CHAPTER 27

FLIGHT CONTROLS

TABLE OF CONTENTS

FLIGHT CONTROLS - DESCRIPTION/OPERATION

1. General

The AA-5, AA-5A and AA-5B aircraft are all equipped with identical flight control systems. These systems consist of a dual control column of the "T" configuration, which operates conventional ailerons and an anti-servo elevator, dual rudder pedals which operate the rudder, and electrically actuated flaps.

2. Lateral Control System

The lateral control system consists of torque-tube actuated ailerons, positioned by cables extending from the control column. As either control wheel is turned the chain and sprocket drive to which it is coupled actuates a bellcrank to which the aileron control cables are attached.

3. Directional Control System

The directional control system consists of a conventional rudder actuated by control cables extending from the rudder pedal linkage.

4. Longitudinal Control System

The longitudinal control system consists of an anti-servo elevator actuated by control cables extending from the control column.

Longitudinal trim is provided by a trim tab mounted on the trailing edge of the elevator. This tab is actuated by a linkage that is adjusted by the trim wheel mounted on the console.

5. Flap System

The flap system consists of two wing flaps, one on each wing, mounted inboard of the ailerons, and an electrically operated flap drive mechanism. The flaps are actuated by torque tubes extending into the fuselage. Linkages transmit the linear motion of the actuator to the torque tubes.

6. Gust Lock

The gust lock consists of a metal pin that can be inserted through a hole in the control column to secure the ailerons and elevators against wind damage.

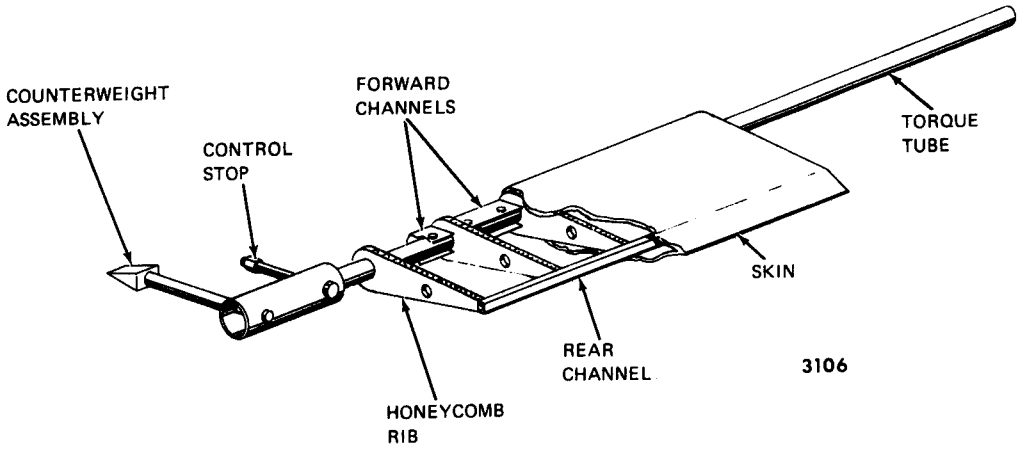
AILERON & TAB - DESCRIPTION/OPERATION

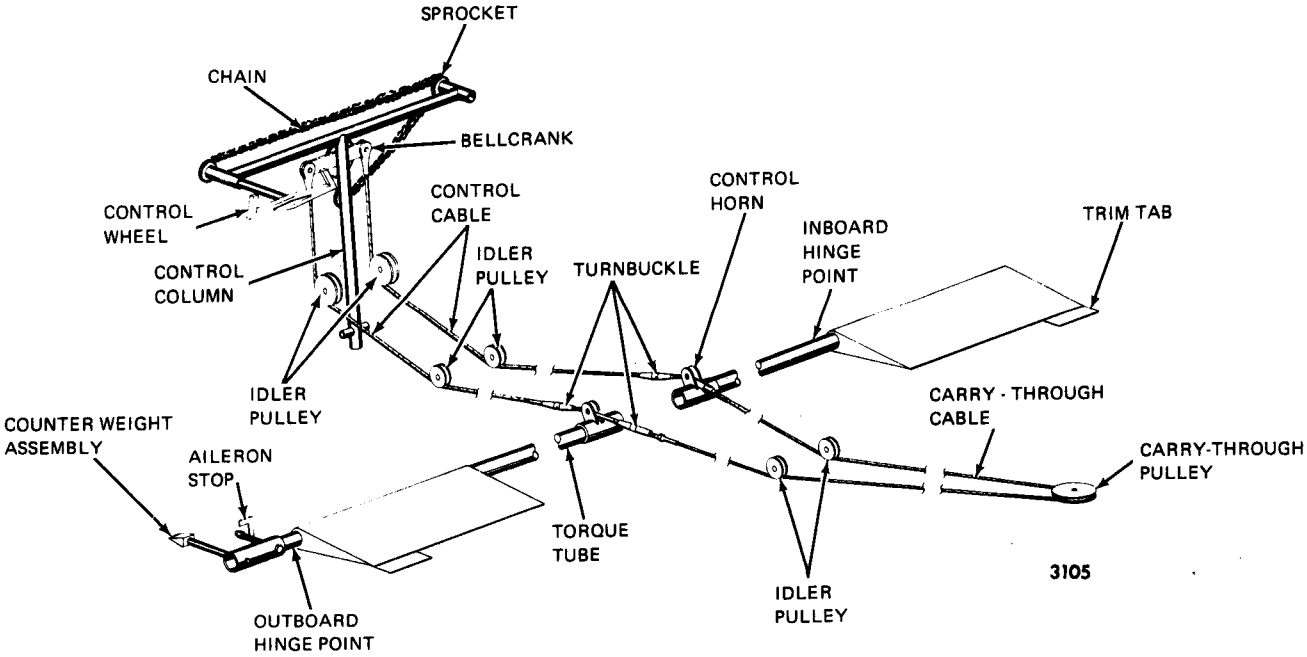
1. General (See Figure 1.)

As the control wheel is rotated its angular displacement is transmitted through a sprocket and chain arrangement on the control column to the bellcrank. Control cables attached to the bellcrank are routed through idler pulleys to the control horns attached to the aileron torque tubes. The control horns rotate the torque tubes, thus positioning the aileron control surfaces in direct proportion to control wheel displacement. A carry-through cable, attached to the control horns, extends aft to the carry-through pulley in the aft fuselage. This cable provides completion of the aileron control loop such that as one aileron moves up the other aileron moves down.

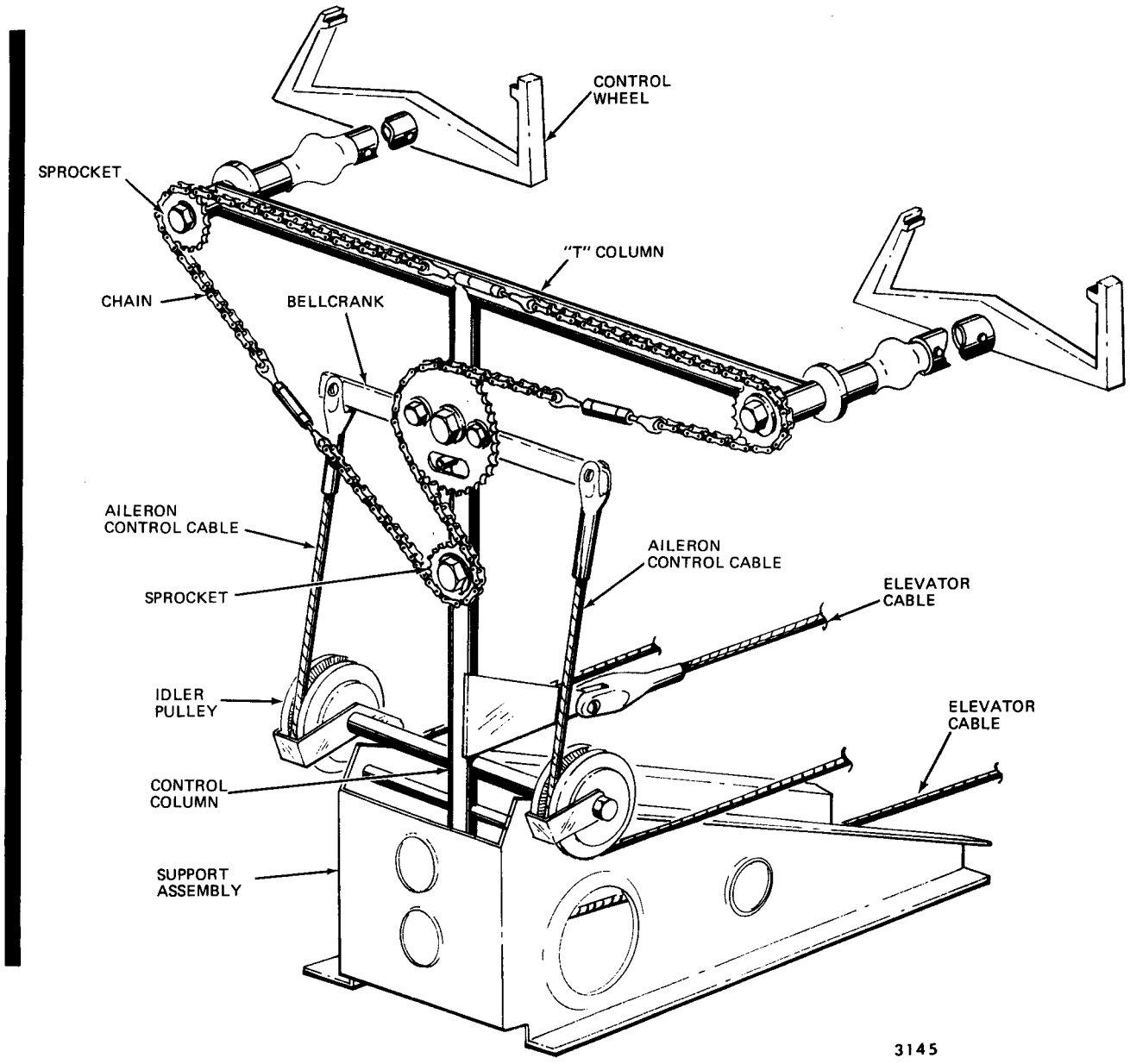
The aileron control surfaces are mounted on bearings that fit over the torque tube at each end of the control surface. Each aileron is composed of a formed metal skin which is bonded to seven internal ribs. The internal ribs are made of aluminum honeycomb. The torque tube extends the length of the aileron through the flap, and into the fuselage. The torque tube forms the aileron hinges. The aileron counterweight and control stop are mounted on the outboard end of the torque tube. The forward channels are riveted to the torque tube and form the contour of the aileron leading edge. The skin is bonded to the channels along its forward seam. In addition, the torque tube is bonded to the ribs. This type of structure enables rotational movement of the torque tube to position the control surface. Ground adjustable trim tabs are attached to the trailing edge of the control surfaces at their outboard ends.

The control column (Figure 2) consists of a "T" column, the bottom of which is attached to the aircraft through a needle bearing hinge. A bicycle-type chain extends around sprockets attached to the control wheel shafts, around an idler sprocket, and around a sprocket attached to the bellcrank. The three turnbuckles on the chain enable adjustment of chain tension, adjustment of the relative control wheel positions, and adjustment of the bellcrank in relation to control wheel position. The shaft of each control wheel is attached through a universal joint to the "T" column. This allows forward and aft movement of the control column (for elevator action) while ensuring that the angular movement of the control wheel is transmitted to the sprocket. Needle bearings in the "T" column and in the sprockets minimize control system friction.





Aileron Control System
Figure 1



Control Column
Figure 2

MAINTENANCE PRACTICES — SERVICING

1. Lubrication of Aileron Bearings and Control Column

A. Aileron Bearing Lubrication

Lubricate the aileron bearings by injecting a small amount of grease, MIL-G-7711 (see Chapter 12) between the bearings and torque tube.

B. Control Column Lubrication

Proper lubrication of the needle bearings in the control column requires disassembly of the control column. Disassemble the control column as described in Removal/Installation, Paragraph 7, this chapter, and lubricate the bearings as follows:

WARNING: USE SOLVENTS IN A WELL VENTILATED AREA. AVOID BREATHING FUMES. KEEP AWAY FROM FLAMES.

(1) Use Stoddard solvent, or equivalent, to wash all grease from the needle bearings and thrust bearings.

(2) Inspect bearings for excessive wear or damage. Replace if defective.

(3) Use a clean, lint-free cloth saturated with Stoddard solvent, or equivalent, to remove all grease and foreign material from bearing races.

(4) Inspect races for excessive wear or damage. Replace if defective.

(5) Pack needle bearings and thrust bearings with MIL-G-7711 grease. (See Chapter 12.)

(6) Assemble control column as described in Removal/Installation, Paragraph 7B, this chapter.

(7) Use a clean, lint-free cloth saturated with Stoddard solvent or equivalent, to wipe all foreign material from the chain and sprockets.

(8) Lubricate the chain with a light coat of MIL-G-7711 grease. (See Chapter 12.)

MAINTENANCE PRACTICES – REMOVAL/INSTALLATION

1. Aileron and Torque Tube Removal/Installation

NOTE: The following procedure treats the aileron and torque tube as a unit. Refer to Paragraph 6 for Removal/Installation of aileron only.

A. Aileron and Torque Tube Removal (See Figure 401.)

(1) Remove trim per Chapter 25 to gain access to the aileron control horns.

(2) Remove nut (1) and washer (2) from bolt (3) that secures control horn (4) to torque tube (11).

(3) Remove wing tip as described in Chapter 57.

(4) Remove nuts (5), washers (6), and bolts (7) from wing and remove control stop (8) and bearing bracket (9) from wing. Disconnect ground terminal.

(5) Pull aileron outboard until torque tube clears inboard hinge.

B. Aileron and Torque Tube Installation (See Figure 401.)

NOTE: When installing the aileron, the torque tube may catch on the ribs in the flap as the tube is pushed through. A guide such as the one shown in Figure 402 may be helpful in preventing this.

(1) Slide aileron torque tube through the flap until it extends into the fuselage. Connect ground terminal.

(2) Position torque tube in control horn (4) until the holes align.

(3) Position bearing bracket (9) and control stop (8) so that their mounting holes align with those in the wing.

(4) Secure with bolts (7), washers (6), and nuts (5). Torque to 50 inch pounds.

(5) Secure with bolt (3), washers (2), and nut (1).

(6) Install wing tip as described in Chapter 57.

(7) Install trim as described in Chapter 25.

2. Aileron Bearing Removal/Installation (See Figure 403.)

A. Aileron Bearing Removal

(1) Remove aileron as described in Removal/Installation, Paragraph 1.

(2) Collapse bearing as shown in Figure 403 and remove from bearing support.

NOTE: Do not attempt to collapse a new bearing if it is cold (below 70°F) since the bearing material loses its elasticity and may break if it is collapsed while cold. Bearing installation can be facilitated by warming the bearing to body temperature (98°F).

B. Aileron Bearing Installation

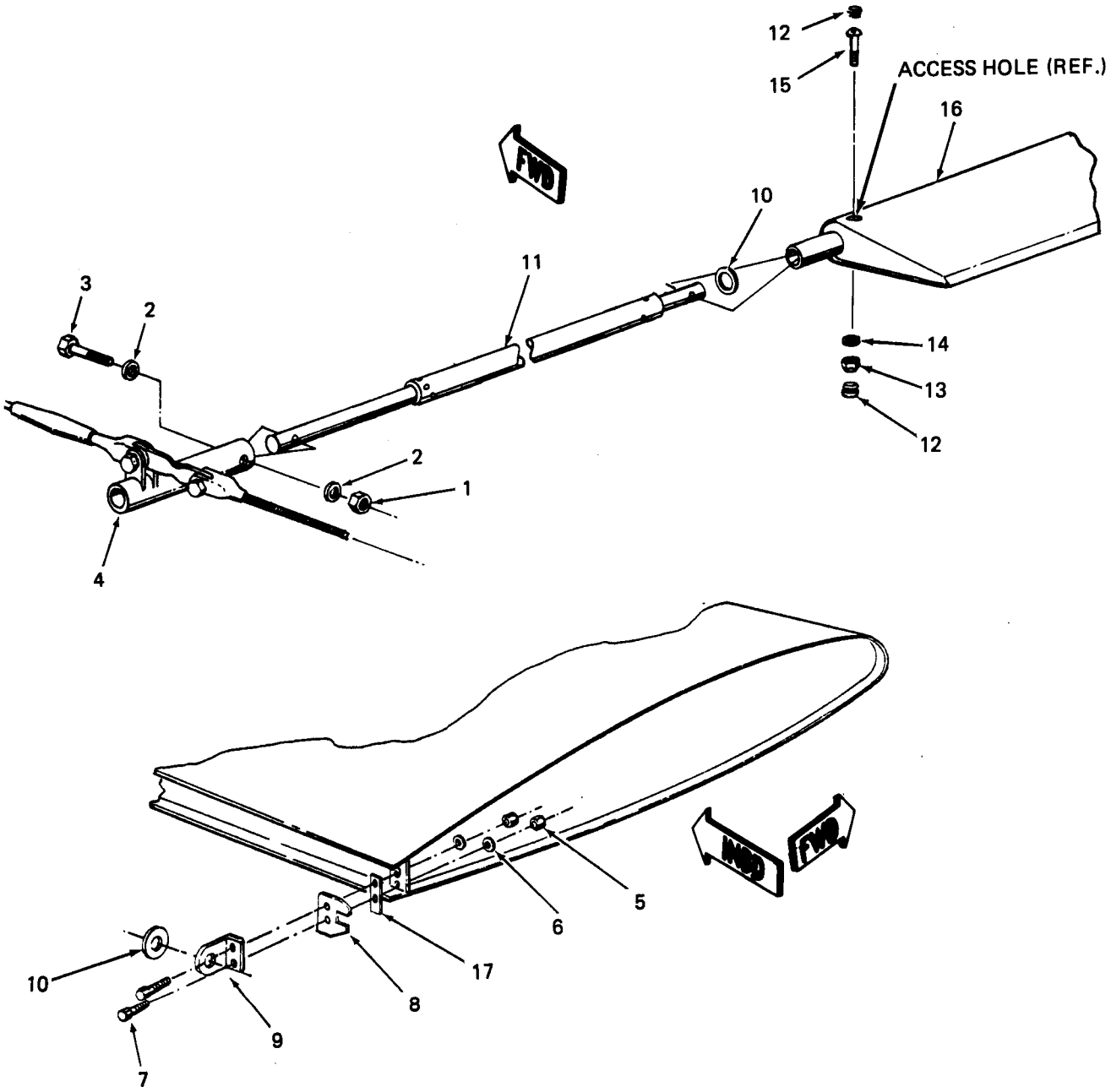
(1) Collapse new bearing and install it in bearing support as shown in Figure 403.

(2) Use aileron and flap bearing sizing tool, 1-1/8 inches I.D., Part No. DE-5006-1, to seat bearing so that it will fit over the torque tube.

NOTE: Once inserted in the support bracket the bearing I.D. should be rounded out or "sized" by inserting the correct bearing sizing tool and rolling the new insert into it correct size. New bearings should be sized to prevent control system stiffness.

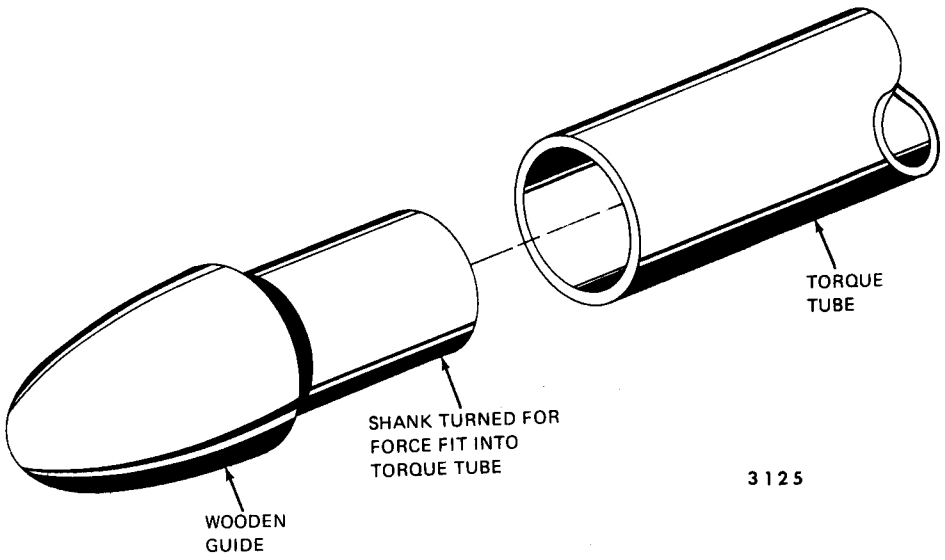
(3) Lightly grease the bearing with MIL-G-7711 grease. (See Chapter 12.)

(4) Install aileron as described in Removal/Installation, Paragraph 1.

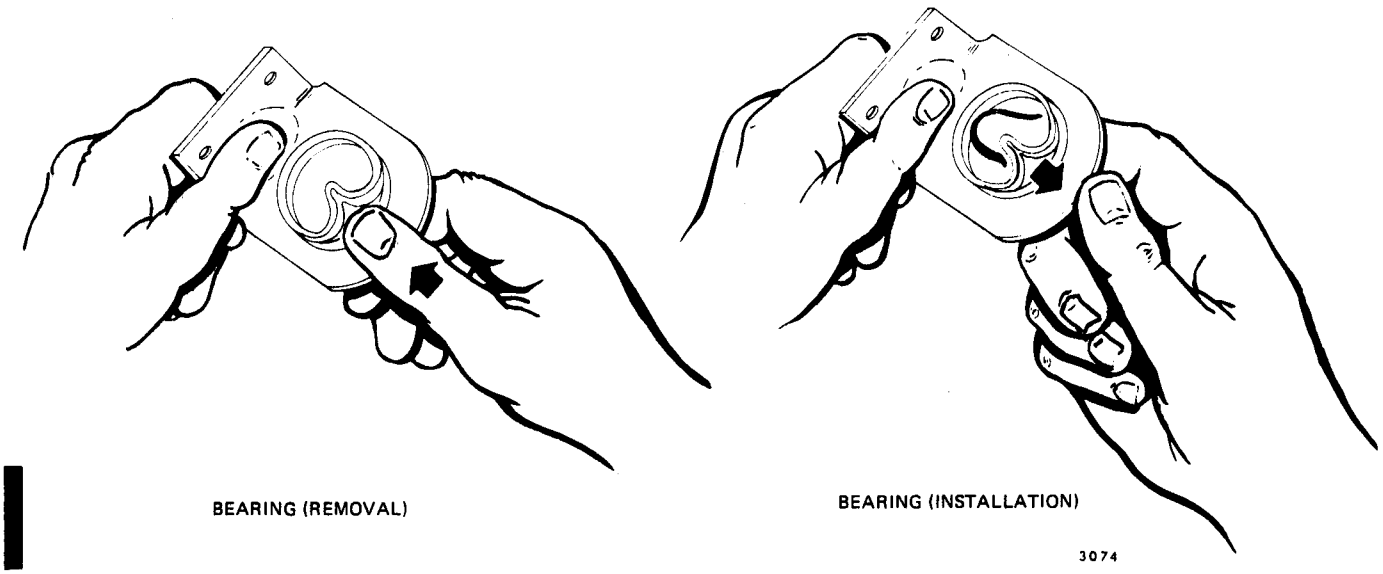


1. NUT
2. WASHER
3. BOLT
4. CONTROL HORN
5. NUT
6. WASHER
7. BOLT
8. CONTROL STOP
9. BEARING BRACKET
10. SPACERS
11. AILERON TORQUE TUBE
12. PLUG
13. NUT
14. WASHER
15. BOLT
16. AILERON
17. SHIMS

Aileron and Torque Tube Removal/Installation
Figure 401



Torque Tube Guide
Figure 402



Aileron Bearing Removal/Installation
Figure 403

3. Aileron Bearing Wear Limits

The maximum wear limits for the 902013 bearings are as follows:

	-1, -2, -3	-4
Minimum wall thickness	.030	.040

Any bearings that have been worn to the above limits must be replaced.

In addition, any bearing with a cracked or separated flange must be replaced.

NOTE: Maximum control surface, or control surface torque tube wear is .030 wall thickness reduction. Wear greater than this requires replacement of the control surface. Service kit No. SK-121, control surface torque tube repair kit, is available from the Grumman American Supply Operations Department for worn torque tubes that have not exceeded the maximum wear limits.

4. Aileron Cable Removal/Installation (See Figure 404.)

A. Control Cable Removal

(1) Remove trim per Chapter 25 to gain access to the aileron control horns.

(2) Remove console trim per Chapter 25 to gain access to the idler pulleys forward of the spar center section.

(3) Remove cotter pin (1), nut (2), washer (3) and bolt (4) from cable clevis end (5), and remove cable clevis (5) from bellcrank (6).

(4) Remove nut (7), washer (8), and bolt (9).

(5) Remove guards (10) from pulleys (11) to clear cables (12).

(6) Remove nuts (13) and washers (14) and lift control pulley assembly (15) to clear cables (12).

(7) Pull cables (12) from beneath control pulley assembly (15) and spar center section.

(8) Remove cotter pin (16), nut (17), washer (18), and bolt (19).

(9) Remove cable clevis (20) from control horn (21).

B. Control Cable Installation (See Figure 404.)

(1) Position cable clevis (20) and link (22) in control horn (21) and secure with bolt (19), washer (18), nut (17) and cotter pin (16).

(2) Route cables (12) under spar center section and under outboard pulley of control pulley assembly (15).

(3) Secure control pulley assembly (15) with washers (14) and nuts (13).

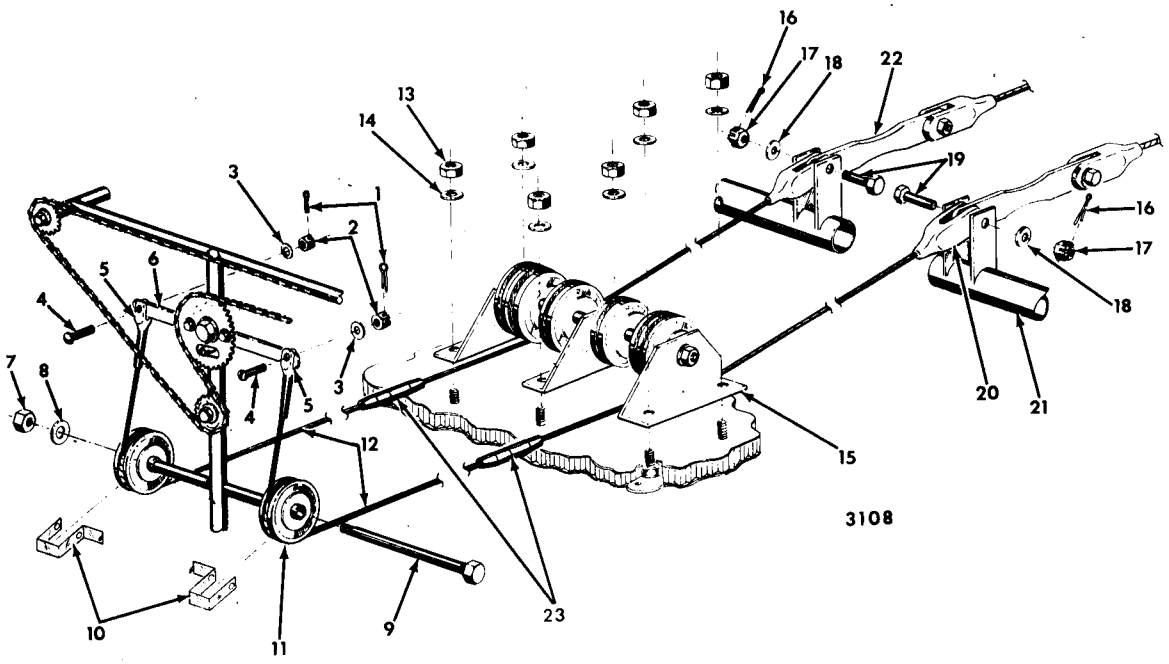
(4) Route cable (12) around pulley (11) and position guards (10) over cable (12).

(5) Install bolt (9) through guards (10) and pulleys (11), and secure with washer (8) and nut (7).

(6) Position cable clevis end (5) over bellcrank (6) and secure with bolt(4), washer (3), nut (2) and cotter pin (1).

(7) Rig aileron controls as described in Adjustment/Test, Paragraph 1.

(8) Reinstall trim removed as described in Chapter 25.



1. Cotter Pin
2. Nut
3. Washer
4. Bolt
5. Clevis
6. Bellcrank
7. Nut
8. Washer
9. Bolt
10. Guard
11. Pulleys
12. Cable
13. Nut
14. Washer
15. Pulley Bracket
16. Cotter Pin
17. Nut
18. Washer
19. Bolt
20. Clevis
21. Control Horn
22. Link
23. Turnbuckle

Aileron Cable Removal/Installation
Figure 404

C. Carry-Through Cable Removal (See Figure 405.)

(1) Remove console trim as described in Chapter 25 to provide access to the aileron control horns.

(2) Remove emergency locator transmitter access panel per Chapter 53.

(3) Remove nut (1), washer (2), and bolt (3) and remove link (4) from control horn (5).

(4) Remove cotter pin (6) from guard (7) and remove guard from bracket (8).

(5) Remove nut (9), washer (10), and bolt (11) from bracket (12).

(6) Remove guard (13) and carry-through pulley (14) from bracket (12).

(7) Slide carry-through cable (15) from pulley (14) and remove from aircraft.

D. Carry-Through Cable Installation (See Figure 405.)

(1) Place carry-through cable (15) on pulley (14) and insert pulley (14) in bracket (12).

(2) Install guard (13), bolt (11), washer (10), and nut (9). Torque to standard value per Chapter 91.

(3) Route cable (15) under outboard pulleys (16) and install guard (7). Secure with cotter pin (6).

(4) Insert link (4) into clevis (17) and place link and clevis in control horn (5). Secure with bolt (3), washer (2) and nut (1). Torque to standard value per Chapter 91.

(5) Install emergency locator transmitter access panel per Chapter 53.

(6) Rig aileron controls per Adjustment/Test, Paragraph 1, this chapter.

(7) Install console trim per Chapter 25.

5. Control Column Removal/Installation

A. Control Column Removal (See Figure 406.)

(1) Remove console trim per Chapter 25.

(2) Remove cotter pin (1), nut (2), washer (3) and bolt (4) attaching elevator and aileron control cables (5) to the control column (6).

(3) Remove nut (7), washer (8) and bolt (9). Slide control wheel shaft (10) from universal (11) and remove shaft from aircraft.

(4) Remove six (3 on each side) nuts (12) and washers (13) securing support assembly (14) to aircraft floor.

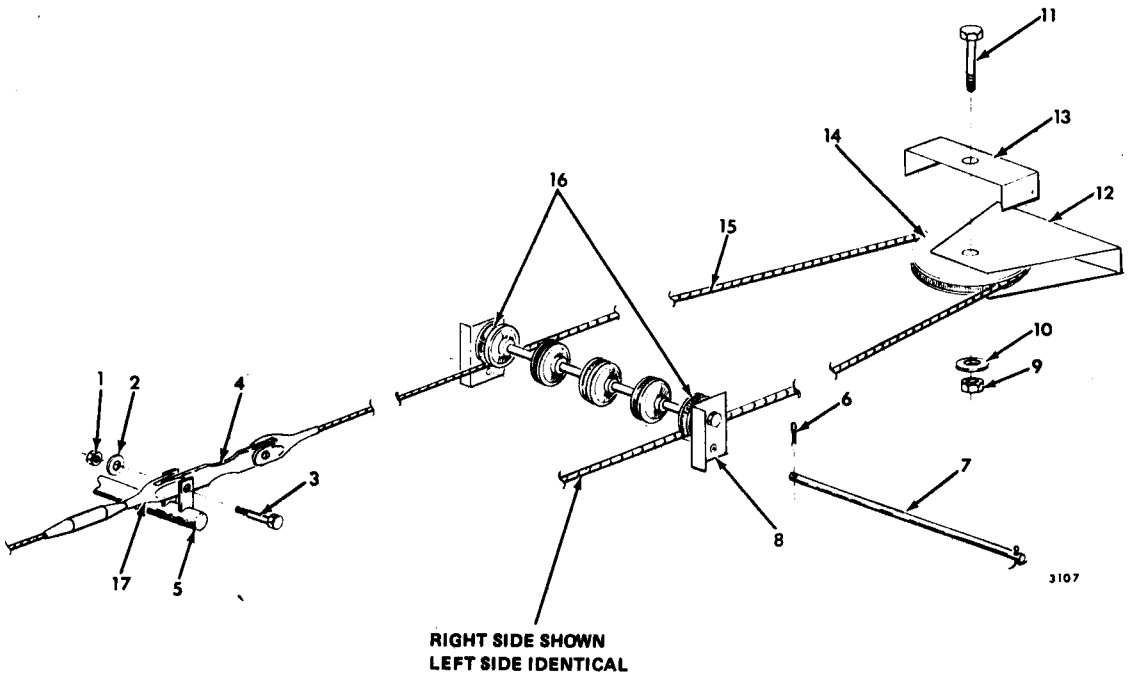
(5) Remove nut (15), washer (16) and bolt (17) from control column (6).

(6) Remove guards (18) from pulleys (19) and remove cables (5) from column.

(7) If an autopilot is installed, remove it per Chapter 22.

(8) Remove control column from aircraft.

(9) Remove washer (20) and rivet (21) from control wheel (22) and remove wheel from shaft (10).



RIGHT SIDE SHOWN
LEFT SIDE IDENTICAL

1.	Nut	9.	Nut
2.	Washer	10.	Washer
3.	Bolt	11.	Bolt
4.	Link	12.	Bracket
5.	Control Horn	13.	Guard
6.	Cotter Pin	14.	Pulley
7.	Guard	15.	Cable
8.	Bracket	16.	Pulley

Carry Through Cable Removal/Installation
Figure 405

B. Control Column Installation (See Figure 406.)

(1) Position control column such that support assembly (14) fits over its six mounting studs. Secure support with six washers (13) and nuts (12). Torque to standard value. (See Chapter 91.)

(2) Attach elevator cables (5) to control column (6) with bolt (4), washer (3), nut (2) and cotter pin (1).

(3) Place aileron cables (5) over pulleys (19) and place guards (18) over pulleys.

