

▶ MAINTENANCE MANUAL

AWBCMM0001-7



Aircraft Wheel & Brake Division
Parker Aerospace



Cleveland
Wheels & Brakes

Publication Number: **AWBCMM0001-7/USA**
Issue 7, Dated: **April 01, 2007**

Reference

MANUALS

Refer to the Component Maintenance Manual for detailed maintenance / overhaul procedures. Consult the Aircraft Maintenance Manual and Airframe Log Books (for optional installations) to confirm the approved part numbers for the particular aircraft application. If any inconsistencies are observed in this data, please notify Cleveland Customer Support.

WARRANTY

The warranty clause for the Wheel and Brake Commercial Product Line is found on the inside back cover of the current Cleveland Wheel & Brake Price List.

IMPORTANT NOTE

Use of other manufacturer's components with original Cleveland Wheel & Brake assemblies will void the Cleveland Wheels & Brakes warranty.

Warnings

SAFETY WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

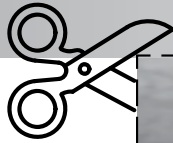
This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure, and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

© 2007 Parker Hannifin Corporation AWBCMM0001-7 04/2007



Revision Service Registration Cards!



Just clip out one of these cards, fill out the information and return it with your check or money order to Cleveland so we can keep you fully informed about new products, specification changes and the very latest wheels and brakes maintenance information.

Everything you need to know about aircraft WHEELS & BRAKES!

- Cleveland Wheels & Brakes Product Catalog
- Wheels & Brakes Component Maintenance Manual - contains complete maintenance, installation instructions and specs on all Cleveland systems and kits.



Both for One Low Price!

Print Version - \$25⁰⁰ or CD-ROM Version - \$10⁰⁰

Fill in the information on the back and mail to:



Parker Hannifin Corporation
Aircraft Wheel & Brake Division
1160 Center Road
Avon, OH 44011

Enclosed is my check or money order for you:

- New Product Catalog - \$15⁰⁰
- Maintenance Manual - \$15⁰⁰
- Both / Print Version - \$25⁰⁰
- CD-ROM - \$10⁰⁰

Revision Service Card

(PLEASE PRINT)

Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____ E-mail _____



Parker Hannifin Corporation
Aircraft Wheel & Brake Division
1160 Center Road
Avon, OH 44011

Technical Service Hotline 1-800-BRAKING



Parker Hannifin Corporation • Aircraft Wheel & Brake Division
1160 Center Road • Avon, Ohio 44011

Web site: www.parker.com/ag/wbd or www.clevelandwheelsandbrakes.com • E-mail: clevelandwbhelp@parker.com
Fax (440) 937-5409 • Technical Service Hotline: 1-800-BRAKING (1-800-272-5464) • (440) 937-1315

Enclosed is my check or money order for your:

- New Product Catalog - \$15⁰⁰
- Maintenance Manual - \$15⁰⁰
- Both / Print Version - \$25⁰⁰
- CD-ROM - \$10⁰⁰

Revision Service Card

(PLEASE PRINT)

Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____ E-mail _____



Parker Hannifin Corporation
Aircraft Wheel & Brake Division
1160 Center Road
Avon, OH 44011

Technical Service Hotline 1-800-BRAKING

Everything you need to know about aircraft WHEELS & BRAKES!

- Cleveland Wheels & Brakes Product Catalog
- Wheels & Brakes Component Maintenance Manual - contains complete maintenance, installation instructions and specs on all Cleveland systems and kits.

Both for One Low Price!

Print Version - \$25⁰⁰ or CD-ROM Version - \$10⁰⁰

Fill in the information on the back and mail to:



Parker Hannifin Corporation
Aircraft Wheel & Brake Division
1160 Center Road
Avon, OH 44011



Parker Hannifin Corporation • Aircraft Wheel & Brake Division

1160 Center Road • Avon, Ohio 44011

Web site: www.parker.com/ag/wbd or www.clevelandwheelsandbrakes.com • E-mail: clevelandwbhelp@parker.com
Fax (440) 937-5409 • Technical Service Hotline: 1-800-BRAKING (1-800-272-5464) • (440) 937-1315

RECORD OF TEMPORARY REVISIONS

REVISION	DESCRIPTION OF CHANGE	DATE
AWBCMM0001-7	Refer to Technical Publication Notice TPN_AWBCMM0001-7.0	04-01-2007
AWBCMM0001-7.1	Refer to Technical Publication Notice TPN_AWBCMM0001-7.1	07-15-2007
AWBCMM0001-7.2	Refer to Technical Publication Notice TPN_AWBCMM0001-7.2	11-30-2007



Table of Contents

<u>SUBJECT</u>	<u>PAGE</u>
LIST OF FIGURES	3
LIST OF TABLES.....	3
INTRODUCTION	4
PART NUMBERING SYSTEM.....	6
DESCRIPTION AND OPERATION.....	7
1. Brake Assemblies	8
2. Wheel Assemblies.....	9
SECTION 100 - TROUBLESHOOTING	101
1. General	101
2. Brake Assembly Troubleshooting	101
3. Wheel Assembly Troubleshooting.....	104
SECTION 200 - ON-AIRCRAFT MAINTENANCE	201
1. General	201
2. Brake Assemblies	201
A. Brake Inspection	201
B. Corrective Maintenance of Brakes.....	201
(1) Replacement of Brake Linings	202
(2) Lining Conditioning Procedures	209
3. Wheel Assemblies.....	210
A. Nose and Tail Wheel Inspection	210
B. Main Wheel Inspection.....	210
4. Tires	210
SECTION 300 - OFF-AIRCRAFT MAINTENANCE.....	301
1. General	301
2. Brake Assembly Maintenance.....	301
A. Removal From Aircraft	301
B. Brake Disassembly.....	302
(1) Disassembly Procedures	302
(2) Lining Removal	305
(3) Anchor Bolt Removal	306
C. Inspection	307
D. Brake Reassembly.....	309
(1) Reassembly Procedures.....	309
(2) Installation of Pistons	310
(3) Lining Installation	310
(4) Further Reassembly of Brake Components	310
E. Storage	311
3. Wheel Assembly Maintenance.....	311
A. Bearing Grease	312
B. Removal From Aircraft.....	312
(1) Removal of Main Wheel.....	312
(2) Removal of Nose Wheel	313
(3) Removal of Tail Wheel.....	314

Cleveland

Wheels & Brakes



Table of Contents

<u>SUBJECT</u>	<u>PAGE</u>
C. Wheel Disassembly	315
(1) Tire Removal	315
(2) Bearing Cone Removal	316
(3) Inflation Valve Removal	317
(4) Bearing Cup Removal	317
D. Inspection	318
E. Wheel Reassembly	321
(1) Bearing Cup Installation	321
(2) Tire Mounting	322
(3) Disc Installation	323
(a) Brake Disc Attached with Wheel Tie Bolts	323
(b) Brake Disc Not Attached with Wheel Tie Bolts	324
(4) Inflation Valve Installation	325
(5) Bearing Installation	325
(6) Tire Inflation	326
F. Storage	326
4. Brake and Wheel Refinishing	327
A. Degreasing	327
B. Paint Removal	328
C. Surface Pretreatment	329
D. Repainting	330
5. Installation of Brake and Wheel Assemblies Onto Aircraft	332
A. Brake Installation	332
B. Wheel Installation	333
(1) Main Wheel	333
(2) Nose Wheel	334
(3) Tail Wheel	335
APPENDIX A - WEAR LIMITS AND TORQUE VALUES	A-1
A1. Brake Lining Wear Limits	A-1
A2. Brake Disc Minimum Thickness	A-2
A3. Back Plate Tie Bolt Torque	A-4
A4. Wheel Assembly Torque Values	A-8
A5. Tire Inflation Valve Stem Torque	A-11
APPENDIX B - SPECIAL TOOLS / LUBRICANTS / REPAIR MATERIALS	B-1
B1. Special Tools	B-1
B2. Lubricants For Elastomeric Compounds	B-1
B3. Lubricants	B-1
B4. Surface Repair	B-1
B5. Primers and Paints	B-2
B6. Chemical Stripping Agents	B-2
APPENDIX C - BRAKE ASSEMBLY / LINING CROSS-REFERENCE	C-1
C1. Brake Assembly / Lining Cross-Reference	C-1
APPENDIX D - SERVICE BULLETINS	D-1
APPENDIX E - PRODUCT REFERENCE MEMOS	E-1

Cleveland

Wheels & Brakes



List of Figures and Tables

<u>FIGURES</u>	<u>PAGE</u>
1 Typical External Wheel and Brake	7
2 Typical External Disc Brake	9
3 Typical Nose/Tail Wheel Assembly	11
4 Typical Main Wheel Assembly	12
201 Pressure Plate Straightening	203
202 Pin Installation, Metallic Lining	205
203 Rivet Installation, Organic Lining.....	206
204 Rivet/Pin Installation, Acceptance Criteria	206
205 Installation of 066-00504 Lining to Brake Shoe	208
301 External Piston Guide	303
302 Internal Piston Guide.....	305
303 Anchor Bolt Removal	306
304 Cylinder To Back Plate Surface Inspection.....	307
305 Anchor Bolt Installation	309
306 Tire Removal.....	316
307 Bearing Cup Removal	317
308 Bead Seat Inspection	318
309 Disc Coning Limits	320
310 Disc Inspection.....	320
311 Bearing Cup Installation	322
312 Wheel Tie Bolts.....	324
313 Pack Bearing Cones	325
314 Typical Torque Plate (Cast), Painted Surfaces	330
315 Typical Brake Cylinder, Painted Surfaces.....	331
316 Typical Wheel Half, Painted Surfaces.....	331
A1 Minimum Lining Thickness.....	A-1
A1-1 Disc Wear Measurement (Piper Aztec).....	A-1
A2 Disc Thickness Measurement.....	A-2
A3 Back Plate Tie Bolts.....	A-4

<u>TABLES</u>	<u>PAGE</u>
-- Units of Measure	5
101 Brake Assembly Troubleshooting	101
102 Wheel Assembly Troubleshooting.....	104

Cleveland

Wheels & Brakes



General

There are a variety of publications available from Cleveland Wheels & Brakes to assist in the maintenance, overhaul or troubleshooting of Cleveland products. These documents are intended to supplement, not replace, the airframe manufacturer's instructions when Cleveland products are used. The "Component Maintenance Manual" (CMM) is an excellent reference publication used by many installers and technicians. It has been generically written to address the common practices and procedures used to inspect, troubleshoot and overhaul most General Aviation external type wheels and brakes. The CMM is often used in conjunction with the Product Catalog which presents detailed illustrated parts breakdowns. The more complex internal type wheels and brakes generally have a manual expressly written for their overhaul and maintenance type activities. Selected Service Bulletins and Product Reference Memos are included as part of the CMM. New releases or revisions to these documents are included with each new issue of the CMM.

Manual Use

Use of this manual requires reference to the Cleveland Wheels & Brakes Product Catalog. When referencing the Product Catalog, please note the term "cylinder assembly" or "caliper" is a reference to a brake assembly which includes the cylinder in addition to a back plate, pressure plate, brake linings, piston(s), and other components.

The term "cylinder" is used to identify the housing for the piston(s), o-rings, and brake fluid. The cylinder is a component of the caliper.

When referencing the Product Catalog, you may note terms "cylinder assembly" and "caliper" being used interchangeably.

Manual Updates

Effective July 1, 1997, this manual (CMM) has been converted to a bound printed publication format. This manual is now identified by a document number "AWBCMM0001-x," which is located in the upper left corner of each page. The "-x" suffix indicates the manual issue number, where "-1" is the first issue. AWBCMM0001-1 (dated July 1, 1997) supersedes CMM Revision D (dated July 1, 1996).

The revision service for this publication, as had been offered in the past, is no longer available. Whenever an interim revision to the publication is required the information will be listed on the Record of Revisions page, which precedes the Table of Contents page. The Technical Publication Notice (TPN) provides detailed revision information to selective sections of the parent publication. Each TPN is identified with the parent publication number and a sequentially assigned revision number indicating the revision level of the parent publication it has been issued against. For example: TPN_AWBCMM0001-7.1 will be the first interim revision issued against AWBCMM0001-7. TPN_AWBCMM0001-7.2 would be the second interim revision and so forth. Whenever a general revision of the parent document is required, the publication's revision number is advanced and the TPN process will begin again.

Cleveland
Wheels & Brakes



Introduction

Consult the Cleveland Wheel & Brakes website for current service publications and any TPN's that have been issued against it. For additional information regarding publication availability please contact the Cleveland Wheels & Brakes Technical Support Team. Product Information Cards located at the front of this publication can also be used to order the CMM and the Product Catalog.

For technical assistance, contact the **TECHNICAL SERVICES HOTLINE:**

clevelandwbhelp@parker.com 1-800-BRAKING (272-5464)

Fax: 440-937-5409

NOTE: This manual, along with the Product Catalog, is also available as part of a Parker General Aviation Product Information CD ROM.

Units of Measure

The measurements used in this manual are presented in U.S. Standard Units with metric equivalents in parentheses after or below the U.S. units. Conversions and abbreviations are listed in the following table:

U.S. Standard Unit	U.S. Standard Abbreviation	Corresponding Metric Unit	Metric Abbreviation
degrees Fahrenheit	°F	degrees Celsius	°C
foot pounds	ft-lb	Newton-meter	N·m
gallon	gal	liter	l
inch	in.	millimeter	mm
inch pounds	in-lb	Newton-meter	N·m
mile	mi	kilometer	km
miles per hour	mph	kilometers/hour	km/hr
ounce	oz	milliliter	ml
pounds per square inch	psi	kilopascals	kPa

Abbreviations

Abbreviations used in this manual are listed and defined below.

para paragraph P/N part number
ref reference

Cleveland

Wheels & Brakes



Two part numbering methods have been used by Cleveland over the years to identify products. The long form is an eight-digit (computer friendly) number and is used to identify detail and subassembly parts. The short form can contain both alpha and numeric characters. Past practices used the short form number on all of the products. Current practice is the use of the eight-digit format to identify all detail and subassembly components. Top assemblies are identified using the FAA TSO approval. These are usually short form numbers, but occasionally are long form, or neither form, depending on the era in which the approval was granted.

To convert from the short form to the long form use the following method:

1. Examples of converting older short version part numbers to the current eight-digit format is shown below:

Example: 65-144 becomes 065-14400

2. For numbers not ending in 00, replace the last two digits with a letter using the table below as a reference.

Example: 65-144C becomes 065-14403

01=A	06=F	11=L	16=R	21=W
02=B	07=G	12=M	17=S	22=X
03=C	08=H	13=N	18=T	23=Y
04=D	09=J	14=P	19=U	24=Z
05=E	10=K	15=Q	20=V	

Letter I and O are deleted, so as not to be confused with the numbers 1 and 0.

Cleveland

Wheels & Brakes



1. Wheel and Brake Assemblies

All wheel and brake combinations, Reference Figure 1, are matched components and qualified as such in accordance with Technical Standard Order (TSO) C26. Unauthorized substitution of wheel and brake components is a violation of the TSO of which the units are jointly qualified, and is prohibited.

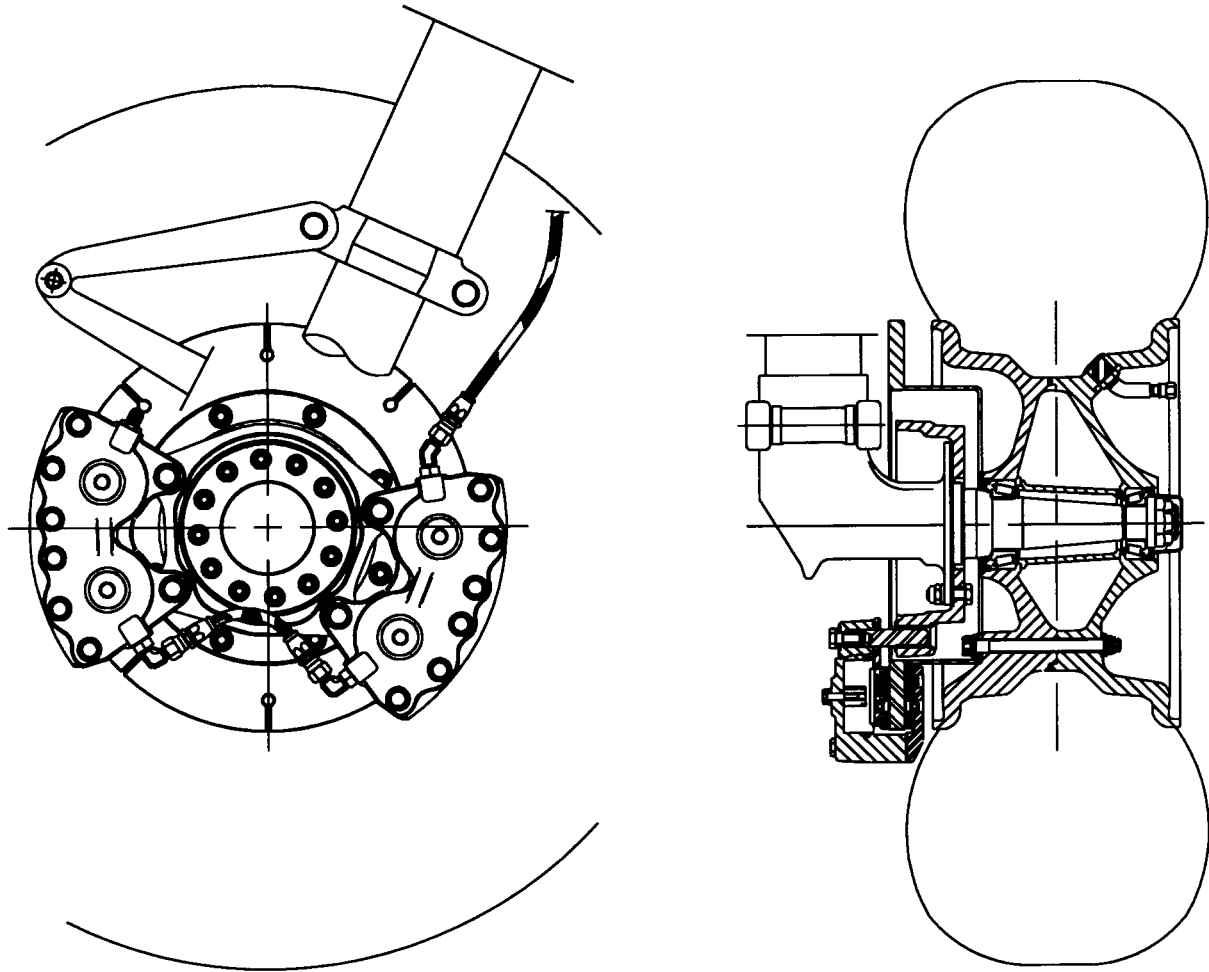


Figure 1 - Typical External Wheel and Brake

Cleveland

Wheels & Brakes



Description and Operation**2. Brake Assemblies**

The brake assembly and disc combination have been designed and qualification tested in accordance with Technical Standard Order (TSO) C26 and specific aircraft requirements to properly and safely decelerate the aircraft under various conditions. Unauthorized substitution of components can compromise brake effectiveness, is a violation of the qualification basis, and is prohibited.

A. Brake Description

The brake is an external caliper-type design. The cylinder (1), Ref. Figure 2, is a cast aluminum or magnesium housing. The pistons (7) are contained by the cylinder and form a pressure vessel for the brake fluid. Two anchor bolts are press fitted into the cylinder and are retained with nuts (12) and washers (13). The pressure plate (5) is held in position by the two anchor bolts. Back plate (4) is secured to the cylinder with bolts (2) and washers (3) on the opposite side of the brake disc. The back plate and pressure plate each hold brake linings (11). The cylinder is allowed to slide or float in torque plate (16) bushings. The torque plate is mounted to the landing gear axle. The caliper (cylinder assembly) is the assembly which includes the cylinder, pistons, back and pressure plates, linings, and other related components. Back plate to cylinder insulator shim (18) and piston to pressure plate insulator disc (17) are typically found on calipers that use the metallic based lining only. Specific illustrated parts breakdown for brake assemblies may be found in the product catalog.

B. Brake Operation

Hydraulic pressure, applied via the pilot's and co-pilot's master cylinders, enters the brake via lines connected to an inlet fitting on the caliper. The pressure then flows through the cylinder and forces the pistons outward against the pressure plate. The caliper should be free to slide on the torque plate assembly bushings allowing both pressure plate and back plate linings to contact the brake which will in turn contact the brake disc at precisely the same time.

The braking action generates a torque which transmits a braking force converting the kinetic energy into heat which is absorbed by the brake disc and surrounding components. This braking force is transmitted to the wheel and into the tire, bringing the aircraft to a stop. Whenever a maximum energy Rejected Take Off (RTO) has occurred the intrinsic heat buildup can be quite severe and the components are to be inspected for airworthiness and overhauled in accordance with these procedures or procedures established by the airframe manufacturer. Releasing toe pedal pressure will allow the hydraulic pressure to decay in the brake caliper removing pressure from the disc. The wheel should be free to rotate with minimal drag. Some caliper designs incorporate a mechanism on the piston that will retract the piston and attached pressure plate lining away from the disc. These units are self-adjusting and retract to obtain approximately 0.02 to 0.04 inch of lining clearance to the disc.

Cleveland

Wheels & Brakes



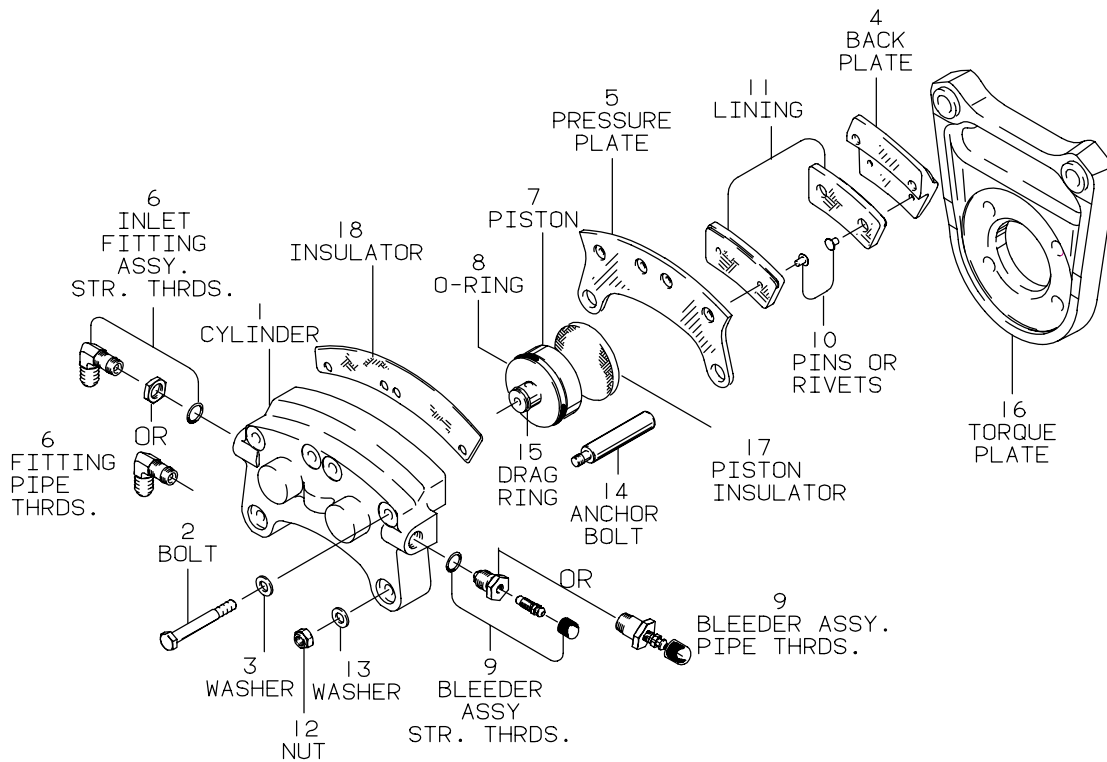


Figure 2 - Typical External Disc Brake

3. Wheel Assemblies

All aircraft wheels are designed and qualification tested in accordance with TSO C26 for a particular tire type and size matching the aircraft requirements. Operating a wheel assembly with unapproved tires, improper inflation pressures or subjected to loads in excess of its design is a violation of the wheel certification basis and is prohibited.

Description and operation of three different wheel assemblies is covered in the following text. The nose wheel assembly and the tail wheel assembly are sufficiently similar to consider together. The main wheel will be described separately. In each case, information is based on a typical wheel assembly. Specific Illustrated parts breakdown for wheel assemblies may be found in the Product Catalog.

Description and Operation

CAUTION: THE FELT GREASE SEALS ARE SHIPPED DRY. THEY MUST BE LUBRICATED TO PROVIDE PROTECTION AND LUBRICANT RETENTION FOR THE BEARINGS. IF THEY ARE NOT PROPERLY LUBRICATED THEN MOISTURE CAN SOAK PAST THE FELTS AND CONTACT THE BEARINGS WHICH CAN LEAD TO BEARING FAILURE. REFER TO PARAGRAPH 3.A AND 3.B BELOW.

A. Nose and Tail Wheel Description

Wheels are made from either aluminum castings, magnesium castings, or aluminum forgings. The wheel is of the divided type, incorporating inner wheel half (10) and outer wheel half (8), Ref. Figure 3, which are fastened together with tie bolts (7), washers (6), and nuts (5). An o-ring (9) fitted between the two wheel halves provides the air seal for wheels designed to operate with tubeless tires. The wheel rotates on two tapered roller bearings (4) which seat in bearing cups, shrink fitted into the hubs. Grease seals (3) provide protection and lubricant retention for the bearings. All new product shipped will have the bearings packed with the appropriate grease (refer to [Section 300 Off-Aircraft Maintenance, paragraph 3.A. Bearing Grease](#)). Felt grease seals are shipped dry. Remove the felt seals and lightly coat all surfaces of the felt with the wheel bearing grease and reinstall prior to wheel use. Hubcaps, when used, are secured to the outboard wheel half by a snap ring (1) or three attachment screws. Full wheel covers are fastened by three attachment screws.

B. Main Wheel Description

Wheels are made from either aluminum castings, magnesium castings, or aluminum forgings. The wheel is of the divided type, incorporating inner wheel half (10) and outer wheel half (8), Ref. Figure 4, which are fastened together with tie bolts (7), washers (6), and nuts (5). The brake disc (11) is attached to the wheel by the tie bolts. In a few designs, the brake disc bolts are threaded directly into inserts pressed into the back of the inboard wheel half. Wheels fall into two categories, tubeless and tube type. An o-ring (9) fitted between the two wheel halves provides the air seal for wheels designed to operate with tubeless tires. The wheel rotates on two tapered roller bearings (4) which seat in bearing cups in the hubs. Grease seals (3) provide protection and lubricant retention for the bearings. All new product shipped will have the bearings packed with the appropriate grease (refer to [Section 300 Off-Aircraft Maintenance, paragraph 3.A. Bearing Grease](#)). Felt grease seals are shipped dry. Remove the felt seals and lightly coat all surfaces of the felt with the wheel bearing grease and reinstall prior to wheel use. Hubcaps, when used, are secured to the outboard wheel half by a snap ring (1) or three attachment screws. Full wheel covers are fastened by three attachment screws.

