

SECTION 7

WING FLAP CONTROL SYSTEM

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7-1. WING FLAP CONTROL SYSTEM. (Refer to figure 7-1.)

7-2. DESCRIPTION. The wing flap control system is comprised of an electric motor and transmission assembly, drive pulleys, push-pull rods, cables, pulleys and a flap position indicator. Power from the motor and transmission assembly is transmitted to the flaps by a system of drive pulleys, cables and push-pull rods. Electrical power to the motor is controlled by a 3-position switch mounted on the instrument panel. The flap position indicator is calibrated to show degrees of extension.

7-3. OPERATIONAL CHECK.

a. Operate flaps through their full range of travel, observing for uneven or jumpy motion, binding and lost motion in system. Ensure flaps are moving together through their full range of travel.

b. THRU AIRCRAFT SERIALS 17259904 AND F172-00804 WHEN NOT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. Attempt to overrun travel extremes and check for transmission free-wheeling at full up and full down positions.

c. BEGINNING WITH AIRCRAFT SERIALS 17259905 AND F17200805 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. Check

for positive shut-off of motor at the flap travel extremes, FLAP MOTOR MUST STOP OR DAMAGE WILL RESULT.

d. Check that flaps are not sluggish in operation. In flight at 100 mph, indicated airspeed, flaps should fully extend in approximately 9 seconds and retract in approximately 5 seconds. On the ground, with engine running, the flaps should extend or retract in approximately 6 seconds.

e. With flaps full UP, mount an inclinometer on one flap and set to 0°. Lower flaps to full DOWN position and check flap angle as specified in figure 1-1. Check approximate mid-range percentage setting against degrees as indicated on inclinometer. Repeat the same procedure for the opposite flap.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-4.

f. Remove access plates adjacent to flap drive pulleys and attempt to rock pulleys to check for bearing wear.

g. Inspect flap rollers and tracks for evidence of binding and defective parts.

7-4. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 7-19.

TROUBLE	PROBABLE CAUSE	REMEDY
BOTH FLAPS FAIL TO MOVE.	Popped circuit breaker.	Reset and check continuity. Replace breaker if defective.
	Defective switch.	Place jumper across switch. Replace switch if defective.
	Defective motor.	Remove and bench test. Replace motor if defective.
	Broken or disconnected wires.	Run continuity check of wiring. Connect or repair wiring as necessary.
	Disconnected or defective transmission.	Connect transmission. Remove, bench test and replace transmission if defective.
	Defective limit switch.	Check continuity of switches. Replace switches found defective.
BINDING IN SYSTEM AS FLAPS ARE RAISED AND LOWERED.	Cables not riding on pulleys.	Open access plates and observe pulleys. Route cables correctly over pulleys.
	Bind in drive pulleys.	Check drive pulleys in motion. Replace drive pulleys found defective.
	Broken or binding pulleys.	Check pulleys for free rotation or breaks. Replace defective pulleys.
	Frayed cable.	Check condition of cables. Replace defective cables.
	Flaps binding on tracks.	Observe flap tracks and rollers. Replace defective parts.
LEFT FLAP FAILS TO MOVE.	Disconnected or broken cable.	Check cable tension. Connect or replace cable.
	Disconnected push-pull rod.	Attach push-pull rod.
INCORRECT FLAP TRAVEL.	Incorrect rigging.	Refer to paragraph 7-19.
	Defective limit switch.	Check continuity of switches. Replace switches found defective.
FLAPS FAIL TO RETRACT.	Disconnected or defective UP limit switch.	Check continuity of switch. Connect or replace switch.

7-4. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
FLAPS FAIL TO EXTEND.	Disconnected or defective DOWN limit switch.	Check continuity of switch. Connect or replace switch.

7-5. FLAP MOTOR AND TRANSMISSION ASSEMBLY.

7-6. REMOVAL AND INSTALLATION.

a. THRU AIRCRAFT SERIALS 17259904 AND F172-00804 WHEN NOT MODIFIED IN ACCORDANCE WITH SK150-37 AND WHEN NOT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. (Refer to figure 7-2, sheet 1.)

1. Run flaps to full DOWN position.
2. Disconnect battery cables at the battery and insulate cable terminals as a safety precaution.
3. Remove access plates adjacent to drive pulley and motor assembly on right wing.

NOTE

Remove motor (1), transmission (4), hinge assembly (2) and actuating tube (6) from aircraft as a unit on aircraft equipped with standard fuel tanks. On aircraft equipped with long range tanks, detach motor and transmission assembly from hinge assembly (2) prior to removal by removing bolt (5).

4. Remove bolt (18) securing actuating tube (6) to drive pulley (9).
 5. Screw actuating tube (6) IN toward transmission (4) by hand to its shortest length.
 6. Remove bolt (3) securing flap motor hinge (2) to wing, or if long range fuel tanks are installed, remove bolt (5) securing transmission to hinge assembly. Retain brass washer between hinge and wing structure for use on reinstallation.
 7. Disconnect motor electrical wiring (21) at quick-disconnects.
 8. Using care, work assembly from wing through access opening.
 9. Reverse the preceding steps for reinstallation. If the hinge assembly (2) was removed from the transmission (4) for any reason, ensure the short end of hinge is reinstalled toward the top.
 10. Complete an operational check as outlined in paragraph 7-3 and re-rig system in accordance with paragraph 7-19.
- b. THRU AIRCRAFT SERIALS 17259904 AND F172-00804 WHEN MODIFIED IN ACCORDANCE WITH SK150-37 AND WHEN NOT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. (Refer to figure 7-2, sheet 2.)

