CHAPTER 11

FLIGHT CONTROLS

SECTION I — CONTROL SURFACES

(NOT APPLICABLE)

SECTION II — FLIGHT CONTROL COMPONENTS

11-1. FLIGHT CONTROL SYSTEM.

11-2. Description — Flight Control System. The flight control system consists of the collective pitch (vertical) control system, cyclic control system (pitch and roll), elevator (pitch only) control system and tail rotor (directional) control system. The flight control systems use mechanical linkages, actuated by conventional controls, and control flight attitude and direction.

The flight control systems are a straight-through system with hydraulic boost. A synchronized elevator is linked into the fore and aft control system at the swashplate. Electrically operated force trims, connected to cyclic and tail rotor controls, induce artificial feel and stabilize control stick and tail rotor control pedals.

11-3. Troubleshooting — Flight Control System. Perform troubleshooting of the flight control system in accordance with table 11-1.

NOTE

Before using table 11-1, ensure all normal operational checks have been performed. If a malfunction not listed in this table is found, notify the next higher level of maintenance.

Isolate potential problem areas by disconnecting the pilot stick or pedals and the hydraulic actuators from the interconnecting linkage prior to troubleshooting.

Table 11-1. Troubleshooting Flight Control System

CONDITION TEST OR INSPECTION **CORRECTIVE ACTION**
a. CYCLIC SYSTEM
1. Cyclic stick rough or binding.
STEP 1. Check for dirt or foreign material at base of stick.
Remove boot, inspect and clean as required (paragraphs 11-59 and 11-61).
STEP 2. Check for interference in control linkage (paragraphs 11-67, 11-92, 11-105).
Inspect linkage and adjust or repair as necessary (paragraph 11-71).
STEP 3. Check for bent control tubes (paragraph 11-99).
Inspect and replace tubes as necessary (paragraph 11-100).

Table 11-1. Troubleshooting Flight Control System (Cont)

CONDITION TEST OR INSPECTION **CORRECTIVE ACTION**
STEP 4. Check for dry or seized bearings (paragraph 11-206).
Inspect and replace bearings as necessary (paragraphs 11-206 and 11-207).
STEP 5. Check for binding, loose or torn boots (paragraph 11-58).
Inspect and adjust or replace boot (paragraphs 11-61 and 11-62).
STEP 6. Check force gradient assemblies and magnetic brakes for binding (paragraphs 11-77 and 11-85).
Inspect and adjust or repair force gradient assemblies in accordance with paragraphs 11-83 thru 11-86. Inspect and adjust or repair magnetic brakes in accordance with paragraphs 11-77 and 11-79.
2. Helicopter drifts to right or left.
STEP 1. Check swashplate for proper rigging.
Rig swashplate (paragraph 11-55).
3. Uneven cyclic application force (boost off).
STEP 1. Check for missing or out of adjustment swashplate balance spring (right forward arm).
Adjust or replace and adjust spring (paragraph 11-55).
4. Insufficient stick travel.
STEP 1. Check for interference in stick base or control linkage.
Inspect linkage and repair as necessary (paragraphs 11-67 and 11-71).
STEP 2. Check for proper rigging.
Rig as required (paragraph 11-55).
5. Pilot and copilot sticks out of synchronization.
STEP 1. Check for correct rigging of interconnecting linkage.
Rig adjustable tubes as necessary (paragraph 11-55).
b. COLLECTIVE SYSTEM
1. Collective stick light or heavy.
STEP 1. Check minimum friction adjustment of collective stick.
Adjust friction as necessary (paragraph 11-27).

Table 11-1. Troubleshooting Flight Control System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 2. Check for dirt, oil, or grease on friction surface.

Remove boot and inspect friction surfaces. Clean and adjust as necessary (paragraphs 11-27, 11-11, and 11-13).

STEP 3. Check control linkage and supports for looseness and damage.

Inspect and replace linkage as necessary (paragraphs 11-10, 11-50).

2. High vertical vibration level.

STEP 1. Check minimum friction nut adjustment (causes pilot induced vibration).

Adjust friction as necessary (paragraph 11-27).

STEP 2. Check control linkage and supports for looseness and damage.

Inspect and replace linkage as necessary (paragraphs 11-10, 11-50).

3. Insufficient collective travel.

STEP 1. Check for interference in control linkage.

Inspect and replace linkage as necessary (paragraphs 11-10, 11-50).

STEP 2. Check linkage for correct rigging.

Rig as necessary (paragraph 11-6).

4. Binding or rough operation.

STEP 1. Check for interference in control linkage.

Inspect and replace linkage as necessary (paragraphs 11-10, 11-50).

STEP 2. Check for bent control rods.

Inspect and replace rods as necessary (paragraphs 11-10, 11-50).

STEP 3. Check for dry or seized bearings.

Inspect and replace bearings as necessary (paragraphs 11-206 and 11-207).

STEP 4. Check for binding, torn, or loose boot.

Inspect, align or replace boots (paragraphs 11-10 and 11-11).

Table 11-1. Troubleshooting Flight Control System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 5. Check for dirt or foreign matter at base of stick.

Remove boot, inspect and clean as necessary (paragraphs 11-10 and 11-11).

5. Motoring collective stick (stick is driven from position by feedback from main rotor)

STEP 1. Check minimum friction adjustment.

Adjust friction as necessary (paragraph 11-27).

c. ELEVATOR CONTROL SYSTEM

1. Elevator loose when cyclic stick is in neutral.

STEP 1. Check for broken or disconnected linkage.

Inspect control linkage and repair as necessary (paragraphs 11-189 and 11-190). Adjust linkage as necessary (paragraph 11-185).

2. Elevator loose only when cyclic stick is in forward or aft position.

STEP 1. Check for loose, worn, or damaged linkage supports.

Inspect linkage system and repair as necessary (paragraph 11-189).

STEP 2. Check for worn bearings.

Inspect and replace bearings as necessary (paragraphs 11-206 and 11-207).

3. Elevator position does not correspond to cyclic stick position.

STEP 1. Check for bent control rods.

Inspect control rods and repair as necessary (paragraphs 11-189 and 11-190). Adjust linkage as necessary (paragraph 11-185).

STEP 2. Check for correct rigging of controls.

Rig as necessary (paragraph 11-185).

4. Elevator binds or operates rough.

STEP 1. Check for dry or seized bearings.

Inspect bearings and replace as necessary (paragraphs 11-206 and 11-207).

Table 11-1. Troubleshooting Flight Control System (Cont)

CONDITION TEST OR INSPECTION	CORRECTIVE ACTION
d. TAIL ROTOR CONTROLS.	
1. Tail rotor pedal adjustment rough or binding.	
STEP 1. Check for dirt or foreign material in pedal adjustment linkage.	**Inspect linkage and clean as necessary. Adjust as required (paragraph 11-120).**
2. Tail rotor controls rough or binding.	
STEP 1. Check for interference in control linkage.	**Inspect linkage between pedals and power cylinder (paragraph 11-174), for any interference over the full travel range. Adjust as required (paragraph 11-120).**
STEP 2. Check for bent control tubes.	**Replace damaged tubes as required (paragraph 11-175).**
STEP 3. Check for dry or seized bearings.	**Inspect and replace bearings as required (paragraphs 11-206 and 11-207).**
STEP 4. Check force gradient and magnetic brake for binding.	**Inspect and adjust as required. Refer to paragraph 11-121 for magnetic brake. Refer to paragraph 11-123 for force gradient assembly.**
3. Pilot and copilot pedal out of synchronization.	
STEP 1. Check interconnecting pushrod (adjustable) for correct rigging.	**Rig as required. Refer to paragraph 11-76 for magnetic brake. Refer to paragraph 11-83 for force gradient assembly.**
4. Insufficient pedal travel.	
STEP 1. Check for any interference in control linkage.	**Rig control linkage as required (paragraph 11-120).**

11-4. COLLECTIVE CONTROL SYSTEM.

11-5. Description — Collective Control System. The collective control system (figure 11-1) consists of a jackshaft assembly with dual control sticks, push-pull tubes and bellcranks, and a hydraulic actuator connected to a collective lever on swashplate assembly.

Movement of either control stick is transmitted through linkage and hydraulic actuator to main rotor pitch control mechanism, causing helicopter to ascend or descend or to remain at constant altitude.

The collective hydraulic actuator has an irreversible valve to reduce feedback forces and to provide for minimum use of controls in event of hydraulic boost failure.

11-6. Rigging — Collective Control System.

a. Rig system with control sticks, jackshaft assembly, and all nonadjustable control tubes and bellcranks installed and connected. (Refer to figure 11-1.)

NOTE

For adequate clearance between bolt and cowling at attaching point control tube (2) to collective pitch control lever (1), bolt head must be outboard.

b. Place collective stick (20) against the low stop and secure with friction nut.

c. Adjust control tube (7) with the servocylinder assembly (4) bottomed in the up direction and control valve (6) in up position. (Detail B.) Shorten control tube (7) three full turns and install bolt and nut. Torque nut fingertight and install cotter pin. Bolt must be free to turn.

d. Place collective control stick (20) against the low stop. Position the collective pitch control lever (1) to proper dimension. (Detail A.)

e. Exert sufficient downward pressure on cylinder assembly (4) to hold control valve (6) lever at top of travel. (Detail B.)

f. Adjust clevis or rod end of control tube (2) to fit collective pitch control lever (1). Shorten clevis by one full turn. Connect, and tighten jamnut to a torque of **480 TO 600** inch-pounds.

NOTE

When bottoming control valves (6), do not exert a force on the collective pitch control lever (1) sufficient to move the controls below the control valves (6). Structure or component deflection, or misrigging will occur.

g. Ensure boot (3) is located properly.

11-7. COLLECTIVE JACKSHAFT.

11-8. Description — Collective Jackshaft. A collective jackshaft, mounted laterally under cabin floor, provides mounting for the collective stick assemblies and attachment of collective control tube. The jackshaft is mounted on structural members by two housing assemblies and a support (23, figure 11-2). The throttle control crossover tube (22) is mounted with the jackshaft.

11-9. Adjustment — Collective Jackshaft (Installed).

NOTE

Adjustment of collective minimum friction is contained in paragraph 11-27.

11-10. Inspection — Collective Jackshaft (Installed). a. Inspect jackshaft for free travel and excessive lateral looseness. Maximum lateral travel is **0.060** inch.

b. Inspect jackshaft for loose, missing or improperly installed hardware.

c. Inspect bolt and bushing installations for enlarged holes and looseness of bolt and bushing. (Refer to figure 11-3.)

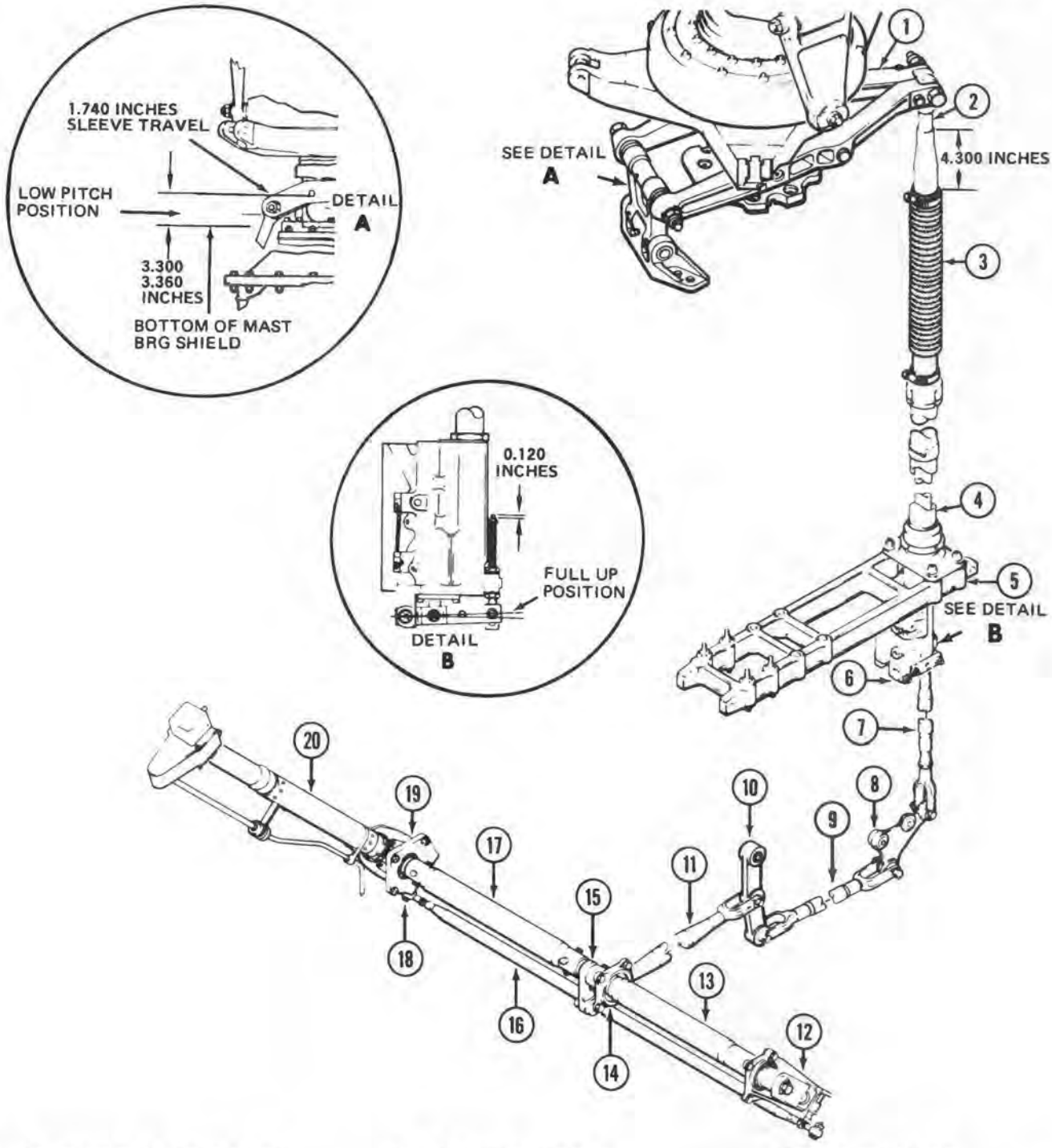
d. Inspect jackshaft for surface corrosion.

11-11. Removal — Collective Jackshaft.

CAUTION

Take precautions against damage by accidental movement of linkage while jackshaft is disconnected.

a. Remove pilot and copilot seats (paragraph 2-214).



1. Collective pitch control lever
2. Control tube — upper
3. Boot
4. Servocylinder assembly
5. Support assembly
6. Control valve
7. Control tube assembly
8. Bellcrank assembly
9. Control tube assembly
10. Lever assembly
11. Control tube assembly
12. Control assembly
13. Jackshaft tube
14. Housing assembly
15. Arm assembly
16. Control connecting tube
17. Jackshaft tube
18. Control lever
19. Control assembly
20. Collective stick

NOTE: ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

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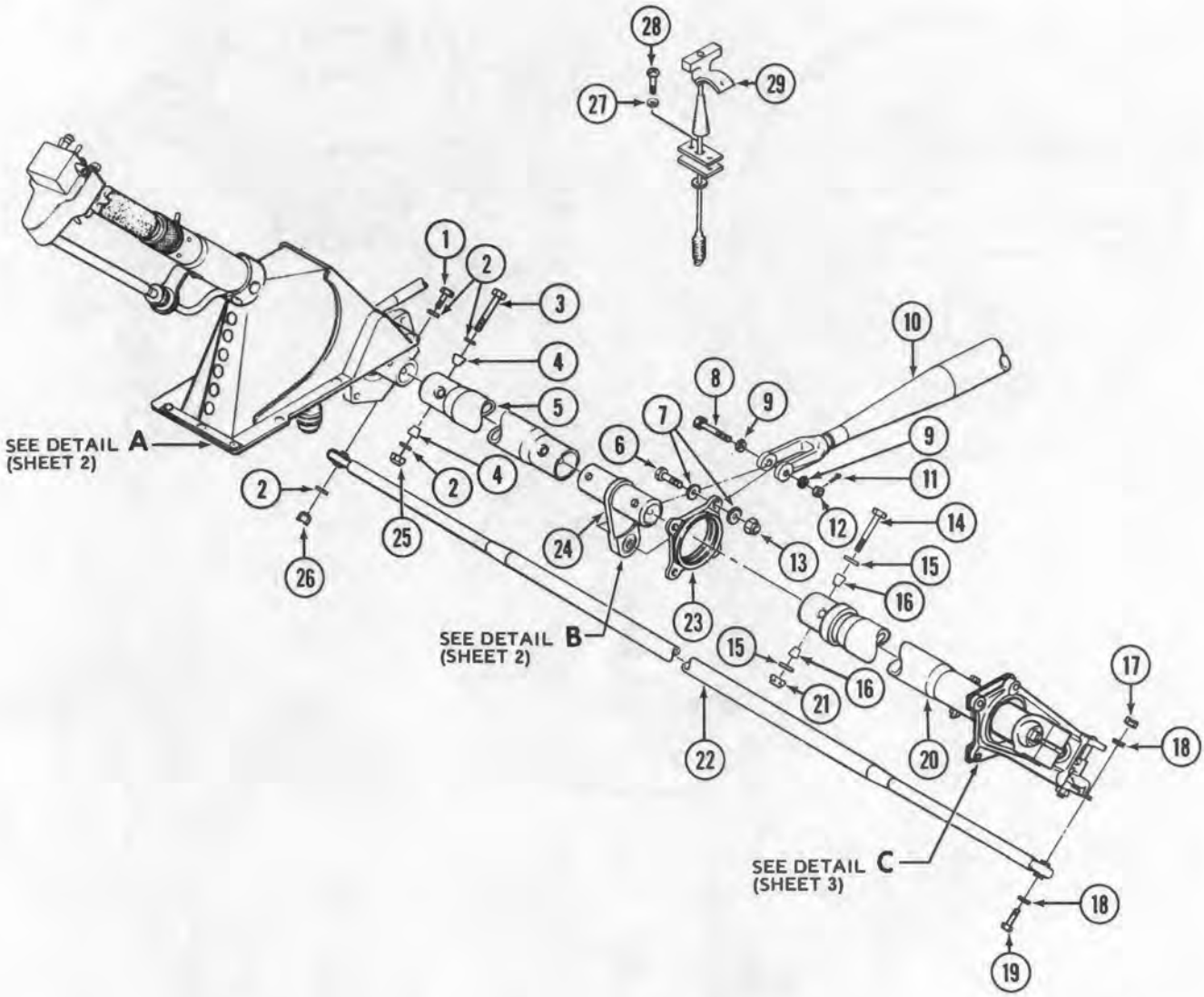
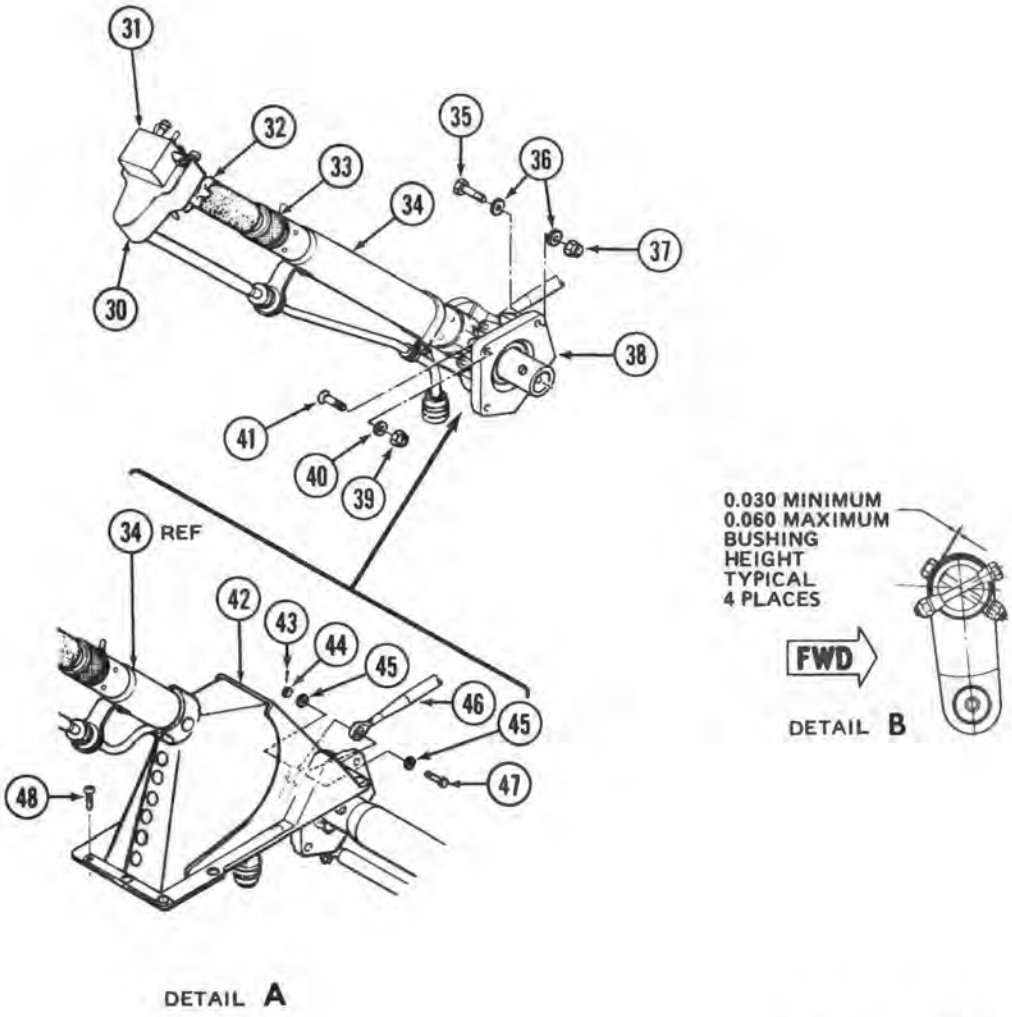
Figure 11-1. Collective control system



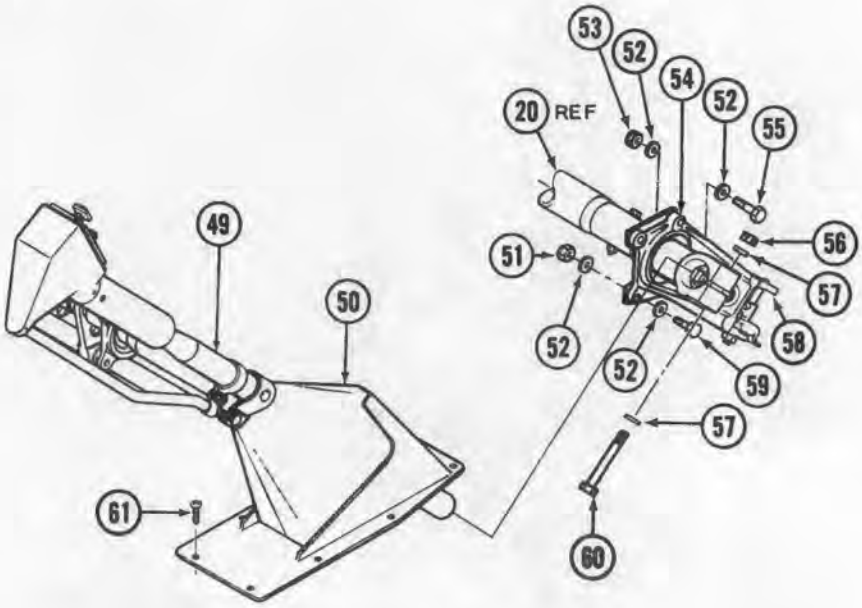
1. Bolt
2. Washer
3. Bolt
4. Tapered bushing
5. Jackshaft tube
6. Bolt
7. Washer
8. Bolt
9. Washer
10. Control tube
11. Cotter pin
12. Nut
13. Nut
14. Bolt
15. Washer
16. Tapered bushing
17. Nut
18. Washer
19. Bolt
20. Jackshaft tube
21. Nut
22. Tube assembly
23. Support
24. Arm
25. Nut
26. Nut
27. Washer
28. Screw
29. Downlock assembly

Figure 11-2. Collective jackshaft (Sheet 1 of 3)



30. Switch box
31. Cover
32. Throttle friction knob
33. Collective friction knob
34. Pilots collective stick
35. Bolt
36. Washer
37. Nut
38. Housing assembly
39. Nut
40. Washer
41. Screw
42. Boot
43. Cotter pin
44. Nut
45. Washer
46. Control tube
47. Bolt
48. Screw

Figure 11-2. Collective jackshaft (Sheet 2 of 3)



DETAIL C

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49. Co-pilots collective stick
50. Boot
51. Nut
52. Washer
53. Nut
54. Housing assembly
55. Bolt
56. Nut
57. Washer
58. Control assembly
59. Bolt
60. Bolt
61. Screw

Figure 11-2. Collective jackshaft (Sheet 3 of 3)

b. Remove boot (42, figure 11-2) from pilot collective control stick (34) (detail A, sheet 2).

c. Disconnect electrical connector from pilot collective stick.

d. Disconnect throttle control tube (46) from gear lever on lower end of pilot collective stick by removing cotter pin (43), nut (44), and bolt (47). Disconnect control tube (22) from both levers by removing nuts (17 and 26), washers (2 and 18), and bolts (1 and 19). Remove through access opening in left side of cabin. Remove two bolts (8) and four tapered bushings (4) from jackshaft tube (5).

e. Remove nuts (37 and 39), washers (36 and 40), screws (41), and bolts (35) attaching housing assembly (38) to structural intercostal. Remove pilot collective stick (34) and housing assembly (38) (detail A, sheet 2).

f. Remove copilot collective stick (49, detail C, figure 11-2) as follows:

(1) Remove access panel from floor.

(2) Remove screws (48) and remove boot (50) from copilot stick.

(3) Remove bolts (60), washers (57) and nuts (56).

(4) Remove copilot stick (paragraph 11-36).

g. Remove collective jackshaft tube as follows:

(1) Disconnect control tube (10) from arm (24) on jackshaft by removing cotter pin (11), nut (12), washers (9), and bolt (8).

VIEW A—A

1. Drill four no. F (0.25) holes in line.
   Taper ream (T87) holes, 125 finish.
   Install
   Tapered bushing (79B1-4-7 or 20-037-4-7) (4 reqd)
   Bolt (2 reqd)
   Washer (4 reqd)
   Nut (2 reqd)

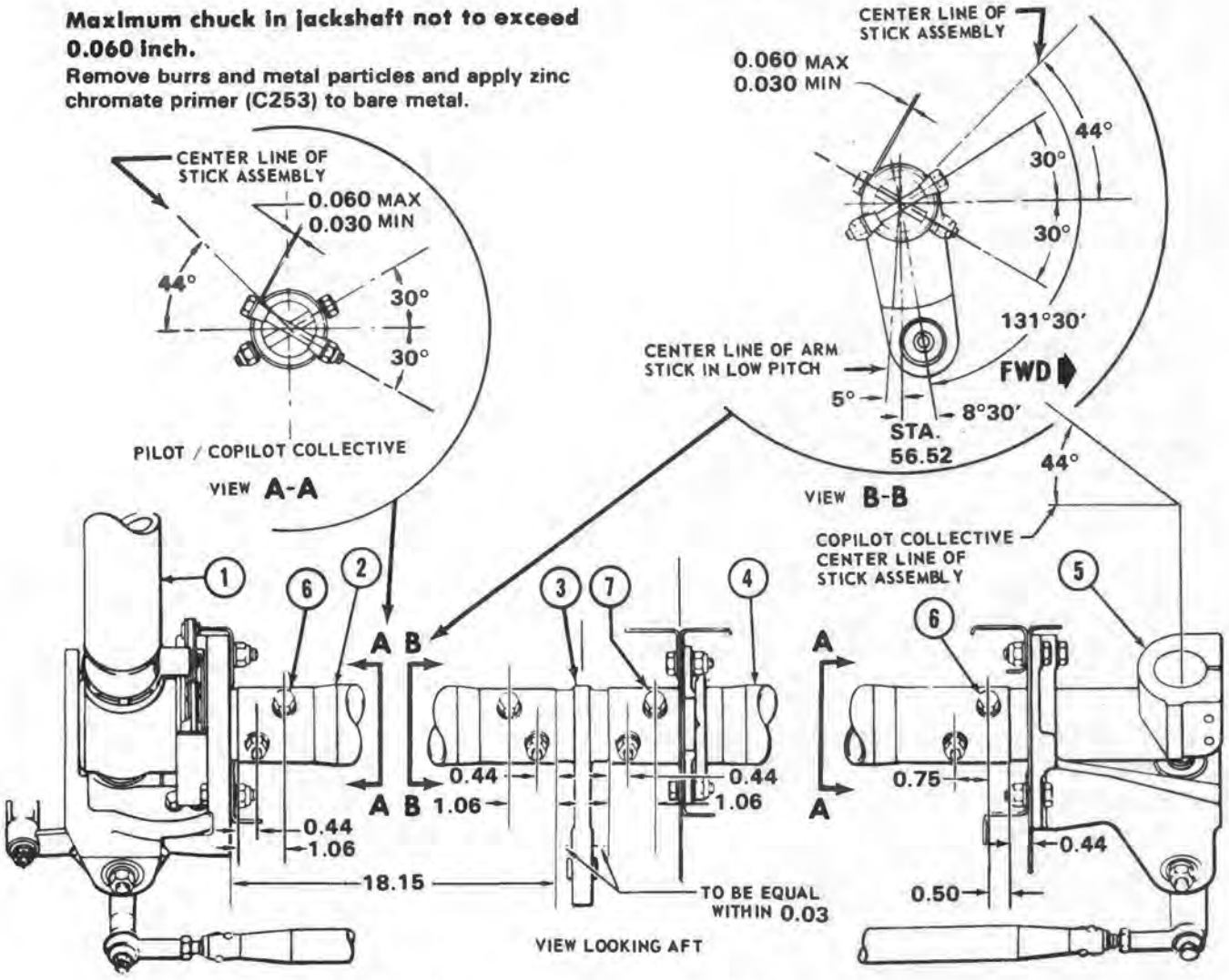
NOTE

Maximum chuck in jackshaft not to exceed 0.060 inch.

Remove burrs and metal particles and apply zinc chromate primer (C253) to bare metal.

VIEW B—B

2. Drill eight no. F (0.25) holes in line.
   Taper ream (T87) holes, 125 finish.
   Install
   Tapered bushing (79B1-4-5 or 20-037-4-5) (8 reqd)
   Bolt (4 reqd)
   Washer (8 reqd)
   Nut (4 reqd)



1. Pilot collective control assembly
2. Tube
3. Arm Assembly
4. Tube
5. Copilot collective control assembly
6. Bolt
   Nut
   Washer
   Tapered bushing
7. Bolt
   Nut
   Washer
   Tapered bushing

NOTE: ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

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Figure 11-3. Collective jackshaft repair

(2) Remove nuts (51 and 53, figure 11-2), bolts (55 and 59), and washers (52), attaching housing (54) to intercostal structural member (detail C, sheet 2).

(3) Remove nuts (21), washers (15), four tapered bushings (16), and bolts (14) attaching jackshaft tubes (5 and 20) to arm (24). Identify bolts and bushings for reinstallation in same location. Remove jackshaft tube (20) from left side of helicopter with control assembly (58).

(4) Remove nuts (25), washers (2), tapered bushings (4), and bolts (3) attaching jackshaft tube (5) to housing assembly (38, detail A). Identify bolts and bushings for reinstallation in same location. Remove jackshaft tube (5).

(5) Remove nuts (13), washers (7), and bolts (6) and remove support assembly (23).

11-12. Disassembly — Collective Jackshaft (AVIM). **a.** Remove control assembly (58, figure 11-2) if not previously removed by removing bolts (55 and 59), washers (52) and nuts (51 and 53) attaching control assembly to jackshaft tube (20).

b. Remove lever arm (24) (if not previously removed) from jackshaft tube (5) by removing bolts (3), washers (2), bushings (4) and nuts (25) attaching lever arm (24) to jackshaft tube (5).

11-13. Inspection — Collective Jackshaft (Disassembled). **a.** Inspect jackshaft for enlarged bushing holes. (Refer to figure 11-3.)

b. Inspect jackshaft details for corrosion and mechanical damage. Maximum depth **0.010** after repair.

11-14. Repair or Replacement — Collective Jackshaft (AVIM). **a.** Repair components of jackshaft as follows:

(1) Polish out scratches and corrosion damage (maximum **0.010** inch depth) using 600 grit sandpaper (C185.2). Obtain a smooth scratch free surface.

(2) Treat repaired areas using chemical film (C42).

(3) Apply two coats zinc chromate primer (C253) or polyamide primer (C167) to repaired area.

11-15. Assembly — Collective Jackshaft (AVIM).
a. Assemble details as shown in figure 11-3.

NOTE
Collective jackshaft becomes a matched set after drilling and reaming. Do not intermix parts.

b. Clamp in a suitable fixture, holding dimensions shown.

c. Drill through tube and detail being replaced using a No. F (**0.257** inch) drill.

d. Insert reamer, (T87 or T88) so that end of pilot projects through parts to be reamed.

e. Ream one side (smooth finish).

f. Install tapered bushing in reamed hole.

g. Ream opposite hole using the tapered bushing to support reamer pilot.

h. Install tapered bushings and secure with bolt, washer and nut.

i. Repeat steps c through h for the remaining holes.

j. Disassemble, remove burrs and metal particles.

k. Apply primer (C253) or polyamide primer (C167) to all bare metal.

11-16. Installation — Collective Jackshaft.

NOTE
If collective sticks and jackshaft are in one assembly; remove bolts and bushings from jackshaft tubes (5 and 20, figure 11-2). Mark bolts and bushings to ensure installation in same location.

a. Apply a coat of primer (C253) or polyamide primer (C167) to mounting faces of housing assembly (38 and 54, figure 11-2) and support assembly (23).

b. Lower pilot control stick through floor opening and insert elbow through mounting hole of structural intercostal. Attach housing assembly (38) to intercostal with screws (41), bolts (35), washers (36 and 40), and nuts (37 and 39). Torque nuts **50 TO 70** inch-pounds.

c. Install tube (5) to housing assembly (38). Secure with tapered bushings (4), nuts (25), washers (2), and bolts (3). Torque nuts **50 TO 70** inch-pounds. Refer to detail B for correct tapered bushing installation.

d. Install arm (24) to jackshaft tube (5) with bolts, tapered bushings, washers, and nuts as in step c. Torque nuts **50 TO 70** inch-pounds.

e. Position support (23) on left side beam at B.L. 14.00. Secure with bolts (6), washers (7), and nuts (13). Torque nuts **50 TO 70** inch-pounds.

f. Install jackshaft tube (20) and housing assembly (54) from left side. Install bolts (55 and 59), washers (52), and nuts (51 and 53) to secure housing assembly (54) to support structure. Torque nuts **50 TO 70** inch-pounds.

g. Install bolts (14), tapered bushings (16), washers (15), and nuts (21) in jackshaft tube (20) and arm (24). Torque nuts **50 TO 70** inch-pounds. Refer to detail B for correct tapered bushing installation.

h. Align levers on axis of each housing assembly. Install control tube (22). Install bolt (19) on left end (copilot) with head down. Install bolt (1) on right side (pilot) with head up. Place washers (2 and 18) under bolt heads and one washer under nuts (17) and (26). Torque nuts **20 TO 25** inch-pounds and install cotter pins.

i. Connect control tube (46) to pilot collective stick with bolt (47), two washers (45) and nut (44). Torque nut **7 TO 12** inch-pounds and install cotter pin (43).

j. Connect electrical connector to receptacle and lockwire (C127). Install boot (50) using screws (61).

k. Install copilot collective stick (49) in control assembly elbow (58).

l. Install bolts (60), washers (57) and nuts (56).

m. Adjust collective friction (paragraph 11-27).

n. Attach control tube (10) to arm (24). Install one washer (9) under bolt head (8) and one washer (9) under nut (12). Torque nut **30 TO 40** inch-pounds and install cotter pin (11).

o. Check collective rigging (paragraph 11-6).

11-17. CONTROL ASSEMBLY — COLLECTIVE JACKSHAFT.

11-18. Description — Control Assembly — Collective Jackshaft. A control assembly (58, figure 11-2) is mounted on left side of the collective jackshaft. The control assembly provides for mounting of the copilot collective stick and transmits copilot throttle motion to control tube (22) which is interconnected to pilot throttle control.

11-19. Removal — Control Assembly — Collective Jackshaft. Refer to paragraph 11-11.

11-20. Disassembly — Control Assembly — Collective Jackshaft (AVIM). a. Remove cotter pin (27, figure 11-4), nut (26), and washer (25).

b. Remove nut (18), washer (17), screw (14). Slide shaft (24) from support assembly (3) and lever (20).

c. Remove lever (20) and shim (19) from support assembly (3).

d. Remove nut (16) and washer (15) attaching pinion (21) to drive assembly (8).

e. Remove pinion (21) from drive assembly (8).

f. Remove shim (13), guide (7), and drive assembly (8) from elbow assembly (10).

g. Remove key (9) from slot in drive assembly (8).

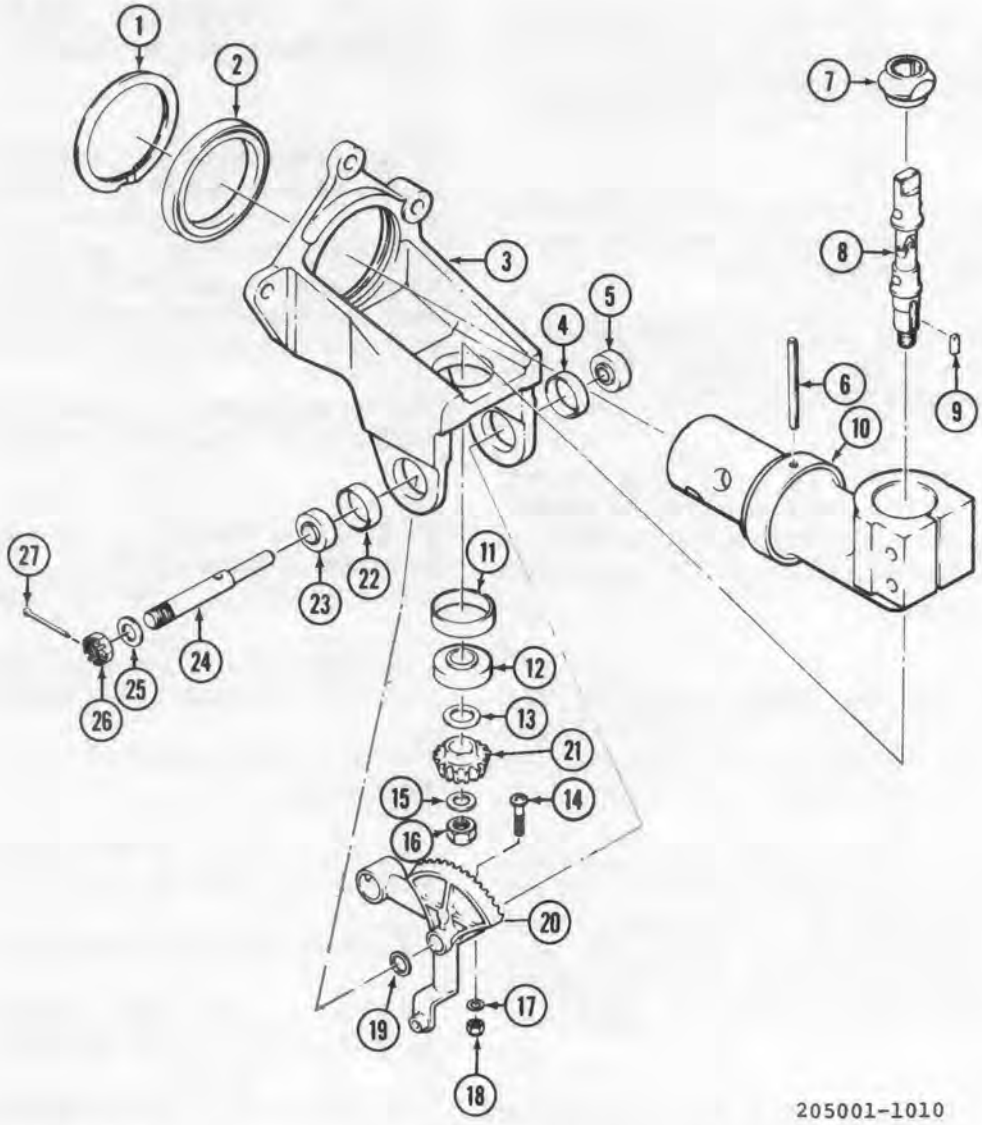
h. Slide elbow assembly (10) out of support assembly (3).

i. Remove spirolox (1) securing bearing (2) to support assembly (3). Remove bearing (2).

j. Refer to paragraph 11-207 for removal of bushings (4 and 22), sleeve (11), and bearings (5, 12 and 23) from support assembly (3).

11-21. Inspection — Control Assembly — Collective Jackshaft (AVIM). a. Inspect all parts of control assembly for wear, damage, and corrosion. Maximum allowable wear or damage is **0.003** inch.

b. Inspect bearings for binding and damage (paragraph 11-206).



1. Spirolox	10. Elbow assembly	19. Shim
2. Bearing	11. Sleeve	20. Lever
3. Support assembly	12. Bearing	21. Pinion
4. Bushing	13. Shim	22. Bushing
5. Bearing	14. Screw	23. Bearing
6. Pin	15. Washer	24. Shaft
7. Guide	16. Nut	25. Washer
8. Drive assembly	17. Washer	26. Nut
9. Key	18. Nut	27. Cotter pin

Figure 11-4. Control assembly — collective jackshaft — exploded view

11-22. Repair or Replacement — Control Assembly — Collective Jackshaft (AVIM). **a.** Replace all defective bearings. Refer to paragraph 11-207 for bearing replacement.

b. Replace all parts that show evidence of wear, damage, and corrosion.

11-23. Assembly — Control Assembly — Collective Jackshaft (AVIM). **a.** Place bearing (2, figure 11-4) in support assembly (3) and secure with spirolox (1).

b. Install sleeve (11), bushings (4 and 22), and bearings (5, 12 and 23) in support assembly (3).

c. Slide elbow assembly (10) into support assembly (3).

d. Install key (9) in slot at bottom of drive assembly (8).

e. Install shim (13), guide (7), and drive assembly (8) in elbow assembly (10).

f. Lubricate throttle drive mechanism in accordance with lubrication chart (figure 1-2).

g. Slide pinion (21) on drive assembly (8) and secure with washer (15) and nut (16). Torque nut (16) **50 TO 70** inch-pounds.

h. Position lever (20) and shim (19) between bearings (5 and 23) and insert shaft (24) through bearings (5 and 23), shim (19), and lever (20). Align hole in lever and shaft and install screw (14), washer (17), and nut (18). Install washer (25) and nut (26) on shaft. Check for a **0.50 TO 1.50** pounds pull at end of lever (20), to rotate lever. Add or remove shim (13), as required, to provide for **0.50 TO 1.50** pounds friction. Secure nut (26) with cotter pin.

11-24. Installation — Control Assembly — Collective Jackshaft. Refer to paragraph 11-16 for installation of control assembly.

11-25. PILOT COLLECTIVE STICK.

11-26. Description — Pilot Collective Stick. The pilot collective stick (right side) controls pitch of the main rotor blade. When collective stick is in up position, main rotor blades are at maximum pitch; when collective stick is down, blades are at minimum pitch. A knurled nut on the pilot collective stick allows the pilot to adjust collective friction to his own requirements. A minimum friction adjustment is provided so that the collective stick will always have a preset minimum feel. A switch box mounted on top of pilot collective stick contains the following switches: landing light switches, searchlight switches, engine governor switch, engine idle stop release switch, and engine start trigger switch.

11-27. Adjustment — Pilot Collective Stick (Minimum Friction). a. Test for proper amount of minimum friction as follows:

(1) Connect external hydraulic power to hydraulic boost system.

(2) Loosen friction nut (2, figure 11-5) so that no friction is being applied by nut (2).

(3) Attach a pull scale at the center of the twist grip (plus-or-minus **0.50** inch). Pull up perpendicular to the collective stick and check for a breakaway force of **8 TO 10** pounds.

(4) Test may be performed without hydraulic power by disconnecting collective control tube from collective jackshaft and repeating procedure, except check for breakaway force of **14 TO 16** pounds.

b. Adjust minimum friction as follows:

CAUTION

Do not adjust setscrews (4) to bear heavily against the washers (6 and 7); to do so will bend the washers, thus requiring disassembly of collective control stick to replace the damaged part.

(1) Adjust friction by turning setscrews (4) in the connector (5) to the desired friction load as described in above steps.

(2) Additional friction load can be applied by adjusting friction nut (2) to individual pilot requirements.

NOTE

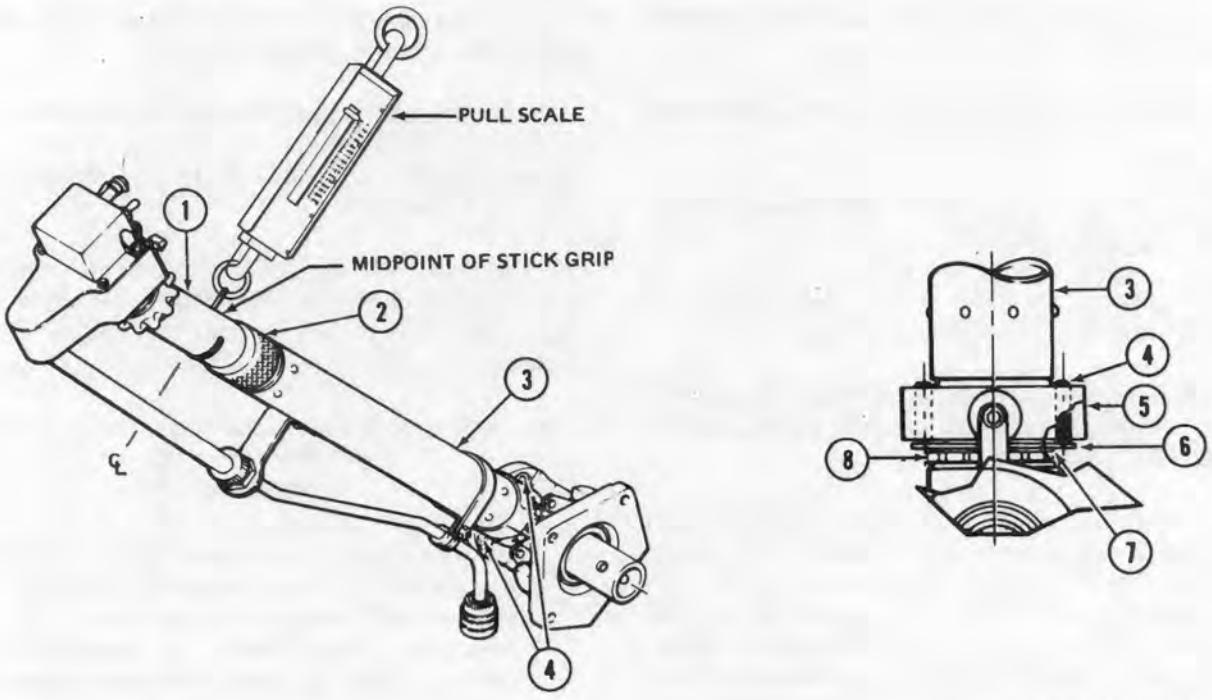
Up and down force should be equal within 1 pound. Friction may be noticeably less on abnormal damp days. Friction adjusted on damp days may be too heavy on dry days.

11-28. Removal — Pilot Collective Stick. a. Remove screws (48, figure 11-2) and remove boot (42).

b. Remove nuts (37 and 39), washers (36 and 40), bolt (35), and screws (41) attaching housing (38) to structure.

c. Remove bolt (1), washers (2), and nut (26) attaching crossover tube (22) to pilot collective stick control assembly.

c.1. Remove bolt (3), washers (2), tapered bushings (4), and nut (25) from jackshaft tube (5).



1. Collective stick grip
2. Friction nut
3. Stick assembly
4. Setscrews
5. Connector
6. Washer
7. Washer
8. Nut

Figure 11-5. Collective friction adjustment — pilot collective stick

d. Disconnect throttle linkage control tube (46) on aft side of control assembly by removing cotter pin (43), nut (44), washers (45), and bolt (47).

e. Disconnect electrical plug and remove stick assembly (34).

11-29. Disassembly — Pilot Collective Stick (AVIM). a. Release clamps at bottom of tube (4, figure 11-6) and unscrew nut to release cable (5) from bracket on tube (4).

b. Remove screws (25) attaching cover on switch box (26). Push cable (5) upward to allow cover to be moved without disconnecting electrical wiring.

c. From inside switch box (26), drive out pin (24) and lift switch box from lever tube (4).

d. Remove washers (29, 28 and 27).

e. Drive pin (34) from throttle grip (33) and slide grip off tube.

f. Remove cotter pin (7) and release drag link (10) from pin (6).

g. Remove retainer ring (1) and unscrew friction nut (3) with bearing (2) installed.

h. Slide lever tube (4) off inner tube.

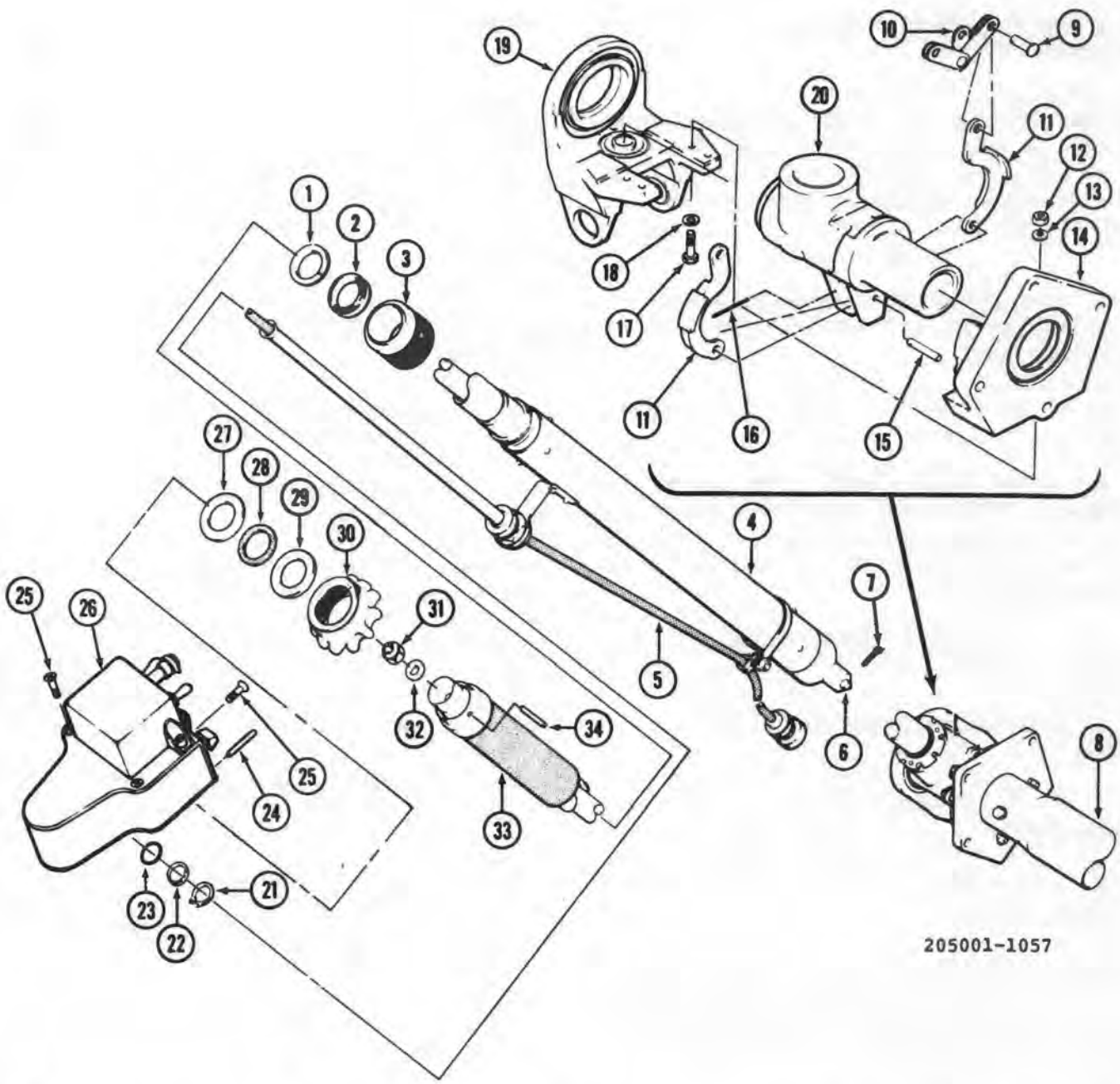
11-30. Inspection — Pilot Collective Stick (AVIM). a. Inspect all parts of pilot collective stick for nicks, scratches, dents, broken or damaged tubing, or frayed or broken cable.

b. Inspect friction mechanism on pilot collective stick for general condition. Inspect friction shoes (11) for condition and secure bonding of friction material to arms.

c. Inspect bearings for wear or roughness (paragraph 11-206).

11-31. Repair or Replacement — Pilot Collective Stick (AVIM). a. Replace all parts that are worn, damaged, broken, bent, or corroded.

b. Replace electrical wires if frayed or broken.



1. Retaining ring
2. Bearing
3. Collective friction nut
4. Tube
5. Cable assembly
6. Pin
7. Cotter pin
8. Jackshaft tube
9. Pin
10. Drag link
11. Friction shoes
12. Nut
13. Washer
14. Housing
15. Pin
16. Pin
17. Bolt
18. Washer
19. Support
20. Elbow
21. Retaining ring
22. Washer
23. Packing
24. Pin
25. Screw
26. Switch box
27. Washer
28. Non-metallic washer
29. Washer
30. Throttle friction nut
31. Nut
32. Bolt
33. Throttle grip
34. Pin

Figure 11-6. Pilot collective stick — exploded view

c. Replace bearings if worn, rough, or damaged (paragraph 11-207).

11-32. Assembly — Pilot Collective Stick (AVIM). a. Slide lever tube (4, figure 11-6) onto inner tube against connector. Install friction nut (3) and bearing (2) on tube assembly. Secure with retainer ring (1).

b. Slide throttle grip (33) onto tube assembly; align holes in grip with hole in throttle shaft, and install pin (34).

c. Install throttle friction nut (30) on throttle grip (33).

d. Install metal washer (29), nonmetallic washer(s) (28), and metal washer (27) on throttle grip. Non-metallic washers (28) are added or removed to provide proper fit between metal washer (27) and switch box (26).

e. Position switch box (26) on lever tube (4). Align holes and install pin (24).

f. Install switch box cover and secure with screws (25).

g. Connect drag link (10) to pin (6). Secure with cotter pin (7).

h. Secure cable (5) to collective lever at bracket and install clamp.

11-33. Installation — Pilot Collective Stick. a. Position stick assembly (34, figure 11-2) in place and secure to airframe using bolts (35), washers (36 and 40), nuts (37 and 39), and screws (41).

b. Align and install bolts (3), bushings (4), washers (2), and nuts (25). Torque nuts **50 TO 70** inch-pounds.

c. Attach interconnect tube (22). Connect power lever linkage control tube (46).

d. Connect electrical plug to airframe receptacle.

e. Install boot (42) using screws (48).

f. Check stick for proper operation.

11-34. COPILOT COLLECTIVE STICK.

11-35. Description — Copilot Collective Stick. The copilot collective stick (left side) provides same collective and throttle control as pilot collective stick. The copilot collective stick is mounted to an elbow on control assembly attached to left side of collective jackshaft.

11-36. Removal — Copilot Collective Stick. a. Remove screws (61, figure 11-2) and remove boot (50).

b. Remove bolts (60), washers (57), and nuts (56) attaching stick assembly to elbow.

c. Disconnect electrical plug from airframe mounted receptacle.

d. Disengage stick assembly (49) from drive assembly. Remove stick assembly.

11-37. Disassembly — Copilot Collective Stick (AVIM). a. Release clamps (13 and 17, figure 11-7) at bottom of stick assembly by removing screw (12), washer (15), and nut (26).

b. Remove four screws (1) and washers (2) securing switch box cover (3) to switch box (5).

c. Drive out pin (6), remove nut (4) and remove switch box (5) from stick assembly (18).

d. Remove conduit (7) from stick assembly (18).

e. Remove screw (19) and washers (21). Remove grip assembly (8).

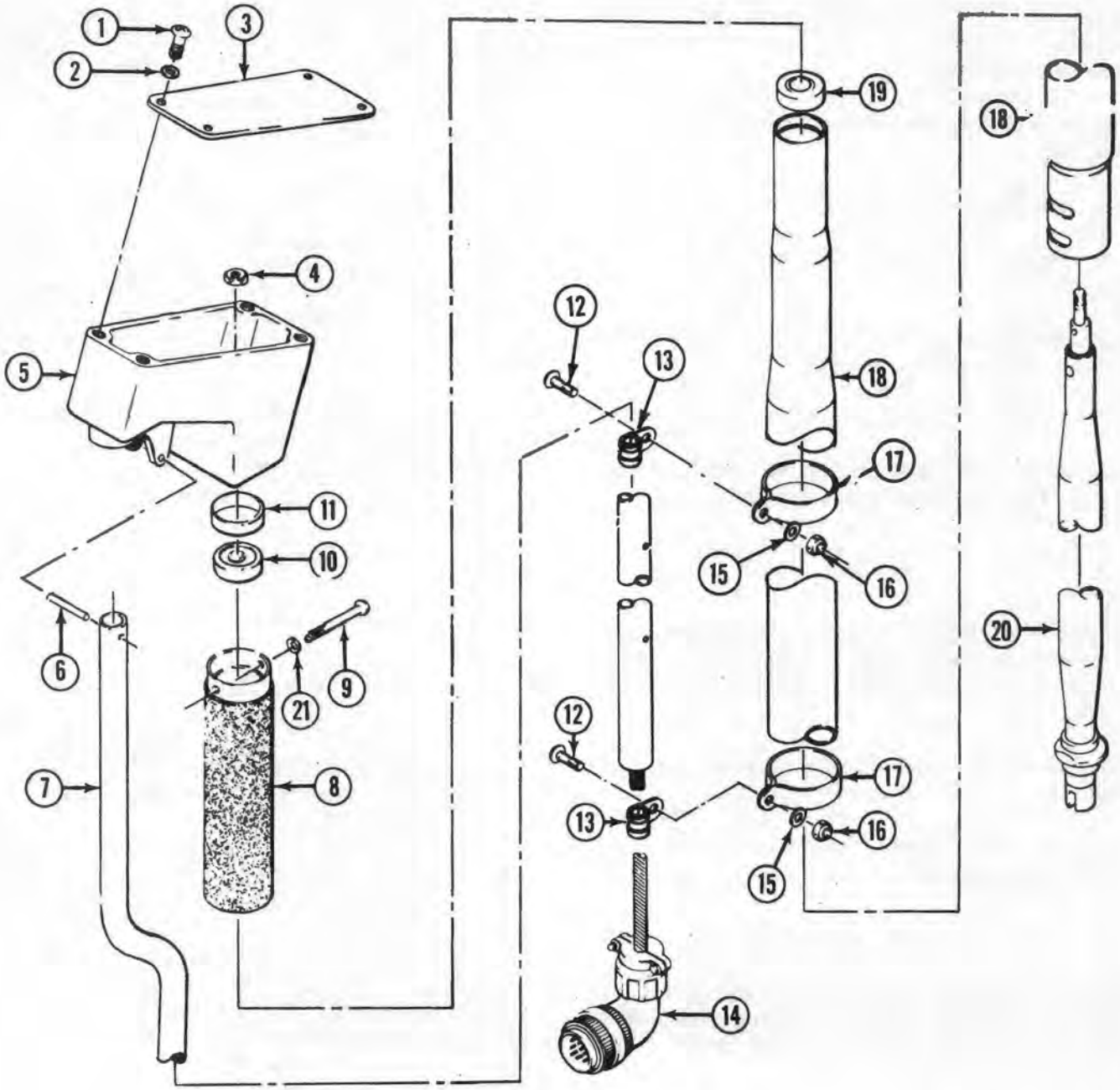
f. Slide tube assembly (20) from stick assembly (18).

11-38. Inspection — Copilot Collective Stick (AVIM). a. Inspect parts for nicks, scratches, and wear. Replace damaged parts.

b. Inspect all detail parts for corrosion. Replace parts that have corrosion.

c. Inspect all parts for thread damage.

d. Inspect bearings for looseness and binding. Replace defective bearings (paragraph 11-207).



1. SCREW
2. WASHER
3. COVER
4. NUT
5. SWITCH BOX
6. PIN
7. CONDUIT
8. GRIP
9. SCREW
10. BEARING
11. BUSHING
12. SCREW
13. CLAMP
14. ELECTRICAL PLUG
15. WASHER
16. NUT
17. CLAMP
18. STICK ASSEMBLY
19. BEARING
20. TUBE ASSEMBLY
21. WASHER

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Figure 11-7. Copilot Collective Stick—Exploded View

11-39. Assembly — Copilot Collective Stick (AVIM). a. Insert tube assembly (20, figure 11-7) into stick assembly (18). Install grip assembly (8) onto stick assembly (18).

b. Align holes in grip assembly (8) with slot in stick assembly.

c. Install screw (19) and washers (21).

d. Assemble switch box (5) to top of stick assembly. Install nut (4).

e. Attach conduit (7) to stick assembly, using pin (6) through switch box (5) and conduit (7).

f. Install cover (3) using screws (1) and washers (2).

g. Attach cable assembly to stick, using two clamps (13 and 17), screw (12), washer (15), and nut (16).

11-40. Installation — Copilot Collective Stick. a. Install stick assembly (49, figure 11-2) to elbow and control assembly (58), engaging stick to control guide.

b. Install two bolts (60), washers (57), and nuts (56).

c. Install boot assembly (50). Secure boot to cabin floor with screws (61).

11-40.1. TRIGGER DETENT MECHANISM.

11-40.2. Description - Trigger Detent Mechanism. The trigger detent mechanism is a device consisting of seven components which provides a positive feel for each of the two trigger switch positions.

11-40.3. Operation - Trigger Detent Mechanism. a. When trigger is depressed for a first stage make, pressure is applied to pin (7, figure 11-7.9). Pin (7) compresses spring (6, figure 11-7.9) which in turn offers resistance to the trigger through pin (7). See figure 11-7.1 for internal position of trigger detent mechanism components at first stage make. Approximate position of trigger at first stage make is shown in figure 11-7.5.

b. After first stage make, peak detent operation is influenced by screw, spring, and ball (1, 3 and 4, figure 11-7.9). Prior to peak detent, ball (4) is seated in ball seat of pin (7, figure 11-7.9). Figure 11-7.2 identifies the different areas of pin (7).

c. Peak detent can be reached by continued depression of the trigger. Ball (4, figure 11-7.9) will ride up radius of ball seat, thereby depressing spring (3, figure 11-7.9), and onto large shank of pin (7, figure 11-7.9). See figure 11-7.3 for internal position of trigger detent mechanism components and figure 11-7.5 for approximate position of trigger at peak detent.

d. As ball (4, figure 11-7.9) leaves ball seat of pin (7, figure 11-7.9) and rides up onto large shank of pin (7), a decrease in trigger pressure will be felt. At this point, trigger pressure is from compression of spring (6, figure 11-7.9) only. Continued depression of trigger will bring second make. See figure 11-7.4 for internal position of trigger detent mechanism components and figure 11-7.5 for approximate position of trigger at second stage make.

11-40.4. Disassembly - Trigger Detent Mechanism. a. Disassembly of trigger detent mechanism may be required for the following reasons:

(1) Inspection of trigger detent mechanism components.

(2) Lubrication of pin and ball (7 and 4, figure 11-7.9).

(3) Replacement of trigger detent mechanism components.

CAUTION

Trigger should be left in grip handle during disassembly of trigger detent mechanism components to prevent loss of ball (4, figure 11-7.9) into interior of grip.

b. Remove screw (1 or 1a, figure 11-7.9) to allow removal of spring and ball (3 and 4, figure 11-7.9). Inspect insert (PM21264, figure 11-7.9) in accordance with paragraph 11-40.5a(5).

c. Remove nut (5 or 5a, figure 11-7.9) to allow removal of spring and pin (6 and 7, figure 11-7.9). Inspect all components and insert (PM21264, figure 11-7.9) in accordance with paragraph 11-40.5a(3), (5), (6).

NOTE

If it is determined that any component of the trigger detent mechanism is worn or defective, replace all components in the trigger detent mechanism.

11-40.5. Inspection - Trigger Detent Mechanism. a. Operate the trigger to insure that there is no binding. If binding occurs check the following:

(1) Lubrication of pin and ball (7 and 4, figure 11-7.9). If necessary, lubricate in accordance with paragraph 11-40.6a, f.

(2) Adjust trigger forces in accordance with paragraph 11-40.7.

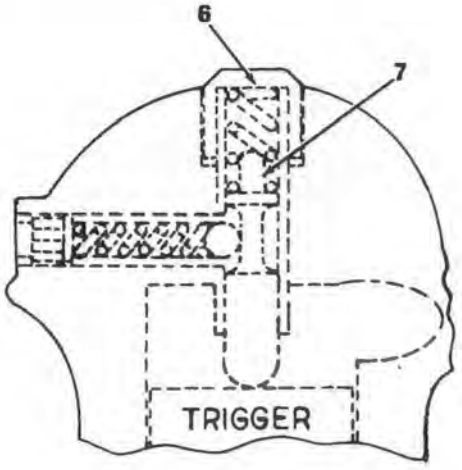


Figure 11-7.1. Internal position of trigger detent mechanism components at first stage make.

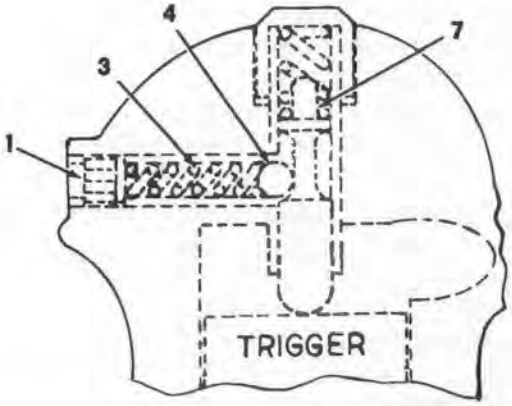


Figure 11-7.3. Internal position of trigger detent mechanism components at peak detent.

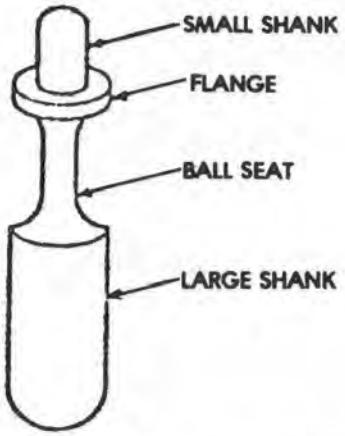


Figure 11-7.2. Pin 7 (PM 21217) area identification.

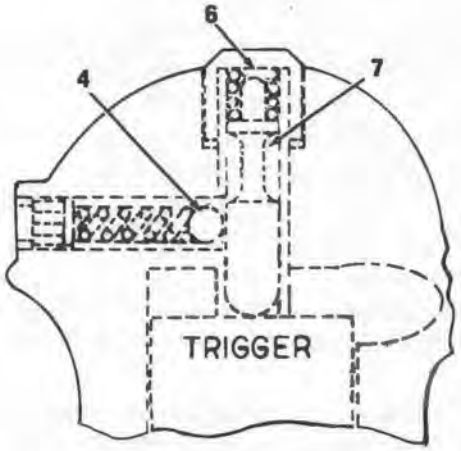


Figure 11-7.4. Internal position of trigger detent mechanism components at second stage make.

(3) If a burr is present between the ball seat radius and large shank of pin (7, figure 11-7.6), replace all components of the trigger detent mechanism.

(4) Insert PM21265 may have corner wear from contact with ball (4, figure 11-7.9) due to poor adjustment (figure 11-7.7). If corner wear is present, replace grip assembly.

(5) Check inserts (PM21265 and PM21264, figure 11-7.9) for thread mutilation. Remove and replace grip assembly if mutilation is present.

(6) Check insert (PM21264). If insert is bent or deformed, remove and replace grip assembly.

11-40.6. Installation - Trigger Detent Mechanism. a. Install trigger and switch into grip handle before installing trigger detent mechanism. Follow installation instructions pertaining to each grip handle.

b. Layout and identify all parts of detent mechanism kit. See figure 11-7.9 for identification and positioning of parts for installation.

c. Apply a.thin film of lubrication (C109) to pin (7, figure 11-7.9). Place pin (7) into insert (PM21264, figure 11-7.9) located at the top of the grip handle.

d. Place spring (6, figure 11-7.9) into insert (PM21264) above pin (7). Spring (6) will seat over small shank and rest on flange of pin (7).

e. Thread nut (5 or 5a, figure 11-7.9) a few turns into insert (PM21264) to retain pin (7) and spring (6).

f. Apply a thin film of lubrication (C109) to ball (4, figure 11-7.9). Install ball (4) into insert (PM21265, figure 11-7.9) located on side of grip handle.

g. Place spring (3, figure 11-7.9) into insert (PM21265). Spring (3) will be seated on top of ball (4).

h. Thread nut (2, figure 11-7.9) onto screw (1) about 1/4 inch. If screw (1a) is used, do not use nut (2).

i. Thread screw (1 or 1a, figure 11-7.9) into insert (PM21265). Thread only a few turns initially, as screw (1 or 1a) is used later to adjust trigger detent force.

11-40.7. Adjustment - Trigger Detent Mechanism. a. Actuate trigger several times to assure smooth action.

b. Check all three trigger actuation forces using a suitable spring gage. Acceptable trigger actuation forces are listed below.

Acceptable Trigger Actuation Forces

Trigger Position	Acceptable Limits
First Stage Make	1.75 to 2.75 lbs
Peak Detent	7.00 to 8.00 lbs
Second Stage Make	4.00 to 6.00 lbs

c. To adjust first stage make:

(1) To increase force, tighten (clockwise) nut (5 or 5a, figure 11-7.9). Check force with spring gage.

(2) To decrease force, loosen (counterclockwise) nut (5 or 5a, figure 11-7.9). Check force with spring gage.

d. To adjust peak detent:

(1) To increase force, tighten (clockwise) screw (1 or 1a, figure 11-7.9). Check force with spring gage.

(2) To decrease force, loosen (counterclockwise) screw (1 or 1a, figure 11-7.9). Check force with spring gage.

e. To adjust second stage make:

(1) To increase force, tighten (clockwise) nut (5 or 5a, figure 11-7.9). Check force with spring gage.

(2) To decrease force, loosen (counterclockwise) screw (1 or 1a, figure 11-7.9). Check force with spring gage.

11-40.8. Testing - Trigger Detent Mechanism. a. After actuation forces have been set, actuate trigger several times to insure that there is no binding. With a spring gage, recheck all forces to insure that they are within the limits described in paragraph 11-40.7.b. Make any necessary adjustments.

b. Apply sealant (C7.2) around nut (5 or 5a, figure 11-7.9) in recessed area of grip handle.

c. Hold screw (1, figure 11-7.9) and secure nut (2) up to grip handle. Do not use nut (2) if screw (1a) is used.

d. If screw (1, figure 11-7.9) and nut (2) are used, apply small amount of glyptol (C117.2) around screw (1) thread at top of nut (2) (figure 11-7.8). Glyptol is used to determine if the detent adjustment has been tampered with.

11-41. CONTROL TUBES — COLLECTIVE CONTROL SYSTEM.

11-42. Description — Control Tubes — Collective Control System. Varied length control tubes (adjustable and non-adjustable) are used in the collective control system. The non-adjustable type are fitted with bonded and riveted clevis ends. The adjustable type have a threaded clevis end and locknut which secures clevis end.

11-43. Removal — Control Tubes — Collective Control System. a. Remove access doors (figure 2-19) as required.

b. Detach forward end of control tube (6, figure 11-8), from torque tube lever (1) by removing cotter pin (5), nut (4), washers (3), and bolt (2).

Figure 11-7.5. Approximate trigger positions.

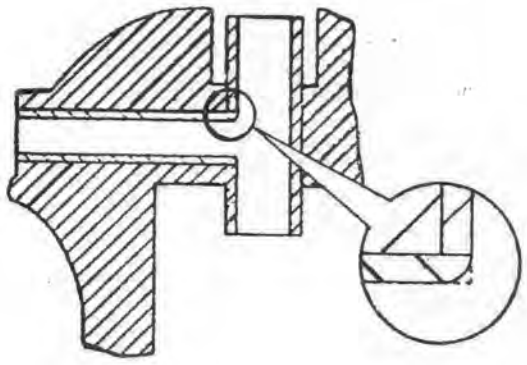


Figure 11-7.7. Insert (PM21265) - Corner Wear.

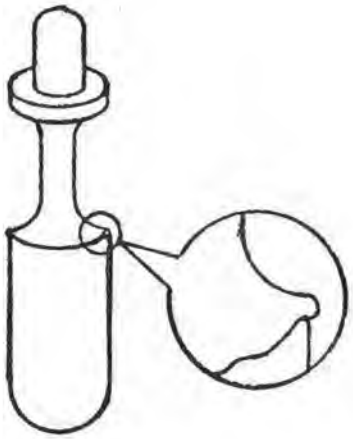


Figure 11-7.6. Pin 7 (PM21217)-Burr Location.

Figure 11-7.8. Glyptol application to screw and nut.

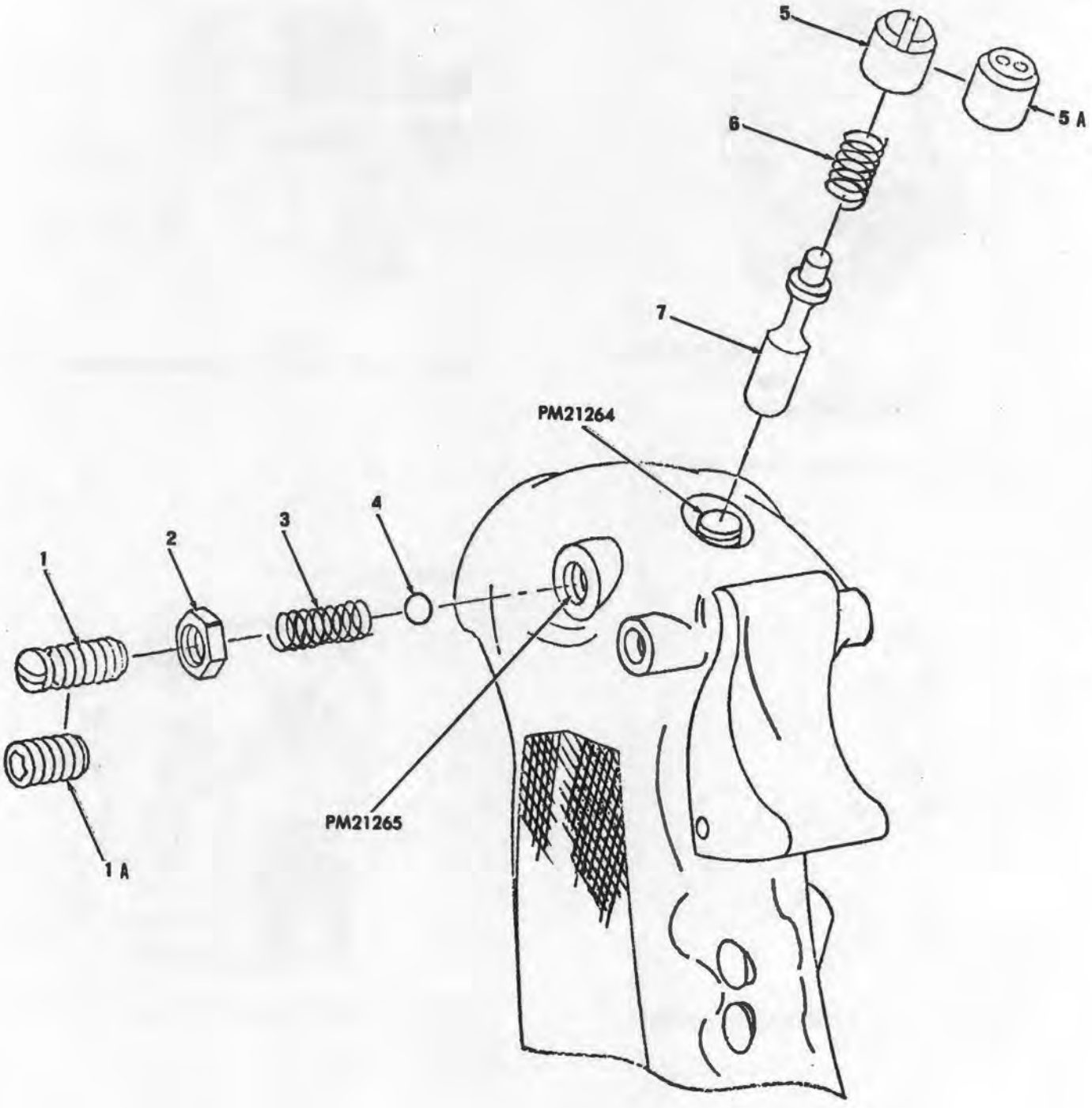


Figure 11-7.9. Trigger detent mechanism-exploded view.

c. Detach aft end of control tube (6) from lever (13) by removing cotter pin (5) and nut (8), washer (3), and bolt (7).

d. Detach forward end of control tube (10) from lever (13) by removing cotter pin (5) and nut (11), washers (3), and bolt (9).

e. Detach aft end of control tube (10) from bellcrank (23) by removing cotter pin (5) and nut (24), washer (3), and bolt (25).

f. Detach lower end of control tube (19) from bellcrank (23) by removing cotter pin (5) and nut (18), washers (3), and bolt (20).

g. Detach upper end of control tube (19) from collective hydraulic actuator by removing cotter pin, nut, washers and bolt.

11-44. Inspection — Control Tubes — Collective Control System. a. Inspect control tubes (6, 10, and 19, figure 11-8) for corrosion, wear, and mechanical damage. Refer to figure 11-9 for wear and damage limits.

b. Inspect clevis end holes for wear and clevis end for looseness in tube.

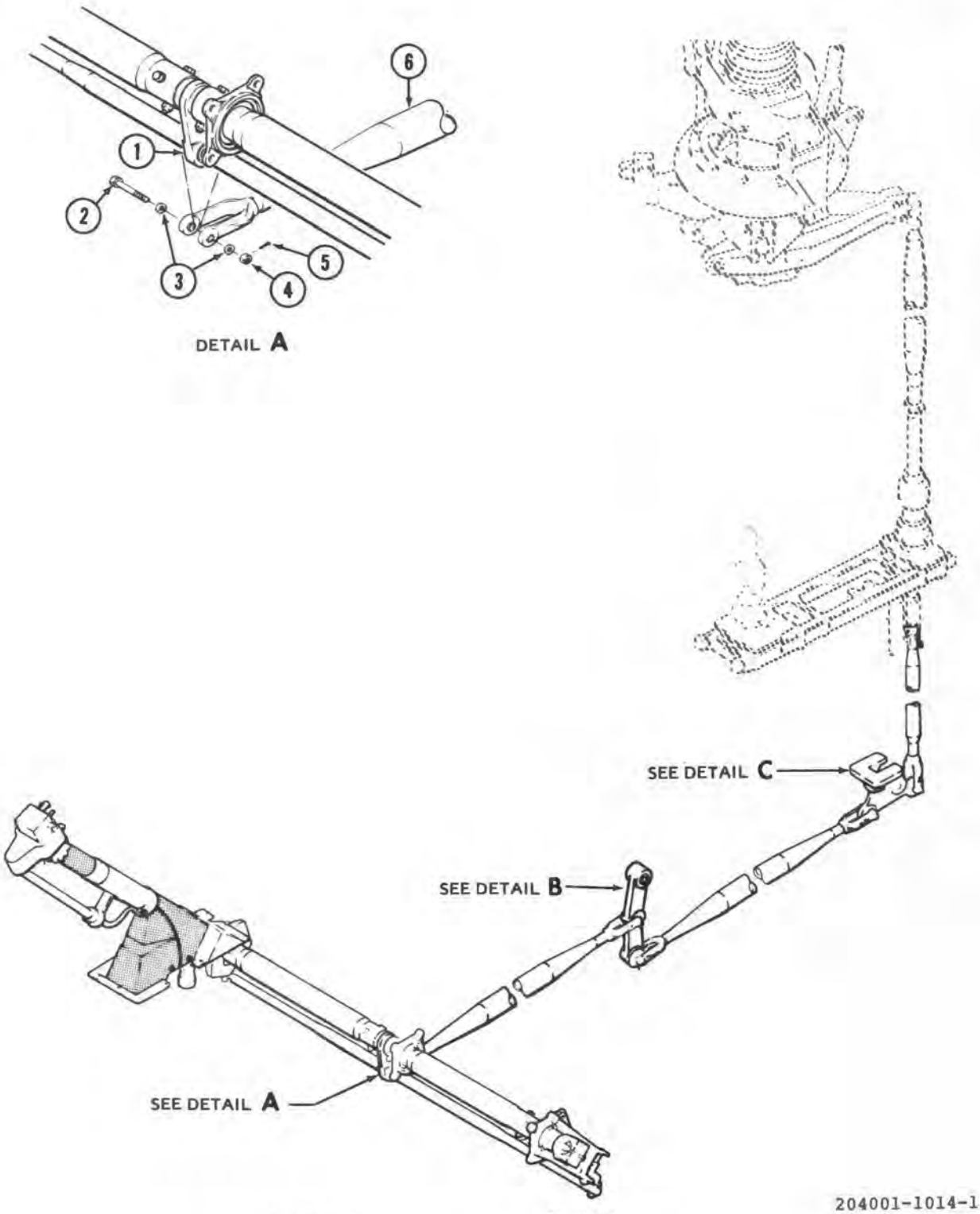
11-45. Repair or Replacement — Control Tubes — Collective Control System. a. Polish out corrosion or mechanical damage to control tubes (repair areas only) in accordance with limits in figure 11-9.

b. Any damage to swage transition area or damage in repair areas that is in excess of limits is cause for replacement of tube assembly.

11-46. Installation — Control Tubes — Collective Control System. a. Position forward end of control tube (6, figure 11-8) to arm on torque tube lever (1) and install bolt (2), washers (3), nut (4), and cotter pin (5).

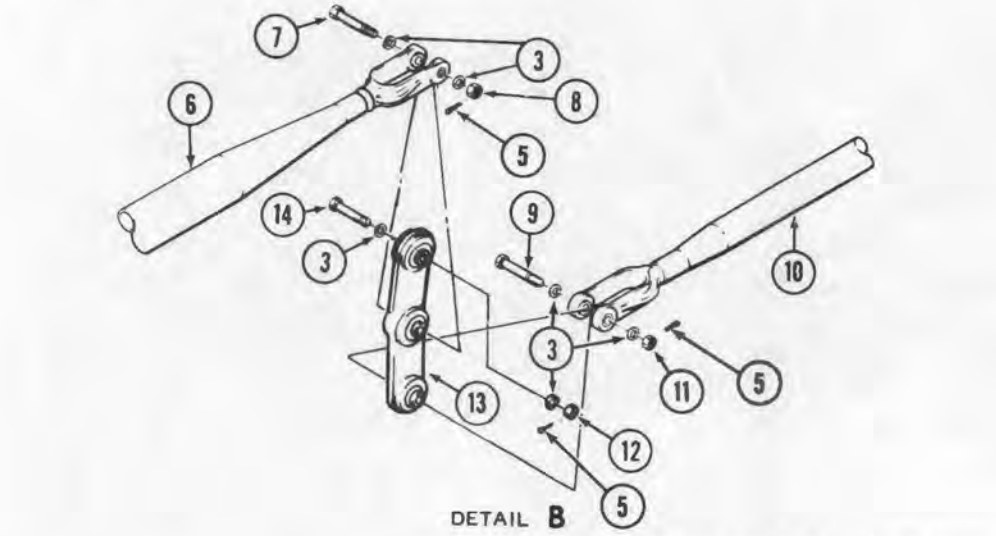
b. Position aft end of control tube (6) to lever (13) and install bolt (7), washers (3), nut (8) and cotter pin (5).

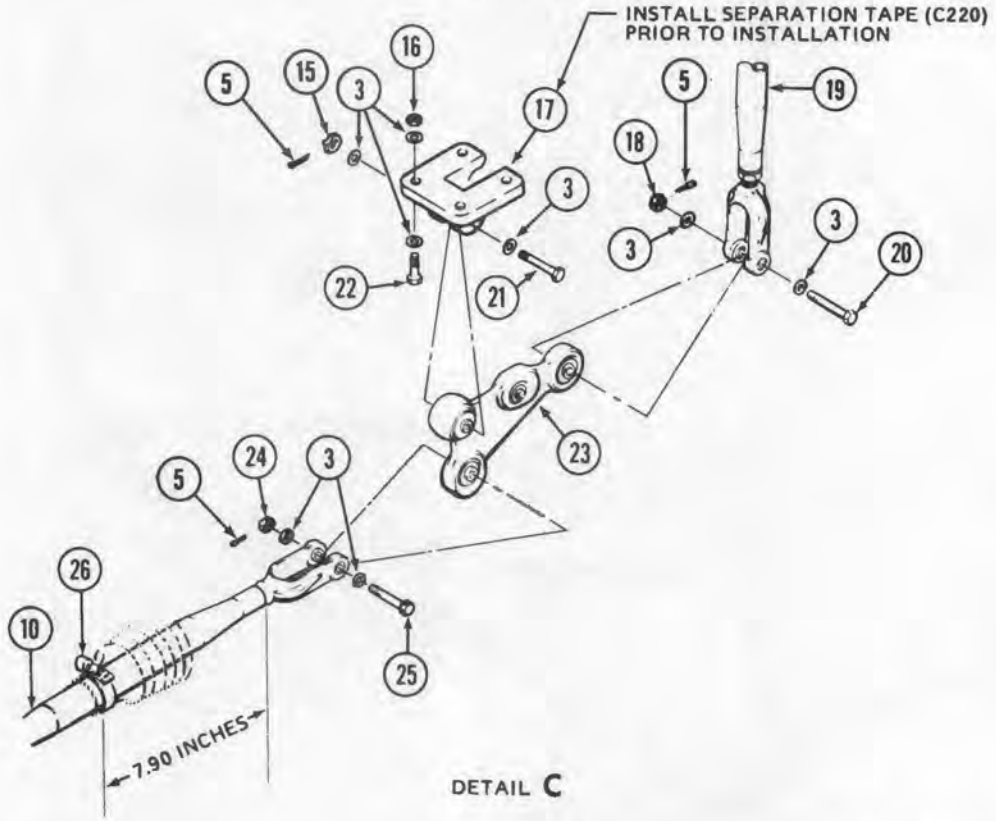
c. Install aft end of control tube (10) through boot (detail C). Position forward end of control tube (10) to lever (13). Install bolt (9), washers (3), nut (11), and cotter pin (5).



1. Lever
2. Bolt
3. Washers
4. Nut
5. Cotter pin
6. Control tube

Figure 11-8. Collective control system (bellcranks, levers, supports, and control tubes) — removal and installation (Sheet 1 of 2)





7. Bolt
8. Nut
9. Bolt
10. Control tube
11. Nut
12. Nut
13. Lever
14. Bolt
15. Nut
16. Nut
17. Support
18. Nut
19. Control tube
20. Bolt
21. Bolt
22. Bolt
23. Bellcrank
24. Nut
25. Bolt
26. Clamp

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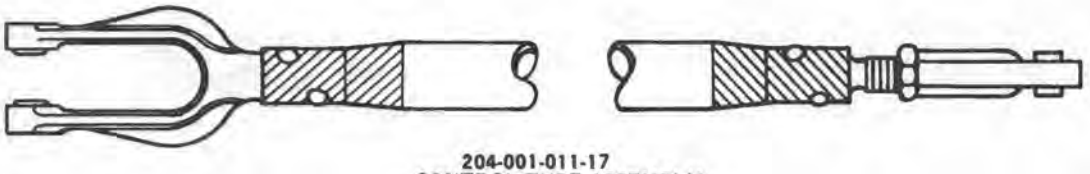
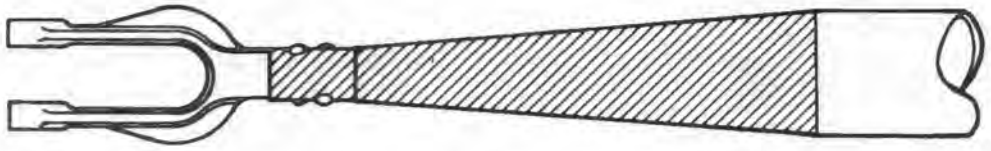
Figure 11-8. Collective control system (bellcranks, levers support, and control tubes) — removal and installation (Sheet 2 of 2)



204-001-011-17
CONTROL TUBE ASSEMBLY



204-001-027-23
CONTROL TUBE ASSEMBLY
(Both Ends Identical)

NOTES:

1. Maximum mechanical and corrosion limits for all three tubes is 0.005 inch after clean-up.
2. No damage in shaded areas.
3. No cracks allowed.

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Figure 11-9. Wear and damage limits (control tubes) collective control system

d. Position aft end of control tube (10) to bellcrank (23). Install bolt (25), washers (3), nut (24), and cotter pin (5) (detail C).

e. Position lower end of control tube (19) to bellcrank (23). Install bolt (20), washers (3), nut (18) and cotter pin (5).

f. Attach upper end of control tube (19) to hydraulic actuator during rigging of collective control system.

11-47. BELLCRANKS, LEVERS AND SUPPORTS — COLLECTIVE CONTROL SYSTEM.

11-48. Description — Bellcranks, Levers and Supports — Collective Control System. Various bellcranks, levers, and supports are incorporated in the collective control system. The supports are airframe mounted and provide a pivot mount for levers and bellcranks.

11-49. Removal — Bellcranks, Levers and Supports — Collective Control System.

a. Remove lever (13, figure 11-8) from bracket as follows:

(1) Remove access door (figure 2-19).

(2) Disconnect control tubes (6 and 10) from lever (13).

(3) Remove cotter pin (5) and nut (12), two washers (3), and bolt (14) from bracket and lever (13). Remove lever (13).

b. Remove bellcrank (23) and support (17) as follows: (Detail C)

(1) Remove cargo suspension assembly (paragraph 14-187).

(2) Disconnect control tubes (10 and 19) (Refer to Detail C.) from bellcrank (23).

(3) Remove cotter pin (5) and nut (15), two washers (3), and bolt (21) from support (17) and remove bellcrank (23).

(4) Remove four nuts (16), eight washers (3), and four bolts (22) from support (17) and remove support (17).

11-50. Inspection — Bellcranks, Levers and Supports — Collective Control System. a. Inspect bellcranks, levers, and supports for loose bearings. Refer to paragraph 11-206 for bearing limits.

b. Inspect bellcranks, levers, and supports for corrosion and mechanical damage. Refer to figure 11-10 for inspection limits.

11-51. Repair — Bellcranks, Levers and Supports — Collective Control System (AVIM). a. Replace loose or damaged bearings in bellcranks, levers, and supports. Refer to paragraph 11-207 for bearing replacement.

b. Remove minor surface corrosion or repair damage areas, using fine grit sandpaper (C185). Observe limits shown in figure 11-10.

(1) Treat repaired areas with chemical film (C42).

(2) Paint repaired area using primer (C253).

11-52. Installation — Bellcranks, Levers and Supports — Collective Control System. a. Install lever (13, figure 11-8) as follows:

(1) Position lever (13) into bracket of cabin structure and install bolt (14), two washers (3), and nut (12).

(2) Install cotter pin (5).

b. Install bellcrank (23) and support (17) as follows:

CAUTION

Ensure that bellcrank (23) and support (17) are positioned properly prior to installation. (Refer to detail C.)

(1) Install separation tape (C220) (overlapping edges 0.25 inch) to support (17).

WARNING

Primer (C253) is flammable with a flash point of 50 degrees F (10 degrees C). Use in a well ventilated area and avoid breathing spray mist.

(2) Install washers (3) on bolts (22).

(3) Apply primer (C253) to bolts (22) and install bolts (22), support (17), washers (3), and nuts (16) through support to cabin structure (detail C).

(4) Position bellcrank (23) as shown in detail C to support (17) and install bolt (21), washers (3), and nut (15). Secure nut (15) with cotter pin (5).

(5) Install control tube assemblies (10 and 19) to bellcrank (23).

(6) Install cargo suspension assembly (paragraph 14-192).

(7) Install access door (figure 2-19).

11-53. CYCLIC CONTROL SYSTEM.

11-54. Description — Cyclic Controls. A system of linkage (figure 11-11) transmits movement from cyclic control sticks to swashplate which actuates rotating controls to main rotor, controlling direction of helicopter. Pitch and roll control are independent linkages from control stick to an intermixing bellcrank. From this point on the swashplate horns, the linkage cannot be considered separately as to effect. Two hydraulic power cylinders are incorporated to reduce effort required for control and to reduce feedback forces from main rotor. Two force gradient units, with magnetic brakes are incorporated for artificial control feel and stabilization of controls.

11-55. Rigging — Cyclic Controls.

Premaintenance requirements for cyclic controls

Conditions	Requirements
Model	All
Part No. or Serial No.	All
Special Tools	(T32)

Conditions	Requirements
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C40), (C96), (C142), (C126.1)
Special Environmental Conditions	None

a. Rig system with control sticks, jackshaft, bellcranks, and all nonadjustable tubes installed and connected (paragraph 11-101).

b. Place and hold both cyclic control sticks in either extreme right or left lateral position against stops. Adjust lateral control tube (32, figure 11-11) to fit and connect.

c. Place and hold both cyclic control sticks in extreme forward or extreme aft position against stops. Adjust tube (31) to fit and connect.

d. Place and hold pilot cyclic stick in extreme aft-left corner position, so that upper arm of bellcrank (10) is in its uppermost position. Bottom out piston up-travel at top of cylinder (14) and set lever of servo valve (12) in up position (detail A, figure 11-11). Adjust tube (11) to fit, then shorten three full turns and attach to valve lever with bolt, nut, and washers. Install washer next to bolt head and also next to nut. Torque nut to 25 inch-pounds maximum (bolt must turn freely). Install cotter pin.

e. Place and hold pilot cyclic stick in extreme aft-right corner position, and adjust cylinder (19), control valve (21), and tube (22) in same manner as in step d. above. Attach tube to valve lever and torque as outlined in step (d).

f. Install cyclic stick fixture (T32) on copilot control stick (detail B, figure 11-11).

g. Position swashplate according to dimensions within limits shown (figure 11-12). With servo valve levers neutral (boost cart on line). Adjust control tubes (16 and 17, figure 11-11) to fit and connect. Use hydraulic power if available (paragraph 7-171).

h. Check arm of fore-aft magnetic brake for alignment of letter "F" opposite scribe mark on shaft and lateral magnetic brake arm for letter "L" opposite mark on shaft (detail C).

i. Position arm on magnetic brake (33) with scribe mark on shaft opposite "L" on arm.

j. With cyclic stick in neutral, position arm on lateral magnetic brake (33) in center of travel.

k. Adjust and install lateral force gradient (34) (paragraph 11-87).

l. Remove rigging fixture (T32).

m. Position boots (15 and 18) on control tubes (16 and 17) to dimension shown.

n. Place cyclic stick against forward stop and place arm on fore-and-aft magnetic brake (26) against its full aft stop. Adjust fore-and-aft force gradient (30) to fit and then connect. Refer to paragraph 11-83.

o. Ensure that controls have full free travel with boost pressure applied.

p. Check that balance spring (detail D) is hooked in hole in bracket secured to swashplate control horn. Preload the spring by twisting lower end one to two turns, so as to close the coils, and hook in proper hole of bracket so that spring does not go slack when swashplate horn is at lowest position (detail D, figure 11-11).

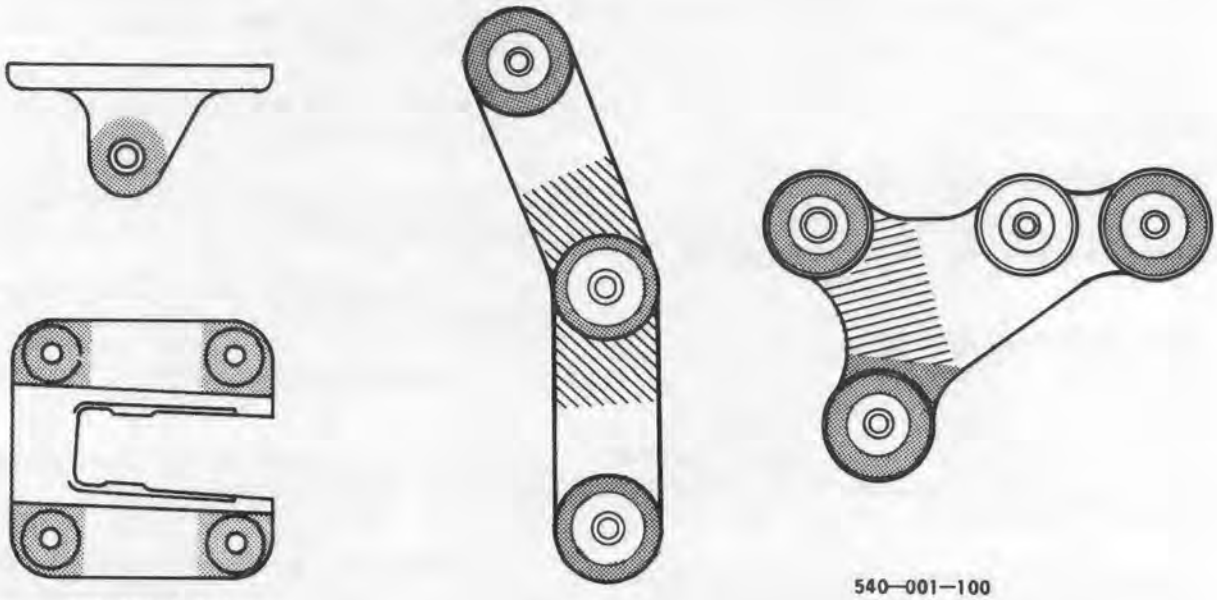
q. Adjust cyclic control system balance to eliminate all motion of cyclic stick with hydraulic boost on and hands off.

r. Adjust by moving washers (one at a time) on counterweight balance weight (28) from location A to location B (detail E, figure 11-11).

s. Relocate washers in equal quantities on both bolts.

t. Inspect complete cyclic controls system for security and safetying of parts.

u. Check synchronized elevator for proper rigging. Adjust as necessary (paragraph 11-185).



204—001—102—1
SUPPORT

540—001—101
LEVER

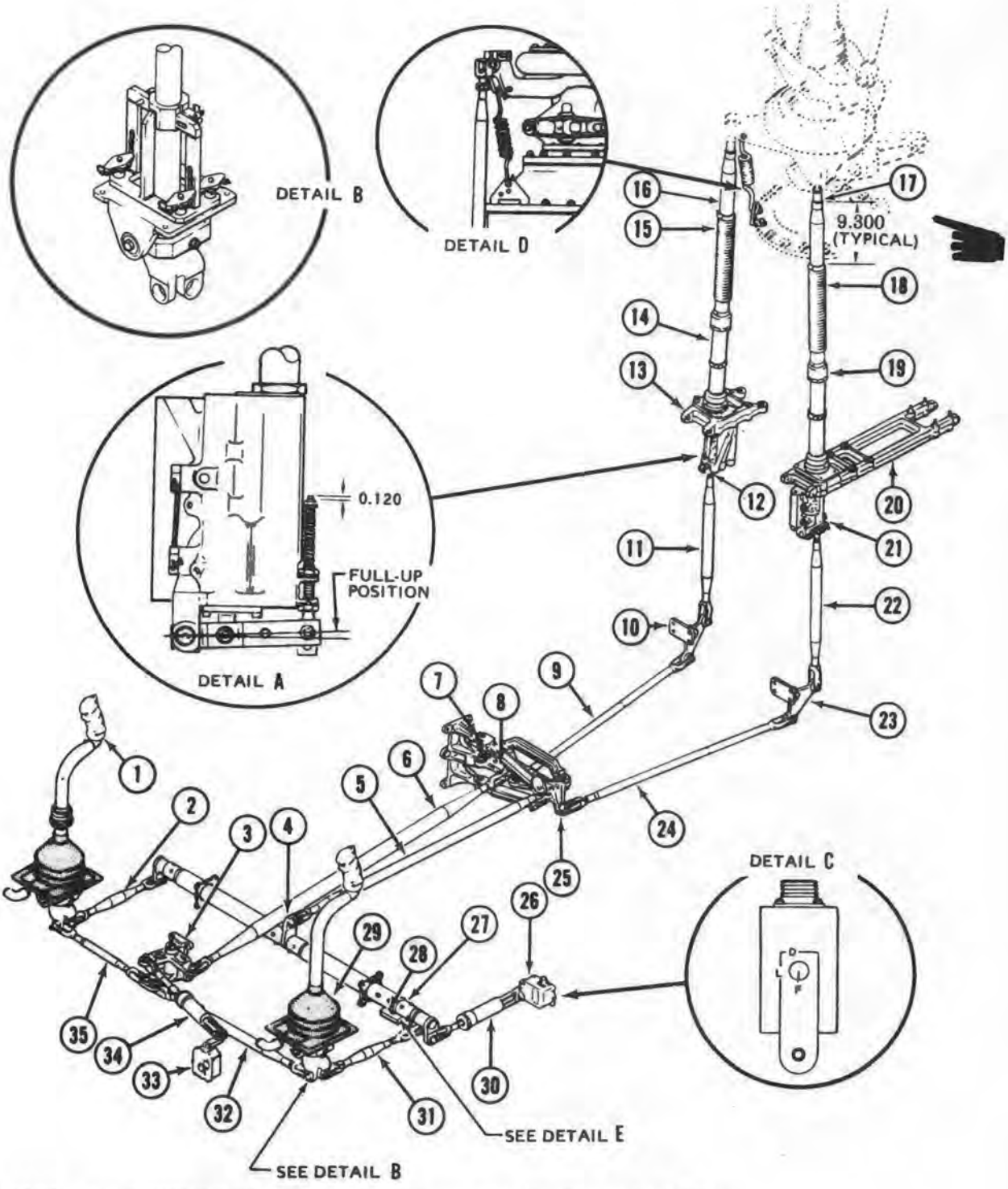
540—001—100
BELLCRANK

DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	▭	▩	▨
MECHANICAL DAMAGE (AFTER CLEANUP)	0.015 IN.	0.010 IN.	0.005 IN.
CORROSION DAMAGE (BEFORE CLEANUP)	0.0075 IN.	0.005 IN.	0.0025 IN.
(AFTER CLEANUP)	0.015 IN.	0.010 IN.	0.005 IN.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 IN. SQ	0.10 IN. SQ.	0.10 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 BY 0.05 IN.	0.04 BY 0.04 IN.	
BORE DAMAGE	0.002 IN. FOR ONE-FOURTH CIRCUMFERENCE		
NO CRACKS ALLOWED			

204001-1034

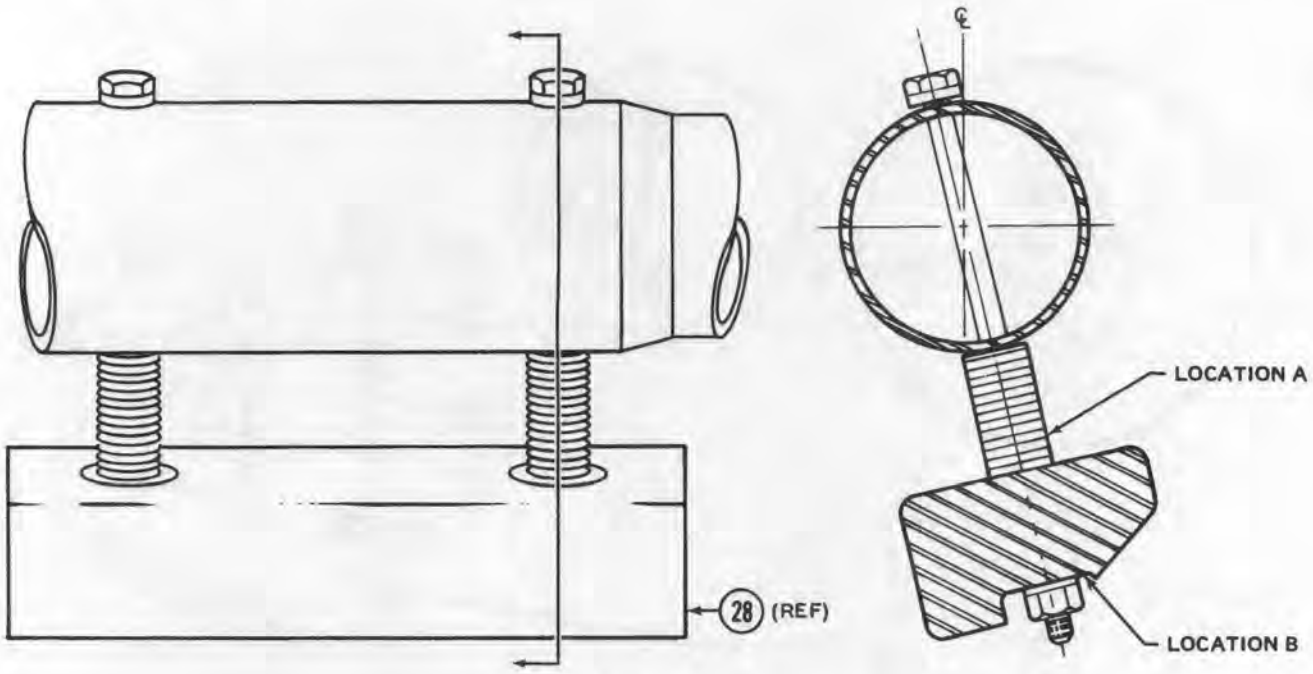
Figure 11-10. Wear and damage limits (bellcranks, levers, and supports — collective control system



NOTE: ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

204001-1035A

Figure 11-11. Cyclic control system (Sheet 1 of 2)



DETAIL E

1. Cyclic control stick — pilot
2. Control tube — fore and aft
3. Bellcrank
4. Tube and lever assembly
5. Control tube
6. Control tube
7. Matched link set
8. Bellcrank
9. Control tube
10. Bellcrank and support
11. Control tube
12. Servo valve
13. Support
14. Servocylinder assembly
15. Boot
16. Control tube
17. Control tube
18. Boot
19. Servocylinder assembly
20. Support
21. Control valve
22. Control tube
23. Bellcrank and support
24. Control tube
25. Bellcrank
26. Magnetic brake — fore and aft
27. Tube and lever assembly
28. Counterweight balance weight
29. Cyclic control stick — copilot
30. Force gradient — fore and aft
31. Control tube — fore and aft
32. Control tube — lateral
33. Magnetic brake — lateral
34. Force gradient — lateral
35. Control tube — lateral

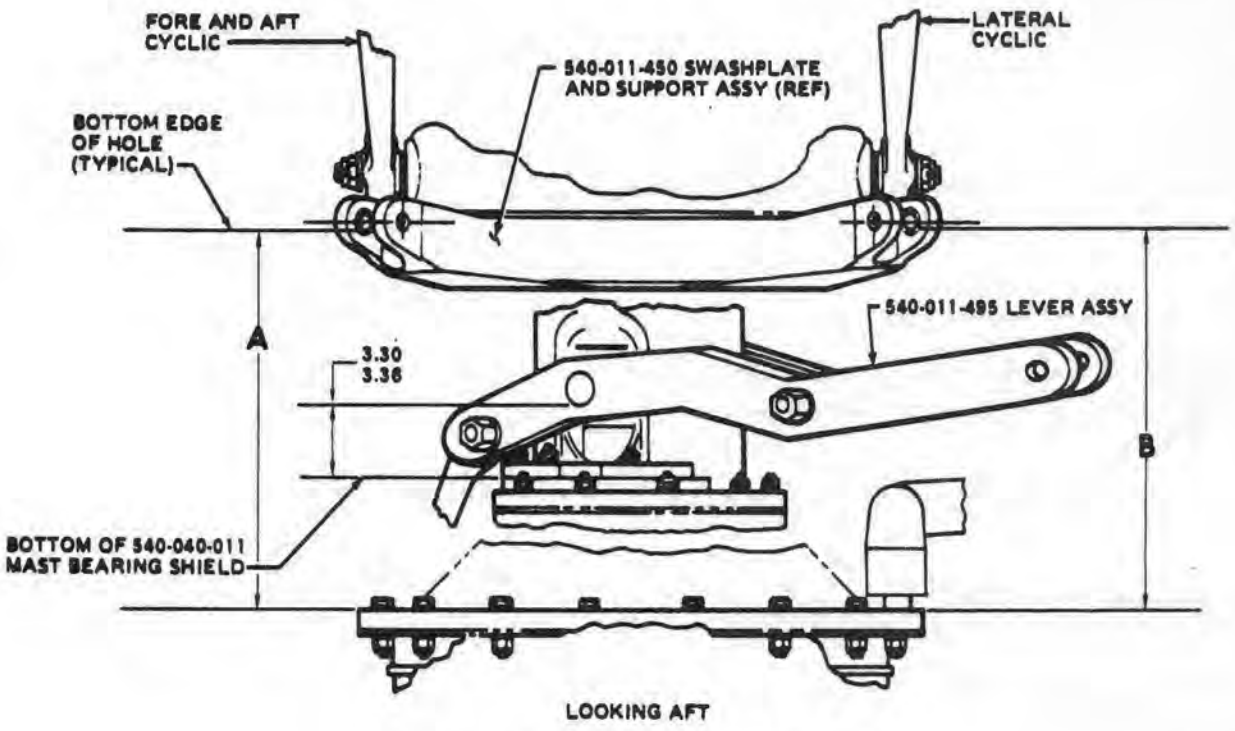
204001-1023-2

Figure 11-11. Cyclic control system (Sheet 2 of 2)

11-56. CYCLIC CONTROL STICK.

11-57. Description — Cyclic Control Stick. Two cyclic control sticks are installed. The grips are equipped with a trigger type two position radio-I.C.S. communications switch, a cargo hook release switch, and a force trim switch. The control sticks are identical except for an adjustable friction on the pilot stick. Linkage between cyclic control sticks and swashplate control horns includes push-pull tubes, bellcranks, control tubes, two force gradients with magnetic brakes, and two hydraulic actuators.

11-58. Inspection — Cyclic Control Stick (Installed). a. Inspect for binding, full travel, and synchronization of pilot and copilot cyclic stick assemblies.



COLLECTIVE LEVER SHOWN OUT OF POSITION IN ITS RELATION TO THE SWASHPLATE

209401-2-1B

1. Swashplate travels from neutral: 14° fwd. 13.5° aft ± 10° lateral.
2. Lateral swashplate pretilt, between limits of ½° and 1½° as required for satisfactory flight.
3. Dimensions A and B are measured from the machined surface of transmission top case to bottom of hole in swashplate.

*** Swashplate setting with respect to mast

FORE & AFT	**LATERAL	DIMENSION (INCHES) A RIGHT HORN	DIMENSION (INCHES) B LEFT HORN
		FORE AND AFT CYCLIC	LATERAL CYCLIC
NORMAL	0.500° DOWN LEFT	11.880	11.750
NORMAL	1.000° DOWN LEFT	11.960	11.660
NORMAL	1.500° DOWN LEFT	12.030	11.600
*NORMAL	2.000° DOWN LEFT	12.100	11.530
*NORMAL	2.500° DOWN LEFT	12.160	11.460

*With rescue hoist

**Lateral swashplate pretilt, between limits of 0.5° and 1.5° as required for satisfactory flight.

***Swashplate travels from neutral 14° forward 13.500° aft, 10° lateral.

4. All dimensions in inches unless otherwise stated.

209401-2-2B

Figure 11-12. Positioning swashplate

b. Inspect friction lock for restriction of cyclic stick movement and proper release.

c. Check boot for cuts, tears, deterioration, and missing, loose, or improperly installed hardware.

11-59. Removal — Cyclic Control Stick (Pilot or Copilot).

NOTE

Use this procedure to remove a complete stick assembly, including support and lever.

a. Remove pilot and copilot seats (paragraph 2-214).

b. Remove screws (33, figure 11-13) and washers (12) to detach boot assembly (32) from floor.

c. Slide boot assembly (32) up on cyclic control stick (2) for access.

d. Remove access doors (25, 26, 36, and 37, figure 2-19).

e. Disconnect cyclic control stick cable plug (31, figure 11-13) from receptacle on structure.

f. Remove cotter pins (11), nuts (30) and (34), washers (12) and bolts (27) and (29) attaching control tube (fore and aft) (35) and control tube (lateral) (28) to lever assembly (26).

g. Remove bolts (6) and washers (7) from support assembly (9).

h. Remove stick assembly (2) and support assembly (9).

11-60. Disassembly — Cyclic Control Stick. (AVIM). a. Remove screw (20, figure 11-13), lockwasher (19), and clamp (18) attaching electric cable (31) to lever assembly (26).

b. Remove cotter pin (11) and nut (17), washers (12), and bolt (24) attaching stick assembly (2) to lever assembly (26) and separate the parts.

c. Remove two cotter pins (11), nuts (10), washers (12), and bolts (8) attaching support assembly (9) to gimbal (14) and separate parts.

d. Remove two cotter pins (11), nuts (13), washers (12), and bolts (21) attaching gimbal (14) to lever assembly (26) and separate parts.

e. Remove two bearings (22), two bearings (16), and shims (23) and (15).

11-61. Inspection — Cyclic Control Stick (Removed). (AVIM) a. Inspect bearings (16 and 22, figure 11-13) for wear and damage.

NOTE

For bearing tolerances, refer to paragraph 11-206.

b. Inspect bolts for thread damage.

c. Inspect cyclic control stick for loose, missing, or improperly installed hardware.

d. Check boots for cuts, tears, and deterioration.

e. Inspect all components of cyclic control sticks for nicks, scratches, dents, broken or damaged tubing, and frayed or broken cabling.

f. Elongation of bolt holes shall not exceed **0.002** inch on the diameter. Score marks on the inside surface of the holes may be polished out for one-fourth of the circumference of the hole, if the depth of the score is **0.002** inch or less.

11-62. Repair or Replacement — Cyclic Control Stick (AVIM)

NOTE

Do not attempt to repair any damaged components.

a. Replace bearings if worn, rough, or damaged. (See figures 11-13 and 11-50.)

b. Replace electrical wires if frayed or broken.

c. Replace friction material (C96) (4, figure 11-13) in bell (3), if worn or damaged.

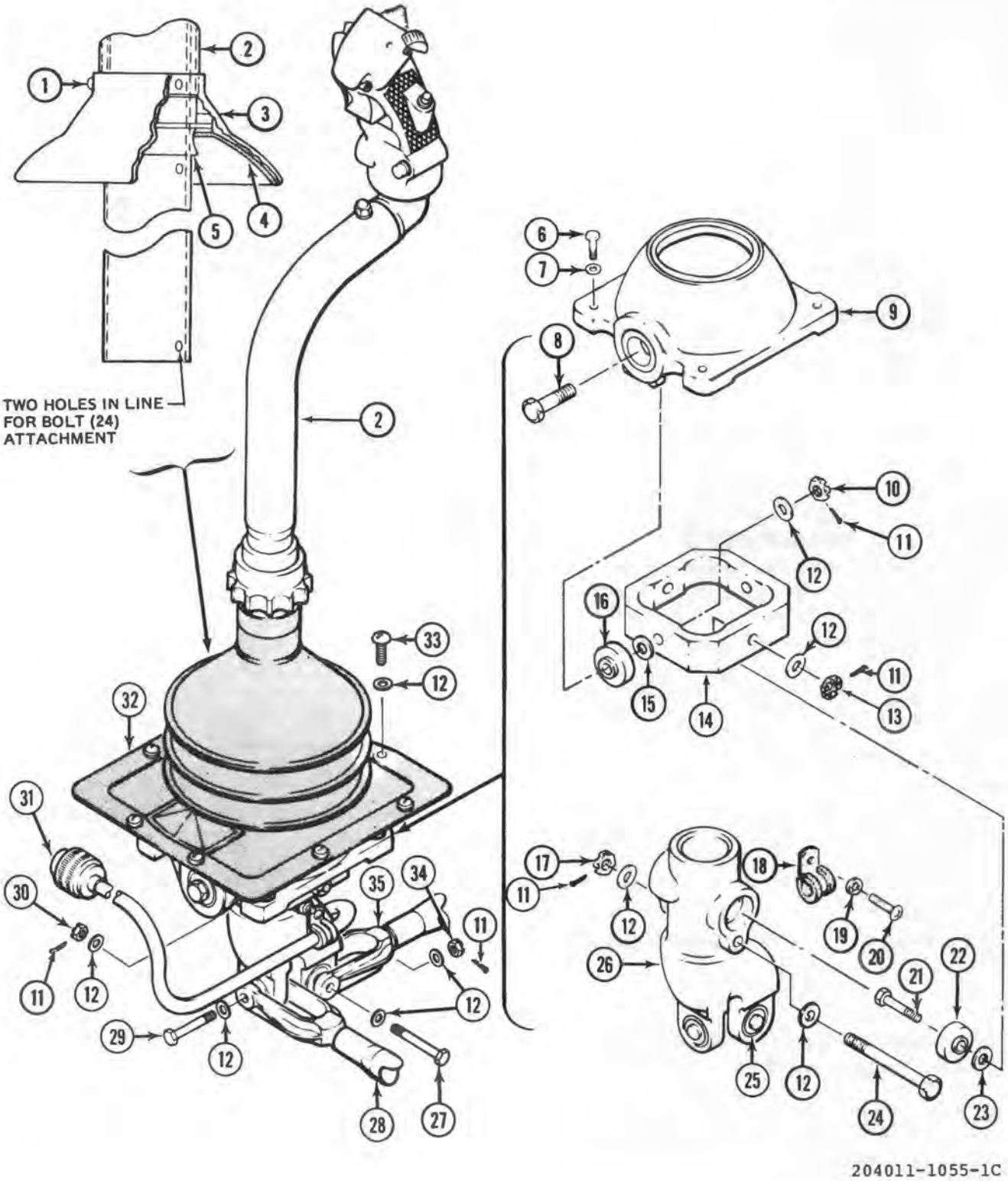


Figure 11-13. Cyclic control stick assembly (Sheet 1 of 2)

1. Rivet
2. Stick assembly
3. Bell
4. Friction material
5. Collar
6. Bolt
7. Washer
8. Bolt
9. Support assembly
10. Nut
11. Cotter pin
12. Washer
13. Nut
14. Gimbal
15. Shim
16. Bearing
17. Nut
18. Clamp
19. Lockwasher
20. Screw
21. Bolt
22. Bearing
23. Shim
24. Bolt
25. Bearing and sleeve
26. Lever assembly
27. Bolt
28. Control tube(lateral)
29. Bolt
30. Nut
31. Electrical cable
32. Boot assembly
33. Screw
34. Nut
35. Control tube (fore and aft)

2040'1-1033-2B

Figure 11-13. Cyclic control stick assembly (Sheet 2 of 2)

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Scrape old friction material (C96) out of bell and clean with MEK (C142).

(2) Apply cement (C40) to new friction material (C96) and install in bell (3).

d. Replace all parts that do not pass inspection requirements.

e. Replace boot if cut, torn, or deteriorated.

11-63. Assembly — Cyclic Control Stick (AVIM)

NOTE

Bolt heads (21, figure 11-13) to be inside lever assembly for step a.

a. Attach gimbal (14) to lever assembly (26) by installing two bearings (22), shims (23), and inserting bolts (21), securing with washers (12), nuts (13), and cotter pins (11).

NOTE

Bolt heads to be outside support assembly for step b.

b. Attach gimbal (14) to support assembly (9) by installing two bearings (16), shims (15), inserting bolts (8) and securing with washers (12), nuts (10), and cotter pins (11).

NOTE

Insert stick assembly (2) so forward and aft control tube attachment point is aft when assembly is installed in helicopter.

c. Place stick assembly (2) through support assembly (9) into lever assembly (26) and secure by inserting bolt (24), washers (12), one under bolt head and one under nut (17), and insert cotter pin (11).

d. Position electrical cable (31) and secure with clamp (18) by installing screw (20) with lockwasher (19).

11-64. Installation — Cyclic Control Stick (Pilot or Copilot).

NOTE

Use this procedure to install a stick assembly complete with support and lever.

a. Position cyclic control stick (2, figure 11-13) in place. Secure support assembly (9) to structure with four bolts (6) and washers (7).

b. Attach fore-aft (35) and lateral control tubes (28) to control stick lever (26) with bolts (27 and 29), washers (12), nuts (30, 34). Secure with cotter pins (11).

c. Connect and lockwire (C126.1) control stick electrical cable plug (31) to receptacle on structure below floor. Check that cable support clamp allows enough slack in cable for full stick travel only.

d. Install boot assembly (32), secured to floor with eight screws (33) and washers (12).

e. Install access doors (25, 26, 36 and 37), figure 2-19).

f. Install pilot and copilot seats (paragraph 2-217).

11-65. TUBE AND LEVER ASSEMBLY — CYCLIC CONTROLS.

11-66. Description — Tube and Lever Assembly — Cyclic Controls. Two control tube and lever assemblies are mounted under the floor and forward of the pilot seat. These are segments of linkage between cyclic control sticks and swashplate control horns.

11-67. Inspection — Tube and Lever Assembly — Cyclic Controls (Installed). a. Inspect tube and lever assemblies (2 and 3, figure 11-14) for binding.

b. Inspect bearing in arm assembly (24) for **0.012** inch radial and **0.030** inch axial maximum allowable wear.

c. Maximum allowable lateral play on tube and lever assemblies (2 and 3) is **0.200** inch. (Reference only, for assembly and overhaul at depot.)

d. Inspect tube and lever assemblies (2 and 3) for corrosion, cracks, nicks, and scratches.

e. Inspect counterweight (28) for security of mounting.

11-68. Removal — Tube and Lever Assembly — Cyclic Controls.

CAUTION

Parts of control system can be removed separately as need occurs, or completely in practical sequence. Take precautions against damage by accidental movement of linkage while disconnected.

a. Remove pilot and copilot seats (paragraph 2-214).

b. Remove access doors (25, 26, 36 and 65, figure 2-19) from cabin floor and lower skin of fuselage.

c. Remove cotter pin (25) and nut (4, figure 11-14), washer (5), and bolt (11) attaching tube assembly (12) to lever assembly (6) (detail A).

d. Remove cotter pin (25), nut (19), washers (17), and bolt (16) attaching tube assembly (18) to arm assembly (24) (detail C).

e. Remove cotter pin (45) and nut (44), washers (42), and bolt (41) attaching tube assembly (43) to lever assembly (34) (detail F).

f. Remove lockwire, washer (31), and bolt (40) attaching clevis assembly (35) to lever assembly (34) (detail E).

g. Remove bolts (13), washers (14), and nuts (15) attaching housing assemblies (1) to beam. Withdraw tube and lever assemblies (2 and 3) through access openings (detail B).

NOTE

Mark bolt and bushing installations prior to removal to ensure installation in same location.

11-69. Disassembly — Tube and Lever Assembly — Cyclic Controls. a. Remove bolts (33, figure 11-14, detail E), washers (31), and tapered bushings (32) attaching components of tube and lever assembly (3).

b. Remove tube (3) from lever assembly (34).

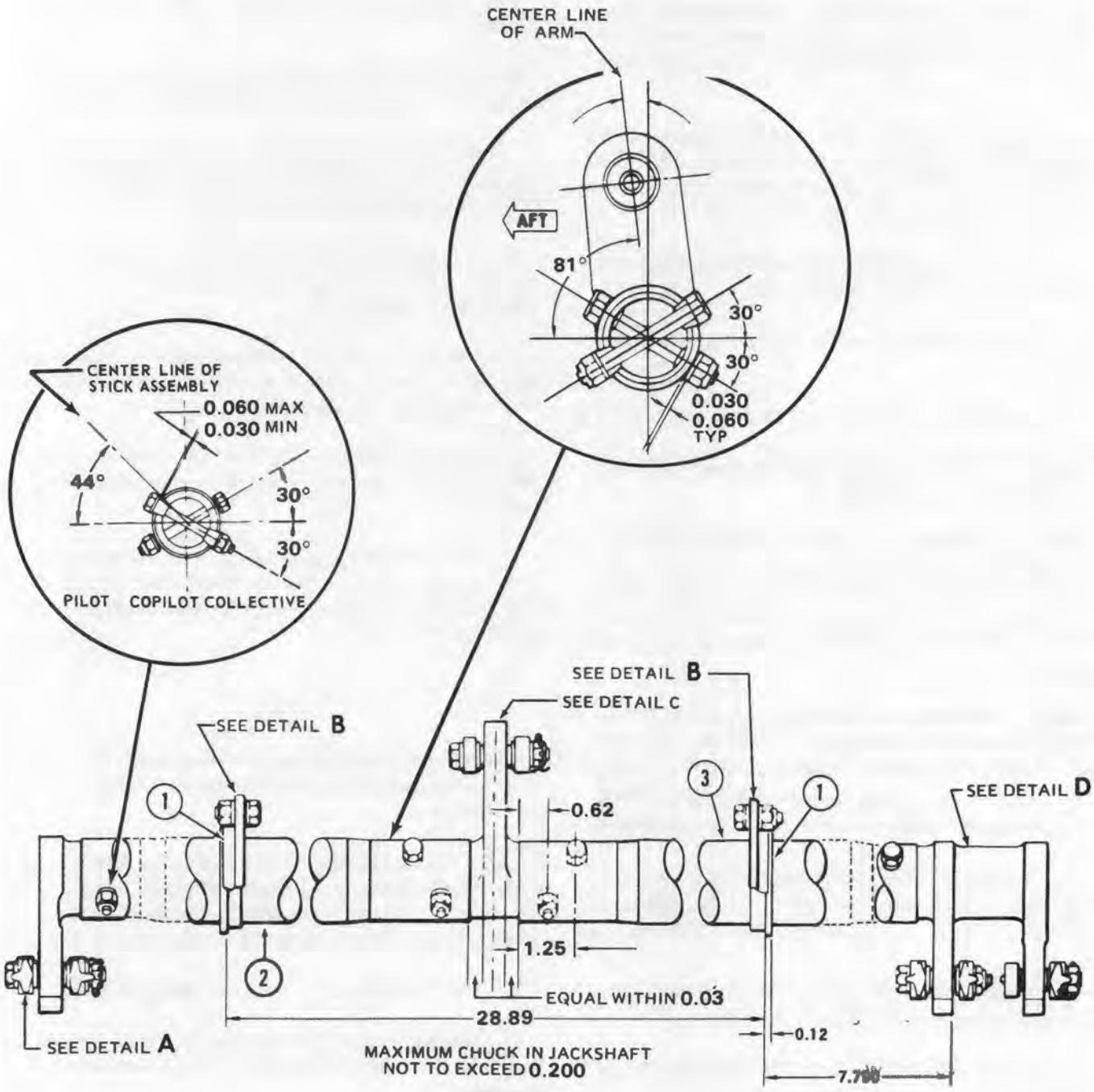
c. Remove bolts (7), washers (9), and tapered bushings (8) attaching components of tube and lever assembly (2).

d. Remove tube (2) from lever assembly (6).

11-70. Inspection — Tube and Lever Assembly — Cyclic Controls (Removed). a. Maximum allowable elongation of bushing hole is **0.003** inch.

b. Maximum allowable lateral play is **0.200** inch.

c. Maximum allowable wear on tube and lever assembly bearings is **0.010** inch radial.



