NAVWEPS 01-40ALF-2

Handbook
Maintenance Instructions

NAVY MODELS

A-1H • A-1J
AIRCRAFT

SECTION II
AIRFRAME, FLIGHT CONTROL SURFACES, LANDING GEAR, AND ARRESTING GEAR

THIS PUBLICATION SUPERSEDES SECTION II, NAVWEPS 01-40ALF-2, DATED 1 JULY 1956, CHANGED 1 JANUARY 1961 WHICH SHOULD BE REMOVED FROM FILES AND DESTROYED.

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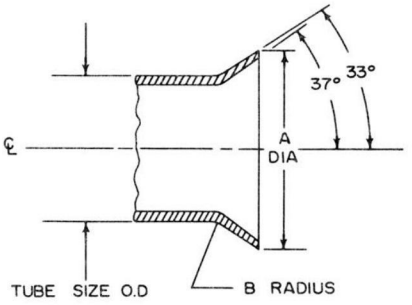
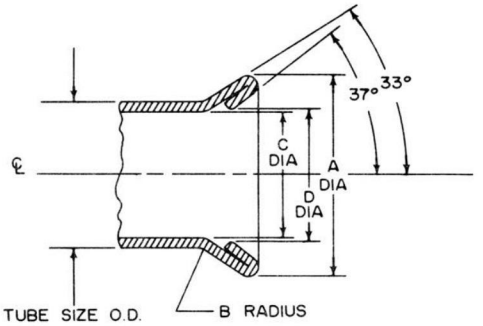
FLARED TUBING

END FLARING DATA

AND 10061



AND 10078



AND 10061 FLARED END DIMENSION DATA (INCHES)			
TUBE SIZE O.D.	A DIA	A DIA TOLERANCE	B RADIUS
1/8	.200	+.010 −.005	.032
3/16	.302		
1/4	.359	+.000 −.010	
5/16	.421		
3/8	.484		.046
1/2	.656		.062
5/8	.781		
3/4	.937		.078
1-	1.187	+.000 −.015	.093
1-1/4	1.500		
1-1/2	1.721		.109

AND 10078 FLARED END (DOUBLE) DIMENSION DATA (INCHES)					
TUBE SIZE O.D.	A DIA +.000 −.010	B RADIUS ± .010	WALL THICKNESS	C DIA MIN*	D DIA MAX**
1/8	.224	.032			
3/16	.302	.032	.028	.114	.179
			.035	.100	.165
1/4	.359	.032	.028	.178	.241
			.035	.159	.227
5/16	.421	.032	.028	.224	.290
			.035	.198	.264
3/8	.484	.046	.028	.310	.366
			.035	.288	.352
			.049	.261	.326

* C-MIN. FLARE LIP & TUBE INSIDE DIAMETERS
** D. MAXIMUM FLARE LIP DIAMETER

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BEFORE FLARING,

Make sure of the following conditions:

1. That tube end is square with tube center line (90 ± ½) degrees,
2. That tube end has been de-burred and smoothed inside and outside,
3. That B-nut or B-nut-and-sleeve combination has been placed on tubing.

AFTER FLARING,

Make sure of the following conditions:

1. That flare is not damaged, rough on inside, distorted into thread way, or out of round,
2. That flare is square with tube center line,
3. That flare is concentric with tube O.D. within 0.005 in., full indicator reading,
4. That flare angle matches cone angle.

PS-8891-11

Figure 1–13. Tubing Assembly and Installation Data (Sheet 11)

OXYGEN SYSTEM TUBING

WARNING

Do not make tubing replacements in oxygen system unless specifically authorized. Liquid oxygen or concentrations of gaseous oxygen will cause painful and dangerous flesh burns and render clothing highly combustible. Remove clothing and wash exposed areas immediately. Keep oxygen system free of oil, grease or fuel, (danger of spontaneous combustion under pressure); free of water, (danger of corrosion and ice); free of toxic gases, antiseize or other foreign matter, (danger of contaminating breathing oxygen and of clogging delicate mechanisms). Do not use lubricants, (except antiseize) anywhere in oxygen system. Keep ends of cleaned tubing plugged until moment of actual installation, and plug disconnected tubing assemblies at once with cleaned, dried and packaged plugs. Caps or plugs that admit moisture, or tapes that leave adhesive residue are not acceptable.

TUBING DATA

TUBE O.D. SIZE (IN.)	DESCRIPTION OF LINE (ALL TUBING 0.035 IN. WALL THICKNESS)	END FLARE DRAWING NO. (REFER TO SHEET 11)	BEND RADIUS MIN. (IN.)	SPACE BETWEEN SUPPORTS MAX. (IN.)	TORQUE LIMITS (DO NOT USE STEEL FITTINGS) STRAIGHT FITTING NO ANTISEIZE (INCH-POUNDS) (WORKING.)	(MAX.)	TAPERED CONNECTION SIZE (IN.)	TAPERED PIPE FITTING WITH ANTISEIZE (INCH-POUNDS.)
3/16	COPPER, HIGH PRESS. (1500 P S I) GASEOUS SYSTEM - TO FILLER, TO DILUTER DEMAND & REDUCER.	NONE; BRAZED CONNECTIONS	3/8	12-24	NO TORQUE INVOLVED; BRAZED CONNECTIONS.			
	ALUMINUM ALLOY LOW PRESS.(70PSI)							
5/16	LIQUID SYSTEM - ALL EXCEPT, FILLER LINES AND VENT LINES	AND 10078	11/16	15-20	100	125	1/8	175
3/8	FILLER LINES	AND 10078	15/16	18-20	200	250	1/4	300
1/2	VENT LINES	AND 10061	1-1/4	19-20	300	400	3/8	450

PREPARATION OF TUBING ASSEMBLY:

Degrease, clean, drain, dry and plug completed flared tube assembly per Spec. MIL-I-19326. (If cleaning materials are not available, sterilize with boiling water and dry with stream of pure, dry oxygen, or bake at 250-300°F.)
Install identification bands as shown on sheets 4 and 5.

ANTISEIZE APPLICATION: Per Spec. MIL-I-19326

Apply antiseize, Spec. MIL-T-5542, to first three male threads of tapered, pipe-threaded fittings only, as shown on sheet 6.
Do not apply antiseize to straight threaded fittings, nor to flares or sleeves. (However, if thread seizure prevents otherwise perfect connection from seating, apply antiseize, Spec. Mil-T-5542, sparingly, omitting first two threads, as shown on sheet 6).

INSTALLATION OF TUBING ASSEMBLY:

Finger tighten nut until flare is snug against fitting cone, then torque to applicable limits, (see chart) and torque-stripe joint.
Install replacement tubing assembly in the same routing configuration and with the same (or equal) spacing, shields, guards, protective sleeving, drip pans, or other insulating devices as on replaced assembly.
If in doubt as to separation from dangerous contacts, or if alternate routing is necessary, conform to the following specifications:

OXYGEN LINE IN PROXIMITY TO FOLLOWING:	* MINIMUM SEPARATION:
OIL, FUEL OR HYDRAULIC LINES	6 IN.
FLEXIBLE CONTROL CABLES OR FLEXIBLE MOVING PARTS	2 IN. (NORMAL)
RIGID CONTROL TUBES OR OTHER MOVING PARTS	1/2 IN. (NORMAL)
FLEXIBLE CONTROL CABLES, RIGID CONTROL TUBES OR OTHER MOVING PARTS NEAR HYDRAULIC, FUEL OR OIL LINES	12 IN. (DANGER AREA)
ELECTRIC WIRING AND CONDUIT (EXCEPT AS OXYGEN SYSTEM COMPONENT OR IN INSULATED HARNESS, OR UNLESS POSITIVELY SEPARATED BY BARRIERS, SUCH AS RIBS, WEBS, FRAMES, STRINGERS, ETC.)	6 IN. (IDEAL)
WIRING RIGIDLY CLIPPED (WHEN 6 INCH SEPARATION CANNOT BE MAINTAINED)	6 TO 2 IN. (ACCEPTABLE)
WIRING RIGIDLY CLIPPED AND INSULATED (WHEN 2 INCH SEPARATION CANNOT BE MAINTAINED)	2 TO 1/2 IN. (ACCEPTABLE)
TUBING LENGTH BETWEEN CYLINDERS AND CHECK VALVES (WIDEST POSSIBLE SEPARATION AGAINST GUN FIRE VULNERABILITY)	6 IN.
HOT DUCTS, CONDUITS OR EQUIPMENT (10° F INCREASE OVER AMBIENT AIR TEMPERATURE - NOT ACCEPTABLE)	ACCORDING TO TEMPERATURE
MOUNT OXYGEN LINES IN CUSHION CLIPS AND IN CUSHION GROMMETS WHERE LINE CROSSES STRUCTURE AT INTERVALS INDICATED IN TUBING DATA CHART	
*UNLESS ABSOLUTELY NECESSARY, BECAUSE OF AN EXISTING NECESSITY, DO NOT INSTALL LINES CLOSER THAN THE MINIMUM SEPARATION LISTED	ALF-2-1 P-41715-5

Figure 1-13. Tubing Assembly and Installation Data (Sheet 12)

SECTION II

AIRFRAME, FLIGHT CONTROL SURFACES, LANDING GEAR, AND ARRESTING GEAR

TABLE OF CONTENTS

TEXT

TABLES

2-1. GENERAL. This section covers line maintenance of the airframe, its movable surfaces, and its supporting landing gear, including the components of the several control systems by which movable surfaces and gear are operated.

2-1A. The Table of Contents on page 41 preceding this section should be consulted to determine where specific information can be found within the section. The Alphabetical Index at the end of the handbook should also be consulted for determining where specific information is contained within the handbook.

2-2. AIRFRAME.

2-3. DESCRIPTION. The airframe is composed of the conventional three major assemblies: fuselage, wing, and empennage. The components of each major structural assembly, including the related equipment and controls, are considered as a group and the three groups are treated progressively in the text.

2-4. FUSELAGE.

2-5. DESCRIPTION. (See figure 2-1.) The fuselage is of all-metal semi-monocoque construction consisting of stressed external plating, longitudinal engine mount upper and lower stiffeners, longitudinal lower stiffeners, vertical stiffeners, frames, bulkheads and interior structure.

2-6. The two engine mount upper stiffeners, the two engine mount lower stiffeners, and the two longitudinal lower stiffeners are the main components of the fuselage. The engine mount upper stiffeners extend from fuselage station 78 (upper firewall) to 364 and are spliced at fuselage station 220. The engine mount lower stiffeners extend from fuselage station 96 (lower firewall) to 180.875 and are spliced at fuselage station 136 (wing front spar). The longitudinal lower stiffeners are extensions of the engine mount lower stiffeners and extend from fuselage station 180.875 to 413.500 with splices at fuselage stations 324 and 374.

2-7. Frames, stiffeners, bulkheads and other interior structure reinforce the fuselage and take various loads from the wings, spars, power plant, arresting hook, etc. A well, into which the tail wheel retracts, is located on the bottom side of the fuselage between fuselage stations 324.500 and 364. Dive brake wells, located one on either side of the fuselage between fuselage stations 217 and 297, and one on the bottom of the fuselage between fuselage stations 220 and 296, allow the dive brakes in the closed position to fair with the fuselage.

2-8. FUSELAGE COMPARTMENTS.

2-9. DESCRIPTION. (See figure 2-1.) The fuselage is divided into five main compartments.

Compartment Designation	Location Station-to-Station	Equipment Contents
Cockpit	78-134.5, upper	Controls, flight instruments, furnishings.
Forward equipment	96-134.5, lower	Hydraulic and electrical system units.
Main fuel cell	134.5-180.875	Fuel tank and lines, control cables, hydraulic lines.
Radio	180.875-268.75	Radio and radar equipment, control cables, hydraulic lines.
Fuselage after section	268.75-413.5	Tail landing gear, arresting gear, control cables, hydraulic lines.

2-10. FUSELAGE COMPARTMENT SEALING.

2-11. DESCRIPTION. (See figure 2-2.) The airplane is adequately sealed against adverse weather and against toxic fumes harmful to operating personnel. The procedures outlined in paragraphs 2-14 and 2-15 are to be followed when any resealing becomes necessary in the areas indicated on figure 2-2.

2-12. WEATHER SEALING.

2-13. DESCRIPTION. (See figure 2-2.) Weather sealing is provided, and should be maintained, to prevent entrance of moisture.

2-14. MINOR REPAIR.

a. Thoroughly clean sealing area with clean cloth dampened with solvent (Fed. Spec. P-D-680); dry with clean cloth.

b. Pack all gaps or voids, as under joggles, etc., with sealant Spec. MIL-S-7502 before filleting. Sealant is to be injected from one side only until sealant extrudes from opposite side.

NOTE

All sealant (Spec. MIL-S-7502) is to be applied by extruding from applicator gun.

c. Apply a 1/8-inch to 1/4-inch diameter fillet of sealant Spec. MIL-S-7502 to all seams and attachments which could provide path of leakage from exterior seam or cut-out edge. In all applications fillet must be carried up and over edge against which it is applied.

d. Brush cement (Spec. MIL-C-5092) over heads of blind rivets and over upset ends of driven rivets.

e. Screws and bolts in sealed areas must be installed with sealant Spec. MIL-S-7502 under heads and on both sides of washers that are under either nuts or bolt heads. Where possible, install sealed bolts by holding head and tightening nut.

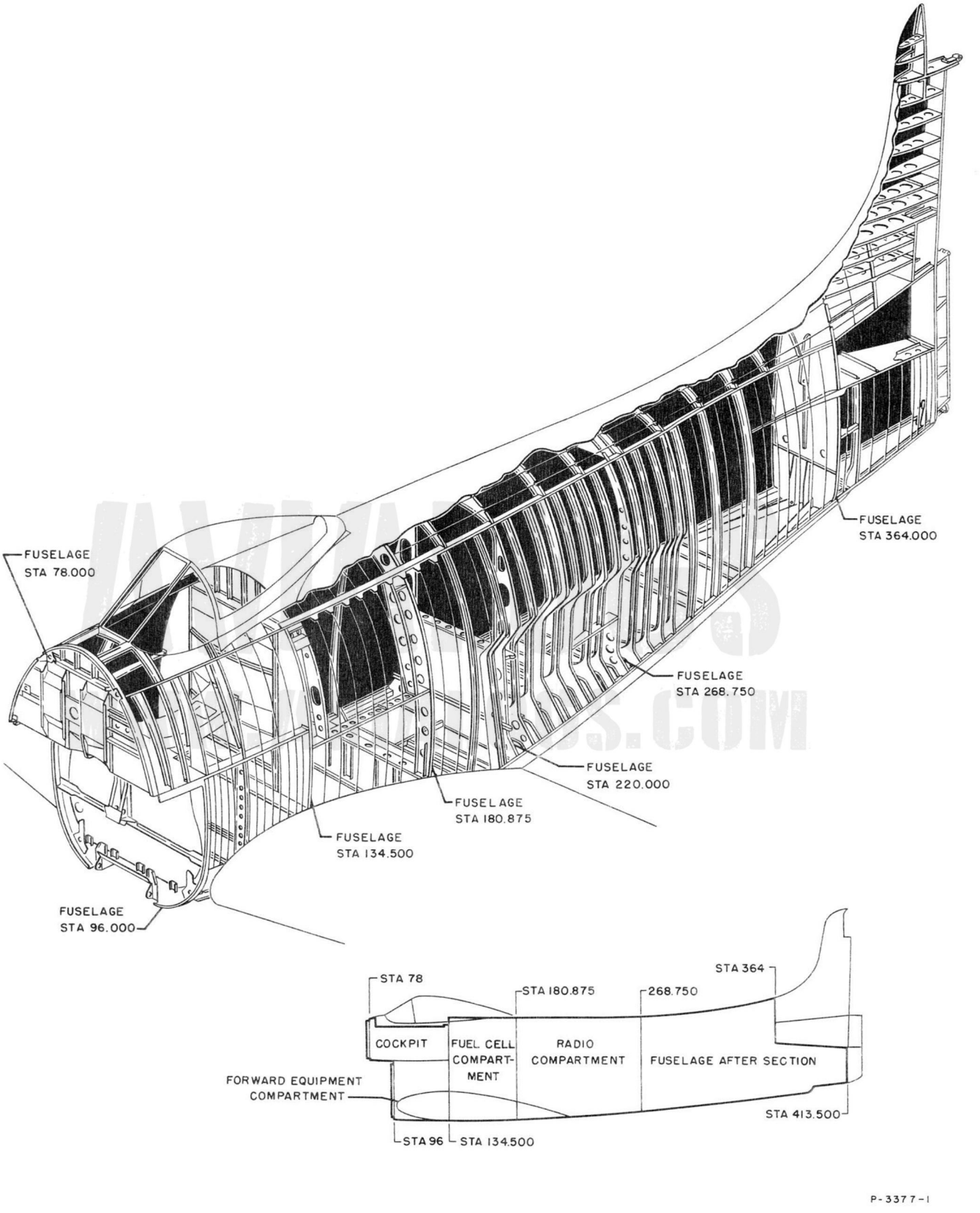

Figure 2–1. Fuselage Structure and Compartments

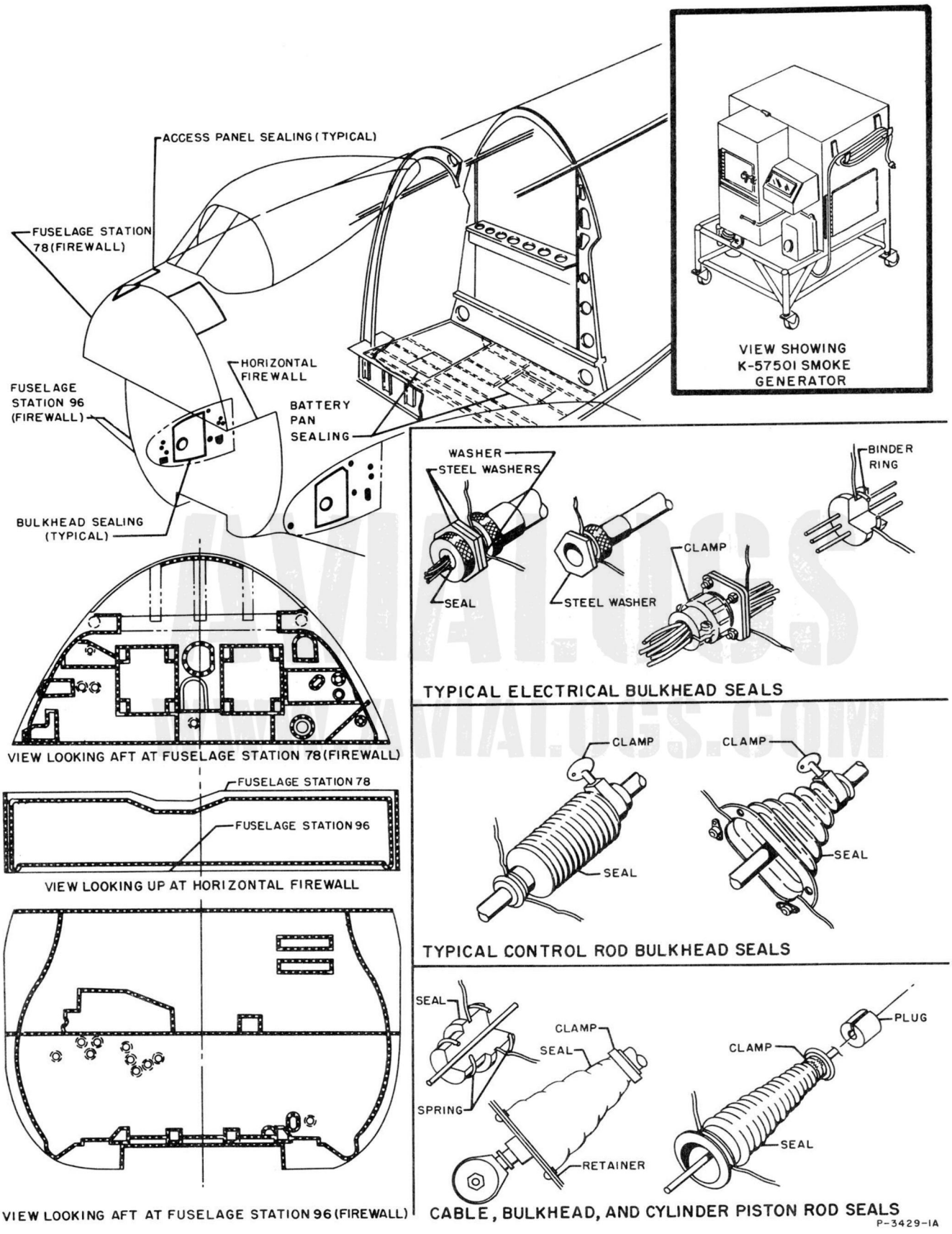

Figure 2–2. Fuselage Compartment Sealing

f. Install nut plates in sealed areas with sealant Spec. MIL-S-7502 on faying surfaces.

g. Plug unused drilled holes with rivets, and close unused cut-outs with sealed doublers.

h. Where sealing is necessary around parts that require periodic removal and replacement, fillet as noted in step b and smooth out fillets with clean cloth dampened with solvent.

i. Where sealing is necessary around windshield panels, mask off both sides of crevice or around area to be sealed before applying sealant. Allow sealant to dry for 48 hours at a temperature of approximately 70°F.

CAUTION

Prevent solvent from coming in contact with plexiglas.

2-15. TESTING.

a. After allowing sealant to set for 48 hours, test seal by spraying fuselage with water. Check interior for leakage.

NOTE

Leaking rivets must be sealed by resetting or replacement. Never peen or center punch rivets to stop leaks.

b. All seals that leak must be resealed until tight.

2-16. LIQUID AND VAPOR SEALING.

2-17. DESCRIPTION. (See figure 2-2.) Liquid and vapor sealing is provided to meet safety requirements by preventing passage of liquids and toxic fumes and gases.

2-17A. CARBON MONOXIDE CONTAMINATION PRECAUTION. Carbon monoxide contaminants may enter the occupied compartments after an extended period of aircraft service. Deterioration of seals, opening of seals in structure, and modification of the airframe due to incorporation of service changes may result in concentration of carbon monoxide during flight. All aircraft that have been modified, overhauled, or stored for more than 30 days before delivery to service may be subject to excessive concentrations of carbon monoxide. Thoroughly examine all seals for physical condition and integrity. Inspect all seals, boots, access plates, ventilation ducts, windshield canopy seals, cockpit bulkheads and decks, and other compartments that form a barrier between the cockpit areas and potential sources of carbon monoxide. Inspection of bulkheads and decks under and to the rear of the cockpit area is as important as inspection of the firewall and cockpit areas. Carbon monoxide can reach the cockpit due to the forward movement of the air currents within the fuselage. Effectively reseal all compartment openings after repair or modification work.

2-18. MINOR REPAIR.

a. Thoroughly clean sealing area with clean cloth dampened with solvent (Fed. Spec. P-D-680); dry with clean cloth.

b. Extrude from applicator gun a fillet of sealant Spec. MIL-S-7502 at edges of lapped seams, stiffeners, doublers, fittings, etc.

c. Fill all crevices or voids up to 1/4-inch diameter with sealant Spec. (MIL-S-7502). Where seals are required to hold pressure, first cover gaps larger than 1/4-inch with plates riveted or bolted in place. If seals are not required to hold pressure, close gaps up to 1/2-inch diameter by packing solidly with compound (Spec. MIL-S-7124) compound and covering with at least 1/8-inch of sealant Spec. MIL-S-7502 carried at least 3/16-inch over surrounding metal surfaces to secure packing in place.

d. Antenna housings and similar parts, or parts requiring periodic removal and replacement, where seal will not be subjected to pressure, fillet with compound Spec. MIL-S-7124 and smooth out with cloth dampened with solvent. In areas subject to engine oil or hydraulic fluid exposure, apply one coat of Spec. MIL-C-5092 over Spec. MIL-S-7124.

e. Allow sealants to set for approximately 70 hours.

2-19. TESTING.

a. A smoke generator K-57501 should be used to test efficiency of safety sealing. Fill compartment to be tested with smoke. Pressure buildup should not exceed 1/2 psi.

b. All leaks should be sealed as soon as possible.

NOTE

Do not allow smoke to remain in compartment for prolonged periods of time.

CAUTION

If generator is allowed to operate at excessively high temperatures or if rate of flow of butyl stearate is too high, flash-back will occur. Combustion will occur if sufficiently large volume of liquid collects on heater liner, because heater is operated above flash point. Periodic inspection of smoke chamber should be made and carbon deposits removed.

c. After testing is completed, thoroughly purge tested compartment.

2-20. COCKPIT.

2-21. DESCRIPTION. (See figure 2-3.) The cockpit is located in the upper part of the fuselage, aft of the firewall. The cockpit contains all the instruments and controls necessary for flight, and is insulated for temperature control and sealed against carbon monoxide. The cockpit floor has a readily removable section, attached with screws and nut plates, which permits access to the upper part of the forward equipment compartment.

2-22. WINDSHIELD.

2-23. DESCRIPTION. (See figure 2-4.) The windshield is mounted in front of the cockpit and consists of a laminated flak-resistant plate glass center panel

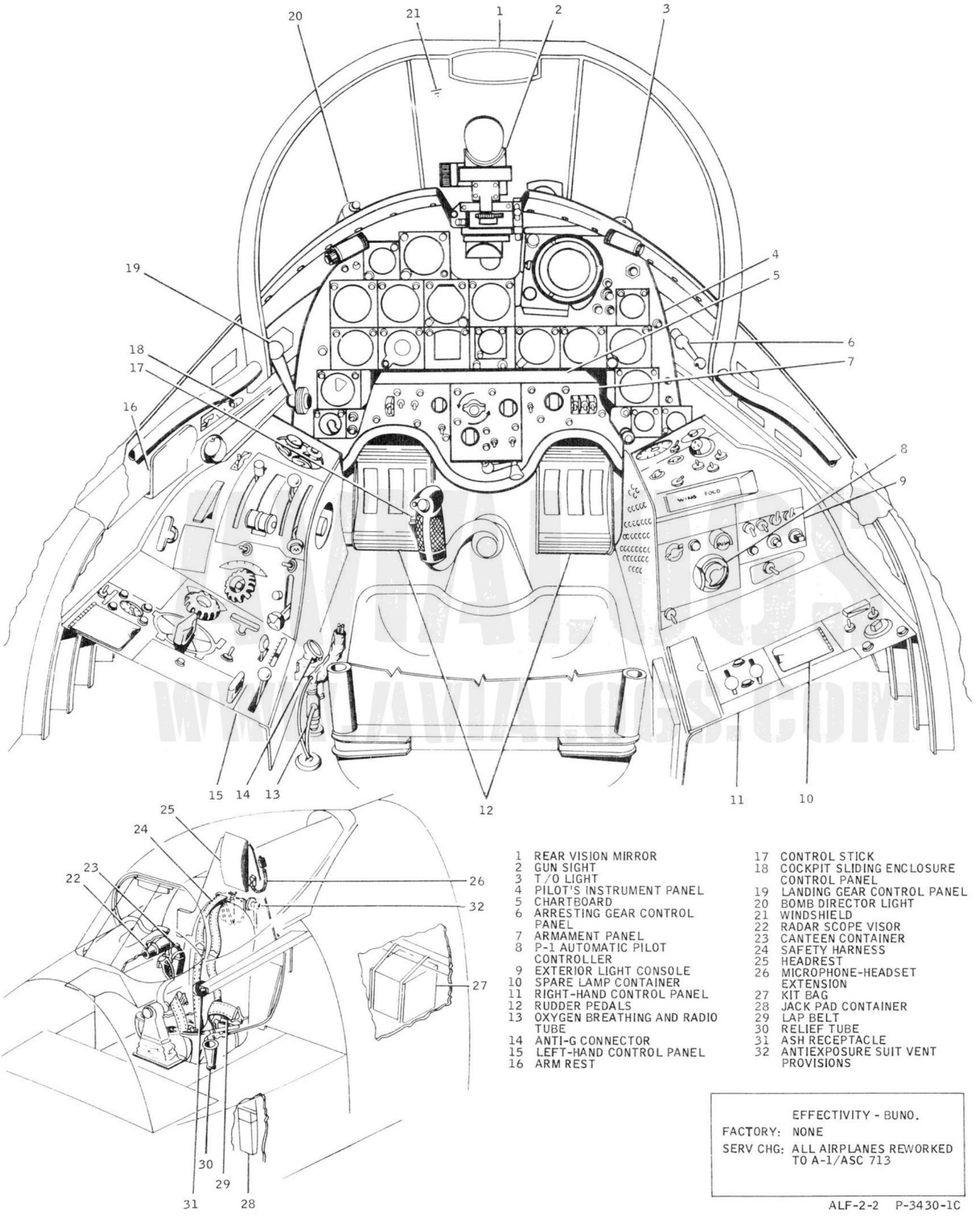

Figure 2-3. Cockpit Arrangement and Fuselage Equipment

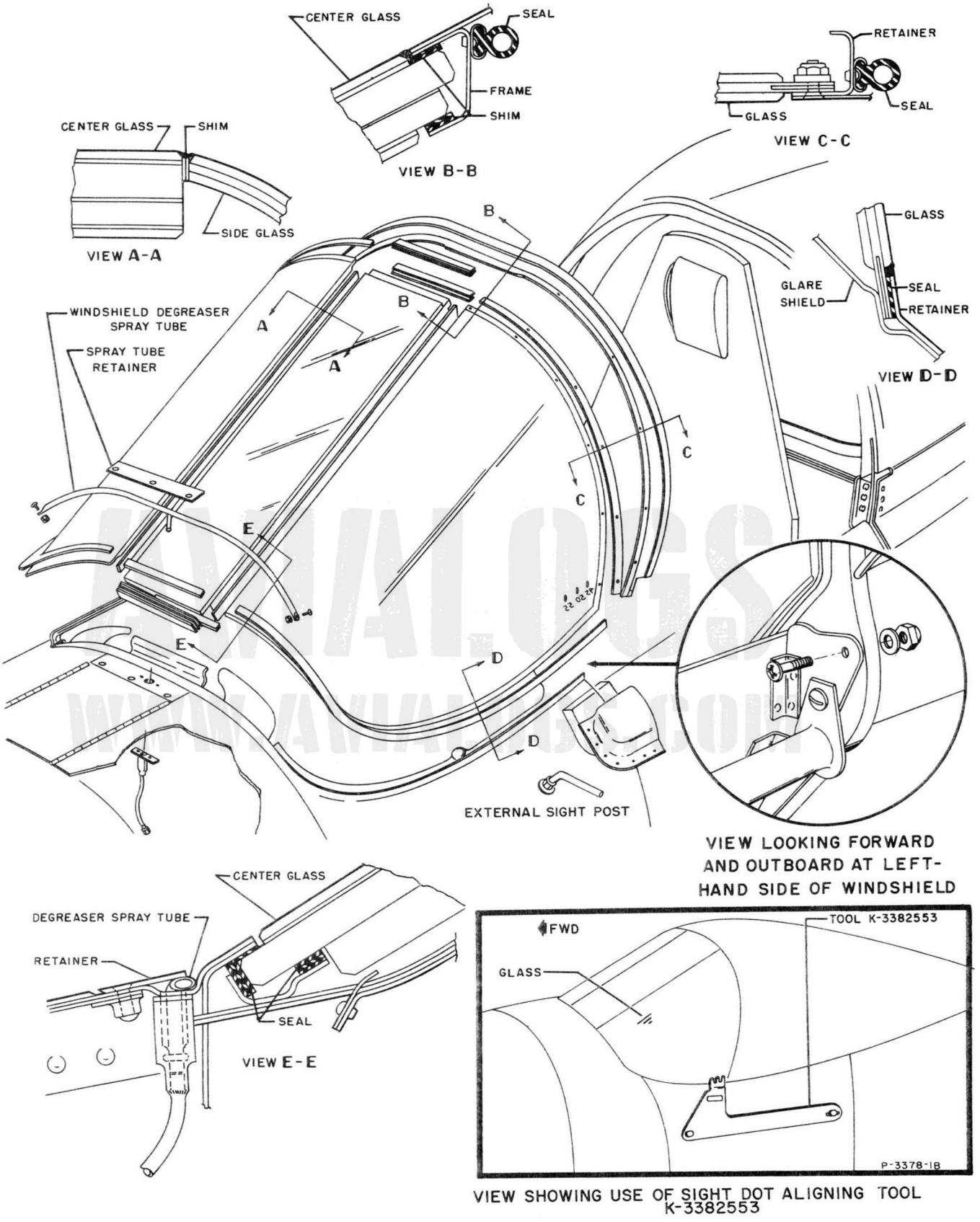

Figure 2–4. Windshield Installation

and two laminated plate glass side panels mounted on sheet-metal supporting structure. The panels are individually removable. The left-hand side panel has three sight dots installed on the inside surface for use with the external sight post. A rain-repellant compound is applied to the windshield to insure visibility during flights in rain.

2-24. REMOVAL. (See figure 2-4.)

a. With sharp, wet knife, slit rubber sealing compound at base of glass panels.

b. Remove screws which fasten frame to glass.

c. Remove two frame attaching bolts and separate frame from glass.

d. Loosen screws along forward edge of windshield and pull glass panels aft and clear of supports, cutting away any remaining sealant.

2-25. INSTALLATION. (See figure 2-4.)

a. Insert side glass panels into support structure, hold panels in place, and install shims and frame. Fasten frame ends to structure with screws.

NOTE

When new side panel windshield is installed it is necessary to drill holes for attachment during installation.

b. Insert center panel, with seal, into frame and shim as required. Install seals, shims, and tighten remaining screws.

c. Seal joints between center and side panels and along outside of panel bases with sealing compound. (Refer to paragraph 2-10.)

d. Using K-3382553, locate and install sight dot decal on left-hand inboard side of windshield at fuselage station 106.125.

2-26. COCKPIT GLARESHIELD.

2-27. DESCRIPTION. (See figure 2-5.) A removable metal glareshield is installed between the base of the windshield and the top of the cockpit instrument panel. The glareshield panel is divided into two sections which can be removed to provide access to the area forward of the instrument panel.

2-28. REMOVAL. (See figure 2-5.)

a. Remove standby compass.

b. Remove oil sump chip detector light.

c. Disconnect wiring from bomb director light and T-145 light and remove attaching screws securing lights to glareshield.

d. Remove screws attaching glareshield sections to gunsight support.

e. Remove two screws from each side of glareshield and maneuver glareshield sections to disengage keyhole slots from remaining screws.

2-29. INSTALLATION. (See figure 2-5.)

a. Maneuver glareshield sections into position to engage keyhole slots with retainer screws.

b. Secure each glareshield section to gunsight support with screws.

c. Secure glareshield to cockpit structure with two screws.

d. Connect bomb director and T-145 light wiring and secure lights to glareshield with bolts.

e. Install standby compass.

f. Install oil sump chip detector light.

2-30. OVERTURN STRUCTURE.

2-31. DESCRIPTION. The overturn structure comprises the cockpit rear armor plate and a steel strut which extends aft and downward over the fuselage fuel cell compartment cover to a supporting bracket at fuselage station 163. In addition to its function as part of the overturn structure, the strut serves also as an air-to-oil transfer cylinder for the cockpit sliding enclosure auxiliary operating system. (Refer to paragraph 2-52.) The overturn structure is designed to protect the pilot if the airplane overturns upon contact with a crash barrier during deck landing. The strut and its forward attaching fitting are removable.

2-32. REMOVAL.

a. Relieve hydraulic system pressure.

b. Disconnect sliding enclosure jettisoning control electrical wiring at strut.

c. Disconnect air and hydraulic hose connections at strut.

d. Remove strut forward attaching fitting by removing screws and bolts which fasten attaching fitting to armor plate.

e. Remove bolts which fasten after end of strut to plate on cylinder support bracket.

2-33. INSTALLATION.

a. With bolts and screws, fasten strut forward attaching fitting to back of cockpit rear armor plate.

b. Bolt forward end of strut to forward attaching fitting. Attach after end of strut to plate on cylinder supporting bracket.

c. Connect air and hydraulic hose connections to strut.

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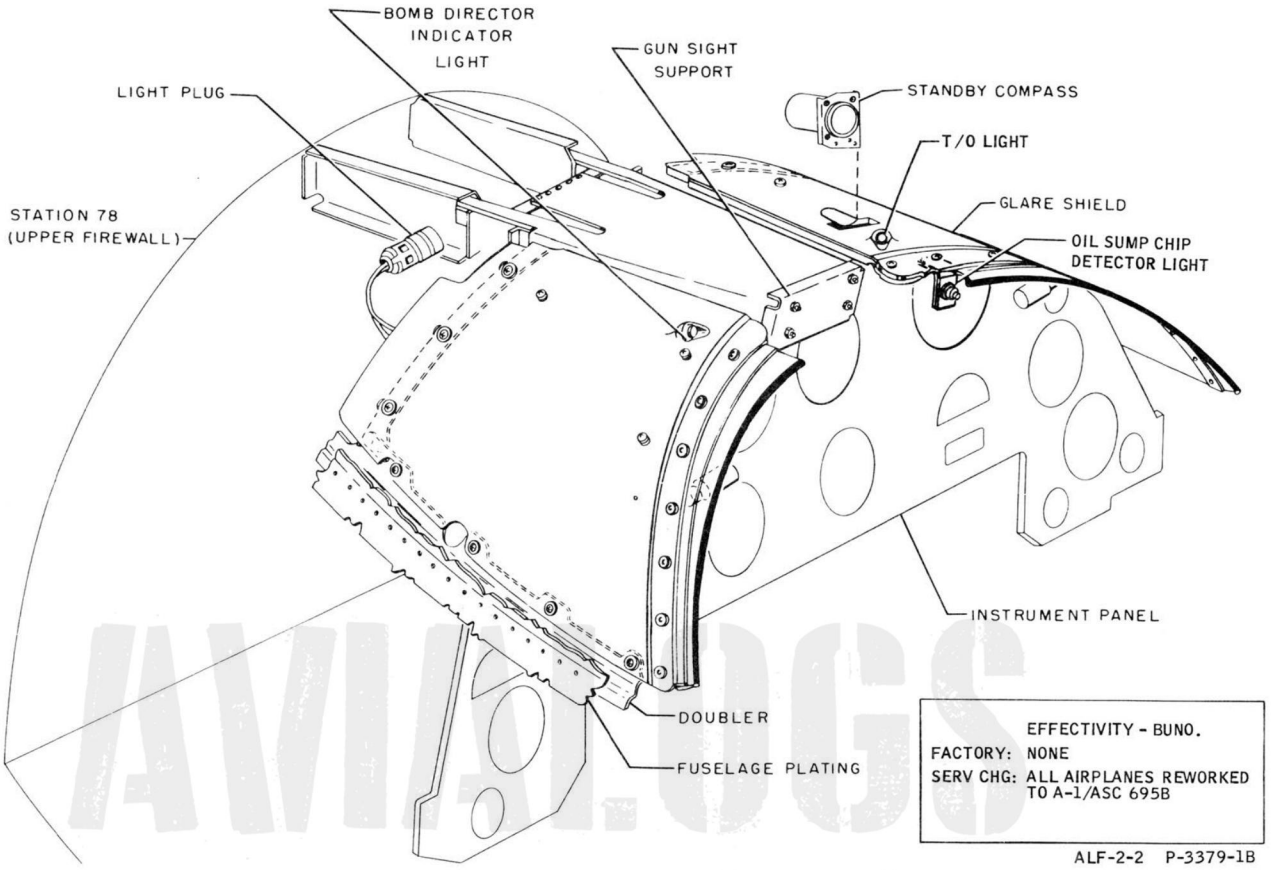


Figure 2-5. Cockpit Glareshield Installation

d. Connect sliding enclosure jettisoning control electrical wiring to strut.

e. Restore hydraulic system pressure.

2-34. COCKPIT SLIDING ENCLOSURE.

2-35. DESCRIPTION. (See figure 2-6.) The cockpit sliding enclosure consists of a formed acrylic plastic bubble mounted in an aluminum-alloy sheet frame. The forward end of the enclosure frame is fastened by two enclosure jettisoning assembly shafts to two forward trucks which ride on tracks inboard of the cockpit rails. The after end of the enclosure is provided with rollers which ride on a track aft of the enclosure. Normal operation of the enclosure can be controlled from inside or outside the cockpit.

2-36. REMOVAL. (See figure 2-6.)

a. Open sliding enclosure and disconnect enclosure jettisoning electrical wiring at plug and receptacle mounted on enclosure left-hand frame.

b. Through sheet-metal access cover at rear of enclosure, remove bolt which attaches enclosure to enclosure actuating cylinder piston rod.

c. Detach after track attaching fitting from fuselage and pull track clear of forward support and enclosure.

NOTE

For access to fuselage fuel cell compartment cover units, it is not necessary to remove enclosure from airplane. After steps a, b, and c have

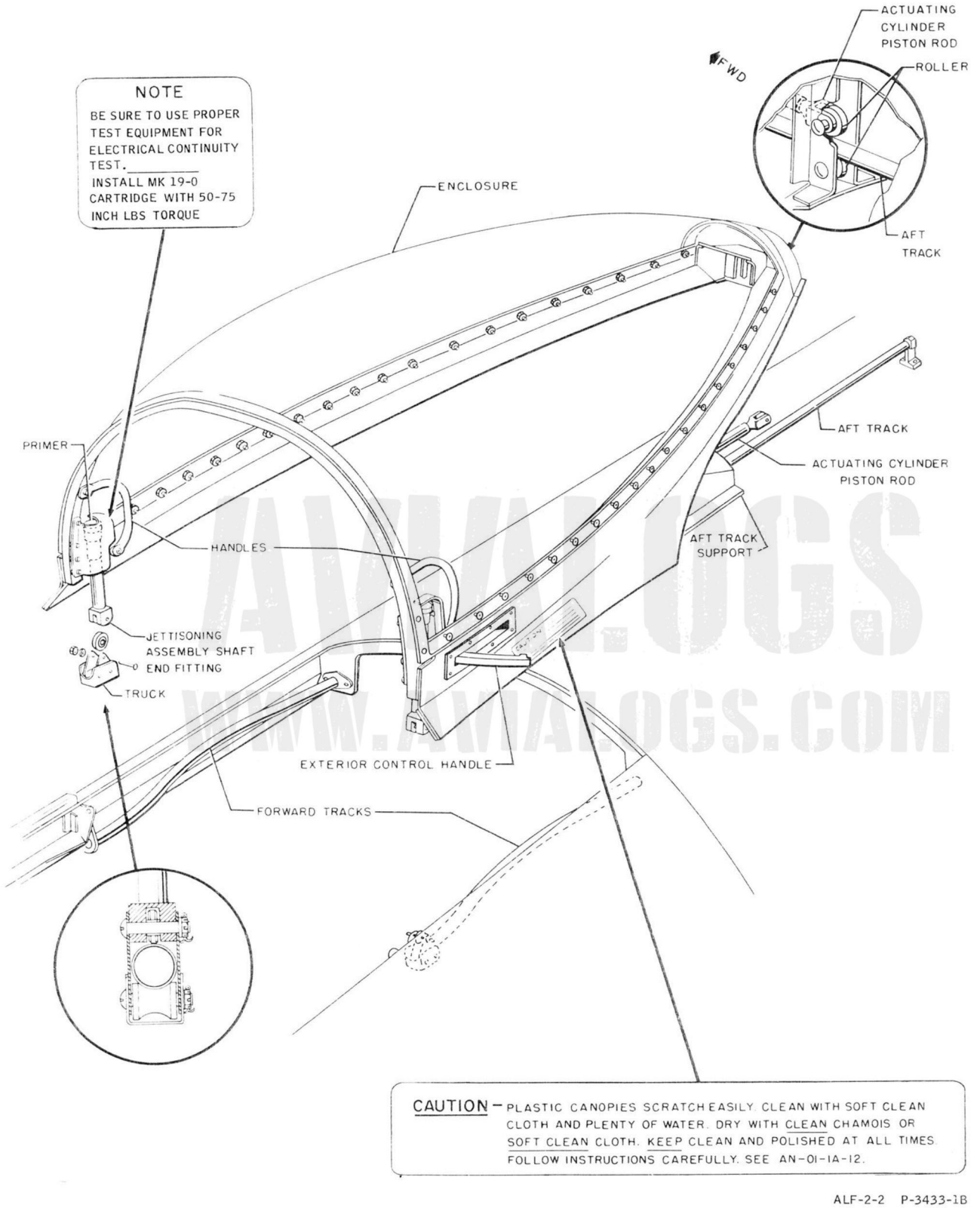
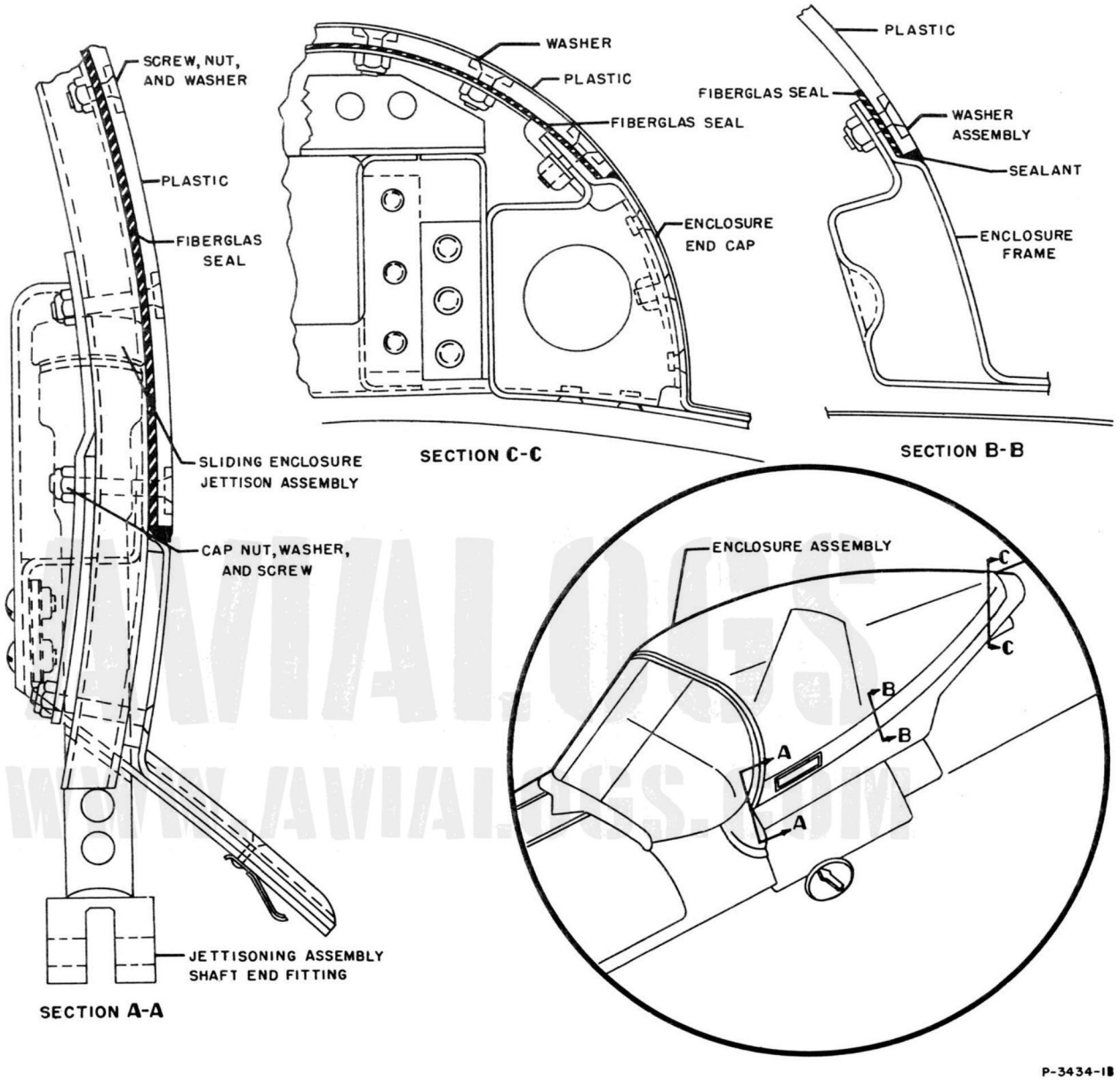


Figure 2-6. Cockpit Sliding Enclosure Installation



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REMOVAL

a. Remove screws from lower and after edges of plastic. See views B-B and C-C.

b. Remove screws that attach plastic to forward truck fittings. See view A-A.

c. With sharp, wet knife, carefully cut sealant material along edge of plastic.

d. Lift plastic from enclosure frame.

INSTALLATION

a. Cement fiberglas seals in place along edges of enclosure frame.

b. Place plastic in position and install attaching screws. See views A-A, B-B, and C-C.

c. Moisten washer assemblies with water and insert. Install retaining screw and tighten only until rubber begins to extrude from under washer.

d. Apply MIL-S-7502 Class B Type II sealant to all joints.

Figure 2–7. Cockpit Sliding Enclosure Plastic Replacement

been accomplished, enclosure can be slid forward on tracks and tilted upward.

d. Remove bolts attaching enclosure jettisoning assembly shafts to forward trucks and disengage enclosure from tracks.

2–37. MINOR REPAIR. The cockpit sliding enclosure plastic can be replaced as shown on figure 2–7.

2–38. CLEANING. Refer to section I.

2–39. INSTALLATION. (See figure 2–7.)

a. Engage forward trucks with forward tracks and bolt enclosure jettisoning assembly shaft to trucks. Lubricate shaft attaching bolts with dry graphite and tighten to snug fit only.

b. Insert after track through enclosure attaching fitting and engage track with support. Bolt track attaching fitting to fuselage.

c. Using bolt and roller, connect enclosure actuating cylinder piston rod with enclosure.

d. Install enclosure access cover.

e. Connect enclosure jettisoning electrical wiring at plug and receptacle on enclosure left-hand frame.

2–40. COCKPIT SLIDING ENCLOSURE CONTROL SYSTEM.

2–41. DESCRIPTION. (See figure 2–9.) The cockpit sliding enclosure control system for normal operation of the enclosure is hydro-mechanical. A pressurized air bottle is incorporated in the normal control system as an auxiliary system for *opening* the enclosure in emergency operation. An electrically controlled cartridge-fired jettisoning system is also provided. The enclosure is operated from the control panel designated CANOPY, mounted just below the cockpit left-hand rail. The control system includes the following principal components for normal operation and emergency opening operation:

Name	*Para Ref*
Control handle	2–42
External control handle	2–42
Hydraulic control valve	2–45
Actuating cylinder	2–45
Relief valve	2–48
Air-to-oil transfer cylinder	2–52
Air control valve	2–57
Air bottle	2–61
Air gage	2–65

2–42. The sliding enclosure normal control system can be operated either from the control handle mounted on the sliding enclosure control panel inside the cockpit or from the external control handle mounted in the enclosure left-hand frame. Both handles operate a cable and pulley system which operates the enclosure hydraulic control valve which, in turn, controls the enclosure actuating cylinder. The enclosure control handle mounted in the enclosure control panel inside the cockpit has four indicated positions: "OPEN," "CLOSE," "STOP," and "EMERGENCY." When the control handle is placed in either "OPEN" or "CLOSE," the enclosure hydraulic control valve directs hydraulic pressure from the airplane hydraulic system to the enclosure actuating cylinder either to open or close the enclosure; when the control handle is placed in "STOP," all ports in the hydraulic control valve are closed. The enclosure can, therefore, be stopped in any desired position.

2–43. The sliding enclosure auxiliary control system is operated by the enclosure auxiliary air control valve. Placing the enclosure control handle in "EMERGENCY" opens the air control valve through linkage attached to the enclosure hydraulic control valve operating pulley. The air control valve directs air pressure from the air bottle to the air-to-oil transfer cylinder, pressurizing the fluid within the cylinder to open the enclosure. Positive stops are provided in the control handle to prevent actuation of the external control handle to "EMERGENCY."

Note

After the enclosure has been opened by use of the auxiliary air control system, the system should be bled by placing the enclosure control handle in "CLOSE."

2–44. TROUBLE SHOOTING. Refer to table 2–1.

2–44A. ADJUSTMENT. See figure 2–9.

2–44B. TESTING.

a. With full system pressure, place sliding enclosure control handle in "CLOSE": enclosure should close in 4 to 8 seconds.

b. Place control handle in "OPEN": enclosure should open in 1 to 3 seconds.

c. Relieve all hydraulic system pressure by operating wing flaps until hydraulic pressure gage indicates zero.

d. Close enclosure manually. Place control handle in "EMERGENCY": enclosure should open in 1 to 2 seconds by pressure from auxiliary air system.

2–45. COCKPIT SLIDING ENCLOSURE ACTUATING CYLINDER AND HYDRAULIC CONTROL VALVE.

2–46. DESCRIPTION. (See figure 2–8.) The cockpit sliding enclosure actuating cylinder is mounted on two supports riveted to the fuselage fuel cell compartment cover at fuselage stations 138 and 171, approximately. The cockpit sliding enclosure hydraulic control valve is mounted on the forward, or head, end of the actuating cylinder. Therefore, removal of the actuating cylinder necessitates removal of the control valve.

2–47. The enclosure actuating cylinder head is fastened to the forward support and the cylinder piston rod end is bolted to enclosure structure. The cylinder head end contains the hydraulic *open* port. The cylinder piston end contains the hydraulic *close* port, a latch mechanism and a cable release for the latch. The latch mechanism is spring-loaded and acts to lock the cylinder in the extended (enclosure open) position. The actuating cylinder has the following dimensions: compressed length, 34 inches; extended length, $58\frac{7}{16}$ inches; stroke, $24\frac{7}{16}$ inches.

2–48. The enclosure hydraulic control valve is connected by a sleeve with the hydraulic *open* port in the enclosure actuating cylinder head. The control valve shaft is attached to a pulley which is actuated by the control cables from the enclosure control handles. The control valve ports are connected with the system as shown on the valve, except that "CYL 1" connects with the *close* line of the actuating cylinder, and "CYL 2" connects with the actuating cylinder *open* line. A relief valve, set to relieve at 4000 $\pm$ 100 psi pressure, is connected between the control valve and the air-to-oil transfer cylinder.

2–49. REMOVAL. (See figure 2–8.)

a. Relieve hydraulic system pressure.

b. Remove sheet-metal access cover at rear of enclosure.

c. Remove bolts which attach enclosure after track support to fuselage. Pull support and track clear of enclosure.

d. Disconnect cylinder piston rod from enclosure structure.

e. Slide enclosure forward and raise enclosure after end clear of cell compartment cover, and remove cylinder boot.

f. Disconnect and cap hydraulic lines at cylinder and at control valve.

g. Loosen or disconnect turnbuckles on enclosure control cables.

h. Remove bolt fastening cylinder head to support. Disengage pulley guard from support and control cable outboard pulley bracket.

2–50. INSTALLATION. (See figure 2–8.)

a. Insert cylinder piston rod end through cylinder after support and position cylinder head in cylinder forward support. Bolt cylinder head to support and engage pulley guard pins with support and with control cable outboard pulley bracket. Guide control cable into pulley groove.

b. Uncap and connect hydraulic lines at cylinder and at control valve.

c. Install and close boot.

d. Adjust cylinder piston rod end as shown on figure 2–10. Install enclosure as instructed in paragraph 2–39.

2–51. ADJUSTMENT. See figure 2–9.

2–52. COCKPIT SLIDING ENCLOSURE AUXILIARY SYSTEM AIR-TO-OIL TRANSFER CYLINDER.

2–53. DESCRIPTION. (See figure 2–8.) The air-to-oil transfer cylinder is mounted above the enclosure actuating cylinder. The air-to-oil transfer cylinder forward end is attached to the cockpit rear armor plate; the cylinder extends aft and downward to a supporting bracket riveted to the fuselage fuel cell compartment cover at fuselage station 163. When the enclosure control handle is placed in "EMERGENCY," the enclosure auxiliary air valve directs pressurized air from the auxiliary system air bottle into the after end of the air-to-oil transfer cylinder where fluid within the cylinder is pressurized to supply hydraulic pressure to the enclosure actuating cylinder to open the enclosure.

2–54. In addition to its function in the enclosure auxiliary control system, the air-to-oil transfer cylinder is a structural component of the overturn structure. (Refer to paragraph 2–30.)

2–55. REMOVAL. Refer to paragraph 2–32.

2–56. INSTALLATION. Refer to paragraph 2–33.

TABLE 2–1. COCKPIT SLIDING-ENCLOSURE CONTROL SYSTEM TROUBLE SHOOTING

Trouble or Symptom	*Probable Cause*	*Correction*
1. Enclosure fails to operate.	a. Insufficient hydraulic pressure.	Check system.
	b. Control valve out of adjustment.	See figure 2–9.
	c. Controls improperly rigged.	See figure 2–8.
2. Enclosure fails to latch open.	Latch cable improperly adjusted.	See figure 2–9.
3. Enclosure fails to open when control handle is placed in "EMERGENCY."	a. Insufficient air pressure.	Check air gage and air bottle.
	b. Trouble 1.b. and c.	
4. Enclosure jettisoning control fails to function.	Electrical circuit failure.	Refer to wiring diagram, section X.

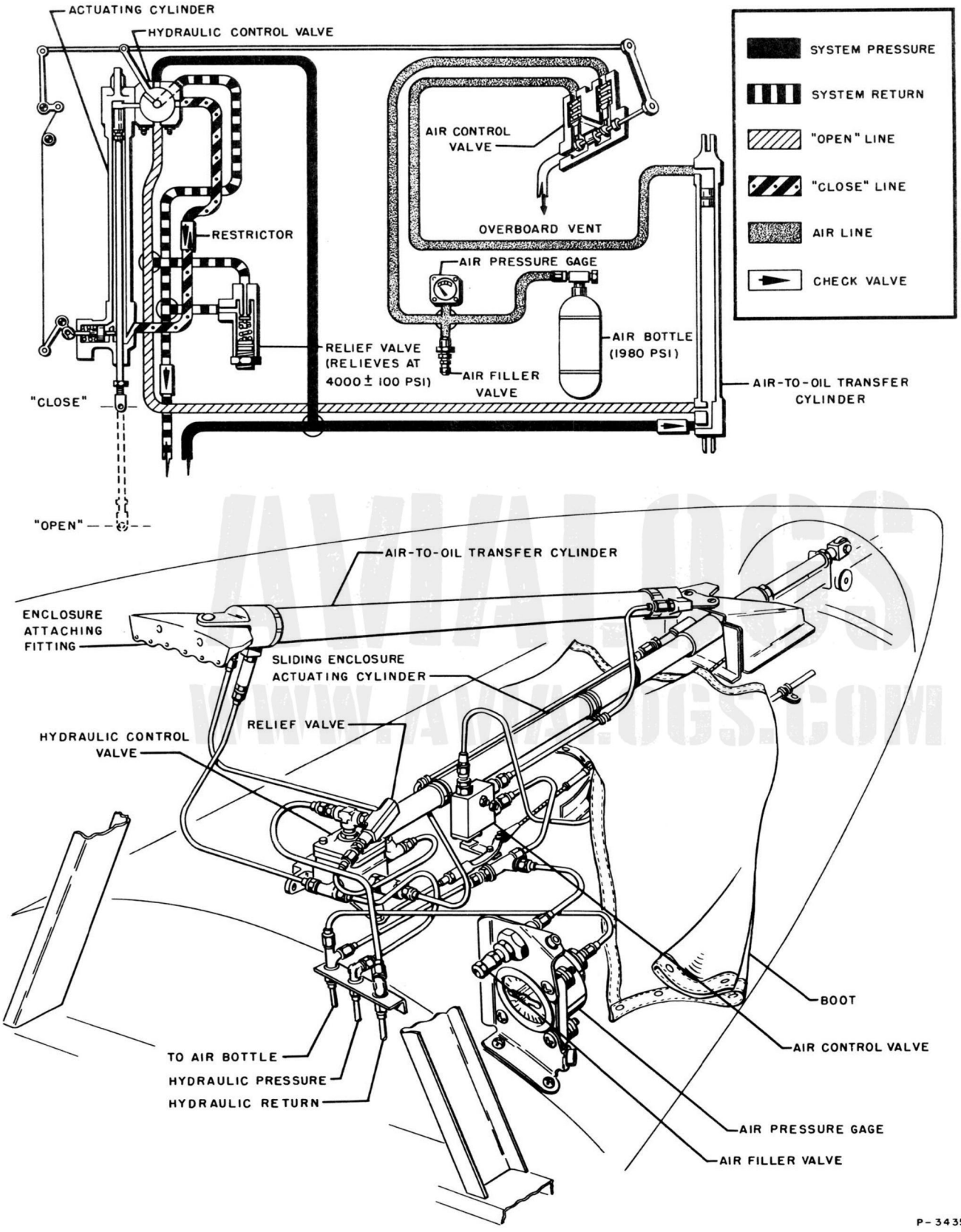


Figure 2–8. Cockpit Sliding Enclosure Control System (Sheet 1)

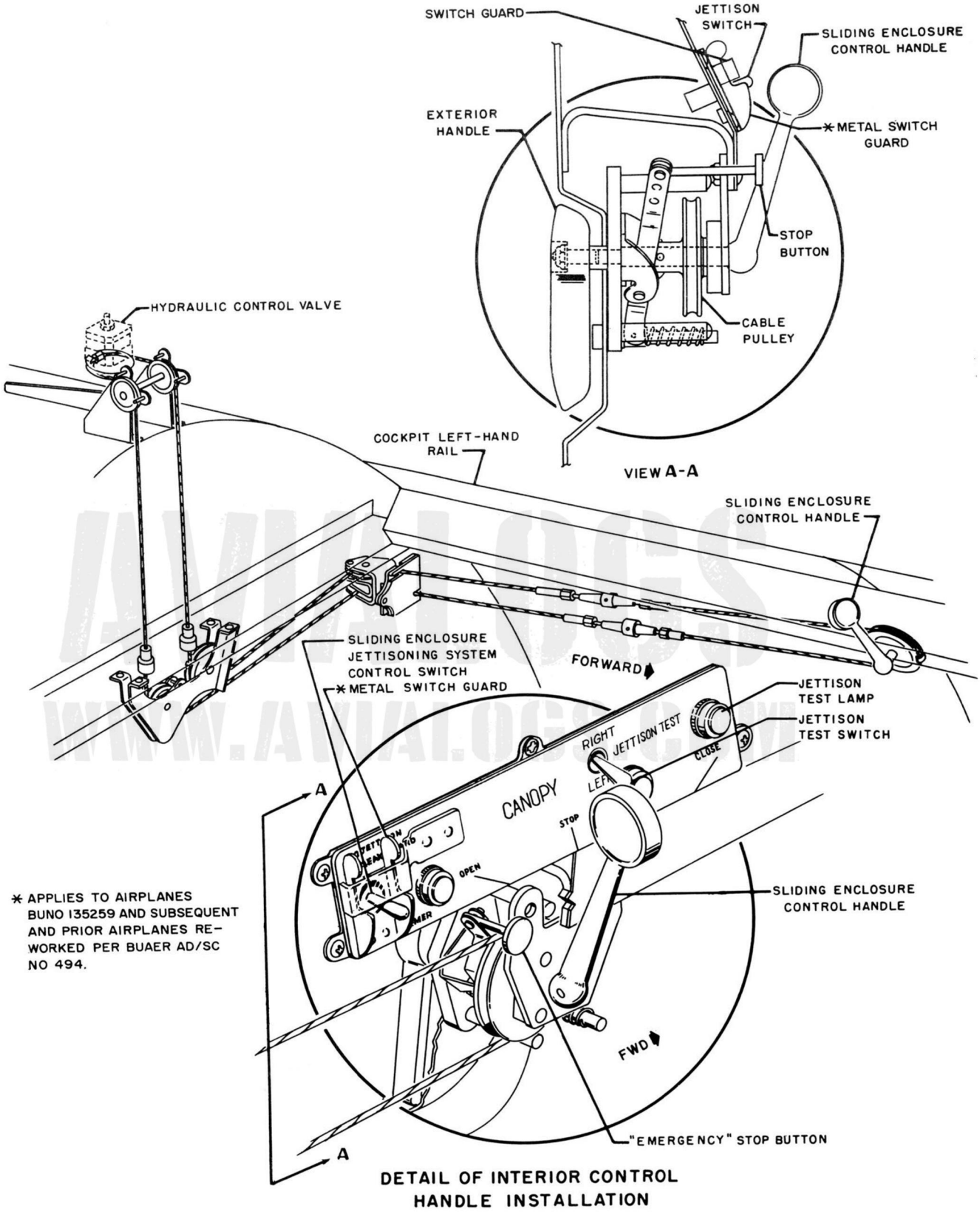


Figure 2–8. Cockpit Sliding Enclosure Control System (Sheet 2)

2-57. COCKPIT SLIDING ENCLOSURE AUXILIARY SYSTEM AIR CONTROL VALVE.

2-58. DESCRIPTION. (See figure 2-8.) The auxiliary air control valve is mounted on a bracket just to the left of the enclosure actuating cylinder and just aft of the enclosure hydraulic control valve. The air valve is operated by linkage attached to the hydraulic valve operating pulley and is actuated when the enclosure control handle is placed in EMERGENCY. Opening the valve directs air pressure from the auxiliary control system air bottle to the air-to-oil transfer cylinder, and fluid pressure is supplied to the actuating cylinder head to open the enclosure.

2-59. REMOVAL. (See figure 2-8.)

a. In forward equipment compartment, disconnect line at auxiliary system air bottle. (A check valve in air bottle connector will seat to retain air pressure in bottle.)

b. Open zipper on boot protecting enclosure actuating cylinder and disconnect lines at air valve.

c. Detach valve actuating linkage and remove valve attaching screws.

2-60. INSTALLATION. (See figure 2-8.)

a. Position valve to support and install attaching screws.

b. Connect lines at valve.

c. Install and adjust valve actuating linkage. (See figure 2-9 for adjustment.)

d. In forward equipment compartment, connect line to enclosure auxiliary system air bottle.

2-61. COCKPIT SLIDING ENCLOSURE AUXILIARY SYSTEM AIR BOTTLE.

2-62. DESCRIPTION. The auxiliary system air bottle is strapped to a bracket on the forward face of the wing center section spar on the left-hand side of the forward equipment compartment. For proper operation of the auxiliary system, the bottle should be charged to a pressure of 1980 psi. The bottle can be removed for charging or can be charged while installed. The air bottle filler valve is mounted adjacent to the enclosure auxiliary control system pressure gage on the fuselage fuel cell compartment cover just aft of the cockpit.

2-63. REMOVAL. The air bottle can be removed by first disconnecting the line (a check valve in the connector will seat to retain pressurized air in the bottle), and then unfastening the retaining straps.

2-64. INSTALLATION. The air bottle can be installed by placing it in position (connector valve downward) on the bracket, fastening the retaining straps, and connecting the line at the bottle.

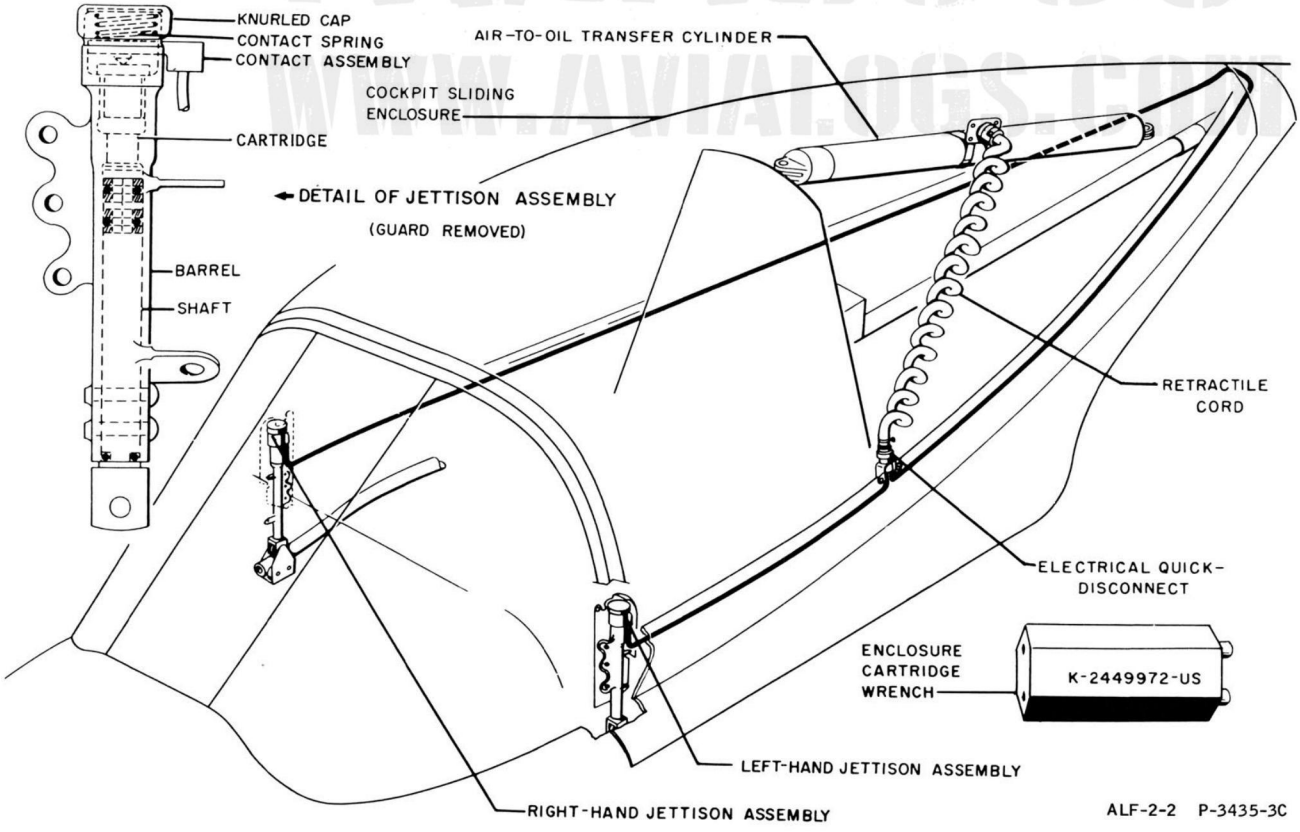
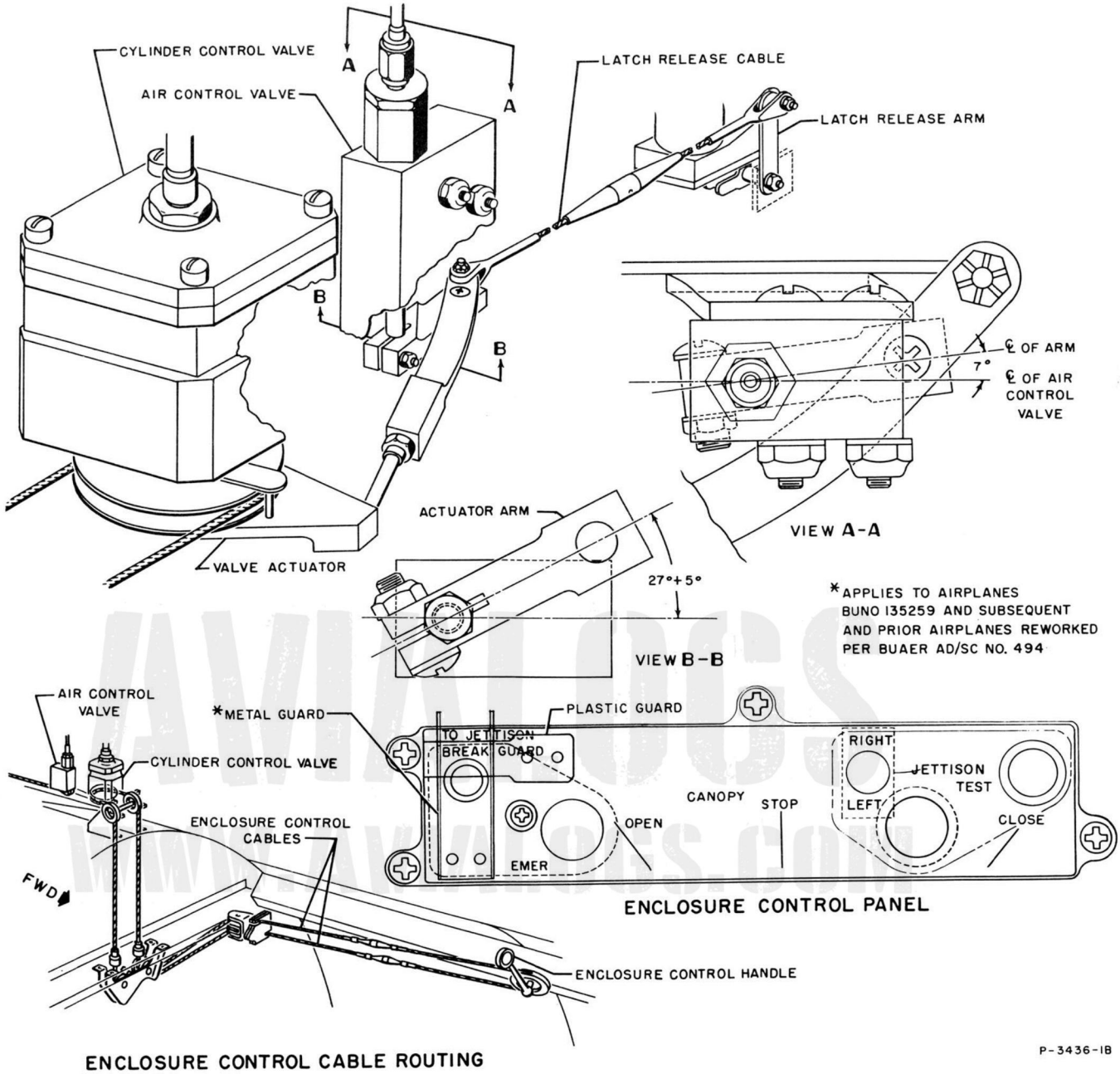


Figure 2-8. Cockpit Sliding Enclosure Control System (Sheet 3)



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ADJUSTMENT

a. Rig control cables to correct tension as shown on figure 2–24.

b. Relieve all air and hydraulic pressure in sliding enclosure control system.

c. Place enclosure control handle in "EMERGENCY."

Note

If new air control valve or actuator arm has been installed, make certain that index marks on valve shaft and valve body are aligned (valve in neutral). Install actuator arm on shaft as shown in view B-B.

d. Disconnect clevis link from air control valve actuator arm and from end of latch release cable.

e. Use protractor to obtain 7-degree setting of actuator arm as shown in view A-A.

f. Adjust clevis link to maintain 7-degree setting of actuator arm. Connect clevis link to actuator arm and latch release cable. Enclosure control handle must go into "EMERGENCY" detent.

g. Place control handle in "CLOSE." Rig latch release cable to release latch. Lockwire turnbuckle.

h. Check normal and auxiliary operation of enclosure control system.

Figure 2–9. Cockpit Sliding Enclosure Control Adjustments

2-65. COCKPIT SLIDING ENCLOSURE AUXILIARY SYSTEM AIR PRESSURE GAGE AND AIR FILLER VALVE.

2-66. DESCRIPTION. (See figure 2-8.) The sliding enclosure air pressure gage and filler valve are mounted, facing forward, in a panel bolted to the fuselage fuel cell compartment cover immediately aft of the cockpit. The gage indicates the psi air pressure within the system. The filler valve is used to pressurize the system. The valve body is screwed into an adapter, connecting the valve with the system.

2-67. REMOVAL. (See figure 2-8.)

a. If system air pressure is less than 100 psi, depress air filler valve core until pressure gage indicates zero. If system pressure is greater than 100 psi, disconnect line from air bottle in forward equipment compartment to prevent additional pressurized air from entering system.

b. Unsnap boot fasteners at gage panel.

c. To remove gage, disconnect line and remove attaching screws.

d. To remove filler valve, unscrew valve body from adapter on after side of panel.

2-68. INSTALLATION. (See figure 2-8).

a. To install gage, position gage from after side of panel, install gage attaching screws and connect gage line.

b. To install filler valve, join valve body and adapter through panel, and connect line.

c. Snap boot fasteners to gage panel.

2-69. COCKPIT SLIDING ENCLOSURE JETTISONING SYSTEM.

2-70. DESCRIPTION. (See figure 2-8.) The cockpit sliding enclosure jettisoning system is used to free the sliding enclosure from the cockpit rails to provide clearance for emergency bail-out with maximum speed. The system consists of left- and right-hand jettisoning assemblies installed at the forward end of the sliding enclosure and the necessary electrical control units to detonate the cartridges of the jettisoning assemblies.

2-71. COCKPIT SLIDING ENCLOSURE JETTISONING ASSEMBLIES.

2-72. DESCRIPTION. (See figure 2-8.) Each cockpit sliding enclosure jettisoning assembly consists of a barrel and shaft mounted permanently on the forward end of the cockpit sliding enclosure. The lower end of the shaft is attached to the truck which rides on the sliding enclosure forward track. The upper end of the shaft fits into the barrel and is secured by two shear pins. The upper end of the barrel contains a MK 19-0 cartridge, a contact assembly, and contact spring. The contact spring and knurled cap hold the contact assembly in place.

WARNING

When making electrical continuity test of enclosure jettisoning control, use only authorized test procedure and equipment.

2-73. REMOVAL.

a. Open sliding enclosure and disconnect enclosure jettisoning electrical wiring at plug and receptacle mounted on enclosure left-hand frame.

b. Unscrew jettisoning assembly knurled cap and remove contact spring contact assembly, and using enclosure cartridge wrench K-2449972-US remove cartridge from jettisoning assembly barrel.

2-73A. INSTALLATION.

a. Using special tool K-2449972, install cartridge in jettisoning assembly barrel.

b. Install contact assembly and contact spring in jettisoning assembly barrel on top of cartridge.

c. Replace jettisoning assembly knurled cap and tighten to a torque of 50-75 inch-pounds.

d. Connect jettisoning electrical wiring at plug and receptacle mounted on enclosure left-hand frame.

e. Test jettisoning control circuit.

2-73B. TESTING. A cartridge test circuit is included in the sliding enclosure jettisoning system. The test switch and test lamp (AN3140-327) are mounted on the pilot's sliding enclosure control panel on the left-hand side of the cockpit. Left- and right-hand cartridge test positions for the test switch are indicated by L and R. Continuity testing procedure for the enclosure jettisoning cartridges is as follows:

WARNING

To prevent cartridges from exploding during test use only authorized procedure and equipment when making continuity test of enclosure jettisoning control.

a. Push test lamp (AN3140-327) in to determine whether test lamp is operating. Replace if necessary.

b. Depress test switch to L position. If test lamp fails to light, replace left-hand cartridge.

c. Depress test switch to R position. If test lamp fails to light, replace right-hand cartridge.

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2-73C. COCKPIT SLIDING ENCLOSURE JETTISON CONTROL SYSTEM.

2-73D. DESCRIPTION. Principal components of the jettison control system include:

Name	Part No.	Location
Circuit-breaker, 10-amp, identified as IFF DESTRUCT CANOPY JETTISON	AN3161P10	Cockpit right-hand circuit breaker panel
Resistor, 8 ohm	RW30G8R0	Cockpit sliding enclosure control panel
Canopy jettison	AN3027-2	Cockpit sliding enclosure control panel
Test lamp	AN3140-327	Cockpit sliding enclosure control panel
Resistor, 220 ohm	RW30G221	
Test switch	AN3021-7	Cockpit sliding enclosure control panel
Retractile cord	Douglas 2438704	

2-73E. When the circuit breaker is closed, battery power is made available to the double-pole, single-throw jettison switch. Closing the switch connects the battery power to the contacts in the jettison assemblies to detonate the cartridges.

