SECTION 6

AILERON CONTROL SYSTEM

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6-1. AILERON CONTROL SYSTEM. (Refer to figure 6-1.)

6-2. DESCRIPTION. The aileron control system is comprised of push-pull rods, bellcranks, cables, pulleys, sprockets and roller chains, all of which, link the control wheels to the ailerons. A control "U" interconnects the control wheels to the aileron cables.

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.	Adjust cables to proper tension.
	Broken pulley or bracket, cable off pulley or worn rod end bearings.	Replace worn or broken parts, install cables correctly.
	Sprung bellcranks.	Replace bellcranks.
	Loose chains.	Adjust to proper tension.

6-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
RESISTANCE TO CONTROL WHEEL MOVEMENT.	Cables too tight.	Adjust cables to proper tension.
	Pulleys binding or cable off.	Replace defective pulleys. Install cables correctly.
	Bellcrank distorted or damaged.	Replace bellcrank.
	Clevis bolts in system too tight.	Loosen, then tighten properly and safety.
	Rusty chain.	Replace chain.
	Chain binding with sprockets.	Replace defective parts.
	Defective U-joints.	Replace defective U-joints.
CONTROL WHEELS NOT LEVEL WITH AILERONS NEUTRAL.	Improper adjustment of chains or cables.	Adjust in accordance with paragraph 6-18.
	Improper adjustment of aileron push-pull rods.	Adjust push-pull rods to obtain proper alignment.
DUAL CONTROL WHEELS NOT COORDINATED.	Chains improperly adjusted.	Adjust in accordance with paragraph 6-18.
INCORRECT AILERON TRAVEL.	Push-pull rods not adjusted properly.	Adjust in accordance with paragraph 6-18.
	Worn bellcrank stop bushings or bellcrank slots.	Replace worn parts.

SHOP NOTES:

