

# MODEL R182 AND TR182 SERVICE MANUAL

## SECTION 6

### AILERON CONTROL SYSTEM

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- 6-1. AILERON CONTROL SYSTEM. (See figure 6-1.)
- 6-2. DESCRIPTION. The aileron control system is comprised of push-pull rods, bellcranks, cables, pulleys, cable drums and components forward of the instrument panel, all of which link the control wheels to the ailerons.
- 6-3. TROUBLE SHOOTING.

#### NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 6-18.

TROUBLE	PROBABLE CAUSE	REMEDY
LOST MOTION IN CONTROL WHEEL.	Loose control cables.	Check cable tension. Adjust cables to proper tension.
	Broken pulley or bracket, cable off pulley or worn rod end bearings.	Check visually. Replace worn or broken parts. install cables correctly.
RESISTANCE TO CONTROL WHEEL MOVEMENT.	Cables too tight.	Check cable tension. Adjust cables to proper tension.
	Pulleys binding or cable off.	Observe motion of the pulleys. Check cables visually. Replace defective pulleys. Install cables correctly.
	Bellcrank distorted or damaged.	Check visually. Replace defective bellcrank.
	Defective quadrant assembly.	Check visually. Replace defective quadrant.

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### 6-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
RESISTANCE TO CONTROL WHEEL MOVEMENT (CONT).	Clevis bolts in system too tight	Check connections where used. Loosen, then tighten properly and safety.
CONTROL WHEELS NOT LEVEL WITH AILERONS NEUTRAL.	Improper adjustment of cables.	Refer to paragraph 6-18.
	Improper adjustment of aileron push-pull rods.	Adjust push-pull rods to obtain proper alignment.
DUAL CONTROL WHEELS NOT COORDINATED.	Cables improperly adjusted.	Refer to paragraph 6-18.
INCORRECT AILERON TRAVEL.	Push-pull rods not adjusted properly.	Refer to paragraph 6-18.
	Incorrect adjustment of travel stop bolts.	Refer to paragraph 6-18.

