

Instructions for Continued Airworthiness

for

GROVE 28-4002 AND 28-4002A WHEEL AND BRAKE CONVERSION KITS

In Select

**PIPER AIRCRAFT INCLUDED
IN THE FAA APPROVED MODEL LIST**

when installed

In Accordance With

Supplemental Type Certificate SA02525LA

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1.0 RECORD OF REVISIONS

This “Record of Revisions” identifies all revisions to this document. When changes to this document are needed, revisions will be issued by the STC holder and posted to their web site: www.groveaircraft.com.

This “Record of Revisions” shall remain in this document at all times. Upon the receipt of revisions, insert the revised page(s) into this document and enter the revision number, revision date, insertion date and signature of person incorporating the revision into the document in the appropriate spaces below.

It is the responsibility of the person(s) performing maintenance on the installed system to ensure that this document is current prior to performing this maintenance. The current revision number may be verified by contacting the STC holder, Grove Aircraft Landing Gear Systems Inc., 1800 Joe Crosson Drive, El Cajon, CA 92020 or on the web at www.groveaircraft.com.

Revision Number	Description	Pages Affected	Revision Date	Inserted By
IR	Initial Release	all	04/20/2015	 Robert P. Grove, Chief Engineer

2.0 INTRODUCTION

This document provides continued airworthiness instructions for Grove 28-4002 and 28-4002A Wheel and Brake Conversion Kits when installed in accordance with STC SA02525LA. It has been developed using the guidelines in Appendix “G” of FAR Part 23 as required by FAR 21.50 and 23.1529.

It is designed to provide aircraft technicians with sufficient information to inspect, troubleshoot, adjust, repair, test, remove, and install the components of the Grove 28-4002 and 28-4002A Wheel and Brake Conversion Kits installed in accordance with FAA Supplemental Type Certificate SA02525LA.

The Grove 28-4002 and 28-4002A Wheel and Brake Conversion Kits are eligible for installation on the airplanes listed on FAA STC SA02525LA Approved Model List.

The information in this document supplements or supersedes the original manufacturer’s maintenance manual only in those areas listed. For limitations,

procedures and other information not contained in this document, refer to the aircraft manufacturer's maintenance manuals and illustrated parts manuals.

The following paragraphs detail the installation, inspection and repair processes for these articles.

3.0 DESCRIPTION

3.1. General

The Grove 28-4002 and 28-4002A Wheel and Brake Conversion Kits consists of a standard aircraft two-piece wheel assembly and a single disc type brake at each main wheel. The disc is bolted to the wheel, while the brake assembly floats laterally on torque pins, which extend through a stationary torque plate, bolted to the axle.

The Conversion Kits are essentially identical except that the 65-1001B wheel in the 28-4002 Conversion Kit is cast from magnesium while the 65-1001C wheel in the 28-4002A Conversion Kit is cast from aluminium. The installation, inspection and repair processes are the same for both except as noted.

3.2. Major Components

Wheel Assembly	P/N 65-1001B or 65-1001C
Brake Assembly	P/N 29-1004
Brake Line Assembly	P/N 007-002

4.0 OPERATION

Operation of the Grove Disc Brake Conversion is identical to the operation of the original 4" BF Goodrich factory-installed brakes.

5.0 AIRWORTHINESS LIMITATIONS SECTION

The Airworthiness Limitations section is FAA approved and specifies maintenance required under §43.16 and §91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved. There are no new (or additional) airworthiness limitations associated with this equipment and or/installation.

6.0 INSPECTIONS

6.1. Scheduled Inspections

At every 100 hour inspection and annual inspection, perform the inspections specified in sections 7.1. and 8.1.

6.2. Unscheduled Inspections

Whenever there are indications that problems may exist with the wheel or brake assembly, perform the inspections specified in sections 7.1. and 8.1. as well as reference Appendix A — Trouble Shooting.

7.0 BRAKE ASSEMBLY INSPECTION AND MAINTENANCE

The brake linings and caliper can be inspected, maintained and repaired without raising the aircraft or removing the wheel. Instructions for installation on the aircraft can be found in section 7.3.3. Failure of any of the following inspections will require maintenance and/or repair as detailed in the following sections.

