprung over tubular struts for removal.

5. Reverse preceding steps to install fairing caps.

c. To remove fuselage fairings (19), proceed as follows:

1. Remove screws attaching fairings to fuselage.
2. Slide fairings down tubular strut fairings or remove screws from nutplates holding fairings together. and spring fairings open to slide over spring strut fairings.
3. Reverse the preceding steps to install fuselage fairings.

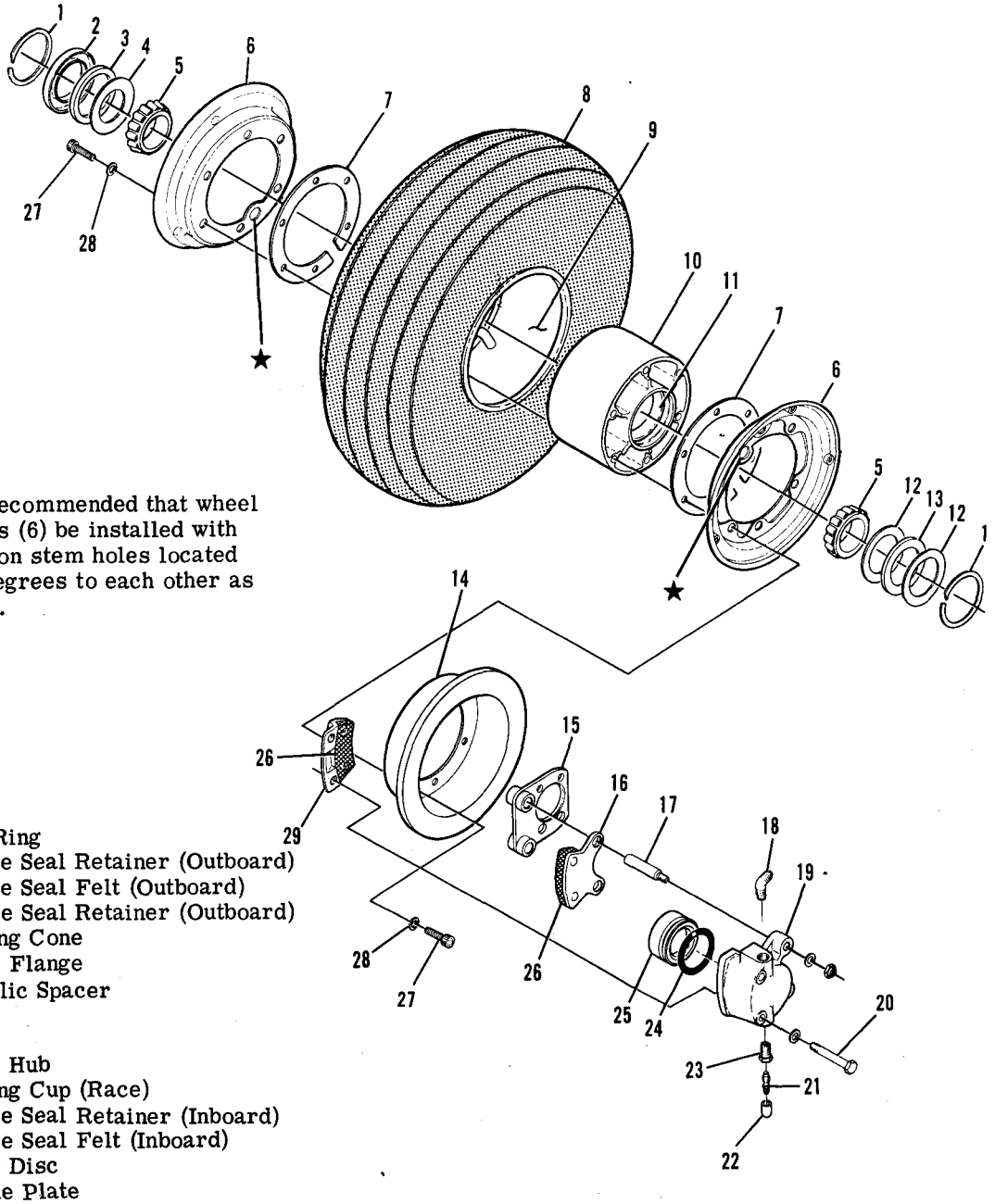
d. To remove tubular strut fairings (18), proceed as follows:

1. Remove brake fairings (15) as outlined in step "a".
2. Remove fairing caps (17) as outlined in step "b".
3. Remove fuselage fairings (19) as outlined in step "c".
4. Remove steps (8).
5. Remove screws from nutplates along strut fairings.
6. Spring fairing over tubular struts, using care not to damage brake lines (6).
7. Reverse the preceding steps to install fairings (18).

5-12. MAIN WHEEL SPEED FAIRING REMOVAL. (Refer to figure 5-2.)

a. Remove brake fairing as outlined in paragraph 5-11, step "a".
b. Remove screws attaching stiffener (1) and inboard side of wheel speed fairing (4) to mounting plate (2), which is attached to the axle.
c. Remove bolt securing outboard side of fairing to axle nut (6).
d. Loosen scraper (5), if necessary, and work speed fairing from wheel.

5-12A. MAIN WHEEL SPEED FAIRING INSTALLATION. (Refer to figure 5-2.)



★ It is recommended that wheel flanges (6) be installed with inflation stem holes located 180-degrees to each other as shown.

1. Snap Ring
2. Grease Seal Retainer (Outboard)
3. Grease Seal Felt (Outboard)
4. Grease Seal Retainer (Outboard)
5. Bearing Cone
6. Wheel Flange
7. Phenolic Spacer
8. Tire
9. Tube
10. Wheel Hub
11. Bearing Cup (Race)
12. Grease Seal Retainer (Inboard)
13. Grease Seal Felt (Inboard)
14. Brake Disc
15. Torque Plate
16. Pressure Plate
17. Anchor Bolt
18. Elbow
19. Brake Cylinder
20. Bolt
21. Bleeder Screw
22. Dust Cap
23. Bleeder Fitting
24. Piston O-Ring
25. Brake Piston
26. Brake Lining
27. Capscrew
28. Washer
29. Back Plate

NOTES

Torque capscrews (27) to 190-200 lb-in.

Torque bolts (20) to 120-130 lb-in.

Torque bleeder screw (21) to 30-40 lb-in.

Torque elbow (18) to a maximum of 60 lb-in. Lube/seal with Liquid-O-Ring #404: (Oil Center Research, P.O. Box 51971, Lafayette, Louisiana 7050.)

Figure 5-3. Main Wheel and Brake

a. Work speed fairing down over wheel.
b. Install bolt securing outboard side of speed fairing to axle nut.
c. Install screws attaching stiffener (1) and inboard side of wheel speed fairing (4) to mounting plate (2), which is bolted to the axle.
d. Install brake fairing as outlined in step "a" of paragraph 5-11.
e. After installation, check scraper-to-tire clearance for a minimum of 0.25-inch to a maximum of 0.38-inch. Elongated holes are provided in the scraper for clearance adjustments.

CAUTION

Always check scraper-to-tire clearance after installing speed fairing, whenever a tire has been changed, and whenever scraper adjustment has been disturbed. If the aircraft is flown from surfaces with mud, snow, or ice, the speed fairing should be checked to make sure there is no accumulation which could prevent normal wheel rotation. Wipe fuel and oil from speed fairings to prevent stains and deterioration.

5-13. MAIN WHEEL REMOVAL. (Refer to figure 5-3.)

NOTE

It is not necessary to remove the main wheel to reline brakes or to remove brake parts, other than the brake disc on the torque plate.

a. Hoist or jack aircraft in accordance with procedures outlined in Section 2.
b. Remove speed fairing, if installed, as outlined in paragraph 5-12.
c. Remove hub caps, if installed, cotter pin and axle nut.
d. Remove bolts and washers attaching brake back plate to brake cylinder, and remove back plate.
e. Pull wheel from axle.

5-14. MAIN WHEEL DISASSEMBLY.

WARNING

Injury can result from attempting to remove wheel flanges with tire and tube inflated. Avoid damaging wheel flanges when breaking tire beads loose. A scratch, gouge or nick in wheel flange could cause wheel failure.

a. Remove valve core and deflate tire and tube. Breake tire beads loose from wheel flanges.
b. Remove capscrews and washers from outboard wheel flange.
c. Remove capscrews and washers from inboard wheel flange.
d. Remove brake disc.
e. Separate wheel flanges from wheel hub. Retain spacers on each side of wheel hub.
f. Remove wheel hub from tire.
g. Remove retainer rings, grease seal retainers, grease seal felts and bearing cones.

NOTE

Bearing cups (races) are a press fit in the wheel hub and should not be removed unless a new part is to be installed. To remove the bearing cup, heat wheel hub in boiling water for 30 minutes, or in an oven not to exceed 121°C (250°F). Using an arbor press, if available, press out the bearing cup and press in the new bearing cup while the wheel hub is still hot.

5-15. MAIN WHEEL INSPECTION AND REPAIR.
a. Clean all metal parts, grease seal felts and mylar spacers in cleaning solvent and dry thoroughly.
b. Inspect wheel flanges and wheel hub for cracks. Cracked wheel flanges or hub shall be discarded and new parts installed. Sand out smooth nicks, gouges and corroded areas. When the protective coating has been removed, the area should be cleaned thoroughly, primed with zinc chromate and painted with aluminum lacquer.
c. If excessively warped or scored, or worn to a thickness of 0.190-inch, brake disc should be replaced with a new part. Sand smooth small nicks and scratches.
d. Carefully inspect bearing cones and cups for damage and discoloration. After cleaning, pack bearing cones with clean aircraft wheel bearing grease. Refer to Section 2 of this manual for grease type.

