LANDING GEAR HYDRAULIC ACTUATOR REBUILD INSTRUCTIONS

(P/N 632-0195-006)

Applicability: Hydraulic Actuators on All Retractable Gear (RG) Glasair I, II, II-S, Super II-S and III Aircraft

Description: The hydraulic actuators used in the Glasair series of aircraft are all very similar in design and appearance. They do however, have differing length and diameter hydraulic actuator rods, which require different hydraulic actuator bushings, different size Poly-Pak seals, and different rod seal retaining washers.
For simplicity, these instructions have been written to describe a generic actuator unit using only the name of the part. Cut-away actuator illustrations (see Figures 1, 2 and 3) have been supplied to give the specific part numbers for the components of various hydraulic actuators supplied with Glasair kits. To find the correct seal for use in a specific location on your aircraft, simply refer to the correct illustration for your type of kit: Figure 1 for Glasair I, II, II-S and Super II-S, or Figure 2 for Glasair III.

Step 1: Hydraulic Actuator Disassembly

A) Disconnect the hydraulic lines from the hydraulic actuator. Plug the ends of the hydraulic lines to prevent loss of fluid and to prevent the entry of foreign material while the lines are disconnected. Remove the hydraulic actuator from the aircraft.

B) Push the piston rod into the hydraulic actuator cylinder body as far as possible so that the piston bottoms in the hydraulic actuator. (Be sure to point the actuator port into a cup or jar to catch the fluid.)

Warning Be very careful not to have the actuator fitting pointed toward your face or eyes when depressing the piston.

C) Remove the set screw from each hydraulic actuator cylinder cap and unscrew the cylinder cap from the cylinder body. It should be possible to unthread the cylinder cap from the cylinder body by simply gripping the cap with your hands and turning it counterclockwise.

Note The cylinder caps and cylinder bodies are manufactured in matched sets; they are not interchangeable, so do not mix them up.

D) With the piston still retracted all the way into the cylinder body, clamp the protruding end of the piston rod (the end opposite the piston) in a padded vise. If you are careful when clamping, you won't have to remove the rod end bearings from the piston rods; this will save you the trouble of readjusting the positions of the rod ends on the piston rod when reassembling.

Note Later style piston rods have been manufactured with flats near the exposed end to allow use of a wrench to be used to hold the piston rod when removing the piston rod retaining nut. These flats are also used to adjust the distance the rod threads into the rod end bearing during gear retraction rigging.

Caution Clamp only the part of the piston rod shaft that protrudes from the end of the cylinder when the piston rod is completely retracted into the cylinder. Do not clamp the rod end bearings or any other part of the piston rod. If the piston rod surface is marred or damaged on any portion that contacts the Poly-Pak seal in the cylinder bushing, leaks may result.

E) Remove the existing piston retaining nut, washer (P/N AN960-D416), and Stat-O-Seal (P/N 620- 0101-250) from the piston rod. Discard the removed piston retaining nut and the Stat-O-Seal since these are replaced during the rebuild. Save and reuse the existing washer.

Note If further disassembly is required, remove the rod end bearing and jam nut from the end of the actuator piston rod and **push** the piston rod and piston out of the cylinder body. Count and record the number of turns when removing the rod end bearings so they can be reinstalled in their original positions.

Caution When removing or installing the piston, always do so from the cylinder cap end of the cylinder body. Pulling or pushing the piston past the sharp edges of the port in the bushing end of the cylinder body can damage the "O" ring seals, resulting in internal leaks and loss of hydraulic pressure.

F) Use a pair of snap-ring pliers to remove the snap ring from the bushing end of the actuating cylinder. Use a wooden dowel (or the equivalent) to push the cylinder bushing and rod seal washer out of the cylinder body.

Note Early model G-I hydraulic actuator cylinders were supplied with an aluminum rod seal washer. We now use only a stainless steel rod seal washer for increased strength. The aluminum washers may become distorted in service, causing the bushing seal to leak. If the rod seal washer removed from the cylinder is aluminum, it must be replaced with the stronger stainless washer. Contact the Stoddard-Hamilton Order Desk to order the replacement rod seal washer. See the figures at the end of these instructions to find the correct part number for ordering the washer.