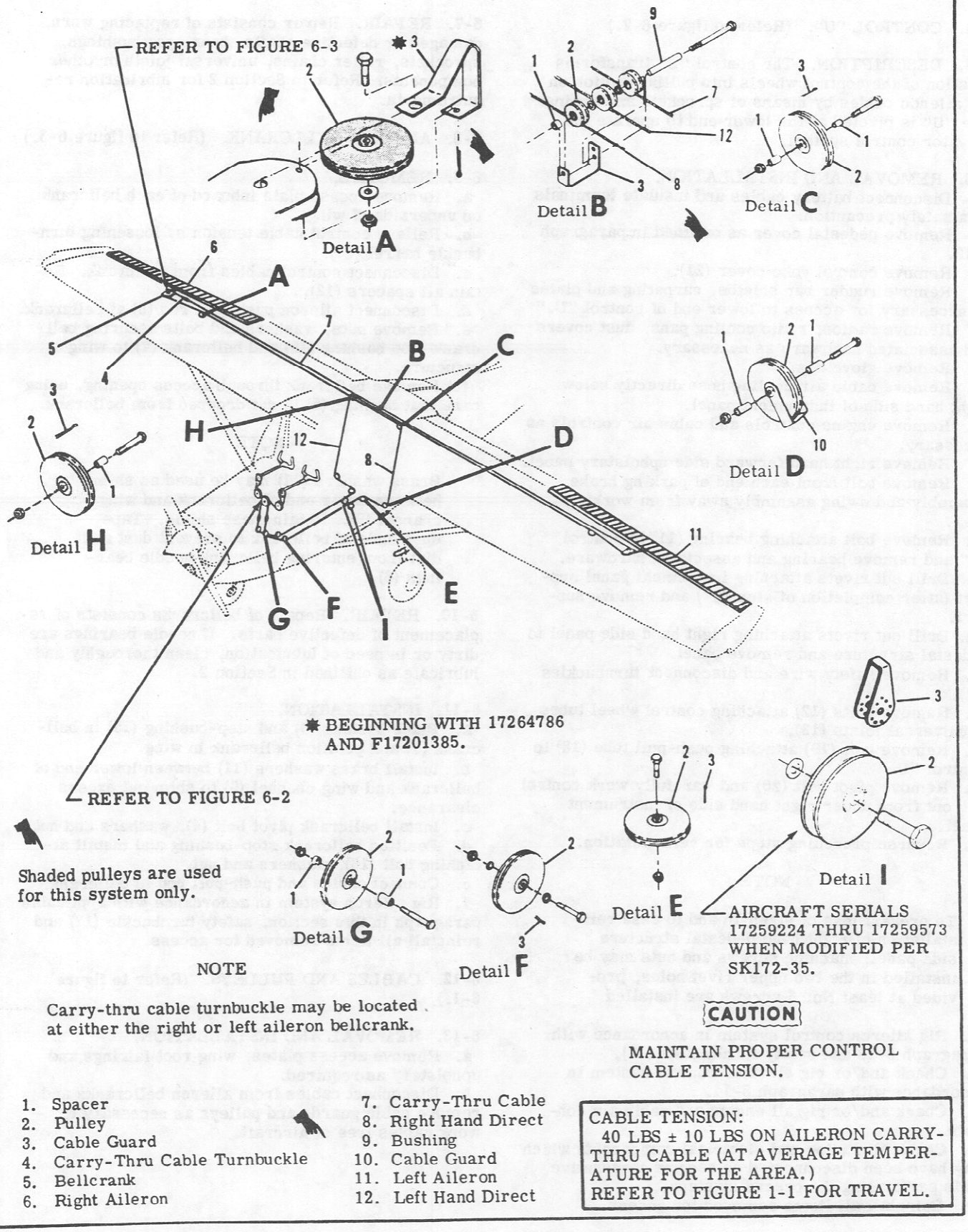


Figure 6-1. Aileron Control System

6-4. CONTROL "U". (Refer to figure 6-2.)

6-5. DESCRIPTION. The control "U" transforms rotation of the control wheels into pulling motion on the aileron cables by means of sprockets and chains. The "U" is pivoted at the lower end to operate the elevator control system.

6-6. REMOVAL AND INSTALLATION.

a. Disconnect battery cables and insulate terminals as a safety precaution.
b. Remove pedestal cover as outlined in paragraph 9-13.
c. Remove control yoke cover (21).
d. Remove rudder bar shields, carpeting and plates as necessary for access to lower end of control "U."
e. Remove radios, radio cooling pans, dust covers and associated hardware as necessary.
f. Remove glove box.
g. Remove cabin air cooling hose directly below right hand side of instrument panel.
h. Remove engine controls and cabin air controls as necessary.
i. Remove right hand forward side upholstery panel.
j. Remove bolt from each end of parking brake assembly and swing assembly away from working area.
k. Remove bolt attaching bearing (11) to control "U" and remove bearing and associated hardware.
l. Drill out rivets attaching instrument panel support (after completion of step "k") and remove support.
m. Drill out rivets attaching right hand side panel to pedestal structure and remove panel.
n. Remove safety wire and disconnect turnbuckles (17).
o. Remove bolts (12) attaching control wheel tubes to universal joints (13).
p. Remove bolt (19) attaching push-pull tube (18) to Control "U."
q. Remove pivot bolt (20) and carefully work control "U" out from under right hand side of instrument panel.
r. Reverse preceding steps for reinstallation.

NOTE

To prevent loss of strength and to ease reinstallation of right hand pedestal structure side panel, machine screws and nuts may be installed in the two upper rivet holes, provided at least No. 6 screws are installed.

s. Rig aileron control system in accordance with paragraph 6-18 and safety turnbuckles (17).
t. Check and/or rig elevator control system in accordance with paragraph 8-14.
u. Check and/or rig all engine and cabin air controls.
v. Check all radios and electrical components which may have been disconnected or become inoperative while performing the preceding steps.
w. Reinstall all items removed for access.

6-7. REPAIR. Repair consists of replacing worn, damaged or defective shafts, bearings, bushings, sprockets, roller chains, universal joints or other components. Refer to Section 2 for lubrication requirements.

6-8. AILERON BELLCRANK. (Refer to figure 6-3.)

6-9. REMOVAL.

a. Remove access plate inboard of each bellcrank on underside of wing.
b. Relieve control cable tension by loosening turnbuckle barrel (17).
c. Disconnect control cables from bellcrank. Retain all spacers (12).
d. Disconnect aileron push-pull rod (8) at bellcrank.
e. Remove nuts, washers and bolts securing bellcrank stop bushing (15) and bellcrank (7) to wing structure.
f. Remove bellcrank through access opening, using care that bushing (5) is not dropped from bellcrank.

NOTE

Brass washers (11) may be used as shims between lower end of bellcrank and wing channel (9). Retain these shims. Tape open ends of bellcrank to prevent dust and dirt from entering bellcrank needle bearings (6).

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.

a. Place bushing (5) and stop-bushing (15) in bellcrank (7) and position bellcrank in wing.
b. Install brass washers (11) between lower end of bellcrank and wing channel (9) to shim out excess clearance.
c. Install bellcrank pivot bolt (4), washers and nut.
d. Position bellcrank stop-bushing and install attaching bolt (16), washers and nut.
e. Connect cables and push-pull rod to bellcrank.
f. Rig aileron system in accordance with applicable paragraph in this section, safety turnbuckle (17) and reinstall all items removed for access.

