

## CHAPTER 64

## TAIL ROTOR

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## CHAPTER 64

## TAIL ROTOR

64-00 Description

The R66 tail rotor assembly is a conventional, two-bladed teetering rotor system.

Tail rotor blades are constructed of a wrap-around aluminum skin, bonded to aluminum honeycomb and a forged aluminum root fitting. Self-lubricating spherical bearings in the root fitting allow blades to change pitch.

Tail rotor blades are assembled to the hub with a fixed precone angle.

The tail rotor aluminum hub mounts to the gearbox output shaft by teeter hinge. Elastomeric bearings in the hub allow the rotor to teeter. The tail rotor hub teetering stop is a urethane bumper, attached to the output shaft.

64-10 Tail Rotor Assembly**A. Removal**

1. Refer to Figure 64-1. Tag each pitch link with corresponding blade serial number. Disconnect pitch links from tail rotor blades; keep associated hardware with each link.

**NOTE**

Tail rotor pitch link-to-blade attachment bolts may be different lengths and/or have different washers installed under nut for dynamic balancing.

2. Remove nut and A141-14 washer securing C119-2 bumper to tail rotor gearbox output shaft.
3. Mark hub with teeter hinge bolt orientation for reinstallation. Remove teeter hinge bolt, then slide tail rotor assembly and bumper off of shaft.

**NOTE**

Protect tail rotor assembly from damage when maintenance is performed on workbench.

4. If removing tail rotor due to gearbox breakage, then perform C148 bulkhead inspection per § 5-75.

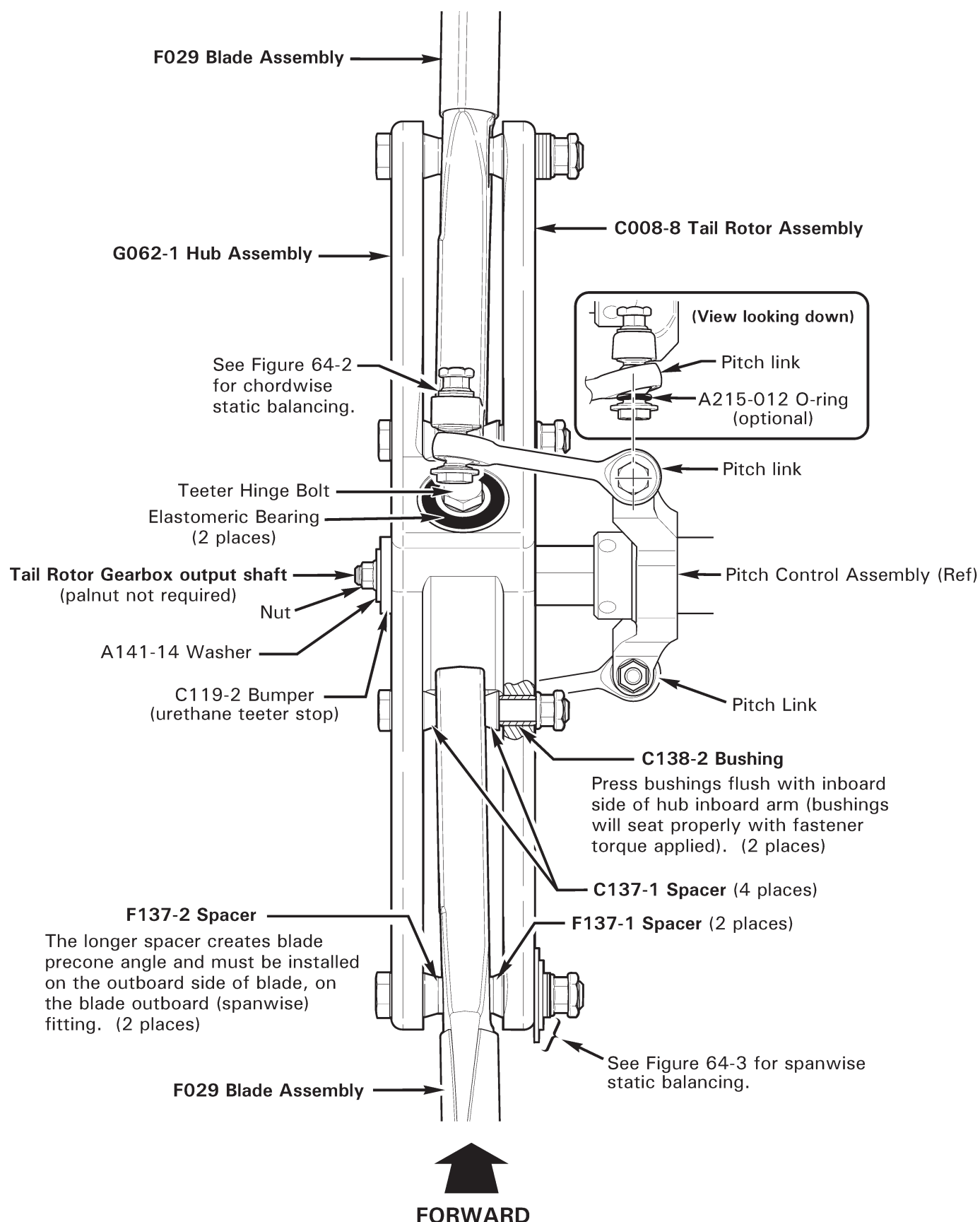


FIGURE 64-1 TAIL ROTOR INSTALLATION

64-10 Tail Rotor Assembly (continued)**B. Installation****CAUTION**

Perform static balance per § 64-11 if balancing hardware information is unknown, if blade(s) or hub bearing(s) were replaced, or if any rework has changed mass of rotor assembly.

