CHAPTER 64 — TAIL ROTOR

CONTENTS — MAINTENANCE PROCEDURES

FIGURES

TABLES

TAIL ROTOR

64-1. TAIL ROTOR.

A two-blade, controllable pitch tail rotor hub and blade is located on the right side of the tail rotor gearbox. It is composed of two assemblies, the hub and the blades, and is driven from the transmission through the tail rotor gearbox.

NOTE

Helicopter S/N 30650 through 31134 are equipped with dynamic balance system for tail rotor. Helicopter S/N 30680 through 31134 are equipped with flap bearing wear indicator.

64-2. TROUBLESHOOTING.

Potential troubles which may occur in tail rotor are listed in table 64-1 with probable causes indicated and corrective action recommended.

Table 64-1. Tail rotor troubleshooting

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
High frequency vibration.	Tail rotor out of track.	Check tracking of tail rotor (Chapter 18).
	Tail rotor out of balance.	Check and balance tail rotor (Chapter 18).
	Loose tail rotor retaining nut.	Torque retaining nut 850 to 900 inch-lbs. (96.05 to101.7 Nm).
	Tail rotor pitch change links bent.	Replace damaged links.
	Worn or loose pitch change tube bearing.	Replace bearing and/or wear sleeve on tube.
	90° gearbox mounting loose.	Inspect gearbox mounting for loose rivets or studs or elongated bolt holes. Repair mounting.
Inability to make normal right and left turns in flight.	Faulty rigging.	Rig tail rotor controls.
Controls creeping.	Hydraulic cylinder in tail rotor controls leaking internally.	Replace faulty hydraulic cylinder.

64-3. OPERATIONAL CHECK.

Operational check of tail rotor hub and blade consists of tracking and dynamic balance of tail rotor hub and blade (Chapter 18).

HUB AND BLADE ASSEMBLY (212-010-701)

64-4. HUB AND BLADE ASSEMBLY (212-010-701).

Accomplish the following maintenance procedures for the 212-010-701 hub and blade assembly. For the 212-011-701 hub and blade assembly, refer to paragraph 64-10 .

64-5. MAINTENANCE.

64-6. Inspection - Trunnion Assembly (212-010-738) Yielding

NOTE

This inspection is required by 25 Hour Special Inspection and certain Conditional Inspections (Chapter 5). This inspection is also required if damaging/excessive bending loads are suspected to have been sustained such as high winds gusts, improper ground handling (tail rotor blade used as a hand hold), improper feathering bearing removal or static ground strike that could cause yielding.

1. Gain access to tail rotor assembly using a maintenance stand or other means to allow close viewing of the trunnion assembly. Perform visual inspection of flapping stop ears for deformation (figure 64-1).

a. Gently place tail rotor yoke against one flapping stop ear, allowing full view of the opposite stop.

b. Repeat in opposite direction to allow viewing of remaining stop.

2. If either flapping stop ear is deformed or bent as shown in figure 64-1 , yoke assembly has been yielded. Both the yoke assembly and trunnion assembly are no longer serviceable and must be removed and discarded. If any doubt exists about serviceability of these parts, contact BHT-Product Support Engineering.

64-7. Bearing check.

NOTE

Accomplish this check for serviceability of bearings in tail rotor hub yoke any time pedal binding or high frequency vibration occurs, as well as at scheduled inspections (Chapter 5).

1. Check tail rotor blade feathering bearing as follows:

a. Disconnect pitch links from pitch horns.

b. Manually move each rotor blade about pitch change axis, verifying bearings move smoothly without evidence of roughness.

c. If bearing condition is questionable, disassemble rotor for further inspection, bearing axial play not to exceed 0.015 inch (0.381 mm) (BHT-212-CR&O). Radial looseness in bearings is normal and is not cause for rejection.

d. Reconnect pitch links when bearing check is satisfactory.

2. Check tail rotor flap bearing as follows:

a. Manually pivot tail rotor around flap axis. Verify bearings move smoothly without evidence of roughness.

b. If bearing condition is questionable, disassemble rotor for further inspection of axial movement. Axial movement not to exceed 0.015 inch (0.381 mm).

3. Helicopters equipped with wear indicators shall be checked as follows:

a. Visually inspect yoke in area of wear indicator.

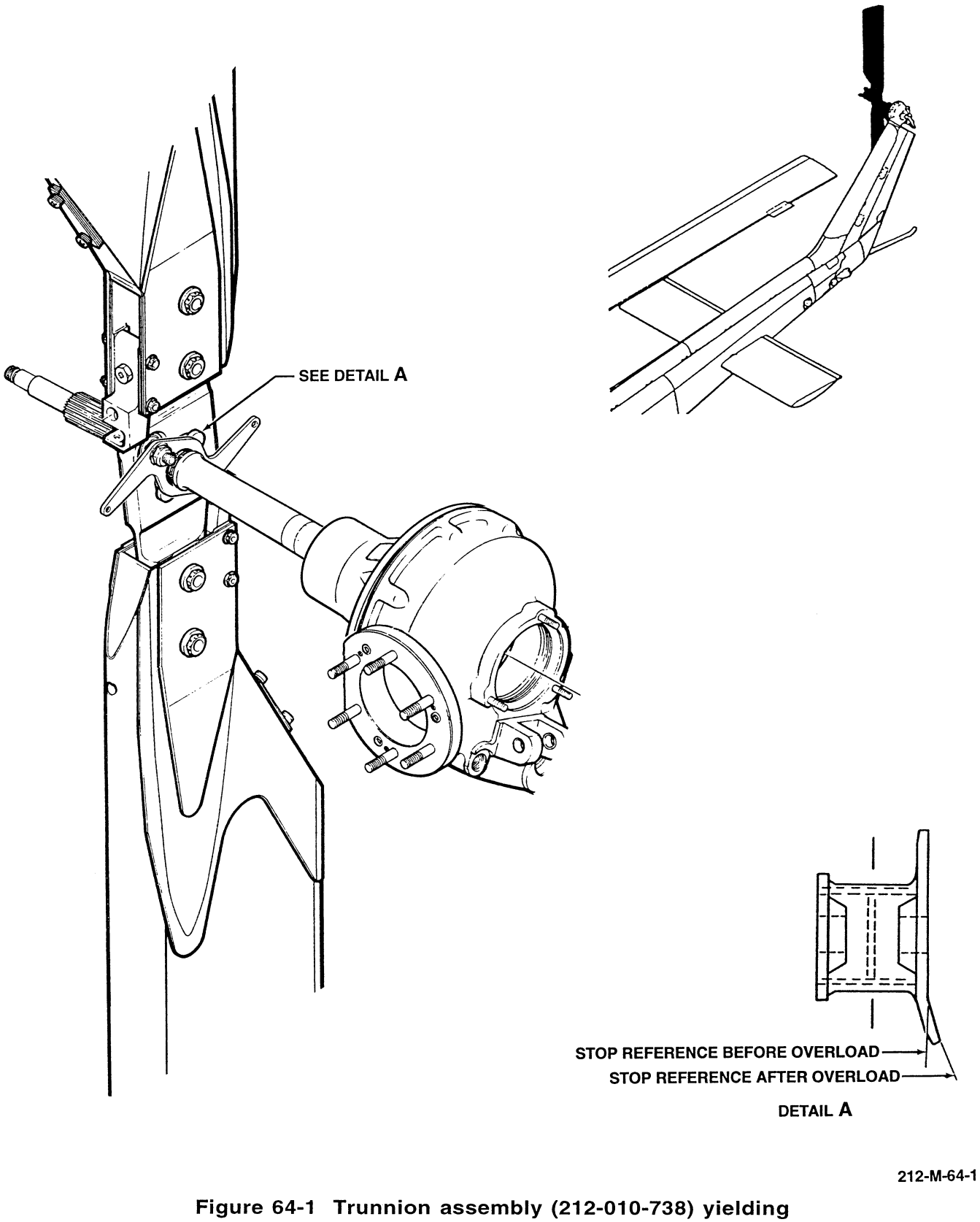


Figure 64-1 Trunnion assembly (212-010-738) yielding

b. First evidence of bearing wear will appear under one or both indicator tips as a bright mark (figure 64-2).

c. Marks will start to appear when bearing has reached approximately half its useful life. Marks will converge (forming one continuous line) when bearing replacement limit has been reached.

64-8. Removal.

NOTE

Refer to step 1. for removal of 212-010-707-1 tail rotor crosshead. Refer to step 2. for removal of 212-010-775-1 tail rotor crosshead.

1. Remove 212-010-707-1 tail rotor crosshead (7, figure 64-3) as follows:

a. Disconnect pitch links (8) from each tail rotor blade pitch horn (16) by removing bolt (14). Install bolt fingertight in barrel nut (17) to keep floating bushing (15) with pitch horn (16).

b. Disconnect each counterweight link (9) from counterweight support (12) by removing nut, washer, and bolt (13).

c. Remove two bolts (1) and washers with cap (2) from crosshead (7).

d. Remove cotter pin, nut (3), and washer (4) from end of pitch change tube (20).

e. Pull crosshead (7) from gearbox output shaft (21).

f. Remove bearing (5) and washer (6) from end of crosshead (7).

2. Remove 212-010-775-1 tail rotor crosshead (26) as follows:

a. Disconnect pitch links (8) from each tail rotor blade pitch horn by removing bolt (14). Install bolt finger tight to keep floating bushing (15) with pitch horn (16).

b. Disconnect each counterweight link (9) from counterweight support (12) by removing nut, washer, and bolt (13).

c. Remove two screws (23), washers, and lock (24) from crosshead (26).

d. Remove retainer nut (25) from crosshead (26).

e. Remove cotter pin, nut (3), and washer (4) from end of pitch change tube (20).

f. Remove bearing (5) and washer (6) from end of crosshead (26).

g. Remove shield (10) and retaining nut (11). Remove counterweight support (12).

h. Remove hub and blade assembly (18) from shaft, removing split cone set (22) as it is released.

NOTE

Sleeve (19) normally remains on pitch change tube (20), unless sleeve or tube is to be replaced. When necessary, pull sleeve outboard to engage threads and turn until disengaged.

