

SECTION 5

CONTROL COLUMN, AILERON AND TRIM CONTROL SYSTEMS

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CAUTION

Primary and secondary flight control cables, push pull tubes, bellcranks and mountings on late model aircraft use dual locking fasteners. The lock nuts for these fasteners incorporate a fiber lock, and are castellated for safetying with a cotter pin. When any of these areas are disconnected on any aircraft, new dual locking fasteners should be installed. See the Aircraft Parts Catalog for part numbers and location of these fasteners.

CONTROL COLUMN

The control column "Y" assembly internally houses the forward aileron control system cables, chains and sprockets. Externally attached to the control column "Y" assembly, is the elevator forward push-pull tube and bob-weight assemblies. The pilot's and copilot's (optional) control wheels are attached to individual tubes which extend through the instrument panel and connect to a universal joint on the control column "Y" assembly.

Removal of Control Column Assembly. (See figure 5-1.)

- a. Refer to Section 3, remove the following items in accordance with removal procedures:
 1. Front and rear seats (middle individual optional).
 2. Bulkhead, pilot's floor and center carpets.
 3. Boot, retainer and cover from lower control column.

- b. Refer to Section 12, remove shock-mounted instrument panel in accordance with removal procedures.
- c. Drill out rivets and remove upper and lower instrument panel braces on RH side only.
- d. Remove access covers just forward of rear spar and just aft of nose wheel well on underside of fuselage.
- e. (See figure 5-3.) Remove safety wire and loosen turnbuckles on aileron cables (17) to relieve tension on aileron control system.
- f. Refer to Section 6, disconnect bob-weight assembly and push-pull tube from control column assembly.
- g. Remove control wheels (1) from control column assembly by removing nuts, bushings and bolts attaching control tube (2) to universal joint (5).

NOTE

If automatic pilot is installed, disconnect electrical wires from control tube assembly at the quick-disconnects.

- h. Disconnect chain assembly (26) from aileron control cables (37) by removing cotter pins and clevis pins.
- i. Remove nut, washer, spacers and bolt attaching control column assembly to fuselage structure.
- j. Carefully work control column assembly from beneath RH side of stationary instrument panel.

Disassembly of Control Column Assembly. (See figure 5-1.)

- a. On lower control column assembly, remove spacers, washers, bearings and sprockets by removing attaching nut, washer and bolt.
- b. Disengage chain assembly (26) from sprocket assembly and remove chain assembly from control column assembly.
- c. Remove triple sprocket assembly from control column assembly by removing nut, washers and bolt.
- d. Disconnect chain assembly (21) by removing turnbuckle (22) and routing chain assembly over sprockets.
- e. Remove cotter pin (15) and nut (16) from shaft (13).
- f. Remove nuts (17) from bolts (6 and 12) and remove bolts from adapter (7) and sprocket (11).
- g. Remove shaft (13), bearing (8), adapter (7) and universal joint (5) from control column assembly.

NOTE

Safety wire shaft (13), adapter (7) and universal joint (5) to each other so that they may be retained together as a matched set.

- h. Refer to figure 5-1 for further disassembly of control column components, as necessary.

Assembly of Control Column. (See figure 5-1.)

- a. Place control column assembly in a suitable padded fixture (such as a vise) facing bob-weight bracket away from the assembler.

NOTE

The following procedure is given for aircraft with dual control wheels installed; single control wheel aircraft need only install upper LH chain (21) and lower chain assembly (26).

- b. Install washer (38) and triple sprocket assembly (23) inside control column assembly using a long, thin bolt or heavy gauge wire to support components temporarily.
- c. If disassembled, assemble the long (twenty link) chains and the short (fourteen link) chains into chain assemblies (21) using attaching turnbuckles (22). Observe that the terminal ends are equal in length after turnbuckles are installed.

NOTE

If the assembly of long and short chains into chain assembly (21) was correct, the index link (red) on the long chain should be nine links from the now open end of the chain assembly (21) with all bolt heads facing in the same direction.

- d. Attach guide wires to each end of chain assembly (21) and route the long chain under the center sprocket on triple sprocket assembly (23) to LH leg of control column assembly.
- e. Assemble into LH leg of control column the following components:
 1. Insert sprocket shaft (13) into universal joint (5) and secure with roll pin (18).
 2. Place adapter (7) over universal joint (5) and sprocket shaft (13).

NOTE

Adapter (7), universal joint (5) and sprocket shaft (13) are drilled as a matched set and cannot be interchanged with other like components.

3. Place bearing (8) over adapter (7) and position adapter, universal joint, sprocket shaft, and sprocket (11) into LH leg of control column assembly with universal joint facing aft.

NOTE

Install sprocket (11) with collar of sprocket facing away from adapter (7).

4. Align holes and install long bolt (6) through adapter (7) and sprocket shaft (13); secure with nut.
5. Align holes and install short bolt (12) through sprocket (11) and sprocket shaft (13); secure with nut.
6. Place bearing (8) on sprocket shaft (13); secure sprocket shaft to control column assembly with washers, nut and cotter pin.
- f. Route the short chain of chain assembly (21) over the top of upper sprocket (11) and align index mark (red) on sprocket with index link (red) on chain.
- g. Secure chain assembly (21) together with turnbuckle and tighten just enough to take up slack. Observe that the terminals on chain are equal in length after turnbuckles are installed.
- h. Assemble and install components in leg of RH control column assembly as described in steps "e" through "g", except position collar on sprocket (11) butted against adapter (7).
- i. Install lower chain and cable assembly (26) on aft sprocket of triple sprocket assembly (23) and align index mark (red) on chain link with index mark (red) tooth of sprocket.
- j. Replace temporary bolt or heavy gauge wire which was used to support triple sprocket (23) during assembly with attaching bolt (20), washer and nut.

NOTE

Care should be taken to insure that the washer between triple sprocket assembly and wall of control column "Y" remains in place when attaching bolt is installed.

k. Using a bolt or pin as a rigging pin, insert through tube assembly attachment holes in universal joints (5) and tighten turnbuckles (22) on upper chain assemblies (21) until bolts or pins are parallel with

vertical leg of control column "Y".

NOTE

After rigging upper chain assemblies (21), safety wire last link on lower chain assemblies (26) to control column "Y", thus preventing chain assemblies from accidentally moving off index tooth on sprocket during installation of control column "Y" in aircraft.

1. Insert bolt through lower control column "Y" tab and assemble component parts as shown in figure 5-1; secure with washer and nut.

Installation of Control Column Assembly. (See figure 5-1.)

- a. Carefully work control column assembly into position from the RH side of instrument panel.
- b. Secure control column assembly to fuselage structure with attaching bolt, spacers, washers and nut.
- c. Connect chain assembly (26) to aileron control cables (37) with attaching clevis pins and cotter pins.
- d. Install control wheel (1) and control tube (2) on control column assembly with attaching bolts, bushings and nuts.

NOTE

If automatic pilot is installed, connect electrical wires to control tube assembly with quick-disconnects.