6-12. CABLES AND PULLEYS. (Refer to figure 6-1.)

6-13. REMOVAL AND INSTALLATION.

a. Remove access plates, wing root fairings and upholstery as required.
b. Disconnect cables from aileron bellcranks and remove cable guards and pulleys as necessary to work cables free of aircraft.

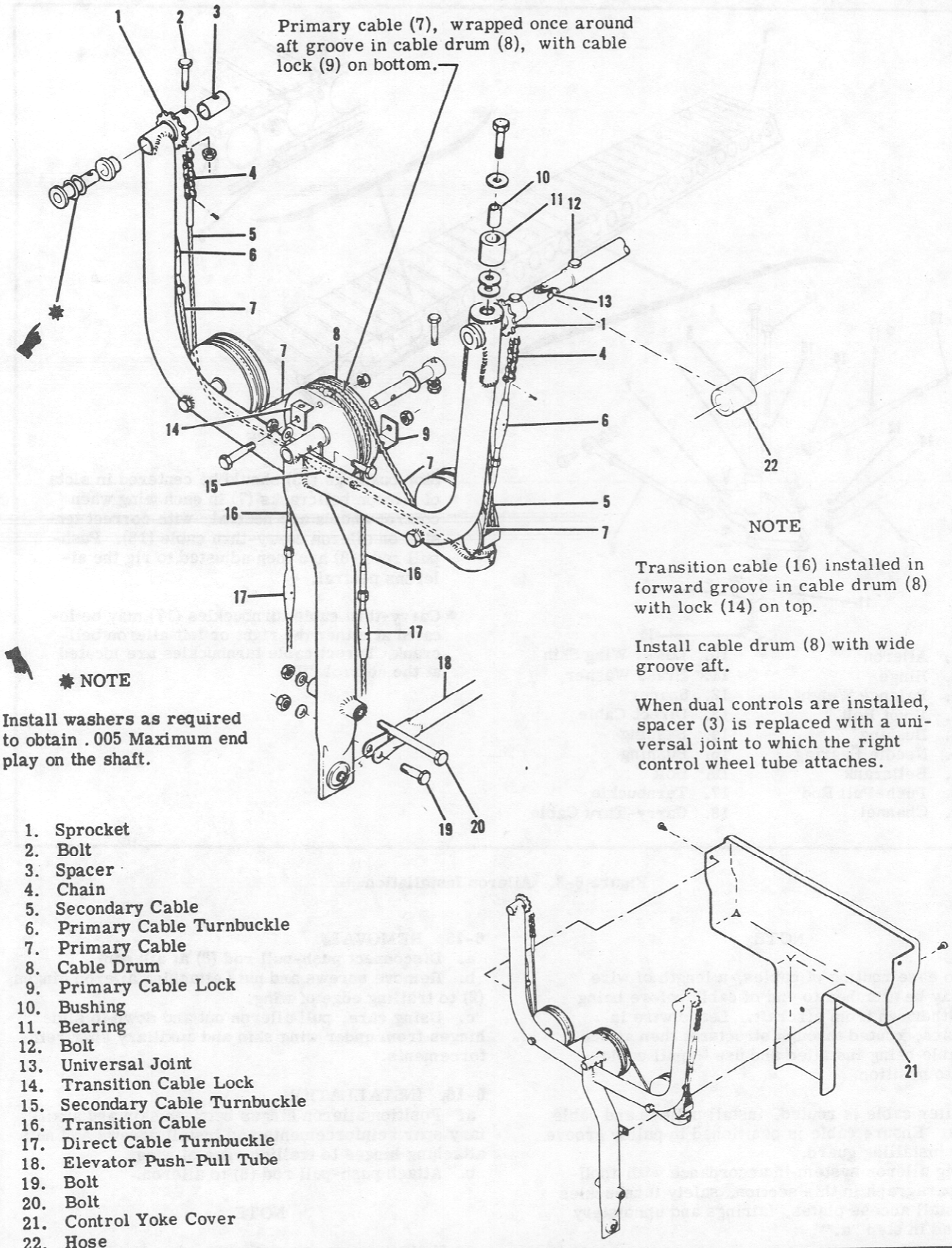
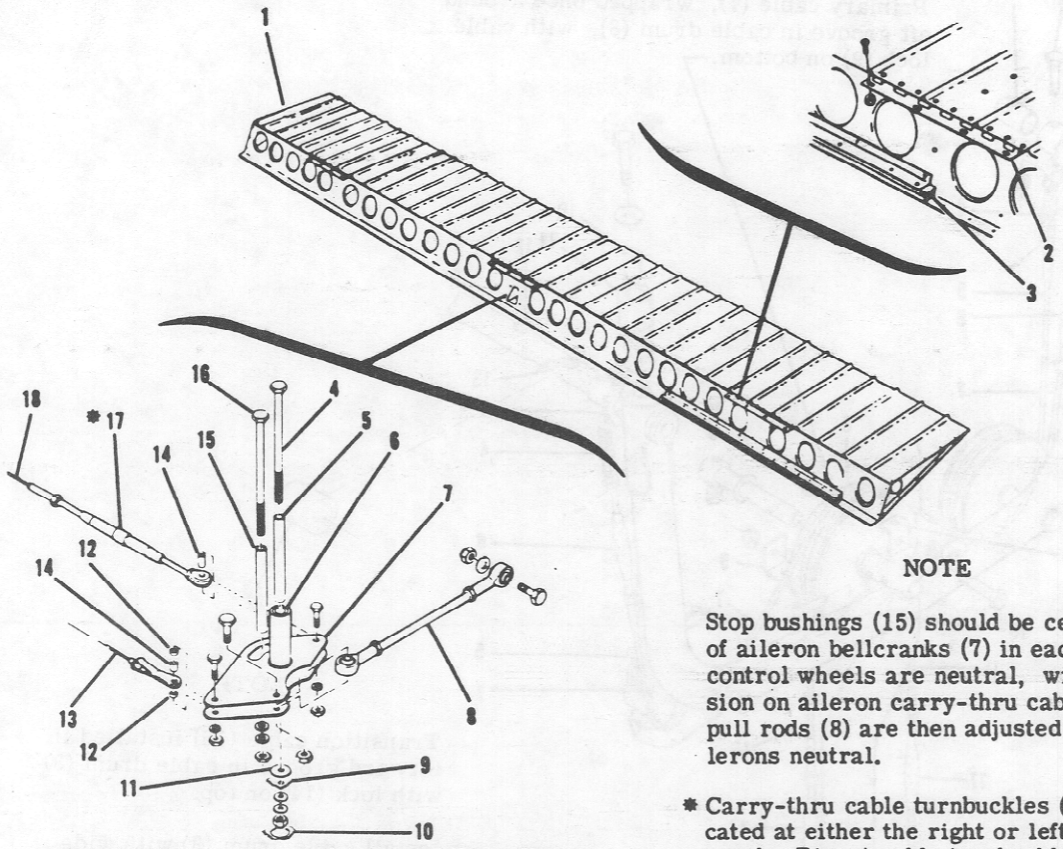