7.1. Visual Inspection

7.1.1. Visually inspect the caliper for corrosion, leaking hydraulic fluid, cracks or visible damage.

7.1.2. Check the back plate tie bolts to insure that they are properly torqued, safety wired and have not worked loose.

7.1.3. Visually check the torque plate for corrosion, cracks and loose bolts that attach the torque plate to the axle.

7.1.4. Visually check the brake linings (pads) for wear. Linings worn to less than 0.100" must be replaced.

7.1.5. Check the brake line and brake line fittings for signs of damage or leakage. If the linings have been contaminated with fluid, they should be replaced.

7.1.6. If any conditions specified in paragraphs 7.1.1. through 7.1.5. above are encountered, repair and/or replacement is required as specified in the following sections.

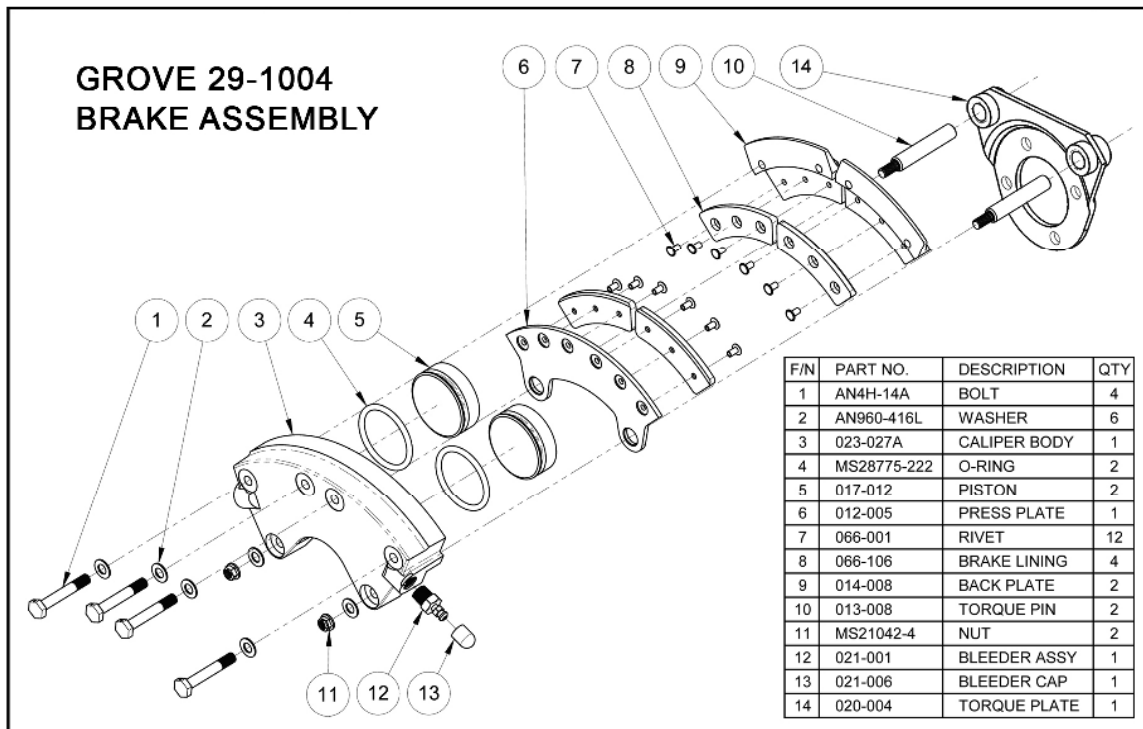


Figure 1

7.2. Brake Linings — Inspection and Replacement

7.2.1. Removal of Brake Caliper Assembly

7.2.1.1. Remove back plate tie bolts and remove back plate assembly.

7.2.1.2. Slide brake caliper out of torque plate assembly. Removal of the brake line may not be necessary. If removal of the brake line is necessary, cap or plug the hydraulic lines to prevent entry of contaminants. After reinstallation of the brake caliper, bleed the brakes in accordance with paragraph 7.3.4.

7.2.1.3. Slide press plate assembly off of torque pins.

7.2.2. Inspection and Installation of New Linings

If linings are worn to less than 0.100", are excessively pitted, heat damaged, oil soaked, or exhibit other damage they must be replaced as follows:

7.2.2.1. Remove old linings by removing the rivets with a small drift punch or 1/8" diameter drill. Use care to prevent elongating the holes in the back plate or press plate. De-burr the holes after drilling if necessary.

7.2.2.2. Clean back plate and press plate surfaces with solvent and air dry before installing new linings.

7.2.2.3. Inspect back plate and press plate for excessive corrosion, visible damage, or excessive warpage. Straighten or replace press plate if warped in excess of 0.010".

