SECTION 8

ELEVATOR CONTROL SYSTEMS

TABLE OF CONTENTS

8-1. ELEVATOR CONTROL SYSTEM.

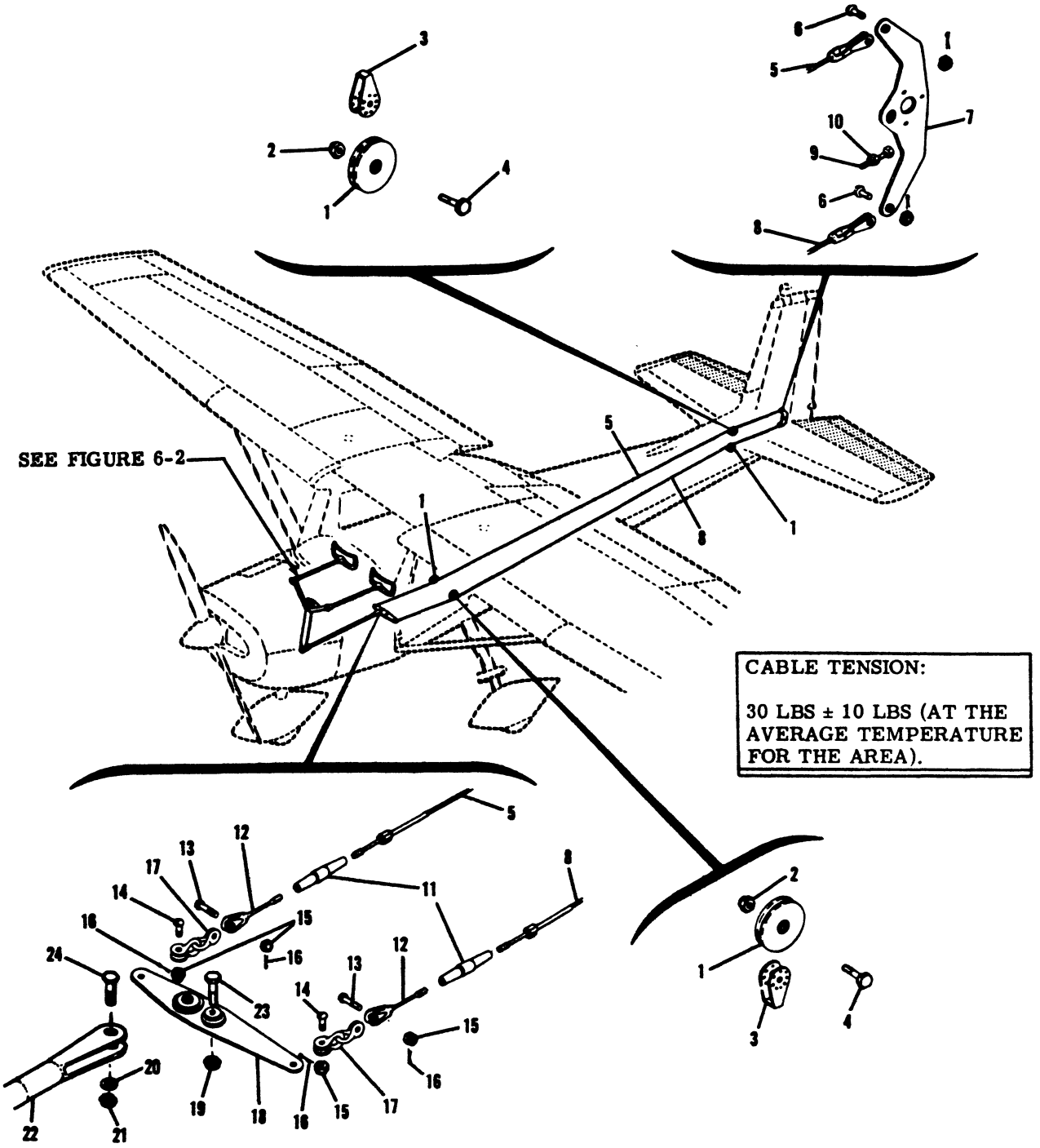
8-2. The elevator control systems for the various models are illustrated in figures 8-1 through 8-4. The forward parts of the systems are operated by four different control installations which are shown in Section 6. On the Models 150, 172, and P172 the elevator control cables are attached directly to a bellcrank installed between the elevators, while on the Models 180, 182, and 185 an additional bellcrank, push-pull tube, and an elevator down-spring are installed in the system.

8-3. TROUBLE SHOOTING.

PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
NO RESPONSE TO CONTROL WHEEL FORE-AND-AFT MOVEMENT.		
Forward or aft push-pull tube disconnected.	Check visually.	Attach push-pull tube correctly.
Cables disconnected.	Check visually.	Attach cables correctly.
BINDING OR JUMPY MOTION FELT IN MOVEMENT OF ELEVATOR SYSTEM.		
Defective forward bellcrank pivot bearing.	Check bellcrank; move to check for play or binding.	Replace bellcrank.
Defective rear bellcrank pivot bearing.	Check bellcrank; move to check for play or binding.	Replace bellcrank.
Cables slack.	Check for correct tension.	Adjust to correct tensions.
Cables not riding correctly on pulleys.	Check cable routing.	Route cables correctly over pulleys.
Defective elevator hinges.	Move elevator by hand, checking hinges.	Replace defective hinges.
Ball socket on instrument panel too tight.	Disconnect universal joint and check binding at panel.	Add washers as necessary between forward socket half and instrument panel.
Clevis bolts too tight.	Check bolt binding.	Readjust to eliminate bolt binding.
Defective control "T," "Y," or "U" pivot bearings.	Disconnect parts and check that control pivots freely.	Replace defective bearings.