(4) Align guards (18) and pulleys (19) with control column and secure with bolt (17), washer (16) and nut (15). Torque to standard value. (See Chapter 91.)

(5) Attach aileron cables (5) to bellcrank (23) with bolt (4), washer (3), nut (2) and cotter pin (1).

(6) Attach control wheel (22) to shaft (10) with rivet (21) and washer (20).

(7) Slide shaft (10) through guide in instrument panel, and over end of universal (11).

(8) Align holes and attach shaft (10) to universal (11) with bolt (9), washer (8) and nut (7). Torque to standard value. (See Chapter 91.)

(9) If autopilot is used, install per Chapter 22.

(10) Rig controls per Adjustment/Test, Paragraph 1, this chapter.

(11) Install console trim per Chapter 25.

6. Control Column Disassembly/Assembly

A. Control Column Disassembly (See Figure 407.)

(1) Loosen turnbuckle (1) and remove chain (2) from sprockets (3), (4), and (5).

(2) Remove nut (6), washer (7), and bolt (8) from collar (9), and remove spacer (10), and universal (11).

(3) Grasp sprocket (3) and pull shaft (12) from control column (13). Shims (14) and thrust plate (15) will fall from shaft.

(4) Remove thrust plate (15) and spacer (16) from shaft (12).

(5) Drive pin (17) from shaft (12) and remove sprocket (3).

(6) Pull thrust bearings (18) from control column.

(7) Remove nut (19), washer (20), and bolt (21) from control column (13).

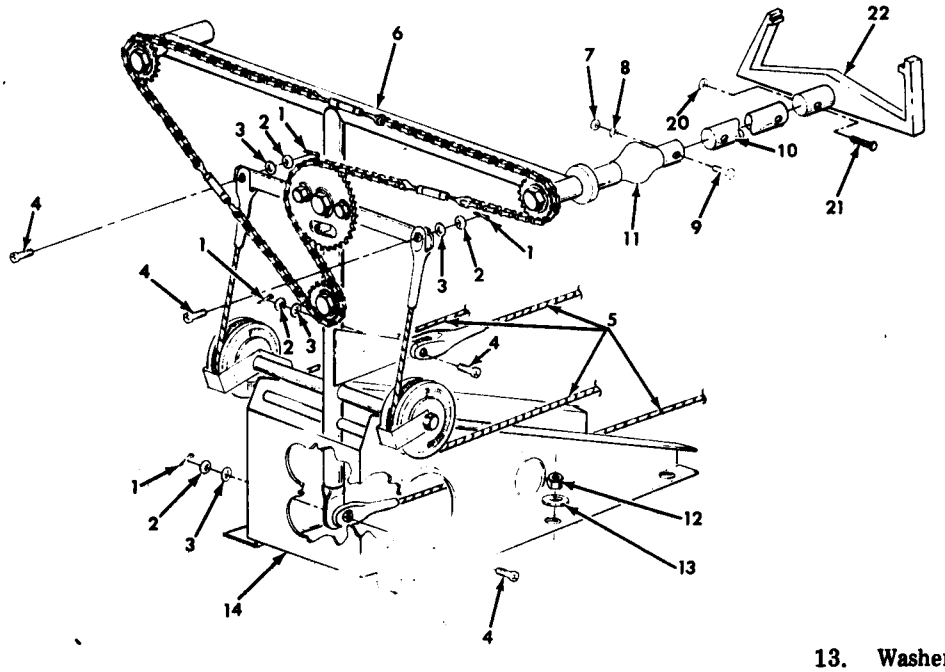
(8) Remove washer (22), sprocket (4), needle bearing (23), sleeve (24), and washers (25) from bolt (21).

(9) Remove nut (26), washer (27) and bolt (28) from control column (13).

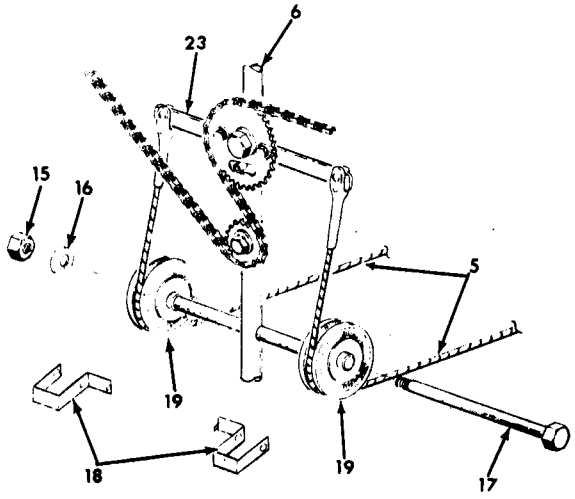
(10) Remove washer (29), sprocket (5), needle bearing (30), sleeve (31), and washers (32) from bolt (28).

(11) Remove nut (33), washer (34) and bolt (35) from sprocket (5) and remove bellcrank (36).

(12) Remove bushing (37) from control column.



1. Cotter Pin
2. Nut
3. Washer
4. Bolt
5. Cables
6. Control Column
7. Nut
8. Washer
9. Bolt
10. Control Wheel Shaft
11. Universal
12. Nut
13. Washer
14. Support
15. Nut
16. Washer
17. Bolt
18. Guard
19. Pulley
20. Washer
21. Rivet
22. Control Wheel
23. Bellcrank



Control Column Removal/Installation
Figure 406

(13) On aircraft AA5-0432 and on, AA-5A and AA5B-0001 and on, remove nut (38), and bolt (39), and lift control column (13) from support assembly (40).

(14) On AA5-0001 through AA5-0431 aircraft, remove nut (41), washers (42), and pin (43) from support assembly (40). Remove sleeve (44) from control column (13).

(15) Remove needle bearing (45) from control column (13).

(16) Disassemble chain (2) by unscrewing turnbuckles (1), (46), and (47).

B. Control Column Assembly (See Figure 407.)

(1) Install needle bearings (45) in control column (13).

(2) On aircraft AA5-0432 and on, AA05A and AA5B-0001 and on, position control column (13) in support assembly (40) such that the mounting holes align. Install bolt (39) and nut (38). Torque to allow free movement.

(3) On all other aircraft, install sleeve (44) in control column (13), and position control column in support assembly (40) such that the mounting holes align. Install pin (43) and secure with washers (42) and nuts (41). Torque per Chapter 91.

(4) Install bushing (37) in control column (13).

(5) Position bellcrank (36) on sprocket (5) such that attachment holes align. Secure with bolts (35), washers (34) and nuts (33). Torque to standard value. (See Chapter 91.)

(6) Place washers (32), and sleeve (31) on bolt (28).

(7) Place needle bearing (30) over sleeve (31).

(8) Install bolt (28), and needle bearing (30) in sprocket (5), and place washer (29) on bolt (28) behind bellcrank (36).

(9) Install bolt (28) in control column (13) and secure with washer (27) and nut (26). Torque per Chapter 91.

(10) Place washers (25) on bolt (21).

(11) Place sleeve (24), on bolt (21) and place needle bearing (23) over sleeve (24).

(12) Place sprocket (4) over needle bearing (23) and place washer (22) on bolt behind sprocket (4).

(13) Install bolt (21) in control column (13) and secure with washer (20) and nut (19). Torque per Chapter 91.

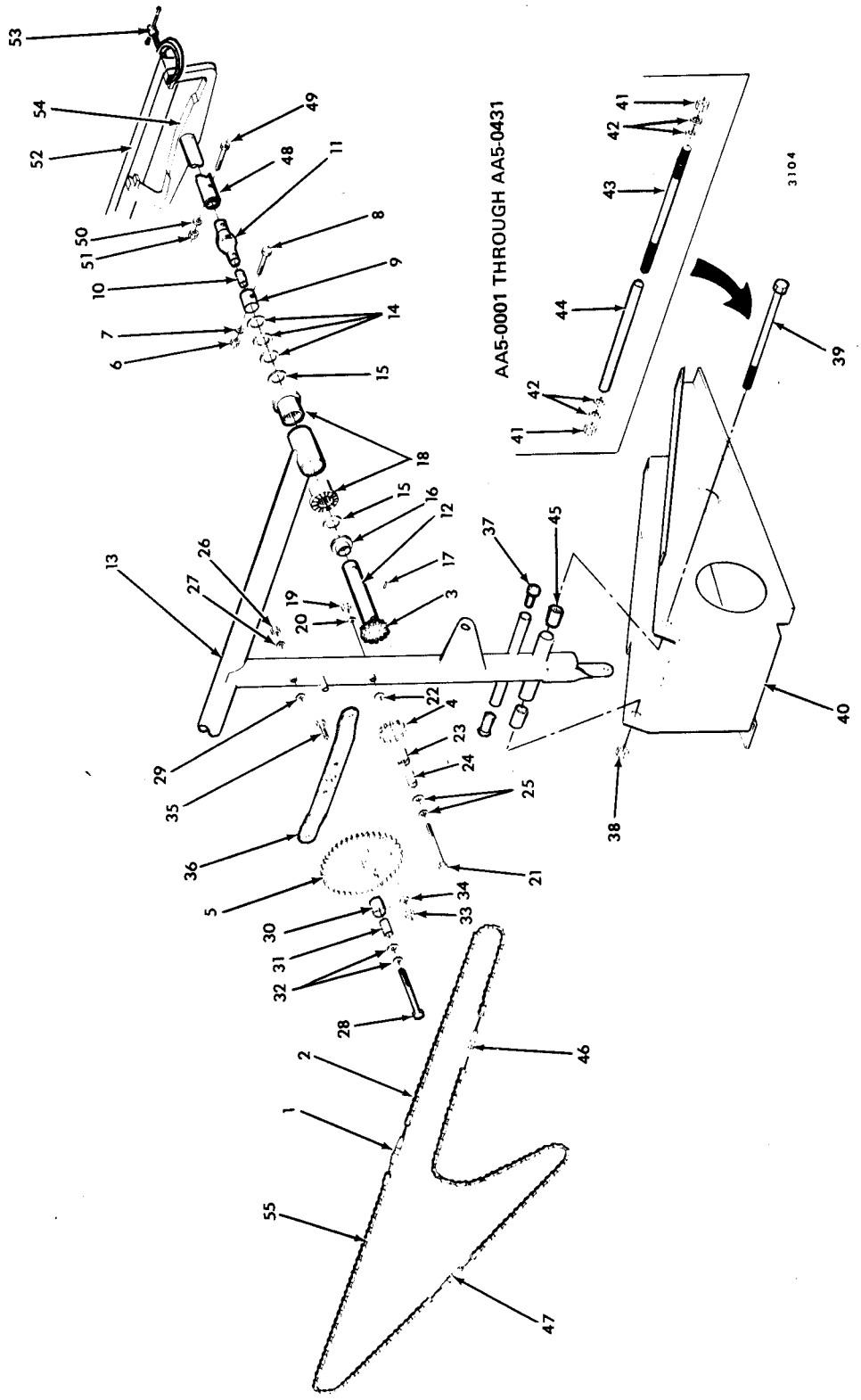
(14) Place sprockets (3) on end of shafts (12) and secure with drive pins (17).

(15) Place spacers (16) and thrust plates (15) on shafts (12).

(16) Install thrust bearings (18) in control column.

(17) Slide shafts (12) through thrust bearings (18) and install thrust plates (15), shims (14) and collars (9) on shafts (12). Align holes in collars (9) and shafts (12).

(18) Place spacers (10) in end of universals (11) such that holes align, then insert universals (11) in end of shafts (12).



Control Column Disassembly/Assembly (Sheet 1 of 2)
Figure 407

1. Turnbuckle
2. Chain
3. Sprocket
4. Sprocket
5. Sprocket
6. Nut
7. Washer
8. Bolt
9. Collar
10. Spacer
11. Universal
12. Shaft
13. Control Column
14. Shims
15. Thrust Plate
16. Spacer
17. Pin
18. Thrust Bearing
19. Nut
20. Washer
21. Bolt
22. Washer
23. Needle Bearing
24. Sleeve
25. Washers
26. Nut
27. Washer
28. Bolt
29. Washer
30. Needle Bearing
31. Sleeve
32. Washers
33. Nut
34. Washer
35. Bolt
36. Bellcrank
37. Bushing
38. Nut
39. Bolt
40. Support
41. Nut
42. Washers
43. Pin
44. Sleeve
45. Needle Bearing
46. Turnbuckle
47. Turnbuckle
48. Shaft
49. Bolt
50. Washer
51. Nut
52. Wood Block
53. Clamp
54. Control Wheel
55. Chain Tension Point

Control Column Disassembly/Assembly (Sheet 2 of 2)
Figure 407

(19) Align holes in universals (11) and shafts (12) and secure with bolts (8), washers (7) and nuts (6). Torque to standard value. (See Chapter 91.)

(20) Install and align chain (2) as follows:

(a) Place control wheel shafts (48) on universals (11) and secure with bolts (49), washers (50), and nuts (51).

(b) Use a straight piece of wood (52) and two clamps (53) to hold both control wheels (54) at their neutral positions.

(c) Position bellcrank (36) so that it is horizontal.

(d) Route chain (2) around the two upper sprockets (3) such that the turnbuckle (1) is over the large sprocket (5), and such that turnbuckle (46) is approximately half-way between sprockets (3) and (5).

(e) Route chain (2) over sprocket (5), under and around sprocket (4) and to sprocket (3).

(f) Adjust turnbuckle (1) to take up slack in chain between two upper sprockets (3).

(g) Adjust turnbuckles (46) and (47) to take up remaining slack in chain.

(h) Tighten all three turnbuckles until chain tension is such that a 2-pound force applied to the chain at point (55) will cause a 1/4 inch deflection in chain, and the bellcrank (36) is horizontal when both wheels (54) are at their neutral position.

(i) Safety wire turnbuckles, with .032 wire.

7. Aileron Removal/Installation

NOTE: Refer to Paragraph 1 above for removal of the aileron and torque tube as a unit.

A. Aileron Removal (See Figure 401.)

(1) Remove the wing tip. Refer to Chapter 57.

(2) Locate and disconnect the ground strap at the aileron leading edge.

(3) Remove plugs (12, Figure 401) from aileron (16).

(4) Remove nut (13) washers (14) and bolt (15). Slide aileron (16) off end of torque tube (11).

B. Aileron Installation (See Figure 401.)

(1) Slide aileron (16) onto end of torque tube (11). Align bolt holes in torque tube and aileron. Install bolt (15), washers (14), and nut (13). Tighten nut (13) to standard torque value (Chapter 91).

(2) Install ground strap to aileron leading edge.

(3) Install the control wheel lock in the control wheel shaft. Place the aileron rigging fixture (Part No. DE-5003-501) on the wing at Wing Station 140. The aileron should be positioned at 0° on the rigging fixture.

(4) Remove the control wheel lock and move the control wheel through its full travel, noting the position at which the aileron contacts the stops. The aileron should contact at 15° + 2°, —0° up, and 7½°, + 2½°, —0° down.

(5) If the requirements of Steps (3) and (4) are not met, rig the ailerons. Refer to Adjustment/Test, Paragraph 1, this section, for rigging procedures.

(6) Install and plug (12).

(7) Install the wing tip. Refer to Chapter 57.

8. Aileron Control Horn and Torque Tube Repair

Excessive play between the ailerons and the control wheel can be caused by slippage at the aileron control horn and torque tube. In certain high-time, in-service aircraft, this condition has been traced to the enlargement or elongation of the attach holes in the aileron torque tube (11, Figure 401) at the aileron control horn (4).

The following is an acceptable repair from a structural standpoint:

A. Install the control wheel lock in the control wheel shaft.

B. Gain access to the aileron control horns (4, Figure 401) by removing required console covers and trim (Chapter 25). Hold one aileron control horn and attempt to rotate the attached aileron torque tube in both directions. Repeat this procedure on the opposite side.

C. If play is noted, determine the largest diameter of the aileron torque tube and aileron control horn bolt holes.

D. If the largest diameter exceeds 0.2505 inch, open the existing bolt holes in the aileron torque tube and aileron control horn to 0.312 to 0.315 inch diameter.

NOTE: Do not increase the hole size beyond that specified. If the holes will not clean up, the aileron control horn and aileron torque tube must be replaced. (On early model aircraft the torque tube is an integral part of the aileron and replacement of the whole assembly will be necessary.) If removal for repair/replacement is necessary, refer to Maintenance Practices — Removal/Installation Paragraphs 1, 4 and 7, this section.

E. If existing bolt holes are opened in accordance with sub-paragraph D above, install oversize attach hardware listed below.

NAS464P5A19	Bolt
AN960-516	Washers
MS20364-524	Nut

F. Perform aileron rigging check if repair or replacement is made. Refer to Adjustment/Test, Paragraph 1, this section, for rigging procedures.

G. Record the repair/replacement in the aircraft log.

MAINTENANCE PRACTICES — ADJUSTMENT/TEST

1. Aileron Rigging

NOTE: The aircraft can be rigged to suit individual requirements by adjusting the fixed trim tabs on the ailerons. Do not exceed 45° as it will not contribute any more toward trim.

A. Aileron Rigging

(1) Secure the control wheels in the neutral position by installing the control wheel lock in the control wheel shaft.

(2) Place the aileron rigging fixture (Part No. DE-5003-501) on the right wing as shown in Figure 501.

(3) Remove trim, per Chapter 25, to gain access to the aileron control horns.

(4) Remove the locking clip from the turnbuckle immediately forward of the right control horn.

(5) Adjust the turnbuckle until the right aileron is positioned at 0° on the rigging fixture

(6) Place rigging fixture on the left wing.

(7) Remove the locking clip from the turnbuckle immediately forward of the right control horn.

(8) Adjust the turnbuckle until the left aileron is positioned at 0° on the rigging fixture.

(9) Check control column cable tension. Tension shall be 30 ± 2 pounds.

(10) Readjust turnbuckles until cable tension is 30 ± 2 pounds and both ailerons are positioned at 0° on the rigging fixture.

(11) Ensure that control column chain tension is as described in Disassembly/Assembly, Paragraph 9, this chapter.

(12) Install locking clips on turnbuckles and remove control wheel lock.

(13) Use rigging fixture to check aileron travel as control wheel is moved through its full travel. Full travel for each aileron should be 15° + 2, - 0° up, and 7½° + 2½°, - 0° down. The free aileron position should be ± 2° of neutral.

(14) If aileron travel does not fall within tolerance, remove wing tips per Chapter 57, and check aileron stops (Figure 401) for damage. Replace if damaged or bent.

NOTE: The down aileron contacts the stop before the up aileron. If aileron stops are not bent or damaged, file the stop contact surface until specified aileron travel is attained.

(15) Reinstall wing tips (if removed) per Chapter 57.

2. Control Surfaces Balancing Procedures

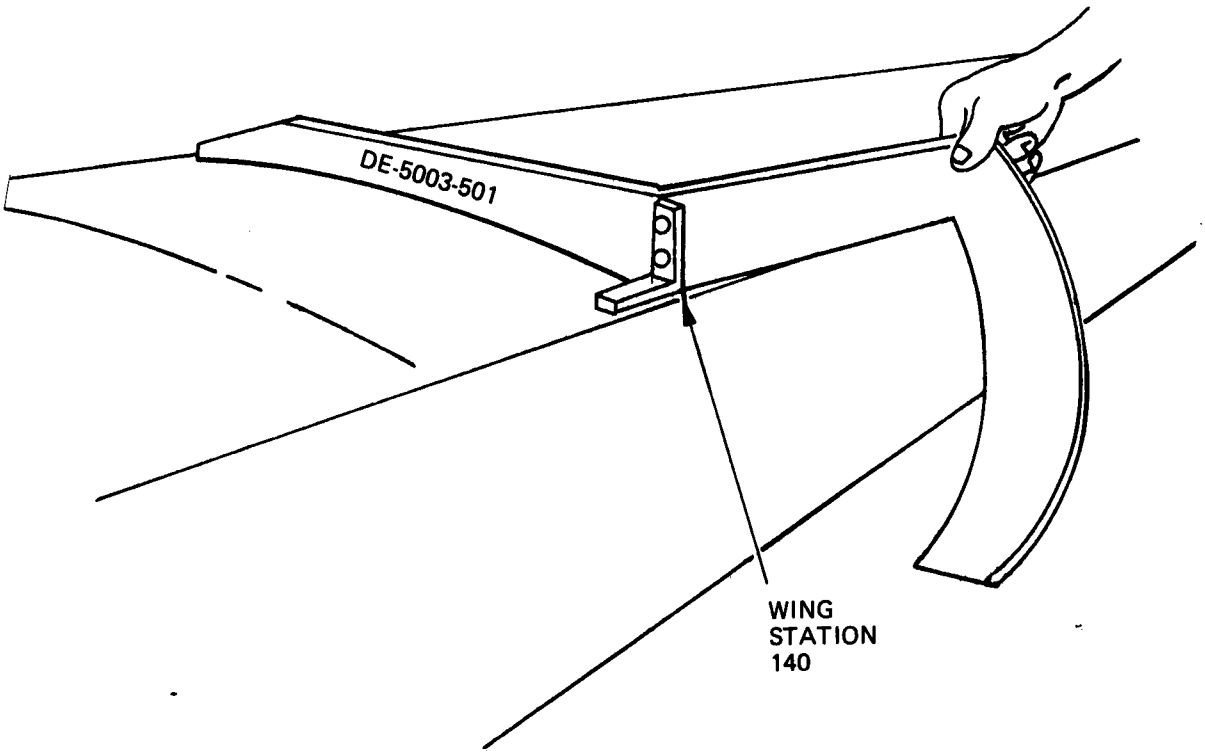
A. Definitions (See Figure 502)

(1) Underbalance is defined as the condition that exists when the control surface is trailing edge heavy and shall be symbolized by the plus (+) sign.

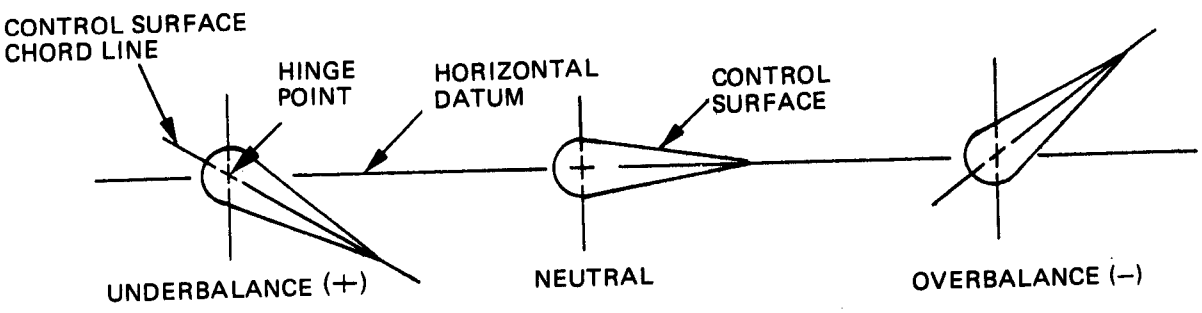
(2) Neutral Static balance is defined as the condition that exists when the chord line of the control surface is horizontal when the surface is balanced.

(3) Overbalance is defined as the condition that exists when the control surface is leading edge heavy and shall be symbolized by the minus (-) sign.

NOTE: This information is applicable to models AA-5, AA-5A and AA-5B for the purpose of clarifying and facilitating the balancing of movable control surfaces.



Aileron Rigging Fixture
Figure 501



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Control Surface Static Balance
Figure 502

B. General Balancing Procedures

NOTE: The balancing device may be constructed in any manner as long as the requirements given below are met.

(1) A line drawn through the hinge line support points must be level and perpendicular to the supporting knife edges.

(2) The supporting knife edges must be horizontal and parallel to each other within the requirements of sub-paragraph (1) above. The knife edges must be designed to allow the control surface to pivot freely about the hinge points.

(3) The control surface must always be balanced with the hinge line in a horizontal attitude.

(4) The area in which balancing operations are performed must be free of drafts or other air movements which might disturb the balancing operation.

(5) Control surfaces equipped with trim tabs must have the tab and the tab actuating rod in place during the balancing operation.

(6) The balancing device must include a means for accurately measuring the distance of the gage weight from the hinge line. The size of the gage weight is not critical as long as it's weight in ounces is accurately known; however, if the values given in table 1 are used, computation of moment will not be necessary.

(7) The balancing device must include a means of determining when the chord line of the control surface is horizontally level, indicating a balanced condition exists.

(8) Control surface balance must be rechecked after any painting, striping, repairs, or alterations to any control surface. An out-of-balanced control surface can seriously affect control and performance of the airplane.

NOTE: A typical device meeting these requirements is shown in Figure 503.

TABLE 1. CONTROL SURFACE BALANCE DATA (Painted surface)

MODEL	CONTROL SURFACE	GAGE WT. (oz)	LIMIT (INCHES) AFT	LIMIT (INCHES) FWD	MOMENT (IN. OZ)
AA5/AA5A/AA5B	Aileron	8	2	4	-16 to +32
AA5/AA5A/AA5B	Rudder	8	4	2	-32 to +16
AA5	Elevator	8	—	6 to 12	+48 to +96
AA5A/AA5B	Elevator	8	14 to 2	—	-112 to -16

C. Aileron Balancing (See Figures 503 and 504)

(1) Level the balancing device.

(2) Support the Aileron on the knife edges of the balancing device at both ends of the hinge line.

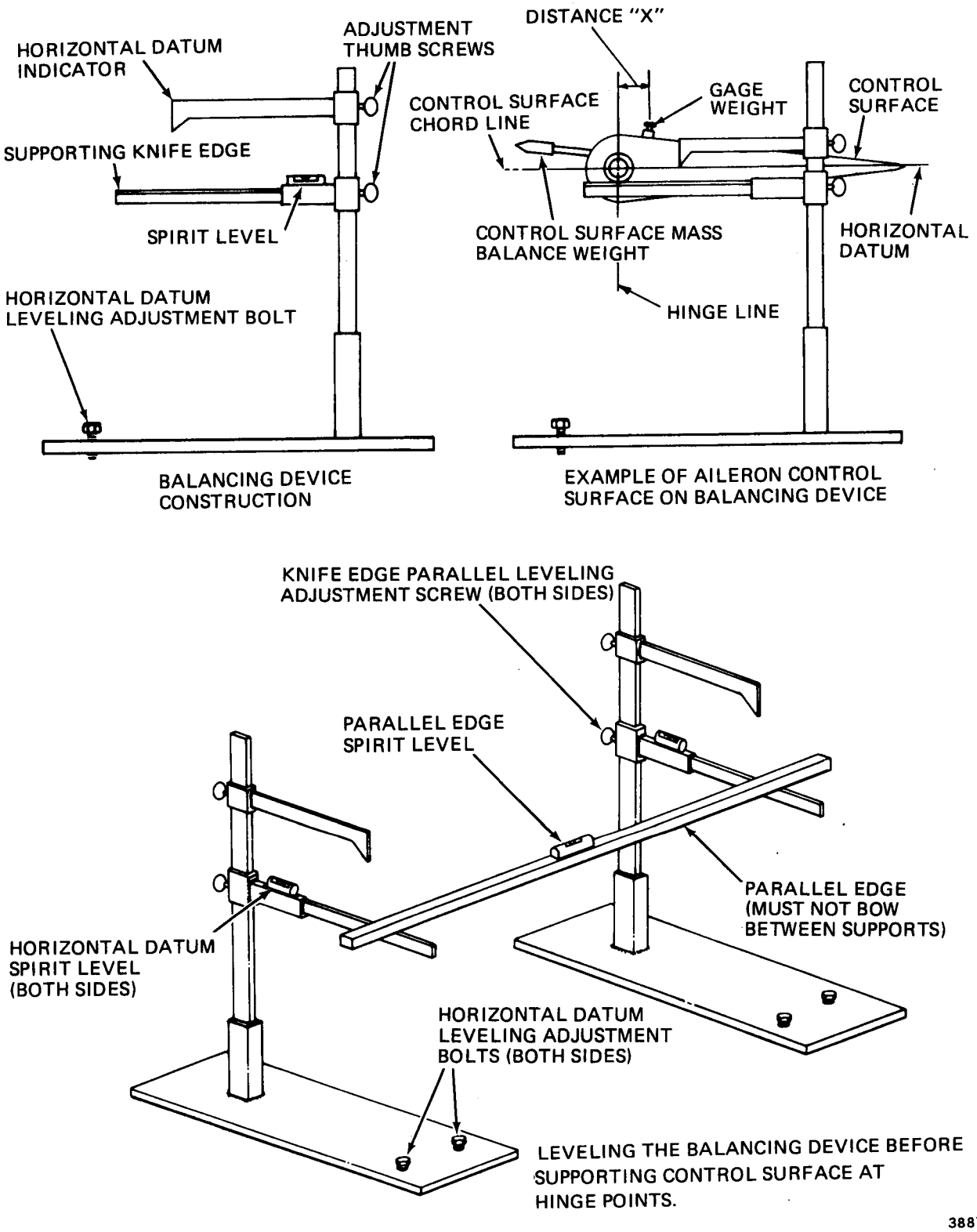
NOTE: The torque tube is the hinge line of the aileron.

(3) Provide aileron chord line/horizontal datum reference as follows:

(a) Place a light mark through the center of the torque tube and the center of the aileron trailing edge.

CAUTION: DO NOT USE A SCRIBE TO DRAW LINE. MARRING THE METAL CAN CAUSE CORROSION.

NOTE: For ease of accessibility, sub-paragraph (3) (a) may be accomplished before supporting aileron on balancing device.



Typical Control Surface Balancing Device
Figure 503

(b) measure the distance from the top edge of the support knife to the center of the torque tube. Then set the horizontal datum indicator by measuring the same distance from the top edge of the support knife to the tip of the indicator pointer.

(4) Check Aileron to see if it is nose heavy or tail heavy.

(a) If Aileron is nose heavy, start balance test by placing gage weight on aileron on aileron surface aft of hinge line.

(b) If Aileron is tail heavy, start balance test by placing gage weight on aileron surface forward of hinge line.

(5) Move gage weight until chord line is horizontally level as pointed out by horizontal datum indicator.

(6) Measure and record the distance (X) from the hinge centerline to the gage weight. The gage weight must be within the distance limits given in Table 1.

(7) If gage weight is forward of the distance limits given in Table 1 (underbalance condition), the mass balance weight assembly must be replaced. This assembly is designed to provide a slight over-balance to allow balancing by removal of weight.

NOTE: If it is necessary to move the gage weight forward of the hinge line, attach string or fine wire to the gage weight and loop it over the mass balance weight support tube.

(8) If gage weight is aft of the distance limits given in Table 1 (overbalance condition), remove weight from aileron mass balance weight until aileron balances by:

(a) shaving away lead material from top and bottom of weight, (Maximum 0.125 inch), or;

(b) drilling holes in either side of weight (Maximum depth 0.38 inch).

D. Elevator Balancing (See Figure 503 and 505)

NOTE: Elevator extension and tip cap on AA-5 models and tip cap on AA-5A/AA-5B models and attaching hardware must be installed on elevator before balancing is accomplished.

(1) Level the balancing device.

(2) Support the elevator on the knife edges of the balancing device at both ends of the hinge line.

NOTE: Balance each elevator separately.

(a) AA5 Models - The torque tube is the hinge line.

(b) AA-5A/AA-5B Models - Install hinge bolts at the inboard and outboard hinge points.

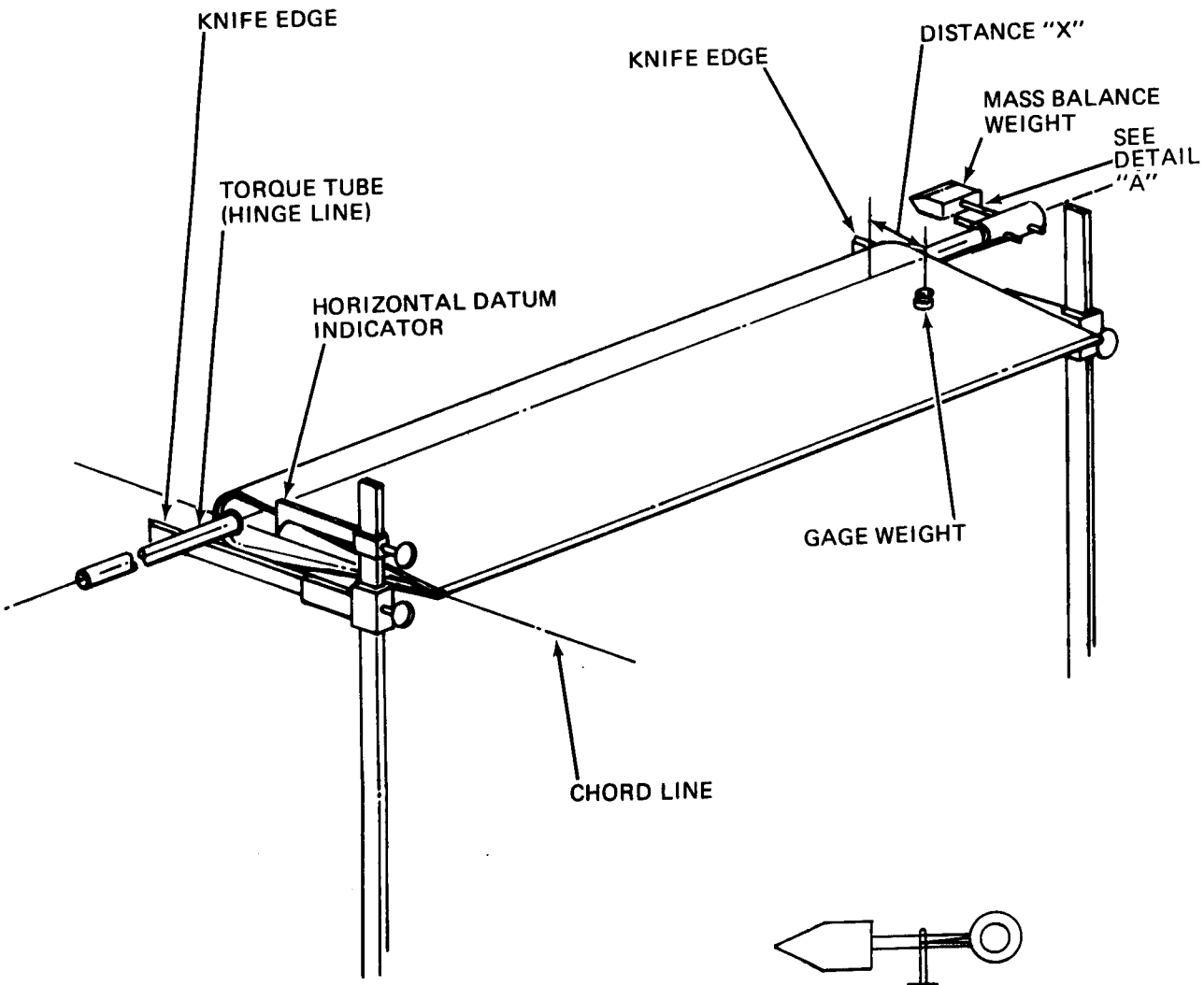
(3) Provide elevator chord line/horizontal datum reference as follows:

(a) place a light mark through the center of the torque tube (AA-5 models) or hinge point bolt hole (AA-5A/AA-5B models) and through the center of the elevator trailing edge.