3. Disassemble tail rotor crosshead as follows:

NOTE

This procedure is for disassembly of crosshead after removal from helicopter. Disassemble only to extent necessary to replace part(s).

a. Disconnect pitch link (17, figure 64-4) from crosshead (4) by removing cotter pin (1), nut (2), washers (3) and bolt (5).

b. Remove cotter pin (12), nut (11), washers (10) and bolt (20) to separate counterweight link (16) from bellcrank (18).

c. Remove bellcrank (18) from crosshead (4) by removing cotter pin (15), nut (14), washer (13) and washer (19).

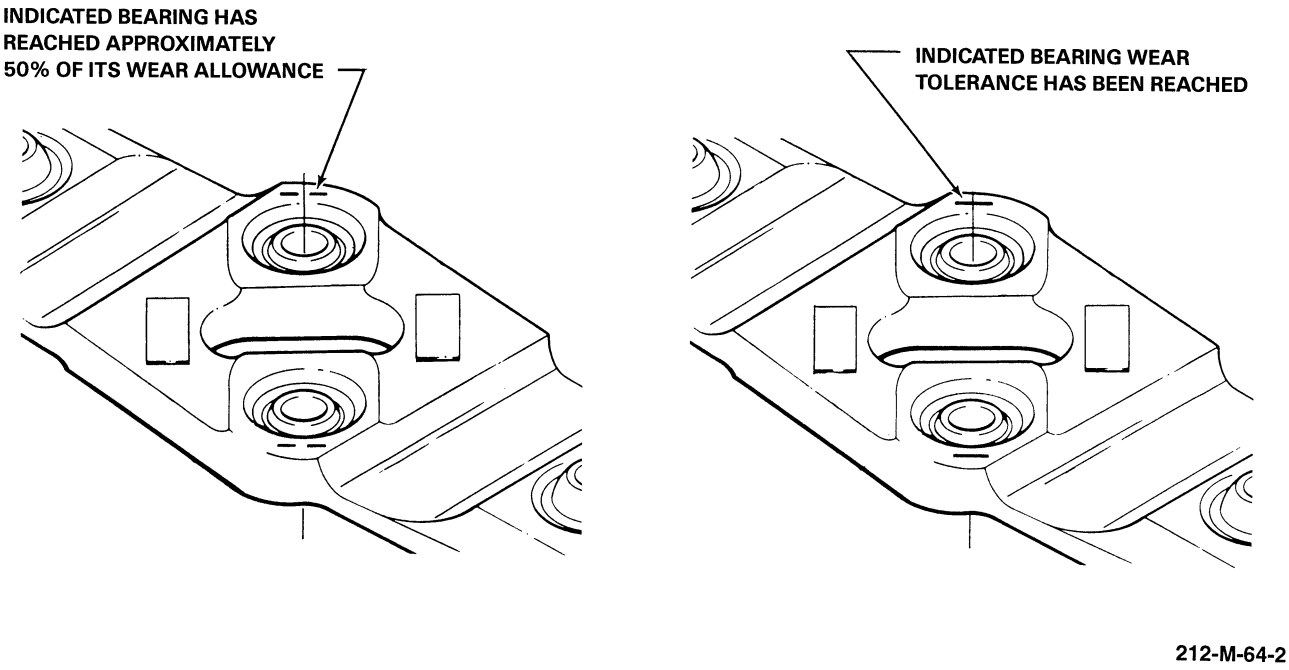


Figure 64-2. Bearing wear indicator marks

d. Remove attaching bolt (6), washer (8) and nut (9) to separate weights (7) from bellcrank (18).

64-9. Inspection and repair.

1. Inspect and repair pitch change mechanism (BHT-212-CR&O).

2. Inspect and repair crosshead components (BHT-212-CR&O).

3. Inspect bearing (5, figure 64-3) for metal contamination, lack of lubricant and roughness. Indication of rough bearing when rotated by hand is cause for replacement.

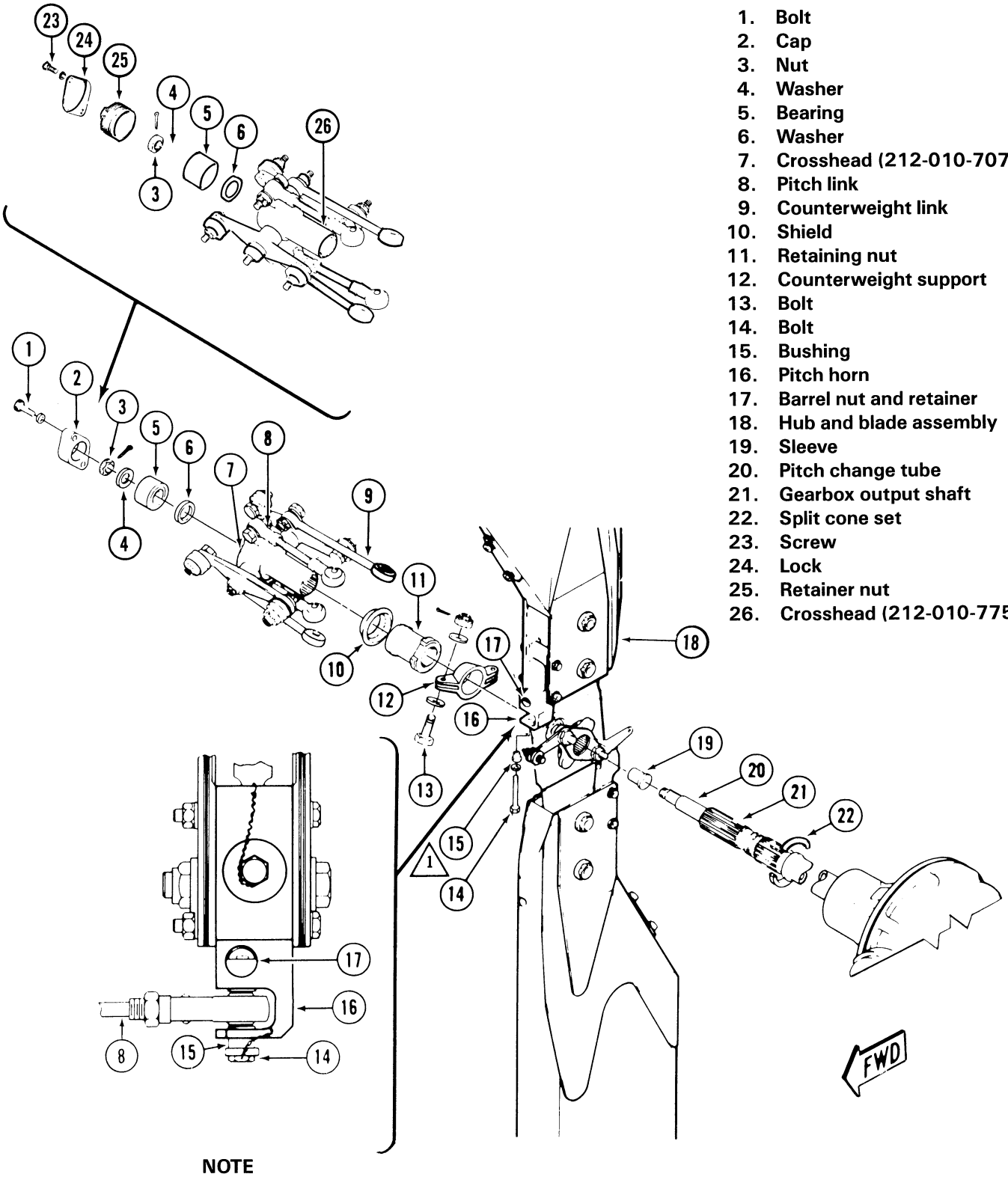
4. Inspect split cone set (22) for nicks, dents, scratches, and corrosion damage (figure 64-5).

5. Inspect sleeve (19), nut (11), and retainer nut (25) for maximum damage and repair limits (table 64-2).

6. Inspect bushing (15) for axial scoring on inside diameter, not more than 0.002 inch (0.0508 mm) is allowed and outside diameter shall not be less than 0.499 inch (12.67 mm).

Table 64-2. Tail rotor components damage and repair limits

TYPE OF DAMAGE	MAXIMUM DAMAGE AND REPAIR LIMITS
Mechanical	0.010 inch (0.254 mm)
Corrosion	0.010 inch (0.254 mm)
Maximum area for full depth repair	0.10 square inch (64.52 sq. mm)
Number of repairs	Not critical
Threads:	
Depths	1/3 of thread
Length	1/4 inch (6.35 mm)
Number	2 threads



NOTE

1 Use corrosion preventive compound (C-101) between bushing and horn.

212-M-64-3

Figure 64-3. Tail rotor hub and blade (212-010-701)

64-10. Installation.

MATERIALS REQUIRED

Refer to BHT-ALL-SPM for specification and source.

NUMBER	NOMENCLATURE
C-001	Grease
C-007	Bearing Grease
C-101	Corrosion Preventive Compound
C-304	Solvent
C-405	Lockwire

1. Verify sleeve (19, figure 64-3) is installed on threaded end of pitch change tube (20). Position hub and blade assembly (18) on gearbox shaft (21) with trunnion flap stops inboard.

2. Align master tooth of trunnion to master spline and slide hub on shaft until trunnion is just started on second set of splines.

3. Place cone set (22) with bevel outboard in groove between splines and shoulder on shaft, and with gaps equal at ends of cone sets. Slide hub inboard to set trunnion on cones. Verify gaps are still equal at end of cone sets.

4. Align counterweight support (12) on shaft against hub and install retaining nut (11). Hold rotor at hub and torque nut 900 inch-lbs. (101.68 Nm). Secure nut to counterweight support nipple with lockwire (C-405).

5. Assemble tail rotor crosshead as follows:

NOTE

This procedure is for reassembly of crosshead if crosshead has been disassembled for parts replacement.

Color coded nuts are matched during reassembly.