Figure 6-2. Control "U" Installation



1. Aileron
2. Hinge
3. Balance Weight
4. Pivot Bolt
5. Bushing
6. Needle Bearing
7. Bellcrank
8. Push-Pull Rod
9. Channel
10. Lower Wing Skin
11. Brass Washer
12. Spacer
13. Direct Cable
14. Bushing
15. Bushing
16. Bolt
17. Turnbuckle
18. Carry-Thru Cable

NOTE

Stop bushings (15) should be centered in slots of aileron bellcranks (7) in each wing when control wheels are neutral, with correct tension on aileron carry-thru cable (18). Push-pull rods (8) are then adjusted to rig the ailerons neutral.

*** Carry-thru cable turnbuckles (17) may be located at either the right or left aileron bellcrank. Direct cable turnbuckles are located at the control "U".**

Figure 6-3. Aileron Installation

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.

c. After cable is routed, install pulleys and cable guards. Ensure cable is positioned in pulley groove before installing guard.

d. Rig aileron system in accordance with applicable paragraph in this section, safety turnbuckles and install access plates, fairings and upholstery removed in step "a."

6-14. AILERONS. (Refer to figure 6-3.)

6-15. REMOVAL.

a. Disconnect push-pull rod (8) at aileron.

b. Remove screws and nuts attaching aileron hinges (2) 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 (8) to aileron.