2-73F. A test circuit is provided to check the electrical continuity of the circuit. For the test procedure refer to paragraph 2-73B.

WARNING

To avoid inadvertent detonation of the cartridges and resultant damage to the airplane use only equipment specified in paragraph 2-73D.

2-74. PILOT'S SEAT.

2-75. DESCRIPTION. (See figure 2-10.) The pilot's seat is fabricated of aluminum-alloy sheet and tubing, and consists of a bucket-type seat and a back rest. Both the seat and the back are provided with pads. The cockpit seat can be adjusted vertically through a range of four and one-half inches by an electrical actuator attached to the underside of the seat. The control handle for the harness inertia reel is on the left-hand side of the seat. The seat lap belt and safety harness form a part of the seat installation.

2-76. REMOVAL. (See figure 2-10.)

a. Through forward equipment compartment, disconnect seat actuator electrical wiring.

b. Remove bolt attaching actuator to support structure.

c. Disconnect harness control handle from pilot seat.

d. Remove clamps holding personnel gear receptacle to support on seat.

e. Lift seat out of supporting structure.

2-77. INSTALLATION. (See figure 2-10.)

a. Insert seat support tube into cockpit floor by lining up key with seat.

b. Through forward equipment compartment, connect actuator to support structure.

c. Connect actuator electrical wiring.

d. Connect harness control handle to seat.

e. Operate seat adjustment switch to raise seat to full-up position. Move control stick full aft: stick should not contact seat.

f. Operate seat adjustment switch to lower seat to full-down position: seat should clear seat support structure.

g. If clearance is not complete at either end of seat travel, remove actuator from seat. Remove key from actuator and insert key into notch in barrel to prevent cap from turning.

CAUTION

Locking cap in place during actuator adjustment is absolutely necessary. Inadvertent turning of cap will change actuator stroke.

h. Screw actuator eyebolt in to lower seat (to obtain control stick clearance) or out to raise seat (to obtain required 1/16- to 3/16-inch support structure clearance). Each complete turn of eyebolt results in 1/8-inch adjustment of seat.

i. Clamp personnel gear receptacle to seat.

2-78. PILOT'S SEAT CONTROL CIRCUIT.

2-79. DESCRIPTION. The pilot's seat is vertically adjustable by an actuator which is electrically controlled and operated. The pilot's seat control circuit receives d-c power from the secondary bus through a 5-ampere circuit breaker. The actuator control switch is mounted in the cockpit right-hand control panel. The circuit includes the following principal items:

Actuator
Circuit breaker, 5-ampere
Control switch.

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2-80. TESTING.

a. Supply external electrical power.

b. Place control switch in SEAT UP: seat should move to full-up position.

c. Place control switch in SEAT DOWN: seat should move to full-down position.

NOTE

If seat response is opposed to switch position, wire leads are reversed either at switch or at actuator. For correct wiring of circuit, refer to section X.

2-81. PILOT'S SEAT ACTUATOR.

2-82. DESCRIPTION. (See figure 2-10.) The pilot's seat actuator is an acme-screw type mechanism attached to the bottom of the seat and to the seat support structure. The mechanism comprises a split-field motor wound with a series-type magnetic clutch, a planetary gear train, and two internal travel-limiting switches. The pilot's seat control switch in the cockpit right-hand control panel governs direction of motor rotation and the resultant extension or retraction of the screw mechanism.

2-83. REMOVAL. (See figure 2-10.)

a. Remove seat.

b. Remove bolt attaching actuator to seat and pull actuator out of seat support tube.

c. Disconnect actuator electrical wiring.

2-84. INSTALLATION. (See figure 2-10.)

a. Connect actuator electrical wiring.

b. Insert actuator into seat support tube.

c. Install bolt attaching actuator to seat.

d. Install seat.

2-85. PILOT'S SEAT CONTROL SWITCH.

2-86. DESCRIPTION. The pilot's seat control switch is mounted in the cockpit right-hand control panel. The

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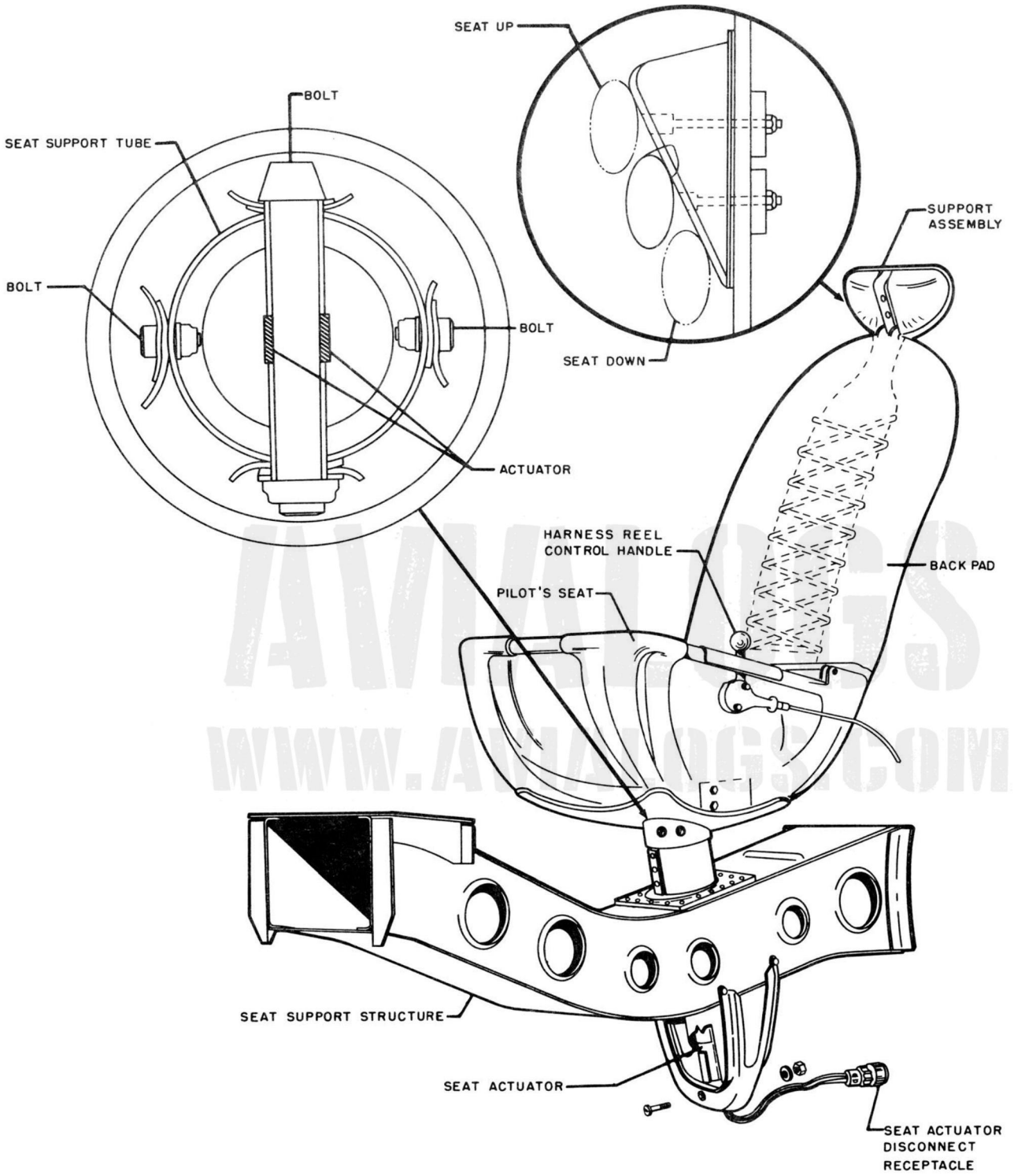

Figure 2–10. Pilot's Seat Installation

switch is normally off, with two momentary contact points, "UP," and "DOWN." When the switch is in "UP," the circuit to the seat actuator is closed for clockwise rotation of the actuator shaft to raise the seat. When the switch is in "DOWN," the circuit is closed to operate the actuator motor counterclockwise to lower the seat.

2-87. SAFETY HARNESS AND INERTIA REEL.

2-88. DESCRIPTION. (See figure 2-11.) The safety harness and inertia reel system consists of the pilot's safety harness, the inertia reel, the harness control handle, and connecting cables. The harness control handle is mounted on the left-hand side of the pilot's seat. The inertia reel control cable, which is attached to the harness control handle, connects to the inertia reel on the fuselage fuel cell compartment cover just aft of the pilot's seat. The safety harness cable leads forward from the inertia reel, and attaches to the safety harness fitting. The ends of the two harness straps are stitched to buckle fittings which latch to the lap belt buckle and are held in place when the lap belt is buckled. When the harness control handle is in the locked or forward position, the safety harness cable will not extend. When the harness control handle is in the unlocked or rear position, the safety harness cable will extend and retract easily. The safety harness inertia reel consists of an inertia reel case which houses a spring-loaded drum on which is wound the harness cable. If the airplane decelerates with a force of 2.5 G's or more, the inertia reel automatically locks; when the tension is released, the harness cable retracts.

2-89. TROUBLE SHOOTING. Refer to table 2-1A.

2-90. REMOVAL.

a. Open cockpit sliding enclosure and disconnect enclosure jettisoning electrical wiring at plug and receptacle mounted on enclosure left-hand frame.

b. Through access at rear of enclosure, remove bolt which attaches enclosure to enclosure actuating cylinder piston rod.

c. Detach after track attaching fitting from fuselage and pull track clear of forward support and enclosure.

d. Slide enclosure forward on tracks and tilt enclosure upward.

e. Remove enclosure cylinder boot.

f. Disconnect safety harness cable from inertia reel.

g. Disconnect inertia reel control cable from inertia reel control arm.

h. Remove bolts attaching inertia reel to bracket on fuel cell cover.

2-90A. INSTALLATION.

a. Bolt inertia reel to bracket on fuel cell cover.

b. Connect inertia reel control cable to inertia reel control arm.

c. Connect safety harness cable to inertia reel.

d. Install enclosure cylinder boot.

e. Test safety harness and inertia reel. Refer to paragraph 2-90B.

f. Tilt enclosure down and slide enclosure aft.

g. Insert after enclosure track through enclosure attaching fitting and engage track with support. Bolt track attaching fitting to fuselage.

h. Using bolt and roller, connect enclosure actuating cylinder piston rod to enclosure.

i. Install enclosure access cover.

j. Connect enclosure jettisoning electrical wiring at plug and receptacle on enclosure left-hand frame.

2-90B. TESTING.

a. Move harness control handle back and forth. Handle should stay securely in locked or unlocked position, and inertia reel should lock and unlock easily.

b. With harness control handle in locked position, safety harness cable should not extend.

c. With harness control handle in unlocked position, extend and retract safety harness cable several times. Operation should be smooth.

d. Place harness control handle in unlocked position. Then, holding safety harness cable partly extended, move harness control handle to locked. Safety harness cable should not extend further, but should retract freely.

e. Place harness control handle in unlocked position. Then, while extending safety harness cable, strike front of inertia reel sharply with hand to simulate G-pressure. Inertia reel should lock, but safety harness cable should retract when tension is released.

Note

If inertia reel is defective, replace. Do not attempt to repair reel.

f. Displace rubber support which protects swaged cable end and inspect cable for fraying at swaged end. If cable is frayed, replace inertia reel and cable.

2-90C. INERTIA REEL CONTROL ASSEMBLY.

2-90D. DESCRIPTION. The inertia reel control assembly consists of the harness control handle and the inertia

TABLE 2-1A. SAFETY HARNESS AND INERTIA REEL TROUBLE SHOOTING

Trouble or Symptom	*Probable Cause*	*Correction*
1. Control handle fails to lock or unlock inertia reel.	a. Kinks or obstructions in control cable. b. Defective control assembly c. Defective inertia reel.	Remove kinks or obstructions. Replace control assembly. Replace inertia reel.
2. Harness cable fails to operate properly.	a. Harness cable obstructed or kinked. b. Defective inertia reel.	Remove obstruction or kinks. Replace inertia reel.

reel control cable. The harness control handle is mounted on the left-hand side of the pilot's seat. When the harness control handle is in the forward position, the inertia reel is locked. When the harness control handle is in the rear position, the inertia reel is unlocked. The inertia reel control cable extends from the harness control handle to the inertia reel control arm.

2-90E. REMOVAL.

a. Open cockpit sliding enclosure and disconnect enclosure jettisoning electrical wiring at plug and receptacle mounted on enclosure left-hand frame.

b. Through access at rear of enclosure, remove bolt attaching enclosure to enclosure actuating cylinder piston rod.

c. Detach after enclosure track attaching fitting from fuselage and pull track clear of forward support and enclosure.

d. Slide enclosure forward on tracks and tilt enclosure upward.

e. Remove enclosure cylinder boot.

f. Disconnect inertia reel control cable from inertia reel control arm.

g. Remove bolt attaching harness control handle knob to harness control handle on left-hand side of pilot's seat.

h. Remove mounting bolts attaching harness control handle to pilot's seat.

2-90F. INSTALLATION.

a. Bolt harness control handle to pilot's seat.

b. Bolt harness control handle knob to harness control handle.

c. Connect control cable to inertia reel control arm.

d. Replace enclosure cylinder boot.

e. Tilt enclosure downward and slide enclosure aft.

f. Insert after enclosure track through enclosure attaching fitting and engage track with support. Bolt track attaching fitting to fuselage.

g. Using bolt and roller, connect enclosure actuating cylinder piston rod to enclosure.

h. Install enclosure access cover.

i. Connect enclosure jettisoning electrical wiring at plug and receptacle on enclosure left-hand frame.

2-91. PILOT'S HEADREST.

2-92. DESCRIPTION. (See figure 2-11.) The pilot's headrest is installed on the forward face of the cockpit rear armor plate and serves as a head support for the pilot during catapult launching of the airplane. The headrest is fabricated of molded synthetic latex foam, covered with synthetic fabric. The headrest is hinged at the bottom and can be tilted to any of four positions by actuation of a cable release handle mounted to the right of the headrest.

2-93. REMOVAL. (See figure 2-11.)

a. Remove bolt attaching tilt control cable tube to channel on back of headrest.

b. Remove hinge pin at bottom of headrest.

2-94. INSTALLATION. (See figure 2-11.)

a. Engage headrest hinge with hinge welded to cockpit rear armor plate and install hinge pin. Peen hinge ends to retain hinge.

b. Bolt tilt control cable tube to channel on back of headrest. Tighten nut to permit 1/32-inch end play in bolt and install cotter.

2-95. CHARTBOARD.

2-96. DESCRIPTION. (See figure 2-12.) A chartboard is installed below the pilot's instrument panel. The chartboard is mounted on tracks and is retained under the pilot's instrument panel by a spring-loaded lever. When the lever is depressed, the chartboard can be pulled out on the chartboard tracks. Two lights installed above the chartboard on the instrument panel glare shield provide light for the chartboard when the chartboard is pulled aft on the chartboard tracks.

2-96A. CHARTBOARD LIGHT CIRCUIT.

2-96B. DESCRIPTION. The chartboard light circuit receives power from the primary bus through the CONSOLE LIGHTS 5 ampere circuit breaker. Power from the circuit breaker to the lights is through the CONSOLE switch installed on the INSTRUMENT LIGHTS console, and through the chartboard switch installed on the left-hand chartboard track. The chartboard lights are illuminated when the CONSOLE switch is placed in any position except OFF and the chartboard is pulled aft on the chartboard tracks to close the circuit through the chartboard switch. The chartboard lights are also illuminated by the cockpit light circuit when the chartboard is in the latched position by placing the COMPASS LIGHT switch installed on the FLOOD LIGHTS console in ON.

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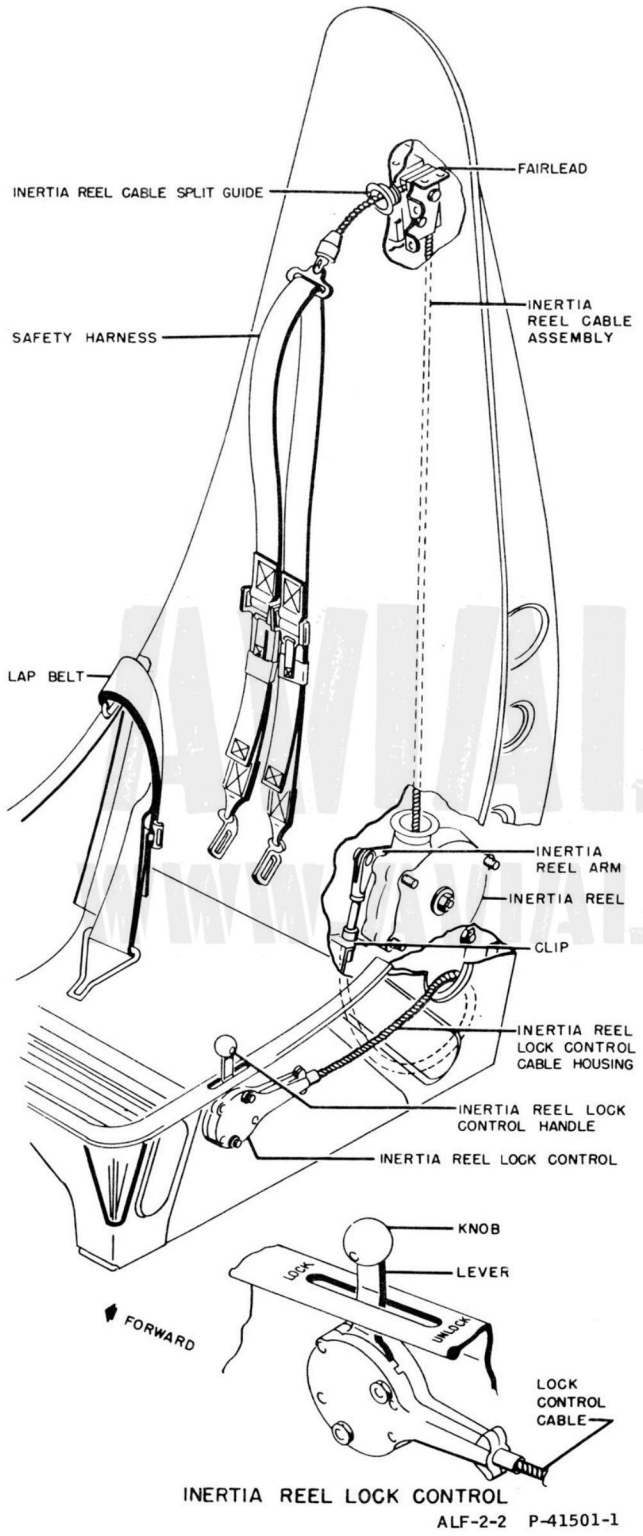

Figure 2-11. Safety Harness and Seat Lap Belt Installation

2-97. PILOT'S RELIEF TUBE.

2-98. DESCRIPTION. (See figure 2-3.) The pilot's relief tube is recessed into the cockpit floor at fuselage station 114, to the left of the pilot's seat. The relief tube drains overboard at the bottom of the fuselage at fuselage station 120.

2-99. CANTEEN CONTAINER.

2-100. DESCRIPTION. (See figure 2-3.) The canteen container, designed to hold a regulation canteen, is fabricated of cotton duck with web straps which are secured by a post-and-socket fastener.

2-100A. SEAT LAP BELT.

2-100B. DESCRIPTION. The seat lap belt is attached to the side of the seat. The safety harness can be connected to the seat lap belt buckle and is held in place when the seat lap belt is buckled.

2-100C. REMOVAL. To remove the seat lap belt proceed as follows:

a. Cut lockwire and remove seat lap bolt attaching belt.

b. Remove seat lap belt.

2-100D. INSTALLATION. To install the seat lap belt proceed as follows:

NOTE

Install seat lap belt so pull from left to right will disengage buckle.

a. Place end fitting of seat lap belt in position at sides of seat and install attaching bolts.

b. Lockwire seat lap belt attaching bolt to bolt installed aft of attaching bolt position on side of seat.

2-100E. ANTIEXPOSURE SUIT VENTING PROVISIONS.

2-100F. DESCRIPTION. (See figure 2-3.) On all airplanes reworked to A-1/ASC 713, antiexposure suit venting provisions have been installed on the bulkhead at station 134.500. The blower attaches to the bracket assembly installed by A-1/ASC 713. Refer to section IV for more detailed information and section X for wiring information.

2-101. DIVE BRAKES.

2-102. DESCRIPTION. (See figure 2-13.) The dive brakes consist of three hydraulically actuated panels, one on each side of the fuselage and one on the bottom of the fuselage. There are two hinge points for each dive brake and each brake is actuated by its own hydraulic

cylinder. There is no mechanical linkage interconnecting the dive brakes.

2–103. SIDE DIVE BRAKES.

2–104. DESCRIPTION. (See figure 2–13.) The side dive brakes are hinged to the fuselage at approximately fuselage station 220. They are plate-type dive brakes and are constructed of channels, angular stiffeners and 75 S-TAL inner and outer plating. The fuselage is recessed in the dive brake area, providing wells into which the dive brakes, when closed, retract completely flush with the fuselage.

2–105. REMOVAL. (See figure 2–13.)

a. Relieve hydraulic system pressure. Make certain that hydraulic pressure is fully relieved by pulling hydraulic relief valve handle up until hydraulic pressure gage indicates zero.

b. Inspect bottom dive brake to make certain bottom dive brake actuating cylinder lock is engaged.

c. Manually open side dive brake which is to be removed.

d. Disconnect actuating cylinder from dive brake.

e. Remove two hinge bolts and remove dive brake.

2–106. INSTALLATION. (See figure 2–13.)

a. Place eccentric bushings in fuselage hinge fittings.

b. Place dive brake in position and install two hinge bolts.

c. Adjust dive brake actuating cylinder as instructed in paragraph 2–132 and connect cylinder piston to dive brake.

d. Adjust eccentric bushings in hinge fittings so that dive brake fits snugly into dive brake well.

Note

The hinges can be adjusted by installing both eccentric bushings on one or the other side of the hinge fitting, or one on the top and one on the bottom of the hinge fitting.

e. When hinge adjustment is satisfactory, install set-screws and stake them in place.

f. Restore hydraulic system pressure.

CAUTION

After installing dive brake, to prevent possible damage to bottom dive brake, make certain that dive brake control handle in cockpit is in "CLOSE" before applying any hydraulic pressure to dive brake hydraulic system.

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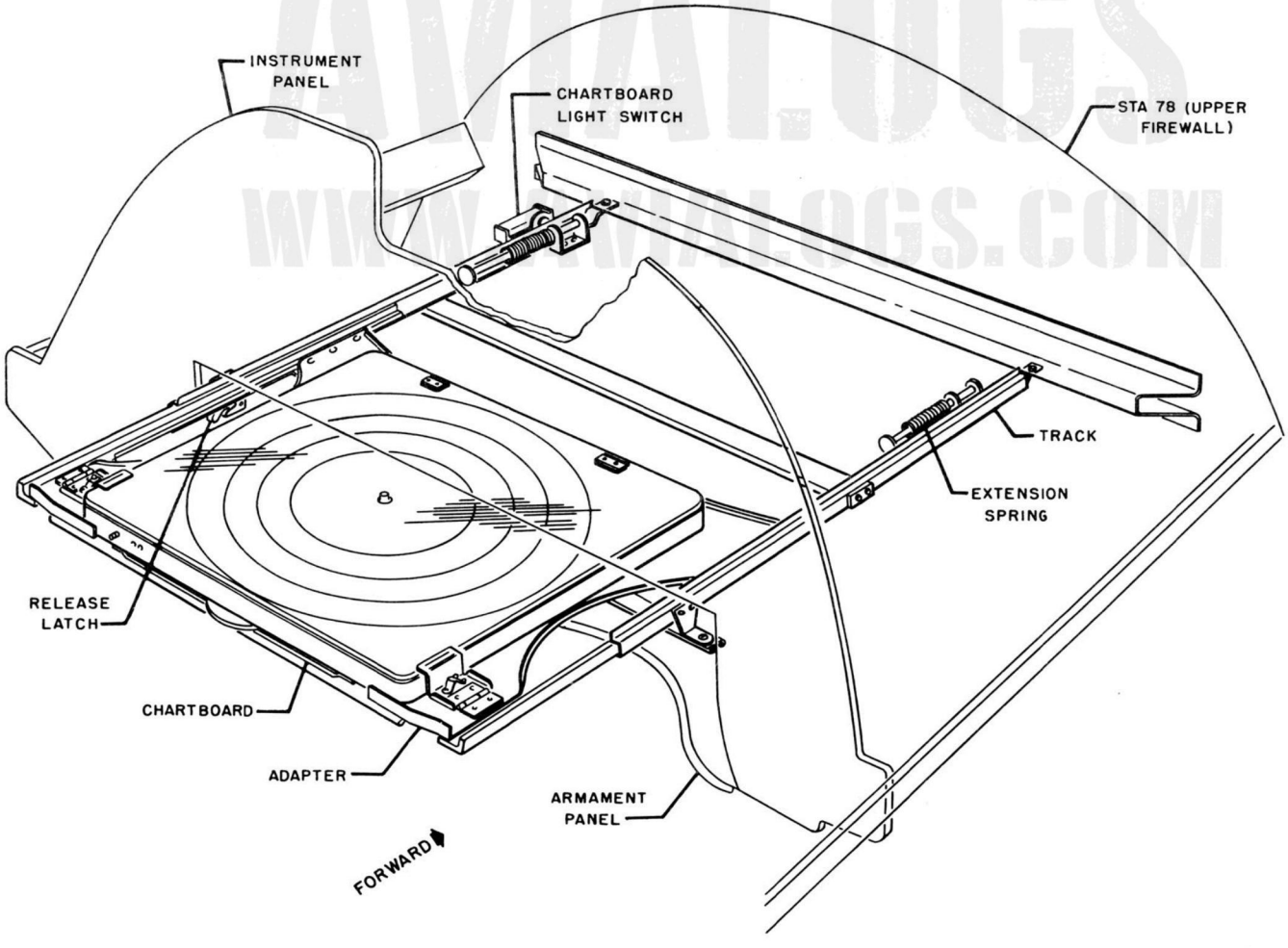

Figure 2–12. Chartboard Installation

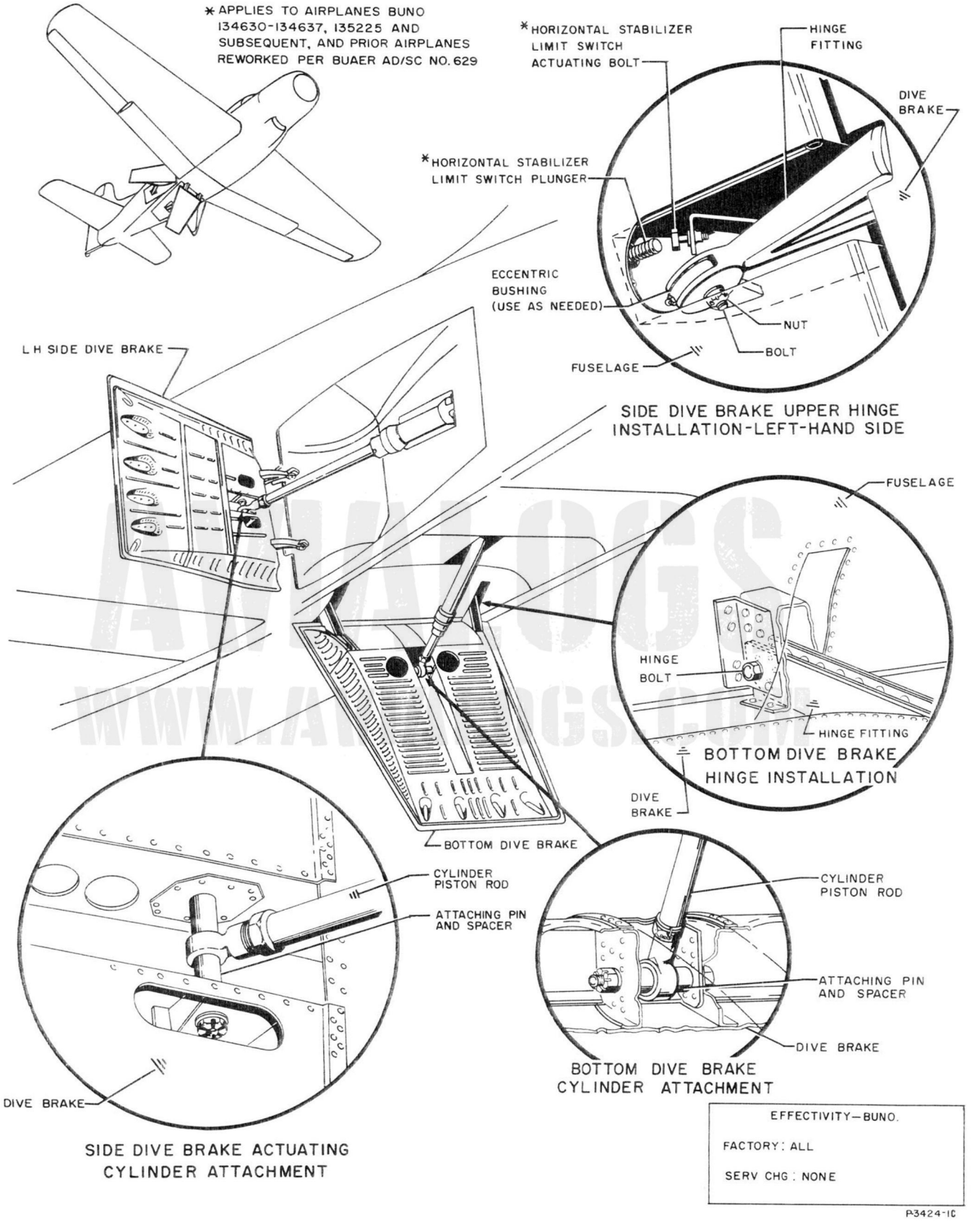

Figure 2–13. Dive Brake Installation

g. On AD-6 airplanes BuNo. 134630-134637, 135225 and subsequent, AD-7 airplanes, and prior airplanes reworked per BuAer AD/SC No. 629, adjust horizontal stabilizer side dive brake controlled switch actuating bolt on left-hand side dive brake upper hinge. (See figure 2–45.)

2–107. BOTTOM DIVE BRAKE.

2–108. DESCRIPTION. (See figure 2–13.) The bottom dive brake is hinged to the fuselage at approximately fuselage station 220. The bottom dive brake is a plate-type dive brake and is constructed of channels, angular stiffeners, 24 S-TAL inner plating, and 75 S-TAL outer plating. The fuselage is recessed in the dive brake area, providing a well into which the bottom dive brake, when closed, retracts completely flush with the fuselage. A hydraulic lockout valve is installed in the airplane to hold the bottom dive brake inoperative in the retracted position when stores which may interfere with the operation of the bottom dive brake are carried on the fuselage stores rack.

2–109. REMOVAL. (See figure 2–13.)

a. Relieve hydraulic system pressure. Make certain that pressure is fully relieved by operating wing flaps until hydraulic pressure gage indicates zero.

b. Connect hand pump test stand to hydraulic system, place dive brake control handle in "OPEN," and pump brakes sufficiently open to gain access to actuating cylinder connection. (If test stand is not available, operate hydraulic auxiliary pump momentarily to release actuating cylinder lock, then manually pull bottom dive brake partly open.)

CAUTION

Unless airplane is raised on jacks, do not fully open dive brakes, or bottom dive brake may be damaged by striking ground.

c. Disconnect actuating cylinder from dive brake.

d. Remove hinge access covers inboard of dive brake hinges.

e. Remove hinge bolts and remove bottom dive brake.

2–110. INSTALLATION. (See figure 2–13.)

a. Place dive brake in position and install two hinge bolts.

b. Install hinge access covers inboard of dive brake hinges.

c. Adjust dive brake actuating cylinder as instructed in paragraph 2–137, and connect cylinder piston to dive brake.

d. Restore hydraulic system pressure.

CAUTION

After installing bottom dive brake, make certain that dive brake control handle in cockpit is in "CLOSE" before applying any hydraulic pressure to dive brake hydraulic system, or bottom dive brake may extend and be damaged by striking ground.

2–111. DIVE BRAKE CONTROL SYSTEM.

2–112. DESCRIPTION. (See figure 2–14.) The dive brakes are hydraulically controlled and are operated by the dive brake control valve and by individual actuating cylinders which operate simultaneously. The principal components of the dive brake control system include:

Name	*Para Ref*
Control lever assembly	2–113
Control valve	2–116
Safety circuit	2–121
Side dive brake actuating cylinders	2–128
Bottom dive brake actuating cylinder	2–133
Lockout valve	2–138
Check valve	

2–113. The dive brake control valve is operated by the dive brake control lever mounted on the inboard edge of the left-hand control panel in the cockpit. The control lever can be placed in either of two indicated extreme positions, "OPEN" or "CLOSE," or in any intermediate position between the two extremes to hold the dive brakes partly open. Except when the dive brakes are in operation, the control lever should remain in "CLOSE" where it will be locked by the dive brake safety solenoid, identical to the landing gear safety solenoid and similarly actuated by the retraction release switch on the main landing gear left-hand shock strut. The dive brake safety solenoid prevents inadvertent movement of the dive brake control lever to "OPEN" and consequent possible damage to the bottom dive brake when the airplane is on the ground; however, for ground maintenance work on the dive brakes, the safety solenoid can be released by operating the red handle, SAFETY RELEASE, just outboard of the dive brake control lever. A lockout valve is installed in the bottom dive brake hydraulic *open* line to hold the bottom dive brake retracted when stores are carried on the fuselage stores rack. Two check valves with a rated flow capacity of 6 gallons per minute are installed in the system, one in the lockout valve return line and one in the pressure line upstream from the control valve.

2–114. TROUBLE SHOOTING. Refer to table 2–2.

2–115. TESTING.

a. Support airplane in fuselage level position with main landing gear clear of ground. (This precaution is necessary to prevent damage to bottom dive brake, which must clear ground when fully extended.)

b. Make certain that full hydraulic system pressure (3000 psi) is available and place dive brake control lever in "OPEN": all dive brakes should open fully in five seconds maximum.

c. Place dive brake control lever in "CLOSE": all dive brakes should close completely in two seconds maximum.

d. Place dive brake control lever in "NEUTRAL": all dive brakes should stop moving.

e. Raise landing gear.

f. Place dive brake control lever in "OPEN" and landing gear control handle in "WHEELS DOWN": landing gear should extend concurrently with extension of dive brakes.

Note

The solenoid-operated lock on the dive brake control lever is actuated by the retraction release switch on the main landing gear left-hand shock strut. The control lever is locked when the weight of the airplane is on the landing gear and unlocked when the airplane is airborne.

2-116. DIVE BRAKE CONTROL VALVE.

2-117. DESCRIPTION. (See figure 2-14.) The dive brake control valve is mounted on a bracket beneath the control lever and the cockpit floor just aft of fuselage station 110, and is accessible from within the forward equipment compartment. An adjustable rod links the control lever to the valve slide. Movement of the lever causes the slide to shift, opening and/or closing the proper valve ports to route hydraulic pressure from the main hydraulic system to the three dive brake actuating cylinders with the result that the dive brakes open or close according to the position of the control lever.

2-118. REMOVAL. (See figure 2-14.)

a. Relieve hydraulic system pressure. Make certain that pressure is fully relieved by operating wing flaps until hydraulic pressure gage indicates zero.

b. Through forward equipment compartment, disconnect and cap four hydraulic lines at control valve.

c. Disconnect control lever linkage from valve slide.

d. Remove bolt which attaches valve to bracket.

2-119. INSTALLATION. (See figure 2-14.)

a. Through left-hand side of forward equipment compartment, position valve against bracket so that valve ports face outboard and aft. Install attaching bolt, washer and nut.

b. Temporarily connect control lever linkage to valve slide.

c. Uncap and connect hydraulic lines to valve ports: *open* line to outboard upper port; *close* line to outboard lower port; *pressure* line to after upper port; and *return* line to after lower port.

d. Adjust and connect control lever linkage to valve slide. (For control valve adjustment refer to paragraph 2-120.)

e. Restore hydraulic system pressure.

2-120. ADJUSTMENT. (See figure 2-14.)

a. Make sure that no pressure exists in hydraulic system.

b. Adjust linkage connecting control lever and valve slide as noted on figure 2-14.

2-121. DIVE BRAKE CONTROL SAFETY CIRCUIT.

2-122. DESCRIPTION. The dive brake control safety circuit is installed in the airplane to prevent inadvertent movement of the dive brake control lever to "OPEN" when the airplane is resting on the ground. The dive brake control safety circuit is junctioned into the landing gear control safety circuit; the dive brake safety solenoid and the landing gear safety solenoid are actuated identically and simultaneously by the retraction release switch mounted on the main landing gear left-hand shock strut. When the strut is compressed by the weight of the airplane, the retraction release switch is open and the dive brake safety solenoid is de-energized, allowing the spring-loaded solenoid plunger to extend and prevent movement of the dive brake control lever from "CLOSE" to "OPEN." When the airplane is airborne, extension of the strut causes the retraction release switch to close the circuit, energizing the solenoid to retract the plunger so that the dive brake control can be moved to any desired position. A release handle, SAFETY RELEASE, mounted just outboard of the dive brake control lever, permits manual disengagement of the solenoid plunger when required for ground maintenance work on the dive brakes. The circuit receives power from the secondary bus through a 5-ampere circuit breaker.

2-123. An interlock switch is installed in the dive brake control safety circuit between the dive brake safety sole-

TABLE 2-2. DIVE BRAKE CONTROL SYSTEM TROUBLE SHOOTING

Trouble or Symptom	*Probable Cause*	*Correction*
1. All brakes fail to operate.	a. Insufficient hydraulic pressure.	Check system.
	b. Control valve out of adjustment.	See figure 2-14.
2. One brake fails to close fully.	Related actuating cylinder out of adjustment.	Refer to paragraphs 2-132 and 2-137.
3. Brakes fail to stop when control valve placed in neutral.	a. Trouble 1.b.	
	b. Control valve failure.	Replace.
4. Bottom brake fails to open when lockout valve placed in "OPEN."	a. Trouble 1.a.	
	b. Lockout valve failure.	Replace.
5. Control handle does not lock in "CLOSE" when landing gear extended.	Safety solenoid defective.	Adjust, repair or replace.

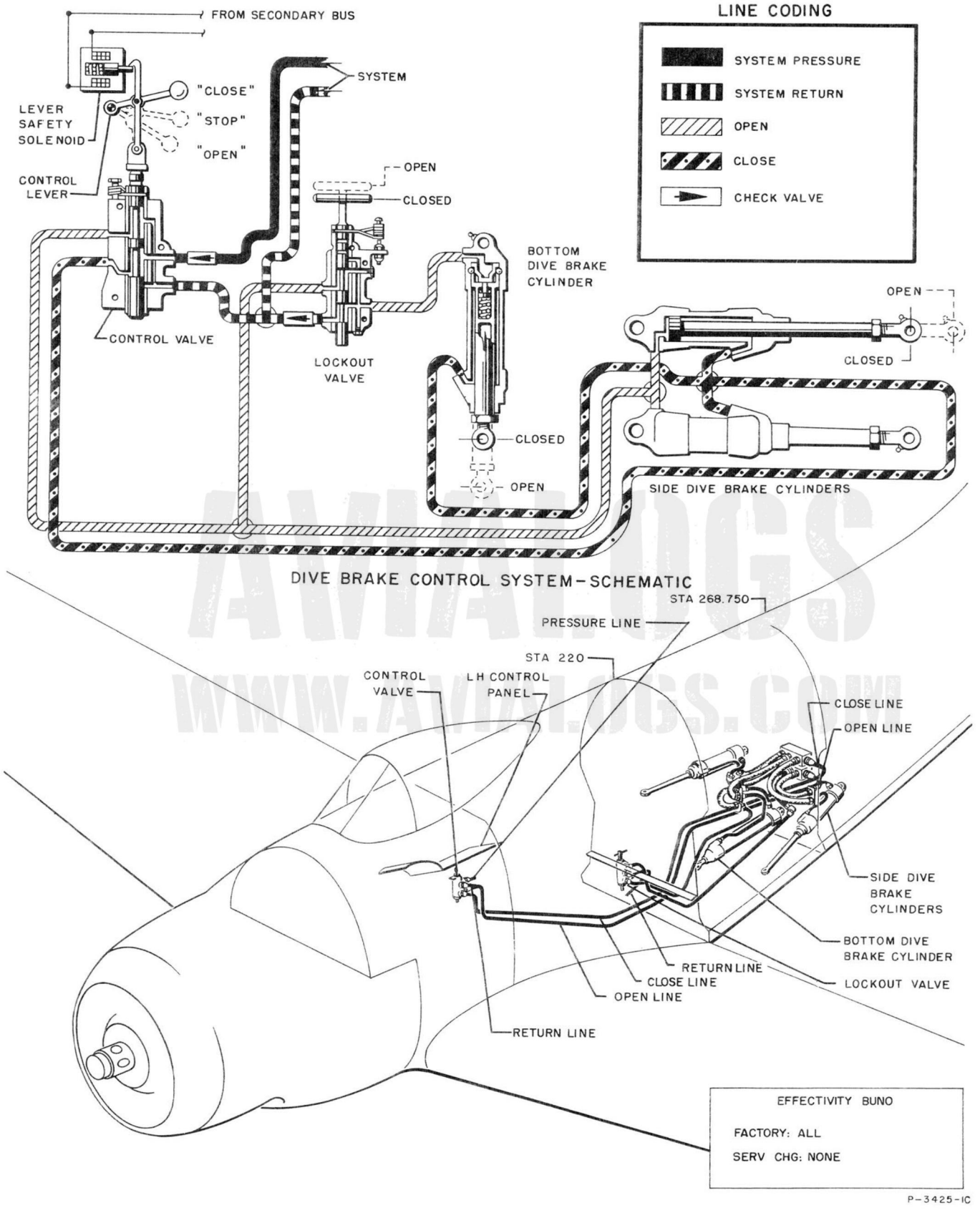

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Figure 2–14. Dive Brake Control System (Sheet 1)

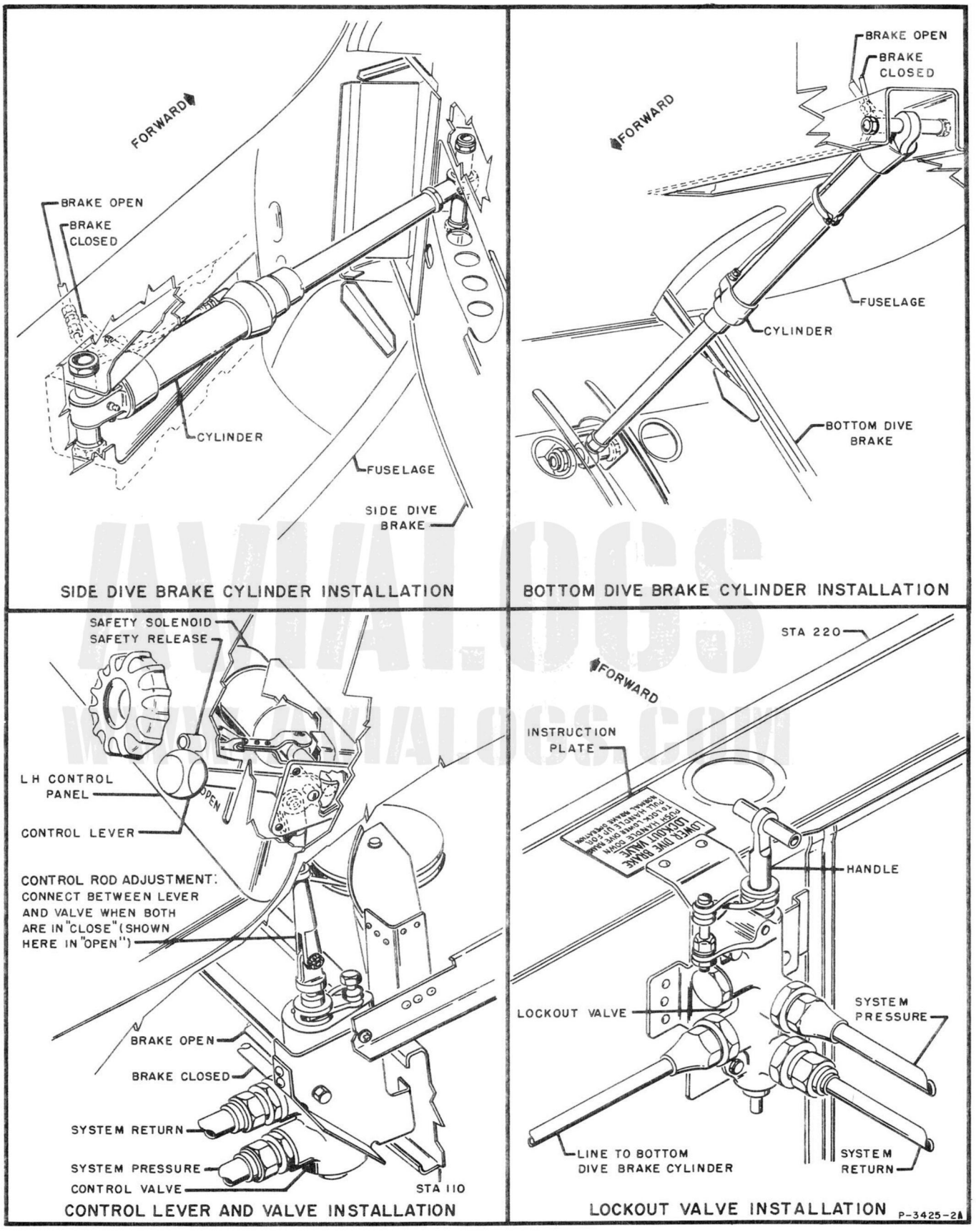


Figure 2–14. Dive Brake Control System (Sheet 2)

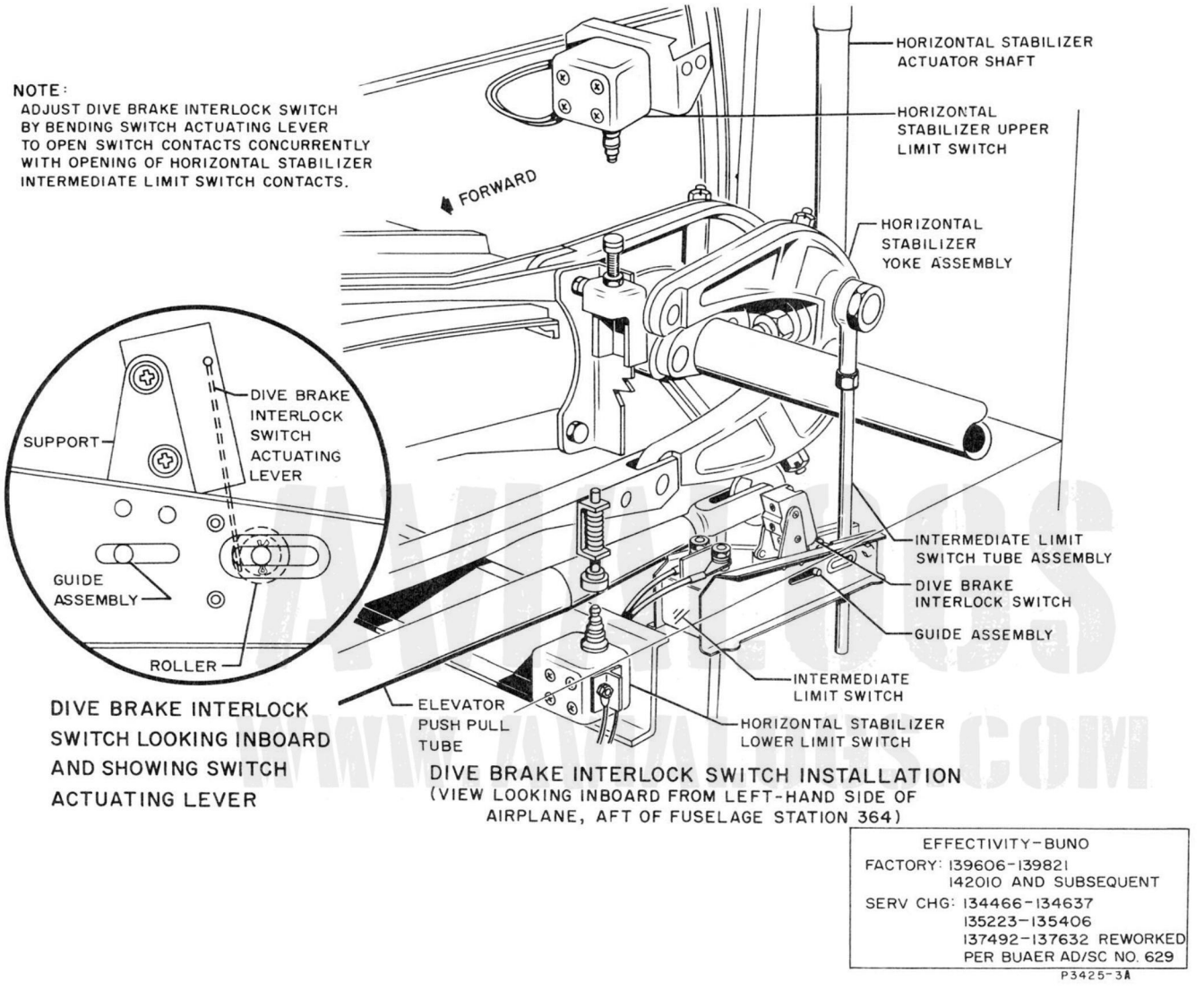
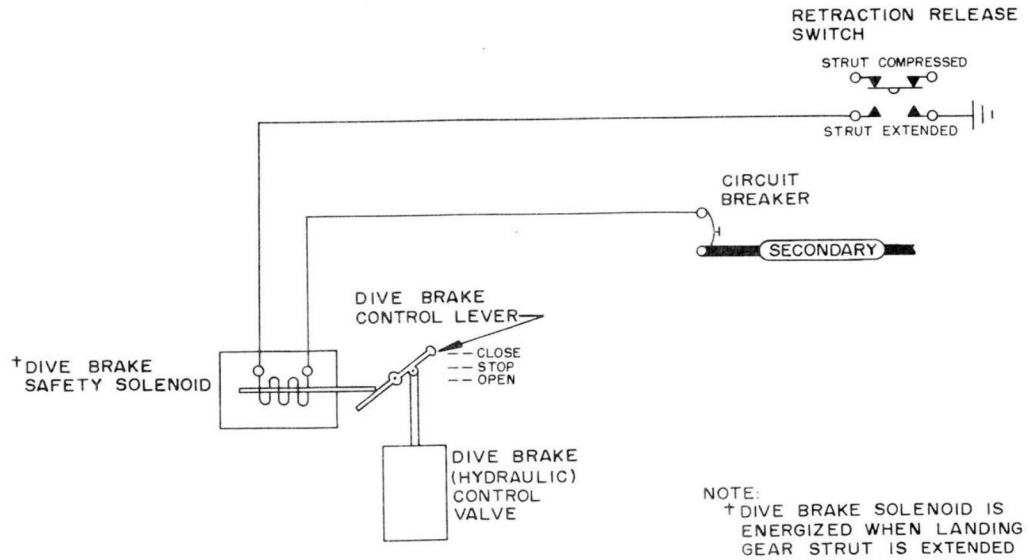


Figure 2–14. Dive Brake Control System (Sheet 3)

noid and the retraction release switch on AD-6 airplanes BuNo. 139606 and subsequent, AD-7 airplanes, and prior airplanes reworked per BuAer AD/SC No. 629. The switch is actuated by the horizontal stabilizer intermediate limit switch tube and guide assembly to open the switch contacts and de-energize the dive brake safety solenoid when the horizontal stabilizer is in "NOSE UP" position. The switch prevents the use of the dive brakes when the horizontal stabilizer is positioned in the "NOSE UP" range.

2–124. DIVE BRAKE SAFETY SOLENOID.

2–125. DESCRIPTION. (See figure 2–14.) The dive brake safety solenoid is mounted in the cockpit left-hand control panel, outboard of the dive brake control lever,



NOTE:
† DIVE BRAKE SOLENOID IS ENERGIZED WHEN LANDING GEAR STRUT IS EXTENDED

EFFECTIVITY - BUNO.
FACTORY: 134466-134637, 135223-135406, 137492-137632 NOT REWORKED PER BUAER AD/SC NO. 629
SERV CHG: NONE

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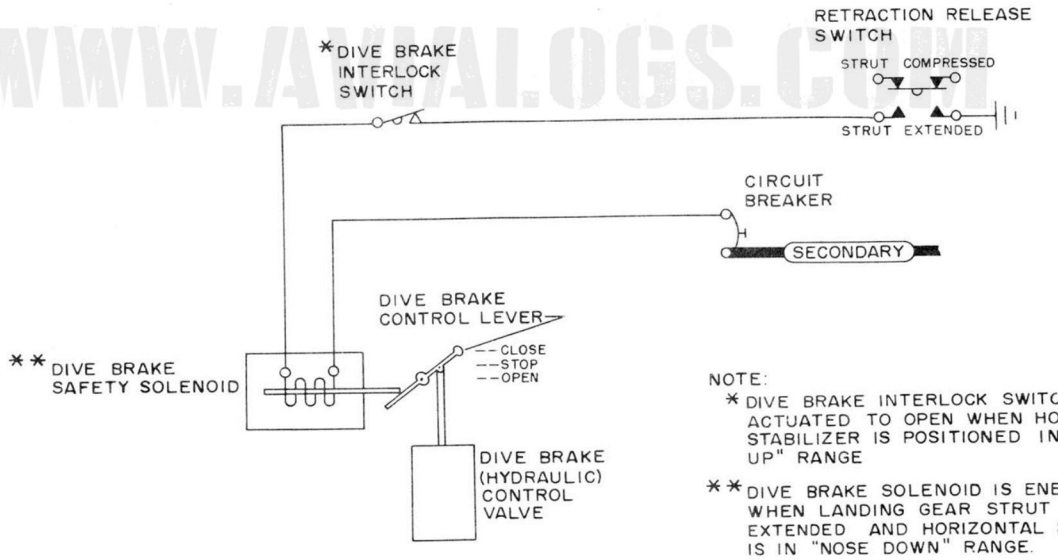

NOTE:
* DIVE BRAKE INTERLOCK SWITCH IS ACTUATED TO OPEN WHEN HORIZONTAL STABILIZER IS POSITIONED IN "NOSE UP" RANGE

** DIVE BRAKE SOLENOID IS ENERGIZED WHEN LANDING GEAR STRUT IS EXTENDED AND HORIZONTAL STABILIZER IS IN "NOSE DOWN" RANGE.

EFFECTIVITY - BUNO.
FACTORY: 139606 - 139821, 142010 AND SUBSEQUENT
SERV CHG: 134466-134637, 135223-135406, 137492-137632 REWORKED PER BUAER AD/SC NO. 629

P-8000-1-B

Figure 2–14A. Dive Brake Control Safety Circuit

and is actuated by the retraction release switch on the main landing gear left-hand shock strut. The dive brake safety solenoid is interchangeable with the landing gear safety solenoid.

2–126. REMOVAL. (See figure 2–14.)

a. Remove side panel of left-hand control panel by removing screws which attach panel to frame.

b. Remove release lever pivot bolt. Then disengage lever from solenoid plunger.

c. Remove solenoid mounting screws and lift solenoid clear of its support.

d. Disconnect electrical wiring from solenoid terminals.

2–127. INSTALLATION. (See figure 2–14.)

a. With side panel of left-hand control panel removed, pull solenoid wiring into position and connect wiring to solenoid terminals.

b. Place solenoid in its support and install and safety-wire mounting screws.

c. Engage release lever slots with solenoid plunger pin and install release lever pivot bolt.

d. Replace side panel.

2–128. SIDE DIVE BRAKE ACTUATING CYLINDERS.

2–129. DESCRIPTION. (See figure 2–14.) The side dive brake actuating cylinders are two-port hydraulic cylinders which receive pressure from the main hydraulic system. The cylinders are mounted on reinforced structure at fuselage station 268.75 and extend through the fuselage plating to connect with their respective dive brakes. The head end of each cylinder is fastened to the fuselage, and the piston end of each cylinder is fastened to its related dive brake. The cylinders are interchangeable and each has the following dimensions: compressed length, 28 3/16 inches; extended length, 36 9/16 inches; stroke, 8 3/8 inches.

2–130. REMOVAL. (See figure 2–14.)

a. Relieve hydraulic system pressure. Make certain that pressure is fully relieved by operating wing flaps until hydraulic pressure gage indicates zero.

b. Manually open dive brake related to actuating cylinder which is to be removed.

c. Disconnect hydraulic line and line clamp from piston end of cylinder barrel and cap hydraulic line.

d. Through access holes in dive brake inner plating remove pin which attaches cylinder piston rod to dive brake.

e. Inside fuselage, disconnect and cap hydraulic line at head end of cylinder.

f. Remove pin which attaches head of cylinder to fuselage structure and remove cylinder.

2–131. INSTALLATION. (See figure 2–14.)

a. Insert ball bearing into sleeve of cylinder head. Place cylinder head between guide plates and bolt plates to head.

b. Insert cylinder head through cut-out in fuselage plating in dive brake well and position cylinder head to support channels. From inside fuselage, install pin, two washers, spacers, nut and cotter pin which attach cylinder to fuselage.

c. Uncap and connect dive brake *open* hydraulic line at cylinder head.

d. Outside fuselage, uncap and connect dive brake *close* hydraulic line at piston end of cylinder and install line clamp.

e. Insert ball bearing in cylinder piston eyebolt. Reach through access holes near recess in dive brake and install pin, two washers, spacers and nut which attach cylinder piston to dive brake.

Note

At this step, tighten the nut hand tight only. The nut should not be fully tightened or safetied until the cylinder has been adjusted. (Refer to paragraph 2–132.)

f. Restore hydraulic system pressure.

CAUTION

After installing dive brake cylinder, make certain that dive brake control handle in cockpit is in "CLOSE" before applying any hydraulic pressure to dive brake hydraulic system or bottom dive brake may extend and be damaged by striking ground.

2–132. ADJUSTMENT.

a. With all brakes closed and held by hydraulic pressure, close lockout valve to prevent opening of bottom dive brake.

b. Inspect edges of side brake for which cylinder is being adjusted: they should fair with fuselage without exerting pressure on plating. If necessary, screw cylinder piston eyebolt in or out until correct adjustment is obtained.

c. Preload cylinder by screwing eyebolt in one full turn.

d. Tighten lock nut on eyebolt, and safety nut on cylinder attaching pin at dive brake.

e. When adjustment is complete, make certain cockpit control is in "CLOSE" and then open lockout valve in bottom brake line.

2–133. BOTTOM DIVE BRAKE ACTUATING CYLINDER.

2–134. DESCRIPTION. (See figure 2–14.) The bottom dive brake actuating cylinder is a two-port hydraulic cylinder which receives pressure from the main hydraulic system. The cylinder is mounted on a channel support centered in the bottom dive brake well. The head end of the cylinder is fastened to the fuselage, and the piston end of the cylinder is fastened to the bottom dive brake. The cylinder has the following dimensions: com-

pressed length, 24-1/2 inches; extended length, 42-5/16 inches; stroke, 17-13/16. The cylinder is similar to the side dive brake cylinders in construction and operation, except that the cylinder head contains an up-latching mechanism consisting of ten steel balls and a spring-loaded latch plunger in the piston head and of a latch ring in the barrel head. When the piston retracts to close the dive brake, the plunger forces the balls into the latch ring where they are held until hydraulic pressure, entering the cylinder head, forces the plunger downward to unseat the balls and allow the piston to extend the dive brake.

2-135. REMOVAL. (See figure 2-14.)

a. Relieve hydraulic system pressure. Make certain pressure is fully relieved by operating wing flaps until hydraulic pressure gage indicates zero.

b. Manually open bottom dive brake sufficiently to gain access to actuating cylinder. Care must be taken to prevent dive brake from striking ground.

c. Remove hydraulic line clamp at cylinder barrel, and disconnect and cap hydraulic line at piston end of cylinder.

d. Remove bolt attaching cylinder piston rod eyebolt to dive brake.

e. Inside fuselage, disconnect and cap hydraulic line at head end of cylinder.

f. Remove pin attaching head end of cylinder to fuselage structure.

2-136. INSTALLATION. (See figure 2-14.)

a. Position cylinder in bottom dive brake well so hydraulic port in head end of cylinder is upward. From inside fuselage, install and cotter one pin attaching cylinder head to supporting channel.

b. Uncap and connect hydraulic open line at cylinder head.

c. Outside fuselage, install and cotter one bolt attaching cylinder piston rod eyebolt to bottom dive brake.

NOTE

At this step, tighten nut handtight only. Nut should not be fully tightened or safetied until cylinder has been adjusted. (Refer to paragraph 2-137.)

d. Uncap and connect hydraulic close line at piston end of cylinder. Install hydraulic line clamp at cylinder barrel.

e. Restore hydraulic system pressure.

CAUTION

After installing bottom dive brake cylinder, make certain dive brake control handle in cockpit is in CLOSE position before applying hydraulic system pressure, or bottom dive brake may extend and be damaged by striking ground.

2-137. ADJUSTMENT.

a. Support airplane in fuselage level position (so bottom dive brake may extend without striking ground).

b. Close dive brakes with hydraulic auxiliary pump pressure.

c. Screw bottom dive brake cylinder piston eyebolt in or out until bottom dive brake, when fully closed, fairs with fuselage without exerting any force on fuselage plating at 3,000 psi pressure. Gap of 1/4-inch maximum between dive brake and fuselage is permissible.

d. Relieve hydraulic system pressure and place dive brake control handle in OPEN position. Gap between bottom dive brake trailing edge and fuselage plating must be 1-1/2-inch minimum.

2-138. BOTTOM DIVE BRAKE LOCKOUT VALVE.

2-139. DESCRIPTION. (See figure 2-14.) The bottom dive brake lockout valve is installed on the airplane to provide for holding the bottom dive brake retracted and inoperative when stores which may interfere with the operation of the bottom dive brake are carried on the fuselage external stores rack. The lockout valve is installed in the bottom dive brake hydraulic open line between the dive brake control valve and the bottom dive brake actuating cylinder. The valve is mounted on a bracket on the after face of fuselage station 220 bulkhead, approximately nine inches to the right of the center line of the airplane. The operation of the valve is manual: when the control handle at the top of the valve is pushed down, the valve is closed and the bottom dive brake is inoperative; when the handle is pulled up, the valve is open and the bottom dive brake is allowed normal operation.

2-140. REMOVAL. (See figure 2-14.)

a. Relieve hydraulic system pressure by operating wing flaps until hydraulic pressure gage indicates zero.

b. Through radio compartment hinged access door, disconnect and cap three hydraulic lines at valve, and plug valve ports.

c. Remove three bolts, washers, and spacers attaching valve to bracket.

2-141. INSTALLATION. (See figure 2-14.)

a. Position valve to bracket so valve ports face inboard and aft and install three bolts, washers and spacers. Make certain inboard upper valve port is plugged.

b. Uncap and connect three hydraulic lines at valve: pressure line to upper after port, return line to lower after port, and cylinder line to lower inboard port.

2-142. WING.

2-143. DESCRIPTION. (See figure 2-15.) The wing of the airplane has a 50-foot span, a six-degree dihedral, and a six-degree sweepback. The wing consists of the following principal components: wing center section, wing outboard panels, wing tips, wing flaps, and ailerons. All components except the wing center section, which is an

integral part of the fuselage, are readily removable from the airplane.

2–144. The wing outboard panels are hinged to the wing center section and can be folded upward through an arc of 125 degrees from the spread position. Synthetic-rubber seals, at the wing-fold joints, prevent air seepage into the wing during flight. The seals are held in place by aluminum-alloy strips riveted to the wing center section.

2–145. WING CENTER SECTION.

2–146. DESCRIPTION. The spanwise structure of the wing center section comprises a front spar and a rear shear web, both of which are continuous through the fuselage from wing-folding joint to wing-folding joint. The chordwise structure includes eight bulkheads, four in each portion of the wing center section outboard of the fuselage, and contour of the section is maintained by chordwise hat-section stiffeners spaced at approximately five-inch intervals. The wing center section plating is 75 S-TAL, stressed and flush-riveted; the upper plating is faired into the fuselage with fillets; the lower plating is continuous and forms the bottom contour of the fuselage from the lower firewall (fuselage station 96) to the after side of the rear shear web (fuselage station 180.875). The main landing gear is mounted in the wing center section nose and each of the two major components of the main landing gear is supported by a truss in the wing center section between the canted bulkheads at wing stations 55.5 and 95.5. The main landing gear wheels retract into wells in the wing center section between the front spar and the rear shear web. When retracted, the main landing gear is fully enclosed by fairings and doors. Bumpers mounted on the rear shear web in the main landing gear wheel wells are provided to protect the wing structure in the event of failure of the main landing gear telescoping mechanism. Catapult hooks are installed just outboard of the fuselage in the left-hand and right-hand sections of the wing center section.

2–147. Access doors in the wing center section have been kept to a minimum in order not to affect adversely the airfoil surfaces of the wing. Access to the guns, mounted in the wing center section just inboard of the wing-folding joints, is through removable doors in the wing-joint upper plating when the wing is spread; when the wing is folded, the guns are accessible through the spray covers, which are installed to protect the wing center

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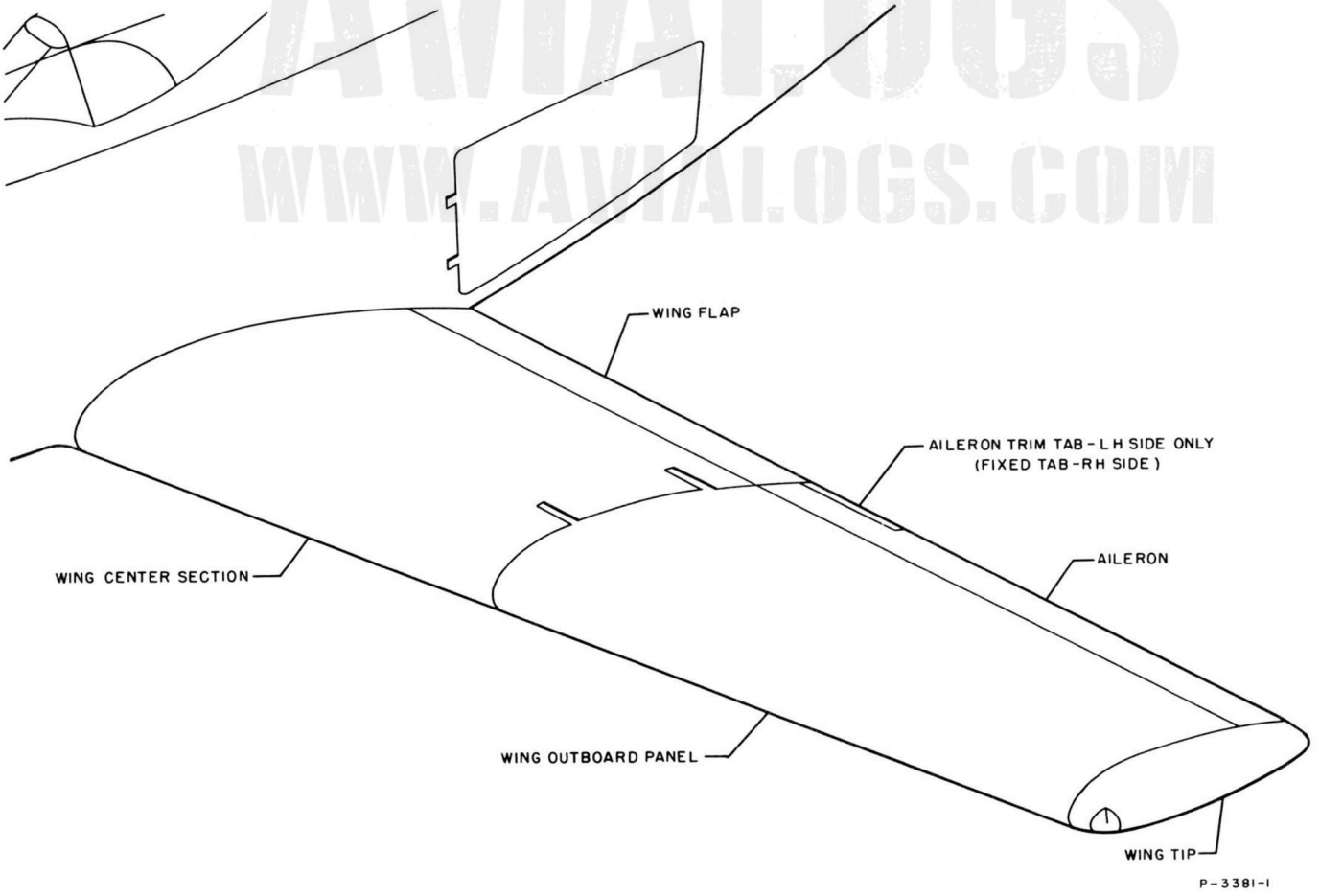

Figure 2–15. Wing Components

section outboard ends. Access to the ammunition compartments, which are located between the guns and the main landing gear wheel wells, is through the wheel wells.

2–148. OUTBOARD WING PANELS.

2–149. DESCRIPTION. (See figure 2–16.) The spanwise structure of the outboard wing panels consists of a front spar and a rear shear web. The chordwise structure includes five bulkheads spaced approximately 36 inches apart, and contour of the panels is maintained by hat-section stiffeners spaced at approximately five-inch intervals. The prime structure of the trailing edge of the outboard wing panels is a large spanwise hat-section; the trailing edge is supported chordwise alternately by ribs and by stiffeners. The major structural members of the outboard wing panels, including the stressed, flush-riveted plating, are 75 S-TAL. The panel structure contains fittings for jury struts, hoisting, formation lights and rocket launchers.

2–150. REMOVAL. (See figure 2–16.)

a. Install suitable lifting sling on outboard wing panel.

b. Fold wings approximately 70 degrees using auxiliary pressure system pump pressure.

c. Support outboard panel in raised position with suitable lifting equipment.

Note

If hydraulic pressure is not available or if the wing locking pin actuating cylinder is inoperative, the wing locking pin can be retracted by the use of special tool No. K-4435767. (See figure 2–17.)

d. Remove wing joint cover from center wing panel.

e. Unsnap cover which protects terminal panel, disconnect electrical wiring from terminal panel and remove clamps which secure wiring to outboard panel.

f. Disconnect AN/APS-19 wiring from terminal panel, located in left-hand wheel well.

g. Remove clamps which secure AN/APS-19 wiring in center wing.

h. Remove wire guide.

i. Disconnect coaxial cable at quick disconnect in center wing.

Note

Access to quick disconnect is through gun access in center wing, located inboard from wing station 144.

j. On airplanes BuNo. 134466-134637, 135223-135406, and 137492-137632, disconnect and cap pitot pressure hose (RH wing) and gun charger pressure and return hoses (LH and RH wing).

k. On airplanes BuNo. 139606-139821, and 142010-142081, disconnect and cap pitot pressure line (RH wing) and gun charger pressure and return lines (LH and RH wing) at piping swivel assembly.

l. Remove aileron push-pull tube outboard attaching bolt.

m. Disconnect aileron trim tab cables, located at wing station 55 (LH wing), and pull cables out of center wing.

CAUTION

Make certain lifting equipment supports outboard wing panel.

n. Disconnect wing folding cylinder piston rod from hinge assembly using special tool No. K-63101. Retract cylinder rod.

o. Remove lockwire, bolts and retainers from forward hinge pin.

CAUTION

Do not remove pin.

p. Remove aft hinge nut (use special tool No. K-62601) and remove bolt (use special tools No. K-2447828 and No. K-4447774).

q. Lower outboard wing panel to spread position.

Note

Access to forward hinge pin is through gun access in center wing, located inboard from wing station 144.

r. Drive out forward hinge pin with phenolic or aluminum drift.

Note

Before separating the outboard wing panel from the center wing, check to make certain that all wiring is disconnected and that lifting equipment is supporting the weight of the outboard wing panel.

s. Carefully lift outboard wing panel away from center wing.

Note

Several men are required to guide the outboard wing panel during separation from the center wing.

t. Protect loose attaching bolts and fittings from loss or damage by installing them in their respective positions in the center wing section.

2–151. INSTALLATION. (See figure 2–16.)

a. Install bushing in aft hinge fitting.

b. Install suitable lifting sling on outboard wing panel.

c. Place a $\frac{3}{4}$ x 2 x $4\frac{1}{2}$ inch aluminum block in center wing locking pin fitting to prevent outboard wing

panel lower skin from contacting center wing skin during installation.

d. Raise outboard wing panel, using lifting sling, and guide panel into position on center wing.

Note

Installation of forward hinge pin and aft hinge bolt must be accomplished through gun access, located inboard from wing station 144.

e. Align forward hinge fitting using special tool No. K-33410.

f. Install forward hinge pin approximately half-way through forward hinge fitting, using special tool No. K-33411.

g. Apply lubricant (Specification MIL-C-6708, Type I) to aft hinge fitting bolt and install bolt and washer through bushing in aft hinge.

h. Complete installation of forward hinge pin.

i. Place a ¾ x 2 x 4½ inch aluminum block above front spar on center wing and fold outboard wing panel against block.

Note

Block will prevent outboard panel from resting on center wing in the folded position.

j. Install spacer through actuating cylinder rod end eye bolt.

k. Connect actuating cylinder rod end to aft hinge fitting and secure with attaching bolt, washer, and nut.

WARNING

After step k is completed, wing folding cylinder serves as a safety measure to prevent collapse of wing in event that lifting equipment should fail. Make certain that wing-folding control handle in cockpit remains in "FOLD."

l. Using special tool No. K-62601, install washer and nut on aft hinge bolt.

m. Remove special tool No. K-33411 from forward hinge pin and install retainers, bolts, and lockwire.

n. Remove ¾ x 2 x 4½ inch aluminum blocks, used in steps c and i.

o. Adjust outboard wing panel. (See figure 2–18.)

p. Connect aileron trim tab cables at wing station 55 and rig cables as shown on figures 2–21 and 2–31.

q. Place aileron push-pull tube in position and install attaching bolt.

r. On airplanes *prior* to BuNo. 139606, connect pitot pressure hose (RH wing) and connect gun charger pressure and return hoses (LH and RH wing).

CAUTION

Do not twist hoses during installation. Twisted hoses will not position properly when outboard wing panels are spread. Make certain hoses are connected to correct fittings and spring guides are properly installed.

s. On airplanes BuNo. 139606 and subsequent, connect pitot pressure line (RH wing) and connect gun charger pressure and return lines (LH and RH wing) at piping swivel assembly.

t. Connect electrical wiring to terminal panel on outboard wing panel, snap cover in place, and secure wire bundle to wing panel with clamps.

u. Feed AN/APS-19 electrical wiring bundle through center wing to left hand wheel well and connect wiring to terminal panel in wheel well. Secure wire bundle in center wing with clamps.

v. Feed coaxial cable through tubular guide into center wing.

Note

Access to coaxial cable quick-disconnect is through gun access, located inboard from wing station 144.

w. Connect coaxial cable to quick-disconnect in center wing.

x. Install wire guide.

y. Install wing joint cover on center wing panel.

Note

After installation of an outboard wing panel on airplanes *prior* to BuNo. 139606, spread wing very slowly and observe the pitot pressure and gun charger hoses to see that hoses fold properly. If hoses do not fold properly, wing panel spreading should be stopped and hoses disconnected and reinstalled.

2–152. WING TIPS.

2–153. DESCRIPTION. (See figure 2–15.) Each wing tip is constructed of 3 SO aluminum alloy 0.051 plating formed over a chordwise rib of 24 S-TAL and two spanwise ribs of 24 S-OAL which align with the wing outboard panel front spar and rear shear web. Each wing is attached to its related wing outboard panel by four ¼-inch screws and nut plates, one each at the top and one each at the bottom of each wing tip spanwise rib. A running light is installed in the forward outboard edge of the wing tip; a formation light is installed in the after section of the wing tip. The disconnect point for the wing tip electrical wiring is at the terminal panel mounted on the after side of the rear shear web in the wing outboard panel approximately at wing station 273.

2–154. REMOVAL.

a. Through access door in trailing edge of outboard wing panel, disconnect wing tip electrical wiring at terminal panel on after side of wing rear shear web.