7.2.2.4. Rivet new 066-106 linings onto back plate and press plate using rivet tool #824 or equivalent with 066-001 rivets. Small cracks in the tubular rivets are allowed after forming, providing that no cracks extend beyond the crest of the rounding. There may be no more than two cracks in any 90 degree segment and no more than three cracks total.

7.2.2.5. Check to ensure that pads are tight to the back plate and press plate, and free from any movement.

7.2.3. Reinstallation of Back Plate and Press Plate Assemblies

If disassembly or repair of the caliper is necessary, refer to section 7.3. Otherwise reinstall the caliper as follows:

7.2.3.1. Wipe dirt, grease, etc. from brake cylinder and piston and push piston back into cylinder.

7.2.3.2. Clean torque pins and lightly lubricate with a dry film such as silicon spray. Grease will attract dirt and may cause excessive wear on the torque pins and press plate.

7.2.3.3. Slide press plate onto torque pins and install brake caliper assembly onto torque plate.

7.2.3.4. Position back plate between tire and brake disc. Install tie bolts and washers and torque to a value of 70-80 in-lbs. This torque value is also found on the caliper label. Safety wire the back plate tie bolts.

7.2.3.5. If you have disconnected the hydraulic lines, bleed the brake system in accordance with paragraph 7.3.4.

7.3. Brake Caliper — Removal, Inspection and Repair

7.3.1. Removal and Disassembly of the Brake Caliper

Removal of the wheel is not necessary unless the torque plate is to be removed. Disassembly should be done on a clean, cushioned flat surface to prevent nicks, scratches, and gouges to the brake parts.

7.3.1.1 Drain the fluid from the brake system by opening the bleeder fitting and pumping the brake pedal until the system is dry. Collect the discharged fluid and dispose of properly.

7.3.1.2. Disconnect brake line from brake caliper. Cap the brake line to prevent entry of foreign material.

7.3.1.3. Remove the back plate.

7.3.1.4. Remove the piston from the caliper body. This can be done by injecting compressed air through the brake line fitting. Care must be taken to ensure that the piston does not exit at high velocity. Slowly introduce the air at low pressure and cover the piston and caliper with a rag and/or place face down on a soft surface.

7.3.1.5. Remove the O-Ring from the piston. It is recommended that new O-Rings be installed. If the old O-Rings are to be re-used, care must be taken to ensure that they are not damaged during removal or re-installation. If the O-Ring is brittle, nicked, scratched or has flat surfaces, it must be replaced with MS28775-222 O-Rings. O-Rings must be compatible with MIL-PRF-5606 hydraulic brake fluid.

7.3.1.6. If removal of the torque plate is required, first remove the wheel as described in paragraph 8.2., then unbolt and remove the torque plate as described in section 7.4.1.

7.3.2. Inspection and Repair

7.3.2.1. Visually inspect caliper for cracks, nicks, corrosion, or other damage. Cracks around the torque pins are cause for replacement.

7.3.2.2. Inspect the caliper torque pins for excessive wear, proper tightness, cracks in the caliper body or other damage. Cracks in the caliper body or loose torque pins are cause for rejection of the caliper body.

7.3.2.3. Inspect the piston bore and piston for contamination, corrosion and scratches. Light nicks and scratches can be removed by polishing. Care must be taken not to damage the protective coating which will result in increased corrosion. Deep nicks or scratches are cause for rejection of the part.

7.3.2.4. Inspect back plate and press plate for excessive corrosion, visible damage, or excessive warpage which is cause for rejection of the part. Straighten or replace press plate if warped in excess of 0.010".

7.3.2.5. Corrosion of aluminum parts should be remedied IAW AC 43-1b section 6.136, and magnesium parts IAW AC 43-1b section 6.152.

7.3.3. Reassembly and Reinstallation of the Brake Caliper Assembly

7.3.3.1. Clean the brake parts, with the exception of the O-Rings and linings, in solvent and air dry.

7.3.3.2. Carefully install a new O-Ring, or serviceable O-Ring, on the piston using aircraft hydraulic fluid, Dow 55M O-Ring Lubricant or equivalent.

7.3.3.3. Lightly coat the piston bore with aircraft hydraulic fluid, Dow 55M O-Ring Lubricant or equivalent, and carefully place the piston into the caliper. The side of the piston with the O-ring closest to the surface goes in first. Insert it until the top of the piston is flush with the caliper body.