CAUTION: DO NOT USE A SCRIBE TO DRAW LINE. MARRING THE METAL CAN CAUSE CORROSION.

NOTE: For ease of accessibility, sub-paragraph (3) (a) may be accomplished before supporting elevator on balancing device.

(b) measure the distance from the top edge of the support knife to the center of the torque tube (AA-5 Models) or center of the hinge point bolt hole (AA-5A/AA-5B models). Then set the horizontal datum indicator by measuring the same distance from the top of the support knife to the tip of the indicator pointer.

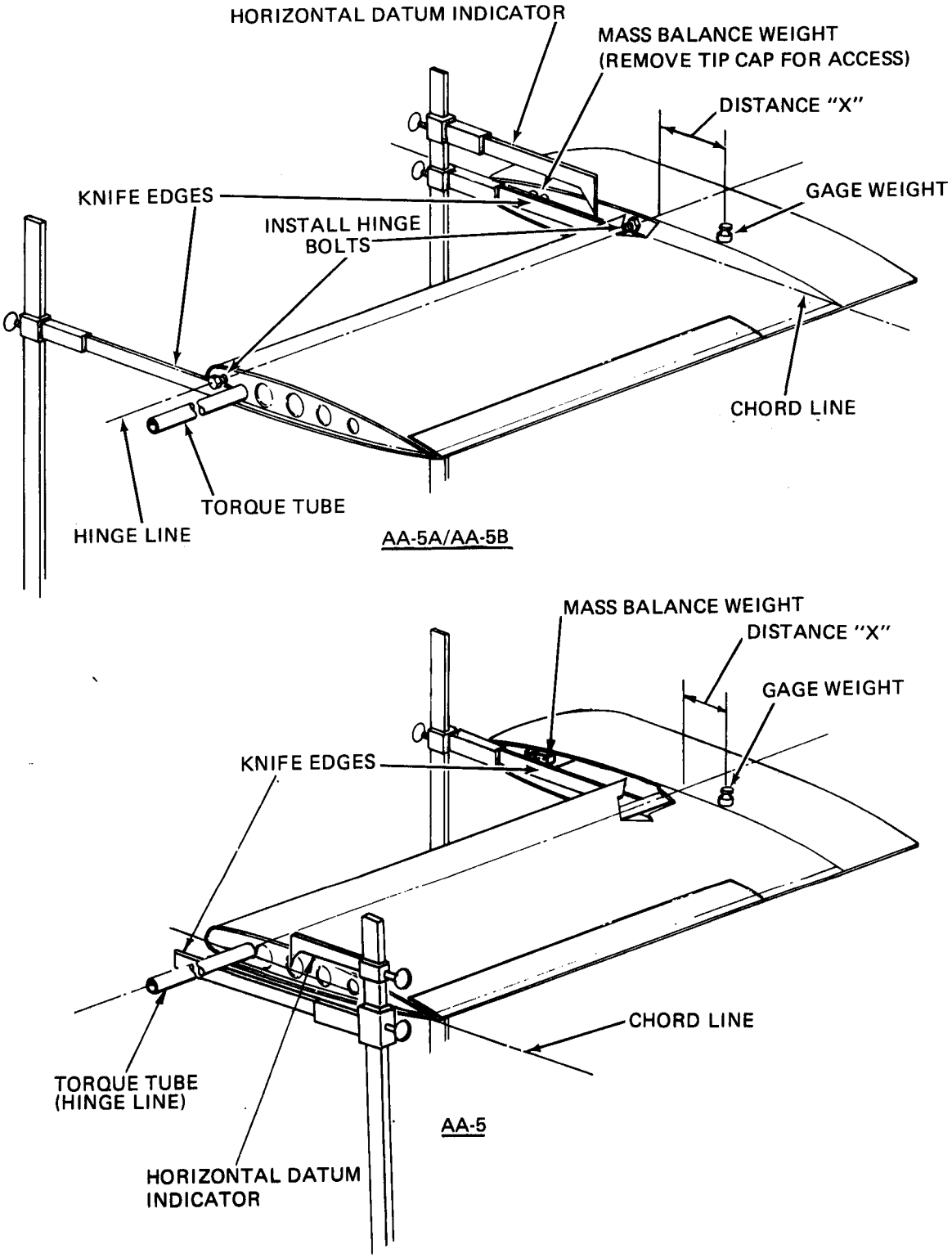


DETAIL A

EXAMPLE OF GAGE WEIGHT LOOPED OVER MASS BALANCE WEIGHT. SUPPORT TUBE WHEN NECESSARY TO MOVE GAGE WEIGHT FORWARD OF HINGE LINE.

3888

Typical Aileron Balancing
Figure 504



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Typical Elevator Balancing
Figure 505

(4) Check elevator to see if it is nose heavy or tail heavy.

(a) If elevator is nose heavy, start balance test by placing gage weight on elevator surface aft of hinge line.

(b) If elevator is tail heavy, start balance test by placing gage weight on elevator surface forward of hinge line.

(5) Move gage weight until chord line is horizontally level as pointed out by horizontal datum indicator.

(6) Measure and record the distance (X) from the hinge center line to the gage weight. The gage weight must be within the distance limits given in Table 1.

(7) If gage weight is forward of the distance limits given in Table 1 (underbalance condition), the mass balance weight must be replaced with a heavier weight.

(a) AA-5 Models - Mass balance weight is accessible without removal of elevator extension and tip cap.

(b) AA-5A/AA-5B Models - Remove elevator tip cap to gain access to mass balance weight. Tip cap must be reinstalled before determining new balance.

(8) If gage weight is aft of the distance limits given in Table 1 (overbalance condition), remove weight from elevator mass balance weight by drilling or shaving away lead weight material to bring elevator within balance limits.

NOTE: AA-5A/AA-5B Models - Tip cap must be reinstalled before determining new balance. It is unnecessary to remove the elevator extension and tip cap on AA-5 Models during mass balance weight rework.

E. Rudder Balancing (See Figure 503 and 506)

NOTE: Rudder tip cap, flashing beacon (optional equipment) and all attaching hardware must be installed on rudder before balancing is accomplished. If equipped with optional flashing beacon, route wire through torque tube to assure that it does not interfere with, or influence balancing procedure.

(1) Level the balancing device.

(2) Support the rudder on the knife edges of the balancing device at both ends of the hinge line.

NOTE: The torque tube is the hinge line of the rudder.

(3) Provide rudder chord line/horizontal datum reference as follows:

(a) place a light mark through the center of the torque tube and the center of the rudder trailing edge.

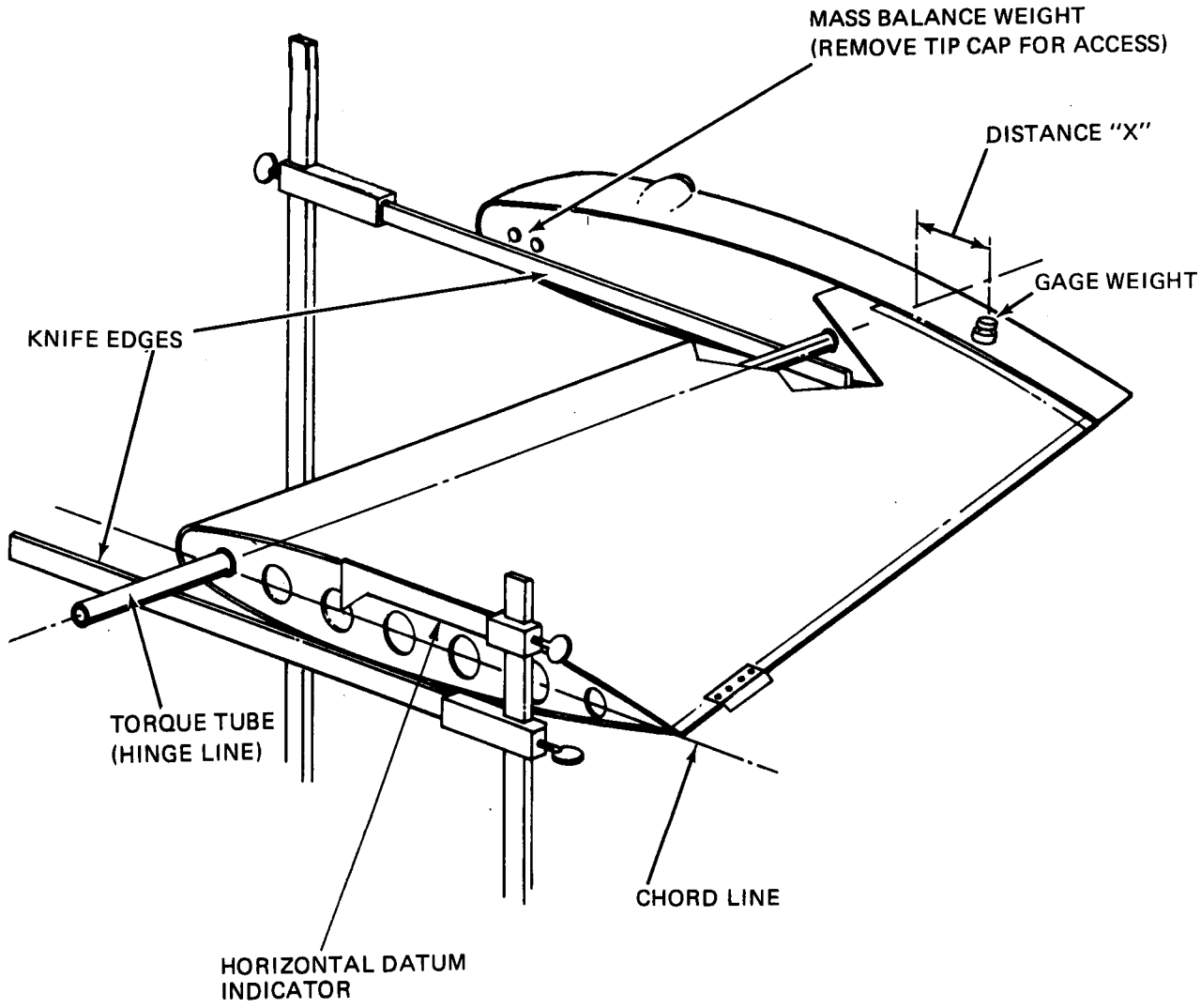
CAUTION: DO NOT USE A SCRIBE TO DRAW LINE. MARRING THE METAL CAN CAUSE CORROSION.

NOTE: For ease of accessibility, sub-paragraph (3) (a) may be accomplished before supporting rudder on balancing device.

(b) measure the distance from the top edge of the support knife to the center of the torque tube. Then set the horizontal datum indicator by measuring the same distance from the top of the support knife to the tip of the indicator pointer.

(4) Check rudder to see if it is nose heavy or tail heavy.

(a) If rudder is nose heavy, start balance test by placing gage weight on rudder surface aft of hinge line.



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Typical Rudder Balancing
Figure 506

(b) If elevator is tail heavy, start balance test by placing gage weight on rudder surface forward of hinge line.

(5) Move gage weight until chord line is horizontally level as pointed out by horizontal datum indicator.

(6) Measure and record the distance (X) from the hinge center line to the gage weight. The gage weight must be within the distance limits given in Table 1.

(7) If gage weight is forward of the distance limits given in Table 1 (underbalance condition), the mass balance weight must be replaced with a heavier weight.

(a) Remove rudder tip cap to gain access to mass balance wieght. Tip cap must be reinstalled before determining new balance.

(8) If gage weight is aft of the distance limits given in Table 1 (overbalance condition), remove weight from rudder mass balance weight by drilling or shaving away lead weight material to bring rudder within balance limits.

NOTE: Tip cap must be reinstalled before determining new balance.

MAINTENANCE PRACTICES - CLEANING/PAINTING

1. General

CAUTION: WHEN CONTROL SURFACES ARE PAINTED THEIR BALANCE IS CHANGED. ALWAYS CHECK BALANCE AFTER PAINTING.

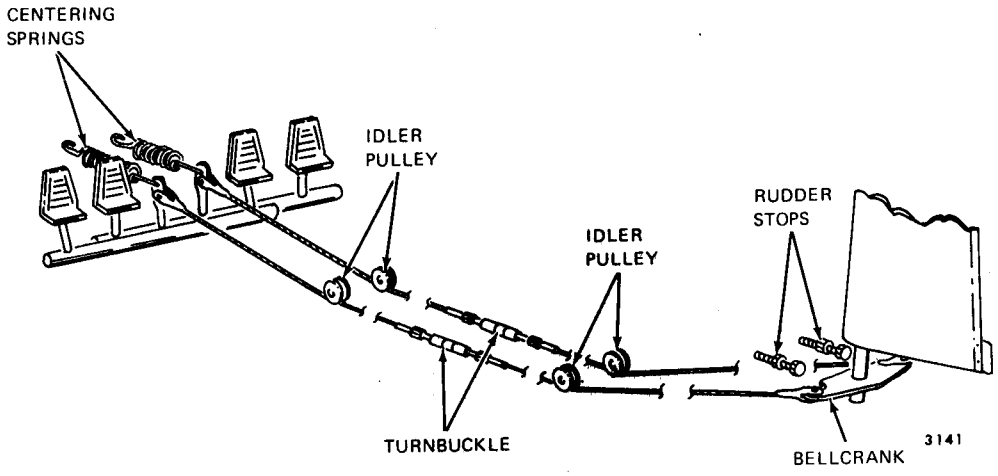
Clean and paint the ailerons in accordance with Chapter 20.

RUDDER & TAB - DESCRIPTION/OPERATION

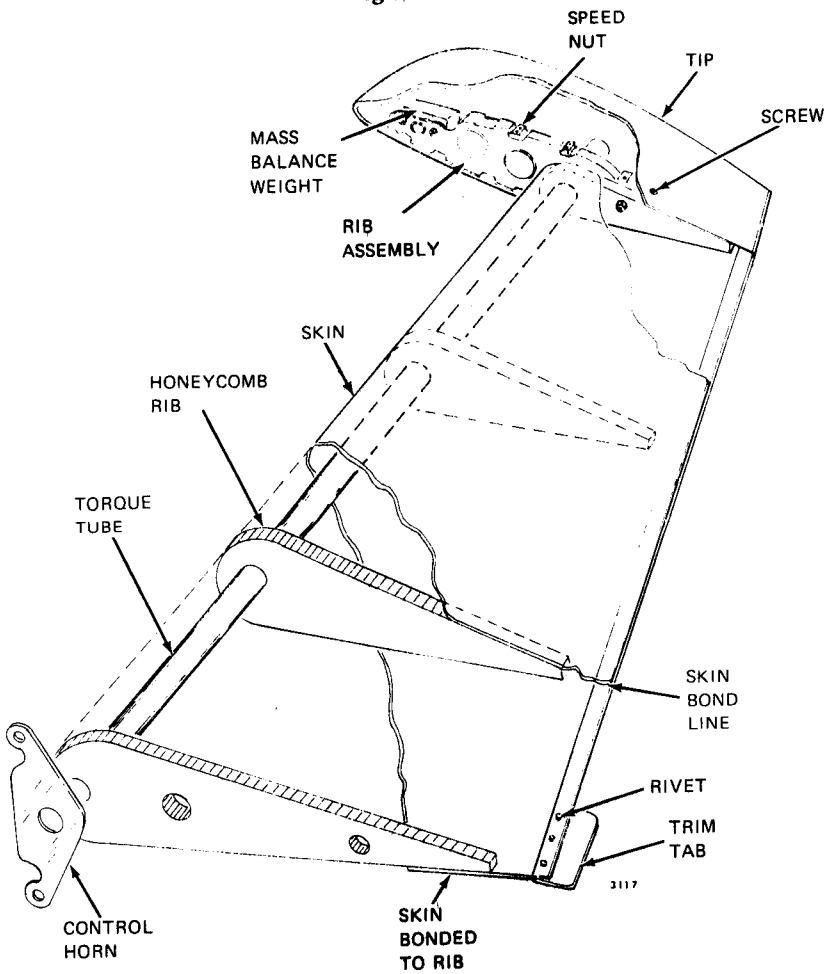
1. General (See Figure 1.)

The rudder system is composed of dual rudder pedals, which are center loaded by centering springs, cables which extend from the rudder pedals to the rudder, and a rudder actuated by a bellcrank attached to the cables. Adjustable rudder stops are provided to limit rudder travel to that required for proper control.

The rudder assembly (Figure 2) is a bonded structure composed of a torque tube, four honeycomb ribs, a skin, and a tip. The ribs are bonded to both the torque tube and the skin, to form a rigid structure that can be positioned by the torque tube. A fixed, ground adjustable trim tab is riveted to the lower trailing edge of the rudder. The rudder is supported by two bearings, one at the base of the rudder, and the other between the top honeycomb rib and the tip. The rudder tip is supported by a rib assembly that is attached to the torque tube and the top honeycomb rib. This rib assembly also provides a mounting point for the rudder mass balance. The plastic rudder tip is attached to the rib by speed nuts and screws. The control horn is attached to the rudder torque tube beneath the bottom hinge.



Rudder System
Figure 1



Rudder Assembly
Figure 2

MAINTENANCE PRACTICES — SERVICING

1. Lubrication

A. Rudder Bearing Lubrication

Apply MIL-L-7870 (See Chapter 12) oil to the torque tube and rudder bearings. Also apply MIL-L-7870 (See Chapter 12) oil to the rudder control horn clevis bolts.

B. Rudder Pedal Lubrication

Apply MIL-L-7870 (See Chapter 12) oil to the rudder pedal bearings.

MAINTENANCE PRACTICES — REMOVAL/INSTALLATION

1. Rudder Removal/Installation

A. Rudder Removal (See Figure 401.)

(1) Remove tailcone per Chapter 53.

(2) Remove ELT access panel per Chapter 53.

(3) Remove nut (1), washers (2) and bolt (3) from bellcrank (4).

(4) Hold rudder deflected and remove screw (5) from top hinge (6).

(5) Hold rudder deflected in the opposite direction and remove the other screw (5) from top hinge (6).

(6) Disconnect BNC connector (7) by twisting counterclockwise and pulling apart.

(6) Disconnect electrical connector (8) by pulling apart. Disconnect ground strap.

(7) Lift rudder (9) until its torque tube (10) clears bottom spacer (11) bellcrank (4) and hinge (12).

(8) Remove top spacer (13) from torque tube (10).

(9) Slowly remove rudder while feeding wire bundle (14) through the vertical fin until it clears.

B. Rudder Installation (See Figure 401.)

(1) Position rudder such that wire bundle (14) can be fed through access hole in vertical fin. Feed wire bundle through bottom of vertical fin. Connect ground strap.

(2) Place upper spacer (13) on torque tube (10).

(3) Slide torque tube (10) through hinge (12).

(4) Place bottom spacer (11) on torque tube and align holes.

(5) Insert bellcrank tube (4) in torque tube and align holes.

(6) Secure with bolt (3), washers (2) and nut (1). Torque per Chapter 91.

(7) Hold rudder deflected and install screw (5) through top hinge (6). Hold rudder deflected in the other direction and install screw (5) in hinge (6).

(8) Connect BNC connector (7) by inserting male end into female end, pressing together, and turning clockwise into detent.

(9) Connect electical connector (8) by pressing two halves together.

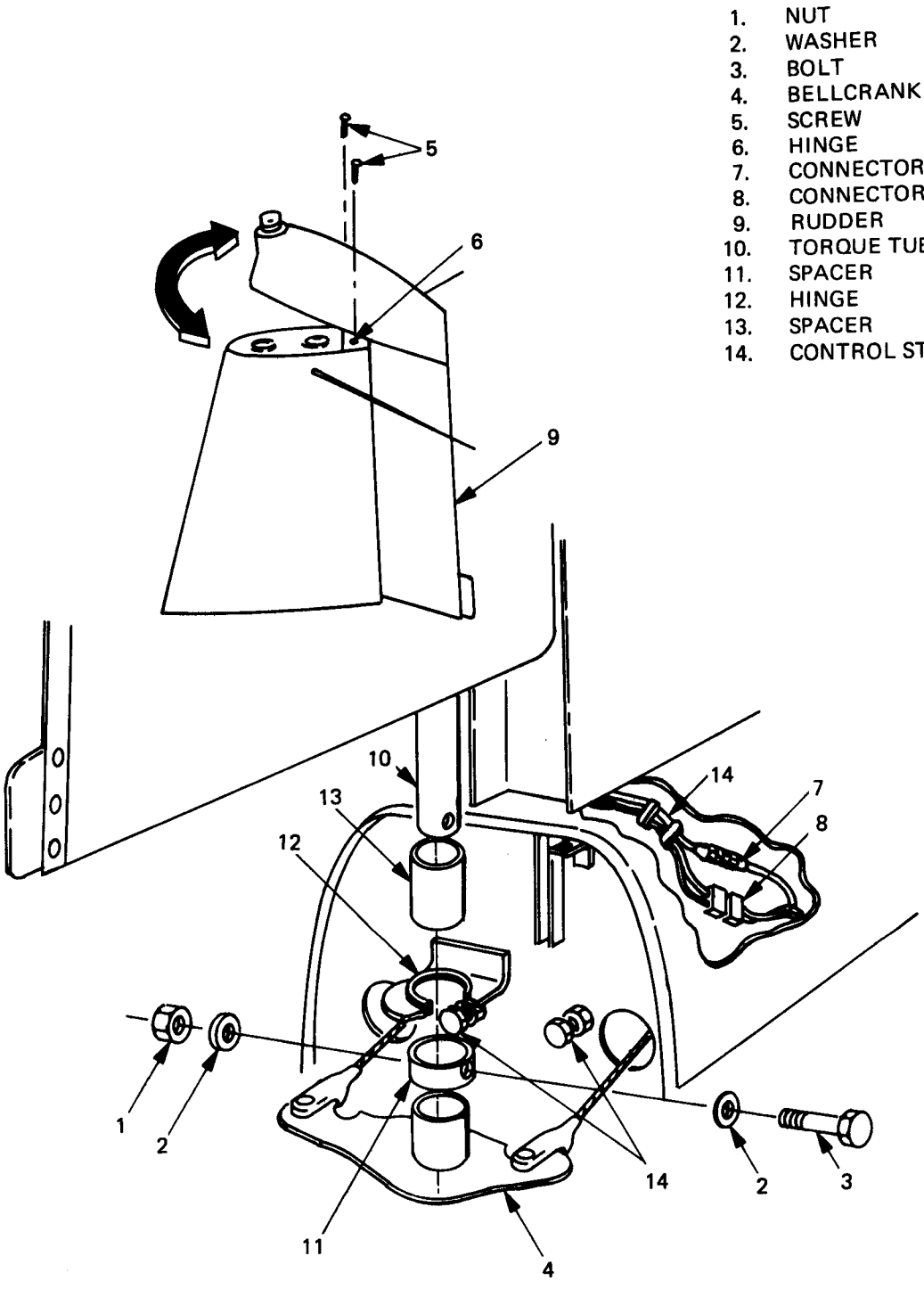
(10) Install ELT access panel per Chapter 53.

(11) Install tailcone per Chapter 53.

(12) Check controls for freedom of movement.

(13) Check operation of flashing beacon.

(14) Check rudder tip fin clearance per Rudder Tip-Fin Clearance Adjustment paragraph.



Rudder Removal/Installation
Figure 401

2. Rudder Pedal Removal/Installation

A. Rudder Pedal Removal (See Figure 402.)

(1) Remove cotter pin (1), washer (2), and clevis pin (3) from brake (4), and remove rudder pedal linkage (5) from brake (4).

(2) Depress left rudder pedal and disconnect left return spring (6) from control horn (7).

(3) Disconnect right return spring (8) from control horn (7).

(4) Remove return springs (6) and (8) from eye bolts (9).

(5) Remove cotter pins (10), nuts (11) and washers (12) from clevis bolts (13), and remove rudder cables (14) from control horns (7).

(6) Remove nuts (15) and washers (16) from mounting bolts (17), and lift bearing assembly (18) from bolts (17).

(7) Remove bearing assemblies (18).

(8) Disconnect hydraulic lines (19) from elbow (20) on rudder bar assembly (21) and remove brake lines (22). Cap all open lines.

(9) Pull the rudder bar assemblies (21) laterally until they clear the bearings (18) on the right side, and remove the rudder bar assemblies (21).

B. Rudder Pedal Installation (See Figure 402.)

(1) Install a bearing assembly (18) in the left end of each rudder bar assembly (21).

(2) Position the rudder bar assemblies (21) such that their open ends slide over the bearings on the right side of the aircraft.

(3) Place the bearing assemblies (18) on the left ends of the rudder bar assemblies (21) so that they fit over the mounting bolts (17) in the floor of the aircraft. Secure with washers (16) and nuts (15), and torque to standard value. (See Chapter 91.)

(4) Connect hydraulic lines (19) to elbow fittings (20) and torque to standard value. (See Chapter 91.)

(5) Position rudder cable clevises (14) over control horns (7) and secure with clevis bolts (13), washers (12, nuts (11) and cotter pins (10).

(6) Hook return springs (6) and (8) into eye bolts (9).

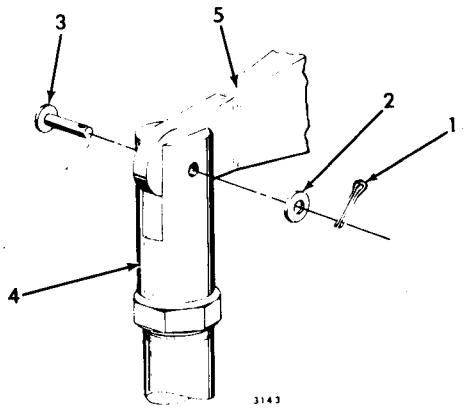
(7) Depress left rudder pedal and hook return spring (6) into control horn (7).

(8) Depress right rudder and connect return spring (8) to control horn (7).

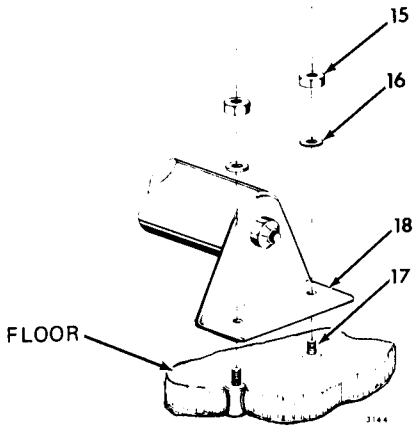
(9) Place rudder pedal brake arms (5) in slot in top of brake (4). Secure with clevis pin (3), washer (2) and cotter pin (1).

(10) Bleed brakes per Chapter 32.

(11) Rig rudder controls per Rudder Pedal Rigging paragraph.

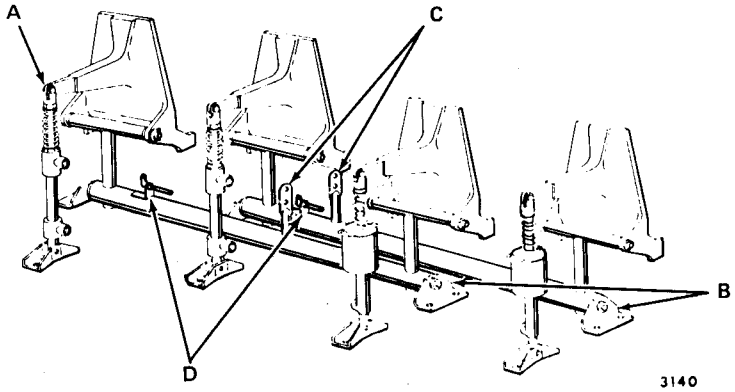


DETAIL A

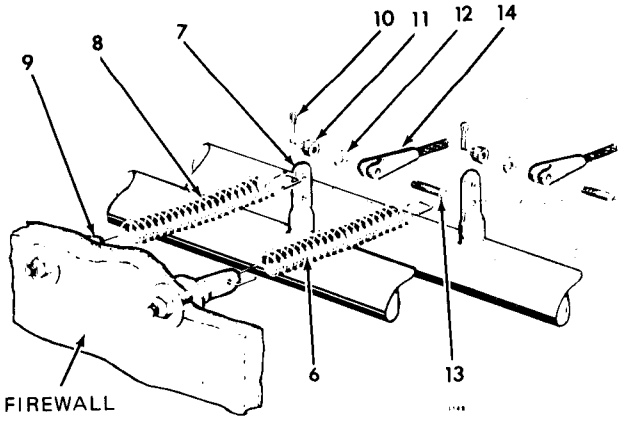


DETAIL B

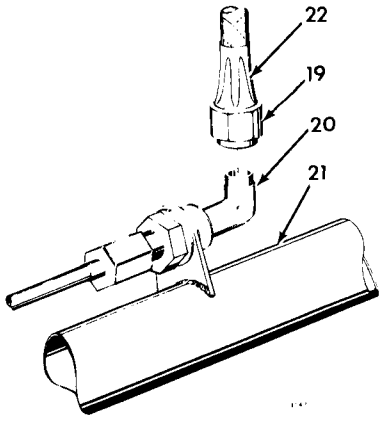
1. Cotter Pin
2. Washer
3. Clevis Pin
4. Brake
5. Rudder Pedal Linkage
6. Spring
7. Control Horn
8. Spring
9. Eye Bolt
10. Cotter Pin
11. Nut



12. Washer
13. Clevis Bolt
14. Rudder Cable
15. Nut
16. Washer
17. Bolt
18. Bearing
19. Hydraulic Line
20. Elbow
21. Rudder Bar
22. Brake Line



DETAIL C



DETAIL D
ROTATED 90°

Rudder Pedal Removal/Installation
Figure 402

3. Rudder Cable Removal/Installation

A. Rudder Cable Removal (See Figure 403.)

(1) Remove tailcone per Chapter 53.

(2) Remove cotter pins (1), nuts (2), washers (3), and clevis bolts (4) from cable clevises (5).

(3) Remove cable clevises (5) from rudder bellcrank (6) and allow cables (7) to move forward into fuselage.

(4) Remove cotter pin (8) from guard (9) and remove guard (9) from pulley assembly (10).

(5) Pull cables (7) from under pulley assembly (10).

(6) Remove nuts (11), and washers (12) from studs (13) in aircraft floor (14) and lift pulley assembly (15) to clear cables (7).

(7) Pull cables (7) from under pulley assembly (15).

(8) Remove cotter pins (16), nuts (17), washers (18), and clevis bolts (19) from cable clevis ends (20).

(9) Remove clevis ends (20) from control horns (21) and remove cables (7) from aircraft.

B. Rudder Cable Installation (See Figure 403.)

NOTE: If new cables are being installed, lubricate them with commercial grade paraffin before installation.

(1) Each rudder cable is composed of a short cable (forward cable) and a long cable (aft cable) joined by a turnbuckle. Select the clevis end (5) of the long cable and attach it to the rudder bellcrank (6) with clevis bolt (4), washer (3), nut (2), and cotter pin (1). Attach both rudder cables to the bellcrank (6).

(2) Feed both cables (7) into the fuselage and route them so that they engage the pulleys (22) on the pulley assembly (10).

(3) While holding the cables (7) in the pulleys (22), install guard (9) and secure it with cotter pin (8).

(4) Route the cables beneath the spar center section, and through the pulleys on the pulley assembly (15).

(5) While holding cables in the pulleys, install pulley assembly (15) over studs (13). Secure with washers (12) and nuts (11). Torque to standard values. (See Chapter 91.)

(6) Place cable clevises (20) over control horns (21); align holes, and secure with clevis bolts (19), washers (18), nuts (17), and cotter pins (16).

(7) Rig rudders per Adjustment/Test, Paragraph 1, this chapter.

(8) Install tailcone per Chapter 53.

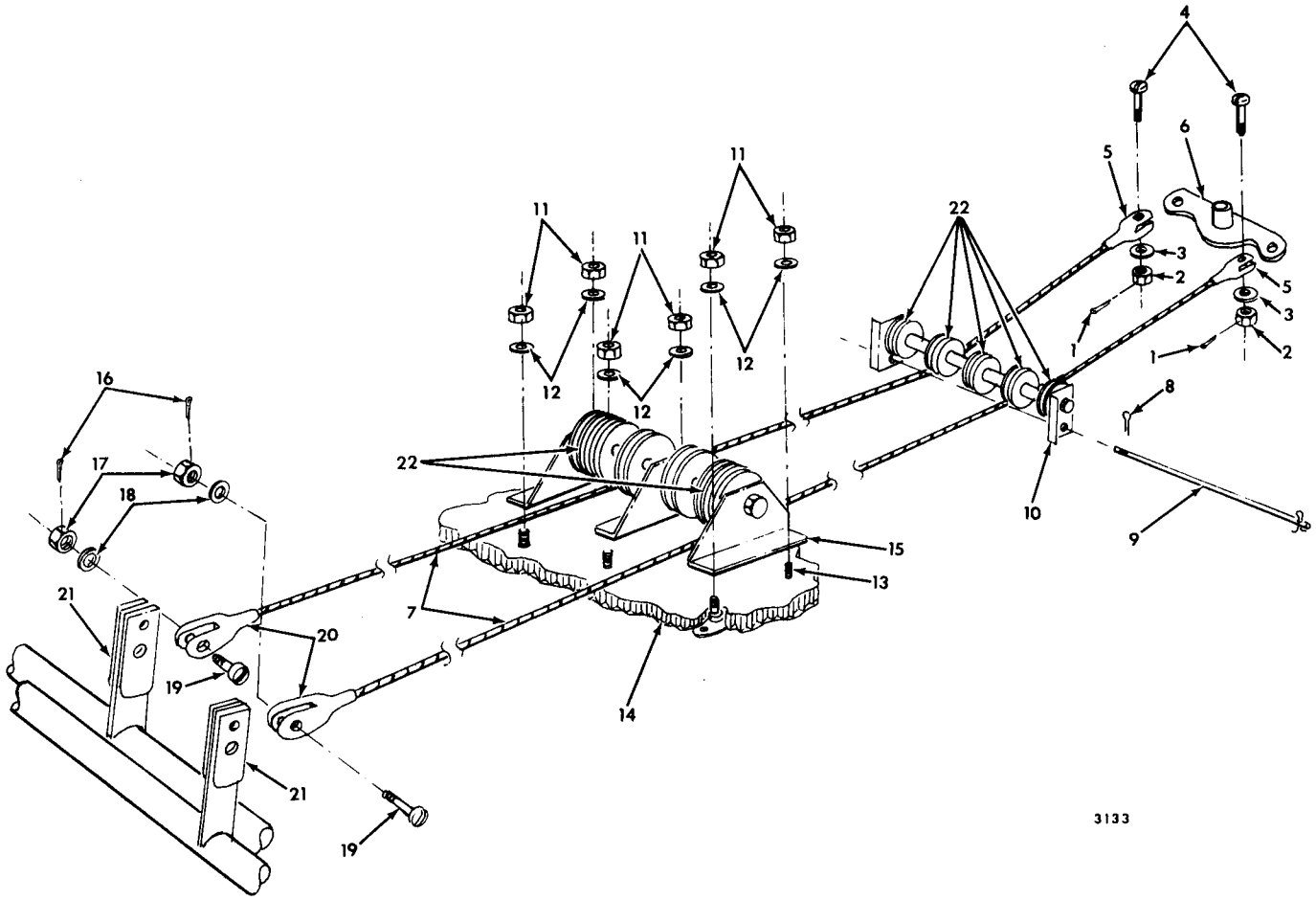
4. Rudder Bearing Removal/Installation

A. Remove the rudder as described in Paragraph 1 above.

B. The rudder bearings are located in the hinges (6 and 12, Figure 401), and are removed and installed in the same manner as the aileron bearings. Refer to Section 27-1-1.

