

SECTION 10

RUDDER CONTROL SYSTEM

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10-1. RUDDER CONTROL SYSTEM. (Refer to figure 10-1.)

10-2. DESCRIPTION. Rudder control is maintained through use of conventional rudder pedals which also control nose wheel steering. The system is com-

prised of rudder pedals, cables and pulleys, all of which link the pedals to the rudder and nose wheel steering. Cable tension is automatically determined when the rudder pedals are rigged against return springs 6.50 inches from firewall.

10-3. TROUBLE SHOOTING.

NOTE

Due to remedy procedures in the following trouble shooting chart it may be necessary to re-rig system, refer to paragraph 10-11.

TROUBLE	PROBABLE CAUSE	REMEDY
RUDDER DOES NOT RESPOND TO PEDAL MOVEMENT.	Broken or disconnected cables.	Open access plates and check visually. Connect or replace cables.

10-3. TROUBLE SHOOTING (Cont).

TROUBLE	PROBABLE CAUSE	REMEDY
BINDING OR JUMPY MOVEMENT OF RUDDER PEDALS.	Cables too tight.	Refer to figure 10-2 for distance between firewall and pedals. Rig system in accordance with paragraph 10-11.
	Cables not riding properly on pulleys.	Open access plates and check visually. Route cables correctly over pulleys.
	Binding, broken or defective pulleys or cable guards.	Open access plates and check visually. Replace defective pulleys and install guards properly.
	Pedal bars need lubrication.	Refer to Section 2.
	Defective rudder bar bearings.	If lubrication fails to eliminate binding. Replace bearing blocks.
	Defective rudder hinge bushings.	Check visually. Replace defective bushings.
	Clevis bolts too tight.	Check and readjust bolts to eliminate binding.
	Steering rods improperly adjusted.	Rig system in accordance with paragraph 10-11.
LOST MOTION BETWEEN RUDDER PEDALS AND RUDDER.	Insufficient cable tension.	Refer to figure 10-2 for distance between firewall and pedals. Rig system in accordance with paragraph 10-11.
INCORRECT RUDDER TRAVEL.	Incorrect rigging.	Rig in accordance with paragraph 10-11.

10-4. RUDDER PEDAL ASSEMBLY. (Refer to figure 10-2.)

10-5. REMOVAL AND INSTALLATION.

- Remove carpeting, shields and soundproofing from pedal and tunnel areas as necessary.
- Disconnect master cylinders (12) at pilot rudder pedals.
- Disconnect parking brake cables at master cylinders.
- Remove rudder pedals (2) and brake links (5).
- Thru Aircraft Serial 17263809 and F17201324, relieve cable tension at turnbuckles (index 6, figure 10-1); beginning with Aircraft Serial 17263810 and F17201325, relieve cable tension at clevises (index 11, figure 10-1).
- Disconnect cables, return springs and steering tubes from rudder bars.

- Remove bolts securing bearing blocks (8) and work rudder bars out of tunnel area.

NOTE

Rudder bar assemblies should be checked for excessive wear before installation. The bearing blocks are nylon and require no lubrication unless binding occurs. A few drops of general purpose oil should eliminate such binding.

- Reverse preceding steps for installation. Rig system in accordance with applicable paragraph in this section. Safety turnbuckles or clevises, as applicable, and reinstall all items removed in step "a".