There shall be two weights at each of four locations on bellcrank for a total of eight weights.

a. Install weights (7, figure 64-4), two at each of four locations, on bellcrank (18) with bolts (6) (with bolthead in opposite direction of rotation), washer (8) and nut (9). Torque nut 60 inch-lbs. (6.78 Nm).

b. Position washer (19) and bellcrank (18) on crosshead (4), install washers (13) and nut (14). Torque nut (14) 100 to 170 inch-lbs. (11.30 to 19.21 Nm). Install cotter pin (15).

CAUTION

DO NOT MIX 212-010-711-1 and -3 COUNTERWEIGHT LINKS. 212-010-711-1 LINKS ARE MADE FROM ALUMINUM ALLOY AND 212-010-711-3 LINKS ARE MADE FROM STEEL.

c. Connect counterweight link (16) to bellcrank (18) with bolt (20) (with bolthead in opposite direction of rotation), washers (10), and nut (11). Torque nut (11) 60 to 110 inch-lbs. (6.78 to 12.43 Nm). Install cotter pin (12).

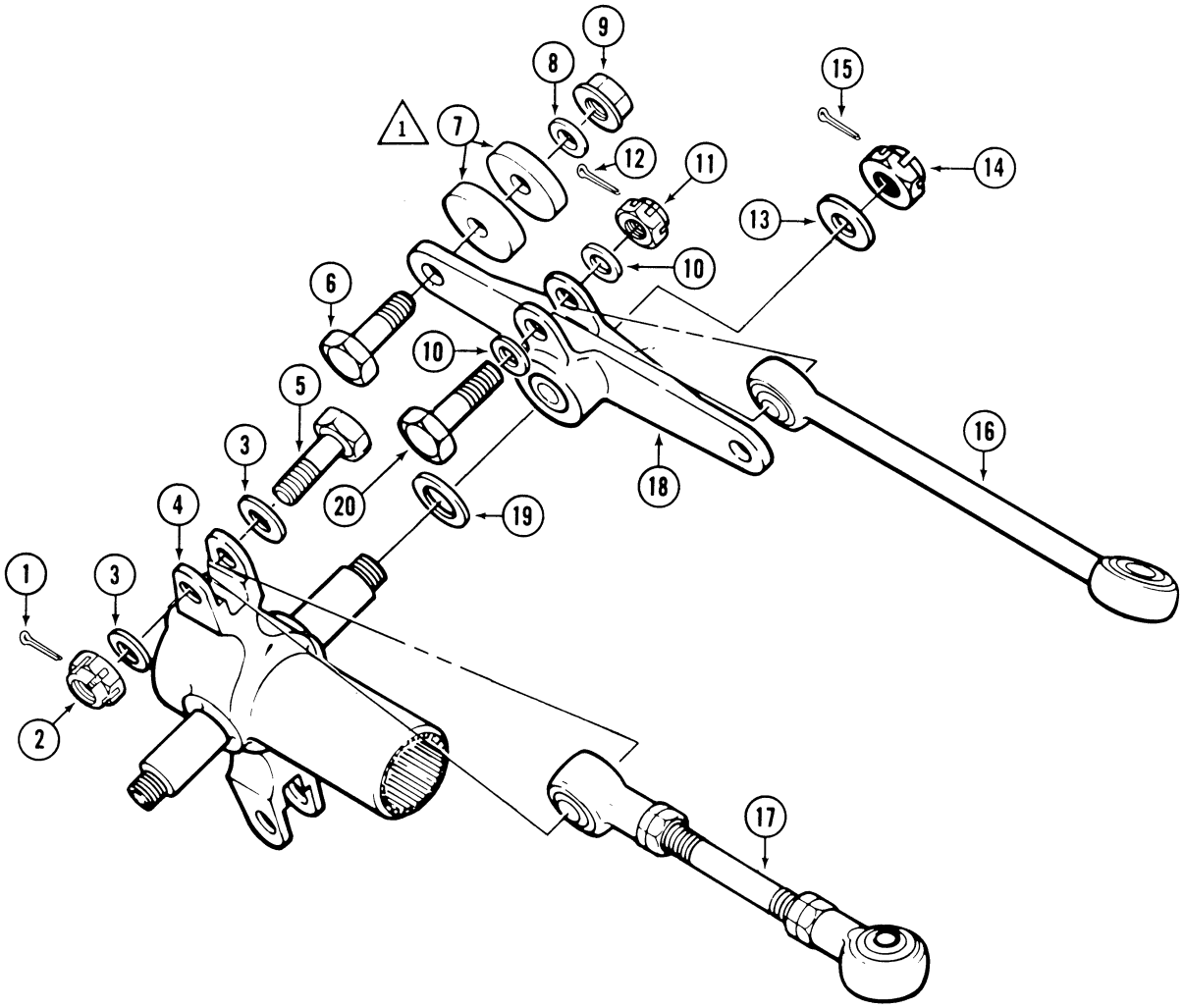
d. If new pitch links (17) or new tail rotor assembly is being installed, adjust pitch links to equal length of 6.115 ± 0.010 inches (155.32 ± 0.254 mm) between center line of bolt holes. If same pitch links and tail rotor assembly is being installed, do not adjust pitch links. Install links in original position.

e. Connect either end of pitch link (17) to crosshead (4) with bolt (5), washers (3) and nut (2). Torque nut (2) 110 to 165 inch-lbs. (12.43 to 18.64 Nm). Install cotter pin (1).

f. Repeat substeps a. through e. for opposite side of crosshead.

6. Place shield (10, figure 64-3), small end first, on inboard end of crosshead (7).

7. Handpack bearing (5) and coat crosshead splines with grease (C-001).



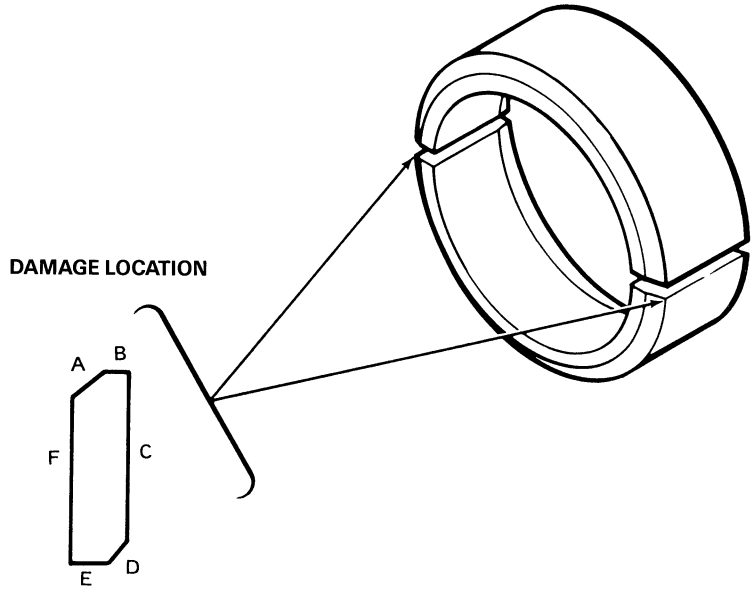
1. Cotter pin
2. Nut
3. Washer
4. Crosshead
5. Bolt
6. Bolt
7. Weight △1
8. Washer
9. Nut
10. Washer
11. Nut
12. Cotter pin
13. Washer
14. Nut
15. Cotter pin
16. Counterweight link
17. Pitch link
18. Bellcrank
19. Washer
20. Bolt

NOTE

△1 There must be two weights at each of the four locations for a total of eight weights.

212-M-64-4

Figure 64-4. Tail rotor crosshead assembly



SURFACES	MAXIMUM DAMAGE AND REPAIR DEPTH
A, B, C, D, E, and F	Damage shall not exceed 0.005 inch (0.127 mm) or 0.020 square inch (12.90 mm^2). Cone set shall not have more than two repairs.
End of Cone	End of cone may be damaged 0.030 inch (0.762 mm), if no material is protruding from the surface or overlapping the edges, the damage may be considered negligible.
A, B, C, D, E, and F	All edges may be chamfered 0.030 inch (0.762 mm).
A, B, C, D, E, and F	Surface dents less than 0.005 inch (0.127 mm) and 0.020 square inch (12.90 mm^2) need not be repaired, but metal moved above surrounding surface shall be dressed smooth.

212-M-64-5

Figure 64-5. Tail rotor cone set damage and repair limits

NOTE

When replacing bearing, wash preservative from new bearing with solvent (C-304), and air dry. Handpack bearing with grease (C-001) or bearing grease (C-007) before installation.

8. Assemble washer (6) and bearing (5) in outboard end of crosshead (7). Install crosshead assembly on gearbox output shaft, engaging master splines. Install washer (4) and nut (3) on end of pitch change control tube (20). Torque nut (3) 70 to 100 inch-lbs. (7.91 to 11.30 Nm). Install cotter pin.

9. If 212-010-707 crosshead is installed, accomplish substeps a. and b. If 212-010-775 crosshead is installed, accomplish substep c.

a. Install cap (2), using bolts (1) and washer.

CAUTION

USE OF A TORQUE WRENCH IS MANDATORY WHILE PERFORMING THE FOLLOWING PROCEDURE. DO NOT OVERTORQUE.

b. Using a torque wrench, tighten bolts (1) equally in increments of 10 inch-lbs. (1.130 Nm) until specified torque is achieved. Torque 25 to 30 inch-lbs. (2.82 to 3.39 Nm). Secure boltheads together with lockwire (C-405).

c. Install retainer nut (25) and torque 300 inch-lbs. (33.90 Nm). Position lock (24) over retainer and install screws (23) and washers. Secure screws with lockwire (C-405). Form lock (24) into notches of retainer (25), two places, near screws (23).

10. Apply two shots of grease (C-001) or bearing grease (C-007) to lube fitting using hand-type grease gun.

11. Connect each counterweight link (9) to counterweight support (12) by installing bolt (13), washers, and nut. Torque bolts 60 to 110 inch-lbs. (6.78 to 12.43 Nm). Install cotter pins.

CAUTION

DO NOT MIX 212-010-711-1 and -3 COUNTERWEIGHT LINKS. 212-010-711-1 LINKS ARE MADE FROM ALUMINUM ALLOY AND 212-010-711-3 LINKS ARE MADE FROM STEEL.

