# CHAPTER 62

## MAIN ROTOR

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CHAPTER 62
MAIN ROTOR

62-00 Description

The main rotor has two all-metal blades and a forged-aluminum hub. Blades mount to the hub by coning hinge; the hub mounts to the main rotor shaft by teeter hinge. Coning and teeter hinges have self-lubricated bearings inside the hub.

The leading edge of the main rotor blade is a corrosion and erosion resistant stainless-steel spar. Aluminum skins are bonded to the spar approximately one inch aft of the leading edge, to the aluminum honeycomb core, and to the forged-aluminum root fitting.

Each blade has six pitch change bearings that attach to a forged, stainless-steel spindle. The bearings and part of the spindle are submerged in oil inside the root fitting housing. The housing is sealed with an elastic boot. The spindle tusk contacts an aluminum droop stop attached to the main rotor shaft, to minimize teetering when blades are at rest or turning at low RPM.

62-10 Main Rotor Blades

WARNING

Due to potentially destructive results, use of blade tape (anti-erosion tape) is prohibited.

A. Removal

Refer to Figure 62-1. Four people will be required to remove the blades. One person must support the blade approximately 2/3 its length from the root while another supports the root and removes or installs the attached bolt.

1. Mark one blade and its corresponding hinge nut & bolt, pitch link and rotor head location with a colored marker, such as a grease pencil and, mark as “X”. Using a different color marker, mark as “O”, on the other blade, nut, bolt, pitch link and rotor head location.

2. Disconnect pitch links from each main rotor blade.

FIGURE 62-1 SUPPORTING MAIN ROTOR BLADES DURING BLADE REMOVAL OR INSTALLATION
A. Removal (continued)

3. Refer to Figure 62-3. Remove cotter pins and loosen nuts of blade coning hinge bolts so they are just finger tight.

4. Remove nut, thrust washer, and shims (if used) from trailing-edge side of one blade hinge bolt. Cone blade so spindle tusk no longer contacts droop stop. While supporting blade at root, carefully rotate pitch horn down and remove hinge bolt and thrust washer.

NOTE
Installation hardware is matched individually to each blade installation; carefully reinstall all attach hardware into rotor hub exactly as removed.

CAUTION
Support remaining main rotor blade in a level position during and after removal of opposite blade.

5. Store rotor blades on a cushioned surface to prevent damage to blade skins.

6. Repeat step 4 to remove remaining blade.

B. Installation


2. If previously installed information is unavailable, perform coning hinge journal and shim calculation per Section 62-31.

3. Refer to Figure 62-3. With rotor hub level, insert journals into coning hinge bearings. Install thrust washer on coning hinge bolt.

4. Position blade in hub until spindle hole aligns with journal bores, coning blade as required to keep tusk away from droop stop. Rotate pitch horn down and install hinge bolt at leading-edge side.

NOTE
To assist bolt installation, temporarily insert an old bolt from trailing-edge side to align spindle with journals.

5. Install trailing-edge shims (if used) and thrust washer and, prior to installing nut, coat bolt threads and nut face with A257-9 anti-seize compound.

NOTE
Do not allow anti-seize compound to contact journals or hub bearing areas. These areas must be clean and dry.
FIGURE 62-4  MEASURING BOLT STRETCH
(Shown on teeter hinge bolt)
62-10 Main Rotor Blades (continued)

B. Installation (continued)

CAUTION
To prevent damage, level and support installed blade until opposite blade is installed.

6. With installed blade level and supported near tip, install opposite blade per steps 1 thru 5.

7. Tighten nut on hinge bolt until journals and thrust washer are firmly seated. Then back nut off until both thrust washers can be freely rotated.

8. Install MT122-6 main rotor bolt stretch tool on hinge bolt per Figure 62-4. Zero dial indicator by rotating dial face. Lock dial and remove tool.

9. Using wrenches with at least 600 ft-lb torque capacity, tighten nut until drilled hole in nut and bolt align. Reinstall MT122-6 tool and measure bolt stretch; the stretch must be between 0.020 - 0.022 inch (0.021 - 0.022 inch for new, undrilled bolt). Remove tool. Install a new cotter pin with wet epoxy primer.

NOTE
If drilled holes in nut and bolt do not align, both nut and bolt must be replaced. Stretch new bolts per § 20-33; drill new nuts and bolts per § 62-33.

WARNING
The main rotor blade and hub attach bolts must be stretched from 0.020 - 0.022 inch (0.021 - 0.022 inch for new, undrilled bolt) to obtain proper clamping force. Under-stretching or over-stretching can cause catastrophic failure of the bolts.

