CHAPTER 65

TAIL ROTOR DRIVE SYSTEM

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TAIL ROTOR DRIVE SYSTEM

65-00 Description

The tail rotor driveline consists of an intermediate shaft running aft from the main gearbox and a long tail rotor driveshaft which runs the length of the tailcone. Flexible couplings are located at both ends of the intermediate shaft. The long tail rotor driveshaft has a support bearing at its front end and a damper bearing approximately one-third of the way aft on the shaft. The cooling fan is mounted to the intermediate shaft. The tail gearbox contains a single 90º splash-lubricated spiral-bevel gearset which increases speed to tail rotor RPM.

65-10 Tail Rotor Drive Fan Shaft

Refer to R66 Illustrated Parts Catalog (IPC) Figure 65-1.

CAUTION

Do not damage F196-1 fan shaft aft yoke or G174-1 fanwheel assembly mid plate during fan shaft removal or installation.

A. Removal

1. Remove tailcone cowling assembly per § 53-23.
2. Refer to Figure 65-1. Remove hardware securing F252-1 strut assembly to upper frame assembly and remove strut.
3. Remove hardware securing intermediate C947-3 flex plate assembly to F196-1 (tail rotor) fan shaft aft flange and D224 tail rotor drive shaft assembly forward yoke, noting hardware removed. Remove flex plate, and temporarily support aft portion of fan shaft.
4. Remove hardware securing fan shaft to forward C947-3 flex plate assembly.
5. Remove hardware securing fan shaft to G174-1 fanwheel assembly. Carefully pull fan shaft forward through fanwheel assembly, rotating yoke as necessary. Remove temporary support.

B. Installation

1. Refer to Figure 65-1. Route F196-1 fan shaft aft through fanwheel assembly, rotating yoke as necessary. Install hardware securing fan shaft to G174-1 fanwheel assembly. Standard torque nuts and palnuts per § 20-32, and torque stripe per Figure 5-1.
2. Install hardware securing fan shaft to forward C947-3 plate assembly. Standard torque nuts and palnuts per § 20-32, and torque stripe per Figure 5-1. Shim tail rotor driveline per § 65-30.
3. Install F252-1 strut assembly and hardware securing strut to upper frame assembly. Standard torque nuts per § 20-32 and torque stripe per Figure 5-1.
4. Install tailcone cowling assembly per § 53-23.