1. Complete steps 1, 3 and 4 of subparagraph "a."

2. Run flap motor to place actuating tube (4) IN to its shortest length.

3. Complete steps 2, 6, 7, 8, 9 and 10 of subparagraph "a."

c. BEGINNING WITH AIRCRAFT SERIALS 172-59905, F17200805 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. (Refer to figure 7-2, sheets 2 and 3.)

1. Complete steps 1 thru 7 of subparagraph "a."
2. Disconnect electrical wiring at limit switches (29 and 32). Tag wires for reference on reinstallation.
3. Complete steps 8, 9 and 10 of subparagraph "a."

7-7. REPAIR. Repair consists of replacement of motor, transmission, coupling, actuating tube and associated hardware. Bearings in hinge assembly may also be replaced. Lubricate as outlined in Section 2.

7-8. DRIVE PULLEYS. (Refer to figure 7-2.)

7-9. REMOVAL AND INSTALLATION.

- a. Remove access plates adjacent to drive pulley (9) in right wing.
- b. Unzip or remove headliner as necessary for access to turnbuckles (index 6, figure 7-1), remove safety wire and loosen turnbuckles.
- c. Remove bolt (15) securing flap push-pull rod (10) to drive pulley (9) and lower RIGHT flap gently.
- d. Remove bolt (18) securing actuating tube (6) to drive pulley (9) and lower LEFT flap gently. Retain bushing.
- e. Remove cable locks (8) securing control cables to drive pulley (9). Tag cables for reference on reinstallation.
- f. Remove pin (17) attaching transmitter rod (14) to arm (16).
- g. Remove bolt (7) attaching drive pulley (9) to wing structure.
- h. Using care, remove drive pulley through access opening, being careful not to drop bushing. Retain brass washer between drive pulley and wing structure for use on reinstallation. Tape open ends of drive pulley after removal to protect bearings.
- i. To remove left wing drive pulley, use this same procedure omitting steps "d" and "f."
- j. Reverse the preceding steps for reinstallation. Rig system in accordance with paragraph 7-19, safety turnbuckles and reinstall all items removed for access.

