

CHAPTER 4

AIRFRAME

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CHAPTER 4

AIRFRAME

4.000 Description

The R22 is a two-place, single main rotor, single engine helicopter constructed primarily of metal and equipped with skid-type landing gear.

The primary fuselage structure is welded steel tubing and riveted aluminum sheet. The tailcone is a monocoque structure in which aluminum skins carry primary loads. Fiberglass and thermoplastics are used in secondary cabin structure, engine cooling shrouds, and various other ducts and fairings.

A right-side cowl door provides access to the main gearbox and drive system. Additional access to controls and other components for maintenance is provided by removable panels and cowlings.

Stainless steel firewalls are located forward of and above the engine.

4.100 Fuselage4.110 Cabin Assembly

The cabin assembly is a non-field-replaceable assembly.

4.111 Repair

1. Vertical firewall replacement must be performed at the factory in a jig. Firewall repairs may be accomplished in accordance with U.S. FAA Advisory Circular 43.13-1B Section 4-59. Firewall material is 0.016 inch, type 301, one-quarter hard corrosion-resistant (CRES) steel.
2. Keel panel replacement must be performed at the factory in a jig. Keel panel repairs may be accomplished in accordance with U.S. FAA Advisory Circular 43.13-1B Sections 4-58 and 4-59. Keel panel material is 0.025 inch, 2024-T3 clad aluminum-alloy sheet.
3. To preserve crashworthiness, repairs to seat structure are limited to replacement of damaged components only.

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4.120 Windshield Assembly

| This section has been moved to Chapter 25 Doors and Windows.

4.130 Door Removal and Installation

| This section has been moved to Chapter 25 Doors and Windows.

4.140 Fairing, Cowling, and Inspection Panels

4.141 Side Skirts

<p style="text-align: center;">CAUTION</p>

<p>This is a structural panel assembly and must be installed for run up and flight.</p>

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4.142 Mast Fairing

CAUTION

Mast fairing must be installed for flight.

The mast fairing upper rib is mounted to swashplate tube assembly. The lower rib is clamped to main rotor gearbox mast assembly.

The pitot tube is mounted on lower front of mast fairing.

The fuel tank vent is installed through lower rib of mast fairing. (Vent should have approximately 0.30 inch clearance from the aft cowling.)

4.143 Aft Cowling

CAUTION

Aft cowling must be installed for flight.

The aft cowling is a two-piece, sheet-aluminum structure with a removable tailcone rain guard.

4.144 Cabin Inspection Panels

CAUTION

All cabin inspection panels must be installed for flight. With the exception of side skirts, all panels may be left off for run-up.

1. Seat Backs: Left side seat back has fuel valve attached. Back cushions are installed using blind rivets.
2. Cyclic Control Inspection Panels – 4 panels:
 - a. Center belly panel
 - b. Inside center of cabin (2 each horizontal: 1 each vertical).
 - c. Instrument console (refer to Chapter 13 Instrument System).
 - d. Forward cross tube inspection panel.

4.200 WELDED STEEL TUBE FRAME ASSEMBLIES**WARNING**

All welded steel tube structures used in the rotorcraft are stress relieved. No weld repairs are permissible outside Robinson Helicopter Co.

1. Frames required on R22 Alpha & Beta Models

A020-2 Upper Frame Serial Number 0400 and subsequent.

A046-1 Lower Left Frame

A046-2 Lower Right Frame

A046-3 Right-Hand Strut

2. Frames required on R22 Standard & HP Models

A020-2 Upper Frame

A020-1 Lower Left Frame

A020-84 Lower Right Frame

A020-3 Right-Hand Strut

3. Optional frame on Mariner

A047-1 Upper Frame with Tie Downs

4.210 Left-Hand Frame Assembly

4.211 Removal

- a) Remove main rotor blades per Section 9.111.
- b) Remove clutch assembly per Section 7.210.
- c) Remove main rotor gearbox per Section 7.110.
- d) Remove tailcone assembly per Section 4.311.
- e) Remove power plant per Section 6.110.
- f) Remove seat backs and center panels per Section 4.144.
- g) Disconnect the three lower forward firewall and left-hand upper aft attach points on the left-hand frame.
- h) Disconnect the aft NAS1306 landing gear attach bolt from the left-hand landing gear support.
- i) Disconnect the two upper left-hand frame attach points at the vertical firewall.
- j) Remove the through bolts connecting the upper frame to the fuselage and lower left-hand frame assembly.
- k) Remove the left-hand frame.
- l) Remove the landing gear support from the left-hand frame assembly.

4.212 Left-Hand Frame Assembly Installation

- a) Install the landing gear support bearing.
- b) Position left-hand frame for installation.
- c) Install the bolt (internal wrenching) connecting the upper frame assembly to the left-hand frame assembly through the horizontal firewall. Torque bolt to 75 ft-lbs. (wet).

4.212 Left-Hand Frame Assembly (cont'd)

- d) Install the two NAS1304 bolts on upper support of the left-hand frame to the vertical firewall. Torque to 100 in-lbs. plus nut drag.
- e) Install fasteners at firewall forward attachment points. Torque the attaching screws and bolts per Fastener Torques, Section 1.300.

NOTE

Lower support at fuselage has a large-area washer AN 970-4 under bolthead next to tab of frame.

NOTE

The outboard support of the frame requires a washer between the frame and the fuselage skin.
(See Fig. 4-1 View H)

- f) Install NAS1306 landing gear attach bolt from frame support to landing gear. Torque NAS1306 bolts to 300 in.-lb plus nut drag. Install palnuts.
- g) Install upper aft support of the left-hand frame arm. Torque NAS1304 bolt to 100 in-lbs. plus nut drag. Install palnut.
- h) Install power plant per Section 6.120.
- i) Install tailcone per Section 4.312.
- j) Install main rotor gearbox per Section 7.120.
- k) Install clutch assembly per Section 7.220.
- l) Install main rotor blades per Section 9.112.
- m) Install seat backs and panels after verifying all attaching nuts and screws are secure.

4.220 Right-Hand Frame Assembly

4.221 Right-Hand Frame Removal

- a) Remove main rotor blades per Section 9.111.
- b) Remove clutch assembly per Section 7.210.
- c) Remove main rotor gearbox per Section 7.110.