Step 2: Inspection and Cleaning

Clean all the hydraulic actuator components to remove any foreign material that might be present in the system. Inspect the inside of the actuator cylinder body for scratches and damage.

Note Minor scratches can be removed from the inside cylinder walls using a small automotive brake hone. Keep the hone well lubricated, preferably with a steady stream of solvent. When all visible scratches have been removed by the hone, wrap a piece of Scotch-Brite pad around the hone and use this to put a fine polish finish on the inside of the cylinder.

Step 3: Hydraulic Actuator Reassembly

Note Always lubricate the "O" rings, back-up rings and seals when mating them to metal components of the hydraulic actuators. Use the same hydraulic fluid as used in the landing gear hydraulic system for lubrication of the actuator parts and seals.

A) Install the new back-up ring (P/N 620-8212-300) and "O" ring (P/N 620-2126-747) onto the cylinder bushing, as shown in Figures 1 and 2. Install the back-up ring on the outboard side of the bushing (the side closest to the snap ring), as shown.

Note Always install the back-up rings with their concave sides toward the "O" ring

Note The standard length of the cylinder bushing is .890". A shortened length, .690" (extended stoke) version of the cylinder bushing (P/N 341-5623-005) is available for use on the main gear hydraulic actuators of G-I, G- II, G-II-S and Super II-S aircraft. The installation of this shortened bushing and its sealing "O" rings and Poly-Pak seals is the same as with the standard length bushing.

B) Insert the new Poly-Pak seal into the cylinder bushing, as shown, with the open side of the seal facing toward the cylinder bushing.

C) Slide the rod seal washer onto the piston rod and then slide the piston rod into the cylinder bushing from the Poly-Pak side, being careful not to displace or damage the Poly-Pak seal in the bushing.

D) Press the piston rod assembly (with rod seal washer and cylinder bushing) into the cylinder body until the flange on the bushing bottoms out on the step in the cylinder body. Press the stainless steel rod seal washer against the face of the cylinder bushing and install the snap ring into the groove in the cylinder body.

E) Push the piston rod into the cylinder body to the fully retracted position of the actuator. Clamp the protruding end of the actuator piston rod in a padded vise.