5. Rudder Bearing Wear Limits

Refer to Section 27-1-1, paragraph entitled "Aileron Bearing Wear Limits."



1. Cotter Pin
2. Nut
3. Washer
4. Clevis Bolt
5. Cable Clevis
6. Bellcrank
7. Cables
8. Cotter pin
9. Guard
10. Pulley Assembly
11. Nuts
12. Washers
13. Studs
14. Aircraft Floor
15. Pulley Assembly
16. Cotter Pins
17. Nuts
18. Washers
19. Clevis Bolts
20. Cable Clevis
21. Control Horn
22. Pulleys

Rudder Cable Removal/Installation
Figure 403

6. Rudder Bellcrank and Torque Tube Repair

Excessive play in the rudder control system can be caused by slippage at the rudder bellcrank and rudder torque tube. In certain high-time, in-service aircraft, this condition has been traced to enlargement or elongation of the attach holes in the rudder torque tube (10, Figure 401) at the rudder bellcrank (4).

The following is an acceptable repair from a structural standpoint:

A. Remove tail cone assembly. Refer to Chapter 53.

B. Hold the rudder bellcrank (4, Figure 401) firmly against one of the rudder control stops (14). Grasp the rudder (9) at the trailing edge and attempt to rotate the rudder torque tube (10) in both directions. (The torque tube is an integral part of the rudder.)

C. If play is noted, determine the largest diameter of the rudder torque tube and rudder bellcrank bolt holes.

D. If the largest diameter exceeds 0.2505 inch, open the existing bolt holes in the rudder torque tube and rudder bellcrank to 0.312 to 0.315 inch diameter.

NOTE: Do not increase the hole size beyond that specified. If the holes will not clean up, the rudder bellcrank and rudder must be replaced. If removal for repair/replacement is necessary, Refer to Maintenance Practices - Removal/Installation, Paragraphs 1 and 3, this section.

E. If existing bolt holes are opened in accordance with sub-paragraph D above, install oversize attach hardware listed below.

NAS464P5A23	Bolt
AN960-516	Washers
MS20364-524	Nut

F. If repair or replacement is made, perform rudder rigging check. Refer to Adjustment/Test, Paragraph 1, this section, for rigging procedures.

G. Record the Repair/Replacement in the aircraft log.

MAINTENANCE PRACTICES — ADJUSTMENT/TEST

1. Rudder Rigging

A. Return Tension Adjustment (See Figure 501.)

(1) Remove tailcone per Chapter 53.

(2) Remove trim per Chapter 25, as required to gain access to rudder turnbuckles.

(3) Hold rudder centered so that it aligns with top of vertical fin, and clamp phenolic blocks to rudder bellcrank as shown in Figure 501 so that rudder is held in alignment.

(4) Loosen rudder cable turnbuckles.

(5) Place a 7 inch wooden block between each pilot rudder pedal and the firewall, as shown in Figure 501.

(6) Slowly tighten rudder turnbuckles (each by same amount) until one or both wooden blocks fall from behind rudder pedals.

(7) Safety rudder turnbuckles.

(8) Remove clamps and blocks from bellcrank.

(9) Install tailcone per Chapter 53

(10) Reinstall removed trim per Chapter 25.

B. Rudder Travel Adjustment (See Figure 502.)

(1) Remove tailcone per Chapter 53.

(2) Position rudder rigging fixture (DE-0002-501) on vertical fin as shown in Figure 502.

(3) Loosen control stop lock nut on each control stop.

(4) Depress left rudder pedal to its stop, and adjust left control stop until rudder rigging fixture incicates 25° ± 2° rudder deflection to the left.

(5) Hold control stop and tighten lock nut.

(6) Repeat Steps (4) and (5) for the right hand side.

(7) Install tailcone per Chapter 53.

C. Rudder Tip-Fin Clearance Adjustment (See Figure 503.)

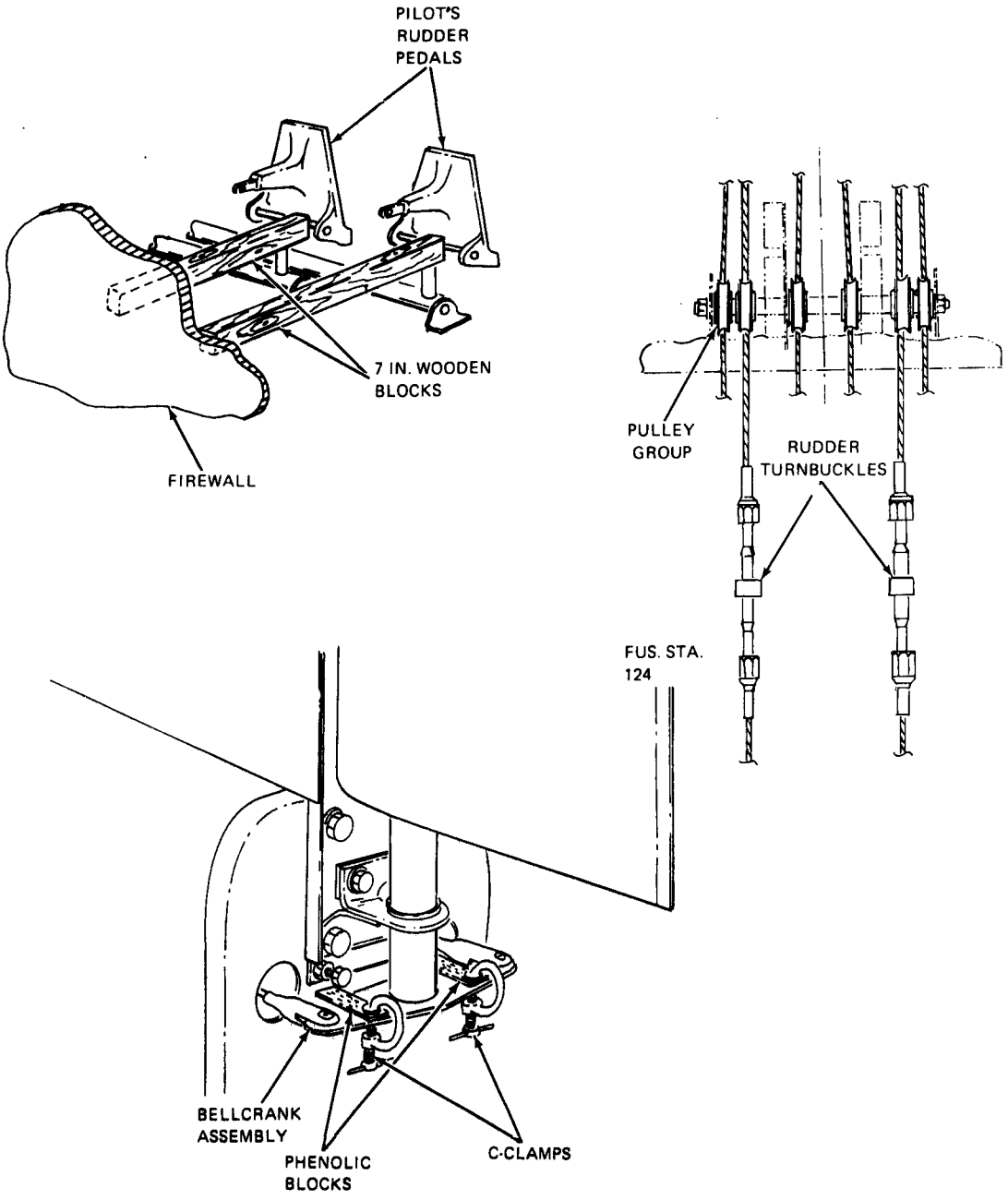
(1) Inspect rudder for proper clearance (0.10 inch minimum) between rudder tip and vertical fin.

(2) If insufficeint clearance exists, remove rudder per Removal/Installation, Paragraph 1.

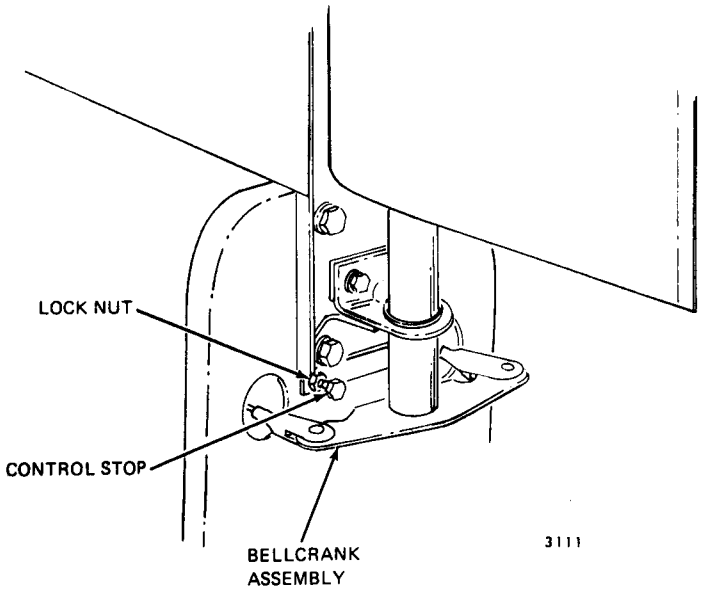
(3) Remove screws (1), and rudder tip (2).

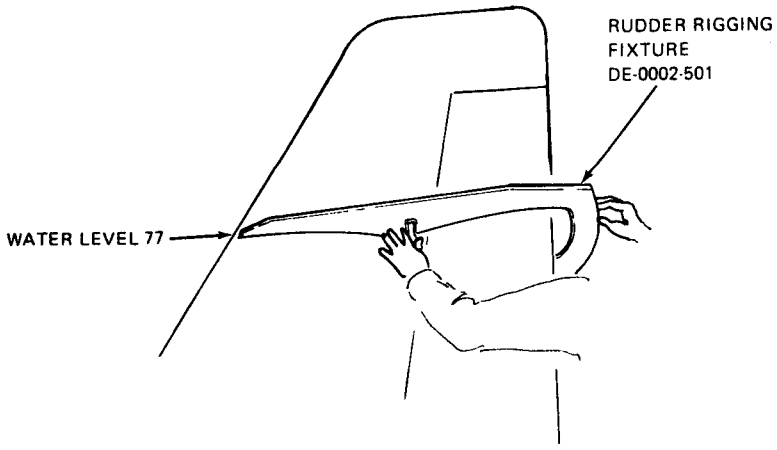
(4) Remove nut (3) and washer (4).

(5) Remove nut (5), washer (6) and bolt (7) from torque tube, and lift rib (8) from rudder (9).

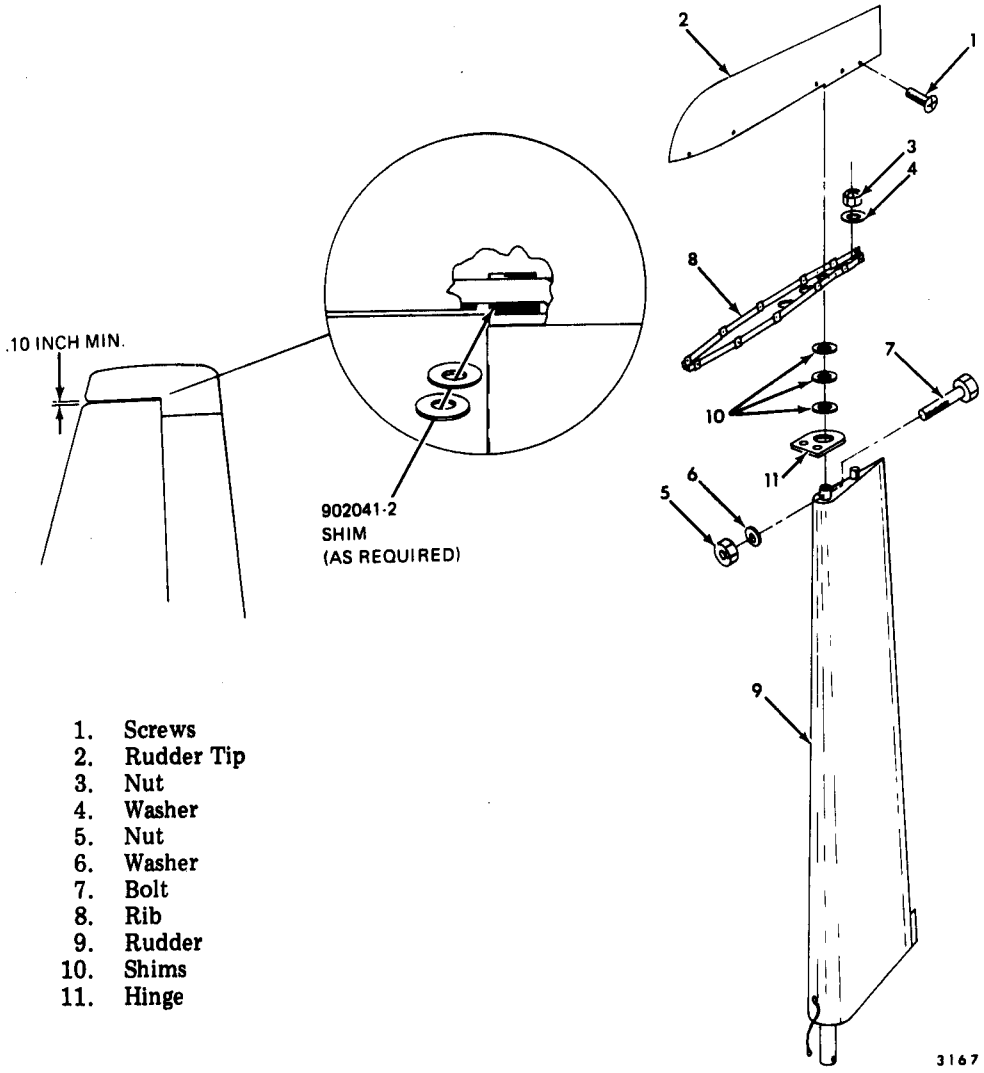


Rudder Return Tension Adjustment
Figure 501





Rudder Travel Adjustment
Figure 502



1. Screws
2. Rudder Tip
3. Nut
4. Washer
5. Nut
6. Washer
7. Bolt
8. Rib
9. Rudder
10. Shims
11. Hinge

Rudder Tip-Fin Clearance Adjustment
Figure 503

(6) Place shims (10) on torque tube between hinge (11) and rib (8), to achieve the required clearance.

(7) Place rib (8) on rudder (9) and secure with washer (4), nut (3), bolt (7), washer (6) and nut (5).

(8) Place tip (2) on rudder (9) and secure with screws (1).

(9) Install rudder per Removal/Installation, Paragraph 1 and Figure 401.

D. Rudder Trim Tab Adjustment

The rudder trim tab consists of a ground adjustable tab located on the lower end of the rudder trailing edge. This tab can be bent to provide rudder trim. Bend the tab opposite the direction of rudder correction desired.

NOTE: The aircraft can be rigged to suit individual requirements by adjusting the fixed trim tab on the rudder. Do not exceed 45° as it will not contribute any more toward trim.

2. Rudder Balancing

Refer to Section 27-1-1 for control surface balancing procedures.

MAINTENANCE PRACTICES - CLEANING/PAINTING

1. Cleaning/Painting

CAUTION: WHEN CONTROL SURFACES ARE PAINTED THEIR BALANCE IS CHANGED. ALWAYS CHECK BALANCE AFTER PAINTING.

Refer to Chapter 20 for proper cleaning and painting procedures.

ELEVATOR & TAB - DESCRIPTION/OPERATION

1. General (See Figure 1.)

A. Elevator Control System

As the control wheel is moved fore and aft, its displacement is transmitted by cables to the bellcrank on the elevator. Turnbuckles in the elevator control cables enable adjustment of cable tension, and control stops permit adjustment of elevator travel.

B. Elevator Assembly (See Figure 2.)

The elevator assembly consists of the elevator, and the anti-servo tab. The elevator is composed of a torque tube to which is bonded honeycomb ribs, which in turn are bonded to an aluminum skin. The one-piece skin is formed around the elevator leading edge, and bonded to the rear spar. The outboard end of the control surface is capped by a formed plastic tip attached with screws. Contained within the tip is the mass balance weight that provides proper control surface balance.

Attached to the inboard trailing edge of the elevator, is the anti-servo tab. This tab is attached to the elevator by a piano hinge. The tab is composed of a formed aluminim skin bonded to internal ribs, and actuated by an arm on its inboard end.

On Aircraft AA5-0001 through AA5-0199 the outboard end of the elevator, extending to the end of the horizontal stabilizer is covered by a plastic tip. The tab extends the full length of the elevator.

On Aircraft AA5-200 and subsequent, the area of the elevator from the end of the horizontal stabilizer to the outboard elevator rib is covered with aluminum panels. Outboard of the rib is covered by a plastic tip. The tab extends the full length of the elevator.

On AA-5A and AA-5B aircraft, the elevator is of similar construction except that it contains more ribs, and does not have as large an aerodynamic balance surface (overhang).

C. Elevator and Trim Linkage (See Figure 3.)

The elevator control cables are attached to the elevator bellcrank. This bellcrank moves the elevator in response to control column movement. The anti-servo bellcrank is mounted on bearings surrounding the elevator torque tubes. The trim arm, which is positioned by the trim system, establishes the position of the anit-servo bellcrank.

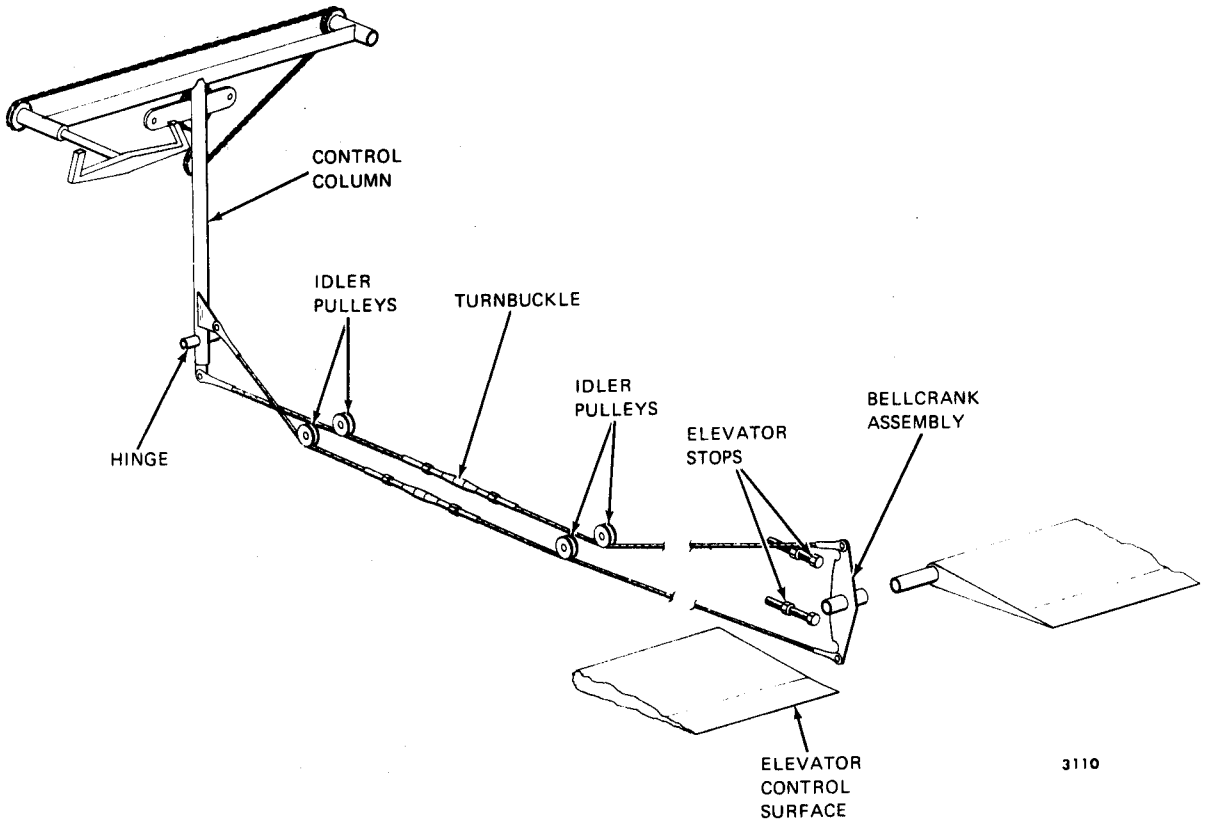
As the elevator is moved upward, a roller, attached to the anti-servo bellcrank, moves the front end of the trim tab arm downward. Since the trim tab arm is hinged at its center (in line with the trim tab hinge) the trim tab is forced upward by an amount proportional to elevator movement. When the elevator moves downward, movement of the trim tab is also in the downward direction.

Thus, the trim tab provides control pressure proper control "feel", and increases the effectiveness of the elevator.

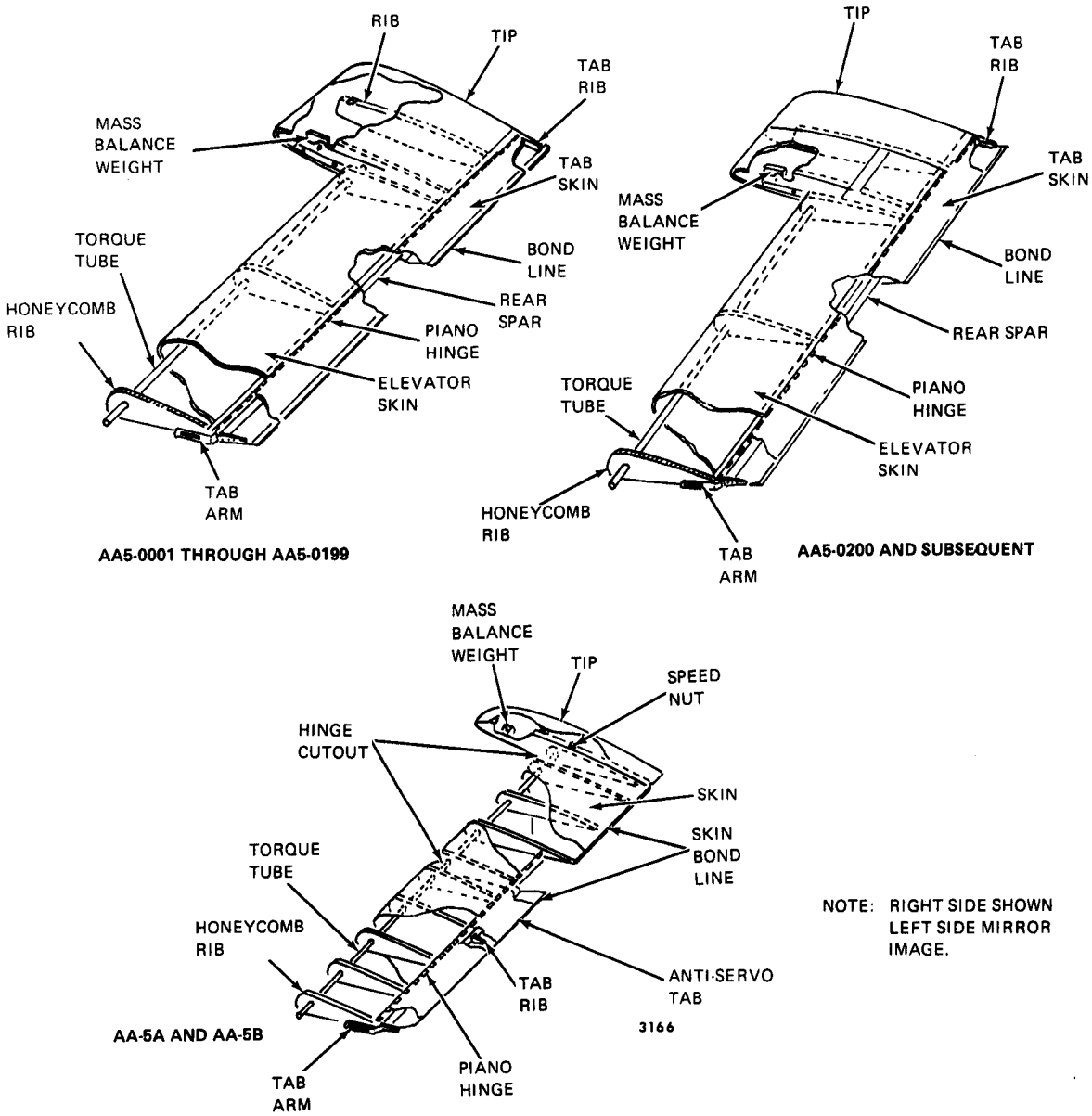
Elevator trim is accomplished by positioning the anti-servo bellcrank, through the trim system such that the deflection of the trim tab is caused to increase in one direction while decreasing in the other direction.

D. Elevator Trim Control (See Figure 3.)

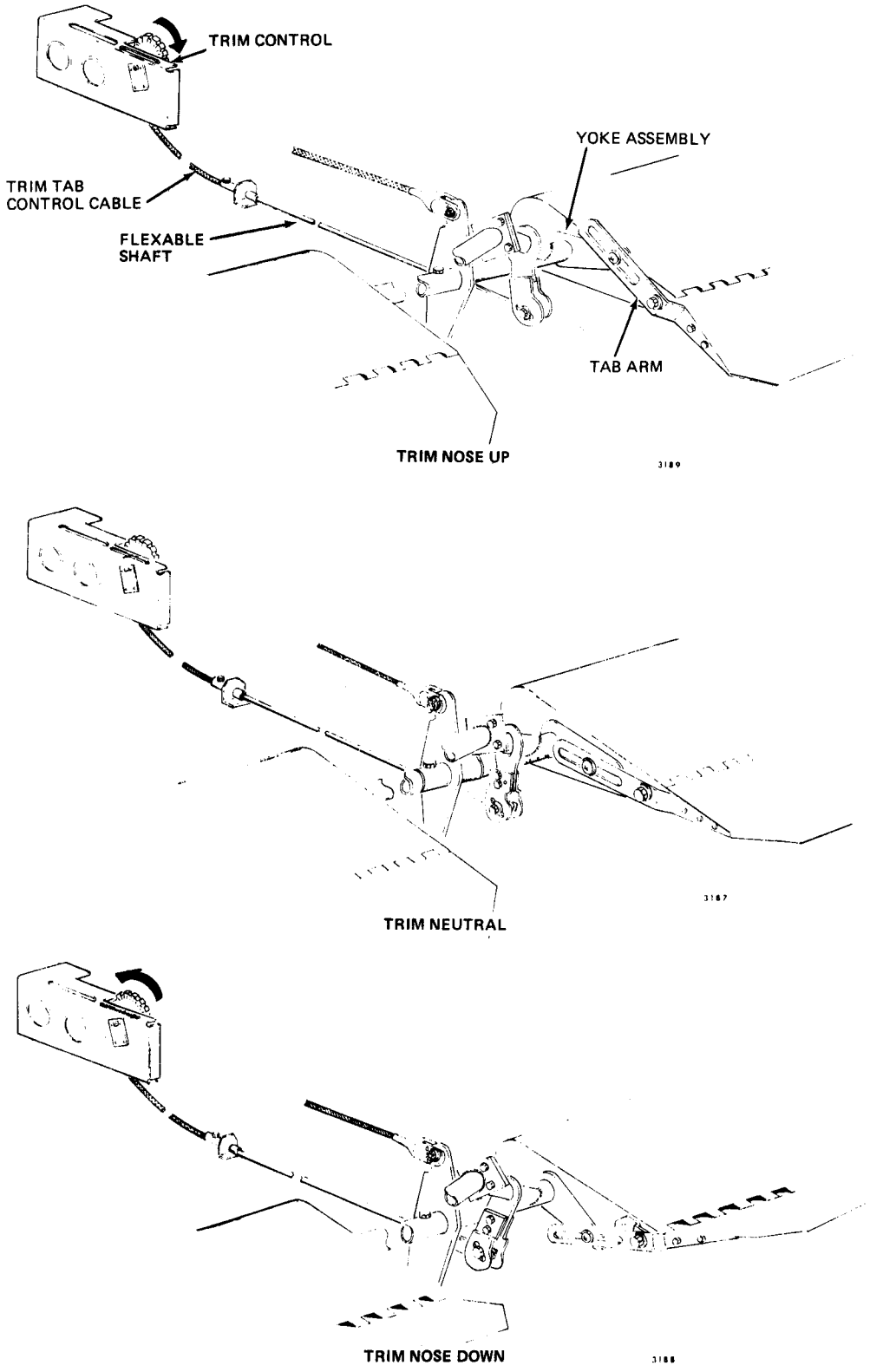
As the trim wheel is rotated, a set of spur gears turn the flexible shaft. This shaft is, in turn, connected through a universal joint to an aluminum shaft that extends to the empennage. The aluminim shaft drives a jackscrew that positions the anti-servo bellcrank.



Elevator Control System
Figure 1



Elevator Control Surface
Figure 2



Elevator and Trim Linkage
Figure 3

MAINTENANCE PRACTICES – SERVICING

1. Lubrication

A. Trim Wheel Gear Lubrication

(1) Remove console trim per Chapter 25.

(2) Use a clean, lint-free cloth to wipe excess grease and foreign material from the gears.

(3) Apply a coating of MIL-G-7711 (See Chapter 12.) grease to the gears.

(4) Install console trim per Chapter 25.

B. Trim Actuator Shaft Lubrication

(1) Remove tailcone per Chapter 53.

(2) Use a clean, lint-free cloth to wipe excess grease and foreign material from the actuator shaft screw threads.

(3) Apply a coating of MIL-G-7711 (See Chapter 12.) grease to the shaft screw threads.

(4) Install tailcone per Chapter 53.

C. Trim Tab Bellcrank and Clevis Pin Lubrication.

(1) Remove tailcone per Chapter 53.

(2) Apply a light coating of oil, MIL-L-7870 (See Chapter 12.) to bellcranks at pivot points and to rollers. Also apply oil, MIL-L-7870 (See Chapter 12) to elevator bellcrank clevis pins.

(3) Install tailcone per Chapter 53.

MAINTENANCE PRACTICES – REMOVAL/INSTALLATION

1. Elevator Removal/Installation

A. Elevator Removal (AA-5 Aircraft) (See Figure 401.)

(1) Remove tailcone per Chapter 53.

(2) Remove bolts (1) and washers (2) from trim tab arm (3).

(3) Remove cotter pin (4), nut (5), washers (6) and bolt (7) from bracket (8).

(4) Remove nut (9), washer (10) and bolt (11) from bellcrank (12).

(5) Disconnect ground strap (13) from horizontal stabilizer (14).

(6) Hold elevator (15) in the full up position, and remove the top screw (16) from hinge (17).

(7) Hold elevator (15) in the full down position and remove screw (18).

(8) Pull elevator (15) outboard and remove from aircraft.

B. Elevator Installation (AA-5 Aircraft) (See Figure 401.)

(1) Position elevator so that its torque tube (19) aligns with bellcrank (12). Align holes in torque tube (19) and bellcrank (12), and install bolt (11), washer (10) and nut (9). Torque to standard value. (See Chapter 91.)

(2) Hold elevator (15) in the full up position and align top mounting hole in hinge (17) with hole in horizontal stabilizer (14). Install screw (16).

(3) Hold elevator (15) in full down position and install screw (18).

(4) Attach ground strap (13) to horizontal stabilizer (14).

(5) Align mounting holes in trim tab arm (3) with holes in trim tab (20) and install bolts (1) with washers (2). Torque to standard value. (See Chapter 91.)

(6) Install bolt (7) and washers (6) through trim tab arm (3) and secure with nut (5) and cotter pin (4).

(7) Rig elevator per Adjustment/Test, Paragraph 1.

(8) Install tailcone per Chapter 53.

C. Elevator Removal (AA-5A and AA-5B Aircraft) (See Figure 402.)

(1) Remove tailcone per Chapter 53.

(2) Remove cotter pin (1), nut (2), washers (3), roller (4), bushing (5), washer (6), and bolt (7) from trim tab arm (8).