12. Connect pitch link (8) to each pitch horn (16) as follows:

a. Assemble bolt (14) and bushing (15) with bushing flange next to bolthead. Apply corrosion preventive compound (C-101) on bushing surface which will mate with bore in horn.

b. Align link rod end in horn and install bolt (14) and bushing (15). Torque bolt 135 inch-lbs. (15.25 Nm). Secure bolt head to horn with lockwire (C-405).

NOTE

Ensure flanges of floating bushings (15) do not seat against ears of pitch horns (16) so tightening bolts does not cause bending stress on horns. No washers are used on these bolts.

13. Check rigging of tail rotor controls (Chapter 67). Check track of tail rotor blades (Chapter 18).

HUB AND BLADE ASSEMBLY (212-011-701)

64-11. HUB AND BLADE ASSEMBLY. (212-011-701)

Accomplish the following maintenance procedures for the 212-011-701 hub and blade assembly. For the 212-010-701 hub and blade assembly, refer to paragraph 64-4 .

64-12. MAINTENANCE.

64-13. Inspection - Flapping Stop (212-011-713) Yielding

NOTE

This inspection is required by 25 Hour Special Inspection and certain Conditional Inspections (Chapter 5). This inspection is also required if damaging/excessive bending loads are suspected to have been sustained such as high winds gusts, improper ground handling (tail rotor blade used as a hand hold), improper feathering bearing removal or static ground strike that could cause yielding.

1. Gain access to tail rotor assembly using a maintenance stand or other means to allow close viewing of the trunnion assembly. Perform visual inspection of flapping stop ears for deformation (figure 64-6).

a. Gently place tail rotor yoke against one flapping stop ear, allowing full view of the opposite stop.

b. Repeat in opposite direction to allow viewing of remaining stop.

2. If either flapping stop ear is deformed or bent as shown in figure 64-6 , yoke assembly has been yielded. Both the yoke assembly and trunnion assembly are no longer serviceable and must be removed and discarded. If any doubt exists about serviceability of these parts, contact BHT-Product Support Engineering.

64-14. Removal.

1. Remove tail rotor crosshead as follows:

a. Remove balance bracket (27, figure 64-7).

b. Disconnect pitch links (10) from each tail rotor blade pitch horn (25) by removing bolt (23). Install bolt fingertight in barrel nut (21), to keep floating bushing (24) with pitch horn (25).

c. Disconnect counterweight link (12) from counterweight support (20) by removing cotter pin (15), nut (19), washers (17 and 18), and bolt (16).

d. Remove two screws (1) and washers (2) with lock (3) from crosshead (11).

e. Remove retainer nut (4) from crosshead (11).

f. Remove cotter pin (6), nut (5), and washer (7) from end of tube (29).

g. Remove bearing (8) and washer (9) from end of crosshead (11).

h. Pull crosshead (11) from shaft.

2. Remove shield (13), nut (14), support (20), and stop (22).

3. Remove hub and blade assembly (26) from shaft.

4. Remove packing (32) and split cone set (31).

NOTE

Sleeve (28) normally remains on pitch change tube (29), unless sleeve or tube is to be replaced. When necessary, pull sleeve

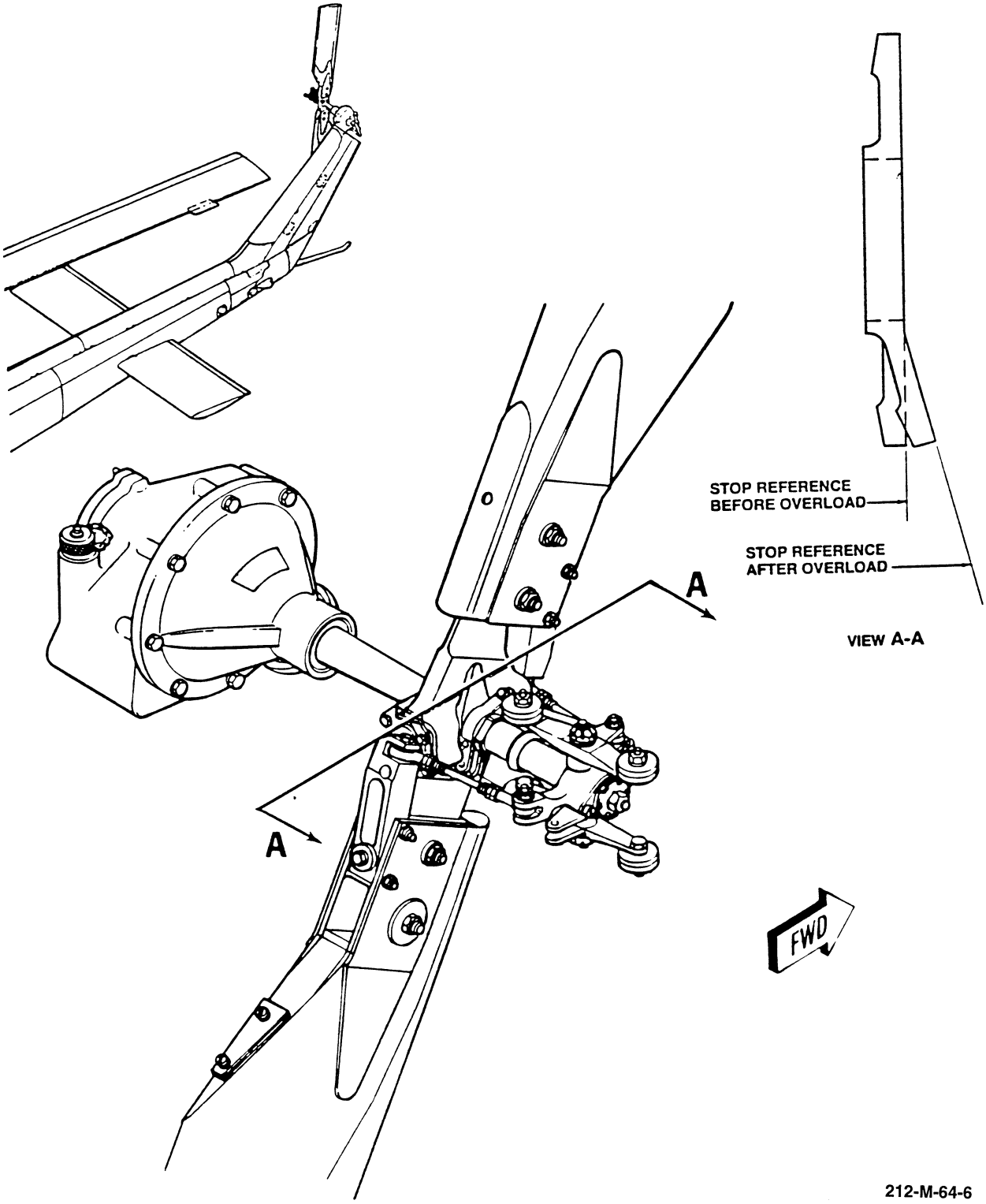


Figure 64-6. Flapping stop (212-011-713) yielding

outboard to engage threads and turn until disengaged.

64-15. Inspection and repair.

1. Inspect pitch change mechanism for mechanical and corrosion damage (BHT-212-CR&O).

2. Inspect bearing (8, figure 64-7) for metal contamination, lack of lubricant, and roughness. Indication of rough bearing when rotated by hand is cause for replacement.

3. Inspect cone set (31) for nicks, dents, scratches and corrosion damage (figure 64-8).

4. Inspect sleeve (28, figure 64-7), nut (14), and retainer (4) for damage (table 64-2).

5. Inspect bushing (24, figure 64-7) for axial scoring on inner diameter, not more than 0.002 inch (0.051 mm) is allowed and outer diameter shall not be less than 0.438 inch (11.13 mm).

64-16. Installation.

MATERIALS REQUIRED

Refer to BHT-ALL-SPM for specification and source.

NUMBER	NOMENCLATURE
C-001	Grease
C-101	Corrosion Preventive Compound
C-304	Solvent
C-405	Lockwire

1. Place cone set (31, figure 64-7), with bevel outboard, in groove between splines and shoulder on shaft. Place packing (32) over cone set, and with gaps equal at ends of cone set.

2. Ensure sleeve (28) is installed on threaded end of tube (29). Position hub and blade assembly (26) on shaft (30).

3. Align master tooth of trunnion to master spline on tail rotor gearbox shaft and slide hub on shaft until trunnion is seated on cone set (31). Verify gaps are still equal at end of cone set.

4. Align stop (22) and support (20) on shaft against hub. Install nut (14). Hold rotor at hub and torque nut 900 inch-lbs. (101.68 Nm). Secure nut to counterweight support (20) with lockwire (C-405).

5. Place shield (13), small end first, on inboard end of crosshead (11).

6. Handpack bearing (8) and coat crosshead splines with grease (C-001).

NOTE

When replacing bearing, wash preservative from new bearing with solvent (C-304)and air-dry. Handpack bearing with grease (C-001) before installation.

7. Assemble washer (9) and bearing (8) in outboard end of crosshead (11).

8. Install crosshead assembly on gearbox output shaft, engaging master splines.

9. Install washer (7) and nut (5) on end of tube (29). Torque nut (5) 70 to 100 inch-lbs. (7.91 to 11.30 Nm). Install cotter pin (6).

10. Fill cavity of retainer (4) with grease (C-001). Install retainer (4) and torque 300 inch-lbs. (33.89 Nm).

11. Position lock (3) over retainer and install screws (1) and washers (2). Secure screws with lockwire (C-405). Form lock (3) into notches of retainer (4), two places, near screws (1).

12. Apply two shots of grease (C-001) to lube fitting using hand-type grease gun.

13. Connect each counterweight link (12) to counterweight support (20) by installing bolt (16), washers (17 and 18), and nuts (19). Torque 60 to 110 inch-lbs. (6.78 to 12.43 Nm). Install cotter pins.