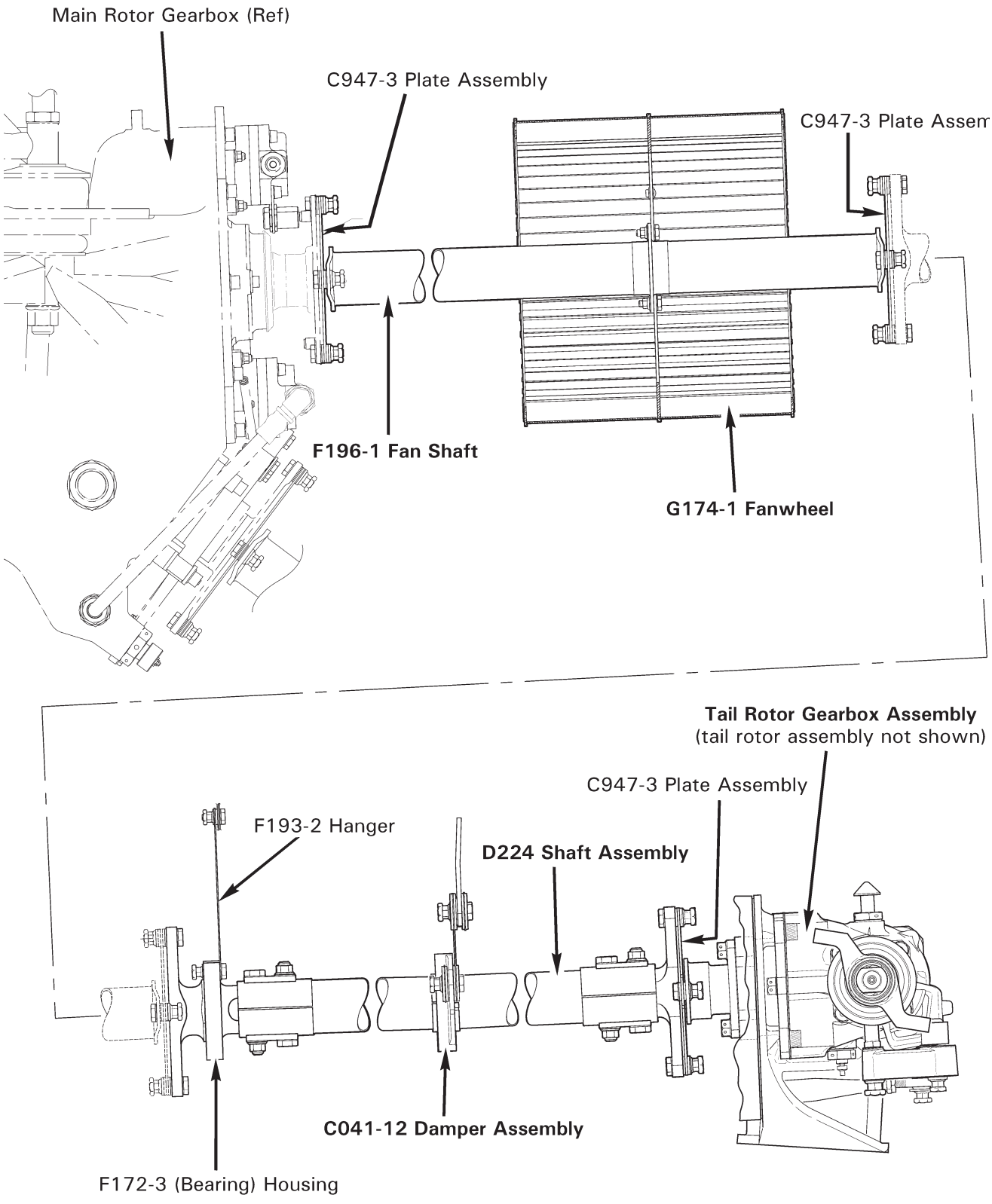

FIGURE 65-1 TAIL ROTOR DRIVELINE

65-20 Tail Rotor Drive Shaft Assembly

Refer to R66 Illustrated Parts Catalog (IPC) Figure 65-3.

A. Removal

1. Remove C023 tailcone assembly per Section 53-40.
2. Refer to Figure 65-1. Remove hardware securing F172-3 (bearing) housing to F193-2 hanger.
3. Refer to Figure 65-3. Using a 3-foot extension, remove bolts securing C041-12 damper assembly arm to D072-1 bulkhead assembly angle. Support forward end of D224 drive shaft assembly.
4. Remove hardware securing A558-2 cover to tailcone and remove cover.
5. Support aft end of drive shaft, and remove hardware securing drive shaft to aft C947-3 plate assembly, noting hardware removed. Carefully pull drive shaft forward through tailcone.

B. Installation

1. Refer to Figure 65-1. Route D224 drive shaft assembly through inside of tailcone. Support drive shaft as required.
2. Install hardware securing drive shaft to aft C947-3 plate assembly, as removed, and remove support. Standard torque fasteners per § 20-32 and torque stripe per Figure 5-1. Install A558-2 cover.
3. Refer to Figure 65-3. Remove forward A231 (tailcone) plug assembly. Estimate longitudinal gap (or interference) between C041-12 damper assembly arm and D072-1 bulkhead assembly angle. If gap (or interference) exceeds 0.12 inch, contact RHC Technical Support. If gap (or interference) is less than 0.12 inch, verify correct damper orientation. Using a 3-foot extension, install bolts securing damper to bulkhead angle. Standard torque bolts per § 20-32 and torque stripe per Figure 5-1. Install plug assembly.
4. Install hardware securing F172-3 (bearing) housing to F193-2 hanger, and remove support. Standard torque bolts per § 20-32 and torque stripe per Figure 5-1.
5. Install C023 tailcone assembly per § 53-40.

