CHAPTER 7

DRIVE TRAIN

CHAPTER 7

DRIVE TRAIN (Continued)

CHAPTER 7

DRIVE TRAIN

7.000 Drive Train

7.001 Introduction

This section contains the procedures for removal, installation, replacement, and maintenance of the drive train components.

7.002 Description (see Figure 7-1)

A V-belt sheave is bolted directly to the crankshaft of the engine; four double V-belts transmit power to the upper sheave, which has an overrunning clutch in its hub. The clutch shaft transmits power forward to the main rotor and aft to the tail rotor. Flexible couplings are located at the input to the main gearbox and at each end of the long tail rotor drive shaft. The main rotor gearbox contains a single-stage spiral-bevel gear set, which is splash-lubricated. The long tail rotor shaft has no hanger bearings but has a lightly-loaded damper bearing. The tail rotor gearbox also contains a splash-lubricated spiral bevel gear set. The tail rotor gearbox input and output shafts are both made of stainless steel to prevent corrosion. Later tail rotor drive shafts are made of aluminum and the remaining shafts throughout the drive system are made of alloy steel.

7.100 Main Rotor Gearbox

7.110 Main Rotor Gearbox Removal

1. Remove main rotor blades and hub per §§ 28-10 and 28-20.
2. Remove swashplate per § 8.412.
3. Remove C706-1 tailcone cowling, both engine side panels, and aft engine cowling.
4. Remove mast fairing. Remove middle and lower mast fairing ribs from mast tube.
5. Remove (3) C121-31 push pull tubes.
6. Loosen bolt securing pulley to D112-1 lever and disconnect rotor brake cable.
7. Remove main and aux fuel tanks per §§ 12-10 & 12-20. Mark all electrical connections for reinstallation.
8. Cut & discard ty-raps and remove hardware and clamps securing wiring, hoses, and tubes to gearbox and jackshaft support struts.
9. Remove hardware securing C343-8 tube's lower rod end to jackshaft and remove aft hydraulic servo from helicopter per § 8.750.
10. Refer to § 8.730. Disconnect and cap suction and pressure lines from hydraulic pump.

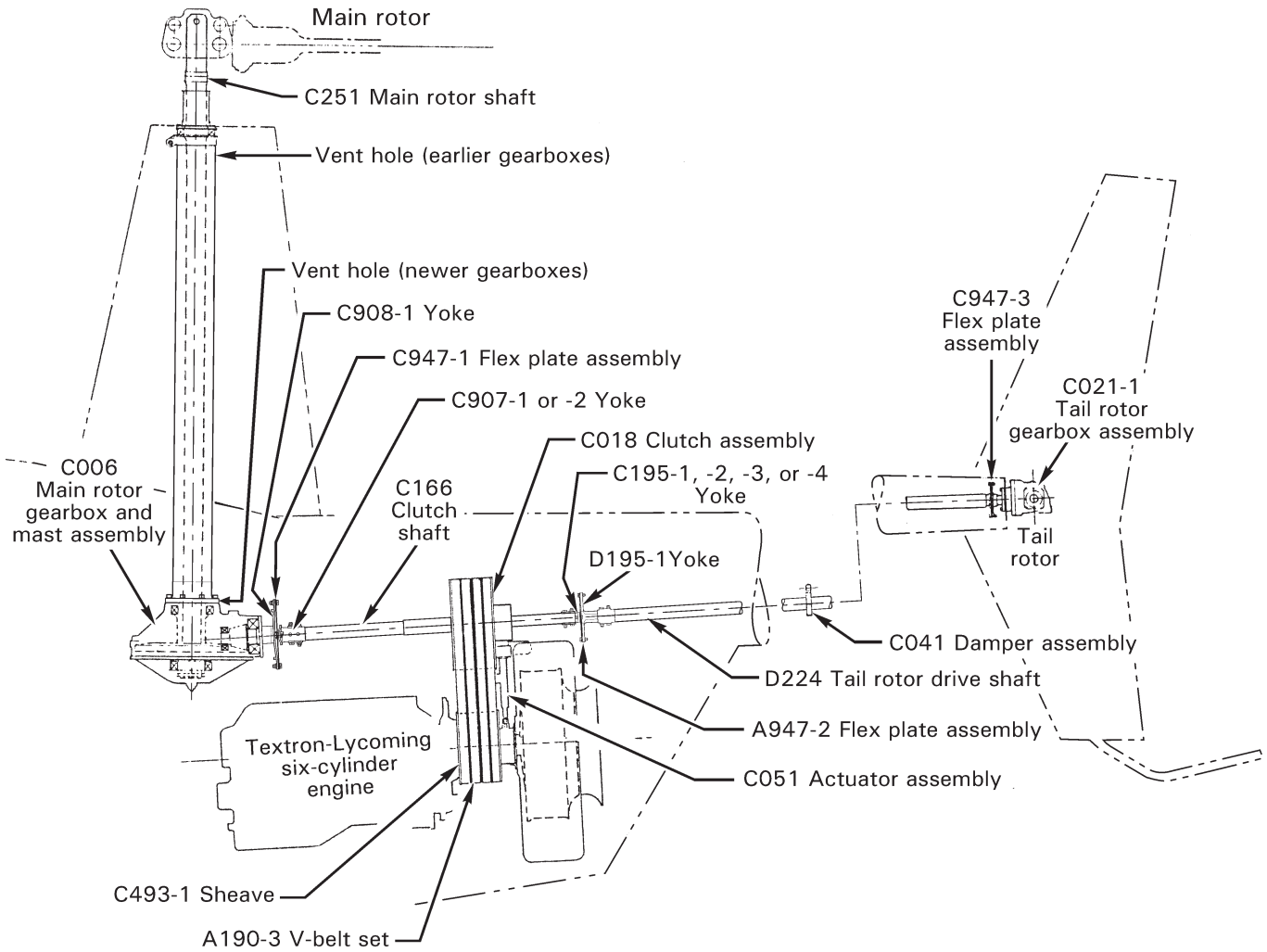

FIGURE 7-1 DRIVE SYSTEM

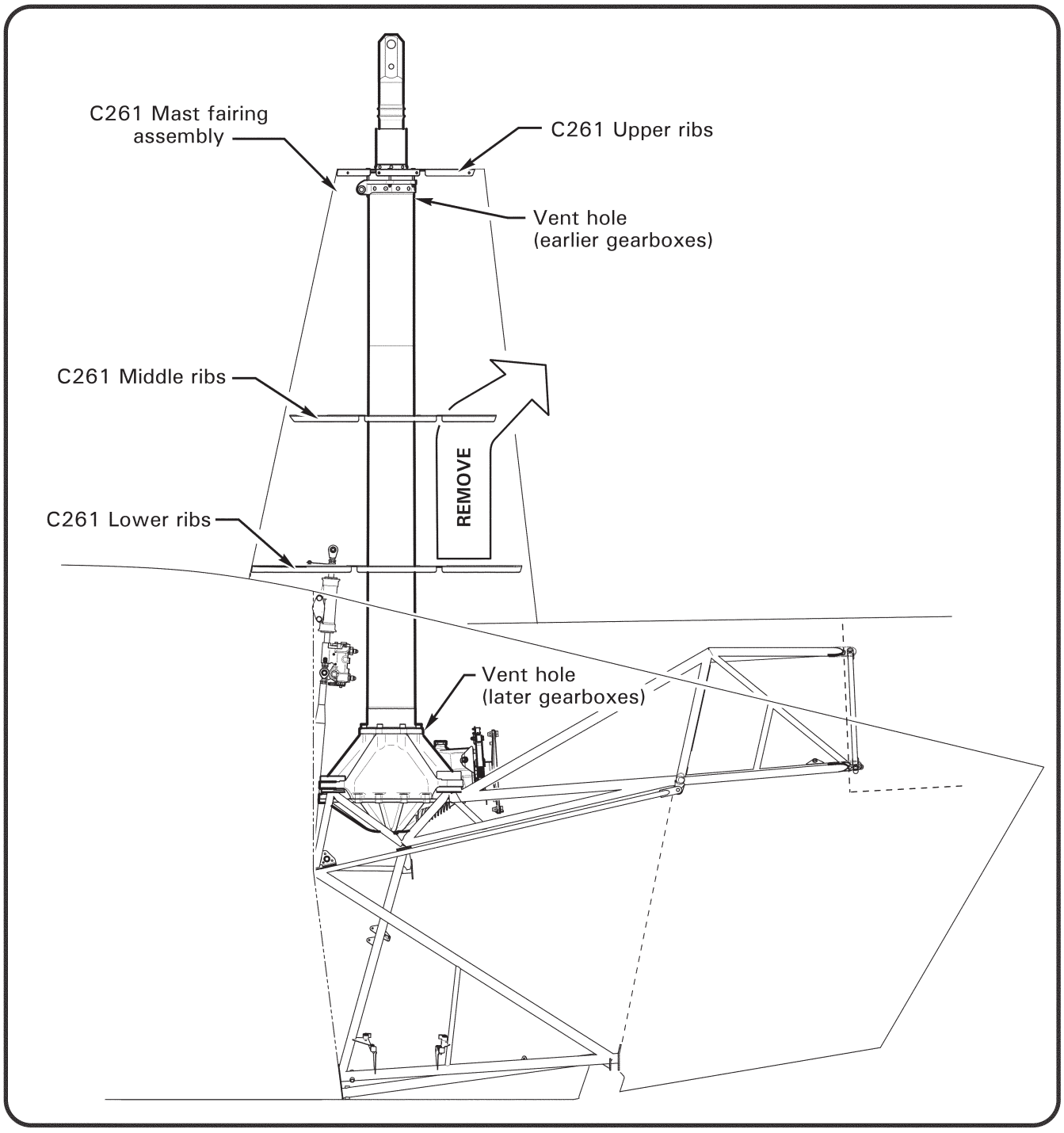

FIGURE 7-2 MAIN ROTOR GEARBOX REMOVAL

7.110 Main Rotor Gearbox Removal (continued)

11. Remove fasteners securing C559-6 (or -3) brace to cabin and record shim washers removed for reinstallation.
12. Remove jackshaft and support struts per §§ 8.311 & 8.321.
13. Remove clutch assembly per § 7.200 (alternately, rest clutch forward yoke on firewall after forward & intermediate flex plates are removed and leave clutch in helicopter).
14. Disconnect electrical wiring at chip detector, hall effect sender, overtemp sender, rotor brake switch, and ground wire. Tag wires for reassembly. Disconnect rotor brake spring from firewall angle.
15. Loosen clamp and disconnect cooling hose from gearbox.
16. Remove (4) A650-4 fittings securing gearbox to upper frame. Carefully lift gearbox up and aft to clear forward hydraulic servos (and clutch forward yoke, if installed) and remove from helicopter (ref Figure 7-2).

NOTE

Note & record location and thickness of leveling shims installed between gearbox mounts and frame mounting pads (each aft pad will have one C796-3 spacer). Mark mounting pads with shim thickness for reinstallation.

7.120 Main Rotor Gearbox Installation

1. If installing new C653-3 (aft) or A653-2 (forward) rubber mounts, apply a light coat of A257-8 lubricant or clean, potable water to rubber smaller-diameter and press into gearbox ears. Wipe off excess lubricant or water.
2. If not previously accomplished, install rotor brake per § 7.620.
3. Level MRGB mounting pads by installing original shims. If original shim thickness is unknown or suspect, or if upper frame has been replaced, level mounting pads per § 7.130.
4. Verify two C796-3 spacers are the same thickness and install one C796-3 spacer on each aft mounting pad atop any shim(s).
5. Remove foreign objects and prepare area for gearbox installation. Assistance is recommended to help position gearbox. Hoist gearbox and position on mounting pads.
6. Ensure all washers, spacers, C559-6 (or -3) brace, and C345-5 weldment are in position and install gearbox mounting hardware. Orient A650-4 fitting tabs laterally per Figure 8-9, special torque per § 23-33, and torque stripe per Figure 2-1.
7. Fill gearbox to center of sight gage using correct gearbox oil (refer to R44 Service Letter SL-73). Special torque filler plug per § 23-33.
8. Examine data plate on C251-2 shaft. If revision ("REV") letter is A thru P, then inject 6 fluid ounces of correct gearbox oil into mast tube vent hole (vent hole may be in early-upper or later-lower location).
9. Install fasteners and recorded shim washers securing C559-6 (or -3) brace to cabin.

7.120 Main Rotor Gearbox Installation (continued)

10. Install clutch assembly per § 7.200. Alternately, install forward flex plate and perform clutch sheave alignment per § 7.230, then install intermediate flex plate per § 7.330.
11. Install jackshaft support struts and jackshaft per §§ 8.322 & 8.312.
12. Refer to § 8.740. Connect suction and pressure lines to hydraulic pump.
13. Install aft hydraulic servo per § 8.760 and connect C343-8 tube's lower rod end to jackshaft.
14. Connect rotor brake spring to firewall angle. Connect electrical leads to main rotor gearbox. Install ty-raps and clamps securing wiring, hoses, and tubes to gearbox and jackshaft support struts.
15. Connect cooling hose to gearbox then position and secure clamp.
16. Install main and auxiliary fuel tanks per §§ 12-10 & 12-20.
17. Connect rotor brake cable to pulley on D112-1 lever. Standard torque bolt per § 23-32 and torque stripe per Figure 2-1.
18. Install (3) C121-31 push pull tubes.
19. Install middle and lower mast fairing ribs to mast tube. Install mast fairing and connect pitot tube.
20. Install swashplate per § 8.412.
21. Install main rotor hub and blades per §§ 28-20 and 28-10.
22. Install all cowling.
23. Bleed hydraulic system per § 1.190.
24. Perform pitot-static leak check per § 13-10.

7.130 Leveling Main Rotor Gearbox

1. Level upper frame's MRGB forward mounting pads laterally to landing gear [straight] aft cross tube. Use A796-1 shims on forward pads.
2. Level MRGB aft mounting pads laterally to landing gear [straight] aft cross tube. Use C796-2 shims on aft mounting pads.
3. Refer to Figure 4-2. Locate C046-6 tube on lower-right frame, and zero a propeller protractor to tube. Note direction protractor faces (Left or Right), and maintain this direction in following steps.
4. On upper frame, add shim(s) to right mounting pad(s) to achieve a 3.6 – 4.0 degree angle to C046-6 tube.
5. On upper frame, add shim(s) to left mounting pad(s) to achieve a 3.6 – 4.0 degree angle to C046-6 tube.
6. At least one pad must lack shims; remove an equal thickness of shims from each pad until at least one pad lacks shims. A maximum of 3 shims per pad is permissible.
7. Mark each mounting pad with needed shim thickness.

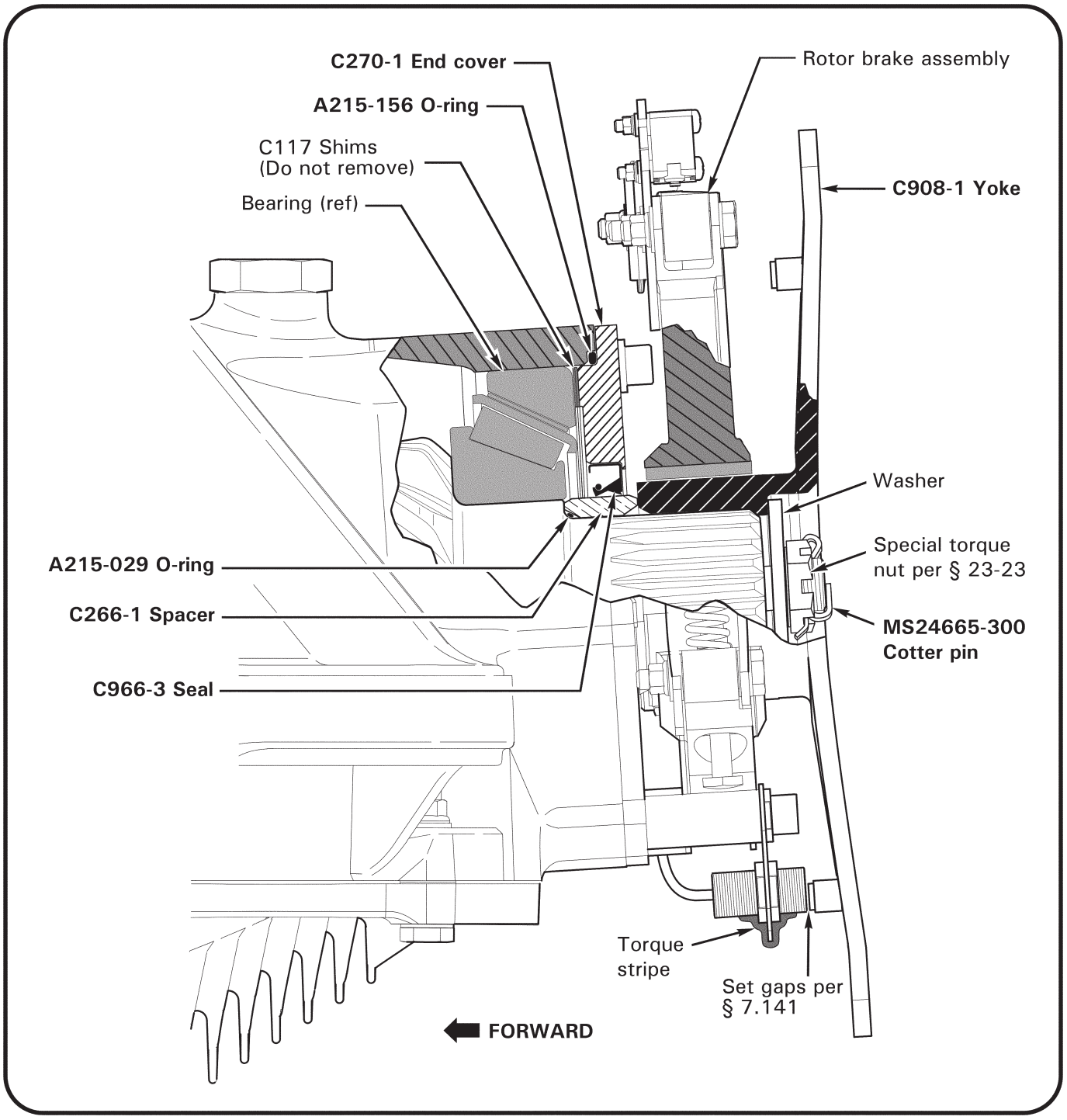

FIGURE 7-2B MAIN ROTOR GEARBOX PINION SEAL REPLACEMENT

7.140 C908-1 Yoke

A. Removal

1. Remove C947-1 flex plate and mark shims for reinstallation and remove clutch per § 7.200 or support clutch shaft per Figure 7-8.
2. Place a wood block between horizontal firewall and yoke flange to prevent yoke from rotating.
3. Remove cotter pin, nut, and washer from gearbox pinion shaft and remove yoke.