### 6-4. CONTROL COLUMN. (See figures 6-2 and 6-3.)

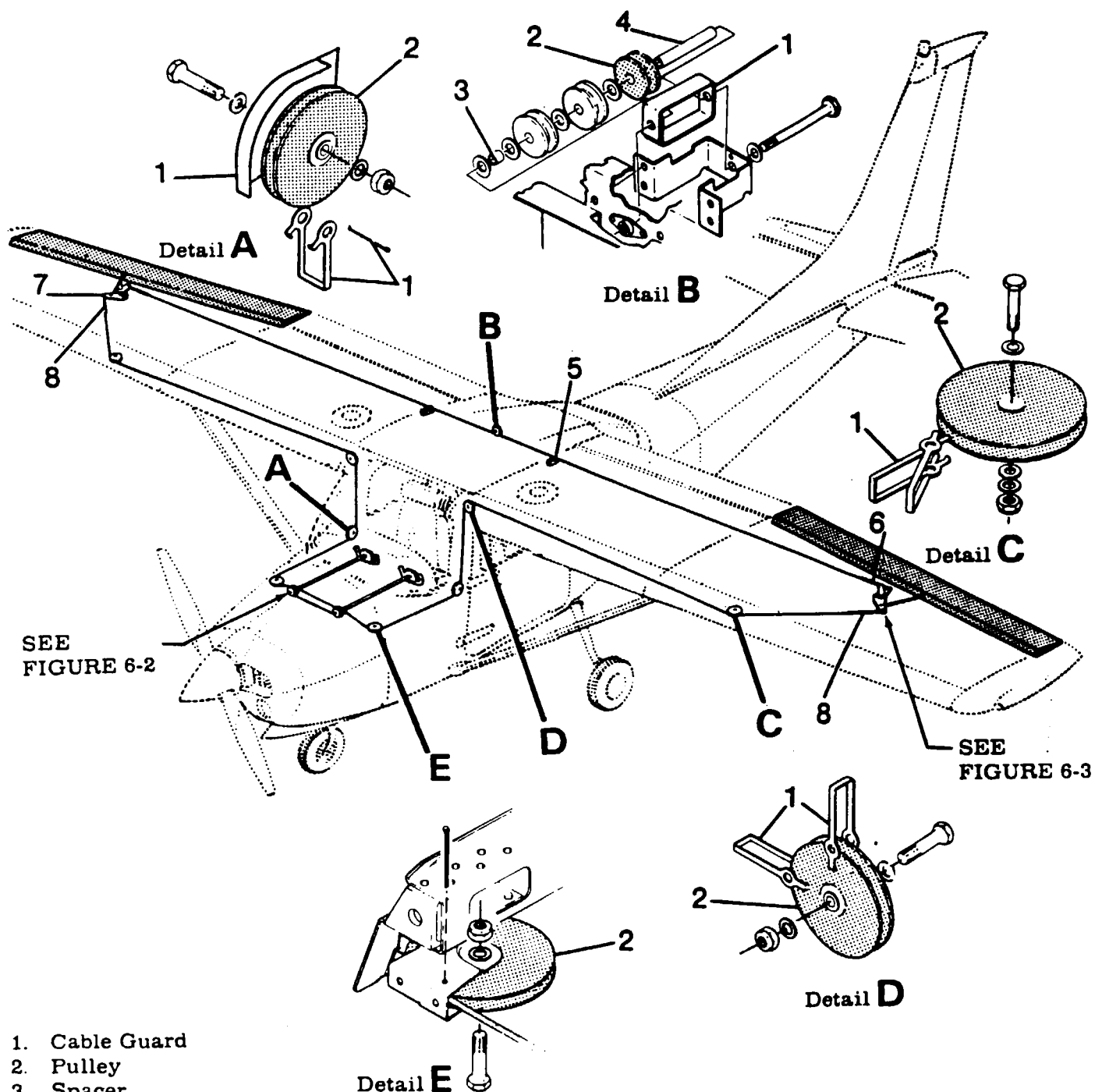
6-5. **DESCRIPTION.** Rotation of the control wheel rotates four bearing roller assemblies (3) on the end of the control wheel tube (12), which in turn, rotates a square control tube assembly (14) inside and extending from the control wheel tube (12). Attached to this square tube (14) is a quadrant (23) which operates the aileron system. This same arrangement is provided for both control wheels. Synchronization of the control wheels is obtained by the interconnect cable (28), turnbuckle (29) and adjustment terminals (26). The forward end of the square control tube (14) is mounted in a bearing block (20) on firewall (30) and does not move fore-and-aft, but rotates with the control wheel. The four bearing roller assemblies (3) on the end of the control wheel tube reduce friction as the control wheel is moved fore-and-aft for elevator system operation. A sleeve weld assembly (5), containing bearings which permit the control wheel tube to rotate within it, is secured to the control wheel tube by a sleeve and retaining ring in such a manner it moves fore-and-aft with the control wheel tube. This movement allows the push-pull tube (15) attached to the sleeve weld assembly (5) to operate an elevator arm assembly (17), to which one elevator cable (19) is attached. A torque tube (18) connects this arm assembly (17) to the one on the opposite end of the torque tube (18), to which the other elevator cable is attached. When dual controls are installed, the copilot's control wheel is linked to the aileron and elevator control systems in the same manner as the pilot's control wheel.

### 6-6. REMOVAL AND INSTALLATION

#### a. PILOT'S CONTROL COLUMN. (See figures 6-2 and 6-3.)

1. Remove bolts securing adapter to control tube assembly (1) and remove control wheel assembly (4).
2. Disconnect electrical wiring to maplight (11) and mike switch (7) at connector if installed.
3. Remove decorative cover from instrument panel.
4. Remove screw securing adjustable glide plug (13) to control tube assembly (14) and remove plug and glide assembly.

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## CAUTION

MAINTAIN SPECIFIED CONTROL CABLE TENSION.

CABLE TENSION:  
40 LBS  $\pm$  10 LBS ON AILERON CARRY-THRU CABLE (AT AVERAGE TEMPERATURE FOR THE AREA.)  
SEE FIGURE 1-1 FOR TRAVEL

Figure 6-1. Aileron Control System

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1. Cover
2. Control Wheel
3. Bearing Roller
4. Collar
5. Sleeve Weld Assembly
6. Bearing
7. Bearing Race
8. Thrust Bearing
9. Snap Ring
10. Support Plate
11. Collar
12. Control Wheel Tube
13. Adjustable Glide Plug
14. Control Tube Assembly
15. Push-Pull Tube
16. Support
17. Arm Assembly
18. Elevator Torque Tube
19. Elevator Control Cable
20. Bearing Block
21. Support
22. Cable Guard
23. Quadrant
24. Nut
25. Idler Shaft
26. Interconnect Cable Adjustment Terminals
27. Roll Pin
28. Interconnect Cable
29. Interconnect Cable Turnbuckle
30. Firewall
31. Washers
32. Retainer
33. Adjustment Nut