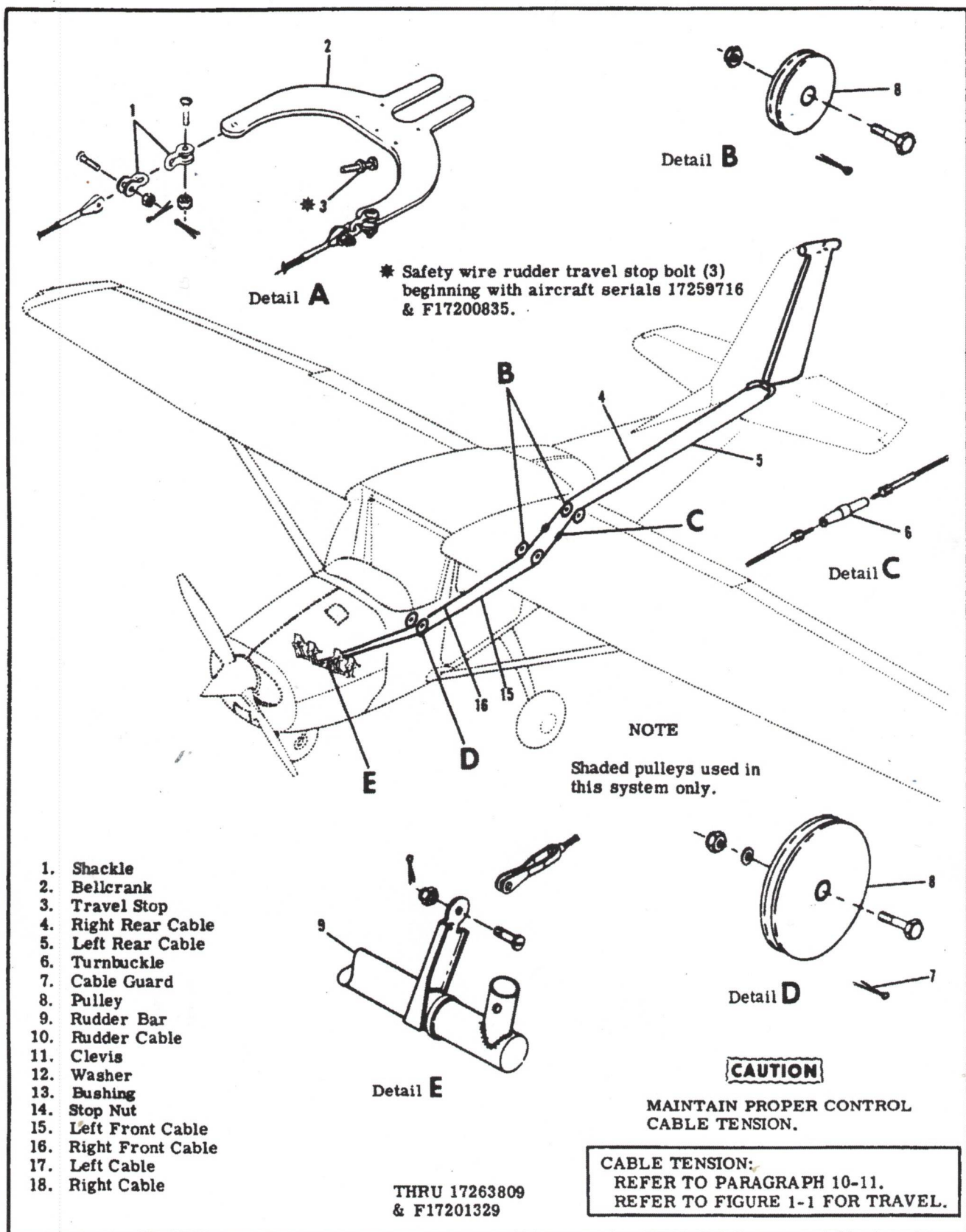


Figure 10-1. Rudder Control System (Sheet 1 of 2)

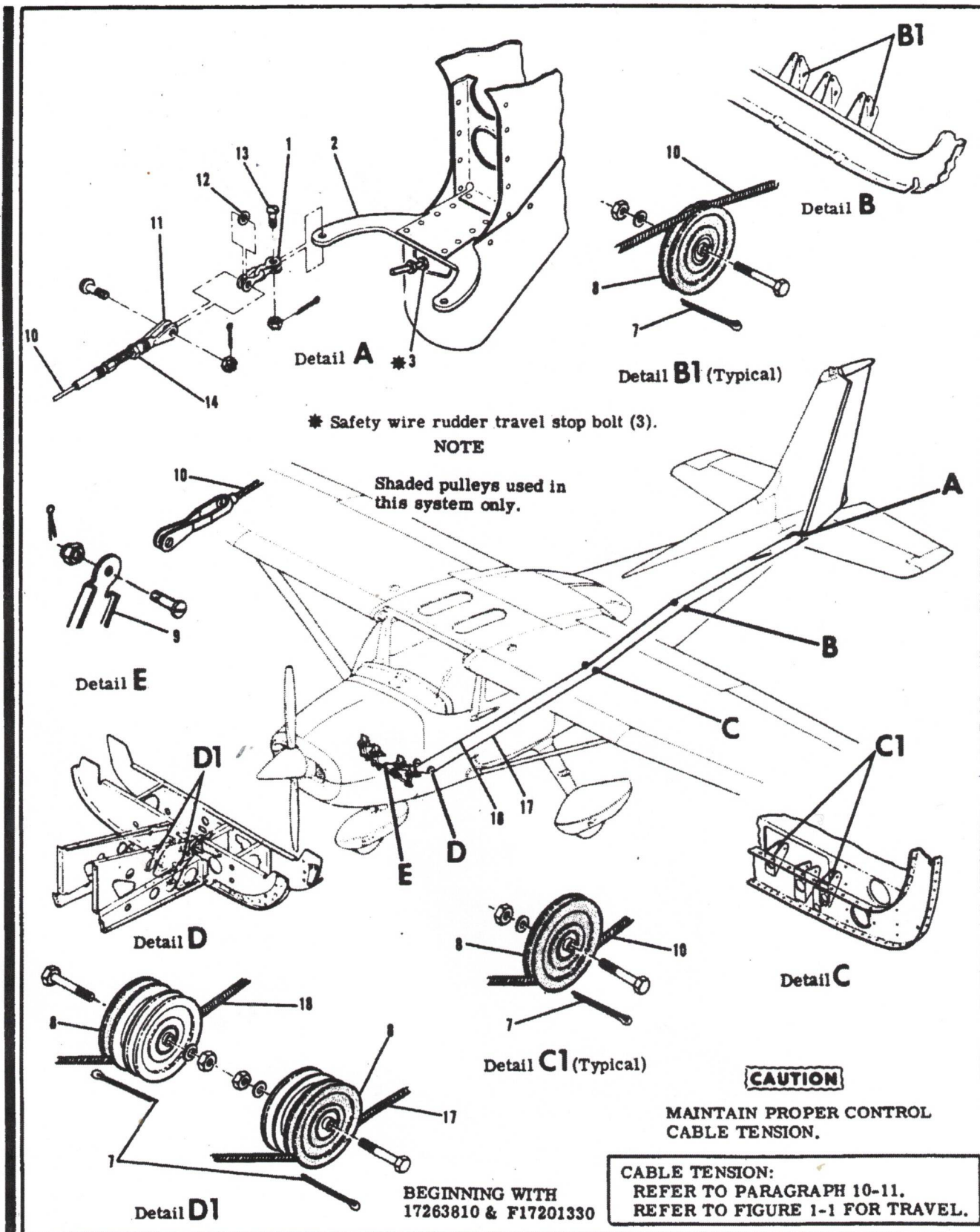


Figure 10-1. Rudder Control System (Sheet 2 of 2)