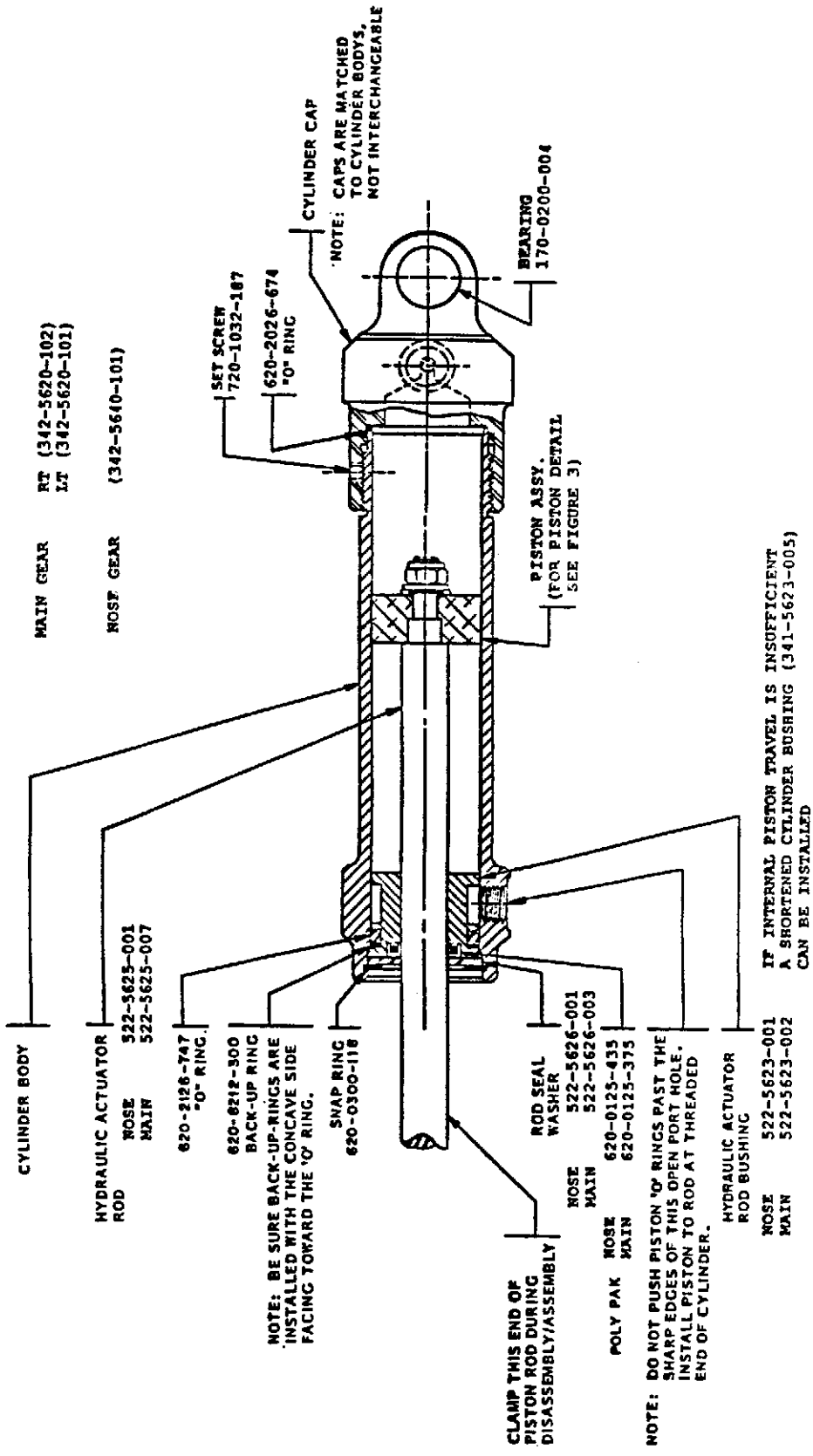

Figure 1: Glasair I, II, II-S and Super II-S Landing Gear Hydraulic Actuator

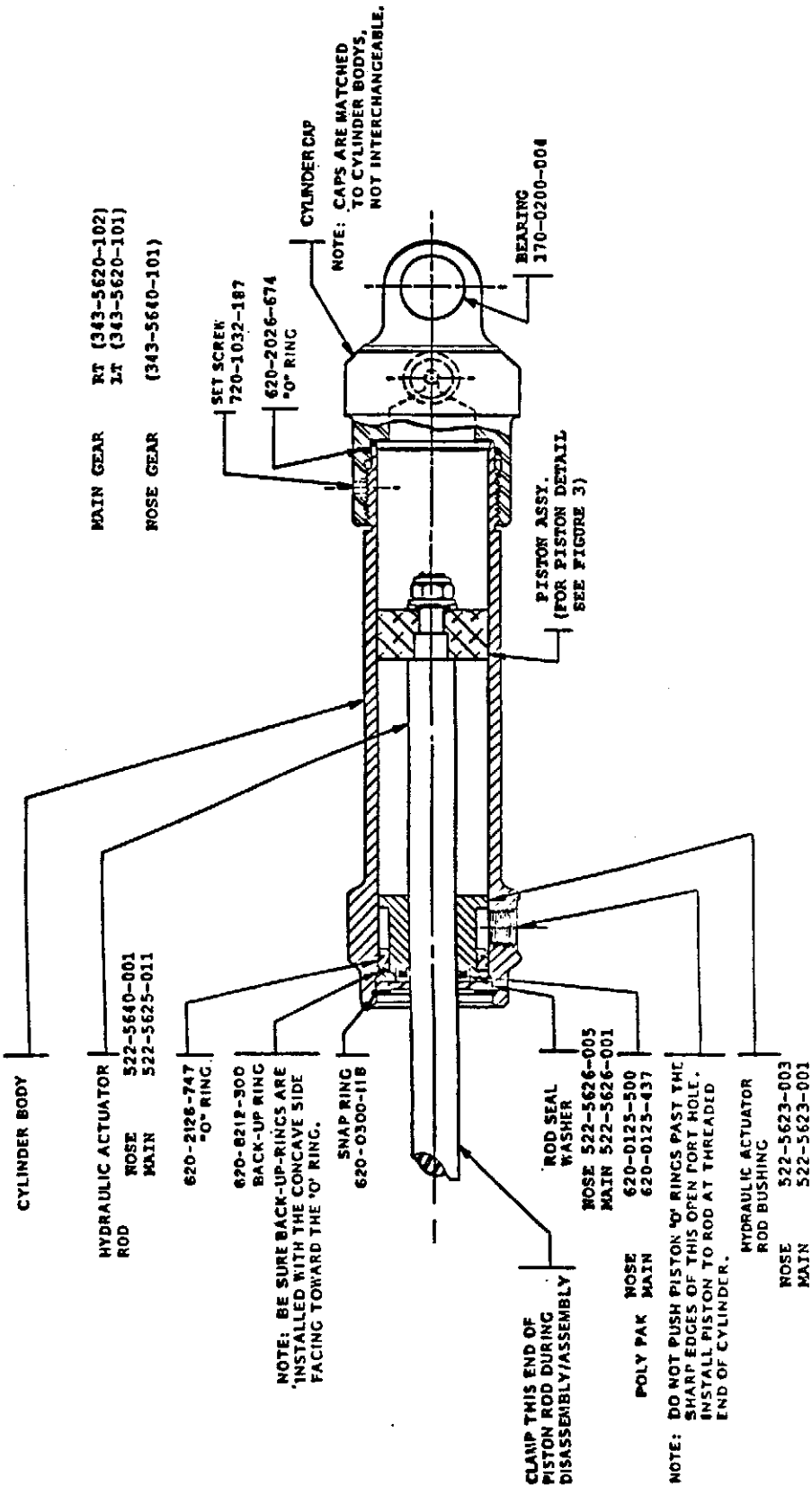

Figure 2: Glasair III Landing Gear Hydraulic Actuator

F) There have been some variations in the hydraulic cylinder pistons supplied over the years:

1) Original-Style Piston Assembly: The most common style of piston is style in Figure 3. This style piston (1/2" thick) does not have an internal "O" ring and has an external "O" ring groove sized for an "O" ring plus two back-up rings.

Install the "O" ring (P/N 620-2126-747) and two back-up rings (P/N 620-8212-300) back-up rings onto the piston, as shown in Figure 3, making sure that the concave sides of the back-up rings are toward the "O" ring.