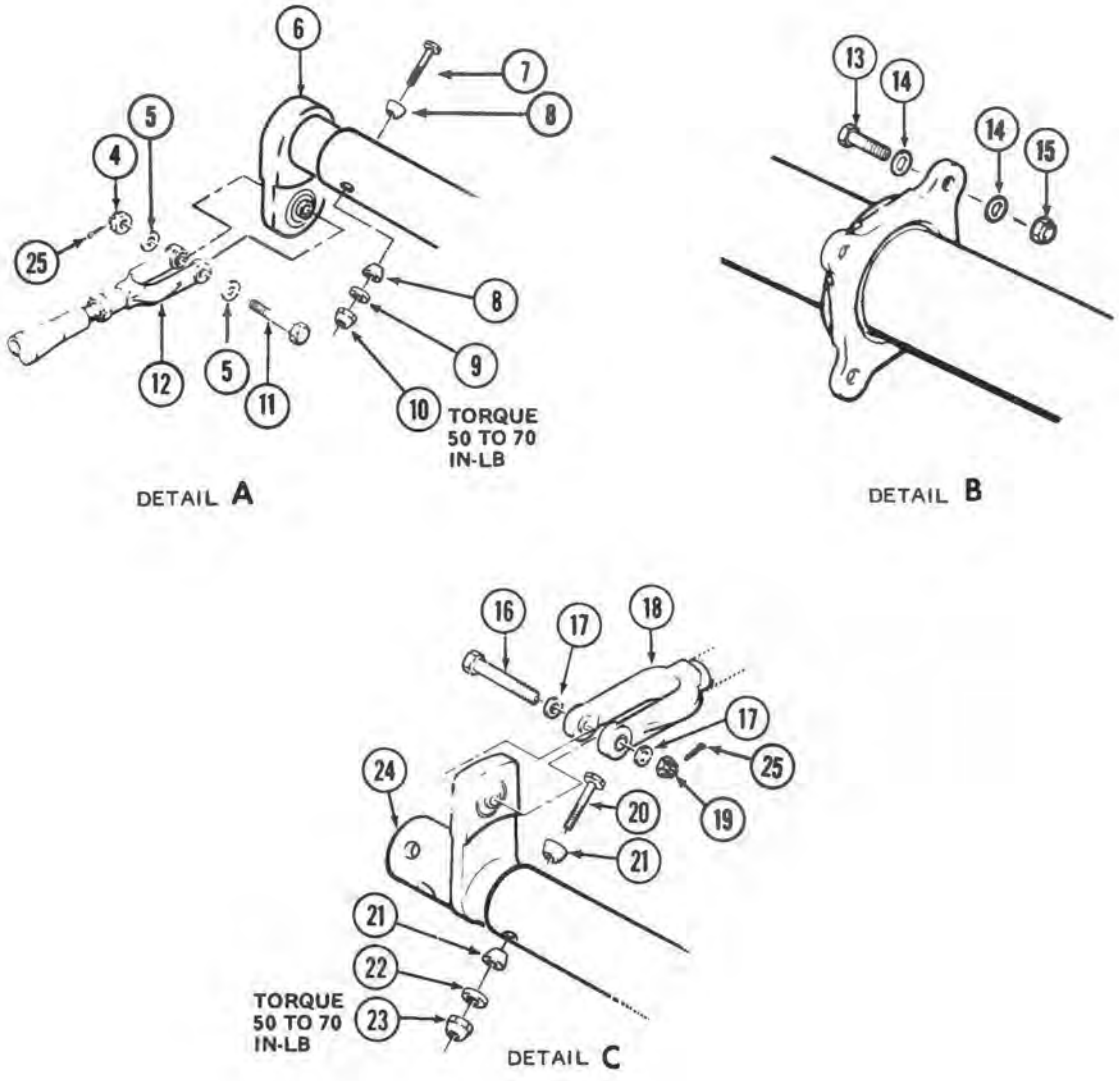
VIEW LOOKING AFT

1. Housing assembly
2. Tube and lever assembly
3. Tube and lever assembly

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

204001-1036-1A

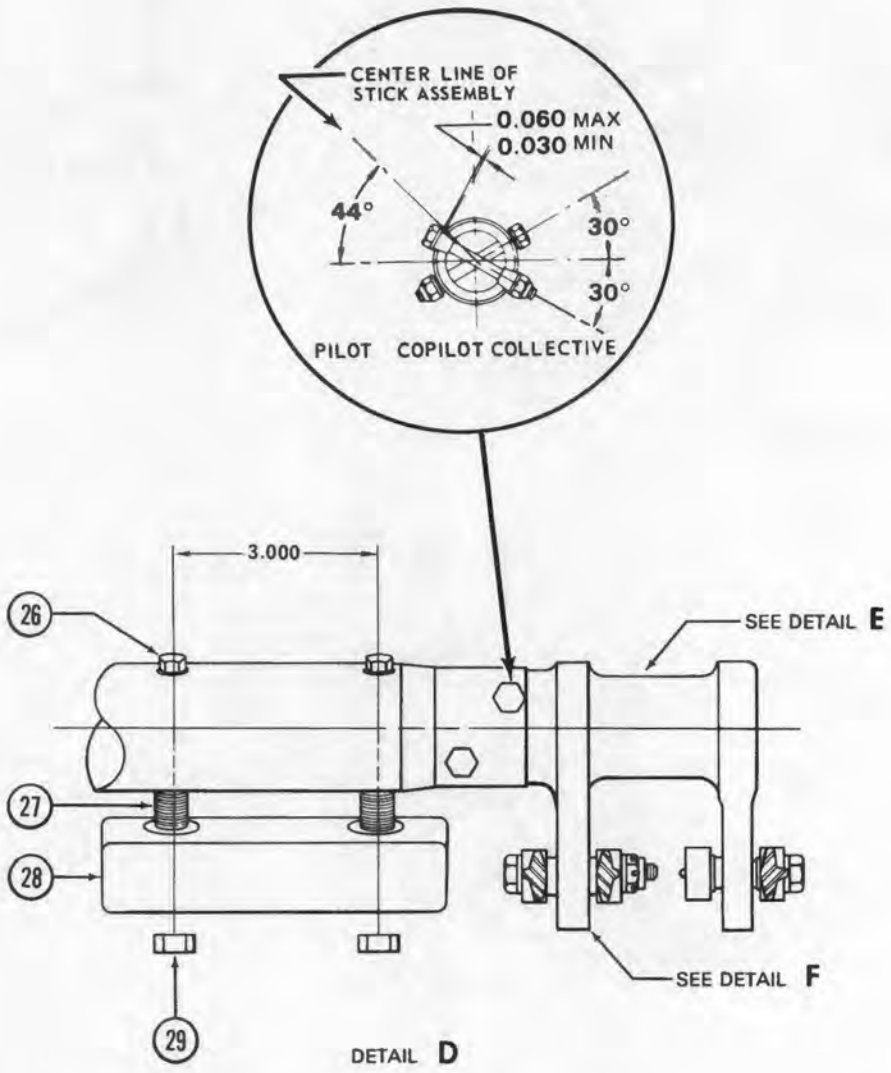
Figure 11-14. Cyclic control tube and lever assembly (Sheet 1 of 4)



4. Nut
5. Washer
6. Lever assembly
7. Bolt
8. Tapered bushing
9. Washer
10. Nut
11. Bolt
12. Tube assembly
13. Bolt
14. Washer
15. Nut
16. Bolt
17. Washer
18. Tube assembly
19. Nut
20. Bolt
21. Tapered bushing
22. Washer
23. Nut
24. Arm assembly
25. Cotter pin

204001-1022-2

Figure 11-14. Cyclic control tube and lever assembly (Sheet 2 of 4)



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

26. Bolt
27. Washers
28. Counterweight
29. Nut

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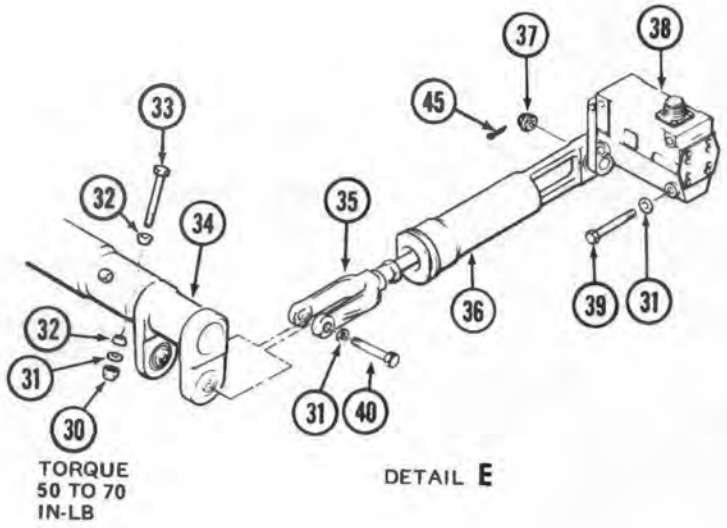
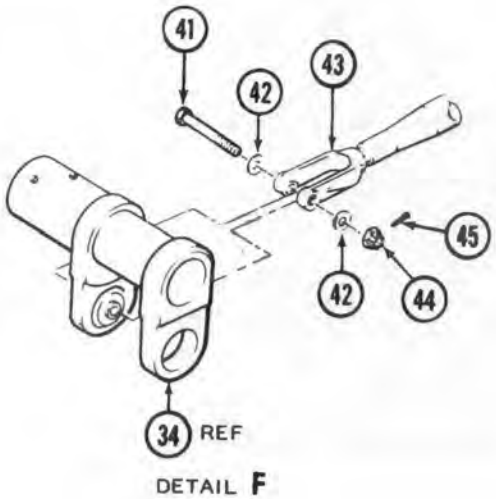
Figure 11-14. Cyclic control tube and lever assembly (Sheet 3 of 4)





30. Nut
31. Washer
32. Tapered bushing
33. Bolt
34. Lever assembly
35. Clevis assembly
36. Force gradient (fore-and aft)
37. Nut
38. Magnetic brake
39. Bolt
40. Bolt
41. Bolt
42. Washer
43. Tube assembly
44. Nut
45. Cotter Pin

204001-1022-4A

Figure 11-14. Cyclic control tube and lever assembly (Sheet 4 of 4)

d. Inspect tube and lever assembly for corrosion, cracks, nicks, and scratches.

e. Inspect bearing in arm assembly (24, figure 11-14) for **0.012** inch radial and **0.030** inch axial maximum allowable wear.

11-71. Repair or Replacement — Tube and Lever Assembly — Cyclic Controls (AVIM) a. Replace worn or rough bearings and damaged or unserviceable parts (figure 11-50).

NOTE

Tube and lever assembly is a matched assembly after drilling and taper reaming to fit matching parts. Do not intermix used parts from another assembly. Replace any damaged part with a new part.

b. Replace all parts that do not meet inspection requirements.

11-72. Assembly — Tube and Lever Assembly — Cyclic Controls. a. Attach lever (34, figure 11-14) to tube (3), using tapered bushings (32), washers (31), bolts (33), and nuts (30). Torque nuts **50 TO 70** inch-pounds (detail E).

b. Attach lever (6) to tube (2), using tapered bushings (8), washers (9), bolts (7), and nuts (10). Torque nuts **50 TO 70** inch-pounds.

11-73. Installation — Tube and Lever Assembly — Cyclic Controls.

Premaintenance requirements for installation of tube and lever assembly

Conditions	Requirements
Model	All
Part No. or Serial No.	All
Special Tools	(T88)
Test Equipment	None
Support Equipment	Maintenance Work Stands
Minimum Personnel Required	Two
Consumable Materials	(C127), (C253)
Special Environmental Conditions	None

a. Insert tube and lever assemblies (2 and 3, figure 11-14) with housing assemblies (1) in place, through access openings at sides of cabin lower skin.

b. Slip ends of tube and lever assemblies (2 and 3) on shafts of arm assembly (24).

c. Align bolt holes with center arm pointing up and ends down. If new tube and lever assemblies (2 and 3) are being installed, line ream holes for bolts (20) using taper reamer (T88).

NOTE

Prior to drill and ream, arm assembly (24) can be installed either way. Once drilled and reamed it shall be placed in original position when reinstalled.

d. Apply primer (C253) on tapered bushings (21) and mounting surfaces on tube and lever assemblies (2 and 3).

CAUTION

Do not intermix parts.

e. Install bolts (20), tapered bushings (21), washers (22), and nuts (23). Torque bolts **50 TO 70** inch-pounds (detail C). Washer must clear tube **0.030 TO 0.060** inch.

f. Secure housing assemblies (1) to each beam by installing bolts (13), washers (14), and nuts (15). Check for free operation (detail B).

g. Install bolt (40) and washers (31) to attach clevis assembly (35) to lever assembly (34). Secure with lockwire (C127) (detail E).

NOTE

If adjustable control tubes are not correct length to be attached, leave one end free until controls are rigged.

h. Install bolt (41), washer (42), and nut (44) to attach tube assembly (43) to lever assembly (34). Secure with cotter pin (45) (detail F).

i. Install bolt (16) from right side, washer (17), and nut (19) to secure tube assembly (18) to arm assembly (24). Secure with cotter pin (25) (detail C).

j. Install bolt (11), washers (5), and nut (4) to install tube assembly (12) to lever assembly (6). Secure with cotter pin (25) (detail A).

k. Install access doors (25, 26, 36 and 45, figure 2-19) in cabin floor and lower skin of fuselage.

l. Install pilot and copilot seats (paragraph 2-217).

11-74. MAGNETIC BRAKE — CYCLIC CONTROLS.

11-75. Description — Magnetic Brake-Cyclic Controls. A magnetic brake used in conjunction with a force gradient assembly is mounted in each control element: the fore and aft cyclic, the lateral cyclic, and the tail rotor pitch control. All three assemblies are identical except for the position of the arm on the brake. By positioning one of the letters "D", "L", or "F" relative to the brake shaft, the brake may be used in either the D—irectional, L—ateral, or F—ore and aft control assembly (figure 11-15).

11-76. Rigging — Magnetic Brake-Cyclic Controls. a. Rig the fore and aft cyclic, lateral cyclic, and tail rotor pitch control magnetic brakes as follows:

(1) Place arm of lateral magnetic brake at center of travel. With cyclic stick in neutral, adjust link on lateral force gradient (34, figure 11-11) to fit and connect.

(2) Place and hold cyclic stick against forward stop. Place arm of fore-aft magnetic brake against aft stop. Adjust fore-aft force gradient (30, figure 11-11) to fit. Extend clevis fitting **3-1/2** turns and connect.

(3) Place directional control arm at center of travel and with control pedals held in neutral, adjust force gradient tube to fit and connect.

b. Attach force gradient assembly to brake arm with nut (37, figure 11-14). Secure with cotter pin (45). Connect electrical plug to brake body and secure with lockwire (C127).

c. Check flight controls for unobstructed full travel.

11-77. Inspection — Magnetic Brake-Cyclic Controls (Installed). a. Check flight controls for unobstructed full travel.

b. Check assembly for corrosion, unobstructed travel, cannon plug safetying.

c. Check for loose, missing, or improperly installed hardware.

11-78. Removal — Magnetic Brake-Cyclic Controls. a. Disconnect electrical plug from fore-aft cyclic magnetic brake (38, figure 11-14) body.

b. Remove cotter pin (45) and nut (37) attaching force gradient (36) to magnetic brake (38) arm.

c. Remove four bolts (39) and washers (31) attaching magnetic brake (38) to structure.

d. Remove lateral magnetic brake (33, figure 11-11) in same manner.

11-79. Repair or Replacement — Magnetic Brake-Cyclic Controls. Replace magnetic brake assemblies having malfunction that will not allow unobstructed full travel for cyclic controls. Replace magnetic brake assembly if corroded or damaged.

11-80. Installation — Magnetic Brake-Cyclic Controls. a. Mount brake arm on brake (paragraph 11-76). Secure arm with retaining bolt (figure 11-15).

b. Position fore-aft magnetic brake (38, figure 11-14) in place on structure and install mounting bolts (39) and washers (31).

c. Connect electrical connector and secure with lockwire (C127).

d. Install lateral magnetic brake (33, figure 11-11) in same manner.

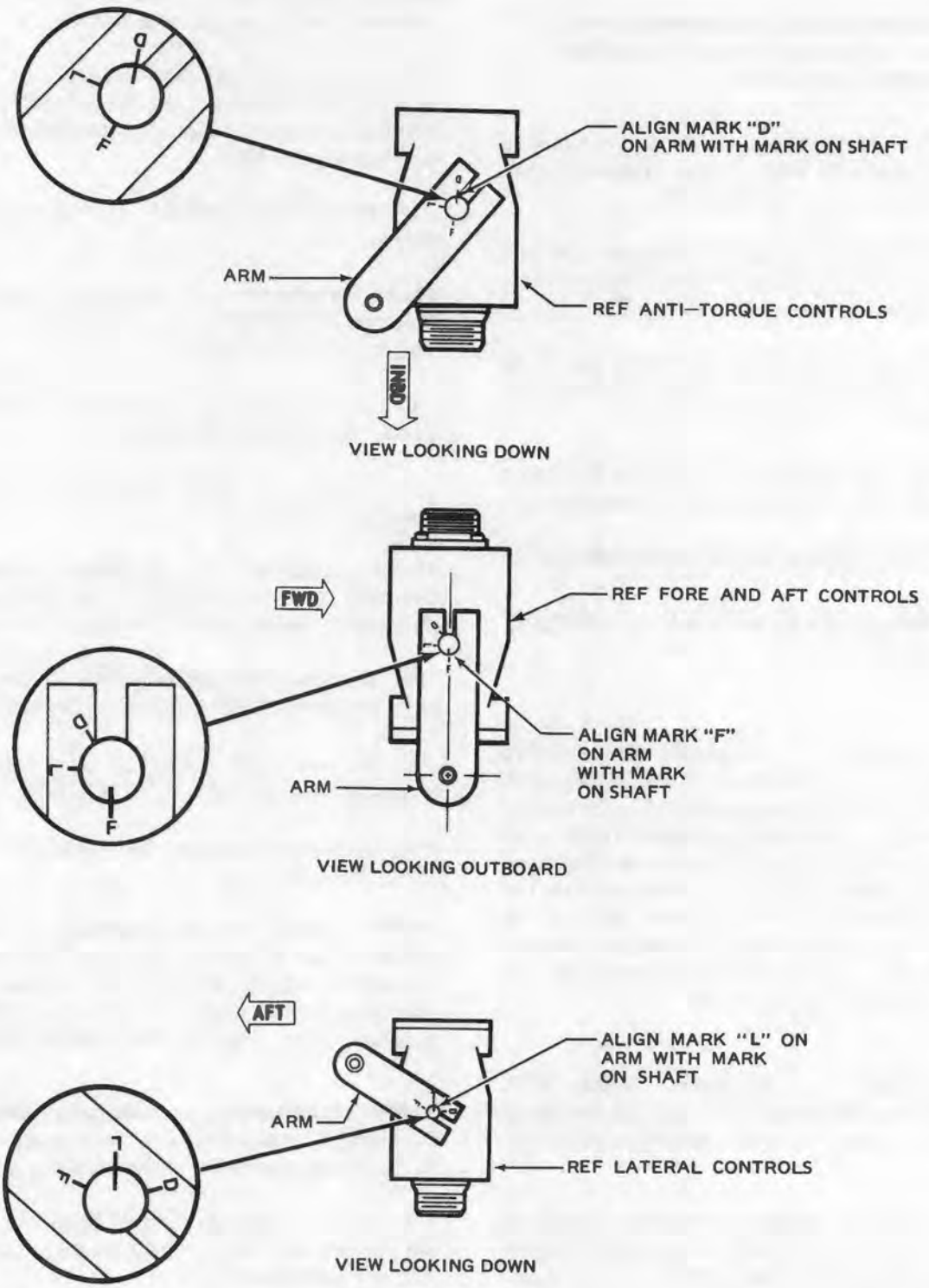


Figure 11-15. Magnetic brake adjustment

11-81. FORCE GRADIENT-CYCLIC CONTROLS.

11-82. Description — Force Gradient — Cyclic Controls. Two force gradient assemblies are used in the cyclic control system in conjunction with magnetic brake assemblies. The force gradient and magnetic brake assemblies serve to give artificial "feel" to the flight controls and enable the pilot to "trim" the helicopter.

11-83. Adjustment - Force Gradient — Cyclic Controls.

NOTE

Ensure that parts are not intermixed when two or more force gradient assemblies are disassembled at one time.

a. Remove force gradient assembly. Refer to paragraph 11-84.

b. Preload spring in force gradient assemblies (lateral, fore and aft, and directional) as follows:

(1) Remove spring assembly (7, figure 11-16) from housing (3) by removing cap (2).

(2) Place spring assembly (7), with clevis installed, in a vise as shown in figure 11-16.

NOTE

Do not tighten vise on rod. Allow spring retainer to pull evenly against both jaws of vise.

(3) Attach spring scale (11) to bolt installed through clevis (12). For lateral cyclic and tail rotor force gradients, compress spring (7) with a steady **2.5 TO 3.5** pounds pull. For fore-and-aft cyclic control force gradient, compress spring (7) with a steady **5.5 TO 6.5** pounds pull.

(4) While maintaining this tension, tighten adjustment nut (8) until it makes contact with spring retainer (6).

(5) Hold adjustment nut (8) while tightening jam nut (9).

c. Reassemble force gradient assembly as follows:

(1) Place spring assembly (7) in housing (3).

(2) Install cap (2) and tighten sufficiently to eliminate end play.

NOTE

A cap too tight or too loose will cause end play.

(3) Lockwire (C127) cap (2) to prevent rotation in either direction.

11-84. Removal - Force Gradient - Cyclic Controls. a. Remove cotter pin (45, figure 11-14) and nut (37) attaching fore-aft force gradient (36) to magnetic brake (38).

b. Disconnect other end at clevis (35) and from lever assembly (34) by removing lockwire, washer (31), and bolt (40).

c. Remove lateral force gradient (34, figure 11-11).

11-85. Inspection - Force Gradient - Cyclic Controls. a. Inspect for preloading and freedom of operation.

b. Inspect for loose, missing, or improperly installed hardware.

c. Inspect for bottoming at all control positions.

d. Inspect shaft lock nuts for security and cap for correct safetying.

e. Inspect bearing for wear and damage (figure 11-50).

f. Inspect for wear and damage in accordance with figure 11-17.

11-86. Repair or Replacement - Force Gradient - Cyclic Controls (AVIM) a. Repair or replace force gradients in accordance with wear and damage limits of figure 11-17.

b. Replace worn or damaged bearings. (figure 11-50)

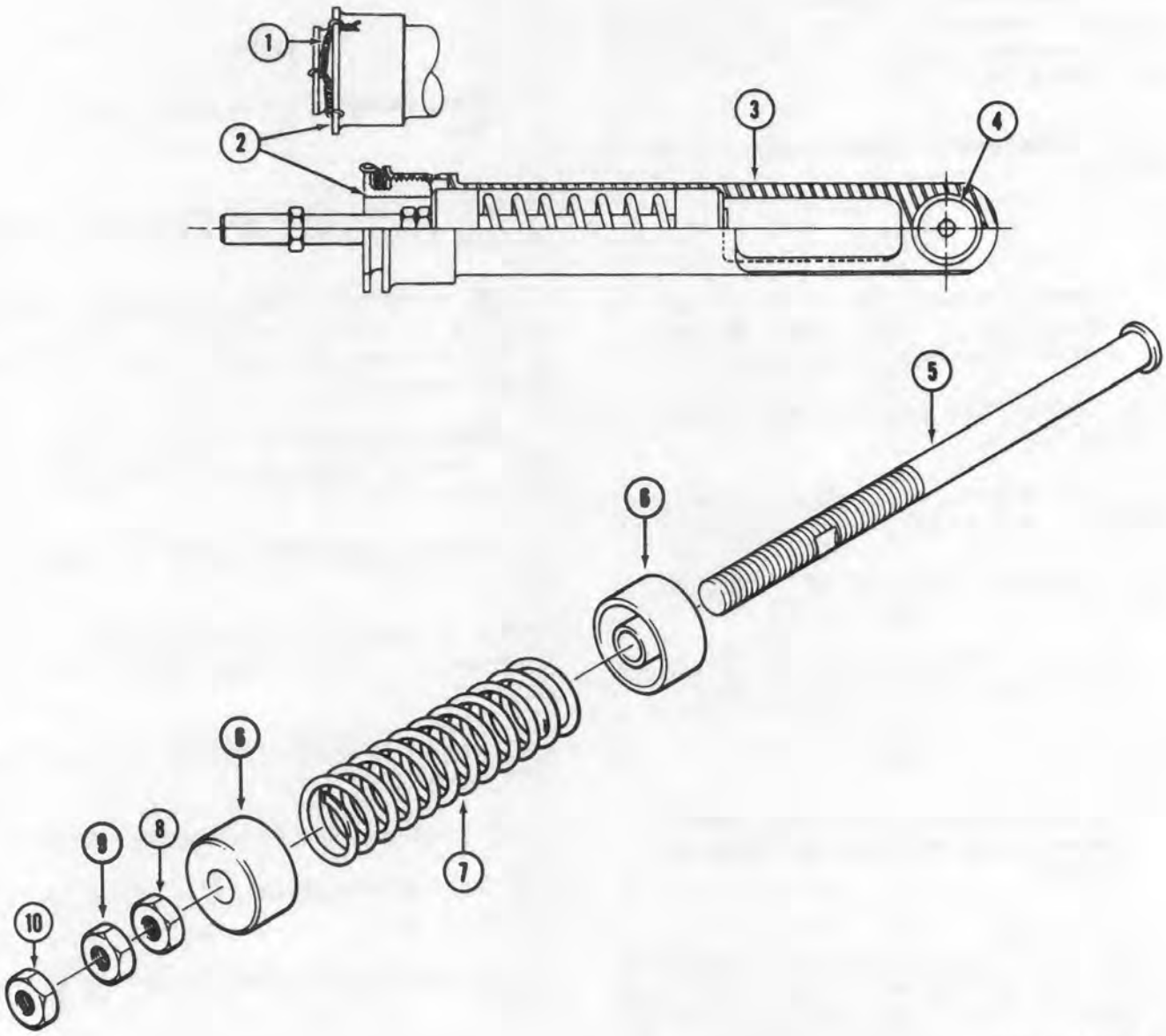
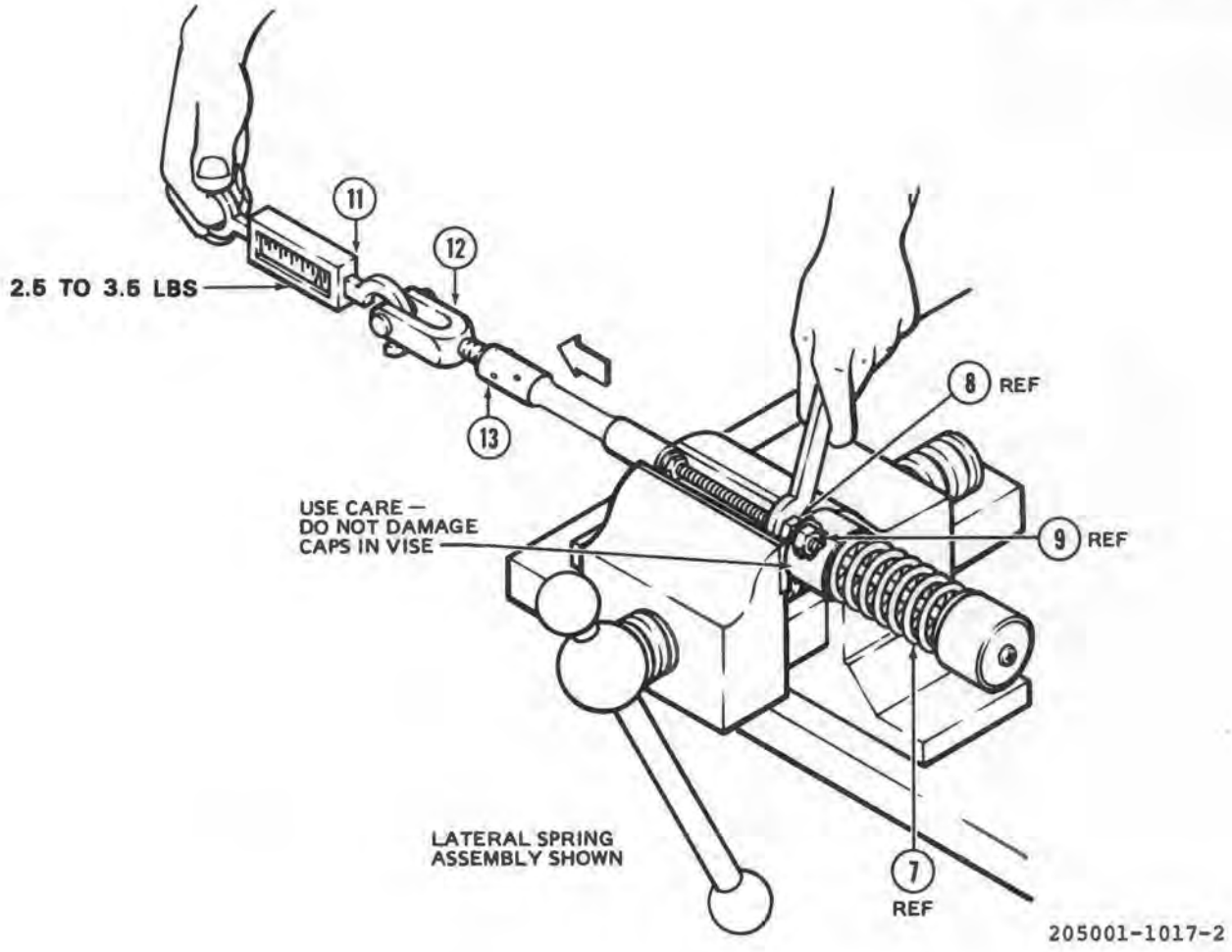


Figure 11-16. Force gradient assembly adjustment (Sheet 1 of 2)



1. Lockwire
2. Cap
3. Housing
4. Bearing
5. Shaft
6. Spring retainer
7. Spring
8. Adjustment nut
9. Jam nut
10. Nut
11. Spring scale
12. Clevis
13. Link assembly

Figure 11-16. Force gradient assembly adjustment (Sheet 2 of 2)

11-87. Installation - Force Gradient - Cyclic Controls. a. Connect fore-aft force gradient (36, figure 11-14 to clevis assembly (35) and to lever assembly (34) using bolt (40) and washer (31). Secure with lockwire (C127).

b. Place force gradient (36) in position on magnetic brake (38) and attach with nut (37). Secure with cotter pin (45).

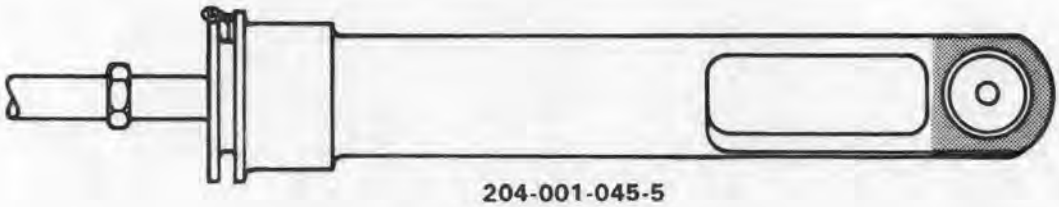
c. Install lateral force gradient (34, figure 11-11).

d. Adjust in accordance with paragraph 11-76.

11-88. MIXING LEVER ASSEMBLY CYCLIC CONTROLS

11-89. Description - Mixing Lever Assembly - Cyclic Controls. The mixing lever assembly consists of bellcranks, matched links, and support. It is mounted on the right main beam below the cabin floor area.

11-90. Removal - Mixing Lever Assembly - Cyclic Controls. a. Remove access door (27, figure 2-19).



204-001-045-5
204-001-045-9
540-001-029-1
FORCE GRADIENT ASSEMBLY

	DAMAGE AREA REPAIR SYMBOLS	
TYPE OF DAMAGE	▭	▨
MECHANICAL DAMAGE (AFTER CLEAN-UP)	0.015 IN.	0.010 IN.
CORROSION DAMAGE (BEFORE CLEAN-UP)	0.0075 IN.	0.005 IN.
(AFTER CLEAN-UP)	0.015 IN.	0.010 IN.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 IN. SQ.	0.10 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 BY 0.05 IN.	0.04 BY 0.04 IN.
BORE DAMAGE	0.002 INCH FOR ONE-FOURTH CIRCUMFERENCE	

REPLACE PARTS WITH DAMAGED THREADS

NO CRACKS ALLOWED

205001-1070

Figure 11-17. Wear and damage limits — force gradient

b. Remove cotter pin (12, figure 11-18), nut (15), washers (3), and bolt (5) disconnecting end of tube (17).

c. Remove cotter pin (12), nut (13), washers (3), and bolt (7) disconnecting end of tube (16).

d. Remove cotter pin (12), nut (14), washers (3), and bolt (6) disconnecting end of tube (8).

e. Remove cotter pin (12), nut (11), washers (3), and bolt (9) disconnecting end of tube (10).

f. Remove bolts (4), washers (3), and self-locking nuts (2) attaching support (1) to right main beam.

11-91. Disassembly - Mixing Lever Assembly - Cyclic Controls. a. Remove cotter pins (21, figure 11-19), nut (20), washers (2), and bolts (1) attaching upper matched link (3).

b. Remove cotter pins (21), nuts (9 and 11), aluminum washers (5), and bolts (4 and 7) attaching upper and lower matched links (6). Remove bellcrank (8).

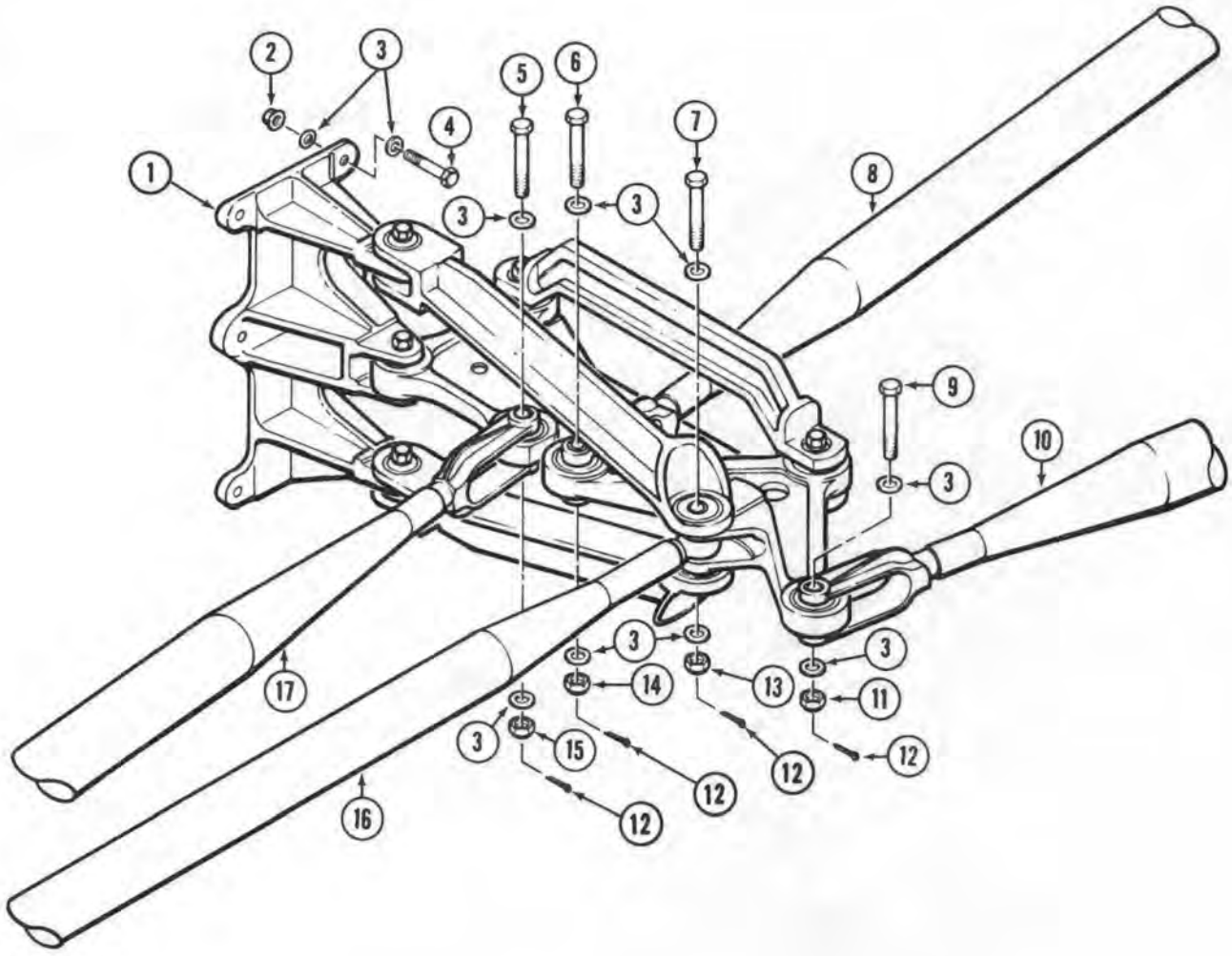
c. Remove cotter pin (21), nut (10), washers (12), and bolt (13) attaching lower matched link (3).

d. Remove cotter pin (16), nut (15), aluminum washers (18), and bolt (19) attaching bellcrank (17) to support (14).

11-92. Inspection - Mixing Lever Assembly - Cyclic Controls. a. Inspect bearings for wear and roughness (paragraph 11-206).

b. Inspect parts for wear, cracks, nicks, and surface damage (figure 11-20).

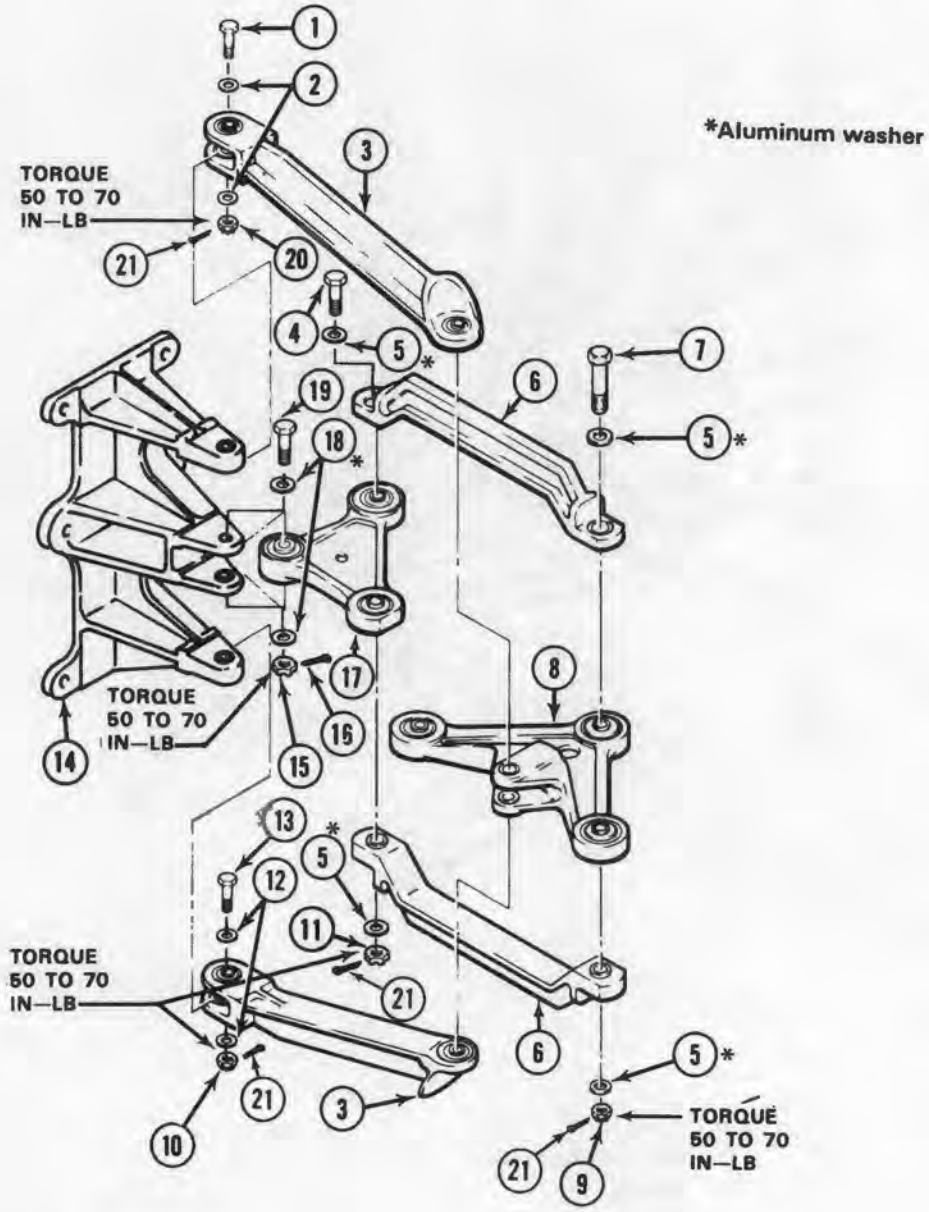
c. Inspect parts for corrosion.



1. Support
2. Self-locking nut
3. Washer
4. Bolt
5. Bolt
6. Bolt
7. Bolt
8. Tube
9. Bolt
10. Tube
11. Nut
12. Cotter pin
13. Nut
14. Nut
15. Nut
16. Tube
17. Tube

205001-1069

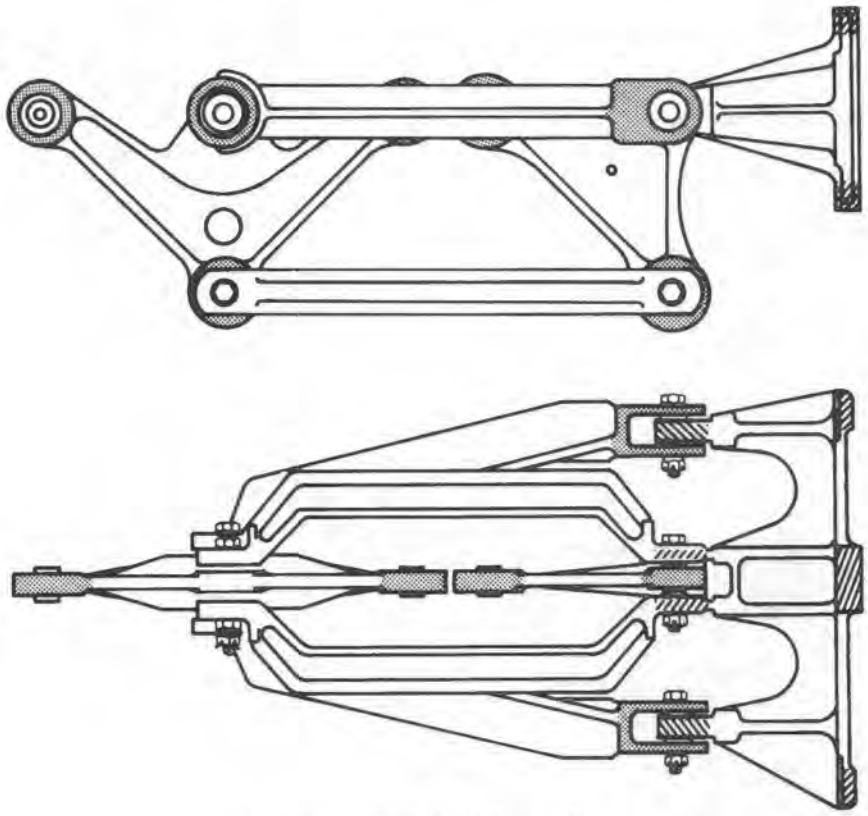
Figure 11-18. Mixing lever assembly — cyclic controls — removal and installation



1. Bolt
2. Washer
3. Link
4. Bolt
5. Aluminum washer
6. Link
7. Bolt
8. Bellcrank
9. Nut
10. Nut
11. Nut
12. Washer
13. Bolt
14. Support
15. Nut
16. Cotter pin
17. Bellcrank
18. Washer
19. Bolt
20. Nut
21. Cotter pin

205001-1019D

Figure 11-19. Mixing lever assembly — cyclic controls — disassembly and assembly



VIEW LOOKING FORWARD

204-001-355-3
MIXING LEVER ASSEMBLY

TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS		
MECHANICAL DAMAGE (AFTER CLEAN-UP)	0.015 IN.	0.010 IN.	0.005 IN.
CORROSION DAMAGE (BEFORE CLEAN-UP)	0.0075 IN.	0.005 IN.	0.0025 IN.
(AFTER CLEAN-UP)	0.015 IN.	0.010 IN.	0.005 IN.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 IN. SQ.	0.10 IN. SQ.	0.10 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 BY 0.05 IN.	0.04 BY 0.04 IN.	
BORE DAMAGE	0.002 INCH FOR ONE-FOURTH CIRCUMFERENCE		
NO CRACKS ALLOWED			

205001-1039B

Figure 11-20. Wear and damage limits — mixing lever assembly, cyclic control system

d. Inspect for loose, missing, or improperly installed hardware.

e. Inspect parts for elongated bolt holes.

11-93. Repair or Replacement - Mixing Lever Assembly - Cyclic Controls. a. Repair or replace mixing lever assembly in accordance with wear and damage limits of figure 11-20.

b. Replace any parts that do not meet inspection requirements.

c. Refer to paragraph 11-207 for bearing replacement.

11-94. Assembly - Mixing Lever Assembly - Cyclic Controls. a. Place bellcrank (17, figure 11-19) on center attachment point of support (14). Install bolt (19), aluminum washers (18), and nut (15). Torque nut **50 TO 70** inch-pounds. Secure with cotter pin (16).

b. Place lower half of link (3) on lower attachment point of support (14). Install bolt (13), washers (12), and nut (10). Torque nut **50 TO 70** inch-pounds. Secure with cotter pin (21).

c. Place bellcrank (8) between both upper and lower matched links (6). Install bolt (7), with aluminum washer (5) through upper link (6) and aft attachment point of bellcrank (8) and through lower link (6). Install aluminum washer (5) and tighten nut (9) slightly. Install bolt (4), with aluminum washer (5) through upper link (6) and through aft attachment point of bellcrank (17), and through lower link (6). Install aluminum washer (5) and nut (11). Torque nuts **50 TO 70** inch-pounds. Secure with cotter pins (21).

d. Place upper link (3) on upper attachment point of support (14). Install bolt (1), with washers (2) and nut (20). Torque nut **50 TO 70** inch-pounds. Secure with cotter pin (21).

11-95. Installation — Mixing Lever Assembly - Cyclic Controls. a. Install six bolts (4, figure 11-18), twelve washers (3) and six self-locking nuts (2) to attach support (1) to right main beam. (Install aluminum washers between airframe and support and steel washers under bolt head.)

b. Place tube (10) on bellcranks (8, figure 11-19) and attach with bolt (9, figure 11-18), washers (3), and nut (11). Secure with cotter pin (12).

c. Place tube (8) on bellcrank (8, figure 11-19) and attach with bolt (6, figure 11-18), washers (3), and nut (14). Secure with cotter pin (12).

d. Place tube (16) on bellcrank (8, figure 11-19) and attach with bolt (7, figure 11-18) washers (3), and nut (13). Secure with cotter pin (12).

e. Place tube (17) on bellcrank (17, figure 11-19) and attach with bolt (5, figure 11-18) washers (3), and nut (15). Secure with cotter pin (12).

f. Install access door (27, figure 2-19).

11-96. CONTROL TUBES — CYCLIC CONTROL SYSTEM.

11-97. Description — Control Tubes - Cyclic Control System. Control tubes (adjustable and non-adjustable) are used throughout the cyclic control system. The tubes are connected to bellcranks, levers, and supports with standard hardware.

11-98. Removal — Controls Tubes — Cyclic Control System. a. Remove access doors (25, 26, 36, and 37, figure 2-19) as required for access to cyclic control tubes.

b. Detach forward end of control tube (6, figure 11-21) from pilot cyclic stick by removing cotter pin (1), nut (2), two washers (3), and bolt (7) (detail A).

c. Detach aft end of control tube (6) from arm of tube and lever assembly by removing cotter pin (1), nut (4), two washers (3), and bolt (5) (detail A).

d. Detach outboard end of control tube (8) from pilot cyclic stick by removing cotter pin (1), nut (9), two washers (3), and bolt (10) (detail A).

e. Detach inboard end of control tube (8) from bellcrank (11) by removing cotter pin (15), nut (19), two washers (13), and bolt (21) (detail B).

f. Detach outboard end of control tube (17) from copilot cyclic stick by removing cotter pin (33), nut (42), two washers (31), and bolt (41) (detail D).

g. Detach inboard end of control tube (17) from bellcrank (11) by removing cotter pin (15), nut (18), two washers (13), and bolt (20) (detail B).

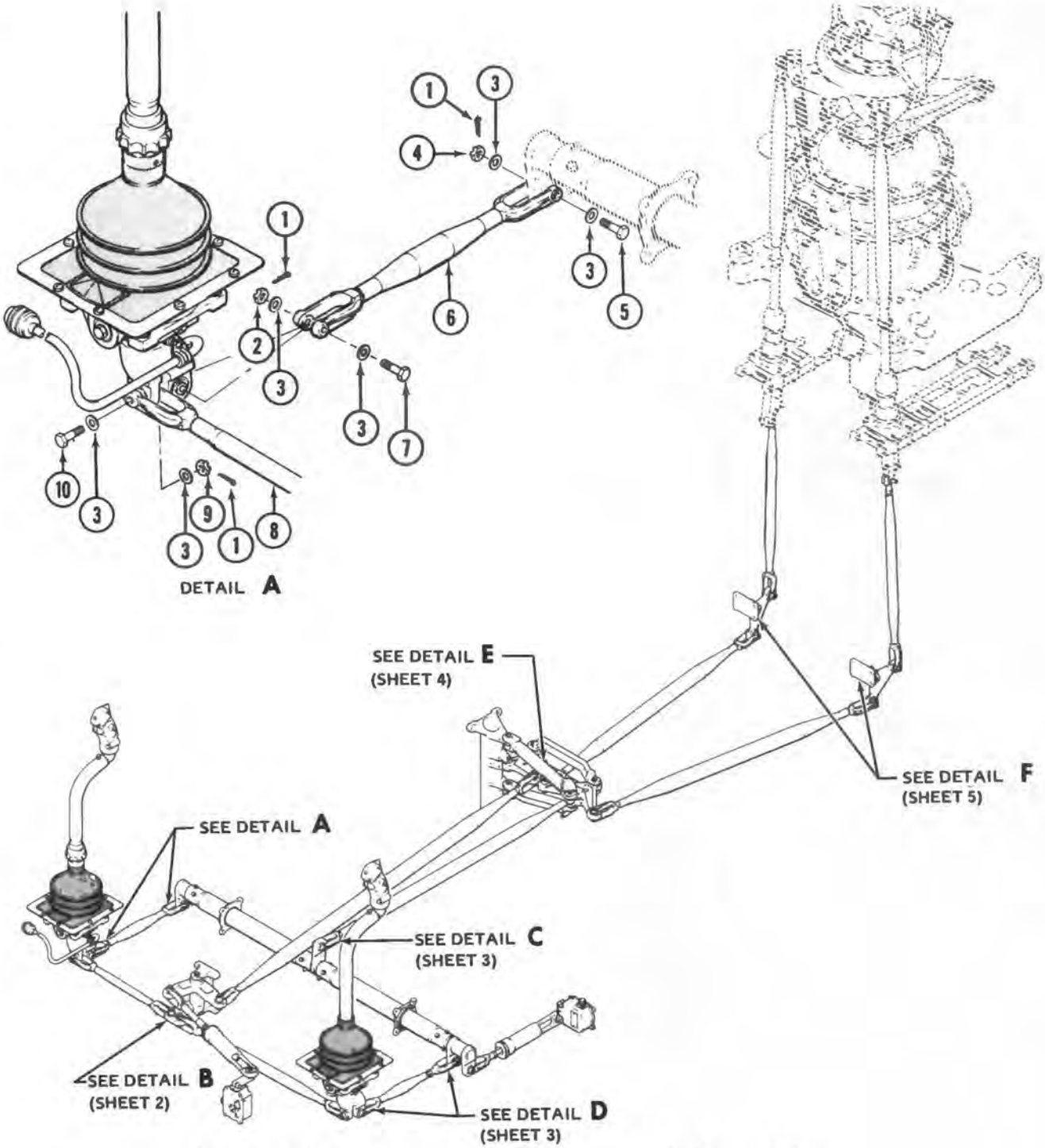
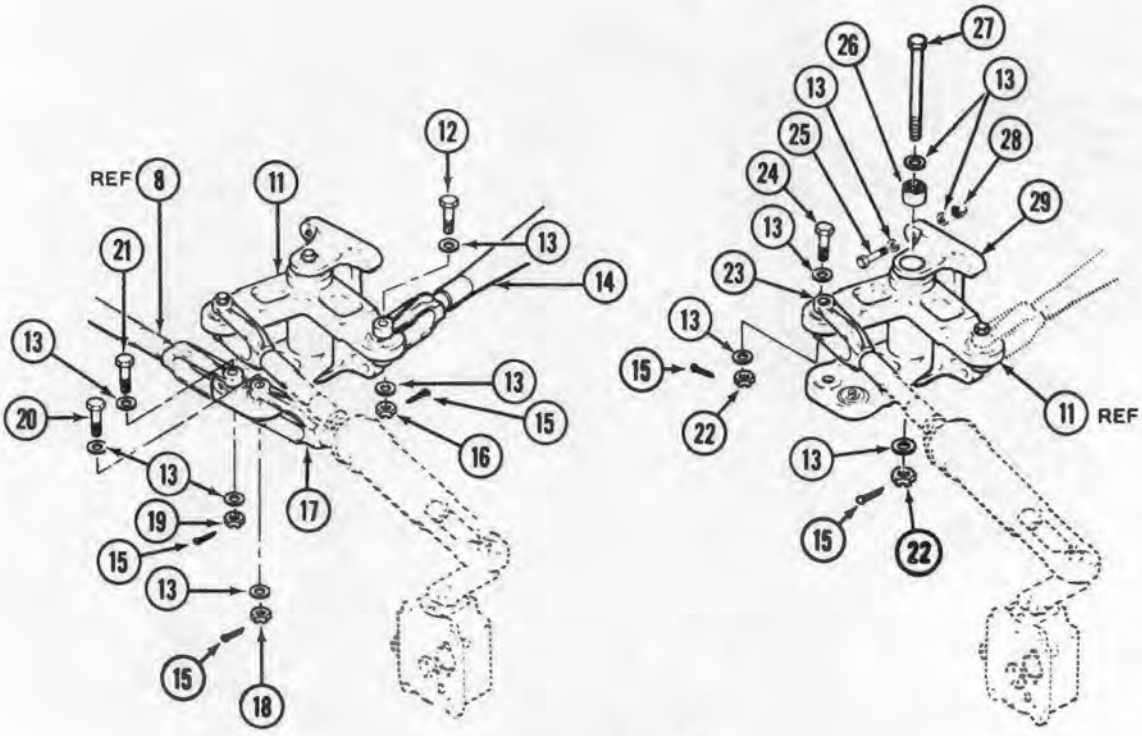


Figure 11-21. Cyclic control system (bellcranks, levers, supports, and control tubes) — removal and installation (Sheet 1 of 5)

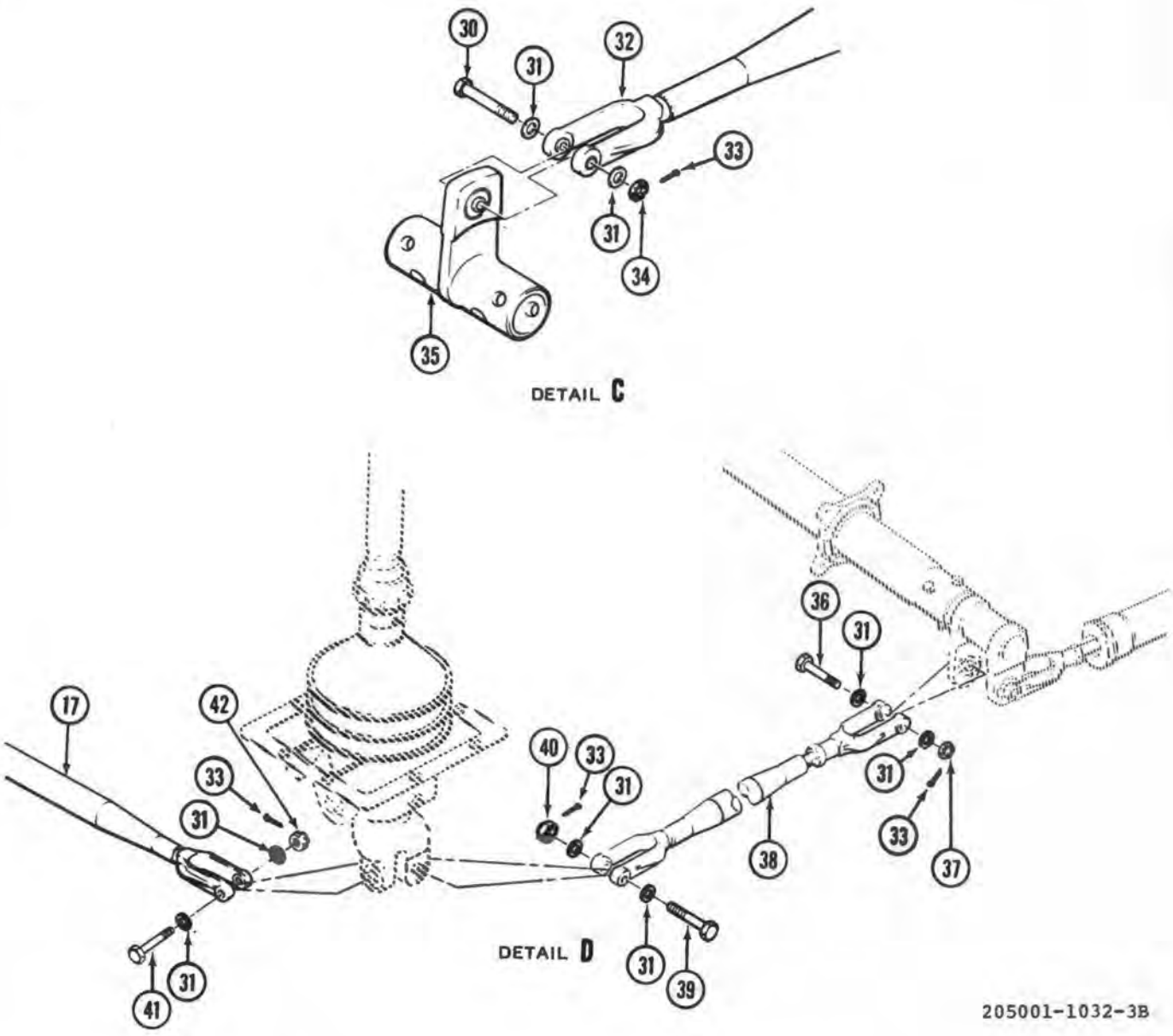


DETAIL **B**

205001-1032-2A

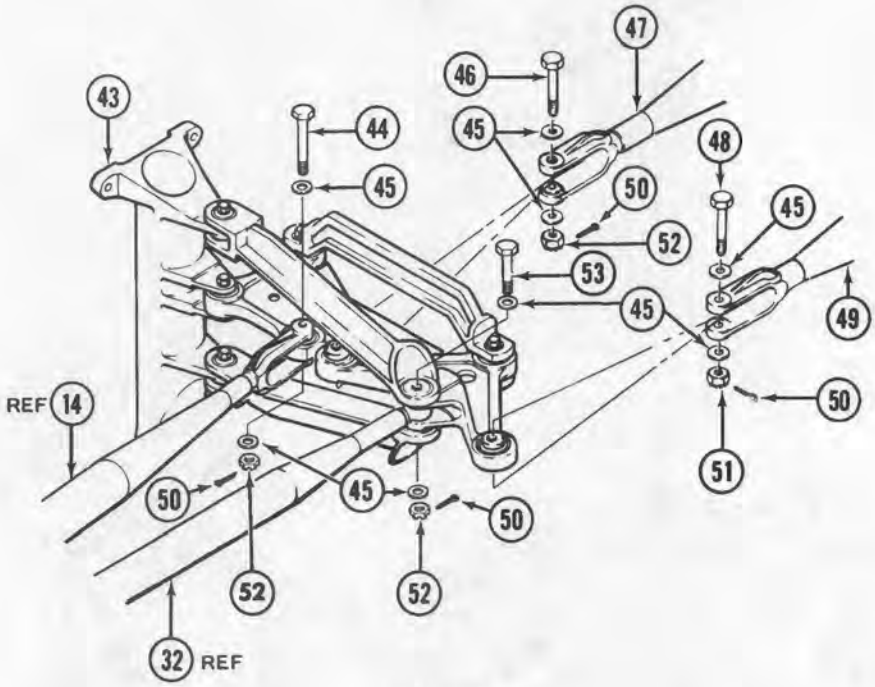
11.	Bellcrank	21.	Bolt
12.	Bolt	22.	Nut
13.	Washer	23.	Clevis
14.	Control tube	24.	Bolt
15.	Cotter pin	25.	Bolt
16.	Nut	26.	Bearing
17.	Control tube	27.	Bolt
18.	Nut	28.	Nut
19.	Nut	29.	Support
20.	Bolt		

Figure 11-21. Cyclic control system (bellcranks, levers, supports, and control tubes) — removal and installation (Sheet 2 of 5)



30. Bolt
31. Washer
32. Control tube
33. Cotter pin
34. Nut
35. Lever
36. Bolt
37. Nut
38. Control tube
39. Bolt
40. Nut
41. Bolt
42. Nut

Figure 11-21. Cyclic control system (bellcranks, levers, supports, and control tubes) — removal and installation (Sheet 3 of 5)

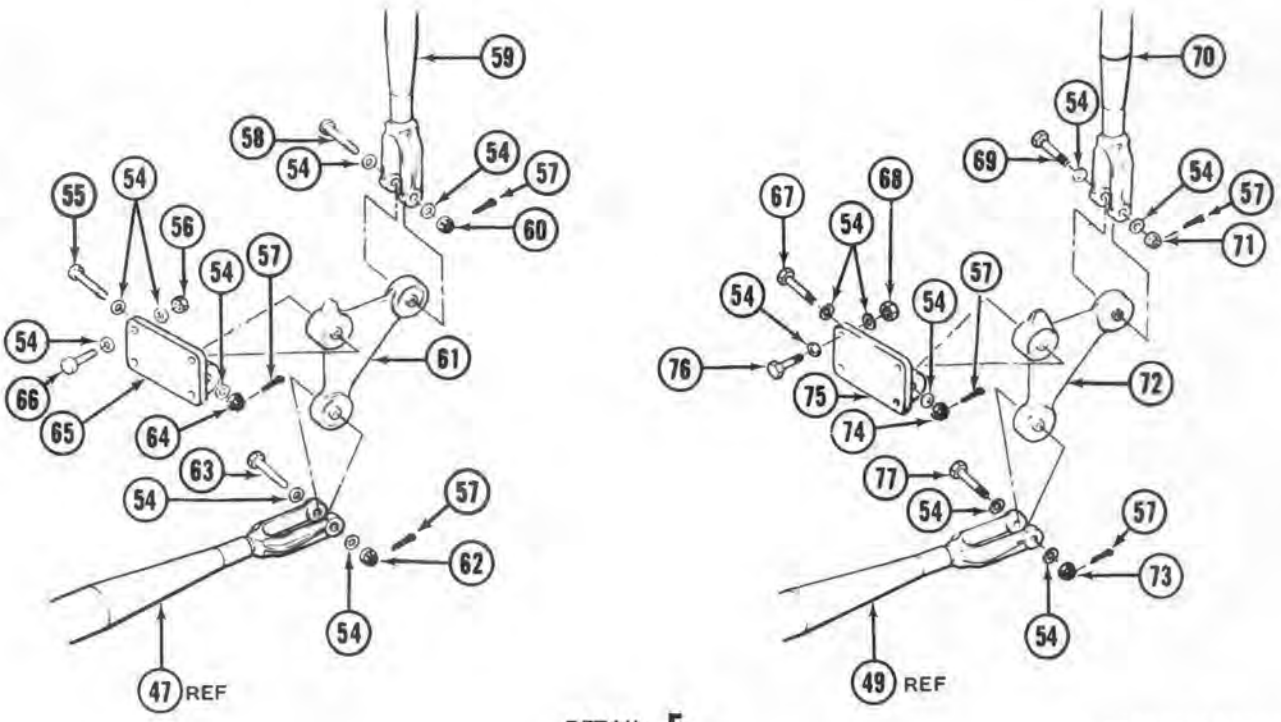


DETAIL **E**

205001-1032-4C

43. Mixing levers and support
44. Bolt
45. Washer
46. Bolt
47. Control tube
48. Bolt
49. Control tube
50. Cotter pin
51. Nut
52. Nut
53. Bolt

Figure 11-21. Cyclic control system (bellcranks, levers, supports, and control tubes) — removal and installation (Sheet 4 of 5)



54. Washer
55. Bolt
56. Nut
57. Cotter pin
58. Bolt
59. Control tube
60. Nut
61. Bellcrank
62. Nut
63. Bolt
64. Nut
65. Support
66. Bolt
67. Bolt
68. Nut
69. Bolt
70. Control tube
71. Nut
72. Bellcrank
73. Nut
74. Nut
75. Support
76. Bolt
77. Bolt

Figure 11-21. Cyclic control system (bellcranks, levers, supports, and control tubes) — removal and installation (Sheet 5 of 5)

h. Detach forward end of control tube (14) from bellcrank (11) by removing cotter pin (15), nut (16), two washers (13), and bolt (12) (detail B).

i. Detach aft end of control tube (14) from mixing levers and support (43) by removing cotter pin (50), nut (53), two washers (45), and bolt (44) (detail E).

j. Detach forward end of control tube (32) from lever (35) by removing cotter pin (33), nut (34), two washers (31), and bolt (30) (detail C).

k. Detach aft end of control tube (32) from mixing levers and support (43) by removing cotter pin (50), nut (52), two washers (45), and bolt (53) (detail E).

l. Detach forward end of control tube (47) from mixing levers and support (43) by removing cotter pin (50), nut (52), two washers (45), and bolt (46) (detail E).

m. Detach aft end of control tube (47) from bellcrank (61) by removing cotter pin (57), nut (62), two washers (54), and bolt (63) (detail F).

n. Detach forward end of control tube (49) from mixing levers and support (43) by removing cotter pin (50), nut (51), two washers (45), and bolt (48) (detail E).

o. Detach aft end of control tube (49) from bellcrank (72) by removing cotter pin (57), nut (73), two washers (54), and bolt (77) (detail F).

p. Detach lower end of control tube (59) from bellcrank (61) by removing cotter pin (57), nut (60), two washers (54), and bolt (58) (detail F).

q. Detach upper end of control tube (59) from right fore and aft, and lateral cyclic actuator (paragraph 7-158).

r. Detach lower end of control tube (70) from bellcrank (72) by removing cotter pin (57), nut (71), two washers (54), and bolt (69) (detail F).

s. Detach upper end of control tube (70) from hydraulic cylinder assembly (paragraph 7-158).

t. Detach forward end of control tube (38) from copilot cyclic stick by removing cotter pin (33), nut (40), two washers (31), and bolt (39) (detail D).

u. Detach aft end of control tube (38) from arm of tube and lever assembly by removing cotter pin (33), nut (37), two washers (31), and bolt (36) (detail D).

11-99. Inspection — Control Tubes — Cyclic Control System. a. Inspect control tubes for corrosion, wear, and mechanical damage. Refer to figure 11-22 for wear and damage limits.

b. Inspect clevis end holes for wear and clevis end for looseness in tube.

c. If tube assembly exceeds inspection limits, replace as an assembly, except for removeable clevis.

11-100. Repair or Replacement — Control Tubes — Cyclic Control System (AVIM) a. Polish out corrosion or mechanical damage to control tubes in accordance with limits of figure 11-22.

b. Any damage to control tubes in excess of limits is cause for replacement of control tube.

11-101. Installation — Control Tubes — Cyclic Control System. a. Install control tubes (17, 38, 59 and 70, figure 11-21) by the rigging procedure (paragraph 11-55).

b. Align aft end of control tube (6, figure 11-21) on arm of tube and lever assembly. Install bolt (5) with washer (3) through clevis. Install washer (3), nut (4), and cotter pin (1) (detail A).

c. Align forward end of control tube (6) to lever on bottom of pilot cyclic stick. Install bolt (7), two washers (3), and nuts (2). Secure with cotter pin (1) (detail A).

d. Align outboard end of control tube (8) on lever on bottom of pilot cyclic stick. Install bolt (10), two washers (3), and nut (9). Secure with cotter pin (1) (detail A).

e. Align inboard end of control tube (8) on bellcrank (11). Install bolt (21) with two washers (13), and nut (19). Secure with cotter pin (15) (detail B).

f. Align aft end of control tube (38, figure 11-21) on arm of tube and lever assembly. Install bolt (36), with washer (31) through clevis. Install washer (31), nut (37), and cotter pin (33) (detail D).

g. Align forward end of control tube (38) (adjust tube as necessary for alignment) to lever on bottom of pilot cyclic stick. Install bolt (39), two washers (31), and nut (40). Secure with cotter pin (33) (detail D).

h. Align outboard end of control tube (17) on lever on bottom of pilot cyclic stick. Install bolt (41), two washers (31), and nut (42). Secure with cotter pin (33) (detail D).

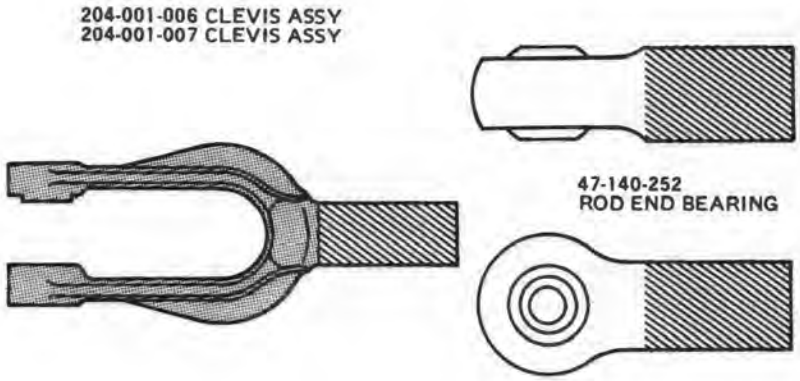
i. Align inboard end of control tube (17) on bellcrank (11). Install bolt (20), with two washers (13), and nut (18). Secure with cotter pin (15) (detail B).

j. Align forward end of control tube (14) to bellcrank (11). Install bolt (12), two washers (13), and nut (16). Secure with cotter pin (15) (detail B).

k. Align aft end of control tube (14) to mixing levers and support (43). Install bolt (44), two washers (45), and nut (52). Secure with cotter pin (50) (detail E).

l. Align forward end of control tube (32) to lever (35). Install bolt (30), two washers (31), and nut (34). Secure with cotter pin (33) (detail C).

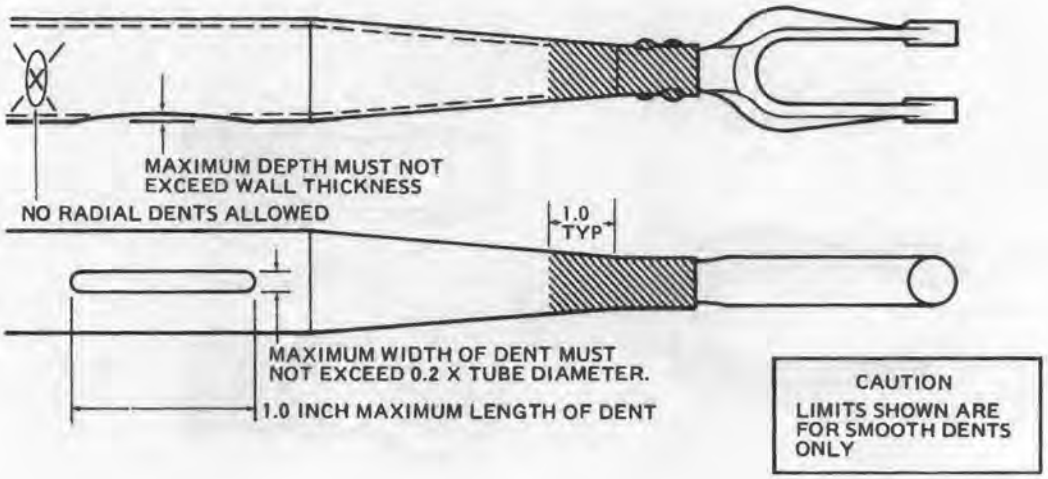
m. Align rod end bearing on aft end of control tube (32) to mixing levers and support (43). Install bolt (53), two washers (45), and nut (52). Secure with cotter pin (50) (detail E).



TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS		
MECHANICAL DAMAGE (AFTER CLEANUP)	0.015 IN.	0.010 IN.	NO DAMAGE ALLOWED
CORROSION DAMAGE (BEFORE CLEANUP)	0.0075 IN.	0.005 IN.	
(AFTER CLEANUP)	0.015 IN.	0.010 IN.	
MAXIMUM AREA PER FULL DEPTH REPAIR	0.5 IN. SQ.	0.10 IN. SQ.	
NUMBER OF REPAIRS	ONE PER AREA	TWO	
EDGE CHAMFER	0.05 BY 0.05 IN.	0.04 BY 0.04 IN.	
BORE DAMAGE	0.002 IN. FOR ONE-FOURTH CIRCUMFERENCE		
NO CRACKS ALLOWED			

205-001-1071-2

Figure 11-22. Wear and damage limits (control tubes, links, and clevises) — cyclic control system (Sheet 1 of 2)



DAMAGE PERMITTED ON TUBES OTHER THAN DENTS

TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS	
	NO DAMAGE ALLOWED	MAXIMUM DAMAGE AFTER CLEANUP 0.005 INCH
MECHANICAL AND CORROSION DAMAGE		
NO CRACKS ALLOWED		

205-001-1071-1

NOTE: All dimensions are in inches unless otherwise stated.

Figure 11-22. Wear and damage limits (control tubes, links, and clevises) — cyclic control system (Sheet 2 of 2)

n. Align forward end of control tube (47) to mixing levers and support (43). Install bolt (46), two washers (45), and nut (52). Secure with cotter pin (50) (detail E).

o. Align aft end of control tube (47) to bellcrank (61). Install bolt (63), two washers (54), and nut (62). Secure with cotter pin (57) (detail F).

p. Align forward end of control tube (49) to arm of mixing levers and support (43) bellcrank. Install bolt (48), two washers (45), and nut (51). Secure with cotter pin (50) (detail E).

q. Align aft end of control tube (49) to bellcrank (72). Install bolt (77), two washers (54), and nut (73). Secure with cotter pin (57) (detail F).

11-102. BELLCRANKS, LEVERS, AND SUPPORTS — CYCLIC CONTROL SYSTEM.

11-103. Description — Bellcranks, Levers, and Supports — Cyclic Control System. Various bellcranks, levers, and supports are incorporated in the cyclic control system. The supports are mounted to the airframe for attachment of levers and bellcranks.

11-104. Removal — Bellcranks, Levers, and Supports — Cyclic Control System. a. Remove bellcrank (11, figure 11-21) and support (29) as follows: (detail B, sheet 2).

(1) Remove access doors (25 and 26, figure 2-19).

(2) Disconnect cyclic control tubes (8, 14 and 17, figure 11-21) and lateral cyclic clevis (23) from bellcrank (11) (paragraph 11-98).

(3) Remove cotter pin (15), nut (22), washers (13) and bolt (27) from support (29) and remove bellcrank (11) and bearing (26) from support.

(4) Remove four nuts (28), washers (13), and four bolts (25) from support (29) and remove support.

b. Remove bellcrank (72) and support (75) as follows: (detail F, sheet 5).

(1) Remove cargo suspension assembly. (paragraph 14-187).

(2) Remove troop seat, soundproofing blanket, and access door (21, figure 2-19) from pylon island in cabin area.

(3) Disconnect control tubes (49 and 70, figure 11-21) from bellcrank (72) (paragraph 11-98).

(4) Remove cotter pin (57), nut (74), two washers (54) and bolt (67) from support (75) and remove bellcrank (72).

(5) Remove four nuts (68), washers (54), and four bolts (76) from support (75) and remove support.

c. Remove bellcrank (61) and support (65) as follows: (detail F, sheet 5).

(1) Remove cargo suspension assembly (paragraph 14-187).

(2) Remove troop seat, soundproofing blanket, and access door (21, figure 2-19) from pylon island in cabin area.

(3) Disconnect control tubes (47 and 59, figure 11-21) from bellcrank (61) (paragraph 11-98).

(4) Remove cotter pin (57), nut (64), two washers (54), and bolt (55) from support (65) and remove bellcrank (61) from support.

(5) Remove four nuts (56), washers (54), and four bolts (66) from support (65) and remove support.

11-105. Inspection — Bellcranks, Levers, and Supports — Cyclic Control System. a. Inspect bellcranks, levers, and supports for corrosion and mechanical damage. See figure 11-23 for inspection limits.

b. Inspect bellcranks and supports for loose bearings. Refer to paragraph 11-206 for bearing limits.

11-106. Repair or Replacement — Bellcranks, Levers, and Supports — Cyclic Control System (AVIM) a. Replace loose or damaged bearings. Refer to paragraph 11-207 for replacement procedures.

b. Remove minor surface corrosion or repair allowable damage, using fine grit sandpaper (C185). Observe limits shown in figure 11-23.

c. Replace parts that are damaged beyond limits.

11-107. Installation — Bellcranks, Levers, and Supports — Cyclic Control System.

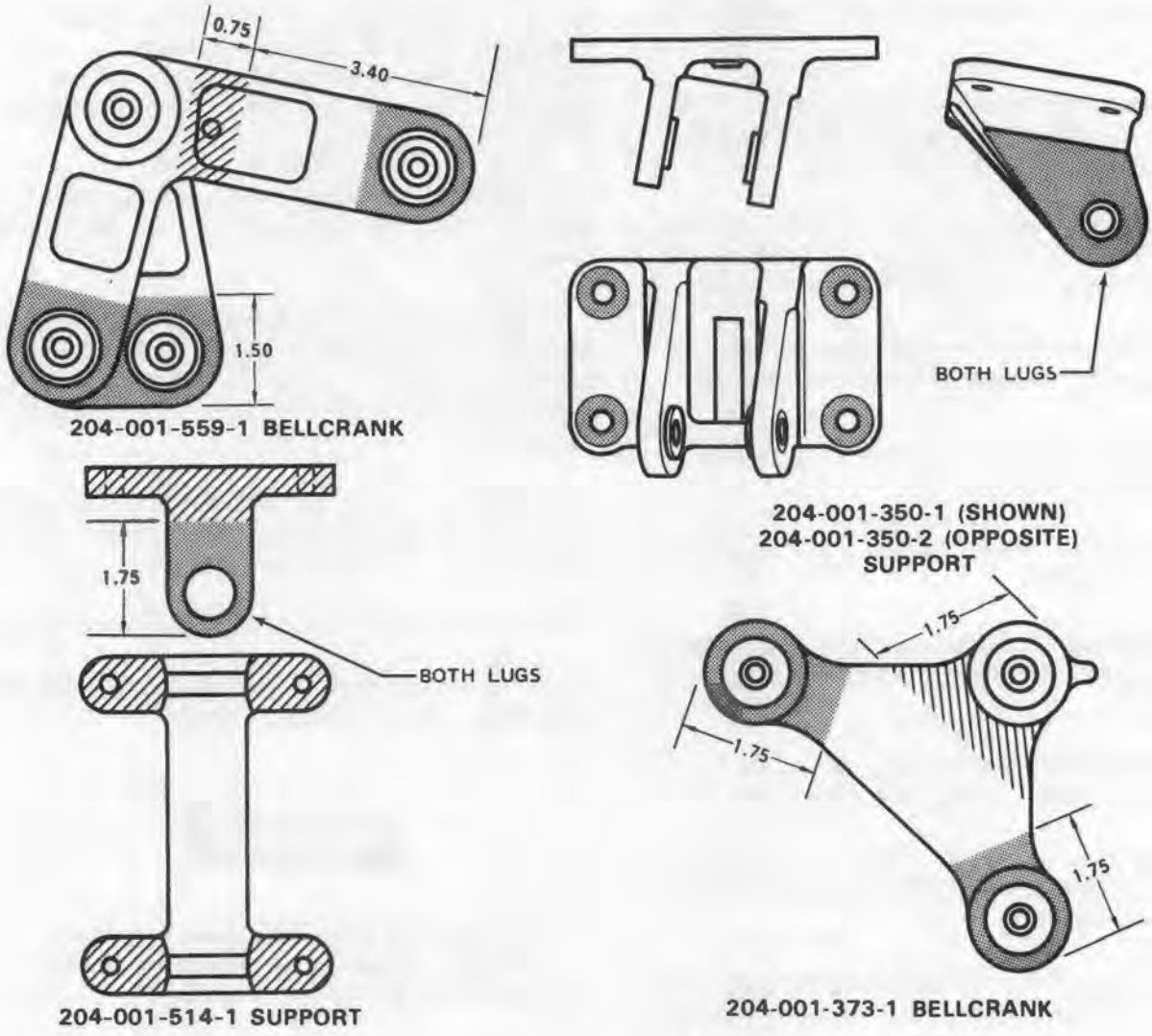
WARNING

Primer (C253) is flammable and toxic. Provide adequate ventilationn. Avoid prolonged breathing of spray mist.

a. Apply unthinned primer (C253) to bolts (25, figure 11-21). Position support (29) to forward side of bulkhead at station 37.00. Install four bolts (25) with aluminum washers (13) and install four washers (13) with nuts (28) (detail B).

b. Position bellcrank (11) between ears of support (29). Apply unreduced primer (C253) to outer race of bearing (26) and install bearing in top arm of support (29). Install bolt (27) with washer (13) through support and bellcrank pivot and install washer (13) with nut (30) and cotter pin (15) (detail B).

c. Apply unreduced primer (C253) to bolts (66 or 76). From inside transmission pylon support area, position support (65 or 75) to aft side of bulkhead at either right or left BL 9.70, at WL 21.00. Install four bolts (66 or 76) with washers (54) through bulkhead and support and install aluminum washers (54) and nuts (56 or 68) (detail F).



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE			
MECHANICAL DAMAGE (AFTER CLEAN-UP)	0.015 IN.	0.010 IN.	0.005 IN.
CORROSION DAMAGE (BEFORE CLEAN-UP)	0.0075 IN.	0.005 IN.	0.0025 IN.
(AFTER CLEAN-UP)	0.015 IN.	0.010 IN.	0.005 IN.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 IN. SQ.	0.10 IN. SQ.	0.10 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 BY 0.05	0.04 BY 0.04	
BORE DAMAGE	0.002 INCH FOR ONE-FOURTH CIRCUMFERENCE		

NO CRACKS ALLOWED
ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED

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Figure 11-23. Wear and damage limits (bellcranks, levers, and supports) — cyclic control system

d. Position bellcrank (61 or 72), with stop at pivot point facing up, to support (65 or 75). Install bolt (55 or 67) with aluminum washer (54) through support and bellcrank. Install aluminum washers (54) with nuts (64 or 74) and cotter pins (57) (detail F).

e. Attach control tubes (47, 49, 59 or 70) as required (paragraph 11-101).

f. Install cargo suspension assembly (paragraph 14-192).

g. Install access door (21, figure 2-19) and soundproofing blanket on transmission pylon in cabin area.

h. Install troop seat (paragraph 2-217).

11-108. SUPPORT ASSEMBLIES

11-109. Description — Support Assemblies.

Two support assemblies are used to support two cyclic hydraulic servo cylinders and one collective hydraulic servo cylinder. The left support assembly, which supports a cyclic servo cylinder at forward end and collective servo cylinder at aft end, is mounted to forward and aft pylon support structure and the lift beam. The right support assembly supports a cyclic servo cylinder only and is mounted to forward pylon structure and the lift beam (figure 11-24).

11-110. Removal — Left Support Assembly. a. Open left transmission cowling.

b. Remove left cyclic servo cylinder (19, figure 11-11) and collective servo cylinder (4, figure 11-1) from support assembly (18, figure 11-24) as detailed in paragraph 7-158.

c. Remove nuts (13), washers (12), and bolts (11) from aft pylon structure.

d. Remove nuts (14), washers (10), and bolts (9) from support assembly (18) and lift beam.

e. Remove nuts (15), washers (16), and bolts (17) from support structure assembly (18) and forward pylon structure. Remove support assembly from helicopter.

11-111. Removal — Right Support Assembly. a. Open right transmission cowling as needed.

b. Remove right cyclic servo cylinder (14, figure 11-11) from support assembly (3, figure 11-24) as detailed in paragraph 7-158.

c. Remove nuts (8), washers (7), and bolts (6) from support assembly (3) and lift beam.

d. Remove nuts (19), washers (5), and bolts (4) from support assembly)3) and lift beam.

e. Remove nuts (1), washers (2), and bolts (20) from support assembly (3) and forward pylon structure. Remove support assembly (3) from helicopter.

11-112. Cleaning — Support Assemblies.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

a. Clean support assemblies with solvent (C205), using a non-metallic, soft-bristle brush as necessary to remove stubborn deposits.

b. Rinse support assemblies with clean water and allow to air dry.

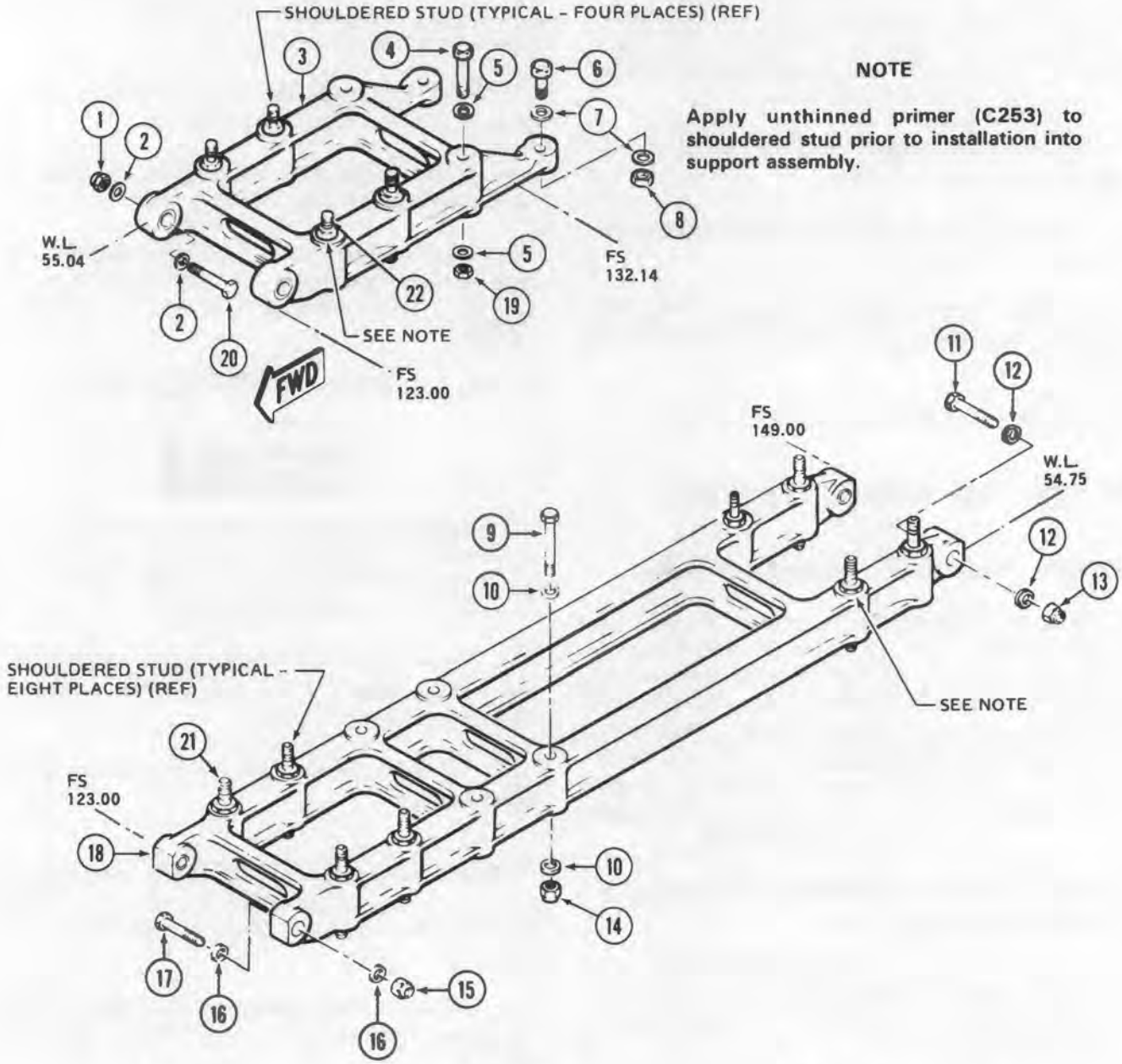
11-113. Inspection — Support Assemblies. a. Inspect support assembly (3, figure 11-24) in accordance with damage limits outlined in figure 11-25.

b. Inspect support assembly (18, figure 11-24) in accordance with damage limits outlined in figure 11-26.

11-114. Repair or Replacement — Support Assemblies. a. Any damage to support assembly (3, figure 11-24) exceeding limits outlined in figure 11-25 requires replacement of part.

WARNING

Chemical film material (C42) and primers (C253 and C167) are flammable and toxic. Provide adequate ventilation. Do not use near fire or open flame.



1. Nut
2. Washer
3. Support assembly
4. Bolt
5. Washer
6. Bolt
7. Washer
8. Nut
9. Bolt
10. Washer
11. Bolt
12. Washers
13. Nut
14. Nut
15. Nut
16. Washers
17. Bolt
18. Support assembly
19. Nut
20. Bolt
21. Stud
22. Stud

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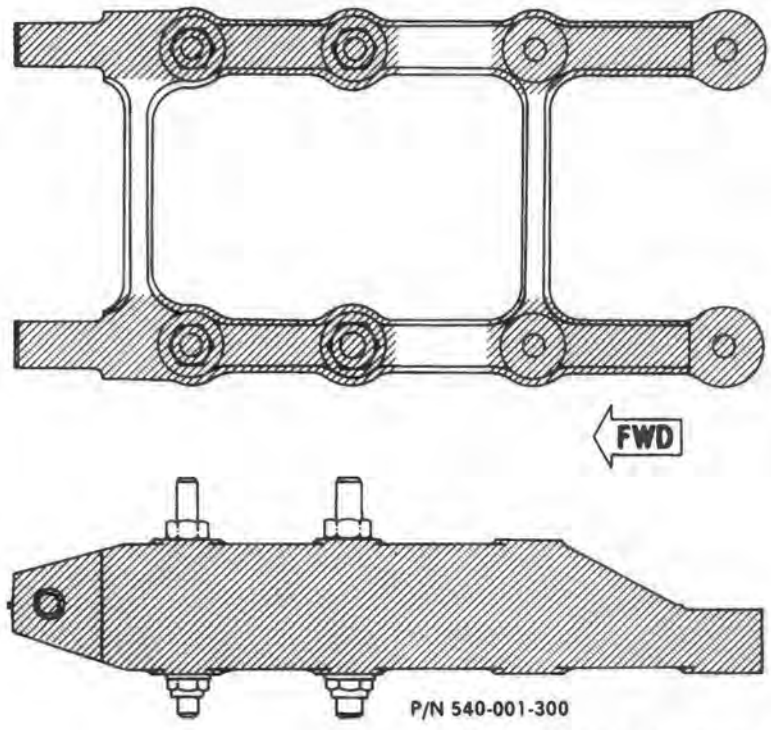
Figure 11-24. Hydraulic servo cylinder support — removal and installation



DAMAGE AREA AND REPAIR ZONES

TYPE OF DAMAGE	▨	▭
MECHANICAL: NICKS, SCRATCHES, ETC.	0.020 INCH	0.030 INCH
CORROSION	0.010 INCH	0.015 INCH
MAXIMUM AREA PER FULL DEPTH REPAIR	0.25 SQUARE INCH	0.50 SQUARE INCH
MAXIMUM NUMBER OF REPAIRS	TWO PER SEGMENT	
EDGE CHAMFER	0.040 INCH	0.060 INCH
SURFACE COATING	BRUSH ALODINE	
BORE REPAIR	0.002 — ONE-QUARTER CIRCUMFERENCE	
THREAD DAMAGE:		
DEPTH:	ONE-THIRD OF THREAD	
LENGTH:	ONE-TENTH INCH	
NUMBER:	ONE PER THREADED SEGMENT	
BORE ELONGATION:	0.0015 INCH MAXIMUM	

NO CRACKS ALLOWED.

NOTE: ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

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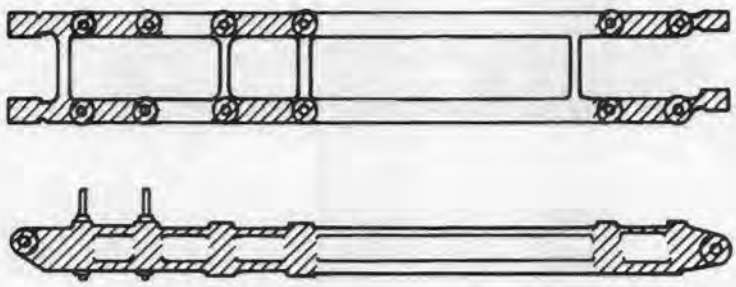
Figure 11-25. Support assembly P/N 540-001-300 — damage limits



P/N 540-001-301

TYPE OF DAMAGE	DAMAGE AREA AND REPAIR ZONES ▨	▭
MECHANICAL: NICKS, SCRATCHES, ETC.	0.020 INCH	0.030 INCH
CORROSION	0.010 INCH	0.015 INCH
MAXIMUM AREA PER FULL DEPTH REPAIR	0.24 SQUARE INCH	0.50 SQUARE INCH
MAXIMUM NUMBER OF REPAIRS	TWO PER SEGMENT	
EDGE CHAMFER	0.040 INCH	0.060 INCH
SURFACE COATING	BRUSH ALODINE	
BORE REPAIR	0.002 — ONE-QUARTER CIRCUMFERENCE	
THREAD DAMAGE:		
DEPTH:	ONE-THIRD OF THREAD	
LENGTH:	ONE-TENTH INCH	
NUMBER:	ONE PER THREADED SEGMENT	
BORE ELONGATION:	0.0015 INCH MAXIMUM	
NO CRACKS ALLOWED		

NOTE: All dimensions are in inches unless otherwise stated.

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Figure 11-26. Support assembly P/N 540-001-301 — damage limits

b. Polish nicks, scratches, or corrosion to original surface finish with 600 grit sandpaper (C185.2). Treat repaired area with chemical film material (C42) followed with a light application of primer (C253) or primer (C167).

c. Thread damage, bent, or corrosion, to studs of support assemblies (3 or 18, figure 11-24) requires replacement of part. Apply primer (C253) to replacement studs (21 or 22) prior to installation to support.

d. Any damage to support assembly (18) exceeding limits outlined in figure 11-26 requires replacement of part.

e. Polish, treat, and touchup damaged repaired areas of support assembly (18, figure 11-24) as outlined in above step b.

f. Replace bent, damaged, or broken cylinder mounting studs (21 or 22), including nut and washer on bottom of support (figure 11-25 and 11-26).

g. Torque studs P/N MS21042L4 **50 TO 70** inch-pounds. Torque studs P/N MS21042L5 **100 TO 140** inch-pounds.

11-115. Installation — Right Support Assembly.

NOTE

Do not torque nuts (1, 8 and 19) until all bolts (4, 6, and 20) are installed (with unthinned wet primer (C253) in support assembly (3).

a. Position support assembly (3, figure 11-24) between attachment supports of pylon structure and align holes in support assembly with holes in top of suspension (cargo hook) lift beam. Place washer (5) on bolts (4). Apply unthinned primer (C253) to shank of bolts and install bolts through support assembly (3) and suspension (cargo hook) lift beam.

b. Place a washer (2) on each of bolts (20). Apply unthinned primer (C253) to shank of bolts and install bolts through support assembly (3) and supports of pylon structure.

c. Place a washer (7) on each of two bolts (6). Apply unthinned primer (C253) to shank of bolts and install bolts through support assembly (3) and top of lift beam.

d. Install washers (2, 5 and 7), and nuts (1, 8 and 19) on bolts (4, 6 and 20), respectively.

e. Install right cyclic servo cylinder as detailed in paragraph 7-167.

f. Close and secure cowling.

11-116. Installation — Left Support Assembly.

NOTE

Do not tighten nuts (13, 14, and 15) until all bolts (9, 11, and 17) are installed in support assembly (18).

a. Position support assembly (18, figure 11-24) between forward and aft attachment supports of pylon stucture and align holes in support assembly with holes in top of lift beam. Place a washer (10) on each of four bolts (9). Apply unthinned primer (C253) to bolts and install bolts through support assembly (18) and suspension (cargo hook) lift beam.

b. Place washers (12) on bolts (11). Apply unthinned primer (C253) to shank of bolts and install bolts through support assembly (18) and supports of pylon structure.

c. Place washers (16) on two bolts (17). Apply unthinned primer (C253) to shank of bolts and install bolts through support assembly (18) and supports of pylon structure.

d. Install nuts (13, 14, and 15) and tighten.

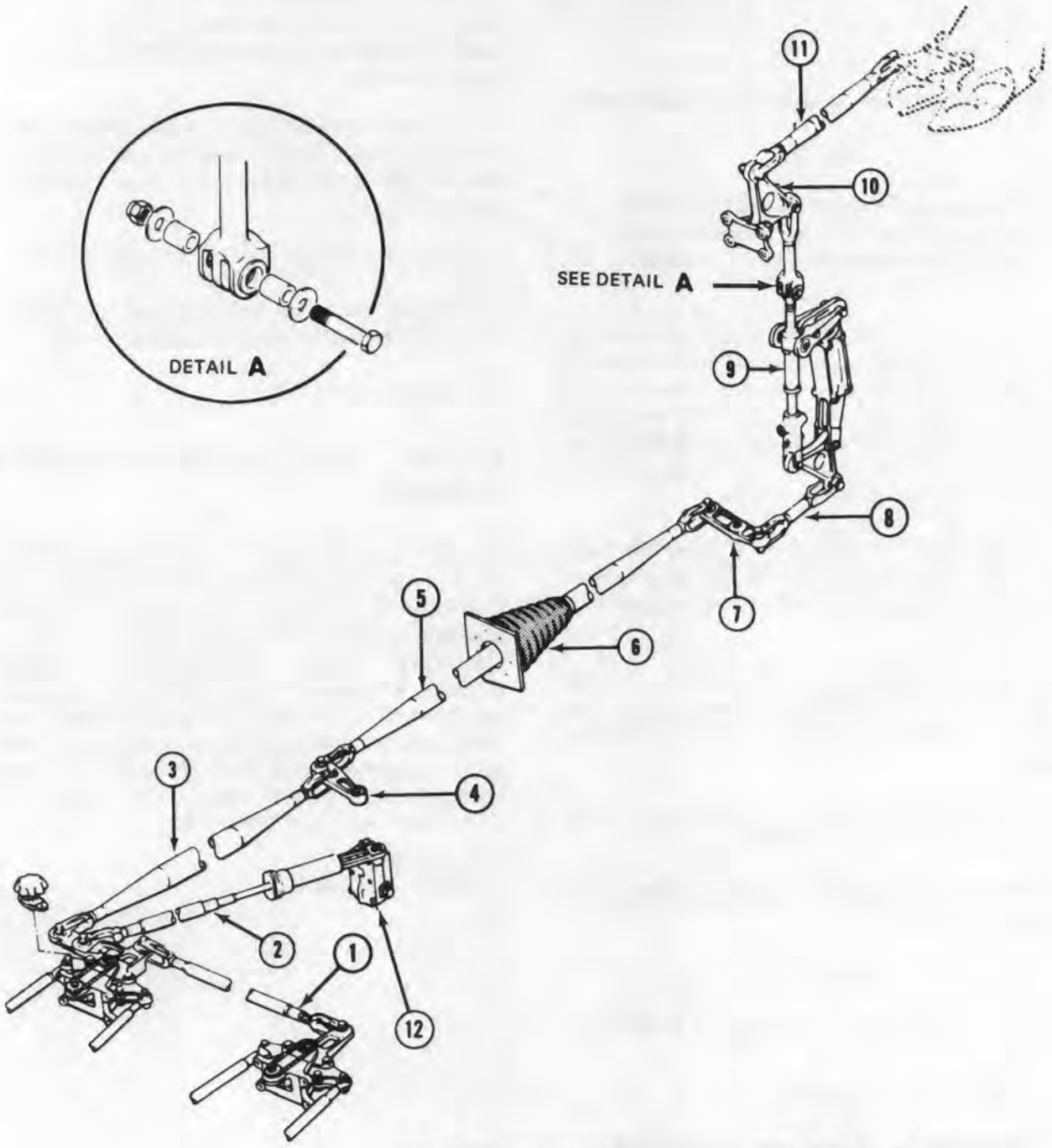
e. Install left cyclic servo cylinder and collective servo cylinder as detailed in paragraph 7-167.

f. Close cowling.

11-117. TAIL ROTOR CONTROL SYSTEM.

11-118. Description — Tail Rotor System.
a. The tail rotor control system (figure 11-27) includes control pedals, pedal adjusters, a force gradient (centering spring) assembly with an electrically operated magnetic brake, hydraulic actuator, a quadrant, cables and chain operating a pitch control mechanism mounted through tail rotor shaft, and connecting linkage. Actuation of pedals causes power-assisted pitch change of tail rotor blades to offset main rotor torque and control directional heading of helicopter.

11-119. Deleted.



1. Interconnect tube
2. Force gradient assembly
3. Control tube
4. Lever
5. Control tube
6. Boot
7. Bellcrank
8. Link rod
9. Power cylinder
10. Bellcrank
11. Control tube
12. Magnetic brake

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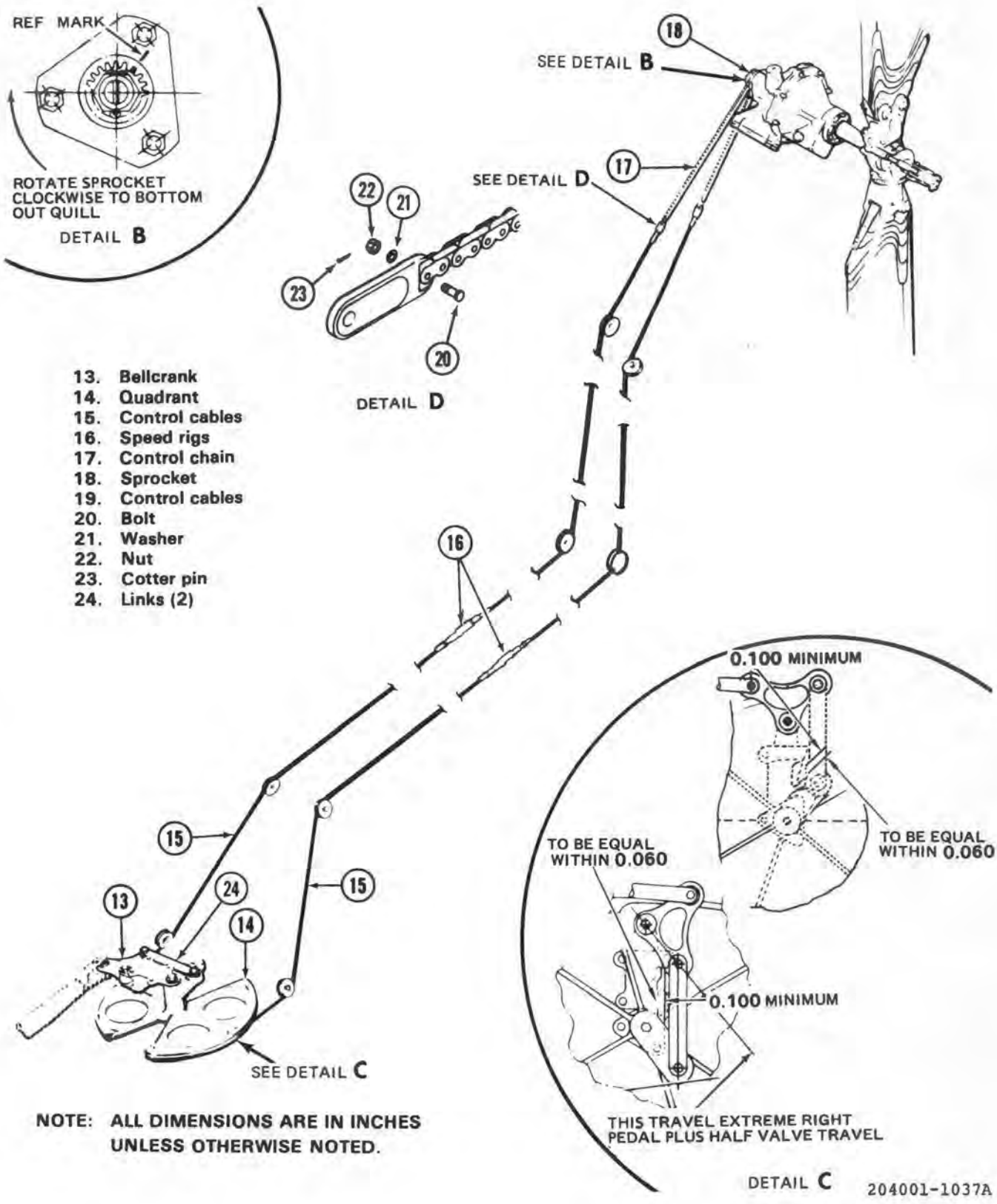
Figure 11-27. Tail rotor control system (Sheet 1 of 2)



NOTE: ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Figure 11-27. Tail rotor control system (Sheet 2 of 2)

11-120. Rigging — Tail Rotor Control System — Roller Type Chain.

Adjust the tail rotor control cables as follows:

NOTE

Accomplish rigging with hydraulic boost off.

a. Adjust pitch change links to **5.4** inches (figure 11-28).

b. Install all control tubes and links in the tail rotor controls.

c. Set pedals at approximately neutral adjustment by use of adjusting knob.

CAUTION

Use crosshead P/N 204-011-711-1, only (figure 11-28).

d. Depress both pilot and copilot left tail rotor control pedals and hold against stops.

e. Adjust and install interconnect tube assembly (1, figure 11-27).

f. Install and adjust control tube (11) to obtain condition shown (figure 11-27, detail C).

g. At control assembly on right side of tail rotor drive gear box, remove housing cover (1, figure 11-35), sprocket guard (2), upper cable quick-disconnect coupling, and control chain (3) from the sprocket. Ensure sprocket guard nuts and washers are reinstalled.

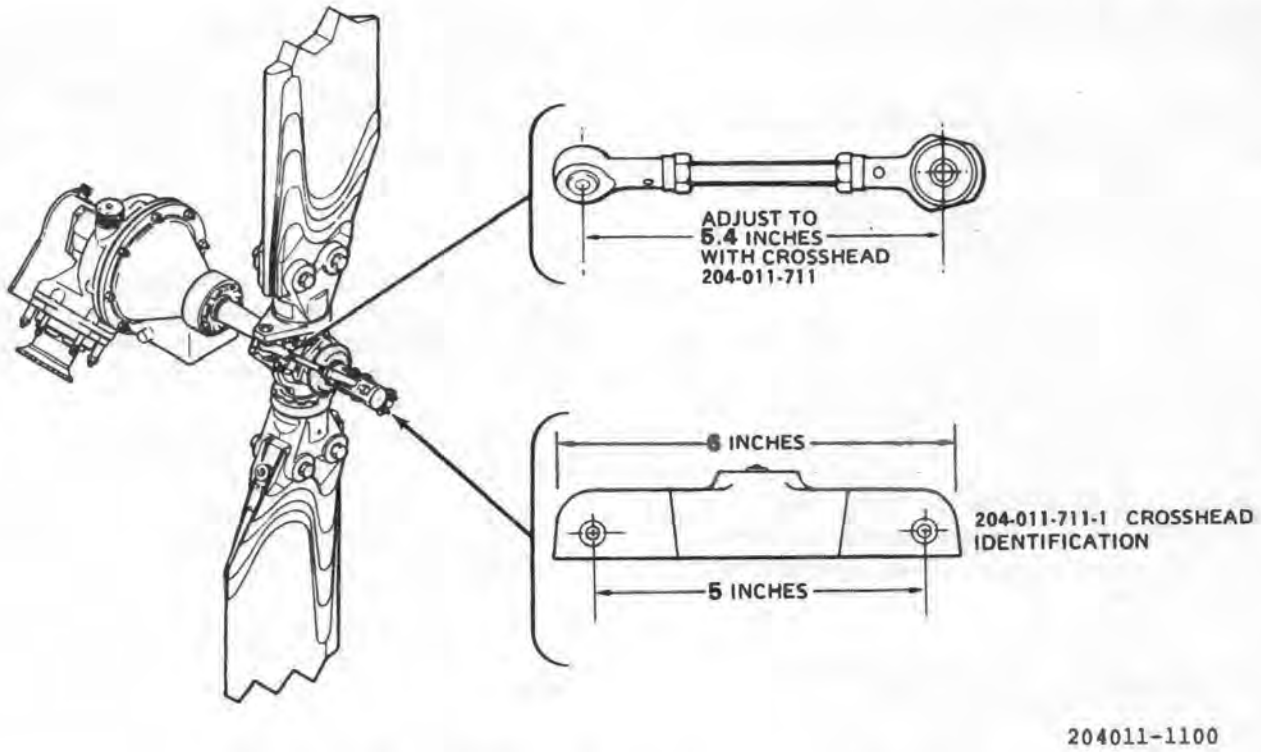


Figure 11-28. Tail rotor control crosshead and link usage

NOTE

Replace nuts on housing pan prior to applying full pedal.

h. Place reference mark, with grease pencil, on surface of retainer adjacent to any tooth on sprocket (figure 11-27, detail B).

i. Turn sprocket clockwise to bottom out control quill and mark tooth opposite retainer reference mark.

j. With sprocket bottomed and left pedal held against stop, apply sufficient tension to lower cable in order to stop cylinder control valve motion.

k. Install control chain over sprocket and connect upper quick-disconnect coupling.

NOTE

Speed rigs should be disconnected when adjusting cable tension, then reconnected and lockwired (C127) after adjustment is made.

l. Adjust cable tension **40 TO 50** pounds, while maintaining sprocket position established in step j above.

m. Actuate pedals through full travel. With full left pedal, sprocket may be off bottom 1-1/4 to 2-1/4 teeth from index reference mark.

n. Manually push forward on top chain to actuate the cylinder valve. Sprocket should again bottom.

o. Actuate control pedals and hold right pedal at full forward stop.

p. Mark sprocket tooth opposite index mark and apply sufficient force to chain to rotate sprocket **2 TO 3** teeth counterclockwise.

q. Ensure splines of pitch change slider and tail rotor shaft are securely engaged. With the **2 TO 3** additional tooth settings obtained in step p, the splines should not disengage.

NOTE

If hydraulic power is available, check full left pedal sprocket position with boost on. Position should be 1/4 TO 1-1/4 teeth from bottom by observing relation of sprocket tooth and index mark.

r. Position arm on magnetic brake with scribe mark on shaft opposite the mark D on arm.

s. Locate pedals and brake arm in their center of travel.

t. Adjust and install directional force gradient assembly (paragraph 11-83).

u. Ensure quick-disconnect couplings have sufficient clearance at fairleads, and lockwire (C127) turnbuckles.

v. Make final adjustment of pitch change links. Adjust to obtain pedals aligned in flight cruise. To move right pedal forward, lengthen both pitch change links, evenly, one turn at a time until desired setting is obtained. To move right pedal aft, shorten both pitch change links, evenly, one turn at a time until desired setting is obtained. Recheck tail rotor to fin clearance, if pitch change links were adjusted.

w. Check tail rotor blade/tailboom vertical fin clearance. Refer to paragraph 5-109

11-121. MAGNETIC BRAKE — TAIL ROTOR CONTROLS

11-122. Description — Magnetic Brake-Tail Rotor Controls. A magnetic brake (12, figure 11-27) used in conjunction with a force gradient assembly is mounted in each control element. This magnetic brake is identical to two other assemblies used in the cyclic control system except for the position of arm on brake. For adjustment, maintenance, and replacement of this magnetic brake, refer to paragraph 11-74.

11-123. FORCE GRADIENT — TAIL ROTOR CONTROLS.

11-124. Description — Force Gradient Tail Rotor Controls. A force gradient assembly (2, figure 11-27) is used in the tail rotor controls in conjunction with a magnetic brake assembly. For adjustment, maintenance, and replacement of force gradient assembly, refer to paragraph 11-81.

11-125. ADJUSTER ASSEMBLY.

11-126. Description — Adjuster Assembly-Tail Rotor Controls. The pedal adjuster is used to change forward or aft position of tail rotor control pedals of pilot and copilot. A control knob is located just aft of the pilot and copilot cyclic stick and just above cabin floor. Pilot and copilot adjuster assemblies are identical except pilot adjuster has a larger bellcrank to provide for attachment of control tube and force gradient.

11-127. Inspection — Adjuster Assembly (Installed) a. Inspect adjuster assembly for nicks, scratches, cracks, loose or missing hardware, and corrosion. Refer to figure 11-31 for limits.

b. Inspect parts for bolt and bushing hole elongation. Refer to paragraph 11-130 for limits.

c. Inspect for proper operation (movement of pedals) and binding.

d. Refer to paragraph 11-130 and 11-131 for disposition of parts that fail to meet inspection requirements.

e. Replace missing or damaged hardware.

11-128. Removal — Adjuster Assembly a. Remove pilot and copilot seats (paragraph 2-214).

b. Remove access doors (figure 2-19).

c. Remove bolts (14, figure 11-29) and washers (2) securing adjuster knob to cabin floor.

d. Remove cotter pin (7), nut (9), washers (2), and bolt (8) attaching end of tube (12).

e. Remove cotter pin (7), nut (16), washers (2), and bolt (17) attaching end of tube (15).

f. Remove cotter pin (7), nut (6), washers (2) and bolts (1) attaching control tube (5) to adjuster assembly.

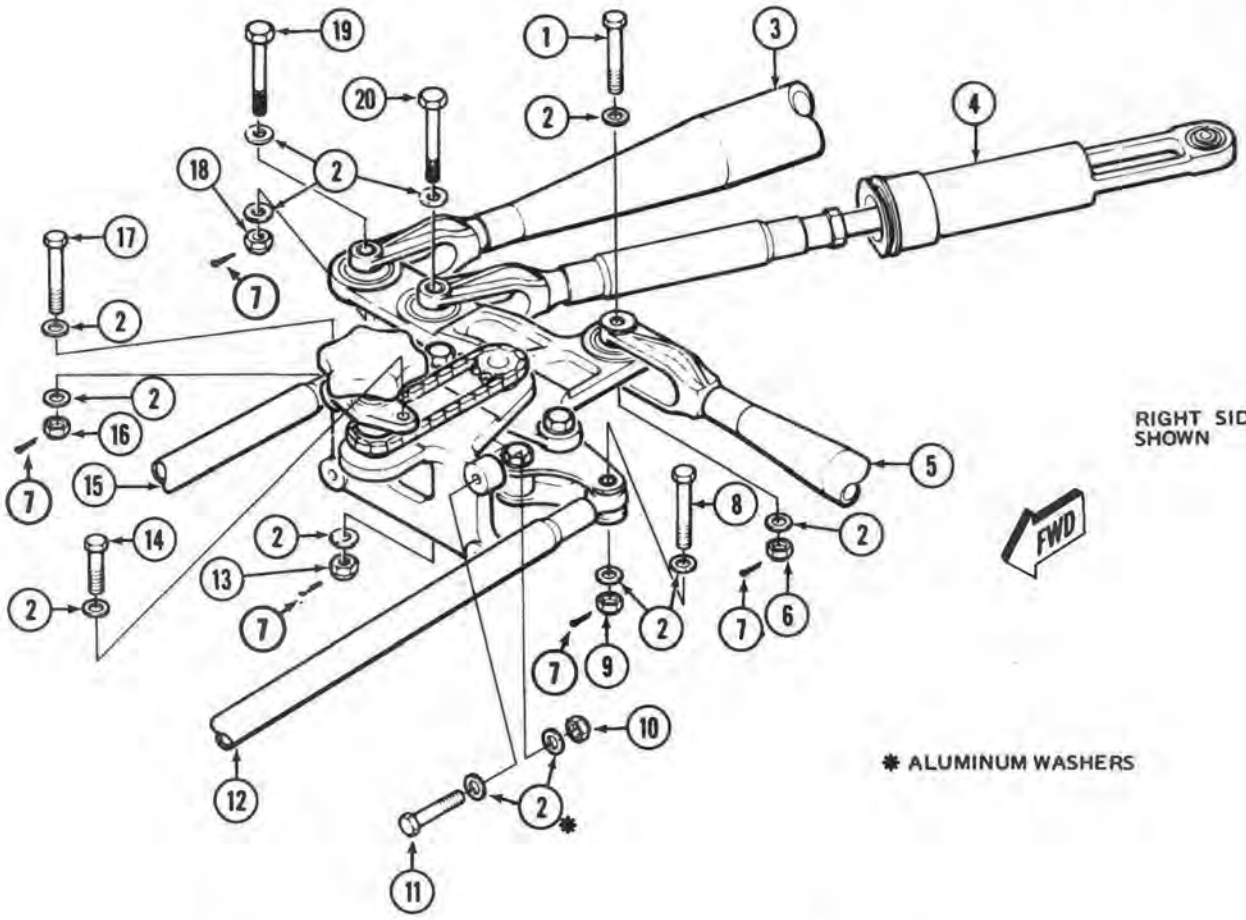
g. Remove cotter pin (7), nut (13), washers (2), and bolt (20) attaching force gradient to adjuster assembly.

h. Remove cotter pin (7), nut (18), washers (2), and bolt (19) attaching control tube (3) to adjuster.

i. Remove nuts (10), aluminum washers (2), and bolts (11) attaching adjuster assembly to structure. Remove adjuster assembly.

11-129. Disassembly — Adjuster Assembly (AVIM) a. Remove cotter pin (38, figure 11-30) and nut (39), washer (40), and bolt (43) attaching sprocket (41).

b. Remove key (42) from bolt (43).



1. Bolt
2. Washer
3. Control tube (right side only)
4. Force gradient (right side only)
5. Control tube
6. Nut
7. Cotter pin
8. Bolt
9. Nut
10. Nut
11. Bolt
12. Control tube
13. Nut
14. Bolt
15. Control tube
16. Nut
17. Bolt
18. Nut
19. Bolt
20. Bolt

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Figure 11-29. Adjuster assembly — tail rotor controls — removal and installation — typical

c. Remove cotter pin (37), nut (36), washer (35), pin (28), and bolt (30) attaching sprocket (33).

d. Remove key (31) from bolt (30).

e. Remove chain (32) and sprockets (41 and 33) and gear (29).

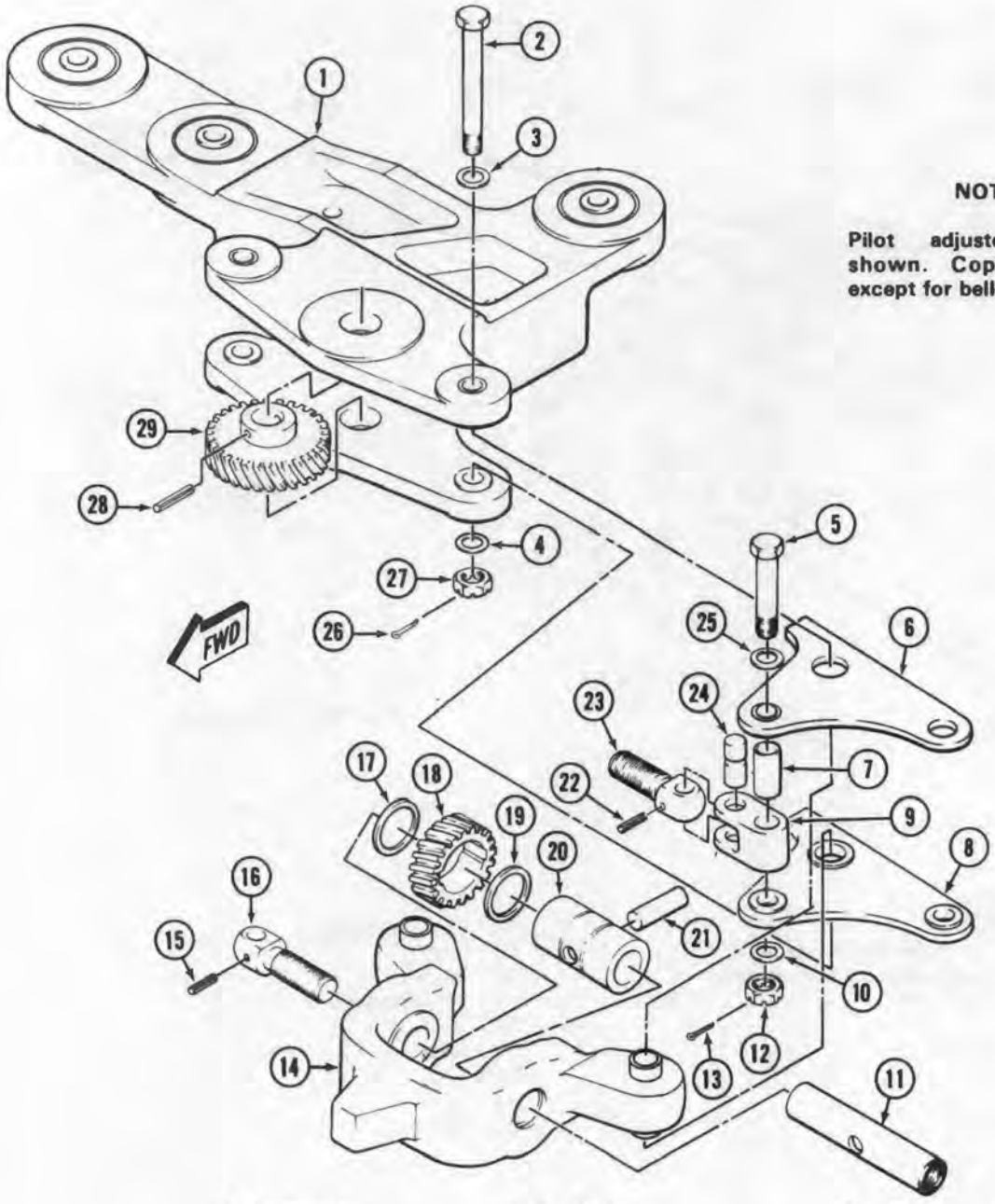
f. Remove cotter pin (13), nut (12), washers (10 and 25), and bolt (5).

g. Remove cotter pin (26), nut (27), washers (3 and 4), and bolt (2) attaching plates (6 and 8).

h. Remove pin (22) and pin (24) attaching screw (23).

i. Remove link (9) and spacer (7).

j. Remove pin (15) and screw (16).

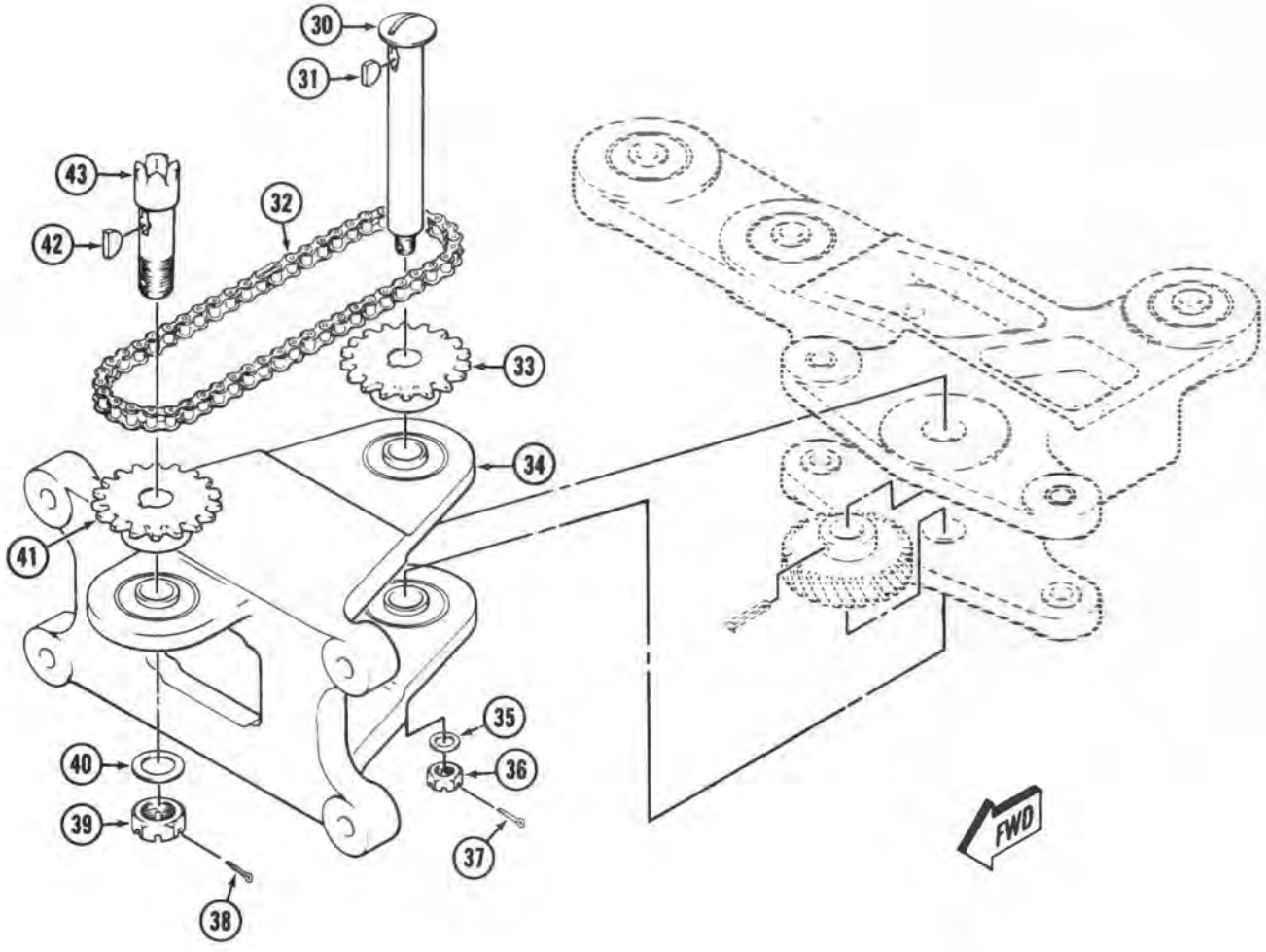


NOTE

Pilot adjuster assembly shown. Copilot same except for bellcrank.