C. Wheel Operation

The wheels, attached to the landing gear, support the tires and weight of the aircraft. The nose wheel provides a means of steering control, if so equipped. The main wheels transmit stopping forces from the brake to the ground.

Cleveland

Wheels & Brakes



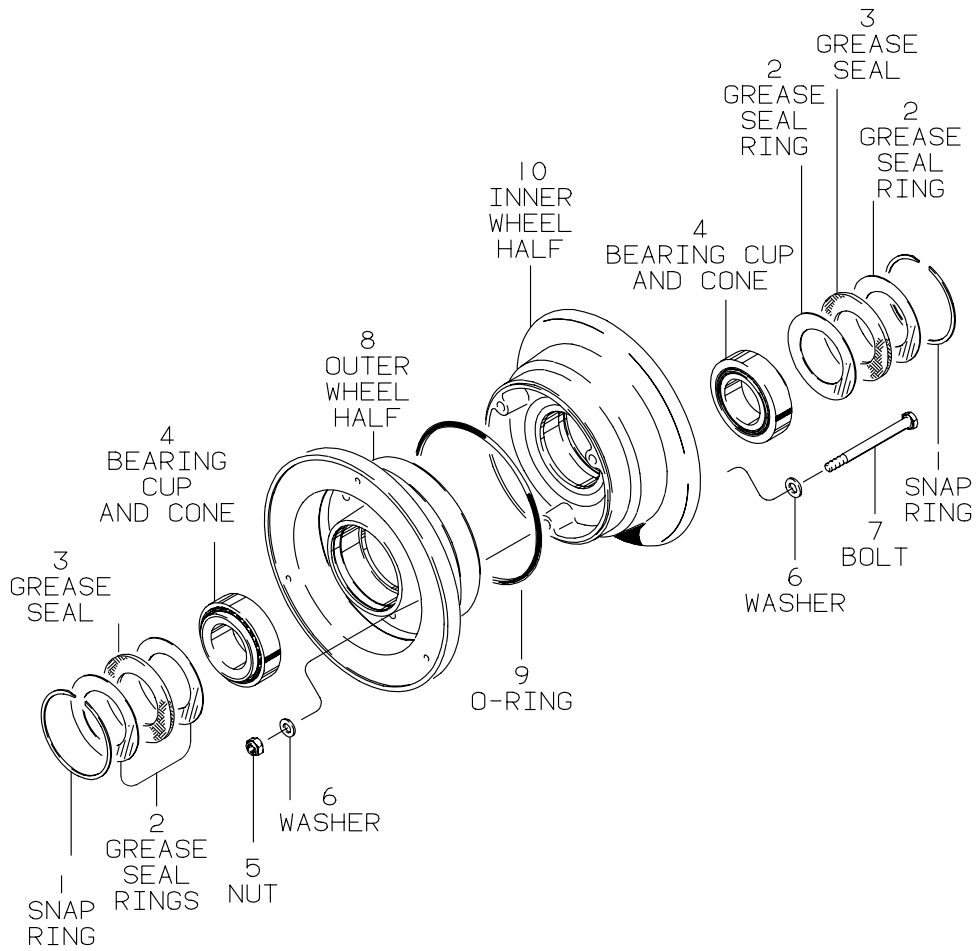


Figure 3 - Typical Nose/Tail Wheel Assembly

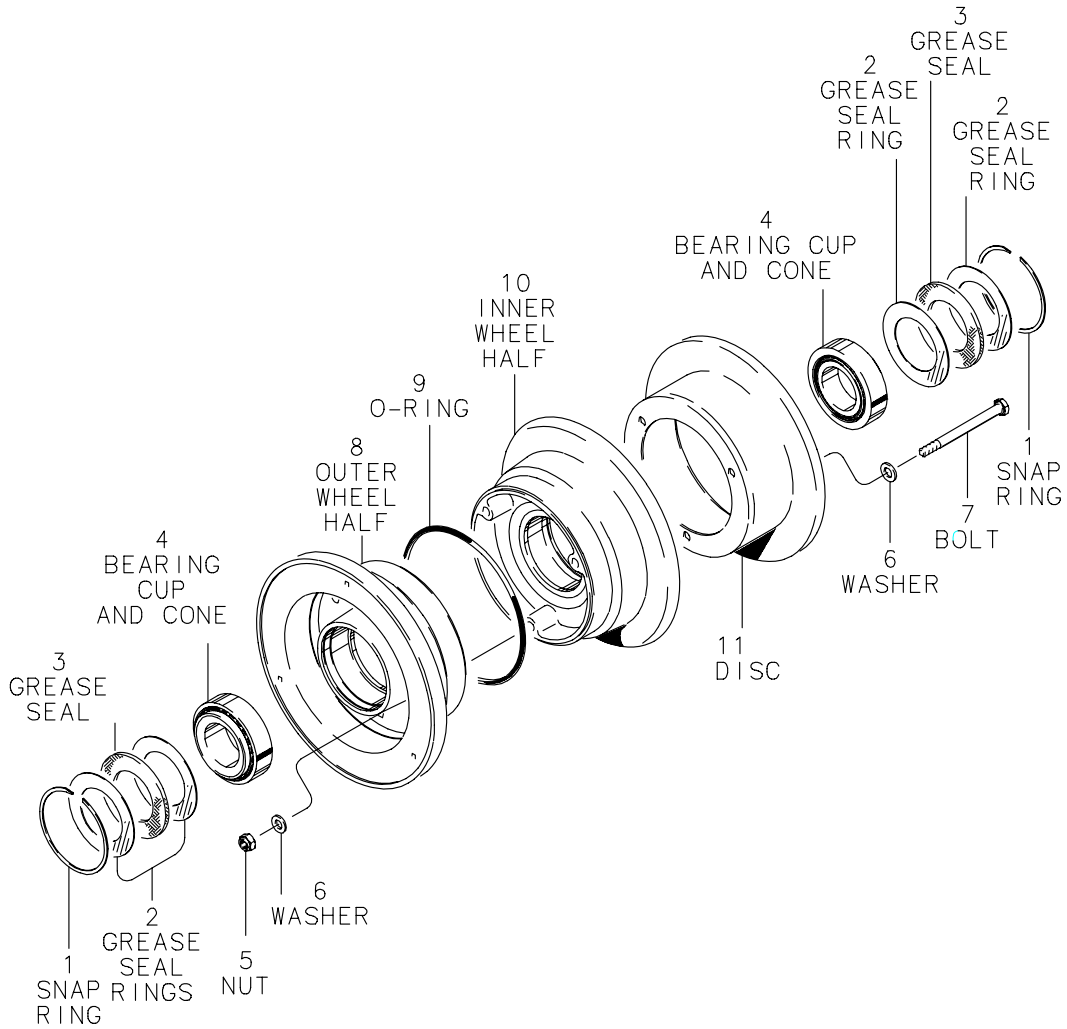


Figure 4 - Typical Main Wheel Assembly

1. General

This section provides information necessary to identify, diagnose, and correct potential problems which may occur with the wheel or brake assemblies.

2. Brake Assembly Troubleshooting

Refer to the troubleshooting chart in Table 101 for assistance in diagnosing brake related difficulties. When a correction has been identified for a particular problem, refer to the appropriate reference in either the ON-AIRCRAFT or OFF-AIRCRAFT MAINTENANCE sections of this manual, or if available, refer to individual wheel and brake maintenance manual for the specific aircraft application.

Table 101
Brake Assembly Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Unable to obtain sufficient hydraulic brake pressure; Excessive toe pedal travel; spongy pedal.	Air in hydraulic system.	Check for source, then bleed hydraulic system.
	Vent in master cylinder reservoir clogged.	Clean vent or overboard drain.
	Leak in system; brake, master cylinder, fittings, or lines.	Locate leak and repair.
	Defective master cylinder.	Replace or repair.
	Back plate bolts loose (not properly torqued), causing excessive brake deflection.	Torque bolts to proper value. See Torque chart in Appendix A.
	Excess bolt torque has caused back plate to crush cylinder, evidenced by depressions around bolt holes.	Replace cylinder and follow manufacturer's recommended torque values.
	Defective brake line (ballooning).	Replace.
	Improper adjustment of master cylinder rod length restricting the development of maximum stroke.	Adjust length per the aircraft maintenance manual.

Table 101 - Continued
Brake Assembly Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
2. Brake drag.	Piston cocked in cylinder, resulting in overheating brake and/or excessive lining wear.	Remove and repair cylinder or piston, or replace brake.
	Foreign matter wedged in brakes.	Locate and remove.
	Back pressure due to malfunction of master cylinder or parking valve.	Bleed hydraulic system and/or repair/replace master cylinder or parking valve.
	Water or ice in hydraulic system.	Flush and bleed hydraulic system (thaw ice first).
	Excessive bolt torque has caused back plate to crush cylinder, evidenced by depressions around bolt holes.	Replace cylinder and follow manufacturer's recommended torque value.
	Piston does not retract.	Bleed system and/or remove piston. Inspect for damage.
	Warped pressure plate.	Replace pressure plate or flatten to within 0.010 inch (0.254 mm).
	Rigid hydraulic line(s) prevents brake from floating freely. Flexible hydraulic lines are recommended.	Check free cylinder movement. Position cylinder and re-tighten fitting.
	Corroded anchor bolts and/or torque plate bushings.	Clean and lubricate or replace.
	Cocked anchor bolts and/or torque plate bushings.	Replace.
	Bent/cracked torque plate.	Replace.
	Warped brake disc - can be checked by laying a straightedge across disc face.	Replace and use caution during operation to prevent excessive energy input into brake.
	Out of position/stuck lining.	Repair/replace.
Restriction in hydraulic line.	Isolate and remove restriction.	
Lining not firmly seated flush against pressure/back plate.	Debur rivet hole on surface adjacent to lining.	

Cleveland

Wheels & Brakes



Table 101 - Continued
Brake Assembly Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
3. Rapid disc and lining wear.	<p>Dragging brakes.</p> <p>Improper conditioning of brake linings.</p> <p>Excessive rusting, scoring, or pitting of brake disc.</p> <p>Excessive back plate deflection caused by bent bolts or over torquing bolts.</p> <p>Incorrect lining and/or disc.</p>	<p>See Table 101, Trouble #2.</p> <p>See lining conditioning procedures, ON-AIRCRAFT MAINTENANCE PARA 2.b. (2)</p> <p>Clean or replace disc. Use factory chrome-plated disc where applicable.</p> <p>Check and replace bolts. Check torque per Appendix A.</p> <p>Replace with correct parts.</p>
4. Brakes won't hold.	<p>Contaminated lining.</p> <p>Improper conditioning of brake linings.</p> <p>Lining worn below minimum wear limits.</p> <p>Discs worn below minimum wear limits.</p> <p>Insufficient hydraulic pressure.</p> <p>Organic brake lining carburized (overheated).</p> <p>Pressure plate contacting torque plate assembly.</p> <p>New Lining installed with old disc, Lining not seated in wear track creating partial contact with disc.</p>	<p>Replace lining.</p> <p>See lining conditioning procedures, ON-AIRCRAFT MAINTENANCE para 2.B. (2).</p> <p>Replace lining. Refer to Appendix A.</p> <p>Replace discs. Refer to Appendix A.</p> <p>See Table 101, TROUBLE #1</p> <p>Replace lining.</p> <p>Check for correct torque plate/wheel installation.</p> <p>Replace excessively worn disc.</p>

3. Wheel Assembly Troubleshooting

Refer to the troubleshooting chart in Table 102 for assistance in diagnosing wheel related difficulties. When a correction has been identified for a particular problem, refer to the appropriate reference in either the ON-AIRCRAFT or OFF-AIRCRAFT MAINTENANCE sections of this manual, or if available refer to the specific wheel and brake maintenance manual for that equipment.

Table 102
Wheel Assembly Troubleshooting

TROUBLE	PROBABLE CAUSE	CORRECTION
1. Cracked or distorted wheel or wheel half.	Hitting rocks or other hard objects during landing or takeoff.	Inspect wheel using Zyglo to determine condition. Replace wheel or wheel half.
	CAUTION: DO NOT ATTEMPT TO WELD OR REPAIR CRACKS IN WHEEL HALVES.	
	Use of sharp objects to break tire bead.	Replace wheel or wheel half.
	Landing with flat tire or abnormally hard landing.	Replace wheel or wheel half.
	Landing in crabbing position in crosswind causing excessive side force.	Replace wheel or wheel half.
2. Damaged bearing cone.	Normal fatigue failure when used beyond expected wheel life.	Replace wheel or wheel half.
	Misalignment of bearings.	Replace bearing cone being sure it is properly seated in bearing bore.
	Axle nut improperly torqued.	Replace and torque axle nut to aircraft manufacturer's specifications.
	Foreign matter in bearing grease.	Check grease seals for damage. Replace seals and be sure bearing grease is free from foreign matter.
3. Worn or damaged grease seals.	Lack of bearing grease.	Replace bearings and repack with grease.
	Normal wear or improper installation.	Replace grease seals.

CAUTION: RUNWAY ANTI-ICING FLUIDS AND CERTAIN DISINFECTANTS USED TO PREVENT THE SPREAD OF HOOF AND MOUTH DISEASE HAVE BEEN FOUND TO HAVE ADVERSE EFFECTS ON THE AIRCRAFT WHEEL AND BRAKE SYSTEM COMPONENTS. A HIGHER DEGREE OF PREVENTATIVE MAINTENANCE IS REQUIRED IN THOSE AREAS USING SUCH AGENTS.

1. General

This section covers maintenance which can be performed while the wheel and brake assemblies remain attached to the aircraft.

2. Brake Assemblies

On-aircraft maintenance of brake assemblies is essentially limited to inspection of the assembly and replacement of the linings.

A. Brake Inspection

- (1) Visually inspect the brakes for corrosion, cracks, or other visible damage. Check inlet fitting bosses and anchor bolt lugs for cracks. Check inlet flares on aircraft side of rigid hydraulic tubing for fatigue cracks.
- (2) Check back plate attachment bolts to insure they are properly torqued and have not worked loose. Gaps between the back plate and cylinder would be evidence of this.
- (3) Check fit of brake cylinder anchor bolts in torque plate bushings for sloppiness. This can be accomplished by grasping the cylinder and moving it; slight movement is normal. Excessive movement is cause for removal and detailed inspection.
- (4) Linings should be visually checked for extreme chipping on the edges. Lining worn to a minimum thickness of 0.100 inch (2.54 mm) must be replaced. ([Ref. Appendix A for more details.](#))
- (5) Visually check torque plate for corrosion, cracks, loose anchor bolt bushings, or other visible damage. Anchor bolt bushings must be flat against torque plate surface.
- (6) Check for any brake fluid leaks. Organic linings which have been contaminated with fluid should be replaced.

B. Corrective Maintenance of Brakes

On-aircraft corrective maintenance of the brake assembly involves replacement of the linings. This maintenance procedure may be accomplished without raising the aircraft or removing the main wheel.

(1) Replacement of Brake Linings

Metallic or organic linings are used in different brake assemblies. The minimum wear thickness for replacement of metallic and organic linings is 0.100 inch (2.54 mm). [Ref. Appendix A, Figure A1](#). The metallic lining is a sintered metal composition and is attached by torque pins which press fit into the back surface (steel carrier plate) of the lining. The holes for the pins are not visible on the lining surface unless the lining is worn beyond its wear limit. [Ref. Figure 202](#).

The organic brake lining is identified by its semi hard composition and rivets used to attach the lining to the pressure plate or back plate. The rivet holes are visible on the lining. Non asbestos, lead free lining material is also being used as a replacement for the old style organic lining and is removed and installed in the same manner as the organic lining. [Ref. Figure 203](#). [Appendix C](#) provides a brake assembly / lining cross-reference information. Once it is determined which type lining is being replaced, follow the appropriate instructions listed below.

(a) Removal of Linings from Calipers

Proceed as follows for metallic or organic linings.

WARNING: BLOCK WHEELS AND INSURE THAT PARKING BRAKE IS IN OFF POSITION.

- 1 Remove back plate attaching bolts and washers, and remove back plates, shims, and insulators (if applicable).
- 2 Carefully slide brake caliper out of torque plate bushing.
- 3 Slide pressure plate assembly (lining carrier) off anchor bolts.

(b) Inspection of Caliper and Torque Plate Assembly

Inspect the caliper for corrosion, bent anchor bolts, cracks around bolts, cracks around anchor bolt lugs and inlet fittings, and other visible damage. Inspect the torque plate assemblies for corrosion around anchor bolt bushings and excessive wear in bushings.

(c) Replacement of Metallic Linings

- 1 On models so equipped, remove center retention rivet, by drilling out with a 1/8-inch drill.

- 2 Pry off old lining using a screwdriver.
- 3 Clean pressure plate and back plate surfaces of dirt, grease, etc. before installing new linings.
- 4 Inspect pressure plate and back plates for excessive warping. Straighten pressure plate to less than 0.010 inch (0.254 mm) flatness, as shown in Figure 201.

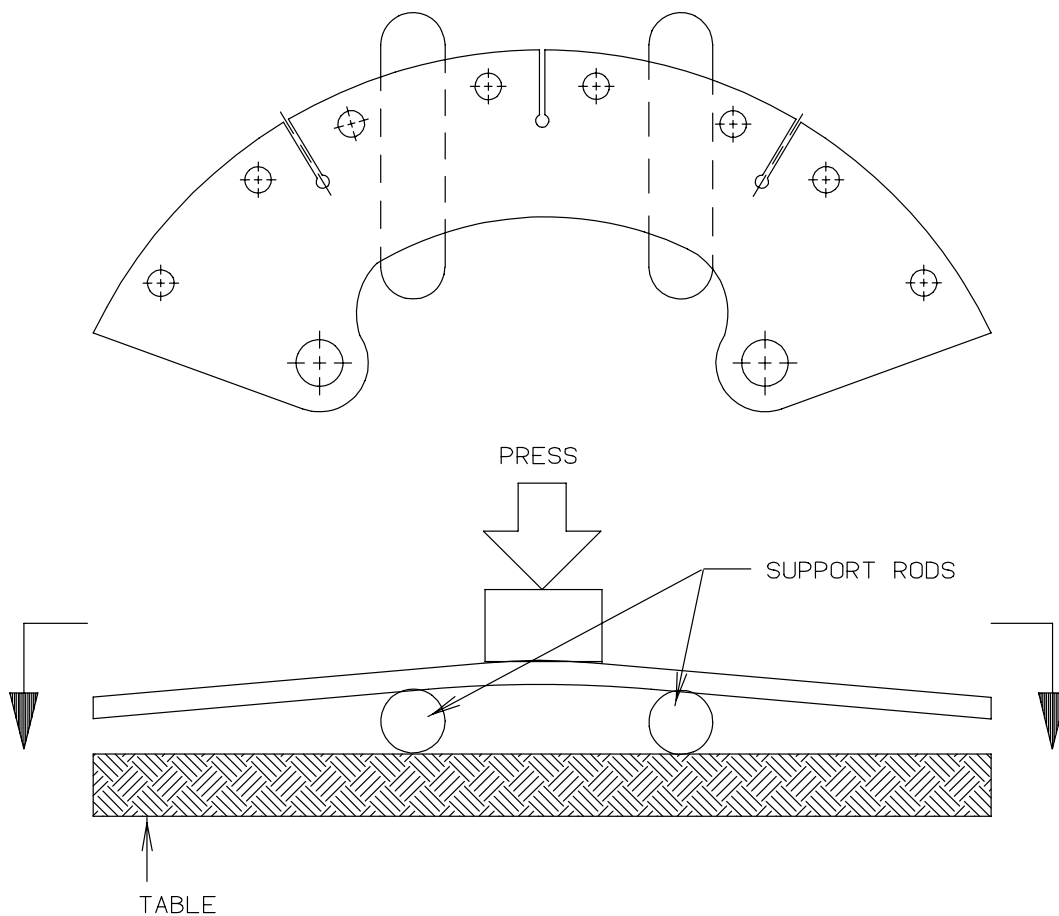


Figure 201 - Pressure Plate Straightening

- 5 Check lining attachment pins for mushroomed heads or other visible damage. Damaged attachment pins may be replaced by carefully drilling out the pins. Ref. Figure 202 and 204.
- a Install replacement pin in holes in pressure plate or back plate with tail of pin toward the counterbored side of part.
 - b Hole locations in pressure plates / back plates should allow installation of lining after pin upset.
 - c Place pins and pressure plate or back plate on a flat metal surface.
 - d Using Cleveland's 199-1 Rivet Set Kit orbital or screw type press, install pins on pressure plate or back plate.
 - e On models so equipped, install center retention rivet.
 - f Check to be sure pins are tight and movement free with no distortion of parts.
 - g Refer to Figure 204 for rivet / pin installation acceptance criteria.
- 6 Apply a light film of spray adhesive to metal backing of lining and install lining segment onto pins. Check to insure metal backing is tight against the pressure plates / back plates.
- NOTE:** The adhesive is used to maintain position of lining until brake is assembled onto disc, and will be burned off in the first few stops. Lining will remain in place on assembly trapped between the brake disc and pressure / back plates.
- 7 On design so equipped, install the center retention rivet as shown in Figure 203.

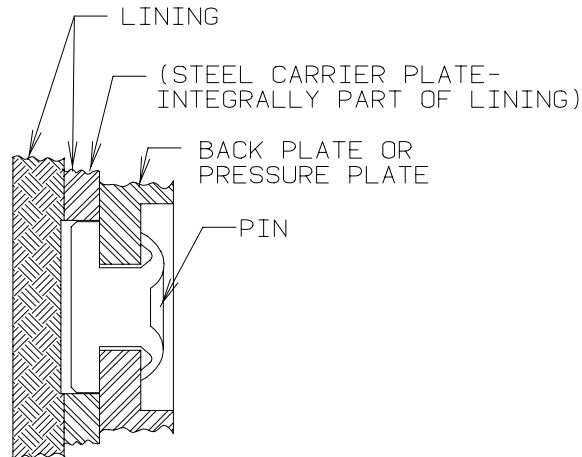


Figure 202 - Pin Installation, Metallic Lining

(d) Replacement of Organic Linings

- 1 Old organic lining may be removed by using a small drift pin or carefully drilling out the rivets with a 1/8-inch diameter drill. Use care to prevent elongating the rivet holes. Deburr the surface adjacent to the lining to allow lining to set flush.
- 2 Clean pressure plate and back plate surfaces of dirt, grease, etc. before installing new linings.
- 3 Inspect pressure plate and back plate for excessive corrosion, visible damage, or excessive warping. Pressure plate should not be used if warped in excess of 0.010 inch (0.254 mm) flatness, by using draw flattening or straightening techniques. Ref. Figure 201. Excessive warping can result in brake drag, especially when new disc and linings are installed.
- 4 Align new factory authorized replacement lining segments on pressure plate/back plates and install rivets of corresponding part number, using Cleveland's Rivet Set, P/N 199-1, or appropriate riveting tools.
- 5 Check to be sure lining is tight and movement free with no distortion of parts.

- 6 With tubular rivets, splits may result from the clinching operation. Refer to rivet sketch, Figure 204, for acceptance criteria.

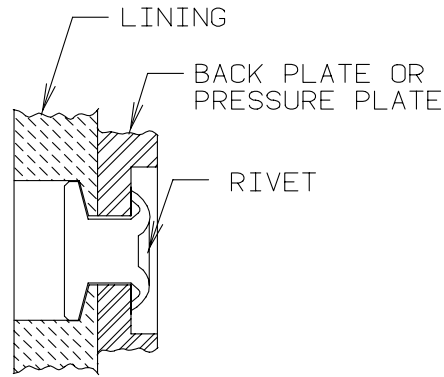


Figure 203 - Rivet Installation, Organic Lining

(e) Rivet / Pin Installation Acceptance Criteria

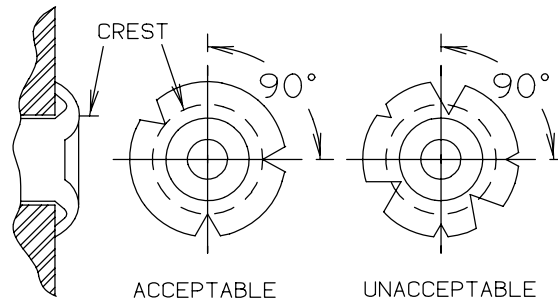


Figure 204 - Rivet / Pin Installation Acceptance Criteria

- 1 The split shall not occur inside the crest of the clenched surface.
- 2 No more than two splits shall occur in a 90° area
- 3 A total of no more than three splits shall be allowed.

- (f) Reassembly of Metallic or Organic Linings to Caliper
- 1 Carefully wipe dirt, grease, etc. from cylinder, pressure plate, and portions of piston extending beyond cylinder face, and push piston back into cylinder.
 - 2 Slide pressure plate with new lining over anchor bolts and install brake caliper into torque plate. For equipment that is operated in an amphibious environment, or in extremely wet climates, lubricate the anchor bolt with Lubriplate. For equipment used in a non-amphibious environment, lubricate anchor bolt with a dry film lubricant (silicone spray). **DO NOT USE GREASE OR OIL.** These materials will attract dirt and enhance the wear of the anchor pins.
 - 3 Install back plate attachment bolts and washers in brake caliper.
 - 4 Install insulator shims (typically used with metallic lining) and spacers as applicable.
 - 5 Slide back plates between brake disc and wheel/tire and install back plate attachment bolts and washers into back plates.
 - 6 Torque brake assembly back plate tie bolts to values listed in [Appendix A](#). Two different types of back plate tie bolts are used. The patch lock bolt (nylon material embedded in threaded end) will require replacement after 6 to 8 installations or whenever the bolts can be run in past the locking feature by use of fingers only. Bolts with drilled heads require safety wire after torquing.

- (g) Installation of 066-00504 Lining to Brake Shoe
- 1 Using an 1/8 inch drill bit, drill out six rivets and remove the old lining from brake shoe.
 - 2 Clean and deburr brake shoe as needed.
 - 3 Place new lining on brake shoe, centered as closely as possible onto lining mount surface. Using a scribe, mark centerline location of 6 holes to be drilled in new lining.
 - 4 Drill and counterbore lining as shown in Figure 205 (6 places).
 - 5 Mount new linings onto shoe with 6 rivets, P/N 105-00300; rivet head to seat to bottom of lining counterbore.