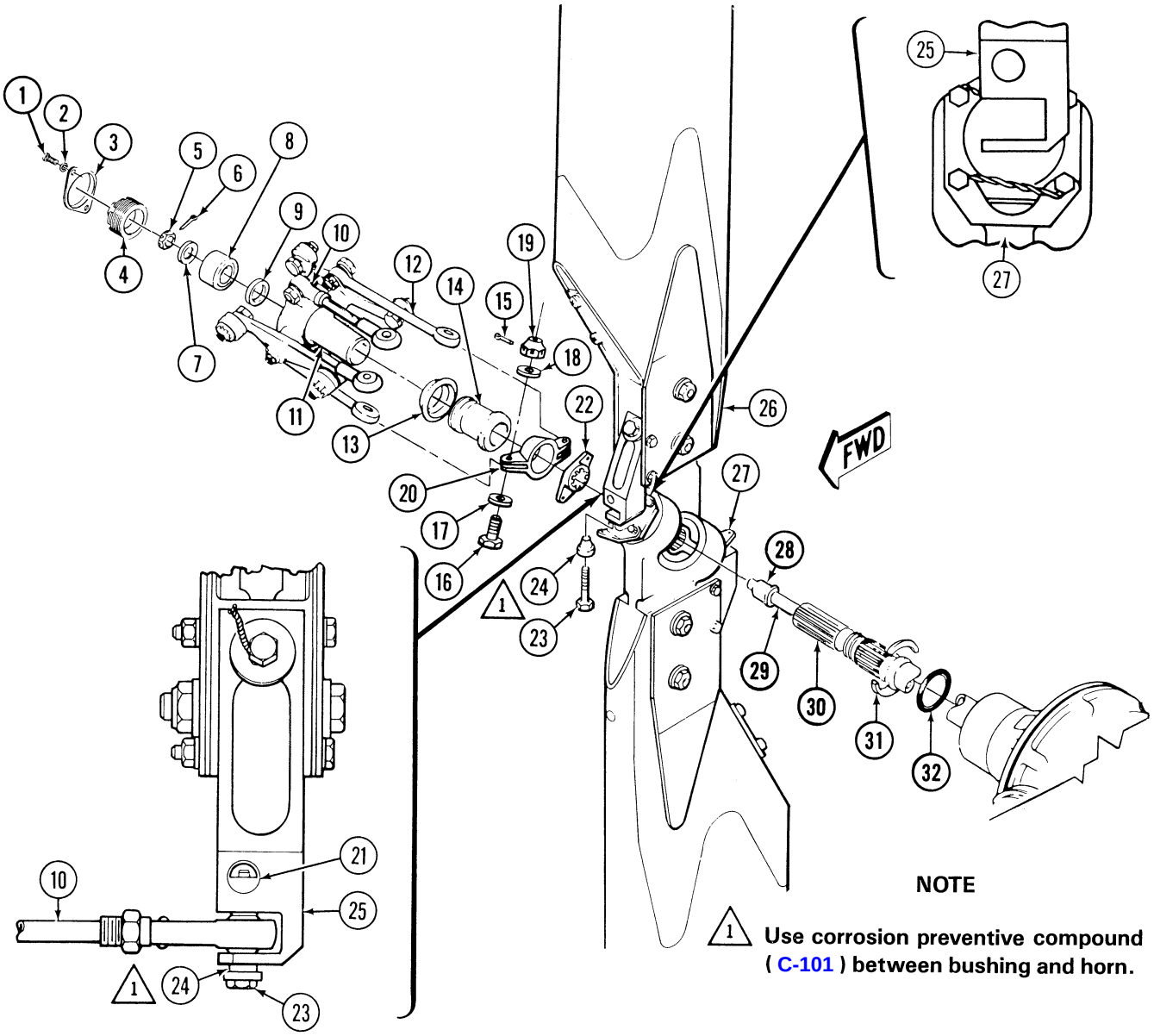
14. Connect pitch link (10) to each pitch horn (25) as follows:

a. Assemble bolt (23) and bushing (24) with bushing flange next to bolt head or bushing next to bolthead (if modified by BHT-212-SI-68 . Apply corrosion preventive compound (C-101) on bushing surface which will mate with bore in horn.

b. Align link rod end in horn and install bolt and bushing. Torque bolt 135 inch-lbs. (15.25 Nm). Secure bolthead to horn with lockwire (C-405).

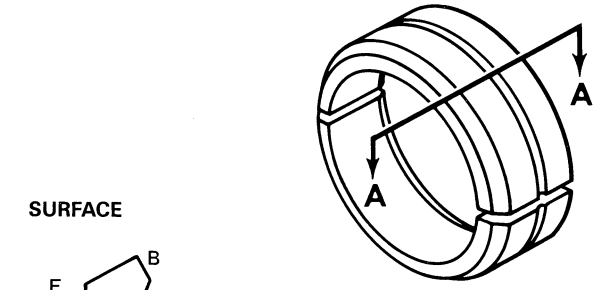
c. Install balance bracket (27). Torque bolts 35 to 40 inch-lbs. (3.95 to 4.52 Nm). Secure with lockwire (C-405) as shown.

15. Check rigging of tail rotor controls (Chapter 67). Check track of tail rotor blades (Chapter 18).



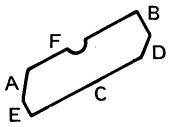
1. Screw
2. Washer
3. Lock
4. Retainer
5. Nut
6. Cotter pin
7. Washer
8. Bearing
9. Special washer
10. Pitch link
11. Crosshead
12. Counterweight link
13. Shield
14. Retaining nut
15. Cotter pin
16. Bolt
17. Washer
18. Washer
19. Nut
20. Counterweight support
21. Barrel nut and retainer
22. Stop
23. Bolt
24. Bushing △1
25. Pitch horn
26. Hub and blade
27. Balance bracket
28. Sleeve
29. Pitch change control tube
30. Gearbox output shaft
31. Split cone set
32. Packing

Figure 64-7. Tail rotor hub and blade (212-011-701)



212-011-714-1
TAIL ROTOR CONE SET

SURFACE



SECTION A-A

NOTES

1. The two halves of the set are serial numbered and must be kept together as a set.

2. No cracks are acceptable.

3. Damage to surfaces C, E, and F that does not exceed 0.010 inch (0.254 mm) and with minimum radii of 0.25 inch (0.64 mm) is acceptable without repair.

4. Surfaces A and D must not have any protrusions above the surrounding surface. Polish out raised material with crocus cloth. Damage is acceptable if depth after polishing does not exceed 0.010 inch (0.254 mm).

5. Mechanical damage on surface B up to 0.005 inch (0.127 mm) deep is acceptable is polished out as follows:

   a. Place a sheet of 600 grit abrasive paper (C-423) on a surface plate or on a piece of smooth glass as large as the sheet of abrasive paper.

   b. Hold two halves of split cone set together and polish out damage on surface B by moving the split cone set (surface B) on the abrasive paper. The same amount of material must be removed from both halves of the set.

   c. When damage has been polished out, the minimum acceptable dimensions from surface B to surface E is 0.370 inch (9.398 mm): also, the dimension must be equal at all points.

6. All edges may be chamfered 0.030 inch (0.762 mm).

212-M-64-8

Figure 64-8. Tail rotor cone set (212-011-714-1) damage and repair limits

PITCH CHANGE MECHANISM

64-17. PITCH CHANGE MECHANISM.

The tail rotor pitch change mechanism consists of a link, lever, and idler mounted on left side of tail rotor gearbox, attached to a control tube, which extends through hollow output shaft of gearbox and connects to pitch control crosshead, which is linked to tail rotor. Movement of pedals is transmitted through linkage to lever which moves control tube to change pitch of blades.

64-18. MAINTENANCE.

64-19. Removal.

1. Separate link (13, figure 64-9) from bellcrank (11) and lever (9) by removing bolts (10 and 12) with attaching nuts and washers.

2. Disconnect lever (9) from pitch change tube (7) and idler (15) by removing bolts (14 and 17) with attaching nuts and washers. Remove race (8) from lever.

3. Separate idler (15) from mounting boss on gearbox housing by removing nut, washers, and bolt (16).

4. Remove tail rotor crosshead (paragraph 64-7 or 64-12).

5. Pull pitch change tube (7) from housing (2).

6. Remove three nuts and washers attaching housing (2) to gearbox housing. Use suitable jackscrews in housing holes and remove housing.

7. Disassemble housing (2) as necessary:

a. Remove retainer (6), excluder housing (5), seal (18), and excluder (4).

b. Push bearing (3) out from inside housing.

c. Remove and discard packing (1).

64-20. Inspection and repair.

MATERIALS REQUIRED

Refer to BHT-ALL-SPM for specification and source.

NUMBER	NOMENCLATURE
C-100	Chemical Film Material
C-201	Primer

1. Inspect and repair lever (9, figure 64-9), idler (15) and tube (7) (BHT-212-CR&O).

2. Inspect for accumulation of foreign material on pitch change tube (7).

3. Inspect lower bearing in lever (9) for binding or excessive tightness. Grasp link (13) with slight hand pressure and check for rotational movement of lower bearing. If tightness of lower bearing in lever (9) is found, rotate lower bearing in lever (9) upward. Attach a spring scale to clevis control bolt nut. Pull slowly and evenly downward on the scale. The force required to rotate the bearing shall not exceed 10 lbs. (44.48 N). If a force greater than 10 lbs. (44.48 N) is required to rotate bearing, replace lever (9).