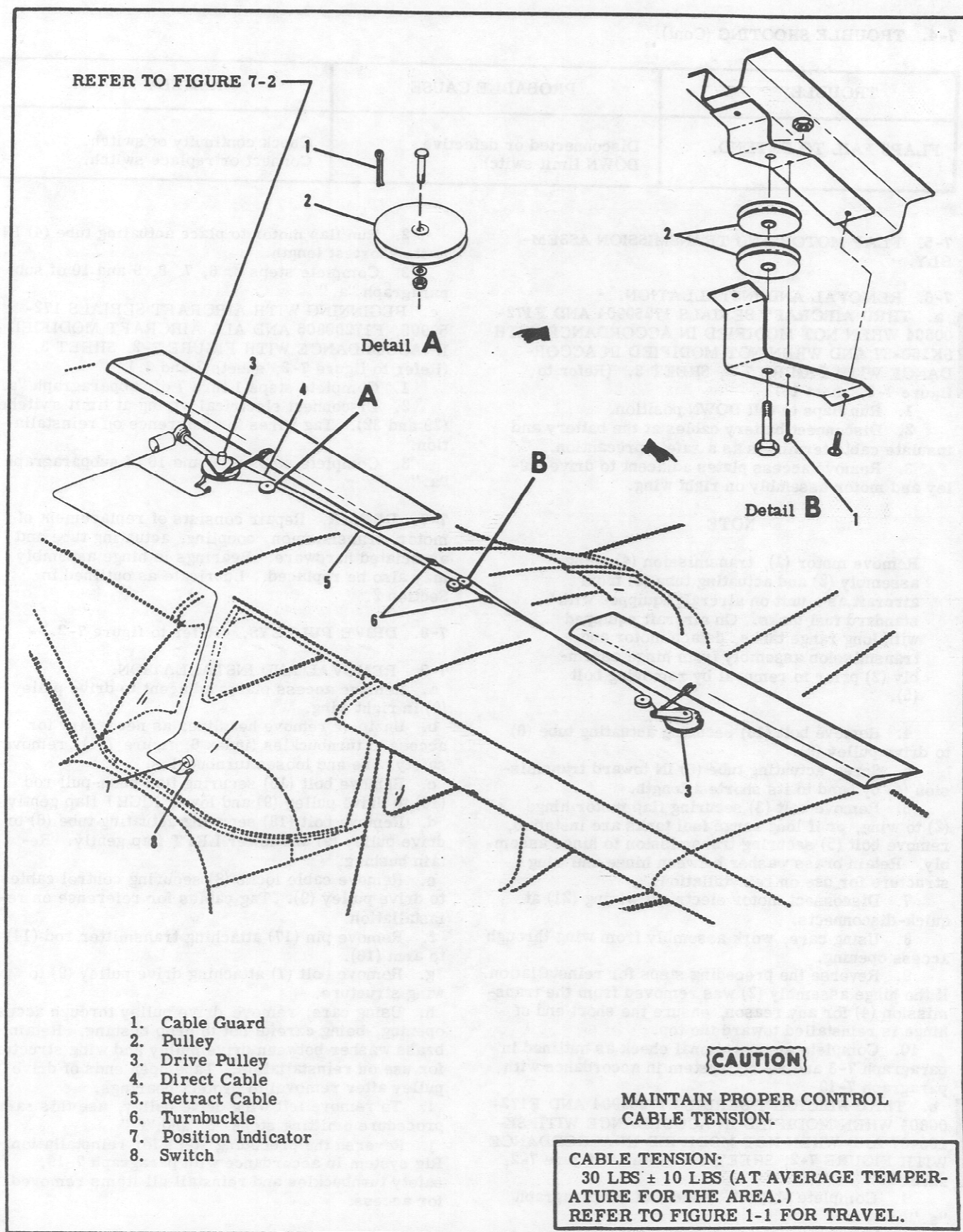
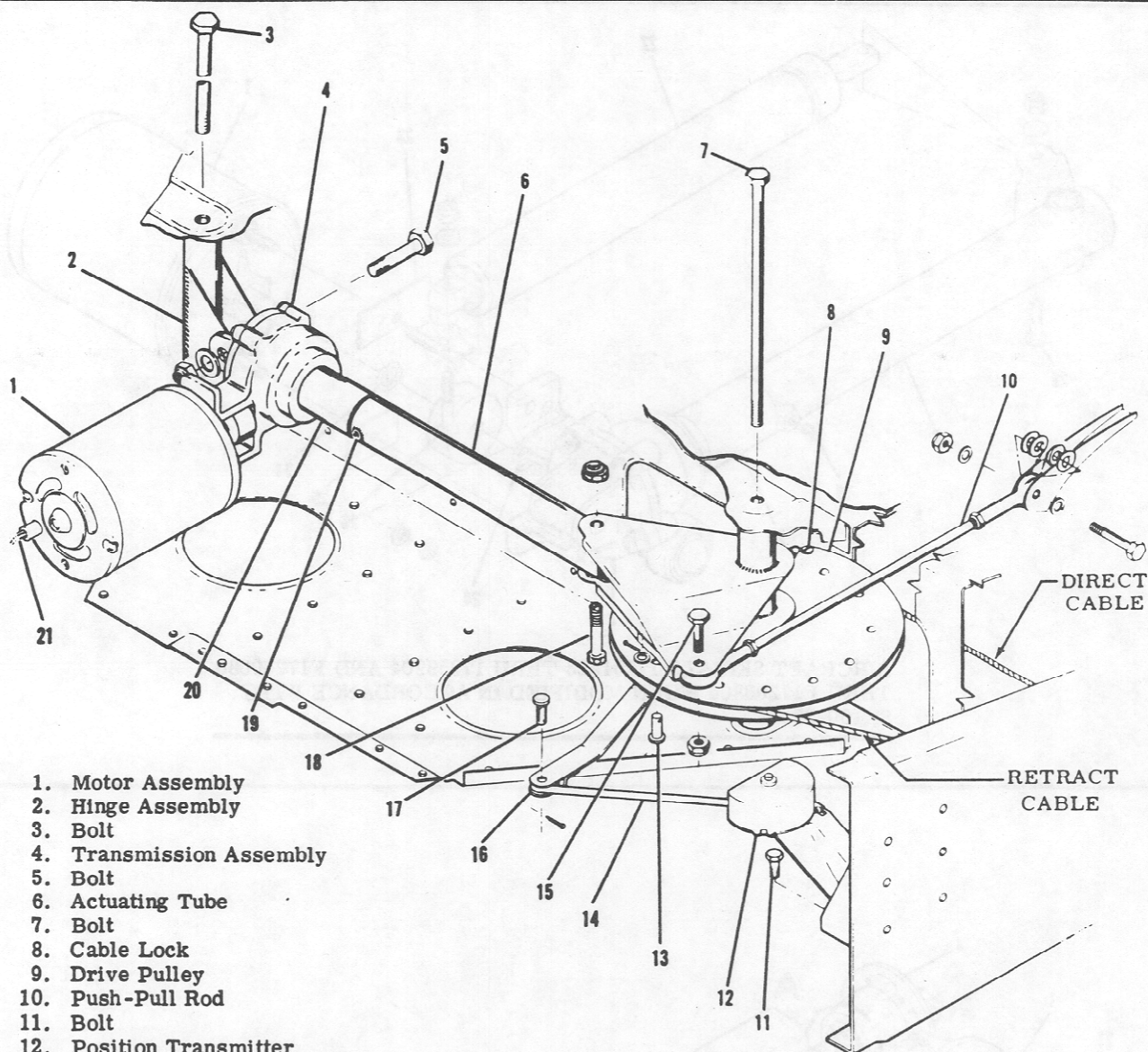