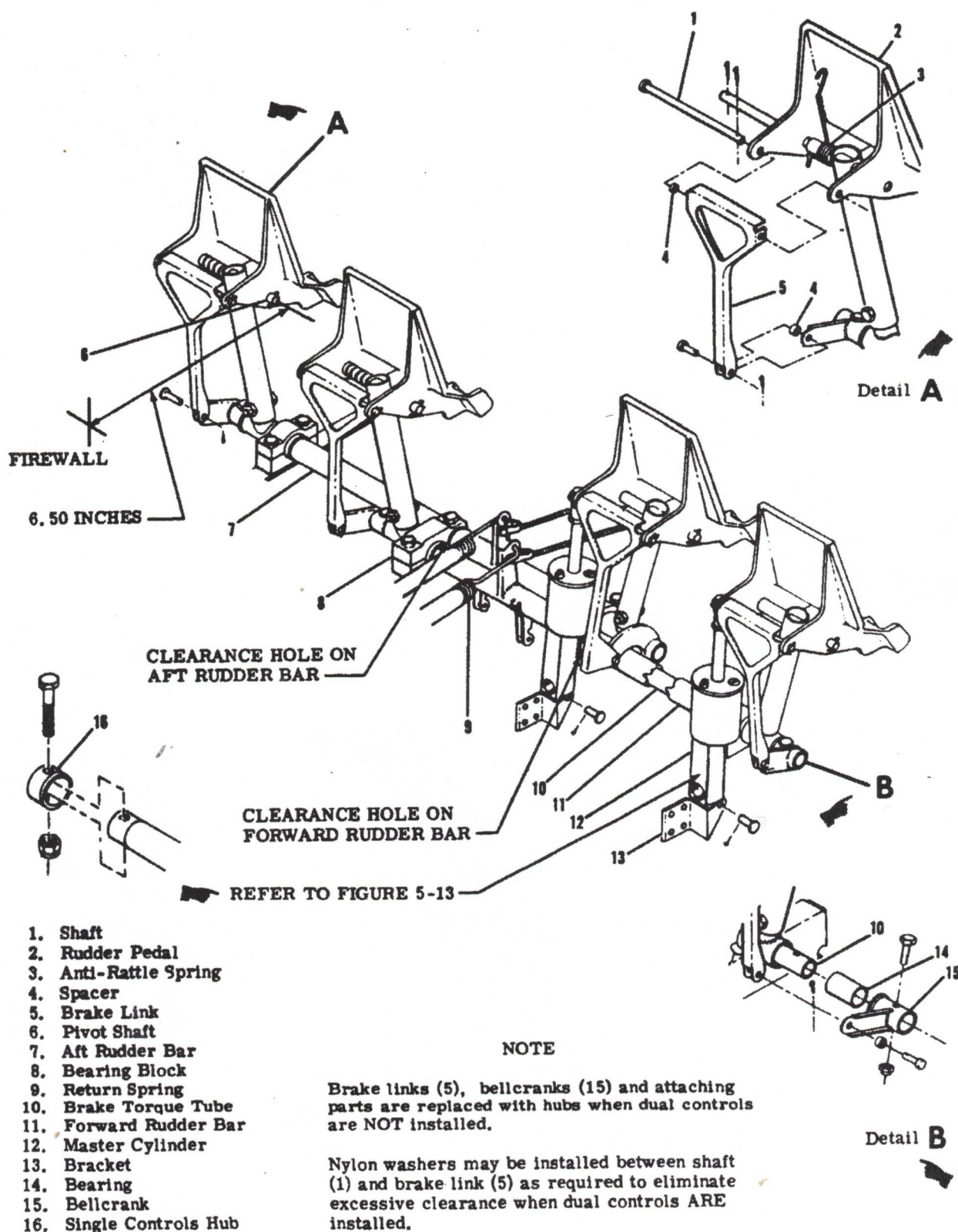
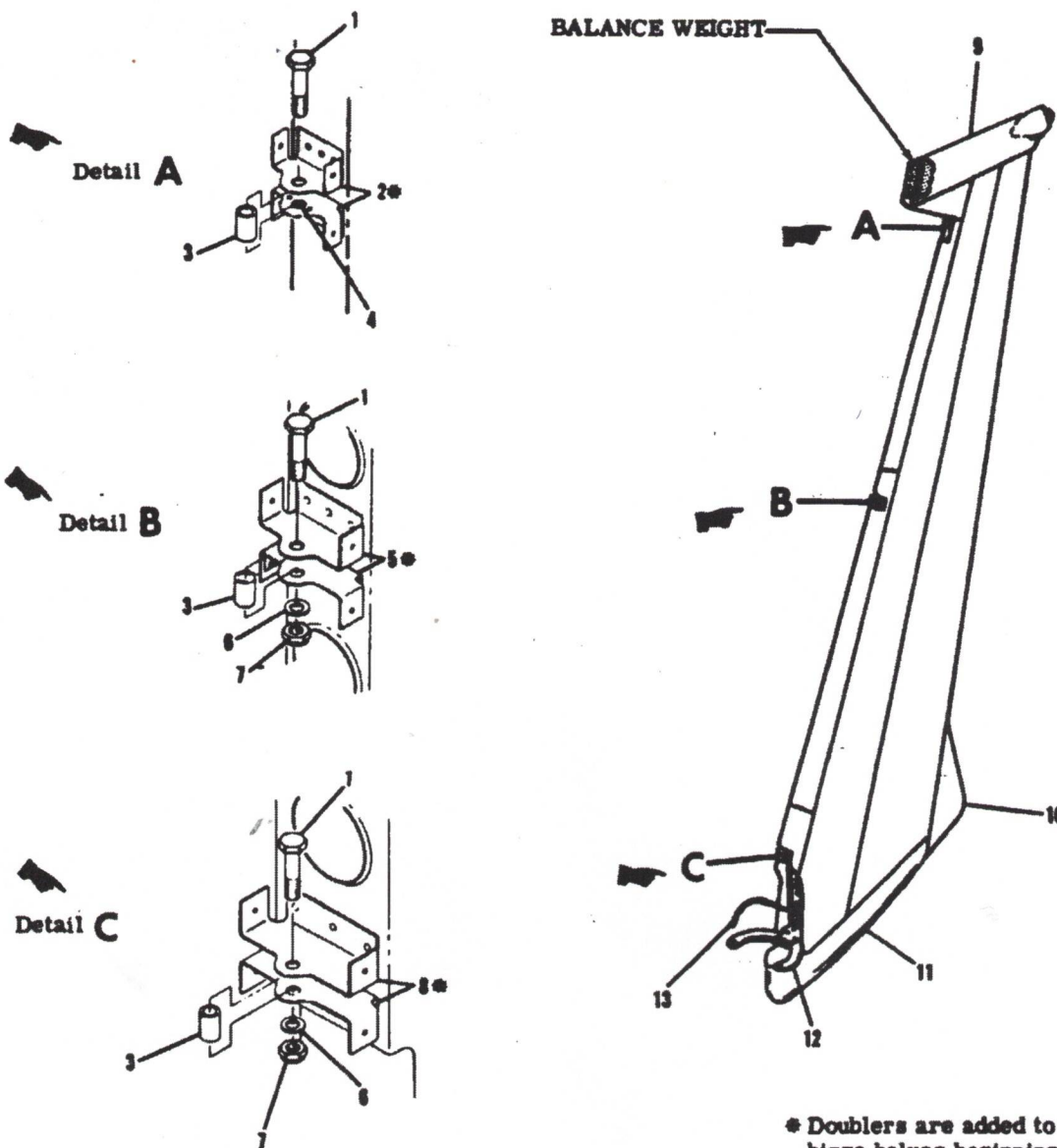