10. Connect pitch link to pitch horn. Standard torque per § 20-32, install palnut, and torque stripe per Figure 5-1.

11. Repeat steps 1 thru 10 for remaining blade. If installed main rotor blade pitch bearing housing has recently been serviced (including new or overhauled blades), perform steps 12 thru 16.

12. Position cyclic and collective at approximately mid-travel positions to minimize wrinkles in boots.

13. Insert two (2) MT549-1 spacers between hub and boot with gaps at top and bottom. Spacers should fit in recess of boot. Hold spacers in place against boot and insert MT549-2 plate from top between hub and spacers. Push plate down until it contacts spindle.

14. Remove lower plug from pitch horn and allow oil to flow. Place a finger over hole as soon as oil flow decreases to a drip to prevent air from being sucked inside blade.

15. Remove finger from hole and quickly install drain plug. Special torque per § 20-33 and torque stripe per Figure 5-1.

16. Remove plate and spacers. Repeat on second blade.
62-11 Blade Boots

Refer to R66 Illustrated Parts Catalog (IPC) Figure 62-1.

A. Removal

1. Remove main rotor blades per § 62-10.

2. Place a suitable drain container below main rotor blade spindle assembly. Remove two B289-2 bolts and drain fluid.

3. Remove outer boot clamp and hold boot back to expose inner boot clamp. Remove inner clamp and peel boot from spindle. Boot inner portion may be sealed to spindle with B270-1 sealant.

4. As required, use a plastic scraper and vacuum cleaner to remove old B270-1 sealant from spindle area to be covered by boot inner lip. Avoid contaminating spindle bearings with old sealant.

WARNING

Use only plastic scrapers to remove old sealant; chemical removal is prohibited.

B. Installation

1. Visually inspect and verify boot is undamaged. Carefully stretch new boot over spindle.

2. Solvent-clean surfaces clamped by boot inner lip. Properly position boot inner lip; install C165-1 (inner) clamp assembly and tighten clamp to 2.850 ± 0.005 inch outside diameter. Rotate spindle and verify adequate clearance between clamp assembly and pitch horn.


4. Fill pitch bearing housing per § 12-51.
62-20 Main Rotor Hub

Refer to R66 Illustrated Parts Catalog (IPC) Figure 62-3.

A. Removal

1. Remove main rotor blades per Section 62-10.

2. Refer to Figure 62-2. Mark rotor hub using a grease pencil or soft marker as follows:
   a. Indicate nut side of teeter bolt.
   b. Indicate chord arm side of drive shaft.

3. Remove cotter pin, nut, thrust washers, C117 shims, C106 journals, and bolt. Rotate hub as required and remove hub. Do not drop C152 thrust washers or C106 journals.

4. Reinstall bolt, thrust washers, shims, journals, and nut in rotor hub exactly as removed.

   **CAUTION**
   
   Main rotor chordwise balance is adjusted using C106 journals and C117 shims. If assembly stackup is altered, an out-of-balance condition can occur.

B. Installation

1. Clean and dry teeter hinge hardware using approved solvent per Section 20-70. Inspect journals and thrust washers for chipping of chrome plating, corrosion, and/or wear grooves extending through chrome plating (0.0006 inch maximum wear). Replace journal or thrust washer if any of these conditions exist.

2. Line up mark on hub with chord arm on rotor shaft.

3. Refer to Figure 62-2. Reinstall teeter hinge bolt, thrust washers, shims, and journals exactly as removed. If previously installed information is unavailable, perform teeter hinge journal and shim calculation per Section 62-31. Ensure journals are clear of droop stops and fully contact drive shaft.

4. Coat nut face and bolt threads with A257-9 anti-seize compound, install and tighten nut, then loosen nut until both thrust washers can be freely rotated.

   **WARNING**
   
   Do not allow anti-seize compound to contaminate drive shaft, journals, shims, or thrust washer inner faces. Contamination prevents proper joint clamp-up and may cause failure.

5. Position MT122-6 main rotor bolt stretch tool on teeter bolt per Figure 62-4. Zero and lock dial indicator. Remove tool.
FIGURE 62-5  MAIN ROTOR HUB BEARING REMOVAL

FIGURE 62-6  MAIN ROTOR HUB BEARING INSTALLATION
B. Installation (continued)

6. Using wrenches with at least 600 ft-lb torque capacity, tighten nut until drilled hole in nut and bolt align. Reinstall MT122-6 tool and measure bolt stretch; the stretch must be between 0.020-0.022 inch (0.021-0.022 inch for new, undrilled bolt). Remove tool.

**NOTE**

If drilled holes in nut and bolt do not align, both nut and bolt must be replaced. Stretch new bolts per Section 20-33; drill new nuts and bolts per Section 62-33.