7.3.3.4. Slide the press plate onto the torque pins with the linings facing away from the caliper body.

7.3.3.5. If the torque plate was removed, reinstall in its original, clocked position.

7.3.3.6. Slide the caliper assembly onto the torque plate on the aircraft.

7.3.3.7. Install the back plate, torque the back plate bolts to a value of 70-80 in-lbs. and safety wire.

7.3.3.8. Reconnect the hydraulic lines.

7.3.4. Bleeding the Brakes

7.3.4.1. Use only MIL-H-5606 (MIL-PRF-5606) hydraulic fluid or its newer replacements: MIL-PRF 83282 and MIL-PRF-87257. All of these fluids are miscible and can be used with each other. All Grove brake systems incorporate Buna-N (Nitrile) O-Ring seals and are compatible with these hydraulic fluids.

7.3.4.2. Remove the vent plug from the brake system reservoir.

7.3.4.3. Connect a clean hydraulic pressure source such as a hydraulic hand pump to the bleeder valve on the lower end of the brake caliper.

7.3.4.4. Open the bleeder valve one-half turn.

7.3.4.5. Pump hydraulic fluid into the system observing the level in the brake system reservoir. When the reservoir is nearly full, tighten bleeder fitting and remove hydraulic pressure source.

7.3.4.6. Replace and tighten brake system reservoir vent plug.

7.3.4.7. Apply hard pressure to the brake pedal. Check to ensure that you have a "hard pedal" and that there are no leaks. You may have to pump the brake pedal several times

7.3.4.8. If a "soft pedal" condition exists, repeat steps 7.3.4.2. through 7.3.4.7.

7.3.5 Conditioning the Brake Linings (Pads)

These non-asbestos organic composition brake pads require a thin layer of glazed material at the lining friction surface in order to provide maximum braking performance. This glazed layer is produced by the heat generated during normal braking operations, and is maintained during the life of the lining. Since new brake pads do not have this layer, it must be created by the following process:

7.3.5.1. Heat the linings by "dragging the brakes" while taxiing at a slow speed with moderate power. Do not use maximum braking pressure.

7.3.5.2. Allow the brakes to cool for 5 - 10 minutes

7.3.5.3. Test the results at full static run-up. If the brakes hold, break-in is complete. If they fail to hold, repeat steps 7.3.5.1 and 7.3.5.2 until they do.

7.3.5.4. NOTE: The brake linings will continue to "break-in" during normal operations. Typically, after several take offs and landings, the linings will have better stopping performance than when new.

7.4. Torque Plate — Removal, Inspection and Repair

7.4.1. Removal of the Torque Plate

After removal of the wheel and brake caliper, the torque plate can be removed from the aircraft by removing the four bolts attaching it to the gear strut. Attention should be paid to the “clocking” of the torque plate in relationship to the gear strut so that it can be reinstalled in the same position.

7.4.2. Inspection and Repair of the Torque Plate

Inspect the torque plate for corrosion, cracks and warpage. Excessive corrosion, pits or cracks are cause for rejection of the part. Straighten or replace torque plate if warped in excess of 0.010”.

Small nicks, scratches, pits or minor corrosion may be blended out and polished with fine (400 grit) sandpaper and then painted and/or treated for corrosion resistance.