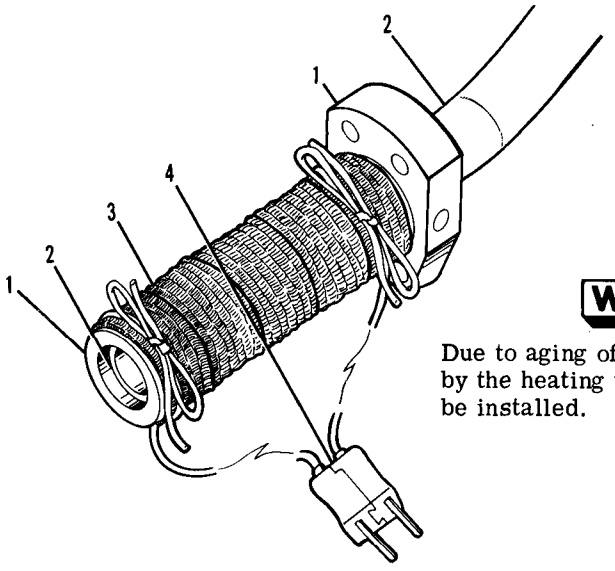
5-16. MAIN WHEEL REASSEMBLY.
a. Place wheel hub in tire and tube with tube inflation stem in cutout of wheel hub.
b. Place spacer and wheel flange on inboard side of wheel hub (opposite of tube inflation stem).
c. Place washer under head of each capscrew, insert capscrew through brake disc, wheel flange and spacer, and start capscrews into wheel hub threads.

CAUTION

Be sure that spacers, wheel flanges and brake disc are seated on flange of wheel hub. Uneven or improper torque of capscrews can cause failure of capscrews or hub threads with resultant wheel failure.

d. Tighten capscrews evenly and torque to the value specified in figure 5-3.
e. Place spacer and wheel flange on outboard side of wheel hub and align valve stem hole in wheel flange.
f. Place washer under head of each capscrew, insert capscrew through wheel flange and spacer. Start capscrews into wheel hub threads.
g. Tighten capscrews evenly and torque to the value specified in figure 5-3.
h. Clean and pack bearing cones with clean aircraft wheel bearing grease. Refer to Section 2 of this manual for grease type.
i. Assemble bearing cones, grease seal felts and retainer into wheel hub.
j. Inflate tire to seat tire beads, then adjust to correct pressure. Refer to chart in Section 1 of this manual for correct tire pressure.

Do not place tape in direct contact with tubular gear spring.



WARNING

Due to aging of the aluminum axle, caused by the heating tape, a new axle will have to be installed.

1. Axle
2. Tubular Gear Strut
3. Electrical Heating Tape
4. Plug

Figure 5-4. Main Wheel Axle Removal

5-17. MAIN WHEEL INSTALLATION.

a. Place wheel assembly on axle.

b. Install axle nut and tighten axle nut until a slight bearing drag is obvious when the wheel is rotated. Back off nut to nearest castellation and install cotter pin.

c. Place brake back plate in position and secure with bolts and washers.

d. Install hub cap. Install speed fairing (if used) as outlined in paragraph 5-12A.

CAUTION

Always check scraper-to-tire clearance after installing speed fairings, whenever a tire has been changed, and whenever scraper adjustment has been disturbed. If the aircraft is flown from surfaces with mud, snow, or ice, the fairing should be checked to make sure there is no accumulation which could prevent normal wheel rotation. Refer to paragraph 5-12A for correct scraper-to-tire clearance.

5-18. MAIN WHEEL AXLE REMOVAL. Refer to figure 5-4.

a. Remove speed fairings, if installed, according to procedures outlined in applicable paragraph of this section.

b. Remove wheels in accordance with procedures outlined in applicable paragraph of this section.

c. Disconnect, drain and cap or plug hydraulic brake line at the wheel brake cylinder.

d. Remove cotter pin, nut and bolt attaching axle to spring strut.

e. Remove brake components and speed fairing plate from axle.

NOTE

Axles are bonded to the struts of tubular gear aircraft with EA9309-25GR adhesive, which is available from the Cessna Service Parts Center. The bond is too strong to allow the axle to be removed without first weakening the bond strength. The only methods of weakening the bond are with heat or cryogenic cold; heat being the most practical. A temperature of approximately 500°F is sufficient to weaken the bond so the axle can be removed. This is still a low enough temperature to prevent damage to the tubular strut.

f. Remove axles as follows:

NOTE

Axles should be removed from strut, using electric heating tape, available from most scientific supply companies. One type can be obtained from Curtin Scientific Co., 6550 East 42nd St., P.O. Box 747, Tulsa, Oklahoma 74101. Tape should conform to the following: 192 watts, 24" long, 1" wide, flexible and heavily insulated.

g. Wrap heating tape around axle from base head to outer end of axle and tie it on with string provided with the tape, as shown in the figure.

CAUTION

Do not place tape in direct contact with tubular gear spring.

h. Plug electric tape into 110 volt wall socket and heat for 20 to 30 minutes.

i. Unplug tape and remove from axle. Remove

axle by striking axle base head with a few sharp blows.

j. Clean any old adhesive off landing gear spring with a wire brush. Brush strokes should run lengthwise along the spring. After old adhesive has been removed, wipe with clean rag saturated with acetone or alcohol. Immediately wipe dry with a clean, lint free cloth.

WARNING

Due to aging of the aluminum axle, caused by the heating tape, a new axle will have to be installed.

5-19. MAIN WHEEL AXLE INSTALLATION.

a. Prior to installing new axle, wipe outer surface of tubular gear and inside of axle with solvent, drying immediately with a clean, lint free cloth.

b. Mix EA9309-25GR adhesive, available from the Cessna Service Parts Center, in accordance with instructions in the package. Spread adhesive thinly and evenly on outer surface of landing gear spring in area that will be covered by axle.

c. Place axle on gear spring and rotate axle to assure even coverage between inner surface of axle and outer surface of spring.

d. Install retaining bolt, washers, nut and cotter pin. Tighten nut securely.

e. Allow 24 hours at 75°F for adhesive to cure, or 30 minutes at 250°F, if heating equipment is available.

f. Install brake components and speed fairing mounting plate to axle.

g. Install wheel on axle in accordance with procedures outlined in applicable paragraph of this section.

h. Connect hydraulic brake line to wheel brake cylinder.

i. Fill and bleed hydraulic brake system in accordance with applicable paragraph in this section.

j. Install speed fairings, if used, in accordance with applicable paragraph in this section.

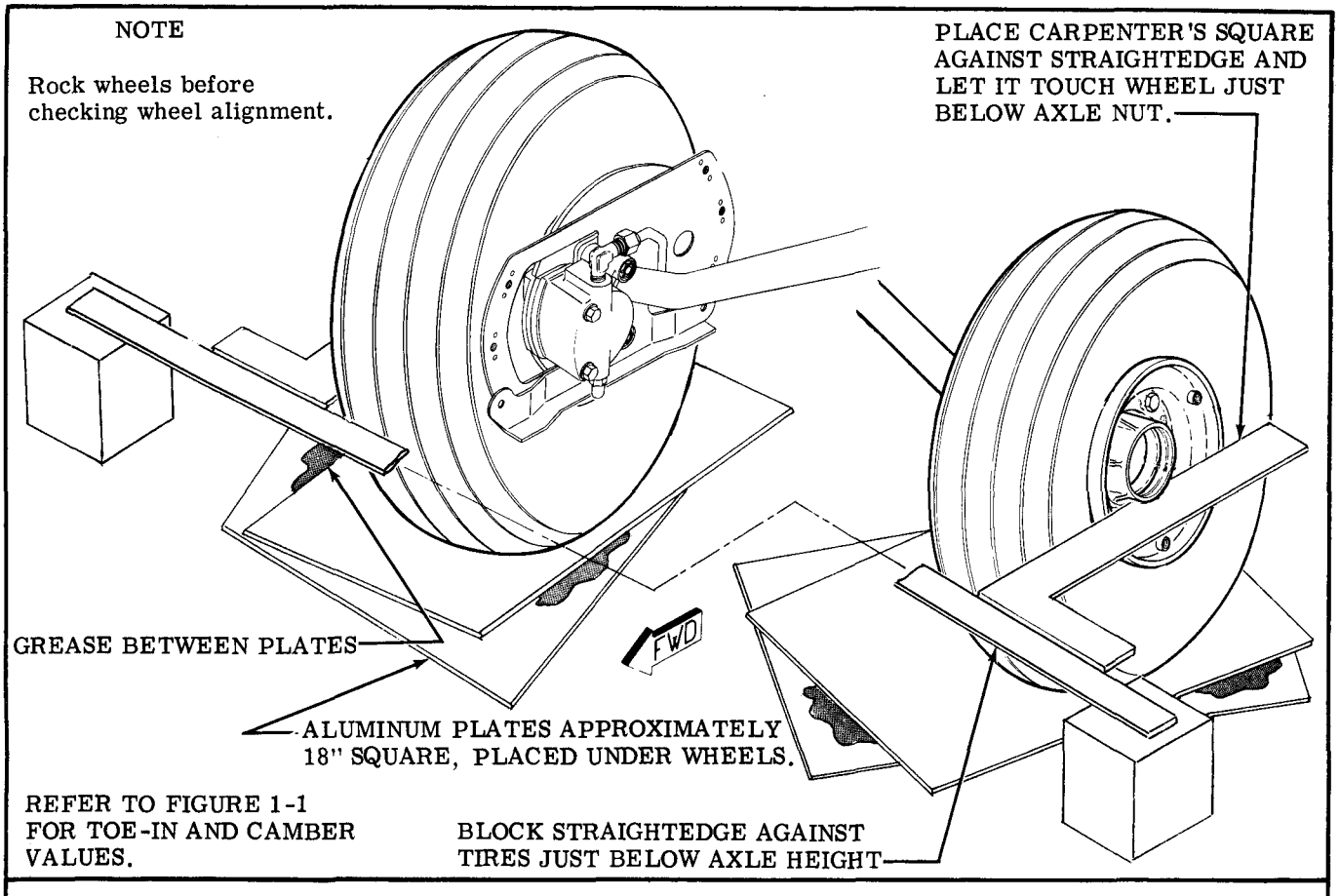
5-20. MAIN WHEEL ALIGNMENT. Refer to the table in figure 1-1 for information.