**WARNING**

The main rotor blade and hub attach bolts must be stretched from 0.020 - 0.022 inch (0.021 - 0.022 inch for new, undrilled bolt) to obtain proper clamping force. Under-stretching or over-stretching can cause catastrophic failure of the bolts.

7. Verify correct teeter hinge friction per Section 62-32; adjust as required and perform step 6.

8. If required, drill cotter pin hole per Section 62-33. Coat a new cotter pin with epoxy primer and install wet.

62-21 Bearing Replacement

Refer to R66 Illustrated Parts Catalog (IPC) Figure 62-3.

1. Remove main rotor hub per Section 62-20.

2. If main rotor hub is to be reinstalled with same blades, measure and record shim thicknesses and locations in hub.


**CAUTION**

To prevent hub damage ensure all tool and bearing surfaces are smooth.

4. Refer to Figure 62-5. Press old bearing(s) out of hub using a socket having an outer diameter of 1.535-1.555 inches and an 8 inch extension.

**CAUTION**

Ensure hub is flat on press table and socket is centered on bearing to prevent hub damage.

5. Inspect hub bearing bore. Verify no scoring or scratches. Polish out fretting and corrosion to a maximum depth of 0.001 inch (0.005 inch on radius at edge of bore) using 320-grit or finer wet-or-dry sandpaper and 0.25 inch minimum blend radius. Replace hub if fretting or corrosion cannot be polished out within limits.
6. Ensure new bearing mating surfaces are clean and smooth. Coat hub bearing bore and hub bearing mating surfaces with epoxy primer (see Section 20-70). Do not allow primer to contaminate Teflon portion of bearing.

7. Refer to Figure 62-6. If seam of bearing Teflon liner is visible, orient bearing so seam is toward top of hub (as installed on helicopter). While primer is still wet, press in new bearing using MT329-6 plug and MT643-1 support (support is not used when pressing in teeter hinge bearings) until bearing flange contacts hub.

CAUTION

Use MT643-1 support when installing coning hinge bearings.
Never install coning hinge bearings into unsupported hub.

8. Seal between bearing flange and hub with epoxy primer. Similarly seal between inboard edge of bearing and hub. Do not allow primer to contaminate Teflon portion of bearing.


10. If reinstalling hub on same helicopter, install hardware as removed in step 2, subject to preceding step. Reinstall hub per Section 62-20.
62-22 Inspection and Repair

1. Remove main rotor hub bearings per § 62-21 steps 1 thru 4.

2. Remove hub paint by dry media blasting.

3. Refer to Figure 62-6A. If required, polish surfaces using 320-grit or finer wet-or-dry sandpaper to 0.25 inch minimum blend radius.
   
   a. Visually inspect hub bearing bores and verify no scoring, scratches, or other obvious damage. Polish out fretting or corrosion to 0.002 inch maximum depth on inner and outer surfaces within 2.125 inches of bearing bores. Polish out fretting or corrosion to 0.001 inch maximum depth on inside of bearing bores; maximum bearing bore diameter is 1.5618 inches.
   
   b. Visually inspect all other areas of hub for obvious damage. Polish out nicks, scratches, gouges, or corrosion to 0.010 inch maximum depth within 0.30 inch of inside and outside edges of hub. Polish out nicks, scratches, gouges, or corrosion to 0.060 inch maximum depth on all other areas.
62-22 Inspection and Repair (continued)

4. Fluorescent penetrant inspect hub per § 20-42.
5. Prime hub per § 20-60.
7. Mask bearings and topcoat hub assembly per § 20-60.
8. When top coat has sufficiently cured, remove masking.
62-30  Main Rotor Assembly

62-31  Journal and Shim Calculations

Refer to Figures 62-2 and 62-3.

A. Teeter Hinge Calculation

1. Measure main rotor hub width across the teeter hinge bearing faces:  _____ inches

2. Subtract measured width of C251 driveshaft at teeter hinge bolt hole:  – _____ inches

   Calculated empty space:  = _____ inches

3. Use one C106-5 journal and a selection of C117 shims to create a combined length of approximately 1.835 inches. Use as many different size shims as possible. Place thrust washer, shims, and journal under teeter bolt head; shims must be placed between thrust washer and journal.

   Subtract combined measured thickness of selected journal and shims:  – _____ inches

   Difference:  = _____ inches

4. Subtract measured length of C106-5 journal to be used on nut-side:  – _____ inches

   Difference:  = _____ inches

   **CAUTION**

   Initial teeter hinge hardware stack-up must be adjusted to 0.005/0.008 inch greater than calculated empty space. A smaller initial stack-up could damage thrust washers and hub bearings during installation.