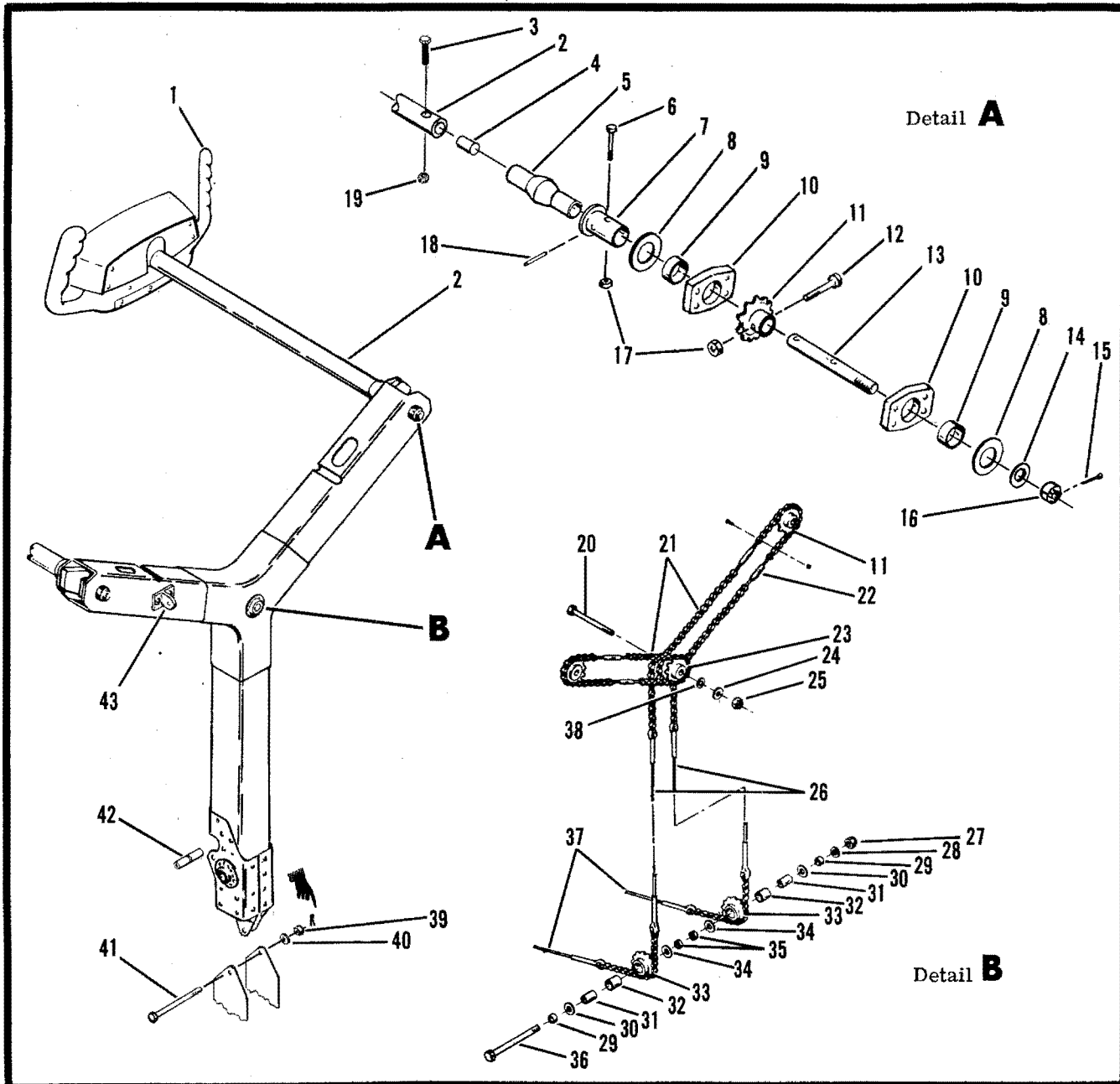
- e. Refer to Section 6, connect bob-weight assembly and push-pull tube to bracket on RH leg of control column assembly.
- f. Install upper and lower instrument panel braces using rivets.
- g. Refer to Section 12, and install shock-mounted instrument panel in accordance with installation procedures.
- h. Rig aileron control cables in accordance with rigging tolerances and safety turnbuckles.
- i. Replace access covers.
- j. Refer to Section 3 and install the following items:
 1. Control column assembly boot, retainer and cover.
 2. Center, pilot's floor and bulkhead carpets.
 3. Front and rear seats (middle individual optional).

AILERON CONTROL SYSTEM

The aileron control system is interconnected through a series of cables, chains, turnbuckles, push-pull rods, bellcranks and quadrants. This system, as described herein, extends from the cable to chain connections at the lower end of the control column to terminal point at the aileron itself.

Troubleshooting Aileron Control System.

TROUBLE	PROBABLE CAUSE	CORRECTION
LOST MOTION BETWEEN CONTROL WHEEL AND AILERON	Cable tension too low.	Adjust cable tension in accordance with aileron rigging procedures.
	Chain tension too low in control column assembly.	Adjust chain tension in accordance with assembly of control column.
	Broken pulley.	Replace pulley.
	Cables not in place on pulleys or quadrants.	Install cables correctly. Check cable guards.
RESISTANCE TO CONTROL WHEEL ROTATION	Cable tension too high.	Adjust cable tension in accordance with aileron rigging procedures.
	Pulleys binding or rubbing.	Replace binding pulleys. Provide clearance if rubbing pulley brackets or cable guards.
	Chain tension too high in control column assembly.	Adjust chain tension in accordance with assembly of control column.
	Cables not in place on pulleys or quadrants.	Install cables correctly.
	Bent aileron.	Repair or replace aileron.
CONTROL WHEELS NOT SYNCHRONIZED	Unequal tensions on control column upper chain assemblies.	Adjust chain tensions in accordance with assembly of control column.
	Chain not indexed on sprockets properly.	Re-index chains and adjust chain tensions in accordance with assembly of control column.



- | | | |
|----------------------|------------------------------|------------------------------|
| 1. Control Wheel | 16. Nut | 30. Washer |
| 2. Tube Assembly | 17. Nut | 31. Race Bearing |
| 3. Bolt | 18. Roll Pin | 32. Bearing |
| 4. Bushing | 19. Nut | 33. Sprocket (Lower) |
| 5. Universal Joint | 20. Bolt | 34. Washer |
| 6. Bolt (Long) | 21. Chain Assembly (Upper) | 35. Spacer |
| 7. Adapter | 22. Turnbuckle | 36. Bolt |
| 8. Bearing | 23. Triple Sprocket Assembly | 37. Cable Assembly (Aileron) |
| 9. Bearing | 24. Washer | 38. Washer |
| 10. Bearing Block | 25. Nut | 39. Nut |
| 11. Sprocket (Upper) | 26. Chain Assembly (Lower) | 40. Washer |
| 12. Bolt (Short) | 27. Nut | 41. Bolt |
| 13. Sprocket Shaft | 28. Washer | 42. Spacer |
| 14. Washer | 29. Spacer (Thick) | 43. Bob-Weight Bracket |
| 15. Cotter Pin | | |

Figure 5-1. Control Column

TROUBLE	PROBABLE CAUSE	CORRECTION
CONTROL WHEELS NOT HORIZONTAL WHEN AILERONS ARE NEUTRAL	Incorrect aileron system rigging.	Rig in accordance with aileron rigging procedures.
	Lower chain assembly not indexed on triple sprocket properly.	Re-index lower chain on triple sprocket in accordance with assembly of control column.
INCORRECT AILERON TRAVEL	Aileron quadrant stops incorrectly adjusted.	Adjust in accordance with aileron rigging procedures.
CORRECT AILERON TRAVEL CANNOT BE OBTAINED BY ADJUSTING QUADRANT STOPS	Incorrect rigging of quadrant cables, compensated for by incorrect adjustment of push-pull rods.	Rig in accordance with aileron rigging procedures.
	Incorrect rigging of aileron bellcranks.	Rig in accordance with aileron rigging procedures.

Removal of Aileron. (See figure 5-2.)

- a. If the left aileron is being removed, move aileron trim tab to the extreme UP position and remove cotter pin, nut, bolt, and spacer from aileron trim tab push-pull tube (6).
- b. Lower flap and disconnect aileron push-pull rod (10) by removing attaching bolt.
- c. Disconnect bonding strap from aileron by removing screw and washer.
- d. Remove aileron from wing by removing attaching bolts.