5-21. WHEEL BALANCING. Since uneven tire wear is usually the cause of wheel unbalance, replacing the tire will probably correct this condition. Tire and tube manufacturing tolerances permit a specified amount of static unbalance. The light-weight point of the tire is marked with a red dot on the tire sidewall and the heavy-weight point of the tube is marked with a contrasting color line (usually near the inflation valve stem). When installing a new tire, place these marks adjacent to each other. If a wheel shows evidence of unbalance during service, it may be statically balanced. Wheel balancing equipment is available from the Cessna Service Parts Center.

5-22. NOSE GEAR.

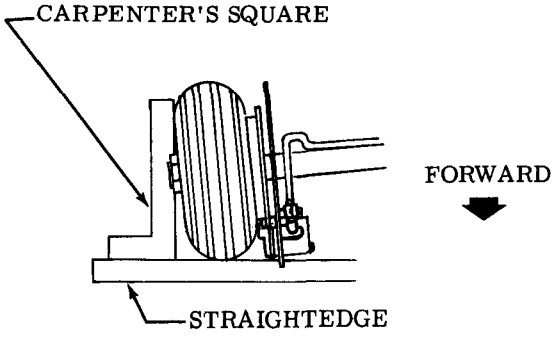
5-23. DESCRIPTION. A steerable nose wheel, mounted in a fork, attached to an air/oil (oleo) shock strut, make up the nose gear. The shock strut is secured to the tubular engine mount. Nose wheel steering is accomplished by two spring-loaded push-pull tubes linking the nose gear steering collar to the rudder pedal bars. A hydraulic fluid-filled shimmy dampener is provided to minimize nose wheel shimmy. A nose wheel speed fairing may be installed on some aircraft.

SHOP NOTES:



TOP VIEW OF TOE-IN CHECK

Measure toe-in at edges of wheel flange. Difference in measurements is toe-in for one wheel. (half of total toe-in.)



FRONT VIEW OF CAMBER CHECK

Measure camber by reading protractor level held vertically against outboard flanges of wheel.

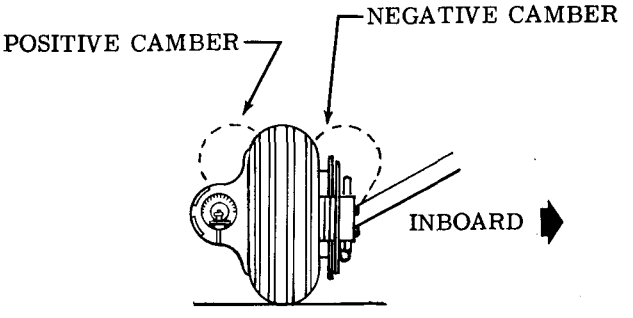


Figure 5-5. Main Wheel Alignment

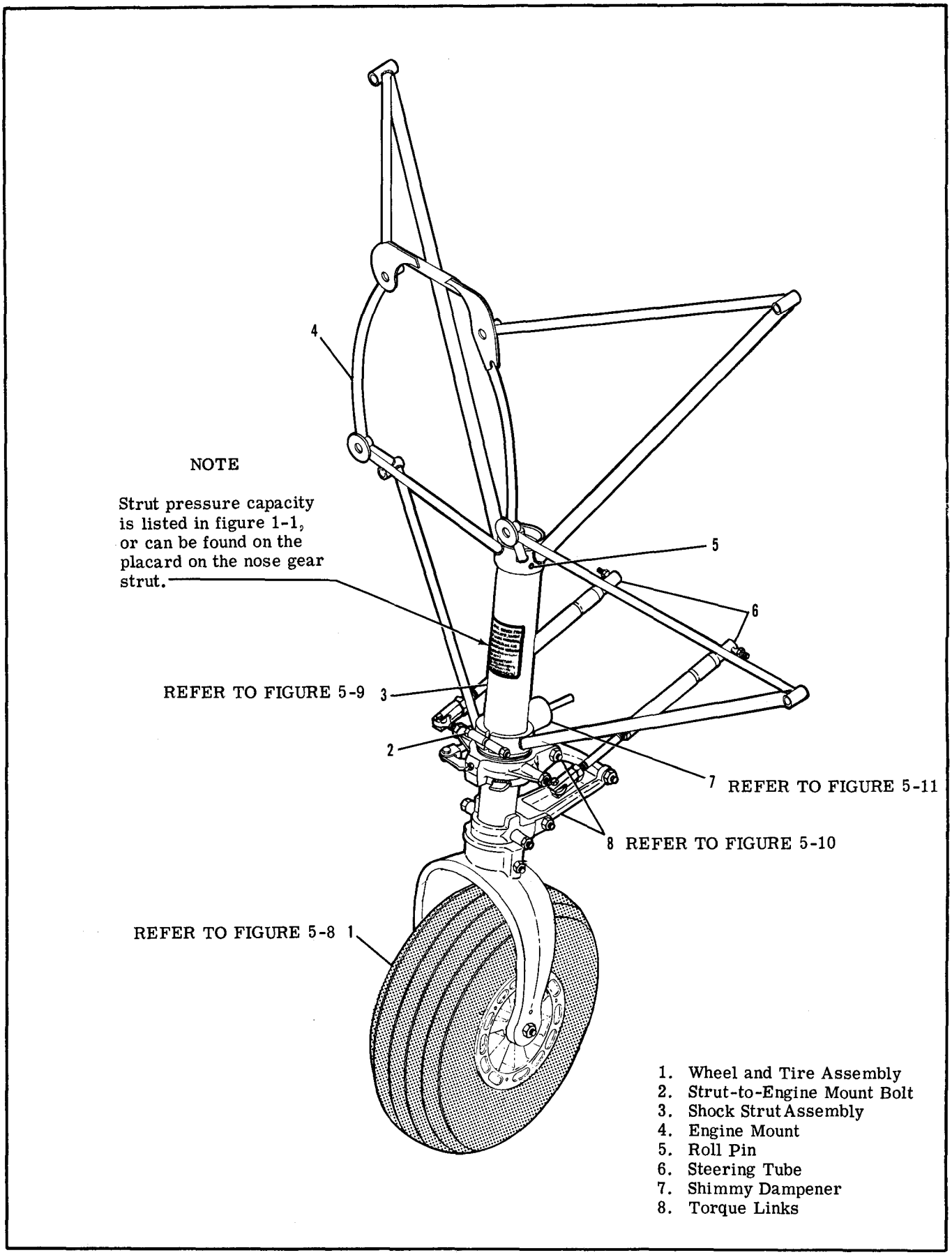


Figure 5-6. Nose Gear Installation

5-24. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
NOSE WHEEL SHIMMY.	Nose strut attaching bolts loose.	Tighten nose strut attaching bolts.
	Loose or worn nose wheel steering linkage.	Tighten. Replace defective parts with new parts.
	Nose wheel out of balance.	Refer to paragraph 5-34.
	Wheel bearings too loose.	Adjust properly.
	Defective shimmy dampener.	Repair, or install new dampener.
	Shimmy dampener fluid low.	Service in accordance with Section 2.
	Loose torque links.	Add shims, or install new parts as required.
NOSE STRUT DOES NOT HOLD AIR PRESSURE.	Defective or loose air filler valve.	Check gasket and tighten loose valve. Install new valve if defective.
	Defective strut seals.	Install new seals.
HYDRAULIC FLUID LEAKAGE FROM NOSE STRUT.	Defective strut seals.	Install new seals.

5-25. NOSE GEAR REMOVAL. (Refer to figure 5-6.)

a. Remove engine cowling for access.

b. Weight or tie down tail of aircraft to raise nose wheel off the floor.

c. Disconnect nose wheel steering tubes from nose gear steering collar.

d. Remove screws attaching hose clamps to strut.

e. Remove air filler valve core and deflate strut completely, and telescope strut to its shortest length.

WARNING

Be sure strut is deflated completely before removing bolt or roll pin at top of strut.

f. Remove roll pin at top of strut, and remove bolt which clamps strut to lower part of engine mount.

g. Pull the strut assembly down out of engine mount fitting.

5-26. NOSE GEAR INSTALLATION. (Refer to figure 5-6.)

a. Reverse the steps outlined in paragraph 5-25 to install the nose gear.

NOTE

Always install roll pin before clamping strut into lower portion of engine mount to prevent misalignment. Torque clamp bolt in lower portion of engine mount fitting to 120±20 lb-in.

5-27. NOSE WHEEL SPEED FAIRING REMOVAL.

a. Weight or tie down tail of aircraft to raise nose wheel off floor.

b. Remove nose wheel axle stud.

c. Remove bolt securing cover plate and fairing to strut; remove cover plate.

WARNING

Do not remove bolt attaching tow bar spacers, unless strut has been completely deflated.

d. Slide speed fairing up and remove nose wheel. Loosen scraper if necessary.

e. Rotate speed fairing 90 degrees and work fairing down over the fork to remove.

5-28. NOSE WHEEL SPEED FAIRING INSTALLATION.