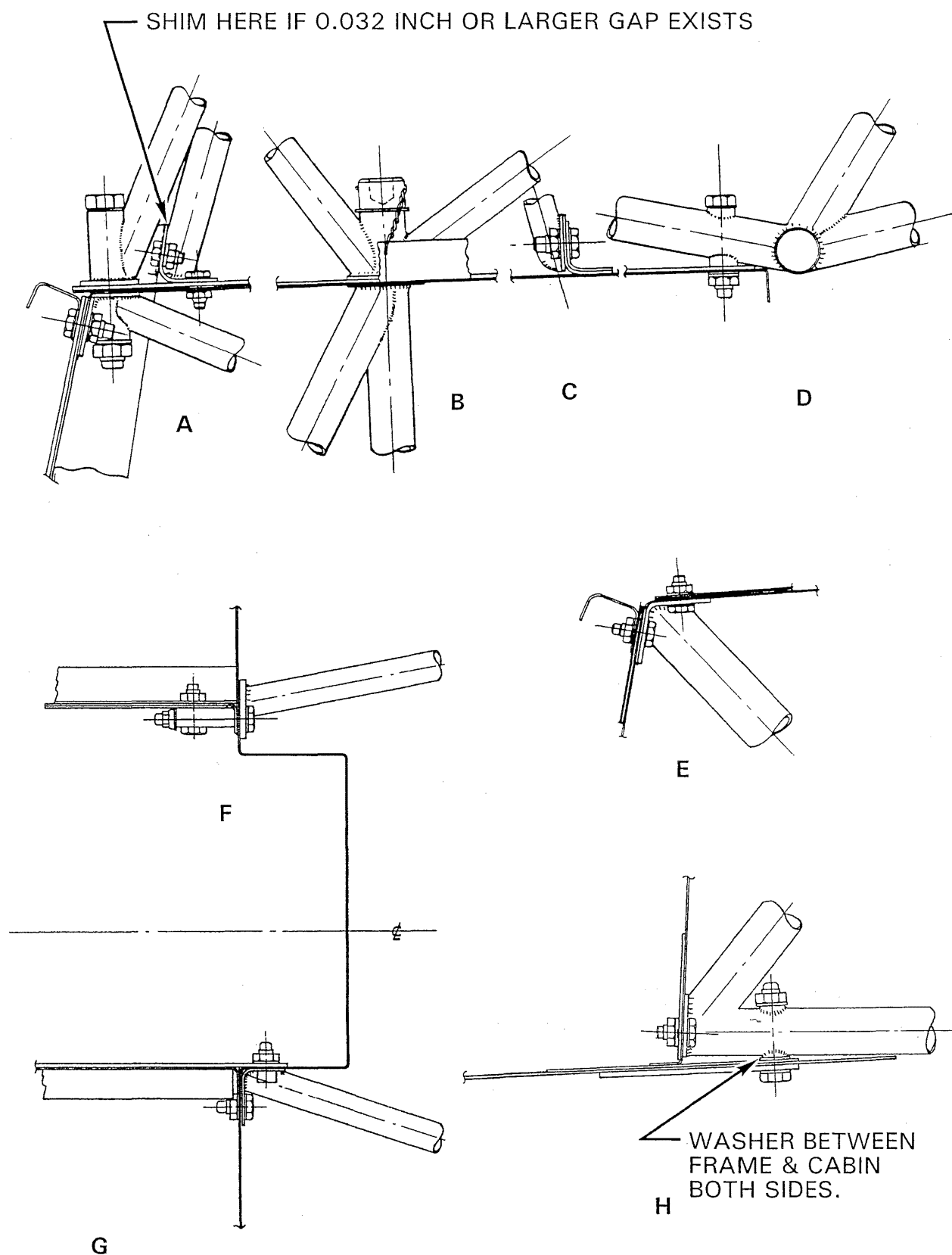


FIGURE 4-1 FRAME-TO-CABIN ATTACHMENTS

FIGURE 4-1A A960 CLAMP ASSEMBLY

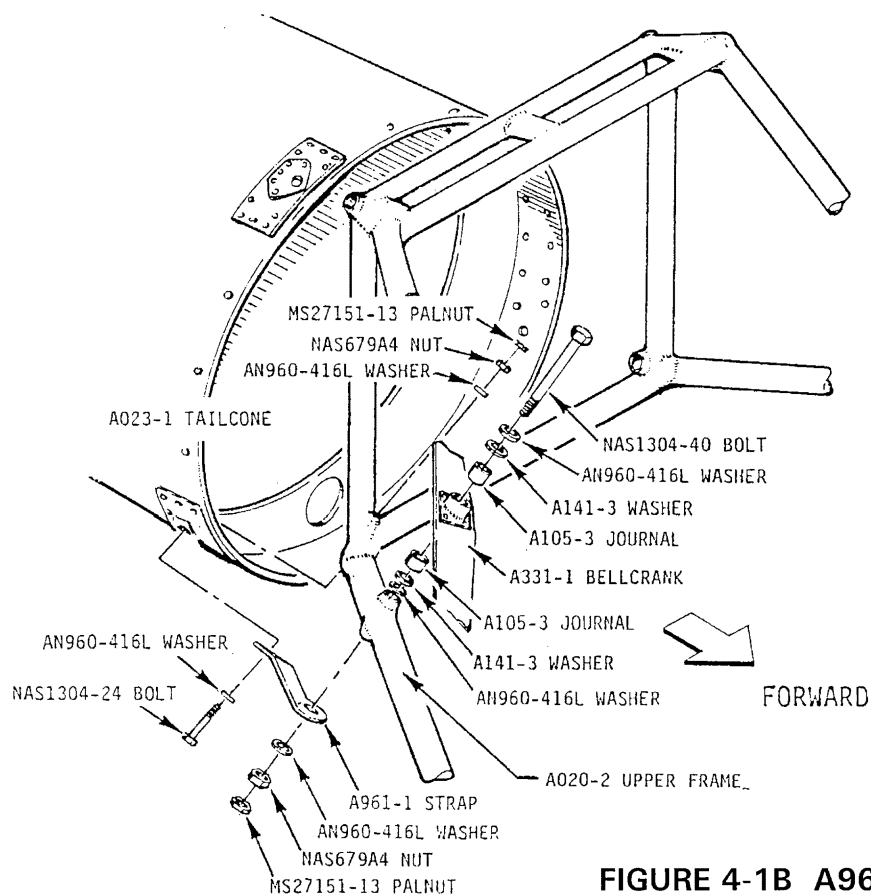
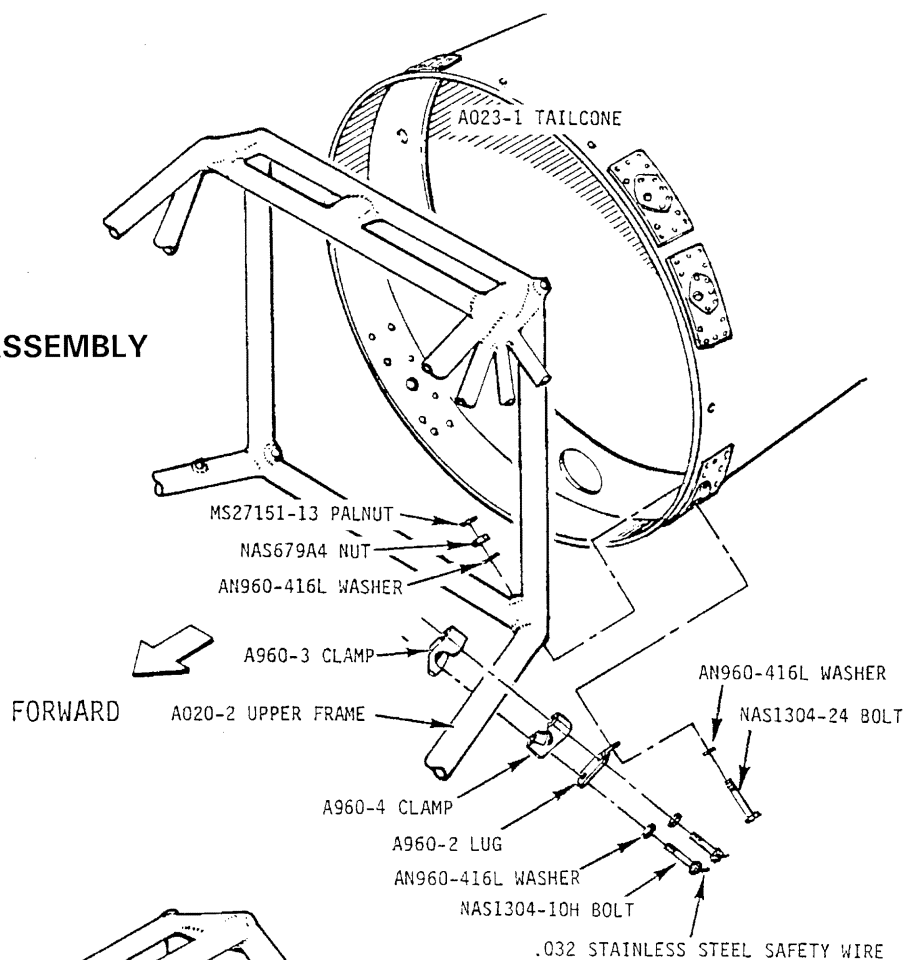


FIGURE 4-1B A961 STRAP ASSEMBLY

4.221 Right-Hand Frame Removal (cont'd)

- d) Remove tailcone assembly per Section 4.311.
- e) Remove powerplant per Section 6.110.
- f) Disconnect aft landing gear attach bolt from right-hand landing gear support.
- g) Disconnect four forward firewall attach points.
- h) Remove (2) through bolts connecting right side of upper frame to fuselage.
- i) Remove right-hand frame from helicopter.
- j) Remove landing gear support from right frame assembly.

4.222 Right-Hand Frame Installation

- a). Install landing gear support bearing.
- b) Position right-hand frame for installation.
- c) Install attaching screw (internal wrenching) connecting upper frame assembly to right hand frame assembly through horizontal firewall. Torque screw per Section 1.330.
- d) Tighten lower inboard support attaching screws to the vertical firewall.
- e) Install fasteners at the forward firewall attachment points. Torque fasteners per Section 1.300.
- f) Install landing gear attach bolt from frame support to landing gear.
- g) Install powerplant per Section 6.120.
- h) Install aft strut assembly between right-hand lower frame and upper frame assemblies. Torque bolts per Section 1.320. Install palnuts.

NOTE

Seal around inner diameter of bolt holes in strut with B270-1 sealant. Verify no sealant on bolt threads.

- i) Install tailcone per Section 4.312.
- j) Install main rotor gearbox per Section 7.120.
- k) Install clutch assembly per Section 7.220.
- l) Install main rotor system per Section 9.112.

4.222 Right-Hand Frame Installation (cont'd)

- m) Install seat backs and panels after verifying all attaching nuts and screws are secure.

4.230 Upper Frame Assembly

4.231 Upper Frame Removal

Before the upper frame is disconnected and removed, the power plant must be either removed or supported.

CAUTION

Extensive damage to the firewall and lower welded tube structures will occur if power plant is not supported or if support is dislodged.

- a) Remove main rotor blades per Section 9.111.
- b) Remove clutch assembly per Section 7.210
- c) Remove the right and left seat back and center push-pull tube panel assemblies.
- d) Remove main rotor gearbox per Section 7.110.
- e) Remove tailcone assembly per Section 4.311.
- f) Support power plant or remove per Section 6.110.
- g) Disconnect right-hand aft vertical strut assembly at upper frame and lower right-hand attach points and remove.
- h) Disconnect the forward support at the horizontal and vertical firewall.

NOTE

If same upper frame is to be re-installed, any shims found at the forward support should be reinstalled in the same position.

- i) Disconnect the two forward through bolts attaching the upper frame to the two lower frames.
- j) Disconnect the two (internal wrenching) bolts attaching the upper frame to the two lower frames.

4.231 Upper Frame Removal (cont'd)

- k) Disconnect the center upper frame mount point at the horizontal firewall stiffener.
- l) Disconnect the aft portion of the upper frame.
- m) Remove upper frame.

4.232 Upper Frame Installation

- a) Clean upper frame and attach points of all old sealant, grease and oil.
- b) Position upper frame for installation.
- c) Install internal wrenching bolts with anti-seize. Do not tighten at this time.
- d) Install the two NAS1306(NAS6606) forward through bolts.
- e) Torque the four attach bolts in c & d above to:

NAS1306(NAS6606)	300 in-lb
NAS1351-8H40P	75 ft-lb (wet)
- f) Measure gap on the upper frame. Shim as required (see Fig. 4-1 View A)
- g) Install the four attaching bolts in forward support. Do not install washers under the two B238-1 bolt heads in the push-pull tube tunnel. Torque the four bolts to 40 in.-lb plus nut drag (see Fig. 4-1 View A).
- h) Install the center support bolts of the upper frame assembly. Torque the two NAS1304(NAS6604) bolts.
- i) Connect the upper frame to the aft end of the horizontal firewall.
- j) Connect the aft end of the upper frame to the lower frame assembly.
- k) Torque the NAS1304(NAS6604) attach bolts.
- l) Install the power plant, if removed.
- m) Seal firewalls at the upper and lower frame attach points to insure no seepage of fuel in the event of a fuel tank leak. Use Coast Pro-Seal 890B2.

4.232 Upper Frame Installation (continued)

- n) Install main rotor gearbox per § 7.120.
- o) Install tailcone per § 4.312.

NOTE

A020-2 upper frames S/N 0002 thru 0399 require A960-1 clamp assembly and A961-1 strap assembly per R22 Service Bulletin SB-26.

- p) Install clutch assembly per § 7.220
- q) Install seat backs and panels after verifying all attaching nuts and screws and secure.

4.240 Vertical Strut Assembly Removal and Installation

To remove strut:

- a. Remove upper and lower attaching bolts.
- b. Remove strut.

To install strut:

- a. Line up holes in strut with upper and lower frame tabs. Lower end of strut goes on aft face of lower frame tab.
- b. Install NAS6604-3 attaching bolts wet with B270-1 sealant on shanks.

CAUTION

Verify threads are clean and dry.