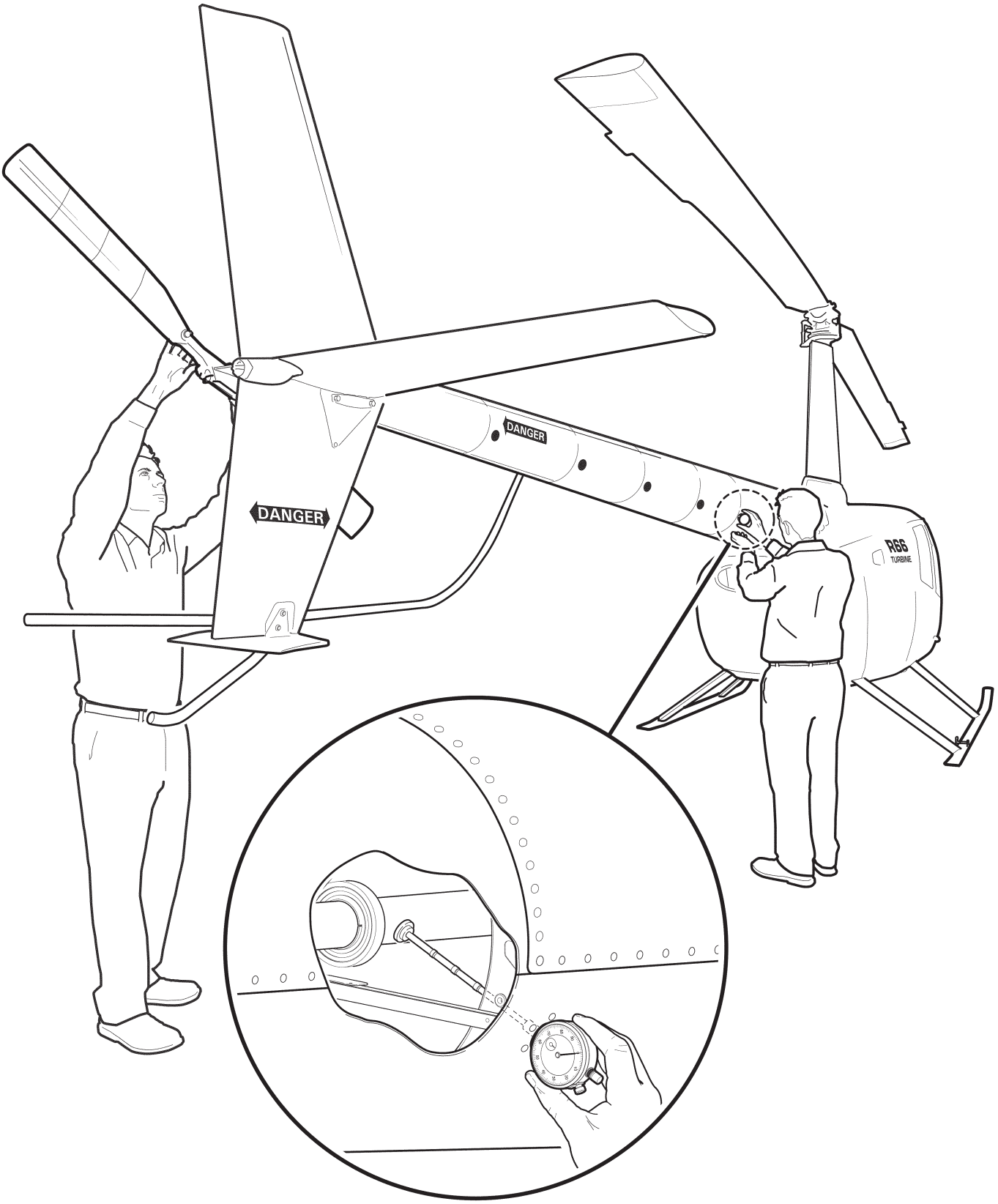

FIGURE 65-2 RUNOUT

65-21 Runout

1. Remove A231 (tailcone) plug assemblies.

2. Assemble MT260-6 tail rotor drive shaft runout tool and a calibrated dial indicator.

3. Refer to Figure 65-2. Using appropriate combination of extension(s), insert tool through tailcone inspection hole. Verify foot squarely contacts tail rotor drive shaft when pressing dial indicator firmly against inspection hole edges. Have a second person rotate rotor system by turning tail rotor hub.

4. Rotate rotor system slowly, smoothly, and for several revolutions until the technician is able to determine the average indicated movement. Maximum runout is 0.025 inch.

