

Glasair Service Bulletin 161

Subject: Inspection of RG Gear Oleos for Corrosion

Application: Glasair I and early model Glasair II RGs

Issue: Possible corrosion inside landing gear oleo struts

Compliance Time: At or before the next annual condition inspection

Discussion and Background Information:

A builder/owner of an early model Glasair II RG has reported finding severe corrosion in one of the main landing gear oleos. The aircraft serial number is 1058, the landing gear build number is 403, and the aircraft was placed in use April, 1990. The aircraft has been based in the Houston, Texas area.

The aluminum main gear half-forks on the subject aircraft have a recessed pocket machined in them where they are attached to the chrome plated oleos using four countersunk Phillips head fasteners. The oleo tubes extend slightly past the welded half fork attachment flange and fit into the half-fork machined pockets. The oleo tubes are sealed internally at the bottom with an aluminum plug having an MS28775-222 o-ring and MS28774-222 back up rings. Since the o-ring at the plug had never leaked hydraulic fluid, the owner saw no need to remove the half forks to inspect the bottom of the oleo tube.

Due to landing gear exposure to moisture, water collected in one of the half fork pockets. Without a drain hole present in these half forks, over time the combination of moisture with dissimilar metals (aluminum plug and steel oleo) resulted in severe corrosion of the plug and inside diameter of the oleo. The corrosion moved up the inside diameter of the oleo tube to the level of the o-ring in the plug. The corrosion pattern was consistent with the gear down position (lower portion of the tube immersed in water) and the gear up position (lower surface of the tube wetted while it was horizontal).

Glasair I aircraft have a drain hole in the half-forks. As very early Glasair IIs used some Glasair I landing gear components they may or may not also have drain holes in the half-forks. Glasair drawings (dated October 1989) indicate the internal plug was eliminated and the oleos were welded shut at the bottom. The machined pocket in the half fork was also eliminated. It is unknown how many pre-1990 II RG models with internal oleo strut plugs may be exposed to this corrosion issue, or if drain holes in the half-forks eliminate corrosion on the inside of the oleo struts.



Note: Glasair I owners could be affected by this Service Bulletin if the landing gear oleo struts were damaged and replaced with Glasair II components.

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Required Action:

Confirm which style oleos are in use.

Glasair landing gear drawings also indicate that Glasair I landing gear prior to serial number 071 did not use an internal plug to seal the bottom of the oleo strut.

Glasair I and II landing gear starting with serial number 071 or higher (until approximately 1990) used the internal plug to seal the oleo strut.

In October of 1989, Glasair II landing gear drawings show that the internal plug was eliminated and the oleo tube was capped off at the lower end. Since the drawings were dated prior to production and delivery, *use the above dates only as a general indicator* of what style gear you may possess.

Do not rely on the delivery date of your Glasair Kit as a determining factor for which style oleo struts are on your aircraft. The only reliable method is to disassemble and inspect a strut to determine if an internal plug is present.



WARNING: To avoid injury, you must relieve the landing gear strut of internal pressure before attempting to remove the nose or main gear forks.

At or before the next annual condition inspection, inspect the base of the oleo for evidence of corrosion by removing the half forks. Jack the aircraft so the wheels are free of the ground, and then depress the schrader valve on the side of the gear strut (covering the valve with a rag to avoid getting hydraulic fluid in your eyes) until all pressure is purged.



Note: Use 632-0195-014 ‘Landing Gear Strut Overhaul Instructions’ as a guide for disassembly (attached).