1. Bellcrank
2. Bolt
3. Washer
4. Washer
5. Bolt
6. Plate
7. Spacer
8. Plate
9. Link
10. Washer
11. Nut
12. Nut
13. Cotter pin
14. Support
15. Pin
16. Screw
17. Retainer
18. Gear
19. Retainer
20. Shaft
21. Pin
22. Pin
23. Screw
24. Pin
25. Washer
26. Cotter pin
27. Nut
28. Pin
29. Gear

Figure 11-30. Adjuster assembly — tail rotor controls — disassembly and reassembly (Sheet 1 of 2)



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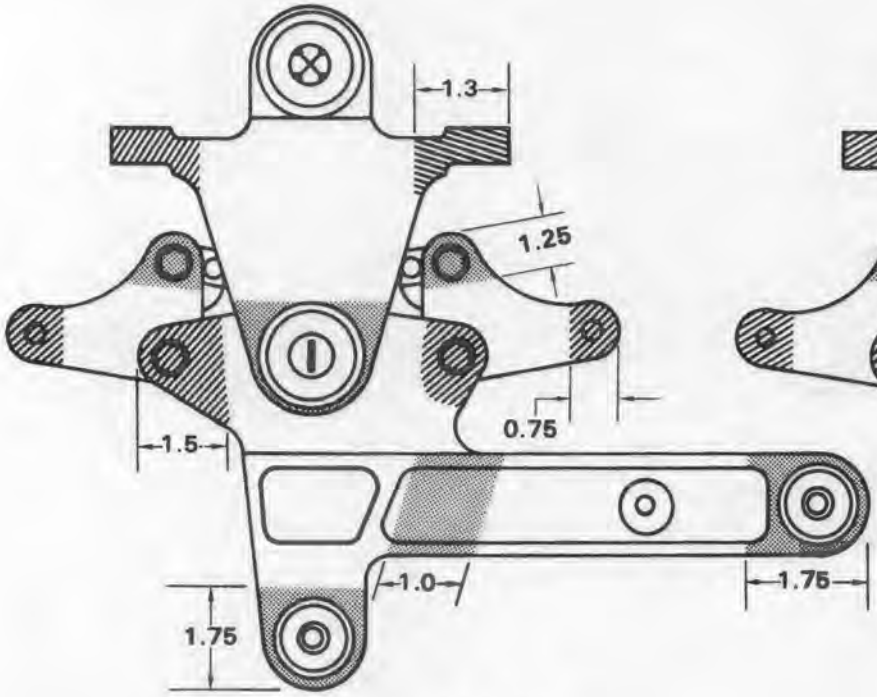
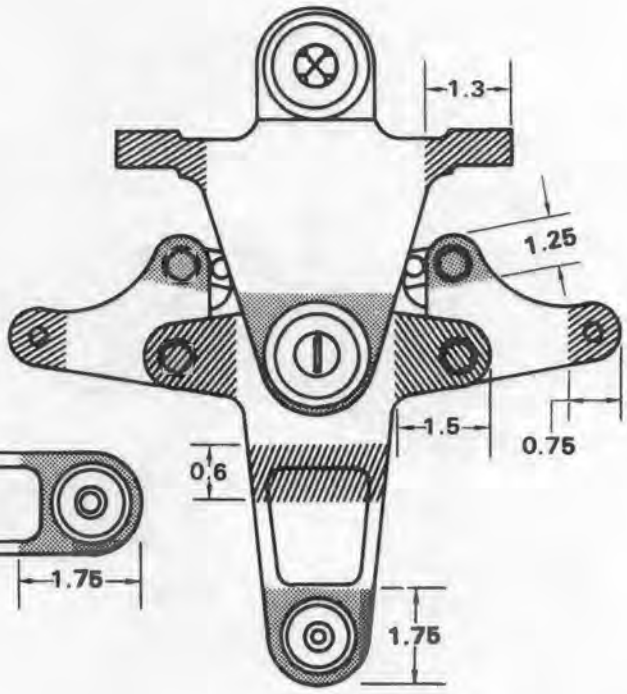
30. Bolt
31. Key
32. Chain
33. Sprocket
34. Support
35. Washer
36. Nut
37. Cotter pin
38. Cotter pin
39. Nut
40. Washer
41. Sprocket
42. Key
43. Bolt

Figure 11-30. Adjuster assembly — tail rotor controls — disassembly and reassembly (Sheet 2 of 2)



204-001-762-13
ADJUSTER ASSEMBLY



204-001-762-15
ADJUSTER ASSEMBLY

DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE			
MECHANICAL DAMAGE (AFTER CLEAN-UP)	0.015 IN.	0.010 IN.	0.005 IN.
CORROSION DAMAGE (BEFORE CLEAN-UP)	0.0075 IN.	0.005 IN.	0.0025 IN.
(AFTER CLEAN-UP)	0.015 IN.	0.010 IN.	0.005 IN.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 IN. SQ.	0.10 IN. SQ.	0.10 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 BY 0.05	0.04 BY 0.04	
BORE DAMAGE	0.002 INCH FOR ONE-FOURTH CIRCUMFERENCE		

NO CRACKS ALLOWED.

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED

205001-1041A

Figure 11-31. Wear and damage limits — adjuster assemblies — tail rotor controls

k. Remove pin (21) attaching shaft (20) and nut (11).

l. Remove nut (11), shaft (20), retainers (17 and 19), gear (18), and support (14).

11-130. Inspection — Adjuster Assembly (AVIM) a. Inspect chain (32, figure 11-30) for wear, damaged links, and corrosion.

b. Inspect sprockets (33 and 41) for wear and chipped or missing teeth.

c. Inspect bellcrank (1) and support (34) for corrosion and damage. See figure 11-31 for limits.

d. Inspect bushings in bellcrank (1, figure 11-30), upper plate (6), lower plate (8), and support assembly (34) for wear, elongation, and looseness. Maximum allowable bushing wear is 0.002 inch over 1/4 of circumference of bore.

11-131. Repair or Replacement — Adjuster Assembly (AVIM) a. Replace components that do not meet inspection requirements.

b. Repair corrosion or damage in adjuster assembly within limits specified on figure 11-31.

c. Replace worn bushings as detailed in paragraph 11-206.

11-132. Assembly — Adjuster Assembly (AVIM) a. Place retainers (17 and 19, figure 11-30) and gear (18) on shaft (20) and place inside support (14).

b. Slide nut (11) into support (14) and inside shaft (20) with the 45 degree chamfer on the opposite side of arm of bellcrank assembly (1).

c. Place pin (21) to attach shaft (20) and nut (11).

d. Install screw (16) and pin (15).

e. Install spacer (7) and link (9).

f. Install pin (24) and pin (22) to attach screw (23).

g. Install nut (27), washers (3 and 4), and bolt (2) to attach plates (6 and 8). Tighten nut and install cotter pin (26).

h. Install nut (12), washers (10 and 25), and bolt (5). Tighten nut and install cotter pin (13).

i. Position bellcrank (1), with inner gear (29) in bellcrank (1), to support assembly (34).

j. Install bolt (30), with key (31) and sprocket (33), through support (34), bellcrank (1), and inner gear (29).

k. Install new pin (28) through inner gear (29) and bolt (30). Stake pin on both sides.

l. Position chain (32) on aft sprocket (33).

m. Assemble bolt (43), key (42), and forward sprocket (41). Position forward sprocket inside chain and install bolt through support (34).

n. Install washer (40) and nut (39). Tighten nut and install cotter pin (38).

o. Install washer (35) and nut (36). Tighten nut and install cotter pin (37).

11-133. Installation — Adjuster Assembly. a. Inspect structural intercostal mounting surfaces of adjuster assembly (figure 11-29) to determine if tape (C220) is torn or missing. Install new tape (C220) if torn or missing.

NOTE

Ensure tape (C220) covers entire mating surface area and extends at least 0.25 inch beyond joint edges.

b. Secure adjuster assembly to structure, using bolts (11, figure 11-29), aluminum washers (2), and nuts (10).

c. Place tube (12) on adjuster assembly and attach with bolt (8), washers (2), and nut (9). Secure with cotter pin (7).

d. Install tube (15) and attach bolt (17), washers (2), and nut (16). Secure with cotter pin (7).

e. Install control tube (5) on adjuster assembly using bolt (1), washers (2), and nut (6). Secure with cotter pin (7).

f. Install control tube (3) using bolt (19), washers (2), and nut (18). Secure with cotter pin (7).

g. Install force gradient (4) using bolt (20), washers (2), and nut (13). Secure with cotter pin (7).

h. Place knob assembly over adjuster and attach securely to floor with bolts (14) and washers (2).

i. Install access doors (25 and 35, figure 2-19).

j. Install pilot and copilot seats. (paragraph 2-217.)

11-134. CABLES — TAIL ROTOR CONTROLS.

11-135. Description — Cables - Tail Rotor Controls. Tail rotor control cables are connected between a quadrant, mounted in front end of tailboom, and ends of a chain assembly which actuates the tail rotor control pitch change mechanism. Left and right cables are each in two sections, connected by turnbuckles with speed rig type barrels which can be disconnected and reconnected without disturbing cable tension adjustment, provided the threaded turnbuckle adjustment is not disturbed. Cable connectors are located on front of tailboom vertical fin under driveshaft access door.

11-136. Adjustment — Cables — Tail Rotor Controls.

NOTE

Tail rotor control cables will be adjusted during rigging (paragraph 11-120).

11-137. Inspection — Cables - Tail Rotor Controls. a. Inspect cables for worn sections and broken strands. (Refer to TM 55-1500-204-25/1.)

b. Inspect pulleys for flat spots, and damaged, tight, or worn bearings. (Refer to TM 55-1510-204-25/1.)

c. Inspect grommets for wear and signs of misalignment.

d. Inspect bracket and clevis pin for security.

e. Inspect supports for security and condition.

f. Inspect chain and sprocket for wear (paragraph 11-157 or 11-158).

11-138. Removal — Cables - Tail Rotor Controls. a. Cut lockwire and disconnect cables at speed rigs. Disconnect cables from control chain (figure 11-32).

b. Disconnect cables from control quadrant.

c. Remove clevis pins from pulley supports and remove pulleys, whenever necessary, to remove cables.

d. Remove fairleads from brackets and remove cables.

11-139. Repair or Replacement - Cables - Tail Rotor Controls. a. Replace cable assembly if a break in a wire of a cable is evident (items 4 and 7, figure 11-29).

b. Replace cable assembly if evidence of corrosion exists where end fitting is swaged on cable.

11-140. Installation — Cables - Tail Rotor Controls. a. Install forward ends of cable on quadrant with a spherical washer next to ball terminal. Secure with clevis pins and cotter pins.

b. Guide cables through pulley supports and grommet supports. Install grommets in supports.

c. Install aft sections of cable in support and temporarily secure aft ends with lockwire (C127).

d. Install pulleys and clevis pins in support.

e. If supports have been disturbed, check alignment of cables through grommets and realign if necessary by altering shims under supports. (Refer to figure 11-32, detail F.)

f. Attach ends of cables to pitch control chain.

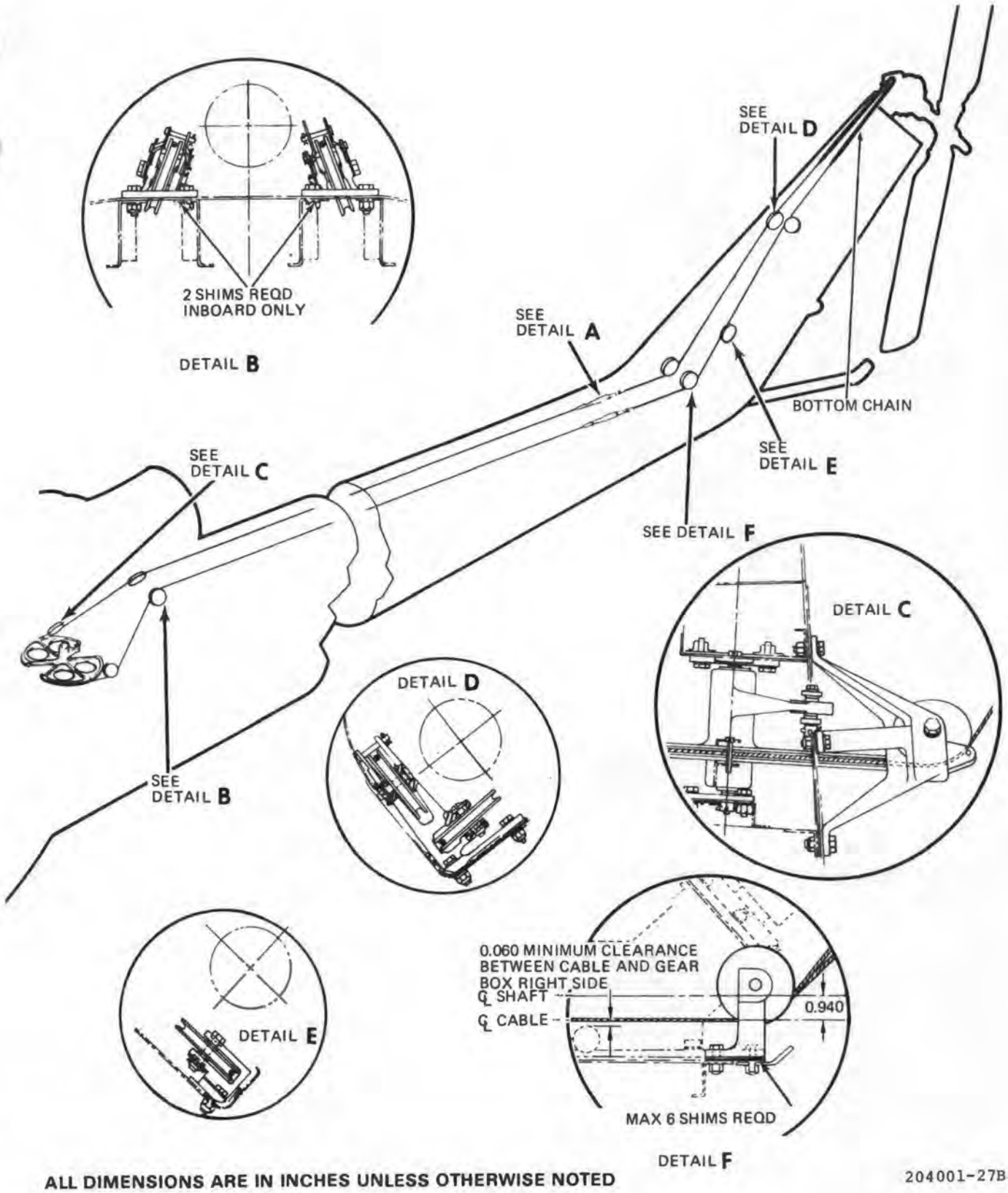
NOTE

Ensure nut and cotter pin installation is on inboard side next to driveshaft.

g. Install pitch control chain on sprocket and adjust tension of cables (paragraph 11-120).

h. Lockwire quick-disconnects (C127). (Refer to figure 11-32, detail A.)

i. Check tail rotor controls for full travel.



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

204001-27B

Figure 11-32. Cable assemblies — tail rotor controls — removal and installation (Sheet 1 of 2)

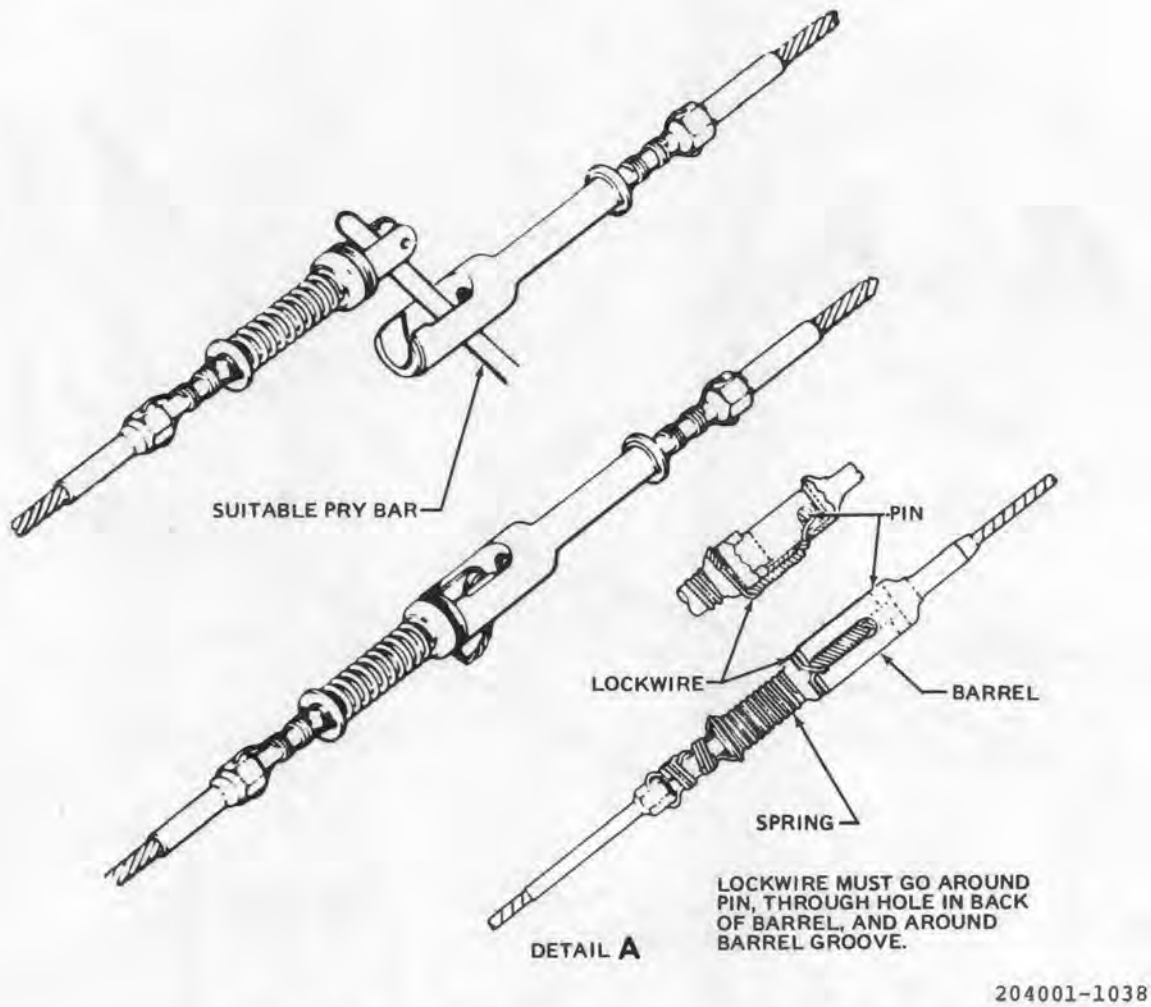


Figure 11-32. Cable assemblies — tail rotor controls — removal and installation (Sheet 2 of 2)

11-141. PULLEYS — TAIL ROTOR CONTROLS.

11-142. Description — Pulleys - Tail Rotor Controls. There are nine nonmetallic pulleys located throughout the tailboom. The pulleys are identical and are attached to brackets with standard hardware.

11-143. Inspection — Pulleys - Tail Rotor Controls. a. Inspect pulleys for flat spots and damage.

b. Inspect parts for tight or worn bearings (paragraph 11-206).

11-144. Removal — Pulleys - Tail Rotor Controls. Refer to paragraph 11-138 for removal.

11-145. Repair or Replacement — Pulleys - Tail Rotor Controls. Replace pulley if damaged or worn.

11-146. Installation — Pulleys - Tail Rotor Controls. Refer to paragraph 11-140 for installation.

11-147. CONTROL QUADRANT.

11-148. Description — Control Quadrant. The tail rotor control quadrant (6, figure 11-33) is located in the upper forward section of the tailboom. The quadrant is utilized to interconnect the push-pull tubes and the tail rotor control cables.

11-149. Removal — Control Quadrant. a. Remove cable assemblies (paragraph 11-138).

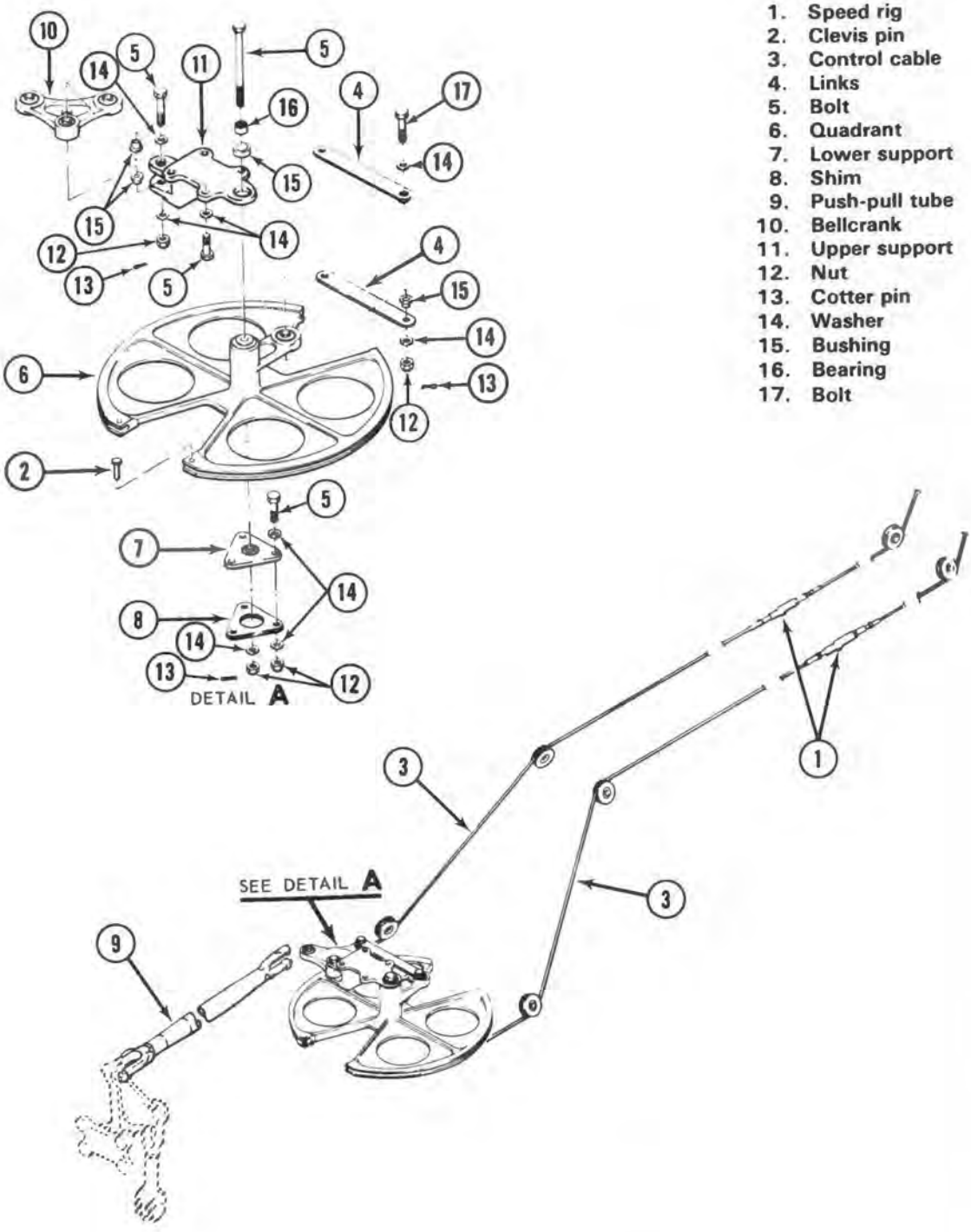


Figure 11-33. Quadrant assembly — tail rotor controls — removal and installation

b. Disconnect control tube (9, figure 11-33) from bellcrank (10) by removing cotter pin, bolt, washers, and nut.

c. Remove links (4) by removing cotter pins (13), bolts (17), washers (14), and nuts (2).

d. Remove cotter pin (13), bolt (5), washers (14), and nut (12), and remove bellcrank (10) from upper support (11).

e. Remove cotter pin (13), bolt (5), washers (14), and nut (12) securing quadrant (6) in supports (7 and 11).

f. Remove quadrant (6) from helicopter.

g. Remove bolts (5), aluminum washers (14), washers (14), and nuts (12) securing lower support assembly (7) to bulkhead.

h. Remove lower support assembly (7) and shim (8) from helicopter. Retain shim for reassembly.

11-150. Inspection — Control Quadrant.
a. Inspect for visible nicks and scratches.

b. Inspect quadrant, support, bellcrank, and link assembly for mechanical damage and corrosion. (Refer to figure 11-34.)

c. Inspect quadrant for cracks.

d. Inspect all bolt holes for elongation (figure 11-34).

e. Inspect bearings for wear and roughness (paragraph 11-205).

11-151. Repair or Replacement — Control Quadrant. Repair or replace control quadrant in accordance with limits specified in figure 11-34.

11-152. Installation — Control Quadrant.
a. Install lower support assembly (7, figure 11-33) and shim (8), and secure to bulkhead with bolts (5), aluminum washers (14), washers (14), and nuts (12). Ensure that shim contains same number of laminations as when removed.

b. Position quadrant (6) in position between upper and lower support assemblies, and install bolt (5), washers (14), and nut (12).

c. Check for **0.010** inch minimum end clearance between quadrant (6) and lower support assembly (7). If gap is excessive, add laminations as required to shim (8). Secure nut (12) with cotter pin (13).

d. Connect bellcrank (10) to upper support assembly (11) with bolts (5), washers (14), nut (12). Secure with cotter pin (13).

e. Connect links (4) to quadrant (6) and to bellcrank (10) with bolts (17), washers (14), and nuts (12). Secure with cotter pins (13).

f. Connect control tube (9) to bellcrank (10) with bolt, washers and nut. Secure with cotter pin.

g. Install cable assemblies (paragraph 11-140).

h. Rig tail rotor control cables in accordance with paragraphs 11-119 and 11-120.

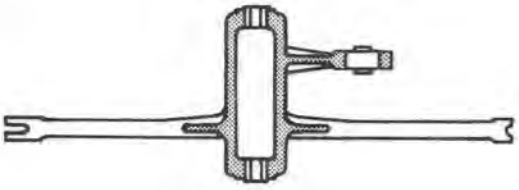
i. Secure with cable terminals to speed rigs with lockwire (C127) (figure 11-32, detail A).

11-153. CHAIN — TAIL ROTOR CONTROL

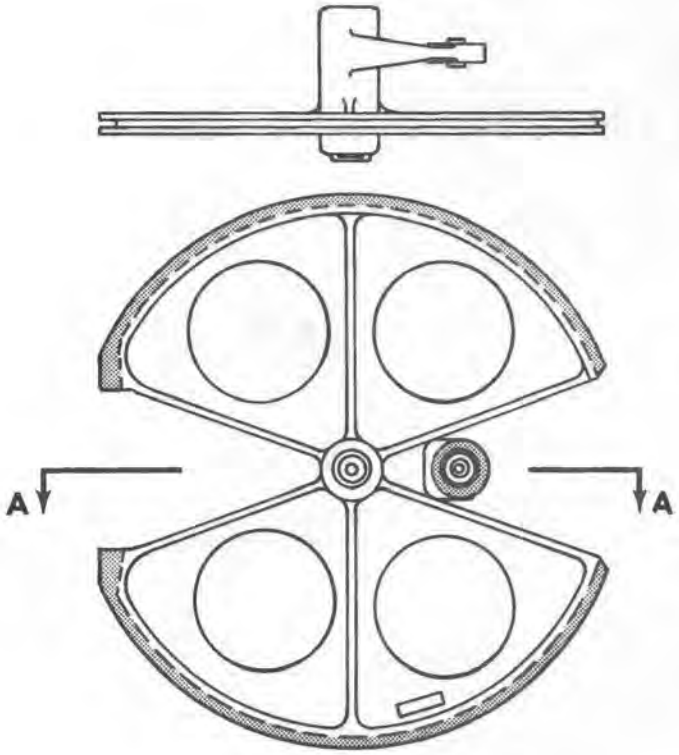
11-154. Description — Chain — Tail Rotor Control. Tail rotor control chain attaches to tail rotor control cables and actuates tail rotor control quill.

11-155. Deleted.

11-156. Deleted.



SECTION **A-A**



204-001-779-5
QUADRANT ASSEMBLY

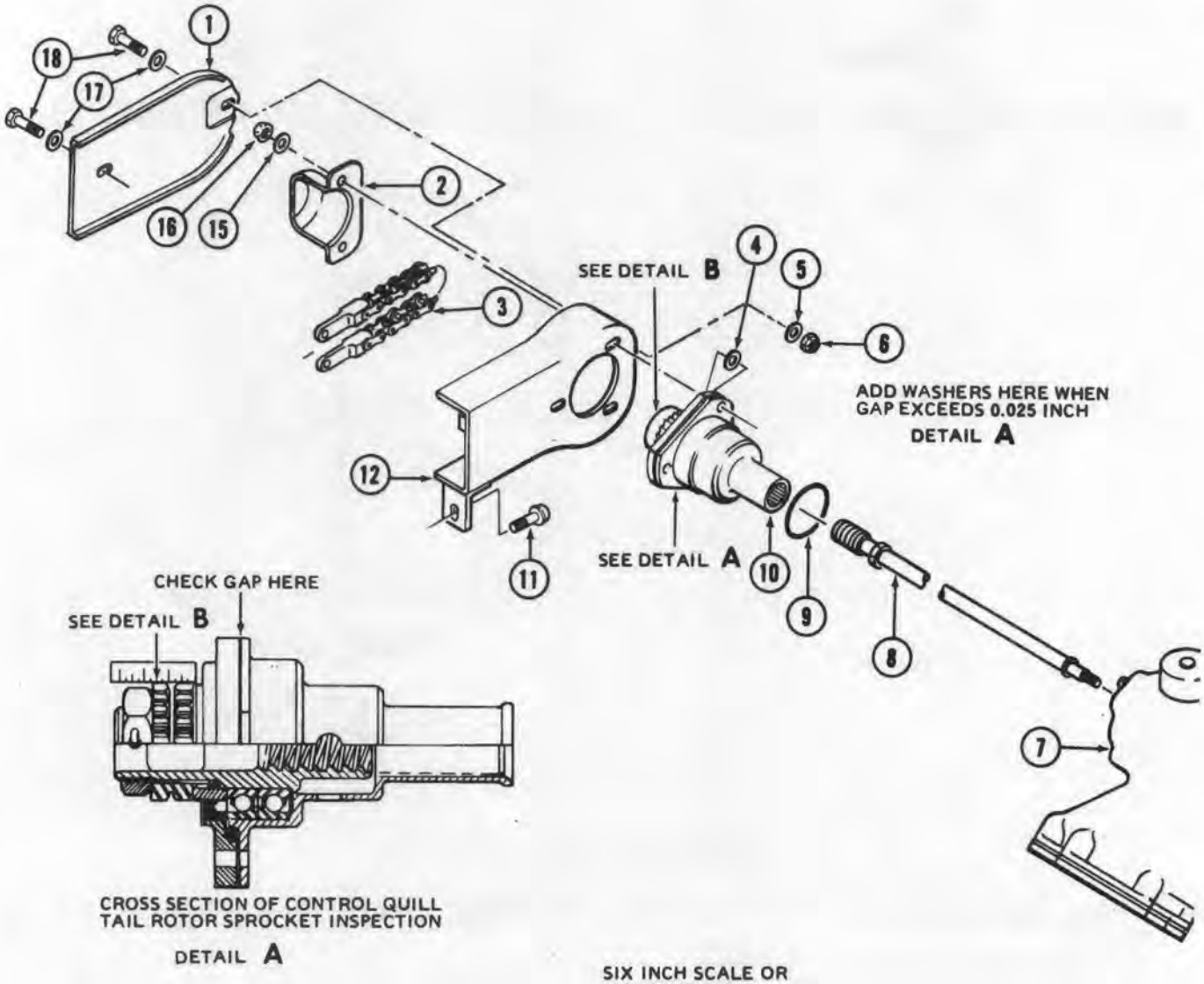
DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	▭	▨
MECHANICAL DAMAGE (AFTER CLEAN-UP)	0.015 IN.	0.010 IN.
CORROSION DAMAGE (BEFORE CLEAN-UP)	0.0075 IN.	0.005 IN.
(AFTER CLEAN-UP)	0.015 IN.	0.010 IN.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 IN. SQ.	0.10 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 BY 0.05	0.04 BY 0.04
BORE DAMAGE	0.002 INCH FOR ONE-FOURTH CIRCUMFERENCE	
NO CRACKS ALLOWED		

205001-1040A

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE STATED.

Figure 11-34. Wear and damage limits — quadrant assembly — tail rotor controls



1. Housing cover
2. Sprocket guard (roller type install)
3. Control chain (roller type)
4. Aluminum washer
5. Washer
6. Nut
7. Gearbox case
8. Control rod
9. Packing
10. Control quill
11. Bolt
12. Housing pan
13. Deleted
14. Deleted
15. Washer
16. Nut
17. Washer
18. Bolt

Figure 11-35. Tail Rotor Control Rod and Quill— Removal/Installation.

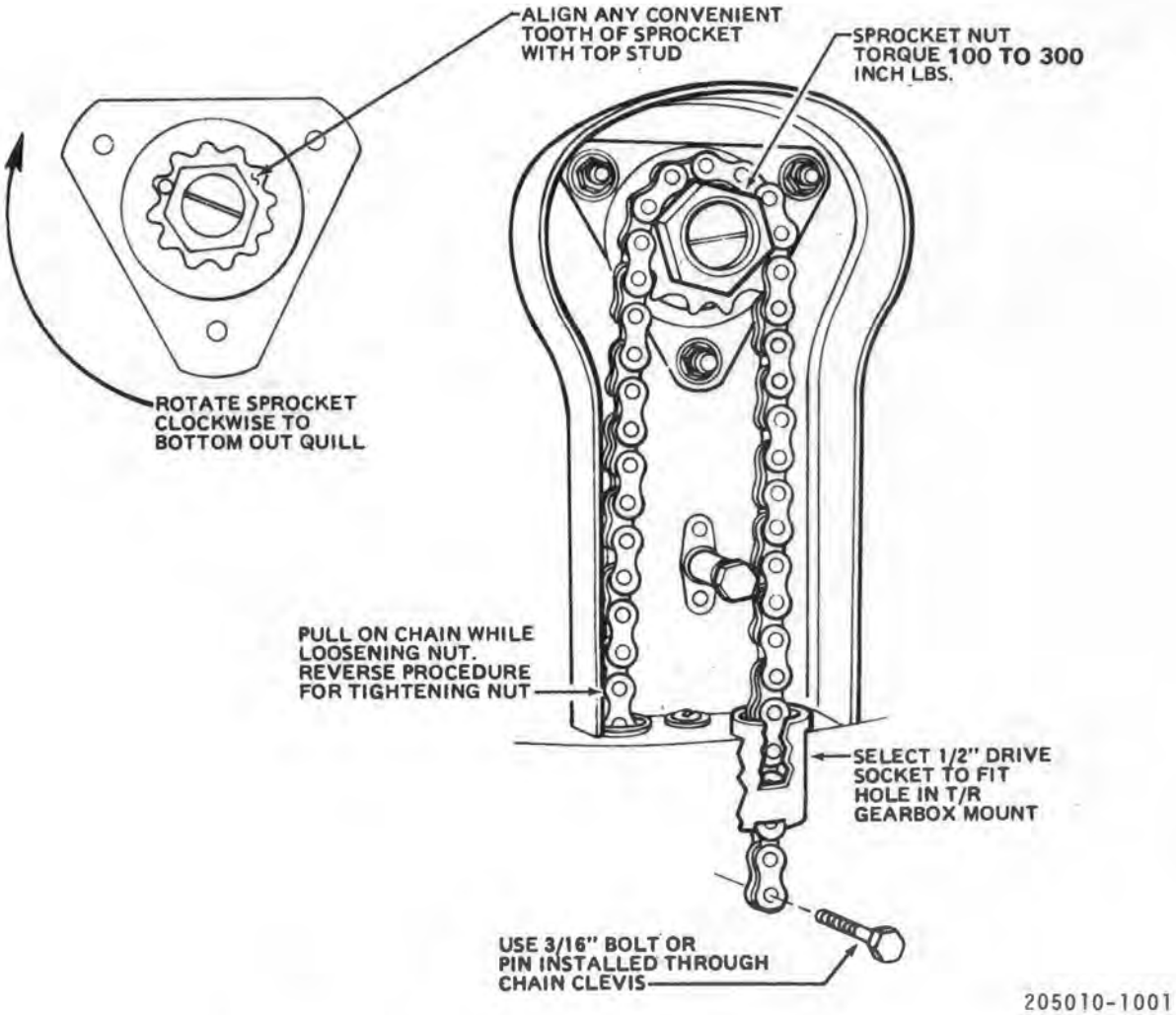


Figure 11-36. Sprocket holding procedure for removal and installation of nut

11-157. Installation — Tail Rotor Control Chain Part No. 1560-UH1-752-1 (Roller type).

a. Bottom out control quill by turning clockwise to end of travel. Position sprocket P/N 1560-UH1-753-1 on control quill splines with any convenient tooth of sprocket in line with upper chain guard mounting stud. Refer to figure 11-35.

NOTE

This sprocket position has been found to be the best for obtaining the sprocket movement limit called out in paragraph h. The sprocket could be removed to another position on the splines if necessary to meet the final adjustment.

Check space between sprocket and gearbox, add spacers if required.

b. Using tail rotor control chain to hold sprocket, hold sprocket near mid-position. Refer to figure 11-36. Approximately **1-1/2** turns counterclockwise from full clockwise will position control quill near mid-position. Install sprocket retaining nut. Torque sprocket retaining nut **100 TO 300** inch-pounds. Aligning cotter pin holes, install sprocket retaining nut cotter pin with spread ends parallel to face of sprocket and bend flat against hex face of retaining nut.

NOTE

Fairleads P/N 1560-UH1-755-1 may require trimming to fit properly.

c. Install new fairleads P/N 1560-UH1-755-1 using previously removed attaching hardware. For ease of fairlead installation, remove control chain and insert retainer plate in slots of fairleads and press fairleads in holes of 90-degree gear box mount.

WARNING

Prior to connecting control chain to clevis of control cable, check for a figure "8" safety on two removable connecting links. On chains furnished without removable connecting links, a safety is not required. See figure 11-37.

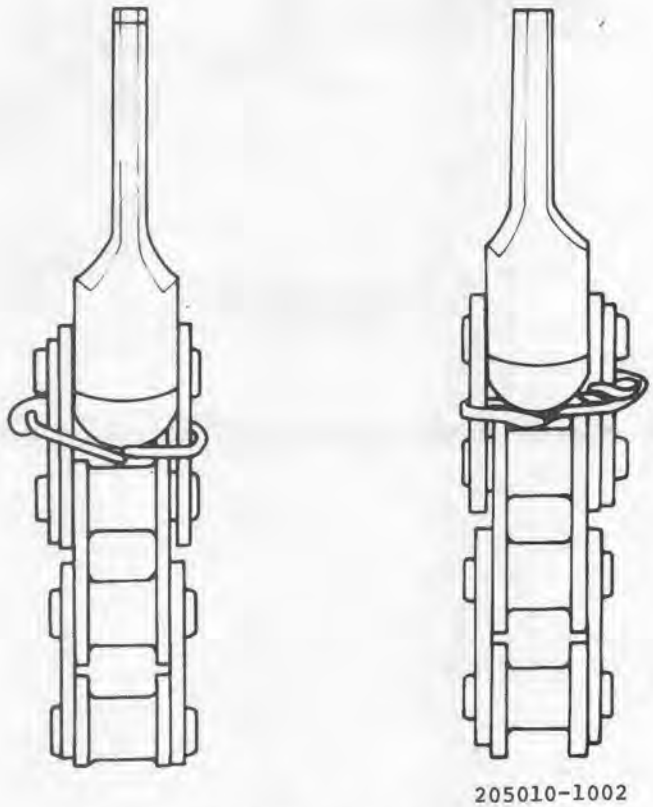


Figure 11-37. Chain safety patterns

NOTE

If safety wire has been removed, refer to step d. If safety has not been removed, refer to step e.

d. Safety removable connecting links with safety wire (C127) (figure 11-37).

e. Connect control chain to clevis of control cable using previously removed attaching hardware (bolts, washers and nuts). Nut should be finger tight, allowing clevis fitting to realign itself when deflected.

NOTE

Nut and cotter pin to be on inboard side next to driveshaft.

f. With sprocket bottomed out in a clockwise position, left tail rotor control pedal held against stop, pull on bottom control cable so as to bottom out servo. Install control chain over sprocket and connect upper speed rig.

NOTE

Move sprocket counterclookwise only as necessary to engage chain.

g. Actuate full right and left tail rotor control pedal, stopping and holding in left pedal position. Mark any convenient tooth of sprocket and cover pan with grease pencil.

h. Pull top chain along its normal downward line of travel until sprocket bottoms out. Sprocket should move **1-1/4 TO 2-1/4** teeth and bottom out.

NOTE

Relocate chain as necessary 1-1/4 TO 2-1/4 teeth movement of sprocket from bottoming out. Verify by repeating steps g and h above.

Check cable tension through lower elevator horn access cover.

i. Positioning pedals in neutral position, mark any convenient tooth of sprocket and cover pan so as to visually assure no movement in sprocket position. Set cable tension **40 TO 50** pounds. Remove grease marks.

j. Place and hold right tail rotor control pedal full forward. Mark sprocket opposite mark on cover pan.

k. Pull lower chain to rotate sprocket **2 TO 3** teeth counterclockwise. At this position, check that splines of pitch change slider and tail rotor are securely engaged. Check for **40 TO 50** pounds cable tension; safety turbuckle.

l. With hydraulic power available, check full left pedal sprocket position with "boost on" sprocket should be from **0.25 TO 1.25** teeth from bottoming out. Check by observing reference marks put on in step j.

m. Disconnect speed rig to relieve tension on chain and remove nuts and washers from chain guard mounting studs.

NOTE

Insure sprocket guard is centered so as not to bind on chain and sprocket throughout travel.

n. Position new sprocket guard (2, figure 11-35) on mounting studs and secure with washers (15) and nuts (16). Torque nuts **50 TO 70** inch-pounds. Reconnect speed rig.

o. Install housing cover (1) on housing pan (12) with two bolts (18) and washers (17).

p. Install lockwire (C127) on speed rig (figure 11-32).

q. Close and secure vertical fin drive shaft cover and elevator horn access cover.

r. Check tail rotor blade to boom clearance in accordance with paragraph 5-136.

s. Check pedal rigging in accordance with paragraph 11-120.

t. Check operation during test flight (TM 55-1520-220-10).

11-158. Inspection — Sprocket and Roller Type Chain. a. Inspect sprocket as follows:

(1) No cracks allowed.

(2) Nicks, scratches, wear, and pitting acceptable if operation of chain is not affected.

b. Inspect roller chain as follows:

(1) Nicks and scratches in link plates acceptable up to a maximum depth of **0.010** inch. No clean-up required.

(2) Wear and pitting of bushings acceptable if operation of chain is not affected or if pin is not exposed. Chain climbing or binding on sprocket not permitted.

(3) Loose bushings — free to turn in link plates — not acceptable.

NOTE

Bushings are roll formed, resulting in a lengthwise seam which may be misinterpreted as a crack. One such indication of a crack is considered normal.

(4) No cracks in link plates or bushings permitted. Bushing seam open to maximum 0.020 inch acceptable.

(5) Pin head wear acceptable if pin security is ensured. No cracks in pin heads permitted if head material may be lost.

(6) Inspect chain for cracks using a suitable light source and a 3-power magnifying glass. No cracks allowed.

NOTE

Most wear occurs in center of chain in sprocket area.

11-159. Installation — Chain — Tail Rotor Control. Refer to paragraph 11-120.

11-160. CONTROL ROD AND QUILL — TAIL ROTOR.

11-161. Description — Control Rod and Quill — Tail Rotor. Tail rotor blade pitch control is accomplished by means of a control quill assembly mounted in right side of 90 degree gearbox, with a control rod extending through hollow rotor driveshaft to a pitch control crosshead and links connected to tail rotor. Control quill has a sprocket, actuated by a chain attached to control cables, with a worm thread engagement to control rod. Rotation of sprocket is transmitted through rod as linear motion at crosshead and pitch change links. Chain and sprocket are enclosed by a metal housing pan with a removable cover for access. (Refer to figure 11-35.)

11-162. Inspection — Control Rod and Quill — Tail Rotor (Installed). a. Inspect guard, cover, and pan for cracks and damage.

b. Inspect control rod for improper operation, binding, cracks, damaged threads, or splines.

c. Inspect sprocket by placing straight edge across top of sprocket teeth and determine if any space exists between the teeth and straight edge.

During this inspection it may be noted that slight depressions are visible on sprocket. This is caused by the chain links and should not be misconstrued as criteria for sprocket replacement. (Refer to figure 11-38.)

d. Check proper mating of chain with sprocket. Replace sprocket and chain if not compatible.

e. Nicks, scratches, wear and pitting are acceptable provided they do not affect the operation of the chain.

f. Cracks are unacceptable and cause for sprocket rejection.

g. Determine the amount of looseness between the internal spline of the slider assembly and the tail rotor shaft spline, and looseness in the tail rotor pitch change thread by means of the following procedure. (See figure 11-37.1)

(1) Mount dial indicator on 90-degree gearbox shaft with indicator against crosshead as illustrated.

(2) Position left tail rotor control pedal in the full forward position and actuate the crosshead as illustrated. Radial play in this position should not exceed 0.030 inch.

(3) Position the right tail rotor control pedal in the full forward position and repeat above procedure. Radial play in this position should not exceed 0.055 inch.

(4) Position pedals in the neutral position and check axial play as illustrated. Move crosshead axially without producing radial play. Axial play in this position shall not exceed 0.018 inch. Excessive axial play indicates worn or loose pitch-change link bearings or worn pitch-change link thread.

11-163. Removal — Control Rod and Quill — Tail Rotor. a. Remove tail rotor pitch control crosshead assembly (paragraph 5-104). Be sure bearings and retaining nut are removed from pitch control rod.

b. Cut lockwire and remove two bolts (18), washers (17 and 5), nuts (6), and cover (1, figure 11-35) from housing pan (12). Remove screw from bracket of pan.

c. Disconnect speed rigs to allow slack in control cables. If chain is to be removed, detach ends from cables by removing bolts.

d. Remove three nuts (16), washers (15), and guard (2) from gearcase studs. Remove load from sprocket before loosening nuts.

e. Remove pan.

f. Pull control quill (10) with packing (9) and control rod (8) out of gear case (7). Cover open port. Detach rod from quill by turning sprocket to disengage thread.

11-164. Disassembly — Control Rod and Quill — Tail Rotor.

Premaintenance requirements for disassembly of control quill.

Conditions	Requirements
Model	All
Part No. or Serial No.	All
Special Tools	(T43)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	None
Special Environmental Conditions	Dust Free

a. If not previously removed, remove cotter pin (20, figure 11-38) and retaining nut (19) while holding sprocket (18) in padded jaws of vise or other suitable tool. Remove sprocket.

b. Remove retainer (17) with seal (16) and press out seal with hollow end of tool (T43).

c. Remove spacer (15) and packing (14). Use tool (T43) to press duplex bearings (13) from control nut (12).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

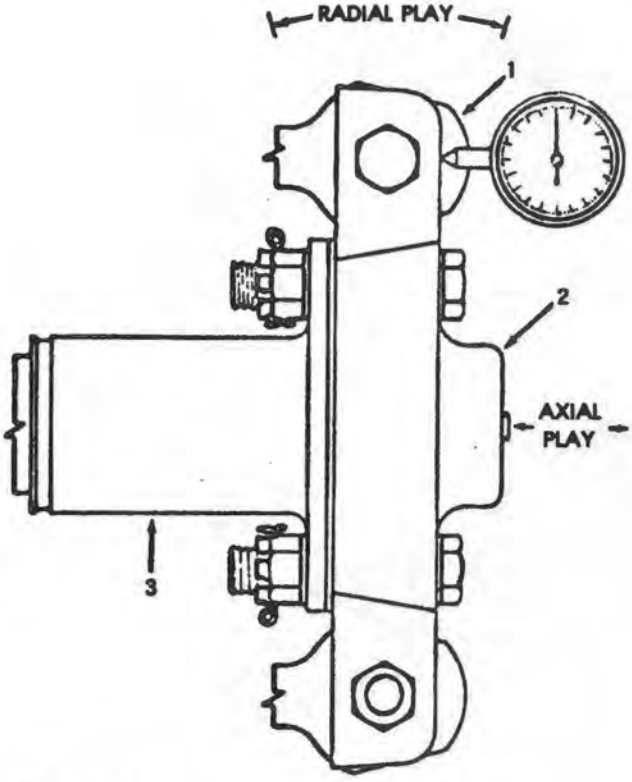
11-165. Cleaning — Control Rod and Quill — Tail Rotor (AVIM) a. Clean disassembled parts with solvent (C205).

b. Dry with filtered compressed air.

11-166. Inspection — Control Rod and Quill (AVIM) a. Visually inspect all parts for damage or excessive wear.

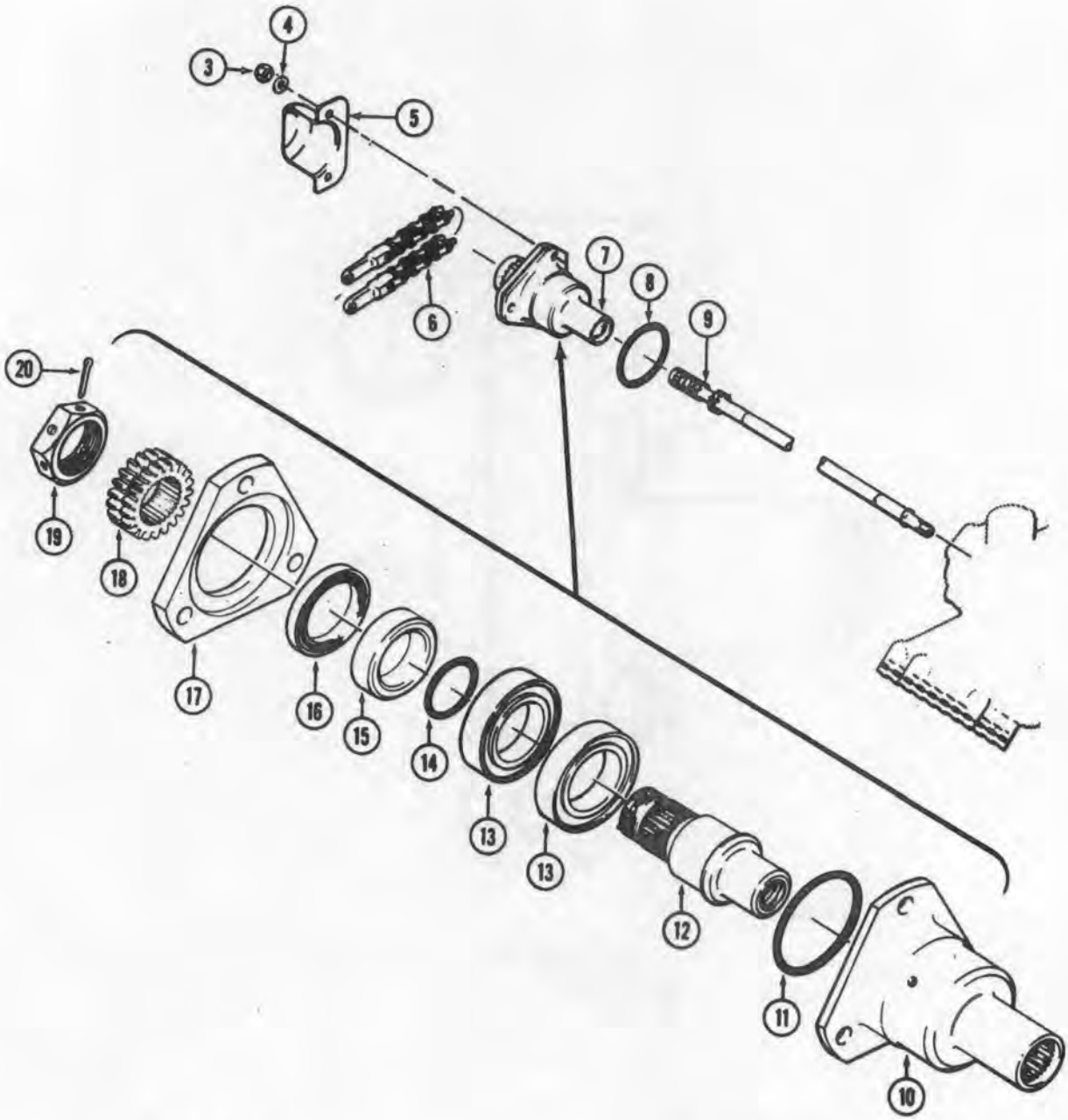
b. Inspect bearings for smooth operation.

c. Inspect control nut (12), control rod (9) and quill housing (10) for burrs or chipping of threads and splines. Inspection of spline wear shall be done visually. If spline teeth are worn such that less than half (50%) of each tooth contact area remains, the part should be rejected. The control tube or the quill housing can be replaced independently of each other.



1. Pitch change link
2. Crosshead
3. Slider

Figure 11-37.1. Checking tail rotor pitch control for looseness



1. Deleted
2. Deleted
3. Nut
4. Washer
5. Sprocket guard
6. Control chain
7. Control quill
8. Packing
9. Control rod
10. Quill housing
11. Preformed packing
12. Control nut
13. Duplex bearings
14. Preformed packing
15. Spacer
16. Seal
17. Bearing retainer
18. Sprocket
19. Retaining nut
20. Cotter pin

Figure 11-38. Control Quill — Assembly.

d. Inspect the following parts by Magnetic Particle (M) or Fluorescent Penetrant (F) (C125) methods (figure 11-38). If cracks are suspected, refer to TM 43-0103.

ITEM	NOMENCLATURE	CODE
2	Sprocket Guard	F
9	Control Rod	M
10	Quill Housing	F
19	Retaining Nut	M
18	Sprocket	F
17	Bearing Retainer	F
15	Spacer	M
12	Control Nut	F

e. Check control rod for out-of-round condition. Mount control rod on centers, take measurement at mid-point of control, rod measurement not to exceed **0.020** T.I.R. (Total Indicator Reading).

11-167. Repair — Control Rod and Quill — Tail Rotor (AVIM). a. Dress splines or threads with fine India stone (C207) if nicks, burrs, or scratches are visible.

b. Apply solid film lubricant (C133) on splines and threads at control screw end of control rod as follows:

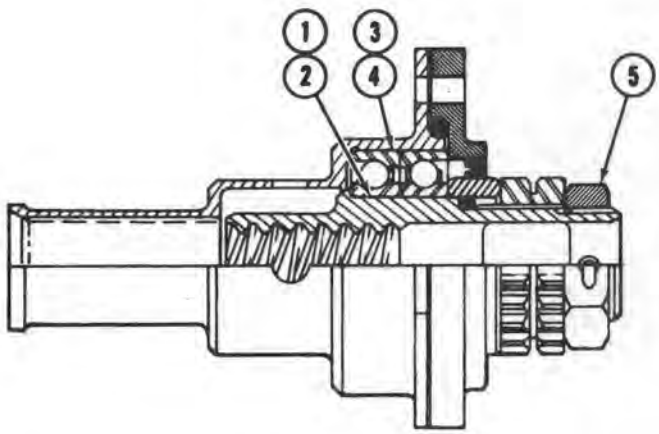
(1) Mask off other areas.

(2) Apply **0.0001 TO 0.0002** inch film thickness of solid film lubricant (C133) on splines and threads.

(3) Cure at **375** degrees F (**190** degrees C) for **60** minutes in a recirculating type automatically controlled oven.

(4) Test film adhesion by applying strip of one-inch adhesive tape (C216) with firm finger pressure, then removing tape with one abrupt motion.

(5) No large particles or flakes should peel off with tape.



ITEM	NOMENCLATURE		MIN.	MAX.	REPLACE
1	Control Nut — Bearing Seat	OD	0.9835	0.9847	0.9825
2	Duplex Bearing				
3	Duplex Bearing				
4	Quill Housing	ID	1.6535	1.6545	1.6555
5	Retaining Nut — Torque	In/Lb	100	300	

NOTE: All dimensions are in inches unless otherwise stated.

204010-38B

Figure 11-39. Control quill — limits chart

c. Replace damaged cork plug in screw-thread end of control rod. Use short cork, coat with wet shellac (C190), and press into place with outer face **0.38** inch deep in screw-thread end fitting.

d. Replace damaged cork plug in outer end of control nut. Use short cork, coat with wet shellac (C190), and press into place with inner face **1.85** inches from inner end of control nut.

11-168. Replacement — Control Rod and Quill — Tail Rotor (AVIM) a. Replace seal and packing at reassembly.

NOTE

Packing must conform with Specification MIL-R-7362, Type I, Composition A, for use with synthetic lubricant.

a. Replace all parts that fail inspection requirements.

b. Replace guard, cover, or pan when cracked or damaged.

c. Replace control rod for faulty operation or visible defects such as cracks, bending, and damaged threads or splines.

d. Replace control chain when faulty operation or visible indications of excessive wear occur. When chain is replaced, replace sprocket on control quill as outlined in step e.

e. Replace sprocket if wear precludes proper operation (figure 11-38). If sprocket replacement is necessary, proceed as follows:

(1) Remove cotter pin (20) and retaining nut (19) while holding sprocket (18) carefully in padded jaws of suitable tool or vise.

(2) Remove and replace sprocket (18) without separating other parts.

(3) Install retaining nut (19) on end of control nut (12). Torque **100 TO 300** inch-pounds and align cotter pin holes.

(4) Install cotter pin (20) with spread ends parallel to face of sprocket and bent flat against hex face of retaining nut (19).

WARNING

When installing duplex bearings, insure that the scribed lines on each bearing half form a "V" with the scribed marks aligned.

11-169. Assembly — Control Rod and Quill — Tail Rotor (AVIM) a. Press duplex bearings (13, figure 11-38) back-to-back on control nut (12), using tool (T43).

b. Place packing (14) in recess between bearing seat and splines of control nut.

c. Place spacer (15) over packing against inner race of bearing.

d. Press seal (16), with lip inward, into bearing retainer (17) until flush with outer face of retainer box, using tool (T43).

e. Place retainer assembly over spacer (15) against outer race of bearing.

f. Place sprocket (18) on splines of control nut (12) and against spacer (15).

g. Install retaining nut (19) while holding sprocket carefully in padded jaws of vise or other suitable tool. Torque nut **100 TO 300** inch-pounds with holes aligned for cotter pin. Insert cotter pin (20). Spread and bend pin against the hex face of retaining nut, parallel to sprocket face.

h. Place packing (11) on outer face of quill housing (10) and assemble housing over bearing.

11-170. Installation — Control Rod and Quill — Tail Rotor. a. Insert control rod (8, figure 11-35) through inner end of control quill (10) with splines meshed. Turn sprocket to engage quill control nut on threads of rod. Place packing (9) on quill.

b. Uncover port on right side of 90 degree gear box (7). Insert control rod carefully through rotor shaft and seat quill flanges over mounting studs.

NOTE

During installation apply sealant (C188) externally around sides of quill housing to prevent entry of moisture.

c. Place housing pan (12) on studs and secure temporarily with nuts and washers, and with screw through bracket on lower corner into matching plate nut of vertical fin.

d. Install pitch change control head assembly (paragraph 5-109).

e. Install and connect control chain (3 or 13) while rigging system.

f. Check gap between flanges of quill housing and retainer. If gap is more than **0.025** but less than **0.040** inch, add one thin aluminum alloy washer (4), between housing and retainer on each stud. If gap is more than **0.040** inch, add two thin aluminum washers (4) in the same manner. Apply sealant (C188) externally around joints at inner and outer sides of quill housing (10, figure 11-38). Complete rigging by installing sprocket guard (2, figure 11-35) on mounting studs, secured by nuts (6) and washer (5). Nuts should be in place while performing rigging.

g. Install cover (1, figure 11-35) secured by two bolts (18), washers (17), and lockwire (C127). Add sealant (C188) around cover and quill.

11-171. CONTROL TUBES — TAIL ROTOR CONTROL SYSTEM.

11-172. Description — Control Tubes — Tail Rotor Control System. Varied length control tubes (adjustable and non-adjustable) are used in the tail rotor control system. The non-adjustable types are fitted with bonded and riveted clevis ends. The adjustable types have a threaded clevis end and locknut which secures clevis end.

11-173. Removal — Control Tubes — Tail Rotor Control System. a. Remove control tubes (5, figure 11-40) by removing cotter pin (1), nuts (2 and 6), washers (3), and bolts (4 and 7) at each end of control tube. (See Detail A - typical four places.)

b. Remove control tube (15) by removing cotter pin and nut, washers, and bolt at forward end of control tube. Remove cotter pin (1), nut (16), washers (3), and bolt (14) at aft end.

c. Remove clamp (8) from boot (9) and tube (10).

d. Remove control tube (10) by removing cotter pin (1), nuts (12 and 20), washers (3), and bolts (11 and 19) (Detail B).

e. Remove link (27) by removing cotter pin (1), nut (25), washers (3), and bolt (26) at aft end of link (Detail B). Remove cotter pin (1), nut (28), washers (3), and bolt (24) at forward end. Remove link (27).

f. Remove control tube (33) by removing cotter pin (47), nut (46), washers (48), and bolt (34) (Detail C).

11-174. Inspection — Control Tubes — Tail Rotor Control System. a. Inspect control tubes for corrosion, wear, and mechanical damage. See figure 11-41 for wear and damage limits.

b. Inspect clevis end holes for wear and clevis end for looseness in tube.

11-175. Repair — Control Tubes (AVIM) — Tail Rotor Control System. a. Polish out corrosion or mechanical damage to control tubes (repair areas only) in accordance with limits in figure 11-41.

b. Any damage to swage transition area or damage in repair areas that is in excess of limits is cause for replacement.

11-176. Installation — Control Tubes — Tail Rotor Control System. a. Install control tube (33, figure 11-40) by adjusting to length of replaced tube and installing bolt (34), washers (48), nut (46), and cotter pin (47). Check adjustment of control tube at quadrant end on final rigging (Detail C).

b. Install control tube (15) by installing bolt, washers, nut, and cotter pin at forward end of control tube. Install bolt (14), washers (3), nut (16), and cotter pin (1) at opposite end.

c. Install control tube (10) by installing bolt (19), washers (3), nut (20), and cotter pin (1) at aft end (Detail B). Install bolt (11), washers (3), nut (12) and cotter pin (1) at forward end.

d. Install link (27) by installing bolt (26), washers (3), nut (25), and cotter pin (1) at aft end of control tube. (Detail B). Install bolt (24), washers (3), nut (28) and cotter pin (1) at forward end.

e. Install control tube (5) by installing bolt (4 and 7), washers (3), nuts (2 and 6), and cotter pins (1). (See Detail A - typical four places.)

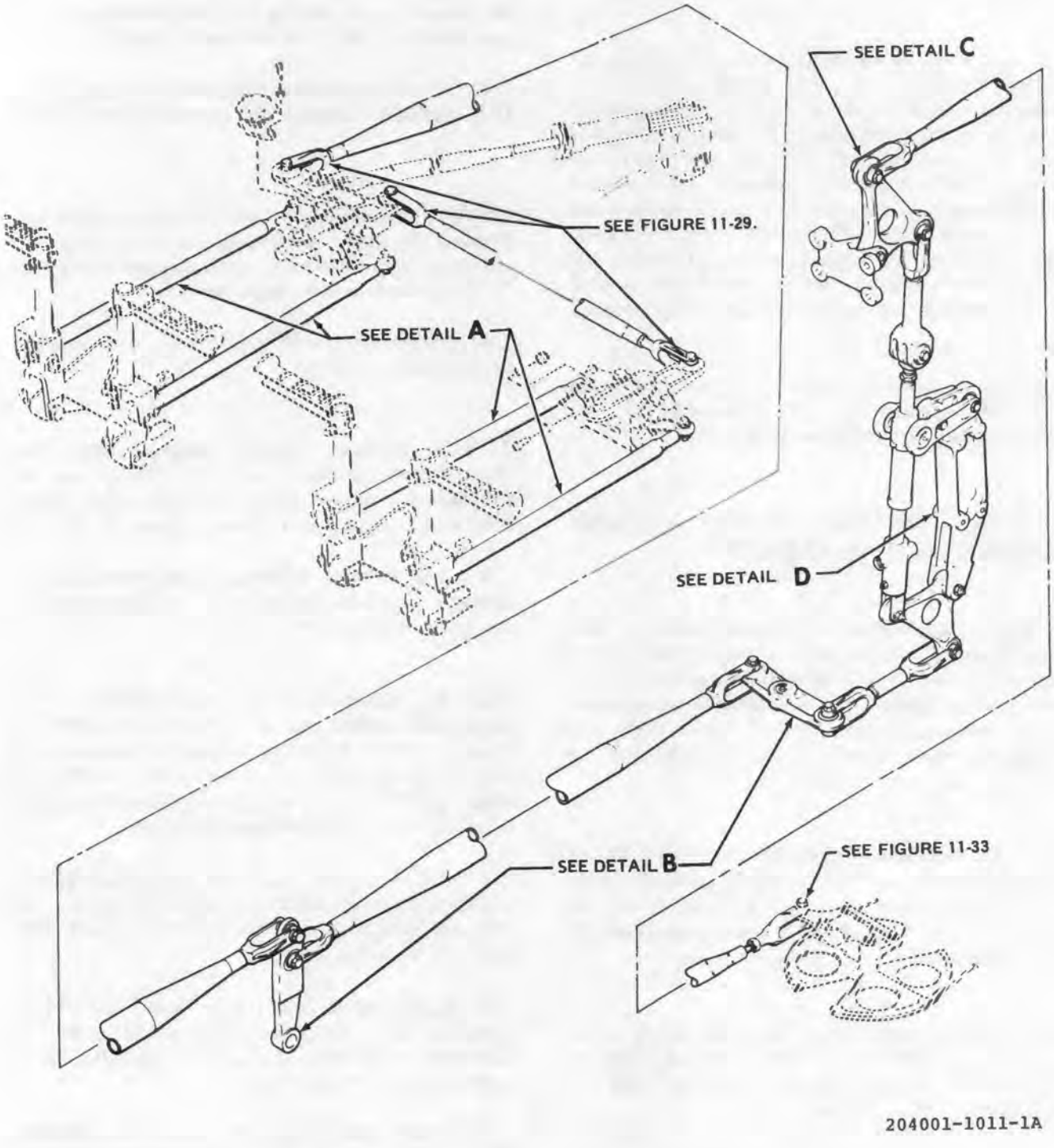


Figure 11-40. Tail rotor control system (bellcranks, levers, supports and tubes) — removal and installation (Sheet 1 of 4)

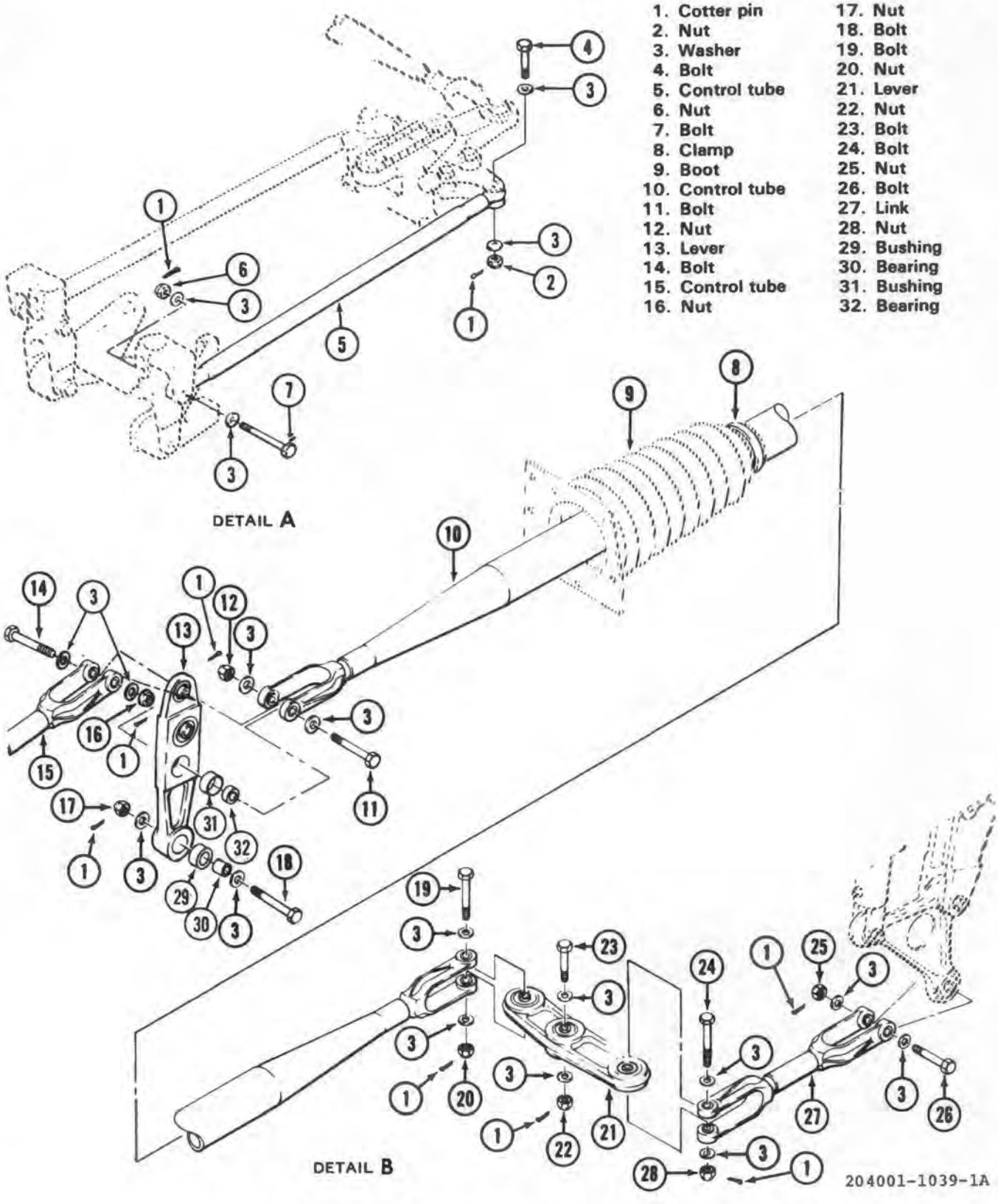
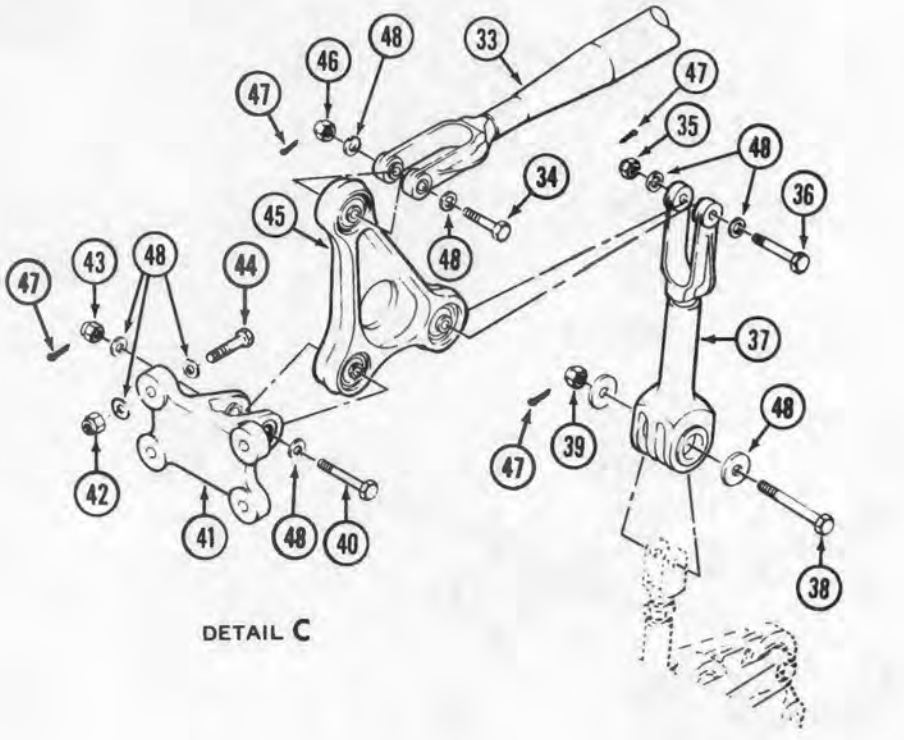
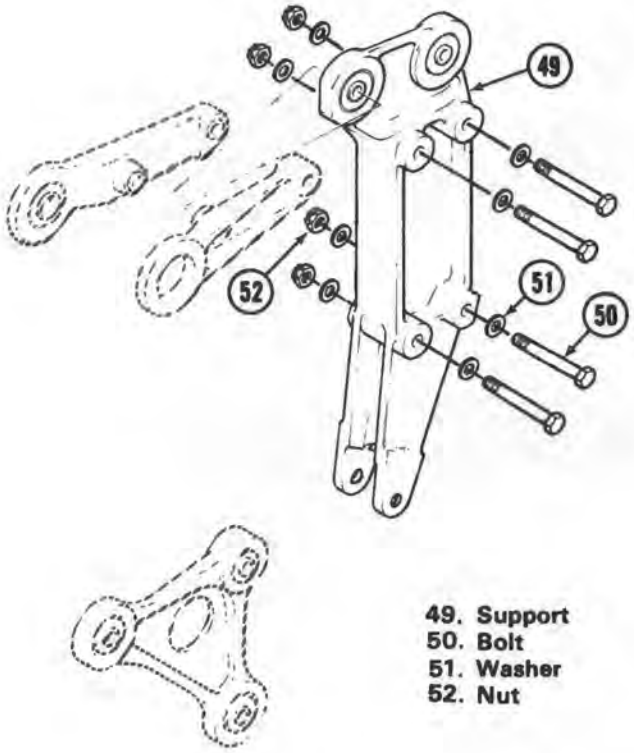


Figure 11-40. Tail rotor control system (bellcranks, levers, supports, and tubes) — removal and installation (Sheet 2 of 4)



33. Control tube
34. Bolt
35. Nut
36. Bolt
37. Link
38. Bolt
39. Nut
40. Bolt
41. Support
42. Nut
43. Nut
44. Bolt
45. Bellcrank
46. Nut
47. Cotter pin
48. Washer

Figure 11-40. Tail rotor control system (bellcranks, levers, supports, and tubes) — removal and installation (Sheet 3 of 4)



49. Support
50. Bolt
51. Washer
52. Nut

DETAIL D

204076-1078

Figure 11-40. Tail rotor control system (bellcranks, levers, supports, and tubes) — removal and installation (Sheet 4 of 4)

11-177. BELLCRANKS, LEVERS, AND SUPPORTS — TAIL ROTOR CONTROL SYSTEM.

11-178. Description — Bellcranks, Levers and Supports — Tail Rotor Control System. Various bellcranks, levers, and two supports are incorporated in the tail rotor control system. One support is airframe mounted and provides a pivot mount for levers and bellcranks. The other support is a pivot mount for the lower aft bellcrank and also supports the tail rotor hydraulic cylinder.

11-179. Removal — Bellcranks, Levers and Supports — Tail Rotor Control System.

a. Remove lever (13, figure 11-40, Detail B) as follows:

(1) Remove cotter pin (1), nut (17), two washers (3), and bolt (18).

(2) Remove cotter pin (1), nut (12), two washers (3), and bolt (11).

(3) Remove cotter pin (1), nut (16), two washers (3), and bolt (14). Remove lever (13).

b. Remove lever (21) as follows:

(1) Remove cotter pin (1), nut (20), bolt (19), and two washers (3).

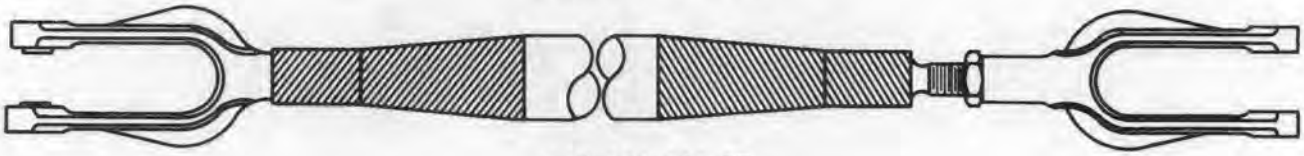
(2) Remove cotter pin (1), nut (28), bolt (24), and two washers (3).

(3) Remove cotter pin (1), nut (22), washers (3) and bolt (23) attaching lever. Remove lever (21).

c. Remove bellcrank (45) as follows:

(1) Remove cotter pin (47), nut (46), washers (48), and bolt (34).

204-001-027-17
204-001-027-19
CONTROL TUBE ASSEMBLY
(Both Ends Identical)



204-001-012-37
204-001-012-77
CONTROL TUBE ASSEMBLY

NOTES:

1. Maximum mechanical or corrosion damage allowed is 0.005 inch after clean-up. This applies to all tube assemblies.
2. No damage in shaded areas. ▨
3. No cracks allowed.

205001-1044A

Figure 11-41. Wear and damage limits (control tubes) tail rotor controls

(2) Remove cotter pin (47), nut (35), washers (48), and bolt (36).

(3) Remove cotter pin (47), nut (43), washers (48), and bolt (40). Remove bellcrank (45).

d. Remove link (37, Detail C) as follows:

(1) Remove bolts (36 and 38), four washers (48) and nuts (35 and 39). Remove cotter pins (47).

e. Remove support (49, figure 11-40, Detail D) as follows:

(1) Remove lower aft bellcrank and hydraulic cylinder (paragraph 7-145).

(2) Remove bolts (50), washers (51), nuts (52). Remove support (49).

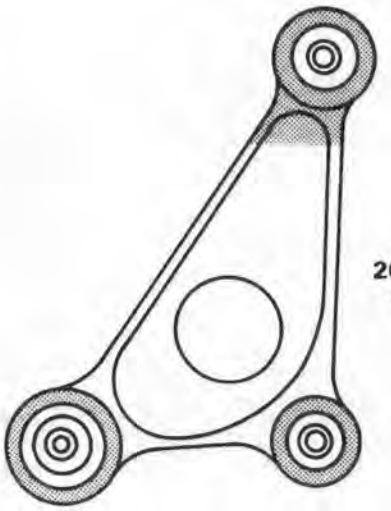
11-180. Inspection — Bellcranks, Levers and Supports — Tail Rotor Control System. a. Inspect bellcranks, levers, and supports for loose bearings. Refer to paragraph 11-206 for bearing limits.

b. Inspect bellcranks, levers, and supports for corrosion and mechanical damage. See figure 11-42 for inspection limits. Flourescent penetrant inspection per TM 43-0103.

11-181. Repair — Bellcranks, Levers and Supports — Tail Rotor Control System (AVIM) a. Replace loose or damaged bearings in bellcranks, levers, and supports. Refer to paragraph 11-205 for bearing replacement.

b. Remove minor surface corrosion or repair damage areas using fine grit sandpaper (C185). Observe limits shown in figure 11-42.

204-001-828-1
LEVER



204-001-813-1
BELLCRANK

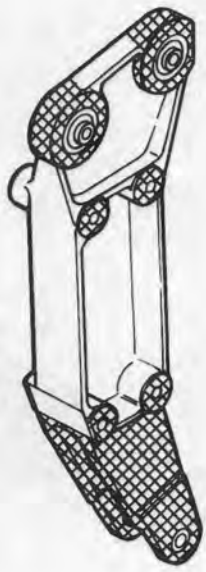
204-001-855-1
LEVER

TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS		
MECHANICAL DAMAGE (AFTER CLEAN-UP)	0.015 IN.	0.010 IN.	0.005 IN.
CORROSION DAMAGE			
(BEFORE CLEAN-UP)	0.0075 IN.	0.005 IN.	0.0025 IN.
(AFTER CLEAN-UP)	0.015 IN.	0.010 IN.	0.005 IN.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 IN. SQ.	0.10 IN. SQ.	0.10 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 BY 0.05	0.04 BY 0.04	
BORE DAMAGE	0.002 INCH FOR ONE-FOURTH CIRCUMFERENCE		
NO CRACKS ALLOWED			

NOTE: ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

205001-1043C

Figure 11-42. Wear and damage limits (bellcranks, levers and supports) — tail rotor control system (Sheet 1 of 2)



P/N 204-001-719

TYPE OF DAMAGE	DAMAGE AREA REPAIR ZONES ▨	DAMAGE AREA REPAIR ZONES ▭
MECHANICAL	0.010 INCH MAX. DEPTH	0.020 INCH MAX. DEPTH
CORROSION	0.005 INCH MAX. DEPTH	0.010 INCH MAX. DEPTH
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 SQUARE INCH	NOT CRITICAL
MAXIMUM NUMBER OF REPAIRS	TWO PER ZONE	NOT CRITICAL
EDGE CHAMFER	0.040 INCH MAX.	0.080 INCH MAX.
BORE HOUSING AND BUSHING		

BEARING RADIAL PLAY: 0.006 INCH

BORE DAMAGE: 0.002 INCH FOR ONE-FOURTH CIRCUMFERENCE

NO CRACKS ALLOWED

204001-1080

Figure 11-42. Wear and damage limits (bellcranks, levers and supports) — tail rotor control system (Sheet 2 of 2)

(1) Treat repaired areas with chemical film (C42).

(2) Paint repaired area using zinc chromate primer (C253).

11-182. Installation — Bellcranks, Levers and Supports — Tail Rotor Control System. a. Install lever (13, figure 11-40, Detail B) as follows:

(1) Secure lever to airframe mount using two washers (3), bolt (18), and nut (17). Install cotter pin (1).

(2) Connect lever (13) to control tube (15) using washers (3), bolt (14), and nut (16). Install cotter pin (1).

(3) Connect opposite end of lever to control tube (10) using two washers (3), bolt (11), and nut (12). Install cotter pin (1).

b. Install lever (21) as follows:

(1) Position lever (21) to airframe mounting bracket. Secure using bolt (23), washers (3), nut (22), and cotter pin (1).

(2) Secure control tube (10) to end of lever using bolt (19), two washers (3), and nut (20). Install cotter pin (1).

(3) Secure link (27) to opposite end of lever (21) using bolt (24), two washers (3), and nut (28). Install cotter pin (1).

c. Install support (41) as follows : (figure 11-40, Detail C).

(1) Secure support using four bolts (44), eight washers (48) and four nuts (42).

d. Install bellcrank (45) as follows:

(1) Secure bellcrank to support using bolt (40), washers (48), and nut (43). Install cotter pin (47).

(2) Secure bellcrank to control tube (33) using bolt (34), washers (48), and nut (46). Install cotter pin (47).

(3) Secure bellcrank to link (37) using bolt (36), washers (48), and nut (35). Install cotter pin (47).

e. Install support (49, figure 11-40, Detail D) as follows:

(1) Secure support (49) using bolts (50), washers (51), nuts (52).

(2) Install lower aft bellcrank and hydraulic cylinder (paragraph 7-150).

11-183. ELEVATOR CONTROL SYSTEM.

11-184. Description — Elevator Control System. The synchronized elevator is located near the aft end of the tail boom and is connected by control tubes, bellcranks, and mechanical linkage to the fore and aft cyclic control system. Fore and aft movement of the cyclic control stick produces a change in the synchronized elevator attitude, thus increasing controllability and lengthening the CG range of the helicopter (figure 11-43).

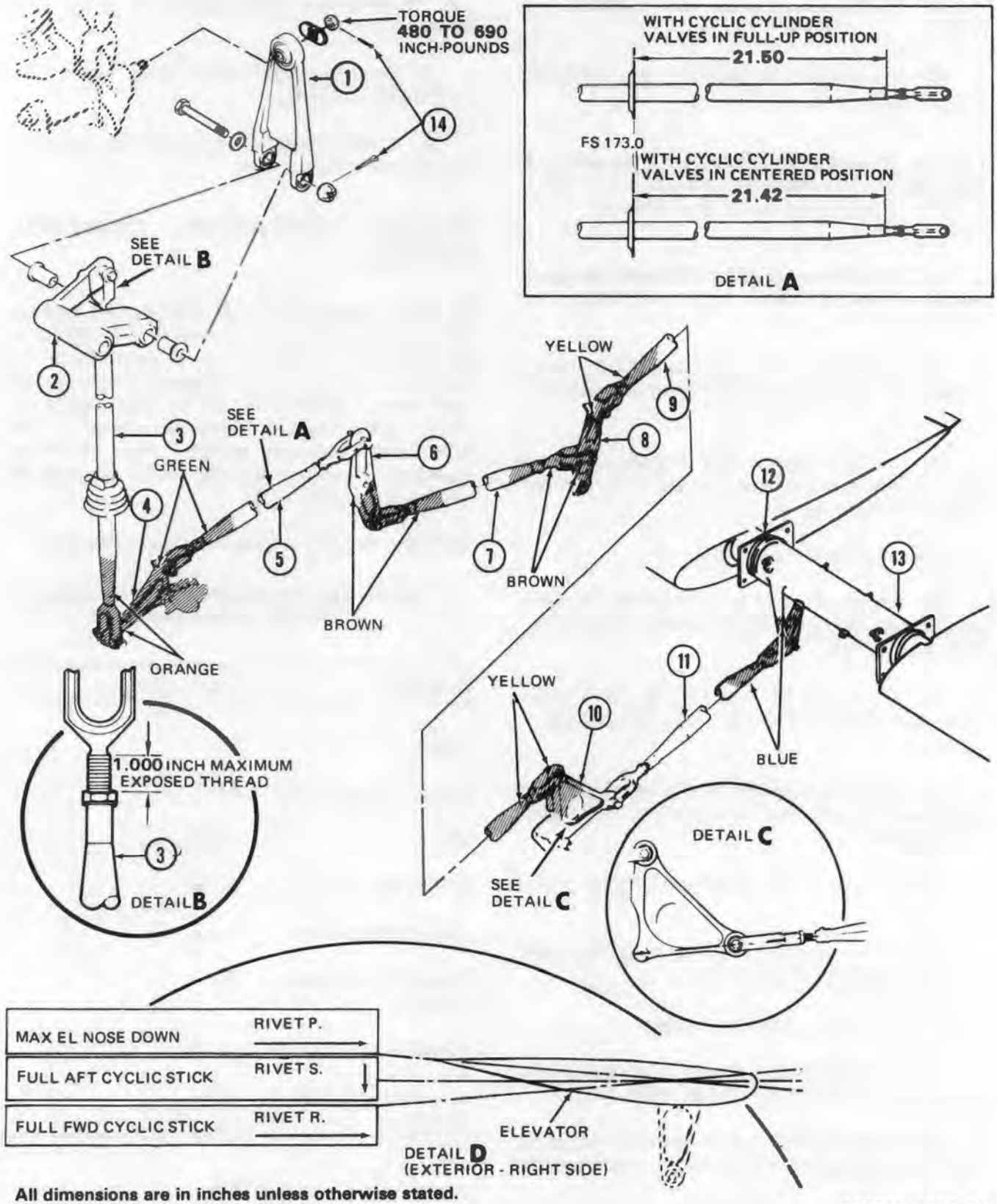
11-185. Rigging — Elevator Control System.

Premaintenance requirements for rigging of elevator control system

Conditions	Requirements
Model	All
Part No. or Serial No.	All
Special Tools	(T32)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	None
Special Environmental Conditions	None

NOTE

Painted end of control tube must match color of painted end of bellcrank.



All dimensions are in inches unless otherwise stated.

204001-1026-1B

Figure 11-43. Elevator controls (Sheet 1 of 2)

1. Link assembly
2. Bellcrank assembly
3. Control tube
4. Bellcrank assembly
5. Control tube
6. Lever assembly
7. Control tube
8. Idler assembly
9. Control tube
10. Bellcrank assembly
11. Control tube
12. Elevator torque tube
13. Elevator horn assembly
14. Cotter pin

204001-1026-2B

Figure 11-43. Elevator controls (Sheet 2 of 2)

a. Ensure control tubes (5, 7, 9, and 11, figure 11-43) are installed.

NOTE

Tighten nut attaching upper end of link assembly (1) to swashplate ring to a torque of 480 TO 690 inch-pounds.

b. Install cyclic rigging fixture (T32) on copilot cyclic stick (figure 11-11, Detail B).

c. When rigging with fluid in a bled hydraulic system, position cyclic cylinder valves in center position and adjust control tube (5) at **21.42** inches from fuselage station 173.0 (Detail A, figure 11-43).

d. When rigging with fluid in a hydraulic system that has not been bled, position cyclic cylinder valves in full-up position and adjust control tube (5) at **21.50** inches from fuselage station 173.0 (Detail A).

e. With both cyclic cylinder valves in correct position (refer to steps c and d), adjust and connect control tube (3).

f. Disconnect control tube (5).

g. Set chord line of elevator to pass through rivet P (Detail D).

h. Adjust control tube (11) to minimum length that will reach bellcrank (10) when bellcrank is positioned so that tube (11) is in line with bellcrank pivot point (Detail C).

i. Remove rigging fixture, (T32) and place pilot cyclic stick in full forward position.

NOTE

If tailboom has two sets of rigging rivets, use the aft set of rivets to rig elevator.

j. With hydraulic boost on, set chord line of elevator **0.50 TO 0.75** inch below rivet R (Detail D). Aft arm of bellcrank (10) must be above horizontal position.

k. With control valves centered in both cyclic cylinders, adjust control tube (5) to fit, and connect tube.

l. Place pilot cyclic stick in extreme aft position and ensure elevator chord line passes through rivet S (Detail D), plus-or-minus **0.40** inch.

m. Check system with boost on. With full forward cyclic stick, elevator chord line should be aligned to rivet R. With neutral cyclic stick, elevator chord line should be a fraction of a degree below rivet P.

11-186. CONTROL TUBES — ELEVATOR CONTROL SYSTEM.

11-187. Description — Control Tubes — Elevator Control System. Control tubes (adjustable and non-adjustable) are used throughout the elevator control system. The tubes are connected to bellcranks, levers, and supports with standard hardware.

NOTE

Close tolerance bolts must be used in all moving and pivotal joints.

11-188. Removal — Control Tubes — Elevator Control System. a. Remove transmission cowling (4, figure 2-19) and the following access doors (40 and 42), as required to remove elevator control tubes.

b. Detach upper end of control tube (8, figure 11-44) from bellcrank (10) by removing cotter pin (4), nut (5), washers (6), and bolt (7) (Detail A, sheet 2).

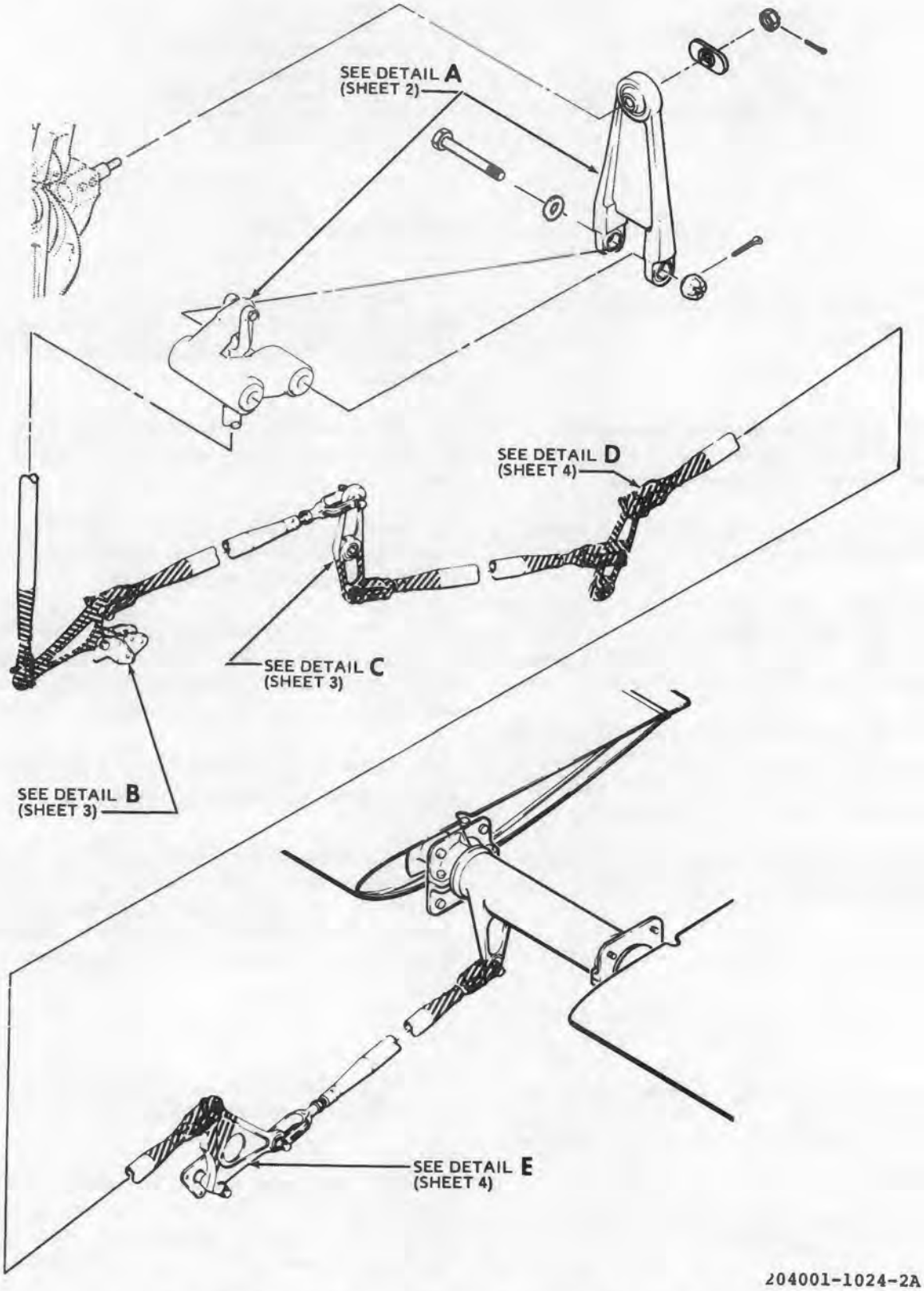


Figure 11-44. Elevator control system (bellcranks, levers, supports, and control tubes) — removal and installation (Sheet 1 of 4)

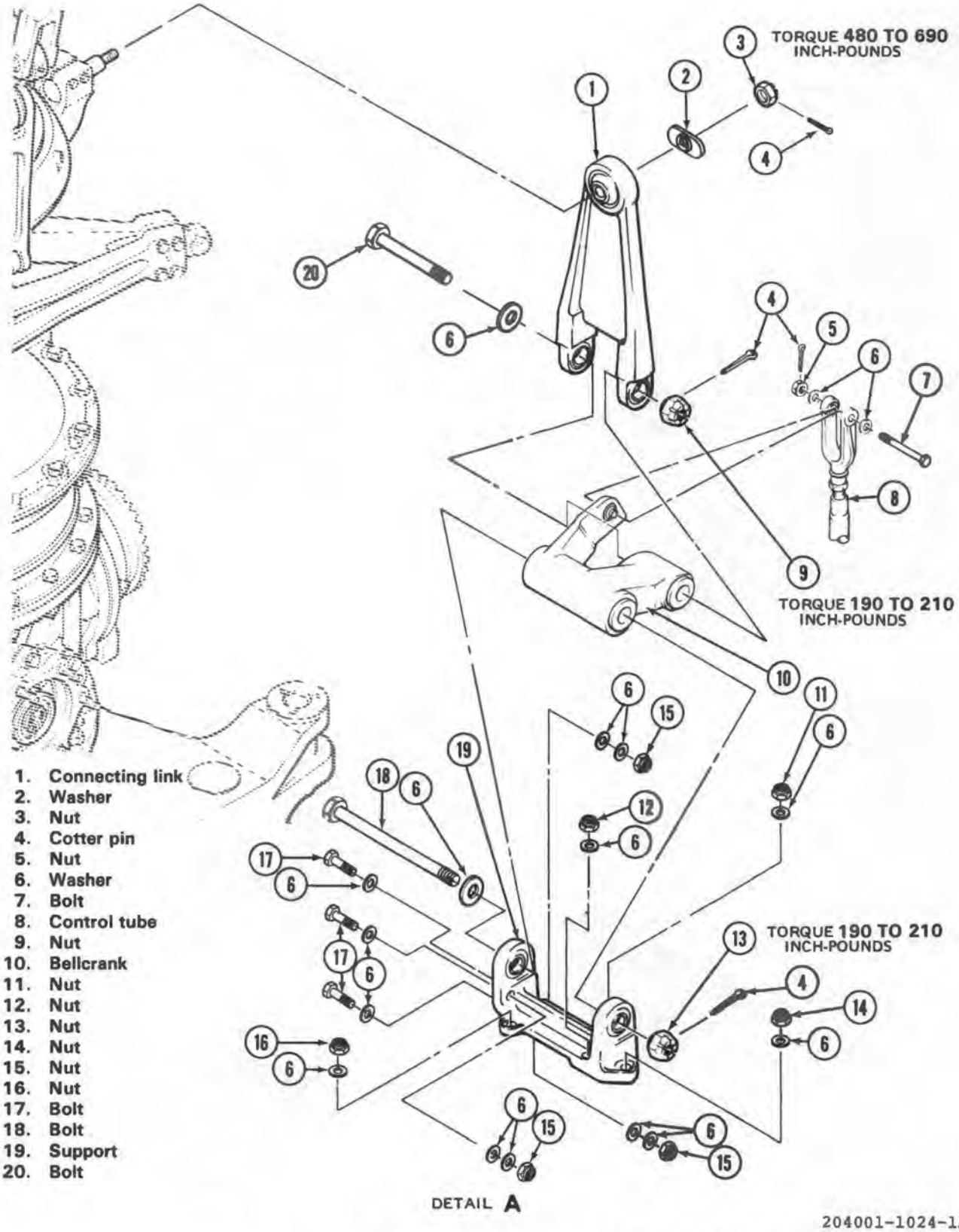


Figure 11-44. Elevator control system (bellcranks, levers, supports, and control tubes) — removal and installation (Sheet 2 of 4)

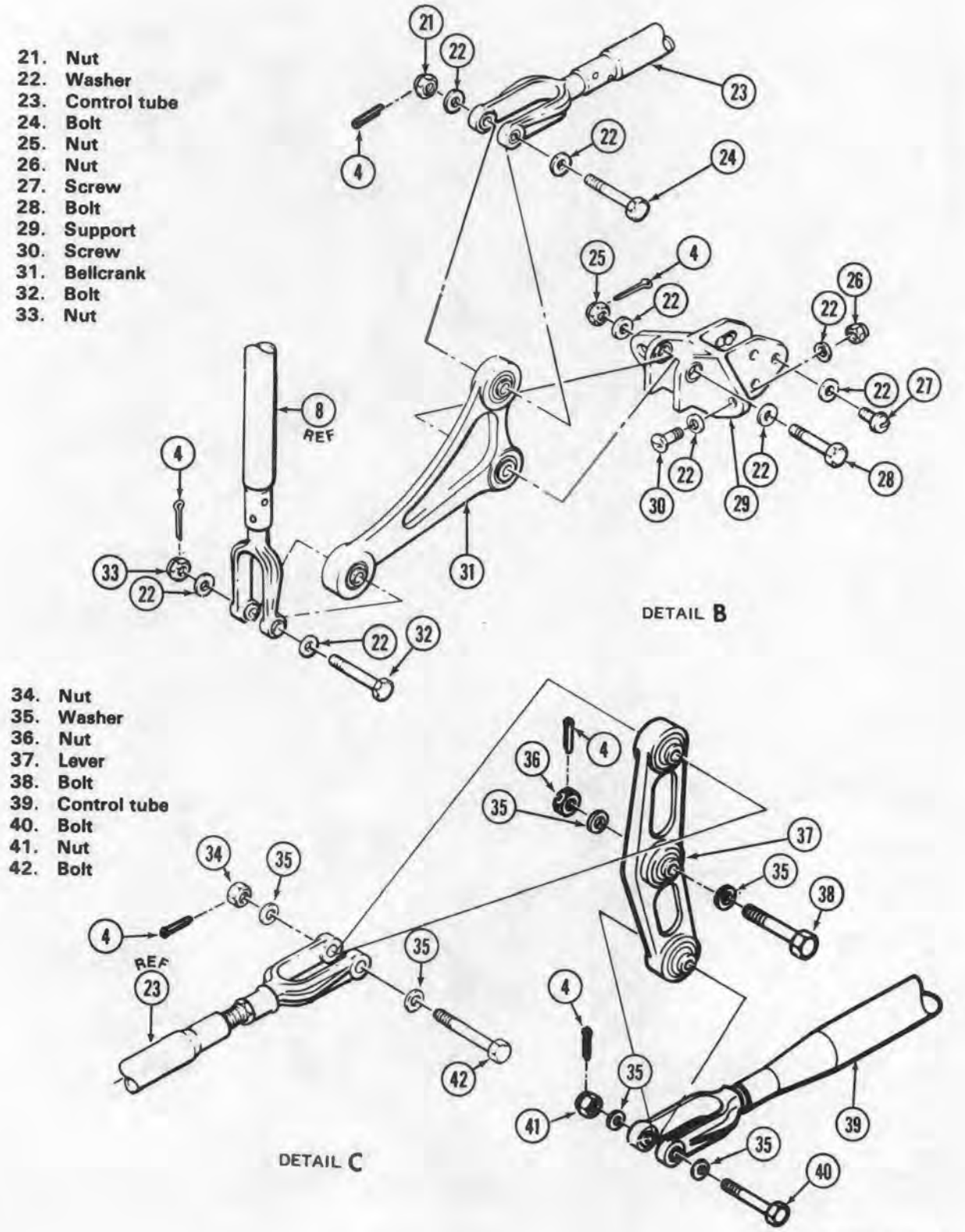


Figure 11-44. Elevator control system (bellcranks, levers, supports, and control tubes) — removal and installation (Sheet 3 of 4)

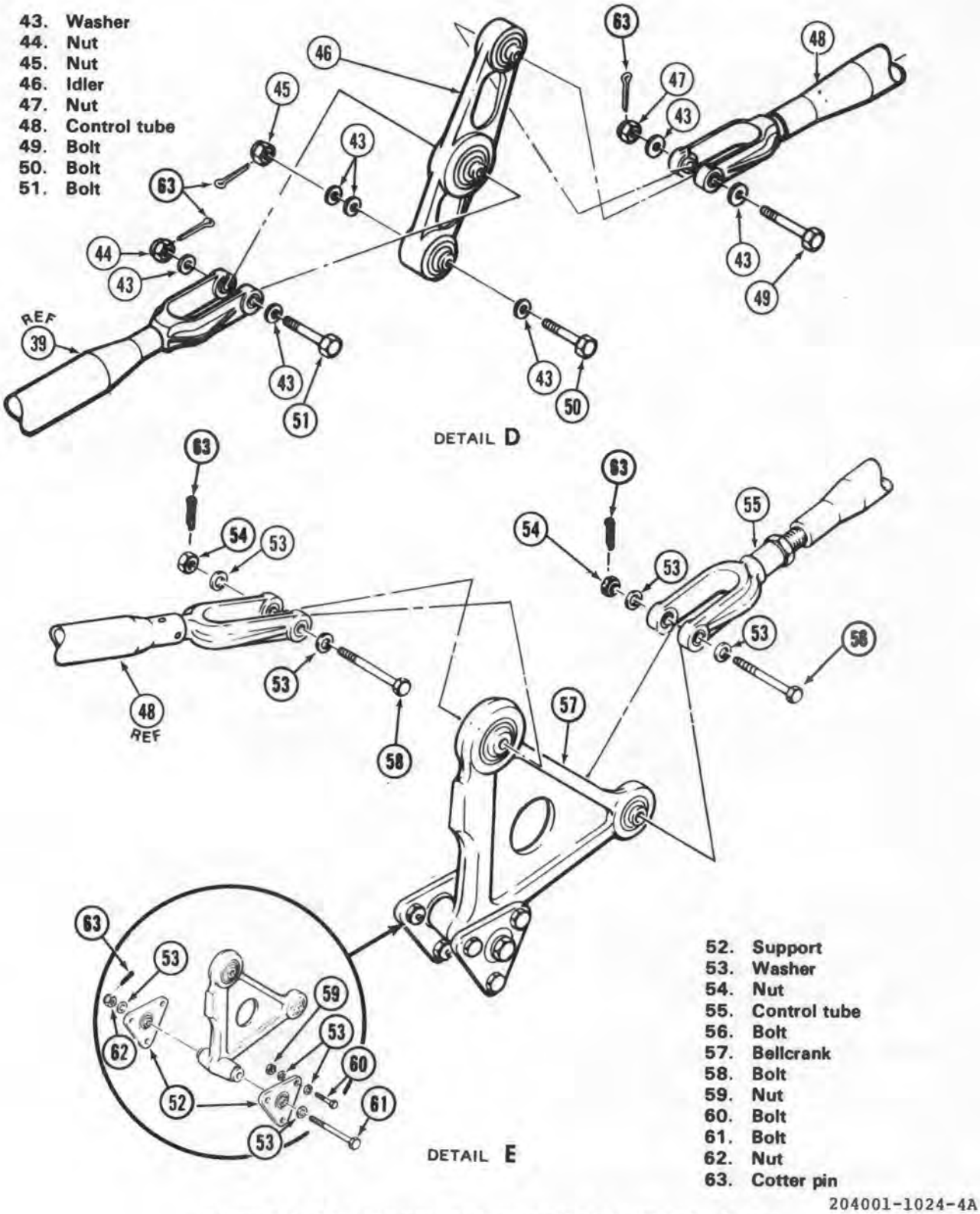


Figure 11-44. Elevator control system (bellcranks, levers, supports, and control tubes) — removal and installation (Sheet 4 of 4)

c. Detach lower end of control tube (8) from bellcrank (31) by removing cotter pin (4), nut (33), washers (22) and bolt (32) (Detail B, sheet 3).

d. Detach forward end of control tube (23) from bellcrank (31) by removing cotter pin (4), nut (21), washers (22), and bolt (24) (Detail B, sheet 3).

e. Detach aft end of control tube (23) from lever (37) by removing cotter pin (4), nut (34), washers (35), and bolt (42) (Detail C, sheet 3).

f. Detach forward end of control tube (39) from lever (37) by removing cotter pin (4), nut (41), washers (35), bolt (40) (Detail C, sheet 3).

g. Detach aft end of control tube (39) from idler (46) by removing cotter pin (63), nut (44), washers (43), and bolt (51) (Detail D, sheet 4).

h. Detach forward end of control tube (48) from idler (46) by removing cotter pin (63), nut (47), washers (43) and bolt (49) (Detail D, sheet 4).

i. Detach aft end of control tube (48) from bellcrank (57) by removing cotter pin (63), nut (54), washers (53), and bolt (58) (Detail E, sheet 4).

j. Detach forward end of control tube (55) from bellcrank (57) by removing cotter pin (63), nut (54), washers (53), and bolt (56) (Detail E, sheet 4).

k. Detach aft end of control tube (55) from elevator horn assembly.

11-189. Inspection — Control Tubes — Elevator Control System. a. Inspect control tubes for corrosion, cracks, and mechanical damage. See figure 11-45 for wear and damage limits.

b. Inspect clevis end holes for wear and clevis end for looseness in tube. Vertical tube (8, figure 11-44) because of location is susceptible to water and condensation.

11-190. Repair or Replacement — Control Tubes — Elevator Control System (AVIM) a. Polish out corrosion or mechanical damage to control tubes (repair areas only) in accordance with limits of figure 11-45.

b. Any damage in repair areas that is in excess of limits is cause for replacement.

11-191. Installation — Control Tubes — Elevator Control System.

NOTE

Control tube must match color code of painted end of bellcrank.

a. Position upper end of control tube (8, figure 11-44) with bellcrank (10) and install bolt (7), washer (6), nut (5) and cotter pin (4) (Detail A, sheet 2).

b. Position lower end of control tube (8) to bellcrank (31) and install bolt (32), washers (22), nut (33), and cotter pin (4) (Detail B, sheet 3).

c. Position forward end of control tube (23) to bellcrank (31) and install bolt (24), washers (22), nut (21), and cotter pin (4) (Detail B, sheet 3).

d. Position aft end of control tube (23) to lever (37) and install bolt (42), washers (35), nut (34) and cotter pin (4).

e. Position forward end of control tube (39) to lever (37) and install bolt (40), washers (35), nut (41), and cotter pin (4) (Detail C, sheet 3).

f. Position aft end of control tube (39) to idler (46) and install bolt (51), washers (43), nut (44), and cotter pin (63) (Detail D, sheet 4).

g. Position forward end of control tube (48) to idler (46) and install bolt (49), washers (43), nut (47), and cotter pin (63) (Detail D, sheet 4).

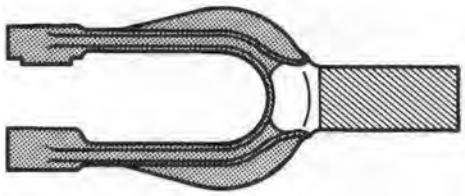
h. Position aft end of control tube (48) to bellcrank (57) and install bolt (58), washers (53), nut (54), and cotter pin (63) (Detail E, sheet 4).

i. Position forward end of control tube (55) to bellcrank (57) and install bolt (56), washers (53), nut (54), and cotter pin (63) (Detail E, sheet 4).

j. Position aft end of control tube (55) to horn elevator assembly.

k. Rig elevator (synchronized) controls in accordance with paragraph 11-185.

l. Install transmission cowling (4, figure 2-19) and access doors (40 and 42).



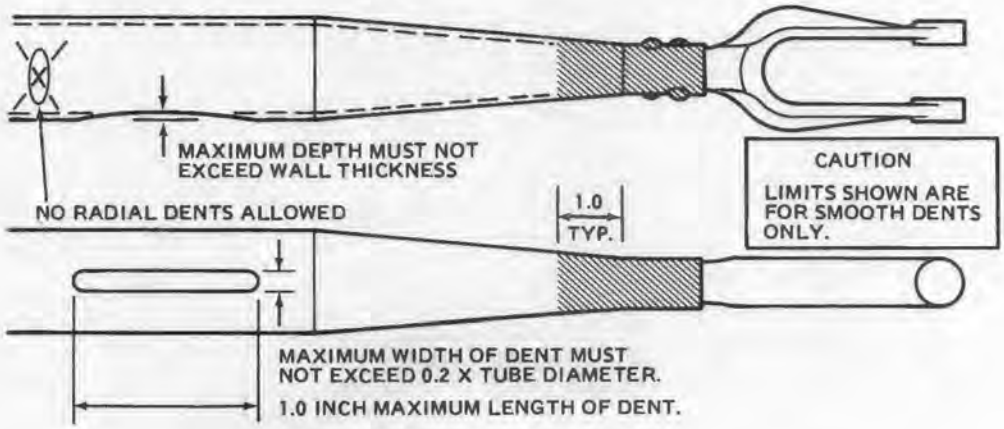
204-001-006 CLEVIS ASSY
204-001-007 CLEVIS ASSY

TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS		
	▭	▨	▨
MECHANICAL DAMAGE (AFTER CLEANUP)	0.015 IN.	0.010 IN.	NO DAMAGE ALLOWED
CORROSION DAMAGE (BEFORE CLEANUP)	0.0075 IN.	0.005 IN.	
(AFTER CLEANUP)	0.015 IN.	0.010 IN.	
MAXIMUM AREA PER FULL DEPTH REPAIR	0.5 IN. SQ.	0.10 IN. SQ.	
NUMBER OF REPAIRS	ONE PER AREA	TWO	
EDGE CHAMFER	0.05 BY 0.05 IN.	0.04 BY 0.04 IN.	
BORE DAMAGE	0.002 IN. FOR ONE-FOURTH CIRCUMFERENCE		
NO CRACKS ALLOWED			

NOTE: All dimensions are in inches unless otherwise stated.

204001-1040-2

Figure 11-45. Wear and damage limits (control tubes) elevator control system (Sheet 1 of 2)



DAMAGE PERMITTED ON TUBES OTHER THAN DENTS

204-001-011-41 TUBE ASSY
204-001-012-65 TUBE ASSY
204-001-012-71 TUBE ASSY
540-001-908-1 TUBE ASSY
540-001-050-7 TUBE ASSY

TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS	
MECHANICAL AND CORROSION DAMAGE	NO DAMAGE ALLOWED	MAXIMUM DAMAGE AFTER CLEANUP 0.005 INCH
NO CRACKS ALLOWED		

NOTE: All dimensions are in inches unless otherwise stated.

204001-1040-1

Figure 11-45. Wear and damage limits (control tubes) elevator control system (Sheet 2 of 2)

11-192. BELLCRANKS, LEVERS AND SUPPORTS — ELEVATOR CONTROL SYSTEM.

11-193. Description — Bellcranks, Levers and Supports — Elevator Control System. Various bellcranks, levers, and supports are incorporated in the elevator control system. The supports are airframe mounted and provide a pivot mount for levers and bellcranks.

11-194. Removal — Bellcranks, Levers and Supports — Elevator Control System. a. Disconnect control tubes (8, 23, 39, 48, or 55, figure 11-44) from bellcranks or levers as necessary (paragraph 11-188).

b. Detach connecting link (1) from swashplate by removing cotter pin (4), nut (3), and washer (2). Detach lower end of connecting link (1) from bellcrank (10) by removing cotter pin (4), nut (9), bolt (20) and washer (6) (Detail A).

c. Detach bellcrank (10) from support (19) by removing cotter pin (4), nut (13), bolt (18), and washer (6) (Detail A).

d. Detach support (19) from transmission mount by removing nuts (15), washers (6), and bolts (17) (typical three places). Remove nuts (14 and 16) and washers (6).

e. Through access door on right side of pylon support, detach bellcrank (31) from support (29) by removing bolts (28) with cotter pin (4), nut (25) and

washers (22). Detach support (29) by removing screws (27 and 30) with nuts (26) and washers (22) (Detail B, sheet 3).

f. Detach lever (37) from support at lower right side in pylon compartment, by removing bolt (38) with cotter pin (4), nut (36) and washers (35) (Detail C, sheet 3).

g. Detach idler (46) from support in aft-center fuselage compartment, by removing bolt (50) with cotter pin (63), nut (45), and washers (43) (Detail D, sheet 4).

h. Detach bellcrank (57) from supports (52) by removing bolt (61) with cotter pin (63), nut (62), and washers (53). Detach supports (52) from tailboom structure by removing six bolts (60), washers (53), and nuts (59) (Detail E, sheet 4).

11-195. Inspection — Bellcranks, Levers and Supports — Elevator Control System. a. Inspect bellcranks, levers, and supports for loose bearings. Refer to paragraph 11-206 for bearing limits.

b. Inspect bellcranks, levers, and supports for corrosion and mechanical damage. See figure 11-46 for inspection limits.

11-196. Repair or Replacement — Bellcranks, Levers and Supports — Elevator Control System (AVIM) a. Replace loose or damaged bearings in bellcranks, levers, and supports. Refer to paragraph 11-206 for bearing replacement.

b. Remove minor surface corrosion or repair damaged areas using fine grit sandpaper (C185). Observe limits shown in figure 11-46.

11-197. Installation — Bellcranks, Levers and Support — Elevator Control System. a. In tailboom at Boom Station 93.84, position supports (52, figure 11-44) to mounting holes on bulkhead. Install six bolts (60) with anodized washers, (53) and nuts (59) (Detail E).

b. Position bellcrank (57), with pivot pointing down in supports (52). Install bolt (61) with washers (53) and nut (62). Tighten nut and install cotter pin (63) (Detail E).

c. Position idler (46) in support. Install bolt (50) with anodized washers (43) and nut (45). Tighten nut and install cotter pin (63) (Detail D).

d. In lower right side of pylon compartment position lever (37) on support and install using bolt (38), washers (35), and nut (36). Secure with cotter pin (4). (Detail C.)

e. Through access door on right side of pylon support, position support (29) and install using screws (27 and 30), washers (22) and nuts (26). Secure with cotter pin (4).

f. Position bellcrank (31) on support (29) and install using bolt (28), washers (22), and nut (25). Secure with cotter pin (4).

g. Position support (19) on transmission mount. Install bolts (17), washers (6), and nuts (15) (typical three places). Install washers (6) and nuts 14 and 16).

h. Position bellcrank (10) on support (19). Install bolt (18), washer (6), and nut (13). Torque nut **190 TO 210** inch-pounds. Secure with cotter pin (4).

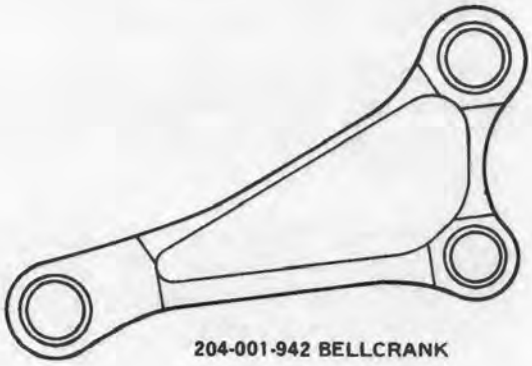
i. Position connecting link (1) between swashplate and bellcrank (10). Install bolt (20), washer (6), and nut (9) attaching link (1) to bellcrank (10). Torque nut (9) **190 TO 210** inch-pounds and secure with cotter pin (4). Install washer (2) and nut (3) attaching link (1) to swashplate. Torque nut (3) **480 TO 690** inch-pounds and secure with cotter pin (4).

j. Attach control tubes (8, 23, 39, 48, or 55) to bellcranks or levers as required (paragraph 11-191).

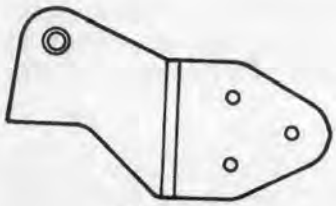
k. Rig synchronized elevator control system (paragraph 11-185).

11-198. ELEVATOR ASSEMBLY.

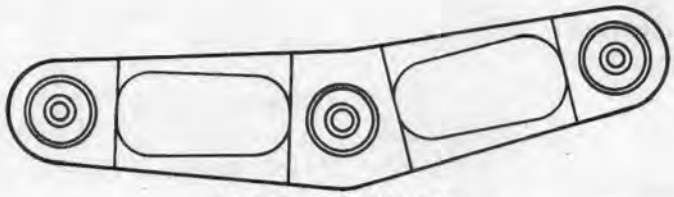
11-199. Description — Elevator Assembly. Synchronized elevator installation consists of two elevator assemblies, a horn assembly, two support sets, and attaching parts. The elevators are mounted horizontally through sides of tailboom, and secured to structure by supports which serve as bearings for rotational movement. A control arm on horn provides attachment for linkage from fore-aft cyclic control system at swashplate.



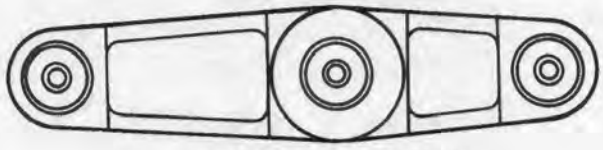
204-001-942 BELLCRANK



204-001-945
SUPPORT BRACKET



204-001-947 LEVER ASSY



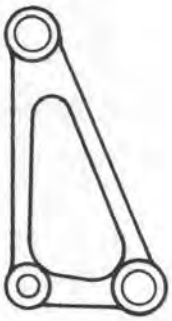
204-001-944 IDLER ASSY

DAMAGE LIMITS

TYPE OF DAMAGE	
MECHANICAL DAMAGE (AFTER CLEANUP)	0.020 IN.
CORROSION DAMAGE (BEFORE CLEANUP)	0.010 IN.
(AFTER CLEANUP)	0.020 IN.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA
EDGE CHAMFER	0.05 BY 0.05 IN.
BORE DAMAGE	0.002 INCH FOR ONE-FOURTH CIRCUMFERENCE
NO CRACKS ALLOWED	

204001-1041-2

Figure 11-46. Wear and damage limits (bellcranks, levers, and supports) — elevator control system (Sheet 1 of 3)



540-001-907-1
BELLCRANK

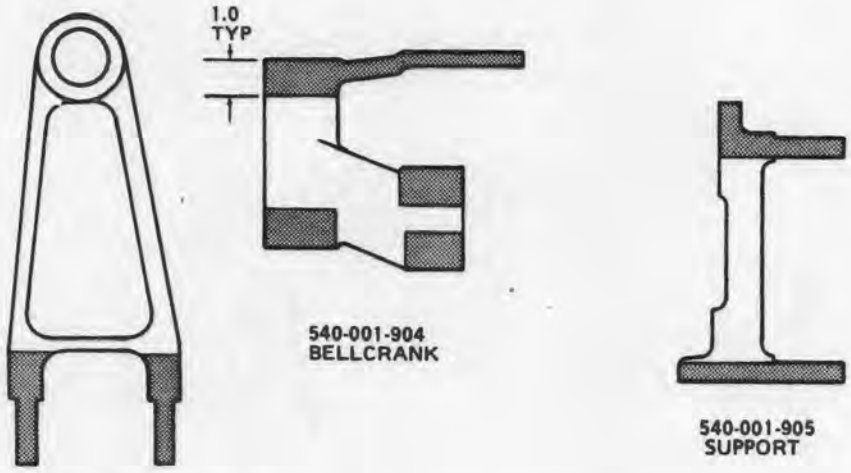
540-001-911-1
LEVER

DAMAGE LIMITS

TYPE OF DAMAGE	
MECHANICAL DAMAGE (AFTER CLEANUP)	0.020 IN.
CORROSION DAMAGE (BEFORE CLEANUP)	0.010 IN.
(AFTER CLEANUP)	0.020 IN.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA
EDGE CHAMFER	0.05 BY 0.05 IN.
BORE DAMAGE	0.002 INCH FOR ONE-FOURTH CIRCUMFERENCE
NO CRACKS ALLOWED	

204001-1041-1

Figure 11-46. Wear and damage limits (bellcranks, levers, and supports) — elevator control system (Sheet 2 of 3)



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	□	▬
MECHANICAL DAMAGE (AFTER CLEANUP)	0.015 IN.	0.010 IN.
CORROSION DAMAGE (BEFORE CLEANUP)	0.0075 IN.	0.005 IN.
(AFTER CLEANUP)	0.015 IN.	0.010 IN.
MAXIMUM AREA PER FULL DEPTH REPAIR	1 IN. SQ.	0.10 IN. SQ.
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA
EDGE CHAMFER	0.05 BY 0.05 IN.	0.04 BY 0.04 IN.
BORE DAMAGE	0.002 INCH FOR ONE-FOURTH CIRCUMFERENCE	
NO CRACKS ALLOWED		

COMPONENT	WEAR LIMIT
BEARING 540-011-414-1	0.005 (RADIAL) 0.030 (AXIAL)
BEARING 540-011-419-1	0.005 (RADIAL) 0.030 (AXIAL)

NOTE: All dimensions are in inches unless otherwise stated.

204001-1041-3

Figure 11-46. Wear and damage limits (bellcranks, levers, and supports) — elevator control system (Sheet 3 of 3)

☆ U.S. GOVERNMENT PRINTING OFFICE: 1982-564029/1326

11-200. Inspection — Elevator Assembly (Installed). Prior to removal of elevator, accomplish the following inspections:

a. Inspect support brackets (21, figure 11-47) on both sides of tailboom for loose attaching rivets. Apply enough vertical pressure to elevator at outboard end to cause normal deflection (up and down). The deflection at the outboard end of the elevator should not exceed **0.040** inch. The deflection may be measured with a dial indicator if desired. Inspect rivets visually and by hand contact for signs of movement. Replace loose, damaged, or missing rivets.

b. Check axial play of elevator horn assembly (11) in support assemblies (6) as follows:

(1) Mount dial indicator inside of the tailboom placing the stylus against the elevator horn at the pivot point.

NOTE

Apply a moderate force when moving the elevator and use care not to bend the elevator, thus causing false indications.

(2) Move elevator inboard and outboard (spanwise) and check the play. A minimum of 0.005 inch and maximum of 0.030 inch play should be indicated (figure 11-48).

(3) If the play is not within tolerance, adjust shims (5, figure 11-47) as necessary.

c. Check radial play as follows:

(1) Mount dial indicator inside tailboom with stylus in contact with upper surface of elevator near the inboard edge of pivot point.

NOTE

Heavy force in moving the elevator will cause flexing of elevator spar tube, thus producing false indications of excess radial play.

(2) Lightly move elevator up and down and observe total read out on dial indicator. A maximum reading of **0.010** inch is permissible (figure 11-48).

(3) If dial indicator readings are not within tolerances, adjust shims (9, figure 11-47) as necessary.

11-201. Removal — Elevator Assembly. a. Disconnect horn (11, figure 11-47) and tube (15), by removing cotter pin (17), nut (16), washers (14), and bolt (13).

b. To remove either elevator: Remove retaining bolt (4) with washer (23) to detach elevator fitting from mounting lug (10) on horn assembly (11). Withdraw elevator (1 or 12) straight outward until spar tube (22) is pulled free.

NOTE

Horn assembly (11) can be left in place, except when replacement of parts is necessary or when shims need adjustment.

c. To remove horn assembly (11), after removal of both elevators (1 and 12), proceed as follows:

(1) Remove access door (40, figure 2-19) from tailboom.

(2) Remove cotter pin (17, figure 11-47), nut (16), washers (14) and bolt (13) and disconnect control tube (15) from horn assembly (11).

(3) At each end of horn assembly (11), inside tailboom, remove two bolts (7) with nuts (19), and washers (8), and shims (9) between upper and lower support assemblies (6) of support. Keep parts in sets for each location.

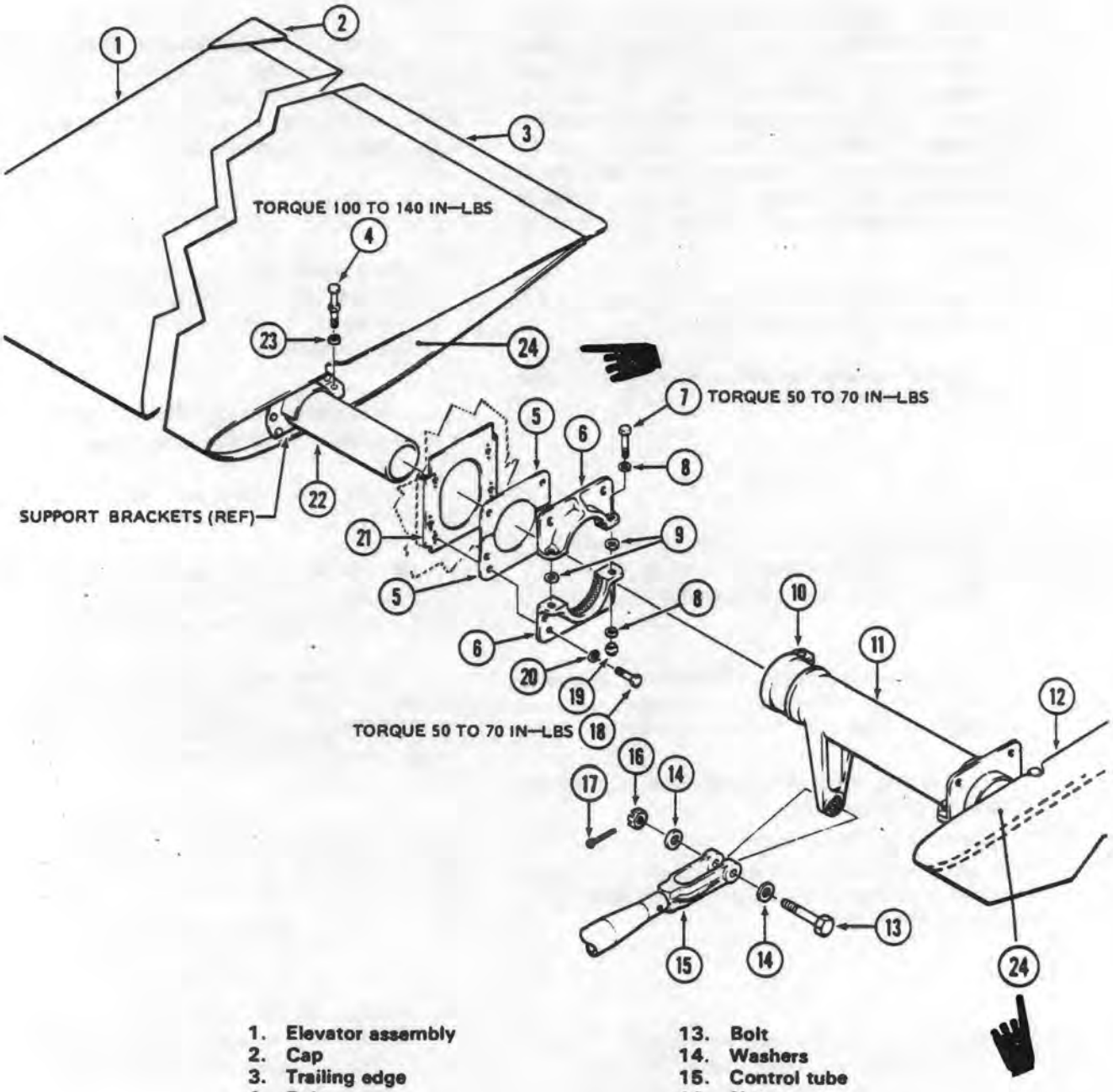
(4) Carefully remove each support set with shims (5), attaching bolts (18), and washers (20) from tailboom brackets (21) in tailboom. Keep parts in sets.