5. Repeat steps at each inspection hole. Record values as required (recommended during 100-hour or annual inspection).

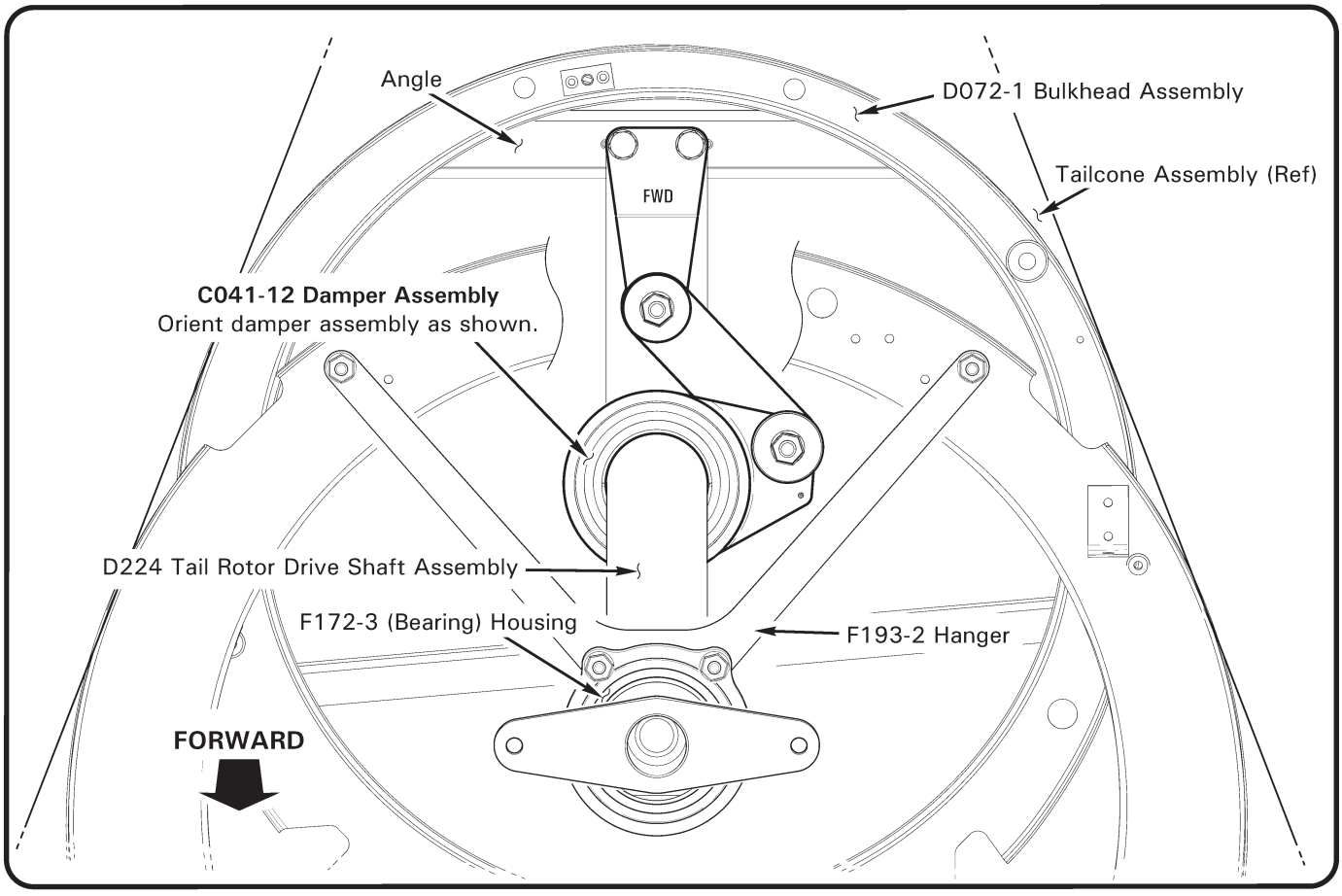

FIGURE 65-3 DAMPER ORIENTATION

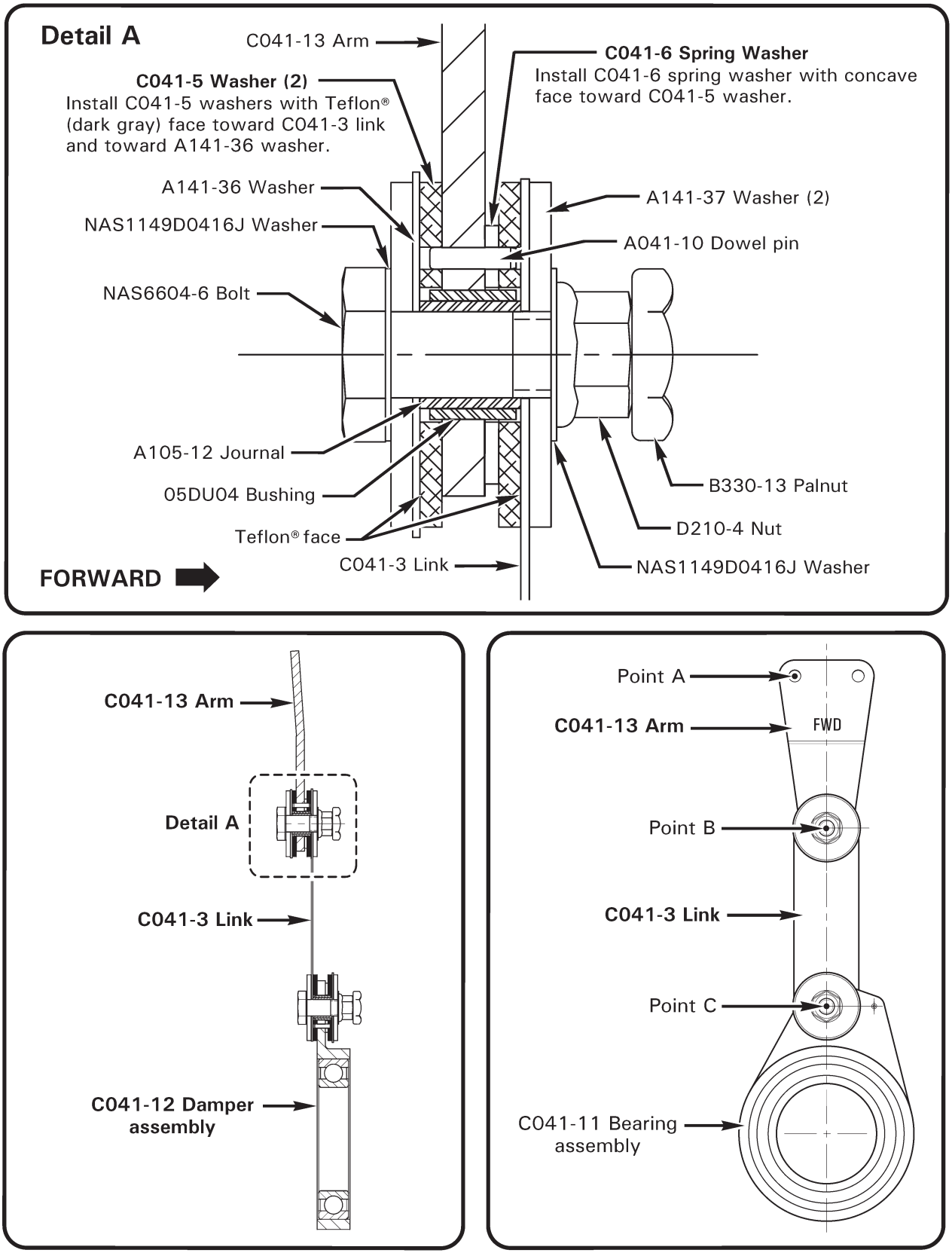

FIGURE 65-4 DAMPER ASSEMBLY

65-22 Damper Assembly

Refer to R66 Illustrated Parts Catalog (IPC) Figure 65-7.

A. Disassembly

1. Remove tail rotor drive shaft per § 65-20, if not previously accomplished.
2. Refer to Figure 65-4. Remove hardware securing C041-11 bearing assembly and C041-13 arm to C041-3 link.

B. Inspection and Assembly

1. Refer to Figure 65-4. Inspect condition of components. Verify no wear on Teflon® (dark gray) face of C041-5 washers. Verify no wear or grooves on A141-36 washers, A141-37 washers, and link. Replace components as required.

CAUTION

Install C041-5 washers with Teflon® face toward C041-3 link and toward A141-36 washer (remove protective coating, if installed).