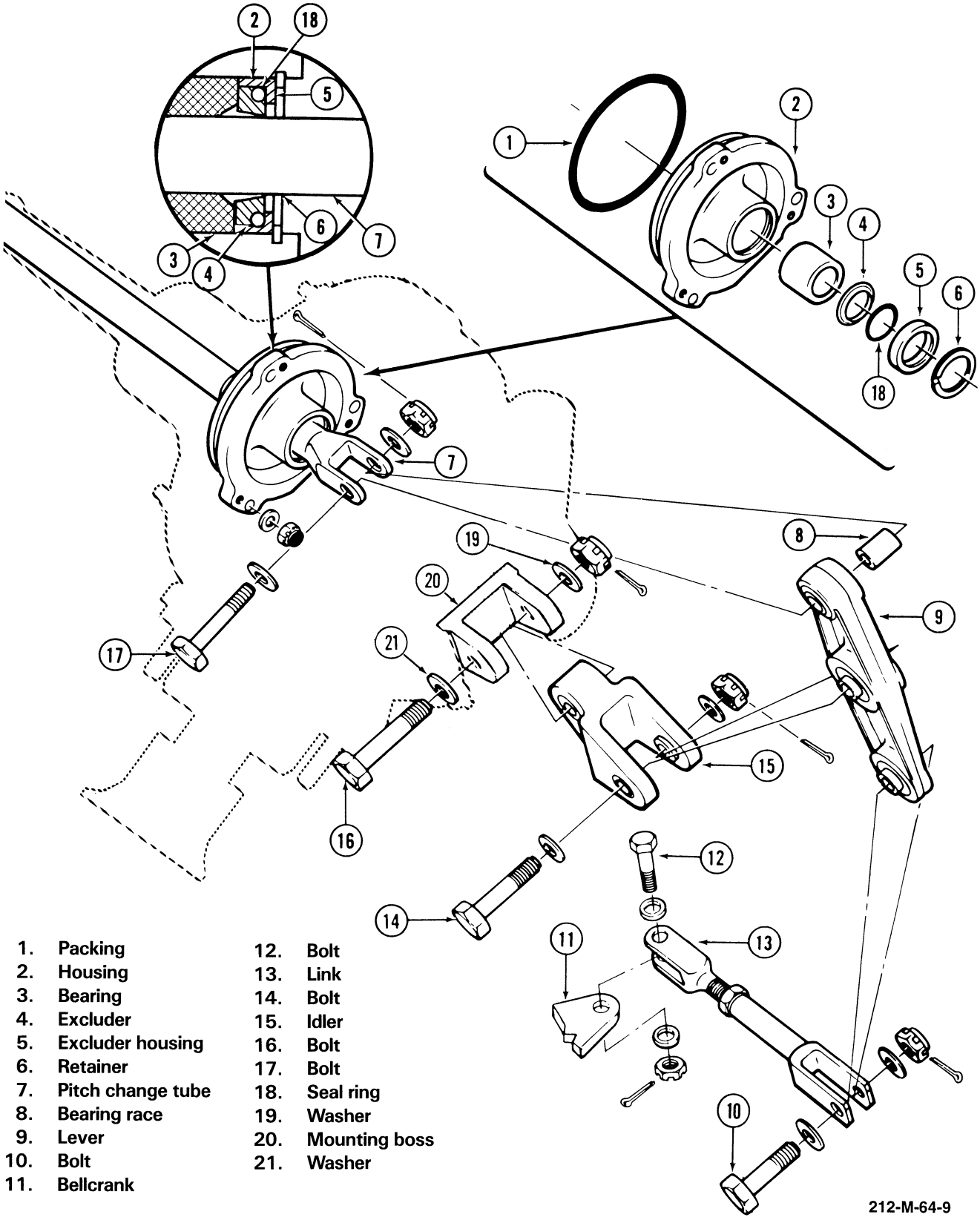
CAUTION

DO NOT ROTATE LINK PAST NORMAL TRAVEL, DAMAGE TO SEAL RETAINER CAN RESULT IF EXCESSIVE ROTATION OCCURS.

4. Inspect link assembly (13), housing (2), and other components for nicks, scratches and other mechanical and corrosion damage (BHT-212-CR&O).

5. Visually inspect excluder housing (5).

6. Inspect bearing (3) for maximum inside diameter of 0.765 inch (19.43 mm).



1. Packing
2. Housing
3. Bearing
4. Excluder
5. Excluder housing
6. Retainer
7. Pitch change tube
8. Bearing race
9. Lever
10. Bolt
11. Bellcrank
12. Bolt
13. Link
14. Bolt
15. Idler
16. Bolt
17. Bolt
18. Seal ring
19. Washer
20. Mounting boss
21. Washer

Figure 64-9. Tail rotor pitch change mechanism

7. Apply chemical film material (C-100) to repaired area.

8. Replace any part that exceeds specified limits.

9. Coat repaired area with primer (C-201).

10. Inspect antitorque control tubes for nicks, dents, scratches, and corrosion (BHT-212-CR&O).

64-21. Installation.

MATERIALS REQUIRED

Refer to BHT-ALL-SPM for specification and source.

NUMBER	NOMENCLATURE
C-007	Bearing Grease
C-201	Primer
C-304	Solvent
C-309	Methyl-Ethyl-Ketone (MEK)
C-328	Sealing Compound
C-407	Abrasive Pad

1. Assemble housing (2, figure 64-9) as follows:

a. Push bearing (3) in from outside of cap until seated.

b. Place excluder (4), seal (18), and excluder housing (5) into housing (2). Press firmly against bearing (3).

CAUTION

INSTALL HOUSING (2) WITH FLANGE OUTBOARD NEXT TO RETAINER.

c. Install retainer (6) in groove of housing (2).

d. Position a new packing (1) into outer flange of housing (2).

2. Apply wet, unreduced primer (C-201) to mating flange of housing (2) and install into gearbox. Install three washers and nuts on case studs. Torque 60 inch-lbs. (6.78 Nm).

3. Lubricate pitch change tube (7) with bearing grease (C-007) in area of bearing (3).

4. Insert threaded end of pitch change tube (7) through housing (2) and gearbox shaft.

NOTE

If pitch change tube (7) binds inside bearing (3), clean inside diameter of bearing using a fine grade of abrasive pad (C-407). Clean bearing and pitch change tube with MEK (C-309).

5. Bond washers (19 and 21) to mounting boss (20) with sealing compound (C-328).

6. Position idler (15) on mounting boss of gearbox. Install bolt (16) with washers under bolthead and nut. Torque nut 110 to 165 inch-lbs. (12.43 to 18.64 Nm). Install cotter pin.

7. Clean bearing in upper end of lever (9) with solvent (C-304). Allow to air-dry. Hand-pack bearing with bearing grease (C-007). Insert race (8) into lever (9).

8. Attach lever (9) to pitch change tube (7) with bolt (17) with washers under bolthead and nut. Torque nut 110 to 165 inch-lbs. (12.43 to 18.64 Nm). Install cotter pin.

9. Align holes in idler (15) with center hole in lever (9). Install bolt (14) with washer under bolthead and nut. Torque nut 110 to 165 inch-lbs. (12.43 to 18.64 Nm). Install cotter pin.

10. Attach link (13) to lower end of lever (9) with bolt (10) with washer under bolthead and nut. Torque nut 60 to 110 inch-lbs. (6.78 to 12.43 Nm). Install cotter pin.

11. Attach opposite end of link (13) to bellcrank (11) of tail rotor controls with bolt (12) using washer under bolthead and nut.

Torque nut 60 to 110 inch-lbs. (6.78 to 12.43 Nm). Install cotter pin.

NOTE

If P/N 209-011-712-101 lever (9) is installed, refer to figure 12-2 for lubrication.

12. Install tail rotor crosshead (paragraph 64-9 or 64-14).

13. Check rigging of tail rotor controls (Chapter 67).

TAIL ROTOR BLADES

64-22. TAIL ROTOR BLADES

Each tail rotor blade is a bonded assembly consisting of a shaped stainless steel spar forming the leading edge, an aluminum alloy honeycomb core, and aluminum alloy skins. A flat trailing edge is formed by the extension of skins over a narrow aluminum strip. Aluminum alloy doublers and grip plates and butt blocks reinforce root end of blade. This section extends inboard to form a "box" open toward hub and trailing edge. Two bolt holes through upper and lower surfaces provide for attachment of blade to hub. Externally attached balance weights and balance screws inside blade tip facilitate blade balancing.

NOTE

Removal and installation of tail rotor blades is not provided in this manual. If a requirement exists to replace or repair any component of the hub and blade assembly, tail rotor hub and blade must be statically balanced (BHT-212-CR&O).

64-23. TAIL ROTOR BLADE MAINTENANCE

The following paragraphs provide inspection, minor repair and touch up painting procedures only. For more extensive maintenance, i.e., removal, balancing, and installation, refer to BHT-212-CR&O For buffer pad replacement and blade butt sealing, refer to BHT-212-CR&O.

64-24. Inspection

MATERIALS REQUIRED

Refer to BHT-ALL-SPM for specifications and source.

NUMBER	NOMENCLATURE
C-309	Methyl-Ethyl-Ketone (MEK)
C-323	Epoxy Filler
C-331	Adhesive
C-424	Putty

1. Inspect tail rotor blade records. If records or physical appearance indicate tail rotor blades have been involved in an accident or incident, refer to Chapter 5 for conditional inspection requirements.

CAUTION

DESCRIBING AND DEFINING ALL DEFECTS WHICH CAN OCCUR ON A TAIL ROTOR BLADE IS VIRTUALLY IMPOSSIBLE THEREFORE, USE THE FOLLOWING INSPECTION CRITERIA ONLY AS A GUIDE. CONSULT QUALIFIED ENGINEERING BEFORE SCRAPPING ANY BLADE EXCEPT IN CASES WHERE BLADES ARE OBVIOUSLY NONREPAIRABLE.

2. Inspect tail rotor blades and record whether damage is within repair limits noted in steps a. through f.

CAUTION

IF A FATIGUE CRACK EXISTS AT ANY LOCATION, FORWARD BLADE TO AN AUTHORIZED BLADE REPAIR STATION FOR EVALUATION. INSPECT DENTS CLOSELY FOR NICKS, SCRATCHES, AND CRACKS. IF NICKS OR SCRATCHES EXIST IN DENTS AND TOTAL DEPTH EXCEEDS THAT PERMITTED FOR DENTS ALONE, REPLACE BLADE.

a. Nicks, scratches, dents, and corrosion on the skins, doublers, grip plates, and stainless steel spar (leading edge) that fall within the following limits are considered repairable damage and are acceptable if repaired in accordance with paragraphs 64-25 and 64-26. Blades with more extensive damage may be sent to an authorized Bell Helicopter blade repair facility for evaluation.