If a plug is present at the bottom of the oleo tube, remove the plug (hydraulic fluid will come out) and inspect the lower 1.5 inches of the oleo bore for corrosion. If no corrosion is present, then the plug can be reinstalled with new o-ring and back up rings. Use a corrosion inhibitor such as a high quality sealed epoxy primer to protect the interior bore where the plug is located. If pitting or corrosion is present, removal of the oleo may be necessary so that something such as Scotch Brite may be used to remove the corrosion. If corrosion pitting is present on the inside of the oleo strut, using the following guideline to determine if the strut can be returned to service or should be replaced:

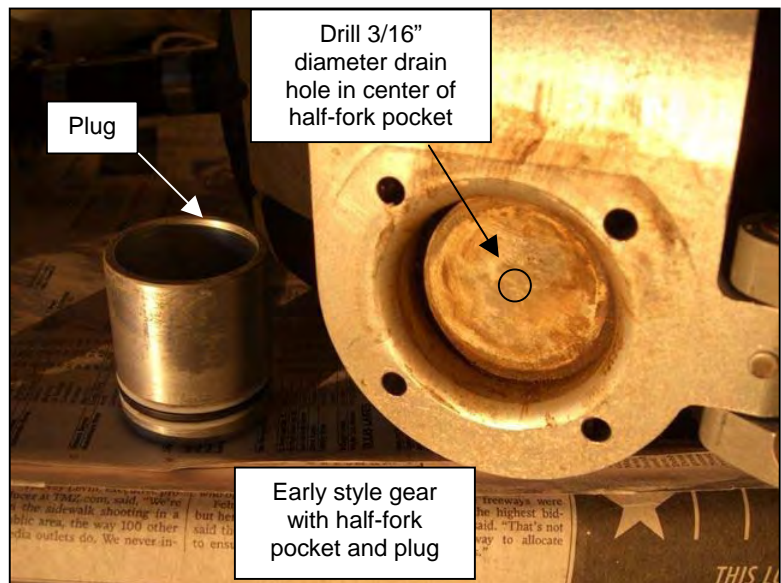
- Maximum allowable depth of pitting: .050”
- Maximum area affected by corrosion pitting up to .050” depth: 40%


As a ground rule, individual corrosion pits not connected together are of less concern than corrosion pits connected together in a continuous line or area. In other words, if corrosion is covering 40% or less of the ID (in the area of the plug), and the pits are .050” deep or less and are not connected together forming a continuous line or area of more than 1/2” in length or diameter, the strut may be re-used. All traces of corrosion must be completely removed and the affected area thoroughly cleaned and sealed with an epoxy primer prior to re-assembly.

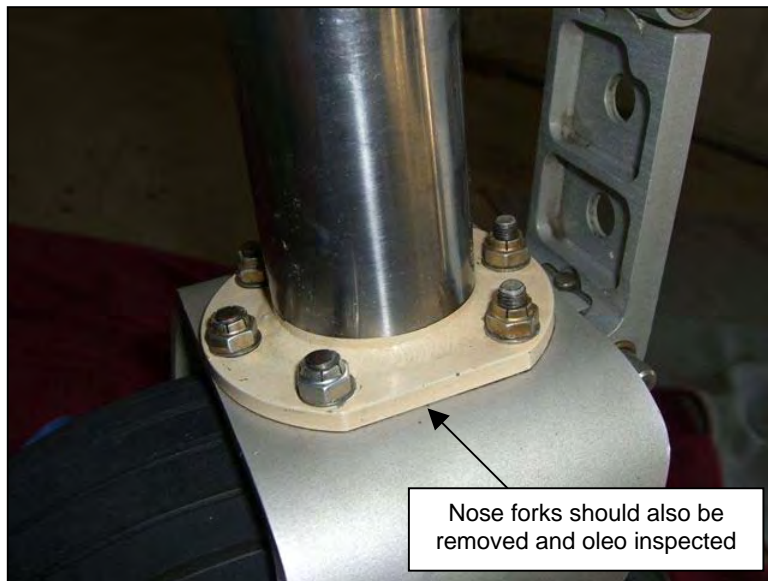
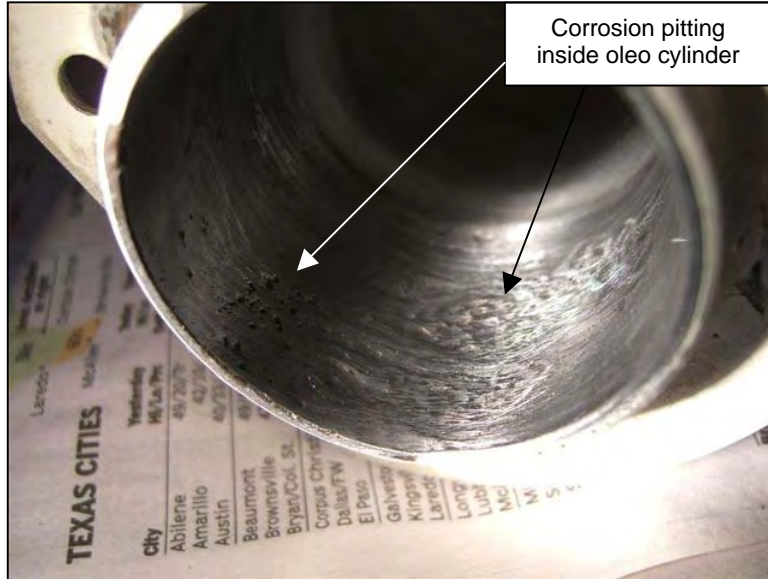
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Prior to reassembly of the half-fork having a machined pocket, drill a 3/16" diameter drain hole aligned with the center of the oleo strut so that moisture cannot get trapped inside.