CAUTION

Install C041-6 spring washer with concave face toward C041-5 washer.

2. Assemble damper. Install hardware securing C041-11 bearing assembly and C041-13 arm to C041-3 link. Align component holes on A041-10 dowel pin(s). Standard torque nuts and palnuts per § 20-32 and torque stripe per Figure 5-1.
3. Attach a calibrated spring scale to Point A. Holding link, verify force required to rotate arm about Point B is 3.5 - 5.8 lb. Adjust as required per Part C.
4. Attach a calibrated spring scale to Point B. Holding bearing assembly, verify force required to rotate link about point C is 2.1 - 3.6 lb. Adjust as required per Part C.

C. Friction Adjustment

CAUTION

Do not adjust damper drag by changing bolt torque.

1. Refer to Figure 65-4. If friction is less than required:
   a. Disassemble C041-12 damper assembly per Part A. Bend C041-6 spring washers to 0.065 - 0.078 inch total height; inspect and reassemble damper assembly per Part B.
   b. If friction is less than required after correcting spring washer height, disassemble damper assembly per Part A. Lap A105-12 journals, as required; inspect and reassemble damper assembly per Part B.
2. If friction is greater than required:
   a. Disassemble damper assembly per Part A. Flatten C041-6 spring washers slightly; inspect and reassemble damper assembly per Part B.
3. Install tail rotor drive shaft per § 65-20.

65-30 (Tail Rotor Driveline) Intermediate Flex Plate Shimming

> NOTE
>
> The tail rotor driveline is shimmed for minimal preload.

1. Refer to Figure 65-1. If not previously accomplished, remove hardware securing intermediate C947-3 flex plate assembly to F196-1 (tail rotor) fan shaft aft flange and D224 tail rotor drive shaft assembly forward yoke. Remove flex plate, and temporarily support aft portion of fan shaft.