Figure 10-2. Rudder Pedals Installation



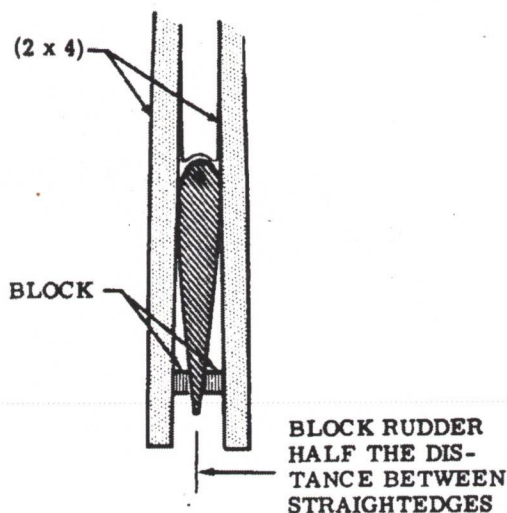
* Doublers are added to the rudder hinge halves beginning with aircraft serials 17259757 and F172-00805

- 1. Bolt
- 2. Upper Hinge
- 3. Bushing
- 4. Nutplate

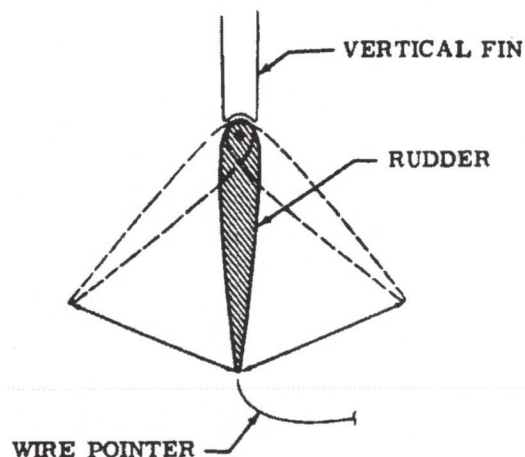
- 5. Center Hinge
- 6. Washer
- 7. Nut
- 8. Lower Hinge
- 9. Upper Tip

- 10. Trim Tab
- 11. Lower Tip
- 12. Bellcrank
- 13. Quick-Disconnect

Figure 10-3. Rudder Assembly



**ESTABLISHING NEUTRAL
POSITION OF RUDDER**



**MEASURING
RUDDER
TRAVEL**

1. Establish neutral position of rudder by clamping straightedge (such as wooden 2 X 4) on each side of fin and rudder and blocking trailing edge of rudder half the distance between straightedges as shown.
2. Tape a length of soft wire to one elevator in such a manner that it can be bent to index with a point on rudder trailing edge just above the lower rudder tip (disregard fixed trim tab).
3. Using soft lead pencil, mark rudder at point corresponding to soft wire indexing point (neutral).
4. Remove straightedges.
5. Hold rudder against right, then left, rudder stop. Measure the distance from pointer to pencil mark on rudder in each direction of travel. Distance should be between 5.29" and 5.91".

Figure 10-4. Checking Rudder Travel

10-6. RUDDER. (Refer to figure 10-3.)

10-7. REMOVAL AND INSTALLATION.

- a. Disconnect tail navigation light quick-disconnect (13).
- b. Thru Aircraft Serial 17263809 and F17201324, relieve cable tension at turnbuckles (index 6, figure 10-1) and disconnect cables from rudder bellcrank (12). Beginning with Aircraft Serial 17263810 and F17201325, relieve cable tension at clevises (index 11, figure 10-1) and disconnect clevises from rudder bellcrank (12).
- c. With rudder supported, remove hinge bolts (1) and lift rudder free of vertical fin.
- d. Reverse preceding steps for installation. Rig system in accordance with appropriate paragraph in this section and safety turnbuckles or clevises, as applicable.