Glasair I and IIs using plugs in the bottom of the oleos should periodically be inspected for corrosion at the bottom of the oleos and corrective action taken as needed.



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NDI LANDING GEAR STRUT OVERHAUL INSTRUCTIONS

PARTS LIST: PLEASE REFER TO THE PACKING LIST

SCOPE: THESE INSTRUCTIONS DESCRIBE THE STEPS REQUIRED FOR DISASSEMBLY, OVERHAUL, AND ASSEMBLY OF GLASAIR II/III MAIN AND NOSE NDI LANDING GEAR STRUTS.

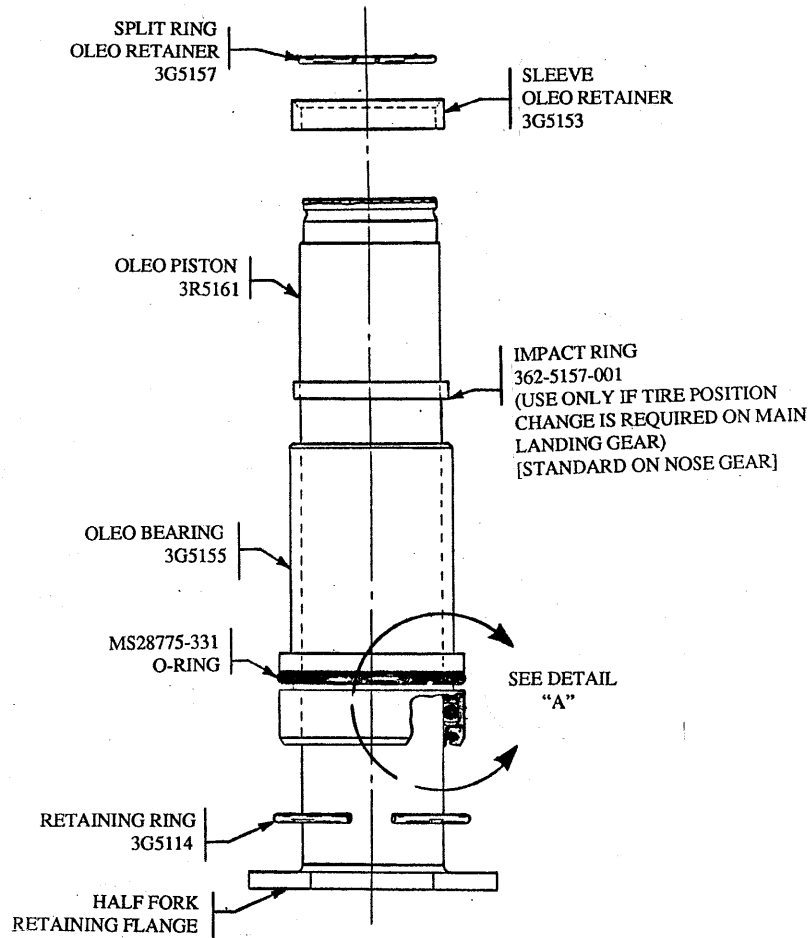

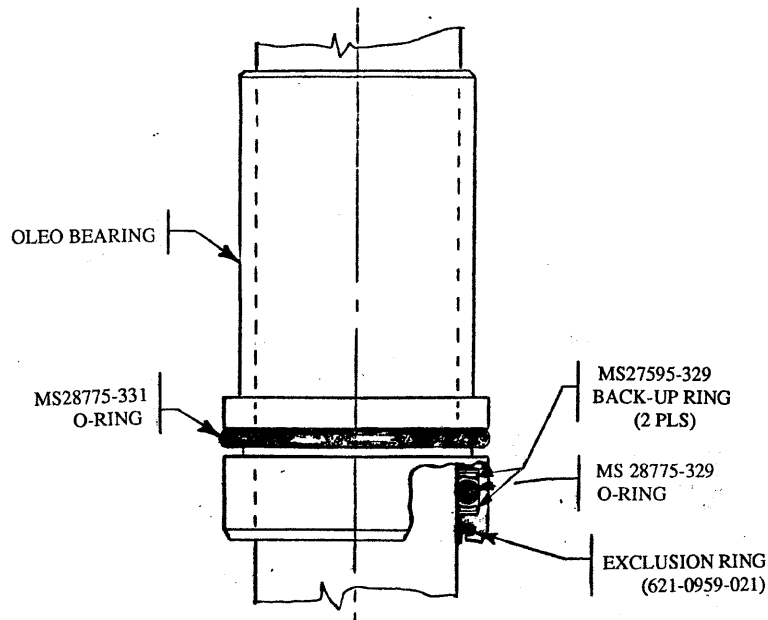


FIGURE 1

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(DETAIL "A" FROM FIGURE 1)
FIGURE 2


Step 1: *Release Internal Pressure and remove Valve Stem*

With the landing gear in the upright and vertical position, slowly depress the charge valve stem to release the nitrogen pressure. Once all of the pressure has been released, remove the internal valve stem using a standard valve stem removal tool.

Step 2: *Scissor Removal*

Collapse the oleo strut to the mid position and remove the lower cotter pin and scissor pin from the fork assembly. Take care to ensure all washers and shims are recovered upon removal.

When removing the nose gear scissor, it is advantageous to remove the forward and aft clamp halves rather than the lower pin. This simplifies the reinstallation of the scissor assembly.

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Step 3: Retainer Ring and Oleo Assembly

The oleo and bearing are held in place by a retainer ring installed in the bottom of the trunnion assembly. To remove the retainer ring, insert a pick, drill rod, or equivalent tool into the 1/16 diameter hole located on the circumference of the trunnion.

Once the retainer ring is removed, the oleo bearing can be pulled out of the trunnion via a firm tug on the oleo piston. Once the bearing has been removed, drain all hydraulic fluid from the trunnion assembly.



Note:

1. It is not necessary to remove the full fork or half fork to perform this task.
2. Be sure the charge valve stem is removed; otherwise a vacuum will develop during bearing removal, which severely hampers this operation.
3. Anytime the oleo bearing is removed, it is imperative that the O. D. seal on the bearing be replaced.


Step 4: Oleo Bearing Removal

The bearing is retained on the oleo piston via a machined retainer and split ring. To remove the ring, insert a small pick or similar tool under the ring and pry it loose. Take care not to overly deflect or stretch the ring beyond its normal elastic limit. Once the ring has been removed, the machined retainer and oleo bearing will slide off the oleo piston.

Step 5: Oleo Plug Removal (II RG Only)

Some models of II RG landing gear have an aluminum plug installed in the I. D. of the main and nose oleos. To extract the plug, the half fork and full fork must be removed from the oleo assembly.