5. To accommodate dimensional change due to clamping force, add:  + 0.005/0.008 inch

   Result:  = _____ inch

   of C117 shims

6. Preceding Result is initial calculated C117 shim stack between nut-side journal and thrust washer. Use as many different size shims as possible to facilitate head shifting during balancing. Deviate from initial shim stack as required to meet teeter hinge friction requirements (8-12 pounds is ideal).
B. Coning Hinge Calculation

1. Measure and record main rotor hub width across the coning hinge bearing faces:  _____ inches

2. Subtract blade’s spindle width measured across faces at coning hinge bolt bore:  - _____ inches

   Calculated empty space: = _____ inches

   **CAUTION**

   Initial coning hinge hardware stack-up must be adjusted to 0.007/0.011 inch greater than calculated empty space. A smaller initial stack-up could damage thrust washers and hub bearings during installation.

3. To accommodate dimensional change due to clamping force, add:  + 0.007/0.011 inch

   Sum: = _____ inch

4. Subtract combined measured length of both C106-7 journals to be installed:  - _____ inches

   Result: = _____ inch of C117 shims

5. Preceding Result is initial calculated C117 shim stack required between trailing-edge journal and thrust washer. Deviate from initial trailing edge shim stack-up as necessary to meet coning hinge axial play per Figure 62-8 and maintain friction requirements as follows: It must be possible to manually cone each blade without teetering the hub when blades are held up off the droop stops and lifted at tip. Increasing shim stack-up or journal length decreases hinge friction.

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<td>Part No.</td>
<td>Length</td>
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<tr>
<td>C106-5</td>
<td>1.775</td>
<td>Teeter hinge (two per hinge)</td>
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<tr>
<td>C106-7</td>
<td>1.284</td>
<td>Coning hinge (two per hinge)</td>
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<td>Part No.</td>
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<td>Location (Between thrust washer and journal)</td>
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<td>C117-8</td>
<td>0.012</td>
<td>Teeter hinge; Coning hinge trailing-edge side</td>
</tr>
<tr>
<td>C117-9</td>
<td>0.015</td>
<td>Teeter hinge; Coning hinge trailing-edge side</td>
</tr>
<tr>
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<td>0.020</td>
<td>Teeter hinge; Coning hinge trailing-edge side</td>
</tr>
<tr>
<td>C117-11</td>
<td>0.025</td>
<td>Teeter hinge; Coning hinge trailing-edge side</td>
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TABLE 62-1  HINGE FRICTION JOURNALS AND SHIMS
(Journal length and shim thickness values given in inches)
FIGURE 62-7  MEASURING TEETER HINGE FRICTION
62-32 Adjusting Hinge Friction

A. Teeter Hinge Adjustment

NOTE
Teeter hinge friction must be checked and adjusted with main rotor blades removed from main rotor hub. If required, remove main rotor blades per Section 62-10.

Teeter hinge friction is adjusted by changing C117 shim stack in small increments.

NOTE
If shim stack is changed per following instructions, a new bolt and nut must be installed per Section 62-10 Part B, steps 3 thru 5.

1. Refer to Figure 62-7. Install MT354 teeter moment tool into main rotor hub coning hinge bearings. Using a spring scale, measure force required to teeter main rotor hub; use sliding force reading, not breakaway reading. Force required to teeter main rotor hub must be:

   Minimum: No axial play
   Maximum: 19 pounds

2. Refer to Figure 62-2. Remove cotter pin and teeter hinge nut. Remove thrust washer and C117 shims under nut.

3. Refer to Table 62-1. Measure thickness of C117 shims under teeter hinge nut. Change shims as necessary to adjust friction. Reducing shim stack-up by 0.003 - 0.005 inch will increase teeter friction. Increasing shim stack-up will reduce teeter friction.

4. Reassemble teeter shims, thrust washer, and nut. Repeat step 1. Torque teeter hinge bolt per Section 62-20 Part B steps 4 thru 6 and check teeter friction often while stretching bolt. Do not exceed maximum teeter hinge friction. If required, increase shim stack-up per preceding step so proper bolt stretch is reached prior to maximum friction.

5. Cotter pin holes in nut and bolt will not align. Remove teeter hinge bolt by pressing it out with an old bolt. Install a new bolt and nut per Section 62-10 Part B, steps 4 thru 6. Drill new bolt and nut per Section 62-33; coat new cotter pin with epoxy primer and install wet.