10-8. REPAIR. Repair may be accomplished as outlined in Section 18. Hinge bushings may be replaced as necessary.

10-9. CABLES AND PULLEYS. (Refer to figure 10-1.)

10-10. REMOVAL AND INSTALLATION.

- a. Remove seats, upholstery and access plates as necessary.
- b. Disconnect cable at rudder bar (9) and bellcrank (2).
- c. 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, attach cable being installed and pull cable into position.

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

e. Rig system in accordance with appropriate paragraph in this section. Safety turnbuckles or clevises, as applicable, and reinstall all items removed in step "a".

10-11. RIGGING. (Refer to figure 10-1.)

a. Adjust travel stops (3) to attain travel specified in Section 1. Figure 10-4 illustrates correct travel and one method of checking.

b. Disconnect nose wheel steering tubes (refer to figure 5-5) from nose strut.

c. Thru Aircraft Serial 17263809 and F17201324, adjust cables at turnbuckles (6); beginning with Aircraft Serial 17263810 and F17201325, adjust cables at clevises (11) to align rudder and pedals in neutral position, 6.50 inches from firewall and pedal pivot shafts (index 6, figure 10-2). This step automatically determines cable tension through use of return springs (index 9, figure 10-2).

NOTE

Due to thickness of insulation on firewall, it is recommended that a piece of 1/16 inch welding rod be ground to a sharp point and notched at the 6.50 inch dimension. Pierce insulation on firewall and use notch to measure proper dimension.

d. Tie down or weight tail to raise nose wheel free of ground.

e. Center nose gear against external stop.

f. Extend steering tubes until free play is removed. DO NOT COMPRESS SPRINGS.

g. Adjust steering tube rod ends to 1.00 inch dimension between steering arm assembly and bolt

hole as illustrated in figure 5-8 and tighten jam nuts.

h. Adjust steering tube clevises to align with rod end bearings.

NOTE

Extend steering tubes to seat rods against internal springs but do not attempt to preload these springs by shortening rod end clevises after alignment. Preload is built into steering tubes.

i. Install clevises on rod ends.

NOTE

DO NOT adjust rudder trim with steering tubes. Degree of steering travel cannot be adjusted.

j. Safety cable turnbuckles or clevises, as applicable, and install all items removed for access.

NOTE

Flight test aircraft to determine if ground adjustment of fixed trim tab is necessary. DO NOT rig rudder "off-center" unless trim tab does not provide adequate correction.

WARNING

Be sure rudder moves in correct direction when operated by pedals.