Figure 7-1. Wing Flap Control System



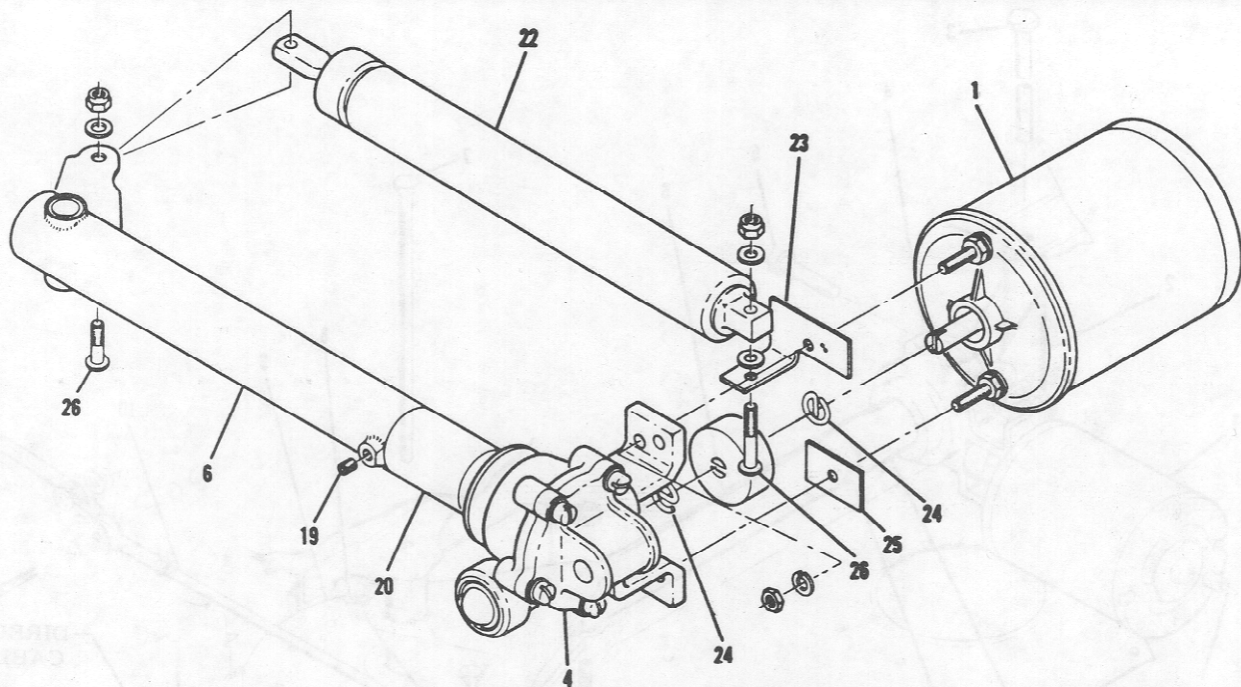
1. Motor Assembly
2. Hinge Assembly
3. Bolt
4. Transmission Assembly
5. Bolt
6. Actuating Tube
7. Bolt
8. Cable Lock
9. Drive Pulley
10. Push-Pull Rod
11. Bolt
12. Position Transmitter
13. Pin
14. Wire Rod
15. Bolt
16. Arm
17. Pin
18. Bolt
19. Setscrew
20. Nut and Ball Assembly
21. Electrical Wiring
22. Snubber
23. Bracket
24. Spacer
25. Shim
26. Screw
27. Setscrew
28. Switch Adjustment Block
29. Up-Limit Switch
30. Switch Actuating Collar
31. Support
32. Down-Limit Switch

NOTE

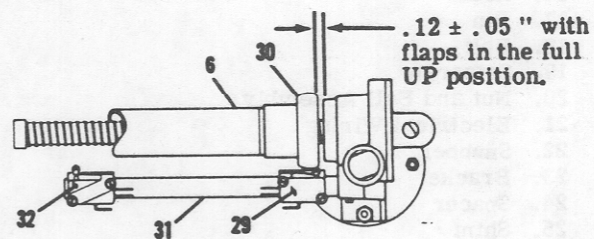
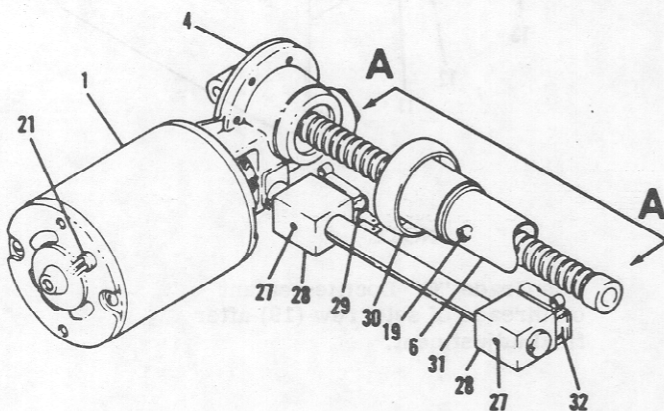
Use Grade "C" Loctite sealant on threads of setscrew (19) after final adjustment.