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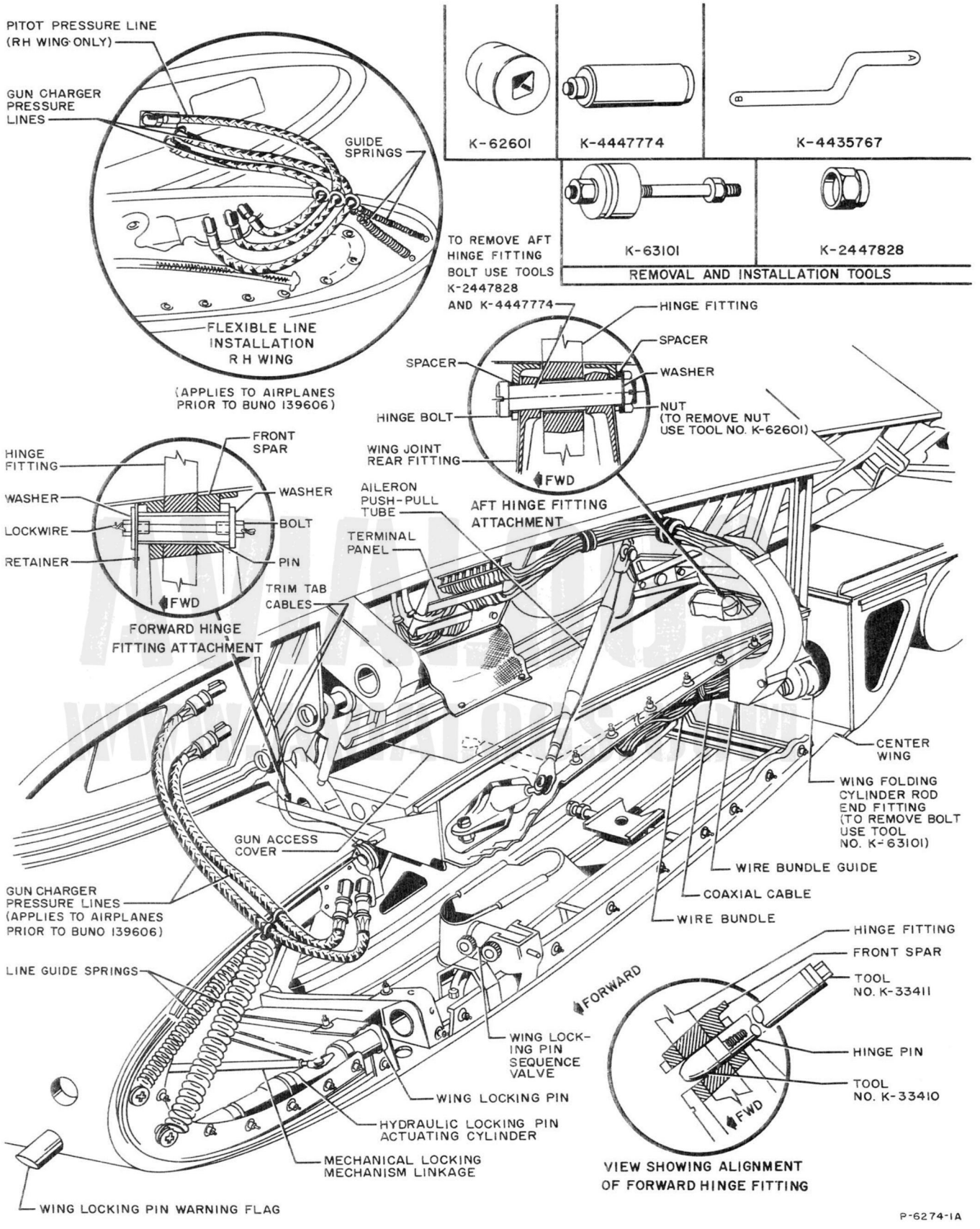


Figure 2–16. Outboard Wing Panel Installation (Sheet 1)

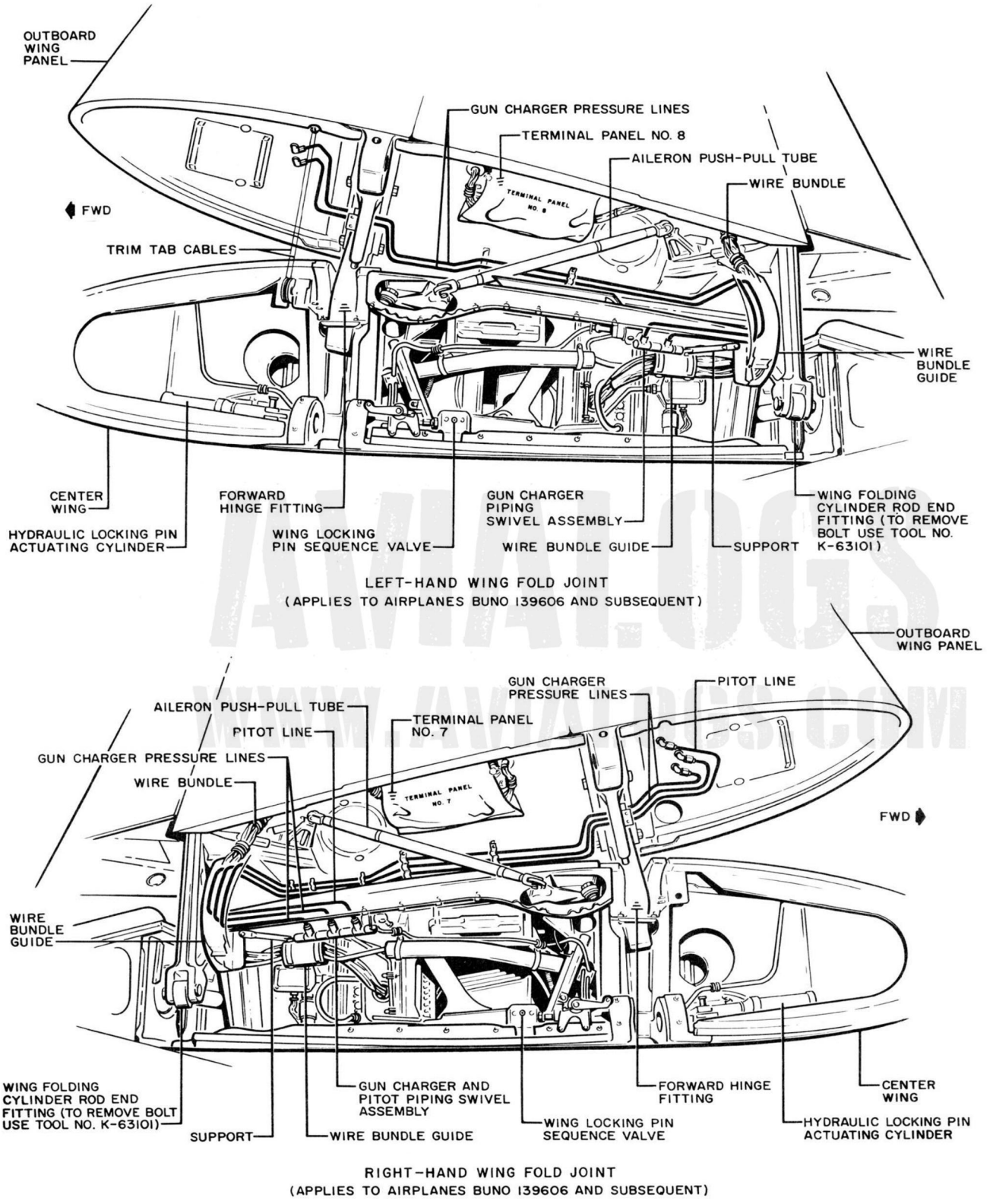
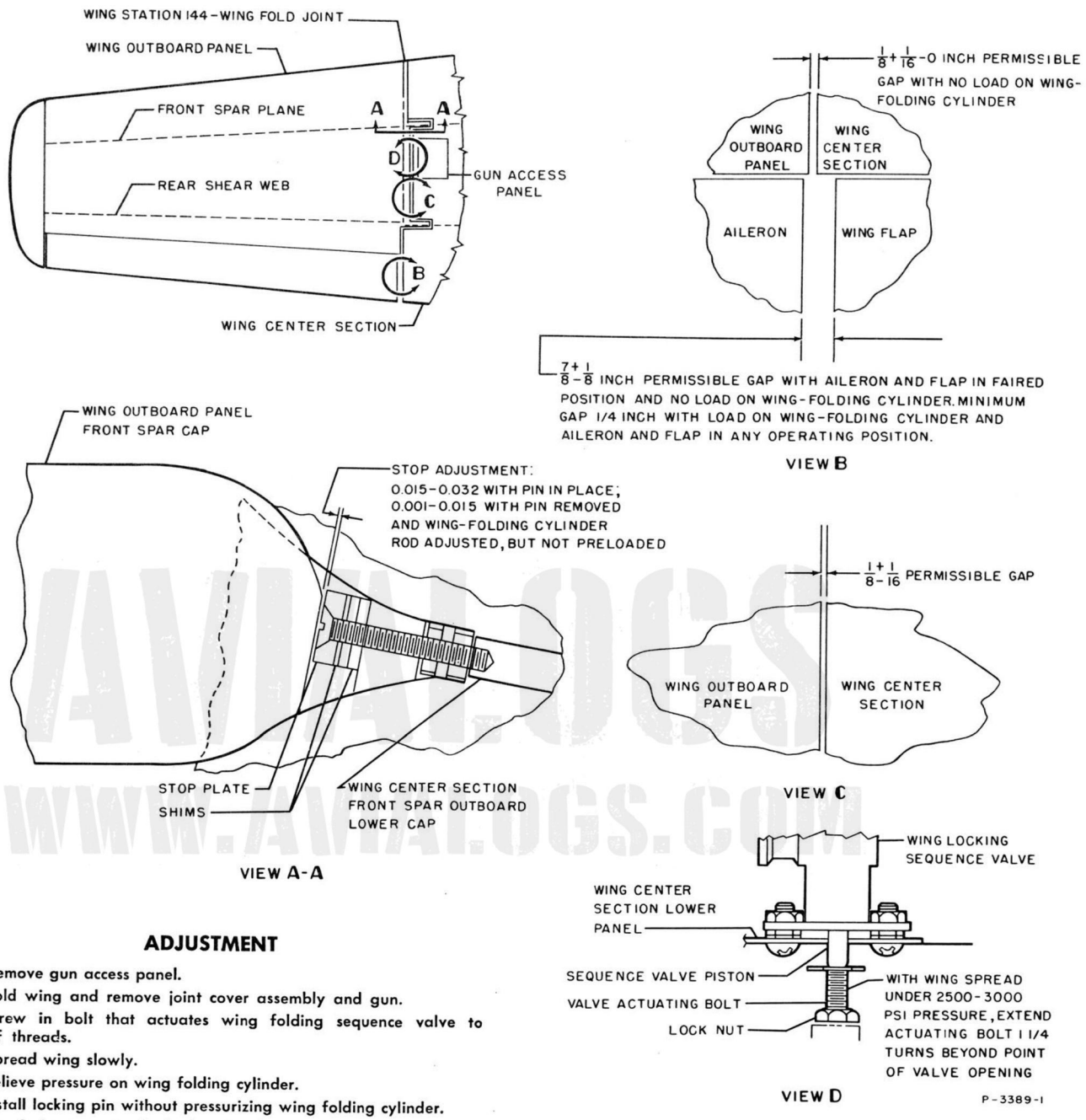


Figure 2–16. Outboard Wing Panel Installation (Sheet 2)



ADJUSTMENT

a. Remove gun access panel.

b. Fold wing and remove joint cover assembly and gun.

c. Screw in bolt that actuates wing folding sequence valve to limit of threads.

d. Spread wing slowly.

e. Relieve pressure on wing folding cylinder.

f. Install locking pin without pressurizing wing folding cylinder.

g. Use feeler gage to check clearance between stop and front spar cap. Clearance should be .015 to .032 inch.

Note

Add or delete shims as necessary to obtain clearance of .015 to .032 inch between stop and outboard wing front spar cap when locking pin is extended and wing is locked.

h. Retract wing locking pin.

i. Apply 1000 to 3000 psi pressure to wing folding cylinder spread line, to retract cylinder.

j. Loosen wing folding cylinder locknut, using special tool No. K-40510.

k. Turn actuating cylinder piston rod to provide .001 to .015 inch clearance between stop and outboard wing front spar cap when locking pin is retracted and 1000 to 3000 psi pressure is applied to wing folding cylinder spread line.

l. Turn wing fold cylinder piston rod three full turns counterclockwise, as viewed from rod end, to preload cylinder.

m. Tighten eyebolt locknut to 300 foot pounds torque.

n. Apply 2500 to 3000 psi hydraulic pressure to wing folding and locking system.

o. Screw sequence valve actuating bolt until bolt contacts wing locking sequence valve piston. Rotate bolt against sequence valve piston until wing locking pin begins to move. Continue rotating bolt for 1¼ turns beyond point of valve opening.

p. Tighten jam nut on actuating bolt.

Note

"Canning" of wing plating and deflection of structure when no pressure is applied to wing folding cylinder is NOT acceptable.

Figure 2–17. Outboard Wing Panel Adjustment

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b. Remove four screws that attach wing tip to outboard wing panel.

2–155. INSTALLATION.

a. Insert wing tip electrical wiring through rubber grommet in outboard wing panel rib at wing station 289.

b. Align wing tip with outboard wing panel and install four screws which attach wing tip to wing.

c. Through access door in trailing edge of outboard wing panel, connect wing tip electrical wiring to terminal panel on after side of wing rear shear web.

2–156. WING-FOLDING AND -LOCKING CONTROL SYSTEM.

2–157. DESCRIPTION. (See figure 2–17.) The wing can be folded, or spread and locked, by the operation of a hydro-mechanical control system. The system is operated by levers beneath the wing-shaped handle mounted in the cockpit right-hand control panel. Principal components of the control system include:

Name	*Para Ref*
Wing-folding control handle	2–158
Wing-locking control handle	2–158
Wind-folding control handle linkage: Valve control rod Valve control rod sleeve Valve actuator rod Valve support assembly	
Wing locking control handle linkage: Lever assembly Torque tube Crank Horizontal control rod Vertical control rod Bellcrank	2–158
Wing-folding control valve	2–162
Wing-folding cylinders	2–167
Wing-folding flow restrictors	
Wing-locking cylinders	2–171
Wing-locking sequence valves	2–175
Wing-locking mechanisms: Mechanism assembly Crank Latch Latch actuator rod	2–180
Warning flags	2–180

2–158. The wing folding sequence is as follows: when the wing-shaped WING FOLD handle is raised, cables operate the non-hydraulic locking mechanism to disengage the latches from the pins of the wing-locking cylinders and to extend the warning "flags." Operation of the PULL TO FOLD handle, under the WING FOLD handle, shifts the wing-folding control valve slide to its extended position to direct hydraulic pressure to the locking cylinders to retract the pins, and to the wing-folding cylinders to raise the wing outboard panels to the folded (125-degree) position. The spreading sequence is as follows: when the valve control handle is returned to its closed position, the control valve slide shifts to its retracted position to direct hydraulic pressure to the wing-folding cylinders to lower the wing outboard panels, which when fully spread contact the wing-locking sequence valves; hydraulic pressure is then directed to the wing-locking cylinders to extend the pins. The WING FOLD handle can then be closed (flush with the control panel) to operate the cable system to engage the locking-mechanism latches with the pins, and to retract the warning flags into the wing center section nose.

CAUTION

After wing has been folded, leave control valve handle in open (pulled) position to prevent possible closing of valve when hydraulic pressure is low and subsequent inadvertent spreading of wing when pressure is restored.

2–159. The wing-folding system hydraulic lines are 1/4-inch and 5/16-inch stainless steel; the control cables are 3/32-inch, 7x7 flexible steel.

2–160. TROUBLE SHOOTING. Refer to table 2–3.

2–161. ADJUSTMENT. See figure 2–18.

2–162. WING-FOLDING CONTROL VALVE.

2–163. DESCRIPTION. (See figure 2–17.) The wing-folding control valve is installed in the right-hand side of the forward equipment compartment, just aft of fuselage station 110, approximately five inches below the cockpit floor. The valve is connected by a lever and a torque tube to a control handle beneath the wing-shaped WING FOLD handle mounted in the cockpit right-hand control panel. The valve is a conventional four-port, two-position valve. The valve slide is retracted when the control handle is flush with the control panel and the wing is spread; the slide is extended when the handle is pulled and the wing is folded. To pull the valve control handle, the WING FOLD handle, operating the wing-locking control system, must first be operated.

2–164. REMOVAL. (See figure 2–17.)

a. Relieve hydraulic system pressure. Make certain pressure is fully relieved by operating wing flaps until hydraulic pressure gage indicates zero.

b. Disconnect valve slide from linkage actuating lever.

c. Disconnect and cap four hydraulic lines at valve, and plug valve ports.

d. Remove three screws which attach valve to valve support.

2–165. INSTALLATION. (See figure 2–17.)

a. Through forward equipment compartment, position valve to valve support and install with three screws.

b. Uncap and connect four hydraulic lines at valve: *pressure* to bottom after port, *return* to bottom forward port, *fold* to inboard forward port, and *spread* to inboard after port.

c. Adjust control valve and control handle linkage (refer to paragraph 2–166) and connect valve slide to linkage actuating lever.

2–166. ADJUSTMENT. (See figure 2–17.)

a. Extend valve slide so that valve spring is engaged with valve slide last detent.

b. Pull valve control handle and connect handle with control rod of valve linkage.

c. Make certain there is no pressure in hydraulic system.

d. Measure distance between stop screw in handle and bottom of channel in control panel: distance should be $\frac{3}{8} \pm \frac{1}{8}$ inch. If measurement does not conform to these limits, adjust stop screw in handle.

2–167. WING-FOLDING CYLINDERS.

2–168. DESCRIPTION. (See figure 2–17.) A wing-folding cylinder is installed inboard of each wing joint forward of the rear shear web, mounted to structure at wing station 105. The piston rod end of each cylinder is bolted to a forged fitting on the shear web of the corresponding wing outboard panel. Extension of the cylinder piston rods raises the wing outboard panels to the folded (125-degree) position and retraction of the piston rods lowers the outboard panels to spread the wing. Each cylinder contains a snubber valve which restricts the flow of pressure fluid during the last few degrees of the wing-spreading operation to prevent sudden jarring contact of the wing spars. The valve is composed of a hollow, tapered metering pin in the cylinder head and an orifice in the cylinder piston. The wing-folding cylinders are controlled by the wing-folding control valve. The cylinders have the following dimensions: compressed length, $21\frac{3}{4}$ inches; extended length, $35\frac{13}{16}$ inches; stroke, $14\frac{1}{16}$ inches. Left- and right-hand wing-folding cylinders can be made interchangeable by adjusting the relative positions of the cylinder head and barrel.

2–169. REMOVAL. (See figure 2–17.)

a. Fold wing and install jury struts.

b. Relieve hydraulic system pressure by operating wing flaps until hydraulic pressure gage indicates zero.

c. Disconnect cylinder piston eyebolt from wing outboard panel fitting, using puller K-63101.

d. Disconnect and cap hydraulic line at piston end of cylinder.

e. Through wheel well and ammunition compartment, disconnect and cap hydraulic line at cylinder head.

f. Disconnect cylinder head from attaching fitting by removing two screws and retaining plate, and pulling pin from fitting with special tool K-3446730.

2–170. INSTALLATION. (See figure 2–17.)

a. Insert cylinder through wheel well and ammunition compartment; align cylinder head with lugs of attaching fitting so that lubrication fitting is upward, and install attaching pin. Secure forward end of pin with retaining plate fastened to support by two screws and safetied together with lockwire.

TABLE 2–3. WING-FOLDING AND -LOCKING CONTROL SYSTEM TROUBLE SHOOTING

Trouble or Symptom	*Probable Cause*	*Correction*
1. Wing fails to fold or spread.	a. Insufficient hydraulic pressure.	Check system.
	b. Control valve improperly adjusted.	See figure 2–17.
	c. Defective wing-folding cylinder.	Replace cylinder.
2. Wing cannot be locked when spread.	a. Locking pin fails to enter spar fittings:	
	(1) Wing-locking sequence valve out of adjustment.	See figure 2–17.
	(2) Wing-folding cylinder out of adjustment.	See figure 2–17.
	b. Mechanical wing-locking control out of adjustment.	See figure 2–17.
3. Warning flag fails to extend or retract.	Trouble 2.b.	
4. Pins start into spar fitting before wing fully spread.	Wing-locking sequence valve leaking internally or plunger stuck.	Replace valve.
5. Locking pin fails to retract.	Failure of main system hydraulic pressure.	Retract locking pin with special tool K-4435767.

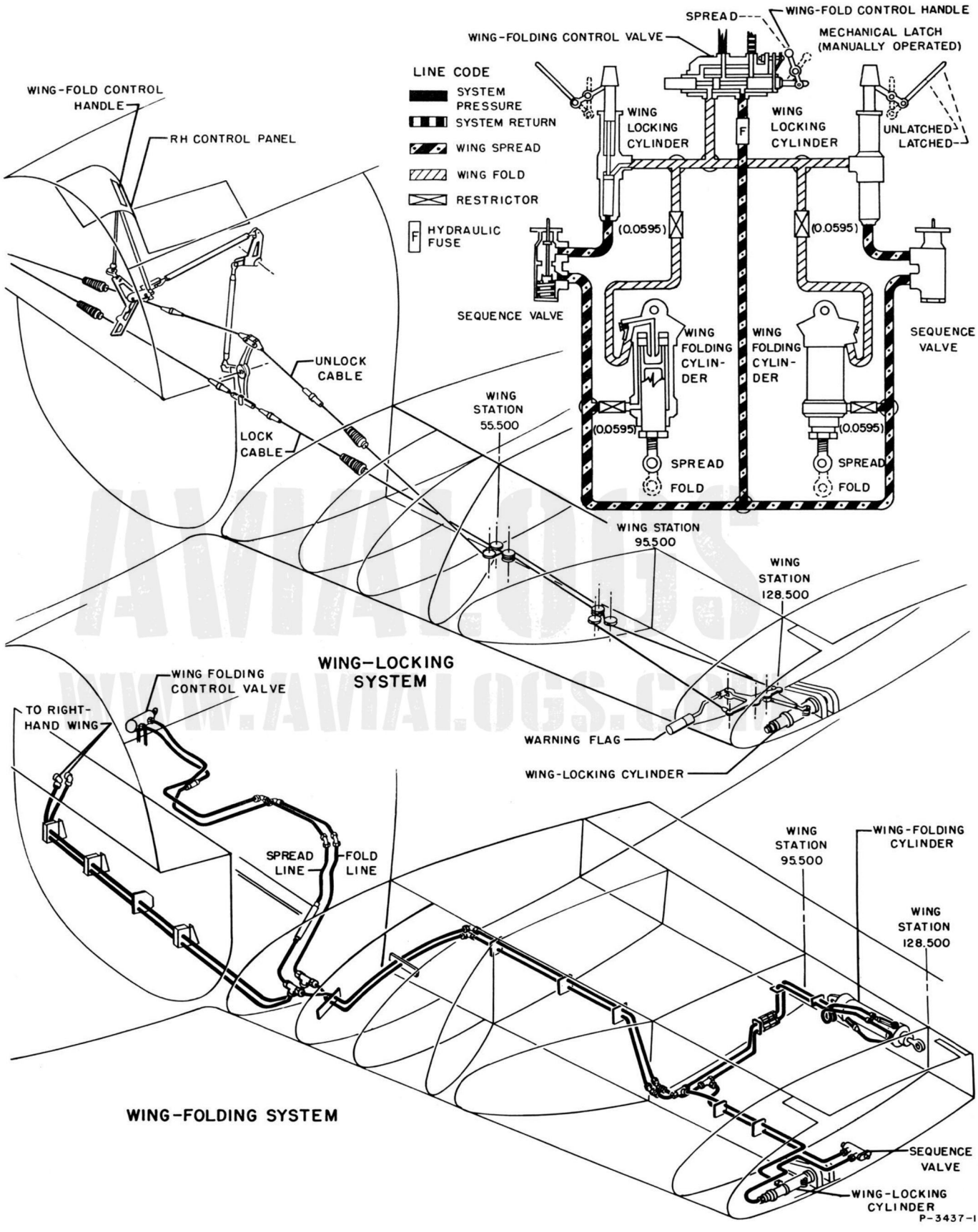

Figure 2–18. Wing-Folding and -Locking Control System (Sheet 1)

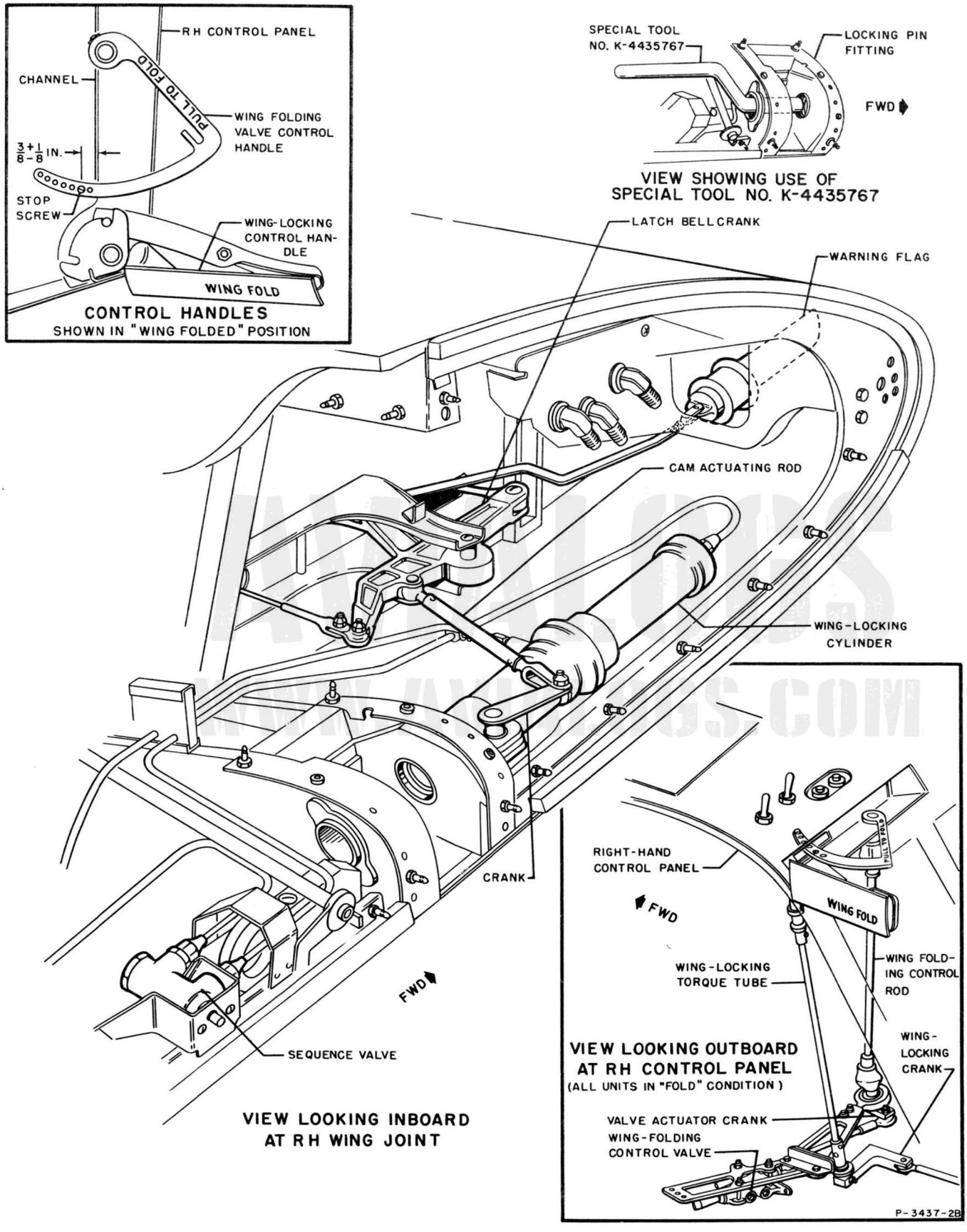

Figure 2–18. Wing-Folding and -Locking Control System (Sheet 2)

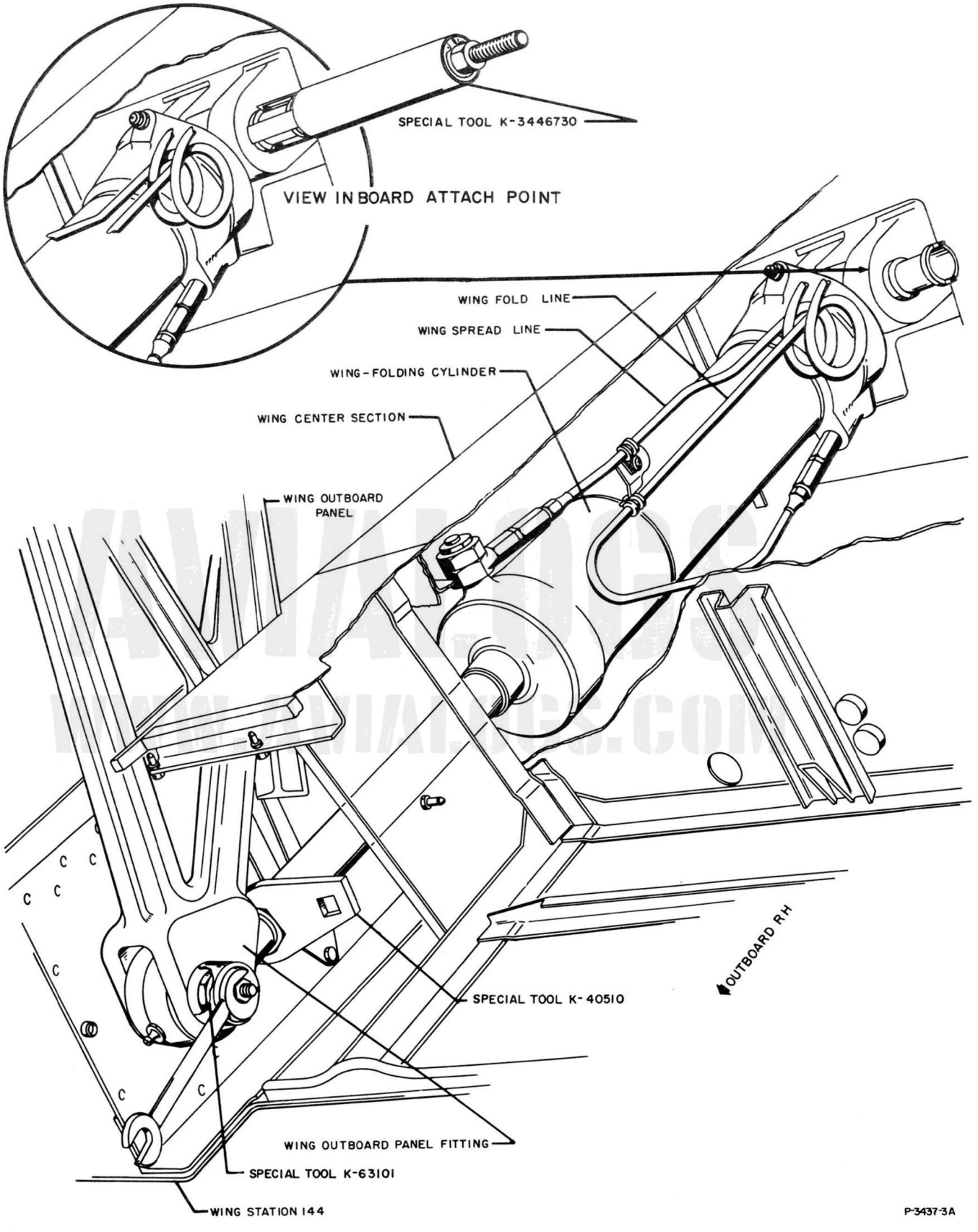

Figure 2–18. Wing-Folding and -Locking Control System (Sheet 3)

b. Uncap and connect *wing fold* hydraulic line at cylinder head.

c. At wing joint (wing folded) uncap and connect *wing spread* hydraulic line at piston end of cylinder.

d. Adjust cylinder (figure 2–18) and bolt cylinder piston eyebolt to wing outboard panel fitting. Use wrench K-40510 to tighten cylinder lock nut.

2–171. WING-LOCKING CYLINDERS.

2–172. DESCRIPTION. (See figure 2–17.) A wing-locking cylinder is located just inboard of each wing joint in the nose section of the wing center section. Each cylinder consists of a barrel screwed into a housing which, in turn, is screwed onto a bushing in the forward lug of the spar end fitting. The cylinder barrel contains a piston to which a locking pin is attached and a port connecting a hydraulic line from the related wing-locking sequence valve. During the wing spreading operation, as the wing reaches the spread position, the sequence valve opens, directing hydraulic pressure to the locking cylinder to extend the cylinder piston and drive the pin through the spar end lugs of the wing center section and the outboard panel. The cylinder housing contains the port to which is connected the *wing fold* hydraulic line from the wing-folding control valve. Pressure in the *wing fold* line retracts the cylinder piston to withdraw the pin from the spar end fittings. The manually controlled latch of the mechanical wing-locking mechanism is mounted on the cylinder housing. When the latch is placed in the locked position, it enters a slot in the cylinder housing to engage a shoulder of the locking pin to prevent withdrawal of the pin from the spar end fittings. Left- and right-hand wing-locking cylinders can be made interchangeable by reversing the latch assemblies.

2–173. REMOVAL. (See figure 2–17.)

a. Fold wing and install jury struts.

b. Relieve hydraulic system pressure by operating wing flaps until hydraulic pressure gage indicates zero.

c. Disconnect linkage between latch crank and bellcrank.

d. Disconnect and cap two hydraulic lines at cylinder and remove line clamp.

e. Loosen housing nut, using special tool K-80201, and unscrew housing from spar fitting.

2–174. INSTALLATION. (See figure 2–17.)

a. Screw housing onto bushing in wing center section spar end fitting and tighten housing nut, using special tool K-80201.

b. Fasten hydraulic line clamp around housing.

c. Uncap and connect two hydraulic lines at cylinder: line from sequence valve to port in cylinder end, and line from control valve to port in housing.

d. Connect linkage between latch crank and bellcrank.

2–175. WING-LOCKING SEQUENCE VALVES.

2–176. DESCRIPTION. (See figure 2–17.) A sequence valve is installed at each wing joint, mounted in the wing center section just aft of the wing spar. Each valve contains a piston which is retracted by contact with an adjustable actuator bolt in the wing outboard panel closing bulkhead; the piston is extended by a spring-loaded poppet. When the wing is spread, the actuator bolt forces the piston to retract to unseat the poppet and permit hydraulic pressure to flow through the valve to the wing-locking cylinder. When the wing is folded, the actuator bolt is removed from contact with the valve piston, the spring reseats the poppet and the valve is closed. The wing-locking sequence valves are interchangeable with the main landing gear door sequence valves.

2–177. REMOVAL. (See figure 2–17.)

a. Fold wing and install jury struts.

b. Relieve hydraulic system pressure by operating wing flaps until hydraulic pressure gage indicates zero.

c. Disconnect and cap two hydraulic lines at valve.

d. Remove two bolts that attach valve to bracket.

2–178. INSTALLATION. (See figure 2–17.)

a. Place valve in bracket and install two attaching bolts.

b. Uncap and connect two hydraulic lines at valve: line from wing-folding control valve to sequence valve inboard port, and line from wing-locking cylinder to sequence valve outboard port.

c. Adjust sequence valve.

2–179. ADJUSTMENT. See figure 2–18.

2–180. WING-LOCKING MECHANISMS.

2–181. DESCRIPTION. (See figure 2–17.) The wing-locking mechanisms latch the hydraulically operated locking pins and operate tubular waving "flags" which extend from the wing center section nose whenever the locking pins are not latched. The mechanisms are actuated by the WING FOLD control handle mounted in the cockpit right-hand control panel. The latches are engaged to lock the wing pins when the handle is closed (flush with the control panel). Raising the handle disengages the latches and extends the warning flags. The wing-folding control valve handle, PULL TO FOLD, can then be operated to fold the wing. A felt wick and plug button fitting in the wing-locking mechanism is provided for lubrication of the mechanism crank assembly and to exclude moisture and dirt from the lubrication hole.

2–182. REMOVAL. (See figure 2–17.)

a. Fold wing.

b. At wing joints disconnect cables and latch linkages from bellcranks.

c. Remove warning flag guide screws and disconnect flag control rods from bellcrank.

d. In forward equipment compartment, disconnect vertical control rod from upper and lower bellcranks and disconnect cables from lower bellcranks.

e. Disconnect fore-and-aft control rod from actuating crank and from upper bellcrank.

f. Disconnect torque tube from actuating crank and from control handle.

2-183. INSTALLATION. (See figure 2-17.)

a. At wing joints (wing folded), bolt control cables to forward and after arms of bellcrank.

NOTE

In left wing, lock cable attaches to bellcrank forward arm, and unlock cable attaches to bellcrank after arm. In right wing, cable positions are reversed.

b. Bolt latch links to outboard arms of bellcranks.

c. Insert warning flags into guides and install guide screws.

d. Guide control cables through wing nose sections, over pulleys at canted bulkheads and through seals into forward equipment compartment.

e. Install turnbuckles (but do not tighten) on cable ends and bolt cables to lower bellcrank.

NOTE

Lock cable from left wing and unlock cable from right wing attach to bellcrank upper arms. Other cables attach to bellcrank lower arms.

f. Connect vertical control rod with upper and lower bellcranks.

g. Connect fore-and-aft control rod with upper bellcrank and with actuating crank.

h. Insert lower (rigid) end of torque tube through support and fasten torque tube to bellcrank.

i. Insert upper (jointed) end of torque tube between handle supports in control panel and bolt torque tube to control handle.

j. Check all linkage attaching bolts to make certain bolts are secured with cotter pins.

2-184. ADJUSTMENT.

a. Spread and lock wing.

b. Remove wing center section fairing at each wing joint.

c. Make certain latch is inserted through slot in wing-locking cylinder housing so latch engages shoulder of locking pin to prevent retraction of pin. Engagement of latch determines proper positioning of bellcrank for succeeding adjustment steps.

d. Adjust control rod which connects warning flag to inboard arm of bellcrank so flag is retracted and flush with wing nose plating. Connect rod with bellcrank, but do not tighten until completion of step e.

e. In forward equipment compartment, adjust turnbuckles on wing-locking cables to correct tension (figure 2-25) so bellcrank is not deflected from established (locked) position; safetywire turnbuckles.

f. Complete attachment of warning flag control rod to wing bellcrank.

2-185. EMPENNAGE.

2-186. DESCRIPTION. (See figure 2-19.) The empennage includes the Vertical stabilizer and Vertical stabilizer tip.

2-187. VERTICAL STABILIZER.

2-188. DESCRIPTION. (See figure 2-19.) The vertical stabilizer is constructed of a single spar and chordwise ribs with 75 ST-AL plating. The vertical stabilizer is built integrally with the fuselage and is not removable. The horizontal stabilizer incidence-change actuator is installed on the forward side of the vertical stabilizer spar and is serviced through the access door on the left-hand side of the vertical stabilizer. Two tail running lights are mounted in each side of the vertical stabilizer just below the stabilizer tip.

2-189. VERTICAL STABILIZER TIP.

2-190. DESCRIPTION. (See figure 2-19.) The vertical stabilizer tip is formed of a single piece of aluminum-alloy sheet stock, and is attached to the vertical stabilizer by No. 10 screws, which are inserted around the uppermost chordwise rib of the vertical stabilizer. The tip houses the static boom of the pitot-static system. On all airplanes reworked to A-1/ASC 709, an anticollision light is installed on the vertical stabilizer tip.

2-191. REMOVAL. (See figure 2-19.)

a. Remove screws attaching tip to vertical stabilizer.

b. Slide tip forward and free of static boom.

2-192. INSTALLATION. (See figure 2-19.)

a. Slide tip over static boom and align tip with vertical stabilizer.

b. Install screws attaching tip to vertical stabilizer.

2-193. MOVABLE SURFACES.

2-193A. DESCRIPTION. (See figure 2-20.) The movable surfaces and their related controls provide the means for longitudinal and lateral control of the airplane during flight. They also enable optimum trim and balance of the airplane for the prevailing flight attitude. The movable surfaces include the following:

Ailerons	Rudder
Aileron trim tab	Rudder trim tab
Aileron fixed tab	Horizontal stabilizer
Elevators	Wing flaps.
Elevator fixed tab	

2-193B. A control stick located in the cockpit is provided to control aileron and elevator actuation and a hydraulic power boost system connects to the aileron controls to aid in aileron operation. Rudder actuation is conventionally controlled by a combination rudder and brake pedal assembly. Hand wheels which are located in the cockpit left-hand control panel are used to control

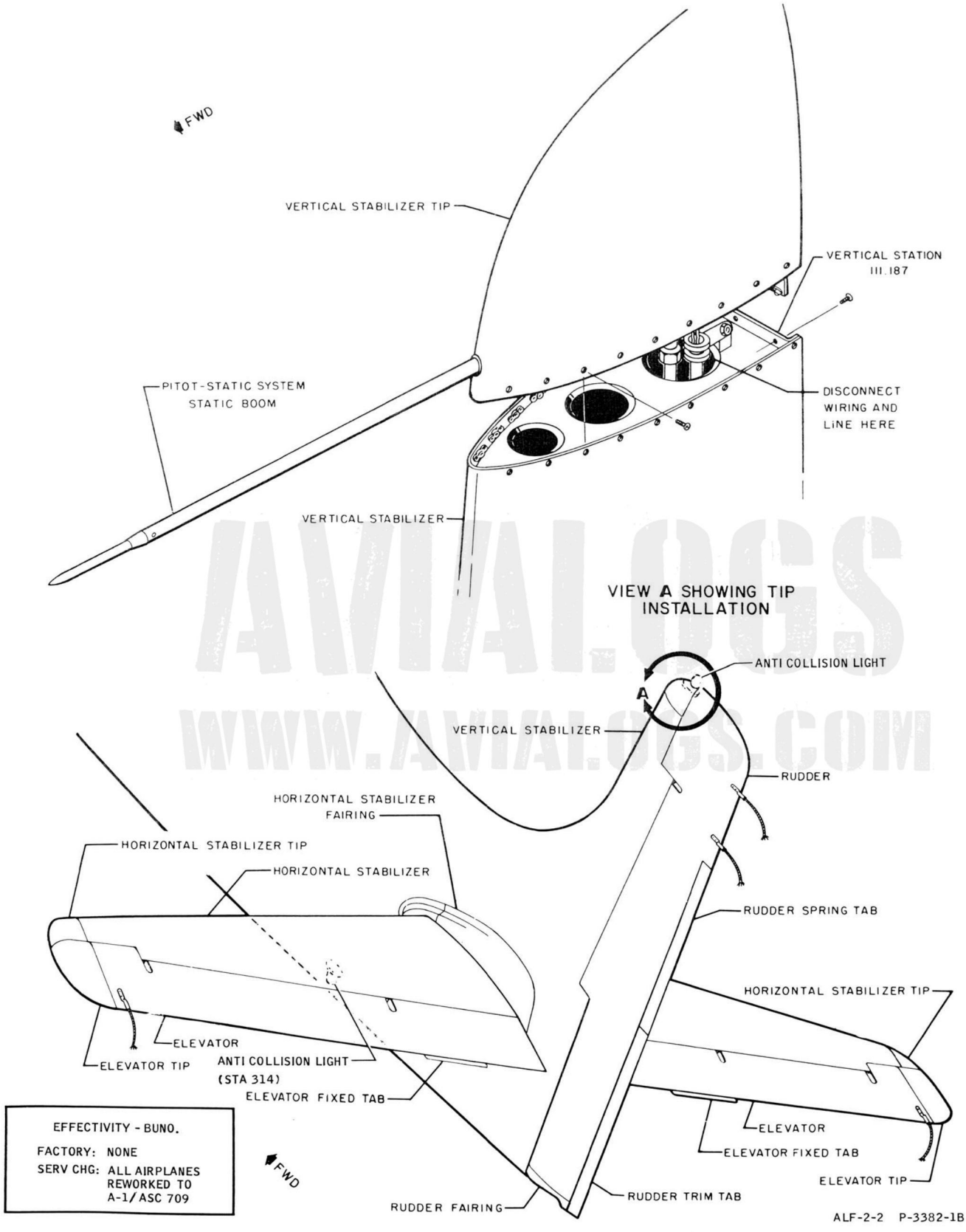

Figure 2-19. Empennage and Vertical Stabilizer Tip

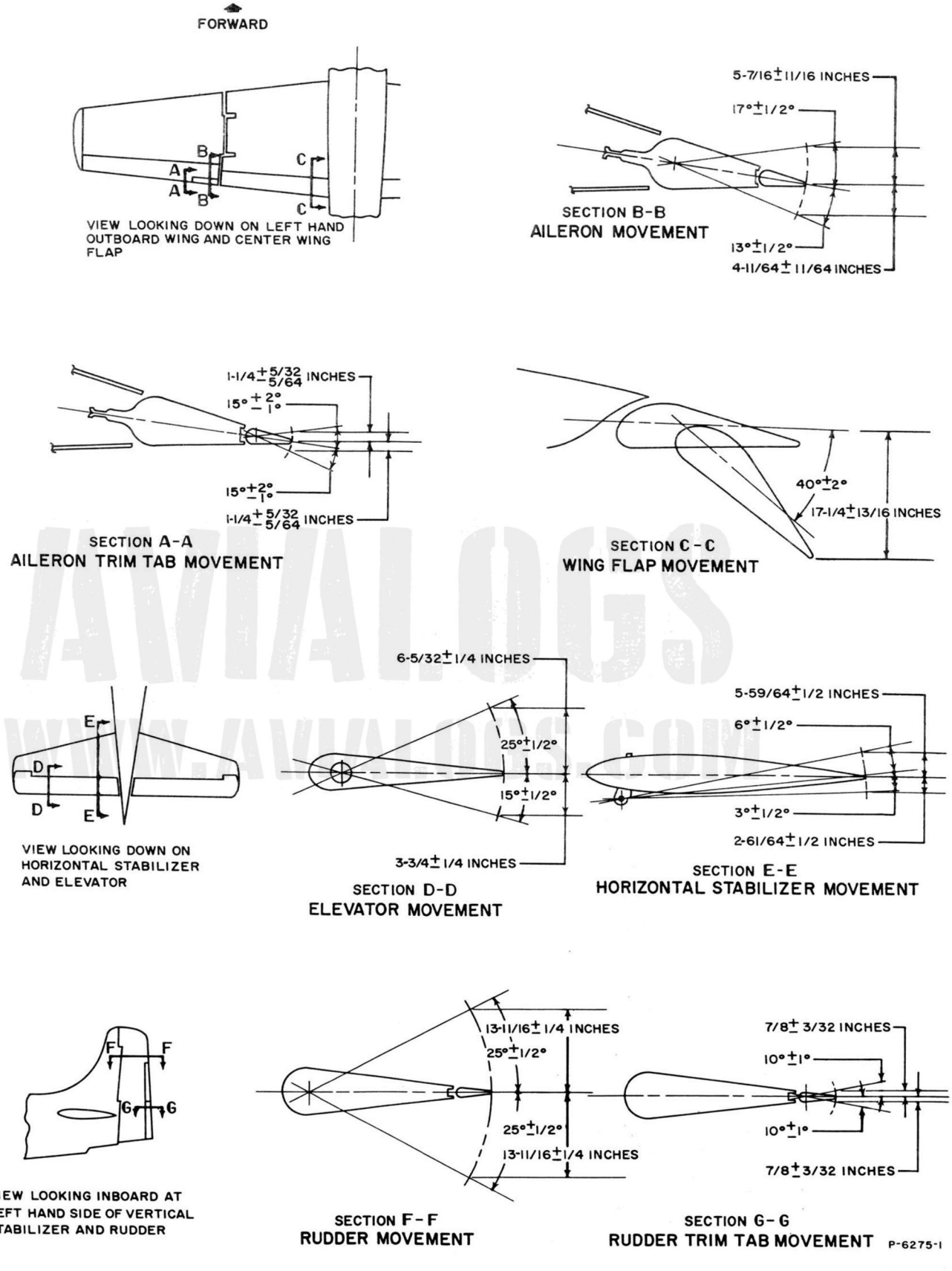

Figure 2–20. Movable Surfaces

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aileron and rudder trim tab actuation. The aileron fixed tab and the elevator fixed tab have no controls and must be adjusted while the airplane is on the ground. Horizontal stabilizer actuation is electrically controlled by a switch installed in the control stick hand grip. The wing flaps are hydraulically actuated and are controlled from the cockpit by a flap control lever.

2–194. CONTROL CABLES.

2–195. DESCRIPTION. (See figures 2–21 and 2–22.) Extra-flexible, tinned carbon steel cables are used throughout the control systems.

2–196. REMOVAL.

a. Attach threadline to disconnected cable to facilitate re-installation.

b. If pulleys or pulley guards must be removed to permit withdrawal of a disconnected cable, temporarily re-install parts finger-tight to prevent loss of parts and to facilitate permanent re-installation.

2–197. CLEANING. Refer to section I.

2–198. INSTALLATION.

a. Inspect pulleys and fairleads for corrugations and roughness.

b. Check bearings and restake if loose. If, after staking, bearing does not turn freely in race, replace bearing.

c. When uncoiling and unreeling cable, do not pull cable off reel loop by loop. Free one end of cable and roll reel away from free end. Permit no twist in cable; leave one end free to rotate at will.

d. To cut cable, use electric cut-off. If electric cut-off is not available, abrasive wheel should be used. Use of shears is not desirable, because of resulting flattened cable ends.

e. After turnbuckle on rigged cable has been adjusted to best locking position, safetywire.

2–199. ADJUSTMENT. When control cables have been installed and adjusted, reference should be made to figure 2–21 for required rigging tension. Reliable tensiometers should be used and accuracy should be maintained within ± 10 per cent on 1/8-inch or larger cables, and within 5 pounds on 3/32- and 1/16-inch cables. A wrench, not pliers, should be used to adjust cable tension. Cables must not be twisted or deflected when adjusting a turnbuckle or using a tensiometer.

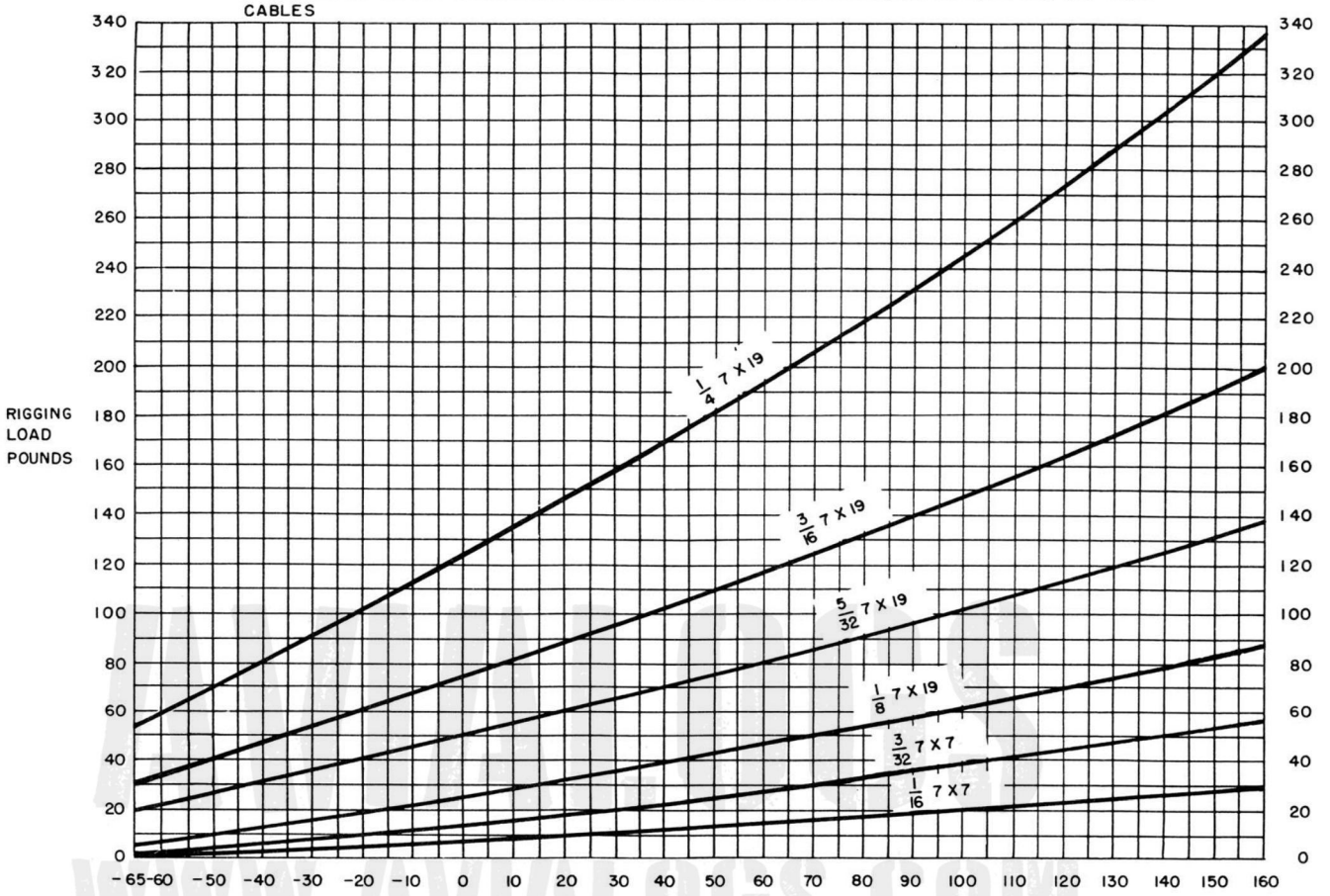
Note

After rigging cables, shake cables vigorously, then recheck tension before safetying turnbuckle barrels.

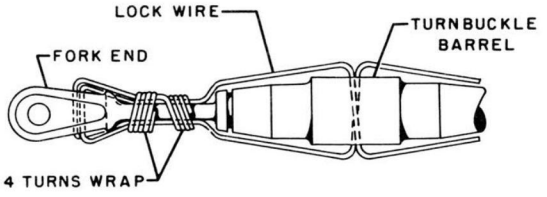
2–200. CONTROL STICK.

2–201. DESCRIPTION. (See figure 2–24.) The control stick assembly is composed of two sections. The upper, or arm, section is moved laterally to operate the ailerons through push-pull tube and bellcrank linkage extending from the arm to the ailerons. The lower, or pedestal, section is moved fore and aft, together with the arm, to provide control of the elevators through a system of push-pull tubes, cables, and torque tubes, extending from the horn on the stick housing to the elevators. The handgrip at the top of the control stick contains firing switches for guns, bombs, and rockets, and the horizontal stabilizer incidence-change control switch. The adjustments of control stick operating limits is concerned with the rigging of the aileron and elevator control systems and is noted in the sections pertaining thereto.

NOTE:
USE RELIABLE TENSIOMETERS FOR ADJUSTING RIGGING LOADS, WHICH MUST BE MAINTAINED WITHIN ± 10 PERCENT ON 1/8 - INCH AND LARGER CABLES AND WITHIN ± 5 POUNDS ON 3/32 AND 1/16 - INCH CABLES



CONTROL CABLE TENSION CHART

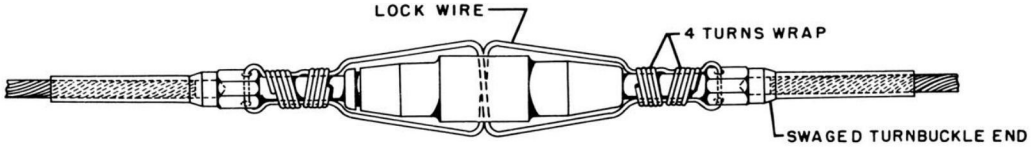


a. Adjust tension with wrench, not pliers, and take care not to twist or deflect cable.

b. With turnbuckle adjusted to best locking position, pass two lock wires through hole in center of barrel and bend one toward each end of barrel.

c. Pass wires through hole in eye or between tines of fork, as applicable; then bend wires back toward center of barrel and wrap each four times around shank as shown.

d. If terminal is swaged, pass only one wire end through terminal hole, loop it over other end, and wrap both around shank.



CABLE TURNBUCKLE LOCKING METHOD

NOTE:

PREFERRED-LAST THREAD OF TURNBUCKLE END FLUSH WITH END OF TURNBUCKLE BARREL. HOWEVER, NOT MORE THAN THREE THREADS CAN BE EXPOSED ON TURNBUCKLE END.

NOTE:

USE AN 995C LOCK WIRE

PS-4230-1C

Figure 2-21. Control Cable Rigging Chart

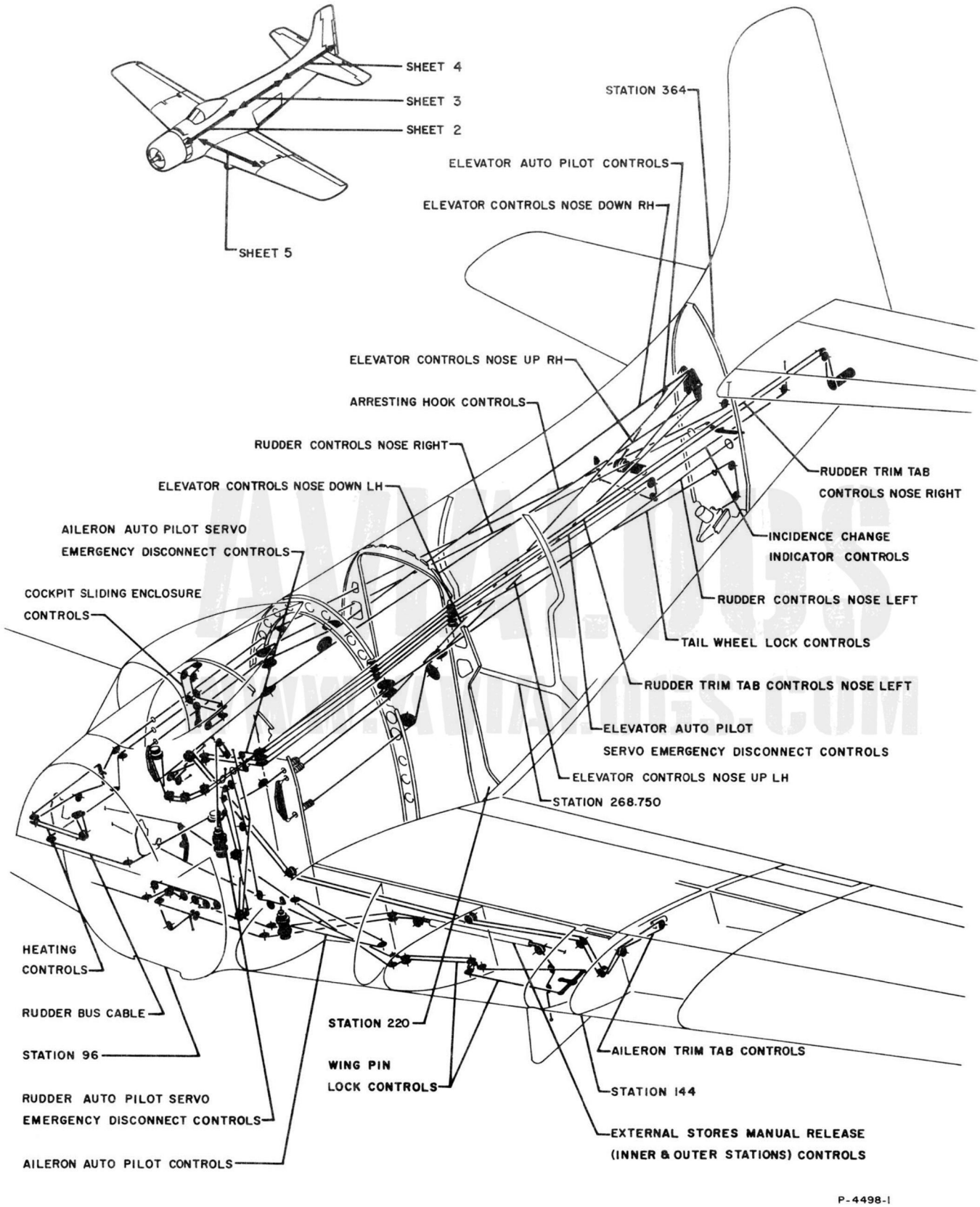


Figure 2–22. Cable Routings (Sheet 1)

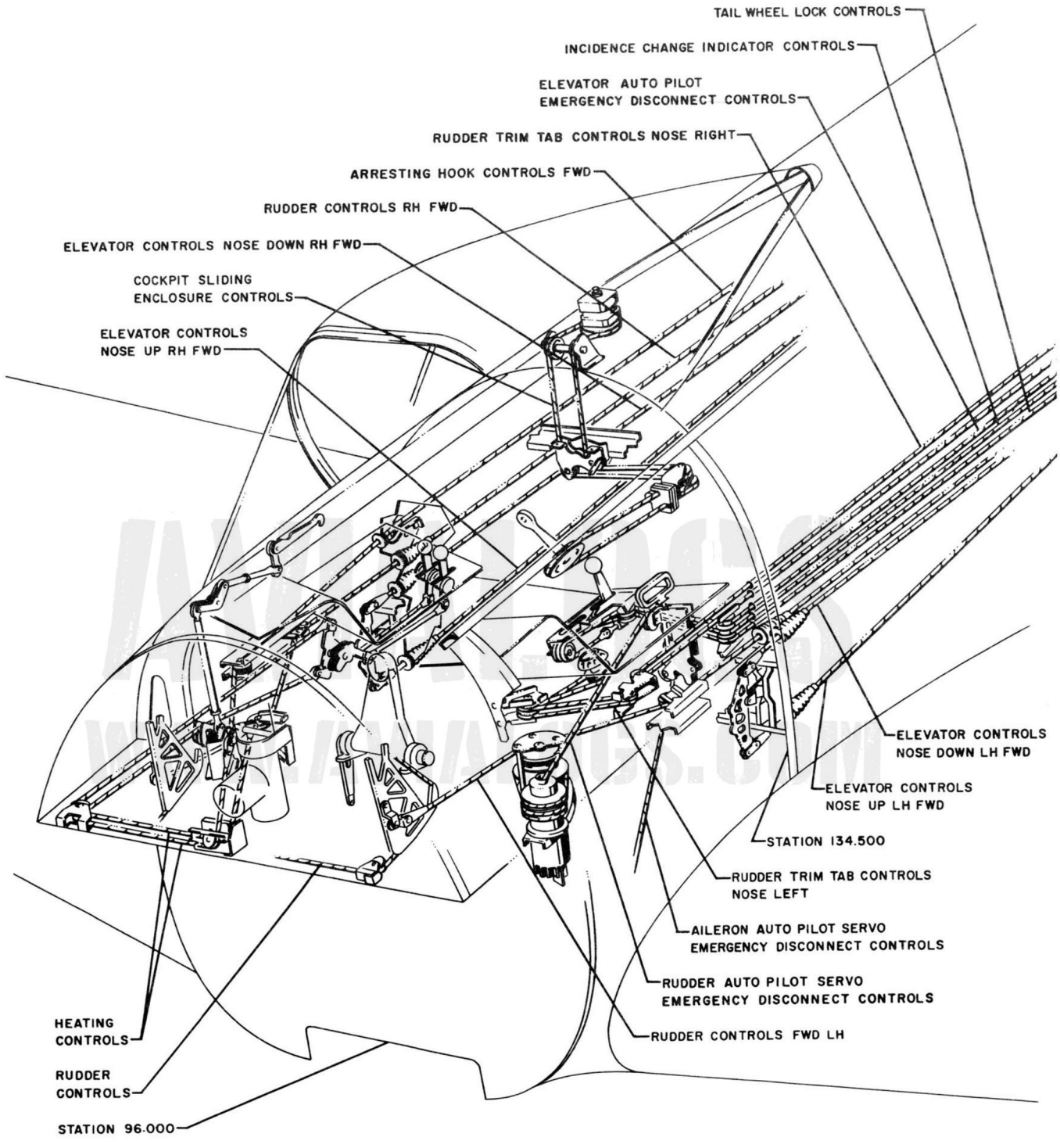


Figure 2–22. Cable Routings (Sheet 2)

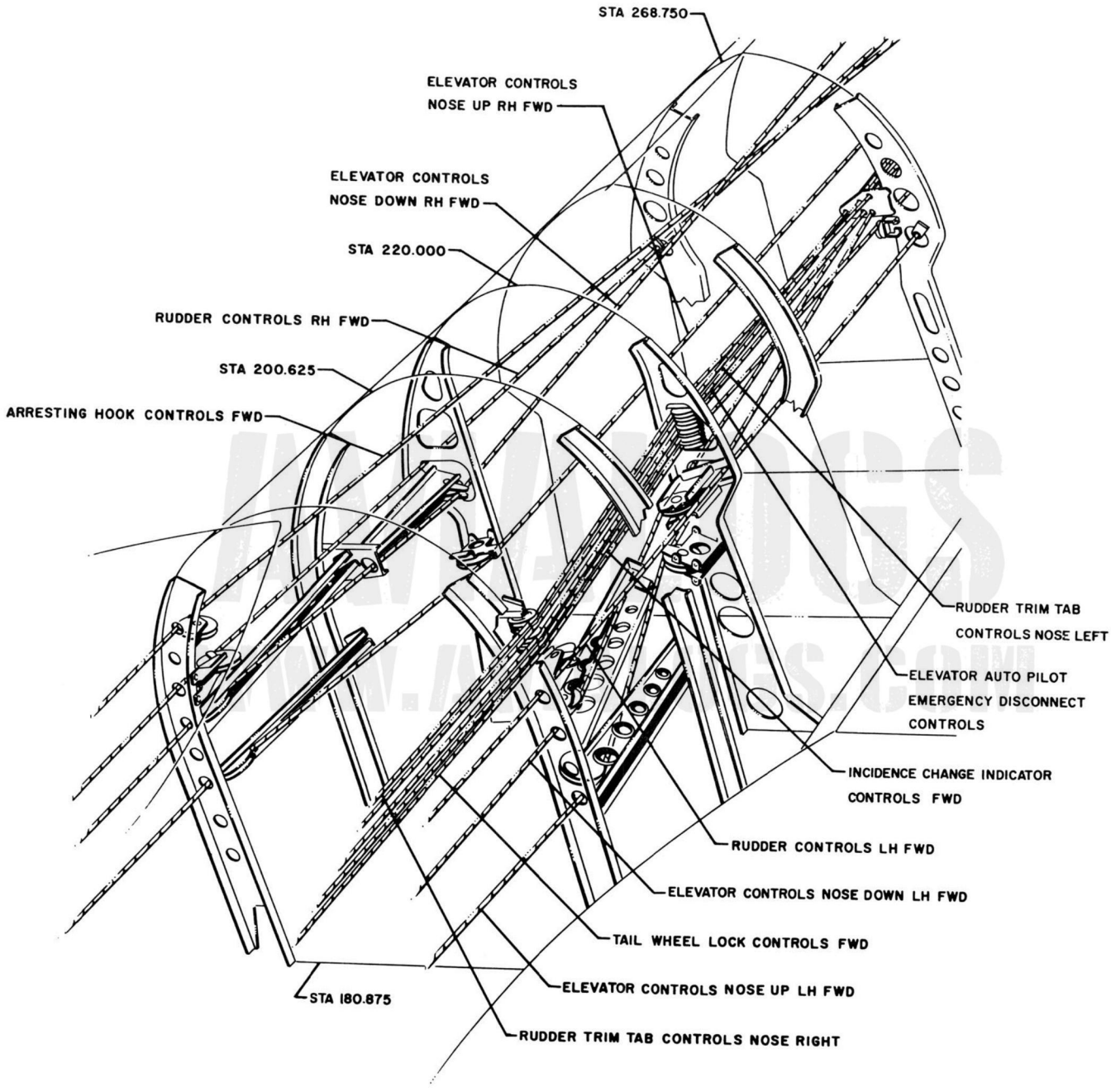


Figure 2–22. Cable Routings (Sheet 3)

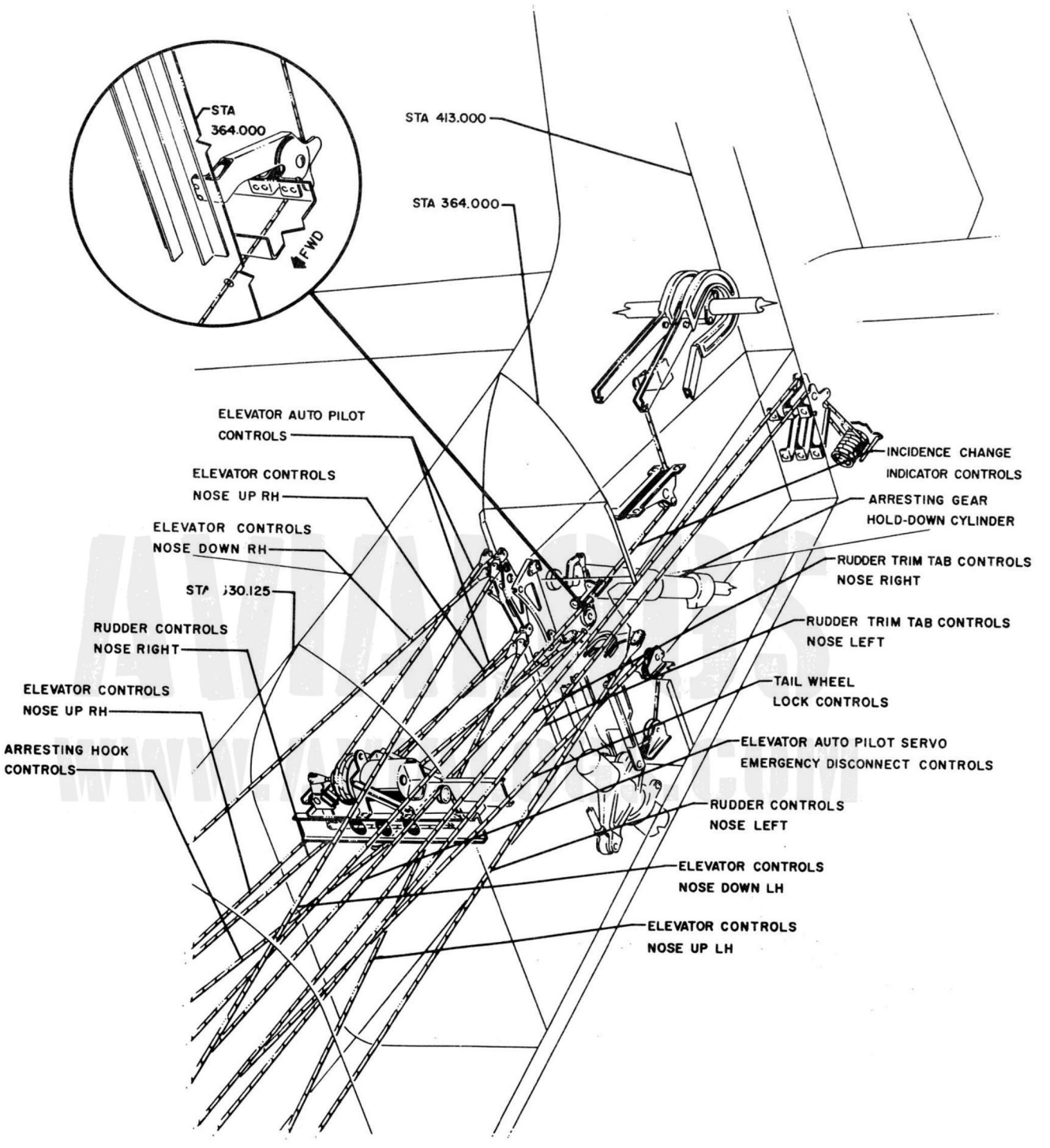


Figure 2–22. Cable Routings (Sheet 4)

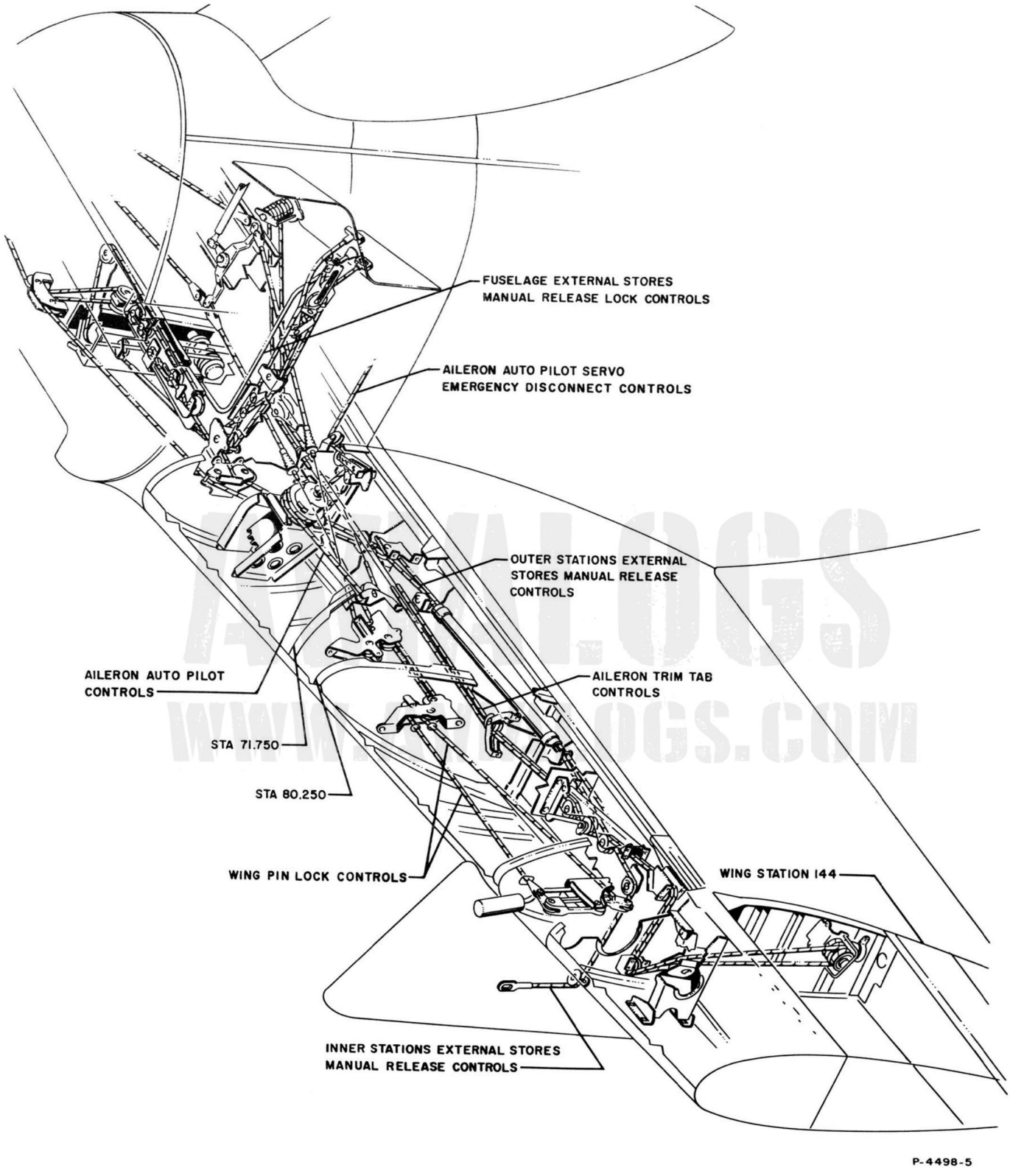
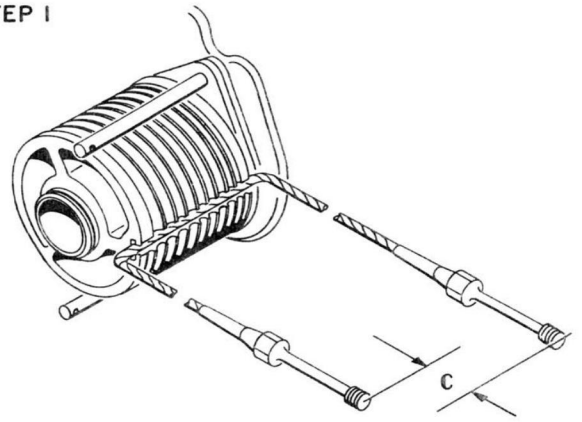


Figure 2–22. Cable Routings (Sheet 5)

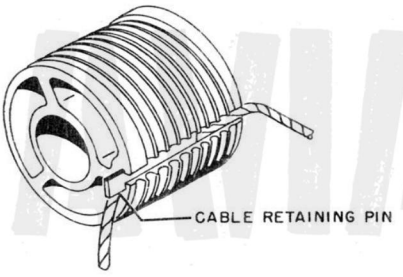
STEP 1



STEP 1

Position cable in drum groove with C dimension in accordance with table.

STEP 2



STEP 2

Insert cable retaining pin.

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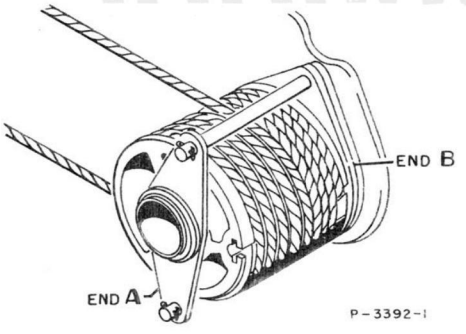
STEP 3



STEP 3

Wrap cable around drum (number of turns in accordance with table).

STEP 4

Tape cable to drum until all cable connections have been made.

CONTROL MECHANISM DRUM	NUMBER OF TURNS END A	NUMBER OF TURNS END B	LENGTH C
Rudder Trim Tab After Drum	4¼	4¼	3
Rudder Trim Tab Cockpit Drum	4¼	4¼	3
Aileron Trim Tab Wing Drum	4¼	4¼	0
Aileron Trim Tab Cockpit Drum	4¼	4¼	0

Figure 2–23. Control Drum Cable Assembly Method

2–202. REMOVAL. (See figure 2–24.)

a. Remove control stick boot.

b. Disconnect external electrical wiring from terminal panel on stick pedestal.

c. Disconnect elevator push-pull tube from horn on right-hand side of stick housing.

d. Disconnect aileron push-pull tube from bellcrank.

e. Remove lockwire and screws from housing cover.

f. Remove nut and washer from bolt which extends fore and aft through housing and attaches internal crank to housing; pull housing cover clear of bolt and re-install washer and nut.

g. Disconnect tube from crank inside housing and remove tube from housing.

h. Remove bolts which fasten housing to support structure and remove control stick.

2–203. INSTALLATION. (See figure 2–24.)

a. In cockpit, lower control stick into position on support structure and install mounting bolts.

b. In forward equipment compartment, insert tube into left-hand opening in housing and bolt tube to crank inside housing.

c. Connect aileron push-pull tube to bellcrank.

d. Connect elevator push-pull tube to horn on right-hand side of housing.

e. Adjust aileron stops as shown on figure 2–28.

f. Remove nut and washer from bolt which attaches internal crank to housing. Install housing cover so that crank-attaching bolt extends through cover and re-install washer and nut on bolt. Install cover attaching screws.

g. Connect external electrical wiring to proper posts on terminal panel on housing.

h. Install control stick boot.

2–204. CONTROL STICK HAND GRIP.

2–205. DESCRIPTION. The control stick hand grip, located on the uppermost end of the control stick arm assembly, is attached to the arm assembly by means of a bolt and lock nut. Included in the hand grip are the control switches for horizontal stabilizer incidence-change, bomb release, rocket release, and gun trigger. The bomb, rocket, and gun trigger switches are normally open, press to close type switches. The incidence-change switch is a three position, center off, momentary contact, press to close type switch.

2–206. REMOVAL. (See figure 2–24.)

Note

Removal and installation of the hand grip on airplanes BuNo. 135344 and subsequent, and prior airplanes reworked per BuAer AD/SC No. 569, is obvious. However, on airplanes prior to BuNo. 135344 not reworked per BuAer AD/SC No. 569 and having solid pedestal bolts installed, the installation of hand grip switch wiring is more difficult. The following removal and installation procedure is given for airplanes prior to BuNo. 135344 not reworked per BuAer AD/SC No. 569, and using solid pedestal bolts.

a. Disconnect switch wiring from terminal panel located on forward side of control stick pedestal.

b. Remove terminals from end of wires and attach a length of strong cord to end of each individual wire.

c. Remove nut and bolt which attach arm assembly to pedestal pivot sleeve.

d. Remove arm assembly from pedestal pivot sleeve.

Note

Index the arm and sleeve to enable correct positioning of arm and sleeve for re-installation.

e. Pull wiring and attached cords through pedestal until electrical wiring is pulled out of pedestal.

Note

Care must be taken while pulling wiring through pedestal sleeve to insure that the attached cords are not broken.

f. Disconnect wiring from cords.

g. Remove nut and bolt which attach control stick hand grip to arm assembly and remove hand grip from arm assembly.

2–207. INSTALLATION. (See figure 2–24.)

a. Install small diameter vinyl tubing over wiring of new control stick hand grip. Tie ends of vinyl tubing to wiring with fine cord to prevent vinyl tubing from slipping from wires during installation into pedestal sleeve.

b. Pull hand grip wire bundle through arm assembly and secure hand grip to arm assembly with bolt and nut.

Note

Care must be taken while installing grip attaching bolt to prevent damage to wiring.

c. Tie ends of hand grip wires to cords protruding from pedestal sleeve and begin to work cord and wire bundle through pedestal sleeve.