Once the forks are removed, the plug can be pushed through the oleo cylinder using a wooden rod or equivalent tool.

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Step 6: Metering Piston Removal




Note: The metering piston need not be removed if the reason for overhauling the gear strut is leaking of fluid past the oleo bearing.

The metering piston assembly is installed in the I. D. of the trunnion and retained by a threaded fastener located on the trunnion cap. To prevent the metering piston from rotating when removing the fastener, fabricate an extraction/anti-rotational tool. The tool is essentially a 20 inch rod which incorporates a 5/16-24 male thread on one end and a handle, or some other means to retract torque during fastener removal, on the other end.

Insert the threaded end of the extraction tool into the trunnion assembly. Thread the tool into the metering piston (approximately four turns) until the tool bottoms. While grasping the extractor tool to resist torque, the metering piston fastener can be removed. Once the fastener is removed, the metering piston can be pulled out of the trunnion with a light tug on the tool. Take care to recover the stat-o-seal which fits between the metering piston rod and the trunnion cap.



Note: III RG landing gear serial no. 001 through 051 do not incorporate metering piston extraction threads. The extraction tool must be modified, therefore, to retract torque via the metering holes located in the piston rather than the 5/16 threads. The two metering holes are .118 inch in diameter and 1.25 inches apart measured from centerline.

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Step 7: *Cleaning and Visual Inspection*

Oleo Assembly: Thoroughly clean the oleo assembly using acetone, alcohol, or an equivalent solvent. If any rust has developed on non-chromed surfaces, it must be removed by using a wire brush. Carefully inspect all welded joints for evidence of cracks or abnormalities. The chromed oleo shaft should exhibit a smooth surface (16RMS) with no evidence of scratches. A scratch in the chrome can be detected by dragging a sharp object (knife edge, pointed pin, profilometer) across the surface.

Oleo Bearing: Remove the o-ring installed on the bearing O. D. Remove the two retainer packings (back-ups) and o-ring from the I. D. Remove the exclusion ring from the outboard I. D. gland. Thoroughly clean the bearing using recommended solvents.

Oleo Plug: (II RG Only) Remove the o-ring and two back up rings installed in O. D. of the plug. Thoroughly clean the plug using recommended solvents.

Metering Piston: (III RG Only) Remove the o-ring installed in the O. D. and the stat-o-seal installed on the metering piston rod. Thoroughly clean using a recommended solvent.

Trunnion Assembly: Thoroughly clean the trunnion assembly using recommended solvents. If any rust is apparent, it must be removed using steel wool, Scotch Brite, or equivalent. It is advantageous to attach the Scotch Brite to a long rod and chuck it in a standard hand drill. This approach works well for cleaning the trunnion I. D.

Carefully inspect all welded joints for evidence of cracks or abnormality.



Note: (III RG Only) The cross tube of the main landing gear trunnions will fill with solvent during cleaning. Take care to ensure all solvents are completely drained after flushing.

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Step 8: Metering Piston Installation

Generously lubricate the metering piston o-ring MS2877-137: III RG only, using Vaseline, petroleum jelly, or the equivalent. Install the o-ring on the O. D. of the metering piston. Install the stat-o-seal (620-0600-001) on the threaded end of the metering piston. Using the metering piston extraction tool, install the metering piston in the trunnion assembly. Install the 5/16 washer and AN nut and torque to 140 inch-pounds, maximum. To ensure the integrity of the stat-o-seal, take care that the metering piston does not rotate while torquing the fastener.



Note: (III RG Only) Substitute o-ring MS28775-138 for landing gear serial numbers 001 through 051.

Step 9: Oleo Bearing/Oleo Assembly


Install the oleo bearing retainer ring on the oleo. Generously lubricate the o-ring (MS28775-331) with a recommended lubricant and install on the O. D. of the oleo bearing. Install two retainer packings (MS27595-329) in the I. D. gland of the oleo bearing. Install one o-ring (MS28775-329) in the I. D. gland of the oleo bearing. Verify that the o-ring is between the retainer packings with one on each side of the o-ring. Install the exclusion ring (620-0959-021) in outboard I. D. gland.