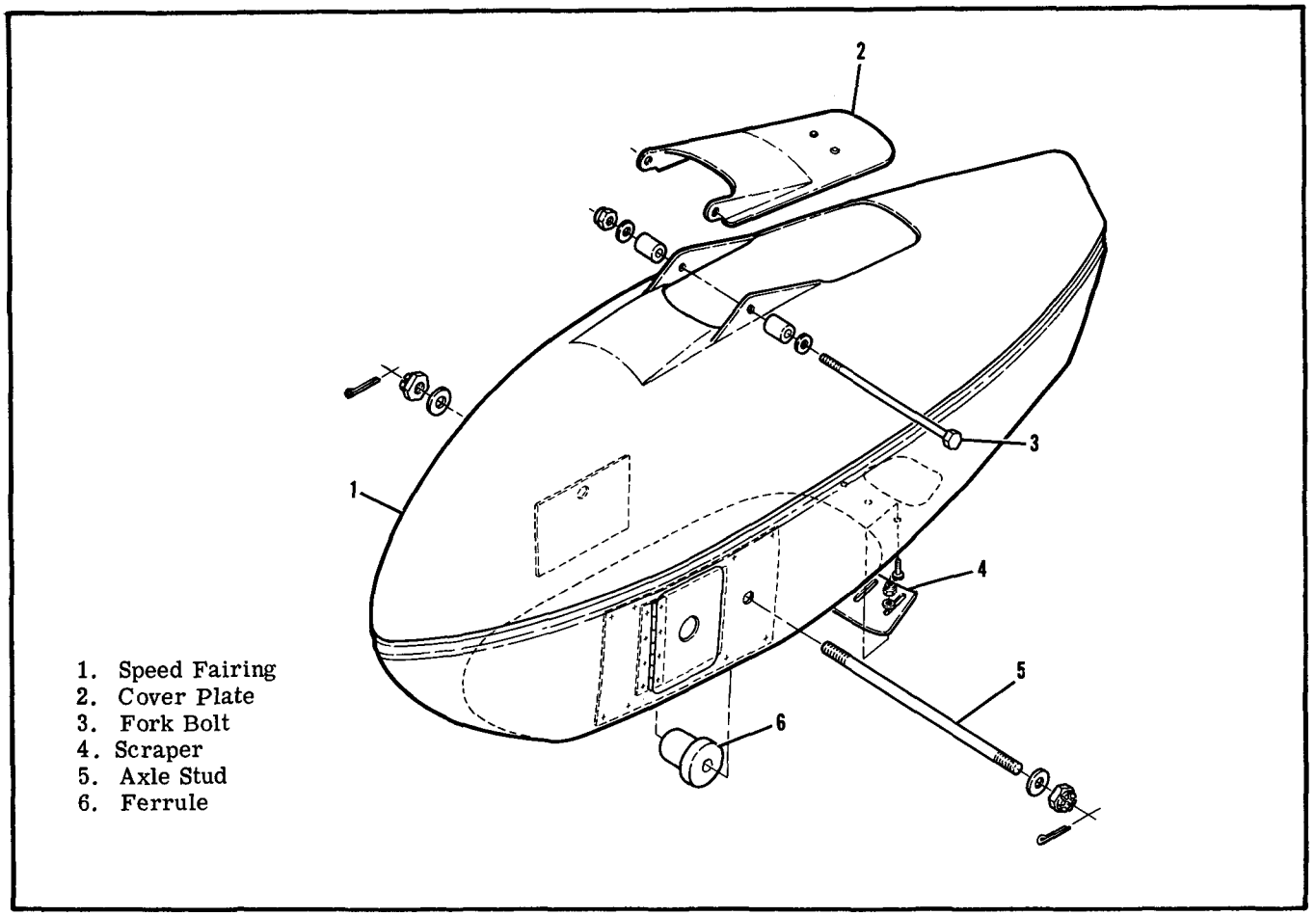
a. Rotate speed fairing 90° and work fairing up over the fork; rotate fairing to correct position.

b. Slide fairing up and install nose wheel; install axle stud.

c. Tighten axle stud until a slight bearing drag is obvious when the wheel is rotated. Back off nut to the nearest castellation, and install cotter pins.

d. If shock strut was deflated, service after installation has been completed. Refer to servicing instructions in Section 2.

e. Adjust wheel scraper clearance in accordance with the following caution.



1. Speed Fairing
2. Cover Plate
3. Fork Bolt
4. Scraper
5. Axle Stud
6. Ferrule

Figure 5-7. Nose Wheel Speed Fairing

CAUTION

Always check scraper clearance after installing speed fairing, whenever a tire has been changed, and whenever scraper adjustment has been disturbed. Set clearance between tire and scraper for a minimum of 0.25-inch to a maximum of 0.38-inch. Elongated holes in the scraper are provided for adjustment. If the aircraft is flown from surfaces with mud, snow, or ice, the speed fairings should be checked to make sure there is no accumulation which could prevent normal wheel rotation. Wipe fuel and oil from speed fairing to prevent staining and deterioration of the fairing.

5-29. NOSE WHEEL REMOVAL.

a. Weight or tie down tail of aircraft to raise the nose wheel off the floor.

b. Remove nose wheel axle stud.

c. Pull nose wheel assembly from fork and remove axle tube from nose wheel. Loosen wheel scraper if necessary, if wheel is equipped with a speed fairing.

5-30. NOSE WHEEL DISASSEMBLY. (Refer to figure 5-8.)

a. Completely deflate tire and tube and break loose tire beads. Extreme care must be exercised to prevent tire tool damage when removing tire from wheel halves (6).

WARNING

Serious injury can result from attempting to separate wheel halves with tire and tube inflated.

b. Remove nuts (4) and washers (5).

c. Remove thru-bolts (8) and washers (5).

d. Separate and remove wheel halves (6) from tire and tube.

e. Remove retaining rings (1), grease seal retainer (2), felt grease seal (3), grease retainer (2) and bearing cone (9) from both wheel halves (6).

NOTE

Bearing cups (races) (7) are a press fit in wheel half (6) and should not be removed unless a new part is to be installed. To remove bearing cups, heat wheel half in boiling water for 30 minutes, or in an oven, not to exceed 121°C (250°F). Using an arbor press, if available, press out bearing cup and press in new bearing cup while wheel half is still hot.

5-31. NOSE WHEEL INSPECTION AND REPAIR.

a. Clean all metal parts and felt grease seals in Stoddard solvent or equivalent, and dry thoroughly.

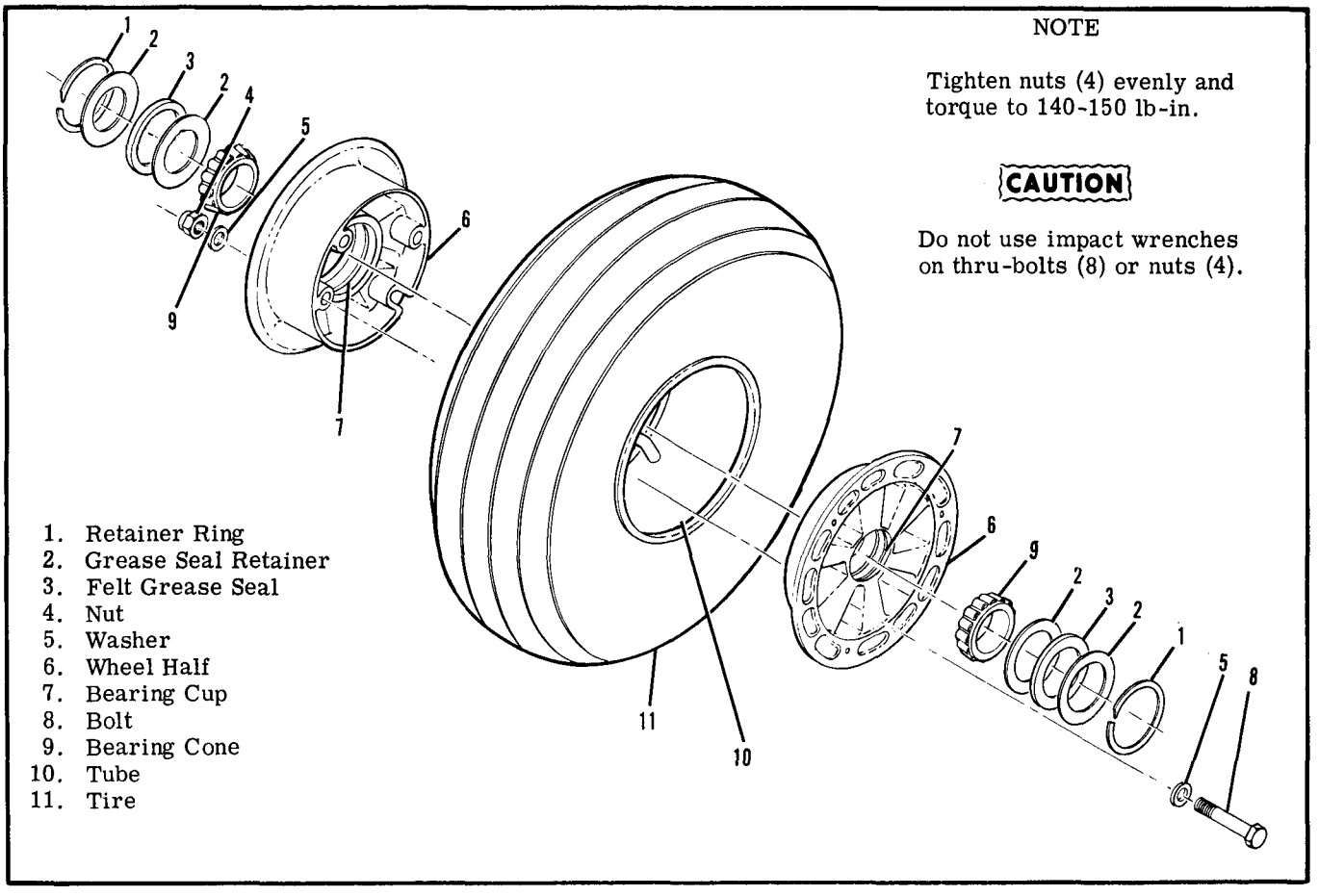


Figure 5-8. Nose Wheel and Tire

NOTE

A soft bristle brush may be used to remove hardened grease, dust or dirt.

b. Inspect wheel halves (6) for cracks or damage.
c. Inspect bearing cones (9), cups (7), retaining rings (1) and seals (2) and (3), for wear or damage.
d. Inspect thru-bolts (8) and nuts (4) for cracks in threads or cracks in radius under bolt head.
e. Replace cracked or damaged wheel half (6).
f. Replace damaged retaining rings (1) and seals (2) and (3).
g. Replace worn or damaged bearing cups (7) and cones (9).
h. Replace any worn or cracked thru-bolts (8) or nuts (4).
i. Remove any corrosion or small nicks.
j. Repair reworked areas of wheel by cleaning thoroughly, then applying one coat of clear lacquer paint.
k. Pack bearings with grease specified in Section 2.