Special torque per § 23-33. Install palnuts and standard torque per § 23-32 and torque stripe per Figure 2-1.

4.300 Tailcone

CAUTION

If tailcone has a B379-1 or -3 bracket then A958-1 bellcranks (original equipment on helicopter S/N 0357 and subsequent) must be installed or retrofitted. Figure 8-2A refers.

If tailcone has a B379-1 or -3 bracket then B375-2 horizontal stabilizer must be installed.

Tailcone equipped with B379-1 or -3 bracket may not be installed on R22 Mariner helicopters.

A044-1 horizontal stabilizer may not be installed on a tailcone that has a B379-1 or -3 bracket.

B902-1 or -2 vertical stabilizers mount assembly may only be installed on a tailcone that has a B379-1 or -3 bracket.

A. Removal

1. Pull open associated circuit breakers for lights and antennas installed on tailcone.
2. Remove A706-1 fairing.
3. Cut and discard ty-raps as required and disconnect tailcone wiring at connectors. Disconnect antenna cables at forward bulkhead, as applicable.
4. Remove hardware securing tail rotor drive shaft assembly forward yoke to A947-2 (intermediate) plate assembly. Support drive shaft using a conspicuous foam block or equivalent, while drive shaft is disconnected from drive train.

WARNING

A193 flex plates, which do not have bonded washers, are obsolete and must be replaced with A947 flex plates having bonded washers. If a bonded washer separates from an A947 flex plate, flex plate is unairworthy and cannot be repaired. Ensure A947-1 forward flex plate is Rev E or subsequent (identified by letter "E" or subsequent letter on two adjacent arms of flex plate).

5. Remove hardware securing A121-17 push-pull tube to A331-1 intermediate bellcrank assembly.
6. Support tailcone and remove hardware securing tailcone to upper frame. Remove tailcone from helicopter.
7. If replacing tailcone, refer to appropriate sections of this manual and remove installed components or assemblies as applicable.

4.300 Tailcone (continued)**B. Installation****NOTE**

Install tail rotor drive shaft, tail rotor gearbox, and A121-17 push-pull tube on tailcone prior to tailcone installation.

1. Inspect tailcone interior. Remove debris. At bulkheads, verify bushings prevent push-pull tube from contacting metal, and wiring is protected by grommets. Verify correct damper assembly orientation per Figure 7-11B.
2. Position A023 tailcone assembly on upper frame assembly; do not pinch wiring between tailcone forward bulkhead and frame. Install hardware securing tailcone to frame, standard torque bolts & palnuts per § 23-32, and torque stripe per Figure 2-1.

NOTE

All R22 helicopters with upper frame A020-2 S/N 0002 thru 0399 are required to install A960-1 clamp and A961-1 strap assemblies per R22 Service Bulletin 26.

3. Install hardware securing A121-17 push-pull tube to A331-1 bellcrank assembly. Standard torque bolt & palnut per § 23-32 and torque stripe per Figure 2-1.

WARNING

A193 flex plates, which do not have bonded washers, are obsolete and must be replaced with A947 flex plates having bonded washers. If a bonded washer separates from an A947 flex plate, then flex plate is unairworthy and cannot be repaired.

4. Inspect flex plate per Figure 2-4B. Perform intermediate flex plate installation and shimming per § 7.330.
5. Measure tail rotor drive shaft runout per § 7.340.
6. Connect tailcone wiring at connectors, connect antenna cables at forward bulkhead, as applicable. Individually test and verify correct function of tail position light, strobe, and TR chip light circuits.
7. Refer to Figure 4-2D. Verify clearance between tailcone edge and upper frame.
8. As required, install B375-2 stabilizer per § 4.400 and empennage assembly per § 4.500.

4.310 Tailcone Replacement

CAUTION

If tailcone has a B379-1 or -3 bracket then A958-1 bellcranks (original equipment on helicopter S/N 0357 and subsequent) must be installed or retrofitted. Figure 8-2A refers.

A. Tailcone Set-up

1. Level helicopter longitudinally and laterally per § 18-10.
2. Verify tailcone part number is correct for helicopter model. Slide forward end of tailcone over upper frame and support aft end of tailcone with a stand.
3. Refer to Figure 4-2A. Insert two bolts of sufficient length (to support a level) in A148 bulkhead's left & right gearbox-mounting holes and place level across bolt shanks. Rotate tailcone on upper frame as required until bolts are level.