1. Inspect elastomeric bearings per § 5-34.
2. Clean tail rotor gearbox output shaft and elastomeric bearing spacer clamping surfaces with lint-free cloth dampened with acetone.
3. Refer to Figure 64-1. Position tail rotor assembly on tail rotor gearbox output shaft, matching tail rotor blades to corresponding pitch links. Verify tail rotor is installed for clockwise rotation when viewed from left side of aircraft.
4. Install teeter hinge bolt and hardware; tighten nut until elastomeric bearing metal spacers contact output shaft, but do not torque. Verify blades cone toward tail rotor gearbox.
5. Remove tags. Install hardware securing tail rotor blades to pitch links as removed, or as determined by static balancing. Standard torque nuts & palnuts per § 20-32, and torque stripe per Figure 5-1.
6. Fabricate a tracking aid using 1x12-inch aluminum sheet; make a 90° bend 2 inches from one end. With tail rotor horizontal, tape tracking aid to tailcone near blade tip.
7. Rotate tail rotor drive shaft and mark tracking aid where each blade tip drain hole passes. Adjust (teeter) tail rotor until both blade tips pass the same point within 0.125 inch. Special torque teeter hinge bolt per § 20-33. Recheck track. Repeat step until blades are tracked.
8. Install palnut on teeter hinge bolt, standard torque per § 20-32, and torque stripe per Figure 5-1. Remove tracking aid.
9. Teeter tail rotor hub back and forth. Verify teeter hinge bolt, bearing metal spacers, washers, and nuts remain stationary when tail rotor is teetered.
10. Install C119-2 bumper, A141-14 washer, and nut. Special torque nut per § 20-33 and torque stripe per Figure 5-1.
11. Dynamically balance tail rotor per § 18-20.

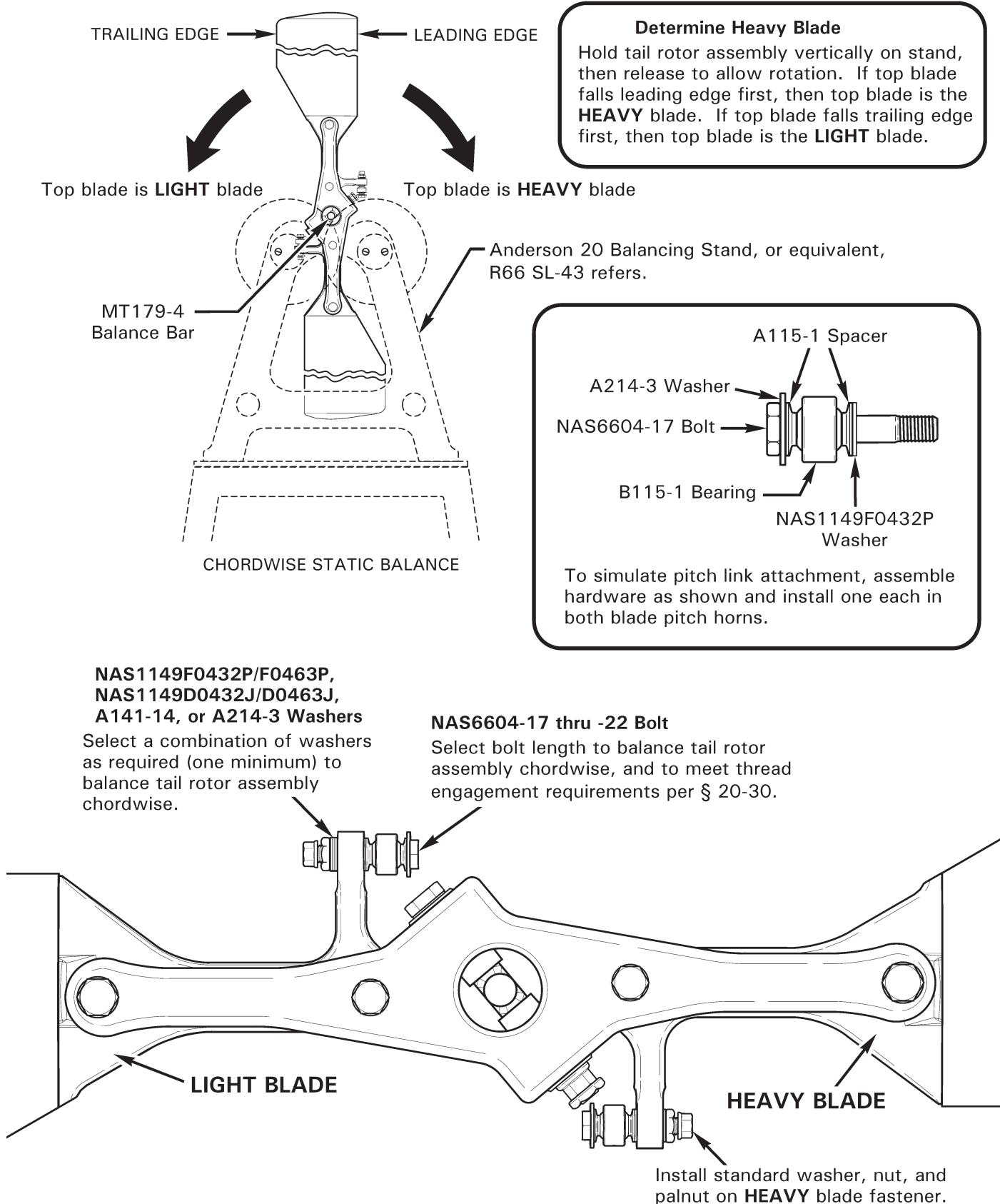


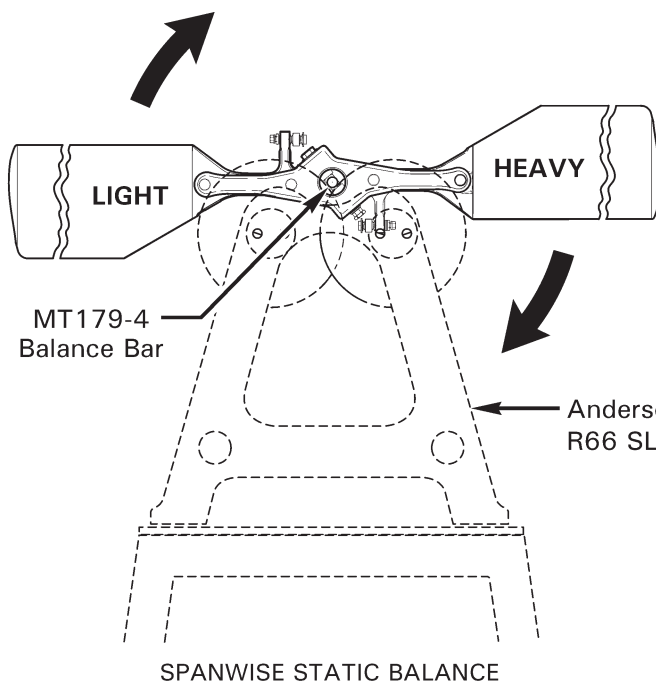
FIGURE 64-2 CHORDWISE STATIC BALANCE

64-11 Static Balance

## NOTE

Tail rotor assemblies received from RHC are static balanced at factory. Perform static balance in calm-air environment.