5-32. NOSE WHEEL REASSEMBLY. (Refer to figure 5-8.)
a. Assemble bearing cone (9), grease seal retainer (2), felt grease seal (3), grease seal retainer (2) and retaining ring (1) into both wheel halves (6).
b. Insert tube in tire, aligning index marks on tire and tube.
c. Place wheel half (6) into tire and tube (side opposite valve stem), aligning base of valve stem in valve slot. With washer (5) under head of thru-bolt (8), insert bolt through wheel half (6).
d. Place wheel half (6) into other side of tire and tube, aligning valve stem in valve slot.
e. Install washers (5) and nuts (4) on thru-bolts (8) and pre-torque to 10-50 lb-in.

CAUTION

Uneven or improper torque of the nuts can cause failure of the bolts with resultant wheel failure.

f. Prior to torquing nuts (4), inflate tube with approximately 10-15 psi air pressure to seat tire.

CAUTION

Do not use impact wrenches on thru-bolts or nuts.

g. Dry torque all nuts (4) evenly to a torque value of 140-150 lb-in.
h. Inflate tire to correct pressure specified in figure 1-1.

5-33. NOSE WHEEL INSTALLATION.
a. Install axle tube in nose wheel.

b. Install nose wheel assembly in fork and install nose wheel axle stud.
c. Tighten axle stud until a slight bearing drag is obvious when wheel is rotated. Back the nut off to the nearest castellation and insert cotter pin.

CAUTION

On aircraft equipped with speed fairings, always check scraper-to-tire clearance after installing speed fairing, whenever a tire has been changed or whenever scraper adjustment has been disturbed. Set scraper clearance in accordance with instructions outlined in the Caution following paragraph 5-28.

5-34. WHEEL BALANCING. Refer to paragraph 5-21 for instructions.

5-35. NOSE GEAR SHOCK STRUT DISASSEMBLY. (Refer to figure 5-9.)

NOTE

The following procedures apply to the nose gear shock strut after it has been removed from the aircraft, and the speed fairing and nose wheel have been removed. In many cases, separation of the upper and lower strut will permit inspection and parts installation without removal or complete disassembly of the strut.

WARNING

Be sure strut is completely deflated before removing lock ring in lower end of upper strut, or disconnecting torque links.

a. Remove shimmy dampener.
b. Remove torque links. Note position of washers, shims and spacers.
c. Remove lock ring from groove inside lower end of upper strut. A small hole is provided at the lock ring groove to facilitate removal of the lock ring (refer to view C-C.)

NOTE

Hydraulic fluid will drain from strut halves as lower strut is pulled from upper strut.

d. Using a straight, sharp pull, separate upper and lower struts. Invert lower strut and drain hydraulic fluid.
e. Remove lock ring and bearing at upper end of lower strut assembly. Note top side of bearing.
f. Slide packing support ring, scraper ring, retaining ring and lock ring from lower strut, noting relative position and top side of each ring; wire or tape together, if desired.
g. Remove O-rings and back-up rings from packing support ring.
h. Remove bolt securing tow bar spacers.

NOTE

Bolt attaching tow bar spacers also holds base plug in place.

i. Remove bolt attaching fork to strut barrel, and remove base plug and metering pin from lower strut. Remove O-rings and metering pin from base plug.
j. Pull orifice piston support from upper strut. Remove O-ring and filler valve.
k. Remove retaining ring securing steering collar to upper strut. Slide steering collar, shims and washer from upper strut. Note number of shims between washer and steering collar.

5-36. NOSE GEAR SHOCK STRUT INSPECTION AND REPAIR. (Refer to figure 5-9.)
a. Thoroughly clean all parts in cleaning solvent and inspect them carefully.
b. All worn or defective parts and all O-rings and back-up rings must be replaced with new parts.
c. Sharp metal edges should be smoothed with No. 400 emery paper, then cleaned with solvent.

5-37. NOSE GEAR SHOCK STRUT REASSEMBLY. (Refer to figure 5-9.)

NOTE

Used sparingly, Dow Corning Compound DC4 is recommended for O-ring lubrication. All other internal parts should be liberally coated with hydraulic fluid during reassembly.

a. Install washer (1) and shim/s (2), if installed.
b. Lubricate needle bearings in steering collar (4) as shown in Section 2, and install collar and retaining ring (5).
c. Check steering collar for snug fit against washer. Shims of variable thickness are available from the Cessna Service Parts Center to provide a snug fit for collar against washer.

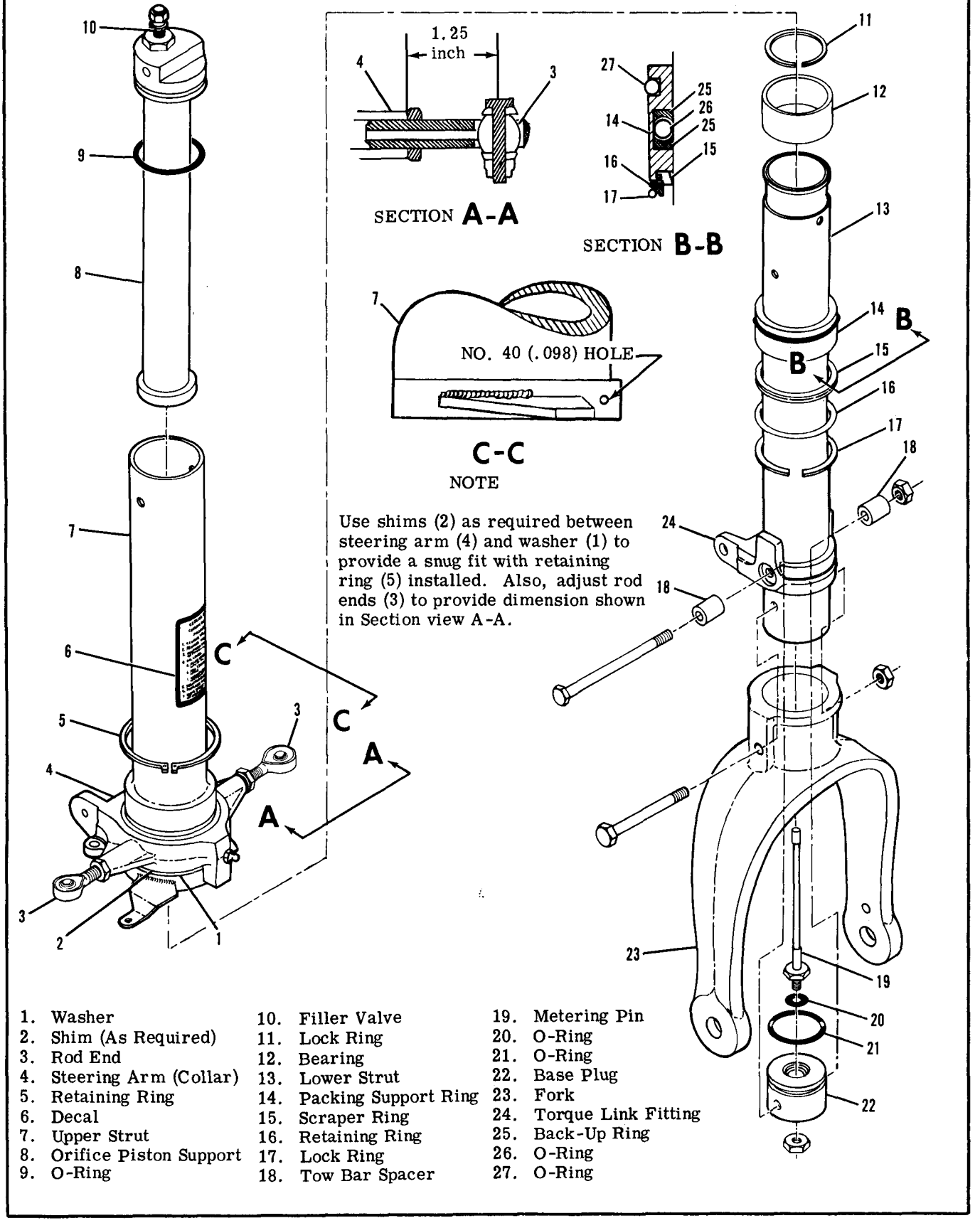
NOTE

If shims are required, remove retaining ring and steering collar and add shims as necessary to provide a snug fit with steering collar retaining ring installed.