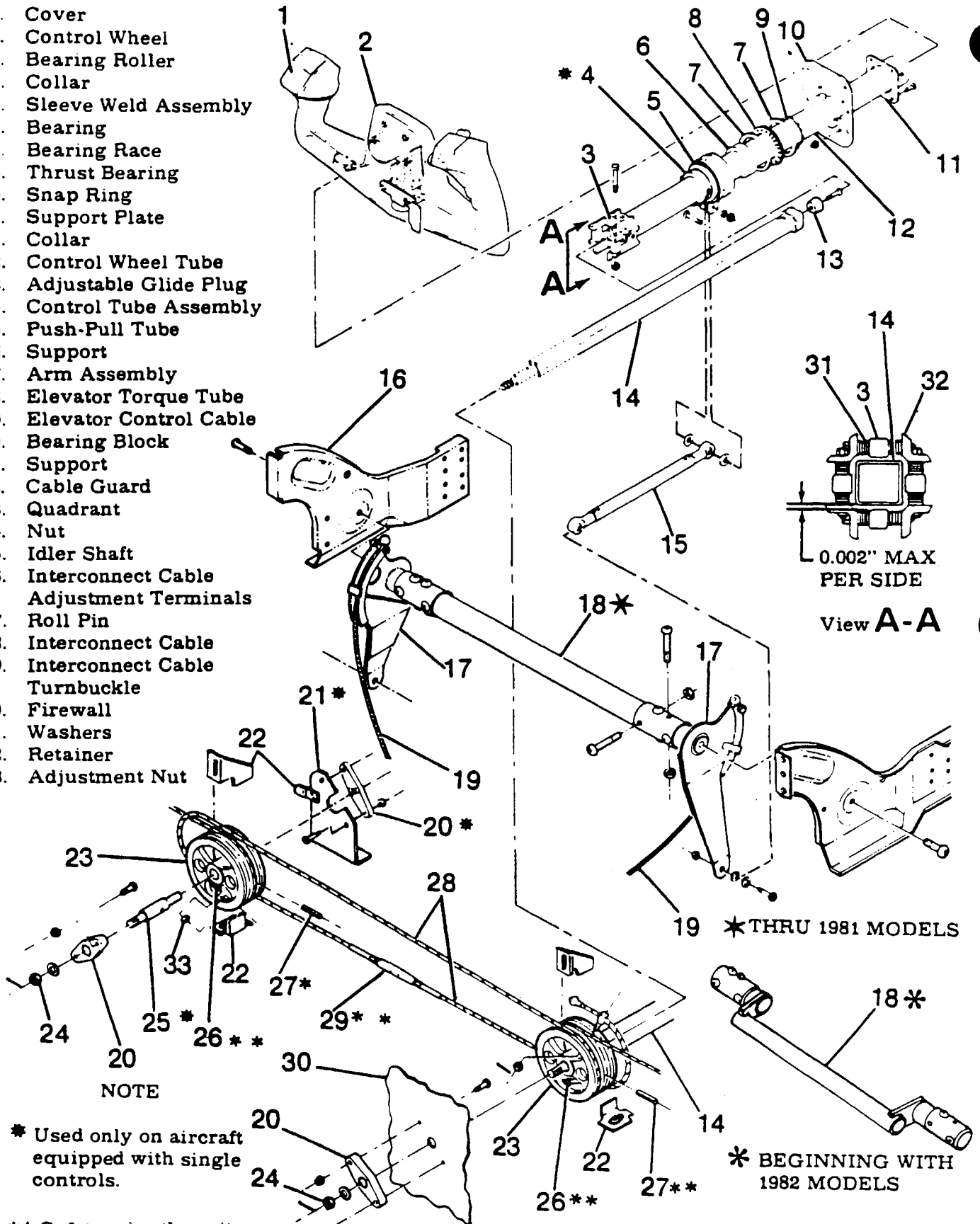


Figure 6-2. Control Column Installation

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5. Disconnect push-pull tube (15) at sleeve weld assembly (5).
6. Remove screws securing support plate (10) at instrument panel.

### NOTE

To ease removal of control wheel tube assembly (12), snap ring (9) may be removed from its locking groove to allow sleeve weld assembly (5) additional movement.

7. Using care, pull control wheel tube assembly (12) aft and work assembly out through instrument panel.

### NOTE

If removal of control tube assembly (14) or quadrant (23) is necessary, proceed to step 8.

8. Remove safety wire and relieve direct cable tension at turnbuckles (index 8, figure 6-1).
9. Remove safety wire and relieve interconnect cable tension at turnbuckle (30).
10. Remove safety wire and remove roll pin (27) through quadrant (23) and control tube assembly (14).
11. Remove pin, nut (24) and washer from control tube assembly (14) protruding through bearing block (21) on forward side of firewall (30).
12. Using care, pull control tube assembly (14) aft and remove quadrant (23).
13. Reverse the preceding steps for reinstallation. Safety wire all items previously safetied, check rigging of aileron and elevator control systems and rig, if necessary, in accordance with paragraph 6-18 and Section 8, respectively. Use figure 6-2 as a guide for reassembly and observe the following notes.