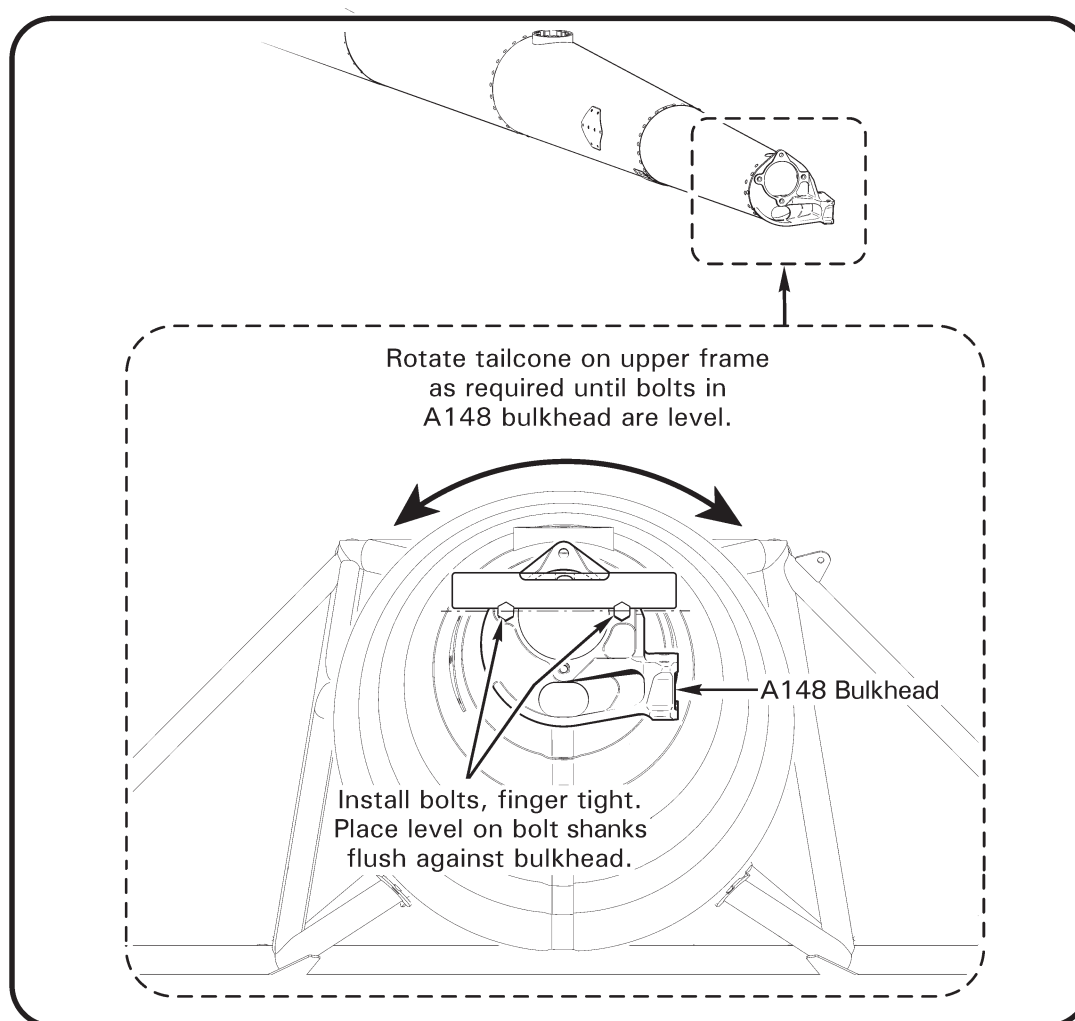


FIGURE 4-2A TAILCONE LATERAL LEVELING

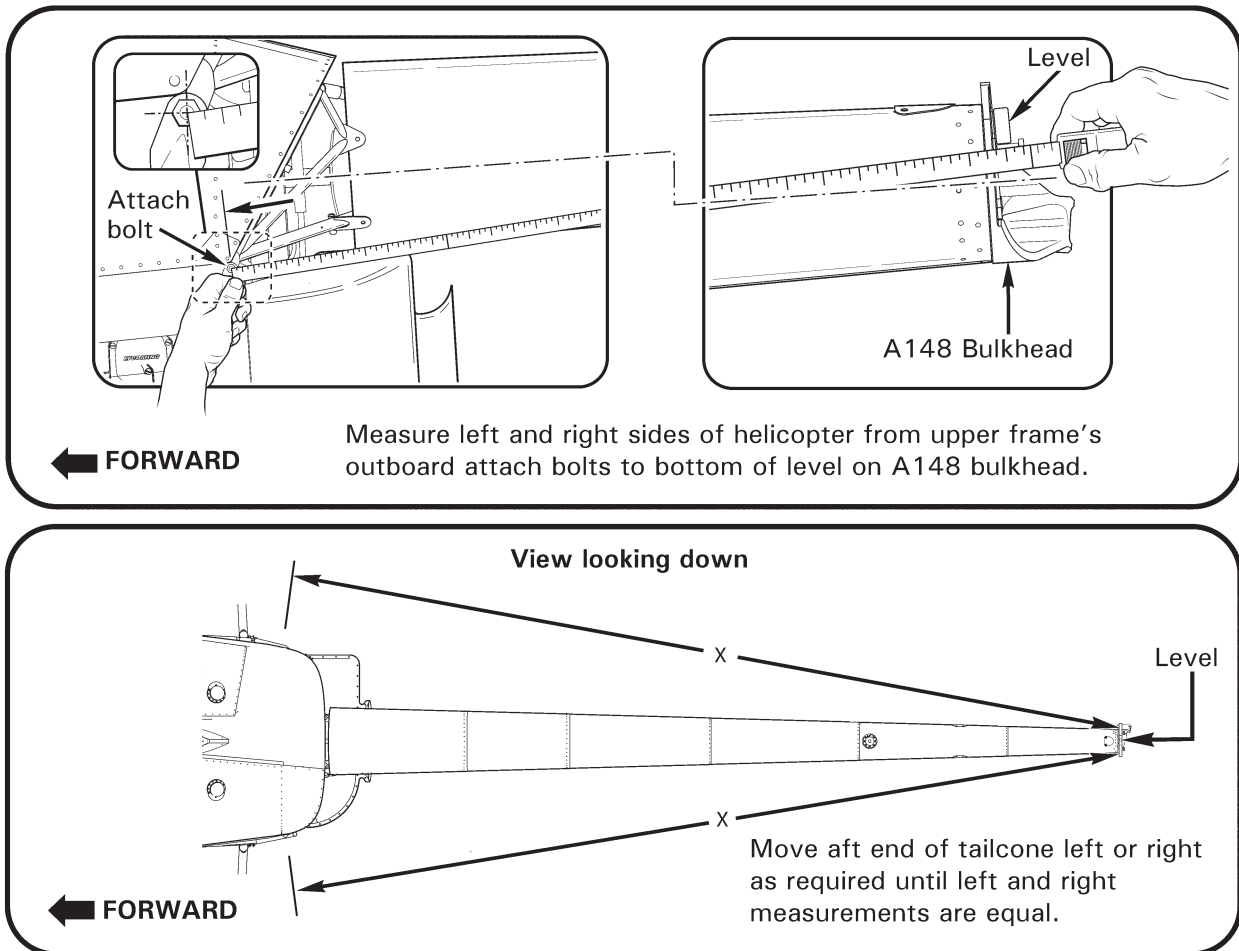


FIGURE 4-2B TAILCONE LATERAL ALIGNMENT

4.310 Tailcone Replacement (continued)

A. Tailcone Set-up (continued)

4. Refer to Figure 4-2B. Measure left and right sides of helicopter from upper frame's outboard attach bolts to bottom of level on A148 bulkhead. Move aft end of tailcone left or right as required until left and right measurements are equal.

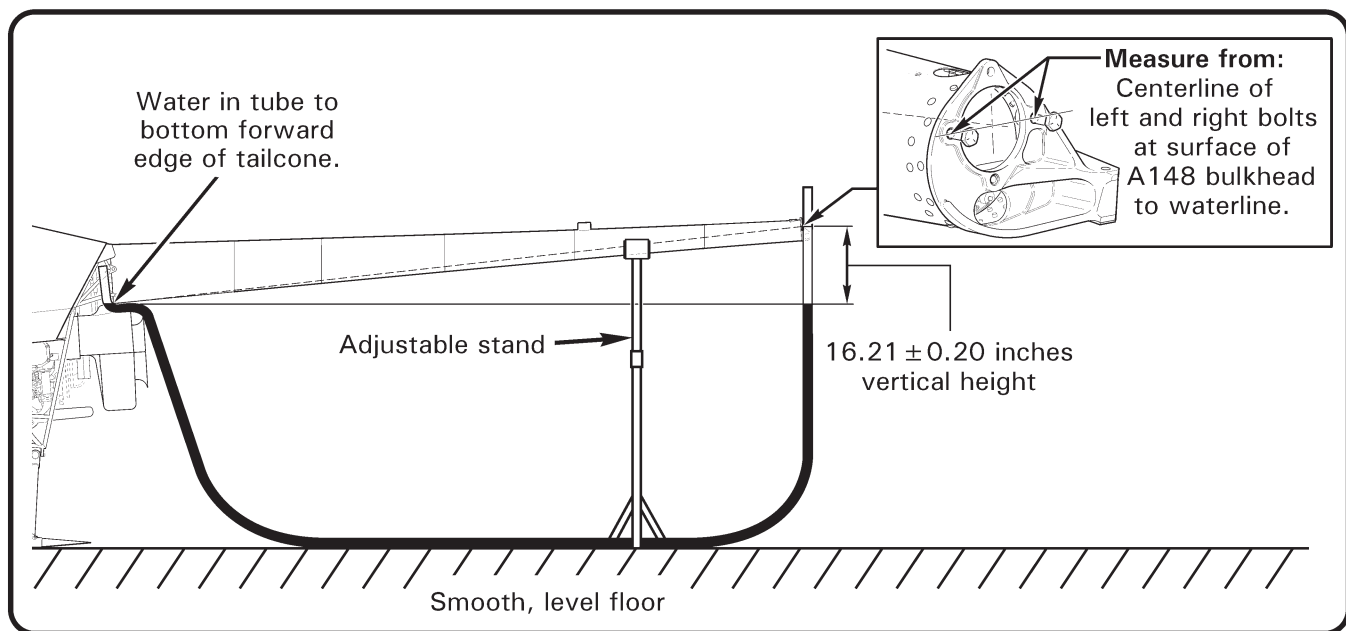


FIGURE 4-2C TAILCONE VERTICAL ALIGNMENT

4.310 Tailcone Replacement (continued)

A. Tailcone Set-up (continued)

5. Refer to Figure 4-2C. Use a water level and measure the difference in vertical height between forward end of tailcone (at lowest point) and centerline of left & right bolts at surface of A148 bulkhead. Using stand, adjust height of tailcone to 16.21 ± 0.20 inches.

NOTE

Due to bolt & hole tolerances, tailcone vertical height tends to decrease when supporting stand is removed.

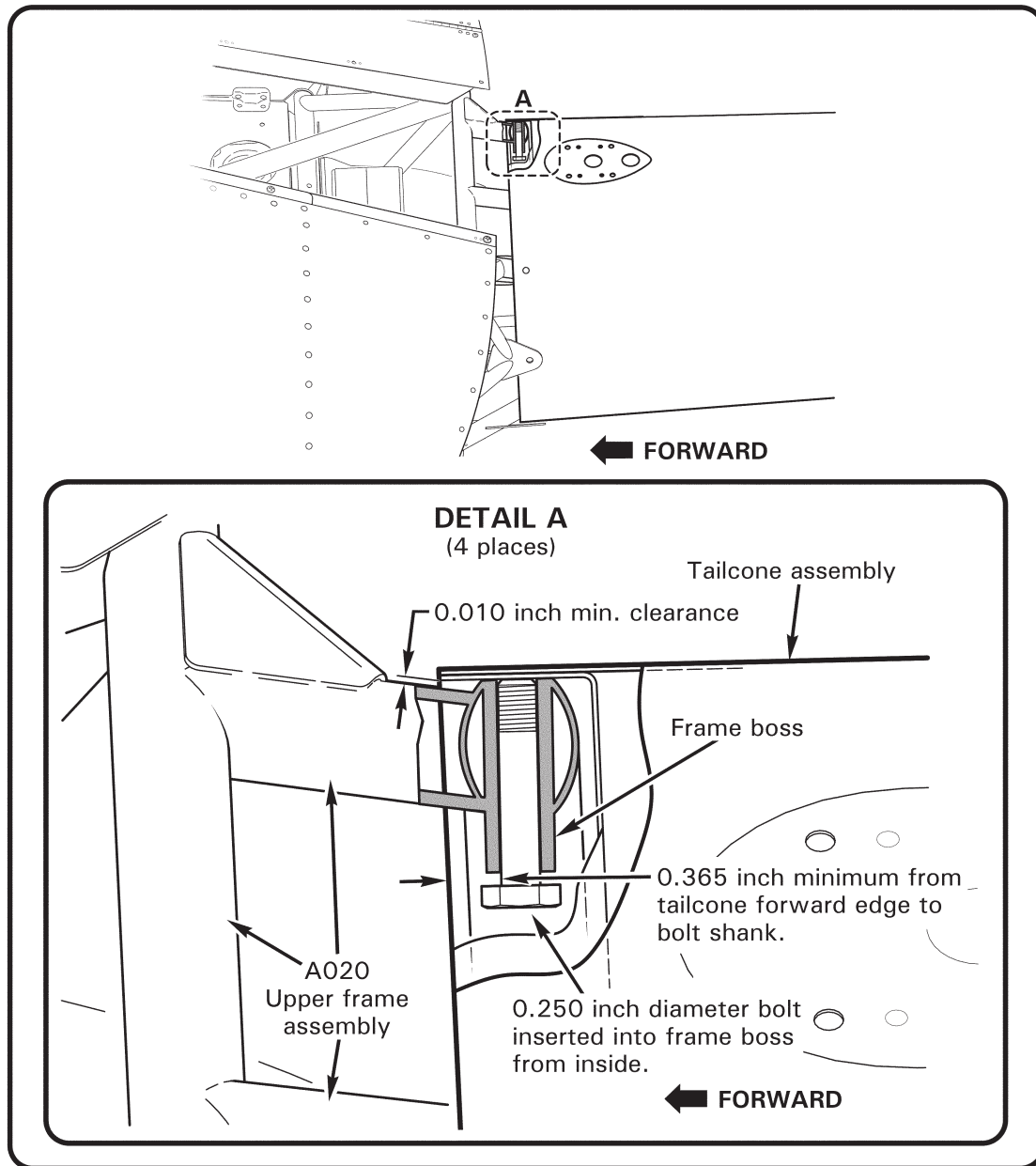


FIGURE 4-2D TAILCONE ATTACH HOLE EDGE DISTANCE

4.310 Tailcone Replacement (continued)

A. Tailcone Set-up (continued)

6. Refer to Figure 4-2D. Verify 0.010 inch minimum clearance between upper frame tubes and tailcone forward edge (4 places). Place a straight edge across forward face of tailcone and verify 0.365 inch minimum between straight edge and mounting bolt shank inserted in frame boss (4 places). Push tailcone forward or pull aft as required to maintain dimensions.
7. Verify tailcone leveling, lateral & vertical alignments, clearances, and minimum edge distances are correct; adjust tailcone set-up as required per steps 3 thru 6. Drill tailcone per Part B.