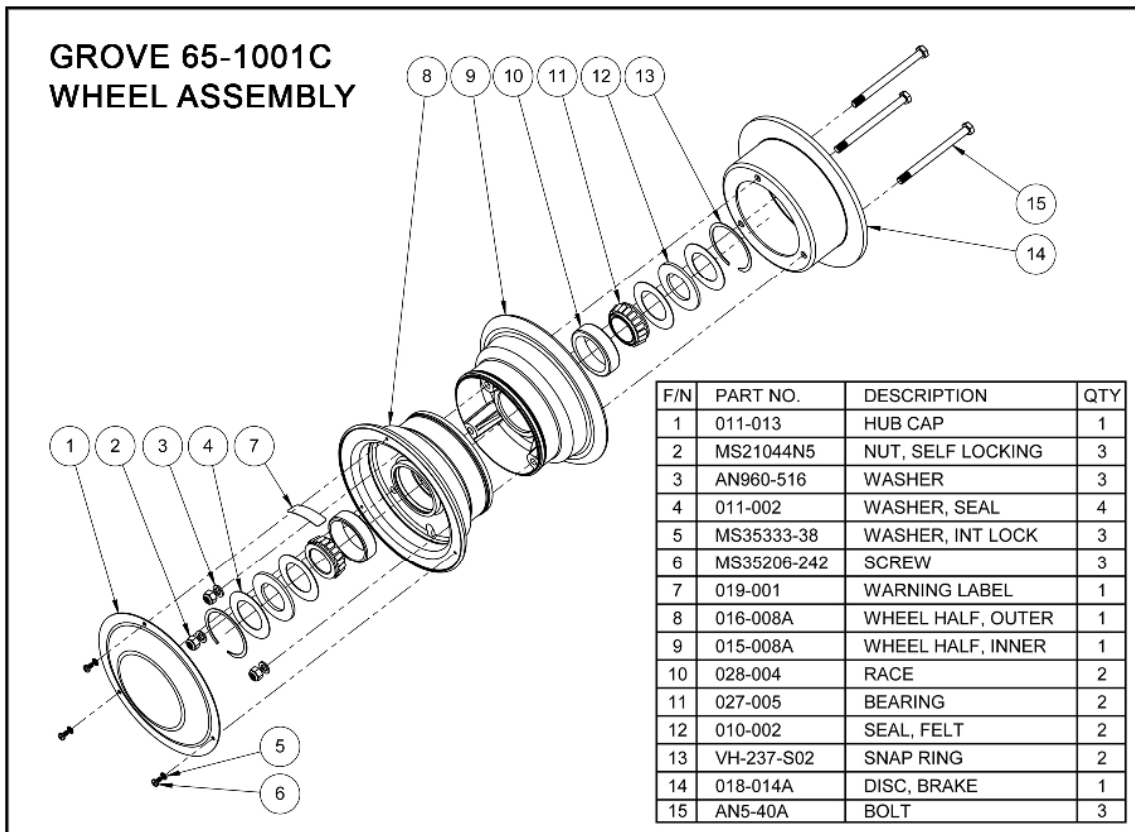
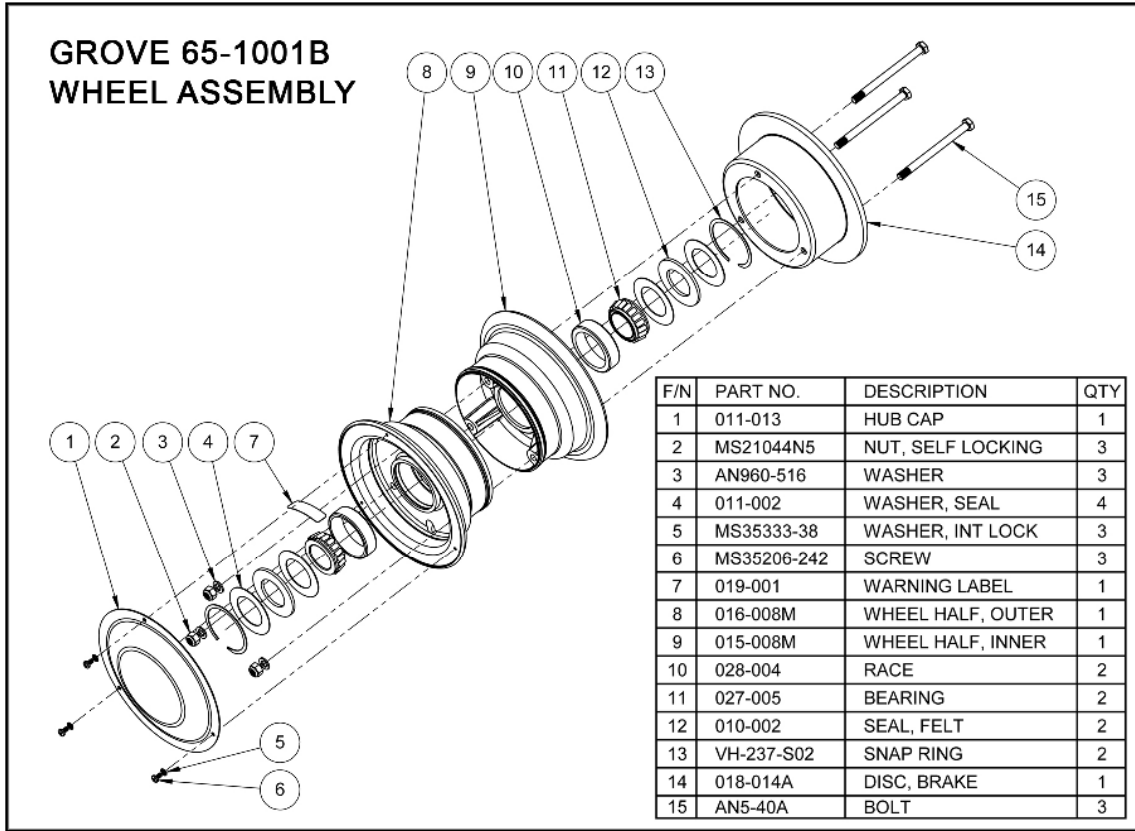
7.4.4. Reinstallation of the Torque Plate