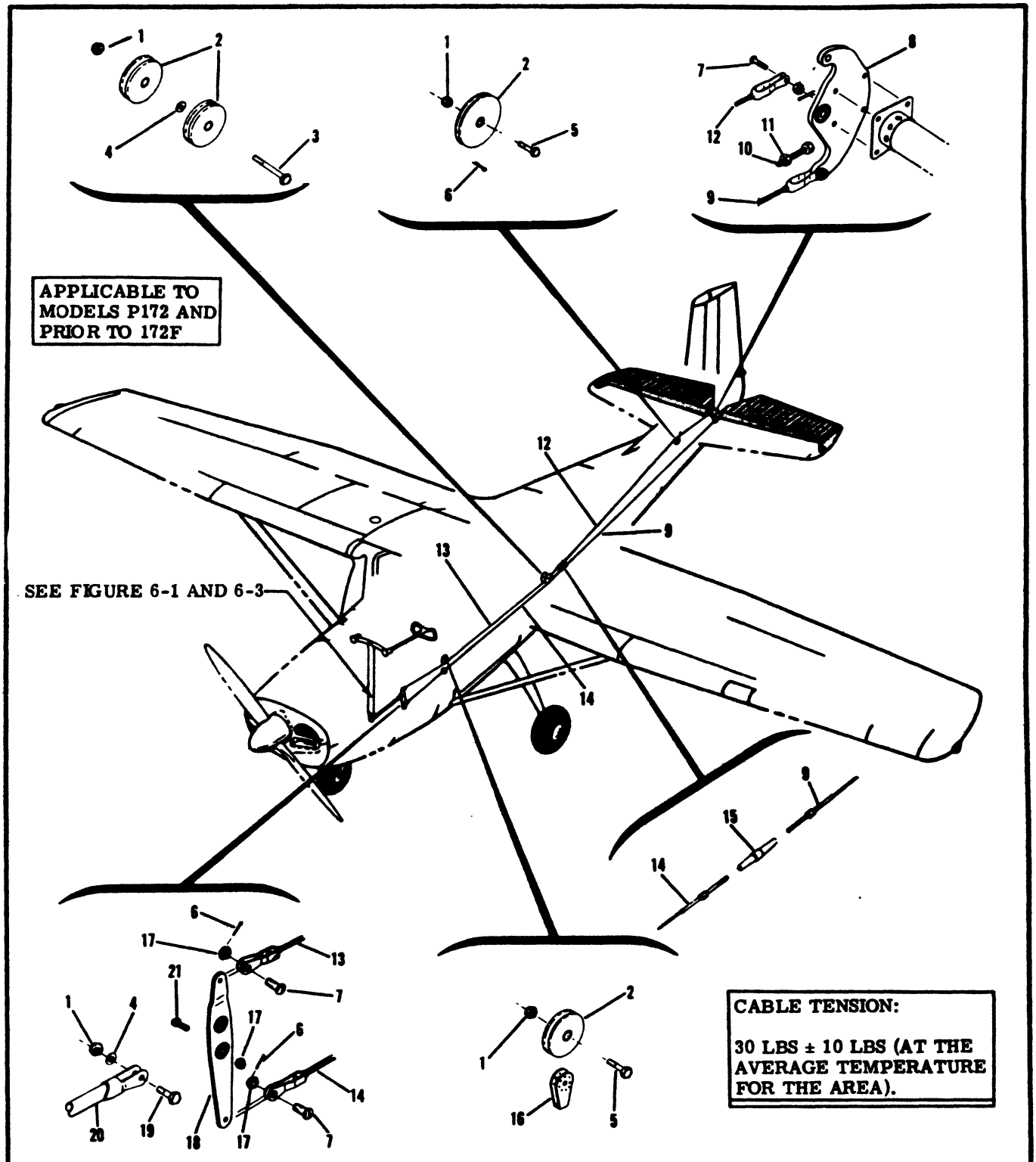
PROBABLE CAUSE	ISOLATION PROCEDURE	REMEDY
BINDING OR JUMPY MOTION FELT IN MOVEMENT OF ELEVATOR SYSTEM (Cont).		
Defective control column needle bearing rollers.	Check visually.	Replace defective rollers.
Defective control column torque tube bearings.	Disconnect parts and check that torque tube rotates freely.	Replace defective bearings.
Glide on aft end of control square tube adjusted too tightly.	Remove control wheel and check glide for binding.	Loosen screw and tapered plug in end of glide enough to eliminate binding.
Lubrication needed.		Lubricate in accordance with figure 2-4.
Defective pulleys or cable guards.	Check manually.	Replace defective parts and install guards properly.
ELEVATOR FAILS TO ATTAIN PRESCRIBED TRAVEL.		
Stops incorrectly set.		Rig per paragraph 8-11.
Cables unevenly tightened.		Rig per paragraph 8-11.
Interference at firewall or instruments.	Check visually.	Rig per paragraph 8-11.
Forward bellcrank stop bolt (Models 180 and 185) adjusted incorrectly.	With rear bellcrank against elevator up stop, check for 1/8 inch clearance at forward bellcrank up stop.	Adjust per paragraph 8-11.

SHOP NOTES:



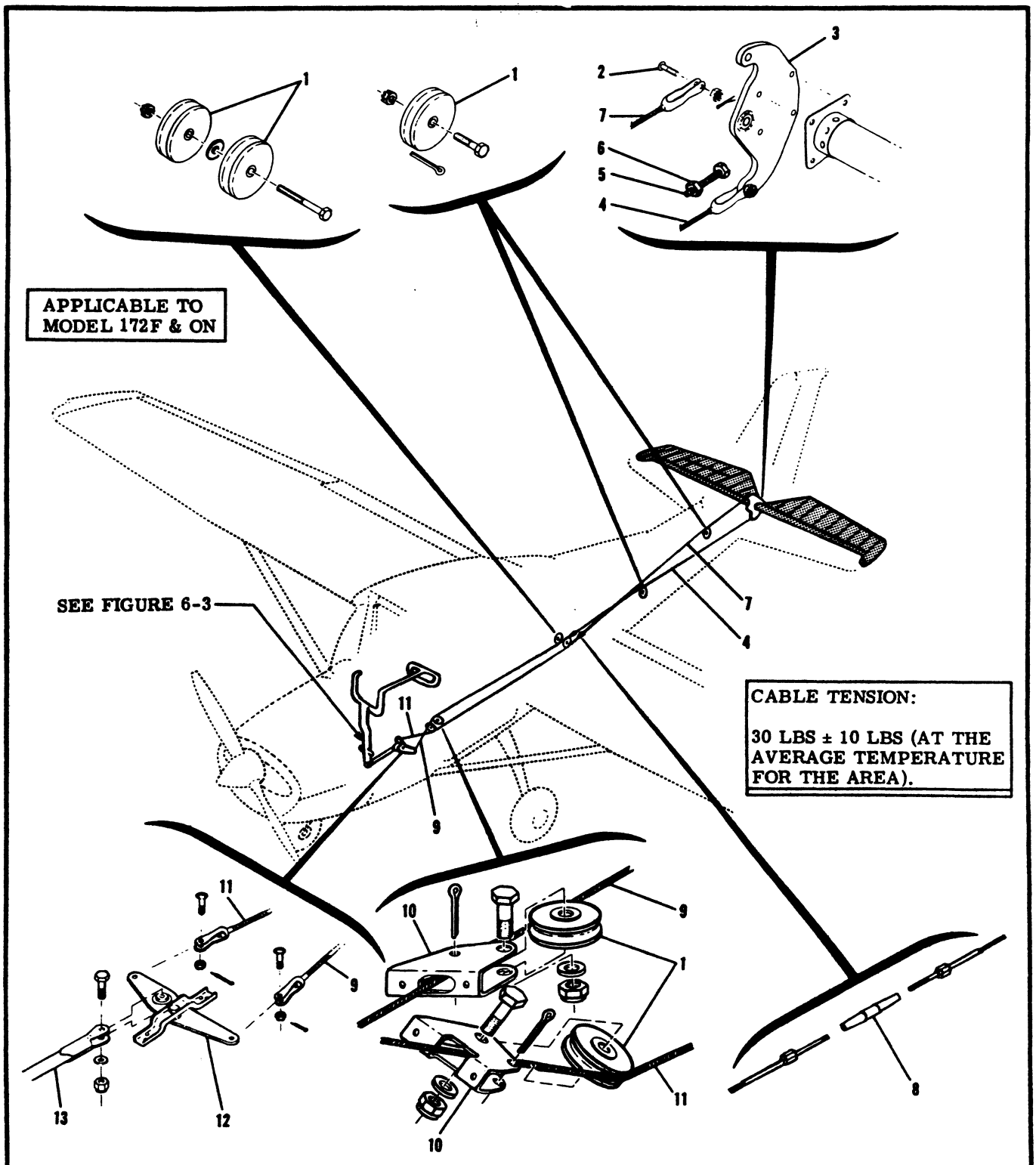
1. Pulley
2. Nut
3. Guard
4. Bolt
5. Up Cable
6. Bolt
7. Elevator Bellcrank
8. Down Cable
9. Elevator Travel Stop
10. Jam Nut
11. Turnbuckle
12. Cable Fork
13. Bolt
14. Clevis Bolt
15. Nut
16. Cotter Pin
17. Link
18. Forward Bellcrank
19. Nut
20. Washer
21. Nut
22. Push-Pull Tube
23. Bolt
24. Bolt

Figure 8-1. Elevator Control System - Model 150



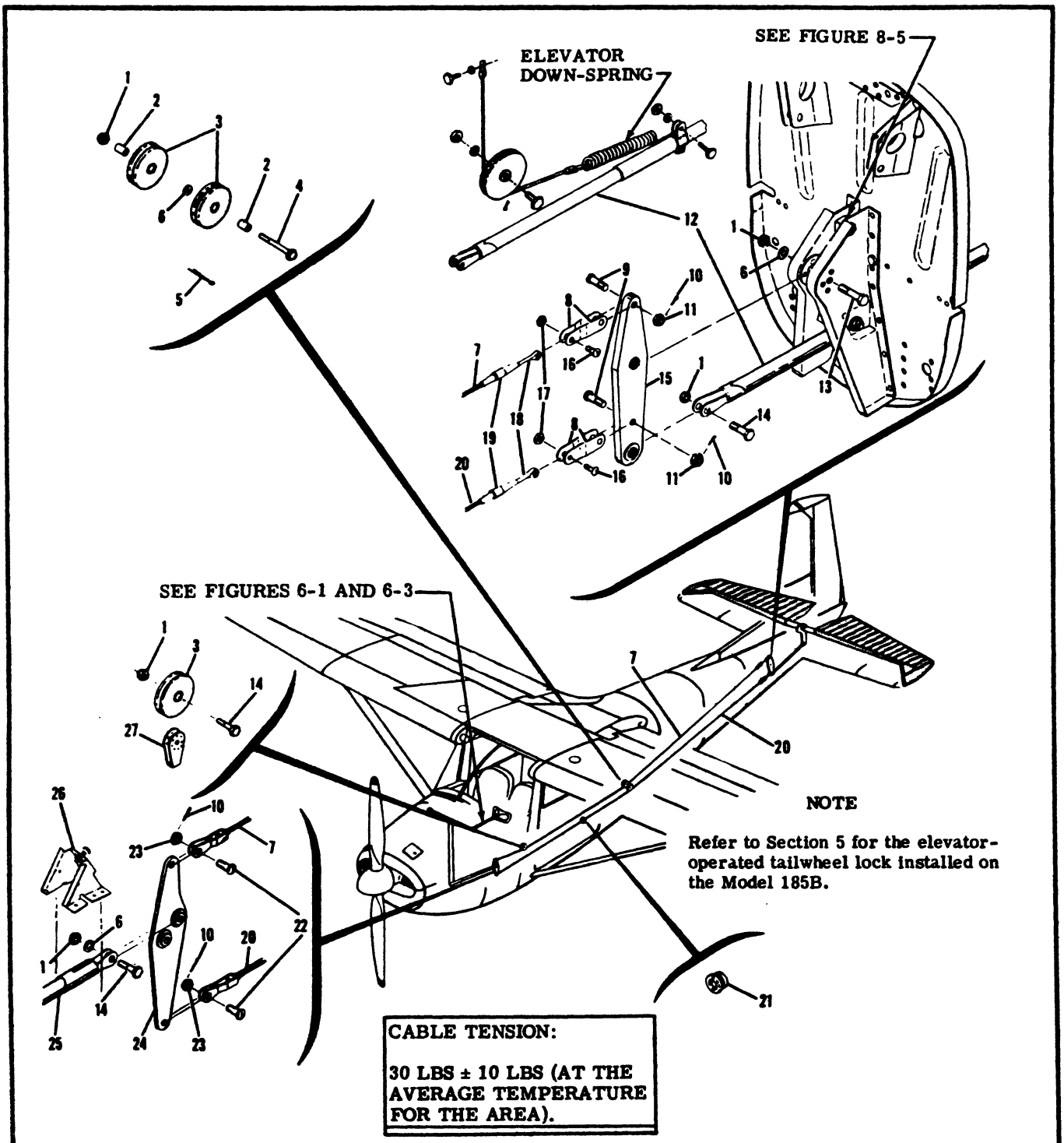
1. Nut
2. Pulleys
3. Bolt
4. Washer
5. Bolt
6. Cotter Pin
7. Clevis Bolt
8. Elevator Bellcrank
9. Rear Down Cable
10. Elevator Travel Stop
11. Jam Nut
12. Rear Up Cable
13. Forward Up Cable
14. Forward Down Cable
15. Turnbuckle
16. Cable Guard
17. Nut
18. Forward Bellcrank
19. Bolt
20. Elevator Push-Pull Rod
21. Bolt