1. Refer to Figure 64-2. Install MT179-4 balance bar into tail rotor assembly. Install teeter hinge bolt thru larger hole, install nut and tighten until elastomeric bearing metal spacers contact bar. Using a protractor or square, adjust balance bar until approximately perpendicular to hub. While maintaining perpendicularity, special torque nut per § 20-33; install palnut finger-tight. Mark hub with teeter hinge bolt orientation for reinstallation.
2. Using NAS6604-17 bolts, assemble hardware as shown in blade pitch horns using bearing to simulate pitch link. Install standard washer, palnut, and nut on each bolt hand-tight.
3. Place tail rotor assembly, with balance bar, vertically on balancing stand. Adjust pitch of both blades so they are similar. Hold tail rotor assembly vertically, then release to allow rotation. If top blade falls leading edge first, then top blade is the heavy blade. If top blade falls trailing edge first, then top blade is the light blade.
4. Chordwise balancing is achieved by varying NAS6604 bolt length and nut-side washers at light blade pitch horn. Select bolt length & washers for balancing, and to meet thread engagement requirements per § 20-30 Part E step 5, and install hand-tight.
5. Repeat steps 3 & 4 until top blade does not fall (or falls very slowly) when tail rotor is positioned vertically on balancing stand. Balance within one thin steel washer.
6. Refer to Figure 64-3. Place tail rotor assembly, with balance bar, horizontally on balancing stand. Hold tail rotor horizontally, then release to allow rotation. The falling blade is the heavy blade; the rising blade is the light blade.
7. Spanwise balancing is achieved by varying nut-side washer mass on light blade's outboard blade-to-hub attach bolt. Four washers are required under nut on outboard blade-to-hub attach bolt; place largest washers closest to hub. Select washers for balancing, standard torque hardware per § 20-32, and repeat step 6.
8. Repeat steps 6 & 7 until tail rotor does not rotate (or rotates very slowly) when positioned horizontally on balancing stand. Balance within one thin aluminum washer.
9. From each blade pitch horn, remove A214-3 washer, two A115-1 spacers, & B115-1 bearing from bolt; install palnut & nut finger-tight to retain bolt and washer(s) in the correct pitch horn.
10. Remove MT179-4 balance bar. Install teeter hinge bolt & washers in hub, and install palnut & nut finger-tight on bolt.
11. As required, touch-up bolt heads using § 20-77 approved paint.



#### Determine Heavy Blade

Hold tail rotor assembly horizontally on stand, then release to allow rotation. The falling blade is the **HEAVY** blade; the rising blade is the **LIGHT** blade

Anderson 20 Balancing Stand, or equivalent, R66 SL-43 refers.

#### (4) NAS1149F0632P/F0663P, NAS1149D0632J/D0663J, C141-23, or C141-24 Washers

Select a combination of four washers to balance tail rotor assembly spanwise. Place largest washers closest to hub assembly.

Install (4) NAS1149D0663J washers under nut of **HEAVY** blade outboard fastener for initial spanwise static balance check.

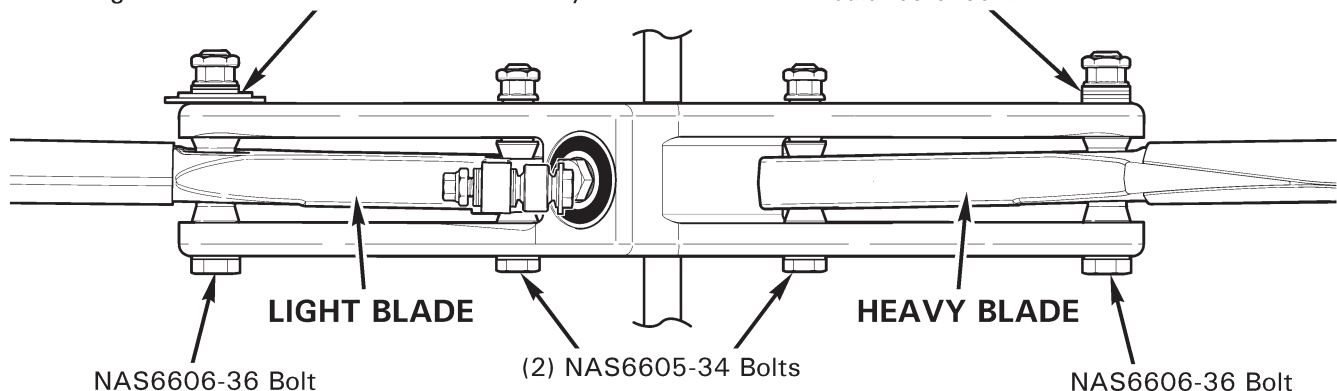


FIGURE 64-3 SPANWISE STATIC BALANCE



64-20 Tail Rotor Blades**NOTE**

Protect tail rotor assembly from damage when maintenance is performed on workbench.

**A. Removal**

1. Remove tail rotor assembly per § 64-10.
2. Refer to Figure 64-1. Remove hardware securing F029 blade assemblies to G062-1 hub assembly. Remove blades, spacers, and hardware; do not remove C138-2 bushings unless required.

**B. Installation****CAUTION**

Tail rotor blades are a matched set. If only one blade is being replaced, contact RHC Customer Service with airworthy blade serial number for a matching replacement blade.

1. Refer to Figure 64-1. If removed, apply light coat of approved primer per § 20-70 to outer surface of C138-2 bushings; while primer is wet, press bushings flush with inboard side of hub inboard arm (bushings will seat properly with fastener torque applied).

**CAUTION**

F137-2 spacer creates blade precone angle and must be installed on the outboard side of blade, on the blade outboard (spanwise) bolt.

2. Install tail rotor blades and spacers in hub. Assemble blades for clockwise rotation when viewed from left side of aircraft, and so blades will cone toward tail rotor gearbox. Install hardware securing blades to hub; standard torque per § 20-32, and torque stripe inboard nuts only.
3. Perform tail rotor assembly static balance per § 64-11.