B. Installation

1. Ensure C908-1 yoke and gearbox pinion shaft splines are clean and undamaged. Apply B270-21 protectant to pinion shaft splines. While protectant is still wet, install yoke on shaft followed by a new washer.
2. Apply B270-11 adhesive to threads and install AN320-8 nut securing C908-1 yoke to shaft.

> **CAUTION**
>
> Ensure clearance between yoke magnets and rotor-RPM senders before rotating yoke.

3. Support yoke for torquing by placing a wood block between yoke flange and horizontal firewall. Special torque AN320-8 nut per § 23-33 and install new MS24665-300 cotter pin, ensure outer prong is pressed flat against end of pinion.
4. Apply B270-21 protectant to nut and exposed threads. Remove block.
5. Adjust rotor-RPM sender gaps per § 7.141.
6. Install C947-1 flex plate using recorded shim stack up or install clutch assembly per § 7.200.

7.141 Setting Rotor-RPM Sender Gap

Rotor-RPM sender-to-magnet gaps must be 0.020–0.040 inch. To adjust, loosen jam nuts on sender and adjust gap. Check gaps between both yoke magnets at each sender. Tighten jam nuts, and torque stripe per Figure 7-2B.

7.150 Replacement of Main Rotor Gearbox Pinion Seal

1. Disconnect A947-2 intermediate flex plate at tail rotor drive shaft. Mark flex plate and fasteners with a grease pencil for reinstallation.
2. Remove C908-1 yoke from gearbox pinion shaft per § 7.140 Part A.
3. Remove rotor brake assembly per § 7.610.
4. Remove remaining hardware securing hall effect sender & overtemp sender brackets and C270-1 end cover. Remove brackets and carefully slide C270-1 end cover off gearbox pinion shaft.

7.150 Replacement of Main Rotor Gearbox Pinion Seal (continued)

CAUTION

Do not remove shims under C270-1 end cover as they control bearing preload and gear backlash.

5. Slide C266-1 spacer off pinion shaft and remove old A215-029 O-ring. Clean spacer and pinion shaft using approved solvent (ref § 23-70).
6. Press old C966-3 seal out of end cover and remove old A215-156 O-ring. Clean end cover mating surfaces using approved solvent (ref § 23-70). Orient new seal with open face pointing toward gearbox and press into end cover until it seats.
7. Lubricate new O-rings using correct gearbox oil (refer to R44 Service Letter SL-73) and install on pinion shaft and end cover. Slide spacer over pinion shaft. Lubricate seal lip with correct gearbox oil and install end cover over pinion shaft.
8. Install hall effect sender and overtemp sender brackets on end cover and install rotor brake assembly per § 7.620. Special torque (6) screws per § 23-33 and safety with 0.032 inch diameter lockwire (if required), or torque stripe per Figure 2-1.
9. Install C908-1 yoke per § 7.140 Part B.
10. Connect intermediate flex plate per § 7.330.

7.155 MRGB Sump O-Ring Replacement Procedure

a. Remove MRGB per § 7.110.
b. Check and record gear backlash at and tangential to a gear tooth, accessible via sight gage or filler plug hole.
c. Carefully note and record position of each fastener, washer and shim stackup at all C263 sump-to-C264 housing attach points (an equal amount of shims is installed between sump and housing at each attach point). Also note location of ground wires and C747-1 baffle attach points. Remove, identify, and retain fasteners, washers, and shims.
d. Remove sump from helicopter. Remove O-ring and clean sump groove using approved solvent (ref § 23-70).
e. Apply A257-19 lube to new A215-382 O-ring (for C263-2 sump) or A215-279 O-ring (for C263-1 sump). Install O-ring in sump groove and ensure it does not twist.
f. Carefully assemble sump, baffle, and ground wires to housing and secure finger-tight with fasteners, washers, and shims installed in exactly the same positions recorded in step c.
g. Draw down each fastener equally before final torque.
h. Standard torque NAS1304-15 bolts per § 23-32. Special torque NAS1352-4 screws per § 23-33 and safety with 0.032 inch diameter lockwire (if required). Torque stripe screws and bolts per Figure 2-1, as required.

7.155 MRGB Sump O-Ring Replacement Procedure (continued)

i) Check gear backlash exactly as performed in step b. Backlash should be within 0.001 inch of value recorded in step b.

j) Install MRGB per Section 7.120.

7.160 Main Rotor Gearbox Overtemp Inspection

1. Perform the following if MR TEMP warning light illuminates, and gearbox Telatemp indicates abnormally high operating temperature:

   a. Inspect gearbox cooling duct for obstructions and conditions. Clear obstructions or replace duct as required.

   b. Remove chip detector and inspect for chips. Return gearbox to RHC if chips are found.

   c. Drain gearbox oil and remove sight gage and filler plug. Observe gear tooth surfaces thru filler plug and sight gage holes while rotating gearbox pinion and inspect for damage. Return gearbox to RHC if damage is detected or if gearbox does not rotate smoothly. If no damage is noted, refill gearbox.

   d. Replace Telatemp. Ensure old Telatemp adhesive is removed and new Telatemp makes good contact with gearbox.

   e. If gearbox overtemp indications continue, return gearbox to RHC.

2. If MR TEMP warning light illuminates but Telatemp indicates normal operating temperature, replace gearbox overtemp sender and perform steps 1a, 1b, and 1e.

3. If Telatemp indicates 240°F/116°C but MR TEMP warning light does not illuminate, test MR TEMP warning circuit and perform steps 1a, 1b, 1d, and 1e.

NOTE
Light illuminates at 240 ± 5°F.

7.170 Main Rotor Gearbox Chip Light Indicator

If MR CHIP light illuminates:

1. Drain and flush gearbox per Section 1.120 except strain oil (a paint filter works well) while draining and examine any particles found in oil or on chip detector.

2. Particles larger than 0.12 inch long or 0.02 inch wide are cause for concern and should be identified as ferrous or non-ferrous with a magnet. If particles are ferrous return main rotor gearbox to RHC for repair along with particles. If particles are non-ferrous, drain and flush gearbox per Section 1.120.

3. If MR CHIP illuminates again within next 100 hours time-in-service a gearbox failure may be imminent. Return gearbox to RHC for repair.

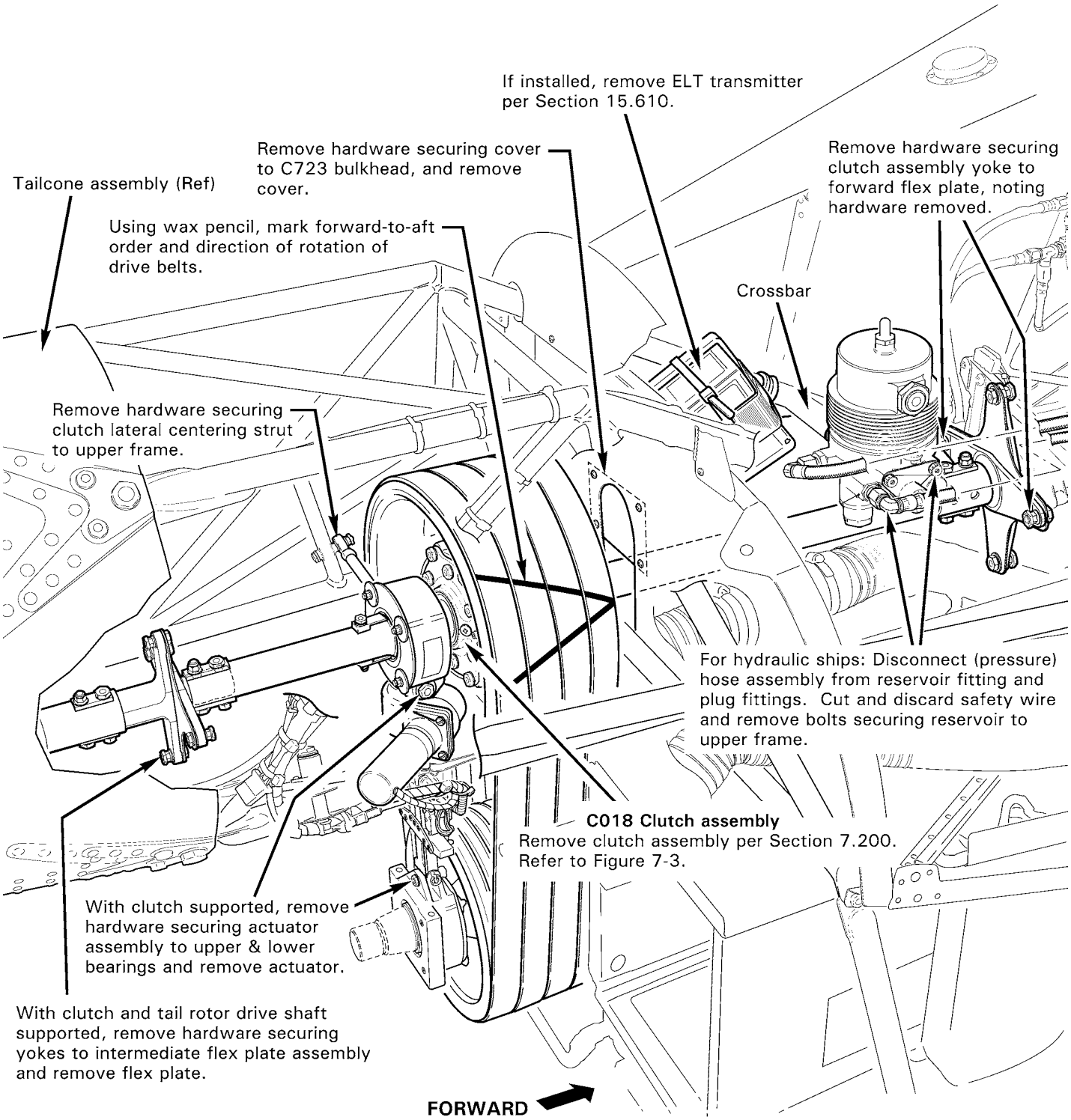

FIGURE 7-2C CLUTCH ASSEMBLY REMOVAL
(Shown with fanwheel and scroll removed)

7.200 Clutch Assembly

A. Removal

1. Turn BATTERY switch ON and verify actuator is fully disengaged. Turn BATTERY switch OFF.
2. Remove C706-1 tailcone fairing assembly.
3. Remove fanwheel and scroll per Section 6.210.
4. Refer to Figure 7-2C. Remove hardware securing C018 clutch assembly and D224 tail rotor drive shaft assembly yokes to A947-2 (intermediate) flex plate assembly, noting locations of hardware removed. Remove plate assembly. Support drive shaft using a foam block, or equivalent, while drive shaft is disconnected from drive train.
5. Remove hardware securing clutch assembly yoke to C947-1 (forward) flex plate assembly, noting locations of hardware removed. Protect forward flex plate from damage. Support clutch assembly by installing ty-raps around forward and aft yokes, and securing ty-raps to upper frame.
6. For hydraulic ships: Disconnect D205-1 or -11 (pressure) hose assembly from hydraulic reservoir elbow or union, and plug fittings. Cut and discard safety wire, and remove bolts securing reservoir to upper frame. Support reservoir.
7. If installed, remove ELT transmitter per Section 15.610.
8. Remove hardware securing C723-6 cover to C723 bulkhead, and remove cover.
9. Remove hardware securing clutch lateral centering strut to upper frame.
10. Cut and discard ty-raps as required and disconnect actuator wiring from airframe harness at connectors. Remove hardware securing actuator to upper & lower bearings and remove actuator.
11. Remove and discard palnuts securing C907 (forward) yoke and C195 (aft) yoke to clutch shaft. (Palnuts in these locations are no longer required.) Tape clutch shaft, yokes, and yoke hardware as required to protect component from damage during removal.
12. Using wax pencil, mark forward-to-aft order and direction of rotation of drive belts. Support clutch assembly, cut and discard ty-raps securing clutch to upper frame, and remove drive belts.
13. Refer to Figure 7-3. Have a second person support the forward end of the clutch shaft, and the hydraulic reservoir, if installed. Move clutch aft, until forward yoke is aft of upper frame crossbar, then move clutch forward (at an angle) over top of crossbar. Move clutch aft (at an angle), until sheave is clear of the tailcone. Carefully maneuver forward yoke aft through C723 bulkhead.
14. If sending clutch assembly to RHC for repair, remove clutch lateral centering strut, and clutch forward and aft yokes per Sections 7.260 and 7.270.

B. Installation

1. On C018 clutch assembly, install clutch lateral centering strut, and C907 (forward) yoke and C195 (aft) yoke per Sections 7.260 and 7.270, if removed. (Palnuts securing yokes to clutch shaft are no longer required.)

7.200 Clutch Assembly (continued)

B. Installation (continued)

2. Tape clutch shaft, yokes, and yoke hardware as required to protect component from damage during installation. If not previously accomplished, protect forward flex plate from damage.
3. Refer to Figures 7-2C and 7-3. Have a second person support the hydraulic reservoir, if installed, and prepared to support the forward end of the clutch shaft. Carefully maneuver clutch forward yoke forward through C723 bulkhead. Move clutch forward (at an angle), over top of upper frame crossbar, until sheave and aft yoke are clear of the tailcone. Move sheave and aft yoke up then aft, until forward yoke is aft of crossbar. Move clutch forward into mounting position.
4. Refer to Figure 7-2C. Observe markings and install drive belts in proper forward-to-aft order and direction of rotation (as removed). Support clutch assembly by installing ty-raps around forward and aft yokes, and securing ty-raps to upper frame.
5. Install actuator per Section 7.520, steps a thru d.
6. Install hardware securing clutch assembly yoke to C947-1 (forward) flex plate assembly, using hardware removed. Standard torque nuts and palnuts per Section 1.320, and torque stripe per Figure 2-1.
7. Install hardware securing clutch lateral centering strut to upper frame. Standard torque nut and palnut per Section 1.320, and torque stripe per Figure 2-1. Cut and discard ty-raps securing clutch to upper frame.
8. Install C723-6 cover on C723 bulkhead. Verify security.
9. If removed, install ELT transmitter per Section 15.610.
10. For hydraulic ships: Install bolts securing hydraulic reservoir to upper frame and special torque bolts per Section 1.330. Install 0.032-inch diameter lockwire and safety bolts together in pairs.
11. For hydraulic ships: Torque check hydraulic reservoir union, or elbow jam nut and palnut, per Section 1.330. Remove plugs and connect D205-1 or -11 (pressure) hose assembly to reservoir elbow or union. Special torque hose B-nut per Section 1.330 and torque stripe per Figure 2-1.
12. Perform fanwheel and scroll installation per Section 6.220, steps 1 thru 11.
13. Connect actuator wiring to airframe harness at connectors. Install ty-raps as required to secure wire harness to frame. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
14. Perform clutch sheave alignment per Section 7.230.
15. Inspect A947-2 (intermediate) flex plate assembly per Section 2.410. Perform intermediate flex plate installation and shimming per Section 7.330.
16. Install C706-1 tailcone fairing assembly.

NOTE

During initial fanwheel balance, perform "Starting Engine and Run-up" per Pilot's Operating Handbook Section 4, with hydraulics off and cyclic neutralized, to purge air from system.

17. Balance fanwheel per Section 6.240.

7.210 Clutch Assembly Lubricant Inspection and Servicing

NOTE

To retrofit older clutch assemblies with C168-5 retainers, order KI-202 kit. Each C168-5 retainer has a B289-3 screw; screws must be installed on opposite sides of the clutch shaft (when one screw is on top, opposite screw must be on bottom). With C168-5 retainers installed, clutch lubricant inspection and servicing may be performed without clutch removal.

NOTE

Sprag clutch housing capacity is approximately 4 fl oz (118 ml).

A. Clutch Assemblies with C168-5 Retainers

WARNING

Avoid contaminating drive belts and sheaves with lubricant. Clean contaminated surfaces with mild soap and water solution, followed by a warm water rinse. Place a clean, absorbent rag beneath MT147-2 fittings, when installed, to catch any drips.

1. Remove C706-1 tailcone fairing assembly. Remove hardware securing C723-6 cover to C723 bulkhead and remove cover.

2. Rotate clutch shaft until bolts securing yokes to shaft are vertical. Engage rotor brake.

3. Rotate sheave until forward retainer B289-3 screw is on top. Remove screw and install clean MT147-2 fitting. Attach drain hose.

4. Rotate sheave until fitting and attached drain hose are on bottom. Route drain hose into a suitable, clean container. Remove aft retainer B289-3 screw and allow lubricant to drain into container.

5. Install second clean MT147-2 fitting in aft retainer and connect a clean supply of A257-4 lubricant to fitting. Flush sprag clutch housing until exiting lubricant is obviously red. Disconnect lubricant supply and allow lubricant to drain completely into container.

6. Strain all lubricant from container through a 180-200 micron paint filter/strainer. Fluid may be dark, and may sparkle with very fine metallic debris; this is normal. If metallic debris is trapped in the filter/strainer, remove clutch assembly and return it to RHC, or an R44 Service Center authorized to overhaul clutch assemblies, for disassembly and inspection.

7. If metallic debris is not found in the filter, attach drain hose to (top) aft retainer fitting. Route drain hose into a suitable container. Connect a clean supply of A257-4 lubricant to (bottom) forward retainer fitting. Fill sprag clutch housing thru bottom fitting until no air bubbles are visible in drain hose. Shut-off fluid flow.

7.210 Clutch Assembly Lubricant Inspection and Servicing (continued)

A. Clutch Assemblies with C168-5 Retainers (continued)

8. Remove (top) aft retainer fitting and install screw. Rotate sheave until forward retainer fitting is on top. Remove fitting and verify lubricant level contacts threads; add lubricant as required. Install forward screw.