Figure 8-2. Elevator Control System - Models 172 and P172 (Sheet 1 of 2)



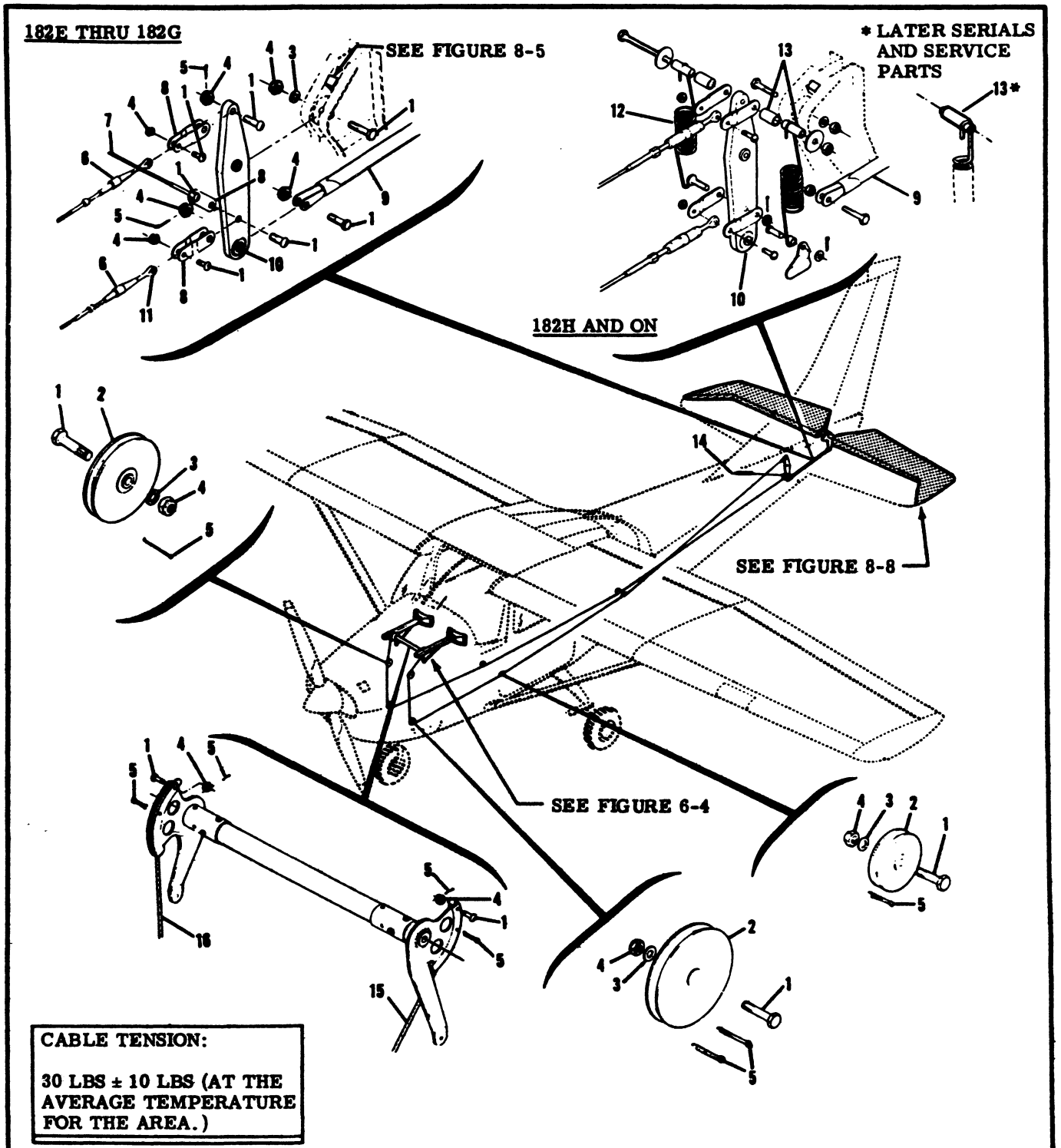
1. Pulley
2. Clevis Bolt
3. Elevator Bellcrank
4. Rear Down Cable
5. Elevator Travel Stop
6. Jam Nut
7. Rear Up Cable
8. Turnbuckle
9. Forward Down Cable
10. Bracket
11. Forward Up Cable
12. Forward Bellcrank
13. Elevator Push-Pull Rod