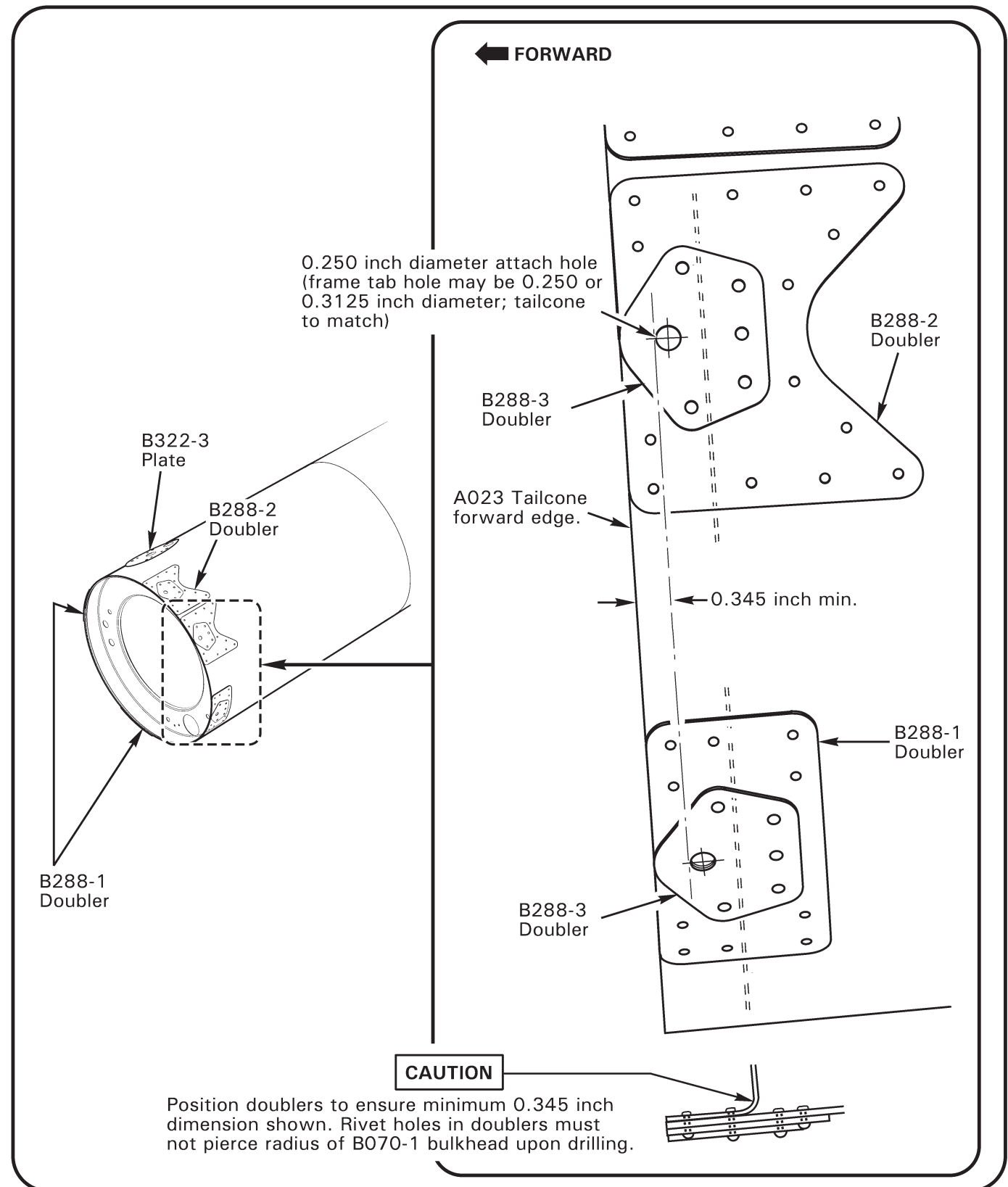


FIGURE 4-2E TAILCONE DOUBLER INSTALLATION

4.310 Tailcone Replacement (continued)**B. Tailcone Drilling****CAUTION**

Protect drive belts from drilling debris.

1. Perform tailcone set-up per Part A.
2. Clamp tailcone at (3) mounting locations to prevent tailcone movement during drilling, do not clamp tailcone at frame tab on left side of tailcone.
3. Back drill from inside of tailcone mounting hole (without clamp) using a center drill with a 0.250 inch diameter shank, then use a 0.250 inch diameter twist drill. After drilling hole, secure tailcone to frame with appropriate fastener.
4. Remove (1) clamp from next mounting location and back drill hole per step 3, repeat process for each clamped mounting hole.
5. Match drill left-side frame tab thru tailcone. Protect steel tube frame behind tailcone skin using a piece of scrap metal before drilling.
6. Remove tailcone. Deburr drilled holes.
7. Refer to Figure 4-2E and accompanying "CAUTION" statement. Center B288-1 or -2 doublers over each tailcone mounting hole and flush with tailcone forward edge. Mark doublers from inside tailcone for drilling 0.250 inch diameter hole.
8. Refer to Figure 4-2E. Drill B288-1 or -2 doubler with a 0.250 inch diameter twist drill at spot marked in step 7. Deburr hole and secure doubler to tailcone with a NAS1304-3 bolt. Drill through existing pilot holes in doubler with a #30 drill bit and secure with clecos.
9. Remove each NAS1304-3 bolt. Install B288-3 doubler atop B288-1 or -2 doubler and secure with NAS1304-3 bolt. Drill through existing pilot holes with a #30 drill bit.
10. Remove doublers and deburr holes. Install doublers with clecos then rivet with MS20470AD4 rivets.
11. If B288-3 doubler protrudes past forward edge of tailcone skin, file doubler flush with forward edge of tailcone, as required.
12. Apply B270-1 sealant all around doublers and forward edge of tailcone skin and B070-1 bulkhead.
13. Apply zinc chromate or epoxy primer (ref. § 23-75) per § 23-60 to doublers. Apply topcoat to tailcone, as required.
14. Install tailcone per § 4.300 Part B.

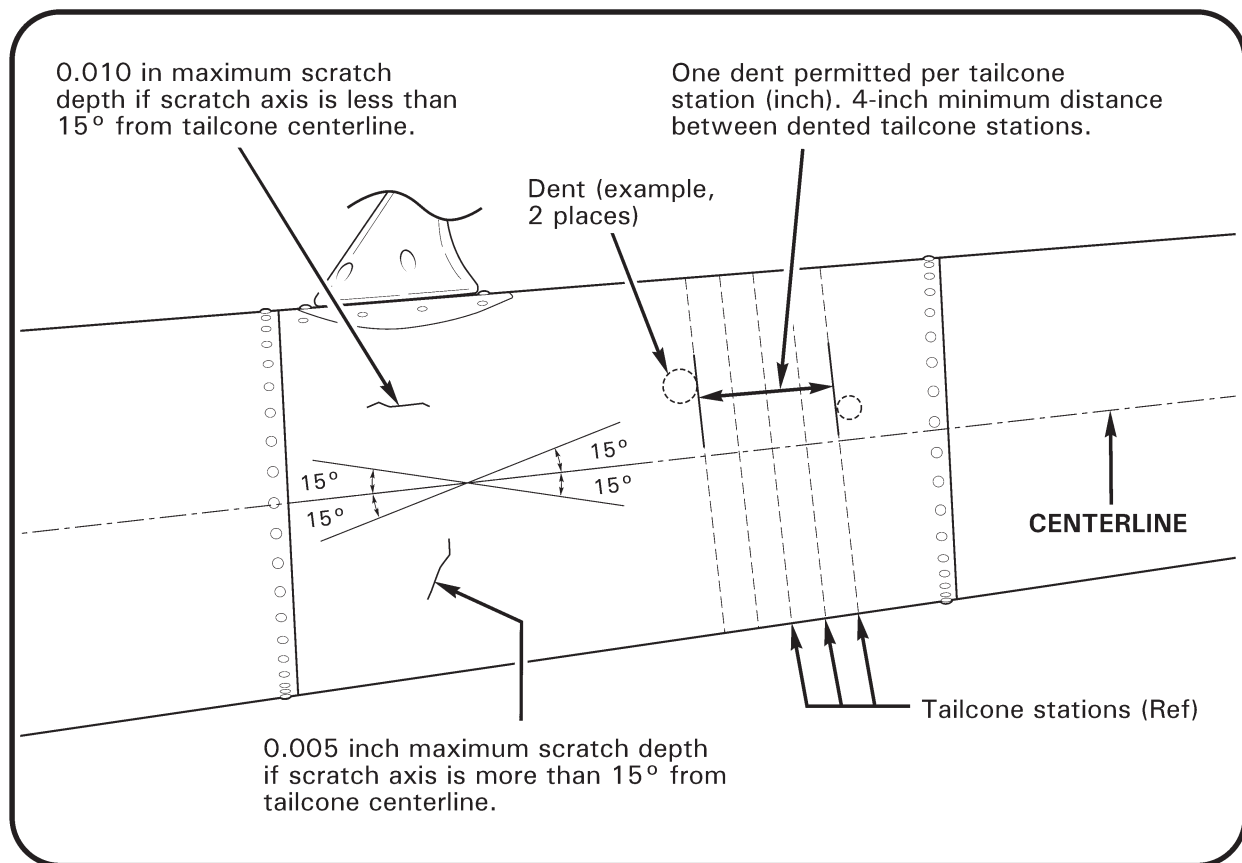
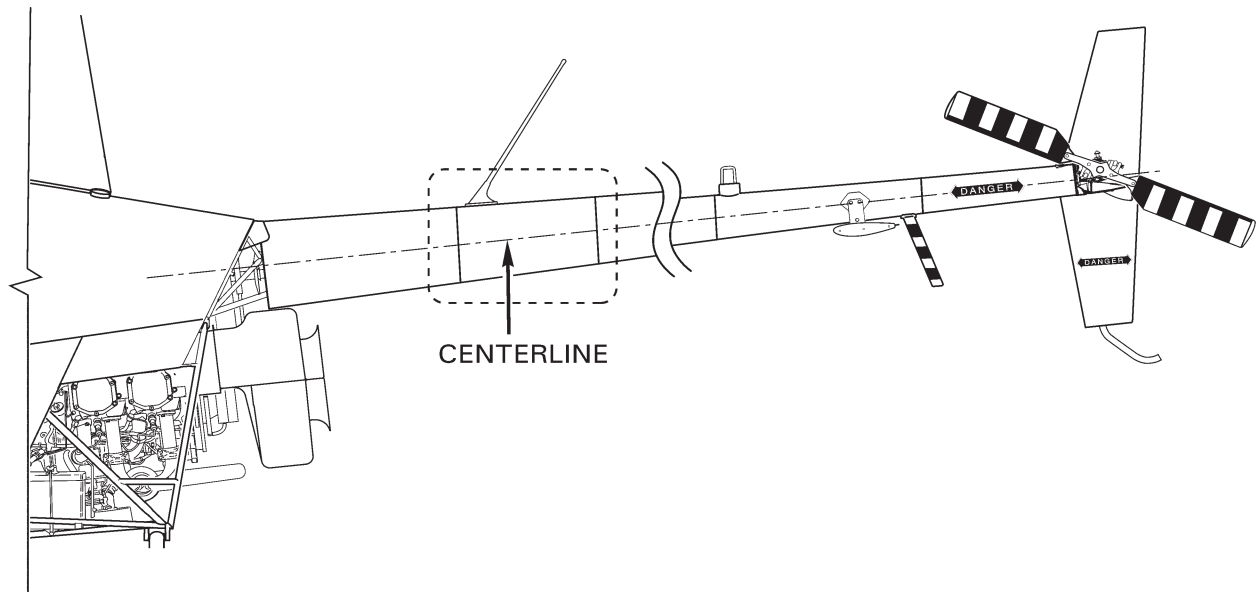


FIGURE 4-3 TAILCONE DAMAGE LIMITS

4.320 Inspection and Repair

Repairs are limited to blending out scratches within limits and refinishing skins. If allowable damage is exceeded, replace tailcone, or submit tailcone to RHC for repair.