9. Install C723-6 cover on C723 bulkhead. Install C706-1 tailcone fairing assembly.

B. Clutch Assemblies with Retainers without B289-3 Screws

1. Perform clutch assembly (aft) seal replacement per Section 7.213.

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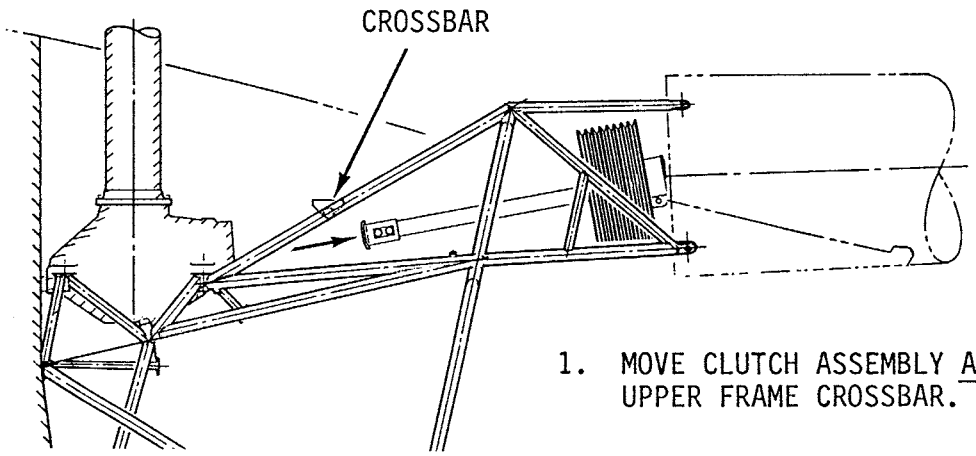
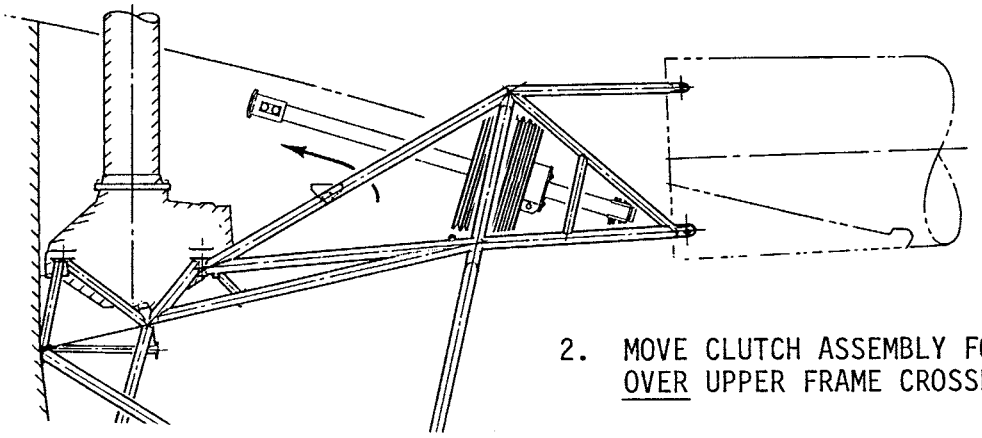
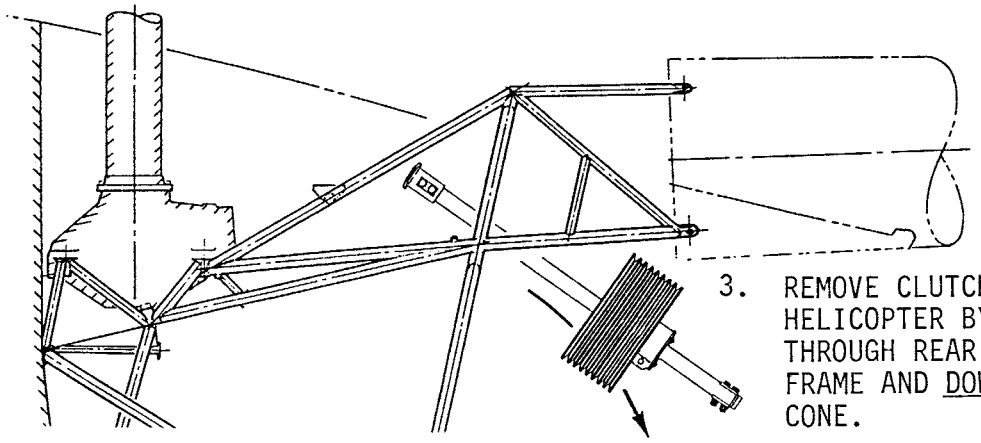


1. MOVE CLUTCH ASSEMBLY AFT AND UNDER UPPER FRAME CROSSBAR.



2. MOVE CLUTCH ASSEMBLY FORWARD UP AND OVER UPPER FRAME CROSSBAR.



3. REMOVE CLUTCH ASSEMBLY FROM HELICOPTER BY LOWERING AFT THROUGH REAR SECTION OF UPPER FRAME AND DOWN BELOW TAIL CONE.

FIGURE 7-3 CLUTCH REMOVAL

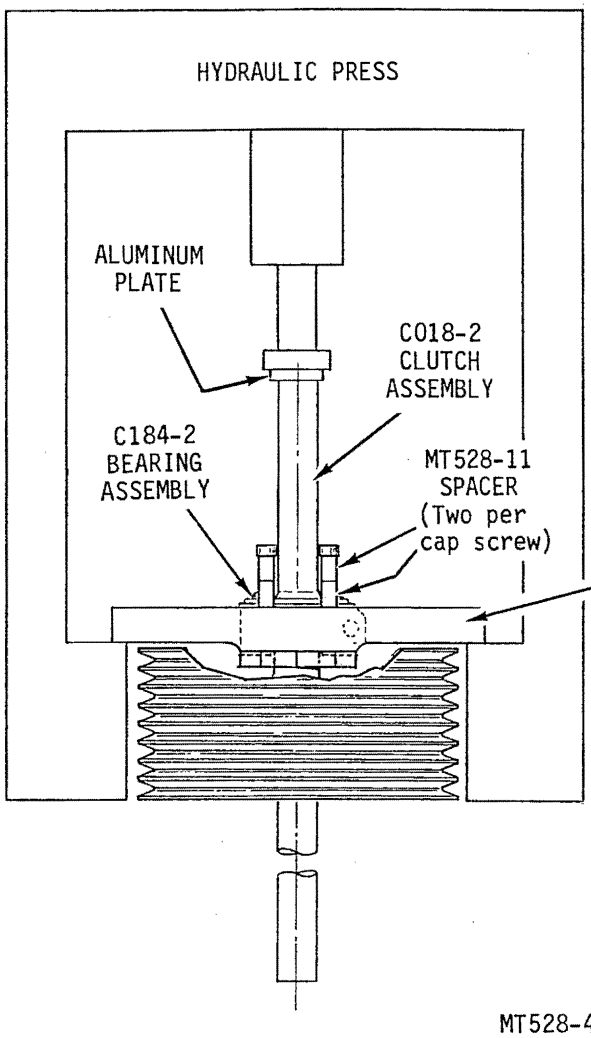


FIGURE 7-3A

REMOVAL OF C184-2 BEARING ASSEMBLY USING HYDRAULIC PRESS AND MT528-1 REMOVAL TOOLS.

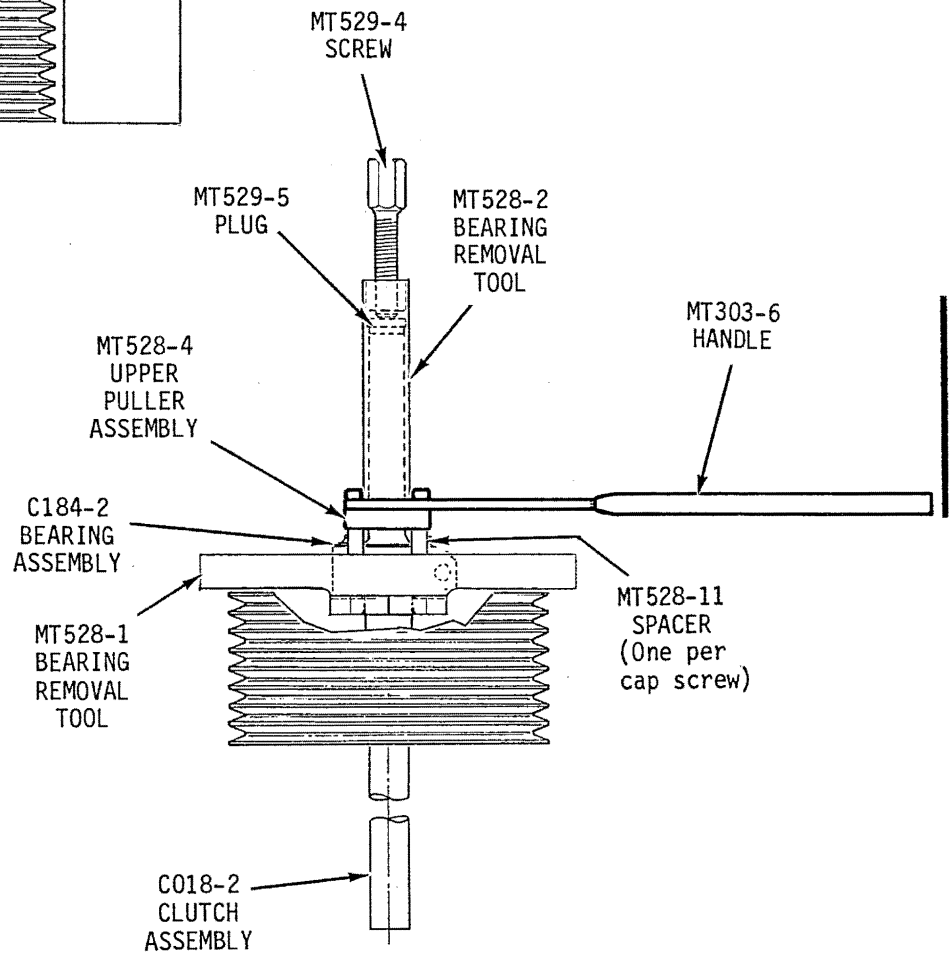


FIGURE 7-3B

REMOVAL OF C184-2 BEARING ASSEMBLY WHEN HYDRAULIC PRESS IS NOT AVAILABLE; USE MT528-1 AND MT528-2 REMOVAL TOOLS.

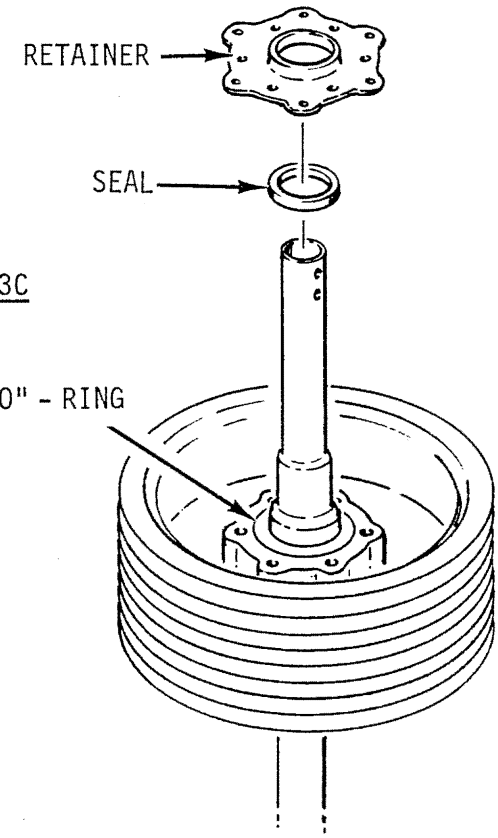


FIGURE 7-3C

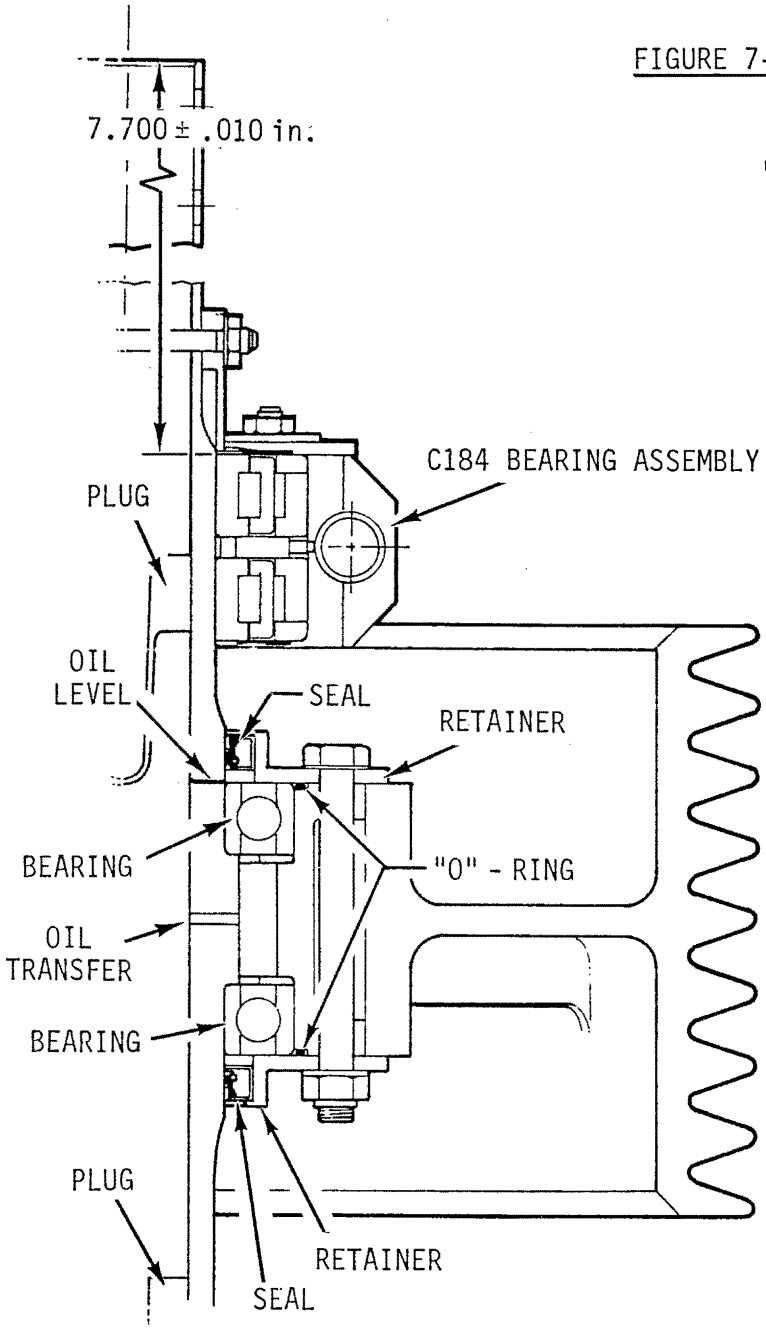


FIGURE 7-3D

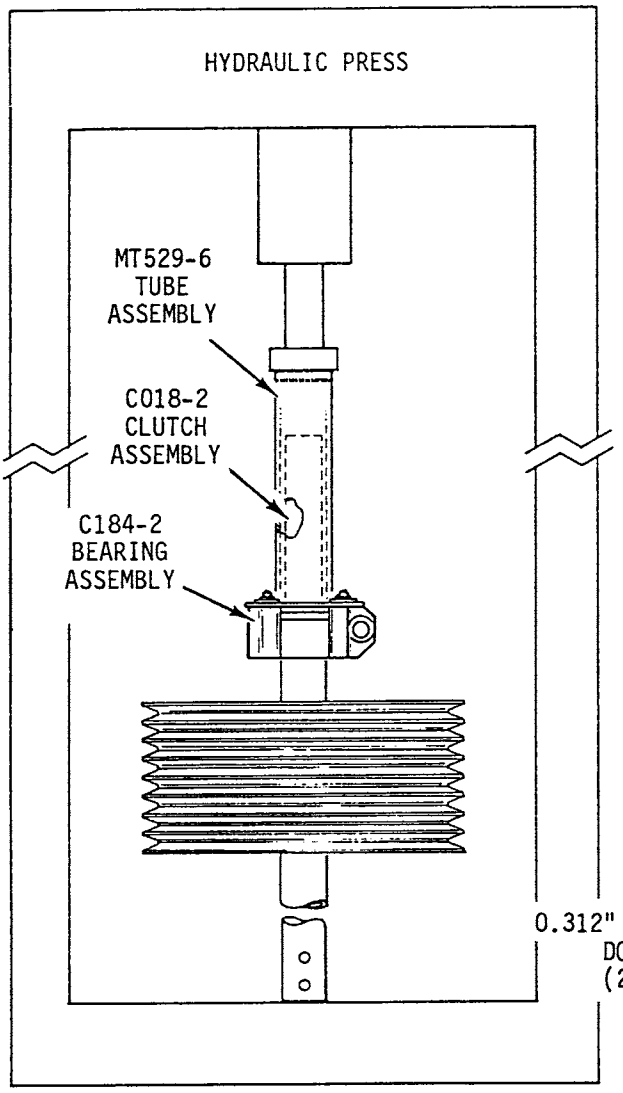


FIGURE 7-3E

INSTALLATION OF C184-2 BEARING USING HYDRAULIC PRESS AND MT528-1 INSTALLATION TOOLS.

WARNING

DO NOT PRESS ACROSS SHEAVE OR BEARINGS WILL BE DAMAGED.

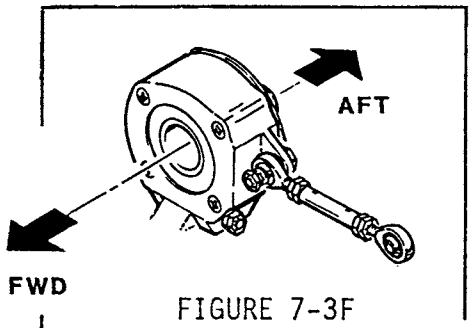


FIGURE 7-3F

INSTALL C184-2 BEARING ASSEMBLY ONTO SHAFT WITH NUTS FACING AWAY FROM CLUTCH.

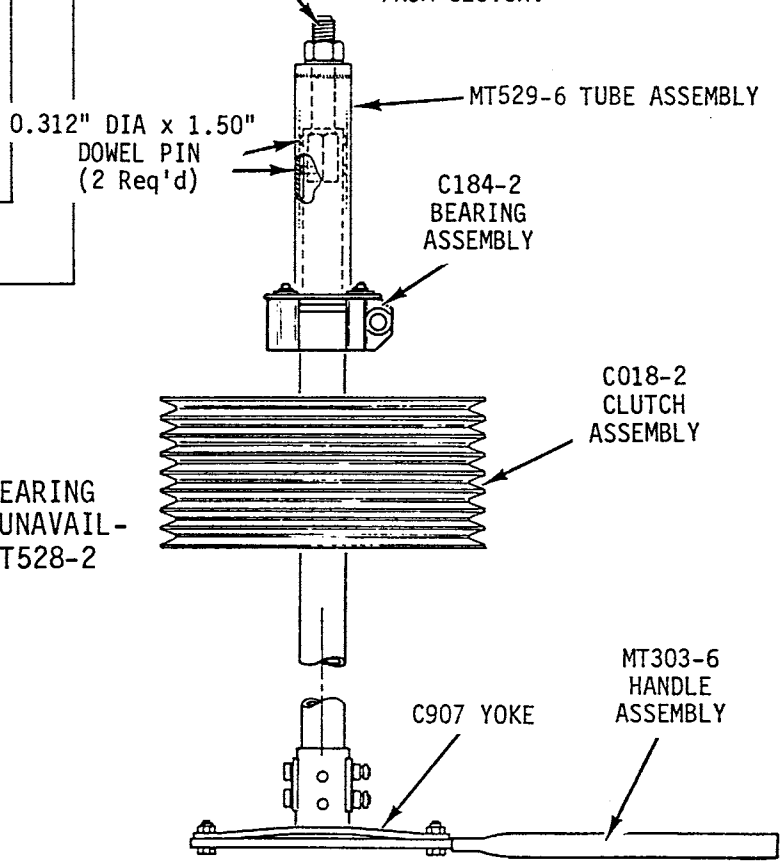


FIGURE 7-3G

INSTALLATION OF C184-2 BEARING WHEN HYDRAULIC PRESS IS UNAVAILABLE; USE MT528-1 AND MT528-2 INSTALLATION TOOLS.