Part numbers of shims available and their thicknesses are as follows:

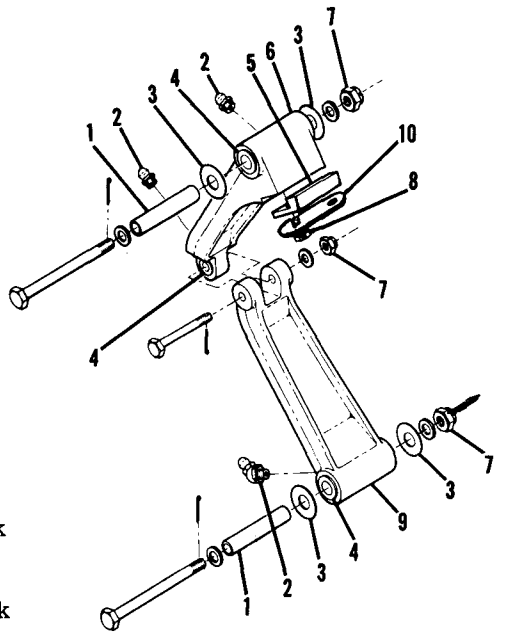
1243030-5	0.006 inch
1243030-6	0.012 inch
1243030-7	0.020 inch

d. Install rod ends (3) in steering collar (4), and adjust rod ends to dimension specified in Section view A-A in Figure 5-9.
e. Install O-ring (9) and filler valve (10) in orifice piston support (8) and install orifice piston support in upper strut (7).
f. Install O-ring (21) and metering pin assembly in lower strut (13); install bolt attaching fork (23) to lower strut.
g. Align base plug (22) holes with holes in lower strut/fork (13) and (23) assembly; install bolt and tow



1. Washer
2. Shim (As Required)
3. Rod End
4. Steering Arm (Collar)
5. Retaining Ring
6. Decal
7. Upper Strut
8. Orifice Piston Support
9. O-Ring
10. Filler Valve
11. Lock Ring
12. Bearing
13. Lower Strut
14. Packing Support Ring
15. Scraper Ring
16. Retaining Ring
17. Lock Ring
18. Tow Bar Spacer
19. Metering Pin
20. O-Ring
21. O-Ring
22. Base Plug
23. Fork
24. Torque Link Fitting
25. Back-Up Ring
26. O-Ring
27. O-Ring

Figure 5-9. Nose Gear Shock Strut



1. Spacer
2. Grease Fitting
3. Shim
4. Bushing
5. Stop Lug
6. Upper Torque Link
7. Nut
8. Bolt
9. Lower Torque Link
10. Safety Lug

NOTE

Tighten bolts (8) to 20-25 pound-inches, then safety the bolts by bending tips of safety lug (10).

Tighten nuts (7) snugly, then tighten to align next castellation with cotter pin hole.

Shims (3) are used as required to remove any looseness to assist in preventing nose wheel shimmy.

Figure 5-10. Torque Links

bar spacers (18). Install and tighten nut.

NOTE

If base plug (22) is to be replaced, new part will need to be line-drilled to accept AN5 bolt.

h. Install lock ring (17), retaining ring (16) and scraper ring (15) on lower strut, making sure they are installed in same positions as they were removed.
i. Install O-rings (26) and (27) and back-up rings in packing support ring (14); slide packing support ring over lower strut (13).
j. Install bearing (12) and lock ring (11) at upper end of lower strut assembly. Note top side of bearing.
k. Install upper strut assembly over lower strut assembly.
l. Install lock ring (17) in groove in lower end of upper strut. Position lock ring so that one of its ends covers the small access hole in the lock ring groove at the bottom of the upper strut. (Refer to Section C-C in figure 5-9.)
m. Install torque links, positioning washers, shims and spacers exactly as removed.
n. Install shimmy dampener.
o. After shock strut assembly is complete, install strut on aircraft as outlined in paragraph 5-26.
p. After strut is installed in aircraft, fill and inflate shock strut in accordance with procedures outlined in Section 2.

5-38. TORQUE LINKS.

5-39. DESCRIPTION. Torque links keep the lower strut aligned with the nose gear steering system, but permit shock strut action.

5-40. REMOVAL.

WARNING

Completely deflate strut before removing torque links.

a. Completely deflate shock strut.
b. Disconnect upper and lower attaching bolts, spacers, shims and nuts, and remove torque links.

5-41. INSPECTION. Torque link bushings should not be removed except for replacement of parts; replace if excessively worn.

5-42. INSTALLATION. (Refer to figure 5-10.)

NOTE

If bolts (8), safety lug (10) and stop lug (5) were removed, upon installation, tighten bolts (8) to 20-25 lb-in, then safety the bolts by bending tips of safety lug (10).

a. With shock strut completely deflated, install upper and lower torque link assemblies.
b. Install bolt attaching upper and lower assemblies.
c. Tighten nuts (7) snugly, then tighten to align next castellation with cotter pin hole in bolt.
d. Check upper torque link (6) and lower torque link (9) for looseness. If looseness is apparent, remove nuts (7) and bolts and install shims (3) as necessary to take up any looseness. This will assist in preventing nose wheel shimmy.
e. Retighten nuts (7) snugly, then tighten to align next castellation with cotter pin hole in bolt; install cotter pin.
f. Fill and inflate shock strut in accordance with

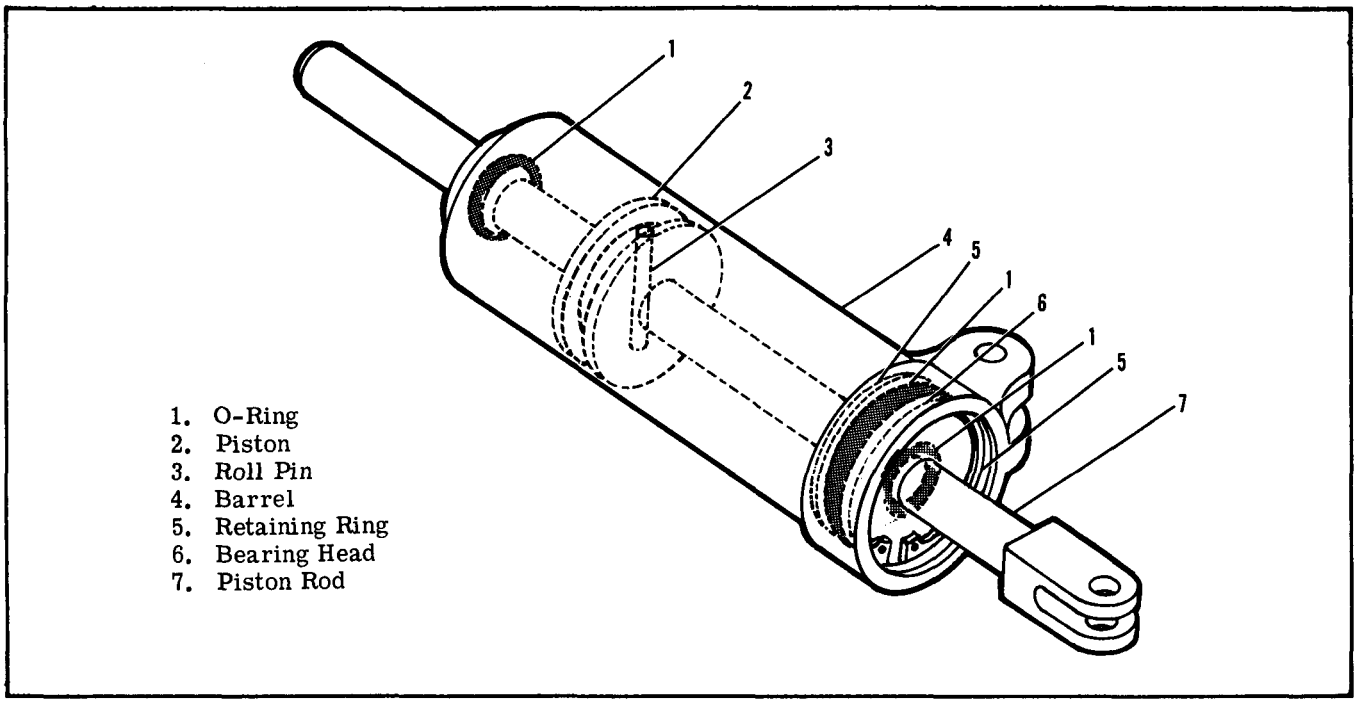


Figure 5-11. Nose Gear Shimmy Dampener

procedures outlined in Section 2.

5-43. SHIMMY DAMPENER.

5-44. DESCRIPTION. The shimmy dampener provided for the nose gear offers resistance to shimmy by forcing hydraulic fluid through small orifices in a piston. The dampener piston shaft is secured to a stationary part and the housing is secured to the nose wheel steering collar which moves as the nose wheel is turned right or left, causing relative motion between the dampener shaft and housing.

5-45. REMOVAL.

a. Remove cotter pin, nut, washers and bolt attaching piston rod clevis.

b. Remove cotter pin, nut, spacer and bolt attaching housing to steering collar.

5-46. DISASSEMBLY AND REASSEMBLY. (Refer to figure 5-11.)

a. Refer to the phantom view of the internal parts of the dampener for disassembly and assembly.

b. When reassembling dampener, install all new O-rings. Lubricate all parts with clean hydraulic fluid.

c. When dampener is completely assembled, service in accordance with procedures outlined in Section 2.

5-46A. INSTALLATION.

a. Attach dampener piston rod clevis to structure with bolt, washers (as required), nut and cotter pin.

b. Attach body of shimmy dampener to steering collar with bolt, spacer, washers, nut and cotter pin.

5-47. NOSE WHEEL STEERING SYSTEM.