A. Scratches

1. Refer to Figure 4-3. Verify damage does not exceed the following limits:
 - a. 0.005 inch maximum scratch depth if scratch axis is more than 15° from tailcone centerline.
 - b. 0.010 inch maximum scratch depth if scratch axis is less than 15° from tailcone centerline.
2. If damage exceeds limits, return tailcone assembly to RHC for repair. If damage is within limits, blend out scratches with a 0.10 inch minimum blend radius. Refinish skins using approved materials per § 23-70.

B. Dents

NOTE

0.125 inch minimum radius can be verified with using a 0.250 inch diameter bearing ball: Place bearing ball within dent and back light with lamp; if light is visible between skin & ball (i.e. ball not contacting dent bottom) then dent radius is less than 0.125 inch.

1. Refer to Figure 4-3. Smooth, round bottom dents with 0.125 inch minimum radius without sharp nicks or cracks are acceptable when damage does not exceed the following limits:
 - a. 0.030 inch maximum dent depth.
 - b. 1.250 inches maximum dent diameter.
 - c. One dent permitted per tailcone station (inch).
 - d. 4.000 inches minimum distance between dented tailcone stations.
2. If damage exceeds limits, replace tailcone or return to RHC for repair.

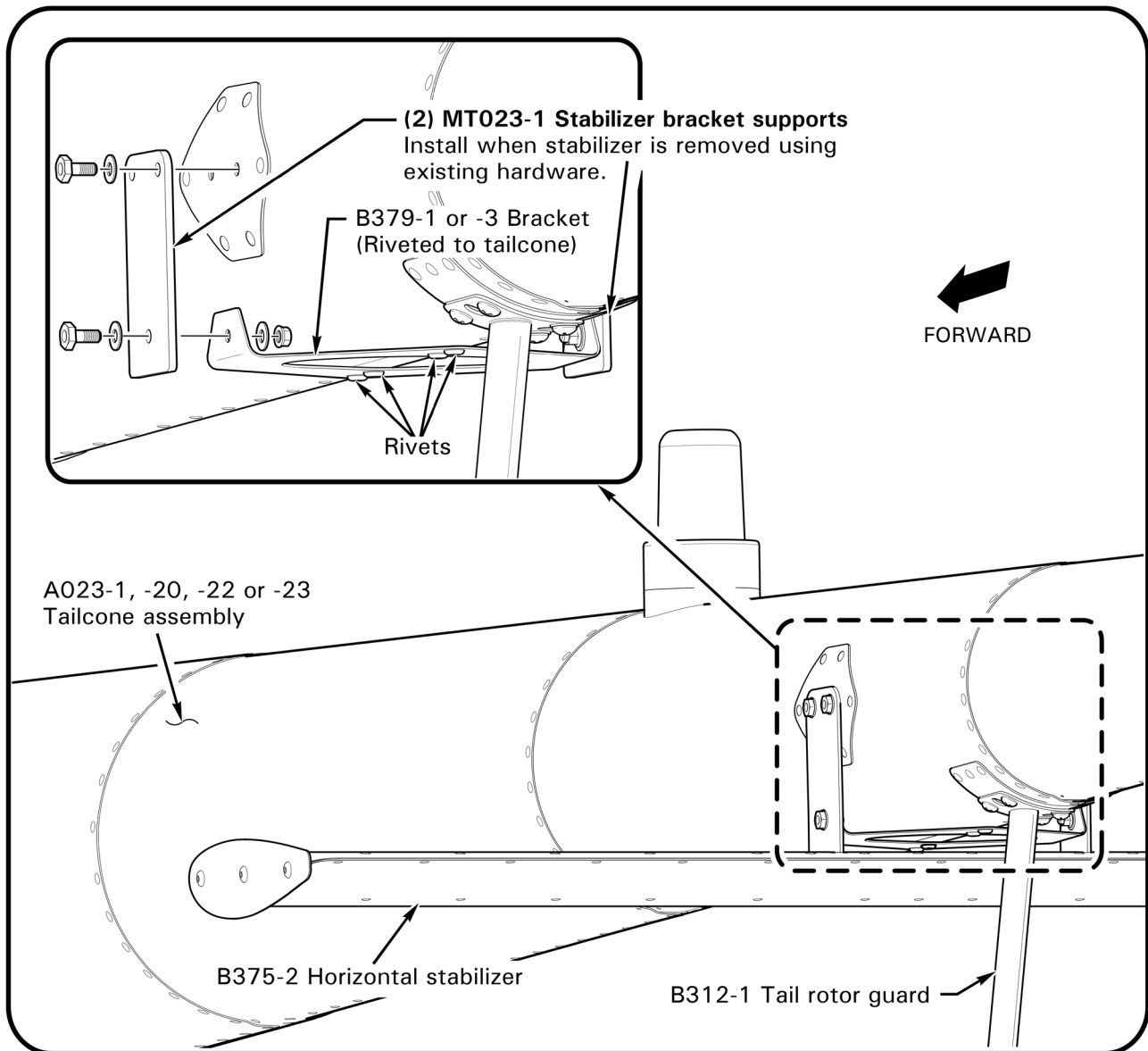


FIGURE 4-4 B375-2 HORIZONTAL STABILIZER ASSEMBLY

4.400 B375-2 Horizontal Stabilizer Assembly

CAUTION

If tailcone has a B379-1 or -3 bracket then A958-1 bellcranks (original equipment on helicopter S/N 0357 and subsequent) must be installed or retrofitted. Figure 8-2A refers.

If tailcone has a B379-1 or -3 bracket then B375-2 horizontal stabilizer must be installed.

B375-2 horizontal stabilizer may not be installed on R22 Mariner helicopters.

CAUTION

Support the B375-2 horizontal stabilizer assembly during removal & installation when upper bolts are removed to prevent bending B379-1 or -3 bracket that is riveted to tailcone.

A. Removal

1. Refer to Figure 4-4. Remove hardware securing B375-2 horizontal stabilizer assembly to B379-1 or -3 bracket.
2. While supporting stabilizer, remove hardware securing stabilizer to tailcone assembly and remove stabilizer.
3. As required, install MT023-1 stabilizer bracket supports using removed hardware (recommended when stabilizer is removed).

B. Installation

1. If installed, remove hardware securing MT023-1 stabilizer bracket supports to B379-1 or -3 bracket & tailcone assembly and remove supports.
2. While supporting B375-2 horizontal stabilizer assembly, install hardware securing stabilizer to tailcone and bracket. Special torque bolts per § 23-33 and torque stripe per Figure 2-1.

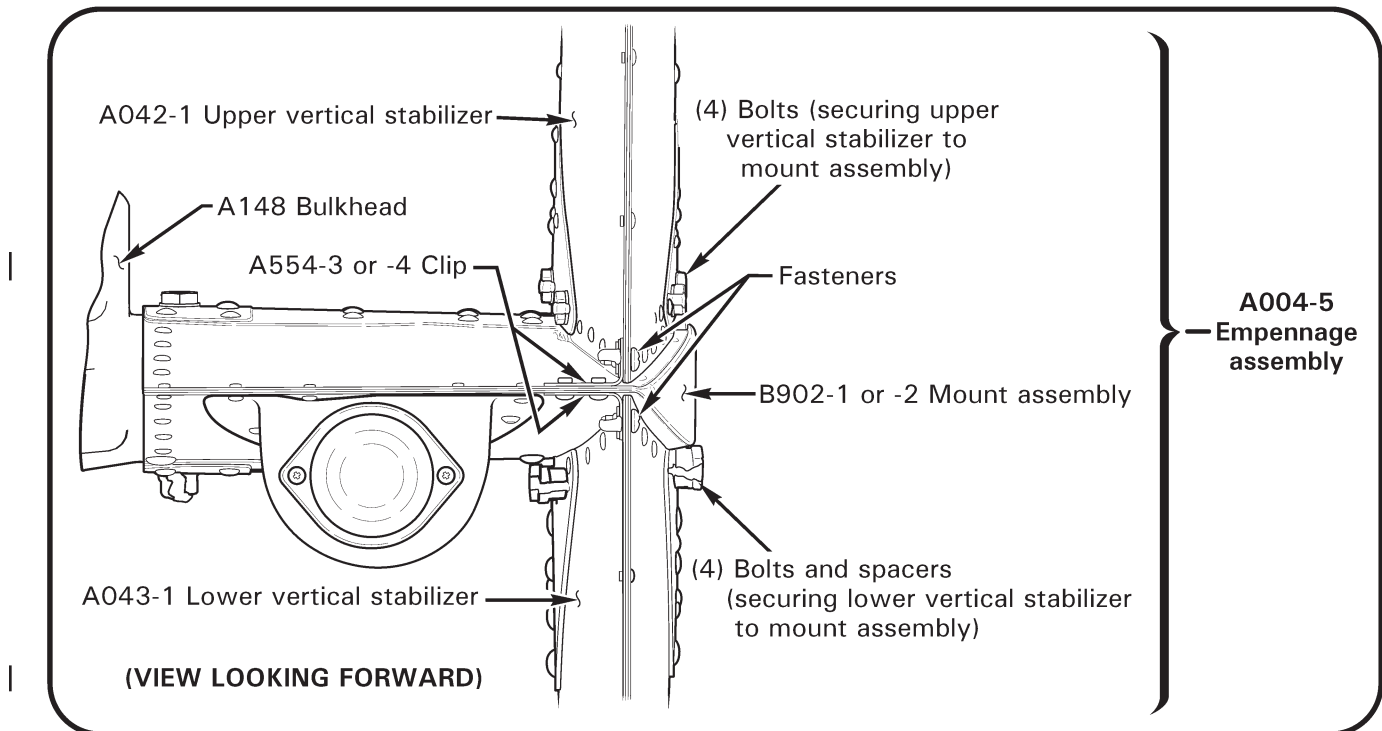


FIGURE 4-5 A004-5 EMPENNAGE ASSEMBLY INSTALLATION
(use with B375-2 horizontal stabilizer)