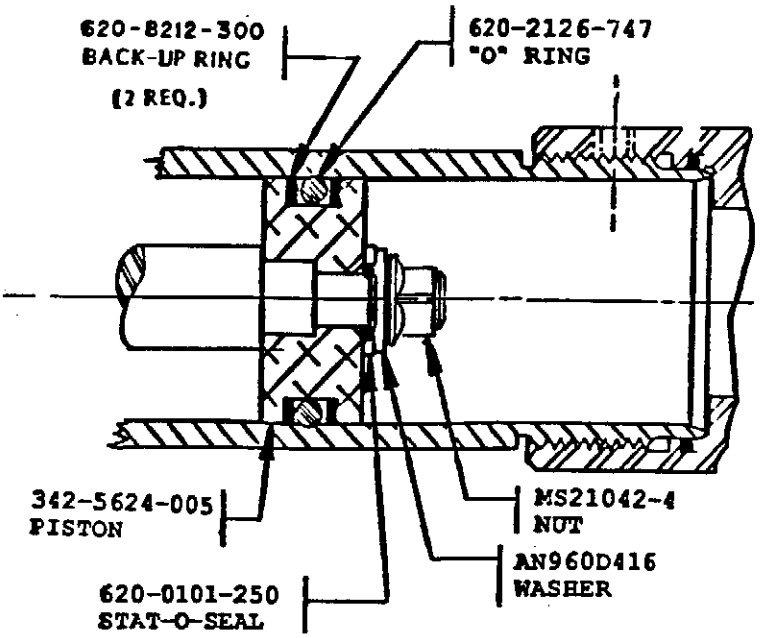

Figure 3: Original-Style Piston Assembly

2) Early Custom-Style Piston Assemblies: Early custom-run Glasair I, II and III pistons were manufactured on a special-order basis with different overall thicknesses (.72") than the original piston. However, these pistons also use "O" rings (P/N 620-2126-747) and two back-up rings (P/N 620-8212-300) and are installed in the same manner as the more common original piston style discussed above.

3) Current-Style Piston Assembly: Hydraulic cylinders shipped since December 1993 feature with an improved piston and seals, as shown in Figure 4. This piston (also 1/2" thick) comes with an external seal groove sized for a "Quad Seal" with back-up rings. Also, an internal "O" ring (P/N MS28775-012) has been added to improve the seal of the piston to actuator rod.

The Quad Seal (P/N 620-4212-212) has a wear life and sealing capabilities superior to those of the "O" ring (P/N 620-2126-747) it replaces.

Note The width of the assembled Quad Seal and back-up rings may not fully equal the width of the exterior piston seal groove. This is normal and will not effect normal hydraulic actuator operation.

Note For a short period of time in 1994 the current-style piston was supplied with a pre-installed, flat band-type seal call a "Cap-Seal." Due to reports of intermitant pressure bleed past the piston during retraction under certain conditions, it has been replaced with the Quad Seal. If, during disassembly of the hydraulic actuator, an installed Cap-Seal is found, we recommend it replaced with the Quad Seal (P/N 620-4212-212) and back-up rings (P/N 620-8212-212).

Note Only original-style pistons that are 1/2" long can be upgraded to the replacement piston assembly (342-5624-103) with the new Quad Seal and internal "O" ring installation, as shown in Figure 4. The piston upgrade is available from the Stoddard-Hamilton Order Desk. If a modified piston is being used, we recommend upgrading it with the Quad Seal and two bgack-up rings only.

Note The Quad Seal and back-up rings will fit the exterior groove of the original-style pistons. These earlier pistons do not, however, have the machined internal "O" ring groove. Therefore, they must be replaced if the internal "O" ring is desired.