5-48. DESCRIPTION. Nose wheel steering is accomplished through use of the rudder pedals. Spring-loaded steering rod assemblies connect the nose gear steering collar to arms on the rudder bars. Steering is afforded up to approximately 10 degrees each side of neutral, after which brakes may be used to gain a maximum deflection of 30 degrees right or left of center. A flexible boot seals the fuselage entrance of the steering rod assembly.

5-49. NOSE WHEEL STEERING ROD ASSEMBLY.

5-50. DESCRIPTION. The steering rods are connected by a clevis to the rod ends extending from the nose gear steering collar, and to an arm on the rudder pedal crossbars.

5-51. NOSE WHEEL STEERING ADJUSTMENT. Since the nose wheel steering system and the rudder system are interconnected, adjustment to one system might affect the other system. Refer to Section 10 of this manual for instructions for rigging the nose wheel steering and the rudder system.

5-52. BRAKE SYSTEM.

5-53. DESCRIPTION. The hydraulic brake system is comprised of two master cylinders, located immediately forward of the pilot's rudder pedals, brake lines and hose connecting each master cylinder to its wheel brake cylinder, and the single-disc, floating cylinder-type brake assembly, located at each main landing gear wheel.

5-54. TROUBLE SHOOTING.

TROUBLE	PROBABLE CAUSE	REMEDY
DRAGGING BRAKES.	Brake pedal binding.	Check and adjust properly.
	Parking brake linkage holding brake pedal down.	Check and adjust properly.
	Worn or broken piston return spring (in master cylinder.)	Repair, or install new cylinder.
	Insufficient clearance at Lock-O-Seal or incorrect adjustment of cylinder overall length.	Adjust as outlined in paragraph 5-60.
	Restriction in hydraulic lines or restrictions in compensating port in brake master cylinder.	Drain brake line and clear the inside of the brake line with filtered compressed air. If cleaning the lines fails to give satisfactory results, the master cylinder may be faulty and should be repaired.
	Worn, scored or warped brake disc.	Install new disc and brake linings.
	Damaged or accumulated dirt restricting free movement of wheel brake parts.	Clean and repair or install new parts as necessary.
BRAKES FAIL TO OPERATE.	Leak in system.	If brake master cylinders or wheel cylinder assemblies are leaking, repair, or install new parts.
	Air in system.	Bleed system.
	Lack of fluid in master cylinders.	Fill and bleed system.
	Defective master cylinder.	Repair, or install new parts.

SHOP NOTES:

5-55. BRAKE MASTER CYLINDERS.

5-56. DESCRIPTION. The brake master cylinders, located immediately forward of the pilot's rudder pedals, are actuated by applying pressure at the top of the rudder pedals. A small reservoir is incorporated into each master cylinder for the fluid supply. When dual brakes are installed, mechanical linkage permits the copilot pedals to operate the master cylinders.

5-57. BRAKE MASTER CYLINDER REMOVAL.

a. Remove bleeder screw at wheel brake assembly and drain hydraulic fluid from brake cylinders.
b. Remove front seats and rudder bar shield for access to the brake master cylinders.
c. Disconnect parking brake linkage and disconnect brake master cylinders from rudder pedals.
d. Disconnect brake master cylinders at lower attach points.
e. Disconnect hydraulic hose from master cylinders and remove cylinders.
f. Plug or cap hydraulic fittings, hose and lines to prevent entry of foreign matter.

5-58. BRAKE MASTER CYLINDER DISASSEMBLY. (Refer to figure 5-12.)

a. Unscrew clevis (1) and jamb nut (2).
b. Remove screw (18), spring (21), lock plate (22), washer (19) and spacer (20).
c. Remove filler plug (17).
d. Remove setscrew (5).
e. Unscrew cover (4) and remove up over piston rod (3).
f. Remove piston rod (3) and compensating sleeve (16).
g. Slide sleeve (16) up over rod (3).
h. Unscrew nut (12) from threads of piston rod (3).
i. Remove spring (13) and O-ring (9) from piston (14).
j. Remove Lock-O-Seal (15).

5-59. BRAKE MASTER CYLINDER INSPECTION AND REPAIR. Repair is limited to installation of new parts, cleaning and adjusting. (Refer to reassembly paragraph for adjustment.) Use clean hydraulic fluid (MIL-H-5606) as a lubricant during reassembly of the cylinders. Inspect Lock-O-Seal (Parker Seal Co. p/n 800-001-6) and replace if damaged. Replace all O-rings. Filler plug (17) must be vented so pressure cannot build up in the reservoir during brake operation. Remove plug and drill 1/16-inch hole, 30° from vertical, if plug is not vented.

5-60. BRAKE MASTER CYLINDER REASSEMBLY. (Refer to figure 5-12.)

a. Install Lock-O-Seal (15) at bottom of piston rod (3).
b. Install O-ring (9) in groove in piston (14); insert piston spring (13) into piston, and slide assembly up on bottom threaded portion of piston rod (3).
c. Run nut (12) up threads to spring (13). Tighten nut (12) enough to obtain 0.040±0.005-inch clearance between top of piston and bottom of Lock-O-Seal, as shown in the figure.

CAUTION

Do not damage Lock-O-Seal.

d. Install piston return spring (11) into cylinder (10) portion of body (7).
e. Install piston rod (3) end through spring (11).
f. Slide compensating sleeve (16) over rod (3).
g. Install cover (4), lock plate (22), spacer (20), washer (19), spring (21) and screw (18).
h. Install jamb nut (2) and clevis (1).
i. Install filler plug (17), making sure vent hole is open.
j. Install setscrew (5).

5-61. BRAKE MASTER CYLINDER INSTALLATION.

a. Connect hydraulic hose to cylinder.
b. Install cylinder at lower attach point.
c. Connect master cylinder to rudder pedals.
d. Connect parking brake linkage.
e. Install rudder bar shield and install front seats.
f. Fill and bleed brake system in accordance with applicable paragraph in this Section.

5-62. HYDRAULIC BRAKE LINES.

5-63. DESCRIPTION. The brake lines are rigid tubing, except for flexible hose used at the brake master cylinders. A separate line is used to connect each brake master cylinder to its corresponding wheel brake cylinder.

5-64. WHEEL BRAKE ASSEMBLIES.

5-65. DESCRIPTION. (Refer to figure 5-3.) The wheel brake assemblies use a disc which is attached to the main wheel. The assemblies also employ a floating brake assembly.

5-66. WHEEL BRAKE REMOVAL. (Refer to figure 5-3.) Wheel brake assemblies can be removed by disconnecting the brake line (drain hydraulic brake fluid when disconnecting line) and removing the brake back plate. The brake disc is removed after the wheel is removed and disassembled. To remove the torque plate, remove wheel and axle. Refer to figure 5-3 for brake disassembly.

5-67. WHEEL BRAKE INSPECTION AND REPAIR.

a. Clean all parts except brake linings and O-rings in dry cleaning solvent and dry thoroughly.
b. Install all new O-rings. If O-ring reuse is necessary, wipe with a clean cloth saturated in hydraulic fluid and inspect for damage.

NOTE

Thorough cleaning is important. Dirt and chips are the greatest single cause of malfunctions in the hydraulic brake system.

c. Check brake lining for deterioration and maximum permissible wear. (Refer to applicable paragraph for maximum wear limit.)

d. Inspect brake cylinder bore for scoring. A scored cylinder will leak or cause rapid O-ring wear. Install a new brake cylinder if the bore is scored.
e. If the anchor bolts on the brake assembly are nicked or gouged, they shall be sanded smooth to prevent binding with the pressure plate or torque plate. When new anchor bolts are to be installed, press out old bolts and install new bolts with a soft mallet.
f. Inspect wheel brake disc for a minimum thickness of 0.190-inch. If brake disc is below minimum thickness, install a new part.

5-68. WHEEL BRAKE REASSEMBLY. (Refer to figure 5-3.)

NOTE

Lubricate parts with clean hydraulic fluid during brake reassembly.

a. Refer to figure 5-3 for assembly procedures.

5-69. WHEEL BRAKE INSTALLATION.
a. Place brake assembly in position with pressure plate in place.
b. Install back plate.

NOTE

If torque plate was removed, install as the axle is installed or install on axle. If the brake disc was removed from the wheel, install as wheel is assembled.

5-70. CHECKING BRAKE LINING WEAR. New brake lining should be installed when the existing lining has worn to a minimum thickness of 3/32-inch. A 3/32-inch thick strip of material held adjacent to each lining can be used to determine amount of wear. The shank end of a drill bit of the correct size can also be used to determine wear of brake linings.

5-71. BRAKE LINING INSTALLATION. (Refer to figure 5-3.)
a. Remove bolts securing back plate, and remove back plate.
b. Pull brake cylinder out of torque plate and slide pressure plate off anchor bolts.
c. Place back plate on a table with lining side down flat. Center a 9/64-inch (or slightly smaller) punch in the rolled rivet, and hit the punch sharply with a hammer. Punch out all rivets securing the linings to the back plate and pressure plate in the same manner.

NOTE

A rivet setting kit, Part No. R561, is available from the Cessna Service Parts Center. This kit consists of an anvil and punch.

d. Clamp the flat side of the anvil in a vise.
e. Align new lining on back plate and place brake rivet in hole with rivet head in the lining. Place the head against the anvil.
f. Center rivet setting punch on lips of rivet. While holding back plate down firmly against lining, hit punch with hammer to set rivet. Repeat blows on punch until lining is firmly against back plate.
g. Realign the lining on the back plate and install and set rivets in the remaining holes.
h. Install a new lining on pressure plate in the same manner.
i. Position pressure plate on anchor bolts and place cylinder in position so that anchor bolts slide into the torque plate.
j. Install back plate with bolts and washers.

5-72. BRAKE SYSTEM BLEEDING.