NOTE

If left aileron is being removed, carefully guide aileron trim tab push-pull tube (6) through opening on aileron during removal.

Installation of Aileron. (See figure 5-2.)

- a. Install aileron by reversing removal procedures.

NOTE

When installing the left aileron, guide aileron trim tab push-pull tube (6) through opening in aileron.

- b. Check aileron and trim tab for proper operation and correct travel. If necessary, rig in accordance with aileron control system rigging procedures.

Removal of Aileron Trim Tab. (See figure 5-2.)

- a. Move aileron trim tab to extreme UP position and remove nut, bolt and spacer disconnecting push-tube from trim tab.
- b. Remove aileron trim tab from aileron by removing cotter pins and attaching hinge pin.

Installation of Aileron Trim Tab. (See figure 5-2.)

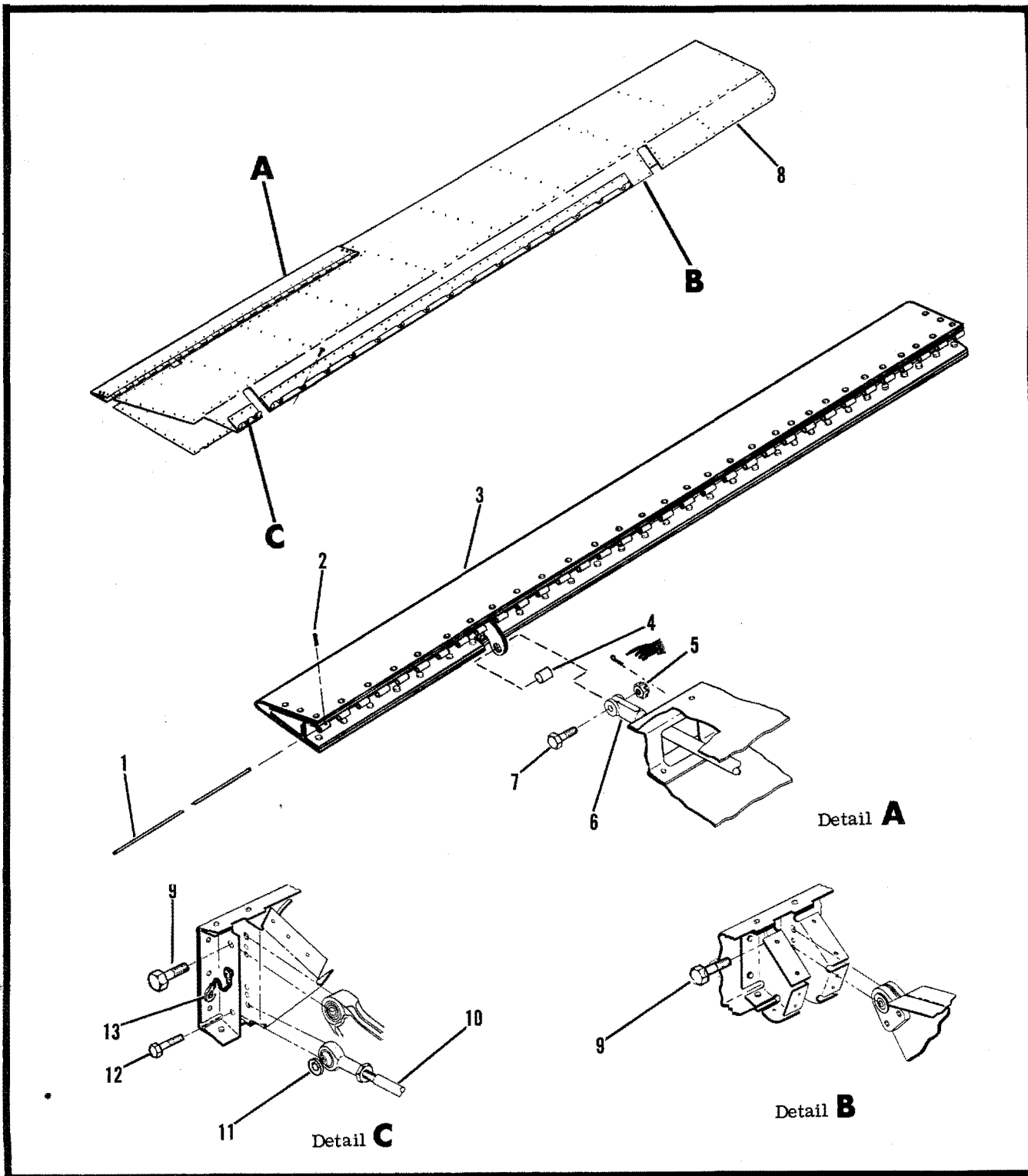
- a. Install aileron trim tab by reversing removal procedures.
- b. Check trim tab for proper operation.

Removal of Aileron Control Cables. (See figure 5-3.)

NOTE

The following procedure is for removing the aileron cables with turnbuckles attached to the cables and pulley cable guard cotter pins removed. If desired, turnbuckle barrels may be unscrewed to leave the turnbuckle forks attached to the fuselage bellcrank.

- a. Refer to Section 3 and remove the following items from the aircraft:
 1. Front seats and rear reclining seat; or middle individual and aft fifth-sixth seats (optional equipment).
 2. Front, center and rear carpets.
 3. Rear upholstery panel if autopilot (optional equipment) is installed.
- b. Remove boot, retainer and cover from lower control column.
- c. Refer to Section 1 and remove floorboard and access covers, access panel located on rear spar adjacent to aft wheel well, lower aft wing root fillets, and aileron quadrant access cover.
- d. Remove safety wire and disconnect turnbuckle (2) to right- and left-hand return cables (1).
- e. Remove cable guard cotter pin on fuselage return cable pulley.
- f. Relieve tension on aileron direct cables (15 and 17) by loosening turnbuckles at the fuselage bellcrank (16).
- g. At the fuselage bellcrank (16), disconnect aileron direct cables (15 and 17) by removing attaching cotter pins, nuts and bolts.
- h. Disconnect aileron cables (17) from lower control column chain (18) by removing attaching cotter pins, washers and clevis pins.



- 1. Hinge Pin
- 2. Cotter Pin
- 3. Aileron Trim Tab
- 4. Spacer

- 5. Nut
- 6. Aileron Trim Tab Push-Pull Tube
- 7. Bolt
- 8. Aileron
- 9. Bolt

- 10. Aileron Push-Pull Rod
- 11. Washer
- 12. Bolt
- 13. Bonding Strap

Figure 5-2. Aileron and Aileron Trim Tab Installation

- i. If an autopilot (optional equipment) is installed, disconnect autopilot cables from aileron direct cables (15) by removing attaching cable clamps.
- j. Remove aileron pulley (outboard of aileron quadrant) by removing cable guard pins, attaching bolt and washer.
- k. Disconnect aileron push-pull tube (8) from aileron quadrant (14) by removing cotter pin, nut, washer and bolt.
- l. Remove two sets of pulleys aft of the wheel well and one set in each wing root by removing cable guard cotter pins and attaching nuts and bolts.

NOTE

When removing control cables, tie safety wire to ends of cables before removal.

- m. Remove bolt and washer attaching aileron quadrant (14) to wing structure.
- n. With aileron return and direct cables (1 and 15) attached to aileron quadrant, remove quadrant and cables from wing using aileron quadrant access hole.
- o. Route fuselage direct cables (17) aft to bellcrank (16) and remove from aircraft.

NOTE

Leave guide wires in wing and fuselage to facilitate installation.

Installation of Aileron Control Cables. (See figure 5-3.)

- a. Secure aileron cables (17) to guide wires and route cable from bellcrank (16) to lower control column chain (18).
- b. Remove guide wires from cables.
- c. Secure aileron cables (17) to chain (18) with attaching clevis, cotter pin, and install pulleys.