Alighting Gear

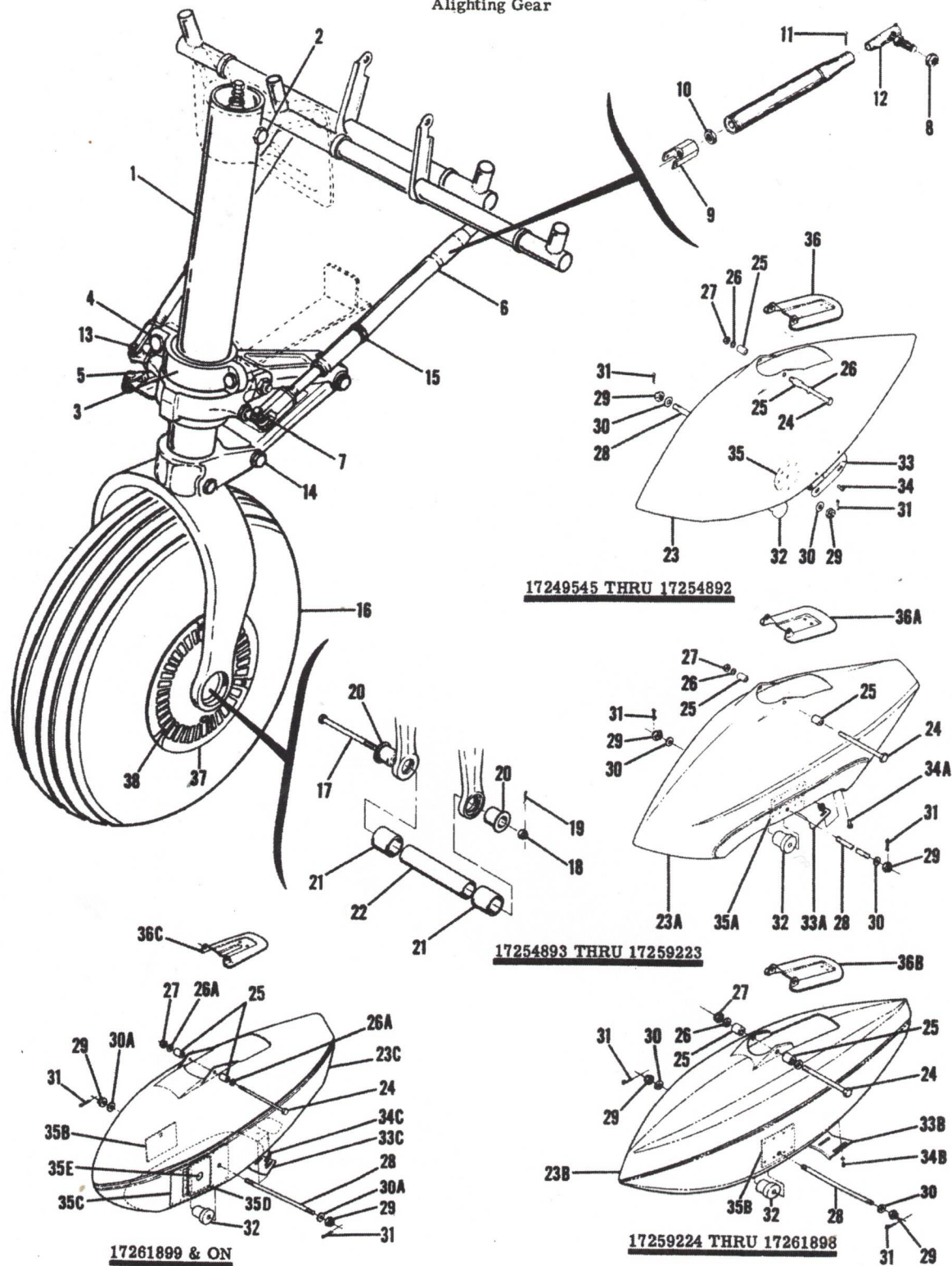


Figure 55. Nose Gear Installation

FIGURE AND INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
55 -		NOSE GEAR INSTALLATION	NP	
- 1	SEE FIG 57	SHOCK STRUT ASSEMBLY-NOSE GEAR	1	
		ATTACHING PARTS		
- 2	AN5-31A	BOLT	1	
	MS21042L5	NUT	3	
- 3	0543018-1	CAP	1	
- 4	AN5-10A	BOLT	2	
	AN960-516	WASHER	2	
	0543042-1	SHIM .032	AR	
	0543042-2	SHIM .016	AR	
		-----*		
- 5	SEE FIG 64	DAMPENER ASSEMBLY-SHIMMY	1	
		ATTACHING PARTS		
	AN23-17	BOLT	1	
	AN320-3	NUT	2	
	NAS75-3-009	SPACER	1	
	MS24665-132	COTTER PIN	2	
	AN23-11	BOLT	1	
	AN960-10L	WASHER	1	
		-----*		
- 6	0543022-1	TUBE ASSEMBLY-STEERING LH	1	
	0543022-2	TUBE ASSEMBLY-STEERING RH	1	
		ATTACHING PARTS		
- 7	AN3-10A	BOLT	1	
	MS21044N3	NUT	1	
- 8	MS21042L6	NUT	1	
		-----*		
- 9	0543023	CLEVIS	1	
-10	AN316-6R	NUT	1	
-11	MS20435-4	RIVET	1	
-12	C109	BALL JOINT TOK	1	
-13	S1823-3	BEARING-ROD END	2	
-14	AN316-6R	NUT	2	
-15	NAS397-16	CLAMP	2	
-16	SEE FIG 59	WHEEL ASSEMBLY-NOSE GEAR	1	
	SEE FIG 62	WHEEL ASSEMBLY-NOSE GEAR ALT	1	
		ATTACHING PARTS		
-17	AN5-47	BOLT	1	
-18	AN310-5	NUT	1	
-19	MS24665-134	COTTER PIN	1	
-20	0543001	FERRULE-AXLE BOLT	2	
-21	0543037-1	SPACER-AXLE NOSE WHEEL	2	
-22	0543003	TUBE-AXLE	1	
		-----*		
-23	0743609-17	SPEED FAIRING ASSEMBLY-NOSE GEAR	1	B
-23A	0743625-4	SPEED FAIRING ASSEMBLY-NOSE GEAR	1	E
-23B	0543065-1	SPEED FAIRING ASSEMBLY-NOSE GEAR	1	F
-23C	0543079-3	SPEED FAIRING ASSEMBLY-NOSE GEAR	1	G
		ATTACHING PARTS		
-24	AN5-51A	BOLT	1	
-25	0743009-1	SPACER	2	
-26	S1450-5-12-035	WASHER	2	H
-26A	AN960-516L	WASHER	AR	G
-27	MS21042L5	NUT	1	
-28	0742410-27	STUD	1	
-29	AN310-5	NUT	2	
-30	AN960-516L	WASHER	2	H
-30A	S1450-5-12-035	WASHER	2	G
-31	MS24665-136	COTTER PIN	2	
-32	0742410-8	FERRULE	2	
		-----*		