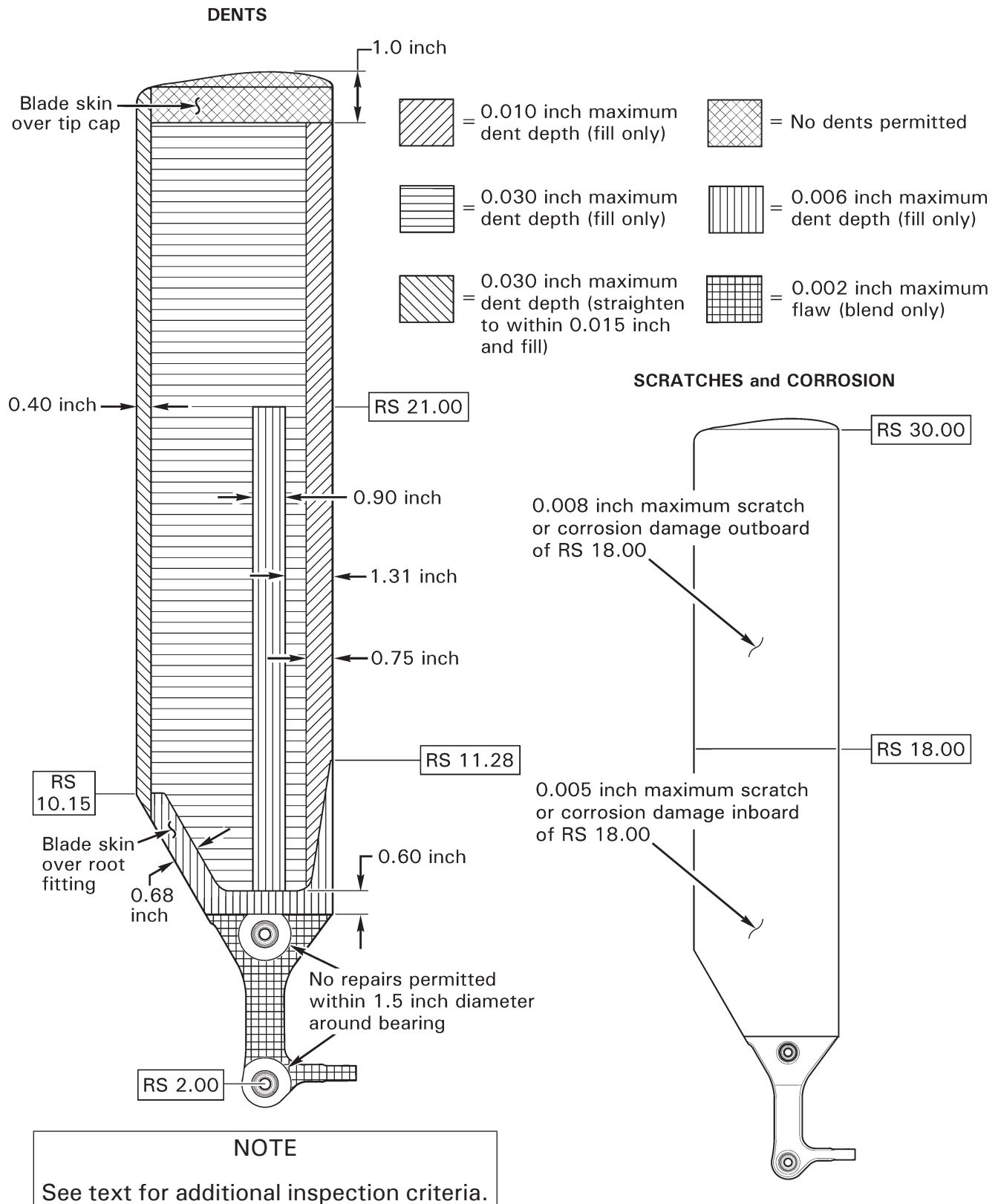


FIGURE 64-4 F029-1 BLADE INSPECTION CRITERIA

### 64-30 Tail Rotor Blade Inspection and Repair

#### **CAUTION**

Do NOT use power tools, chemical paint strippers, or chemical corrosion removers to repair rotor blades.

This blade repair procedure outlines the repair limits, methods and materials used for repairing tail rotor blades. Repairs are limited to blending out scratches, dents, nicks, removing corrosion, and refinishing the blades. The inspections, repairs and limitations contained herein refer to damage sustained in service, including damage during shipping and handling (manufacturing irregularities are treated separately by the factory). In-service damage will generally exhibit paint scuffing or scratches and often times freshly-exposed metal in the form of scratches in the finish. If there are any questions as to the possibility of a manufacturing irregularity, contact RHC Technical Support.

#### **CAUTION**

A blade may be repaired more than one time. However, in no case can more than the maximum material be removed or the maximum dent depth be exceeded in any one location.

### 64-31 Scratches and Corrosion

#### **A. Limits**

1. Refer to Figure 64-4. Measure damage in blade skins per § 62-40; verify damage does not exceed the following limits:
  - a. 0.005 inch maximum damage inboard (spanwise) of RS 18.00.
  - b. 0.008 inch maximum damage outboard (spanwise) of RS 18.00.
2. If damage is within limits, repair blade skins per Part B.

#### **B. Repair**

1. Blend out scratches or corrosion on blade skins in spanwise direction with a 0.10 inch blend radius minimum. Use 220-grit or finer wet-or-dry aluminum-oxide abrasive paper, and finish with 320-grit or finer wet-or-dry abrasive paper.
2. Measure material removed per § 62-40; verify repair does not exceed limits per Part A.
3. Refinish blade repairs per § 64-36.

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64-32 Dents**CAUTION**

Tap-test dented areas in honeycomb. If any voids are found associated with dents, contact RHC Technical Support.

Tap-test voids, debonds, and dents in blades using an AN970-4 washer or 1965-or-later U.S. quarter-dollar coin in good condition.

**CAUTION**

When dented areas are found, inspect opposite side of the blade for a bulge. Replace blade with a bulge greater than 0.010 inch opposite a dent.

**CAUTION**

Do not repair any dent that has a sharp cut or break in the skin. If necessary, locally fluorescent penetrant inspect, keeping penetrant materials away from bond joints.

**WARNING**

**Any damaged tail rotor blade that cannot be repaired within the limits of this section must be removed from service immediately and marked "scrap."**

**A. Limits**

1. Measure dents in blade skin per § 62-40.
2. Refer to Figure 64-4. Smooth, round bottom dents with 0.060 inch minimum radius may be repaired when damage does not exceed the following limits:
  - a. Forward of 0.75 inch (chordwise) from leading edge:
    - i. 0.010 inch maximum dent depth.
  - b. Aft of 0.75 inch (chordwise) from leading edge, and forward of 0.40 inch (chordwise) from trailing edge:
    - i. 0.030 inch maximum dent depth (except noted area).
    - ii. 0.006 inch maximum dent depth 0.90 inch wide aft of 1.31 inch from leading edge, inboard of RS 21.00.
  - c. Aft of 0.40 inch (chordwise) from trailing edge:
    - i. 0.030 inch maximum dent depth (repair: straighten to within 0.015 inch depth before fill).
  - d. Dents over the skin-to-root fitting bond joint:
    - i. 0.006 inch maximum dent depth.
3. No dents are permitted on visible portion of tip cap or on blade skin within 1.0 inch of blade tip.
4. If damage is within limits, repair blade skins per Part B.