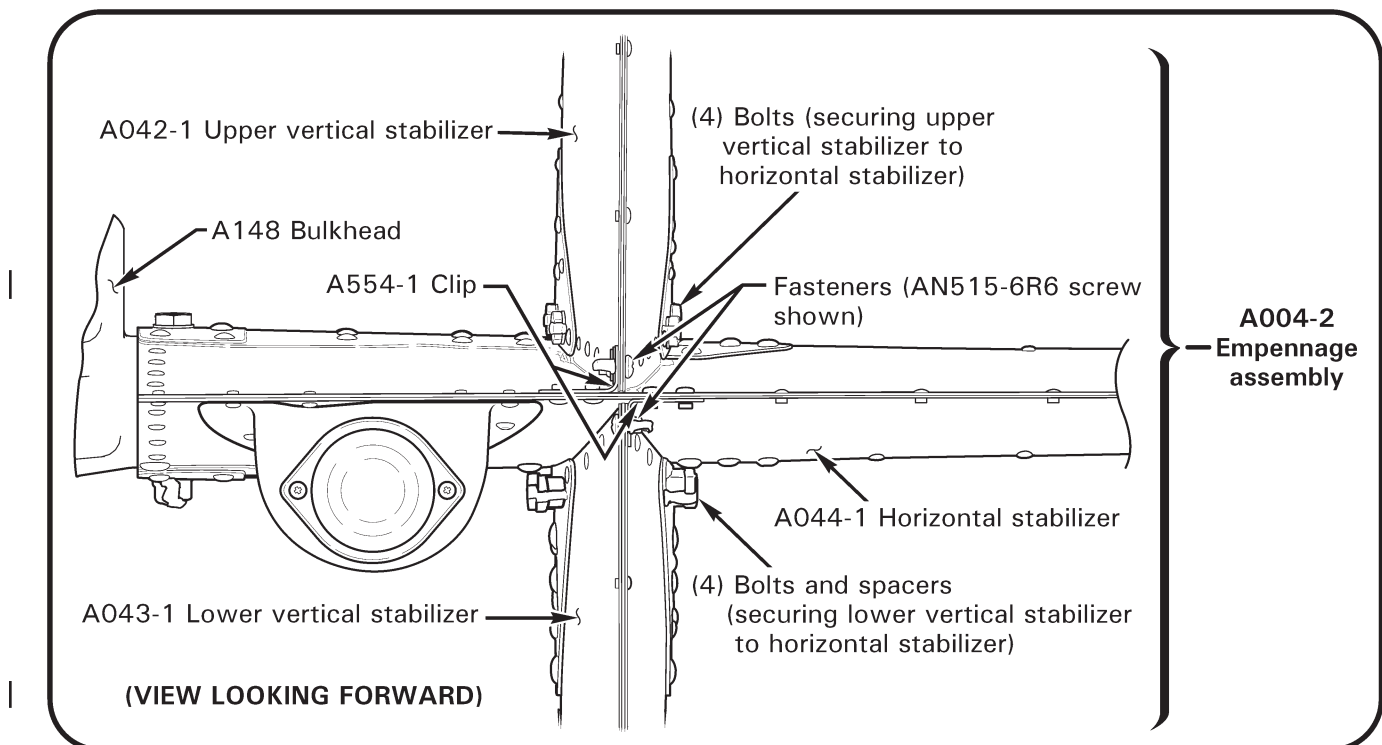


FIGURE 4-5A A004-2 EMPENNAGE ASSEMBLY INSTALLATION
(includes A044-1 horizontal stabilizer)

4.500 Empennage Assembly

CAUTION

If tailcone has a B379-1 or -3 bracket then A958-1 bellcranks (original equipment on helicopter S/N 0357 and subsequent) must be installed or retrofitted. Figure 8-2A refers.

If tailcone has a B379-1 or -3 bracket then B375-2 horizontal stabilizer must be installed.

A044-1 horizontal stabilizer may not be installed on a tailcone that has a B379-1 or -3 bracket.

B902-1 or -2 vertical stabilizers mount assembly may only be installed on a tailcone that has a B379-1 or -3 bracket.

A. Removal

1. Remove hardware securing MS21919WDG2 clamp to B902-1 (or -2) vertical stabilizers mount assembly (or A044-1 horizontal stabilizer, if installed). Cut and discard ty-raps securing position light and gearbox chip detector wires and connectors together. Disconnect position light at connectors.
2. Refer to Figure 4-5 or 4-5A. While supporting empennage assembly, remove hardware securing empennage to A148 bulkhead, and remove empennage.

B. Installation

1. Refer to Figure 4-5 or 4-5A. Position empennage assembly on A148 bulkhead.
 - a. **If A301-5 (empennage ballast; ref. § 18-32) weight will not be installed:** Install (2) NAS6604-28 bolts & associated hardware securing empennage to A148 bulkhead. Standard torque bolts and palnuts per § 23-32 and torque stripe per Figure 2-1.
 - b. **If A301-5 (empennage ballast; ref. § 18-32) weight will be installed:** Install (2) NAS6604-44 bolts & associated hardware securing empennage to A148 bulkhead. Standard torque bolts and palnuts per § 23-32 and torque stripe per Figure 2-1.
2. Connect position light wire connectors. Secure wires and install hardware securing MS21919WDG2 clamp to B902-1 (or -2) vertical stabilizers mount assembly (or A044-1 horizontal stabilizer, if installed). Install MS3367-4-9 ty-raps as required to secure wires and connectors together. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
3. Test and verify correct function of position and TR chip light circuits.

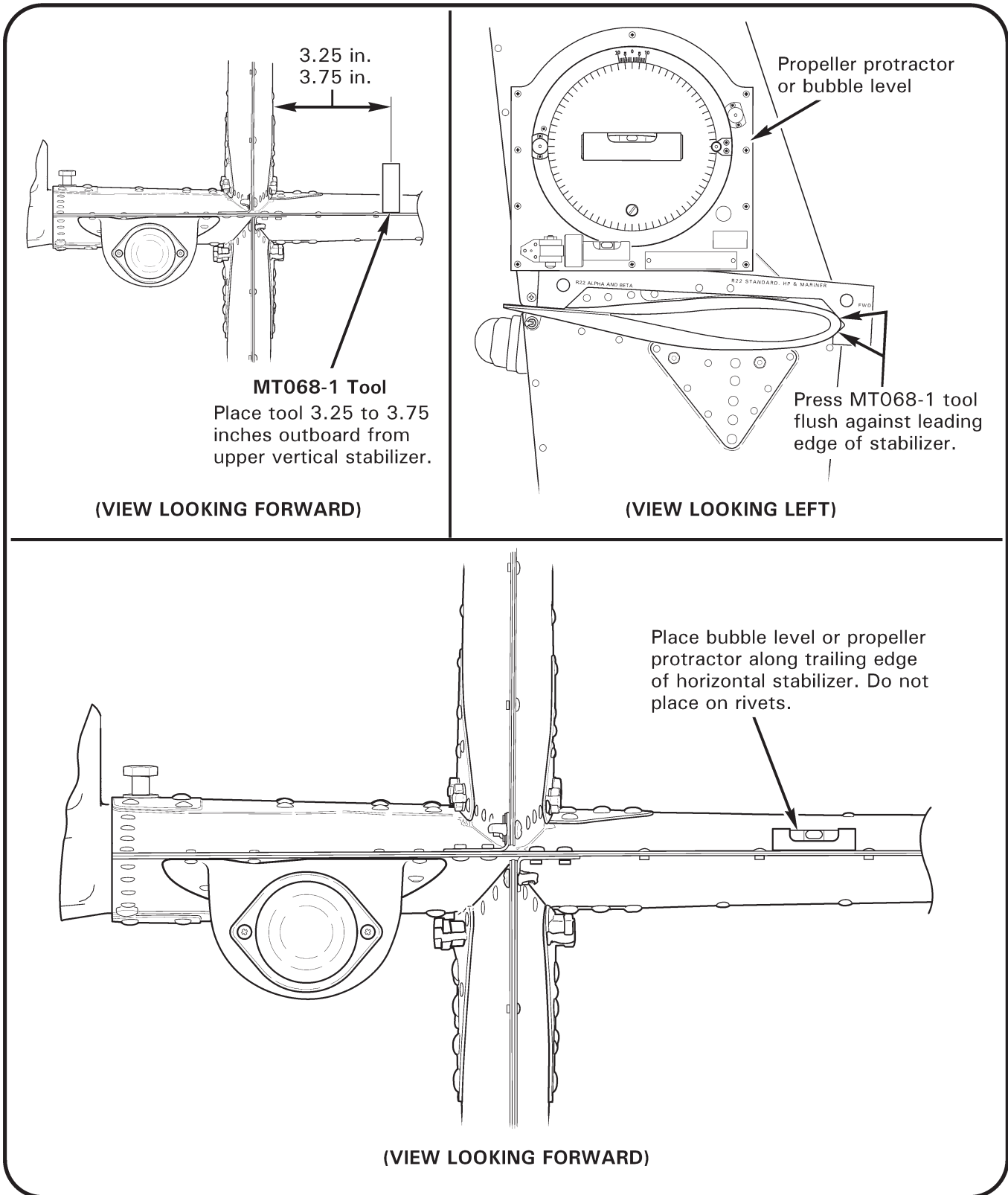


FIGURE 4-6 EMPENNAGE ASSEMBLY REPLACEMENT

4.500 Empennage Assembly (continued)**C. Replacement (A004-2 Empennage Only)**

1. Level aircraft per § 18-10.
2. Refer to Figure 4-6. Position empennage assembly on tailcone aft bulkhead. Insert (2) NAS1304-28 bolts thru top mounting holes in A044-1 horizontal stabilizer.