CAUTION

Handle support assemblies (6) with care to avoid damaging inner surface of bushings, which are dry bearing material bonded in place.

(5) Remove horn assembly (11) through access opening.

11-202. Inspection — Elevator Assembly (Removed). a. Inspect closing (inboard) rib (24, figure 11-47) for cracks. Inspect elevator tip caps (2) for secure bonding.



1. Elevator assembly
2. Cap
3. Trailing edge
4. Bolt
5. Shim set
6. Support assembly
7. Bolt
8. Washers
9. Shims
10. Mounting lug
11. Horn assembly
12. Elevator assembly
13. Bolt
14. Washers
15. Control tube
16. Nut
17. Cotter pin
18. Bolt
19. Nut
20. Washer
21. Tailboom bracket
22. Spar
23. Washer
24. Closing (Inboard) Rib

Figure 11-47. Elevator control assembly — removal and installation

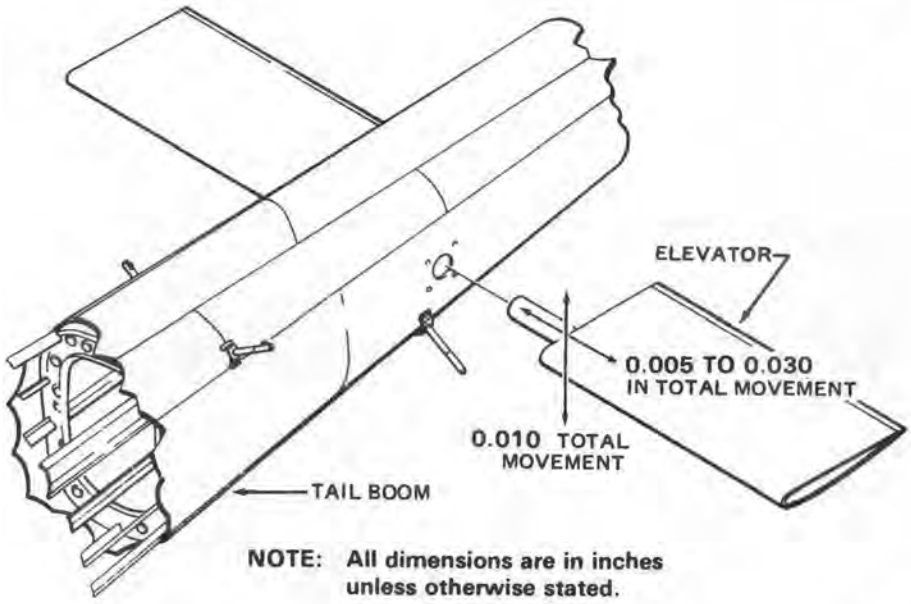


Figure 11-48. Elevator bearing limits

b. Visually inspect four support retainers (6) for evidence of cracks in the vicinity of each of the holes in the retainers. Make fluorescent penetrant inspection (TM 43-0103) of any suspect areas. If any cracks are present and/or if any hole is elongated, reject that support retainer set.

c. Visually inspect four support retainers (6) for defective bushing inserts (figure 11-49, Detail A, sheet 2). If the bushing is loose, cracked, has scratches deeper than **0.015** inch, or if less than **0.040** inch bushing insert material remains, reject that support retainer set. If the support retainer set cannot be properly shimmed during installation to provide prescribed drag or eliminate chatter and binding when the horn is rotated, reject that support retainer set.

d. Inspect the horn assembly (11, figure 11-47) for the following defects:

(1) Inspect the two bearing areas for damage (figure 11-49, sheet 1). No scoring is allowed. Inspect bearing in end of arm for wear in excess of **0.012** inch radial and **0.030** inch axial.

(2) Inspect horn (11, figure 11-47) for dents. If any dents which result in visible depressions in the barrel are present, reject the part.

(3) Inspect horn visually for scoring, nicks, and scratches (figure 11-49, sheet 1). This type of damage is limited to **0.015** inch in depth, except in the bearing and critical areas shown in Detail B, figure 11-49. No scoring is allowed in bearing area.

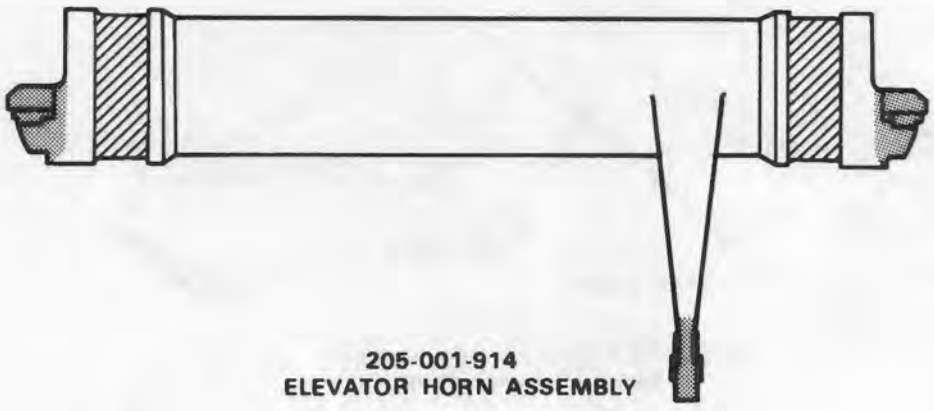
(4) Make fluorescent penetrant inspection (TM 43-0103) of critical inspection areas shown on Detail B, figure 11-49. If any cracks are present, reject the part.

(5) Inspect internal mating surfaces of horn and spar for scoring and check dimensionally. A maximum of **0.0046** inch clearance between the mating surfaces of the elevator spar and horn is permissible. Scoring damage limits are **0.015** inch depth on the horn in this area. Scoring damage limits on the spar are given on figure 2-57.

(6) Remove elevator skin as required to inspect spar. See figure 2-57 for allowable damage limits.

e. Inspect elevators skins for mechanical and corrosion damage. Refer to paragraph 2-284 for limits.

f. Inspect spar and rib flange for loose or broken rivets.



205-001-914
ELEVATOR HORN ASSEMBLY

TYPE OF DAMAGE	DAMAGE AREA REPAIR SYMBOLS		
	▭	▬	▨
MECHANICAL DAMAGE (AFTER CLEAN-UP)	0.015 IN.	0.010 IN.	*
CORROSION DAMAGE (BEFORE CLEAN-UP)	0.0075 IN.	0.005 IN.	*
(AFTER CLEAN-UP)	0.015 IN.	0.010 IN.	
MAXIMUM AREA PER FULL DEPTH REPAIR	1 IN. SQ.	0.10 IN. SQ.	*
NUMBER OF REPAIRS	ONE PER AREA	ONE PER AREA	*
EDGE CHAMFER	0.05 BY 0.05	0.04 BY 0.04	*
BORE DAMAGE NO CRACKS ALLOWED	0.002 INCH FOR ONE-FOURTH CIRCUMFERENCE		

NOTES:

* No Damage Allowed In ▨ Areas.

NO CRACKS ALLOWED

205001-1036-1D

Figure 11-49. Wear and damage limits — elevator support and horn assembly — elevator control system (Sheet 1 of 2)

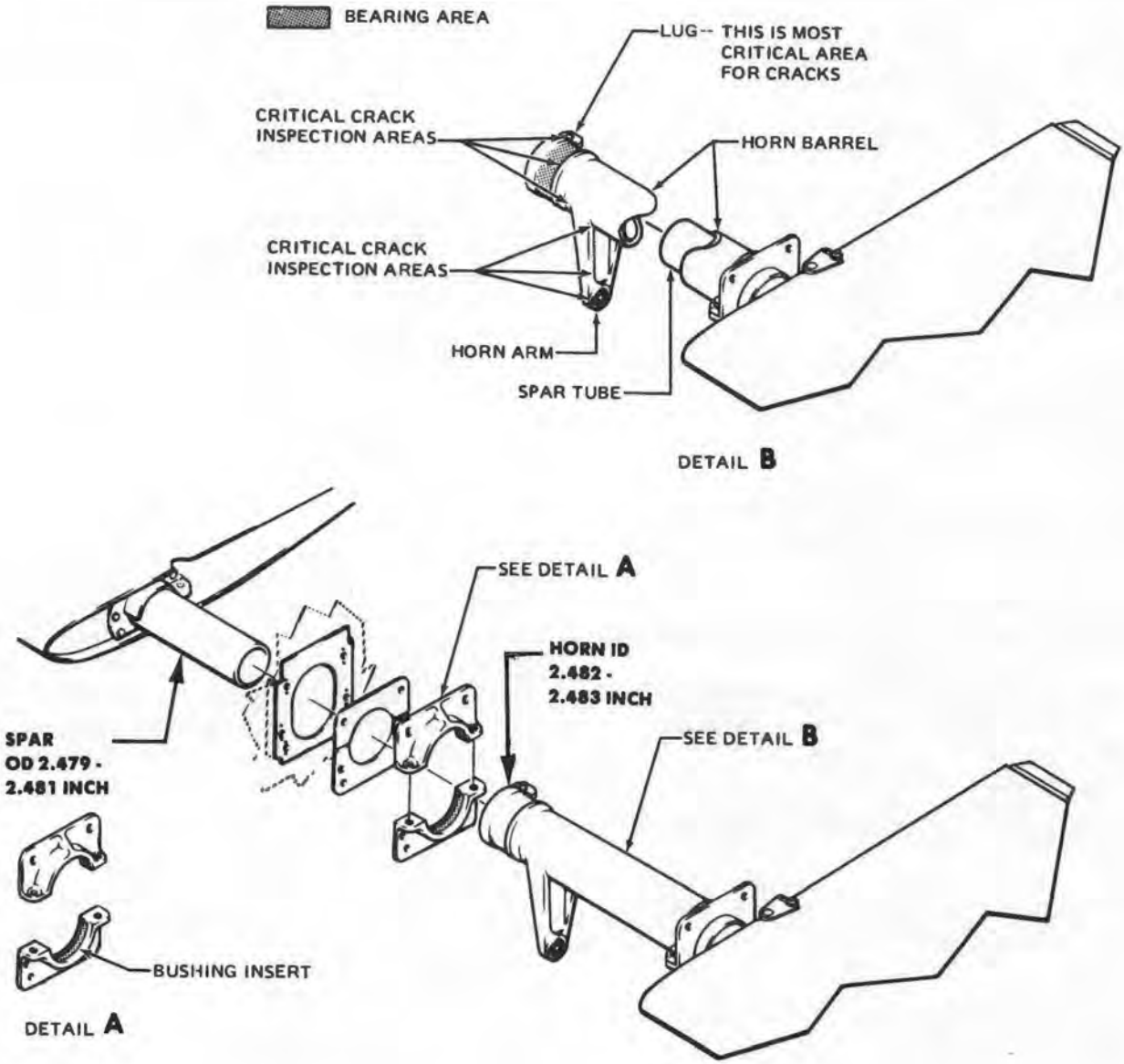


Figure 11-49. Wear and damage limits — elevator support and horn assembly — elevator control system (Sheet 2 of 2)

11-203. Repair or Replacement — Elevator Assembly.

Premaintenance requirements for repair of elevator assembly

Conditions	Requirements
Model	All
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C43), (C70.1), (C73), (C142), (C167), (C185.2),
Special Environmental Conditions	None

NOTE

If play is evident between elevator spar O.D. and I.D. of assembly, refer to paragraph 2-291.

a. Repair cracks, holes, tears, etc., which are within repairable limits in accordance with standard repair procedures (TM 55-1500-204-25/1).

b. Replace unserviceable support assembly retainer sets (6, figure 11-47).

c. Replace bearing in horn (11) if damaged or worn (paragraph 11-207).

d. Refer to paragraph 2-283 for inspection limits and structural repair procedure of elevator assembly.

e. Replace elevator if repair limits are exceeded.

f. Minor nicks, scratches, and corrosion to horn assembly (11) may be repaired by polishing damaged area to original finish with 600 grit sandpaper (C185.2). Treat sanded area with chromic acid (C43) followed with a light coat (by brush) of primer (C167).

11-204. Installation — Elevator Assembly.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

NOTE

When replacing elevator P/N 205-030-856-45 with P/N 205-030-856-65; elevator 205-030-856-47 must also be replaced with 205-030-856-67. The -65 and -67 elevators are used only on armored helicopters.

If horn assembly was not removed, proceed to step g.

a. Coat horn assembly (11, figure 11-47) with corrosion preventive compound (C73) or (C70.1). No lubrication is required on elevator spars prior to installation; horns are coated with electrofilm dry lubricant. Do not use zinc chromate as substitute for corrosion preventive compound. If zinc chromate has been applied to horn or spars, remove chromate with MEK (C142), and a soft rag. Do not saturate spar assembly with MEK as it may remove electrofilm coating.

b. Insert horn assembly (11) into tailboom through access door. Place assembly with ends through tailboom brackets (21) at each side, and with control arm of horn assembly at right of center pointing down.

c. Attach lower and upper support assemblies (6) and shims (5) with bolts (18) and washers (20) to matching holes and plate nuts of tailboom brackets (21) in tailboom. Torque bolts 50 to 70 inch-pounds. Install dial indicator and check for proper clearance. Install shims of equal thickness on both sides of horn. Shim 0.005 inch to 0.030 inch clearance.

CAUTION

Handle support assemblies (6) with care to avoid damaging bearing surface of bushings.

d. Install bolts (7), washers (8), shims (9), and nuts (19) in support assemblies (6). Install a thin aluminum washer under heads of bolt and under nut.

e. Torque bolts (7) on right side **50 TO 70** inch-pounds. Bolts (7) on left side shall be left loose. Check drag on control arm of horn assembly (11), using spring scale applied **90** degrees to arm to obtain a correct reading. Add or remove shims (9) as required, to obtain **13 TO 16** pounds drag.

f. Torque bolts (7) on left side **50 TO 70** inch-pounds. Check drag on control arm of horn assembly (11), using spring scale applied **90** degrees to arm to obtain a correct reading. Add or remove shims (9) as required, to obtain **26 TO 32** pounds drag.

g. Connect elevator control tube (15) to arm of horn assembly (11) with bolt (13), washers (14), nut (16), and cotter pin (17).

WARNING

Special bolt (4) will be P/N 205-030-476-5. Measure bolt for overall length of 2.71 inches. Use of incorrect bolt may result in loss of elevator during flight.

h. Install each elevator by inserting spar tube (22) into end of horn assembly (11), aligning mating holes, elevator support bracket and mounting lug (10) of horn assembly (11), and installing special bolt (4) with washer. Torque bolt **100 TO 140** inch-pounds.

i. Check rigging of elevator (paragraph 11-185).

j. Install access door (40, figure 2-19) on underside of tailboom.

11-205. BEARINGS.

11-206. Inspection — Bearings. a. Inspect bearings of bellcrank-to-servo-valve tube assembly (7, figure 11-1) for **0.005** inch radial and **0.030** inch axial maximum allowable wear. Any wear in excess of these limits is cause for replacement.

b. Maximum allowable elongation of bushing or clevis hole in control system is **0.003** inch.

c. Maximum allowable lateral chuck or play for collective pitch jackshaft is **0.060** inch.

d. Check pilot collective stick friction after installation (paragraph 11-27).

e. Inspect jackshaft-to-mixing-lever tube assembly (5, figure 11-11) bearing for **0.005** inch radial and **0.030** inch axial maximum allowable wear.

f. Inspect bellcrank to servo valve tube assemblies (11 and 22) bearings for **0.005** inch radial and **0.030** axial maximum allowable wear.

g. Maximum allowable lateral play on jackshaft (20, figure 11-2) is **0.060** inch.

h. Maximum allowable wear of jackshaft bearings is **0.010** inch radial.

i. Mechanical damage limits for exposed surfaces of clevis and rod end bearings is **0.010** inch in depth before and after repair. Corrosion damage limit is **0.005** inch before repair and **0.010** inch after repair.

11-207. Repair or Replacement — Bearing (AVIM). The following instructions contain bearing replacement information on the bellcranks, levers, and supports of the flight control system (figure 11-50). Replacement is limited to bearings that are retained by a ring staked sleeve and bearings that do not require staking. Figure 11-50 illustrates each assembly and provides sleeve diameter requirements. Each detail is coded to footnotes located on the last page of the illustration. The footnotes provide specific information on each assembly and must be used in conjunction with the following instructions.

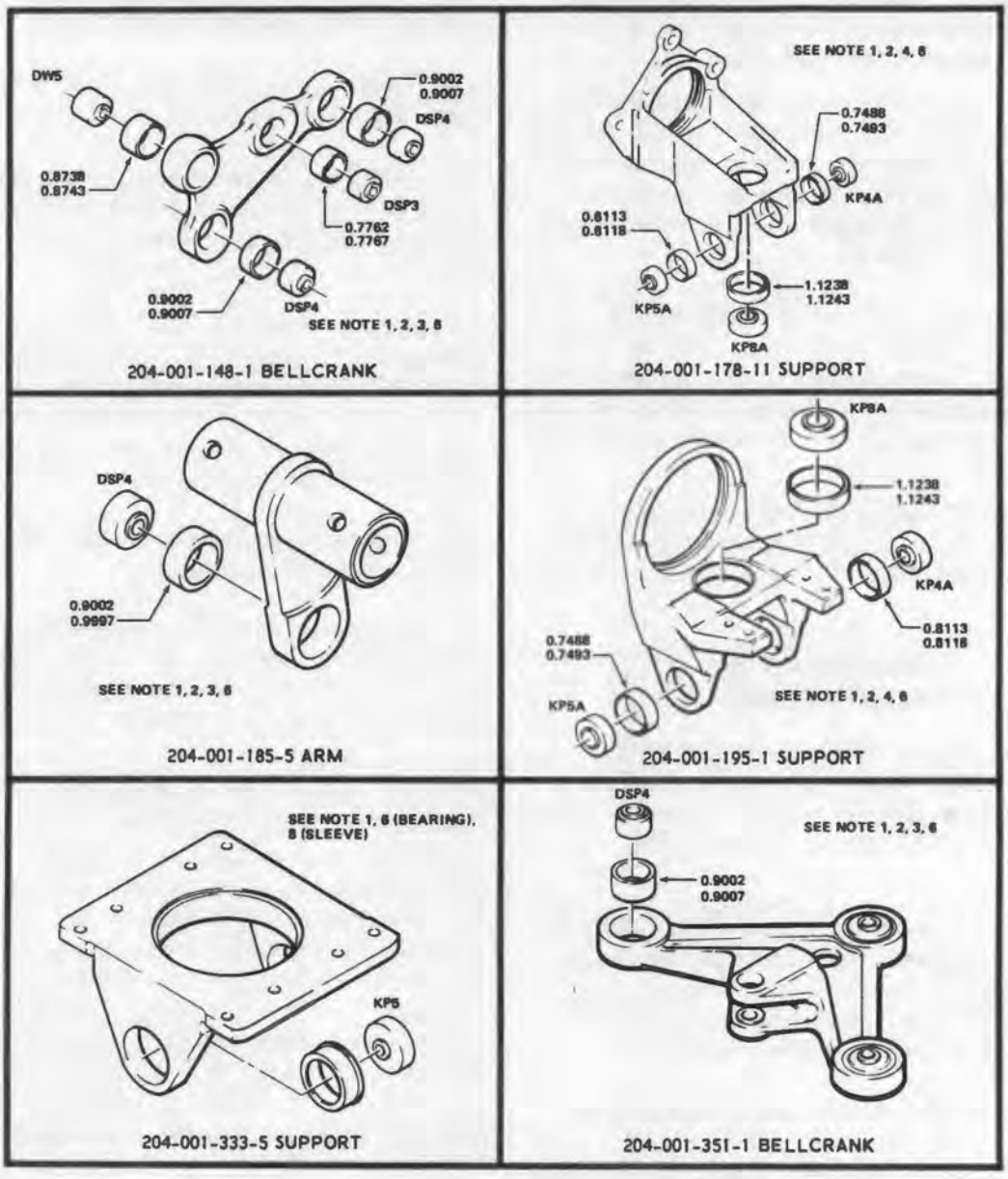
a. Remove bearing as follows:

(1) Place bearing on a suitable support having clearance for bearing. Support the bearing housing.

(2) Apply pressure to outer race of bearing and remove bearing from housing.

(3) Remove sleeve from housing.

b. Inspect housing by method specified in note 1, figure 11-50.



DW 5	**Bearing**	**Radial 0.006 Axial 0.030**
DSP3	**Bearing**	**Radial 0.006 Axial 0.030**
DSP4	**Bearing**	**Radial 0.006 Axial 0.030**
KP5	**Bearing**	**Radial 0.006 Axial 0.030**
KP4A	**Bearing**	**Radial 0.006 Axial 0.030**
KP5A	**Bearing**	**Radial 0.006 Axial 0.030**
KP8A	**Bearing**	**Radial 0.007 Axial 0.030**

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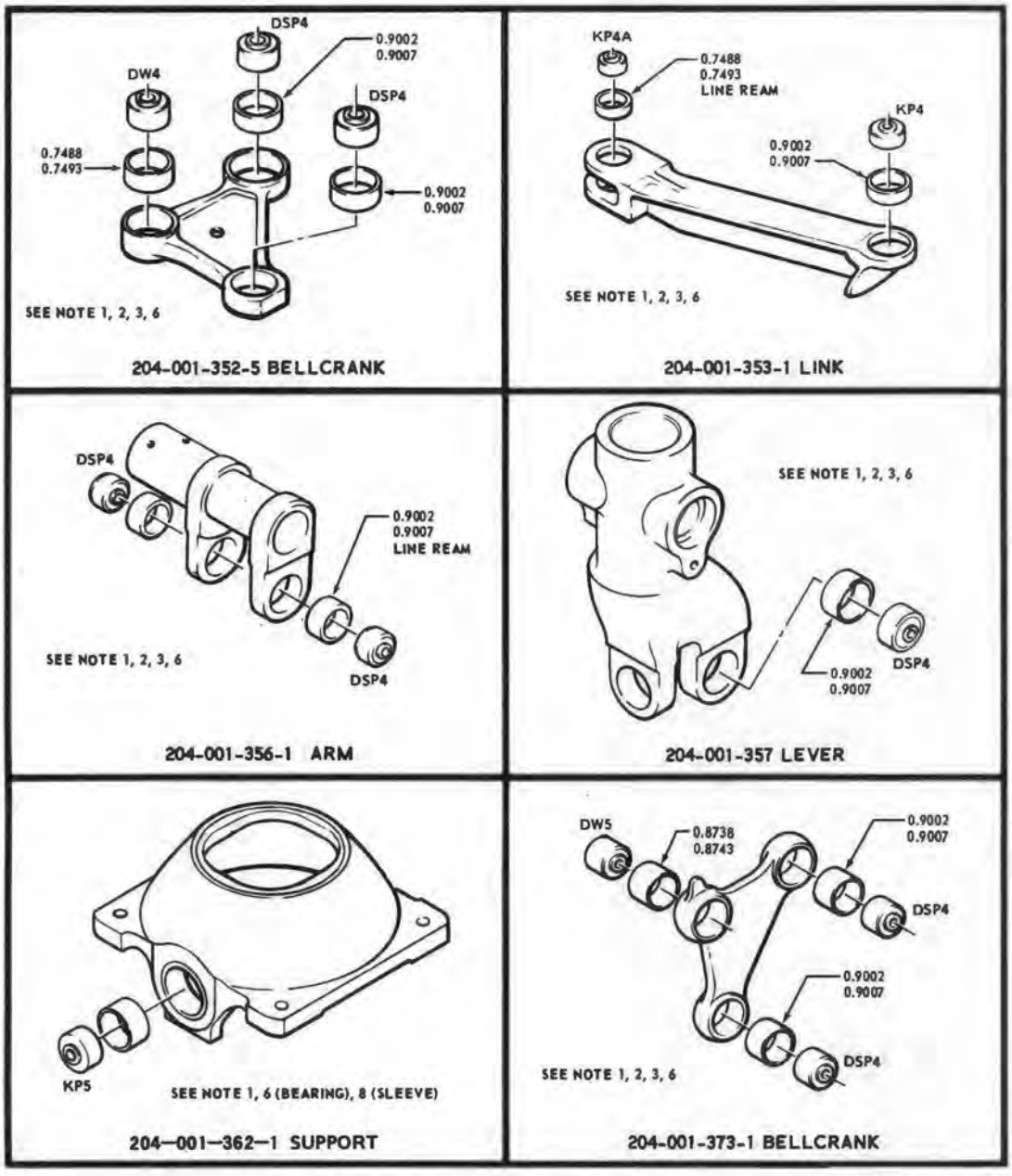
Figure 11-50. Bearing replacement (Sheet 1 of 7)



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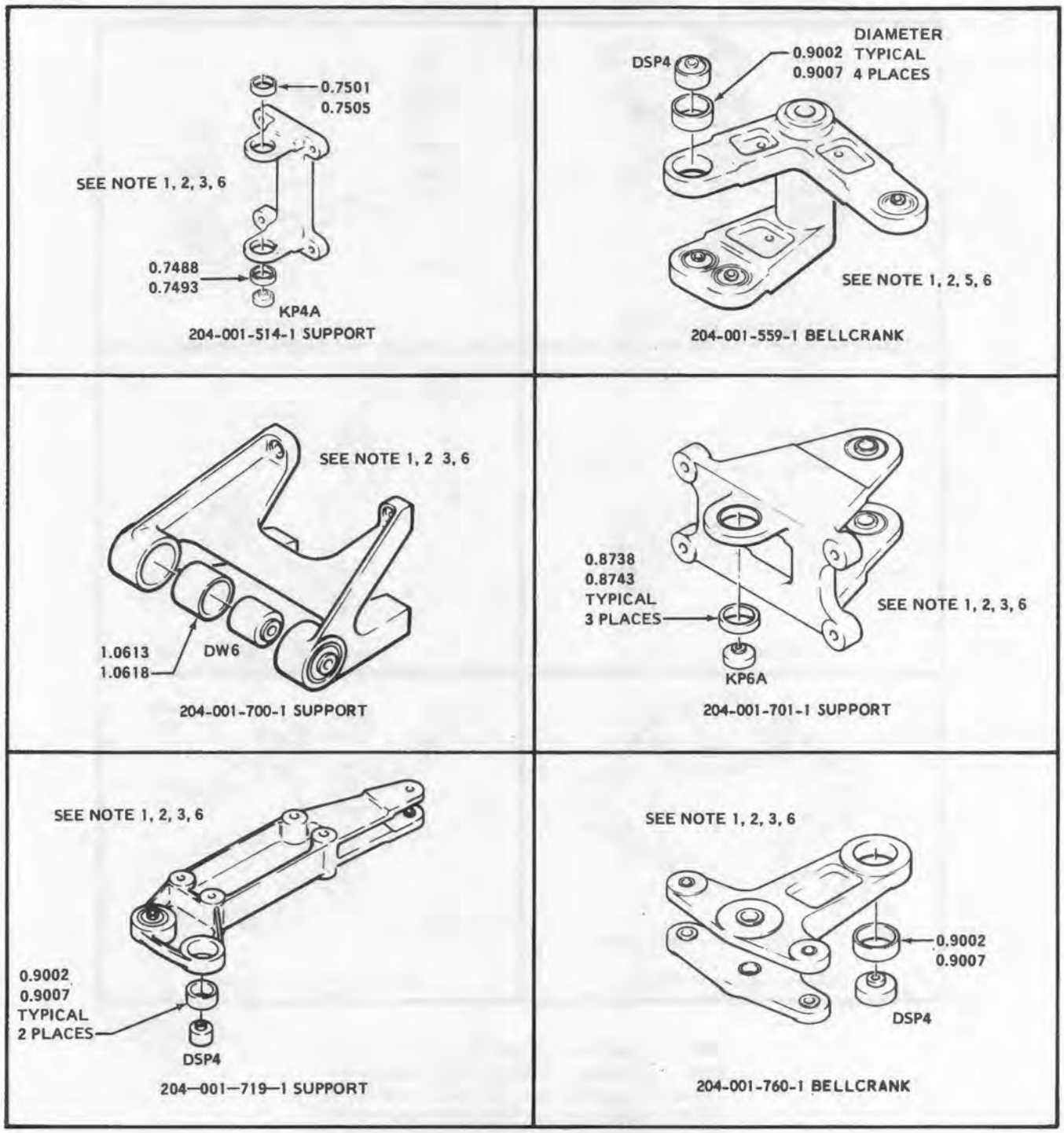
KP4	Bearing	Radial 0.006 Axial 0.030
KP5	Bearing	Radial 0.006 Axial 0.030
KP4A	Bearing	Radial 0.006 Axial 0.030
DW4	Bearing	Radial 0.006 Axial 0.030
DW5	Bearing	Radial 0.006 Axial 0.030
DSP4	Bearing	Radial 0.006 Axial 0.030

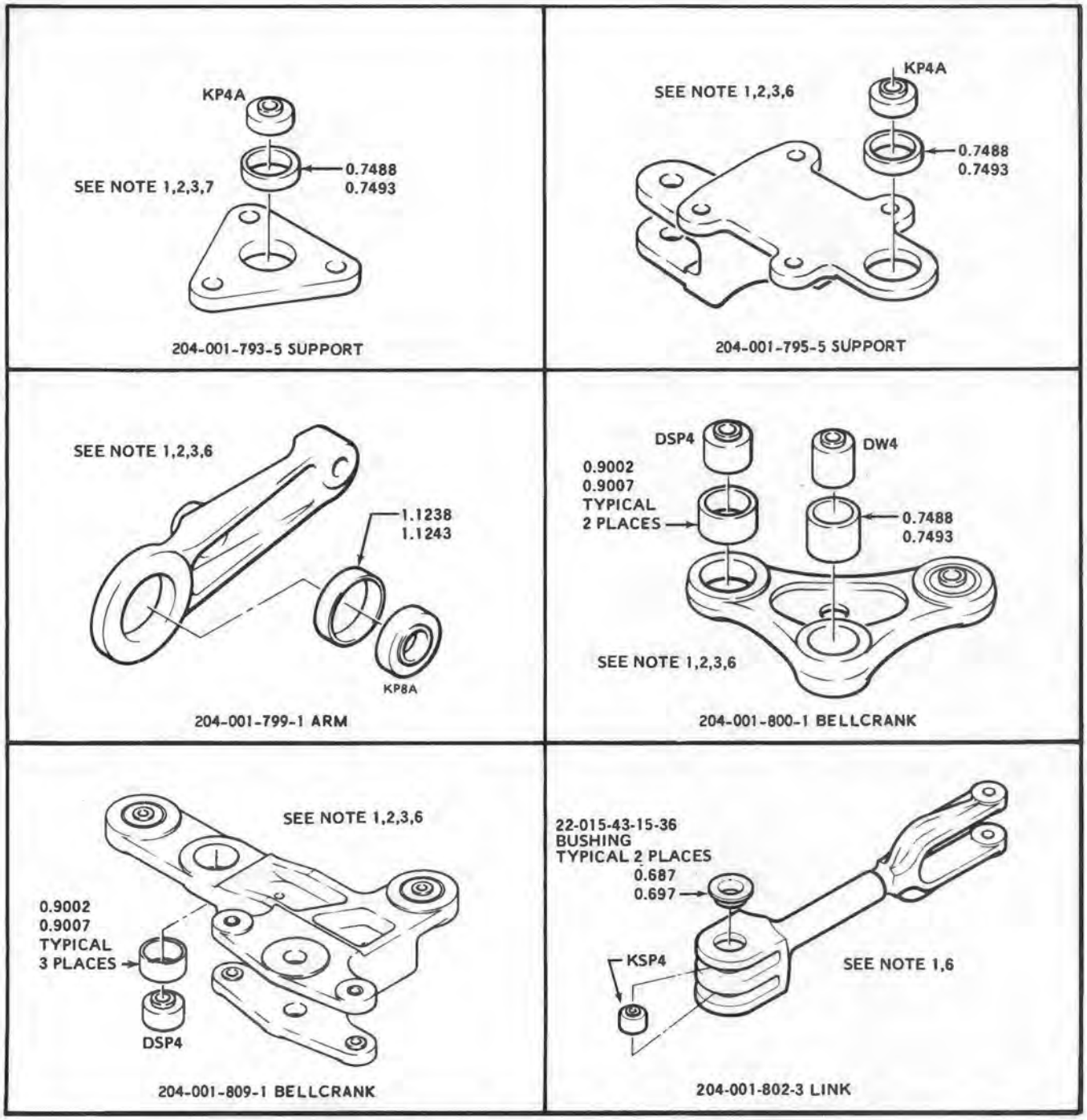
Figure 11-50. Bearing replacement (Sheet 2 of 7)



DSP4 Bearing Radial (0.012) Axial (0.030)
KP4A Bearing Radial (0.005) Axial (0.030)
DW6 Bearing Radial (0.005 Axial (0.030)
KP6A Bearing Radial (0.005) Axial (0.030)

204001-83-3D

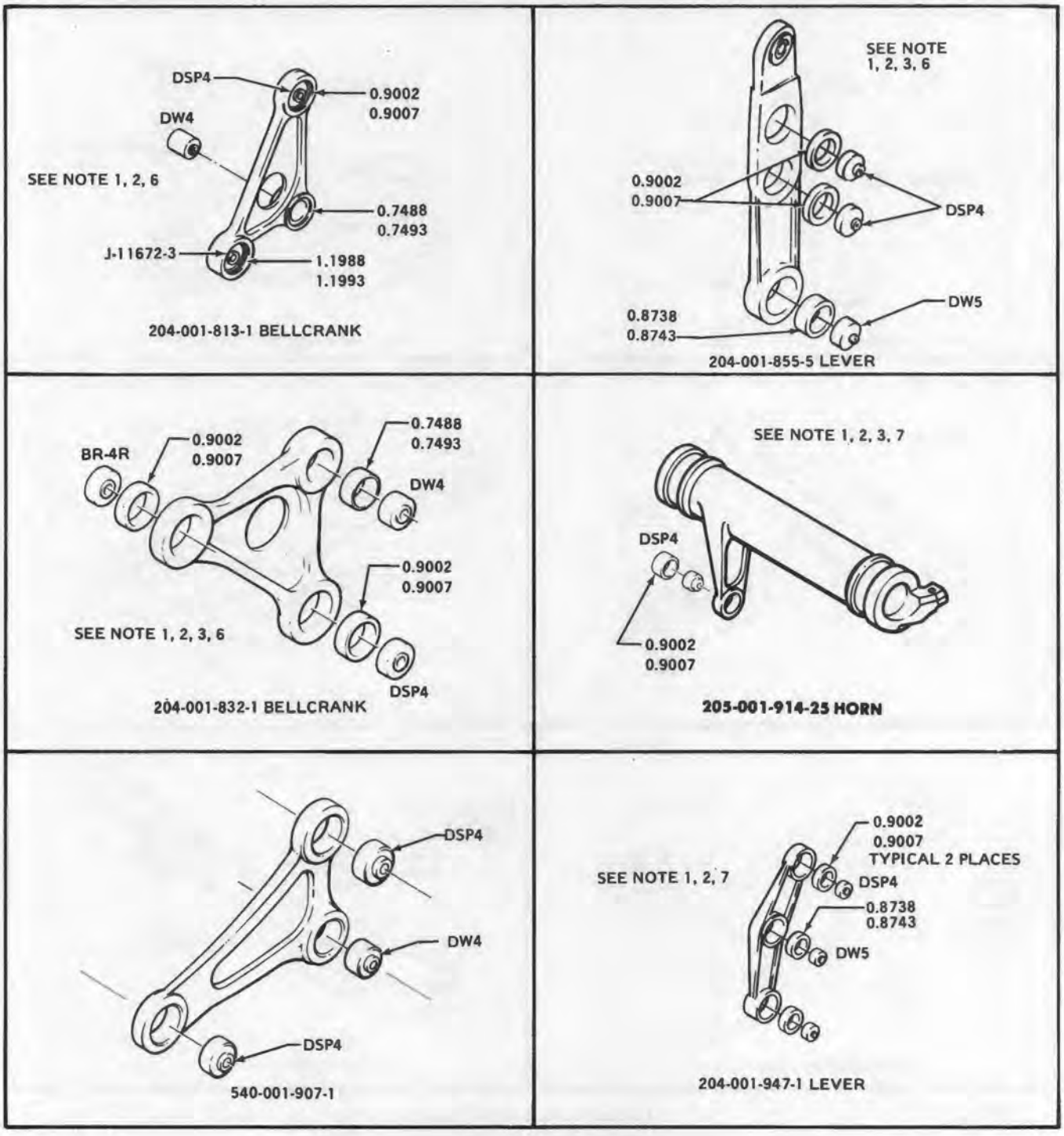
Figure 11-50. Bearing replacement (Sheet 3 of 7)



DW4 Bearing Radial (0.005) Axial (0.030)
DSP4 Bearing Radial (0.012) Axial (0.030)
KP4A Bearing Radial (0.005) Axial (0.030)
KSP4 Bearing Radial (0.012) Axial (0.045)
KP8A Bearing Radial (0.005) Axial (0.030)

204001-88-4D

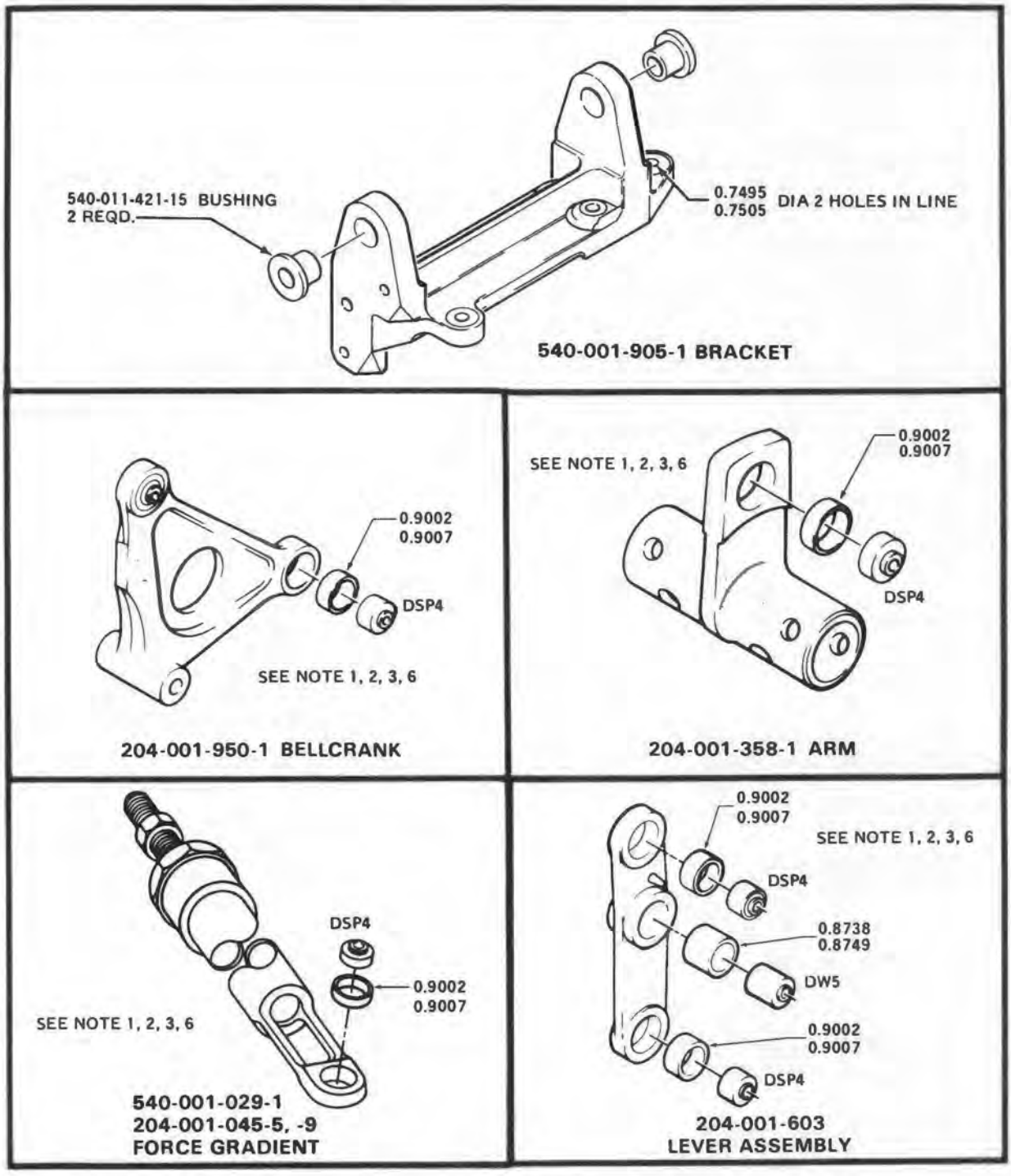
Figure 11-50. Bearing replacement (Sheet 4 of 7)



DW4 Bearing Radial (0.005) Axial (0.030)
DSP4 Bearing Radial (0.012) Axial (0.030)
BR-4R Bearing Radial (0.012) Axial (0.030)
DW5 Bearing Radial (0.012) Axial (0.030)

204001-88-5D

Figure 11-50. Bearing replacement (Sheet 5 of 7)



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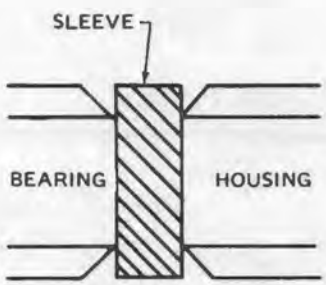
DSP4 Bearing Radial (0.012) Axial (0.030)
DW5 Bearing Radial (0.005) Axial (0.030)
DSP5 Bearing Radial (0.012) Axial (0.030)
KP5A Bearing Radial (0.005) Axial (0.030)

Figure 11-50. Bearing replacement (Sheet 6 of 7)

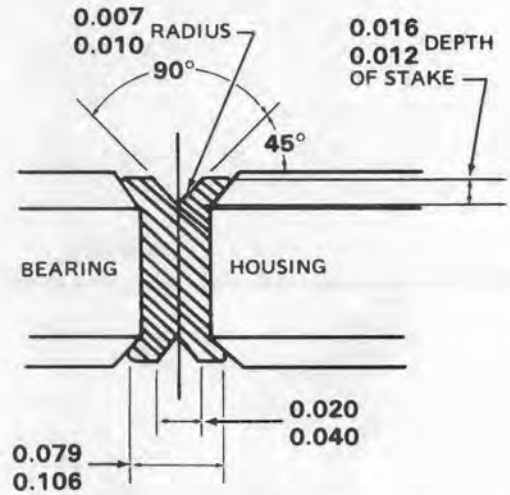
NOTE

1. Fluorescent penetrant inspect housing per TM-0103 (reference TM 55-1500-204-25/1) after bearing removal.
2. Ring stake sleeve both sides.
3. Chamfer 0.030 inch depth x 45 degrees each side of hole in housing.
4. Chamfer 0.032 inch depth x 45 degrees each side of hole in housing.
5. Chamfer 0.025 inch depth x 45 degrees each side of hole in housing.
6. Coat sleeve ID and OD, bearing OD, and housing bore with wet zinc chromate primer (C253) during assembly.
7. Retain sleeve and bearing with anaerobic sealant, grade CV and locquic primer, grade T, (C189).
8. Retain sleeve and bearing with anaerobic sealant, grade AA and locquic primer, grade Q, (C189).



BEFORE STAKING

TYPICAL RING STAKE UTILIZING SLEEVE. CROSS SECTIONAL VIEW



AFTER STAKING OF ALUMINUM SLEEVE

CROSS SECTIONAL VIEW. ALL DIMENSIONS TYPICAL

205001-1052B

Figure 11-50. Bearing replacement (Sheet 7 of 7)

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

c. Clean aged primer from housing bore. Clean bore with aliphatic naphtha (C143).

d. Inspect chamfered edge of bearing bore hole each side to depth and degree specified in figure 11-50.

e. Remove any visible burrs on replacement sleeve with 320 grit or finer sandpaper (C185.3). Chamfer sleeve both ends, **0.005** inch x **45** degrees maximum.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

f. If required, ream sleeve to dimension shown on figure 11-50, with a surface finish of 63 micro inches. Clean sleeve thoroughly with aliphatic naphtha (C143).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

Refer to step g for applications requiring zinc chromate primer and to step h and i for sealant application. Do not allow primer or sealant to contaminate bearings.

g. Apply wet primer (C253) to sleeve OD and housing bore as required by figure 11-50. Press sleeve into housing with equal projection on each side. Apply wet primer to sleeve ID and bearing OD and install bearing, centered equally from each end.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

h. Clean housing bore, sleeve, and bearing OD with naphtha (C143). Apply primer (C172) (grade as specified by figure 11-50) to sleeve OD and housing bore. Allow **three** to **five** minutes drying and apply sealant (C189) (grade as specified by figure 11-50) sparingly to sleeve and bore. Install sleeve and check for equal projection each side. Sealant cure time is **10 TO 40** minutes.

CAUTION

Do not allow sealant to contaminate bearings.

i. Apply primer (C172) (grade as specified by figure 11-50) to ID of sleeve and OD of bearing. Allow three to five minutes drying time and apply sealant (grade as specified by figure 11-50) to bearing OD and sleeve ID. Install bearing, centered equally from each end. After bearing is centered, apply additional drops of sealant to parting line between bearing and sleeve.

CAUTION

Staking operation should be performed within 30 minutes after sealant application. Do not allow sealant to cure before staking.

NOTE

Select a staking tool to accomplish a ring stake as shown in figure 11-50. The tool shall be so designed to have a 90 degree ring stake, using a ring radius equal to the retaining hole plus 1/2 the thickness of the sleeve, within plus or minus 0.0025 inch tolerance.

j. Ring stake sleeve both sides in accordance with figure 11-50.

k. Check bearing for freedom of movement after curing of sealant. Check that bearing is true to surface.

l. Inspect housing by fluorescent penetrant per TM 43-0103.

CHAPTER 12

UTILITY SYSTEMS

SECTION I — FIRE DETECTOR SYSTEM

12-1. FIRE DETECTION SYSTEM — ENGINE.

12-2. Description - Fire Detection System - Engine. The engine fire detection system (figure 12-1) consists of a fire detector unit, fire detector control, FIRE warning light and FIRE DETECTOR TEST pushbutton switch. The fire detector unit consists of two heat sensitive elements inside a protective shield and mounted in spring support brackets (Detail A) inside each engine cowl. As an element is heated, the resistance between the center conductor and electrically grounded outer shield decreases. This resistance is compared to resistor R11 (10) mounted on the detector control (11) and when the element resistance is less than R11 the FIRE warning light on the instrument panel is illuminated. The FIRE DETECTION TEST switch located on the instrument panel simulates a fire by electrically grounding the detector element at one end opposite from the control. This checks operation of the control and continuity through the element. In the off position the switch connects the ends of the element together enabling the element to remain active to sense a fire along its length from both ends to the first, if any, break from the end.

12-3. Troubleshooting — Fire Detection System — Engine. The following is a list of conditions, test or inspection and corrective actions.

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 12-1. Troubleshooting Fire Detector

CONDITION TEST OR INSPECTION **CORRECTIVE ACTION**
1. Indicator light inoperative.
STEP 1. Check for burned out bulb.
Replace bulb (paragraph 9-5).
STEP 2. Check for defective test switch.
Replace switch if defective (paragraph 9-5).
STEP 3. Check for loose electrical connections.
Repair faulty connections (paragraph 9-5).
STEP 4. Check for broken or disconnected detector wire.
Replace or connect detector wire (paragraph 12-5).
STEP 5. Perform test in accordance with paragraph 12-4.
Replace fire detector control unit if test and control circuit does not work (paragraph 12-8).
Replace fire detector wire if test or alarm circuit shows malfunction (paragraph 12-8).
2. Indicator light stays on.
STEP 1. Check for defective switch.
Replace switch if defective (paragraph 9-5).
STEP 2. Perform test in accordance with paragraph 12-4.
Replace fire detector wire if alarm circuit does not work (paragraph 12-8).
Replace control box if test of control circuit indicates malfunction (paragraph 12-8).
3. Warning light stays on.
STEP 1. Check for inoperative switch.
Replace switch.
STEP 2. Check for fire detector wire shorted to ground.
Replace fire detector wire.

Table 12-1. Troubleshooting Fire Detector (Cont)

CONDITION TEST OR INSPECTION	CORRECTIVE ACTION
STEP 3. Check for inoperative control alarm.	**Replace control.**
STEP 4. Check for 1000 OHM resistor open condition.	**Replace 1k resistor.**

12-4. Testing — Fire Detection System — Engine. a. Disconnect electrical plug located in work deck directly under power plant on left side of helicopter.

b. Short receptacle pins "C" and "F" together, depress Push-to-Test switch. Fire warning lights should come on.

NOTE

This test assures that the test and control circuit is operable.

c. Remove the jumper wire from pins "C" and "F" and use it to short either receptacle pin "C" or "F" to ground.

d. Fire warning light should come on.

NOTE

This test assures that the alarm circuit is operable.

e. Use an ohmmeter to check continuity between pins "C" and "F" at plug side of harness.

NOTE

Maximum resistance should not exceed 20 ohms. If higher value registers, check all connectors for tightness.

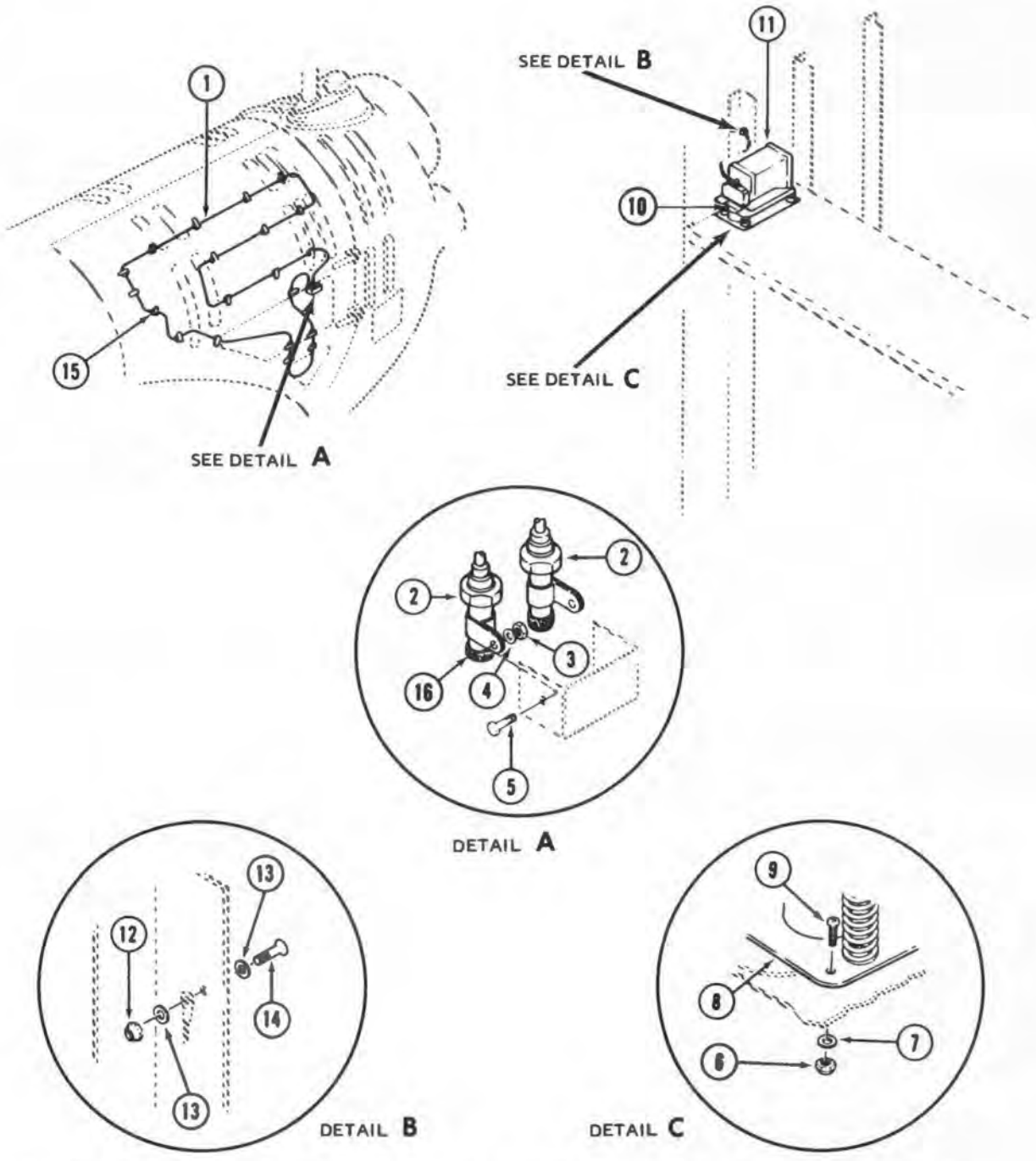
f. Use an ohmmeter to check either pin "C" or "F" to ground at plug side of harness.

NOTE

Value register should always be a minimum of 200,000 ohms at an ambient temperature of 72 degrees F (22 degrees C). As the ambient temperature rises, the resistance value of pin "C" or "F" to ground will decrease. At 100 degrees F (39 degrees C) this resistance should be a minimum of 100,000 ohms.

g. If the above values are not obtained, it will be necessary to check each cable for resistance from center pin of cable to ground. At 72 degrees F (22 degrees C), the minimum value of each cable is one megohm. Resistance below this value will indicate a faulty cable which should be replaced.

h. Reconnect main firewall electrical connector.



1. Fire detector sensing element
2. Connector
3. Nut
4. Washer
5. Bolt
6. Nut
7. Washer
8. Mount assembly
9. Screw
10. Resistor assembly
11. Control unit
12. Nut
13. Washer
14. Screw
15. Retention clips
16. Receptacle

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Figure 12-1. Fire detection system — engine

NOTE

Make sure that temperature probe is contacting nothing but the cable. It is easy to "heat-sink" the probe if contact is made with helicopter structure.

i. Remove test equipment and safety wire all electrical connectors.

12-5. Removal — Fire Detection System — Engine. a. Make sure battery switch is in "OFF" position.

b. Disconnect electrical wiring from detector wire receptacles (16, figure 12-1) and cover wire ends with insulating tape.

c. Remove bolts (5), washers (4), and nuts (3) attaching detector wire receptacles (16) to engine cowl. Save all hardware to be used for reinstallation.

d. Apply pressure on each side of detector wire retention clips (15) and remove fire detector sensing element (1) from cowl.

e. Remove safety wire from retaining nuts on each end of detector wire receptacles (16). Remove top nut on each receptacle and remove detector wire ends.

f. Remove fire detector control unit (11).

(1) Disconnect cable connector from the fire detector control unit.

(2) Remove screw (14), two washers (13), and nut (12) securing ground cable to bulkhead.

(3) Remove four screws (9), four washers (7), and four nuts (6), securing fire detector control unit (11) to shelf of electrical and radio compartment.

(4) Remove fire detector control unit (11).

12-6. Inspection — Fire Detection System — Engine. a. Inspect wires for damage and wear.

b. Inspect wire retention clips (15, figure 12-1) for cracks and serviceability.

c. Inspect fire detector control unit (11) for security of mounting.

12-7. Repair or Replacement — Fire Detection System — Engine. a. Replace wires if damaged or worn.

b. Replace retention clips (15, figure 12-1) if broken, cracked, or otherwise unserviceable.

c. Replace fire detector control unit (11) if unserviceable.

12-8. Installation — Fire Detection System — Engine. a. Insert detector wire ends into receptacle (16, figure 12-1) and tighten retaining nuts. Safety wire top and bottom retaining nuts together, on each receptacle.

b. Position detector wire receptacles (16) on engine cowl and install attaching units with bolts (5), washers (4), and nuts (3).

c. Position and route sensing element (1) through spring retention clips (15).

d. Remove insulating tape from wire ends and connect electrical wiring to detector wire receptacles.

e. Install fire detector control unit (11) in electrical and radio compartment.

NOTE

Before installation, check resistor (10) for continuity and security on face of fire detector control unit.

(1) Secure fire detector control unit (11) to shelf of electrical and radio compartment using four screws (9), four washers (7), and four nuts (6).

(2) Attach ground cable to bulkhead with screw (14, two washers (13), and nut (12).

(3) Reconnect battery.

SECTION II — WINDSHIELD WIPER SYSTEM

12-9. WINDSHIELD WIPER.

12-10. Description — Windshield Wiper. The windshield wiper assembly consists of the arm and wiper, motor converter, and motor. Helicopters are equipped with a windshield wiper for both pilot and copilot. Circuit breakers in the overhead console panel protect these installations in case of malfunction. A five-position rotary switch on the miscellaneous panel of the overhead console permits operation of the wipers at low, medium or high speed. A selector switch permits operation of pilot and copilot windshield wipers separately or simultaneously. The left and right assemblies are identical and all maintenance procedures are applicable to each.

12-11. Troubleshooting — Windshield Wiper. Table 12-2 and Table 12-3 provide a guide to aid in isolating troubles which may be encountered during testing of the units.

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 12-2. Troubleshooting — Electric Motor Assembly

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Motor fails to start.

   STEP 1. Check for electrical power.

   Replace circuit breaker (paragraph 9-12).

   STEP 2. Check for defective thermoprotector.

   Replace thermoprotector (paragraph 12-13 and 12-17).

   STEP 3. Check for defective field or armature circuit.

   Repair motor assembly (paragraph 12-13 thru 12-19).

2. Motor assembly has excessive vibration/noise.

   STEP 1. Check for defective motor assembly components.

   Repair motor assembly (paragraph 12-13 thru 12-19).

3. Thermoprotector fails to de-energize motor assembly.

   STEP 1. Check for defective thermoprotector.

   Replace defective thermoprotector (paragraph 12-13 and 12-17).

Table 12-2. Troubleshooting — Electric Motor Assembly (Cont)

CONDITION TEST OR INSPECTION CORRECTIVE ACTION
4. Thermoprotector de-energizes motor assembly but fails to complete cycle.
STEP 1. Check for defective thermoprotector.
Replace defective thermoprotector (paragraph 12-13 and 12-17).
5. Excessive current consumption when motor operates under load and fails to reach minimum speed.
STEP 1. Check for good brush contact.
Replace brush holder if spring tension is below tolerance (paragraph 12-13 and 12-17).
STEP 2. Check for worn brushes.
Replace brush and clip assemblies (paragraph 12-13 and 12-17).
STEP 3. Check for dirty commutator.
Clean commutator (paragraph 12-14).
STEP 4. Check for field strength below normal.
See Corrective Action Steps for 1, 2, 3.
STEP 5. Check for shorted commutator segments.
Repair motor (paragraph 12-13 thru 12-19).
STEP 6. Check for shorts in rotor windings.
Repair motor (paragraph 12-13 thru 12-19).
6. Motor fails to stop in PARK position.
STEP 1. Check for defective parking switch.
Replace parking switch (paragraph 12-13 and 12-17).
STEP 2. Check for defective cam assembly.
Replace cam assembly (paragraph 12-13 and 12-17).
STEP 3. Check for idler gear assemblies not secure on pinions.
Replace gear assemblies (paragraph 12-13 and 12-17).

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 12-3. Troubleshooting — Converter Assembly

CONDITION TEST OR INSPECTION	**CORRECTIVE ACTION**
1. Apparent grease leakage after run-in.	
STEP 1. Check for proper sealing of cover plates.	**Reseal plates to worm and housing assembly (paragraph 12-17).**
STEP 2. Check for crack in housing assembly.	**Replace worm gear and housing assembly (paragraph 12-13 thru 12-19).**
STEP 3. Check for defective preformed packing.	**Replace preformed packing at wiper shaft (paragraph 12-13 and 12-17).**
2. Wiper stroke not within limits.	
STEP 1. Check for defective eccentric.	**Replace linkage assembly (paragraph 12-13 thru 12-19).**
3. Wiper does not stop at PARK position.	
STEP 1. Check for defective parking switch.	**Refer to table 12-2, item 6.**
STEP 2. Check for proper motor and motor converter alignment.	**Align or replace as required (paragraph 12-18).**
STEP 3. Check for defective or worn parts in converter assembly.	**Replace worn parts as required (paragraph 12-13 thru 12-19).**

12-12. Removal — Windshield Wiper.

Premaintenance requirements for adjusting pressure on windshield wiper blade

Condition	Requirements
Model	All
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C205), (C187.4), (C105), (C127), (C187.2), (C108.1)
Special Environmental Conditions	Dust free

CAUTION

Do not operate wiper on dry windshields. Install 3/32 inch cotter key in standoff holes in base of arm before operating or performing maintenance.

a. Turn BAT switch to OFF position.

b. Remove windshield wiper blade (13, figure 12-2) and universal arm (3) from shaft on motor (4). Disconnect electrical connection on motor (23).

c. Remove bolts (7 and 9) and washers (8 and 10) attaching head guard bracket (11) and windshield wiper support to cabin. Lift brackets and motor-converter from cabin.

d. Remove four washers (5), and bolts (6) which attach motor-converter (4) to bracket support.

12-13. Disassembly — Windshield Wiper.

a. Motor and Converter (4, figure 12-2).

(1) Cut lockwire and remove three screws (14 and 16) and lockwashers (15). Remove bracket (17).

(2) Remove screw (19) to free lock plate (18).

(3) Remove three gear case mounting screws (10, figure 12-4).

(4) Separate converter (24, figure 12-2) from electric motor (23).

(5) Unscrew motor gear case (11, figure 12-4) from converter assembly (24, figure 12-2).

(6) Remove nipple (21) and coupling (22). Remove lock insert (20) and separate nipple and coupling.

b. Converter Assembly.

(1) Remove bolt (18, figure 12-3) and retaining ring (17) from linkage shaft.

CAUTION

Insert screwdriver in slots to separate cover plate from housing.

(2) Remove four nuts (13) and screws (8). Separate cover plate (12) from worm gear and housing assembly (9).

(3) Remove sleeve (16) and packing (15) from inside of sleeve (14).

NOTE

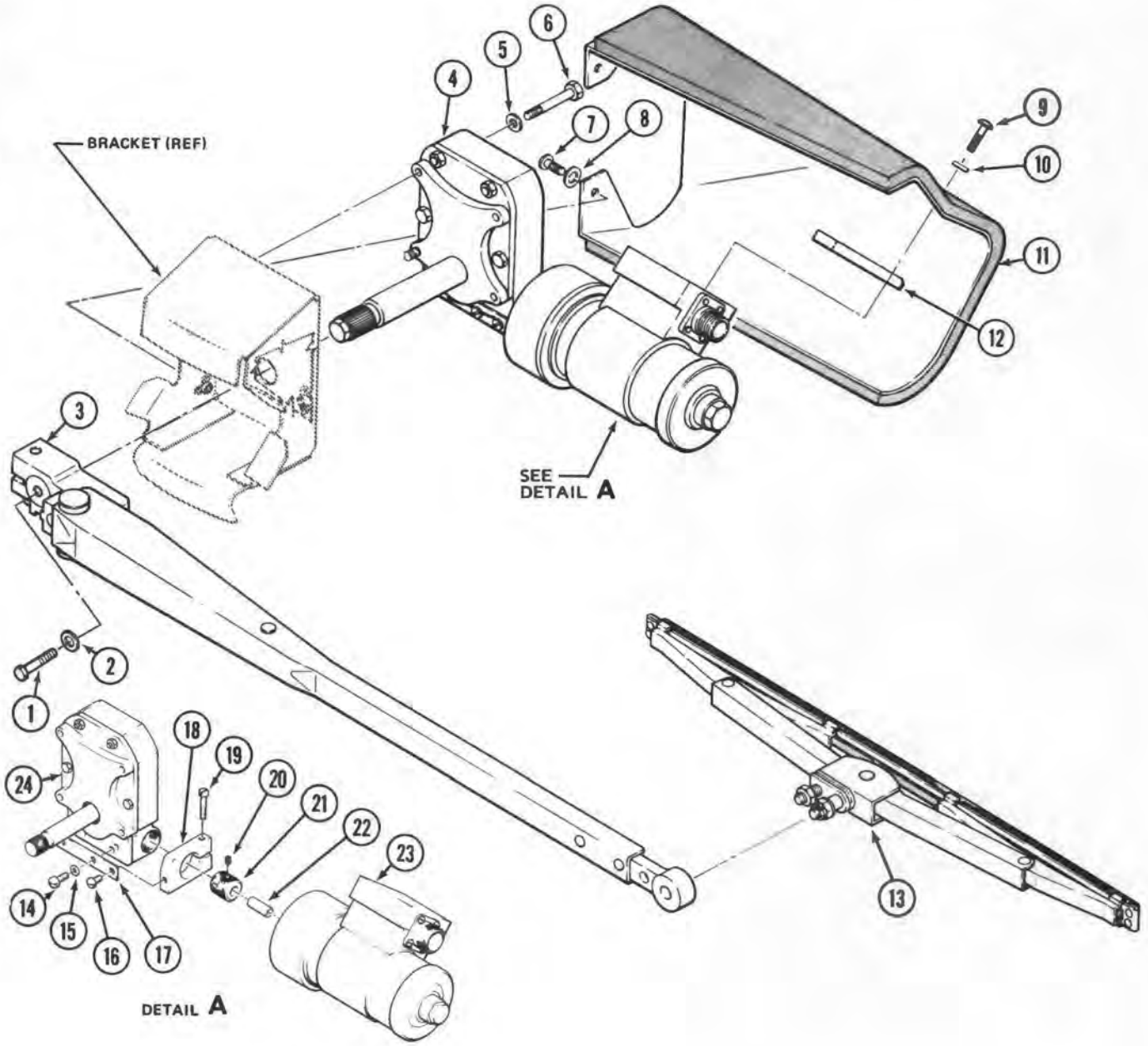
Do not remove sleeve (14) from cover plate (12) unless sleeve is damaged and must be replaced. The sleeve is staked in placed and damage may result during removal.

(4) Using bearing puller, if necessary, remove bearings (2) and washers (1) from linkage assembly (11).

NOTE

Do not attempt to remove worm gear from housing.

(5) Remove three screws (5); remove idler cover plate (6) and washer (7).



1. Bolt
2. Washer
3. Wiper arm
4. Motor and converter assembly
5. Washer
6. Bolt
7. Screw
8. Washer
9. Screw
10. Washer
11. Headguard
12. Spacer
13. Wiper blade
14. Screw
15. Washer
16. Screw
17. Bracket
18. Lock plate
19. Screw
20. Lock insert
21. Nipple
22. Coupling
23. Motor assembly
24. Converter assembly

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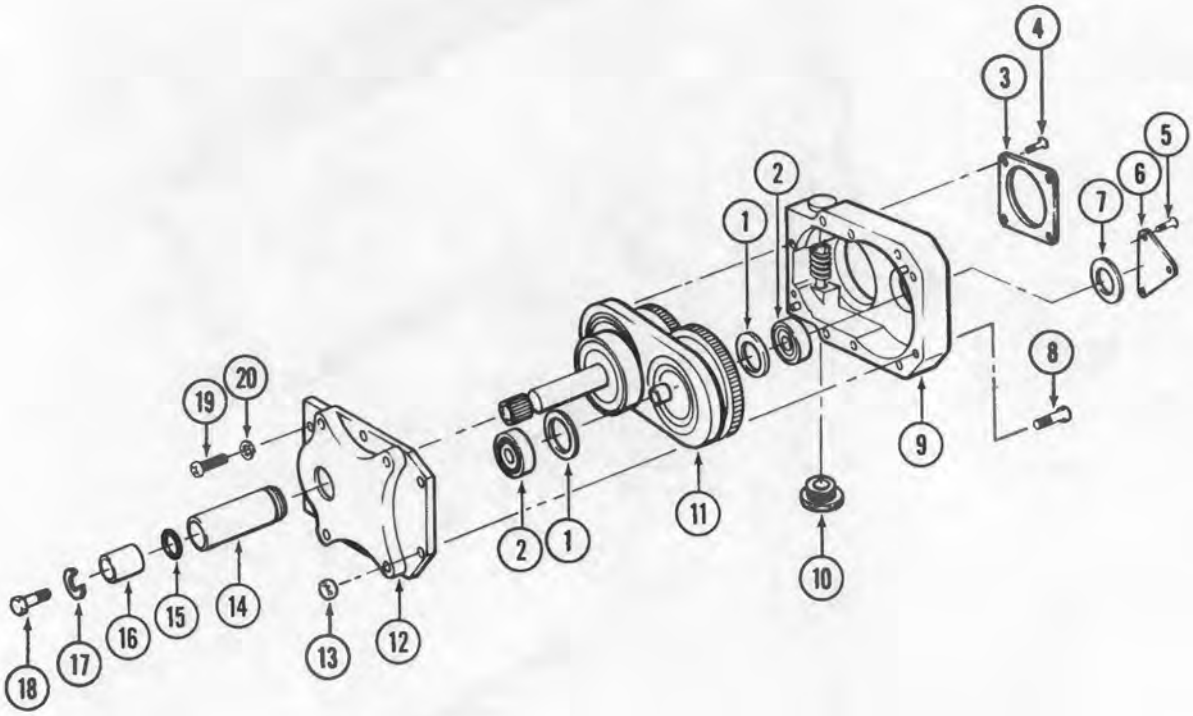
Figure 12-2. Windshield wiper installation



1. Washer
2. Annular ball bearing
3. Nameplate
4. Screw
5. Screw
6. Idler cover plate
7. Washer
8. Screw
9. Worm gear and housing assembly
10. Worm end cap
11. Converter linkage assembly
12. Cover plate
13. Nut
14. Sleeve
15. Preformed packing
16. Sleeve
17. Retaining ring
18. Bolt
19. Screw
20. Washer

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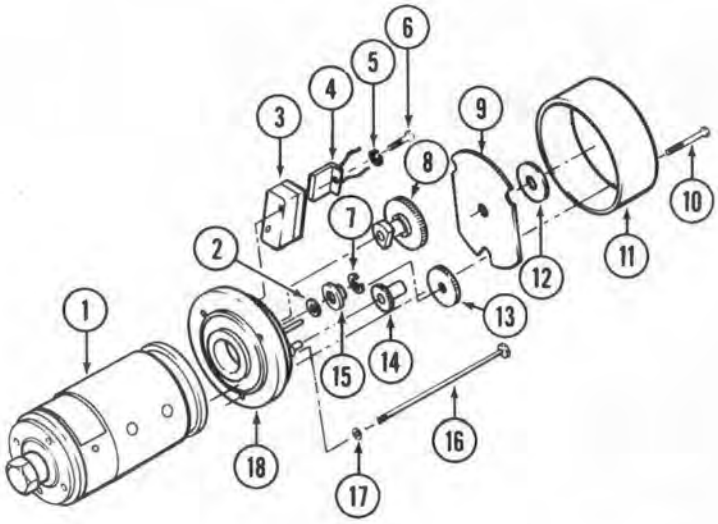
Figure 12-3. Converter assembly



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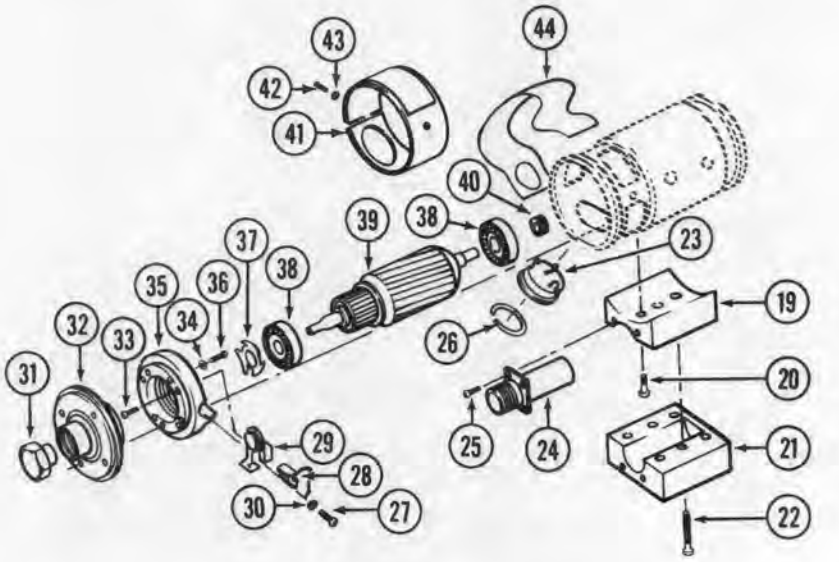
1. Barrel assembly
2. Washer
3. Parking switch
4. Filter
5. Lockwasher
6. Screw
7. Retaining ring
8. Cam assembly
9. Insulator
10. Screw
11. Gear case
12. Washer
13. Idler gear assembly
14. Idler gear assembly
15. Idler gear assembly
16. Tie bolt
17. Lockwire
18. End bell and idler shaft assembly

Figure 12-4. Motor assembly (Sheet 1 of 2)



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19. Base
20. Screw
21. Sub-base
22. Screw
23. Thermoprotector
24. Filter connector
25. Screw
26. Retaining ring
27. Screw
28. Brush and clip assembly
29. Brush holder assembly
30. Lockwasher
31. End cap
32. Brush holder end bell assembly
33. Screw
34. Lockwasher
35. Brush holder ring
36. Screw
37. Spring washer
38. Annular ball bearing
39. Rotor assembly
40. Driveshaft gear
41. Cover and nameplate assembly
42. Screw
43. Lockwasher
44. Brush cover insulation

Figure 12-4. Motor assembly (Sheet 2 of 2)

NOTE

Washer (7) may be stuck to cover plate by sealing compound. Remove washer by carefully separating with a sharp knife.

(6) Remove four screws (4); remove converter nameplate (3).

c. Electric Motor Assembly.

(1) Cut lockwire and remove end cap (31, figure 12-4).

(2) Cut lockwire and remove three screws (10) securing gear case (11) to end bell and idler shaft assembly (18).

(3) Remove insulator (9) and washer (12) only if worn or damaged. The insulator is secured with sealing compound and the washer is staked in place.

(4) Remove cam assembly (8), idler gear assemblies (13 and 14).

(5) Remove retaining ring (7), idler gear assembly (15), and washer (2).

(6) Remove two screws (6) and lockwashers (5); remove filter (4) and parking switch (3).

NOTE

When removing electrical components, unsolder electrical leads when necessary. Identify leads to ensure proper connection during reassembly.

(7) Remove three screws (42) and lockwashers (43); remove cover and nameplate assembly (41). Remove insulation (44) and retaining ring (26).

(8) Lift brushes out of brush holder assemblies (29).

(9) Remove two tie bolts (16) and lockwashers (17).

(10) Remove end bell and idler shaft assembly (18).

(11) Remove rotor assembly (39), bearings (38) and driveshaft gear (40) as an assembly. Disassemble only if parts are damaged or worn. Remove spring washer (37).

(12) Cut lockwire and remove four screws (25) securing filter-connector (24) in base assembly. Remove two screws (22); remove sub-base (21). Unsolder wires and remove filter-connector.

(13) Remove two screws (27) and lockwashers (30); remove brush and clip assemblies (28).

(14) Unsolder wires and remove brush holder end bell assembly items (29, 32, 33, 34 ,35, 36).

(15) Remove two screws (36) and lockwashers (34); remove end bell assembly (32).

(16) Remove four screws (33); remove two brush holder assemblies (29).

(17) Remove thermoprotector (23).

(18) Remove two screws (20); remove base (19).

12-14. Cleaning — Windshield Wiper Assembly.

a. Electric Motor Assembly.

(1) Clean all metal parts with the exception of the rotor assembly (39, figure 12-4), brush and clip assemblies (28) and barrel assembly (1) with cleaning solvent (C205).

(2) Carefully dry with compressed air or clean lint-free cloth.

(3) Rotor assembly (39), particularly the commutator, should be cleaned with a dry brush. The commutator should be wiped clean to remove any film deposit.

b. Converter Assembly.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

Do not clean bearings with cleaning solvent.

(1) Wash all metal parts, with the exception of bearings (2, figure 12-3) with cleaning solvent (C205).

(2) Dry with compressed air or clean lint-free cloth.

12-15. Inspection — Windshield Wiper. a. General Inspection. Make a careful visual inspection of all parts to determine obvious defects or damage. Pay particular attention to the condition of threads on all bolts and nuts. Check for nicks, burrs, dents, and other deformations which may interfere with proper operation. Minimum or maximum measurement limits which determine replacement requirements are given in table 12-4.

b. Converter Assembly. Perform inspection of the converter assembly parts as follows: (figure 12-3).

(1) Visually inspect all parts for obvious defects or excessive wear.

(2) Check worm gear and housing assembly (9) and cover plate (12) for cracks.

(3) Check condition of all parts of the converter linkage assembly (11). Replace assembly if any of the following conditions are apparent; serrations on wiper shaft are stripped; gear teeth are chipped, broken, or show signs of excessive wear; linkage is distorted; bearings are rough (table 12-4).

(4) Check that bearings are free running.

(5) Check worm gear in worm and housing assembly (9) for free movement.

NOTE

If worm gear is found to be defective or worn, replace worm gear and housing assembly (9) which will contain new worm gear.

Table 12-4. Inspection Limits — Windshield Wiper

ITEM NO.	FIGURE NO.	DESCRIPTION	MAX	MIN	REMEDY
18	12-4	Bearing bore	**0.8665** inch	—	Replace end bell and idler shaft assembly if bearing bore exceeds dimension.
32	12-4	Bearing bore	**0.8665** inch	—	Replace end bell assembly if bearing bore exceeds dimension.
39	12-4	Shaft diameter	—	**0.2754** inch	Replace rotor assembly if shaft diameter is less than dimension.
39	12-4	Commutator diameter (Make sure surfaces are smooth and clean.)	—	**0.869** inch	Replace rotor assembly if commutator diameter is less than indicated.
28	12-4	Brush length	—	**5/32** inch	Replace brush and clip assembly if worn beyond dimension.
29	12-4	Brush spring compression	—	**1** in.-lb.	Replace brush holder assembly if spring pressure is less than indicated.
	12-2	Converter backlash (At wiper shaft)	**5** degrees	—	Replace converter linkage assembly (11, figure 12-3), if backlash is greater than indicated.

c. Electric Motor Assembly. Perform inspection of the electric motor assembly parts as follows: (figure 12-4).

(1) Visually inspect all parts for obvious defects or excessive wear. Particular attention should be given to gear and pinion teeth, gear posts and bores.

(2) Check that bearings are free running. Bearing fits should be snug but not tight at room temperature (table 12-4).

(3) Check windings on rotor assembly (39) and stator windings of barrel assembly (1) for broken leads and frayed insulation.

(4) Check commutator for excess wear and make sure surfaces are smooth and clean (table 12-4).

(5) Check brushes on brush and clip assemblies (28) and discard if excessively worn. Check brush holder assembly (29) spring pressure which should be adequate for positive contact (table 12-4).

(6) Check parking switch (3) by pressing in and releasing the switch actuating plunger. Switch action should be positive acting and a distinct "click" should be audible each time the plunger is pressed in or released. Reject switch if switch action is slow or terminals are loose, or if switch plunger is sufficiently worn to prevent positive contact with cam assembly (8).

12-16. Repair or Replacement — Windshield Wiper. a. Converter Assembly. Repair or replace parts of the converter assembly as follows:

(1) Discard preformed packing (15, figure 12-3) and replace during reassembly.

(2) Make minor repairs as necessary to correct minor defects. Replace defective or worn parts during reassembly.

b. Electric Motor Assembly. Repair or replace parts of the electric motor assembly. See figure 12-4 and table 12-4 for Inspection Limits.

(1) Resolder loose connections where necessary.

(2) Make minor repairs where practical, such as removing nicks and burrs, unless specific instructions are given. Replace all damaged, worn, or otherwise defective parts during reassembly.

12-17. Assembly — Windshield Wiper. a. Converter Assembly. To assemble the converter assembly, refer to figure 12-3.

(1) Position converter nameplate (3) on worm gear and housing assembly (9); secure with four screws (4). Stake screws.

NOTE

Apply sealing compound (C187.4) to all mating surfaces of nameplate (3) and idler cover plate (6) during reassembly.

(2) Position idler cover plate (6) on housing and secure with three screws (5). Stake screws.

(3) Position washer (7) in bearing bore against idler cover plate (6).

(4) Install washers (1) and bearings (2) on linkage assembly (11).

(5) Apply grease (C105) to housing and linkage assembly.

(6) Install linkage assembly (11) in housing with the wiper shaft eccentric positioned to the side as shown in figure 12-5.

(7) If removed during disassembly, install sleeve (14, figure 12-3) in cover plate (12). Stake sleeve (four places) to inside of cover plate.

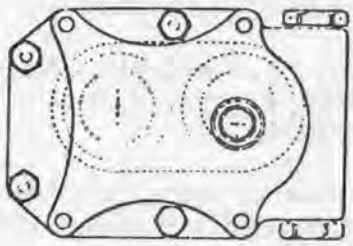
(8) Install packing (15) and sleeve (16) on inside of sleeve (14). Stake sleeve (16) in place.

(9) Clean all mating surfaces of worm gear and housing assembly (9) and cover plate (12).

(10) Apply sealing compound (C187.4) to all mating surfaces of cover plate (12) and worm gear and housing assembly (9). Position cover plate on housing and secure with four screws (8) and nuts (13).

(11) Install bolt (18) and retaining ring (17) on linkage shaft.

(12) Test converter assembly in accordance with paragraph 12-19.



ASSEMBLE LINKAGE WITH WIPER SHAFT ECCENTRIC POSITIONED TO THE SIDE AS SHOWN

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Figure 12-5. Positioning of wiper shaft eccentric

b. Electric Motor Assembly. To assemble the electric motor assembly, see figure 12-4.

NOTE

Refer to figure 12-6 for motor assembly schematic diagram.

(1) Position base (19) on barrel assembly (1) and secure with two screws (20).

(2) Install thermoprotector (23). Soft solder electrical leads to thermoprotector.

(3) Position two brush holder assemblies (29) on brush holder ring (35) and secure with four screws (33).

(4) Position brush holder (35) on end bell assembly (32) and secure with two screws (36) and lockwashers (34).

(5) Position brush holder end bell assembly on barrel assembly (1). Ensure locating pins are properly seated. Soft solder electrical leads to brush holder bases.

(6) Soft solder electrical leads to filter-connector (24). Install sub-base (21) on base and secure with two screws (22). Stake screws.

(7) Seat filter-connector in base cavity and secure with four screws (25). Secure screws with lockwire (C127).

NOTE

Driveshaft gear must be pressed onto rotor shaft with the inside diameter chamfered end leading.

(8) Install bearing (38) and driveshaft gear (40) on rotor assembly (39). Outer face of driveshaft gear must be **0.150 ±0.002** inch from surface of end bell and idle shaft assembly (18) when rotor is installed.

(9) Position spring washer (37) in bore of end bell assembly (32) with prongs against bearing (38). Carefully install rotor assembly in barrel assembly (1).

(10) Position end bell and idler shaft assembly (18) on barrel assembly (1). Be sure locating pins are properly seated.

(11) Install two tie bolts (16) and lockwashers (17).

(12) Install parking switch (3) and filter (4) and secure with two screws (6) and lockwashers (5). Soft solder electrical leads to parking switch and filter.

(13) Install washer (2) and idler gear assembly (15). Secure with retaining ring (7).

(14) Install idler gear assemblies (13 and 14) and cam assembly (8). Apply light coat of grease (C108.1) on all gear shafts, gear teeth, and on cam operating surface.

(15) Install washer (12) in gear case (11) and stake in place. Install insulator (9) in gear case and secure with sealing compound (C187.2).

(16) Install gear case (11) and secure with three screws (10). Do not lockwire screws until final assembly.

(17) Position brush and clip assemblies (28) in brush holders and secure with two screws (27) and lockwashers (30).

(18) Position brush cover insulation (44) and cover and nameplate assembly (41) on barrel assembly (1). Secure with three screws (42) and lockwashers (43).

(19) Install end cap (31). Secure with lockwire (C127).

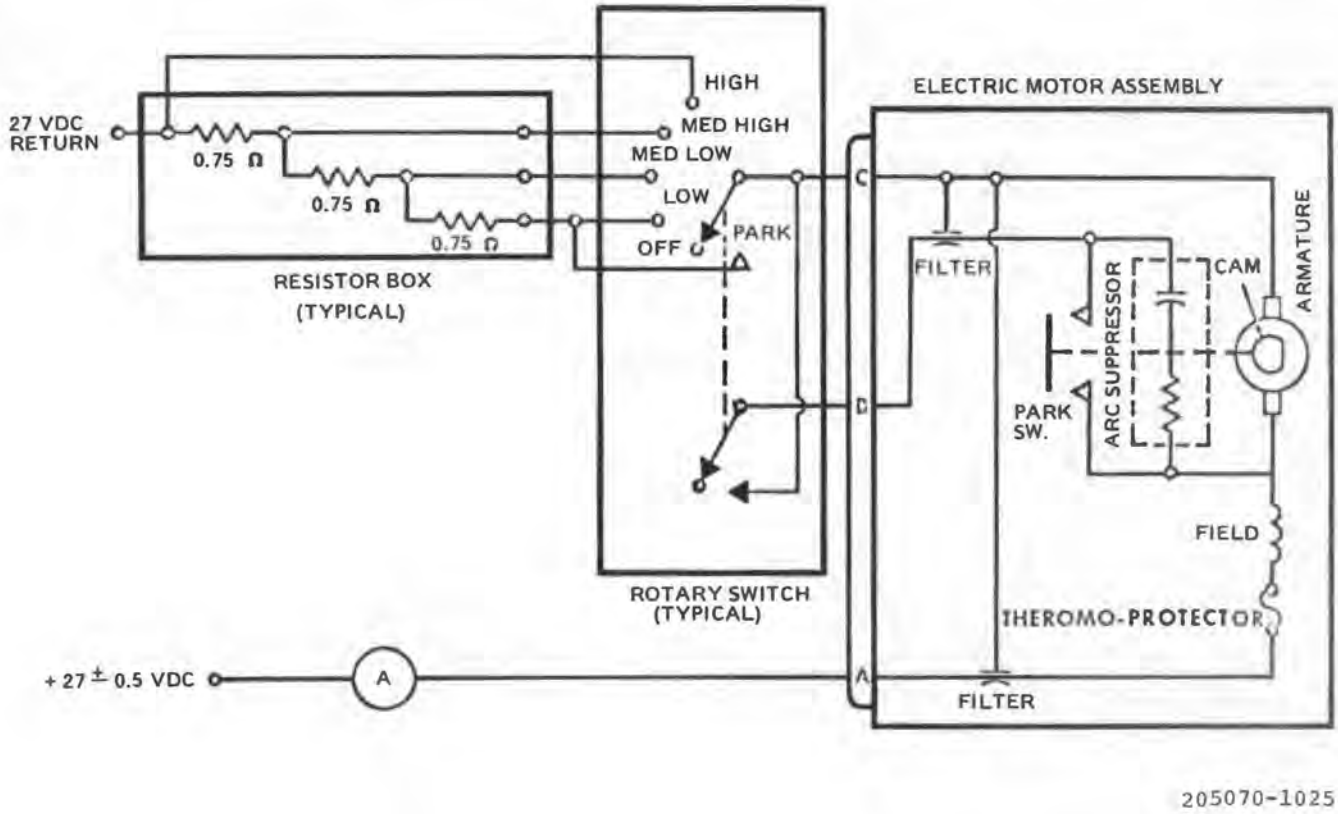


Figure 12-6. Electric motor assembly — schematic diagram

(20) Test electric motor assembly in accordance with paragraph 12-19.

12-18. Final Assembly — Windshield Wiper. The motor and converter assembly may be assembled in either the left-hand or right-hand configuration. Figure 12-7 illustrates both configurations and depicts the proper angular orientation of the electric motor assembly in respect to the converter assembly. Determine the desired configuration, then proceed as follows:

a. If lock inserts (20, figure 12-2) were removed from nipple (21) during disassembly, install new lock inserts. Install nipple in converter assembly (24).

b. Install coupling (22) on converter driveshaft.

c. Remove three screws (10, figure 12-4) securing gear case (11) to electric motor assembly; remove gear case.

d. Position lock plate (18, figure 12-2) on gear case (11, figure 12-4) flange. Screw gear case onto nipple (21, figure 12-2).

e. Install bracket (17) and secure with screws (14 and 16) and washers (15).

f. Remove worm end cap (10, figure 12-3) from converter assembly. Rotate converter driveshaft counterclockwise until the output shaft stops in the park position. After output shaft has stopped, continue rotating driveshaft counterclockwise and count the number of turns necessary before the output shaft reverses its direction of rotation. Divide this number of turns by two, and back up (rotate clockwise) converter driveshaft by that number of turns (i.e., four turns, back up two turns).

g. Slide cam assembly (8, figure 12-4) and idler gear assembly (13) just far enough to rotate cam assembly to a position so its flat segment opens parking switch (3). The flat segment of the cam assembly should be placed in a position approximately parallel to the side of the parking switch. Then slide cam assembly (8) and idler gear assembly (13) back to their fully installed position.

h. Position motor assembly on gear case (11). Ensure rotor shaft engages coupling (22, figure 12-2).

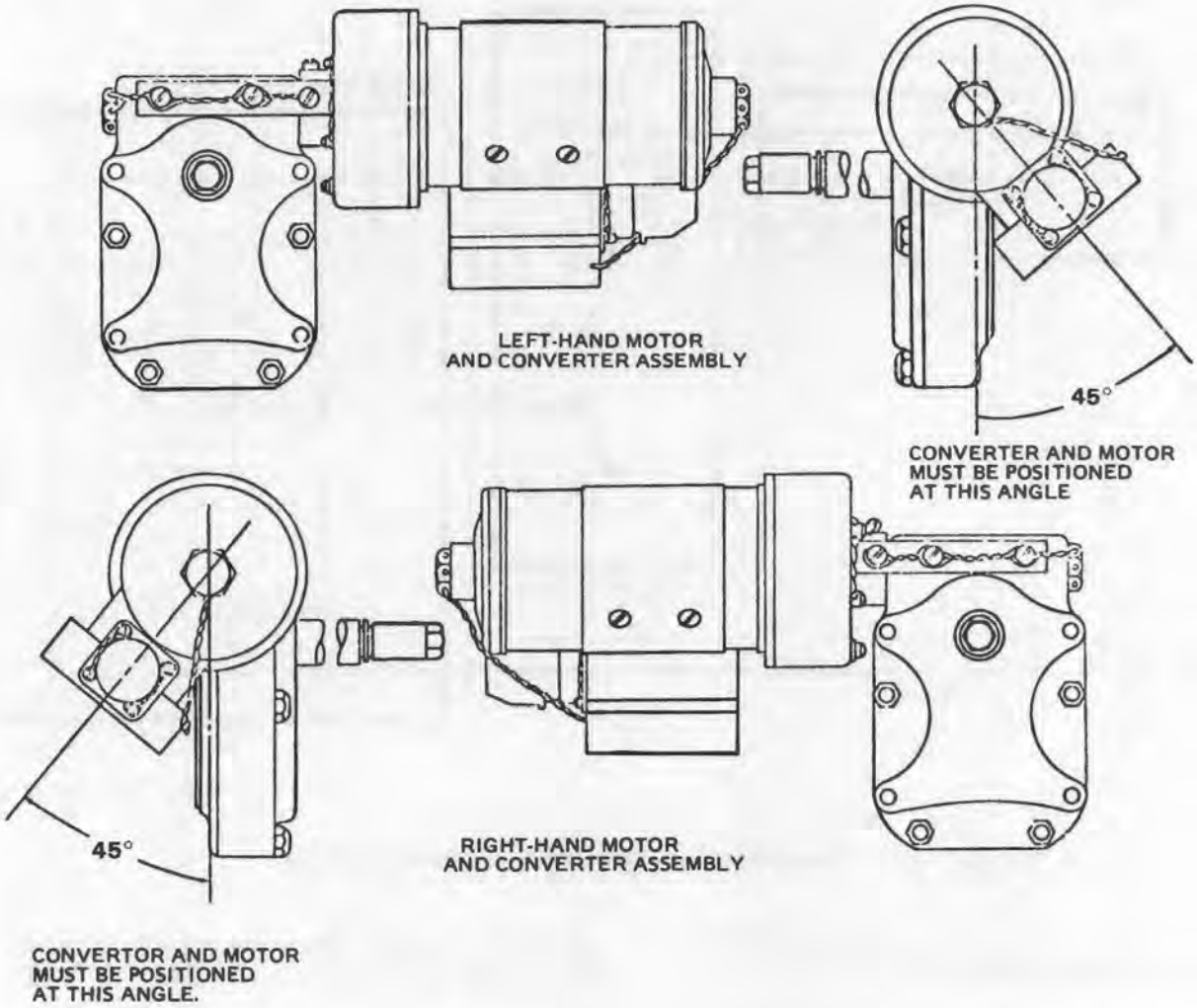


Figure 12-7. Motor and converter assembly — left and right configuration

Install three screws (10, figure 12-4) and secure with lockwire (C127).

i. Position converter assembly and electric motor assembly at **45** degree angle as shown in figure 12-7. Install screw (19, figure 12-2) to tighten lock plate (18). Secure screws (19, 14, and 16) with lockwire (C127).

j. Apply light coat of sealing compound (C187.4) to threads only of worm end cap (10, figure 12-3). Carefully install worm end cap in converter assembly. Sealing compound must not enter bearing in converter assembly. Secure end cap with lockwire (C127).

k. Test final assembly in accordance with paragraph 12-19.

12-19. Testing — Windshield Wiper. To test the complete motor and converter assembly, proceed as follows:

a. Install the motor and converter assembly on the helicopter (paragraph 12-20, and figure 12-2).

b. Install wiper blade.

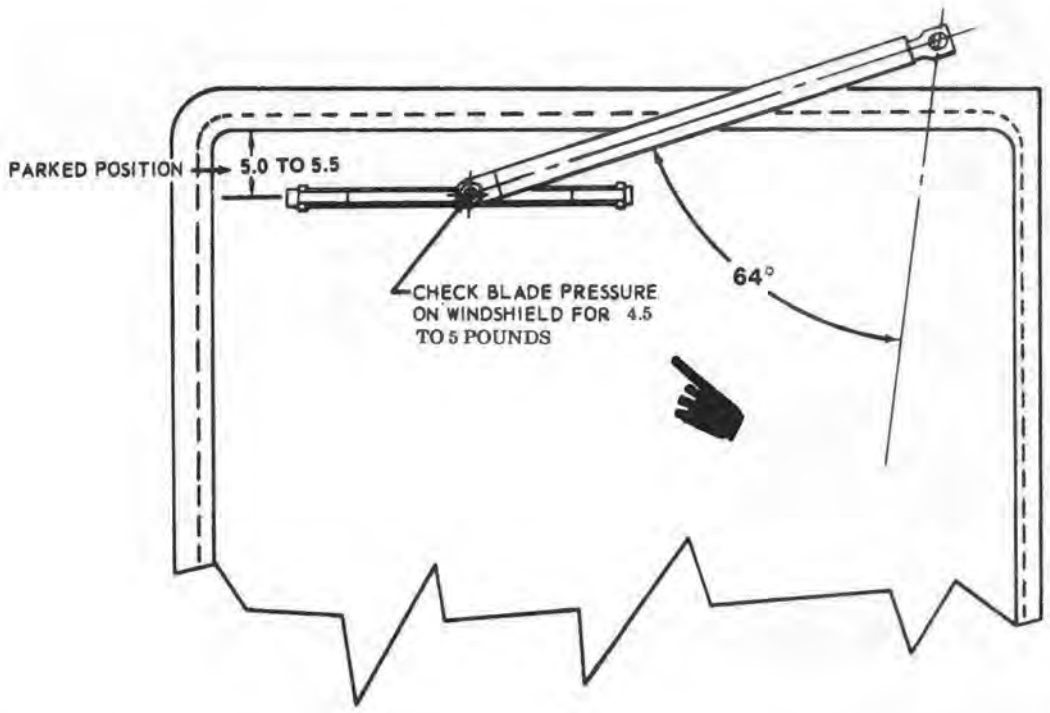


Figure 12-8. Testing windshield wiper

CAUTION

Do not operate wiper on dry windshields. Install 3/32 inch cotter key in standoff holes at base of arm before operating or performing maintenance.

Testing of the wiper with blade raised clear of windshield should be done in small increments. Do not allow blade to operate fast enough to cause whipping; this can bend wiper arm.

c. Turn rotary switch to any "on" position.

d. Turn rotary switch through OFF to PARK position, and hold in PARK for five seconds. Motor must not coast or creep through park position.

e. Repeat three times and observe that wiper blade returns to park position in the same place each time. (Figure 12-8).

f. Check **5.0 TO 5.5** inch distance from top of windshield.

g. Check blade pressure on windshield for 4.5 to 5 lbs.

h. Check travel arc for **64** degree movement.

12-20. Installation — Windshield Wiper Assembly. a. Position motor-converter (4, figure 12-2) in support and install mounting bolts (6), washers (5) and nuts.

b. Place converter shaft through hole in cabin and position head guard assembly over motor-converter. Align holes in headguard assembly (11) with holes in cabin. Install mounting screws (9) and washers (10) and connect electrical connection.

c. Operate the motor-converter so that wiper shaft is stopped in the PARK position.

d. Install wiper arm (3) and blade assembly (13) on serrated shaft so that blade will be parallel to and **5.0 TO 5.5** inches below the windshield wiper stop, with a slight upward pressure being applied to arm.

e. Tighten allen head screw clamping wiper arm to shaft, install washer and mounting bolt. Safetywire the allen head screw to the mounting bolt.

f. Adjust pressure of blade on windshield to 4.5 to 5 pounds measured at intersection of wiper blade and wiper arm.

CAUTION

Do not operate wiper on dry windshields. Install 3/32 inch cotter pin in standoff holes at base of arm before operating or performing maintenance.

Testing of the windshield wiper with blade raised clear of windshield should be done in small increments. Do not allow blade to operate fast enough to cause whipping; this can bend wiper arm.

g. Place BAT switch to ON position. Close PILOT WINDSHIELD WIPER circuit breaker. Operate the wiper through all speeds, and return to the PARK position.

h. Remove cotter pin from standoff holes and carefully lower blade onto windshield.

SECTION III — REAR VIEW MIRROR

12-21. REAR-VIEW MIRROR.

12-22. Description — Rear-View Mirror. An adjustable rear-view mirror is mounted outside the forward cabin under the nose door. This mirror, when properly adjusted, enables pilot to check visual operation of the cargo suspension assembly. On missions not requiring suspension assembly, the rear-view mirror may be removed to provide a clean configuration.

12-23. Removal — Rear-View Mirror. a. Remove cover (6, figure 12-9) from mirror (5).

b. Remove spring pins (4) from two adjustment handles (3) and remove both handles. Remove mirror (5).

c. Loosen and retain two bolts (13), washers (10), and nuts (11) attaching braces (8 and 12) and support (1). Remove three quick release pins (7) and remove braces and support as a unit.

d. Store rear-view mirror (5), braces (8 and 12), and support (1) in upper baggage compartment area, using strap, bracket, and hardware provided for this purpose.

12-24. Inspection — Rear-View Mirror. a. Inspect mirror (5, figure 12-9) for damage, security and cleanliness. Install cover (6) anytime mirror is not required for use.

b. Inspect support (1), braces (8 and 12), quick release pins (7) and clips (9) for damage and security.

12-25. Repair or Replacement — Rear-View Mirror. Replace parts (figure 12-9) that are cracked, corroded or damaged.

12-26. Installation — Rear-View Mirror. a. Install braces (8 and 12, figure 12-9) and support (1) to structure, using three quick release pins (7).

b. Position mirror (5) to support (1) and align mounting holes.

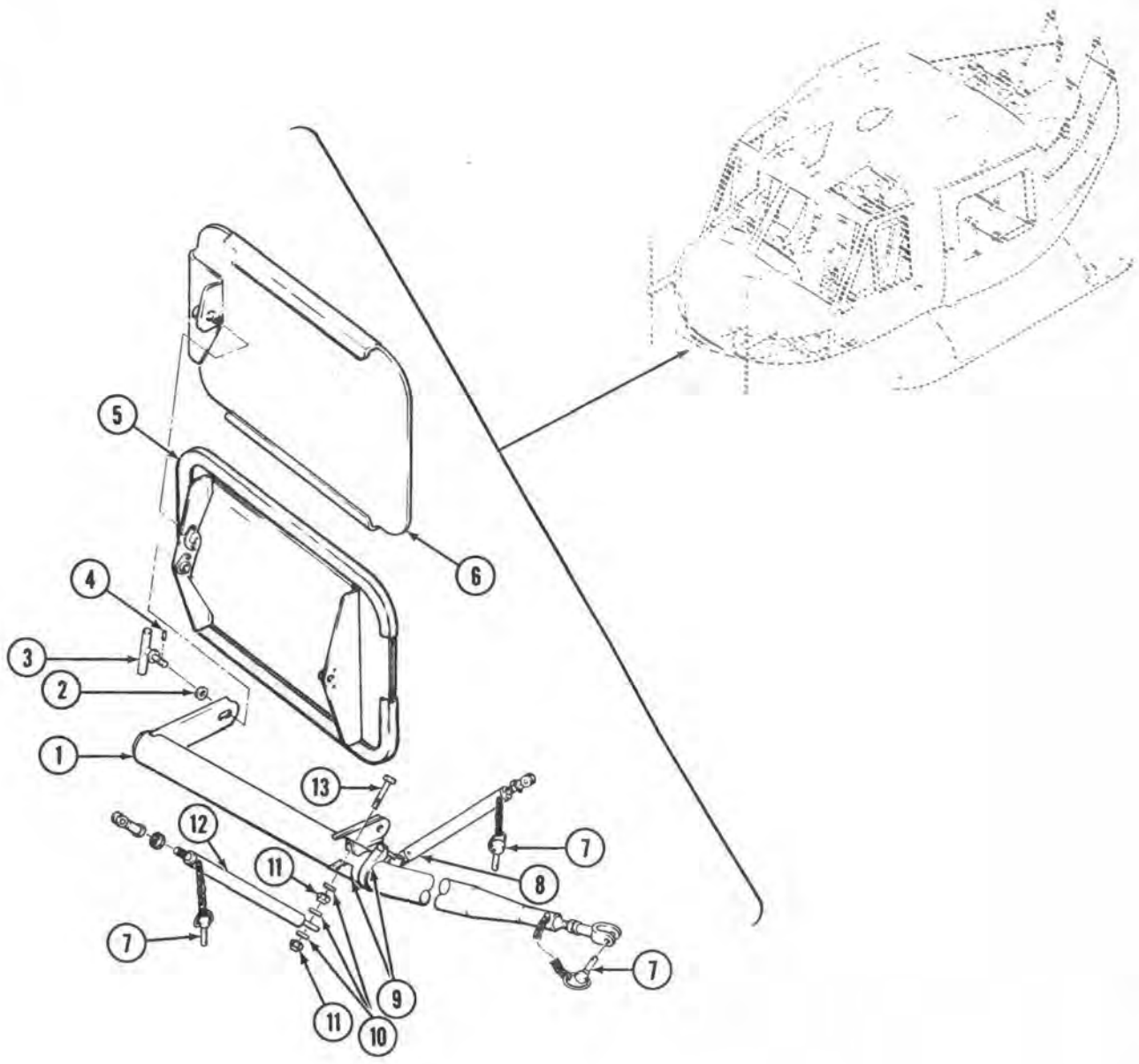
c. Screw two adjustment handles (3) through mounting holes with steel washers (2). Adjust mirror to desired angle, tighten adjustment handles, and insert spring pins (4) in threaded ends of handles.

d. Slide protective cover (6) over mirror and secure.

12-27. Adjustment — Rear-View Mirror. a. Remove two spring pins (4, figure 12-9) and loosen adjustment handles (3).

b. Manually adjust mirror (5) to desired angle requested by pilot.

c. Tighten adjustment handles (3) and insert spring pins (4).



1. Support
2. Washer — steel
3. Handle
4. Pin — spring
5. Mirror
6. Cover
7. Pin — quick release
8. Brace
9. Clip
10. Washer — steel
11. Nut
12. Brace
13. Bolt

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Figure 12-9. Rear-view mirror installation

CHAPTER 13

ENVIRONMENTAL CONTROL SYSTEM

SECTION I — HEATING SYSTEM

13-1. BLEED AIR HEATER AND DEFROSTER INSTALLATION.

13-2. Description — Bleed Air Heater and Defroster Installation. The basic helicopter is equipped with a heater-defroster system which uses engine compressor bleed air mixed with ambient air and routed through a distribution system to cabin outlets (figure 13-1). Controls, valves, and switches provide for the most effective utilization of the system. Thermal output is regulated by controlling the amount of bleed air drawn from the engine. The distribution system carries heated air from the hot air mixing valve to a heat/defrost valve which enables the pilot to direct air to the heat outlets or the windshield defrost nozzles. Two additional outlet positions are provided at the right and left doorposts. Air for these outlets is diverted from the main duct by a pilot controlled selector valve which provides control over the quantity of air diverted.

For cold weather operations, an auxiliary combustion-type heater may be installed in the right hand side of the fuselage (figure 13-2), aft of the cargo area. Fuel for the combustion air heater is supplied from the engine fuel system, or depending on helicopter serial number, a muff heater winterization kit utilizing engine exhaust heat is provided.

13-3. Troubleshooting — Bleed Air Heater and Defroster Installation.

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 13-1. Troubleshooting — Air Distribution System

CONDITION	TEST OR INSPECTION	CORRECTIVE ACTION
1. No heated air from nozzles or registers.		
	STEP 1. Manual HEAT SELECTOR control at wrong position.	**Set control to BLEED AIR ON.**
	STEP 2. Faulty limit switch at manual control.	**Replace switch (paragraph 9-5).**
	STEP 3. Open or faulty BLEED AIR circuit breaker.	**Reset or replace circuit breaker (paragraph 9-5).**
	STEP 4. Faulty AIR control switch CABIN HEATING panel.	**Replace switch (paragraph 9-5).**

Table 13-1. Troubleshooting — Air Distribution System (Cont)

CONDITION TEST OR INSPECTION CORRECTIVE ACTION
STEP 5. Faulty connection on bleed air valve. **Repair electrical circuit to valve (paragraph 9-5).**
2. Restricted warm air supply at nozzles and registers.
STEP 1. Faulty bleed air valve operation. **Repair control circuit or replace valve (paragraph 13-5).**
STEP 2. Faulty air mixing valve. **Replace valve (paragraph 13-17).**
STEP 3. Faulty BLEED AIR FOUR-WAY circuit or distribution valve operation. **Repair control circuit, or replace valve or solenoid (paragraph 13-35 or 13-41).**
STEP 4. Leaks or obstruction in ducts. **Repair or replace ducts (paragraph 13-47).**
STEP 5. Air leaking through valve to right-side (auxiliary heater) duct system. **Repair or replace valve (paragraph 13-35).**
3. Excessive hot air.
STEP 1. Faulty air mixing valve. **Replace valve (paragraph 13-17).**

13-4. Inspection — Bleed Air Heater and Defroster Installation. **a.** Check heater ducts for cracks, fraying, and wear (paragraph 13-47).

b. Check clamps for security and condition.

c. Check defrost nozzles (1, figure 13-1) and underseat registers (12) for cleanliness and freedom from obstructions (paragraph 13-47).

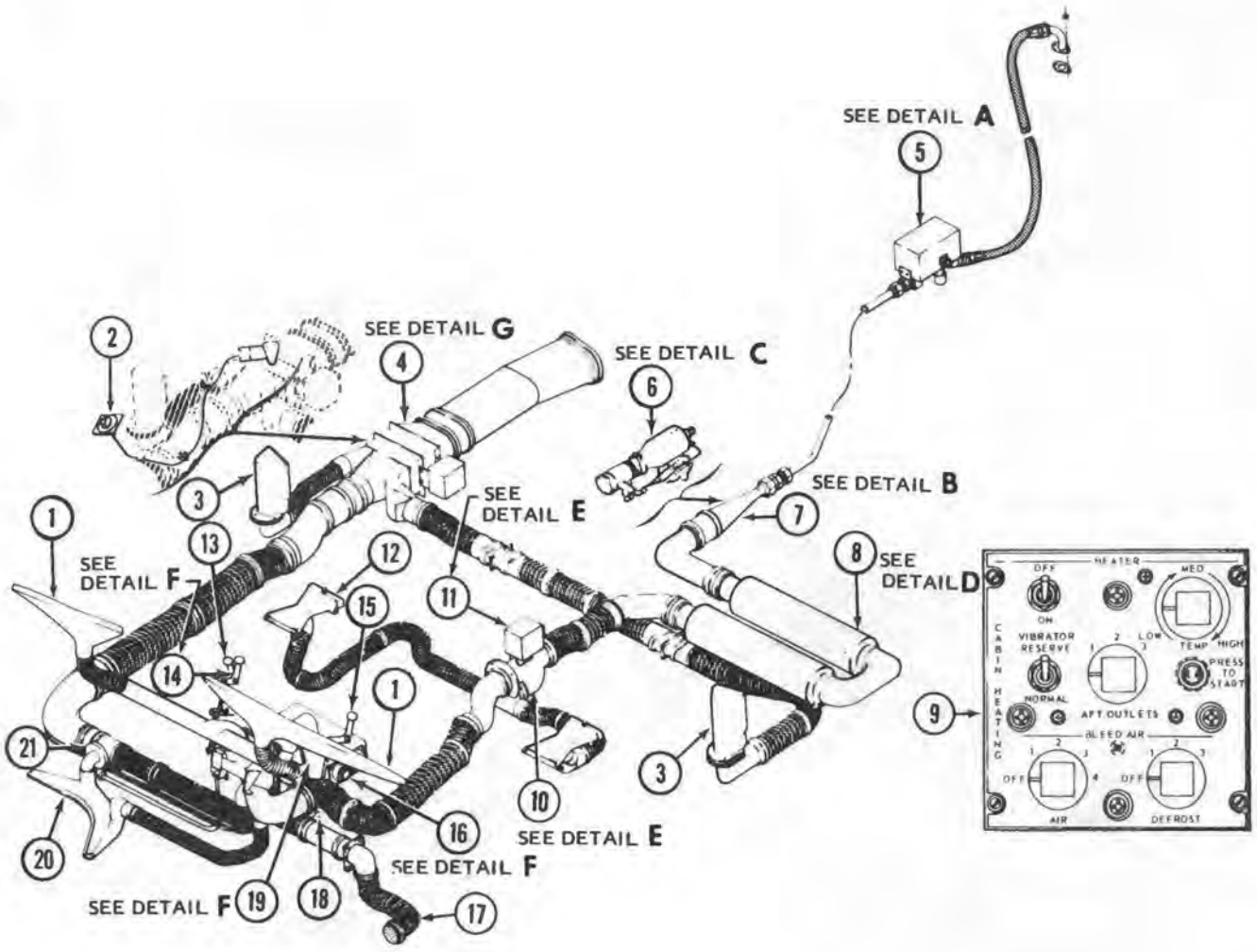
d. Check manual control levers (13 and 14) on pedestal for operation and freedom of movement.

e. Check electrical connections on all switches and circuit breakers for security.

f. Check bleed air control valve (10) for operation and security of attachment (paragraph 13-35).

g. Check bleed air hose for security of attachment to bleed air selector (paragraph 13-5).

h. Check bleed air mixing valve (6) for operation and security of attachment (paragraph 3-17).



1. Windshield defroster nozzles
2. Selector valve control dial and cable
3. Aft cabin air valve
4. Selector valve, combustion heater
5. Selector valve, bleed air
6. Hot air mixing valve
7. Venturi assembly
8. Noise suppressors
9. Heat control panel
10. Bleed air four way control valve
11. Four way control valve solenoid
12. Cabin floor registers
13. Right lower defroster control
14. Heater and bleed air
15. Copilot foot warmer control
16. Pilot and copilot heat air valves
17. Copilot heat outlet
18. Copilot foot warmer control valve
19. Heating and bleed air separator valve
20. Right lower defroster nozzle
21. Right lower defroster control valve

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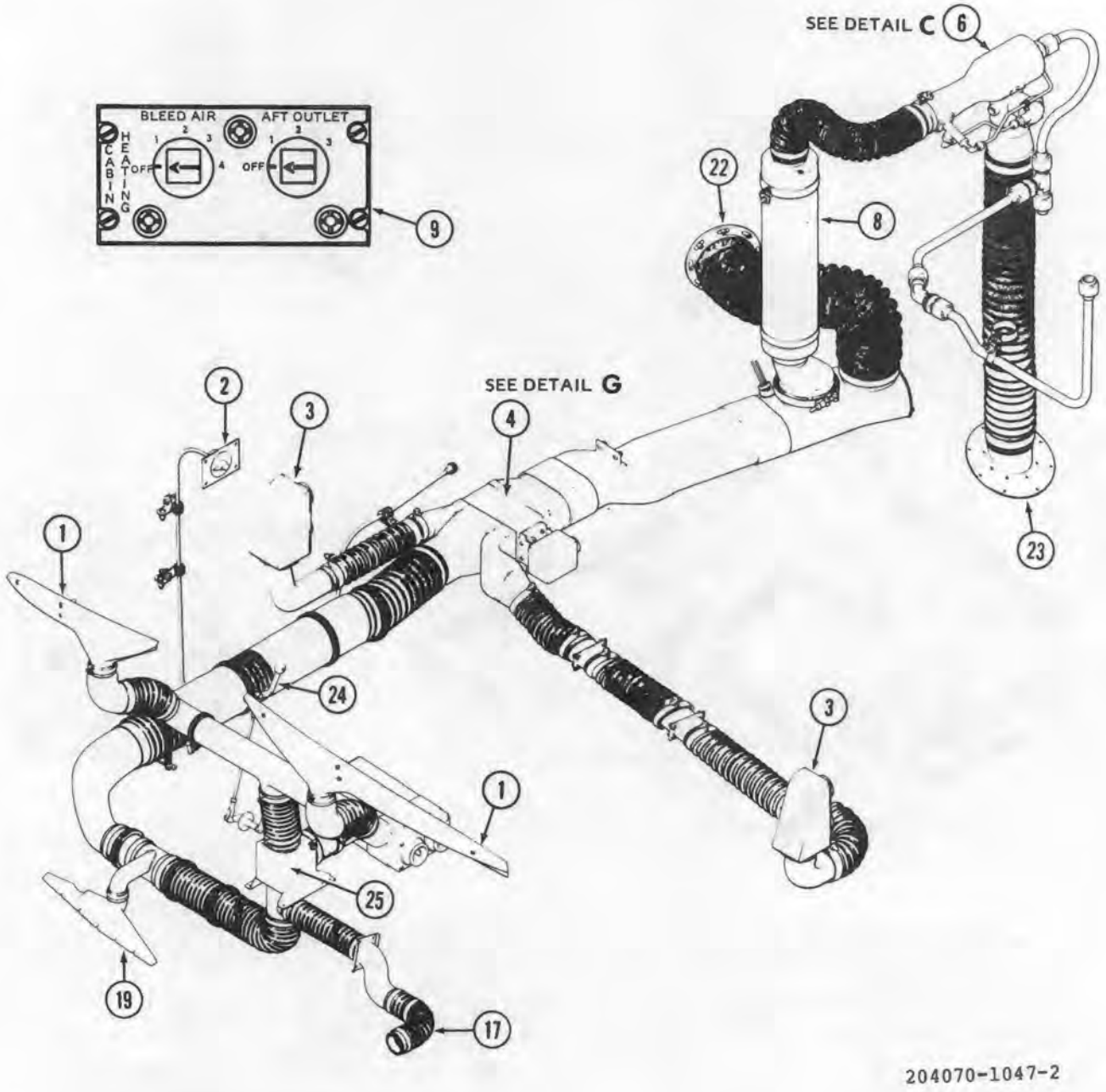
Figure 13-1. Heating and defrosting system — bleed air (typical) serial number 65-9416 and subsequent (Sheet 1 of 4)



22. Spot heating connection
23. Fresh air intake screen
24. Air directing control lever
25. Air directing valve

Figure 13-1. Heating and defrosting system — bleed air (typical) serial number 65-9416 and subsequent (Sheet 2 of 4)

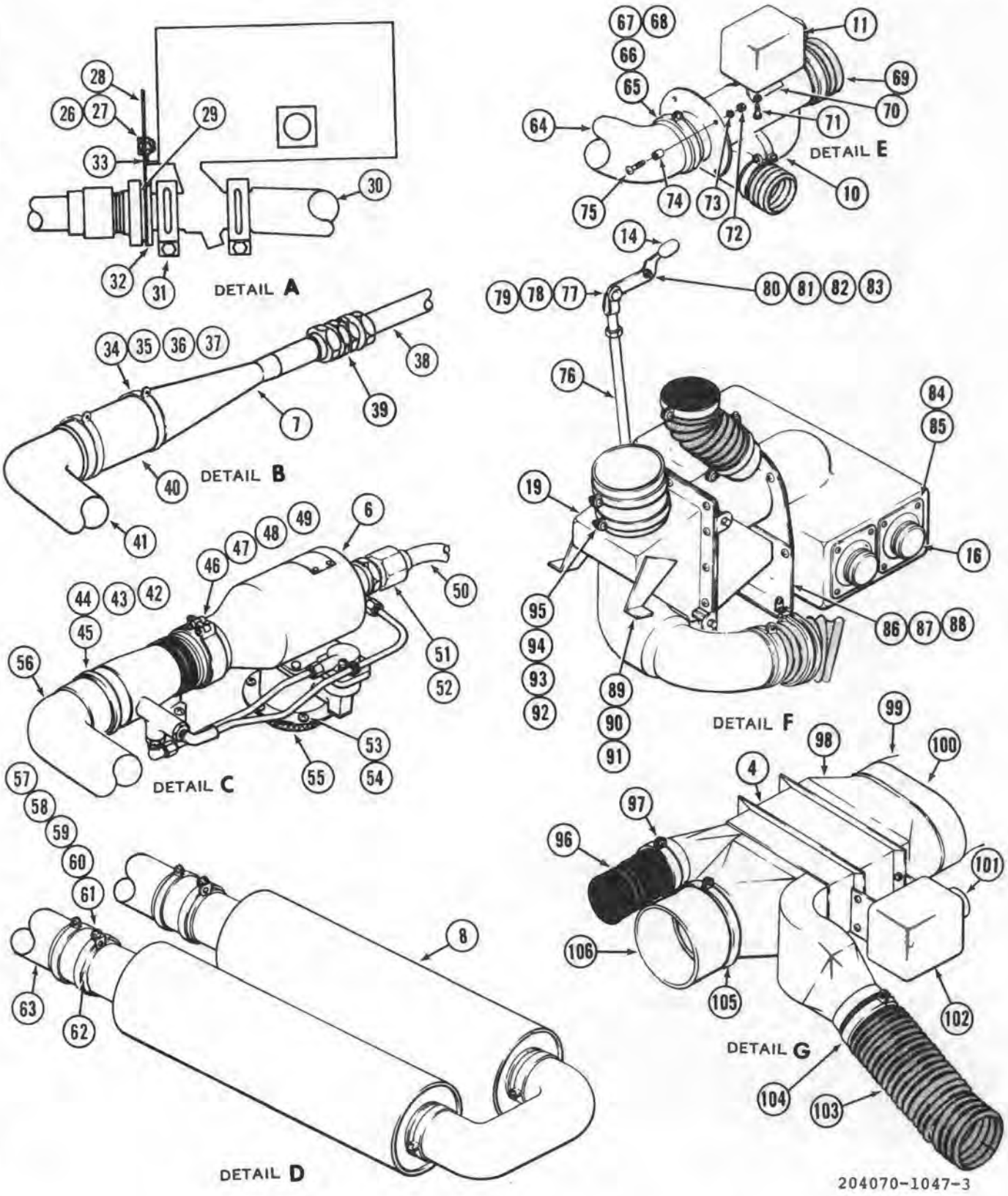


Figure 13-1. Heating and defrosting system — bleed air (typical) serial number 65-9416 and subsequent (Sheet 3 of 4)

26. Washer
27. Bolt
28. Engine firewall
29. Preformed packing
30. Tee
31. Clamp assembly
32. Bulkhead fitting
33. Bracket
34. Clamp
35. Screw
36. Washer
37. Nut
38. Bleed air line
39. Bulkhead fitting
40. Coupling
41. Elbow
42. Washer
43. Nut
44. Screw
45. Clamp
46. Washer
47. Nut
48. Screw
49. Clamp
50. Air inlet line
51. Nut
52. Washer
53. Screw
54. Washer
55. Screen
56. Duct
57. Clamp
58. Screw
59. Nut
60. Washer
61. Spacer
62. Coupling
63. Duct
64. Duct
65. Nut
66. Washer
67. Screw
68. Clamp
69. Coupling
70. Washer
71. Bolt
72. Nut
73. Washer
74. Spacer
75. Screw
76. Control rod
77. Pin
78. Washer
79. Cotter pin
80. Bolt
81. Washer
82. Nut
83. Cotter pin
84. Washer
85. Screw
86. Screw
87. Washer
88. Nut
89. Screw
90. Nut
91. Washer
92. Nut
93. Washer
94. Screw
95. Clamp
96. Hose
97. Clamp
98. Thermostatic switch
99. Hot air duct
100. Glass cloth
101. Electrical connector
102. Solenoid
103. Hose
104. Clamp
105. Clamp
106. Duct

204070-1047-4

Figure 13-1. Heating and defrosting system — bleed air (typical) serial number 65-9416 and subsequent (Sheet 4 of 4)

13-5. BLEED AIR SELECTOR VALVE.

13-6. Description — Bleed Air Selector Valve. The bleed air selector valve is a five position, electrically operated valve (5, figure 13-1). This valve is located just aft of forward engine firewall and left of the engine. The valve is operated by a switch in the overhead console heater control panel.

13-7. Removal — Bleed Air Selector Valve. a. Ensure battery switch is OFF.

b. Open engine cowl on left side of engine compartment.

c. Disconnect electrical connection to valve solenoid on selector valve (5) and cover wire end with insulating tape.

NOTE

Bolt heads are on forward side of engine firewall.

d. Remove bolts (27) and washers (26) attaching valve bracket (33) to aft side of engine firewall (28).

e. Remove clamps (31) attaching valve (5) to tee (30) and bulkhead fitting (32) and remove valve (5) from bleed air line together with preformed packing (29) at each end of valve.

13-8. Inspection — Bleed Air Selector Valve. Inspect selector valve (5) for damage and serviceability.

13-9. Repair or Replacement — Bleed Air Selector Valve. Replace damaged or unserviceable selector valve (5).

13-10. Installation — Bleed Air Selector Valve a. Position preformed packing (29) on each end of selector valve (5) and position valve (5) between tee (30) and bulkhead fitting (32). Loosely install clamps (31) attaching valve (5) to tee (30) and fitting (32). Connect valve to tee and bleed air line.

NOTE

Bolt heads are on forward side of engine firewall.

b. Install washers (26) and bolts (27) attaching valve bracket (33) to aft side of engine firewall (28).

c. Tighten clamps (31) attaching valve (5) to tee (30) and bulkhead fitting (32). Remove insulating tape from wire end and connect electrical wiring to valve (5).

d. Close engine cowl.

13-11. BLEED AIR VENTURI ASSEMBLY.

13-12. Description — Bleed Air Venturi Assembly. Bleed air from selector valve is conducted into system by means of a venturi assembly (7, figure 13-1) located under aft cabin floor just forward of the aft cabin bulkhead.

13-13. Removal — Bleed Air Venturi Assembly. a. Remove access plate from aft cabin floor.

b. Back off nut on venturi assembly (7) to disconnect venturi from bleed air inlet line (38).

c. Remove screw (35), washer (36), nut (37), and clamp (34) attaching venturi (7) to outlet coupling (40) and bracket and remove from helicopter.

13-14. Inspection — Bleed Air Venturi Assembly. Inspect bleed air venturi (7) assembly for damage, corrosion and general condition.

13-15. Replacement — Bleed Air Venturi Assembly. Replace bleed air venturi assembly (7) if damaged, corroded or otherwise unserviceable.

13-16. Installation — Bleed Air Venturi Assembly. a. Position venturi assembly between bleed air inlet line (38) and outlet coupling (40) and attach to coupling by installing clamp (34), nut (37), washer (36), and screw (35).

b. Connect venturi assembly (7) to bleed air inlet line (38).

c. Install access plate in aft cabin floor.

13-17. HOT AIR MIXING VALVE.

13-18. Description — Hot Air Mixing Valve. The helicopter is equipped with a hot air mixing valve (6, figure 13-1) located under the aft cabin floor just forward of aft cabin bulkhead. This valve controls the temperature of cabin heating and defrosting air by mixing bleed air from the engine compressor section with outside air. The bleed air acts as the power source to operate the valve and control the intake of outside air. The outside air inlet butterfly valve is fully closed at or below a mixed air temperature of **180 ± 5** degrees F (**82 ± 2** degrees C), and is fully open at or above a mixed air temperature of **220 ± 5** degrees F (**104 ± 2** degrees C).

13-19. Removal — Hot Air Mixing Valve. a. Remove access plate from aft cabin floor.

b. Remove screws (48, figure 13-1), washers (46), nuts (47), and clamps (49) attaching mixing valve assembly (6) to support bracket and output duct assembly (56).

c. Loosen nut (43) and washers (42) attaching mixing valve assembly (6) to support bracket and output duct assembly (56).

d. Loosen nut (51) and washer (52) attaching mixing valve assembly (6) to bleed air inlet line (50) and remove valve assembly.

e. Remove screws (53) and washers (52) attaching screen assembly (55) to valve (6) and remove screen assembly from valve.

13-20. Inspection — Hot Air Mixing Valve. Inspect hot air mixing valve (6, figure 13-1) for damage, corrosion and general condition.

13-21. Replacement — Hot Air Mixing Valve. Replace hot air mixing valve (6, figure 13-1) if damaged, corroded or otherwise unserviceable.

13-22. Installation — Hot Air Mixing Valve. a. Position screen assembly (55, figure 13-1) on mixing valve (6) and install attaching washers (54) and screws (53).

b. Position valve assembly (6) between bleed air inlet line (50) and output duct assembly (56) and attach to bleed air inlet line (50) with washer (52) and nut (51).

c. Attach valve assembly (6) to output duct assembly (56) with clamps (45 and 49), nuts (43 and 47), washers (42 and 46), and screws (44 and 48).

d. Install access plate in aft cabin floor.