2. Measure flex plate thickness at bonded washers (4 places) to determine average thickness:

   (1st place) _____ inch

   (2nd place) + _____ inch

   (3rd place) + _____ inch

   (4th place) + _____ inch

   Total = _____ inch

   Total ÷ 4 = _____ inch **(Flex plate average thickness)**

3. a. Position F196-1 fan shaft aft flange arms and D224 tail rotor drive shaft assembly forward yoke flange arms at 3 o'clock and 9 o'clock positions (horizontal). Measure gap between arms to determine average gap:

   (3 o'clock position) _____ inch

   (9 o'clock position) + _____ inch

   Total = _____ inch

   Total ÷ 2 = _____ inch **(Average gap between flange arms)**

   b. Rotate D224 tail rotor drive shaft assembly 180°, and repeat step a:

   (3 o'clock position) _____ inch

   (9 o'clock position) + _____ inch

   Total = _____ inch

   Total ÷ 2 = _____ inch **(Average gap between flange arms)**

4. Evaluate flange straightness by calculating the difference between the 3 o'clock positions in steps 3a and 3b. Also calculate the difference between the 9 o'clock positions in steps 3a and 3b. If either calculated difference exceeds 0.015 inch, either one or both flanges are bent and require replacement.

65-30 (Tail Rotor Driveline) Intermediate Flex Plate Shimming (continued)

5. Using the smaller average gap from step 3a or 3b, subtract the flex plate average thickness determined in step 2:

Smaller average gap between flange arms (step 3a or 3b) _____ inch

Subtract flex plate average thickness (step 2) – _____ inch

Total = _____ inch

6. Select shims per Table 65-1 and install intermediate C947-3 flex plate assembly. Standard torque nuts and palnuts per § 20-32 and torque stripe per Figure 5-1. Remove F196-1 (tail rotor) fan shaft temporary support.

WARNING

Shim both arms of flanges equally. All fasteners must meet torque requirements given in § 20-33.

Calculated Dimension	Shim required between intermediate C947-3 flex plate and F196-1 fan shaft aft flange	Shim required between intermediate C947-3 flex plate and D224 tail rotor drive shaft forward yoke
–0.017 or greater negative number	NAS1149F0432P washer between forward C947-3 flex plate assembly and F908-1 yoke assembly and/or F196-1 fan shaft forward flange may be relocated under nut as required to achieve –0.016 / +0.016 inch calculated dimension. Relocate washers as required, and repeat steps 3 thru 6.	
–0.016 / +0.016 in.	None	None
+0.017 / +0.047 in.	NAS1149F0432P washer	None
+0.048 / +0.079 in.	NAS1149F0432P washer	NAS1149F0432P washer
+0.080 / +0.110 in.	NAS1149F0463P washer	NAS1149F0432P washer
+0.111 / +0.141 in.	NAS1149F0463P washer	NAS1149F0463P washer
+0.142 or greater positive number	NAS1149F0432P washer between forward C947-3 flex plate assembly and F908-1 yoke assembly and/or F196-1 fan shaft forward flange may be exchanged with NAS1149F0463P washer as required to achieve –0.016 / +0.016 inch calculated dimension. Exchange washers as required, and repeat steps 3 thru 6.	

TABLE 65-1 TAIL ROTOR DRIVELINE

7. Measure fanwheel-to-inlet gaps per § 79-11.

65-40 Tail Rotor Gearbox Assembly

Refer to R66 Illustrated Parts Catalog (IPC) Figure 65-9.

A. Removal

> NOTE
>
> Drain tail rotor gearbox oil per § 12-21 prior to gearbox removal, or keep gearbox vertical after removal to avoid oil escape thru filler-vent plug.

1. Remove hardware securing push-pull tube assembly to bellcrank assembly.
2. As required, remove tail rotor assembly per § 64-10. As required, remove hardware securing bellcrank to tail rotor gearbox assembly output cartridge. Slide (assembled) bellcrank, pitch control assembly, and pitch links off of gearbox output shaft.
3. Remove hardware securing A558-2 cover to tailcone and remove cover.
4. Support aft end of D224 drive shaft assembly, and remove hardware securing gearbox input yoke to aft C947-3 plate assembly, noting hardware removed.
5. Cut and discard ty-raps as required and disconnect chip detector wiring at plastic connector.
6. Remove hardware securing gearbox to tailcone casting and remove gearbox.