(1) Skins

(a) Inboard of Station 40.0

Nicks and scratches on the aluminum skin 0.003 inch (0.08 mm) deep or less are acceptable when polished out in accordance with paragraph 64-25.

Sharp dents 0.003 inch (0.08 mm) deep or less are acceptable when polished out in accordance with paragraph 64-25.

Non-sharp dents 0.015 inch (0.38 mm) deep or less are permissible, provided all other repair limits are met.

Corrosion: Only superficial corrosion that can be removed with aluminum wool or very fine grade scrotchbrite abrasive pad is permissible. Repair in accordance with paragraph 64-25.

No damage permitted within 0.75 inch (19.05 mm) of a doubler edge.

(b) Outboard of Station 40.0

Nicks and scratches on the aluminum skin 0.005 inch (0.13 mm) deep or less are acceptable when polished out in accordance with paragraph 64-25.

Sharp dents 0.005 inch (0.13 mm) deep or less are acceptable when polished out in accordance with paragraph 64-25.

Non-sharp dents 0.030 inch (0.76 mm) deep or less are permissible, provided all other repair limits are met.

Corrosion: Only superficial corrosion that can be removed with aluminum wool or very fine grade scotchbrite abrasive pad is permissible. Repair in accordance with paragraph 64-25.

(2) Spar

(a) Inboard of Station 40.0

Nicks and scratches on the steel spar 0.003 inch (0.08 mm) deep or less are acceptable when polished out in accordance with paragraph 64-25.

Sharp dents on the steel spar 0.005 inch (0.13 mm) deep or less are acceptable when polished out in accordance with paragraph 64-25.

Non-sharp dents 0.015 inch (0.38 mm) deep or less are permissible, provided all other repair limits are met.

Corrosion: Corrosion on the steel spar 0.003 inch (0.08 mm) deep or less is acceptable when polished out in accordance with paragraph 64-25.

No damage permitted within 0.75. inch (19.05 mm) of a doubler edge.

(b) Outboard of Station 40.0

Nicks and scratches on the steel spar 0.005 inch (0.13 mm) deep or less are acceptable when polished out in accordance with paragraph 64-25.

Sharp dents on the steel spar 0.015 inch (0.38 mm) deep or less are acceptable when polished out in accordance with paragraph 64-25.

Non-sharp dents 0.030 inch (0.76 mm) deep or less are permissible, provided all other repair limits are met.

Corrosion: Corrosion on the steel spar 0.005 inch (0.13 mm) deep or less is acceptable when polished out in accordance with paragraph 64-25.

(3) Doublers and Grip Plates

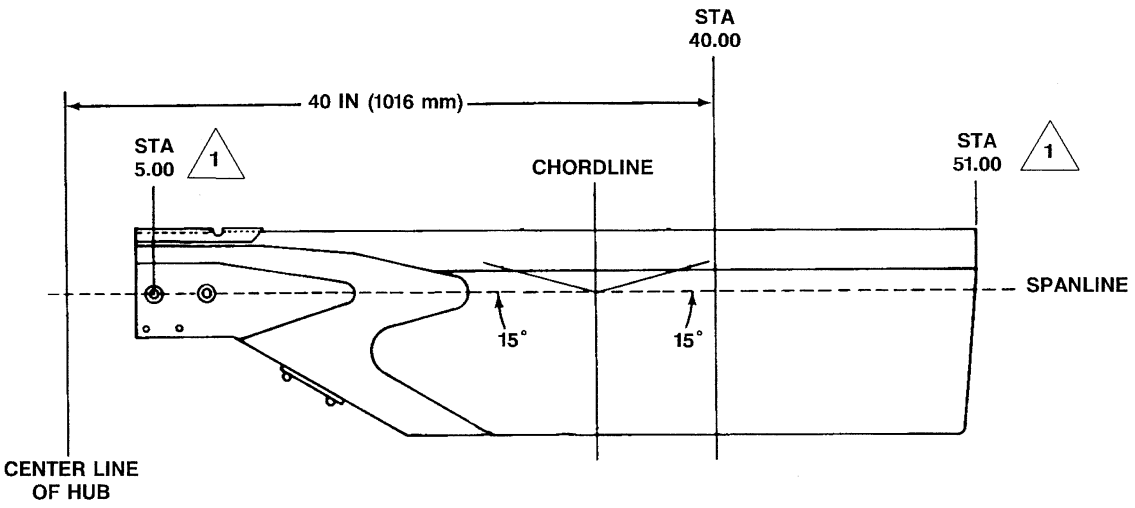
Damage to edges: No damage or repair permitted on an edge of a doubler or grip plate, or within 0.5 inch (12.7 mm) of an edge.

Nicks and scratches on the aluminum doublers and grip plates 0.005 inch (0.13 mm) deep or less are acceptable when polished out in accordance with paragraph 64-25.

Sharp dents 0.005 inch (0.13 mm) deep or less are acceptable when polished out in accordance with paragraph 64-25.

Non-sharp dents 0.015 inch (0.38 mm) deep or less are permissible.

Corrosion: Corrosion on the aluminum doublers and grip plates 0.0025 inch (0.06 mm) deep or less is acceptable when polished out in accordance with paragraph 64-25. Repair must be twice the depth of the visible corrosion to ensure complete removal.



NOTE:

1 Add 0.5 inch (12.7 mm) if blade is installed on tail rotor hub 212-011-701.

212MM-64000-00100-001

Figure 64-10. Tail Rotor Blade

(4) Limits - trailing edge

(a) Nicks and scratches in trailing edge up to 0.030 inch (0.762 mm) in depth (chordwise) are acceptable if polished out over a distance of at least 3.0 inches (76.2 mm) each side of damage.

(b) Refer to paragraph 64-25 for instructions to polish out damage.

(5) Requirement to smooth and fair dented areas: Non-sharp dents that are within limits, but are more than 0.010 inch (0.254 mm) deep shall be filled and faired with putty (C-424) or epoxy filler (C-323).

b. Void limits

NOTE

Voids are defined as unbonded areas which are supposed to be bonded. Many subdefinitions of voids are often given, such as lack of adhesion, gas pockets, misfits, etc. The general term "void" as used herein makes no distinction between these definitions. Where two voids of different limitations (Example: Void between core and skin adjacent to a void between skin and doubler) are closer together than 1.0 inch (25.4 mm), consider the defect as one void and apply the stricter limitation.

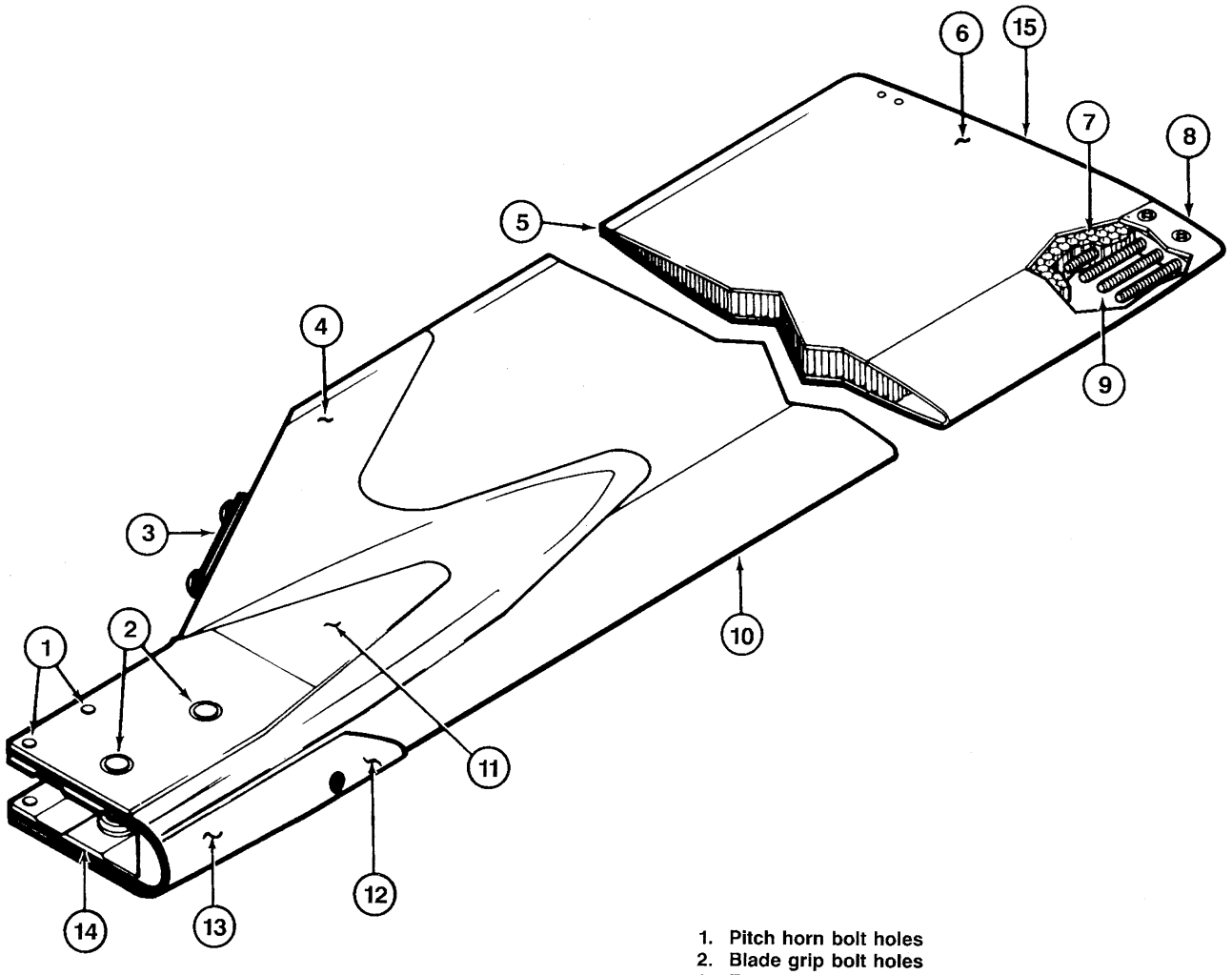
(1) Edge voids (figure 64-11): Acceptable edge voids must be sealed in accordance with paragraph 64-25.