13-23. TEMPERATURE SENSITIVE ELEMENT.

13-24. Description — Temperature Sensitive Element. The helicopter is equipped with a temperature sensitive element located on rear of the aft cabin bulkhead in the engine compartment.

13-25. Removal — Temperature Sensitive Element. a. Ensure battery switch is OFF.

b. Open engine cowl on left side of engine compartment.

c. Disconnect electrical connection on element and cover wire ends with insulating tape.

d. Remove screws and washers attaching element to support and remove element.

13-26. Inspection — Temperature Sensitive Element. Visually inspect for cracks, dents and external damage.

13-27. Repair or Replacement — Temperature Sensitive Element. Replace temperature sensitive element if cracked, dented or damaged.

13-28. Installation — Temperature Sensitive Element. a. Position element on support and install washers and screws.

b. Remove insulating tape from wire ends and connect electrical wiring to element.

c. Close engine cowl.

13-29. NOISE SUPPRESSORS.

13-30. Description — Noise Suppressors. Two in-line, straight-through noise suppressors (8, figure 13-1), are located between venturi assembly, hot air mixing valve, and bleed air four-way control valve.

13-31. Removal — Noise Suppressors. a. Remove access panels to expose suppressors.

b. Remove screws (58, figure 13-1), washers (60), spacers (61), nuts (59), and clamps (57) attaching noise suppressors to flexible ducts (63) and remove noise suppressors.

13-32. Inspection — Noise Suppressors. a. Inspect noise suppressors (8, figure 13-1) for cracks, dents and holes.

b. Inspect for corrosion and security of installation.

13-33. Repair or Replacement — Noise Suppressor. Minor nicks and scratches are permissible; however, cracks, dents, and holes are cause for replacement of unit.

13-34. Installation — Noise Suppressors. a. Position noise suppressors on flexible ducts (63, figure 13-1), and install attaching clamps (57), nuts (59), spacers (61), washers (60), and screws (58).

b. Install access panels.

13-35. BLEED AIR FOUR-WAY CONTROL VALVE.

13-36. Description — Bleed Air Four-Way Control Valve. The solenoid operated, four-way control valve (10, figure 13-1) is located between the floor registers and directs heated air to either defroster nozzles or cabin floor registers. It is operated by a switch in overhead console heater control panel.

13-37. Removal — Bleed Air Four-Way Control Valve. a. Ensure battery switch is OFF.

b. Remove access panel in bottom outside skin.

c. Disconnect electrical plug from solenoid (11) and cover plugs with insulating tape.

d. Remove screws (67), washers (66), nuts (65), and clamps (68) attaching ducts to control valve (10).

e. Remove screws (75), spacers (74), washers (73) and nuts (72) mounting control valve (10) to bulkhead and remove valve from helicopter.

13-38. Inspection — Bleed Air Four-Way Control Valve. Inspect bleed control valve (10, figure 13-1) for corrosion, damage and general condition.

13-39. Replacement — Bleed Air Four-Way Control Valve. Replace control valve (10, figure 13-1) if damaged, corroded or otherwise unserviceable.

13-40. Installation — Bleed Air Four-Way Control Valve. a. Position control valve in helicopter and install four screws (75, figure 13-1), spacers (74), washers (73) and nuts (72).

b. Install ducts on valve (10) using clamps (68), screws (67), washers (66) and nuts (65).

c. Remove insulating tape from electrical plug and connect plug to solenoid.

d. Install access panel in bottom outside skin.

13-41. FOUR-WAY CONTROL VALVE SOLENOID.

13-42. Description — Four Way Control Valve Solenoid. The four-way control valve solenoid (11, figure 13-1) is mounted on top of four-way control valve. The solenoid is controlled by a DEFROST switch on overhead panel.

13-43. Removal — Four-Way Control Valve Solenoid. a. Remove four-way control valve (paragraph 13-28).

b. Remove bolts (71) and washer (70) attaching solenoid (11) to mount on top of solenoid valve (11) housing and remove solenoid from valve.

13-44. Inspection — Four-Way Control Valve Solenoid. Check electrical connection on control valve solenoid (11, figure 13-1) for security and condition of cables. Inspect connector for damage and corrosion.

13-45. Repair or Replacement — Four-Way Control Valve Solenoid. a. Secure loose cable or connector of solenoid (11, figure 13-1).

b. Replace solenoid cable if frayed or worn.

c. Replace solenoid connector if corroded or damaged.

13-46. Installation — Four-Way Control Valve Solenoid. a. Position solenoid valve (11, figure 13-1) on control valve (10) housing mount with shaft entering into flapper shaft adapter.

NOTE

Energized solenoid must be in starting or neutral position prior to attaching shaft to adapter. In neutral position the flats of the solenoid shaft are at right angles to center line of the solenoid and should be at right angles to the adjoining flapper in the top duct.

b. Align mounting holes of solenoid (11) and install washers (70) and bolts (71).

c. Install four-way control valve (paragraph 13-29).

13-47. DUCTS, NOZZLES, REGISTERS, GASKETS AND MISCELLANEOUS VALVES.

13-48. Description — Ducts, Nozzles, Registers, Gaskets and Miscellaneous Valves. Various components are used to interconnect the heater and defroster system. These items are located at various places throughout the helicopter as shown in figure 13-1.

13-49. Removal — Ducts, Nozzles, Registers, Gaskets and Miscellaneous Valves. Remove attaching hardware and/or clamps and remove component.

13-50. Inspection — Ducts, Nozzles, Registers, Gaskets and Miscellaneous Valves. Inspect ducts for cracks, fraying, or corrosion. Inspect nozzles, registers, screens, gaskets and valves for damage.

13-51. Repair or Replacement — Ducts, Nozzles, Registers, Gaskets and Miscellaneous Valves. a. Replace ducts if cracked, frayed, corroded, or worn.

b. Replace damaged or unserviceable nozzles, registers, screens, and valves.

c. Replace unserviceable gaskets.

13-52. Installation — Ducts, Nozzles, Registers, Gaskets and Miscellaneous Valves. Install components and secure with attaching hardware and clamps.

13-53. HEATING AND BLEED AIR SEPARATOR VALVE CONTROL.

13-54. Description — Heating and Bleed Air Separator Valve Control. The handle of the heating and bleed air separator valve control (14, figure 13-1) is located on the side of the instrument pedestal and shall be in aft detent to operate on bleed air.

13-55. Removal — Heating and Bleed Air Separator Valve Control. a. Remove pins (77, figure 13-1) and washers (78) from each end of control rod (76) and remove rod.

b. Remove cotter pin (83), nut (82), washers (81), and bolt (80) attaching control handle (14) and remove handle.

13-56. Installation — Heating and Bleed Air Separator Valve Control. a. Position control handle (14) and attach with bolt (80), washers (81), nut (82), and cotter pin (83).

b. Position control rod (76) and attach each end with pins (77), washer (78) and cotter pins (79).

13-57. PILOT AND COPILOT HEAT AIR VALVES.

13-58. Description — Pilot and Copilot Heat Air Valves. The pilot and copilot heat air valves (16, figure 13-1) are located in forward part of the cabin.

13-59. Removal — Pilot and Copilot Heat Air Valves. Remove screws (85, figure 13-1) and washers (84) attaching heat air valves (16) and remove valves.

13-60. Inspection — Pilot and Copilot Heat Air Valves. Inspect heat air valves (16, figure 13-1) for corrosion, cracks, damage and general condition.

13-61. Repair or Replacement — Pilot and Copilot Heat Air Valves. Replace heat air valves (16, figure 13-1) if cracked, damaged or otherwise unserviceable.

13-62. Installation — Pilot and Copilot Heat Air Valves. Position heat air valves (16, figure 13-1) and install attaching washers (84) and screws (85).

13-63. HEATING AND BLEED AIR SEPARATOR VALVE.

13-64. Description — Heating and Bleed Air Separator Valve. The heating and bleed air separator valve (19, figure 13-1) is located in the lower forward portion of the instrument pedestal and controls heated air for both the pilot and copilot upper windshield, as well as the pilot lower panel defroster outlet. On helicopters 64-14101 through 64-14191, these switches are located on the right side of the instrument pedestal. The upper microswitch must be actuated to turn on the five-position selector valve located near the engine. If the bleed air is on and this microswitch is de-energized, the five-position valve will rotate to the off position. The lower of these two microswitches is used with the auxiliary combustion heat system and actuates the door post outlet control valve. The function of the separator control valve is to prevent the mixing of high pressure bleed air with low pressure combustion air.

13-65. Removal — Heating and Bleed Air Separator Valve. a. Ensure battery switch is OFF.

b. Remove instrument pedestal access doors.

c. Disconnect wiring from microswitches and cover wire ends with insulating tape.

d. On helicopters 64-14101 through 64-14191, remove the screws, washers, and nuts attaching the microswitches to the brackets and remove the switches.

e. Remove cotter pin (79), washer (78), and pin (77) attaching lower end of control rod (76) to separator valve (19).

f. Remove four screws (86), washers (87), and nuts (88) attaching air valves and duct combination (16) to separator valve and support bracket (19). Remove valves and duct combination and gasket.

g. Remove three screws (89), washers (91), and nuts (90) attaching forward part of separator valve (19) to instrument pedestal.

h. Remove screws (94), washers (93), nuts (92), and clamps (95) attaching ducts and hoses to seaparator valve (19) and remove valve.

13-66. Inspection — Heating and Bleed Air Separator Valve. Inspect separator valve (19, figure 13-1) for damage and serviceability.

13-67. Repair or Replacement — Heating and Bleed Air Separator Valve. Replace gasket and separator valve if damaged or otherwise unserviceable.

13-68. Installation — Heating and Bleed Air Separator Valve. a. Position separator valve (19) and attach ducts and hoses with clamps (95), nuts (92), washers (93), and screws (94).

b. Attach forward part of separator valve (19) to instrument panel with three nuts (90), washers (91), and screws (89).

c. Position gasket and air valves and duct combination (16) on aft part of separator valve (19) and support bracket and install four attaching nuts (88), washers (87), and screws (86).

d. Attach lower end of control rod (76) to separator valve (19) with pin (77), washers (78), and cotter pin (79).

NOTE

Adjust the bleed air microswitch (upper) to indicate when the flappers are fully closed. This will give a maximum overtravel of 0.03 inch. Adjust the aft outlet microswitch (lower) to indicate when the flappers are fully open. This will give a maximum overtravel of 0.12 inch.

e. On helicopters 64-14101 through 64-14191, position the microswitches on the brackets and install the attaching nuts, washers, and screws.

f. Remove insulating tape from wire ends and connect wiring to microswitches.

g. Install instrument pedestal access doors.

13-69. MUFF HEATER.

13-70. Description — Muff Heater. The auxiliary exhaust heater system (figure 13-2) consists of a heat exchanger on the exhaust tailpipe, a blower for circulating air through the heat exchanger, a mixing valve to maintain the desired temperature, a selector valve assembly which controls the flow of air to aft cabin outlet ducts, a selector dial to actuate the remote sensor which controls the mixing valve, and a control lever assembly. A screen covers the inlet duct of the blower. Air is routed through the sae ducts, valve and controls used by the bleed air heater installation. The muff heater is connected to the air duct at station 149.

13-71. Troubleshooting — Muff Heater System.

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 13-2. Troubleshooting — Muff Heater System

CONDITION	TEST OR INSPECTION	CORRECTIVE ACTION
1. No heat from air valves.	STEP 1. Selecting dial (on right door post) set to minimum heat position.	**Set selecting dial.**

Table 13-2. Troubleshooting — Muff Heater System (Cont)

CONDITION TEST OR INSPECTION CORRECTIVE ACTION
2. Heater output cycles from hot to cold and back to hot.
STEP 1. Remote sensor (thermostat) malfunctioning. **Replace remote sensor (paragraph 13-86).**
STEP 2. Air mixing valve malfunctioning. **Replace air mixing valve (paragraph 13-17).**
3. Heater output excessively hot.
STEP 1. Selecting dial on right door post incorrectly set or faulty. **Set or replace selecting dial (paragraph 13-194).**
STEP 2. Remote sensor (thermostat) faulty. **Replace remote sensor (paragraph 13-86).**
STEP 3. Air mixing valve malfunctioning. **Replace air mixing valve (paragraph 13-17).**

13-72. HEAT EXCHANGER.

13-73. Description — Heat Exchanger. The heat exchanger (19, figure 13-2) is mounted on the tailpipe of the engine and serves to heat the air as it is circulated through the distribution system by the blower.

13-74. Removal — Heat Exchanger. a. Open small access door at lower left on tailpipe fairing and disconnect antenna and collision light wiring at deck connectors. Open section of driveshaft access door which overlaps tailpipe fairing. Release fasteners and remove fairing.

b. Disconnect tailpipe fuel drain hose coupling.

c. Remove clamps securing ducts to air inlet and outlet ports of heat exchanger.

d. Remove V-band clamp securing starter-generator exhaust air duct to heat exchanger.

e. Remove V-band from mating flanges of engine exhaust diffuser and tailpipe. Remove heat exchanger.

f. Install protective cover on engine exhaust diffuser opening to prevent entry of foreign matter.

13-75. Inspection — Heat Exchanger — Auxiliary Exhaust Heater (Visual) (Installed). a. Inspect tailpipe heat exchanger for cracks or holes.

b. Ensure that heat exchanger is securely mounted and connections are tight.

13-76. Inspection — Heat Exchanger — Auxiliary Exhaust Heater — Functional (Uninstalled). a. Perform leakage test on heat exchanger as follows:

(1) Cap off ventilating air ports on exchanger.

CAUTION

Do not exceed 2.5 psig in performing leakage test.

(2) Attach regulated air supply and pressurize to 2 psig. Close off air supply and monitor pressure gage for two minutes. A drop in pressure indicates a leak.

b. Inspect heat exchanger for leakage. There shall be no leakage allowed into the exhaust side of the heat exchanger.

13-77. Inspection — Heat Exchanger. a. Heat exchangers failing to pass leakage test shall be repaired or replaced.

b. Heat exchangers with through cracks or holes that allow exhaust gases to impinge on structures shall be replaced.

c. Heat exchangers with cracks exceeding the limits defined in d. and e. below shall be replaced:

d. Forward flange area — acceptable limits.

(1) Maximum single crack lengths — **2** inch limits.

(2) Total accumulated length of all cracks in aft tailpipe flange shall not exceed **6** inches.

(3) Cracks shall be separated by not less than **6** inches.

e. Aft tailpipe flange — acceptable limits.

(1) Maximum single crack length — **6** inches.

(2) Total accumulated length of all cracks in aft tailpipe flange shall not exceed **12** inches.

(3) Cracks shall be separated by not less than the length of the longest adjacent crack in question.

13-78. Repair - Heat Exchanger. a. Clean and degrease heat exchanger.

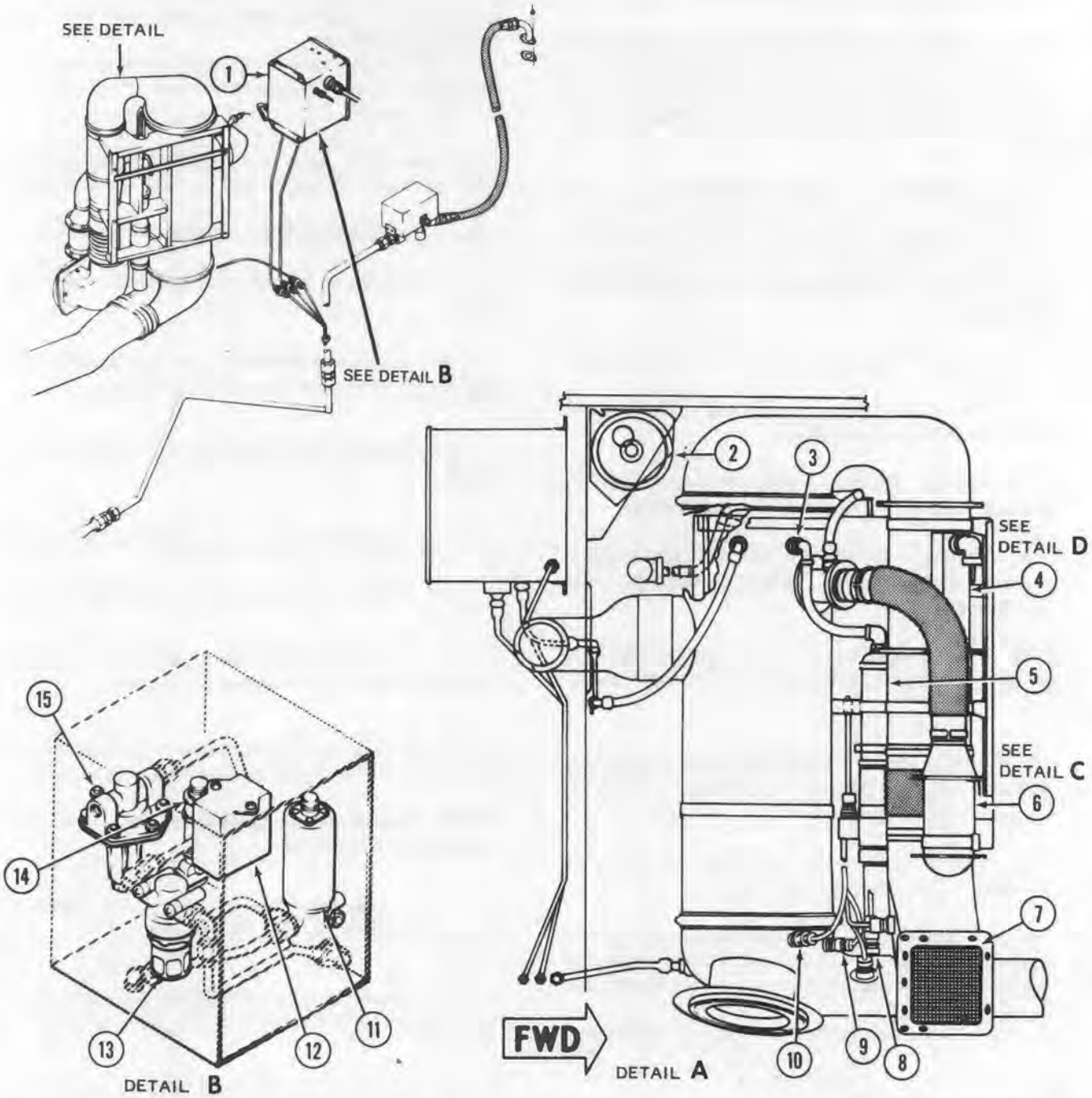
b. Tungsten Inert Gas (TIG) braze all accessible cracks in heat exchanger as follows:

(1) Fabricate and install doublers as necessary. Doublers to be brazed with brazing alloy (C144).

(2) Apply brazing alloy (C144) over entire tube, and joint area.

(3) After brazing, perform leakage test in accordance with paragraph 13-76.

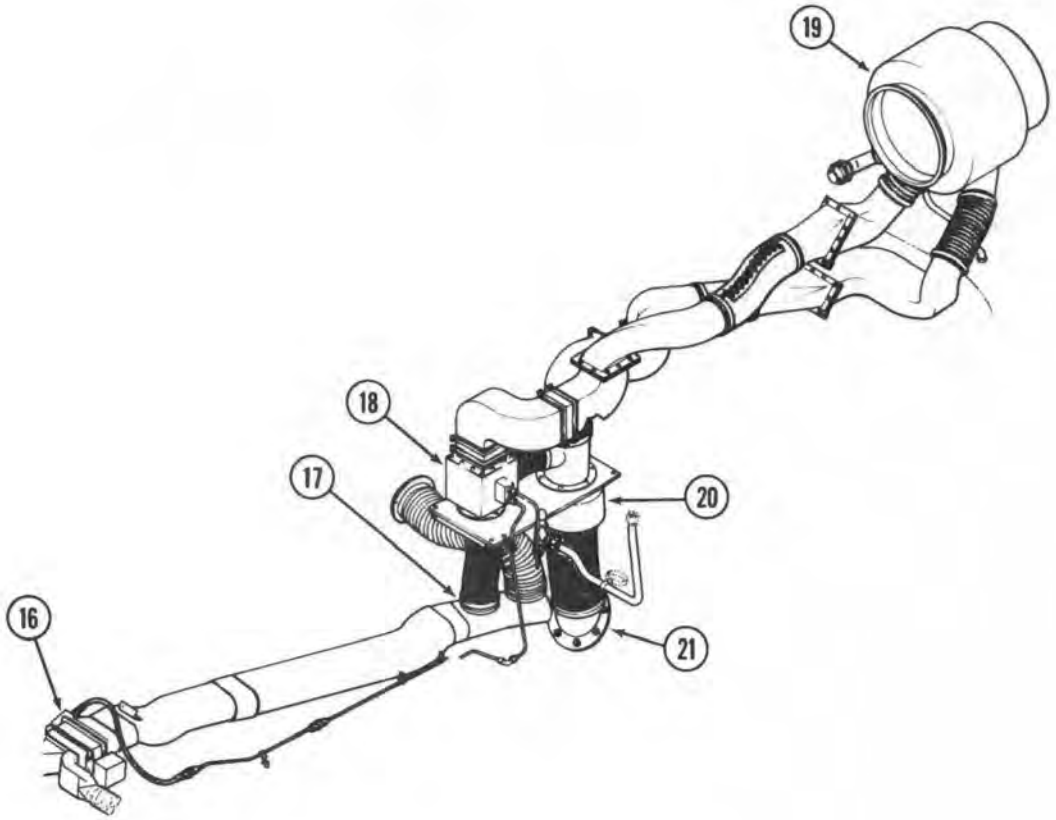
(4) If no leaks are apparent, place heat exchanger in oven and heat to **1130** plus or minus **10** degrees F (**610** plus or minus **5.5** degrees C) for one hour.



1. Fuel control box
2. Air pressure switch
3. Ignitor plug
4. Vent blower
5. Ignition assembly
6. Air blower
7. Fresh air intake screen
8. Cycling switch
9. Overheat switch
10. Purge switch
11. Cabin heater control box fuel pump
12. Cabin heater control box lockout relay
13. Cabin heater control box fuel filter
14. Cabin heater control box solenoid valve
15. Cabin heater control box fuel pressure regulator

204070-1044-1

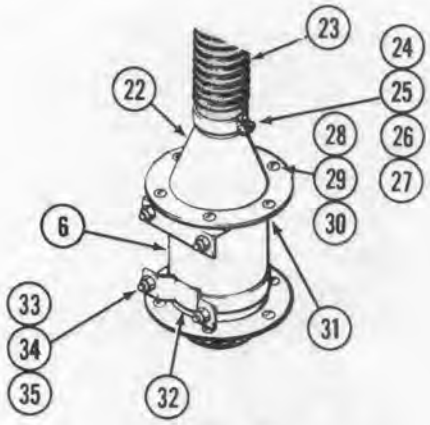
Figure 13-2. Auxiliary heater (combustion) (Sheet 1 of 3)



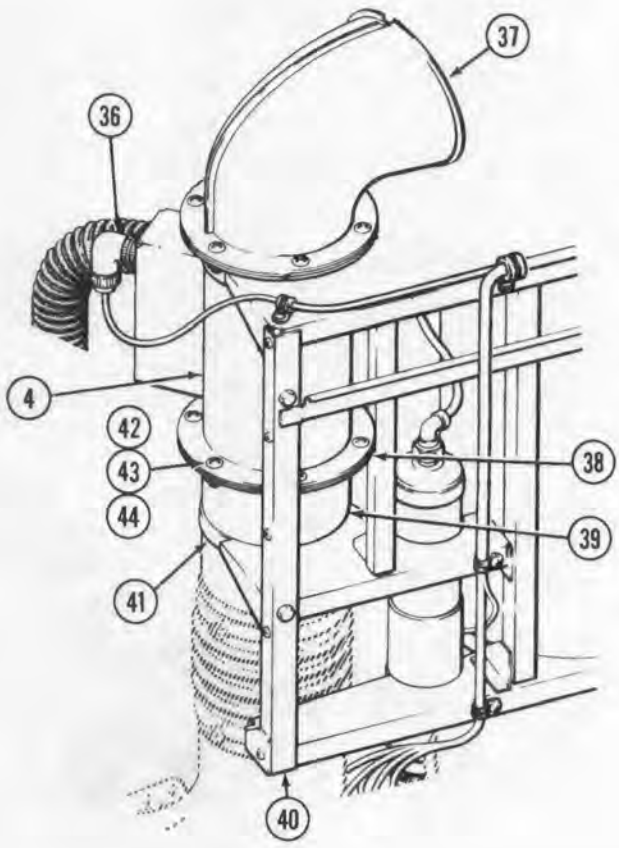
16. Remote sensor
17. Thermal switch
18. Mixing valve
19. Exhaust jacket heat exchanger
20. Exhaust heat exchange blower
21. Fresh air intake screen

204070-1044-2

Figure 13-2. Auxiliary heater (combustion) (Sheet 2 of 3)



DETAIL C



DETAIL D

22. Adapter
23. Duct
24. Screw
25. Washer
26. Nut
27. Clamp
28. Screw
29. Washer
30. Nut
31. Gasket
32. Support
33. Clamp
34. Washer
35. Nut
36. Electrical plug
37. Duct
38. Gasket
39. Adapter
40. Frame
41. Clamp
42. Nut
43. Washer
44. Screw

204070-1044-3

Figure 13-2. Auxiliary heater (combustion) (Sheet 3 of 3)

(5) Air check for leaks after heating.

(6) Place heat exchanger in **-40** plus or minus **5** degrees F (**-40** plus or minus **2** degrees C) for **12** hours minimum. Air check for leaks. If no leaks occur, heat exchanger is serviceable.

13-79. Installation — Heat Exchanger. a. Remove protective cover from engine exhaust diffuser (figure 13-2).

CAUTION

Make sure inside of pipe is aligned with exhaust diffuser.

b. Position tailpipe on outer flange of diffuser with drain fitting down and locating dowels engaged. Secure with V-band clamps around flanged joint. Seat clamp by tapping with soft mallet from center toward ends while tightening nuts on clamp bolts to a torque of **40 TO 50** inch-pounds. Lockwire nuts using (C127).

c. Connect tailpipe fuel drain hose coupling.

d. Install ducts and clamps to inlet and outlet ports of heat exchanger.

e. Install V-band clamp securing starter-generator exhaust air duct to heat exchanger.

f. Install tailpipe fairing (paragraph 2-57).

g. Connect antenna and anti-collision light at deck connectors (paragraph 9-215).

h. Close small access door on lower left side of tailpipe fairing.

i. Close driveshaft access doors.

j. Install protective cover on tailpipe.

13-80. BLOWER.

13-81. Description — Blower. The exhaust heat exchange blower (20, figure 13-2) is mounted in the outside air inlet duct to the heat exchanger and is driven by bleed air from the engine.

13-82. Removal — Blower. a. Gain access to blower through the heater compartment door.

b. Disconnect blower bleed air inlet line at tee.

c. Remove clamps from inlet air duct and remove duct.

d. Remove nuts, washers and screws securing blower assembly to shelf and remove blower.

13-83. Inspection — Air Blower — Exhaust Heat. a. Check blower for excessive vibration.

b. Check blower for security of mounting (if installed) and attachment of bleed air lines.

c. Check blower for security of all exposed fasteners and tube fitting connections.

d. Check blower shaft for excessive end play indicating worn bearings.

e. Check two piece flapper check at outlet of blower for security of mounting and freedom of movement.

13-84. Replacement — Air Blower — Exhaust Heat. a. Replace blower if shaft has excessive end play and/or worn bearings.

b. Replace blower if vibration is excessive or if flapper valve is damaged.

13-85. Installation — Blower. a. Position blower on shelf and secure with screws, washers and nuts.

b. Install inlet air duct and secure with clamps.

c. Connect bleed air inlet from blower to tee.

d. Close heater access door.

e. Check operation of heater. Refer to TM 55-1520-220-10.

13-86. REMOTE SENSOR.

13-87. Description — Remote Sensor. The remote sensor (16, figure 13-2) senses the temperature of air in the distribution duct and controls the mixing valve by increasing or decreasing bleed air pressure against the butterfly, to maintain the selected temperature.

13-88. Removal — Remote Sensor. a. Remove access panels in bottom of outside skin.

b. Disconnect hose and cable from remote sensor.

c. Remove screws and washers securing sensor to selector valve and remove sensor.

13-89. Installation — Remote Sensor. a. Position remote sensor on selector valve and secure with washers and screws.

b. Connect hose and cable to sensor (16, figure 13-2).

c. Install access panels.

13-90. Deleted.

13-91. Deleted.

SECTION II — AIR COOLING SYSTEM

13-92. AIRSCOOP ASSEMBLIES — VENTILATION.

13-93. Description — Air Scoop Assemblies — Ventilation. Volume and directional flow of air into cabin is controlled by a valve in the air scoop. The air scoops are located in cabin roof. Each scoop pan is vented by a tube to an opening in roof skin to prevent excessive moisture in the scoop.

13-94. Removal — Air Scoop Assemblies — Ventilation. a. Remove screws from scoop assemblies on top of cabin roof and remove scoop.

b. Use a sharp non-metallic instrument for separating scoop from pan assembly.

c. Pull drain tube from pan assembly nipple inside cabin roof.

d. Remove the screws attaching air control valve to the pan and remove the valve from the assembly.

NOTE

The air control valve may be removed as a unit from inside the cabin without removing either the pan or air scoop.

13-95. Inspection — Air Scoop Assemblies — Ventilation. a. Check air scoops and valves for security of mounting and condition.

b. Check air valves for freedom of operation.

c. Inspect ventilation system and drain tubes for obstructions.

13-96. Installation — Air Scoop Assemblies — Ventilation. a. Position control valve on pan assembly, align holes and install attaching screws.

b. Connect drain tube to pan assembly nipple.

c. Place a bead of zinc chromate putty (C175), on mating sections of roof skin position pan and align screw holes.

d. Position scoop assembly on pan assembly, align holes and install screws.

SECTION III — WINTERIZATION EQUIPMENT

13-97. COMBUSTION HEATER AND DEFROSTER INSTALLATION.

13-98. Description — Combustion Heater and Defroster Installation. Helicopters may be equipped with an auxiliary heater and defroster installation which permits use of a combination of bleed air heat and combustion heat for heating, bleed air heat for defrosting, and combustion heat for heating, or combustion heat for defrosting only. This installation consists of a combustion type burner, electrically powered blower, plenum chamber and ducting, registers, and nozzles to the cabin area. Fuel for the combustion air heater is supplied from the engine fuel system. The atomized fuel, under pressure, is mixed with air and ignited by an electrical spark. Burning gasses are contained in a combustion chamber and the electrically powered blower forces air around the chamber, where it is heated and then forced forward into the cabin area. Exhaust gas from the combustion chamber is vented overboard.

13-99. Removal — Combustion Heater. (AVIM). a. Ensure battery switch in OFF position and disconnect battery.

b. Open heater access door and place fuel shut-off valve in OFF position.

c. Disconnect all electrical connections, lines, and hoses from heater assembly. Cover all connections and openings to prevent entry of foreign particles.

d. Remove combustion air blower (6) as follows:

(1) Remove combustion air blower duct (23, figure 13-2) by removing clamps (27) connecting heater and air blower (6).

(2) Ensure electrical plug is disconnected. Cover plug with insulating tape.

(3) Remove screws (28), washers (29), and nuts (30) attaching air blower to adapter (22).

(4) Loosen clamps (33) on support assemblies (32) and remove air blower and adapter gasket (31).

f. Remove vent blower (4, figure 13-2) as follows:

(1) Ensure battery switch is in OFF position.

(2) Disconnect electrical plug (36) from vent blower (4) and cover plug with insulating tape.

(3) Remove clamp and V-band from crossover duct and remove duct and gasket.

(4) Remove screws (44), washers (43), and nuts (42) attaching vent blower (4) to fresh air hose adapter (39) and remove blower and adapter gasket (38).

g. Remove ignition assembly (5) as follows:

(1) Ensure battery switch is OFF.

(2) Remove igniter plug lead (3) and electrical receptacle from ignition assembly. Cover wire ends with insulating tape.

(3) Loosen clamps and lift ignition assembly from heater.

h. Remove heater exhaust stack by removing clamps and separating from heater.

i. Remove clamps securing plenum to bottom of heater and to forward ducting.

j. Loosen clamps securing combustion heater to frame. Separate combustion heater from plenum and disconnect drain lines and all electrical connections. Lift heater up and out of compartment.

k. Remove plenum, if desired. Cover all openings of ducts and exhaust openings in skin.

13-100. Disassembly — Combustion Heater (AVIM). a. Disassemble combustion heater as follows:

(1) Disconnect nuts at each end of tube assembly (32, figure 13-3). Remove nipple (33) and elbow (31).

(2) Remove cap (28) and plug (18). Cut lockwire and remove plug (2) from flange assembly (1).

(3) Remove screws (3) and remove flange (1) and gasket (4).

NOTE

Do not remove plate (30) unless replacement is necessary.

(4) Remove nuts (10) and washers (11) from feed assembly (17). When removing nuts (10), exercise care not to bend fuel feed and nozzle air tubes. Hold square fitting with a wrench to avoid bending tubes.

(5) Remove two screws (19) securing feed assembly (17).

(6) Remove nozzle holder gasket (21). Unscrew spray nozzle (20) from feed assembly (17) using a socket wrench.

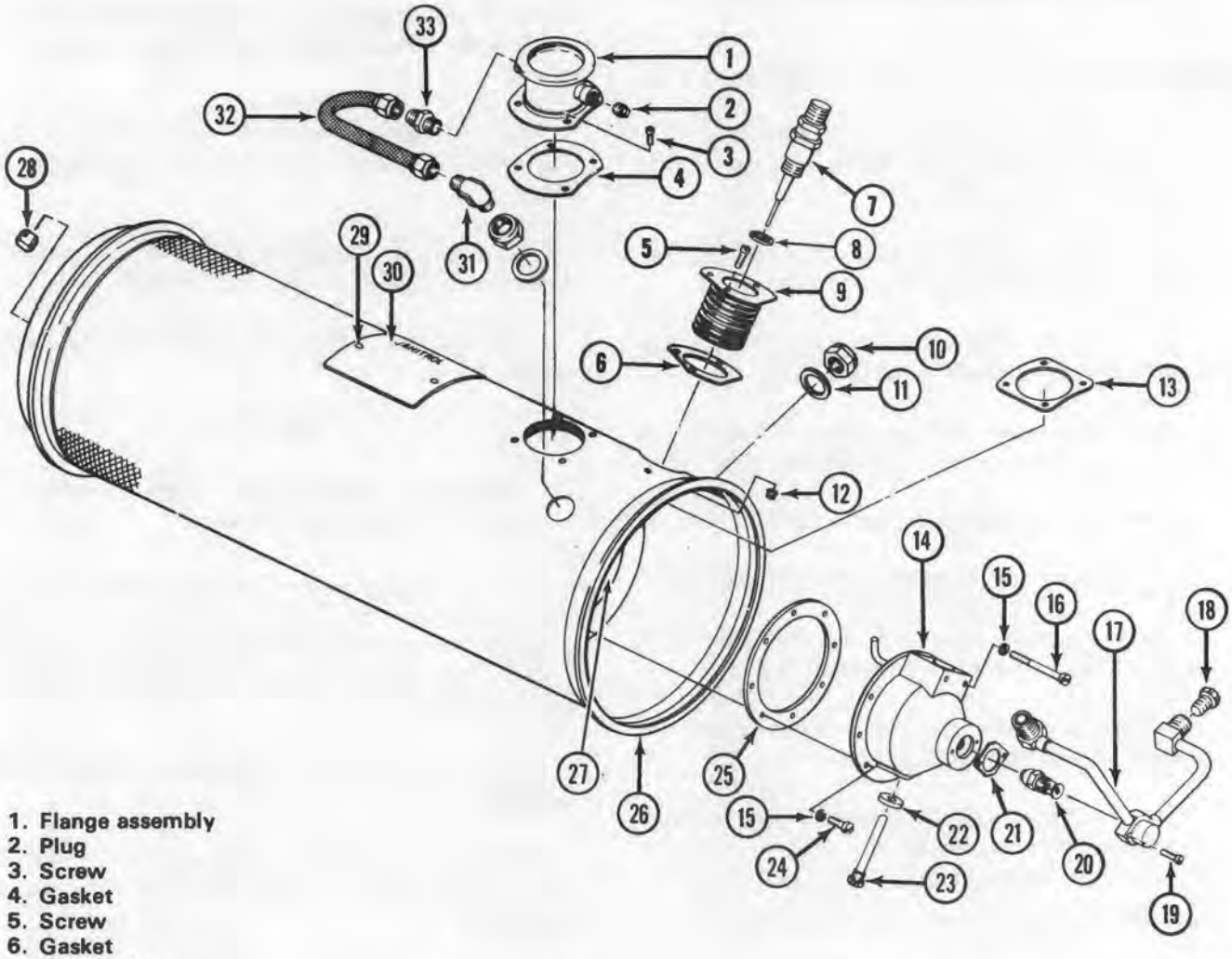
(7) Remove ignitor plug (7).

(8) Remove screws (16), screws (24), and washers (14) from combustion head assembly (14). Before removing combustion head assembly (14), make scribe marks on combustion head assembly and combustion chamber to ensure proper orientation of head at reassembly, it may be necessary to tap combustion head assembly (14) with soft-faced hammer in order to break it loose from combustion chamber (26).

(9) Remove gasket (25).

(10) Remove screws (5). Remove housing assembly (9) and gasket (6).

b. Remove electrode (23) and washer (22) from combustion head assembly (14).



1. Flange assembly
2. Plug
3. Screw
4. Gasket
5. Screw
6. Gasket
7. Ignitor plug
8. Gasket
9. Housing assembly
10. Nut
11. Washer
12. Nut
13. Gasket
14. Combustion head assembly
15. Washer, copper
16. Screw
17. Feed assembly
18. Plug
19. Screw
20. Spray nozzle
21. Gasket
22. Washer
23. Electrode
24. Screw
25. Gasket, copper asbestos
26. Radiator and jack assembly
27. Combustion chamber
28. Cap
29. Rivet
30. Plate
31. Elbow
32. Tube assembly
33. Nipple

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Figure 13-3. Combustion heater — exploded view

13-101. Cleaning — Combustion Heater. (AVIM). a. Clean combustion chamber (27, figure 13-3), radiator, and jacket assembly (26) by soaking in stripper solution (C209). Maintain solution temperature of **190 TO 210** degrees F (**88 TO 99** degrees C) during soaking period. After soaking, rinse all parts thoroughly with water.

CAUTION

Do not brush outside of combustion chamber, radiator, and jacket until after inspection.

b. An alternate method of cleaning is to use a stainless steel brush or sand blast cleaner to remove carbon or other foreign material from inside of combustion chamber.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

c. If spray nozzle becomes contaminated, disassemble as shown in figure 13-4 and immerse parts in solvent (C205). A soft, non-metallic brush may be used to assist in cleaning. Rinse nozzle parts in clean solvent.

13-102. Inspection — Combustion Heater. (AVIM). a. If heater has been subjected to severe overheating, inspect heater for soft or spongy metal. usually indicated by metal discoloration.

b. Inspect combustion chamber and radiator for fatigue and pin holes.

c. Inspect radiator for deformation.

d. Inspect all parts for damage resulting from overheating.

13-103. Repair or Replacement — Combustion Heater. (AVIM). a. Repair sheet metal parts by welding.

CAUTION

Do not cut access holes. No attempt shall be made to weld parts containing soft or spongy metal.

b. Wipe area to be welded with a **30**-percent solution of nitric acid (C145). Use stainless steel rod (C183) and flux (C102) when welding with acetylene. If heliarc method is employed, use flux (C101). When welding holes or cracks, use same material as used in construction of original parts. If stainless steel rod is not available, a piece of scrap heater may be used.

c. Replace combustion chamber and radiator if soft spots and/or pin holes are found.

d. Replace radiator and jacket assembly if deformation causes an increase of more than **10** percent in the ventilating air pressure drop across the heater.

13-104. Reassembly — Combustion Heater. (AVIM). a. Assemble ignitor plug (7, figure 13-3). ground electrode (23), and washer (22) on combustion head assembly (14). Measure spark gap, which should be between **0.250 and 0.312** inch. After checking spark gap, remove ignitor plug.

b. Coat both sides of gasket (25) with sealing compound (C187.2). Position gasket so copper surface is in contact with head assembly (13).

NOTE

Line up scribe marks made at disassembly so combustion head assembly will be oriented properly.

c. Attach combustion head assembly (14) and gasket (25) to combustion chamber with screws (16 and 24) and copper washers (15).

d. Install spray nozzle (20) into feed assembly (17) and carefully tighten with a socket wrench.

e. Install gasket (21) and feed assembly (17) on combustion head assembly (14), using two screws (19). Attach fuel feed tube to jacket (26) with nut (10) and washer (11) at both fuel and air connections. Hold fitting while tightening nut (10).

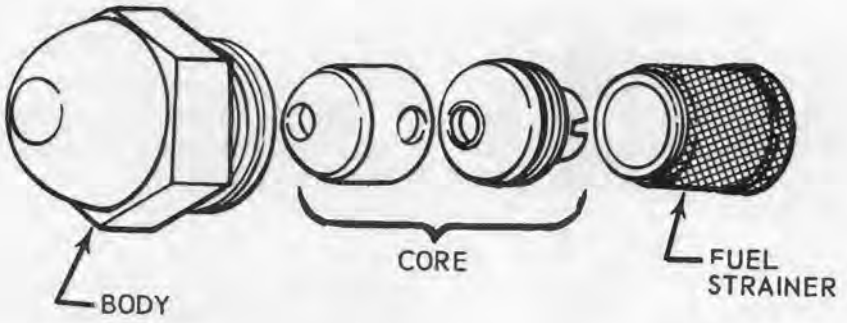

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Figure 13-4. Spray nozzle

f. Install gasket (6) and ignitor plug housing (9), using screws (5) and self-locking nuts (12). Install ignitor plug (7) and gasket (8) and tighten ignitor plug to **28** foot-pounds torque applied to large hex.

g. Install gaskets (4 and 13) and flange assembly (1) with screws (3).

h. Install plug (2) in flange assembly (1).

i. Install cap (28) and plug (18).

j. Install elbow (31) and nipple (33). Install tube assembly (32) and connect to elbow (31) and nipple (33).

k. Lockwire (C127) all drilled head screws and drain plugs.

13-105. Installation — Combustion Heater. (AVIM). a. Remove covering from ducts and exhaust opening in skin.

b. Position plenum in compartment.

c. Position combustion heater in compartment. Attach drain line in plenum to heater and connect all electrical leads.

d. Connect plenum to forward ducts and secure plenum to heater and heater to frame.

e. Install heater exhaust stack through exhaust opening and attach to combustion heater.

f. Install ignition assembly as follows:

(1) Position ignition assembly in attachment clamps and install nuts and washers.

(2) Remove insulating tape from wire ends and install electrical receptacle plug lead.

g. Position and secure ventilation air blower duct on top of combustion heater.

h. Install combustion heater air blower as follows:

(1) Replace adapter gasket (31, figure 13-2) as necessary. Place adapter gasket on air blower (6) and position blower in support assembly clamps (33). Tighten clamps.

(2) Install nuts (30), washers (29), and screws (28) which attach the air blower to the adapter.

(3) Remove insulating tape from electrical plug and connect plug to air blower. Install air blower ducting.

i. Install combustion heater vent blower as follows:

(1) Position adapter gasket (38) on fresh air hose adapter (39) and vent blower in heater and on adapter (39). Align holes and install mounting nuts (42), washers (43), and screws (44).

(2) Position crossover duct gasket and crossover duct (37). Install attaching clamp (41) and V-band.

(3) Remove insulating tape from electrical plug (36) and connect plug to vent blower (4).

j. Remove protective covering from all connections and openings. Connect all wiring, lines, and hoses.

k. Place fuel shut-off valve in ON position.

l. Connect battery for operation.

13-106. Operational Check — Combustion Heater. a. Check heater operation by starting in accordance with operating instructions. (Refer to TM 55-1520-220-10.)

b. If heater starts, check air distribution controls by use of manual levers and AFT OUTLETS selector switch. During shutdown, check for proper operation of purging switch.

c. If heater fails to start, determine whether trouble is in air, fuel, or ignition system of heater. (Refer to table 13-3.)

13-107. Troubleshooting — Heater Air System. Refer to table 13-3 for troubleshooting information on heater air system. Refer to Appendix F, Master Wiring Diagram.

NOTE

Components of the heater air system are listed below. These components, except the purging switch, must all function correctly for the heater to have air. (See NOTE following this troubleshooting procedure.)

(1) HEAT AND VENT POWER circuit breaker

(2) HEATER CONTROL circuit breaker

(3) CABIN HTR switch S3

(4) Blower motor relay K22

(5) Combustion blower B16

(6) Vent blower B15

(7) Purging switch S69

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 13-3. Troubleshooting Chart — Heater Air System — Combustion Heater

CONDITION TEST OR INSPECTION **CORRECTIVE ACTION**
1. No voltage at terminal X1 of blower motor relay K22.
STEP 1. Broken wire. **Repair or replace broken wire (paragraph 9-3).**
STEP 2. Defective HEAT AND VENT POWER circuit breaker. **Replace circuit breaker (paragraph 9-3).**

Table 13-3. Troubleshooting Chart — Heater Air System — Combustion Heater (Cont)

CONDITION TEST OR INSPECTION	CORRECTIVE ACTION
2. No voltage at terminal A2 of relay K22.	
STEP 1. Defective relay K22.	**Replace relay (paragraph 9-3).**
3. Relay K22 not closing.	
STEP 1. Broken wire from relay K22 to CABIN HTR switch S3.	**Repair or replace broken wire (paragraph 9-3).**
STEP 2. Defective CABIN HTR switch S3.	**Replace switch (paragraph 9-3).**
4. Correct voltage present at above points, but combustion blower not running.	
STEP 1. Defective blower motor.	**Replace blower (paragraph 13-103).**
5. Correct voltage present at above points, and vent blower not running.	
STEP 1. Defective blower motor.	**Replace blower (paragraph 13-103).**

NOTE

After the heater has been in operation and the CABIN HTR switch S3 is returned to the OFF position, both blowers should continue to run until the heater plenum has cooled to the temperature determined by the purging switch. Failure of the blowers to operate in this manner indicates a defective purging switch S69.

13-108. Troubleshooting — Heater Fuel System. If combustion heater is still inoperative after check of air system, check for trouble in heater fuel system. Refer to table 13-4 for troubleshooting information on heater fuel system.

NOTE

All of the following components must function correctly for fuel to reach the heater:

(1) HEATER CONTROL circuit breaker

(2) HEAT AND VENT POWER circuit breaker

(3) CABIN HTR switch S3

(4) Vent blower

(5) Combustion blower

(6) Vent air pressure switch

(7) Combustion air pressure switch

(8) Lockout relay K11

(9) Overheat switch S19

(10) Heater START switch S34

(11) Heater fuel pump

(12) Heater fuel filter

(13) Heater cycling switch S19

(14) TEMP CONTROL switch S17

(15) Thermostat S21

(16) Fuel solenoid valve

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 13-4. Troubleshooting Chart — Heater Fuel System — Combustion Heater

CONDITION TEST OR INSPECTION	**CORRECTIVE ACTION**
1. No voltage at terminal B1 of lockout relay K11.	
STEP 1. Defective HEATER CONTROL circuit breaker.	**Replace circuit breaker (paragraph 9-3).**
STEP 2. Defective CABIN HTR switch.	**Replace defective switch (paragraph 9-3).**
2. No voltage at terminal A2 of lockout relay K11.	
STEP 1. Defective combustion blower air pressure switch or vent blower air pressure switch.	**Replace defective switch (paragraph 9-3).**
3. No voltage at terminals A1, B1, and X1 on lockout relay K11.	
STEP 1. Relay not energized.	**Replace switch and/or relay (paragraph 9-3).**
4. No voltage at terminal X1 on lockout relay when heater START switch is pressed.	
STEP 1. Defective heater START switch.	**Replace switch (paragraph 9-3).**

Table 13-4. Troubleshooting Chart — Heater Fuel System — Combustion Heater (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

5. No voltage at terminal A1 on lockout relay K11 when heater START switch is pressed and ambient temperature is below cutoff temperature of overheat switch.

   STEP 1. Defective relay K11.

   Replace relay (paragraph 9-3).

   NOTE

   While pressing heater START switch and observing voltage at terminal A1, momentarily short lockout relay terminal X2 to ground. If the relay closes as indicated by the presence of 28 volts DC at terminal A1, the relay is normal.

   STEP 2. Defective overheat switch.

   Replace switch (paragraph 9-3).

6. Heater fuel pump motor not running.

   STEP 1. Broken wire between fuel pump plug and terminal board TB17.

   Repair or replace wire (paragraph 9-3).

7. No fuel input to pump.

   STEP 1. Clogged fuel filter.

   Clean or replace filter (paragraph 13-146).

8. No voltage at center terminal of TEMP CONTROL switch.

   STEP 1. Defective cycling switch.

   Replace defective switch (paragraph 9-3).

9. No voltage at pin B of heater solenoid valve plug with TEMP CONTROL switch in MAN position.

   STEP 1. Defective TEMP CONTROL switch.

   Replace defective switch (paragraph 9-3).

Table 13-4. Troubleshooting Chart — Heater Fuel System — Combustion Heater (Cont)

CONDITION TEST OR INSPECTION	**CORRECTIVE ACTION**
10. No voltage at pin B of heater solenoid valve plug with TEMP CONTROL switch in THERMO position and thermostat set to a temperature lower than ambient.	
STEP 1. Defective thermostat.	**Replace thermostat (paragraph 9-3).**
STEP 2. Defective TEMP CONTROL switch.	**Replace TEMP CONTROL switch (paragraph 9-3).**
11. No fuel at input to combustion chamber but all previous tests have not indicated the trouble.	
STEP 1. Defective solenoid valve.	**Replace valve (paragraph 13-142).**

13-109. Troubleshooting — Ignition System. If combustion heater is still inoperative after check of fuel system, check for trouble in heater ignition system. Refer to table 13-5 for troubleshooting information on heater ignition system.

NOTE

All of the items listed below must be functioning properly for the igniter system to operate, except the heater IGNITION switch which is not used in the normally functioning heater system.

(1) HEATER CONTROL circuit breaker

(2) HEATER AND VENT POWER circuit breaker

(3) Combustion blower

(4) Vent blower

(5) Combustion blower pressure switch

(6) Vent blower pressure switch

(7) Lockout relay K11

(8) Overheat switch

(9) Heater START switch

(10) Ignition unit

(11) Heater IGNITION switch.

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 13-5. Troubleshooting Chart — Heater Ignition System — Combustion Heater

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. No voltage at pin A of ignition unit plug.

   STEP 1. Broken wire.

   Repair or replace broken wire (paragraph 9-3).

2. No voltage at pin of ignition unit plug with heater IGNITION switch in RESERVE position.

   STEP 1. Defective IGNITION switch.

   Replace switch (paragraph 9-3).

WARNING

Ensure that all electrical power is disconnected. Voltage at the output of the ignition unit is normally 30,000 volts. Use standard high-voltage handling techniques.

3. No high-voltage output from ignition unit with high-tension lead disconnected.

   STEP 1. Defective ignition unit.

   Replace unit (paragraph 13-130).

4. No high voltage output from ignition unit with high-tension lead disconnected.

   STEP 1. Defective high-tension lead.

   Replace high-tension lead (paragraph 9-3).

5. High voltage present to ignitor plug but fuel does not ignite.

   STEP 1. Defective ignitor plug.

   Replace ignitor plug (paragraph 13-126).

13-110. COMBUSTION HEATER AIR BLOWER.

13-111. Description — Combustion Heater Air Blower. The combustion air blower (figure 13-5) is an electrically driven, axial-flow blower with a direct current driving motor centered and supported in blower housing. A multivane impeller is attached directly to motor shaft.

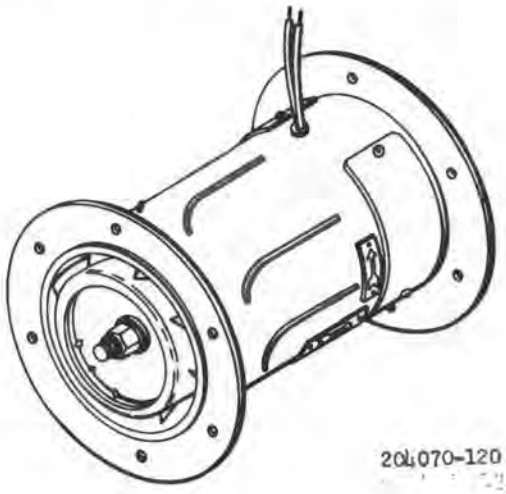


Figure 13-5. Combustion air blower

13-112. Disassembly — Combustion Heater Air Blower. (AVIM). a. Remove screws, washers, and nut attaching screen assembly to air blower and remove screen assembly from blower.

b. Remove nut (12, figure 13-6) and washer (13). Hold impeller with hand or wooden wedges. If impeller (14) sticks to shaft, remove by tapping lightly with soft mallet. Do not use a puller.

c. Remove four machine screws (11) and washers (10). Remove motor (2) from housing (15). Guide motor leads through grommet (16). Remove woodruff key (1).

d. Remove four screws (25) from covers (29) and cover (30). Remove cover (30).

e. Remove two caps (18) and two brushes (19). Remove fan (21) secured by two setscrews (20).

f. Disconnect lead (23) by removing screws (22) and washer (24). Replace entire lead if terminal is damaged.

g. Disconnect terminal lug (42) by removing screw (40) and washer (41).

h. Remove end bell (34) by removing two machine screws (32) and two key washers (33). Remove end bell (43) and stator (39). Do not disassemble end bell (43) and stator (39). Any defect is cause for replacement of entire assembly.

i. Remove bearings (36 and 38) from armature shaft (37), using appropriate puller or press to avoid damage to shaft.

j. Do not remove identification plates (9 and 27) or directional plates (7), unless housing replacement is anticipated.

13-113. Cleaning — Combustion Heater Air Blower. (AVIM). a. After complete disassembly of blower, remove loose accumulation of foreign matter with dry, filtered, compressed air at nozzle pressure not to exceed **40** psi.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

b. Direct light spray of solvent (C205) on armature at nozzle pressure not to exceed **50** psi.

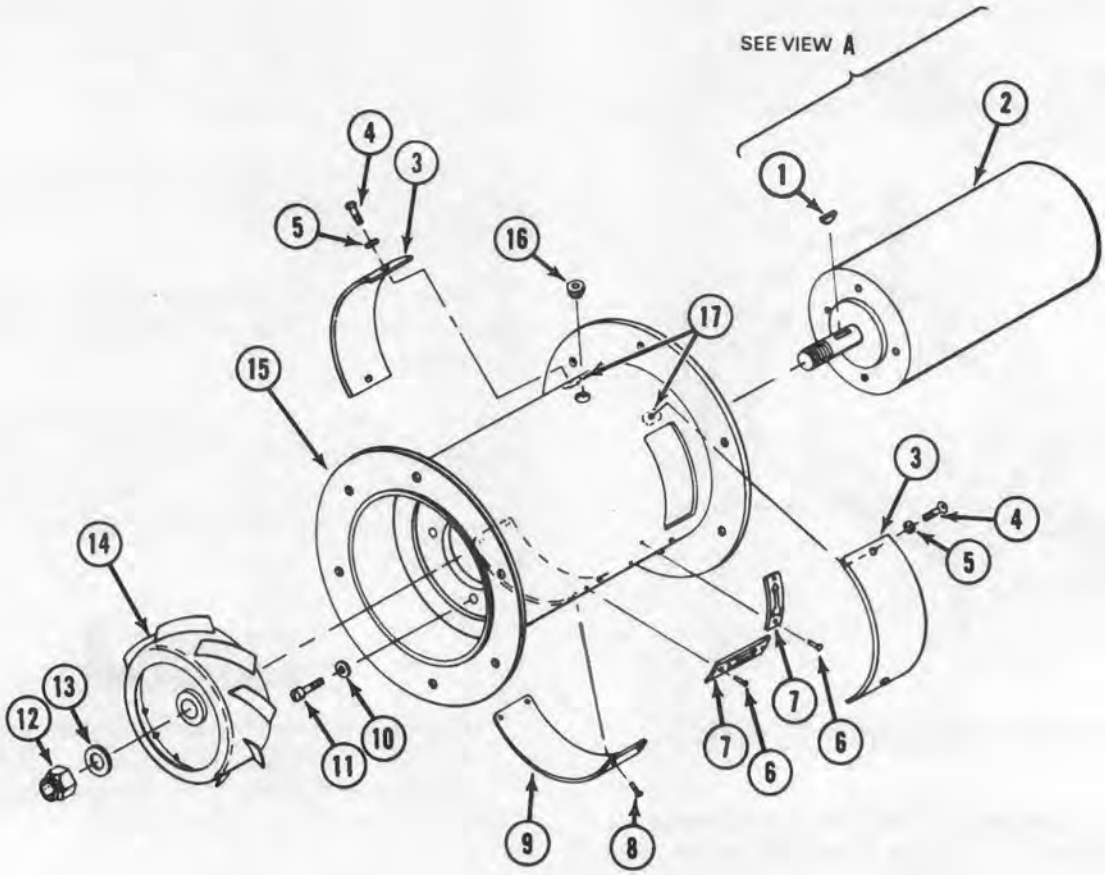
c. Use light solvent spray (C205) on stator at nozzle pressure of **25** psi or less.

d. Immediately blow off excess solvent with dry, filtered compressed air and place armature and stator into ventilated oven at **275** degrees F (**135** degrees C) for **two** hours.

CAUTION

Do not allow any component containing plastic insulation to soak in solvent. Avoid solvent contact with rubber and wax-sealed parts.

e. Remove all paint and foreign material from remaining parts by submerging in suitable solvents. It is not necessary to clean bearings (36 and 38) or



1. Key
2. Motor
3. Cover
4. Screw, machine
5. Washer
6. Rivet
7. Plate, directional
8. Rivet, solid
9. Plate, identification
10. Washer
11. Screw, machine
12. Nut
13. Washer
14. Impeller
15. Housing
16. Grommet
17. Nut

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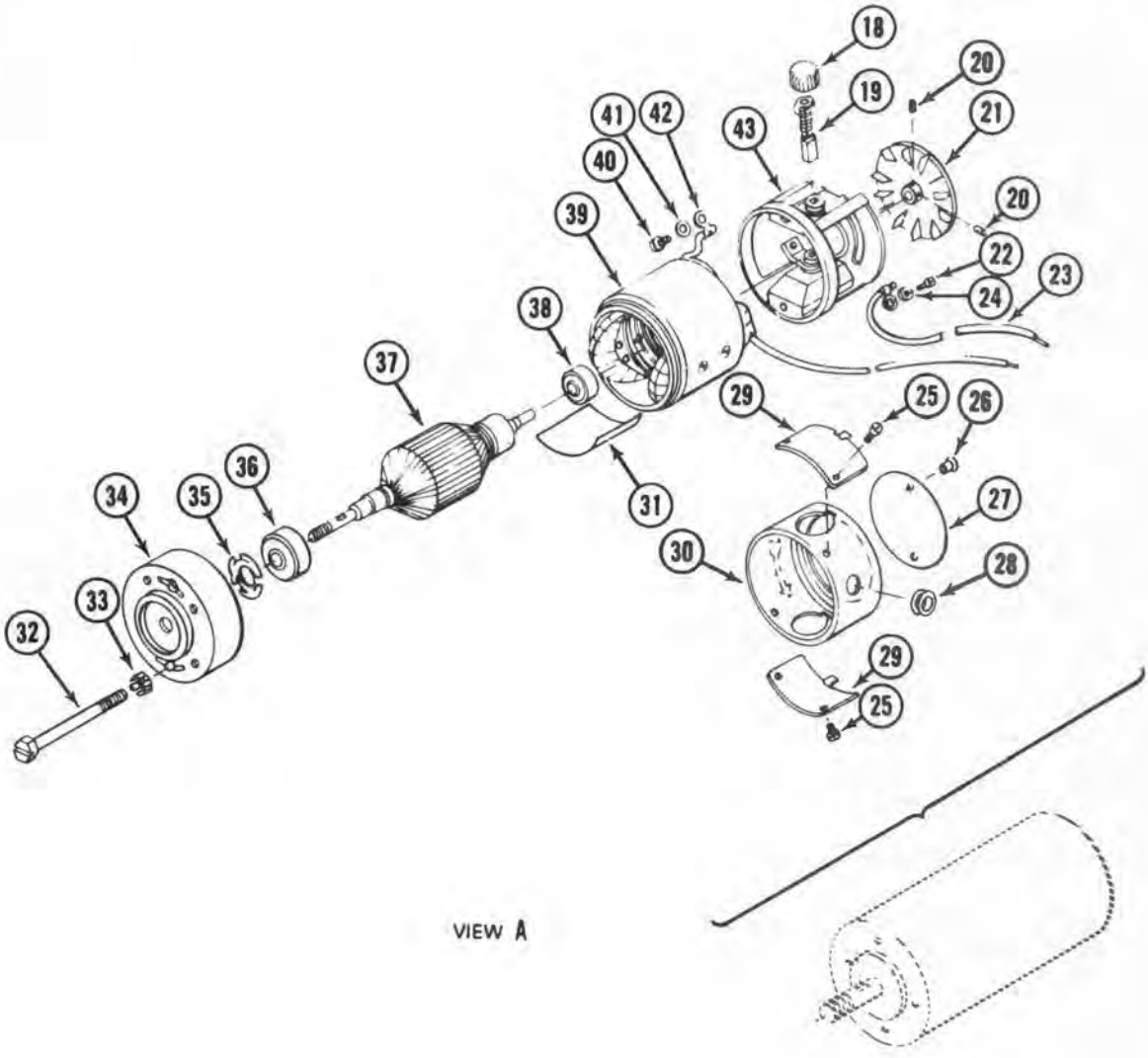
Figure 13-6. Combustion air blower — exploded view (Sheet 1 of 2)



18.	Cap	31.	Insulation
19.	Brush	32.	Screw, machine
20.	Setscrew	33.	Washer, key
21.	Fan	34.	End bell
22.	Screw	35.	Spring, loading
23.	Lead	36.	Bearing
24.	Washer	37.	Armature, motor
25.	Screw	38.	Bearing
26.	Rivet	39.	Stator, motor
27.	Plate	40.	Screw
28.	Grommet	41.	Washer
29.	Cover	42.	Terminal, lug
30.	Cover	43.	End bell

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Figure 13-6. Combustion air blower — exploded view (Sheet 2 of 2)

brushes (19) since they are replaced during reassembly.

13-114. Inspection — Combustion Heater Air Blower. (AVIM). a. Visually inspect commutator for serviceability.

b. Resurface motor commutator if the following defects are indicated: nicks, scratches, burned bars, visible grooving, or visible wear in the brush track. If any bar, or bars, are visible above the adjacent surface of the commutator, the armature shall be discarded.

c. Check commutator for a minimum diameter of **0.672** inch.

13-115. Repair or Replacement — Combustion Heater Air Blower. (AVIM). a. Aluminum parts must be free of nicks, scratches, and dents prior to repainting. If alodine coating has been removed from any area, repair area with patch-up kit materials in accordance with Specification MIL-C-5541 before painting. Apply one coat of primer (C167) in accordance with TM 43-0105, except machined mating surfaces. When repainting impeller, a thin, even coat should be applied to prevent imbalance.

b. Resurface commutator as follows:

(1) Mount armature in engine lathe with a flexible collett in head stock and live ball bearing in tail stock.

(2) Chuck collet on bearing journal at commutator end of armature. Do not damage bearing journal and ensure bearing journal and shaft center on chamfer are clean and free of any nicks or burrs. Alignment and concentricity at bearing journal must be within **0.0005** TIR.

(3) Rough turn with carbide-tipped tool at surface speed of **600 TO 800** feet-per-minute and cutting depth of **0.004 TO 0.006**-inch per turn. Rough cut just enough to remove glaze and major irregularities of commutator.

NOTE

If mica under-cut is less than 0.0156 inch below commutator bars after rough turning, under-cut to 0.0312-inch at a width of 0.028 TO 0.032-inch, before finish turning.

(4) Finish turn with a diamond-tipped tool at a surface speed of **600 TO 800** feet per minute and a maximum cutting depth of **0.001 TO 0.0015**-inch per turn for each cut. Repeat finish turning until entire surface is within tolerance and is clean.

c. Replace all leads which have been burned or have broken connections. Splice new wire (**26** strands of **0.010**, red) to the stator at a point as close to the coil as possible. Solder in place, using a flux-core, pure tin solder containing **three** percent resin core. Insulate splice and identify the new lead the same as the lead replaced.

d. Replace worn or unserviceable bearings and brushes.

13-116. Reassembly — Combustion Heater Air Blower. (AVIM) a. Bend tab of key washer (33, figure 13-6) and install in end bell (34). Apply a thin film of molybdenum disulfide mixture (C131) to inside diameter of end bell inserts.

b. Install bearings (36 and 38) on armature (37). Install bearing (38) with shield toward commutator. Install loading spring (35).

NOTE

Note locating notch on stator (39) for correct positioning of end bell (34).

c. When replacing brushes (19), wrap No. 400 grit paper (C160), grit side out, around commutator before inserting armature and bearing assembly into stator (39). Install end bell (34 and 43). Note locating notch on stator for correct positioning of end bell. Temporarily place brushes (19) in position and rotate armature in direction of normal rotation, a few times to seat brushes. (See figure 13-7 for electrical connections.)

d. Remove brushes before removing armature. Remove sandpaper from commutator. Blow out all loose carbon dust before reinserting armature assembly into stator and end bells.

e. Install and tighten screws (32).

f. Install terminal lug (42) and lead (23) with attaching screws (22) and washers (24).

g. Install fan (21) and secure with setscrews (20). Use Glyptol cement on setscrews.

h. Install brushes (19) and cap (18).

i. Install cover (30) and covers (29). Secure with screws (25). Apply antiseize compound (C28) on screws (25).

j. Stamp rotation indicator on cover (30) with white ink.

k. Guide motor lead through grommet (16). Install motor (2) in housing (15). Install four machine screws (11) with washers (10). Install woodruff key (1).

l. Install impeller (14) on shaft with washer (13). Install nut (12) and tighten to a torque of **48 TO 55** inch-pounds.

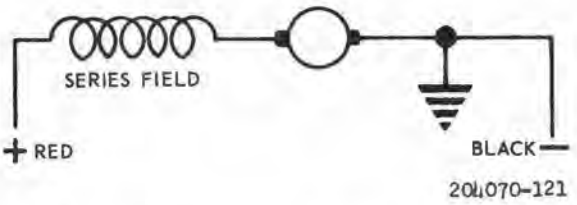


Figure 13-7. Schematic diagram — combustion air blower

m. Position screen assembly on air blower and attach with nuts, washers, and screws.

13-117. COMBUSTION HEATER VENT BLOWER.

13-118. Description — Combustion Heater Vent Blower. The ventilating air blower is an electrically driven, axial-flow blower with a multivane impeller (figure 13-8). A radio noise filter is included as part of the component.

13-119. Disassembly — Combustion Heater Vent Blower. (AVIM). a. Remove nut (16, figure 13-9) and washer (17). Secure impeller (18) with wooden wedges if unable to hold by hand. Remove impeller (18) by tapping on shaft lightly with rawhide mallet.

b. Uncover terminals (5) and remove nuts (3) and washers (4). Remove nipples (6) from leads. Remove filter (8) secured by screws (7) and nuts (14).

c. Remove four screws (19) and washers (20) securing motor (2) to housing (21). Remove motor. Withdraw motor leads through grommet (9). Remove woodruff key (1).

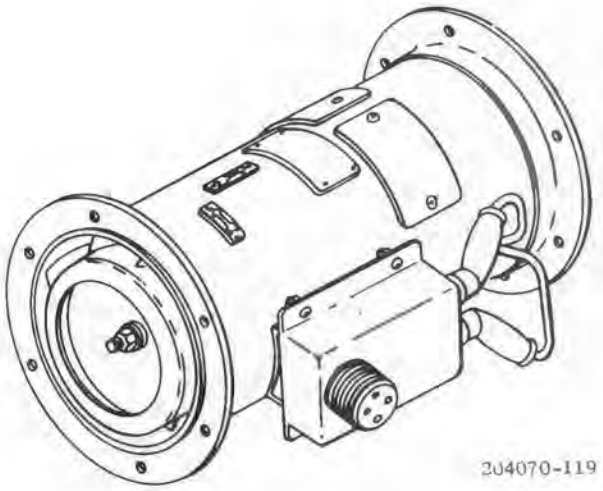


Figure 13-8. Combustion heater vent blower

d. Remove two screws (39) and lockwashers (40) from motor cover (41). Remove cover.

e. Remove screw (44) and washer (45). Remove fan (38).

f. Remove two screws (46) from plate (47). Remove plate and washer (48).

g. Remove screws and washers associated with electrical lead exit plate (35) and exit grounding plate. Remove plates.

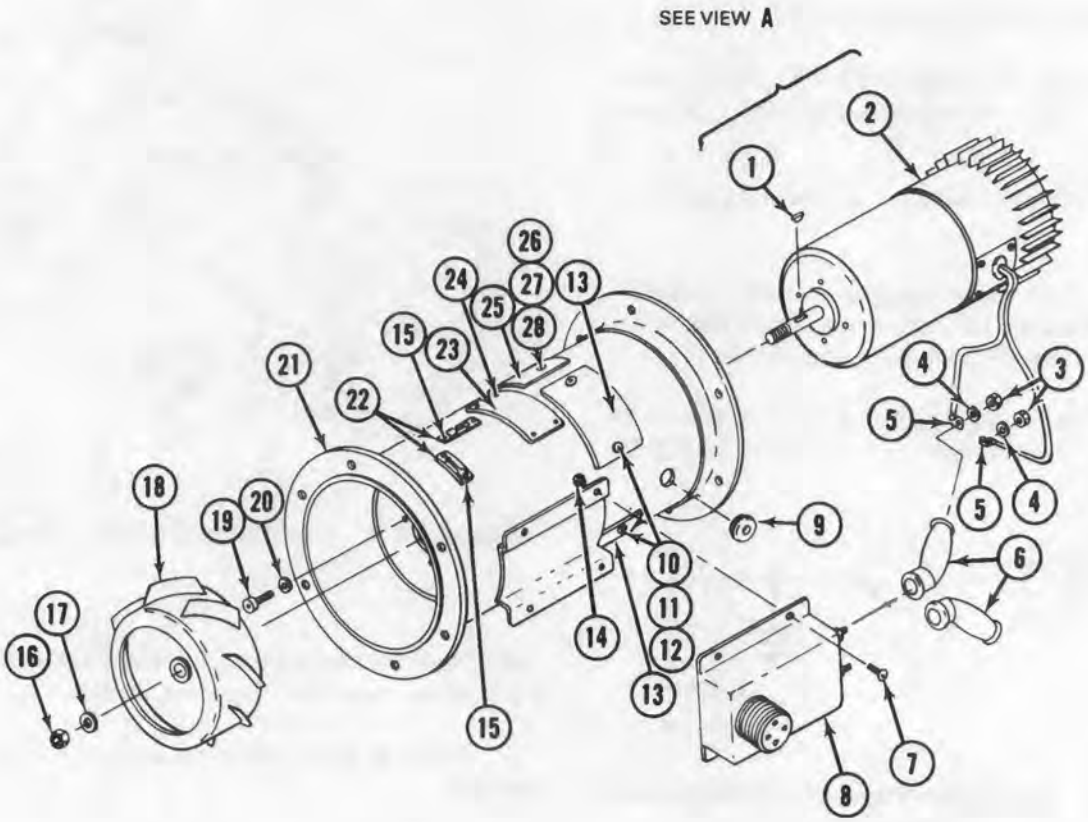
h. Before further disassembly, make scribe mark on ring (52) and end bells (49 and 56) to facilitate location of neutral during reassembly.

i. Remove two screws (54) and key washers (55) from end bell (56). Remove end bells (49 and 56).

j. Remove armature (58) from stator (59). Do not attempt to disassemble stator (59) beyond that shown in exploded view. Replace entire stator if simple repair cannot be accomplished. Replace terminal (60) as required.

k. Use an appropriate puller to remove bearings (57) from armature shaft.

l. Remove two screws (37), washers (36), and plate nuts (31) from end bell (49). This will release brush holder ring (52). Do not attempt disassembly of holder ring (52) beyond that shown in exploded view. Replace if simple repair cannot be accomplished.



1. Key
2. Motor
3. Nut
4. Washer
5. Terminal
6. Cable nipple
7. Screw
8. Filter
9. Grommet
10. Nut
11. Washer
12. Screw
13. Cover
14. Nut
15. Rivet
16. Nut
17. Washer
18. Impeller
19. Screw
20. Washer
21. Housing
22. Plate
23. Plate
24. Rivet
25. Cover
26. Nut
27. Washer
28. Screw

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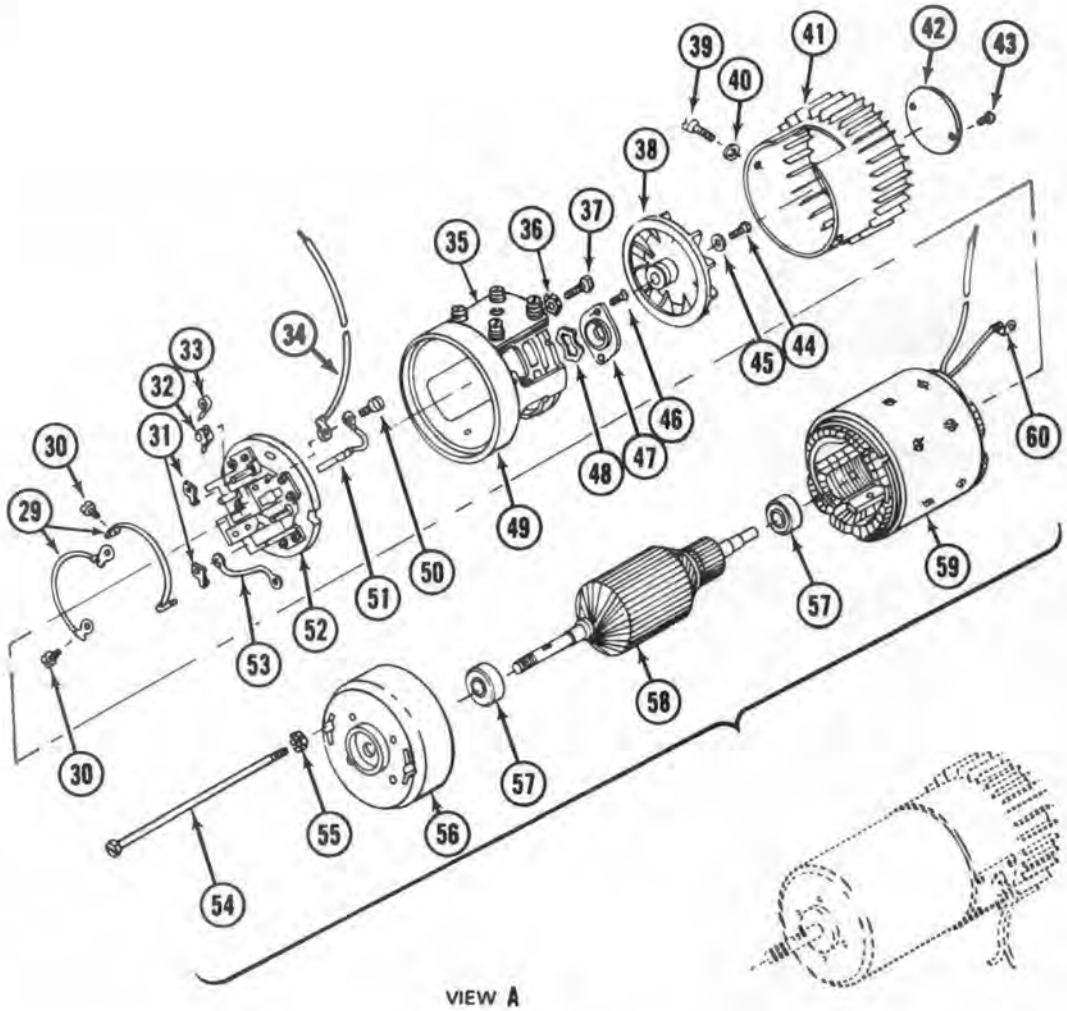
Figure 13-9. Combustion heater vent blower — exploded view (Sheet 1 of 2)



29. Lead	40. Washer	51. Brush
30. Screw	41. Cover	52. Ring
31. Nut	42. Plate	53. Lead
32. Arm	43. Rivet	54. Screw
33. Spring	44. Screw	55. Washer
34. Lead	45. Washer	56. End Bell
35. Plate	46. Screw	57. Bearing
36. Washer	47. Plate	58. Armature
37. Screw	48. Washer	59. Stator
38. Fan	49. End bell	60. Terminal
39. Screw	50. Screw	

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Figure 13-9. Combustion heater vent blower — exploded view (Sheet 2 of 2)

m. Do not repair leads (29, 34, and 53). Replace entire lead when damaged.

n. Do not remove rotation direction plates (22 and 23) unless replacement is required.

13-120. Cleaning — Combustion Heater Vent Blower. (AVIM). a. Remove loose foreign matter with dry, filtered, compressed air at nozzle pressure not to exceed **40** psi.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

b. Direct a light spray of solvent (C205) on armature. Use light solvent spray on stator at nozzle pressure of **25** psi or less. Immediately blow off excess solvent with dry, filtered compressed air.

13-121. Inspection — Combustion Heater Vent Blower. (AVIM). a. Visually inspect bearings, commutator, and brushes for serviceability.

b. Check commutator for a minimum diameter of **0.969** inch.

c. Resurface motor commutator if following defects are indicated: nicks, scratches, burned bars, visible grooving, or visible wear in brush track. If any bar, or bars, are visible above adjacent surface of commutator, armature shall be discarded.

13-122. Repair or Replacement — Combustion Heater Vent Blower. (AVIM). a. Aluminum parts must be free of nicks, scratches, and dents prior to repainting. If alodine coating has been removed, repair with chemical film (C42) in accordance with MIL-C-5541 before painting. Apply one coat of primer (C167) in accordance with TM 43-0105, except to machined surfaces. When repainting impeller, a thin, even coat should be applied to prevent imbalance.

b. Resurface commutator as follows:

(1) Mount armature in engine lathe with flexible collet in head stock and live ball bearing in tail stock.

(2) Check collet on bearing journal at commutator end of armature. Do not damage bearing journal. Check journal and shaft center for cleanliness, nicks, and burrs. Alignment and concentricity at bearing journal must be within **0.005** inch T.I.R.

(3) Rough turn with carbide-tipped tool at surface speed of **600 TO 800** feet per minute and cutting depth of **0.004 TO 0.006** inch per turn. Rough cut just enough to remove glaze and major irregularities of commutator.

NOTE

If mica under-cut is less than 0.0156 inch below commutator bars after rough turning, under-cut to 0.0312 inch, at width of 0.028 TO 0.032 inch, before finish turning.

(4) Finish turn with diamond-tipped tool at surface speed of **600 TO 800** feet per minute and maximum cutting depth of **0.001 TO 0.0015** inch per turn for each cut. Repeat finish turning until entire surface is within tolerance and is clean.

c. Replace all burned leads or leads with broken conductors. Splice new wire (41 strands of **0.010** inch wire) to stator at a point as close to coil as possible. Solder in place using pure tin solder containing three-percent resin core. Insulate splice. Identify new lead same as lead replaced.

d. Replace worn or unserviceable brushes and bearings.

13-123. Reassembly — Combustion Heater Vent Blower. (AVIM). a. Make electrical connections in accordance with figure 13-10 as assembly progresses. Use lockwire (C126.1) on screws (19, 30, and 50, figure 13-9) and on screws securing plate (35).

b. Assemble ring (52) and arm (32), spring (33), lead (53), leads (29), and screw (30). Bend clips on brush shunt leads (29) upward after installation of brushes.

c. Lay ground lead (53) in plate recess and solder in place using three-percent resin core, pure tin solder. Thread inter-pole lead through shielding. Leads (29) connect to opposite brush holders.

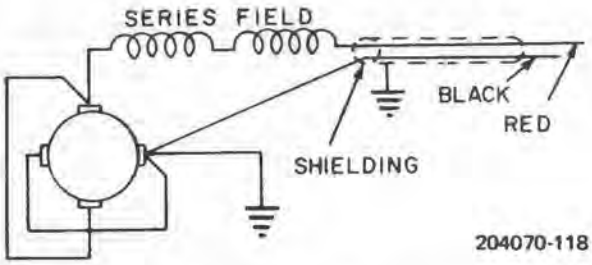

Figure 13-10. Schematic diagram — ventilating air blower

NOTE

Apply thin coat of molybdenum disulfide mixture (C131) to inside diameter of end bell inserts.

d. Assemble ring (52) and end bell (49) at neutral using scribe mark. Secure with screws (37), washers (36), and nuts (31).

e. Install bearings (57).

NOTE

Whenever brushes (51) are replaced, wrap No. 400 grit paper (C160), grit side out, around commutator before inserting armature (58) into stator (59).

f. Install armature (58) in stator (59).

g. Bend one tab of key washer (55) so it engages in end bell (56) and install end bell on armature shaft. Note locating notch on end bell (56) for correct positioning on stator (59). Install end bell on commutator end of armature shaft. Install screws (54).

h. Temporarily place brushes (51) in position and rotate armature in direction of normal rotation a few times to seat brushes. Remove brushes before removing armature from stator to take out sandpaper. Blow out all loose carbon dust before reinserting armature. Repeat step g. and tighten screws (54). Install brushes (51), lead (34), and screws (50).

NOTE

Use antiseize compound (C28) on screws (39, 46, and 54), and on screw securing plate (35).

i. Install washer (48), bearing retainer plate (47), and secure with screws (46). Stake screws (46) on side of slot.

j. Install fan (38), washer (45), and screws (44).

k. Install plate under plate (35) with embossed holes toward shaft extension end of motor.

NOTE

Three washers are installed in plate next to fan (38). Use antiseize compound on screws before installing.

l. Install plate (35) with washers and screws.

m. Install motor cover (41) and secure with screws (39) and washers (40).

n. Stamp rotation arrow on cover (41).

o. Install motor in housing (21), guide leads through grommet (9). Install screws (19), and washers (20).

p. Install filter (8) with screws (7) and nuts (14). Install nipples (6) over motor leads and connect leads to filter terminals with washers (4) and nuts (3).

NOTE

Replace filter (8) if there is a reported malfunction or a preservative compound leakage.

q. Install impeller (18) on shaft with washer (17) and nut (16). Torque nut **48 TO 55** inch-pounds.

r. After blower is completely assembled, retest as follows:

(1) Rotate impeller by hand to ensure motor and impeller rotate without binding or rubbing.

(2) Secure blower housing in rigid support and apply 28-vdc power to energize blower.

(3) Blower speed shall be not less than **12,000** rpm with 28-vdc input. No unusual noise or vibration shall be present.

(4) Current drawn at **12,000** rpm shall not exceed **34.5** amperes at 28-vdc input.

13-124. COMBUSTION HEATER IGNITION UNIT AND IGNITOR PLUG.

13-125. Description — Combustion Heater Ignition Unit and Ignitor Plug. Ignition to heater combustion chamber is provided by means of an ignition unit (5, figure 13-2) mounted on heater, a high voltage lead, an ignitor plug, and a ground electrode. Ignition unit is a vibrator type, energized by 28-volt dc to produce a high voltage oscillating current output for a continuous spark at gap between plug and electrode in combustion head. A spare set of vibrator points in ignition unit can be actuated by VIBRATOR switch on control panel when required.

13-126. Removal — Ignitor Plug. a. Ensure battery switch is OFF.

b. Remove ignitor plug lead from heater ignition assembly and cover wire end with insulating tape.

c. Unscrew ignitor plug from ignitor plug housing and remove ignitor plug and gasket.

13-127. Cleaning — Ignitor Plug. a. Remove all grease and carbon deposits from ignitor plug well housing, and spring connector which seats in ignitor plug well.

b. Dry with clean, filter, compressed air.

13-128. Inspection — Ignitor Plug. a. Inspect ignitor plug for evidence of cracked or broken porcelain, arcing, or carbon tracks inside wall of ignitor plug.

NOTE

Arcing or carbon tracks may be caused by shorting of ignitor plug or by dirt on spring connector which seats in the well of the ignitor plug. Correct fault before reinstalling or replacing ignitor plug.

b. Replace ignitor plug if cracked or defective.

13-129. Installation — Ignitor Plug. a. Insert new gasket and ignitor plug into ignitor plug housing.

b. Remove insulating tape from wire end and connect ignitor plug lead to heater ignition assembly.

c. Check operation of heater. (Refer to TM 55-1520-220-10).

13-130. Removal — Heater Ignition Unit. a. Ensure battery switch is OFF.

b. Remove ignitor plug lead and electrical receptacle from ignition assembly. Cover wire ends with insulating tape.

c. Remove nuts and washers from attachment clamps and lift ignition assembly from heater.

13-131. Installation — Heater Ignition Unit. a. Position ignition assembly in attachment clamps and install nuts and washers.

b. Remove insulating tape from wire ends and install electrical receptacle plug lead.

c. Check heater operation. (Refer to TM 55-1520-220-10.)

13-132. HEATER FUEL CONTROL BOX.

13-133. Description — Heater Fuel Control Box. The fuel control box assembly (1, figure 13-2) is located in aft, right side of heater compartment. Its function is to monitor flow of filtered fuel from engine fuel system to heater combustion chamber.

13-134. Removal — Heater Fuel Control Box. a. Ensure battery switch is OFF.

b. Disconnect and cap all tube assemblies entering control box.

c. Remove eight screws (19, figure 13-11) and washers (18) attaching cover and gasket (17) to control box and remove cover.

d. Remove screws (24), washers (25), and nuts (26) attaching wiring assembly (28) to control box (27) and disconnect wiring assembly. Remove wiring assembly from control box and cover wire ends with insulating tape.

e. Remove screw (7), washers (8 and 9), and nut (10) attaching electrical ground to top of control box (27).

f. Remove four screws (6) and washers (5) attaching control box (27) to structure and remove control box assembly.

1. Tube assembly
2. Washer
3. Nut
4. Ground wire
5. Washer
6. Screw
7. Screw
8. Washer
9. Washer
10. Nut
11. Screw
12. Washer
13. Nut
14. Relay
15. Washer
16. Screw
17. Cover & Gasket
18. Washer
19. Screw
20. Tube assembly
21. Nut
22. Washer
23. Screw
24. Screw
25. Washer
26. Nut
27. Box
28. Wiring assembly

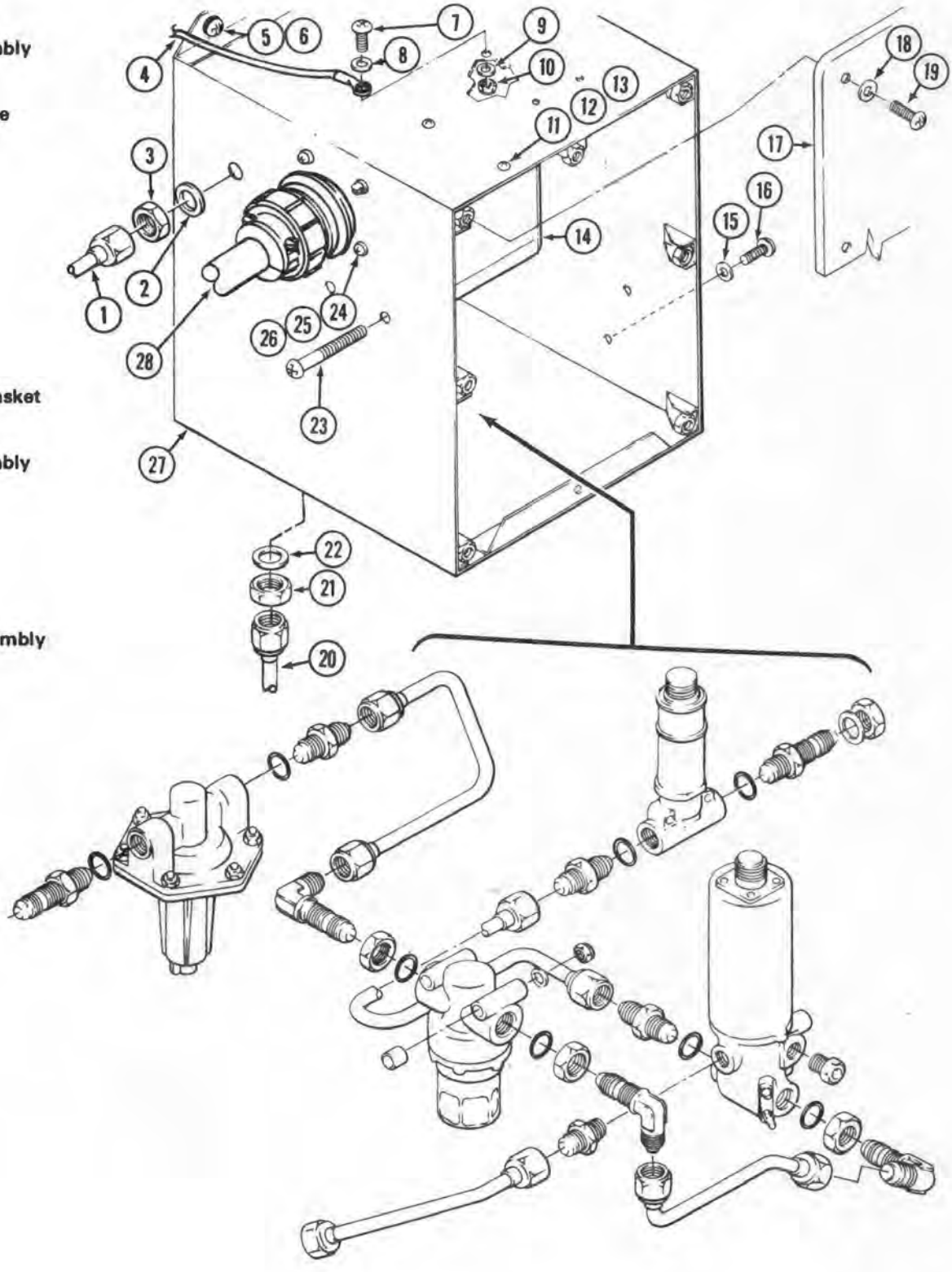

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Figure 13-11. Heater fuel control box — exploded view (Sheet 1 of 2)

29. Nipple
30. Tube assembly
31. Solenoid valve
32. Preformed packing
33. Nipple
34. Washer
35. Nut
36. Nut
37. Washer
38. Nut
39. Fuel pump
40. Nipple
41. Preformed packing
42. Preformed packing
43. Nut
44. Elbow
45. Preformed packing
46. Nipple
47. Tube assembly
48. Tube assembly
49. Filter
50. Spacer
51. Preformed packing
52. Tube assembly
53. Elbow
54. Pressure regulator
55. Preformed packing

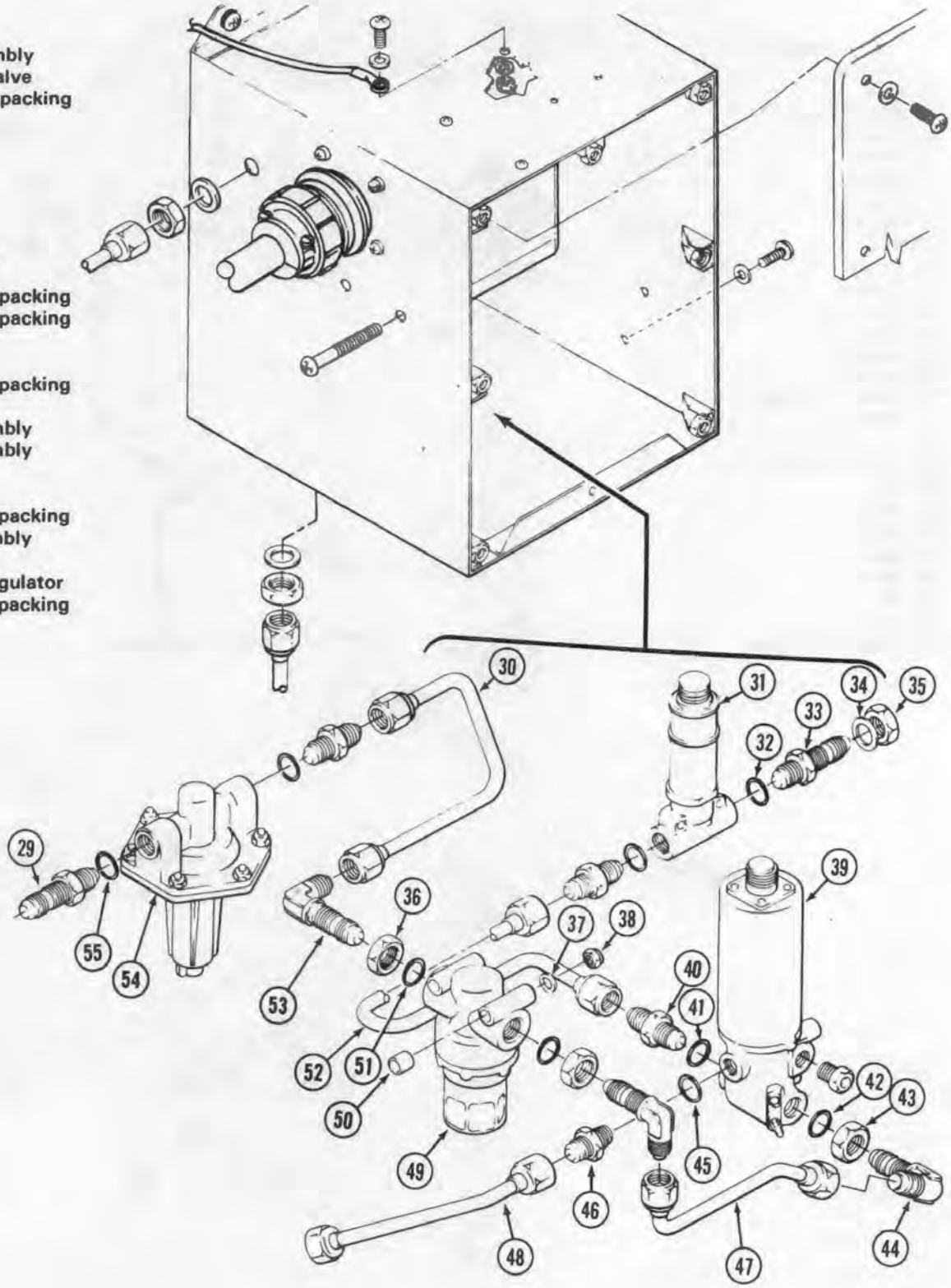

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Figure 13-11. Heater fuel control box — exploded view (Sheet 2 of 2)

13-135. Inspection — Heater Fuel Control Box. a. Inspect electrical wiring connected to control box for fraying, worn and general condition.

b. Check all tube assemblies and hardware for security of attachment.

c. Inspect fuel pump (39, figure 13-11), solenoid valve (31), fuel filter (49), lockout relay (14) and fuel pressure regulator (54) for damage, corrosion and serviceability.

d. Check fuel filter (49) and fuel pump (39) for contamination and leakage.

e. Check solenoid valve (31) and lockout relay (14) electrical leads for condition and security.

f. Inspect connection of all tube assemblies for leakage and security.

13-136. Repair or Replacement — Heater Fuel Control Box. a. Repair any fuel leaks in connections between components by replacing unserviceable gaskets, fittings, or lines.

b. Replace electrical leads and connectors if inspection criteria is exceeded.

c. Replace fuel pump (39, figure 13-11), fuel filter (49) and fuel pressure regulator (54) in event of a malfunction which is not reparable.

13-137. Installation — Heater Fuel Control Box. a. Position control box assembly (27, figure 13-11) against structure in aft, right side of heater compartment and attach with four washers (5) and screws (6).

b. Attach electrical ground (4) to top of control box (27) with nut (10), washers (8 and 9), and screw (7).

c. Remove insulating tape from wire ends and connect wiring assembly (28) and attach to control box (27) with four nuts (26), washers (25), and screws (24).

d. Position cover and gasket (17) on control box (27) and attach with eight washers (18) and screws (19).

e. Uncap and connect all tube assemblies.

f. Check heater operation. (Refer to TM 55-1520-220-10.)

13-138. HEATER CONTROL BOX FUEL PUMP.

13-139. Description — Heater Control Box Fuel Pump. The heater control box fuel pump (11, figure 13-2) supplies fuel to the heater from the engine fuel system. It also increases fuel pressure to the combustion heater.

13-140. Removal — Heater Control Box Fuel Pump. a. Ensure battery switch is OFF.

b. Remove eight screws (19, figure 13-11) and washers (18) attaching cover and gasket (17) to control box (17) and remove cover.

c. Disconnect electrical connections from solenoid valve (31) and fuel pump (39) and cover wire ends with insulating tape.

d. Remove tube assemblies (47, 48 and 52) and nipples (40 and 46) and elbow (44) from fuel pump and cap fuel line openings.

e. Remove three mounting screws (16) and washers (15) from the fuel pump (39) and remove fuel pump from control box (27).

13-141. Installation — Heater Control Box Fuel Pump. a. Position fuel pump (39, figure 13-11) in control box (27) and attach with three washers (15) and screws (16).

b. Install nipples (40 and 46) and elbow (44) with new preformed packing (41, 42 and 45). Uncap and install tube assemblies (47, 48 and 52).

c. Remove insulating tape from wire ends and connect electrical wiring to fuel pump (39) and solenoid valve (31).

d. Position cover and gasket (17) on control box (27) and attach with eight washers (18) and screws (19).

e. Check heater operation. (Refer to TM 55-1520-220-10.)

13-142. HEATER CONTROL BOX SOLENOID VALVE.

13-143. Description — Heater Control Box Solenoid Valve. This electrically operated fuel shutoff solenoid valve (14, figure 13-2) governs the flow of fuel to the heater combustion chamber.

13-144. Removal — Heater Control Box Solenoid Valve. a. Ensure battery switch is OFF.

b. Remove eight screws (19, figure 13-11) and washers (18) attaching cover (17) to control box (27) and remove cover.

c. Disconnect electrical wiring from solenoid valve (31) and cover wire ends with insulating tape.

d. Remove tube assemblies (52) from both ends of the solenoid valve (31), together with the locknut (35) holding the solenoid nipple (33) to the side of the control box (27). Cap fuel line openings.

e. Remove the solenoid valve (31) from the control box (27) and remove nipples (33) and preformed packing (32) from each end of the solenoid valve.

13-145. Installation — Heater Control Box Solenoid Valve. a. Install new preformed packing (32, figure 13-11) and nipples (33) on each end of the solenoid valve (31).

NOTE

The bulkhead nipple (33) is located on the inlet end of the solenoid valve.

b. Position the solenoid valve (31) in the control box (27) with the bulkhead nipple (33) extending out through the side of the control box. Install locknut (35) and washer (34) on the portion of the bulkhead fitting which is outside the control box.

c. Uncap and install tube assembly (52) to solenoid valve (31).

d. Remove insulating tape from wire ends and connect electrical wiring to solenoid valve (31).

e. Position cover and gasket (17) on control box (27) and attach with eight washers (18) and screws (19).

f. Check heater operation. (Refer to TM 55-1520-220-10.)

13-146. HEATER CONTROL BOX FUEL FILTER.

13-147. Description — Heater Control Box Fuel Filter. Fuel is filtered through a ten-micron screen fuel filter (13, figure 13-2) which has a four-gallon per hour capacity at 60 psi minimum.

NOTE

Fuel filter and drain lines shall be checked daily for accumulation of ice or water. During low temperature operation below 32 degrees F (0 degrees C), water vapor in the combustion gasses flowing through the drain line may condense and form ice. Water produced during combustion may collect on the fuel nozzles and ignitor plug and form ice after the heater has been shutdown. This ice may preclude initial starting of the heater without first preheating.

13-148. Removal — Heater Control Box Fuel Filter. a. Ensure battery switch is OFF.

b. Remove eight screws (19, figure 13-11) and washers (18) attaching cover (17) to control box (27) and remove cover.

c. Disconnect tube assemblies (30 and 47) from filter (49) and cap fuel line openings.

d. Remove screws (23), washers (37), spacers (50), and nuts (38) attaching fuel filter (49) to control box (27) and remove filter from control box.

e. Remove elbows (53) and preformed packing (51) from fuel filter ports.

13-149. Installation — Heater Control Box Fuel Filter. a. Install preformed packing (51, figure 13-11) and elbows (53) in fuel filter ports.

b. Position fuel filter (49) in control box assembly (27) and attach with nuts (38), spacers (50), washers (37), and screws (23).

c. Uncap and connect tube assemblies (30 and 47) to fuel filter (49).

d. Position cover (17) on control box (27) and attach with eight washers (18) and screws (19).

e. Check heater operation. (Refer to TM 55-1520-220-10.)

13-150. HEATER CONTROL BOX LOCKOUT RELAY.

13-151. Description — Heater Control Box Lockout Relay. The heater lockout relay (12, figure 13-2) shuts off the heater in case of overheating or when air pressure is too low to sustain combustion.

13-152. Removal — Heater Control Box Lockout Relay. a. Ensure battery switch is OFF.

b. Remove eight screws (19, figure 13-11) and washers (18) attaching cover (17) to control box (27) and remove cover.

c. Disconnect electrical wiring from relay (14) and cover wire ends with insulating tape.

d. Remove mounting screws (11), washers (12), and nuts (13) from relay (14) and remove the relay from the control box.

13-153. Installation — Heater Control Box Lockout Relay. a. Position relay (14, figure 13-11) in control box (27) and install mounting nuts (13), washers (12), and screws (11).

b. Remove insulating tape from wire ends and connect electrical wiring to relay.

c. Position cover on control box and attach with eight washers (18) and screws (19).

d. Check heater operation. (Refer to TM 55-1520-220-10.)

13-154. HEATER CONTROL BOX FUEL PRESSURE REGULATOR.

13-155. Description — Heater Control Box Fuel Pressure Regulator. The fuel pressure regulator (15, figure 13-2) has a minimum capacity of four gallons per hour with an inlet pressure of **1 TO 15** psi and an outlet pressure of **1** psi.

13-156. Removal — Heater Control Box Fuel Pressure Regulator. a. Ensure battery switch is OFF.

b. Remove eight screws (19, figure 13-11) and washers (18) attaching cover (17) to control box (27) and remove cover (17).

c. Remove tube assembly (30) from the pressure regulator (54), together with the locknut (3) holding the regulator (54) to the side of the control box (27). Cap fuel line openings.

d. Remove the pressure regulator (54) from the control box (27) and remove the nipples (29) and preformed packing (55) from each port of the regulator.

13-157. Installation — Heater Control Box Fuel Pressure Regulator. a. Install new preformed packing (55, figure 13-11) and nipples (29) in each port of the regulator (54).

NOTE

The nipple (29) is located on the inlet side of the pressure regulator.

b. Position the pressure regulator (54) in the control box (27) with the nipple (29) extending out through the side of the control box. Install washers (2), locknut (3) on the portion of the nipple (29) which is outside the control box (27).

c. Uncap and install tube assembly (30) to the pressure regulator (54).

d. Position cover (17) on control box (27) and attach with eight washers (18) and screws (19).

e. Check heater operation. (Refer to TM 55-1520-220-10.)

13-158. COMBUSTION HEATER 250 DEGREES F (121.1 DEGREES C) CYCLING SWITCH

13-159. Description — Combustion Heater 250 Degrees F (121.1 Degrees C) Cycling Switch. The combustion heater cycling switch (8, figure 13-2) is located in the upper inboard part of the lower plenum behind the fresh and hot air sensing elements.

13-160. Removal — Combustion Heater 250 Degrees F (121.1 Degrees C) Cycling Switch. a. Ensure battery switch is OFF.

b. Disconnect electrical wiring from switch and cover wire ends with insulating tape.

c. Unthread cycling switch from plenum and remove switch.

13-161. Inspection — Combustion Heater 250 Degrees F (121.1 Degrees C) Cycling Switch. a. Inspect electrical connections for security, corrosion and general condition.

b. Check switch operation, security of mounting and corrosion.

13-162. Replacement — Combustion Heater 250 Degrees F (121.1 Degrees C). Replace switch if corroded or otherwise unserviceable. Replace electrical leads if unserviceable.

13-163. Installation — Combustion Heater 250 Degrees F (121.1 Degrees C) Cycling Switch. a. Thread the cycling switch into the upper inboard part of the lower plenum behind the fresh and hot air sensing elements.

b. Remove insulating tape from wire ends and connect electrical wiring to cycling switch.

NOTE

The cycling switch is set at 250 degrees F (121.1 degrees C), plus or minus 6 degrees (3.3 degrees), and is normally closed. This switch closes on decreasing temperature.

13-164. COMBUSTION HEATER 350 DEGREES F (176.7 DEGREES C) OVERHEAT SWITCH.

13-165. Description — Combustion Heater 350 Degrees F (176.7 Degrees C) Overheat Switch. The combustion heater overheat switch (9, figure 13-2) is located in the heater plenum. The purpose of this switch is to prevent damage to the heater assembly from excessively high heat.

13-166. Removal — Combustion Heater 350 Degrees F (176.7 Degrees C) Overheat Switch. a. Ensure battery switch is OFF.

b. Disconnect electrical wiring from switch and cover wire ends with insulating tape.

c. Unthread overheat switch from plenum and remove switch.

13-167. Installation — Combustion Heater 350 Degrees F (176.7 Degrees C) Overheat Switch. a. Thread overheat switch into heater plenum.

b. Remove insulating tape from wire ends and connect electrical wiring to overheat switch.

NOTE

The overheat switch is set at 350 ± 6 degrees F (176.7 ± 3.3 degrees C), and is normally closed. This switch opens on increasing temperature.

13-168. Deleted.

13-169. Deleted.

13-170. COMBUSTION HEATER 115 DEGREES F (46.1 DEGREES C) PURGE SWITCH.

13-171. Description — Combustion Heater 115 Degrees F (46.1 Degrees C) Purge Switch. The combustion heater purge switch (10, figure 13-2) is located in the heater plenum. The purpose of this switch is to keep both the combustion air blower and

the heater vent blower in operation for a sufficient period of time after shutdown of the heater assembly to prevent damage to the combustion heater.

13-172. Removal — Combustion Heater 115 Degrees F (46.1 Degrees C) Purge Switch. a. Ensure battery switch is OFF.

b. Disconnect electrical wiring from switch and cover wire ends with insulating tape.

c. Unthread purge switch from plenum and remove switch.

13-173. Inspection — Combustion Heater 115 Degrees F (46.1 Degrees C) Purge Switch. a. Check switch for operation, security of mounting, and corrosion.

b. Check electrical connections for security and electrical leads for fraying and general condition.

13-174. Replacement — Combustion Heater 115 Degrees F (46.1 Degrees C) Purge Switch. Replace switch and leads if corroded, damaged or otherwise unserviceable.

13-175. Installation — Combustion Heater 115 Degrees F (46.1 Degrees C) Purge Switch. a. Thread purge switch (10, figure 13-2) into heater plenum.

b. Remove insulating tape from wire ends and connect electrical wiring to purge switch.

NOTE

The purge switch is set at 115 ± 6 degrees F (46.1 ± 3.3 degrees C), and is normally open. This switch closes on increasing temperature.

13-176. COMBUSTION HEATER AIR PRESSURE SWITCH.

13-177. Description — Combustion Heater Air Pressure Switch. The heater air pressure switch (2, figure 13-2) is mounted in the upper aft corner of the heater compartment. It is operated by the air pressure in the heater system.

13-178. Inspection — Combustion Heater Air Pressure Switch. a. Check switch for operation, corrosion and security of mounting.

b. Check security of electrical connections, condition of wires, and condition of air hose.

13-179. Replacement — Combustion Heater Air Pressure Switch. a. Replace switch if corroded, damaged or otherwise unserviceable.

b. Replace air hose and/or wiring if unserviceable.

13-180. Removal — Combustion Heater Air Pressure Switch. a. Ensure battery switch is OFF.

b. Disconnect flexible hose and electrical plug from air pressure switch (2, figure 13-2). Cap hose opening and cover plug with insulating tape.

c. Remove mounting screws, spacers, washers, and nuts and lift air pressure switch from mounting bracket.

13-181. Installation — Combustion Heater Air Pressure Switch. a. Position air pressure switch (2) on mounting bracket and install nuts, washers, spacers, and screws.

b. Uncap flexible hose opening and remove insulating tape from electrical plug. Connect hose and plug to air pressure switch (2).

13-182. FRESH AIR INTAKE SCREEN.

13-183. Description — Fresh Air Intake Screen. The fresh air intake screen (7, figure 13-2) is located on the lower end of the combustion heater air intake duct and prevents foreign material from entering the heater.

13-184. Inspection — Fresh Air Intake Screen. Inspect screen for bent sections, foreign material and corrosion.

13-185. Repair — Fresh Air Intake Screen. a. Remove corrosion from screen using 600 grit sandpaper (C185.3)

b. Straighten bent sections of screen assembly.

13-186. Replacement — Fresh Air Intake Screen. a. Replace screen assembly if unable to repair in accordance with repair procedures.

b. Replace screen assembly if screen sections are broken.

13-187. Removal and Installation — Fresh Air Intake Screen. a. Remove attaching screws and washers and remove screen.

b. Position screen on lower end of combustion heater air intake duct and install attaching washers and screws.

13-188. COMBUSTION HEATER SELECTOR VALVE.

13-189. Description — Combustion Heater Selector Valve. The solenoid operated combustion heat selector valve (4, figure 13-1) is located at approximately midpoint of the cabin passenger cargo area on the right side of the aircraft. The purpose of this valve is to distribute heated air from the combustion heater to various cabin areas, as required. This valve is equipped with a thermostat in addition to the electrical solenoid.

13-190. Removal — Combustion Heater Selector Valve. a. Ensure battery switch is OFF.

b. Disconnect electrical wiring from thermostatic switch (98) and solenoid (102) and cover wire ends with insulating tape.

c. Remove clamps (97, 104 and 105) attaching valve housing to forward hot air duct (106) and hose (96 and 103).

d. Remove two screws, washers and nuts attaching selector valve (4) to structure.

e. Remove flame resistant glass cloth (100) attaching aft portion of valve (4) housing to main combustion heater hot air duct (99) and remove selector valve.

f. Remove screws and washers attaching solenoid (102) to mount on selector valve (4) and remove solenoid (102).

g. On helicopter 64-14101 through 64-14191, remove screws and washers attaching thermostat (98) to selector valve (4) housing and remove thermostat.

13-191. Inspection — Combustion Heater Selector Valve. a. Inspect selector valve (4) for condition, corrosion and security.

b. Check valve for operation.

c. Inspect connecting ducts (99 and 106) and hose (96 and 103) for serviceability.

13-192. Replacement — Combustion Heater Selector Valve. a. Replace valve (4) if corroded, damaged or otherwise unserviceable.

b. Replace ducts (99, 106) if unserviceable.

13-193. Installation — Combustion Heater Selector Valve. a. On helicopters 64-14101 through 64-14191, position thermostat (98) in selector valve (4) housing and install attaching washers and screws.

b. Position solenoid (102) on mount and install attaching washers and screws.

c. Position selector valve (4) on structure with aft portion of valve housing mated to main combustion heater hot air duct (99), and install washers and screws attaching valve to structure.

d. Connect aft portion of selector valve housing to hot air duct (99) as follows:

(1) Apply Selectron adhesive (C-12.1) to soft ends.

(2) Apply three complete wraps to **two** inch wide Scotch brand flame resistant glass cloth (C50).

NOTE

Do not stretch last wrap.

e. Attach forward hot air duct (106) and hose (96 and 103) to selector valve (4) housing with clamps (105, 97 and 104).

f. Remove insulating tape from wire ends and connect electrical wiring to selector valve thermostatic switch (98) and solenoid (102).

13-194. COMBUSTION HEATER SELECTOR VALVE CONTROL DIAL AND CABLE.

13-195. Description — Combustion Heater Selector Valve Control Dial and Cable. Helicopters 64-14101 through 64-14191, are equipped with a selector valve control dial and flexible control cable (2, figure 13-1) for proper operation of the combustion heat selector valve.

13-196. Removal — Combustion Heater Selector Valve Control Dial and Cable. a. Ensure battery switch is OFF.

b. Disconnect electrical wiring from solenoid and cover wire ends with insulating tape.

c. Remove clamps and grommet attaching flexible cable.

d. Remove screws attaching selecting dial and remove selecting dial and flexible cable.

13-197. Installation — Combustion Heater Selector Valve Control Dial and Cable. a. Position selector dial and install attaching screws.

b. Position and route flexible cable, progressively installing attaching grommet and clamps.

c. Remove insulating tape from wire ends and connect electrical wiring to solenoid.

13-198. AFT CABIN AIR VALVES.

13-199. Description — Aft Cabin Air Valves. The aft cabin air valves (3, figure 13-1) are located just aft of the pilot and copilot seats and distribute heated air to the aft cabin area.

13-200. Inspection — Aft Cabin Air Valves. a. Inspect valves for corrosion, cracks and serviceability.

b. Check air valves for security of mounting.

13-201. Replacement — Aft Cabin Air Valves. Replace damaged, corroded or otherwise unserviceable valves.

13-202. Removal and Installation — Aft Cabin Air Valves. a. Remove screws and washers attaching valves and remove valves.

b. Posistion air valves and install attaching washers and screws.

13-203. COMBUSTION HEAT CONTROL RELAY.

13-204. Description — Combustion Heat Control Relay. The helicopters are equipped with a combustion heat control relay (figure 13-12) located near the top of the right door pillar post between pilot and passenger-cargo areas of the cabin.

13-205. Removal — Combustion Heat Control Relay. a. Ensure battery switch is OFF.

b. Disconnect electrical wiring from relay and cover wire ends with insulating tape.

c. Remove attaching screws, washers and nuts and remove relay.

13-206. Installation — Combustion Heat Control Relay. a. Position relay on right door pillar post and install attaching nuts, washers, and screws.

b. Remove insulating tape from wire ends and connect electrical wiring to relay.

13-207. COPILOT FOOT WARMER CONTROL.

13-208. Description — Copilot Foot Warmer Control. The copilot foot warmer control (15, figure 13-1) is mounted left of control panel assembly.

13-209. Removal — Copilot Foot Warmer Control. a. Remove cotter pins, washers, and pins connecting control rod to handle and to control valve and remove rod.

b. Remove screw, washers, spacer, and nut attaching handle, and remove handle.

13-210. Installation — Copilot Foot Warmer Control. a. Position control handle and attach with nut, spacer, washer, and screw.

b. Position control rod and attach to control valve and handle with pins, washers, and cotter pins.

13-211. COPILOT FOOT WARMER CONTROL VALVE.

13-212. Description — Copilot Foot Warmer Control Valve. The copilot foot warmer control valve (18, figure 13-1) is located directly below the control handle and regulates flow of warm air to foot warmer outlet.

13-213. Removal — Copilot Foot Warmer Control Valve. a. Disconnect control rod from valve.

b. Remove three screws, washers, and nuts attaching control valve to duct flanges and remove valve from between ducts.

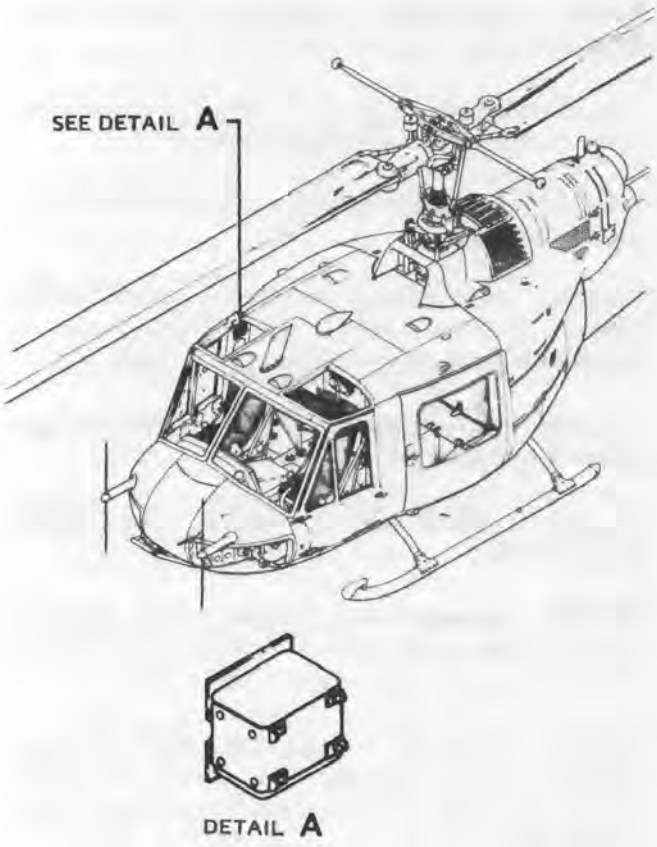

Figure 13-12. Combustion heat control relay

13-214. Inspection — Copilot Foot Warmer Control Valve. a. Check valve for corrosion, cracks and general condition.

b. Check valve control rod for freedom of movement and security.

13-215. Repair or Replacement — Copilot Foot Warmer Control Valve. a. Repair of control valve is limited to minor scratches and dents.

b. Replace valve (18) if corroded, damaged or otherwise unserviceable.

c. Replace valve control rod if binding or roughness of operation exists.

13-216. Installation — Copilot Foot Warmer Control Valve. a. Position control valve between ducts and install three nuts, washers, and screws.

b. Connect control rod to valve.

13-217. WINDSHIELD DEFROSTER NOZZLES.

13-218. Description — Windshield Defroster Nozzles. The windshield defroster nozzles (1, figure 13-1) are located just below and aft of the pilot and copilot windshields.

13-219. Inspection — Windshield Defroster Nozzles. Check nozzles for free air flow and security of mounting.

13-220. Replacement — Windshield Defroster Nozzles. Replace nozzles which are cracked or otherwise unserviceable.

13-221. Removal and Installation — Windshield Defroster Nozzles. a. Remove bolts, washers, and nuts attaching nozzle to duct and remove nozzle.

b. Position nozzle on duct and install attaching nuts, washers, and bolts.

13-222. RIGHT LOWER DEFROSTER CONTROL.

13-223. Description — Right Lower Defroster Control. The right lower defroster control handle (13, figure 13-1) is located on the right side of instrument pedestal.

13-224. Removal — Right Lower Defroster Control. a. Remove cotter pins and washers at each end of control cable.

b. Remove screw, washer, nut, clamp, and grommet attaching control cable and remove cable.

13-225. Installation — Right Lower Defroster Control. a. Position control handle and attach with bolt, washers, nut, and cotter pin.

b. Attach upper end of control cable with washer and cotter pin.

c. Route and position control cable progressively installing grommet, clamp, nut, washer, and screw.

d. Attach lower end of cable to control valve with washer and cotter pin.

13-226. RIGHT LOWER DEFROSTER CONTROL VALVE.

13-227. Description — Right Lower Defroster Control Valve. The control valve (21, figure 13-1) for the right lower defroster is located between nozzle elbow and T-duct which carries warm air to the nozzle.

13-228. Removal — Right Lower Defroster Control Valve. a. Remove defroster nozzle by removing bolts, washers, and nuts attaching nozzle to duct and remove nozzle.

b. Disconnect control cable from control lever of valve.

c. Remove screws, washers, and nuts attaching elbow, control valve, and T-duct.

d. Remove elbow, gaskets, and control valve from T-duct.

13-229. Inspection — Right Lower Defroster Control Valve. a. Inspect control valve for wear, damage, and serviceability.

b. Inspect gasket for serviceability.

13-230. Replacement — Right Lower Defroster Control Valve. a. Replace control valve if worn damaged or unserviceable.

b. Replace gasket if unserviceable.

13-231. Installation — Right Lower Defroster Control Valve. a. Position control valve, gaskets, and elbow on T-duct, align holes, and install nuts, washers, and screws.

b. Connect control cable to control lever of valve.

c. Install defroster nozzle by positioning nozzle on duct and installing attaching nuts, washers, and bolts.

13-232. HEATING CONTROL PANEL.

13-233. Description — Heating Control Panel. The heating control panel (9, figure 13-1) is located on the forward lower left side of the overhead console panel and contains electrical switches necessary for operation of the heater and defroster installation.

13-234. Removal — Heating Control Panel. a. Ensure battery switch is OFF.

b. Loosen fasteners attaching control panel to overhead console panel and carefully disengage control panel from console.

c. Disconnect all electrical wiring from control panel and cover wire ends with insulating tape. Remove control panel.

13-235. Installation — Heating Control Panel. a. Remove insulating tape from wire ends and connect electrical wiring to control panel.

b. Position control panel in overhead console panel and secure with fasteners.

CHAPTER 14

HOIST AND WINCHES

SECTION I. PERSONNEL RESCUE HOIST

14-1. RESCUE HOIST.

CAUTION

(Breeze Hoist Only)
A locally manufactured placard shall be affixed to the hoist control box on an area visible from inside the aircraft when the hoist boom is extended. The placard will state: THIS HOIST IS TOTALLY RESTRICTED FROM ANY LIVE RESCUE MISSIONS, NON-CRITICAL TRAINING AND DEMONSTRATION MISSIONS. ONLY TRAINING WITH DUMMY LOADS IS AUTHORIZED. PICK UP DUMMY LOADS OVER WATER OR OVER UNINHABITED AREAS.

14-2. Description — Rescue Hoist. The internal rescue hoist assembly consists of vertical post extending from the floor structure to the cabin roof, a hoist boom, and an electrically operated winch which can only be positioned on right side of cabin (figures 14-1 and 14-2). The hoist has a maximum capacity of 600 pounds. Cable speed is approximately 100 feet per minute and length is 256 feet. A linear actuator is provided for swinging the boom in and out of the cabin door. The hoist is operated by means of a control pendant or by controls on the right side cyclic stick. The pilot hoist contol switch provides for boom positioning and reeling up or down of the winch cable. The pilot control has priority over the hoist operator controls; however, the pilot has only a fixed full speed capability. The hoist operator controls are located in the hoist control pendant and provide the following switches: a speed control knob that is self-centering with variable speed control for reeling the cable up or down; a boom in and out switch and an intercom trigger switch to provide communication with the flight crew through the hoist operator headset. An electrically powered traction sheave assembly, mounted on the end of the hoist boom aids in lowering the hoist cable and prevents snarling of cable while being reeled out. The traction sheave is unpowered while the cable is being retrieved. A cable cutting guillotine, employing a pressure charge, provides a means of cutting the cable free of the helicopter in an emergency. The cutter is electrically actuated by guarded switches located on the hoist control box and on the pilot pedestal. The switches are sealed with breakaway wire. Electrical power to the hoist and its controls is 28 Vdc. Circuit protection is provided by the HOIST CABLE CUT, HOIST CONT, and HOIST PWR circuit breakers located in the overhead console. The electrical connection for hoist power is located in the cabin roof above the sound proofing.

CAUTION

Rescue hoist is life support equipment and shall be kept clean and in good operating condition. Hook and bumper assembly must be checked for bent safety latches and latch pins, at regular intervals. When the guillotine has been used it shall be cleaned, as soon as practical, to prevent any corrosion buildup.

NOTE

CABLE CUT circuit breaker does not control crew operators CABLE CUT switch.

14-3. Inspection — Rescue Hoist (Installed). a. Inspect hoist cable (3, figure 14-1) for cleanliness, broken wires, kinks, and other evidence of damage. Check cable for interferences along its routing.

b. Inspect upper, middle, and lower rollers (43, 45, and 46) for damage and freedom of movement.

c. Inspect traction sheave assembly (1) for pulley damage and pressure roller for spring tension on hoist cable (3).

d. Inspect adapters (11 and 30) for positive locking and security to roof stud (10) and plate stud (29). Check the two actuator plates (28) for security of adapter fittings (26) to floor studs (27).

e. Inspect power cables (6, 18, 21, 34, and 37) for condition and security.

f. Inspect control box (19) and control pendant (35) for security of attachment, power cables for connections, and switches for proper function and condition.

g. Check pilot and hoist operator CABLE CUT switch guards are closed and secured with breakaway wire (C246.1).