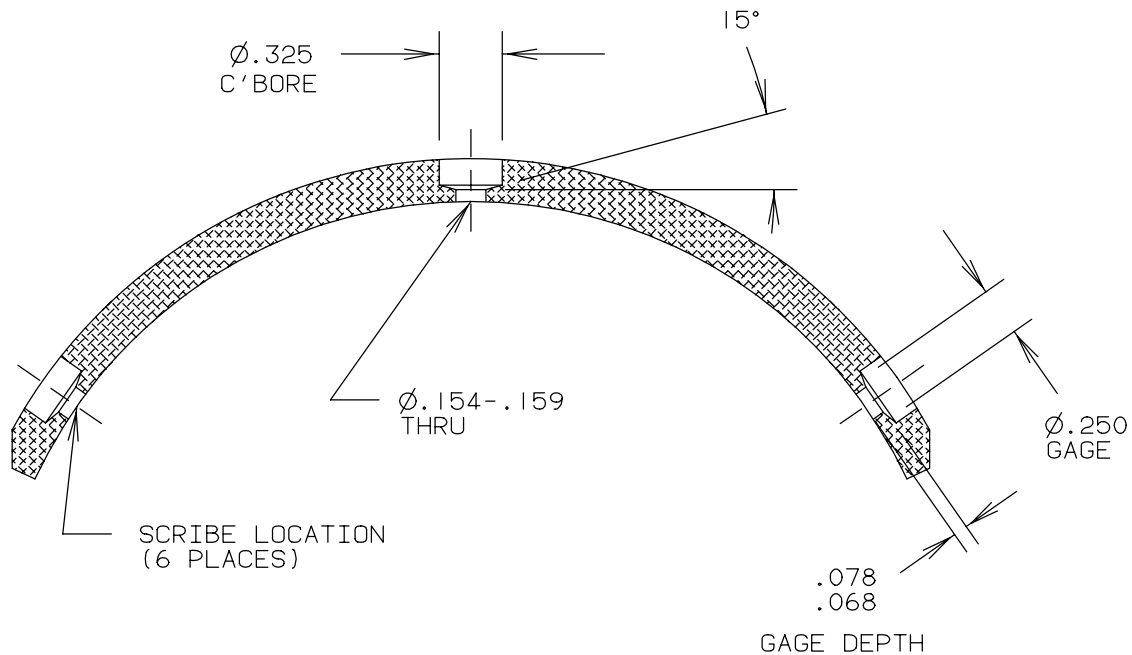


Figure 205 - Installation of 066-00504 Lining to Brake Shoe

(2) Lining Conditioning Procedures

When new linings have been installed, it is important to condition them properly to obtain the service life designed into them. The metallic and organic linings are not conditioned in the same manner because they have different operating characteristics. Separate conditioning procedures are given for metallic and organic linings.

NONASBESTOS ORGANIC LININGS

1. Taxi aircraft for 1500 feet with engine at 1700 rpm applying brake pedal force as needed to develop a 5-10 mph taxi speed.
2. Allow the brakes to cool for 10 to 15 minutes.
3. Apply brakes and check for restraint at high static throttle. If brakes hold, conditioning is complete.
4. If brakes cannot hold aircraft during static run up, allow brakes to completely cool, and repeat steps 1 through 3.

METALLIC LININGS

1. Perform two (2) consecutive full stop braking applications from 30 to 35 knots. Do not allow the brake discs to cool substantially between the stops.
2. Allow the brakes to cool for 10-15 minutes.
3. Apply brakes and check for restraint at high static throttle. If brakes hold, conditioning is complete.
4. If brakes cannot hold aircraft during static run-up, allow brakes to completely cool, and repeat steps 1 through 3.

CAUTION: DUE TO THE EFFICIENCY OF THESE BRAKES, EXTREMELY HARD BRAKING ON AIRCRAFT WITH TAIL WHEELS COULD RESULT IN LIFTING THE TAIL FROM THE GROUND.

This conditioning procedure will wear off high spots and generate sufficient heat to create a thin layer of glazed material at the lining friction surface. Normal brake usage should generate enough heat to maintain the glaze throughout the life of the lining.

Properly conditioned linings will provide many hours of maintenance free service. A visual inspection of the brake disc will indicate the lining condition. A smooth surface, one without grooves, indicates the linings are properly glazed. If the disc is rough (grooved), the linings must be reglazed. The conditioning procedure should be performed whenever the rough disc condition is observed. Light use, such as in taxiing, will cause the glaze to be worn rapidly.

3. Wheel Assemblies

On-aircraft maintenance of wheel assemblies is limited to inspection of wheel assemblies. Inspections of the nose and trail wheels and of the main wheel are treated separately as follows.

A. Nose and Tail Wheel Inspection

Perform on-aircraft inspection as follows:

- (1) Visually inspect the wheels for corrosion, cracks, or other visible damage.
- (2) Check wheel nuts to be sure they are properly installed and have not worked loose. Bolt threads should be flush to 1.5 threads extending beyond the nut.

B. Main Wheel Inspection

Perform on-aircraft inspection as follows:

- (1) Visually inspect the wheels for corrosion, cracks, or other visible damage.
- (2) Check wheel nuts to be sure they are properly installed and have not worked loose. Bolt threads should be flush to 1-1/2 threads extending beyond the nut. Nuts should be on the side of wheel opposite the brake disc (outboard side of wheel), except in those cases where spline nuts and bolts are used to secure wheel halves.

NOTE: Brake Disc cracks are not allowed unless covered by a PRM (Product Reference Memo) or SB (Service Bulletin) issued specifically for a brake disc.

- (3) Inspect the brake disc for rust, excessive grooves, large cracks, or other visible damage. Refer to [Appendix A](#).

4. Tires

On-aircraft maintenance of tires is limited to inspection and air pressure maintenance.

A. Tire Inspection

- (1) Visually inspect tires for cuts, flat spots, and tread or sidewall damage.
- (2) Check inflation pressure. Proper inflation will provide maximum tire and wheel life.
 - (a) Pressure should be checked daily, when tires are cool.
 - (b) Tubeless tires have an allowable 5% pressure loss in any 24-hour period.
- (3) Refer to tire manufacturer's service and maintenance manuals for recommended servicing procedures.

Cleveland

Wheels & Brakes



1. General

The following maintenance to brake assemblies and wheel assemblies is intended to be performed while these assemblies are off the aircraft.

2. Brake Assembly Maintenance

This section provides complete repair and refinishing instructions for the brake assembly. When servicing the brake assembly, careful handling of the brake components will assure optimum service life and trouble free operation.

CAUTION: A PRESSURE TEST [[PARAGRAPH 2.D. \(5\)](#)] IS REQUIRED WHENEVER THE FOLLOWING OCCURS:

- ANY REPAIR TO THE CYLINDER PRESSURE CHAMBER OR PISTON.
- ANY TIME A PISTON OR O-RING IS REMOVED WHICH CAN CAUSE DAMAGE TO THE O-RING; OR A NEW O-RING IS INSTALLED WHICH MAY UNKNOWINGLY BE DEFECTIVE.

THE BRAKE CYLINDER AND TORQUE PLATE SHOULD BE PROPERLY MAINTAINED TO PROTECT THE PAINT AND SURFACE FINISHES; EXPOSED ALUMINUM OR MAGNESIUM IS SUSCEPTIBLE TO CORROSION. NICKS, SCRATCHES, AND OTHER DAMAGE CAUSED BY IMPROPER HANDLING OF BRAKE PARTS DURING MAINTENANCE INVITE CORROSION, WHICH IF UNATTENDED, COULD LEAD TO FATIGUE CRACKS AND BRAKE FAILURE.


A. Removal From Aircraft

NOTE: Wheel removal is not necessary unless brake torque plate is to be removed.

The following procedure describes how to remove the brake assembly from the main wheel.

WARNING: INSURE PARKING BRAKE IS IN OFF POSITION AND WHEELS ARE BLOCKED.

- (1) Remove and cap hydraulic line attached to brake. Cap brake inlet fitting.
- (2) Remove back plate tie bolts and washers, and remove back plate.
- (3) Carefully slide brake cylinder out of torque plate.
- (4) If torque plate removal is required, remove wheel/tire per wheel removal instructions in [paragraph 3. Wheel Assembly Maintenance](#).

SAFETY WARNING  : DEFLATE TIRE IMMEDIATELY AFTER JACKING AIRCRAFT AND BEFORE AXLE NUT IS LOOSENED. FAILURE TO DEFLATE TIRE BEFORE WHEEL REMOVAL COULD RESULT IN SEVERE PERSONAL INJURY

- (5) Remove torque plate attachment bolts, nuts, and washers. Note the torque plate mounting rotational orientation for reinstallation.
- (6) Remove torque plate.

B. Brake Disassembly


- (1) Disassembly Procedures

The following disassembly procedures for the removed brake assembly also apply to dual-caliper brakes. Disassembly should be performed only to the level required to effect necessary repairs. Refer to [Figure 2, DESCRIPTION AND OPERATION](#) section for a general illustration, or to the [Product Catalog](#) for the specific illustration of the unit being disassembled.

CAUTION: DISASSEMBLE BRAKE ON A CLEAN, CUSHIONED, FLAT SURFACE, BEING CAREFUL NOT TO NICK, SCRATCH, OR GOUGE BRAKE PARTS.

NOTE: Inspect parts in the dirty condition, as removed, for sources of leakage, damage, corrosion, and moisture in brake fluid.

- (a) Separate assembled cylinder (1) and torque plate (16). Brake assemblies that use metallic lining will also incorporate a thermal insulator shim (18) located between the back plate (4) and cylinder (1), and piston insulator (17), pressed into piston pocket, isolating piston (7), and pressure plate (5).
- (b) Remove back plate attachment bolts (2) and washers (3). Separate cylinder (1) and back plate (4).
- (c) Remove pressure plate (5) by sliding over anchor pins (14).
- (d) Remove inlet fitting.
- (e) On brakes so equipped, remove external retract mechanism from back of caliper. Note position of components for reassembly purposes.

SAFETY WARNING  : USE CAUTION IN BLOWING PISTONS OUT OF CYLINDER WITH AIR, AS PISTONS COULD FLY OUT AT HIGH VELOCITY. IT IS SUGGESTED THAT THE CYLINDER BE TURNED OVER SO THAT PISTONS FACE WORKING SURFACE. USE A RAG TO CUSHION PISTON CONTACT WITH SURFACE TO PREVENT PISTON DAMAGE. SAFETY GLASSES SHOULD BE WORN TO PROTECT EYES AND PREVENT DIRT OR BRAKE FLUID FROM ENTERING EYES.

DEATH OR SERIOUS INJURY COULD OCCUR IF COMPRESSED AIR IS DIRECTED AGAINST THE SKIN. MAXIMUM PRESSURE SHALL NOT EXCEED 20 PSI (138 kPa). WHEN WORKING WITH COMPRESSED AIR ALWAYS USE CHIP GUARDS, EYE PROTECTION, AND OTHER PERSONAL PROTECTIVE EQUIPMENT.

- (f) Remove pistons (7) by injecting air into the ports (15 to 20 psi) [103 to 138 kPa] maximum pressure.

NOTE: Some pistons are equipped with a friction spring (drag ring) on the piston tail. It is recommended that this ring not be removed unless it is damaged or corroded. Ref. Figure 301.

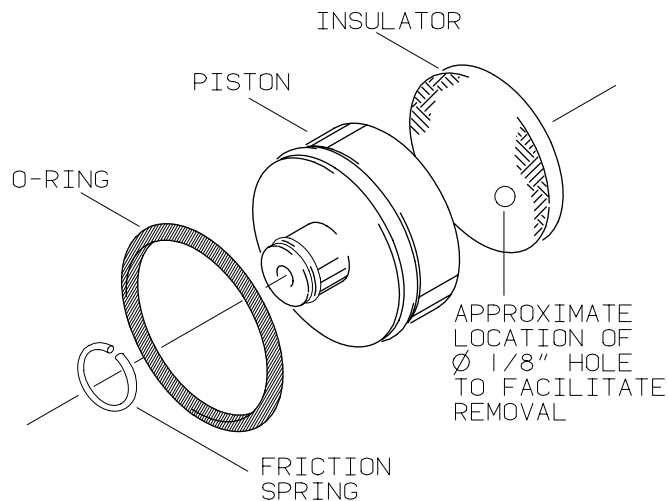


Figure 301 - External Piston Guide

- (g) Remove o-rings (8) from either pistons or cylinder. It is recommended that o-rings be replaced at reassembly. However, if necessary, o-rings may be reused if not damaged, cut, or deteriorated.

CAUTION: CARE SHOULD BE USED IN HANDLING O-RINGS TO PREVENT DAMAGE.

- (h) If possible, it is always best to remove o-rings without the use of tools. This may be accomplished as follows:

Securely holding piston in one hand, using opposite hand, form a “V” with thumb and index finger and push directly against o-ring to extrude it away from the piston groove on opposite side of piston. Push until outside diameter of the piston matches the natural radius on your hand between the index finger and thumb. Piston should now be held firmly in place with this hand. Grip extruded o-ring on opposite side and remove from piston.

If this method is unsuccessful use Cleveland’s O-ring Extractor Kit, P/N 199-18, for o-ring removal.

- (i) A piston to pressure plate insulator disc is used on brake assemblies with metallic linings. Constant heat and pressure will compress the insulator over time. Replace the insulator when it is flush with the head of the piston. Drill 1/8” diameter hole directly into insulator approximately .10 inches deep, slightly off center, but not close to outside diameter of piston. Use small screwdriver working through the 1/8” diameter hole, lift and pry off insulator disc.

- (j) Remove bleeder fitting (9), rubber caps, and o-rings from cylinder.

NOTE: Some designs have an internal piston guide (inside of the piston) attached to the cylinder by a bolt, washer, and Stat-O-Seal. It is recommended that this unit not be removed unless it is damaged or corroded. Ref. Figure 302. If Stat-O-Seal is removed, replace it. Do not reuse as it will not re-seal properly.

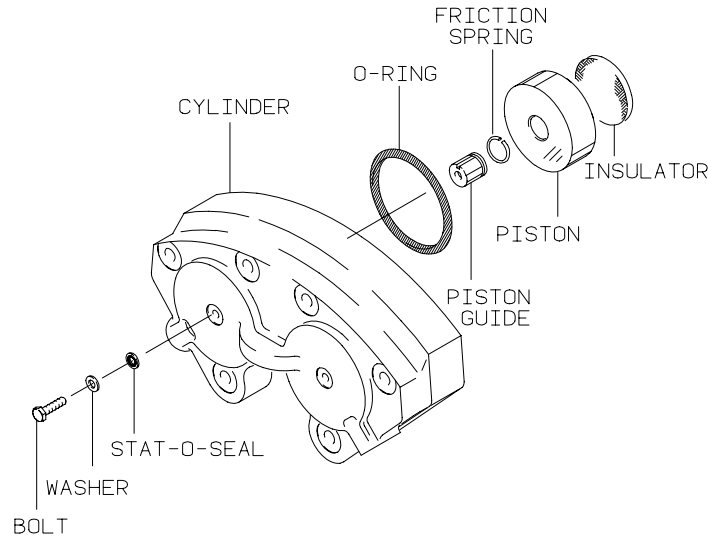


Figure 302 - Internal Piston Guide

(2) Lining Removal

Removal of the linings is unique for both metallic and organic linings. The following text explains how to identify whether a lining is metallic or organic and gives step-by-step removal procedures. The minimum wear thickness on metallic and organic linings is 0.100 inch (2.54 mm) thickness. [Ref. Appendix A, Figure A1](#). A brake assembly / lining cross-reference list is located in [Appendix C](#).

(a) Removal of Metallic Linings

The metallic lining is a hard composition and is attached by pins which press fit into the back surface (steel carrier plate) of the lining. [Ref. Figure 202](#). The holes for the pins are not visible on the lining surface unless the lining is worn beyond its wear limit. Remove as follows:

NOTE: On some designs with a wide face lining, a rivet is also used for retention.

- 1 Pry lining off pressure plate/back plate with a thin screwdriver.
- 2 Damaged attachment pins may be removed by carefully drilling out the pin.

(b) Removal of Organic Linings

The organic brake lining is identified by its semi hard composition and rivets used to attach the lining to the pressure plate. The rivet holes are visible on the lining. Remove as follows:

- 1 Being careful not to enlarge holes in pressure plate/back plate, drill out rivets attaching lining with a 1/8-inch diameter drill.
- 2 Separate lining from pressure plate/back plate.

(3) Anchor Bolt Removal

- (a) Remove anchor bolt attachment nuts (12) and washers (13). The anchor bolts should be removed by using an arbor press. Ref. Figure 303.
- (b) Place on a clean, flat surface to prevent damage and nicks to soft cylinder material.

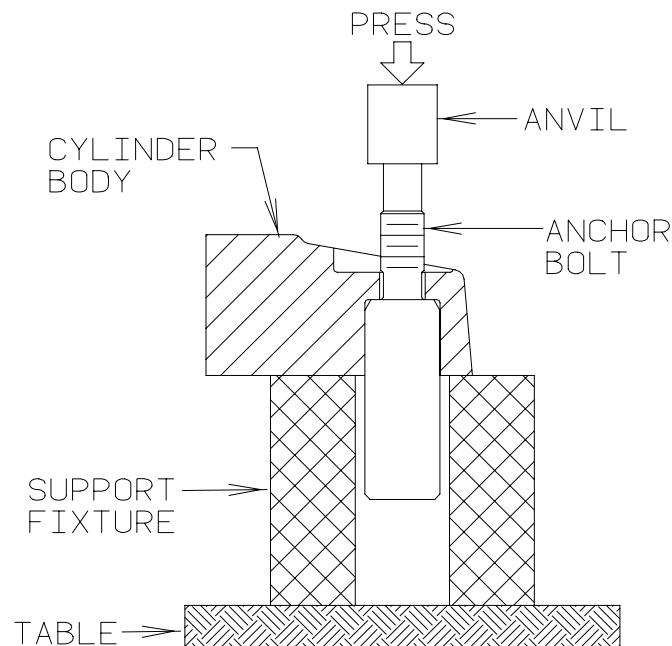


Figure 303 - Anchor Bolt Removal

C. Inspection

NOTE: Parts of the inspection procedure require removal of paint. Refer to Section 4 for information concerning paint removal and refinishing of these parts.

- (1) Visually inspect cylinder for cracks, nicks, corrosion, or other damage. Cracks in the lug area around the anchor bolts or the port bosses are cause for replacement of the cylinder. Check for dimpled areas around back plate bolt holes. Maximum allowable depression is 0.005 inch (0.127 mm). Ref. Figure 304.
- (2) Inspect the fitting ports and piston bores for contamination. Light scratches or nicks in the piston bores, pilot bores, or on the chamfered surfaces within these bores may be hand polished with 600 grit emery. Power tools are not recommended as they may remove excessive amounts of material. Thoroughly clean part.

NOTE: Heavy scratches, nicks and burrs in the pilot bore area can prevent the pistons from properly retracting, resulting in brake drag.

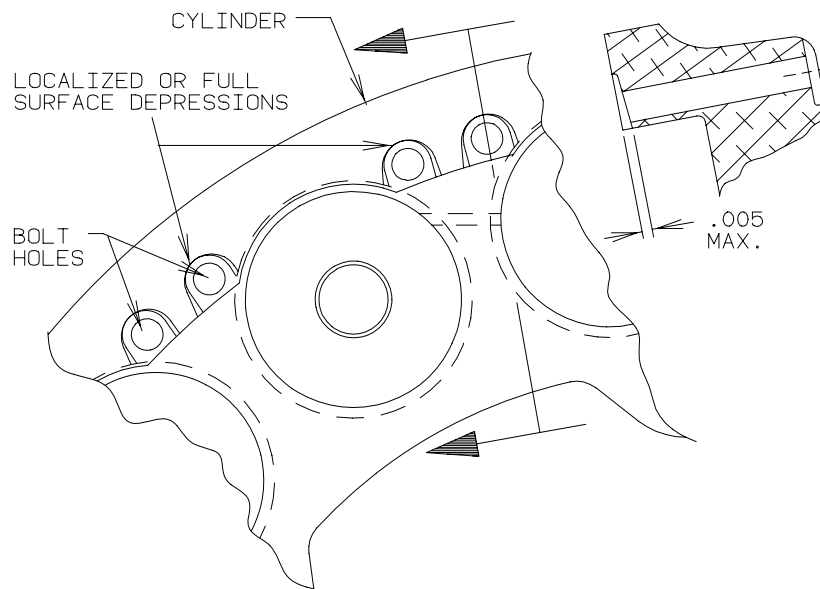


Figure 304 -Cylinder To Back Plate Surface Inspection

- (3) Replace o-rings with o-rings of corresponding part numbers. If necessary, o-rings may be reused in the same position from which they were removed if not damaged. Inspect o-rings for cuts, nicks, distortion, or excessive wear. Check to be sure o-ring has not become brittle. Refer to o-ring removal procedure in paragraph 2B (1)(h).

Cleveland

Wheels & Brakes



- (4) Inspect pistons for nicks or burrs. Check the piston tail for damage, and replace piston if damaged beyond repair. Remove nicks or burrs by hand polishing with 600 grit emery paper. Thoroughly clean part.
- (5) Inspect brake lining for edge chipping and surface deterioration. Normal use will result in some edge chipping. A maximum of 10 percent surface loss is acceptable. Minor accumulation of metal chips in lining is normal and not detrimental. Elongated rivet or pin holes is cause for replacement. Smearing of lining material on the brake disc which exceeds 30 percent of the surface is cause for replacement.

NOTE: Any fluid contamination of organic brake lining is cause for replacement.

- (6) Inspect back plates and pressure plate for cracks, nicks, rust, warping, stripped threads, elongated holes, or other damage. Small nicks and light corrosion may be hand finished using emery of 600 grit sandpaper. Any area from which the protective coating is removed should be thoroughly cleaned and treated per instructions in [Chapter 4](#) of this section.

NOTE: Slightly warped pressure plates can be cold straightened, Ref. Figure 201. When laid on a flat surface, flatness should be within 0.010 inch (0.254 mm). Warped pressure plates can cause brake drag.

- (7) Inspect anchor bolt bushings in torque plate for internal corrosion or contamination. If present, clean with emery and apply a light coat of dry film lubricant, (Silicone-Spray). **DO NOT USE GREASE OR OIL.** Exercise care in removing corrosion from torque plate bushings to prevent material removal.

NOTE: Cast torque plates have bushings press fit into the casting. The unit must be replaced as an assembly. Individual components are not available.

- (8) Check for steps in bushing holes, which indicate severe cocking of the cylinder anchor bolts in the torque plate. Bushing damage is cause for torque plate replacement.

NOTE: Bushings installed in cast torque plates must have the lip of the bushing seated flat against the machined torque plate surface.

- (9) Check the anchor bolt bushings and mounting bolt hole areas for elongation or cracks. Badly elongated holes or cracked torque plates should be replaced with a new torque plate of corresponding part number. Minor corrosion on the torque plates should be removed with 600 grit emery.

- (10) Inspect bolts for cracks, bending, thread damage, or excessive corrosion. Bolts with evidence of any of these should be replaced with bolts of corresponding part numbers, as specified in the Cleveland parts list or catalog. Two different types of back plate tie bolts are used. The patch lock bolt (nylon material embedded in threaded end) will require replacement after 6 to 8 installations or whenever the bolts can be run in past the locking feature by use of fingers only. Bolts with drilled heads require safety wire after torquing.

D. Brake Reassembly

CAUTION: ASSEMBLE BRAKE ON A CLEAN FLAT SURFACE, BEING CAREFUL NOT TO NICK, SCRATCH, OR DAMAGE PROTECTIVE FINISH OF BRAKE PARTS.

(1) Reassembly Procedures

- (a) Thoroughly clean parts before assembling.
- (b) If anchor bolts were removed, install anchor bolts using an arbor press and a holding fixture. Refer to Figure 305. Insure that bolt is **perpendicular** to the cylinder and **parallel** to one another. Install washers and nuts. Dry torque nuts to 90 inch-pounds (7.9 N·m). The torque to overcome the locking feature of the nut must be added to the above torque level to obtain the true torque.

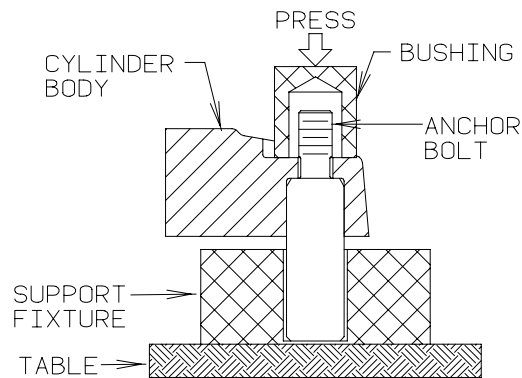


Figure 305 - Anchor Bolt Installation

- (c) Use an arbor press and install new piston insulator disc (puck) into piston pocket. Examine outside diameter lip of piston and replace if cracked or if O.D. is excessively enlarged and interferes with installation.
- (d) Check friction spring for sharp edges. Carefully square off edges by light filing or sanding.
- (e) Install o-rings on pistons or in cylinder. O-rings and cylinder bores should be lubricated with brake fluid or a silicone-based O-ring grease per MIL-G-4343 or Dow Corning 55 O-Ring Lubricant.

Cleveland

Wheels & Brakes



(2) Installation of Pistons

Installation of pistons with an internal guide is the same as for other pistons. Care must be taken to insure that no damage to parts occurs during installation. If considerable effort is required, remove piston and inspect bore and pilot bore area for damage. If bore is damaged, check the corresponding area of piston for damage.

- (a) Place piston in bore and rotate to seat friction spring (if applicable), and insure that piston and o-ring are in proper alignment. Press piston into bore by hand. Tap the piston squarely with a wooden or plastic mallet (if required) while rotating piston.

(3) Lining Installation

Refer to ON-AIRCRAFT MAINTENANCE section for instructions.

(4) Further Reassembly of Brake Components

The remaining components of the disassembled brake unit shall be reassembled as follows:

- (a) Install inlet fitting, bleeder fitting, rubber caps, and O-rings, if applicable. A majority of the inlet fittings used on Cleveland brakes are pipe threads. Care should be exercised to prevent over tightening which could result in cracking of the cylinder casting. Install pipe thread fittings as follows.

CAUTION: NEVER BACK OFF (LOOSEN) PIPE THREADED FITTINGS TO ACHIEVE ALIGNMENT.

- 1 Inspect and clean each fitting to remove any oil or surface contamination prior to assembly.

CAUTION: AVOID COATING THE FIRST THREAD TO AVOID SYSTEM CONTAMINATION.

- 2 Apply a light coat of a thread lubricant (Lubon #404) to the threads of the fitting.
- 3 Screw the fitting into the port to the finger tight position.
- 4 Wrench tighten the fitting 1 to 1-1/2 turns from finger tight. Fittings that require a specific orientation to receive the incoming tube or hose assembly may be adjusted from 1 to 2 turns, beyond finger tight to achieve the desired location.

Straight thread inlet fittings and bleeder adapter fittings with o-rings are to be torqued 65-70 in-lb. Bleeder seats are to be tightened snug to preclude leakage.

NOTE: Cap fittings if brake is not being immediately installed on the aircraft.

- (b) Install pressure plate lining facing away from pistons by sliding over anchor bolts. Pressure plate should slide freely over anchor bolts.