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7.211 C184 Bearing Assembly Removal

a. Remove clutch assembly per Section 7.210.

b. Remove C195 yoke per Section 7.270.

c. Remove C191-5 stops.

d. Remove bearing assembly as follows:

Using a hydraulic press:

1. Install MT528-1 bearing removal tool per Figure 7-3A.
2. Support MT528-1 bearing removal tool on hydraulic press per Figure 7-3A.
3. Install aluminum plate between clutch shaft and press ram per Figure 7-3A to protect end of shaft.
4. Press until C184-2 bearing is removed from the shaft.

CAUTION

Hold clutch assembly to prevent clutch from falling to the floor.

Without a hydraulic press:

1. Install MT528-1 and MT528-2 bearing removal tools per Figure 7-3B. Use only one MT528-11 spacer at each cap screw. Ensure MT529-4 screw threads are coated with anti-seize.
2. Remove bearing assembly by holding handle and tightening screw.

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7.212 C184 Bearing Assembly Installation

1. Remove loose paint and clean mating area on clutch shaft. If reusing a bearing assembly, inspect condition of seals and inner races.

2. Heat C184 bearing assembly to 200º F maximum (approximately 5 minutes in 200ºF oven). Monitor bearing temperature with a pyrometer or a telatemp.

3. Coat bearing shoulder on clutch shaft with zinc-chromate or epoxy primer. While primer is still wet, install bearing assembly on clutch shaft:

NOTE
Do NOT install bearing with B270-10 adhesive.

NOTE
Be sure to put side of C184 bearing assembly with nuts facing away from clutch (see Figure 7-3F).

   a. Using a hydraulic press: Support clutch assembly at forward end of clutch shaft. Place MT529-6 tube assembly on clutch shaft per Figure 7-3E. Center tube assembly over inner race of bearing assembly. Press bearing assembly until MT529-6 tube assembly bottoms on end of clutch shaft (bearing assembly should be at dimension shown in Figure 7-3D).

CAUTION
Do NOT support clutch assembly at sheave or internal bearings will be damaged.

   b. Without hydraulic press: Use MT529-6 tube assembly (included in MT528-1 tool set) and MT528-2 tool set as shown in Figure 7-3G. Center tube assembly over inner race of C184 bearing assembly. Tighten nut onto MT529-4 screw (coat nut face and screw with anti-seize) until MT529-6 tube assembly bottoms on end of clutch shaft (bearing assembly should be at dimension shown in Figure 7-3D).

4. Remove bearing press tooling.

5. Check bearing for smooth rotation.

6. Seal bearing inner race-to-shaft juncture with primer to minimize corrosion.

7. Torque stripe inner race of bearing to clutch shaft two places, 180º apart.

8. Install C191-5 stops. Torque bolts per Section 1.130 and torque stripe.

9. Install new telatemp on C184 bearing housing if original was altered by heating.

10. Install clutch assembly C195 aft yoke per Section 7.270.

7.213 Clutch Assembly Seals Replacement

NOTE

To retrofit older clutch assemblies with C168-5 retainers, order KI-202 kit.

1. Remove clutch assembly per Section 7.200.
2. a. If replacing aft seal, remove C184 bearing per Section 7.211.

   b. If replacing forward seal, remove C907 yoke per Section 7.260. If C168 retainers lack B289-3 screws, also remove C184 bearing per Section 7.211 due to lubricant filling requirements.
3. Remove loose paint from clutch shaft, then thoroughly clean entire clutch assembly.

NOTE

Sprag clutch housing capacity is approximately 4 fl oz (118 ml). Retain drained lubricant in a suitable, clean container.

CAUTION

Some clutch assemblies have roller bearings and require two bearing-preload shims under each retainer; do NOT lose shims when removing retainer(s).

4. Position clutch assembly horizontally with upper sheave resting in a clean, non-marking container. Remove bolts and associated hardware and both NAS1352 screws securing affected seal retainer. Remove retainer and keep both shims (used with roller bearings only) in place. Discard o-ring. Rotate clutch shaft until yoke attachment holes are vertical and allow lubricant to drain into container (shaft oil transfer holes are parallel with yoke attachment holes).
5. Flush cavity containing bearings and sprag clutch with clean A257-4 lubricant until lubricant draining into container is obviously red.
6. Strain all lubricant from container through a 180-200 micron paint filter/strainer. Lubricant may be dark, and may sparkle with very fine metallic debris; this is normal. However, if metallic debris is trapped in the filter, submit clutch assembly to RHC, or an R44 Service Center authorized to overhaul clutch assemblies, for repair.
7. Press old seal out of retainer and discard seal. Clean and dry retainer bore.
8. Press new seal, with flat face outboard, into retainer until it seats against retainer lip.

NOTE

If C168-5 retainers are installed, B289-3 screws must be on opposite sides of the clutch shaft (when one screw is on top, opposite screw must be on bottom).

7.213 Clutch Assembly Seals Replacement (cont'd)

9. If replacing forward seal, position clutch assembly vertically with long end of shaft pointing up. Lightly lubricate new o-ring and seal inner lip with A257-4 lubricant, install o-ring in clutch housing forward groove, and slide retainer over clutch shaft forward end. If installed, ensure both shims are properly positioned against roller bearing outer race. Align retainer and housing screw holes and install NAS1352 screws.

10. Position clutch assembly vertically with short end of shaft pointing up.

11. a. If retainers lack B289-3 screws, remove aft retainer and keep both shims (used with roller bearings only) in place. Discard o-ring. Lightly lubricate new o-ring with A257-4 lubricant and install in clutch housing aft groove.

    b. If retainers have B289-3 screws and aft retainer has not been removed, remove B289-3 screw from aft retainer.

12. With clutch assembly remaining vertical, fill housing with A257-4 lubricant until lubricant level is flush with top of bearing races per Figure 7-3D.

13. a. If retainers lack B289-3 screws, lightly lubricate aft retainer seal inner lip with A257-4 lubricant and slide retainer over clutch shaft aft end. If installed, ensure both shims are properly positioned against roller bearing outer race. Align retainer and housing screw holes and install NAS1352 screws.

    b. If retainers have B289-3 screws, install B289-3 screw in aft retainer.

14. Position clutch assembly horizontally and rotate clutch shaft until yoke attachment holes are vertical. Allow lubricant to transfer internally for two minutes.

15. Repeat steps 10 thru 14 until no more lubricant can be added.

16. Install bolts and associated hardware securing C168 retainers to sheave. Using a criss-cross pattern, standard torque bolts per Section 1.320 and torque stripe per Figure 2-1.

17. Tighten four cap screws securing retainers to sheave and torque stripe per Figure 2-1.

18. Install C184 bearing assembly per Section 7.212, as required. Install C907 yoke per Section 7.260, as required.

19. Install clutch assembly per Section 7.200, as required.

7.220 (Reserved)

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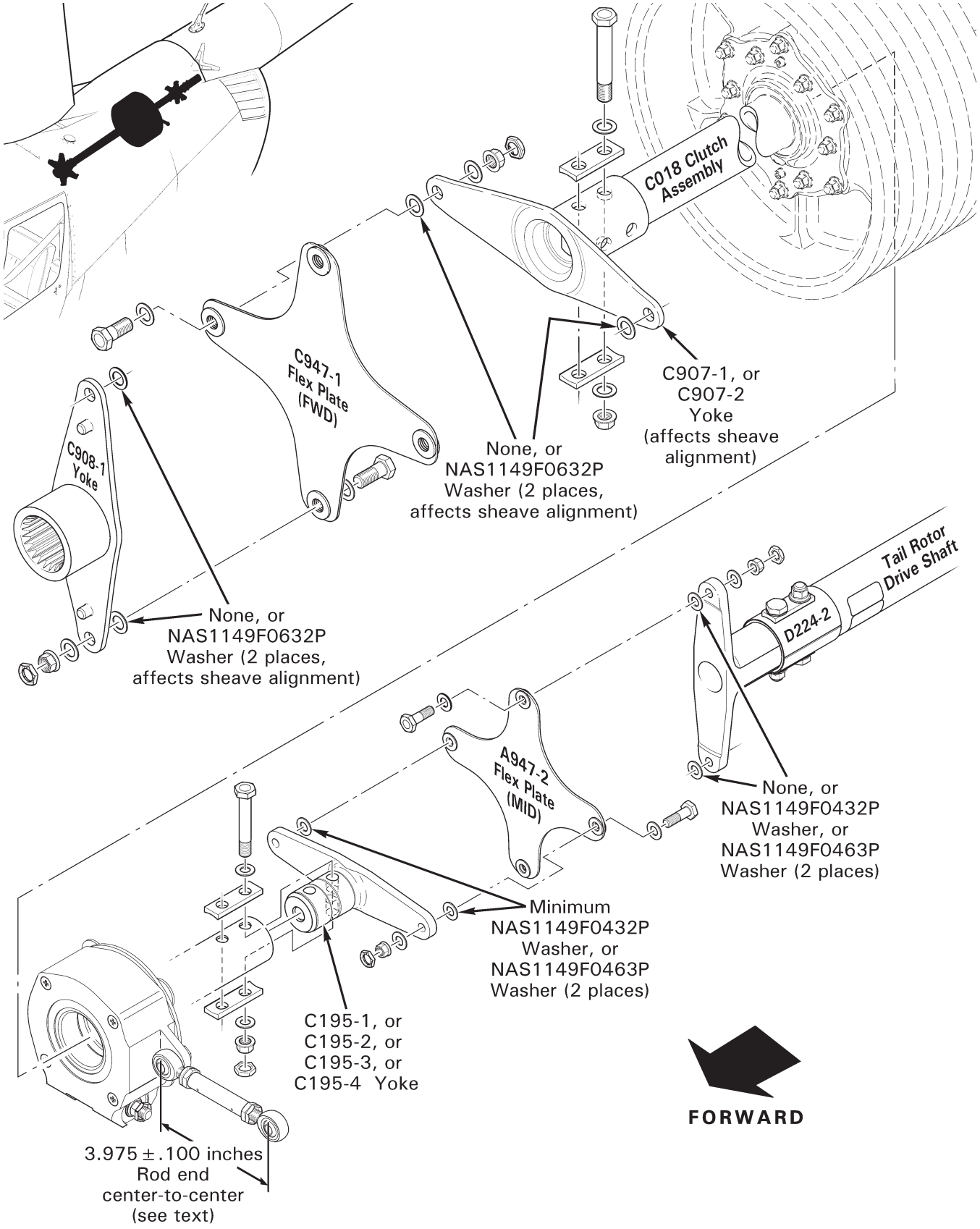


FIGURE 7-4 FORWARD AND INTERMEDIATE FLEX PLATE INSTALLATION

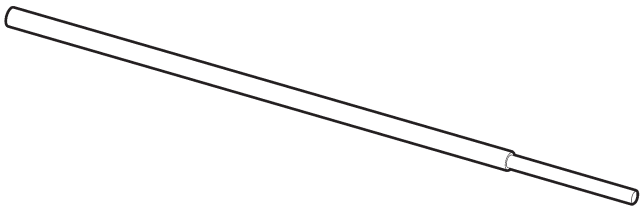


FIGURE 7-5 MT331-4 SHEAVE ALIGNMENT BAR

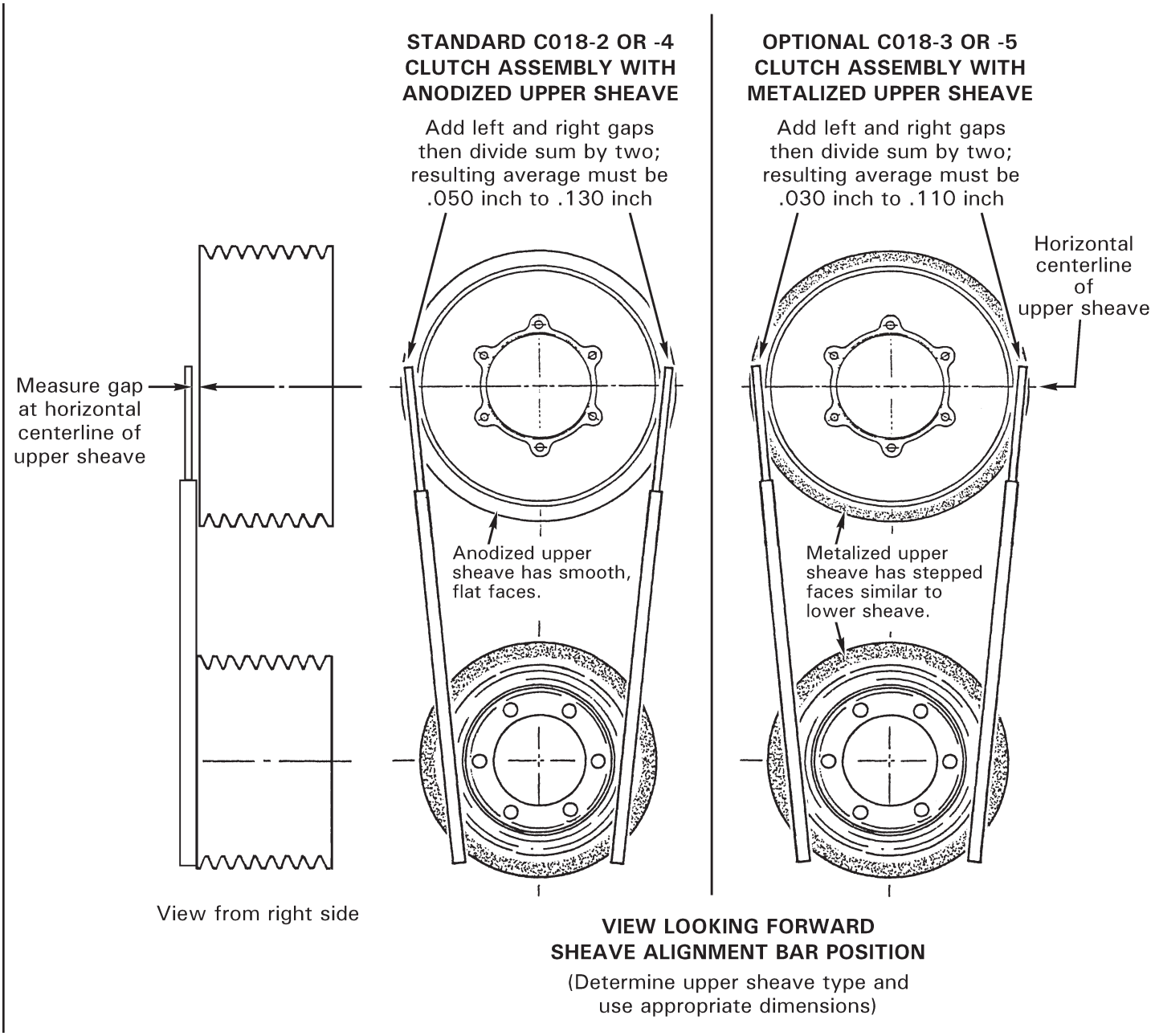


FIGURE 7-6 SHEAVE ALIGNMENT DIMENSIONS

7.230 Clutch Sheave Alignment

Checking sheave alignment:

1. Engage clutch.
2. Adjust length of lateral centering strut, if required, to center upper sheave in steel tube frame. If length was adjusted, standard torque attach bolts, jam nuts, and palnuts per § 23-32 and torque stripe per Figure 2-1.
3. Hold MT331-4 Sheave Alignment Bar against aft face of lower sheave extending bar upward to horizontal center line of upper sheave.
4. Measure left and right gaps per Figure 7-6. Average of both gaps must be within noted limits.

   If average gap exceeds maximum limit then upper sheave is too far forward and must be moved aft by:

   - Shimming forward flex plate, and/or
   - Adjusting C907 yoke length.

   Shimming is accomplished by installing a maximum of one NAS1149F0632P washer between C947-1 flex plate and both arms of C907 and/or C908 yoke; NAS1149F0632P washers installed on either yoke will decrease gap an amount equal to washer thickness. Each C907 yoke has two sets of mounting holes which change the effective yoke length by 0.120 inch. The C907-2 yoke is either 0.120 inch or 0.240 inch longer than the long position of the C907-1 yoke. Gap will decrease by 0.120 inch with each 0.120 inch increase in C907 yoke length.

   If average gap is smaller than minimum limit then upper sheave is too far aft and must be moved forward by:

   - Removing shims (if installed) at forward flex plate, and/or
   - Adjusting C907 yoke length.

   Removing NAS1149F0632P washers from between C947-1 flex plate and both arms of C907 and/or C908 yoke will increase gap an amount equal to washer thickness. Each C907 yoke has two sets of mounting holes which change the effective yoke length by 0.120 inch. The C907-1 yoke is either 0.120 inch or 0.240 inch shorter than the short position of the C907-2 yoke. Gap will increase by 0.120 inch with each 0.120 inch decrease in C907 yoke length.
5. Check intermediate flex plate shimming per § 7.330 if shim washers were added or removed at C947-1 flex plate or if C907 yoke length was altered.
6. Rotate drive train by hand. Verify operating clearance with belt tension actuator disengaged, and with belt tension actuator engaged.

7.240 Clutch Shaft Angle

No check of the clutch shaft angle is required.

7.250 [Reserved.]