64-32 Dents (continued)**B. Repair**

1. Using 10X magnification, visually inspect blade skin dented area for cracked metal; remove blade from service if metal is cracked.
2. Remove cracked paint by hand-sanding spanwise with 220-grit or finer wet-or-dry aluminum-oxide abrasive paper, and finishing with 320-grit or finer wet-or-dry abrasive paper. Avoid removing metal.
3. Refinish dented area per § 64-36.

64-33 Erosion

Replace any blade where erosion has caused deformation or ripples in the leading edge.

64-34 Root Fitting Damage**A. Limits**

1. Measure damage in root fitting per § 62-40.
2. Refer to Figure 64-4. All damage must be repaired within the following limits:
  - a. No repairs permitted within 1.5 inch diameter centered around spherical feathering bearings.
  - b. Pitch horn clamping surfaces:
    - i. 0.002 inch deep each side (may only be repaired one time).
    - ii. Parallel to each other within 0.002 inch.
    - iii. Perpendicular to 0.250 inch diameter hole within 0.002 inch.
  - c. 0.250 inch diameter hole may be reamed to 0.252 inch diameter maximum.
  - d. 0.002 inch maximum depth on other root fitting exposed areas.
3. If damage is within limits, repair root fitting per Part B.

**B. Repair**

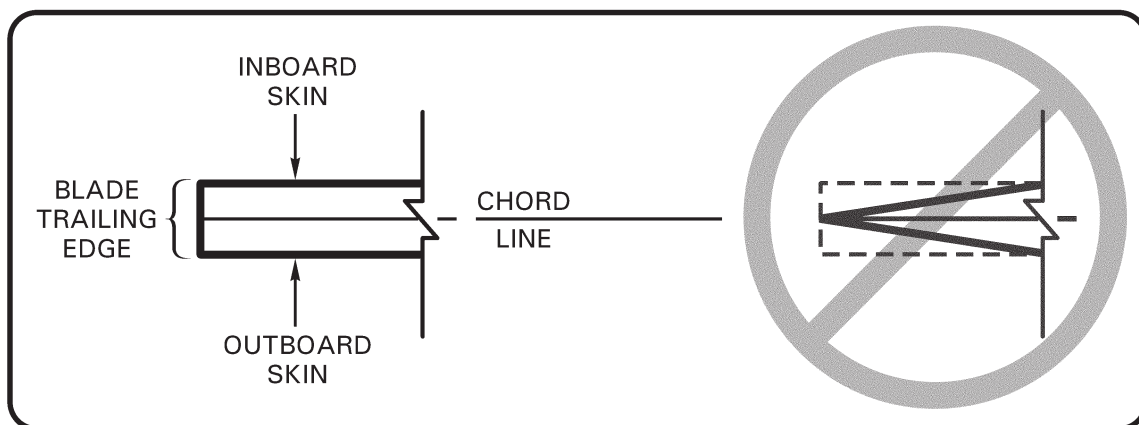
1. All damage on root fitting must be hand-blended spanwise using a 0.10 inch blend radius minimum within Part A limits.
2. Use 220-grit or finer wet-or-dry aluminum-oxide abrasive paper, and finish with 320-grit or finer wet-or-dry abrasive paper. Remove minimum material necessary for damage removal.
3. Conversion coat and prime (chromated epoxy primer preferred) bare aluminum per § 20-60. Do not allow conversion coat chemical to contact blade bond joint.
4. Paint root fitting per § 64-37.

64-35 Nicks and Notches (Trailing Edge)**A. Limits**

1. Refer to Figure 64-5. Verify damage (or repair) does not exceed following limits:
  - a. 0.050 inch maximum depth (chordwise) in trailing edge.
  - b. Overall chord length 5.450 inches minimum.
  - c. Blended area to extend 1.0 inch minimum to each side of damage with a 2.0 inch radius minimum.
2. If damage is within limits, repair blade skins per Part B but do not exceed limits.

**B. Repair**

1. Refer to Figure 64-5. Trailing edge must remain square with skins; skin must not taper.
2. Polish out blade damage using 220-grit or finer wet-or-dry aluminum-oxide abrasive paper, and finish with 320-grit or finer wet-or-dry abrasive paper. Hand-sand in spanwise direction.
3. A fine-toothed file may be used along trailing edge, provided the area is finished with 320-grit or finer wet-or-dry abrasive paper. Hand-sand or file in spanwise direction only.
4. Remove only the material necessary to reach the bottom of the damage, and to blend the reworked area to the radius or dimension required. Visually inspect and verify all damage is removed.
5. Measure reworked area and verify material removed and/or new chord dimension is permissible per Part A.
6. Apply B270-27 sealant to exposed bond joints.
7. Refinish blade per § 64-36, as required.

FIGURE 64-5 REPAIRS TO BLADE TRAILING EDGE

**64-36 Blade Refinishing**

1. Using 320-grit or finer wet-or-dry aluminum-oxide abrasive paper, feather existing paint around blade repairs. Do not remove metal.
2. Conversion coat and prime (chromated epoxy primer preferred) bare aluminum per §§ 20-51 & 20-60.
3. In areas where damage or repair has affected blade airfoil, apply layers of Corlar 13580S Epoxy Primer (or equivalent high-build primer) to build up airfoil.
4. Hand-sand cured epoxy primer (or block sand) in spanwise direction to a smooth, aerodynamic finish, congruent with blade airfoil.
5. Paint blade per § 64-37.

**64-37 Painting**

1. Perform § 64-36 as required.
2. Apply two coats of Desoprime CA7502 epoxy primer (or equivalent) to required areas. Scuff primer prior to applying second coat. Time limits are 10 minutes minimum, 8 hours maximum between coats. If 8 hours is exceeded, scuff with 600-grit wet-or-dry aluminum oxide abrasive paper in a spanwise direction, QSOL 220 wipe and mist primer before applying next coat.
3. Reference § 20-77. Apply white Imron polyurethane enamel or equivalent paint to required areas. Allow to dry before masking for trim stripes.
4. Refer to Figure 64-6. Apply masking to bearings and white trim stripes. Apply black paint to black trim stripes and root fitting.
5. Remove all masking materials.