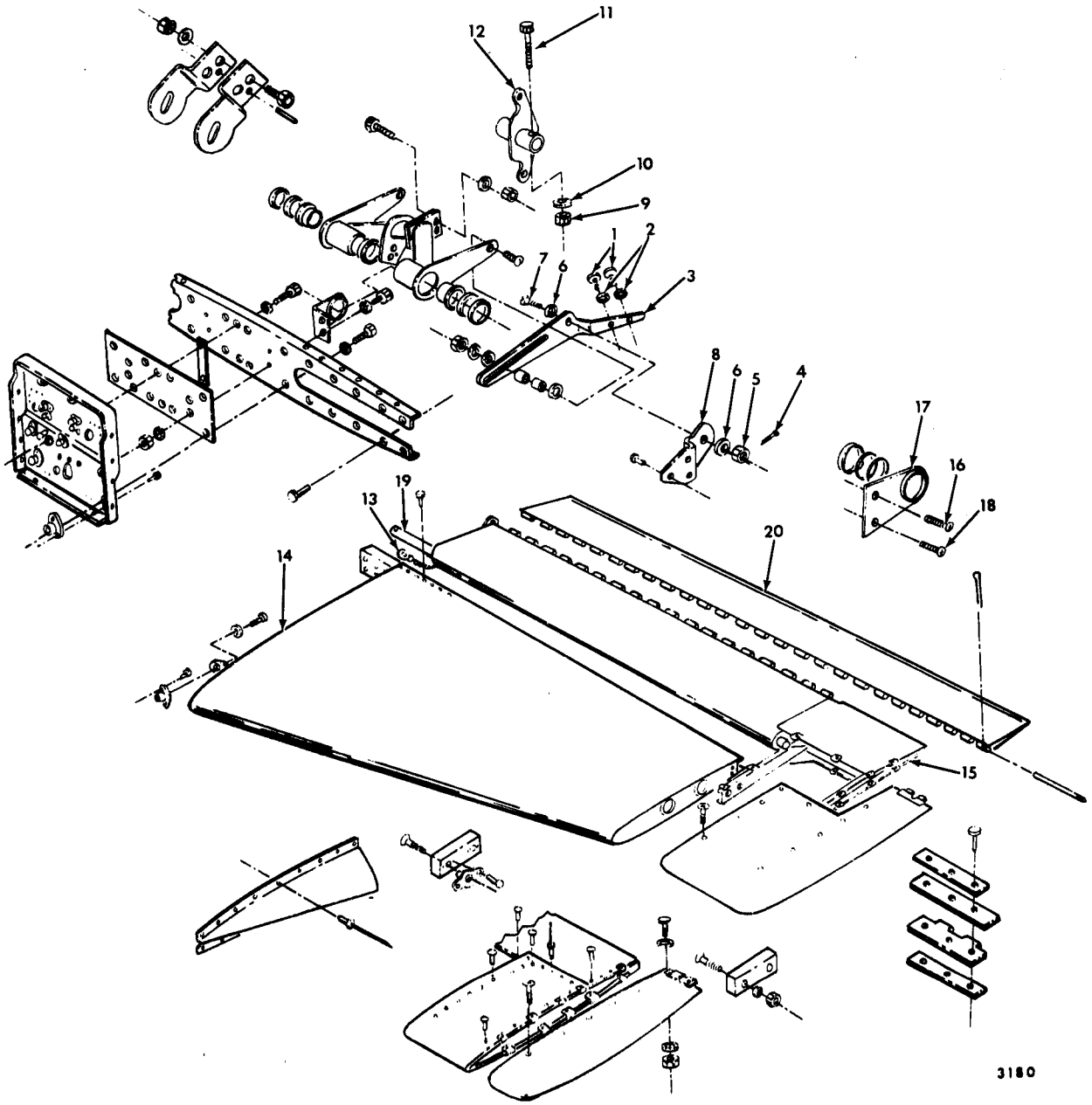
(3) Cut safety wire (9) and remove bolt (10), washer (11) and spacer (12) from yoke assembly (13).

(4) Remove nut (14), washers (15) and bolt (16).

NOTE: Support elevator so that it does not fall when the hinge bolts are removed.

(5) At the two hinges, hold elevator in the full up position, and cut safety wire (17). Remove bolts (18), and washers (19 and 25).

(6) Pull elevator (20) outboard until torque tube (21) clears bellcrank (22) and remove elevator from aircraft.



1. Bolt
2. Washer
3. Trim Tab Arm
4. Cotter Pin
5. Nut
6. Washer
7. Bolt
8. Bracket
9. Nut
10. Washer
11. Bolt
12. Bellcrank
13. Ground Strap
14. Horizontal Stabilizer
15. Elevator
16. Screw
17. Hinge
18. Screw
19. Torque Tube
20. Trim Tab

Elevator Removal/Installation (AA-5 Aircraft)
Figure 401

D. Elevator Installation (AA-5A and AA-5B Aircraft) (See Figure 402.)

(1) Position elevator (20) on horizontal stabilizer (23) so that hinges (24) align with bolt holes in stabilizer. Also ensure that torque tube (21) is inserted in bellcrank (22) with holes aligned.

(2) Install bolts (18) and washers (19 and 25), through hinge (24) into nut plate in elevator.

(3) Use bolt (16), washers (15), and nut (14) to secure bellcrank (22) to torque tube (21).

(4) At the forward end of each elevator tip cap, check for a maximum 0.35-inch gap between the tip cap and the horizontal stabilizer. If the gap is excessive, adjust the quantity and position of washers (25, Figure 402) between the bellcranks (22) and at the hinges (24) as required to obtain the proper clearance. Tighten bolts (18 and 16) to standard value (Chapter 91). Secure bolts (18) with safety wire.

(5) On bolt (7), place washer (6) and bushing (5).

(6) Place roller (4) over bushing (5) and install bolt (7) through the slot in the trim tab arm (8).

(7) Place washer (3) on bolt (7) and insert bolt (7) in rear arm of yoke assembly (13). Secure bolt (7) with washer (3), nut (2) and cotter pin (1).

(8) Align forward arm of yoke (13) with hole in elevator (20).

(9) Place bushing (12) in arm of yoke (13) and secure to elevator (20) with washer (11) and bolt (10). Torque to standard value and safety wire with 0.32 wire. (See Chapter 91.)

(10) Rig elevator per Adjustment/Test, Paragraph 3.

(11) Install tailcone per Chapter 53.

2. Elevator Disassembly/Assembly

A. Elevator Disassembly (AA-5 Aircraft) (See Figure 403.)

NOTE: Any disassembly or alteration of the elevator that affects its balance will require that the control surface be balanced prior to installation on aircraft.

(1) Trim Tab Removal

(a) Remove cotter pin (1) from hinge (2).

(b) Pull hinge pin (3) from hinge (2).

(c) Disconnect ground strap (4) from elevator (5) and remove trim tab (6).

(2) Elevator Tip Removal (AA-5 Aircraft Prior to S/N 200)

NOTE: Since the outer hinge (7) is riveted to the elevator tip (8), it is necessary to remove the trim tab (6) prior to removing the tip.

(a) Remove screws (9) from tip (8).

(b) Pull tip (8) outboard to remove from elevator (5).

(3) Elevator Tip Removal (AA-5 Aircraft S/N 200 and Subsequent)

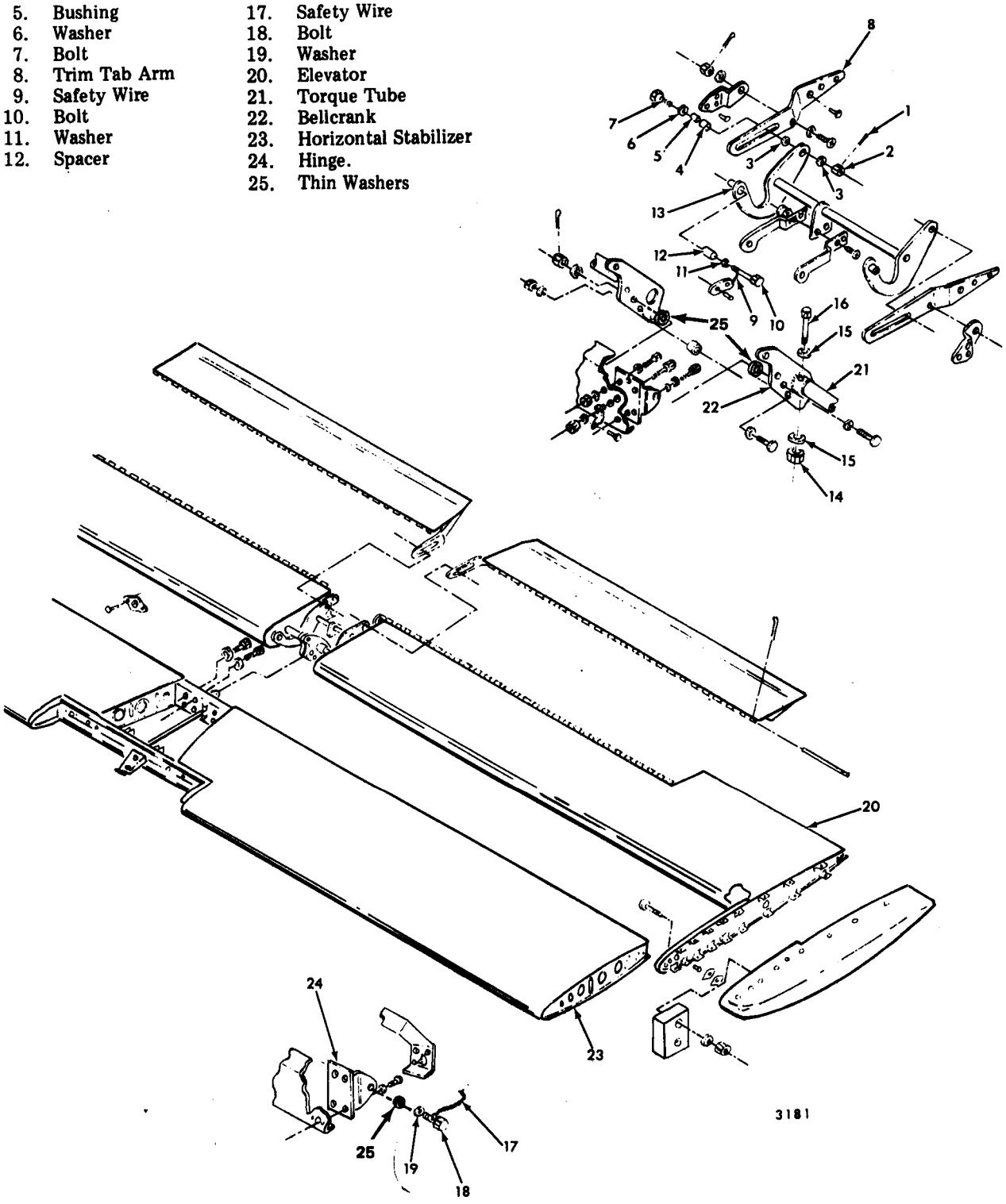
NOTE: It in not necessary to remove trim tab prior to removing elevator tip (10).

(a) Remove nuts (11), washers (12), and screws (13) from hinge (14).

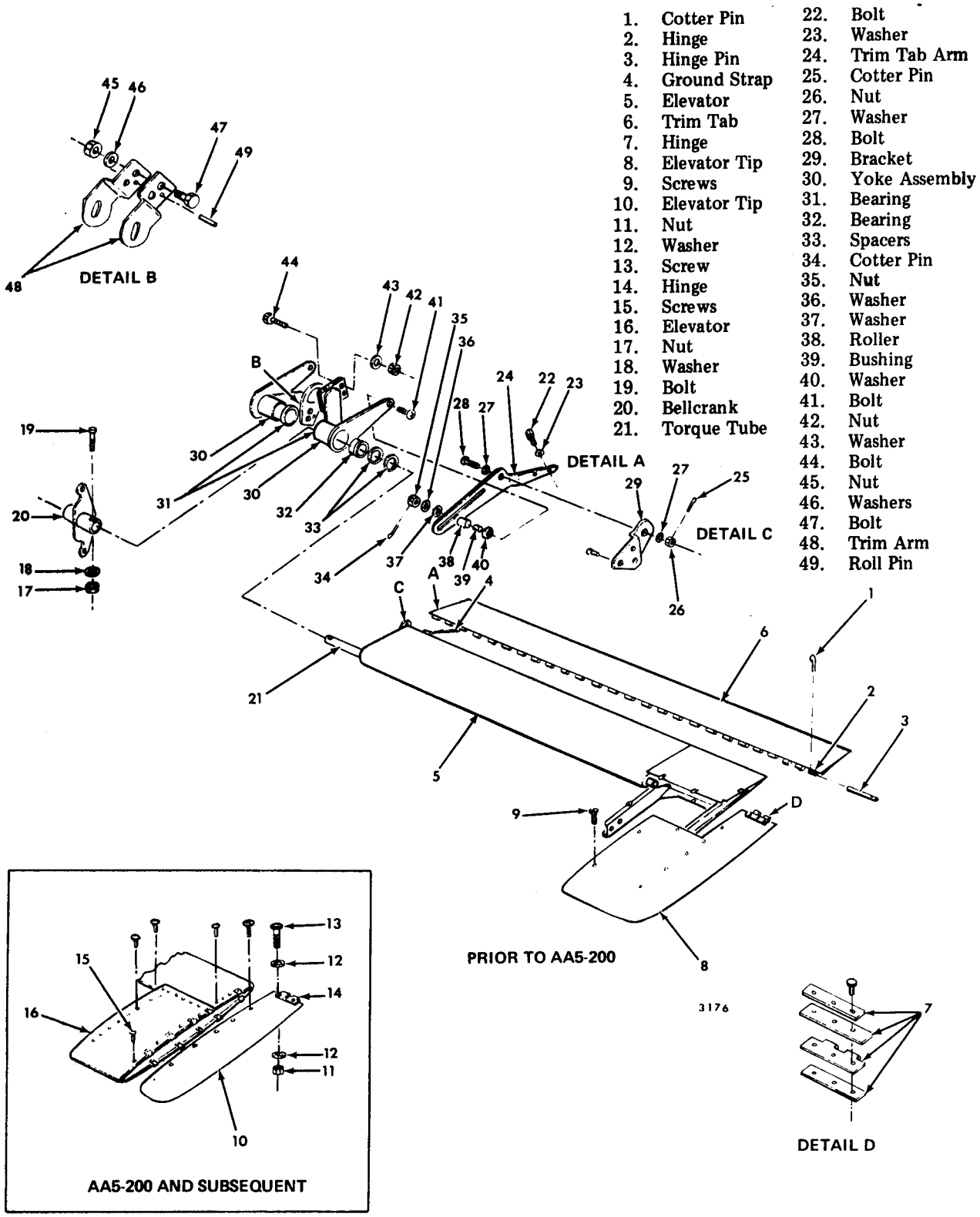
(b) Remove screws (15) from elevator tip (10).

(c) Pull elevator tip (10) outboard to remove from elevator (16).

1. Cotter Pin
2. Nut
3. Washers
4. Roller
5. Bushing
6. Washer
7. Bolt
8. Trim Tab Arm
9. Safety Wire
10. Bolt
11. Washer
12. Spacer
13. Yoke Assembly
14. Nut
15. Washer
16. Bolt
17. Safety Wire
18. Bolt
19. Washer
20. Elevator
21. Torque Tube
22. Bellcrank
23. Horizontal Stabilizer
24. Hinge.
25. Thin Washers



Elevator Removal/Installation (AA-5A and AA-5B Aircraft)
Figure 402



Elevator Disassembly/Assembly (AA-5 Aircraft)
Figure 403

(4) Elevator Linkage Disassembly (AA-5 Aircraft) (See Figure 403.)

(a) Remove nut (17), washer (18), and bolt (19) from bellcrank (20).

(b) Remove bolts (22) and washers (23) from trim tab arm (24).

(c) Remove cotter pin (25), nut (26), washers (27), and bolt (28) from trim tab arm (24) and bracket (29).

(d) Pull elevator torque tube (21) from bellcrank (20), and remove bearing (31).

(e) Pull yoke assembly (30) from torque tube (21).

(f) Remove bearing (32) and spacers (33) from torque tube (21).

(g) Remove cotter pin (34), nut (35), washers (36 and 37), roller (38), bushing (39), washer (40, and bolt (41) from yoke assembly (30) and trim tab arm (24). Remove arm (24) from yoke assembly (30).

(h) Remove nuts (42), washers (43), and bolts (44) from yoke assembly (30) and remove two halves of yoke assembly (30).

(i) Remove nuts (45), washers (46), and bolts (47) from trim arm (48).

(j) Drive roll pin (49) from arms (48) and remove them from right half of yoke assembly (30).

B. Elevator Assembly (AA-5 Aircraft) (See Figure 403.)

(1) Elevator Linkage Assembly

(a) Position trim arms (24) on right yoke (30), and secure roll pin (49), bolts (47), washers (46), and nuts (45). Torque to standard value. (See Chapter 91.)

(b) Assemble two halves of yoke assembly (30) and secure with bolts (44), washers (43), and nuts (42). Torque to standard value. (See Chapter 91.)

(c) Place spacers (33) and bearing (32) on torque tube (21) in yoke assembly (30).

(d) Install bearing (31) on torque tube (21), inside of yoke assembly (30).

(e) Position bellcrank (20) so that it aligns with end of torque tube (21) and insert end of torque tube in bellcrank so that the holes align. Secure with bolt (19), washer (18), and nut (17). Torque to standard value. (See Chapter 91.)

(f) Place bolt (41) through hole in yoke assembly arm (30).

(g) On bolt (41) place washer (40) and bushing (39).

(h) Place roller (38) over bushing (39).

(i) Place slot in trim tab arm (24) over roller (38).

(j) Place washers (37 and 36) on bolt (41) and secure with nut (35) and cotter pin (34).

(k) Attach trim tab arm (24) to trim (6) with bolts (22) and washers (23). Torque to standard value. (See Chapter 91.)

(l) Attach trim tab arm (24) to bracket (29) with bolt (28), washers (27), nut (26), and cotter pin (25).

(2) Elevator Tip Installation (AA-5 Aircraft Prior to S/N 200)

(a) Position elevator tip (8) over elevator (5) so that holes align.

(b) Install screws (9).

(3) Elevator Tip Installation (AA-5 Aircraft S/N 200 and Subsequent)

(a) Position elevator tip (10) so that holes in tip and hinge (14) align.

(b) Secure hinge (14) to tip (10) with screws (13), washers (12), and nuts (11).

(c) Position tip (10) to align its mounting holes with elevator (16) and secure tip with screws (15).

(4) Trim Tab Installation

(a) Attach ground strap (4) to elevator (5).

(b) Align hinges (2) on trim tab (6) and elevator (5) and install hinge pin (3).

(c) Secure hinge pin (3) to hinge (2) with cotter pin (1).

C. Elevator Disassembly (AA-5A and AA-5B Aircraft) (See Figure 404.)

(1) Trim Tab Removal

(a) Remove screws (1) and pull tip (2) from elevator (3).

(b) Remove cotter pin (4), nut (5), washers (6), roller (7), bushing (8), washer (9), and bolt (10) from trim tab arm (11).

(c) Remove cotter pin (12), nut (13), washers (14), and bolt (15) from trim tab arm (11) and bracket (16).

(d) Remove cotter pin (17) from hinge pin (18) and hinge (19).

(e) Pull hinge pin (18) from inboard end of hinge (19) and remove trim tab (20) from elevator (3).

(2) Linkage Disassembly

(a) Remove nut (21), washers (22), and bolt (23) from bellcrank (24).

(b) Cut safety wire (25). Remove bolt (26), washer (27), and bushing (28) from yoke assembly (29).

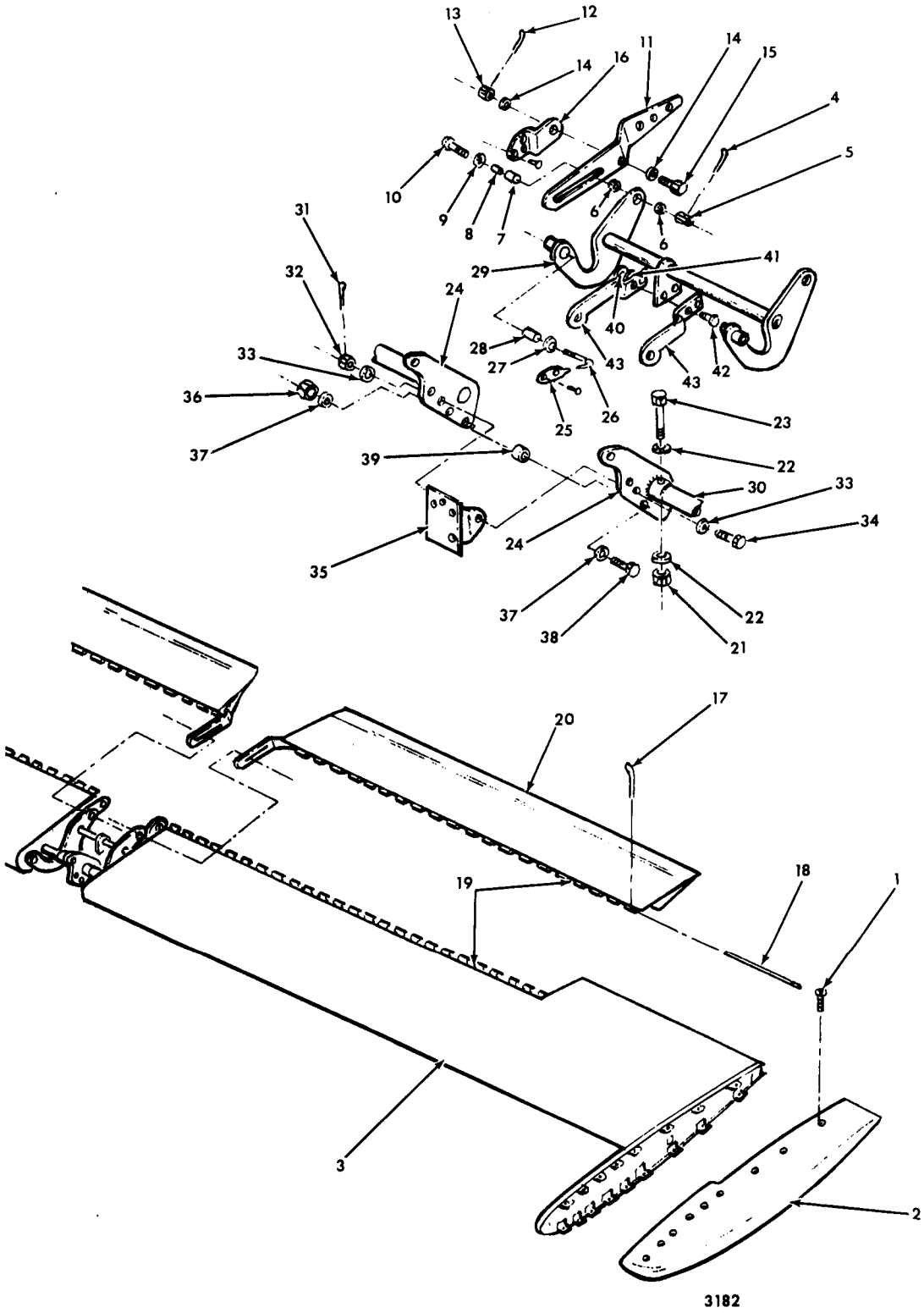
(c) Pull torque tube (30) from bellcrank (24).

(d) Remove cotter pin (31), nut (32), washers (33), and bolt (34) from bellcrank (24) and hinge (35).

(e) Remove nuts (36), washers (37), bolts (38), and spacers (39) from bellcrank (24) and separate two halves of bellcrank.

(f) Remove nuts (40), washers (41), and bolts (42) and remove tab arms (43) from yoke assembly (29).

1. Screws
2. Elevator Tip
3. Elevator
4. Cotter Pin
5. Nut
6. Washers
7. Roller
8. Bushing
9. Washer
10. Bolt
11. Trim Tab Arm
12. Cotter Pin
13. Nut
14. Washers
15. Bolt
16. Bracket
17. Cotter Pin
18. Hinge Pin
19. Hinge
20. Trim Tab
21. Nut
22. Washers
23. Bolt
24. Bellcrank
25. Safety Wire
26. Bolt
27. Washer
28. Bushing
29. Yoke Assembly
30. Torque Tube
31. Cotter Pin
32. Nut
33. Washers
34. Bolt
35. Hinge
36. Nuts
37. Washers
38. Bolts
39. Spacers
40. Nuts
41. Washers
42. Bolts
43. Trim Tab Arm



Elevator Disassembly/Assembly (AA-5A and AA-5B Aircraft)
Figure 404

D. Elevator Assembly (AA-5A and AA-5B Aircraft) (See Figure 404.)

(1) Trim Tab Installation

(a) Position tip (2) on end of elevator (3) so that holes align. Secure with screws (1).

(b) Position trim tab so that its hinge (19) aligns with that of the elevator.

(c) Drive hinge pin (18) through hinge from inboard end.

(d) Align hole in end of hinge pin with that in hinge and secure pins (18) with cotter pin (17).

(2) Linkage Assembly

(a) Position spacers (39) between halves of bellcrank (24). Align holes and secure with bolts (38), washers (37) and nuts (36).

(b) Insert hinge (35) between halves of bellcrank (24) and align holes. Secure with bolt (34), washers (33), nut (32), and cotter pin (31).

(c) Insert torque tube (30) in bellcrank (24), align holes, and secure with bolt (23), washers (22) and nut (21). Torque to standard value. (See Chapter 91.)

(d) Position tab arms (43) on yoke assembly (29) and secure with bolts (42), washers (41) and nuts (40). Torque to standard value. (See Chapter 91.)

(e) Place washer (27) and spacer (28) on bolt (26).

(f) Align hole in front arm of yoke assembly (29) with mounting hole in elevator (3) forward of torque tube (30).

(g) Insert bolt (26) with bushing (28) and washer (27) through yoke assembly (29) arm into elevator, and torque to standard value. (See Chapter 91.) Safety wire bolt (26), with .032 wire.

(h) On bolt (10) place washer (9) and bushing (8).

(i) Place roller (7) over bushing (8) and install bolt with bushing and roller in slot in trim tab arm (11).

(j) Place washer (6) on bolt (10) and insert bolt (10) through hole in rear arm of yoke assembly (29).

(k) Secure bolt (10) with washer (6), nut (5) and cotter pin (4).

(l) Place washer (14) on bolt (15) and insert bolt (15) through hole in trim tab arm (11) and hole in bracket (16).

(m) Secure with washer (14), nut (13) and cotter pin (12).

3. Trim Tab Control Removal/Installation

A. Trim Tab Control Removal (See Figure 405.)

(1) Actuator Removal

(a) Remove tailcone per Chapter 53.

(b) Remove nuts (1), washers (2), bolts (3) and drive pin (4) from trim arms (5).

(c) Remove ELT access panel per Chapter 53.

(d) Remove nut (6), washer (7) and bolt (8) from torque tube (9).

(e) Pull actuator (10) aft until it clears guide assembly (11).

(f) Remove bearings (12) and washer (13).

(g) Remove nuts (14), washers (15) and bolts (16), then remove guide assembly.

(2) Torque Tube Removal

(a) Remove console trim per Chapter 25.

(b) Remove roll pins (17) from universal (18) and pull rear torque tube (9) from universal (18).

(c) Pull rear torque tube (9) forward through its bushing (19) until it clears the rear support (20).

(d) Pull universal (18) from front torque tube (21).

(e) Remove nut (22), washer (23) and bolt (24) from flexible cable (25), and pull cable (25) from torque tube (21).

(f) Pull torque tube (21) aft until it clears bushing (26) in front support (27) and bushing (28) in aft support (29).

(3) Trim Wheel Assembly Removal

(a) Remove console trim per Chapter 25.

(b) Drive roll pin (30) from pinion gear (31), and pull flexible shaft (25) from bracket assembly (33).

(c) Drive roll pin (34) from flexible shaft (25) and pull shaft (32) from flexible shaft (25).

(d) Remove cotter pin (35), nut (36), washers (37 and 38) and bolt (39) from trim wheel (40).

(e) Drive roll pin (41) from trim wheel (40) and remove pinion gear (42).

(f) Remove cotter pin (43), nut (44), washers (45 and 46), bolt (47) and indicator bracket (48) from bracket assembly (33).

(4) Actuator Disassembly

(a) Remove nuts (49) and washers (50). Pull trim arms (5) from actuator assembly (51).

(b) Remove roller (52), bushing (53) and washer (54) from actuator assembly (51).

(c) Unscrew actuator assembly (51) from screw (10).

B. Trim Tab Control Installation (See Figure 405.)

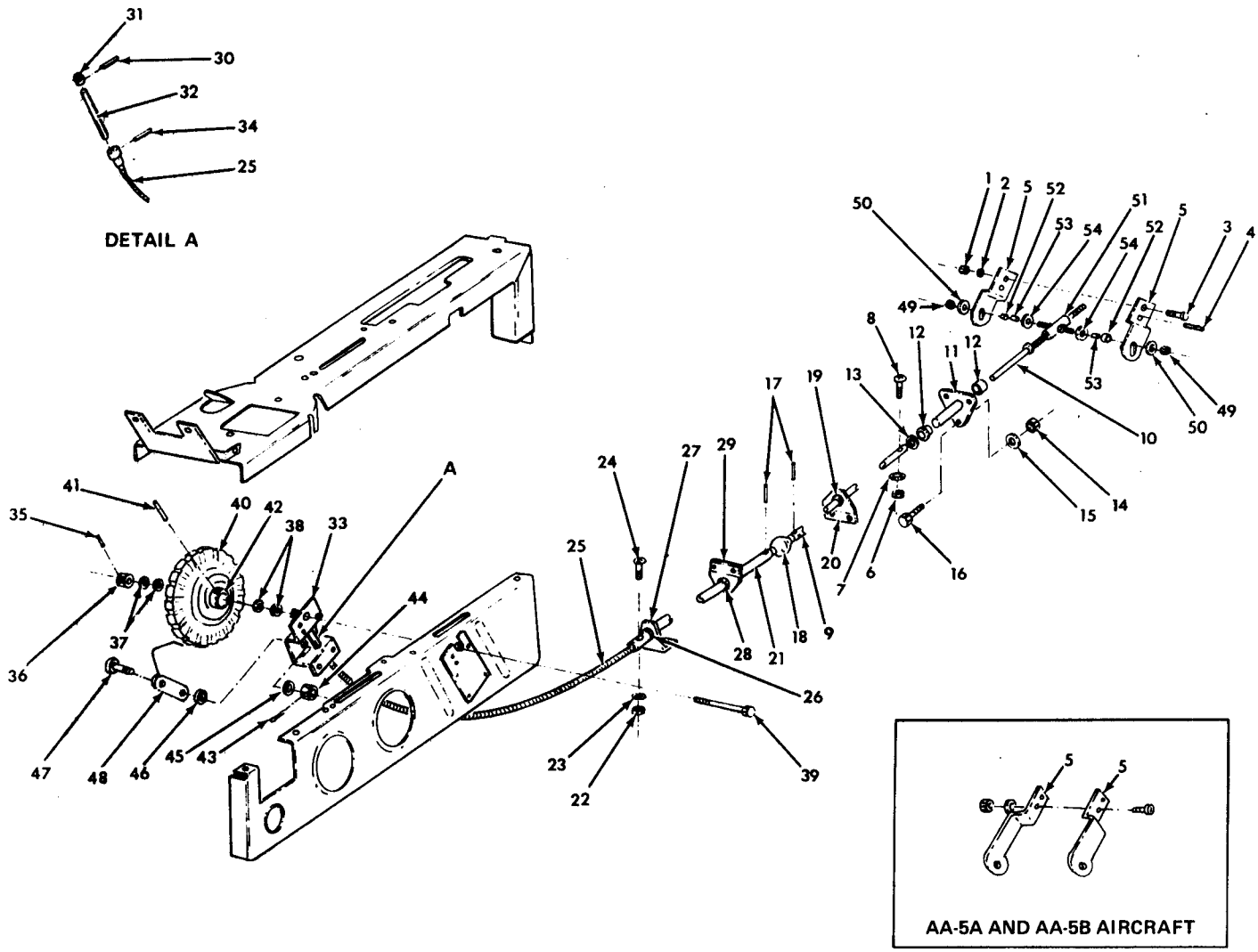
(1) Actuator Assembly/Installation

(a) Screw actuator (51) onto screw (10).

(b) Place washers (54) and bushings (53) on actuator (51).

(c) Place rollers (52) over bushings (53) and place trim arms (5) over rollers (52). Secure with washers (50) and nuts (49). Torque to standard value. (See Chapter 91.)

(d) Place arms (5) on yoke assembly and secure with roll pin (4), bolts (3), washers (2) and nuts (1). Torque to standard value. (See Chapter 91.)



1.	Nut	20.	Rear Support	39.	Bolt
2.	Washer	21.	Torque Tube	40.	Trim Wheel
3.	Bolt	22.	Nut	41.	Roll Pin
4.	Drive Pin	23.	Washer	42.	Pinion Gear
5.	Trim Arms	24.	Bolt	43.	Cotter Pin
6.	Nut	25.	Flexible Cable	44.	Nut
7.	Washer	26.	Bushing	45.	Washer
8.	Bolt	27.	Support	46.	Washer
9.	Torque Tube	28.	Bushing	47.	Bolt
10.	Actuator	29.	Support	48.	Indicator Bracket
11.	Guide	30.	Roll Pin	49.	Nut
12.	Bearing	31.	Pinion Gear	50.	Washer
13.	Washer	32.	Shaft	51.	Actuator Assembly
14.	Nut	33.	Bracket Assembly	52.	Roller
15.	Washer	34.	Roll Pin	53.	Bushing
16.	Bolt	35.	Cotter Pin	54.	Washers
17.	Roll Pin	36.	Nut		
18.	Universal	37.	Washer		
19.	Bushing	38.	Washer		

Trim Tab Control Removal/Installation
Figure 405

(2) Trim Wheel Assembly

(a) Insert shaft (32) into flexible shaft (25) and secure with roll pin (34).

(b) Insert shaft (32) through Nyliner bushings in bracket assembly (33).

(c) Place pinion gear (31) on shaft (32) and secure with roll pin (30).

(d) Place pinion (42) in trim wheel (40); align holes, and secure with roll pin (41).

(e) Place bolt (47) through trim indicator (48), washer (46) and bracket assembly (33).

(f) Secure with washer (45), nut (44) and cotter pin (43).

(g) Place bolt (39) through bracket assembly (33), and place washers (38) on bolt (39).

(h) Slide trim wheel (40) on bolt (39) until pinion teeth (31 and 42) engage, and follower pin on trim indicator (48) engages in spiral groove on trim wheel (40).

(i) Secure trim wheel (40) with washers (37), nut (36) and cotter pin (35).