Note

Apply talcum powder to vinyl covered wire bundle to allow it to slip easily, and guide wire bundle through hole in pedestal sleeve using tip of finger.

d. Pull wiring until it comes out forward side of pedestal.

e. Install control arm assembly on pedestal sleeve splines, using index marks to align arm assembly with pedestal sleeve.

f. Install arm assembly attaching bolt and nut.

g. Cut wiring to proper length and attach terminals to end of wires.

h. Conduct continuity check for switches.

i. Connect wiring to terminal panel.

j. Replace terminal panel guard.

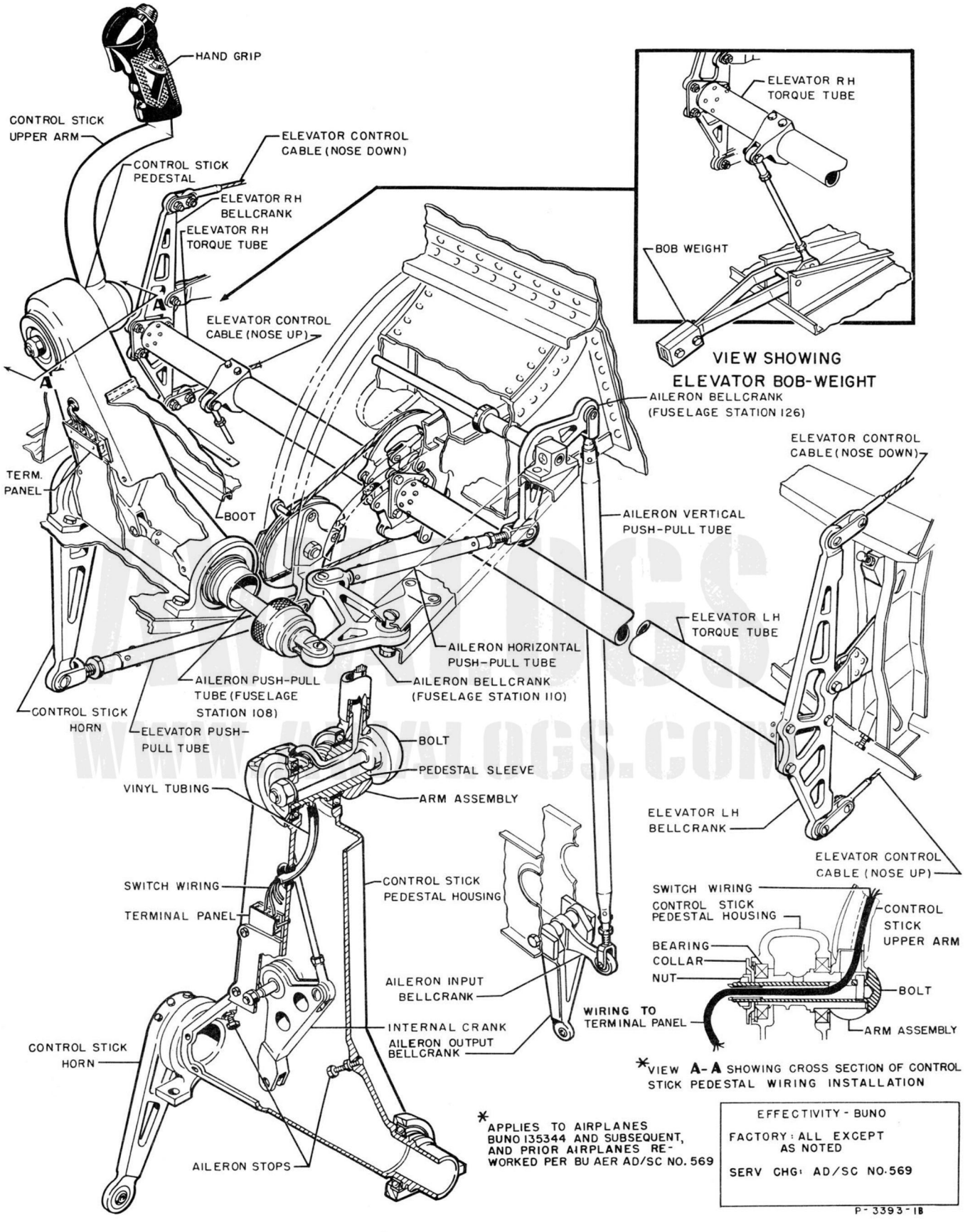


Figure 2–24. Control Stick Installation

2–208. AILERONS.

2–209. DESCRIPTION. (See figure 2–25.) The ailerons are metal-covered movable surfaces installed at the trailing edges of the wing outboard panels. Each aileron incorporates a spanwise main spar, a spanwise auxiliary channel in the nose, a spanwise trailing edge channel, and chordwise ribs. Each aileron is hinged at three points to its related wing outboard panel and is actuated by a push-pull tube at the inboard end. A fabric seal is riveted to each aileron nose and is attached by dzus fasteners to a channel along the shear web. A trim tab is installed in the inboard trailing edge of the left-hand aileron; a fixed tab is installed in the inboard trailing edge of the right-hand aileron. Three static-discharge straps are mounted on each aileron to stream over the aileron trailing edge and dissipate possible accumulation of static electricity.

2–210. REMOVAL. (See figure 2–25.)

a. Through hinged access panel along lower surface of wing outboard panel trailing edge, detach aileron fabric seal by loosening dzus fasteners along length of seal.

b. At wing station 148, disconnect trim tab actuating rod, aileron actuating rod and aileron hinge assembly.

c. Disconnect aileron hinge assembly at wing station 289.

d. Disconnect aileron hinge assembly at wing station 218.

2–211. INSTALLATION. (See figure 2–25.)

a. Lift aileron into place and connect aileron hinge fittings at wing stations 148, 218, and 289 after greasing hinge bolts with corrosion preventive compound (AN-C-124, type I).

b. Connect aileron actuating rod and (left-hand aileron only) trim tab actuating rod.

c. Adjust aileron and aileron trim tab actuating rods. (See figures 2–28 and 2–31.)

d. Install aileron fabric seal by tightening dzus fasteners along length of seal.

2–212. AILERON CONTROL SYSTEM.

2–212A. DESCRIPTION. (See figure 2–27.) The range of aileron travel from the neutral position is 17 degrees upward and 13 degrees downward. The aileron control system is fundamentally mechanical; however, a hydraulic power boost system is incorporated into the aileron control system to reduce control stick forces. The mechanical aspects of the system are conventional: movement of the control stick is transferred to the control surfaces by a series of push-pull tubes and bellcranks located in the leading edge of the wing center section and at the wing fold joints. The aileron push-pull tubes swivel at the wing joints to allow the wing to fold. A vibration damper is mounted on the left-hand aileron push-pull tube in the forward equipment compartment approximately 12 inches to the left of the center line of the airplane.

2–212B. TROUBLE SHOOTING. Refer to table 2–4.

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TABLE 2–4. AILERON CONTROL SYSTEM TROUBLE SHOOTING

Trouble or Symptom	*Probable Cause*	*Correction*
1. Surface fails to move.	a. Mechanical obstruction.	Inspect linkage and remove obstruction.
	b. Insufficient hydraulic pressure.	Check system. Refer to hydraulic system trouble shooting in section III.
	(1) Leaking lines or connections.	Replace or repair leaking units.
	(2) Relief valve stuck open.	Adjust valve.
	(3) Pump sheared.	Loosen pump pressure line connection. If no fluid flows when pump actuated, replace pump.
	c. Cable off pulley.	Restore.
	d. Cable disconnected or broken.	Connect or repair.
	e. Bellcrank, hinge, or horn bent or broken.	Replace.
	f. Drum binding.	Inspect for overtightened retaining and locking nuts. Loosen and re-safety.
	g. Fairlead or pulley damaged, causing fouled cable.	Repair or replace.
2. Surface overtravels or undertravels.	a. Improper rigging.	Refer to system adjustment procedure.
	b. Trouble 1.e., f., and g.	
3. Surface moves counter to control.	Cables crossed between control and surface.	Refer to system adjustment procedure.
4. Boost cylinder does not latch in operating position.	Latch out of adjustment.	See figure 2–28.
5. Cable release fails to operate to disengage boost cylinder.	Trouble 4.	

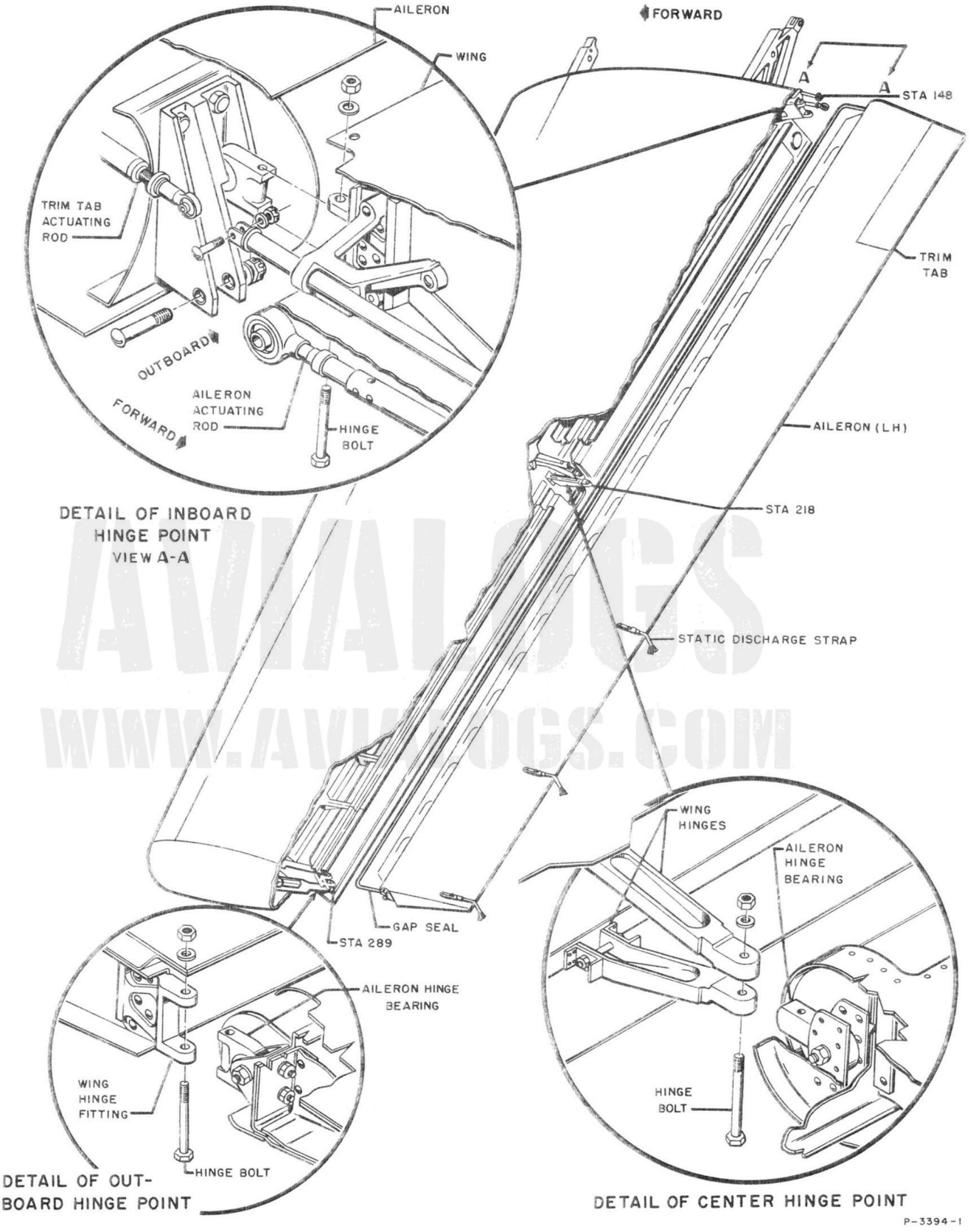

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Figure 2–25. Aileron Installation

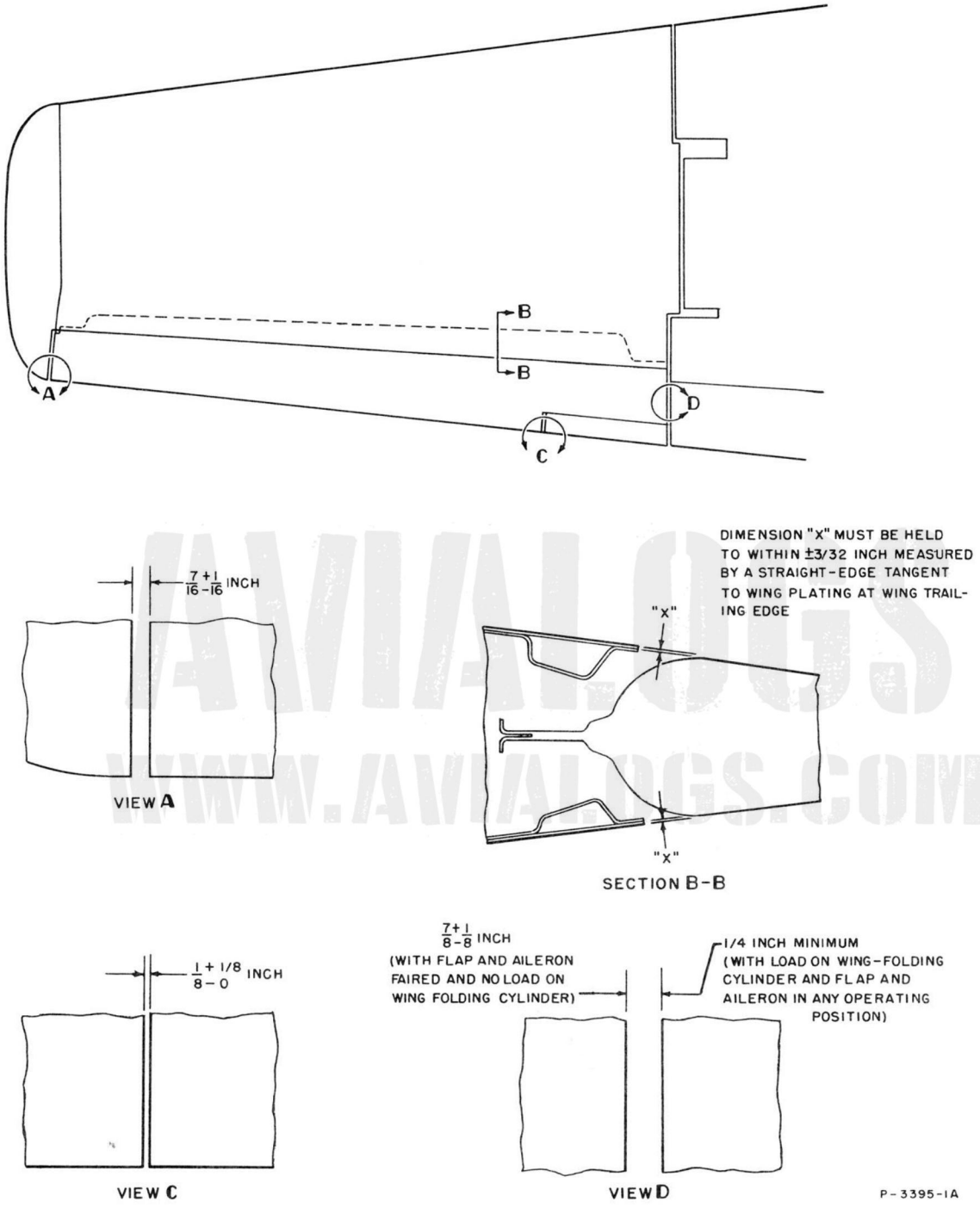

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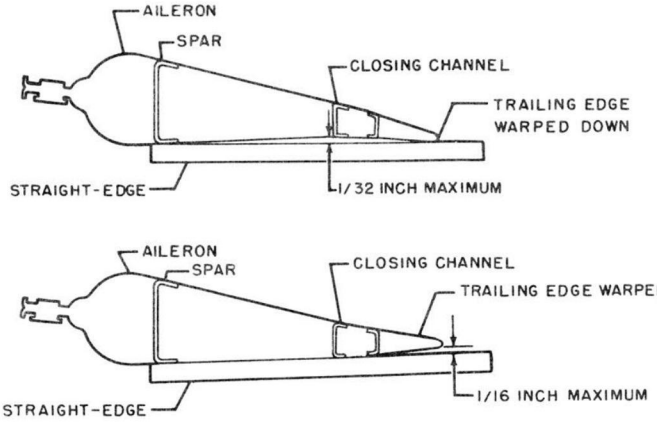
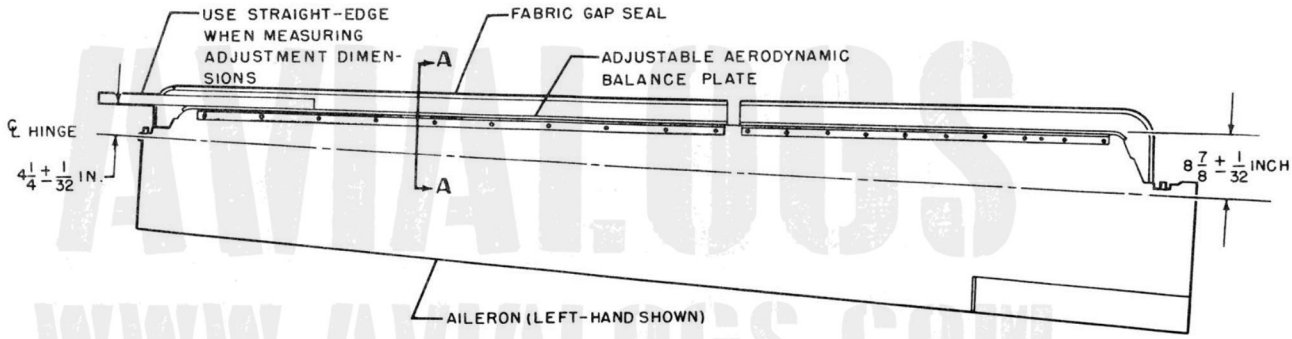
Figure 2–26. Aileron Clearances and Adjustments (Sheet 1)

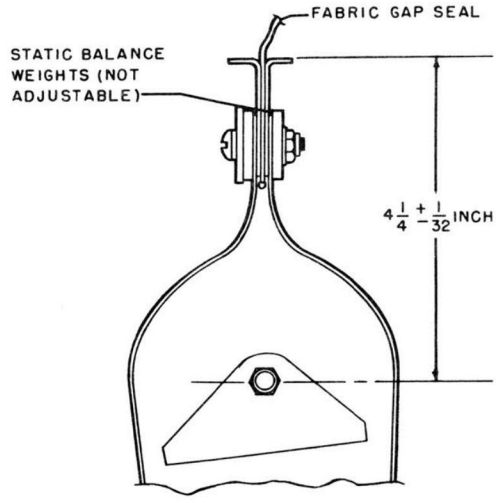


NOTE

IT IS DESIRABLE TO HAVE THE LOWER SURFACE OF THE AILERON FLAT AS CHECKED BY LAYING A STRAIGHT-EDGE FROM SPAR TO TRAILING EDGE AS SHOWN. THE TOLERANCES MAY BE EXCEEDED IN A SMALL SECTION OF THE AILERON. CHECK PARTICULARLY FOR THE CONDITION OF ONE AILERON TRAILING EDGE WARPED UP AND THE OTHER AILERON TRAILING EDGE WARPED DOWN.

AILERON TRAILING EDGE ALIGNMENT





AERODYNAMIC BALANCE PLATE (ADJUST BY LOOSENING SCREWS AND MOVING PLATE EVENLY ALONG FULL SPAN OF AILERON. SECURE SCREWS AFTER ADJUSTMENT)

SECTION A-A

P-3395-2

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Figure 2–26. Aileron Clearances and Adjustments (Sheet 2)

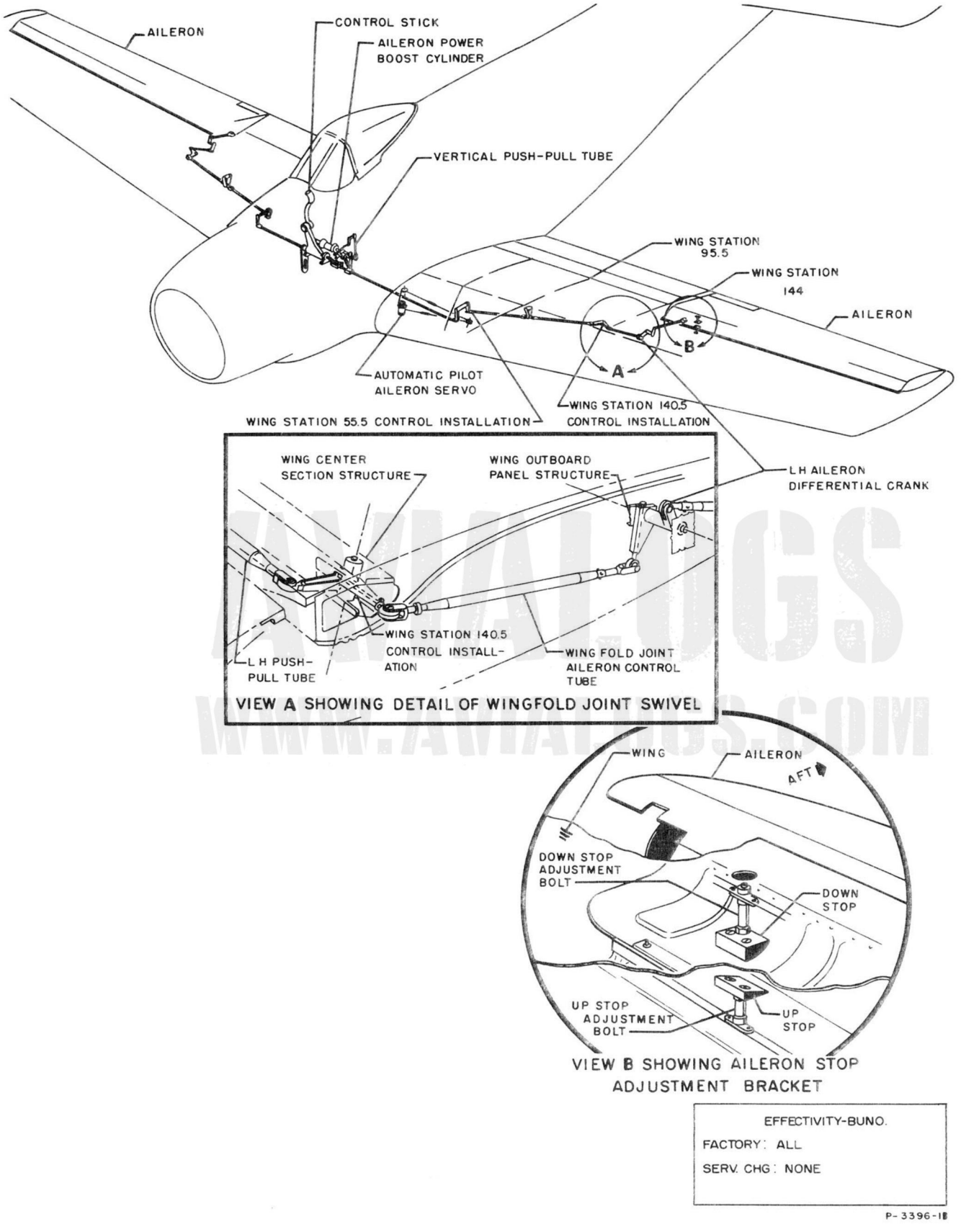

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Figure 2–27. Aileron Control System (Sheet 1)

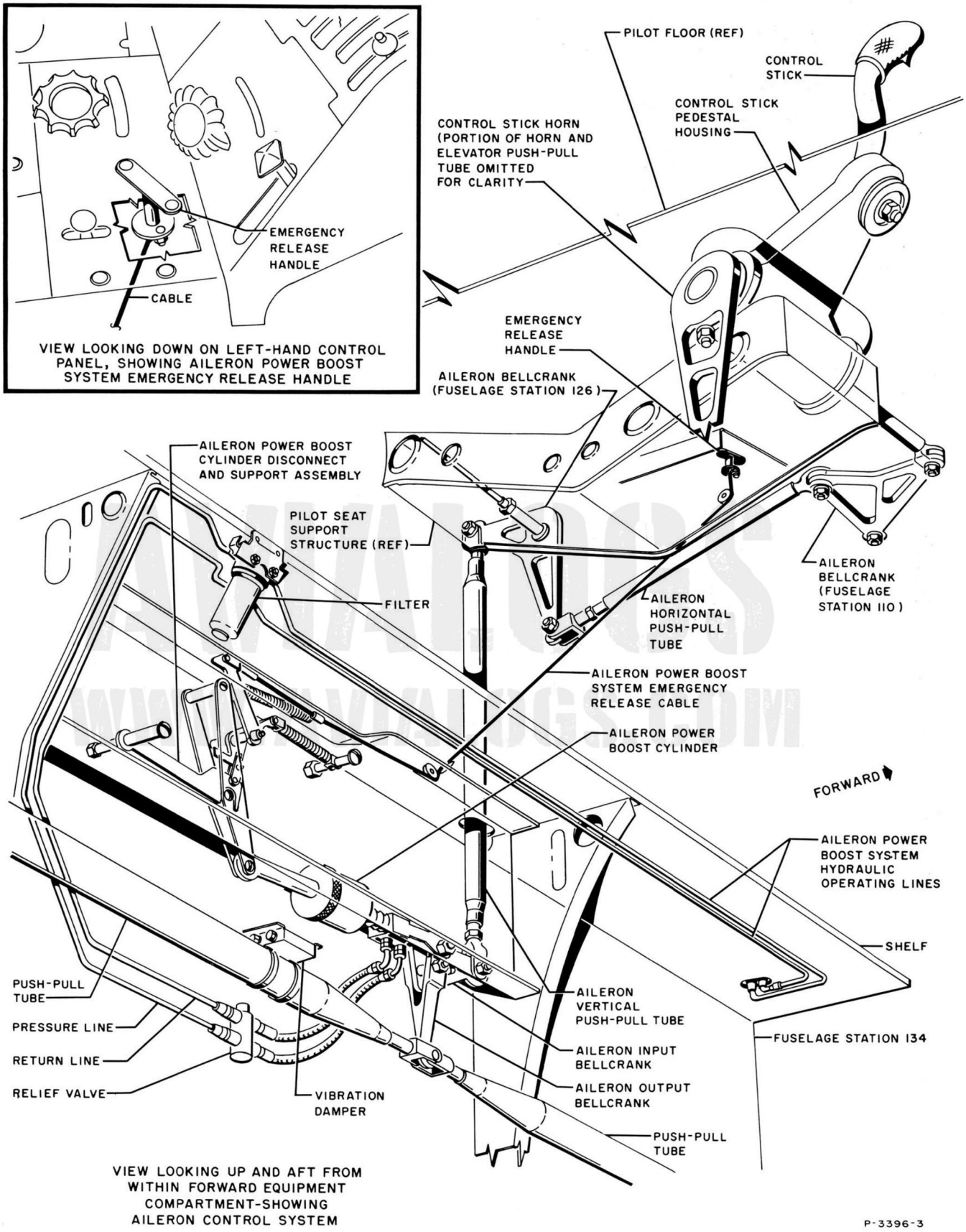

Figure 2–27. Aileron Control System (Sheet 2)

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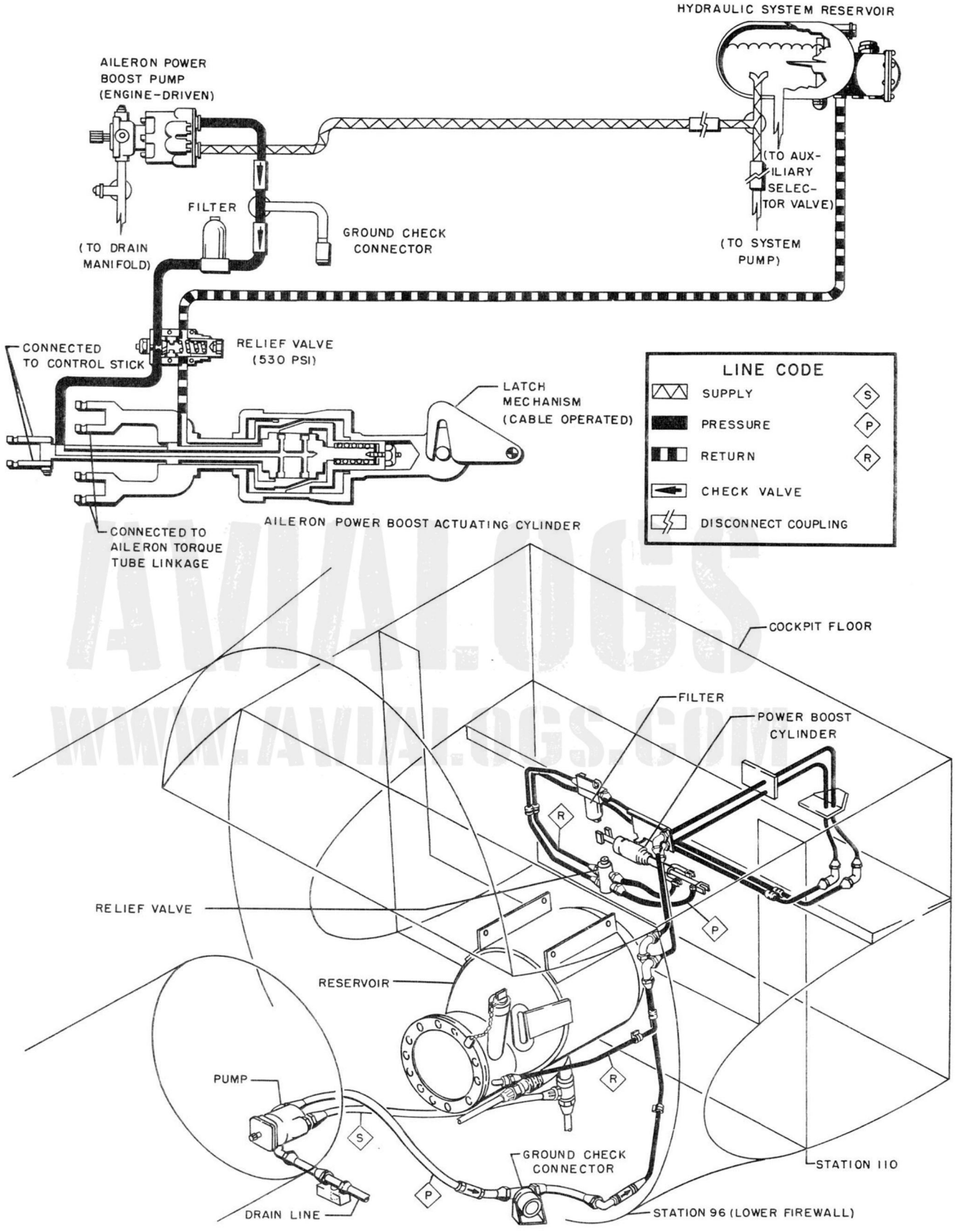
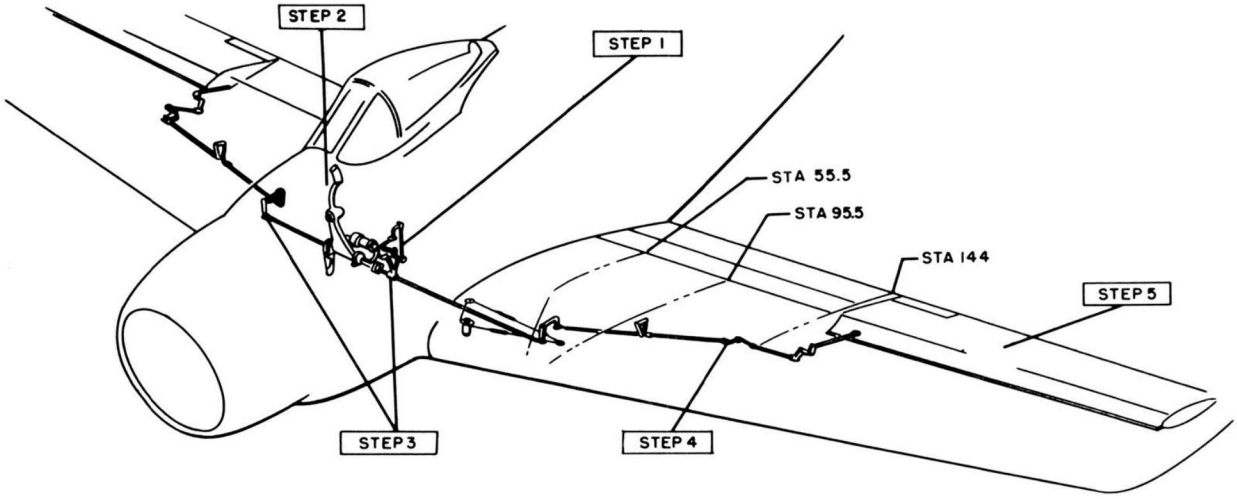
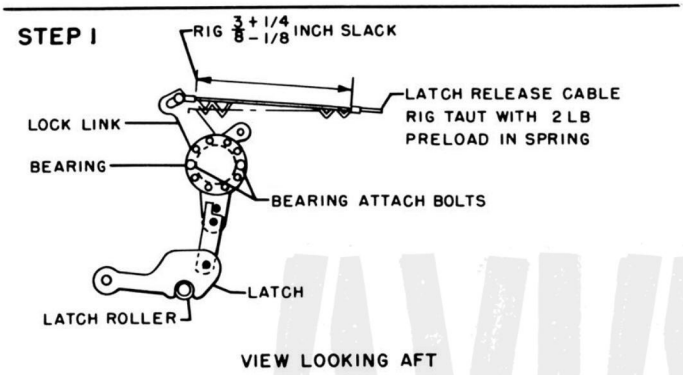
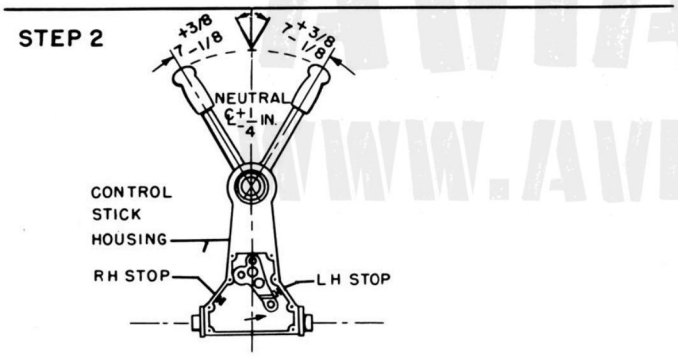
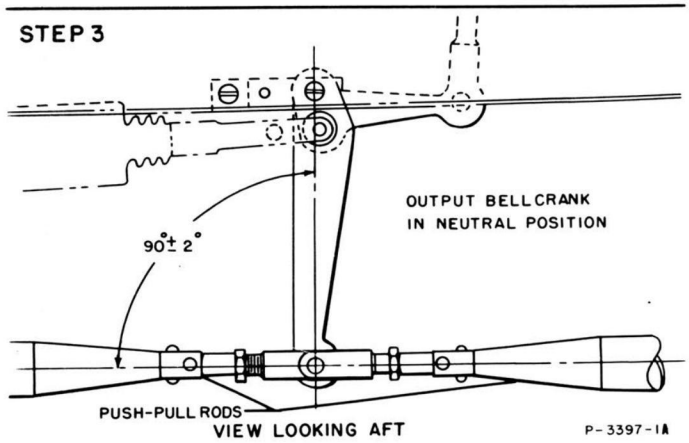


Figure 2–27. Aileron Control System (Sheet 3)









ADJUSTMENT

STEP 1

Aileron Power Boost Cylinder Latch:

a. Engage latch with latch roller.

b. Rotate lock link bearings until all backlash between latch and latch roller is removed. Then install bearing attach bolts.

c. Rig release cable so that cable section between spring and operating handle is taut, with preload of two pounds on spring, and so that cable section between spring and lock link arm has 3/8- to 5/8-inch slack.

STEP 2

Control Stick:

a. Place control stick in neutral.

Note

Because control stick grip is mounted in rotated position, top of grip will not be on center line of airplane.

b. Adjust stops inside control stick housing to permit $7 + \frac{3}{8} - \frac{1}{8}$ inches of stick travel on each side of airplane center line.

STEP 3

Output Bellcrank and Aileron Push-Pull Tubes:

a. In forward equipment compartment, rig aileron push-pull rods in wing center section to align with output bellcrank when control stick is in neutral.

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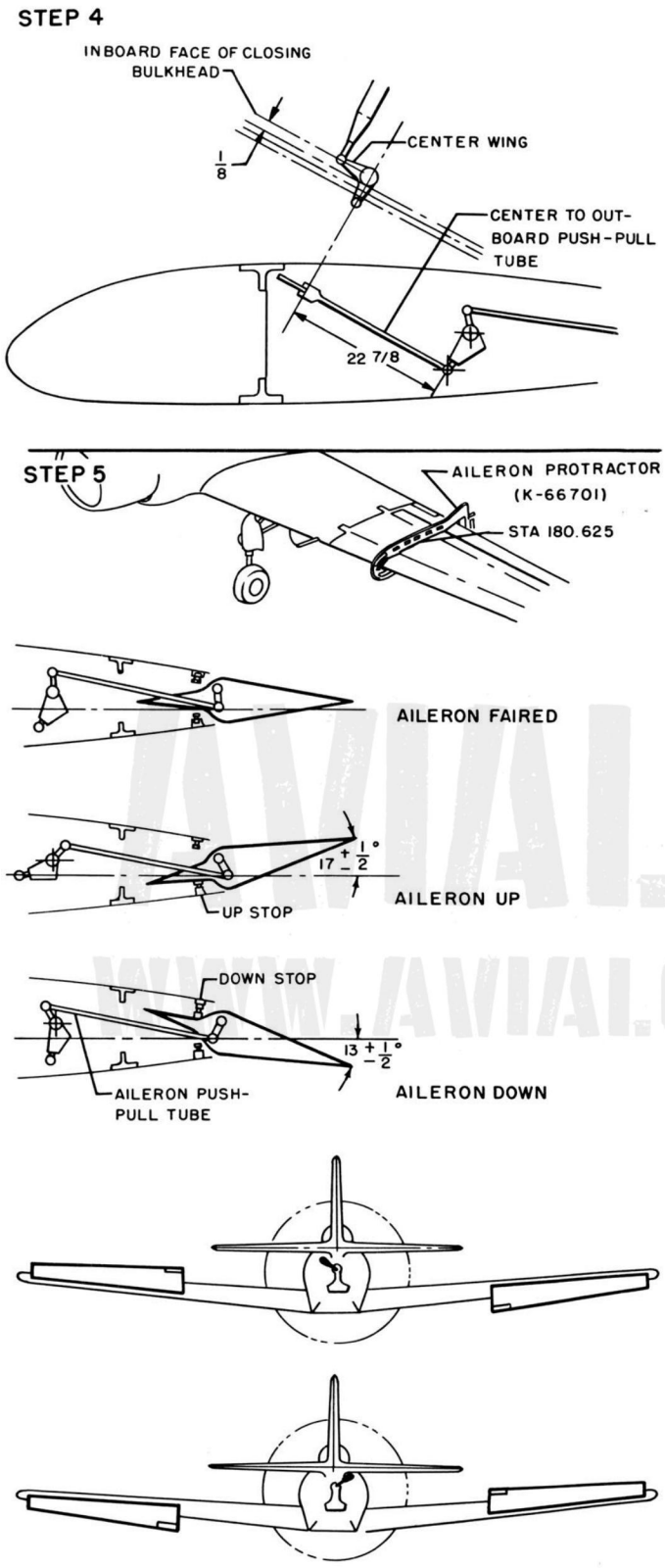
Figure 2–28. Aileron Control Adjustments (Sheet 1)



STEP 4

Aileron Bellcranks at Wing Joints:

a. Fold wing. At wing stations 144, left-hand and right-hand, set forward arm of each bellcrank $1\frac{7}{16}$ inches inboard of closing bulkhead inboard face. Control stick must be in neutral position.

b. Adjust center-to-outboard push-pull tube so that dimension between centers of attaching bolts is 22⅞ inches.

Note

Check safety holes in all adjustable rod ends to insure that no end is extended too far. Tighten lock nuts and safety bolts.

STEP 5

Aileron Deflections:

a. Spread and lock wing outboard panels.

b. Install aileron rigging protractor on each wing outboard panel at wing station 180.625.

c. Release power boost latch mechanism, secure control stick in neutral, and fair ailerons by adjusting length of aileron push-pull tubes.

d. Deflect left-hand aileron 17 ± ½ degrees UP; adjust UP stop on left-hand aileron. Set right-hand aileron 13 ± ½ degrees DOWN; adjust DOWN stop on right-hand aileron.

e. Deflect right-hand aileron 17 ± ½ degrees UP; adjust UP stop on right-hand aileron. Set left-hand aileron 13 ± ½ degrees DOWN; adjust DOWN stop on left-hand aileron.

f. Move control stick to left of center line. Left-hand aileron should move UP and right-hand aileron should move DOWN.

g. Move control stick to right of center line. Right-hand aileron should move UP and left-hand aileron should move DOWN.

STEP 6

Freedom of Movement:

a. Re-engage power boost mechanism.

b. Operate ailerons through entire range of movement and check for ease of operation.

c. Operate engine at approximately 800 rpm. Check aileron controls through entire range of movement for ease of operation.

Figure 2–28. Aileron Control Adjustments (Sheet 2)

2–213. The left-hand aileron cable also provides connection to the aileron servo of the automatic pilot. (Refer to section VI.)

2–214. ADJUSTMENT. See figure 2–28.

2–215. AILERON POWER BOOST SYSTEM.

2–216. DESCRIPTION. (See figure 2–27.) The aileron power boost system, in addition to the necessary lines and fittings, includes the following components:

Name	*Para Ref*
Power boost pump	2–217
Power boost cylinder	2–221
Relief valve	2–230
Filter	2–234
Check valve (2)	

The aileron power boost system is a closed system with fluid supplied by and returned to the hydraulic system reservoir, and operates under a pressure of 500 to 650 psi. Hydraulic pressure is furnished by the aileron power boost pump and the pressurized fluid is directed to the power boost cylinder to actuate the ailerons. The power boost system is connected to the aileron mechanical linkage by the power boost actuating cylinder and can be disconnected from the mechanical system in flight or on the ground by the AILERON POWER BOOST DISCONNECT handle installed in the left-hand control panel in the cockpit. Once disconnected, the power boost system cannot be re-engaged during flight.

2–217. AILERON POWER BOOST HYDRAULIC PUMP.

2–218. DESCRIPTION. (See figure 2–27.) The aileron power boost hydraulic pump is engine driven and is mounted on the engine accessory drive section below the main hydraulic system engine-driven pump and can be reached through the lower left-hand accessory cowling. The ratio of the aileron boost hydraulic pump speed to engine speed is 1.1:1. The pump delivers 2.2 gallons per minute.

2–219. REMOVAL.

a. Remove engine accessory cowling.

b. Disconnect and cap three hydraulic lines at pump and plug pump ports.

c. Remove nuts from mounting pad studs and remove pump.

2–220. INSTALLATION.

a. Remove pump drain plug and fill pump body with hydraulic fluid. Re-install drain plug.

b. Align pump mounting holes with mounting pump pad studs, taking care to position pump for clockwise rotation as shown on instruction plate, and install and safety stud nuts.

c. Uncap and connect hydraulic lines: *supply* to pump inboard port, *pressure* to pump outboard port, and *drain* to pump bottom port.

d. Replace accessory cowling.

2–221. AILERON POWER BOOST ACTUATING CYLINDER.

2–222. DESCRIPTION. (See figure 2–27.) The aileron power boost actuating cylinder is installed in the forward equipment compartment just forward of fuselage station 134.500 bulkhead. The cylinder is connected by bellcranks to the mechanical linkage of the aileron control system. The cylinder is operated by an integral slide which is connected to the control stick linkage. When the control stick is in neutral, movement of the control stick shifts the slide to direct hydraulic fluid to one side of the cylinder piston. The resulting movement of the piston is reflected by the cylinder fork, the aileron torque tube linkage to which the cylinder fork is attached, and finally to the ailerons.

2–223. REMOVAL. (See figure 2–27.)

a. In cockpit, operate aileron power boost disconnect handle to disengage actuating cylinder from latch mechanism.

b. Disconnect cylinder head from supporting arms.

c. Disconnect and cap hydraulic lines at cylinder. Plug cylinder ports.

d. Remove bolt which attaches cylinder slide end to input bellcrank.

e. Remove bolt which attaches cylinder fork to output bellcrank.

2–224. INSTALLATION. (See figure 2–27.)

a. Bolt cylinder slide end to input bellcrank.

b. Bolt cylinder fork to output bellcrank.

c. Uncap and connect hydraulic lines at cylinder: *pressure* line to slide port, and *return* line to fork port.

d. Bolt cylinder head to supporting arms of latch mechanism.

2–225. AILERON POWER BOOST LATCH MECHANISM.

2–226. DESCRIPTION. (See figure 2–27.) The aileron power boost latch mechanism is installed in the forward equipment compartment just forward of fuselage station 134.500 bulkhead and engages the aileron power boost actuating cylinder head. The latch mechanism holds the actuating cylinder in operating position. Releasing the latch, by use of the cable handle in the left-hand control panel in the cockpit, disengages the cylinder from the aileron mechanical controls, which then become operable in the conventional manner.

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2–227. REMOVAL. (See figure 2–27.)

a. Disconnect latch release cable from lock link arm.

b. Disconnect outboard end of bungee from structure.

c. Remove bolt which attaches cylinder supporting arms to structure.

d. Remove bolt which attaches latch to structure.

e. Remove four bolts which attach lock link bearings to structure and remove bearings and lock link arm.

2–228. INSTALLATION. (See figure 2–27.)

a. Bolt cylinder supporting arms to structural support.

b. Bolt latch to structural support.

c. Assemble bungee spring assembly and bolt outboard end of bungee to structure.

d. Connect latch release cable to lock link arm.

e. Assemble lock link arm and lock link bearings to support. Adjust bearings and install attaching bolts, washers and nuts.

2–229. ADJUSTMENT. (See figure 2–28.)

a. Engage latch roller with latch.

b. Rotate lock link bearings until all backlash between latch and roller is eliminated. Install bearing attaching bolts.

c. Rig release cable so that section between spring and handle is taut, with a two-pound preload in the spring, and so that section between spring and latch lock link arm has $\frac{3}{8}$- to $\frac{5}{8}$-inch slack.

2–230. AILERON POWER BOOST SYSTEM RELIEF VALVE.

2–231. DESCRIPTION. (See figure 2–27.) The aileron power boost system relief valve is mounted on the forward face of fuselage station 134.500 bulkhead, approximately one foot to the right of the center line of the airplane, below the aileron power boost actuating cylinder. Relief pressure range of the valve is 500 to 650 psi, which is sufficient for the operation of the power boost actuating cylinder. The valve is, therefore, installed between the cylinder pressure and return lines to supply to the cylinder only the amount of pump output required for the operation of the cylinder.

2–232. REMOVAL.

a. Disconnect and cap four hydraulic lines at valve.

b. Remove three valve attaching screws.

2–233. INSTALLATION.

a. Position valve to bulkhead and install three attaching screws. (Do not install screw in inboard lower mounting hole.)

b. Uncap and connect four hydraulic lines to valve: *pressure* lines to lower ports, *return* lines to upper ports.

2–234. AILERON POWER BOOST SYSTEM LINE FILTER.

2–235. DESCRIPTION. (See figure 2–27.) The aileron power boost system line filter is installed in the pressure line between the power boost pump and the power boost actuating cylinder to prevent foreign particles from entering the cylinder and causing damage to, or improper operation of, the cylinder. The filter is mounted on a support in the forward equipment compartment above the power boost actuating cylinder.

2–236. AILERON TRIM TAB.

2–237. DESCRIPTION. (See figure 2–29.) The aileron trim tab is installed in the inboard end of the trailing edge of the left-hand aileron and is used to trim the airplane in flight. The trim tab is constructed of 24 S-TAL flush-riveted plating formed over 24 S-TAL spars and ribs. The tab is hinged at two points and is sealed to the aileron with a vinyl-coated fabric gap seal riveted to the tab and attached by screws to the aileron. The trim tab is actuated by a control rod attached to the inboard end of the tab. The control rod is housed in a streamlined fairing.

2–238. REMOVAL. (See figure 2–29.)

a. Remove screws which attach trim tab fabric gap seal to aileron.

b. Place trim tab in extreme upward position to provide access to control rod, and disconnect control rod from trim tab.

c. Remove trim tab hinge bolts.

2–239. INSTALLATION. (See figure 2–29.)

a. Place trim tab in position and install trim tab hinge bolts.

b. Place trim tab in extreme upward position and connect control rod to trim tab.

c. Install screws which attach trim tab fabric gap seal to aileron.

Note

Clearance between outboard end of trim tab and aileron should be $\frac{1}{8} + \frac{1}{8} - 0$ inch. (See figure 2–26.)

2–240. AILERON TRIM TAB CONTROL SYSTEM.

2–240A. DESCRIPTION. (See figure 2–30.) The trim tab is adjustable from the cockpit in flight. The trim tab control system is mechanical and includes the following principal components:

Name	*Para Ref*
Hand wheel	2–244
Cockpit mechanism	2–244
Cable take-up mechanism	2–241
Lead screw mechanism	2–249

2–241. Control cables extend from the trim tab control drum in the left-hand control panel in the cockpit through the wing center section nose to a lead screw mechanism in the wing outboard panel at wing station 144. The lead screw shaft is connected to a push-pull

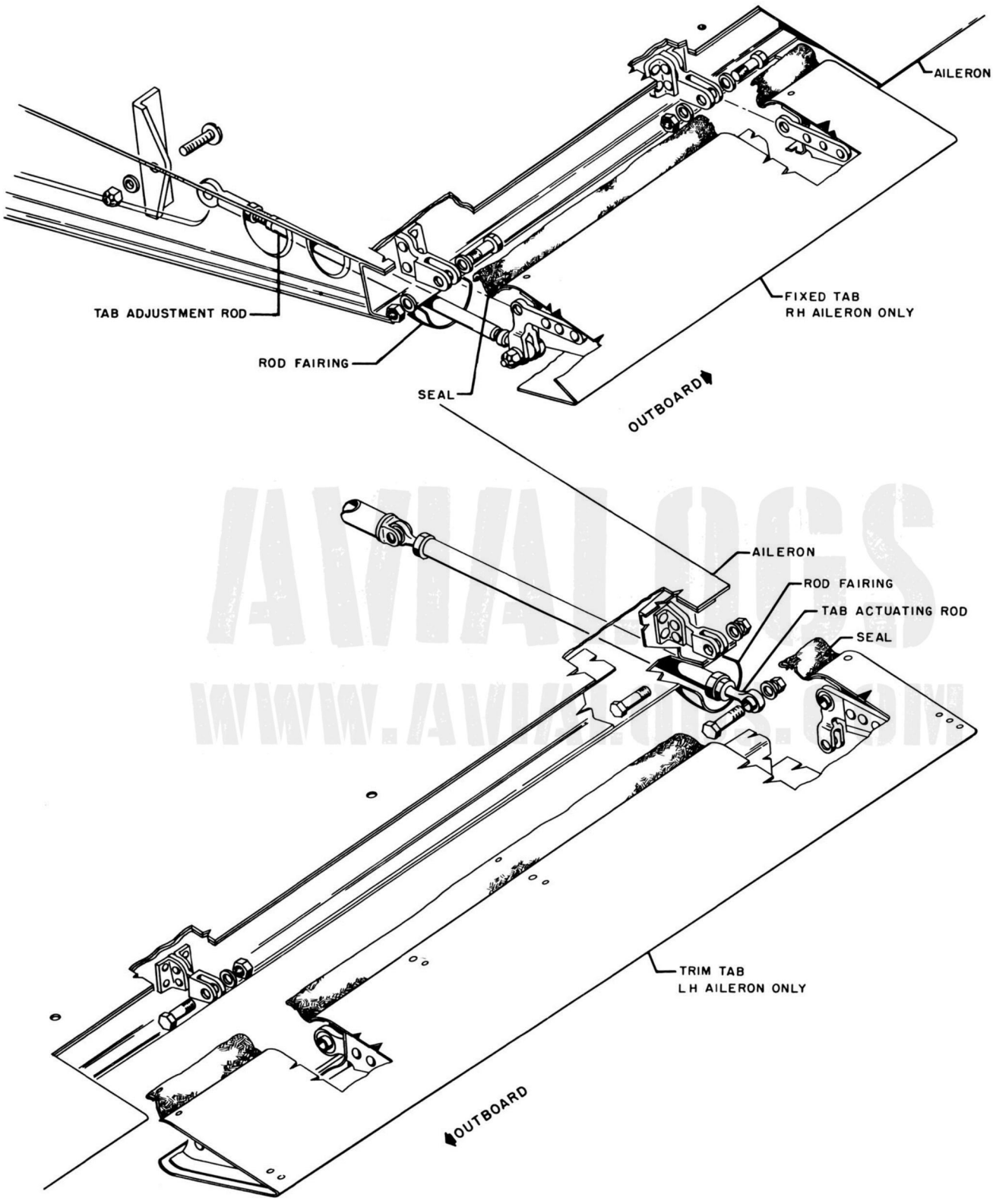

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Figure 2–29. Aileron Trim Tab Installation

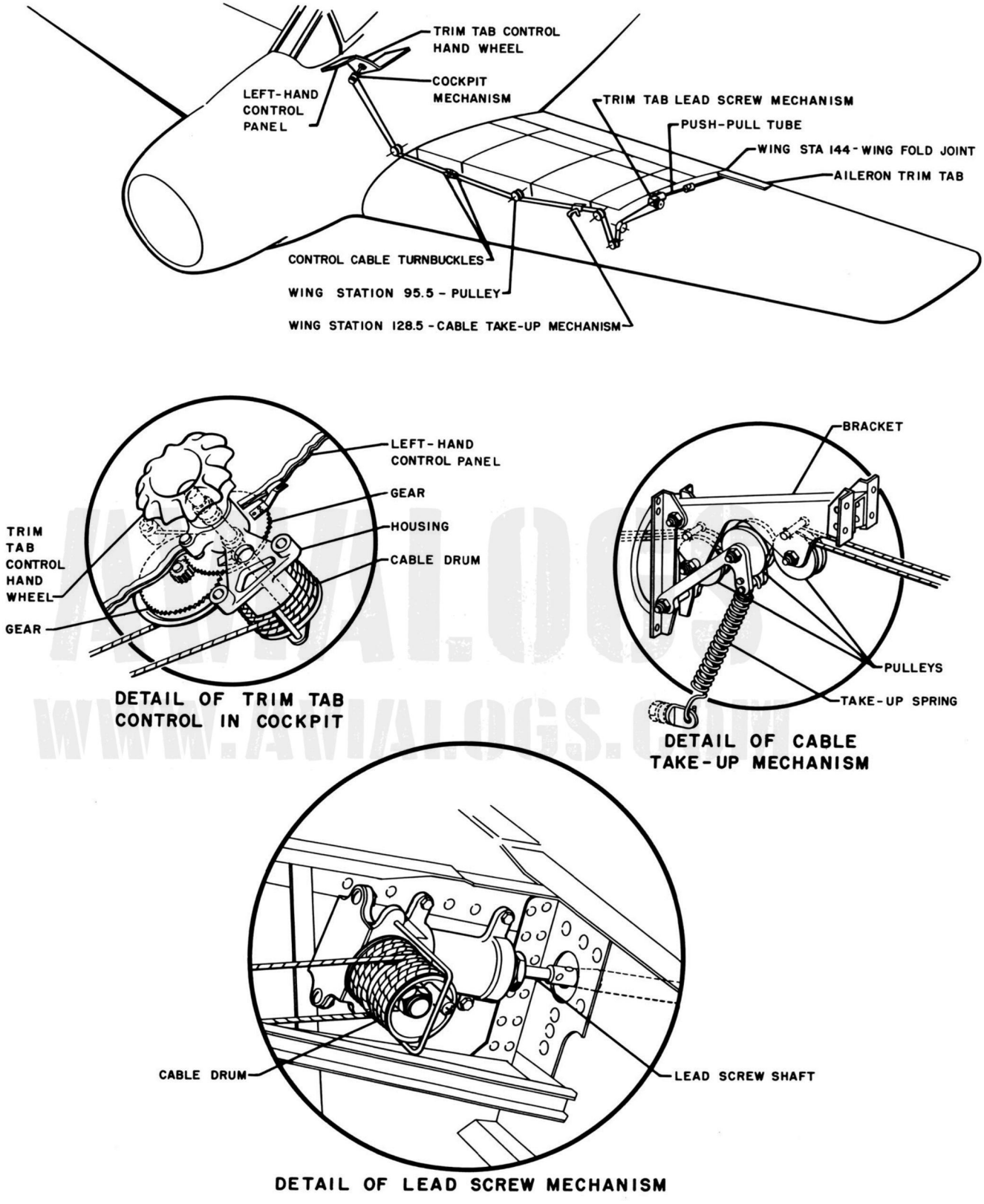


Figure 2–30. Aileron Trim Tab Control System

tube which operates the trim tab. A cable take-up mechanism, consisting of a pair of spring-loaded pulley arms, is provided in the wing center section nose between wing stations 121.625 and 128.5 to maintain proper trim tab cable tension when the wing is folded. Aileron trim tab control cables are $\frac{1}{16}$-inch flexible steel.

2–242. TROUBLE SHOOTING. Refer to table 2–4.

2–243. ADJUSTMENT. See figure 2–31.

2–244. AILERON TRIM TAB CONTROL—COCKPIT MECHANISM.

2–245. DESCRIPTION. (See figure 2–30.) The cockpit mechanism of the aileron trim tab control system is mounted in the cockpit left-hand control panel, and consists of a cable drum mounted on a geared shaft and operated by a hand wheel, and a pointer geared to the shaft to show movement of the trim tab within a 30-degree range, 15 degrees "LW DOWN" and 15 degrees "RW DOWN." Aileron trim tab movement is five degrees for each complete cycle of the hand wheel.

CAUTION

Do not operate aileron trim tab control system when wing is folded.

2–246. REMOVAL. (See figure 2–30.)

a. Place aileron trim tab in neutral position (indicator pointer on zero).

b. Through left-hand main landing gear wheel well, disconnect trim tab cable turnbuckles in wing center section nose at wing station 55.5.

c. Tape cables to cockpit control mechanism drum, then pull cable ends from wing into fuselage.

d. In cockpit, remove nut that fastens trim tab hand wheel to mechanism shaft.

e. Remove four screws which fasten mechanism and indicator unit to control panel.

2–247. INSTALLATION. (See figure 2–30.)

a. Through forward equipment compartment, position trim tab cockpit mechanism to control panel and install with four screws.

b. In cockpit, install trim tab hand wheel on mechanism shaft.

c. Guide cables over pulleys on wing spar cap and through left-wing nose section to landing gear wheel well. Connect cables to turnbuckle barrels on outboard cables.

2–248. ADJUSTMENT. See figure 2–31.

2–249. AILERON TRIM TAB LEAD SCREW MECHANISM.

2–250. DESCRIPTION. (See figure 2–30.) The aileron trim tab lead screw mechanism is mounted in the left-hand wing outboard panel at wing station 144 just forward of the rear shear web. The mechanism comprises a drum, to guide the trim tab outboard cables, and a geared drive shaft and lead screw which actuate the trim tab push-pull tube.

2–251. REMOVAL. (See figure 2–30.)

a. Place trim tab control in neutral position (indicator pointer on zero).

b. Through main landing gear left-hand wheel well, disconnect trim tab cable turnbuckles in wing center section nose at wing station 55.5.

c. Through wing outboard panel inboard access, tape cables to mechanism cable drum.

d. Pull outboard cables out of wing center section, removing pulleys and guards as necessary.

e. Through aileron access, remove screw which attaches trim tab control rod end fitting to lead screw at guide.

f. Remove four bolts which fasten mechanism housing to wing structure. Pull lead screw forward and clear of shear web.

2–252. INSTALLATION. (See figure 2–30.)

a. Insert lead screw mechanism through wing outboard-panel inboard access and guide lead screw through cut-out in rear shear web. Bolt mechanism housing to wing structure with four bolts.

b. Through aileron access, adjust lead screw and fasten it to trim tab control rod end fitting at guide.

c. Guide cables over pulleys and connect cable ends to trim tab inboard cable turnbuckles in landing gear wheel well forward of the wing front spar.

2–253. AILERON FIXED TAB.

2–254. DESCRIPTION. (See figure 2–29.) The aileron fixed tab is installed in the inboard end of the trailing edge of the right-hand aileron and can be adjusted on the ground to trim the airplane. The fixed tab is constructed of 24 S-TAL flush-riveted plating formed over a 24 S-TAL spanwise spar and chordwise 24 S-TAL ribs. The tab is hinged at two points and is sealed to the aileron with a vinyl-coated fabric gap seal riveted to the tab and attached by screws to the aileron. An adjusting rod, attached to the inboard end of the fixed tab, is housed in a streamlined fairing.

2–255. REMOVAL. (See figure 2–29.)

a. Remove screws that attach fixed tab fabric gap seal to aileron.

b. Remove bolt that attaches adjustment rod to tab.

c. Remove tab hinge bolts.

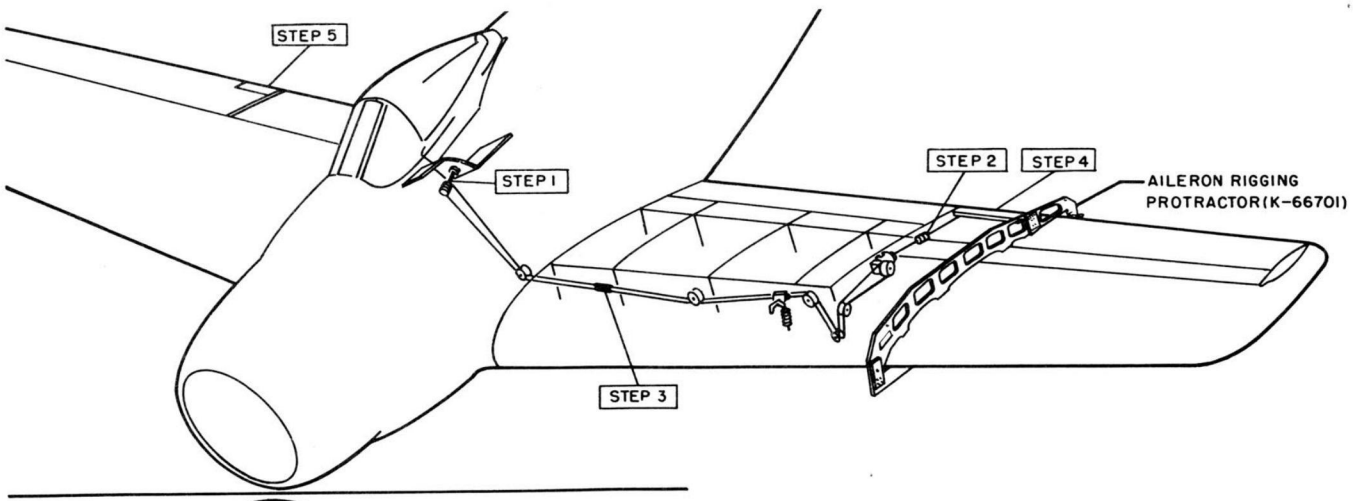
2–256. INSTALLATION. (See figure 2–29.)

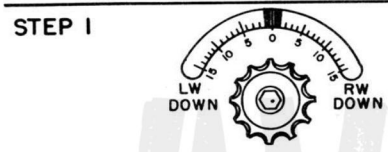
a. Place fixed tab in position and install tab hinge bolts.

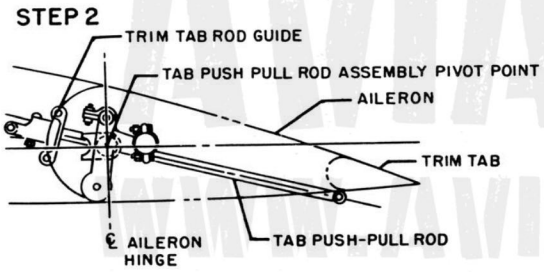
b. Install bolt that attaches adjustment rod to tab.

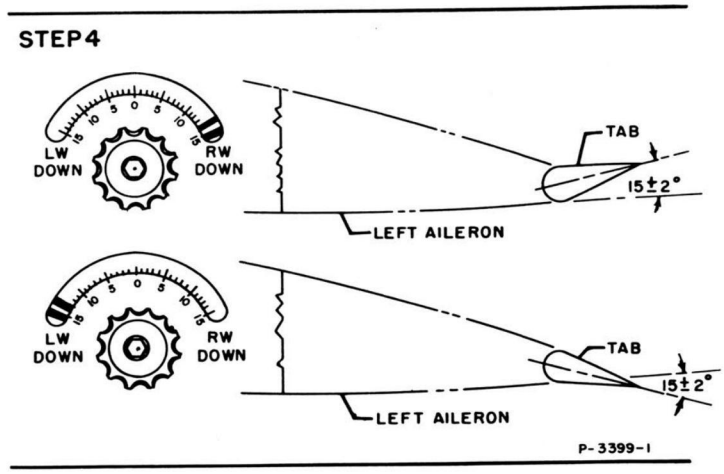
c. Install screws that attach fixed tab fabric gap seal to aileron.

2–257. ADJUSTMENT. See figure 2–31.









ADJUSTMENT

STEP 1

Place aileron trim tab control cockpit mechanism at neutral (zero) position.

STEP 2

Trim Tab and Drum:

a. Adjust trim tab push-pull rod assembly so that pivot point aligns with center line of aileron hinge.

b. Adjust length of trim tab push-pull rod so that trim tab fairs with aileron in neutral position.

STEP 3

Rig cables to correct tension as shown on figure 2–21.

STEP 4

Trim Tab Deflection:

a. When indicator is turned to RW DOWN, trim tab should move UP 15 + 2/—1 degrees.

b. When indicator is turned to LW DOWN, trim tab should move DOWN 15 + 2/—1 degrees.

c. Indicator movement is 15 ± 2 degrees LW DOWN and 15 ± 2 degrees RW DOWN.

STEP 5

Aileron fixed tab on right-hand aileron should be rigged to fair prior to first flight. Wing heaviness adjustment should be made with fixed tab. Fixed tab adjustment to give 2 degrees left wing down to 1 degree right wing down aileron trim (on indicator dial) at 230 knots to be determined by flight. Wing heaviness in excess of ± 5 degrees indicates faulty rigging or contours and should not be corrected by tab adjustment.

Figure 2–31. Aileron Trim Tab Control Adjustments

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2–258. ELEVATORS.

2–259. DESCRIPTION. (See figure 2–32.) The elevators are horizontal control surfaces hinged to the horizontal stabilizer. The elevators are constructed of 75 S-TAL flush-riveted plating formed over a spanwise formed spar, a trailing edge spanwise channel, formed chordwise ribs, and chordwise angle stiffeners. A balance horn, in which steel weights are mounted to obtain proper static balance of the elevators, is installed in each elevator nose outboard section. A fabric gap seal is attached to the trailing edge of the horizontal stabilizer and to the nose section of the elevator. A metal fixed tab, adjustable by bending, is riveted to the trailing edge of each elevator.

CAUTION

After fixed tab has been properly adjusted, extreme care should be exercised to avoid possible change of adjustment.

The elevators are interchangeable and can be installed on either the left- or right-hand side of the horizontal stabilizer.

2–260. REMOVAL. (See figure 2–32.)

a. Disconnect fabric gap seal from horizontal stabilizer by loosening dzus fasteners.

b. Place horizontal stabilizer in full down position and remove the stabilizer-to-fuselage upper fairing.

c. Disconnect elevator torque tube from actuating arm and from supports on horizontal stabilizer yokes.

d. Remove bolts at two elevator hinge points.

2–261. INSTALLATION. (See figures 2–32 and 2–33.)

a. Place elevator in position and install bolts at two elevator hinge points. Grease (Specification AN C-124) bolts before installation.

CAUTION

In step b, install two rubber shims to the aft end of the elevator, torque-tube actuating arm, one on each side, and four rubber shims to the forward end of the elevator, torque-tube actuating arm, two on each side. Torque ¼ attaching bolts to 40 in. lb. (See figure 2–32.)

b. Connect elevator torque tube to actuating arm and to support on horizontal stabilizer yokes.

c. Place horizontal stabilizer in full down position and install stabilizer-to-fuselage upper fairing.

d. Connect elevator fabric gap seal by tightening dzus fasteners along horizontal stabilizer trailing edge.

e. Adjust elevator fixed tabs. (See figure 2–35.)

2–262. ELEVATOR TIPS.

2–263. DESCRIPTION. (See figure 2–32.) Each elevator tip is formed of two pieces of 0.040 aluminum alloy sheet welded together. The tips are attached to the outboard ends of the elevators by screws which are inserted around the chordwise bulkhead. Left- and right-hand elevator tips are interchangeable.

2–264. REMOVAL. (See figure 2–32.) The elevator tip can be removed by removing the attaching screws and pulling the tip free.

2–265. INSTALLATION. (See figure 2–32.) The elevator tip can be installed by aligning the tip with the elevator and installing the attaching screws.

2–266. ELEVATOR CONTROL SYSTEM.

2–267. DESCRIPTION. (See figure 2–32.) The elevators are controlled by the fore-and-aft movement of the control stick and are operated by a conventional cable system. Elevator up-travel is 25 degrees, and down-travel is 15 degrees. The control system includes the following principal components:

Torque tubes	Push-pull tube
Operating bellcrank assembly	Load-feel bungee
	Bob-weight

2–268. A push-pull tube connects the horn of the control stick with a differential cable drum, the cables of which actuate sectors bolted to the left- and right-hand torque tubes in the after end of the forward equipment compartment. Movement of the control stick rotates the torque tubes and pulls dual sets of cables attached to bellcranks riveted to the outboard ends of the torque tubes. A load-feel bungee spring mechanism is attached to the right-hand torque tube bellcrank. A bob-weight is attached to the right-hand torque tube to reduce high forces in the control of the elevators. From the torque tube bellcranks, the cables are routed aft through the fuselage to a double bellcrank assembly on the forward side of fuselage station 364 bulkhead. A spring-loaded push-pull tube extends aft from the left-hand bellcrank of the double bellcrank assembly through the bulkhead to an operating arm mounted on the horizontal stabilizer yoke and attached to the elevator torque tubes. The automatic pilot elevator servo is installed at fuselage station 332, approximately, and, when engaged, controls the elevators through a cable system connected to the double bellcrank assembly. The incidence change feature of the horizontal stabilizer eliminates the need for elevator trim tabs; however, a fixed tab, adjustable by bending, is riveted into the trailing edge of each elevator.

2–269 and 2–270. DELETED.

2–271. ADJUSTMENT. See figure 2–35.

2–272. RUDDER.