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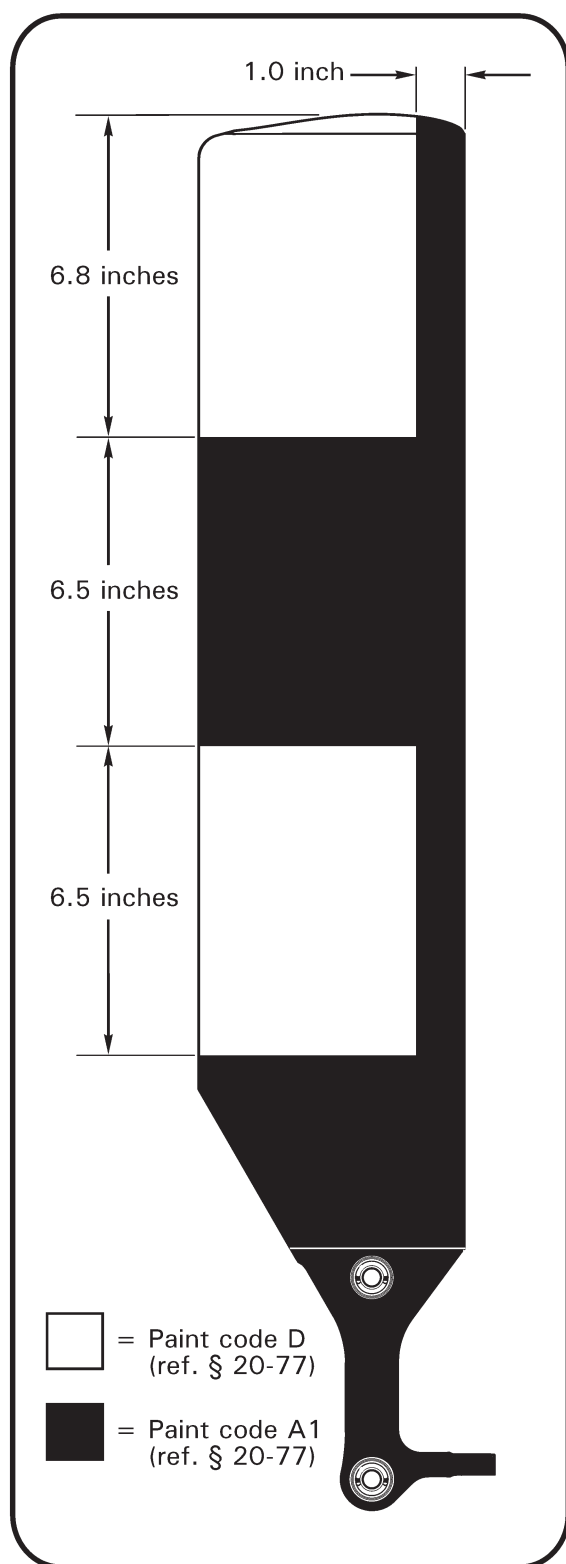


FIGURE 64-6 F029-1 BLADE PAINT SCHEME

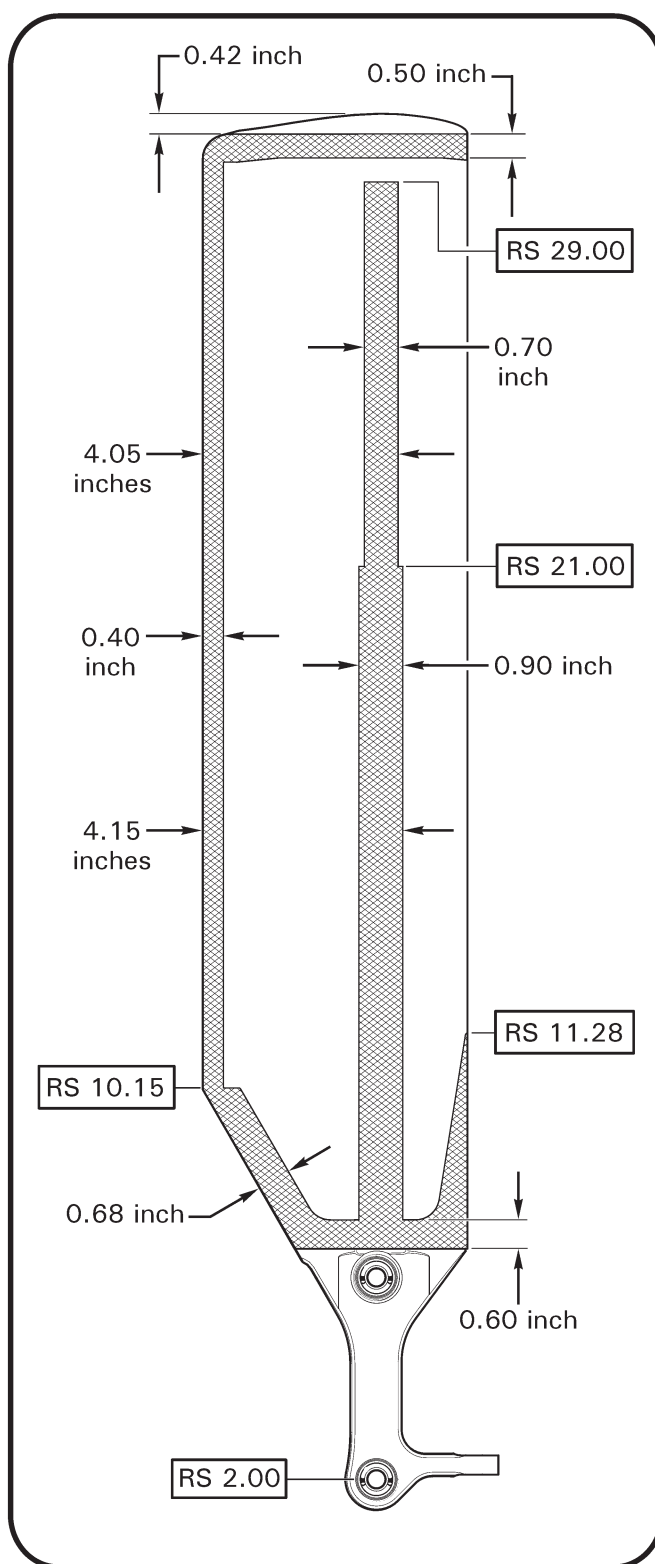


FIGURE 64-7 F029-1 BLADE BONDED AREAS

### 64-38 Tail Rotor Blade Condition and Care

Regular preventive maintenance of tail rotor blades is imperative for continued safe operation. Leading edge pitting or degradation of the bond at the tip cap can result if regular preventive maintenance is not performed; additional care may be required in corrosive environments such as coastal or shipboard operations. The following maintenance is recommended to prevent and mitigate the effects of corrosion:

1. Bubbled paint can be an indication of underlying corrosion. If bubbled paint is observed at or adjacent to tip cap bond line, or if bond line is exposed, perform following maintenance prior to further flight.