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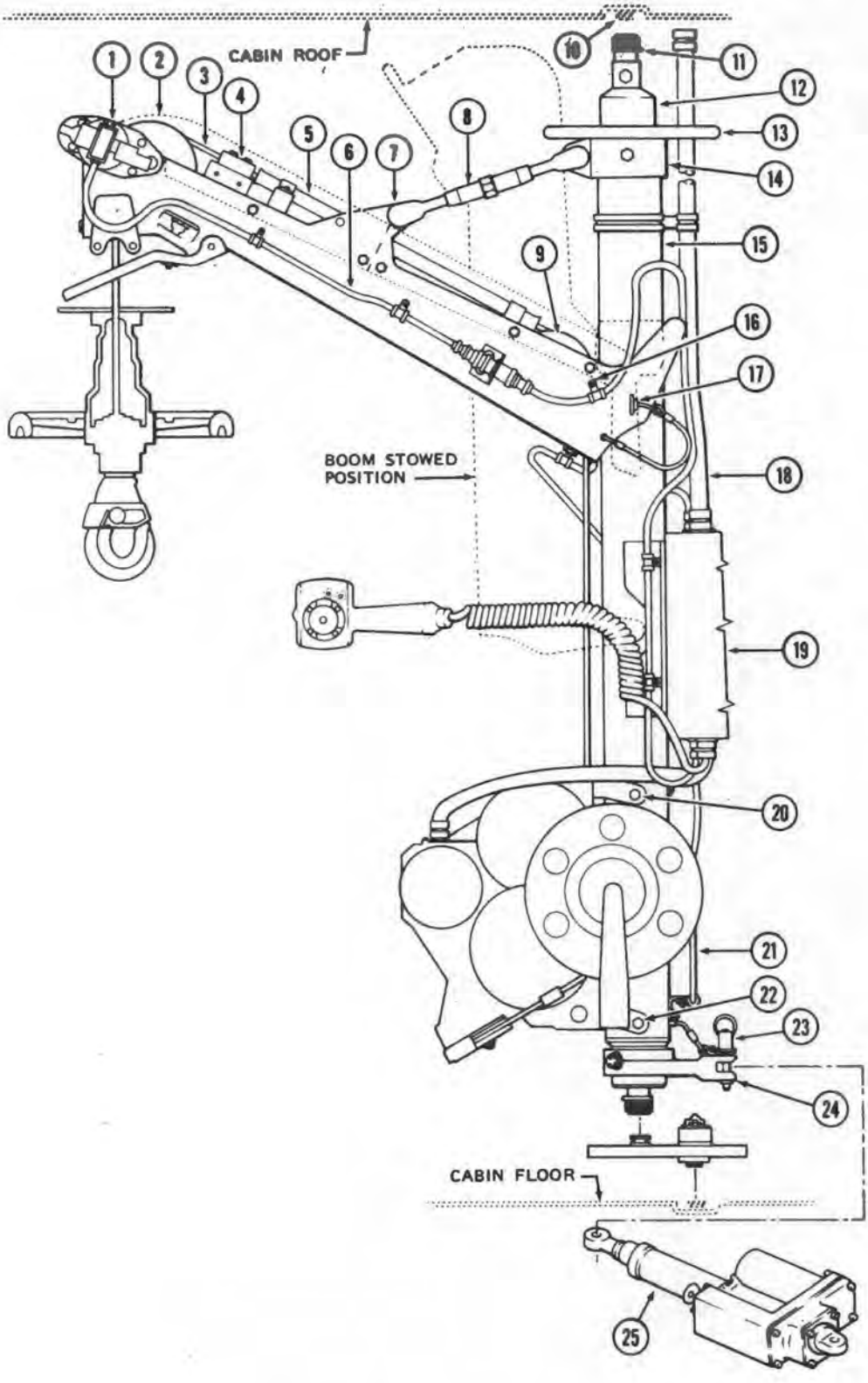

Figure 14-1. Rescue hoist (Sheet 1 of 4)

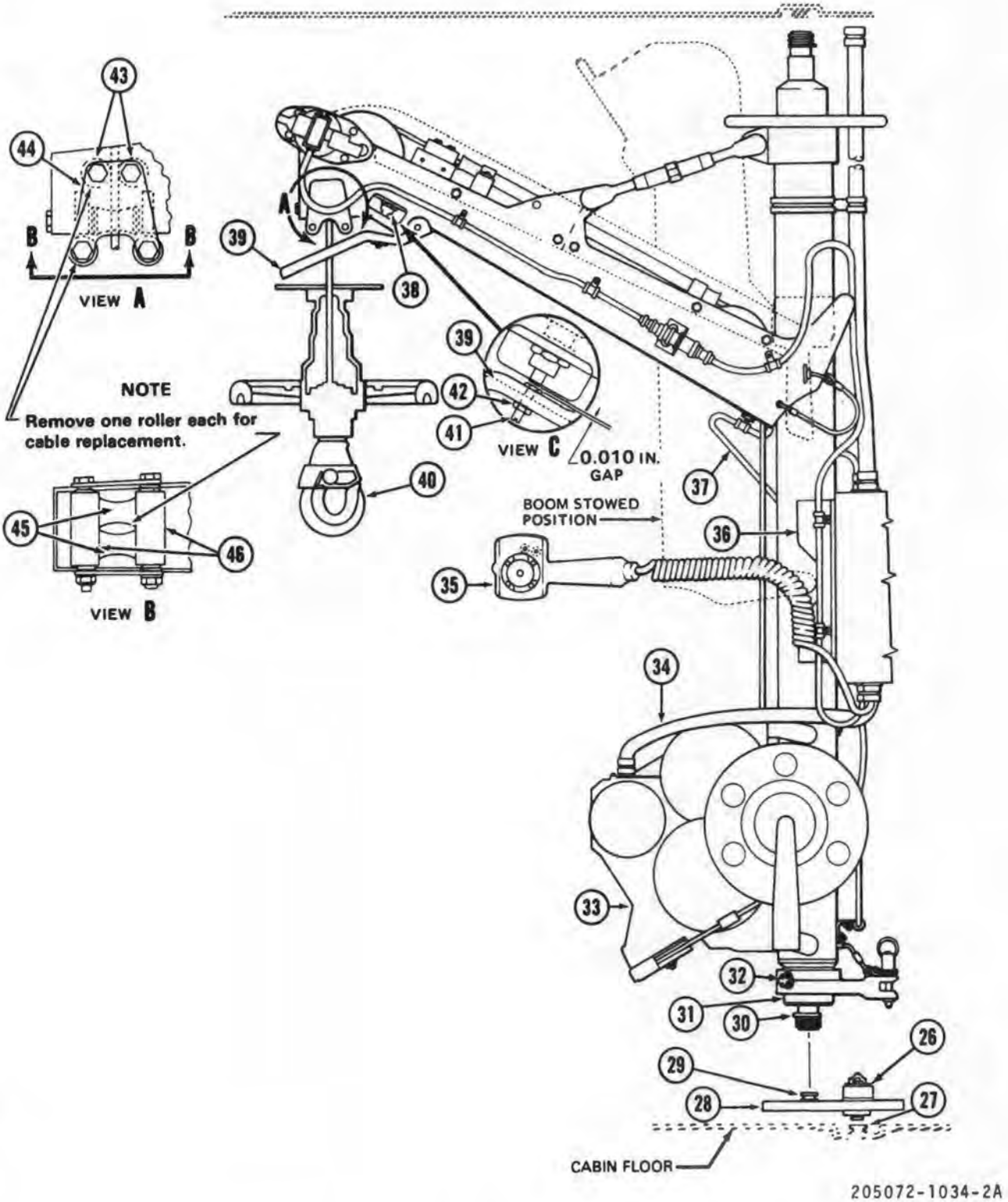

Figure 14-1. Rescue hoist (Sheet 2 of 4)

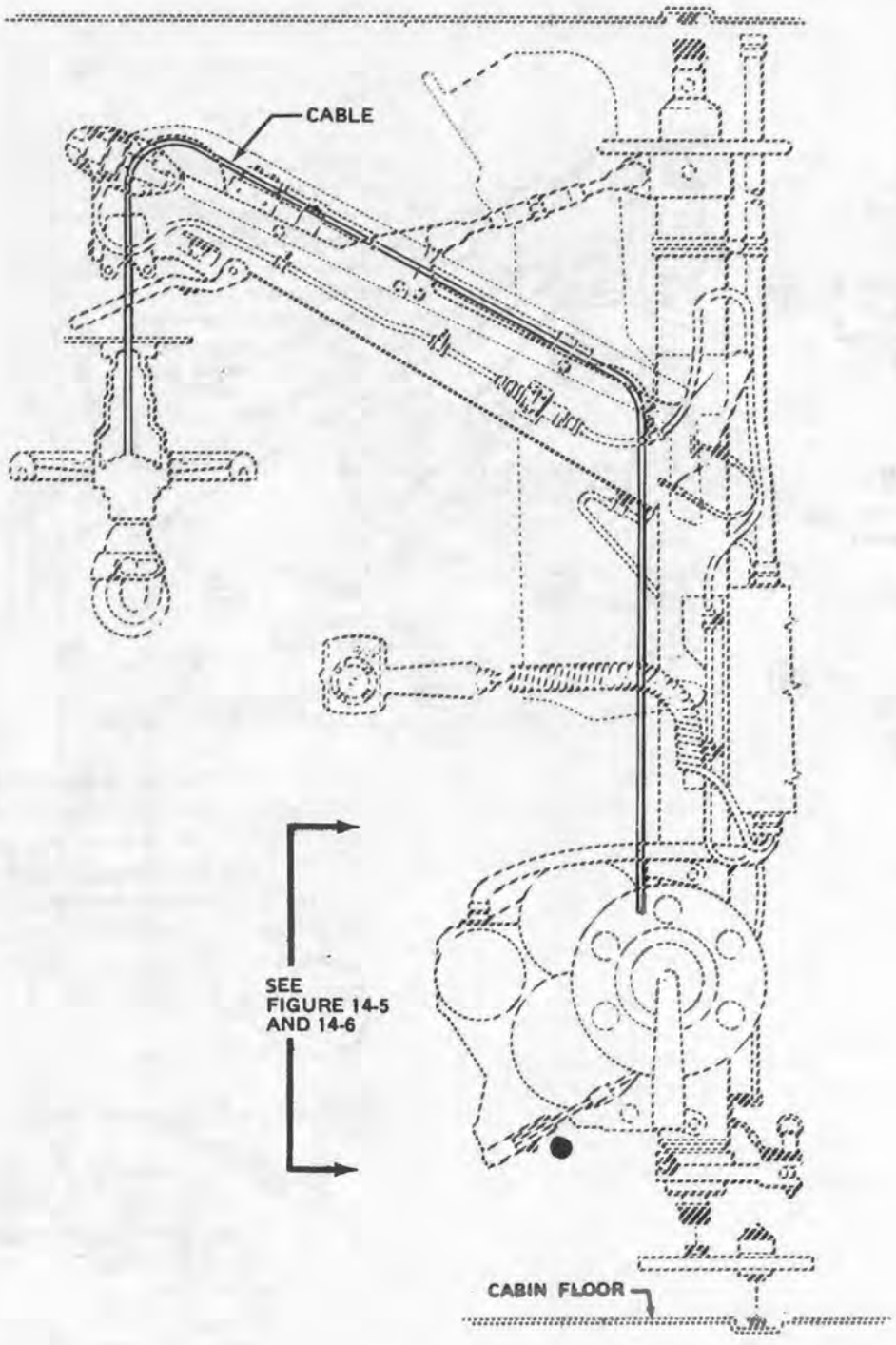

Figure 14-1. Rescue hoist (Sheet 3 of 4)

1. Traction sheave assembly
2. Boom cover
3. Hoist cable
4. Guillotine assembly
5. Guide tube
6. Sheave power cable
7. Boom
8. Turnbuckle
9. Pulley
10. Roof stud
11. Adapter — quick disconnect
12. Support
13. Locknut
14. Fitting
15. Post
16. Guide bolt
17. Boom retaining pin
18. Hoist power cable
19. Control box
20. Bracket — upper
21. Actuator power cable
22. Bracket — lower
23. Pin
24. Actuator lever
25. Actuator
26. Adapter fitting
27. Floor stud
28. Actuator plate — outboard
29. Stud
30. Adapter — quick disconnect
31. Support — lower post
32. Bolt — actuator lever
33. Hoist drive unit
34. Drive unit power cable
35. Control pendant
36. Mounting angle
37. Guillotine power cable
38. Up limit switch
39. Trigger assembly
40. Hook and bumper assembly
41. Bolt — up limit switch actuator
42. Nut — up limit switch actuator
43. Upper rollers
44. Side plates
45. Middle rollers
46. Lower rollers

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Figure 14-1. Rescue hoist (Sheet 4 of 4)

h. Check to ensure that guillotine assembly (4) is properly charged. Do not discharge.

i. Check oil level in gearbox of hoist drive unit (33).

j. Inspect rescue hoist for general condition and security of all components.

k. Perform operational check (paragraph 14-4).

14-4. Operational Check — Rescue Hoist. Perform operational check of rescue hoist as follows:

CAUTION

Ensure cargo door adjacent to hoist is fully open and secured before operating hoist.

Ensure a minimum load of 5 pounds, normally the weight of the hook and bumper assembly, is maintained on the hoist cable when it is reeled out.

NOTE

To ensure hoist is inspected after each operation, apply a 2-inch wide, 6-inch long strip of white adhesive tape (C220.1) on hoist post or control box in a prominent location. Divide tape into two columns: one column to indicate date of usage, the other to be initialed by operator or inspector.

a. BAT Switch — ON.

b. NON-ESS BUS Switch MANUAL — ON.

NOTE

If external power is used, position BAT switch to OFF and NON-ESS BUS switch to NORMAL-ON.

c. Check that CABLE CUT switch guards are in closed position and secured with breakaway wire (C246.1). Ensure that guillotine assembly is properly charged (paragraph 14-33). Do not discharge.

d. Close HOIST PWR, HOIST CONT, and HOIST CABLE CUT circuit breakers.

e. On control pendant, hold BOOM switch to OUT position. Observe that hoist boom swings to outboard, release switch and observe switch returns to center position. Hold control button to IN position, boom should swing to inboard position.

f. On pilot cyclic stick, hold hoist control button to right, observe that boom swings to outboard, release switch and allow control button to center. Hold control button to left position, boom should swing to inboard position.

g. Place boom in full outboard position, using either control. Check to ensure that top of boom will clear door frame.

WARNING

Full speed operation of hook and bumper assembly into up limit switch might overstress hoist cable without causing visible damage. Cable should be replaced if this is suspected or known. (This may be caused by limit switch or motor brake out of adjustment).

WARNING

Do not spill oil on storage drum clutch. Wipe clean and dry any oil spilled on floor around hoist.

CAUTION

Operate rescue hoist normally at full speed, to avoid excessive heating of motor and gearbox. Use slow speed near either end of hoist cable travel.

NOTE

To simulate lowering and raising the hook and bumper assembly in the following steps, use a clean 55 gallon oil drum with top removed and rubber bumper (split hose) placed around rim or other suitable container of equal size. Allow hoist cable to coil into drum as cable is extended from hoist. Dragging cable over ground or allowing it to kink must be avoided.

h. Move pendant control cable switch to right and toward DOWN. Hoist cable should reel out, and speed should be faster as control is moved further from center position. Check oil level through sight glass on gearbox of hoist drive unit, while hoist is running. Stop drive unit by releasing control switch. If required, add oil through filler port on side of gearbox (paragraph 14-12). Return pendant control switch to DOWN and continue reeling cable out, observing amount of cable on storage drum. Hoist drive motor should stop (by action of down-limit switch on storage drum) when three wraps of cable remain on storage drum.

h.1. Check operation of traction sheave by powering out 10 feet of cable under a no load condition. (Do not pull on the cable or allow the weight of the hook to apply tension to the cable.) The traction sheave will keep the internal cable routing under tension properly. If the traction sheave is not working, slack will appear in the internal cable routing and can be observed between the motor and boom where it runs near the hoist post. If the sheave is not working, the hoist shall not be used until it is repaired and the cable condition and routing are verified as serviceable.

NOTE

Check traction sheave assembly daily for operation and condition. Failure of traction sheave to operate can lead to hoist cable looseness at hoist drive unit and misrouting, followed by cable entanglement and breakage. Avoid forcing the boom in or out which, can lead to actuator relay failure. Use boom to swing (free hanging) load through door. Avoid pulling loads into helicopter without bringing in boom since this tends to kink and weaken cable near the hook and bumper assembly. The hook should not be allowed to cock and should hang nearly straight to reduce strain on cable where it joins the hook.

i. Inspect hoist cable for clean condition, broken wires, kinks, and other evidence of damage. Check cable drum for wobble while hoist is operating and ensure that cable windings on drum are uniform and flat.

NOTE

During final rewind of hoist cable, a clean, heavy, lint-free cloth should be held firmly around cable. The cloth will help remove foreign particles (grit, dirt, etc.) and in the event a broken wire (or wires) was overlooked during visual inspection, the wire end will snag the cloth, preventing break from being overlooked. No broken wire (or wires) allowable in hoist cable.

j. Move pendant control switch left then toward UP position. Hoist cable should reel in, with faster speed when control is moved further from center. Release switch and observe that it centers and hoist drive motor stops.

k. Resume reeling in hoist cable, with pendant control held to UP position. With approximately 3 feet of cable left extended, stop hoist drive motor by releasing switch and inspect hook and bumper assembly for condition. Disconnect boot for inspection of cable ball end. Replace boot.

l. Resume reeling in hoist cable at slow speed and let hook rubber covered spring bumper actuate trigger on boom against up-limit switch. Hoist drive motor should stop with very little compression of bumper in slow speed mode.

m. Check operation with control button on pilot cyclic stick; move button down to reel out hoist cable approximately 5 feet and move up to reel in cable. Operation should be same as with pendant control switch, except that speed is not variable.

WARNING

Prior to actual "live" hoisting of personnel after a rescue hoist has had a new or used hoist cable installed or rerigged in any way, one or more hoist lifts of a total of at least 20 feet of upward movement shall be made with a dummy load of 300 pounds. If a low profile weight is used, 300 pound lift can be made with helicopter on the ground.

CAUTION

If hoist is not fitted with a traction sheave assembly, it must be removed from service until modified (MWO 55-1500-206-30/1).

14-5. Troubleshooting — Rescue Hoist. Troubleshoot rescue hoist assembly in accordance with table 14-1.

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

NOTE

Ensure that HOIST CONT, HOIST PWR, and HOIST CABLE CUT circuit breakers in overhead console are closed, the NON-ESS BUS switch is set to MANUAL ON position and BAT switch is ON.

For wiring diagrams refer to paragraph F-11.

Table 14-1. Troubleshooting — Rescue Hoist

CONDITION TEST OR INSPECTION **CORRECTIVE ACTION**
1. HOIST PWR circuit breaker opening.
STEP 1. Ensure 28 Vdc power is available through closed circuit breaker. Check circuit with multimeter. **If multimeter does not read 28 Vdc, replace faulty circuit breaker (paragraph 9-12).**

Table 14-1. Troubleshooting — Rescue Hoist (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 2. Ensure 28 Vdc power is available to power relay with HOIST PWR circuit breaker closed. Check circuit with multimeter.

If multimeter does not read 28 Vdc, replace faulty power relay (paragraph 9-5).

STEP 3. Check to ensure that continuity is available in hoist power circuit with multimeter.

If multimeter does not indicate continuity, repair shorted or broken wiring (paragraph 9-5).

2. Hoist power inoperative when pendant or pilot hoist control switch is operated to hoist extend or hoist retract.

STEP 1. Ensure that 28 Vdc power is available at sense control. Check circuit with multimeter.

If multimeter does not read 28 Vdc, replace faulty sense control (paragraph 9-5).

STEP 2. Ensure 28 Vdc power is available to power relay. Check circuit with multimeter.

If multimeter does not read 28 Vdc, replace faulty power relay (paragraph 9-5).

STEP 3. Check continuity of control switches in control pendant or pilot cyclic control switch.

If multimeter does not indicate continuity replace faulty control pendant or pilot control switch (paragraph 14-114 or paragraph 9-5).

STEP 4. Ensure 28 Vdc power is available through HOIST CONT circuit breaker. Check circuit with multimeter.

If multimeter does not read 28 Vdc, replace faulty circuit breaker (paragraph 9-12).

STEP 5. Ensure 28 Vdc power is available through control relays or circuits in hoist control box.

If multimeter does not read 28 Vdc, replace faulty hoist control box (paragraph 14-72).

3. Boom does not swing in or out when actuating control switch in pendant or pilot control switch.

STEP 1. Ensure 28 Vdc power is available through control circuit in control box.

If multimeter does not read 28 Vdc, replace faulty hoist control box (paragraph 14-72).

STEP 2. Check continuity of control switches in control pendant or pilot cyclic control stick.

If multimeter does not indicate continuity, replace faulty control pendant or pilot control switch (paragraph 14-114 or paragraph 9-5).

Table 14-1. Troubleshooting — Rescue Hoist (Cont)

CONDITION TEST OR INSPECTION **CORRECTIVE ACTION**
STEP 3. Ensure 28 Vdc power is available to plug for actuator with IN-OUT switch actuated.
If multimeter indicates 28 Vdc, replace faulty actuator (paragraph 14-6).
4. Pilot unable to override action of pendant hoist controls with cyclic stick hoist controls.
STEP 1. Ensure 28 Vdc power is available through control relays in hoist control box.
If multimeter does not read 28 Vdc power through control relays, replace faulty hoist control box (paragraph 14-72).
5. Pendant switch will not return to center; motor continues to run.
STEP 1. Ensure that rubber boot over switch is secured and not damaged.
Secure or replace damaged boot (paragraph 14-116).
6. Hoist cable snarls in boom when hook is reeled out.
STEP 1. Ensure 28 Vdc power is available at plug at traction sheave assembly.
If multimeter does not read 28 Vdc, repair defective wiring (paragraph 9-5).
STEP 2. Ensure that traction sheave pulley rotates during hoist cable reel-out.
If traction sheave pulley does not rotate, replace traction sheave assembly (paragraph 14-16).
STEP 3. Ensure that traction sheave assembly pressure roller maintains tension on hoist cable and is free to rotate.
If pressure roller is not maintaining hoist cable contact, replace spring, or if roller is not free to turn, replace assembly (paragraph 14-16).
7. Hoist cable jams or is kinked.
STEP 1. Inspect complete length of hoist cable for condition and damage.
If hoist cable exceeds the inspection limits criteria of paragraph 14-30, replace cable (paragraph 14-28).

14-6. Removal — Rescue Hoist. a. Disconnect battery and external power.

b. Disconnect hoist power cable (8, figure 14-2) from receptacle on bulkhead, STA 123.00. Install protective covers.

c. Disconnect actuator power cable (13) from actuator (9). Install protective covers.

d. Pull release pin (2), disconnecting actuator lever (4) from actuator (9) at base of rescue hoist (5).

e. Remove knurl knob (10, view AA) from fitting (11) on inboad actuator plate (12). Remove actuator (9) from helicopter; reinstall knob in fitting.

f. Release quick disconnect adapters (11 and 30, figure 14-1) from roof stud (10) and stud (29) on outboard actuator plate (28). Loosen locknut (13) and lower support (12) enough to clear roof stud. Lower top of post (15) aft and lift rescue hoist from stud on actuator plate.

CAUTION

Stow rescue hoist in upright position (if possible), or lay on a padded surface with storage drum upright. Weight of the hoist on the drum may bend drum side frames. During transport of hoist, extreme care should be taken to avoid damage to hoist components. The hoist boom is normally left in the extended position.

g. Remove actuator plates (1 and 12, figure 14-2) from cabin floor (14) by removing nuts (15, view B-B) and washers (16) from each adapter fitting (3).

h. Slide collars of quick disconnect adapters (17) up and remove from floor studs (18).

14-7. Disassembly — Rescue Hoist. Refer to applicable paragraph for removal of hoist components. Remove parts only to the extent necessary to accomplish repairs.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

14-8. Cleaning — Rescue Hoist. Clean rescue hoist with cloths dampened with solvent (C205). Do not spray clean; damage to electrical components may result.

14-9. Inspection — Rescue Hoist (Removed). a. Inspect hoist cable (3, figure 14-1) for clean condition, broken wires, kinks, and other evidence of damage (paragraph 14-30).

b. Inspect all pulleys and rollers for damage and freedom of movement.

(1) Inspect upper, middle, and lower rollers (43, 45, and 46, figure 14-1) for freedom of movement (paragraph 14-146).

(2) Inspect pressure roller at traction sheave assembly (1, figure 14-1) for spring tension on hoist cable (3) (paragraph 14-17).

c. Inspect hoist drive unit (33, figure 14-1) (paragraph 14-103).

d. Inspect guillotine assembly (4, figure 14-1) (paragraph 14-37).

e. Inspect rescue hoist power cables (6, 18, 21, 34, and 37, figure 14-1) for condition and security (paragraph 14-49).

f. Inspect control box (19, figure 14-1) and control pendant (35) for the following: (paragraphs 14-73 and 14-115).

(1) Check security of mounting to hoist post.

(2) Check security of switches.

(3) Check security of cable connectors.

(4) Inspect cables for fraying and wear. Inspect coil wire end and plug for security.

(5) Inspect rubber boot for security.

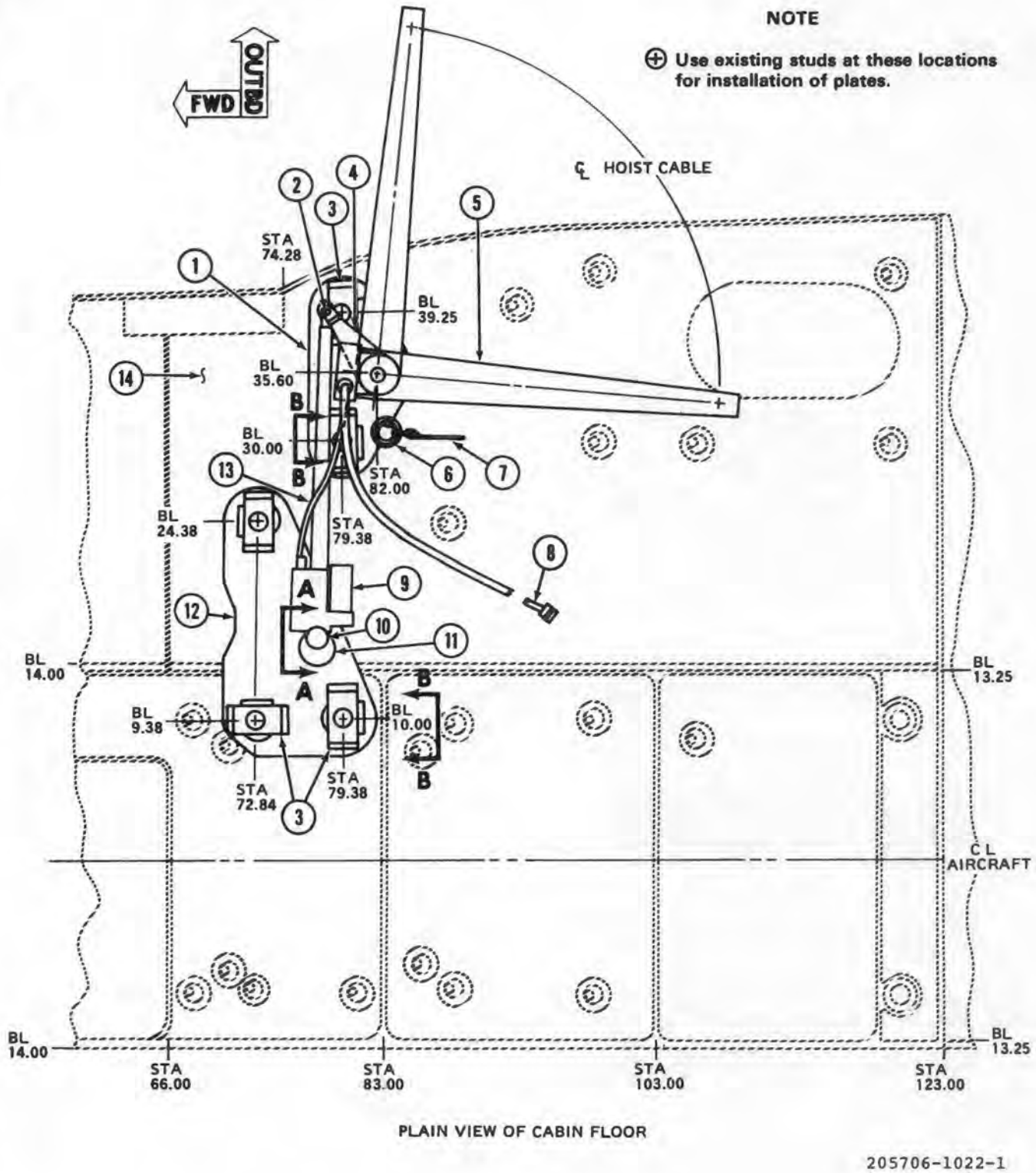
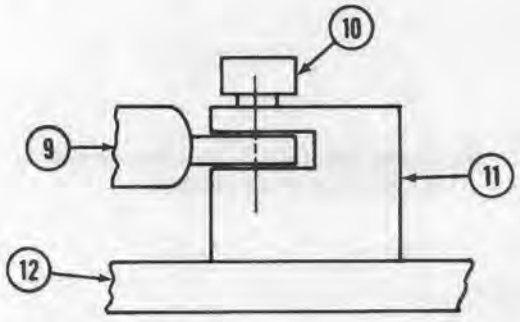
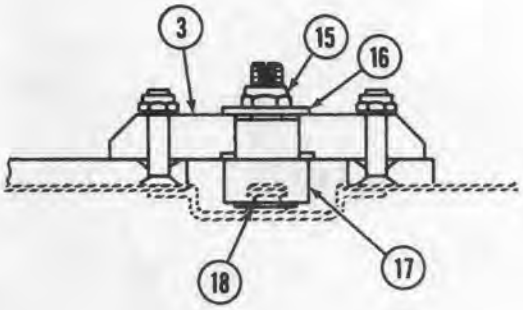


Figure 14-2. Rescue hoist and actuator plate positions (Sheet 1 of 2)



ACTUATOR TO PLATE ATTACHMENT

VIEW **A-A**



ACTUATOR PLATE AND FLOOR STUDS

VIEW **B-B**

1. **Actuator Plate — Outboard**
2. **Release Pin**
3. **Adapter Fitting**
4. **Actuator Lever**
5. **Rescue Hoist**
6. **Tiedown Ring**
7. **Safety Vest Strap**
8. **Hoist Power Cable**
9. **Actuator**
10. **Knob**
11. **Fitting**
12. **Actuator Plate — Inboard**
13. **Actuator Power Cable**
14. **Cabin Floor**
15. **Nut**
16. **Washer**
17. **Adapter — Quick Disconnect**
18. **Floor Stud**

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Figure 14-2. Rescue hoist and actuator plate positions (Sheet 2 of 2)

NOTE

If pendant switch will not return to center and motor continues to run, rubber boot is not secure.

g. Check oil level in gearbox of hoist drive unit (33, figure 14-1) (paragraph 14-12).

h. Inspect actuator (25, figure 14-1) for damage. Check electrical cabling for condition.

i. Inspect rescue hoist for correct installation and security of all components, hardware, cotter pins, lockwire, etc.

14-10. Repair or Replacement — Rescue Hoist.

a. The rescue hoist is a life saving device; therefore repair of parts is limited. Parts that exceed a minor damage limit **0.002 inch** for nicks and scratches shall be replaced.

b. Repair or replace parts that exceed the inspection limits of paragraphs 14-3 or 14-9 and inspection paragraphs pertaining to hoist components within section I of this chapter.

c. Replace explosive charge in guillotine assembly (4, figure 14-1) five years from date of manufacture on cartridge. Uninstalled cartridge shelf life not to exceed three years.

d. Replace hoist cable (3, figure 14-1) if broken wire (s) or kinks are evident (paragraph 14-28).

e. If storage drum wobbles and the runout exceeds **0.050** inch on outer indicator and **0.015** inch on inner indicator, measured with a dial indicator, as outlined in paragraph 14-109, replace the hoist drive unit (33, figure 14-1).

f. If traction sheave motor is inoperative or sheave pulley is damaged or badly worn, replace the

complete traction sheave assembly (1), (paragraph 14-16).

g. Replace pressure roller assembly when loose or damaged at pulley of traction sheave assembly (1, figure 14-1), (paragraph 14-16).

h. Replace damaged or badly worn pulley (9, figure 14-1) and rollers (43, 45, and 46). Shallow cable marks in rollers and pulleys are not cause for replacement. Disassemble and clean pulley and rollers that do not rotate freely. Replace badly worn parts.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

NOTE

The six rollers in the outboard end of the hoist boom incorporate oilite bushings which eliminate the need for lubrication. Do not oil these bushings or the felt dust washers protecting the ends of the rollers. Clean bushings and bolts with a cloth dampened with solvent (C205). Do not immerse rollers in cleaning solvent.

i. Remove rubber pressure roller (paragraph 14-79) from hoist drive unit (33, figure 14-1) and carefully check for freedom of movement on shaft and for signs of scuff marks.

j. Replace actuator (25, figure 14-1) if a malfunction has occurred or damage is evident.

14-11. Assembly — Rescue Hoist. Refer to applicable paragraphs for installation of hoist components.

14-12. Lubrication — Rescue Hoist. To properly check oil supply level of hoist drive unit (33, figure 14-1), system must be operated and hoist cable reeled out and reeled in at least 25 feet. This shall be accomplished by two men; one to operate hoist and the other to walk cable. The oil level in hoist gearbox should be checked at the time that the hoist is running and cable is either being reeled out or reeled in. Do not drag cable or put excess tension on it.

WARNING

Do not spill oil on hoist storage drum clutch. Wipe clean and dry any oil spilled on helicopter floor or around hoist.

a. The hoist drive unit is lubricated with oil (C136), serviced through a filler port on side of gearcase. With hoist in operating position, fill gearbox to top of sight glass located below filler port.

NOTE

Do not use filler port dip stick to measure oil level in this installation.

b. Wipe surfaces of hoist and helicopter floor to remove all spilled oil.

14-13. Installation — Rescue Hoist.

NOTE

Rescue hoist can only be installed in the right forward area of cabin as shown in figure 14-2. Helicopters equipped with personnel rescue hoist provisions and subject to frequent installation of the rescue hoist kit should be rigged to provide maximum cyclic control capability for the side opposite the hoist (desirable, but not mandatory). Refer to Chapter 5, Section II, for swashplate setting.

a. Disconnect battery and external power.

b. Install outboard actuator plate (1, figure 14-2) as follows:

CAUTION

If quick disconnect adapters (17, view B-B) and floor studs (18) will not engage in a locked position, they must be immediately replaced.

(1) Position two quick disconnect adapters (17, view B-B) to floor studs (18) at STA 79.38, BL 30.00 and BL 39.25. Slide adapter collars up to position adapter jaws over studs; then slide collar full down to lock.

(2) Position outboard actuator plate (1) with installed adapter fittings (3) onto shank of two quick disconnect adapters (17, view B-B). Check to ensure that hoist stud is on aft side; then secure plate with washers (16) and nuts (15). Hold slotted end of adapter to tighten nuts.

c. Install inboard actuator plate (12) as follows:

CAUTION

If quick disconnect adapters (17, view B-B) and floor studs (18) will not engage in a locked position, they must be immediately replaced.

(1) Position three quick disconnect adapters (17, view B-B) to floor studs (18) at STA 72.84, BL 9.38 and BL 24.38, and STA 79.38 BL 10.00. Slide adapter collars up to position adapter jaws over studs; then slide collar full down to lock.

(2) Position inboard actuator plate (12) onto shank of three quick disconnect adapters (17, view B-B) and secure with washers (16) and nuts (15). Hold slotted end of adapters to tighten nuts.

d. Position rescue hoist upright in cabin area and secure to floor and roof as follows:

CAUTION

If quick disconnect adapters (11 and 30), roof stud (10), and stud (29) on actuator plate (28) will not engage in a locked position, they must be immediately replaced.

(1) With rescue hoist in upright position, lower quick disconnect adapter (30, figure 14-1) to stud (29) on outboard actuator plate (28). Slide adapter collar up to position adapter jaws over studs, then slide collar full down to lock.

(2) Adjust length of post (15) as required, by loosening locknut (13) and adjusting support (12) to engage roof stud (10) and quick disconnect adapter (11). Slide adapter collar down to lock adapter jaws to stud.

CAUTION

Do not use tools or extension bars to turn locknut (13). Hand tighten only. Excessive force applied in turning locknut may result in damage to the roof structure or looseness to structure fittings.

CAUTION

Operation of actuator P/N WE-2834 before attaching hoist post lever will result in damage to actuator. Do not operate actuator unless the extension tube is fixed so that it will not rotate.

(3) Check rescue hoist for rotation on roof stud (10) and floor stud (29) on actuator plate (28). Hoist should rotate freely without unnecessary binding and vertical movement. Verify locking of disconnect adapters (11 and 30).

e. Position motor end of actuator (9, figure 14-2) to fitting (11) and secure with knob (10).

f. Insert outboard end of actuator (9) into clevis of actuator lever (4) and install release pin (2).

g. Connect actuator power cable (13) from rescue hoist (5) to receptacle on actuator (9).

h. Open soundproofing in cabin roof at STA 123.00 and uncover receptacle for hoist power cable (8). Connect cable to receptacle and hand tighten.

CAUTION

Do not operate with boom in stow position.

i. If boom (7, figure 14-1) is in the stowed (upright) position, remove boom retaining pin (17), place boom in extended position and reinstall pin.

CAUTION

Ensure that boom does not strike airframe when actuating boom in and out of cabin.

j. Adjust turnbuckle (8) so that traction sheave assembly (1) just brushes against the cabin door upper rubber molding when the boom (7) is rotated outboard or inboard. Safety turnbuckle with lockwire (C127) or safety clip.

k. Reconnect battery or external power unit.

l. Perform operational check (paragraph 14-4).

14-14. TRACTION SHEAVE ASSEMBLY.

14-15. Description — Traction Sheave Assembly. The traction sheave assembly (1, figure 14-1) is located on the end of the boom (7). The sheave assembly (figure 14-3) consists of a motor, gear housing, gear train, and pulley. The pulley is driven by an electric motor through a series of reduction gears and incorporates a roller clutch which drives the pulley when hoist cable is played-out, but permits pulley to free-wheel should speed of the hoist ever exceed speed of traction sheave.

14-16. Removal — Traction Sheave Assembly. a. Apply electrical power to rescue hoist and extend hook and bumper assembly (40, figure 14-1) approximately **12** inches. Disconnect electrical power to rescue hoist.

b. Remove boom covers (2) from top of boom (7) by removing screws and washers.

c. Disconnect sheave power cable (6) at connector bracket along left side of boom (7). Remove two retaining clamps on left side of boom.

d. Remove cotter pin (12, figure 14-3), washer (11), shim (13) from end of shaft (19). Record shim thickness and tag for reinstallation.

e. Carefully remove housing assembly (20) and shaft (19) by working out of boom (16).

NOTE

Exercise care to prevent dropping shims (1, 5 and 18), thrust washers (2 and 4), sheave pulley (3), and washers (17) which will be freed as the shaft (19) is retracted from the boom (16). Record shim thickness and tag for reinstallation.

f. To remove pressure roller assembly (6), cut lockwire on head of bolt (10) and remove with washer (9). Lift roller assembly from boom (16) with spring (7).

14-17. Inspection — Traction Sheave Assembly. a. Inspect housing assembly (20, figure 14-3) for damage and security of motor (22) and sheave motor cable. Inspect relay, filter, and filter box on outboard side of housing assembly cover for security and condition.

b. Inspect pressure roller assembly (6) for worn bearing, spring (7) for condition, and bearing support (8) for burrs, nicks, dents, scratching, or scoring.

c. Inspect shaft (19) of housing assembly (20) and inner race of sheave pulley (3) for burrs, nicks, dents, scratching, or scoring. No repairs permitted.

d. Inspect boom (16) and housing assembly (20) for cracks. No cracks permitted.

e. Inspect teflon faces of thrust washers (2 and 4) for condition.

14-18. Repair or Replacement — Traction Sheave Assembly (AVIM). a. If traction sheave assembly does not meet inspection requirements, replace without repair. Send part to next higher level of maintenance.

b. Replace damaged or worn thrust washers (2 and 4, figure 14-3), sheave pulley (3), shims (1, 5, 13, and 18), pressure roller assembly (6), spring (7), and bolt (10).

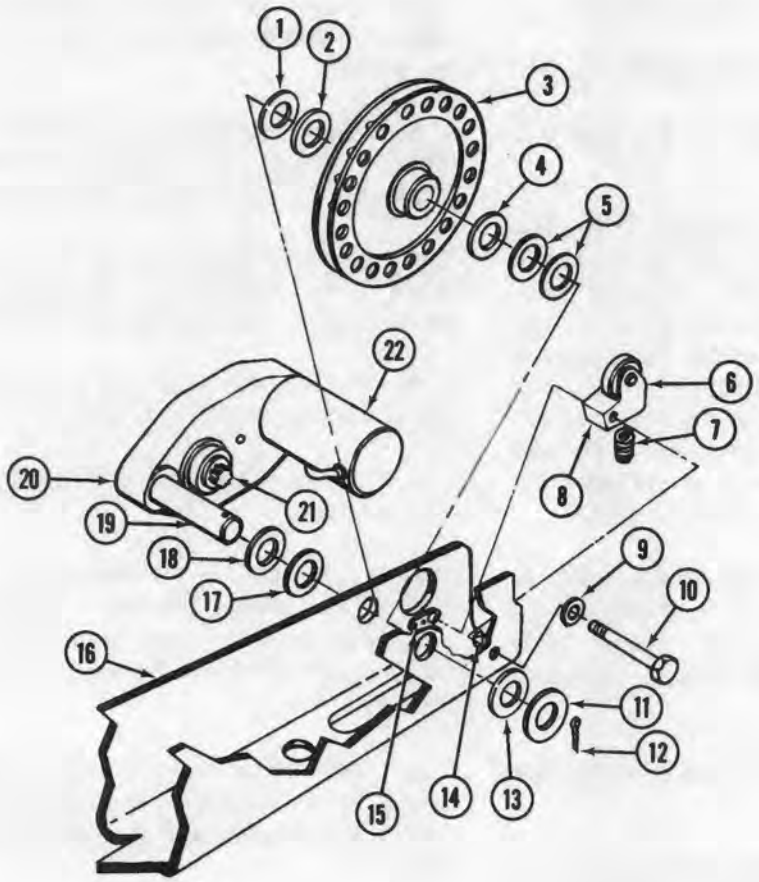
14-19. Installation — Traction Sheave Assembly. a. Fit spring (7, figure 14-3) into hole in support (8) of the pressure roller assembly (6). Position pressure roller assembly into boom (16) depressing spring onto roll pin (14) and aligning bolt holes. Secure the pressure roller assembly with bolt (10) and thin steel washer (9). Safety head of bolt to boom using lockwire (C127).

b. Prepare traction sheave assembly for installation by removing shims (1, 5, 13, and 18), thrust washers (2 and 4), pulley (3), and washers (11 and 17) from shaft (19).

NOTE

For the following procedures refer to recorded shim dimensions taken during removal.

c. Place shim (18) and thin CRES washer (17) on shaft (19). Insert shaft part way through hole on left side of boom (16). Place shim (1), thrust washer (2) and pulley (3) onto shaft, then remaining thrust washer (4) and two shims (5); teflon faces of thrust



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1. Shim
2. Thrust washer
3. Pulley — sheave
4. Thrust washer
5. Shim
6. Pressure roller assembly
7. Spring
8. Support
9. Washer — thin steel
10. Bolt
11. Washer — thin CRES
12. Cotter pin
13. Shim
14. Roll pin — spring
15. Nutplate
16. Boom
17. Washer — thin CRES
18. Shim
19. Shaft
20. Housing assembly
21. Gear — power drive
22. Motor — electric

Figure 14-3. Traction sheave assembly

washers shall be against pulley. Insert winch cable into groove of pulley (3) and under pressure roller assembly (6).

d. Work shaft (19) through boom (16) aligning power drive gear (21) with 1.0 inch hole in boom. Engage gear teeth of power drive gear with gear teeth on pulley (3). Temporarily secure traction sheave assembly to boom with a shim (13), thin CRES washer (11), and cotter pin (12).

e. Check for correct shimming of pulley (3) and power drive gear (21) as follows:

(1) Slide pulley (3) back and forth on shaft (19) to determine end play. Adjust thickness of shims (1 and 5) to limit end play **0.002 TO 0.010** inch, center pulley in boom within **0.015** inch, and to provide clearance for pressure roller assembly (6) as shown in figure 14-4, Note 1.

(2) Align gear teeth of power drive gear (21, figure 14-3) and pulley (3). Adjust thickness of shims (13 and 18) to align gear teeth mesh and limit pulley final end play to **0.005** inch maximum as shown in figure 14-4, Note 2.

f. Secure traction sheave assembly (1, figure 14-1) to boom (7) with required shims (13, figure 14-3), thin CRES washer (11), and cotter pin (12).

g. Connect sheave power cable (6, figure 14-1) to receptacle on boom (7) and secure. Secure cable to boom with clamps.

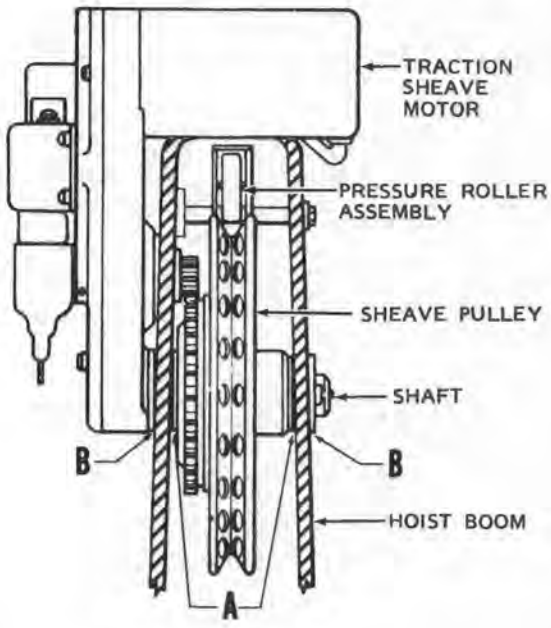
h. Ensure that hoist cable (3) is correctly installed on sheave pulley and reinstall boom covers (2).

i. Perform operational check (paragraph 14-4).

14-20. BOOM.

14-21. Description — Boom. The boom (7, figure 14-1) is fabricated from **0.160** inch 7075 aluminum alloy and provides mounting locations for the traction sheave assembly (1), boom covers (2), guillotine assembly (4), guide tube (5), turnbuckle (8), pulley (9), trigger assembly (39), limit switch (38), and the routing of the hoist cable (3).

14-22. Removal — Boom. a. Operate hoist and extend hook and bumper assembly (40, figure 14-1) **12 TO 24** inches. Disconnect electrical power to rescue hoist.



NOTE

1. SHIM AT POINTS **A** TO CENTER SHEAVE PULLEY WITHIN **0.015** INCH AND PROVIDE **0.002** TO **0.010** INCH END PLAY.
2. SHIM AT POINTS **B** TO ALIGN GEAR TEETH MESH AND LIMIT PULLEY FINAL END PLAY TO **0.005** INCH MAXIMUM

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Figure 14-4. Shimming traction sheave assembly

b. Disconnect guillotine power cable (37) from control box (19). Disconnect sheave power cable (6) at connection on left side of boom (7) and remove guide bolt (16) with clamp.

c. Remove hook and bumper assembly (40) from hoist cable (3), (paragraph 14-120).

d. Remove boom covers (2, figure 14-1) from top of boom (7) by removing attaching screws and washers.

e. Remove one upper, middle, and lower roller (43, 45, and 46) from end of boom (7), (paragraph 14-145).

f. Remove pressure roller assembly at traction sheave assembly (1, figure 14-1), (paragraph 14-16).

g. Remove upper support and anvil from guillotine assembly (4, figure 14-1), (paragraph 14-35).

h. Remove hoist cable (3, figure 14-1) from traction sheave assembly (1), guide tube (5), and pulley (9). Loosen or remove guide tube, as required.

i. Support boom (7) and disconnect turnbuckle (8). Remove retaining pin (17) and separate boom from hoist cable (3) and post (15).

j. Wrap and protect hoist cable (3) and install protective covers and plugs over open electrical connectors.

14-23. Inspection — Boom. a. Inspect boom (7, figure 14-1) for nicks, scratches, or corrosion.

b. Inspect attaching parts on boom (7) for security, corrosion, proper installation, and serviceability. Check nutplates for thread damage or looseness.

c. Inspect guide tube (5), turnbuckle (8) and clevis ends for damage and security.

14-24. Repair or Replacement — Boom. a. Polish out nicks and scratches using No. 400 grit abrasive cloth or paper (C1). Touchup repaired area using chemical conversion materials (C42) and primer coating (C167).

b. Replace damaged hardware and nutplates.

c. Replace guide tube (5, figure 14-1) if bent, distorted, or cracked.

14-25. Installation — Boom. a. With boom covers (2, figure 14-1) removed, place boom (7) to post (15) with open side up. Align mounting holes and install retaining pin (17).

b. Align clevises and connect turnbuckle (8). Adjust turnbuckle so that top surface of traction sheave assembly (1) just brushes against upper rubber molding of cabin door when boom is rotated inboard or outboard. Safety turnbuckle with lockwire (C127) or safety clip.

c. Unwrap loose end of hoist cable (3) and feed through guide tube (5) and over guillotine assembly (4) with upper support and anvil removed. Feed remaining cable over pulley of traction sheave assembly (1); down between upper, middle, and lower rollers (43, 45, and 46), and trigger assembly (39).

d. Install hook and bumper assembly (40) onto end of hoist cable (3), (paragraph 14-125).

e. Check to ensure that hoist cable (3, figure 14-1) is in groove of pulley (9). Route loose end of sheave power cable (6) to connector on left side of boom (7) and connect. Install guide bolt (16) through power cable clamp and boom, ensure that hoist cable is between bolt and pulley.

f. Install pressure roller assembly at traction sheave assembly, (paragraph 14-19).

g. Install upper, middle, and lower rollers (43, 45, and 46, figure 14-1) in side plates (44) on end of boom (7), (paragraph 14-148).

h. Install anvil and upper support in guillotine assembly (4, figure 14-1), (paragraph 14-39). Connect guillotine power cable (37, figure 14-1) to control box (19).

i. Check guide tube (5) for alignment to hoist cable (3) and that cable is free from possible abrasion along length of boom (7). Install boom cover (2) and secure with screws and washers.

j. Perform operational check (paragraph 14-4).

14-26. HOIST CABLE.

CAUTION

This cable is highly susceptible to abrasion wear and damage.

14-27. Description — Hoist Cable. The rescue hoist assembly is equipped with a 3/16 inch diameter 19X7 extra flexible spin resistant stainless steel cable.

Premaintenance requirements for inspection and replacement of hoist cable.

Conditions	Requirements
Model	All
Special Tools	(T5)

Conditions	Requirements
Test Equipment	None
Support Equipnent	BL6423 Supplement Kit (Furnished with BL8439 Hoist Cable)
Minimum Personnel Required MOS	Two
Consumable Materials	(C73.1) (C111) and Lint Free Cloths
Special Environmental Conditions	Dust Free

14-28. Removal — Hoist Cable. a. Remove boom covers (2, figure 14-1) from boom (7) by removing attaching screws and washers.

b. Remove hook and bumper assembly (40), (paragraph 14-120).

c. Operate rescue hoist until hoist cable (3, figure 14-1) is fully extended (paragraph 14-4).

WARNING

Use wrench (T5) to loosen set screw. Allen type wrench will strip head of set screw if used. Wrench is provided with replacement hoist cable in the BL6423 supplemental kit (instructions, wrench, and new set screw).

d. Using wrench (T5) loosen set screw (figure 14-5) on storage drum flange and remove inboard end of hoist cable.

e. Remove rubber pressure roller (7, figure 14-6) below primary pulley (13) by removing screws (11), lockwashers (10), and cover (12). Thread one screw into end of tension roll shaft (9). Using the screw as a puller, and maintaining hand pressure on the roller to keep it centered, withdraw the shaft to free the roller.

f. Remove remainder of hoist cable (1) from primary and secondary pulleys (13 and 14), and storage drum (2) by unwinding manually. Remove cable from boom (7, figure 14-1).

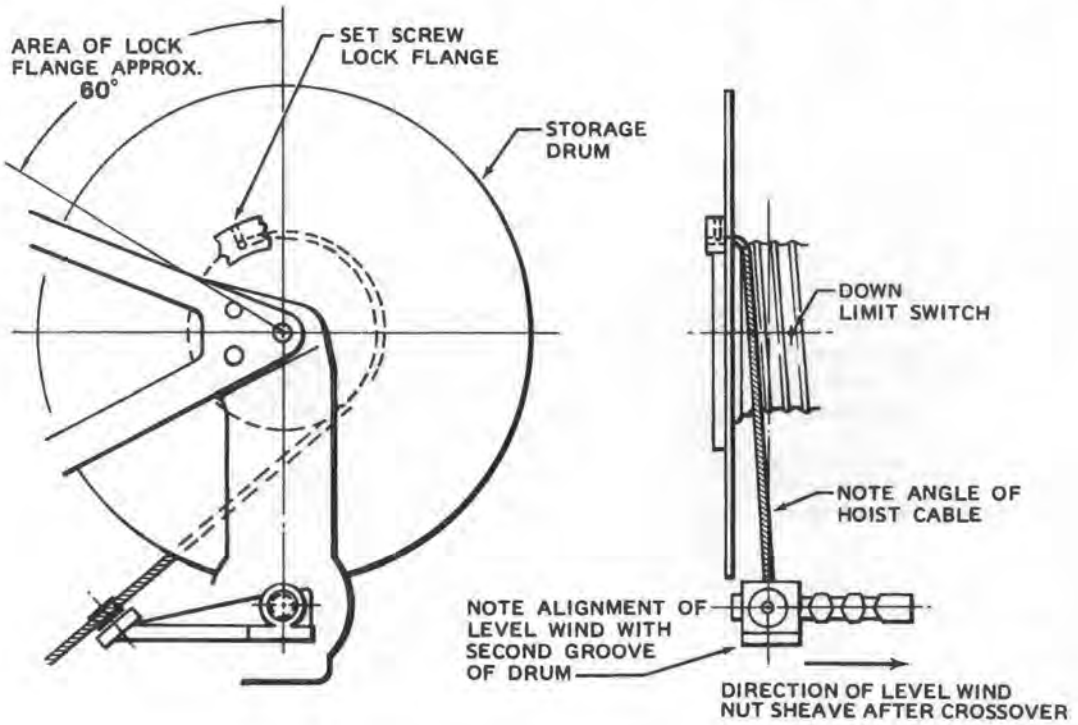
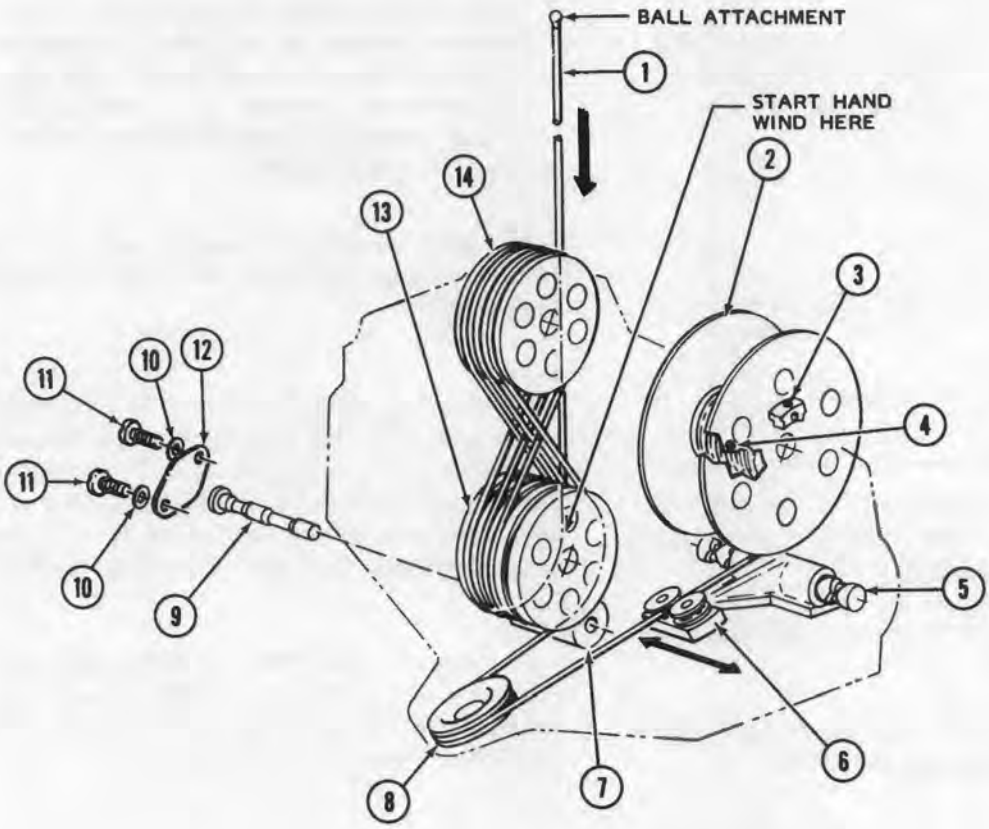


Figure 14-5. Hoist cable to storage drum attachment



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1. Hoist cable
2. Storage drum
3. Lock flange
4. Actuator pins — down limit switch
5. Level wind shaft
6. Rollers — level wind guide and
7. Rubber pressure roller
8. Idler pulley
9. Tension roll shaft
10. Lockwashers
11. Screws
12. Cover
13. Primary pulley
14. Secondary pulley

Figure 14-6. Hoist drive unit — cable routing

14-29. Cleaning — Hoist Cable. Clean the complete length of hoist cable using a clean, heavy, lint free cloth held firmly around cable. The cloth will aid in the removal of foreign particles and in detection of broken wires. The broken wire ends will snag the cloth, preventing the break from being overlooked.

14-30. Inspection — Hoist Cable (Installed or Removed). a. Inspect hoist cable (3, figure 14-1) for clean condition, broken wires, kinks, abrasion, bird caging, and interference anywhere along its routing as follows:

NOTE

Internal wear caused by grit, dirt, sand, etc., embedded between the hoist cable wires is extremely difficult to detect. Preventive maintenance is the best procedure. The cable should be carefully wiped to remove gritty material as it is reeled in during inspection. Prolonged use of cable embedded with gritty materials will result in broken wires.

(1) Abrasion of hoist cable is caused by contact with other cable sections or any material that may contact the cable such as helicopter structural members, auxiliary equipment, or almost any abrasive surface. Dirt, sand, grit, and other foreign particles also are frequent causes of abrasion. Nicking, scarring, and scrubbing are also referred to as abrasion. Abrasion due to cable being constantly dragged over a fixed point is usually continuous and confined to a particular section of the cable circumference. Worn guide tube (5, figure 14-1) and guide bolts (16) are a common cause of this type of abrasion. Operation of the hoist at excessive flight angles which cause the cable to constantly abrade against the middle or lower rollers (45 and 46) or side plates (44) also contributes to this type of abrasion.

(2) Abrasion caused by an improperly adjusted or defective level wind shaft (5, figure 14-6) is evidenced by localized worn section of the outer hoist cable wires. These localized sections can be traced to the crossover point of the cable as it is wound on the storage drum (2). The abrasion results from scrubbing contact with the adjacent wrap of cable and the drum flange. Proper adjustment of the level wind shaft during cable installation will prevent this type of wear.

(3) Overloading of hoist cable will normally result in broken wires. However, broken wire cores may also result from overload. Nicking-down of a section of cable is an indication of broken core wires. A cable that has been knowingly overloaded should be replaced immediately even if no obvious physical damage is detected.

(4) Kinks are usually man-made defects in a host cable, caused by a loop in the cable being pulled up tight, resulting in a sharp, permanent bend in the cable. Kinks are identified as two types, open and closed. An open kink is caused by pulling a loop tight, creating a sharp permanent bend which tends to open the lay of the cable. A closed kink is caused in the same manner, but creates a sharp permanent bend which tends to close the lay of the cable. Continued use of a kinked cable creates additional abrasion and subsequent early failure of the cable. A kinked cable is cause for replacement.

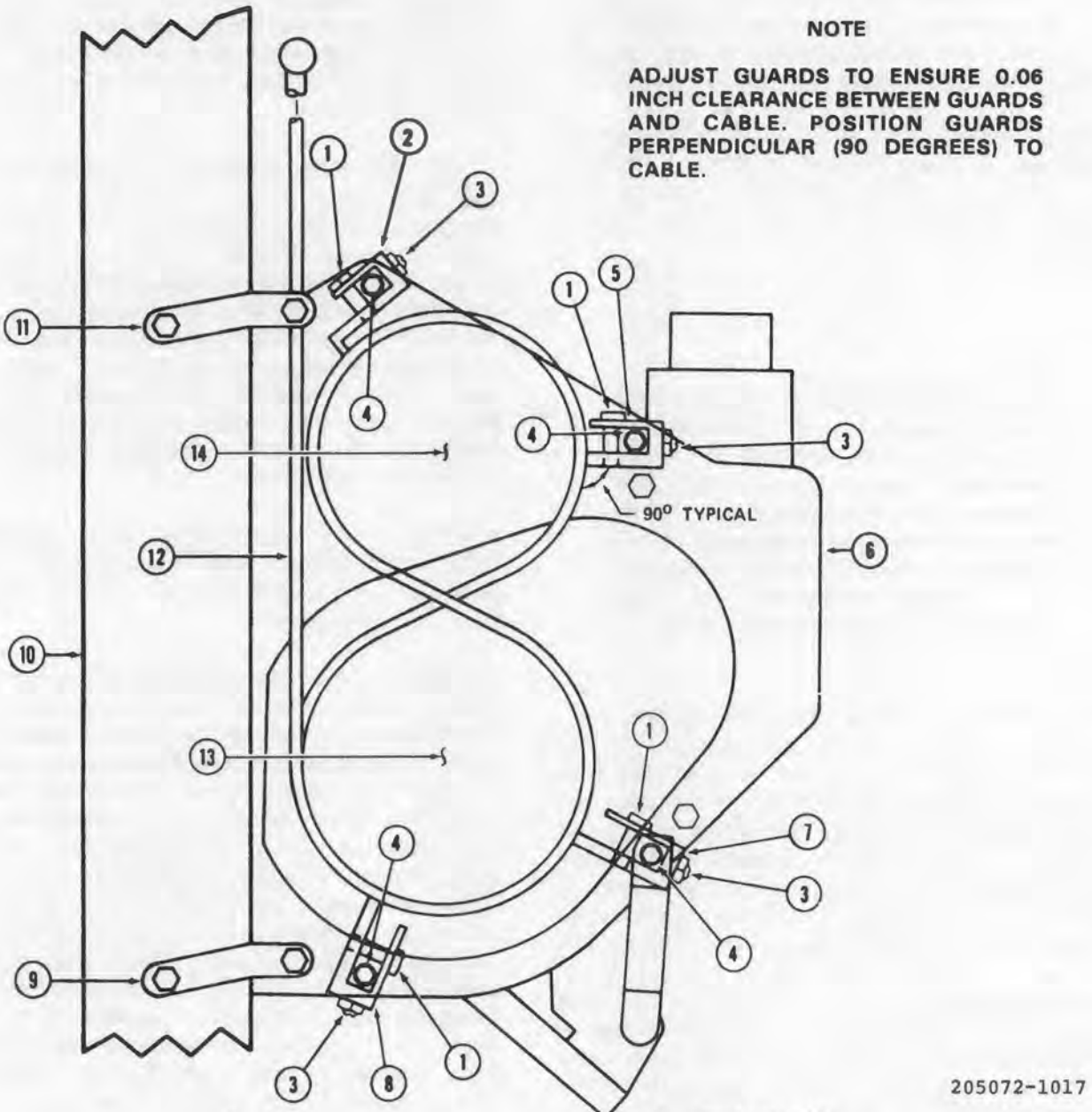
(5) A bird caged cable has stretched or untwisted the outer wraps of wire strands. Severe bird caging will appear as a small cocoon formed by the outer cable strands.

b. Do not attempt any repair to hoist cable. No broken wires, strands, kinking, corrosion, or birdcaging of the cable is allowed. Flat spots on the outer cable strands is evidence of cable misrouting or misalignment. Cables with flat spots worn into the outer strands should be replaced, and routing and cable alignment (under tension) should be checked. Cable should not touch the anvil or knife in the guillotine assembly, pulley guide bolt, or other items. Pulleys and rollers must turn freely and not be frozen or jammed. Cable guards on primary and secondary pulleys should be checked to ensure **0.0625** inch clearance exists from cable to guards (2, 5, 7, and 8, figure 14-7). Check to ensure correct routing of the cable over the storage drum (2, figure 14-6), and primary and secondary pulleys (13 and 14).

WARNING

Do not substitute any other hoist cable for the correct cable part number (BL8439).

c. Visually inspect storage drum (2, figure 14-6), level wind guide and rollers (6), rubber pressure roller (7), idler pulley (8), and primary and secondary pulleys (13 and 14) for smooth operation and serviceability.



1. Bolt
   Washer
   Safety wire
2. Guard
3. Screw
   Washer
   Nut
4. Spacer
5. Guard
6. Hoist assembly
7. Guard
8. Guard
9. Lower bracket
10. Hoist post
11. Upper bracket
12. Hoist cable
13. Primary pulley
14. Secondary pulley

Figure 14-7. Cable guard installation

d. Check for free operation of down limit switch actuator pin (4) in third groove of storage drum (2). Do not depress pin below surface of drum groove.

14-31. Repair or Replacement — Hoist Cable (AVIM).

WARNING

No repairs are permitted to the hoist cable (1, figure 14-6).

a. When damage exceeds shallow cable marks to the storage drum (2), level wind guide and rollers (6), idler pulley (8), and primary and secondary pulleys (13 and 14), send hoist drive unit to next higher level of maintenance for repair.

b. When tears are evident or the rubber pressure roller (7) does not provide sufficient pressure to maintain hoist cable position on primary pulley (13), it should be replaced, (paragraph 14-79).

c. When hoist assembly is to be operated in a salt-laden environment, it is recommended that a new hoist cable (1, figure 14-6) be treated as follows before installation.

(1) Treat the ball attachment end of new hoist cable with Class 1 or 1A corrosion preventive compound (C73.1) prior to first use.

(2) Heat corrosion preventive compound (C73.1) to **150 TO 160** degrees F (**66 TO 71** degrees C). Immerse ball attachment end of hoist cable and adjoining **5.0** inches in compound for a minimum of **3** minutes. Cables treated in this manner have only a thin film of compound and must be further coated with compound to a minimum thickness of **0.002** inch.

(3) After installation of hoist cable and reinstallation of hook and bumper assembly, wipe off compound above bumper guard.

14-32. Installation — Hoist Cable.

WARNING

Do not substitute any other hoist cable for the correct cable part number (BL8439).

CAUTION

Protect hoist cable from damage by storing bulk cable in a container during installation. Do not allow cable to kink or bend. Check to ensure that the cable is under tension and properly aligned with the guillotine assembly.

NOTE

Due to the relatively low hoist cable tension which exists at the storage drum, small gaps between cable wraps may be observed after reel in. These gaps are allowable; however, the cable should be held snugly on the drum. Any loosening or snarling of the cable shall be cause for rejection.

a. Unwind approximately **25** feet of hoist cable (3, figure 14-1) from coil, starting with the red painted soldered end.

b. If not previously accomplished remove boom covers (2), pressure roller at traction sheave assembly (1), upper support and anvil of guillotine assembly (4), guide bolt (16) at pulley (9), and one upper, middle, and lower roller (43, 45, and 46), (paragraph 14-16).

WARNING

Check to ensure that the hoist cable (3, figure 14-1) is in pulley groove of traction sheave assembly (1) and not over guide pin or cable failure may occur.

Check to ensure that the hoist cable (3) is in groove of pulley (9) and not over the cable guide bolt (16) or cable failure may occur.

c. Feed hoist cable (3) between remaining lower, middle, and upper rollers (46, 45, and 43), over pulley of the traction sheave assembly (1), through the guillotine assembly (4) guide tube (5), over pulley (9), and down to hoist drive unit (33).

d. Loosen four hoist cable guards (2, 5, 7, and 8, figure 14-7) and swing out of the way of primary and secondary pulleys (13 and 14).

e. Pull hoist cable (1, figure 14-6) into outboard groove of the primary pulley (13) (groove farthest from the storage drum (2) side of hoist drive unit.)

f. Begin wrapping hoist cable (1), keeping constant tension applied; work cable onto secondary and primary pulleys (14 and 13) in figure eight fashion. The pulleys are fully wound when they have three complete wraps.

g. Route hoist cable (1) from wrapped secondary and primary pulleys (14 and 13) around idler pulley (8); then temporarily hold with tension until completion of step h.

h. Pack grooves of tension roller shaft (9) with a coating of grease (C111). Install rubber pressure roller (7), on tension roller shaft and secure with cover (12), lockwashers (10), and screws (11).

i. Align center of level wind (figure 14-5) with centerline of second groove in storage drum. Angle of cable should approximate angle of grooves in storage drum.

WARNING

Use spline wrench (T5) to tighten setscrew. Allen type wrench will strip head of setscrew, if used. Wrench is provided with replacement hoist cable in the BL 6423 supplement (instructions, wrench, and new setscrew).

j. Route hoist cable (1, figure 14-6) between level wind guide and rollers (6) and around outboard groove of storage drum (2) from lower side, and into lock flange (3). Install setscrew into lock flange and tighten using spline wrench (T5), secure end of cable. Do not permit soldered end of cable to extend outside of the lock flange.

k. Manually turn storage drum (2) to take up remaining portion of slack hoist cable (1), tightening each wrap on drum as winding progresses.

WARNING

Ensure figure eight wraps on primary and secondary pulleys (13 and 14) are correct as shown in figure 14-6 and 14-7.

NOTE

At this point the cable will depress the down limit switch actuator pin (4, figure 14-6) in third groove of the storage drum (2), and the rescue hoist can be operated electrically.

l. Install and reposition the four cable guards (2, 5, 7, and 8, figure 14-7). Adjust guards to ensure **0.06** inch clearance between guards and hoist cable (12) and that they are **90** degrees to cable.

m. Check for movement of down limit switch actuator pin (4, figure 14-6), by reeling out the hoist cable (1) in and out of third groove in storage drum (2), while maintaining **5** pounds tension on the cable. (Three wraps should remain on storage drum.)

n. Recheck lay of the hoist cable (1) on storage drum (2) as the cable is reeled in.

o. Operate rescue hoist electrically until three layers of hoist cable (1) are wrapped on storage drum (2). Layers must be smoothly and uniformly wrapped, if necessary repeat procedures starting with preceding step i.

CAUTION

Stop hoist cable travel before ball attachment contacts trigger assembly (39, figure 14-1).

p. Continue operating rescue hoist and reel in remainder of extended hoist cable (3) until ball attachment on cable end is within **12 TO 24** inches of boom (7).

q. Install hook and bumper assembly (40), (paragraph 14-125).

r. Complete installation of hoist cable (3, figure 14-1) along boom (7) in accordance with paragraph 14-25, step e. and subsequent.

s. Perform operational check, (paragraph 14-4).

14-33. GUILLOTINE AND SUPPORT.

14-34. Description — Guillotine and Support. Guillotine assembly (4, figure 14-1) is located near the outboard end of boom (7). The guillotine functions as an emergency cable cutter actuated by the HOIST CABLE CUT switches located on the pilot pedestal and the hoist control box (19).

WARNING

The hoist cable cutter contains an explosive cartridge. Use extreme caution when handling explosive cartridge. Spark or static producing clothing is prohibited. Any time cable cutter harness is disconnected, install aluminum foil shorting strips between cartridge pins to prevent accidental firing.

14-35. Removal — Guillotine and Support. a. Disconnect guillotine power cable (37, figure 14-1) at control box (19).

b. Remove boom covers (2) from top of boom (7) by removing attaching screws and washers.

c. Cut lockwire and remove four screws attaching guillotine upper support (1, figure 14-8) and anvil (2).

d. Lift out anvil (2) and barrel (5) as separate parts and disconnect wires for primer charge (6).

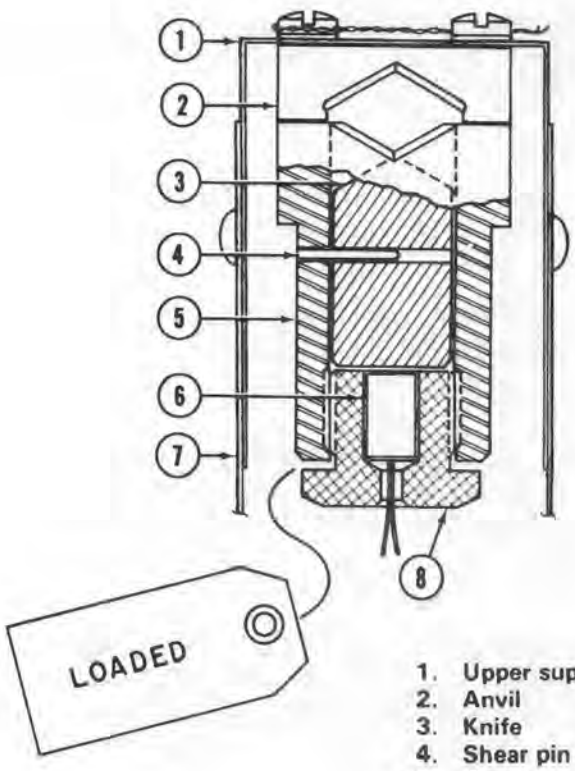
e. Remove retainer (8) from barrel (5) and primer charge (6) from retainer.

f. Remove knife (3) from barrel (5) and remove ends of shear pin (4) from barrel and knife.

WARNING

Cleaning materials are flammable and toxic. Avoid skin contact and breathing of solvent vapors.

14-36. Cleaning — Guillotine and Support. Clean powder deposits from knife (3, figure 14-8) and chamber of barrel (5) using a cloth dampened with solvent (C205). Remove corrosion deposits using crocus cloth (C49).



1. Upper support
2. Anvil
3. Knife
4. Shear pin
5. Barrel
6. Primer charge
7. Lower support
8. Retainer

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Figure 14-8. Guillotine assembly and support

14-37. Inspection — Guillotine and Support (Removed). a. Inspect upper and lower supports (1 and 7, figure 14-8), anvil (2), knife (3), shear pin (4), barrel (5), and retainer (8) for evidence of damage or corrosion. Parts that cannot be cleaned and returned to a serviceable condition shall be replaced.

b. Inspect primer charge (6) for corrosion, serviceability, and deteriorated wiring. Record charge date of manufacture, not to exceed **5** years.

c. Inspect boom (7, figure 14-1) for damage in area of guillotine assembly (4) and for corrosion deposits.

d. Inspect guillotine power cable (37) for continuity, wiring for fraying, kinks, wear and abrasion.

14-38. Repair or Replacement — Guillotine and Support. a. Replace all parts that are cracked and those that are corroded and cannot be cleaned.

b. Repair or replace defective electrical wiring and connectors, as required.

c. Replace primer charge (6, figure 14-8) if any doubt exists to its serviceability or service life.

14-39. Installation — Guillotine and Support. a. Clean all parts to ensure that they are free of dirt and corrosion deposits prior to installation (paragraph 14-36).

b. Install knife (3, figure 14-8) into barrel (5). Align mounting holes for shear pin (4) and install new shear pin. Perform a stray voltage check between pins A and B of receptacle on hoist control box. (Refer to Appendix F.)

c. Place new primer charge (6) into retainer (8) and screw retainer securely into barrel (5). Record charge date of manufacture on DA Form 2408-18.

d. Connect wires of primer charge (6) to guillotine power cable (37, figure 14-1).

e. Position barrel (5, figure 14-8) in lower support (7) and install in boom (7, figure 14-1) under hoist cable (3).

f. Slide anvil (2, figure 14-8) into position on barrel (5) and install upper support (1). Align barrel and anvil to supports, and install four screws and washers. Tighten screws securely and safety in pairs using lockwire (C127).

g. Secure lower support (7) to boom (7, figure 14-1) with two screws and washers; tighten securely.

h. Loosen upper two screws in lower support (7). Apply a **40** pound (minimum) load to hook and bumper assembly (40, figure 14-1); equally center guillotine assembly (4) and support hoist cable (3). Tighten screws securely after centering guillotine.

i. Install boom covers (2) and secure with screws and washers.

14-40. GUIDE TUBE.

14-41. Description — Guide Tube. Guide tube (5, figure 14-1) is located in boom (7) below boom covers (2) and guides hoist cable (3) along the mid-length of the boom.

14-42. Removal — Guide Tube. a. Operate hoist and extend hook and bumper assembly (40, figure 14-1) **12 TO 24** inches. Disconnect electrical power to rescue hoist.

b. Remove hook and bumper assembly (40), (paragraph 14-121).

c. Remove boom covers (2) from top of boom (7) by removing attaching screws and washers.

d. Remove one upper, middle, and lower roller (43, 45 and 46) from side plates (44), (paragraph 14-145).

e. Remove pressure roller assembly at traction sheave assembly (1, figure 14-1), (paragraph 14-16).

f. Remove upper support anvil from guillotine assembly (4), (paragraph 14-35).

g. Remove screws, washers, and clamps attaching guide tube (5) to boom (7). Lift hoist cable (3) and feed from boom and guide tube.

14-43. Inspection — Guide Tube. Inspect guide tube (5, figure 14-1) for security of mounting, corrosion, cracks, and loose or missing hardware.

14-44. Repair or Replacement — Guide Tube. a. Replace loose or missing hardware for guide tube (5, figure 14-1) and boom (7).

b. Replace guide tube (5) that is cracked, corroded, damaged, or distorted.

14-45. Installation — Guide Tube. a. Route hoist cable (3, figure 14-1) over pulley (9). Ensure that hoist cable is between pulley and adjacent guide bolt (16).

b. Route hoist cable (3) through guide tube (5), guillotine assembly (4), over sheave pulley of traction sheave assembly (1), then down through upper, middle, and lower rollers (43, 45, and 46) and trigger

assembly (39). Secure guide tube to brackets in boom (7) with clamps, screws, and washers. Ensure ends of guide tube do not contact pulley (9) or guillotine assembly (4).

c. Reinstall hook and bumper assembly (40), (paragraph 14-125).

d. Reinstall upper, middle, and lower rollers (43, 45, and 46) in side plates (44), (paragraph 14-148).

e. Reinstall pressure roller to sheave pulley of the traction sheave assembly (1), (paragraph 14-19).

f. Reinstall and adjust upper support and anvil to guillotine assembly (4) (paragraph 14-39).

g. Check hoist cable (3) to ensure there is no binding in guide tube (5) or at any other parts along boom (7) length. Reinstall boom covers (2) and secure with screws and washers.

h. Perform operational check (paragraph 14-4).

14-46. POWER CABLES.

14-47. Description — Power Cables. The rescue hoist contains five power cables, the sheave power cable (6, figure 14-1), hoist power cable (18), actuator power cable (21), drive unit power cable (34), cable for control pendant (35), and guillotine power cable (37).

14-48. Removal — Power Cables. a. Place BAT switch in OFF position.

b. Disconnect power cable and plug from mating receptacle on control box (19, figure 14-1).

NOTE

Use care not to twist, bend, or damage contact pins and individual wires when disengaging or engaging plugs and receptacles.

c. Disconnect opposite end of power cable; remove attaching clamps, then remove cable.

d. Install protective covers on cable plugs and receptacles on control box (19).

14-49. Inspection — Power Cables. a. Inspect power cables for security and for loose or missing hardware.

b. Inspect power cables for broken, kinked, frayed, or worn wires. Check cable continuity.

14-50. Repair or Replacement — Power Cables. a. Replace loose or damaged hardware and clamps.

b. Repair or replace broken, kinked, frayed, and worn wires. Replace with wire of equivalent specification. Replace plugs and receptacles that are damaged. (Refer to Appendix F for wiring diagrams.)

14-51. Installation — Power Cables. a. Remove protective covers from plugs and receptacles.

b. Connect power cable plug to mating receptacle on control box (19, figure 14-1).

c. Connect opposite end of power cable; install required clamp installations to support cable.

d. Perform operational check (paragraph 14-4).

14-52. QUICK DISCONNECT ADAPTERS.

14-53. Description — Quick Disconnect Adapters. The quick disconnect adapters (11 and 30, figure 14-1) are installed on either end of the post (15). The adapters are the quick release type that permits rapid installation or removal of the rescue hoist from roof and actuator plate stud (10 and 29).

14-54. Removal — Quick Disconnect Adapters. a. Remove upper quick disconnect adapter (11, figure 14-1) by removing bolt, washers, and nut from support (12). Using a plastic mallet, tap adapter from support.

b. Remove lower quick disconnect adapter (30) by punching out steel spring pin in lower post support (31); using a plastic mallet, tap adapter from support.

14-55. Inspection — Quick Disconnect Adapters. Inspect adapters (11 and 30, figure 14-1) for cracks, positive latching, corrosion, and security.

14-56. Repair or Replacement — Quick Disconnect Adapters. a. Replace adapters (11 and 30, figure 14-1) that are cracked, corroded, or will not provide a positive latch, or do not have a smooth sliding locking collar.

b. No repairs permitted to adapters (11 and 30).

14-57. Installation — Quick Disconnect Adapters. a. Insert upper quick disconnect adapter (11, figure 14-1) into support (12) and align bolt holes. Secure adapter with bolt, washers, and nut.

b Secure lower quick disconnect adapter (30) to lower post support (31), and align pin holes. Secure adapter with new steel spring pin.

14-58. LOWER POST SUPPORT.

14-59. Description — Lower Post Support. The lower post support (31, figure 14-1) is fabricated from 2024 aluminum alloy and provides a mounting base for the lower end of post (15), actuator lever (24), and quick disconnect adapter (30).

14-60. Removal — Lower Post Support. a. Remove rescue hoist (paragraph 14-6).

b. Disconnect drive unit power cable (34, figure 14-1) from control box (19). Install protective covers over plug and receptacle.

c. Disconnect hoist drive unit (33) from lower end of post (15) by loosening the two screws at upper bracket (20), and removing the two bolts, nuts, and washers at the lower bracket (22). Swing hoist drive unit free of lower bracket.

d. Remove the two through bolts attaching the lower bracket (22) to the post (15). Using a plastic mallet tap bracket and actuator lever (24) from post.

e. Remove actuator lever bolt (32) and remove actuator lever (24) from lower post support (31).

f. Remove quick disconnect adapter (30) from lower post support (31) by punching out steel spring pin.

14-61. Inspection — Lower Post Support. Inspect lower post support (31, figure 14-1), brackets (20 and 22), actuator lever (24), and quick disconnect adapter (30) for corrosion, cracks, deformation, and security.

14-62. Repair or Replacement — Lower Post Support. a. Replace lower post support (31, figure 14-1), bracket (20 and 22), actuator lever (24), and quick disconnect adapter (30) that are corroded, cracked, or deformed.

b. No repairs permitted to lower post support (31), bracket (20 and 22), actuator lever (24), and quick disconnect adapter (30).

14-63. Installation — Lower Post Support. a. Install quick disconnect adapter (30, figure 14-1) into new lower post support (31), align pin holes, and install new steel spring pin. Ensure pin does not protrude above support surface.

b. Position actuator lever (24) on lower post support (31) with flat portion of arm down; align bolt holes and install actuator lever bolt (32) with aluminum washer under nut.

c. Insert lower post support (31) into post (15); align bolt holes; position lower bracket (22) in place, and secure to two through bolts. Install bolt with thin aluminum washer through hoist drive side of bracket and attach actuator power cable (21) and clamp installation under nut. Install remaining bolt through bracket from far side with tab for pin (23) chain under bolt head, and thin aluminum washer under nut.

d. Reposition hoist drive unit (33) to lower bracket (22) and install two bolts (heads inboard) with thin aluminum washers and nuts. Torque nuts to **50 TO 70** inch-pounds after reviewing the following note.

NOTE

Mounting flange of hoist drive unit is installed outboard on near side of lower bracket (22) inboard on opposite side. (Reference mounting at upper bracket (20)). Shim, as required, to eliminate preload in excess of 0.005 inch.

e. Remove protective covers and connect drive unit power cable (34) to mating receptacle on control box (19).

f. Install rescue hoist (paragraph 14-13).

g. Perform operational check (paragraph 14-4).

14-64. POST AND LOCKNUT.

14-65. Description — Post and Locknut. The post (15, figure 14-1) is fabricated from 2024 aluminum alloy tubing and provides the primary attachment and mounting locations for the rescue hoist components. The locknut (13) provides hand adjustment of post length for installation security.

14-66. Removal — Post and Locknut. a. Remove rescue hoist (paragraph 14-6).

b. Disconnect turnbuckle (8, figure 14-1) from boom (7) or fitting (14) on post (15).

c. Remove nut, bolt, and washer securing fitting (14) to post (15). Grasp locknut (13) and lift or turn to remove support (12) from post. Slide fitting (14) from post.

d. When post (15) is to be replaced, refer to applicable paragraphs for removal of parts.

14-67. Inspection — Post and Locknut. Inspect adapter (11, figure 14-1), support (12), locknut (13), fitting (14), and post (15) for corrosion, cracks, damage, missing hardware, and security.

14-68. Repair or Replacement — Post and Locknut. a. Replace adapter (11, figure 14-1), support (12), locknut (13), fitting (14), and post (15) that are corroded, cracked, or damaged.

b. No repairs permitted to adapter (11), support (12), locknut (13), fitting (14), and post (15).

c. Replace loose, missing, or damaged hardware.

14-69. Installation — Post and Locknut. a. When adapter (11, figure 14-1) requires replacement, refer to paragraph 14-54.

b. Thread locknut (13, figure 14-1) onto support (12) to upper end of slot.

c. Place fitting (14) on post (15) and insert support (12). Align fitting, post, and support bolt holes and install bolt with thin aluminum washer under nut.

d. When new post (15) is to be installed, refer to applicable paragraphs for installation of parts.

e. Connect clevises of turnbuckle (8) to boom (7) and fitting (14) with pins, two thin aluminum washers, and cotter pins.

f. Install rescue hoist (paragraph 14-13).

14-70. CONTROL BOX.

14-71. Description — Control Box. The control box (19, figure 14-1) serves as the control center for entire rescue hoist system. It accepts signals from either the hoist operator or pilot to extend or retract rescue boom, and a reel out or reel in cable. The pilot has priority in hoist operation and can override hoist operator actions at any time. In addition, special circuitry provides a continuously variable output voltage which is applied to hoist motor to permit operator to adjust cable speed to suit the mission. Since the variable output voltage limits cable speed to approximately 80 feet-per-minute maximum, provision is made to apply full line voltage to the motor to obtain the rated cable speed of 100 fpm. It should be noted that the pilot does not have the variable speed feature at his disposal, but is limited to 100 fpm operation only. Other circuits within the control box assembly supply operating power to the boom actuator and the traction sheave assembly. There is also a cable cutter actuating switch and a channel for operation of an intercom relay.

14-72. Removal — Control Box. a. Disconnect electrical power to rescue hoist.

b. Disconnect the five attaching power cable plugs from mating receptacles on control box (19, figure 14-1), (paragraph 14-48).

c. Install protective covers over power cable plugs and receptacles on control box (19, figure 14-1).

d. Remove four mounting screws and washers attaching control box (19) to mounting angle (36) on post (15). Remove control box from post.

14-73. Inspection — Control Box. a. Inspect control box (19, figure 14-1) and mounting angles (36) for corrosion, dents, scratches, cracks, loose or missing hardware, and security.

b. Inspect switches and receptacles on control box (19) for security, damage, and general condition.

c. Inspect attaching power cables (paragraph 14-49).

14-74. Repair or Replacement — Control Box (AVIM). a. If control box (19, figure 14-1) shows evidence of damage, replace box.

b. Replace mounting angles (36) that are corroded or cracked. Replace loose, missing, or damaged hardware.

4-75. Installation — Control Box. a. Position nounting angles (36, figure 14-1) to post (15), align oolt holes and secure with two bolts, thin aluminum washers, and nuts.

b. Position control box (19) to mounting angles (36), align screw holes, and secure with four screws and thin aluminum washers.

c. Remove protective covers from receptacles on control box (19) and plugs on power cables. Connect power cable plugs to mating receptacles on control box. Safety plugs with lockwire (C127).

d. Perform operational check (paragraph 14-4).

14-76. Testing — Control Box (AVIM). If operation of hoist shows evidence of malfunction of control box, send to next higher level of maintenance.

14-77. RUBBER PRESSURE ROLLER.

14-78. Description — Rubber Pressure Roller. The rubber pressure roller (7, figure 14-6) is located below the primary pulley (13) of the hoist drive unit and maintains hoist cable position on the pulley.

14-79. Removal — Rubber Pressure Roller. a. Remove screws (11, figure 14-6), lockwashers (10), and cover (12) from hoist drive unit cover.

b. Install one screw (11) in threaded end of tension roll shaft (9) and utilize the screw to withdraw shaft from hoist drive unit.

c. Remove rubber pressure roller (7) as soon as it is free of the tension roll shaft (9) to prevent contaminating the roller with oil.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

14-80. Cleaning — Rubber Pressure Roller. Clean tension roller shaft (9, figure 14-6) and rubber pressure roller (7) with a cloth dampened with solvent (C205).

14-81. Inspection — Rubber Pressure Roller. a. Inspect tension roller shaft (9, figure 14-6) for nicks, cracks, dents, and pits. Dimensional check outside diameter of shaft, if less than **0.308** inch, replace.

b. Inspect rubber pressure roller (7) for cuts, tears, and deterioration. When installed, roller must apply friction pressure to hoist cable (1).

c. Inspect cover (12) for distortion and damage.

14-82. Repair or Replacement — Rubber Pressure Roller. a. Replace rubber pressure roller (7, figure 14-6) if torn, deteriorated, or if it does not apply friction pressure to hoist cable (1).

b. Replace tension roller shaft (9) when inspection limits are exceeded.

c. Replace cover (12) if distorted, and replace lockwashers (10) and screws (11) if damaged.

14-83. Installation — Rubber Pressure Roller. a. Pack grooves in tension roller shaft (9, figure 14-6) with grease (C111).

b. Place clean rubber pressure roller (7) in position below primary pulley (13), align shaft holes. Press tension roller shaft (9) through hoist drive cover and into bore, retaining roller.

c. Install cover (12) and secure with new lockwashers (10) and screws (11).

14-84. ACTUATOR PLATES.

14-85. Description — Actuator Plates. Actuator plates are fabricated from 0.37 inch 2024 aluminum alloy. Plates provide mounting supports for the rescue hoist and actuator to helicopter cabin floor.

14-86. Removal — Actuator Plates. Remove rescue hoist and actuator plates (1 and 12, figure 14-9) in accordance with paragraph 14-6.

14-87. Disassembly — Actuator Plates. a. Disassemble outboard actuator plate (1, figure 14-9, view A) as follows:

(1) Thread stud (8) from bushing (10) in plate (1) and remove washer (9).

(2) Only if damage is evident, press out bushing (10).

(3) Remove two quick disconnect adapters (7) from fittings (2) by removing nuts (6) and washers (5).

(4) Remove two fittings (2) from plate (1) by removing nuts (4), washers (3) and screws (11).

b. Disassemble inboard actuator plate (12, view B) as follows:

(1) Remove fitting (13) from plate (12) by removing screws (15). Remove knob (14).

(2) Remove three disconnect fittings (2) from plate (12) by removing nuts (4), washers (3) and screws (11).

(3) Remove three fittings (2) from plate (12) by removing nuts (4), washers (3) and screws (11).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

14-88. Cleaning — Actuator Plates. Clean parts with solvent (C205) and dry with filtered compressed air.

14-89. Inspection — Actuator Plates. a. Inspect actuator plates (1 and 12, figure 14-9) for cracks and distortion.

b. Inspect quick disconnect adapters (7) for damaged sliding collar, chipped or cracked locking jaws, and thread damage.

c. Inspect stud (8) and bushing (10) for chips, cracks, and thread damage.

14-90. Repair or Replacement — Actuator Plates. a. Replace actuator plates (1 and 12, figure 14-9) if cracks or distortion are evident.

b. Polish out surface damage to actuator plates (1 and 12) and fittings (2 and 13), using No. 400 grit abrasive cloth (C1).

(1) Treat bore and repaired aluminum surfaces with chemical conversion materials (C42).

(2) Touch up repaired areas with primer coating (C167).

c. Replace quick disconnect adapters (7, figure 14-9), stud (8), and bushing (10) if chips, cracks, or thread damage are evident.

14-91. Assembly — Actuator Plates. a. Assemble outboard actuator plate (1, figure 14-9, view A) as follows:

(1) Apply primer coating (C167) to OD of bushing (10) and ID of actuator plate (1) at bushing hole.

(2) Press fit new bushing (10) into lower side of plate (1).

(3) Place thin steel washer (9, figure 14-9) on stud (8) and thread into actuator plate (1). Tighten stud securely.

(4) At two openings in actuator plate (1), install fittings (2) with screws (11), thin aluminum washers (3), and nuts (4).

(5) Loosely install two quick disconnect adapters (7) to lower side of fittings (2) and secure with special washers (5) and nut (6).

b. Assemble inboard actuator plate (12, view B) as follows:

(1) Position fitting (13) to top side of plate (12) and secure with two screws (15).

(2) Loosely install knob (14) in fitting (13).

(3) At three openings in actuator plate (12) install fittings (2) with screws (11), thin aluminum washers (3), and nuts (4).

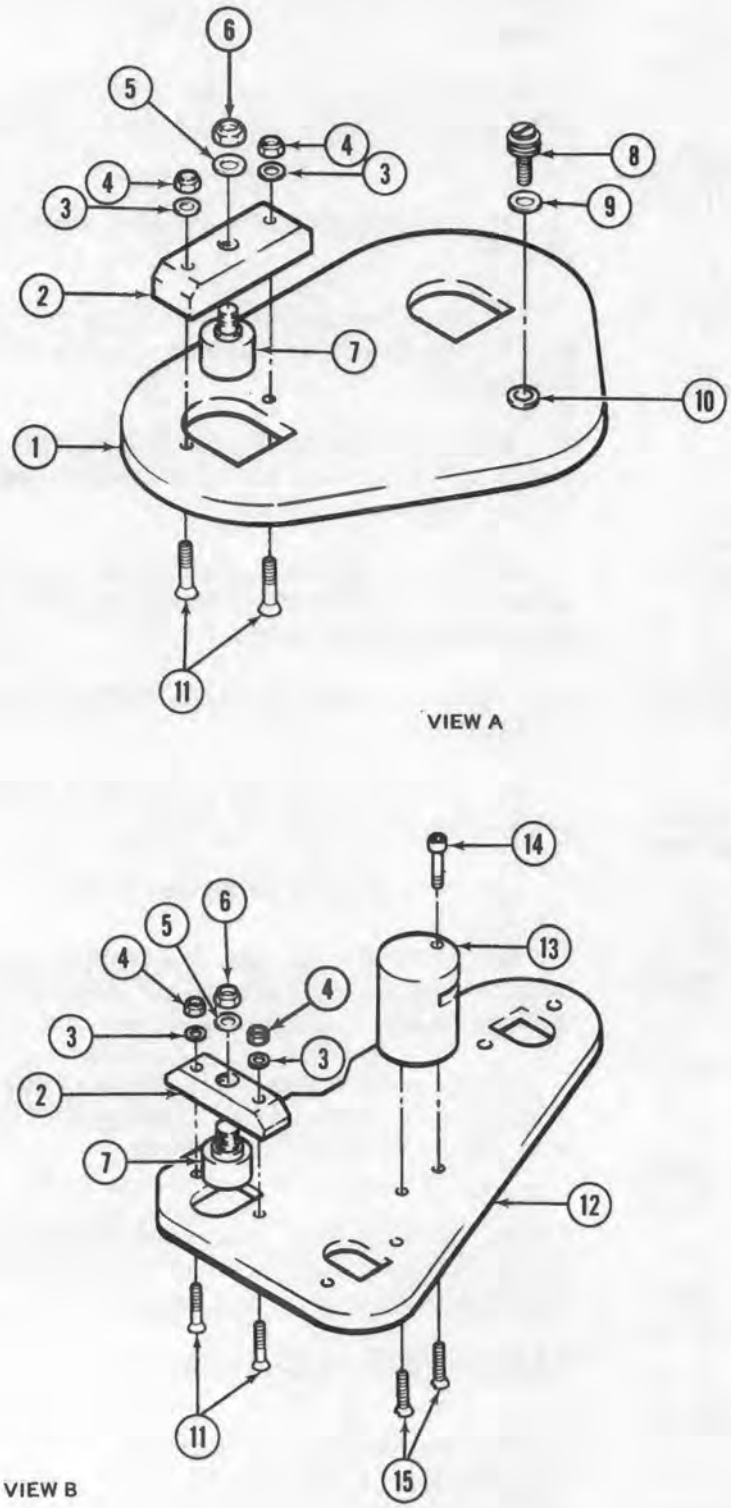
(4) Loosely install three quick disconnect adapters (7) to lower side of fittings (2) and secure with special washers (5) and nut (6).

14-92. Installation — Actuator Plates. Install actuator plates (1 and 12, figure 14-9) and rescue hoist in accordance with paragraph 14-13.

14-93. ACTUATOR LEVER.

14-94. Description — Actuator Lever. The actuator lever (24, figure 14-1) is fabricated from 2024 aluminum alloy and acts as the pivot lever between the actuator (25) and rescue hoist, when moving hoist in or out.

14-95. Removal — Actuator Lever. a. Remove rescue hoist (paragraph 14-6).



1. Actuator Plate — Outboard
2. Fitting
3. Washer — Thin Aluminum
4. Nut
5. Washer — Special
6. Nut
7. Adapter — Quick Disconnect
8. Stud
9. Washer — Thin Steel
10. Bushing
11. Screw
12. Actuator Plate — Inboard
13. Fitting
14. Knob
15. Screw

Figure 14-9. Actuator plates

b. Remove actuator lever bolt (32, figure 14-1), washer, and nut from lower post support (31). Using a plastic mallet, tap actuator lever (24) from support. Ensure that steel spring pin in lower support is flush to surface and will not contact lever.

14-96. Inspection — Actuator Lever. Inspect actuator lever (24, figure 14-1), lower post support (31), and actuator lever bolt (32) for corrosion, cracks, deformation, and security.

14-97. Repair or Replacement — Actuator Lever. **a.** Replace actuator lever (24, figure 14-1) and actuator lever bolt (32) that are corroded, cracked, or deformed.

b. No repairs permitted to actuator lever (24).

14-98. Installation — Actuator Lever. a. Position actuator lever (24, figure 14-1) on lower post support (31) with flat portion of arm down. Align bolt holes and install actuator lever bolt (32) with aluminum washer and nut.

b. Install rescue hoist (paragraph 14-13).

14-99. HOIST DRIVE UNIT.

14-100. Description — Hoist Drive Unit. The hoist drive unit (33, figure 14-1) is powered by an electrical motor that drives a primary pulley through a reduction gear and load brake assembly. The primary pulley, in turn, drives a secondary pulley. An integral cable storage drum is also driven by the primary pulley. Hoist cable, routing from the storage drum, passes through a level wind device, around a guide pulley, wraps around the primary and secondary pulleys in figure eight type style. A mechanically actuated down limit switch located in the hoist storage drum, halts the hoist when the cable is fully played-out. The hoist primary and secondary pulleys act as capstans. The drive unit assembly incorporates a self-contained lubrication system.

Premaintenance requirements for hoist drive unit

Conditions	Requirements
Model	All
Part No. or Serial No.	All
Speical Tools	(T5)
Test Equipment	None
Support Equipment	BL6423 supplement kit (furnished with BL8439 Hoist Cable.
Minimum Personnel Required	Two
MOS	
Consumable Materials	(C1), (C42), (C167), (C127), (C205)
Special Environmental Conditions	Dust Free

14-101. Removal — Hoist Drive Unit. a. Operate rescue hoist until hoist cable is fully extended. Allow cable to coil in a protected container while operating hoist (paragraph 14-4).

WARNING

Use spline wrench (T5) to loosen set screw. Allen type wrench will strip head of set screw if used. Bristol wrench is provided with replacement hoist cable in the BL6423 supplemental kit (instructions, wrench, and new set screw).

b. Using spline wrench (T5), loosen set screw in lock flange (3, figure 14-6) of storage drum (2) and remove hoist cable (1).

c. Remove rubber pressure roller (7) from below primary pulley (13). Remove screws (11), lockwashers (10), and cover (12); then thread one screw into end of the tension roll shaft (9). Using the screw as a puller, and maintaining hand pressure on the roller to keep it centered, withdraw the shaft to free the roller.

d. Remove remainder of hoist cable (1) from hoist drive unit by manually unwrapping from storage drum (2) and primary and secondary pulleys (13 and 14).

e. Secure loose end of hoist cable (1). If cable is to be removed from rescue hoist refer to paragraph 14-28.

f. Disconnect hoist drive power cable (34, figure 14-1) from hoist drive unit (33). Install protective covers over plug and receptacle.

g. Remove hoist drive unit (33) from post (15) by removing two screws, washers, and nuts at upper bracket (20), then two bolts, washers, nuts, and shims at lower bracket (22).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

14-102. Cleaning — Hoist Drive Unit. Clean hoist drive unit with cloth and brush dampened with solvent (C205). Dry with filtered compressed air. Do not allow solvent to enter drive motor, clutch, or electrical components.

14-103. Inspection — Hoist Drive Unit. a. Inspect hoist drive unit (33, figure 14-1) for corrosion, dents, scratches, cracks, loose and missing hardware, and security of parts.

b. Inspect hoist cable (3) for condition (paragraph 14-30).

c. Inspect storage drum (2, figure 14-6) for runout. Runout not to exceed **0.015** inch during reel-in and **0.050** inch during reel-out (paragraph 14-109).

d. Inspect storage drum (2, figure 14-6), level wind guide and rollers (6), rubber pressure roller (7), idler pulley (8), and primary and secondary pulleys (13 and 14) for damage and excessive wear from hoist cable (1). Shallow cable marks in pulleys and rollers (except rubber pressure roller), are not cause for replacement.

e. Inspect electrical wiring on hoist drive unit (33, figure 14-1) for chafing, wear, and abrasion.

f. Inspect level wind shaft (5, figure 14-6) for nicks, scratches, burrs, and lack of lubricant. Inspect arm of level wind guide and rollers (6) to ensure it is not distorted or damaged.

g. Inspect guards (2, 5, 7, and 8, figure 14-7) to ensure they provide **0.0625** inch clearance between guards and hoist cable (12) and that guards are **90** degrees to the cable on the primary and secondary pulleys (13 and 14, figure 14-7).

14-104. Repair or Replacement — Hoist Drive Unit (AVIM). a. Polish out minor nicks, scratches, and corrosion not greater than **0.0015** inch in depth on hoist drive unit (33, figure 14-1), using No. 400 grit abrasive cloth (C1). Touch up repaired areas using chemical conversion (C42) and primer coating (C167).

b. Replace hoist cable (3), no repairs permitted (paragraph 14-28).

c. Send hoist drive unit (33, figure 14-1) to next higher level of maintenance when cracks are evident, storage drum runout exceeds limits, excessive wear is evident on primary and secondary pulleys, arm of level wind guide and rollers is distorted, or level wind shaft is damaged.

14-105. Installation — Hoist Drive Unit. a. Position hoist drive unit (33, figure 14-1) to lower bracket (22) on post (15). Mounting flange of drive unit to be on outboard side of bracket on one side and inboard on the opposite side. Loosely install two bolts (boltheads inboard) with thin aluminum washers and nuts.

b. Position hoist drive unit (33) to upper bracket (20) and loosely install two screws (screw heads inboard) with thin aluminum washers and nuts.

c. Shim between clevis of lower bracket (22) and hoist drive unit (33) to eliminate preload in excess of **0.005** inch, as required. Tighten mounting bolts and screws to standard torque.

d. Remove dust covers from plug and receptacle of hoist drive power cable (34) and control box (19). Connect cable to control box and safety with lockwire (C127).

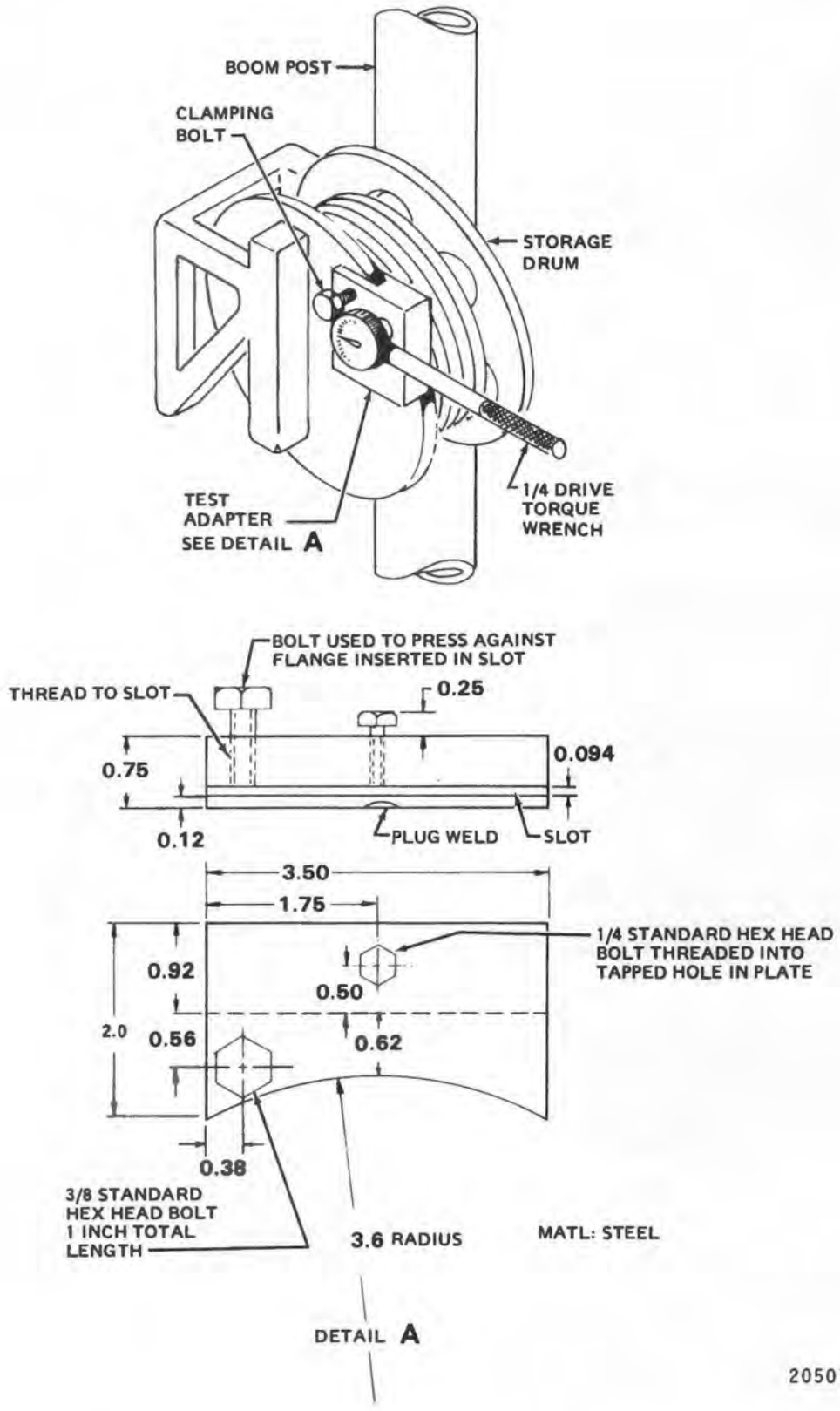


Figure 14-10. Installation — Storage drum clutch tester

NOTE

If hoist cable was removed from the rescue hoist, install cable in accordance with paragraph 14-32.

If hoist cable was retained in rescue hoist, complete cable installation in accordance with paragraph 14-32, step c, warning statement and subsequent steps.

e. Perform operational check (paragraph 14-4).

14-106. HOIST CABLE STORAGE DRUM.

14-107. Description — Hoist Cable Storage Drum. The hoist cable storage drum (2, figure 14-6) secures the end of hoist cable (1) and incorporates the down limit switch.

14-108. Removal — Hoist Cable Storage Drum. Send hoist drive unit (33, figure 14-1) to next higher level of maintenance (paragraph 14-101).

14-109. Inspection — Hoist Cable Storage Drum. a. Inspect hoist cable storage drum (2, figure 14-6) for corrosion, binding, nicks, cracks, loose or missing hardware, and security of parts.

b. Inspect clutch of the hoist drive unit for proper setting as shown in figure 14-10. If the storage drum does not rotate with **35** inch-pounds applied to the torque wrench, the clutch is good. Fabricate test adapter (figure 14-10).

c. Inspect storage drum for runout as shown in figure 14-11. Mount dial indicator to hoist drive unit with pointer in contact with surfaces indicated. Runout not to exceed **0.015** inch during reel-in and **0.050** inch during reel-out with hoist operating electrically.

14-110. Repair or Replacement — Hoist Cable Storage Drum (AVIM). a. Polish out minor nicks, scratches, and corrosion not greater than **0.0015** inch on stowage drum (2, figure 14-6), using No. 400 grit abrasive cloth (C1). Touch up repaired areas with chemical conversion materials (C42) and primer coating (C167).

b. Replace loose or missing hardware.

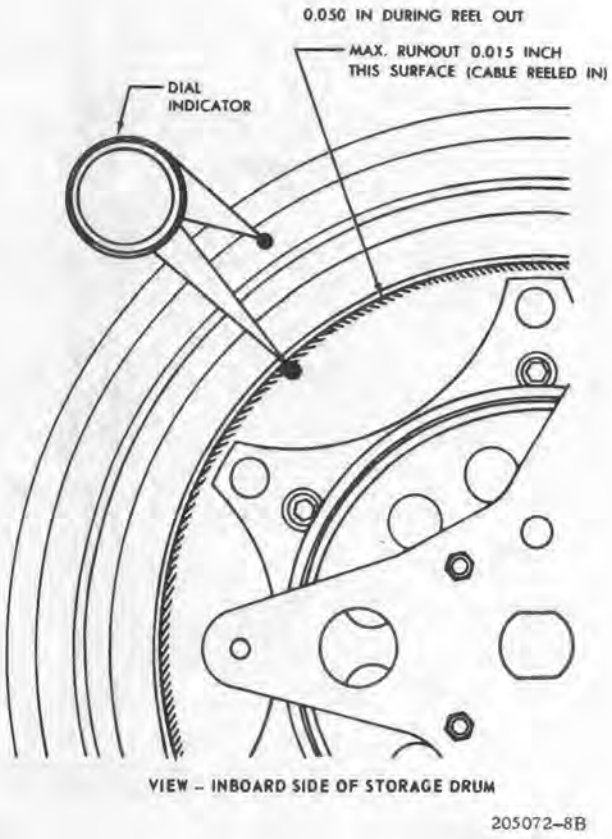


Figure 14-11. Measuring storage drum runout

c. Send hoist drive unit (32, figure 14-1) to next higher level of maintenance when inspection limits are exceeded.

14-111. Installation — Hoist Cable Storage Drum. Install hoist drive unit (33, figure 14-1) in accordance with paragraph 14-105.

14-112. CONTROL PENDANT.

14-113. Description — Control Pendant. The control pendant (35, figure 14-1) is a hand-held, remote-control device that incorporates a double-throw, center-off, toggle switch for boom-in and boom-out operation, a control switch that governs the hoist direction and speed, and a control button for the intercommunication system. The pendant assembly housing is nonconductive and impact resistant. When properly assembled, the pendant housing is dust and moisture resistant.

14-114. Removal — Control Pendant. a. Disconnect plug for control pendant (35, figure 14-1) at mating receptacle on control box (19).

b. Remove control pendant (35) and protect plug and receptacle with dust covers.

14-115. Inspection — Control Pendant. a. Inspect control pendant (35, figure 14-1) for condition and wiring for security of plug.

b. Inspect switches for security movement, continuity, and rubber boot for condition, tears, and flexibility.

NOTE

If pendant switch will not return to center and motor continues to run; rubber boot is not secure.

14-116. Repair or Replacement — Control Pendant. a. Repair rubber boot on control pendant (35, figure 14-1) as follows:

(1) Remove retaining ring securing boot and remove boot.

(2) Secure boot to pendant control with adhesive (C11), ensuring that boot is centered.

(3) Replace retaining ring.

b. Replace control pendant (35), if damaged.

14-117. Installation — Control Pendant. a. Remove dust covers from plug of control pendant (35, figure 14-1) and receptacle on control box (19).

b. Connect control pendant (35) to control box (19) and tighten plug.

14-118. HOOK AND BUMPER ASSEMBLY.

14-119. Description — Hook and Bumper Assembly. The hook and bumper assembly (40, figure 14-1) is attached to the hoist cable (3) providing a positive means to rapidly connect a sling to the hoist. The swivel hook, handwheel, and bumper assembly are composed of two major subassemblies: swivel hook and handwheel and the bumper assembly. The hook is machined from a forging and incorporates a spring actuated safety hook to prevent accidental release of a load from the hook. The handwheel is machined from a corrosion resistant steel casting. The bumper assembly consists of a molded rubber bumper and a corrosion resistant steel shield and washer assembly. The bumper assembly encloses a tapered compression spring which adds body and resiliency to the rubber bumper. The hook assembly is attached to the hoist cable by means of a split collar that encloses the shank end of the hook and the ball terminal of the hoist cable. The collar is pinned to the handwheel.

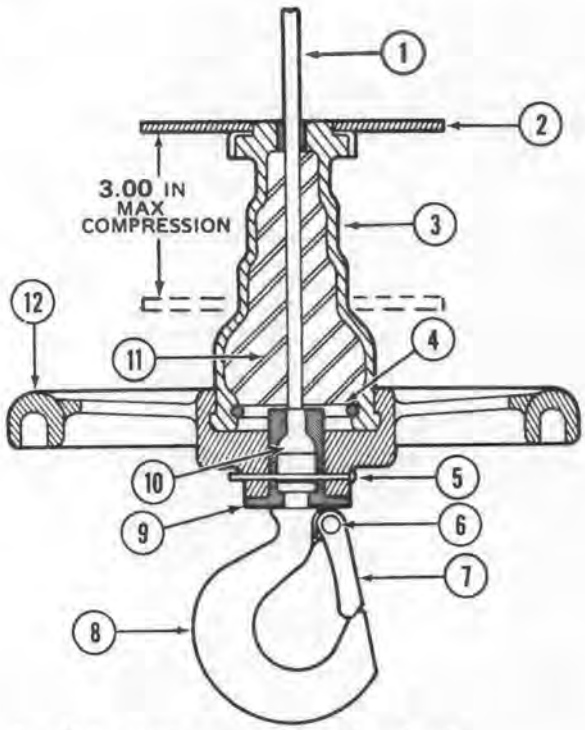
14-120. Removal — Hook and Bumper Assembly.

NOTE

It may be necessary to reel out hoist cable 12 to 24 inches to aid in hook and bumper removal.

a. Pull cotter pin and remove retaining pin (5, figure 14-12) from center of handwheel (12).

b. Hold hook (8) stationary and firmly work (pull) handwheel (12) from collar (9) and hook. Separate collar and remove hook and ball terminal (10) of hoist cable (1).



1. Hoist cable
2. Shield
3. Bumper
4. Retaining ring
5. Retaining pin
6. Screw, washers and nut
7. Safety hook and spring
8. Hook
9. Collar
10. Ball terminal
11. Spring
12. Handwheel

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Figure 14-12. Hook and bumper assembly

c. Withdraw hoist cable (1) from shield (2). Compress bumper (3) and retaining ring (4) and remove handwheel (12). Separate bumper (3), ring (4), and spring (11).

d. Remove safety hook and spring (7) from hook (8) by removing screw, washers, and nut (6).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

14-121. Cleaning — Hook and Bumper Assembly. Clean hook and bumper assembly with cloths dampened with solvent (C205).

14-122. Inspection — Hook and Bumper Assembly (Installed). a. Inspect hook (8, figure 14-12) for visible damage and freedom of movement in handwheel (12).

b. Compress bumper (3) and retaining ring (4), and remove from handwheel (12).

c. Inspect hoist cable (1) for cleanliness and damage (paragraph 14-30).

d. Inspect cable at ball terminal (10) for broken strands or other damage.

e. Check operation and security of safety hook and spring (7).

f. Check bumper (3) and shield (2) for wear and tears or other damage that may limit function. Check for a maximum compression of **3.00** inches.

g. Check security of retaining pin (5).

14-123. Inspection — Hook and Bumper Assembly (Removed) (AVIM). a. Complete inspection requirements of paragraph 14-122.

b. Inspect the following parts by fluorescent penetrant code (F) or magnetic particle code (M) as applicable:

Figure 14-12

Index No.	Nomenclature	Code
8	Hook	M
9	Collar	M
12	Handwheel	F

(1) Fluorescent penetrant inspect handwheel (12) in accordance with TM 43-0103.

(2) Magnetic particle inspect hook (8) and collar (9) in accordance with TM 43-0103. as follows:

(a) Inspect hook using 1200 amps by circular and longitudinal method. Defects — None.

(b) Inspect collar using 1000 amps by longitudinal method. Defects — None.

c. Inspect hook and bumper assembly in accordance with figure 14-13. Parts exceeding wear limits shall be replaced.

d. Inspect hoist cable at ball terminal (6) for broken strands or other damage (paragraph 14-30).

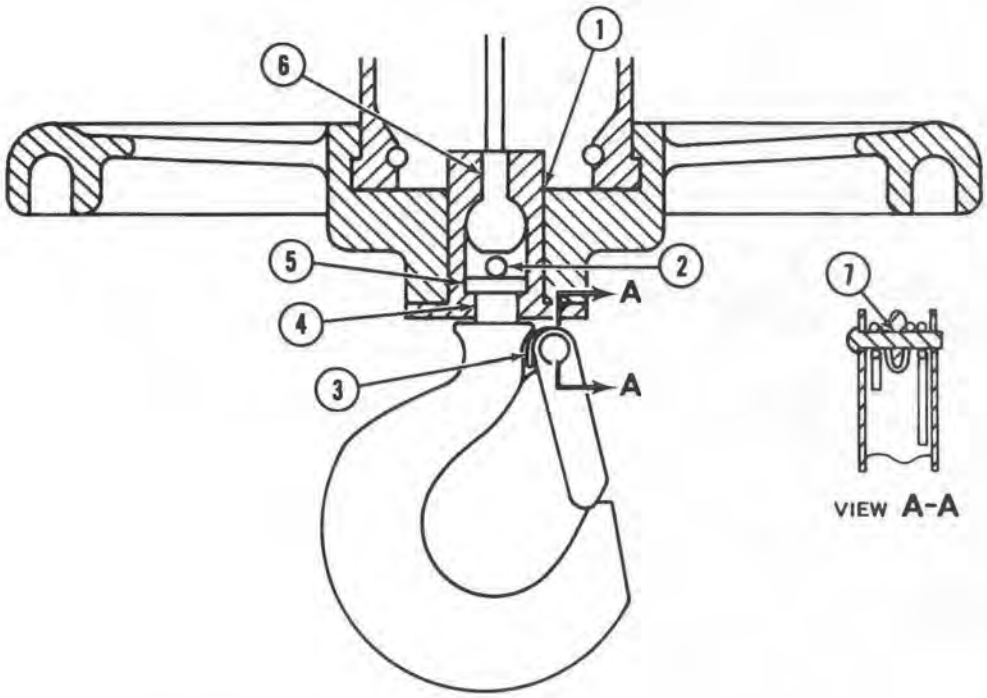
14-124. Repair or Replacement. Replace all parts that do not meet inspection requirements of paragraph 14-122 and 14-123.

14-125. Installation — Hook and Bumper Assembly. a. Assemble safety hook and spring (7, figure 14-12) together so that long end of spring will be under tongue of hook.

b. Position safety hook and spring (7) to hook (8) and install screw, two washers, and nut (6). Tighten screw, then depress safety hook several times to ensure freedom of movement.

c. Apply several drops of lubricating oil (C136) to contacting surfaces at hook and at pivot point on screw.

d. If shield (2) is separated from bumper (3), coat the inside surfaces of shield and outside surfaces of bumper flange with adhesive (C13). Force bumper flange into shield. Assembly may be handled



ITEM NO.	NOMENCLATURE	NEW PART DIMENSIONS MIN.	NEW PART DIMENSIONS MAX.	WEAR LIMITS
1	Collar to Handwheel Fit	0.000	0.004L	0.010
2	Retaining Pin Bore — ID	0.160	0.163	0.172
3	Safety Hook Bore — ID	0.152	0.156	0.176
4	Collar to Hook Fit	0.000	0.010L	0.020
5	Hook Collar Retaining Land — THK	0.167	0.177	0.150
6	Ball Terminal Shank to Collar Fit	0.008	0.023	0.036
7	Safety Hook Screw Bore — ID	0.142	0.147	0.156

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Figure 14-13. Hook and bumper assembly — wear limits

immediately after cementing; however, allow to air cure 24 hours before hoist operations.

e. Install retaining ring (4) into inner groove of bumper (3). Fit spring (11) into bumper.

f. Fit wide end of bumper (3) into recess in handwheel (12) until bead on bumper seats in groove.

g. Apply a liberal coating of grease (C109) to load bearing surfaces of collar (9).

h. Insert hoist cable (1) down through shield (2), bumper (3) and handwheel (12).

i. Fit collar (9) over ball terminal (10) and hook (8). Press collar into recess in handwheel (12) until seated and holes for retaining pin (5) are aligned.

j. Insert retaining pin (5) through handwheel (12) and collar (9). Secure pin with washer and cotter pin.

14-126. LIMIT SWITCHES.

14-127. Description — Limit Switches. Two limit switches are installed in the hoist assembly. The up limit switch (38, figure 14-1) is located on the lower side of the boom (7) and stops the hoist when the switch is closed as the hook and bumper assembly (40) contacts the trigger assembly (39). The down limit switch is located in the hoist storage drum and stops the hoist when the cable is fully reeled-out.

14-128. Removal — Limit Switches. a. Remove up limit switch (38, figure 14-1) as follows:

(1) Operate hoist and extend hook and bumper assembly (40) **12 TO 24** inches. Disconnect electrical power to rescue hoist.

(2) Remove boom covers (2) by removing attaching screws and washers.

(3) Remove guillotine assembly (4) as an assembly and relocate to allow access to up limit switch (38), (paragraph 14-35).

(4) Disconnect two electrical wires attached to up limit switch (38, figure 14-1).

(5) Loosen check nuts securing up limit switch (38) to boom (7). Lift switch from boom.

b. Down limit switch is located inside the storage drum (4, figure 14-6) of the hoist drive unit (33, figure 14-1). Send hoist drive unit to next higher level of maintenance for replacement of switch.

14-129. Inspection — Limit Switches. a. Inspect up limit switch (38, figure 14-1) for cracks, corrosion, security, and missing hardware.

b. Check up limit switch (38) for proper adjustment (paragraph 14-132).

c. Check free operation of down limit switch actuator pin (figure 14-6). Do not depress actuator pin below surface of storage drum (4).

d. Check down limit switch for proper adjustment (paragraph 14-132).

14-130. Repair or Replacement — Limit Switches. a. Replace up limit switch (38, figure 14-1) when cracked, damaged, or not operable. No repair permitted.

b. Replace down limit switch when not operable. In the event the actuator pin remains below the surface of the storage drum (4, figure 14-6), send hoist drive unit (33, figure 14-1) to next higher level of maintenance.

14-131. Installation — Limit Switches. a. Install up limit switch (38, figure 14-1) as follows:

(1) Connect the two electrical wires in boom (7) to up limit switch (38).

(2) Insert up limit switch (38) into opening in boom (7) and adjust and tighten furnished nuts securely to secure switch. Adjust switch in accordance with paragraph 14-132.

b. For installation or replacement of down limit switch send hoist drive unit (33, figure 14-1) to next higher level of maintenance.

14-132. Adjustment — Limit Switches. a. Adjust up limit switch (38, figure 14-1) as follows:

(1) Operate hoist and extend hook and bumper assembly (40) to just above ground level, or approximately 6 feet.

(2) Check trigger (39) to ensure that no binding exists. With the trigger in its normal (down) position, adjust bolt (41) until **0.010** inch clearance exists between bolt head and actuator on up limit switch as shown in view c. Tighten nut (42) until lockwasher is fully compressed, maintaining bolt position. Verify required clearance exist.

(3) Operate hoist and slowly retract hook and bumper assembly (40), actuate trigger (39) three or four times to ensure that up limit switch stops hoist. Extend and retract hook and bumper assembly several times checking to ensure that when the bumper contacts the trigger the hoist stops before stressing hoist cable (3).

b. Adjustments to down limit switch are as follows:

(1) For internal adjustment send hoist drive unit (33) to next higher level of maintenance.

(2) Operate hoist until hoist cable (1, figure 14-6) is fully reeled out and three wraps remain on storage drum (2). Check third groove of storage drum for actuator pin (4). If pin is missing or cannot be depressed by **5** pounds cable tension, the switch must be replaced before hoist operations can be resumed. Send hoist drive unit to next higher level of maintenance.

14-133. OVERLOAD SENSING RELAY.

14-134. Description — Overload Sensing Relay. The overload sensing control is mounted near the hoist power relay in the aft radio compartment, serves to sense hoist overload current surges, and opens circuit to hoist power relay holding coil, thus removing electrical power from hoist motor. Sensing control will reset automatically, but hoist PWR circuit breaker will remain open. (Refer to paragraph F-11

14-135. Removal — Overload Sensing Relay. a. Disconnect battery and external power.

b. Remove electrical wires from overload sensing control terminal.

c. Tape ends of disconnected wires.

d. Remove mounting screws and washers from overload sensing relay.

e. Remove relay.

14-136. Installation — Overload Sensing Relay. a. Remove protective tape from overload sensing control wire terminals.

b. Electrically ground sensing control mounting hole and contact surface.

c. Position sensing control on mounting bracket; install mounting screws and washers.

d. Place wire terminals on sensing control terminal post and secure with existing washers and nuts.

e. Connect battery.

14-137. TRIGGER ASSEMBLY.

14-138. Description — Trigger Assembly. The trigger assembly (23, figure 14-14) is mechanically actuated by the hook and bumper assembly (21) closing the up limit switch and halting the hoist in the full-up position.

14-139. Removal — Trigger Assembly. a. Operate the hoist assembly and extend the hook and bumper assembly (21, figure 14-14) **12 TO 24** inches. Disconnect electrical power to rescue hoist.

b. Remove hook and bumper assembly (21) from hoist cable (1), (paragraph 14-120).

c. Remove nut (25, figure 14-14), washer (24), and bolt (22) from trigger (23), then remove from boom (13).

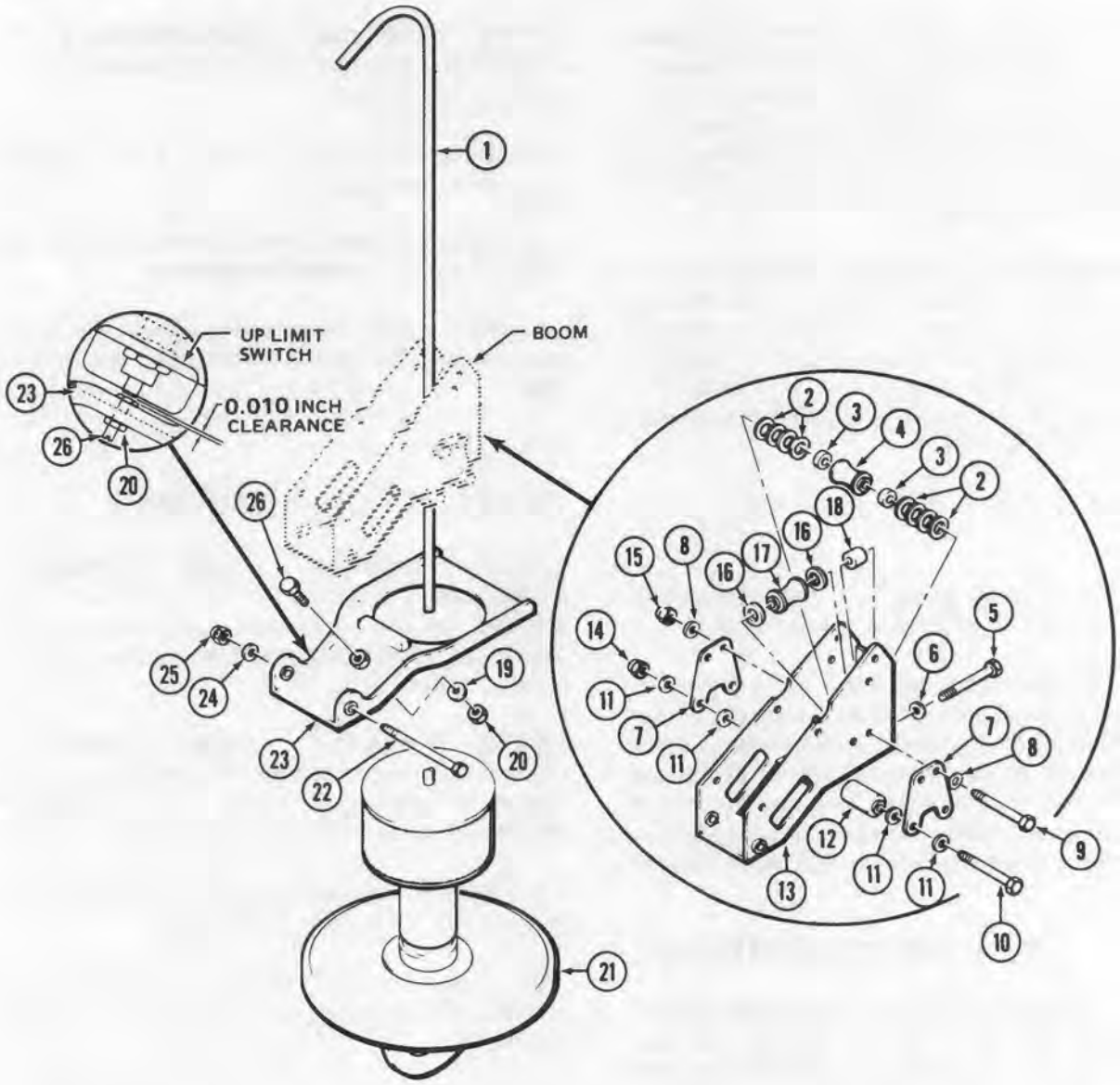
14-140. Inspection — Trigger Assembly. a. Inspect trigger (23, figure 14-14) for damage, distortion, corrosion, and cracks.

b. Inspect trigger (23) for worn bushings, damaged nut, and loss of rubber bumper.