2–273. DESCRIPTION. (See figure 2–36.) The rudder, constructed of 24 S-TAL flush-riveted plating over a formed spar, a trailing edge closing channel, chordwise ribs, and chordwise angle stiffeners, is a control surface hinged to the vertical stabilizer trailing edge at three

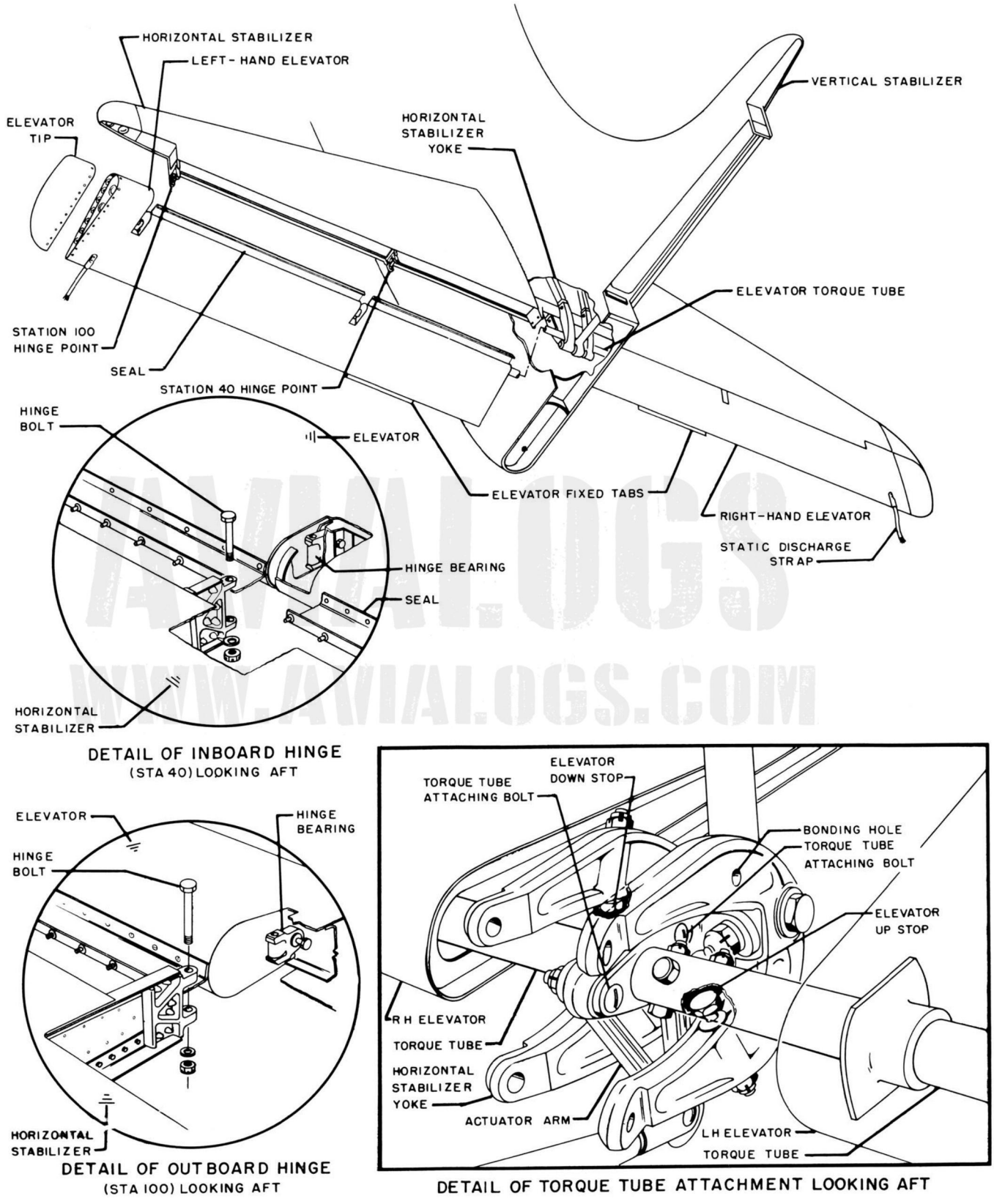

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Figure 2–32. Elevator Installation (Sheet 1)

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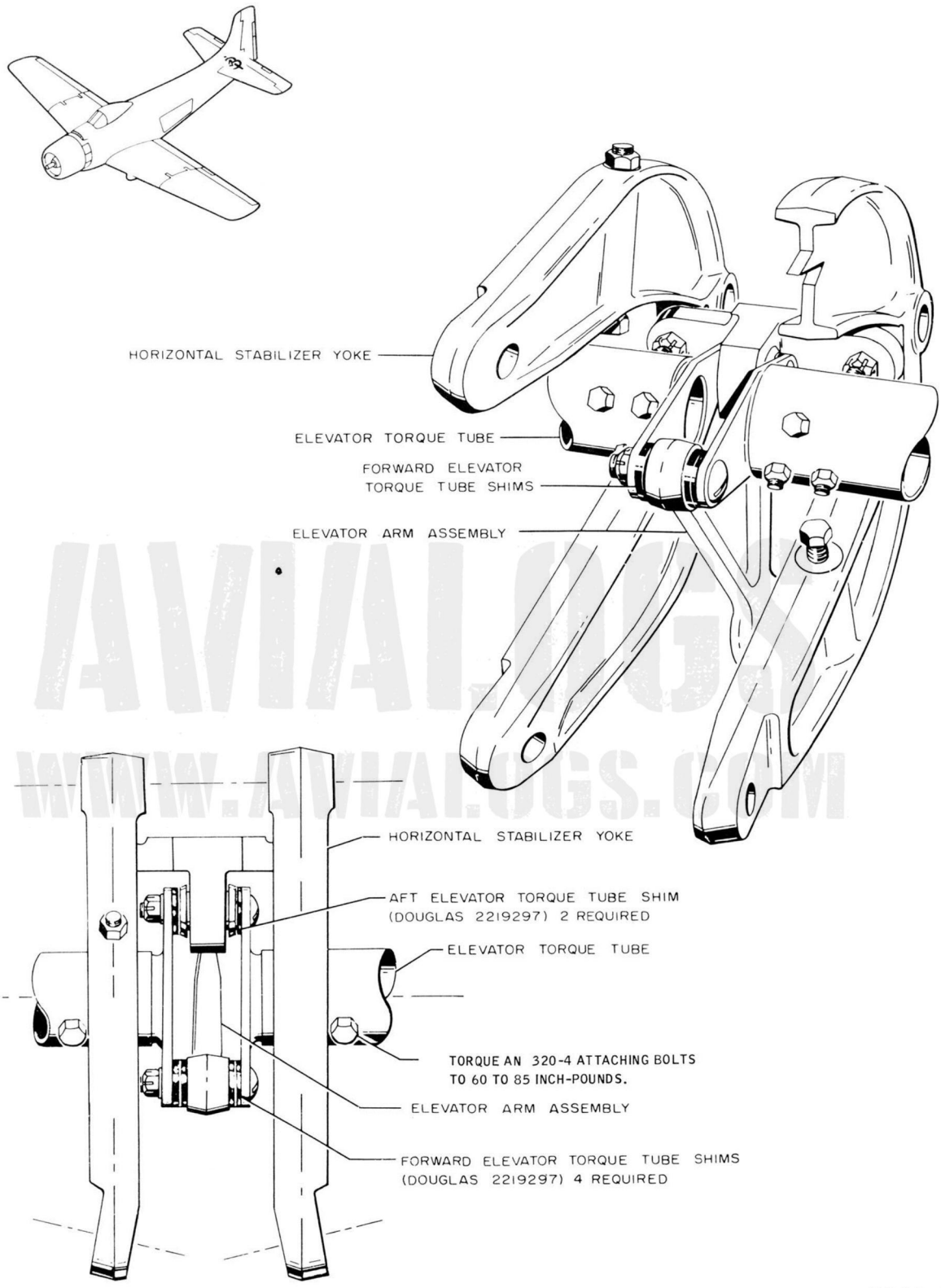

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Figure 2-32. Elevator Installation (Sheet 2)

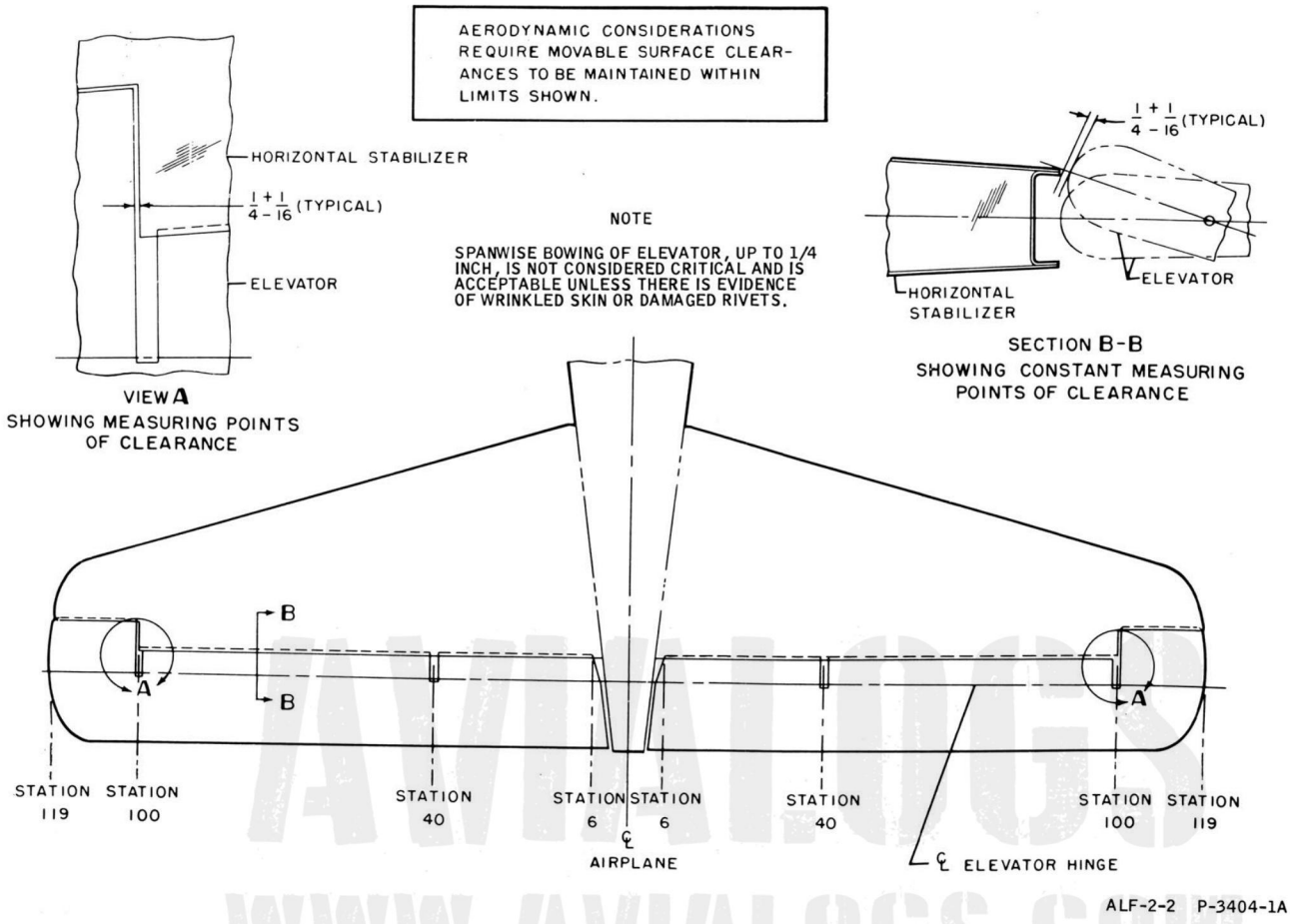

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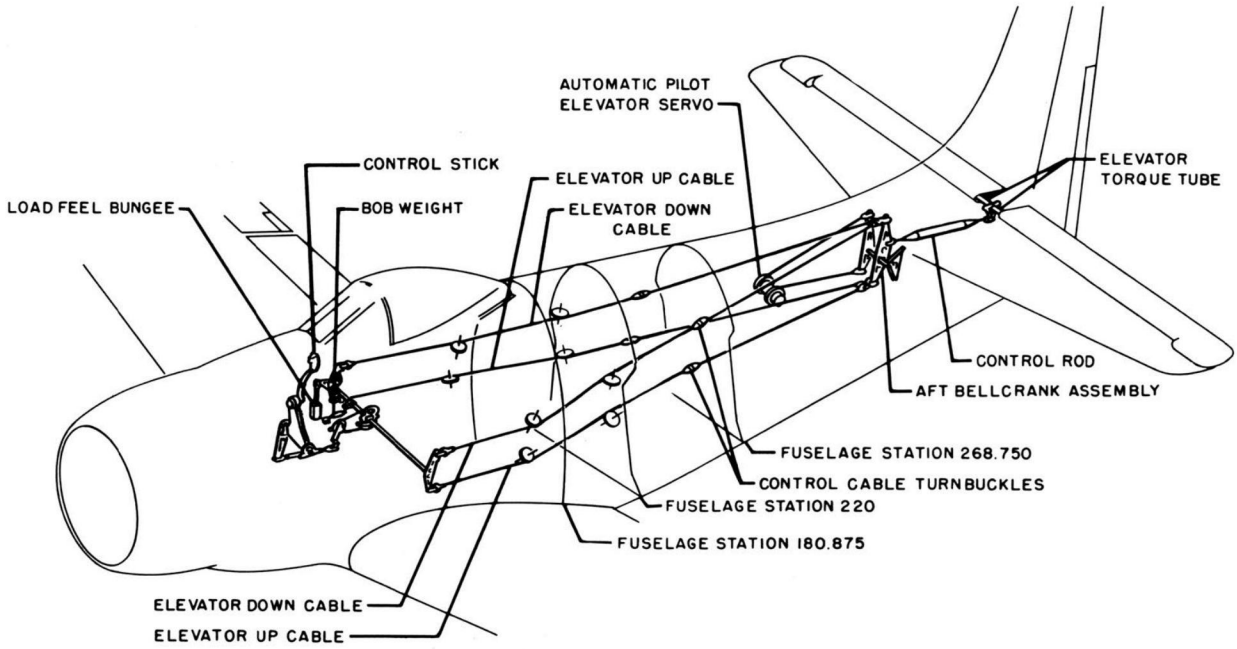
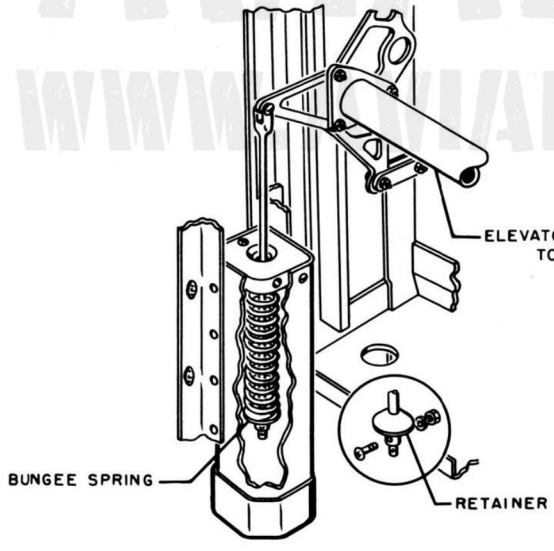
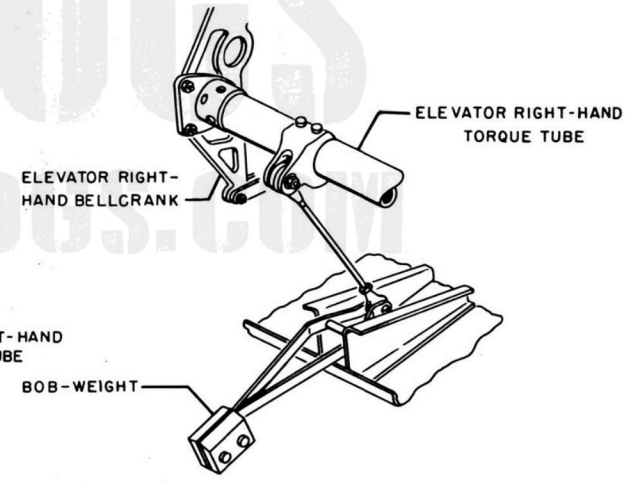
Figure 2-33. Elevator Clearances and Adjustments





DETAIL OF LOAD FEEL BUNGEE



DETAIL OF BOB-WEIGHT

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Figure 2–34. Elevator Control System (Sheet 1)

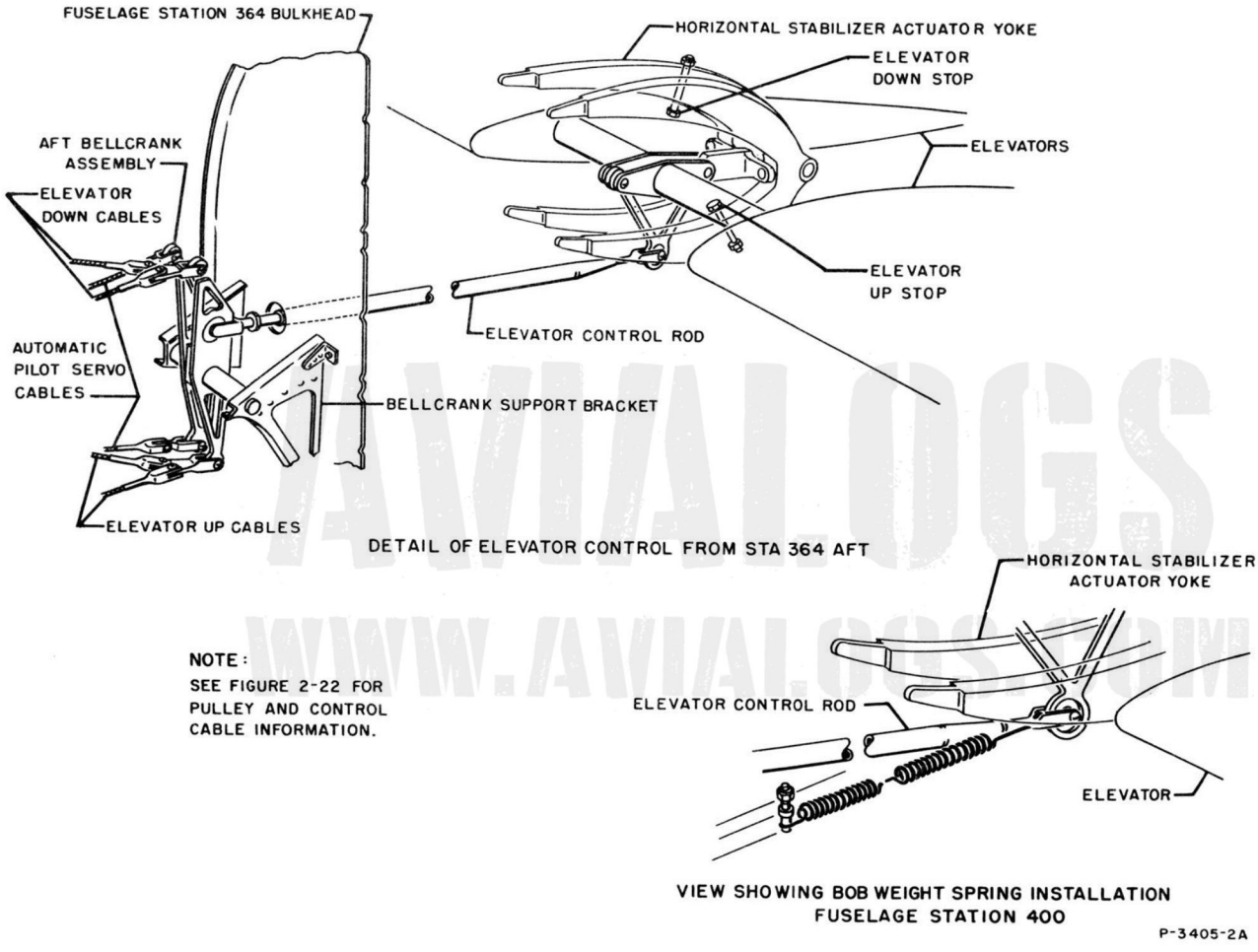

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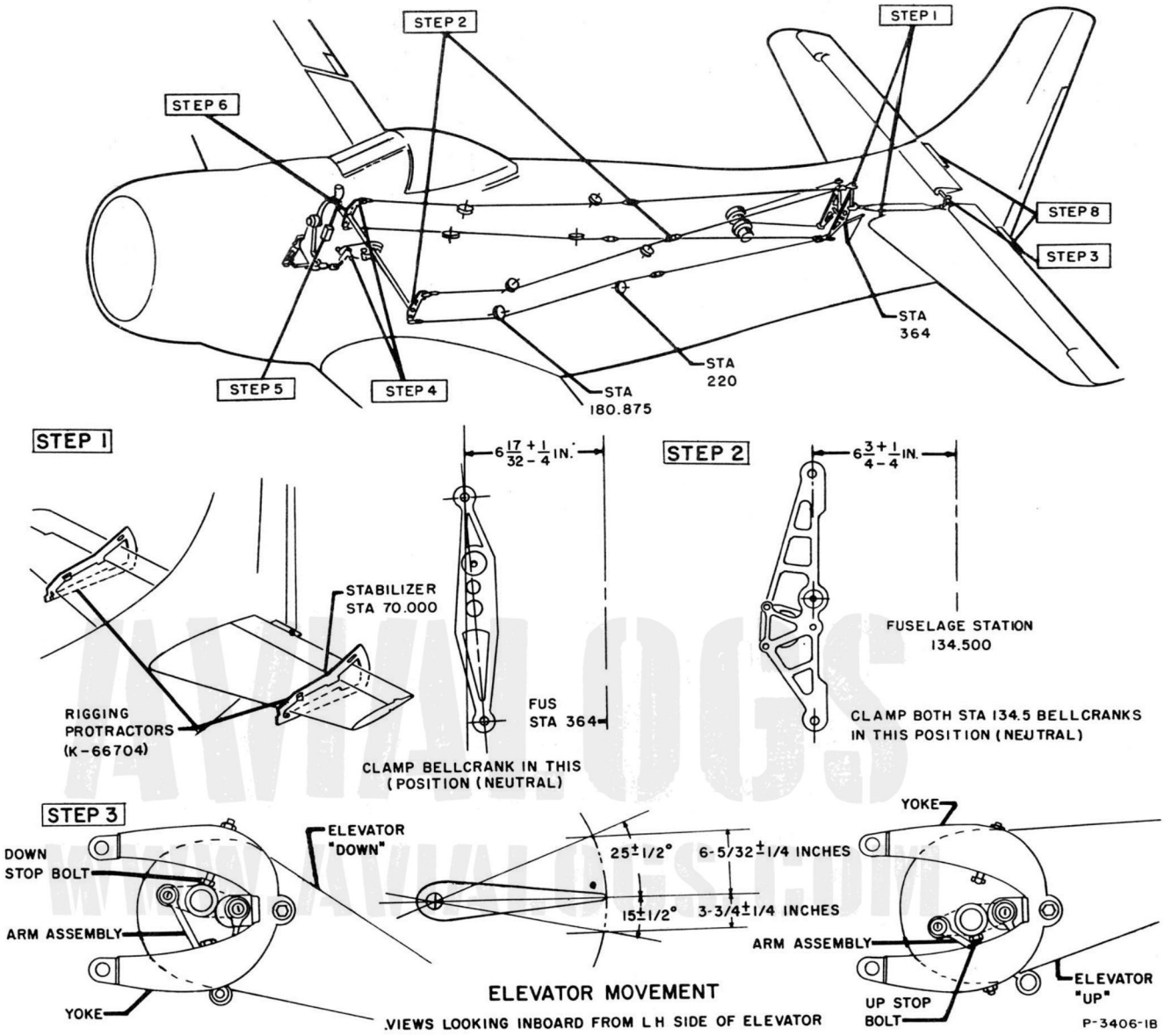
Figure 2–34. Elevator Control System (Sheet 2)



STEP 1

Elevator Controls to Neutral with Elevator Surfaces Faired:

a. Set horizontal stabilizer to zero incidence.

b. Install elevator rigging protractors on each elevator at horizontal stabilizer station 70.

c. With elevators held in faired position, adjust elevator push-pull rod so that bellcranks at fuselage station 364 are in neutral position as shown.

d. Clamp bellcranks at station 364 in neutral position.

STEP 2

Elevator Torque Tube Bellcranks and Elevator Control Cables:

a. Clamp elevator torque tube bellcranks at fuselage station 134.5 in neutral position.

b. Rig cables to correct tension as shown on figure 2–21.

STEP 3

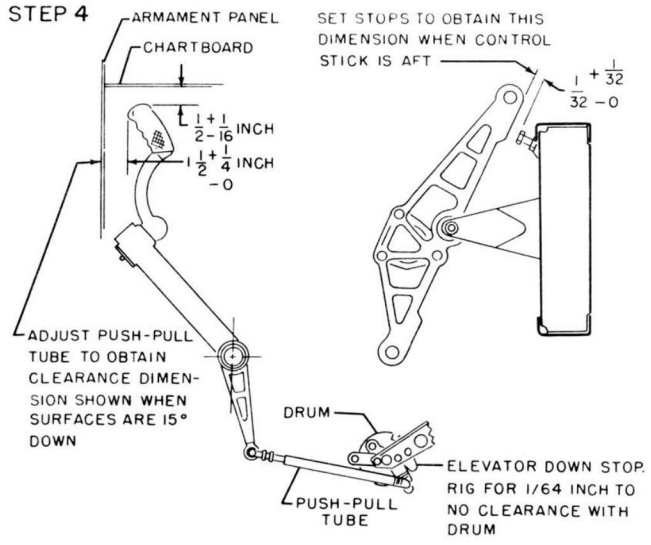
Elevator Deflection:

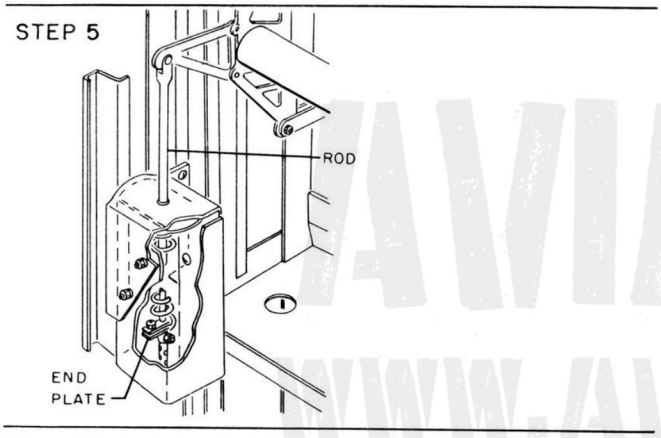
a. Remove clamps from bellcranks and remove centering clamps from elevator protractors.

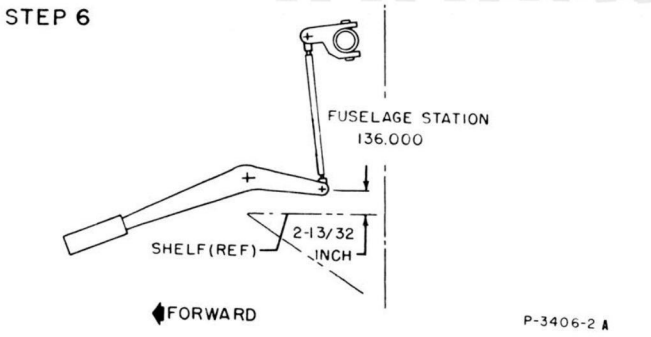
b. Move control stick forward and deflect elevators 15 ± ½ degrees DOWN. Adjust DOWN stop to contact elevator crank in this position.

c. Move control stick aft and deflect elevators 25 ± ½ degrees UP. Adjust UP stop to contact elevator crank in this position.

Figure 2–35. Elevator Control Adjustments (Sheet 1)







STEP 4

Control Stick and Stops:

a. Deflect elevators to DOWN position. In forward equipment compartment, adjust control stick push-pull tube to provide 1½ to 1¾ inches clearance between control stick grip and armament panel.

b. Set stop on cable drum to 1/64-inch maximum clearance.

c. Deflect elevator to UP position. In forward equipment compartment, adjust bellcrank stops at fuselage station 134.5 to obtain 1/32- to 1/16-inch clearance.

STEP 5

Load-Feel Bungee:

With elevator system rigged, locate end plate on rod (by adjustment of holes in end of rod) so that spring will engage elevator system when elevators are at 5 degrees UP. Bungee spring will be engaged when elevators are from 5 to 25 degrees UP.

STEP 6

Bob-Weight:

With elevators locked in 5 degrees UP (mid-stroke) position, adjust rod to obtain clearance dimension shown.

STEP 7

Freedom of Movement:

Operate elevator controls through entire range of movement and check ease of operation.

STEP 8

Adjust elevator fixed tabs whenever elevator or horizontal stabilizer is replaced, whenever elevators are interchanged, or whenever fixed tab settings have been disturbed.

Note

To insure uniform bend, grip tab with two straight-edged blocks of wood or micarta.

a. Bend elevator fixed tabs 3 degrees UP from faired position, for approximate setting prior to flight testing.

b. Desired level flight trim of airplane, as indicated on horizontal stabilizer indicator, should be 1 to 1½ degrees nose-down at 230 knots IAS during flight test. If airplane trim indication was 1 to 1½ degrees nose-down during flight test, no additional bending of elevator fixed tabs is required.

c. If airplane level flight trim during flight test varied no more than 2 degrees from desired trim condition (within limits of 1 degree nose-up and 3½ degrees nose-down) bend fixed tabs as follows: 1 degree nose-down to 1 degree nose-up, bend down; 1½ to 3½ degrees nose-down, bend up.

d. If airplane level flight trim indication during flight test varied more than 2 degrees from desired trim condition, faulty elevator contour or improper adjustment of horizontal stabilizer is indicated. Do not attempt to correct longitudinal unbalance in excess of limits of 1 degree nose-up to 3½ degrees nose-down by bending elevator fixed tabs.

Figure 2–35. Elevator Control Adjustments (Sheet 2)

places. The tip of the rudder contains a balance horn to which lead weights are mounted to obtain correct static balance of the rudder. A fabric gap seal is attached to the rudder nose section and to the vertical stabilizer trailing edge between the two upper hinge points of the rudder. A spring tab and a trim tab form a portion of the rudder trailing edge. Two static-discharge straps are mounted on the rudder to stream over the rudder trailing edge and dissipate possible accumulation of static electricity.

2–274. REMOVAL. (See figure 2–36.)

a. Disconnect fabric gap seal by loosening dzus fasteners and removing screws.

b. Disconnect rudder push-pull tube at bottom hinge point of rudder.

c. Remove rudder fairing and trim tab push-pull tube fairing.

d. Loosen trim tab push-pull tube jam nut.

e. Remove nuts from trim tab push-pull tube forward end fitting attaching screw and guide screw.

f. From right-hand side, rotate trim tab push-pull tube until forward end fitting attaching screw can be withdrawn.

g. Remove bolts at three rudder hinge points.

2–275. INSTALLATION. (See figures 2–36 and 2–37.)

a. Place rudder in position and install bolts at three hinge points.

b. With trim tab push-pull tube fairing removed and jam nut loosened, rotate push-pull tube and lead screw fitting until attaching screw can be inserted.

c. Install guide screw on lead screw fitting.

d. Tighten trim tab push-pull tube jam nut and install fairing.

e. Connect rudder push-pull tube at bottom hinge point.

f. Attach fabric gap seal by tightening dzus fasteners and installing screws.

g. Install rudder fairing.

2–276. RUDDER CONTROL SYSTEM.

2–277. DESCRIPTION. (See figure 2–38.) The rudder is controlled in the conventional manner through a cable system operated from pedals in the cockpit. Rudder travel is 25 degrees left or right of neutral. The control system includes the following principal components:

Rudder and brake pedal assemblies	Push-pull tube
Bellcrank	Rudder spring mechanism

2–278. Two cables extend aft through the fuselage from the rudder pedal sectors to a bellcrank on the aft face of station 364 bulkhead. A push-pull tube extends aft from the bellcrank to a spring mechanism secured to the rudder spar. When the push-pull tube is pulled forward by movement of the right-hand pedal, the rudder is deflected proportionately to the right. Movement of the left-hand pedal pushes the push-pull tube aft and deflects the rudder to the left. The spring tab incorporated in the trailing edge of the rudder acts as a flying tab to reduce rudder pedal forces. Movement of the pedals causes the spring tab to deflect and aid movement of the rudder in the direction opposite to spring tab deflection. The automatic pilot rudder servo, which controls the rudder when the automatic pilot system is engaged, is located just aft of fuselage station 96 (firewall) and just below the cockpit floor.

2–279. TROUBLE SHOOTING. Refer to table 2–4, troubles 1, 2, 3.

2–280. ADJUSTMENT. See figure 2–39.

2–281. RUDDER PEDALS.

2–282. DESCRIPTION. (See figure 2–40.) The adjustable rudder and brake pedal assembly in the cockpit controls rudder movement in the conventional manner and each pedal actuates the corresponding (left- or right-hand) hydraulic brake cylinder by toe pressure on the upper area of the pedal to operate the main landing gear wheel brakes. The pedal assembly includes the following principal parts:

Pedals	Sectors	Adjustment barrel
Hangers	Adjustment crank	Idler assembly
Pedal supports	Adjustment chain	Rudder bus cable

2–283. The pedals are individually suspended from supports bolted to the firewall and the cockpit sides. Fore-and-aft movement of the pedals operates the rudder cables which are fastened to the sectors outboard of the hangers. The pedals can be adjusted to accommodate the pilot by operation of the adjustment crank mounted at the bottom of the armament panel. Turning the adjustment crank moves the pedals forward or aft as directionally indicated on the panel.

2–284. REMOVAL. (See figure 2–40.)

a. Remove crank and adjustment mechanism housing from armament panel.

b. Remove armament panel.

c. Disconnect both ends of hydraulic brake cylinders.

Note

If cylinders are also to be removed, relieve hydraulic pressure and disconnect and cap hydraulic lines at cylinders.

d. Disconnect rudder cable ends from sectors.

e. Remove screws attaching hanger supports to structure and lift complete pedal assembly out of cockpit.

Note

For single-pedal removal, detach only corresponding cables, lines and structure-attaching bolts. Remove coupling pin to disconnect adjustment chain, then remove connector tube bolts and telescope tube sufficiently to release hanger support.

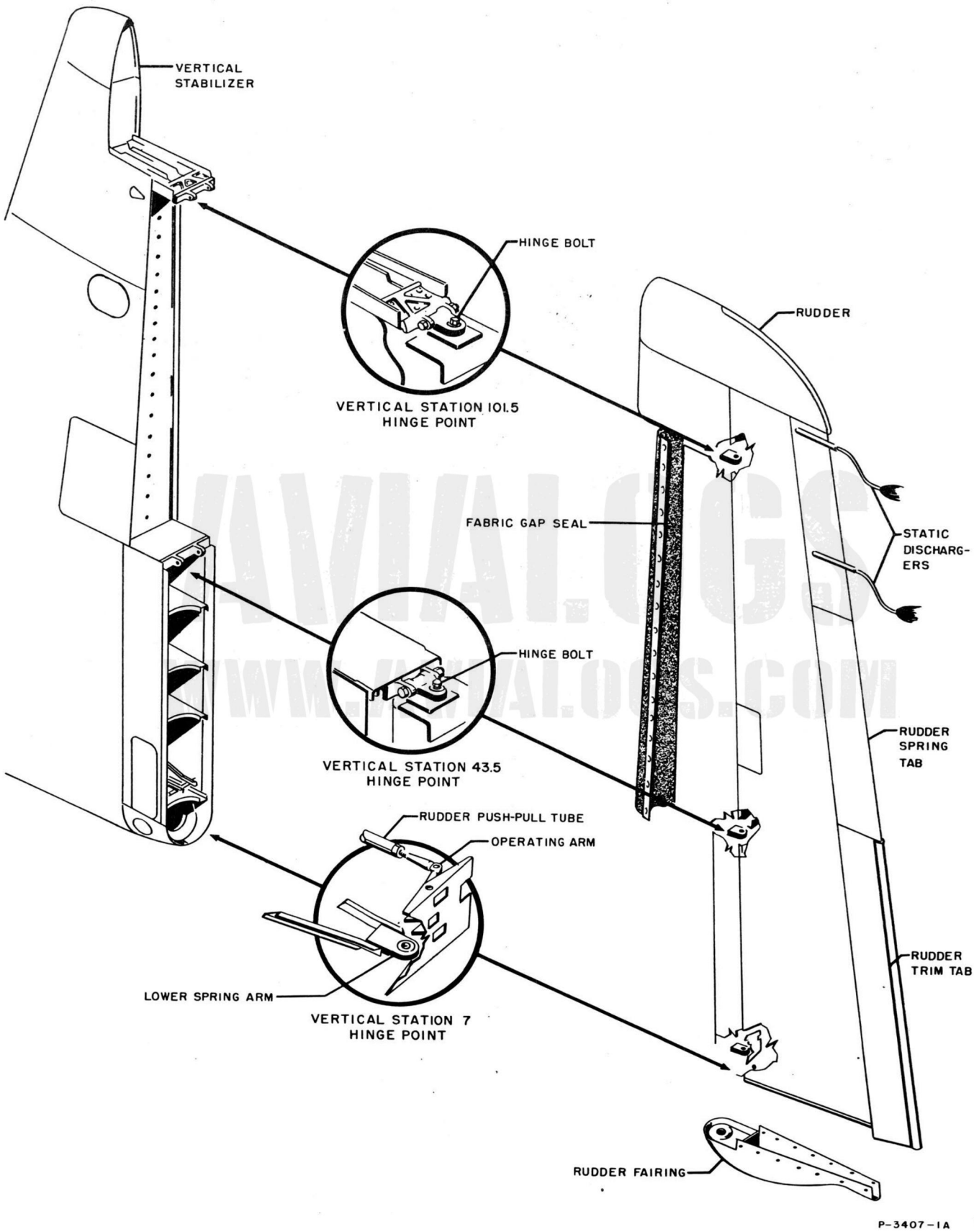
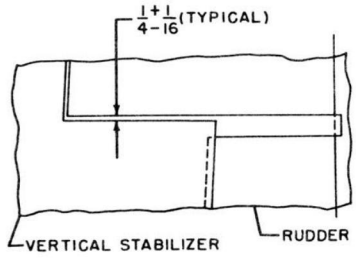
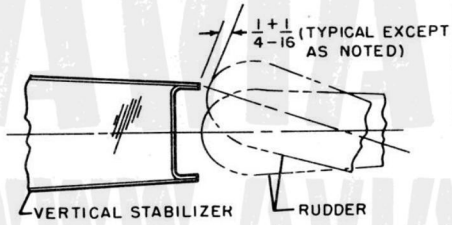


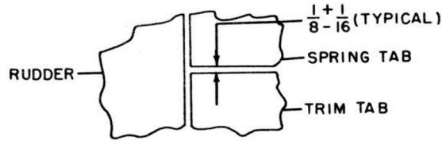
Figure 2–36. Rudder Installation



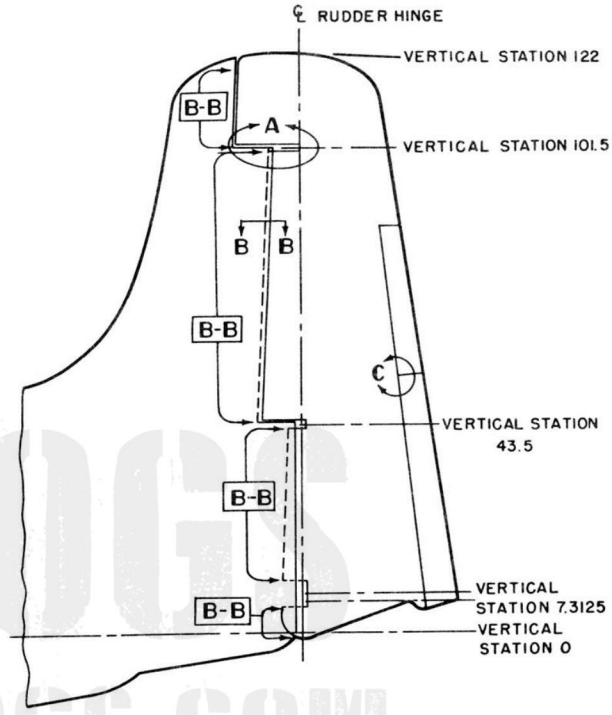
VIEW A
SHOWING MEASURING POINTS OF CLEARANCE



SECTION B-B
SHOWING MEASURING POINTS OF CLEARANCE
NOTE: RUDDER CLEARANCE BETWEEN VERTICAL STATIONS 7.3215 AND 43.5 IS 1/8 + 1/16



VIEW C
SHOWING MEASURING POINTS OF CLEARANCE



AERODYNAMIC CONSIDERATIONS REQUIRE MOVABLE SURFACE CLEARANCES TO BE MAINTAINED WITHIN LIMITS SHOWN

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Figure 2–37. Rudder Clearances and Adjustments

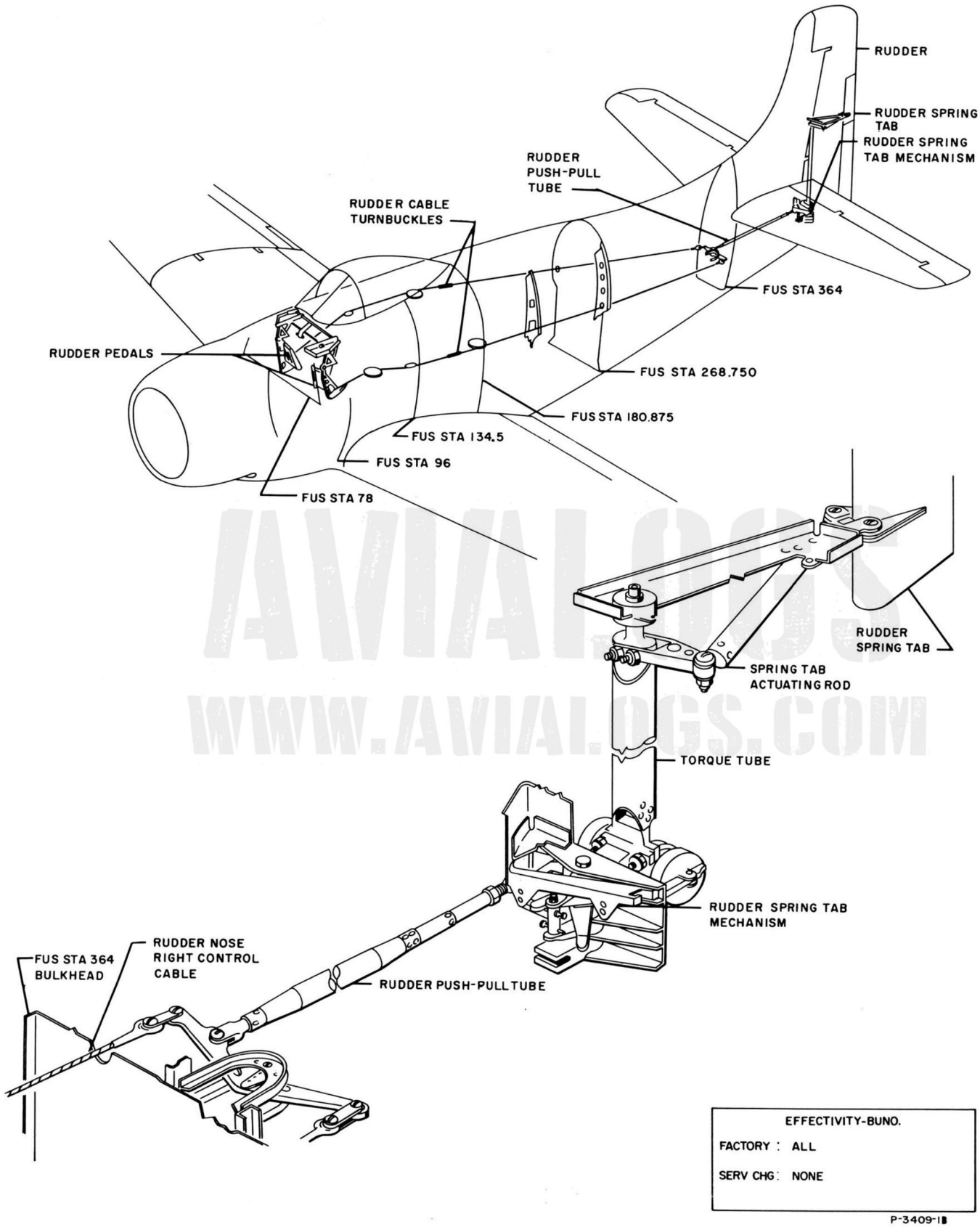

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Figure 2–38. Rudder Control System (Sheet 1)

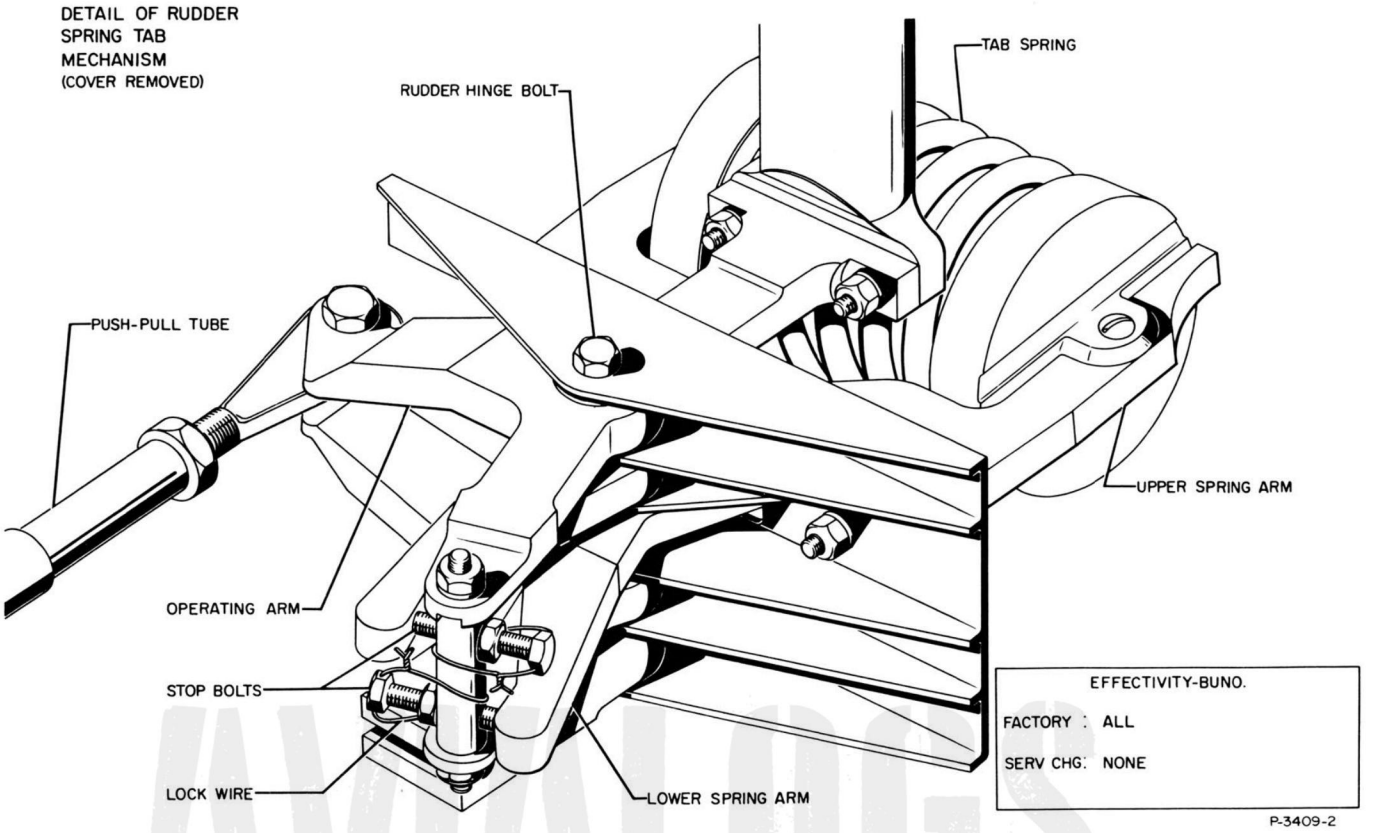

Figure 2–38. Rudder Control System (Sheet 2)

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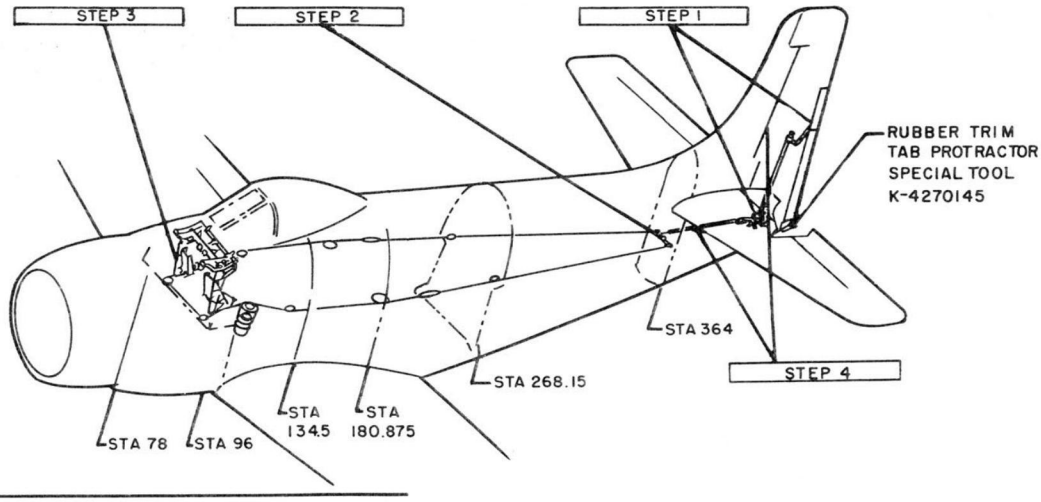
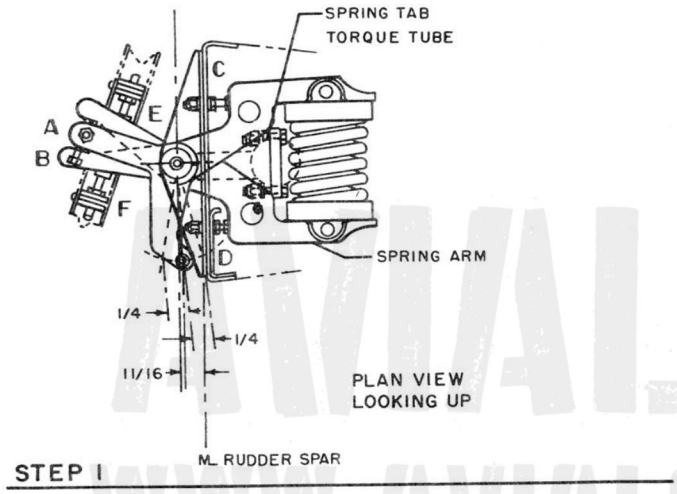
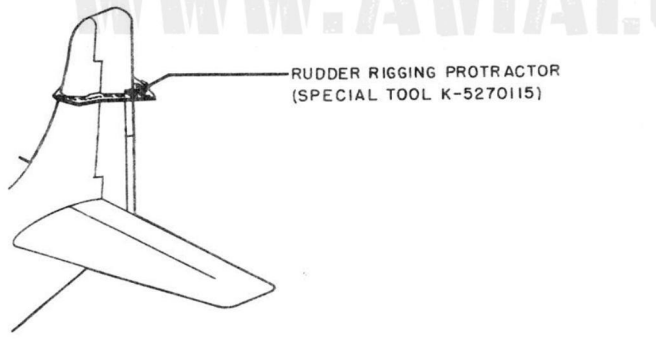
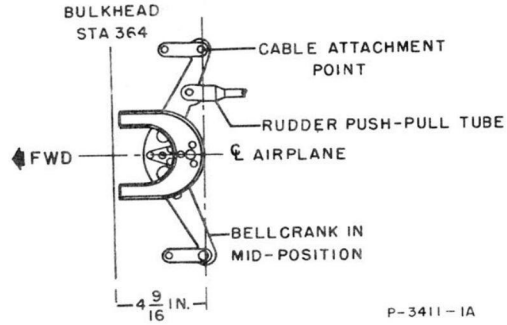




STEP 1





STEP 2

ADJUSTMENT

STEP 1

a. Back off stops C and D from spring arm.

b. Adust stops A and B so that spring arms hold spring snugly but without preload; then back-off on stops A and B one-half turn to preload spring. Secure stops A and B and lockwire them as shown on Figure 2–38.

c. Adjust stops C and D to center actuating arms $11/16$ inch forward of rudder spar.

d. Adjust stops E and F to allow actuating arms to swing 4½ degrees (offset: ¼ inch) to each side of neutral position.

e. Using special tool K-4270145, adjust length of spring tab push-pull tube to fair tab surface root with root of rudder surface within ± 1 degree (offset: ± $1/16$ inch).

f. Apply force to rudder pedals with rudder blocked at 25 degrees. Maximum spring tab throw with rudder so blocked should be 9 ± ½ degrees. If necessary, readjust in accordance with steps d and e to obtain required rudder travel.

STEP 2

a. Set rudder at neutral, using rudder rigging protractor (special tool K-5270115).

b. Clamp rudder control bellcrank at fuselage station 364 in neutral position (cable attachment points $4 9/16$ inches aft of fuselage station 364 bulkhead).

STEP 3

a. Remove coupling pin from rudder pedal adjustment drive chain and remove chain.

b. Position rudder pedals full aft. (Minimum clearance of $1/32$ inch should exist between aft edge of track slide block and track.)

c. Install rudder adjustment drive chain.

d. Operate rudder pedal adjustment crank to position rudder pedals full forward, install K-3270143-5 plug in aft side of left-hand track slot, and crank pedals aft to contact plug.

Figure 2–39. Rudder Control Adjustments (Sheet 1)

e. With pedals in this position, check right-hand track slot for same spacing, using K-3270143-5 plug. (In this position pedals are on neutral.)

f. Using K-3270143-3 protractor to measure angle, adjust brake power boost cylinder ends to obtain 77 degrees pedal tilt relative to cockpit floor.

Note

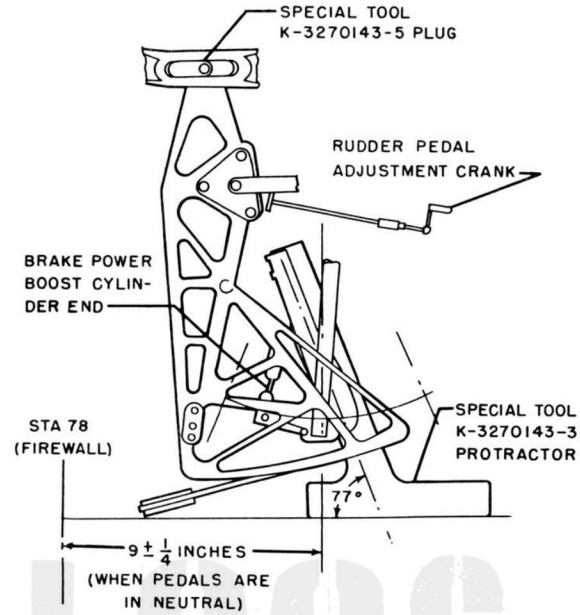
This neutral adjustment may be checked by operating the adjustment crank through full travel in each direction. Full forward travel should move the pedals $\frac{5}{8} \pm \frac{1}{4}$ inch forward of neutral and position the track slide with $1\frac{9}{32}$-inch clearance to the forward end of the track; full aft travel should move the pedals $2\frac{3}{4} \pm \frac{1}{4}$ inches aft of neutral and position the track slide with $\frac{1}{32}$-inch clearance to the aft end of the track.

g. With rudder pedals in neutral, rig rudder main and bus cables to main cable tension in accordance with figure 2–21.

h. Align bus cable pulley groove with sector groove to $\frac{1}{16}$ inch by using washers on bracket attaching bolt or on bracket screw.

Note

If a new bus cable pulley bracket is installed, minimum clearance between the sector and pulley with pedal full forward should be ¼ inch and cable pull-off not more than 4 degrees before the pulley bracket attaching screw hole is drilled.



STEP 3

STEP 4

a. Disconnect rudder push-pull tube.

b. Deflect rudder 25 ± ½ degrees ($13\frac{11}{16}$ inches at base and trailing edge of rudder with tab faired) to **left** of neutral and set stop at center hinge in contact with hinge support.

c. Repeat step b, except to **right** of neutral.

d. Reconnect rudder push-pull tube.

e. Test rigging and operation of rudder by pushing each rudder pedal forward in turn: left pedal forward should deflect rudder left; right pedal forward should deflect rudder right.

Note

Contact between rudder pedal and firewall is permissible when brakes are applied.

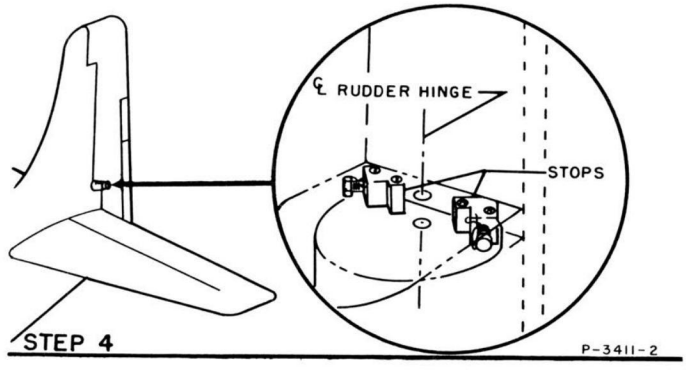


Figure 2–39. Rudder Control Adjustments (Sheet 2)

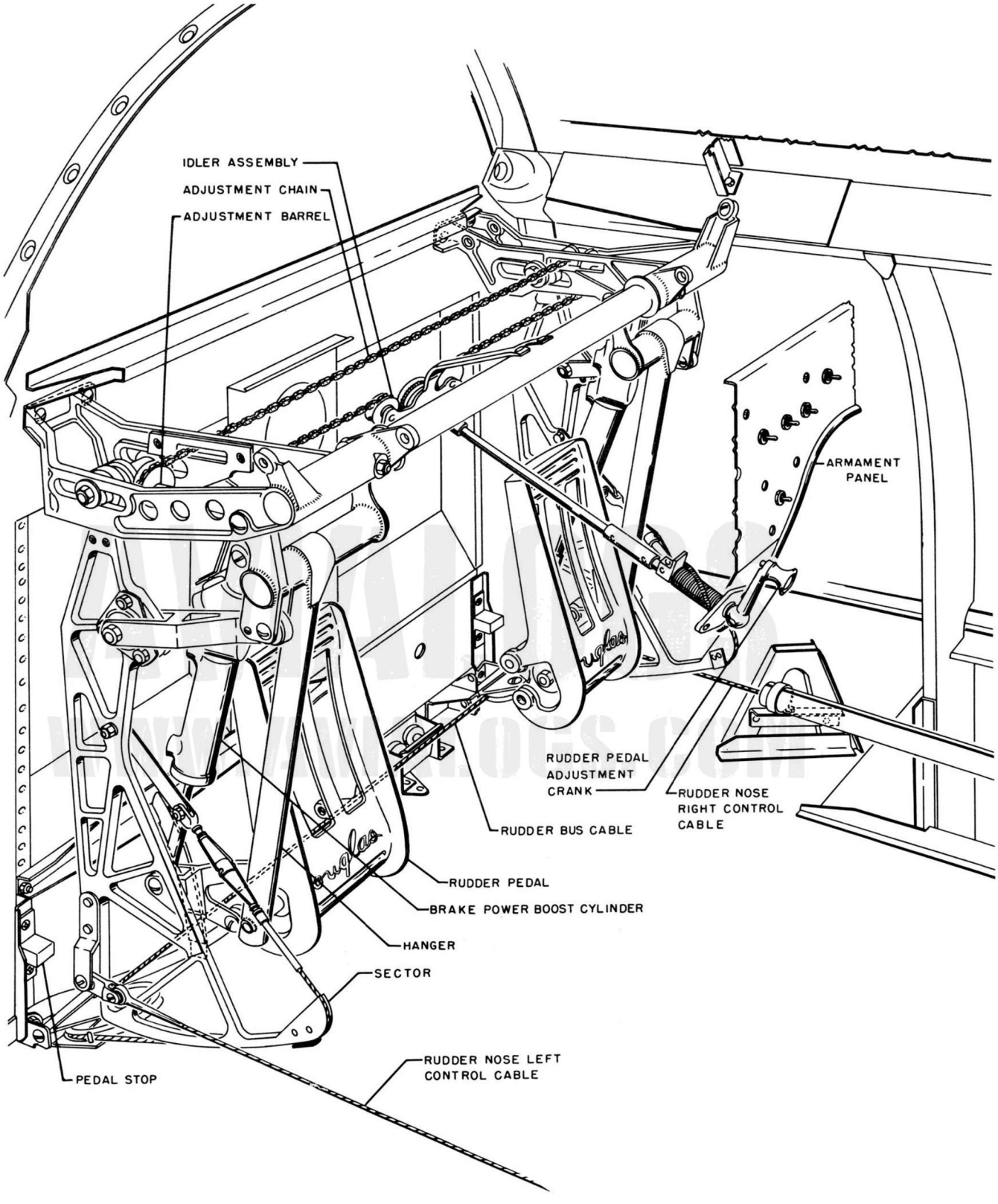


Figure 2–40. Rudder Pedal Installation

2–285. INSTALLATION. (See figure 2–40.)

a. Place pedal assembly in position and fasten supports to structure.

b. Engage each end of bus cable between corresponding sector and guard, and fasten cable terminal to sector.

c. Connect rudder cables to sectors.

d. Install hydraulic brake cylinders.

e. Install armament panel.

f. Install adjustment mechanism housing and adjustment crank on armament panel.

g. Adjust rudder controls. (See figure 2–39.)

2–286. RUDDER SPRING MECHANISM.

2–287. DESCRIPTION. (See figure 2–38.) The rudder spring mechanism is installed on the rudder spar to which it is fastened by the rudder lower hinge fitting and a pivot bolt. The mechanism is a composite assembly of operating arms which are connected with both the rudder push-pull tube and the rudder spring tab torque tube and of spring arms which bear on the tab spring to deflect the torque tube left or right as the rudder is deflected right or left. Stops for adjusting the mechanism are integral and access to the mechanism is through cut-outs in the rudder plating. Rudder spring tab range of travel is 9 degrees nose left and 9 degrees nose right.

2–288. REMOVAL. (See figure 2–38.)

a. Through right-hand plating cut-out, remove bolt attaching push-pull tube to operating arms; then remove pivot bolt.

b. Remove rudder bottom fairing.

c. Remove bolts connecting spring tab torque tube with mechanism.

d. Separate and remove parts of mechanism mounted fore and aft of spar.

2–289. INSTALLATION. (See figure 2–38.)

a. With rudder bottom fairing removed, install mechanism spring arms and upper operating arm through spar slot.

b. Bolt upper operating arm to torque tube.

c. Install pivot bolt through hinge fitting and pivot bearings of all arms.

d. Insert spring between retaining cups and adjust stop bolts in cylinder to hold cups lightly against spring.

e. Connect rudder push-pull tube.

f. Before installing rudder bottom fairing, adjust spring tab. (See figure 2–39.)

2–290. DELETED.

2–291. RUDDER TRIM TAB.

2–292. DESCRIPTION. (See figure 2–41.) The rudder trim tab is constructed of flush-riveted sheet-metal plating over spars and ribs. The trim tab is hinged to the rudder at three points and forms the lower part of the rudder trailing edge. The tab provides longitudinal trim of the airplane and is adjustable in flight. A fabric gap seal is riveted to the tab and attached by screws to the rudder. A streamlined fairing houses the trim tab actuating tube.

2–293. REMOVAL. (See figure 2–41.)

a. Remove screws attaching fabric gap seal to rudder.

b. Remove rudder push-pull tube fairing.

c. Unbolt push-pull tube from tab actuating bracket.

d. Remove three trim tab hinge bolts.

2–294. INSTALLATION. (See figure 2–41.)

a. Place tab in position and install three hinge bolts.

b. Bolt push-pull tube to tab actuating bracket.

c. Install rudder push-pull tube fairing.

d. Install trim tab fabric gap seal screws at rudder trailing edge.

2–295. RUDDER TRIM TAB CONTROL SYSTEM.

2–296. DESCRIPTION. (See figure 2–42.) The rudder trim tab control system is mechanical and includes the following principal components:

Name	*Para Ref*
Hand wheel	2–300
Cockpit mechanism	2–300
Lead screw mechanism	2–304

2–297. The rudder trim tab is controlled from the hand wheel mounted in the left-hand control panel in the cockpit. The wheel handle rotates a cable drum below the panel; control cables extend from the drum aft through the fuselage to a cable drum at fuselage station 413.5. Rotation of the after drum operates a lead screw mechanism, connected by a push-pull tube with the trim tab, to deflect the tab. Rudder trim tab control cables are $\frac{3}{32}$-inch flexible steel.

2–298. TROUBLE SHOOTING. Refer to paragraph 2–279.

2–299. ADJUSTMENT. See figure 2–43.

2–300. RUDDER TRIM TAB CONTROL—COCKPIT MECHANISM.

2–301. DESCRIPTION. (See figure 2–42.) The rudder trim tab control mechanism is mounted in the cockpit left-hand control panel, and consists of a hand wheel, a drum and a cable mechanism. A pointer, geared to the hand wheel shaft, indicates the amount of trim obtained between the extremes of 10 degrees "NOSE LEFT" and 10 degrees "NOSE RIGHT." Rudder trim tab movement is four degrees for each complete cycle of the hand wheel.

2–302. REMOVAL. (See figure 2–42.)

a. Tape cables to mechanism drum. Then disconnect cable turnbuckle aft of fuselage station 364.

b. Attach threadline to cable ends and pull cables forward through fuselage, removing cable pulleys or guards as necessary.

c. Remove hand wheel from shaft.

d. Remove screws attaching mechanism to control panel and remove mechanism through forward equipment compartment.

2–303. INSTALLATION. (See figure 2–42.)

a. Through forward equipment compartment, attach mechanism to left-hand control panel.

b. Feed cables aft through fuselage, installing pulleys and guards as required, and connect turnbuckles.

c. Install hand wheel in cockpit.

2–304. RUDDER TRIM TAB CONTROL—LEAD SCREW MECHANISM.

2–305. DESCRIPTION. (See figure 2–42.) The rudder trim tab lead screw mechanism is mounted in the trailing edge of the vertical stabilizer, immediately below the rudder push-pull tube. The mechanism comprises a drum to guide the trim tab control cables, a drive shaft, and a lead screw which is connected to the trim tab push-pull tube.

2–306. REMOVAL. (See figure 2–42.)

a. Through access door on left-hand side of vertical stabilizer, tape cables to mechanism drum.

b. Disconnect cable turnbuckles aft of fuselage station 364.

c. Disconnect trim tab push-pull tube from lead screw.

d. Remove four bolts attaching mechanism to vertical stabilizer.

2–307. INSTALLATION. (See figure 2–42.)

a. Attach mechanism to vertical stabilizer with four bolts.

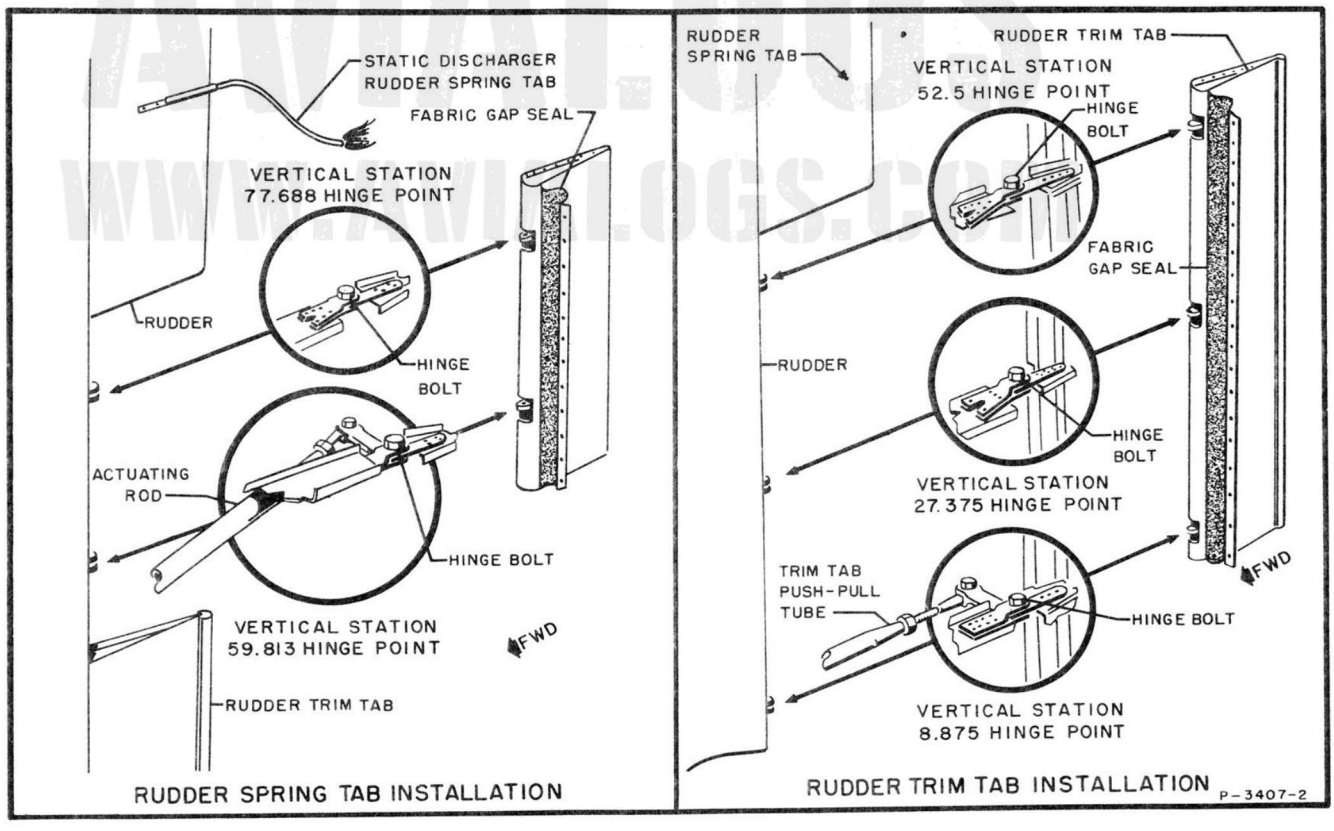


Figure 2–41. Rudder Trim Tab Installation

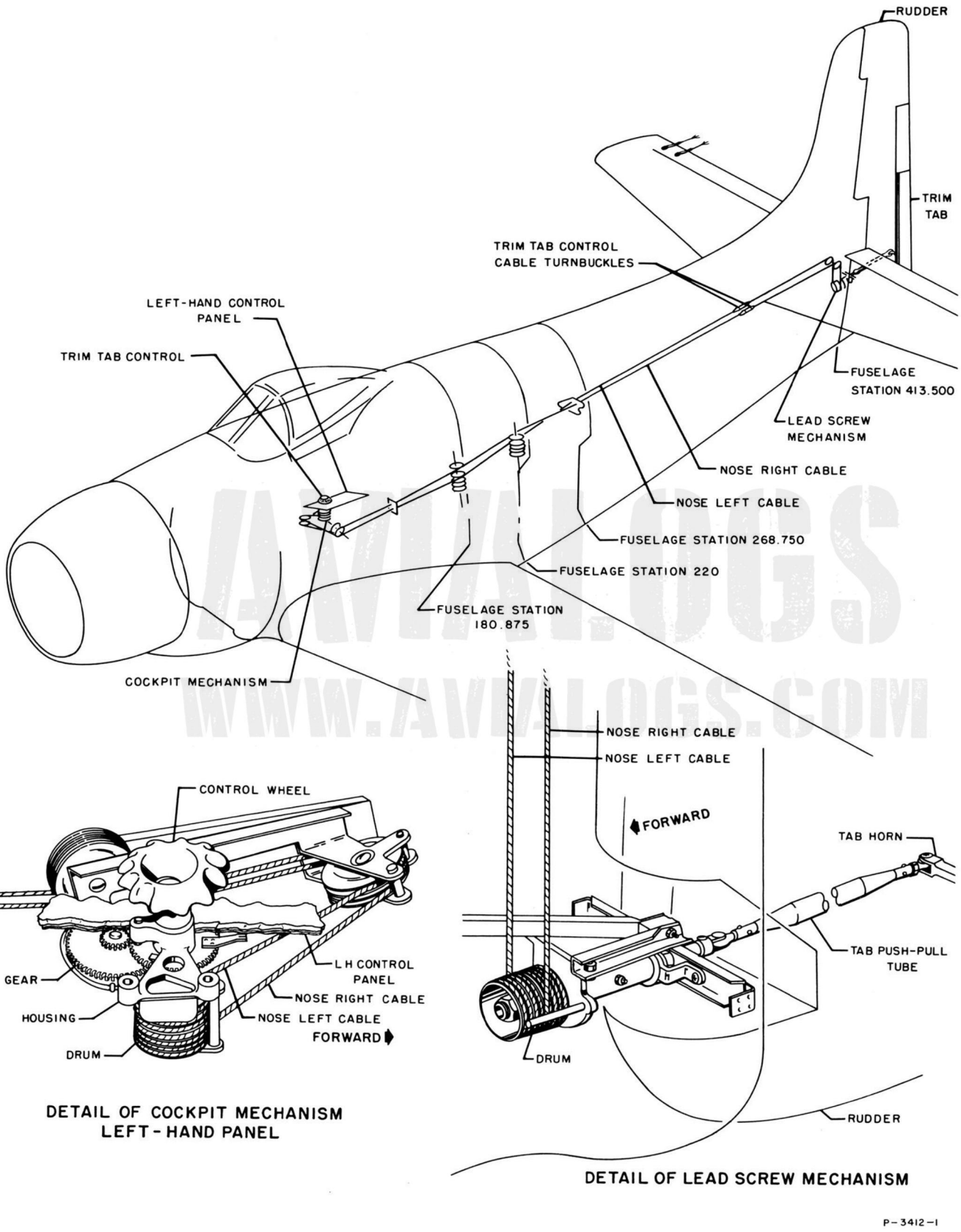


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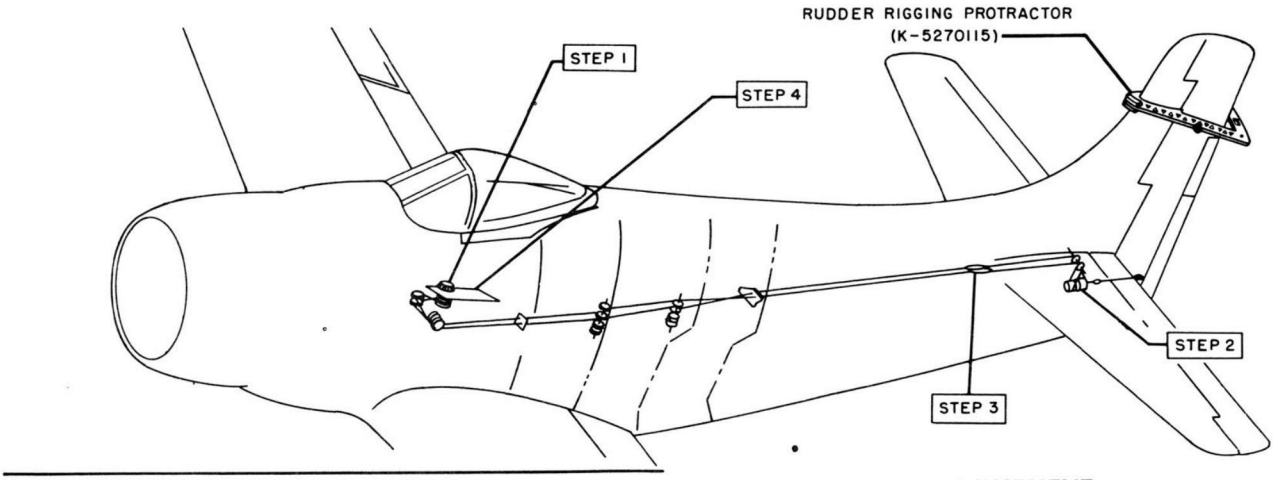
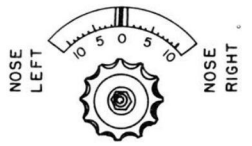
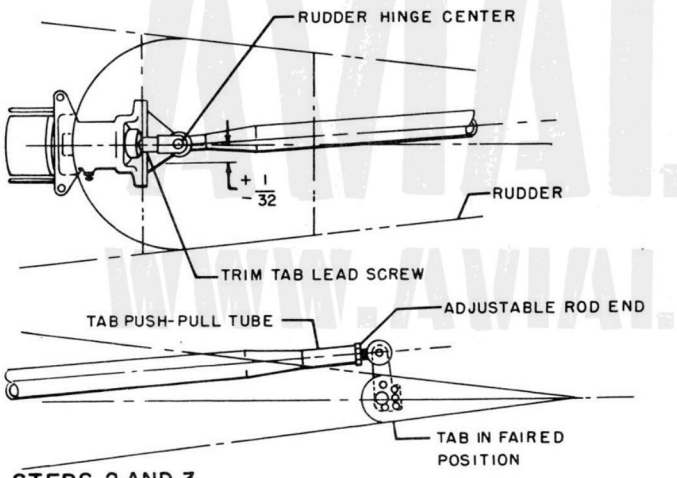
Figure 2–42. Rudder Trim Tab Control System

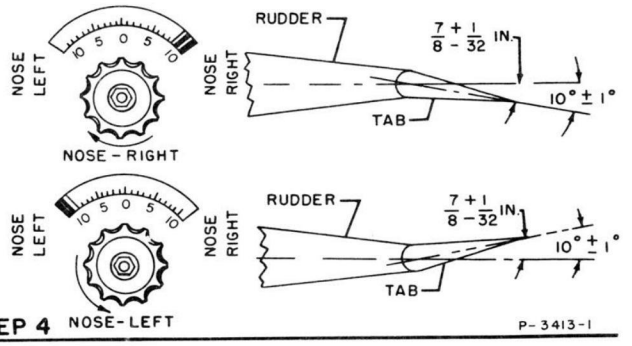




STEP 1



STEPS 2 AND 3



STEP 4

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ADJUSTMENT

STEP 1

a. Install rudder rigging protractor, K-5270115, in position on rudder.

b. Place rudder trim tab control cockpit mechanism in neutral (zero) position.

STEP 2

Trim Tab and Drum:

a. Adjust lead screw so that rod end of tab push-pull tube is on rudder hinge center line within $\pm \frac{1}{32}$ inch.

b. Adjust length of tab push-pull tube so that tab fairs with rudder in neutral position.

STEP 3

Rig cables to correct tension as shown on figure 2–21.

STEP 4

Tab Deflection:

a. Trim tab should move LEFT 10 ± 1 degrees (offset: $\frac{7}{8} \pm \frac{1}{32}$ inch, measured at top of trim tab) when control in cockpit is turned to extreme CLOCKWISE position.

b. Trim tab should move RIGHT 10 ± 1 degrees (offset: $\frac{7}{8} \pm \frac{1}{32}$ inch, measured at top of trim tab) when control in cockpit is turned to extreme COUNTER-CLOCKWISE position.

Note

Indicator movement of control in cockpit is 10 ± 2 degrees.

Flight Check:

Align trim tab to fair with rudder prior to first flight. Tab adjustment to obtain 2 ± ½ degrees nose-left trim (on indicator dial) at 230 knots to be determined by flight. Trim variation in excess of ± 5 degrees from this setting indicates faulty rigging or contours and should not be corrected by tab adjustment.

Figure 2–43. Rudder Trim Tab Control Adjustments

b. Connect lead screw to trim tab push-pull tube.

c. Connect cable turnbuckles.

2–308. HORIZONTAL STABILIZER.

2–309. DESCRIPTION. (See figure 2–44.) The horizontal stabilizer is mounted in a slot below the vertical stabilizer. It is constructed of a front spar, a rear shear web, chordwise ribs, stiffeners, and aluminum alloy flush riveted plating. The spar and shear web extend the length of the horizontal stabilizer. The horizontal stabilizer hinges at two fittings on the front spar and can be adjusted in flight by means of an electrical actuator which is controlled by a three-position trim switch, located on the control stick hand grip, and a trim relay-manual override lever, located on the cockpit left-hand control panel. The trailing edge of the stabilizer can be raised six degrees or lowered three degrees from neutral. Metal fairings attached to the horizontal stabilizer, adjacent to the fuselage, enclose the stabilizer slot at all angles of stabilizer incidence. The airplane tail hoist fitting is attached to the horizontal stabilizer spar, just outboard of the left-hand side of the fuselage. A removable tip is installed on each outboard end of the horizontal stabilizer and a mechanical position indicating system is provided to give visual indication of the position of the horizontal stabilizer on the horizontal stabilizer position indicator. The position indicator is located on the inboard edge of the cockpit left-hand control panel.

2–310. REMOVAL. (See figure 2–44.)

a. Remove stabilizer-to-fuselage fairing on left-hand side of fuselage by removing attaching screws.

b. Repeat step a for right-hand side of fuselage.

c. Disconnect wiring at terminal panel below left-hand horizontal stabilizer.

d. On airplanes BuNo. 134477 and subsequent, disconnect AN/APN-22 Radio Altimeter wiring at electrical connector assembly.

e. Remove elevators.

f. Disconnect elevator push-pull tube from actuating arm on stabilizer yoke.

g. Remove adjusting screws from upper and lower limit switch actuators.

h. Disconnect stabilizer position indicator cable from stabilizer.

i. On airplanes BuNo. 134630 and subsequent, remove intermediate limit switch tube assembly.

j. For temporary support of stabilizer, insert appropriately sized block of wood between stabilizer and fuselage structure directly beneath stabilizer.

k. Disconnect and remove stabilizer yoke assembly.

l. Retract actuator drive shaft; then swing actuator forward and clear of stabilizer, and secure actuator to fuselage structure with lockwire.

m. Remove either left-hand or right-hand fairing support bracket.

n. Remove stabilizer hinge pins.

o. Remove block of wood from beneath stabilizer.

p. Move stabilizer aft to clear adjacent structure and slide stabilizer out of slot. (Stabilizer should be removed from side opposite to that side from which fairing support bracket has been removed.)

2–311. INSTALLATION. (See figure 2–44.)

a. Set stabilizer in place in fuselage after section slot.

b. Align stabilizer attach fitting with special tool K-2445659 and insert stabilizer hinge pins.

Note

The stabilizer hinge lugs must align with the fuselage attaching fittings without distortion of the stabilizer spar. If necessary, remove the spacers from between the spar and the hinge fittings and grind the spacers to obtain proper alignment.

c. Raise stabilizer trailing edge and insert appropriately sized block of wood between stabilizer and structure directly beneath stabilizer, then complete installation of hinge pins.

d. Install fairing support bracket aft of stabilizer.

e. Remove lockwire securing actuator drive shaft to structure.

f. Bolt yoke assembly to stabilizer structure.

g. Extend actuator drive shaft and bolt shaft to yoke assembly.

h. On airplanes BuNo. 134630 and subsequent, install intermediate limit switch tube assembly.

i. Remove block of wood from beneath stabilizer.

j. Connect position indicator cable to stabilizer.

k. Install adjusting screws in upper and lower limit switch actuators.

l. Connect elevator push-pull tube to actuating arm on stabilizer yoke.

m. Install elevators.

n. Connect wiring at terminal panel below horizontal stabilizer.

o. On airplanes BuNo. 134477 and subsequent, connect AN/APN-22 Radio Altimeter wiring at electrical connector assembly.

p. Install stabilizer-to-fuselage fairings.

2–312. HORIZONTAL STABILIZER TIPS.

2–313. DESCRIPTION. (See figure 2–44.) Each horizontal stabilizer tip is formed of two pieces of 0.032 aluminum alloy sheet welded together. The tips are attached to the outboard ends of the horizontal stabilizer with No. 8 screws, which are inserted around the chordwise bulkhead. The tips are interchangeable between the right- and left-hand sides of the horizontal stabilizer.

2–314. REMOVAL. (See figure 2–44.) The horizontal stabilizer tip can be removed by removing the attaching screws and pulling the tip free.

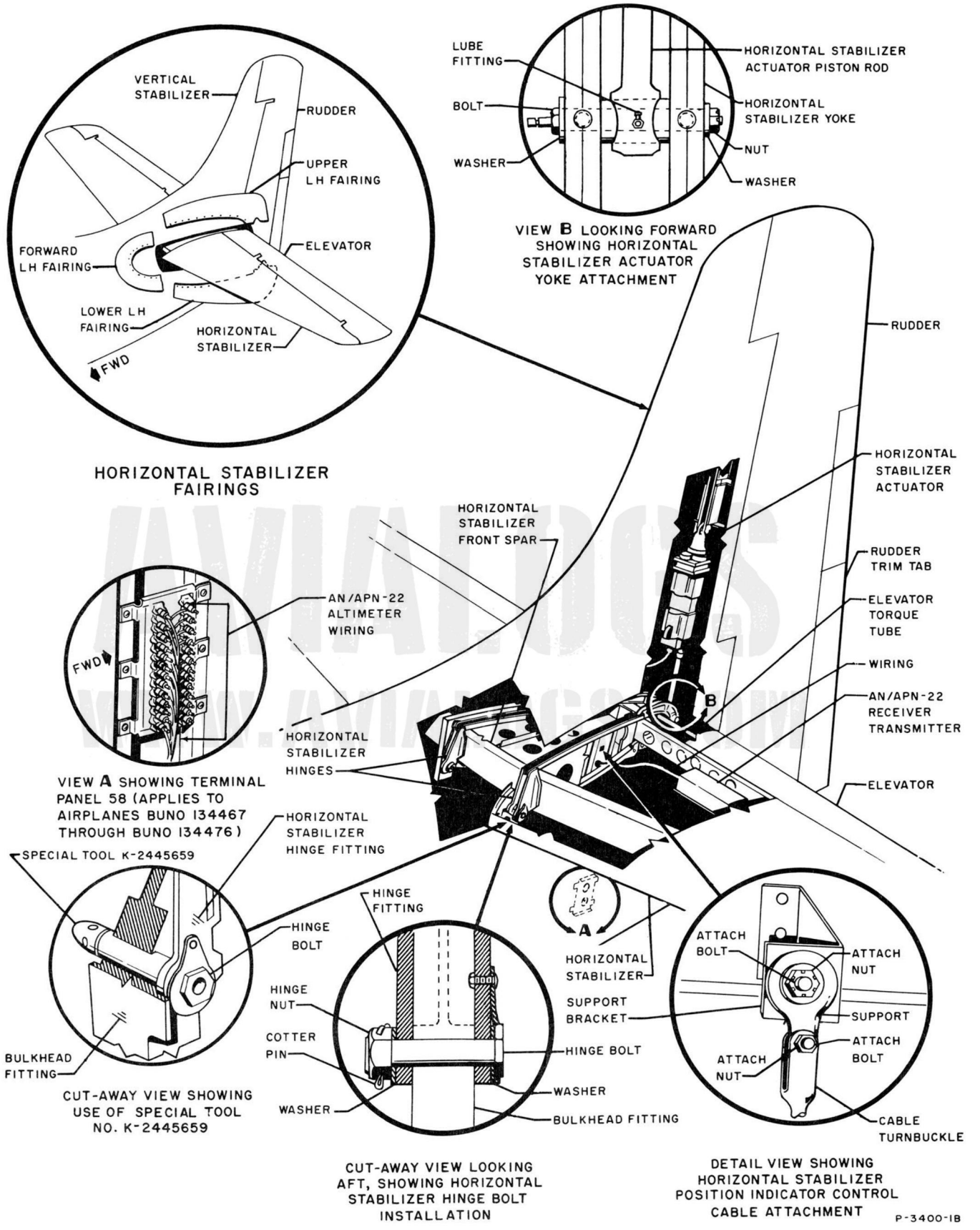


Figure 2–44. Horizontal Stabilizer Installation

2–315. INSTALLATION. (See figure 2–44.) The horizontal stabilizer tip can be installed by aligning the tip with the stabilizer and installing the attaching screws.