B. Installation

1. Position tail rotor gearbox assembly on tailcone casting and install mounting hardware. Special torque screws per § 20-33 and torque stripe per Figure 5-1.
2. Connect chip detector wiring at plastic connector and install ty-raps, as required. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
3. Install hardware securing gearbox input yoke to aft C947-3 plate assembly, and remove support. Shim tail rotor driveline per § 65-30. Standard torque bolts per § 20-32 and torque stripe per Figure 5-1. Install A558-2 cover.
4. If removed, slide (assembled) bellcrank assembly, pitch control assembly, and pitch links onto gearbox output shaft. Install hardware securing bellcrank to gearbox output cartridge. Standard torque bolts per § 20-32 and torque stripe per Figure 5-1. Shim pitch control per § 67-62, as required.
5. Install hardware securing push-pull tube assembly to bellcrank. Standard torque fastener per § 20-32 and torque stripe per Figure 5-1.
6. If removed, install tail rotor assembly per § 64-10.
7. Service tail rotor gearbox per § 12-21, as required.

65-41 Output Shaft Seal Replacement

Refer to R66 Illustrated Parts Catalog (IPC) Figure 65-13.

1. Remove tail rotor assembly per Section 64-10.
2. Remove hardware securing push-pull tube assembly to bellcrank assembly.
3. Remove hardware securing bellcrank to tail rotor gearbox assembly output cartridge. Slide (assembled) bellcrank, pitch control assembly, and pitch links off of gearbox output shaft.
4. Cut and discard safety wire securing C112-2 cap retaining hardware. Remove hardware securing cap to gearbox and remove cap with C966-2 seal and C215-133 o-ring.

CAUTION

Do not remove shims between cap and gearbox assembly. Shims control output shaft drag.

5. Using hydraulic press, press old seal from cap. Remove and discard o-ring. Clean and dry cap, especially seal seating surface and o-ring groove.
6. Verify open face of seal points toward gearbox and press new seal into cap bore 0.160 inches from external surface. Lightly coat new o-ring with A257-22 oil and install in cap.
7. Lightly coat output shaft seal seating area with A257-22 lubricant and slide cap onto shaft. Install hardware securing cap to gearbox and special torque bolts per Section 20-33. Install 0.032-inch diameter lockwire through hardware and safety in pairs.
8. Slide (assembled) bellcrank assembly, pitch control assembly, and pitch links onto gearbox output shaft. Shim pitch control per Section 67-62, as required.
9. Install hardware securing push-pull tube assembly to bellcrank. Standard torque fastener per Section 20-32 and torque stripe per Figure 5-1.
10. Install tail rotor assembly per Section 64-10.

65-42 Input Shaft Seal Replacement

Refer to R66 Illustrated Parts Catalog (IPC) Figure 65-13.

1. Remove tail rotor gearbox per Section 65-40. Tail rotor assembly and pitch control assembly removal are not required.

2. Remove and discard cotter pin securing tail rotor input yoke retaining nut. On a suitable work bench, place a wood block between yoke and gearbox housing to prevent tail rotor rotation; remove castellated nut, washer, and yoke.

3. Cut and discard safety wire securing C112-1 cap retaining hardware. Remove hardware securing cap to gearbox and remove cap with A966-3 seal and C215-140 o-ring.

CAUTION

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

4. Using hydraulic press, press old seal from cap. Remove and discard o-ring. Clean and dry cap, especially seal seating surface and o-ring groove.

5. Verify open face of seal points toward gearbox and press new seal into cap bore 0.25 inch from external surface. Lightly coat new o-ring with A257-22 oil and install in cap.

6. Install cap, and hardware securing cap to gearbox; special torque bolts per Section 20-33. Install 0.032-inch diameter lockwire through hardware and safety in pairs.

7. Install input yoke, washer, and castellated nut onto gear shaft. Place wood block between yoke and gearbox housing to prevent tail rotor rotation, special torque nut per Section 20-33, and install new MS24665-210 cotter pin.

8. Install tail rotor gearbox per Section 65-40.