THRU AIRCRAFT SERIALS 17259904 AND F17200804 WHEN NOT MODIFIED IN ACCORDANCE WITH SK150-37

Figure 7-2. Flap Motor and Transmission Assembly (Sheet 1 of 3)

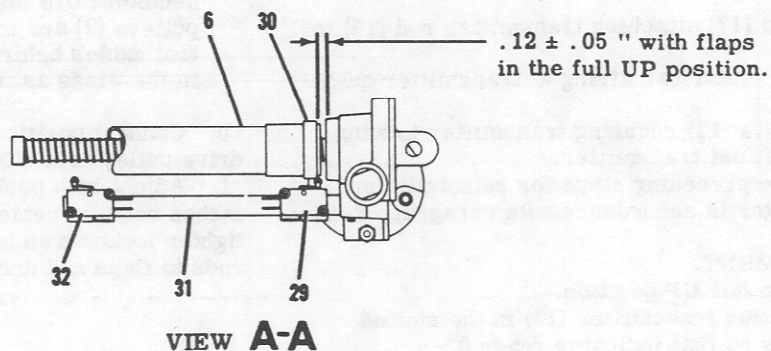
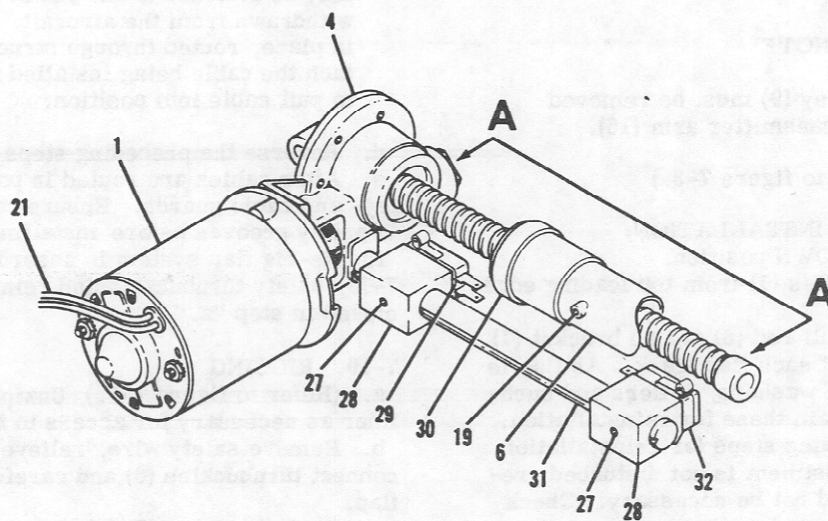


AIRCRAFT SERIALS 17251823 THRU 17259904 AND F17200086
THRU F17200804 WHEN MODIFIED IN ACCORDANCE WITH
SK150-37



VIEW A-A

BEGINNING WITH AIRCRAFT SERIALS
17259905 AND F17200805



SK150-41 AND THIS FLAP ACTUATOR INSTALLATION IS
EFFECTIVE ONLY WHEN USED AS A REPLACEMENT
SPARE, OR ON PRODUCTION FLAP ACTUATOR INSTALL-
ATIONS PRIOR TO AIRCRAFT SERIALS 17259905 AND
F17200805

Figure 7-2. Flap Motor and Transmission Assembly (Sheet 3 of 3)

7-10. REPAIR. Repair is limited to replacement of bearings. Cracked, bent or excessively worn drive pulleys must be replaced. Lubricate bearings as outlined in Section 2.

NOTE

The right drive pulley (9) must be removed to detach position transmitter arm (16).

7-11. FLAPS. (Refer to figure 7-3.)

7-12. REMOVAL AND INSTALLATION.

- a. Run flaps to full DOWN position.
- b. Remove access plates (1) from top leading edge of flap.
- c. Disconnect push-pull rod (6) at flap bracket (7).
- d. Remove bolts (5) at each flap track. As flap is removed from wing, all washers, rollers and bushings will fall free. Retain these for reinstallation.
- e. Reverse the preceding steps for reinstallation. If push-pull rod (6) adjustment is not disturbed, re-rigging of system should not be necessary. Check flap travel and rig in accordance with paragraph 7-19, if necessary.

7-13. REPAIR. Flap repair may be accomplished in accordance with instructions outlined in Section 18.

7-14. FLAP POSITION TRANSMITTER. (Refer to figure 7-2.)

7-15. REMOVAL AND INSTALLATION.

- a. Remove access plate adjacent to drive pulley in right wing.
- b. Remove pin (17) attaching transmitter rod (14) to arm (16).
- c. Disconnect electrical wiring at transmitter quick-disconnects.
- d. Remove bolts (11) securing transmitter to wing structure and lift out transmitter.
- e. Reverse the preceding steps for reinstallation. Adjust transmitter in accordance with paragraph 7-16.

7-16. ADJUSTMENT.