14-141. Repair or Replacement — Trigger Assembly. a. Replace trigger (23, figure 14-14) when damaged to the extent it is no longer functional, distorted, cracked, or bushings are elongated.

b. When rubber bumper is missing or loose, bond new bumper in place using adhesive (C7).

14-142. Installation — Trigger Assembly. a. Loosely install bolt (26, figure 14-14), lockwasher (19), and nut (20) in trigger (23).



1. Hoist cable
2. Felt washers
3. Spacer
4. Roller
5. Bolt
6. Washer
7. Side plate
8. Washer
9. Bolt
10. Bolt
11. Washer
12. Roller
13. Boom
14. Nut
15. Nut
16. Felt washer
17. Roller
18. Spacer
19. Lockwasher
20. Nut
21. Hook and bumper assembly
22. Bolt
23. Trigger
24. Washer
25. Nut
26. Bolt

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Figure 14-14. Trigger, slide plates and rollers

b. Position trigger (23) to boom (13) and install bolt (22), washer (24) and nut (25). Tighten nut sufficiently to provide security for trigger, but allow freedom of movement. Secure with cotter pin.

c. Adjust bolt (26) and up limit switch (paragraph 14-132).

d. Reinstall hook and bumper assembly (21, figure 14-14), (paragraph 14-125).

14-143. SIDE PLATES AND ROLLERS.

14-144. Description — Side Plates and Rollers. The side plates (7, figure 14-14) and roller (4, 12 and 17) are located on the outboard end of the boom (13) and limit oscillation of hook and bumper assembly (21).

14-145. Removal — Side Plates and Rollers. a. Operate the hoist assembly and extend the hook and bumper assembly (21, figure 14-14) **12 TO 24** inches. Disconnect electrical power to rescue hoist.

b. Remove hook and bumper assembly (21) from hoist cable (1), (paragraph 14-120).

c. Remove lower pair of rollers (12, figure 14-14) by removing bolts (1), washers (11), and nuts (14) from side plates (7).

d. Remove middle pair of rollers (17) by removing bolts (5), washers (6), spacer (18), and felt washers (16) from boom (13).

e. Remove upper pair of rollers (4) by removing bolts (9), washers (8), felt washers (2), spacers (3), and nuts (15) from side plates (7) and boom (13). Remove side plates from boom.

14-146. Inspection — Side Plates and Rollers. a. Inspect side plates (7, figure 14-14) and rollers (4, 12 and 17) for security, cracks, corrosion, and missing hardware.

b. Inspect bushings in ends of rollers (4, 12 and 17) for cracks and elongation.

c. Inspect felt washers (2 and 16) for condition.

14-147. Repair or Replacement — Side Plates and Rollers. a. Replace side plates (7, figure 14-14) and rollers (4, 12 and 17) when cracks, elongated holes, or excessive wear is evident. Shallow cable marks on rollers are not cause for replacement.

b. Replace felt washers (2 and 16) if torn, dirty, or oil soaked.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

14-148. Installation — Side Plates and Rollers. a. Clean oilite bushings in rollers (4, 12 and 17, figure 14-14) with a cloth dampened with solvent (C205). Do not lubricate oilite bushings.

b. Install middle pair of rollers (17) in boom (13). Place new felt washers (16) over bushings on each end of rollers and position in boom with spacers (18). Align bolt holes and install bolts (5) with thin steel washers (6). Tighten bolts to standard torque and safety bolt heads together with lockwire (C127).

c. Install upper pair of rollers (4) in boom (13). Place new felt washers (2) over bushings on each end of rollers and on spacers (3), four felt washers each side of rollers. Position rollers, spacers, and felt washers in boom; align bolt holes and install side plates (7), steel washers (8), bolts (9), and nuts (15).

d. Install lower pair of rollers (12) between side plates (7). Place a steel washer (11) next to bushings on each end of rollers and position between side plates. Align bolt holes and install bolts (10), additional steel washers (11) and nuts (14).

e. Torque four nuts (14 and 15) **20 TO 25** inch-pounds. After assembly, all rollers (4, 12 and 17) must turn freely.

f. Route hoist cable (1) through rollers (4, 12, and 17) if not previously accomplished.

g. Install hook and bumper assembly (21) (paragraph 14-125).

SECTION II. CARGO SUSPENSION SYSTEM

14-149. CARGO SUSPENSION SYSTEM.

14-150. Description — Cargo Suspension System. The cargo suspension system figure 14-15, capable of carrying a 4000 pound external load, consists of a suspension assembly located at helicopter approximate center of gravity. The suspension assembly is mounted to a fitting, bolted to the load beam below the main transmission by a link. The suspension assembly is free swinging with the cargo hook load beam always facing forward. Three centering and restraint springs are attached to the suspension assembly to increase cargo load stability and minimize load swinging. Release of an external load may be accomplished electrically or by a mechanical release system. The electrical release system consist of a CARGO RELEASE switch located on the pilot cyclic control grip or a two-position toggle switch on the overhead console labeled CARGO RELEASE has two positions, OFF and ARM. Electrical power to cargo hook release relay is furnished from the 28 Vdc essential bus. Circuit protection is provided by the CARGO HOOK REL circuit breaker. The mechanical release system consists of a foot pedal located at the pilot station, two steel cables connected by a turnbuckle at the right side of the cargo suspension compartment, and a spring-loaded cable connector attached to the suspension assembly.

CAUTION

With non-rotating cargo suspension assembly, a flexible loop or swivel device shall be installed between cargo hook and load to prevent transfer of excessive torque to the hook by a rotating cargo load. Recommended device for this application is: sling, endless, nylon webbing, type 1, 10 inch, Part No. PD101-10.

14-151. Inspection — Cargo Suspension System (Installed).

CAUTION

Wear of bolts, screws, or pins in suspension assembly can alter rigging of mechanical release, and an inadvertent release of external cargo can result.

a. Inspect pedal (3, figure 14-15) for damage and forward release cable (11) for security of attachment.

b. Inspect aft release cable (9) and external control cable (35) for security of attachment to connector (28).

c. Inspect bolt (37) and suspension assembly (41) for security and attachment to suspension fitting (43).

d. Check electrical cable (1, figure 14-16) for condition and security.

e. Inspect link (2), screws (7 and 21), bolts (10 and 22) and shear pin (28, view C-C for condition and security.

f. Restraint springs (8 and 19) for condition and security.

g. Bumper (12) and cargo hook (13 and 14) for condition and security.

h. Perform operational check (paragrah 14-154).

14-152. Troubleshooting — Cargo Suspension System Assembly. Troubleshoot the cargo suspension system in accordance with table 14-2.

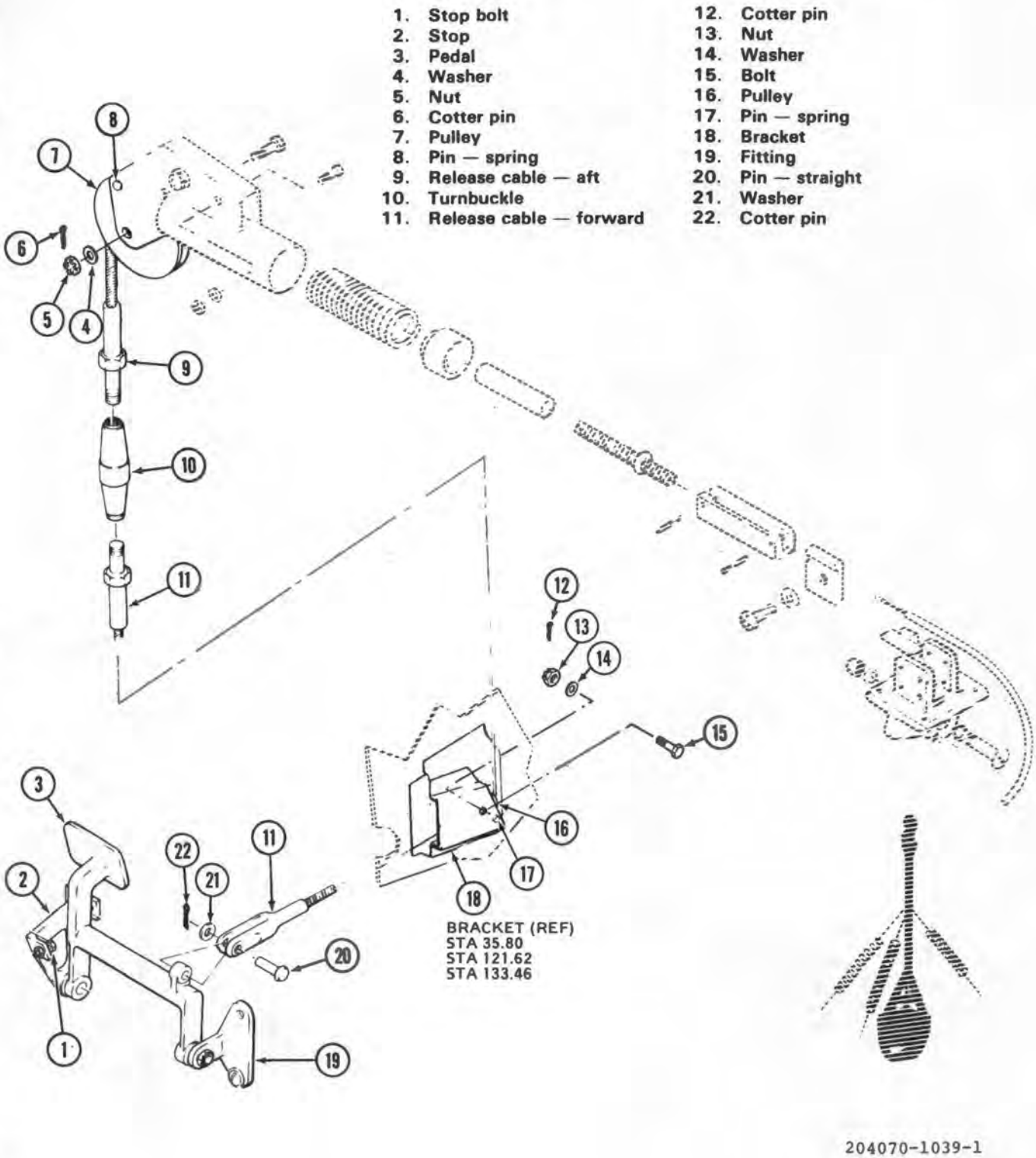


Figure 14-15. Cargo suspension system (Sheet 1 of 2)

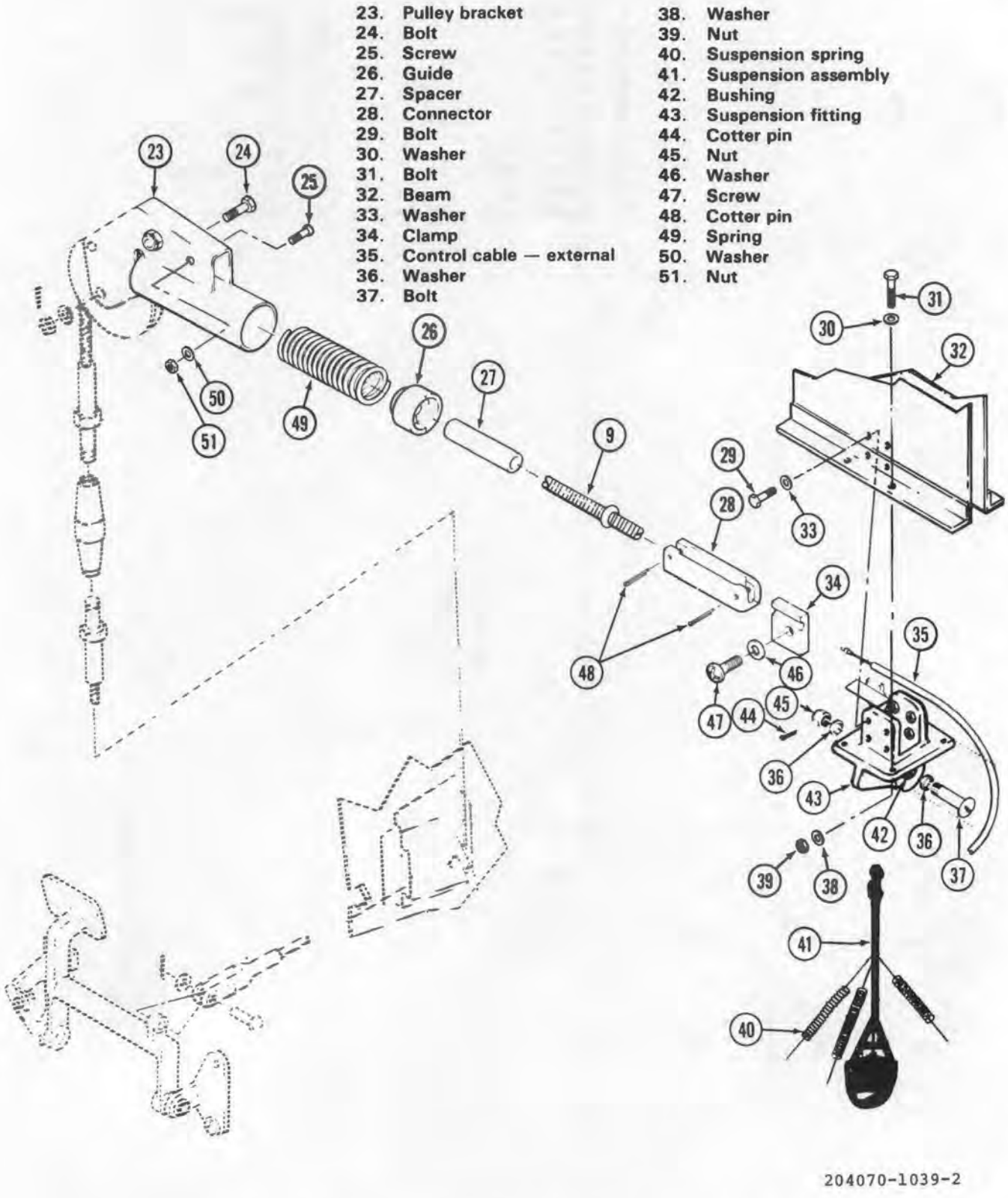
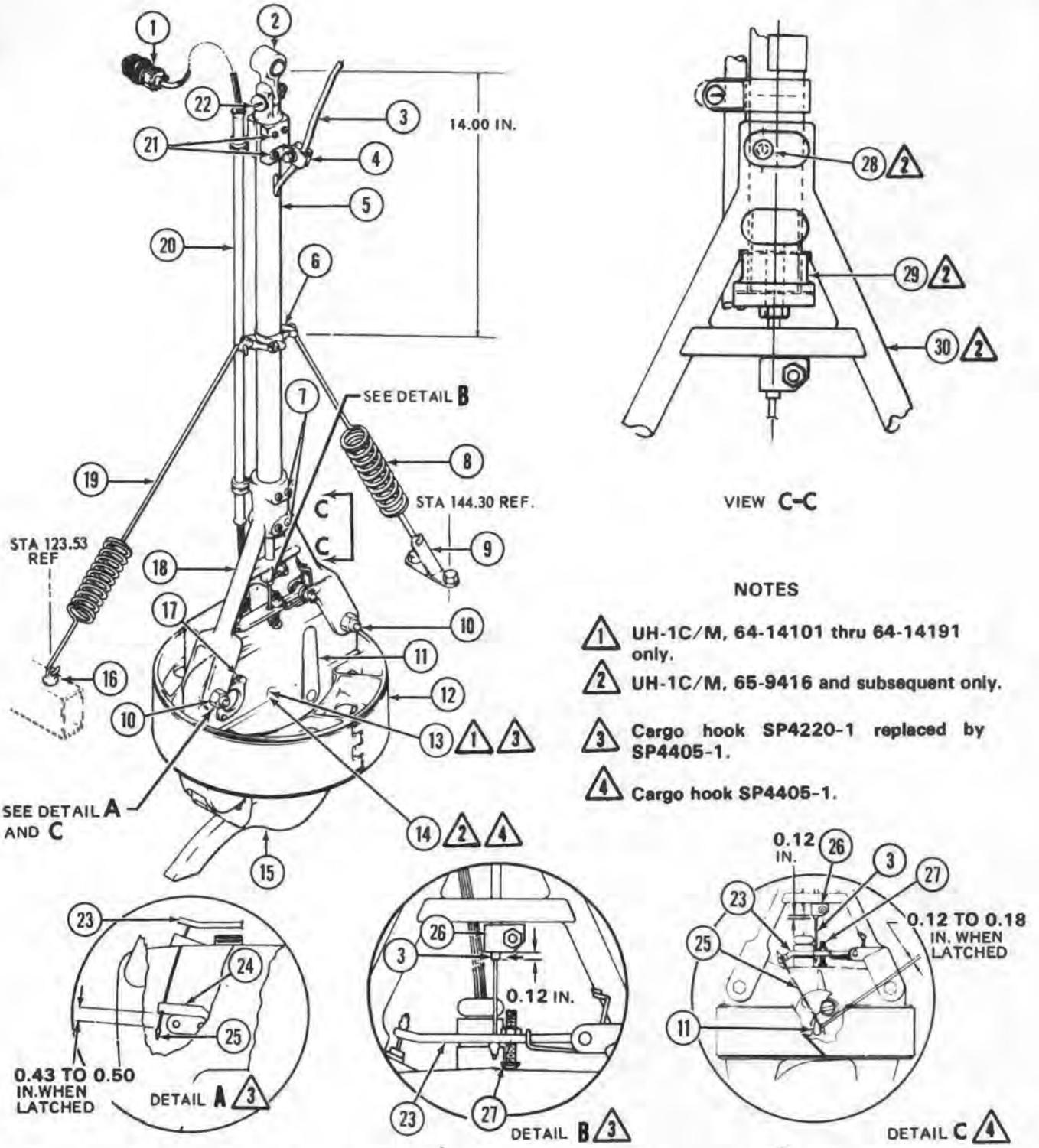


Figure 14-15. Cargo suspension system (Sheet 2 of 2)



NOTES

1. UH-1C/M, 64-14101 thru 64-14191 only.
2. UH-1C/M, 65-9416 and subsequent only.
3. Cargo hook SP4220-1 replaced by SP4405-1.
4. Cargo hook SP4405-1.

SUSPENSION ASSEMBLY 204-072-900-5 1 **CARGO HOOK SP4220-1** 3

SUSPENSION ASSEMBLY 204-072-024-1 2 **CARGO HOOK SP4405-1** 4

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Figure 14-16. Suspension assemblies (Sheet 1 of 2)

1. Electrical cable
2. Link
3. Control cable — external
4. Clamp
5. Shaft
6. Clamp
7. Screws
8. Restraint spring — aft
9. Fitting
10. Bolt
11. Ground release lever
12. Bumper
13. Cargo hook
14. Cargo hook
15. Load beam
16. Eyebolt
17. Window — inspection
18. Yoke
19. Restraint spring — forward
20. Conduit
21. Screws
22. Bolt
23. Lever — external
24. Lever — internal
25. Control cable — internal
26. Clamp
27. Bolt
28. Shear pin
29. Collar and thrust bearing
30. Yoke

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Figure 14-16. Suspension assemblies (Sheet 2 of 2)

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 14-2. Troubleshooting — Cargo Suspension Assembly

CONDITION TEST OR INSPECTION CORRECTIVE ACTION
1. Electrical cargo release inoperative.
STEP 1. Ensure that 28 Vdc is present at receptacle when CARGO HOOK circuit breaker is closed, CARGO RELEASE switch is in ARM position, and CARGO REL switch on cyclic stick grip is depressed.
If 28 Vdc is present, replace faulty cargo hook (paragraph 14-229 or 14-241).
STEP 2. Depress CARGO REL switch on pilot cyclic stick grip and check for 28 Vdc at receptacle.
If 28 Vdc is not present at receptacle with switch depressed, replace faulty switch (paragraph 9-5).

Table 14-2. Troubleshooting — Cargo Suspension Assembly (Cont)

CONDITION TEST OR INSPECTION CORRECTIVE ACTION
STEP 3. Depress CARGO REL switch on copilot cyclic stick grip and check for 28 Vdc at receptacle.
If 28 Vdc is not present at receptacle with switch depressed, replace faulty switch (paragraph 9-5).
STEP 4. Depress CARGO REL switch (pilot or copilot) and check for 28 Vdc at receptacle.
If 28 Vdc is not present, replace faulty circuit breaker (paragraph 9-5).
STEP 5. Check wiring and electrical continuity.
Repair or replace defective wiring (paragraph 9-5 and paragraph F-11).
2. Mechanical cargo release malfunctioning.
STEP 1. Apply 8 pound load and depress mechanical cargo release pedal and check that cargo hook load beam opens.
If load beam does not open, replace broken cable, damaged pulley, or secure cable connections (paragraphs 14-155 through 14-173).
STEP 2. Depress mechanical cargo release pedal and check that cargo hook load beam opens.
If load beam does not release, adjust cargo suspension system (paragraph 14-153).
3. Cargo suspension assembly power failure.
STEP 1. Ensure that CARGO HOOK circuit breaker does not open with CARGO RELEASE switch in ARM position and CARGO REL switch and cyclic stick grip depressed.
If circuit breaker opens, correct short in system, repair or replace defective wiring, or replace faulty circuit breaker (paragraphs 9-5 or 9-12 and paragraph F-11).
4. Cargo hook swivels on shaft (65-9416 and subsequent.)
STEP 1. Check shear pin in yoke for shearing.
Replace damaged shear pin (paragraph 14-211).

14-153. Adjustment — Cargo Suspension System.

NOTE

The following procedural steps are applicable to all cargo suspension assemblies unless otherwise noted.

a. Check pedal (3, figure 14-15) for security and shims (26, figure 4-17) for snug fit at supports.

b. Adjust bolt (27, figure 14-16, detail B or C) until external lever (23) is parallel to bolts (10). Close and latch load beam (15).

c. On helicopters 64-14101 through 64-14191 equipped with SP4220-1 cargo hook, check for **0.43 TO 0.50** inch clearance between internal lever (24, detail A) and upper edge of ball terminal on lower end of internal control cable (25). Adjust bolt (27) to obtain required clearance, secure with checknut.

d. On helicopters 65-9416 and subsequent equipped with SP4405-1 cargo hook, check for **0.12 TO 0.18** inch clearance between flat on ground release lever (11, detail C) and upper edge of ball terminal on internal control cable (25). Adjust bolt (27) to obtain required clearance; secure with checknut.

e. Check to ensure that external lever (23, detail B or C) does not bottom out against shield end of external control cable (3). Clearance between end of cable shield and clamp (26) not to exceed **0.12** inch; adjust clamp, as required.

f. Loosen external control cable (3) in clamp (4).

g. Loosen external control cable (35, figure 14-15) in clamp (34) by loosening screw (47). Check to ensure that cables are secure in connector (28).

h. Adjust release cables (9 and 11) at turnbuckle (10) to provide **20 TO 24** pounds cable tension. Safety turnbuckle (10) with lockwire (C127).

i. Adjust shield at upper end of external control cable (35) to provide approximately **1.0** inch clearance from cable ball terminal to clamp (34). Secure clamp with screw (47) and thin aluminum washer (46). Check that ball terminal is snug in connector (28).

j. Check that electrical cable (1, figure 14-16) and external control cable (3) allow unrestricted movement of assembly. Secure clamp (4).

k. Swing suspension assembly to travel limits, load beam (15) must not open. If beam opens with 8 pound load, repeat preceding steps i. and k. Ensure that indicator stays aligned with mark.

l. Press pedal (3, figure 14-15) against stop bolt (1) and check the following:

(1) Check that spring (49) and spacer (27) are not bottomed out in pulley bracket (23).

(2) Check that external control lever (23, figure 14-16, detail B or C) is up, but not stopped by shield on external control cable (3).

(3) Check that load beam (15) has opened with **8** pound load.

(4) Adjust stop bolt (1, figure 14-15), as required.

(5) Release pedal (3) and check that internal control cable (25, figure 14-16, details A or C) returns to locking (latched) position as shown. Check that load beam (15) is latched.

m. Perform operational check (paragraph 14-154).

14-154. Operational Check — Cargo Suspension System. a. Check to ensure that electrical cable (1, figure 14-16) and external control cable (3) have enough slack to allow full swing of suspension assembly. Cable must not allow load beam (15) to open during swing test.

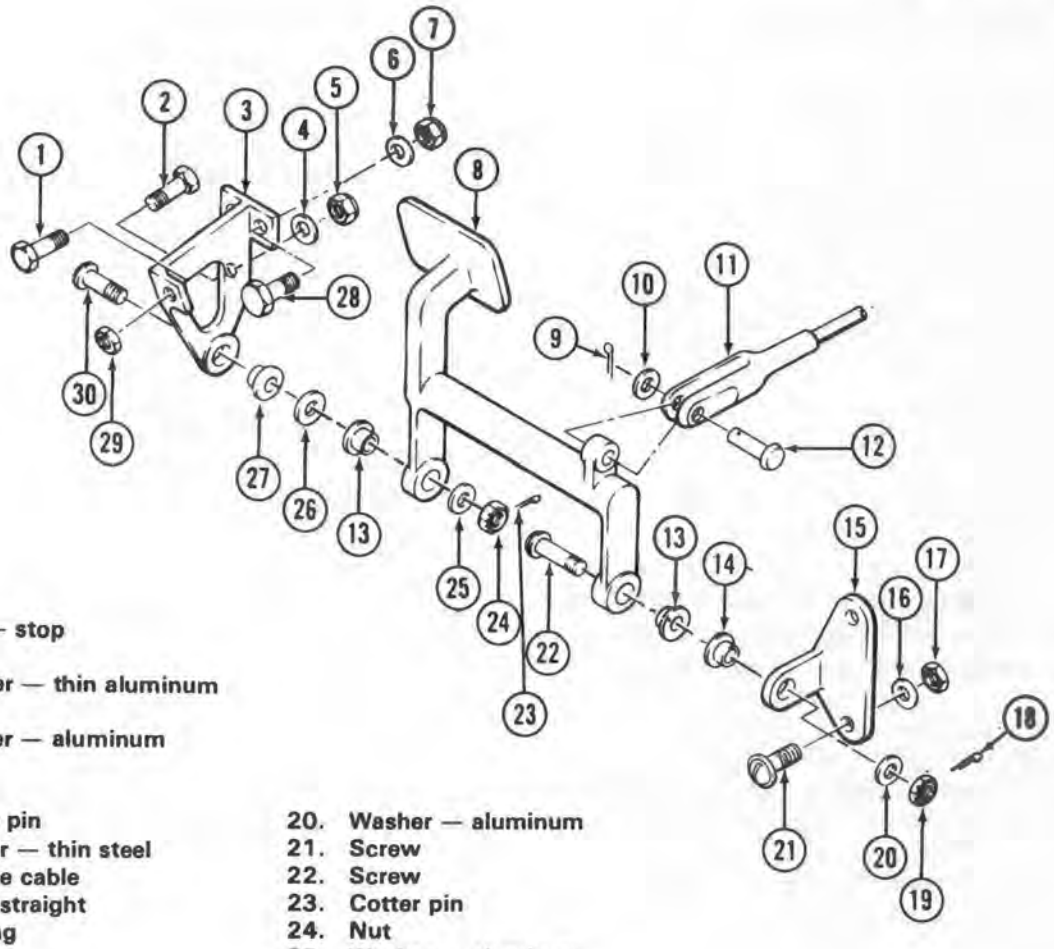
b. Check operation of mechanical release system as follows:

(1) Check to ensure that external lever (23, detail B or C) is parallel to plane of bolts (10).

(2) Attach a 20 pound test load to load beam (15).

(3) Press pedal (3, figure 14-15) against stop bolt (1) and check the following:

(a) Check that spring (49) and spacer (27) in pulley bracket (23) are not bottomed out internally.



1. Bolt
2. Bolt — stop
3. Stop
4. Washer — thin aluminum
5. Nut
6. Washer — aluminum
7. Nut
8. Pedal
9. Cotter pin
10. Washer — thin steel
11. Release cable
12. Pin — straight
13. Bushing
14. Bushing
15. Fitting
16. Washer — aluminum
17. Nut
18. Cotter pin
19. Nut
20. Washer — aluminum
21. Screw
22. Screw
23. Cotter pin
24. Nut
25. Washer — aluminum
26. Shim
27. Bushing
28. Bolt
29. Nut — stop
30. Screw

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Figure 14-17. Pedal assembly

(b) Check that external lever (23, figure 14-16, detail B or C) is up, but not in contact with sleeve on external control cable (3) just below clamp (26), and that load beam (15) released test load.

(c) Release pedal (3, figure 14-15) and check that external control cable (3, figure 14-16) and external lever (23, details B or C) return to locked position and that load beam (15) is latched. On SP4405, check indicator to ensure it realigns with its mark.

c. If system fails any of the preceding checks, adjust cargo suspension system (paragraph 14-153).

d. Check electrical operation of cargo hook, with minimum test load of **125** pounds suspended on load beam (15, figure 14-16). Check for release with switch in ARM and REL button on cyclic grip depressed. Check for retention with switch in OFF and REL button on cyclic grip depressed.

NOTE

Ensure that BAT SWITCH is positioned to ON, or external power source is connected. NON-ESSENTIAL BUS switch shall be set to MANUAL, and CARGO HOOK circuit brekar shall be closed.

14-155. PEDAL ASSEMBLY.

14-156. Description — Pedal Assembly. A foot pedal (8, figure 14-17) is provided for manual release of the cargo. The pedal is mounted on the floor at Station 23.00 and is connected to the cargo hook release mechanism by release cables.

14-157. Removal — Pedal Assembly. a. Disconnect release cable (11, figure 14-17) from pedal (8) by removing straight pin (12), washer (10) and cotter pin (9) at clevis.

NOTE

Release cable (11) tension is approximately 30 pounds.

b. Remove pedal (8) by removing screws (22 and 30), washers (20 and 25), nuts (19 and 24), shims (26), and cotter pins (18 and 23). Tag shims (26) for installation.

c. Remove stop (3) by removing bolt (2) with washers (4) and nut (5); remove two bolts (28) with washers (6) and nuts (7).

d. Remove fitting (15) by removing two screws (21), washers (16), and nuts (17).

14-158. Inspection — Pedal Assembly. a. Inspect pedal (8, figure 14-17) for cracks and worn or damaged bushings (13). Bushing wear or damage not to exceed **0.002** inch for one-fourth circumference.

b. Inspect stop (3) and fitting (15) for cracks and worn or damaged bushings (14 and 27). Bushing wear or damage not to exceed **0.002** inch for one-fourth circumference.

14-159. Repair or Replacement - Pedal Assembly. a. Replace stop (3, figure 14-17), pedal (8), and fitting (15) if cracked or other damage is evident that may impair operation.

b. Replace bushings (13, 14, and 27) if wear or damage exceeds **0.002** inch for one-fourth circumference. Set new bushings with primer coating (C167).

14-160. Installation — Pedal Assembly. a. Position stop (3, figure 14-17) to structure at STA 23.00 and install two bolts (28) with thin aluminum washers (6) and nuts (7) in upper holes. In lower hole of stop install bolt (2), aluminum washer (4) and nut (5). Torque nuts **50 TO 70** inch-pounds.

b. Position fitting (15) to structure and install two screws (21) with aluminum washers (16) and nuts (17). Torque nuts **50 TO 70** inch-pounds.

c. Position pedal (8) between stop (3) and fitting (15). At inboard end install screw (22), aluminum washer (20), nut (19), and cotter pin (18).

NOTE

Add shims (26) and torque nuts (19 and 24) to eliminate end play and allow free movement.

d. Position pedal (8) to stop (3) and add sufficient amount of shims (26) to provide a snug fit. Install screw (30), aluminum washer (25), nut (24), and cotter pin (23).

e. Install stop bolt (1) and stop nut (29) in stop (3).

f. Connect release cable (11) to pedal (8) with straight pin (12), thin steel washer (10), and cotter pin (9).

g. Adjust cargo suspension system (paragraph 14-153).

14-161. RELEASE CABLES AND PULLEYS.

14-162. Description — Release Cables and Pulleys. Cargo manual release system cables are fabricated from 3/32 inch diameter 7x7 CRES cable. Forward cable contains a clevis terminal and right-hand thread terminal; aft cable contain left-hand thread terminal and ball terminal.

14-163. Removal — Release Cables and Pulleys. a. Cut lockwire on turnbuckle (10, figure 14-15) and disconnect release cables (9 and 11).

b. Remove pulley (7) from pulley bracket (23) by removing attaching bolt (24) with washer (4), nut (5), cotter pin (6) and spring pin (8).

c. Disconnect aft end of release cable (9) from connector (28) by removing cotter pin (48) and lifting out ball terminal. Separate cable from spacer (27), guide (26) and spring (49). Pull cable from pulley bracket (23).

d. Disconnect clevis of forward release cable (11) from pedal assembly (3) by removing straight pin (20) with washer (21) and cotter pin (22).

e. At STA 35.80, STA 121.62 and STA 133.46 remove pulleys (16) from three brackets (18) by removing bolts (15) with washers (14), nuts (13), cotter pins (12), and spring pins (17).

14-164. Cleaning — Release Cables and Pulleys. a. Clean the complete length of release cables (9 and 11, figure 14-15) using a clean, heavy, lint free cloth held firmly around cable. The cloth will aid in the removal of foreign particles and in detection of broken wires. The broken wire ends will snag the cloth, preventing the break from being overlooked.

b. Clean bearings in pulleys (16 and 7) using a clean lint free cloth. Use caution not to force foreign particles into bearings.

14-165. Inspection — Release Cables and Pulleys. a. Inspect release cables (9 and 11, figure 14-15) for clean condition, broken wires, kinks, abrasion, bird caging, and interference anywhere along their routing.

b. Inspect pulleys (16 and 7) for chips, cracks, and for worn or damaged bearings. Shallow cable grooves in pulleys are permissible.

c. Inspect pulley brackets (18 and 23), attaching bolts (15 and 24), spring pins (8 and 17), and grommets located along routing of release cables (9 and 11) for damage.

14-166. Repair or Replacement — Release Cables and Pulleys. a. Replace release cables (9 and 11, figure 14-15) that are worn, frayed, or damaged.

b. Replace pulleys (7 and 16) that are cracked, damaged, heavily grooved, or contain rough or worn bearings.

c. Replace worn or damaged spring pins (8 and 17), bolts (15 and 24), and grommets.

14-167. Installation — Release Cables and Pulleys. a. Connect forward release cable (11, figure 14-15) to pedal assembly (3) with cable clevis on forward release cable (11), straight pin (20), thin steel washer (21) and cotter pin (22).

b. Route forward release cable (11) through pulley brackets (18) at STA 35.80, STA 121.62, grommet STA 123.00, and bracket (18) at STA 133.46. Install pulleys (16) in each bracket with bolts (15), aluminum washers (14), and nuts (13). Torque nuts **50 TO 70** inch-pounds and secure with cotter pins (12).

c. Insert ball terminal end of aft release cable (9) through pulley bracket (23), spring (49), guide (26), and spacer (27). Insert ball terminal into connector (28) and secure with cotter pin (48).

d. Position pulley (7) on release cable (9) and into pulley bracket (23). Install bolt (24), aluminum washer (4), and nut (5). Torque nut **50 TO 70** inch-pounds and secure with cotter pin (6).

e. Install new spring pins (8 and 17) in each pulley bracket (18 and 23). Pins must be installed on outboard side of release cables (9 and 11).

f. Connect release cables (9 and 11) together with turnbuckle (10) and tighten and lockwire (C127) turnbuckle (10).

g. Adjust cargo suspension system (paragraph 14-153).

14-168. PULLEY BRACKET ASSEMBLY.

14-169. Description — Pulley Bracket Assembly. The pulley bracket (23, figure 14-15) located at STA 134.20. Bracket provides spring tension and attachment for the manual pedal release system to the suspension assembly. Pulley bracket contains pulley (7), spring (49), guide (26), spacer (27), and connector (28).

14-170. Removal — Pulley Bracket Assembly. a. Cut lockwire at turnbuckle (10, figure 14-15) and fully relieve tension on release cables (9 and 11).

b. Detach external control cable (35) from structure by removing screw (47), washer (46), and clamp (34).

c. At connector (28) remove cotter pins (48) and ift out ball terminal of release cable (9) and external control cable (35).

d. Remove spacer (27), guide (26) and spring (49) from release cable (9) and pulley bracket (23).

e. Remove pulley (7) from pulley bracket (23) by removing bolt (24), washer (4), nut (5), and cotter pin (6).

f. Pull release cable (9) from pulley bracket (23) and remove spring pin (8).

g. Remove pulley bracket (23) from structure by removing two screws (25), washers (50), and nuts (51).

14-171. Inspection — Pulley Bracket Assembly. a. Inspect pulley bracket (23, figure 14-15) for cracks, elongated bolt holes, broken welds, or other damage that may impair movement of pulley (7), spring (49), or guide (26).

b. Inspect pulley (7) and release cable (9) in accordance with paragraph 14-165.

c. Inspect spring (49, figure 14-15) for a free length of **3.40** inches without distortion. Test spring by compressing to **1.40** inches, should require **35 TO 45** pound test load.

d. Inspect guide (26), spacer (27), connector (28), and clamp (34) for nicks, scratches, and cracks.

14-172. Repair or Replacement — Pulley Bracket Assembly (AVIM). a. Replace pulley bracket (23, figure 14-15) if cracked, damaged, or bolt holes are elongated.

b. Replace pulley (7) and release cable (9) if limits of paragraph 14-165 are exceeded.

c. Replace spring (49, figure 14-15) if distorted or fails load test (paragraph 14-170).

d. Polish out nicks and scratches on guide (26), spacer (27), connector (28), and clamp (34), using No. 400 grit abrasive cloth (C1).

(1) Touch up aluminum parts with chemical conversion materials (C42).

(2) Prime repaired surfaces with primer coating (C167).

14-173. Installation — Pulley Bracket Assembly. a. Postion pulley bracket (23, figure 14-15) to structure and secure with two screws (25), thin aluminum washers (50) and nuts (51). Torque nuts **20 TO 25** inch-pounds.

b. Insert ball terminal ends of release cable (9) into pulley bracket (23). Install spring (49), guide (26) and spacer (27) over cable and into the end of bracket (23).

c. Insert ball terminals of release cable (9) and external control cable (35) into connector (28) and secure with cotter pins (48).

d. Loosely attach external control cable (35) to structure with clamp (34), thin aluminum washer (46) and screw (47).

e. Position pulley (7) onto release cable (9) and insert into pulley bracket (23). Secure pulley with bolt (24), aluminum washer (4) and nut (5). Torque nut **50 TO 70** inch-pounds and secure with cotter pin (6).

f. Install new spring pin (8) in pulley bracket (23). Ensure pin is on outboard side of release cable (9).

g. Connect release cables (9 and 11) with turnbuckle (10); tighten and lockwire (C127) turnbuckle.

h. Adjust cargo suspension system (paragraph 14-153).

14-174. SUSPENSION FITTING.

14-175. Description — Suspension Fitting. The suspension fitting (43, figure 14-15) is bolted to the lower side of the pylon beam (32) below the transmission at STA 132.138 BL 0.00. The fitting provides attachment points for the suspension assembly and safety cable for seat support fitting.

14-176. Removal — Suspension Fitting. a. Remove suspension assembly (paragraph 14-187).

b. Disconnect safety cable attached to forward lug on suspension fitting (43, figure 14-15).

c. Remove suspension fitting (43) from pylon beam (32) below transmission by removing four vertically installed bolts (31), washers (30 and 38) and nuts (39), and eight horizontally mounted bolts (29) and washers (33).

14-177. Inspection — Suspension Fitting. Inspect suspension fitting (43, figure 14-15) for cracks and bushings (42) for wear or elongation. Bushing wear or damage not to exceed **0.002** inch for one-fourth circumference.

14-178. Repair or Replacement — Suspension Fitting (AVIM). a. Replace suspension fitting (43, figure 14-15) if cracked, heavily nicked, or gouged.

b. Replace bushings (42) that are worn or damaged as follows:

NOTE

Bushings (42) must be replaced in pairs.

(1) Press out bushings (42) using a plug slightly smaller than OD of installed bushings.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(2) Clean bores in fitting (43) with a clean cloth dampened with MEK (C142).

(3) Inspect bores in fitting (43) for damage after bushing removal. Damage exceeding **0.002** inch for one-fourth circumference shall require replacement of fitting.

(4) Coat OD of new bushings (42) and ID of fitting (43) with primer coating (C167). Press bushing in place until flush on both sides. Allow primer to cure.

(5) Line ream new bushing to an ID of **0.4995 TO 0.5005** inch. Surface finish to be **125** micro-inches.

(6) Fluorescent penetrant inspect fitting in accordance with TM 43-0103 after installation of new bushings (42).

14-179. Installation — Suspension Fitting. a. Position suspension fitting (43, figure 14-15) to lower surface of transmission pylon beam (32) with lug for safety cable forward.

(1) Install four bolts (31) vertically through beam (32) and fitting (43) with aluminum washers (30 and 38) and nuts (39). Use standard size washers under boltheads and thin washers under nuts. Torque nuts **20 TO 25** inch-pounds.

(2) Install four bolts (29) horizontally through each side of pylon beam (32) and fitting (43) with thin aluminum washers (33). Torque bolts **50 TO 70** inch-pounds.

b. Connect safety cable to forward lug on suspension fitting (43) with bolt, thin steel washers and nut. Torque nut **60 TO 85** inch-pounds.

c. Install suspension assembly (paragraph 14-192).

14-180. RESTRAINT SPRINGS AND FITTINGS.

14-181. Description — Restraint Springs and Fittings. Restraint springs (8 and 19, figure 14-16) are installed on suspension assemblies to increase cargo load stability and minimize load swinging.

14-182. Removal — Restraint Springs and Fittings. a. Disconnect restraint springs (8 and 19, figure 14-16) from clamp installation (6) at center of shaft (5), and from fitting (9) and two eyebolts (16).

b. Remove clamp installation (6) from shaft (5) by removing nuts, washers, and eyebolts.

c. Remove fitting (9) from structure panel by removing two bolts and washers, and eyebolts (16) by removing washers and nuts.

14-183. Inspection — Restraint Springs and Fittings. a. Inspect aft restraint spring (8, figure 14-16) for an overall dimension of **14.38** inches, measured from inside loop and hook. Test spring with a load of **42.75 TO 47.25** pounds, spring should extend **3.0** inches.

b. Inspect two forward restraint springs (19, figure 14-16) for an overall dimension of **14.38** inches, measured from inside loop and hook. Test spring with a load of **28.50 TO 31.50** pounds, spring should extend **3.0** inches.

c. Inspect clamp installation (6) for cracks and elongation of spring attachment holes.

d. Inspect fitting (9) for cracks and elongation of spring attachment hole.

e. Inspect two eyebolts (16, figure 14-16) in structural channel for elongation of spring attachment hole.

14-184. Installation — Restraint Springs and Fittings. a. Install clamp installation (6, figure 14-16) **14.00** inches below centerline of upper hole in link (2). Clamp installation consist of two clamp halves, two eyebolts, two thin steel washers, and two nuts. Torque nuts **20 TO 25** inch-pounds.

b. Loosely install two eyebolts (16) in structural channel with thin aluminum washers under nuts. Connect the two smaller (3.72 inches of coils) forward restraint springs (19) to forward eyebolt in clamp installation (6) and eyebolts in channel. Align channel eyebolts to spring centerline, torque nuts **50 TO 70** inch-pounds.

c. Position aft fitting (9) to structural panel with arm pointing up and forward. Install fitting with two bolts, thin aluminum washers, and nuts. Torque bolts **50 TO 70** inch-pounds.

d. Connect the large (4.38 inches of coils) aft restraint spring (8) to rear eyebolt in clamp installation (6) and to fitting (9).

e. Reposition clamp installation (6) on shaft (5) to center suspension assembly in structural opening. Torque nuts **20 TO 25** inch-pounds.

14-185. SUSPENSION ASSEMBLY.

14-186. Description — Suspension Assembly. Helicopters Serial No. 64-14101 through 64-14191 were equipped with Part No. 204-072-900-5 suspension assembly (figure 14-16). The suspension assembly consists of a link; a shaft with a yoke retained by screws and a Part No. SP4220-1 cargo hook that is free swinging, a load beam which always opens facing forward, and three restraint springs.

Helicopters Serial No. 65-9416 and subsequent were equipped with Part No. 204-072-024-1 suspension assembly (figure 14-16). The suspension assembly consists of a link; shaft with a yoke retained by a shear pin and Part No. SP4405-1 cargo hook that is free swinging, a load beam which always opens facing forward, and three restraint springs.

14-187. Removal — Suspension Assembly. a. Disconnect battery and electrical power.

b. Remove pylon access door in cabin.

c. Remove clamp (34, figure 14-15), screw (47), and washer (46) from external control cable (35) and structure.

d. Disconnect external control cable (35) from connector (28) by removing cotter pin (48) retaining ball terminal.

NOTE

If ball terminal cannot be removed, cut lockwire on turnbuckle (10) and loosen release cables (9 and 11) to remove ball terminal.

e. Disconnect electrical cable (1, figure 14-16) from receptacle on structure and remove three restraint springs (8 and 19).

f. Support suspension assembly (41, figure 14-15) and remove bolt (37) with washers (36), nut (45) and cotter pin (44) from suspension bracket (43). Remove suspension assembly from helicopter.

WARNING

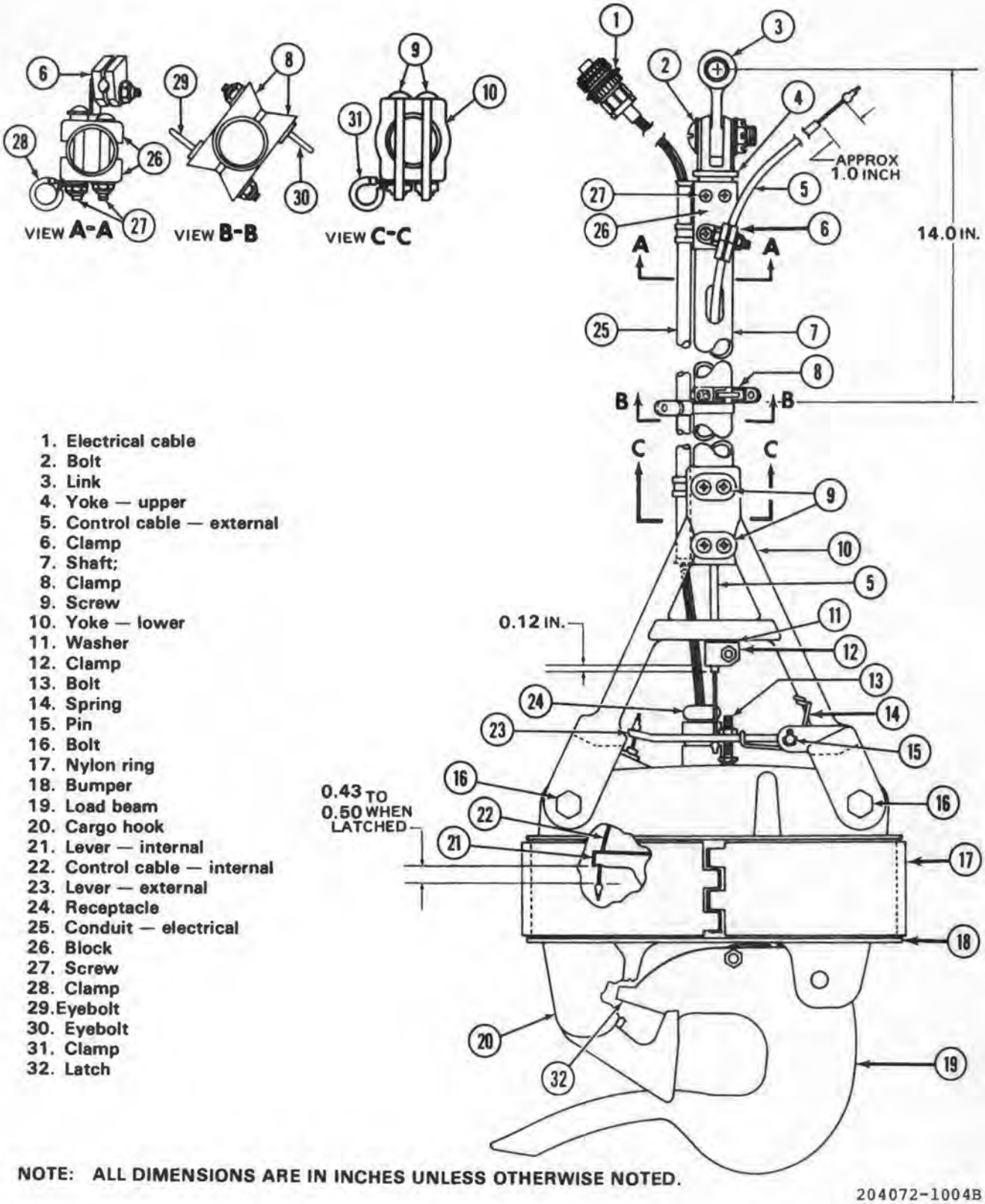
Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

14-188. Cleaning — Suspension Assembly. Clean suspension assembly with cloths dampened with solvent (C205). Do not spray clean, damage to electrical components may result.

14-189. Inspection — Suspension Assembly. a. Inspect electrical cable (1, figure 14-18 or 14-19), conduit and receptacles for deterioration, wear, and chafing, Check continuity.

b. Inspect bolt (2) and link (3) for wear or damage.

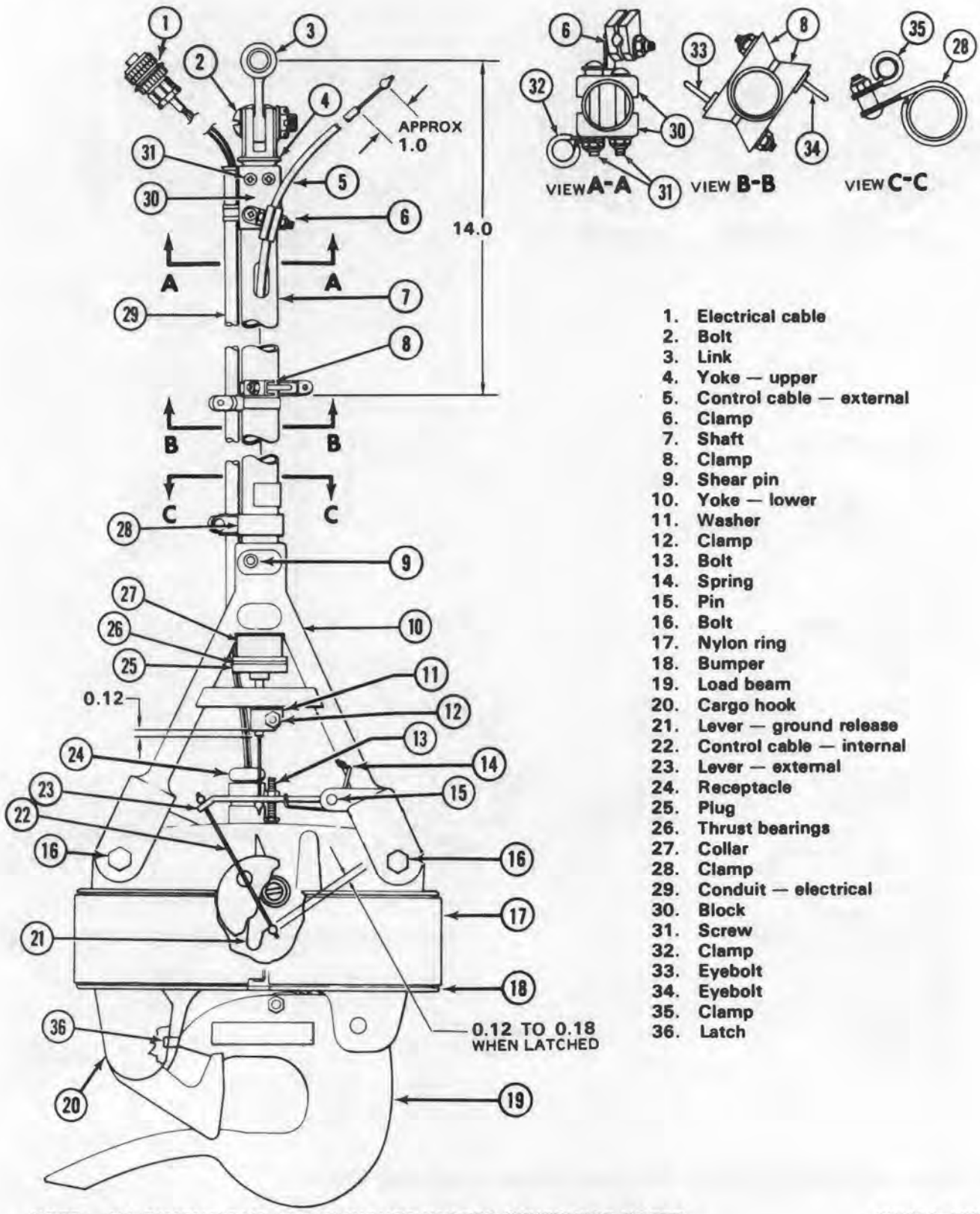
c. Inspect external and internal control cables (5 and 22) and shielding for wear or damage, ball terminals for condition.



1. Electrical cable
2. Bolt
3. Link
4. Yoke — upper
5. Control cable — external
6. Clamp
7. Shaft;
8. Clamp
9. Screw
10. Yoke — lower
11. Washer
12. Clamp
13. Bolt
14. Spring
15. Pin
16. Bolt
17. Nylon ring
18. Bumper
19. Load beam
20. Cargo hook
21. Lever — internal
22. Control cable — internal
23. Lever — external
24. Receptacle
25. Conduit — electrical
26. Block
27. Screw
28. Clamp
29. Eyebolt
30. Eyebolt
31. Clamp
32. Latch

NOTE: ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Figure 14-18. Suspension assembly — part number 204-070-900-5 (64-14101 through 64-14191)



1. Electrical cable
2. Bolt
3. Link
4. Yoke — upper
5. Control cable — external
6. Clamp
7. Shaft
8. Clamp
9. Shear pin
10. Yoke — lower
11. Washer
12. Clamp
13. Bolt
14. Spring
15. Pin
16. Bolt
17. Nylon ring
18. Bumper
19. Load beam
20. Cargo hook
21. Lever — ground release
22. Control cable — internal
23. Lever — external
24. Receptacle
25. Plug
26. Thrust bearings
27. Collar
28. Clamp
29. Conduit — electrical
30. Block
31. Screw
32. Clamp
33. Eyebolt
34. Eyebolt
35. Clamp
36. Latch

NOTE: ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

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Figure 14-19. Suspension assembly — part number 204-072-024-1 — (65-9416 and subsequent)

d. Inspect screws (9 and 27, figure 14-18), shaft (7), yokes (4 and 10), and bolts (16); or shaft (7, figure 14-19), shear pin (9), yokes (4 and 10), bolts (16), and screws (31) for damage and security.

e. Inspect cargo hook (20, figure 14-18) for wear or damage. Test operation (paragraphs 14-231 and 14-239).

f. Inspect cargo hook (20, figure 14-19) for wear or damage. Test operation (paragraph 14-243 and 14-250).

g. Inspect suspension assembly (figures 14-18 or 14-19) for correct installation and security of all components, hardware, cotter pins, lockwire, etc.

14-190. Repair or Replacement — Suspension Assembly. a. Replace electrical cable (1, figure 14-18 or 14-19), conduit, and receptacles if deteriorated or damaged.

b. Replace bolt (2) and link (3) if wear or damage is evident. Bushing wear not to exceed **0.002** inch for one-fourth circumference.

c. Replace external and internal control cables (5 and 22) if frayed. Replace shielding if damaged.

d. Replace shaft (7), yokes (4 and 10), and attaching hardware if cracks or damage are evident.

e. Replace shear pin (9, figure 14-19) if sheared or damaged.

f. Replace cargo hook (20) if damaged or fails operational test.

14-191. Lubrication — Suspension Assembly. When suspension assembly is in daily use, apply a small amount of grease (C111) to the following areas:

a. Area of bolt (2, figure 14-18 or 14-19) and bushings in link (3).

b. Area where latch (32, figure 14-18 or 36, figure 14-19) in cargo hook (20) contacts load beam (19).

14-192. Installation — Suspension Assembly. a. Disconnect battery and electrical power.

b. Position suspension assembly (figure 14-16) on helicopter with open side of load beam (15) forward.

c. Insert link (2) of suspension assembly (41, figure 14-15) into fitting (43) and install bolt (37) with CRES washers (36) and nut (45). Torque nut **20 TO 34** foot-pounds and secure with cotter pin (44).

NOTE

Link (2, figure 14-16) must move freely in suspension fitting (43, figure 14-15).

d. Connect large (4.38 inches of coils) restraint spring (8, figure 4-16) to aft eyebolt in center clamp installation (6) and to fitting (9) on lower aft side of structure (STA 144.30).

e. Connect two smaller (3.72 inches of coils) restraint springs (19) to single eyebolt on forward side of clamp installation (6) and two eyebolts (16) on lower corners of structure (STA 123.53).

f. Reposition clamp installation (6) to center suspension assembly in structural opening. Torque nuts **20 TO 25** inch-pounds.

g. Connect electrical cable (1) to receptacle located on lower right side of lift beam.

h. Route free end of external control cable (35, figure 14-15) aft and to the right of suspension fitting (43). Engage ball terminal of cable in connector (28) and secure with cotter pin (48).

i. Loosely attach external control cable (35) to structure with clamp (34), thin aluminum washer (46) and screw (47).

j. Adjust cargo suspension system (paragraph 14-153).

14-193. EXTERNAL AND INTERNAL CONTROL CABLES.

14-194. Description — External and Internal Control Cables. Control cables are fabricated from 1/16 inch 7x7 stainless steel cable with ball terminals attached to each end. External control cable is enclosed in flexible stainless steel wire type shielding.

14-195. Removal — External and Internal Control Cables. a. Remove suspension assembly (paragraph 14-187).

b. Disconnect external and internal control cables (5 and 22, figure 14-18 or 14-19) from external lever (23) by removing cotter pins retaining ball terminals.

c. Helicopters Serial No. 64-14101 through 64-14191. Open inspection window on side of cargo hook (20, figure 14-18) and disconnect lower end of internal control cable (22) from internal lever (21). Lift out cable and guide plug.

d. Helicopters Serial No. 65-9416 and subsequent. Disconnect lower end internal control cable (22, figure 14-19) from ground release lever (21) by removing retaining screw and lockwasher.

e. Remove clamp (12) and steel washer (11) from lower end of external control cable (5) at lower yoke (10) cross-member.

NOTE

To assist in reinstallation of external control cable (5) attach a 4 foot length of lockwire (C127) to lower ball terminal of cable before removal.

f. Disconnect upper end of external control cable (5) from clamp (6). Carefully pull cable and shielding from suspension assembly.

14-196. Inspection — External and Internal Control Cables. a. Inspect external and internal control cables (5 and 22, figure 14-18 or 14-19) for fraying, wear, abrasion, and damaged ball terminals.

b. Inspect flexible stainless steel shielding on external control cable (5) for damage.

14-197. Repair or Replacement — External and Internal Control Cables (AVIM). Replace external and internal control cables (5 and 22, figure 14-18 or 14-19) and shielding if fraying, noticeable wear, abrasion, or damage is evident.

14-198. Installation — External and Internal Control Cables. a. Attach one ball terminal of external control cable (5, figure 14-18 or 14-19) to lockwire (used during removal) and pull cable and shielding up through cross-member of lower yoke (10) and out opening in upper end of shaft (7).

b. With shielding of external control cable (5) through cross-member of yoke (10), install steel washer (11) and clamp (12) over cable shielding. Position shielding **0.12** inch below lower edge surface of clamp. Tighten clamp bolt, washer, and nut.

c. Pull upward on shielding of external control cable (5) and secure in clamp (6) with bolt, washer, and nut.

d. Connect lower ball terminal of external control cable (5) to external lever (23) and secure with cotter pin.

e. Helicopters Serial No. 64-14101 through 64-14191. Insert internal control cable (22, figure 14-18) with guide plug down through opening in cargo hook (20) to internal lever (21). Attach lower end of cable to lever and upper end to external lever (23) with cotter pins.

f. Helicopters Serial No. 65-9416 and subsequent. Attach one end of internal control cable (22, figure 14-19) to lower end of ground release lever (21) with screw and lockwasher. Attach upper end of cable to external lever (23) and secure with cotter pin.

g. Install suspension assembly (paragraph 14-192).

14-199. EXTERNAL LEVER AND ADJUSTMENT BOLT.

14-200. Description — External Lever and Adjustment Bolt. External lever is fabricated from a steel investment casting. Lever provides attachment points for the external and internal control cables and for adjustment bolt and jamnut.

14-201. Removal — External Lever and Adjustment Bolt. a. Remove suspension assembly (paragraph 14-187).

b. Disconnect external and internal control cables (5 and 22, figure 14-18 or 14-19) from external lever (23) by removing cotter pins retaining ball terminals.

c. Remove spring (14) and external lever (23) from lower yoke (10) by removing pin (15) with spacer and cotter pin.

14-202. Inspection — External Lever and Adjustment Bolt. a. Inspect spring (14, figures 14-18 or 14-19), pin (15), and spacer, and external lever (23) for distortion, thread damage, or elongation of hole for pin and spacer.

b. Inspect bolt (13) and jamnut for thread damage.

14-203. Repair or Replacement — External Lever and Adjustment Bolt. Replace spring (14, figures 14-18 or 19), pin (15), spacer, and external lever (23) for thead damage, distortion, or elongation of pin hole.

14-204. Installation — External Lever and Adjustment Bolt. a. Thread adjustment bolt (13, figures 14-18 or 14-19) and jamnut into external lever (23).

b. Helicopters Serial No. 64-14101 through 64-14191. Position external lever (23, figure 14-18) with bent end up and spring (14) in lower yoke (10). Install pin (15) with spacer and secure with cotter pin.

c. Helicopters Serial No. 65-9416 and subsequent. Position external lever (23, figure 14-19) with bent end down and spring (14) in lower yoke (10). Install pin (15) with spacer and secure with cotter pin.

d. Connect external and internal control cables (5 and 22) to external lever (23) and secure ball terminals with cotter pins.

e. Close and latch load beam (19).

f. Helicopters Serial No. 64-14101 through 64-14191. Adjust bolt (13, figure 14-18) to provide **0.43 TO 0.50** inch clearance between lower edge of internal lever (21) and upper edge of ball terminal on lower end of interval control cable (22); tighten jamnut. External lever (23) should be approximately parallel to bolts (16).

g. Helicopters Serial No. 65-9416 and subsequent. Adjust bolt (13, figure 14-19) to provide **0.12 TO 0.18** inch clearance between flat on ground release lever (21) and upper edge of ball terminal on lower end of internal control cable (22); tighten jamnut. External lever (23) should be approximately parallel to bolts (16).

h. Install suspension assembly (paragraph 14-192).

14-205. SHAFT AND LOWER YOKE (HELICOPTERS SERIAL NO. 64-14101 THROUGH 64-14191).

14-206. Description — Shaft and Lower Yoke. Shaft is fabricated from 4130 alloy steel tubing 1.0x0.065x20.6 inches. Lower yoke is fabricated from a steel forging, and together they provide an extension between load beam suspension support bracket and cargo hook.

14-207. Removal — Shaft and Lower Yoke. a. Remove suspension assembly (paragraph 14-187).

b. Remove cargo hook (20, figure 14-18), (paragraph 14-232).

c. Remove upper yoke (4) (paragraph 14-225).

d. Remove clamp (8) from shaft (7) by removing eyebolts (29 and 30, view B-B) with washers and nuts.

e. Remove four screws (9) with clamp (31, view C-C) from shaft (7) and lower yoke (10). Separate electrical conduit (25) from ports.

f. Remove clamp (12) with washer (11) from lower end of external control cable (5). Pull control cable from shaft (7).

g. Using a plastic mallet, tap yoke (10) from end of shaft (7).

h. If lower yoke (10) is to be replaced, remove external lever (23) and spring (14) by removing pin (15) with spacer and cotter pin.

14-208. Inspection — Shaft and Lower Yoke. a. Inspect shaft (7, figure 14-18) and lower yoke (10) for damage and elongation of holes for screws (9) and bolts (16).

b. Inspect link (3) and upper yoke (4), (paragraphs 14-220 and 14-226).

c. Inspect cargo hook (20, figure 14-18), (paragraph 14-231).

14-209. Repair or Replacement — Shaft and Lower Yoke (AVIM). a. Replace shaft (7, figure 14-18) and lower yoke (10) if damaged, or holes for screws (9) or bolts (16) are elongated.

b. Replace damaged or worn hardware.

14-210. Installation — Shaft and Lower Yoke. a. Insert shaft (7, figure 14-18) into lower yoke (10) and

align screw holes. Install four screws (9), clamp (31, view C-C) and electrical conduit (25) with thin steel washers and nuts. Torque nuts **20 TO 25** inch-pounds.

b. Install link (3) and upper yoke (4) in shaft (7), (paragraphs 14-222 and 14-228).

c. Install clamp (8, figure 14-18) with eyebolts (29 and 30, view B-B), thin steel washers, and nuts. Position clamp installation 14.0 inches below centerline of link (3), and eyebolt with oversize hole pointing aft. Torque nuts **20 TO 25** inch-pounds.

d. Insert external control cable (5) down through opening in top of shaft (7) and through opening in cross-member of lower yoke (10).

e. Insert a steel washer (11) and clamp (12) on lower end of control cable (5). Position cable shielding **0.12** inch below lower edge of clamp. Tighten clamp, bolt, washer, and nut. Pull upward on cable shielding and secure in clamp (6) with bolt, washer, and nut.

f. Position external lever (23) in lower yoke (10) with bent end up, spring (14), pin (15) with spacer and secure with cotter pin.

g. Install cargo hook (20) to lower yoke (10), (paragraph 14-240).

h. Connect external and internal control cables (5 and 22, figure 14-18) to external lever (23) and secure ball terminals with cotter pins.

i. Install suspension assembly (paragraph 14-192).

14-211. SHAFT AND LOWER YOKE (HELICOPTERS SERIAL NO. 65-9416 AND SUBSEQUENT).

14-212. Description — Shaft and Lower Yoke. Shaft is fabricated from 4130 alloy steel tubing 1.0 x 0.065 x 21.33 inches. Lower yoke is fabricated from a steel forging, and together they provide an extension between load beam suspension support bracket and cargo hook.

14-213. Removal — Shaft and Lower Yoke. a. Remove suspension assembly (paragraph 14-187).

b. Remove cargo hook (20, figure 14-19), (paragraph 14-244).

c. Remove upper yoke (4, figure 14-19), (paragraph 14-225).

d. Remove clamp (8, figure 14-19) from shaft (7) by removing eyebolts (33 and 34, view B-B) with washers and nuts.

e. Remove clamp (28) and clamp (35, view C-C) from shaft (7) by removing screw, spacer, washer, and nut. Separate electrical conduit (29) from shaft.

f. Remove clamp (12) with washer (11) from lower end of external control cable (5). Pull cable from shaft (7).

g. Break adhesive bond on plug (25) and remove from lower end of shaft (7) with two thrust bearings (26) and collar (27).

h. Remove cotter pin from shear pin (9). Remove pin and separate shaft (7) from lower yoke (10).

i. If yoke (10) is to be replaced, remove external lever (23) and spring (14) by removing pin (15) with spacer and cotter pin.

14-214. Inspection — Shaft and Lower Yoke. a. Inspect shaft (7, figure 14-19) and lower yoke (10) for damage and elongation of holes for shear pin (9) and bolts (16).

b. Inspect link (3) and upper yoke (4), (paragraphs 14-220 and 14-226).

c. Inspect cargo hook (20, figure 14-19), (paragraph 14-243).

d. Inspect shear pin (9, figure 14-19), collar (27), thrust bearings (26), and plug (25) for damage.

14-215. Repair or Replacement — Shaft and Lower Yoke (AVIM). a. Replace shaft (7, figure 14-19) and lower yoke (10) if damaged, or holes for shear pin (9) or bolts (16) are elongated.

b. Replace shear pin (9), collar (27), thrust bearings (26), and plug (25) if damaged.

c. Replace shaft (7) and plug (25) if thread damage is evident.

d. Replace damaged or worn hardware.

14-216. Installation — Shaft and Lower Yoke. a. Insert shaft (7, figure 14-19) into lower yoke (10). Install shear pin (9) and secure with cotter pin.

b. Place collar (27) and two thrust bearings (26) on end of shaft (7) at yoke (10). Install plug (25) as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Clean threads in end of shaft (7) and on plug (25) with a clean cloth dampened with MEK (C142).

(2) Mix adhesive (C14) per manufacturer instructions, or **100** parts (A) to **33** parts (B). Pot life **40** minutes at **75** degrees F (**24** degrees C).

(3) Apply mixed adhesive to threads in end of shaft (7) and on plug (25). Thread plug onto shaft until secure.

(4) Cure at **65 TO 85** degrees F (**18 TO 29** degrees C) for **24** hours, or for **55 TO 65** minutes at **175 TO 195** degrees F (**79 TO 91** degrees C).

c. Install link (3) and upper yoke (4) in shaft (7), (paragraphs 14-222 and 14-228).

d. Install clamp (8, figure 14-19) with eyebolts (33 and 34, view B-B), thin steel washers, and nuts. Position clamp installation 14.0 inches below centerline of link (3), and eyebolt with oversize hole pointing aft. Torque nuts **20 TO 25** inch-pounds.

e. Insert external control cable (5) down through opening in top of shaft (7), through plug (25) and cross-members of lower yoke (10).

f. Insert a steel washer (11) and clamp (12) on lower end of control cable (5). Position shielding **0.12** inch below lower edge of clamp. Tighten clamp bolt, washer, and nut. Pull upward on cable shielding and secure in clamp (6) with bolt, washer, and nut.

g. Postion external lever (23) in lower yoke (10) with bent end down, spring (14), pin (15), and spacer. Secure with cotter pin.

h. Install cargo hook (20) to lower yoke (10), (paragraph 14-251).

i. Connect external and internal control cables (5 and 22, figure 14-19) to external lever (23) and secure ball terminals with cotter pins.

j. Install suspension assembly (paragraph 14-192).

14-217. LINK ASSEMBLY.

14-218. Description — Link Assembly. Link assembly is fabricated from a steel forging incorporating two bushings to allow for movement of suspension assembly.

14-219. Removal — Link Assembly. a. Remove suspension assembly (paragraph 14-187).

b. Remove bolt (2, figures 14-18 or 14-19) with washers, nut, cotter pin, and lift out link (3).

14-220. Inspection — Link Assembly. a. Inspect link assembly (3, figure 14-18 or 14-19) for damage, bushings for wear and pitting. Bushing wear not to exceed **0.002** inch for one-fourth circumference.

b. Inspect bolt (2) for wear or damage.

14-221. Repair or Replacement — Link Assembly. a. Replace link (3, figure 14-18 or 14-19) if damaged.

b. Replace bushings in link (3) if worn as follows:

NOTE

Bushings must be replaced in pairs.

(1) Press out damaged bushings and inspect bores for damage. Damage not to exceed **0.002** inch for one-fourth circumference.

(2) Apply primer coating (C167) to OD of new bushings and ID of link (3).

(3) Press new bushings into link (3) until flush both sides.

(4) Line ream new bushings concentric to bore and to **0.4995 TO 0.5005** inch. Surface finish to be **125** micro-inches.

c. Replace bolt (2) if worn or damaged.

14-222. Installation — Link Assembly. a. Apply a coating grease (C111) to bushings in link (3, figure 14-18 or 14-19) and shank of bolt (2).

b. Position link (3) in upper yoke (4) and install bolt (2) with CRES washers and nut. Torque nut **24 TO 34** foot-pounds and secure with cotter pin.

NOTE

Link (3) must move freely in upper yoke (4).

c. Install suspension assembly (paragraph 14-192).

14-223. UPPER YOKE.

14-224. Description — Upper Yoke. Upper yoke is fabricated from a steel forging incorporating bushings to allow for movement of suspension assembly.

14-225. Removal — Upper Yoke. a. Remove suspension assembly (paragraph 14-187).

b. Remove link (3, figure 14-18 or 14-19) from upper yoke (4), (paragraph 14-219).

c. Remove four screws (27, figure 14-18) or (31, figure 14-19), clamp (6), clamp (28, figure 14-18, view A-A) or (32, figure 14-19, view A-A), and blocks (26, figure 14-18) or (30, figure 14-19).

d. Using a plastic mallet tap upper yoke (4) from shaft (7).

14-226. Inspection — Upper Yoke. a. Inspect upper yoke (4, figure 14-18 or 14-19) for damage and bushings for wear and pitting. Bushing wear not to exceed **0.002** inch for one-fourth circumference.

b. Inspect bolt (2) and screws (27, figure 14-18) or (31, figure 14-19) for wear or damage.

14-227. Repair or Replacement — Upper Yoke. a. Replace upper yoke (4, figure 14-18 or 14-19) if damaged.

b. Replace bushings in upper yoke (4) if worn or damaged as follows:

NOTE

Bushings must be replaced in pairs.

(1) Press out bushings and inspect bores for damage. Damage not to exceed **0.002** inch for one-fourth circumference.

(2) Apply primer coating (C167) to OD of new bushings and ID of upper yoke (4).

(3) Press new bushings into upper yoke (4) until flush on each side.

(4) Line ream new bushings concentric to bore and to **0.4995 TO 0.5005** inch. Surface finish to be **125** micro inches.

c. Replace bolt (2) and screws (27, figure 14-18) or (31, figure 14-19) if worn or damaged.

14-228. Installation — Upper Yoke. a. Insert upper yoke (4, figure 14-18 or 14-19) into shaft (7) and align screw holes.

b. Install four screws (27, figure 14-18) or (31, figure 14-19) with blocks (26, figure 14-18, view A-A) or (30, figure 14-19, view A-A), clamp (6), and clamp (28, figure 14-18) or (32, figure 14-19) with thin steel washers and nuts. Torque nuts **20 TO 25** inch-pounds.

c. Install link (3) in upper yoke (4), (paragraph 14-222).

d. Install suspension assembly (paragraph 14-192).

14-229. CARGO HOOK (PART NO. SP4220-1) HELICOPTERS SERIAL NO. 64-14101 THROUGH 64-14191).

14-230. Description — Cargo Hook (Part No. SP4220-1 and SP4405-1). The cargo hook has an operating capacity of 4500 pounds for external loads, which may be released by the pilot electrically or under emergency conditions (loss of electrical power) by the mechanical release system. For ground operation, the cargo hook load beam may be opened by moving the ground release lever in the direction indicated. The load beam is connected to a self-closing spring which when the load is released the beam will return to the closed position. When this occurs and safety switch (9) adjustments are correct, a repetitive or machine-gunning action of the latch mechanism may be heard until the switch is released and beam closes.

The machine-gunning is caused by the safety switch momentarily breaking the solenoid circuit. The function of the safety switch is to prevent the solenoid from over heating. The hook (figure 14-22) is properly adjusted if after the above test , indicator (56) aligns with its mark on cover (33). This indicates that link (50) is overcenter and against its stop. If this condition does not exist, it is possible to have an inadvertent release. SP4220 hook is similar except that it does not have a true indication because of the relative motion of the ground release lever to the toggle shaft.

Premaintenance requirements for cargo hook (Part No. SP4220-1 and SP4405-1)

Conditions	Requirements
Model	All
Part No. or Serial No.	All
Special Tools	None
Test Equipment	10 lb test load
Support Equipment	None
Minimum Personnel Required	One
MOS	
Consumable Materials	(C49), (C111), (C127) (C136), (C188), (C205)
Special Environmental Conditions	Dust Free

14-231. Inspection — Cargo Hook (Installed) (Part No. SP4220-1). a. Inspect cargo hook (figure 14-20) for cleanliness, damage, and security of attachment to suspension assembly.

b. Inspect automatic pickup latch (12), load beam (18), and lever (49) for damage that may interfere with operation.

c. Check electrical connector (29) for damage.

d. Inspect bumper (57, view A) and nylon ring (59) for security of attachment and damage.

e. Perform cargo suspension system operational check (paragraph 14-154).

14-232. Removal — Cargo Hook (Part No. SP4220-1). a. Remove suspension assembly (paragraph 14-187).

b. Disconnect electrical receptacle (24, figure 14-18) from cargo hook (20).

c. Disconnect external and internal control cables (5 and 22) from external lever (23) by removing cotter pins retaining ball terminals.

d. Remove cargo hook (20) from lower yoke (10) by removing two bolts (16) with washers, nuts, and cotter pins.

e. Remove bumper (57, figure 14-20, view A) and nylon ring (59) by removing bolts (2 and 21) with washers (33 and 40) and nuts (34 and 39). Separate nylon ring from bumper by removing cotter pin (58) at mating ends. Reinstall bolts, washers, and nuts in cargo hook.

14-233. Disassembly - Cargo Hook (Part No. SP4220-1). a. Close and latch load beam (18, figure 14-20). Remove solenoid cover (41). Locate load beam return spring (26) inside opening in solenoid cover (41) and disconnect from post and case (24) and rollpin (27) in trunnion and assembly (42); remove spring.

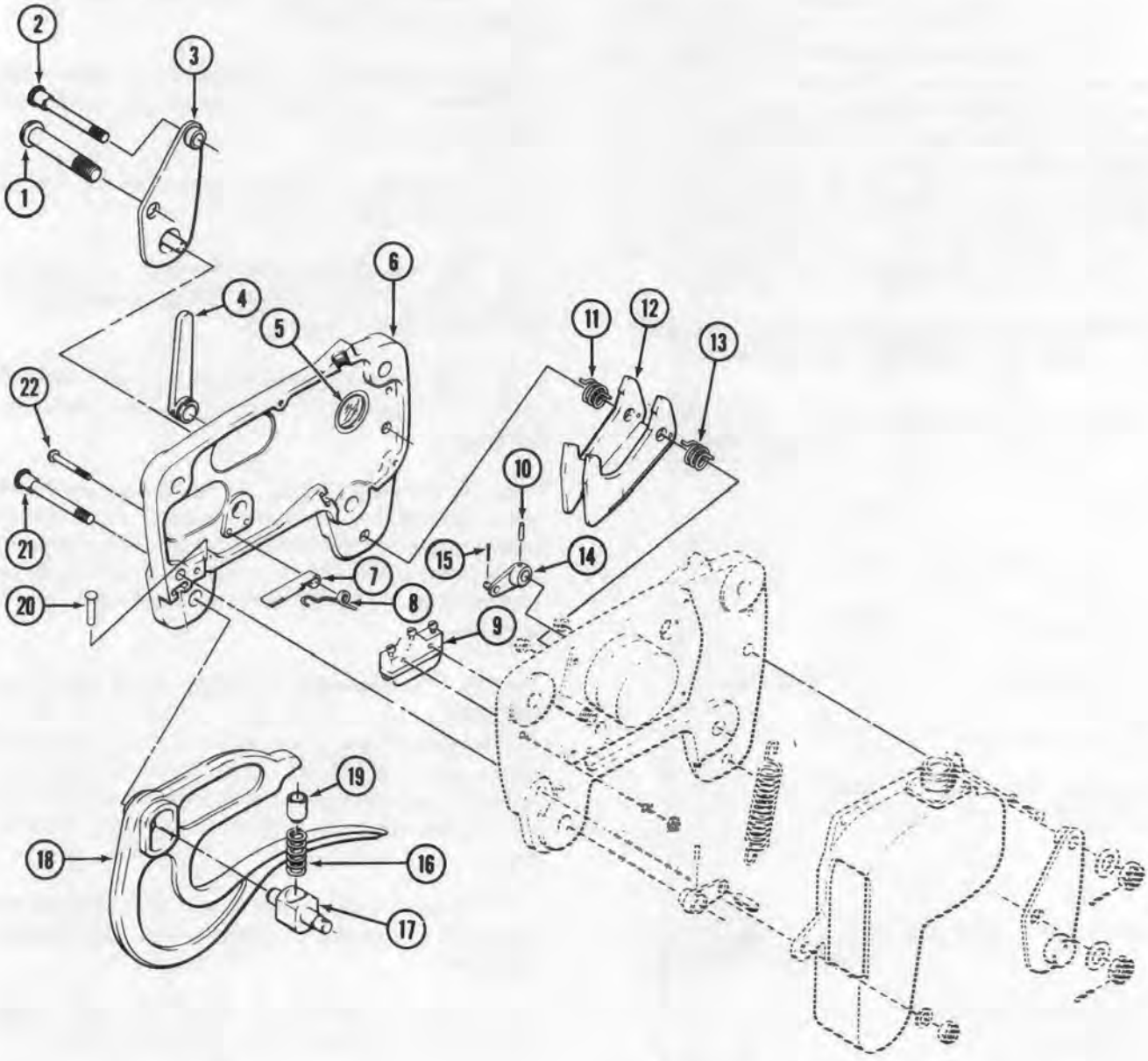
b. Remove bolts (1 and 2) with nuts (34 and 36), washers (33 and 35), and cotter pins (37 and 38) from cargo hook.

c. Separate pivot plates (3 and 32), pivot springs (11 and 13), and automatic pickup latch (12).

d. Remove one bolt (21) with washer (40), and nut (39), and two bolts (22) with washers (43) and nuts (28).

WARNING

Exercise extreme caution when removing cover (6) and load beam (18) from case (24). Plunger (19) is under tension from trunnion spring (16) in trunnion (17).



1. Bolt
2. Bolt
3. Pivot plate
4. Lever - ground release
5. Window - inspection
6. Cover
7. Actuator
8. Spring - actuator
9. Switch - automatic touchdown
10. Pin
11. Spring - pivot
12. Latch - automatic pickup
13. Spring pivot
14. Arm - solenoid
15. Cotter pin
16. Spring - trunnion
17. Trunnion
18. Load beam
19. Plunger
20. Pin
21. Bolt
22. Bolt

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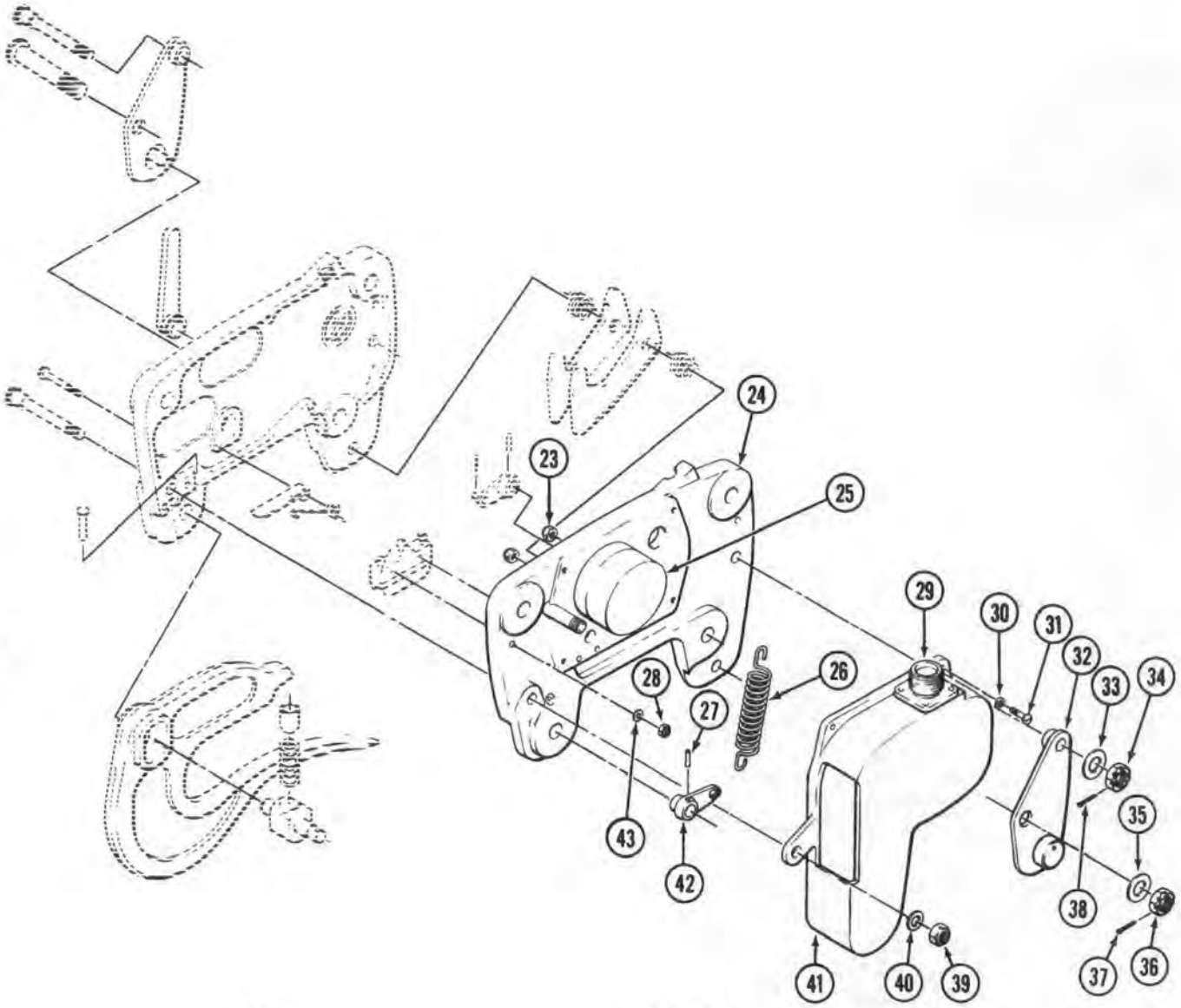
Figure 14-20. Cargo hook — part number SP4220-1 (Sheet 1 of 3)



23. Nut
24. Case
25. Solenoid
26. Spring - load beam return
27. Pin
28. Nut
29. Connector
30. Washer
31. Screw
32. Pivot plate
33. Washer
34. Nut
35. Washer
36. Nut
37. Cotter pin
38. Cotter pin
39. Nut
40. Washer
41. Cover - solenoid
42. Arm - trunnion assembly
43. Washer

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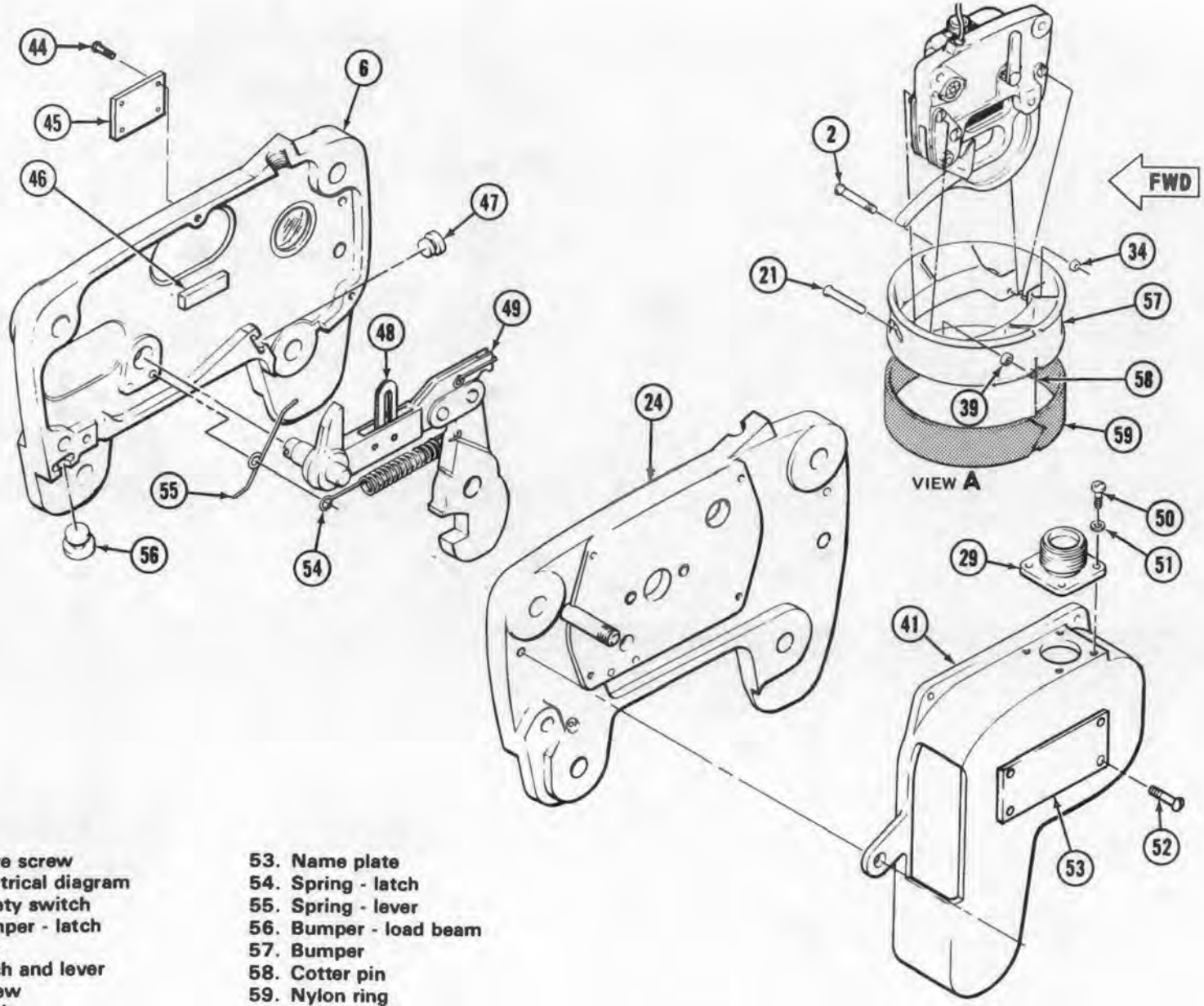
Figure 14-20. Cargo hook — part number SP4220-1 (Sheet 2 of 3)



44. Drive screw
45. Electrical diagram
46. Safety switch
47. Bumper - latch
48. Link
49. Latch and lever
50. Screw
51. Washer
52. Drive screw
53. Name plate
54. Spring - latch
55. Spring - lever
56. Bumper - load beam
57. Bumper
58. Cotter pin
59. Nylon ring

Figure 14-20. Cargo hook — part number SP4220-1 (Sheet 3 of 3)

e. Carefully remove cover (6) from case (24), maintaining load beam (18) in position on trunnion (17).

NOTE

When separating cover (6) from case (24), latch and load beam bumpers (47 and 56) will be loose and free to fall out; also ground release lever (4) will be released.

f. Carefully slide load beam (18) from trunnion (17) and remove plunger (19) and trunnion spring (16).

g. Disconnect two electrical leads to automatic touchdown switch (9) and slide from post on case (24).

h. Remove actuator (7), actuator spring (8), pin (20), and ground release lever (4).

i. Remove cotter pin (15) from pin in solenoid arm (14) to free link (48). Remove lever spring (55), latch and lever (49), and latch spring (54) from case (24).

j. Remove pin (10) from solenoid arm (14) and remove from shaft of solenoid (25).

k. Cut lockwire and remove three screws (31) and washers (30) from solenoid cover (41) and case (24). Remove two nuts (23) from inside case (24) and remove solenoid (25) with cover (41).

l. Disconnect electrical lead to connector (29) and remove solenoid (25) from solenoid cover (41).

m. If damage is evident, cut lockwire and remove four screws (50), washers (51), and connector (29) from solenoid cover (41).

n. Remove latch and load beam bumpers (47 and 56) from cover (6) or case (24), if still installed.

o. If not legible remove electrical diagram (45) and name plate (53) by removing drive screws (44 and 52).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

14-234. Cleaning — Cargo Hook (Part No. SP4220-1 and SP4405-1). a. Clean all parts (figure 14-20 or 14-22), except electrical components by washing with solvent (C205). Dry parts with filtered compressed air, not to exceed 30 psig.

b. Clean electrical components by wiping with a clean cloth moistened with solvent (C205). Dry by wiping with a clean, lint-free cloth.

c. Clean sealing compound from cover, case, and connector, using a sharp plastic scraper.

14-235. Inspection - Cargo Hook (Disassembled) (Part No. SP4220-1). a. Inspect all threaded parts (figure 14-20) for crossed, deformed, or damaged threads.

b. Inspect springs (8, 11, 13, 26, 16, 54 and 55) for broken coils, deformed ends, and permanent set.

c. Inspect latch and lever (49) for loose link (48) between peened end of pivots and side links.

d. Inspect contacting surfaces of latch and lever (49), automatic pickup latch (12), and load beam (18) for signs of abrasion and burrs.

e. Inspect safety switch (9) for cracks in housing or roller, signs of excessive heat, and bent arm.

f. Inspect electrical wiring at solenoid (25) and connector (29) for insulation breaks, charring, abrasion, or damaged pins and terminals.

g. Inspect bumper (57, view A) for cracks in housing; and nylon ring (59) for tears and deterioration.

14-236. Repair or Replacement - Cargo Hook (Part No. SP4220-1). a. Replace all parts (figure 14-20) that have crossed, deformed, or damaged threads.

b. Replace springs (8, 11, 13, 26, 16, 54, and 55) that have broken coils, deformed ends, or permanent set.

c. Replace loose rivets in latch and lever (49) at pivot ends and side links. Slight play is permissible at operating pivot points. Should play greater than

0.015 inch be evident at pivot connections between the side links and lever or latch, replace latch and lever.

d. Polish out abrasion and burrs on contacting surfaces of latch and lever (49), automatic pickup latch (12), and load beam (18), using crocus cloth (C49).

e. Replace safety switch (9), solenoid (25) and connector (29) if cracks, breaks, or charring is evident.

f. Replace electrical wiring and terminals that are damaged.

g. Replace bumper (57, view A) and nylon ring (59) if cracked or damaged.

14-237. Lubrication — Cargo Hook (Part No. SP4220-1). a. Apply oil (C136) to each toggle pivot point of latch and lever (49, figure 14-20) and apply film of grease (C111) to internal pivot points.

NOTE

All surfaces to be lubricated shall be clean and free from moisture, solvents, and other contamination when applying lubricant. Apply by any method that will cover the surface to be lubricated without excess pile-up of grease or runoff of oil. Never apply lubricant over a rusted or corroded surface.

b. Apply grease (C111) to trunnion (17), both inside and outside of trunnion spring (16) and to plunger (19).

14-238. Assembly - Cargo Hook (Part No. SP4220-1). a. Insert trunnion (17, figure 14-20) into case (24) and install trunnion arm assembly (42) with pin (27).

b. Install solenoid (25) to case (24) and secure with two new nuts (23). Stake nuts in place.

c. Position solenoid arm (14) on shaft of solenoid (25) and install pin (10).

WARNING

Exercise extreme caution when installing plunger (19), trunnion spring (16) and load beam (18) to trunnion (17); parts are under spring tension.

d. Insert plunger (19) and trunnion spring (16) in trunnion (17). Compress plunger and install load beam (18) over trunnion.

e. Connect latch spring (54) to latch and lever (49) and install in case (24), then install lever spring (55).

f. Latch load beam (18) into latch and lever (49) and connect load beam return spring (26) between trunnion arm assembly (42) and post on outside of case (24).

g. Install connector (29) to solenoid cover (41) with four screws (50) and washers (51). Safety screws together with lockwire (C127).

h. Connect two electrical leads to connector (29) for solenoid (25) and safety switch (9). Route two leads for safety switch through opening in case (24). For wiring diagram see figure 14-21 or (45, figure 14-20).

i. Install solenoid cover (41) to case (24) with three screws (31) and washers (30). Safety screws together with lockwire (C127).

j. Connect two electrical leads to automatic touchdown switch (4). Install switch actuator (7) and actuator spring (8) to post in case (24).

k. Install pin (20) and latch and load beam bumpers (47 and 56) in slots in case (24).

l. Apply a coating of sealing compound (C188) to edge surfaces of cover (6). Use sparingly and take care to keep moving surfaces within cargo hook.

m. Check to ensure that all springs are in place; that load beam (18), trunnion (17), latch and lever (49), safety switch (9), actuator (7), pin (20), and bumpers (47 and 56) are in their proper positions.

n. Place ground release lever (4) in cover (6) with handle up. Fit cover to case (24) and align lever to shaft of latch and lever (49) which will protrude through cover and lock lever into position. Cover should close by finger pressure when all internal ports are in proper position. Secure cover to case with two bolts (22), steel washers (43), and nuts (28).

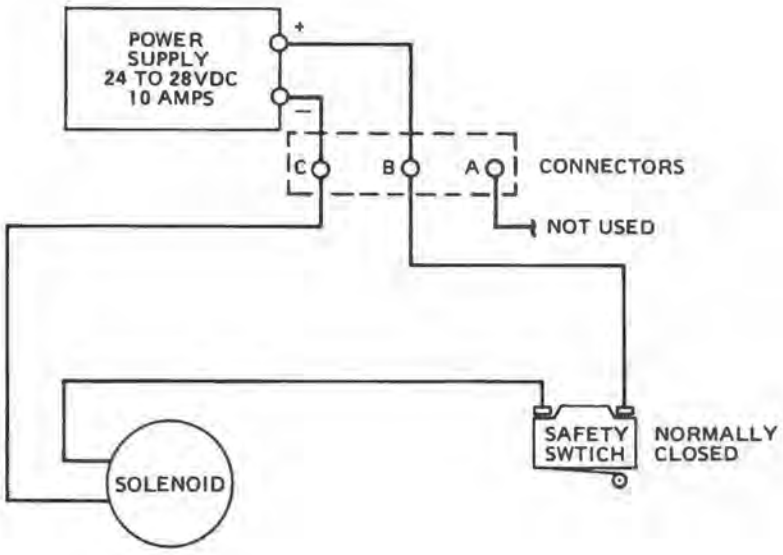


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Figure 14-21. Cargo hook electrical diagram — part number SP4420-1 and SP4405-1

o. Apply a bead of sealing compound (C188) around edges of solenoid cover (41) to case (24) and connector (29) to cover.

p. Position pivot plate (3) to cover (6) with bolt (1). Assemble pivot springs (11 and 13), automatic pickup latch (12), and pivot plate (32) with ends of springs engaging holes in plates and latch. Secure bolt with thin steel washer (35), nut (36), and cotter pin (37).

q. Position bumper (57, view A) to cargo hook and install bolts (2 and 21), thin steel washers (33 and 40) and nuts (34 and 39), secure with cotter pins (38 and 58).

r. Position nylon ring (59) around bumper (57) and secure with cotter pin (58) at mating ends.

s. Test cargo hook (paragraph 14-239).

14-239. Testing — Cargo Hook (Part No. SP4220-1). After each assembly and/or repair of cargo hook, mount hook in a support that will allow free access to ground release lever, full movement of load beam, and application of **24 TO 28** Vdc power to connector.

a. Open inspection window (5, figure 14-20) on cover (6) and attach an internal control cable (22, figure 14-18) to end of latch and lever (49, figure 14-20) and extending through opening in top of cargo hook.

b. Connect electrical power to connector (29) with a micro-switch in circuit to simulate helicopter electrical release system.

c. Attach a minimum **10** pound test load to load beam (18) for each of the following checks.

d. Actuate electrical release system (micro switch); load beam should open releasing test load; release switch; load beam should close and latch. Repeat test several times.

e. Manually release test load by pulling on end of internal control cable; load beam should open; release cable; load beam should close and latch. Repeat test several times.

f. Manually release test load using ground release lever (4); load beam should open; release

lever; load beam should close and latch. Repeat test several times.

14-240. Installation — Cargo Hook (Part No. SP4220-1). a. Position cargo hook (20, figure 14-18) into yoke (10) with load beam (19) pointing forward. Align mounting holes and install two bolts (16) with steel washers and nuts. Use thin steel washers for spacers, as required, maximum 6 per bolt. Torque nuts **50 TO 70** inch-pounds and secure with cotter pins.

b. Insert internal control cable (22) down through opening in cargo hook (20) to internal lever (21). Attach lower end of cable to lever and upper end to external lever (23) with cotter pins.

c. Attach ball terminal of external control cable (5) to external lever (23) and secure with cotter pin.

d. Adjust bolt (12) in external lever (23) until lever is approximately parallel with bolts (16); tighten jamnut.

e. Connect receptacle (24) to cargo hook (20).

f. Install suspension assembly (paragraph 14-192).

14-241. CARGO HOOK (PART NO. SP4405-1) (HELICOPTERS SERIAL NO. 65-9416 AND SUBSEQUENT).

14-242. Description — Cargo Hook (Part No. SP4405-1), (refer to paragraph 14-230).

14-243. Inspection — Cargo Hook (Installed) (Part No. SP4405-1). a. Inspect cargo hook (figure 14-22) for cleanliness, damage, and security of attachment to suspension assembly.

b. Inspect automatic pickup latch (5), load beam (13), and latch of latch and lever (51) for damage that may interfere with operation.

c. Check electrical connector (22) for damage.

d. Inspect bumper (61, view A) and nylon ring (63) for security of attachment and damage.

e. Perform cargo suspension system operational check (paragraph 14-154).

14-244. Removal — Cargo Hook (Part No. SP4405-1). a. Remove suspension assembly (paragraph 14-187).

b. Disconnect electrical receptacle (24, figure 14-19) from cargo hook (20).

c. Disconnect external control cable (5) and internal control cable (22) from external lever (23) by removing cotter pins securing cable ball terminals.

d. Remove cargo hook (20) from lower yoke (10) by removing two bolts (16) with washers, nuts, and cotter pins.

e. Remove bumper (61, figure 14-22, view A) and nylon ring (63) from cargo hook by removing bolts (1 and 14) with washers (26 and 33) and nuts (27 and 32). Separate nylon ring (63) from bumper (61) by removing cotter pin (62) at mating ends. Reinstall bolts, washers, and nuts in cargo hook.

14-245. Disassembly — Cargo Hook (Part No. SP4405-1). a. Close and latch load beam (13, figure 14-22). Locate load beam return spring (20) inside opening in solenoid cover (21) and disconnect from post on case (18) and pin in arm (34); remove spring.

b. Remove pin (35) from arm (34) and shaft of trunnion (12). Separate parts from case (18).

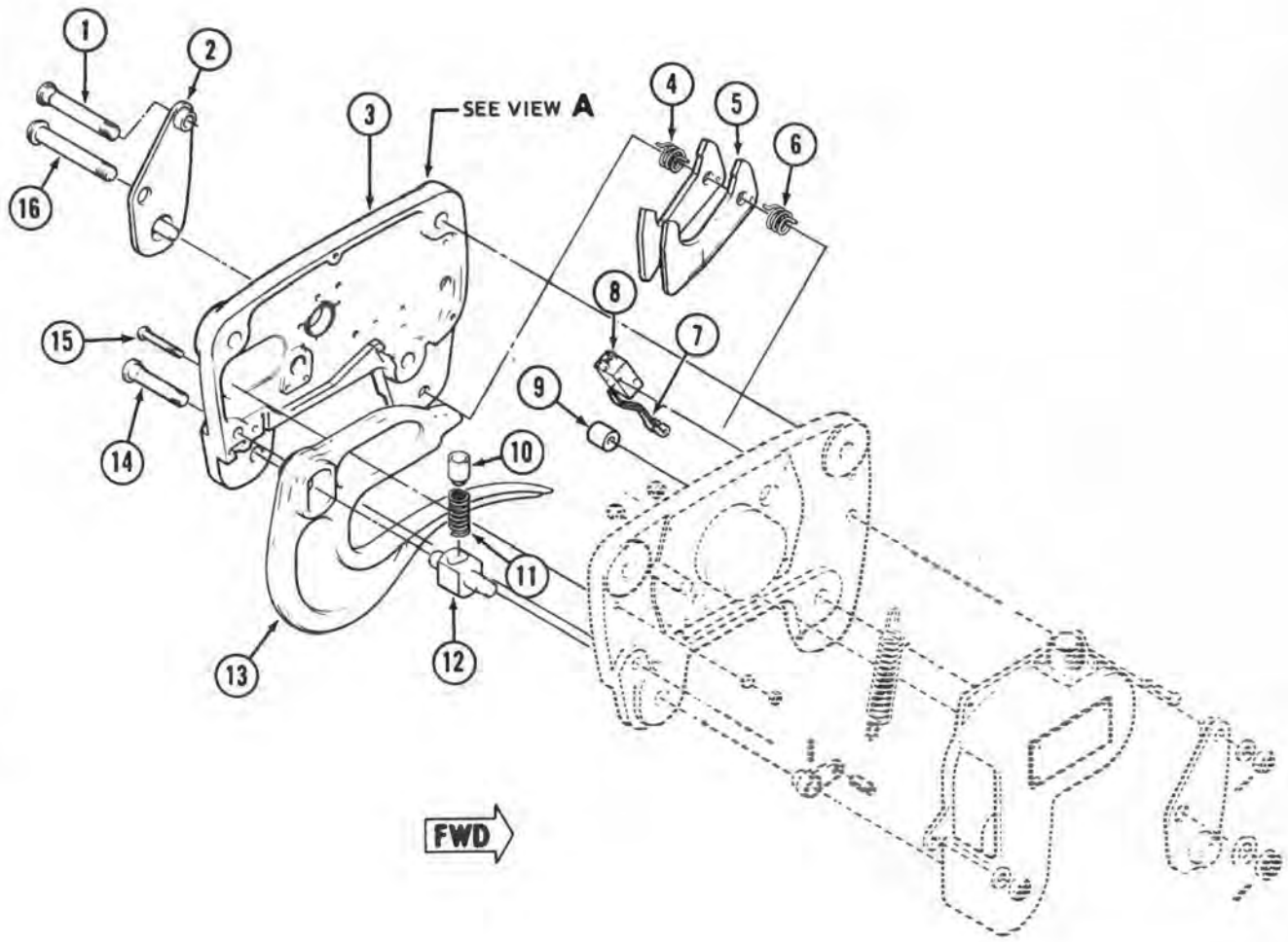
c. Remove bolts (1 and 16) with nuts (27 and 29), washers (26 and 31), and cotter pins (28 and 30) from cargo hook.

d. Separate pivot plates (2 and 25), pivot springs (4 and 6), and automatic pickup latch (5).

e. Remove one bolt (14) with washers (33) and nut (32), and two bolts (15) with washers (37) and nut (36).

WARNING

Exercise extreme caution when removing cover (3) and load beam (13) from case (18). Plunger (10) is under tension from trunnion spring (11) in trunnion (12).



1. Bolt
2. Pivot plate
3. Cover
4. Spring-pivot
5. Latch - automatic
6. Spring - pivot
7. Actuator
8. Safety switch
9. Stop - nylon
10. Plunger
11. Spring - trunnion
12. Trunnion
13. Load beam
14. Bolt
15. Bolt
16. Bolt

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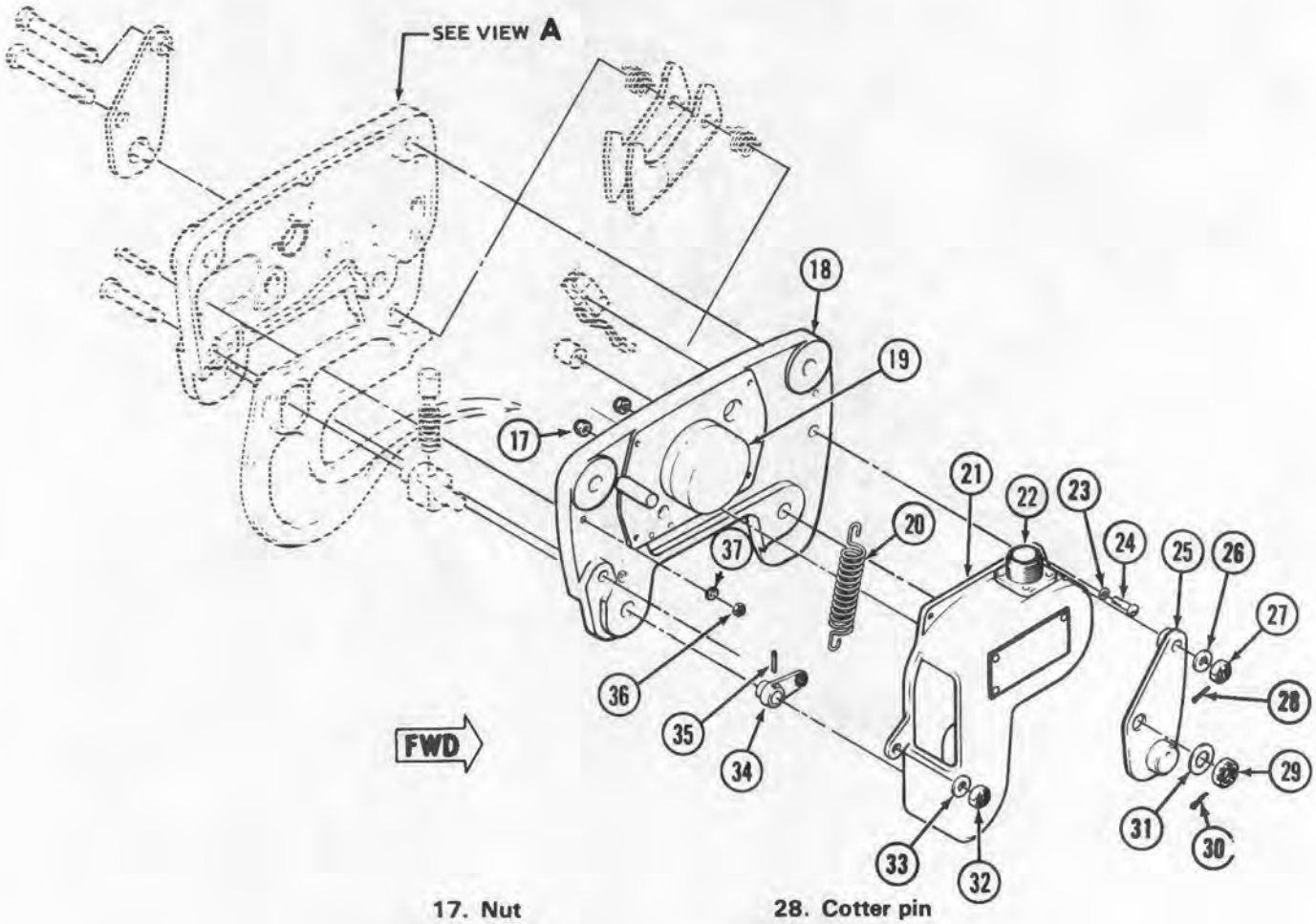
Figure 14-22. Cargo hook — part number SP4405-1 (Sheet 1 of 4)



17. Nut
18. Case
19. Solenoid
20. Spring
21. Cover - solenoid
22. Connector
23. Washer
24. Screw
25. Pivot plate
26. Washer
27. Nut
28. Cotter pin
29. Nut
30. Cotter pin
31. Washer
32. Nut
33. Washer
34. Arm assembly
35. Pin
36. Nut
37. Washer

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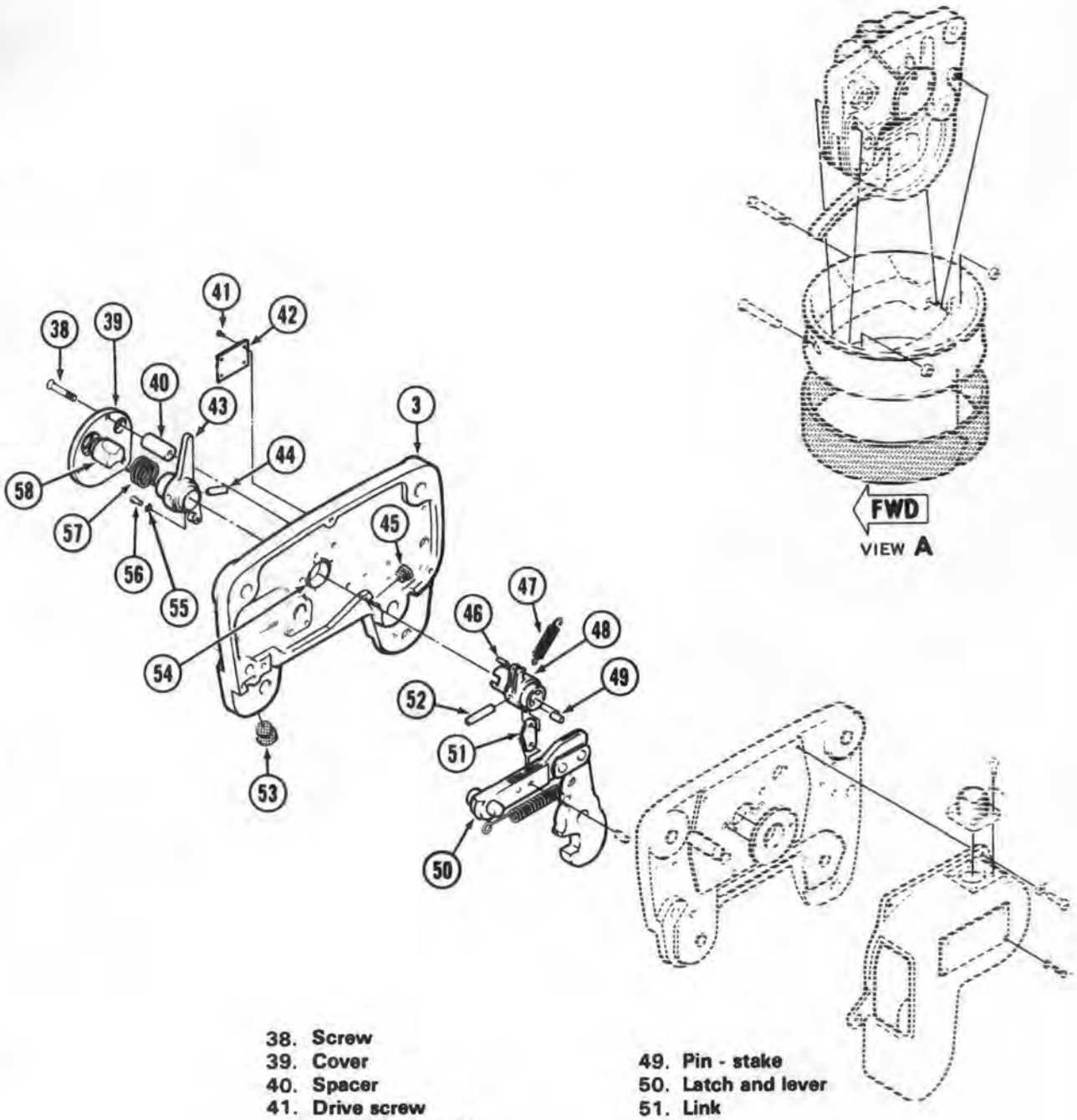
Figure 14-22. Cargo hook — part number SP4405-1 (Sheet 2 of 4)



38. Screw
39. Cover
40. Spacer
41. Drive screw
42. Electrical diagram
43. Lever - ground release
44. Pin
45. Bumper - latch
46. Roll pin
47. Spring - toggle
48. Toggle shaft
49. Pin - stake
50. Latch and lever
51. Link
52. Pin
53. Bumper - load beam
54. Support
55. Washer
56. Screw
57. Spring
58. Indicator

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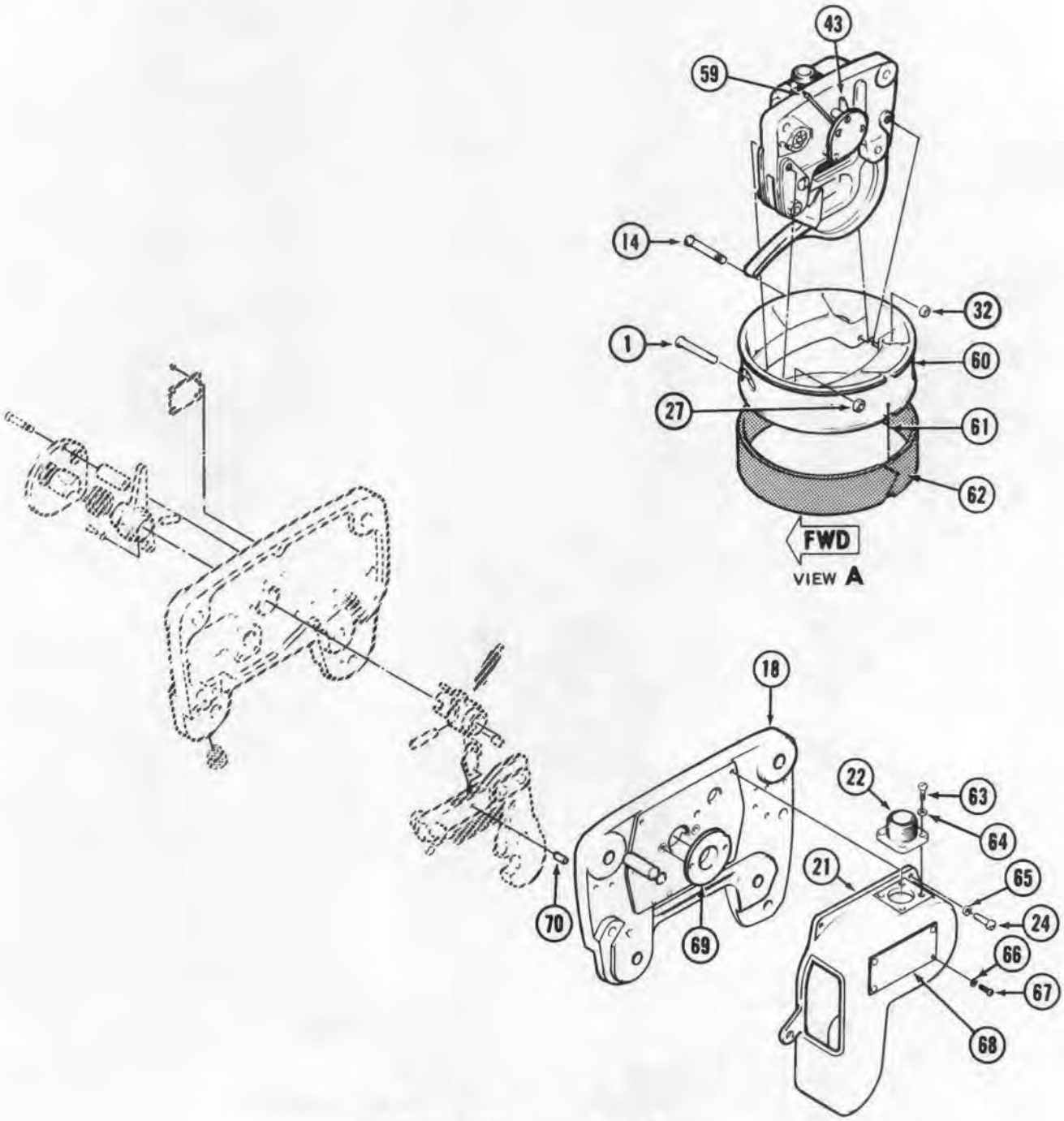
Figure 14-22. Cargo hook — part number SP4405-1 (Sheet 3 of 4)



59. Control cable
60. Bumper
61. Cotter pin
62. Nylon ring
63. Screw
64. Washer
65. Washer
66. Washer
67. Drive screw
68. Name plate
69. Retainer - solenoid
70. Pin - stake

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Figure 14-22. Cargo hook — part number SP4405-1 (Sheet 4 of 4)

f. Carefully remove cover (3) from case (18), maintaining load beam (13) in position on trunnion (12).

NOTE

When separating cover (3) from case (18), latch and load beam bumpers (45 and 53) will be loose and free to fall out.

g. Carefully slide load beam (13) from trunnion (12) and remove plunger (10) and trunnion spring (11).

h. Slide nylon stop (9) and actuator (7) from posts on inside of case (18). Disconnect two electrical leads from safety switch (8) and slide from post on case (18).

i. Disconnect toggle spring (47) from toggle shaft (48) and post on case (18).

j. Remove pin (52) from toggle shaft (48). Lift shaft (48) and latch and lever (50) as an assembly from case (18).

k. Cut lockwire and remove four screws (24) and washers (23) from solenoid cover (21) and case (18). Remove two nuts (17) from inside case (18) and remove solenoid (19) with cover.

l. Disconnect two electrical leads to connector (22) and remove solenoid (19) from solenoid cover (21).

m. If damage is evident, cut lockwire and remove four screws (63), washers (64) and connector (22) from solenoid cover (21).

n. If damage is evident, press out solenoid retainer (69) from case (18).

o. Remove pin (35) from arm (34) and shaft of trunnion (12). Separate parts from case (18).

p. Remove three staked screws (38), cover (39), spacers (40), indicator (58), spring (57), and ground release lever (43) from cover (3). Disconnect control cable (59, view A) from lever by removing screw (56) and lockwasher (55).

q. Remove latch and load beam bumpers (45 and 53) from cover (3) or case (18) if still installed.

r. If damage is evident, remove four rivets retaining support (54) to cover (3), press out support.

s. If not legible, remove electrical diagram (42) and name plate (68) by removing drive screws (41 and 67).

14-246. Inspection — Cargo Hook (Disassembled) (Part No. SP4405-1). a. Clean cargo hook (paragraph 14-234).

b. Inspect all threaded parts (figure 14-22) for crossed, deformed, or damaged threads.

c. Inspect springs (4, 6, 11, 20, 47, and 57) for broken coils, deformed ends, and permanent set.

d. Inspect contacting surfaces of automatic pickup latch (5), load beam (13), and latch and lever (50) for signs of abrasion and burrs.

e. Inspect latch and lever (50) for loose link (51) between side links and stake pins (49 and 70).

f. Inspect safety switch (8) for cracks in housing or roller, signs of excessive heat, and bent arm.

g. Check operation of actuator (6) to ensure it does not bottom out in actuated position.

h. Inspect electrical wiring at connector (22) and solenoid (19) for insulation breaks, charring, abrasion, or damaged pins and terminals.

i. Inspect bumper (60, view A) for cracks in housing, and nylon ring (62) for tears and deterioration.

14-247. Repair or Replacement — Cargo Hook (Part No. SP4405-1). a. Replace all parts (figure 14-22) that have crossed, deformed, or damaged threads.

b. Replace springs (4, 6, 11, 20, 47, and 57) that have broken coils, deformed ends, or permanent set.

c. Replace latch and lever (50) if stake pin (70) is loose or side links are damaged. Replace toggle shaft (48) and link (51) if damaged.

d. Polish out abrasion and burrs on contacting surfaces of automatic pickup latch (5), load beam (13), and latch and lever (50), using crocus cloth (C49).

e. Replace safety switch (8), connector (22) and solenoid (19) if cracks, breaks, or charring is evident.

f. Replace actuator (6) if it bottoms out.

g. Replace electrical wiring and terminals that are damaged.

h. Replace solenoid retainer (69) in case (18) and support (54) in cover (3) if damaged. Secure support with four rivets (part No. AN426AD3-6).

i. Replace bumper (60, view A) and nylon ring (62) if cracked or damaged.

14-248. Lubrication — Cargo Hook (Part No. SP4405-1). a. Apply oil (C136) to toggle shaft (48, figure 14-22) pivot points at link (51), and latch and lever (50).

NOTE

All surfaces to be lubricated shall be clean and free from moisture, solvents, and other contamination when applying lubricant. Apply by any method that will cover the surface to be lubricated without excess pile-up of grease or runoff of oil. Never apply lubricant over a rusted or corroded surface.

b. Apply film of grease (C111) to internal points of latch and lever (50).

c. Apply grease (C111) to trunnion (12), both inside and outside of trunnion spring (11), and to plunger (10).

14-249. Assembly — Cargo Hook (Part No. SP4405-1). a. Insert trunnion (12, figure 14-22) into case (18) and install arm (34) with pin (35).

b. Install solenoid (19) to case (18) and secure with two new nuts (17). Stake nuts in place.

c. Position assembled toggle shaft (48) and latch and lever (50) to mounting points inside case (18). Secure toggle shaft to shaft of solenoid (19) with pin (52).

d. Install nylon stop (9) to post in case (18) and connect toggle spring (47) between toggle shaft (48) and post in case at left of top center.

WARNING

Exercise extreme caution when installing plunger (10), trunnion spring (11), and load beam (13) to trunnion (12); parts are under spring tension.

e. Insert plunger (10) and trunnion spring (11) in trunnion (12). Compress plunger and install load beam (13) over trunnion. Latch load beam into latch and lever (50) and connect load beam return spring (20) between arm assembly (34) and post on outside of case (18).

f. Install connector (22) to solenoid cover (21) with four screws (64) and washers (64). Safety screws together with lockwire (C127).

g. Connect two electrical leads to connector (22) for solenoid (19) and safety switch (8). Route two leads for safety switch through opening in case (18). For wiring diagram see figure 14-21 or (42, figure 14-22).

h. Install solenoid cover (21) to case (18) with four screws (24) and washers (23). Safety screws together with lockwire (C127).

i. Connect two electrical leads to safety switch (8). Install switch and actuator (7) to post in case (18).

j. Install latch and load beam bumpers (45 and 53) in slots in case (18).

k. If removed, install pin (44) in ground release lever (43) and attach control cable (59, view A) to lever with screw (56) and lockwasher (55).

l. Position ground release lever (43) to outside of cover (3) with spring (57), indicator (58), three spacers (40), cover (39), and three screws (38). Check that ends of spring (57) engages lever (43) and indicator (58). Stake screws (38) to cover.

m. Apply a coating of sealing compoung (C188) to edge surfaces of cover (3). The sealant should be used sparingly and care taken to keep moving surfaces within cargo hook.

n. Check to ensure that all springs are in place; that load beam (13), trunnion (12), latch and lever (50), safety switch (8), actuator (7), and bumpers (45 and 53) are in their proper positions.

o. Place ground release lever (43) in latch position, (marks on indicator (58) and cover (39) aligned).

p. Fit cover (3) to case (18) and align ground release lever (43) to toggle shaft (48) and to latch and lever (50). Cover should close by finger pressure when all internal parts are in proper position. Secure cover to case with two bolts (15), steel washers (37) and nuts (36).

q. Apply a bead of sealing compound (C188) around edges of solenoid cover (21) to case (18) and connector (22) to cover (21).

r. Position pivot plate (2) to cover (3) with bolt (16). Assemble pivot springs (4 and 6), automatic pickup latch (5), and pivot plate (25) with ends of springs engaging holes in plates and latch. Secure bolt with thin steel washer (31), nut (29), and cotter pin (30).

s. Position bumper (61, view A) to cargo hook and install bolts (1 and 14), thin steel washers (26 and 33), and nuts (32 and 27); secure with cotter pins (28 and 61).

t. Position nylon ring (62) around bumper (60) and secure with cotter pin (61) at mating ends.

u. Test cargo hook (paragraph 14-250).

14-250. Testing — Cargo Hook (Part No. SP 4405-1). After each assembly and or repair of cargo hook, mount hook in a support that will allow free access to ground release lever, full movement of load beam and application of **24 TO 28** Vdc power to connector.

a. Connect electrical power to connector (22, figure 14-22) with a micro switch in circuit to simulate helicopter electrical release system.

b. Attach a minimum 8 pound test load to load beam (13) for each of the following checks.

c. Check the closing action of the load beam (13) by energizing the electrical circuit and pulling the beam open one-fourth movement and releasing. From this position load beam should swing to relatch position, while the latch mechanism is machine gunning. When electrical circuit is opened, load beam should stop in closed position. Check that indicator (58) realigns with its mark on cover (33).

d. Should the latch and lever (50) be in closed position with the tip of load beam (13) unlatched, close the electrical circuit momentarily, and the beam should enter into latched position.

e. Repeat electrical circuit test several times with weight attached to load beam (13). Hold release switch 1 to 2 seconds; weight should drop free and the load beam relatch.

f. Check that indicator (58) is aligned with mark on cover (39) when load beam (13) is closed and latched.

g. Actuate ground release lever (43) for proper action without binding.