Reinstallation of the torque plate is essentially the reverse process of the removal. Attention must be made to ensure that the torque plate is installed in the same “clocked” position with reference to the gear strut as it was when removed.

The four attaching nuts and bolts should be examined. If there is any doubt as to their serviceability, they must be replaced.

Install the four bolts, washers and nuts, with the nuts on the inboard side of the gear strut, then torque to a value of 70-80 inch-pounds.

Figure 2 — Grove 65-1001B Magnesium and 65-1001C Aluminum Wheels



8.0 WHEEL ASSEMBLY INSPECTION AND MAINTENANCE

8.1. Visual Inspection

Failure of any of the following inspections will require maintenance and/or repair as detailed in the following sections.

8.1.1. Insure that the wheel tie bolts are secure and have not worked loose.

8.1.2. Visually inspect the wheels for corrosion, cracks, or other visible damage.

8.1.3. Inspect the brake disc for evidence of cracks, corrosion, deep grooves, or other visible damage.

8.2. Removal of the Wheel Assembly

8.2.1. Remove wheel hub cap if so equipped.

8.2.2. Remove brake caliper back plates. It is not necessary to disconnect the hydraulic line.

8.2.3. Jack and secure the aircraft in accordance with the manufacture's instructions.

8.2.4. Ensure that the aircraft is stable.

8.2.5. Deflate the tire by depressing the valve stem plunger until no more air escapes.

CAUTION: Do not attempt to remove valve stem core, loosen the axle nut, or disassemble the wheel halves until all tire pressure has been released. Failure to do so can result in severe personal injury.

8.2.6. Remove the valve stem core.

8.2.7. Remove the axle cotter pin and axle nut.

8.2.8. Carefully slide the wheel assembly off of the axle.

8.3. Disassembly of the Wheel

8.3.1. Place the wheel assembly on a clean flat working surface. Care must be taken to prevent damage to the wheel such as scratches and/or nicks which will destroy the corrosion resistant protection of the wheel.

8.3.2. Separate the tire beads from the wheel halves using a tire bead breaker or other suitable tool. Do not pry between the tire and wheel flange as damage to tire and/or wheel may occur.

8.3.3. Remove the nuts, washers and bolts that hold the wheel halves together.

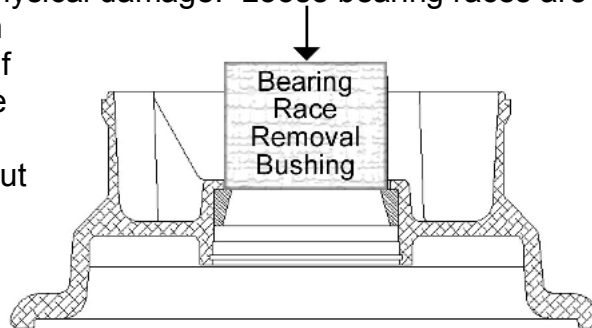
8.3.4. Separate and remove the brake disc from the inner wheel half.

8.3.5. Separate each wheel half from the tire using care to not damage the inner tube or its valve stem.

8.3.6. Remove the retaining snap rings, washers, felt grease seals and wheel bearings using care to prevent damage to the wheel or bearings.

8.4. Wheel Inspection and Repair

8.4.1. Inspect the bearing races for scoring, corrosion, signs of over heating or other physical damage. Loose bearing races are cause for rejection of the wheel half. If replacement of the race is necessary, carefully press it out using a press and properly sized bushing as illustrated.



8.4.2. Visually inspect each wheel half for cracks, nicks, corrosion or other damage. Particular attention should be paid to the tire bead seat area. Obvious cracks and severe corrosion are cause for rejection of the part. A further inspection using the dye penetrant method should be performed on any part whose serviceability is questionable. Small nicks, scratches and pits may be blended out and polished with fine (400 grit) sandpaper and then treated for corrosion resistance. Corrosion of aluminum parts should be remedied IAW AC 43-1b section 6.136, and magnesium parts IAW AC 43-1b section 6.152.