Figure 8-2. Elevator Control System - Models 172 and P172 (Sheet 2 of 2)



1. Nut
2. Spacer
3. Pulley
4. Bolt
5. Cotter Pin
6. Washer
7. Up Cable
8. Links
9. Bolt
10. Cotter Pin
11. Nut
12. Push-Pull Tube
13. Bolt
14. Bolt
15. Rear Bellcrank
16. Clevis Bolt
17. Nut
18. Turnbuckle Eye
19. Turnbuckle
20. Down Cable
21. Fairlead
22. Clevis Bolt
23. Nut
24. Forward Bellcrank
25. Push-Pull Tube
26. Bellcrank Stop
27. Cable Guard

Figure 8-3. Elevator Control System - Models 180 and 185



1. Bolt
2. Pulley
3. Washer
4. Nut
5. Cotter Pin
6. Turnbuckle
7. Elevator Down-Spring Cable
8. Link
9. Push-Pull Tube
10. Bellcrank
11. Turnbuckle Eye
12. Down-Spring
13. Spacer
14. Down-Spring
15. Left (Up) Elevator Cable
16. Right (Down) Elevator Cable

Figure 8-4. Elevator Control System - Model 182

8-4. REPLACEMENT OF COMPONENTS.

8-5. ELEVATORS.

a. Remove stinger on Models 180, 182, and 185.

b. When removing an elevator with an attached trim tab, disconnect the trim tab push-pull tube at the trim tab. Do not move the trim control wheel or rotate the actuator screw while the trim tab is disconnected, or the trim system will have to be rerigged.

c. Remove bolts attaching elevators to elevator pylon or arm assembly.

d. On some Model 185 airplanes, a tailwheel anti-swiveling lock cable must be disconnected from the elevator pylon or arm assembly.

e. Remove bolts at each elevator hinge point and remove elevator.

f. Reverse the preceding steps to install the elevators. Check elevator and elevator trim tab travels, and rerig if necessary.

8-6. CONTROL COLUMN replacement is described in Section 6.

8-7. REAR BELLCRANK (Models 180, 182, and 185).

a. On all tricycle gear airplanes, position a support stand under the tail tie-down ring to prevent the tailcone from dropping while working inside the tailcone.

b. Loosen elevator cables at turnbuckles in aft tailcone, then disconnect elevator cables from rear bellcrank.

c. Disconnect elevator down-spring system at the rear bellcrank on the Model 182. On the Models 180 and 185, the down-spring system need not be disconnected if care is used when disconnecting the rear push-pull tube.

d. Disconnect rear push-pull tube at rear bellcrank.

e. Remove bellcrank by removing bolt attaching it to support bracket.

f. Reverse the preceding steps to install the rear bellcrank. Refer to paragraph 8-11 for rigging procedure.

NOTE

The elevator pylon or arm assembly, to which each elevator is attached, can be removed without removing the elevators. Remove stinger, disconnect rear push-pull tube, remove bolts attaching elevators to the pylon or arm assembly, and remove pivot bolt. On some Model 185 airplanes, the tailwheel anti-swiveling lock cable must be disconnected from the pylon or arm assembly.

8-8. REAR BELLCRANK (Models 150, 172, and P172).

a. Remove rudder.

b. Remove bolts attaching elevators to rear bellcrank, and either support elevators at inboard ends or remove elevators.

c. Loosen elevator cable turnbuckles, then disconnect elevator cables from rear bellcrank.

d. Remove bellcrank pivot bolt and remove bellcrank. On the Model 150, it may be necessary to remove one of the stabilizer attaching bolts for clearance when removing the bellcrank pivot bolt.

e. Install the rear bellcrank by reversing the preceding steps. Refer to paragraph 8-11 for rigging procedure.

8-9. FORWARD BELLCRANK (All Models except Model 182). Refer to Section 6 for removal of forward components in the Model 182.

NOTE

Access to the forward bellcrank on the Model 150 is gained by removing large access plates from the front seat pans. Access to the forward bellcrank on the Model 172F and on is gained by removing access plates from the floor just aft of the pedestal console. On other models, remove front seats, tunnel cover plate, and access plate on the underside of the fuselage adjacent to the bellcrank.

a. Loosen elevator cables at turnbuckles, then disconnect cables from bellcrank.

b. Disconnect forward push-pull tube from bellcrank.

c. Remove bellcrank pivot bolt and remove bellcrank.

d. Install the forward bellcrank by reversing the preceding steps. Refer to paragraph 8-11 for rigging procedure.

8-10. CABLES in the elevator control system can be removed and installed more easily if a guide wire is attached to one end and the cable pulled out from the opposite end. Leave the guide wire in place to aid installation. Pulleys and cable guards must be removed before cables can be removed. When cables are installed, be sure that cables are in pulley grooves, cable guards are installed, and turnbuckles are safetied. Refer to paragraph 8-11 for rigging procedure.

8-11. RIGGING.

NOTE

An inclinometer for measuring control surface travel is available from the Cessna Service Parts Center. Refer to figure 6-12.

8-12. Models 150, 172, and P172 are equipped with adjustable elevator stop bolts, the heads of which contact the rear elevator bellcrank to limit travel. The Model 182 is equipped with elevator stops which are four-sided bushings, drilled off-center so they may be rotated to any one of four positions to attain correct travel. Each 90-degree rotation changes elevator travel approximately one degree. Travels are relative to horizontal stabilizer. Neutral position of elevators is the position where elevators are streamlined with the stabilizer. Disregard counterweight areas of elevators when streamlining, since some

models have these areas contoured to streamline elevator tips in cruise flight.

a. Set elevator stops to attain travel specified for particular model in the applicable chart in Section 1.

b. Tighten elevator cables to tension shown on applicable illustration in this section. Turnbuckles should be adjusted so the control column does not contact the instrument panel in the full-up position and the forward bellcrank does not contact the firewall in the full-down position.

c. Models 150, 172, and P172 are not equipped with an elevator down-spring system. On the Model 182, the down-spring is not adjustable.

d. Check that all safeties are installed, all parts are secure, then reinstall all parts removed for access.