- a. Run flaps to full UP position.
- b. Adjust position transmitter (12) in the slotted adjustment holes so that indicator reads 0°.
- c. If necessary, transmitter rod (14) may be bent slightly for additional adjustment.

7-17. CABLES AND PULLEYS. (Refer to figure 7-1.)

7-18. REMOVAL AND INSTALLATION.

- a. Remove access plates, fairings, headliner and upholstery as necessary for access.
- b. Remove safety wire, relieve cable tension, disconnect turnbuckles (6) and carefully lower LEFT flap.
- c. Disconnect cables at drive pulleys, 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 the end of cable being withdrawn from the aircraft. Leave wire in place, routed through structure; then attach the cable being installed and use wire to pull cable into position.

- d. Reverse the preceding steps for reinstallation.
- e. After cables are routed in position, install pulleys and cable guards. Ensure cables are positioned in pulley grooves before installing guards.
- f. Re-rig flap system in accordance with paragraph 7-19, safety turnbuckles and reinstall all items removed in step "a."

7-19. RIGGING.

- a. (Refer to figure 7-1.) Unzip or remove headliner as necessary for access to turnbuckles (6).
- b. Remove safety wire, relieve cable tension, disconnect turnbuckles (6) and carefully lower LEFT flap.
- c. (Refer to figure 7-2.) Disconnect push-pull rods (10) at drive pulleys (9) in both wings and lower RIGHT flap gently.
- d. Disconnect actuating tube (6) from drive pulley (9).

NOTE

If control cables are not connected to left and right drive pulleys, actuating tube (6) and push-pull rods (10) must be disconnected before installing cables. If drive pulleys (9) are not installed, attach control cables before installing drive pulleys in the wings as illustrated in figure 7-4.

- e. Connect position transmitter rod (14) to right drive pulley arm (16).
- f. Adjust both push-pull rods (10) to 8.83±.12 inches between centers of rod end bearings and tighten locknuts on both ends. Connect push-rods to flaps and drive pulleys.

NOTE

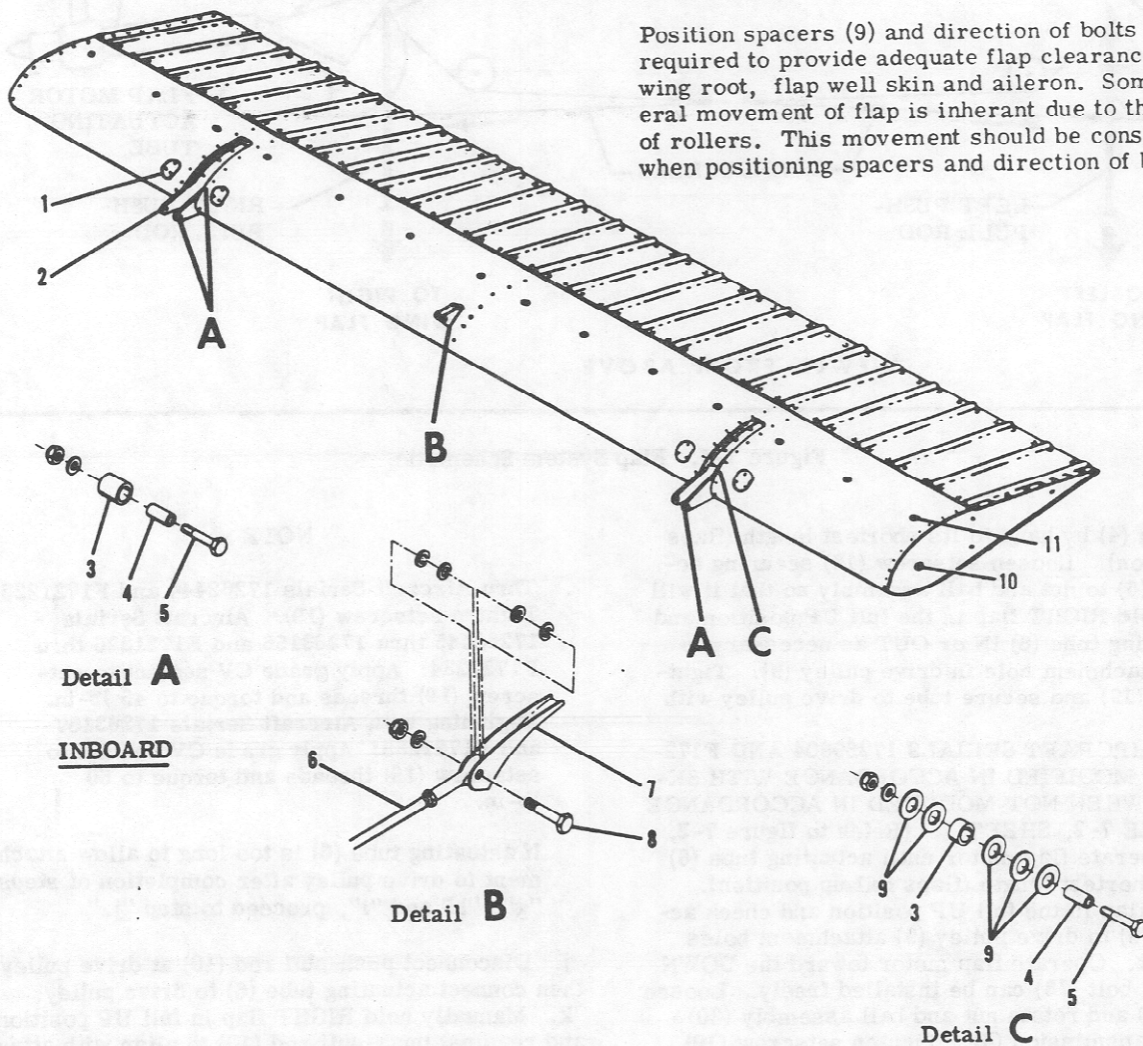
Temporarily connect cables at turnbuckles (index 6, figure 7-1) and test flaps by hand to ensure both flaps extend and retract together. If they will not, the cables are incorrectly attached to the drive pulleys. Ensure that the right drive pulley rotates clockwise, when viewed from below as the flaps are extended. Tag cables for reference and disconnect turnbuckles again.