### NOTES

Referring to figure 6-2, allow 0.030" minimum clearance between bearing block (20) and nut (24) after tightening. Adjust interconnect cables (28) to 40 LBS  $\pm$  10 LBS. Washers (31) are of various thicknesses and are used to obtain dimension shown in VIEW A-A.

Referring to figure 6-3, torque bolt (12) to 30 inch-pounds.

- b. COPILOT'S CONTROL COLUMN.
    1. Complete steps 1, 2, 3, 4, 5, 6, 8, 9, 10 and 11 of subparagraph "a".
    2. Using care, pull control tube assemblies (12 and 14) aft and remove quadrant (23).
    3. Remove radios, radio dust covers, cooling pans and associated equipment as necessary to work control wheel tube assembly (12) out from under instrument panel.
    4. Complete step 13 of subparagraph "a".
- 6-7. REPAIR. Worn, damaged or defective shafts, bearings, drums, cables or other components should be replaced. Refer to Section 2 for lubrication requirements.

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1. Control Tube Assembly
2. Adapter
3. Rheostat
4. Control Wheel
5. Cover
6. Setscrew
7. Mike Switch
8. Not Used
9. Not Used
10. Trim Switch
11. Maplight Assembly
12. Knob
13. Bolt

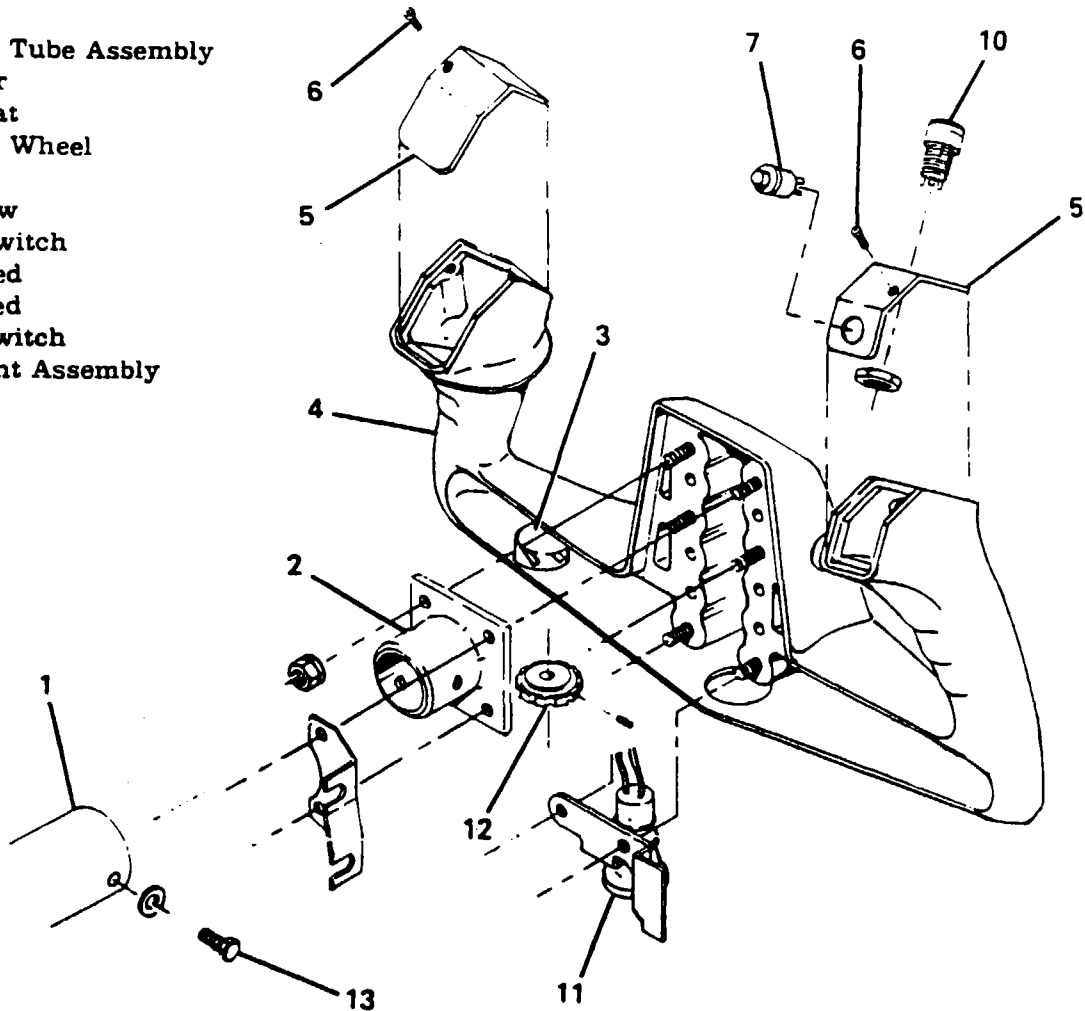


Figure 6-3. Control Wheel Installation (Sheet 1 of 2)

6-8. AILERON BELLCRANK. (See figure 6-4.)