6. If required, install main rotor blades per Section 62-10.
FIGURE 62-8  MEASURING THRUST WASHER AND HUB BEARING GAP

TOP VIEW OF MAIN ROTOR HUB

MAXIMUM GAP, A TOTAL OF BOTH SIDES:
0.005 in. - USED
0.003 in. - NEW

FEELER GAUGE

FRONT VIEW OF MAIN ROTOR HUB
62-32 Adjusting Hinge Friction (continued)

B. Coning Hinge Adjustment

Coning hinge friction is adjustable through use of various thickness C117 shims. Shims are installed between the thrust washer and the trailing-edge journal.

1. Check blade hinge friction by lifting blades until spindle tusks clear droop stops. Hold one blade level and cone opposite blade. Rotor hub should not teeter as blade is coned. Repeat check on opposite blade.

2. Refer to Figure 62-8. Using a feeler gage, measure gap between thrust washer and rotor hub bearing. Gap must be measured on both leading edge & trailing edge sides of coning hinge and the total must not exceed 0.005 inch (0.003 inch if new hub bearings are installed).

3. Refer to Figure 62-3. Remove cotter pin, nut, and thrust washer from coning hinge bolt.

4. Refer to Table 62-1. Remove shim(s) to be changed. Measure shim thickness and select next size thicker or thinner as required. A thicker shim will decrease blade’s coning hinge friction. A thinner shim will increase blade’s coning hinge friction and decrease any gap between blade’s thrust washers and hub bearings.

5. Replace coning hinge bolt with a new bolt.


7. Repeat steps 1 and 2. Drill new bolt and nut per § 62-33; coat new cotter pin with epoxy primer and install wet. Repeat on opposite blade as required.

62-33 Drilling Nuts and Bolts

New bolts and nuts must be installed and bolts stretched to § 20-32 limits prior to drilling. Nuts have three blind holes pre-drilled into every other nut flat to be used as drilling guides.

Using a six inch long 0.156-inch diameter Cobalt twist-drill, drill a hole through nut and bolt using an accessible pre-drilled hole in nut. If a shorter length drill is used, protect hub from damage due to chuck contact by wrapping chuck and/or covering hub edge with several layers of tape. Prevent chips from contaminating other mechanisms.

NOTE
If none of the predrilled holes in nut are accessible for use as a guide after stretching bolt, loosen nut and reposition bolt and nut. Restretch bolt per § 20-32.
FIGURE 62-8A  MT524-2 MAIN ROTOR STATIC BALANCE FIXTURE ASSEMBLY

MT524-4 Head shift shaft

N = nut side, see text

MT524-3 End plate

MT524-3 End plate

NAS1351-3-10P Screws

MT524-5 Droop stop spacer

MT009-4 Tube

MT009-3 Rod

MT009-9 Base assembly

MS16562-15 Roll pin

MT009-4 Tube

MT009-3 Rod

FIGURE 62-8A  MT524-2 MAIN ROTOR STATIC BALANCE FIXTURE ASSEMBLY
62-34 Static Balance

**CAUTION**
Ensure surfaces contacting blade skins and trailing edges are sufficiently cushioned to prevent blade damage.

1. Refer to Table 62-1. Assemble main rotor blade & spindle assembly to main rotor hub by selecting a combination of C106-7 coning hinge journals and C117 coning hinge shims to obtain total axial clearance between 0.002–0.006 inch.

2. Install nuts (dry); tighten nuts on hinge bolts until journals and thrust washers are firmly seated (snug). Measure gaps between thrust washers and hub bearing faces per Figure 62-8; verify total axial clearance at each hinge is between 0.002–0.006 inch.

3. Refer to Figure 62-8A. Install MT524-2 main rotor static balancing fixture assembly in hub as shown. Hoist main rotor assembly and position on MT009-9 base assembly.

4. Refer to Figure 62-8B. Verify blade pitch angles are approximately equal with pitch horns adjusted as shown. If blade pitch angles are not equal, then pitch horn(s) are not correctly installed.

5. Place a spirit level chordwise (parallel with teeter and coning hinges) atop main rotor hub. Level by adjusting NAS1351-3-10P screws.

![Figure 62-8B Equalizing Blade Pitch](image)
6. Refer to Figure 62-8C. Insert depth micrometer (or calipers) thru (either) hole of MT524-3 end plate until dowel contacts MT524-4 shaft and mark dowel at edge of end plate; repeat on opposite side of hub. Determine side of hub with smaller measured distance and mark top of hub with letter "N" to indicate nut-side of teeter hinge bolt.

7. Place a spirit level spanwise (perpendicular to teeter and coning hinges) atop main rotor hub. Place tip cover, tip cover attach screws, and two A722-4 screws as close to blade tip as possible. Level rotor system by adding C298 balance strips, NAS1149F0332P washers, and/or NAS1149F0363P washers as required. Final balance to be within one NAS1149F0332P washer.