g. THRU AIRCRAFT SERIALS 17259904 AND F172-00804 WHEN NOT MODIFIED IN ACCORDANCE WITH SK150-37 AND WHEN NOT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. (Refer to figure 7-2, sheet 1.) Screw actuating tube (6) IN toward

NOTE

Bushings (4), rollers (3) and spacers (9) are first positioned through slots in flap tracks, then are secured to the flap roller supports (2) with attaching bolts, washers and nuts. Nylon plug buttons (11) prevent wing flap from chafing wing trailing edge.

Position spacers (9) and direction of bolts (5) as required to provide adequate flap clearance at wing root, flap well skin and aileron. Some lateral movement of flap is inherent due to the width of rollers. This movement should be considered when positioning spacers and direction of bolts.



Detail A

INBOARD

Detail B

Detail C

OUTBOARD

1. Access Plate
2. Flap Support
3. Roller Assembly
4. Bushing
5. Bolt
6. Push-Pull Rod
7. Flap Bracket
8. Bolt
9. Spacer
10. Plug Button
11. Nylon Plug Button

Figure 7-3. Flap Installation

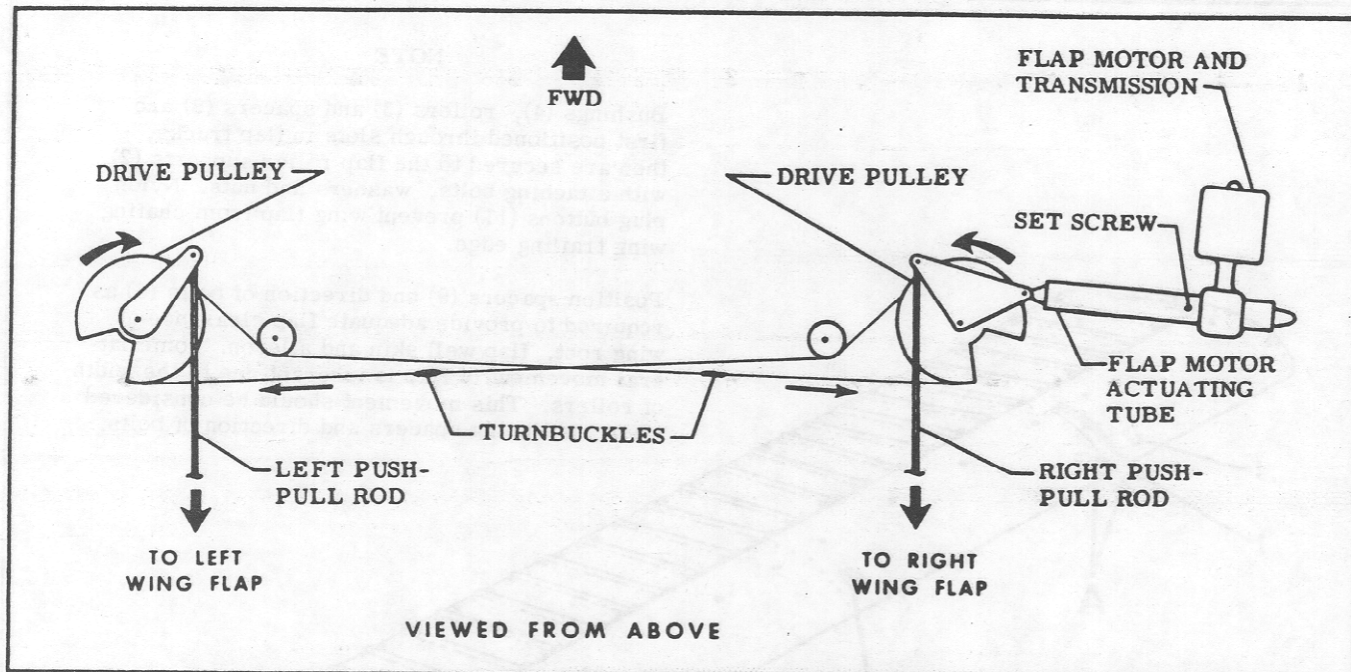


Figure 7-4. Flap System Schematic

transmission (4) by hand to its shortest length (flaps full up position). Loosen setscrew (19) securing actuating tube (6) to nut and ball assembly so that it will not move, hold RIGHT flap in the full UP position and adjust actuating tube (6) IN or OUT as necessary to align with attachment hole in drive pulley (9). Tighten setscrew (19) and secure tube to drive pulley with bolt (18).