8.4.3. Clean the wheel bearings in a suitable solvent and air dry using compressed air being careful to not allow the compressed air to spin the bearings.

8.4.4. Inspect the bearings for pitting, cracks, evidence of overheating, or excessive corrosion, any of which is cause for rejection of the part.

8.4.5. Inspect the felt grease seals. Excessively worn, hardened or contaminated seals are cause for replacement. Serviceable seals should be cleaned in solvent, air dried, and set aside in a clean, protected environment until required for reassembly.

8.4.6. Inspect the felt seal retaining washers and snap rings for distortion, excessive corrosion or other physical damage which is cause for rejection.

8.4.7. Inspect wheel tie bolts for cracks, bending, thread damage, or excessive corrosion, any of which is cause for rejection. The tie bolts

are subjected to fatigue type loads and should be replaced whenever there is any question as to their serviceability.

8.4.8. Test the wheel tie bolt nuts by temporarily installing them onto the bolts. If the nut can be turned by hand past the self-locking section, the nut must be replaced.

8.4.9. Inspect brake disc for excessive wear, scoring, or corrosion, cracks, warpage, or other physical damage which is cause for rejection of the part. Minor corrosion and surface irregularities can be blended using 220 grit sandpaper. Any corrosion on the non-braking part of the disc should be removed and then painted and/or treated for corrosion resistance.

8.4.10. Measure disc thickness. Minimum disc thickness is 0.165". If the disc thickness is less than 0.165", the disc must be replaced.

8.5. Reassembly of the Wheel

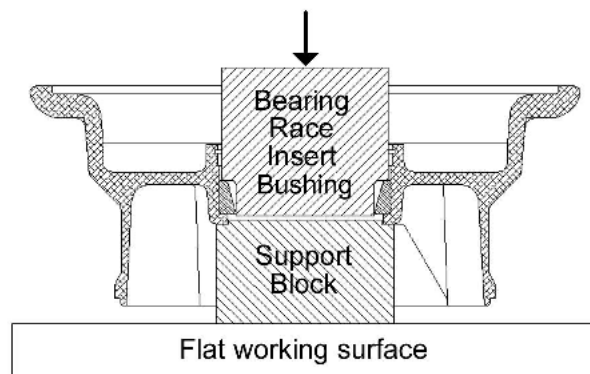
8.5.1. Reassembly of the wheel is basically the reverse of the disassembly process. Assemble the wheel on a clean, flat surface being careful to not nick, scratch, or damage the protective finish of the wheel.

8.5.2. Reinstall the bearing races if applicable. Heating the wheel and/or cooling the bearing race is of minimal benefit in the installation process.

8.5.3. Clean the wheel bearing race bore and apply a thin coat of wheel bearing grease.

8.5.4. Place the bearing race in the wheel bore, being careful to insure that it is aligned properly and not cocked.

8.5.5. Place the wheel half in the press as shown in the adjacent figure being sure to support the wheel half at the bottom of the bearing seat. Failure to do so may result in breakage of the wheel casting if too much force is applied.



8.5.6. Press the bearing race into the wheel until it is fully seated.

8.5.7. Remove the wheel from the press and visually check to see that the race is fully seated and that it is tight in the wheel.

8.5.8. Prior to mounting the tire on the wheel, ensure that the wheel is clean and dry. Particular attention should be paid to the bead seat

area to ensure that it is clean, dry and free of grease or other contamination which may cause the tire to spin on the wheel as the brakes are applied.

8.5.9. Insert the inner tube into the tire. Align the red dot on the tire (its lightest point) with the white or yellow dot on the tube (its heaviest point). If the tube does not have a white dot, align the red dot on the tire with the valve stem of the tube. In order to allow the tube to move freely within the tire, it is recommended that you coat the tube and inner part of the tire with talc powder.

8.5.10. Inflate the inner tube to approximately 10 psi, allowing it to take the shape of the tire. Deflate the tube to the point that it just retains its shape.

8.5.11. Place the tire and tube onto the outer wheel half carefully inserting the valve stem through the hole in the wheel half.

8.5.12. Insert the inner wheel half into the tire with the tie bolt holes aligned and using care not to pinch the inner tube.