(3) Torque Tube Installation

(a) Slide forward torque tube (21) through its rear support (29) and then through its forward support (27).

(b) Place end of flexible shaft (25) in front end of forward torque tube (21) and align holes. Secure with screw (24), washer (23) and nut (22).

(c) Place one end of universal (18) in rear end of torque tube (21). Secure with roll pin (17) and safety wire pin with 0.032 wire.

(d) Slide aft torque tube (9) through lower elevator cable access hole and through the torque tube support (20).

(e) Place forward end of rear torque tube (9) over the universal end (18). Align holes, and secure with roll pin (17). Safety wire roll pin (17) with 0.032 wire.

(f) Place bushings (12) in guide assembly (11), and secure guide assembly (11) to fuselage with bolts (16), washers (15) and nuts (14). Torque to standard value. (See Chapter 91.)

(g) Slide screw (10) through guide assembly (11) and place washer (13) on end of screw (10).

(h) Insert front end of screw (10) in aft end of torque tube (9). Align holes and secure with screw (8), washer (7) and nut (6).

4. Elevator Bearing Removal/Installation

A. Remove the elevator as described in Paragraph 1 or 3 above.

B. The elevator bearings are located in the elevator hinges at the aft fuselage bulkhead and at the outboard end of each horizontal stabilizer. The bearings are removed and installed in the same manner as the aileron bearings. (Refer to Section 27-1-1.)

5. Elevator Bearing Wear Limits

Refer to Section 27-1-1, paragraph entitled "Aileron Bearing Wear Limits."

6. Elevator Trim Tab Free Play Reduction (AA-5A and AA-5B)

A. Free Play

Free play is defined as the accumulated free motion at the elevator trim tab trailing edge, the sum of normal manufacturing tolerances, wear, and any other contributing conditions. When progressed sufficiently to allow an excessive amount of free play, replacement of defective components is indicated. While any component in the elevator trim tab system linkage may be involved, data obtained inspecting and repairing high-time, in-service aircraft indicate that the components listed below frequently contribute to excessive free play.

(1) Trim tab arms (11, Figure 404) rollers (7), and bushings (8). Refer to Subparagraph B below.

(2) Excessive end play at actuator assembly (51, Figure 405). Refer to Subparagraph C below.

(3) Trim arms (5, Figure 405), rollers (52), and bushings (53). Refer to Subparagraph D below.

B. Trim Tab Arm and Roller Replacement (AA-5A and AA-5B Aircraft)

(1) Remove the elevator and disassemble as required to remove the trim tab. Refer to Paragraphs 1 and 2 above.

CAUTION: TO AVOID MISALIGNMENT OR OTHER DAMAGE TO THE TRIM TAB, FOLLOW THE INSTRUCTIONS GIVEN BELOW CLOSELY. DO NOT ATTEMPT TO DRILL THE RIVETS OUT.

(2) At the inboard end of the elevator trim tab, locate the rivets securing the trim tab arm (11, Figure 404) to the trim tab. Block all openings into the trim tab interior with masking tape to prevent the entry of foreign matter.

(3) Grind off the heads of the three rivets securing the trim tab arm to the trim tab. Use a soft brush to remove all grindings and other foreign matter from the end of the trim tab.

(4) Remove the tape from the openings. Using a drift or punch, lightly drive the rivets into the interior of the trim tab.

NOTE: It is essential that all rivet parts be removed from the trim tab interior. Foreign material left within the trim tab could cause surface balance change, corrosion, or block the drain holes.

(5) Rotate the trim tab so that it is standing on the hinge. Using a pipe cleaner, wire, or other means, locate and move the rivet parts out through the gap between the inboard rib and the skin at the leading edge.

(6) Temporarily install the trim tab and the hinge pin. Open the pilot holes in the new trim tab arm to 0.143/0.146 inch. Using alignment clamps (Cleco or equivalent), install the new trim tab arm in its proper position.

(7) Use the existing hole in the bracket (16, Figure 404) and/or the elevator trim tab hinge pin to locate and drill a 0.187/0.190-inch hole in the trim tab arm concentric with the hinge pin center line.

(8) Remove the alignment clamps and install the trim tab arm to the trim tab using blind rivets. Part Number CR3243-4-3 or CR2249-4-3 rivets may be used.

NOTE: Lubricate all moving parts during assembly in accordance with servicing instructions (Chapter 12).

(9) Using a new bushing and roller (8 and 7, Figure 404), assemble and install the elevator in accordance with instructions contained in Paragraphs 1 and 2 above.

(10) Perform an elevator and elevator trim tab rigging check. Refer to Adjustment/Test, Paragraph 1, this section, for rigging procedures.

C. Actuator Assembly End Play Reduction

With the cone removed, actuator assembly end play can be measured at the aft bearing (12, Figure 405) as follows:

(1) With approximately 10 pounds of hand pressure, rock the actuator assembly (51, Figure 405) fore and aft along its longitudinal axis several times.

(2) While maintaining the actuator assembly in the aft position measure the gap between the aft bearing (12) and the actuator (10). Maximum permissible gap is 0.010 inch.

(3) Add Part Number 607016-1 shims at the washer (13) as required to provide a maximum end play of 0.010 inch.

D. Trim Arm and Roller Replacement

Wear at the trim arm slot and roller can result in free play at the elevator trim tab trailing edge. Replace both trim arms (5, Figure 405), rollers (52) and bushings (53). Inspect the arms of the actuator assembly (51) for scoring and replace if defective.

7. Elevator Bellcrank and Torque Tube Repair

Excessive play in the elevator control system can be caused by slippage at the elevator bellcrank and elevator torque tube. In certain high-time, in-service aircraft, this condition has been traced to the enlargement or elongation of the attach holes in the elevator torque tube (5, Figure 406), at the elevator bellcrank (4).

The following is an acceptable repair from a structural standpoint:

A. Remove the tailcone assembly in accordance with Chapter 53.

B. Hold the elevator bellcrank (4, Figure 406) firmly against one of the elevator control stops (7). Grasp one elevator (6) at the trailing edge and attempt to rotate the elevator torque tube (5) in both directions. Repeat this procedure on the opposite elevator. (The torque tube is an integral part of the elevator.)

C. If play is noted, determine the largest diameter of the elevator torque tube and elevator bellcrank bolt holes.

D. If the largest diameter exceeds 0.2505 inch, open the existing bolt holes in the elevator torque tube and elevator bellcrank to 0.312 to 0.315 inch diameter.

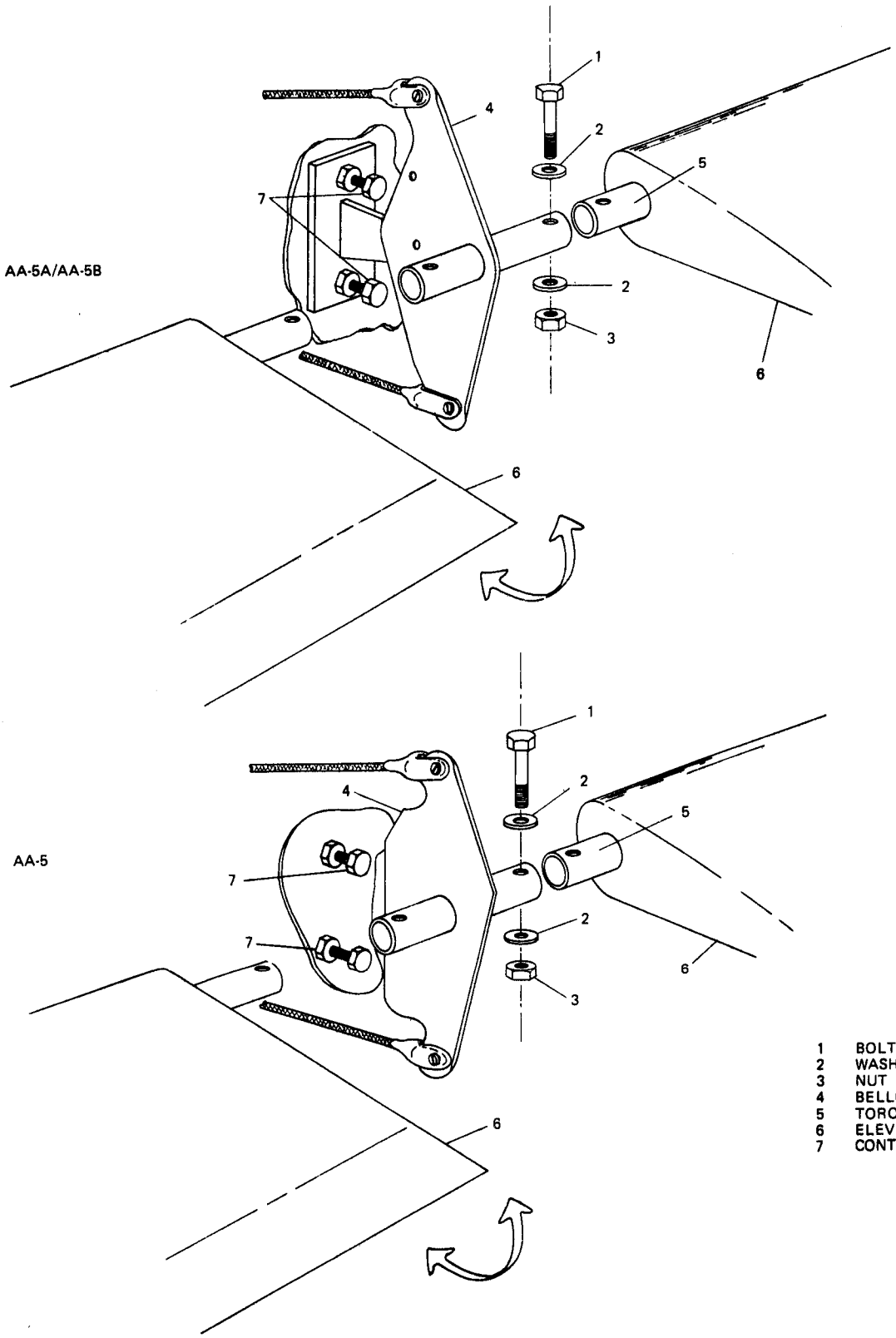
NOTE: Do not increase the hole size beyond that specified. If the holes will not clean up, the elevator and elevator bellcrank must be replaced. If removal for repair/replacement is necessary, refer to Maintenance Practices - Removal Installation, Paragraphs 1, 2 and 3, this section.

E. If existing bolt holes are opened in accordance with sub-paragraph D above, install oversize attach hardware listed below.

NAS464P5A19	Bolt
AN960-516	Washers
MS20364-524	Nut

F. If repair of replacement is made, perform elevator rigging check. Refer to Adjustment/Test, Paragraph 1, this section, for rigging procedures.

G. Record the repair/replacement in the aircraft log.



Elevator Bellcrank and Torque Tube Repair
Figure 406

MAINTENANCE PRACTICES — ADJUSTMENT/TEST

1. Rigging

A. Elevator Rigging (AA-5 Aircraft)

(1) Secure the control wheel in the neutral position by installing the control wheel lock in the forward control wheel hole on aircraft with two holes in this shaft. On aircraft with only one hole in the control wheel shaft, a fixture (Part No. DE 5005-501, Figure 501), must be used for this purpose.

(2) Remove trim per Chapter 25 to provide access to the elevator turnbuckles located under the aft end of the console.

(3) Adjust the elevator turnbuckles (Figure 502) until the elevator is located at neutral. Neutral position of the elevators is the position where elevators are streamlined with the stabilizer.

(4) Check the elevator cable tension and adjust the turnbuckles to obtain 35 + 0, -5 lbs tension. (At the average temperature for the aircraft operation area.) Recheck the 0° position of the elevator surface.

(5) Remove control wheel lock (or rigging fixture).

(6) Remove tailcone per Chapter 53.

(7) Loosen lock nuts (Figure 503) on elevator control stops.

(8) Place an angle vernier scale (or inclinometer) on the elevator surface forward of the trim tab, and in the center of the elevator.

(9) Hold the elevator at neutral (elevator streamlined with horizontal stabilizer) and center the bubble in the angle vernier scale. Lock the zero adjustment.

(10) Move the elevator to its full up position (against the control stop) and measure the throw of the control on the angle vernier scale.

(11) Adjust the top elevator stop to obtain 30° ± 2° indication on the angle vernier scale. Tighten control stop lock nut.

(12) Move the elevator to its full down position (against the control stop) and measure the throw of the control on the angle vernier scale.

(13) Adjust the bottom elevator stop to obtain 20° ± 2° indication on the angle vernier scale. Tighten control stop lock nut.

(14) Recheck cable tension, and safety turnbuckles with clips.

(15) Replace trim per Chapter 25.

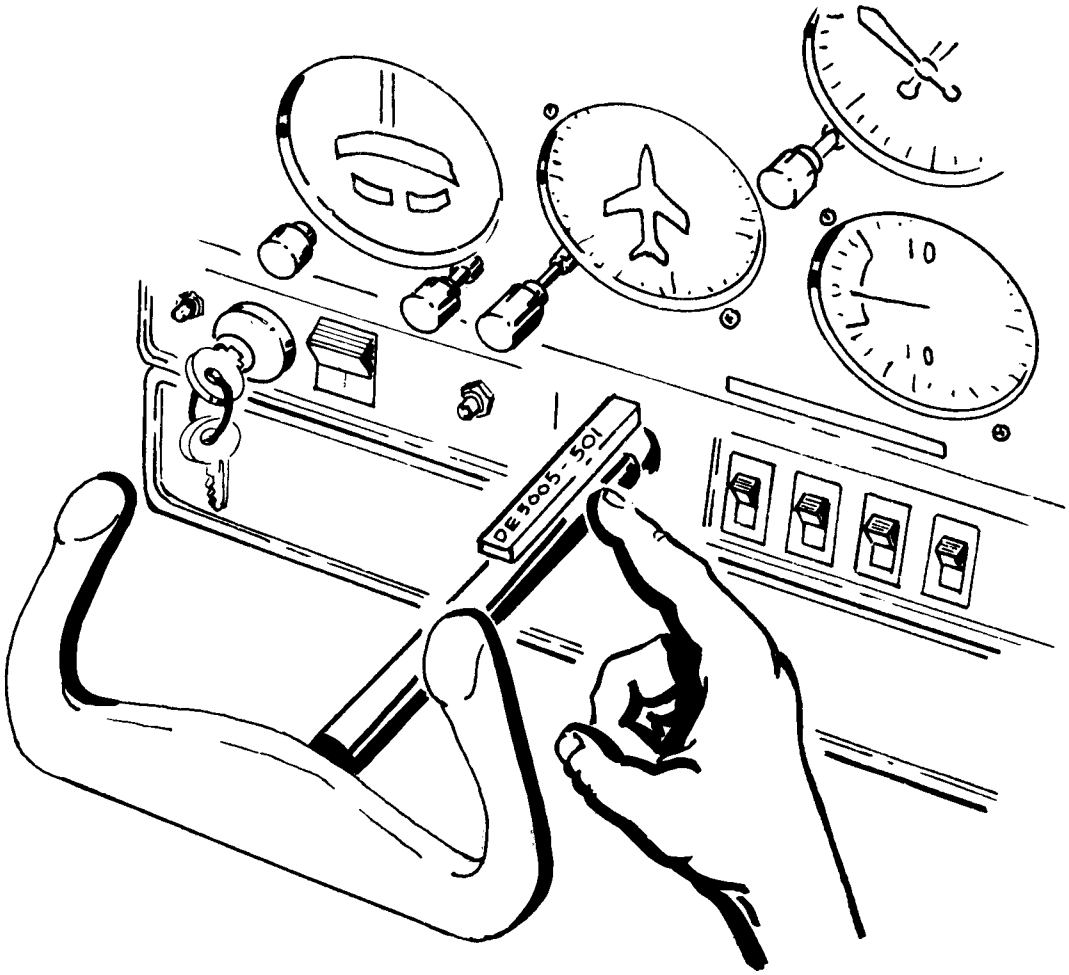
(16) Reinstall tailcone per Chapter 53.

B. Elevator Rigging (AA-5A Aircraft)

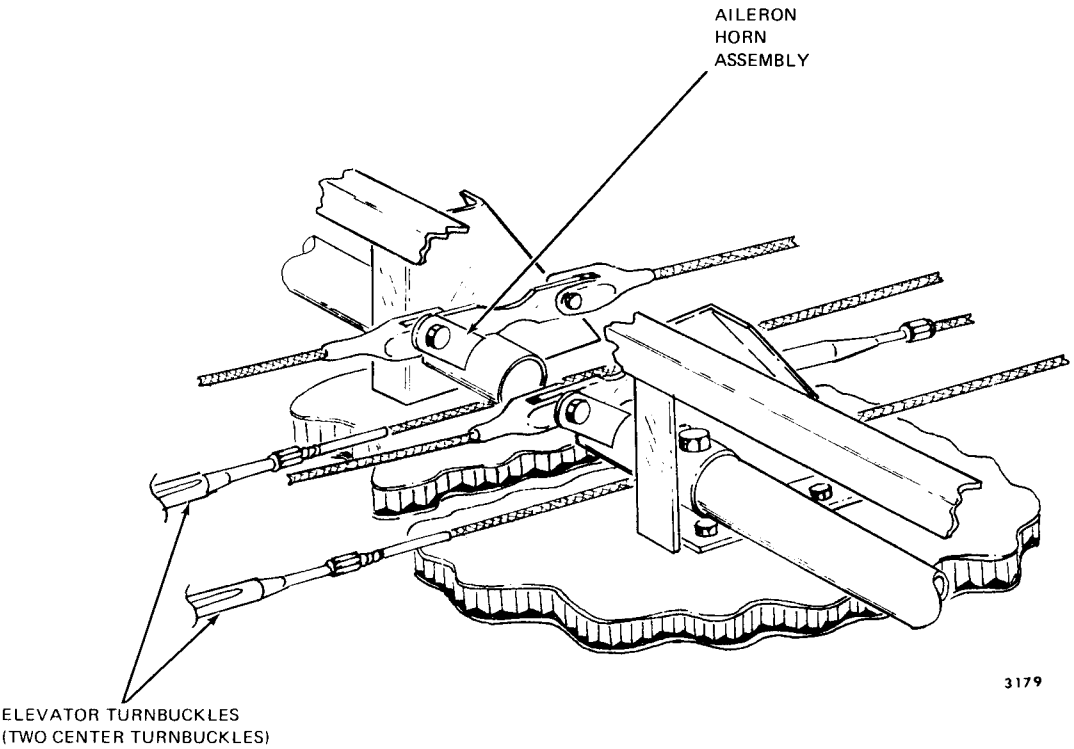
(1) Secure the control wheel in the neutral position by installing fixture (Part No. DE 5005-501, Figure 501).

(2) Remove trim per Chapter 25 to provide access to the elevator turnbuckles located under the aft end of the console.

(3) Adjust the elevator turnbuckles (Figure 502) until the elevator is located at neutral. Neutral position of the elevators is the position where elevators are streamlined with the stabilizer.



Elevator Rigging Fixture
Figure 501



Elevator Turnbuckles
Figure 502

(4) Check the elevator cable tension and adjust the turnbuckles to obtain 35 + 0, -5 pounds tension. (At the average temperature for the aircraft operation area). Recheck the 0° position of the elevator surface.

(5) Remove rigging fixture.

(6) Remove tailcone per Chapter 53.

(7) Loosen lock nuts (Figure 503) on elevator control stops.

(8) Place an angle vernier scale (or inclinometer) on the elevator surface forward of the trim tab, and in the center of the elevator.

(9) Hold the elevator at neutral (elevator streamlined with horizontal stabilizer) and center the bubble in the angle vernier scale. (Lock the zero adjustment.

(10) Move the elevator to its full up position (against the control stop) and measure the throw of the control on the angle vernier scale.

(11) Adjust the top elevator stop to obtain 23° ± 1° indication on the angle vernier scale. Tighten control stop lock nut.

(12) Move the elevator to its full down position (against the control stop) and measure the throw of the control on the angle vernier scale.

(13) Adjust the bottom elevator stop to obtain 17° ± 2° indication on the angle vernier scale. Tighten control stop lock nut.

(14) Recheck cable tension, and safety turnbuckles with clips.

(15) Replace trim per Chapter 25.

(16) Reinstall tailcone per Chapter 53.

C. Elevator Rigging (AA-5B Aircraft)

(1) Secure the control wheel in the neutral position by installing fixture (Part No. DE 5005-501, Figure 501).

(2) Remove trim per Chapter 25 to provide access to the elevator turnbuckles located under the aft end of the console.

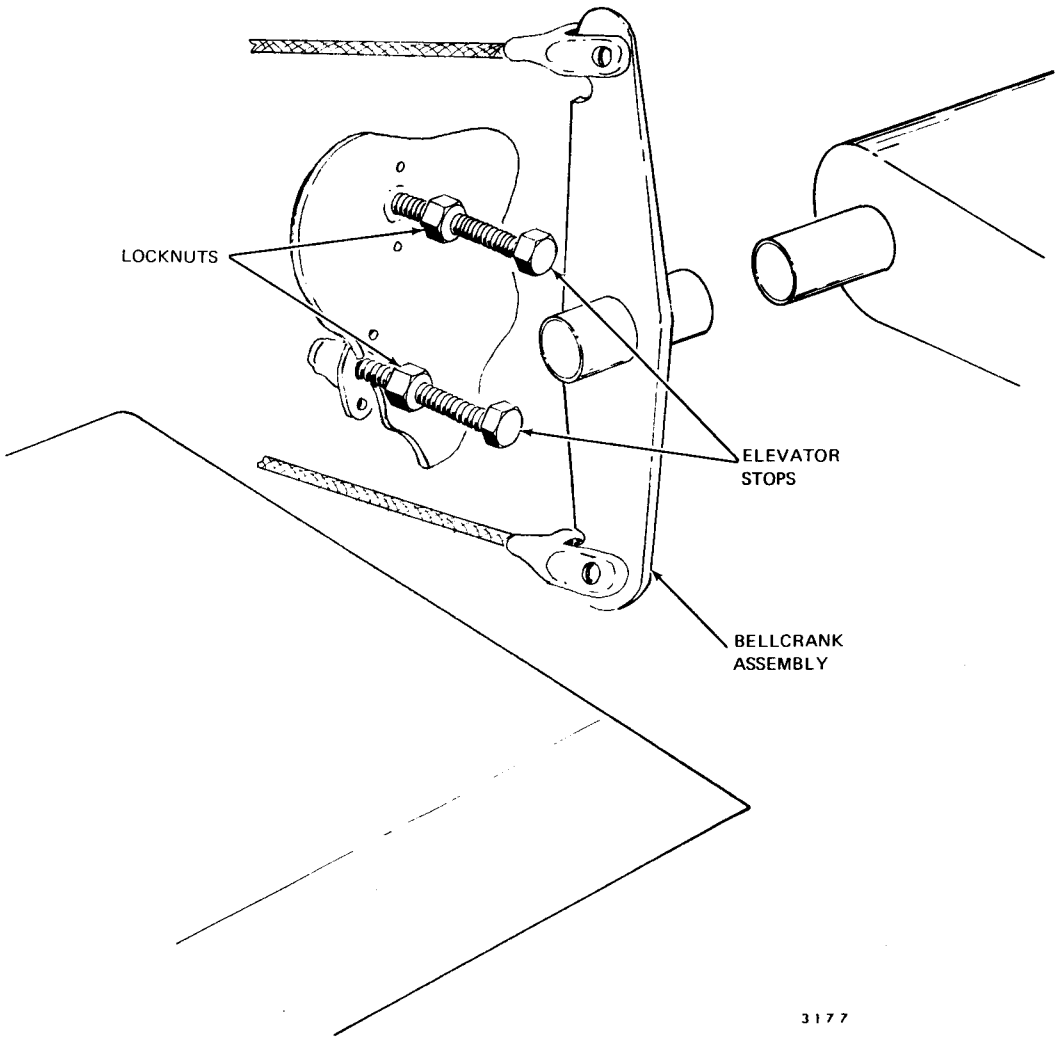
(3) Adjust the elevator turnbuckles (Figure 502) until the elevator is located at neutral. Neutral position of the elevators is the position where elevators are streamlined with the stabilizer.

(4) Check the elevator cable tension and adjust the turnbuckles to obtain 35 + 0, -5 pounds tension. (At the average temperature for the aircraft operation area.) Recheck the 0° position of the elevator surface.

(5) Remove rigging fixture.

(6) Remove tailcone per Chapter 53.

(7) Loosen lock nuts (Figure 503) on elevator control stops.



Elevator Control Stops
Figure 503

(8) Place elevator rigging fixture (Part No. 5302050-501, Figure 504) on horizontal stabilizer, outboard of trim tab.

(9) Move the elevator to its full up position (against the control stop) and measure the throw of the control on the rigging fixture.

(10) Adjust the elevator stop to obtain 23° ± 1° indication on the fixture. Tighten lock nut.

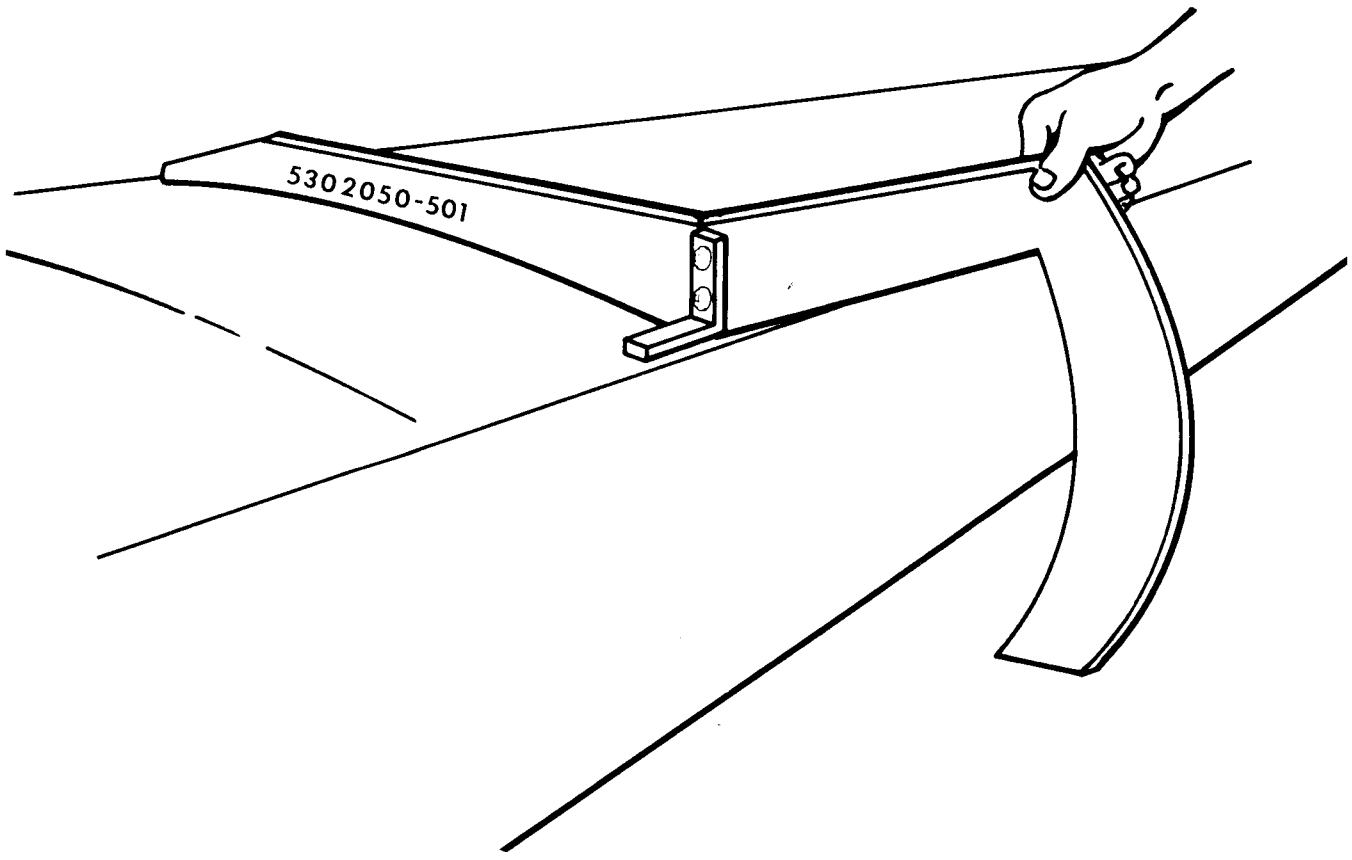
(11) Move the elevator to its full down position (against the control stop) and measure the throw of the control on the rigging fixture.

(12) Adjust the elevator stop to obtain 17° ± 2° indication on the fixture. Tighten lock nut.

(13) Recheck cable tension, and safety turnbuckles with clips.

(14) Replace trim per Chapter 25.

(15) Install tailcone per Chapter 53.



Elevator Rigging Fixture
Figure 504

D. Trim Tab Rigging (AA-5 Aircraft)

NOTE: Elevator rigging should always be checked prior to checking or changing trim tab rigging.

(1) Run trim wheel to its full up position (full aft rotation).

(2) Place trim tab rigging fixture (Part No. DE 5004-501, Figure 505) on the elevator, at the center of the trim tab span.

(3) Position elevator to its neutral position (streamlined with horizontal stabilizer) and note reading on fixture.

(4) Fixture shall indicate 19° ± 2° down throw of trim tab. If tab throw is not within tolerance, adjust rigging as follows:

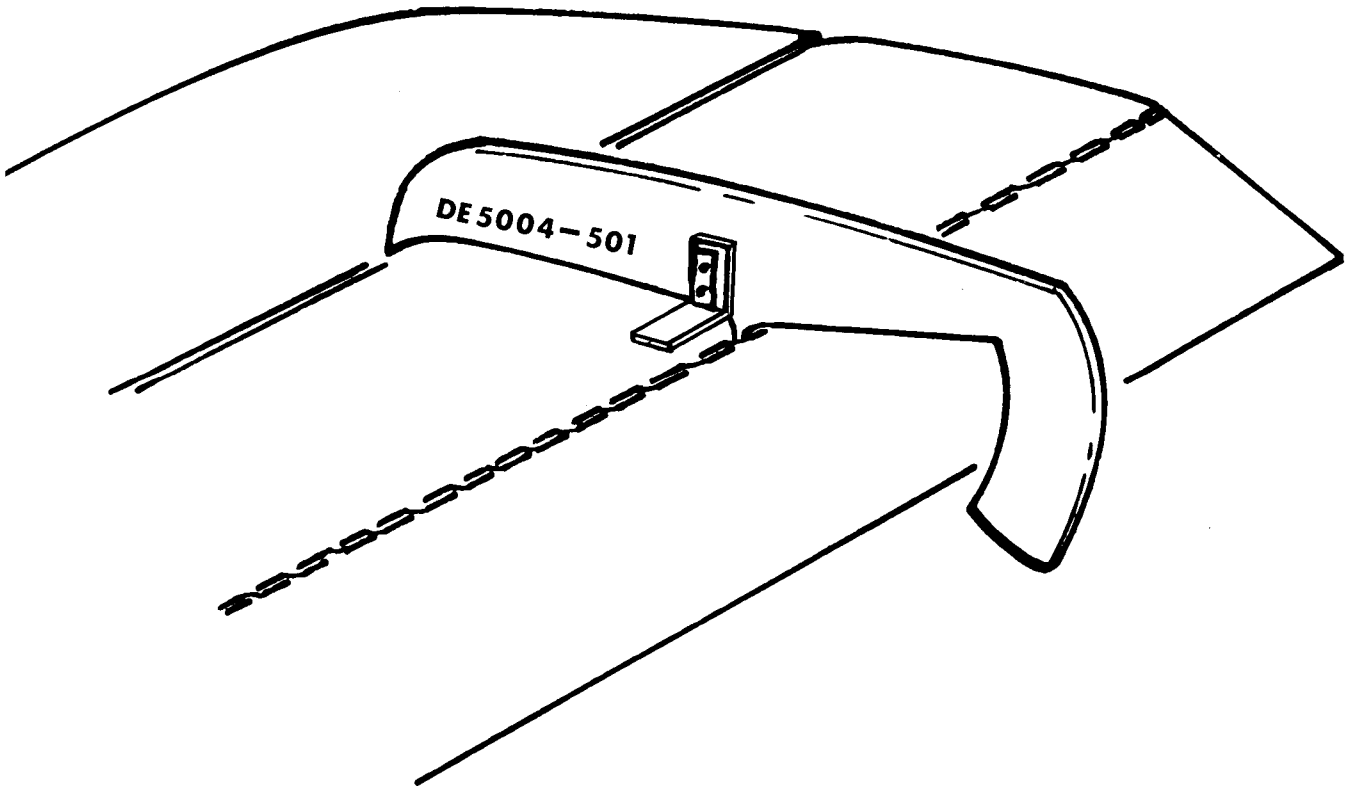
(a) Position control wheel to its neutral (0° ± 2°) position and install control lock or rigging fixture (Figure 501).

(b) Rotate control wheel to its full up position (full aft rotation).

(c) Remove console trim per Chapter 25 to provide access to trim control mechanism.

(d) Remove cotter pin (35, Figure 405), nut (36) and washers (37).

(e) Pull trim wheel (40) out until its pinion (42) clears the drive pinion (31).



Trim Tab Rigging Fixture
Figure 505

(f) Rotate flexible shaft (25) until the trim tab down throw is 19° ± 2°.

(g) Push the trim wheel (40) in to engage the pinion gears (42 and 31). Secure with washers (37), nut (36) and cotter pin (35).

(h) Rotate trim wheel (40) until the trim tab is in the neutral (0°) position.

(i) Bend indicator wire on trim indicator bracket (48) to agree with "N" on trim indicator.

(j) Remove rigging fixture (Figure 505) and control lock (or rigging fixture, Figure 501).

(k) Check trim system for freedom of movement.

(l) Reinstall console trim per Chapter 25.

E. Trim Tab Rigging (AA-5A and AA-5B Aircraft)

NOTE: Elevator rigging should always be checked prior to checking or changing trim tab rigging.

(1) Run trim wheel to its full up position (full aft rotation).

(2) Place trim tab rigging fixture (Part No. DE 5004-502, Figure 505) on the elevator, at the trim tab hinge cutout area.

(3) Position elevator to its neutral position (streamlined with horizontal stabilizer) and note reading on fixture.