### 6-9. REMOVAL.

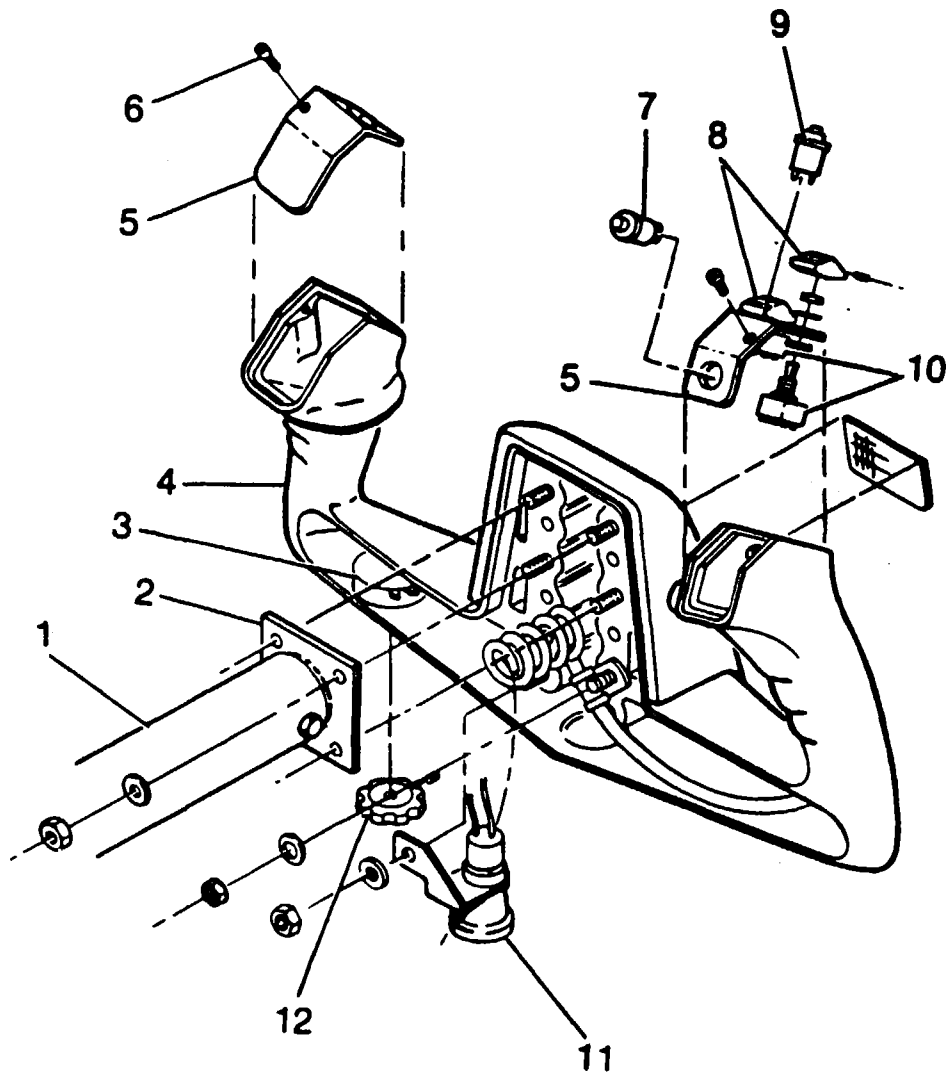
- a. Remove access plate inboard of each bellcrank (8) on underside of wing.
- b. Remove safety wire and relieve cable tension at turnbuckle (5).

### NOTE

Carry-thru cable turnbuckle (5) may be located at either the right or left aileron bellcrank.

- c. Disconnect control cables from bellcrank (8). Retain all spacers and bushings.
- d. Disconnect push-pull rod (12) at bellcrank.
- e. Remove nuts, washers and bolts securing bellcrank stop bushing (7) and bellcrank (8) to wing structure.
- f. Remove bellcrank through access opening, using care that bushing (14) is not dropped from bellcrank.