h. THRU AIRCRAFT SERIALS 17259904 AND F172-00804 WHEN MODIFIED IN ACCORDANCE WITH SK-150-37 AND WHEN NOT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. (Refer to figure 7-2, sheet 2.) Operate flap motor until actuating tube (6) is IN to its shortest length (flaps full up position). Hold RIGHT flap in the full UP position and check actuating tube (6) to drive pulley (9) attachment holes for alignment. Operate flap motor toward the DOWN position until bolt (18) can be installed freely. Loosen setscrew (19) and rotate nut and ball assembly (20) IN against transmission (4). Tighten setscrew (19) and bolt (18).

i. BEGINNING WITH AIRCRAFT SERIALS 172-59905, F17200805 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. (Refer to figure 7-2, sheets 2 and 3.) Screw actuating tube (6) IN toward transmission (4) by hand to $.12 \pm .05$ inches between switch actuating collar (30) and transmission as illustrated in figure 7-2, VIEW A-A. Loosen setscrew (19) securing actuating tube (6) to switch actuating collar (30), hold actuating collar to maintain $.12 \pm .05$ ", hold RIGHT flap in the full UP position and adjust actuating tube (6) IN or OUT as necessary to align with attachment hole in drive pulley (9). Tighten setscrew (19) in accordance with procedures outlined in the following note and secure actuating tube to drive pulley with bolt (18).

NOTE

Thru Aircraft Serials 17262444 and F1721225: Tighten setscrew (19). Aircraft Serials 17262445 thru 17263156 and F1721226 thru F1721234: Apply grade CV sealant to setscrew (19) threads and torque to 45 lb-in. Beginning with Aircraft Serials 17263157 and F1721235: Apply grade CV sealant to setscrew (19) threads and torque to 60 lb-in.

If actuating tube (6) is too long to allow attachment to drive pulley after completion of steps "g", "h" and "i", proceed to step "j."

j. Disconnect push-pull rod (10) at drive pulley (9), then connect actuating tube (6) to drive pulley.

k. Manually hold RIGHT flap in full UP position and readjust push-pull rod (10) to align with attachment hole in drive pulley. Connect push-pull rod and tighten locknuts or castellated nuts and install cotter pins.

NOTE

The right flap and actuator must be correctly rigged before cables and left flap can be rigged.

l. With flaps in full UP position, loosen setscrew (27) and slide up-limit switch adjustment block (28) on support (31) to operate switch (29) and shut-off electrical power to motor at this position. Tighten setscrew (27).

m. Manually hold LEFT flap full UP and connect control cables at turnbuckles (index 6, figure 7-1). Remove reference tags previously installed in step

"f" as turnbuckles are connected.

n. With flaps full UP, adjust turnbuckles to obtain 30 ± 10 pounds tension on cables. Adjust retract cable first.

NOTE

Ensure cables are positioned in pulley grooves and cable ends are positioned correctly at drive pulleys before tightening turnbuckles.

o. Disconnect push-pull rod at left drive pulley. Run motor to extend flaps approximately 20° and check tension on each flap cable. If necessary, re-adjust turnbuckles to maintain 30 ± 10 pounds tension on each cable and safety turnbuckles.

p. Fully retract right flap. Manually hold left flap in full up position and readjust push-pull rod to align with attaching hole in drive pulley. Connect push-pull rod and tighten locknuts or castellated nuts and install cotter pins.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-4.

q. Mount an inclinometer on one flap and adjust to 0° . Extend flaps and check down angle.

r. THRU AIRCRAFT SERIALS 17259904 AND F17200804 WHEN NOT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. After completion of steps "a" thru "q", the flap down angle should be as specified in figure 1-1. Repeat down angle check on opposite flap.

s. BEGINNING WITH AIRCRAFT SERIALS 172-59905, F17200805 AND ALL AIRCRAFT MODIFIED IN ACCORDANCE WITH FIGURE 7-2, SHEET 3. After completion of steps "a" through "q", adjust down-limit switch (32) to operate and shut-off electrical power to motor at degree of travel specified in figure 1-1. Repeat down angle check on opposite flap. Check operation of limit switches for positive shut-off through several cycles.

NOTE

Since the flap rollers may not bottom in the flap tracks with flaps fully extended, some free play may be noticed in this position.

t. With flaps full UP, adjust position transmitter (12) in accordance with paragraph 7-16.

u. Perform an operational check in accordance with paragraph 7-3, check all locknuts for tightness, all turnbuckles are saftied, cotter pins installed, and reinstall all items removed for access.