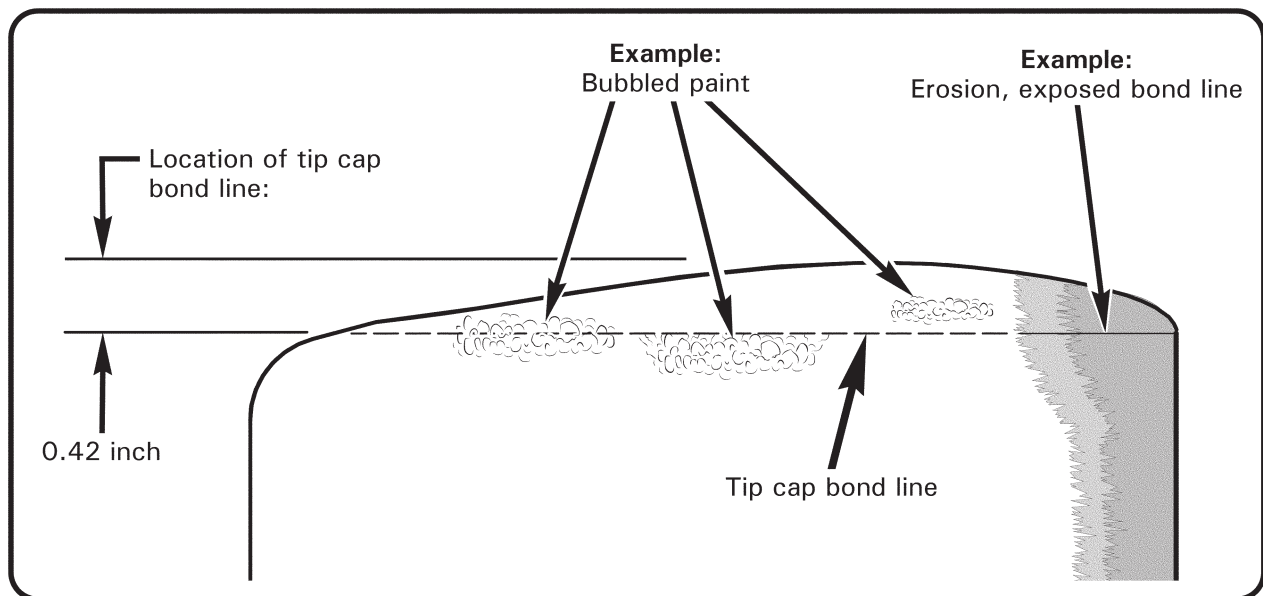


FIGURE 64-8 F029-1 BLADE TIP CAP BOND LINE

#### 2. Maintain blade condition as follows:

- a. At, or adjacent to, tip cap bond line: Remove loose or bubbled paint with fingernail or plastic scraper. Using minimum 10X magnification, examine bond line for both presence of adhesive & no corrosion (white powder and/or pitting). Metal-to-metal contact of tip cap to skin is permissible, but any gaps in remaining bond line due to missing blue (or brown) adhesive requires blade replacement. Any evidence of corrosion at bond line requires blade replacement. If blade(s) require replacement, contact RHC Technical Support with part number & serial number of affected and opposite blades.
- b. At areas away from tip cap bond line: Remove any corrosion, and bubbled or loose paint, by hand-sanding in a spanwise direction using 220-grit aluminum-oxide abrasive paper and minimum 0.1 inch blend radius; finish sand with 320-grit aluminum-oxide abrasive paper. Remove only material necessary to eliminate corrosion; any hole that completely penetrates blade skin requires blade replacement.

**64-38 Tail Rotor Blade Condition and Care (continued)**

2. c. Feather edge of paint bordering any bare metal by hand-sanding spanwise with 320-grit or finer wet-or-dry aluminum-oxide abrasive paper. Do not remove bare metal when feather sanding.

Preferred blade condition is with fully painted leading edge. Use two coats of Desoprime CA7502 epoxy primer (or equivalent). Scuff primer prior to applying second coat. Use Imron polyurethane enamel or equivalent paint. Refer to § 20-77 for specific paint codes. Blades with striped leading edges may be painted with solid black leading edge (ref. Figure 64-6) if desired for ease of application.

Paint offers the best protection against leading edge corrosion. If painting blades is impractical, at least a single coat of primer on leading edges provides some protection.

3. Balance tail rotor per § 18-20 after any corrosion removal or painting.
4. When operating in a corrosive environment, clean tail rotor daily per POH section 8, Cleaning Helicopter (mild soap means a pH between 7 & 9). If waxing blades is impractical, wipe blade leading edges with standard WD-40® brand light oil or equivalent; do not use ACF-50® lubricant or "Specialist" versions of WD-40® on blades, and do not use Salt-Away®.