Cleveland

Wheels & Brakes



- (c) Install back plates with attachment bolts and washers. Install metal or insulating shim, if applicable. Do not tighten bolts if brake is to be installed on aircraft or put into storage. Insulating (fiber) shims are used on brakes with metallic linings.
 - (d) Install cylinder assembly in torque plate by sliding anchor bolts into bushings. Dry film lubricants such as silicone spray should be applied to anchor bolts and torque plate bushings to assist sliding motion. Exercise care to insure that linings do not become contaminated with fluid or lubricant. For best service life, **cylinders must slide freely in torque plate.**
- (5) After installation on the aircraft, pressure test the brake assembly at 600 psi and check for leakage.

E. Storage

Brake assemblies which are not to be immediately installed on the aircraft must be properly stored. Acceptable storage conditions are listed below.

CAUTION: BRAKES STORED IN CARDBOARD BOXES, WHICH HAVE BECOME WET OR HAVE BEEN EXPOSED TO HIGH HUMIDITY, CAN BECOME CORRODED.

- (1) The length of time that a brake assembly can be stored is governed by the storage life of its rubber components. Basically, rubber components are considered to have a storage life of up to ten years from the date of cure. The storage life may be shortened by exposure to sunlight, extreme temperatures, humidity, ozone, contamination of fluids, severe operating conditions, etc.
- (2) Normal storage environmental temperatures of 50° to 77°F (10° to 25°C) are desired. If this temperature range cannot be maintained, temperatures as high as 125°F (51.7°C) and as low as -20°F (-28.9°C) can be tolerated for shorter periods. Total time above 100°F (37.8°C) shall not exceed three months.

3. Wheel Assembly Maintenance

This section covers the removal, disassembly, inspection, reassembly, and installation of the main, nose, and tail wheel assemblies. When conducting wheel maintenance, observe the following general cautions:

- Careful handling of the wheel components will assure a long service life and trouble free operation.
- Strictly observe the tire deflation and inflation procedures, and the torque values specified. Wheel nut torque values are shown on the nameplate or on the outboard wheel half. Do not overtighten any bolt, nut, or fitting. Do not employ impact or power wrenches to remove or tighten any threaded parts.
- Handle the wheel bearing cones with extreme care. Many bearing failures can be traced to dropping or mishandling the cones during maintenance. Bearing cups and cones should be used as a matched set to provide maximum service life. Do not drive bearing cones onto the aircraft axle, and never overtighten the axle nut. For more information, refer to Timken Bearing Company's catalog, "How to Recognize and Prevent Tapered Roller Bearing Damage."

Cleveland

Wheels & Brakes



- The wheel halves should be properly maintained to protect the paint and surface finishes; exposed aluminum/magnesium is susceptible to corrosion. Nicks, scratches, and other damage caused by improper handling of the wheel halves during maintenance invite corrosion which, if unattended, could lead eventually to fatigue cracks and wheel failure.

A. Bearing Grease

CAUTION: DO NOT MIX AVIATION WHEEL BEARING GREASES WITH EACH OTHER. IF USING OTHER APPROVED GREASE, COMPLETE REMOVAL OF CONTAINED GREASE AND BEARING CLEANING IS REQUIRED. REPLACEMENT OF PREVIOUSLY LUBRICATED FELT GREASE SEALS IS ALSO REQUIRED.

CAUTION: THE FOLLOWING GREASE CHANGE DOES NOT APPLY TO AMPHIBIOUS APPLICATIONS NOTED IN TABLE A4.


Beginning March, 2007 all active wheel assemblies listed in Table A4, except those noted for amphibious application, will be shipped from the Cleveland Wheels & Brakes facility with the bearings packed with Mobil Aviation Grease SHC 100, the approved preferred grease for all Parker Hannifin wheel assemblies.

NOTE: If your non-amphibious wheel assembly was shipped prior to March 2007 it may contain other approved bearing grease. To change to the Mobil Aviation Grease SHC 100, you must completely remove the contained grease and clean the bearings. You must also replace any felt grease seals which were previously lubricated with other approved grease. Refer to [paragraph 3.E. \(5\) \(a\) for grease packing instructions](#).

B. Removal From Aircraft


Separate removal procedures are given for the main, nose, and tail wheels.

(1) Removal of Main Wheel


SAFETY WARNING  : INSURE AIRCRAFT IS SECURE AND STABLE BEFORE BEGINNING ANY WORK. WORKING UNDER AN IMPROPERLY STABILIZED AIRCRAFT COULD CAUSE INJURY OR DEATH.

NOTE: Brake back plates must be removed for wheel removal. Refer to paragraph 2.A of this section. Hydraulic line need not be disconnected for wheel removal.


- Remove wheel pants/fairings if aircraft is so equipped.
- Properly raise the aircraft off the ground following the aircraft manufacturer's instructions.
- Remove hubcap/wheel cover, if applicable.

SAFETY WARNING  : DEFLATE TIRE IMMEDIATELY AFTER JACKING AIRCRAFT AND BEFORE AXLE NUT IS LOOSENED. FAILURE TO DEFLATE TIRE BEFORE WHEEL REMOVAL COULD RESULT IN SEVERE PERSONAL INJURY.


- (d) Remove air from tire by depressing the valve stem plunger until air can no longer be heard escaping from the tire.

SAFETY WARNING  : DO NOT ATTEMPT TO REMOVE VALVE CORE UNTIL TIRE HAS BEEN COMPLETELY DEFLATED. VALVE CORES WILL BE EJECTED AT HIGH VELOCITIES IF UNSCREWED BEFORE AIR PRESSURE HAS BEEN RELEASED.


- (e) Remove valve core.
- (f) Remove cotter pin from axle and remove axle nut.
- (g) Rock wheel/tire slightly to unseat the outboard bearing.
- (h) Carefully remove and store the bearing. Label the bearing for reinstallation into position from which it was removed.
- (i) Remove wheel/tire.
- (j) Carefully remove and store inboard bearing.
- (2) Removal of Nose Wheel

SAFETY WARNING  : INSURE AIRCRAFT IS SECURE AND STABLE BEFORE BEGINNING ANY WORK. WORKING UNDER AN IMPROPERLY STABILIZED AIRCRAFT COULD CAUSE INJURY OR DEATH.


- (a) Remove wheel pants/fairings if aircraft is so equipped.
- (b) Properly raise the aircraft off the ground following the aircraft manufacturer's instructions.

SAFETY WARNING  : DEFLATE TIRE IMMEDIATELY AFTER JACKING AIRCRAFT AND BEFORE AXLE NUT IS LOOSENED. FAILURE TO DEFLATE TIRE BEFORE WHEEL REMOVAL COULD RESULT IN SEVERE PERSONAL INJURY.


- (c) Remove air from tire by depressing the valve stem plunger until air can no longer be heard escaping from the tire.

SAFETY WARNING  : DO NOT ATTEMPT TO REMOVE VALVE CORE UNTIL TIRE HAS BEEN COMPLETELY DEFLATED. VALVE CORES WILL BE EJECTED AT HIGH VELOCITIES IF UNSCREWED BEFORE AIR PRESSURE HAS BEEN RELEASED.


- (d) Remove valve core.
 - (e) Support wheel/tire and remove axle attachment bolts, nuts, and washers. In some cases, the nose wheel will be attached with an axle nut, similar to the main gear, which must be removed.
 - (f) Remove wheel/tire, axle spacers, and shims.
 - (g) Separate wheel/tire from axle, axle spacers, and shims. Carefully remove and store bearings. Label bearings for reinstallation into positions from which removed.
- (3) Removal of Tail Wheel

SAFETY WARNING  : INSURE AIRCRAFT IS SECURE AND STABLE BEFORE BEGINNING ANY WORK. WORKING UNDER AN IMPROPERLY STABILIZED AIRCRAFT COULD CAUSE INJURY OR DEATH.

- (a) Properly raise the aircraft off the ground following the aircraft manufacturer's instructions.

SAFETY WARNING  : DEFLATE TIRE IMMEDIATELY AFTER JACKING AIRCRAFT AND BEFORE AXLE NUT IS LOOSENED. FAILURE TO DEFLATE TIRE BEFORE WHEEL REMOVAL COULD RESULT IN SEVERE PERSONAL INJURY.

- (b) Remove air from tire by depressing the valve stem plunger until air can no longer be heard escaping from the tire.

SAFETY WARNING  : DO NOT ATTEMPT TO REMOVE VALVE CORE UNTIL TIRE HAS BEEN COMPLETELY DEFLATED. VALVE CORES WILL BE EJECTED AT HIGH VELOCITIES IF UNSCREWED BEFORE AIR PRESSURE HAS BEEN RELEASED.


- (c) Remove valve core.
- (d) Support wheel/tire and remove axle attachment bolts, nuts, and washers.
- (e) Remove wheel/tire, axle spacers, and shims.
- (f) Carefully remove and store bearings. Label bearings for reinstallation into positions from which removed.

C. Wheel Disassembly

The step-by-step disassembly procedure given below is common to the main, nose, and tail wheels. Disassembly should be performed only to the level required to effect necessary repairs. When doing any wheel maintenance, the technician shall first refer to the aircraft manufacturer's maintenance manual for guidance. In the absence of detailed information from the aircraft manufacturer the technician may use the information in this publication by referring to Figure 3 or 4, Typical Wheel Assemblies, or to the Product Catalog for the specific unit being disassembled.

Cleveland products of identical part number are used on a variety of different aircraft. The combined effects of negligent service, environmental conditions and the application itself may affect the service life of the product. Therefore, a very thorough inspection of the wheel and its components is recommended whenever the tire is changed or whenever the technician determines that it is warranted.

Organizations that routinely perform their own maintenance may want to use their experiential observations to develop their own unique inspection procedures. Some organizations will perform the more thorough dye penetrant inspection after a predetermined number of tire changes with newly introduced wheel assemblies typically permitting the largest number of tire changes. The tire change to dye penetrant inspection interval will be progressively reduced as the time in service of the product increases. This type of program will eventually result in a more thorough dye penetrant detailed inspection at each tire change.

SAFETY WARNING  : DO NOT ATTEMPT TO DISASSEMBLE WHEEL UNTIL TIRE HAS BEEN COMPLETELY DEFLATED. SERIOUS INJURY TO PERSONNEL OR EQUIPMENT DAMAGE CAN RESULT IF THESE PRECAUTIONARY MEASURES ARE IGNORED.

DO NOT ATTEMPT TO REMOVE VALVE CORE UNTIL TIRE HAS BEEN COMPLETELY DEFLATED. VALVE CORES WILL BE EJECTED AT HIGH VELOCITIES IF UNSCREWED BEFORE AIR PRESSURE HAS BEEN RELEASED.

CAUTION: DISASSEMBLE WHEEL ON A CLEAN FLAT SURFACE, BEING CAREFUL NOT TO NICK, SCRATCH, OR GOUGE WHEEL HALVES.

- (1) Tire Removal
 - (a) Remove valve cap and deflate tire completely.

CAUTION: DO NOT PRY BETWEEN WHEEL FLANGE AND TIRE BEADS, AS THIS COULD CAUSE DAMAGE TO WHEEL AND TIRE.

- (b) Separate tire beads from wheel halves, using a bead breaker or by applying pressure in even increments around the entire sidewall of the tire as close to the tire beads as possible. Suggestion: Fabricate two each rings from a substantially thick piece of plywood. The inside diameter should be slightly larger than the wheel rim outside diameter. Sandwich the wheel/tire between the two rings and apply pressure to the top ring. The tube well area of the wheel is tapered and once the bead is broken the tire should slide progressively easier. Ref. Figure 306.

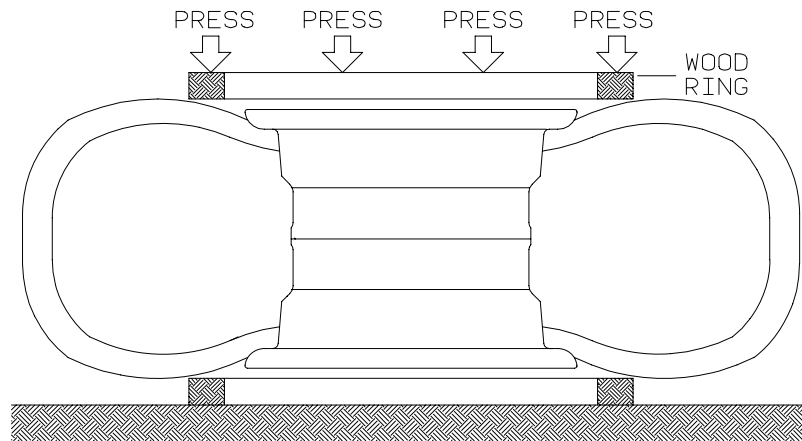


Figure 306 - Tire Removal

- (c) Remove nuts (5), washers (6), and bolts (7) holding wheel halves together. If brake disc bolts are separate from wheel tie bolts, remove them and separate brake disc (11) from wheel.
- (d) Separate inner wheel half (10), outer wheel half (8), and brake disc (11), and remove tire. Mark wheel halves to note relationship to each other for reassembly.
- (2) Bearing Cone Removal

Remove hubcap/wheel cover, grease seals, and bearing cones. Use caution in handling bearing cones to prevent damage or contamination.

CAUTION: USE CARE IN REMOVING OUTBOARD WHEEL HALF TO PREVENT DAMAGE TO INFLATION VALVE STEM.

(3) Inflation Valve Removal

Remove o-ring (9) and inflation valve if wheel is designed for use with a tubeless tire. Mark o-ring with respect to wheel half for reassembly. Retaining o-ring position will aid in minimizing leakage at reassembly. It is recommended that the o-ring be replaced at reassembly.

(4) Bearing Cup Removal

The bearing cup is a shrink fit into the wheel half and should not be removed, unless replacement is necessary due to scratches, nicks, pitting, corrosion, or evidence of overheating.

WARNING: USE PROTECTIVE GLOVES WHEN HANDLING HEATED PARTS.

- (a) If replacement is necessary, place wheel half in an oven not exceeding 212°F (100°C) for 15 minutes.

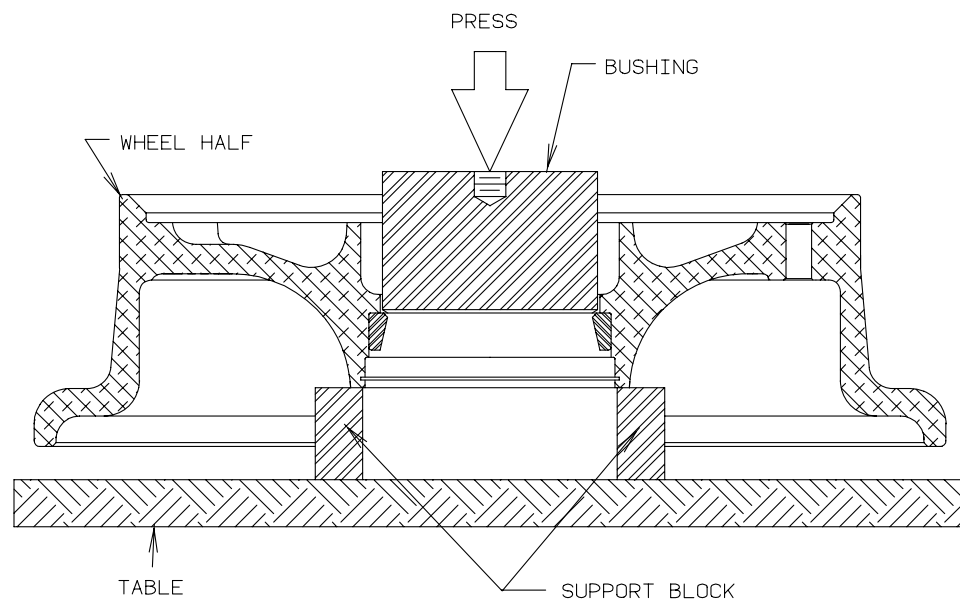


Figure 307 - Bearing Cup Removal

- (b) Remove wheel half from heat source and immediately remove bearing cup. If bearing cup does not fall out, tap it evenly with a fiber drift pin or use a suitable arbor press.

D. Inspection

- (1) Visually inspect wheel halves for cracks, nicks, corrosion, or other damage. Any cracks in the wheel half are cause for replacement of wheel half. The tire bead seat area of a wheel (Fig 308) is typically an area of stress concentration and possibly subjected to trauma from tire beads and tools used to remove tires. These combined effects warrant that this area receive special attention when inspecting for defects. All defect indications must be thoroughly investigated to determine part airworthiness. Dye penetrant inspection and visual examination is an effective method to evaluate a defect indication. To facilitate the inspection process it is recommended that the paint be stripped in the area being evaluated.

The use of alternate inspection methods such as eddy current can also be very effective when performed by an experienced NDT Technician. Cleveland has not developed the acceptance standards or tooling for eddy current inspection techniques. Maintenance facilities that want to use this method will have to locally develop tooling and acceptance standards that adequately identify defects.

Replace any cracked or excessively corroded parts. Small nicks, scratches, or pits may be blended out and polished with fine sandpaper. Treat and repaint per [paragraph 4. Brake and Wheel Refinishing.](#)

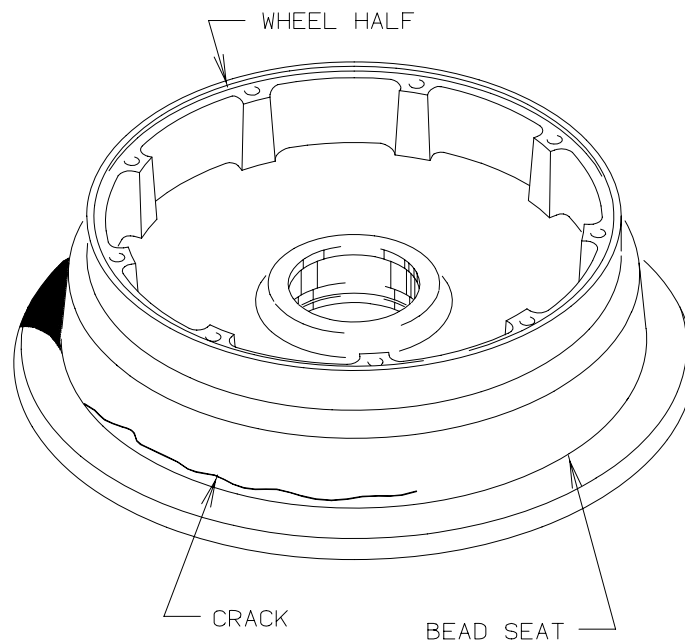


Figure 308 - Bead Seat Inspection

- (2) Inspect wheel bearing grease for contamination and solidification at each periodic inspection. Repack bearings with fresh grease – [Refer to paragraph 3.A. Bearing Grease](#).

NOTE: Do not exceed 500 wheel miles (804.5 km) or on annual inspection whichever comes first between repacking intervals.

- (3) Inspect wheel half bearing cup bore for burrs, primer residue, or foreign matter. Make sure surface is clean.
- (4) Inspect snap rings and grease seals for distortion or wear. Replace grease seal felts if they are hard or contaminated. Lightly coat all surfaces of the new felt with the wheel bearing grease ([refer to paragraph 3.A. Bearing Grease](#)). Molded rubber grease seals should be replaced if cracked, dried out or distorted.
- (5) Wheel tie bolts by nature of their application are subjected to fatigue type loads. It is best to replace these fasteners at overhaul. If bolts are to be reused they must be inspected for cracks, bending, thread damage, or excessive corrosion. Bolts with evidence of any of these should be replaced with bolts of corresponding part numbers, as specified in the Cleveland Parts List or Catalog. Magnetic particle inspection is the recommended procedure for bolt inspection. Alternate nondestructive inspection techniques, such as ultrasonic inspection, can demonstrate determination of non-airworthy ferromagnetic products consistent with the fluorescent magnetic particle methods. Cleveland typically uses AN, MS, and NAS bolts which, as part of the procurement specification, employ the fluorescent magnetic particle inspection as one of the recognized standards in determining acceptance of product. Therefore, the acceptance standards and methodologies for the ultrasonic inspection techniques have not been specifically developed at Cleveland. Use of the ultrasonic method or any other inspection techniques is the responsibility of the agency determining airworthiness of the product.

NOTE: Inspect self-locking nuts for damage. If nut can be turned onto bolt by hand, past the nut's self-locking section, it should be replaced with nuts of corresponding part numbers.

- (6) Replace o-rings with o-rings of corresponding part numbers. If necessary, o-rings may be reused. Inspect o-rings for cuts, nicks, distortion, or excessive wear. Check to be sure o-ring has not become brittle or hard.

NOTE: Brake disc cracks are not allowed unless covered by a PRM (Product Reference Memo) or SB (Service Bulletin) issued specifically for a brake disc.

- (7) Inspect brake disc for cracks, excessive wear, or scoring, mounting hole elongation, corrosion, and warpage. Remove corrosion and blend out small nicks using fine (400 grit) sandpaper. Replace brake disc if worn below wear limits detailed in [Appendix A](#). Coning of disc in excess of 0.015 inch (0.381 mm) is cause for replacement. Ref. Figure 309.

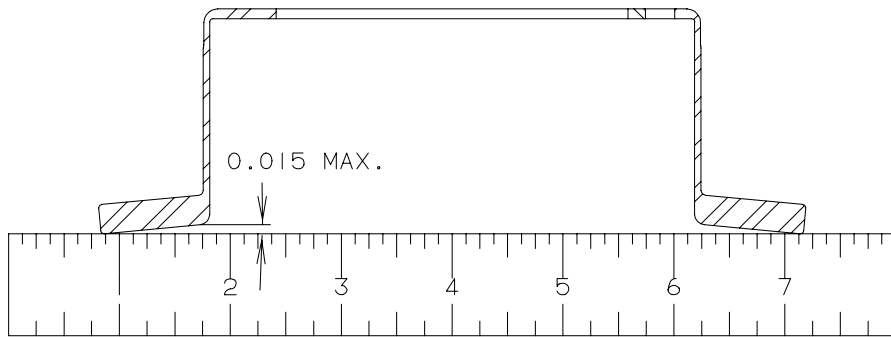


Figure 309 - Disc Coning Limits

- (8) Welded brake discs will have a slight gap on the side opposite the weld at the cup interface. This is normal. Ref. Figure 310.
- (9) Heat created during braking promotes the development of corrosion and pitting at the flange to cup area. Annually, or on condition, sandblast these areas or use a wire wheel to remove corrosion and pitting. Treat affected areas with zinc chromate primer and a coat of heat resistant spray paint. Heat resistant paints may be locally procured from auto parts supply.

NOTE: Corrosion, if left unattended will result in decreased service life of the part.

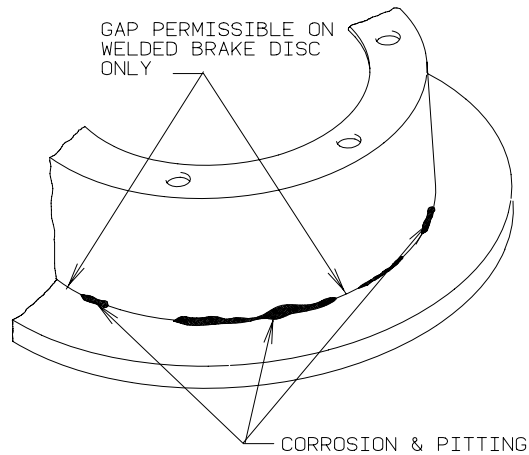


Figure 310 - Disc Inspection

E. Wheel Reassembly

Reassembly of the wheel assembly is essentially the reverse of the disassembly procedures detailed in paragraph 3B of this section. Assemble the wheel on a clean, flat surface, being careful not to nick, scratch, or damage protective finish or wheel halves.

NOTE: If bearing cup was removed, use the following procedure for installation of a new bearing cup.

(1) Bearing Cup Installation

WARNING: USE PROTECTIVE GLOVES WHEN WORKING WITH DRY ICE OR HANDLING HEATED PARTS.

- (a) Place wheel half in an oven not exceeding 212°F (100°C) for 15 minutes. Chill new bearing cup in an atmosphere of -25°F to -65°F for no less than 4 hours. Chilling may also be accomplished by placing the bearing cup in dry ice for a minimum of 15 minutes.
- (b) To install a new bearing cup, apply one coat of zinc chromate to cup bore.
- (c) Remove wheel half from heat source and remove bearing cup from cold source. Dry cup thoroughly.
- (d) Install the chilled bearing cup into bearing bore of heated wheel half. Tap gently into place with a fiber drift making sure cup is evenly seated against shoulder of wheel half. Ref. Figure 311. Avoid cocking bearing cup during installation. If bearing cup will not seat properly in wheel half, repeat above procedure or replace wheel half assembly.

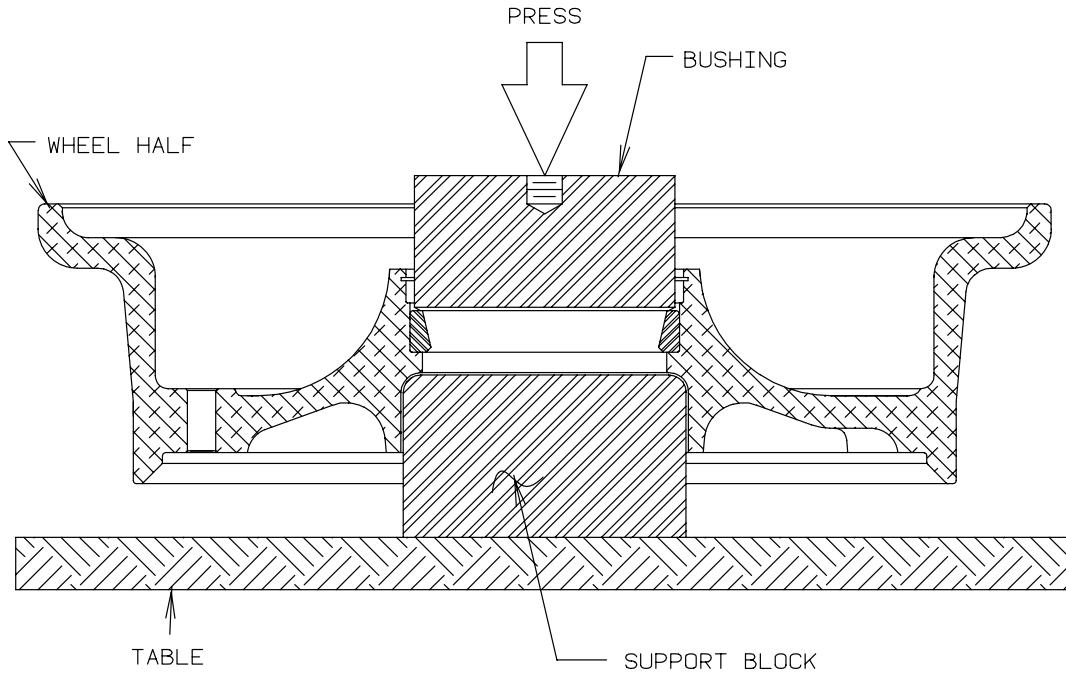


Figure 311 - Bearing Cup Installation

(2) Tire Mounting

NOTE: Prior to mounting, make sure tire is clean. Inspect bead area and wipe it clean with denatured alcohol, followed by soap and water, then thoroughly dry the bead area prior to mounting. A dry lube (talc only) can be used between the mating surfaces of wheel halves to aid in the assembly and disassembly process.