(4) Fixture shall indicate 29° ± 1° up throw of trim tab. If tab throw is not within tolerance, adjust rigging as follows:

(a) Position control wheel to its neutral (0° ± 2°) position and install control lock or rigging fixture (Figure 501).

(b) Rotate control wheel to its full up position (full aft rotation).

(c) Remove console trim per Chapter 25 to provide access to trim control mechanism.

(d) Remove cotter pin (35, Figure 405), nut (36) and washers (37).

(e) Pull trim wheel (40) out until its pinion (42) clears the drive pinion (31).

(f) Rotate flexible shaft (25) until the trim tab throw is 29° ± 1°.

(g) Push the trim wheel (40) in to engage the pinion gears (42 and 31). Secure with washers (37), nut (36) and cotter pin (35).

(h) Rotate trim wheel (40) until the trim tab is in the neutral (0°) position.

(i) Bend indicator wire on trim indicator bracket (48) to agree with "N" on trim placard.

(j) Remove rigging fixture (Figure 505) and control lock (or rigging fixture, Figure 501).

2. Elevator Balancing

Refer to Section 27-1-1 for control surface balancing procedures.

3. Elevator Trim Tab Free Play Measurement (AA-5A and AA-5B aircraft)

It has been determined that the amount of free play at the elevator trim tab is an indicator of the effectiveness of the tab in fulfilling the requirements for irreversibility. The procedures outlined below provide a means to determine the general condition and amount of wear sustained by certain trim system components.

A. Preparation

(1) Move the aircraft into a hangar or other protected location so that wind or other air disturbances do not interfere with the control surfaces.

(2) Set the parking brake or install wheel chocks. Provide support for the fuselage at or near the aft bulkhead to steady the aircraft.

(3) Fair the elevator with the horizontal stabilizer and use plywood or blocks and long 1/8-inch bolts as shown in Figure 507 to hold the elevators in this position during the remainder of the proceedings.

(4) Using the trim tab control wheel, fair the trim tab and elevator trailing edges.

NOTE: The trim tab control wheel should not be moved again until the measurements are completed. Procedures given below are for one trim tab only, and must be repeated on the other trim tab.

(5) Using tape or other means, fasten a flat, thin piece of suitable material to the trim tab trailing edge to act as a reference pointer as shown in Figure 507.

(6) Fasten a 6-inch scale to the elevator trailing edge as shown in Figure 507.

(7) Provide a 2 ± 0.05-pound weight and safety wire or other means to suspend it from the slot in the trim tab arm. (See Figure 507.)

NOTE: An unopened quart can of aircraft engine oil, and a suitable length of safety wire fashioned to hold the can, as shown in Figure 507 weigh approximately two pounds. Any discrepancy can be corrected by placing suitable washers or other small parts on the can.

B. Measurement of Free Play

(1) Using 8 to 10 pounds of hand pressure, press down on the elevator trim tab at the inboard end to remove all of the slack from the system.

(2) Slowly release the hand pressure to zero and remove the hand from the trim tab. Note the position of the reference pointer relative to the scale.

NOTE: After the initial measurement is taken, the positions of the elevator, index, and scale must not be disturbed.

(3) Suspend the balance weight (2 ± 0.05 pounds) at the forward end of the slot in the trim tab arm. Do not allow the balance weight to slip from the forward end of the slot.

(4) Using 8 to 10 pounds of hand pressure, press up on the elevator trim tab at the inboard end to remove all of the slack from the system.

(5) Slowly release the hand pressure to zero and remove the hand from the trim tab. Note the position of the reference pointer relative to the scale.

(6) Using the scale readings obtained in Steps (2) and (5) above, subtract the smaller from the larger to obtain the net free play. Note the net free play measurement.

(7) Remove the balance weight from the trim tab arm. Repeat Steps (1) through (6) above to obtain a second net free play measurement.

(8) If the difference between the two net free play measurements is 0.020 inch or less, calculate the average of the two values (add them together, then divide by 2). The maximum allowable free play is 0.27 inch.

(9) If the difference between the two net free play measurements is more than 0.020 inch, repeat Steps (1) through (7) above to obtain two more net free play measurements. Discard the highest and lowest of the four values obtained. Calculate the average of the two values (add them together, then divide by 2). The maximum allowable free play is 0.27 inch.

(10) If the free play exceeds 0.27 inch, excessive wear to the trim tab arm system components may be indicated. Refer to Maintenance Practices — Removal/Installation, paragraph entitled "Elevator Trim Tab Free Play Reduction."

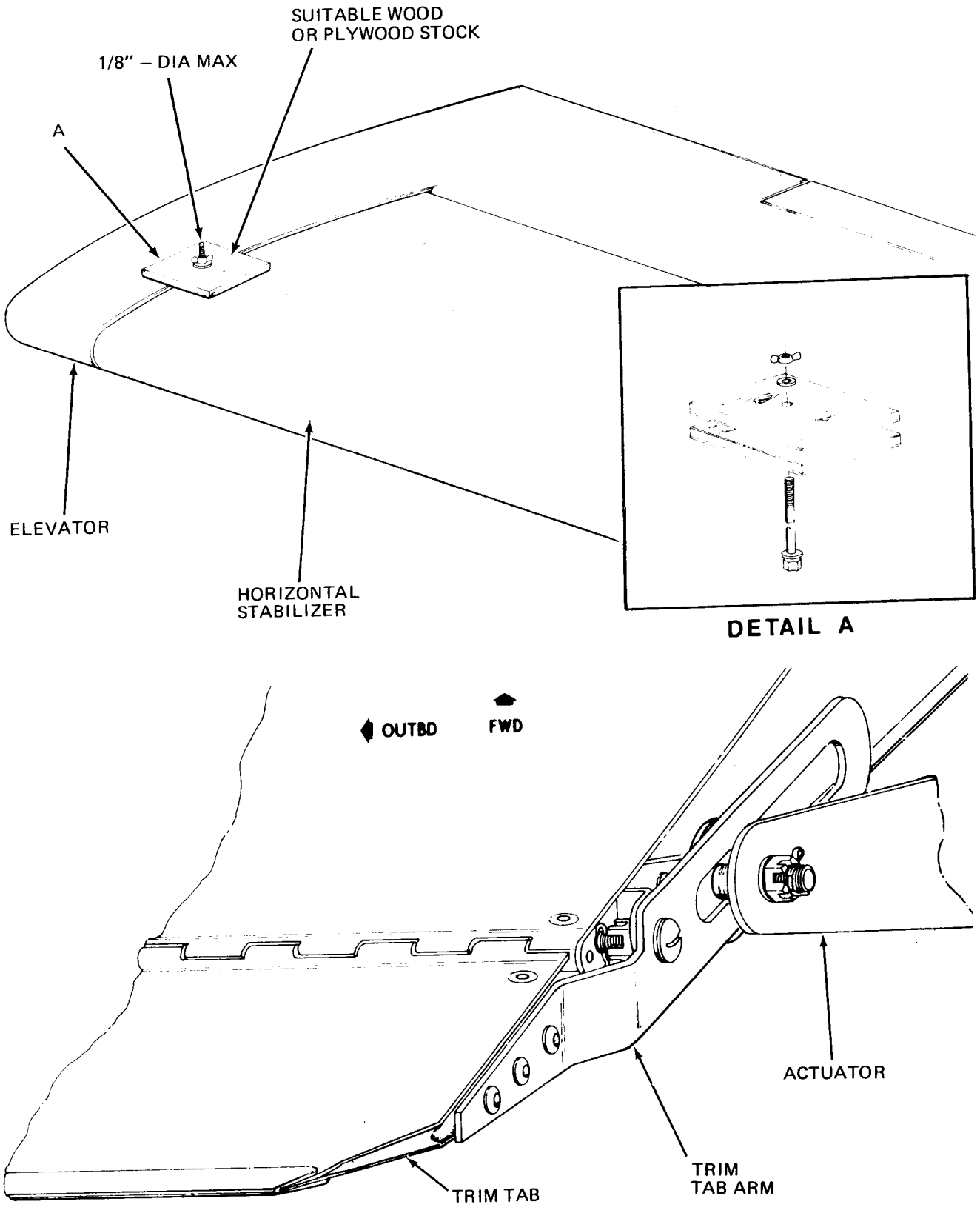


Figure 507. Elevator Trim Tab Free Play Measurement
(Sheet 1 Of 2)

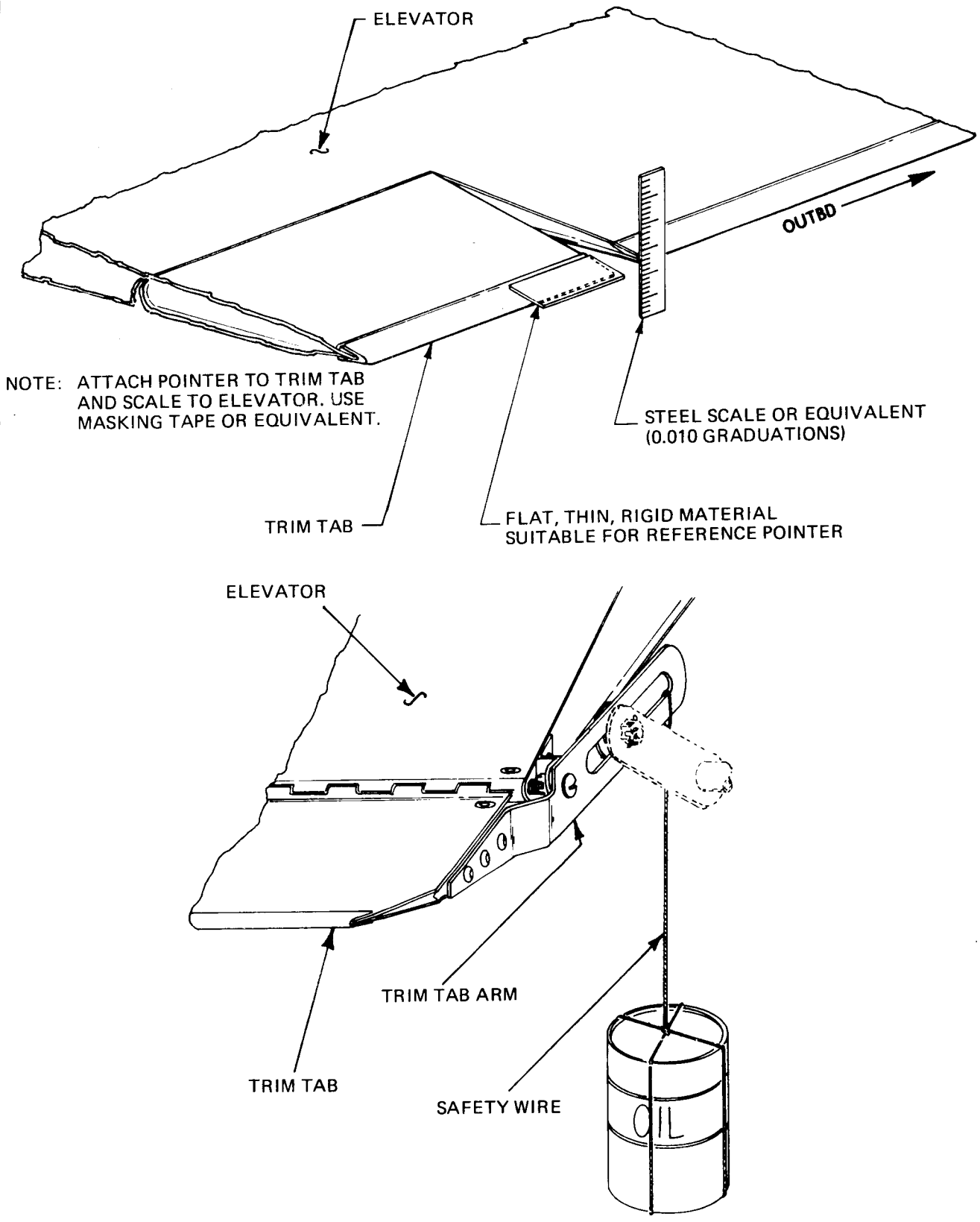


Figure 507. Elevator Trim Tab Free Play Measurement
(Sheet 2 Of 2)

MAINTENANCE PRACTICES – CLEANING/PAINTING

1. General

CAUTION: WHEN CONTROL SURFACES ARE PAINTED THEIR BALANCE IS CHANGED. ALWAYS CHECK BALANCE AFTER PAINTING.

Refer to Chapter 20 for proper cleaning and painting procedures.

FLAPS - DESCRIPTION/OPERATION

1. General (See Figure 1.)

The flap system consists of two flaps, one on each wing, mounted inboard of the ailerons, an electrically driven actuator, and mechanical linkages to actuate the flaps. The electrical motor is controlled by a toggle-type switch mounted on the console, and flap position is indicated by a mechanically positioned tab on the console.

2. Flap Structure (See Figure 2.)

The flap structure consists of honeycomb ribs bonded to two stiffener tubes extending the length of the flap, and an aluminum skin bonded to the ribs. Each of the ribs contains a hole along its hinge line. These holes contain bearings to accommodate the aileron torque tube, over which the flaps fit. The flap torque tube fits over the aileron torque tube, and actuates the flap by means of a horn bolted to the root flap rib.

3. Flap Drive and Linkage (See Figure 3.)

The flaps are positioned by a reversible DC motor. When this motor is actuated, it turns a worm drive gear in the gearbox. The driven gear actuates a screw mechanism to move the push-pull linkage. This linkage is attached to a horn on the center torque tube, thus as the push-pull linkage moves the center torque tube rotates. The center torque tube is attached, through adjustable linkages and horn assemblies, to the flap torque tubes. Thus, as the center torque tube rotates, the flap torque tubes rotate the same amount. This arrangement provides a large mechanical advantage for the DC motor so that it can move the flaps against the aerodynamic load imposed in flight. In addition, it is a "one-way" mechanism that effectively locks the flaps in position when the motor is stopped.

Flap position is indicated by means of an indicator on the console. This indicator is positioned by a flexible cable actuated by an arm attached to the push-pull linkage.

Flap travel is limited by microswitches located adjacent to the push-pull linkage. As this linkage moves to each limit of travel, a cam on the linkage actuates a microswitch to remove power from the motor.

4. Flap Electrical System (See Figure 4.)

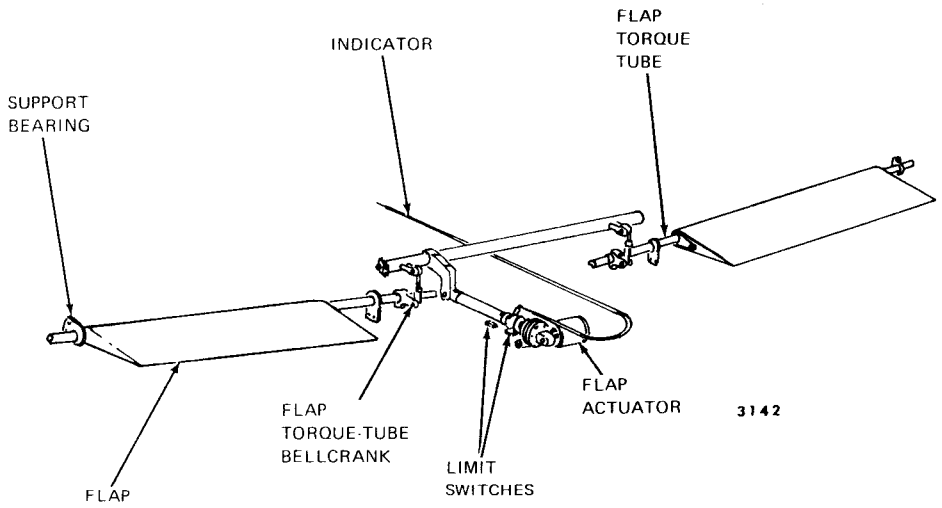
The flap electrical system receives DC voltage from the bus through a 15-amp fuse. This voltage is applied to one arm of the double pole, double throw flap switch.

When this switch is held in the DOWN position (aft position), voltage is routed through the normally-closed contacts of the down limit switch, through the orange (ORN) lead, to the flap motor. The ground return for the flap motor is through its black (BLK) lead, and through the other arm of the flap switch to ground.

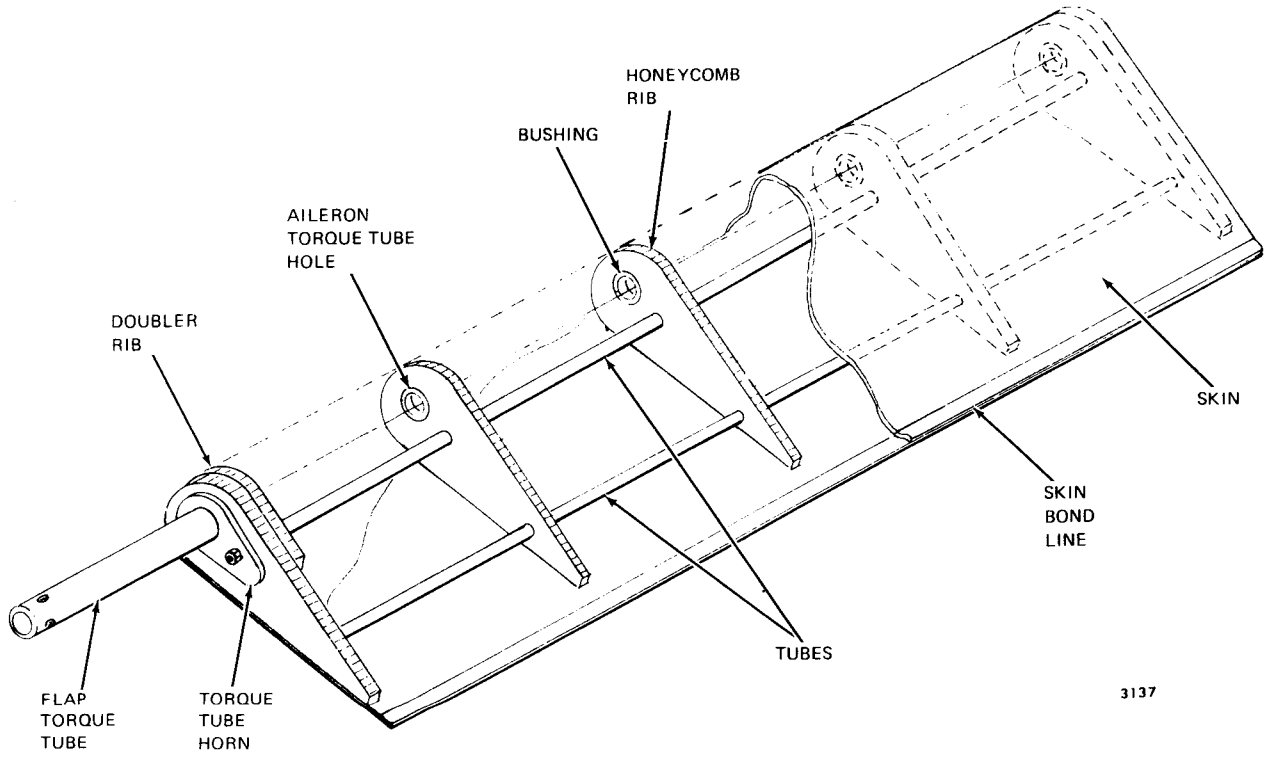
The flap motor drives the flaps down until the limit of downward movement is reached. At this point the down limit switch is opened, breaking the DC voltage supply for the flap motor, thus causing the motor to stop.

The flap switch is spring-loaded so that when it is released it moves from the down position to the neutral position.

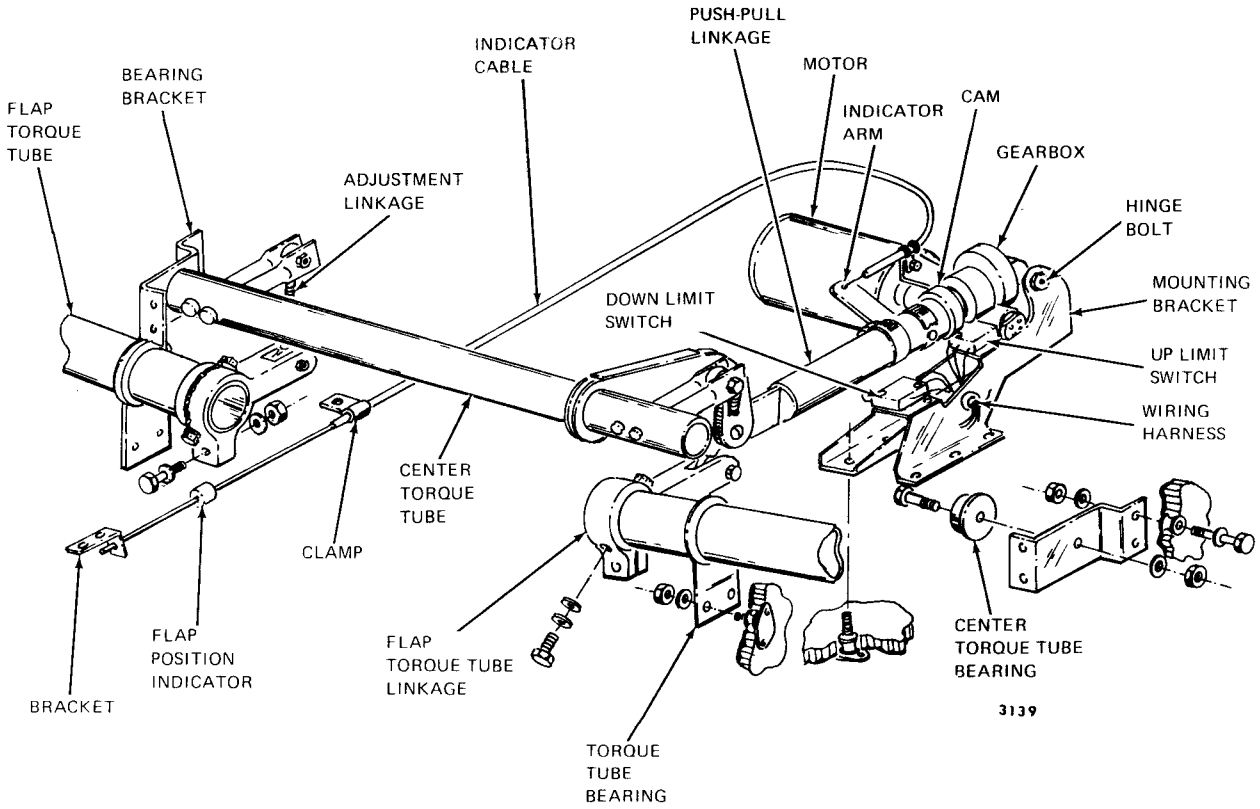
When the flap switch is set to UP (forward position), voltage is routed through the flap switch, the normally-closed contacts of the up limit switch, and through the black (BLK) lead of the motor. The ground return for the motor is through its orange (ORN) lead, and the other arm of the flap switch to ground.



Flap System
Figure 1



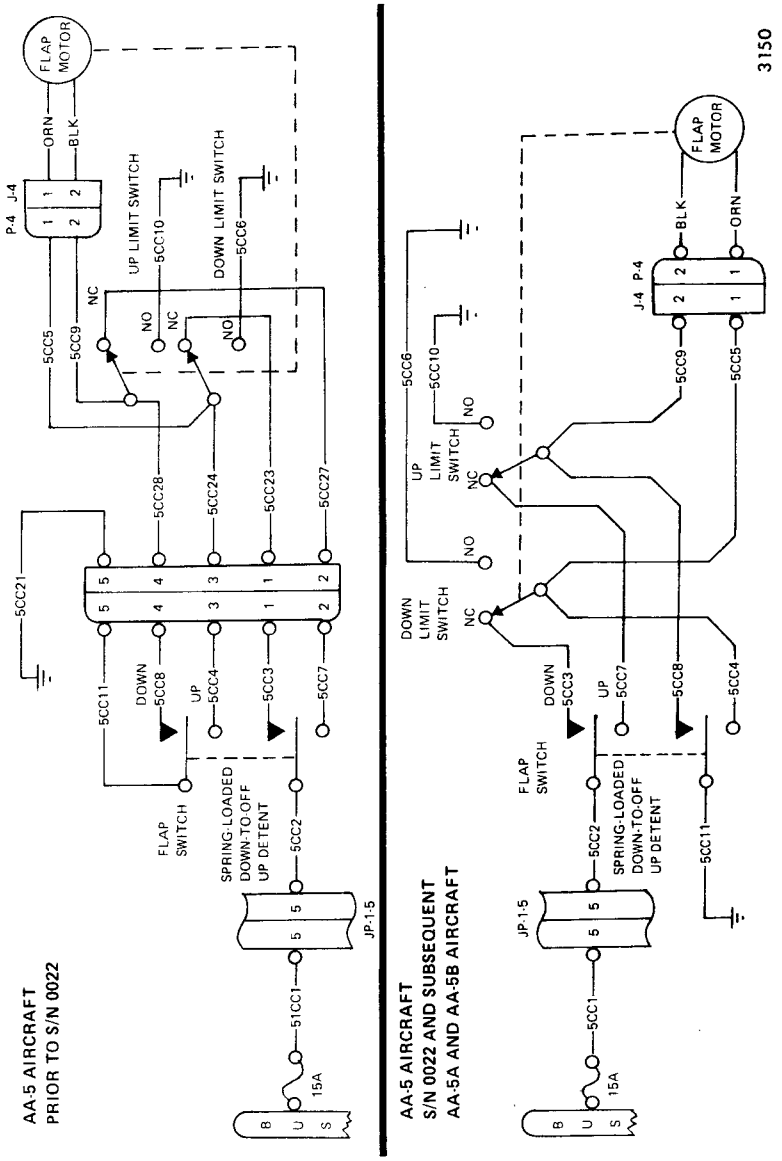
Flap Surface Structure
Figure 2



Flap Drive Mechanism
Figure 3

The flap motor drives the flaps up until the upward limit of travel is reached. At this point the up limit switch is opened, breaking the DC supply to the motor, causing the motor to stop.

The flap switch has a detent in its UP position and the switch will remain in the UP position until moved out of detent.



Flap Electrical System Schematic
Figure 4

FLAPS – TROUBLESHOOTING

1. Troubleshooting Flaps (AA-5 Aircraft Prior to S/N 0022) (See Figure 4.)

TROUBLE	PROBABLE CAUSE	REMEDY
Flaps do not move when switch is actuated.	Set MASTER switch to ON. Check fuse.	Replace if defective.
	Hold flap switch in DOWN position and check for 12V DC at pin 1 of connector.	If voltage is not present, replace switch.
		If voltage is present, check that pin 4 of connector is grounded. If not, replace switch.
	Hold flap switch in UP position and check for 12V DC at pin 2 of connector.	If voltage is not present, replace switch.
		If voltage is present, check that pin 3 of connector is grounded. If not, replace switch.
	Disconnect plug P4 from connector J4. Hold flap switch in DOWN position and jumper across down limit switch.	On plug P4, pin 1 should be positive (12V DC) with respect to pin 2. If not, check wiring. If so, replace down switch.
	Hold flap switch in UP position and jumper across up limit switch.	On plug P4, pin 2 should be positive (12V DC) with respect to pin 1. If not, check wiring. If so, replace up limit switch.
	Reconnect plug P4 to connector J4 and actuate flap switch.	If flaps do not move, check motor, jackscrew, and linkages. Replace as required.
Flaps move past up or down limit.	Check limit switches.	Adjust flap rigging per Adjustment/Test, Paragraph 1, or replace limit switch.

2. Troubleshooting Flaps (AA-5 Aircraft S/N 0022 and Subsequent, AA-5A and AA-5B) (See Figure 4.)

TROUBLE	PROBABLE CAUSE	REMEDY
Flaps do not move when switch is actuated.	Set MASTER switch to ON. Check fuse.	Replace fuse if defective.
	Hold flap switch in DOWN position and check for 12V DC at normally-closed and contact of down limit switch.	If voltage is not present, replace flap switch.
		If voltage is present, check that pin 2 of J4 is grounded. If not, replace flap switch.
	Hold flap switch in UP position and check for 12V DC at normally-closed contact of up limit switch.	If voltage is not present, replace flap switch.
		If voltage is present check that pin 1 of J4 is grounded. If not replace flap switch.
	Disconnect plug P4 from connector J4. Hold flap switch in DOWN position and jumper across down limit switch.	On plug P4, pin 1 should be positive (12V DC) with respect to pin 2. If not, check wiring. If so, replace down limit switch.
	Hold flap switch in UP position and jumper across up limit switch.	On plug P4, pin 2 should be positive (12V DC) with respect to pin 1. If not, check wiring. If so, replace up limit switch.
	Reconnect plug P4 to connector J4 and actuate flap switch.	If flaps do not move, check motor, jackscrew, and linkage. Replace as required.
Flaps move past up or down limit.	Check limit switches.	Adjust flap rigging per Adjustment/Test, Paragraph 1, or replace limit switch.

MAINTENANCE PRACTICES — SERVICING

1. Lubrication

A. Flap Drive Jackscrew Lubrication

(1) Set MASTER switch to ON.

(2) Hold flap switch in DOWN (aft) position until flaps are fully deployed.

(3) Set MASTER switch to OFF.

(4) Remove trim per Chapter 25 to provide access to the flap drive mechanism.

(5) Use a clean, lint-free cloth to wipe excess oil and foreign material from exposed threads of jackscrew.

(6) Apply a light coat of MIL-L-7870 oil (See Chapter 12.) to exposed threads. Wipe off excess oil.

(7) Install trim per Chapter 25.

(8) Set MASTER switch to ON.

(9) Set flap switch to UP.

(10) When flaps have moved to the up position, set MASTER switch to OFF.

B. Torque Tube Oilite Bearing Lubrication

(1) Remove trim per Chapter 25 to expose flap torque tube bearings.

(2) Inject a small amount of MIL-L-7870 oil (See Chapter 12.) between torque tube and bearings.

(3) Install trim per Chapter 25.

C. Flap Position Indicating Cable Lubrication

(1) Remove trim per Chapter 25 to provide access to flap position indicator cable.

(2) Remove indicator cable assembly from console per Removal/Installation, Paragraph 2A, this chapter.

(3) Pull wire from center of cable assembly.

(4) Use a clean, lint-free cloth to wipe all grease and foreign material from wire.

(5) Apply a light coating of MIL-G-21164 Molybdenum Disulphide grease (See Chapter 12.) to wire.

(6) Install wire in cable assembly.

(7) Install cable assembly in console per Removal/Installation, Paragraph 2B.

(8) Install trim per Chapter 25.

MAINTENANCE PRACTICES — REMOVAL/INSTALLATION

1. Flap Assembly Removal/Installation

A. Flap Assembly Removal (See Figure 401.)

(1) Remove aileron per Section 27-1-0.

(2) Remove trim per Chapter 25 to expose flap drive mechanism and flap torque tubes.

(3) Remove nut (1), washer (2), and bolt (3) from arm (4).

(4) Cut safety wire (5) and remove bolts (6) and washers (7).

(5) Use a screwdriver or similar tool to open the slot in the arm (4) slightly, then pull the torque tube (8) outboard until it clears the aircraft.

B. Flap Assembly Installation (See Figure 401.)

(1) Position flap on wing and slide torque tube (8) through the oilite bearing (9) and arm (4).

NOTE: Be sure that special screws are indexed properly in torque tube holes. Safety as shown in Figure 401. Use same number of washers under each bolt. Bolt should be flush minimum and extend not more than 0.032 inch through torque tube.

(2) Align holes in arm (4) and torque tube (8) and secure with bolts (6) and washers (7). Torque to standard value per Chapter 91 and safety wire bolts (6) with 0.032 wire.

(3) Install bolt (3), washer (2), and nut (1). Torque per Chapter 91.

(4) Install aileron per Section 27-1-0, this chapter.

(5) Install trim per Chapter 25.

2. Flap Drive Removal/Installation

C. Flap Drive Removal (See Figure 401.)

(1) Remove trim per Chapter 25 to provide access to flap drive.

(2) Remove nuts (10), washers (11), and bolts (12) from torque tube (13).

(3) Remove nuts (14), washers (15), and bolts (16) from torque tube mounting bracket (17).

(4) Remove cotter pin (18), nut (19), washer (20), and bolt (21) from torque tube (13) and disconnect actuator fitting (22) from horn on torque tube (13).

(5) Remove bracket (17) from aircraft and pull bearing (23) from torque tube (13).

(6) Remove torque tube (13) from aircraft.

(7) Disconnect drive motor connector (24).

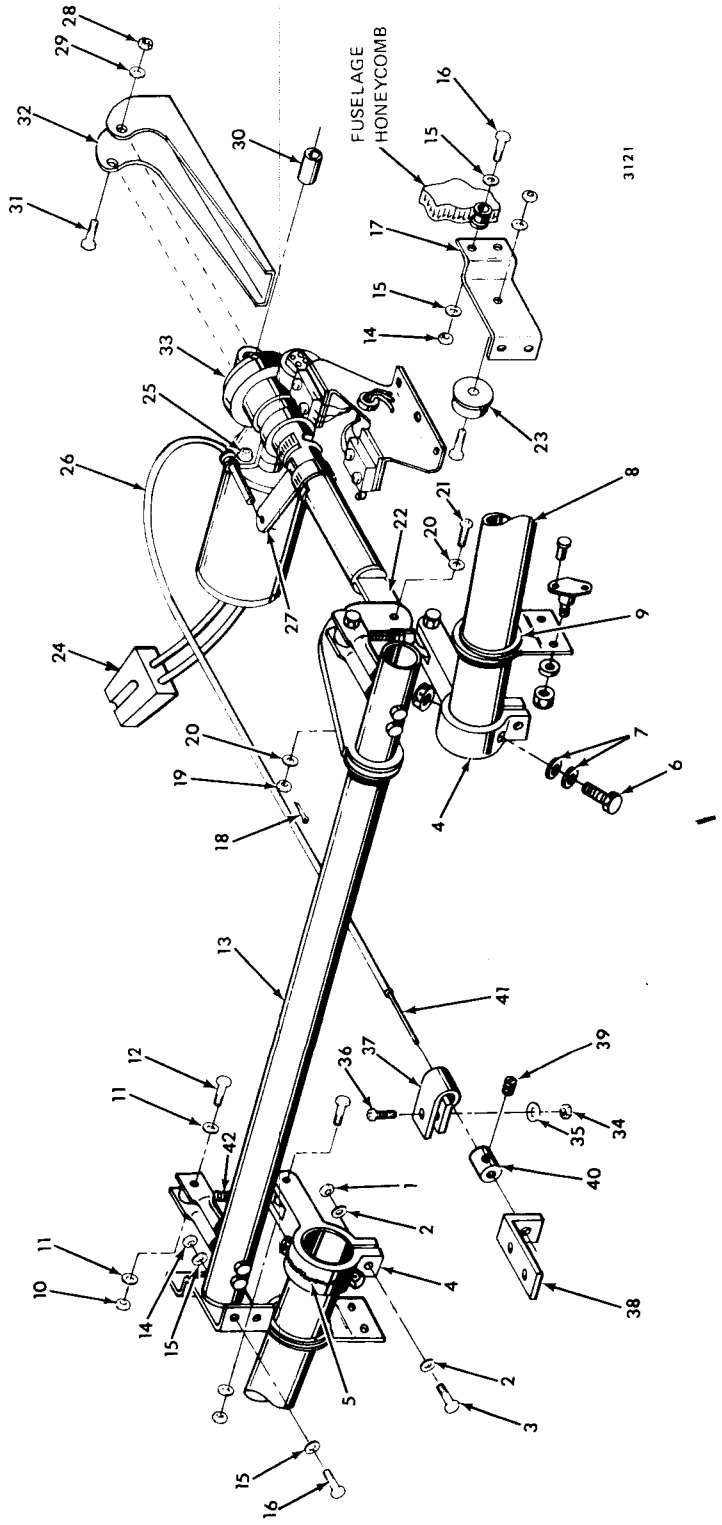
(8) Remove screw (25) securing indicator cable (26) to actuator assembly and disconnect joggled end of cable from horn (27).