CONTINUED ON NEXT PAGE

FIGURE AND INDEX	PART NUMBER	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
55 -33	0743609-6	SCRAPER -----	1	B
-33A	0743625-11	SCRAPER -----	1	E
-33B	0541205-2	SCRAPER -----	1	F
-33C	0541221-2	SCRAPER -----	1	G
		ATTACHING PARTS		
-34	NAS221-7	SCREW -----	4	B
	MS21044N3	NUT -----	4	B
-34A	AN520-10R10	SCREW -----	3	E
	AN960-10	WASHER -----	3	E
	MS21044N3	NUT -----	3	E
-34B	AN520-10R6	SCREW -----	3	F
	AN960-10	WASHER -----	3	F
	MS21044N3	NUT -----	3	F
-34C	AN520-10R12	SCREW -----	3	G
	AN960-10	WASHER -----	6	G
	MS21044N3	NUT -----	3	G
		-----*		
-35	0742410-14	DOUBLER -----	2	B
-35A	0743625-9	DOUBLER -----	2	E
-35B	0541207-3	DOUBLER -----	2	F
	0541207-3	DOUBLER -----	1	G
-35C	0541222-5	DOUBLER-FAIRING -----	1	G
-35D	0541223-13	DOOR ASSY-SPEED FAIRING -----	1	G
-35E	KM610-64	LATCH-DOOR CLC -----	1	
-36	1243616-1	COVER PLATE ASSEMBLY -----	1	B
-36A	0543063-1	COVER PLATE ASSEMBLY -----	1	E
		ATTACHING PARTS		
-36B	0743063-5	COVER PLATE ASSEMBLY -----	1	F
-36C	0543063-7	COVER PLATE ASSEMBLY -----	1	G
		ATTACHING PARTS		
	AN4-31	BOLT -----	1	
	AN310-4	NUT -----	1	
	AN960-416L	WASHER -----	AR	
	MS24665-134	COTTER PIN -----	1	
		-----*		
-37	0743627-1	HUB CAP-NOSE GEAR VALVE STEM SIDE -----	1	C
	0743627-3	HUB CAP-NOSE GEAR VALVE STEM SIDE -----	1	D
	0743627-2	HUB CAP-NOSE GEAR -----	1	C
	0743627-4	HUB CAP-NOSE GEAR -----	1	D
		ATTACHING PARTS		
-38	AN515-8R4	SCREW -----	3	A
	S2191-8-4	SCREW USE WITH MCCAULEY WHEEL -----	3	
	AN936A8	WASHER -----	3	A
		-----*		
	6241M	EXTENSION-VALVE DL -----	1	A
	3680C	EXTENSION-VALVE ALTERNATE SU -----	1	A
		A---172 SERIAL 17254893 THRU 17263458 F172 SERIAL F172-0320 THRU F17201234		
		B---172 SERIAL 17249545 THRU 17254892 F172 SERIAL F172-0001 THRU F172-0319		
		C---172 SERIAL 17254893 THRU 17256512 F172 SERIAL F172-0320 THRU F172-0431 F172-0436 THRU F172-0442 F172-0444 THRU F172-0446		
		D---172 SERIAL 17256513 THRU 17263458 F172 SERIAL F172-0432 THRU F172-0435, F172-0443, F172-0447 THRU F17201234		
		E---172 SERIAL 17254893 THRU 17259223 F172 SERIAL F172-0320 THRU F17200754		
		F---172 SERIAL 17259224 THRU 17261898 F172 SERIAL F17200755 THRU F17201034		
		G---172 SERIAL 17261899 THRU 17263458 F172 SERIAL F17201035 THRU F17201234		
		H---172 SERIAL 17249545 THRU 17261898 F172 SERIAL F172-0001 THRU F17201034		



FIGURE AND INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
160 -		RUDDER CONTROL SYSTEM INSTALLATION -----	NP	
- 1	0510105-205	CABLE-FORWARD LH -----	1	
	0510105-305	CABLE-FORWARD LH STAINLESS STEEL -----	1-	
- 2	0510105-206	CABLE-FORWARD RH -----	1	
	0510105-306	CABLE-FORWARD RH STAINLESS STEEL -----	1	
		ATTACHING PARTS		
- 3	AN23-10	BOLT -----	1	
- 4	AN310-3	NUT -----	1	
- 5	MS24665-134	COTTER PIN -----	1	
		-----*		
- 6	0510105-207	CABLE-AFT -----	2	
	0510105-307	CABLE-AFT STAINLESS STEEL -----	2	
		ATTACHING PARTS		
- 7	AN23-11	BOLT -----	2	
- 8	AN310-3	NUT -----	2	
- 9	MS24665-134	COTTER PIN -----	2	
-10	0533010-1	SHACKLE -----	2	
		-----*		
-11	AN155832S	BARREL -----	2	
-12	NAS428H3-12	BOLT-RUDDER STOP -----	2	
-13	AN315-3R	NUT-RUDDER STOP -----	2	
-14	S378-4	PULLEY -----	2	
		ATTACHING PARTS		
-15	AN4-14A	BOLT -----	1	
-16	AN960-416L	WASHER -----	1	
-17	MS21042L4	NUT -----	1	
		-----*		
-18	MS24665-355	COTTER PIN -----	2	
-19	S378-3L	PULLEY -----	4	
		ATTACHING PARTS		
-20	AN4-10A	BOLT -----	1	
-21	MS21042L4	NUT -----	1	
		-----*		
-22	MS24665-136	PIN-COTTER -----	4	
-23	SEE FIG 23	HORN-RUDDER -----	1	