NOTE

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

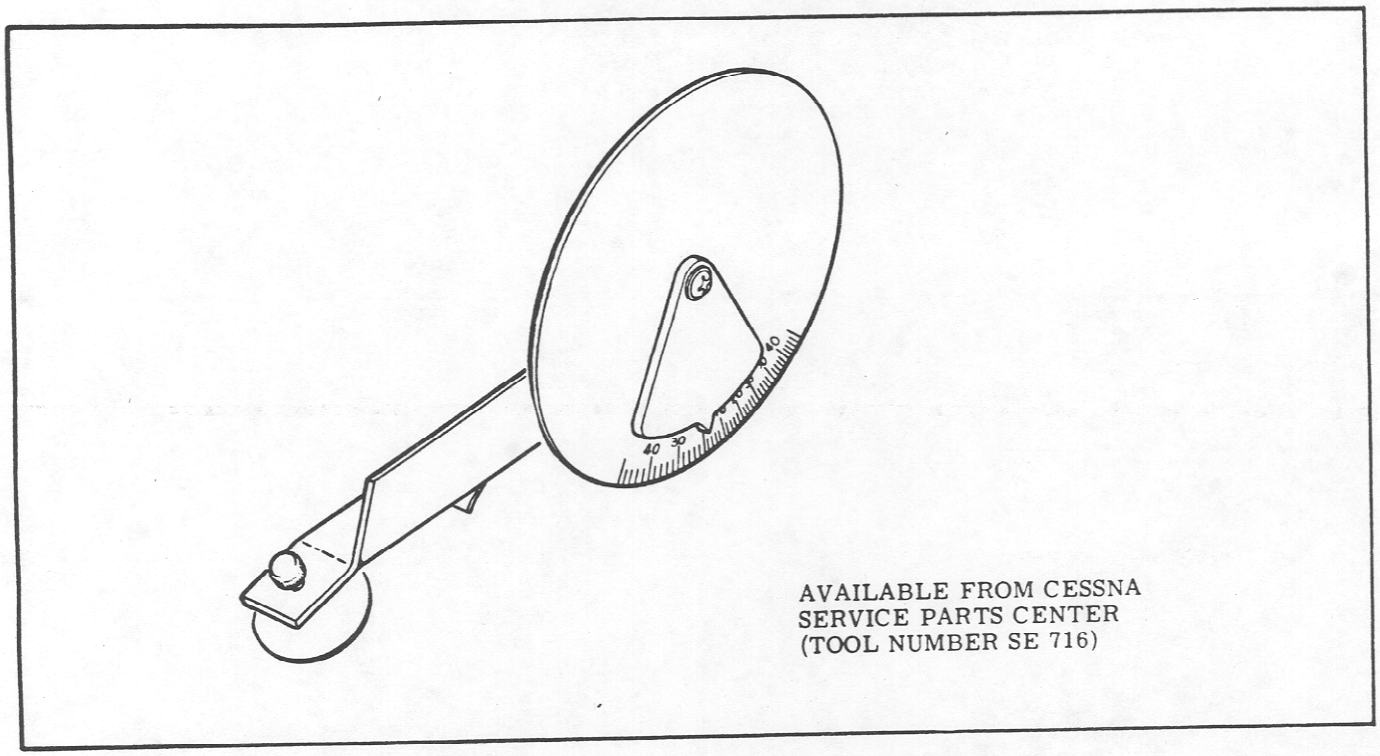


Figure 6-4. Inclinometer for Measuring Control Surface Travel

c. Check aileron travel and alignment, rig if necessary, in accordance with applicable paragraph in this section.

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. (Refer to figure 6-2.)

a. Check primary control cable (7) is in aft groove of cable drum (8) and wrapped once around drum. The primary cable lock (9) is installed at bottom of drum and transition cable lock (14) is installed at top.

b. With control wheels neutral, check chain ends (4) are approximately same distance from sprockets (1).

c. Keeping control wheels neutral, tighten turnbuckles (6) so control wheels are level in neutral position (synchronized), with enough tension on cables to remove slack from chains (4), without binding. Results of adjusting turnbuckles are as follows:

1. Loosening primary cable turnbuckles (6) and tightening secondary cable turnbuckle (15) at center of control "U" will move inboard sides of both control wheels down.

2. Tightening either primary control cable turnbuckle and loosening secondary cable turnbuckle at center of control "U" will move outboard side of applicable control wheel down.

d. Tape a bar across both control wheels to hold them in neutral position.

e. Adjust direct cable turnbuckles (17) below control "U" and single carry-thru turnbuckle (index 17, figure 6-3) at aileron bellcrank (index 7, figure 6-3) so bellcrank stop bushings (index 15, figure 6-3) are centered in both bellcrank slots with 40 ± 10 pounds tension on aileron carry-thru cable (index 18, figure 6-3). Disregard tension on direct cables, which will be different than tension on carry-thru cable.

f. Adjust push-pull rods (index 8, figure 6-3) at each aileron until ailerons are neutral with reference to trailing edge of wing flaps. Be sure wing flaps are fully up when making this adjustment.

g. Safety all turnbuckles by the single-wrap method using 0.040-inch monel safety wire.

h. Remove bar from control wheels and install all items removed for access.

i. Check aileron travel, using inclinometer illustrated in figure 6-4.

WARNING

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