(9) Remove nut (28), washer (29), bushing (30), and bolt (31) from mounting bracket (32) and lift drive mechanism (33) from aircraft.

(10) Remove nut (34), washer (35), and screw (36) from clamp (37). Pull cable (26) from bracket (38). Remove cable (26) from console.

(11) Remove setscrew (39), and pull indicator (40) from wire (41).

1. NUT
2. WASHER
3. BOLT
4. ARM
5. SAFETY WIRE
6. BOLTS
7. WASHERS
8. TORQUE TUBE
9. OILITE BEARING
10. NUT
11. WASHERS
12. BOLT
13. TORQUE TUBE
14. NUT
15. WASHERS
16. BOLT
17. TORQUE TUBE MOUNT BRACKET
18. COTTER PIN
19. NUT
20. WASHERS
21. BOLT
22. ACTUATOR FITTING
23. TORQUE TUBE
24. CONNECTOR
25. SCREW
26. CABLE, INDICATOR
27. HORN
28. NUT
29. WASHER
30. BUSHING
31. BOLT
32. MOUNTING BRACKET
33, DRIVE MECHANISM
34. NUT
35. WASHER
36. SCREW
37. CLAMP
38. BRACKET
39. SET SCREW
40. INDICATOR
41. WIRE



Flap Removal/Installation
Figure 401

B. Flap Drive Installation (See Figure 401.)

(1) Insert wire (41) into indicator (40) and secure with setscrew (39).

(2) Insert cable (26) in clamp (37) and secure to console with screw (36), washer (35), and nut (34).

(3) Insert bearing (23) in each end of torque tube (13).

(4) Position brackets (17) to align mounting holes. Secure to aircraft with bolts (16), washers (15), and nuts (14). Torque to standard value. (See Chapter 91.)

(5) Insert bushing (30) in mounting hole on aft end of actuator (33). Secure actuator (33) to bracket (32) with bolt (31), washer (29), and nut (28). Torque to standard value. (See Chapter 91.)

(6) Insert joggled end of cable (26) in arm (27) and attach cable to actuator (33) with screw (25).

(7) Align holes in fitting (22) and the arm on the torque tube (13). Secure with bolt (21), washer (20), nut (19), and cotter pin (18).

(8) Connect electrical connector (24) to its mating connection in the aircraft wiring bundle.

(9) Place linkages (42) in horns on torque tube (13). Secure with bolts (12), washers (11), and nuts (10). Torque to standard value. (See Chapter 91.)

3. Flap Switch Removal/Installation

A. Flap Switch Removal (See Figure 402.)

(1) Unscrew flap switch knob (1) from flap switch (2).

(2) Remove console trim per Chapter 25.

(3) Remove mounting nut (3) from flap switch (2) and pull flap switch from console.

(4) Tag and disconnect wires.

B. Flap Switch Installation

(1) Connect wires.

(2) Insert flap switch (2) from underside of console, positioning locator slot in switch to correspond to tab on console.

(3) Install mounting nut (3) on switch (2) and tighten nut.

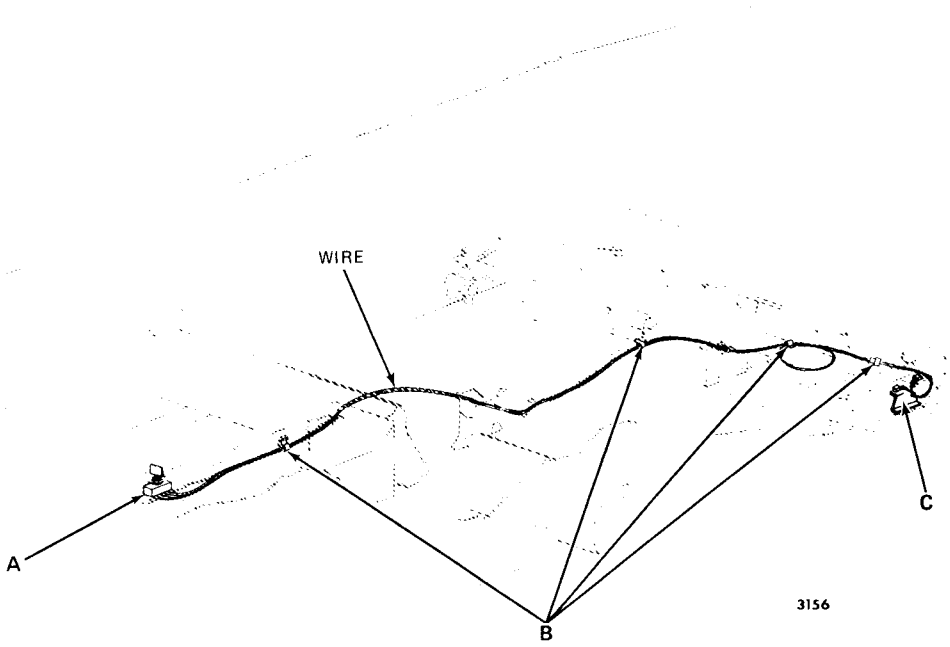
(4) Install trim per Chapter 25.

(5) Screw flap knob (1) on flap switch (2).

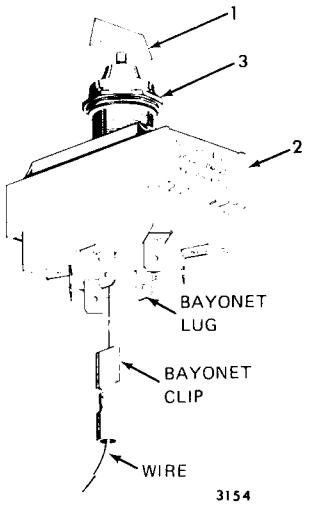
4. Microswitch Removal/Installation

A. Microswitch Removal

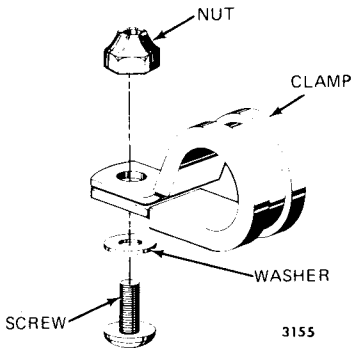
(1) Remove trim per Chapter 25 to provide access to microswitch.



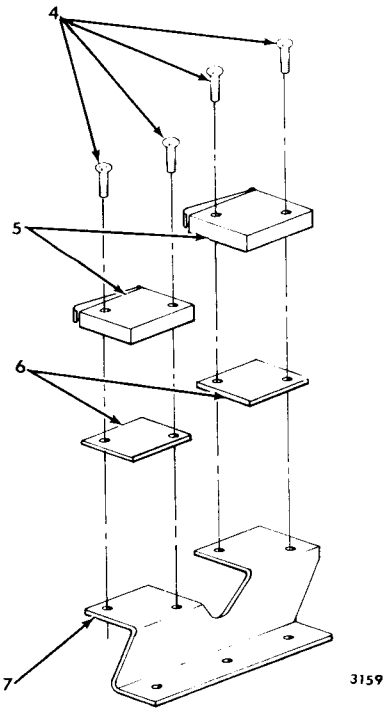
1. Flap Switch Knob
2. Flap Switch
3. Mounting Nut
4. Screws
5. Microswitch
6. Pad
7. Bracket



DETAIL A



DETAIL B



DETAIL C

Flap Wiring Removal/Installation
Figure 402

(2) Tag and disconnect wires.

(3) Remove screws (4) from microswitch (5). Lift microswitch (5) and pad (6) from bracket (7).

B. Microswitch Installation

(1) Position pad (6) on bracket (7) so that holes align.

(2) Place microswitch (5) on pad (6) and secure with screws (4).

(3) Reconnect wires.

(4) Install trim per Chapter 25.

5. Wiring Removal/Installation

A. Wiring Removal

(1) Ensure that electrical power is off prior to removing or installing wires.

(2) Disconnect wiring.

B. Wiring Installation

(1) Route wires per Figure 402.

(2) Refer to Figure 4 under (Flaps — Description/Operation) for wiring numbering and wiring diagram.

MAINTENANCE PRACTICES — ADJUSTMENT/TEST

1. Rigging

A. Flap Rigging (AA-5 Aircraft) (See Figure 501.)

(1) Remove trim per Chapter 25 to provide access to the flap drive.

(2) Ensure that flap switch is set to OFF.

(3) Manually rotate rubber coupling (1) until cam (2) depresses roller on aft limit switch (3) and a click is heard from the switch. This is the fully retracted flap position.

(4) Place rigging fixture (P/N DE 5003-501) on wing at mid-span of flap, as shown in Figure 501.

NOTE: Aerodynamic lift and normal tolerance buildup in the linkage from flap motor to flap trailing edge result in a smaller flap angle in flight than on the ground. Before taking flap angle readings, grasp the flap at the center of the trailing edge and lift upward with 5 to 10 pounds of force as required to take up any slack in the linkage. Failure to comply will result in shortened flap travel when airborne.

(5) While holding both flaps up, note the reading on the flap rigging fixture. Flaps should be 0 degree ± 1 degree with no more than 1 degree difference between left and right flap readings.

(6) If flap readings are not as given in Step (5), loosen locknuts (4) and adjust rod ends (5) to provide proper flap position. Tighten locknuts (4) when proper flap position is obtained.

(7) Check flap position indicator in forward console for correct alignment. If adjustment is required, loosen the setscrew in the indicator and position as required.

(8) With power on, cycle the flaps to the full down position, then back up until stopped by the aft limit switch (3). Check the flap position as in Steps (5) and (6) above. Hold the flap switch in the DOWN position until the flaps are stopped by the forward limit switch (6). With the flaps held up to remove slack (See NOTE above.), the flap rigging fixture should indicate 30 degrees ± 3 degrees. Adjust forward limit switch (6) as required to obtain this condition.

(9) Move cam (2) past front limit switch (6) by turning rubber coupling (1) until end stop in jackscrew is reached. Check for positive clearance between flap actuation parts and aileron torque tubes.

(10) Install trim per Chapter 25.

B. Flap Rigging (AA-5A and AA-5B Aircraft) (See Figure 501.)

(1) Remove trim per Chapter 25 to provide access to the flap drive.

(2) Ensure that flap switch is set to OFF.

(3) Manually rotate rubber coupling (1) until cam (2) depresses roller on aft limit switch (3) and a click is heard from the switch. This is the fully retracted flap position.

(4) Place rigging fixture (P/N DE 5003-501) on wing at mid-span of flap, as shown in Figure 501.

NOTE: Aerodynamic lift and normal tolerance buildup in the linkage from flap motor to flap trailing edge result in a smaller flap angle in flight than on the ground. Before taking flap angle readings, grasp the flap at the center of the trailing edge and lift upward with 5 to 10 pounds of force as required to take up any slack in the linkage. Failure to comply will result in shortened flap travel when airborne.

(5) While holding both flaps up, note the reading on the flap rigging fixture. Flaps should be 0 degree ± 1 degree with no more than 1 degree difference between left and right flap readings.

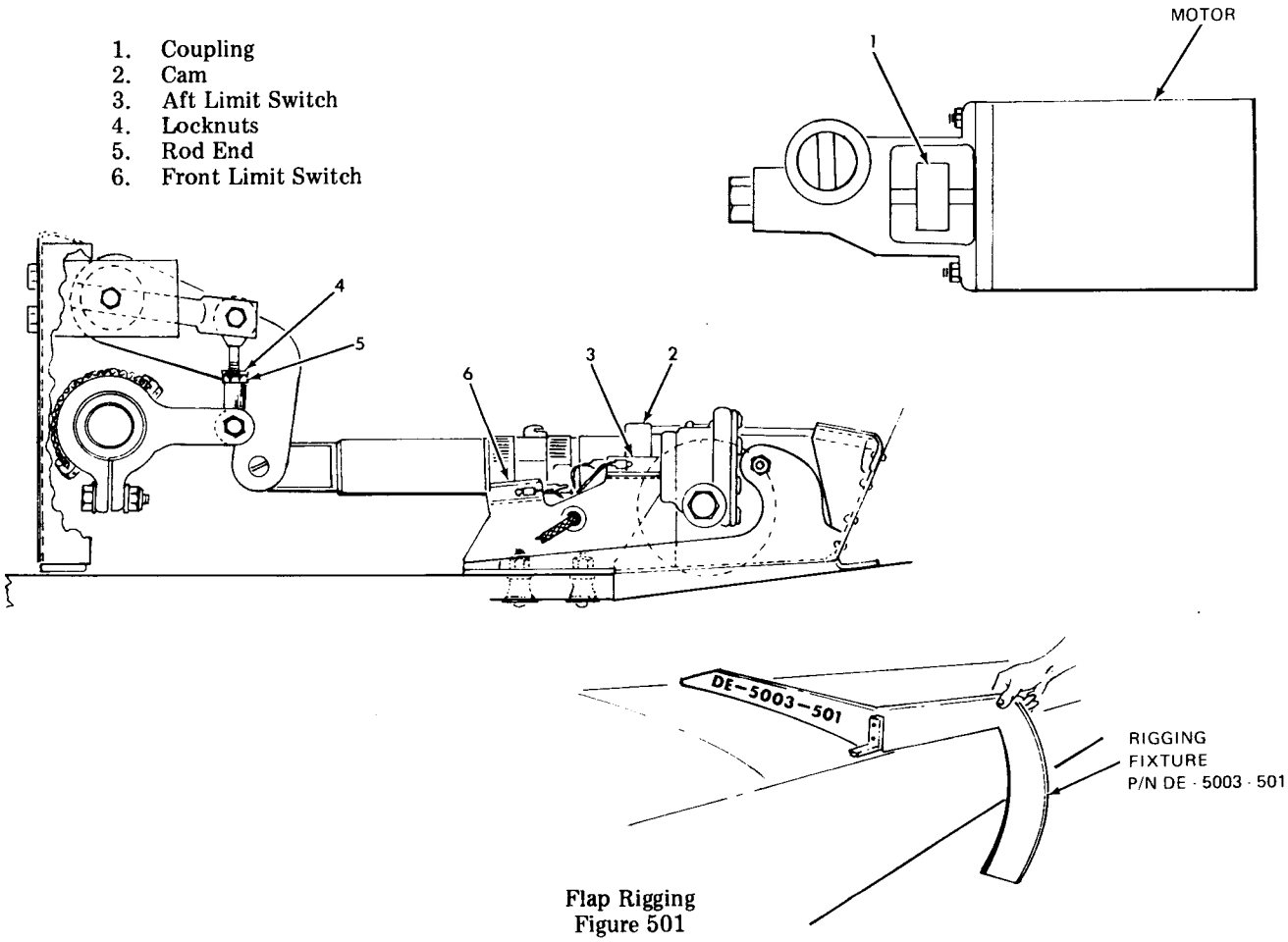
(6) If flap readings are not as given in Step (5), loosen locknuts (4) and adjust rod ends (5) to provide proper flap position. Tighten locknuts (4) when proper flap position is obtained.

(7) Check flap position indicator in forward console for correct alignment. If adjustment is required, loosen the setscrew in the indicator and position as required.

(8) With power on, cycle the flaps to the full down position, then back up until stopped by the aft limit switch (3). Check the flap position as in Steps (5) and (6) above. Hold the flap switch in the DOWN position until the flaps are stopped by the forward limit switch (6). With the flaps held up to remove slack (See NOTE above.), the flap rigging fixture should indicate 45 degrees ± 2 degrees. Adjust forward limit switch (6) as required to obtain this condition.

(9) Move cam (2) past front limit switch (6) by turning rubber coupling (1) until end stop in jackscrew is reached. Check for positive clearance between flap actuation parts and aileron torque tubes.

(10) Install trim per Chapter 25.



Flap Rigging
Figure 501

MAINTENANCE PRACTICES - CLEANING/PAINTING

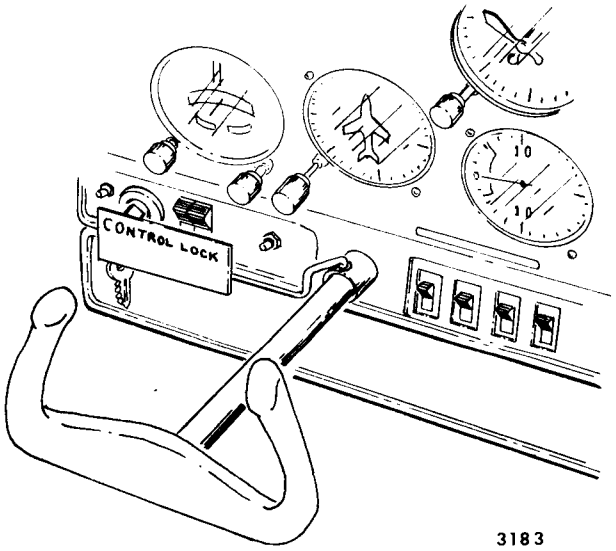
1. Cleaning/Painting

Refer to Chapter 20 for proper cleaning and painting procedures.

GUST LOCK - DESCRIPTION/OPERATION

1. General (See Figure 1.)

The gust lock is composed of a formed metal rod attached to a placard tab. The lock is installed by positioning the control wheel until the hole in its shaft is aligned with the hole in its guide, and inserting the gust lock pin.



Gust Lock
Figure 1

STALL WARNING SYSTEM — DESCRIPTION/OPERATION

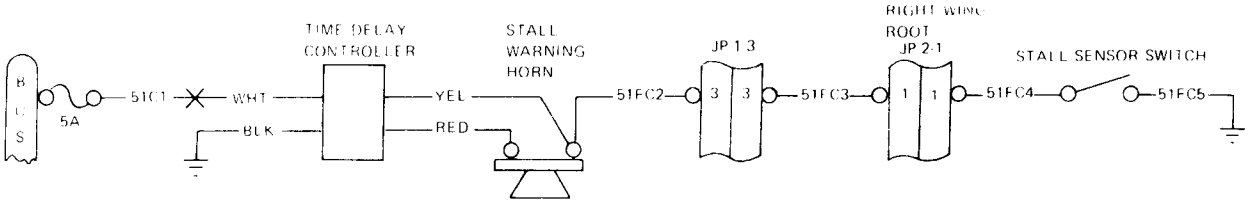
1. General (See Figure 1.)

The stall warning system is an electrically operated aural warning that informs the pilot of an impending stall at approximately 4 to 9 knots (5 to 10 mph) prior to stall. This system is composed of a stall sensor switch, wiring, and a stall warning horn. On Aircraft AA5-0001 through 0834, AA5A-0001 through 0054, and AA5B-0001 through 0181, a time delay controller is installed. The controller introduces a time delay of approximately one second to prevent the stall warning system from being momentarily activated by turbulence.

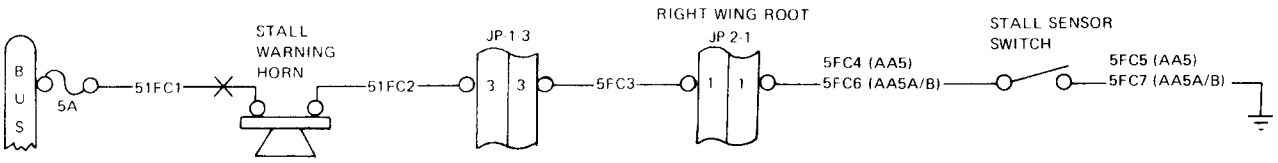
DC power from the aircraft bus is applied through a 5-amp fuse to the stall warning system. On Aircraft AA5A-0055 and subsequent, and AA5B-0182 and subsequent, the DC power is applied directly to one side of the stall warning horn. The other side of this horn is connected to the normally-open stall sensor switch. When the aircraft approaches to within 4 to 9 knots (5 to 10 mph) of its stalling speed, the stall sensor switch closes, completing the ground to the stall warning horn. The horn then sounds as long as the switch remains closed.

On Aircraft AA5-0001 through 0834, AA5A-0001 through 0054, and AA5B-0001 through 0181, input power is applied to the time delay controller. This controller is connected to the stall warning horn, one side of which is connected to the stall sensor switch. When the stall sensor switch is closed (due to impending stall) the time delay controller circuit is activated. After a delay of approximately one second, an electronic switch in this circuit applies DC voltage to the stall warning horn through its red lead. Since the yellow lead of the stall warning horn is grounded, the horn sounds as long as the stall sensor switch remains closed. When the stall sensor switch opens, the electronic switch in the time delay controller resets so that a one-second delay is again introduced when the stall sensor switch is closed.

The stall sensor switch is mounted on the leading edge of the right wing. The stall warning horn is mounted on a bracket beneath the left side of the instrument panel. On Aircraft AA5-0001 through 0834, AA5A-0001 through 0054 and AA5B-0001 through 0181, the time delay controller is mounted adjacent to the stall warning horn.

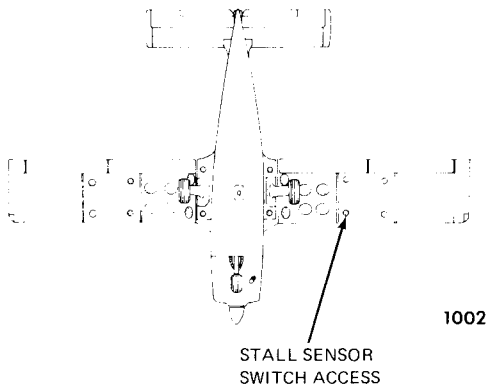


AA5-0001 THROUGH 0834
AA5A-0001 THROUGH 0054
AA5B-0001 THROUGH 0181



AA5-0835 AND SUBSEQUENT
AA5A-0055 AND SUBSEQUENT
AA5B-0182 AND SUBSEQUENT

3151



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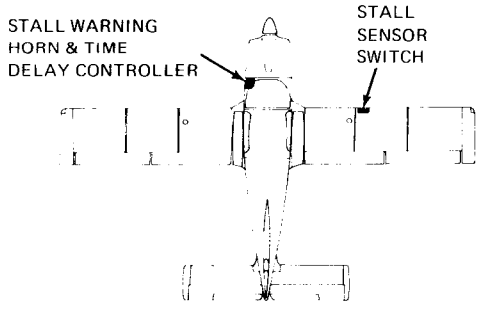


1001

Stall Warning System
Figure 1

STALL WARNING SYSTEM — TROUBLESHOOTING

1. Troubleshooting Stall Warning System (Aircraft AA5-0001 through 0834, AA5A-0001 through 0054, and AA5B-0001 through 0181) (See Figures 1 and 401.)

TROUBLE	PROBABLE CAUSE	REMEDY
Horn fails to sound when sensor switch is closed.	Set MASTER switch to ON. Check fuse.	Replace if defective.
	Check that black lead of time delay controller is grounded.	Establish proper ground.
	Check that yellow lead of time delay controller is grounded when stall sensor switch is closed.	Check wiring and switch. Repair or replace if defective.
	Check that 12V is present on red lead of time delay controller within 1 second after stall sensor switch is closed.	If 12V is present, replace stall warning horn. If 12V is not present, replace time delay controller.
Horn remains on when sensor switch is open.	Disconnect the stall switch sensor.	If horn stops, replace sensor. If not, reconnect sensor.
	Check that yellow lead of time delay controller is not grounded.	If not, repair wiring between controller and switch. If yes, replace time delay controller.

2. Troubleshooting Stall Warning System (Aircraft AA5A-0055 and subsequent, and AA5B-0182 and subsequent) (See Figures 1 and 401.)

TROUBLE	PROBABLE CAUSE	REMEDY
Horn fails to sound when sensor switch is closed.	Set MASTER switch to ON. Check fuse.	Replace if defective.
	Check that pin 3 of JP-1-3 is grounded when stall sensor switch is closed.	If not, repair wiring or replace switch. If grounded, replace stall warning horn.

MAINTENANCE PRACTICES – REMOVAL/INSTALLATION

1. Stall Sensor Switch Removal/Installation

   A. Stall Sensor Switch Removal (See Figure 401.)

      (1) Remove access cover (1) from bottom of wing.

      (2) Remove screws (2) securing sensor switch (3) to wing (4).

      (3) Tag and disconnect wires (5) and remove sensor switch (3) from inside of wing (4).

      (4) Ensure that insulating strip (6) is not damaged.

   B. Stall Sensor Switch Installation (See Figure 401.)

      (1) Check that insulation strip (6) is in position beneath switch mounting location.

      (2) Connect wires (5) to sensor switch (3).

      (3) Position sensor switch (3) inside wing (4) and secure with screws (2).

      (4) Adjust sensor switch per Adjustment/Test, Paragraph 1.

      (5) Install access cover (1).

2. Stall Warning Horn Removal/Installation

   A. Stall Warning Horn Removal (See Figure 401.)

      (1) Tag wires (7).

      (2) Remove nuts (8), washers (9), and wires (7) from stall warning horn connection studs (10).

      (3) Remove washers (11), nuts (12), and washers (13 and 14) from studs (10).

      (4) Remove stall warning horn (15) from mounting bracket (16).

   B. Stall Warning Horn Installation (See Figure 401.)

      (1) Position stall warning horn (15) so that its mounting studs (10) align with holes in mounting bracket (16), and so that adjustment screw (17) aligns with access holes in mounting bracket.

      (2) Place washers (14), washers (13), and nuts (12) on studs (10).

      (3) Tighten nuts (12) per Chapter 91.

      (4) Place washers (11), wires (7), washers (9), and nuts (8) on studs (10). Tighten per Chapter 91.

3. Time Delay Controller Removal/Installation

   A. Time Delay Controller Removal (Aircraft AA5-0001 through 0834, AA5A-0001 through 0054, and AA5B-0001 through 0181). (See Figure 401.)

      (1) Tag wires (18).

      (2) Remove screws (19).

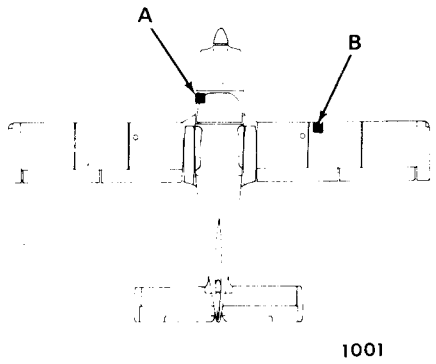
      (3) Disconnect wires (18) and remove controller (20) from airplane.

   B. Time Delay Controller Installation (Aircraft AA5-0001 through 0834, AA5A-0001 through 0054, and AA5B-0001 through 0181). (See Figure 401.)

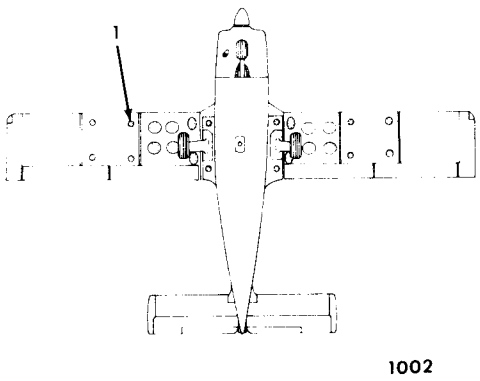
      (1) Connect wires (18).

      (2) Position controller (20) so that its holes align with mounting holes.

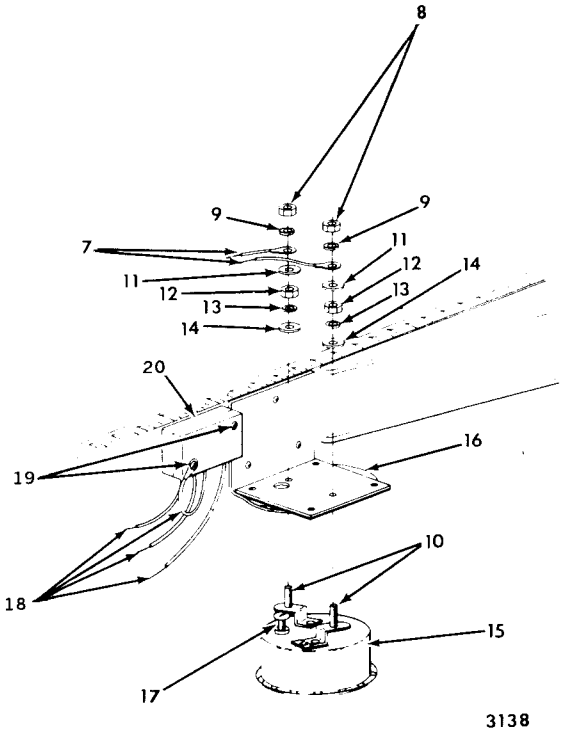
      (3) Secure with screws (19).



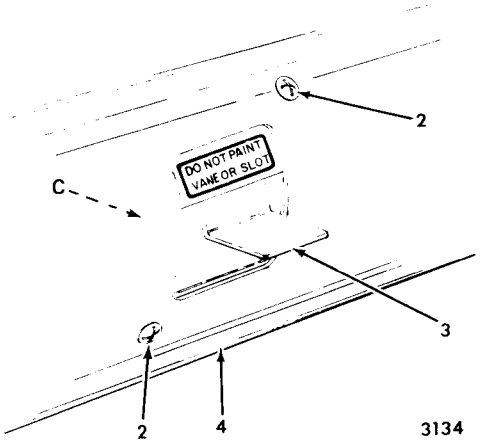
AIRCRAFT TOP VIEW



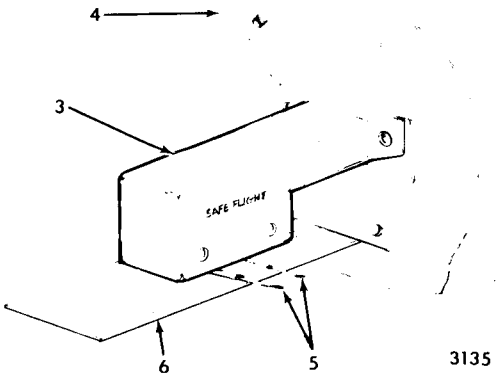
AIRCRAFT BOTTOM VIEW



DETAIL A



DETAIL B



DETAIL C

1. Access Cover
2. Screws
3. Sensor Switch
4. Wing
5. Wires
6. Insulating Strip
7. Wires
8. Nuts
9. Washers
10. Studs
11. Washers
12. Nuts
13. Washers
14. Washers
15. Stall Warning Horn
16. Bracket
17. Adjustment Screw
18. Wires
19. Screws
20. Controller

Stall Warning System — Removal/Installation
Figure 401

MAINTENANCE PRACTICES — ADJUSTMENT/TEST

1. Stall Sensor Switch Adjustment/Operational Check

A. Stall Sensor Switch Adjustment (See Figure 501.)

NOTE: Adjustment of the stall sensor switch requires flight testing the airplane.

(1) Install stall sensor switch per Removal/Installation, Paragraph 1B.

(2) Flight test aircraft, noting speed at which stall warning system sounds, and speed at which stall occurs. Stall warning horn shall sound 4 to 9 knots (5 to 10 mph) prior to stall.

(3) If stall warning occurs at incorrect speed, adjust switch as follows:

(a) Remove stall sensor switch access panel (1, Figure 401).

(b) Loosen screws (2) securing sensor switch.

(c) Reposition switch slightly, downward to decrease speed at which horn sounds, or upward to increase speed.

(d) Tighten screws (2) and replace access panel (1).

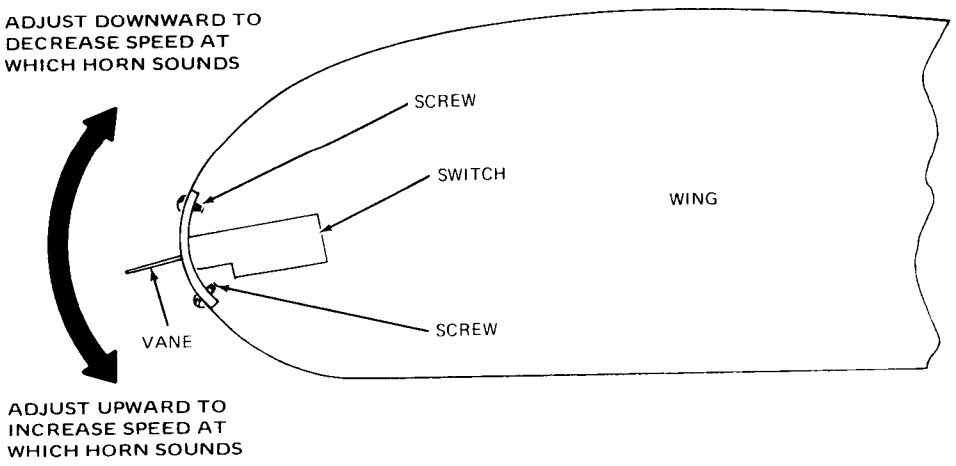
(e) Repeat Step C as necessary to obtain proper stall warning.

B. Stall Warning System Operational Check

(1) Set MASTER switch to ON.

(2) Lift vane on stall sensor switch. Stall warning horn shall sound within two seconds.

(3) Release vane and set MASTER switch to OFF.



Stall Sensor Switch Adjustment
Figure 501