NOTE

Insure that fuselage direct cables (17) are not crossed and routed on the underneath side of pulley.

- d. Secure aileron cable (17) to bellcrank (16) with attaching bolt, nut and cotter pin.
- e. Install cable guard cotter pin on fuselage pulleys.
- f. Secure aileron cables (1 and 15) to guide wires and route cables and quadrant into position.
- g. Remove guide wire from cables.
- h. Install quadrant (14) in wing and secure with washer and bolt.

CAUTION

Be sure bushing (11) is installed with quadrant or serious binding will occur during rigging.

- i. Install two sets of pulleys on pulley brackets aft of the wheel well and secure with attaching bolts and nuts.

- j. Install one set of pulleys on lower aft wing root pulley brackets and secure with attaching bolt and nuts.

- k. Position aileron direct cables (15) on lower pulleys and aileron return cables (1) on upper pulleys and install cable guard cotter pins.

NOTE

Aileron cables (1 and 15) must be routed on aft side wing pulleys.

- l. Secure aileron cables (1 and 15) to fuselage bellcrank with attaching bolts, nuts and cotter pins.

CAUTION

Insure that aileron cables are in place on aileron quadrants and pulleys in both wings before rigging tension on aileron system. Wing structure can be damaged by the aileron cables if tension is rigged on the cables while not properly in place on aileron quadrants or pulleys.

- m. If an autopilot (optional equipment) is installed, attach to the aileron cables and rig in accordance with rigging procedures.

- n. Install lower aft wing root fillets, fuselage floorboard access covers, aft underside wing access covers, and quadrant access cover.

- o. Install boot, retainer and cover on lower control column.

- p. Refer to Section 3 and install the following items:
 1. Rear upholstery panel, if autopilot (optional equipment) is installed.
 2. Front, center and rear carpets.
 3. Front seats and rear reclining seat, or middle individual and aft fifth and sixth seats (optional equipment).

Removal of Aileron Quadrant. (See figure 5-3.)

- a. Refer to Section 3 and remove the following items:
 1. Rear reclining seat or middle, fifth and sixth seats (optional equipment).
 2. Rear carpet.
 3. Rear upholstery panel, if autopilot (optional equipment) is installed.

- b. Refer to Section 1 and remove aft floorboard access covers and wing access cover above quadrant.
- c. If autopilot (optional equipment) is installed, disconnect autopilot cables from aileron cables.
- d. Remove safety wire from turnbuckles (2) on cables (1 and 15) and disconnect cables at bellcrank.
- e. Remove aileron pulley outboard of aileron quadrant by removing cable guard pins, attaching bolt and washer.

- f. Attach safety wires to cables (1 and 15) to be used as guides on installation.
- g. Disconnect aileron push-pull tube (8) from aileron quadrant (14) by removing attaching cotter pin, nut, washer and bolt.
- h. Remove bolt and washer attaching aileron quadrant (14) to wing structure.

- i. Attach safety wires to cables (1 and 15) to be used as guides on installation.
- g. Disconnect aileron push-pull tube (8) from aileron quadrant (14) by removing attaching cotter pin, nut, washer and bolt.
- h. Remove bolt and washer attaching aileron quadrant (14) to wing structure.

- h. Remove bolt and washer attaching aileron quadrant (14) to wing structure.

i. Remove aileron quadrant (14) from wing by working quadrant and cables through wing access hole.

NOTE

To prevent routing cables (1 and 15) through entire wing, disconnect cable ends from quadrant as near to the wing access hole as working room will permit. Care also should be taken to prevent bushing (11) from falling during removal.

j. Disconnect aileron cables from quadrant by removing cotter pins, cable guard, nut, washer and bolt.

Installation of Aileron Quadrant. (See figure 5-3.)

a. Place aileron quadrant (14) near aft wing access hole and connect aileron cables (1 and 15) to quadrant using attaching bolt, washer and nut; secure cables in position with cable guard and cotter pins.

NOTE

Position return cable (1) on bottom groove of quadrant and direct cable (15) on upper groove of quadrant.

b. Install quadrant (14) in wing and secure with washer, bolt, and safety wire to pulley bracket.

CAUTION

Be sure bushing (11) is reinstalled with quadrant or serious binding will occur during rigging.

c. Connect aileron push-pull tube (8) to quadrant with attaching bolt, washer, nut and cotter pin.

d. Install pulley (outboard of aileron quadrant) with attaching bolt, washer and cable guard cotter pin.

e. Route aileron cable (15) to bellcrank (16), connect cable to turnbuckle fork with turnbuckle.

f. Route return cable (1) to center fuselage and connect with turnbuckle.

g. Rig aileron control system in accordance with rigging procedures.

CAUTION

Insure that aileron cables are in place on aileron quadrants and pulleys in both wings before rigging tension on aileron system. Wing structure can be damaged by the aileron cables if tension is rigged on the cables while not properly in place on aileron quadrants or pulleys.

h. If autopilot (optional equipment) is installed, connect autopilot cables to aileron cables with attaching clamps.

i. Install wing access covers and floorboard access covers.

j. Install removed carpets and seats.

Removal of Aileron Bellcrank. (See figure 5-3.)

a. Refer to Section 3. Remove rear seats and carpets.

b. Remove floorboard access cover just in front of rear spar.

c. Remove safety wire from turnbuckle (2) and loosen tension on aileron return cable (1).

d. Disconnect aileron direct cables (15 and 17) from bellcrank (16) by removing cotter pins, nuts and bolts.

e. Remove bellcrank (16) by removing attaching bolts.

Installation of Aileron Bellcrank. (See figure 5-3.)

a. Reverse removal procedures and rig in accordance with rigging procedures.

CAUTION

Insure that aileron cables are in place on aileron quadrants and pulleys in both wings before rigging tension on aileron system. Wing structure can be damaged by the aileron cables if tension is rigged on the cables while not properly in place on aileron quadrants or pulleys.

Rigging of Aileron Control System. (See figure 5-3.)

a. Refer to Section 3, and remove rear seats and rear carpet.

b. Remove floorboard access covers forward of rear spar.

c. Remove wing access covers above aileron quadrant.

d. Align control wheels horizontal and tape a straightedge to lower edge of both control wheels to insure alignment during rigging.