NOTE

A large C-clamp and wooden blocks may be used between NAS1304 bolts to prevent empennage moving prior to drilling.

3. Place MT068-1 horizontal stabilizer rigging tool on top of horizontal stabilizer 3.25–3.75 inches from outboard edge of vertical stabilizer.
4. Place propeller protractor or bubble level atop MT068-1 forward flat surface if tailcone is A023-1 or -22 (Standard, HP, & Mariner helicopters), or aft flat surface if tailcone is A023-20 or -23 (Alpha & Beta helicopters).
5. Push forward or pull aft slightly on tail skid to adjust horizontal stabilizer angle of incidence until correct flat of MT068-1 tool is level with helicopter.
6. Place propeller protractor or bubble level along trailing edge of horizontal stabilizer. Push up or pull down slightly at outboard end of horizontal stabilizer as required to obtain $0^{\circ} \pm 0.5^{\circ}$ level laterally.
7. Verify angle of incidence performed in step 5. Adjust stabilizer per steps 5 & 6 as required.
8. Remove aft bolt from horizontal stabilizer top hole. Using existing hole as a drill guide, drill thru stabilizer's lower surface using 0.250 inch diameter drill bit. Temporarily secure stabilizer using NAS1304-28 bolt & D210-4 nut with washers in drilled hole.
9. Verify stabilizer angle of incidence and lateral level, adjust per steps 5 & 6 if required.
10. Remove forward bolt from horizontal stabilizer top hole. Using existing hole as a drill guide, drill thru stabilizer's lower surface using 0.250 inch diameter drill bit.
11. Remove aft bolt and C-clamp (if used), and remove empennage from tailcone. Deburr holes and install empennage per Part B.

4.510 Upper Vertical Stabilizer Assembly

A. Removal

1. Refer to Figure 4-5 or 4-5A. Remove fastener securing A554 clip to A042-1 upper vertical stabilizer assembly.
2. While supporting A042-1 vertical stabilizer, remove bolts securing vertical stabilizer to B902-1 (or -2) vertical stabilizers mount assembly or A044-1 horizontal stabilizer, as applicable, and remove A042-1 vertical stabilizer.

B. Installation

1. Refer to Figure 4-5 or 4-5A. Position A042-1 upper vertical stabilizer assembly on B902-1 (or -2) vertical stabilizers mount assembly or A044-1 horizontal stabilizer, as applicable. Verify 0.030–0.120 inch gap between vertical stabilizer skin edges and mount assembly (or horizontal stabilizer) upper skin. File vertical stabilizer skin edge(s) as required. Conversion coat & prime bare aluminum edges per §§ 23-51 & 23-60.
2. Install bolts securing vertical stabilizer to mount assembly (or horizontal stabilizer). Special torque bolts per § 23-33 and torque stripe per Figure 2-1.
3. If replacing vertical stabilizer, match drill A554 clip to stabilizer using 0.144 inch diameter drill. Deburr holes as required, install fastener and torque stripe per Figure 2-1.

4.520 Lower Vertical Stabilizer Assembly

A. Removal

1. Refer to Figure 4-5 or 4-5A. Remove fastener securing A554 clip to A043-1 vertical stabilizer.
2. While supporting A043-1 vertical stabilizer, remove bolts & spacers securing vertical stabilizer to B902-1 (or -2) vertical stabilizers mount assembly or A044-1 horizontal stabilizer, as applicable, and remove A043-1 vertical stabilizer.

B. Installation

1. Refer to Figure 4-5 or 4-5A. Position A043-1 lower vertical stabilizer assembly on B902-1 (or -2) vertical stabilizers mount assembly or A044-1 horizontal stabilizer, as applicable. Verify 0.030–0.120 inch gap between vertical stabilizer skin edges and mount assembly (or horizontal stabilizer) lower skin. File vertical stabilizer skin edge(s) as required. Conversion coat & prime bare aluminum edges per §§ 23-51 & 23-60.
2. Install bolts & spacers securing vertical stabilizer to mount assembly (or horizontal stabilizer). Special torque bolts per § 23-33 and torque stripe per Figure 2-1.
3. If replacing vertical stabilizer, match drill A554 clip to stabilizer using 0.144 inch diameter drill. Deburr holes as required, install fastener and torque stripe per Figure 2-1.

4.530 B902-1 or -2 Vertical Stabilizers Mount Assembly**A. Removal**

1. Remove A042-1 & A043-1 vertical stabilizer assemblies per §§ 4.510 & 4.520.
2. Remove hardware securing MS21919WGD2 clamp to B902-1 (or -2) vertical stabilizers mount assembly. Cut and discard ty-raps securing position light and gearbox chip detector wires and connectors together. Disconnect position light at connectors.
3. While supporting mount assembly, remove hardware securing mount to A148 bulkhead and remove mount.

B. Installation**CAUTION**

If tailcone has a B379-1 or -3 bracket then A958-1 bellcranks (original equipment on helicopter S/N 0357 and subsequent) must be installed or retrofitted. Figure 8-2A refers.

B902-1 or -2 vertical stabilizers mount assembly may only be installed on a tailcone that has a B379-1 or -3 bracket.

1. Refer to Figure 4-5. Position B902-1 (or -2) vertical stabilizers mount assembly on A148 bulkhead.
 - a. **If A301-5 (empennage ballast; ref. § 18-32) weight will not be installed:** Install (2) NAS6604-28 bolts & associated hardware securing empennage to A148 bulkhead. Standard torque bolts and palnuts per § 23-32 and torque stripe per Figure 2-1.
 - b. **If A301-5 (empennage ballast; ref. § 18-32) weight will be installed:** Install (2) NAS6604-44 bolts & associated hardware securing empennage to A148 bulkhead. Standard torque bolts and palnuts per § 23-32 and torque stripe per Figure 2-1.
2. Install A042-1 & A043-1 vertical stabilizer assemblies per §§ 4.510 & 4.520. If installing B902-2 mount assembly, match drill vertical stabilizers to A554-4 clips using 0.144 inch diameter drill. Deburr holes, install fasteners and torque stripe per Figure 2-1.
3. Connect position light at connectors. Install hardware securing clamp to mount assembly. Install MS3367-4-9 ty-raps as required to secure position light and gearbox chip detector wires and connectors together. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
4. Test and verify correct function of position and TR chip light circuits.

4.540 A044-1 Horizontal Stabilizer Assembly

A. Removal

1. Remove A042-1 & A043-1 vertical stabilizer assemblies per §§ 4.510 & 4.520.
2. Remove hardware securing MS21919WGD2 clamp to A044-1 horizontal stabilizer assembly. Cut and discard ty-raps securing position light and gearbox chip detector wires and connectors together. Disconnect position light at connectors.
3. While supporting horizontal stabilizer, remove hardware securing stabilizer to A148 bulkhead and remove stabilizer.
4. If replacing horizontal stabilizer, A554-1 clips may be reused. Drill out two rivets securing each clip to stabilizer and retain clips.

B. Installation

CAUTION

A044-1 horizontal stabilizer may not be installed on a tailcone that has a B379 bracket.

1. Refer to Figure 4-5A. Position A044-1 horizontal stabilizer assembly on A148 bulkhead.
 - a. If A301-5 (empennage ballast; ref. § 18-32) weight will not be installed: Install (2) NAS6604-28 bolts & associated hardware securing empennage to A148 bulkhead. Standard torque bolts and palnuts per § 23-32 and torque stripe per Figure 2-1.
 - b. If A301-5 (empennage ballast; ref. § 18-32) weight will be installed: Install (2) NAS6604-44 bolts & associated hardware securing empennage to A148 bulkhead. Standard torque bolts and palnuts per § 23-32 and torque stripe per Figure 2-1.
2. Install A042-1 & A043-1 vertical stabilizer assemblies per §§ 4.510 & 4.520.
3. Connect position light at connectors. Install hardware securing clamp to stabilizer. Install MS3367-4-9 ty-raps as required to secure position light and gearbox chip detector wires and connectors together. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
4. Test and verify correct function of position and TR chip light circuits.

4.540 A044-1 Horizontal Stabilizer Assembly (continued)**C. Repair**

A single dent on A044-1 horizontal stabilizer leading edge outboard of vertical stabilizers is permitted provided:

1. Dent is no more than 0.050-inch deep.
2. Dent must have a smooth bottom, with minimum 0.125-inch radius, and no sharp nicks or cracks.
3. Dent must be less than 1.25 inches spanwise.
4. It is permissible to remove above dent via metalworking.

Skin replacement, damage to spars, and either forward or middle attachment for vertical stabilizers, is not field repairable.

To inspect spars, remove NAS1919B04S01 rivets securing B722-3 outboard rib. Only B722-3 outboard tip rib may be field replaced; all other parts require use of the factory jig.

D. Replacement

1. On a padded surface, install A042-1 & A043-1 vertical stabilizer assemblies on A044-1 horizontal stabilizer per §§ 4.510 & 4.520.
2. Refer to Figure 4-5A. Position A554-1 clips on horizontal stabilizer, install fastener securing each clip to upper or lower vertical stabilizer. With upper and lower vertical stabilizers in-line, match drill clips to horizontal stabilizer using #30 drill. Deburr holes and install rivets securing clips to horizontal stabilizer. Reinstall fasteners and torque stripe per Figure 2-1.
3. Perform empennage replacement per § 4.500 Part C.

4.600 Tail Skid**A. Removal**

Remove hardware securing tail skid to A043-1 vertical stabilizer and remove skid.

B. Installation

Position tail skid in bottom of A043-1 vertical stabilizer. Install hardware securing skid. Standard torque bolts & palnuts per § 23-32 and torque stripe per Figure 2-1.

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