(a) Tubeless Tires

- 1 Check for the word TUBELESS on sidewall. Make sure tire is clean inside. Inspect bead area and wipe it clean with denatured alcohol, followed by soap and water. Dry thoroughly and use only dry talc to aid installation.
- 2 Wipe the bead seat and o-ring seal area of wheel halves with an alcohol dampened cloth. Lubricate o-ring seal with a light coat of grease MIL-G-4343 (Dow Corning 55 O-Ring compound) or equivalent and place it carefully in its groove without stretching or twisting.

- 3 Place the tire on the inboard wheel half being careful not to disturb the o-ring. Position the red (light spot) balancing dot on the tire adjacent to the wheel valve.
- 4 Place outboard wheel half inside the tire. Align marks made at disassembly with those on inboard half.

(b) Tube-Type Tires

NOTE: Tire slippage may occur with new, unused tires, tubes, and wheel. Wiping the tire and tube with denatured alcohol, followed by soap and water.

- 1 Make sure the inside of the tire is clean and dry. Inspect bead area and wipe it clean with denatured alcohol, followed by soap and water, then dry thoroughly.
- 2 Inflate the inner tube just enough to round it out.
- 3 Install the inner tube with the yellow strip (or equivalent heavy spot marking) adjacent to the red (light spot) balance dot on the tire. If the tube has no balance mark, place valve adjacent to tie balance dot.
- 4 Install the tire and inner tube on the outer wheel half, inserting the valve stem through the valve hole in the wheel. Place the inner wheel half inside the tire. Align the marks made at disassembly with those on the outer wheel half.

(3) Disc Installation

Disc installation applies only to the main wheel. Brake discs may be attached to the wheel in either of the two ways detailed below.

NOTE: Replace discs only with factory authorized replacement discs to obtain full warranty protection.

(a) Brake Disc Attached with Wheel Tie Bolts

NOTE: Observe the torque required to turn the nut (free running torque). This value must be added to the value stated on the casting/nameplate to obtain a true torque value.

WARNING: **FAILURE TO PROPERLY TORQUE THE WHEEL ASSEMBLY TIE BOLTS MAY RESULT IN PREMATURE FAILURE OF THE MATING COMPONENTS OR HARDWARE.**

- 1 Install disc in inner wheel half and align bolt holes with wheel half.

NOTE: All Torque values listed on Cleveland Products are considered to be “DRY TORQUE” values unless “LUBTORK” is specified. “LUBTORK” requires the application of an antiseize compound conforming to MIL-T-5444 or MIL-T-83483 to all friction surfaces as shown in Figure 312. Only use the antiseize specified for your wheel assembly.

CAUTION: Torquing a fastener to a dry torque value with antiseize applied can result in an over torqued condition for the fasteners or assembly.

NOTE: Product received from Cleveland with antiseize applied is correct for that particular product and will be so designated on service publications. **When in doubt - call Cleveland.**

- 2 Install bolts through brake disc and wheel halves. Both plain and countersunk washers may be used. Some designs use bolts that have a radius between the head and shank, which requires the countersunk washers. Inspect bolts and washers prior to assembly. (Ref. Figure 312). Properly oriented washers with countersunk surfaces to sit flush against the bolt head. Install washers and nuts on bolts (bolt heads are to be on brake disc side of wheel). Torque nuts to value specified on wheel casting or nameplate, using a crisscross pattern until all nuts are properly torqued. Do not use power tools for the installation of nuts and bolts.

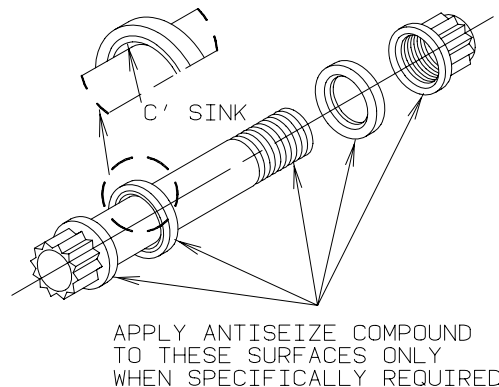


Figure 312 - Wheel Tie Bolts

(b) Brake Disc Not Attached With Wheel Tie Bolts

- 1 Install brake disc in inner wheel half and align bolt holes with wheel half inserts.
- 2 Install bolts through brake disc, thread into each insert, and torque to 150 in-lbs (1034 kPa).
- 3 Install wheel bolts, washers, and nuts.

Cleveland

Wheels & Brakes



(4) Inflation Valve Installation

Two configurations of inflation valve stems, grommet and the o-ring types, are used for tubeless tire applications. Both types should have either the rubber bushing (grommet) or the o-ring coated with Dow Corning 55 O-Ring Lubricant prior to installation. Torque to all the appropriate values as listed in the [Appendix A4](#) and [A5](#).

(5) Bearing Installation

CAUTION: DO NOT MIX AVIATION WHEEL BEARING GREASES WITH EACH OTHER. [REFER TO PARAGRAPH 3.A. BEARING GREASE.](#)

CAUTION: HANDLE BEARING CONES WITH EXTREME CARE TO PREVENT CONTAMINATION OR DAMAGE.

(a) Pack the bearing cones as follows.

The correct application of grease to the tapered roller bearing will reduce friction, dissipate heat and maintain a rust and corrosion proof coating on the operating surfaces of the roller bearings.

NOTE: Pack the bearing cones just before installation to prevent contamination.

NOTE: Bearing cones can be packed by hand or by using a mechanical bearing greaser. The mechanical bearing greaser will do a more thorough job of packing the grease.

- 1 Clean the bearing cones. [Refer to paragraph 4.A. Degreasing.](#)
- 2 Push and force the grease up and out between the rollers, cone and cage.
- 3 The bearing is properly greased when no voids or daylight can be observed between the rollers and inner and outer races.
- 4 Disperse excess grease around each end and the tapered sides of each cone.

NOTE: Shaded area shows the recommended quantity of grease.

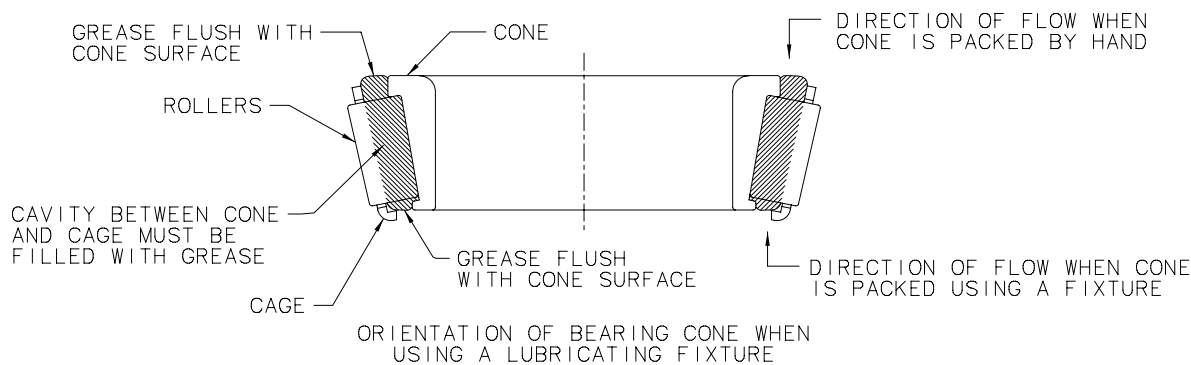


Figure 313 Packing Bearing Cones

Cleveland

Wheels & Brakes



- (b) Liberally swab the bearing cup, bearing bore hub and grease seal/snap ring areas with bearing grease.
 - (c) If felt seals are used, lightly coat all surfaces of the felt with the wheel bearing grease (refer to paragraph 3.A. Bearing Grease). If rubber lip seals are used, lightly coat the rubber surfaces with bearing grease.
 - (d) Install the bearing cones, grease seals (felts and rings or rubber lip seals) and snap rings.
 - 1 Excess grease will squeeze out. Remove the excess grease with an inward rotating movement against the bearing cone ID. Disperse any small amounts of grease on the exterior surface of the grease seal and snap ring and remove any grease from the hub outside surface.
 - (e) Install hubcap/wheel cover if part of wheel assembly. Use care that bearing grease does not become contaminated.
- (6) Tire Inflation

SAFETY WARNING  : PLACE THE WHEEL/TIRE IN AN INFLATION CAGE FOR INITIAL INFLATION, TO PREVENT INJURY TO PERSONNEL FROM POSSIBLE EXPLOSION.

- (a) Inflate tire to tire manufacturer's specifications to seat beads on wheel. Deflate tire to 10 psi (68.9 kPa) for storage.
- (b) Place protective cover over bearing hubs to prevent contamination of grease or bearing damage during storage of wheel.

F. Storage

Wheel storage procedures differ depending on whether the wheels are stored with or without tires installed.

CAUTION: WHEELS STORED IN CARDBOARD BOXES, WHICH HAVE BECOME WET OR HAVE BEEN EXPOSED TO HIGH HUMIDITY, CAN BECOME CORRODED.


- (1) Wheels Stored With Tires Installed
 - (a) The length of time that a wheel assembly can be stored is governed by the storage life of its rubber components. Basically, rubber components are considered to have a usable life of up to ten years from the date of cure. The usable life may be shortened by exposure to sunlight, extreme temperatures, and low humidity; contamination by fluids; severe operating conditions, etc.
 - (b) The wheel assembly should be stored in a clean, dry storeroom. The desirable storeroom temperature range is from 50° to 77°F (10° to 25°C). If this temperature range cannot be maintained, temperatures as high as 125°F (51.7°C) and as low as -20°F (-28.9°C) can be tolerated for shorter periods. Total time above 100°F (37.8°C) shall not exceed three months. The recommended storage pressure for tires is 10 psi (68.9 kPa).

- (2) Wheels Stored Without Tires Installed
 - (a) Short-term storage of tubeless wheel assemblies may be stored with the wheel o-ring packing installed between the two halves.
 - (b) Storage of components containing rubber longer than two years should be assembled without the o-ring packing. O-rings to be placed in an ultraviolet protective package.
 - (c) Wheels stored without rubber components installed have an indefinite storage life.

4. Brake and Wheel Refinishing

Complete procedure necessary to remove existing paint from brake and wheel components and then to repaint them is described in the following paragraphs.

A. Degreasing

SAFETY WARNING  : CLEANING SOLVENTS CAN BE TOXIC AND VOLATILE. USE ONLY IN WELL VENTILATED AREAS. AVOID PHYSICAL CONTACT WITH SOLVENT AND DO NOT INHALE VAPORS. KEEP SOLVENT CONTAINERS COVERED WHEN NOT IN USE.

- (1) Clean all metal parts by immersing in a clean degreasing solution. An alkaline based solution is recommended for aluminum and magnesium parts.
- (2) Hardened dirt or grease may be removed with a soft bristle brush, or by soaking in cleaning solution.
- (3) Clean bearing cones carefully in a separate container of mineral spirits.

CAUTION: DO NOT SPIN BEARING CONES WITH COMPRESSED AIR.


- (4) After cleaning, thoroughly dry all metal parts with filtered dry compressed air.
- (5) It is recommended that all o-rings, back-up rings and wipers be replaced at each overhaul. However, if necessary, o-rings may be reused but should be put back into position from which removed.
- (6) Wipe down o-rings, back-up rings, wipers, or other rubber parts with a clean dry cloth. Lubricate with a suitable o-ring lubricant prior to installation.

B. Paint Removal

Disassemble brake and wheel components to the level required for repainting, then proceed as follows:

- (1) Degrease part per [paragraph 4.A](#).
- (2) Cleveland recommends the use of plastic media stripping techniques to be performed per equipment manufacturer's recommended instructions.

NOTE: Chemical stripping agents are commercially available for removing topcoat and primer, and may be used if plastic media stripping equipment is not available. Follow manufacturer's recommendations for use and disposal of stripping solutions. If chemical stripping is used, the Bearing Cup must be removed from the wheel half assembly prior to proceeding.

SAFETY WARNING  : CHEMICAL STRIPPING AGENT SOLVENTS CAN BE TOXIC AND VOLATILE. USE ONLY IN WELL VENTILATED AREAS. AVOID PHYSICAL CONTACT WITH SOLVENT AND DO NOT INHALE VAPORS. KEEP STRIPPING AGENT SOLVENT CONTAINERS COVERED WHEN NOT IN USE.

WARNING: **DO NOT SANDBLAST.** Sandblasting is too abrasive and will damage smooth piston bore or o-ring Seal areas.

- (3) Rinse part thoroughly with water heated to 160° to 180°F (71° to 82°C). If used, flush chemical stripping agent solvent from all cavities and threaded holes where entrapment might occur.
- (4) Thoroughly dry part with filtered, dry compressed air.
- (5) Refer to inspection procedures in [paragraph 2C](#) for specific parts to locate possible defects.

NOTE: Refinishing should be completed as soon as possible; unprotected parts will begin to corrode.


C. Surface Pretreatment

All cast products are to be surface pretreated after any nicks, dings, corrosion, or other discontinuities have been mechanically removed. It is necessary to know the cast alloy material such that the proper treatment can be performed. Both aluminum and magnesium alloy casting are used in products at Cleveland. Refer to [A3. Brake Assembly Back Plate Tie Bolt Torque](#) and [A4. Wheel Assembly Torque Values](#) table for material identification.

- (1) Aluminum parts should have a protective barrier between the topcoat and base material. It is recommended they be treated with conversion coating per MIL-C-5541, Class 1A (Alodine).

NOTE: Alodine is ineffective on magnesium.


- (a) Apply solution liberally and evenly. Allow it to set from 1 to 5 minutes. The solution must completely wet the surface and overlap onto the adjoining anodize.
- (b) Remove excess coating by flushing with clean water.

SAFETY WARNING  : RUBBER GLOVES AND EYE PROTECTION SHOULD BE WORN WHEN MIXING AND APPLYING THIS SOLUTION. CARE SHOULD BE EXERCISED TO PREVENT SKIN CONTACT. WASH EXPOSED AREAS IMMEDIATELY WITH COLD WATER AND SOAP.

- (2) Magnesium parts may be treated with surface pretreatment per MIL-M-3171, Type VI, Chromic Acid.

NOTE: MIL-M-3171 Type VI is ineffective on aluminum.

- (a) Apply mixed solution liberally at room temperature and allow to dry. Parts may be dipped for 1/2 to 2 minutes in solution at room temperature.
- (b) Remove excess coating by flushing with clean, cold water.
- (c) Dry in oven or hot air. Never rinse in hot water.

SAFETY WARNING:  EXPOSURE TO CADMIUM DUST IN UNVENTILATED GRINDING ACTIVITIES AND WORKING WITH CADMIUM AND ITS COMPOUNDS CAN BE A POTENTIAL HEALTH HAZARD.

- (3) Stripping and re-cadmium plating steel parts is generally cost prohibitive in small lot sizes. Therefore, steel parts that have been cadmium plated may be protected with an application of zinc rich cold galvanizing compound or zinc chromate. Finish with an application of a good quality topcoat.

D. Repainting

Refer to Figures 314, 315, 316 to identify surfaces of brake and wheel components that require paint. Proceed as follows:

- (1) Parts to be repainted should be cleaned and stripped per instructions in degreasing and paint removal paragraphs 4.A. and 4.B.
- (2) Pretreat surface using appropriate materials per paragraph 4.C.
- (3) Coat parts with one thin coat of zinc chromate primer or equivalent. Allow to dry thoroughly.

NOTE: Prior to prime and paint, mask any areas which had not previously been coated. This includes Cylinder piston bores, all internal threads and ports, Wheel Half seal and bearing bores (to be primed only), and Bearing Cups.

- (4) Paint parts with one coat of locally obtained, finish enamel, polyurethane, epoxy or lacquer to match original color. Allow to dry thoroughly before reassembly.

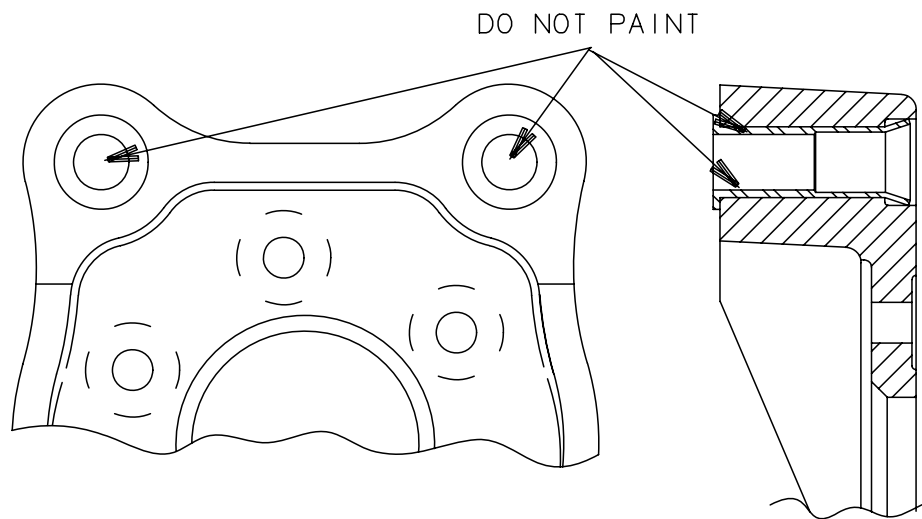


Figure 314 - Typical Torque Plate (Cast), Painted Surfaces

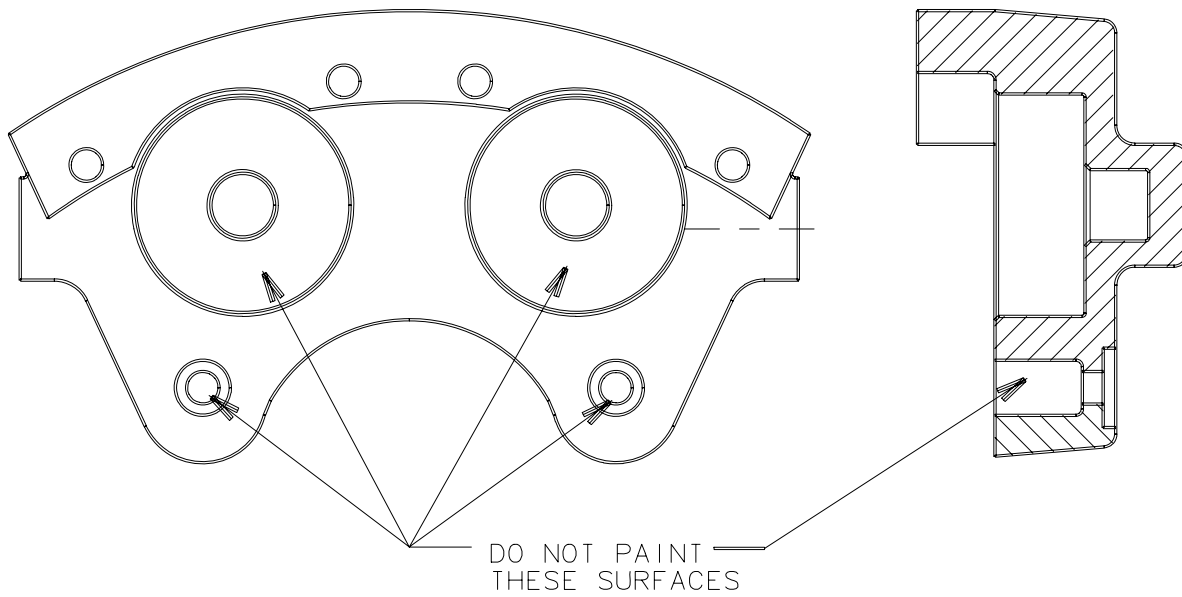


Figure 315 - Typical Brake Cylinder, Painted Surfaces

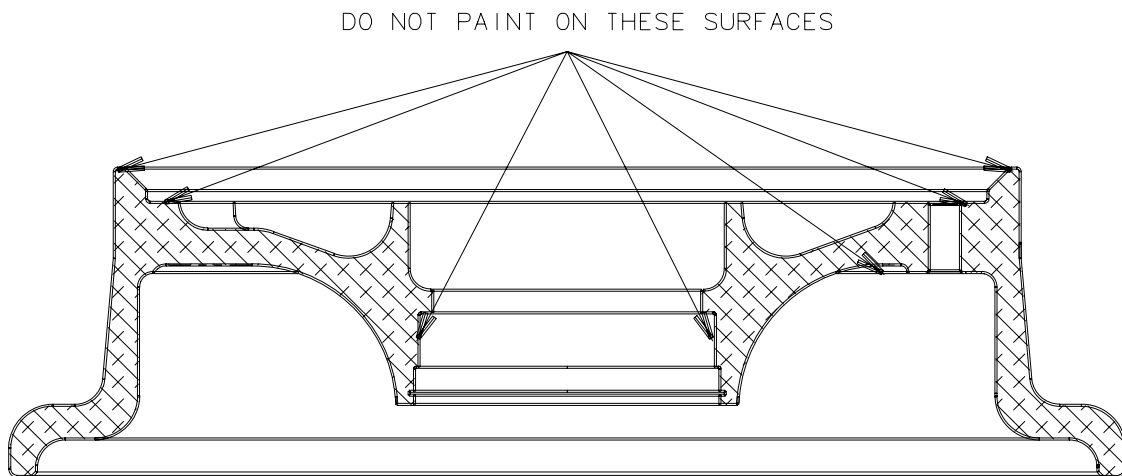


Figure 316 - Typical Wheel Half, Painted Surfaces

5. Installation of Brake and Wheel Assemblies Onto Aircraft

A. Brake Installation

- (1) If torque plate was removed, install it in the same rotational orientation as when removed. Install torque plate on axle flange with attachment bolts, nuts, and washers. Torque nuts to level specified in aircraft manual.
- (2) If wheel had been removed, install wheel per instructions in paragraph 5.B. of this section prior to installing brake cylinder assembly.
- (3) Remove back plate attachment bolts, washers, and back plates.
- (4) Install cylinder in torque plate by sliding (do not force) anchor bolts into torque plate bushings. A dry film lubricant, such as Dri-Slide (molybdenum disulfide) or silicone spray, may be applied to anchor bolts and torque plate bushings to provide ease of installation and operation. Reapply dry film lubricant periodically as required to maintain friction free operation.

NOTE: A liquid type lubricant should not be used as it will attract dirt and moisture, thereby enhancing the possibility of corrosion, binding, and wear.


- (5) Install back plates, shims, or insulators, if applicable, and back plate attachment bolts and washers. Torque attachment bolts to level specified in Bolt Torque Values listed in [Appendix A](#).
- (6) Uncap and attach hydraulic line to cylinder inlet fitting.
- (7) Bleed the system in accordance with the aircraft service manual. Using the A.W.B. bleeder assembly, P/N 087-00500, will simplify this operation. Use the bleeder as follows:
 - (a) Remove the rubber bleeder fitting cap.
 - (b) Loosen the AN815 4D fitting, place the bleeder screw into the slot on the 087-00500 bleeder assembly.
 - (c) Finger tighten to center the bleeder screw, then wrench tighten with light pressure (do not over tighten).
 - (d) Attach the bleeder hose.
 - (e) Open the bleeder screw 1 to 2 turns.
 - (f) The system is now ready to be bled.
 - (g) After the system is properly bled, tighten the bleeder screw, loosen and remove the bleeder assembly, then replace the rubber bleeder fitting cap.
- (8) After accomplishing system bleeding, depress and release toe pedal several times, checking for brake drag by rotating the wheel by hand. A slight amount of drag is normal; however, a tightly bound wheel should be investigated and corrected prior to aircraft release to service.

- (9) Condition linings in accordance with PRM13A for organic materials and PRM14A for Metallic materials.

B. Wheel Installation

Separate installation procedures for the main, nose, and tail wheels are given in the following paragraphs.

(1) Main Wheel

SAFETY WARNING  : INSURE AIRCRAFT IS SECURE AND STABLE BEFORE BEGINNING ANY WORK. WORKING UNDER AN IMPROPERLY STABILIZED AIRCRAFT COULD CAUSE INJURY OR DEATH.

- (h) Properly raise the aircraft off the ground following the manufacturer's instructions.
(i) If Brake is installed, remove back plate attachment bolts, washers, and back plates.


CAUTION: INFLATION OF TIRE CAN BE EXTREMELY DANGEROUS AND IT IS RECOMMENDED THAT INFLATION BE PERFORMED IN AN INFLATION CAGE, PRIOR TO INSTALLATION ON AIRCRAFT.

- (c) Check tire inflation pressure. Carefully inflate if not to specified level.
(d) Check to be sure that the wheel bearings are installed and lubricated, and that the felt grease seal surfaces were lightly coated with the wheel bearing grease ([refer to paragraph 3.A. Bearing Grease](#)).
(e) Carefully slide wheel/tire onto axle making sure inboard bearing is seated.
(f) Install axle nut.

NOTE: Axle nut torquing procedures vary considerably. The following procedure is based on the best available service information.


- (g) Torque axle nut using value specified in aircraft manual or the following:
- 1 Rotate the wheel/tire while tightening axle nut to 150 to 200 inch-pounds (16.9 to 22.6 N•m) to seat the bearing.
 - 2 Back off axle nut to zero torque.
 - 3 Tighten axle nut to 30-40 inch-pounds (3.4 to 4.5 N•m) while rotating wheel/tire.
 - 4 Rotate axle nut (clockwise or counterclockwise) to nearest slot and cotter pin hole, and insert cotter pin. Bend ends of cotter pin around axle nut. Note: Wheel must rotate freely without perceptible play.

- (h) Carefully lower aircraft to ground following manufacturer's instructions.
 - (i) Replace wheel pants, if applicable.
 - (j) Recheck tire inflation pressure.
- (2) Nose Wheel

SAFETY WARNING  : INSURE AIRCRAFT IS SECURE AND STABLE BEFORE BEGINNING ANY WORK. WORKING UNDER AN IMPROPERLY STABILIZED AIRCRAFT COULD CAUSE INJURY OR DEATH.

- (a) Properly raise the aircraft off the ground following the manufacturer's instructions.
- (b) Check to be sure that the wheel bearings are installed and lubricated, and that the felt grease seal surfaces were lightly coated with the wheel bearing grease ([refer to paragraph 3.A. Bearing Grease](#)).
- (c) Check tire inflation pressure. Refer to aircraft service manual for proper inflation value.
- (d) Install axle, axle spacers, and shims on nose wheel for fork type assemblies.
- (e) Install nose wheel/tire in fork and install axle attachment bolts, washers, and nuts. Torque nuts and bolts to level specified in aircraft manual.
- (f) On axle-type nose struts, wheel installation would be as defined in paragraph 5.B.(1).
- (g) Carefully lower aircraft to ground following manufacturer's instructions.
- (h) Replace wheel fairings, if applicable.
- (i) Recheck tire inflation pressure.

(3) Tail Wheel

SAFETY WARNING  : INSURE AIRCRAFT IS SECURE AND STABLE BEFORE BEGINNING ANY WORK. WORKING UNDER AN IMPROPERLY STABILIZED AIRCRAFT COULD CAUSE INJURY OR DEATH.