2–316. HORIZONTAL STABILIZER CONTROL SYSTEM.

2–317. DESCRIPTION. (See figure 2–45.) The horizontal stabilizer angle of incidence is electrically controlled through a switch designated TRIM, installed in the control stick hand grip in the cockpit. The stabilizer is used in conjunction with the aileron trim tab and the rudder trim tab to obtain optimum trim and balance of the airplane for the prevailing flight attitude. The range of horizontal stabilizer movement from neutral position is three degrees down and six degrees up at the trailing edge. Principal components of the horizontal stabilizer control system include:

Name	*Para Ref*
Horizontal stabilizer trim control switch	2–322
Horizontal stabilizer trim relay-manual override switch	2–324
Horizontal stabilizer upper and lower limit switches	2–327A
Horizontal stabilizer intermediate limit switch	2–327G
Horizontal stabilizer side dive brake controlled switch	2–327L
Horizontal stabilizer actuator	2–327R

2–318. ADJUSTMENT. See figure 2–46A.

2–319. HORIZONTAL STABILIZER CONTROL CIRCUIT.

2–320. DESCRIPTION. (See figure 2–46.) The horizontal stabilizer control circuit receives power from the upper secondary bus through the HORIZ STAB 50-ampere circuit breaker located on the right-hand circuit breaker panel. The trim control switch portion of the circuit receives power from the upper secondary bus through the HORIZ STAB CONT 5-ampere circuit breaker. The trim control switch is a three-position, center off, two momentary on contacts, snap action switch. The trim relay-manual override switch is a two coil, single pole, double throw relay with manual override switch features. When the trim control switch is placed in "NOSE UP" the circuit is completed to the up side of the trim relay-manual override switch, through the override switch and upper limit switch to the retract side of the stabilizer actuator motor. When the trim control switch is placed in "NOSE DOWN" the circuit is completed to the down side of the trim relay-manual override switch, through the override switch and lower limit switch to the extend side of the stabilizer actuator motor. When the trim relay-manual override switch control *lever* is placed in either "NOSE UP," or "NOSE DOWN," the trim relay-manual override switch completes the circuit to the actuator motor through either the upper or lower limit switch, bypassing the trim control switch portion of the circuit.

2–321. On airplanes BuNo. 134630-134637, 135225 and subsequent, and prior airplanes reworked per BuAer AD/SC No. 629, an intermediate limit switch and a side dive brake controlled switch are installed in the up side of the horizontal stabilizer control circuit. The switches prevent movement of the horizontal stabilizer from a position below neutral, past neutral, to a position above neutral when the side dive brakes are full open. The side dive brake controlled switch opens a portion of the up side of the control circuit to the actuator when the side dive brakes are full open. The up circuit is then completed through the intermediate limit switch to raise the horizontal stabilizer to neutral position. When the horizontal stabilizer reaches neutral position the intermediate limit switch is actuated to open the remainder of the control circuit to the actuator motor, stopping stabilizer movement at neutral position.

2–321A. On airplanes BuNo. 139606-139821, 142010 and subsequent, and prior airplanes reworked per BuAer AD/SC No. 629, an interlock switch is installed adjacent to the horizontal stabilizer intermediate limit switch. The switch de-energizes the dive brake safety solenoid which results in making the dive brakes inoperative when the horizontal stabilizer is in the "NOSE UP" range. The interlock switch is a component of the dive brake control safety circuit.

2–322. HORIZONTAL STABILIZER TRIM CONTROL SWITCH.

2–323. DESCRIPTION. (See figure 2–45.) The horizontal stabilizer trim control switch is a three-position, center off, two momentary on contacts, snap action switch. The trim switch is installed in the control stick hand grip. Refer to the paragraph concerning the control stick hand grip for additional information.

2–324. HORIZONTAL STABILIZER TRIM RELAY-MANUAL OVERRIDE SWITCH.

2–325. DESCRIPTION. (See figure 2–45.) The horizontal stabilizer trim relay-manual override switch is a two coil, single pole, double throw relay with a manual override control lever which is accessible to the pilot. It acts as a relay in the horizontal stabilizer control circuit when the trim switch located in the control stick hand grip is used to control horizontal stabilizer trim. The manual override feature permits it to be used as a control for positioning the horizontal stabilizer trim, regardless of the position of the horizontal stabilizer trim switch. The trim relay-manual override switch control lever is located in the left-hand control panel and is spring-loaded to an intermediate off position. Control lever positions are identified as "NOSE UP" and "NOSE DOWN" on the left-hand control panel.

2–326. REMOVAL. (See figure 2–45.)

a. Remove rudder trim tab control hand wheel from trim tab control rod.

b. Disconnect aileron power boost system emergency release handle cable from emergency control lever in forward equipment compartment.

c. Remove knob from trim relay-manual override switch control handle.

d. Remove lamps from forward left-hand control panel console and remove control console.

e. From within forward equipment compartment, disconnect electrical leads from trim relay-manual override switch.

f. Support the trim relay-manual override switch. From within cockpit remove attaching screws.

g. Remove trim relay-manual override switch from airplane.

2–327. INSTALLATION. (See figure 2–45.)

a. From within forward equipment compartment, place trim relay-manual override switch in position against left-hand control panel.

b. From within cockpit, secure trim relay-manual override switch with attaching screws.

c. From within forward equipment compartment, connect electrical leads to trim relay-manual override switch.

d. Install lamps in forward left-hand control panel console and secure console to control panel.

e. Install knob on trim relay-manual override switch control handle.

f. Install rudder trim tab control hand wheel on trim tab control rod.

g. Connect aileron power boost system emergency release handle cable to emergency control lever in forward equipment compartment.

2–327A. HORIZONTAL STABILIZER UPPER AND LOWER LIMIT SWITCHES.

2–327B. DESCRIPTION. (See figure 2–45.) The horizontal stabilizer upper and lower limit switches are normally closed, plunger type switches, located above and below the horizontal stabilizer near the center line of the airplane. The switches are actuated to open the circuit to the stabilizer actuator motor when stabilizer travel reaches a preset limit, either above or below neutral position, by adjustable switch actuating bolts installed on the horizontal stabilizer. When the applicable limit switch is actuated open, horizontal stabilizer travel stops.

2–327C. REMOVAL (UPPER LIMIT SWITCH).

a. Remove horizontal stabilizer upper right-hand fairing.

b. Lower horizontal stabilizer.

c. Disconnect electrical leads at upper limit switch.

d. Remove upper limit switch attaching bolts, nuts and washers and remove upper limit switch.

2–327D. INSTALLATION (UPPER LIMIT SWITCH).

a. Place upper limit switch in position against support bracket and secure switch to bracket with attaching bolts, nuts, and washers.

b. Connect electrical leads to upper limit switch.

c. Adjust upper limit switch actuating bolt.

d. Replace horizontal stabilizer upper right-hand fairing.

2–327E. REMOVAL (LOWER LIMIT SWITCH).

a. Remove fuselage aft right-hand access panel.

b. Disconnect electrical leads at lower limit switch.

c. Remove lower limit switch attaching bolts, nuts, and washers and remove lower limit switch.

2–327F. INSTALLATION (LOWER LIMIT SWITCH).

a. Place lower limit switch in position against support structure and secure switch to structure with attaching bolts, nuts, and washers.

b. Connect electrical leads to lower limit switch.

c. Remove horizontal stabilizer lower left-hand fairing access and adjust lower limit switch actuating bolt.

d. Replace horizontal stabilizer lower left-hand fairing access panel.

e. Replace fuselage aft right-hand access panel.

2–327G. HORIZONTAL STABILIZER INTERMEDIATE LIMIT SWITCH.

2–327H. DESCRIPTION. (See figure 2–45.) On airplanes BuNo. 134630-134637, 135225-135406, 137492-137632, 139606-139821, 142010 and subsequent, and prior airplanes reworked per BuAer AD/SC No. 629, an intermediate limit switch is installed in the fuselage below the horizontal stabilizer. The switch is a normally closed, plunger type switch supported by an actuating guide assembly. A tube assembly attached to the horizontal stabilizer passes through the actuating guide assembly and actuates the guide assembly to open the intermediate limit switch contacts when the horizontal stabilizer reaches neutral position. The switch is used electrically in conjunction with the side dive brake controlled switch to stop horizontal stabilizer movement at neutral position when the side dive brakes are full open.

2–327J. REMOVAL.

a. Raise horizontal stabilizer.

b. Remove horizontal stabilizer lower left-hand fairing access panel.

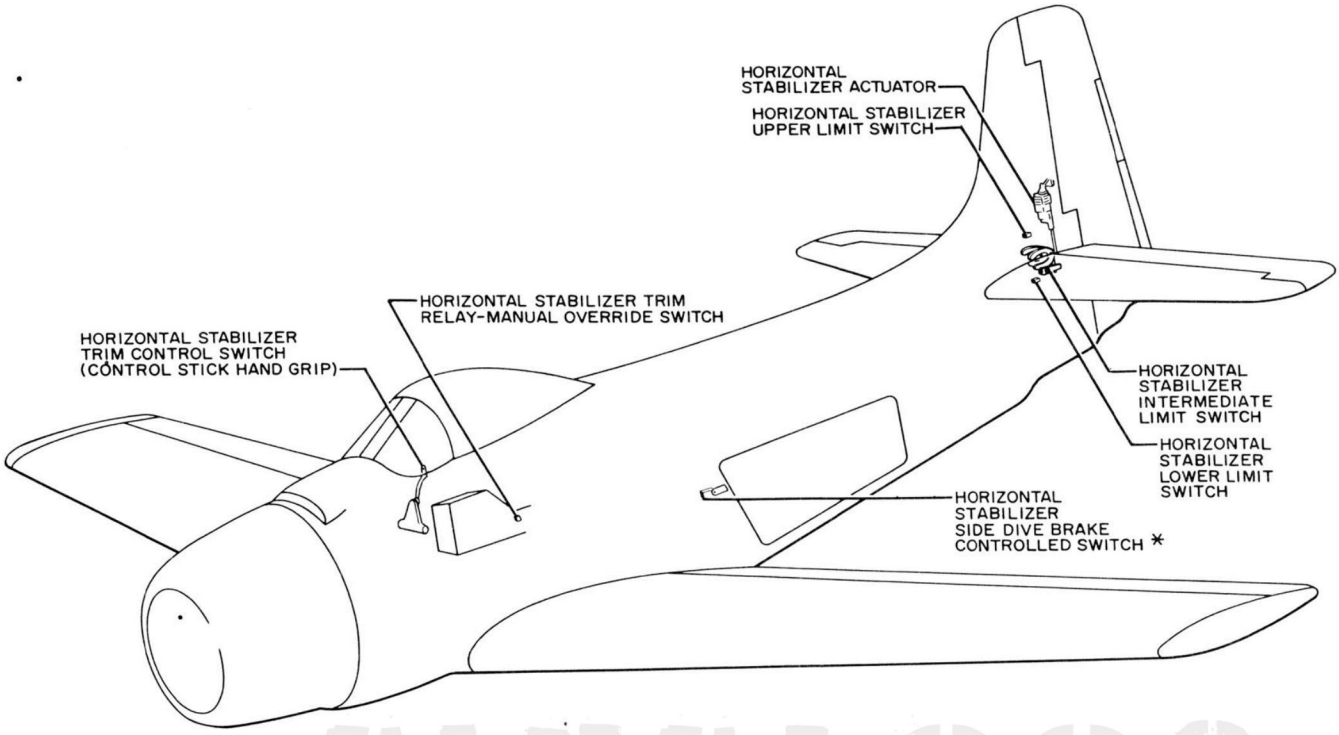
c. Disconnect electrical leads at intermediate limit switch.

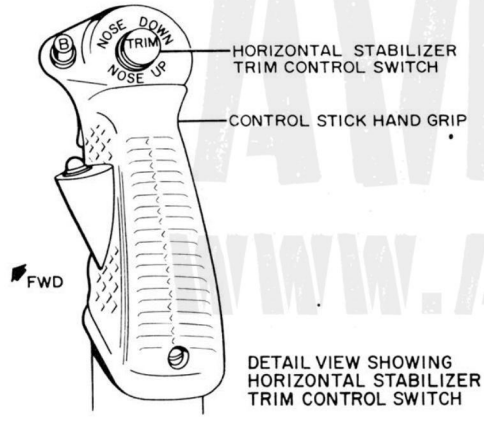
d. Remove intermediate limit switch attaching bolts, nuts, and washers and remove intermediate limit switch.

2–327K. INSTALLATION.

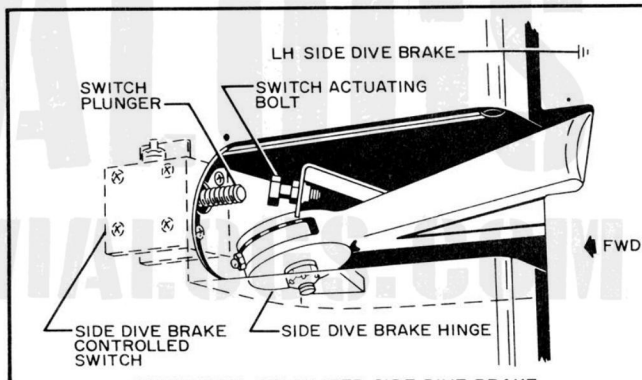
a. Position intermediate limit switch in actuating guide assembly and secure switch to assembly with attaching bolts, nuts, and washers.

b. Connect electrical leads to intermediate limit switch.



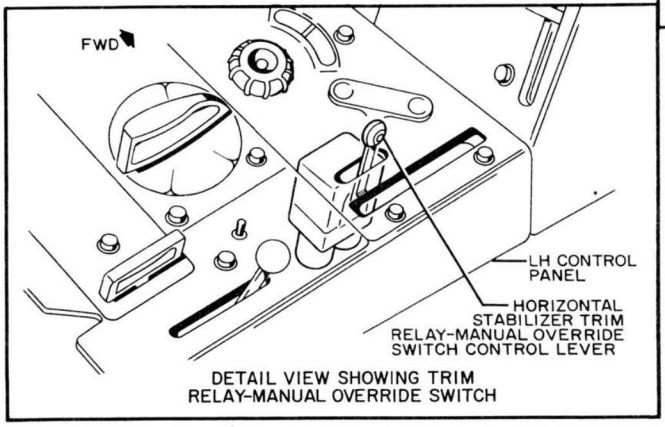


DETAIL VIEW SHOWING HORIZONTAL STABILIZER TRIM CONTROL SWITCH



HORIZONTAL STABILIZER SIDE DIVE BRAKE CONTROLLED SWITCH INSTALLATION

APPLIES TO AIRPLANES BUNO 134630-134637, 135225 AND SUBSEQUENT (PRIOR AIRPLANES REWORKED PER BUAER AD/SC 629)



DETAIL VIEW SHOWING TRIM RELAY-MANUAL OVERRIDE SWITCH

EFFECTIVITY-BUNO.
FACTORY: ALL EXCEPT AS NOTED
SERV CHG: 134466-134629, 135223-135224 REWORKED PER BUAER AD/SC NO. 629 AS NOTED *

P-3401-1B

Figure 2–45. Horizontal Stabilizer Control System (Sheet 1)

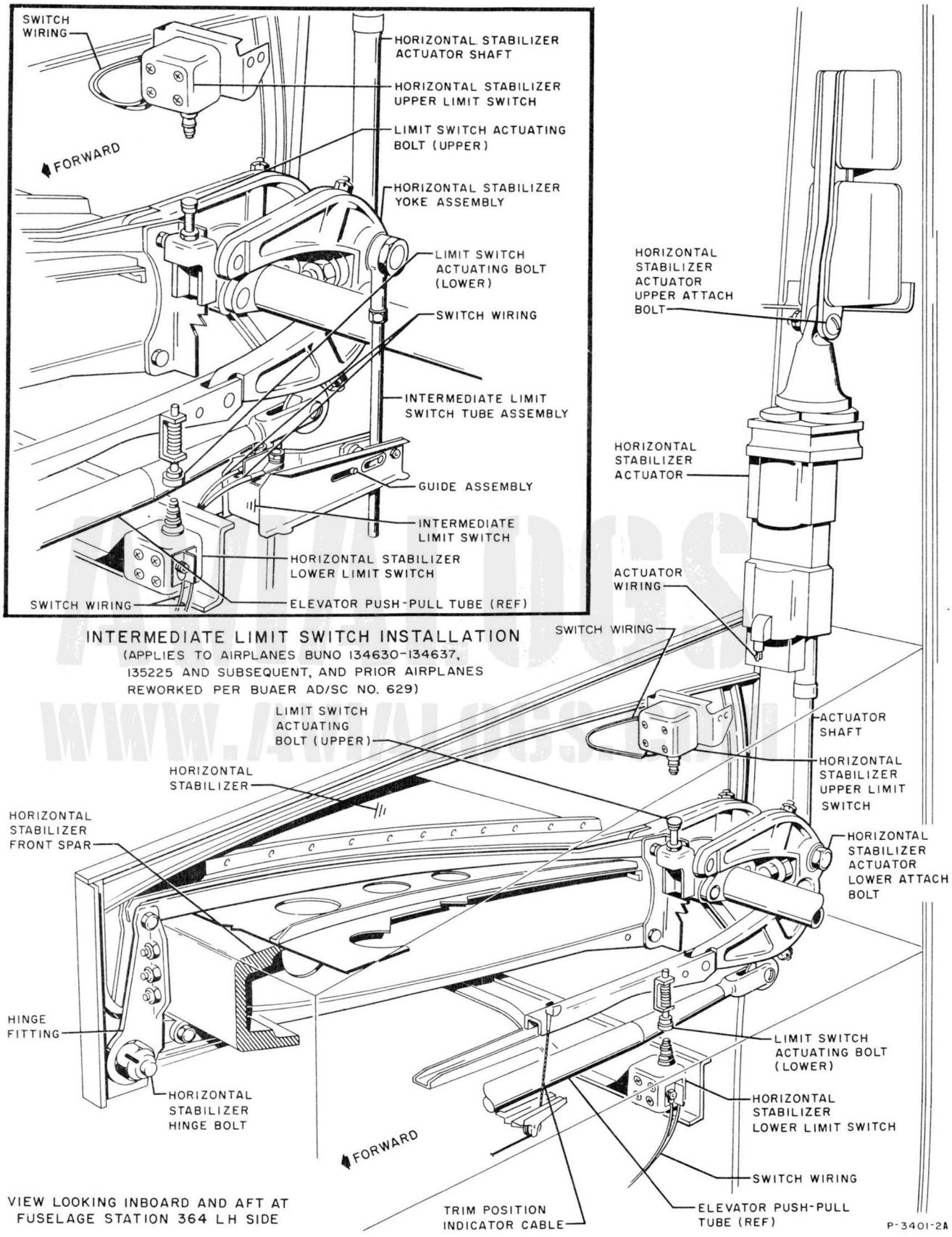
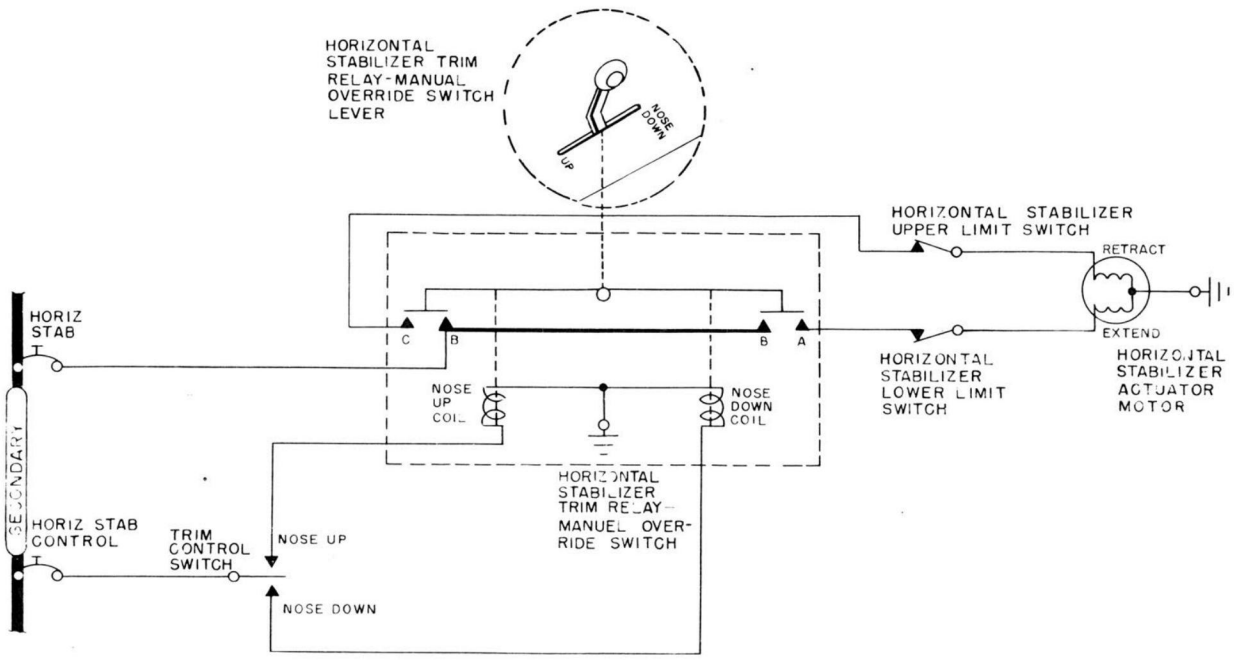
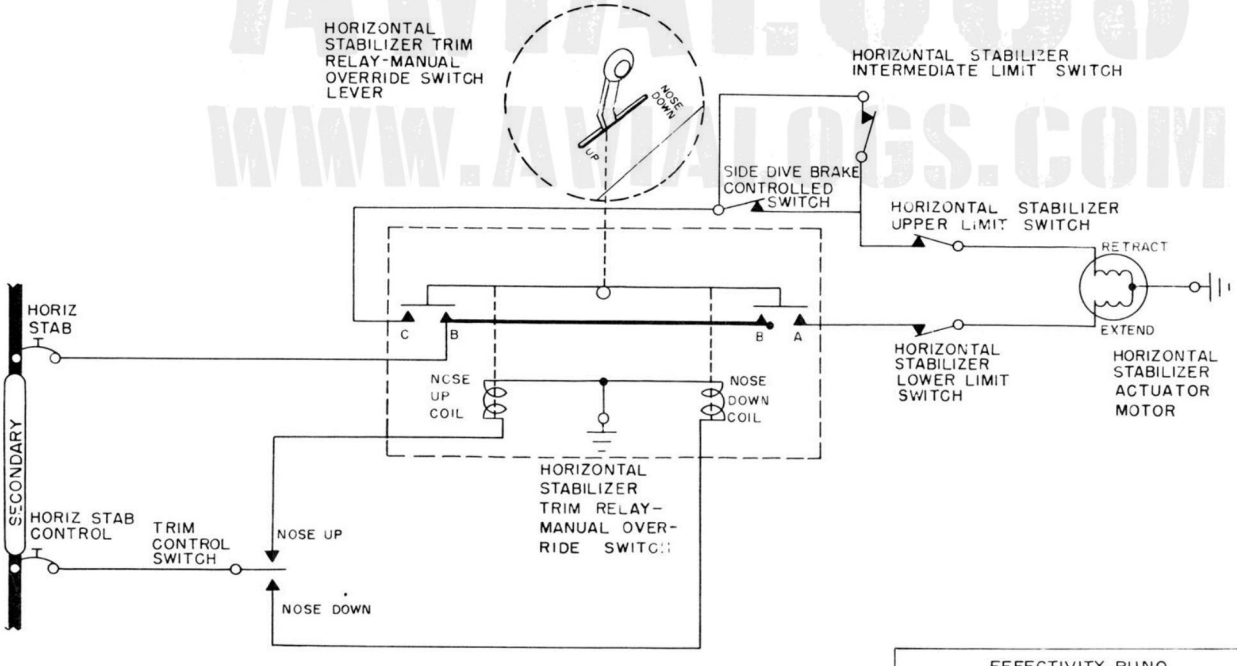


Figure 2–45. Horizontal Stabilizer Control System (Sheet 2)



HORIZONTAL STABILIZER CONTROL CIRCUIT SCHEMATIC

EFFECTIVITY-BUNO.
FACTORY: 134466-134629
135223-135224
NOT REWORKED PER BUAER AD/SC NO. 629
SERV CHG: NONE



HORIZONTAL STABILIZER CONTROL CIRCUIT SCHEMATIC

EFFECTIVITY-BUNO.
FACTORY: 134630-134637, 135225-135406, 137492-137632, 139606-139821, 142010 AND SUBSEQUENT
SERV CHG: 134466-134629, 135223-135224 REWORKED PER BUAER AD/SC NO. 629

P-6661-1-B

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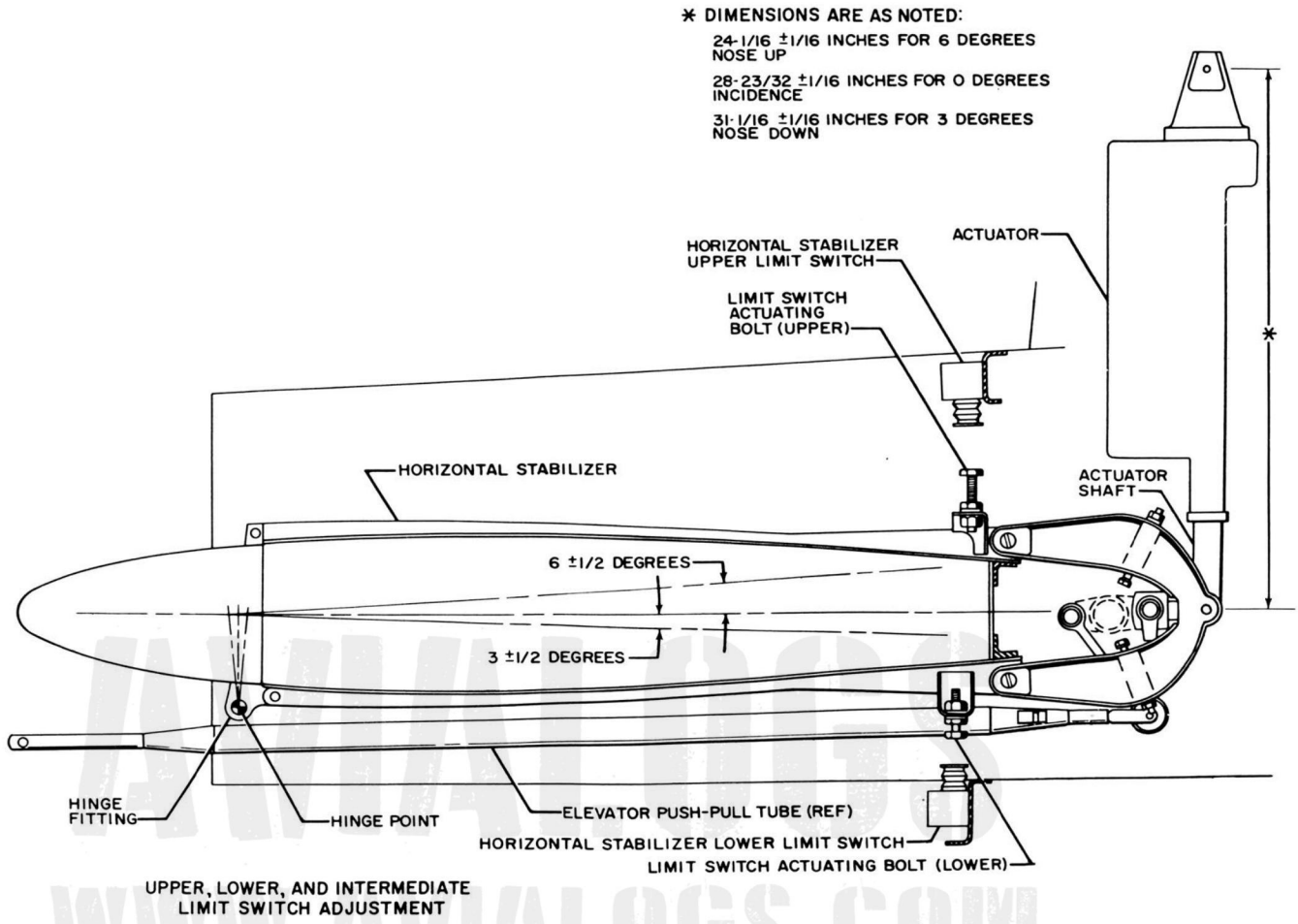
Figure 2–46. Horizontal Stabilizer Control Circuit Schematic Diagram



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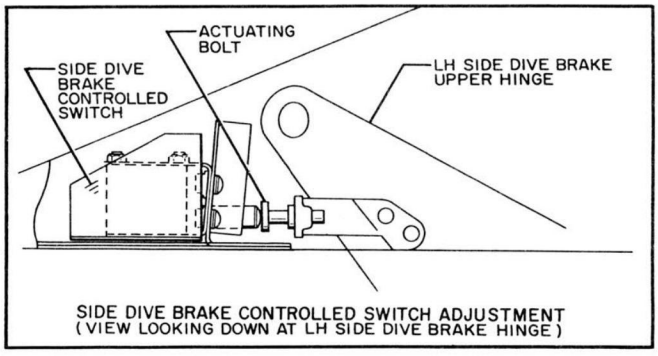
ADJUSTMENT—UPPER AND LOWER LIMIT SWITCHES

a. Remove horizontal stabilizer fairings.
b. Remove fuselage aft right-hand access panel.
c. Set horizontal stabilizer at zero degrees incidence.
d. Screw in upper and lower limit switch actuating bolts as far as possible.
e. Measure upper limit switch plunger in fully extended position.
f. Using half-power, retract actuator shaft as far as possible.
g. Adjust upper limit switch plunger actuating bolt until switch plunger has been depressed $\frac{5}{16} \pm \frac{1}{16}$ inch from its original, full extended length.
h. Adjust lower limit switch plunger to open actuator circuit when actuator extends to $31\frac{1}{16} \pm \frac{1}{16}$ inches, for 3 degrees airplane nose down position.
i. Retract actuator to length of $28\frac{23}{32} \pm \frac{1}{16}$ inches for zero degrees incidence.
j. Replace fuselage aft right-hand access panel.

P-8827-1A

EFFECTIVITY-BUNO.
FACTORY: 134466-134629, 135223-135224 NOT REWORKED PER BUAER AD/SC NO. 629
SERV. CHG: NONE

Figure 2–46A. Horizontal Stabilizer Control Adjustment (Sheet 1)



SIDE DIVE BRAKE CONTROLLED SWITCH ADJUSTMENT
(VIEW LOOKING DOWN AT LH SIDE DIVE BRAKE HINGE)

EFFECTIVITY-BUNO.
FACTORY: 134630-134637, 135225-135406, 137492-137632 NOT REWORKED PER BUAER AD/SC NO. 629
SERV. CHG: NONE

* DIMENSIONS ARE AS NOTED:
24-1/16 ±1/16 INCHES FOR 6 DEGREES NOSE UP
28-23/32 ±1/16 INCHES FOR 0 DEGREES INCIDENCE
31-1/16 ±1/16 INCHES FOR 3 DEGREES NOSE DOWN

UPPER, LOWER, AND INTERMEDIATE LIMIT SWITCH ADJUSTMENT

ADJUSTMENT—UPPER AND LOWER LIMIT SWITCHES

a. Remove horizontal stabilizer fairings.

b. Remove fuselage aft right-hand access panel.

c. Set horizontal stabilizer at zero degrees incidence.

d. Screw in upper and lower limit switch actuating bolts as far as possible.

e. Measure upper limit switch plunger in fully extended position.

f. Using half-power, retract actuator shaft as far as possible.

g. Adjust upper limit switch plunger actuating bolt until switch plunger has been depressed $5/16 \pm 1/16$-inch from its original, full extended length.

h. Adjust lower limit switch plunger to open actuator circuit when actuator extends to $31\,1/16 \pm 1/16$ inches, for 3 degrees airplane nose down position.

i. Retract actuator to length of $28\,23/32 \pm 1/16$ inches for zero degrees incidence.

j. Replace fuselage aft right-hand access panel.

ADJUSTMENT—INTERMEDIATE LIMIT SWITCH

a. Retract actuator to length of $28\,23/32 \pm 1/16$ inches for zero degrees incidence.

b. Adjust length of intermediate limit switch tube assembly to actuate intermediate limit switch open at zero degrees stabilizer incidence.

c. Replace horizontal stabilizer fairings.

ADJUSTMENT—SIDE DIVE BRAKE CONTROLLED SWITCH

CAUTION

Lock lower dive brake during adjustment check.

a. Actuate side dive brakes open.

b. With side dive brakes full open, adjust left-hand side dive brake actuating bolt to depress side dive brake controlled switch plunger $1/4 \pm 1/16$ inch.

HORIZONTAL STABILIZER ADJUSTMENT CHECK

a. With power on, actuate horizontal stabilizer to three degrees nose down position.

b. With side dive brakes open, actuate stabilizer up and observe that stabilizer moves to six degrees nose up position.

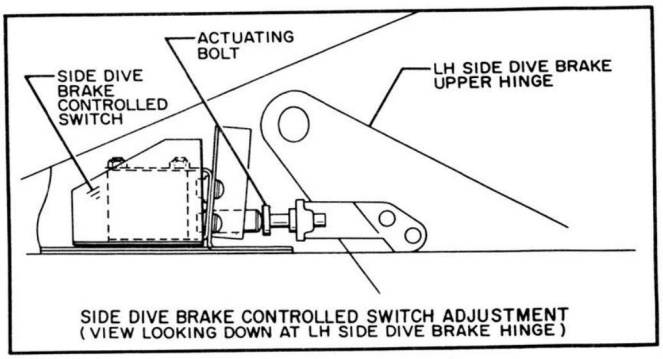
c. Actuate stabilizer to three degrees nose down position.

d. Actuate side dive brakes full open.

e. Actuate horizontal stabilizer up and observe that it stops at zero degrees incidence.

f. Close side dive brakes.

Figure 2-46A. Horizontal Stabilizer Control Adjustments (Sheet 2)



SIDE DIVE BRAKE CONTROLLED SWITCH ADJUSTMENT
(VIEW LOOKING DOWN AT LH SIDE DIVE BRAKE HINGE)

UPPER, LOWER, AND INTERMEDIATE LIMIT SWITCH ADJUSTMENT

EFFECTIVITY-BUNO.
FACTORY: 139606-139821, 142010 AND SUBSEQUENT
SERV. CHG: 134466-134637, 135223-135406, 137492-137632 REWORKED PER BUAER AD/SC NO. 629

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ADJUSTMENT—UPPER AND LOWER LIMIT SWITCHES

a. Remove horizontal stabilizer fairings.
b. Remove fuselage aft right-hand access panel.
c. Set horizontal stabilizer at zero degrees incidence.
d. Screw in upper and lower limit switch actuating bolts as far as possible.
e. Measure upper limit switch plunger in fully extended position.
f. Using half-power, retract actuator shaft as far as possible.
g. Adjust upper limit switch plunger actuating bolt until switch plunger has been depressed $5/16 \pm 1/16$-inch from its original, full extended length.
h. Adjust lower limit switch plunger to open actuator circuit when actuator extends to $31\,1/16 \pm 1/16$ inches, for 3 degrees airplane nose down position.
i. Retract actuator to length of $28\,23/32 \pm 1/16$ inches for zero degrees incidence.
j. Replace fuselage aft right-hand access panel.

ADJUSTMENT—INTERMEDIATE LIMIT SWITCH

a. Retract actuator to length of $28\,23/32 \pm 1/16$ inches for zero degrees incidence.
b. Adjust length of intermediate limit switch tube assembly to actuate intermediate limit switch open at zero degrees stabilizer incidence.
c. Replace horizontal stabilizer fairings.

ADJUSTMENT—SIDE DIVE BRAKE CONTROLLED SWITCH

CAUTION

Lock lower dive brake during adjustment check.

a. Actuate side dive brakes open.
b. With side dive brakes full open, adjust left-hand side dive brake actuating bolt to depress side dive brake controlled switch plunger $1/4 \pm 1/16$ inch.

HORIZONTAL STABILIZER ADJUSTMENT CHECK

a. With power on, actuate horizontal stabilizer to three degrees $\pm 1/2$ degree nose down position.
b. With side dive brakes open, actuate stabilizer up and observe that stabilizer actuator stops at one degree $\pm 1/2$ degree.
c. With side dive brakes closed, actuate stabilizer to six degrees $\pm 1/2$ degree nose up.
d. Use jumper to ground normally closed terminal of intermediate limit switch, if weight of airplane is on landing gear. Speed brake handle detent solenoid actuates stabilizer to one degree $\pm 1/2$ degree nose down position.
e. Remove jumper.

Figure 2-46A. Horizontal Stabilizer Control Adjustments (Sheet 3)

c. Make adjustments to intermediate limit switch tube assembly.

d. Replace horizontal stabilizer lower left-hand fairing access panel.

2–327L. HORIZONTAL STABILIZER SIDE DIVE BRAKE CONTROLLED SWITCH.

2–327M. DESCRIPTION. (See figure 2–45.) On airplanes BuNo. 134630-134637, 135225-135406, 137492-137632, 139606-139821, 142010 and subsequent, and prior airplanes reworked per BuAer AD/SC No. 629, a horizontal stabilizer side dive brake controlled switch is installed in the fuselage just forward of the left-hand side dive brake upper hinge. The switch is a normally closed, plunger type switch actuated to open the up side of the horizontal stabilizer control circuit when the left-hand side dive brake is full open. When the side dive brake controlled switch is open the circuit is completed through the intermediate limit switch to energize the actuator motor and raise the stabilizer to zero incidence. The intermediate limit switch opens when the stabilizer reaches zero incidence, stopping horizontal stabilizer movement.

2–327N. REMOVAL.

a. Remove side dive brake controlled switch terminal shield.

b. Disconnect electrical leads at side dive brake controlled switch.

c. Remove two screws attaching switch support bracket to support structure and remove switch and support bracket from airplane.

2–327P. INSTALLATION.

a. Place side dive brake controlled switch and support bracket in position against support structure and secure support bracket to support structure with attaching screws and washers.

b. Connect electrical leads to side dive brake controlled switch.

c. Replace side dive brake controlled switch terminal shield.

2–327R. HORIZONTAL STABILIZER ACTUATOR.

2–327S. DESCRIPTION. (See figure 2–45.) The horizontal stabilizer actuator is installed in the vertical stabilizer, above the horizontal stabilizer. The upper, housing end of the actuator attaches to the vertical stabilizer structure, the shaft end attaches to the horizontal stabilizer yoke assembly. Rotation of the actuator motor controls extension and retraction of the actuator shaft to raise or lower the angle of horizontal stabilizer incidence. The direction of rotation of the actuator motor is determined by the position of the horizontal stabilizer trim control switch, or the position of the horizontal stabilizer trim relay-manual override switch.

2–327T. REMOVAL. (See figure 2–45.)

a. Place stabilizer at zero incidence.

b. Through stabilizer mechanism access panel, disconnect actuator wiring from terminal panel on fuselage closing bulkhead.

c. Remove horizontal stabilizer upper fairings.

d. Disconnect actuator shaft from stabilizer yoke assembly, and disconnect top of actuator from vertical stabilizer structure.

2–327U. INSTALLATION. (See figure 2–45.)

a. Insert actuator through stabilizer mechanism access on left-hand side of vertical stabilizer and bolt top of actuator to structure.

b. Adjust actuator shaft as necessary to align with stabilizer yokes and install attaching bolt.

c. Connect actuator wiring to terminal panel on fuselage closing bulkhead.

2–327V. HORIZONTAL STABILIZER POSITION INDICATOR.

2–327W. DESCRIPTION. (See figure 2–46B.) The horizontal stabilizer position (or incidence change) indicator is installed on the inboard side of the left-hand control panel, adjacent to the trim relay-manual override switch control lever. A spring-loaded cable assembly extends aft through pulleys in the left-hand side of the fuselage to a bracket on the horizontal stabilizer. The forward section of the cable contains a pointer which is pulled along the indicator slot to register, in degree increments, the position of the stabilizer from full up to full down. Settings recommended for various flight conditions are designated on the indicator as "LAND," "CRUISE," and "DIVE."

2–327X. ADJUSTMENT. See figure 2–46B.

2–328. WING FLAPS.

2–329. DESCRIPTION. (See figure 2–47.) The wing flaps extend the length of the wing center panel trailing edge, outboard of the fuselage, one on either side of the fuselage. The wing flaps are of single-spar spanwise construction reinforced with chordwise ribs and stiffeners, and are covered with sheet metal. Each wing flap has two external hinges. The trailing edge of the wing is contoured, closed and flush-riveted to direct airflow over the wing flaps when the flaps are extended, thus eliminating the need for deflector vanes; however, small spoilers, designed to prevent aileron "snatch," are riveted to the tops of the wing flap outermost ribs.

2–330. REMOVAL. (See figure 2–47.)

a. Extend wing flaps.

b. Remove bolt which attaches wing flap actuator arm to actuating link.

c. Remove bolt from each wing flap hinge.

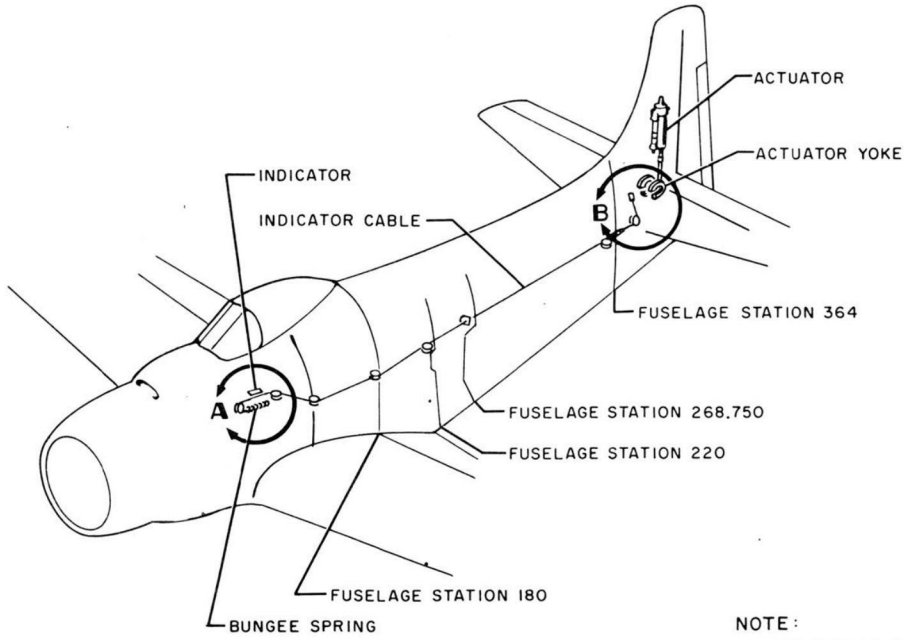
2–331. INSTALLATION. (See figure 2–47.)

a. Position wing flap to trailing edge of wing center section and install bolt in each hinge.

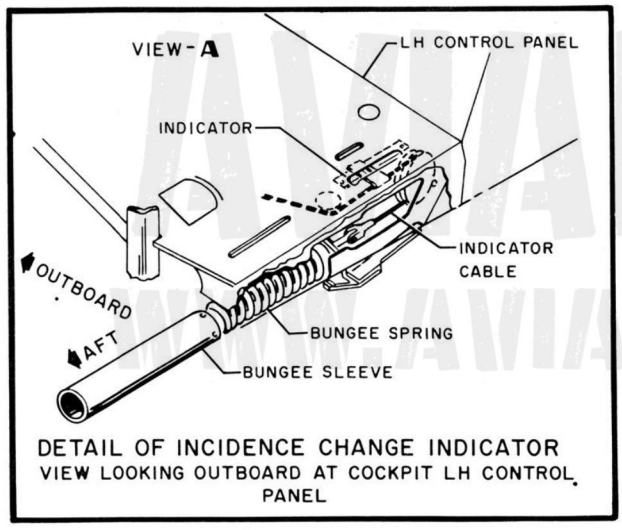
b. Connect wing flap actuator arm to actuating link with attaching bolt.

2–332. WING FLAP CONTROL SYSTEM.

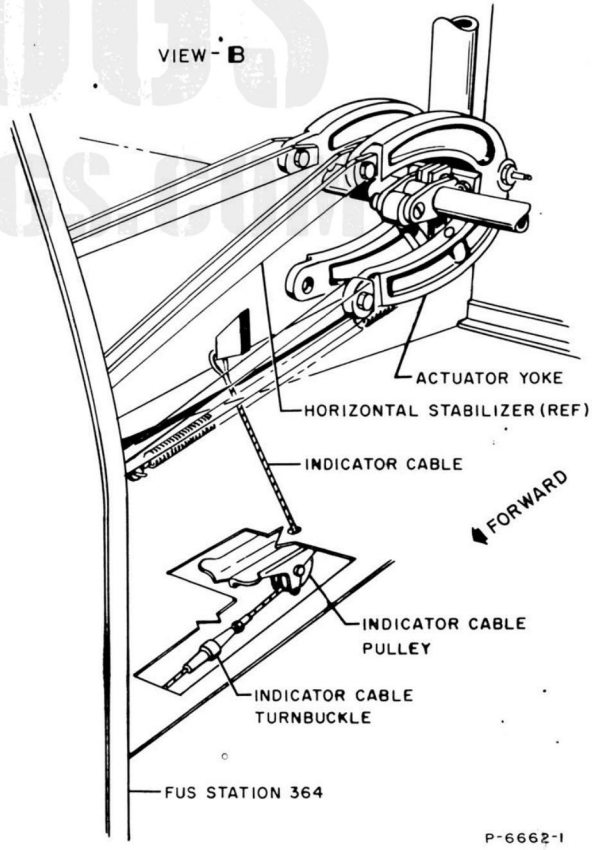
2–333. DESCRIPTION. (See figure 2–48.) The wing flap control system is hydro-mechanical. The system is oper-



NOTE:
SEE FIGURE 2-22
FOR CABLE ROUTING



DETAIL OF INCIDENCE CHANGE INDICATOR
VIEW LOOKING OUTBOARD AT COCKPIT LH CONTROL PANEL



ADJUSTMENT

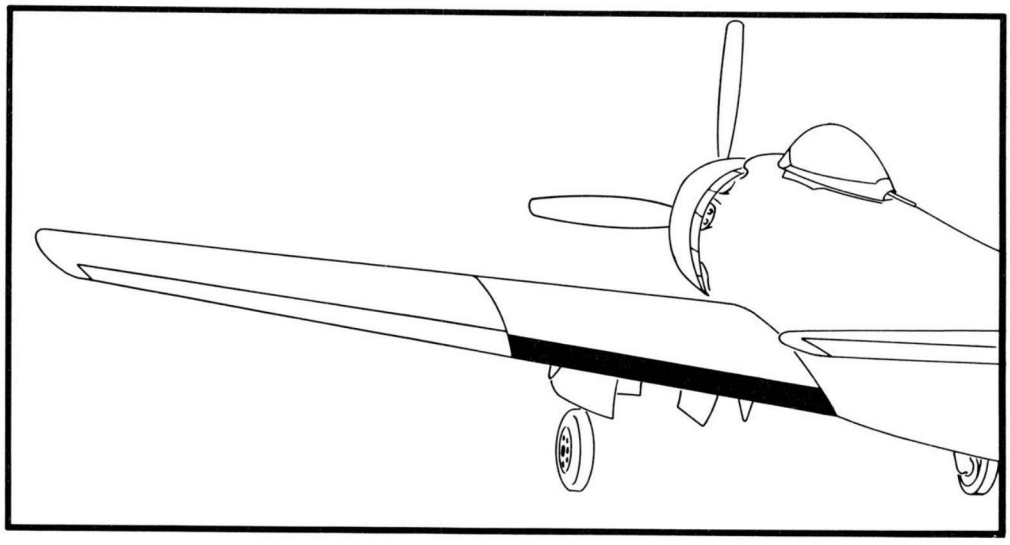
a. Set horizontal stabilizer at zero incidence.

b. Remove phenolic sleeve from bungee spring.

c. Adjust indicator cable turnbuckle aft of fuselage station 364 so that indicator pointer is located at 0 degrees, ± 1/8 inch.

d. Operate stabilizer control switch on control stick to raise stabilizer six degrees NOSE UP. Check bungee inside control panel to insure that spring coils are not fully compressed.

Figure 2–46D. Horizontal Stabilizer Position Indicating System Installation and Adjustment



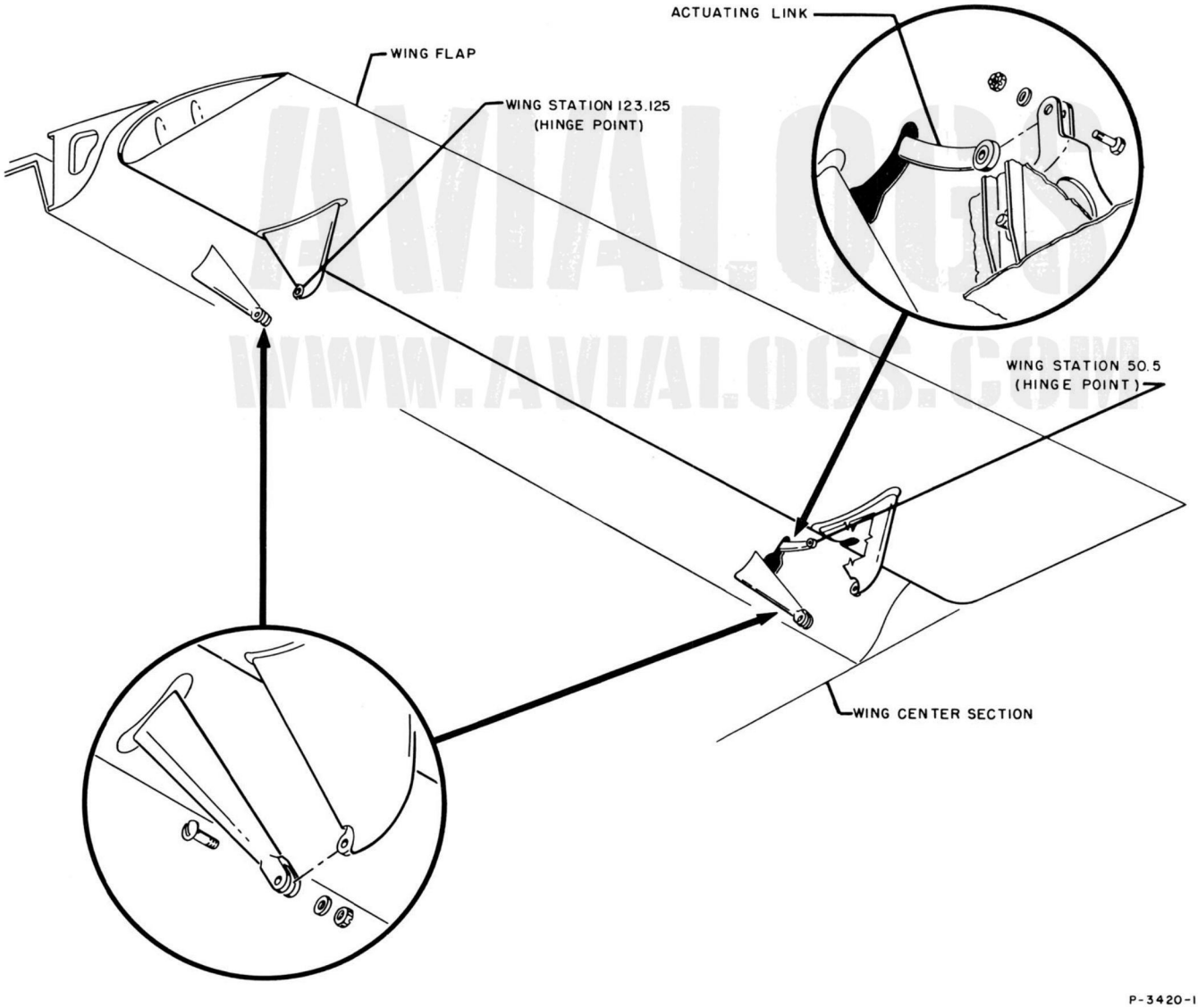


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Figure 2–47. Wing Flap Installation

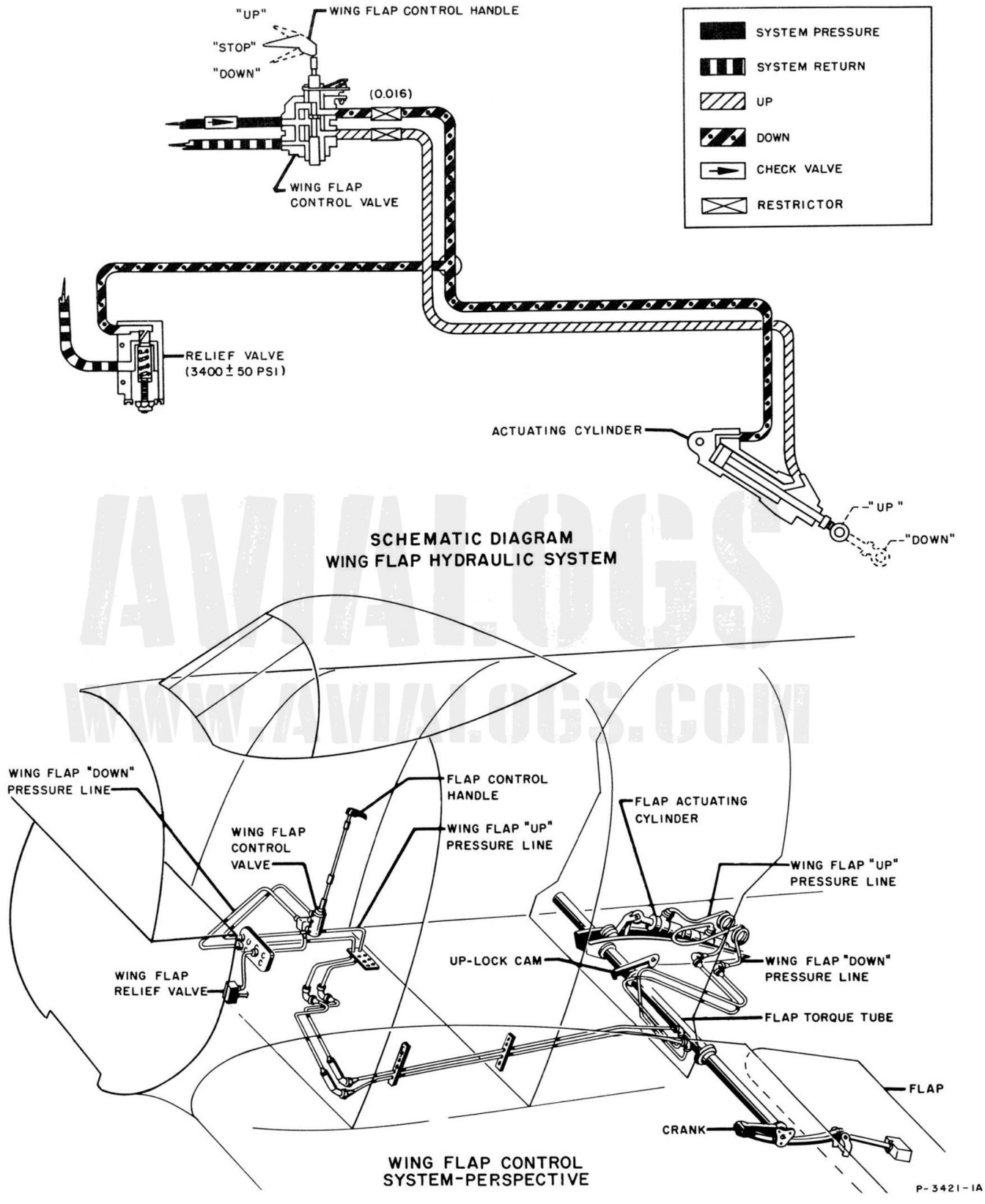

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Figure 2–48. Wing Flap Control System (Sheet 1)

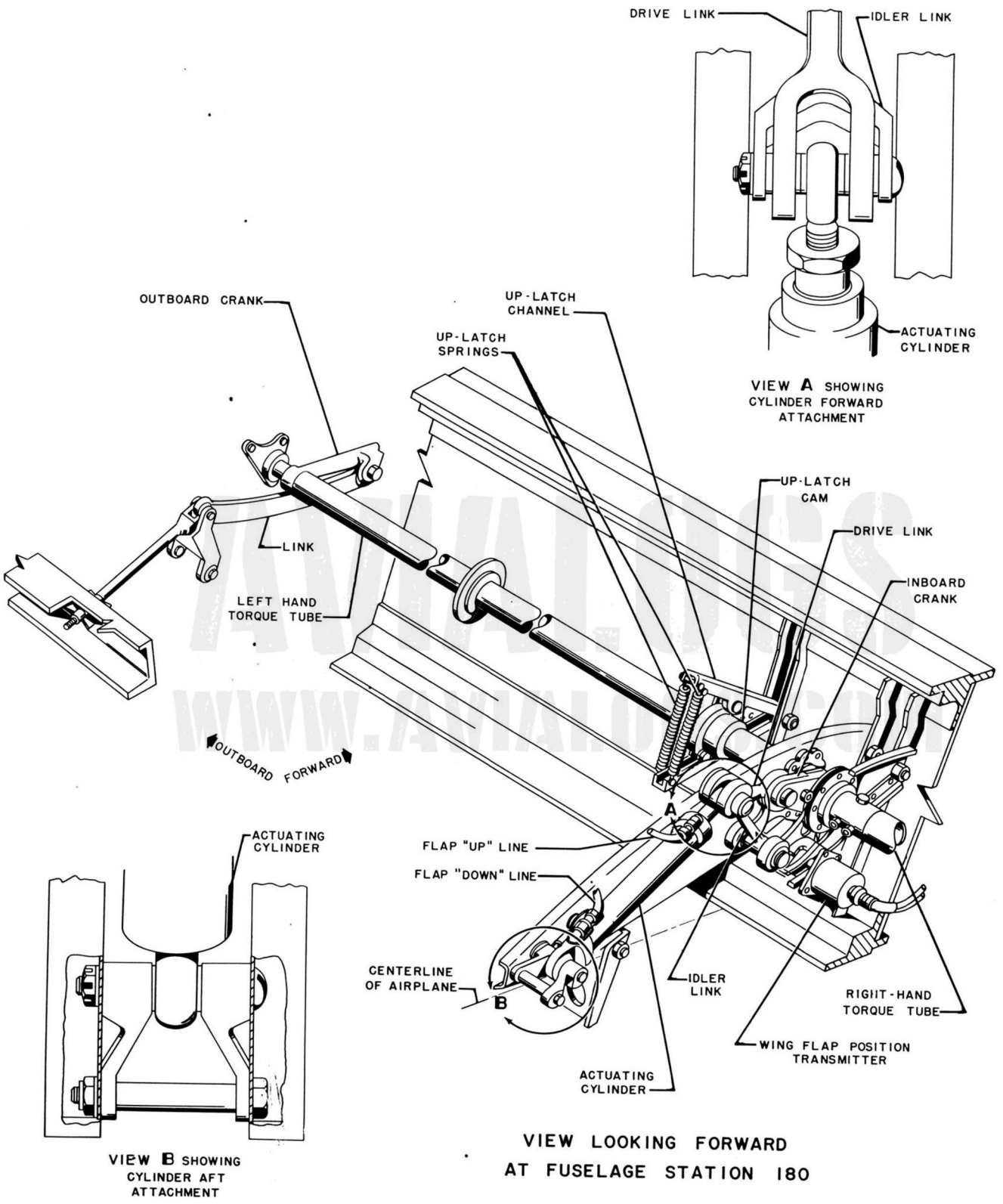

Figure 2–48. Wing Flap Control System (Sheet 2)

ated from the flap-shaped control lever mounted in the cockpit left-hand control panel. The principal components of the wing flap control system include:

Name	*Para Ref*
Control lever	2–334
Control rod	
Control valve	2–338
Drive link	
Idler link	
Torque tubes	
Flap link assemblies	
Actuating cylinder	2–343
Relief valve	2–347
Flow restrictors	2–352
Check valve	

2–334. According to the position of the wing flap control lever, the control valve routes hydraulic pressure to the actuating cylinder either to extend or to retract the wing flaps. The single-drive link and the idler link coordinate wing-flap control, resulting in simultaneous operation of the two wing flaps. Extension of the actuating cylinder piston rod rotates the torque tubes to extend the wing flaps; retraction of the cylinder piston rod reverses the rotation of the torque tubes to retract the flaps. Spring-loaded channels engage a cam on the left-hand torque tube to lock the flaps in the faired (retracted) position when the control lever is in "UP." Partial extension or retraction of the flaps is accomplished by moving the control lever to "STOP" during any part of wing-flap travel. The relief valve allows the extended wing flaps to "blow back" to the faired position when air loads on the flaps exceed the pressure-limit setting of the relief valve. The flow restrictors are incorporated in the system to retard flap movement and insure smooth operation and adequate control.

2–335. TROUBLE SHOOTING. Refer to table 2–5.

2–336. TESTING.

a. Operate wing flaps under full system pressure: flaps should extend completely (40 degrees) in 6 to 9 seconds, and should retract completely in 6 to 9 seconds.

b. With flaps fully retracted, place control lever in "DOWN." After three seconds have elapsed, move control lever to "STOP:" flaps should stop approximately at mid-travel.

c. With flaps fully extended, place control lever in "UP." After three seconds have elapsed, move control lever to "STOP:" flaps should stop approximately at mid-travel.

d. Return control lever to "UP." When flaps have retracted completely, inspect up-latch mechanism on left-hand torque tube. Mechanism should be engaged with cam.

2–337. ADJUSTMENT. See figure 2–49.

2–338. WING FLAP CONTROL VALVE.

2–339. DESCRIPTION. (See figure 2–49A.) The wing flap control valve is installed in the forward equipment compartment, just below the cockpit floor; the valve is mounted on the forward face of fuselage station 110 frame, approximately 20 inches to the left of the center line of the airplane. It is connected to the wing flap control lever by an adjustable rod. The valve is a sleeve and slide type of valve and has three detent positions which correspond with the "UP," "STOP," and "DOWN" of the control lever.

2–340. REMOVAL. (See figure 2–49A.)

a. Relieve hydraulic system pressure. Make certain that pressure is fully relieved by operating wing flaps until hydraulic pressure gage indicates zero.

b. In the forward equipment compartment, disconnect and cap four hydraulic lines at control valve.

c. Disconnect valve slide from control rod.

d. Remove three bolts which attach valve to structure.

2–341. INSTALLATION. (See figure 2–49A.)

a. Inside forward equipment compartment, position control valve against frame so that valve ports face forward and inboard. Install three bolts which attach valve to structure.

b. Uncap and connect four hydraulic lines to valve: *pressure* line to forward upper port; *return* line to forward lower port; *down* line to inboard upper port; and *up* line to inboard lower port.

c. Adjust control valve. Then connect valve slide to control lever rod.

d. Restore hydraulic system pressure.

2–342. ADJUSTMENT. (See figure 2–49A.)

a. With hydraulic system pressure fully relieved, place wing flap control lever in "STOP."

TABLE 2–5. WING FLAP CONTROL SYSTEM TROUBLE SHOOTING

Trouble or Symptom	*Probable Cause*	*Correction*
1. Flaps fail to operate.	a. Insufficient hydraulic pressure.	Check system.
	b. Control valve out of adjustment.	See figure 2–32.
	c. Mechanical failure.	See figure 2–30, and refer to paragraph 2–195.
2. Flaps fail to "blow back."	a. Relief valve out of adjustment.	Adjust valve to open at 3400 ± 50 psi.
	b. Mechanical failure.	Refer to table 2–4.

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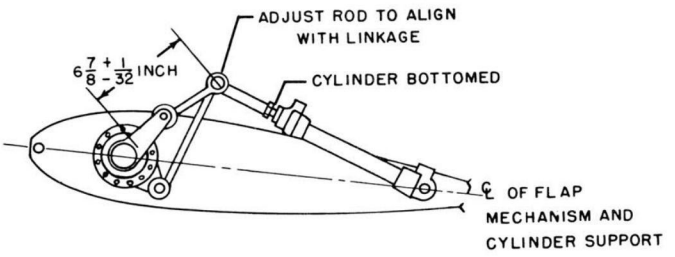


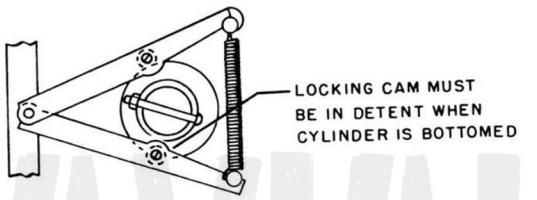
ADJUSTMENT

STEP 1

Wing Flap Actuating Cylinder Linkage at Fuselage Station 180:

a. With no load applied by flap actuating cylinder, adjust cylinder to bottom with flap linkage in position shown.

b. Check flap locking cam to insure that cam is locked in detent.



STEP 1

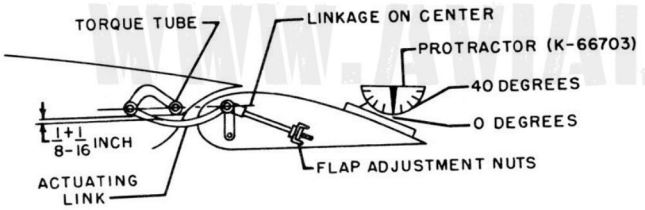
STEP 2

Flap Deflection:

a. Install flap rigging protractor on each wing outboard panel at wing station 180.625. Set ailerons in neutral position.

b. With flap mechanism in UP position, adjust flaps to fair with neutral position of ailerons within ± 1/16 inch. Adjustment can be made with flap position adjustment nuts.

c. Lower flaps to 40 ± 2 degrees DOWN as established by use of protractor attached to flat surface, and adjust stroke of actuating cylinder for required travel.

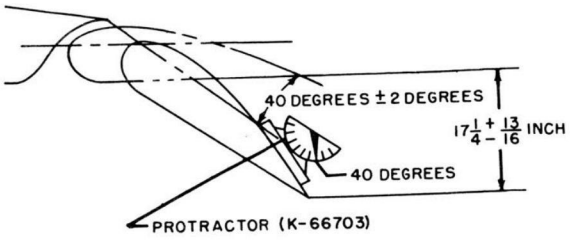


STEP 3

Movement and Clearances:

a. Place wing flap control handle in "UP." When flaps have returned to faired position, protractors should indicate 0 degrees and flap locking cam should be in detent.

b. Place wing flap control handle in "DOWN." Flaps should deflect so that protractors indicate 40 ± 2 degrees.



STEP 2

P-3422-1A

Note

Clearance of 7/8 ± 1/8 inch between wing flap and aileron is permissible when both surfaces are faired and no load is on wing-folding cylinder. With load on wing-folding cylinder and with wing flap and aileron in any operating position, 1/4 inch minimum clearance between flap and aileron is required.

Figure 2-49. Wing Flap Control Adjustments

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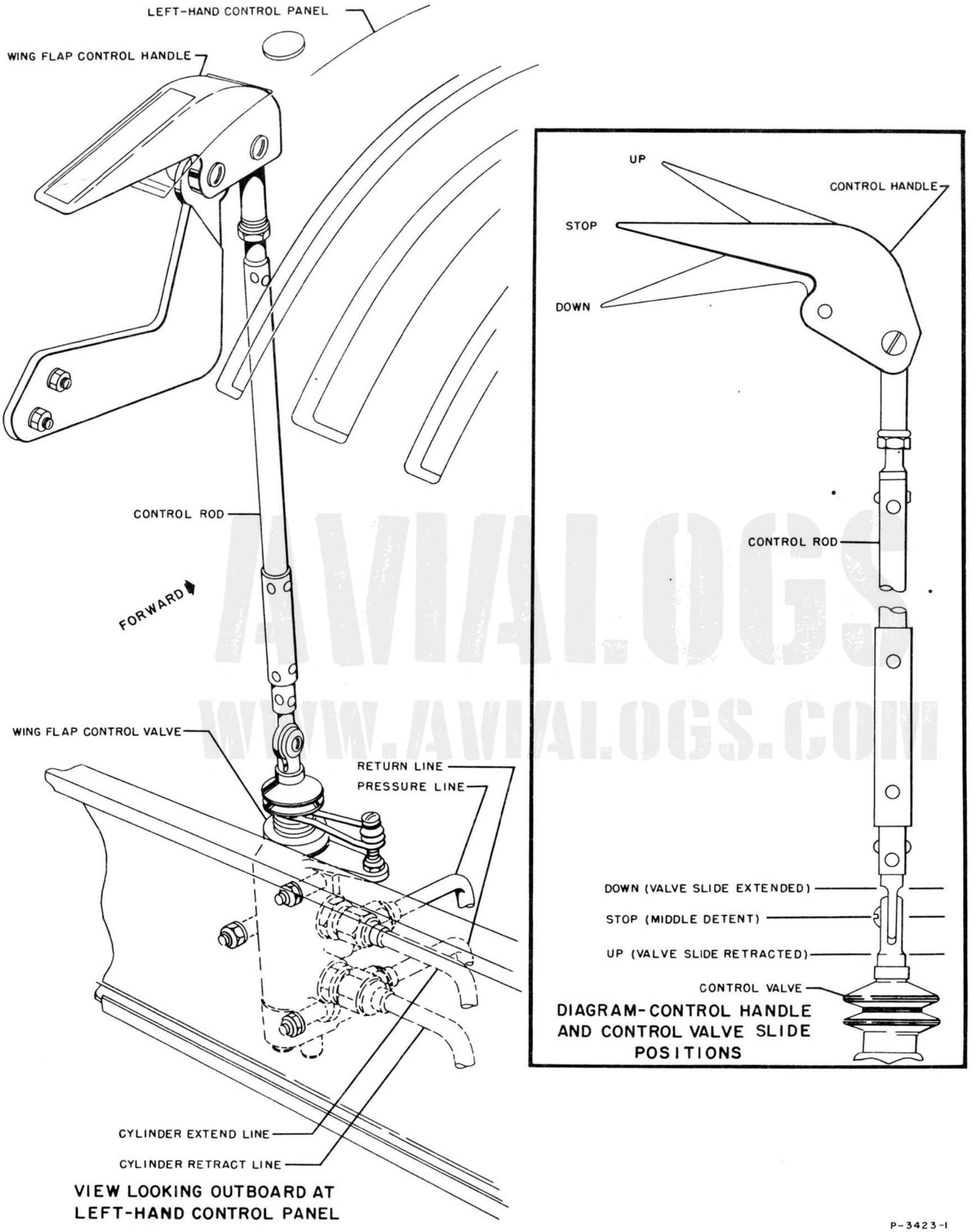

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Figure 2–49A. Wing Flap Control Valve and Linkage

b. Place control valve slide in neutral ("STOP") position by engaging valve spring with neutral (middle) detent.

c. Adjust control rod between valve and control lever to meet valve slide.

2–343. WING FLAP ACTUATING CYLINDER.

2–344. DESCRIPTION. (See figure 2–48.) The wing flap actuating cylinder is located near the bottom of the fuselage on the center line of the airplane between fuselage stations 194 and 205. The cylinder head is bolted to a stationary fitting and the cylinder piston rod eyebolt is attached to the linkage on the wing flap torque tubes and channel supports. The cylinder receives fluid pressure from the main hydraulic system.

2–345. REMOVAL. (See figure 2–48.)

a. Relieve hydraulic system pressure. Make certain that pressure is fully relieved by operating wing flaps until hydraulic pressure gage indicates zero.

b. Disconnect and cap two hydraulic lines at actuating cylinder.

c. Remove bolt which connects cylinder head to attaching fitting. Remove bolt which connects cylinder piston rod eyebolt to torque tube linkage.

2–346. INSTALLATION. (See figure 2–49.)

a. Position actuating cylinder with cylinder ports facing upward. Install bolt which attaches cylinder head to attaching fitting.

b. Install bolt which attaches cylinder piston rod to torque tube linkage.

c. Uncap and connect two hydraulic lines to actuating cylinder: *down* line to port in cylinder head, and *up* line to port in cylinder piston end.

d. Restore hydraulic system pressure.

2–347. WING FLAP RELIEF VALVE.

2–348. DESCRIPTION. (See figure 2–48.) The wing flap relief valve is installed in the *down* line between the wing flap control valve and the wing flap actuating cylinder. The relief valve is mounted in the left-hand side of the forward equipment compartment at fuselage station 108, approximately four inches below the cockpit floor. The "blow-back" feature of the wing flaps is dependent on the proper operation of the wing flap relief valve, which is designed to open at 3400 ± 50 psi and to close at 3200 psi minimum pressure. Blow-back occurs when atmospheric air pressure (120 knots) against the wing flaps exceeds the pre-set pressure limit of the relief valve. During flight, rising air loads on the flaps increase the pressure on the hydraulic fluid trapped in the wing flap *down* line between the actuating cylinder and the control valve. When the hydraulic pressure is thus caused to increase to the pressure limit of the relief valve (3400 psi), the valve opens, permitting part of the fluid to escape into the return line to the hydraulic reservoir. This relief of hydraulic pressure causes air loads to blow the wing flaps back slightly until hydraulic pressure decreases sufficiently to permit the relief valve to close (3200 psi minimum). The remaining hydraulic pressure in the *down* line holds the wing flaps in their newly assumed position.

2–349. REMOVAL.

a. Relieve hydraulic system pressure. Make certain that pressure is fully relieved by operating wing flaps until hydraulic pressure gage indicates zero.

b. Disconnect and cap two hydraulic lines at valve.

c. Remove two bolts which attach valve to mounting plate.

2–350. INSTALLATION.

a. Position valve to mounting plate so that valve ports face inboard and install two bolts which attach valve to mounting plate.

b. Uncap and connect two hydraulic lines at valve.

c. Restore hydraulic system pressure.

2–351. ADJUSTMENT. The wing flap relief valve is not adjustable while installed in the airplane.

2–352. WING FLAP FLOW RESTRICTORS.

2–353. DESCRIPTION. (See figure 2–48.) Two flow restrictors are installed, one in each of the two hydraulic lines between the wing flap control valve and the wing flap actuating cylinder. The purpose of the flow restrictors in the wing flap hydraulic system is to retard movement of the actuating cylinder piston, thereby preventing jerky operation of the wing flaps and aiding in the control of wing flap blow-back.

2–354. LANDING GEAR.

2–355. DESCRIPTION. The airplane is equipped with conventional tail-wheel type landing gear. The landing gear is fully retractable. The extendible components of the landing gear, main and tail, are hydraulically controlled and operate simultaneously.

2–356. CLEANING. Refer to section I.

2–357 through 2–359. DELETED.

2–360. MAIN LANDING GEAR.

2–361. DESCRIPTION. (See figure 2–49B.) The main landing gear is located in the wing center section, ap-

proximately 3-1/2 feet outboard of the fuselage. The gear is supported by reinforced structure, is fully retractable, and is hydraulically controlled. The tail gear operates in conjunction with the main gear, all landing gear units being controlled simultaneously by the landing gear control valve, which is operated from the wheel-shaped landing gear control handle in the cockpit. Each main gear installation is composed of the following principal components:

Shock struts
Actuating linkage
Wheels
  Casing, 32 x 8.8, 12-ply rating — Spec. MIL-C-5041, type VII
  Tube, 32 x 8.8 — Spec. MIL-T-5014
Telescoping mechanisms
Doors
Fairings

2-362. Each main gear actuating linkage raises and lowers the related gear and causes the shock strut to pivot (96 degrees) so that in the retracted position the wheel is stowed flush with and in the same plane as the wing lower surface, and mechanically locks the gear in the full-down position. A telescoping mechanism supplements the action of the actuating linkage by partially retracting the shock strut so that the gear can be stowed within the limits of the wheel well. When retracted, the gear is enclosed by a fairing over the gear actuating linkage and by two hydraulically operated doors at each wheel well.

2-363. ADJUSTMENT. See figure 2-50.

2-364. MAIN LANDING GEAR SHOCK STRUTS.

2-365. DESCRIPTION. (See figure 2-49B.) The main gear shock struts are pneudraulic (hydraulic fluid, Spec. MIL-H-5606, and compressed air). Principal components include a barrel, an inner cylinder (pressure chamber), and a combination axle and outer cylinder assembly. The actuating linkage is attached to the strut at the torque collar, which is screwed onto the strut barrel. The axle section of the strut includes a jack pad and a removable towing bolt, which attaches the lower end of the telescoping mechanism to the axle. An air and fluid filler valve extends through the strut barrel wall at the upper end of the barrel. For detailed description of main landing gear shock struts and components, refer to NAVWEPS 03-25EE-510 and 03-25EE-511.

2-366. The components of the right and left hand main main landing gear shock struts are identical and each strut can be converted to the opposite hand configuration during assembly or installation by reversing the position of the barrel-head assembly relative to the axle center line.

2-367. TROUBLESHOOTING. Refer to table 2-7.

2-368. REMOVAL. (See figure 2-49B.)

a. Relieve hydraulic system pressure.

b. Deflate strut.

c. Jack wing until wheel is clear of ground.

d. Disconnect brake line at connection in wing nose section.

e. Use special tool K-24305 to remove wheel and brake to lighten strut.

f. Disconnect fairing from strut or remove it from strut attaching fitting.

g. Detach actuating linkage from torque collar.

h. Disconnect telescoping mechanism from strut attaching fitting.

i. Remove lockwire and setscrews from barrel and pivot pin.

j. Place jack under strut to relieve tension on spindle; steady strut by hand to prevent strut from overturning, and drive pivot pin out to separate head from spindle.

2-369. INSTALLATION. (See figure 2-49B.)

a. Position strut (axle outboard) to attaching fitting so that lug of strut head is aligned with lugs of pivot spindle; tap pivot pin into place.

b. Install pivot pin setscrews and safety with lockwire.

c. Position torque collar on strut barrel to obtain correct location of drag linkage and install main pin.

d. Strap felt seals over threads which remain exposed after torque collar has been installed and adjusted.

e. Connect brake hose at wing nose section and install hose retaining straps.

f. Connect telescoping mechanism to strut attaching fitting.

g. Install wheel and brake, using special tool K-24305, and connect brake hose at inlet fitting.

h. Fill and inflate shock strut as instructed in section I.

i. When inflation has been completed, install air valve cap and test valve and plug for leakage by applying drops of oil at valve and plug seats.

TABLE 2-7. LANDING GEAR SHOCK STRUT TROUBLESHOOTING

Trouble	Probable Cause	Remedy
1. Strut low or completely collapsed.	a. Air leakage.	Tighten valve body or replace core or gasket.
	b. Fluid leakage.	Replace seals.
2. Strut bottoms during normal landing.	Insufficient fluid.	Add fluid and air.
3. Strut leaking at bottom of barrel.	Defective lower bearing packing.	Replace packing.