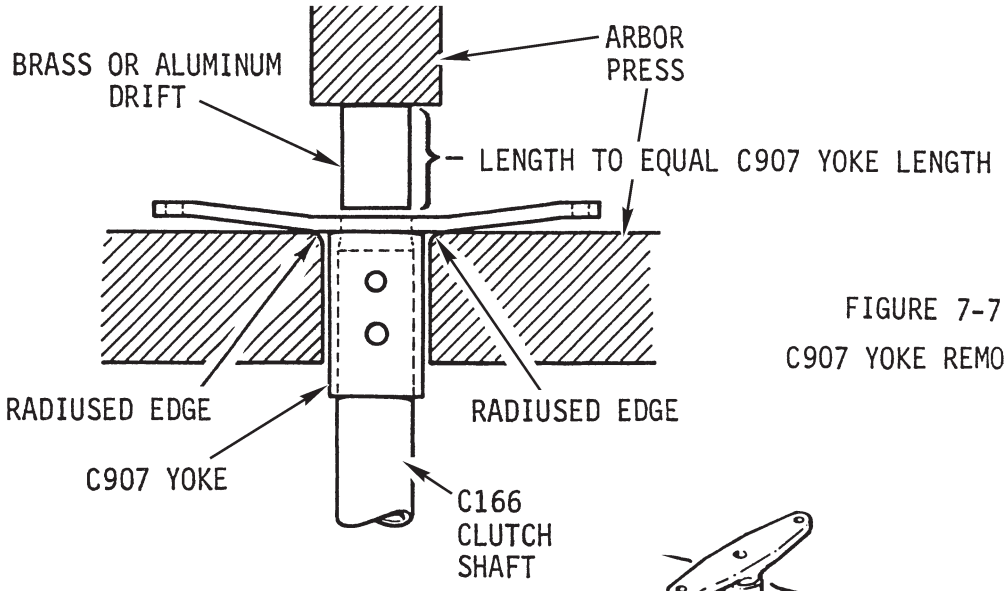


FIGURE 7-7
C907 YOKE REMOVAL

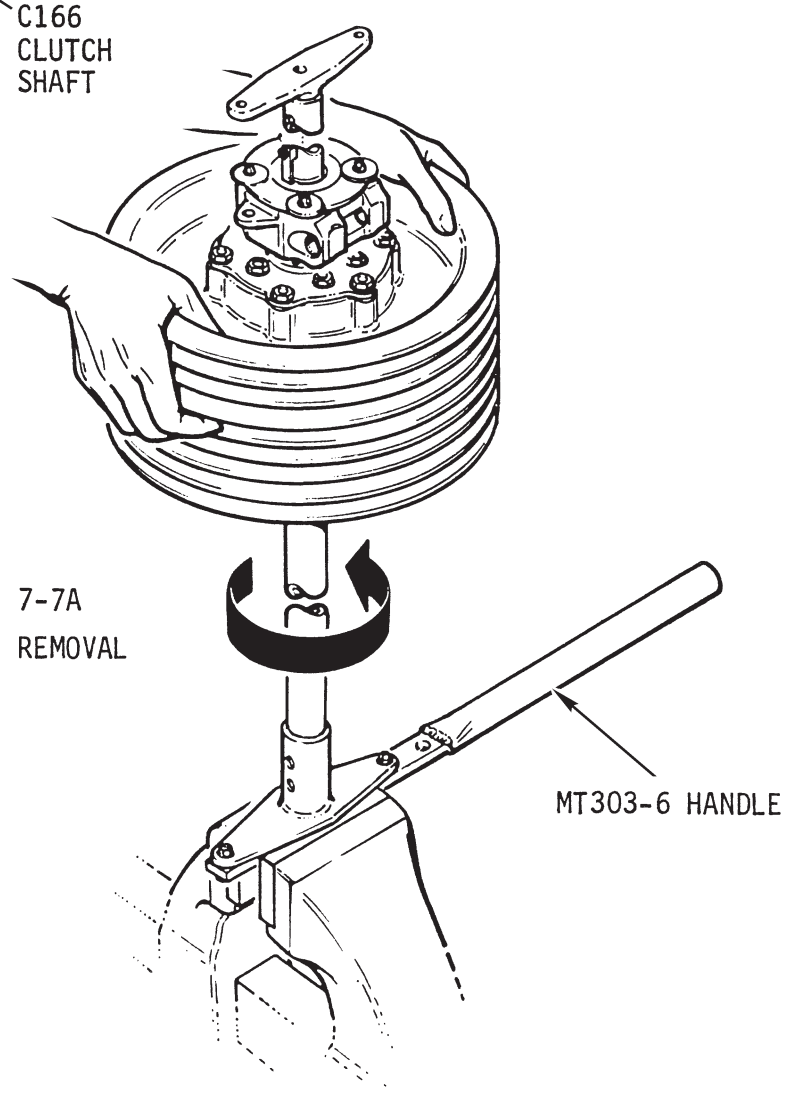


FIGURE 7-7A
C907 YOKE REMOVAL

7.260 C907 Yoke Removal and Installation

A. Removal

1. Remove the clutch assembly per § 7.210.
2. Remove bolts and clamping blocks securing C907 yoke to clutch shaft. Mark which set of yoke attachment holes are used.
3. Remove C907 yoke:
   a. (Preferred method). If press is available, position clutch assembly in press per Figure 7-7. Ensure brass or aluminum drift fits against outer rim of clutch shaft and not against inner spacer. Press clutch shaft out of yoke.

CAUTION

Ensure clutch assembly does not fall when yoke is removed.

   b. If a press is not available, tightly secure C907 yoke arms to MT303-6 handle using NAS6606 bolts. Refer to Figure 7-7A. Clamp handle in a vise and twist clutch shaft out of yoke by turning upper sheave. Apply penetrating oil to yoke-shaft juncture as required. If difficulty is encountered, remove handle and arrange to use a press as described in preceding step.

CAUTION

Avoid bending loads on clutch shaft when handle is clamped in vise as C907 yoke can be damaged.

B. Installation

1. Remove loose paint and clean mating area on shaft with non-residue solvent.
2. Coat inside of C907 yoke and mating portion of clutch shaft with zinc-chromate or epoxy primer. While primer is still wet, install yoke on clutch shaft and align marked holes on yoke (if applicable) with clutch shaft holes.
3. Secure yoke to shaft with clamping blocks and bolts. Standard torque bolts per § 23-32 and torque stripe per Figure 2-1.

7.270 C195 Yoke Removal and Installation

A. Removal

NOTE

Yoke may be removed without clutch removal.

1. Remove intermediate flex plate.
2. Remove bolts and clamping blocks securing C195 yoke to clutch shaft.
3. Twist yoke out of clutch shaft.

B. Installation

1. Remove loose paint and clean mating area inside shaft with non-residue solvent.
2. Coat inside of clutch shaft and shank of C195 yoke with zinc-chromate or epoxy primer. While primer is still wet, slide yoke into clutch shaft and align holes.
3. Install clamping blocks and bolts. Standard torque bolts per § 23-32 and torque stripe per Figure 2-1.
4. Install intermediate flex plate per § 7.330.

CAUTION

There must be (1) NAS1149F0432P or (1) NAS1149F0463P washer between each arm of C195 yoke and A947-2 flex plate. Refer to § 7.330.

7.280 V-Belts

7.281 V-Belt Removal

a) Remove tailcone cowling.

b) Lower clutch actuator to its fully disengaged position.

c) Mark the back of each belt with a felt pen. Use numbers or a v-mark to indicate direction and order so they will be in the same positions if they are to be reinstalled. Mark the direction of rotation on each belt so that they cannot be reversed.

d) Mark and disconnect the intermediate flex plate from clutch. Disconnect the centering strut from clutch to upper frame at frame end.

e) Remove fan and scroll per Section 6.200.

f) Remove actuator assembly per Section 7.510.

g) Remove belts from sheave.

CAUTION

Used belts must be reinstalled in proper order due to individual differences in belt stretch.

7.282 V-Belt Installation

WARNING

Install V-belts only in matched sets. Do Not install used V-belts from another helicopter.

a) Before installation of new belts, inspect the sheave grooves. Replace any sheave showing corrosion, pitting or flaking of the metalized or anodized coatings, wear through the anodized coating, roughness, or sharp ridges.

CAUTION

Rough or corroded grooves in the upper or lower sheave can cause V-belts to roll, break, or come off. Refer also to Section 2.160.

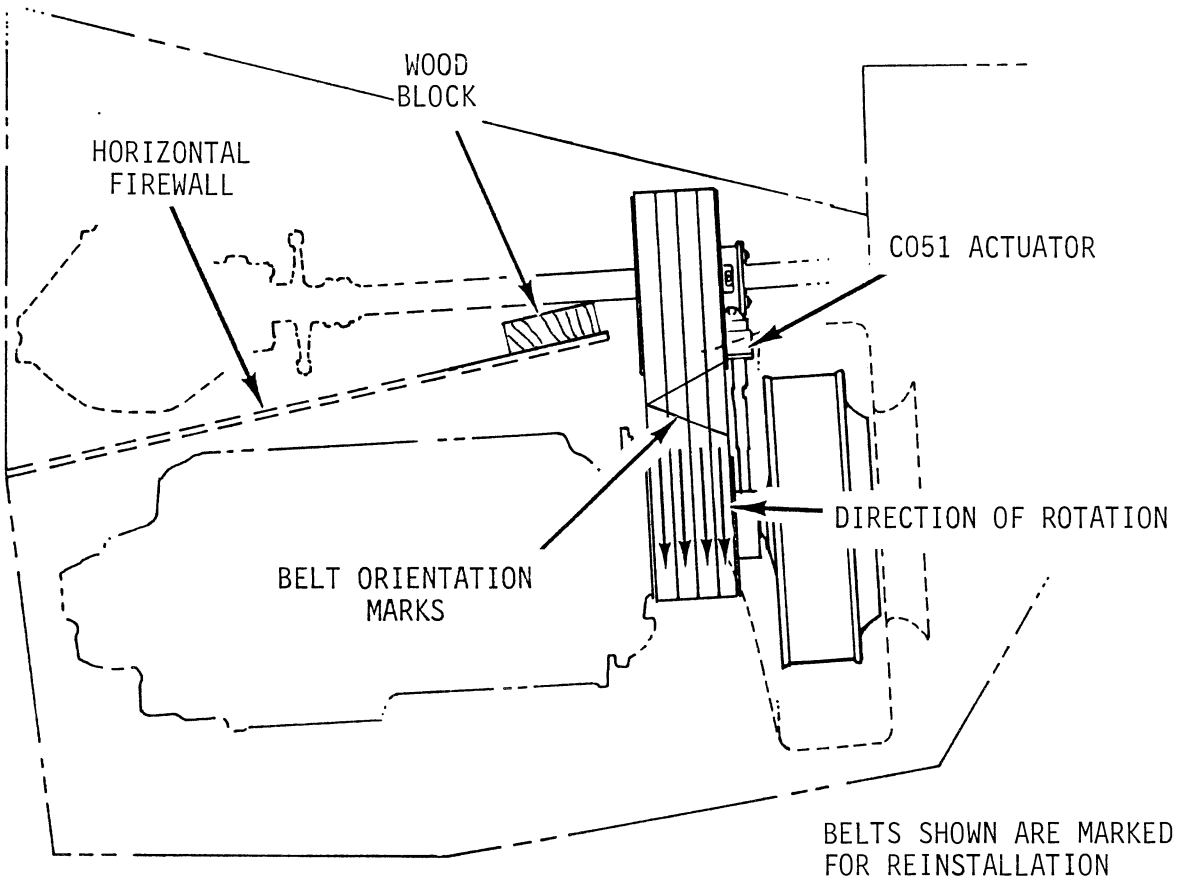


FIGURE 7-8 V-BELT AND ACTUATOR REMOVAL

7.282 V-Belt Installation (cont'd)

b) Paint the grooves in the lower sheave with a thin coating of zinc chromate or epoxy primer per Section 1.400.

c) Install belts on sheaves. If used belts are reinstalled, inspect them for damage per Section 2.150. Make sure they are in their proper order with respect to fore/aft position and proper direction of rotation.

d) Install the actuator assembly per Section 7.520.

e) Connect the intermediate flex plate to the clutch.

f) Install fan and scroll per Section 6.200.

g) Check clutch sheave alignment per Section 7.230.

h) Shim and connect intermediate flex plate per Section 7.330.

i) Adjust the actuator's down-limit stop screw so when the actuator is engaged at start up there is a delay of less than 5 seconds before rotor starts turning.

NOTE

First adjustments of the actuator down limit screw, to regulate new belt disengage slack, occur relatively soon with longer periods between later adjustments. Recheck.

A delay between clutch switch engagement and the rotor starting to turn of more than 5 seconds indicates excessive slack. If rotor rotates when cranking engine with starter motor, belts may not have enough slack.

CAUTION

During start up and engagement, belts too tight can damage flex plates and belts too loose can jump out of grooves.

j) Ground run or hover the helicopter for at least 20 minutes.

k) At the end of the ground run, inspect the sheave grooves for the contact pattern in the primer. A similar contact pattern in all eight grooves indicates the belt/sheave combination is compatible. A noticeably different contact pattern from groove to groove indicates the combination is not compatible.

l) If the belt/sheave combination is not compatible, re-check sheave alignment, replace belts, and repeat installation procedure. If belt/sheave combination is still not compatible, it may be necessary to replace the lower sheave. The wear pattern in all eight grooves must be similar before the aircraft is released for flight.

7.283 Belt Tension

No procedure for checking belt tension on the helicopter is required.

7.290 C007 Fanshaft and Bearing Assembly, Starter Ring Gear Support, Lower Sheave and Alternator Belt Replacement.

7.291 Removal

a) Remove V-belts per Section 7.281.

b) Cut the safety wire and remove the six NAS6608 bolts holding the fanshaft.

c) Remove the C007 fanshaft and bearing assembly. Temporarily secure the lower sheave with one of the removed bolts if it is not to be removed.

d) To remove the lower sheave, the use of a soft mallet may be required to tap the sheave while pulling it off.

e) Removal of the starter ring gear support is required to change alternator belt or gain access to the nose section of the engine.

1) Loosen the alternator belt tension.
2) Note the zero mark on the starter ring gear support at one propeller flange bushing. Mark this bushing to ease reinstallation.
3) Remove the starter ring gear support.

7.292 Installation

a) Install a new alternator belt at this time if required. Reinstall the starter ring gear support. Align the zero mark on the ring gear support with the marked bushing. The bushing and matching hole are slightly larger than the five other holes. This makes the incorrect installation of the starter ring gear support difficult but not impossible.

b) Install the lower sheave and fanshaft assembly. Check that two AN960-816 washers are installed under each NAS6608-42H bolt. Lightly snug the bolts. Check for clearance between the lower sheave and starter ring gear support's conical surface. Insert a 0.005 inch feeler gauge at 6 places between the attachment bolts. Lack of clearance indicates the wrong starter ring gear support is installed or that the ring gear support is improperly installed. Torque the bolts per Section 1.330 in a star pattern followed by a circular pattern. Safety wire the bolts in pairs with 0.041 inch diameter stainless steel safety wire.

7.290 C007-4 Fanshaft and Bearing Assembly, Starter Ring Gear Support, Lower Sheave and Alternator Belt Replacement (continued)

CAUTION

Installing NAS6608H42 bolts with less than two NAS1149F0863P washers will prevent proper clamping of lower sheave and fanshaft & bearing assembly.

c) Refer to Lycoming Service Instruction 1129 (latest revision). Adjust belt tension as required and special torque bolts securing alternator per § 23-33.

d) Install V-belts per § 7.282.

7.300 Tail Rotor Drive Shaft

7.310 Tail Rotor Drive Shaft Removal

a) Remove tailcone per § 4.300 Part A.

b) Using 3-foot socket extension, remove NAS6603 bolts securing drive shaft damper arm to its mounting bracket.

c) Using upper aft tailcone inspection hole, disconnect C947-3 aft flex plate from tail rotor gearbox input shaft flange. Support aft end of drive shaft to protect drive shaft and tailcone from damage.

d) Remove drive shaft thru forward end of tailcone.

7.320 Tail Rotor Drive Shaft Installation

a) Refer to Figure 7-9. If not previously accomplished, install hardware securing C947-3 aft flex plate to tail rotor drive shaft's aft yoke. Standard torque bolts and palnuts per § 23-32 and torque stripe per Figure 2-1.

b) Insert tail rotor drive shaft into tailcone and support aft end of drive shaft thru upper aft tailcone inspection hole to prevent damage and for alignment purposes. Using 3-foot socket extension, insert (2) NAS6603-3 bolts & washers, 1–2 turns only, to align drive shaft damper arm to its mounting bracket.

c) Using upper aft tailcone inspection hole, install hardware securing C947-3 aft flex plate to gearbox input flange with bolt heads facing forward. Standard torque bolts and palnuts per § 23-32 and torque stripe per Figure 2-1. Remove drive shaft support from upper aft inspection hole.

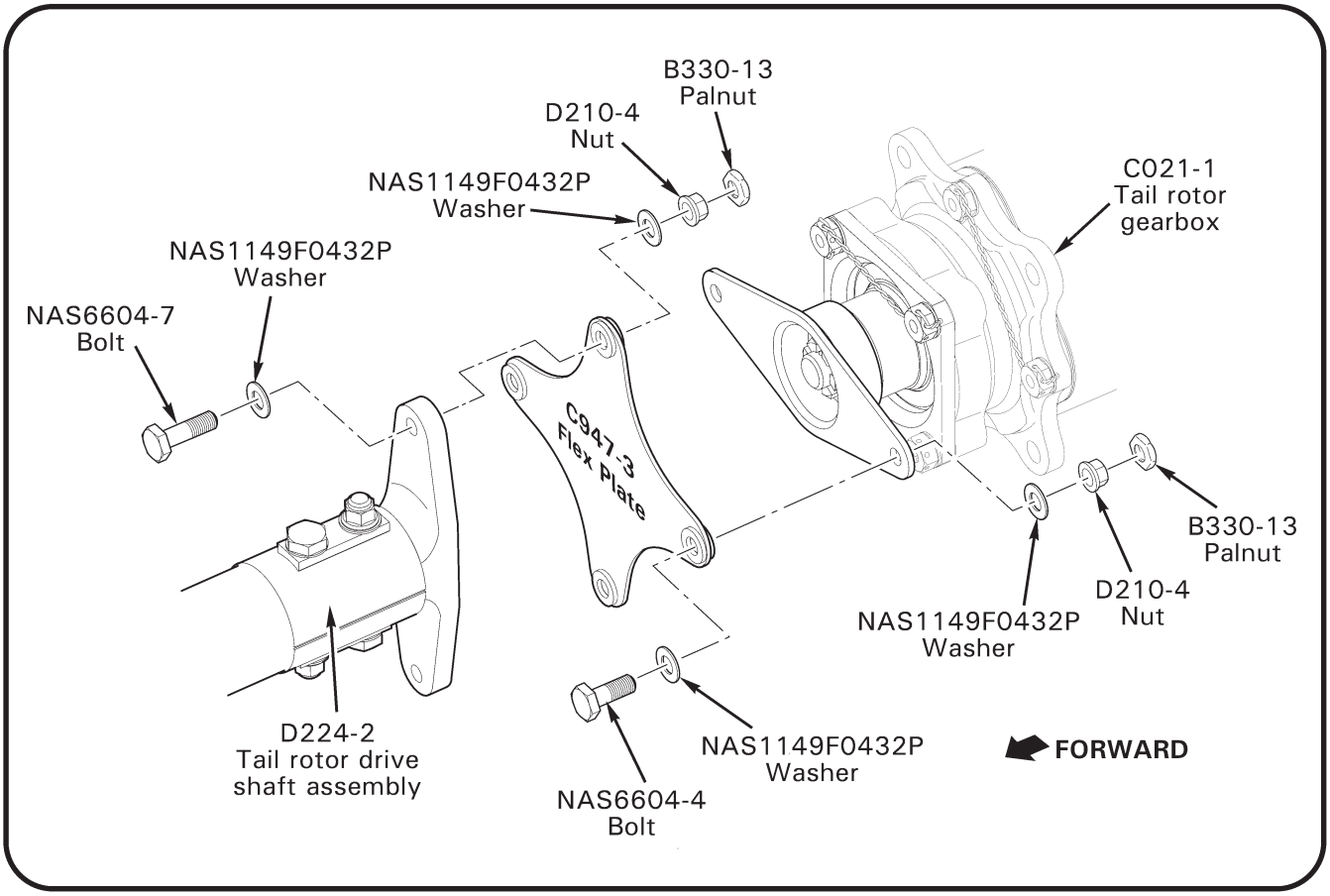


FIGURE 7-9 C947-3 AFT FLEX PLATE INSTALLATION

7.320 Tail Rotor Drive Shaft Installation (cont'd)

CAUTION

Improper installation of flex plate can damage tail rotor drive shaft and gearbox.

d) Through inspection holes on side of tailcone, determine longitudinal alignment of damper arm with tailcone attachment bracket. If clearance or interference between arm and bracket is greater than 0.12 inches, contact Robinson Helicopter Technical Support Department. If clearance or interference is less than 0.12 inch, connect damper assembly to tailcone cross member. Torque bolts per Section 1.320.

e) Install tailcone per Section 4.312.

f) Install and shim intermediate flex plate per Section 7.330.

g) Perform tail rotor drive shaft run-out check per Section 7.340.