- (a) Properly raise the aircraft off the ground following the manufacturer's instructions.
- (b) Check to be sure that the wheel bearings are installed and lubricated, and that the felt grease seal surfaces were lightly coated with the wheel bearing grease ([refer to paragraph 3.A. Bearing Grease](#)).
- (c) Check tire inflation pressure. Refer to aircraft service manual for proper inflation value.
- (d) Install axle, axle spacers, and shims on tail wheel.
- (e) Install tail wheel/tire in fork and install axle attachment bolts, washers, and nuts. Torque nuts and bolts to level specified in aircraft manual.
- (f) Carefully lower aircraft to ground following manufacturer's instructions.
- (g) Recheck tire inflation pressure.

A1. Brake Lining Wear Limits

The minimum replacement thickness on metallic and organic linings is 0.100 inch (2.54 mm). Refer to Figure A1.

Note: On some designs the metallic lining is bonded directly to the pressure plate and back plate. In these cases, the part should be replaced when the lining material is worn to 0.030 inch (0.76 mm) thick.

For equipment used on Piper Aztec (using either 164-00206 or 164-03206 disc), see PRM19 or follow the procedure below:

- First, measure linings as shown in Figure A1. Linings worn below .100 inch are cause for replacement.
- If linings are still usable or are replaced, measure the cumulative thickness of two linings, disc, and pressure plate as shown in Figure A1-1. If the stack measures less than 1.00 (1-inch) with good linings (linings above .100 inch), the brake disc is considered below minimum wear thickness and should be replaced.

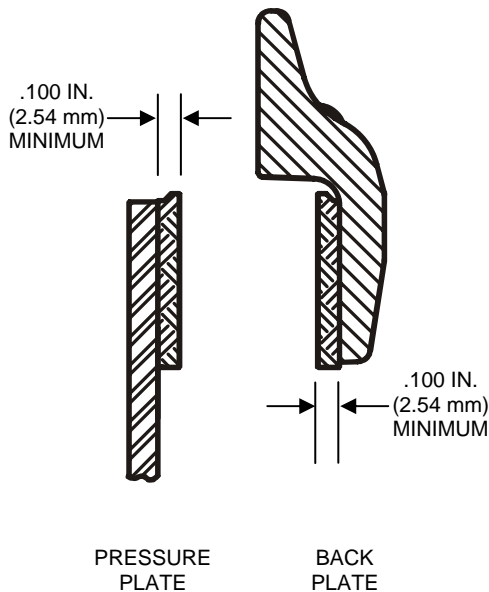


Figure A1
Minimum Lining Thickness

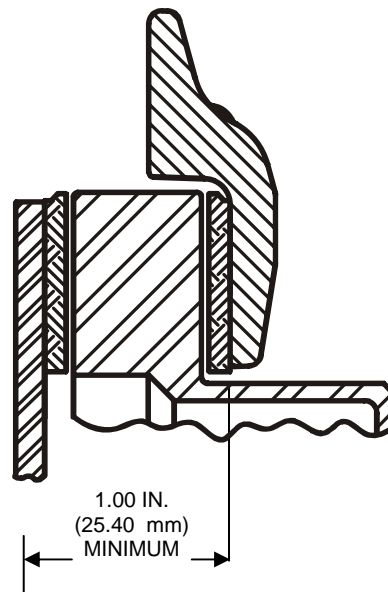


Figure A1-1
Disc Wear Measurement
(Piper Aztec)

A2. Brake Disc Minimum Thickness

Under average field conditions a brake disc should give years of trouble free service. However, unimproved fields, standing water, heavy industrial pollution, or infrequent use of the aircraft may necessitate more frequent inspection of discs to prolong the life of the brake lining.

Generally the disc faces should be checked for wear (Figure A2 Dim. "A"), grooves, deep scratches, excessive general pitting or coning of the brake disc. Coning beyond 0.015 inch (0.381 mm) in either direction would be cause for replacement.

Single or isolated grooves up to 0.030 deep should not be cause for replacement, although general grooving of the disc faces will reduce lining life.

Discs are plated for special applications only, therefore, rust in varying degrees can occur. If a powder rust appears, one or two taxibraking applications should wipe the disc clear. Rust allowed to progress beyond this point, may require removal of the disc from wheel assembly to properly clean both faces. Wire brushing, followed by sanding with 220 grit sandpaper, can restore the braking surfaces for continued use.

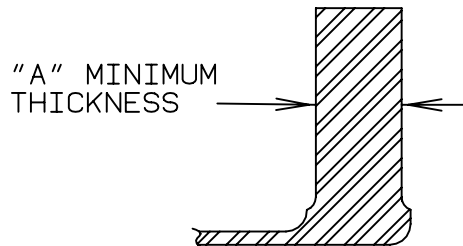


Figure A2 - Disc Thickness Measurement

Wear Limits

External Design Wheels & Brakes

A2. Brake Disc Minimum Thickness (Cont'd)

Part Number	"A" in/mm
159-00104	0.225/5.715
159-00204	0.475/12.065
164-00206	See Page A-1
164-00300	0.205/5.207
164-00400	0.162/4.115
164-00500	0.157/3.988
164-00700	0.345/8.763
164-00806	0.334/8.484
164-00900	0.227/5.766
164-01000	0.345/8.763
164-01100	0.345/8.763
164-12000	0.205/5.207
164-12601	0.205/5.207
164-01300	0.227/5.764
164-14000	0.205/5.207
164-01406	0.334/8.484
164-01501	0.327/8.306
164-01506	0.327/8.306
164-01600	0.157/3.988
164-01700	0.167/4.242
164-01900	0.227/5.766
164-02000	0.205/5.207
164-02201	0.345/8.763
164-02300	0.345/8.763
164-02501	0.445/11.303
164-02502	0.445/11.303
164-02503	0.445/11.303
164-02504	0.445/11.303
164-02505	0.445/11.303
164-02601	0.205/5.207
164-02700	0.330/8.382
164-02701	0.340/8.636
164-02706	0.330/8.382
164-02707	0.330/8.382
164-02800	0.227/5.766
164-02900	0.580/14.732
164-03006	0.282/7.163
164-03106	0.163/4.140
164-03206	See Page A-1
164-03300	0.235/5.969
164-03506	0.260/6.604
164-03600	0.327/8.306
164-03601	0.327/8.306
164-03700	0.345/8.763
164-03906	0.600/15.240
164.04000	0.205/5.207
164-04300	0.205/5.207
164-04406	0.334/8.484
164-04600	0.405/10.287
164-04700	0.345/8.763
164-04800	0.327/8.306
164-05006	0.475/12.065
164-05500	0.492/12.497
164-05606	0.395/10.033
164-05700	0.525/13.335

Part Number	"A" in/mm
164-05806	0.395/10.033
164-06106	0.475/12.065
164-06306	0.465/11.811
164-06406	0.465/11.811
164-06506	0.240/6.096
164-06700	0.220/5.588
164-06900	0.205/5.207
164-07200	0.492/12.497
164-07306	0.395/10.033
164-07400	0.492/12.497
164-07500	0.205/5.207
164-07700	0.470/11.938
164-07800	0.450/11.43
164-07906	0.465/11.811
164-08100	0.450/11.43
164-08200	0.327/8.306
164-08300	0.327/8.306
164-08406	0.330/8.382
164-08500	0.325/8.255
164-08800	0.190/4.826
164-08900	0.330/8.382
164-09000	0.330/8.382
164-09100	0.492/12.497
164-09200	0.190/4.826
164-09300	0.190/4.826
164-09400	0.190/4.826
164-09500	0.325/8.255
164-09600	0.325/8.255
164-09700	0.325/8.255
164-09900	0.275/6.985
164-10500	0.157/3.988
164-10700	0.345/8.763
164-10900	0.227/5.766
164-11501	0.327/8.306
164-11700	0.167/4.242
164-11800	0.162/4.115
164-11900	0.227/5.766
164-12000	0.205/5.207
164-12300	0.345/8.763
164-12501	0.445/11.303
164-12502	0.445/11.303
164-12504	0.445/11.303
164-12505	0.445/11.303
164-12601	0.205/5.207
164-13300	0.235/5.969
164-13600	0.327/8.306
164-13601	0.327/8.306
164-14000	0.205/5.207
164-14300	0.205/5.207
164-14800	0.327/8.306
164-16700	0.220/5.588
164-17500	0.205/5.207
164-18300	0.327/8.306
164-18800	0.190/4.826
164-18900	0.330/8.382

Part Number	"A" in/mm
164-19000	0.330/8.382
164-19200	0.191/4.826
164-19300	0.190/4.826
164-19400	0.190/4.826
164-19500	0.325/8.255
164-19600	0.325/8.255
164-19700	0.325/8.255
164-20100	0.250/6.350
164-20206	0.334/8.484
164-20306	0.465/11.811
164-20500	0.525/13.335
164-20600	0.455/11.557
164-20700	0.410/10.414
164-20806	0.475/12.065
164-20900	0.410/10.414
164-21000	0.436/11.074
164-21100	0.492/12.497
164-21200	0.327/8.306
164-21406	0.334/8.484
164-21600	0.405/10.287
164-21700	0.475/12.065
164-21900	0.590/14.986
164-22000	0.360/9.144
164-22201	0.537/13.640
164-22202	0.537/13.640
164-22400	0.385/9.779
164-22900	0.410/10.414
164-23000	0.565/14.351
164-23001	0.582/14.783
164-23002	0.582/14.783
164-23100	0.345/8.763
164-23300	0.475/12.065
164-23400	0.205/5.207
164-23600	0.190/4.826
164-23900	0.325/8.255
164-24000	0.325/8.255
164-24100	0.325/8.255
164-24200	0.167/4.242
164-24400	0.290/7.366
164-24500	0.327/8.306
164-24501	0.327/8.306
164-30007	0.190/4.826
164-30195	0.190/4.826
164-30388	0.325/8.255
164-30398	0.325/8.255
164-30414	0.325/8.255
164-30440	0.190/4.826
164-30615-1	0.190/4.826
164-30615-2	0.330/8.382
164-30615-3	0.330/8.382
164-30804-1	0.190/4.826
164-30804-2	0.330/8.382
164-30804-3	0.330/8.382
464-11501	0.327/8.306
464-11700	0.164/4.166

Part Number	"A" in/mm
464-12000	0.205/5.207
464-12601	0.205/5.207
464-13601	0.327/8.306
464-14000	0.205/5.207
464-14300	0.205/5.207
464-17500	0.205/5.207
464-18300	0.327/8.306

Cleveland

Wheels & Brakes



A3. Brake Assembly Back Plate Tie Bolt Torques

A “D” shown adjacent to the torque value indicates the value to be a “Dry” torque only.

An “L” shown adjacent to the torque value indicates a “Lubtork” torque only. Lubtork requires the application of an antiseize compound to all friction surfaces of the hardware. Only use the antiseize specified for your brake assembly. A flag note will specify which antiseize to use.

Caution: Do not “lubtork” any bolt and nut combinations that are specified as a “Dry” torque value.

Note: If there is any conflict or question regarding dry torque, lubtork, or torque value on your assembly, please contact Cleveland Customer Support for resolution.

Overtorquing (exceeding these values) could cause depressions in the brake cylinder, which result in dragging or bound up brakes. Use a torque wrench when installing back plate bolts to insure the proper torquing values are attained. Replace the back plate bolts with approved bolts as shown in the Cleveland Product Catalog. Depressions in the brake cylinder (surface A) exceeding 0.005 inch (0.127 mm) deep require replacement of the brake cylinder.

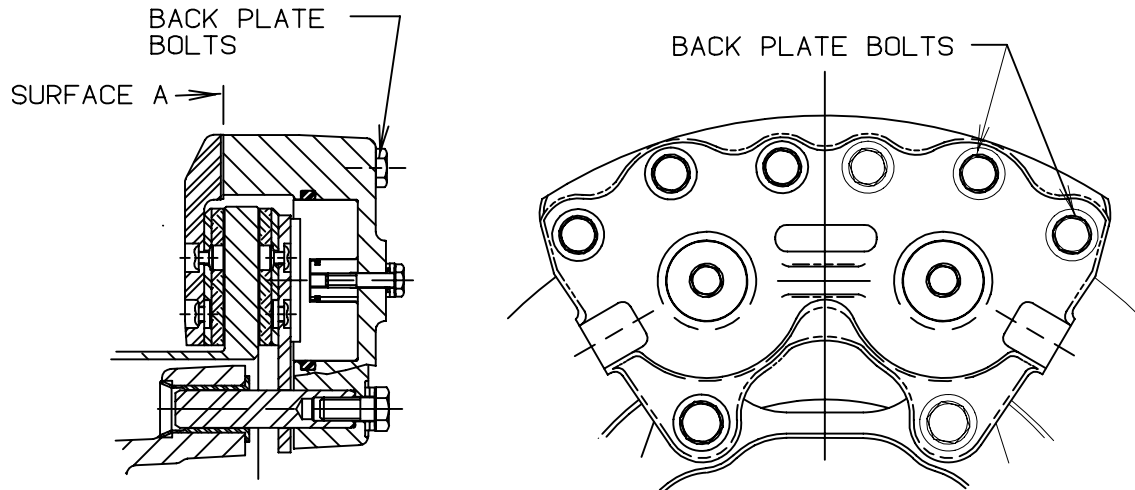


Figure A3 - Back Plate Bolts

Cleveland

Wheels & Brakes



Torque Values

A3. Brake Assembly Back Plate Tie Bolt Torques (Cont'd)

Brake Assembly	Bolt Torque		Material	
	In-lb	N-M	Housing	Torque Plate
35-200A (30-1)	60 D	6.8	A	S
30-4	60 D	6.8	A	S
30-5	60 D	6.8	A	S
30-6	60 D	6.8	A	S
30-7	60 D	6.8	A	S
37-200-2 (30-8)	90 D	10.2	A	S
30-9	75-80 D	8.5-9.0	A	S
30-9A	75-80 D	8.5-9.0	A	S
30-9C	75-80 D	8.5-9.0	A	S
30-9D	75-80 D	8.5-9.0	A	S
30-9E	75-80 D	8.5-9.0	A	S
3000-250 (30-12)	90 D	10.2	A	S
3000-500 (30-13)	90 D	10.2	A	S
30-18	75-80 D	8.5-9.0	A	S
30-19	75-80 D	8.5-9.0	A	S
30-19A	75-80 D	8.5-9.0	A	S
30-21	65-75 D	7.3-8.5	A	S
30-23	65-75 D	7.3-8.5	A	N/A
30-23A	65-75 D	7.3-8.5	A	N/A
30-23B	65-75 D	7.3-8.5	A	N/A
30-23C	65-75 D	7.3-8.5	A	N/A
30-23D	65-75 D	7.3-8.5	A	N/A
30-24	65-75 D	7.3-8.5	(1)	(1)
30-28B	80-90 D	9.0-10.2	M	M
30-28C	80-90 D	9.0-10.2	M	M
30-28D	80-90 D	9.0-10.2	M	M
30-30	90 D	10.2	M	S
30-31	1/4-28	9.6-10.2	A	S
	85-90 D			
	3/8-24	14.0-17.0		
	125-150 D			
30-32	65-75 D	7.3-8.5	A	S
30-32A	65-75 D	7.3-8.5	A	S
30-32B	65-75 D	7.3-8.5	A	S
30-32C	65-75 D	7.3-8.5	A	S
30-32E	65-75 D	7.3-8.5	A	S
30-35	65-75 D	7.3-8.5	(1)	S
30-40	60 D	6.8	A	S
30-40A	75-80 D	8.5-9.0	A	S
30-41	65-75 D	7.3-8.5	A	N/A
30-41A	90 D	10.2	A	S
30-41B	65-75 D	7.3-8.5	A	N/A
30-45	60 D	6.8	A	S
30-51	65-75 D	7.3-8.5	A	S

Brake Assembly	Bolt Torque		Material	
	In-lb	N-M	Housing	Torque Plate
30-51A	65-75 D	7.3-8.5	A	S
30-51B	65-75 D	7.3-8.5	A	S
30-52	90 D	10.2	M	S
30-52A	90 D	10.2	M	S
30-52B	90 D	10.2	M	S
30-52D	90 D	10.2	M	S
30-52E	90 D	10.2	M	S
30-52F	90 D	10.2	M	S
30-52G	90 D	10.2	M	S
30-52H	90 D	10.2	M	S
30-52K	90 D	10.2	M	S
30-52L	75-80 D	8.5-9.0	M	N/A
30-52M	90 D	10.2	M	S
30-52N	90 D	10.2	M	S
30-52P	90 D	10.2	M	S
30-52Q	90 D	10.2	M	S
30-52S	90 D	10.2	M	S
30-52T	90 D	10.2	M	S
30-52U	90 D	10.2	M	S
30-52V	90 D	10.2	M	S
30-52W	90 D	10.2	M	S
30-52X	90 D	10.2	M	S
30-52Y	90 D	10.2	A	S
30-52Z	90 D	10.2	M	S
30-52AA	90 D	10.2	M	S
30-52AB	90 D	10.2	M	S
30-52AC	90 D	10.2	M	S
30-53	75-80 D	8.5-9.0	(1)	(1)
30-53A	75-80 D	8.5-9.0	M	S
30-54	90 D	10.2	M	A
30-54A	90 D	10.2	M	A
30-54B	90 D	10.2	M	S
30-54C	85-90 D	9.6-10.2	M	A
30-55	75-80 D	8.5-9.0	M	S
30-55A	75-80 D	8.5-9.0	(1)	(1)
30-55B	75-80 D	8.5-9.0	M	S
30-56	75-80 D	8.5-9.0	M	S
30-56A	75-80 D	8.5-9.0	M	S
30-56B	75-80 D	8.5-9.0	M	S
30-56C	75-80 D	8.5-9.0	M	S
30-56D	75-80 D	8.5-9.0	M	S
30-56F	75-80 D	8.5-9.0	M	S
30-58A	75-80 D	8.5-9.0	(1)	(1)

Material column designations are as follows: "A" Aluminum "M" Magnesium "S" Steel

(1) For assistance contact the Technical Services Hotline (see page 4).

Antiseize Compound:

(2) Use SAE AMS2518 (MIL-T-5544). (3) Use MIL-PRF-83483 (MIL-T-83483).

Cleveland

Wheels & Brakes



Torque Values

External Design Wheels & Brakes

A3. Brake Assembly Back Plate Tie Bolt Torques (Cont'd)

Brake Assembly	Bolt Torque		Material	
	In-lb	N-M	Housing	Torque Plate
30-58B	75-80 D	8.5-9.0	M	(1)
30-59	75-80 D	8.5-9.0	M	S
30-59A	75-80 D	8.5-9.0	M	S
30-59D	75-80 D	8.5-9.0	M	S
30-59E	75-80 D	8.5-9.0	M	S
30-60	75-80 D	8.5-9.0	(1)	S
30-60A	65-75 D	7.3-8.5	A	S
30-60B	65-75 D	7.3-8.5	A	S
30-61	90 D	10.2	M	S
30-61A	90 D	10.2	M	S
30-61B	65-75 D	7.3-8.5	M	S
30-61D	90 D	10.2	M	S
30-61E	90 D	10.2	M	S
30-61F	90 D	10.2	M	S
30-63	75-80 D	8.5-9.0	M	S
30-63A	75-80 D	8.5-9.0	M	S
30-63B	75-80 D	8.5-9.0	M	S
30-63D	75-80 D	8.5-9.0	M	S
30-63E	75-80 D	8.5-9.0	M	S
30-63F	75-80 D	8.5-9.0	M	S
30-63J	75-80 D	8.5-9.0	M	S
30-63K	75-80 D	8.5-9.0	M	S
30-63M	75-80 D	8.5-9.0	M	S
30-63P	75-80 D	8.5-9.0	M	S
30-63Q	75-80 D	8.5-9.0	M	S
30-63S	75-80 D	8.5-9.0	M	S
30-65	75-90 D	8.5-10.2	M	S
30-65A	75-90 D	8.5-10.2	M	S
30-65E	75-90 D	8.5-10.2	M	S
30-66	90 D	10.2	A	A
30-66A	90 D	10.2	M	M
30-66B	90 D	10.2	A	A
30-66C	90 D	10.2	A	A
30-66D	90 D	10.2	M	(1)
30-66F	90 D	10.2	M	M
30-66G	80-90 D	9.0-10.2	M	A
30-66H	75-90 D	8.5-10.2	M	S
30-67	85-90 D	9.6-10.2	A	A
30-67A	85-90 D	9.6-10.2	A	A
30-67B	85-90 D	9.6-10.2	A	A
30-67C	85-90 D	9.6-10.2	A	A
30-67D	85-90 D	9.6-10.2	A	A

Brake Assembly	Bolt Torque		Material	
	In-lb	N-M	Housing	Torque Plate
30-67E	85-90 D	9.6-10.2	A	A
30-67X	85-90 D	9.6-10.2	A	A
30-68	75-80 D	8.5-9.0	M	M
30-68A	75-80 D	8.5-9.0	M	M
30-68B	75-80 D	8.5-9.0	M	M
30-69A	85-95 D	9.6-10.7	M	M
30-69B	90 D	10.2	M	M
37-200A (30-72)	65-70 D	7.3-7.9	A	S
30-74B	60-75 D	6.8-8.5	M	M
30-75	75-80 D	8.5-9.0	A	S
30-75A	75-80 D	8.5-9.0	A	S
30-75B	75-80 D	8.5-9.0	A	S
30-75X	75-80 D	8.5-9.0	A	S
30-79	90 D	10.2	A	S
30-79A	90 D	10.2	A	S
30-79B	90 D	10.2	A	S
30-83	90 D	10.2	M	S
30-83A	90 D	10.2	M	S
30-84	80-90 D	9.0-10.2	A	N/A
30-88	75-80 D	8.5-9.0	M	A
30-89	80-90 D	9.0-10.2	A	A
30-89A	80-90 D	9.0-10.2	A	A
30-89B	80-90 D	9.0-10.2	A	A
30-89C	80-90 D	9.0-10.2	A	A
30-89E	80-90 D	9.0-10.2	A	A
30-93	80-90 D	9.0-10.2	M	M
30-93A	80-90 D	9.0-10.2	M	M
30-93B	80-90 D	9.0-10.2	M	M
30-93C	80-90 D	9.0-10.2	M	M
30-93D	80-90 D	9.0-10.2	M	M
30-93E	90-100 D	10.2-11.3	M	M
30-94	80-90 D	9.0-10.2	A	A
30-95	60 D	6.8	(1)	(1)
30-95A	60 D	6.8	M	M
30-95B	60 D	6.8	M	M
30-96	60 D	6.8	M	S
30-97	80-90 D	9.0-10.2	A	M
30-98	80-90 D	9.0-10.2	A	A
30-98A	80-90 D	9.0-10.2	A	A
30-98B	80-90 D	9.0-10.2	A	A
30-98C	80-90 D	9.0-10.2	A	A
30-98D	80-90 D	9.0-10.2	A	A

Material column designations are as follows: "A" Aluminum "M" Magnesium "S" Steel

(1) For assistance contact the Technical Services Hotline (see page 4).

Antiseize Compound:

(2) Use SAE AMS2518 (MIL-T-5544). (3) Use MIL-PRF-83483 (MIL-T-83483).

Cleveland

Wheels & Brakes



Torque Values

External Design Wheels & Brakes

A3. Brake Assembly Back Plate Tie Bolt Torques (Cont'd)

Brake Assembly	Bolt Torque		Material	
	In-lb	N-M	Housing	Torque Plate
30-99	75-80 D	8.5-9.0	M	A
30-99A	75-80 D	8.5-9.0	M	M
30-100	75-80 D	8.5-9.0	M	M
30-106	80-90 D	9.0-10.2	M	M
30-107	85-90 D	9.6-10.2	A	M
30-107A	85-90 D	9.6-10.2	A	M
30-107B	85-90 D	9.6-10.2	A	M
30-107C	85-90 D	9.6-10.2	A	M
30-107D	85-90 D	9.6-10.2	A	M
30-107E	80-95 D	9.0-10.7	A	M
30-111	80-90 D	9.0-10.2	A	A
30-113	80-90 D	9.0-10.2	A	M
30-113A	80-90 D	9.0-10.2	A	M
30-123	80-90 D	9.0-10.2	M	M
30-127	90 D	10.2	M	S
30-127A	90 D	10.2	M	S
30-127C	90 D	10.2	M	S
30-127D	90 D	10.2	M	S
30-129	75-90 D	8.5-10.2	M	S
30-131	80-90 D	9.0-10.2	A	M
30-133	75-80 D	8.5-9.0	M	S
30-138	80-90 D	9.0-10.2	M	M
30-139	75-80 D	8.5-9.0	M	S
30-141	150 D	16.9	A	M
30-142	150 D	16.9	A	M
30-143	150 D	16.9	A	M
30-144	85-90 D	9.6-10.2	A	M
30-144A	85-90 D	9.6-10.2	A	M
30-144B	85-90 D	9.6-10.2	A	M
30-145	80-90 D	9.0-10.2	M	M
30-146	85-90 D	9.6-10.2	A	M
30-146A	85-90 D	9.6-10.2	A	A
30-149	80-90 D	9.0-10.2	A	A
30-158	80-90 D	9.0-10.2	M	M
30-159	85-90 D	9.6-10.2	A	M
30-159A	85-90 D	9.6-10.2	A	M
30-159B	85-90 D	9.6-10.2	A	M
30-159C	85-90 D	9.6-10.2	A	M
30-163	85-90 D	9.6-10.2	M	A
30-164	75-80 D	8.5-9.0	M	S
30-170	80-85 D	9.0-9.6	A	A
30-176	85-90 D	9.6-10.2	A	A

Brake Assembly	Bolt Torque		Material	
	In-lb	N-M	Housing	Torque Plate
30-181A	75-80 D	8.5-9.0	A	S
30-182	85-90 D	9.6-10.2	M	A
30-184	80-90 D	9.0-10.2	A	A
30-195	85-90 D	9.6-10.2	A	A
30-195A	85-90 D	9.6-10.2	A	A
30-210	80-85 L (2)	9.0-9.6	A	A
30-210A	80-85 L (3)	9.0-9.6	A	A
30-214	75-80 D	8.5-9.0	M	S
30-214B	75-80 D	8.5-9.0	M	S
30-220	85-90 D	9.6-10.2	A	M
30-224	75-80 D	8.5-9.0	M	S
30-231	80-90 D	9.0-10.2	A	A
30-233	90 D	10.2	M	S
30-233A	90 D	10.2	M	S
30-233B	90 D	10.2	M	S
30-236	75-80 D	8.5-9.0	M	N/A
30-239	75-80 D	8.5-9.0	M	S
30-239A	75-80 D	8.5-9.0	M	S
30-239B	75-80 D	8.5-9.0	A	S
30-241	90 L (3)	10.2	A	S
C-30018	120-130 D	13.6-14.7	A	S
C-30018-1	120-130 D	13.6-14.7	A	S
C-30018-2	120-130 D	13.6-14.7	A	S
C-30018-3	120-130 D	13.6-14.7	A	S
C-30018-4	120-130 D	13.6-14.7	A	S
C-30018-5	120-130 D	13.6-14.7	A	S
C-30018-6	120-130 D	13.6-14.7	A	S
C-30018-7	120-130 D	13.6-14.7	A	S
D-30118-3	100-110 D	11.3-12.4	A	S
D-30118-4	100-110 D	11.3-12.4	A	S
D-30118-5	100-110 D	11.3-12.4	A	S
D-30118-6	100-110 D	11.3-12.4	A	S
D-30118-7	100-110 D	11.3-12.4	A	S
D-30118-8	100-110 D	11.3-12.4	A	S
D-30118-9	100-110 D	11.3-12.4	A	S
D-30118-10	100-110 D	11.3-12.4	A	S
C-30764-5	120-130 D	13.6-14.7	A	S
C-30764-6	120-130 D	13.6-14.7	A	S
C-30764-7	120-130 D	13.6-14.7	A	S
D-30793-3	100-110 D	11.3-12.4	A	S
D-30793-4	100-110 D	11.3-12.4	A	S
D-30793-5	100-110 D	11.3-12.4	A	S
D-30793-6	100-110 D	11.3-12.4	A	S

Material column designations are as follows: "A" Aluminum "M" Magnesium "S" Steel

(1) For assistance contact the Technical Services Hotline (see page 4).