Control Pedals

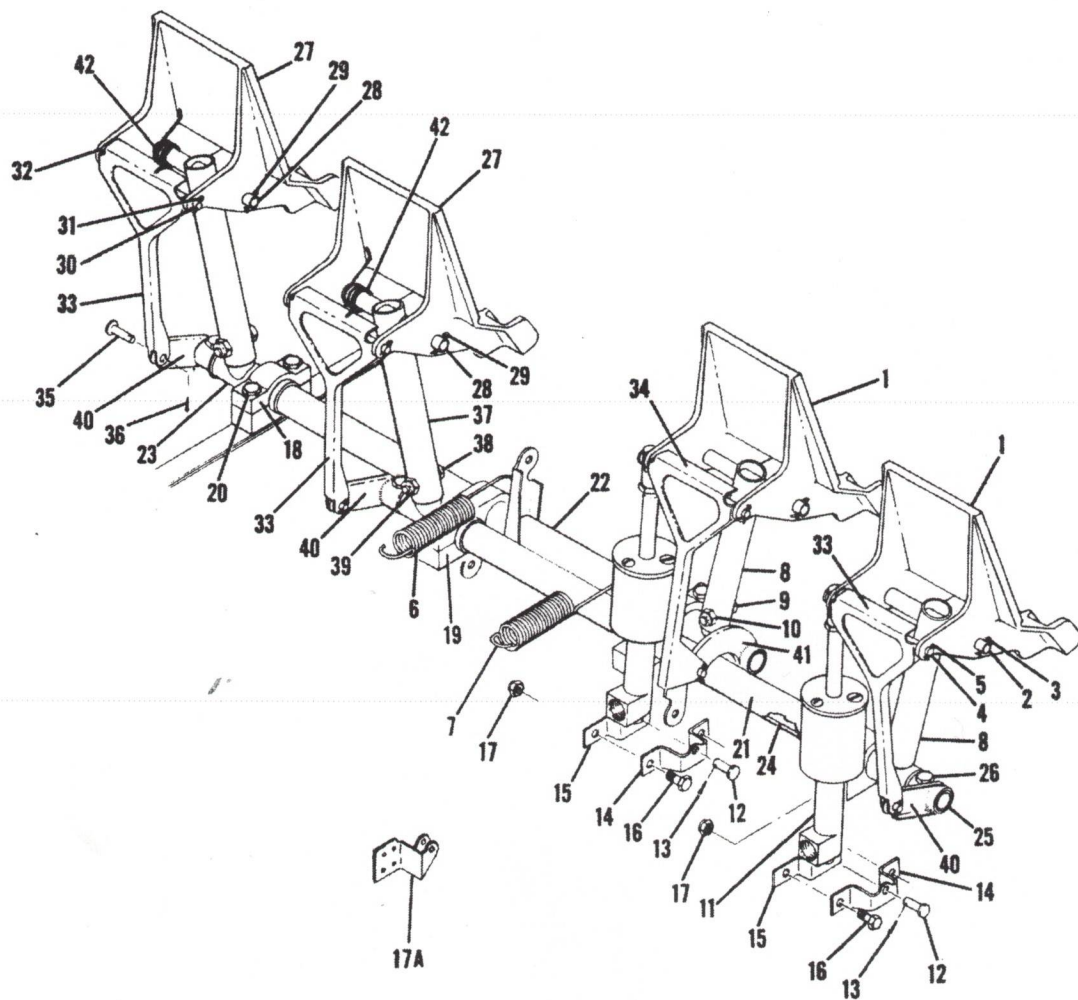


Figure 145. Brake & Rudder Pedals Installation

FIGURE AND INDEX NO.	PART NUMBER	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		1 2 3 4 5 6 7		
145 -14	0411550	BRACKET-BRAKE CYLINDER OUTSIDE -----	2	C
-15	0411549	BRACKET-BRAKE CYLINDER INSIDE -----	2	C
		ATTACHING PARTS		
-16	AN3-4A	BOLT -----	2	C
-17	MS21045L3	NUT -----	2	C
		-----*		
-17A	0713624-2	ANCHOR-MASTER CYLINDER -----	2	D
-18	S1674-1	BEARING-TORQUE TUBE -----	4	
-19	S1675-1	BEARING-TORQUE TUBE -----	4	
		ATTACHING PARTS		
-20	AN3-16A	BOLT -----	2	
	AN960-10	WASHER -----	2	
	MS21045L3	NUT -----	2	
		-----*		
-21	0411306-14	WELD ASSEMBLY -----	1	
-22	0411306-13	WELD ASSEMBLY -----	1	
-23	S1003-43A	BEARING -----	4	
-24	0411565	TUBE-DUAL BRAKE -----	2	
-25	0411562	HUB-DUAL BRAKE -----	4	
		ATTACHING PARTS		
-26	AN3-10A	BOLT -----	1	
	MS21045L3	NUT -----	1	
		-----*		
-27	1460320-1	PEDAL INSTALLATION-BRAKE & RUDDER RH -----	NP	
		PEDAL-BRAKE & RUDDER -----	2	
		ATTACHING PARTS		
-28	1460501-21	SHAFT -----	1	
-29	MS24665-285	PIN-COTTER -----	2	
-30	0411778-2	SHAFT -----	1	
-31	MS24665-132	PIN-COTTER -----	2	
-32	NAS42HT6-8	SPACER -----	1	
	S1438-2	WASHER -----	1	AR
		-----*		
-33	0411564	LINK-DUAL BRAKES -----	3	
-34	0411564-3	LINK-DUAL BRAKES -----	1	
		ATTACHING PARTS		
-35	MS20392-2C15	PIN -----	1	
-36	MS24665-132	PIN-COTTER -----	1	
	NAS43HT3-12	SPACER -----	1	
		-----*		
-37	0411307	ARM-RUDDER BAR -----	2	
		ATTACHING PARTS		
-38	AN3-11A	BOLT -----	1	
-39	MS21045L3	NUT -----	1	
		-----*		
-40	0411563	BELLCRANK ASSEMBLY -----	3	
-41	0411573-1	BELLCRANK ASSEMBLY -----	1	
-42	1460505-1	SPRING -----	2	
		 A---172 SERIAL 17249545 THRU 17250572 P172 SERIAL P17257120 THRU P17257188 F172 SERIAL F172-0001 THRU F172-0018 FP172 SERIAL FP172-0001 THRU FP172-0003 B---172 SERIAL 17250573 THRU 17256512 F172 SERIAL F172-0019 THRU F172-0559 C---172 SERIAL 17249545 THRU 17252327 F172 SERIAL F172-0001 THRU F172-0159 P172 SERIAL P17257120 THRU P17257188 FP172 SERIAL FP172-0001 THRU FP172-0003 D---172 SERIAL 17252328 THRU 17263458 F172 SERIAL F172-0160 THRU F17201234 E---172 SERIAL 17256513 THRU 17263458 F172 SERIAL F172-0560 THRU F17201234		