7.321 Adjustment of Damper Friction

a) Remove tail rotor drive shaft from tailcone per Section 7.310.

b) Disassemble damper per Figure 7-10.

c) Inspect C041-5 DU washers for worn Teflon® coating (dark gray face) and replace as required.

d) Inspect A141-37 washers and C041-3 arm for indications of wear or grooving. Replace as required.

e) Reassemble damper per Figure 7-10. Torque pivot bolts per Section 1.320.

CAUTION

Teflon® (dark gray) face of C041-5 DU washer must be placed against A141-36 washer or C041-3 link. Remove plastic or tape coating if installed.

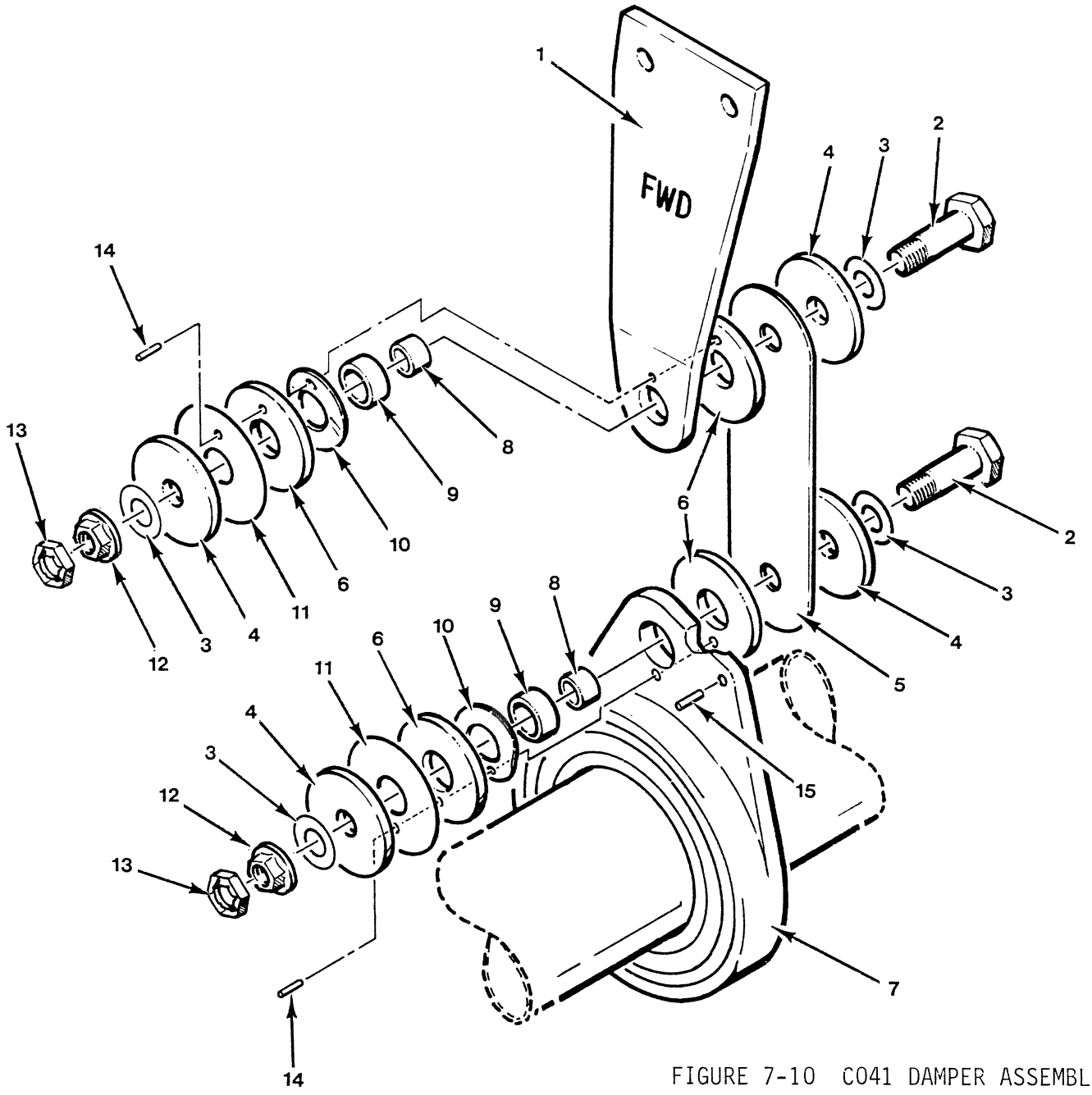
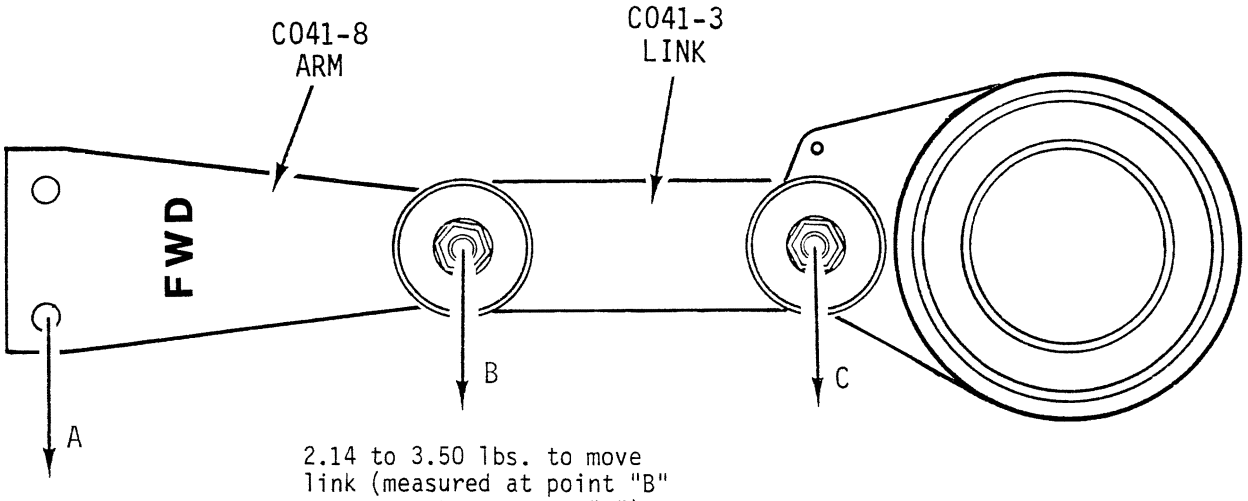


FIGURE 7-10 C041 DAMPER ASSEMBLY

NUMBER	PART NUMBER	DESCRIPTION	NUMBER	PART NUMBER	DESCRIPTION
1	C041-8	Arm	9	05DU04	Bushing
2	NAS6604-6	Bolt	10	C041-6	Spring Washer
3	AN960PD416L	Washer	11	A141-36	Washer
4	A141-37	Washer	12	NAS679A4	Nut
5	C041-3	Link	13	B330-13	Palnut
6	C041-5	Washer	14	A041-10	Dowel Pin
7	C041-11	Bearing Assembly	15	MS16562-11	Roll Pin
8	A105-12	Journal			



2.50 to 4.25 lbs. to move arm (Measured at point "A" rotating about point "B").

2.14 to 3.50 lbs. to move link (measured at point "B" rotating about point "C").

FIGURE 7-11A C041 DAMPER ASSEMBLY ADJUSTMENT

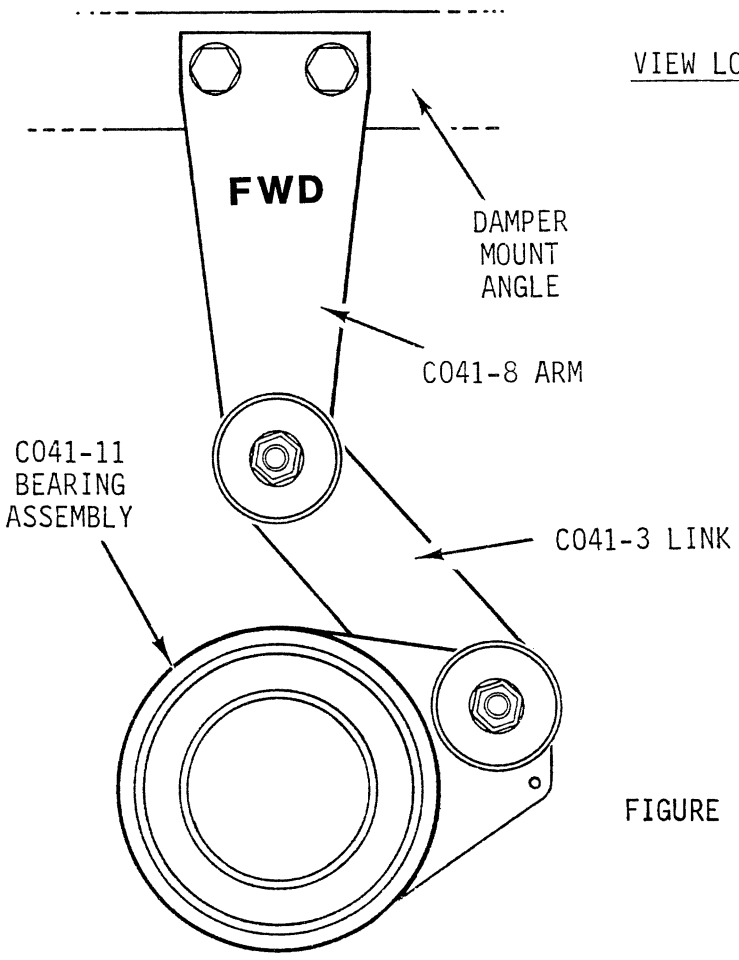


FIGURE 7-11B C041 DAMPER ORIENTATION

7.321 Adjustment of Damper Friction (cont'd)

f) Refer to Figure 7-11A. Hold C041-3 link and attach a spring scale or dead weight to one bolt hole in C041-8 arm. It should take 2.50 to 4.25 lb to move arm. Check bearing housing pivot friction with spring scale or dead weight at link bolt. It should take 2.14 to 3.50 lb to move link.

If drag is less than specified, check C041-6 spring washer and bend washer until it has a total height of 0.065 - 0.078 inch. If spring washer is correct height, but drag is still too low, lap end of A105-12 journal. If drag is greater than specified, flatten spring washer slightly.

CAUTION

DO NOT ADJUST DAMPER DRAG BY CHANGING BOLT TORQUE.

g) Torque MS21042L4 nut per Section 1.320 and recheck damper frictions per Step f). Install B330-13 palnuts and torque stripe.

h) Install tail rotor drive shaft per Section 7.320.

7.330 Intermediate Flex Plate Installation and Shimming

Measurements taken with intermediate flex plate removed.

a) Engage clutch actuator.

b) Rotate drive flanges of tail rotor shaft and C195 yoke horizontal.

c) Insert NAS1304 bolt through tail rotor shaft and C195 aft clutch yoke at 9 o'clock position. Measure and record gap between flanges at 3 o'clock position. Remove bolt.

d) Insert bolt at 3 o'clock position. Measure and record gap at 9 o'clock position. Measurements in sequence C and D are Measurement 1.

e) Remove bolt and rotate tail rotor shaft 180 degrees. Repeat steps C & D. This will be Measurement 2.

NOTE

Measurement 1 and 2 should be similar. If measurements are not similar, one or both yokes are bent.

f) Determine difference between 3 o'clock and 9 o'clock gap in Measurement 1. Determine difference between 3 o'clock and 9 o'clock gap in Measurement 2.

7.330 Intermediate Flex Plate Installation and Shimming (cont'd)

g) Use following formula to obtain the calculated dimensions for proper shimming required at the intermediate flex plate.

NOTE

Use the measurement with the smaller difference between 3 and 9 o'clock readings.

9 o'clock reading + 3 o'clock reading	=	_____
Divide above sum by 2	=	_____
Subtract *		_____ *
Calculated Dimension	=	_____

*Average thickness of the A947-2 flex plate measured at the bonded washers.

Shim as required per Table 7-1.

h) Reinstall the flex plate using the shims determined above. Torque the attach bolts per Section 1.320. Install palnut and torque stripe. Refer to Figure 7-4.

7.340 Checking Tail Rotor Drive Shaft Runout

The runout check described below is to prevent excessive runout on the tail rotor drive shaft which can cause a failure in the intermediate flex coupling or damper assembly.

a) Remove all the tailcone inspection covers on the tailcone right side. Engage the clutch.

b) Assemble the Robinson Tool Number MT260-6 tool and a suitable dial indicator.

NOTE

The dial indicator included in the Robinson MT122 bolt stretch gauge is recommended for this tool.

7.340 Checking Tail Rotor Drive Shaft Runout (cont'd)

c) Insert the dial indicator through the inspection hole farthest aft on the right side of the tailcone. Press the dial indicator firmly against the tailcone when the extension is riding on the drive shaft.

d) Have someone rotate the drive shaft at the C166 clutch shaft at least three full revolutions. The indicator may vary somewhat with each revolution so it will be necessary to take an average.

e) Repeat procedure in steps C & D at the next inspection hole forward.

f) Remove the extension from the MT260 tool and, using the longer extensions, check the drive shaft at each of the other two inspection holes.

g) The maximum amount of runout at any of the locations must not exceed 0.025 inch. If the runout is excessive, the drive shaft must be repaired or replaced.

7.350 Two-Piece Tail Rotor Drive Shaft

a) The two-piece tail rotor drive shaft consists of one C196-1 shaft, one C195-5 yoke, one C041-1 damper assembly, two C191-2 clamping blocks and associated hardware. See Figure 7-12A .

b) The C041-1 damper bearing assembly is field replaceable; refer to Figures 7-12A and 7-12B for appropriate dimensional criteria.

c) The D224-1 drive shaft is produced in one length only.

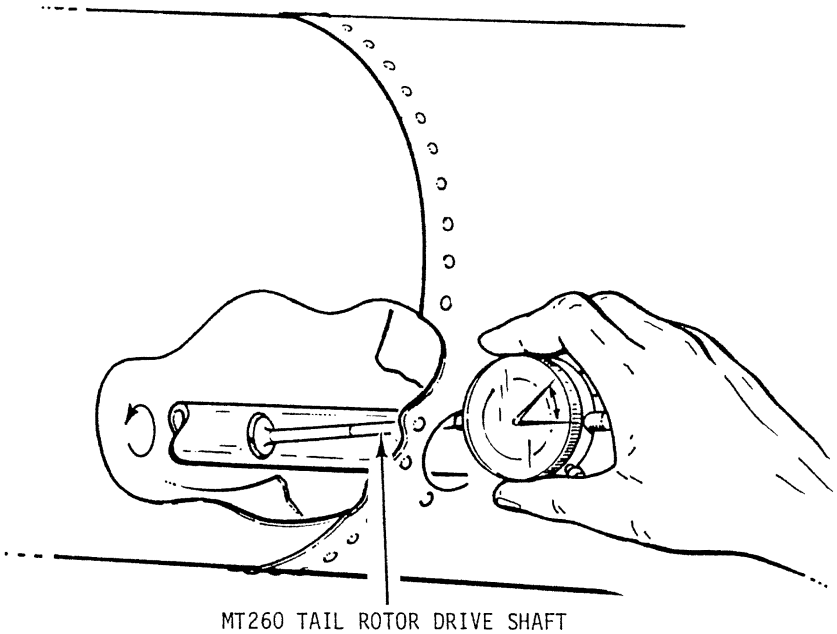


FIGURE 7-12 TAIL ROTOR DRIVE SHAFT RUNOUT CHECK

Calculated dimension from § 7.330 (g)	Total shims required between flex plate and clutch shaft's aft C195 yoke	Total shims required between flex plate and TR drive shaft's forward yoke
0.137 inch or more	Measurement is over limit and a longer C195 yoke is required.	Measurement is over limit and a longer C195 yoke is required.
0.136 inch to 0.107 inch	1 each NAS1149F0463P washer substituted for NAS1149F0432P (required 2 places)	1 each NAS1149F0463P washer (required 2 places)
0.106 inch to 0.077 inch	1 each NAS1149F0432P washer (required 2 places)	1 each NAS1149F0463P washer (required 2 places)
0.076 inch to 0.047 inch	1 each NAS1149F0432P washer (required 2 places)	1 each NAS1149F0432P washer (required 2 places)
0.046 inch to 0.017 inch	1 each NAS1149F0432P washer (required 2 places)	No washers for shimming
0.016 inch or less	Shorter C195 yoke is required	Shorter C195 yoke is required

CAUTION

There must be an NAS1149F0432P or NAS1149F0463P washer between each arm of C195 yoke and A947-2 flex plate.