Antiseize Compound:

(2) Use SAE AMS2518 (MIL-T-5544). (3) Use MIL-PRF-83483 (MIL-T-83483).

Cleveland

Wheels & Brakes



Torque Values

A4. Wheel Assembly Torque Values

All wheel assembly tie bolt and nut torque values listed are to be applied to the **nut** only.

A “**D**” shown adjacent to the torque value indicates the value to be a “**Dry**” torque only.

An “**L**” shown adjacent to the torque value indicates a “**Lubtork**” torque only. Lubtork requires the application of an antiseize compound to all friction surfaces of the hardware as shown in Figure 312. Only use the antiseize specified for your wheel assembly. A flag note will specify which antiseize to use.

Caution: Do not “lubtork” any bolt and nut combinations that are specified as a “Dry” torque value.

Note: If there is any conflict or question regarding dry torque, lubtork, or torque value on your assembly, please contact Cleveland Customer Support for resolution.

[A5-#] = Code for inflation valve stem torque. See appropriate dash number, -#, in Table A5 for torque value.

Table Flag Note Legend:

Material Column Designations: “**A**” Aluminum “**M**” Magnesium

(1) For assistance contact the Technical Services Hotline (see page 4).

Antiseize Compound:

(2) Use SAE AMS2518 (MIL-T-5544). (3) Use MIL-PRF-83483 (MIL-T-83483).

Wheel Bearing Grease: (Refer to Section 300, paragraph 3.A. Bearing Grease)

All active wheel assemblies listed are shipped with Mobil Aviation Grease SHC 100 except:

(4) Wheel uses BG Products HCF Grease P/N 605 (Amphibious).

Torque Values:

(5) Dry torque brake disc bolts to 80 in-lbs.

(6) Dry torque brake disc bolts to 150 in-lbs.

(7) Torque value is dependent on hardware configuration. Refer to PRM 83 for torque values.

(8) Torque value is dependent on hardware configuration. PRM’s are in development to release the hardware upgrade for the following assemblies. In the interim, follow the wheel assembly nameplate for torque value. The table below is for reference only.

For assistance contact the Technical Services Hotline (see page 4).

(9) Torque value is dependent on hardware configuration. Refer to PRM 86 for torque values.

Wheel Assembly	Nut / Washer (qty)	Torque in-lb (N-M)
40-77A, 40-77B, 40-77F, 40-87C, 40-110, 40-168	094-01200 / 095-10400	75 D (8.5)
	094-10300 / 095-10200	90 D (10.2)
40-87	094-01200 / 095-10400 (6)	75 D (8.5)
	094-10300 / 095-10400 (3)	90 D (10.2)
40-78, 40-78A, 40-78B, 40-78E, 40-78J, 40-151, 40-151A, 40-230	094-01200 / 095-10200	75 D (8.5)
	094-10300 / 095-10200	90 D (10.2)
40-87A, 40-87D, 40-87F, 40-110B, 40-152	094-01200 / 095-10400	75 D (8.5)
	094-10300 / 095-10400	90 D (10.2)

Cleveland

Wheels & Brakes



Torque Values

External Design Wheels & Brakes

A4. Wheel Assembly Torque Values (Cont'd)

Wheel Assembly	Bolt Torque		Material Wheel
	In-lb	N-M	
27-100D (40-1)	90 D	10.2	A
21-100D (40-2)	90 D	10.2	M
3080A (40-3)	90 D	10.2	M
3080B (40-4)	90 D	10.2	M
3070 (40-5)	90 D	10.2	M
3040 (40-6)	90 D	10.2	A
3050 (40-7)	90 D	10.2	A
3050A (40-7A)	90 D	10.2	A
38501 (40-8)	90 D	10.2	M
40-12	90 D	10.2	M
40-12A	90 D	10.2	M
40-18	90 D	10.2	M
40-19	90 D	10.2	A
40-19A	90 D	10.2	A
40-21	90 D	10.2	A
40-24	90 D	10.2	A
40-28	90 D	10.2	M
40-28D	90 D	10.2	M
40-30A	90 D	10.2	A
40-32	90 D	10.2	A
40-34	90 D	10.2	M
40-37	90 D	10.2	A
40-40A	135-145D	15.3-16.4	M
40-40B	135-145D	15.3-16.4	M
40-40C	90 D	10.2	M
40-40D	150 D	16.9	M
40-41	150 D	16.9	M
40-46	90 D	10.2	A
40-47	150 D	16.9	A
40-50	90 D	10.2	A
40-55	90 D	10.2	A
40-56	150 D	16.9	M
40-56B	150 D	16.9	M
40-56C	150 D	16.9	M
40-57	90 D	10.2	A
40-57A	90 D	10.2	A
40-58	90 D	10.2	M
40-59	150 D	16.9	M
40-59A	150 D	16.9	M
40-59D	150 D	16.9	M
40-59E	150 D	16.9	M
40-60	90 D	10.2	M
40-60A	90 D	10.2	A
40-61	90 D	10.2	M
40-66	90 D	10.2	A
40-67	90 D	10.2	A

Wheel Assembly	Bolt Torque		Material Wheel
	In-lb	N-M	
40-74	90 D	10.2	A
40-74A	90 D	10.2	A
40-74B	90 D	10.2	A
40-75B	150 D	16.9	M
40-75D	150 D	16.9	M
40-75E	150 D	16.9	M
40-75F	150 D	16.9	M
40-75G	150 D	16.9	M
40-75H	150 D	16.9	M
40-75J	150 D	16.9	M
40-75P	150 D	16.9	M
40-75S	150 D	16.9	M
40-75T	150 D	16.9	M
40-75W	150 D	16.9	M
40-75Z	150 D	16.9	M
40-76A	150 D	16.9	M
40-76B	150 D	16.9	M
40-76C	150 D	16.9	M
40-76D	150 D	16.9	M
40-76E	150 D	16.9	M
40-76F	150 D	16.9	M
40-76G	150 D	16.9	M
40-76H	150 D	16.9	M
40-76P	150 D	16.9	M
40-76-1	150 D	16.9	(1)
40-77		(9)	M
40-77A		(8)	M
40-77B		(8)	M
40-77C		(7)	M
40-77D	90 D	10.2	M
40-77E		(7)	M
40-77F		(8)	M
40-77G	90 L (2)	10.2	M
40-78		(8)	M
40-78A		(8)	A
40-78B		(8)	M
40-78E		(8)	M
40-78J		(8)	A
40-79A	150 D	16.9	M
40-83	150 D	16.9	M
40-83A	150 D	16.9	M
40-83B	150 D	16.9	M
40-84	150 D	16.9	M
40-84A	150 D	16.9	M
40-84B	150 D	16.9	M

Cleveland

Wheels & Brakes



Torque Values

External Design Wheels & Brakes

A4. Wheel Assembly Torque Values (Cont'd)

Wheel Assembly	Bolt Torque		Material Wheel	Wheel Assembly	Bolt Torque		Material Wheel
	In-lb	N-M			In-lb	N-M	
40-86	150 D	16.9	M	40-110	(8)		M
40-86A	150 D	16.9	M	40-110B	(8)		M
40-86B	150 D	16.9	M	40-111	150 D	16.9	M
40-86E	150 D	16.9	M	40-111A	150 D	16.9	M
40-86F	150 D	16.9	M	40-112	90 D	10.2	A
40-87		(8)	M	40-113	90 D	10.2	A
40-87A		(8)	M	40-113A	90 D	10.2	A
40-87C		(8)	A	40-113B	90 D	10.2	A
40-87D		(8)	M	40-113C	90 D	10.2	A
40-87F		(8)	M	40-113X	90 D	10.2	A
40-87G	115-135 D	13.0-15.3	M	40-115	90 D	10.2	M
40-88C	150 D	16.9	M	40-115A	115-135 D	13.0-15.3	M
40-90	150 D	16.9	M	40-115B	115-135 D	13.0-15.3	M
40-90A	150 D	16.9	M	40-115C	115-135 D	13.0-15.3	M
40-90B	150 D	16.9	M	3080D (40-116) (5)	90 D	10.2	M
40-90D	150 D	16.9	M	40-117A	150 D	16.9	M
40-90E	150 D	16.9	M	40-120	150 D	16.9	M
40-90F	150 D	16.9	M	40-120A	150 D	16.9	M
40-96E	150 D	16.9	M	40-120C	150 D	16.9	M
40-97A	150 D	16.9	M	40-124	180 D	20.3	M
40-97B	150 D	16.9	M	40-127	180 L (2)	20.3	A
40-97C	150 D	16.9	M	40-128	180 D	20.3	M
40-97D	150 D	16.9	M	40-128A	180 D	20.3	M
40-97E	150 D	16.9	M	40-128C	180 D	20.3	M
40-97F	150 D	16.9	M	40-128D	180 D	20.3	M
40-98	150 D	16.9	M	40-128E	180 D	20.3	M
40-98A	150 D	16.9	M	40-129	90 D	10.2	A
40-98D	150 D	16.9	M	40-130	90 D	10.2	M
40-98E	150 D	16.9	M	40-131 (5)	90 D	10.2	M
40-98F	150 D	16.9	M	40-132 [A5-1]	150 D	16.9	M
40-98G	150 D	16.9	M	40-133	150 D	16.9	A
40-98H	150 D	16.9	M	40-134 [A5-2]	150 D	16.9	M
40-98N	150 D	16.9	M	40-134A [A5-2]	150 D	16.9	M
40-98P	150 D	16.9	M	40-135	135-145 D	15.3-16.4	M
40-99	90 D	10.2	M	40-135A	150 D	16.9	M
40-101	90 D	10.2	A	40-137	180 D	20.3	A
40-101A	90 D	10.2	A	40-138A	150 D	16.9	M
40-101D	90 D	10.2	A	40-139	150 D	16.9	A
40-101E	90 D	10.2	A	40-140	150 D	16.9	M
40-102	90 D	10.2	M	40-140A	150 D	16.9	M
40-102A	90 D	10.2	M	40-140B	150 D	16.9	M
40-103	90 D	10.2	A	40-140C	150 D	16.9	M
40-103A	90 D	10.2	A	40-141	150 D	16.9	M
40-106	150 D	16.9	M	40-142	150 D	16.9	M
40-106A	150 D	16.9	M	40-142A	150 D	16.9	M
40-107A [A5-3]	300 L (2)	33.9	M	40-143	150 D	16.9	M

Cleveland

Wheels & Brakes



Torque Values**External Design Wheels & Brakes****A4. Wheel Assembly Torque Values (Cont'd)**

Wheel Assembly	Bolt Torque		Material Wheel
	In-lb	N-M	
40-148 [A5-3]	300 D	33.9	M
40-151	(8)		M
40-151A	(8)		A
40-152	(8)		M
40-162	150 D	16.9	M
40-163	150 D	16.9	M
40-166 [A5-1] (6)	300 D	33.9	M
40-167 (6)	300 D	33.9	M
40-168	(8)		A
40-169 [A5-1] (6)	150 D	16.9	M
40-170 [A5-3]	300 L (2)	33.9	M
40-170A [A5-3]	300 L (2)	33.9	A
40-170B [A5-3]	300 L (2)	33.9	M
40-171	180 D	20.3	M
40-172	180 D	20.3	M
40-174	300 L (2)	33.9	A
40-175	150 D	16.9	A
40-176 [A5-1]	300 D	33.9	A
40-176A [A5-1]	300 D	33.9	A
40-177A	150 D	16.9	M
40-179	150 D	16.9	A
40-179A	150 D	16.9	A
40-181B [A5-1]	180 D	20.3	A
40-181C [A5-1]	180 D	20.3	A
40-193	150 D	16.9	A
40-195	150 D	16.9	M
40-196	90 D	10.2	M
40-198 [A5-3]	300 L (2)	33.9	M
40-199	90 D	10.2	A
40-199A	90 D	10.2	A
40-202 [A5-1]	300 L (2)	33.9	A
40-203 [A5-4]	290-300 L (2)	32.8-33.9	A
40-204 [A5-4]	290-300 L (2)	32.8-33.9	A
40-205 [A5-1]	180 D	20.3	M
40-210 [A5-6]	150 L (2)	16.9	M
40-211 [A5-3]	300 D	33.9	M
040-21101 [A5-3]	300 L (2)	33.9	M
40-212 [A5-1]	150 L (2)	16.9	M

Wheel Assembly	Bolt Torque		Material Wheel
	In-lb	N-M	
40-223	90 D	10.2	A
40-230	(8)		M
40-234	90 D	10.2	A
40-239 [A5-6]	300 L (2)	33.9	A
040-23901 [A5-6]	300 L (2)	33.9	A
40-240A [A5-6]	125 L (2)	14.1	M
40-255 [A5-1]	90-100 L (2)	10.2-11.3	M
40-256	135-145 D	15.3-16.4	M
40-258	300 D	33.9	(1)
40-259 [A5-1]	95-105 L (2)	10.7-11.8	M
40-260 [A5-1]	95-105 L (2)	10.7-11.8	M
40-262A [A5-6]	90 L (2)	10.2	M
40-270 [A5-6]	115-135 L (2)	13.0-15.3	M
40-273 [A5-5]	300 L (2)	33.9	A
40-273A [A5-4]	290-300 L (2)	32.8-33.9	A
40-273B [A5-4]	290-300 L (2)	32.8-33.9	A
40-276 [A5-6]	90-100 L (2)	10.2-11.3	M
40-279 [A5-3]	300 L (2)	33.9	M
40-279A [A5-3]	300 L (3)	33.9	M
40-281	90 D	10.2	M
40-289 [A5-1]	300 L (2)	33.9	A
40-293 [A5-6]	180-190 L (2)	20.3-21.5	A
40-403	150 D	16.9	A
40-406	150 D	16.9	M
40-406A	150 D	16.9	M
40-407	150 D	16.9	M
40-414	150 D	16.9	M
40-414A	150 D	16.9	M
40-417 [A5-7]	115-125 L (3)	12.9-14.1	A
40-418 (4)	150 D	16.9	A
40-418A (4)	150 D	16.9	A
40-418B (4)	150 D	16.9	A
40-426 (4)	150 D	16.9	A
40-426A (4)	150 D	16.9	A
40-434 [A5-6]	315-325 L (3)	35.6-36.7	A
40-450	105-115 L (2)	11.9-13.0	A
40-455	150 D	16.9	A

Cleveland

Wheels & Brakes



Torque Values**External Design Wheels & Brakes****A4. Wheel Assembly Torque Values (Cont'd)**

Wheel Assembly	Bolt Torque		Material
	In-lb	N-M	Wheel
C-30174-1	95 D	10.7	(1)
C-30179	190-200 D	21.5-22.6	(1)
D-30204	95 D	10.7	(1)
D-30255	195 D	22.0	(1)
D-30260	195 D	22.0	(1)
D-30260-1	195 D	22.0	(1)
D-30291-1	195 D	22.0	A
D-30291-2	195 D	22.0	A
D-30291-3	195 D	22.0	A
D-30291-4	195 D	22.0	A
D-30291-5	195 D	22.0	A
D-30291-6	195 D	22.0	A
D-30380	95 D	10.7	A
C-30480	195 D	22.0	(1)
D-30500	145 D	16.4	A
D-30500-1	145 D	16.4	A

Wheel Assembly	Bolt Torque		Material
	In-lb	N-M	Wheel
D-30570	195 D	22.0	A
D-30580	195 D	22.0	(1)
D-30585	195 D	22.0	(1)
D-30660-1	145 D	16.4	A
D-30660-2	145 D	16.4	A
D-30660-3	145 D	16.4	A
D-30660-4	145 D	16.4	A
D-30660-5	145 D	16.4	A
D-30660-6	145 D	16.4	A
D-30660-7	145 D	16.4	A
D-30660-8	145 D	16.4	A
D-30660-9	145 D	16.4	A
D-30660-10	145 D	16.4	A
D-30665	145 D	16.4	A
D-30665-1	145 D	16.4	A

A5. Tire Inflation Valve Stem Torques

Dash No.	Inflation Valve P/N	Recommended Torque	
		In-Lb	N-M
-1	160-00700	50-60	5.7-6.8
-2	160-00900	165-200	18.7-22.6
-3	160-01100	75-100	8.4-11.3
-4	160-01200	35-45	4.0-5.1

Dash No.	Inflation Valve P/N	Recommended Torque	
		In-Lb	N-M
-5	160-01500	70-80	7.9-9.0
-6	160-01900	50-60	5.7-6.8
-7	160-02000	25-35	2.8-3.9

Cleveland

Wheels & Brakes



B1. Special Tools

Item	Part Number	Description
Rivet Set Kit	199-1	Consists of Punch & Anvil
Parker O-Ring Extractor Kit	199-18	Consists of Multi-hook, Multi-ramp & Case
Brake Line Bleeder	087-00500	The brake line bleeder can be used to service all Cleveland Products hydraulic brake assemblies or any other brake assembly utilizing the 079-00300 (FC-6446) Bleeder Screw.
Brake Lining Rivet Tool Kit	199-579	Consists of a tool frame, anvil, set, punch, and tool bag. It is for use with P/N's 105-00200 (5/32" rivets) and 177-00300 (5/32" pins) on external caliper type brake assemblies.

B2. Lubricants For Elastomeric Compounds

Pneumatic Applications

Grease per MIL-G-4343:

Royco 43 – Royal Lubricants Co., Inc., East Hanover, NJ

Aeroshell 43 – Royal Lubricants Co., Inc., East Hanover, NJ

Cosmolube 615 – Houghton International, Inc., Fogelsville, PA

Other:

55 O-Ring Lubricant – Dow Corning Corp., Midland, MI

Hydraulic Applications – Use fluids compatible with the system

MIL-H-5606 / MIL-H-83282 (Red Oils)

Skydrol – Only compatible with itself.

B3. LubricantsWheel Bearing Grease – [Refer to Section 300 Off-Aircraft Maintenance, paragraph 3.A. Bearing Grease](#)

MIL-PRF-81322, Grade 2 or DOD-G-24508A

(Aeroshell Grease 22) Shell Oil Company, Metairie, LA

Mobil Aviation Grease SHC 100

ExxonMobil Oil Corp., Beaumont, TX

HCF Grease P/N 605 (Amphibious)

BG Products, Wichita, KS

Cleveland

Wheels & Brakes



Special Tools/Lubricants/Repair Materials External Design Wheels & Brakes**B3. Lubricants (Cont'd)**

Bolts/Nuts Antiseize -- Only use antiseize specified for your assembly per SAE-AMS2518 (MIL-T-5544)

Armitex Laboratories, Costa Mesa, CA
Royco 44 – Royal Lubricant, East Hanover, NJ

per MIL-PRF-83483

Moly-50 P/N 51094 – Fel-Pro Chemical Products L.P., Skokie, IL

Pipe Threads (Brake Cylinder Inlet Fittings) - Apply to First 3 Threads

Lubon #404 - Oil Center Research, Lafayette, LA

B4. Surface Repair

Aluminum - Conversion Coating per MIL-C-5541, Class 1A, (Alodine)

Magnesium - Surface Pretreatment per AMS-M-3171 (MIL-M-3171)

Type III (Dip), Type VI (Brush On), or Type VIII (Dip)

IRIDITE 15, P/N of MacDermid, Inc., Waterbury, CT (800) 325-4158.

Use instructions furnished by Mfgr. for AZ81 & AZ91 Magnesiums.

B5. Primers and Paints

Color	(1) Columbia Paint Corp., Huntington, WV Ph: 304-529-3237	Sherwin Williams, Cleveland, OH www.sherwin-williams.com
White Paint	18-017A (Gray Primer)	P60G2 (Primer)
	11-358A (524 Gloss White)	F63W13 (White)
Silver Paint	18-017A (Gray Primer)	P60G2 (Primer)
	17-250A (524 Aluminum)	F63BXS58-4337 (Silver)
Silver Paint (brake discs)	18-017A (Gray Primer) or 12-231A (Dk Gray Primer)	P60G2 (Primer)
	17-250A (524 Aluminum)	F63BXS58-4337 (Silver)

(1) Products are low volatile organic compounds (low VOC) and water reducible. Longer drying times may be required.

ZRC Products (Quincy, MA), phone: 1-800-831-3275

- ZRC Galviline Cold Galvanizing Compound (per MIL-P-26915A) – P/N 11011-10014

NOTE: Substitution of products is permissible, provided an equivalent level of protection is produced. Consult your local EPA regulations prior to using substitute products.

B6. Chemical Stripping Agents

For Magnesium alloys AZ81 and AZ91

Turco Products (Carson, CA) www.hstna.com/turco/aviation.cfm

- Spray or brush on application:
Water Based Environmentally Advantaged Paint Remover
P/N T-6813 or T-6840S
- Tank type stripping application:
Diphase Hot Tank Paint Remover
P/N T-5668

Cleveland

Wheels & Brakes



Brake Assembly / Lining Cross-Reference External Design Wheels & Brakes**C1. Brake Assembly / Lining Cross-Reference**

This cross-reference identifies the proper brake lining for each of the brake assemblies listed. All linings require conditioning prior to use.

Abbreviations:

pp = Pressure Plate

bp = Back Plate

tp = Torque Plate

cp = Carrier Plate

N/A = Not Available

Brake Assembly	Lining	Qty
35-200A (30-1)	066-11100	2
C2000 (30-2)	066-00504	2
C7000 (30-3)	066-00504	2
C7000A (30-3A)	066-00504	2
30-4	066-11100	2
30-5	N/A	
30-6	066-11100	2
30-7	066-11100	2
37-200-2 (30-8)	066-10600	8
30-9	066-10600	2
30-9A	066-10600	2
30-9C	066-10600	2
30-9D	066-10600	2
30-9E	066-10600	2
3000-250 (30-12)	066-10600	4
3000-500 (30-13)	066-10600	4
30-18	066-10600	2
30-19	066-10600	2
30-19A	066-10600	2
30-21	066-10600	4
30-23	066-06500 pp	2
	066-06200 bp	2
30-23A	066-06500 pp	2
	066-06200 bp	2
30-23B	066-06500 pp	2
	066-06200 bp	2
30-23C	066-06500 pp	2
	066-06200 bp	2
30-23D	066-06500 pp	2
	066-06200 bp	2
30-24	066-10600	4
30-28B	066-03300	6
30-28C	066-03300	6
30-28D	066-03300	6
30-30	066-10500	2
30-31	066-11700 tp	4
	066-11900 cp	4
	066-11800 bp	4
30-32	N/A	
30-32A	066-10600	4
30-32B	066-10600	4
30-32C	066-10600	4
30-32D	066-10600	4
30-32E	066-10600	4
30-35	066-10600	4
30-40	066-10600	2
30-40A	066-10600	2
30-41	066-10600	4
30-41A	066-10600	4
30-41B	066-10600	4

Brake Assembly	Lining	Qty
30-45	066-11100	2
30-51	066-10600	4
30-51A	066-10600	4
30-51B	066-10600	4
30-52	066-10500	4
30-52A	066-10500	4
30-52B	066-10500	4
30-52D	066-10500	4
30-52E	066-10500	4
30-52F	066-10500	4
30-52G	066-10500	4
30-52H	066-10500	4
30-52K	066-10500	4
30-52L	066-10500	4
30-52M	066-10500	4
30-52N	066-10500	4
30-52P	066-10500	4
30-52Q	066-10500	4
30-52S	066-10500	4
30-52T	066-10500	4
30-52U	066-10500	4
30-52V	066-10500	4
30-52W	066-10500	4
30-52X	066-10500	4
30-52Y	066-10500	4
30-52Z	066-10500	4
30-52AA	066-10500	4
30-52AB	066-10500	4
30-52AC	066-10500	4
30-53	066-11200	2
30-53A	066-11200	2
30-54	066-10500	4
30-54A	066-10500	4
30-54B	066-10500	4
30-54C	066-10500	4
30-55	066-10500	2
30-55B	066-10500	2
30-56	066-10500	2
30-56A	066-10500	2
30-56B	066-10500	2
30-56C	066-10500	2
30-56D	066-10500	2
30-56F	066-10500	2
30-58A	N/A	
30-58B	N/A	
30-59	066-11200	2
30-59A	066-11200	2
30-59D	066-11200	2
30-59E	066-11200	2
30-60	066-10600	4

Brake Assembly	Lining	Qty
30-60A	066-10600	4
30-60B	066-10600	4
30-61	066-10500	4
30-61A	066-03600	4
30-61B	066-03600	4
30-61D	066-10500	4
30-61E	066-10500	4
30-61F	066-10500	4
30-63	066-10500	2
30-63A	066-10500	2
30-63B	066-10500	2
30-63D	066-10500	2
30-63E	066-10500	2
30-63F	066-10500	2
30-63J	066-10500	2
30-63K	066-10500	2
30-63M	066-10500	2
30-63P	066-10500	2
30-63Q	066-10500	2
30-63S	066-10500	2
30-65	066-10500	4
30-65A	066-10500	4
30-65E	066-10500	4
30-66	066-04400	4
30-66A	066-11000	4
30-66B	066-11000	4
30-66C	066-02200	4
30-66D	066-02200	4
30-66F	066-04400	4
30-66G	066-09700	4
30-66H	066-02200	4
30-67	066-10800	4
30-67A	066-10800	4
30-67B	066-10800	4
30-67C	066-10800	4
30-67D	066-10800	4
30-67E	066-10800	8
30-67X	066-10800	4
30-68	066-03300	6
30-68A	066-03300	6
30-68B	066-03300	6
30-69A	066-02200	4
30-69B	066-02200	4
37-200-A (30-72)	066-06500 pp	4
	066-06200 bp	4
30-74B	066-06700	4
30-75	066-10500	2
30-75A	066-10500	2
30-75B	066-10500	2
30-75X	066-10500	2

Cleveland

Wheels & Brakes



Brake Assembly / Lining Cross-Reference External Design Wheels & Brakes**C1. Brake Assembly / Lining Cross-Reference (Cont'd)**