(a) Edge voids of 0.250 inch (6.350 mm) maximum in depth by 1.50 inches (38.10 mm) maximum in length between butt block (13, figure 64-11) and spar (10), or between butt block and inner grip plates (14).

(b) Edge voids of 0.060 inch (1.524 mm) maximum in depth, by 2.0 inches (50.80 mm) maximum in length between grip plates (11) and doublers (4), doublers and skins (6), or spar (10), inner grip plates (14) and spar, butt block (13) and skins (6). Edge voids between the skin and spar are not acceptable.

(c) Edge voids of 0.120 inch (3.048 mm) maximum in depth by 3.0 inches (76.20 mm) maximum in length between the skins (6) and trailing edge strip (5).

(d) Edge voids of 0.50 inch (12.7 mm) maximum in width (chordwise) between spar (10) and tip block (8).



1. Pitch horn bolt holes
2. Blade grip bolt holes
3. External balance weights
4. Doubler
5. Trailing edge
6. Skin
7. Honeycomb core
8. Tip block
9. Balance screws
10. Spar
11. Grip plate
12. Drain hole doubler
13. Butt block
14. Inner grip plate
15. Tip closure

212MM-64000-00110-001

Figure 64-11. Tail Rotor Blade Assembly

(e) A void of 0.38 inch (9.652 mm) maximum spanwise by 3.0 inches (76.2 mm) maximum chordwise is acceptable between the skin and tip closure in either the top or bottom or both, provided it is not within 0.12 inch (3.048 mm) from the edge of skin. If edge distance is less than 0.12 inch (3.048 mm), void may be repaired by lifting the skin and rebonding with adhesive (C-331).

CAUTION

NO VOIDS ARE ACCEPTABLE WITHIN 0.50 INCH (12.7 MM) OF THE EDGES OF DRAIN HOLE DOUBLER. NO VOIDS ARE ACCEPTABLE BETWEEN DRAIN HOLE DOUBLER AND SPAR WITHIN 0.50 INCH (12.7 MM) OF EDGE OF THE DRAIN HOLE.

(2) Voids, other than edge voids:

(a) No voids are acceptable between grip plates (11) and doublers (4), or between inner grip plates (14) and spar (10), except as described in step (1)(b).

(b) A void of 0.50 inch (12.7 mm) maximum chordwise by 2.0 inches (50.80 mm) maximum spanwise between doublers (4) and skin (6), or spar (10), is acceptable provided it is not within 0.50 inch (12.7 mm) of edge of doubler.

(c) Inboard of STA.25, a void of 0.50 inch (12.7 mm) maximum chordwise by 2.0 inches (50.80 mm) maximum spanwise, is acceptable between skin (6) and spar (10), provided it is not within 0.250 inch (6.350 mm) of edge of skin. Outboard of STA.25, the maximum size for acceptable voids is 0.250 inch (6.350 mm) chordwise by 2.0 inches (50.80 mm) spanwise, provided it is not within 0.250 inch (6.350 mm) of edge of skin.

(d) A void of 0.50 inch (12.7 mm) maximum chordwise by 2.0 inches (50.80 mm) maximum spanwise is acceptable between skin (6) and core (7).

(e) A void of 0.38 inch (9.652 mm) maximum spanwise by 3.0 inches (76.2 mm) maximum chordwise is acceptable between the skin and tip closure in either the top or bottom or both, provided it is not within 0.12 inch (3.048 mm) from the edge of skin. If edge distance is less than 0.12 inch (3.048 mm), void may be repaired by lifting the skin and rebonding with adhesive (C-331).

c. Cracks defined in the following steps are not acceptable.

(1) Visually check for bond line cracks between phenolic blocks and skin, spar inside drain hole, inner grip plates or joint between phenolic blocks.

(2) Inspect all butt area bond lines.

CAUTION

DO NOT ALLOW ANY MEK (C-309) TO ENTER BLADE. DO NOT SATURATE BOND LINES WITH MEK AS IT WILL SOFTEN THE ADHESIVE.

(3) If crack(s) are suspected, remove paint in suspected area(s) by sanding the effected area in a spanwise direction using 400-grit paper or cloth.

(4) Touch up paint after inspection is complete (paragraph 64-26).

d. Inspect buffer pads around blade bolt holes for wear, tears, or debonding. For repair refer to BHT-212-CR&O manual.

e. Inspect bushings in tail rotor blade bolt holes (2, figure 64-11) for secure installation. Any looseness is cause for blade replacement. Measure bushing inside diameter. If dimension exceeds 0.5005 inch (12.71 mm), replace blade bushing at an authorized blade overhaul facility.

Inspect bushings for cracks. Any crack is cause to remove the blade from service.

f. Damage defined in the following steps is cause to remove the tail rotor blade from service. The blade may be sent to an authorized repair facility for evaluation of possible repair.

(1) Damage in excess of limits specified in inspection steps 2.a. through 2.c.

(2) One or more holes in the skin.

(3) Edge voids between the skin and the spar.

(4) Evidence of corrosion at any edge void.

g. Damage defined in the following steps is cause to scrap tail rotor blade.

(1) Water or corrosion in rotor blade honeycomb core.

(2) Damage in excess of limits defined in inspection step a through step c and/or in the BHT-212-CR&O manual on a rotor blade that has reached maximum airworthiness life (hours) (Chapter 4), or has less than 200 hours remaining airworthiness life (hours).

(3) One or more cracks extending from a previously repaired area.

(4) Wear completely through blade spar at tip.

(5) Loose balance screws (9, Figure 64-11).

(6) Loose bushings at blade grip bolt holes (2).

64-25. Minor Repair

All nicks, scratches, sharp dents, and corrosion that are within the repair limits in paragraph 64-24 must be removed by hand polishing in a spanwise direction (±15°) only.

NOTE

Repair to the blade by material removal (polishing) are permitted only once at any local area. Overlapping repairs are not permitted. Any permissible repair by polishing should be accomplished by removing the minimum amount of material required to remove the damage.

1. Nicks, Scratches, and Sharp Dents.

Polish out all repairable nicks and scratches using aluminum wool or very fine grade scotchbrite abrasive pad when repairing aluminum. On steel surfaces, fine abrasive paper or cloth may be used (180 grit or finer may be used to remove damage, but must be followed by polishing with 400 grit or finer to improve the surface finish). Nicks in the trailing edge may be polished out using very fine abrasive paper or cloth if followed by polishing with aluminum wool or very fine grade scotchbrite abrasive pad. Hand polish in a spanwise direction.

2. Non-sharp Dents.

The bottom of a dent must be smooth and clearly non-sharp to be classified as a non-sharp dent. A dent with any crease in it is considered to be a sharp dent. Non-sharp dents, which are within the limits in paragraph 64-24, are not to be polished out. Carefully inspect for any surface irregularities, such as a nick, scratch, or a burr, in and around a non-sharp dent. Any additional damage must be within the limits in paragraph 64-24.

3. Corrosion.

Polish out all repairable corrosion using aluminum wool or very fine grade abrasive pad on all aluminum surfaces, or very fine abrasive paper or cloth (400 grit or finer) may be used on the stainless steel spar. 180 grit may be used to polish out corrosion on the steel spar if followed with polishing using 400 grit to improve the surface finish. Repair depth on aluminum must be to twice the depth of the visible corrosion to ensure complete removal. Hand polish in a spanwise direction. Do not over-polish. On all surfaces where corrosion has been polished out, apply alcoholic phosphoric cleaner using a clean cloth or brush. Rub solution briskly into surface for approximately 40 to 60 seconds. Carefully check for pits with a 10X magnifying glass following clean-up. No pitting is permissible.

4. Sealing Edge Voids.

Seal edge voids by thoroughly cleaning affected area using alcohol and clean wipes. A thin plastic spatula may be used to solvent wipe the bond line. Do not stretch or gouge blade skins, spars, or doublers. Allow to dry. Seal area using Hysol EA956 adhesive or equivalent. Adhesive and blade may be warmed to 120°F (48.9°C) to promote adhesive flow. A thin plastic spatula may be used to work adhesive into bond lines. Allow to cure.

64-26. Paint Touch Up

MATERIALS REQUIRED

Refer to BHT-ALL-SPM for specifications and source.

NUMBER	NOMENCLATURE
C-100	Chemical Film Material
C-204	Primer
C-245	Polyurethane Coating
C-318	Cleaning Compound
C-386	Solvent
C-407	Abrasive Pad

NOTE

Touch up tail rotor blades when warranted by paint condition, or when paint is removed to repair scratches, nicks, gouges, dents, or corrosion.

1. Thoroughly wipe blade with solvent (C-386). Allow solvent to wet blade a few minutes, then wipe dry with clean cloths.

2. Plug blade grip bolt holes (2, figure 64-11) to prevent entry of refinishing materials.

3. Use abrasive pad (C-407) or equivalent, to remove all surface oxides and all aged chemical conversion coatings from all bare aluminum surfaces.

4. Wash blade with cleaning compound (C-318) or equivalent. Achieve water break free surface which will be evident by continuous unbroken film of water on surface after thoroughly rinsing soap from surface.

NOTE

From completion of this step through final paint, surfaces of blades should not be handled with bare hands.

5. Apply chemical film material (C-100) on all bare aluminum in accordance with instructions in BHT-ALL-SPM .

6. Apply one coat of epoxy polyamide primer (C-204) to touch up areas only.

NOTE

Primer shall be overcoated not less than one nor more than 24 hours after application. If 24 hours is exceeded, repeat steps 3 through 6.

7. Mask areas which are not to be painted.

8. Using gloss white (color no.17925) or gloss black (color no.17038), as applicable, to match area being painted, apply one to two light covering coats of polyurethane coating (C-245). Allow 30 minutes to 72 hours drying time between coats. If 72 hours is exceeded, lightly sand initial coat with abrasive pad (C-407) prior to final coat application.

9. Remove masking installed in step 7.