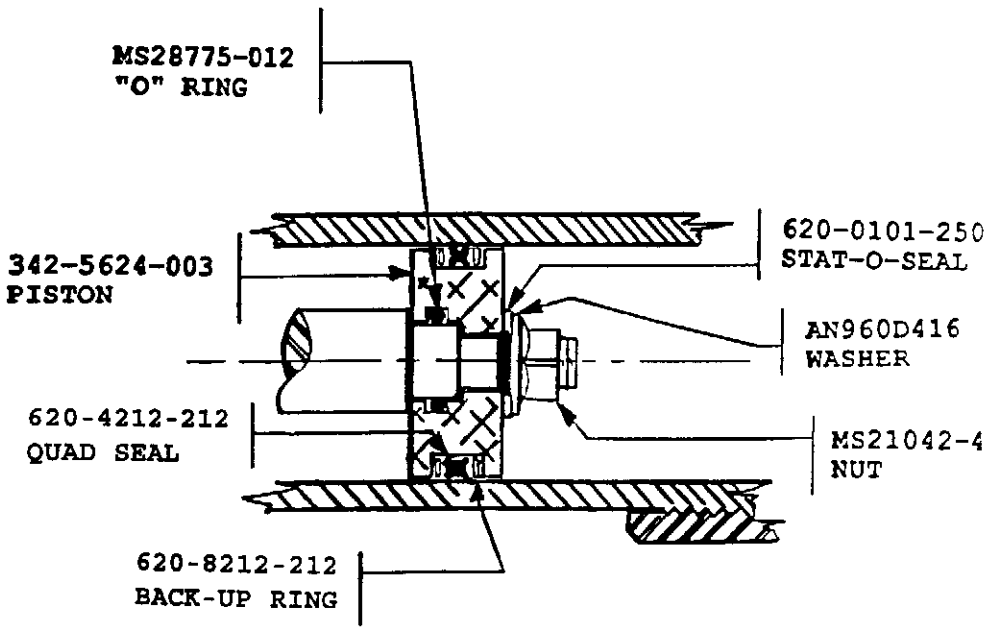

Figure 4: Current-Style Piston Assembly

4) G-III Nose Gear Emergency Extension Hydraulic Actuator Piston Assembly: The "Emergency Gear Extension Retrofit Kit" includes a nose gear hydraulic actuator that uses a Cap-Seal (P/N 620-0212-099), as shown in Figure 5. This band-type piston seal is used in this location because of its long-wearing nature.

Note This Cap-Seal is intended to be used only in this nose gear emergency actuator, as there is fluid on only one side of the piston in this application.

The Cap-Seal unit (P/N 620-0212-099) is a flat, circular seal that is installed over the standard "O" ring (P/N 620-2126-747). No back-up rings are used. The Cap-Seal unit is installed by expanding the seal so that it will fit over the piston. Once the Cap-Seal is in place, it is compressed back to its original diameter. This expanding and compressing is not easily done without special tools, and therefore the Cap-Seal is only available pre-installed on the piston. This piston assembly (with the seals installed) is P/N 342-5624-103.

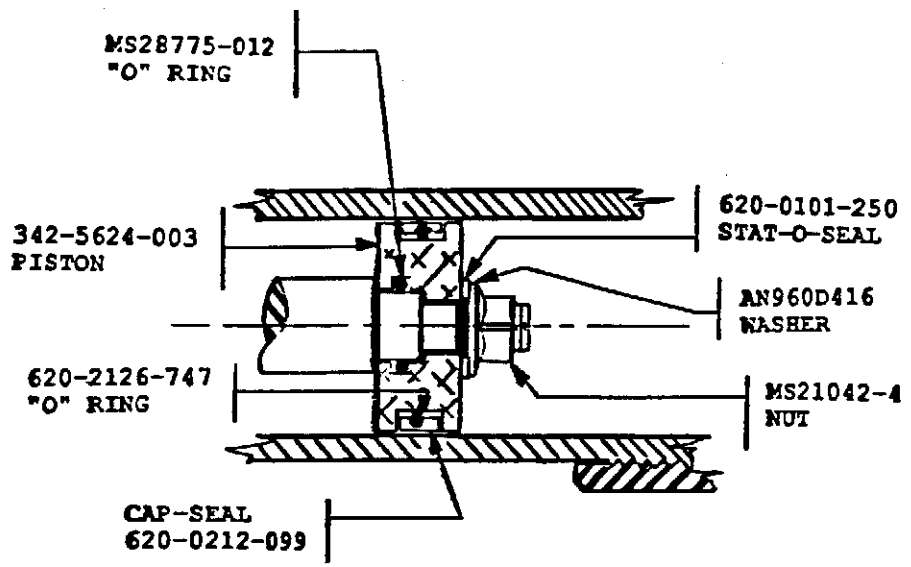

Figure 5: G-III Nose Gear Emergency Extension Hydraulic Actuator Piston Assembly

Step 4: Reinstallation of the Hydraulic Actuators

Jack the airplane up and make sure it is secure on the jacks. Reinstall the actuators in the proper position. Fill all the actuators and lines with the appropriate fluid on the high pressure (gear retract) side by connecting a temporary line and using the actuator like a syringe to pull the fluid in from a container. Fill the pump reservoir. Operate the pump momentarily on the **up** cycle until fluid flows out of the high pressure line into the container, and then reconnect the high pressure line to the actuator. Use the same procedures to fill the lines on the low pressure (gear extension) side. Then, after the reservoir has been replenished, the system can be operated without trapped air in the lines. Cycle the gear two or three times. Make sure the gear is operating correctly during both the extension and retraction cycles and then let the airplane down off the jacks.