Brake Assembly	Lining	Qty
30-79	066-10500	2
30-79A	066-10500	2
30-79B	066-10500	2
30-83	066-06200	4
30-83A	066-06200	4
30-84	066-10800	8
30-88	066-02200	8
30-89	066-10800	6
30-89A	066-10800	6
30-89B	066-10800	6
30-89C	066-10800	6
30-89E	066-10800	6
30-91	066-11300	12
30-93	066-04400	6
30-93A	066-02200	6
30-93B	066-04400	6
30-93C	066-09700	6
30-93D	066-04400	6
30-93E	066-04400	6
30-94	066-10800	8
30-95	066-03300	8
30-95A	066-06600	8
30-95B	066-06600	8
30-96	066-06200	8
30-97	066-06400	8
30-98	066-10800	12
30-98A	066-10800	12
30-98B	066-10800	12
30-98C	066-10800	12
30-98D	066-10800	12
30-99	066-06600	8
30-99A	066-06600	8
30-100	066-06600	8
30-103	066-11300	16
30-106	066-06800	16
30-107	066-09000	8
30-107A	066-09000	8
30-107B	066-09000	8
30-107C	066-09000	8
30-107D	066-09000	8
30-107E	066-09000	8
30-111	066-10800	8
30-113	066-06400	8
30-113A	066-06400	8
30-123	066-06800	12
30-127	066-06200	4
30-127A	066-06200	4
30-127C	066-06200	4
30-127D	066-06200	4
30-129	066-06200	4
30-131	066-09000	8
30-133	066-10500	2
30-138	066-06800	6
30-139	066-06200	8
30-141	066-07300	8
30-142	066-07300	8
30-143	066-07300	8

Brake Assembly	Lining	Qty
30-144	066-09000	8
30-144A	066-09000	8
30-144B	066-09000	8
30-145	066-09700	6
30-146	066-09100 pp	2
	066-09200 bp	2
30-146A	066-09100 pp	2
	066-09200 bp	2
30-148	066-11300	16
30-149	066-06600	12
30-158	066-06800	8
30-159	066-09000	8
30-159A	066-09000	8
30-159B	066-09000	8
30-159C	066-09000	8
30-163	066-03300	8
30-164	066-06200	2
30-170	066-10000	8
30-176	066-10800	4
30-181A	066-10600	2
30-182	066-03300	8
30-184	066-10800	8
30-195	066-10800	4
30-195A	066-10800	4
30-208	N/A	
30-208A	066-12901	2
30-210	066-13100	16
30-210A	066-13100	16
30-214	066-10500	2
30-214B	066-10500	2
30-220	066-13500 pp	2
	066-13700 bp	2
30-224	066-10500	2
30-231	066-06600	12
30-233	066-06200	4
30-233A	066-06200	4
30-233B	066-06200	4
30-236	066-10500	2
30-239	066-14100	2
30-239A	066-14100	2
30-239B	066-14100	2
30-241	066-10500	4
C-30018	066-30026	2
C-30018-1	066-30026	2
C-30018-2	066-30026	2
C-30018-3	066-30026	2
C-30018-4	066-30026	2
C-30018-5	066-30026	2
C-30018-6	066-30026	2
C-30018-7	066-30026	2
D-30118-3	066-30026	4
D-30118-4	066-30026	4
D-30118-5	066-30026	4
D-30118-6	066-30026	4
D-30118-7	066-30026	4
D-30118-8	066-30026	4
D-30118-9	066-30026	4

Brake Assembly	Lining	Qty
D-30118-10	066-30026	4
C-30764-5	066-30026	2
C-30764-6	066-30026	2
C-30764-7	066-30026	2
D-30793-3	066-30026	4
D-30793-4	066-30026	4
D-30793-5	066-30026	4
D-30793-6	066-30026	4

Cleveland

Wheels & Brakes



The following is a comprehensive list of all Cleveland Service Bulletins. In the past, these publications have been known as Engineering Service Bulletins (ESB) or Engineering Service Letters (ESL). Document identification numbers were preceded by the letters ESB or ESL. Publications selected for incorporation into Revision B of the Cleveland Component Maintenance Manual (CMM) have been revised to be reidentified as Service Bulletins (SB). In this case, the basic identification number is retained, and the original prefix letters (ESB or ESL) are replaced by SB. Included in this list is a document status code, with legend as follows:

Status Code

A = Active

O = Obsolete

LD = Limited Distribution

Obsolete publications are not available for general distribution (not included in the CMM). Superseding documents, if applicable, will be referenced in the title of the obsolete publication. Publications coded as LD are not for general distribution. These publications were explicitly created for the Original Equipment Manufacturers (OEM's) using Cleveland products.

<u>NUMBER</u>	<u>REV</u>	<u>STATUS</u>	<u>TITLE</u>	<u>DATE</u>
SB7000-2	C	A	Converting 3080C Piper Aztec Wheel Assemblies to 3080D (forged disc) Configuration.	07/01/95
SB7000-4	B	A	Converting Early Piper Aztec Wheel 3080B & 3080D Brake Assemblies (37-200-2 & 37-200A) to Current Production Models (40-131 Wheel, 30-96 Brake) Field Conversion.	07/01/95
SB7000-5	C	A	Converting Piper Chieftain (PA31-350) Wheel (40-102A), Brake Assemblies (30-68A & 30-68B) to Current Production Models (40-130 Wheel & 30-95) Brake) - Field Conversion (199-66).	07/01/95
SB7000-6	B	A	Converting 3080C Piper Aztec Wheel Assemblies to 3080D (forged disc) Configuration (199-41).	07/01/95
SB7002	A	A	Heat checks in Piper Aztec Brake Disc, Part No. 164-03206	07/01/95
SB7003	A	A	Lockwire Aero Commander Thrush S2R (30-94) Brake Cylinder Bolts with 8.50-10 Wheels.	07/01/95
SB7005	A	A	Heat checks in Piper Aztec Brake Disc, Part No. 164-05700	07/01/95
SB7006	A	A	Possible Development of Circumferential Cracks in Cleveland Brake Discs used on Certain Models of the Piper - PA31 Navajo Aircraft.	07/01/95
SB7007	A	A	Definition of Acceptable Limits of Bolt Protrusion Beyond Spline Nuts in 40-4, 40-116, and 40-131 Aztec Wheel Assemblies (PA23-250).	07/01/95
SB7008	A	A	Possible Development of Circumferential Cracks in Cleveland Brake Discs used on Ted Smith Aerostar Aircraft (164-06100).	07/01/95

Cleveland

Wheels & Brakes



Service Bulletins

NUMBER	REV	STATUS	TITLE	DATE
SB7009	B	A	Heat Checks in Forged Brake Disc 164-05006 Ted Smith Aerostar Models 600, 601 & 601P (Piper).	07/01/95
SB7010	A	A	Heat Checks in Forged Brake Disc 164-05006 Rockwell Commander Model 700.	07/01/95
SB7011	A	A	Axle Spacer to Grease Seal - Interference with Kit 199-61 Cessna Models 190 and 195.	07/01/95
SB7012	A	A	Possible Development of Circumferential Cracks in Cleveland Brake Discs 164-05000 used on Ted Smith Aerostar.	07/01/95
SB7013	A	A	Field Service Bulletin Subject: Stainless Steel Brake Discs Being Offered for use with Cleveland Wheels and Brakes.	07/01/95
ESB 7015	--	A, LD	199-130/130A Availability of Kit for Commander Series.	04/17/85
ESB 7017	B	O	Installation of 075-17600 Torque Plate Subassembly in Parker 30-161 Brake Assembly	03/15/90
SB7018	B	A	Installation of 075-17600 Torque Plate Subassembly 159-03500 Discs in Parker 30-189 Brake Assembly.	07/01/95
ESB 7019	NC	O	Repair of 157-01300 Heat Shields on 40-202 Wheel Assembly. (Superseded by ESB7026)	08/21/89
ESB 7020	B	A, LD	Production Modification of Pressure Switch Assembly for the Hydraulic Power Pak.	02/14/90
ESB 7021	NC	A, LD	Production Modification of End Gland Material for Main Landing Gear Locking Actuator Part Number 11-20.	02/14/90
SB7022	B	A	Installation of 075-17600 Torque Plate Subassembly and 159-03500 Discs in Parker 30-161 Brake Assembly.	07/01/95
SB7023	A	A	Replacement of Anchor Bolts 069-00400 with 069-01900 as used on Cleveland Brake Model 30-99.	07/01/95
SB7024	B	A	40-211 Main Wheel - Crack Inspection and Wheel Half Replacement.	07/01/95
SB7025	A	A	Replacement Disc for P/N 164-22200 used on Parker 40-179 Wheel Assembly.	07/01/95
ESB 7026	B	O	Replacement of 157-01300 Heat Shields with 157-01600 Heat Shield Clips as used on Cleveland Models 40-202 and 40-239 (Superseded by SB7032)	06/30/95
SB7027	A	A	Main Wheel & Brake Kit 199-84 Applicability Error on Cessna 182 Model Aircraft	07/01/95
SB7028	A	A	Replacement of 103-22700 Bolts used in Cleveland Brake Assemblies on The Cessna Citation	07/01/95
ESB 7029	A	A, LD	Upgrade of Piper Malibu/Mirage Hydraulic Power Pak	03/05/93
ESB 7030	A	A, LD	Inspection of Main Gear AFT Cross Tube Support Structure for Chafing Damage	12/18/92
ESB 7031	A	A, LD	Repair of Main Gear AFT Cross Tube Support Structure Chafing Damage	05/06/93

Cleveland

Wheels & Brakes



Service Bulletins

<u>NUMBER</u>	<u>REV</u>	<u>STATUS</u>	<u>TITLE</u>	<u>DATE</u>
SB7032	A	A	Drive Key Modification for 40-202, 40-239, and 40-239A (Supersedes ESB 7019 and ESB 7026)	07/01/95
SB7033	B	A	Main Wheel Assembly - Brake Disc - Inspect/Replace With New Disc	07/01/95
SB7034	B	A	Landing Gear - Emergency Extension - Inspect/Replace Air Line	12/19/95
SB7035	A	A, LD	Upgrade of 40-77B Nose Wheel Assembly to 40-77G Configuration	02/25/97
SB7036	NC	A, LD	Landing Gear - AFT Cross Tube Supports - Inspect/Rework	03/28/94
SB7037	A	A	Main Wheel Assembly - 40-172 Superseded By 40-289 - Product Improvement	07/01/95
SB7038	A	A	Nose Wheel Assembly - BHTI Model 222 - Inspect/Replace With New	07/01/95
SB7039	NC	A, LD	Upgrade of 30-208 Brake Assembly to 30-208A Configuration	07/12/94
SB7040	NC	A, LD	Landing Gear - Trunnion/Socket Assembly - Inspection/Replacement	08/22/94
SB7041	A	A	Upgrade of 30-204 Brake Assembly to 30-204A Configuration	07/01/95
SB7042	NC	A, LD	P/N 30-9 Brake Assembly - Rework to P/N 30-9D	12/07/94
SB7043	A	A	Citation Main Wheel - Fuseplug Port - Inspection / Replace Wheel Half	07/01/95
SB7044	NC	A, LD	Landing Gear - Hydraulic Power Pak - Replace O-Rings - Torque Manifold Screws	01/16/95
SB7045	NC	A, LD	Landing Gear - Hydraulic Power Pak - Replacement of Pressure Switches	06/14/95
SB7046	NC	A	Citation Brake - Shuttle Valve and Port, Inspect and Replace	10/01/95
SB7047	A	A, LD	Landing Gear - Hydraulic Power Pak - Improved Pressure Switch	05/02/96
SB7048	NC	A, LD	Brake Disc / Drive Keys - BHT Model 230 - Superceding Parts	01/29/96
SB7049	NC	A, LD	Landing Gear - Hydraulic Actuators - Inspect / Replace	03/08/96
SB7050	NC	A	Upgrade of 40-97E Wheel Assembly to 40-97F Configuration	04/25/97
SB7051	NC	A	Brake Assembly - Air Tractor 802 - Remove / Replace Pistons	03/25/96
SB7052	NC	A, LD	Landing Gear - Bolt Torque - Inspect	05/15/96
SB7053	NC	A	Brake Model 30-66D - Torque Plate - Inspect / Replace / Re-Identify Assembly	01/22/97
SB7054	NC	A	Citation Brake Assy - Brake Rotor Disc - Inspect / Replace	05/30/96
SB7055	NC	A	Brake Assembly - Socata - Remove / Replace Tie Bolts & Washers	02/05/97
SB7056	NC	A, LD	Landing Gear – Center Support Assembly – Inspect / Rework	01/27/97
SB7057	A	A, LD	Upgrade of 40-86B Wheel Assembly to 40-407 Configuration	02/17/98
SB7058	NC	A	Upgrade of 40-86B Wheel Assembly to 40-86F Configuration	6/11/99
SB7059	NC	A	Upgrade of 40-84 Wheel Assembly to 40-84B Configuration	11/11/99

Cleveland

Wheels & Brakes



Service Bulletins

<u>NUMBER</u>	<u>REV</u>	<u>STATUS</u>	<u>TITLE</u>	<u>DATE</u>
SB7063	NC	A, LD	Landing Gear – Retract Cylinder – Inspect / Replace	08/27/98
SB7064	NC	A	Wheel Assembly – 6 Inch Die Cast – Inspect/Replace	5/13/99
SB7065	NC	A	Brake Assembly – Cylinder Housing – Inspect/Replace	12/20/99
SB7066	NC	A, LD	Wheeled Landing Gear Aft Cross Tube – Inspect/Replace	01/18/01
SB7067	NC	A, LD	40-279 / 30-210 Wheel & Brake – Tire Rub – Upgrade to P/N 40-279A / 30-210A Wheel & Brake	03/20/01
SB7068	A	A, LD	Master Cylinder – Soft Toe Pedal – Inspect/Replace	12/12/01
SB7071	A	A	Wheel Assembly 40-90 and 40-90B – 164-02201 Brake Disc – Inspect/Replace	06/25/02
SB7073	A	A, LD	Landing Gear – Retract Cylinder – Inspect/Replace	08/08/02
SB7074	NC	A	Wheel Assembly 40-40B – Inner Bearing Cup – Inspect/Replace	04/03/02
SB7075	NC	A	Main Wheel Assembly 40-424 – P/N 157-02100 Fairing – Inspect/Rework or Replace	05/10/04
SB7076	A	A, LD	Landing Gear Actuator – Rod Seal Leakage – Inspect/Replace	12/08/05
SB7079	NC	A	Main Brake Assembly 30-204A – Torque Ring – Inspect/Replace	09/19/03
SB7081	NC	A	Felt Grease Seal – Inside Diameter – Inspect/Replace	04/22/04
SB7082	NC	A	40-279 / 40-279A Wheel Assemblies – Improved Hubcap and Grease Seal	05/27/05
SB7083	A	A, LD	Upgrade 40-77B Nose Wheel Assembly to 40-77G Configuration	05/23/06
SB7084	NC	A, LD	Conversion of P/N 40-414 Wheel Assembly to P/N 40-75P Configuration	11/15/05
SB7085	NC	A, LD	Conversion of P/N 40-75P Wheel Assembly to P/N 40-406 Configuration	11/15/05
SB7086	A	A, LD	Main Wheel Assembly 40-421 – P/N 157-02800 Fairing – Inspect/Rework Or Replace	04/21/06
SB7087	A	A, LD	Main Wheel Assembly 40-424 – P/N 154-08400 Grease Seal Replacement	02/19/07
SB7088	NC	A, LD	040-25300 Main Wheel Assy – 154-05000 Grease Seal – Inspect / Replace	01/05/07
SB7089	NC	A	40-279 / 40-279A Wheel Assemblies – 154-10600 Inboard Grease Seal – Inspect / Replace	07/17/07

Cleveland

Wheels & Brakes



The following is a comprehensive list of all Cleveland Product Reference Memos. Included in this list is a document status code, with legend as follows:

Status Code

A = Active

O = Obsolete

LD = Limited Distribution

Obsolete publications are not available for general distribution (not included in the CMM). Superseding documents, if applicable, will be referenced in the title of the obsolete publication. Publications coded as LD are not for general distribution. These publications were explicitly created for the Original Equipment Manufacturers (OEM's) using Cleveland products.

<u>NUMBER</u>	<u>REV</u>	<u>STATUS</u>	<u>TITLE</u>	<u>DATE</u>
PRM03	A	A	Beech Master Cylinder Compatibility with AW&BD Kits 199-49 & 199-50.	07/01/95
PRM05	A	O	Field Modification Kit 199-86 for Cessna Models 190 & 195 (Ref. ESL 7011)	06/30/95
PRM08	A	A	164-06100 Slotted Brake Disc Assembly Product Improvement	07/01/95
PRM09	A	A	Heat Checks, 164-07700 Brake Disc Assembly used on 40-141 Wheel Assembly, Kit 199-83 Piper Chieftain and "P" Navajo Aircraft.	07/01/95
PRM10	A	A	Heat Checks, 164-03906 Brake Disc Assembly used on 40-106 Wheel Assembly, Piper Models Cheyenne I & II	07/01/95
PRM11	A	A	Heat checks in 164-04600 Brake Disc Assembly used on 40-120 Wheel Assembly, Piper Aircraft	07/01/95
PRM12	A	A	Heat checks in 164-06400 Brake Disc Assembly used on 40-135 Wheel Assembly, Cessna Aircraft	07/01/95
PRM13	A	O	Organic Brake Lining Conditioning Procedure	06/30/95
PRM13A	A	A	Conditioning Procedure for Non-asbestos Organic Brake Lining.	07/01/95
PRM14	A	O	Metallic Brake Lining Conditioning Procedure	06/30/95
PRM14A	A	A	Metallic Brake Lining Conditioning Procedure	07/01/95
PRM15	A	A	Heat checks in 164-04400 Brake Disc Assembly used on 40-102A Wheel Assembly, Piper Navajo	07/01/95
PRM16	A	A	Heat Checks in 164-27 Brake Disc Assembly used on 40-98 Wheel Assembly, Beech Aircraft	07/01/95

Cleveland

Wheels & Brakes



Product Reference Memos

<u>NUMBER</u>	<u>REV</u>	<u>STATUS</u>	<u>TITLE</u>	<u>DATE</u>
PRM17	--	A, LD	One Time Inspection of Cleveland Brake Assembly 30-100, Cessna Models 402C, 414A, and 421C	08/80
PRM17A	A	A	One Time Inspection of Cleveland Brake Assemblies 30-100 (Cessna Part Number 9910393-3) installed on Cessna 402C	07/01/95
PRM18	--	A, LD	One Time Inspection of Cleveland Wheel Assemblies 40-40A and 40-135, Cessna Models 301, 335, 340, 402, 414, and 421	08/80
PRM18A	A	A	One Time Inspection of Cleveland Wheel Assemblies 40-40A and 40-135, Cessna Models 310, 335, 340, 402, 414, and 421	07/01/95
PRM19	A	A	Minimum Wear Limits for Piper Aztec Discs 164-00206 and 164-03206	07/01/95
PRM20	A	O	Cleveland Chrome Disc Application Chart	06/30/95
PRM22	A	O	Cleveland Conversion Kits for Early Piper Aztec Aircraft	06/30/95
PRM23	A	O	Superseded Parts - Cleveland Wheels and Brakes 40-32/30-21 -- 40-66/30-21 -- 40-67/30-35	06/30/95
PRM24	A	O	Superseded Parts - Cleveland Wheel and Brake	06/30/95
PRM25	A	A, LD	30-107 Brake Assembly, Installation of 2 additional 068-03000 Insulator Shims and 4 Additional 095-16800 Disc Springs per Brake Assembly	09/21/81
PRM26	A	A	Installation Instructions for 095-00800 when using 8.00-6 Tires on Cleveland Wheel Assembly Part No. 40-97D (040-09704)	07/01/95
PRM27	A	A	Gulfstream American or Rockwell, Commander Models 560F, 680F, 680FL (P), 680T, 680V, 680W, 681, 690, 690A, 690C (840), 690D (900), 695 (980), and 695A (1000); those Equipped with Cleveland Brake Assembly 30-107 or 30-107A	07/01/95
PRM28	A	O	30-107 and 30-107A Brake Assembly Installation of 2 Additional 068-03000 Insulator Shims and 4 Additional 095-16800 Disc Springs per Brake Assembly.	06/30/95
PRM29	A	A	Application of New Label to 30-107/40-107 Series Wheel and Brake to indicate Requalification from TSO C26b to TSO C26c	07/01/95
PRM30	A	O	Cleveland 199-49 and 199-50 Wheel and Brake Conversion Kits for Beech Aircraft (Superseded by PRM 36 or PRM 38)	06/30/95
PRM31	A	A	Upgrade of Cleveland Wheel and Brake Assemblies 40-137/30-103 (per TSO C26b) to 40-174/30-148 (per TSO C26c)	07/01/95

Product Reference Memos

<u>NUMBER</u>	<u>REV</u>	<u>STATUS</u>	<u>TITLE</u>	<u>DATE</u>
PRM32	A	O	Conversion to Cleveland Brake Assembly 30-107 to 30-107B (Superseded by PRM36)	06/30/95
PRM33	C	A	Conversion of Cleveland 40-120 and 40-120C Main Wheel to use Slotted Brake Disc, Part No. 164-21600	10/10/97
PRM36	B	A	Installation of Self Adjusting Retract Mechanism on 30-107 and 30-107B Brake Assemblies. (Supersedes PRM30 and PRM32)	07/01/95
PRM37	B	A	New High Strength Wheel Bolts Part No. 103-15500	07/01/95
PRM38	B	A	Installation of Self-Adjusting Retract Mechanism on 30-107A Brake Assemblies, per 199-130A Kit (Supersedes PRM30)	07/01/95
PRM39	A	A	Replace of Brake Inlet Fitting on Aircraft Equipped with 199-73 Conversion Kit	07/01/95
PRM40	A	A	Piper 400LS Brake Rework	07/01/95
PRM41	B	A	Replacement of Tie Bolts, Washers and Nuts on 40-135A Wheel Assembly with Optional High Strength Hardware	12/08/03
PRM43	A	A	Heat checks in 164-22200 Brake Disc used in 40-179 Wheel Assembly	07/01/95
PRM44	A	A	Replacement of Backplate Bolts 103-15900 and 103-1600, Model 30-170	07/01/95
PRM45	A	A	Replacement of Brake Linings P/N 066-05900 with . . . P/N 066-03300 as used on . . . 30-182 and 30-163	07/01/95
PRM46	C	A	Inspection of 161-01900 and 162-03500 Wheel Half Assemblies used in 40-102, 40-102A and 40-106 Wheel	07/01/95
PRM47	A	A	Main Landing Gear Brake Freeze-up	07/01/95
PRM48	A	A	Replacement and Retorque of Bolts on 40-107A Wheel Assembly	07/01/95
PRM49	A	A	Installation of Self Adjusting Retract Mechanism on 30-159 Brake Assembly, to become Brake Model 30-159B	07/01/95
PRM50	C	A	Replacement of Brake Attachment Bolts, Nuts, and Washers on aircraft equipped with 199-125 Main Wheel and Brake Conversion Kit	10/15/00
PRM51	A	A	Alternate Cylinder connecting line installation for Brake Model 30-146	07/01/95
PRM52	B	O	Conversion of Cleveland 40-83A and 40-83B Main Wheel to use Brake Disc P/N 164-02503 (Superseded by PRM61)	06/30/95
PRM53	A	A	Availability of Heavy Duty Bolts and Nuts for Cleveland Wheel Models 40-107A, 40-170, 40-170A, and 40-198	07/01/95

Product Reference Memos

<u>NUMBER</u>	<u>REV</u>	<u>STATUS</u>	<u>TITLE</u>	<u>DATE</u>
PRM54	A	A	Availability of Heavy Duty Bolts and Nuts for Cleveland Wheel Models 40-127, 40-137, and 40-174	07/01/95
PRM55	A	A	Bolt Recall - P/N 103-21500	07/01/95
PRM56	B	O	Availability of Upgraded Shuttle Valve Assembly for Cleveland Brake Models 30-161, 30-161A, 30-189A, and 030-18902	09/26/95
PRM57	D	A	Availability of New Main Wheel & Brake to provide additional tire to backplate clearance on Islander Aircraft equipped with 7.00-6 tires.	06/25/02
PRM58	A	A	Availability of Kit to retrofit obsolete brake Model 30-181 to become 30-181A	07/01/95
PRM59	A	A	Availability of Spirallock Flange Nuts for 040-21101 Wheel Assembly.	07/01/95
PRM60	A	A	Chrome Disc Service	07/01/95
PRM61	A	A	Superseded Brake Discs (Supersedes PRM52)	07/01/95
PRM62	B	A	Conversion Kit/Chrome Disc Data Sheet	01/26/04
PRM63	NC	A	Product Color Change	07/24/95
PRM64	K	O	Technicians Service Guide (This PRM is now obsolete – refer to AWBTSG0001)	04/25/06
PRM65	NC	A	Wheel Inflation Valve - Inspect / Retorque	03/30/96
PRM66	NC	A	40-279 / 30-210 Wheel & Brake - Brake Disc / Pressure Plate - Superseded	06/18/96
PRM67	NC	A	Heat Check Service Limits for the 164-00806 Brake Disc	01/22/97
PRM68	NC	A	External Brake Discs - Part Marking / Paint - Process Improvements	01/09/97
PRM69	NC	A	Availability of General Maintenance Information and Torquing Procedures	02/01/97
PRM70	NC	A	Wheel Assembly - Lubtork Instructions -Tie Bolts / Nuts	03/19/99
PRM71	D	A	FAA-PMA Products List	12/13/04
PRM72	C	A	Conversion Kit / Performance Gold Disc Data Sheet	01/26/04
PRM73	B	A	Wheels & Brakes – Preparation For Service – On-Aircraft Cleaning	06/22/06
PRM75	NC	A	PC-12 Brake Lining Conditioning Procedure	06/20/01
PRM77	NC	A, LD	40-279 / 40-279A Wheel Assy.-Corrosion – Inspect/Repair	03/05/02
PRM78	A	A	Wheel Assemblies – Alternate Bearing Grease (Mobil Aviation Grease SHC 100)	01/29/07
PRM79	NC	A	Wheel Assembly – Lubtork Instructions – Tie Bolts/Nuts	06/02/03
PRM80	NC	A	Nose Wheel Assembly P/N 40-413 – Pressure Loss – Inspect/Test/Replace	08/22/03
PRM81	NC	A	External Caliper Brake Assy – Piston Orientation – Inspect/Correct	09/04/03
PRM82	NC	A, LD	Brake Assembly P/N 030-22501 – Rotating Disk – Part Supersedure	04/21/04
PRM83	NC	A	40-77C and 40-77E Wheel Assemblies, Tiebolt / Overhauls Set Availability	01/30/07
PRM84	A	A	40-142 Wheel Assy. – Low Profile Tiebolt Nut – Inspect / Replace	03/09/07
PRM86	NC	A	40-77 Wheel Assembly, Tie Bolt/Overhaul Set Availability	04/10/07

Cleveland

Wheels & Brakes