WARNING

Be sure elevators move in the correct direction when operated by the control wheel.

8-13. The Models 180 and 185 are equipped with two elevator stops, attached to the rear elevator bellcrank bracket (see figure 8-5). These stops are four-sided bushings, drilled off-center so they may be rotated to any one of four positions to attain control travel. Each 90-degree rotation changes elevator travel approximately one degree.

a. With horizontal stabilizer leading edge full down, set elevator stop bushings to attain travel specified in applicable chart in Section 1.

NOTE

An additional stop bolt is located at the forward bellcrank on Models 180 and 185. Adjust this stop bolt for 1/8 inch clearance from the forward bellcrank, while the rear bellcrank is against the rear up-stop. The purpose of this additional stop bolt is to furnish a positive stop, so that excessive back pressure on the control wheel will not stretch control cables and allow instrument panel to be contacted with control column.

b. Tighten elevator cables to tension shown in figure 8-3. Adjust turnbuckles so control column does not contact instrument panel in full-up position, and forward bellcrank does not contact firewall in full-down position.

c. With horizontal stabilizer leading edge full-down, adjust elevator down-spring tension by moving down-spring clamp along the rear push-pull tube. Position clamp in approximately position indicated in figure 8-5.

d. Check that all safeties are installed, all parts are secure, then reinstall all parts removed for access.

WARNING

Be sure elevators move in the correct direction when operated by the control wheel.

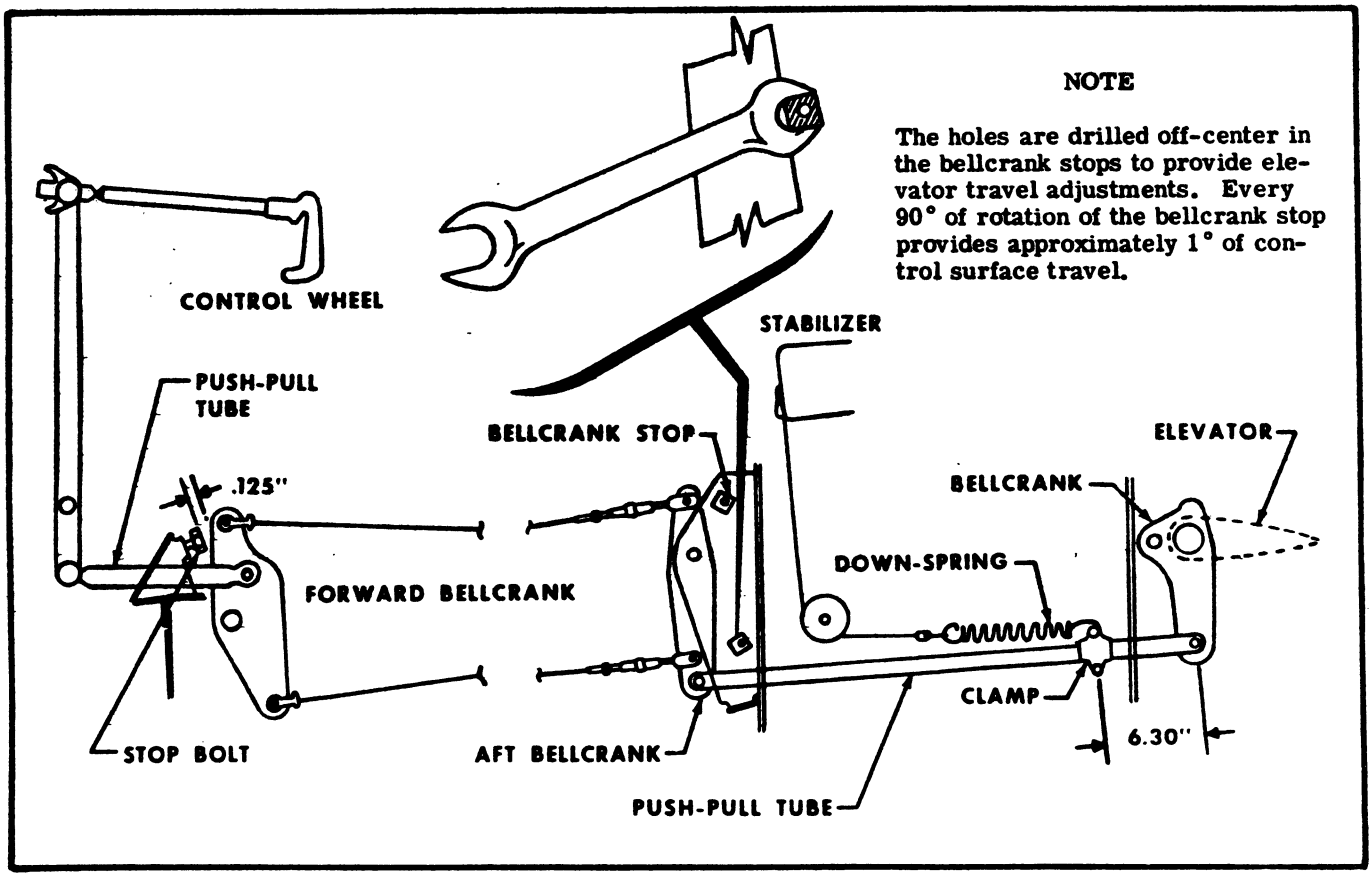
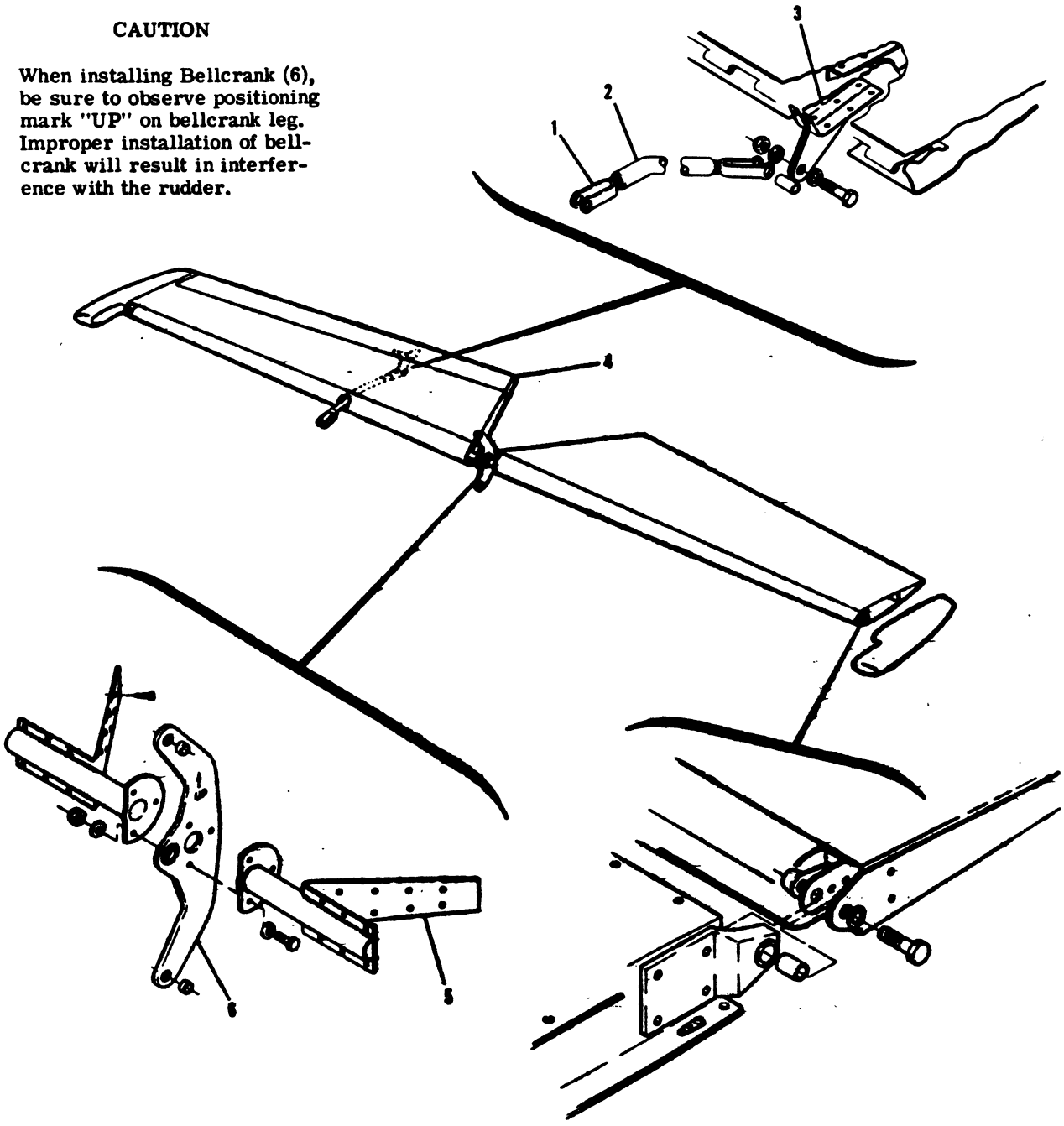