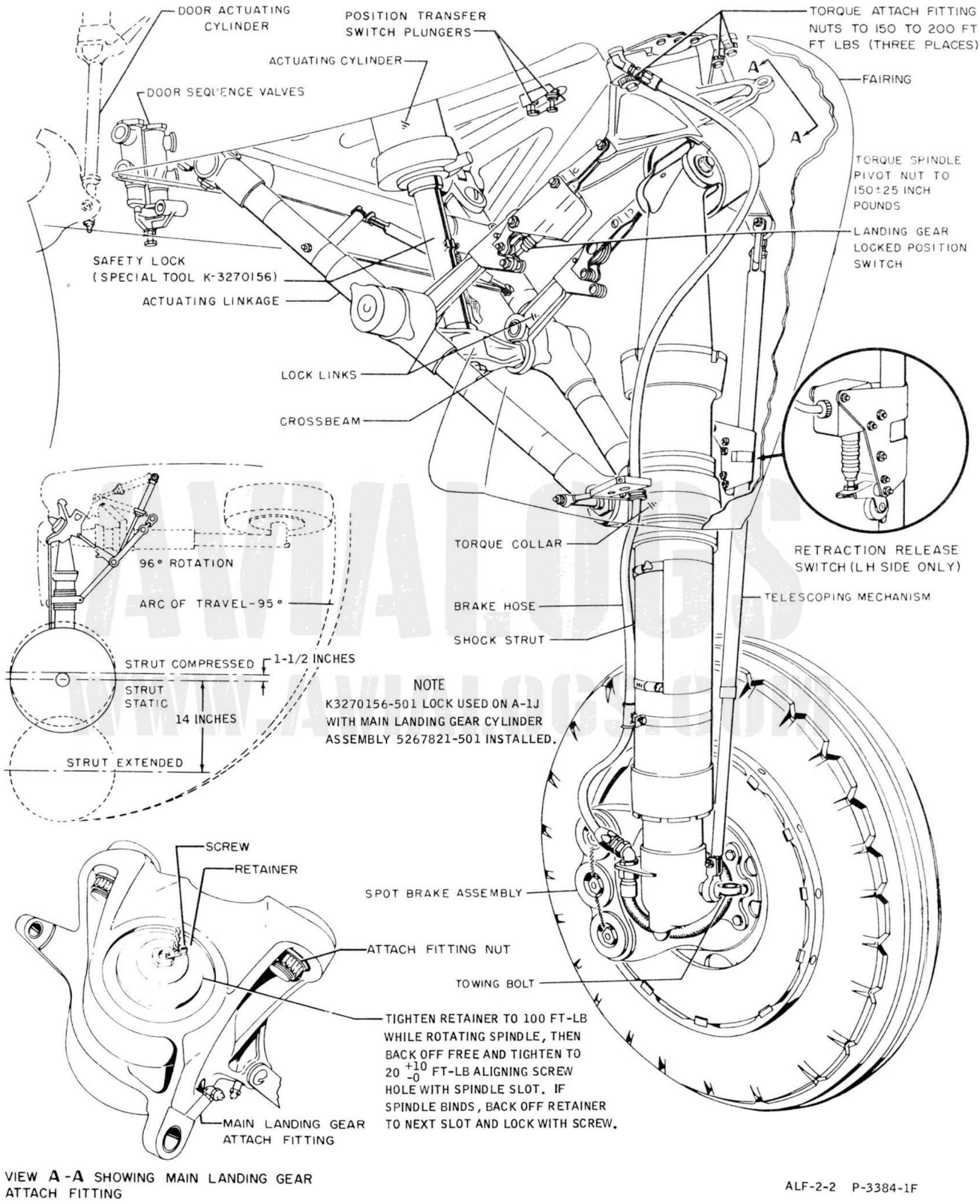


Figure 2-49B. Main Landing Gear Installation

MAIN LANDING GEAR ADJUSTMENT.

1. LANDING GEAR CONTROL LINKAGE ADJUSTMENT

a. Adjust control linkage as outlined in figure 2–57A.

2. MAIN LANDING GEAR ADJUSTMENT PREPARATIONS

a. Place airplane on jacks. Refer to paragraphs 1–14 and 1–15.

WARNING

Personnel must not stand in travel path of retracting or extending landing gear strut.

b. With suitable external hydraulic power source connected to airplane hydraulic system, extend landing gear.

c. Disconnect landing gear door actuating cylinders from landing gear doors.

3. DRAG LINKS, LOCK LINKS AND ACTUATING CYLINDER ADJUSTMENT

a. With strut extended, loosen upper and lower actuating cylinder bushing nuts which attach cylinder piston rod to crossbeam, to relieve preload against crossbeam.

b. Loosen clamps securing felt seals on both sides of strut collar.

c. Remove strut collar pin "A" and rotate collar on strut using special tool K-49502 to align drag link pivot points "A," "B," and "C" to within $\frac{1}{8}$ inch of straight line at point "B."

d. Replace strut collar pin "A," washer, nut and cotter pin.

e. Secure clamps and felt seals above and below strut collar.

f. With down lock linkage locked and preload against crossbeam relieved, extend cylinder piston rod with hydraulic pressure until piston bottoms.

g. With hydraulic pressure maintained in cylinder, screw upper bushing nut down $\frac{1}{2}$ turn after contacting crossbeam and torque lower bushing nut lightly against upper bushing nut.

h. Retract landing gear and check to make certain that lock links **do not** lock in "up" position by pushing up on landing gear after it is hydraulically retracted.

i. When lock links **do not** lock in up position, lower gear, maintain hydraulic pressure, loosen lower bushing nut and screw upper bushing nut down $\frac{1}{2}$ turn. Torque lower bushing nut to 100 $\pm$ 5 ft.-lbs. and lockwire upper and lower bushing nuts.

j. When lock links lock in "up" position, lower gear, maintain hydraulic pressure, loosen lower bushing nut and screw upper bushing nut down additional $\frac{1}{2}$ turn. Torque lower bushing nut lightly and repeat step h and step j until lock links **do not** lock in "up" position, then torque lower bushing nut to 100 $\pm$ 5 ft.-lbs. and lockwire upper and lower bushing nuts.

Note

After adjusting cylinder make certain clearance between wing front spar and retracted landing gear strut is $\frac{3}{8} \pm \frac{1}{4}$ inch. If clearance is less than $\frac{3}{8} \pm \frac{1}{4}$ inch, readjust strut collar to obtain desired clearance but maintain to within $\frac{1}{8}$ inch the straight line alignment of drag links at points "A," "B," and "C" when landing gear is extended.

4. LANDING GEAR STRUT-WING SPAR CLEARANCE ADJUSTMENT

a. Remove strut collar pin "A" and rotate collar up or down on strut to obtain clearance of $\frac{3}{8} \pm \frac{1}{4}$ inch. Move strut collar up to increase clearance, down to decrease clearance.

b. Install strut collar pin "A," washer, nut, and cotter pin.

c. Retract landing gear and check to make certain that lock links **do not lock** in up position by pushing up on landing gear after it is hydraulically retracted.

5. LOCK LINK BUSHING ADJUSTMENT

a. Rotate threaded bushings in lower lock links to obtain clearance of $\frac{1}{16}$ to $\frac{1}{8}$ inch between lock links and crossbeam. See view A-A. Dimension "D" + "E" = $\frac{1}{16}$ to $\frac{1}{8}$ inch.

b. Back off threaded bushings in lower lock links to nearest safetying slot in bushings and secure bushings with AAF 565C8H4 set screws. Secure AAF 565C8H4 set screws with AAF 565A8H3 set screws.

6. OPERATIONAL CHECK

a. Cycle system to insure proper operation.

b. After proper operation is obtained, extend landing gear.

c. Connect landing gear door actuating cylinders to landing gear doors.

d. Lower airplane, remove jacks and external hydraulic power equipment.

Figure 2–50. Main Landing Gear Adjustment (Sheet 1)

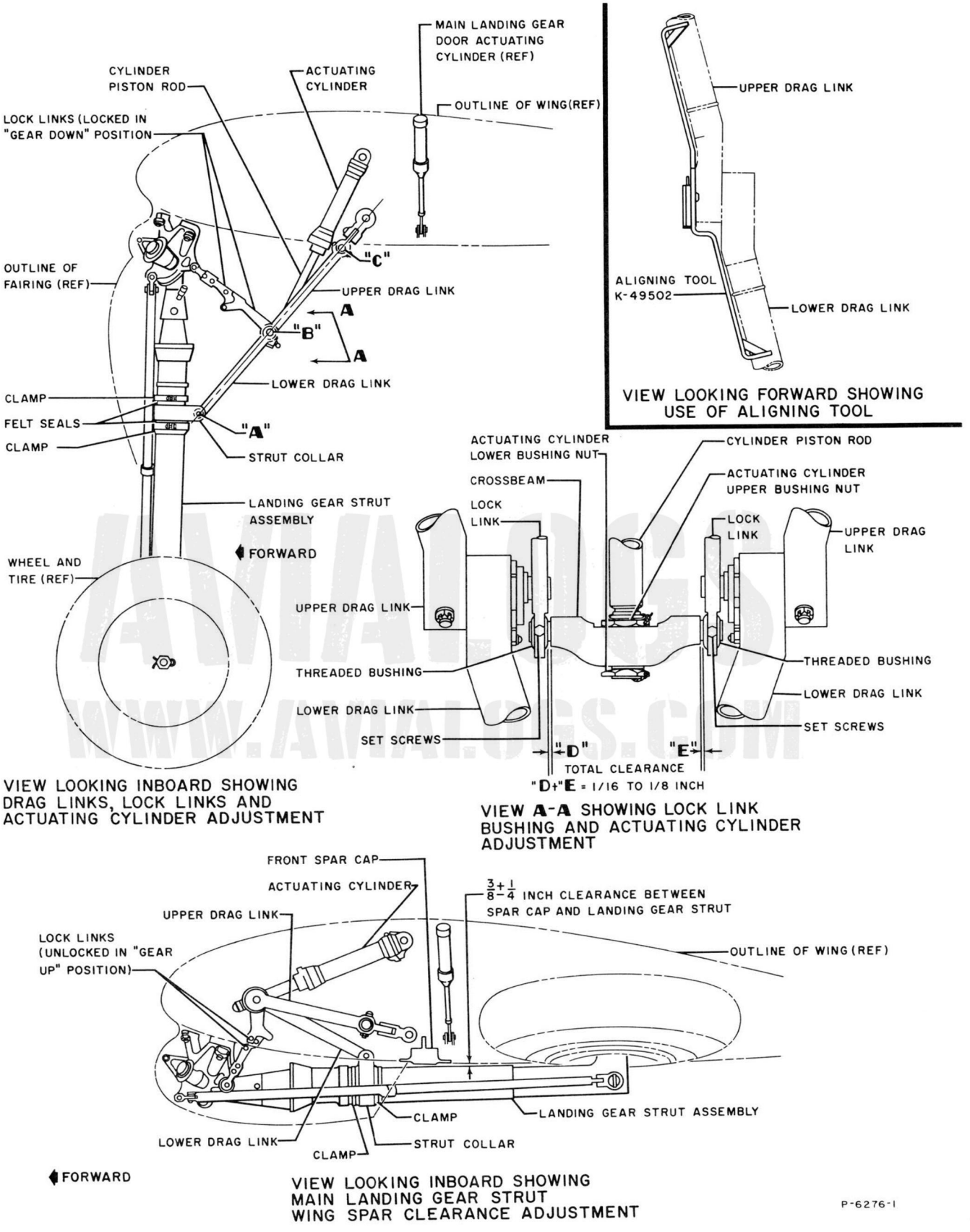


Figure 2–50. Main Landing Gear Adjustment (Sheet 2)

2-370. MAIN LANDING GEAR ACTUATING LINKAGE.

2-371. DESCRIPTION. (See figure 2-49B.) The main landing gear actuating linkage constitutes the mechanical portion of the system that raises, lowers and pivots the landing gear. Each set of links is operated by movement of the related actuating cylinder piston. Extension of the cylinder piston extends the gear, and retraction of the cylinder piston retracts the gear. Each set of links is operated by movement of the related actuating cylinder piston. Extension of the cylinder piston extends the gear, and retraction of the cylinder piston retracts the gear. The principal components of each actuating linkage include a crossbeam and dual sets of lock links and drag links. (There are no left-hand or right-hand parts. Complete left-hand and right-hand linkages are interchangeable.) Force from the actuating cylinder is transmitted through the crossbeam, to which the cylinder piston is attached, to the lock links mounted on the center pins of the drag links, which are, in turn, connected to the torque collar on the shock strut. The actuating linkage is furnished as a unit and no attempt should be made to disassemble the unit for replacement of integral parts.

2-372. REMOVAL. (See figure 2-49B.)

a. Jack airplane at wing to relieve load on landing gear.

b. Disconnect strut fairing from main pin at torque collar, or remove fairing from gear.

c. Disconnect actuating cylinder piston from crossbeam.

d. Remove lock switch from lock link.

e. Disconnect lock links from strut attaching fitting.

f. Disconnect lower drag links from torque collar on strut.

g. Disconnect upper drag links from attaching fittings. (Unless damaged, upper drag link attaching fittings should be left installed on spar supports.)

NOTE

Wear of the 0.9375-inch diameter hole in the upper end (part number 4254833) of the main landing gear drag link assembly (part number 3254724) is acceptable up to a maximum diameter of 0.943-inch. Holes exceeding 0.943-inch diameter shall be bushed with a QP1600SC-15AA63 bushing. The minimum acceptable diameter due to uniform wear on the shank of the main landing gear drag link attaching bolt (part number 2255398) shall be 0.932-inch. Bolts with a shank diameter of less than 0.932-inch are not acceptable.

2-373. INSTALLATION. (See figure 2-49B.)

a. Bolt upper drag links to attaching fittings on spar supports.

b. Align lower drag links with torque collar on strut and install main pin. Do not install washers and nuts until linkage has been adjusted.

c. Fasten lock links to strut attaching fitting.

d. Adjust lower lock link bearings so that links operate freely. With both lock links on center, adjust as shown on figure 2-51.

e. Connect actuating cylinder piston to crossbeam and preload linkage (figure 2-50).

f. Make gear-down adjustment. (See figure 2-50.)

g. Lubricate all grease fittings. (Refer to section I.)

h. Before operating landing gear with newly installed linkage, check gear-up adjustment. (See figure 2-50.)

2-374. MAIN LANDING GEAR STRUT TELESCOPING MECHANISM.

2-375. DESCRIPTION. (See figure 2-49B.) A telescoping mechanism causes partial compression of each shock strut so that the gear can be retracted within the limits of the wheel well. The mechanism comprises a piston within a barrel, and is fastened to the strut attaching fitting and to the strut axle. Extended length of the mechanism is 55-13/32 ±3/16 inches. The minimum operating length is 39 inches.

2-376. REMOVAL. (See figure 2-49B.)

a. Disconnect shock strut fairing at lower attaching points.

b. Disconnect telescoping mechanism piston from towing bolt at axle.

c. Disconnect telescoping mechanism from strut attaching fitting.

2-377. INSTALLATION. (See figure 2-49B.)

a. Connect telescoping mechanism to strut attaching fitting.

b. Connect telescoping mechanism piston to towing bolt at axle.

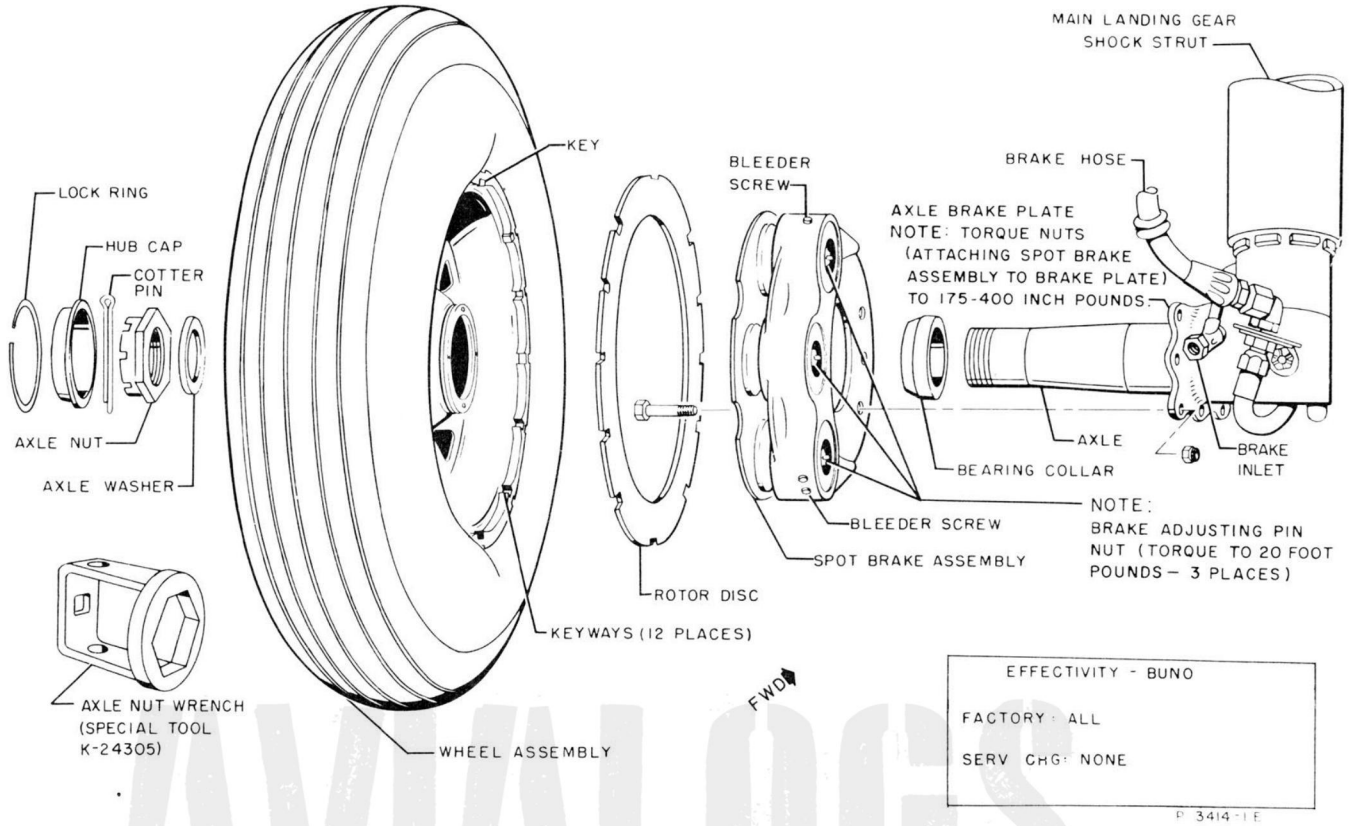
c. Connect strut fairing lower attaching points.

2-378. MAIN LANDING GEAR WHEELS AND BRAKES.

2-379. DESCRIPTION. (See figure 2-51.) The airplane is equipped with 32 x 8.8 inch main wheels and single disc spot brakes. The wheels carry 32 x 8.8 inch, type VII, 12-ply rating, casings (Spec. MIL-C-5041) and regular tubes (Spec. MIL-T-5014) with TR176A valves. The brakes are bolted to the brake plates on the strut axles and the wheels are mounted on the brakes and on the wheel bearing collars. (For wheel brake fires refer to paragraph 1-44B.)

2-380. The main wheel is a drop-center-type aluminum-alloy casting with a removable outboard rim. The axle bore contains inboard and outboard roller bearings. The wheel is statically balanced within 7 inch-ounces. The steel drive ring bolted to the inboard flange of the wheel engages the rotor disc of the spot brake.

2-381. The spot brake consists of an aluminum housing which contains three interconnected, magnesium-alloy "spots" or pistons, and a single chrome-plated steel rotor disc held between two 3/8-inch raybestos



REMOVAL

a. Jack shock strut until wheel is clear of ground.

b. Remove lockring and hub cap, and remove axle nut and washer. Use special tool K-24305 to remove axle and nut.

c. Lift wheel off brake and axle.

d. Disconnect and cap brake hydraulic hose.

e. Remove bolts attaching brake to axle.

INSTALLATION

a. Place spot brake assembly on axle brake plate so that spots are aft.

b. Secure spot brake assembly on axle brake plate with bolts, washers and nuts.

CAUTION

Nuts must be installed on outboard side of axle brake plate and bolts on inboard side closest wheel.

c. Torque nuts and bolts attaching spot brake assembly to axle brake plate to 175-400 inch pounds each and install cotter pin in each attaching bolt.

d. Uncap and connect brake hydraulic hose to brake inlet port.

e. Bleed brake. (Refer to paragraph 2-396.)

f. Grease wheel bearings (Spec. MIL-G-3545). Install wheel on axle, guiding rotor disc to engage drive ring.

g. Install axle washer and nut. Using special tool (K-24305), rotate wheel slowly and tighten nut until wheel frictional rotation binds slightly; back nut off to nearest cotter pin hole in axle and install cotter pin.

h. Place hub cap in position on wheel and secure in place with lock ring.

CAUTION

When main landing gear wheel is replaced, or during overhaul, MS35337-42 lockwashers must be placed under inboard bearing closure ring retaining screws. Screws must be sufficiently tightened to prevent backing out and dislodging between brake disk and brake housing assembly.

Figure 2-51. Main Landing Gear Wheel and Brake (Sheet 1)

linings, or brake shoes, housed in each piston cavity. The rotor disc contains 12 keyways which engage the keys on the drive ring of the wheel so that the disc revolves with the wheel. The pistons are held in the housing cavities by individual cylinder heads sealed with O-rings. The brake fluid supply port is located between the middle and upper cavities. Bleeder screws are located at the top of the upper piston cavity and at the bottom of the lower piston cavity.

2-382. The operation of the spot brake assembly is essentially as follows: hydraulic pressure applied through the brake power boost cylinders acts against the spot brake cylinder heads and pistons. The pistons press against the inboard linings, the inboard linings against

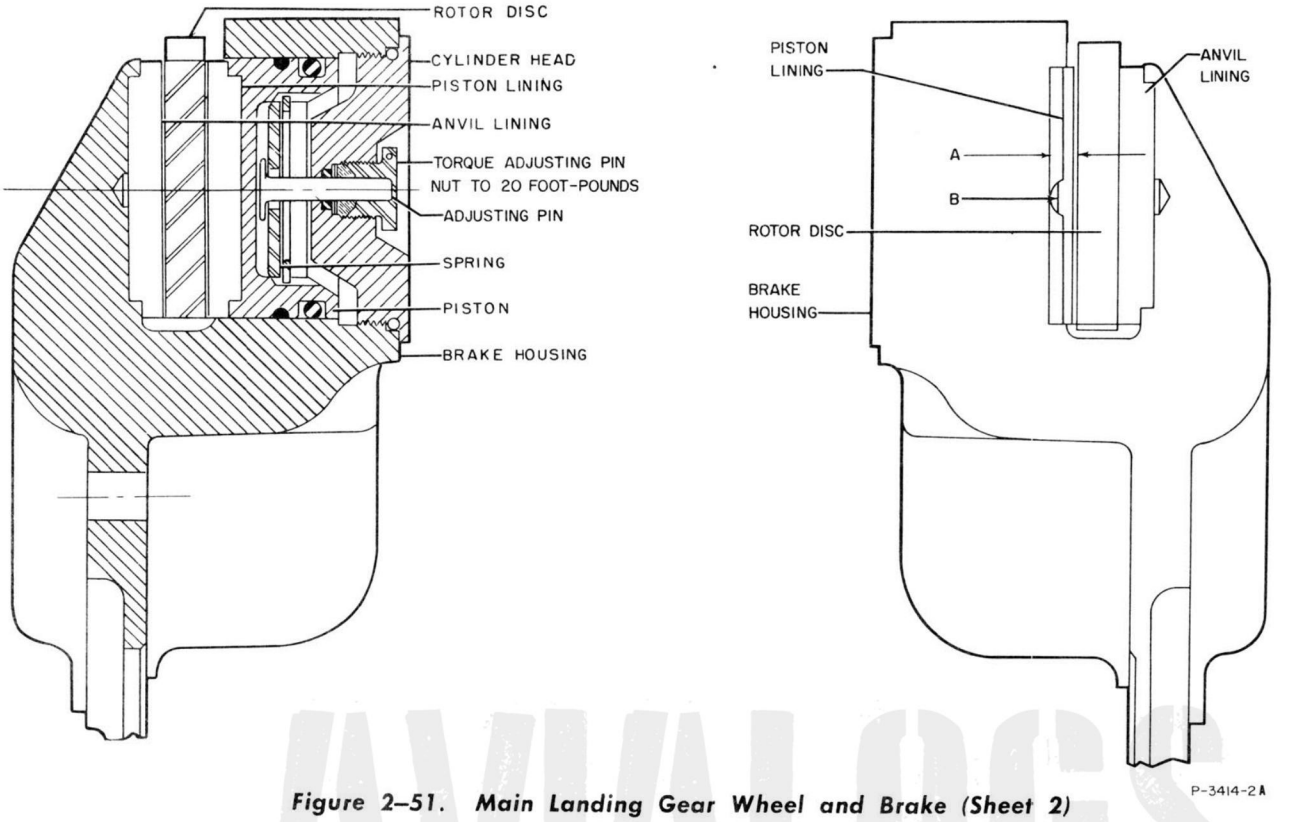


Figure 2–51. Main Landing Gear Wheel and Brake (Sheet 2)

the rotor disc and the disc against the outboard linings, so that equal pressure is exerted on both sides of the disc to retard the revolving speed of the disc, and, consequently, the wheel. When braking pressure is released, two washer-type springs, held in each piston by lock rings, insure full release of the brake.

2–383. As the brake linings wear, brake clearance is automatically adjusted by the action of the springs to maintain correct return distance of the pistons to prevent increased travel of the rudder pedals (by which the wheel brakes are remotely controlled). This characteristic provides continual self-adjustment of the brake as long as the brake lining remains effective.

2–383A. BRAKE LINING REPLACEMENT.

2–383B. Lining wear in the brake assembly can be determined as follows (see figure 2–51):

a. Apply brakes and measure distance A between face of brake disc and flat surface of housing parallel to disc. If this distance is $\frac{3}{8}$ inch or greater, anvil lining is worn below limits and all linings should be replaced.

b. If above dimension (a) is less than $\frac{3}{8}$ inch visually check thickness of piston linings B. If any one is worn to thickness of less than $\frac{1}{16}$ inch, replace all linings.

CAUTION

Brake linings excessively worn must be replaced. Always replace complete set of brake linings in a brake. Never mix new and used linings.

2–383C. REPLACING BRAKE LINING.

a. Jack wheel clear of ground and remove wheel. (See figure 2–51.)

b. Back off brake adjusting nut one-quarter turn, force piston back into brake cavity ("OFF" position).

c. Raise rotating brake disc, remove worn brake linings.

d. Replace with new linings; reinstall disc between linings.

e. Move disc laterally to insure pistons being in complete "OFF" position.

f. Torque brake adjusting nuts. (See figure 2–51.)

Note

Tighten the adjusting nuts to 20 foot-pounds torque, then release the wrench and retighten several times to insure the proper torque. Hold cylinder head while tightening the adjusting nuts.

g. Install wheel. (See figure 2–51.)

h. Apply brakes several times to set adjusting mechanism.

i. With brakes released, check for excessive drag. Wheel should rotate freely. If brakes drag, retorque adjusting nuts.

j. Lower wheel and remove jack.

2–384. REMOVAL. See figure 2–51.

2–385. MINOR REPAIR. A *wheel* is no longer serviceable when the rim or any of the ribs is cracked or broken. Also, cracked or distorted flanges, chipped or broken bearing cups, cracked or broken bearings, and saturated or shrunken grease seals are unserviceable and should be replaced. Corrosion can be remedied if treated in time:

a. If necessary for access to damaged area, dismount tire and tube.

b. Thoroughly clean wheel.

c. When wheel is dry, sand damaged area to bare metal.

d. Apply spray or brush coat of zinc chromate primer (Specification MIL-P-6889) to bare metal.

e. When primer has dried, finish surface with two coats of aluminum varnish or lacquer.

2–386. INSTALLATION. See figure 2–51.

2–387. MAIN LANDING GEAR BRAKE CONTROL SYSTEM.

2–388. DESCRIPTION. (See figure 2–52.) The main landing gear brakes are operated by hydraulic pressure; the brake hydraulic system is a sub-system of the airplane hydraulic system. The brakes are controlled by toe-pressure applied to the rudder pedals and by individual power boost cylinders supplying hydraulic pressure to the pistons in the brake housings. The principal components of the brake system include the following:

Name	*Para Ref*
Brake power boost cylinders	2–391
Spot brakes	2–378

2–389. Should hydraulic system failure occur, braking still is available by exerting approximately twice the normal force on the rudder pedals.

2–390. TROUBLE SHOOTING. Refer to table 2–8.

2–391. MAIN LANDING GEAR BRAKE POWER BOOST CYLINDERS.

2–392. DESCRIPTION. (See figure 2–52.) The brake power boost cylinders are installed between the rudder pedal hanger supports and the brake horn of each related rudder pedal. Each cylinder contains two interconnected chambers. An upper chamber is ported to the hydraulic system pressure and return lines and contains a spring-loaded slide which acts to open and close the system pressure port to the upper chamber. A lower chamber is ported to the brake operating line and houses a power boost piston assembly. When a force is applied to the upper half of the rudder pedal the power boost piston assembly in the cylinder lower chamber is extended and the slide in the upper chamber is moved to a position which allows hydraulic fluid under pressure to flow through the upper chamber to the head of the power boost piston assembly in the lower chamber. Hydraulic system pressure forces the piston assembly down, increasing pressure in the cylinder lower chamber and brake operating line to actuate the main landing gear brake. When the force on the upper half of the rudder pedal is relieved, the power boost piston assembly is retracted into the cylinder by the action of two springs which are installed in the cylinder lower chamber be-

TABLE 2–8. MAIN LANDING GEAR BRAKE CONTROL SYSTEM TROUBLE SHOOTING

Trouble or Symptom	*Probable Cause*	*Correction*
1. Brakes fail to operate.	a. Insufficient hydraulic pressure.	Check system.
	b. Leakage in power boost cylinder.	Replace cylinder.
2. Wheel binds.	a. Axle nut too tight.	See figure 2–52.
	b. Damaged bearings.	Install new bearings or replace wheel.
3. Insufficient braking action.	a. Air in system.	Bleed brakes.
	b. Power boost cylinder out of adjustment.	Refer to paragraph 2–391.
	c. Worn linings.	Replace.
	d. Oil or grease on linings.	Disassemble brake and wash linings in alcohol or carbon tetrachloride.
	e. Leakage around adjustment pin.	Tighten packing nut to 15 ft-lb torque.
	f. Leakage past piston.	Replace piston seals.
4. Brakes drag.	a. Trouble 3.c.	
	b. Internal dirt preventing return of brake pistons.	Disassemble and clean brake. Reline spots.

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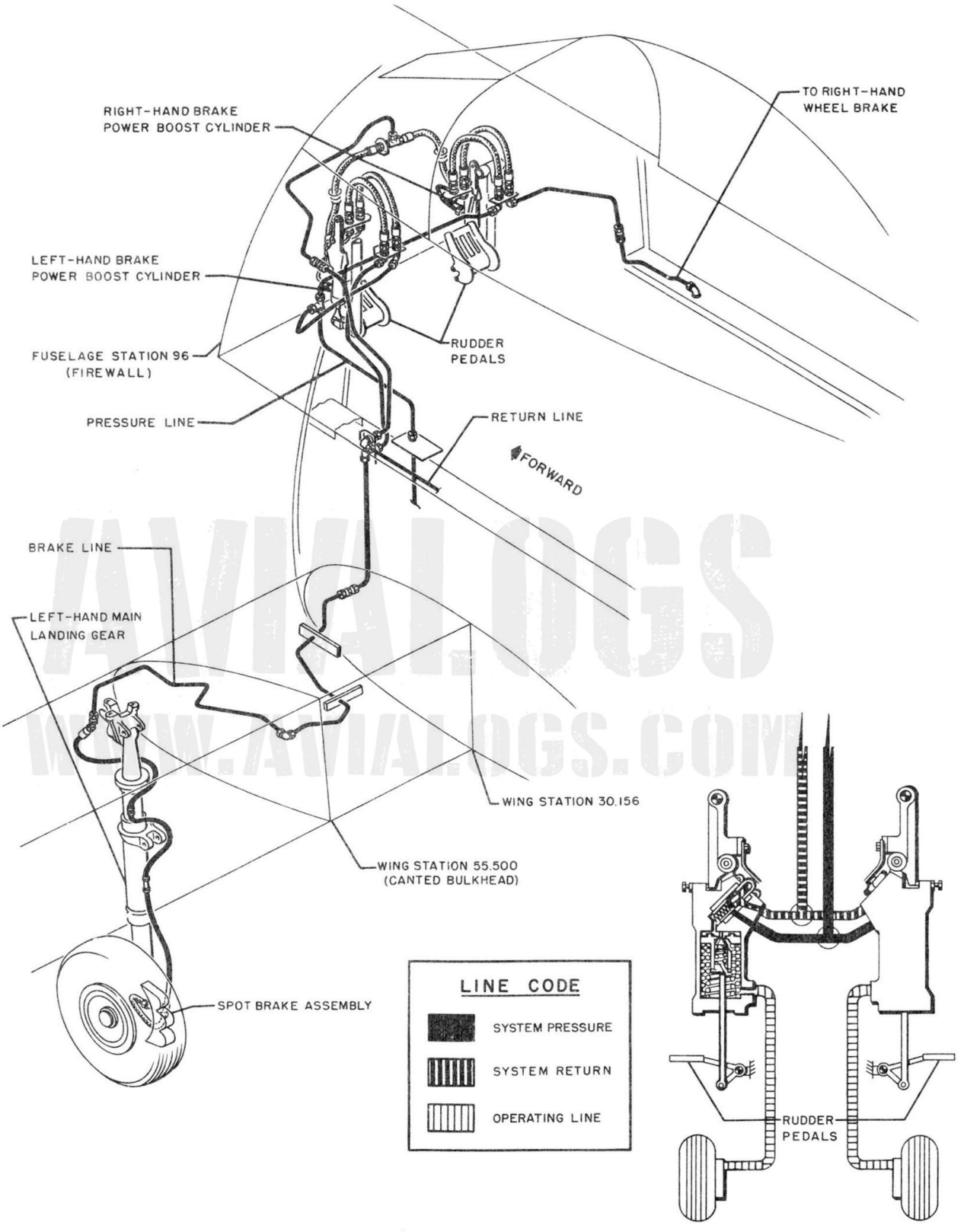

Figure 2–52. Main Landing Gear Brake Control System (Sheet 1)

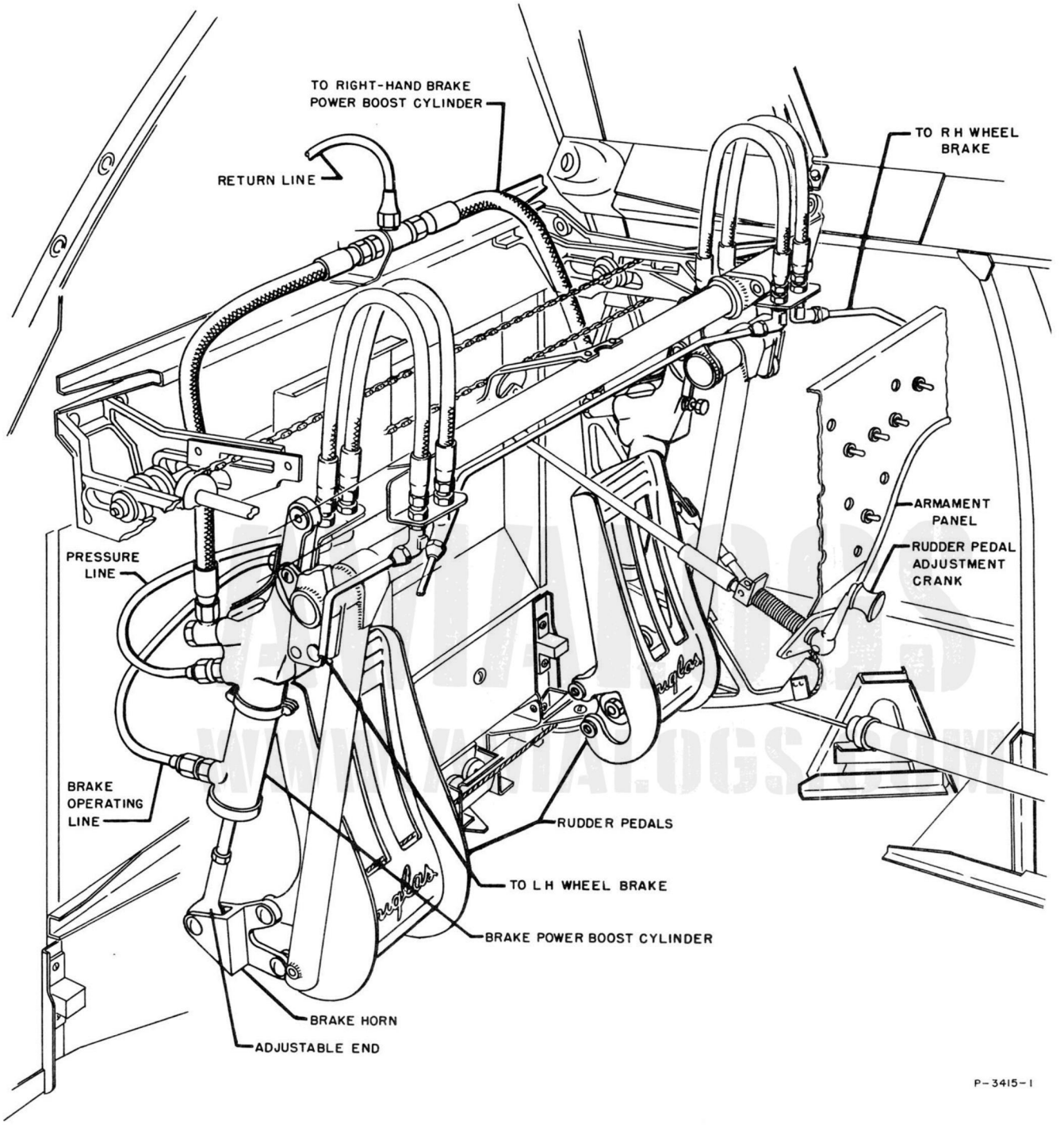

Figure 2–52. Main Landing Gear Brake Control System (Sheet 2)

tween the bottom of the cylinder and the underside of the piston head. The slide in the upper chamber then moves to a position which allows fluid trapped in the lower chamber to escape through the upper chamber to the hydraulic system return line. A poppet in the power boost piston head assembly is unseated allowing fluid pressure in the brake operating line and hydraulic system return line to neutralize, relieving pressure on the brake. The brake is actuated without system pressure by the manual force applied on the power boost piston assembly through the rudder pedals. It is necessary to exert approximately twice the normal force on the rudder pedals to actuate the brake when there is no hydraulic system pressure.

2–393. REMOVAL. (See figure 2–52.)

a. Relieve hydraulic system pressure.

b. Disconnect return spring from cylinder.

c. Disconnect and cap brake hoses at cylinder.

d. Disconnect cylinder end from brake horn on pedal.

e. Remove bolt attaching cylinder to pedal hanger support.

2–394. INSTALLATION. (See figure 2–52.)

a. Bolt cylinder to lug between fore-and-aft arms of pedal hanger support.

b. Connect system pressure line to lower port and system return line to upper port in cylinder head; connect brake operating line to port near bottom of cylinder barrel.

c. Adjust cylinder end and bolt cylinder to brake horn on rudder pedal.

d. Connect return spring to cylinder.

e. Restore hydraulic system pressure.

2–395. DELETED.

2–396. BLEEDING BRAKES.

a. Remove top and bottom bleeder screws from brake housing and install standard bleeder hoses. Submerge free ends of hoses in container of clean hydraulic fluid.

CAUTION

Make certain that hydraulic fluid in container is same type used in airplane hydraulic system.

b. Apply system pressure and operate brake pedal or manually depress slide of related brake power boost cylinder with finger. Full pump flow should pass through brake system.

CAUTION

Do not wedge screwdriver or shims between valve slide and leaf spring when depressing slide on cylinder.

c. After all air has been removed from brake system, replace and tighten lower bleeder screw, then top bleeder screw. Lockwire bleeder screws.

d. Fill hydraulic reservoir to proper fluid level.

2–397. TESTING.

a. Inflate tire in accordance with information given in section I. Check alignment of red stripe on tire and wheel. Stripes must be aligned.

b. Test action of brake pedal and linkage by depressing pedal and noting "snap-back." Eliminate any binding or undue friction in linkage.

2–398. MAIN LANDING GEAR DOORS AND FAIRINGS.

2–399. DESCRIPTION. (See figures 2–53 and 2–54.) Hydraulically operated doors are hinged to the sides of the main gear wheel wells. Fairings are attached to, and move with, the shock struts and cover the upper portions of the struts. When the landing gear is retracted, the fairings are raised with the struts and the doors close to cover the gear completely and fair the bottom surface of the wing. When the gear is operated to extend, the doors open and the fairings move down with the struts. Sequence of operation, to insure that the struts are fully raised before the doors close during retraction of the gear, and that the doors are open before the struts are lowered during extension of the gear, is provided by sequence valves in the landing gear hydraulic control system.

2–400. REMOVAL. (See figures 2–53 and 2–54.)

a. To remove fairings, remove nuts which attach hinge links to main pin in torque collar, and remove bolt which attaches top of fairing to strut attaching fitting.

b. To remove doors, remove bolts which attach door forward hinge to door actuating cylinder and to attaching fitting on structure; then remove door aft hinge bolt.

2–401. INSTALLATION. (See figures 2–53 and 2–54.)

a. To install fairings, bolt fairing to lug on forward face of strut attaching fitting, connect hinge links with main pin in strut torque collar, and adjust fairing (paragraph 2–402) before tightening hinge link nuts.

b. To install doors, align door hinges with hinge fittings on structure and install hinge bolts; adjust door actuating cylinder (paragraph 2–458) and bolt cylinder piston to door fitting.

2–402. ADJUSTMENT. (See figures 2–53 and 2–54.)

a. Support airplane so that landing gear is clear of ground.

b. Retract landing gear and observe clearance between each side of fairing and wing plating.

c. Lower landing gear and adjust eyebolt in each hinge link to close gap between sides of fairing and wing surface.

d. Raise landing gear, check for results of adjustment and, if necessary, repeat steps b and c until fairing fits properly against plating.

e. Lower landing gear and tighten lock nuts on eyebolts, then fasten eyebolts to main pin in torque collar.

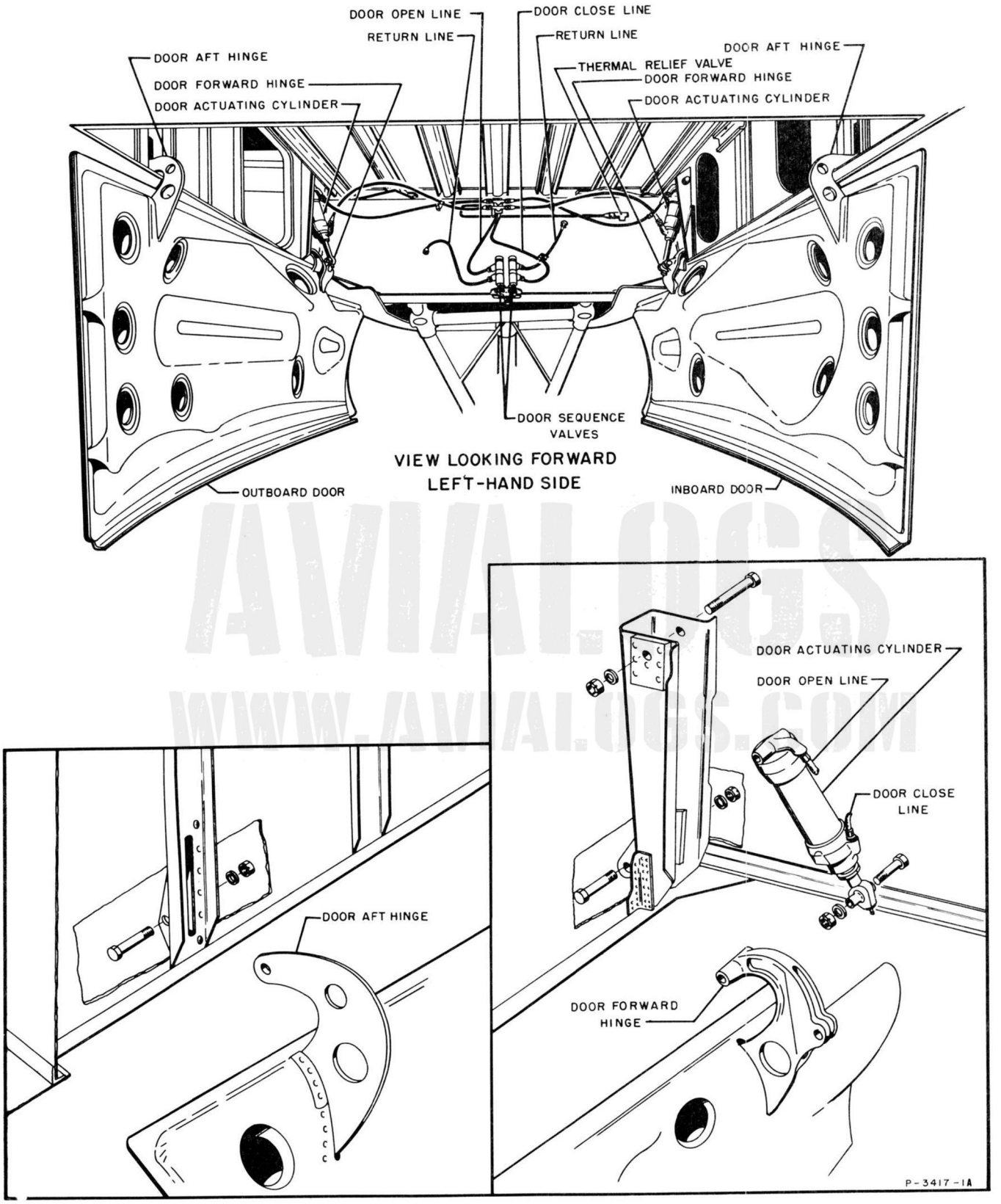

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Figure 2–53. Main Landing Gear Door Installation and Adjustments (Sheet 1)

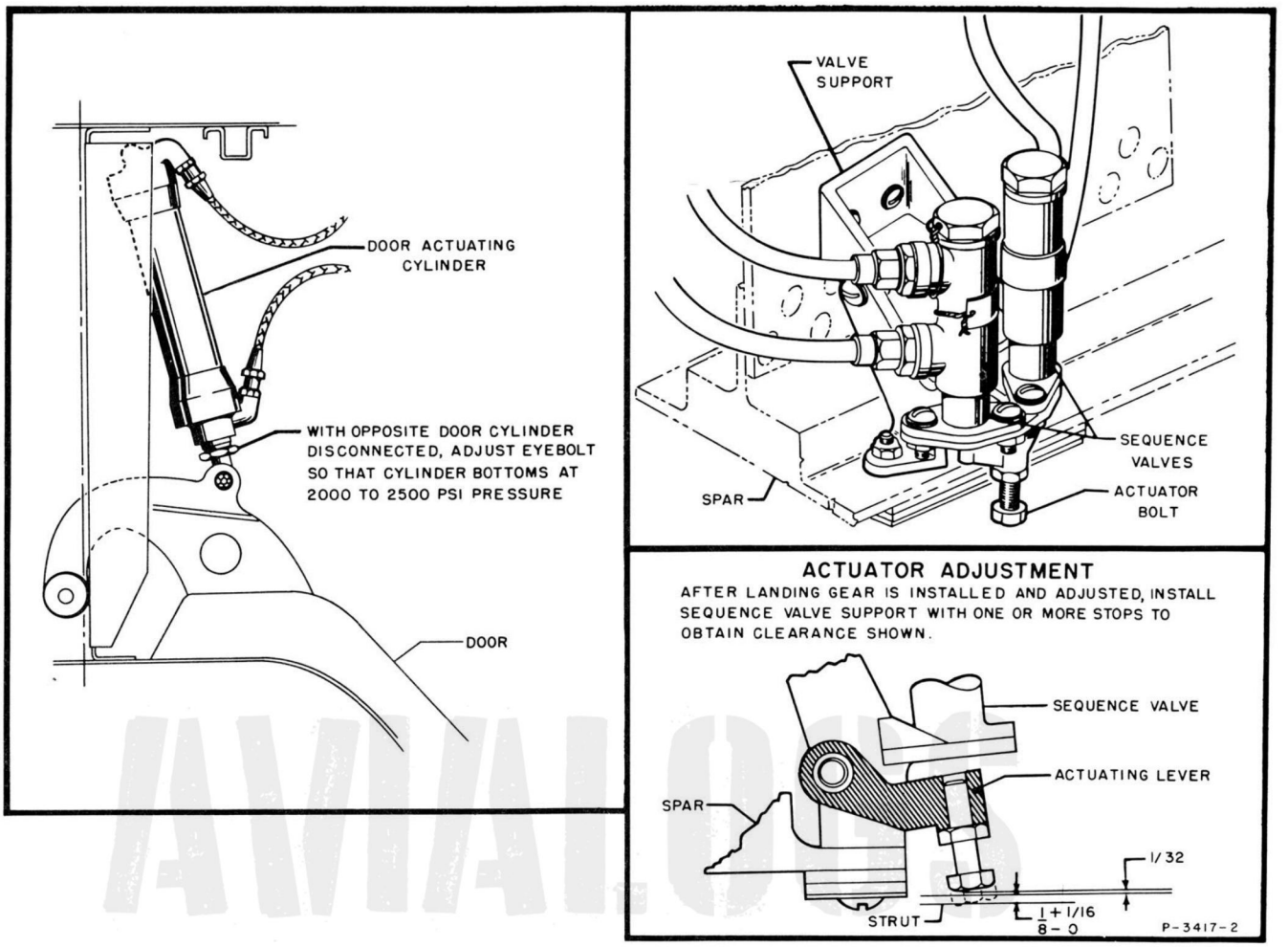

Figure 2–53. Main Landing Gear Door Installation and Adjustments (Sheet 2)

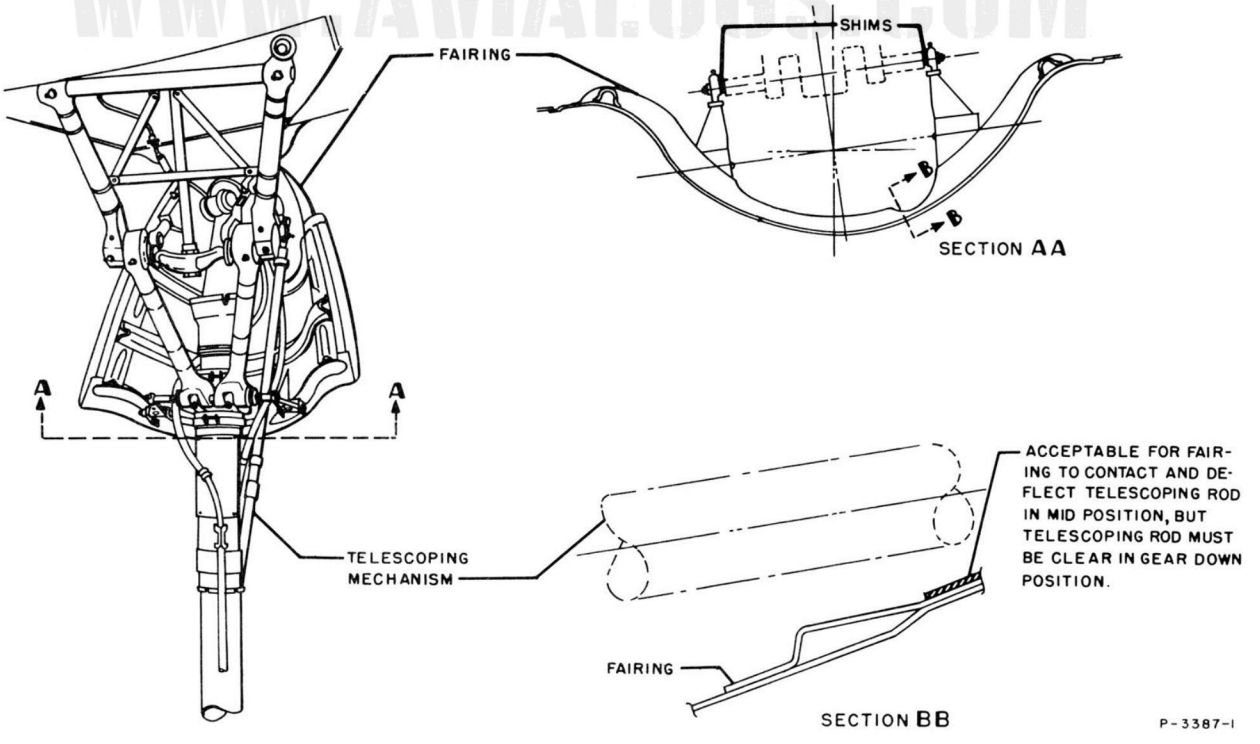

Figure 2–54. Main Landing Gear Fairing Installation and Adjustment

2-403. TAIL LANDING GEAR.

2-404. DESCRIPTION. (See figure 2-55.) The tail landing gear is retractable, non-steerable, but full-castering through a 360-degree range. The tail gear is hydraulically actuated and operates simultaneously with the main landing gear. The tail gear is housed in a well in the fuselage after section just forward of fuselage station 364 bulkhead. The top and sides of the tail-gear well are sheet-aluminum; the bottom of the well is open and a waterproof cotton fabric boot, clamped to the tail gear actuating cylinder, protects the cylinder opening in the housing. The tail landing gear includes the following principal components:

Shock strut	Yoke
Torque link	Wheel, 9-1/2 x 4-3/4, solid
Retracting shaft	Axle

2-405. A centering mechanism and a locking mechanism, which operate to hold the tail wheel in the straight fore-and-aft position, are components of the tail gear shock strut. A position indicating switch is mounted on the supporting structure and is actuated by a special bolt through the left end of the gear retracting shaft to register the full-up and full-down positions of the gear on the landing gear and flap position indicator in the cockpit.

2-406. TAIL GEAR SHOCK STRUT.

2-407. DESCRIPTION. (See figure 2-55.) The tail gear shock strut is pneudraulic. The principal components of the strut include a barrel, a piston and a metering pin. A fluid-and-air filler valve is located at the top of the strut and is accessible from the ground when the gear is extended. The tail wheel centering mechanism and the tail wheel locking mechanism are components of the shock strut.

2-408. TROUBLESHOOTING. Refer to table 2-7.

2-409. REMOVAL. (See figure 2-55.)

a. Support tail of airplane so tail wheel is clear of ground.

b. Relieve hydraulic system pressure.

c. Unlock tail wheel.

d. Detach torque link from strut barrel and detach yoke from strut piston.

e. Remove filler-valve cap and release air slowly by depressing valve core.

f. Detach actuating cylinder piston rod from strut housing.

g. Disconnect locking cable from lock actuator.

h. Remove pin retainer and pin to disengage strut barrel from retracting shaft.

i. Withdraw retracting shaft through hole in fuselage until shaft is clear of strut lugs.

2-409A. INSPECTION. Before installation, inspect the tail gear torque link bearings (2266856) for excessive wear in the area of the grease groove. The diameter in the area of the grease groove (0.934- to 0.936-inch) shall be acceptable at a minimum diameter of 0.932-inch. Bearings showing wear in excess of 0.932-inch diameter shall be sent to Overhaul activities for rework. The two 0.9375-inch diameter holes shall be acceptable up to a maximum diameter of 0.940-inch.

2-410. INSTALLATION. (See figure 2-55.)

a. Position shock strut so retracting shaft attaching lugs are aligned with holes in support and insert shaft through one lug; place lock actuator on shaft so cable attachment extends left and insert shaft through other lug and structure.

b. Using Douglas special tool K-70801, engage shaft end slot and rotate shaft to align retainer-pin hole with hole in strut lug. Insert pin and lock in place by installing pin retainer.

c. Connect actuating cylinder piston rod with forward arms of strut housing.

d. Bolt strut piston to tail wheel yoke. Shim as necessary to provide 0.020 ±0.015-inch accumulated clearance between strut piston and yoke.

e. Bolt torque link to lugs on barrel and to yoke. Spacer between link bearings must be adjusted to provide 0.010 ±0.005-inch total clearance between torque link and bearing flanges.

f. Lower tail of airplane so weight of airplane rests on wheel.

g. Fill fully collapsed strut with clean hydraulic fluid (Spec. MIL-H-5606) until fluid reaches level of filler port.

h. Install, but do not tighten, filler valve.

i. Actuate strut piston several times to expel trapped air.

j. Compress strut fully; check fluid level and add sufficient fluid to bring fluid-level to level of port. (Capacity of strut is approximately 1-3/4 pints.)

k. Tighten air valve and inflate strut with compressed air until strut piston extends 2-15/16 inches from fully collapsed position.

l. Install filler-valve cap to extreme finger tightness.

NOTE

Approximately 650-psi pressure is required to obtain static position noted in step k. Proper inflation is indicated by piston position, not by pressure.

2-411. TESTING. After assembly and installation, strut should be allowed to stand under normal load for one hour. At the end of that time period there should be no loss of fluid or air pressure.

2-412. TAIL WHEEL YOKE.

2-413. DESCRIPTION. (See figure 2-55.) The tail wheel yoke is cast aluminum alloy. The yoke links the tail wheel and the tail gear shock strut by attachment to the strut piston and the torque link. The lower left-hand lug of the yoke is slotted to engage the tail wheel axle.

2-414. REMOVAL. (See figure 2-55.)

a. Support tail of airplane.

b. Remove lockring, nut, and washer from tail wheel axle. Remove axle and tail-wheel.

c. Disconnect yoke from torque link.

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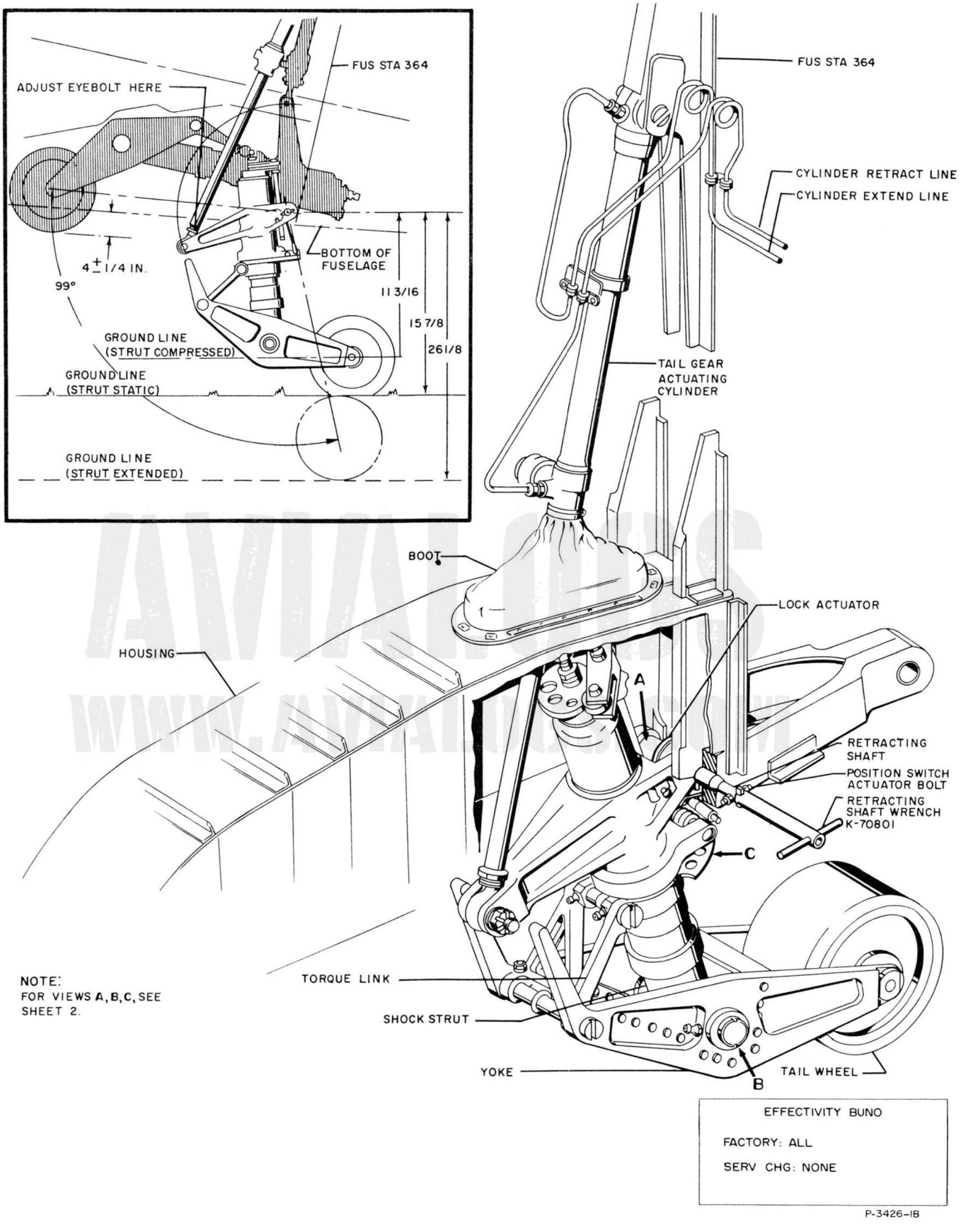


Figure 2–55. Tail Landing Gear Installation (Sheet 1)

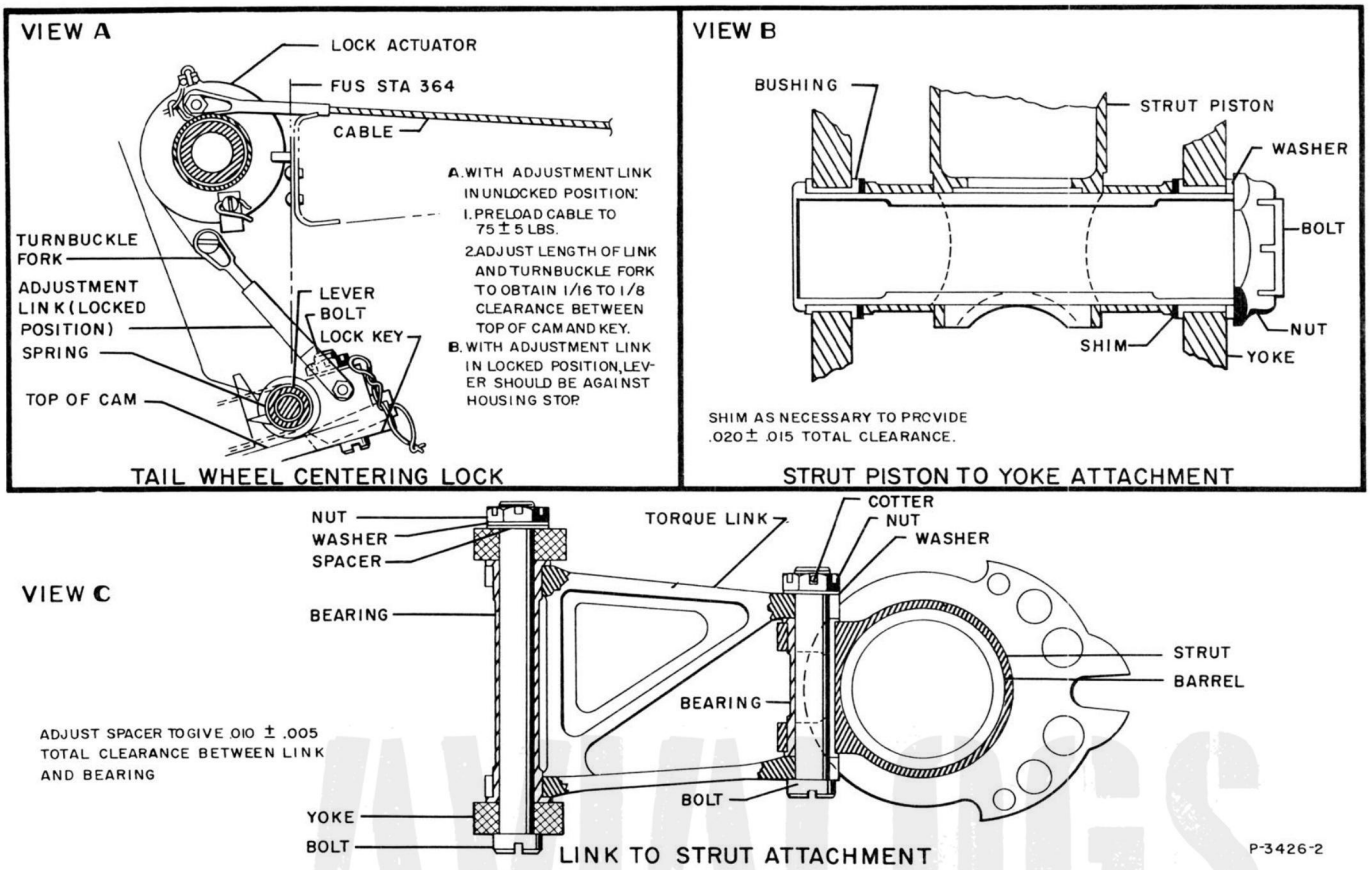


Figure 2–55. Tail Landing Gear Installation (Sheet 2)

d. Disconnect yoke from shock strut piston.

2–415. INSTALLATION. (See figure 2–55.)

a. Support airplane tail sufficiently elevated to obtain 12-inch minimum clearance between bottom of fuselage and ground.

b. Bolt yoke center lugs to shock strut piston.

c. Bolt yoke forward lugs to torque link.

d. Install tail wheel and axle.

2–416. TAIL WHEEL AXLE.

2–417. DESCRIPTION. The tail wheel axle is cadmium-plated steel, heat-treated to a tensile strength of 200,000 to 220,000 psi.

2–418. REMOVAL.

a. Raise and support airplane tail so that tail gear is clear of ground.

b. Remove axle lock ring, axle nut and washer.

c. Pull axle clear of wheel and tail gear yoke.

2–419. INSTALLATION.

a. Support airplane tail sufficiently elevated to obtain 6-inch minimum clearance between tail wheel yoke and ground.

b. Place tail wheel between axle lugs on yoke and insert axle from left to right through yoke lugs and wheel bore. Make certain axle engages slot in yoke left-hand lug.

c. Install washer and axle nut. Tighten nut until tail wheel binds slightly, then back nut off until nearest index hole aligns with hole in axle. Recheck wheel for binding and, if necessary, back nut off to next hole. Install lock ring.

2–420. LANDING GEAR CONTROL SYSTEM.

2–421. DESCRIPTION. (See figure 2–56.) The landing gear—main and tail—is hydraulically operated. Principal components of the landing gear control system include:

Name	*Para Ref*
CONTROL VALVE SECTION:	
Control handle	2–422
Safety circuit	2–429
Control valve	2–436
MAIN GEAR SECTION:	
Actuating cylinders	2–440
Shuttle valves	
Lock valves	2–445
Relief valve	
Door sequence valves	2–449
Door actuating cylinders	2–454
TAIL GEAR SECTION:	
Actuating cylinder	2–459
Wheel-locking control system	2–464

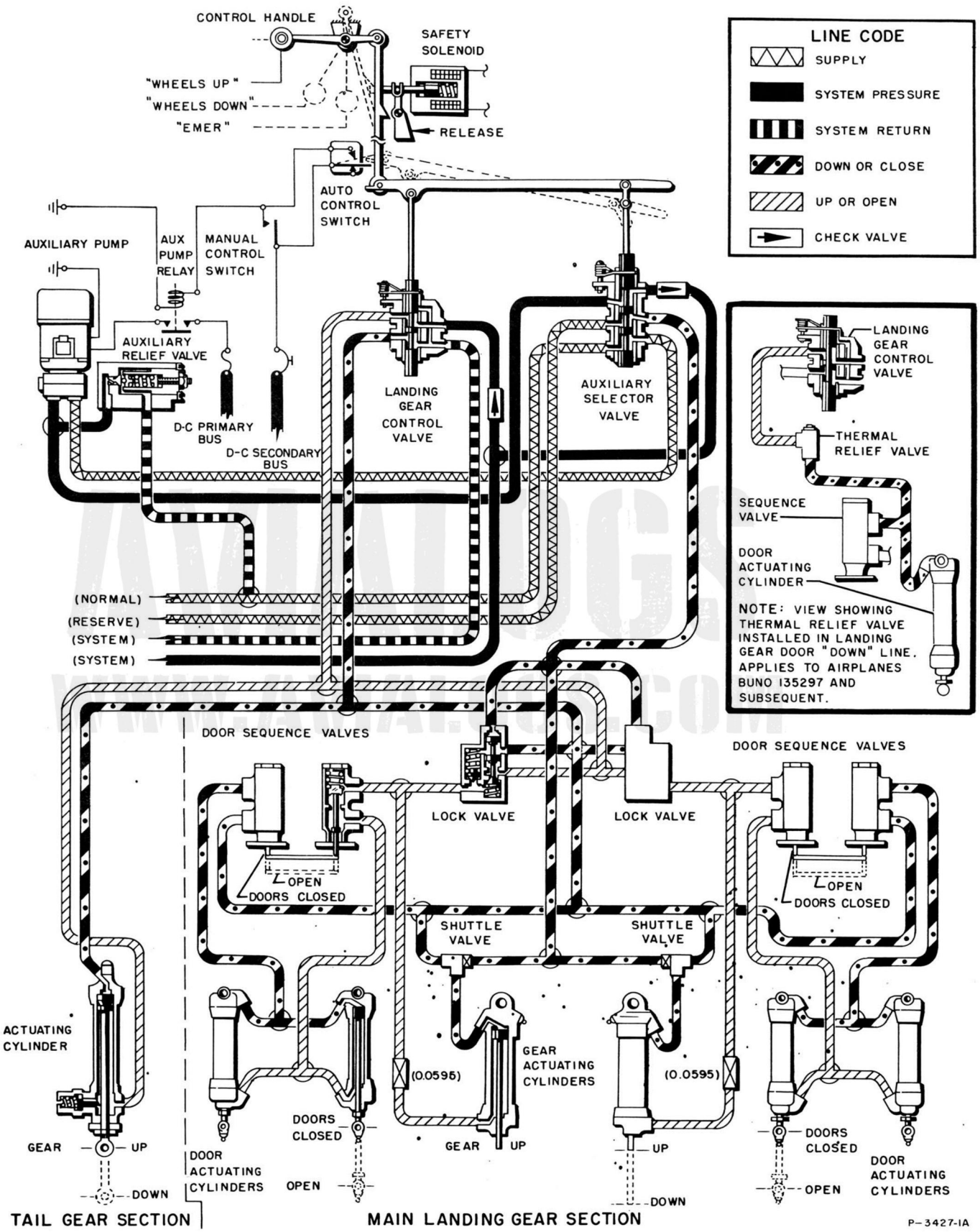


Figure 2–56. Landing Gear Control System Schematic

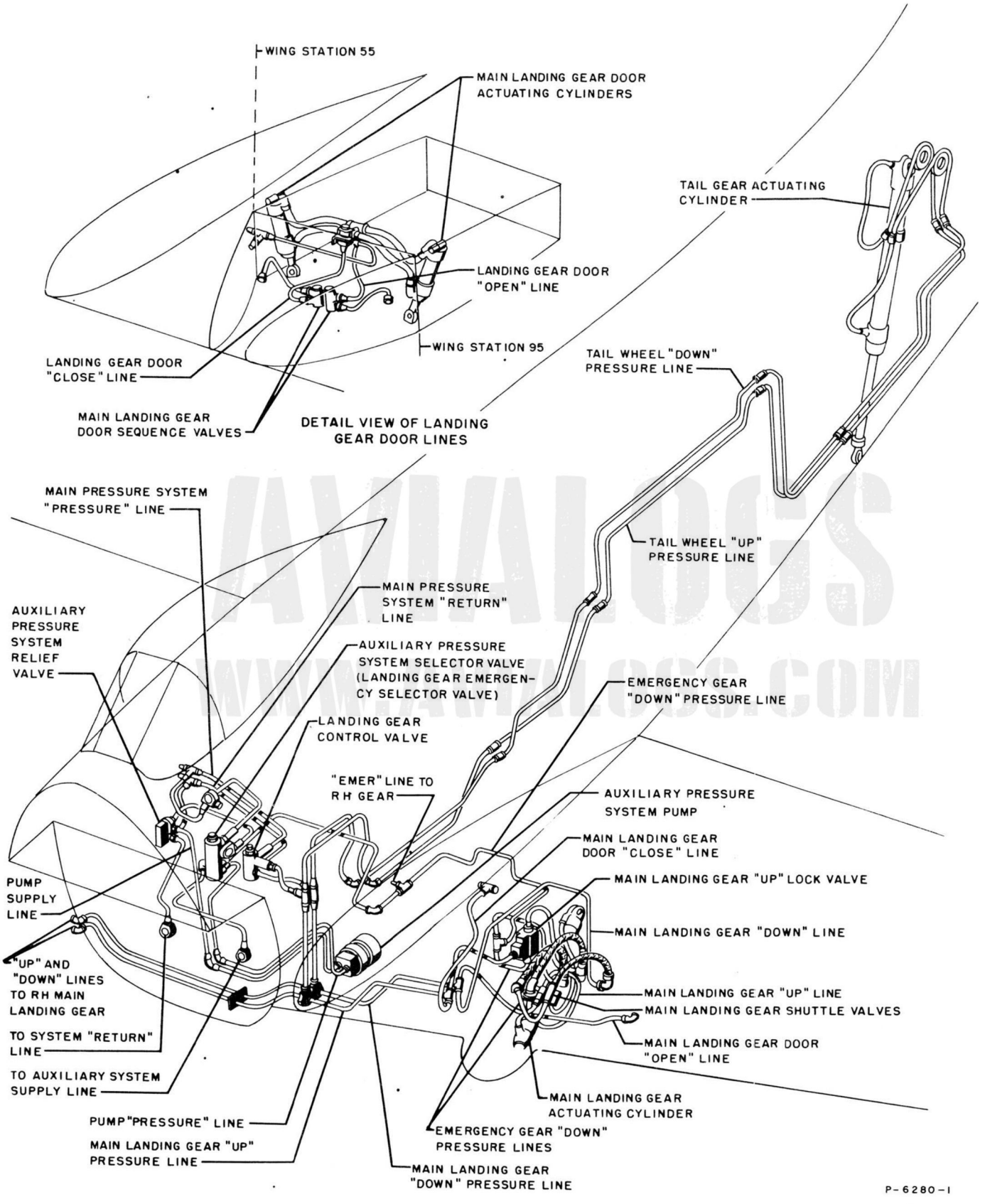


Figure 2–56A. Landing Gear Control System Perspective

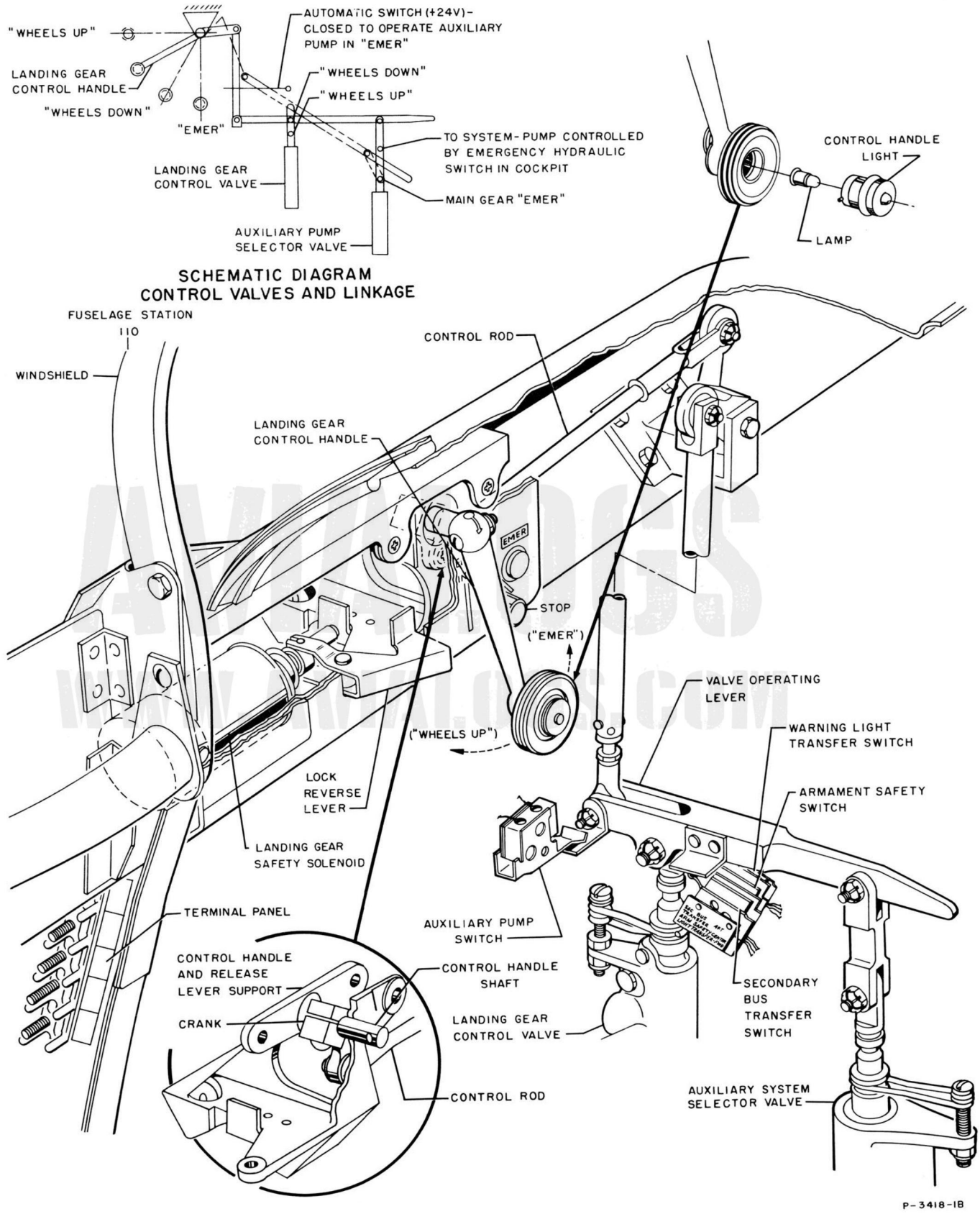
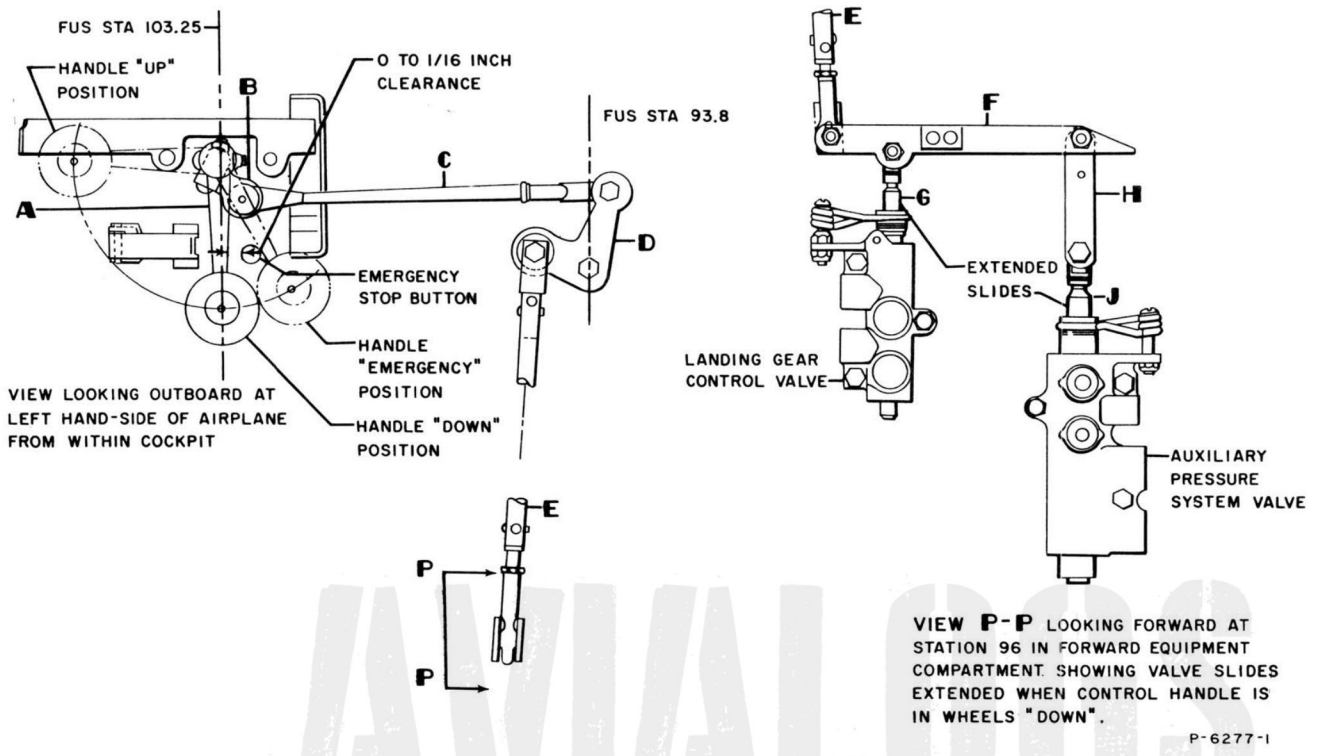


Figure 2–57. Landing Gear Control Handle and Linkage



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1. PRELIMINARY PREPARATIONS

a. Place airplane on jacks. Refer to paragraphs 1–14 and 1–15.

b. Pull hydraulic system relief valve handle up to relieve hydraulic system pressure.