8.5.13. Place the wheel and tire assembly on a flat working surface with the inboard side of the wheel facing up. Install the brake disc in the inner wheel half and align the bolt holes with the wheel half. Insert the tie bolts through the brake disc and wheel.

8.5.14. Rotate the wheel from the working surface in order to be able to attach the washers and nuts to the tie bolts. Hand tighten a nut with washer on each of the tie bolts. Care should be taken to ensure that the wheel halves are in contact with each other and not pinching the inner tube.

8.5.15. Torque the tie bolt nuts to 150 in-lbs. This value is also shown on the wheel label. Observe the amount of torque required to turn the nut due to the locking friction of the nut and add this to get the proper torque wrench reading.

8.5.16. Repack the bearings using MIL-G-81322 grease such as Aeroshell 22, Mobil 28, Mobile SHC 100, or equivalent.

8.5.17. With the wheel on a flat working surface, insert a wheel bearing. Lightly coat the bearing race with bearing grease before installing the bearing.

8.5.18. Install the washers, felt grease seal and retention snap ring. A light coat of light weight oil on the felt grease seal is recommended.

8.5.19. Turn the wheel over and repeat steps 8.5.17. and 8.5.18. above.

8.5.20. Place the wheel in a protective enclosure and inflate to 30 psi. Deflate the tire by depressing the valve stem plunger and re-inflate to the pressure appropriate to the aircraft type and weight.

CAUTION: Under-inflation of the tire can cause the tire to slip on the wheel resulting in shearing of the valve stem.

8.6. Reinstalling the Wheel on the Aircraft

- 8.6.1. Inspect the axle to ensure that it is clean, dry and in serviceable condition.
- 8.6.2. Slide the wheel onto the axle with the brake disc side inboard.
- 8.6.3. Install axle nut and hand tighten ensuring that inboard wheel bearing is fully seated against the bearing stop on the axle.
- 8.6.4. While slowly rotating the wheel, tighten the axle nut until you feel resistance of the wheel to rotate. Care must be taken to ensure that the valve stem is not damaged during this process.
- 8.6.5. Loosen the axle nut only enough so that the wheel runs free, or with very little drag.
- 8.6.6. Check that a hole in the axle nut aligns with a slot in the axle. If you need to move the nut for alignment, first try to tighten it. If the wheel still moves with little or no resistance, use that alignment. If there is significant resistance to rotation, loosen the nut to the next hole.
- 8.6.7. Install cotter pin to safety the axle nut to the axle. Use care to ensure that there is adequate clearance between the cotter pin and the valve stem as the wheel rotates.
- 8.6.8. Reinstall the brake caliper backing plate. Torque the bolts to a value of 70-80 in-lbs. and safety wire. Refer to section 7.2.3.
- 8.6.9. Reinstall the wheel hub cap if so equipped.
- 8.6.10. Rotate the wheel to ensure that it is secure and rotates freely.
- 8.6.11. Lower the aircraft to the ground following aircraft manufacturer's instructions.

APPENDIX A — TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Unable to obtain sufficient hydraulic brake pressure or spongy pedal	Air in hydraulic system. Brake pedal binding	Check for source, then bleed hydraulic system IAW section 7.3.4. Check for freedom of movement of brake pedal and master cylinder
2. Excessive pedal travel	Incorrect installation Leak in system—brake, master cylinder, fittings, or lines. Defective master cylinder. Back plate bolts loose.	Refer to aircraft manual. Locate leak and repair. Repair or replace. Torque bolts to proper value IAW paragraph 7.2.3.4.
3. Brake Drag	Piston jammed in caliper Foreign matter wedged in brakes Master cylinder not releasing hydraulic pressure Foreign matter lodged between torque pins and torque plate bushings. Bent torque plate. Bent torque pins	Remove caliper and repair cylinder or piston Locate and remove Check for proper master cylinder installation. Repair or replace master cylinder. Clean and inspect. Replace if necessary. Replace torque plate. Replace torque pins.
4. Rapid disc and/or pad wear.	Dragging brakes Excessive rusting, scoring, or pitting of brake disc Excessive back plate deflection caused by bent bolts or over torquing bolts.	Refer to Trouble #3 Clean or replace disc. Check torque of bolts IAW paragraph 7.2.3.4. and replace bolts if bent.
5. Brakes won't hold.	Improper conditioning of brake pads. Contaminated pads. Insufficient hydraulic pressure. Brake pad carburized (overheated)	Condition pads IAW section 7.3.5. Replace pads. Refer to Trouble #1. Replace pads