14-251. Installation — Cargo Hook (Part No. SP4405-1). a. Position cargo hook (20, figure 14-19) into lower yoke (10) with load beam (19) pointing forward. Align mounting holes and install two bolts (16) with steel washers and nuts. Use thin steel washers for spacers, as required, maximum 6 per bolt. Torque nuts **50 TO 70** inch-pounds and secure with cotter pins.

b. Insert one end of internal control cable (22) into lower end of ground release lever (21) and secure with screw (56, figure 14-22) and lockwasher (55). Attach upper ball terminal of cable to external lever (23, figure 14-19) and secure with cotter pin.

c. Adjust bolt (13) in external lever (23) until lever is approximately parallel with bolts (16); tighten jamnut.

d. Connect receptacle (24) to cargo hook (20).

e. Install suspension assembly (paragraph 14-192).

CHAPTER 15

AUXILIARY POWER PLANTS

(Not Applicable)

CHAPTER 16

MISSION EQUIPMENT

16-1. EXTERNAL STORES SUPPORT.

16-2. Description — External Stores Support. Two external stores support assemblies (figure 16-1) can be installed on the helicopter. Each support assembly consists of a forward and aft support beam attached to hardpoint fittings on the fuselage, a crossbeam installed between the two support beams, and two sway braces attached diagonally between the support beams and the center of the crossbeam.

16-3. Removal — External Stores Support. a. Remove lockwire. Remove bolt and washer (5, figure 16-1), and pad (3) from tripod fitting (4).

b. Remove bolt, washer and nut that attach external stores brace (6) to clevis (8). Remove external stores brace from clevis.

c. Remove cotter pins, nuts, washers, and bolts attaching external stores support assembly to hardpoints on fuselage structure.

d. Remove external stores support assembly from helicopter.

e. Remove nuts, washers, and bolts attaching sway brace assemblies (10) to external stores support assembly. Remove sway brace assemblies.

f. Remove nuts, washers, and bolts attaching external stores support assembly crossbeam (9) to forward and aft support beams (1 and 2).

g. Remove clevis (8) from under head of rear bolt on crossbeam (9).

CAUTION

The external stores brace shall be installed when the external stores support assembly is installed. The external stores brace is required due to greater loads induced on external stores as a result of higher airspeeds attainable by UH-1C/M helicopters.

16-4. Cleaning — External Stores Support.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

Clean parts with a bristle brush (C32) and solvent (C205).

16-5. Inspection — External Stores Support. a. Inspect bushings in support beams (1 and 2, figure 16-1) and in tangs of crossbeam (9) for excessive wear and damage.

b. When external stores have been mounted on the aircraft, inspect support beams (1 and 2) and cross beam (9) for corrosion and cracks. Pay particular attention to attaching points of support beams. Perform a dye penetrant inspection (refer to TM 55-1500-204-25/1), inspecting for fatigue cracks in an area approximately six inches adjacent to the upper attachment point and any other area where indications of cracks are found.

c. Inspect for loose, missing, or improperly installed hardware.

d. Inspect sway braces (10) for damage and excessive wear in clevis mounting holes.

e. The corrosion and/or mechanical damage limits for the external stores are as follows:

(1) Hardpoints. Negligible damage, none. Reparable damage, not to exceed a minimum thickness of **0.335** inch after cleanup. Damage requiring replacement, damage in excess of **0.335** inch minimum thickness.

(2) Mount holes in hardpoints. Negligible damage, damage less than **0.010** inch in depth. Reparable damage, elongation not to exceed **0.4380** inch I.D. after cleanup. Damage requiring replacing, elongation in excess of **0.4380** inch, or that has a tearout thickness less than **0.660** inch.

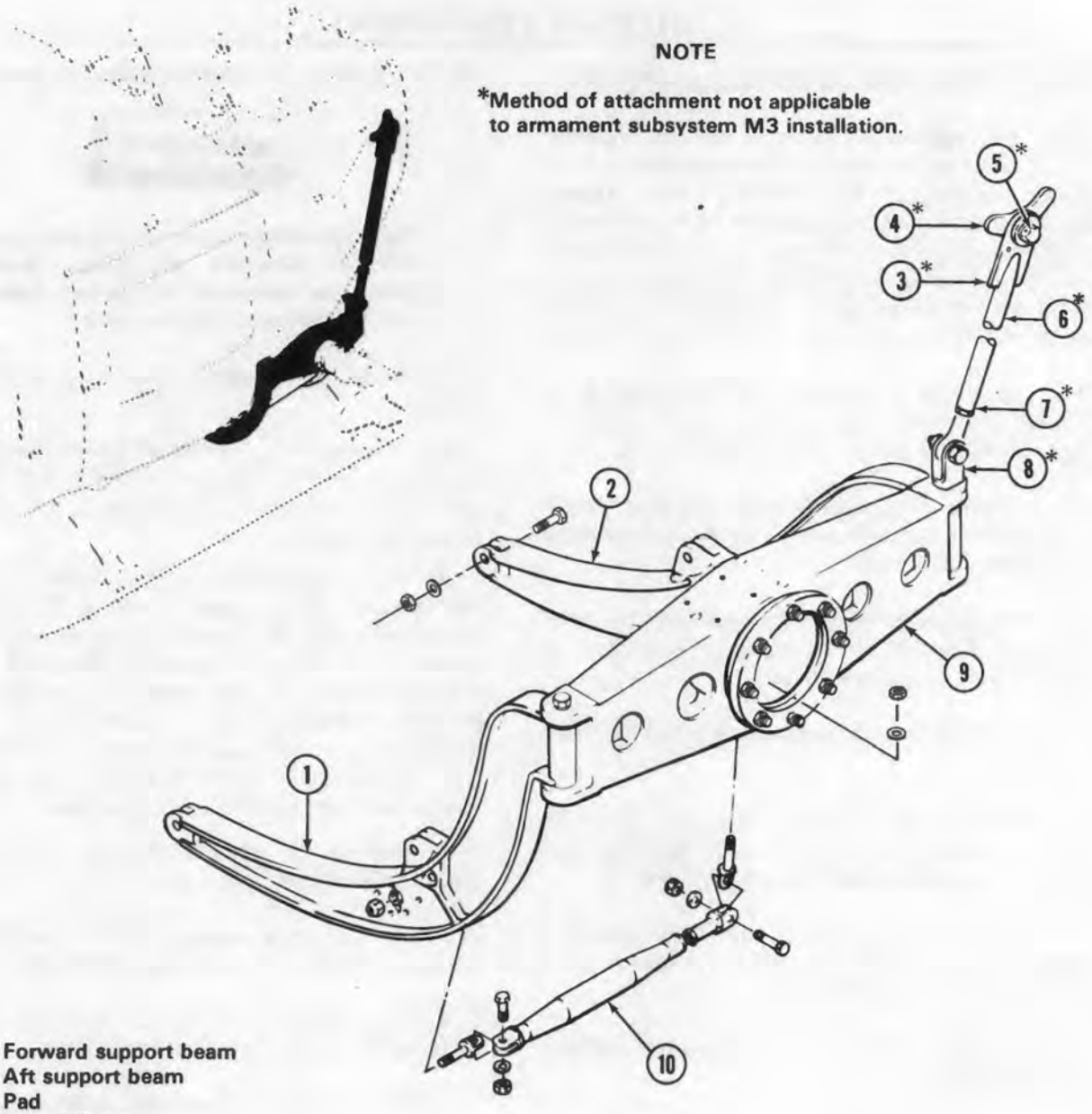


Figure 16-1. External stores support assembly

16-6. Repair or Replacement — External Stores Support. a. Replace support beams (1 and 2, figure 16-1) if cracked or if bushings in attachment point are worn sufficiently to allow movement when parts are assembled.

b. Repair small nicks and scratches by polishing out with fine abrasive paper (C185). Coat repaired areas with primer (C167).

c. Replace sway braces (10) if bent, dented or if riveted clevis end is excessively worn. Adjustable clevis end can be replaced separately.

16-7. Installation — External Stores Support. a. Fit clevis (8, figure 16-1) under head of rear bolt on

crossbeam (9). Position external stores support assembly crossbeam (9) between outer ends of forward and aft support beams (1 and 2).

b. Install bolts, washers, and nuts that attach forward and aft support beams (1 and 2) to crossbeam (9).

c. Position sway brace assemblies (10) on external stores support assembly. Install attaching bolts, washers, and nuts.

d. Position external stores support assembly against hard points on fuselage structure. Install attaching bolts, washers, nuts, and cotter pins.

e. Attach rod end of external stores brace (6) to clevis (8) with previously removed bolt, nut, and washer.

f. Adjust external stores brace (6) as necessary so hole in opposite end of brace aligns with hole in tripod fitting (4).

g. Position pad (3) over hole in tripod fitting (4).

h. Install bolt and washer (5). Lockwire (C127) bolt.

16-8. MANUAL EMERGENCY JETTISON CONTROLS.

16-9. Description. A series of cables, actuated by a manually operated jettison lever located by the pilot seat, enables the pilot to mechanically jettison external stores or equipment. Both left and right stores are jettisoned simultaneously. Cables are equipped with adjustable fittings which facilitate final rigging and adjustment during installation of stores or equipment on the external stores support. Manual release extension assemblies consisting of tubes, cables and connectors are used when armament subsystem kits or external auxiliary fuel tank kits are installed. The manual extension assembly (figure 16-2, items 7 through 14) is used with armament subsystem M22 guided missile system. For information pertaining to manual extension assemblies used with other armament subsystem kits, refer to the respective subsystem.

16-10. Removal — Manual Emergency Jettison Controls. a. Remove access plate from lower fuselage skin below external stores forward support beam.

b. Disconnect inboard end of lower cable assembly (13, figure 16-2) from quick-disconnect on outboard end of emergency jettison cable assembly.

c. Remove grommet (14) from fuselage skin and pull lower cable assembly (13) outboard.

d. Remove cotter pin, washer, and flathead pin attaching cable assembly (8) to mechanical release actuating lever.

e. Remove cotter pins, pins, nuts, washers, and bolts holding pulleys in pulley brackets (9) and remove pulleys.

f. Remove nuts, washers, screws, and clamps attaching upper (10) and lower (11) guard tubes and remove guard tubes.

g. Remove cable assemblies and cut lockwire at barrel (7) to separate.

h. Remove cotter pins, pins, nuts, washers, and bolts holding lateral release cable pulleys (12) in pulley brackets and remove pulleys.

i. Remove cotter pins, washers, and flathead pins attaching cable assemblies to bellcrank (5). Remove two lateral release cable assemblies (4 and 6) and cut lockwire on barrel (7).

j. Remove cotter pin, nut, washer, and screw attaching bellcrank (5) and remove bellcrank.

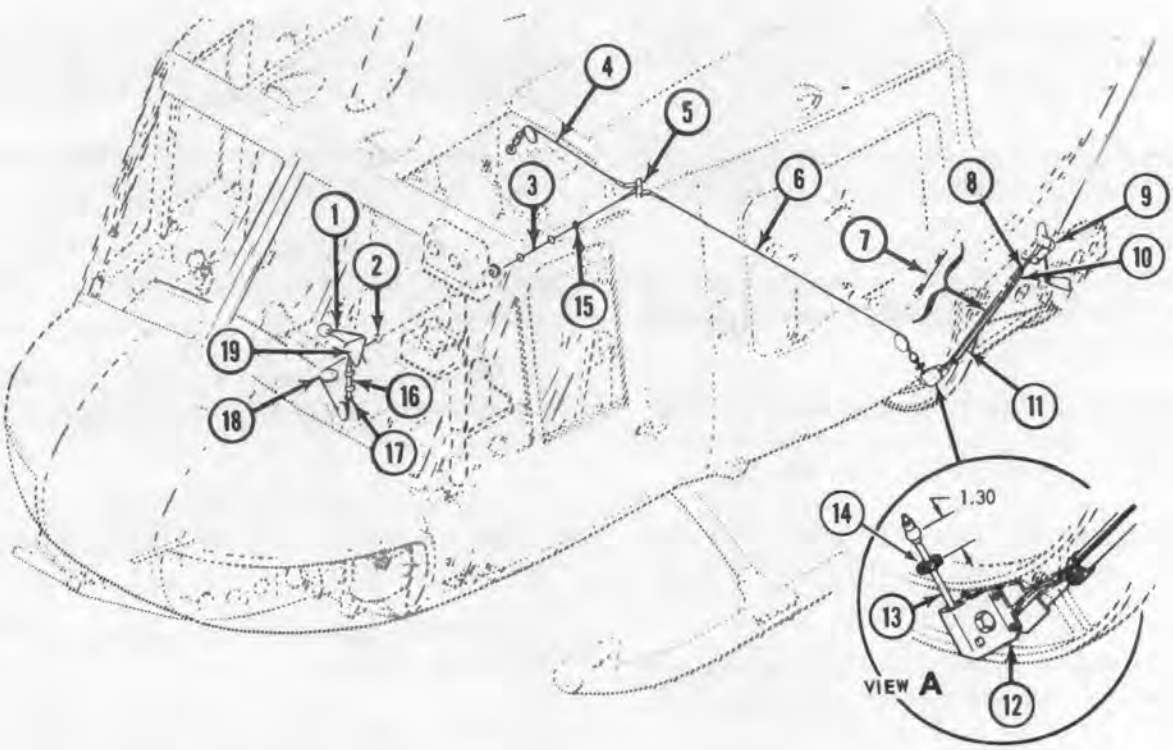
k. Remove nuts, washers, spacers, screws, and clamps attaching cable guard (16) to pedestal. Remove cotter pin and pin attaching longitudinal release cable (3) to emergency release lever assembly (1). Remove cable guard and grommet (17).

l. Remove cotter pins, pins, nuts, washers, and bolts holding longitudinal release cable pulleys (18) in pulley brackets and remove pulleys.

m. Remove fairlead (15) and six grommets (2) which guide longitudinal release cable (3) and remove release cable.

n. Remove cotter pin, nut, washer, and clevis bolt attaching lever assembly (1) to support assembly (19).

o. Remove three nuts, washers, and bolts attaching support assembly (19) to pedestal and remove support assembly.



1. Emergency release lever assembly
2. Grommets
3. Longitudinal release cable assembly
4. Right lateral release cable assembly
5. Bellcrank
6. Left lateral release cable assembly
7. Barrel
8. Cable assembly
9. Pulley brackets
10. Upper guard tube
11. Lower guard tube
12. Lateral release cable pulleys
13. Lower release cable assembly
14. Grommet
15. Fairlead
16. Cable guard
17. Grommet
18. Longitudinal release cable pulleys
19. Support assembly

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Figure 16-2. Manual emergency jettison controls

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

16-11. Cleaning — Manual Emergency Jettison Controls. a. Clean lever assembly (1, figure 16-2), support assembly (19), bellcrank (5), guard tubes (10 and 11), and pulleys (12) by washing with a bristle brush (C32) and solvent (C205).

b. Wipe cables with a clean cloth moistened with solvent (C205).

16-12. Inspection — Manual Emergency Jettison Controls. a. Inspect pulleys (12 and 18, figure 16-2) for wear, damage, and freedom of rotation.

b. Inspect cables (3, 4, 6, 8 and 13) for broken or frayed wires.

c. Inspect grommets (2, 14, and 17) for wear.

d. Inspect lever assembly (1) for serviceability and damage.

e. Inspect support assembly (19) bushing for wear.

f. Inspect bellcrank (5) for damage or wear at cable attachment holes and center pivot hole.

16-13. Repair or Replacement — Manual Emergency Jettison Controls. a. Replace worn and unserviceable pulleys (12 and 18, figure 16-2) and grommets (2, 14, and 17).

b. Replace frayed or unserviceable cables (3, 4, 6, 8 and 13).

c. Replace damaged or unserviceable lever assembly (1).

d. Replace support assembly (19) if bushing is worn or unserviceable.

e. Replace bellcrank (5) if cable attachment holes or center pivot hole is worn.

16-14. Installation — Manual Emergency Jettison Controls. a. Position support assembly (19, figure 16-2) on pedestal and install three attaching bolts, washers, and nuts.

b. Position emergency release lever assembly (1) on support assembly (19) and install attaching clevis bolt, washer, nut, and cotter pin.

c. Thread longitudinal release cable (3) through bulkhead openings and install fairlead (15) and grommets (2).

d. Position longitudinal release cable pulleys (18) and cable (3) in pulley brackets and install attaching bolts, washers, nuts, pins, and cotter pins.

e. Thread forward end of longitudinal release cable (3) through cable guard (16) and attach to emergency release lever assembly (1) with pin and cotter pin.

f. Position cable guard (16) and install grommet (17) and attaching clamps, screws, spacers, washers, and nuts.

g. Position bellcrank (5) and install attaching screw, washer, nut, and cotter pin.

h. Position aft end of longitudinal release cable (3) and inboard end of lateral release cable assemblies (4) and (6) on bellcrank (5) and attach with flathead pins, washers, and cotter pins.

i. Position lateral release cable pulleys (12) and cables (4) and (6) in pulley brackets. Install attaching bolts, washers, nuts, pins, and cotter pins.

j. Position upper (10) and lower (11) guard tubes and install attaching clamps, screws, washers, and nuts.

k. Connect external support cable assemblies (8) and (13) by means of barrel (7) and thread through guard tubes (10 and 11).

l. Position external support cable pulley and cable (8) in pulley bracket (9) and install attaching bolts, washers, nuts, pins, and cotter pins.

m. Connect cable assembly (8) to mechanical release actuating lever with flathead pin, washer, and cotter pin.

n. Thread inboard end of lower cable assembly (13) through opening in fuselage skin and install grommet (14).

o. Connect inboard end of lower cable assembly (13) to quick-disconnect on outboard end of emergency jettison cable assembly.

p. Perform adjustment procedures. (paragraph 16-15.)

16-15. Adjustment — Manual Emergency Jettison Controls. a. Place emergency release lever assembly (1, figure 16-2) in full forward position.

b. Check that mechanical release actuating lever is in full down (locked) position. (Adjust cable barrel (7) if necessary.)

c. Loosen attaching parts of upper guard tube (10) and slide guard tube down over lower guard tube (11) to expose barrel (7).

d. Adjust cable barrels to obtain **1.30** inch clearance between inside edge of lower aircraft skin and center of terminal on inboard end of lower cable assembly (13). See figure 16-2, detail A.

NOTE

The 1.30 inch clearance is to be maintained with the system in full locked (armed) position.

e. Install lockwire (C127) on all cable barrels.

f. Slide upper guard tube (10) up from lower guard tube (11) and tighten attaching parts.

g. Reinstall removed access panels.

16-16. MECHANICAL JETTISON DEVICE.

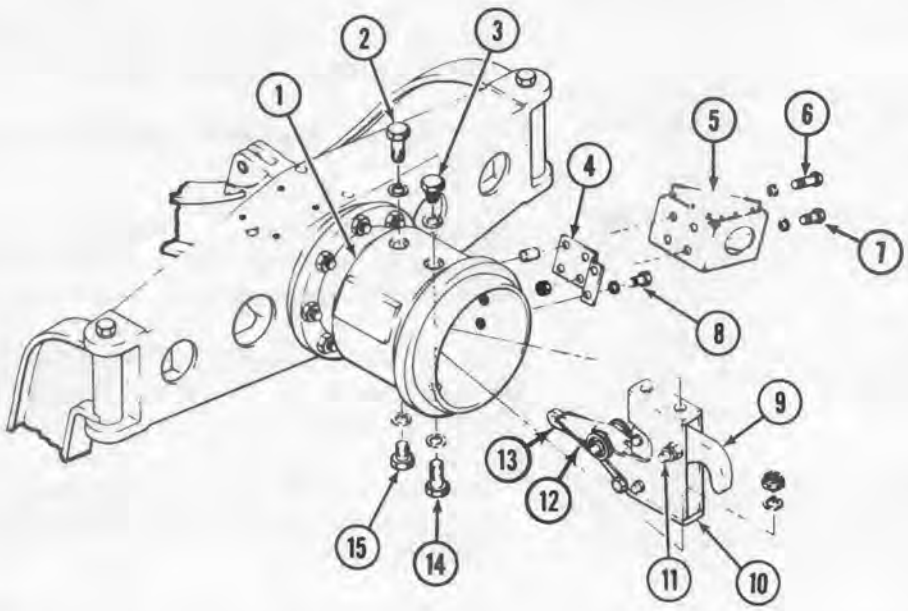
16-17. Description — Mechanical Jettison Device. A mechanical jettison device (figure 16-3) may be attached to the center of each external stores support assembly crossbeam. The jettison devices attach to the inboard end of boom assemblies and are used in conjunction with M22 guided missile launcher installations. Each mechanical jettison device is equipped with a mechanical release assembly which makes it possible to jettison boom assemblies in case of emergency. The mechanical release assembly contained in mechanical jettison device adapter, is actuated by mechanical jettison lever beside pilot seat.

16-18. Removal — Mechanical Jettison Drive. a. Remove cotter pin, washer, and flat head pin attaching outboard manual release cable to mechanical release assembly bellcrank (13, figure 16-3).

b. Disconnect electrical wiring from mechanical jettison device, cut lockwire and remove screws, washers, and nuts attaching cable connector to electrical plug bracket (5) on mechanical jettison device adapter (1). Remove cable from bracket.

c. Remove eight nuts, washers, and bolts attaching mechanical jettison device to external stores support assembly crossbeam and remove mechanical jettison device from crossbeam.

d. Cut lockwire and remove two aft bolts (6), washers, and spacers attaching electrical plug bracket (5) to plug support (4) and mechanical jettison device adapter (1).



1. Mechanical jettison device adapter
2. Upper aft bolt
3. Upper forward bolt
4. Plug support
5. Electrical plug bracket
6. Aft electrical plug bracket bolts
7. Forward electrical plug bracket bolts
8. Plug support bolts
9. Mechanical release assembly hook
10. Mechanical release assembly housing
11. Mechanical release assembly shaft
12. Mechanical release ejection spring
13. Bellcrank
14. Lower forward bolt
15. Lower aft bolt

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Figure 16-3. Mechanical jettison device

e. Remove two forward bolts (7), washers, and nuts attaching electrical plug bracket (5) to plug support (4) and adapter (1). Remove electrical plug bracket (5) from support (4) and adapter (1).

f. Cut lockwire and remove two bolts (8) and washers attaching plug support (4) to mechanical jettison device adapter (1). Remove plug support (4) from adapter (1).

g. Cut lockwire on top and bottom of mechanical jettison device and remove upper forward and lower aft bolts (3 and 15) and washers attaching mechanical release assembly housing (10) to jettison device adapter (1).

h. Remove upper aft and lower forward bolts (2 and 14), washers, and nuts and remove mechanical release assembly housing (10) from mechanical jettison device adapter (1).

i. Remove nuts and washers holding mechanical release assembly shaft (11) in mechanical release assembly housing (10) and remove shaft (11). Remove mechanical release assembly hook (9) and examine bearing for continued serviceability. If bearing is considered unsuitable for continued use, replace hook assembly (9).

j. Remove rings and pin that position mechanical release ejection spring (12) in housing (10) and on bellcrank (13). Remove nut, washer and bolt which attach spring to housing and remove spring.

k. Remove rings and pin attaching bellcrank (13) to mechanical release assembly housing (10) and remove bellcrank.

l. Remove dowel pin attaching bellcrank (13) arm to assembly housing and remove arm assembly.

16-19. Cleaning — Mechanical Jettison Device.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

Clean parts by washing with a bristle brush (C32) and solvent (C205).

16-20. Inspection — Mechanical Jettison Device. a. Inspect bearings in mechanical release assembly hook (9, figure 16-3) for excessive wear and damage.

b. Inspect mechanical release assembly housing (10) parts for wear and damage.

c. Inspect mechanical release ejection spring (12) for tension and wear.

d. Inspect for loose, missing, or improperly installed hardware.

e. Inspect mechanical jettison device adapter (1) and electrical plug bracket (5) and plug support (4) for damage.

f. Inspect bellcrank (13) arm assembly bearing for continued serviceability.

16-21. Repair or Replacement — Mechanical Jettison Device. a. Replace mechanical jettison device adapter (1, figure 16-3) if cracked or damaged.

b. Repair small nicks and scratches by polishing out with fine abrasive paper (C185). Coat repaired areas with primer (C167).

c. Replace mechanical release assembly housing (10) if hook bearings are damaged or excessive wear is evident.

d. Replace ejection spring (12) if defective.

e. If bellcrank (13) arm assembly bearing is unserviceable, remove rings and pin which hold bearing in arm and replace with new bearing.

16-22. Installation — Mechanical Jettison Device. a. Reassemble bellcrank arm assembly to bellcrank (13, figure 16-3) by installing dowel pin.

b. Position mechanical release ejection spring (12) on bellcrank (13). Carefully insert bellcrank and spring into mechanical release assembly housing (10) and install bolt, washer, and nut attaching spring ends to housing.

c. Install pins and rings attaching bellcrank (13) to housing (10) and position spring (12) on bellcrank.

d. Position mechanical release assembly hook (9) in housing (10) and install attaching shaft (11) with washers and nuts.

e. Insert mechanical release assembly housing (10) into mechanical jettison device adapter (1) and install upper aft and lower forward bolts (2 and 14), washers and nuts. Install upper forward and lower aft bolts (3 and 15) and nuts and torque **95 TO 110** inch-pounds. Install lockwire (C127) on bolts.

f. Position electrical plug support (4) on mechanical jettison device adapter (1) and install two bolts (8) and washers attaching support to adapter. Install lockwire (C127) on bolts.

g. Position electrical plug bracket (5) against electrical plug support (4) and align mounting holes. Install two forward bolts (7), washers, and nuts which attach bracket to support. Install two aft bolts (6), washers, and spacers which attach bracket (5) to support (4) and mechanical jettison device adapter (1). Install lockwire (C127) on bolts.

h. Position mechanical jettison device adapter (1) in center of external stores support assembly crossbeam and install eight attaching bolts, washers, and nuts.

i. Attach electrical cable connector to electrical plug bracket (5) with screws, washers, and nuts. Install lockwire (C127) on each side. Connect electrical wiring to mechnical jettison device.

j. Align end of outboard manual release cable with hole in end of mechanical release assembly bellcrank (13). Install flat head pin, washer, and cotter pin.

16-23. ARMAMENT PROVISIONS.

16-24. Description — Armament Provisions. Complete airframe electrical and hydraulic provisions are incorporated in the helicopter for installing the various armament subsystems and external auxiliary fuel system. See figure 16-4.

16-25. Maintenance and Repair — Armament Provisions. Refer to figures F-16 through F-21 for armament subsystem airframe wiring diagrams; paragraphs 9-5 through 9-11 for electrical component maintenance; and paragraph 10-230 for external auxiliary fuel system maintenance.

16-26. ARMAMENT SUBSYSTEM M3.

16-27. Description — Armament Subsystem M3. Armament subsystem M3 (figure 16-5) consists of two fixed 2.75 inch rocket launcher pods, two launcher adapter assemblies, two crank assemblies, armament control panel, reflex sight assembly and sight light panel assembly, armament junction box, and interconnecting electrical components. Each launcher pod (9, figure 16-5) consists of four modules, each of which contains six launcher tubes, giving a total armament capability of forty-eight modified Navy Type Mark IV, Mod VI, rockets. Each launcher pod may be adjusted in elevation from plus **six** degrees to minus **six** degrees by manually operating the adjustable link assembly (5) the aft end of which is pinned to the actuator bracket (7). Manually adjustable backup bearings act as mechanical stops to limit the launcher at plus **8** degrees to minus **18** degrees in elevation. Launcher pods can be jettisoned by means of explosive bolts. Each pod is attached to an adapter assembly (11) by means of four quick-release attachment pins. Each adapter assembly is attached to a crank assembly (8) which mates to the center hole in the external stores support assembly (12) crossbeam. The external stores support assembly is attached to the hardpoints on the helicopter fuselage structure. The system is capable of selective firing from the cabin, by either the pilot or copilot in the following modes:

a. Pair, single — one from each pod.

b. Ripples of 1-2-3-4-5-6 or 24 pairs (up to 48 rounds).

NOTE

Refer to paragraph F-11 for armament subsystem airframe wiring diagrams, and paragraphs 9-5 through 9-19 for electrical component maintenance.

16-28. ROCKETS, 2.75 INCH (FFAR) M3.

16-29. Description — Rockets, 2.75 Inch (FFAR). The 2.75 inch folding-fin aerial rockets (FFAR) used with armament subsystem M3 fixed rocket installation is a standard Navy Type IV, Mod VI, which has been modified to impart a ballistic spin of fifteen revolutions-per-second by scarfing the thrusting nozzles at a twenty-four degree angle. Each rocket weighs 18 pounds, with the warhead containing 1.40 pounds of HEX-1 explosive. A shear release of 100 pounds is required for the shear wire in the detent rod. Rockets are fired with an average thrust of 761 pounds and have a burning distance of 6000 feet.

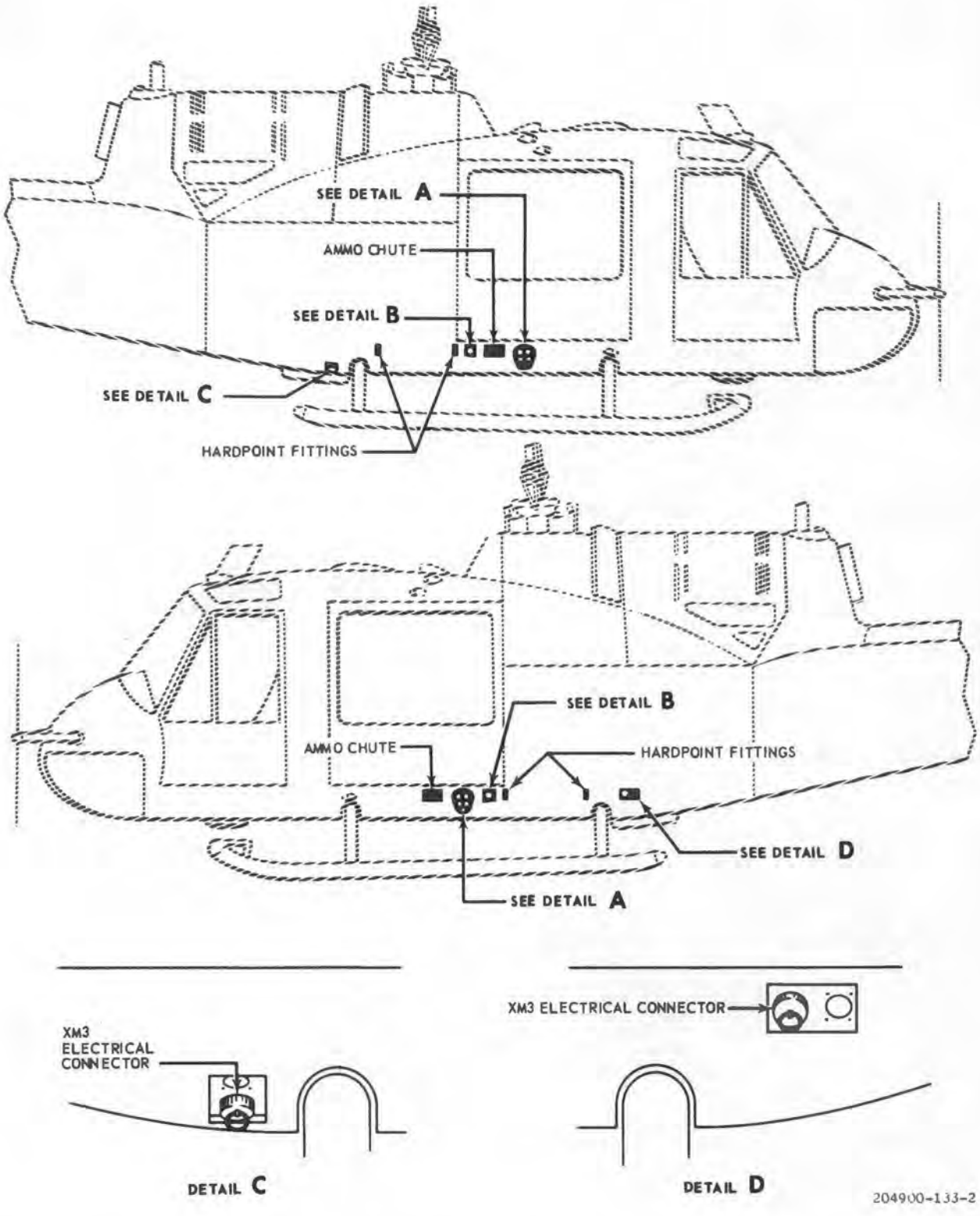


Figure 16-4. Armament and external fuel kit connections (Sheet 1 of 2)

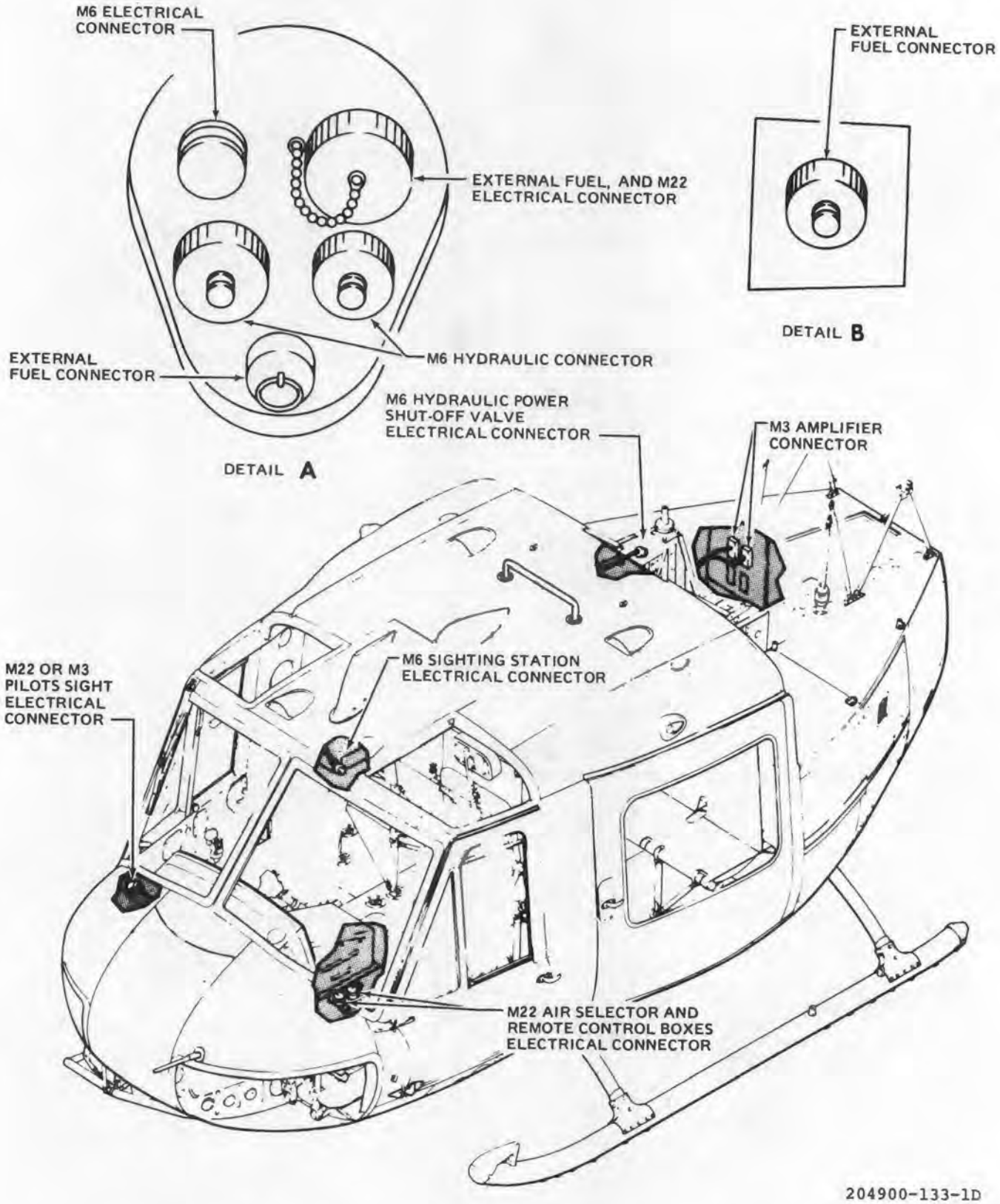
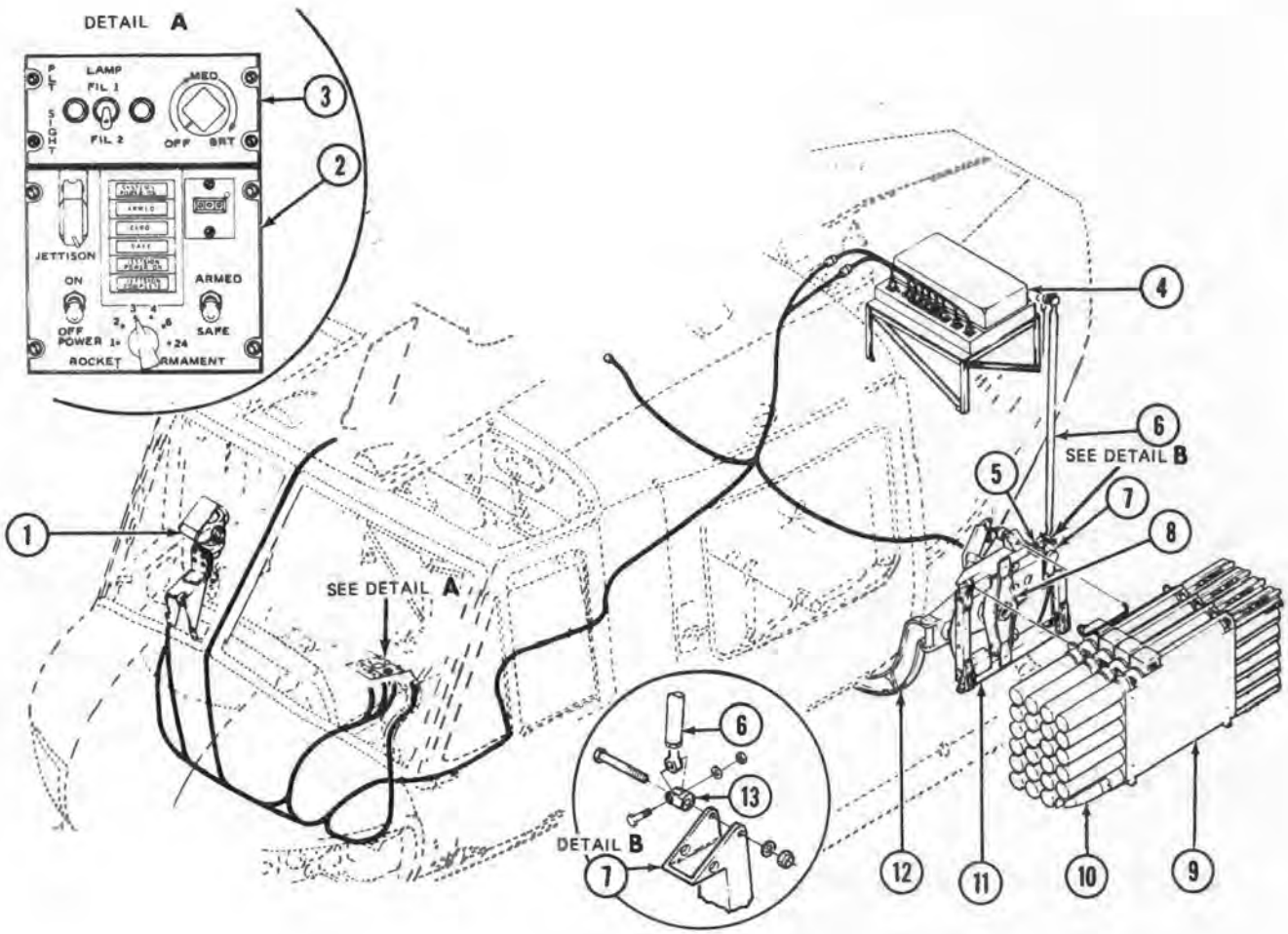


Figure 16-4. Armament and external fuel kit connections (Sheet 2 of 2)



1. Reflex sight assembly
2. Armament control panel
3. Sight light panel assembly
4. Armament junction box
5. Adjustable link assembly
6. External stores brace
7. Actuator bracket
8. Crank assembly
9. Launcher pods
10. 2.75 inch rocket
11. Adapter assembly
12. External stores support assembly
13. Clevis

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Figure 16-5. Armament subsystem M3

16-30. Removal — Rockets, 2.75 Inch (FFAR).

WARNING

Handling of rockets is confined to qualified personnel.

Before removing an unfired round from the launcher, make sure firing circuit is safe at rocket armament control panel and rocket jettison circuit breakers are pulled.

Smoking is not allowed near rockets. Do not use spark producing devices or power tools near rockets.

Precautions must be taken when handling unshielded rockets in the vicinity of radio and radar transmitters, as there is the possibility of squibs actuating prematurely.

A motor or rocket which is dropped is not to be used, but is labeled DROPPED ROUNDS, stored apart from usable rounds, and proper personnel contacted for disposition.

Do not fuel helicopter when rockets are in the launchers or nearby.

While launchers are being loaded or unloaded, helicopter shall be pointed away from personnel and installation and unnecessary personnel shall be kept well away from front and rear of launchers.

NOTE

Handling of 2.75 inch FFAR is similar to that of other aircraft rockets. Rockets should be transported to and from the assembly area and loaded and unloaded in accordance with standard handling practices.

a. Place helicopter BAT switch to OFF and disconnect battery.

b. Electrically ground helicopter to an earth ground.

c. Release the launcher firing pin assembly from the fin retainer assembly and swing the firing pin assembly clear of the breech.

d. Release and remove aluminum shear wire from detent rod.

NOTE

Rocket may be loaded and unloaded from either the muzzle or the breech end of the launcher tube.

e. Release launcher latch and carefully remove rocket from launcher tube.

f. Install fin protector as soon as rocket has been removed from launcher tube.

g. Visually inspect synchronized elevator and forward section of tailboom for possible damage caused by rocket debris.

16-31. Maintenance and Repair — Rockets, 2.75 Inch (FFAR). Refer to TM 9-1340-223-34.

16-32. Installation — Rockets, 2.75 Inch (FFAR).
a. Observe all removal warnings (paragraph 16-30).

NOTE

Handling of 2.75 inch FFAR is similar to that of other aircraft rockets. It should be transported to and from the assembly area and loaded and unloaded in accordance with standard handling practices.

b. Ensure armament control panel counter reads 000 and the ZERO indicators on control panel and junction box are illuminated.

c. Open (pull out) the two rocket jettison circuit breakers.

d. Place helicopter BAT switch to OFF and disconnect battery.

e. Electrically ground helicopter to an earth ground.

f. Ensure JETTISON switch guard on armament control panel is closed in place and wired with copper breakaway wire.

g. Ensure launcher firing pin assembly is clean and will make good electrical contact. Swing firing pin assembly clear of breech.

h. Remove fin protector from rocket fins. Ensure fin retainer and contact button are in place and launcher retaining groove and contact disk are free from grease and foreign material.

WARNING

If a gap exists between front end of rocket motor and rocket head when assembled handtight, the rocket shall not be used.

NOTE

Rocket may be loaded and unloaded from either muzzle or breech end of launcher tube.

i. Push rocket into launcher tube until launcher latch seats firmly into launcher latch retaining groove on the rocket.

WARNING

Use of improper shear wire may cause rocket to hang and not launch.

j. Position aluminum shear wire in detent rod and crimp to retain.

k. Swing launcher firing pin assembly back in place until pin assembly snaps into fin retainer assembly.

16-33. ROCKET LAUNCHER POD AND LAUNCHER ADAPTER ASSEMBLY M3.

16-34. Description — Rocket Launcher Pod and Launcher Adapter Assembly. A rocket launcher pod (9, figure 16-5) and launcher adapter assembly (11) are attached to each side of the helicopter fuselage. Each rocket launcher contains four six-rocket modules which are attached to the launcher adapter assembly. All modules are interchangeable with respect to attachment points and alignment. Switch boxes are on top of the module on the left side of the helicopter (looking forward) and on bottom of the module on the right side. The adapter assembly is an open, rectangular, aluminum frame which is attached to the crank assembly (8) by means of two explosive bolts. The crank assembly (8) is attached to the external stores support assembly (12).

16-35. Removal — Rocket Launcher Pod and Launcher Adapter Assembly. a. Remove all unfired rockets (paragraph 16-30).

b. Disconnect electrical connectors from explosive bolts, adapter assembly (11, figure 16-5) and switch box on inside module. Cap or cover connectors to prevent entrance of foreign material.

c. Remove launcher pod module assemblies (9) by pulling attachment pins.

d. Cut lockwire and remove two explosive bolts attaching adapter assembly (11) to crank assembly (8). Remove adapter assembly.

16-36. Cleaning — Rocket Launcher Pod and Launcher Adapter Assembly.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

Petroleum products such as bore cleaner, dry cleaning solvent, mineral spirits, paint thinner, and lubricants may damage electrical components, wiring, and rubber parts.

Launcher tubes should be cleaned after each day's firing with bore cleaner or hot, soapy water. The firing contacts should be examined after each day's firing and thoroughly cleaned. Wipe the firing contacts with cloth moistened with bore cleaner to remove all residue. Use a wire brush to aid in cleaning firing contacts.

16-37. Installation — Rocket Launcher Pod and Launcher Adapter Assembly. a. Position launcher adapter assembly (11, figure 16-5) on crank assembly (8) and install attaching explosive bolts and lockwire (C127).

b. Install launcher pod (9) assemblies on adapter assembly (11) with attachment pins.

WARNING

Do not connect electrical connectors to explosive bolts until just before flight.

c. Uncap or uncover electrical connectors and connect connectors to switch box on inside module and to adapter assembly (11).

16-38. CRANK ASSEMBLY AND ADJUSTABLE LINK ASSEMBLY M3.

16-39. Description — Crank Assembly and Adjustable Link Assembly. The crank assembly (8, figure 16-5) is an aluminum box section unit. In conjunction with a steel shaft, bearings, and other miscellaneous components, the crank assembly is attached to the crossbeam of the external stores support (12). The crank assembly serves as the mounting point for the adapter assembly (11). The adjustable link assembly (5) forward end is mounted in a yoke formed by the upper end of the crank and the plate and spacer assembly. The aft end of the adjustable link is pinned to the actuator bracket (7). The actuator bracket is an open box type structure with extended sides which form lugs for pinning the aft end of the adjustable link to the aft end of the crossbeam. The actuator bracket also receives the threaded ends of the adjustable backup bearings.

16-40. Removal — Crank Assembly and Adjustable Link Assembly. a. Remove rocket launcher pod (9) and launcher adapter assembly (11) (paragaraph 16-35).

b. Remove lockwire and unscrew bolt, washer, and pad from tripod fitting on fuselage securing external stores brace (6, figure 16-5).

c. Remove bolt, washer, and nut that attached external stores support brace (6, figure 16-5) to clevis (13) and lift brace from clevis.

d. Cut lockwire and remove bolt attaching the forward end of the adjustable link (5, figure 16-5) to the yoke formed by the upper end of the crank and the plate and spacer assembly.

e. Remove nut, washer, and bolt attaching aft end of adjustable link (5) to the actuator bracket (7). Remove adjustable link.

f. Remove teflon bearings from threaded holes in actuator bracket.

g. Remove nut, washers, and bolt attaching actuator bracket (7) to aft end of crossbeam and remove actuator bracket. Reinstall bolt, washer, and nut to attach crossbeam to aft support.

h. Cut lockwire and remove four nuts, washers, and bolts attaching brace (6) and bracket (7) to plate and spacer assembly. Remove bracket.

i. Cut lockwire and remove four bolts attaching brace (6) to crank assembly (8). Remove stop brace.

j. Remove crankshaft retainer nut from outboard end of crankshaft and remove keeper, key, crank assembly (8), bearing retainer, and roller bearing from crossbeam.

k. Remove crankshaft, with keeper, plate and spacer assembly, key, bearing retainer, and roller bearings, as a unit from the inboard side of the crossbeam.

l. Remove nuts, washers, and bolts attaching bearing housings to the external stores support crossbeam and remove bearing housings.

16-41. Installation — Crank Assembly and Adjustable Link Assembly. a. Position bearing housings to external stores support crossbeam and install attaching bolts, washers, and nuts. (See figure 16-5.)

b. Assemble roller bearings, bearing retainer, short key, plate and spacer assembly (with flat side outboard) and keeper to the end of the crankshaft which has the short keyway. Secure loosely with shaft retainer nut.

c. Insert the items assembled in preceding step b. into the external stores support crossbeam in such a manner that the plate and spacer assembly is on the inboard side of the crossbeam.

d. Assemble roller bearing, bearing retainer, crank assembly, long key, keeper, and shaft retainer nut to outboard end of crankshaft.

e. Tighten both retainer nuts until there is no looseness, but crankshaft rotates freely. Lock both nuts with tangs of keepers.

f. Align one end of stop brace with crank assembly (8) so that stop brace is above crossbeam. Install four bolts to attach stop brace to crank assembly and install lockwire (C127).

g. Position bracket (7) and other end of stop brace to plate and spacer assembly. Install four attaching bolts, washers, and nuts, then install lockwire (C127).

h. Remove nut, washers, and bolt attaching external stores support (12) crossbeam to aft support. Position actuator bracket (7) to aft end of crossbeam and install bolt, washers, and nut.

i. Install teflon backup bearings in threaded holes. Tighten front and bottom rear bearings **one** turn. Tighten top rear bearing **one and one-half** turns. Starting point for these torque values is **0.002** inch between the bearing arc and the teflon backup bearing.

j. Position aft end of adjustable link (5) to actuator bracket (7) and attaching clevis (13). Install attaching bolt, washer, and nut.

k. Attach external stores support brace (6) to clevis (13) with previously removed hardware.

l. Adjust brace (6) as necessary, so hole in opposite end of rod aligns with hole in tripod fitting.

m. Place washer and pad under bolt head, insert bolt through brace, and screw into fitting. Lockwire (C127) bolt when tight.

n. Position forward end of adjustable link (5) to the yoke formed by the upper end of the crank (8) and the plate and spacer assembly. Install attaching bolt and lockwire (C127).

16-42. ARMAMENT CONTROL PANEL M3.

16-43. Description — Armament Control Panel. The armament control panel (2, figure 16-5) is located in the lower left corner of the pedestal. The controls necessary for jettisoning the two pod assemblies, for turning on system power, for selecting the number of pairs of rounds in a ripple, and the SAFE-ARMED switch are on the panel. It also contains a counter to record the number of pairs of rounds fired during a mission, a SYSTEM POWER ON indicator light, an ARMED indicator light, a ZERO indicator light, a SAFE indicator light, a JETTISON POWER ON indicator light, and a JETTISON COMPLETE indicator light.

16-44. Removal — Armament Control Panel. a. Ensure that BAT switch is OFF and external power is disconnected.

b. Release quick-disconnect fasteners attaching armament control panel (2, figure 16-5) to pedestal and carefully raise panel assembly from pedestal.

c. Disconnect electrical connectors at back of panel and remove control panel. Cap or cover electrical connectors to prevent entrance of foreign material.

16-45. Installation — Armament Control Panel. a. Uncap or uncover electrical connectors and connect to back of control panel (2, figure 16-5).

b. Position control panel in pedestal and engage quick-disconnect fasteners.

16-46. REFLEX SIGHT ASSEMBLY M3.

16-47. Description — Reflex Sight Assembly. The pilot reflex sight assembly (1, figure 16-5) is used with armament subsystems M3, SS-11, and M22 as an aid in maintaining alignment of helicopter with target during firing. The reflex sight is mounted on a support assembly which is attached to the right side of the instrument panel in front of the pilot seat. The reflex sight consists of a sight body, a lamp and housing, and a Mark 4 Mod 0 reflector assembly. A small control panel on the center console contains a FIL 1 — FIL 2 switch and an intensity control for illumination of the reticle.

16-48. Removal — Reflex Sight Assembly.

CAUTION

The reflex sight assembly is a delicate optical instrument. Handle with care.

a. Remove four nuts and bolts attaching reflex sight (1, figure 16-5) to support assembly and remove reflex sight.

b. Remove five nuts, washers, and screws attaching support assembly to right side of instrument panel, and remove support assembly.

16-49. Installation — Reflex Sight Assembly. a. Position support assembly on instrument panel, and install attaching screws, washers, and nuts.

b. Position reflex sight (1, figure 16-5) against support assembly and install attaching bolts and nuts.

16-50. SIGHT LIGHT PANEL ASSEMBLY.

6-51. Description — Sight Light Panel Assembly. The sight light panel assembly (3, figure 16-5) for the 2.75-inch M3 fixed rocket installation is in the lower left corner of the pedestal just forward of the armament control panel. The purpose of this panel is to control the power to the reflex sight lamp. This action, as well as the intensity of illumination, is accomplished by means of a rheostat. The sight lamp has two filaments, either of which may be used for illumination. A switch on the sight light panel assembly affords the operator a choice of FIL 1 or FIL 2. The panel also is equipped with two standard panel lights.

16-52. Removal — Sight Light Panel Assembly. a. Ensure that BAT switch is OFF and external power is disconnected.

b. Release quick-disconnect fasteners attaching sight light panel assembly (3, figure 16-5) to pedestal and carefully raise panel assembly from pedestal.

c. Disconnect electrical connectors at back of panel and remove panel assembly. Cap or cover electrical connectors to prevent entrance of foreign materials.

16-53. Installation — Sight Light Panel Assembly. a. Uncap or uncover electrical connectors and connect to back of panel assembly (3, figure 16-5).

b. Position sight light panel assembly (3) in pedestal and engage quick-disconnect fasteners.

16-54. ARMAMENT JUNCTION BOX M3.

16-55. Description — Armament Junction Box. The armament junction box (4, figure 16-5) contains the circuitry necessary for firing the rockets and for jettisoning the two rocket pod assemblies. The junction box also contains a RESET button that cycles the stepping switch to zero, and a zero indicator light that illuminates when the stepping switch is in zero position.

16-56. Removal — Armament Junction Box. a. Ensure that BAT switch is OFF and external power is disconnected.

b. Disconnect electrical connectors from junction box (4) and cap or cover to prevent entrance of foreign material.

c. Remove bolts and washers attaching junction box (4) to shelf assembly and remove junction box from aircraft.

16-57. Installation — Armament Junction Box. a. Position junction box (4, figure 16-5) in place on shelf and install attaching bolts and washers.

b. Uncap or uncover electrical connectors and connect to junction box (4).

16-58. ARMAMENT SUBSYSTEM M5.

16-59. Description — Armament Subsystem M5. Helicopters having MWO 55-1520-211-34/33 incorporated may be equipped with armament subsystem M5, chin mounted 40 millimeter grenade launcher. Armament subsystem M5 is an electrically powered, remote controlled weapon system capable of launching antipersonnel type grenades from a turret assembly externally mounted on the nose of the helicopter. The subsystem consists of a 40 millimeter grenade launcher M75 mounted in a turret assembly, ammunition feed system, servo-amplifier junction box assembly, turret control panel assembly, hand control sight assembly, and sight mount bracket assembly. Refer to TM 9-1010-207-12 and TM 9-1010-207-34 for additional information.

NOTE

Refer to paragraph F-11 for armament subsystem airframe wiring diagrams, and paragraphs 9-5 through 9-11 for electrical component maintenance.

16-60. Removal — Armament Subsystem M5. Refer to TM 9-1010-207-12 and TM 9-1010-207-34.

16-61. Maintenance and Repair — Armament Subsystem M5. Refer to TM 9-1010-207-12 and TM 9-1010-207-34.

16-62. Installation — Armament Subsystem M5. Refer to TM 9-1010-207-12 and TM 9-1010-207-34.

16-63. ARMAMENT SUBSYSTEM M6.

16-64. Description — Armament Subsystem M6. Armament subsystem M6 (figure 16-6) consists of four 7.62 mm M60C machine guns, two gun mount assemblies, and two turret adapters. The subsystem also includes the ammunition feed group, armament control panel, sighting station, and interconnecting electrical and hydraulic power sources. Refer to TM 9-1005-243-12 for additional information.

NOTE

Refer to paragraph F-11 for armament subsystem airframe wiring diagrams, and paragraphs 9-5 through 9-19 for electrical component maintenance.

16-65. MACHINE GUN, 7.62MM M60C.

16-66. Description — Machine Gun, 7.62MM M60C. The 7.62mm M60C machine gun is a basic M60 machine gun modified for use on the helicopter. Armament subsystem M6 utilizes two 7.62mm M60C machine guns mounted on each side of the helicopter, one above the other (figure 16-6). The gun cover assemblies on the left guns face inboard, towards the helicopter, while those on the right guns face outboard. Ammunition is fed to the guns from above and cartridge cases are ejected downward. The guns are attached to the mount assemblies in such a manner that they can be quickly removed and replaced. All four machine guns are interchangeable and may be installed on either mount assembly.

16-67. Removal — Machine Gun, 7.62MM M60C.

WARNING

To guard against danger in case of accidental firing, all personnel should remain clear of front end of guns. NO-STEP markings on armament should be observed at all times.

NOTE

Removal procedures for all four machine guns are the same.

a. Before removing machine guns (36, figure 16-6) from helicopter, perform the following:

(1) Ensure that BAT switch is OFF and external power is disconnected.

(2) Set the OFF-SAFE-ARMED switch to OFF.

(3) Ensure control panel indicator lights are out.

(4) Ensure all machine gun charger cylinder assembly (16) pistons are in out-of-battery position.

b. Unload machine guns (36) as follows:

(1) Rotate gun cover latch lever (13) counterclockwise and open gun cover (11).

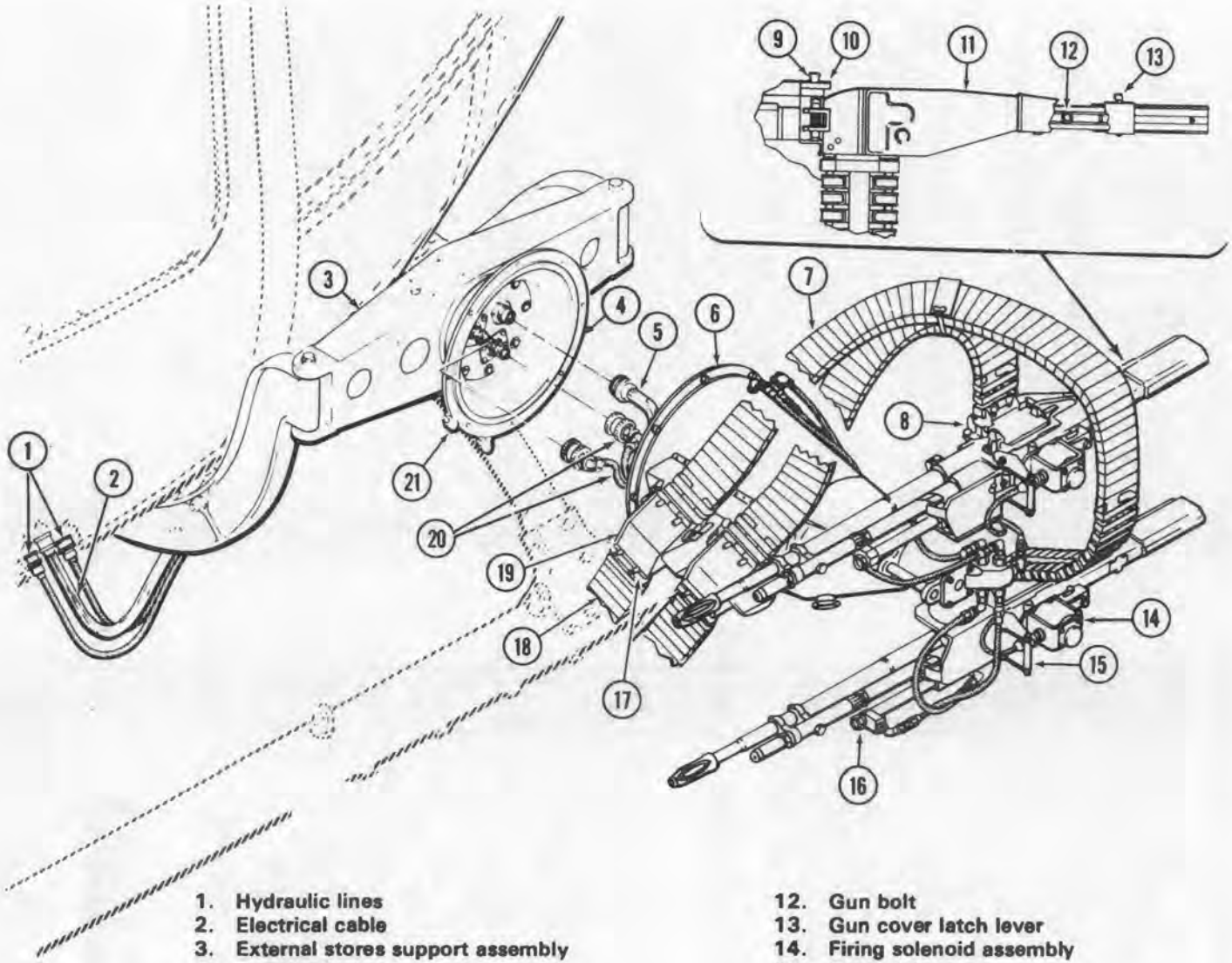
(2) Depress spring-loaded ammunition chute latches (8) on the machine gun ammunition receiver, and disconnect ammunition chute (7) from gun. Carefully fold loose end of ammunition chute (7) over gun mount assembly (6).

c. Close gun cover (11) and ensure cover latch lever (13) locks the cover in place.

d. Use a 3/16-inch offset drift pin, or other suitable tool, to depress plunger in aft end of charger cylinder assembly (16) piston. This action unlocks a detent inside the charger cylinder assembly, which relieves hydraulic pressure and permits disengagement of spring-loaded finger latch (10) attaching charger cylinder assembly (16) to machine gun cocking handle (9) bolt. Disengage finger latch (10) and rotate latch and charger cylinder assembly piston to clear cocking handle bolt.

e. Press up on underside of firing solenoid assembly (14) to trip sear. This action permits the gun bolt (12), cocking handle (9) and charger cylinder assembly (16) piston to move forward to battery position and remain in that position.

f. Disconnect electrical connector from mating receptacle on firing solenoid assembly (14).



1. Hydraulic lines
2. Electrical cable
3. External stores support assembly
4. Turret adapter
5. Electrical cable
6. Gun mount
7. Ammunition chute — cartridge drive to machinegun
8. Ammunition chute latch
9. Cocking handle
10. Finger latch
11. Gun cover
12. Gun bolt
13. Gun cover latch lever
14. Firing solenoid assembly
15. Gun latch
16. Charger cylinder assembly
17. Ammunition chute latches
18. Ammunition chute — ammunition box to cartridge drive
19. Cartridge drive
20. Hydraulic lines
21. Hinge pins

Figure 16-6. Armament subsystem M6 (Sheet 1 of 2)

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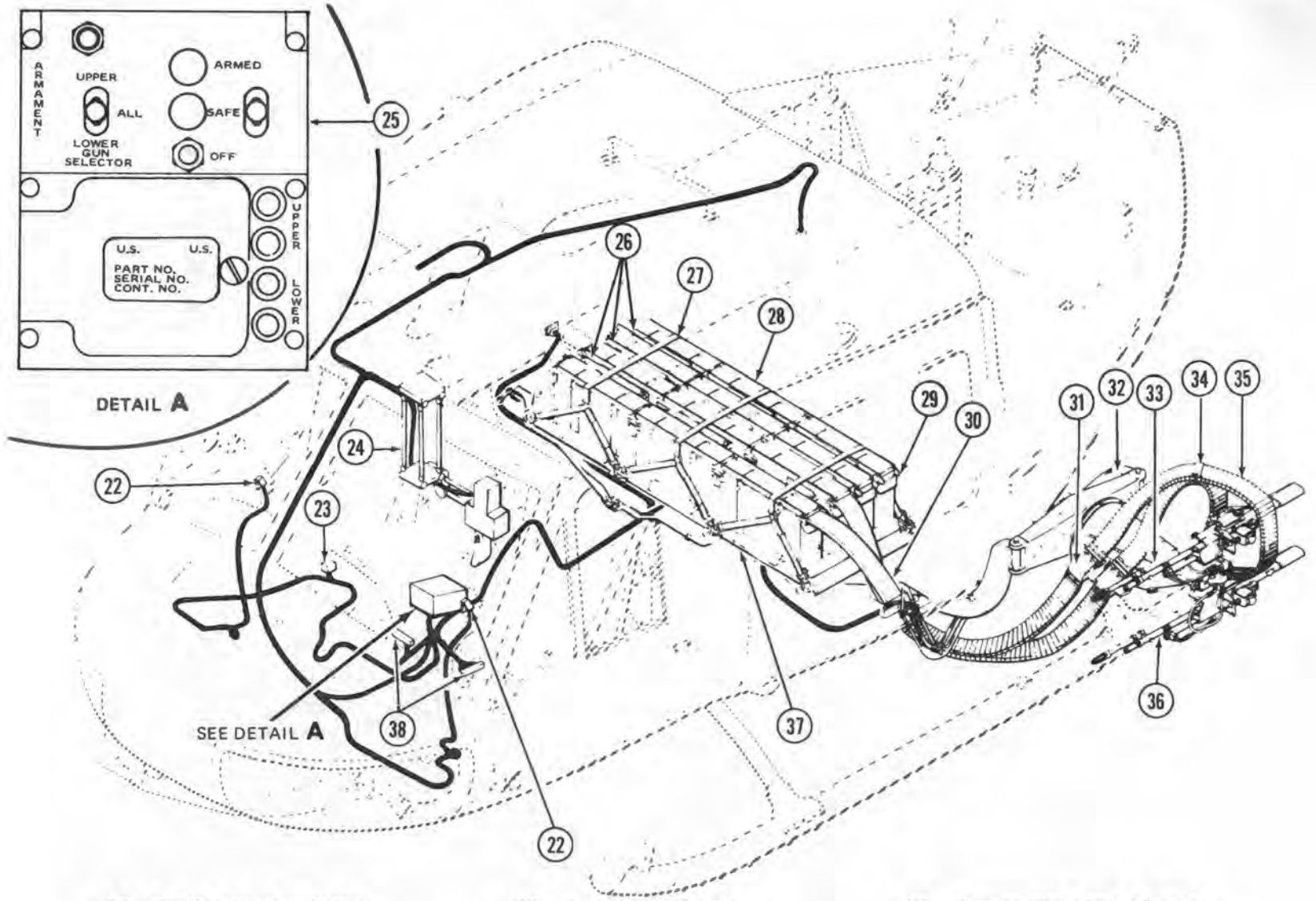

22. Cyclic trigger switches
23. Armament fire control relay
24. Sighting station
25. Control panel
26. Ammunition box clamps
27. Strap assemblies
28. Ammunition boxes
29. Ammunition chute latch
30. Ammunition chutes
31. Cartridge drive
32. External stores support assembly
33. Machinegun mount and adapter
34. Ammunition chute clamps
35. Ammunition chute
36. Machine gun
37. Ammunition box tray
38. Terminal blocks

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Figure 16-6. Armament subsystem M6 (Sheet 2 of 2)

g. Depress spring-loaded safety latches on gun latch (15) and unlock gun latch. Disengage machine gun from gun latch pawls. Remove machine gun (36) from gun mount (6).

16-68. Maintenance and Repair — Machine Gun, 7.62MM M60C. Refer to TM 9-1005-243-12 and TM 9-1005-243-34.

16-69. Installation — Machine Gun, 7.62mm M60C. a. Before installing machine guns on helicopter, perform the following:

(1) Ensure that BAT switch is OFF and external power disconnected.

(2) Set the OFF-SAFE-ARMED switch to OFF.

b. Depress spring-loaded safety latches on gun latch (15, figure 16-6) and unlock gun latch. Position and engage machine gun (36) in gun latch pawls. Close and lock spring-loaded safety latches.

c. Connect electrical connector to mating receptacle on firing solenoid assembly (14).

d. Position spring-loaded finger latch (10) aft of cocking handle (9) bolt. Engage finger latch with bolt.

e. Reinstall ammunition chutes (7) (paragraph 16-79).

16-70. GUN MOUNT ASSEMBLY AND TURRET ADAPTER M6.

16-71. Description — Gun Mount Assembly and Turret Adapter. The flexible gun mount assemblies (6, figure 16-6) provide support for 7.62mm M60C machine guns, and the necessary mechanism to position the guns as directed by the gunner. The gun mount assemblies are capable of moving the two guns through a vertical arc of plus **9** degrees and minus **66** degrees from center line position. They can also move both guns horizontally from **12** degrees inboard to **70** degrees outboard. All four guns move simultaneously, but when either mount moves the attached guns to the **12** degree inboard position, a solenoid switch is activated and both movement and firing of those guns is automatically stopped. Movement of the guns is controlled by means of hydraulic power. Each gun mount is equipped with an electrically operated cartridge drive which moves the ammunition from the ammunition boxes to the machine guns. The inboard end of each gun mount is attached to the turret adapter, which is attached to the external stores support assembly. A hinge at the junction of the gun mount and turret adapter permits the mount to be swung to one side for easy access to hydraulic and electrical connectors.

16-72. Removal — Gun Mount Assembly and Turret Adapter.

NOTE

Left and right gun mounts and turret adapters are not interchangeable.

a. Remove 7.62mm machine guns (36, figure 16-6) (paragraph 16-67).

b. Depress spring-loaded ammunition chute latches (8, figure 16-6) at top and bottom of cartridge drives (19) and release ammunition chutes (7) from cartridge drives. Remove cartridge drive (19) to machine gun ammunition chutes (7) and place on helicopter aft cabin floor or other suitable location. Fold ammunition chutes (18) back onto aft cabin floor.

c. Remove nuts, washers, and bolts attaching gun mount (6) to turret adapter (4). Carefully swing gun mount open.

NOTE

Use care not to damage hydraulic lines or electrical cables. Cap or cover hydraulic line couplings, and electrical receptacles upon removal to prevent entrance of foreign material.

d. Disconnect two hydraulic lines (20) at quick-disconnects on turret adapter (4). Disconnect electrical cable (5) from receptacle on turret adapter (4).

WARNING

Each gun mount assembly weighs approximately 60 pounds. Use two men to remove each mount as outlined in the following step e.

e. Position one man on each side of the gun mount (6) and carefully raise the mount from the hinge pins (21) on the turret adapter (4). Move gun mount (6) to location where it will not be damaged.

f. Disconnect hydraulic lines (1) at helicopter fuselage quick-disconnects.

g. Back off check nuts connecting hydraulic lines (1) to turret adapter (4) quick-disconnects. Disconnect hydraulic lines from quick-disconnects.

h. Disconnect electrical cable (2) from receptacle at fuselage skin.

i. Remove eight nuts, washers, and bolts attaching turret adapter (4) to external stores support assembly (3) and remove turret adapter (4).

j. Back off check nut attaching electrical receptacle to turret adapter (4) and remove receptacle and attached electrical cable (2).

k. Remove four nuts, washers, and bolts attaching each hydraulic mounting flange to turret adapter (4) and remove mounting flanges. Back off quick-disconnect check nuts and remove hydraulic quick-disconnect from turret adapter (4).

16-73. Maintenance and Repair — Gun Mount Assembly and Turret Adapter. Refer to TM 9-1005-243-12 and TM 9-1005-243-34.

16-74. Installation — Gun Mount Assembly and Turret Adapter.

NOTE

If turret adapter (4, figure 16-6) has not been removed, proceed to step f.

a. Position hydraulic quick-disconnect in turret adapter (4) and install check nuts. Position hydraulic mounting flange over each check nut and install four attaching bolts, washers, and nuts.

b. Thread electrical cable (2) through turret adapter (4) and position electrical receptacle. Install attaching check nut.

c. Position turret adapter (4) to external stores support assembly (3) and install eight attaching bolts, washers, and nuts.

NOTE

Remove caps or covers from electrical cables and receptacles, and hydraulic lines and couplings just prior to installation.

d. Connect electrical cable (2) to receptacle at fuselage skin.

e. Connect hydraulic lines (1) to quick-disconnects at fuselage skin.

WARNING

Each gun mount weighs approximately 60 pounds. Use two men to install each mount as outlined in following step f.

f. Position one man on each side of the gun mount (6) and carefully engage the gun mount half-hinge with the turret adapter hinge pins (21).

g. Connect electrical cable (5) to receptacle at turret adapter (4).

h. Connect hydraulic lines (20) to quick-disconnects at turret adapter (4).

CAUTION

Use extreme care when closing the gun mount assembly to avoid pinching or kinking the hydraulic hoses and to ensure hoses do not interfere with servo valves in the gun mount assembly. Ensure small two-pin plug is properly mated with the receptacle on the charger control valve. Do not force gun mount assembly into position.

i. Carefully swing gun mount (6) to the closed position and install bolts, washers, and nuts attaching the gun mount to the turret adapter (4).

j. Position loose end of ammunition box to cartridge drive ammunition chutes (18) to bottom of cartridge drives (19). Depress spring-loaded ammunition chute latches (17) and connect ammunition chutes (18) to cartridge drives (19).

k. Position cartridge drive to machine gun ammunition chutes (7) to top of cartridge drives (19). Depress spring-loaded ammunition chute latches (17) and connect ammunition chutes (7) to cartridge drives (19).

l. Install 7.62mm M60C machine guns (paragraph 16-69).

16-75. AMMUNITION FEED GROUP M6.

16-76. Description — Ammunition Feed Group. The ammunition feed group (figure 16-6) consists of eight ammunition chutes, twelve ammunition boxes and an ammunition box tray equipped with three hold-down strap assemblies. Four ammunition chutes, two on each side of the helicopter, connect the top of the cartridge drive assemblies to the machine guns. A comparable installation connects the ammunition boxes to the bottom of the cartridge drive assemblies. The chutes connecting the ammunition boxes to the bottom of the cartridge drive assemblies pass through an opening in the cargo floor and the fuselage. The ammunition boxes are mounted on the ammunition box tray, in the cargo area, and are held firmly in place by three hold-down strap assemblies. The ammunition boxes are arranged in three groups of four boxes each. Each box is capable of holding approximately 450 rounds of ammunition, with a total capacity of **5434** rounds, weighing **353.21** pounds. The ammunition box tray is attached to the cargo area floor by screws. The holddown strap assemblies secure the ammunition boxes and tray to the cargo area floor.

16-77. Removal — Ammunition Feed Group. a. Observe safety precautions and unload machine gun (paragraph 16-67, steps **a** and **b**).

NOTE

Removal procedures for right and left ammunition chutes are the same.

b. Depress the spring-loaded ammunition chute latches (17, figure 16-6) which connect the chutes (7) to the top of the cartridge drives (19) and disengage chutes from cartridge drives.

NOTE

Ammunition chute clamps may be removed from chutes before storage.

c. Depress the spring-loaded ammunition chute latches (17) which connect the chutes (18) to the bottom of the cartridge drives (19) and the ammunition boxes. Withdraw chutes through opening in the cargo floor and fuselage.

NOTE

Ammunition chute clamps may be removed from chutes before storage.

d. Release three ammunition box hold-down strap assemblies (27) at lower forward side of ammunition box tray (37). Remove strap assemblies and ammunition box clamps (26).

e. Remove ammunition boxes (28) from helicopter.

f. Remove screws attaching ammunition box tray (37) to cargo area floor and remove tray from helicopter.

16-78. Maintenance and Repair — Ammunition Feed Group. Refer to TM 9-1005-243-12 and TM 9-1005-243-34.

16-79. Installation — Ammunition Feed Group. a. Position ammunition box tray (37, figure 16-6) in helicopter and install attaching screws.

b. If ammunition boxes are not loaded, complete the following:

(1) Unsnap clamps (26) on top of ammunition box covers and remove covers.

(2) Fold the allowable maximum quantity of ammunition into boxes with links up, single-link end first. Projectiles must point to the left for feed to the left machine guns and to the right for feed to the right machine guns.

(3) Position the twelve ammunition boxes (28) on the ammunition box tray (37).

(4) Connect the ammunition belts together at adjoining boxes.

(5) Crimp over the trailing link hanging out of the end of the third box in each row with a pair of pliers. Inspect all ammunition to ensure it is placed properly in all boxes.

(6) Install covers on all ammunition boxes (28).

c. Position ammunition box clamps (26) in place. Hook three holddown strap assemblies (27) to strap loops along aft side of ammunition box tray (37) and position snugly over ammunition boxes (28). Position

other ends of strap assemblies to strap loops forward of ammunition box tray. Tighten and secure holddown strap assemblies (27).

d. Position one end of ammunition chutes (7) to top of cartridge drives (19). Depress ammunition chute latches (17) and connect chutes to drives. Allow opposite ends of these two chutes to hang over the gun mount assembly (6).

e. Position one end of ammunition chutes (18) to bottom of cartridge drives (19). Depress ammunition chute latches (17) and connect chutes to drives. Grasp the two ammunition chutes (7) and position the lower chute on top of the upper chute a short distance behind the gun mount assembly (6). Secure chutes in this position with an ammunition chute clamp (34) approximately midway between the gun mount assembly (6) and the opening in the helicopter fuselage.

f. Extend free ends of left ammunition chutes (7) through the opening in the helicopter fuselage and cargo area floor into the cargo area. Connect the lower machine gun chute to the end box of the second row of ammunition boxes (28).

NOTE

Installation of left and right ammunition chutes is the same, except the right lower gun chute is connected to the end box of the fourth row of ammunition boxes and the right upper gun chute is connected to the end box of the third row of ammunition boxes.

16-80. ARMAMENT CONTROL PANEL M6.

16-81. Description — Armament Control Panel. The armament control panel (25, figure 16-6) contains the OFF-SAFE-ARMED switch, GUN SELECTOR switch, ARMED (red) indicator light, SAFE (green) indicator light, and four fuses. The armament control panel is located in the lower left corner of the pedestal console.

16-82. Removal — Armament Control Panel. a. Ensure helicopter BAT switch is OFF and external power is disconnected.

b. Release quick-disconnect fasteners attaching control panel (25, figure 16-6) to pedestal console and carefully raise control panel from pedestal to expose electrical connectors.

c. Disconnect electrical connectors from receptacles at back of panel and remove control panel (25).

d. Cap or cover electrical connectors to prevent entrance of foreign material.

16-83. Maintenance and Repair — Armament Control Panel. Refer to TM 9-1005-243-12 and TM 9-1005-243-34.

16-84. Installation — Armament Control Panel. a. Remove protective caps or covers and connect electrical connectors to receptacles at back of control panel (25, figure 16-6).

b. Position control panel (25) in pedestal console and engage quick-disconnect fasteners.

16-85. SIGHTING STATION M6.

16-86. Description — Sighting Station. The sighting station (24, figure 16-6) provides the means of remotely directing and firing the machine guns. The sighting station is suspended from the cabin roof above and forward of the copilots station.

16-87. Removal — Sighting Station. a. Ensure helicopter BAT switch is OFF and external power is disconnected.

b. Disconnect electrical connector from receptacle on sighting station mounting pad bracket and cap or cover connector and receptacle to prevent entrance of foreign materials.

CAUTION

The sighting station is a delicate, precision instrument. Do not drop or jar at any time.

c. Manually support the sighting station (24, figure 16-6) and remove the four bolts and washers attaching it to the mounting pad on the cabin roof.

d. Carefully remove sighting station (24) from the helicopter.

16-88. Maintenance and Repair — Sighting Station. Refer to TM 9-1005-243-12 and TM 9-1005-243-34.

16-89. Installation — Sighting Station.

CAUTION

The sighting station is a delicate, precision instrument. Do not drop or jar at any time.

NOTE

Thick edge of the mounting plate must be forward, toward the nose of helicopter.

a. Carefully position sighting station (24, figure 16-6) in place and align mounting holes. Install four attaching washers and bolts.

b. Remove protective caps or covers and connect electrical connector to receptacle on mounting pad bracket.

16-90. ARMAMENT SUBSYSTEM M16.

16-91. Description — Armament Subsystem M16. Helicopters with MWO 55-1520-211-30/4 incorporated may have armament subsystem M16 installed. Armament subsystem M16 adds 2.75 inch rocket capability to the 7.62mm machine guns of armament subsystem M6 (figure 16-6). Armament subsystem M16 includes the components of armament subsystem M6 (paragraph 16-63), two rocket launcher rack and support assemblies which replace the M6 turret adapters, and an intervalometer control panel. The rocket launcher rack and support assemblies bolt to the external stores support assemblies on the helicopter, and each rack contains an MA-4A bomb rack with four sway braces. Cabling in the rack is connected to the helicopter wiring to furnish firing voltage and electrical jettison capability. The rocket launchers may also be jettisoned manually. Refer to TM 9-1090-201-12 for additional information.

NOTE

Refer to paragraph F-11 for armament subsystem airframe modification wiring diagrams, and paragraphs 9-5 through 9-11 for electrical component maintenance.

16-92. Removal — Armament Subsystem M16. Refer to TM 9-1090-201-12.

16-93. Maintenance and Repair — Armament Subsystem M16. Refer to TM 9-1090-201-12.

16-94. Installation — Armament Subsystem M16. Refer to TM 9-1090-201-12.

16-95. ARMAMENT SUBSYSTEM M21.

16-96. Description — Armament Subsystem M21. Armament subsystem M21 consists of two M134 high rate 7.62-millimeter machine guns and assemblies, two M158 2.75-inch aircraft rocket launchers with two rack and support assemblies, a control panel, a control box assembly, an intervalometer, 12 ammunition box assemblies, a sighting station (copilot station), an M60 reflex sight (pilot station), and sight mount. Armament subsystem M21 is installed in accordance with MWO 55-1520-211-30/8 and TB 55-1520-211-20/5. Refer to TM 9-1090-202-12 and TM 9-1090-202-34 for additional information.

NOTE

Refer to paragraph F-11 for armament subsystem airframe wiring diagrams, and paragraphs 9-5 through 9-19 for electrical component maintenance.

16-97. Removal — Armament Subsystem M21. Refer to TM 9-1090-202-12 and TM 9-1090-202-34.

16-98. Maintenance and Repair — Armament Subsystem M21. Refer to TM 9-1090-202-12 and TM 9-1090-202-34.

16-99. Installation — Armament Subsystem M21. Refer to TM 9-1090-202-12 and TM 9-1090-202-34.

16-100. ARMAMENT SUBSYSTEM M22.

16-101. Description — Armament Subsystem M22. Armament subsystem M22 is a guided missile launcher system designed for use on helicopters

serial No. 64-14101 and subsequent. The system is primarily an antitank weapon, but can be used effectively against such targets as fortified gun emplacements and bunkers. The system contains six M22 missiles (12, figure 16-7), launchers (11), and pylons (10) attached to boom assemblies (9) that protrude from the fuselage. Each boom assembly is equipped with three missiles, launchers, and pylons. The inboard end of each boom assembly is secured by a mechanical jettison device (8) that is attached to the external stores support assembly (7).

A gunner sight assembly (6) is provided for visual contact with the missile after firing. The gunner control stick assembly (3) incorporates an adjustable armrest and is mounted on a panel assembly which is attached to the cabin floor. The pilot reflex sight assembly (1) acts as a visual aid to maintain proper alignment of the helicopter with the target during firing of a missile. The missile selection box (5) and guidance control unit box (13), mounted just aft of the console, control the operation of the system. The missile selection box contains switches and controls necessary to energize the system, select missile to be fired, jettison guidance wires of fired missiles, and jettison either a single launcher or all launchers and missiles. The guidance control unit, located below the missile selection box, contains the electronic signals coder which converts control stick commands to missile guidance signals. The switching mechanism controlling the ignition and firing sequence of the missile is also contained in the guidance control unit. The manual emergency jettison controls (2) and mechanical jettison device (8) enable the pilot to manually jettison both boom assemblies (9) simultaneously. The pilot also has available an electrical jettison control which is on the right side of the console. This control jettisons all launchers (11) simultaneously, but leaves the boom assemblies (9) attached to the helicopter. Refer to TM 9-1400-461-20 and TM 9-1400-461-35 for additional information.

NOTE

Refer to paragraph F-11 for armament subsystem airframe wiring diagrams, and paragraphs 9-5 through 9-11 for electrical component maintenance.

16-102. Removal — Armament Subsystem M22. Refer to TM 9-1400-461-20 and TM 9-1400-461-35.

16-103. Maintenance and Repair — Armament Subsystem M22. Refer to TM 9-1400-461-20 and TM 9-1400-461-35

16-104. Installation — Armament Subsystem M22. Refer to TM 9-1400-461-20 and TM 9-1400-461-35.

16-105. EXTERNAL AUXILIARY FUEL PYLON.

16-106. Description — External Auxiliary Fuel Pylon. The pylon assemblies are attached to the pylon supports (2, figure 16-8) on both sides of the helicopter and contain the pylon hooks to which the fuel tanks (4) are attached. An air pump (8, figure 16-9) is mounted on the forward end of each pylon and an air pressure regulator (6) is located at the approximate center on the outboard side. Fuel, air, and electrical lines and cabling are also a part of each pylon assembly.

16-107. Removal — External Auxiliary Fuel Pylon. a. Remove fuel tank (paragraph 10-234).

b. Disconnect fuselage fuel and air coupling (11 and 12, figure 16-9) and electrical connector (10) inside helicopter skin. Cover fuel, air, and electrical connections to prevent entry of foreign matter.

c. Disconnect lower manual release cable (13) inside helicopter skin.

d. Install access panel in skin on left side of helicopter and in cabin floor on right side.

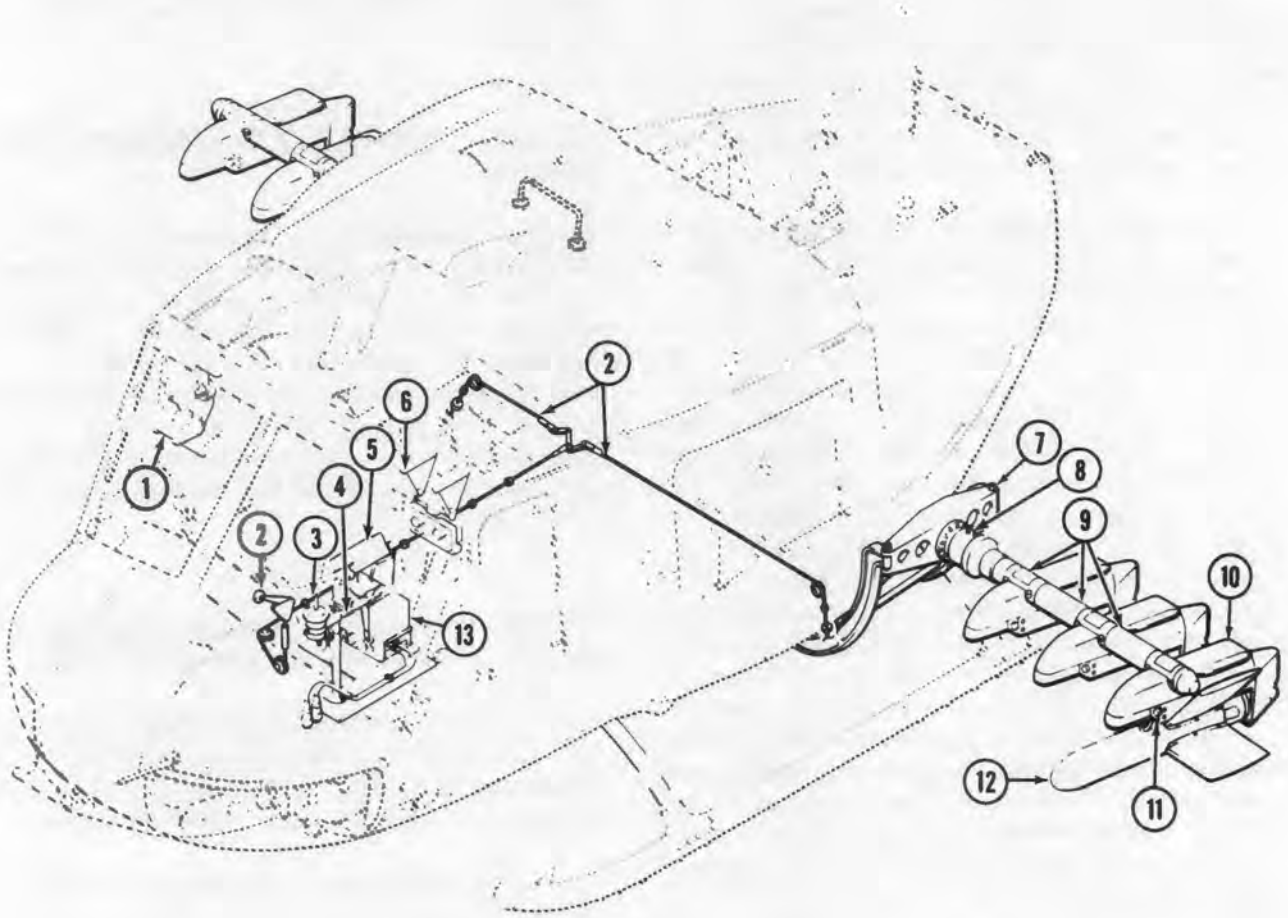
e. Remove pin and cotter pin attaching cable guard tube (15) to support assembly (9).

f. Disengage cable guard tube (15) from support assembly (9).

g. Withdraw manual release cables from lower guard tubes.

h. Remove pin, washer, and cotter pin (14) attaching upper end of manual release cable to pylon assembly.

i. Support pylon assembly. Remove nuts, washers, and bolts attaching pylon to pulley support tubes and pylon support. Remove pylon assembly.



1. Pilots reflex sight
2. Manual emergency jettison controls
3. Control stick assembly
4. Control stick support
5. Missile selection box
6. Gunners sight assembly
7. External stores support
8. Mechanical jettison device
9. Boom assembly
10. Pylon
11. Launcher
12. Missile
13. Guidance control unit box

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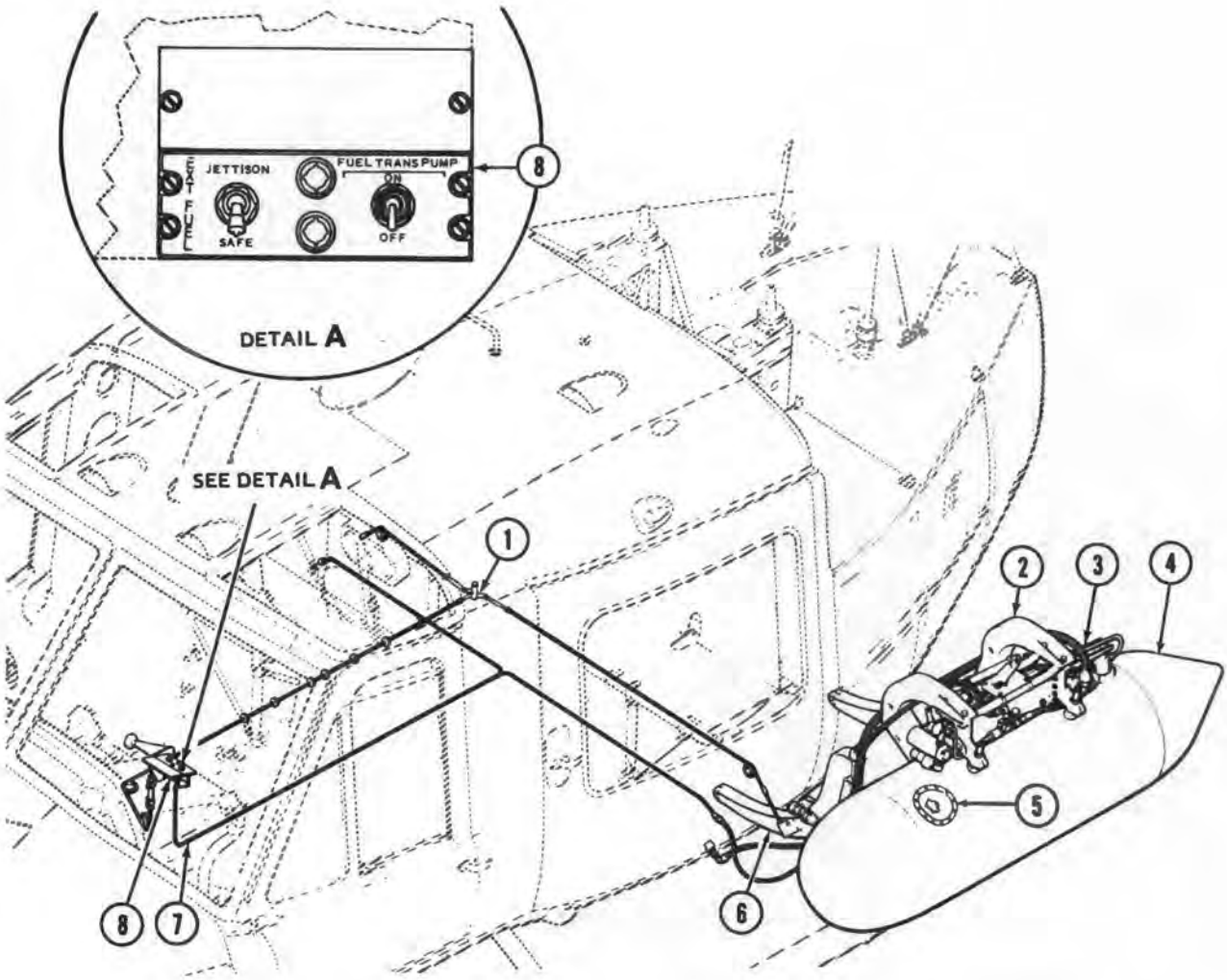
Figure 16-7. Armament subsystem M22



1. Manual release mechanism
2. Pylon support
3. Pylon assembly
4. Auxiliary fuel tank
5. Filler cap
6. External stores support assembly
7. Electrical release controls
8. Control panel

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Figure 16-8. External auxiliary fuel system

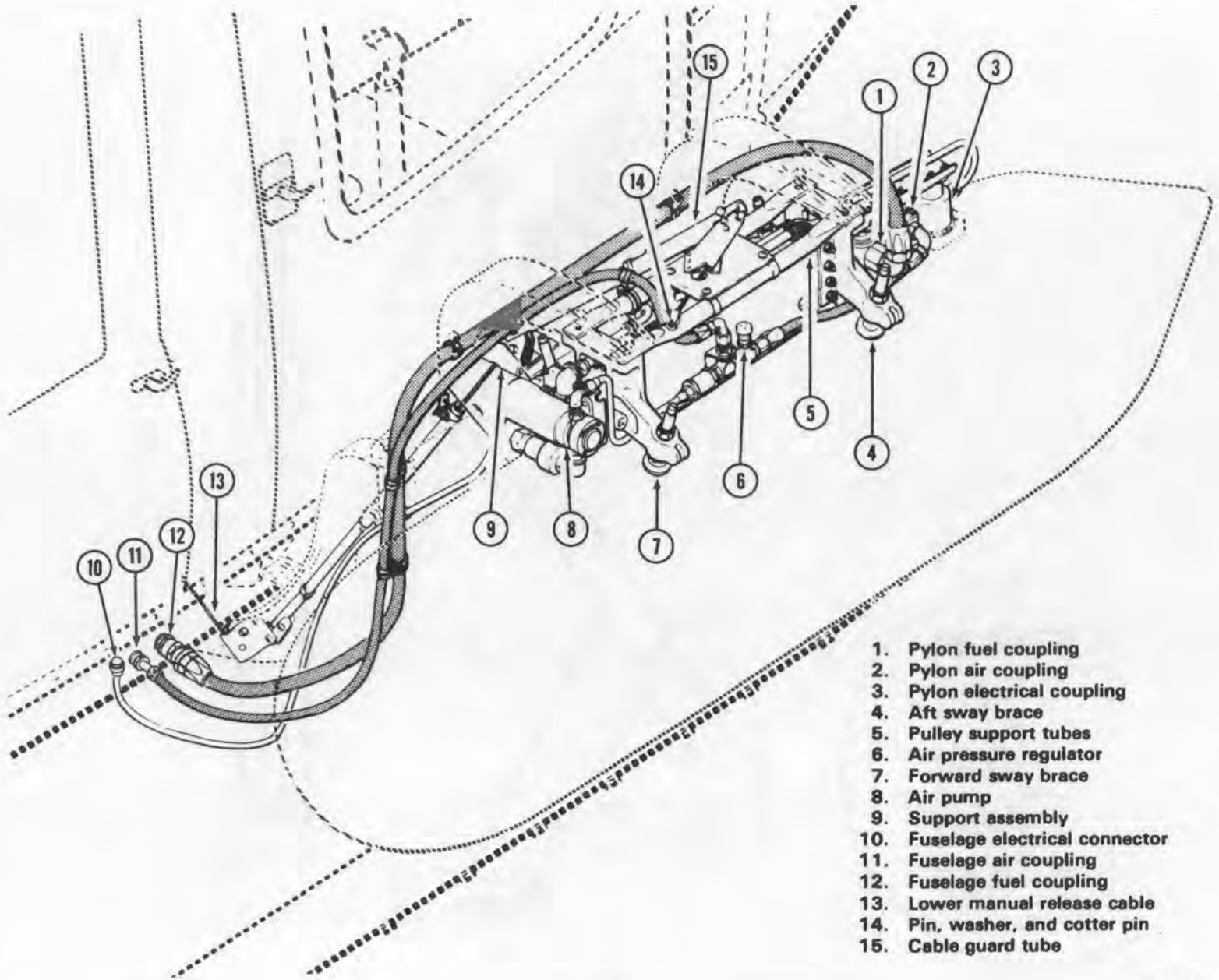


Figure 16-9. External auxiliary fuel tank installation

j. Remove pulley support tubes (5) with support, cable guard tube, and manual release cables still attached.

16-108. Installation — External Auxiliary Fuel Pylon. a. Install pulley support tubes (5, figure 16-9) and pylon assembly on pylon support. Install bolts, washers, and nuts.

NOTE

Cable guard tube with manual release cables installed shall be attached to pulley support tubes. Air pump (8) on pylon shall be forward.

b. Attach upper end of manual release cable to pylon assembly with pin, washer, and cotter pin (14).

c. With hand tension on cable, adjust pulley support bracket to obtain proper cable alignment. This adjustment will place the forward edge of support bracket between **3.6 and 4.6** inches aft of aft edge of pylon support forward arm.

d. Align manual release cable over the pulley in support assembly (9) on top of external stores support assembly.

e. Align holes in cable guard tube (15) with holes in support assembly (9) and install attaching pin and cotter pin.

f. Thread lower manual release cable (13) through lower guard tubes.

NOTE

Cable tension can be varied by adjustment of the turnbuckle located between the upper and lower manual release cables.

g. Remove access panels from fuselage skin on left side of helicopter and from cabin floor on right side.

h. Connect lower manual release cable (13) to existing release cable.

CAUTION

Fuel couplings are colored RED, and air couplings are colored GREEN. Ensure connection of red coupling to red coupling and green to green.

i. Uncap or uncover fuel and air couplings (11 and 12) and electrical connector (10).

j. Connect fuel and air couplings (11 and 12) and electrical connector (10) to existing internal lines and electrical receptacle.

k. Before installing fuel tank, arm the pylon and operate both the manual and electrical release mechanisms to ensure smooth, efficient operation.

16-109. EXTERNAL AUXILIARY FUEL PYLON SUPPORT.

16-110. Description — External Auxiliary Fuel Pylon Support. The pylon support (2, figure 16-8) is a heavy-duty aluminum alloy casting. It is attached to the external stores support assembly and supports the pylon and fuel tank.

16-111. Removal — External Auxiliary Fuel Pylon Support. a. Adequately support the pylon support (2, figure 16-8).

b. Remove nuts, washers, and bolts attaching the pylon support (2) to the external stores support assembly (6).

c. Remove pylon support (2) from helicopter.

16-112. Inspection — External Auxiliary Fuel Pylon Support. Inspect pylon support (2, figure 16-8) by fluorescent penetrant method. Refer to TM 43-0103.

16-113. Installation — External Auxiliary Fuel Pylon Support. a. Position the pylon support (2, figure 16-8) against the external stores support assembly (6).

b. Align bolt holes.

c. Install attaching bolts, washers, and nuts with a washer under each bolt head and under each nut.

16-114. YAW STABILIZATION SYSTEM ASW-12 PROVISIONS.

16-115. Description — Yaw Stabilization System ASW-12 Provisions. Complete provisions are incorporated in the helicopter for installation of yaw stabilization system AN/ASW-12. Provisions consist of miscellaneous electrical components and airframe wiring. Yaw stabilization system AN/ASW-12 components, when installed, consists of two accelerometers, an acceleration monitor, an attitude reference control, a directional control panel, an electro-mechanical rotary actuator calibration unit, and two rotary motion transducers. A four-position control switch is located on each cyclic stick grip. The system, when installed, enhances maneuverability and stability with heading-hold and damping action during launching and guidance operation of M22 guided missiles.

16-116. Maintenance and Repair - Yaw Stabilization System ASW-12 Provisions. Refer to paragraph F-11 for armament subsystem wiring diagrams, and paragraphs 9-5 through 9-11 for electrical component maintenance.

16-117. MULTIARMAMENT HELICOPTER MOUNT XM156.

16-118. Description — Multiarmament Helicopter Mount XM156. Helicopters having armament subsystem M16 (paragraph 16-90) wiring modification (MWO 55-1520-211-30/4) incorporated may have multiarmament helicopter mount XM156 installed. Multiarmament mount XM156 components include two rocket launcher rack and support assemblies, capable of carrying 2.75 inch rocket launchers or other compatible external stores; two dust shields, one for each rack and support assembly; two four-inch spacers, which offset the rack and support assembly from the helicopter to accommodate 19 tube rocket launchers; a rocket launcher intervalometer and an arming control panel, both mounted on the pedestal console; and necessary electrical wiring and cable assemblies. Refer to TM 9-1090-204-12 and TM 9-1090-204-35 for additional information.

16-119. Removal — Multiarmament Helicopter Mount XM156. Refer to TM 9-1090-204-12 and TM 9-1090-204-35.

16-120. Maintenance and Repair — Multiarmament Helicopter Mount XM156. Refer to TM 9-1090-204-12 and TM 9-1090-204-35.

16-121. Installation — Multiarmament Helicopter Mount XM156. Refer to TM 9-1090-204-12 and TM 9-1090-204-35.

16-122. CONCEALED PERSONNEL DETECTOR M3.

16-123. Description — Concealed Personnel Detector M3. The concealed personnel detector M3 is a device designed to detect human beings and their activities when hidden from observation. The M3 detector is installed in the helicopter in a dual configuration that requires the use of two detector assemblies, two observer control boxes, two pilot indicators, a distribution box, and interconnecting air hoses and electrical cables. The detector assemblies are mounted on a base plate in either a lateral or stacked arrangement directly behind the pedestal. Refer to TM 3-6665-267-12 and TM 3-6665-267-35 for additional information.

WARNING

Handle converter acid wick with care to prevent burns from hydrochloric acid. Wear rubber gloves at all times when handling either acid or acid wick. If acid touches skin, wash the affected area thoroughly with clean, clear water. If acid splashes in eyes, flush eyes continuously with clean, clear water for 5 minutes.

16-124. Maintenance and Repair — Concealed Personnel Detector M3. Refer to TM 3-6665-267-12 and TM 3-6665-267-35.

16-125. BALLAST WEIGHTS INSTALLATION.

16-126. Description — Ballast Weights Installation. Some armament configurations require installation of ballast weights to keep helicopter within CG limits. Refer to DD Form 365C.

16-127. Removal — Ballast Weights. a. Remove inspection plates from both sides of tailboom.

b. Remove four ballast attaching nuts (5, figure 16-10), washers (4), and bolts (3). Remove ballast halves (1 and 2).

c. Replace inspection plates.

16-128. Installation — Ballast Weights.

NOTE

Install 35 pound or 50 pound ballast weight assemblies with the counterbored end of the center hole aft.

a. Remove inspection plates from both sides of tailboom.

b. Install the two ballast halves with four attaching nuts (5, figure 16-10), bolts (3), and washers (4).

16-129. LITTER RACKS, CURVED STANCHION SUPPORTED.

16-130. Description — Litter Racks, Curved Stanchion Supported. Helicopters may be equipped with three litters, supported by standard litter racks

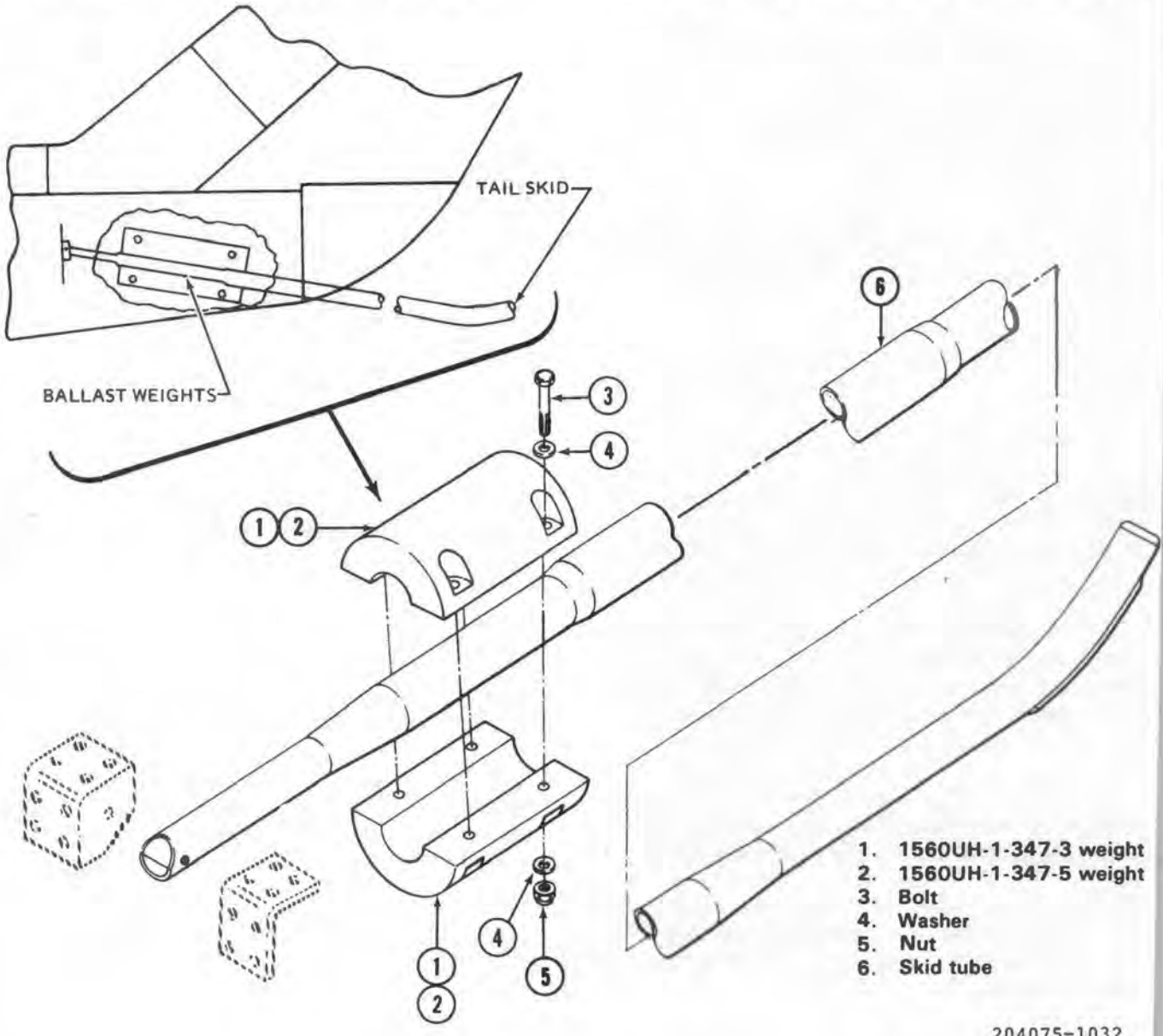


Figure 16-10. Ballast location — tail skid

(figure 16-11), arranged one above the other. The bottom litter rests on the cabin floor; the other two, directly above it, are supported on litter rails (1, figure 16-11) extending between, and attached to, curved stanchions (12).

16-131. Removal — Litter Racks, Curved Stanchion Supported. a. Release litter tiedown belts (6, figure 16-11) and center tiedown hook (14) securing lower litter.

b. Pull quick-release pins (2) securing litters to litter rails (1) and remove litters from helicopter.

c. Pull quick-release pins (4) securing litter rails (1) to rail supports (3) and remove litter rails.

d. Release and disconnect forward stanchion floor fittings (11) and quick-disconnect adapters (10) from floor holddown stud.

e. Pull upward on each stanchion (12) releasing stanchion attachment fittings (8) from bulkhead channel fittings (9) and remove stanchion from helicopter.

f. Remove screws attaching bulkhead channel fittings (9) to aft cabin bulkhead and remove channels.

g. Remove center tiedown hook assembly (14) from cargo holddown rings just forward of lower litter position at helicopter centerline. Remove litter tiedown belts (6) from bulkhead brackets (7) at each lower outboard end of aft cabin bulkhead.

16-132. Disassembly — Litter Racks, Curved Stanchion Supported. a. Remove nuts, washers, and bolts attaching stanchion (12, figure 16-11) to floor fitting (11) and remove fitting and quick-disconnect adapter (10) from stanchion.

b. Pull pins (5) attaching stanchion attachment fittings (8) and adjustable rail supports (3) to stanchion (12) and remove fittings and supports.

16-133. Inspection — Litter Racks, Curved Stanchion Supported. a. Inspect litters, litter rails, fittings, stanchion, and channels for damage and general condition.

b. Check tiedown belts (6, figure 16-11), brackets (7), and center tiedown assembly hook (14) for damage and excessive wear.

c. Fittings and adjustable supports may be inspected by dye penetrant method (TM 43-0103) for fatigue cracks.

d. Visually inspect pins and cables for general condition. Inspect stanchion (12) for bent, damaged, or distorted tubing.

e. Inspect tiedown belts for fraying and general condition.

16-134. Repair or Replacement — Litter Racks, Curved Stanchion Supported. Replace all parts that are unserviceable, or do not meet inspection requirements.

16-135. Assembly — Litter Racks, Curved Stanchion Supported. a. Install stanchion attachment fittings (8, figure 16-11) and adjustable rail supports (3) in place on stanchion (12) and secure by inserting quick-release pins (4 and 5).

b. Position floor fitting (11) and quick-disconnect adapter (10) in place on stanchion (12). Install bolts, washers, and nuts attaching stanchion (12) to floor fitting (11).

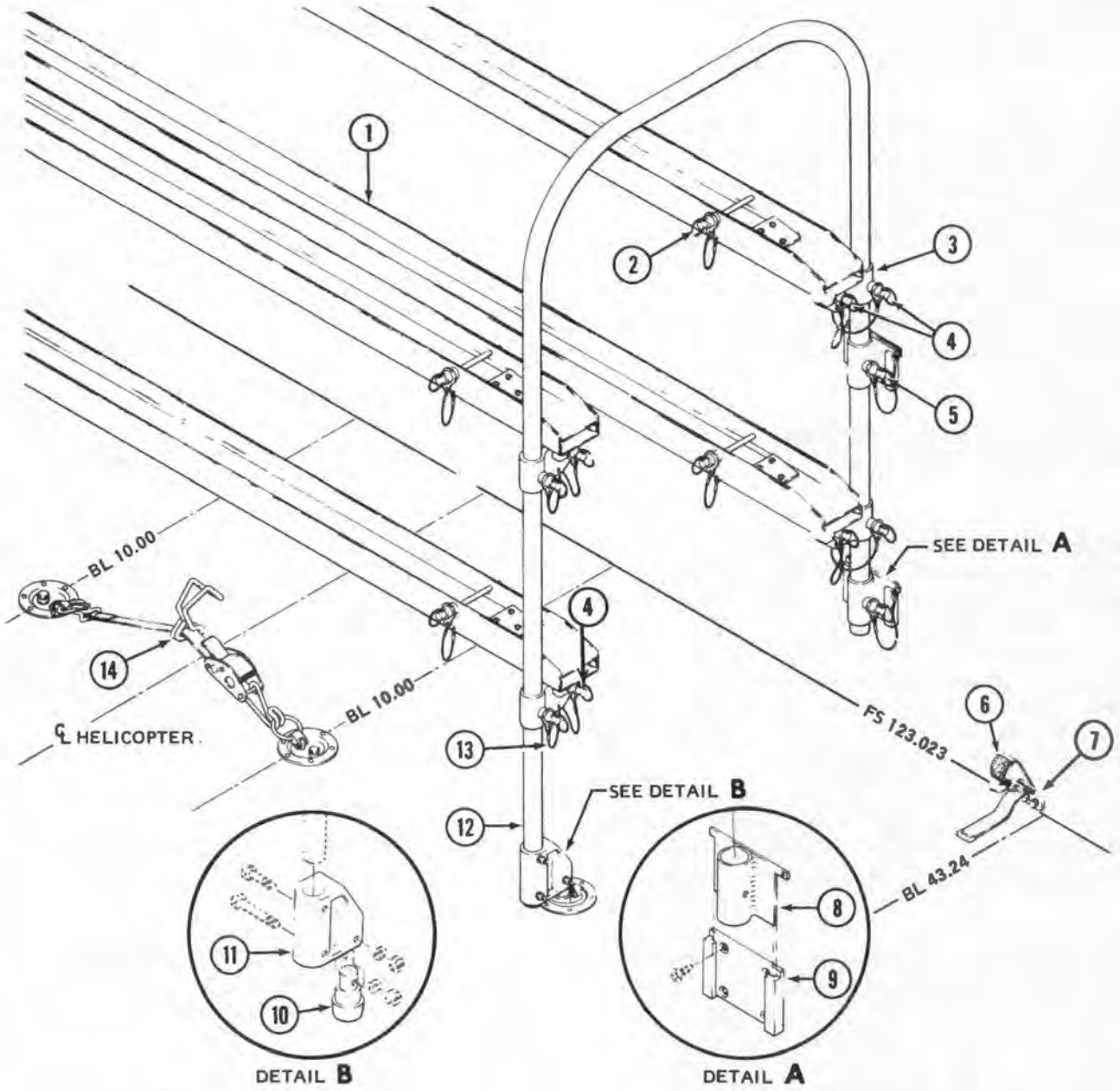
16-136. Installation — Litter Racks, Curved Stanchion Supported. a. Install bulkhead channel fittings (9, figure 16-11) to aft cabin bulkhead with screws.

b. Position stanchions (12) parallel to helicopter centerline with forward stanchion floor fittings (11) over floor holddown studs, and aft attachment fittings (8), aligned with bulkhead channel fittings (9).

c. Press down on stanchions (12) to secure stanchion floor fittings (11) in floor holddown studs and lock attachment fittings (8) into bulkhead channel fittings (9).

d. Position adjustable litter rail supports (3) on each stanchion at same relative heights so that litters will be level.

e. Align hole in each rail support (3) with corresponding hole through stanchion (12) and attach rail support to stanchion by inserting pin (4) through rail support (3) and stanchion (12).



1. Litter rails (4)
2. Pins, rail quick-release (8)
3. Rail supports (4)
4. Pins, rail support quick-release (8)
5. Attachment fitting pins (4)
6. Tiedown belts (2)
7. Brackets (2)
8. Stanchion attachment fittings (4)
9. Bulkhead channel fittings (9)
10. Quick-disconnect adapter (2)
11. Floor fitting (2)
12. Stanchion assembly (2)
13. Cables
14. Center tiedown hook assembly

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Figure 16-11. Litter racks, curved stanchion supported

f. Place each rail (1) in position between stanchions (12) resting on top of rail supports (3). Align holes in ends of rail supports with holes in angles on bottom ends of litter rail and attach by installing pins (4).

g. Install litter tiedown belts (6) in bulkhead brackets (7) at each lower outboard end of aft cabin bulkhead. Attach strap, buckle, and hook assembly (14) to cargo holddown rings just forward of lower litter position on each side of helicopter centerline.

h. Position litters on litter rails (1) and secure with pins (2). Secure lower litter at ends with tiedown belts (6) and at forward center with strap, buckle, and hook assembly (14).

16-137. LITTER RACKS, VERTICAL STANCHION SUPPORTED.

16-138. Description — Litter Racks, Vertical Stanchion Supported. Helicopters may be equipped with three litters, supported by vertical stanchion supported litter racks (figure 16-12). The bottom litter in this arrangement rests on the cabin floor, with the other two above it. All three litters are held in adjustable brackets (3 and 4) attached to tracks on the aft cabin bulkhead (5 and 8) and to two vertical stanchions (1) on the forward side.

16-139. Removal — Litter Racks, Vertical Stanchion Supported. a. Release litters from adjustable brackets (3 and 4, figure 16-12) and remove from helicopter.

b. Release and disconnect stanchion floor fitting (14) from floor holddown studs (12). Remove stanchions (1) from receptacles (2) in cabin roof.

c. Pull quick release pins (15) attaching adjustable brackets and lower track assemblies (8) to lower track mounting brackets (9), and remove brackets and track assemblies.

d. Pull four spring loaded pins (7) on each upper track assembly (5) to release track and adjustable brackets (4) from upper track mounting brackets (6). Remove track assembly and adjustable brackets as a unit.

e. Remove bolts and washers attaching upper and lower track mounting brackets (6 and 9) to aft cabin bulkhead and remove brackets.

16-140. Disassembly — Litter Racks, Vertical Stanchion Supported. a. Pull quick-release pins attaching support brackets (17, figure 16-12), sleeve spacers (16), and adjustable brackets (3) to stanchions (1) and slide brackets (3) to stanchions (1) and slide brackets and spacers off stanchions.

b. Remove nuts, bolts, and washers attaching adjustable bracket (3) to stanchion support brackets (17) and track assemblies (5 and 8).

c. Remove nuts and bolts attaching spring-loaded pins (7) to upper track assembly (5), then remove spring pins and springs (10) and remove pins (11).

16-141. Inspection — Litter Racks, Vertical Stanchion Supported. a. Inspect stanchion assembly (1, figure 16-12) for general condition, and stanchion floor fitting (14) for proper operation.

b. Visually inspect support brackets (17) and sleeve spacers (16) for evidence of damage. Check adjustable brackets (3) for freedom of operation and general condition.

c. Visually inspect upper track assembly (5) components for damage and serviceability.

NOTE

Track pin spring (10) shall have a maximum load of 6.10 pounds at a compressed length of 0.41 inch.

d. Visually inspect stanchion roof receptacle (2) in cabin roof. If rubber strip is torn or damaged, bond a new strip in place with adhesive (C13).

16-142. Repair or Replacement — Litter Racks, Vertical Stanchion Supported. Replace components that fail to meet inspection requirements.

16-143. Assembly — Litter Racks, Vertical Stanchion Supported. a. Assemble upper track spring loaded pin assemblies (7, figure 16-12) by installing pins (11), track pin springs (10), and spring pins. Secure pin assemblies (7) to upper track assemblies (5) with nuts and bolts.

b. Assemble adjustable brackets (3) to stanchion support brackets (17) and track assemblies (5 and 8) with attaching nuts, bolts, and washers.

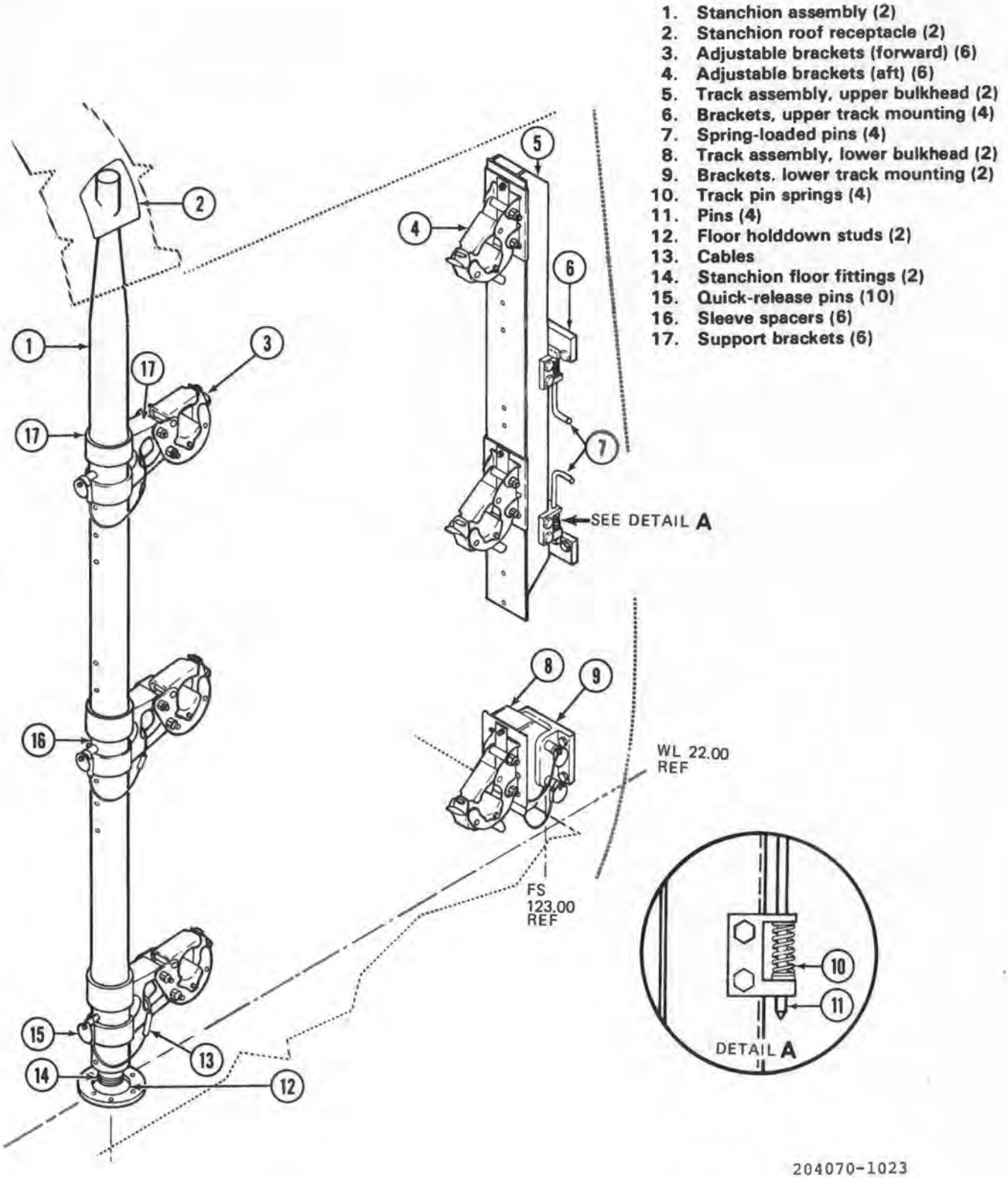

Figure 16-12. Litter racks, vertical stanchion supported

c. Install sleeve spacers (16) in place on stanchion support brackets (17), with adjustable brackets (3) attached, and slide on stanchion (1). Secure in place with quick-release pins (15).

16-144. Installation — Litter Racks, Vertical Stanchion Supported. a. Install upper and lower track mounting brackets (6 and 9, figure 16-12) to aft cabin bulkhead, using bolts and washers.

CAUTION

Each upper track has four spring-loaded pins. Ensure all four pins on each track are properly seated in bulkhead fitting receptacle.

b. Position upper track assembly (5) and adjustable bracket combination on upper aft cabin bulkhead brackets (6) and attach by inserting spring-loaded pins (7) on track into receptacles in bulkhead brackets.

c. Position lower track assembly (8) and adjustable bracket combinations on brackets (9) at each lower outboard end of aft cabin bulkhead and attach by inserting quick-release pins (15).

d. Position upper end of stanchions (1) into roof receptacles (2) and floor fittings (14) over floor holddown studs (12). Press down on stanchion to lock fittings in studs.

e. Check that adjustable brackets (3) on stanchions (1) are in line with adjustable brackets (4) on track assemblies (5 and 8). Adjust brackets on stanchions, if necessary, by removing quick-release pins (15) from sleeve spacers (16), and slide support brackets (17) and sleeve spacers on stanchions to lineup, then secure with pins (15) through sleeve spacers (16).

f. Secure litters in adjustable brackets (3 and 4) between stanchions and aft cabin bulkhead.

16-145. BLOOD BOTTLE HOOKS.

16-146. Description — Blood Bottle Hooks. Six blood bottle hooks (three on each side) are mounted in the cabin roof structure within easy reach of the medical attendant station, to permit administering blood or glucose to litter patients in flight.

16-147. Inspection — Blood Bottle Hooks. Inspect blood bottle hooks for damage and security of mounting.

16-148. Repair or Replacement — Blood Bottle Hooks. a. Tighten or reinstall loose or improperly installed hooks.

b. Replace damaged hooks.

CHAPTER 17

EMERGENCY EQUIPMENT

17-1. FIRST AID KITS.

17-2. Description — First Aid Kits. Two aeronautical type first aid kits are installed on the left and right sides of the cabin roof above the center door posts. The third kit is located on the center door post. The kits are attached by snap-type fasteners.

17-3. Inspection — First Aid Kits Installed. a. Inspect first aid kit for broken or missing seal, and a legible, serviceable material condition tag.

b. Inspect first aid kits for security. Check for loose or missing fasteners.

17-4. Removal — First Aid Kits. Pull outward on kit to release from snap fasteners.

17-5. Repair — First Aid Kits. a. If seal is broken or missing or material condition tag is missing, kit should be inspected, sealed, and new material condition tage attached by station medical supply office.

b. Tighten or replace loose or missing fasteners on door post.

17-6. Installation — First Aid Kit. Position kit over snap fasteners and push to engage fasteners.

17-7. FIRE EXTINGUISHER AND BRACKET.

17-8. Description — Fire Extinguisher and Bracket. The fire extinguisher is a portable, hand operated monobromotrifluoromethane (CF3Br) type. The fire extinguisher is located on the floor to the right of the pilots seat or on the left side of the center pedestal.

17-9. Inspection - Fire Extinguisher and Bracket Installed. a. Refer to TM 55-1500-204-25/1 for inspection of fire extinguisher.

b. Inspect hanger bracket for damaged retaining clamp and loose or missing hardware.

17-10. Removal — Fire Extinguisher and Bracket. a. Loosen retaining clamp from around upper section of the extinguisher by pulling the hinged lever aft. Tension on the extinguisher will be released so that the catch on the hinged lever will be disengaged from the attaching ring.

b. Grasp the fire extinguisher by the handle and remove from the hanger bracket.

c. Remove screws, washers, and nuts attaching hanger bracket to aircraft and remove hanger bracket.

17-11. Installation - Fire Extinguisher and Bracket. a. Position hanger bracket and install attaching nuts, washers, and screws.

b. Position fire extinguisher in hanger bracket with extinguisher handle opposite bracket.

c. Hook the latch of the retaining clamp handle through ring on inboard section of the retaining clamp. Force free end of clamp handle to the left and forward. This will close the clamp and secure the fire extinguisher in the hanger bracket.

ALPHABETICAL INDEX

By Order of the Secretary of the Army:

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General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

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RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

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COA, 3d ENGINEER BN
FT. LEONARD WOOD MO 63108

DATE

PUBLICATION NUMBER	DATE	TITLE
TM 55-1520-220-23-2	17 Sep 80	Aviation Unit and Intermediate Maintenance Instructions Army Model UH-1C/M Helicopters

BE EXACT. . .PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.	
6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders.
81		4-3		Callout 16 on figure 4-3 is pointing at a bolt. In the key to fig. 4-3, item 16 is called a shim. Please correct one or the other.
125	line 20			I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered so the NSN is wrong. Please give me a good NSN.

SAMPLE

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
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John Doe

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