Install the oleo bearing on the oleo shaft. The bearing will slide onto the shaft with less than 10 pounds force. While applying thrust, carefully rock the bearing until the exact concentric fit is achieved. At this point, the bearing will easily slide onto the shaft.



Note: Do not hammer or force the oleo bearing onto the shaft.

Once the bearing is installed on the shaft, install the machined oleo retainer and the split retainer ring. Once the ring is seated, carefully inspect the installation for proper assembly. This is a very critical joint and care must be taken to ensure integrity.

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Step 10: Oleo Plug Installation (II RG Only)

Generously lubricate the oleo plug o-ring (MS28775-222) using Vaseline, petroleum jelly or the equivalent. Install the o-ring on the O. D. of the plug. Install two back up rings (MS28774-222) in the o-ring groove. Take care to ensure one back up ring is installed on either side of the o-ring.



Note: (II RG Only) Perform Step 12 (Oleo Bearing Installation) followed by Step 11 (Fill Strut with Oil) prior to continuing. The oil can be poured directly into the I. D. of the oleo cylinder.

Install the plug in the I. D. of the oleo cylinder. Reinstall the half forks and the full forks using threaded fasteners.



Note: 1/4-28 bolts are torqued to 70 inch-pounds, maximum. 10-32 bolts are torqued to 25 inch-pounds, maximum.

Step 11: Fill Strut with Oil

Lay the trunnion assembly on a flat surface and tilt the open end up at approximately 30 degrees. Fill the trunnion with MIL-H-5606 hydraulic oil as indicated below:


II RG:

Main Landing Gear: 500 ml = 16.9 fluid oz.
Nose Landing Gear: 400 ml = 13.5 fluid oz.

III RG:

Main Landing Gear: 450 ml = 15.2 fluid oz.
Nose Landing Gear: 620 ml = 21.0 fluid oz.

Allow the oil to drain past the metering piston; however, do not let it drain out the charge valve. The charge valve stem must be removed; otherwise it will not be possible to install the oleo bearing due to pressure build-up.

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Step 12: Oleo Bearing Installation

Grasp the oleo assembly and insert the oleo bearing into the trunnion. Firmly seat the oleo bearing to ensure adequate clearance for the retainer ring. If necessary, the oleo bearing may be seated by using a wood or plastic block and hammer. Take care to strike the bearing only at its O. D. perimeter to avoid damage to the exclusion ring groove. Once the bearing is installed, insert the retainer ring into its groove.



Note: Take extra care to inspect the installation of the retainer ring. This installation is very critical to safety.

Step 13: Charging Valve Installation

Place the landing gear assembly in the upright vertical position. Allow the hydraulic fluid to drain through the metering piston. Slowly compress the strut to purge air from the trunnion assembly. With the strut fully collapsed, install the charge valve stem using a standard installation tool.

Step 14: Scissor Installation

With the strut in the mid stroke position, reinstall the scissor assembly. Take care to ensure all washers and shims are in place. Make sure the cotter pin is in place.

Step 15: Charging Procedure

With the strut in the fully collapsed position, apply sufficient Nitrogen pressure (30 PSI) to fully extend the oleo.



WARNING: Make sure there are no people in the line of fire of the oleo/trunnion. If the retainer ring installation is faulty, the unit could blow apart. Before charging, very carefully re-inspect the oleo bearing retainer ring to ensure it is properly seated in its groove.

Once you are satisfied that the installation is correct, slowly raise the Nitrogen pressure to the specified value:

III RG:

Main Landing Gear: 150 PSI
Nose Landing Gear: 120 PSI

II RG:


Main Landing Gear: 110 PSI
Nose Landing Gear: 90 PSI



WARNING: Take extra care to ensure that nobody will be injured in the case the unit fails due to improper assembly. Please remember that compressed gas can be dangerous.

Step 16: Strut Service Interval

It is recommended that the fluid level in the struts be checked every 500 hrs of aircraft service.

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