Figure 8-5. Rigging Elevator System (Models 180 & 185)

CAUTION

When installing Bellcrank (6), be sure to observe positioning mark "UP" on bellcrank leg. Improper installation of bellcrank will result in interference with the rudder.

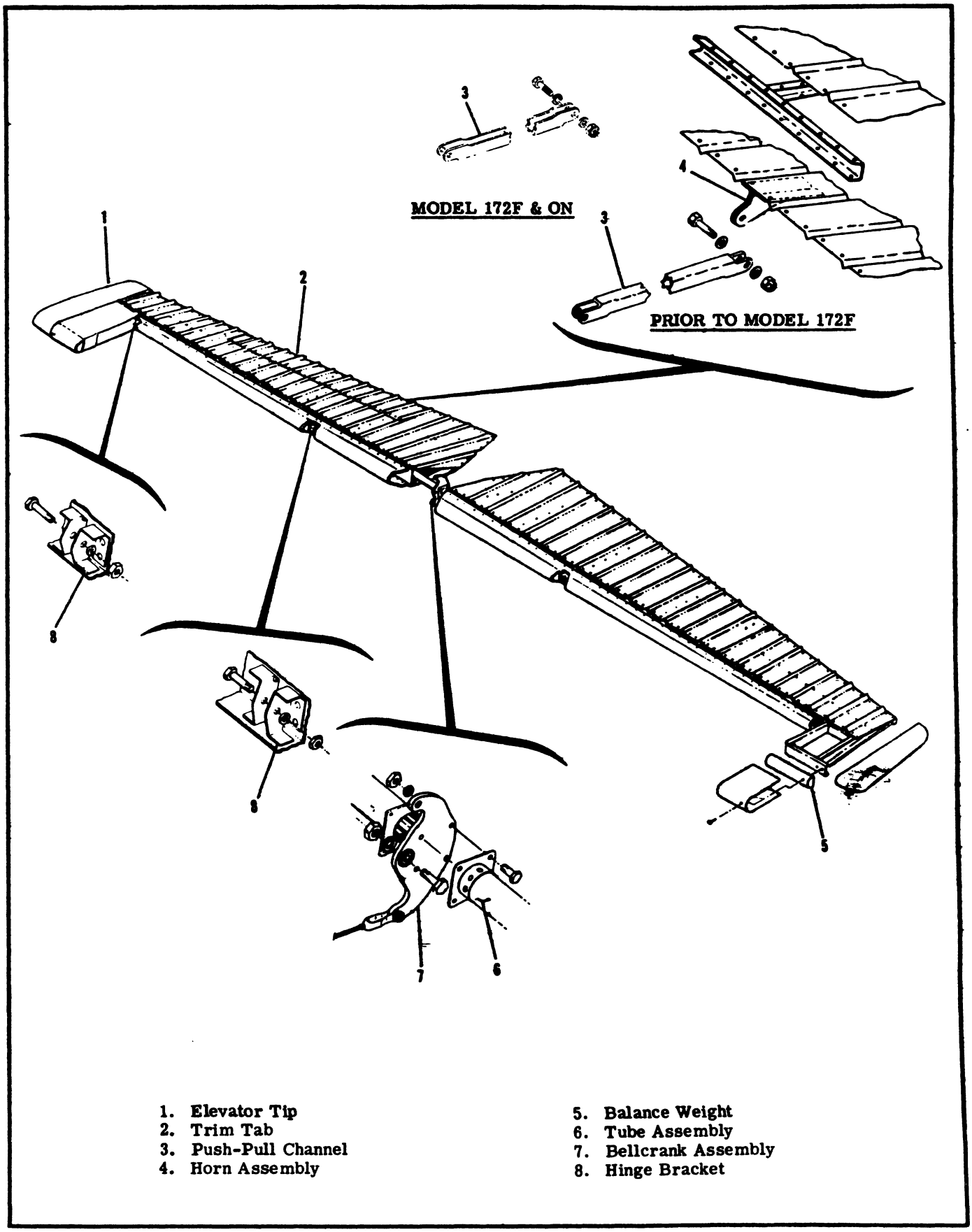


1. Clevis
2. Rod Assembly
3. Horn Assembly
4. Trim Tab
5. Tube Assembly
6. Bellcrank

NOTE

Beginning with the Model 150D, an aerodynamic balance weight is included in each elevator tip.

Figure 8-6. Elevator Installation - Model 150



1. Elevator Tip
2. Trim Tab
3. Push-Pull Channel
4. Horn Assembly
5. Balance Weight
6. Tube Assembly
7. Bellcrank Assembly
8. Hinge Bracket

Figure 8-7. Elevator Installation - Model 172 and P172

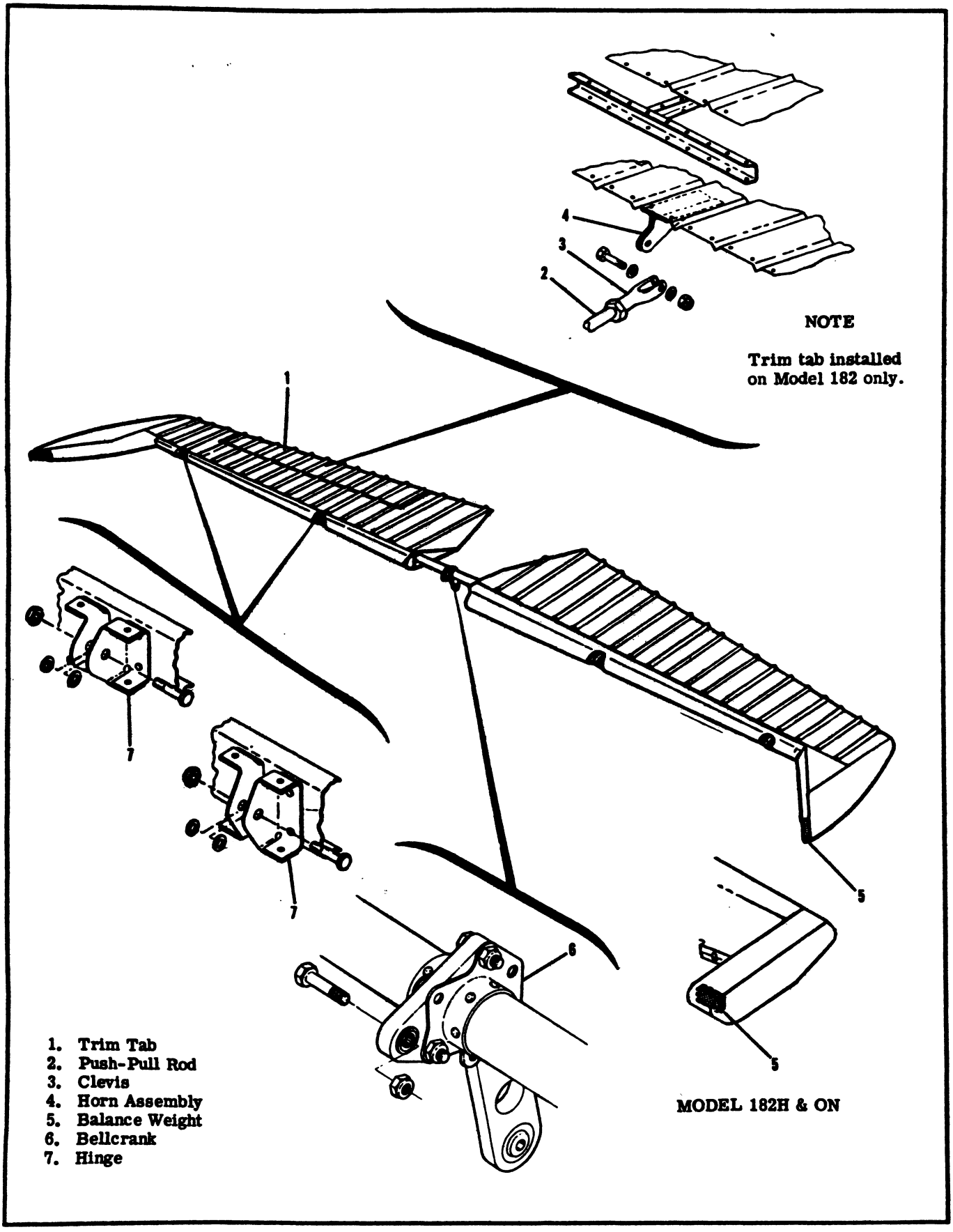


Figure 8-8. Elevator Installation - Models 180, 182, and 185