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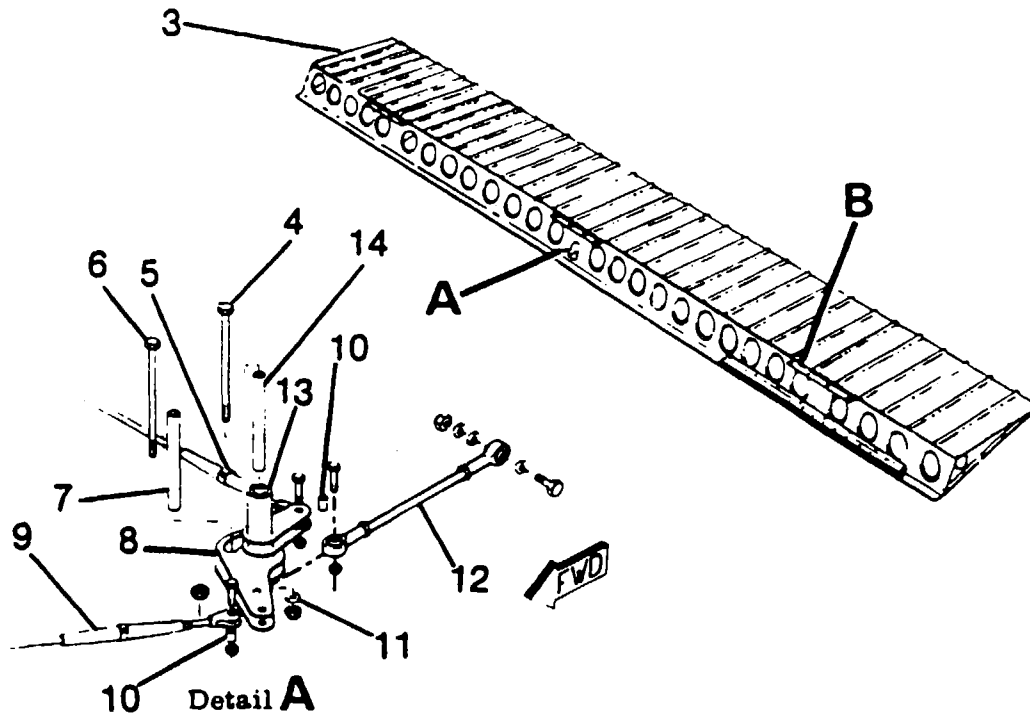


### BEGINNING WITH 1981 MODELS

1. Control Tube Assembly
2. Adapter
3. Rheostat
4. Control Wheel
5. Cover
6. Setscrew
7. Mike Switch
8. Trim Controls
9. Trim Disengage Switch
10. Trim Switches
11. Maplight Assembly
12. Knob

Figure 6-3. Control Wheel Installation (Sheet 2 of 2)

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- |                            |                        |
|----------------------------|------------------------|
| 1. Hinge                   | 8. Bellcrank           |
| 2. Balance Weight          | 9. Turnbuckle (Direct) |
| 3. Aileron                 | 10. Bushing            |
| 4. Pivot Bolt              | 11. Brass Washer       |
| 5. Turnbuckle (Carry-Thru) | 12. Push-Pull Rod      |
| 6. Bolt                    | 13. Needle Bearing     |
| 7. Stop Bushing            | 14. Bushing            |

**Figure 6-4. Aileron Installation (Sheet 1 of 2)**

## NOTE

Brass washers (11) may be used as shims between lower end of bellcrank and wing structure. Retain these shims. Tape open ends of bellcrank to prevent dust and dirt from entering bellcrank needle bearings (13).