8. Apply light coat A257-9 anti-seize to threads and install screws securing tip weights to blade; special torque screws to 40 in.-lb. Apply light coat A257-9 anti-seize to threads and install screws securing tip cover to blade; special torque screws to 40 in.-lb. Recheck spanwise and chordwise balance.

9. Conspicuously mark rotor assembly with colored "X" and "O" on hub, blade roots, and coning bolts (consistent marking on each side of hub) as reference for correct assembly on helicopter. Disassemble main rotor assembly.

FIGURE 62-8C MEASURING GAP BETWEEN THRUST WASHER AND HUB BEARING
62-40 Inspection of Main Rotor Blades

NOTE
Main rotor blades are 14 CFR § 27.602 critical parts. Notify RHC Technical Support when voids exceeding the limits specified in the instructions below are found, providing blade serial number, helicopter serial number, time in service for the rotor blade, and location and size of the voids that exceed the limits.

NOTE
The inspection criteria in this section applies to blade damage that occurs after blade manufacturing (including shipping and handling and time in service). Damage after blade manufacturing usually exhibits paint scuffing, scratches, or freshly-exposed metal in the form of scratches in the finish. If a blade manufacturing irregularity is suspected, 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.
62-40 Inspection of Main Rotor Blades (continued)

A. Measuring Damage

1. Refer to Figure 62-9. Measure blade damage using a straight edge and a thickness gage. Keep straight edge parallel with the leading and trailing edges.

2. If blades are installed on the helicopter, measure damage using the shortest straight edge possible to span damaged area. Using a straight edge of excessive length will cause a false reading due to natural droop of the blade.

B. Measuring Material Removed After Repair

1. Use calipers or micrometers and compare measurements before and after repair to estimate amount of material removed.

2. Use a straight edge and thickness gage to measure repaired areas less than 2 inches across in the blade skins and spar.

62-41 Scratches and Corrosion

A. Skins and Doublers

1. Refer to § 62-50 for repair procedures. Polish out damage by hand with a 0.10 inch minimum blend radius.

2. Refer to § 62-40 for measuring damage and measuring material removed after repair. Repair may not exceed the following limits:
   a. 3.0 inch maximum diameter.
   b. 3.0 inch minimum distance from another repaired area.
   c. 0.012 inch maximum depth between RS 174.0 and RS 198.0.
   d. 0.008 inch maximum depth between RS 18.7 and RS 174.0.

3. When recording repair(s), indicate upper or lower blade surface, diameter, depth, and rotor station location (span and chord).
62-42 Dents

**CAUTION**

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

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 penetrant inspect, keeping penetrant materials away from bond joints.

A. Skins and Doublers

1. Refer to Figure 62-11. Smooth, round bottom dents with 0.060 inch minimum radius that occur in honeycomb and unsupported areas of the blade as listed below may be repaired when damage does not exceed the following limits:
   a. 0.125 inch maximum depth dent between RS 162.90 and RS 196.50
   b. 0.090 inch maximum depth dent between RS 124.00 and RS 162.90.
   c. 0.030 inch maximum depth dent between RS 70.00 and RS 124.00.
   d. Maximum area of any dent or dents is 12 square inches and maximum length is 2.0 inches between RS 70.00 and RS 162.90.
   e. Maximum area of any dent or dents is 24 square inches and maximum length is 4.0 inches between RS 162.90 and RS 196.50.
   f. Replace blade with any dent in 0.7 inch area immediately aft of skin-to-spar bond line.
   g. For dents in skins and/or doublers inboard of RS 70.00, contact RHC for repair procedures.

2. Refer to Part C for leading edge cap damage. Refer to § 62-50 for repair procedures for damage within limits.

B. Trailing Edge Bond Joints

1. Refer to Figure 62-12. Verify damage does not result in an edge void and does not exceed the following limits:
   a. 0.030 inch maximum damage between RS 70.00 and RS 124.00.
   b. 0.060 inch maximum damage between RS 124.00 and 198.00.
   c. Refer to Part A, step 1(d).

2. Refer to § 62-50 for repair procedures for damage within limits. Blend out dents in trailing edge bond joints with a 0.10 inch blend radius.

C. Leading Edge Cap

1. Verify damage does not result in a crack or tear and dent depth does not exceed 0.020 inch.

2. Dents do not require blending or filling. Dents may be blended with a 0.10 blend radius.
62-43 Spar Damage

1. Refer to Figure 62-13. Spar damage limits exclude leading edge cap. Verify damage does not exceed the following limits:

   a. 0.020 inch maximum depth between RS 70.00 and RS 198.00.
   b. Replace blade if erosion has reduced thickness at spar leading edge to 0.040 inch.
   c. Replace blade if erosion has cause ripples in or deformation to spar leading edge.