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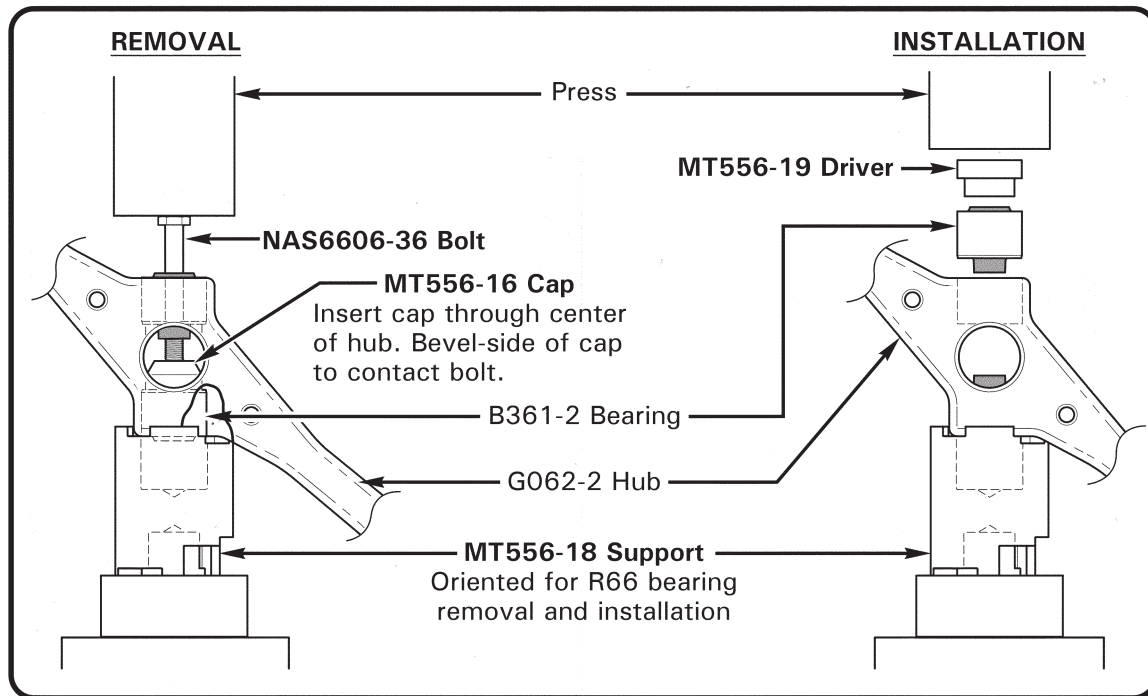


FIGURE 64-9 MT556-17 (ALL-MODEL) TAIL ROTOR HUB BEARING REPLACEMENT TOOL KIT

(Kit includes [1] MT556-6 Cap [R22], [1] MT556-16 Cap [R44 & R66], [1] MT556-18 Support, [1] MT556-19 Driver, [1] NAS6604-26 Bolt [R22], and [1] NAS6606-36 Bolt [R44 & R66])

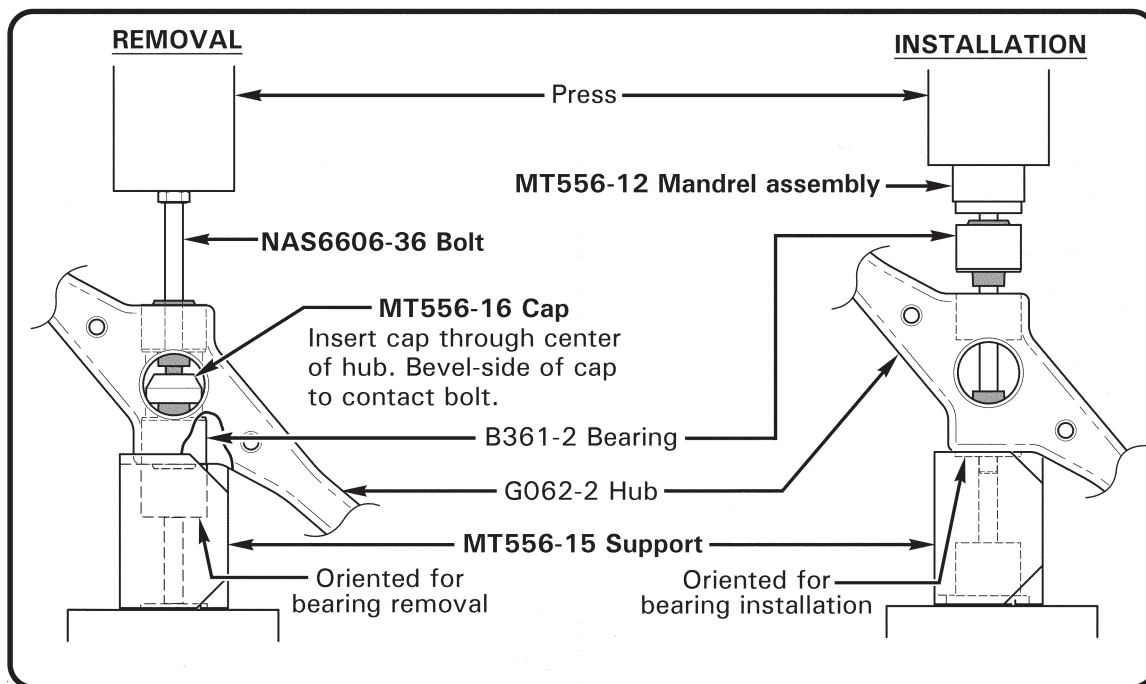


FIGURE 64-10 (EARLIER) MT556-11 (R44 & R66) TAIL ROTOR HUB BEARING REPLACEMENT TOOL KIT

(Kit includes [1] MT556-12 Mandrel assembly, [1] MT556-15 Support, [1] MT556-16 Cap, and [1] AN6-34A Bolt)

## 64-40 Tail Rotor Hub

### 64-41 Bearing Replacement

#### **A. Removal**

1. Remove tail rotor assembly per § 64-10.
2. Remove tail rotor blades per § 64-20.
3. Refer to Figures 64-9 and 64-10, as applicable. Press bearing(s) from hub using MT556-17 or MT556-11 bearing replacement tools as shown.

#### **B. Installation**

1. Inspect tail rotor hub per § 64-42.

#### **CAUTION**

Elastomeric bearings are a slight press fit in tail rotor hub bores. Inspect bores for fretting; if fretting is detected, hub is unairworthy.

2. Refer to Figures 64-9 and 64-10, as applicable. Using a cotton or foam tipped applicator, apply light coat of approved primer per § 20-70 to bottom of hub bearing bore. Apply a thin line of primer to center of bearing outside diameter. While primer is wet, press bearing(s) into hub using MT556-17 or MT556-11 bearing replacement tools as shown. Wipe away excess primer.

### 64-42 Inspection

1. Remove tail rotor blades per § 64-20, and inspect blades per § 64-30.
2. Remove elastomeric bearings per § 64-41.
3. Clean G062-2 tail rotor hub using approved solvent per § 20-70.
4. Visually inspect for indications of damage, wear, nicks, dings, and corrosion. Check arms for straightness, bolt holes for elongation, and bearing bores for fretting or galling. Corrosion is not permitted on clamp-up surfaces.
5. For suspect areas, locally remove paint from hub using approved paint stripper per § 20-70; fluorescent penetrant inspect per § 20-40.
6. Touch-up bare metal using approved materials per § 20-70.
7. Install elastomeric bearings per § 64-41.
8. Install tail rotor blades per § 64-20.

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