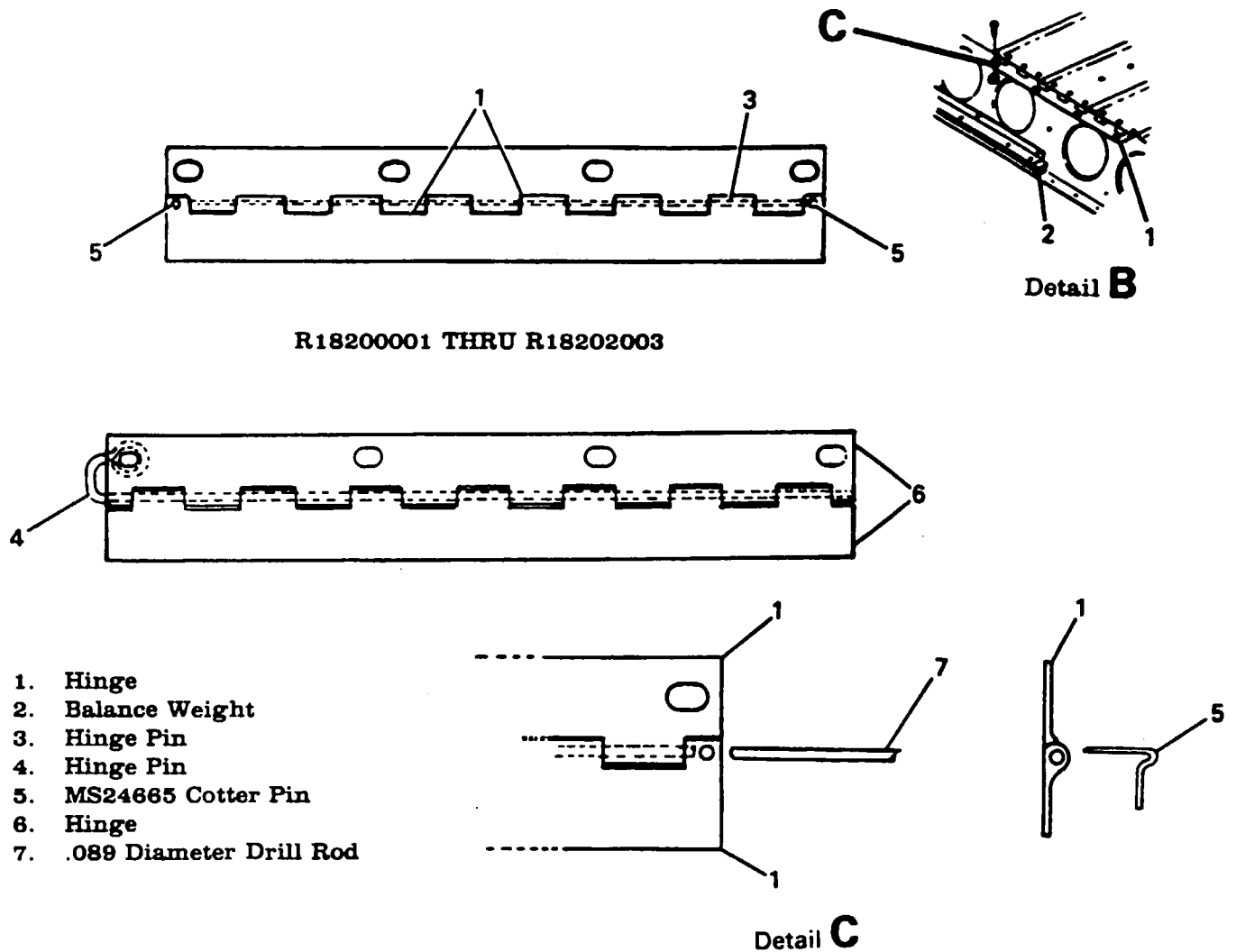
- 6-10. **REPAIR.** Repair of bellcranks consists of replacement of defective parts. If needle bearings are dirty or in need of lubrication, clean thoroughly and lubricate as outlined in Section 2.
- 6-11. **INSTALLATION.**
- Place bushing (14) and stop bushing (7) in bellcrank (8) and position bellcrank in wing.
  - Install brass washers (11) between lower end of bellcrank (8) and wing structure to shim out excess clearance.

## NOTE

Brass washers (11) may be used as required between lower end of bellcrank and wing channel to shim out excess clearance.



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## NOTES

Install loop of hinge pin (4) on outboard end of hinge.

The following method may be utilized to check wear on aileron hinges used prior to R18202004. Refer to Service Letter SE83-18 for specific serials affected.

1. Remove cotter pins (5) from both ends of hinge (1).
2. Push drill rod (7) or number 43 drill bit into hinge pin hole beyond holes from which cotter pins (5) were removed.
3. Bend one leg of cotter pin (5) back and attempt to install the other leg past drill rod (7) or number 43 drill bit. If leg of cotter pin (5) GOES, replace hinge (7). If NO GO condition exists, hinges are not worn sufficiently to require replacement.
4. Remove drill rod (7) and replace new cotter pins (5) in hinges (1).

Figure 6-4. Aileron Installation (Sheet 2 of 2)

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- c. Install bellcrank pivot bolt (4).
- d. Position bellcrank stop-bushing (7) and install attaching bolt (6).

### NOTE

Stop bushing (7) should be centered in slots of aileron bellcrank (8) in each wing when control wheels are neutral, with correct tension on aileron carry-thru cable (5). Push-pull rods (12) are then adjusted to rig the ailerons neutral.

- e. Connect control cables to bellcrank.
- f. Connect push-pull rod (12) to bellcrank.
- g. Re-rig aileron system in accordance with paragraph 6-18, safety turnbuckle (5) and reinstall all items removed for access.