2. Refer to § 62-50 for repair procedures for damage within limits. Blend out spar damage with a minimum 1.0 inch blend radius.
62-44 Root Fitting Damage

1. Refer to Figure 62-14. Verify damage does not exceed the following limits:
   a. 0.040 inch maximum depth on outside diameter of flange.
   b. 0.002 inch maximum depth on area 0.35 inch outboard of flange.
   c. 0.060 inch maximum depth on other root fitting exposed areas.

2. Refer to § 62-50 for repair procedures for damage within limits. Blend out root fitting damage with a minimum 1.0 inch blend radius.
FIGURE 62-15  REPAIRS TO BLADE AND TRIM TAB TRAILING EDGES

FIGURE 62-16  MINIMUM CHORD AFTER BLADE AND TRIM TAB TRAILING EDGE REPAIRS
62-45 Nicks and Notches

A. Blade Trailing Edge (see also Blade Tip)

1. Refer to Figure 62-15 and § 62-50 for repair procedures for damage within limits. Blend out nicks and notches in blade trailing edge for 1.0 inch minimum each side of nick or notch (with a minimum 12 inch blend radius).

2. Refer to Figure 62-16. After repair, verify minimum chord is within the following limits:
   a. 12.10 inch minimum chord between RS 124.00 and RS 194.00.
   b. 11.40 inch minimum chord between RS 19.55 and RS 122.00.


B. Blade Tip

1. Refer to Figure 62-17. Using a fine-toothed hand file, file in spanwise or chordwise direction, within limits indicated. Remove file marks using 220 grit or finer aluminum oxide abrasive paper.

2. File trailing edge to maintain square edge at skins, perpendicular to chord line, per Figure 62-15. Seal exposed trailing edge bond joint.

3. Track and Balance Main Rotor per Chapter 18.

C. Trim Tab Trailing Edge

1. Verify damage does not exceed 0.050 inch chordwise or 0.30 inch spanwise.

2. Refer to Figure 62-15 and § 62-50 for repair procedures for damage within limits. Blend out nicks & notches in trim tab trailing edges, 1.0 inch minimum each side of nick or notch (with a minimum 12 inch blend radius) keeping edge parallel with blade trailing edge.
**FIGURE 62-17  BLADE TIP REPAIR LIMITS**

Permissible to remove up to noted area via hand filing parallel to span and chord.

- Minimum 0.75 inch radius
- 0.75 inch
- 1.00 inch
- 4.0 inches

**FIGURE 62-18  TIP CAP, SPAR, AND TRAILING EDGES - VOID AND DEBOND LIMITS**

- 1.85 in.
- 1.15 in.
- R.S. 198.00
- R.S. 196.50

- 1.80”
- 2.50”
62-46 Voids and Debonds

**WARNING**

Voids or debonds in rotor blades are not field repairable. Notify RHC Technical Support when voids exceeding the limits specified in the instructions below are found, providing blade serial number, helicopter serial number, time in service for the rotor blade, and location and size of the voids that exceed the limits.

**CAUTION**

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

A. Tip Caps, Spars, and Trailing Edges

1. Refer to Figure 62-18. Verify no continuous void larger than 0.10 square inch. 90% of the area must be securely bonded. Voids separated by 0.25 inch or less spanwise are considered continuous.

B. Doublers

1. Refer to Figure 62-19. Voids or debonds in doublers are not field-repairable.
   
   a. Critical Areas: Area less than 0.50 inch spanwise and less than 0.30 inch chordwise from edge of doubler. Verify no individual void larger than 0.10 square inch except at the doubler finger tips. The finger tips may be debonded from the outboard tip to 1.0 inch inboard. Voids that are separated by less than 0.25 inch shall be considered continuous.

   b. Non-Critical Areas: Area more than .50 inch spanwise or more than .30 inch chordwise from doubler edges. Verify void does not exceed 2.0 inches chordwise by 7.0 inches spanwise maximum continuous void. Voids that are separated by less than 0.25 inch shall be considered continuous. Total area of any void may not exceed 6.0 square inches.

2. If voids or debonds are beyond limit, contact RHC Technical Support.

C. Honeycomb

1. Refer to Figure 62-20. Verify damage does not exceed the following limits:

   a. 1.50 inch chordwise or 20.00 inch spanwise maximum continuous void between RS 121.00 & inboard. Total area of any void may not exceed 15.0 square inches.

   b. 2.50 inch chordwise or 20.00 inch spanwise maximum continuous void between RS 121.00 & RS 196.50. Total area of any void may not exceed 15.0 square inches.
FIGURE 62-19  DOUBLERS - VOID AND DEBOND LIMITS

FIGURE 62-20  HONEYCOMB - VOID AND DEBOND LIMITS
62-50 Repair of Main Rotor Blades

WARNING
Unauthorized repairs to rotor blades have caused fatal crashes.