TABLE 7-1 A947-2 INTERMEDIATE FLEX PLATE SHIM TABLE

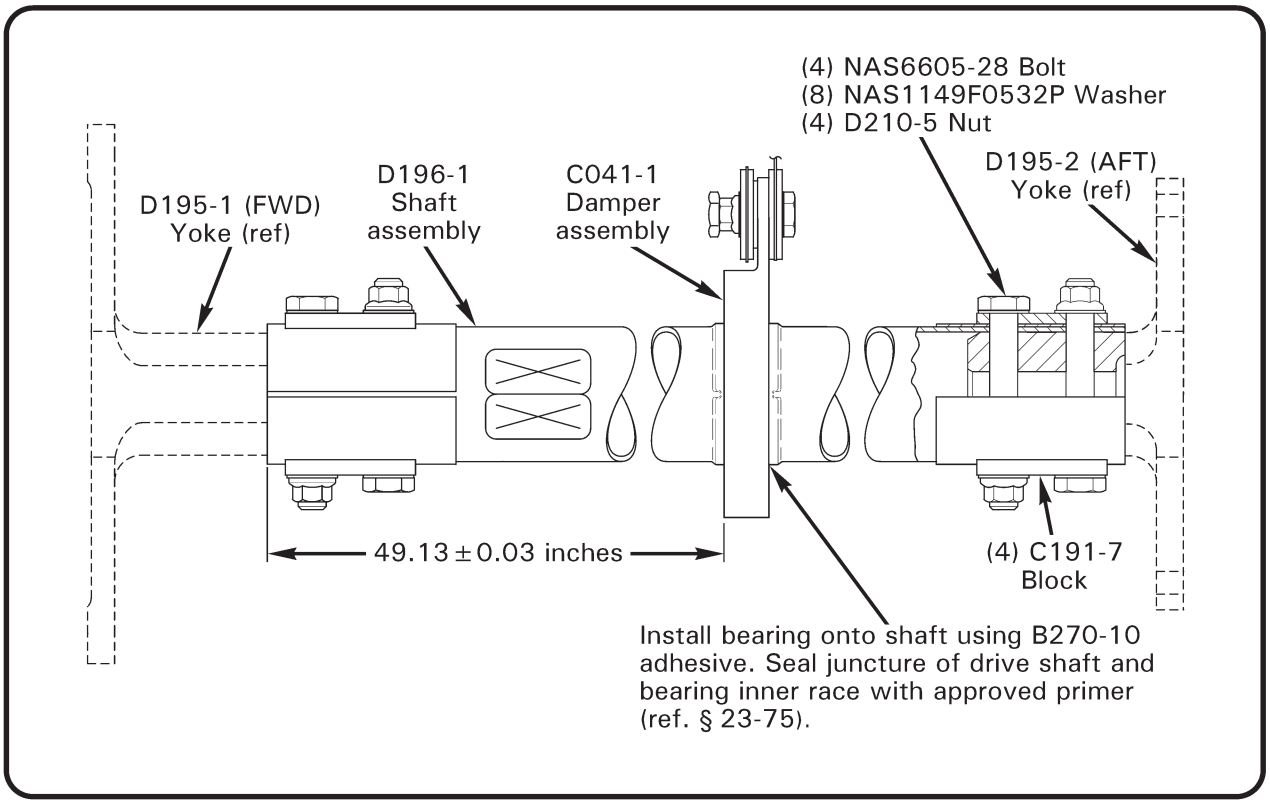


FIGURE 7-12A D196-1 TAIL ROTOR DRIVE SHAFT

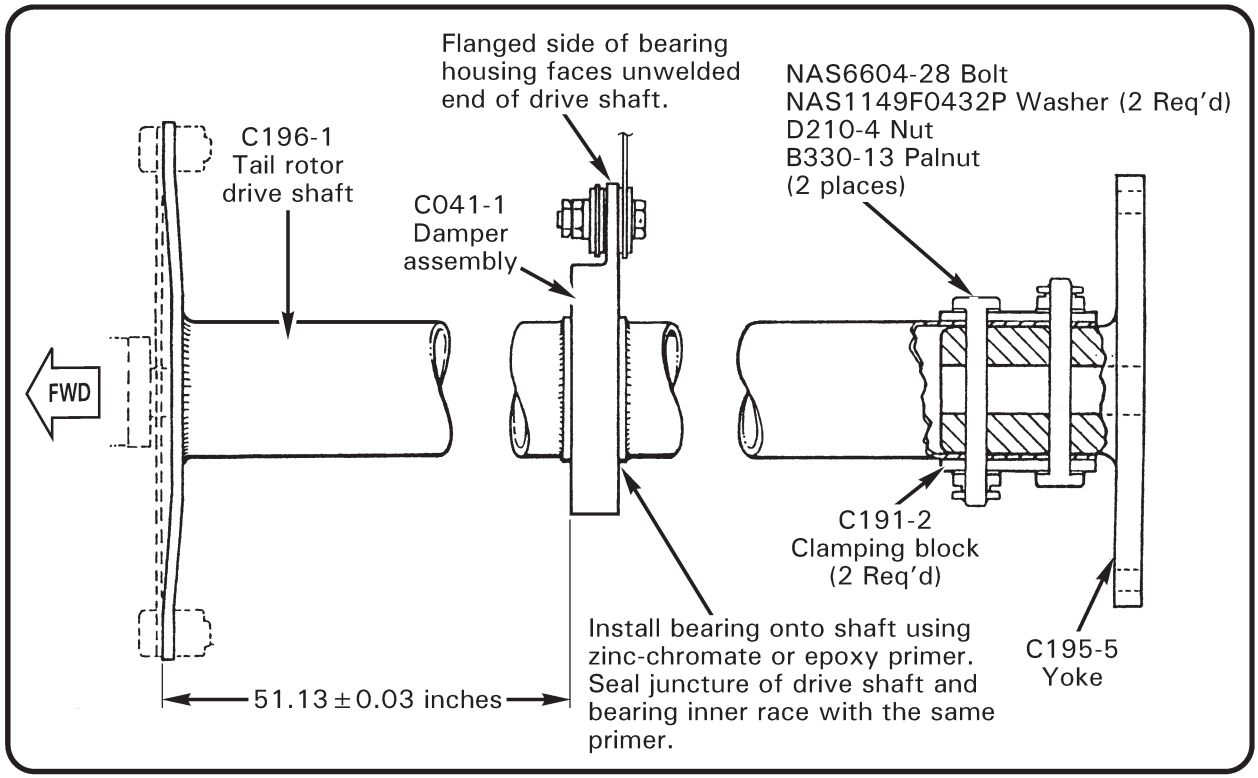


FIGURE 7-12B C196-1 TAIL ROTOR DRIVE SHAFT

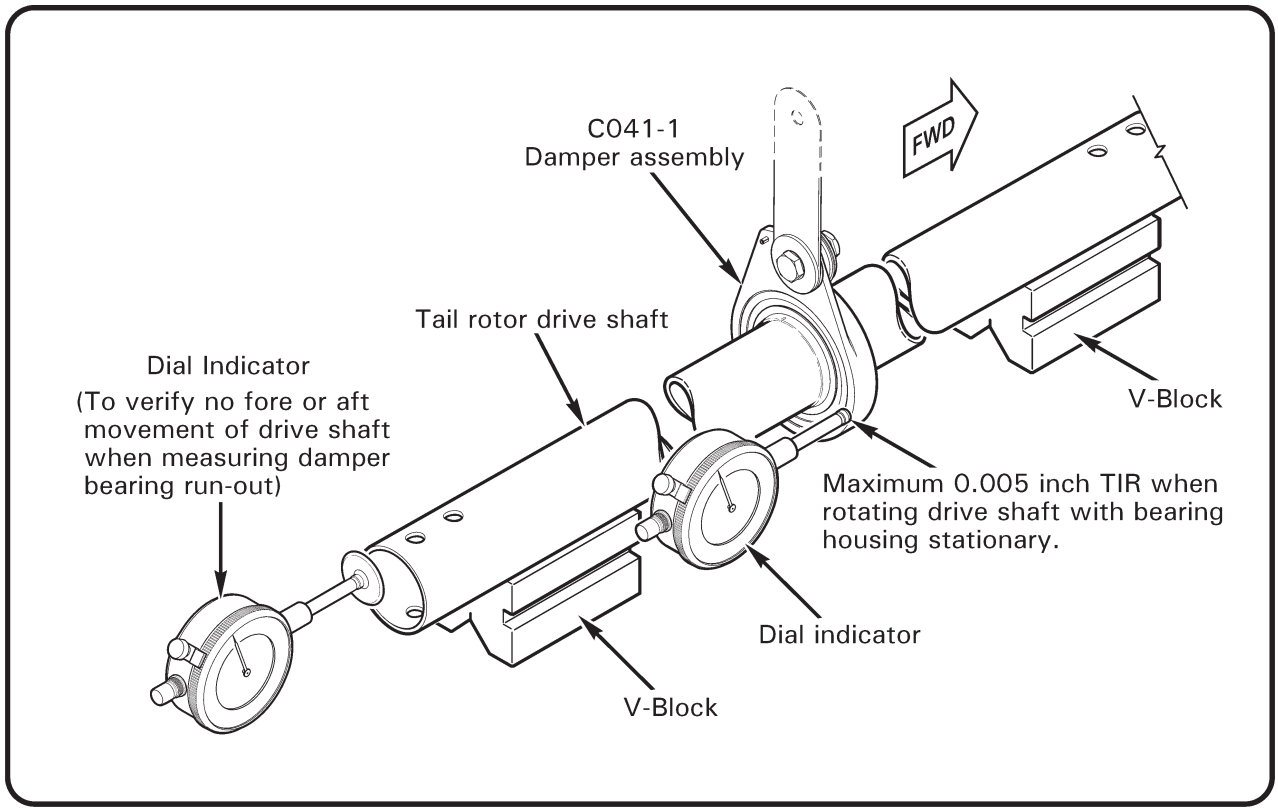


FIGURE 7-12C DAMPER BEARING RUN-OUT INSPECTION

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7.400 Tail Rotor Gearbox

7.410 Tail Rotor Gearbox Removal

NOTE

Drain tail rotor gearbox oil (ref. § 7.430) prior to gearbox removal, or keep gearbox vertical after removal to avoid oil escape thru filler-vent plug.

1. Remove tail rotor assembly per § 30-10 Part A.
2. Remove C031-1 pitch control assembly & A120-3 aft bellcrank per § 8.561.
3. Working through upper aft inspection hole of tailcone, remove hardware securing C947-3 aft flex plate to C116-1 yoke.

CAUTION

Drive shaft must be supported through upper aft inspection hole to prevent damage to flex plate and drive shaft. Do not leave any loose hardware inside tailcone.

4. Disconnect chip detector wire at bottom of gearbox. As required, remove wires from chip detector for transfer to replacement gearbox.
5. Cut & discard safety wire if installed. Remove four bolts securing tail rotor gearbox to tailcone and remove gearbox.

7.420 Tail Rotor Gearbox Installation

1. Install hardware securing tail rotor gearbox to tailcone. Special torque (4) cap screws per § 23-33. Safety screws in pairs using 0.032-inch diameter lockwire or torque stripe per Figure 2-1, as applicable.
2. Connect chip detector wire at tail rotor gearbox.
3. Install hardware securing C947-3 aft flex plate to C116-1 yoke. Standard torque bolts per § 23-32. Install palnuts and standard torque per § 23-32. Torque stripe fasteners per Figure 2-1.
4. Remove temporary support from tail rotor drive shaft and install A558-2 cover.
5. Check intermediate flex plate shimming per § 7.330.
6. Install C031-1 pitch control assembly & A120-3 aft bellcrank per § 8.562.
7. Install tail rotor assembly per § 30-10 Part B or C.

7.430 Tail Rotor Gearbox Chip Indicator

Use the following procedure to drain the gearbox and inspect the lubricant and chip detector for chips.

1. Use a clean container to catch tail rotor gearbox oil.
2. If installed, cut safety wire on chip detector and disconnect electrical wires. Remove chip detector and drain oil.
3. Strain oil and inspect for any particles found in oil or on chip detector. Examine particles for size; any particles larger (0.09 inch long or 0.02 inch wide) than fine fuzz (normal wear) should be identified as ferrous or nonferrous by using a magnet. If numerous particles are found and next running of gearbox produces more particles, a tail rotor gearbox failure may be impending and a tail rotor gearbox overhaul is required.
4. Connect chip detector wiring to airframe harness at connectors. Turn battery on. Touch detector's magnet to airframe and verify appropriate gearbox caution light illuminates. Turn battery off. Disconnect chip detector wiring from airframe harness at connectors.
5. Using new O-ring install chip detector and special torque per § 23-33. Safety using 0.032-inch diameter lockwire or torque stripe per Figure 2-1, as required. Connect chip detector wiring and secure using MS3367-5-0 ty-raps. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
6. Turn battery on. Depress push-to-test button(s) and verify appropriate gearbox caution light illuminates. Turn battery off.
7. As required, remove filler-plug. Fill gearbox to center of sight gage using correct gearbox oil (refer to R44 Service Letter SL-73). Verify filler-plug vent holes are clear, then install filler-plug and special torque per § 23-33. Safety using 0.032-inch diameter lockwire or torque stripe per Figure 2-1, as required.

7.440 Tail Rotor Gearbox Output Shaft Seal Replacement

1. Drain gearbox oil. Clean and inspect chip detector. Clean sight gage as required. Using new O-ring(s) install chip detector & sight gage and special torque per § 23-33. Safety using 0.032-inch diameter lockwire or torque stripe per Figure 2-1, as required.
2. Remove tail rotor assembly per § 30-10 Part A.
3. Remove C031-1 pitch control assembly & A120-3 aft bellcrank per § 8.561.
4. Cut & discard safety wire and remove (4) MS20074-04-06 bolts securing C112-2 cap and slide cap off output shaft.

CAUTION

Do not alter shim stack-up between cap and bearing.

5. Press old C966-2 seal out of cap and remove old A215-133 O-ring. Clean cap mating surfaces and O-ring groove using approved solvent (ref § 23-70).
6. Orient new seal with open face pointing toward gearbox and press into cap bore 0.160 inch below external flat surface.
7. Lubricate new O-ring using correct gearbox oil (refer to R44 Service Letter SL-73) and install in cap groove, ensuring O-ring has not twisted.
8. Lubricate output shaft at seal-seating area using correct gearbox oil.
9. Carefully slide cap over output shaft. Align cap and gearbox bolt holes and press cap into gearbox. Install (4) MS20074-04-06 bolts. Special torque bolts per § 23-33 and safety in pairs using 0.032-inch diameter lockwire.
10. Install C031-1 pitch control assembly & A120-3 aft bellcrank per § 8.562.
11. Install tail rotor assembly per § 30-10 Part B or C.
12. Fill gearbox to center of sight gage using correct gearbox oil (refer to R44 Service Letter SL-73). Verify filler-plug vent holes are clear. Install filler-plug and special torque per § 23-33. Safety using 0.032-inch diameter lockwire or torque stripe per Figure 2-1, as required.
13. Dynamically balance tail rotor per § 10.240, then inspect gearbox for leaks.

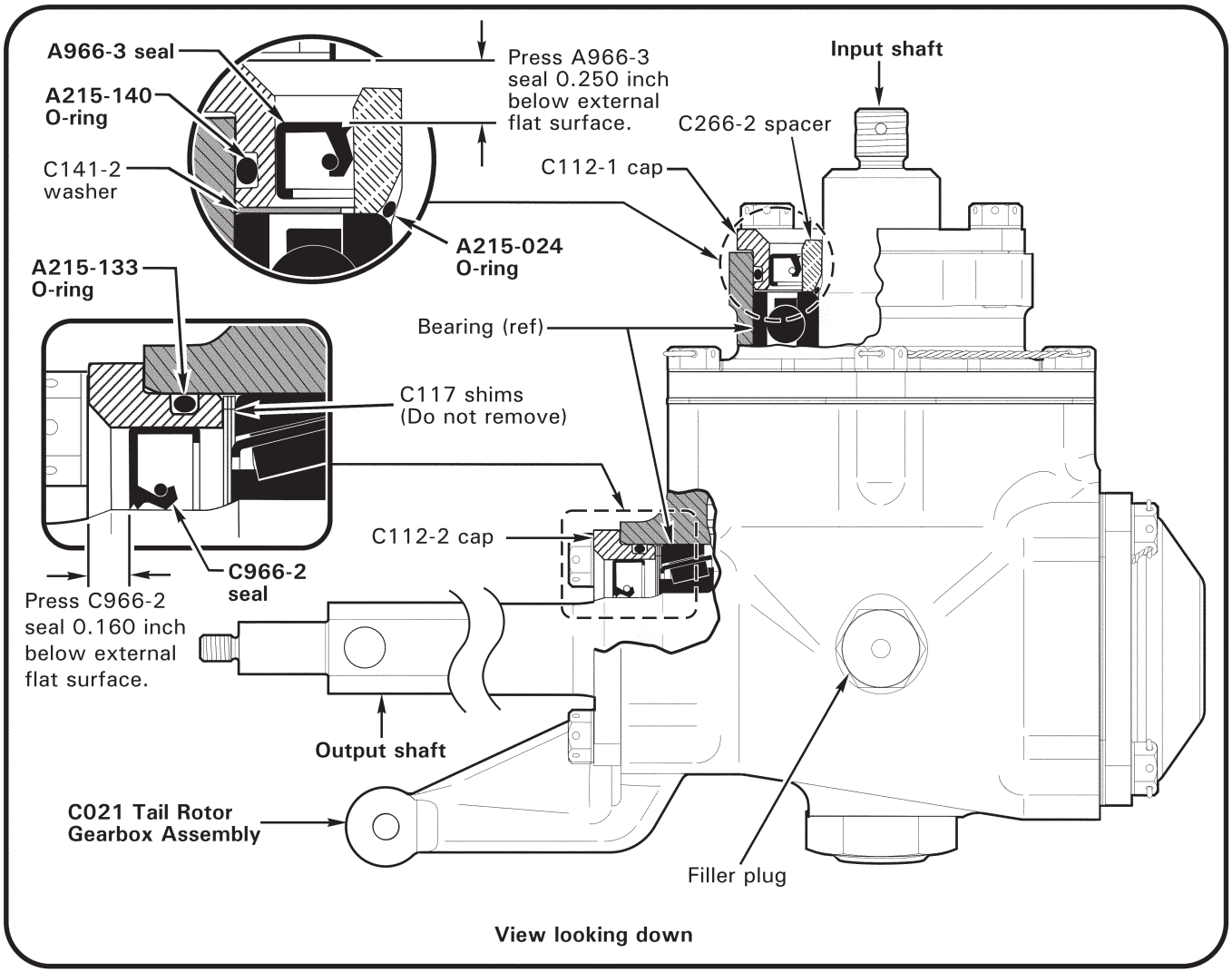

FIGURE 7-13 SHAFT SEAL REPLACEMENT

7.450 Tail Rotor Gearbox Input Shaft Seal Replacement

1. Drain tail rotor gearbox oil and remove gearbox per § 7.410. Tail rotor assembly and pitch control assembly removal are not required.
2. On a suitable work bench, place a wood block between C116-1 yoke and gearbox housing to prevent tail rotor rotation. Remove cotter pin and nut from gearbox input shaft and remove yoke.
3. Cut & discard safety wire and remove (4) MS20074-04-06 bolts securing C112-1 cap to gearbox. Remove cap, C266-2 spacer, and A215-024 O-ring.