2. LINKAGE ADJUSTMENT

a. Place control handle "A" in WHEELS DOWN and maintain 0 to $\frac{1}{16}$ inch clearance between control handle and emergency stop button.

Note

Control handle in WHEELS DOWN is parallel to fuselage station 103.

b. Adjust push-pull rod "C" to perfect fit between crank "B" and upper attach point of bellcrank "D," with upper attach point of bellcrank "D" positioned $\frac{1}{2}$ inch forward of fuselage station 93.8.

c. Install push-pull rod "C."

d. With landing gear control handle "A" in WHEELS DOWN, place control valve slide "G" in up (extended) detent and auxiliary system valve slide "J" in up (extended) detent.

e. Install lever "F" and link "H" and maintain valve slide positions as indicated in step d.

f. Adjust push-pull rod "E" to perfect fit between lower attach point of bellcrank "D" and valve lever "F," with control handle "A" in WHEELS DOWN and lever "F" positioned as indicated in step e.

g. Install push-pull rod "E."

Note

After completing steps a through g, check clearance between landing gear control handle and emergency stop button. Clearance should be 0 to $\frac{1}{16}$ inch. If handle is preloaded against stop button, readjust push-pull rod "C" to obtain desired clearance.

3. ADJUSTMENT CHECK

a. Place control handle "A" in WHEELS UP and inspect valves. Landing gear control valve slide "G" should be retracted and auxiliary valve slide "J" should be extended.

b. Place control handle "A" in EMERGENCY position. Landing gear control valve slide "G" should be extended and auxiliary valve slide "J" should be retracted.

Figure 2–57A. Main Landing Gear Control Linkage Adjustment

2–422. Operation of the landing gear is controlled by the wheel-shaped handle mounted just below the cockpit left-hand rail. The control handle is connected by linkage to the landing gear control valve and to the auxiliary pump selector valve. Movement of the control handle either to "WHEELS UP" or to "WHEELS DOWN" shifts the landing gear control valve slide to direct hydraulic pressure to the landing gear actuating cylinders and the landing gear door actuating cylinders either to raise or lower the main gear and the tail gear in simultaneous operation. The control valve operating lever is connected also to the auxiliary pump selector valve; placing the control handle in "EMER" causes the operating lever to overtravel and shift the auxiliary pump selector valve slide and, at the same time, operate a limit switch which actuates the hydraulic auxiliary pump to supply reserve pressure to lower the landing gear. A hydraulic lock valve is installed in each main gear *up* line to hold the gear fully retracted in the event of hydraulic system pressure failure.

2–423. A landing gear locked position switch is mounted on each main gear lock linkage. The locked position switches are actuated by the linkage when the landing gear is locked down to indicate the locked positions of the main gear on the landing gear and flap position indicator in the cockpit. A tail gear position and warning light switch, mounted on the tail gear supporting structure and actuated by a bolt installed on the tail gear retracting shaft, indicates the full-up or full-down positions of the tail gear on the landing gear and flap position indicator. An amber warning light in the landing gear control handle is illuminated when the handle is placed in "WHEELS UP" or "WHEELS DOWN," and remains illuminated until the gear is locked in the corresponding position. Refer to section VI for additional information concerning the landing gear and flap position indicator circuit.

2–424. A retraction release switch, clamped to the main gear left-hand shock strut telescoping mechanism, is actuated by compression of the strut to de-energize the landing gear safety solenoid (paragraph 2–432), which prevents inadvertent movement of the control handle to "WHEELS UP" when the airplane is resting on the landing gear.

2–425. The landing gear is designed to extend and retract within maximum periods of 10 seconds and 6 seconds, respectively.

2–426. A cable operated tail wheel-locking control system is described in paragraph 2–464.

2–427. TROUBLE SHOOTING. Refer to table 2–9.

2–428. TESTING.

a. Fill and inflate main and tail gear shock struts. Allow airplane to stand on gear for minimum period of one hour. At end of time period, there should be no loss of fluid or air pressure.

b. Supply external hydraulic pressure.

c. Jack airplane so that wheels are clear of ground.

d. Check landing gear controls as noted in table 2–10.

Note

The control handle lock is solenoid-actuated and is controlled by the retraction release switch on the main landing gear left-hand shock strut. The landing gear control handle is locked in "WHEELS DOWN" until the weight of the airplane is off the main landing gear shock struts.

2–429. LANDING GEAR CONTROL SAFETY CIRCUIT.

2–430. DESCRIPTION. The landing gear control safety circuit is installed in the airplane to prevent inadvertent movement of the landing gear control handle from "WHEELS DOWN" when the airplane is resting on the landing gear. The landing gear control safety circuit is junctioned into the dive brake control safety circuit; the landing gear safety solenoid and the dive brake safety solenoid are actuated identically and simultaneously by the retraction release switch mounted on the main landing gear left-hand shock strut. When the strut is compressed by the weight of the airplane, the retraction release switch is open and the landing gear safety solenoid is de-energized, allowing the spring-loaded solenoid plunger to extend and prevent movement of the landing gear control handle from "WHEELS DOWN" to

TABLE 2–9. LANDING GEAR CONTROL SYSTEM TROUBLE SHOOTING

Trouble or Symptom	*Probable Cause*	*Correction*
1. Gear fails to retract fully or extend fully.	a. Hydraulic failure.	Refer to section III.
	b. Actuating cylinder out of adjustment.	Check adjustments.
	c. Control valve out of adjustment.	Check adjustments.
	d. Mechanical interference.	Check components and system for obstruction.
2. Doors fail to close.	a. Mechanical interference.	Inspect and clean well rim and door hinges.
	b. Door cylinder out of adjustment.	Check adjustments.
	c. Sequence valve out of adjustment.	Check adjustments.
3. Control handle fails to lock in "WHEELS DOWN" when airplane on gear.	a. Safety solenoid failure.	Replace. Refer to electrical trouble shooting in section VII.

TABLE 2–10. LANDING GEAR CONTROL SYSTEM — GROUND TESTING

Control Handle Position	*Tail Wheel Lock Lever Position*	*Gear Position*	*Control Handle Lock Position*	*Gear Position Indicator*	*Control Handle Light*	*Operating Time (Seconds)*
1. "WHEELS DOWN"	Locked	DOWN	Locked	Wheel image shows on tabs	ON (gear down and not locked) OFF (gear down and locked)	4—9 UP to DOWN
2. "WHEELS UP"	Locked	UP	Unlocked	"UP" appears on tabs	ON (gear up and not locked) OFF (gear up and locked)	4—9 DOWN to UP
3. "EMER."	Locked	DOWN (with auxiliary hydraulic pump only)	Locked	Wheel image shows on tabs	ON (gear down and not locked) OFF (gear down and locked)	

"WHEELS UP." When the airplane is airborne, extension of the strut causes the retraction release switch to close the circuit, energizing the solenoid to retract the plunger; the control handle can then be moved to "WHEELS UP." A release lever, aft of the control handle, provides manual disengagement of the solenoid plunger when necessary for ground servicing of the landing gear. The circuit receives power from the secondary bus through a 5-ampere circuit breaker.

2–431. TROUBLE SHOOTING. Refer to procedures for electrical trouble shooting in section VII of this manual.

2–432. LANDING GEAR SAFETY SOLENOID.

2–433. DESCRIPTION. (See figure 2–57.) The landing gear safety solenoid is mounted just aft of the landing gear control handle in the cockpit, and is actuated by the retraction release switch on the main landing gear left-hand shock strut. The landing gear safety solenoid is interchangeable with the dive brake safety solenoid.

2–434. REMOVAL. (See figure 2–57.)

a. Remove landing gear control handle and panel.

b. Remove release lever pivot pin and disengage lever from solenoid plunger.

c. Remove four solenoid mounting bolts.

d. Disconnect electrical wiring from solenoid terminals.

2–435. INSTALLATION. (See figure 2–57.)

a. Connect wiring to solenoid terminals. (Refer to wiring diagram in section X.)

b. Place solenoid in position and install and safety-wire four mounting bolts.

c. Engage release lever slots with solenoid plunger and install lever pivot pin.

d. Install landing gear control panel and control handle.

2–436. LANDING GEAR CONTROL VALVE.

2–437. DESCRIPTION. (See figure 2–58.) The landing gear control valve is installed on the after face of fuselage station 96 (firewall), just below the cockpit floor and outboard of the auxiliary pump selector valve. The landing gear control valve is manually operated by movement of the wheel-shaped control handle mounted just below the cockpit left-hand rail. Linkage from the control handle to the control valve includes an operating lever which is connected to both the control valve slide and the auxiliary selector valve slide. Movement of the control handle to "WHEELS UP" or "WHEELS DOWN" affects only the landing gear control valve, to operate all the landing gear units by normal system pressure. Movement of the control handle to "EMER" causes overtravel of the valve operating lever and shifts the auxiliary pump selector valve to provide reserve pressure to lower the landing gear. The landing gear control valve slide travel is 3/4 inch from the fully retracted ("WHEELS UP") position to the fully extended ("WHEELS DOWN") position.

2–438. REMOVAL. (See figure 2–58.)

a. Relieve hydraulic system pressure by operating wing flaps until hydraulic pressure gage indicates zero.

b. Disconnect valve slide from actuator link.

c. Disconnect and cap four hydraulic lines at valve and plug valve ports.

d. Remove three bolts which attach valve to structure.

2–439. INSTALLATION. (See figure 2–58.)

a. Position valve on firewall with valve slide up and valve ports facing aft and outboard; bolt valve to structure.

b. Uncap and connect four hydraulic lines at valve: landing gear *up* line to upper outboard port; landing

gear *down* line to lower outboard port; system pressure line to upper after port; and system return line to lower after port.

2–440. MAIN LANDING GEAR ACTUATING CYLINDERS.

2–441. DESCRIPTION. (See figure 2–59.) The main landing gear actuating cylinders are bolted to the forward face of the wing spar at approximately left- and right-hand wing stations 75. The threaded piston end of each cylinder is connected to the actuating linkage crossbeam of the related main landing gear by adjustable nuts which are used to preload the cylinder. Extension of the cylinder piston lowers the gear; retraction of the piston raises the gear. Cylinder stroke is $12\frac{27}{32}$ inches.

2–442. REMOVAL. (See figure 2–59.)

a. Relieve hydraulic system pressure by operating wing flaps until hydraulic pressure gage indicates zero.

b. Jack airplane wing adjacent to cylinder which is to be removed; raise wing so that affected landing gear is clear of ground.

c. Remove hydraulic line support bracket on cylinder barrel.

d. Disconnect and cap two hydraulic lines at cylinder and plug cylinder ports.

e. Unscrew lower nut from piston rod end and manually retract rod clear of actuating linkage crossbeam.

f. Disconnect cylinder head from attaching fitting on wing spar.

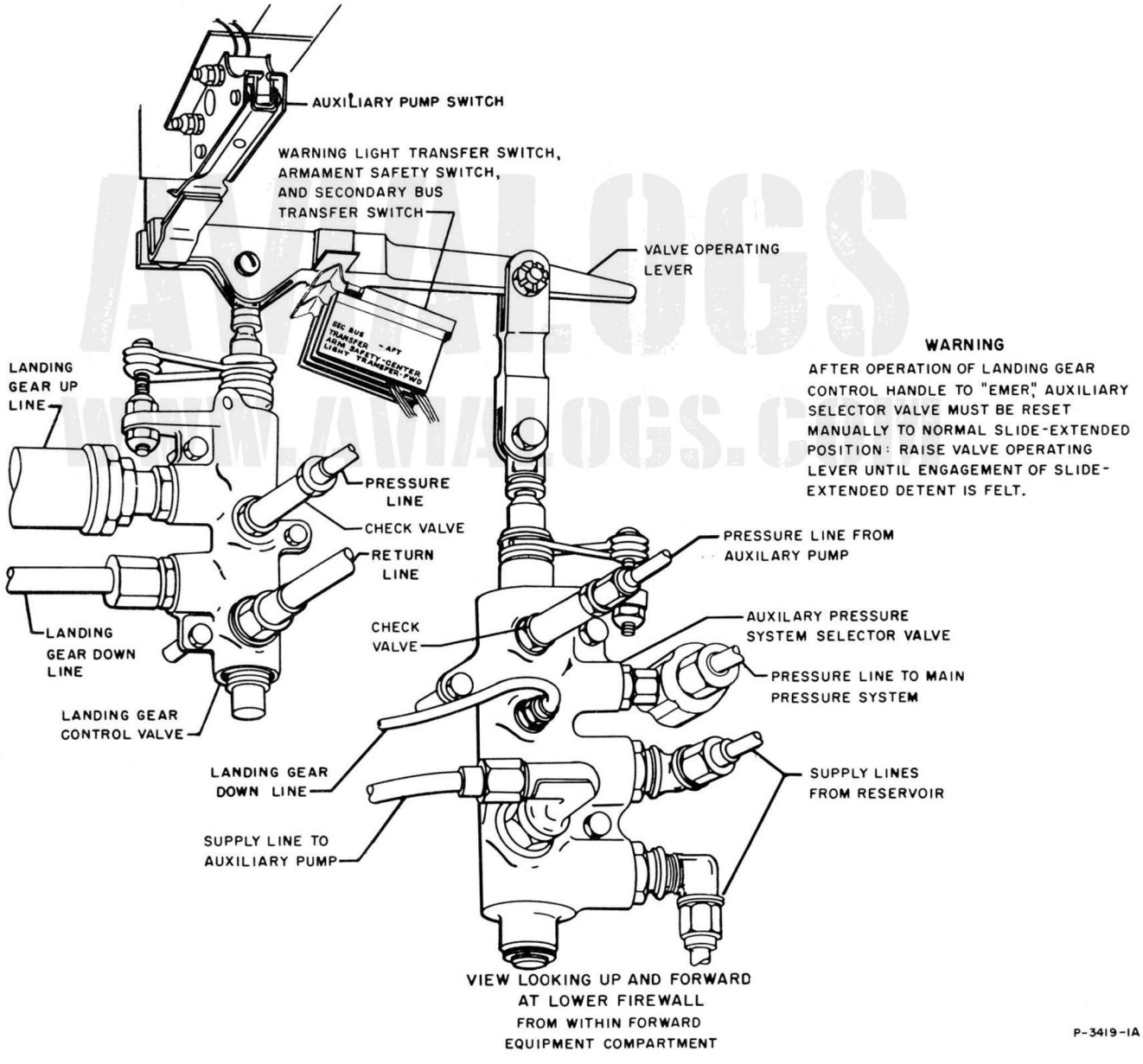

Figure 2–58. Landing Gear Control Valve and Auxiliary System Selector Valve Installation

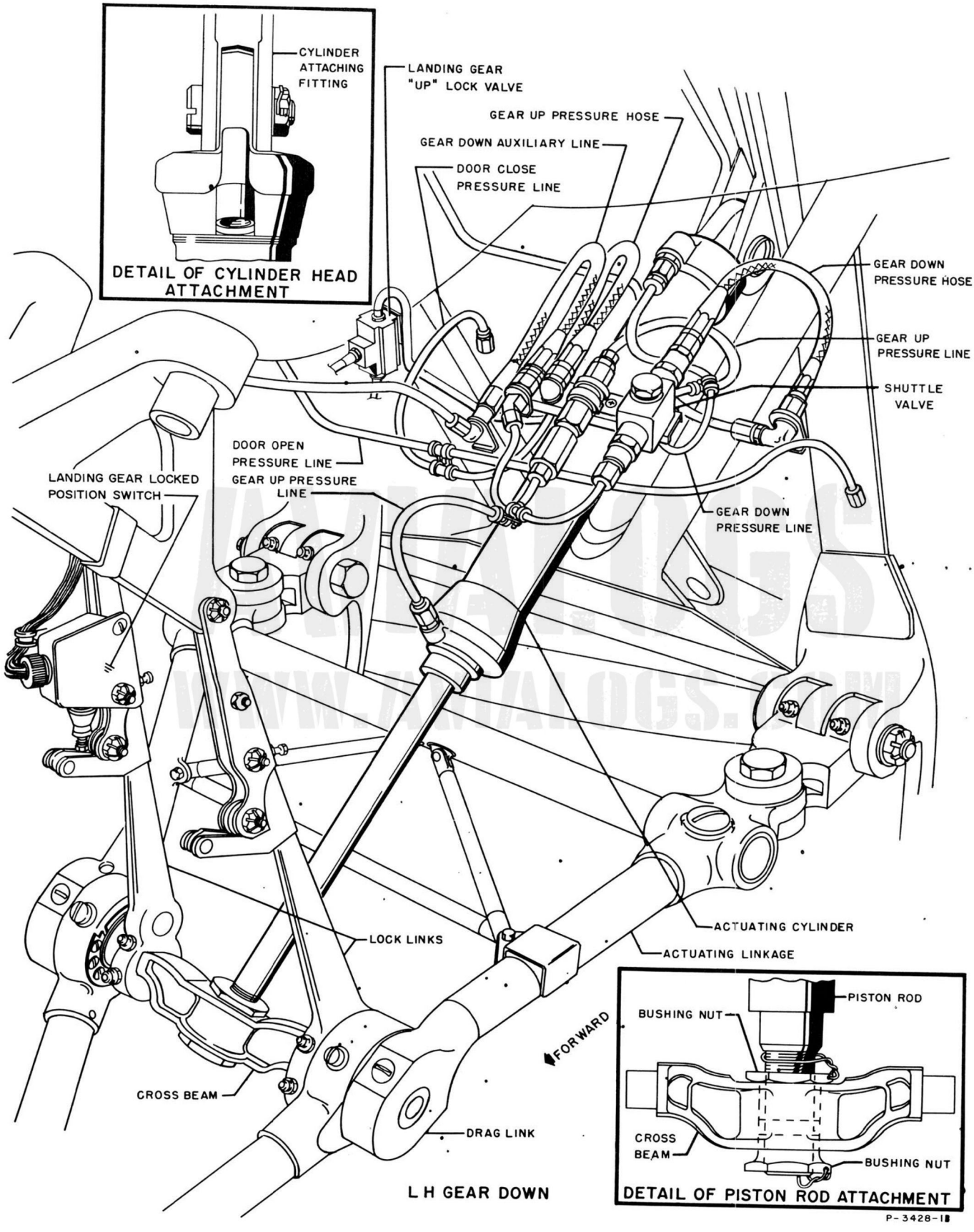

Figure 2–59. Main Landing Gear Actuating Cylinder and Up-Lock Valve Installation

2–443. INSTALLATION. (See figure 2–59.)

a. Using required spacers, bolt cylinder head to attaching fitting on wing spar in landing gear forward wheel well.

b. Uncap and connect two hydraulic lines at cylinder.

c. Fasten hydraulic lines support bracket to cylinder barrel.

d. Connect cylinder piston rod to actuating linkage crossbeam and preload cylinder. (See figure 2–54.)

2–444. ADJUSTMENT. See figure 2–54.

2–445. MAIN LANDING GEAR LOCK VALVES.

2–446. DESCRIPTION. (See figure 2–56.) A hydraulic lock valve is installed in each main gear *up* line to hold the gear fully retracted if pressure failure in the hydraulic system should occur. When hydraulic pressure is applied to retract the gear, the landing gear lock valves trap the pressure fluid in the piston end of the main landing gear actuating cylinders to maintain full *up* pressure until full *down* pressure is applied at the head end of the actuating cylinders. The lock valves are installed in each main gear wheel well and are mounted on the forward face of the wing spar just outboard of wing station 55.500 canted bulkhead.

2–447. REMOVAL. (See figure 2–56.)

a. Relieve hydraulic system pressure.

b. Disconnect and cap four hydraulic lines at valve.

c. Remove three bolts attaching valve to wing spar.

2–448. INSTALLATION. (See figure 2–56.)

a. In main gear wheel well position valve on forward face of wing spar and install three attaching bolts.

b. Uncap and connect four hydraulic lines at valve.

c. Restore hydraulic system pressure.

2–449. MAIN LANDING GEAR DOOR SEQUENCE VALVES.

2–450. DESCRIPTION. (See figure 2–56.) Two sequence valves are mounted on the spar at the forward end of each wheel well. One valve is installed in the door *open* line and the other in the door *close* line, in each case between the landing gear control valve and the main landing gear door actuating cylinders. The valves are actuated by the main gear shock struts. The valves are closed when the landing gear is extended and remain closed until the main gear is fully retracted. When the sequence valve in the door *open* line is closed (doors open and gear extended), hydraulic fluid in the head ends of the door actuating cylinders is prevented from returning and the doors are held open against air loads. At the same time, the valve in the door *close* line serves as a standby; in case of failure of the other valve, it prevents door *close* pressure from entering the piston end of the door actuating cylinders. The landing gear door sequence valves are interchangeable with the wing-locking sequence valves.

2–451. REMOVAL. (See figure 2–56.)

a. Relieve hydraulic system pressure.

b. To remove valves only, disconnect and cap two hydraulic lines at each valve and plug valve ports; then remove two bolts which attach each valve to valve support.

c. To remove valve support, remove four bolts which attach support to spar cap and fitting on spar web.

2–452. INSTALLATION. (See figure 2–56.)

a. After landing gear is installed and adjusted, bolt valve support to fitting on spar web. Stops as required must be installed under spar cap to provide $\frac{1}{8} + \frac{1}{16}/-0$ inch clearance between bottom of stop and head of valve actuator bolt after door sequence valves have been adjusted. (Refer to paragraph 2–453.)

b. Position valves on support so that valve plungers project through holes in support and bolt each valve to support.

c. Uncap and connect two hydraulic lines at each valve: system lines to outboard valve lower port and to inboard valve upper port; door *down* line to outboard valve upper port and door *up* line to inboard valve lower port.

2–453. ADJUSTMENT. (See figure 2–52.)

a. Support complete airplane on jacks so that landing gear is clear of ground.

b. Disconnect one main landing gear door actuating cylinder.

c. Install $\frac{1}{16}$-inch shims on bottom of front spar as required to obtain clearance of $\frac{1}{8} + \frac{1}{16}/-0$ between shock strut in up position and bottom of shims with 3000 psi applied to system and with one door closed.

d. Relieve system pressure with landing gear down. Raise sequence valve actuating lever to limit of travel. Adjust actuating bolt so that bottom surface of shims on spar projects $\frac{1}{32}$ inch beyond lowest point of bolt.

e. Connect door actuating cylinders, restore system pressure, raise landing gear and check operation of doors.

2–454. MAIN LANDING GEAR DOOR ACTUATING CYLINDERS.

2–455. DESCRIPTION. (See figure 2–52.) Each main landing gear door is actuated by a hydraulic cylinder mounted to wing structure and connected to the door forward hinge. Extension of the cylinder pistons opens the doors as the gear is lowered. Retraction of the cylinder pistons, which closes the doors, is delayed by sequence valves so that the doors do not close until the gear is fully retracted into the wheel wells.

2–456. REMOVAL. (See figure 2–52.)

a. Relieve hydraulic system pressure.

b. Disconnect and cap two hydraulic lines at cylinder and plug cylinder ports.

c. Remove bolts attaching cylinder head to structure and cylinder piston to door hinge.

2–457. INSTALLATION. (See figure 2–52.)

a. Bolt cylinder head to structure.

b. Adjust cylinder piston (paragraph 2–458) and bolt piston to door hinge.

c. Uncap and connect two hydraulic lines at cylinder: door *open* line to cylinder upper port, and door *close* line to cylinder lower port.

2–458. ADJUSTMENT. (See figure 2–52.)

a. To adjust any one cylinder, leave opposite door cylinder disconnected.

b. Apply 2000 to 2500 psi pressure to retract and bottom cylinder piston.

c. Adjust piston eyebolt so that holes in end block align with door hinge when door is closed and faired.

d. Extend piston, tighten lock nut and complete installation (paragraph 2–457) when both door cylinders have been adjusted.

2–458A. MAIN LANDING GEAR DOOR THERMAL RELIEF VALVE.

2–458B. DESCRIPTION. A thermal relief valve is installed in the main landing gear door "down" pressure line on airplanes BuNo. 135297-135406, 137492-137632, 139606-139821, and 142010-142081. The valve relieves excessive pressure in the door "down" pressure line caused by thermal expansion of fluid trapped in the line and is set to open at 3900 psi pressure.

2–459. TAIL GEAR ACTUATING CYLINDER.

2–460. DESCRIPTION. (See figure 2–55.) The tail gear actuating cylinder is installed on the forward face of fuselage station 364 bulkhead. The cylinder head is bolted to a bracket on the bulkhead structure and the cylinder piston rod eyebolt is fastened to the forward arms of the tail gear shock strut housing. Placing the landing gear control handle in "WHEELS DOWN" directs hydraulic pressure to extend the tail gear actuating cylinder piston rod, which forces the tail gear to move downward and aft as the retracting shaft to which the tail gear shock strut is attached pivots in the support structure. When the cylinder piston reaches the fully extended position, a spring-loaded lock piston in the offset chamber at the lower end of the cylinder barrel extends and engages a shoulder on the cylinder piston. By holding the cylinder extended, the mechanical lock prevents possible retraction of the tail gear as a result of landing impact. The lock remains in the extended, or "lock," position as long as the control handle is in "WHEELS DOWN." When the control handle is placed in "WHEELS UP," hydraulic pressure first releases the lock piston, and then retracts the cylinder piston to move the tail gear upward and forward into the tail gear well. No lock is provided to hold the tail gear retracted. The tail gear cylinder has the following dimensions: extended length, $44\frac{29}{32}$ inches; compressed length, $26\frac{5}{16}$ inches; stroke, $18.281 + 0.144/-0.091$.

2–461. REMOVAL. (See figure 2–55.)

a. Jack airplane tail.

b. Relieve hydraulic system pressure.

c. Remove hydraulic line supporting clamp from actuating cylinder barrel.

d. Disconnect and cap two hydraulic lines at cylinder and plug cylinder ports.

e. Unbolt cylinder piston from shock strut housing forward arms.

f. Unbolt cylinder head from bracket.

2–462. INSTALLATION. (See figure 2–55.)

a. Bolt cylinder head to bracket on forward face of fuselage station 364 bulkhead.

b. Uncap and connect two hydraulic lines at cylinder: tail gear *down* line to cylinder upper port and tail gear *up* line to cylinder lower port.

c. Install hydraulic line supporting clamp on cylinder barrel.

d. Adjust cylinder for gear up position and bolt cylinder piston to shock strut housing forward arms.

2–463. ADJUSTMENT. See figure 2–55.

2–464. TAIL WHEEL-LOCKING CONTROL SYSTEM.

2–465. DESCRIPTION. (See figure 2–60.) The tail wheel is centered, locked and unlocked by mechanisms which are components of the tail wheel shock strut. The tail wheel-locking mechanism is operated by a cable control system and the tail wheel lock control lever in the cockpit left-hand control panel. The centering mechanism is not controllable.

2–466. The centering mechanism consists of a spring assembly which forces a roller against a cam mounted on top of the shock strut inner cylinder, causing the wheel to caster to the trailing position.

2–467. The locking mechanism can be controlled either to unlock the tail wheel and allow 360-degree castering of the wheel, or, in conjunction with the action of the centering mechanism, to lock the tail wheel in the trailing position. When the tail wheel lock control lever in the cockpit is placed in "UNLOCK," the cable moves the lock actuator to pull the locking lever upward against the action of the torsion springs and disengages the key from the slot in the strut barrel flange, permitting full castering of the wheel. When the lock control lever is placed in "LOCK," the torsion springs force the lock lever downward so that when the centering mechanism pivots the wheel to the trailing position, the key drops into the slot in the strut barrel flange, and the wheel is held in the trailing position.

2–468. TROUBLE SHOOTING. Refer to table 2–11.

2–469. REMOVAL. (See figure 2–60.)

a. To remove locking mechanism from strut: disconnect lock actuator connecting arm from locking lever and remove bolt which attaches lever to strut housing.

b. To remove locking controls: disconnect after control cable from lock actuator and from turnbuckle aft of fuselage station 364, and, through forward equipment compartment, disconnect forward control cable from control lever link.

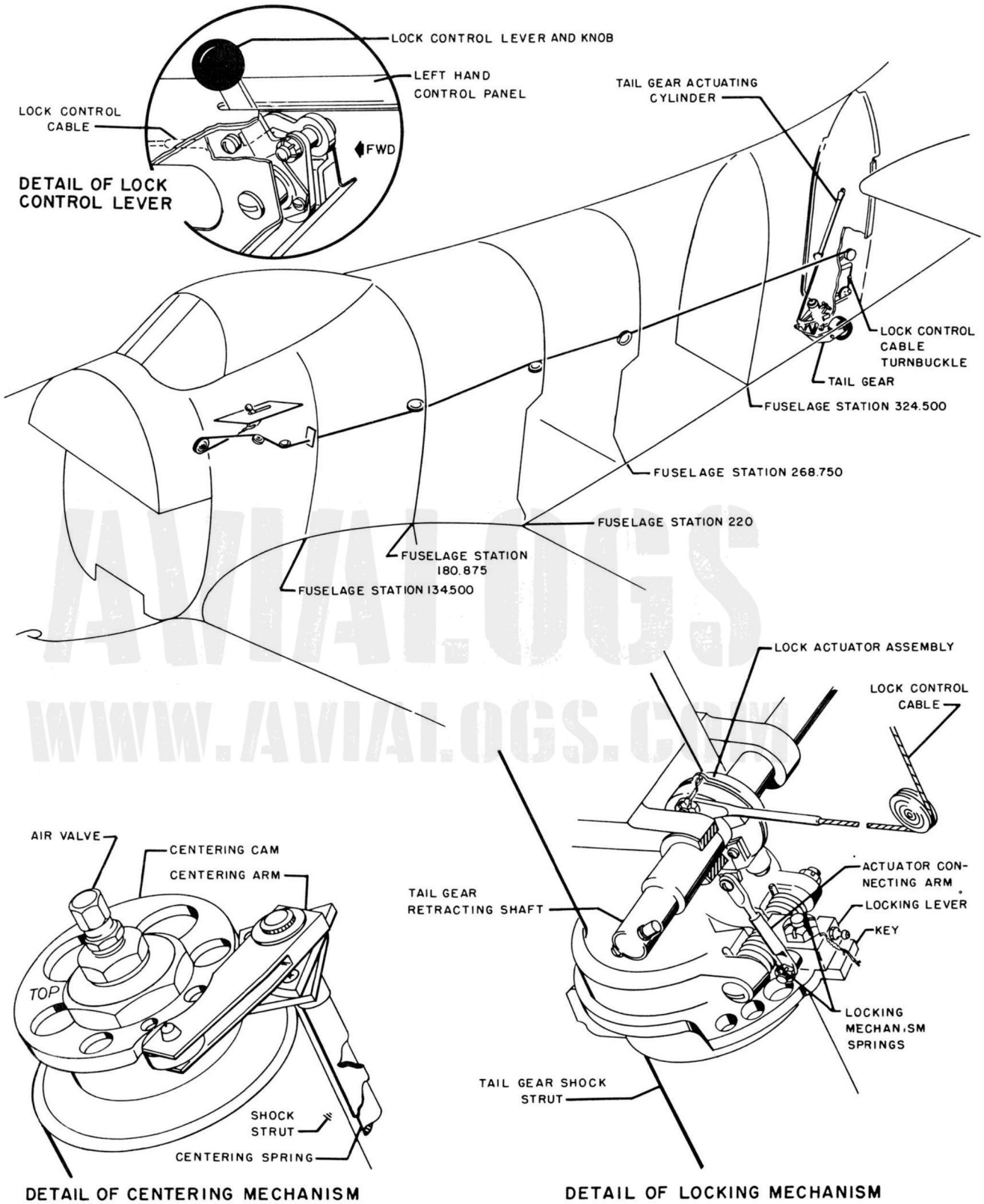

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Figure 2–60. Tail Wheel-Locking Control

TABLE 2–11. TAIL WHEEL-LOCKING CONTROL SYSTEM TROUBLE SHOOTING

Trouble or Symptom	*Probable Cause*	*Correction*
1. Wheel fails to lock.	a. Obstruction in: (1) Actuator. (2) Torsion spring. (3) Locking slot.	Remove obstruction.
	b. Cable off pulley.	Check cable routing.
	c. Torsion spring weak or broken.	Replace.
	d. Broken cable or connection.	Replace or repair.
	e. Locking key bolt sheared.	Replace.
2. Wheel fails to unlock.	a. Trouble 1.a., b., and d.	
	b. Broken actuator.	Install new actuator.

c. To remove control lever: first remove knob, then remove bolt which fastens lever to panel and lower lever through panel slot.

2–470. MINOR REPAIR. Repair of the centering mechanism usually requires removal and overhaul of the tail wheel shock strut. In the locking mechanism, the torsion springs, if weakened, and the lock actuator, if damaged, require replacement. The control cables of the tail wheel-locking control system should be treated in the same manner as other control cables in the airplane.

2–471. INSTALLATION. (See figure 2–60.)

a. To install locking mechanism on strut: insert lever attaching bolt through bearing, strut housing lugs, locking lever, and springs (arranged so that free ends of springs bear against strut housing) and install washer and nut; then connect lock actuator connecting arm to lever pin.

b. To install locking controls: connect after control cable to lock actuator and to turnbuckle aft of fuselage station 364, and, through forward equipment compartment, connect forward control cable to control lever link.

c. To install control lever: assemble control lever by bolting link between lever arms, and, through forward equipment compartment, insert lever through panel slot and bolt lever bearing to structure; fasten control lever knob to lever.

2–472. ADJUSTMENT. (See figure 2–55.)

2–473. TESTING. Operation of the tail wheel-locking control system can be tested most satisfactorily when the tail of the airplane is raised so that the tail wheel is clear of the ground.

a. Place control lever in "UNLOCK": locking mechanism key should disengage from slot in strut barrel flange and wheel should have 360-degree castering.

b. By hand, rotate tail wheel from trailing position: from any position of wheel, centering mechanism should immediately return wheel to trailing position.

c. Place control lever in "LOCK": locking mechanism key should engage slot in strut barrel flange and tail wheel should be locked in trailing position.

2–474. ARRESTING GEAR.

2–475. DESCRIPTION. (See figure 2–61.) The arresting gear consists of a retractable hook and the hydraulic and mechanical equipment necessary to control the hook for use during carrier landings. The hook is mechanically extended and hydraulically retracted.

2–476. ARRESTING HOOK.

2–477. DESCRIPTION. (See figure 2–61.) The arresting hook, consisting of a replaceable point on a steel shank, is attached to structure by a forged fitting at fuselage station 376.5. The hook is controlled directly by a retracting and hold-down cylinder, to which it is attached, and remotely by the arresting hook control lever in the cockpit. The lever actuates hydraulic control of the retracting and hold-down cylinder and cable control of the hook-releasing system. The catapult hold-back fitting, mounted immediately below the hook, is assembled with the hook.

2–478. REMOVAL. (See figure 2–61.)

a. Lower hook.

b. Remove fairing aft of hook attachment point.

c. Disconnect retracting and hold-down cylinder piston eyebolt from hook attach fitting.

d. Support hook and remove hinge pin. Use Douglas Special Tool No. K-71002.

2–479. INSTALLATION. (See figure 2–61.)

a. Align hook attach fitting to structure and use Douglas Special Tool No. K-71002 to install hinge pin.

b. Connect retracting and hold-down cylinder piston eyebolt to hook attach fitting.

2–480. ARRESTING HOOK CONTROL SYSTEM.

2–481. DESCRIPTION. (See figure 2–62.) The arresting hook control system is a semi-mechanical, hydraulic system. It is controlled from the cockpit by a hook-shaped control lever, located above the right-hand control panel. The mechanical portion of the system actuates a con-

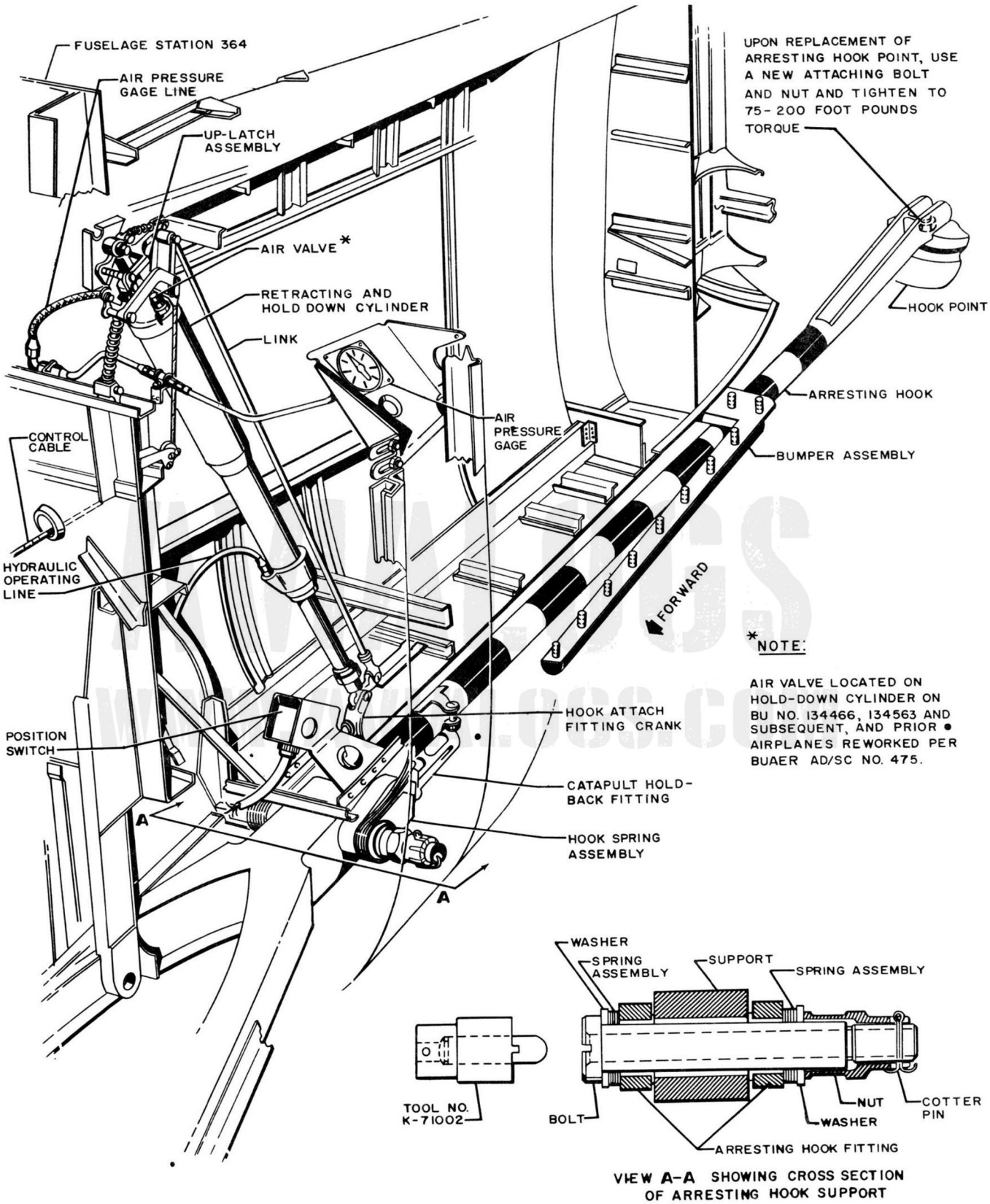


Figure 2–61. Arresting Hook Installation

trol valve in the hydraulic section of the system, controlling hydraulic pressure on the retracting and hold-down cylinder. An up latch assembly aids in holding the arresting hook in the retracted (up) position, and is mechanically actuated by means of a control cable. The system hydraulic section retracts the arresting hook when the control lever is placed in "HOOK UP," and also assists in holding the arresting hook in the retracted position. Principal components of the arresting hook control system include:

Name	*Para Ref*
Arresting hook control lever and push-pull linkage	2–485
Arresting hook release cable and up-latch assembly	2–491
Arresting hook control valve	2–493
Arresting hook retracting and hold-down cylinder	2–499

2–482. The retracting and hold-down cylinder has three principal functions: The lower portion, which contains the retracting chamber, serves to raise the hook assembly; the linkage, attached to each end of the retracting and hold-down cylinder, engages the up-latch assembly as the hook is raised, and assists in locking the hook in the up position; the reservoir, in the top portion of the retracting and hold-down cylinder, contains hydraulic fluid (Specification MIL-O-5606, red) and compressed air (250–270 psi) which serve to force the hook assembly down, when the control lever is moved to the "HOOK DOWN" position, and hold the hook point against the carrier deck during arrested landings.

2–483. TROUBLE SHOOTING. Refer to table 2–12.

2–484. ADJUSTMENT. See figure 2–62A.

2–485. ARRESTING HOOK CONTROL LEVER AND PUSH-PULL LINKAGE.

2–486. DESCRIPTION. (See figure 2–62.) The arresting hook control lever is mechanically connected by a crank and a rod to a bellcrank at fuselage station 95. The bellcrank is mutual to the mechanical and hydraulic sections of the control system. A push-pull tube extends downward from the bellcrank at station 95 to a bellcrank on the cockpit floor. The up-latch assembly control cable connects to the opposite end of the floor bellcrank. A second push-pull tube extends forward from station 95 bellcrank, through fuselage station 78 firewall, and connects with the slide linkage of the arresting hook control valve. The arresting hook control lever has two indicated positions, "HOOK UP," and "HOOK DOWN." When the control lever is placed in "HOOK DOWN," the push-pull linkage actuates the up-latch assembly control cable to release the up-latch holding the retracting and hold-down cylinder. The retracting and hold-down cylinder extends and lowers the arresting hook. When the control lever is placed in "HOOK UP," push-pull linkage to the control valve actuates the arresting hook control valve to a position which allows hydraulic system pressure to act on the retracting and hold-down cylinder, to retract the cylinder piston rod and raise the arresting hook.

2–487. The arresting hook control lever contains a light assembly. A lamp in the light assembly is illuminated when the control lever is in "HOOK DOWN," and the arresting hook is up.

2–488. An arresting hook warning light switch is actuated by the bellcrank at fuselage station 95, when the arresting hook control lever is placed in "HOOK DOWN." When the arresting hook control lever is in "HOOK DOWN," and the arresting hook is up, the arresting hook warning light circuit is completed through one side of the hook position switch, located on a bracket at fuselage station 376, and through the warning light and arresting hook warning light switch to ground. The hook position switch at fuselage station 376 also serves in the approach light circuit.

2–489. The gun firing circuit safety switches are installed on a bracket adjacent to the arresting hook control lever at fuselage station 104. The switches are actuated by

TABLE 2–12. ARRESTING GEAR CONTROL SYSTEM TROUBLE SHOOTING

Trouble or Symptom	*Probable Cause*	*Correction*
1. Hook fails to extend.	a. Obstruction in controls.	Inspect and clear cable.
	b. Latch improperly adjusted.	Make necessary adjustment.
	c. Incorrect tension in release cable.	See figure 2–21.
	d. No air in retracting and hold-down cylinder reservoir.	Check air gage. If cylinder reservoir does not hold charge, inspect line and cylinder valve for leakage.
2. Hook fails to retract.	a. Insufficient hydraulic pressure.	Check system.
	b. Too much fluid in hold-down cylinder.	Check for proper fluid level in cylinder reservoir and recharge cylinder reservoir with air.
	c. Hold-down cylinder improperly adjusted.	Make necessary adjustments.
3. Hook bounces.	a. Retracting and hold-down cylinder internal poppet spring out of adjustment.	Replace cylinder.
	b. Low fluid level in hold-down cylinder reservoir.	Check cylinder for correct fluid level.

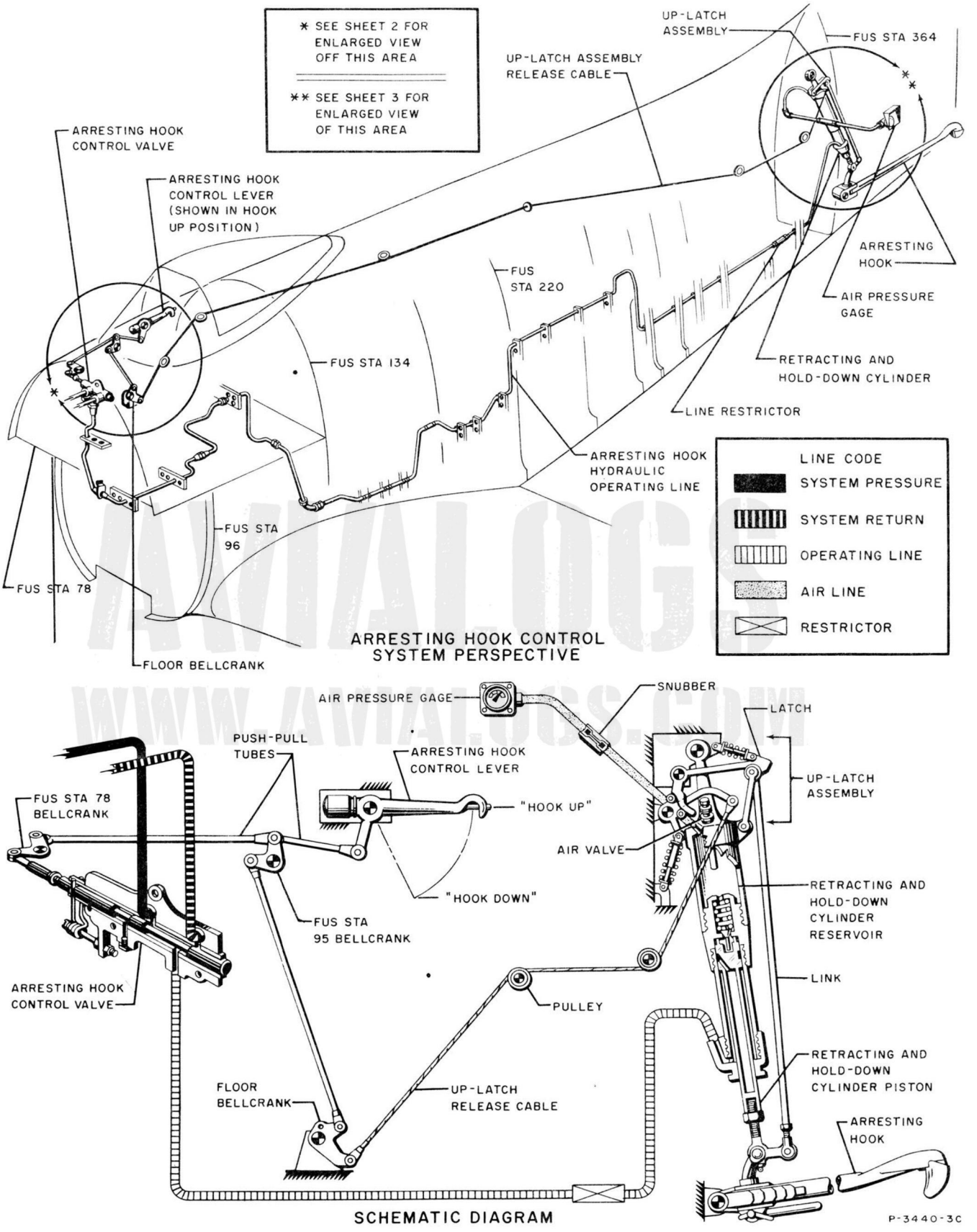


Figure 2–62. Arresting Hook Control System (Sheet 1)

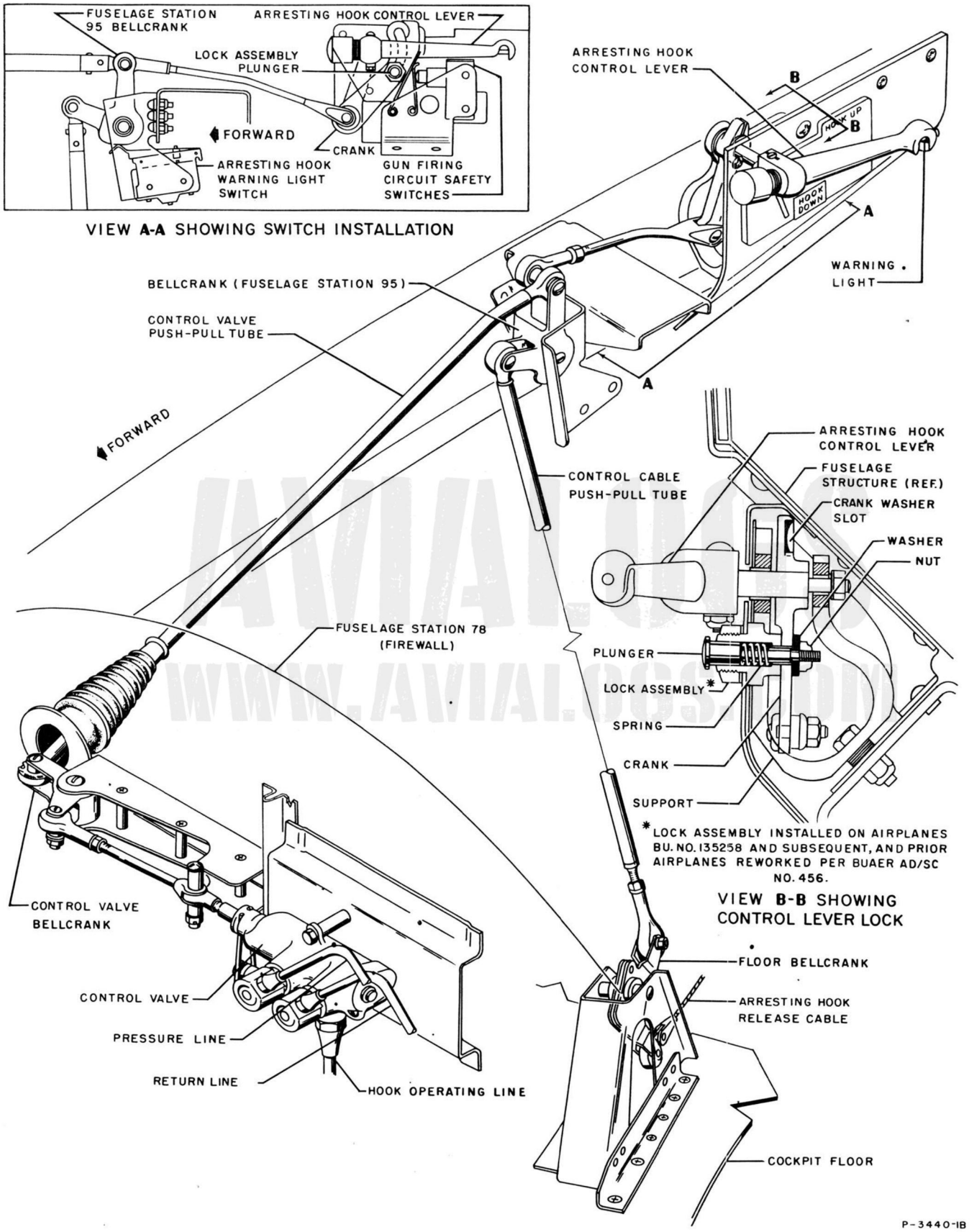


Figure 2–62. Arresting Hook Control System (Sheet 2)

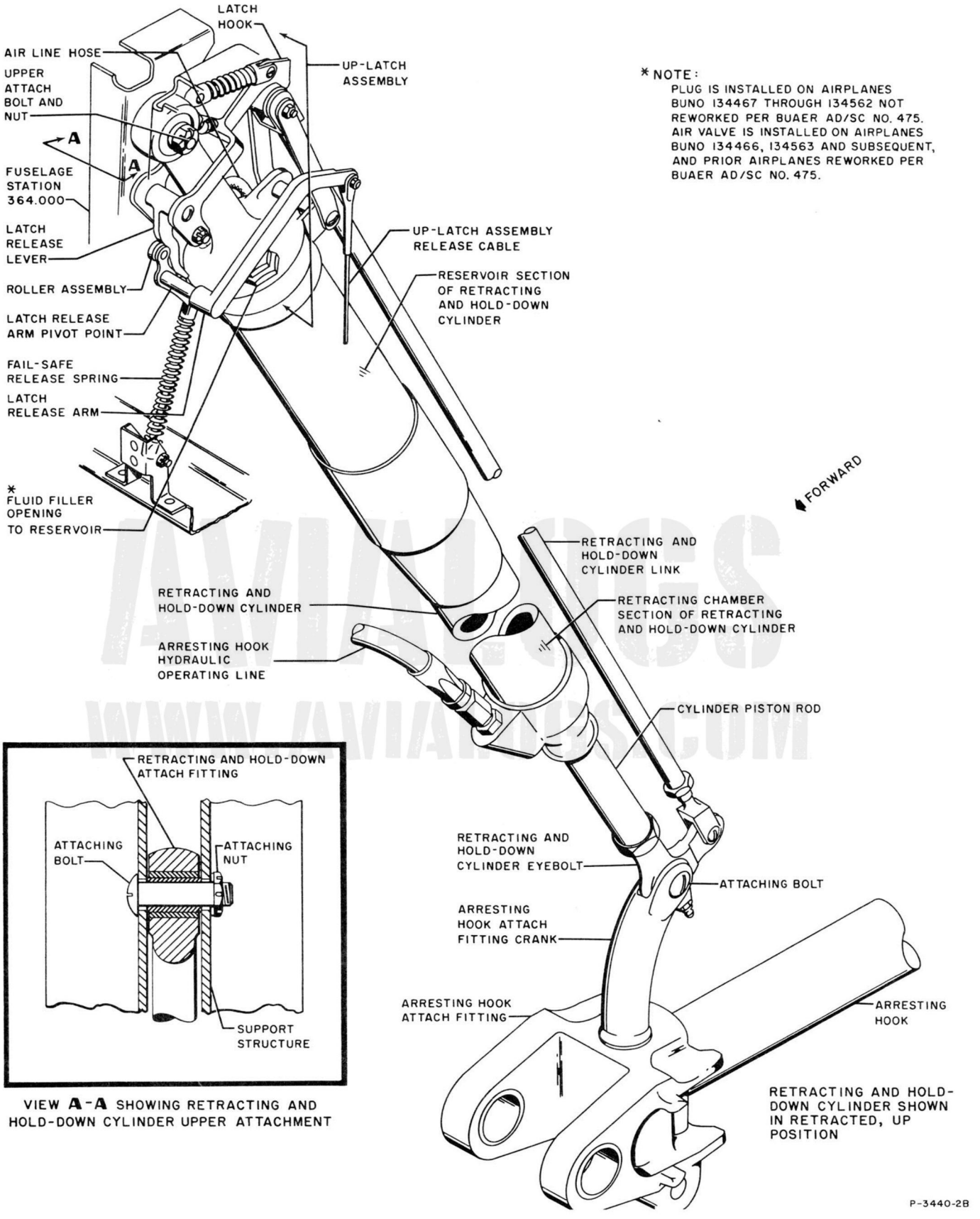
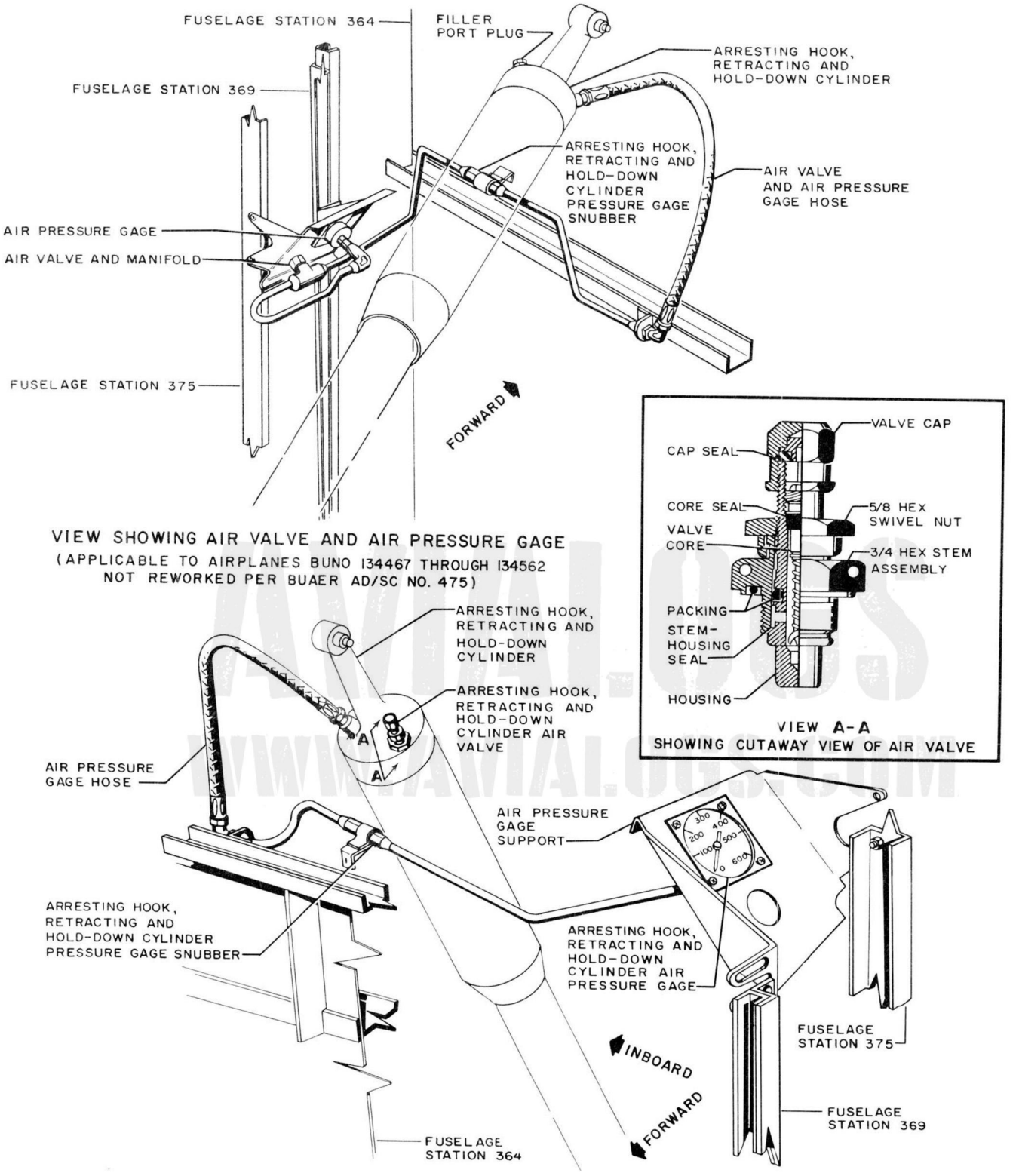


Figure 2–62. Arresting Hook Control System (Sheet 3)



VIEW SHOWING AIR VALVE AND AIR PRESSURE GAGE
(APPLICABLE TO AIRPLANES BUNO 134467 THROUGH 134562 NOT REWORKED PER BUAER AD/SC NO. 475)

VIEW SHOWING AIR VALVE AND AIR PRESSURE GAGE
(APPLICABLE TO AIRPLANES BUNO 134466, 134563 AND SUBSEQUENT AND PRIOR AIRPLANES REWORKED PER BUAER AD/SC NO. 475.)

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Figure 2–62. Arresting Hook Control System (Sheet 4)

movement of the arresting hook control lever crank. When the control lever is placed in "HOOK DOWN," the safety switches are actuated to open the gun firing circuit, thus preventing inadvertent gun firing during arrested landings.

2–490. A lock assembly comprising a plunger, sleeve, spring, washers, and nuts is installed on a support bracket, adjacent to the control lever crank on airplanes BuNo. 135258-135406, 137492-137632, 139606-139821, and 142010-142081. The lock assembly consists of a plunger, sleeve, spring, washers, and nuts. The lock assembly washer engages a cutout in the control lever crank when the control lever is in "HOOK DOWN" position, and prevents inadvertent change of control lever position. The lock assembly plunger is accessible at the arresting hook control panel, and when depressed, the lock assembly releases the control lever and permits return of the control lever to "HOOK UP" position.

2–491. ARRESTING HOOK RELEASE CABLE AND UP-LATCH ASSEMBLY.

2–492. DESCRIPTION. (See figure 2–62.) The arresting hook release cable and up-latch assembly are components of the arresting hook mechanical release system. The arresting hook control lever, located in the cockpit, is mechanically connected through push-pull linkage and bellcranks, to the arresting hook release cable. The release cable connects between a bellcrank on the cockpit floor, at fuselage station 94, and the latch release arm on the arresting hook up-latch assembly. The up-latch assembly is installed aft of fuselage station 364, above the retracting and hold-down cylinder. The up-latch assembly consists of a latch hook and lever, a release arm and roller assembly, a spring, and a spring guide. When the arresting hook control lever is placed in "HOOK DOWN" position, the push-pull linkage and release cable actuate the release arm and roller assembly. The release arm and roller assembly pivots on a bolt, and disengages the latch hook from the tension link. The fail-safe feature of the latch operates when there is no tension in the release cable. The spring and spring guide extend, causing the up-latch release arm and roller assembly to pivot and disengage the latch hook from the tension link. The hydraulic operating system will hold the hook retracted until the control lever is placed in "HOOK DOWN" position. A small spring and pin installed between the latch hook and the structure prevent the latch hook from disengaging the tension link accidentally.

2–493. ARRESTING HOOK CONTROL VALVE.

2–494. DESCRIPTION. (See figure 2–62.) The arresting hook control valve is installed on a bracket on the forward side of fuselage station 78 firewall. The slide type control valve is connected by push-pull linkage to the arresting hook control lever in the cockpit. When the control lever is placed in "HOOK UP," the control valve slide is actuated and the valve directs main hydraulic system pressure through the arresting hook operating line to the lower chamber end of the arresting hook retracting and hold-down cylinder. The cylinder piston then retracts, raising the arresting hook. When the control lever is placed in "HOOK DOWN," the control valve slide is actuated to a position which allows hydraulic pressure in the arresting hook operating line to dissipate into the return line of the main hydraulic system. The subsequent release of pressure on the lower chamber end of the retracting and hold-down cylinder allows the piston to extend, and lower the arresting hook.

2–495. REMOVAL. (See figure 2–62.)

a. Relieve main hydraulic system pressure.

b. Through left-hand upper accessory cowling, disconnect valve slide from control lever linkage.

c. Disconnect and cap hydraulic lines at valve.

d. Remove bolts attaching valve to bracket.

2–496. INSTALLATION. (See figure 2–62.)

a. Through left-hand upper accessory cowling, position valve on bracket and install attaching bolts.

b. Uncap and connect hydraulic lines to valve.

c. Connect valve slide to control lever linkage.

2–497. ARRESTING HOOK CONTROL SYSTEM RESTRICTOR.

2–498. DESCRIPTION. (See figure 2–62.) A restrictor with an .078 diameter orifice is installed in the arresting hook control system operating line between the arresting hook control valve and the arresting hook retracting and hold-down cylinder. The restrictor contains a filter element, and restricts fluid flow in two directions as indicated by arrows on the outer surface of the restrictor body.

2–499. ARRESTING HOOK RETRACTING AND HOLD-DOWN CYLINDER.

2–500. DESCRIPTION. (See figure 2–62.) The retracting and hold-down cylinder is installed in the fuselage, aft of fuselage station 364. The cylinder serves as an actuating cylinder to raise the hook, and as a hook snubber to hold the arresting hook point down against the carrier deck during arrested landings. The cylinder reservoir, an integral part of the cylinder, contains hydraulic fluid (Specification MIL-O-5606, red) and compressed air. When the arresting hook up-latch assembly is actuated to release the retracting and hold-down cylinder from the retracted (up) position, the compressed air and fluid in the cylinder reservoir act on the cylinder piston to extend the piston and, consequently, the arresting hook. The compressed air and fluid also provides the snubbing action of the cylinder. The arresting hook operating line is connected to the lower, chamber end of the retracting and hold-down cylinder. When pressure from the main hydraulic system is supplied, through the arresting hook control valve and operating line, to the

ARRESTING HOOK CONTROL SYSTEM ADJUSTMENT

a. Jack tail of airplane sufficiently high to allow full stroke of arresting hook (52 ± 5 degrees).

b. Establish danger zone around arresting hook area.

ARRESTING HOOK CONTROL LINKAGE ADJUSTMENT

a. Place handle "D" in "UP" position.

b. Place valve "J" slide in extended position detent.

c. Adjust push-pull rod "H" to obtain [redacted] ± 1/16 inch between center line of crank "G" and fuselage station 78.

d. With control handle "D" in "UP" position, adjust push-pull rod "C" to position crank "B" center line in vertical position parallel to station 95.

e. With crank "B" center line in vertical position and crank "G" center line 1 3/32 ± 1/16 inch from station 78, adjust push-pull tube "A" to perfect fit between crank "G" and crank "B."

Note

Move handle "D" to "DOWN" position and observe actuation of valve "J" slide. Valve "J" slide should be in retracted position detent.

f. With handle "D" in "UP" position, adjust push-pull tube "E" between crank "B" and crank "F" to position upper connecting end of crank "F" 3 15/16 ± 1/16 inch from pilot's floor.

ARRESTING HOOK HOLD-DOWN CYLINDER ADJUSTMENT

a. Remove access door from right-hand side of fuselage, aft of station 364.

Note

Make certain hold-down cylinder is properly filled with fluid and air. Refer to section I.

b. Lower arresting hook.

c. Remove lockwire which secures locknut "U" and lockwasher "V."

d. Back off locknut "U" and lockwasher "V."

e. Apply 1500 psi hydraulic pressure to hold-down cylinder operating line using suitable external power equipment.

f. Check hold-down cylinder piston rod "T" to determine that piston rod "T" is not bottomed in hold-down cylinder, due to preloading of arresting hook against bumper assembly. When piston rod "T" is bottomed in hold-down cylinder, turn piston rod "T" counterclockwise, as viewed from piston rod end, until piston rod "T" will not bottom in hold-down cylinder due to preloading of arresting hook against bumper assembly.

Note

It is necessary to relieve hydraulic system pressure on hold-down cylinder when turning hold-down cylinder piston rod "T."

g. Turn hold-down cylinder piston rod "T" clockwise, as viewed from piston rod end so that piston will just bottom in hold-down cylinder when 1500 psi hydraulic pressure is applied to cylinder operating line and hook is preloaded against bumper assembly. Align lockwasher "V" with slot in end of piston rod "T," tighten locknut "U" and secure lockwasher and locknut with lock wire.

ARRESTING HOOK UP-LATCH MECHANISM ADJUSTMENT

a. With arresting hook lowered and hydraulic pressure relieved from system, place handle "D" in "UP" position.

b. Adjust tension on latch release cable "S" to place both rollers of latch release lever "R" in contact with release lever "P."

CAUTION

Make certain latch release arm "M" is properly installed on serrated shaft. Misalignment of arm "M" will displace latch release spring mechanism over-center and prevent latch assembly "K" from engaging latch roller "L" when control handle "D" is in "UP" position.

c. Turn latch release cable "S" turnbuckle to nearest locking position and lockwire turnbuckle.

d. Rotate latch adjusting cam "N" to place latch assembly "K" in lowest position.

e. With 2600 psi maximum hydraulic pressure in hold-down cylinder, and with arresting hook preloaded against bumper, adjust tension link clevis "W" to obtain 1/16 (+ 1/16 — 1/32) inch clearance between latch assembly "K" and aft surface of latch roller "L."

f. Relieve pressure from hold-down cylinder and check to see that preload on arresting hook is maintained by up-latch mechanism. If preload is not maintained, back off locknut "U" and lockwasher "V" and turn piston rod "T" 1/4 turn counterclockwise, as viewed from piston rod end, and repeat adjustment for latch clearance as in step e.

CAUTION

After completing adjustments, lockwire tension link clevis "W," locknut "U" and lockwasher "V."

g. With 2600 psi hydraulic pressure in hold-down cylinder, rotate latch adjusting cam "N" until throat of latch assembly "K" just begins to rise from top of latch roller "L." Rotate adjusting cam in opposite direction to first position where lock hole in latch assembly "K" aligns with hole in flange of cam "N." Lock adjusting cam "N" to latch assembly "K" with rivet.

Note

Install washer on cam attaching bolt to retain adjusting cam locking rivet.

h. Check arresting hook control system for satisfactory operation. With hook latched up and hydraulic pressure relieved from hold-down cylinder operating line, release tension on control cable. Latch release spring must release latch assembly "K" so that hook extends.

i. With hook latched up and hydraulic pressure relieved, place handle "D" in "DOWN" position. Up-latch mechanism must release hook.

Note

Arresting hook should release at 25 ± 10 pounds handle load.

j. Actuate control lever to raise and lower hook, and check operation time: 3 1/2 ± 1/2 seconds to lower hook, 3 (+ 1 — 1/2) seconds to raise hook.

k. Place control lever in "UP" position and raise hook.

l. Lower airplane and remove jack.

Figure 2–62A. Arresting Hook Control System Adjustment (Sheet 1)

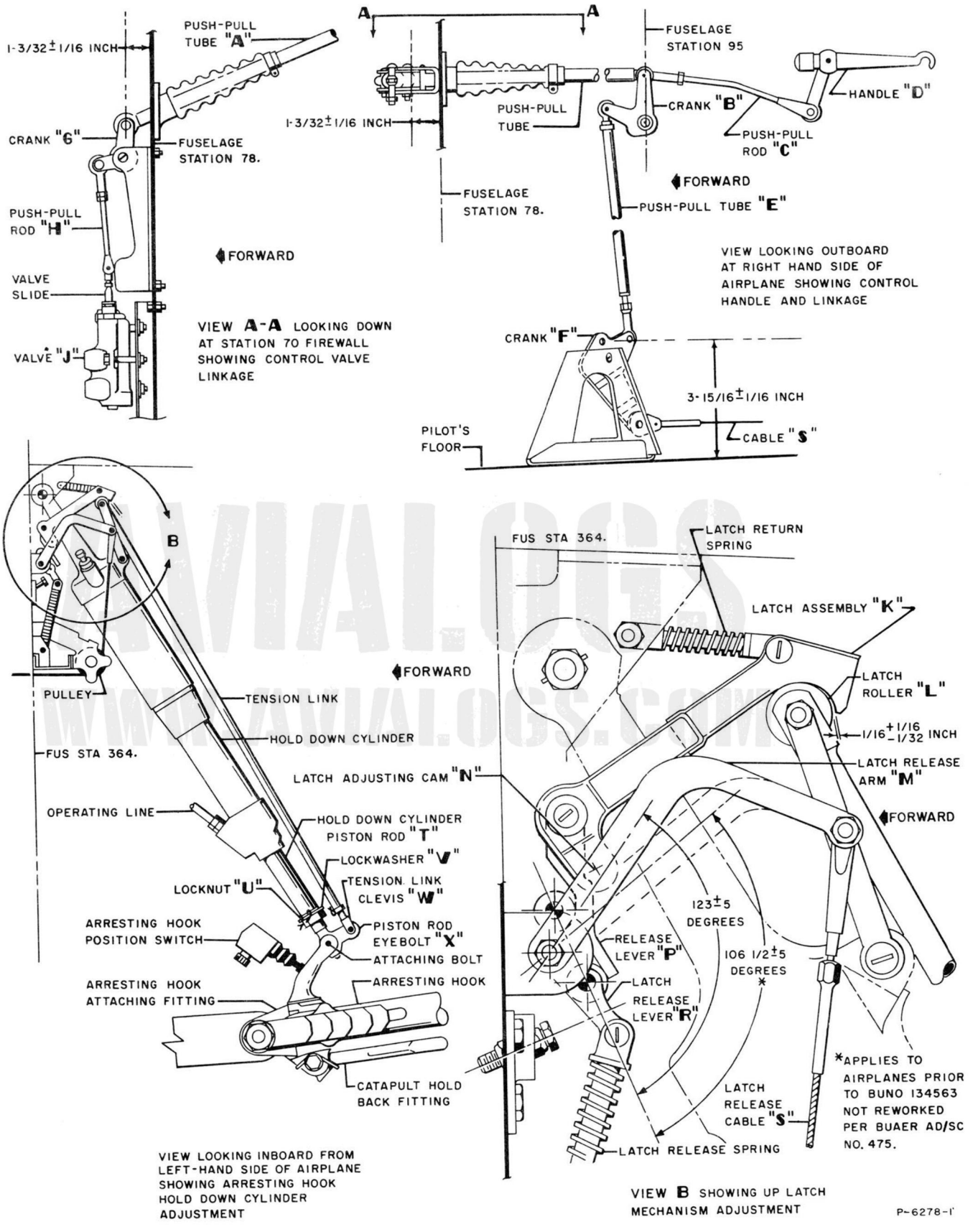

Figure 2–62A. Arresting Hook Control System Adjustment (Sheet 2)

lower, chamber end of the cylinder, the cylinder retracts and raises the arresting hook.

2–501. REMOVAL. (See figure 2–62.)

a. Lower arresting hook.

b. Relieve hydraulic system pressure.

c. Relieve air pressure from cylinder reservoir through air valve.

d. Disconnect air line at retracting and hold-down cylinder.

e. Disconnect and cap hydraulic operating line at retracting and hold-down cylinder.

f. Remove bolt attaching cylinder piston rod eyebolt to arresting hook attach fitting crank.

g. Remove bolt attaching cylinder head to support structure and remove cylinder.

2–502. INSTALLATION. (See figure 2–62.)

a. Place retracting and hold-down cylinder in position at fuselage station 364 and attach cylinder head to support structure with attaching bolt.

b. Connect retracting and hold-down cylinder piston rod eyebolt to arresting hook attach fitting crank with attaching bolt.

c. Uncap and connect operating line to retracting and hold-down cylinder.

d. Connect air line to retracting and hold-down cylinder.

e. Service arresting hook retracting and hold-down cylinder. Refer to section I.

f. Adjust arresting hook control linkage. See figure 2–62A.

2–503. ARRESTING HOOK RETRACTING AND HOLD-DOWN CYLINDER AIR PRESSURE GAGE.

2–504. DESCRIPTION. (See figure 2–62.) An air pressure gage is installed on a support bracket between fuselage stations 369 and 375. The gage indicates in pounds per square inch the amount of air pressure in the retracting and hold-down cylinder reservoir, and it is accessible when the access cover at fuselage station 375 is removed. The correct air pressure for the retracting and hold-down cylinder reservoir is 250 to 270 psi, although the air pressure gage is calibrated up to 600 psi.

2–505. REMOVAL.

a. Relieve air pressure from retracting and hold-down cylinder reservoir through reservoir air valve assembly.

b. Disconnect air line at air pressure gage elbow.

c. Remove air pressure gage attaching screws and remove air pressure gage.

2–506. INSTALLATION.

a. Place air pressure gage in position on support bracket and secure with attaching screws.

b. Connect air line at air pressure gage elbow.

c. Charge retracting and hold-down cylinder reservoir with air through reservoir air valve assembly. Refer to service instructions in section I of manual.

2–507. ARRESTING HOOK RETRACTING AND HOLD-DOWN CYLINDER PRESSURE GAGE SNUBBER.

2–508. DESCRIPTION. (See figure 2–62.) A snubber is installed in the line between the retracting and hold-down cylinder reservoir and the air pressure gage. The snubber is provided to prevent high pressure surges in the retracting and hold-down cylinder reservoir from registering on the air pressure gage, and thus it protects the air pressure gage from being damaged. The snubber has a bore of 0.0995 inch which is plugged with a pin of 0.095 inch diameter.

2–509. ARRESTING HOOK RETRACTING AND HOLD-DOWN CYLINDER AIR VALVE.

2–510. DESCRIPTION. The retracting and hold-down cylinder air valve is a high pressure type valve which contains a housing, stem, core and cap. The stem, core, and cap seal the air passages of the valve housing. The stem-housing seal is opened by backing off on the valve $\frac{5}{8}$-inch swivel nut several turns, and must be accomplished when charging or deflating air through the valve. After charging air through the valve, the valve $\frac{5}{8}$-inch hex swivel nut must be tightened to seat the valve stem against the valve housing and provide the stem-housing seal. The air valve can be removed by dissipating air through the valve and unscrewing the valve $\frac{3}{4}$-inch hex stem nut. On airplanes BuNo. 134467 through 134562, not reworked per BuAer AD/SC No. 475, the air valve is installed on the air pressure gage support bracket, adjacent to the air pressure gage. On airplanes BuNo. 134466, 134563 and subsequent, and prior airplanes reworked per BuAer AD/SC No. 475, the air valve is installed in the port on the upper, reservoir end of the retracting and hold-down cylinder.

2–511. FILLING AND INFLATING ARRESTING HOOK HOLD-DOWN CYLINDER. Refer to service instructions in section I of this manual.