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

NOTE
Refer to § 20-70 for approved materials.

1. Measure damage per § 62-40.

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.

3. A fine-toothed file may be used along the spar and trailing edge, provided the area is finished with 320 grit or finer wet-or-dry abrasive paper. Hand-sand or file in spanwise direction.

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 § 62-40.

6. Seal and fill per § 62-51, as required. Paint per § 62-52, as required.

7. Track and balance main rotor per Chapter 18, as required.

62-51 Sealing, Filling, and Fairing

1. Clean area needing sealing, filling, and fairing with QSOL 220.

2. a. Apply B270-27 adhesive to seal all exposed bond joints except at tip of blade and 4–6 inches of outboard end of skin/spar joint; remove excess adhesive.

   b. Apply B270-1 sealant to seal tip of blade and 4–6 inches of outboard end of skin/spar joint; remove excess sealant. Cure for 2–3 hours at 125° ± 25° or air dry for 72 hours minimum.

3. Using 240 grit or finer wet-or-dry aluminum-oxide abrasive paper, hand-sand cured adhesive in spanwise direction to a smooth, aerodynamic finish, congruent with the blade airfoil. Do not remove metal.

4. Hand-sand surrounding painted surface until 25% primer remains. Keep bare metal to a minimum.
62-52 Painting

<table>
<thead>
<tr>
<th>CAUTION</th>
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<tbody>
<tr>
<td>If force-drying paint, do not exceed 175°F surface temperature on blade; monitor blade temperature by temporarily installing P/N 110-2 Telatemp on blade skin.</td>
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</table>

1. Mask area to prevent overspray contamination.

2. Clean bare metal to be painted with a lint-free cloth dampened with enamel cleaner (see Approved Materials, § 20-70).

3. Prime bare metal with at least two coats of epoxy primer. Scuff first coat of primer with 320 grit abrasive paper (or very fine Scotch-Brite), and wipe down with a lint-free cloth dampened with enamel cleaner prior to applying new coat.

<table>
<thead>
<tr>
<th>NOTE</th>
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<tr>
<td>Best results are achieved if primer is allowed to air-dry for 12 hours prior to top coat application.</td>
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</table>

4. Refer to Figure 62-21. Apply dark gray, flat black, white, and/or yellow Dupont Imron polyurethane enamel (or equivalent; see Approved Materials, § 20-70), as required, to primed area in accordance with paint manufacturer’s recommendations.

<table>
<thead>
<tr>
<th>NOTE</th>
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<tr>
<td>Allow Imron paint to cure at least 72 hours before flying in erosive conditions (such as drizzle, rain, or dust).</td>
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</table>

5. Remove masking materials.

![Figure 62-21 Main Rotor Blade Paint Scheme](image)
62-60 Main Rotor Blade Tip Maintenance

After removing rounded tip covers, use 10X magnification when visually inspecting blade tip to verify no loose or blistered paint, white-powder corrosion products, or pitting of skins aft of skin-to-spar bond lines (upper & lower). If bare metal (other than spar leading edge) or corrosion is detected, proceed as follows:

**WARNING**

Review appropriate Safety Data Sheet (SDS) when working in proximity to hazardous materials. Specific recommendations for use of personal protective equipment are located in the SDS.

**CAUTION**

Do NOT use power tools or chemical paint strippers to remove blade paint.

1. Remove any corrosion and loose paint on tip cap and outboard edges of blade skins by hand-sanding vertical surface in a chordwise direction; use a hard, flat block with 220-grit aluminum-oxide abrasive paper, then finish sand with 320-grit aluminum-oxide abrasive paper. Remove only material necessary to eliminate corrosion.

2. Remove any corrosion and loose paint from skins on upper or lower surface of blade, aft of skin-to-spar bond joint, 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.
3. Clean bare metal area with lint-free cloth dampened with acetone and allow to dry.

4. Seal exposed bond joints, including bond joints on vertical surfaces, with smooth layer of B270-1 sealant (poly-sulfide, refer to § 20-79) and allow to cure.

5. Prime remaining exposed metal with two coats of epoxy primer (chromated epoxy preferred).

6. Apply yellow paint topcoat within 2–48 hours of primer application. For best performance, allow paint to cure 48 hours before flight.

7. Install tip covers and special torque screws to 40 in.-lb wet with A257-9 anti-seize; ensure cover edges are flush with blade profile.