NOTE

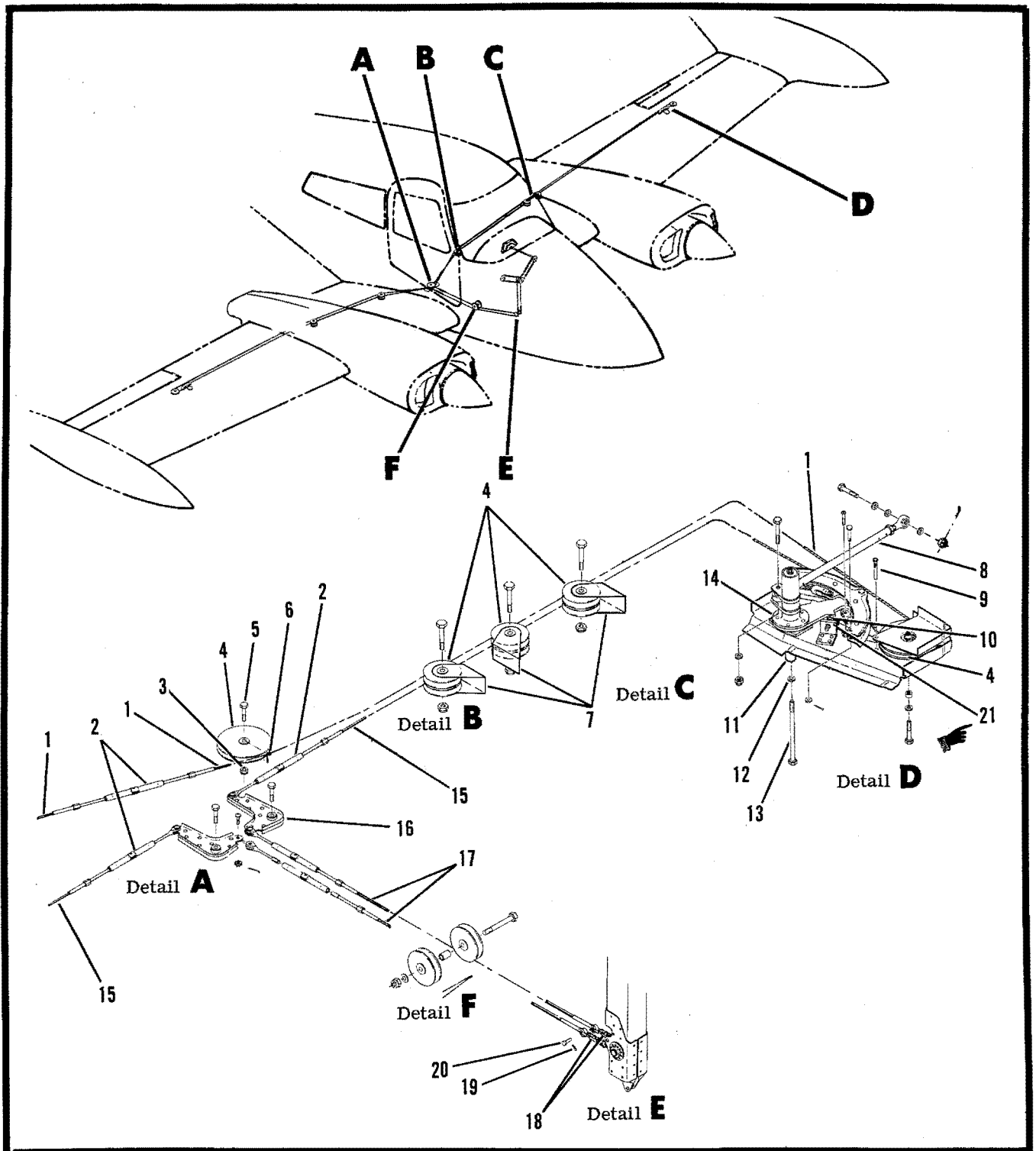
Dual control wheels are optional equipment, if only one control wheel is installed, it must be kept in the horizontal position during rigging.

e. Remove safety wire from all turnbuckles at the fuselage bellcrank.

f. Adjust turnbuckles on aileron cables (15 and 17) so that both halves of bellcrank (16) are aligned in the same relative position in respect to each other.

NOTE

During all aileron rigging adjustments, maintain 25 ±5 pounds tension on both the wing and fuselage forward cables.



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|---------------------------|------------------------|-------------------------------------|
| 1. Aileron Cable | 8. Push-Pull Tube | 15. Aileron Cable (Wing Direct) |
| 2. Turnbuckle | 9. Cable Guard Pin | 16. Bellcrank |
| 3. Nut | 10. Quadrant Stop Bolt | 17. Aileron Cable (Fuselage Direct) |
| 4. Pulley | 11. Bushing | 18. Control Column Chain (Lower) |
| 5. Bolt | 12. Washer | 19. Cotter Pin |
| 6. Cable Guard Cotter Pin | 13. Bolt | 20. Clevis Bolt |
| 7. Pulley Bracket | 14. Aileron Quadrant | 21. Safety Wire |

Figure 5-3. Aileron Control System

g. Adjust turnbuckles connecting wing direct cables (15) to bellcrank and turnbuckle connecting return cables (1) so that the ailerons align with the trailing edges of the wings.

NOTE

If length of aileron push-pull tube (8) has been changed, or new push-pull rods are being installed, adjust rod ends so that push-pull rod is as short as possible, prior to alignment of ailerons with trailing edge of wings.

h. Resafety turnbuckles from which safety wire was removed, and remove straightedge which was taped to control wheels during rigging.

i. Adjust quadrant stop bolts (10) so that aileron travel is 20 +1, -0 degrees up and 20 +1, -0 degrees down. Safety wire stop bolts after adjustment.

WARNING

Insure that ailerons move in the proper direction when operated by the control wheel.

j. Install access covers on wing and in fuselage.
k. Refer to Section 3, and install center carpet and seats.

Troubleshooting Aileron Trim Control System.

TROUBLE	PROBABLE CAUSE	CORRECTION
TRIM CONTROL WHEEL MOVES WITH EXCESSIVE RESISTANCE	Cable tension too high. Defective miter gear assembly. Defective trim tab actuator. Pulleys binding or rubbing. Cables not in place on pulleys during installation. Trim tab hinge binding.	Adjust cable tension in accordance with rigging procedures. Repair or replace miter gear assembly. Repair or replace actuator. Replace binding pulleys. Provide clearance if rubbing pulley brackets or cable guards. Install pulleys correctly. Lubricate hinge. If necessary, replace.
LOST MOTION BETWEEN TRIM CONTROL WHEEL AND TRIM TAB	Cable tension too low. Broken pulley. Cables not in place on pulleys. Excessive backlash on miter gear assembly. Worn trim tab actuator.	Adjust cable tension in accordance with rigging procedures. Replace pulley. Install pulleys correctly. Check cable guards. Repair or replace miter gear assembly. Repair or replace actuator.
TRIM INDICATOR FAILS TO INDICATE CORRECT TRIM POSITION	Indicator incorrectly engaged with wheel track.	Engage in accordance with rigging procedures.
INCORRECT TRIM TAB TRAVEL	Travel stop blocks loose or incorrectly adjusted.	Adjust stop blocks in accordance with rigging procedures.
CORRECT TRAVEL CANNOT BE OBTAINED BY ADJUSTING STOP BLOCKS	Actuator screw incorrectly adjusted.	Adjust in accordance with rigging procedures.

AILERON TRIM CONTROL SYSTEM.

The aileron trim control system is interconnected by chains, cables, sprockets, turnbuckles, miter gears, an actuator, and a push-pull tube. The aileron trim control wheel, mounted on the aft side of the control pedestal, incorporates a track in which the indicator rides.

Removal of Aileron Trim Control Cables and Chains.
(See figure 5-4.)

- a. Refer to Section 3, and remove the following items:
 1. Front seats, middle and rear seats.
 2. Front and rear carpets.
- b. Remove side panels from control pedestal.
- c. Remove floorboard access covers, bottom fuselage access cover aft of nose wheel well, aileron quadrant access cover on left wing, and aft left wing root fillet.
- d. In the fuselage, remove safety wire and disconnect turnbuckle (11) connecting the top cables together.
- e. In the fuselage, remove nut and bolt attaching bottom cable ends (8) together.
- f. Remove four sets of pulleys (6) in wing and two sets of pulleys (6) in fuselage by removing nuts, bolts, and cable guard cotter pins.
- g. Remove chain guard (3) from actuator (2) by removing nuts and screws. Remove chain (4).
- h. Remove stop blocks (7) and bushings (10) by removing nuts and bolts.
- i. Remove cables from wing by pulling out through aileron quadrant access hole in wing.

NOTE

When removing cables, tie safety wire to ends of cables before removal. Leave the wires in the aircraft to facilitate installation.

- j. Remove chain guard (12) by removing attaching screws and washers, and pull fuselage cables (8 and 9) out through access hole.
- k. Remove chain (4) from around sprockets on gear support (15) and trim wheel (22) by disconnecting at master link.

NOTE

If, during removal or installation of chain, the indicator reaches its extreme travel, it can be disengaged from trim control wheel track by inserting a screwdriver beneath indicator and prying out of track. This permits indicator to be moved to a different position or wheel to be turned, before indicator is re-engaged with track.

Installation of Aileron Trim Control Cables and Chains. (See figure 5-4.)

- a. Install chain (4) around sprockets on gear support (15) and trim wheel (22) by connecting chain ends with master link.

- b. Secure fuselage cables (8 and 9) to guide wires and pull aft into position, then remove guide wires.
- c. Rotate trim control wheel to center indicator, engage lower chain with sprocket (13) so that ends of chain are equal in length and install chain guard (12) with screws and washers.
- d. Secure wing cables (8 and 9) to guide wires and route from actuator to fuselage connections, then remove guide wires.
- e. Align aileron with trailing edge of wing; then rotate sprocket on actuator to move trim tab to neutral. Engage chain with sprocket so that ends of chain are equal in length, and install chain guard (3) with attaching screws and nuts.
- f. Install four sets of pulleys (6) in wing and two sets of pulleys in fuselage with bolts and nuts.
- g. Connect fuselage and wing bottom cables (8) with attaching bolt and nut.
- h. Connect fuselage and wing top cables (9) with turnbuckle (11), rig in accordance with rigging procedures, and safety turnbuckle.
- i. Install stop blocks (7) and bushings (10) on cables (8 and 9) between ribs at wing stations 100.5 and 111.5 with bolts and nuts and rig in accordance with rigging procedures.
- j. Check trim tab for proper operation.
- k. Install aft wing root fillet, and access hole covers on underside of fuselage aft of nose wheel well, aft underside of left wing, and cabin floor.
 - l. Install side panels on control pedestal.
- m. Install front and rear carpets in accordance with Section 3.
- n. Install front seats in accordance with Section 3.

Removal of Aileron Trim Tab Actuator. (See figure 5-4.)

- a. Refer to Section 3, remove rear seats and rear carpet in accordance with removal procedures.
- b. Remove floorboard access covers above landing gear actuator and from aileron quadrant access cover on left wing.
- c. Remove safety wire from turnbuckle (11) and disconnect.
- d. Remove left aileron in accordance with removal procedures.
- e. Remove aileron trim tab push-pull tube from actuator (2) by removing attaching nut and bolt.
- f. Remove chain guard (3) from actuator by removing nuts and screws.
- g. Disengage chain from sprocket.
- h. Remove clamp (1) and clamps (5) by removing attaching bolts, screws and nuts.
- i. Remove actuator from wing.

Disassembly, Overhaul and Assembly of Aileron Trim Tab Actuator. (See figure 5-5.)

- a. Disassemble aileron trim tab actuator assembly in accordance with figure 5-5. This view clearly illustrates the proper relationship of all component parts.
- b. Do not remove bearing (4) from screw (5) unless replacement parts are required.

c. Clean all component parts, except bearing (4), by washing in suitable solvent. Do not clean sealed bearing (4).

d. Inspect all component parts for obvious indications of damage such as stripped threads, cracks, deep nicks and dents.

e. Check bearings (6 and 13) and screws (5 and 11) for excessive wear and scoring. Dimension of parts shall be as follows:

Front bearing (13) ID	0.373 in. min.
	0.380 in. max.
Rear bearing (6):	
Small hole ID	0.248 in. min.
	0.253 in. max.
Large hole ID	0.373 in. min.
	0.380 in. max.
Screw (5) OD (shank)	0.242 in. min.
	0.246 in. max.
Screw (11) OD	0.367 in. min.
	0.370 in. max.

NOTE

(See figure 5-5.) Relative linear movement between internal threaded screw (11) and bearing (6) should be 0.004 to 0.010 inches on aileron and elevator trim tab actuator when set at room temperature.

NOTE

Relative linear movement between internal threaded screw (11) and bearing (6) should be 0.008 to 0.012 inch on rudder trim tab actuator when set at room temperature.

- f. Examine screws (5 and 11) for damaged threads or dirt particles that may impair smooth operation.
- g. Check sprocket (14) for broken, chipped, and/or worn teeth.
- h. Check bearing (4) for smoothness of operation.
- i. Do not attempt to repair damaged or worn parts of the actuator assembly. Discard all defective items and install new parts during reassembly.
- j. Always discard the following items and install new parts during reassembly: nuts (16), groov-pins (10 and 12), and O-ring packing (8).
- k. During reassembly, lubricate collars (7) and screw (11) with general purpose lubricating grease.
- l. Reassemble actuator in accordance with the following:
 1. Press sprocket (14) into hollow end of screw (11), making sure pin holes are aligned. Press two new groov-pins (10 and 12) into pin holes.
 2. Slip bearing (13) and collar (7) on screw (11) and slide down against sprocket (14). Install retaining rings (2) in the grooves of screw (11).
 3. Insert screw (11), with assembled parts, into housing (9).

NOTE

Locate sprocket (14) at the end of housing (9) which is farthest from the groove for retaining ring (3).

4. Align pin holes in bearing (13) and housing (9). Press new groov-pin (10) into pin holes.

5. Insert collar (7), new O-ring (8), and bearing (6) into end of housing (9). Align pin holes in bearing and housing and install new groov-pin (10).

6. If new parts are required, press bearing (4) into boss at end of screw (5). Be sure force bears against outer race of bearing. Install screw (5) in housing (9) and screw (11).

7. Install retaining rings (3) in grooves provided on outside of housing (9).

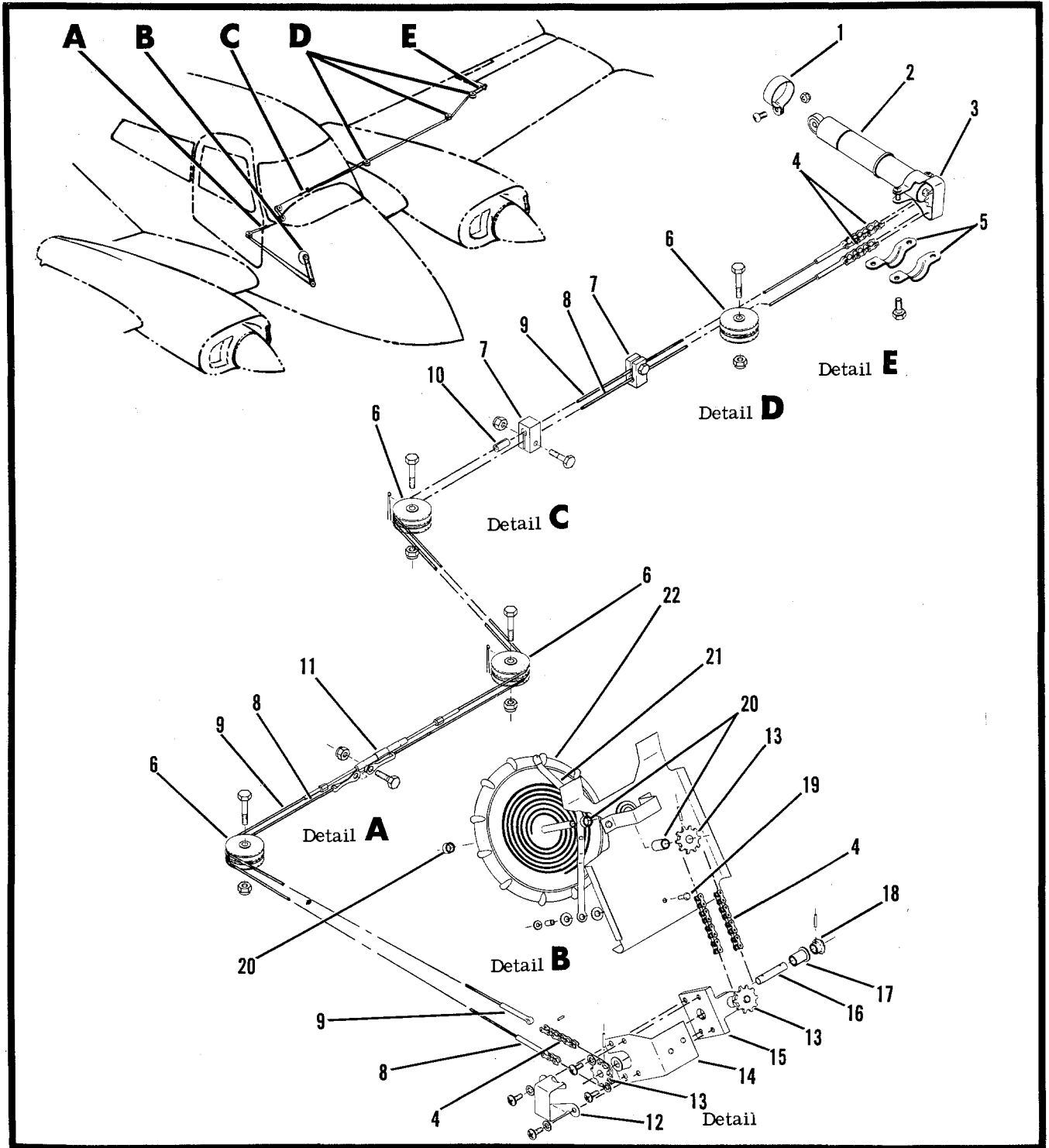
m. Test actuator assembly by rotating sprocket (14) with fingers while holding bearing end of screw (5). Screw (5) should travel in and out of housing (9) smoothly, with no indication of binding.

Installation of Aileron Trim Tab Actuator. (See figure 5-4.)

- a. Place actuator in position, install clamps (5) and clamp (1) with attaching bolt, screws and nuts.
- b. Engage chain on sprocket and install chain guard (3) with attaching screws and nuts.
- c. Connect turnbuckle (11) to fuselage and wing cables (9), tighten cables to 10 ± 3 pounds tension, and safety turnbuckle.
- d. Connect aileron trim push-pull tube to actuator (2) with attaching bolt and nut.
- e. Install left aileron in accordance with installation procedures.
- f. Rotate aileron trim control knob to the neutral position and align aileron with trailing edge of wing.
- g. With trim tab in neutral, adjust actuator screw so that push-pull tube is aligned with hole in trim tab horn; install attaching bolt, spacer and nut.
- h. Check aileron trim tab for proper operation, correct travel and rigging.
- i. Install access covers, carpet and seats.

Removal of Aileron Trim Gear Assembly. (See figure 5-4.)

- a. Refer to Section 3 and remove front seats and left front carpet.
- b. Remove access hole covers from forward cabin floor, aft cabin floor above the landing gear actuator, and underside of fuselage just aft of the nose wheel well.
- c. Remove safety wire from turnbuckle (11) and disconnect.
- d. Remove chain guard (12) by removing two screws and washers, and disengage chain from sprocket (13).
- e. Remove sprocket (13) from shaft by removing roll pin.
- f. Remove two screws and washers attaching gear assembly support (15) and support guard (14) in fuselage.
- g. Rotate forward side of gear assembly support upward, disengage upper chain from sprocket, and remove support guard and gear assembly support through access hole in cabin floor.



- | | | |
|------------------------------|------------------------|----------------------------|
| 1. Aft Actuator Clamp | 8. Bottom Cable | 16. Gear Shaft |
| 2. Aileron Trim Tab Actuator | 9. Top Cable | 17. Shaft Bearing |
| 3. Chain Guard | 10. Stop Block Bushing | 18. Miter Gear |
| 4. Chain | 11. Turnbuckle | 19. Rivet |
| 5. Aft Clamp | 12. Chain Guard | 20. Spacer |
| 6. Aileron Trim Pulley | 13. Sprocket | 21. Aileron Trim Indicator |
| 7. Stop Block | 14. Support Guard | 22. Aileron Trim Wheel |
| | 15. Gear Support | |

Figure 5-4. Aileron Trim Control System

Disassembly, Overhaul, and Reassembly of Aileron Trim Gear Assembly. (See figure 5-4.)

- a. Remove miter gears (18) and sprocket (13) from shafts by driving out roll pins. Remove shafts (16) from gear assembly support (15).
- b. Remove press-fit bearings (17) only to replace.
- c. Clean components with suitable solvent, inspect for visible damage and excessive wear, and replace all defective parts.
- d. To reassemble, reverse disassembly procedures.

Installation of Aileron Trim Gear Assembly. (See figure 5-4.)

- a. Insert gear assembly support (15) and support guard (14) through access hole in cabin floor, and engage upper chain with sprocket.
- b. With support guard in position, align mounting holes in gear assembly support and install with two screws and washers. Use the two mounting holes that are not utilized to attach chain guard (12).
- c. Attach sprocket to shaft by installing roll pin.
- d. Engage chain (4) with sprocket (13) and install chain guard (12) with two screws and washers.
- e. Connect trim control cables with turnbuckle (11), tighten cables to 10 ± 3 pounds tension, and safety turnbuckle.

NOTE

Cable tension should be adjusted when ambient temperature is 60°F to 90°F . Allow aircraft temperature to stabilize for four hours.

- f. Move aileron trim tab to neutral and adjust indicator to neutral.

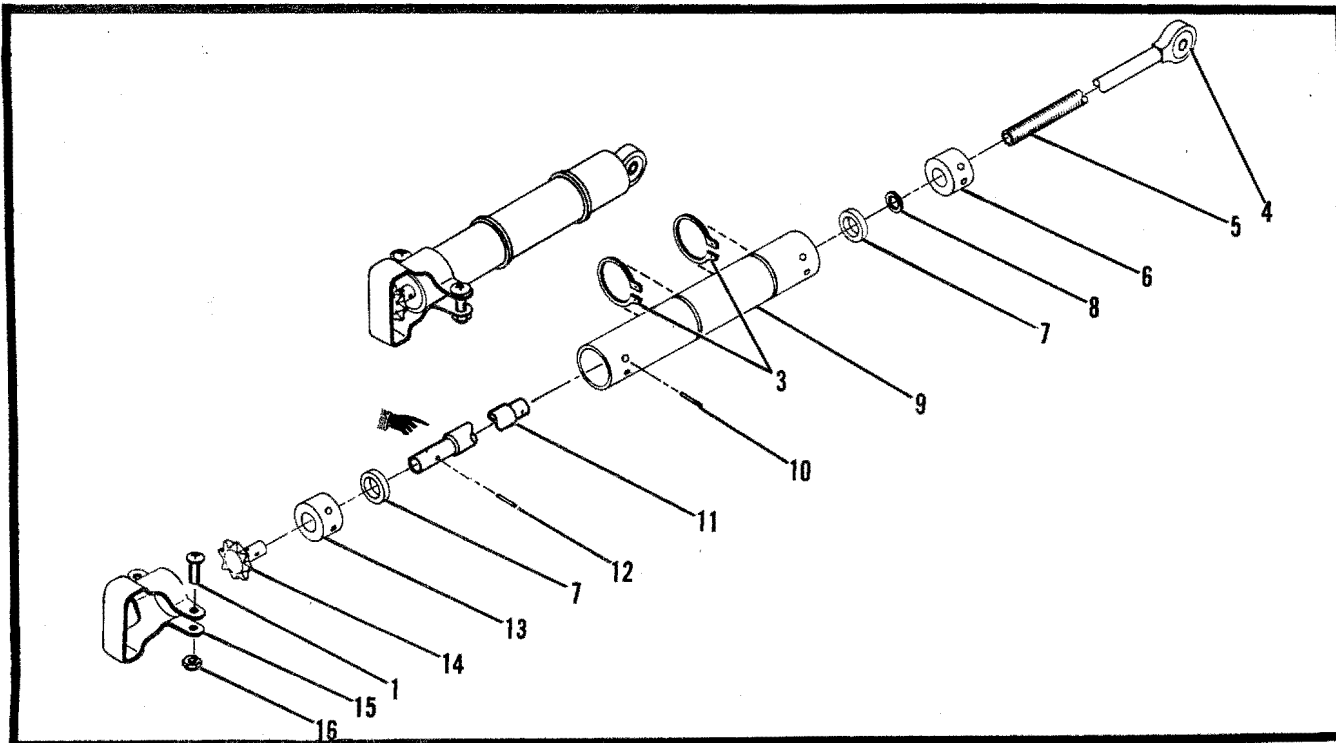
NOTE

To disengage indicator from trim control wheel track, insert a screwdriver beneath indicator and pry out of track. This permits indicator to be moved to a neutral position and re-engaged with track.

- g. Check aileron trim tab for proper operation, correct travel and rigging.
- h. Install access hole covers on forward cabin floor, aft cabin floor and underside of fuselage aft of nose wheel well.
- i. Install carpets and front seats.

Removal and Installation of Aileron Trim Wheel and Indicator Assemblies. (See figure 5-4.)

Removal of aileron trim wheel and indicator assemblies is not recommended. However, removal can be accomplished by drilling out the rivets which attach the wheel bracket to the control pedestal, and the rivet around which the indicator pivots.



- | | | | |
|-------------------|-------------------|---------------|-----------------|
| 1. Screw | 5. Screw | 9. Housing | 13. Bearing |
| 2. Deleted | 6. Bearing | 10. Groov-Pin | 14. Sprocket |
| 3. Retaining Ring | 7. Collar | 11. Screw | 15. Chain Guard |
| 4. Bearing | 8. O-Ring Packing | 12. Groov-Pin | 16. Nut |

Figure 5-5. Trim Tab Actuators

Rigging of Aileron Trim Control System. (See figure 5-4.)

- a. Refer to Section 3 and remove the following items:
 1. Front seats, middle and rear seats.
 2. Front and center carpets.
- b. Remove access cover from underside of the fuselage just aft of the nose wheel well, the fuselage floorboards above the landing gear actuator, the spar access covers aft of main wheel wells, and the access cover above aileron quadrant.
- c. Remove safety wire from turnbuckle (11) connection aileron trim control cables, adjust to 10 ±3 pounds tension, and resafety turnbuckle.

NOTE

Cable tension should be adjusted when ambient temperature is 60° F to 90° F. Allow aircraft temperature to stabilize for four hours.

- d. Move aileron trim control system to neutral by rotating trim control wheel so that the chain on actuator sprocket is equal in length, and the chain on gear support sprocket (13) is equal in length.
- e. Adjust aileron trim indicator (21) to neutral by inserting a screwdriver beneath indicator and prying out of track in trim control wheel, moving the indicator to neutral, and re-engaging with track.
- f. Remove nut, bolt and spacer attaching push-pull tube to aileron trim tab.

- g. Align aileron with trailing edge of wing and place trim tab in neutral.
- h. (See figure 5-5.) Adjust actuator screw (5) so that aft hole in push-pull tube is aligned with hole in trim tab horn; attach push-pull tube to trim tab horn with bolt, spacer and nut.
- i. Loosen stop blocks (7), move trim tab to 20 degrees DOWN, slide outboard stop block against outboard rib (wing station 111.5), and tighten stop block.

NOTE

Stop blocks (7) should be installed so that bottom cable (8) passes through bushings (10), and top cable is clamped by stop blocks.

- j. Move trim tab to 20 degrees UP, slide inboard stop block against inboard rib (wing station 100.5), and tighten stop block.
- k. Tolerance for aileron trim tab travel is plus one degree and minus zero degrees.

WARNING

Insure that aileron trim tab moves in the proper direction when operated by the trim control wheel.

- l. Install access covers, carpets and seats.

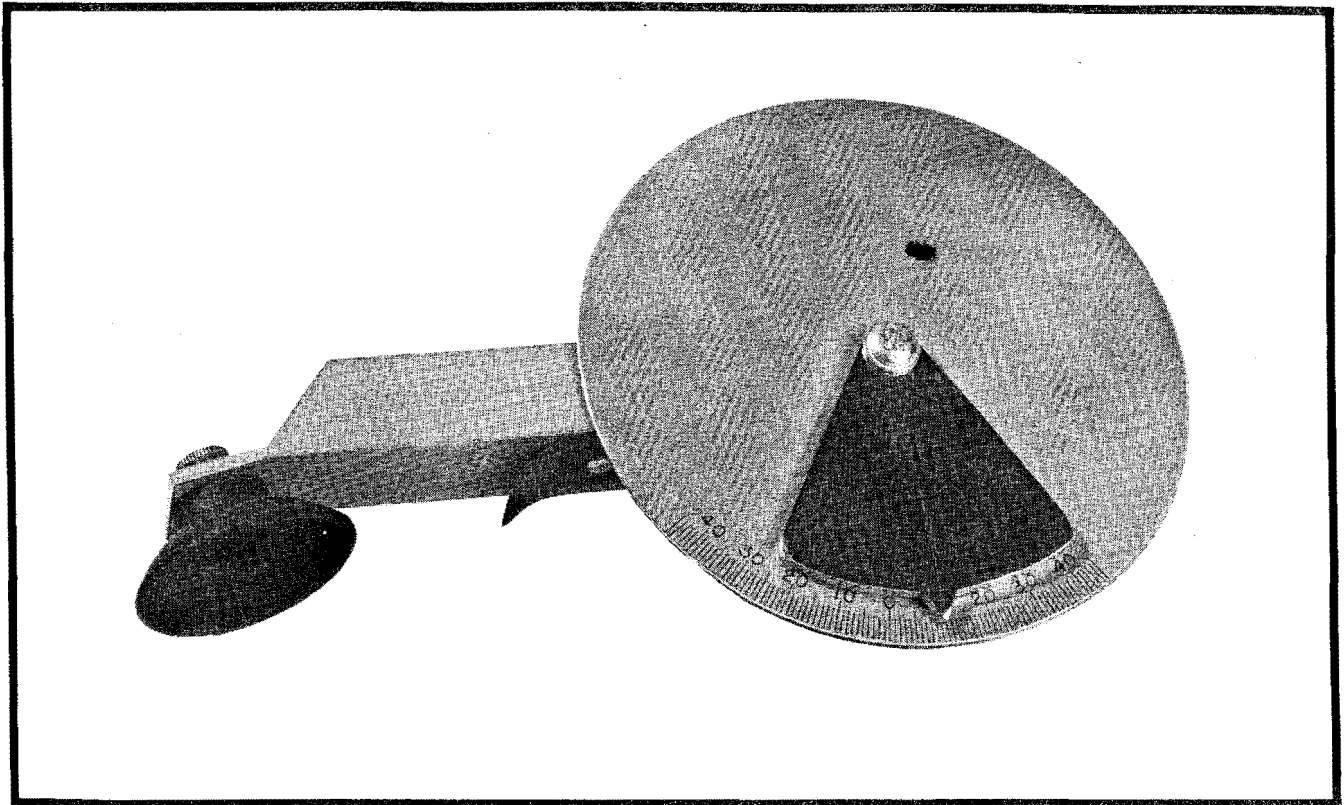


Figure 5-6. SE716 Inclinator for Measuring Control Surface Travel