CAUTION

Do not remove C141-2 washer between cap and bearing.

4. Press old A966-3 seal out of cap and remove old A215-140 O-ring. Clean cap mating surfaces and O-ring groove using approved solvent (ref § 23-70).
5. Refer to Figure 7-13. Orient new seal with open face pointing toward gearbox and press into cap bore 0.250 inch below external flat surface.
6. Lubricate new A215-140 O-ring using correct gearbox oil (refer to R44 Service Letter SL-73) and install in cap groove without twisting O-ring.
7. Lubricate new A215-024 O-ring with correct gearbox oil. Install O-ring and C266-2 spacer (inner-chamfered end first) on input shaft without twisting O-ring.
8. Lubricate seal lip with correct gearbox oil and slide cap over input shaft. Align cap and gearbox bolt holes and press cap into gearbox. Install (4) MS20074-04-06 bolts. Special torque bolts per § 23-33 and safety in pairs using 0.032-inch diameter lockwire.
9. Ensure yoke and gearbox input shaft splines are clean and undamaged. Apply B270-21 protectant to input shaft splines. While protectant is still wet, install yoke on shaft.
10. Install A141-10 washer and AN320-8 nut onto input shaft. Place wood block between yoke and gearbox housing to prevent tail rotor rotation and special torque nut per § 23-33. Install new MS24665-300 cotter pin.
11. Install tail rotor gearbox per § 7.420.
12. Install tail rotor assembly per § 30-10 Part B or C, if removed.
13. Fill gearbox to center of sight gage using correct gearbox oil (refer to R44 Service Letter SL-73). Verify filler-plug vent holes are clear. Install filler-plug and special torque per § 23-33. Safety using 0.032-inch diameter lockwire or torque stripe per Figure 2-1, as required.
14. Dynamically balance tail rotor per § 10.240, then inspect gearbox for leaks.

7.500 Actuator Assembly

7.510 Actuator Removal

1. Remove aft cowling assembly.
2. Fully disengage clutch.
3. Remove fanwheel & scroll per § 6.210.
4. Refer to Figure 7-8. Place a six-inch wooden block on horizontal firewall under clutch shaft just forward of upper sheave. This keeps sheave from drooping and prevents damage to forward flex plate.
5. Disconnect two wiring connections to actuator.
6. Disconnect clutch lateral centering strut from upper frame.
7. Remove the upper NAS6605 bolt & lower NAS6604 bolt connecting actuator to bearings and remove actuator.

7.520 Actuator Installation

1. Inspect upper and lower clutch actuator bearings per §§ 2.501 thru 2.503.
2. Position actuator in helicopter per Figure 7-14.
3. Install hardware (and journals) connecting clutch actuator gearmotor housing to C184 (upper) bearing. Special torque bolt per § 23-33. Install palnut, standard torque per § 23-32, and torque stripe per Figure 2-1.
4. Install lower attach bolt with head facing forward. Use one NAS1149F0432P washer under bolt head and one NAS1149F0463P washer under nut. Standard torque bolt per § 23-32. Install palnut, standard torque per § 23-32, and torque stripe per Figure 2-1.
5. If installed, remove block(s) supporting clutch assembly.
6. Connect clutch lateral centering strut. Standard torque bolt per § 23-32. Install palnut, standard torque per § 23-32, and torque stripe per Figure 2-1.
7. Install fanwheel and scroll per § 6.220.
8. Connect gearmotor and switch harness electrical leads and ty-rap as required.
9. Balance fanwheel per § 6.240.
10. Install aft cowling.

CAUTION

Do not engage actuator without scroll installed.

7.530 Actuator Gearmotor Replacement

NOTE

Actuator Gearmotor can be replaced with actuator on helicopter.

1. Disconnect gearmotor electrical leads.
2. Cut & discard safety wire if installed and remove (4) gearmotor attaching screws. Exercise care not to drop either safety wire or screws in V-belt sheaves.
3. Slowly slide gearmotor assembly from housing. An unscrewing motion may be necessary.
4. Lightly lubricate worm gear on new gearmotor assembly with A257-1 grease before installing. Install O-ring onto gearmotor nose.
5. Install new gearmotor into housing with wire leads pointing outboard. Verify no gap exists between housing and motor mounting flange before installing screws; do not use screws to draw gearmotor into housing as motor flange can break.
6. Install MS27039C1-09 screws wet with A257-9 anti-seize securing gearmotor to C501-2 housing, or install AN503-10-10 screws securing gearmotor to C501-1 housing. Standard torque screws per § 23-32. Safety AN503-10-10 screws in pairs using 0.032-inch diameter lockwire or apply torque stripe per Figure 2-1, as required.
7. Connect gearmotor electrical leads. Engage clutch, listen for binding, and verify actuator shuts off after column springs yield (indicated by “popping” sound).
8. Refer to Figure 2-6A. As required, apply torque stripe to gearmotor and install MS3367-7-0 ty-raps securing gearmotor electrical wiring. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.

CAUTION

Severe damage to actuator and drive belts can occur if gearmotor electrical leads are installed incorrectly in wiring connector (gearmotor will operate backwards and down-limit switch and spring switches will not shut off gearmotor current).

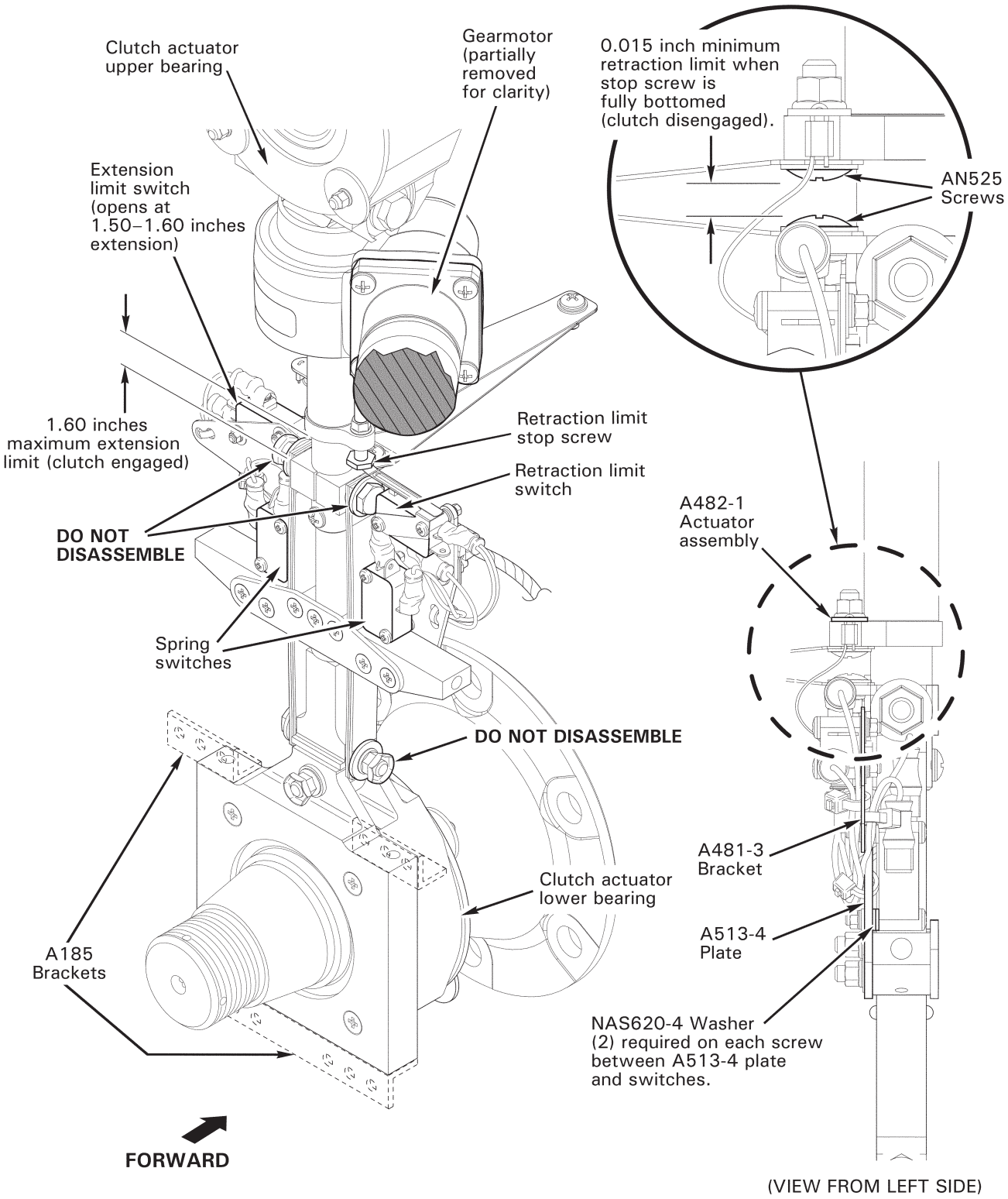

FIGURE 7-14 ACTUATOR LIMIT SWITCHES

7.540 Actuator Adjustment

A. Engaged (Extension) Limit

The actuator engaged limit is determined by column springs which control drive belt tension. Column springs may only be adjusted by the factory.

B. Disengaged (Retraction Limit) Adjustment

The retraction limit switch is activated by the retraction limit stop screw, which can be adjusted using long 3/8-inch open-end (or MT357-6) and ¼-inch box-end (or MT357-7) wrenches. Adjust retraction limit stop screw to maintain proper belt deflection per § 7.282 with actuator fully disengaged. Minimum clearance between screw heads at scissors is 0.015 inch per Figure 7-14.

C. Maximum Extension

Refer to Figure 7-14. Maximum engaged extension is 1.60 inches. The extension-limit switch activates at 1.50–1.60 inches extension. Drive V-belts must be replaced when maximum extension is encountered.

7.550 Switch and Fuse Replacement

A. Switch Replacement

NOTE

Limit switches may be replaced individually or by replacing C053-2 switches assembly.

1. Remove actuator per § 7.510.
2. Remove fasteners and spacing washers securing switch(es) to actuator assembly. If replacing individual switch, cut and remove heat shrink on switch terminal and remove terminal screw or cut wire near solder joint.

NOTE

Spacing washers may be bonded to new switch(es) to ease reassembly.

3. If replacing switches assembly, cut and discard ty-raps securing wiring and remove wiring from actuator.
4. Slide new heat shrink over each wire. Apply a drop of B270-20 adhesive to terminal screw and install screw securing wire to terminal without over-tightening (or solder wires to terminals, as required). Position heat shrink and apply heat.
5. Install fasteners securing switch(es) to actuator. Ensure (2) spacing washers are installed between switch(es) and plate. Do not over tighten screws or plastic switch housing may crack. Install MS3367-4-9 ty-raps securing wiring. Cinch ty-raps until snug without over-tightening and trim tips flush with heads.
6. Reinstall actuator per § 7.520.

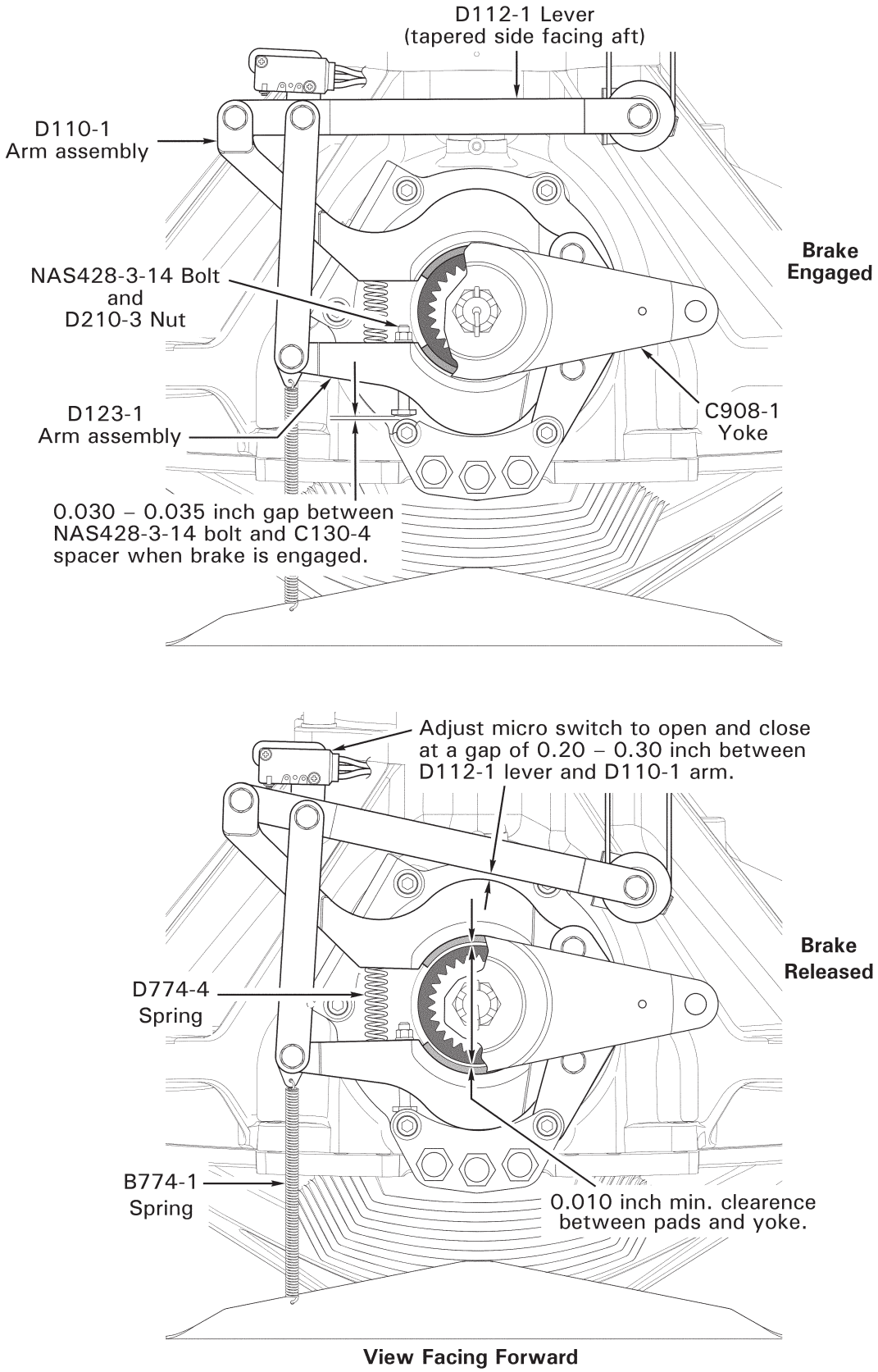

FIGURE 7-15 ROTOR BRAKE ADJUSTMENTS AND CLEARANCES

7.550 Switch and Fuse Replacement

B. Fuse Replacement

An in-line fuse holder is installed in the clutch actuator motor power circuit. R44 S/N 0106 & prior have the fuse holder ty-rapped in wire bundle above horizontal firewall in main rotor gearbox compartment. On R44 S/N 0107 and subsequent the fuse holder is mounted on the test switch panel. Replace fuse with 3.0 amp (AGC 3.0) fuse.

7.600 Rotor Brake

7.610 Rotor Brake Removal

1. Remove tailcone cowling. Remove C908-1 yoke per § 7.140.
2. Remove cable pulley from D112-1 lever. Disconnect wiring to micro switch at three-pin connector. Disconnect spring from firewall angle.
3. Cut and discard safety wire if installed. Remove (3) NAS1352-4 screws securing rotor brake assembly and D114-1 bracket to C270-1 end cover and remove rotor brake assembly.

7.620 Rotor Brake Installation

1. Measure rotor brake pad thickness. If pads are less than 0.030 inch thick, replace D110-1 & D123-1 arm assemblies per § 7.630.
2. If installing rotor brake assembly on a new gearbox, remove (3) NAS1352-4-12 screws from 3, 5, and 7 o'clock positions, as required.
3. Position rotor brake assembly over gearbox pinion shaft and insert top NAS1352-4 screw thru washer, rotor brake assembly & A130-41 spacer, and C130-3 spacer, finger tight.
4. Position D114-1 bracket on rotor brake assembly and insert bottom NAS1352-4 screw thru washer, bracket, washer, rotor brake assembly & A130-41 spacer, and C130-3 spacer, finger tight.
5. Install NAS1352-4 screw thru washer, bracket, and C130-4 spacer, finger tight.
6. Special torque (3) NAS1352-4 screws per § 23-33 and safety with 0.032 inch diameter lockwire (if required), or torque stripe per Figure 2-1.
7. Install C908-1 yoke per § 7.140.
8. Install cable pulley to D112-1 lever. Connect micro switch wiring at three-pin connector. Attach spring to firewall angle.
9. Refer to Figure 7-15. Engage rotor brake. Adjust gap between NAS428-3-14 bolt head on D123-1 arm and C130-4 spacer to 0.030–0.035 inch. Standard torque D210-3 nut to lock adjustment.
10. Release rotor brake. Measure gap between D112-1 lever and D110-1 arm assembly. Adjust length of bead chain as required to obtain 0.030–0.170 inch gap.

7.620 Rotor Brake Installation (continued)

11. Adjust micro switch to open and close at 0.20–0.30 inch gap between D112-1 lever and D110-1 arm.
12. Install tailcone cowling.

7.630 Rotor Brake Pad Replacement

NOTE

Minimum pad thickness is 0.030 inch.

1. Remove rotor brake assembly per § 7.610.
2. Remove hardware securing D110-1 arm assembly and D123-1 arm assembly to D111-1 brackets, D113-1 & -2 links, and D112-1 lever. Remove and retain A130-39 & -40 spacers and discard arm assemblies.
3. Clean spacers & bores using approved solvent (ref. § 23-70) and allow to dry. Apply A257-1 grease to spacers and install in new arm assemblies and lever.
4. Position D774-4 spring between arm assemblies and install hardware securing both arms to brackets, links, and lever.
5. Install NAS428-3-14 bolt and D210-3 nut on D123-1 arm assembly (adjustment performed in rotor brake installation).
6. Install rotor brake per § 7.620.