#### 6-12. CABLES AND PULLEYS. (See figure 6-1.)

#### 6-13. REMOVAL AND INSTALLATION.

- a. Remove access plates, wing root fairings and upholstery as required.
- b. Remove safety wire and relieve cable tension at turnbuckles (8).
- c. Disconnect cables from aileron bellcranks (7) and quadrants (index 23, figure 6-2.)
- d. Remove cable guards and pulleys as necessary to work cables free of aircraft.

### NOTE

To ease routing of cables, a length of wire may be attached to end of cable before being withdrawn from aircraft. Leave wire in place, routed through structure; then attach cable being installed and use to pull cable into position.

- e. After cable is routed in position, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guard.
- f. Re-rig aileron system in accordance with paragraph 6-18, safety turnbuckles and install access plates, fairings and upholstery removed in step "a".

#### 6-14. AILERONS. (See figure 6-4.)

#### 6-15. REMOVAL.

- a. Disconnect push-pull rod (12) at aileron.
- b. Remove screws and nuts attaching aileron hinges (1) to trailing edge of wing.
- c. Using care, pull aileron out and down to slide hinges from under wing skin and auxiliary spar reinforcements.

#### 6-16. INSTALLATION.

- a. Position aileron hinges between skin and auxiliary spar reinforcements and install screws and nuts attaching hinges to trailing edge of wing.
- b. Attach push-pull rod (12) to aileron.

### NOTE

If rigging was correct and push-pull rod adjustment was not disturbed, it should not be necessary to re-rig system.

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AVAILABLE FROM CESSNA SUPPLY  
DIVISION (TOOL NO. SE 716).

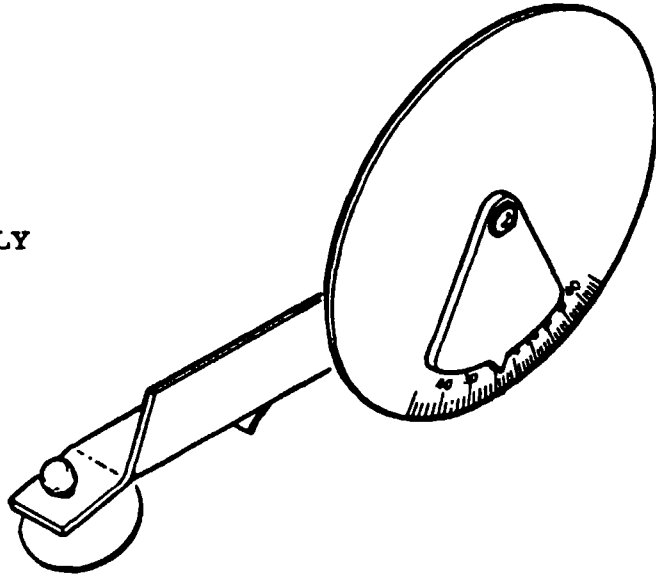


Figure 6-5. Inclinometer for Measuring Control Surface Travel

- c. Check aileron travel and alignment, re-rig if necessary, in accordance with paragraph 6-18.
- 6-17. REPAIR. Aileron repair may be accomplished in accordance with instructions outlined in Section 18. Before installation, ensure balance weights and hinges are securely attached.
- 6-18. RIGGING. (See figure 6-1.)
  - a. Remove safety wire and relieve cable tension at turnbuckles (6 and 8).
  - b. Disconnect push-pull rods at bellcranks (7).
  - c. Adjust interconnect cable turnbuckle (index 29, figure 6-2) and adjustment terminals (index 26, figure 6-2) to remove cable slack, acquire proper tension ( $40 \pm 10$  pounds) and position control wheels level (synchronized).
  - d. Tape a bar across both control wheels to hold them in neutral position.
  - e. Adjust direct cable turnbuckles (8) and carry-thru cable turnbuckle (6) so bellcrank stop-bushings (index 7, figure 6-4) are centered in both bellcrank slots with  $40 \pm 10$  pounds tension on carry-thru cable. Disregard tension on direct cables.
  - f. Adjust push-pull rods (index 12, figure 6-4) at each aileron until ailerons are neutral with reference to trailing edge of wing flaps. Be sure wing flaps are full UP when making this adjustment.
  - g. With ailerons in neutral position (streamlined), mount an inclinometer on trailing edge of one aileron and set to  $0^\circ$ . (See figure 6-5 for inclinometer.)
  - h. Remove bar from control wheels and check degree of travel as specified in figure 1-1. If travel is not within specified limits, readjust push-pull rods and cables as necessary.
  - i. Ensure all turnbuckles are safetied, all cables and cable guards are properly installed, all jam nuts are tight and replace all items removed for access.

### WARNING

Be sure ailerons move in the correct direction when operated by the control wheel and check for freedom of movement.