NOTE

Bleeding with a clean hydraulic pressure source connected to the wheel cylinder bleeder is recommended.

a. Remove brake master cylinder filler plug and screw flexible hose with appropriate fitting into the filler hole at top of the master cylinder.
b. Immerse opposite end of flexible hose in a container with enough hydraulic fluid to cover the end of the hose.
c. Connect a clean hydraulic pressure source, such as a hydraulic hand pump or Hydro-Fill unit, to the bleeder valve in the wheel cylinder.
d. As fluid is pumped into the system, observe the immersed end of the hose at the master brake cylinder for evidence of air bubbles being forced from the brake system. When bubbling has ceased, remove bleeder source from wheel cylinder, and tighten the bleeder valve.

NOTE

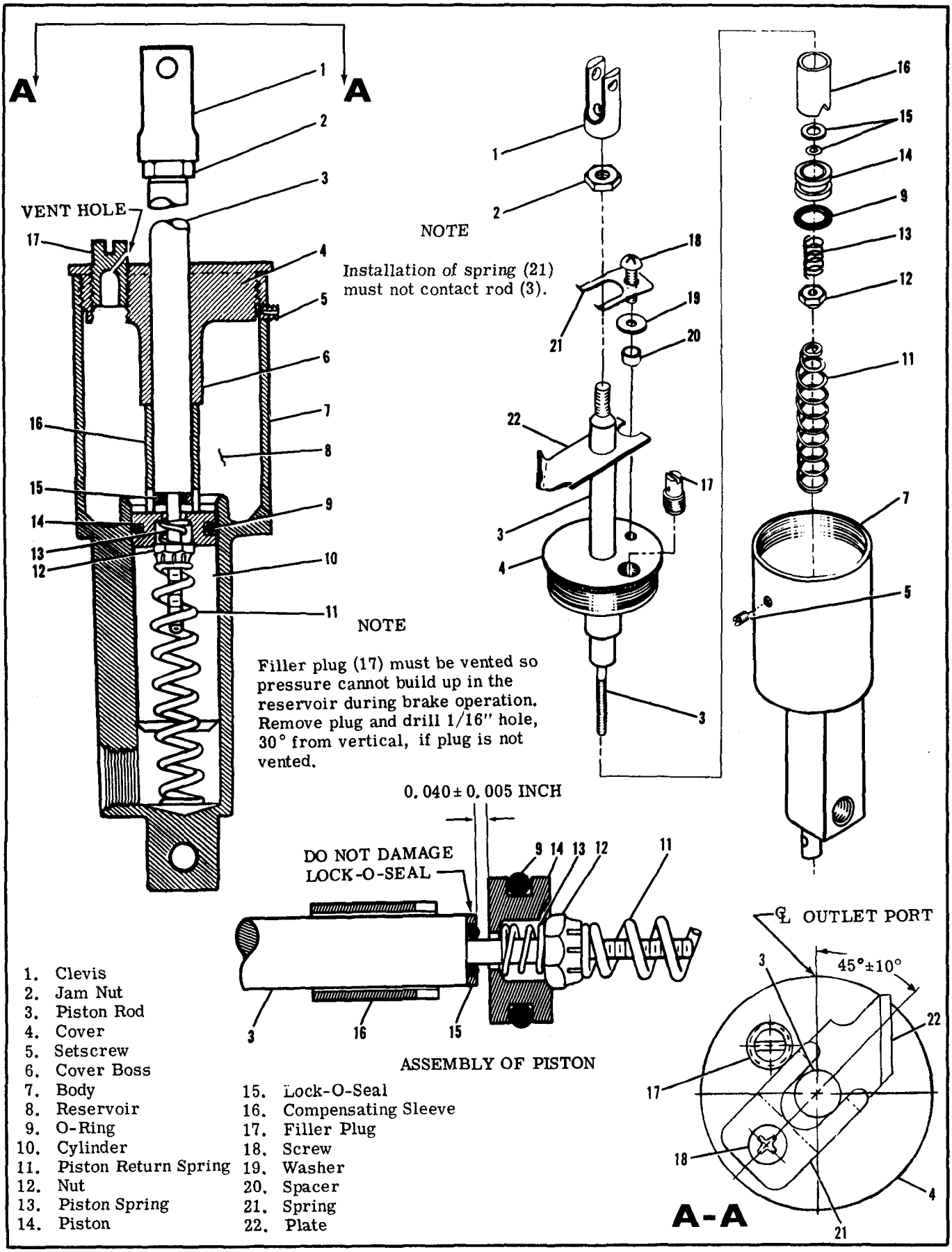
Ensure that the free end of the hose from the master cylinder remains immersed during the entire bleeding process.

5-73. PARKING BRAKE SYSTEM. (Refer to figure 5-13.)

5-74. DESCRIPTION. The parking brake system consists of a control knob on the instrument panel which is connected to linkage at the brake master cylinders. At the brake master cylinders, the control operates locking plates which trap pressure in the system after the master cylinder piston rods have been depressed by toe operation of the rudder pedals. To release the parking brake, depress the pedals and push the control knob full in.

5-75. REMOVAL AND INSTALLATION. (Refer to figure 5-13.) Refer to the figure for relative locations of system components. The illustration may be used as a guide during removal and installation of components.

5-76. INSPECTION AND REPAIR OF SYSTEM COMPONENTS. Inspect lines for leaks, cracks, dents, chafing, proper radius, security, corrosion, deterioration, obstruction and foreign matter. Check brake master cylinders, and repair as outlined in applicable paragraph in this Section. Check parking brake control for operation and release. Replace worn or damaged parts.



1. Clevis
2. Jam Nut
3. Piston Rod
4. Cover
5. Setscrew
6. Cover Boss
7. Body
8. Reservoir
9. O-Ring
10. Cylinder
11. Piston Return Spring
12. Nut
13. Piston Spring
14. Piston
15. Lock-O-Seal
16. Compensating Sleeve
17. Filler Plug
18. Screw
19. Washer
20. Spacer
21. Spring
22. Plate

Figure 5-12. Brake Master Cylinder

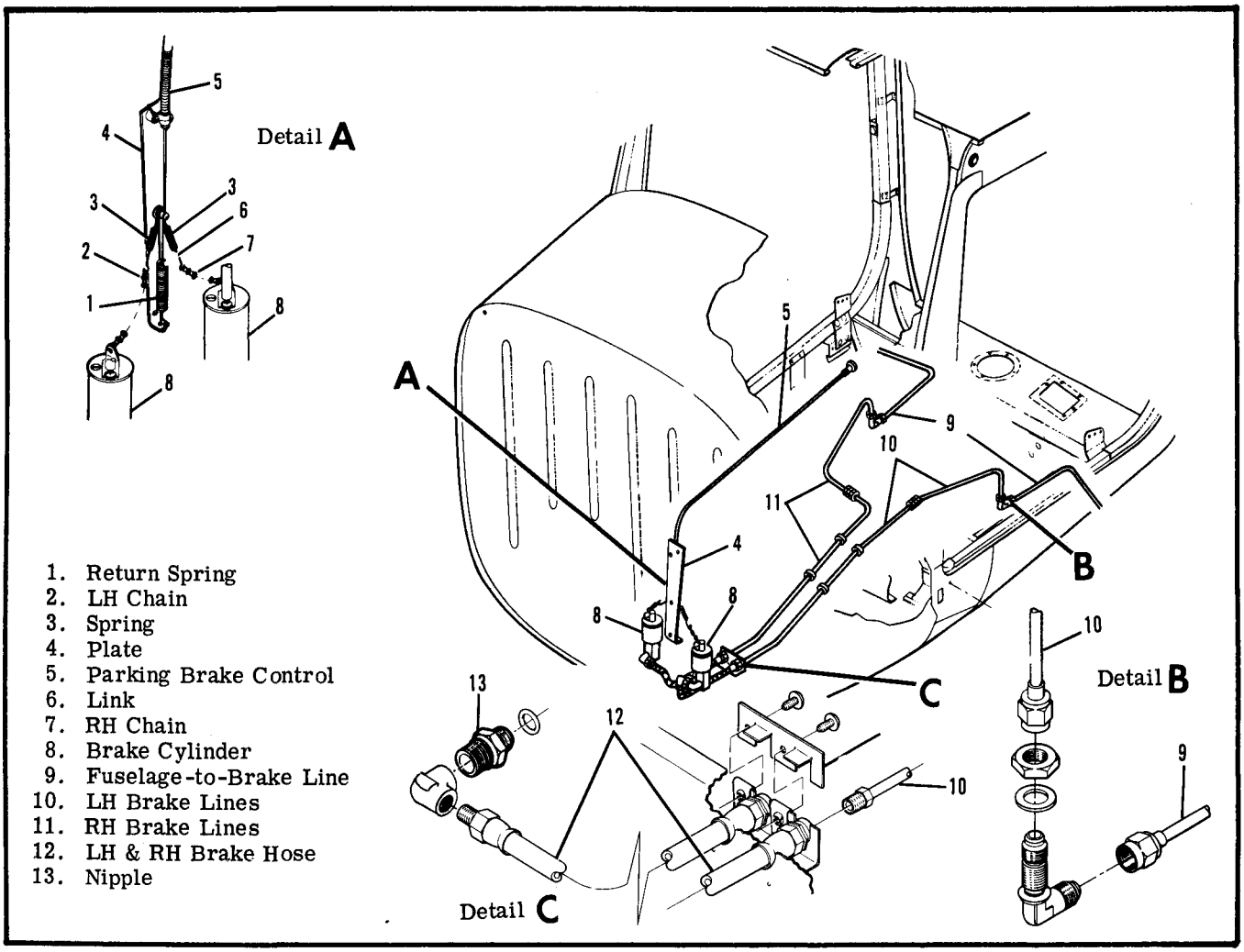


Figure 5-13. Brake Systems

SHOP NOTES: